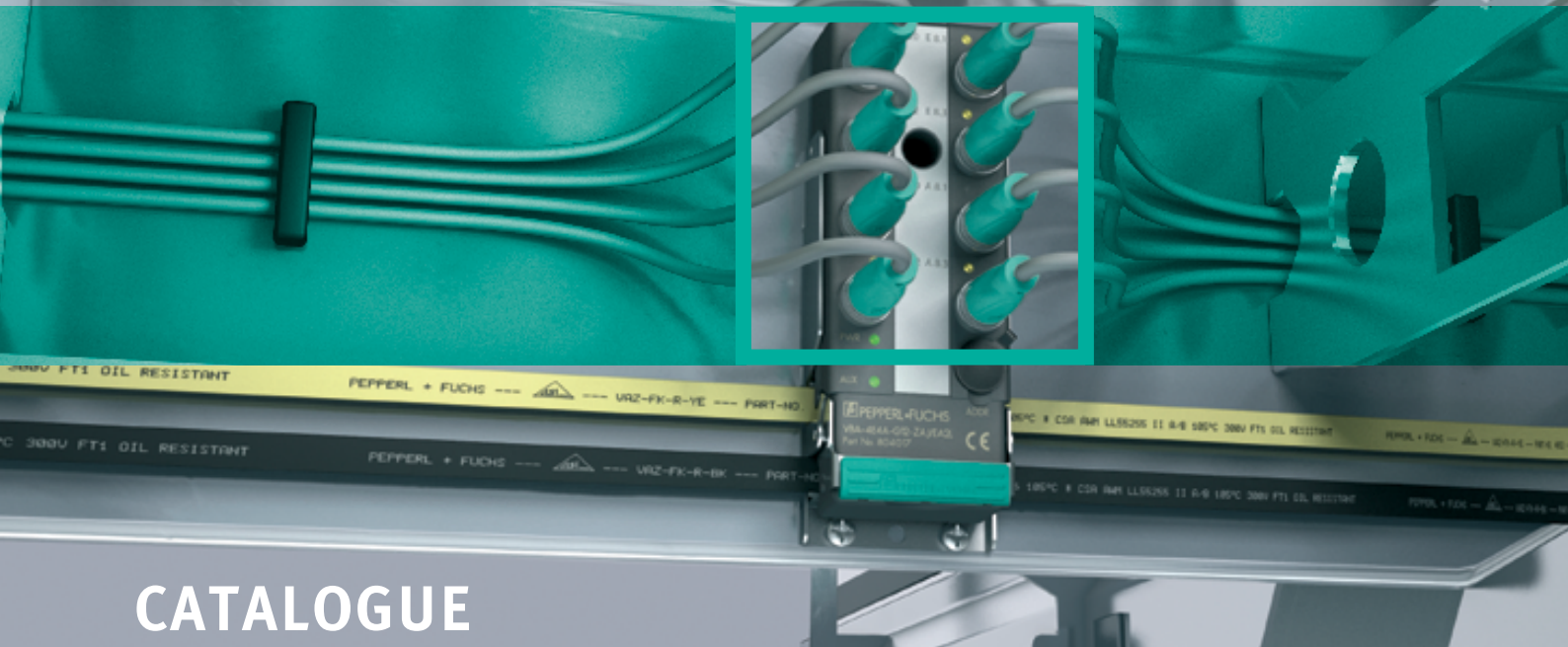
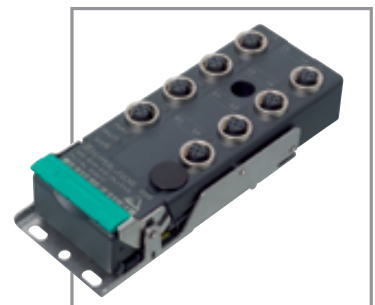


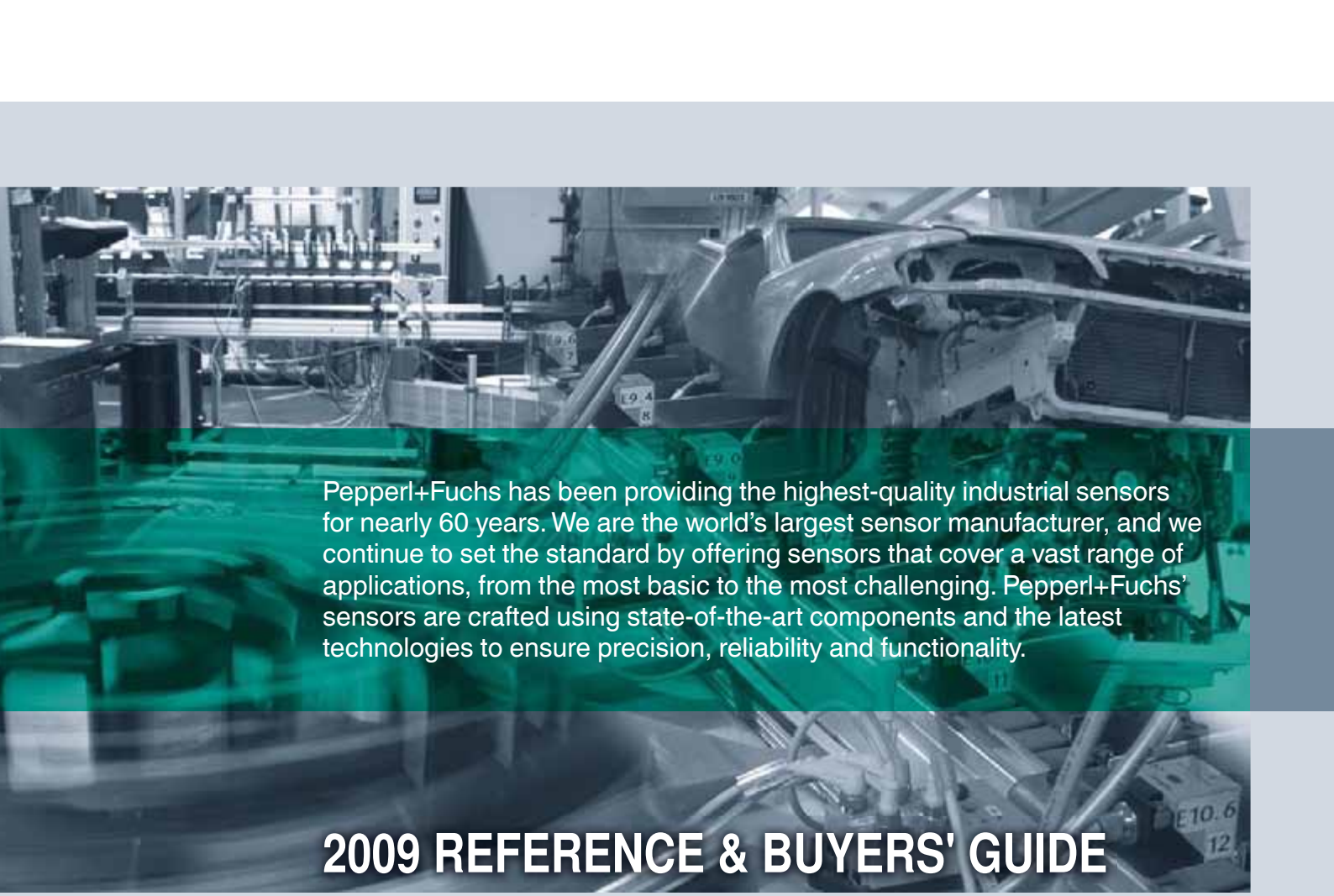


# CATALOGUE

## AS-INTERFACE

Edition 2009/2010





Pepperl+Fuchs has been providing the highest-quality industrial sensors for nearly 60 years. We are the world's largest sensor manufacturer, and we continue to set the standard by offering sensors that cover a vast range of applications, from the most basic to the most challenging. Pepperl+Fuchs' sensors are crafted using state-of-the-art components and the latest technologies to ensure precision, reliability and functionality.

## **2009 REFERENCE & BUYERS' GUIDE**

### **AS-INTERFACE PRODUCTS**

|                                          |            |
|------------------------------------------|------------|
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## Automation using networks

The history of automation shows that innovative technologies often follow a similar path: before becoming accepted, they are greeted with skepticism. Before the PLC became widely accepted in the 1970s, automation depended heavily on relays to perform logic tasks. In hind site, the logic tasks performed using relays were limited and made process changes difficult. Any changes to the logical operation required moving wires, adding additional relays, and possibly creating more panel space. All of that changed when Modicon introduced the Programmable Logic Controller (PLC) in the late 1960s.

Many control professionals were first skeptical of the PLC, questioning whether a single electrical component could replace electromechanical devices. They asked:

- Would the PLC be reliable enough to run a line?
- How difficult would it be to find errors and problems?
- Would the dedicated programming panels needed to setup the logic create another level of problems?
- Would the PLC present an affordable solution?
- Why would anybody want to change a logic system that worked?

While those were valid questions at the time, the PLC has since proven to be reliable and very capable of controlling complex automation systems. Advanced diagnostics and PC based programming with the

ability to keep programmers from making many basic mistakes helped to establish the PLC. In addition, many electronic solutions, including PLCs and PCs, are extremely affordable today, offering fast set-up time and reduced panel space over relays.

Perhaps the lesson to be learned with the introduction and eventual success of the PLC is this: many industry professionals must be convinced that innovations will improve their processes before making changes. Like the PLC, two other advancements in automation, I/O networks and more recently, the networking of safety devices such as light curtains, door interlock switches and safety e-stops, were received with a similar level of skepticism and doubt.

## History repeats itself

The generation of control engineers who bucked tradition to bring us the PLC suddenly found themselves involved in another paradigm shift in 1987, when INTERBUS, the first I/O network for industrial applications was introduced, with many other such networks soon to follow. Some automation professionals embraced the concept while others adopted the mindset of their colleagues of the previous generation, repeating the concerns they once worked to dispel.

- Would networked I/O be reliable enough to run a line?

- How difficult would it be to find errors and problems?
- Would the additional electronics needed to setup the network just create another level of problems?
- Would it be an affordable solution?
- Why would anybody want to change an I/O system that worked?

Not only are these the same questions asked previously, but so are the answers. Of course, not every I/O network proposed at the time was able to address reliability concerns adequately, and some poorly designed solutions disappeared. Now, twenty years later, we know that well-designed I/O networks offer excellent reliability, and increased setup flexibility: the same features that aided the transition to PLCs. History had repeated itself.

## Networks in the New Millennium

Today, a few networks stand out in terms of features and flexibility: PROFIBUS, CC-Link, DeviceNet, Ethernet, and AS-Interface. Those familiar with networks know that this network quintet dominates the world market with a combined strength of close to 40 million installed nodes! However, it is less well-known that AS-Interface stands out in a very important way: AS-Interface was designed not to compete with the others, but rather to enhance them. To understand how AS-Interface can work to improve these higher level networks, it helps to compare automation networks with another movement system we are familiar with: human transportation systems.

## Optimizing Flow

Moving data is comparable to moving people around the country using various transportation systems. Traveling cross country might include: driving to the airport, boarding a plane, flying to another airport, and finally using another car to reach the destination. While some people prefer driving the entire distance, nobody expects an airline to pick them up at home and drop them off at their final destination. Therefore, we have become accustomed to being 're-packaged' in various vehicles, and with other travelers. In other words: the traveler starts out on a system that allows small units to be transported quickly to a consolidator. Here units, arriving from all different directions are re-packaged into larger packets, moved at high speed to another consolidator, and again taken apart and sent on their final leg of the trip. Clearly, this structured approach optimizes flow, reduces the time it takes to reach a destination, and increases efficiency.

AS-Interface is the road system connecting highly distributed I/O to a data consolidator, handing it over to an upper level network designed to handle large amounts of data, which moves it to the PLC

for processing and analysis. AS-Interface enhances networks such as DeviceNet because it collects I/O data to create large bundles, ensuring that it does not lose efficiency by transmitting a few data bits in its multi-byte size cargo space. PROFIBUS also works better because AS-Interface removes the stringent requirement of adhering to a single topology (daisy-chain), allowing I/O to be placed anywhere needed. We call this topology-free networking.

In its 15 year history, AS-Interface has become the accepted universal feeder system for data. With over 13 million field nodes, AS-Interface is well past the initial acceptance phase, having proven its effectiveness in a wide variety of applications. This Reference & Buyer's Guide focuses on the many reasons for its success, including its flexibility and simplicity, exceptional noise immunity, availability of a full electromechanical installation system, and its low price point.

## Networking Safety

Today, another relatively new and revolutionary idea in automation concerns the way safety devices are connected. The concept of transmitting safety data over a network, while technologically a huge step, is ultimately just another example of technological innovation in automation. PLCs replaced relay logic, networks replaced hardwired I/O, and networking safety devices will most certainly make hardwired safety a relic of our times.

Again AS-Interface stands out, as the I/O network enhancing the functionality of upper level solutions. With AS-Interface Safety at Work – the base technology that allows AS-Interface to transmit safety data in applications up to Category 4 or Safety Integrity Level (SIL) 3 – DeviceNet, PROFIBUS, CC-Link and any industrial Ethernet can now benefit in more ways than ever from the flexibility and simplicity of AS-Interface.

## The Future

It is very difficult to predict what technological advances will shape the world of automation over the next decade. It is certainly not too early to recognize Ethernet as one of the technologies that will significantly influence the way control systems are designed and built. But irrespective of what the automation and networking future will hold, AS-Interface will surely be a part of it. As the only true, universal I/O level network, working flawlessly with all important upper level solutions, addressing the most important demands of the automation market (broad support world wide, excellent troubleshooting features, flexible installation, and low cost, to name just a few), it has all the great features needed to be the preferred partner for today's and tomorrow's automation networks.



# Gateways



|                           | Enhanced                                                                                                                                              | Enhanced with Safety Controller                                                                                                                | Basic                                                                                                                                                             | Basic                                                                                                                                          |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| See Pages                 | 36, 40, 47, 48, 52                                                                                                                                    | 41                                                                                                                                             | 36, 40, 52                                                                                                                                                        | 40                                                                                                                                             |
| Highlights                | <ul style="list-style-type: none"> <li>• Duplicate address detection and diagnostic port</li> <li>• One and two network versions available</li> </ul> | <ul style="list-style-type: none"> <li>• Duplicate address detection and diagnostic port</li> <li>• 16 independent release circuits</li> </ul> | <ul style="list-style-type: none"> <li>• RS-232 version comes with stand-alone control functionality</li> <li>• One and two network versions available</li> </ul> | <ul style="list-style-type: none"> <li>• Low-profile, slim housing with top-mount connector</li> <li>• LCD display with pushbuttons</li> </ul> |
| Specification and Profile | 3.0 (M4)                                                                                                                                              | 3.0 (M4)                                                                                                                                       | 3.0 (M4)                                                                                                                                                          | 3.0 (M4)                                                                                                                                       |
| PLC Connectivity          |                                                                                                                                                       |                                                                                                                                                |                                                                                                                                                                   |                                                                                                                                                |
| EtherNet/IP               | ■                                                                                                                                                     |                                                                                                                                                |                                                                                                                                                                   |                                                                                                                                                |
| Modbus/TCP                | ■                                                                                                                                                     |                                                                                                                                                |                                                                                                                                                                   |                                                                                                                                                |
| PROFINET                  | ■                                                                                                                                                     |                                                                                                                                                |                                                                                                                                                                   |                                                                                                                                                |
| PROFIBUS                  | ■                                                                                                                                                     | ■                                                                                                                                              | ■                                                                                                                                                                 | ■                                                                                                                                              |
| DeviceNet                 | ■                                                                                                                                                     |                                                                                                                                                | ■                                                                                                                                                                 |                                                                                                                                                |
| Modbus ASCII/RTU          | ■                                                                                                                                                     |                                                                                                                                                |                                                                                                                                                                   |                                                                                                                                                |
| RS-232                    |                                                                                                                                                       |                                                                                                                                                | ■                                                                                                                                                                 |                                                                                                                                                |
| Diagnostics               |                                                                                                                                                       |                                                                                                                                                |                                                                                                                                                                   |                                                                                                                                                |
| RS-232 Port               | ■                                                                                                                                                     | ■                                                                                                                                              |                                                                                                                                                                   |                                                                                                                                                |
| Ground Fault Detection    | ■                                                                                                                                                     | ■                                                                                                                                              | ■                                                                                                                                                                 | ■                                                                                                                                              |
| Noise Detection           | ■                                                                                                                                                     | ■                                                                                                                                              | ■                                                                                                                                                                 | ■                                                                                                                                              |
| Duplicate Addr. Detection | ■                                                                                                                                                     | ■                                                                                                                                              |                                                                                                                                                                   |                                                                                                                                                |
| Over Voltage Detection    | ■                                                                                                                                                     | ■                                                                                                                                              | ■                                                                                                                                                                 | ■                                                                                                                                              |
| Approvals                 | CE c UL US 15°                                                                                                                                        | CE c UL US 15°                                                                                                                                 | CE c UL US 15°                                                                                                                                                    | CE c UL US 15°                                                                                                                                 |
| Safety                    |                                                                                                                                                       |                                                                                                                                                |                                                                                                                                                                   |                                                                                                                                                |
| Safe Outputs (onboard)    |                                                                                                                                                       | 2 relay and 2 electronic                                                                                                                       |                                                                                                                                                                   |                                                                                                                                                |
| Safe AS-i Output Channels |                                                                                                                                                       | 16                                                                                                                                             |                                                                                                                                                                   |                                                                                                                                                |
| Safe Network Coupling     |                                                                                                                                                       | ■                                                                                                                                              |                                                                                                                                                                   |                                                                                                                                                |
| Scan 2 Networks           |                                                                                                                                                       | ■                                                                                                                                              |                                                                                                                                                                   |                                                                                                                                                |
| Memory Card               |                                                                                                                                                       | ■                                                                                                                                              |                                                                                                                                                                   |                                                                                                                                                |
| Graphical Display         |                                                                                                                                                       | ■                                                                                                                                              |                                                                                                                                                                   |                                                                                                                                                |
| CAT 4/SIL 3 Approved      |                                                                                                                                                       | ■                                                                                                                                              |                                                                                                                                                                   |                                                                                                                                                |

## Scanner Cards



**Allen-Bradley**

|                           |                                                                                                                                                   |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| See Page                  | 29                                                                                                                                                |
| Highlights                | <ul style="list-style-type: none"> <li>• AS-i connected to backplane of PLC</li> <li>• Many scanner cards can be connected to one rack</li> </ul> |
| Specification and Profile | 3.0 (M4)                                                                                                                                          |
| PLC Connectivity          |                                                                                                                                                   |
| SLC503/04/05              | ■                                                                                                                                                 |
| MicroLogix 1500           | ■                                                                                                                                                 |
| ControlLogix              | ■                                                                                                                                                 |
| CompactLogix              | ■                                                                                                                                                 |
| Diagnostics               |                                                                                                                                                   |
| Diagnostic Port           | ■                                                                                                                                                 |
| Ground Fault Detection    |                                                                                                                                                   |
| Noise Detection           |                                                                                                                                                   |
| Duplicate Addr. Detection |                                                                                                                                                   |
| Over Voltage Detection    |                                                                                                                                                   |
| Approvals                 |                                                                                                                                                   |

## Network Extension



**Repeaters**

|                          |                                                                                                                                                                            |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| See Page                 | 67                                                                                                                                                                         |
| Highlights               | <ul style="list-style-type: none"> <li>• Field mount or enclosure mount housings</li> <li>• Built-in terminator extends the first segment to 200 m, 300 m total</li> </ul> |
| Length of First Segment  | 100 m, 200 m                                                                                                                                                               |
| Length of Second Segment | 100 m                                                                                                                                                                      |
| Protection Rating        | IP20 and IP67                                                                                                                                                              |
| Communication Monitoring | ■                                                                                                                                                                          |
| AS-i Connection          | Flat cable piercing or terminals                                                                                                                                           |



**Terminator**



**Tuner**

|                                          |                                                                                                                                             |                                                                                                                                                           |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| See Page                                 | 206                                                                                                                                         | 206                                                                                                                                                       |
| Highlights                               | <ul style="list-style-type: none"> <li>• Extends linear network to 200 m without repeater</li> <li>• Low voltage diagnostic LEDs</li> </ul> | <ul style="list-style-type: none"> <li>• Extends linear network to 300 m without repeater</li> <li>• Network communication and diagnostic LEDs</li> </ul> |
| Length of Segment (linear topology only) | 200 m                                                                                                                                       | 300 m                                                                                                                                                     |
| Protection Rating                        | IP65                                                                                                                                        | IP65                                                                                                                                                      |
| Communication Monitoring                 |                                                                                                                                             | ■                                                                                                                                                         |
| AS-i Connection                          | M12 quick disconnect                                                                                                                        | Flat cable piercing or M12 quick disconnect                                                                                                               |

**Want more information?**

Simply go to: [www.sensing.net/as-interface](http://www.sensing.net/as-interface)

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## I/O Modules

|                               |                                   |                                                                                              |                                                     |                                                                           |                                                                                             |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                               | Flat (G2)                                                                                                          | Flat (G12)                                                                                                                                                                    | Field (G4)                                                                                                                            | Compact (G16)                                                                                                                                                | Enclosure (KE)                                                                                                                                                                 |
| See Page                      | 75                                                                                                                 | 80                                                                                                                                                                            | 84                                                                                                                                    | 88                                                                                                                                                           | 91                                                                                                                                                                             |
| Highlights                    | <ul style="list-style-type: none"> <li>• Low-profile flat housing</li> <li>• Integrated addressing jack</li> </ul> | <ul style="list-style-type: none"> <li>• Overload indication at each output</li> <li>• No tools required for installation</li> <li>• Metal M12 SPEEDCON connectors</li> </ul> | <ul style="list-style-type: none"> <li>• Input wires can be cut to exact length</li> <li>• Anti-vibration spring terminals</li> </ul> | <ul style="list-style-type: none"> <li>• Smallest field mount housing offered</li> <li>• Waterproof potted housing</li> <li>• Metal M8 connectors</li> </ul> | <ul style="list-style-type: none"> <li>• Thinnest housing offered</li> <li>• AS-Interface or external power, switchable</li> <li>• Approved for hazardous locations</li> </ul> |
| AS-Interface 3.0 (4 In/4 Out) | ■                                                                                                                  | ■                                                                                                                                                                             | ■                                                                                                                                     | ■                                                                                                                                                            | ■                                                                                                                                                                              |
| Address Range                 | 1-31 A/B                                                                                                           | 1-31 A/B                                                                                                                                                                      | 1-31 A/B                                                                                                                              | 1-31 A/B                                                                                                                                                     | 1-31 A/B                                                                                                                                                                       |
| I/O Mix                       | 4 in, 4 in/2 out, 4 in/4 out, 4 in/3 out, 2 in/2 out, 8 in                                                         | 4 in, 4 in/4 out, 2 in/2 out, 4 out, 8 in                                                                                                                                     | 4 in, 4 in/4 out, 4 in/3 out, 2 in/2 out                                                                                              | 4 in, 4 in/4 out                                                                                                                                             | 4 in, 4 in/4 out, 4 in/3 out                                                                                                                                                   |
| Input Type                    | 2-, 3-, 4-wire, dry contact                                                                                        | 2-, 3-, 4-wire, dry contact                                                                                                                                                   | 2-, 3-, 4-wire, dry contact                                                                                                           | 2-, 3-wire, dry contact                                                                                                                                      | 2-, 3-, 4-wire, dry contact                                                                                                                                                    |
| Input Power Supplied By       | AS-Interface/aux.                                                                                                  | AS-Interface/aux.                                                                                                                                                             | AS-Interface                                                                                                                          | AS-Interface                                                                                                                                                 | AS-Interface/ext.                                                                                                                                                              |
| Sensor Type                   | PNP                                                                                                                | PNP                                                                                                                                                                           | PNP                                                                                                                                   | PNP                                                                                                                                                          | PNP/NPN                                                                                                                                                                        |
| Output Power Supplied By      | AS-Interface/aux.                                                                                                  | Auxiliary                                                                                                                                                                     | Auxiliary                                                                                                                             | Auxiliary                                                                                                                                                    | AS-Interface/aux.                                                                                                                                                              |
| Output Type                   | PNP                                                                                                                | PNP                                                                                                                                                                           | PNP                                                                                                                                   | PNP                                                                                                                                                          | PNP, NPN, Relay                                                                                                                                                                |
| Approvals                     |                                 |                                                                                            |                                                   |                                                                         | <br>Class 1 Div 2, groups A,B,C,D                                                         |
| Protection                    | IP67                                                                                                               | IP67                                                                                                                                                                          | IP65, IP67                                                                                                                            | IP69K                                                                                                                                                        | IP20                                                                                                                                                                           |
| I/O Connection Method         | M12 quick disconnect                                                                                               | M12 (SPEEDCON compatible)                                                                                                                                                     | Spring terminals                                                                                                                      | M8 quick disconnect                                                                                                                                          | Keyed, removable colored terminals                                                                                                                                             |







**Junction Box (KE1)**



**Junction Box (CB1)**



**Analog (G4, KE2)**



**Pushbuttons and Stack Lights**



**Pneumatic**



**Drive Control**

| 95                                                                                                                                                                                      | 95                                                                                                                                               | 99                                                                                                                                                             | 105                                                                                                                                                                                   | 111                                                                                                                                                 | 115                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Low-profile housing</li> <li>• Easy connection for pushbuttons &amp; pilot lights</li> <li>• Anti-vibration spring terminals option</li> </ul> | <ul style="list-style-type: none"> <li>• Lowest profile housing available</li> <li>• Fully potted</li> <li>• Mounting strips included</li> </ul> | <ul style="list-style-type: none"> <li>• Scaled automatically 0-10,000 or 4,000-20,000</li> <li>• AS-Interface or auxiliary power options available</li> </ul> | <ul style="list-style-type: none"> <li>• Different colored button covers available</li> <li>• Red, yellow, green, blue, clear stack light options</li> <li>• Audible alarm</li> </ul> | <ul style="list-style-type: none"> <li>• 4 inputs available on 2 connectors</li> <li>• Pneumatics powered from AS-Interface or auxiliary</li> </ul> | <ul style="list-style-type: none"> <li>• All auxiliary powered</li> <li>• M25 conduit adapter included</li> <li>• Stainless steel cylindrical housing</li> </ul> |
| 1-31 A/B                                                                                                                                                                                | 1-31 A/B                                                                                                                                         | 1-31 A/B                                                                                                                                                       | 1-31 A/B                                                                                                                                                                              | 1-31 A/B                                                                                                                                            | 1-31 A/B                                                                                                                                                         |
| 4 in, 4 in/2 out, 4 in/4 out                                                                                                                                                            | 4 in/4 out                                                                                                                                       | 4 in, 2 in, 2 out                                                                                                                                              | 2 in/2 out, 4 out                                                                                                                                                                     | 4 in/2 out                                                                                                                                          | 1 in/3 out                                                                                                                                                       |
| 2-, 3-wire, dry contact                                                                                                                                                                 | 2-, 3-, 4-wire, dry contact                                                                                                                      | 2-, 3-, 4-wire                                                                                                                                                 | LEDs, pushbuttons                                                                                                                                                                     | 2-, 3-, 4-wire, dry contact                                                                                                                         | 2-, 3-, 4-wire, dry contact                                                                                                                                      |
| AS-Interface/aux.                                                                                                                                                                       | AS-Interface                                                                                                                                     | AS-Interface/aux.                                                                                                                                              | AS-Interface                                                                                                                                                                          | AS-Interface                                                                                                                                        | Auxiliary                                                                                                                                                        |
| PNP                                                                                                                                                                                     | PNP                                                                                                                                              | 4-20 mA, 0-10 V or PT100                                                                                                                                       | Pushbuttons                                                                                                                                                                           | PNP                                                                                                                                                 | PNP                                                                                                                                                              |
| Auxiliary                                                                                                                                                                               | AS-Interface                                                                                                                                     | AS-Interface/aux.                                                                                                                                              | AS-Interface/aux.                                                                                                                                                                     | AS-Interface/aux.                                                                                                                                   | Auxiliary                                                                                                                                                        |
| PNP                                                                                                                                                                                     | PNP                                                                                                                                              | 4-20 mA or 0-10 V                                                                                                                                              | LEDs                                                                                                                                                                                  | Pneumatic                                                                                                                                           | PNP                                                                                                                                                              |
|                                                                                                                                                                                         |                                                                                                                                                  |                                                                                                                                                                |                                                                                                                                                                                       |                                                                                                                                                     |                                                                                                                                                                  |
| IP20                                                                                                                                                                                    | IP20                                                                                                                                             | IP20, IP67                                                                                                                                                     | IP67                                                                                                                                                                                  | IP65                                                                                                                                                | IP67                                                                                                                                                             |
| Keyed, removable colored terminals                                                                                                                                                      | Removable terminals                                                                                                                              | Terminals                                                                                                                                                      |                                                                                                                                                                                       | M12 quick disconnect, 8 mm pneumatic                                                                                                                | 20 cm cabled                                                                                                                                                     |

## Accessories



### Flat Cable Splitters

Connects or splits two pieces of flat cable,

8 A capacity.



### Flat to M12 Adapters

Connects one or two flat cables to an M12 connector or

pigtail. Many lengths and connector styles available.



### Handheld Programmer

A must for every network. Can set AS-i addresses,

read inputs and set outputs of a single AS-i node.

## Want more information?

Simply go to: [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)

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## Safety Monitors



**2-Channel Basic**



**16-Channel Enhanced**

|                           |                                                                                                                                  |                                                                                                                                                    |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| See Page                  | 119                                                                                                                              | 41, 119                                                                                                                                            |
| Highlights                | <ul style="list-style-type: none"> <li>• Scans up to 31 safe input modules</li> <li>• 1 channel for safe AS-i outputs</li> </ul> | <ul style="list-style-type: none"> <li>• Scans up to 62 safe input modules on two networks</li> <li>• 16 channels for safe AS-i outputs</li> </ul> |
| Safe Outputs (onboard)    | 1 or 2 relay                                                                                                                     | 2 relay and 2 electronic                                                                                                                           |
| Safe AS-i Output Channels | 1                                                                                                                                | 16                                                                                                                                                 |
| Safe Network Coupling     | ■                                                                                                                                | ■                                                                                                                                                  |
| Scan 2 Networks           |                                                                                                                                  | ■                                                                                                                                                  |
| Memory Card               |                                                                                                                                  | ■                                                                                                                                                  |
| Graphical Display         |                                                                                                                                  | ■                                                                                                                                                  |
| CAT 4/SIL 3 Approved      | ■                                                                                                                                | ■                                                                                                                                                  |

## Safety Modules



**Safe Inputs**



**Safe Outputs**



**E-Stops**

|                         |                                                                                                                                                                                                                               |                                                                                                                                                                                                                       |                                                                                                                                                                                                                |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| See Page                | 123                                                                                                                                                                                                                           | 123                                                                                                                                                                                                                   | 132                                                                                                                                                                                                            |
| Highlights              | <ul style="list-style-type: none"> <li>• Dry-contact inputs for connection of standard e-stops and gate switches</li> <li>• Electronic inputs for connection of light curtains or any device with electronic OSSDs</li> </ul> | <ul style="list-style-type: none"> <li>• One set of redundant relay outputs</li> <li>• 4 inputs, one can be for EDM</li> <li>• One address for safety output channel</li> <li>• One A/B address for inputs</li> </ul> | <ul style="list-style-type: none"> <li>• AS-i safety e-stop connects directly to AS-i cable</li> <li>• Field mount or panel mount e-stop housings</li> <li>• Available with or without illumination</li> </ul> |
| Safe Inputs             | 1 or 2                                                                                                                                                                                                                        | -                                                                                                                                                                                                                     | 1 E-Stop                                                                                                                                                                                                       |
| Safe Relay Outputs      | -                                                                                                                                                                                                                             | 1                                                                                                                                                                                                                     |                                                                                                                                                                                                                |
| Standard Inputs/Outputs | 2-out                                                                                                                                                                                                                         | 4-in/1-out                                                                                                                                                                                                            | 1-out                                                                                                                                                                                                          |
| CAT 4/SIL 3 Approved    | ■                                                                                                                                                                                                                             | ■                                                                                                                                                                                                                     | ■                                                                                                                                                                                                              |

# Safety Interlock Switches



**Mechanical**



**Coded Magnetic**



**RFID**

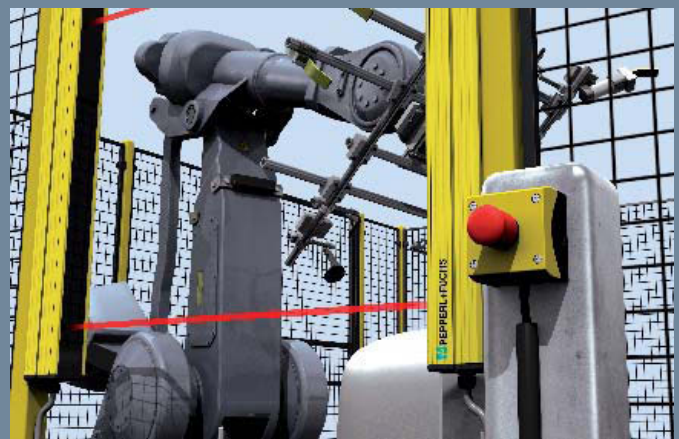
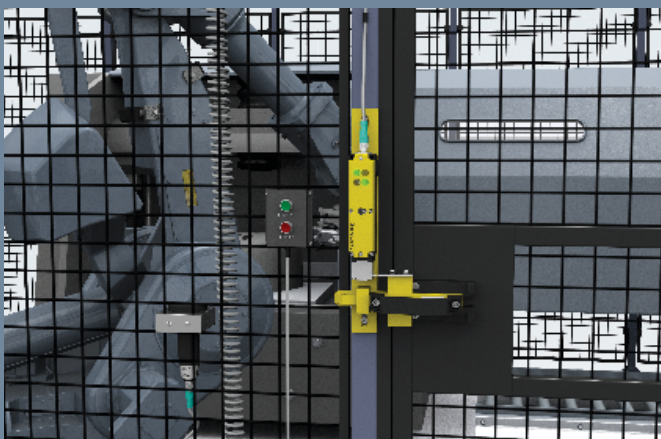


**Enabling Switch**

| See Page             | 135                                                                                                                                        | 141                                                                                                                                                                                                          | 144                                                                                                                                                                                                                                                             | 148                                                                                                                                              |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Highlights           | <ul style="list-style-type: none"> <li>• Steel actuator head</li> <li>• Key and coil monitoring</li> <li>• High-visibility LEDs</li> </ul> | <ul style="list-style-type: none"> <li>• Direct connection to AS-Interface</li> <li>• 1 m pigtail integrated</li> <li>• IP69K good for wash-down applications</li> <li>• Small mounting footprint</li> </ul> | <ul style="list-style-type: none"> <li>• High-end RFID solution replaces magnetic interlocks</li> <li>• Up to 4 doors monitored from one control unit</li> <li>• Long read range for worry free alignment</li> <li>• High-visibility diagnostic LEDs</li> </ul> | <ul style="list-style-type: none"> <li>• Lightweight enabling switch</li> <li>• Rugged rubberized housing</li> <li>• Ergonomic design</li> </ul> |
| Address Range        | 1-31                                                                                                                                       | 1-31                                                                                                                                                                                                         | 1-31                                                                                                                                                                                                                                                            | 1-31                                                                                                                                             |
| Input Type           | Safety, mechanical                                                                                                                         | Safety, magnetic                                                                                                                                                                                             | Safety, RFID                                                                                                                                                                                                                                                    | Safety, mechanical                                                                                                                               |
| Input Activations    | 1,000,000                                                                                                                                  | 100,000,000                                                                                                                                                                                                  | Unlimited                                                                                                                                                                                                                                                       | 100,000                                                                                                                                          |
| Input Powered By     | AS-Interface                                                                                                                               | AS-Interface                                                                                                                                                                                                 | AS-Interface                                                                                                                                                                                                                                                    | AS-Interface                                                                                                                                     |
| Output Type          | Solenoid/LEDs                                                                                                                              |                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                 |                                                                                                                                                  |
| Output Powered By    | AS-Interface/aux.                                                                                                                          |                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                 |                                                                                                                                                  |
| CAT 4/SIL 3 Approved | ■                                                                                                                                          | ■                                                                                                                                                                                                            | ■                                                                                                                                                                                                                                                               | ■                                                                                                                                                |

## Want more information?

Simply go to: [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com)



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**PEPPERL+FUCHS**  
SENSING YOUR NEEDS

## Power Supplies



**AS-i**

**AS-i with Ground Fault Detection**

**Power Conditioners**

**24 VDC**

|                           |                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                   |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| See Page                  | 58                                                                                                                                                                                                        | 61                                                                                                                                                                                                                                                                                                                  | 64                                                                                                                                                                                                                                              | 70                                                                                                                                                                                                                                                |
| Highlights                | <ul style="list-style-type: none"> <li>• Class 2 power option</li> <li>• Power/overload LEDs</li> <li>• High-output current in slim package</li> <li>• Low-current option for smaller networks</li> </ul> | <ul style="list-style-type: none"> <li>• Ground fault simulator button with potential-free electronic output</li> <li>• Rear and side mounting options</li> <li>• Switch-selectable power disconnect on ground fault</li> <li>• Spring terminals and metal DIN rail clip for high-vibration environments</li> </ul> | <ul style="list-style-type: none"> <li>• Two networks or two segments can connect to one conditioner</li> <li>• Enclosure or field-mount options</li> <li>• LED low-voltage indication</li> <li>• 2.8 A and 4 A field-mount versions</li> </ul> | <ul style="list-style-type: none"> <li>• 115/230 VAC jumper selectable</li> <li>• Used with -C1 gateways that have integrated power conditioner</li> <li>• Voltage adjustable from 24 V to 30 V</li> <li>• 3-phase power supply option</li> </ul> |
| Output Current            | 1.8 A, 2.5 A, 4 A, 8 A                                                                                                                                                                                    | 2.4 A, 4.8 A                                                                                                                                                                                                                                                                                                        | 2.8 A, 4 A, 2 x 4 A                                                                                                                                                                                                                             | 5 A, 10 A                                                                                                                                                                                                                                         |
| Input Voltage             | 90-265 VAC                                                                                                                                                                                                | 85-264 VAC                                                                                                                                                                                                                                                                                                          | 30 VDC                                                                                                                                                                                                                                          | 93-132 VAC, 187-265 VAC or 3 x 340-500 VAC                                                                                                                                                                                                        |
| Output Voltage            | 30 V AS-i                                                                                                                                                                                                 | 30 V AS-i                                                                                                                                                                                                                                                                                                           | 30 V AS-i                                                                                                                                                                                                                                       | 24-30 VDC                                                                                                                                                                                                                                         |
| Output Voltage Adjustable |                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                 | ■ ●                                                                                                                                                                                                                                               |
| IP Rating                 | IP20                                                                                                                                                                                                      | IP20                                                                                                                                                                                                                                                                                                                | IP20 or IP65                                                                                                                                                                                                                                    | IP20                                                                                                                                                                                                                                              |
| Mounting                  | DIN rail                                                                                                                                                                                                  | DIN rail                                                                                                                                                                                                                                                                                                            | DIN rail or mounting holes                                                                                                                                                                                                                      | DIN rail                                                                                                                                                                                                                                          |
| Approvals                 | CE cUL US AS-i                                                                                                                                                                                            | CE cUL US AS-i                                                                                                                                                                                                                                                                                                      | CE cUL US AS-i                                                                                                                                                                                                                                  | CE cUL US                                                                                                                                                                                                                                         |





# Intelligent Sensors



**Cylindrical Inductive**



**Limit Switch Inductive**



**Rhino™ Inductive**



**Rectangular Inductive**

| See Page   | 153                                                                                                                                                                                                        | 157                                                                                                                                                                                                         | 160                                                                                                                                                           | 162                                                                                                                                                                                                   |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Highlights | <ul style="list-style-type: none"> <li>• 12, 18, and 30 mm diameter models</li> <li>• Weld field immunity</li> <li>• Normally open/normally closed programmable</li> <li>• Collision monitoring</li> </ul> | <ul style="list-style-type: none"> <li>• 20, 30, and 40 mm sensing ranges</li> <li>• Terminal compartment with conduit entrance</li> <li>• Oscillator monitoring</li> <li>• Collision monitoring</li> </ul> | <ul style="list-style-type: none"> <li>• 25-position rotating head</li> <li>• Multi-corner LEDs for easy visibility</li> <li>• Quick connect lever</li> </ul> | <ul style="list-style-type: none"> <li>• Embeddable in metal with 6 mm range</li> <li>• 2 m pigtail</li> <li>• Normally open/normally closed programmable</li> <li>• Oscillator monitoring</li> </ul> |



**Flat Pack Inductive**



**Valve Positioning Inductive**



**Series 28 Photoelectric**



**Absolute Rotary Encoders**

| See Page   | 164                                                                                                                                                                | 166                                                                                                                                                                                             | 169                                                                                                                                                                                                         | 178, 182                                                                                                                                                                                   |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Highlights | <ul style="list-style-type: none"> <li>• 40 and 50 mm sensing ranges</li> <li>• Plastic base with molded M12 connector</li> <li>• Oscillator monitoring</li> </ul> | <ul style="list-style-type: none"> <li>• Two inductive sensors for 1/4 turn valve positioning</li> <li>• 2.5 W solenoid driver</li> <li>• Normally open/normally closed programmable</li> </ul> | <ul style="list-style-type: none"> <li>• Background suppression, thru-beam, retro-reflective, and foreground suppression modes available</li> <li>• Weak signal output</li> <li>• -40 ° F rating</li> </ul> | <ul style="list-style-type: none"> <li>• 16-bit absolute rotary encoder, max. 5 ms update time</li> <li>• Servo or clamping flange</li> <li>• 10 or 12 mm recessed hollow shaft</li> </ul> |

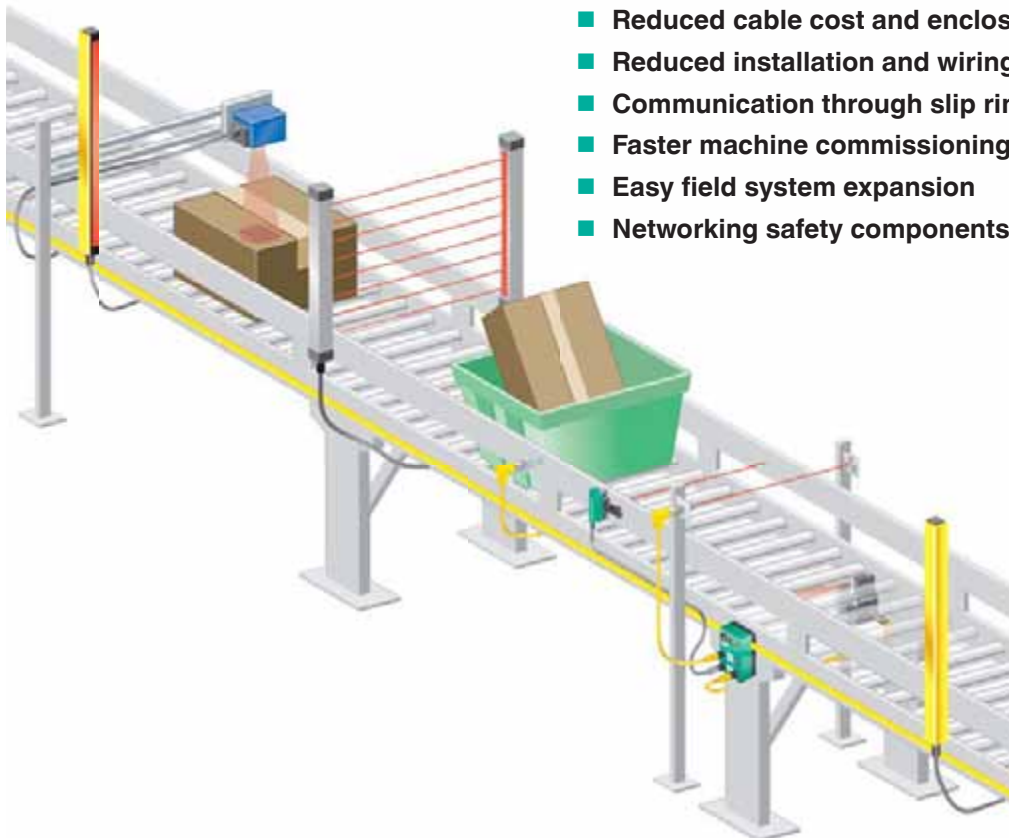
## Accessories

|            |                                                                                                                                                                       |                                                                                                                                                   |                                                                                                                                                                         |                                                                                                                                                           |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
|            |                                                                                      |                                                                  |                                                                                       |                                                                        |
|            | <b>Handheld Programmer</b>                                                                                                                                            | <b>Software and Cables</b>                                                                                                                        | <b>Diagnostic Tools</b>                                                                                                                                                 | <b>Master Simulators</b>                                                                                                                                  |
| See Page   | 202                                                                                                                                                                   | 203                                                                                                                                               | 204                                                                                                                                                                     | 205                                                                                                                                                       |
| Highlights | <ul style="list-style-type: none"> <li>• Programs any AS-i module</li> <li>• Rechargeable battery for cable free operation</li> </ul>                                 | <ul style="list-style-type: none"> <li>• AS-i safety programming software</li> <li>• Diagnostic and configuration software</li> </ul>             | <ul style="list-style-type: none"> <li>• AS-i network analyzer</li> <li>• Statistical mode for easy health status of network</li> </ul>                                 | <ul style="list-style-type: none"> <li>• Converters for PROFIBUS, DeviceNet, and RS-485</li> <li>• Easy RS-232 or USB connections to the PC</li> </ul>    |
|            |                                                                                     |                                                                 |                                                                                      |                                                                       |
|            | <b>Terminator and Tuner</b>                                                                                                                                           | <b>Bases</b>                                                                                                                                      | <b>AS-Interface Cable</b>                                                                                                                                               | <b>Flat Cable Adapters/Splitters</b>                                                                                                                      |
| See Page   | 206                                                                                                                                                                   | 207                                                                                                                                               | 208                                                                                                                                                                     | 209                                                                                                                                                       |
| Highlights | <ul style="list-style-type: none"> <li>• Extend network 200 m or 300 m without repeater</li> <li>• Diagnostic LEDs for network health indication</li> </ul>           | <ul style="list-style-type: none"> <li>• Bases for flat or round cable</li> <li>• Standard or DIN rail mounting styles</li> </ul>                 | <ul style="list-style-type: none"> <li>• Yellow and black standard and oil resistant flat cable</li> <li>• Flat cable stripper available</li> </ul>                     | <ul style="list-style-type: none"> <li>• Flat cable splitters and M12 to flat cable adapters</li> <li>• Water tight housings IP69K rated</li> </ul>       |
|            |                                                                                    |                                                                |                                                                                      |                                                                      |
|            | <b>Bulkhead Connectors, Cordgrips, and Conduit Adapters</b>                                                                                                           | <b>Covers and Mounting Accessories</b>                                                                                                            | <b>AC Input Accessories</b>                                                                                                                                             | <b>PROFIBUS Accessories</b>                                                                                                                               |
| See Page   | 212                                                                                                                                                                   | 213                                                                                                                                               | 214                                                                                                                                                                     | 215                                                                                                                                                       |
| Highlights | <ul style="list-style-type: none"> <li>• Attach flat cable to junction boxes and enclosures</li> <li>• 0.606", 0.740", and 0.807" mounting hole clearances</li> </ul> | <ul style="list-style-type: none"> <li>• Flat cable mounting adapters</li> <li>• M12 and M8 covers</li> <li>• Flat cable rubber covers</li> </ul> | <ul style="list-style-type: none"> <li>• Convert any DC module into an AC input module</li> <li>• LED diagnostic indicator</li> <li>• Easy DIN rail mounting</li> </ul> | <ul style="list-style-type: none"> <li>• 1, 2, or 4 port protected and unprotected round cable splitters</li> <li>• Disconnect switch optional</li> </ul> |
|            |                                                                                  |                                                                                                                                                   |                                                                                                                                                                         |                                                                                                                                                           |
|            |                                                                                                                                                                       |                                                                                                                                                   |                                                                                                                                                                         |                                                                                                                                                           |

# AS-Interface for the Material Handling Industry



Material handling applications demand fast and reliable networks. AS-Interface is a fast and dependable discrete I/O network designed to help you stay competitive and increase profitability in the new global economy. AS-Interface reduces the total cost of ownership for OEMs, as well as increasing productivity and safety for end users.



- Reduced cable cost and enclosure size
- Reduced installation and wiring time
- Communication through slip rings
- Faster machine commissioning/post commissioning
- Easy field system expansion
- Networking safety components and devices on one cable

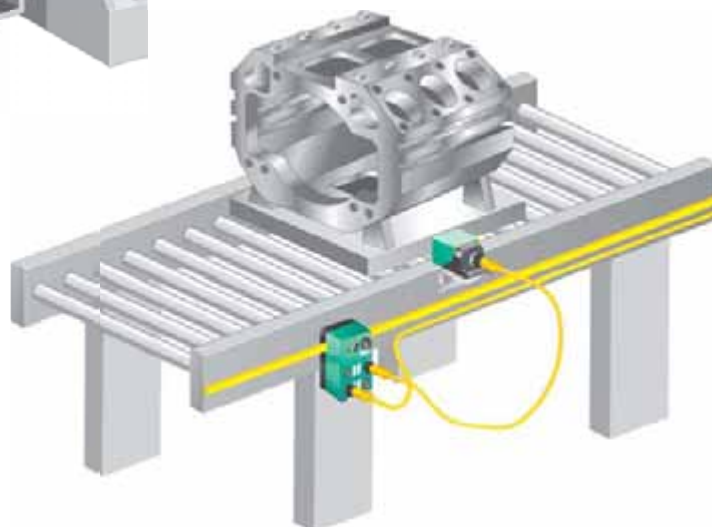
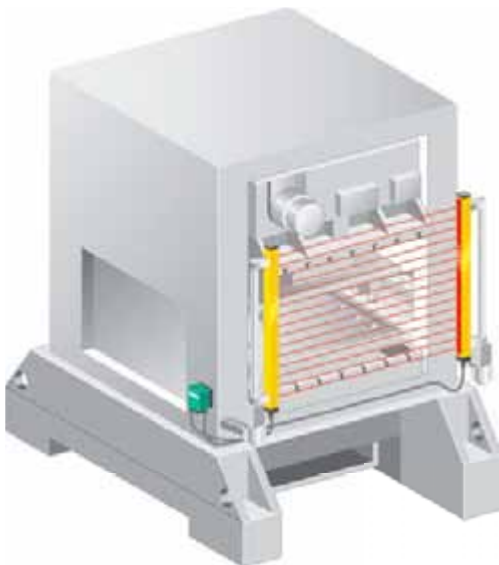


# AS-Interface for the Automotive Industry



The automotive industry demands equipment that supports lean, flexible manufacturing. Pepperl+Fuchs' AS-Interface meets this challenge by providing speed, simplicity, and reliability in I/O networking.

- Reduced cost (smaller PLC rack, less wire, smaller panel, and fewer I/O cards)
- Fast I/O exchange on robots and end-effectors
- Increased system availability and safety system uptime
- Reduced installation and maintenance time





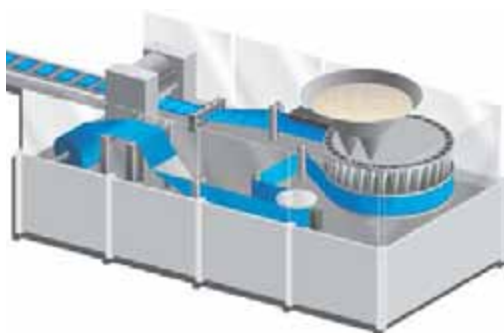
# AS-Interface for the Packaging and Printing Industries



## Packaging

Changeover and uptime maximization are the name of the game in packaging. AS-Interface keeps networks simple, versatile, and ready to respond to changing demands. From flow-wrappers to palletizers, AS-Interface connects all modular components together. In the dynamic world of packaging, AS-Interface just makes sense.

- **Simplified machine guarding (Safety at Work: SaW)**
- **Fast modular machine setup and changeover**
- **Superior diagnostics enable efficient and fast trouble shooting**
- **Fast I/O updates support high speed packaging**
- **Rugged housings hold up to messy packaging materials**



## Printing

The printing/converting industries require heavy-duty, flexible equipment to get the job done right and on time. If your application requires high-speed operation, excellent diagnostic features, optimum cost-effectiveness, and safety device monitoring, you simply won't find a better solution than Pepperl+Fuchs' AS-Interface discrete I/O system.

- **Reduced wiring saves time and cabinet space**
- **Diagnostic monitoring decreases downtime**
- **Simplified safety device monitoring via Safety at Work (SaW)**



# MAINTENANCE AND TROUBLESHOOTING GUIDE

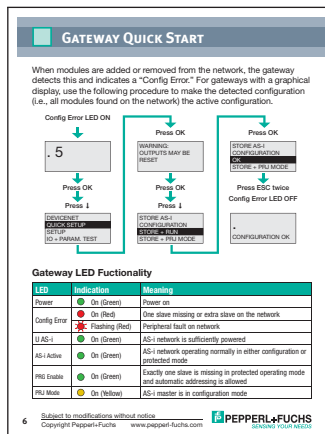
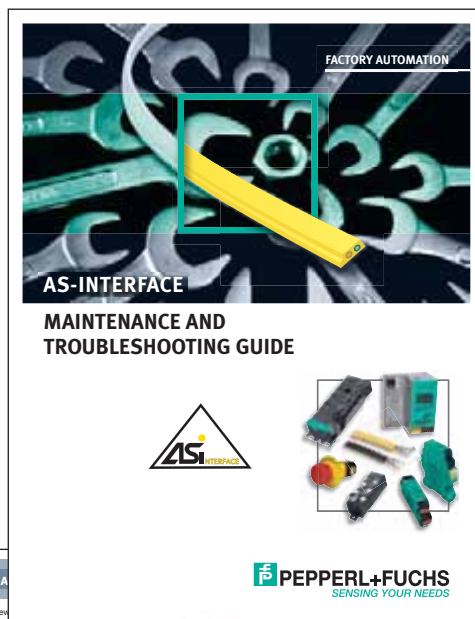
We stand behind AS-Interface...even if you bought it from the competition.

The Pepperl+Fuchs AS-Interface Maintenance and Troubleshooting Guide is the true must have document for every maintenance person; even if you are currently not using Pepperl+Fuchs AS-Interface hardware. This is a handy document that can assist in setting up and troubleshooting a system and is available in print and electronically

Order your copy today and see why we are considered to be one of the premier AS-Interface suppliers ... worldwide.

The following topics are included in this guide:

- AS-Interface Basics
- Handheld Programmer (Reading Inputs and Setting Outputs)
- Gateway Quick Start
- Gateway Advanced Features
- Exchanging SafetyNodes
- Exchanging SafetyMonitors
- LED Functionality (Modules)
- LED Functionality (SafetyMonitors)
- Repeaters
- Termination and Tuner
- Power Supplies
- Analyzer



Some gateway features the built-in fault detector will display new and old network errors. All advanced diagnostics are found on the display by going to ADV. DIAGNOSIS > AS-I CIRCUIT > ...

**Error Counters**

- If a node requires at least 2 consecutive retries, counts will appear on the display next to that node address. A clean network will have few or no retries. Single retries are automatically handled at the AS-Interface chip level and cannot be detected using the gateway. (Counts always go up by 2.)
- If any node has 6 consecutive retries, it appears in the LCS with an X by the node address. (This node caused a configuration error.)

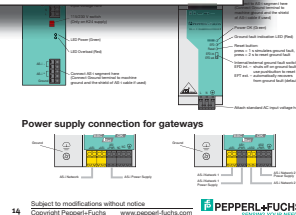
**Fault Detector**

The following errors occurred in the past (HISTORIC) or are currently happening (ACTUAL). Duplicate addresses are also displayed on this screen.

**EFLT:** An earth or ground fault has occurred. Check to make sure that AS-I+ or - is not touching machine ground anywhere.

**OVRF:** A power spike occurred on AS-I such that the AS-I voltage was too high.

**NOIS:** Noise was detected. Route AS-I cable away from potential noise sources.



**ANALYZER**

The network analyzer, VAZ-ANALYSER, provides information about network stability and allows detailed analysis of protocol-specific communication detail.

There are two modes of operation. The first is online statistics where the overall health of the network is read. The second is trace mode where individual AS-I telegrams are recorded, filtered, and viewed for later analysis. This mode is often used to track down specific input, output or timing problems.

**Online Statistics (check for)**

- Little or no missing telegrams
- No slave telegrams without master call

**Consecutive errors**

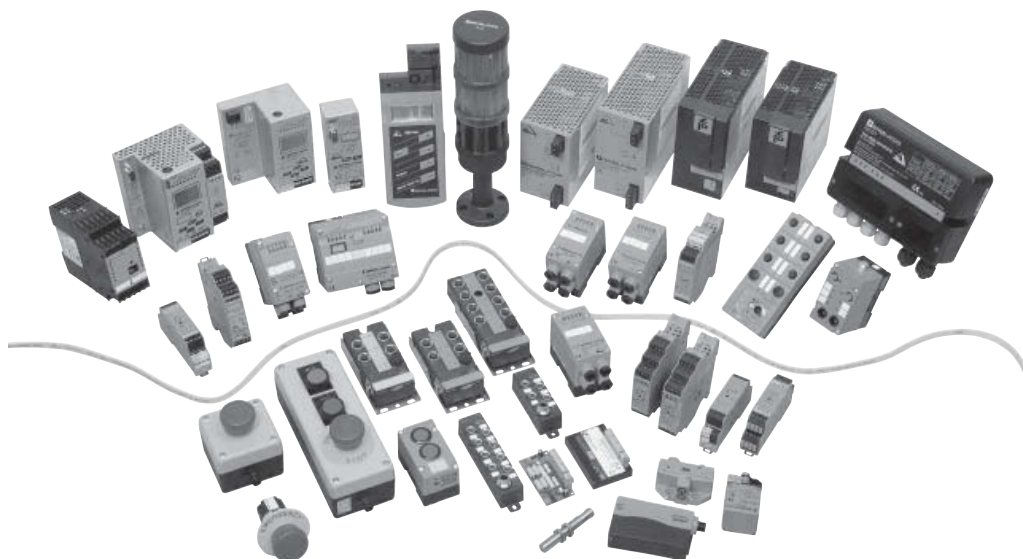
- Make sure consecutive errors are kept to a minimum. (Ex = configuration error)

**Network overview**

- Check to make sure all connected nodes are green

**I/O data**

- Verify that the input and output data is correct
- Find out if a certain input is flickering or turning on for a short time by running a trace on that input



## What is AS-Interface?

Actuator Sensor Interface (AS-Interface) is a simple to install two-wire network for discrete I/O, intelligent sensors, analog and safety data, encoders, light curtains, and e-stops. Specifically designed for simplicity, flexibility, and reliability, AS-Interface has extremely fast mounting, start-up and update times, and replaces traditional wiring architectures. It has a totally open topology—there are no limitations on how to route or split network runs. A single unshielded cable with no termination and a very high degree of noise immunity carries both data and power. In addition, AS-Interface is truly an open system, supported by all major PLC manufacturers and compatible with any of the major industrial upper level networks.

## The Development of AS-Interface



AS-Interface was developed by a group of companies that saw the need for a cost-effective, simple, and reliable sensor network designed for discrete sensors and simple output devices that could replace discrete wiring. The original objective was not a universal field bus for all areas

of automation, but rather a system for discrete I/O only. And so, a consortium of 11 sensor, actuator, and control-system companies—Balluff, Baumer, Elesta, Festo, ifm electronic, Leuze electronic, Pepperl+Fuchs, Sick, Siemens, Turck, and Visolux—started work on this innovative wiring system in 1990. The consortium completed its work in 1993, and ownership of the specification was transferred to AS-International.

AS-International is a nonprofit, member-funded organization of AS-Interface manufacturers. Numerous national organizations exist worldwide. There are over 300 members and to date, over 15 million AS-Interface chips are in use around the world.

## The AS-Interface Standard



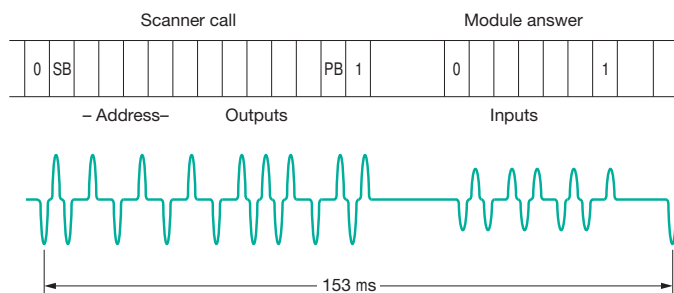
AS-Interface was introduced into the market in 1994. Since that time, it has become the standard discrete I/O system used in automation industries throughout the world to

connect devices such as sensors, solenoids, limit switches, pushbuttons, valves, and relays to higher level controllers such as PCs, PLCs, CNCs, and DCSs. Featuring a single, unshielded, two-wire cable design, AS-Interface transfers signals and power simultaneously, simplifying installation and significantly reducing commissioning costs. AS-Interface requires only a single cable to connect I/O modules from any manufacturer, offering users an elegant, simple to use I/O discrete communication system, requiring no knowledge of bus systems or communication protocols. And, unlike all other networks, AS-Interface doesn't use shielded cables and terminating resistors. Installing the network is fast and configuration takes less time than with other networks on the market. AS-Interface is standardized in EN50295 and IEC 62026-2.

With AS-Interface, compatibility between devices is not a matter of luck: compatibility is a guaranteed part of the system design. A module is only permitted to use the AS-Interface logo after it has successfully completed testing by an independent institute. The AS-Interface logo ensures quality and compatibility, guaranteeing that approved devices can be used in the system with no problems.

## How Does AS-Interface Operate?

The scanner/gateway automatically controls communication over the AS-Interface cable. Up to 62 modules can be connected to the network and each module can connect a number of I/O points. The scanner/gateway calls each module sequentially and awaits each response. If the module fails to respond, the scanner/gateway repeats the request. If there is still no response, the scanner/gateway will record the address of the module and inform the PLC. The scanner/gateway will continue to try to access the unresponsive address. In each cycle, 4 bits of information are transferred from the scanner/gateway unit to each module, and 4 bits are returned.



## Interoperability of Pepperl+Fuchs Products with Other AS-Interface Manufacturers

AS-Interface is truly an open, vendor-independent system. Interoperability of certified products is guaranteed by rigid conformance testing so that all AS-Interface products will work well on the same network.

## Device Profiles

Each module's I/O mix and device type are stored in its profile. The I/O code is used to define the inputs and outputs that are used by the module. The ID code defines other advanced features of the module. For example, the profile S-0.A means 4 inputs with extended addressing capability. In addition, many AS-Interface modules have an ID1 and ID2 subprofile that further breaks down the module's functionality. The ID1 can be programmed by the user, but caution must be taken to ensure that the device profile stored in the AS-Interface master matches that of the I/O module. If they are different, the AS-Interface scanner/gateway will need to be 'retaught' to activate the node. While this transfer of information sounds complicated, the scanner/gateway knows what to do. It performs these actions seamlessly.

### Device Profiles

| IO CODE | Scanner profiles | ID code    |     |     |     |     |     |     |   |   |   |     |     |   |     |     |     |
|---------|------------------|------------|-----|-----|-----|-----|-----|-----|---|---|---|-----|-----|---|-----|-----|-----|
|         |                  | 0          | 1   | 2   | 3   | 4   | 5   | 6   | 7 | 8 | 9 | A   | B   | C | D   | E   | F   |
|         | 0                | I, I, I, I | 0.0 | 0.1 |     |     |     |     |   |   |   | 0.A | 0.B |   |     |     | 0.F |
|         | 1                | I, I, I, O | 1.0 | 1.1 |     |     |     |     |   |   |   | 1.A |     |   |     |     | 1.F |
|         | 2                | I, I, I, B | 2.0 |     |     |     |     |     |   |   |   | R   |     |   |     |     | 2.F |
|         | 3                | I, I, O, O | 3.0 | 3.1 |     |     |     |     |   |   |   | 3.A |     |   |     |     | 3.F |
|         | 4                | I, I, B, B | 4.0 |     |     |     |     |     |   |   |   | 4.A |     |   |     |     | 4.F |
|         | 5                | I, O, O, O | 5.0 |     |     |     |     |     |   |   |   | 5.A |     |   |     |     | 5.F |
|         | 6                | I, B, B, B | 6.0 |     |     |     |     |     |   |   |   | 6.A |     |   |     |     | 6.F |
|         | 7                | B, B, B, B | 7.0 | 7.1 | 7.2 | 7.3 | 7.4 | 7.5 |   |   |   | 7.A | 7.B |   | 7.D | 7.E | 7.F |
|         | 8                | O, O, O, O | 8.0 | 8.1 |     |     |     |     |   |   |   | 8.A |     |   |     |     | 8.F |
|         | 9                | O, O, O, I | R   |     |     |     |     |     |   |   |   | 9.A |     |   |     |     | 9.F |
|         | A                | O, O, O, B | A.0 |     |     |     |     |     |   |   |   | R   |     |   |     |     | A.F |
|         | B                | O, O, I, I | R   | B.1 |     |     |     |     |   |   |   | B.A |     |   |     |     | B.F |
|         | C                | O, O, B, B | C.0 |     |     |     |     |     |   |   |   | C.A |     |   |     |     | C.F |
|         | D                | O, I, I, I | R   | D.1 |     |     |     |     |   |   |   | D.A |     |   |     |     | D.F |
|         | E                | O, B, B, B | E.0 |     |     |     |     |     |   |   |   | E.A |     |   |     |     | E.F |
|         | F                | T, T, T, T |     |     |     |     |     |     |   |   |   |     |     |   |     |     |     |

I: input, O: output, B: bi-directional port, R: reserved, V: new status

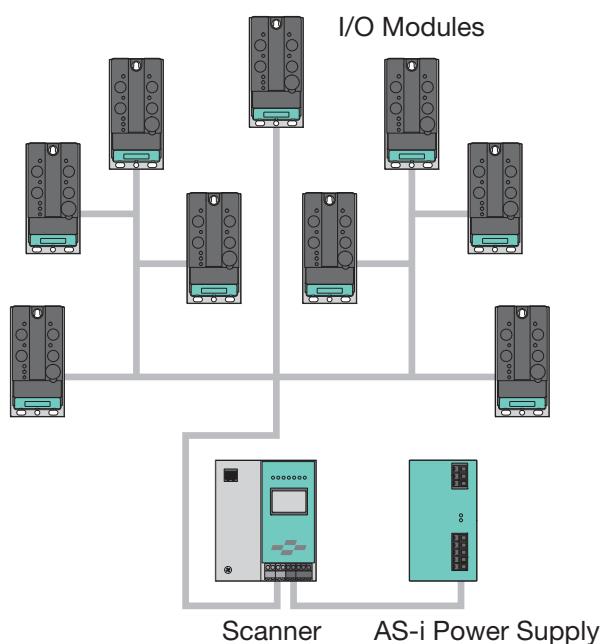
### Extended Device Profiles with ID Code = A

| Profile Description                                             | IO Code | ID2 Code |
|-----------------------------------------------------------------|---------|----------|
| Remote I/Os (X = 0, 1, 3-9, B-E)                                | X       | 0        |
| Free profiles for slaves in extended address mode (X = 0 ... E) | X       | E        |
| Remote I/Os with dual signals (X = 0, 3, 7, 8, B)               | X       | 2        |
| Single sensor with extended control                             | 3       | 1        |
| Combination slave with support for serial profile               | 7       | 5        |
| 4I/4O in extended addressing mode                               | 7       | 7        |
| Slave profile for analog input (single channel)                 | 7       | 8        |
| Slave profile for analog input (dual channel)                   | 7       | 9        |
| 8I/8O in extended addressing mode                               | 7       | A        |
| Slave with support for serial profile                           | B       | 5        |



## AS-Interface Topology

The topology of the AS-Interface network is completely open, enabling the user to install the system in a layout that best fits each application. Because AS-Interface does not use termination, additions are possible without the time consuming task of locating the “end” of the existing network. The power supply and additional modules can also be placed anywhere in the segment. This truly unique approach not only reduces the total network length, but also simplifies installation, resulting in the shortest installation time possible.



## Network Length

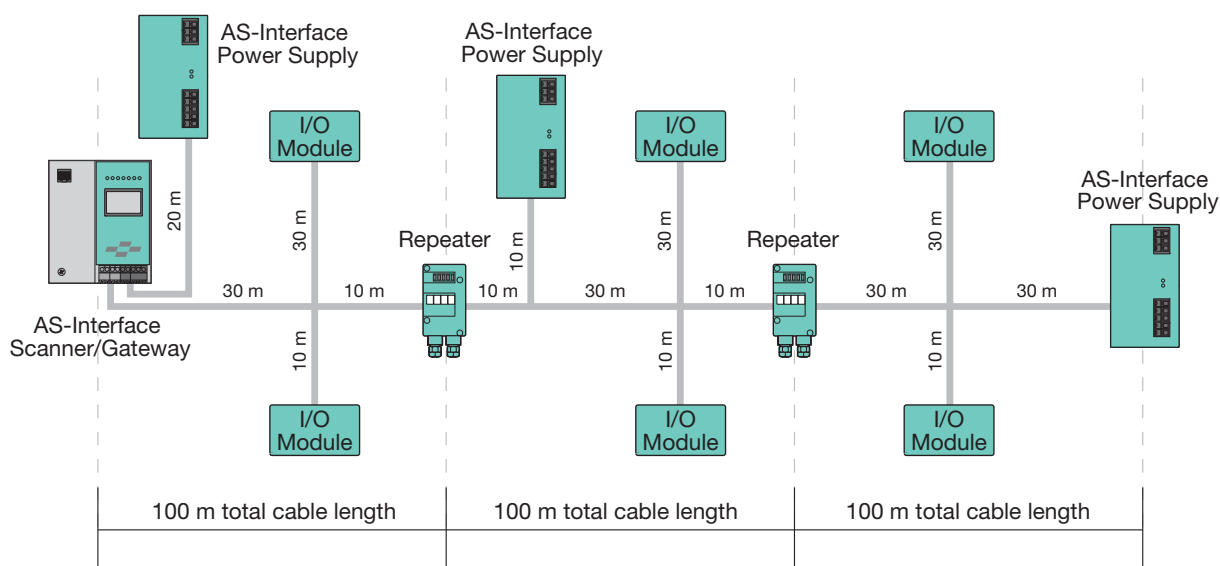
AS-Interface segments can have a cumulative cable length of 100 meters (328 feet). This means that all network cable added together in a segment must equal less than 100 m. If larger networks are needed, a repeater can be used to extend the length by 100 meters. Because repeaters isolate the connected network segments, an AS-Interface power supply must be located in each. When designing networks with repeaters, it is important to note that no signal from a scanner/gateway to a node can travel through more than 2 repeaters. Consequently, the maximum length of a linear AS-Interface network is 500 m. Star shaped networks can use even more repeaters allowing for even larger area networks.

**NOTE:** Regardless of cable length and number of repeaters, a maximum of 62 I/O modules can be placed on AS-Interface. Other than that, there are no complicated rules or limitations based on trunk and spur lengths to consider.

## Wiring

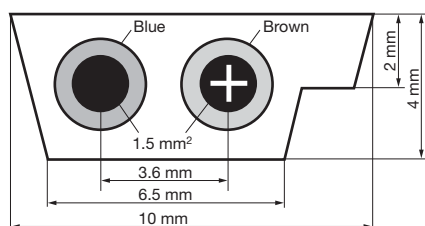
Installation and wiring of AS-Interface is as easy as it gets. First of all, the system is based on a two-conductor power and communication method. Secondly, when using the famous mechanically keyed “yellow flat cable” electrical connections are not only reliable and secure, but also extremely fast.

The distinctive yellow cable that typically identifies an AS-Interface system has several additional features that make it stand out. The cable has a special mechanical



profile that guarantees a correct connection every time by eliminating the danger of reversing polarity. It utilizes redundant piercing connection technology that allows the connectors to nestle tightly and securely among the fine copper strands in the core of each of the conductors. The reliability of the connections has been proven repeatedly and has been formally evaluated using the DIN EN-60068-2-64. The self-sealing property (insulation displacement) of the rubber insulation maintains a protection class of up to IP69K. To further enhance system reliability, Pepperl+Fuchs uses round, machined, and gold plated piercing contacts in all models. In terms of long term reliability, nothing beats gold!

Because the contacts penetrate the insulation to secure an electrical connection, some of the most time-consuming electrical tasks are eliminated. There is no need to cut, strip, apply terminals, or label the wire ends. AS-Interface does not use termination. Workers spend less time pulling long lengths of wire through hard to reach places. The reduction of wires not only decreases the size of the control panel, it increases modularity—machines are easier to disassemble, and easier to reassemble at another site.



## Update Time

AS-Interface is a deterministic network. Given the number and type of modules, one can determine the network update time. To calculate the total network update time, simply multiply the number of modules by 150 microseconds. The cycle time is the same for I/O modules with full or half addresses. Analog nodes, however, are exceptions as they split the data up over several scans. AS-Interface is typically as fast as the update time on a typical PLC (or faster) and in most cases, significantly faster than any upper level network. In fact, because AS-Interface gateways act as data consolidators, they help to make those upper level networks faster, while reducing overhead by as much as 90%.

## Data Integrity and Noise Immunity of AS-Interface

AS-Interface has been designed from the ground up to be used in tough industrial applications. As a result, AS-Interface is extremely noise immune—as applications involving linear sliding contacts and slip rings impressively prove every day. You can rely on AS-Interface to perform in environments where other systems fail. Nevertheless, an AS-Interface system does not negate the need for good wiring practices to make sure that AS-Interface's advanced noise management features are available when needed. Pepperl+Fuchs has over 10 years of application experience with AS-Interface. We can help you design an AS-Interface system that is most suitable for your application, assist you in choosing the correct components, and guide you through the installation in order to ensure that your system fulfils your manufacturing requirements

## Approvals

All Pepperl+Fuchs AS-Interface devices are constructed to adhere to national and international rules and regulations.



All Pepperl+Fuchs modules are CE approved and meet the highest level for electronic noise immunity possible for AS-Interface.



This symbol indicates products have been tested and listed to Underwriters Laboratory standards and are in compliance with both Canadian and U.S. requirements.

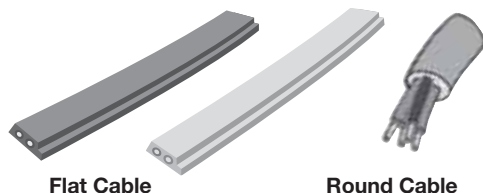


Safety modules with this approval can be used up to category 4 according to EN954 and up to SIL 3 according to IEC 61508.

## Round Cable and Flat Cable Connections of AS-Interface

Although a standard two-wire round cable can be used, the preferred way to install AS-Interface is via the famous yellow flat cable. It provides an efficient installation method and, due to the mechanical keying, guarantees correct polarity. Also, the yellow cable ensures that the network operates at peak electrical performance, regardless of the network length (up to 100 meters per segment) and network topology. On the practical side, AS-Interface cable is sold in 100-meter spools. This eliminates the possibility of inadvertently creating a network that is too long.

In addition to using the yellow AS-Interface network cable, a black, mechanically keyed flat cable supplies auxiliary power. The auxiliary power is used to power output devices, such as lights, valves, or actuators. Both cables are offered in standard and oil-resistant versions.



## Shielding or No Shielding

In general, AS-Interface uses unshielded cable. If shielded cable is used, it is important to connect the shielded wire to a solid machine ground wherever the data/power leads are exposed and at the power supply ground connection. Essentially, shielding is used for mechanical protection, not noise immunity. Because of the way AS-i is designed the shield may reduce the performance of the network by as much as 20%.

**NOTE: Do not ground ANY of the AS-Interface leads under ANY circumstances.**

AS-Interface utilizes a floating signal and derives much of its noise immunity from it. Tying one lead to ground will interfere with AS-Interface communications. Data transmission of AS-Interface is at 167 kHz and requires no shielding, no termination and no twisted pairs.

## Flat Cable Piercing Technology

In addition to being the fastest installation method, the AS-Interface flat cable offers other benefits resulting in long-term performance and reliability.

**Redundant piercing**—Redundant electrical connections are established when the AS-Interface flat cable is placed on a Pepperl+Fuchs I/O module. The reliability of those connections has been proven time and again and has been formally evaluated using the DIN EN-60068-2-64 standard.

## Applications

### Easy machine connection / breakdown / reassembly

AS-Interface is the ideal solution to wire modular systems. During the build phase, modules are placed on various sections of the machine, and sensors/actuators are connected. Quick-Blocks and molded cordsets are used between the individual conveyor/machine sections.

Breaking down the machine is as easy as removing the cordsets. No cutting. No splicing. No wire bundles hanging off the module during shipment.



### Slip Ring and Sliding Contact Wiring

AS-Interface is the wiring method of choice when I/O is required on a continuously rotating machine.

With AS-Interface, only two conductors are necessary to get hundreds of I/O back to a PLC. Therefore, it is no longer necessary to over size the slip rings. With its high noise immunity, AS-Interface will easily deal with the electrical noise generated by the sliding contacts.

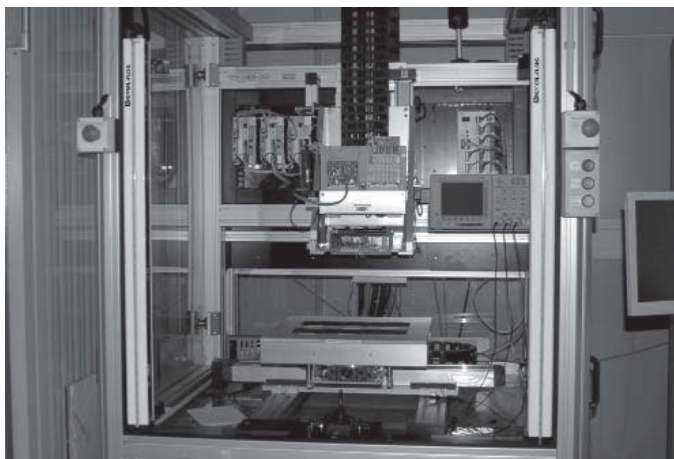
AS-Interface has been successfully transferred to applications with linear sliders, such as on overhead cranes and assembly lines. Only the I/O modules are placed on the carrier system while the PLC remains separate, at a more convenient location. Since this system is controlled by a small number of PLCs, software modifications are quickly and easily accomplished. Additionally, adding I/O on the carriers is trouble-free, uncomplicated, and fast.



**Note:** To get the best possible long term reliability, Pepperl+Fuchs suggests silver/carbon contacts. A silver/carbon combination has been proven to be superior to traditional copper contacts, which are less stable and have shorter service lives.

### Safety

It is also possible to route safety data (from door interlocks, e-stops, light curtains) over AS-Interface. AS-Interface Safety at Work allows networking of safety devices using a standard AS-Interface network. With the Safety at Work system, safety devices benefit from all of the advantages that AS-Interface offers. Safety input status is directly available to the PLC without the need for additional wiring to auxiliary contacts. The safe outputs on the SafetyMonitor (roughly equivalent to the safety relay in a hardwired system) can also be retrieved by the PLC without the need for additional wiring.



### Repositioning of Work Stations During System Start-up

Frequently, workstations need to be redesigned, modified, or moved. While this is a common occurrence, only AS-Interface has the flexibility to address it fully and offer a simple, efficient, and cost-effective solution. If a module needs to be moved to a different location, it can simply be removed from the yellow cable and relocated where it will best fit the application. The piercings at the original location in the cable will self-heal. The same is true when larger groups of I/O modules, including safety devices, are moved.

### Quick Change Tools On Robotic Arms

Many robotic applications frequently require a change of end arms within the same work cell. AS-Interface is so versatile that a scanner is able to recognize the I/O components on the new end arm in a fraction of a second. With a fully loaded network of 62 nodes the quick change time is only 35 ms. By the time the mechanical connections are complete, the I/O system is available.



### Valve Tops

Valves have been controlled by AS-Interface for many years and remain a prime example of network efficiency. Typically, a valve top has two sensors (indicating the open and closed position of the valve) and one or two outputs that drive the valve into position. AS-Interface utilizes a small I/O module that is integrated into the valve top. As a result, connecting a large number of valves to a PLC or DCS is reduced to running a single two-conductor cable between the DCS and the valves. It can't get any simpler.





## Enhancements and Compatibility: How to Expand to 62 Modules

In its original (2.0) specification, AS-Interface accommodates 31 I/O modules where each module uses one, complete address between 1 and 31. With later enhancements, AS-Interface 2.1 allows I/O modules to take up only one half of an address. Therefore, scanners/gateways that support this addressing scheme are able to communicate with up to 62 modules on a network. This is accomplished with full forward and backward compatibility where modules that use a full address offer up to 4 inputs and 4 outputs, and modules with one half of an address provide 4 inputs and 3 outputs. AS-Interface 2.0 supports up to 124 inputs and 124 outputs, AS-Interface 2.1 supports up to 248 inputs and 186 outputs, and AS-interface 3.0 supports up to 248 inputs and 248 outputs.



Any scanner/gateway can communicate with any type of node. Whole-address modules and half-address modules may be used within the same AS-Interface network. However, the following rules must be observed:

- When an address number is assigned to a whole-address module (5, 6, 7...), that address number cannot be used for a half-address module (5A or 5B, 6A or 6B, 7A or 7B...). Another number must be selected. Likewise, an address number assigned to a half-address module (5A or 5B, 6A or 6B, 7A or 7B...) cannot be used for a whole-address module (5, 6, 7...).
- When an address number is assigned to a half-address module (9A), the other half of the address number (9B) can be used by another half-address module.
- When a half-address module is used on a scanner/gateway that does not support A/B addressing, that module must be set to an A address (3A). No additional modules can be used at that address (3B, for example, cannot be used). Also, the control/system must not turn on or use output D3 or parameter P3.

### NOTE:

- Analog modules with profile S-7.3 use a full address and profile S-7.A supports extended addressing.
- Safety at Work modules use a full address.

- The newest specification enhancements make AS-Interface even more powerful. With the release of Specification 3.0, it is possible to use I/O nodes that support half-addresses and still offer 4 inputs and 4 outputs. As long as a scanner/gateway is used that supports this newest specification, selecting an I/O module is easy: any configuration is possible, irrespective of how old the module is. How does that sound for design simplicity?

The AS-Interface gateways and scanners have a master specification. This specification defines the capabilities and features of the device. All gateways and scanners in this catalog support all features of the latest AS-i specification 3.0 and are M4 compliant.

### Master Specification

#### M4 (Version 3 extended master)

- Extended addressing 1-31A, 1-31B
- Support for analog profile S-7.1 and S-7.3
- Support for 4-in/4-out with extended addressing
- Support for analog with extended addressing
- Support for analog using consecutive addresses
- Support for bi-direction serial data transfer

#### M3 (Full extended master)

- Extended addressing 1-31A, 1-31B
- Support for analog profile S-7.1 and S-7.3

#### M1 (Full standard master)

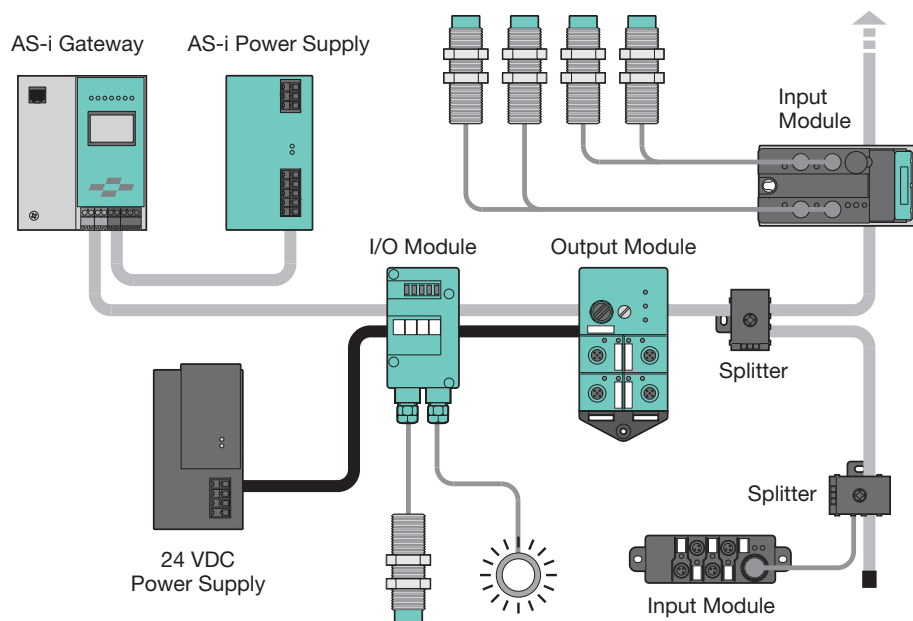
- Standard addressing 1-31, complete support

#### M2 (Reduced standard master)

- Standard addressing 1-31, some parameters used

#### M0 (minimum standard master)

- Standard addressing 1-31, I/O data only



## Standard AS-Interface Components

### Requirements

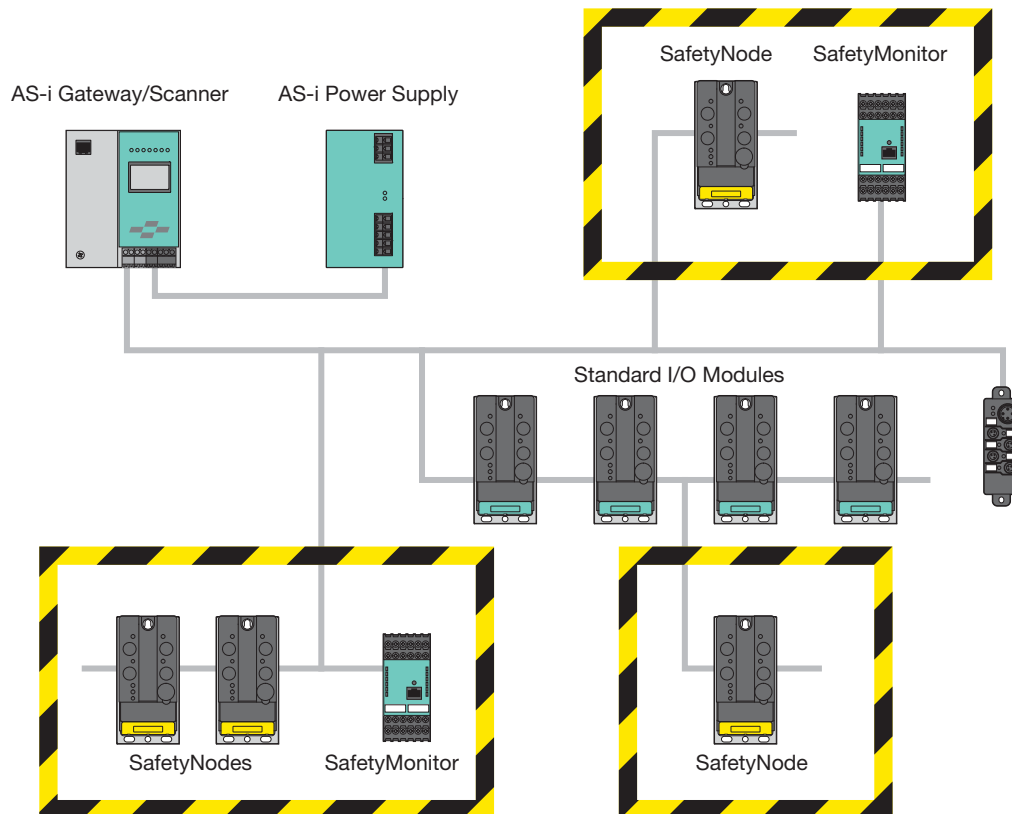
- **AS-Interface scanner or gateway:** This may be a P+F model or made directly by the PLC manufacturer.
- **AS-Interface power supply:** Every AS-Interface network must have a single power supply with AS-Interface decoupling circuitry. If a repeater is used, an additional power supply is required for each.
- **Cable:** This can be the patented flat cable with the piercing technology or any round cable that meets AS-Interface specifications.
- **I/O modules:** Any I/O module from any manufacturer will work, but the Pepperl+Fuchs modules are guaranteed AS-Interface compliant and will work for years to come.
- **24 V external power supply:** A power supply is required only if externally powered outputs are used. Any standard 24 V power supply is suitable. See page 70 for Pepperl+Fuchs standard 24-30 V power supplies.

### Safety at Work

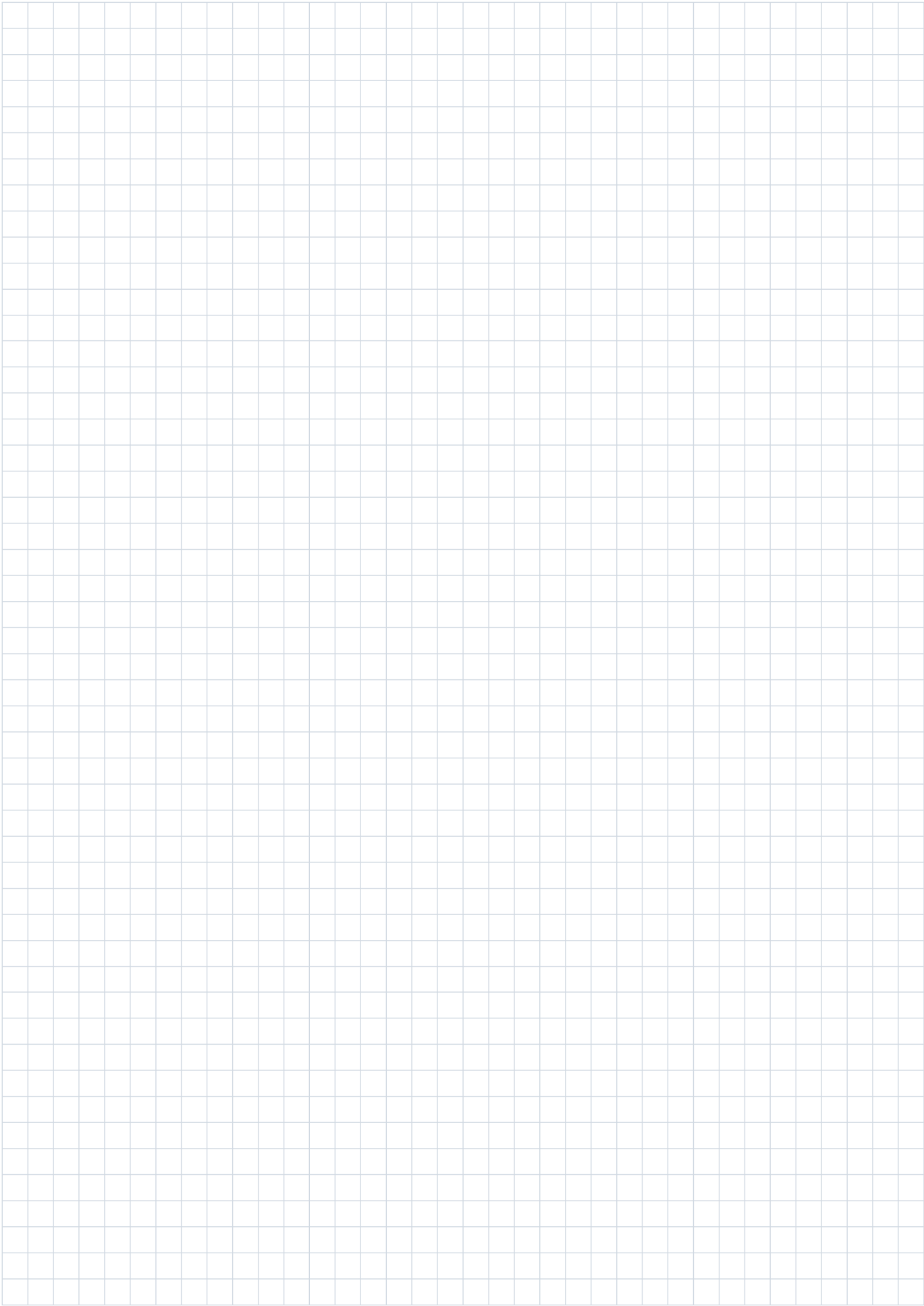
AS-Interface Safety at Work (SaW) is a system that enables networking of safety devices (safety door switches, e-stops, safety light curtains, etc.) using a standard AS-Interface network. With SaW, users can quickly implement a safety system that satisfies the rules and regulations needed for Category 4, SIL 3 safety. The simplicity of the successful AS-Interface is retained and is a major reason for users to implement SaW systems. The following features make SaW unique and powerful:



- Control I/O and safety information on the same network
- Usable up to Safety Category 4, SIL 3
- Does not require a Safety PLC
- Automatic single node replacement is supported
- SafetyMonitor allows implementation of both simple and powerful safety procedures
- Adding additional safety devices is simple and fast
- SafetyNodes can be added wherever needed, even during final phases of the project
- Each SafetyNode requires one whole address; 31 SafetyNodes per network



- SafetyMonitor can be placed anywhere on the AS-Interface network—it is not necessary to be close to the SafetyNodes
- The status of safety inputs and safety relays can be monitored directly on AS-Interface and sent to the PLC
- The SafetyMonitor does not require an address. Assign an address to read the states of OSSDs
- SaW devices are certified according to EN 954 and IEC 61508 from TÜV Rheinland and are UL approved
- Configured using VAZ-SW-SIMON(+) software
- Can scan up to two networks simultaneously
- Up to 16 channels on one safety monitor
- Gateways also available with integrated 16-channel enhanced safety monitors



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# Gateways and Scanners

|                                     |           |
|-------------------------------------|-----------|
| <b>Allen-Bradley Scanners .....</b> | <b>29</b> |
| <b>DeviceNet .....</b>              | <b>35</b> |
| <b>PROFIBUS .....</b>               | <b>39</b> |
| <b>Ethernet .....</b>               | <b>46</b> |
| <b>Serial .....</b>                 | <b>50</b> |

## Gateways and Scanners

An AS-Interface system is based on just a few essential components. Scanner cards/gateways are at the heart of the AS-Interface system and “connect” the I/O to the control system. Scanner cards are directly mounted in the PLC rack and appear in the PLC configuration as large, standard I/O cards. Therefore, transitioning between discrete wiring with standard input and output card systems to the AS-Interface is seamless. The PLC programmer won’t even see a difference between the two systems. One AS-Interface card can replace 10, 20 or more I/O cards and save valuable panel space, as well as reduce the cost of the PLC.

### Gateways

Upper level (i.e., word and byte based) networks such as PROFIBUS, DeviceNet, and Ethernet benefit from the strength of AS-Interface, and handle the AS-Interface gateway simply as a large collection of I/O. Users familiar with their upper level network of choice will have no problem reading inputs and setting outputs on AS-Interface.

Pepperl+Fuchs’ large selection of scanner cards and gateways presents another advantage that is especially important for OEM users. Regardless of

the upper level network (or PLC model) used in a particular application, the AS-Interface I/O modules remain unchanged. One can even use a PC with its graphical capabilities during the I/O system installation and setup. Once completed, the same two-conductor AS-Interface cable is connected to the scanner card or gateway. Assured that the I/O system is operational, and that sensor connections and output switches are connected correctly, programming the PLC logic will be fast and easy. AS-Interface drastically reduces the overall time necessary to complete an installation.

In addition to simplifying the installation, AS-Interface can also increase the performance speed of the upper level bus. Because the AS-Interface gateway collects all I/O data for a single scan update on the upper level network, overhead processing is significantly reduced, by up to 90%.

### Scanners

AS-Interface Scanners are available from virtually every PLC/DCS manufacturer, and are a great way to bring AS-Interface directly into your control system. A number of scanner card options are available to suit your networking needs. Some cards are available with two AS-Interface networks and with twice as many inputs and outputs available for simultaneous scanning (compared to single network systems). Also, all scanners can communicate with A and B addressed AS-Interface modules. Up to 62 modules can be scanned by AS-Interface. Analog capabilities are often required for control systems. All scanners and gateways in the *2009 Reference & Buyer’s Guide* fully support analog modules.

## AS-Interface Scanners by Manufacturer

| Manufacturer                                          | PLC/PCS Platform | Extended Addressing | Number of AS-Interface Networks | Analog Capable | AS-i Specification |
|-------------------------------------------------------|------------------|---------------------|---------------------------------|----------------|--------------------|
| Allen-Bradley<br>(sold by Pepperl+Fuchs, see page 29) | SLC 503/4/5      | Yes                 | 2                               | Yes            | 3.0 (M4)           |
|                                                       | ControlLogix     | Yes                 | 2                               | Yes            | 3.0 (M4)           |
|                                                       | MicroLogix 1500  | Yes                 | 1                               | Yes            | 3.0 (M4)           |
|                                                       | CompactLogix     | Yes                 | 1                               | Yes            | 3.0 (M4)           |
| Emerson Process Management                            | DeltaV           | No                  | 2                               | No             | 2.0 (M0)           |
| GE Fanuc                                              | VersaMax         | No                  | 1                               | No             | 2.0 (M1)           |
| Mitsubishi                                            | FX2N             | No                  | 1                               | No             | 2.0 (M1)           |
|                                                       | AnS(H)/QnAS      | No                  | 2                               | No             | 2.0 (M1)           |
|                                                       | Q                | Yes                 | 1                               | Yes            | 2.1 (M3)           |
| Schneider Electric (Modicon, Telemecanique)           | Quantum          | No                  | 1                               | No             | 2.0 (M1)           |
|                                                       | Premium          | No                  | 1                               | No             | 2.0 (M1)           |
|                                                       | Micro            | No                  | 1                               | No             | 2.0 (M1)           |
|                                                       | Nano, Twido      | Yes                 | 1                               | Yes            | 2.1 (M3)           |
| Omron                                                 | CQM1H            | No                  | 1                               | No             | 2.0 (M1)           |
| Siemens                                               | S7-300, ET-200M  | Yes                 | 1                               | Yes            | 3.0 (M4)           |
|                                                       | S7-200           | Yes                 | 1                               | Yes            | 2.1 (M3)           |

## Scanners and Gateways Supporting 2.1 Specification

Scanners/gateways that support version 2.1 or higher are able to communicate with up to 62 modules on one network. This is accomplished with full forward and backward compatibility; modules that use a full address offer up to 4 inputs and 4 outputs, and modules with one half of an address provide 4 inputs and 3 outputs. AS-Interface 2.1 supports up to 248 inputs and 186 outputs. A scanner/gateway that supports 2.1 can communicate with full-address modules, and can also communicate with half-address modules, set to both A and B addresses. With the release of AS-Interface specification 3.0, users also have the option of utilizing modules that offer half addressing mode and still have 4 inputs and 4 outputs.



## Diagnostics

How is the I/O data from the AS-Interface modules mapped into various PLCs?

Typically, PLCs are organized using 16/32-bit input and output words, and I/O cards are associated with those words, based on their location in the rack. The same is true when using an AS-Interface scanner card. The difference is that the AS-Interface scanner represents an I/O card with many more inputs and outputs. The following example for an Allen-Bradley SLC illustrates this difference:

The AS-Interface scanner has been mounted in rack slot 3 and the inputs are mapped in I:3. In contrast to a discrete input card at this rack location (where inputs are mapped between I:3.0/0 and I:3.0/15), the data from the AS-Interface scanner is mapped between I:3.0/0 to I:3.31/15. The input data from four AS-Interface modules is represented within each data table word.



## Allen-Bradley Scanners

- MicroLogix 1500, ControlLogix, SLC500, and CompactLogix supported
- Easy configuration port, PLC, or pushbutton programming
- Easy visual indication of network status
- Advanced diagnostics for easy troubleshooting

### A-B Scanner Overview

All scanner cards come with a configuration port that is great for online diagnostics and commissioning. The MicroLogix and ControlLogix cards can be monitored online while the PLC maintains control. During the start-up phase, the outputs can be set and the inputs can be read without going online with the PLC.

#### Display

Some cards have an integrated seven-segment display. This display is used in configuration mode to show all connected I/O modules. In Protected (Run) mode, the display is used to show missing nodes or recently added nodes that have not yet been added to the scan list.

**See pages 31-32 for Allen-Bradley gateway/scanner wiring.**



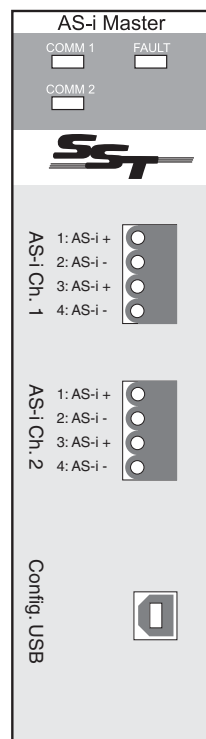
## Specifications

| PLC PLATFORM OR NETWORK              | SLC 5/03, SLC 5/04, SLC 5/05                                               | ControlLogix                                                               | MicroLogix 1500, CompactLogix                                              |
|--------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|
| MODEL NUMBER(S)                      | Single Network<br>Dual Network                                             |                                                                            |                                                                            |
|                                      | SST-ASI-SLC                                                                | VBM-CLX-DM                                                                 | VBM-MLX/CPLX                                                               |
| CAPABILITIES                         |                                                                            |                                                                            |                                                                            |
| SPECIFICATION                        | 3.0                                                                        | 3.0                                                                        | 3.0                                                                        |
| MASTER PROFILE                       | M4                                                                         | M4                                                                         | M4                                                                         |
| EXTENDED ADDRESSING POSSIBLE (62)    | Yes                                                                        | Yes                                                                        | Yes                                                                        |
| ANALOG CAPABILITY                    | Yes                                                                        | Yes                                                                        | Yes                                                                        |
| MAX DISCRETE I/O COUNT               | 496 in/496 out                                                             | 496 in/496 out                                                             | 248 in/248 out                                                             |
| CONFIGURATION OPTIONS                |                                                                            |                                                                            |                                                                            |
| PUSHBUTTONS                          | —                                                                          | Yes                                                                        | Yes                                                                        |
| PLC                                  | Yes                                                                        | Yes                                                                        | Yes                                                                        |
| DISPLAY                              | —                                                                          | 2, 7 segment + LEDs                                                        | 2, 7 segment + LEDs                                                        |
| SOFTWARE                             | Windows HyperTerminal                                                      | VAZ-SW-ACT32 (optional)                                                    | VAZ-SW-ACT32 (optional)                                                    |
| Cable                                | USB (included)                                                             | K-ADP2 (purchased separately)                                              | K-ADP2 (purchased separately)                                              |
| STAND-ALONE CONTROL (Optional)       | No                                                                         | No                                                                         | No                                                                         |
| ELECTRICAL SPECIFICATION             |                                                                            |                                                                            |                                                                            |
| OPERATING CURRENT AS-INTERFACE (1/2) | 50 mA                                                                      | 70 mA/70 mA                                                                | 100 mA                                                                     |
| OPERATING CURRENT BACKPLANE          | 500 mA @ 5 VDC                                                             | 390 mA @ 5 VDC, 2 mA @ 24 VDC                                              | 450 mA @ 5 VDC                                                             |
| ALLEN-BRADLEY                        |                                                                            |                                                                            |                                                                            |
| CONNECTION                           | Backplane                                                                  | Backplane                                                                  | Backplane                                                                  |
| I/O MAPPING                          | Input and output files                                                     | Input and output files                                                     | Input and output files                                                     |
| DIAGNOSTICS MAPPING                  | M0 and M1 files                                                            | Input and output files using mailbox                                       | Input and output files using mailbox                                       |
| CARDS PER PLC                        | Limited by rack space                                                      | Limited by rack space                                                      | Power supply rating of 4                                                   |
| ADVANCED FUNCTIONALITY               |                                                                            |                                                                            |                                                                            |
| GROUND FAULT DETECTION               | No                                                                         | No                                                                         | No                                                                         |
| NOISE DETECTION                      | No                                                                         | No                                                                         | No                                                                         |
| DUPLICATE ADDRESS DETECTION          | No                                                                         | No                                                                         | No                                                                         |
| OVER VOLTAGE DETECTION               | No                                                                         | No                                                                         | No                                                                         |
| DIAGNOSTIC PORT                      | Yes (USB)                                                                  | Yes (RS-232)                                                               | Yes (RS-232)                                                               |
| PROTECTION (IEC)                     | IP20                                                                       | IP20                                                                       | IP20                                                                       |
| TEMPERATURE RANGE                    | Working<br>Storage                                                         |                                                                            |                                                                            |
|                                      | +32 °F to +122 °F (0 °C to +50 °C)<br>-13 °F to +158 °F (-25 °C to +70 °C) | +32 °F to +122 °F (0 °C to +50 °C)<br>-13 °F to +158 °F (-25 °C to +70 °C) | +32 °F to +122 °F (0 °C to +50 °C)<br>-13 °F to +158 °F (-25 °C to +70 °C) |
| WEIGHT                               | 620 g (22 oz)                                                              | 375 g (13 oz)                                                              | 258 g (9 oz)                                                               |
| APPROVALS                            | CE                                                                         | CE UL US 45                                                                | CE UL US 45                                                                |
| AS-INTERFACE CONNECTION              | Removable terminals                                                        | Removable terminals                                                        | Removable terminals                                                        |



## Wiring Diagrams

SST-ASI-SLC

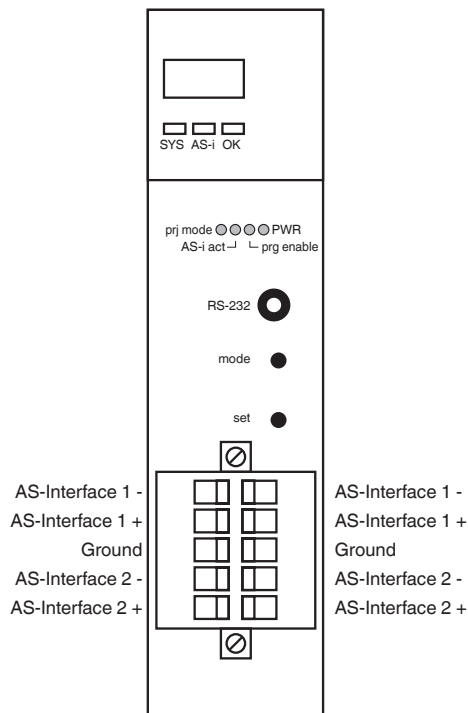


## LED Indicators

| FAULT          | COMM 1/<br>COMM 2 | Description                                          |
|----------------|-------------------|------------------------------------------------------|
| Off            | Green             | Normal operation                                     |
| Red (flashing) |                   | G-File error or slot disabled                        |
| Red (flashing) | Green (flashing)  | 2 or more AS-I nodes missing, configuration mismatch |
| Red (flashing) | Red (flashing)    | In HyperTerminal configuration mode                  |
|                | Red (flashing)    | Power too low, off-line, in configuration mode       |
|                | Green (flashing)  | 1 AS-I node missing                                  |
| Red            | Red               | Error                                                |

## Wiring Diagrams

VBM-CLX-DM



## LED Indicators

**SYS:** Green: PLC Connected

**AS-i:** Green (solid): Good  
 Green (flashing): In configuration mode  
 Red (flashing): Peripheral fault  
 Red (solid): Configuration error

**OK:** Red (solid/flashing): Error  
 Green (solid): PLC run mode  
 Green (flashing): PLC program mode

**PRJ Mode:** Yellow: AS-i master is in configuration mode

**AS-i act:** Green: AS-i network operating normally in either configuration or protected mode

**PRG Enable:** Green: Exactly one slave is missing in protected operating mode and automatic addressing is allowed

**PWR:** Green: Power on

## Pushbuttons

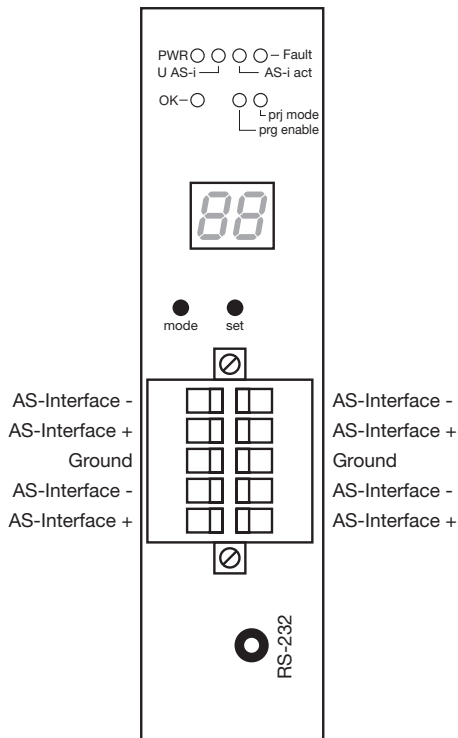
**Mode:** Switches between normal operating mode and configuration mode

**Set:** Changes slave addresses in configuration mode

## Display

**LED Display:** 4 digits

VBM-MLX/CPLX



## LED Indicators

**SYS: LED PWR:** Green: Power on

**U AS-i:** Green: AS-i network is sufficiently powered

**AS-i act:** Green: AS-i network operating normally in either configuration or protected mode

**Fault:** Red (solid): One slave missing or extra slave on the network  
 Red (flashing): Peripheral fault on network

**PRG Enable:** Green: Exactly one slave is missing in protected operating mode and automatic addressing is allowed

**PRJ Mode:** Yellow: AS-i master is in configuration mode

**OK:** Green: PLC in run mode

## Pushbuttons

**Mode:** Switches between normal operating mode and configuration mode

**Set:** Changes slave addresses in configuration mode

## Display

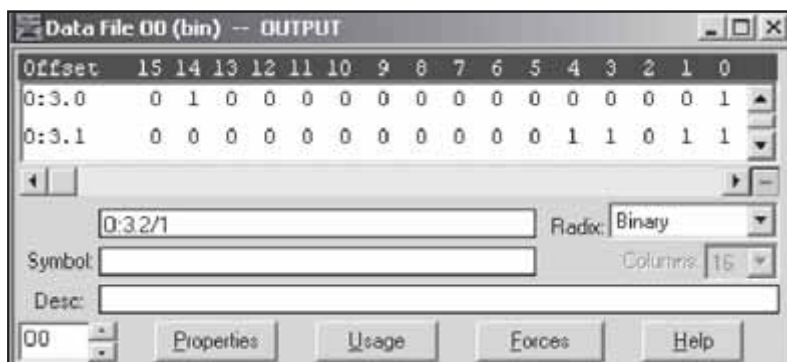
**7 Segment Display:** 2 digits and 2 dots

## DATA MAPPING – SLC500

Allen-Bradley scanners map directly into the input and output images of your PLC.

The SLC 500 scanner works with the SLC 5/03, SLS 5/04 and SLC 5/05.

*An example of an RS Logix 500 screen capture for SLC 500 mapping (slot 3).*



### Mapping Data

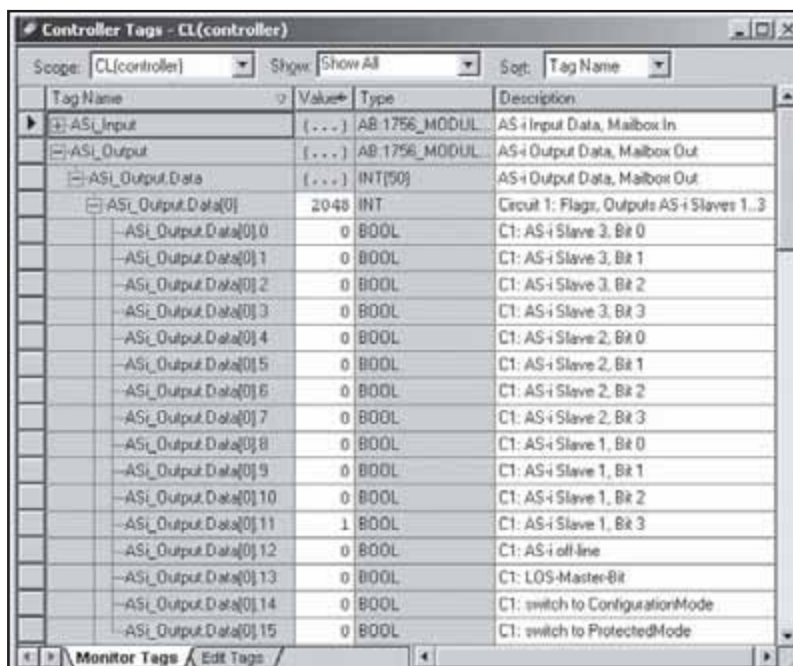
Address 1 outputs 1-4 O:3.0/4 - O:3.0/7  
 Address 2 outputs 1-4 O:3.0/8 - O:3.0/11  
 Address 3 outputs 1-4 O:3.0/12 - O:3.0/15  
 Address 4 outputs 1-4 O:3.1/0 - O:3.1/3

Address 5 outputs 1-4 O:3.1/4 - O:3.1/7  
 Address 6 outputs 1-4 O:3.1/8 - O:3.1/11  
 Address 7 outputs 1-4 O:3.0/12 - O:3.0/15  
 ...

## DATA MAPPING – ControlLogix

The ControlLogix scanner works with all models.

*An example of an RS Logix 5000 screen capture for ControlLogix mapping (slot 1).*

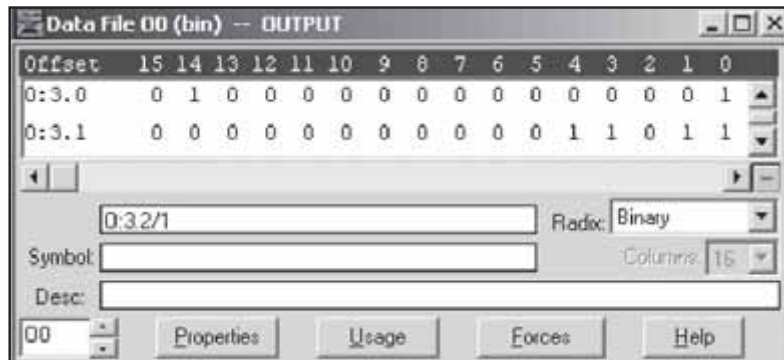


## DATA MAPPING – MicroLogix

Allen-Bradley scanners map directly into the input and output images of your PLC.

The Compact I/O scanner works with the MicroLogix 1500 or the CompactLogix.

*An example of an RS Logix 500 screen capture for MicroLogix 1500 mapping third card.*



### Mapping Data

Address 1/1A outputs 1-4 O:3.0/8 - O:3.0/11  
 Address 2/2A outputs 1-4 O:3.0/4 - O:3.0/7  
 Address 3/3A outputs 1-4 O:3.0/0 - I:3.0/3  
 Address 4/4A outputs 1-4 O:3.1/12 - O:3.1/15

Address 5/5A outputs 1-4 O:3.1/8 - O:3.1/11  
 Address 6/6A outputs 1-4 O:3.1/4 - O:3.1/7  
 Address 7/7A outputs 1-4 O:3.1/0 - O:3.1/3

## Accessories

### VAZ-SW-ACT32

AS-Interface Control Tools  
 configuration and diagnostic software for  
 ControlLogix and Compact I/O scanners



### K-ADP2

Communication cable for ControlLogix and  
 Compact I/O scanners (RS-232)



**See pages 201-216 for complete AS-Interface accessory listing.**





## DeviceNet Gateways

- Advanced graphical display
- Polled, cyclic, change of state, and explicit messaging
- Powered via AS-Interface
- Duplicate address, noise, and ground fault detection

### DeviceNet Gateway Overview

The VBG-DN-K20-D single network gateway and the VBG-DN-K20-DMD... double network gateway support the AS-Interface Specification 3.0.



The advanced graphical display is great for configuring the AS-Interface network as well as diagnosing problems at every stage of installation. Complete lists of all configured nodes, failed nodes, and detected nodes are all stored in the unit. Diagnostic counters keep track of all communication errors in the unlikely event of EMC or noise problems on the network. The easy-to-use pushbuttons can also be used to configure the entire network. DeviceNet gateways also offer features such as duplicate address detection, over voltage detection, and integrated noise monitoring—features no other manufacturer can match.

**DEVICENET**  
 QUICK SETUP  
 SLAVE ADR TOOL  
 SLAVE TEST TOOL  
 SETUP  
 IO + PARAM. TEST  
 DIAGNOSIS  
 ADV. DIAGNOSIS  
 AS-I SAFETY  
 LANGUAGE  
 DISP CONTRAST

To expedite troubleshooting, all outputs can be set directly from the display and every input can be easily read.

In addition to discrete inputs and outputs, analog points are easy to troubleshoot as well. Analog outputs can be written and analog inputs can be read as if you were standing in front of an HMI.

#### BINARY INPUTS

D3 ... D0  
 1A - 0 1 0 1  
 2A - 0 1 0 1 ↓

#### BINARY OUTPUTS

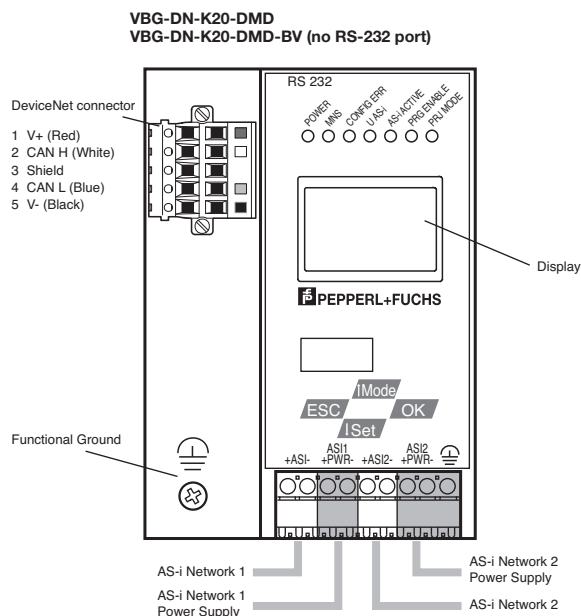
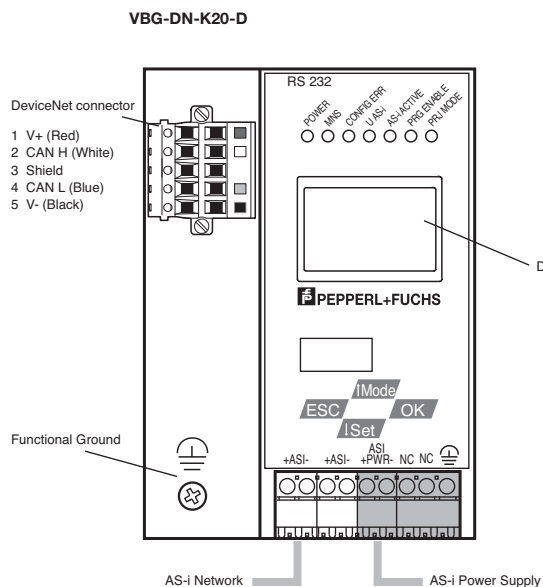
D3 ... D0  
 1A - 0 1 0 1  
 2A - 0 1 0 1 ↓

**See pages 37-38 for DeviceNet gateway wiring and dimensions.**



| Specifications                                             | Enhanced Diagnostics                                                                                                                                                                                                                                        | Basic Diagnostics        |
|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| <b>NETWORK</b>                                             | <b>DeviceNet</b>                                                                                                                                                                                                                                            |                          |
| <b>MODEL</b> <i>Single Network</i>                         | <b>VBG-DN-K20-D</b>                                                                                                                                                                                                                                         |                          |
| <b>NUMBER(S)</b> <i>Dual Network</i>                       | <b>VBG-DN-K20-DMD</b>                                                                                                                                                                                                                                       | <b>VBG-DN-K20-DMD-BV</b> |
| <b>CAPABILITIES</b>                                        |                                                                                                                                                                                                                                                             |                          |
| <i>SPECIFICATION</i>                                       | 3.0                                                                                                                                                                                                                                                         |                          |
| <i>MASTER PROFILE</i>                                      | M4                                                                                                                                                                                                                                                          |                          |
| <i>EXTENDED ADDRESSING POSSIBLE (62)</i>                   | Yes                                                                                                                                                                                                                                                         |                          |
| <i>ANALOG CAPABILITY</i>                                   | Yes                                                                                                                                                                                                                                                         |                          |
| <i>MAX DISCRETE I/O COUNT</i>                              | 248 inputs/248 outputs per network                                                                                                                                                                                                                          |                          |
| <b>CONFIGURATION OPTIONS</b>                               |                                                                                                                                                                                                                                                             |                          |
| <i>PUSHBUTTONS</i>                                         | Yes                                                                                                                                                                                                                                                         |                          |
| <i>PLC / DEVICENET</i>                                     | Yes                                                                                                                                                                                                                                                         |                          |
| <i>DISPLAY</i>                                             | Graphical                                                                                                                                                                                                                                                   |                          |
| <i>SOFTWARE</i>                                            | VAZ-SW-ACT32 (optional)                                                                                                                                                                                                                                     |                          |
| <i>Converter required</i>                                  | No                                                                                                                                                                                                                                                          | Yes                      |
| <b>STAND-ALONE CONTROL (Optional)</b>                      | Disabled by default, purchase VAZ-CTR to unlock                                                                                                                                                                                                             |                          |
| <b>ELECTRICAL SPECIFICATION</b>                            |                                                                                                                                                                                                                                                             |                          |
| <i>OPERATING CURRENT (1/2)</i>                             | 200 mA/70 mA                                                                                                                                                                                                                                                |                          |
| <i>OPERATING CURRENT DEVICENET</i>                         | 35 mA                                                                                                                                                                                                                                                       |                          |
| <b>DEVICENET</b>                                           |                                                                                                                                                                                                                                                             |                          |
| <i>CONNECTION</i>                                          | Dual row 5-pin removable terminals                                                                                                                                                                                                                          |                          |
| <i>COMMUNICATION</i>                                       | Polling, change of state, cyclic                                                                                                                                                                                                                            |                          |
| <i>BAUD RATES (Set via DeviceNet or graphical display)</i> | 125, 250, 500 kbps                                                                                                                                                                                                                                          |                          |
| <i>MAC ID (Set via DeviceNet or graphical display)</i>     | 0-63                                                                                                                                                                                                                                                        |                          |
| <b>ADVANCED FUNCTIONALITY</b>                              |                                                                                                                                                                                                                                                             |                          |
| <i>GROUND FAULT DETECTION</i>                              | Yes                                                                                                                                                                                                                                                         | Yes                      |
| <i>NOISE DETECTION</i>                                     | Yes                                                                                                                                                                                                                                                         | Yes                      |
| <i>DUPLICATE ADDRESS DETECTION</i>                         | Yes                                                                                                                                                                                                                                                         | No                       |
| <i>OVER VOLTAGE DETECTION</i>                              | Yes                                                                                                                                                                                                                                                         | Yes                      |
| <i>RS-232 DIAGNOSTIC PORT</i>                              | Yes                                                                                                                                                                                                                                                         | No                       |
| <b>PROTECTION (IEC)</b>                                    | IP20                                                                                                                                                                                                                                                        |                          |
| <b>TEMPERATURE</b> <i>WORKING</i>                          | +32 °F to +131 °F (0 °C to +55 °C)                                                                                                                                                                                                                          |                          |
| <b>RANGE</b> <i>STORAGE</i>                                | -13 °F to +185 °F (-25 °C to +85 °C)                                                                                                                                                                                                                        |                          |
| <b>HOUSING MATERIAL</b>                                    | Stainless steel                                                                                                                                                                                                                                             |                          |
| <b>WEIGHT</b>                                              | 590 g (21 oz)                                                                                                                                                                                                                                               |                          |
| <b>APPROVALS</b>                                           |    |                          |
| <b>AS-INTERFACE CONNECTION</b>                             |  Yellow removable spring terminals                                                                                                                                       |                          |
| <b>AS-INTERFACE POWER SUPPLY CONNECTION</b>                |  Black removable spring terminals for 30 V AS-i power supply                                                                                                             |                          |

## Wiring Diagrams



## LED Indicators

**Power:** Green: Power on

**MNS:** DeviceNet Status: Green (solid): Online connected  
Green (brinking): Online not connected  
Red: Busoff  
Off: Offline no connection

**Config Error:** Red (solid): One slave missing or extra slave on the network  
Red (flashing): Peripheral fault on network

**U AS-i:** Green: AS-i network is sufficiently powered

**AS-i Active:** Green: AS-i network operating normally in either configuration or protected mode

**PRG Enable:** Green: Exactly one slave is missing in protected operating mode and automatic addressing is allowed

**PRJ Mode:** Yellow: AS-i master is in configuration mode

## Pushbuttons

↑ **Mode:** Switching between normal operating mode and configuration mode and moving up through display

↓ **Set:** Changes slave addresses in configuration mode and moves down through display

**OK:** Moves forward through graphical display and to accept changes

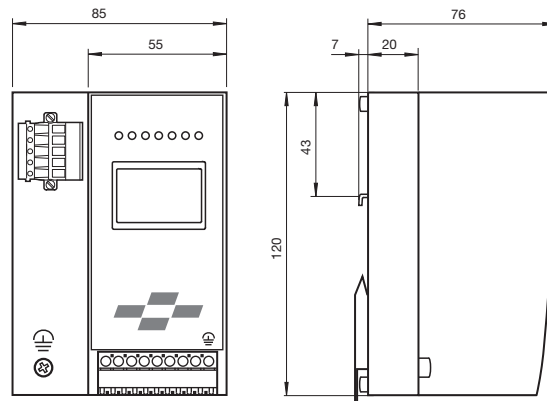
**ESC:** Moves backward through display

## Display

**Graphical Display:** 4 Line black and white display

## Dimensions (mm)

VBG-DN-K20-D  
 VBG-DN-K20-DMD  
 VBG-DN-K20-DMD-BV



## Accessories

**VAZ-DN-SIM-USB**

*DeviceNet master simulator connects DeviceNet gateway directly to USB port on PC.*

**VAZ-SW-ACT32**

*AS-Interface Control Tools configuration and diagnostic software. BV version also requires simulator.*

**VAZ-CTR**

*Unlock codes for stand-alone control functionality of gateway. Must have VAZ-SW-ACT32 to program and unlock stand-alone control functionality. BV version also requires simulator.*

Serial Number: 1234567  
 Unlock codes: \_\_\_\_, \_\_\_\_, \_\_\_\_

**See pages 201-216 for complete AS-Interface accessory listing.**





## PROFIBUS Gateways

- RS-232 port for diagnostic monitoring of network
- Low-cost housing option available without advanced diagnostics
- Built-in duplicate address, noise, and ground fault detection

### PROFIBUS Gateway Overview

Pepperl+Fuchs offers single and double PROFIBUS gateways that fulfill AS-Interface Specification 3.0. These units are also modular PROFIBUS slaves, which means that they can be configured using the GSD file to specify which data, and the amount of data that will be transferred.

These gateways also support acyclical communication of the PROFIBUS DPV1. The acyclical services are used to access all the data made available by the AS-Interface/PROFIBUS gateway. Communication is available up to 12 Mbps.

Pushbuttons or the graphical display are used to assign addresses, accept the target configuration, and adjust the PROFIBUS address and baud rate. Some models use 7 LEDs on the front panel to show the current status of the AS-Interface network. Our

**PROFIBUS**  
 QUICK SETUP  
 SLAVE ADR TOOL  
 SLAVE TEST TOOL  
 SETUP  
 IO + PARAM. TEST  
 DIAGNOSIS  
 ADV. DIAGNOSIS  
 AS-I SAFETY  
 LANGUAGE  
 DISP CONTRAST

top of the line PROFIBUS gateways use a graphical display to provide status indication in full text.

AS-Interface gateways with graphical displays allow the AS-Interface circuit to be placed in service and the test of the connected I/O can be kept entirely separate from the commissioning of PROFIBUS and the programming.

| BINARY INPUTS  | BINARY OUTPUTS |
|----------------|----------------|
| D3 ... D0      | D3 ... D0      |
| 1A - 0 1 0 1   | 1A - 0 1 0 1   |
| 2A - 0 1 0 1 ↓ | 2A - 0 1 0 1 ↓ |

The K20 housing series provides new functions with an improved display. The PROFIBUS connection is recessed on the side. When connected, the device and the connector fit snugly together (only 83 mm high). These gateways are ideal for installation in low-profile junction boxes.

All of the information presented on the large, graphic display is clearly readable thanks to the backlit illumination. Extensive diagnostic functions make fault location a simple task.

Dual addresses are detected via the gateway. The gateway also monitors AS-Interface for ground faults. The integrated ground connection and the color-coded removable terminals make it easy to replace a defective unit or to disassemble a machine for maintenance.

**See pages 42-44 for PROFIBUS gateway wiring and dimensions.**



| Specifications                           | Enhanced Diagnostics                                        | Basic Diagnostics | Basic Diagnostics                    |
|------------------------------------------|-------------------------------------------------------------|-------------------|--------------------------------------|
| <b>NETWORK</b>                           | <b>PROFIBUS</b>                                             |                   |                                      |
| <b>MODEL NUMBER(S)</b>                   | <i>Single Network</i><br>VBG-PB-K20-D                       |                   | VBG-PB-K25                           |
|                                          | <i>Dual Network</i><br>VBG-PB-K20-DMD                       | VBG-PB-K20-DMD-BV |                                      |
| <b>CAPABILITIES</b>                      |                                                             |                   |                                      |
| <i>SPECIFICATION</i>                     | 3.0                                                         |                   |                                      |
| <i>MASTER PROFILE</i>                    | M4                                                          |                   |                                      |
| <i>EXTENDED ADDRESSING POSSIBLE (62)</i> | Yes                                                         |                   |                                      |
| <i>ANALOG CAPABILITY</i>                 | Yes                                                         |                   |                                      |
| <i>MAX DISCRETE I/O COUNT</i>            | 248 inputs/248 outputs per network                          |                   |                                      |
| <b>CONFIGURATION OPTIONS</b>             |                                                             |                   |                                      |
| <i>PUSHBUTTONS</i>                       | Yes                                                         |                   |                                      |
| <i>PLC / PROFIBUS</i>                    | Yes                                                         |                   |                                      |
| <i>DISPLAY</i>                           | Graphical                                                   |                   | 3, 7 segment + LEDs                  |
| <i>SOFTWARE</i>                          | VAZ-SW-ACT32 (optional)                                     |                   |                                      |
| <i>Converter Required</i>                | No                                                          | Yes               | Yes                                  |
| <b>STAND-ALONE CONTROL (Optional)</b>    | Disabled by default, purchase VAZ-CTR to unlock             |                   |                                      |
| <b>ELECTRICAL SPECIFICATION</b>          |                                                             |                   |                                      |
| <i>OPERATING CURRENT (1/2)</i>           | 200 mA/70 mA                                                | 200 mA/70 mA      | 200 mA                               |
| <b>PROFIBUS</b>                          |                                                             |                   |                                      |
| <i>CONNECTION</i>                        | DB9                                                         |                   |                                      |
| <i>COMMUNICATION</i>                     | PROFIBUS, DPV0 AND DPV1                                     |                   |                                      |
| <i>BAUD RATES</i>                        | Up to 12 Mbps                                               |                   |                                      |
| <i>ADDRESSES</i>                         | 0-127                                                       |                   |                                      |
| <b>ADVANCED FUNCTIONALITY</b>            |                                                             |                   |                                      |
| <i>GROUND FAULT DETECTION</i>            | Yes                                                         | Yes               | Yes                                  |
| <i>NOISE DETECTION</i>                   | Yes                                                         | Yes               | Yes                                  |
| <i>DUPLICATE ADDRESS DETECTION</i>       | Yes                                                         | No                | No                                   |
| <i>OVER VOLTAGE DETECTION</i>            | Yes                                                         | Yes               | Yes                                  |
| <i>RS-232 DIAGNOSTIC PORT</i>            | Yes                                                         | No                | No                                   |
| <b>PROTECTION (IEC)</b>                  | IP20                                                        |                   |                                      |
| <b>TEMPERATURE</b>                       |                                                             |                   |                                      |
| <i>WORKING RANGE</i>                     | +32 °F to +131 °F (0 °C to +55 °C)                          |                   | +32 °F to +131 °F (0 °C to +55 °C)   |
| <i>STORAGE</i>                           | +5 °F to +167 °F (-15 °C to +75 °C)                         |                   | -13 °F to +185 °F (-25 °C to +85 °C) |
| <b>HOUSING MATERIAL</b>                  | Stainless steel                                             |                   |                                      |
| <b>WEIGHT</b>                            | 590 g (21 oz)                                               |                   | 460 g (16 oz)                        |
| <b>APPROVALS</b>                         |                                                             |                   |                                      |
| <b>AS-INTERFACE CONNECTION</b>           | Yellow removable spring terminals                           |                   |                                      |
| <b>POWER SUPPLY CONNECTION</b>           | Black removable spring terminals for 30 V AS-i power supply |                   |                                      |

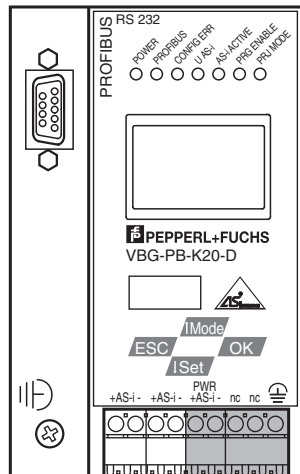


| Specifications                    |                | Enhanced Diagnostics<br>+ Enhanced SafetyMonitor                                                                                                   |
|-----------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| NETWORK                           |                | PROFIBUS                                                                                                                                           |
| MODEL NUMBER(S)                   | Single Network | VBG-PB-K30-D-S16                                                                                                                                   |
|                                   | Dual Network   | VBG-PB-K30-DMD-S16                                                                                                                                 |
| CAPABILITIES                      |                |                                                                                                                                                    |
| SPECIFICATION                     |                | 3.0                                                                                                                                                |
| MASTER PROFILE                    |                | M4                                                                                                                                                 |
| EXTENDED ADDRESSING POSSIBLE (62) |                | Yes                                                                                                                                                |
| ANALOG CAPABILITY                 |                | Yes                                                                                                                                                |
| MAX DISCRETE I/O COUNT            |                | 248 inputs/248 outputs per network                                                                                                                 |
| CONFIGURATION OPTIONS             |                |                                                                                                                                                    |
| PUSHBUTTONS                       |                | Yes                                                                                                                                                |
| PLC / PROFIBUS                    |                | Yes                                                                                                                                                |
| DISPLAY                           |                | Graphical                                                                                                                                          |
| SOFTWARE                          |                | VAZ-SW-ACT32 (optional)<br>and VAZ-SW-SIMON+ (required)                                                                                            |
| Converter Required                |                | No                                                                                                                                                 |
| STAND-ALONE CONTROL (Optional)    |                | Disabled by default, purchase VAZ-CTR to unlock                                                                                                    |
| ELECTRICAL SPECIFICATION          |                |                                                                                                                                                    |
| OPERATING CURRENT (1/2)           |                | 300 mA/70 mA                                                                                                                                       |
| PROFIBUS                          |                |                                                                                                                                                    |
| CONNECTION                        |                | DB9                                                                                                                                                |
| COMMUNICATION                     |                | PROFIBUS, DPV0 AND DPV1                                                                                                                            |
| BAUD RATES                        |                | Up to 12 Mbps                                                                                                                                      |
| ADDRESSES                         |                | 0-127                                                                                                                                              |
| ADVANCED FUNCTIONALITY            |                |                                                                                                                                                    |
| GROUND FAULT DETECTION            |                | Yes                                                                                                                                                |
| NOISE DETECTION                   |                | Yes                                                                                                                                                |
| DUPLICATE ADDRESS DETECTION       |                | Yes                                                                                                                                                |
| OVER VOLTAGE DETECTION            |                | Yes                                                                                                                                                |
| RS-232 DIAGNOSTIC PORT            |                | Yes                                                                                                                                                |
| PROTECTION (IEC)                  |                | IP20                                                                                                                                               |
| TEMPERATURE RANGE                 | WORKING        | +32 °F to +131 °F (0 °C to +55 °C)                                                                                                                 |
|                                   | STORAGE        | -13 °F to +185 °F (-25 °C to +85 °C)                                                                                                               |
| HOUSING MATERIAL                  |                | Stainless steel                                                                                                                                    |
| WEIGHT                            |                | 800 g (28 oz)                                                                                                                                      |
| APPROVALS                         |                | CE cULus AS                                                                                                                                        |
| AS-INTERFACE CONNECTION           |                |  Yellow removable spring terminals                              |
| POWER SUPPLY CONNECTION           |                |  Black removable spring terminals<br>for 30 V AS-i power supply |
| SAFETY INFORMATION                |                |                                                                                                                                                    |
| START/EDM INPUTS                  |                | 4, 10 mA @ 24 VDC                                                                                                                                  |
| SAFETY OUTPUT CHANNELS            |                | 16                                                                                                                                                 |
| SAFETY OUTPUTS (OSSDs)            |                | 4 channels (2 relay, 2 PNP)                                                                                                                        |
| SAFE OUTPUTS ON AS-i              |                | Yes (up to 16 channels)                                                                                                                            |
| SAFE COUPLING                     |                | Yes (up to 16 channels)                                                                                                                            |
| NETWORK CONNECTIONS               |                | 2                                                                                                                                                  |
| MAX. NUMBER SAFETY DEVICES        |                | (31 x 2 networks) = 62                                                                                                                             |
| MAX. NUMBER PROG. BLOCKS          |                | 256                                                                                                                                                |
| REMOVABLE MEMORY CARD             |                | Yes                                                                                                                                                |



## Wiring Diagrams

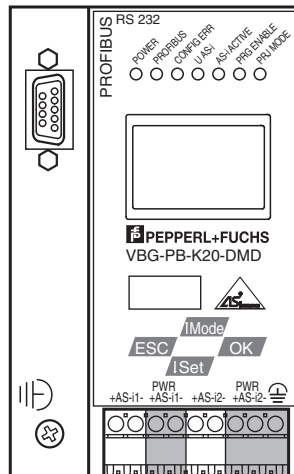
VBG-PB-K20-D



AS-i Network  
AS-i Network  
AS-i Power Supply

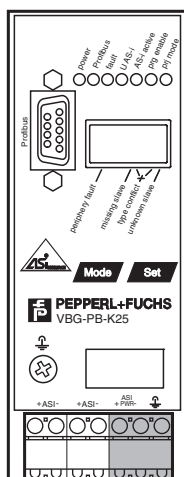
VBG-PB-K20-DMD

VBG-PB-K20-DMD-BV (no RS-232 port)



AS-i Network 1  
AS-i Network 1  
AS-i Network 2  
AS-i Network 2  
AS-i Power Supply

VBG-PB-K25



AS-i Network  
AS-i Network  
AS-i Power Supply

## LED Indicators

**Power:** Green: Power on**PROFIBUS:** Green (solid): Allocated to a PROFIBUS master**Config Error:** Red (solid): One slave missing or extra slave on the network

Red (flashing): Peripheral fault on network

**U AS-i:** Green: AS-i network is sufficiently powered**AS-i Active:** Green: AS-i network operating normally in either configuration or protected mode**PRG Enable:** Green: Exactly one slave is missing in protected operating mode and automatic addressing is allowed**PRJ Mode:** Yellow: AS-i master is in configuration mode

## Pushbuttons

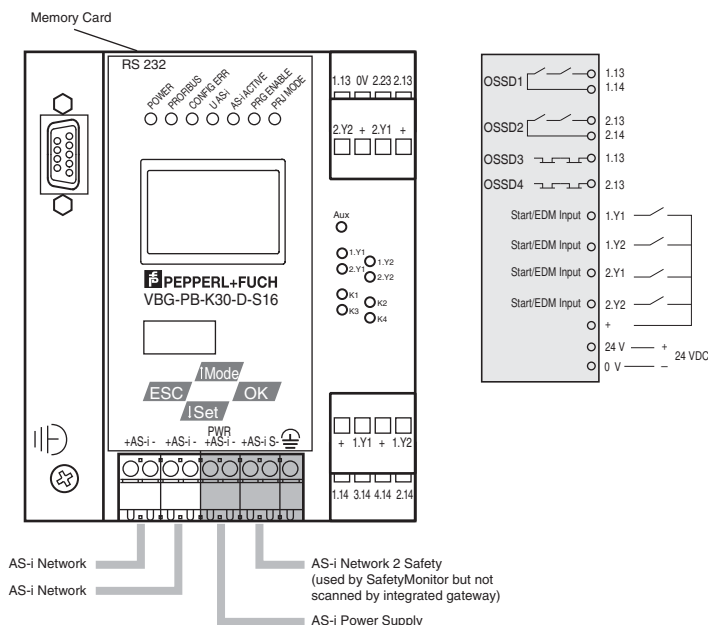
**Mode:** Switching between normal operating mode and configuration mode**Set:** Changes slave addresses in configuration mode

## Display

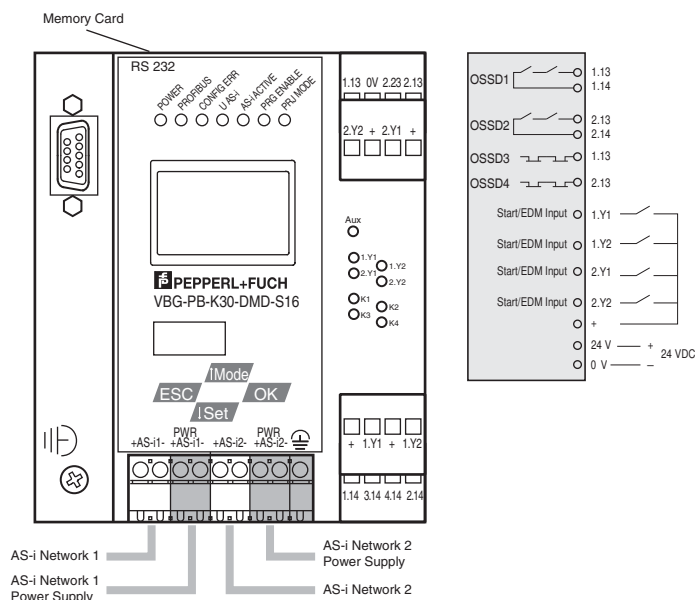
**7 Segment Display:** 3 digits, 2 dots

## Wiring Diagrams

VBG-PB-K30-D-S16



VBG-PB-K30-DMD-S16



## LED Indicators

**Power:** Green: Power on

**PROFIBUS:** Green (solid): Allocated to a PROFIBUS master

**Config Error:** Red (solid): One slave missing or extra slave on the network  
Red (flashing): Peripheral fault on network

**U AS-i:** Green: AS-i network is sufficiently powered

**AS-i Active:** Green: AS-i network operating normally in either configuration or protected mode

**PRG Enable:** Green: Exactly one slave is missing in protected operating mode and automatic addressing is allowed

**PRJ Mode:** Yellow: AS-i master is in configuration mode

**Aux:** Green: Power on

**1.Yx, 2.Yx:** Yellow: Input on

**Kx:** Yellow: OSSD on

## Pushbuttons

↑ **Mode:** Switching between normal operating mode and configuration mode and moving up through display

↓ **Set:** Changes slave addresses in configuration mode and moves down through display

**OK:** Moves forward through graphical display and to accept changes

**ESC:** Moves backward through display

## Display

**Graphical Display:** 4 line black and white display

## LED Indicators

**Power:** Green: Power on

**PROFIBUS:** Green (solid): Allocated to a PROFIBUS master

**Config Error:** Red (solid): One slave missing or extra slave on the network  
Red (flashing): Peripheral fault on network

**U AS-i:** Green: AS-i network is sufficiently powered

**AS-i Active:** Green: AS-i network operating normally in either configuration or protected mode

**PRG Enable:** Green: Exactly one slave is missing in protected operating mode and automatic addressing is allowed

**PRJ Mode:** Yellow: AS-i master is in configuration mode

**Aux:** Green: Power on

**1.Yx, 2.Yx:** Yellow: Input on

**Kx:** Yellow: OSSD on

## Pushbuttons

↑ **Mode:** Switching between normal operating mode and configuration mode and moving up through display

↓ **Set:** Changes slave addresses in configuration mode and moves down through display

**OK:** Moves forward through graphical display and to accept changes

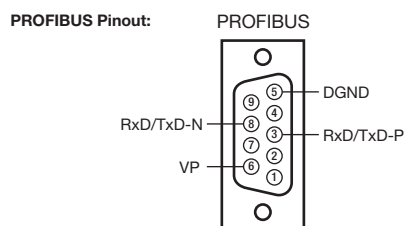
**ESC:** Moves backward through display

## Display

**Graphical Display:** 4 line black and white display

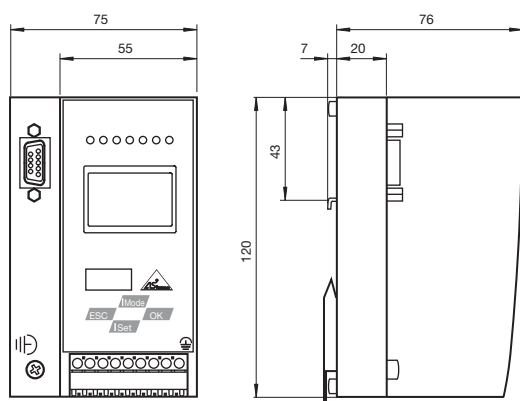


## Wiring Diagrams

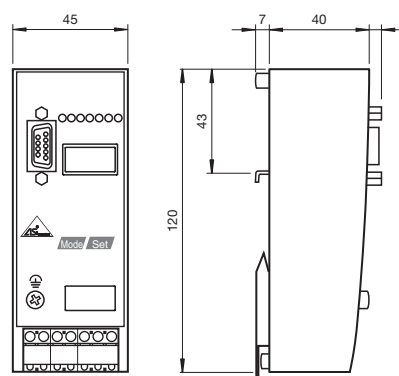


## Dimensions (mm)

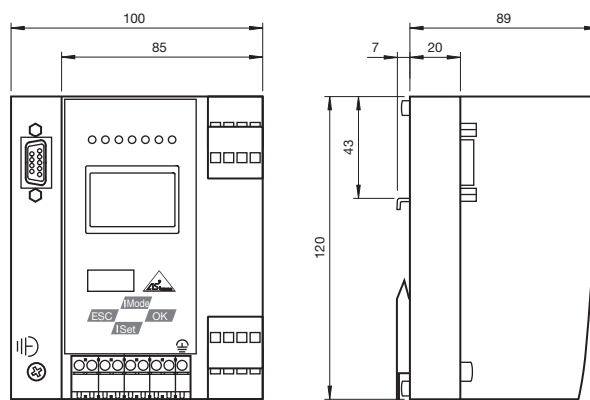
**VBG-PB-K20-D**  
**VBG-PB-K20-DMD**  
**VBG-PB-K20-DMD-BV**



**VBG-PB-K25**



**VBG-PB-K30-D-S16**  
**VBG-PB-K30-DMD-S16**



## Accessories

### VAZ-PB-SIM

PROFIBUS master simulator



### VAZ-SW-ACT32

AS-Interface Control Tools  
configuration and diagnostic software



### VAZ-PB-DB9-W

PROFIBUS 9-pin, right angle D-sub  
connector for 2 PROFIBUS cables  
with terminator switch



### VAZ-SW-SIMON+

AS-Interface safety monitor configuration  
software. RS-232 configuration cable included.



### VAZ-CTR

Unlock codes for stand-alone control functionality of  
gateway. Must have VAZ-SW-ACT32 to program and  
unlock stand-alone control functionality. BV and K25  
also require simulator to communicate with gateway.

Serial Number: 1234567

Unlock codes: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

See pages 201-216 for complete AS-Interface accessory listing.

# Ethernet Gateways

- RS-232 port for diagnostic monitoring of network
- Advanced graphical display
- Duplicate address, noise, and ground fault detection built in
- 10/100 Mbps Ethernet connection, IP address set using display, DHCP, or BOOTP
- ActiveX, DLLs, OPC servers, .NET drivers
- EtherNet/IP support allows direct integration with modern Allen-Bradley PLCs
- Integrated PROFINET and Modbus/TCP protocols



## Overview

Pepperl+Fuchs offers gateways that function as complete AS-Interface networks and also as servers to the upper level Ethernet networks. In configuration mode, all AS-Interface modules detected are displayed on the LCD. There are seven LEDs on the front panel available for diagnostics. Pushbuttons are used to program the addresses of the AS-Interface modules and to store the network configuration.

Each Ethernet gateway is supplied with a unique MAC-ID. An IP address can be assigned to the gateway using the graphical display or DHCP. All the information presented on the large, graphical display is clearly readable thanks to the backlit illumination. Extensive diagnostic functions make fault location a simple task.

### BINARY INPUTS

D3 ... D0  
1A - 0 1 0 1  
2A - 0 1 0 1 ↓

### BINARY OUTPUTS

D3 ... D0  
1A - 0 1 0 1  
2A - 0 1 0 1 ↓

Duplicate addresses are detected via the gateway. The gateway also monitors AS-Interface for ground faults. The integrated ground connection and the color-coded removable terminals make it easy to replace a defective unit or disassemble a machine.

With direct EtherNet/IP, support integration of our Ethernet gateways into an Allen-Bradley ControlLogix or Compact I/O environment is easy and convenient. Once the gateway is inserted into the configuration, all I/O data is directly mapped and immediately available for use. The native implementations guarantee fast data updates. PROFINET is another Ethernet based protocol predominately supported by many, including Siemens PLCs.

If Ethernet is used, Modbus/TCP is uniquely qualified to allow multiple users to log on simultaneously. This function enables one control program to be used along side data acquisition, diagnostic, and monitoring software.

Special C1 gateways are available with integrated power conditioner. This allows one standard 30 VDC supply to power both networks.

**See pages 48-49 for Ethernet gateway wiring and dimensions.**



| Specifications                       |                | Enhanced Diagnostics                                        |                                                      |                                                     |
|--------------------------------------|----------------|-------------------------------------------------------------|------------------------------------------------------|-----------------------------------------------------|
| NETWORK                              |                | EtherNet/IP                                                 | Modbus/TCP                                           | PROFINET                                            |
| MODEL NUMBER(S)                      | Single Network | VBG-EN-K20-D                                                | VBG-IP-K20-D                                         | VBG-PN-K20-D                                        |
|                                      | Dual Network   | VBG-EN-K20-DMD                                              | VBG-IP-K20-DMD                                       |                                                     |
| CAPABILITIES                         |                |                                                             |                                                      |                                                     |
| SPECIFICATION                        |                | 3.0                                                         |                                                      |                                                     |
| MASTER PROFILE                       |                | M4                                                          |                                                      |                                                     |
| EXTENDED ADDRESSING POSSIBLE (62)    |                | Yes                                                         |                                                      |                                                     |
| ANALOG CAPABILITY                    |                | Yes                                                         |                                                      |                                                     |
| MAX DISCRETE I/O COUNT               |                | 248 inputs/248 outputs per network                          |                                                      |                                                     |
| CONFIGURATION OPTIONS                |                |                                                             |                                                      |                                                     |
| PUSHBUTTONS                          |                | Yes                                                         |                                                      |                                                     |
| PLC / ETHERNET                       |                | Yes                                                         |                                                      |                                                     |
| DISPLAY                              |                | Graphical                                                   |                                                      |                                                     |
| SOFTWARE                             |                | VAZ-SW-ACT32 (optional)                                     |                                                      |                                                     |
| Converter required                   |                | No                                                          |                                                      |                                                     |
| STAND-ALONE CONTROL (Optional)       |                | Disabled by default, purchase VAZ-CTR to unlock             |                                                      |                                                     |
| ELECTRICAL SPECIFICATION             |                |                                                             |                                                      |                                                     |
| OPERATING CURRENT (1/2)              |                | 200 mA/70 mA                                                |                                                      | 200 mA                                              |
| ETHERNET                             |                |                                                             |                                                      |                                                     |
| CONNECTION                           |                | RJ45                                                        |                                                      |                                                     |
| COMMUNICATION                        |                | EtherNet/IP                                                 | Modbus/TCP                                           | PROFINET I/O                                        |
| BAUD RATES                           |                | Autonegotiate 10/100 Mbps full/half duplex                  |                                                      |                                                     |
| ADDRESSES                            |                | IP address static, DHCP, or BOOTP                           |                                                      | IP address static, DHCP, or BOOTP and PROFINET Name |
| ADVANCED FUNCTIONALITY               |                |                                                             |                                                      |                                                     |
| GROUND FAULT DETECTION               |                | Yes                                                         |                                                      |                                                     |
| NOISE DETECTION                      |                | Yes                                                         |                                                      |                                                     |
| DUPLICATE ADDRESS DETECTION          |                | Yes                                                         |                                                      |                                                     |
| OVER VOLTAGE DETECTION               |                | Yes                                                         |                                                      |                                                     |
| RS-232 DIAGNOSTIC PORT               |                | Yes                                                         |                                                      |                                                     |
| AVAILABLE DRIVERS                    |                | —                                                           | ActiveX-Control, 32 bit DLL, OPC SERVER, .NET, LINUX | —                                                   |
| PROTECTION (IEC)                     |                | IP20                                                        |                                                      |                                                     |
| TEMPERATURE RANGE                    | WORKING        | +32 °F to +131 °F (0 °C to +55 °C)                          |                                                      | +32 °F to +131 °F (0 °C to +55 °C)                  |
|                                      | STORAGE        | -13 °F to +167 °F (-25 °C to +75 °C)                        |                                                      | -13 °F to +185 °F (-25 °C to +85 °C)                |
| HOUSING MATERIAL                     |                | Stainless steel                                             |                                                      |                                                     |
| WEIGHT                               |                | 590 g (21 oz)                                               |                                                      |                                                     |
| APPROVALS                            |                |                                                             |                                                      |                                                     |
| AS-INTERFACE CONNECTION              |                | Yellow removable spring terminals                           |                                                      |                                                     |
| AS-INTERFACE POWER SUPPLY CONNECTION |                | Black removable spring terminals for 30 V AS-i power supply |                                                      |                                                     |

Gateways and Scanners

Power Supplies and Repeaters

I/O Modules

Safety at Work

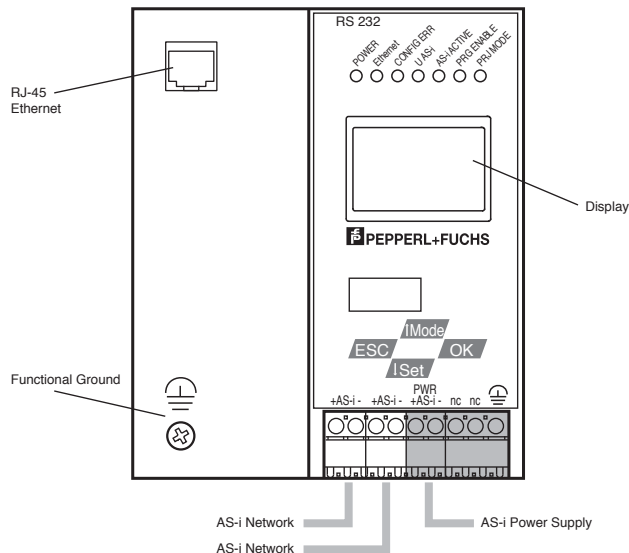
Sensors

Cordsets

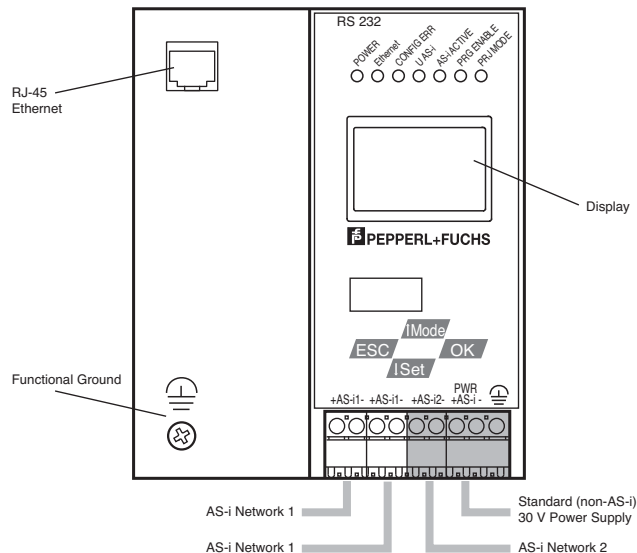
Accessories

## Wiring Diagrams

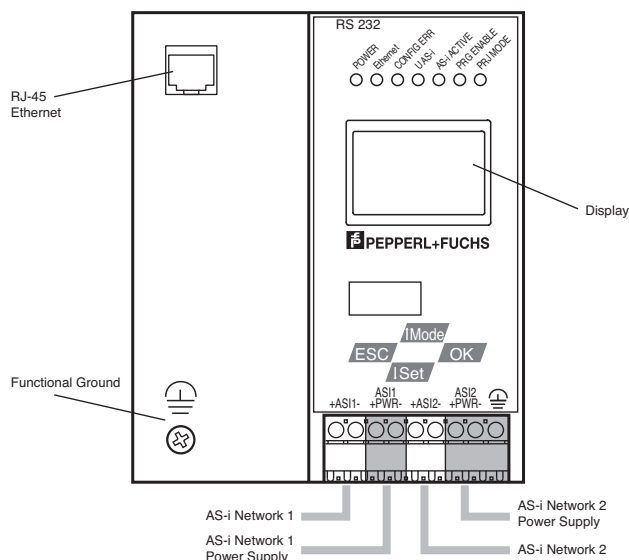
VBG-IP-K20-D  
VBG-EN-K20-D  
VBG-PN-K20-D



VBG-EN-K20-DMD-C1



VBG-IP-K20-DMD  
VBG-EN-K20-DMD



## LED Indicators

**Power:** Green: Power on

**Ethernet:** Green (solid): IP address assigned  
Green (3 flashes): No Ethernet cable connected  
Green (4 flashes): No MAC address assigned, defective  
Green (5 flashes): Waiting for BOOTP/DHCP

**Config Error:** Red (solid): One slave missing or extra slave on the network  
Red (flashing): Peripheral fault on network

**U AS-i:** Green: AS-i network is sufficiently powered

**AS-i Active:** Green: AS-i network operating normally in either configuration or protected mode

**PRG Enable:** Green: Exactly one slave is missing in protected operating mode and automatic addressing is allowed

**PRJ Mode:** Yellow: AS-i master is in configuration mode

## Pushbuttons

↑ **Mode:** Switching between normal operating mode and configuration mode and moving up through display

↓ **Set:** Changes slave addresses in configuration mode and moves down through display

**OK:** Moves forward through graphical display and to accept changes

**ESC:** Moves backward through display

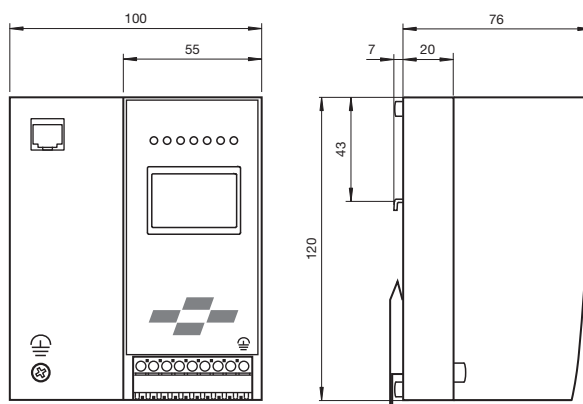
## Display

**Graphical Display:** 4 line black and white display



## Dimensions (mm)

VBG-...-K20-D  
VBG-...-K20-DMD...



## Accessories

### VAZ-SW-ACT32

AS-Interface Control Tools  
configuration and diagnostic software



### VAZ-CTR

Unlock codes for stand-alone control  
functionality of gateway. Must have  
VAZ-SW-ACT32 to program and unlock  
stand-alone control functionality.

Serial Number: 1234567  
Unlock codes: \_\_\_\_, \_\_\_\_, \_\_\_\_

See pages 201-216 for complete AS-Interface accessory listing.

## Serial Gateways

- P+F or Modbus protocol support
- Stand-alone control
- Removable terminals
- ActiveX, DLLs, OPC, .NET drivers
- RS-232 up to 57.6 kbps
- RS-485 up to 115.2 kbps on Modbus



### Serial Gateway Overview

The RS-232 gateway is used for PC or stand-alone control applications. The serial port can communicate up to 57.6 kbps. Up to 62 discrete I/O or 31 analog modules can be placed on one network. The keyed removable terminals add flexibility when connecting AS-Interface or RS-232.

Our Modbus gateways are designed to support the open Modbus protocol. Since many PC based control platforms and SCADA packages support the Modbus protocol, our serial gateway is the ideal solution for adding hundreds of I/O points. Modbus driver communication can also be used with custom PC based applications written in Visual Basic or other higher level languages.

Our gateways using the P+F protocol, such as VBM-CTR..., also have built-in and enabled stand-alone control offering PLC functionality. This control platform allows users to write powerful programs to control their process without using a PLC or PC. In addition, these gateways are perfect for distributed control systems where some outputs are controlled by the gateways, while others are controlled by the PLC. Stand-alone control programs have the following capabilities:

#### Stand-Alone Control Capabilities

|                                  |                                    |
|----------------------------------|------------------------------------|
| Program memory                   | 16 kB                              |
| Data memory ex. counters, timers | 8 kB                               |
| Cycle time                       | 2 ms /1000 instructions            |
| Timers                           | 1024, 10ms resolution              |
| Counters                         | 1024                               |
| Programming language             | AWL (structured text), or Assembly |

This simple programming language allows for easy reading of inputs, setting of outputs, and manipulation of analog data. Binary operations such as AND, AND NOT, OR, OR NOT, =, NOT, SET, and RESET are available. Word based operations include Load Timer, Load Counter, Load Parameter, Load Byte, Load Word, Copy Byte, Copy Word, Addition, and Subtraction. In addition, logical operators such as LESS THAN, LESS THAN OR EQUAL, GREATER THAN, GREATER THAN OR EQUAL, EQUAL, and NOT EQUAL can be used.

Program control is done with segment end, block end, and jump type instructions. These gateways also have built-in function blocks to retrieve and send data up to the AS-Interface master. These blocks include read/write parameters, reading slave lists, reading safety data, and accessing the mailbox. Over 15 built-in function blocks are available to the user.

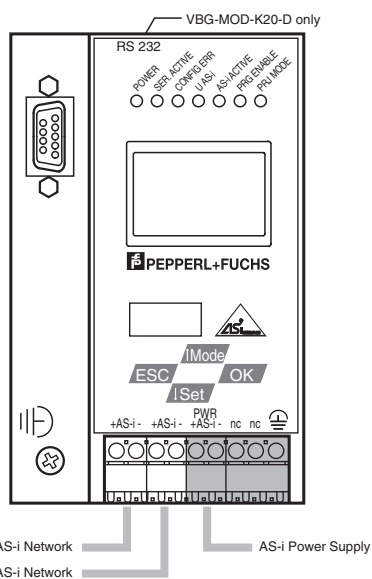
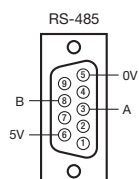
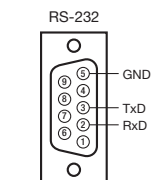
**See page 52 for Serial gateway wiring and dimensions.**



| Specifications                       | Enhanced Diagnostics                                        | Basic Diagnostics                                    |
|--------------------------------------|-------------------------------------------------------------|------------------------------------------------------|
| NETWORK                              | Modbus Serial RS-485                                        | P+F Serial RS-232                                    |
| MODEL NUMBER(S)                      | VBG-MOD-K20-D                                               | VBM-CTR-K20-R2                                       |
| <i>Single Network</i>                |                                                             |                                                      |
| <i>Dual Network</i>                  |                                                             |                                                      |
| CAPABILITIES                         |                                                             |                                                      |
| SPECIFICATION                        | 3.0                                                         | 3.0                                                  |
| MASTER PROFILE                       | M4                                                          | M4                                                   |
| NUMBER OF NETWORKS                   | 1                                                           | 1                                                    |
| EXTENDED ADDRESSING POSSIBLE (62)    | Yes                                                         | Yes                                                  |
| ANALOG CAPABILITY                    | Yes                                                         | Yes                                                  |
| MAX DISCRETE I/O COUNT               | 248 inputs/248 outputs per network                          | 248 inputs/248 outputs per network                   |
| CONFIGURATION OPTIONS                |                                                             |                                                      |
| PUSHBUTTONS                          | Yes                                                         | Yes                                                  |
| PC                                   | Yes                                                         | Yes                                                  |
| DISPLAY                              | Graphical                                                   | Graphical                                            |
| SOFTWARE                             | VAZ-SW-ACT32 (optional)                                     | VAZ-SW-ACT32 (optional)                              |
| <i>Converter required</i>            | No                                                          | No                                                   |
| STAND-ALONE CONTROL (Optional)       | Disabled by default, purchase VAZ-CTR to unlock             | Enabled by default                                   |
| ELECTRICAL SPECIFICATION             |                                                             |                                                      |
| OPERATING CURRENT AS-INTERFACE       | 200 mA                                                      | 200 mA                                               |
| SERIAL-SPECIFIC INFORMATION          |                                                             |                                                      |
| CONNECTION                           | DB9                                                         | DB9                                                  |
| SERIAL INTERFACE                     | RS-485                                                      | RS-232                                               |
| COMMUNICATION                        | Modbus ASCII/RTU                                            | Standard P+F protocol                                |
| BAUD RATES                           | 1200 to 115200 bps                                          | 1200 to 57600 bps, autobaud                          |
| PARITY                               | Odd, even or none                                           | None                                                 |
| ADDRESSES                            | 1-31                                                        | None                                                 |
| ADVANCED FUNCTIONALITY               |                                                             |                                                      |
| GROUND FAULT DETECTION               | Yes                                                         | Yes                                                  |
| NOISE DETECTION                      | Yes                                                         | Yes                                                  |
| DUPLICATE ADDRESS DETECTION          | Yes                                                         | No                                                   |
| OVER VOLTAGE DETECTION               | Yes                                                         | Yes                                                  |
| RS-232 DIAGNOSTIC PORT               | Yes                                                         | No                                                   |
| AVAILABLE DRIVERS                    | ActiveX-Control, 32 bit DLL, OPC SERVER, .NET, LINUX        | ActiveX-Control, 32 bit DLL, OPC SERVER, .NET, LINUX |
| PROTECTION (IEC)                     | IP20                                                        | IP20                                                 |
| TEMPERATURE WORKING RANGE            | +32 °F to +131 °F (0 °C to +55 °C)                          | +32 °F to +131 °F (0 °C to +55 °C)                   |
| STORAGE                              | +5 °F to +167 °F (-15 °C to +75 °C)                         | -13 °F to +185 °F (-25 °C to +85 °C)                 |
| HOUSING MATERIAL                     | Stainless steel                                             | Stainless steel                                      |
| WEIGHT                               | 590 g (21 oz)                                               | 590 g (21 oz)                                        |
| APPROVALS                            |                                                             |                                                      |
| AS-INTERFACE CONNECTION              | Yellow removable spring terminals                           |                                                      |
| AS-INTERFACE POWER SUPPLY CONNECTION | Black removable spring terminals for 30 V AS-i power supply |                                                      |

## Wiring Diagrams

VBG-MOD-K20-D  
VBM-CTR-K20-R2



## LED Indicators

**Power:** Green: Power on

**Ser. Active:** Green (flash): On successful send/receive of serial data

**Config Error:** Red (solid): One slave missing or extra slave on the network  
Red (flashing): Peripheral fault on network

**U AS-i:** Green: AS-i network is sufficiently powered

**AS-i Active:** Green: AS-i network operating normally in either configuration or protected mode

**PRG Enable:** Green: Exactly one slave is missing in protected operating mode and automatic addressing is allowed

**PRJ Mode:** Yellow: AS-i master is in configuration mode

## Pushbuttons

↑ **Mode:** Switching between normal operating mode and configuration mode and moving up through display

↓ **Set:** Changes slave addresses in configuration mode and moves down through display

**OK:** Moves forward through graphical display and to accept changes

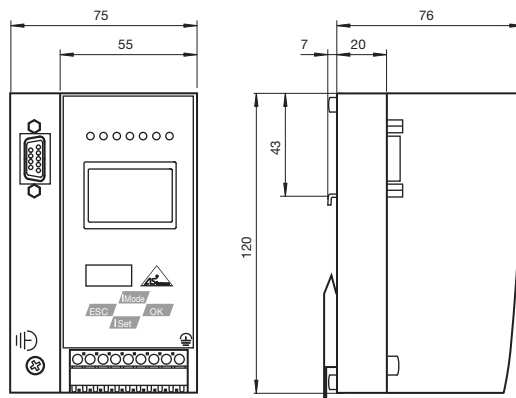
**ESC:** Moves backward through display

## Display

**Graphical Display:** 4 line black and white display

## Dimensions (mm)

VBG-MOD-K20-D  
VBM-CTR-K20-R2



## Accessories

**VAZ-SW-ACT32**

AS-Interface Control Tools  
configuration and diagnostic software

**VAZ-R4-R2**

RS-232 to RS-485 converter

**VAZ-CTR**

Unlock codes for stand-alone control  
functionality of gateway. Must have  
VAZ-SW-ACT32 to program and unlock  
stand-alone control functionality.

Serial Number: 1234567

Unlock codes: \_\_\_\_, \_\_\_\_, \_\_\_\_

See pages 201-216 for complete AS-Interface accessory listing.





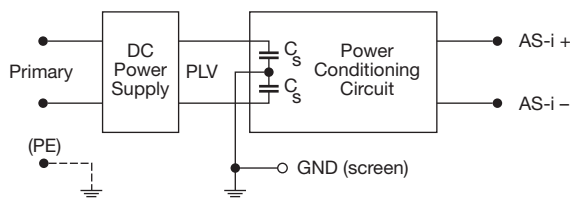


# Power Supplies and Repeaters

|                                                   |           |
|---------------------------------------------------|-----------|
| <b>Standard AS-Interface Power Supplies.....</b>  | <b>58</b> |
| <b>Ground Fault Detection Power Supplies.....</b> | <b>61</b> |
| <b>Power Conditioners.....</b>                    | <b>64</b> |
| <b>Repeaters.....</b>                             | <b>67</b> |
| <b>Standard 24-30 VDC Power Supplies .....</b>    | <b>70</b> |

## Power Supplies and Repeaters

AS-Interface power supplies are an integral part of the AS-Interface network. On AS-Interface, data and power are transmitted on the same cable. The data signal is transferred using amplitude pulse modulation and rides on top of 30 VDC that powers the modules. Because both DC and high-frequency communication components are present on AS-Interface, power conditioning circuitry is required.



## Features of AS-Interface Power Supplies

### Startup and overload protection

An overload can last for an indefinite amount of time without damaging the power supply. Removing the overload will allow the power supply to come back automatically to the full-rated current.

### Power specifications

The output voltage of the power supply is between 29.5 VDC and 31.6 VDC over the entire load range.

### Power interruptions

Power interruption of 10 ms or less on the primary side will not affect AS-Interface.

### Power-on delay

The power-on delay is less than 2 s.

## Rated Operating Current

The rated operating current can be exceeded by a maximum of 0.4 A to meet the expectations of the modules requiring extra current during power up.

### AC input and AS-Interface output connections

|         |              |                                      |
|---------|--------------|--------------------------------------|
| Primary | <b>L</b>     | Single phase                         |
|         | <b>N</b>     | Neutral                              |
|         | <b>PE</b>    | Protected earth ground               |
|         | <b>AS-i+</b> | AS-Interface Power +                 |
|         | <b>AS-i-</b> | AS-Interface Power -                 |
|         | <b>GND</b>   | Machine ground and shield connection |

## Ground Fault Detection

AS-Interface (+) and AS-Interface (-) must never be grounded. In addition, they can never be connected to any load other than the appropriate terminals on AS-Interface I/O modules, AS-Interface intelligent sensors, or other loads. Standard PNP or NPN sensors are connected to AS-Interface through I/O modules. Grounding will reduce the noise immunity of the network. For this reason, ground fault detection supplies have been developed and will ensure that the AS-Interface network runs properly. This feature is also built into a number of AS-Interface gateways. Pepperl+Fuchs recommends using a power supply with ground fault detection when the scanner or gateway does not have integrated ground fault detection. We also recommend using these supplies in network segments after a repeater.

## Choosing the Correct Power Supply

AS-Interface power supplies feature short-circuit and overload protection. In addition to providing power to the AS-Interface scanner/gateway, the AS-Interface power supply provides power to the electronics of

the I/O modules and most inputs on the network. Modules can consume between 15 and 250 mA and a typical AS-Interface scanner/gateway uses 200 mA. A power supply must be chosen that has a current rating that is equal to or greater than total current required by the network. Power supply units are certified by the AS-Interface Association and are available with current ratings from 2.4 A to 8 A.

#### Sizing the AS-Interface power supply:

$$\begin{array}{l} \text{Current AS-Interface Scanner/Gateway} \\ + \text{ Max current of I/O modules} \\ \hline = \text{Total Current} \end{array}$$

#### Example:

|    |                       |                |        |
|----|-----------------------|----------------|--------|
| 1  | AS-Interface Scanner  | VBM-MLX/CPLX   | 100 mA |
| 10 | Flat 4 input modules  | VBA-4E-G2-ZA   | 240 mA |
| 10 | Flat 4 output modules | VAA-4A-G12-EA2 | 40 mA  |

$$\begin{array}{r} 100 \text{ mA} \\ + 10 (240 \text{ mA}) \\ + 10 (40 \text{ mA}) \\ \hline = 2.9 \text{ A} \end{array}$$

With a total of 2.9 A, a number of power supplies or power conditioners can be used:

|                       |         |
|-----------------------|---------|
| VAN-115/230AC-K17     | 4 A     |
| VAN-115/230AC-K22-EFD | 4.8 A   |
| VAN-115/230AC-K24     | 8 A     |
| VAN-G4-PE-4A          | 4 A     |
| VAN-KE2-2PE           | 2 x 4 A |

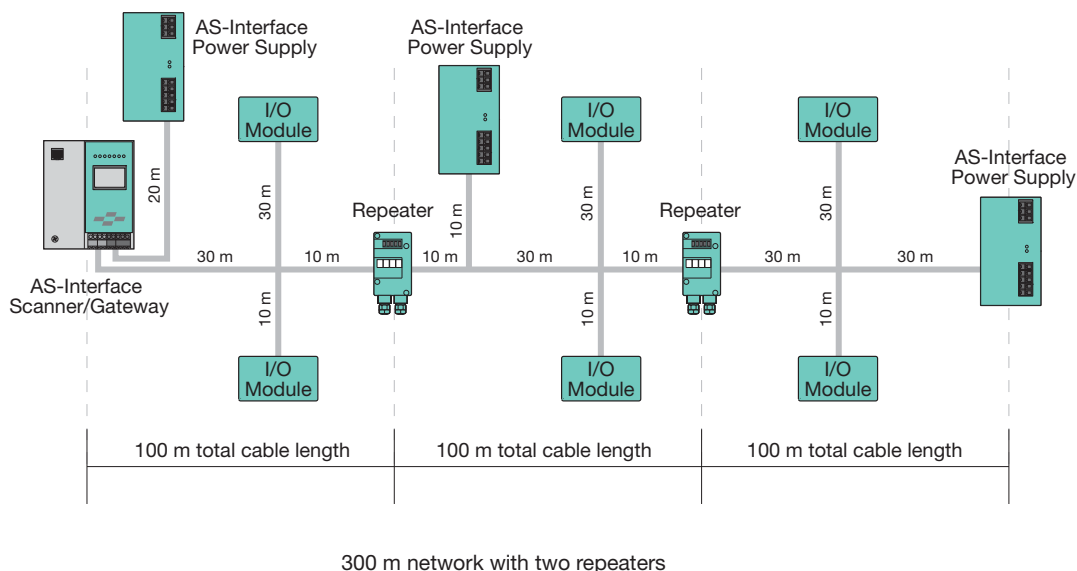
The calculations are very conservative because not all of the modules will be used to the maximum current consumption listed. See the AS-i power supply calculator and network checking utility on our web site for a more accurate calculation. The software is called "AS-i PS Calculator and Network Checking Utility."

With AS-Interface, one single cable transmits both power and data. Pepperl+Fuchs' power supplies contain internal data separation coils so that the capacitive filtering of the supply does not interfere with the data stream. One of the strongest features of AS-Interface is its immunity to noise without a shielded cable. The communication signal is symmetrically transmitted on AS-Interface (+) and AS-Interface (-) so that all noise transmitted and radiated that affects (+) and (-) will be filtered out.

### Network Length and Repeaters

AS-Interface segments can have a cumulative cable length of 100 meters (328 feet). If larger networks are needed, the use of a repeater allows extension by another 100 meters. Because repeaters isolate the connected network segments, an additional AS-Interface power supply must be located in each 100-meter segment. I/O modules can be placed anywhere within the segments. Repeaters occupy no AS-Interface address (they are passive on the AS-Interface network).

**NOTE:** Regardless of cable length and number of repeaters, a maximum of 62 I/O modules can be placed on one AS-Interface network.





## Standard AS-Interface Power Supplies

- LED power/overload indicators
- Automatic overload recovery
- Narrow 70 mm housing
- Class 2 rated power supply



### Standard AS-Interface Power Supply Overview

All P+F power supplies have power factor correction and high efficiency ratings. The wide input voltage range allows the power supplies to be used in Europe, the United States, and all over the world. All are overload protected and can recover easily when a short is removed.

The VAN-115/230AC-K24 unit has a high output current of 8 A.

The VAN-115/230AC-K17 has a high current rating of 4 A in a very narrow housing. The removable terminals make disconnecting the network quick and easy.

A low current model, K26, in a small compact plastic housing is used for systems where all nodes will not exceed the 1.8 A current limit. This power supply will make AS-i economical for even the smallest networks.

A Class 2 power supply should be used whenever open wiring must have a maximum of 100 VA of power. Also some products are not approved without connection to a Class 2 power source.

**See pages 59-60 for standard AS-Interface power supply wiring and dimensions.**





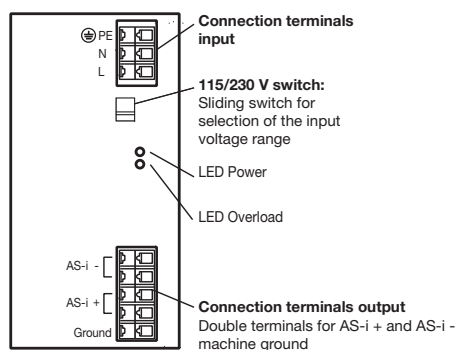
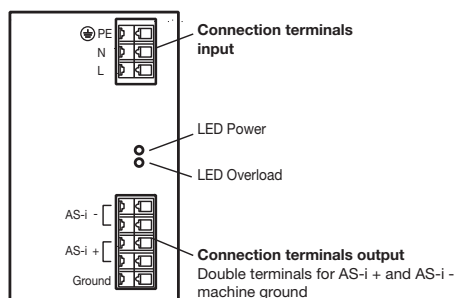
## Specifications

| TYPE                                 | 8 A                                                                                                                                                                                                                                                         | 4 A               | 2.5 A (Class 2)                                                                                                                                                                                                                                                   | 1.8 A                                                                                                                                                                                                                                                             |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MODEL NUMBER(S)                      | VAN-115/230AC-K24                                                                                                                                                                                                                                           | VAN-115/230AC-K17 | VAN-115/230AC-K17-CL2                                                                                                                                                                                                                                             | VAN-115/230AC-K26                                                                                                                                                                                                                                                 |
| OUTPUT SUPPLY                        |                                                                                                                                                                                                                                                             |                   |                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                   |
| CURRENT NOMINAL                      | 8 A                                                                                                                                                                                                                                                         | 4 A               | 2.5 A                                                                                                                                                                                                                                                             | 1.8 A                                                                                                                                                                                                                                                             |
| CURRENT LIMIT                        | ≈ 8.5 A                                                                                                                                                                                                                                                     | ≈ 4.5 A           | ≈ 2.6 A                                                                                                                                                                                                                                                           | ≈ 2.3 A                                                                                                                                                                                                                                                           |
| VOLTAGE                              | 29.5-31.6 VDC AS-Interface                                                                                                                                                                                                                                  |                   |                                                                                                                                                                                                                                                                   | 31.2 V ± 3%                                                                                                                                                                                                                                                       |
| SHORT CIRCUIT/<br>OVERLOAD PROTECTED | Yes                                                                                                                                                                                                                                                         |                   |                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                   |
| INPUT SUPPLY                         |                                                                                                                                                                                                                                                             |                   |                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                   |
| RATED OPERATING CURRENT<br>@ 115 VAC | 4 A                                                                                                                                                                                                                                                         | 2.2 A             | 1.7 A                                                                                                                                                                                                                                                             | 1.1 A                                                                                                                                                                                                                                                             |
| FREQUENCY                            | 47-63 Hz                                                                                                                                                                                                                                                    |                   |                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                   |
| OPERATING VOLTAGE                    | 93-132 VAC, 190-265 VAC                                                                                                                                                                                                                                     | 90-265 VAC        |                                                                                                                                                                                                                                                                   | 110-250 VAC                                                                                                                                                                                                                                                       |
| EFFICIENCY                           | ≈ 87%                                                                                                                                                                                                                                                       | ≈ 89%             |                                                                                                                                                                                                                                                                   | ≈ 89%                                                                                                                                                                                                                                                             |
| POWER FACTOR CORRECTION              | Yes                                                                                                                                                                                                                                                         |                   |                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                   |
| INPUT VOLTAGE SELECTION              | 115/230 AC selector switch                                                                                                                                                                                                                                  | Automatic         |                                                                                                                                                                                                                                                                   | Automatic                                                                                                                                                                                                                                                         |
| FUSE INTERNAL                        | T6.3 / 250 V                                                                                                                                                                                                                                                | T3.15 / 250 V     |                                                                                                                                                                                                                                                                   | T2.5/250 V                                                                                                                                                                                                                                                        |
| POWER SUPPLY OVERLOAD<br>RESET       | Automatic                                                                                                                                                                                                                                                   |                   |                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                   |
| GROUND FAULT DETECTION               | No                                                                                                                                                                                                                                                          |                   |                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                   |
| PROTECTION (IEC)                     | IP20                                                                                                                                                                                                                                                        |                   |                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                   |
| TEMPERATURE WORKING<br>RANGE STORAGE | +14 °F to +131 °F (-10 °C to +55 °C)<br>-13 °F to +185 °F (-25 °C to +85 °C)                                                                                                                                                                                |                   |                                                                                                                                                                                                                                                                   | +14 °F to +104 °F (-10 °C to +40 °C)<br>-13 °F to +185 °F (-25 °C to +85 °C)                                                                                                                                                                                      |
| HOUSING MATERIAL                     | Steel, aluminum                                                                                                                                                                                                                                             |                   |                                                                                                                                                                                                                                                                   | Plastic                                                                                                                                                                                                                                                           |
| WEIGHT                               | 1320 g (46 oz)                                                                                                                                                                                                                                              | 890 g (31 oz)     |                                                                                                                                                                                                                                                                   | 200 g (7 oz)                                                                                                                                                                                                                                                      |
| APPROVALS                            |    |                   |    |    |
| MOUNTING*                            | DIN rail                                                                                                                                                                                                                                                    |                   |                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                   |
| AS-INTERFACE CONNECTION              |  Removable terminals                                                                                                                                                     |                   |                                                                                                                                                                                                                                                                   |  Terminals                                                                                                                                                                   |

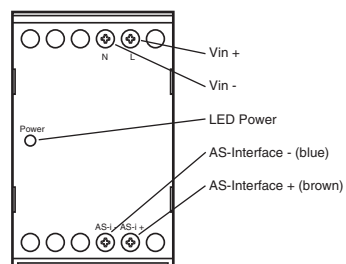
\* **Important:** Power supplies must be mounted with ventilation holes located at top.  
Allow 100 mm top/bottom clearance and 30 mm side clearance.

## Wiring Diagrams

VAN-115/230AC-K24

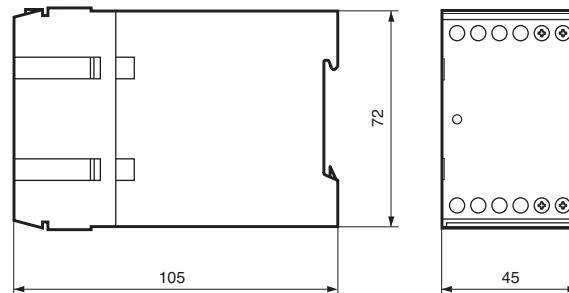
VAN-115/230AC-K17  
VAN-115/230AC-K17-CL2

VAN-115/230AC-K26

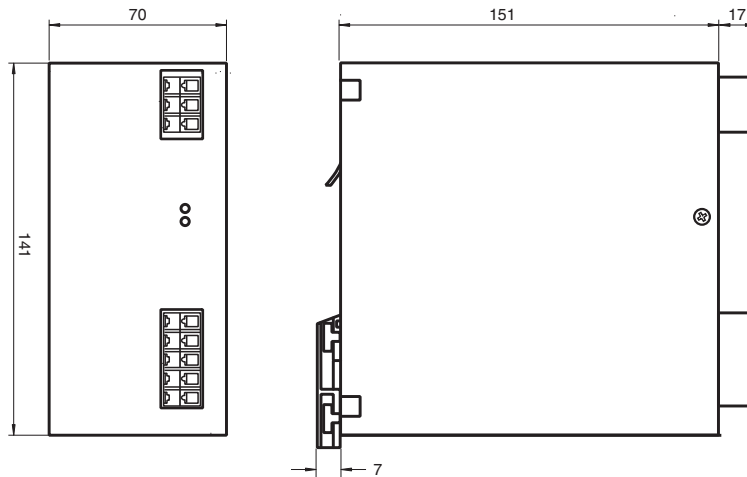
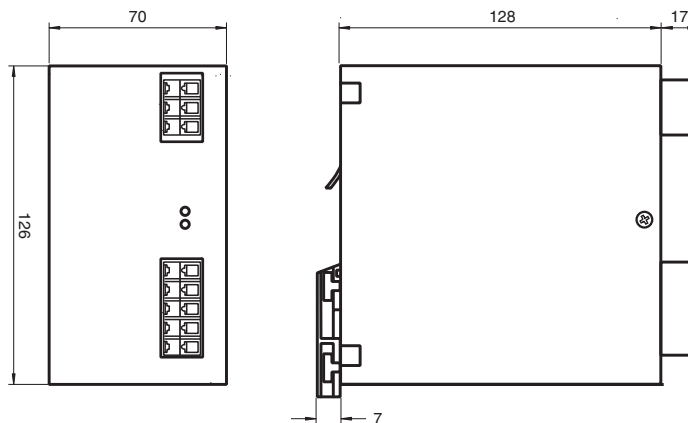


## Dimensions (mm)

VAN-115/230AC-K26



VAN-115/230AC-K24

VAN-115/230AC-K17  
VAN-115/230AC-K17-CL2

See pages 201-216 for complete AS-Interface accessory listing.



## Ground Fault Detection Power Supplies

- 2.4 A or 4.8 A nominal load current
- Reset/simulate button
- Ground fault detection
- Network disconnect/recovery ground fault switch

### Ground Fault Detection Power Supply Overview

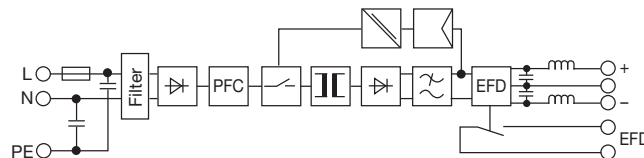
As mentioned in the introduction, the AS-Interface cable must not be grounded. Grounding the AS-Interface cable would lead to faults that may cause the system to fail, weakening the noise immunity of the network. Pepperl+Fuchs offers AS-Interface power supplies that have the ability to signal ground faults on both the AS-Interface (+) or the AS-Interface (-) conductors. The fault is indicated via an LED and an electronic output.

These power supplies should be used on systems that do not use a Pepperl+Fuchs gateway with integrated ground fault detection, or when the power supply is connected to an AS-Interface segment on the secondary side of a repeater.

In the factory-default configuration, the power supply resets automatically when the ground fault is removed. It is also possible to configure the AS-Interface power supply so that, in the event of a ground fault, the AS-Interface voltage will be automatically disconnected (until reset using

the button on the front panel of the supply). This eliminates the risk of endangering personnel and/or equipment.

The VAN-115/230AC-K21-EFD and the VAN-115/230AC-K22-EFD power supplies are designed for all AS-Interface applications. They are



electronically protected against short circuits, and supply a fully loaded AS-Interface system with an output current of up to 4.8 A.

These power supplies also have the unique feature of side mounting. The DIN rail base can be removed and remounted on the side of the power supply using the mounting holes and self tapping screws provided. Side mounting provides a low profile power supply that sits only 2 1/4" from the din rail

**See page 63 for ground fault detection power supply wiring and dimensions.**



## Specifications

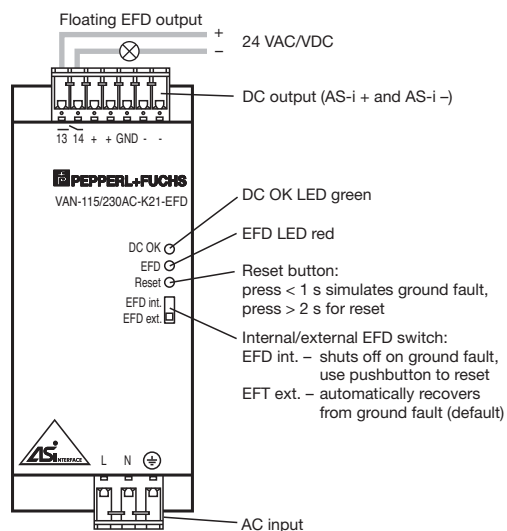
| TYPE                                 | 2.4 A (with Ground Fault Detection)                                                                                                                                                                                                                         | 4.8 A (with Ground Fault Detection) |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| MODEL NUMBER(S)                      | VAN-115/230AC-K21-EFD                                                                                                                                                                                                                                       | VAN-115/230AC-K22-EFD               |
| OUTPUT SUPPLY                        |                                                                                                                                                                                                                                                             |                                     |
| CURRENT NOMINAL                      | 2.4 A                                                                                                                                                                                                                                                       | 4.8 A                               |
| CURRENT LIMIT                        | ≈ 3 A                                                                                                                                                                                                                                                       | ≈ 6 A                               |
| VOLTAGE                              | 29.5-31.6 VDC AS-Interface                                                                                                                                                                                                                                  |                                     |
| SHORT CIRCUIT/<br>OVERLOAD PROTECTED | Yes                                                                                                                                                                                                                                                         |                                     |
| INPUT SUPPLY                         |                                                                                                                                                                                                                                                             |                                     |
| RATED OPERATING CURRENT @ 120 VAC    | 1.2 A                                                                                                                                                                                                                                                       | 1.8 A                               |
| FREQUENCY                            | 45-65 Hz                                                                                                                                                                                                                                                    |                                     |
| OPERATING VOLTAGE                    | 85-264 VAC                                                                                                                                                                                                                                                  |                                     |
| EFFICIENCY                           | > 86%                                                                                                                                                                                                                                                       |                                     |
| POWER FACTOR CORRECTION              | Yes                                                                                                                                                                                                                                                         |                                     |
| INPUT VOLTAGE SELECTION              | Yes                                                                                                                                                                                                                                                         |                                     |
| FUSE INTERNAL                        | 5 AT                                                                                                                                                                                                                                                        |                                     |
| POWER SUPPLY OVERLOAD RESET          | Automatic                                                                                                                                                                                                                                                   |                                     |
| GROUND FAULT DETECTION               | Yes                                                                                                                                                                                                                                                         |                                     |
| EFD OUTPUT RATING                    | Max. 30 VAC/VDC, 1 A                                                                                                                                                                                                                                        |                                     |
| PROTECTION (IEC)                     | IP20                                                                                                                                                                                                                                                        |                                     |
| TEMPERATURE WORKING RANGE            | -13 °F to +158 °F (-25 °C to +70 °C)                                                                                                                                                                                                                        |                                     |
| STORAGE                              | -40 °F to +185 °F (-40 °C to +85 °C)                                                                                                                                                                                                                        |                                     |
| HOUSING MATERIAL                     | Aluminum                                                                                                                                                                                                                                                    |                                     |
| WEIGHT                               | 750 g (27 oz)                                                                                                                                                                                                                                               | 900 g (32 oz)                       |
| APPROVALS                            |    |                                     |
| MOUNTING*                            | DIN rail                                                                                                                                                                                                                                                    |                                     |
| AS-INTERFACE CONNECTION              |  Removable spring terminals                                                                                                                                              |                                     |

\* Important: Power supplies must be mounted with ventilation holes located at top.  
50 mm spacing should be observed at top and bottom of power supply.

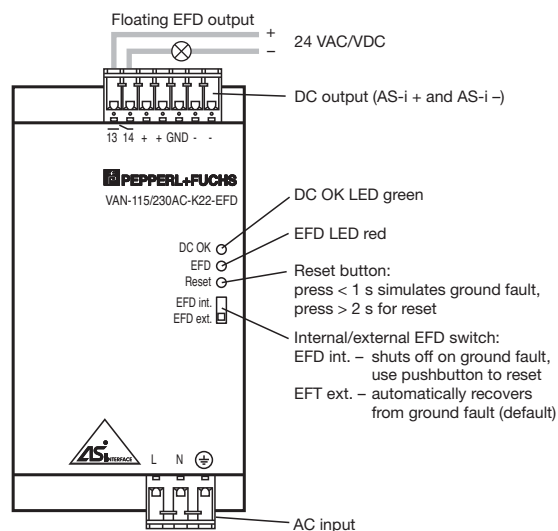
See pages 201-216 for complete AS-Interface accessory listing.

## Wiring Diagrams

VAN-115/230AC-K21-EFD

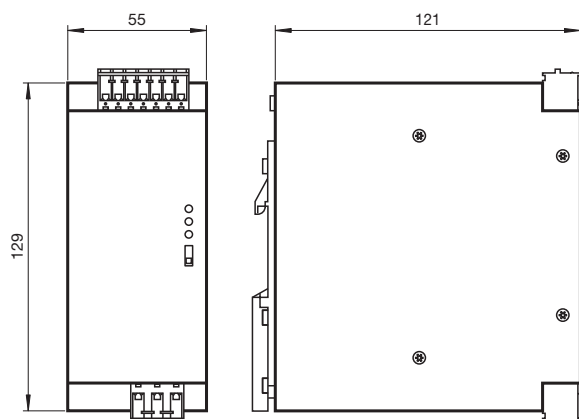


VAN-115/230AC-K22-EFD

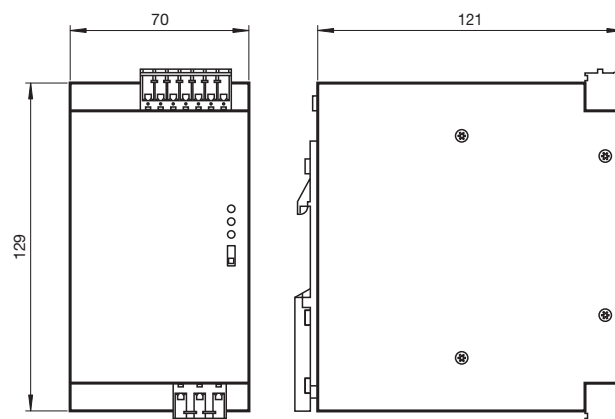


## Dimensions (mm)

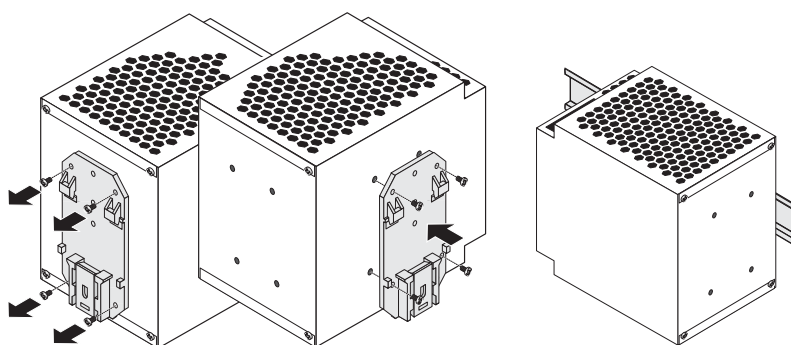
VAN-115/230AC-K21-EFD



VAN-115/230AC-K22-EFD



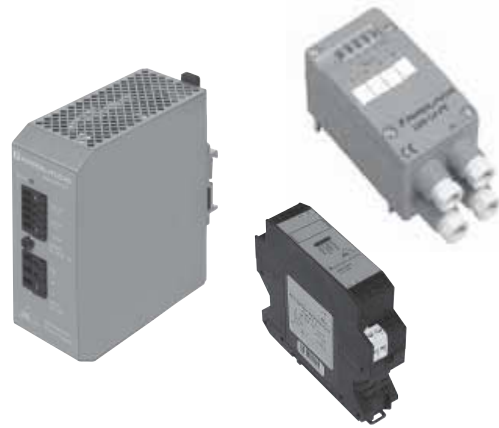
## Side Mount Option





# Power Conditioners

- Output current up to 4 A per segment
- DC input voltage
- Diagnostic LED indication
- Protection degree IP20 or IP67



## DC Input Overview

The AS-Interface power supply unit VAN-24DC-K6 can supply 31.5 V at 3 A to a fully loaded AS-Interface system. The input voltage from 18-32 VDC is stepped up to power AS-Interface. This model is perfect for mobile equipment or other applications where no AC power is present.

The VAN-G4-PE is a power conditioner for either flat or round cable. Often, multiple power extenders are used with a single 30 VDC power supply. Also available is an enclosure mount power extender, VAN-KE2-2PE, for two AS-i segments. This is often used on a dual network gateway or before and after a repeater.

Because any 30 VDC supply can be used with the power conditioner, it is possible to utilize redundant power supplies. Often, redundant power supplies are required for process applications. The power conditioner, however, can never be redundant. A maximum of one power conditioner can be used in each AS-Interface segment.

Since power conditioners are field mountable IP67 devices, it is now possible to feed an AS-Interface segment from a standard 30 VDC power supply located in an enclosure far away from the AS-Interface network without taking up segment length. The length of cable that feeds the power conditioner does not count towards the 100 m AS-Interface segment limit.

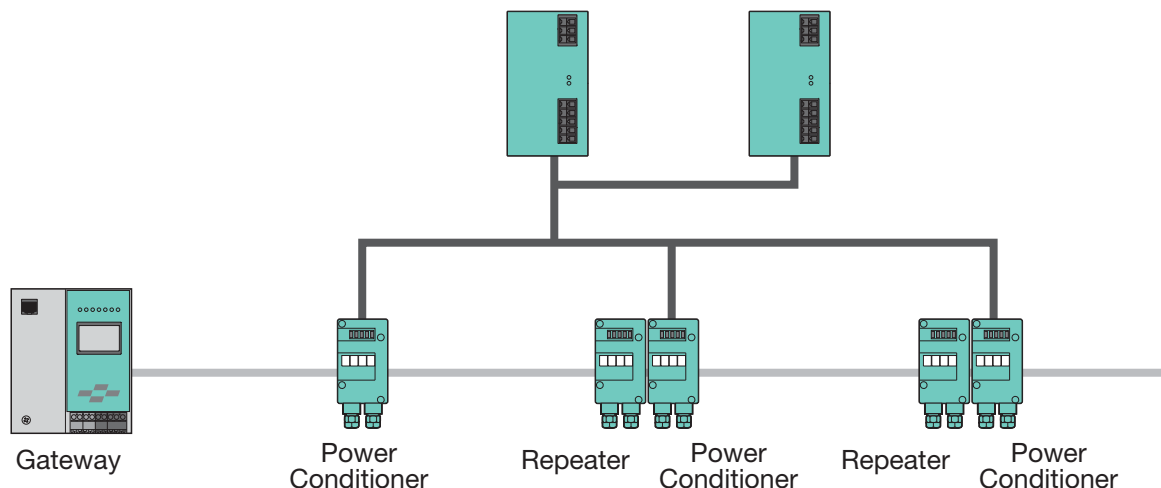
Regardless of the cable length and the use of repeaters, a maximum of 62 modules per gateway can be placed on an AS-Interface network.

Power extender voltage will depend on network length. The following typical limits should be observed:

- ≈ 30 V 100 m AS-i cable
- ≈ 28 V 80 m AS-i cable
- ≈ 26 V 60 m AS-i cable

**See pages 65-66 for DC input power supply wiring and dimensions.**

30 V Standard or Redundant Power Supplies

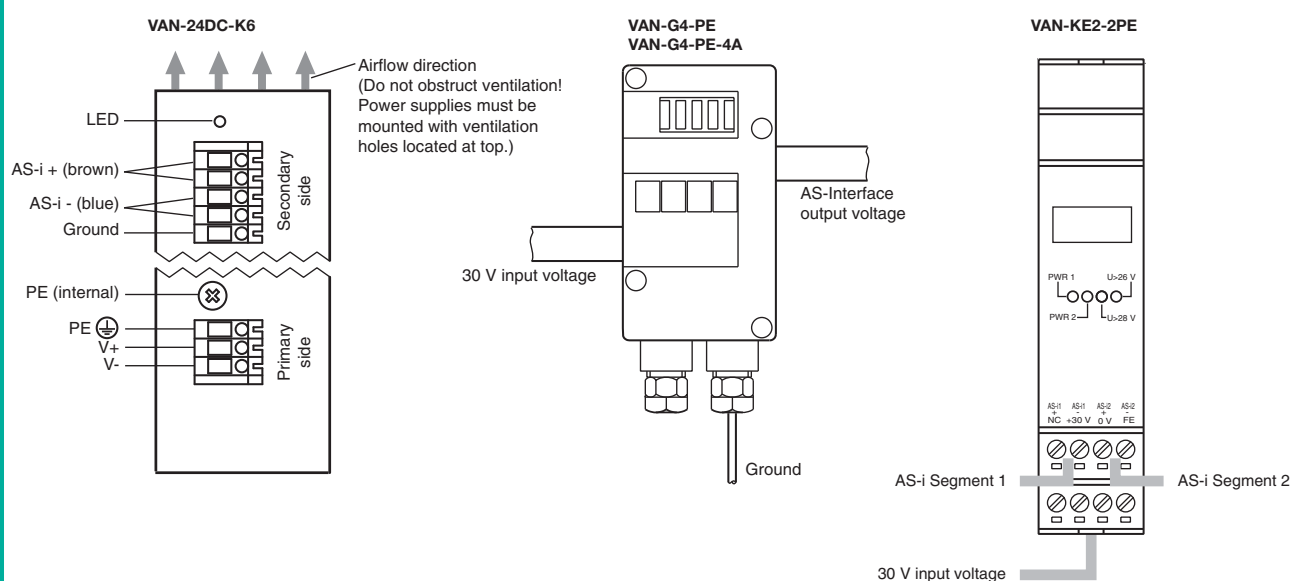




## Specifications

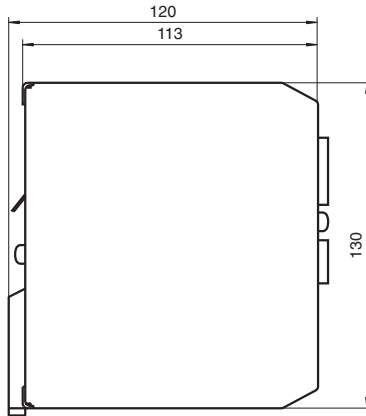
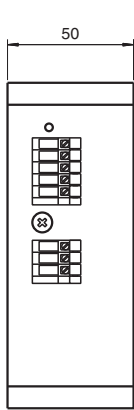
| TYPE                                 | 3 A Power Supply                                                            | 2.8 A Power Conditioner                                                    | 4 A Power Conditioner                                                      | Dual 4 A Power Conditioner                                                 |
|--------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|
| MODEL NUMBER(S)                      | VAN-24DC-K6                                                                 | VAN-G4-PE                                                                  | VAN-G4-PE-4A                                                               | VAN-KE2-2PE                                                                |
| OUTPUT SUPPLY                        |                                                                             |                                                                            |                                                                            |                                                                            |
| CURRENT NOMINAL                      | 3 A                                                                         | 2.8 A                                                                      | 4 A                                                                        | 4 A x 2 networks                                                           |
| CURRENT LIMIT                        | ≈ 3.6 A                                                                     | ≈ 3 A                                                                      | ≈ 6 A                                                                      | ≈ 6 A x 2 networks                                                         |
| VOLTAGE                              | 29.5-31.6 VDC AS-Interface                                                  | 29.5-31.6 VDC AS-Interface                                                 | 29.5-31.6 VDC AS-Interface                                                 | 29.5-31.6 VDC AS-Interface                                                 |
| SHORT CIRCUIT/<br>OVERLOAD PROTECTED | Yes                                                                         | —                                                                          | —                                                                          | —                                                                          |
| INPUT SUPPLY                         |                                                                             |                                                                            |                                                                            |                                                                            |
| RATED OPERATING CURRENT              | 6 A @ 24 VDC                                                                | 2.8 A @ 30 VDC                                                             | 4 A @ 30 VDC                                                               | 8 A @ 30 VDC                                                               |
| FREQUENCY                            | —                                                                           | —                                                                          | —                                                                          | —                                                                          |
| OPERATING VOLTAGE                    | 24 V ± 1 %                                                                  | 30 VDC                                                                     | 30 VDC                                                                     | 30 VDC                                                                     |
| VOLTAGE RANGE                        | 18-32 VDC                                                                   | —                                                                          | —                                                                          | —                                                                          |
| EFFICIENCY                           | ≈ 88%                                                                       | —                                                                          | —                                                                          | —                                                                          |
| POWER SUPPLY OVERLOAD<br>RESET       | Automatic                                                                   | —                                                                          | —                                                                          | —                                                                          |
| GROUND FAULT DETECTION               | No                                                                          | No                                                                         | No                                                                         | No                                                                         |
| PROTECTION (IEC)                     | IP20                                                                        | IP65                                                                       | IP65                                                                       | IP20                                                                       |
| TEMPERATURE WORKING<br>RANGE STORAGE | +14 °F to +158 °F (-10 °C to +70 °C)<br>-4 °F to +176 °F (-20 °C to +80 °C) | +32 °F to +158 °F (0 °C to +70 °C)<br>-13 °F to +185 °F (-25 °C to +85 °C) | +32 °F to +158 °F (0 °C to +70 °C)<br>-13 °F to +185 °F (-25 °C to +85 °C) | +32 °F to +131 °F (0 °C to +55 °C)<br>-13 °F to +185 °F (-25 °C to +85 °C) |
| HOUSING MATERIAL                     | Steel, aluminum                                                             | PA6-GF30                                                                   | PA6-GF30                                                                   | PA 66-FR                                                                   |
| WEIGHT                               | 550 g (20 oz)                                                               | 120 g (6 oz)                                                               | 120 g (6 oz)                                                               | 120 g (6 oz)                                                               |
| APPROVALS                            | CE cULus AS                                                                 | CE cULus AS                                                                | CE AS                                                                      | CE AS                                                                      |
| MOUNTING                             | DIN rail                                                                    | DIN rail, mounting holes                                                   | DIN rail, mounting holes                                                   | DIN rail                                                                   |
| AS-INTERFACE CONNECTION              | terminals                                                                   | Flat or round cable                                                        | Flat or round cable                                                        | Removable terminals                                                        |

## Wiring Diagrams

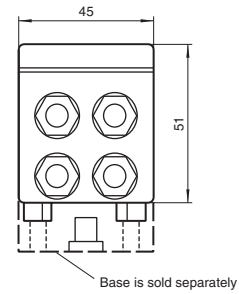
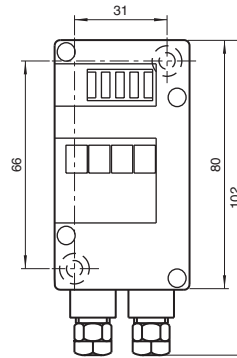


## Dimensions (mm)

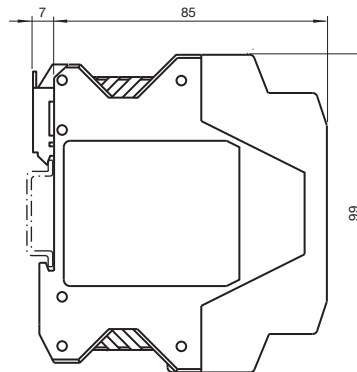
**VAN-24DC-K6**



**VAN-G4-PE  
VAN-G4-PE-4A**



**VAN-KE2-2PE**



## Accessories

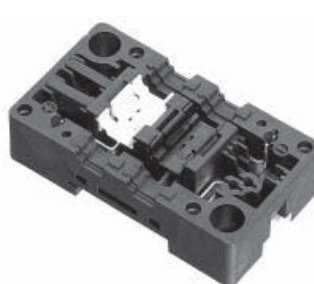
**U-G1PP**

Round cable base with external power terminals



**U-G1FF**

Flat cable mounting base for black and yellow cables



**PG11-1/2NPT**

PG11 male to 1/2" NPT female conduit adapter



See pages 201-216 for complete AS-Interface accessory listing.



## Repeaters

- Lengthens line by 100 m (max. 2 repeaters in series)
- Galvanic isolation
- IP67 or IP20 housings
- No address required

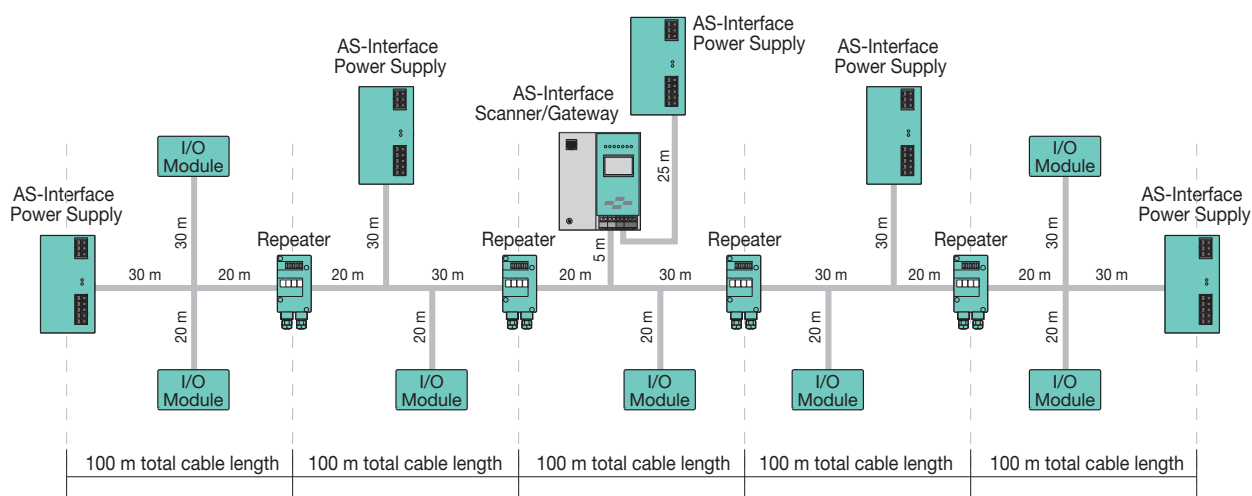
### Repeaters Overview

AS-Interface cable length can be increased an additional 100 meters with the use of a repeater. Since repeaters isolate the connected network segments, an AS-Interface power supply must be located in both segments. A maximum of two repeaters can be used back-to-back in a single cable run resulting in an overall length of 300 meters. As long as a signal traveling from the scanner/gateway to a module does not cross more than two repeaters, longer networks can be built. A linear network of 500 m is easily possible by placing the scanner/gateway in the middle section. When using repeaters, I/O modules can be placed in any cable segment. Regardless of the cable length and number of repeaters, a maximum of 62 modules per gateway can be placed on an AS-Interface network.

The enclosure mount repeater VAR-KE3-TERM, only 22.5 mm in width, takes up little space in the control cabinet. The new KE3 Series modules feature color-coded terminals to help simplify the installation. This method of mounting permits easy removal during initial operation or servicing.

The VAR-KE3-TERM also includes a termination switch. Once enabled, this termination can extend the first segment to 200 m. In this case, the incoming segment is 200 m long and the outgoing segment is 100 m, for a total length of 300 m. If termination is used the power supply must be located as far from the termination as possible at the other end of the network.

**See pages 68-69 for repeater wiring and dimensions.**





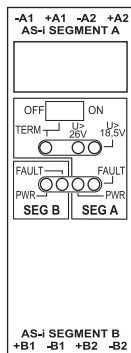
## Specifications

| TYPE                      | Advanced Repeaters                   |                                             |
|---------------------------|--------------------------------------|---------------------------------------------|
| MODEL NUMBER(S)           | VAR-KE3-TERM                         | VAR-G4F                                     |
| BASE                      | –                                    | Flat cable base incl., U-G1PP base optional |
| MAX. SEGMENT LENGTH (1/2) | 100 m (200 m with termination)/100 m | 100 m/100 m                                 |
| OPERATING CURRENT         |                                      |                                             |
| NETWORK 1                 | 60 mA                                |                                             |
| NETWORK 2                 | 60 mA                                |                                             |
| DELAY TIME                | 9 µs                                 | 9 µs                                        |
| TERMINATION SWITCH        | Yes                                  | No                                          |
| PROTECTION (IEC)          | IP20                                 | IP67                                        |
| TEMPERATURE RANGE         |                                      |                                             |
| WORKING                   | +32 °F to +131 °F (0 °C to +55 °C)   |                                             |
| STORAGE                   | -13 °F to +167 °F (-25 °C to +75 °C) |                                             |
| HOUSING MATERIAL          | PA66-FR                              | PA6-GF                                      |
| WEIGHT                    | 120 g (6 oz)                         |                                             |
| APPROVALS                 |                                      |                                             |
| MOUNTING                  | DIN rail                             | DIN rail, mounting holes                    |
| AS-INTERFACE CONNECTION   | Removable terminals                  | Flat yellow or round cable                  |

## Wiring Diagrams

## TERMINALS

VAR-KE3-TERM



## LED Indicators

**PWRx:** Green: Power on  
Off: no power

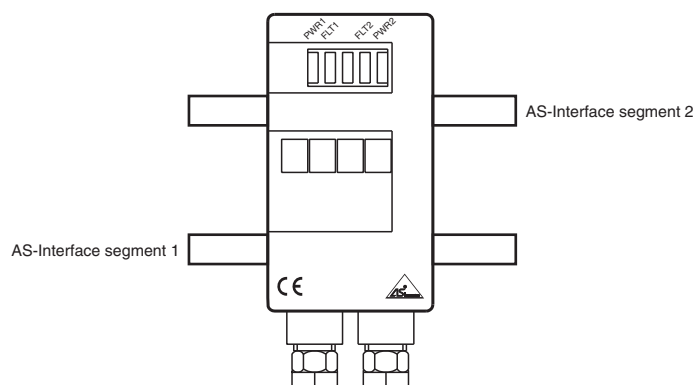
**FAULT:** Off: no errors  
Red: Communication errors

**TERM:** On: Termination connected  
Off: No termination

**26V:** On: Voltage above 26 V  
Off: Voltage below 26 V

**18.5V:** On: Voltage above 18.5 V  
Off: Voltage below 18.5 V

VAR-G4F



## LED Indicators

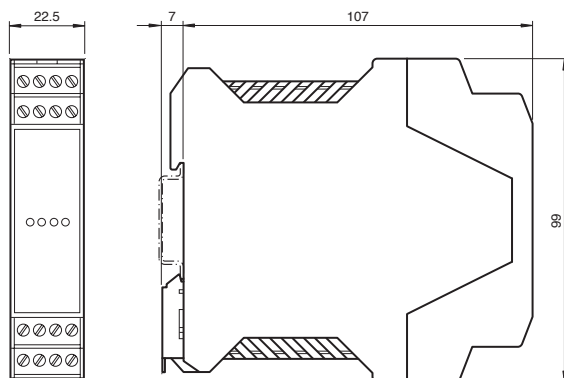
**PWRx:** Green: Power on  
Off: no power

**FLTx:** Off: no errors  
Red: Communication errors

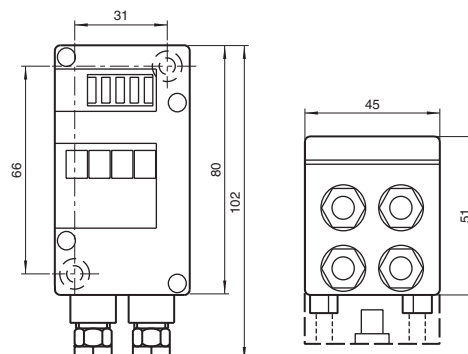


## Dimensions (mm)

VAR-KE3-TERM



VAR-G4F



## Accessories

U-G1PP

Round cable base with  
external power terminals



PG11-1/2NPT

PG11 male to 1/2" NPT female  
conduit adapter



See pages 201-216 for complete AS-Interface accessory listing.

## Standard 24-30 VDC Power Supplies

- Slim 70 mm housing
- Cover to protect AC terminals
- Voltage adjustment potentiometer



### Standard 24-30 VDC Power Supply Overview

These power supplies are designed to be used with the AS-Interface black cable or with the power conditioner only. They can never be used on the AS-Interface yellow cable or with an AS-Interface gateway without a built-in conditioner. These power supplies do not have the required decoupling coils in them to allow error-free AS-Interface communication.

Three versions are available with 5 A or 10 A capacities. Plastic covers protect the power supplies against accidental shorting of AC input lines as well as the voltage adjustment terminals. The voltage adjustment screw is often used to bump the power supply up to the 30 V required by AS-Interface if you are using the power conditioner. If the voltage is increased then the total current output will be reduced to a maximum of 4 A and 8 A, respectively.

**See pages 71-72 for standard 24-30 VDC power supply wiring and dimensions.**



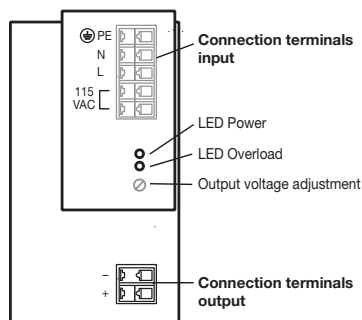
## Specifications

| TYPE                                  | 5 A                                                                          | 10 A                  | 10 A (3-phase)                                 |
|---------------------------------------|------------------------------------------------------------------------------|-----------------------|------------------------------------------------|
| MODEL NUMBER(S)                       | K17-STR-24..30VDC-5A                                                         | K24-STR-24..30VDC-10A | K34-STR-24..30V-3X500VAC-10A                   |
| OUTPUT SUPPLY                         |                                                                              |                       |                                                |
| CURRENT NOMINAL                       | 5 A @ 24 VDC                                                                 | 10 A @ 24 VDC         | 10 A @ 24 VDC                                  |
| CURRENT LIMIT                         | ≈ 6 A                                                                        | ≈ 12 A                | ≈ 12.5 A                                       |
| VOLTAGE                               | 24 V ± 1 %                                                                   |                       | 24 V ± 1 %                                     |
| ADJUSTMENT RANGE                      | 22 - 30 VDC, default 30 VDC                                                  |                       | 23 - 30 VDC, default 30 VDC                    |
| SHORT CIRCUIT/<br>OVERLOAD PROTECTED  | Yes                                                                          |                       | Yes                                            |
| MAX. OUTPUT POWER                     | 220 W, 30 V @ 4 A                                                            | 240 W, 30 V @ 8 A     | 240 W, 30 V @ 8 A                              |
| PARALLEL/REDUNDANT<br>WIRING POSSIBLE | Yes                                                                          |                       |                                                |
| INPUT SUPPLY                          |                                                                              |                       |                                                |
| RATED OPERATING CUR-<br>RENT          | 2.2 A @ 115 VAC                                                              | 4.2 A @ 115 VAC       | 3 x 0.7 A @ 400 VAC                            |
| FREQUENCY                             | 47-63 Hz                                                                     |                       |                                                |
| OPERATING VOLTAGE                     | 93-132 VAC, 187-265 VAC                                                      |                       | 3 x 380-500 VAC, 3-phase                       |
| EFFICIENCY                            | ≈ 89%                                                                        |                       |                                                |
| POWER FACTOR CORREC-<br>TION          | Yes                                                                          |                       |                                                |
| INPUT VOLTAGE SELECTION               | 115/230 VAC, selectable using jumper                                         |                       | —                                              |
| FUSE INTERNAL                         | T3.15 / 250 V                                                                | T6.3 / 250 V          | None (protect with 690 V 1A fuse on each line) |
| POWER SUPPLY OVERLOAD<br>RESET        | Automatic                                                                    |                       |                                                |
| PROTECTION (IEC)                      | IP20                                                                         |                       |                                                |
| TEMPERATURE WORKING<br>RANGE STORAGE  | +14 °F to +140 °F (-10 °C to +60 °C)<br>-13 °F to +185 °F (-25 °C to +85 °C) |                       |                                                |
| HOUSING MATERIAL                      | Steel, aluminum                                                              |                       |                                                |
| WEIGHT                                | 890 g (31 oz)                                                                |                       | 1400 g (49 oz)                                 |
| APPROVALS                             | CE UL US                                                                     |                       |                                                |
| MOUNTING*                             | DIN rail                                                                     |                       |                                                |
| AS-INTERFACE CONNECTION               | Spring terminals                                                             |                       |                                                |

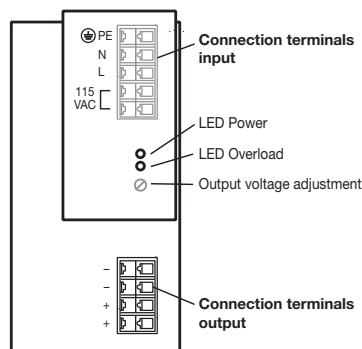
\* Important: Power supplies must be mounted with ventilation holes located at top.  
Allow 100 mm top/bottom clearance and 30 mm side clearance.

## Wiring Diagrams

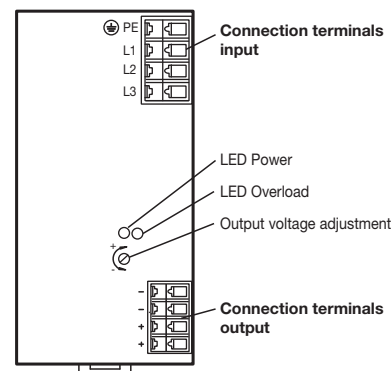
K17-STR-24..30VDC-5A



K24-STR-24..30VDC-10A

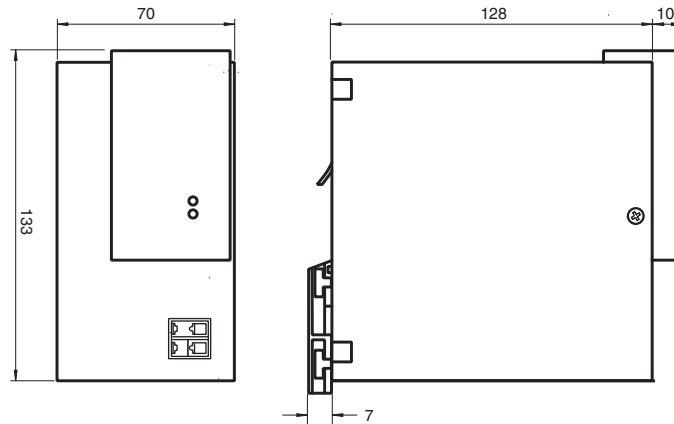


K34-STR-24..30V-3X500VAC-10A

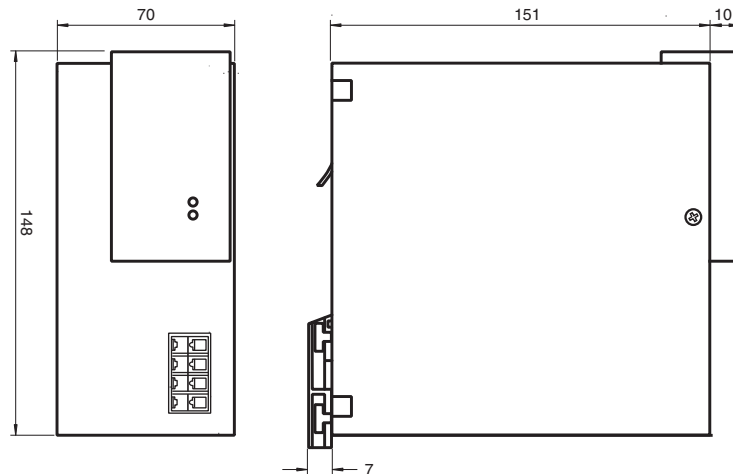


## Dimensions (mm)

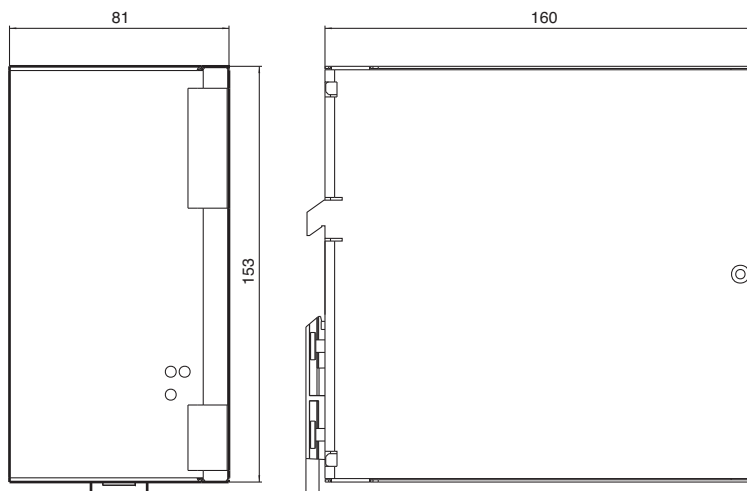
K17-STR-24..30VDC-5A



K24-STR-24..30VDC-10A



K34-STR-24..30V-3X500VAC-10A



|                                             |            |
|---------------------------------------------|------------|
| <b>Low-Profile Flat .....</b>               | <b>75</b>  |
| <b>Low-Profile Flat with SPEEDCON .....</b> | <b>80</b>  |
| <b>Field Mountable .....</b>                | <b>84</b>  |
| <b>Compact.....</b>                         | <b>88</b>  |
| <b>Enclosure .....</b>                      | <b>91</b>  |
| <b>Junction Box .....</b>                   | <b>95</b>  |
| <b>Analog.....</b>                          | <b>99</b>  |
| <b>Pushbuttons and Stack Lights .....</b>   | <b>105</b> |
| <b>Pneumatic .....</b>                      | <b>111</b> |
| <b>Drive Control.....</b>                   | <b>115</b> |

## I/O modules

I/O modules are the essence of the AS-Interface system. All inputs and outputs communicate with the scanner/gateway through the modules. They drive the solenoids and relays, initiate the valves, and enable the pushbuttons. For enclosures and junction boxes, Pepperl+Fuchs offers a broad selection of modules to connect AS-Interface to DIN rail, as well as junction box modules sure to meet the specific needs of each application. Pepperl+Fuchs offers a wide variety of rugged and robust field mountable modules for any application, including flat modules for limited space applications, compact modules with a variety of mounting options, field modules that use cord grips instead of quick disconnects, and modules that use both the AS-Interface flat cable or standard 16 AWG round cable.

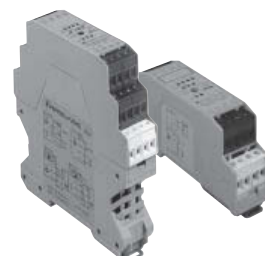
Our top-of-the-line family of field mounted modules, the G12 series, reduces installation time and enhances diagnostics even further. It is now possible to install AS-Interface I/O modules without any tools! The G12 line is an important addition to our products and is Pepperl+Fuchs' long term answer to our customers demands concerning high end, feature rich products. It is yet another reason why Pepperl+Fuchs' AS-Interface system stands out from the competition.

# I/O Modules

## Within an Enclosure

Enclosure modules feature a narrow profile that uses a minimal amount of space. All enclosure modules have diagnostic LEDs, feature removable terminals that support wire sizes up to 14 AWG for connection of the I/O, and have a protection rating of IP20.

**KE Series Modules** feature color-coded terminals to help simplify installation. Both standard and extended addressing versions are available.



**KE1 Series Modules** are especially designed to be installed in junction boxes.

The height of the KE1 is only 50 mm and are available with 4 inputs, 4 inputs and 2 outputs, or 4 inputs and 4 outputs. The addressing can be accomplished via an addressing jack.

## In the Field

Pepperl+Fuchs offers modules with rugged housings and high IP ratings for various types of field applications where cost savings, installation time, and module size are crucial.

**G4 Modules** are designed for quick installation.

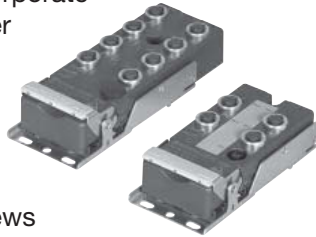
Sensors and actuators are connected to the G4 module via cable glands and cage tension spring terminals making it ideal for applications where heavy vibrations may be encountered. These connections also enable the use of standard cabled sensors and eliminate the need for coiled up, molded cables. Additionally, G4 modules can be used with flat or round AS-Interface cable.



**G2 Flat Modules** are ideal when installation time is critical. They feature an addressing jack for connection of the handheld programmer. By using the cinch cable, (VAZ-PK-1.5M-V1-G), the module can also be addressed while connected to the network.



**G12 Series Modules** incorporate what we have learned over the last 15 years and offer an AS-Interface solution that reduces installation time to an absolute minimum. No tools are required; no screws need to be turned. Additionally, we added diagnostic features like true output overload/short circuit indication on a per output basis. With clear, uncomplicated fault indication, maintenance personnel can act faster, getting lines up and running again in the shortest time imaginable. The universal SPEEDCON M12 makes sensor connections faster than ever before. Making a 1/2 turn on the connector is all it takes to install the modules. Naturally, these top-of-the-line modules satisfy IP67, making them applicable for most field mounted applications.



**G16 Compact Modules** are ideal for limited space applications where it is not possible to mount any other module. G16 modules are commonly used for material handling equipment and robotics. The AS-Interface and external power connections are made using a single M12x1 quick disconnect. The sensors/actuators are attached via nano (M8x1) quick disconnects. By eliminating the mounting plate, the IP69K rated compact module is simple to mount.



**Analog Modules** use standard AS-Interface analog profiles, which put these modules into operation in the same way as digital modules and starts the data exchange automatically.



**Illuminated Pushbutton Modules** are offered in two styles and attach to the network to provide a link between maintenance personnel and AS-Interface.

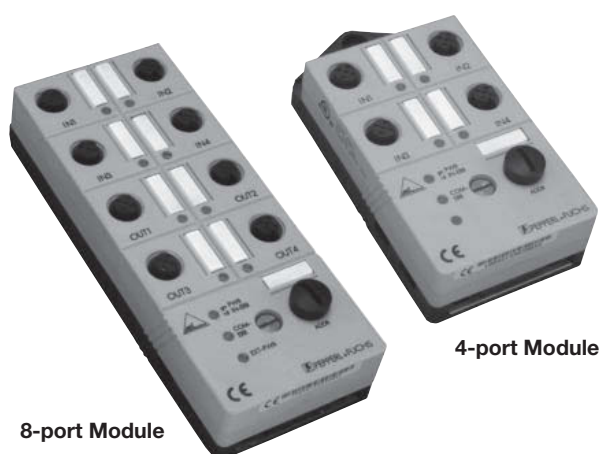


**AS-Interface Stack Lights** are flexible devices that allow multiple configurations by simply combining individual light and audible alarm modules. The 4 output base can power up to four modules in any combination.



Additionally, Pepperl+Fuchs offers **pneumatic modules**.



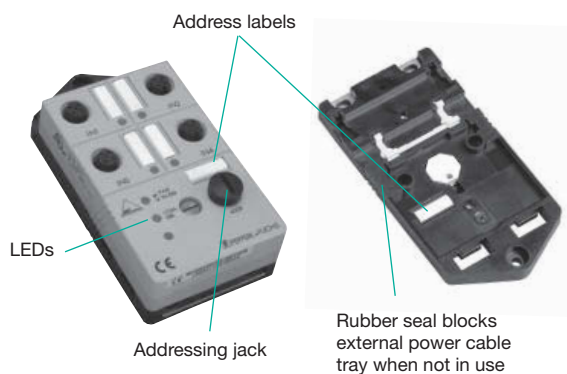


8-port Module

4-port Module

### Flat Module Overview

With the G2 line of AS-Interface, Pepperl+Fuchs offers a wide variety of I/O modules suitable when the advanced features offered by the high-end G12 line are not desired. With a height of only 30 mm, the G2 line is ideal for limited space applications. This IP67 housing can be mounted directly in the field and accepts sourcing I/O from a variety of different devices. The following diagrams show some of the features of this product:



The flat module mounting bases (U-G2FF and U-G3FF) are mechanically coded for reverse polarity protection. To prevent the possibility of connection errors, each AS-Interface module has

## Low-Profile Flat I/O Modules

- Low-profile flat housing—30 mm high
- Built in addressing jack
- M12 quick disconnect for all I/O
- Flat cable AS-Interface connections

I/O and ID codes that allow the scanner/gateway to electronically identify the I/O configuration and version of the device.

To simplify addressing of the flat modules, an addressing jack is integrated into the housing for easy connection of a hand-held addressing device (e.g., VBP-HH1-...). The addressing jack enables the user to address the module before or after connection to AS-Interface.

**See pages 77-78 for Flat Module wiring and dimensions.**

### Common Specifications

|                              |                                                                                                |
|------------------------------|------------------------------------------------------------------------------------------------|
| OPERATING VOLTAGE AS-i       | 26.5-31.6 V                                                                                    |
| OPERATING VOLTAGE, $V_{AUX}$ | 20-30 VDC                                                                                      |
| INPUT SWITCHING FREQUENCY    | ≤ 250 Hz                                                                                       |
| INPUT DELAY                  | ≤ 2 ms from input to AS-i                                                                      |
| PROTECTION                   | IP67                                                                                           |
| HOUSING MATERIAL             | PBT-FR                                                                                         |
| TEMPERATURE RANGE            | Working: -13 °F to +140 °F (-25 °C to +60 °C)<br>Storage: -13 °F to +185 °F (-25 °C to +85 °C) |
| APPROVALS                    | CE, UL, AS                                                                                     |



## Specifications

| INPUTS/OUTPUTS                 | 4-in                        | 8-in                      | 2-in/2-out                  | 4-in/4-out                  |
|--------------------------------|-----------------------------|---------------------------|-----------------------------|-----------------------------|
| MODEL NUMBER(S)*               | VBA-4E-G2-ZA                | VBA-8E-G2-ZA              | VBA-2E2A-G2-ZA/EA2          | VBA-4E4A-G2-ZA/EA2          |
| BASE                           | U-G3FF                      | U-G2FF                    | U-G3FF                      | U-G2FF                      |
| EXTENDED ADDRESSING (62 NODES) | Yes                         | Yes (2 addresses)         | Yes                         | Yes                         |
| REQUIRED MASTER SPEC.          | —                           | —                         | M3, M4                      | M4                          |
| AS-i OPERATING CURRENT         | 40-240 mA                   | 80-280 mA                 | 40-140 mA                   | 40-220 mA                   |
| AUXILIARY CURRENT LIMIT        | —                           | —                         | 2 A                         | 2 A                         |
| INPUTS                         | —ZA, PNP, AS-i powered      | PNP, AS-i powered         | PNP, AS-i powered           | PNP, AS-i powered           |
| TYPE                           | 2-, 3-, or 4-wire           | 2-, 3-, or 4-wire         | 2-, 3-, or 4-wire           | 2-, 3-, or 4-wire           |
| SUPPLY VOLTAGE                 | 21-31 V from AS-Interface   | 21-31 V from AS-Interface | 21-31 V from AS-Interface   | 21-31 V from AS-Interface   |
| MAXIMUM CURRENT                | 150 mA, 200 mA (T ≤ 104 °F) | 200 mA                    | 75 mA, 100 mA (T ≤ 104 °F)  | 140 mA, 180 mA (T ≤ 104 °F) |
| SWITCH POINT                   | OFF ≤ 2 mA, ON ≥ 4 mA       | OFF ≤ 2 mA, ON ≥ 4 mA     | OFF ≤ 2 mA, ON ≥ 4 mA       | OFF ≤ 3 mA, ON ≥ 5 mA       |
| LOAD CURRENT                   | ≤ 8 mA                      | ≤ 8 mA                    | ≤ 8 mA                      | ≤ 9 mA                      |
| OUTPUTS                        | —EA2, —                     | —                         | PNP, auxiliary powered      | PNP, auxiliary powered      |
| SUPPLY VOLTAGE                 | —                           | —                         | ≥ (V <sub>AUX</sub> -0.5 V) | ≥ (V <sub>AUX</sub> -0.5 V) |
| CURRENT PER OUTPUT             | —                           | —                         | ≤ 1 A                       | ≤ 0.5 A                     |
| DATA BITS                      | D0 IN1                      | IN1.1, IN2.1              | OUT1                        | IN1/OUT1                    |
| D1                             | IN2                         | IN1.2, IN2.2              | OUT2                        | IN2/OUT2                    |
| D2                             | IN3                         | IN1.3, IN2.3              | IN3                         | IN3/OUT3                    |
| D3                             | IN4                         | IN1.4, IN2.4              | IN4                         | IN4/OUT4                    |
| PARAMETER BITS                 | P0 —                        | —                         | —                           | Watchdog on†/off            |
| P1                             | —                           | —                         | —                           | —                           |
| P2                             | —                           | —                         | —                           | —                           |
| PERIPHERAL FAULT BIT           | Input overload              | Input overload            | Input/output overload       | Input/output overload       |
| PROFILE                        | S-IO.ID.ID1.ID2 S-0.A.7.2   | S-0.A.7.2, S-0.A.7.2      | S-B.A.7.2                   | S-7.A.7.7                   |
| WEIGHT                         | 100 g (3.5 oz)              | 150 g (5.3 oz)            | 100 g (3.5 oz)              | 150 g (5.3 oz)              |
| AS-INTERFACE CONNECTION        | Flat yellow cable           | Flat yellow cable         | Flat yellow cable           | Flat yellow cable           |
| AUXILIARY POWER CONNECTION     | —                           | —                         | Flat black cable            | Flat black cable            |
| I/O CONNECTION                 | M12 quick disconnect        | M12 quick disconnect      | M12 quick disconnect        | M12 quick disconnect        |

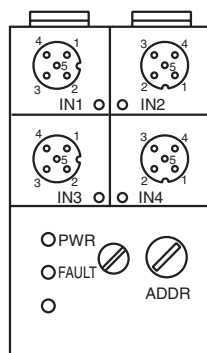
† Default setting

## \*Also Available

| INPUTS/OUTPUTS | Model Number         | Base   | Required Master Spec. | Profile S-IO.ID.ID1.ID2 | Extended Addressing | Special Features                     |
|----------------|----------------------|--------|-----------------------|-------------------------|---------------------|--------------------------------------|
| 4-in           | VAA-4E-G2-ZA         | U-G3FF | —                     | S-0.1.F.F               | No                  |                                      |
| 2-in/2-out     | VBA-2E2A-G2-ZEJ/XE2J | U-G3FF | M3, M4                | S-B.A.7.E               | Yes                 | AS-i powered inputs and outputs      |
|                | VAA-2EA-G2-ZA/EA2    | U-G3FF | —                     | S-3.F.F.F               | No                  |                                      |
| 4-in/2-out     | VBA-4E2A-G2-XE/E2    | U-G3FF | M3, M4                | S-7.A.7.E               | Yes                 | Auxiliary powered inputs and outputs |
| 4-in/3-out     | VBA-4E3A-G2-ZA/EA2   | U-G2FF | M3, M4                | S-7.A.7.2               | Yes                 |                                      |
| 4-in/4-out     | VAA-4E4A-G2-ZA/EA2   | U-G2FF | —                     | S-7.F.F.E               | No                  |                                      |

## Wiring Diagrams

**Note:** Wiring Diagrams show quick disconnect pin numbers.



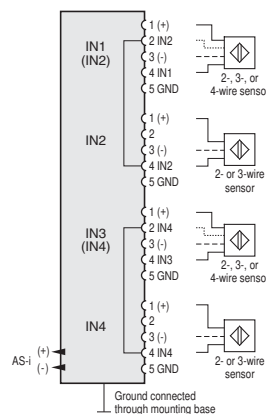
### LED Indicators

**IN:** Yellow: Input on

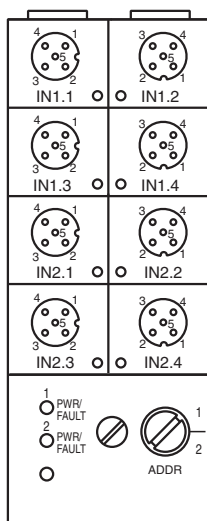
**PWR:** Green: AS-Interface powered

**FAULT:** Red (solid): Address 0 or no communication  
Red (flashing): Overload of input power

VBA-4E-G2-ZA



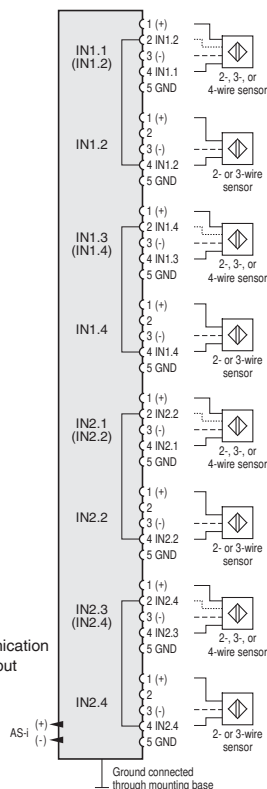
VBA-8E-G2-ZA



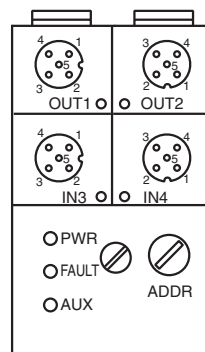
### LED Indicators

**IN:** Yellow: Input on

**PWR/FAULT:** Green: Powered  
Red (solid): Address 0 or no communication  
Green/Red (flashing): Overload of input power



VBA-2E2A-G2-ZA/EA2



### LED Indicators

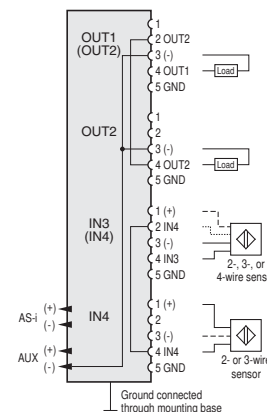
**IN:** Yellow: Input on

**OUT:** Yellow: Output on

**PWR:** Green: AS-Interface powered

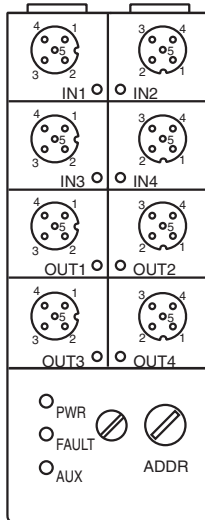
**FAULT:** Red (solid): Address 0 or no communication  
Red (flashing): Overload of input power or outputs

**AUX:** Green: Auxiliary powered



## Wiring Diagrams

**Note:** Wiring Diagrams show quick disconnect pin numbers.



## LED Indicators

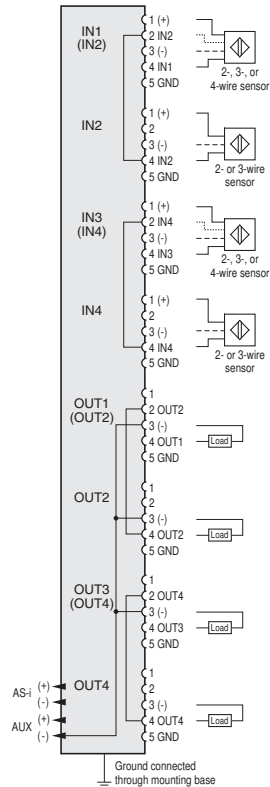
**IN:** Yellow: Input on

**OUT:** Yellow: Output on

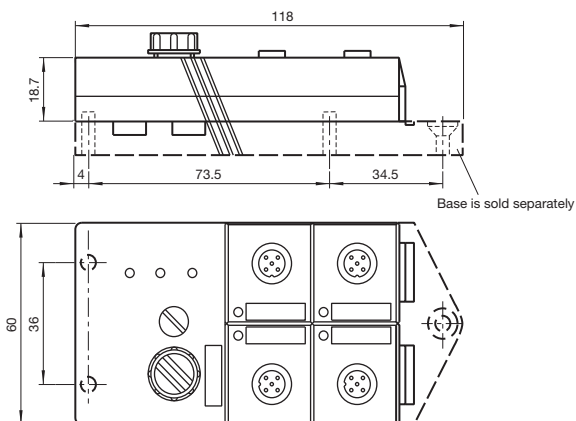
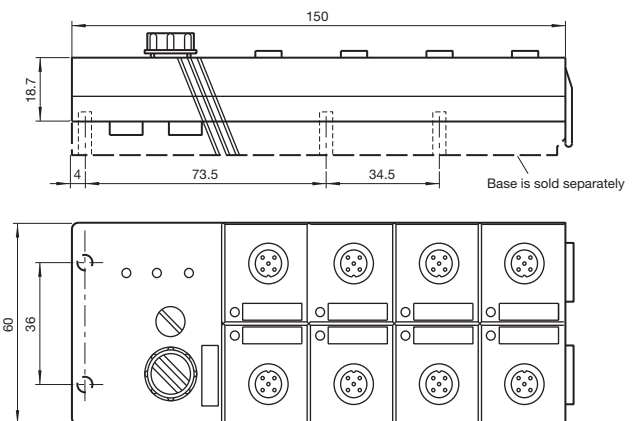
**PWR:** Green: AS-Interface powered

**FAULT:** Red (solid): Address 0 or no communication  
Red (flashing): Overload of input power or outputs

## VBA-4E4A-G2-ZA/EA2



## Dimensions (mm)

VBA-4E-G2-ZA  
VBA-2E2A-G2-ZA/EA2VBA-8E-G2-ZA  
VBA-4E4A-G2-ZA/EA2

## Accessories

### U-G3FF

Mounting base for 4-port flat modules



### U-G2FF

Mounting base for 8-port flat modules



### VAZ-V1-B

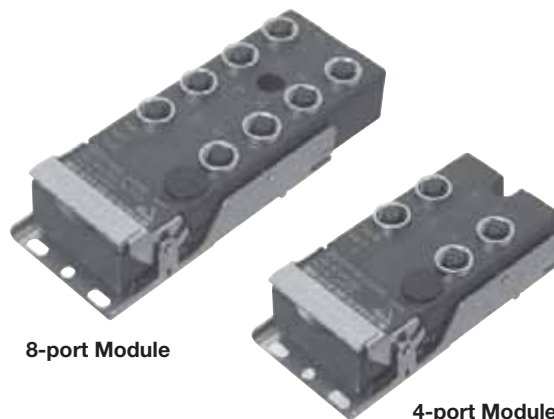
M12x1 protective cap



See pages 201-216 for complete AS-Interface accessory listing.

## Low-Profile Flat with SPEEDCON I/O Modules

- Low-profile flat housing—30 mm high
- Standard and DIN rail mount integrated in base
- Built in addressing jack
- SPEEDCON M12 quick disconnect for all I/O
- Flat cable AS-Interface connections



8-port Module

4-port Module

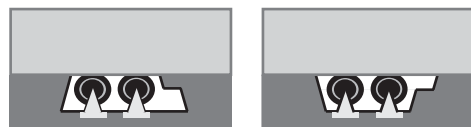
### Flat Module with SPEEDCON Overview

High-end G12 modules are ideal for applications requiring fast and flexible installation, easy access to diagnostic feedback, and long service lives. The G12 features a stainless steel installation bar that pulls the module safely onto the stainless steel base. Once the installation bar has been closed, a “click” tells the user that the module has been installed properly and securely. I/O connections are achieved with a single ½-turn using our SPEEDCON M12 solution. These M12 I/O connectors can be used with both standard cables as well as SPEEDCON versions.

G12 comes in a number of I/O mixes and two distinct housing sizes. Both housing sizes use the same rugged stainless steel mounting base. With the stainless steel mounting base, changing the I/O count is as simple as replacing one module top with another, without having to remount the base and AS-Interface cable.

Diagnostic feedback is provided with an output-specific overload indication right on the module. Under normal operating conditions, the multicolor LEDs display the state of the output. Short-circuited and overloaded outputs are provided at the PLC via the peripheral fault bit. This allows maintenance personnel to quickly determine which module has a problem. The overloaded output is directly indicated via a red LED. Faster problem resolution results in higher machine up-time.

Gold-plated piercing contacts ensure long-term, AS-Interface performance. Our machined, gold-plated contacts offer corrosion resistance that is superior to stamped (flat) contacts plated with non-precious metals.



The G12 also features an integrated DIN clip for DIN rail mounting. With the integrated DIN clip, stainless steel mounting base customers do not have to choose ahead of time how G12 is mounted. Less to consider means faster planning, ordering, and installation.

**See pages 82-83 for Flat Module with SPEEDCON wiring and dimensions.**

### Common Specifications

|                              |                                                                                                                                                                                                                                                                   |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OPERATING VOLTAGE AS-i       | 26.5-31.6 V                                                                                                                                                                                                                                                       |
| OPERATING VOLTAGE, $V_{AUX}$ | 20.4-27.6 VDC                                                                                                                                                                                                                                                     |
| INPUT SWITCHING FREQUENCY    | ≤ 1 kHz                                                                                                                                                                                                                                                           |
| INPUT DELAY                  | ≤ 1 ms from input to AS-i                                                                                                                                                                                                                                         |
| PROTECTION                   | IP67                                                                                                                                                                                                                                                              |
| HOUSING MATERIAL             | PBT                                                                                                                                                                                                                                                               |
| TEMPERATURE RANGE            | Working -13 °F to +158 °F (-25 °C to +70 °C)                                                                                                                                                                                                                      |
|                              | Storage -13 °F to +185 °F (-25 °C to +85 °C)                                                                                                                                                                                                                      |
| APPROVALS                    |    |





| Specifications                        |  | 4-in                                     | 8-in                                     | 2-in/2-out                               | 4-in/4-out                               |
|---------------------------------------|--|------------------------------------------|------------------------------------------|------------------------------------------|------------------------------------------|
| <b>INPUTS/OUTPUTS</b>                 |  |                                          |                                          |                                          |                                          |
| <b>MODEL NUMBER(S)*</b>               |  | VBA-4E-G12-ZAJ                           | VBA-4E4E-G12-ZAJ                         | VBA-2E2A-G12-ZAJ/EA2L                    | VBA-4E4A-G12-ZAJ/EA2L                    |
| <b>BASE</b>                           |  | Included                                 | Included                                 | Included                                 | Included                                 |
| <b>EXTENDED ADDRESSING (62 NODES)</b> |  | Yes                                      | Yes (2 addresses)                        | Yes                                      | Yes                                      |
| <b>REQUIRED MASTER SPEC.</b>          |  | —                                        | —                                        | M3, M4                                   | M4                                       |
| <b>AS-i OPERATING CURRENT</b>         |  | 40-240 mA                                | 80-280 mA                                | 40-240 mA                                | 40-240 mA                                |
| <b>AUXILIARY CURRENT LIMIT</b>        |  | —                                        | —                                        | 4 A                                      | 4 A, 6 A (T ≤ 104 °F)                    |
| <b>INPUTS</b>                         |  |                                          |                                          |                                          |                                          |
| -ZAJ                                  |  | PNP, AS-i powered                        | PNP, AS-i powered                        | PNP, AS-i powered                        | PNP, AS-i powered                        |
| <b>TYPE</b>                           |  | 2-, 3-, or 4-wire                        | 2-, 3-, or 4-wire                        | 2-, 3-, or 4-wire                        | 2-, 3-, or 4-wire                        |
| <b>SUPPLY VOLTAGE</b>                 |  | 21-31 V from AS-Interface                | 21-31 V from AS-Interface                | 21-31 V from AS-Interface                | 21-31 V from AS-Interface                |
| <b>MAXIMUM CURRENT</b>                |  | 200 mA                                   | 200 mA                                   | 200 mA                                   | 200 mA                                   |
| <b>SWITCH POINT</b>                   |  | OFF ≤ 2 mA, ON ≥ 4 mA                    | OFF ≤ 2 mA, ON ≥ 4 mA                    | OFF ≤ 2 mA, ON ≥ 4 mA                    | OFF ≤ 2 mA, ON ≥ 4 mA                    |
| <b>LOAD CURRENT</b>                   |  | ≤ 8 mA                                   | ≤ 8 mA                                   | ≤ 8 mA                                   | ≤ 8 mA                                   |
| <b>OUTPUTS</b>                        |  |                                          |                                          |                                          |                                          |
| EA2L                                  |  | —                                        | —                                        | PNP, auxiliary powered                   | PNP, auxiliary powered                   |
| <b>SUPPLY VOLTAGE</b>                 |  | —                                        | —                                        | ≥ (V <sub>AUX</sub> -0.5 V)              | ≥ (V <sub>AUX</sub> -0.5 V)              |
| <b>CURRENT PER OUTPUT</b>             |  | —                                        | —                                        | ≤ 2 A                                    | ≤ 2 A                                    |
| <b>DATA BITS</b>                      |  |                                          |                                          |                                          |                                          |
| D0                                    |  | IN1                                      | IN1.1, IN2.1                             | OUT1                                     | IN1/OUT1                                 |
| D1                                    |  | IN2                                      | IN1.2, IN2.2                             | OUT2                                     | IN2/OUT2                                 |
| D2                                    |  | IN3                                      | IN1.3, IN2.3                             | IN3                                      | IN3/OUT3                                 |
| D3                                    |  | IN4                                      | IN1.4, IN2.4                             | IN4                                      | IN4/OUT4                                 |
| <b>PARAMETER BITS</b>                 |  |                                          |                                          |                                          |                                          |
| P0                                    |  | —                                        | —                                        | Watchdog on <sup>†</sup> /off            | Watchdog on <sup>†</sup> /off            |
| P1                                    |  | 2 ms input filtering on/off <sup>†</sup> | 2 ms input filtering on/off <sup>†</sup> | 2 ms input filtering on/off <sup>†</sup> | 2 ms input filtering on/off <sup>†</sup> |
| P2                                    |  | Synchronization on/off <sup>†</sup>      | Synchronization on/off <sup>†</sup>      | Synchronization on/off <sup>†</sup>      | Synchronization on/off <sup>†</sup>      |
| <b>PERIPHERAL FAULT BIT</b>           |  | Input overload                           | Input overload                           | Input/output overload                    | Input/output overload                    |
| <b>PROFILE</b>                        |  | S-0.A.7.2                                | S-0.A.1.2, S-0.A.2.2                     | S-B.A.7.2                                | S-7.A.7.7                                |
| <b>WEIGHT</b>                         |  | 200 g (7.1 oz)                           | 230 g (8.1 oz)                           | 200 g (7.1 oz)                           | 230 g (8.1 oz)                           |
| <b>AS-INTERFACE CONNECTION</b>        |  | Flat yellow cable                        | Flat yellow cable                        | Flat yellow cable                        | Flat yellow cable                        |
| <b>AUXILIARY POWER CONNECTION</b>     |  | —                                        | —                                        | Flat black cable                         | Flat black cable                         |
| <b>I/O CONNECTION</b>                 |  | M12 SPEEDCON                             | M12 SPEEDCON                             | M12 SPEEDCON                             | M12 SPEEDCON                             |

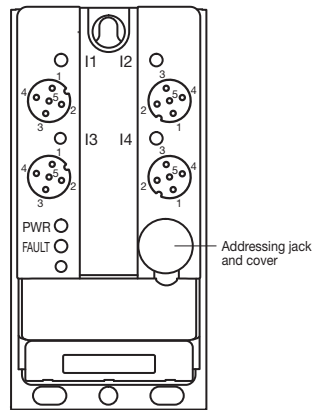
<sup>†</sup> Default setting

### \*Also Available

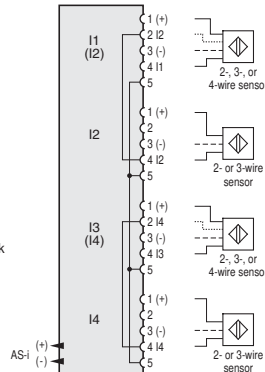
| INPUTS/OUTPUTS | Model Number          | Base     | Required Master Spec. | Profile S-IO.ID.ID1.ID2 | Extended Addressing | Special Features                     |
|----------------|-----------------------|----------|-----------------------|-------------------------|---------------------|--------------------------------------|
| 4-in           | VBA-4E-G12-ZAL        | Included | —                     | S-0.A.7.2               | Yes                 | Auxiliary powered inputs             |
| 4-in/3-out     | VBA-4E3A-G12-ZAJ/EA2L | Included | M3, M4                | S-7.A.7.2               | Yes                 |                                      |
| 4-in/4-out     | VAA-4E4A-G12-ZAJ/EA2L | Included | —                     | S-7.F.F.E               | No                  |                                      |
|                | VAA-4E4A-G12-ZAL/EA2L | Included | —                     | S-7.F.F.E               | No                  | Auxiliary powered inputs and outputs |
| 4-out          | VAA-4A-G12-EA2L       | Included | —                     | S-8.1.F.E               | No                  |                                      |

## Wiring Diagrams

**Note:** Wiring Diagrams show quick disconnect pin numbers.



VBA-4E-G12-ZAJ



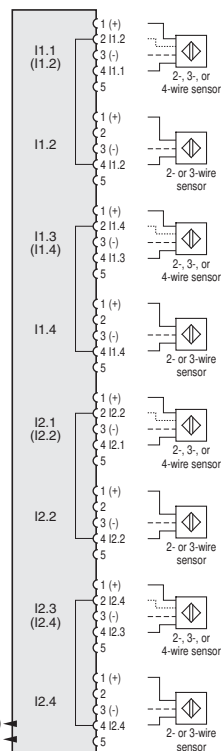
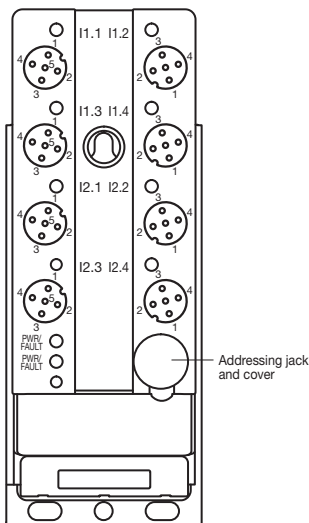
## LED Indicators

**I:** Yellow: Input on

**PWR:** Green (solid): AS-Interface powered  
Green (flashing): Address 0

**FAULT:** Red (solid): Address 0 or no communication  
Red (flashing): Overload of input power

VBA-4E4E-G12-ZAJ

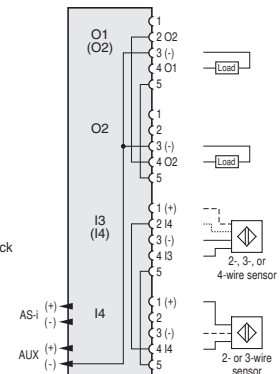
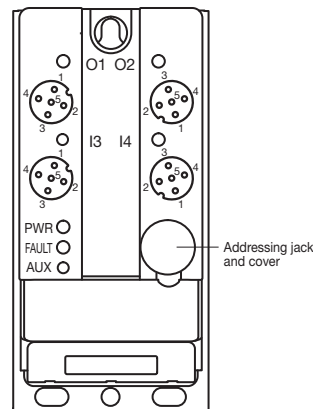


## LED Indicators

**I:** Yellow: Input on

**PWR/FAULT:** Green (solid): AS-Interface powered  
Red (solid): No communication  
Red/Yellow (alternating): Address 0  
Red/Green (alternating): Overload of input power

VBA-2E2A-G12-ZAJ/EA2L



## LED Indicators

**I:** Yellow: Input on

**O:** Yellow: Output on  
Red: Output overload

**PWR:** Green (solid): AS-Interface powered  
Green (flashing): Address 0

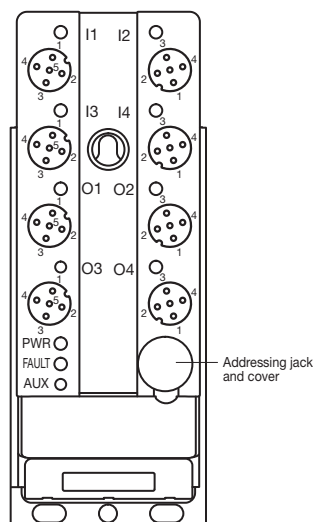
**FAULT:** Red (solid): Address 0 or no communication  
Red (flashing): Overload of input power or outputs

**AUX:** Green: Auxiliary powered  
Red: Reverse polarity

See pages 201-216 for complete AS-Interface accessory listing.

## Wiring Diagrams

**Note:** Wiring Diagrams show quick disconnect pin numbers.



### LED Indicators

**I:** Yellow: Input on

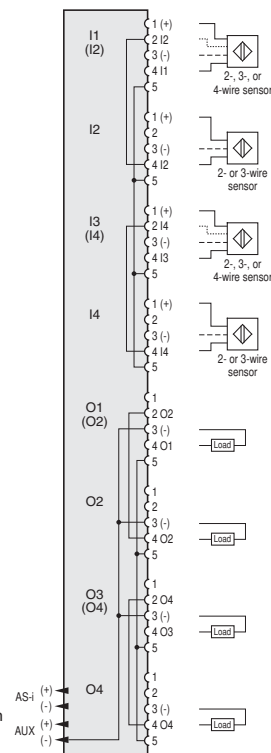
**O:** Yellow: Output on  
Red: Output overload

**PWR:** Green (solid): AS-Interface powered  
Green (flashing): Address 0

**FAULT:** Red (solid): Address 0 or no communication  
Red (flashing): Overload of input power or outputs

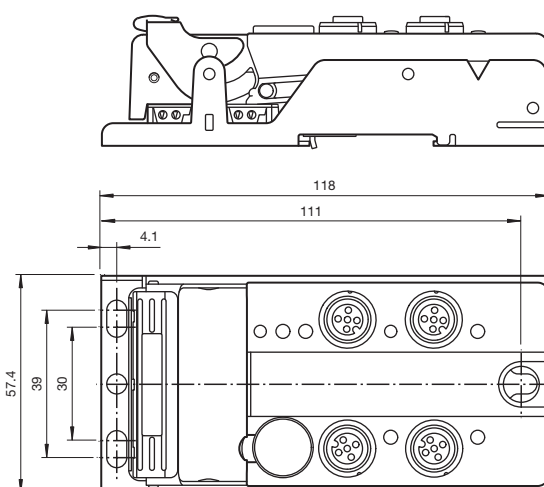
**AUX:** Green: Auxiliary powered  
Red: Reverse polarity

VBA-4E4A-G12-ZAJ/EA2L

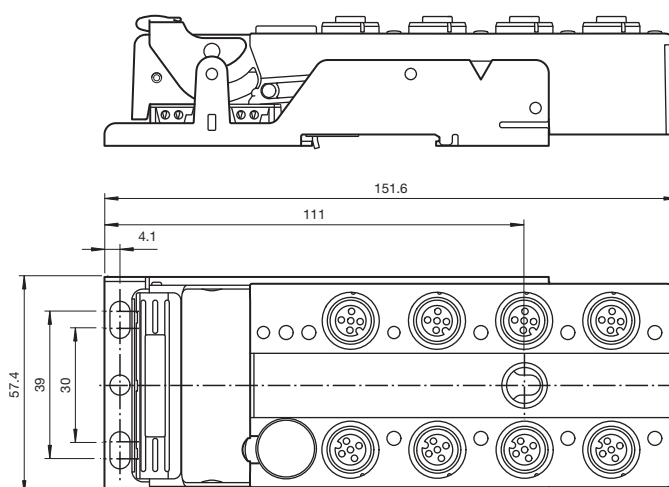


## Dimensions (mm)

VBA-4E-G12-ZAJ  
VBA-2E2A-G12-ZAJ/EA2L

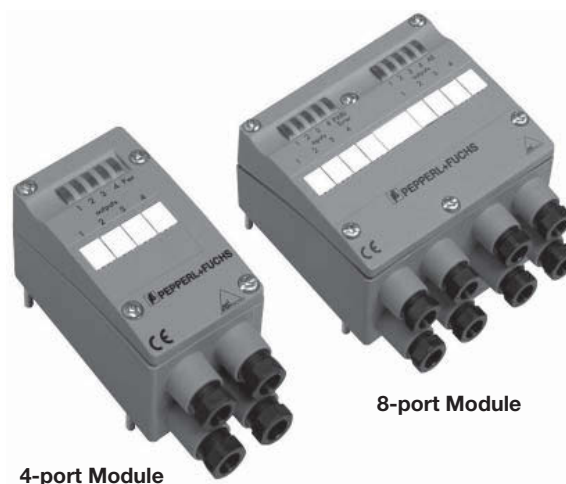


VBA-4E4E-G12-ZAJ  
VBA-4E4A-G12-ZAJ/EA2L



## Field Mountable I/O Modules

- Cord grips allow input cable to be cut to length
- Module fits directly on top of programmer without cable
- Flat or round cable AS-Interface connection through base
- Mounting through holes or DIN rail
- Field-mount housing



4-port Module

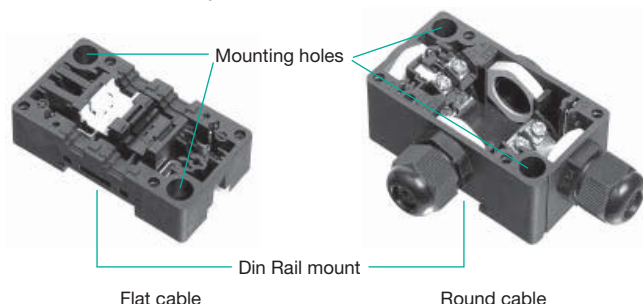
8-port Module

### Field Module Overview

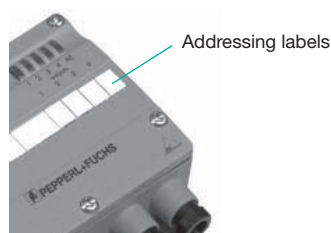
These watertight modules were developed in response to customer requests for a rugged, water tight housing. They can withstand high vibration applications such as valve positioning and actuation. The following is an overview of the G4 module key features:



Sensors and actuators are connected to the field module using the included cord grips for the cable connection and cage tension spring terminals for the electrical connection. By eliminating the quick disconnect, I/O connections are inexpensive and offer a water tight, more compact installation. Custom molded cables of differing lengths are no longer required because these field modules accept cable that can be cut to any length, eliminating waste and coiled leads. Below are the two AS-Interface cable options.



The field modules are connected to the AS-Interface cable using standard bases. These bases allow connection of AS-Interface flat or round cable. Also, the U-G1FFA base has an integrated addressing jack that eliminates the need to unscrew the cover or use a master for addressing.



**See pages 86-87 for Field Module wiring and dimensions.**

### Common Specifications

|                              |                                                                                              |
|------------------------------|----------------------------------------------------------------------------------------------|
| OPERATING VOLTAGE AS-i       | 26.5-31.6 V                                                                                  |
| OPERATING VOLTAGE, $V_{AUX}$ | 21.4-27.6 VDC                                                                                |
| INPUT SWITCHING FREQUENCY    | ≤ 250 Hz                                                                                     |
| INPUT DELAY                  | ≤ 2 ms from input to AS-i                                                                    |
| HOUSING MATERIAL             | PA 6 GF30                                                                                    |
| TEMPERATURE RANGE            | Working -13 °F to +140 °F (-25 °C to +60 °C)<br>Storage -13 °F to +185 °F (-25 °C to +85 °C) |
| APPROVALS                    | CE cULus                                                                                     |



## Specifications

| INPUTS/OUTPUTS                                        | 4-in                          | 2-in/2-out                    | 4-in/4-out                    |
|-------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------|
| MODEL NUMBER(S)*                                      | VBA-4E-G4-ZE                  | VBA-2E2A-G4-ZE/E2             | VBA-4E4A-G4-ZE/E2             |
| BASES                                                 | U-G1FFA, U-G1PP               | U-G1FFA, U-G1PP               | U-G1FFA, U-G1PP               |
| EXTENDED ADDRESSING (62 NODES)                        | Yes                           | Yes                           | Yes                           |
| REQUIRED MASTER SPEC.                                 | —                             | M3, M4                        | M4                            |
| AS-i OPERATING CURRENT                                | 40-190 mA                     | 30-140 mA                     | 30-230 mA                     |
| AUXILIARY CURRENT LIMIT                               | —                             | 2 A                           | 4 A                           |
| INPUTS <span style="float:right">-ZE</span>           | PNP, AS-i powered             | PNP, AS-i powered             | PNP, AS-i powered             |
| TYPE                                                  | 2-, 3-wire                    | 2-, 3-wire                    | 2-, 3-wire                    |
| SUPPLY VOLTAGE                                        | 21-31 V from AS-Interface     | 21-31 V from AS-Interface     | 21-31 V from AS-Interface     |
| MAXIMUM CURRENT                                       | 120 mA, 150 mA (T ≤ 104 °F)   | 75 mA, 100 mA (T ≤ 104 °F)    | 160 mA, 200 mA (T ≤ 104 °F)   |
| SWITCH POINT                                          | OFF ≤ 2 mA, ON ≥ 4 mA         | OFF ≤ 2 mA, ON ≥ 4 mA         | OFF ≤ 3 mA, ON ≥ 5 mA         |
| LOAD CURRENT                                          | ≤ 8 mA                        | ≤ 8 mA                        | ≤ 9 mA                        |
| OUTPUTS <span style="float:right">E2</span>           | —                             | PNP, auxiliary powered        | PNP, auxiliary powered        |
| SUPPLY VOLTAGE                                        | —                             | ≥ (V <sub>AUX</sub> -0.5 V)   | ≥ (V <sub>AUX</sub> -0.5 V)   |
| CURRENT PER OUTPUT                                    | —                             | ≤ 1 A                         | ≤ 1 A                         |
| DATA BITS <span style="float:right">D0</span>         | IN1                           | OUT1                          | IN1/OUT1                      |
| <span style="float:right">D1</span>                   | IN2                           | OUT2                          | IN2/OUT2                      |
| <span style="float:right">D2</span>                   | IN3                           | IN3                           | IN3/OUT3                      |
| <span style="float:right">D3</span>                   | IN4                           | IN4                           | IN4/OUT4                      |
| PARAMETER BITS <span style="float:right">P0</span>    | —                             | —                             | Watchdog on/off               |
| <span style="float:right">P1</span>                   | —                             | —                             | —                             |
| <span style="float:right">P2</span>                   | —                             | —                             | —                             |
| PERIPHERAL FAULT BIT                                  | Input overload                | Input/output overload         | Input/output overload         |
| PROFILE <span style="float:right">S-IO.ID1.ID2</span> | S-0.A.7.0                     | S-B.A.7.0                     | S-7.A.7.7                     |
| PROTECTION                                            | IP67                          | IP67                          | IP65                          |
| WEIGHT                                                | 180 g (6.3 oz)                | 180 g (6.3 oz)                | 312 g (11 oz)                 |
| AS-INTERFACE CONNECTION                               | Flat yellow or round cable    | Flat yellow or round cable    | Flat yellow or round cable    |
| AUXILIARY POWER CONNECTION                            | —                             | Flat black or round cable     | Flat black or round cable     |
| I/O CONNECTION                                        | Cage tension spring terminals | Cage tension spring terminals | Cage tension spring terminals |

† Default setting

## \*Also Available

| INPUTS/OUTPUTS | Model Number      | Bases           | Required Master Spec. | Profile S-IO.ID1.ID2 | Extended Addressing | Special Features |
|----------------|-------------------|-----------------|-----------------------|----------------------|---------------------|------------------|
| 4-in           | VAA-4E-G4-ZE      | U-G1FFA, U-G1PP | —                     | S-0.0.F.E            | No                  |                  |
| 4-in/3-out     | VBA-4E3A-G4-ZE/E2 | U-G1FFA, U-G1PP | M3, M4                | S-7.A.7.0            | Yes                 |                  |
| 4-in/4-out     | VAA-4E4A-G4-ZE/E2 | U-G1FFA, U-G1PP | —                     | S-7.0.F.E            | No                  |                  |

Gateways and Scanners

Power Supplies and Repeaters

I/O Modules

Safety at Work

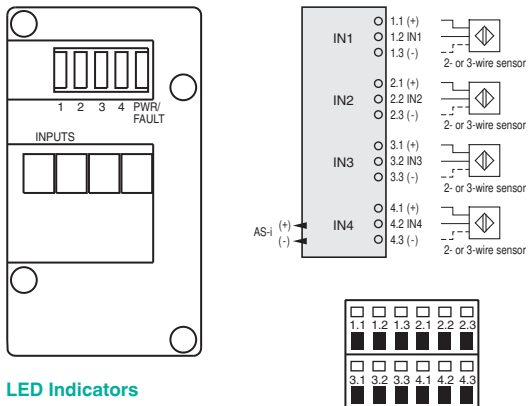
Sensors

Cordsets

Accessories

## Wiring Diagrams

VBA-4E-G4-ZE



## LED Indicators

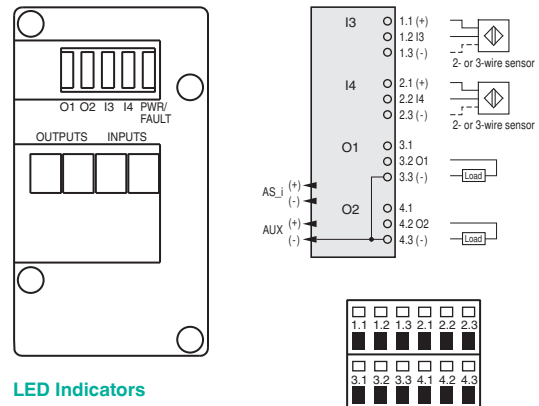
**INPUTS:** Yellow: Input on

**PWR/FAULT:** Green: AS-Interface powered

Red (solid): Address 0 or no communication

Green/Red (flashing): Overload of input power

VBA-2E2A-G4-ZE/E2



## LED Indicators

**I:** Yellow: Input on

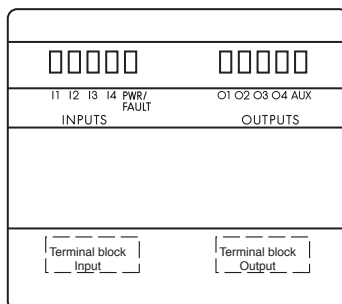
**O:** Yellow: Output on

**PWR/FAULT:** Green: AS-Interface powered

Red (solid): Address 0 or no communication

Green/Red (flashing): Overload of input power or outputs

VBA-4E4A-G4-ZE/E2



## LED Indicators

**I:** Yellow: Input on

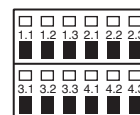
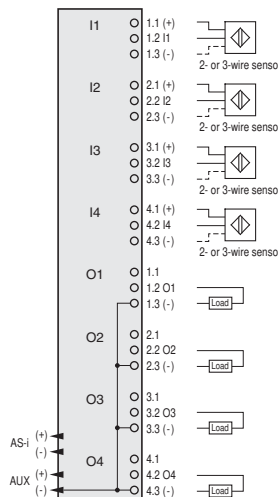
**O:** Yellow: Output on

**PWR/FAULT:** Green: AS-Interface powered

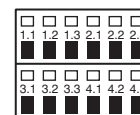
Red (solid): Address 0 or no communication

Green/Red (flashing): Overload of input power or outputs

**AUX:** Green: Auxiliary powered



INPUTS

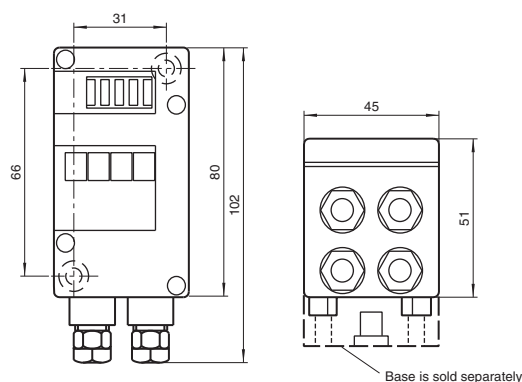


OUTPUTS

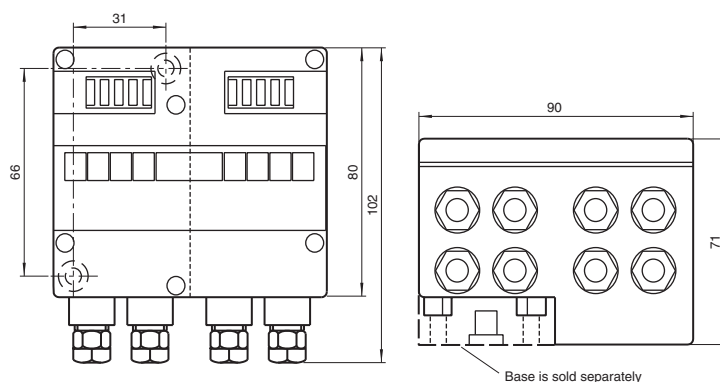


## Dimensions (mm)

VBA-4E-G4-ZE  
VBA-2E2A-G4-ZE/E2



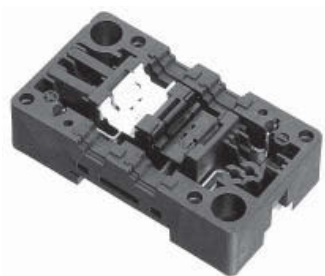
VBA-4E4A-G4-ZE/E2



## Accessories

**U-G1FFA**

Flat cable mounting base for black and yellow cables with addressing jack



**U-G1PP**

Round cable base with external power terminals



**PG11 CORD GRIP**

PG11 cord grip, includes nut and round cable grommet



**PG11-1/2NPT**

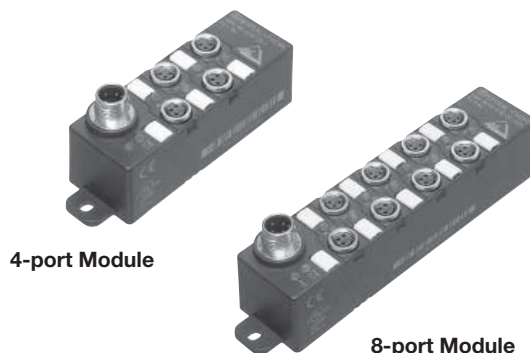
PG11 male to 1/2" NPT female conduit adapter



See pages 201-216 for complete AS-Interface accessory listing.

## Compact I/O Modules

- Potted water tight housing, IP69K
- AS-Interface and I/O quick disconnect
- Smallest field mountable housing available
- Short circuit indication output



4-port Module

8-port Module

### Compact Module Overview

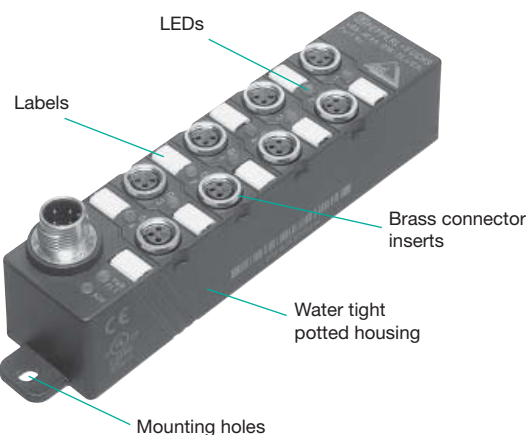
AS-Interface offers advantages for many areas of automation. Many of the modules commonly available on the market are too large for robotics and material handling applications. Circuit boards are an alternative but are expensive to protect from rigorous industrial environmental conditions. Pepperl+Fuchs offers these compact modules as a cost-effective solution.

Our compact modules connect to field devices through the use of Nano (M8x1) quick disconnects. These small modules are rated IP69K and are ideal for rugged industrial environments. The unique mounting hole arrangement enables the module to be mounted in almost any location.

Compact modules use V1 M12x1 quick disconnects to attach AS-Interface and external power. The VAZ-2T1-FK-... adapter connects both the yellow (AS-Interface) and black (external 24 VDC) flat cables.

The same adapter can also be used for the 4 input modules, but because no external power is required for input-only modules, the VAZ-T1-FK-... is the preferred option. The VAZ-2T5-G2 adapter allows connection of up to five compact modules using standard V1 (M12x1) extension cables.

The VBP-HH1-... hand-held addressing device uses a V1 (M12x1) quick disconnect and a V1-G-2M-PVC-V1-G cable to connect to the compact module. The VBP-HH1-... enables the user to address the compact module before or during installation.



See page 90 for Compact Module wiring and dimensions.

### Common Specifications

|                              |                                                                                                 |
|------------------------------|-------------------------------------------------------------------------------------------------|
| OPERATING VOLTAGE AS-i       | 26.5-31.6 V                                                                                     |
| OPERATING VOLTAGE, $V_{AUX}$ | 20-30 VDC                                                                                       |
| INPUT SWITCHING FREQUENCY    | ≤ 1 kHz                                                                                         |
| INPUT DELAY                  | ≤ 1 ms from Input to AS-i                                                                       |
| PROTECTION                   | IP69K                                                                                           |
| HOUSING MATERIAL             | PBT                                                                                             |
| TEMPERATURE RANGE            | <div>Working</div> <div>Storage</div>                                                           |
|                              | <div>-13 °F to +158 °F (-25 °C to +70 °C)</div> <div>-13 °F to +185 °F (-25 °C to +85 °C)</div> |
| APPROVALS                    |                                                                                                 |



## Specifications

| INPUTS/OUTPUTS                                           | 4-in                         | 4-in/4-out                   |
|----------------------------------------------------------|------------------------------|------------------------------|
| MODEL NUMBER(S)*                                         | VBA-4E-G16-ZEJ               | VBA-4E4A-G16-ZEJ/E2L         |
| EXTENDED ADDRESSING (62 NODES)                           | Yes                          | Yes                          |
| REQUIRED MASTER SPEC.                                    | —                            | M4                           |
| AS-i OPERATING CURRENT                                   | 40-240 mA                    | 40-240 mA                    |
| AUXILIARY CURRENT LIMIT                                  | —                            | 4 A                          |
| INPUTS <span style="float:right">-ZEJ</span>             | PNP, AS-i powered            | PNP, AS-i powered            |
| TYPE                                                     | —                            | —                            |
| SUPPLY VOLTAGE                                           | 21-31 V from AS-Interface    | 21-31 V from AS-Interface    |
| MAXIMUM CURRENT                                          | 150 mA, 200 mA (T ≤ 104 °F)  | 150 mA, 200 mA (T ≤ 104 °F)  |
| SWITCH POINT                                             | OFF ≤ 3 mA, ON ≥ 5 mA        | OFF ≤ 3 mA, ON ≥ 5 mA        |
| LOAD CURRENT                                             | ≤ 9 mA                       | ≤ 9 mA                       |
| OUTPUTS <span style="float:right">E2L</span>             | —                            | PNP, auxiliary powered       |
| SUPPLY VOLTAGE                                           | —                            | ≥ (V <sub>AUX</sub> - 0.5 V) |
| CURRENT PER OUTPUT                                       | —                            | ≤ 1 A                        |
| DATA BITS <span style="float:right">D0</span>            | IN1                          | IN1/OUT1                     |
| <span style="float:right">D1</span>                      | IN2                          | IN2/OUT2                     |
| <span style="float:right">D2</span>                      | IN3                          | IN3/OUT3                     |
| <span style="float:right">D3</span>                      | IN4                          | IN4/OUT4                     |
| PARAMETER <span style="float:right">P0</span>            | —                            | Watchdog on/off              |
| BITS <span style="float:right">P1</span>                 | 2 ms input filtering on/off† | 2 ms input filtering on/off† |
| <span style="float:right">P2</span>                      | Synchronization on/off†      | Synchronization on/off†      |
| PERIPHERAL FAULT BIT                                     | Input overload               | Input/output overload        |
| PROFILE <span style="float:right">S-IO.ID.ID1.ID2</span> | S-0.A.7.0                    | S-7.A.7.7                    |
| WEIGHT                                                   | 100 g (3.5 oz)               | 150 g (5.3 oz)               |
| AS-INTERFACE CONNECTION                                  | M12 quick disconnect         | M12 quick disconnect         |
| AUXILIARY POWER CONNECTION                               | —                            | —                            |
| I/O CONNECTION                                           | M8 quick disconnect          | M8 quick disconnect          |

† Default setting

## \*Also Available

| INPUTS/OUT-PUTS | Model Number         | Bases | Required Master Spec. | Profile S-IO.ID.ID1.ID2 | Extended Addressing | Special Features |
|-----------------|----------------------|-------|-----------------------|-------------------------|---------------------|------------------|
| 4-in/4-out      | VAA-4E4A-G16-ZEJ/E2L | —     | —                     | S-7.0.FE                | No                  |                  |

Gateways and Scanners

Power Supplies and Repeaters

I/O Modules

Safety at Work

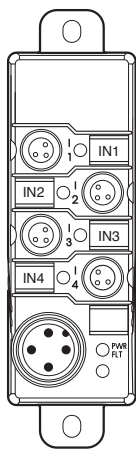
Sensors

Cordsets

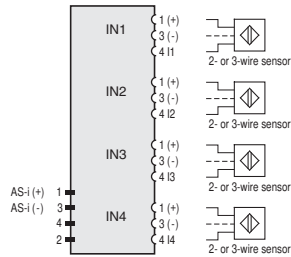
Accessories

## Wiring Diagrams

**Note:** Wiring Diagrams show quick disconnect pin numbers.



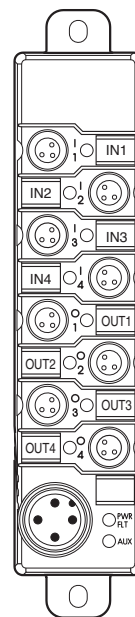
VBA-4E-G16-ZEJ



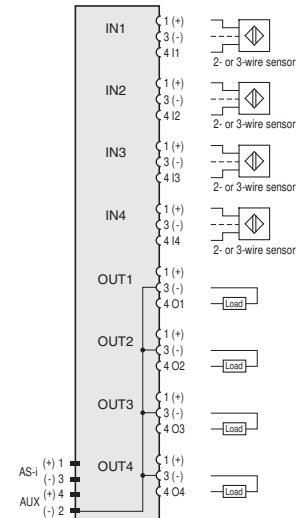
## LED Indicators

I: Yellow: Input on

**PWR/FLT:** Green (solid): AS-Interface powered  
Red (solid): Communication error  
Yellow/Red (flashing): Address 0  
Green/Red (flashing): Overload of input power



VBA-4E4A-G16-ZEJ/E2L



## LED Indicators

I: Yellow: Input on

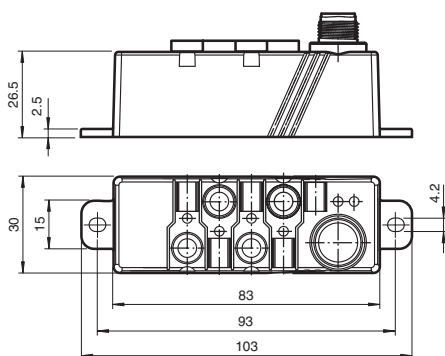
O: Yellow: Output on, Red: Output overload

**PWR/FLT:** Green (solid): AS-Interface powered  
Red (solid): Communication error  
Yellow/Red (flashing): Address 0  
Green/Red (flashing): Overload of input power or outputs

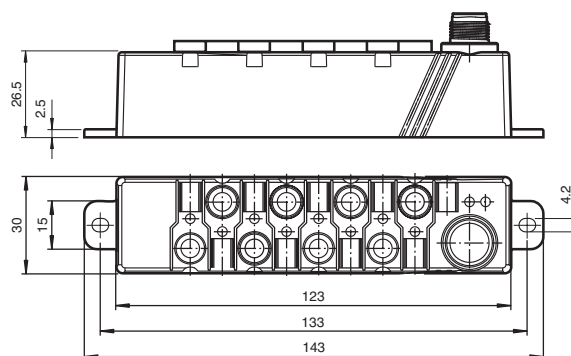
**AUX:** Green: Auxiliary powered  
Red: Reverse polarity

## Dimensions (mm)

VBA-4E-G16-ZEJ



VBA-4E4A-G16-ZEJ/E2L



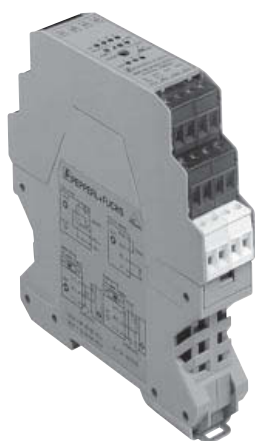
## Accessories

## VAZ-V3-B

V3 (M8 x 1) protective cover

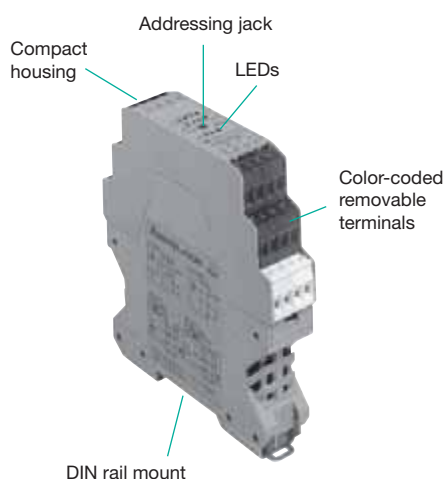


See pages 201-216 for complete AS-Interface accessory listing.



### Enclosure Module Overview

The KE modules have the following features: narrow housing, internal/external input power switch, color-coded removable terminals and advanced diagnostic capabilities. Special relays are used so that the modules can carry the Class I, Division 2 hazardous location approval. The AS-Interface network is signaled when a short occurs on the inputs or outputs. If the outputs are shorted, the inputs will still function and the reverse is also true. The module will automatically recover once the overload/short circuit is removed. Both standard versions and extended addressing versions are available for any application.



**See pages 93-94 for Enclosure wiring and dimensions.**

## Enclosure I/O Modules

- Color-coded removable terminals
- Choose between AS-Interface or externally powered inputs
- Class I, Division 2 approvals for electronic and relay outputs

### Common Specifications

|                              |                     |                                                                                                                                                                             |
|------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OPERATING VOLTAGE AS-i       |                     | 26.5-31.6 V                                                                                                                                                                 |
| OPERATING VOLTAGE, $V_{EXT}$ |                     | 12-30 VDC (inputs using EXT mode)                                                                                                                                           |
| OPERATING VOLTAGE, $V_{AUX}$ |                     | 20-30 VDC (electronic outputs)                                                                                                                                              |
| INPUT SWITCHING FREQUENCY    |                     | ≤ 250 Hz                                                                                                                                                                    |
| INPUT DELAY                  |                     | ≤ 2 ms from input to AS-i                                                                                                                                                   |
| PROTECTION                   |                     | IP20                                                                                                                                                                        |
| HOUSING MATERIAL             |                     | PA 66-FR                                                                                                                                                                    |
| RELATIVE HUMIDITY            |                     | 90%, non-condensing                                                                                                                                                         |
| TEMPERATURE RANGE            | Working             | -13 °F to +140 °F (-25 °C to +60 °C)                                                                                                                                        |
|                              | Storage             | -13 °F to +185 °F (-25 °C to +85 °C)                                                                                                                                        |
| APPROVALS                    | Hazardous location* |  Class I, Div. 2, Groups A, B, C, D                                                    |
|                              | General purpose     |   |



## Specifications

| INPUTS/OUTPUTS                 | 4-in                                   | 4-in/4-out                             | 4-in/4-out (relay)                                                  |
|--------------------------------|----------------------------------------|----------------------------------------|---------------------------------------------------------------------|
| MODEL NUMBER(S)*               | VBA-4E-KE-ZE                           | VBA-4E4A-KE-ZE/E2                      | VBA-4E4A-KE-ZE/R                                                    |
| EXTENDED ADDRESSING (62 NODES) | Yes                                    | Yes                                    | Yes                                                                 |
| REQUIRED MASTER SPEC.          | —                                      | M4                                     | M4                                                                  |
| AS-i OPERATING CURRENT         | 30-180 mA                              | 35-190 mA                              | 35-210 mA                                                           |
| AUXILIARY CURRENT LIMIT        | —                                      | 2.8 A                                  | —                                                                   |
| INPUTS <i>-ZE</i>              | PNP, AS-i or V <sub>EXT</sub> powered  | PNP, AS-i or V <sub>EXT</sub> powered  | PNP, AS-i or V <sub>EXT</sub> powered                               |
| TYPE                           | 2-, 3-wire                             | 2-, 3-wire                             | 2-, 3-wire                                                          |
| SUPPLY VOLTAGE                 | 21-31 V from AS-i, or V <sub>EXT</sub> | 21-31 V from AS-i, or V <sub>EXT</sub> | 21-31 V from AS-i, or V <sub>EXT</sub>                              |
| MAXIMUM CURRENT                | 150 mA (when using AS-i power)         | 150 mA (when using AS-i power)         | 150 mA (when using AS-i power)                                      |
| SWITCH POINT                   | OFF ≤ 2 mA, ON ≥ 4 mA                  | OFF ≤ 2 mA, ON ≥ 4 mA                  | OFF ≤ 2 mA, ON ≥ 4 mA                                               |
| LOAD CURRENT                   | ≤ 8 mA                                 | ≤ 8 mA                                 | ≤ 8 mA                                                              |
| ELECTRONIC OUTPUTS <i>-E2</i>  | —                                      | PNP, auxiliary powered                 | —                                                                   |
| SUPPLY VOLTAGE                 | —                                      | ≥ (V <sub>AUX</sub> -0.5 V)            | —                                                                   |
| CURRENT PER OUTPUT             | —                                      | ≤ 0.7 A                                | —                                                                   |
| RELAY OUTPUTS <i>-R</i>        | —                                      | —                                      | Relay, SPST                                                         |
| NOMINAL LOAD PER CONTACT       | —                                      | —                                      | 2 A @ 30 VDC, 2 A @ 253 VAC                                         |
| NOMINAL LOAD PER MODULE        | —                                      | —                                      | 8 A                                                                 |
| SWITCH DELAY                   | —                                      | —                                      | < 10 ms                                                             |
| MAXIMUM SWITCHING OPERATIONS   | —                                      | —                                      | 5,000,000 (no load)<br>200,000 (250 VAC, 2 A, cos φ = 0.4)          |
| CONTROL CIRCUIT                | —                                      | —                                      | 8 mA from AS-i per relay                                            |
| DATA BITS <i>D0</i>            | IN1                                    | IN1/OUT1                               | IN1/OUT1                                                            |
| <i>D1</i>                      | IN2                                    | IN2/OUT2                               | IN2/OUT2                                                            |
| <i>D2</i>                      | IN3                                    | IN3/OUT3                               | IN3/OUT3                                                            |
| <i>D3</i>                      | IN4                                    | IN4/OUT4                               | IN4/OUT4                                                            |
| PARAMETER BITS <i>P0</i>       | —                                      | —                                      | Watchdog on/off                                                     |
| <i>P1</i>                      | —                                      | —                                      | 2 ms input filtering on/off†                                        |
| <i>P2</i>                      | —                                      | —                                      | Synchronization on/off†                                             |
| PERIPHERAL FAULT BIT           | Input overload                         | Input/output overload                  | Input overload                                                      |
| PROFILE <i>S-IO.ID1.ID2</i>    | S-0.A.7.0                              | S-7.A.7.7                              | S-7.A.7.7                                                           |
| WEIGHT                         | 150 g (5.3 oz)                         | 150 g (5.3 oz)                         | 170 g (6.0 oz)                                                      |
| AS-INTERFACE CONNECTION        | Yellow removable terminals             | Yellow removable terminals             | Yellow removable terminals                                          |
| AUXILIARY POWER CONNECTION     | —                                      | Gray removable terminals               | —                                                                   |
| I/O CONNECTION                 | Black removable terminals              | Black removable terminals              | Black removable terminals (input), red removable terminals (output) |

† Default setting

## \*Also Available

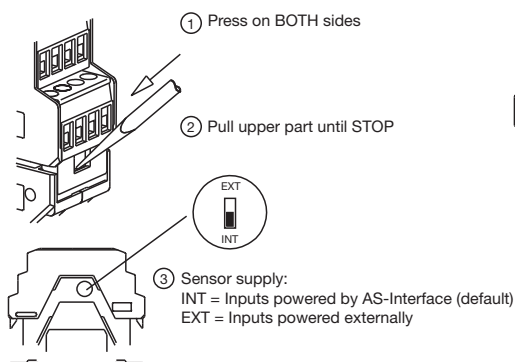
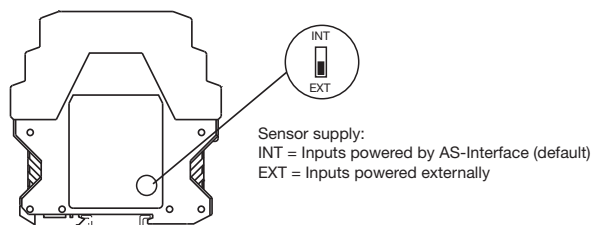
| INPUTS/OUT-PUTS    | Model Number       | Base | Required Master Spec. | Profile S-IO.ID1.ID2 | Extended Addressing | Special Features                     |
|--------------------|--------------------|------|-----------------------|----------------------|---------------------|--------------------------------------|
| 4-in               | VBA-4E-KE-ZE0      | —    | —                     | S-0.A.7.0            | Yes                 | NPN                                  |
| 4-in/3-out         | VBA-4E3A-KE-ZE/E2  | —    | M3, M4                | S-7.A.7.0            | Yes                 | Outputs 3 A or 1.5 A, 6 A total      |
| 4-in/3-out         | VBA-4E3A-KE-ZE0/E0 | —    | M3, M4                | S-7.A.7.0            | Yes                 | NPN, outputs 3 A or 1.5 A, 6 A total |
| 4-in/3-out (relay) | VBA-4E3A-KE-ZE/R   | —    | M3, M4                | S-7.A.7.0            | Yes                 | Relay outputs                        |
| 4-in/4-out         | VAA-4E4A-KE-ZE/E2  | —    | —                     | S-7.0.F.E            | No                  |                                      |
| 4-in/4-out (relay) | VAA-4E4A-KE-ZE/R   | —    | —                     | S-7.0.F.E            | No                  | Relay outputs                        |



## Wiring Diagrams

## Switching Between AS-i and External Input Power

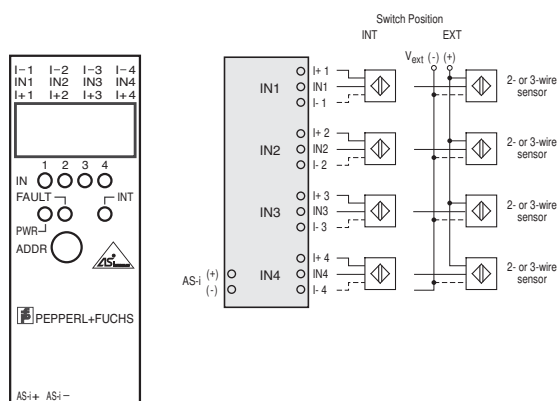
VBA-4E-KE-ZE

VBA-4E4A-KE-ZE/R  
VBA-4E4A-KE-ZE/E2**ATTENTION**

Do not connect the terminals I+, IN and I- with any external potential when switch set to "INT".

INT/EXT switchable under off-circuit conditions only

VBA-4E-KE-ZE

**LED Indicators**

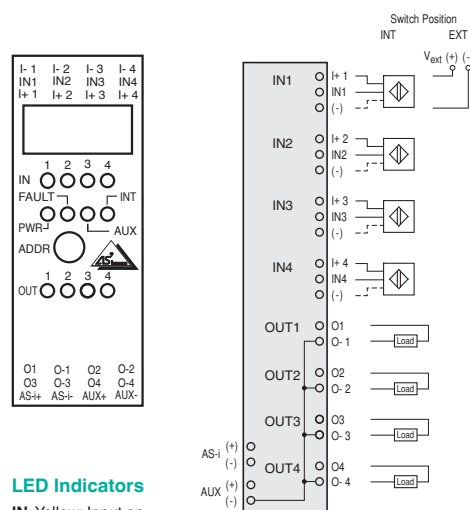
**IN:** Yellow: Input on

**PWR:** Green: AS-Interface powered

**FAULT:** Red (solid): Address 0 or no communication  
Red (flashing): Overload of input power

**INT:** Yellow: Inputs powered by AS-Interface  
Off: Inputs powered externally

VBA-4E4A-KE-ZE/E2

**LED Indicators**

**IN:** Yellow: Input on

**OUT:** Yellow: Output on

**PWR:** Green: AS-Interface powered

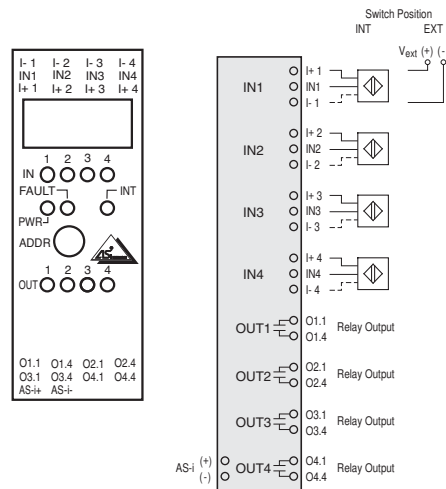
**FAULT:** Red (solid): Address 0 or no communication  
Red (flashing): Overload of input power or outputs

**INT:** Yellow: Inputs powered by AS-Interface  
Off: Inputs powered externally

**AUX:** Green: Auxiliary powered  
Red: Reverse polarity

## Wiring Diagrams

VBA-4E4A-KE-ZE/R



## LED Indicators

IN: Yellow: Input on

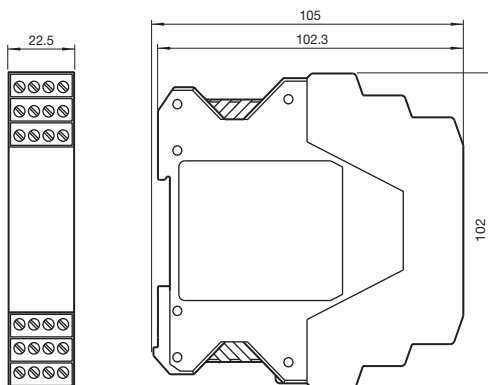
OUT: Yellow: Output on

PWR: Green: AS-Interface powered

FAULT: Red (solid): Address 0 or no communication  
Red (flashing): Overload of input powerINT: Yellow: Inputs powered by AS-Interface  
Off: Inputs powered externally

## Dimensions (mm)

VBA-4E-KE-ZE  
VBA-4E4A-KE-ZE/E2  
VBA-4E4A-KE-ZE/R



See pages 201-216 for complete  
AS-Interface accessory listing.



## Junction Box I/O Modules

- 2- and 3-wire models
- AS-Interface and auxiliary powered options
- Lowest profile housing, 1" high including removable terminals

### Junction Box Module Overview

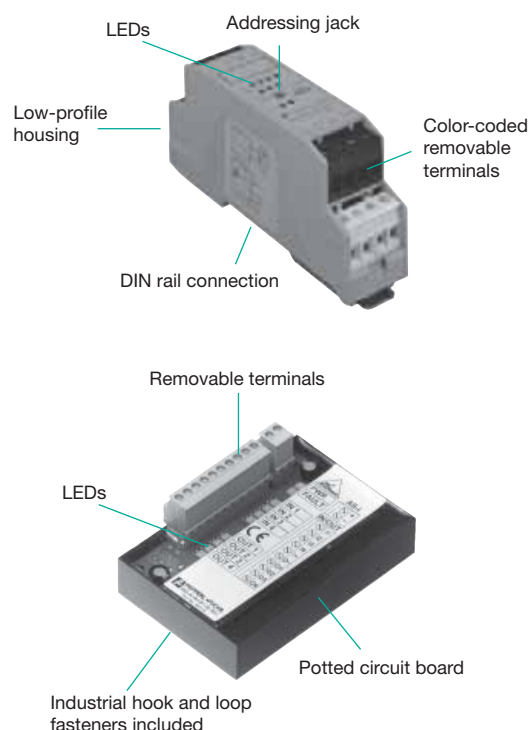
To ensure the correct fit for your applications, Pepperl+Fuchs offers the compact KE1 series modules.

The KE1 series modules come in several input/output configurations. The housing, only 22.5 mm in width and 48.5 mm in height, takes up very little space in the junction box. The module is mounted by snapping onto the 35 mm DIN rail. Plug-in terminals are used for connection. LEDs on the front control plate are used to display the current switching state for each input.

The VBA-4E-KE1-Z connects to AS-Interface using a yellow removable terminal. Inputs are for 2-wire and dry contact type inputs only. The load current is limited internally to 8 mA.

The VBA-4E2A-KE1-Z/E2 connects to AS-Interface and external power using gray and yellow removable terminals. This makes it possible to separate power to individual modules or to disconnect power during commissioning or servicing. Inputs are for two-wire and dry contact type inputs only. The load current is limited internally to 8 mA.

The CB1 junction box module offers the lowest profile housing. Including the removable terminals the module only sits 25 mm high. It is uniquely mounted with dual-lock mounting strips eliminating the requirement for the extra space required for DIN rail. This 3.0 spec housing allows up to 62 nodes to be put on one network all having 4-in and 4-out. The completely encapsulated housing protects it from accidental damage.



**See pages 97-98 for Junction Box Module wiring and dimensions.**

### Common Specifications

|                              |                                                                                                                                                                                                                                                                   |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OPERATING VOLTAGE AS-i       | 26.5-31.6 V                                                                                                                                                                                                                                                       |
| OPERATING VOLTAGE, $V_{AUX}$ | 21.4-27.6 VDC                                                                                                                                                                                                                                                     |
| INPUT SWITCHING FREQUENCY    | ≤ 250 Hz                                                                                                                                                                                                                                                          |
| INPUT DELAY                  | ≤ 2 ms from input to AS-i                                                                                                                                                                                                                                         |
| PROTECTION                   | IP20                                                                                                                                                                                                                                                              |
| HOUSING MATERIAL             | PA 66-FR                                                                                                                                                                                                                                                          |
| APPROVALS                    |    |



## Specifications

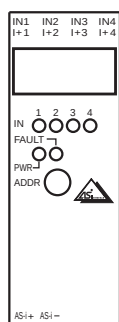
| INPUTS/OUTPUTS                 |         | 4-in (2-wire)                        | 4-in/2-out (2-wire)                  | 4-in/4-out (AUX powered)                | 4-in/4-out (AS-i powered)            |
|--------------------------------|---------|--------------------------------------|--------------------------------------|-----------------------------------------|--------------------------------------|
| MODEL NUMBER(S)*               |         | VBA-4E-KE1-Z                         | VBA-4E2A-KE1-Z/E2                    | VAA-4E4A-KE1-Z/E2                       | VBA-4E4A-CB1-ZEJ/E2J                 |
| EXTENDED ADDRESSING (62 NODES) |         | Yes                                  | Yes                                  | No                                      | Yes                                  |
| REQUIRED MASTER SPEC.          |         | —                                    | M3, M4                               | —                                       | M4                                   |
| AS-i OPERATING CURRENT         |         | 25-60 mA                             | 25-60 mA                             | ≤ 40 mA                                 | 30-180 mA                            |
| AUXILIARY CURRENT LIMIT        |         | —                                    | 2 A, 3 A (T ≤ 104 °F)                | 2 A                                     | —                                    |
| INPUTS                         |         | PNP, AS-i powered                    | PNP, AS-i powered                    | PNP, auxiliary powered                  | PNP, AS-i powered                    |
| —Z, -ZEJ                       |         | —                                    | —                                    | —                                       | —                                    |
| TYPE                           |         | 2-wire                               | 2-wire                               | 2-, 3-wire                              | 2-, 3-wire                           |
| SUPPLY VOLTAGE                 |         | 21-31 V from AS-Interface            | 21-31 V from AS-Interface            | V <sub>AUX</sub>                        | 21-31 V from AS-Interface            |
| MAXIMUM CURRENT                |         | —                                    | —                                    | —                                       | Limited by operating current         |
| SWITCH POINT                   |         | OFF ≤ 2 mA, ON ≥ 4 mA                | OFF ≤ 2 mA, ON ≥ 4 mA                | OFF ≤ 2 mA, ON ≥ 4 mA                   | OFF ≤ 0.5 mA, ON ≥ 2 mA              |
| LOAD CURRENT                   |         | ≤ 8 mA                               | ≤ 8 mA                               | ≤ 8 mA                                  | ≤ 5 mA                               |
| OUTPUTS                        |         | —                                    | PNP, auxiliary powered               | PNP, auxiliary powered                  | PNP, AS-i powered                    |
| —E2, E2J                       |         | —                                    | —                                    | —                                       | —                                    |
| SUPPLY VOLTAGE                 |         | —                                    | ≥ (V <sub>AUX</sub> -0.5 V)          | ≥ (V <sub>AUX</sub> -0.5 V)             | 21-31 V from AS-Interface            |
| CURRENT PER OUTPUT             |         | —                                    | ≤ 1 A, ≤ 1.5 A (T ≤ 104 °F)          | ≤ 0.5 A                                 | ≤ 100 mA (≤ 140 mA total)            |
| DATA BITS                      | D0      | IN1                                  | IN1/OUT1                             | IN1/OUT1                                | IN1/OUT1                             |
|                                | D1      | IN2                                  | IN2/OUT2                             | IN2/OUT2                                | IN2/OUT2                             |
|                                | D2      | IN3                                  | IN3                                  | IN3/OUT3                                | IN3/OUT3                             |
|                                | D3      | IN4                                  | IN4                                  | IN4/OUT4                                | IN4/OUT4                             |
| PARAMETER BITS                 | P0      | —                                    | —                                    | —                                       | Watchdog on/off                      |
|                                | P1      | —                                    | —                                    | —                                       | 2 ms input filtering on/off†         |
|                                | P2      | —                                    | —                                    | —                                       | Synchronization on/off†              |
| PERIPHERAL FAULT BIT           |         | Input overload                       | Input/output overload                | Output overload                         | Output overload                      |
| PROFILE                        |         | S-0.A.7.0                            | S-7.A.7.0                            | S-7.0.FE                                | S-7.A.7.7                            |
| TEMPERATURE RANGE              | WORKING | -13 °F to +185 °F (-25 °C to +85 °C) | -13 °F to +158 °F (-25 °C to +70 °C) | -13 °F to +140 °F (-25 °C to +60 °C)    | -13 °F to +140 °F (-25 °C to +60 °C) |
|                                | STORAGE | -13 °F to +185 °F (-25 °C to +85 °C) | -13 °F to +185 °F (-25 °C to +85 °C) | -40 °F to +185 °F (-40 °C to +85 °C)    | -40 °F to +185 °F (-40 °C to +85 °C) |
| WEIGHT                         |         | 80 g (2.8 oz)                        | 80 g (2.8 oz)                        | 80 g (2.8 oz)                           | 90 g (3.2 oz)                        |
| AS-INTERFACE CONNECTION        |         | Yellow removable terminals           | Yellow removable terminals           | Removable cage tension spring terminals | Green removable terminals            |
| AUXILIARY POWER CONNECTION     |         | —                                    | Gray removable terminals             | Removable cage tension spring terminals | —                                    |
| I/O CONNECTION                 |         | Black removable terminals            | Black removable terminals            | Removable cage tension spring terminals | Green removable terminals            |

† Default setting

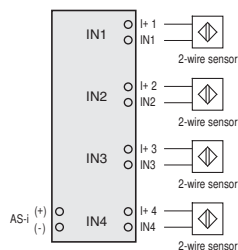
## \*Also Available

| INPUTS/OUTPUTS | Model Number      | Base | Required Master Spec. | Profile S-IO.ID.ID1.ID2 | Extended Addressing | Special Features                     |
|----------------|-------------------|------|-----------------------|-------------------------|---------------------|--------------------------------------|
| 4-in/4-out     | VAA-4E4A-CB1-Z/E2 | —    | —                     | S-7.0.FE                | No                  | AS-i powered inputs and outputs      |
| 4-in/4-out     | VAA-4E4A-CB2-Z/E2 | —    | —                     | S-7.0.FE                | No                  | Auxiliary powered inputs and outputs |

## Wiring Diagrams



VBA-4E-KE1-Z

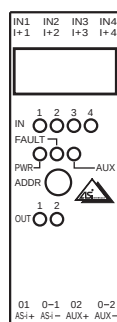


## LED Indicators

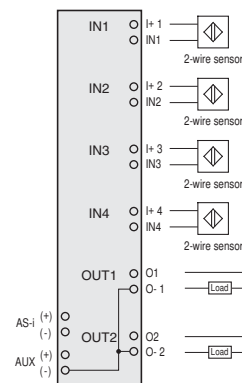
IN: Yellow: Input on

PWR: Green: AS-Interface powered

FAULT: Red (solid): Address 0 or no communication



VBA-4E2A-KE1-Z/E2



## LED Indicators

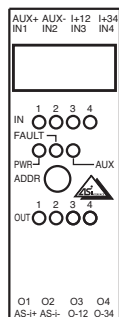
IN: Yellow: Input on

OUT: Yellow: Output on

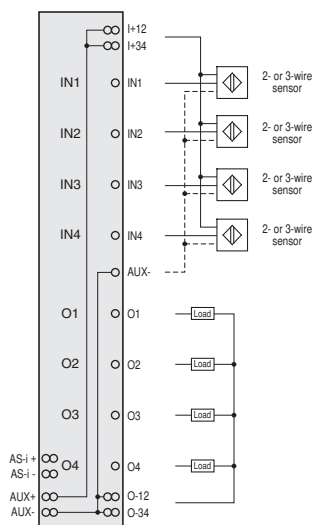
PWR: Green: AS-Interface powered

FAULT: Red (solid): Address 0 or no communication  
Red (flashing): Overload of outputs

AUX: Green: Auxiliary powered



VAA-4E4A-KE1-Z/E2

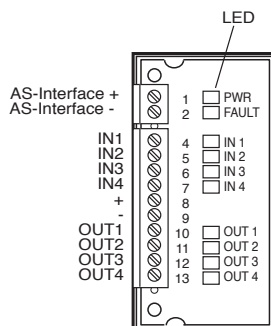


## LED Indicators

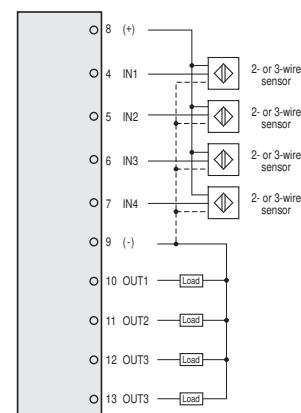
IN: Yellow: Input on

OUT: Yellow: Output on

PWR: Green: AS-Interface powered

FAULT: Red (solid): Address 0 or no communication  
Red (flashing): Overload of outputsAUX: Green: Auxiliary powered  
Red: Reverse polarity

VBA-4E4A-CB1-ZEJ/E2J



## LED Indicators

PWR: Green: AS-Interface powered

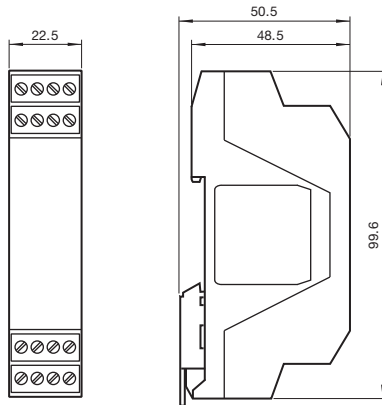
FAULT: Red (solid): Address 0 or no communication  
Red (flashing): Overload of outputs

IN: Yellow: Input on

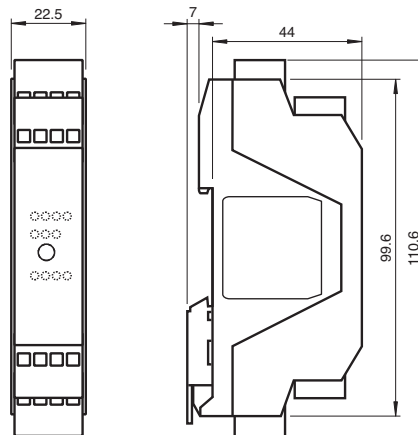
OUT: Yellow: Output on

## Dimensions (mm)

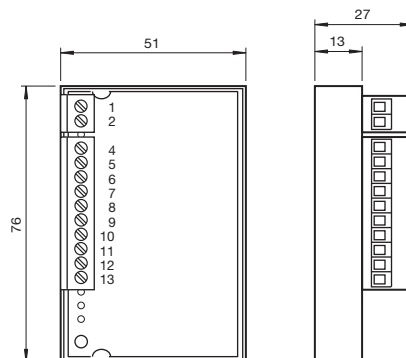
VBA-4E-KE1-Z  
VBA-4E2A-KE1-Z/E2



VAA-4E4A-KE1-Z/E2



VBA-4E4A-CB1-ZEJ/E2J



See pages 201-216 for complete AS-Interface accessory listing.



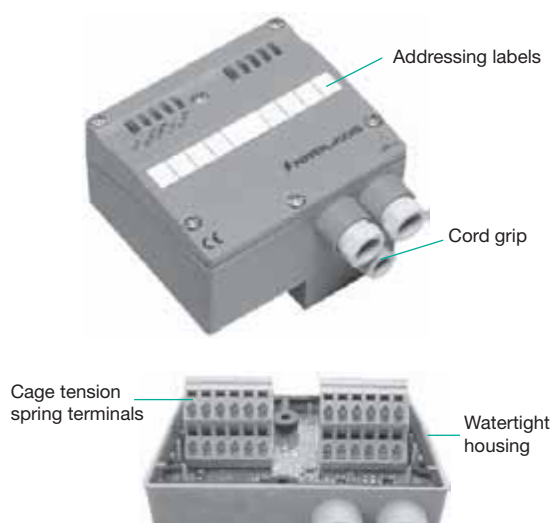


## Analog I/O Modules

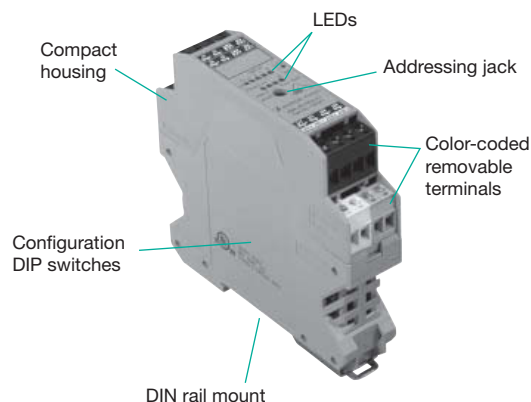
- Monitor 4-20 mA, 0-10 V analog signals via AS-Interface
- Transmit analog values as simply as binary signals
- Automatic scaling 4000-20000 or 0-10000
- Modules with extended addressing now available
- 12- and 14-bit resolution possible for fast response times

### Analog Module Overview

The transmission of analog values with AS-Interface is not completely revolutionary: it has been available for several years. However, the integration of analog values in real applications has not been as simple as that of binary values. With *Profile 7.3* and AS-Interface specifications greater than or equal to 2.1, it is possible to transmit analog values as simply as binary signals. The AS-Interface gateway/scanner puts the analog modules into operation in the same manner as the digital modules and starts data exchange automatically. The module transmits analog data, such as pressure and temperature, in interference-free digital signal form. The host system (PC, PLC, fieldbus, etc.) can read the 16-bit value directly out of the AS-Interface gateway/scanner.



Pepperl+Fuchs' AS-Interface analog modules have been developed for secure and direct connection of sensors and actuators according to the standardized Profile 7.3.



See pages 102-104 for Analog Module wiring and dimensions.

### Common Specifications

|                                     |                                                                                             |
|-------------------------------------|---------------------------------------------------------------------------------------------|
| OPERATING VOLTAGE AS-i              | 26.5-31.6 V                                                                                 |
| OPERATING VOLTAGE, V <sub>AUX</sub> | 21.4-27.6 VDC                                                                               |
| PROTECTION                          | IP65, IP20 for KE2 module                                                                   |
| HOUSING MATERIAL                    | PA6 GF30, PA66-FR for KE2 module                                                            |
| TEMPERATURE RANGE                   | Working* +32 °F to +158 °F (0 °C to +70 °C)<br>Storage -13 °F to +185 °F (-25 °C to +85 °C) |
| APPROVALS                           | CE, UL, AS                                                                                  |

\* VBA-2A-KE2-I/U working temp. is +32 °F to +131 °F (0 °C to +55 °C)



## Specifications

| INPUTS/OUTPUTS                 |                    | 2-in (analog I or V)                            | 4-in (analog RTD)                          | 2-out (analog I or V)                        |
|--------------------------------|--------------------|-------------------------------------------------|--------------------------------------------|----------------------------------------------|
| MODEL NUMBER(S)                |                    | VBA-2E-G4-I<br>VBA-2E-G4-U                      | VBA-4E-G4-PT100                            | VBA-2A-G4-I<br>VBA-2A-G4-U                   |
| BASES                          |                    | U-G1FFA, U-G1PP                                 | U-G1FFA, U-G1PP                            | U-G1FFA, U-G1PP                              |
| EXTENDED ADDRESSING (62 NODES) |                    | No                                              | No                                         | No                                           |
| REQUIRED MASTER SPEC.          |                    | M3, M4                                          | M3, M4                                     | M3, M4                                       |
| AS-i CYCLES PER ANALOG CHANNEL |                    | 7                                               | 7                                          | 7                                            |
| AS-i OPERATING CURRENT         |                    | 80-170 mA                                       | 50 mA                                      | 80-170 mA                                    |
| AUXILIARY CURRENT LIMIT        |                    | 500 mA                                          | —                                          | 500 mA                                       |
| INPUTS                         | -I, -PT100         | 2 analog in 4-20 mA                             | 4 RTDs -200 °C to +850 °C                  | —                                            |
|                                | -U                 | 2 analog in 0-10 V                              | —                                          | —                                            |
|                                | TYPE               | 2-, 3-, 4-wire                                  | 2-, 3-wire                                 | —                                            |
|                                | SUPPLY VOLTAGE     | 21-31 V from AS-i or from V <sub>AUX</sub>      | 21-31 V from AS-i or from V <sub>AUX</sub> | —                                            |
|                                | MAXIMUM CURRENT    | 90 mA from AS-i or use V <sub>AUX</sub>         | —                                          | —                                            |
|                                | INPUT RESISTANCE   | 4-20 mA is 50 Ω, 0-10 V is 100 kΩ               | —                                          | —                                            |
|                                | MAXIMUM INPUT LOAD | 40 mA, 50 V                                     | < 1.2 mA                                   | —                                            |
|                                | RESOLUTION         | 16 bit / 1 mV / 1 μA                            | 16 bit / 0.1 °C                            | —                                            |
|                                | SCALING            | 4-20 mA (4000 to 20000),<br>0-10 V (0 to 10000) | -200 °C to +850 °C (-2000 to 8500)         | —                                            |
|                                | OUTPUTS            | —                                               | —                                          | 2 analog out 0-20 mA                         |
| OUTPUTS                        | -I, -U             | —                                               | —                                          | 2 analog out 0-10 V                          |
|                                | TYPE               | —                                               | —                                          | 2-, 3-, 4-wire                               |
|                                | SUPPLY VOLTAGE     | —                                               | —                                          | 21-31 V from AS-i or from V <sub>AUX</sub>   |
|                                | MAXIMUM CURRENT    | —                                               | —                                          | 90 mA from AS-i or use V <sub>AUX</sub>      |
|                                | LOAD RESISTANCE    | —                                               | —                                          | max 600 Ω (0-20 mA),<br>min 3.3 kΩ (0-10V)   |
|                                | RESOLUTION         | —                                               | —                                          | 16 bit / 1 mV / 1 μA                         |
|                                | SCALING            | —                                               | —                                          | 0-20 mA (0 to 20000),<br>0-10 V (0 to 10000) |
| ANALOG DATA                    | W1                 | Analog Input 1                                  | Analog Input 1                             | Analog Output 1                              |
|                                | W2                 | Analog Input 2                                  | Analog Input 2                             | Analog Output 2                              |
|                                | W3                 | —                                               | Analog Input 3                             | —                                            |
|                                | W4                 | —                                               | Analog Input 4                             | —                                            |
| PARAMETER BITS                 | P0                 | Main power filter 50 Hz*, 60 Hz                 | Main power filter 50 Hz*, 60 Hz            | —                                            |
|                                | P1                 | 2nd channel connected yes*/no                   | Channels connected selector, default all   | 2nd channel connected yes*/no                |
|                                | P2                 | Peripheral fault bit reported yes*/no           |                                            | Peripheral fault bit reported yes*/no        |
|                                | P3                 | —                                               | 2-wire* or 3-wire mode                     | —                                            |
| PERIPHERAL FAULT BIT           |                    | < 1 mA, > 23 mA, > 11.5 V                       | Input disconnected, analog out of range    | > 23 mA, > 11.5 V                            |
| PROFILE                        |                    | S-7.3.F.D                                       | S-7.3.F.E                                  | S-7.3.F.5                                    |
| WEIGHT                         |                    | 350 g (12.4 oz)                                 | 350 g (12.4 oz)                            | 350 g (12.4 oz)                              |
| AS-INTERFACE CONNECTION        |                    | Flat yellow or round cable                      | Flat yellow or round cable                 | Flat yellow or round cable                   |
| AUXILIARY POWER CONNECTION     |                    | Flat black or round cable                       | —                                          | Flat black or round cable                    |
| I/O CONNECTION                 |                    | Cage tension spring terminals                   | Cage tension spring terminals              | Cage tension spring terminals                |

\* Default setting



## Specifications

| INPUTS/OUTPUTS                 |    | 2-in (analog I or V)                                  | 2-in (analog I or V)                                  | 2-out (analog I or V)                             |
|--------------------------------|----|-------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------|
| MODEL NUMBER(S)                |    | VBA-2E-KE2-I/U                                        | VBA-2E-KE2-I/U-V3.0                                   | VBA-2A-KE2-I/U                                    |
| EXTENDED ADDRESSING (62 NODES) |    | No                                                    | Yes                                                   | No                                                |
| REQUIRED MASTER SPEC.          |    | M3, M4                                                | M4                                                    | M3, M4                                            |
| AS-i CYCLES PER ANALOG CHANNEL |    | 7                                                     | 3 (12-bit) or 4 (14-bit)                              | 7                                                 |
| AS-i OPERATING CURRENT         |    | 80-170 mA                                             | 80-170 mA                                             | 80-170 mA                                         |
| AUXILIARY CURRENT LIMIT        |    | 500 mA                                                | 500 mA                                                | 500 mA                                            |
| INPUTS                         |    | -I/U, 2 analog in 4-20 mA or 0-10 V                   | 2 analog in 4-20 mA or 0-10 V                         | —                                                 |
| TYPE                           |    | 2-, 3-, 4-wire                                        | 2-, 3-, 4-wire                                        | —                                                 |
| SUPPLY VOLTAGE                 |    | 21-31 V from AS-i or from V <sub>AUX</sub>            | 21-31 V from AS-i or from V <sub>AUX</sub>            | —                                                 |
| MAXIMUM CURRENT                |    | 90 mA from AS-i or use V <sub>AUX</sub>               | 90 mA from AS-i or use V <sub>AUX</sub>               | —                                                 |
| INPUT RESISTANCE               |    | 4-20 mA is 50 Ω, 0-10 V is 100 kΩ                     | 4-20 mA is 50 Ω, 0-10 V is 100 kΩ                     | —                                                 |
| MAXIMUM INPUT LOAD             |    | 40 mA, 50 V                                           | 40 mA, 50 V                                           | —                                                 |
| RESOLUTION                     |    | 16 bit / 1 mV / 1 μA                                  | 12 bit or 14 bit / 1 mV / 1 μA                        | —                                                 |
| SCALING                        |    | 4-20 mA (4000 to 20000), 0-10 V (0 to 10000)          | 4-20 mA (4000 to 20000), 0-10 V (0 to 10000)          | —                                                 |
| OUTPUTS                        |    | —                                                     | —                                                     | 2 analog out 0-20 mA or 0-10 V                    |
| TYPE                           |    | —                                                     | —                                                     | 2-, 3-, 4-wire                                    |
| SUPPLY VOLTAGE                 |    | —                                                     | —                                                     | 21-31 V from AS-i or from V <sub>AUX</sub>        |
| MAXIMUM CURRENT                |    | —                                                     | —                                                     | 90 mA from AS-i or use V <sub>AUX</sub>           |
| LOAD RESISTANCE                |    | —                                                     | —                                                     | max 600 Ω (0-20 mA), min 3.3 kΩ (0-10V)           |
| RESOLUTION                     |    | —                                                     | —                                                     | 16 bit / 1 mV / 1 μA                              |
| SCALING                        |    | —                                                     | —                                                     | 0-20 mA (0 to 20000), 0-10 V (0 to 10000)         |
| ANALOG DATA                    | W1 | Analog Input 1                                        | Analog Input 1 (address A)                            | Analog Output 1                                   |
|                                | W2 | Analog Input 2                                        | Analog Input 2 (address A)                            | Analog Output 2                                   |
|                                | W3 | —                                                     | Analog Input 1 (address B)                            | —                                                 |
|                                | W4 | —                                                     | Analog Input 2 (address B)                            | —                                                 |
| PARAMETER BITS                 | P0 | Main power filter 50 Hz*, 60 Hz                       | Main power filter 50 Hz*, 60 Hz                       | Automatic output recognition* or set by parameter |
|                                | P1 | 2nd channel connected yes*/no                         | Both channels 4-20 mA or automatic input recognition* | Channel 1 current* or voltage                     |
|                                | P2 | Peripheral fault bit reported yes*/no                 | Peripheral fault bit reported yes*/no                 | Peripheral fault bit reported yes*/no             |
|                                | P3 | Both channels 4-20 mA or automatic input recognition* | —                                                     | Channel 2 current* or voltage                     |
| PERIPHERAL FAULT BIT           |    | < 1 mA (only in automatic mode), > 23 mA, > 11.5 V    | < 1 mA (only in automatic mode), > 23 mA, > 11.5 V    | > 23 mA, > 11.5 V                                 |
| PROFILE S-IO.ID1.ID2           |    | S-7.3.F.D                                             | S-7.A.7.9†                                            | S-7.3.F.5                                         |
| WEIGHT                         |    | 150 g (5.3 oz)                                        | 150 g (5.3 oz)                                        | 150 g (5.3 oz)                                    |
| AS-INTERFACE CONNECTION        |    | Yellow removable terminals                            | Yellow removable terminals                            | Yellow removable terminals                        |
| AUXILIARY POWER CONNECTION     |    | Gray removable terminals                              | Gray removable terminals                              | Gray removable terminals                          |
| I/O CONNECTION                 |    | Black removable terminals                             | Black removable terminals                             | Black removable terminals                         |

\* Default setting

† See ID1 configuration table on page 103

16 bits, 14 bits, or 12 bits of analog data are sent to or from the I/O modules. When only 14 bits or 12 bits of analog data are used, the least significant 2 bits or 4 bits are set to 0 respectively.

| Analog data bits sent based on the resolution of the module |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |
|-------------------------------------------------------------|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
|                                                             | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 16-bit (profile 7.3.x.x)                                    | x  | x  | x  | x  | x  | x  | x | x | x | x | x | x | x | x | x | x |
| 14-bit (profile 7.A.x.x)                                    | x  | x  | x  | x  | x  | x  | x | x | x | x | x | x | x | x | 0 | 0 |
| 12-bit (profile 7.A.x.x)                                    | x  | x  | x  | x  | x  | x  | x | x | x | x | x | x | 0 | 0 | 0 | 0 |

Gateways and Scanners

Power Supplies and Repeaters

I/O Modules

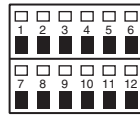
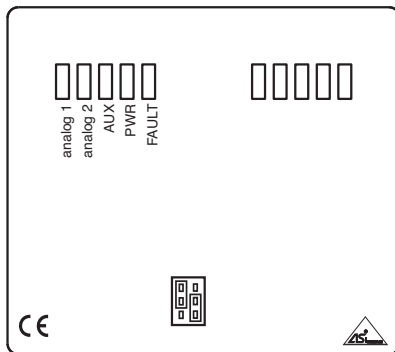
Safety at Work

Sensors

Cordsets

Accessories

## Wiring Diagrams



Plug-in jumper:

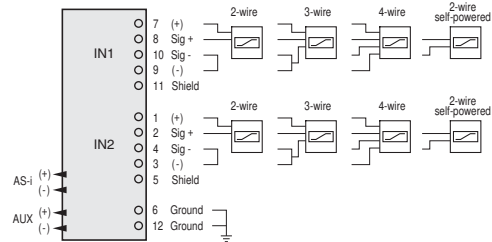


Power supply of inputs from the external auxiliary power



Power supply of inputs from the module (AS-Interface)

VBA-2E-G4-I  
VBA-2E-G4-U



## LED Indicators (VBA-2E-G4-I)

**Analog:** Green:  $1 \text{ mA} \leq I \leq 3 \text{ mA}$   
Green (flashing):  $> 23 \text{ mA}$   
OFF:  $< 1 \text{ mA}$  or disconnected

**PWR:** Green: AS-Interface powered

**FAULT:** Red (solid): Address 0 or no communication  
Red (flashing): Analog current out of range

**AUX:** Green: Power available to analog devices

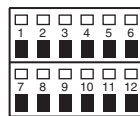
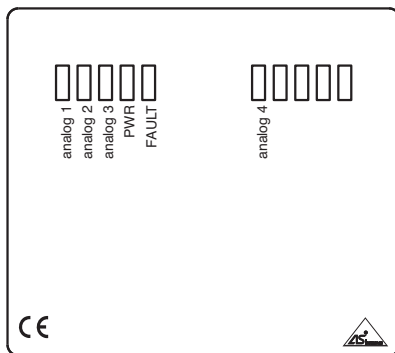
## LED Indicators (VBA-2E-G4-U)

**Analog:** Green:  $0 \text{ V} \leq V \leq 11.5 \text{ V}$   
Green (flashing):  $V > 11.5 \text{ V}$

**PWR:** Green: AS-Interface powered

**FAULT:** Red (solid): Address 0 or no communication  
Red (flashing): Analog voltage out of range

**AUX:** Green: Power available to analog devices



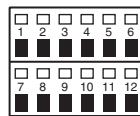
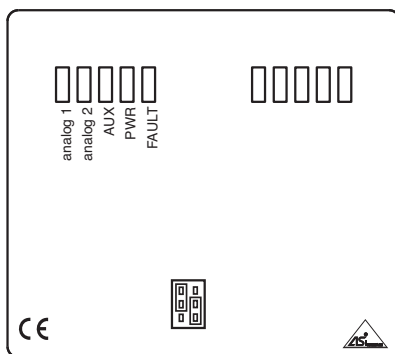
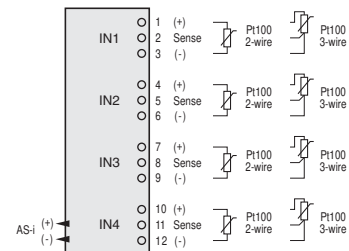
## LED Indicators

**Analog:** Green:  $-200 \text{ }^{\circ}\text{C}$  to  $+850 \text{ }^{\circ}\text{C}$   
Green (flashing): Out of range

**PWR:** Green: AS-Interface powered

**FAULT:** Red (solid): Address 0 or no communication  
Red (flashing): Temperature out of range

VBA-4E-G4-PT100



Plug-in jumper:

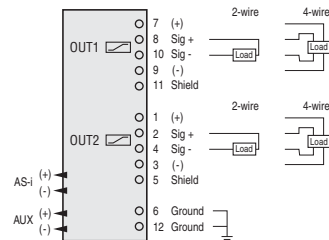


Power supply of outputs from the external auxiliary power

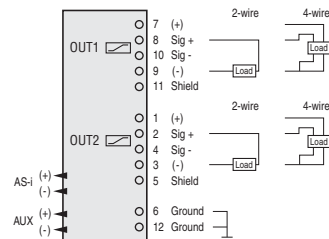


Power supply of outputs from the module (AS-Interface)

VBA-2A-G4-I



VBA-2A-G4-U



## LED Indicators (VBA-2A-G4-I)

**Analog:** Green:  $0 \text{ mA} \leq I \leq 23 \text{ mA}$   
Green (flashing):  $> 11.5 \text{ V}$   
OFF: Disconnected

**PWR:** Green: AS-Interface powered

**FAULT:** Red (solid): Address 0 or no communication  
Red (flashing): Analog current out of range

**AUX:** Green: Power available to analog devices

## LED Indicators (VBA-2A-G4-U)

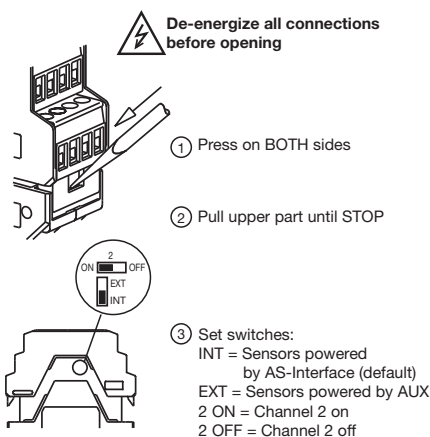
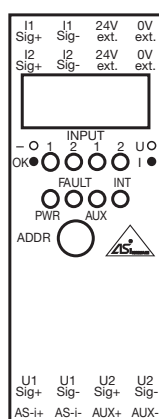
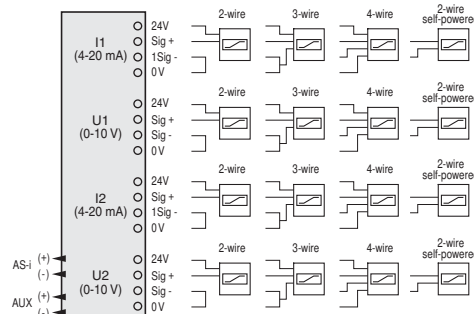
**Analog:** Green:  $0 \text{ V} \leq V \leq 11.5 \text{ V}$   
Green (flashing):  $V > 11.5 \text{ V}$

**PWR:** Green: AS-Interface powered

**FAULT:** Red (solid): Address 0 or no communication  
Red (flashing): Analog voltage out of range

**AUX:** Green: Power available to analog devices

## Wiring Diagrams

VBA-2E-KE2-I/U  
VBA-2E-KE2-I/U-V3.0

## LED Indicators

**Analog OK:** Green:  $0\text{ V} \leq V \leq 11.5\text{ V}$  or  $1\text{ mA} \leq I \leq 23\text{ mA}$   
Green (flashing): Out of range  
Off: Not connected

**Analog UI:** Green: Analog current mode  
Off: Analog voltage mode

**PWR:** Green: AS-Interface powered

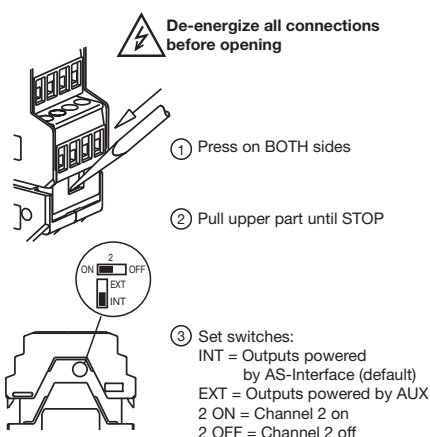
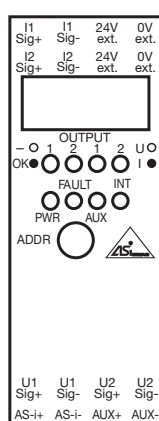
**FAULT:** Red (solid): Address 0 or no communication  
Red (flashing): Analog current out of range

**AUX:** Green: Power available to analog devices

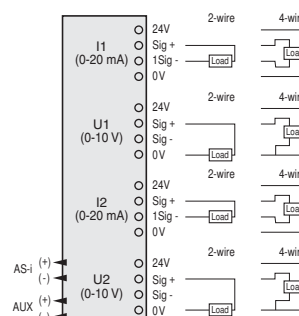
**INT:** Yellow: Inputs powered by AS-Interface  
Off: Inputs powered by auxiliary

## Special ID1 Settings for VBA-2E-KE2-I/U-V3.0

|               | 14-bit        | 12-bit    |
|---------------|---------------|-----------|
| Input 1 only  | ID1 = (0,2,3) | ID1 = (1) |
| Input 1 and 2 | ID1 = (4,5,7) | ID1 = (6) |



VBA-2A-KE2-I/U



## LED Indicators

**Analog OK:** Green:  $0\text{ V} \leq V \leq 11.5\text{ V}$  or  $1\text{ mA} \leq I \leq 23\text{ mA}$   
Green (flashing): Out of range  
Off: Not connected

**Analog UI:** Green: Analog current mode  
Off: Analog voltage mode

**PWR:** Green: AS-Interface powered

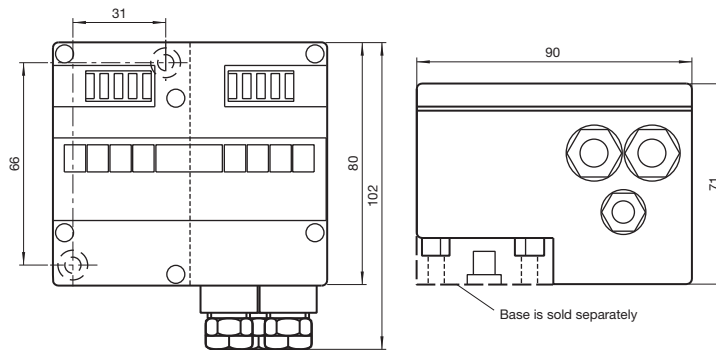
**FAULT:** Red (solid): Address 0 or no communication  
Red (flashing): Analog current out of range

**AUX:** Green: Power available to analog devices

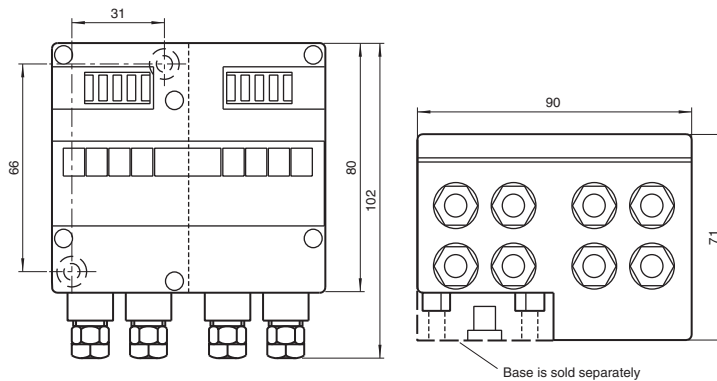
**INT:** Yellow: Inputs powered by AS-Interface  
Off: Inputs powered by auxiliary

## Dimensions (mm)

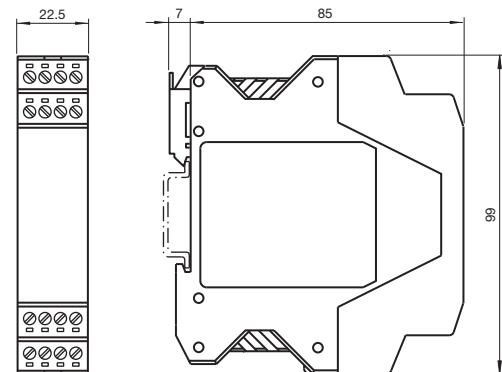
VBA-2A-G4-I  
VBA-2A-G4-U  
VBA-2E-G4-I  
VBA-2E-G4-U



VBA-4E-G4-PT100



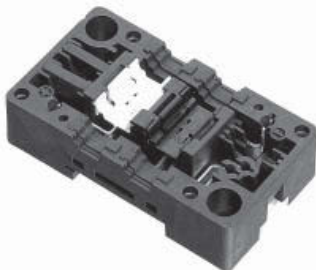
VBA-2E-KE2-I/U  
VBA-2E-KE2-I/U-V3.0  
VBA-2A-KE2-I/U



## Accessories

## U-G1FFA

Flat cable mounting base for black and yellow cables with addressing jack



## U-G1PP

Round cable base with external power terminals



## PG11 CORD GRIP

PG11 cord grip, includes nut and round cable grommet



## PG11-1/2NPT

PG11 male to 1/2" NPT female conduit adapter



See pages 201-216 for complete AS-Interface accessory listing.





## Pushbuttons and Stack Lights I/O Modules

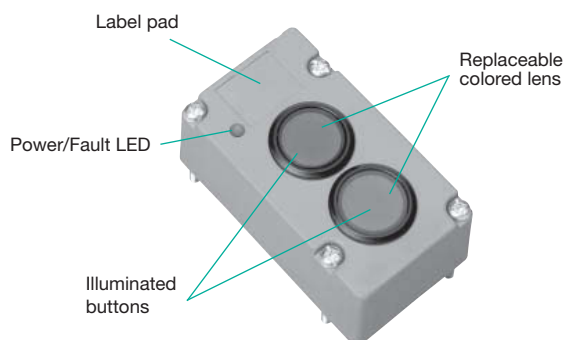
- User configurable housing for pushbutton, selector switches, and LEDs
- Up to 62 LT2 pushbutton stations on one network
- Red, yellow, blue, green, and clear stack light options
- 85 and 105 dBA audible alarms

### Pushbutton and Stack Lights Overview

Illuminated pushbutton modules attach easily to AS-Interface without diminishing the simplicity of the system, providing a link between the maintenance personnel and AS-Interface. Pepperl+Fuchs offers I/O pushbutton modules for AS-Interface in two styles:

The VBA-LT2-G1 module features two LEDs that are integrated in the buttons. The LEDs are white with green and red lens covers.

The module has an IP67 protection class and is especially suitable for use in the field. Use the U-G1FFA base to connect to the AS-Interface flat cable, or use the U-G1PP base to connect to the round cable. The VBA-LT2-G1 is fully powered from AS-Interface. The AS-Interface standardized base U-G1FFA includes an integrated addressing jack that allows easy connection to the hand-held addressing device.



The VAA-LT3-F86-V1 module is a user configurable pushbutton station for AS-Interface. The internal AS-Interface I/O module is ideally suited for integrating customer-specific electronics. Six 22.5 mm diameter holes can be used for any combination of pushbuttons, rotary selectors, key switches, and LED clusters that are typically used at operator call stations.

The inputs and outputs are protected against short circuits and overload. The connection to the AS-Interface is implemented by means of a micro (M12 x 1) quick disconnect.

Output overloads are relayed to the AS-Interface gateway/scanner via the "peripheral fault" function. Communication via the AS-Interface remains intact. The pushbutton module can be expanded to a total of 8 inputs/8 outputs by means of an additional printed circuit board module VAA-4E4A-CB1-Z/E2.



The stack light is a fully configurable system utilizing a 4-output AS-i node and up to four light/audible alarm modules. Lights can be used in any combination (including the same color multiple times) while each stack light can have only one audible alarm, which must be the last module. Power to the lights/alarm is switch selectable (internal from AS-Interface or external from AUX power). Status LEDs on the base output node provide detailed diagnostics information. The node is addressed using a standard cinch connector.



Gateways and Scanners

Power Supplies and Repeaters

I/O Modules

Safety at Work

Sensors

Cordsets

Accessories



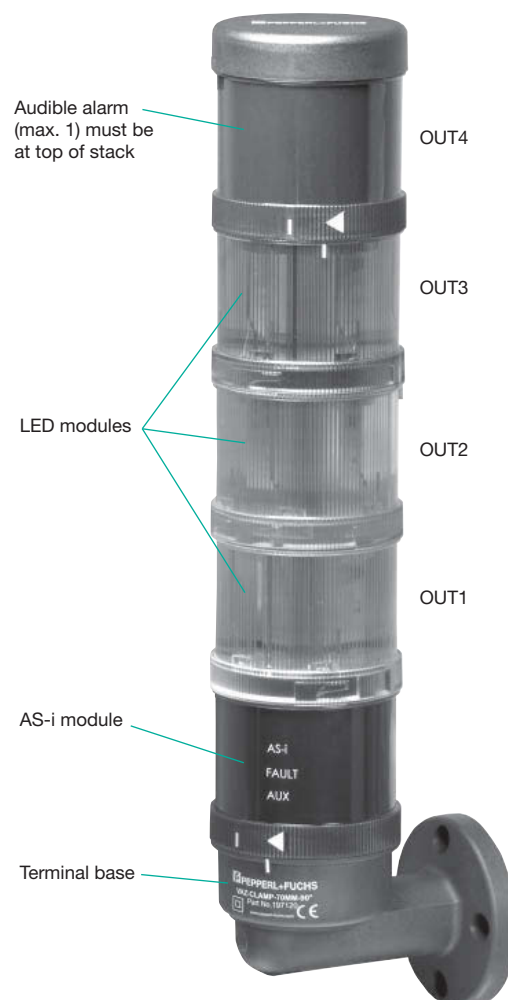
## Specifications

| INPUTS/OUTPUTS                 |         | 2-in (pushbuttons)/2-out (LEDs)                                                                                                                                         | 6 knockouts for 4-in/4-out                                                                                                                                                 |
|--------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MODEL NUMBER(S)                |         | VBA-LT2-G1                                                                                                                                                              | VAA-LT3-F86-V1                                                                                                                                                             |
| BASES                          |         | U-G1FFA, U-G1PP                                                                                                                                                         | —                                                                                                                                                                          |
| EXTENDED ADDRESSING (62 NODES) |         | Yes                                                                                                                                                                     | No                                                                                                                                                                         |
| REQUIRED MASTER SPEC.          |         | M3, M4                                                                                                                                                                  | —                                                                                                                                                                          |
| OPERATING VOLTAGE AS-i         |         | 26.5-31.6 V                                                                                                                                                             | 26.5-31.6 V                                                                                                                                                                |
| OPERATING VOLTAGE $V_{AUX}$    |         | —                                                                                                                                                                       | —                                                                                                                                                                          |
| AS-i OPERATING CURRENT         |         | ≤ 50 mA                                                                                                                                                                 | 30-180 mA                                                                                                                                                                  |
| INPUTS                         |         | PNP, AS-i powered                                                                                                                                                       | PNP, AS-i powered                                                                                                                                                          |
| TYPE                           |         | Pushbuttons                                                                                                                                                             | 2-, 3-wire                                                                                                                                                                 |
| SUPPLY VOLTAGE                 |         | 21-31 V from AS-i                                                                                                                                                       | 21-31 V from AS-i                                                                                                                                                          |
| MAXIMUM CURRENT                |         | —                                                                                                                                                                       | Limited by operating current of module                                                                                                                                     |
| SWITCH POINT                   |         | —                                                                                                                                                                       | OFF ≤ 1.5 mA, ON ≥ 4 mA                                                                                                                                                    |
| LOAD CURRENT                   |         | —                                                                                                                                                                       | ≤ 8 mA                                                                                                                                                                     |
| OUTPUTS                        |         | PNP, AS-i powered                                                                                                                                                       | PNP, AS-i powered                                                                                                                                                          |
| SUPPLY VOLTAGE                 |         | 21-31 V from AS-i                                                                                                                                                       | 21-31 V from AS-i                                                                                                                                                          |
| CURRENT PER OUTPUT             |         | —                                                                                                                                                                       | 100 mA                                                                                                                                                                     |
| CURRENT PER MODULE             |         | —                                                                                                                                                                       | 140 mA                                                                                                                                                                     |
| DATA BITS                      | D0      | LED 2 red                                                                                                                                                               | IN1/OUT1                                                                                                                                                                   |
|                                | D1      | LED 1 green                                                                                                                                                             | IN2/OUT2                                                                                                                                                                   |
|                                | D2      | Button 2 red                                                                                                                                                            | IN3/OUT3                                                                                                                                                                   |
|                                | D3      | Button 1 green                                                                                                                                                          | IN4/OUT4                                                                                                                                                                   |
| PARAMETER BITS                 | P0      | —                                                                                                                                                                       | —                                                                                                                                                                          |
|                                | P1      | —                                                                                                                                                                       | —                                                                                                                                                                          |
|                                | P2      | —                                                                                                                                                                       | —                                                                                                                                                                          |
| PERIPHERAL FAULT BIT           |         | —                                                                                                                                                                       | —                                                                                                                                                                          |
| PROFILE S-IO.ID.ID1.ID2        |         | S-B.A.F.E                                                                                                                                                               | S-7.0.F.E                                                                                                                                                                  |
| PROTECTION (IEC)               |         | IP67                                                                                                                                                                    | IP65 (when knockouts are covered)                                                                                                                                          |
| TEMPERATURE RANGE              | Working | 32 °F to +158 °F (-25 °C to +60 °C)                                                                                                                                     | 32 °F to +104 °F (-25 °C to +40 °C)                                                                                                                                        |
|                                | Storage | -40 °F to +185 °F (-40 °C to +85 °C)                                                                                                                                    | -40 °F to +185 °F (-40 °C to +85 °C)                                                                                                                                       |
| HOUSING MATERIAL               |         | —                                                                                                                                                                       | Polycarbonate                                                                                                                                                              |
| WEIGHT                         |         | 110 g (3.9 oz)                                                                                                                                                          | 80 g (5.3 oz)                                                                                                                                                              |
| APPROVALS                      |         |   |   |
| AS-INTERFACE CONNECTION        |         |  Flat yellow or round cable                                                          |  M12 quick disconnect                                                                  |
| AUXILIARY POWER CONNECTION     |         | —                                                                                                                                                                       | —                                                                                                                                                                          |
| I/O CONNECTION                 |         | —                                                                                                                                                                       |  Terminals                                                                             |

## Specifications

| INPUTS/OUTPUTS                                                              |                         | 4-out                                                                                                                       |
|-----------------------------------------------------------------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>MODEL NUMBER(S)</b>                                                      |                         |                                                                                                                             |
| <i>AS-i Module (optional)</i>                                               |                         | VAA-4A-70MM                                                                                                                 |
| <b>LEDs and Audible Alarm</b><br>(choose up to 4 with AS-i, 5 without AS-i) | Red                     | VAZ-LED-70MM-RD                                                                                                             |
|                                                                             | Red (flashing)          | VAZ-FLASH-70MM-RD                                                                                                           |
|                                                                             | Yellow                  | VAZ-LED-70MM-YE                                                                                                             |
|                                                                             | Yellow (flashing)       | VAZ-FLASH-70MM-YE                                                                                                           |
|                                                                             | Green                   | VAZ-LED-70MM-GN                                                                                                             |
|                                                                             | Blue                    | VAZ-LED-70MM-BU                                                                                                             |
|                                                                             | Clear                   | VAZ-LED-70MM-CL                                                                                                             |
|                                                                             | Alarm (85 dBA)          | VAZ-HORN-70MM-85DBA                                                                                                         |
|                                                                             | Alarm (105 dBA)         | VAZ-HORN-70MM-105DBA                                                                                                        |
| <b>Terminal base, mount and cover</b><br>(choose 1 set)                     | Tube mount (order both) | VAZ-CLAMP-70MM<br>VAZ-MH 100-70MM                                                                                           |
|                                                                             | 90° mount (order both)  | VAZ-CLAMP-70MM-90°<br>VAZ-MH 90°-70MM                                                                                       |
|                                                                             |                         |                                                                                                                             |
| <b>EXTENDED ADDRESSING (62 NODES)</b>                                       |                         | No                                                                                                                          |
| <b>REQUIRED MASTER SPEC.</b>                                                |                         | —                                                                                                                           |
| <b>OPERATING VOLTAGE AS-i</b>                                               |                         | 26.5-31.6 V                                                                                                                 |
| <b>OPERATING VOLTAGE V<sub>AUX</sub></b>                                    |                         | 21.4-27.6 VDC                                                                                                               |
| <b>AS-i OPERATING CURRENT</b>                                               |                         | 21-210 mA                                                                                                                   |
| <b>AUXILIARY CURRENT LIMIT</b>                                              |                         | ≤ 300 mA                                                                                                                    |
| <b>OUTPUTS</b>                                                              |                         |                                                                                                                             |
| <b>SUPPLY VOLTAGE</b>                                                       |                         | From AS-i or AUX switchable                                                                                                 |
| <b>CURRENT PER OUTPUT</b>                                                   |                         | 25 mA - green, blue, clear, 85 dBA alarm<br>30 mA - red, yellow<br>35 mA - red, yellow (flashing)<br>150 mA - 105 dBA alarm |
| <b>DATA BITS</b>                                                            | D0                      | OUT1                                                                                                                        |
|                                                                             | D1                      | OUT2                                                                                                                        |
|                                                                             | D2                      | OUT3                                                                                                                        |
|                                                                             | D3                      | OUT4                                                                                                                        |
| <b>PARAMETER BITS</b>                                                       | P0                      | Watchdog on*/off                                                                                                            |
|                                                                             | P1                      | —                                                                                                                           |
|                                                                             | P2                      | —                                                                                                                           |
| <b>PERIPHERAL FAULT BIT</b>                                                 |                         | —                                                                                                                           |
| <b>PROFILE</b>                                                              | S-IQ.ID1.ID2            | S-8.F.F.F                                                                                                                   |
| <b>PROTECTION (IEC)</b>                                                     |                         | IP65, IP40 (using 105 dBA alarm)                                                                                            |
| <b>TEMPERATURE RANGE</b>                                                    | Working                 | -4 °F to +122 °F (-20 °C to +50 °C)                                                                                         |
|                                                                             | Storage                 | -4 °F to +122 °F (-20 °C to +50 °C)                                                                                         |
| <b>HOUSING MATERIAL</b>                                                     |                         | Polycarbonate                                                                                                               |
| <b>APPROVALS</b>                                                            |                         | CE cULus AS                                                                                                                 |
| <b>AS-INTERFACE CONNECTION</b>                                              |                         | Terminals                                                                                                                   |
| <b>AUXILIARY POWER CONNECTION</b>                                           |                         | Terminals (optional)                                                                                                        |

\* Default setting



Gateways and Scanners

Power Supplies and Repeaters

I/O Modules

Safety at Work

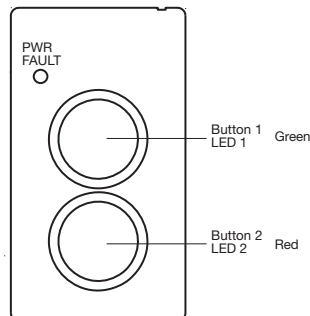
Sensors

Cordsets

Accessories

## Wiring Diagrams

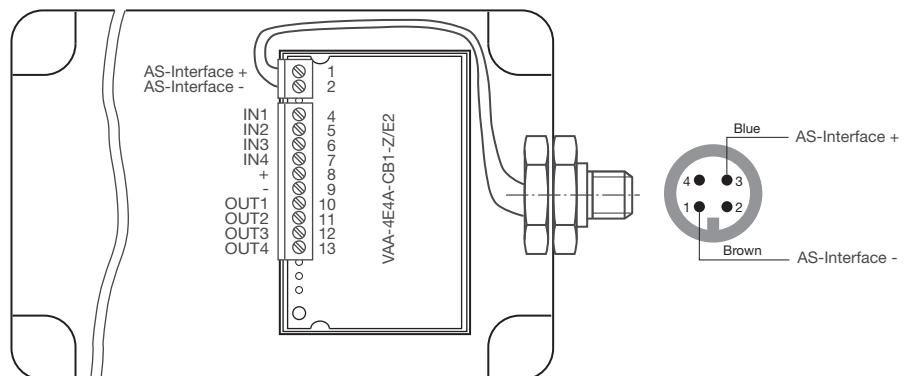
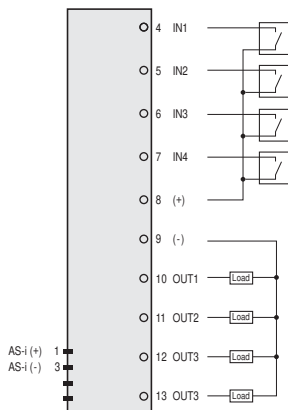
VBA-LT2-G1



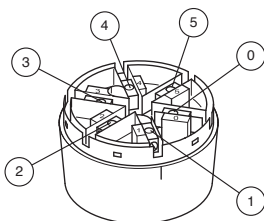
## LED Indicators

**PWR/FAULT:** Green: AS-Interface powered  
Red (solid): Address 0 or no communication

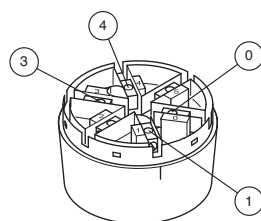
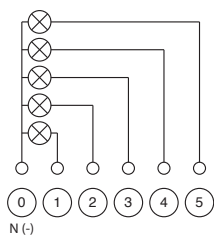
VAA-LT3-F86-V1



Stack lights

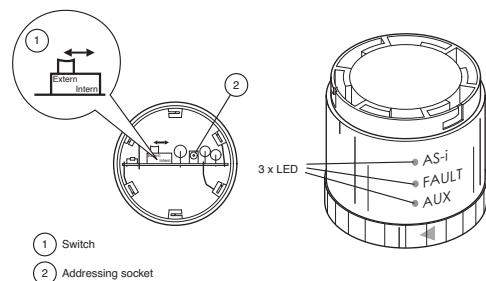


Without AS-Interface Module



With AS-Interface Module

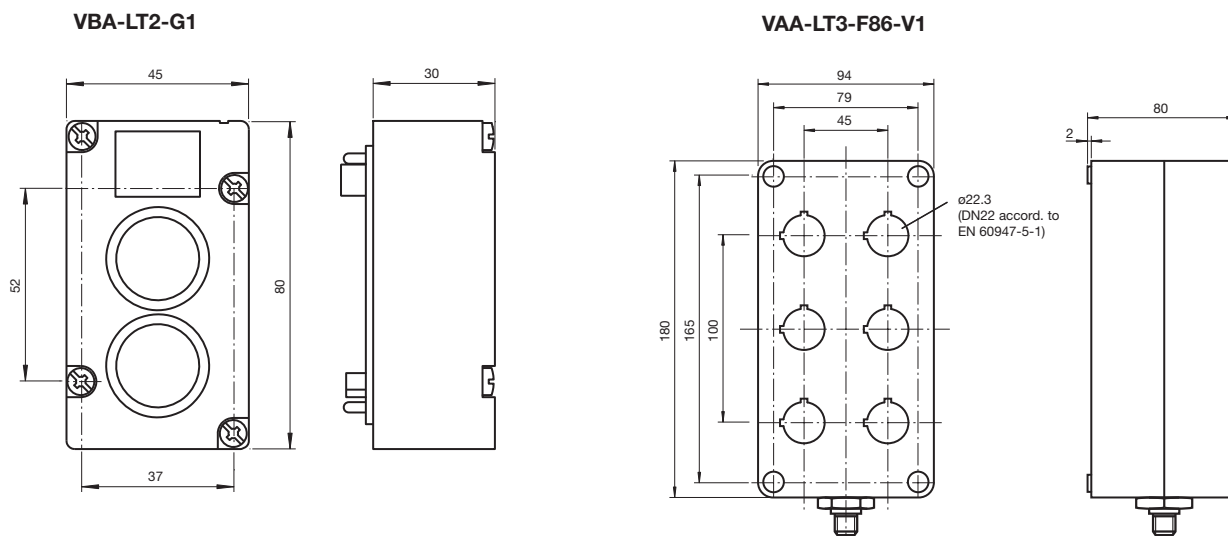
- 0 - AS-Interface  
1 + AS-Interface  
optional supply from  $V_{AUX}$   
3 -  $V_{AUX}$   
4 +  $V_{AUX}$



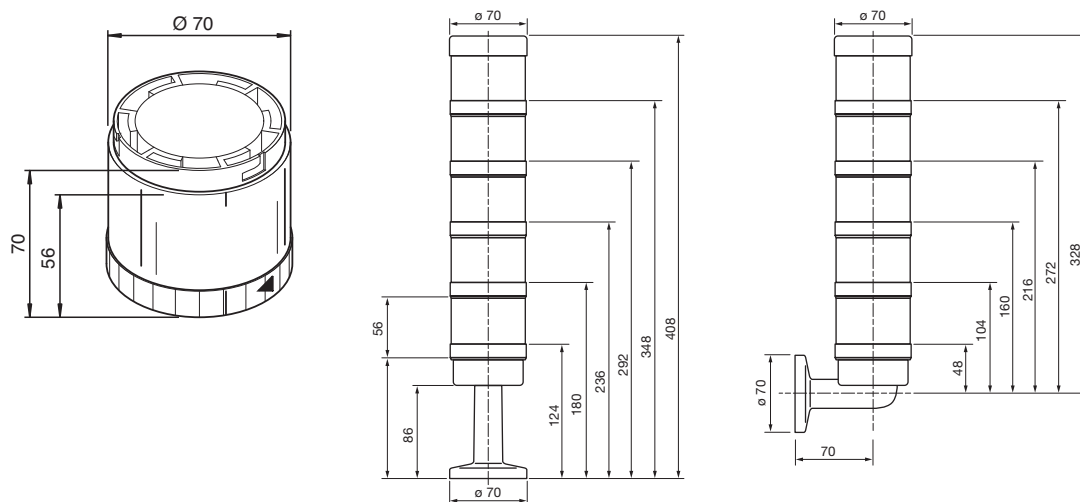
## LED Indicators

**AS-i:** Green: AS-Interface powered  
**FAULT:** Red (solid): Address 0 or no communication  
**AUX:** Green: Auxiliary powered

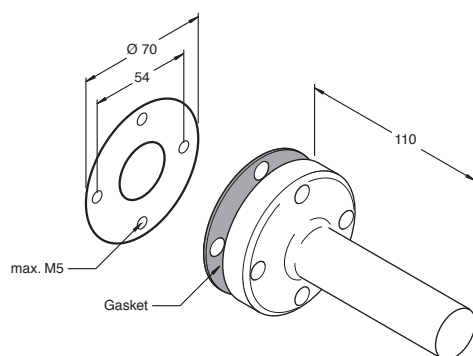
## Dimensions (mm)



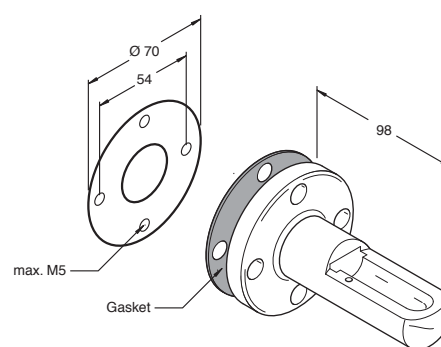
## Stack lights



## VAZ-MH 100-70MM



## VAZ-MH 90°-70MM



Gateways and Scanners

Power Supplies and Repeater

I/O Modules

Safety at Work

Sensors

Cordsets

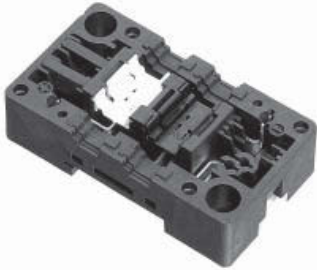
Accessories

## Accessories

## Pushbutton Module Accessories

**U-G1FFA**

Flat cable mounting base for black and yellow cables with addressing jack

**U-G1PP**

Round cable base with external power terminals

**PG11 CORD GRIP**

PG11 cord grip, includes nut and round cable grommet

**PG11-1/2NPT**

PG11 male to 1/2" NPT female conduit adapter



## Stack Light Accessories

**VAZ-MH-1/2"Conduit-70MM**

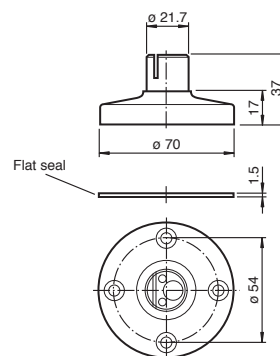
Connects tube mount base VAZ-CLAMP-70MM to 1/2" NPT conduit.

**VAZ-TUBE400-70MM**

A 400 mm long tube. Connects to tube mount base VAZ-CLAMP-70MM.

**VAZ-TUBE-BASE-70MM**

Mounting base for VAZ-TUBE400-70MM



See pages 201-216 for complete AS-Interface accessory listing.





## Pneumatic I/O Modules

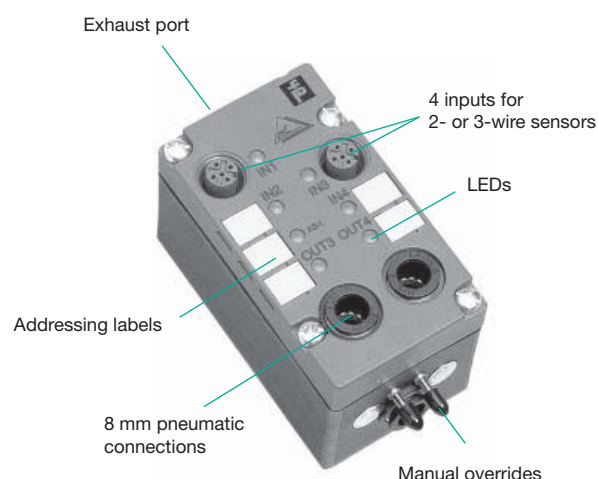
- 4 standard inputs and 2 pneumatic outputs
- Connects directly to pneumatic cylinders
- AS-Interface or externally powered outputs
- Flat or round cable AS-Interface connection
- Filter allows easy, direct exhaust to open air

### Pneumatic Module Overview

Pepperl+Fuchs offers pneumatic modules that broaden the concept of integrated system components. Two single cylinders or one double-acting cylinder, for example, can be connected to a module of this series. You can wire up the input sockets directly with sensors (PNP, via M12 plugs) in 2- or 3-wire connection. The outputs (two 3/2-way valves) and the compressed air supply are connected to the module via an 8 mm plug-in tube connector.

Filtered (5 µm), oiled or unoled compressed air (2 to 8 bar) must be used for correct operation.

**See page 113 for Pneumatic Module wiring and dimensions.**



### Common Specifications

|                                     |         |                                     |
|-------------------------------------|---------|-------------------------------------|
| OPERATING VOLTAGE AS-i              |         | 26.5-31.6 V                         |
| OPERATING VOLTAGE, V <sub>AUX</sub> |         | 21.4-27.6 VDC                       |
| PROTECTION                          |         | IP65                                |
| HOUSING MATERIAL                    |         | PBT                                 |
| TEMPERATURE RANGE                   | Working | 32 °F to +131 °F (0 °C to +55 °C)   |
|                                     | Storage | -4 °F to +185 °F (-20 °C to +85 °C) |
| APPROVALS                           |         | CE                                  |



## Specifications

| INPUTS/OUTPUTS                 |    | 4-in/ 2-out (pneumatic AS-i powered)         | 4-in/2-out (pneumatic AUX powered) |
|--------------------------------|----|----------------------------------------------|------------------------------------|
| MODEL NUMBER(S)*               |    | VBA-4E2A-G1-ZE/P-S                           | VBA-4E2A-G1-ZE/PEXT-S              |
| BASES                          |    | U-G1FFA, U-G1PP                              |                                    |
| EXTENDED ADDRESSING (62 NODES) |    | Yes                                          |                                    |
| REQUIRED MASTER SPEC.          |    | M3, M4                                       |                                    |
| AS-i OPERATING CURRENT         |    | 45-195 mA                                    | 45-145 mA                          |
| AUXILIARY CURRENT LIMIT        |    | –                                            | ≤ 50 mA                            |
| INPUTS                         |    | PNP, AS-i powered                            |                                    |
| TYPE                           |    | –                                            |                                    |
| SUPPLY VOLTAGE                 |    | 2-, 3-, 4-wire                               |                                    |
| MAXIMUM CURRENT                |    | 21-31 V from AS-Interface                    |                                    |
| SWITCH POINT                   |    | 100 mA                                       |                                    |
| LOAD CURRENT                   |    | OFF ≤ 1.5 mA, ON ≥ 5 mA                      |                                    |
| OUTPUTS                        |    | ≤ 8 mA                                       |                                    |
| P-S, PEXT-S                    |    | Pneumatic, AS-i powered                      | Pneumatic, AUX powered             |
| SUPPLY VOLTAGE                 |    | From AS-Interface                            | From auxiliary                     |
| AIR VENTING                    |    | Sinter filter                                |                                    |
| COMPRESSED AIR                 |    | 2-8 bar, filtered (5 µm), oiled or unoled    |                                    |
| AIR THROUGHPUT                 |    | 550 NI/min at 6/0 bar, 350 NI/min at 6/5 bar |                                    |
| CONNECTION                     |    | 8 mm                                         |                                    |
| DATA BITS                      | D0 | IN1/OUT1                                     |                                    |
|                                | D1 | IN2/OUT2                                     |                                    |
|                                | D2 | IN3                                          |                                    |
|                                | D3 | IN4                                          |                                    |
| PARAMETER BITS                 | P0 | –                                            |                                    |
|                                | P1 | –                                            |                                    |
|                                | P2 | –                                            |                                    |
| PERIPHERAL FAULT BIT           |    | Input overload                               |                                    |
| PROFILE                        |    | S-7.A.7.E                                    |                                    |
| S-IO.ID.ID1.ID2                |    | 230 g (8 oz)                                 |                                    |
| WEIGHT                         |    | Flat yellow or round cable                   |                                    |
| AS-INTERFACE CONNECTION        |    | Flat black or round cable                    |                                    |
| AUXILIARY POWER CONNECTION     |    | –                                            |                                    |
| I/O CONNECTION                 |    | M12 quick disconnect and 8 mm pneumatic      |                                    |

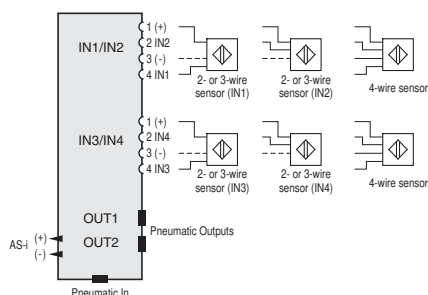
## \*Also Available

| INPUTS/OUT-PUTS | Model Number          | Base            | Required Master Spec. | Profile S-IO.ID.ID1.ID2 | Extended Addressing | Special Features                   |
|-----------------|-----------------------|-----------------|-----------------------|-------------------------|---------------------|------------------------------------|
| 4-in/2-out      | VAA-4E2A-G1-ZE/P-S    | U-G1FFA, U-G1PP | –                     | S-7.F.F.F               | No                  |                                    |
| 4-in/2-out      | VAA-4E2A-G1-ZE/PEXT-S | U-G1FFA, U-G1PP | –                     | S-7.F.F.F               | No                  | Auxiliary powered outputs          |
| 2-in/2-out      | VAA-2EA-G1-ZE/P-S     | U-G1FFA, U-G1PP | –                     | S-3.F.F.F               | No                  |                                    |
| 2-in/2-out      | VAA-2EA-G1-ZE/P-V2A   | U-G1FFA, U-G1PP | –                     | S-3.F.F.F               | No                  | 8 mm exhaust port, stainless steel |

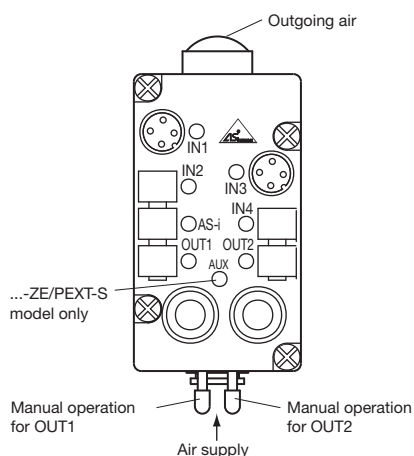
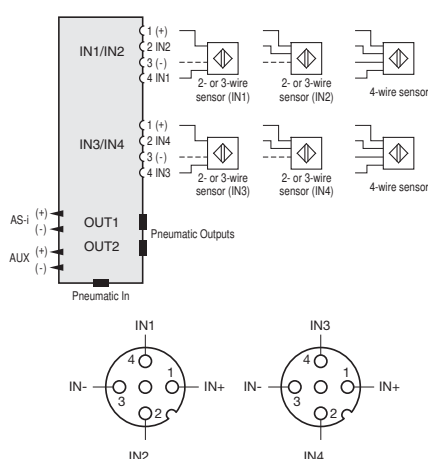
## Wiring Diagrams

**Note:** Wiring Diagrams show terminal numbers.

### VBA-4E2A-G1-ZE/P-S



### VBA-4E2A-G1-ZE/PEXT-S



#### LED Indicators

**IN:** Yellow: Input on

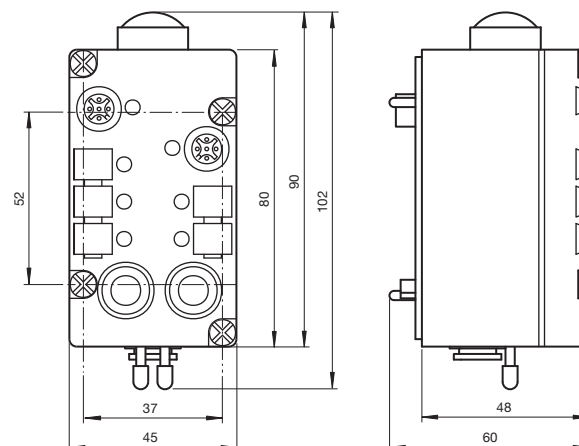
**OUT:** Yellow: Output on

**Power:** Green: AS-Interface powered

**AUX:** Green: Auxiliary powered  
(VBA-4E2A-G1-ZE/PEXT-S only)

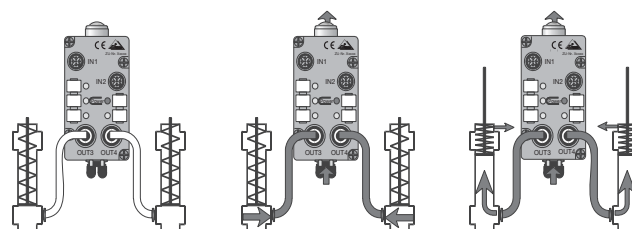
## Dimensions (mm)

### VBA-4E2A-G1-ZE/P-S VBA-4E2A-G1-ZE/PEXT-S

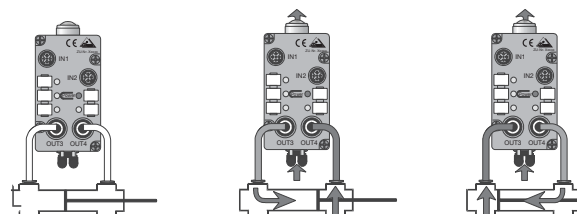


## Example for AS-Interface Airbox Functions

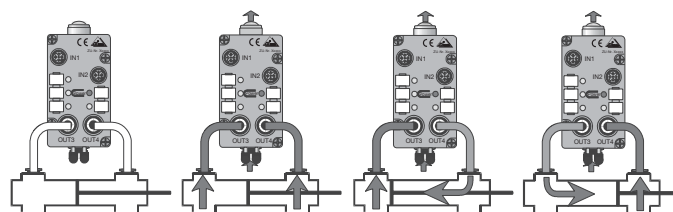
3/2-way valve



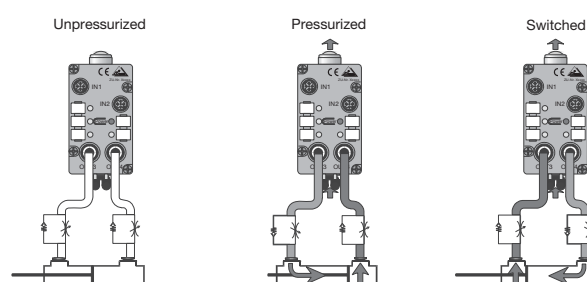
4/2-way valve



5/2-way valve



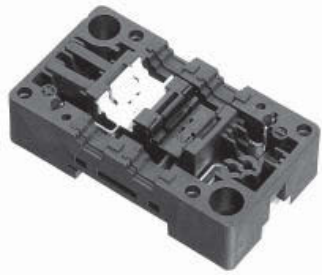
5/2-way valve



## Accessories

**U-G1FFA**

*Flat cable mounting base for black and yellow cables with addressing jack*

**U-G1PP**

*Round cable base with external power terminals*

**PG11 CORD GRIP**

*PG11 cord grip, includes nut and round cable grommet*

**PG11-1/2NPT**

*PG11 male to 1/2" NPT female conduit adapter*



**See pages 201-216 for complete AS-Interface accessory listing.**



## Drive Control I/O Module

- 1-in/3-out in small cylindrical housing
- Included adapter to fit MOVIMOT® by SEW Eurodrive
- I/O Auxiliary powered

### Drive Control Overview

Networks like AS-Interface are often used in decentralized control systems where a single AS-Interface module controls the functionality of a motor on a conveyor section.

Our AS-Interface module was specifically designed to control MOVIMOT® by SEW Eurodrive. MOVIMOT is a motor with a built-in digital frequency inverter. Because the drive is built into the motor, the AS-Interface module needs only to control the variable operation of the drive, including direction and speed. Our AS-Interface module for drive control can also be used for any application requiring 1 input and 3 outputs.

The 3 outputs on the module are often used to control motor Start/Stop, Forward/Reverse, and Fast/Slow. The input can be used to detect pallet presence on a power and free conveyor system, or any other common PNP/dry contact input.

### Other options

Pepperl+Fuchs also offers other I/O modules particularly useful for drives. The flat module, VBA-2E2A-G2-ZEJ/XE2J (see page 76) is very useful for controlling two MOVISWITCH® drive inverters by SEW Eurodrive. The MOVISWITCH does not require any special motor starter, and the VBA-2E2A-G2-ZEJ/XE2J from Pepperl+Fuchs controls its on/off functionality directly from the field. What makes our VBA-2E2A-G2-ZEJ/XE2J so special is that it allows both inputs and outputs to be powered using AS-Interface, and each connector has an input and output both for easy wiring and control.

**See page 116 for Drive Control wiring and dimensions.**

### Common Specifications

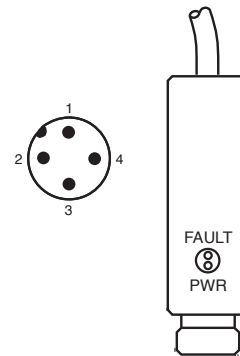
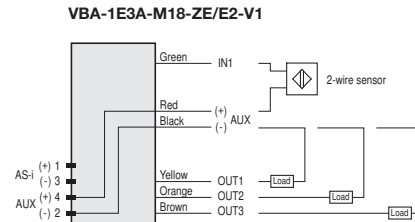
|                                     |                                                                                           |
|-------------------------------------|-------------------------------------------------------------------------------------------|
| OPERATING VOLTAGE AS-i              | 26.5-31.6 V                                                                               |
| OPERATING VOLTAGE, V <sub>AUX</sub> | 21.6 - 26.4 VDC                                                                           |
| PROTECTION                          | IP67                                                                                      |
| HOUSING MATERIAL                    | Stainless Steel                                                                           |
| TEMPERATURE RANGE                   | Working 32 °F to +158 °F (0 °C to +70 °C)<br>Storage -13 °F to +158 °F (-25 °C to +70 °C) |
| APPROVALS                           | CE   |



## Specifications

| INPUTS/OUTPUTS                 |                 | 1-in/3-out (AUX powered)        |
|--------------------------------|-----------------|---------------------------------|
| MODEL NUMBER(S)                |                 | VBA-1E3A-M18-ZE/E2-V1           |
| EXTENDED ADDRESSING (62 NODES) |                 | Yes                             |
| REQUIRED MASTER SPEC.          |                 | M3, M4                          |
| AS-i OPERATING CURRENT         |                 | ≤ 30 mA                         |
| AUXILIARY CURRENT LIMIT        |                 | ≤ 68 mA                         |
| INPUTS                         |                 | PNP, AS-i powered               |
| TYPE                           |                 | 2-, 3-wire                      |
| SUPPLY VOLTAGE                 |                 | from AUX                        |
| MAXIMUM CURRENT                |                 | —                               |
| SWITCH POINT                   |                 | OFF ≤ 0.8 mA, ON ≥ 5 mA         |
| LOAD CURRENT                   |                 | ≤ 8 mA                          |
| OUTPUTS                        |                 | PNP, auxiliary powered          |
| SUPPLY VOLTAGE                 |                 | ≥ (V <sub>AUX</sub> - 0.5 V)    |
| CURRENT PER OUTPUT             |                 | ≤ 20 mA                         |
| DATA BITS                      | D0              | OUT1                            |
|                                | D1              | OUT2                            |
|                                | D2              | OUT3                            |
|                                | D3              | IN1                             |
| PARAMETER BITS                 | P0              | —                               |
|                                | P1              | —                               |
|                                | P2              | —                               |
| PERIPHERAL FAULT BIT           |                 | Input overload                  |
| PROFILE                        | S-IO.ID.ID1.ID2 | S-9.A.7.E                       |
|                                | ID1             | 7                               |
| WEIGHT                         |                 | 110 g (3.9 oz)                  |
| AS-INTERFACE CONNECTION        |                 | M12 quick disconnect            |
| AUXILIARY POWER CONNECTION     |                 |                                 |
| I/O CONNECTION                 |                 | 0.2 m pigtail with flying leads |

## Wiring Diagrams



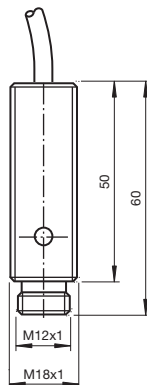
## LED Indicators

**FAULT:** Red (solid): Address 0 or no communication

**PWR:** Green: AS-Interface powered

## Dimensions (mm)

VBA-1E3A-M18-ZE/E2-V1



See pages 201-216 for complete AS-Interface accessory listing.





# Safety at Work

|                                                       |            |
|-------------------------------------------------------|------------|
| <b>Safety Monitors .....</b>                          | <b>119</b> |
| <b>Safe Input/Output Modules .....</b>                | <b>123</b> |
| <b>Emergency Stops .....</b>                          | <b>132</b> |
| <b>Mechanical Safety Interlock Switches ....</b>      | <b>135</b> |
| <b>Coded Magnetic Safety Interlock Switches .....</b> | <b>141</b> |
| <b>RFID Safety Interlock Switches .....</b>           | <b>144</b> |
| <b>Enabling Switch .....</b>                          | <b>148</b> |

## Overview

AS-Interface Safety at Work (SaW) is a system that enables networking of safety devices (safety door switches, emergency stop pushbuttons, safety lightarrays, etc.) using standard AS-Interface networks. With SaW, users can quickly implement a safety system that satisfies the rules and regulations needed for Category 4/SIL 3 Safety. The simplicity of AS-Interface is retained and is a major reason for users to implement SaW systems.

The following features make SaW unique and powerful:

- Control I/O and safety information on the same network
- Usable up to Safety Category 4 (SIL 3)
- Does not require a Safety PLC
- Automatic single SafetyNode replacement is supported
- SafetyMonitor allows implementation of powerful safety procedures
- Safe inputs and outputs both supported
- Scan one or two networks simultaneously
- Up to 16 safe independent output/coupling channels on a single network
- Adding additional safety devices is fast and easy

## What is needed?

SaW utilizes AS-Interface's proven wiring design to transmit safety information (position of an e-stop, state of a blade switch, position of a key switch, etc.) from a SafetyNode to a SafetyMonitor. SafetyNode and SafetyMonitor are the only new hardware items needed to implement SaW. The AS-Interface Gateway/ Scanner and the AS-Interface power supply remain the same. The power supply and gateway/ scanner chosen enable communication over the network and reflect the parameters of the job (e.g. the upper-level network used, speed of application, etc.), but do not affect the safety level.

## Safe Input modules

SafetyNodes are I/O modules that have been designed and constructed to satisfy the rules and regulations necessary to obtain desired safety ratings. This construction includes redundancy at the inputs and internal components. A SafetyNode transmits 4-bits of data like any other I/O module, but with the SafetyNode, the 4-bits transmitted from the module to the AS-Interface Gateway/Scanner follow special rules that allow the SafetyMonitor to determine whether an e-stop has been activated. The Gateway/Scanner evaluates this data in the same manner as the data from a 'nonsafe' I/O module. The SafetyMonitor takes the place of a Safety Relay in conventional hardwire systems.

## Safe Output modules

Safety output modules work the opposite way that safe input modules do. The SafetyMonitor will generate an address that will be called the safe output channel. This safe output channel and a standard A/B address are programmed into the safety output module. The safety sequence will only be transmitted over the safe output channel when the SafetyMonitor determines that its configuration is safe. This information from the SafetyMonitor is then evaluated by the safe output module and the safe contacts are closed. If the SafetyMonitor determines that the machine must stop, all data bits that are

transmitted via the safe output channel are set to 0. Diagnostics and EDM inputs are all sent/connected through the inputs on the safety output module that can be monitored by the SafetyMonitor and PLC. Several safe output modules can be configured for the same safe output channel and, in that case, their safe contacts will all switch at the same time. An A/B standard address must however be unique for each safety output module used.

## Safe Coupling

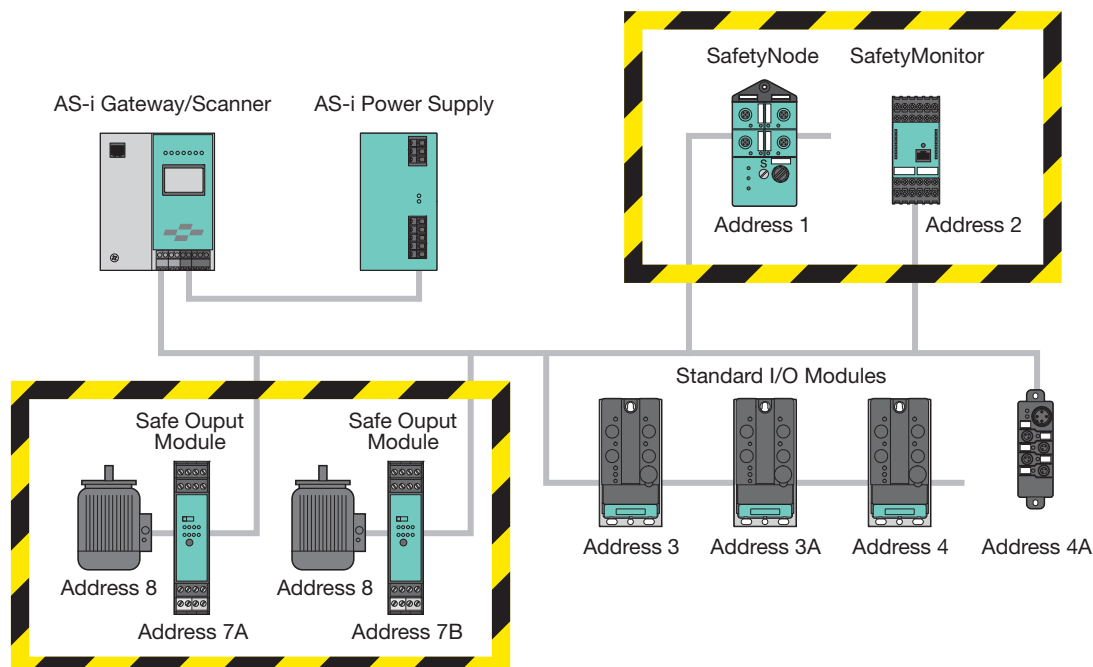
Safe Coupling is a term used to define a method of transmitting the state of one SafetyMonitor to another. A SafetyMonitor that needs to send the state of a channel will generate a safety address. It sends the safety sequence while running and sends 0000 when released. This safety address can be entered into the configuration of other SafetyMonitors allowing one SafetyMonitor to control another.

## SafetyMonitors

Constructed to meet safety requirements, the SafetyMonitor connects to the AS-Interface network like any other module, monitoring the data sent by AS-Interface modules on the network.

## SafetyMonitor Configuration

SaW can be added to an existing AS-Interface system as long as the basic AS-Interface network rules are satisfied (see pages 21-25). In most cases, SaW is used along side standard I/O modules. All components are wired according to AS-Interface installation rules and the data from the Safety Nodes are evaluated in the same manner as any other I/O module on the network. The SafetyMonitor is added to the network as if it were a module. The SafetyMonitor is configured with the software package VAZ-SW-SIMON or VAZ-SW-SIMON+. This MS-Windows package offers a simple, user-friendly interface and supports drag & drop functionality. This software allows users to quickly configure a new SafetyMonitor, or retrieve an existing configuration from one, and make modifications to a configuration if the safety system has been changed. In addition, the software has powerful diagnostics tool. After configuration and start-up, the SafetyMonitor continuously monitors the data going over the AS-Interface network. If the monitor detects a discrepancy, it shuts down. The maximum time for the SafetyMonitor to open an OSSD (including the time it take for the relays to physically open) is 40 ms.



Two safe remote output modules share the safe address 8 thus switching simultaneously when the SafetyMonitor signals an on/off state. The two safe output modules also have a unique, standard A/B address to transmit standard inputs, EDM and diagnostics data.



## Safety Monitors Safety Solutions

- Connects to standard AS-Interface network
- Monitors status of safety inputs and sets safe outputs
- Safety requirements in accordance with category 4 to EN 954-1
- Comes with one or two redundant relay outputs, electronic outputs, and up to 16 safe output channels
- Safe coupling allows communication between safety monitors

### Monitors Overview

Constructed to meet safety requirements, the SafetyMonitor monitors all SafetyNodes on the AS-Interface network and connects to the AS-Interface network like any other module.

**NOTE:** The SafetyMonitor is not an AS-Interface Gateway/Scanner. The primary functions of the SafetyMonitor are to evaluate the safe data from the safe input models, perform logic operations, and if needed activate internal or remote release circuits. Pepperl+Fuchs does offer safety monitors with integrated PROFIBUS gateways as well. See page 41 for details.

The SafetyMonitor contains the OSSDs (Output Signal Switching Devices, i.e., redundant set of safe relays or electronic outputs) that switch off the unsafe motion when an unsafe condition is detected.

It is not necessary to have the SafetyMonitor in close proximity to the SafetyNodes. The SafetyMonitor may be placed anywhere within the network. SafetyMonitors do not require a Node address. If the user wants to monitor the states of the OSSDs on a SafetyMonitor, the monitor itself will require an address.

There are two versions of SafetyMonitors available: 2-channel and 16-channel. The 2-channel versions

have 1 or 2 sets of safe relay outputs and a safe output/coupling channel. This safe output/coupling channel can be used to turn on a safe output module or to couple to another SafetyMonitor.

The 16-channel SafetyMonitors come with 2 safe relay outputs and 2 safe electronic outputs. In addition to these integrated outputs, up to 16 safe output and coupling channels are possible. This makes it possible to release 16 different safe output groups and couple up to 16 other SafetyMonitors. This capability allows complete application flexibility. The 16-channel SafetyMonitors will also scan two networks, have an integrated memory card, integrated AS-i fault detector, and a graphical display and keypad.

**See pages 121-122 for SafetyMonitor wiring and dimensions.**



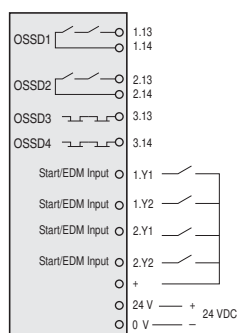
## Specifications

| NUMBER OF CHANNELS                 | 16                                                                                                                        | 2                                                                                                                         |              |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|--------------|
| MODEL NUMBER(S)                    | VAS-4A16L-K31                                                                                                             | VAS-1A1L-K12                                                                                                              | VAS-2A1L-K12 |
| RESPONSE DELAY                     | 40 ms                                                                                                                     | 40 ms                                                                                                                     |              |
| STARTUP DELAY                      | < 10 s                                                                                                                    | < 10 s                                                                                                                    |              |
| EXTENDED ADDRESSING (62 NODES)     | No                                                                                                                        | No                                                                                                                        |              |
| REQUIRED MASTER SPEC.              | M4                                                                                                                        | —                                                                                                                         |              |
| OPERATING VOLTAGE AS-i             | 26.5-31.6 V                                                                                                               | 26.5-31.6 V                                                                                                               |              |
| OPERATING VOLTAGE V <sub>AUX</sub> | 21.4-27.6 VDC                                                                                                             | 21.4-27.6 VDC                                                                                                             |              |
| AS-i OPERATING CURRENT             | 45 mA                                                                                                                     | 45 mA                                                                                                                     |              |
| AUXILIARY CURRENT LIMIT            | < 200 mA                                                                                                                  | < 200 mA                                                                                                                  |              |
| INPUTS                             | 4                                                                                                                         | 2                                                                                                                         |              |
| SUPPLY VOLTAGE                     | From AS-Interface                                                                                                         | 24 VDC                                                                                                                    |              |
| LOAD CURRENT                       | ≈ 4 mA                                                                                                                    | ≈ 10 mA                                                                                                                   |              |
| SAFE COUPLING CHANNELS             | 16                                                                                                                        | 1                                                                                                                         |              |
| SAFE OUTPUT CHANNELS               | 16                                                                                                                        | 1                                                                                                                         |              |
| OUTPUTS: Safe Relays               | 2                                                                                                                         | 1                                                                                                                         | 2            |
| DRY CONTACT LOAD (RELAY)           | DC-13, 1 A @ 30 VDC<br>AC-15, 3 A @ 30 VAC                                                                                | DC-13, 1 A @ 24 VDC<br>AC-15, 3 A @ 230 VAC                                                                               |              |
| OUTPUTS: Safe Electronic           | 2                                                                                                                         | —                                                                                                                         |              |
| LOAD CURRENT                       | 0.5 A @ 30 VDC                                                                                                            | —                                                                                                                         |              |
| OUTPUTS: Non-Safe                  | —                                                                                                                         | 1                                                                                                                         | 2            |
| LOAD CURRENT                       | —                                                                                                                         | < 200 mA at 24 VDC                                                                                                        |              |
| SERIAL INTERFACE                   | RS232: 19200, 8, n, 1                                                                                                     | RS232: 9600, 8, n, 1                                                                                                      |              |
| PROFILE                            | Base addr.(S-7.5.F.5),<br>Simulated addr.(S-7.F.F.F),<br>Safe coupling addr.(S-7.B.F.E),<br>Safe output addr. (S-6.B.F.D) | Base addr.(S-7.F.F.F),<br>Simulated addr.(S-7.F.F.F),<br>Safe coupling addr.(S-7.B.1.F),<br>Safe output addr. (S-6.B.0.D) |              |
| PROTECTION (IEC)                   | IP20                                                                                                                      | IP20                                                                                                                      |              |
| TEMPERATURE WORKING RANGE          | +32 °F to +131 °F (0 °C to +55 °C)                                                                                        | -4 °F to +140 °F (-20 °C to +60 °C)                                                                                       |              |
| STORAGE                            | -13 °F to +185 °F (-25 °C to +85 °C)                                                                                      | -22 °F to +158 °F (-30 °C to +70 °C)                                                                                      |              |
| HOUSING MATERIAL                   | Stainless steel                                                                                                           | PA 66                                                                                                                     |              |
| WEIGHT                             | 800 g (27 oz)                                                                                                             | 405 g (14 oz)                                                                                                             |              |
| APPROVALS                          | CE c UL US TÜV approved up to cat.4 / SIL3 NFPA 79                                                                        | CE c UL US TÜV approved up to cat.4 / SIL3 NFPA 79                                                                        |              |
| AS-INTERFACE CONNECTION            | Removable terminals                                                                                                       | Removable terminals                                                                                                       |              |



See Page 41 for PROFIBUS gateways with integrated 16 channel safety monitors: same functionality and diagnostics and no base address required.

**Note:** Wiring diagrams show terminal numbers.



Power: Green: powered

Power: Green: powered

**Fault:** Red (solid): Communication error on AS-i  
Red (flashing): At least one OSSD released

**Ready:** Yellow (solid): Waiting for start condition  
Yellow (flashing): Safety module test or local acknowledge required

UAS1: Green: AS-i power Okay

UASI2: Green: AS-i power Okay

**AUX:** Green: Power on

1 Yx 2 Yx: Yellow: Input on

Kx: Yellow: QSSD on

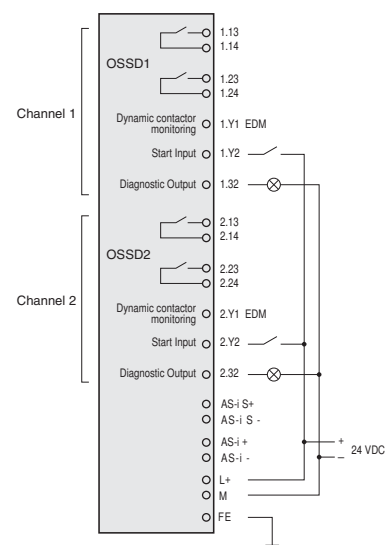
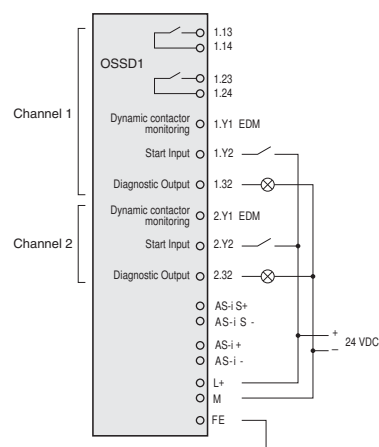
↑ **Mode:** Switching between normal operating mode and configuration mode and moving up through display

↓ **Set:** Changes slave addresses in configuration mode and moves down through display

**OK:** Moves forward through graphical display and to accept changes

**ESC:** Moves backward through display

**Graphical Display:** 4 line black and white display



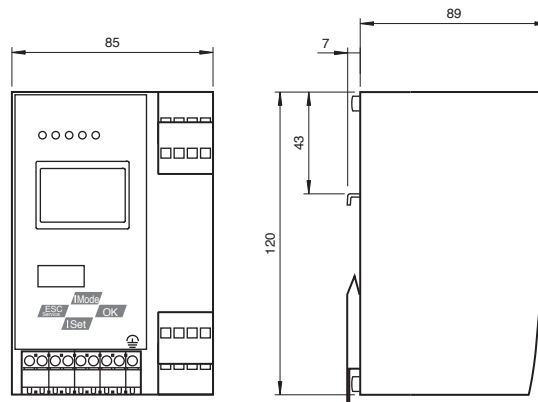
| LED                            | Indication                      | Meaning                                                                    |
|--------------------------------|---------------------------------|----------------------------------------------------------------------------|
| AS-i 1                         | Off                             | No 30 V AS-i connection to AS-i+ and AS-i- terminals                       |
|                                | On (Green)                      | Normal                                                                     |
| AS-i 2                         | Off                             | Normal operation                                                           |
|                                | On (Red)                        | No AS-i communication or monitor address not stored in gateway/scanner     |
| 1 READY                        | On (Yellow)                     | Waiting for start condition or door unlock condition                       |
|                                | Flashing (Yellow)               | Safety module test, local acknowledge required, or diagnostic stop enabled |
| 2 ON                           | On (Green)                      | Contacts of the output switching elements closed                           |
|                                | Flashing (Green)                | Delay time runs in event of Stop Category 1                                |
| 3 OFF/FAULT                    | On (Red)                        | Contacts of the output switching elements open                             |
|                                | Flashing (Red)                  | Error on level of the monitored AS-i components                            |
| 1 READY<br>2 ON<br>3 OFF/FAULT | Simultaneously flashing rapidly | Internal device error; power cycle is required                             |
| 1 READY<br>2 ON<br>3 OFF/FAULT | Cycling slowly                  | Learning safety code sequences                                             |
| 1 READY<br>2 ON<br>3 OFF/FAULT | Off                             | No 24 V supply connected to L+ and M terminals                             |

Press to Clear faults, teach safety sequences of safety modules, swap safety monitors.  
See manual for complete details.

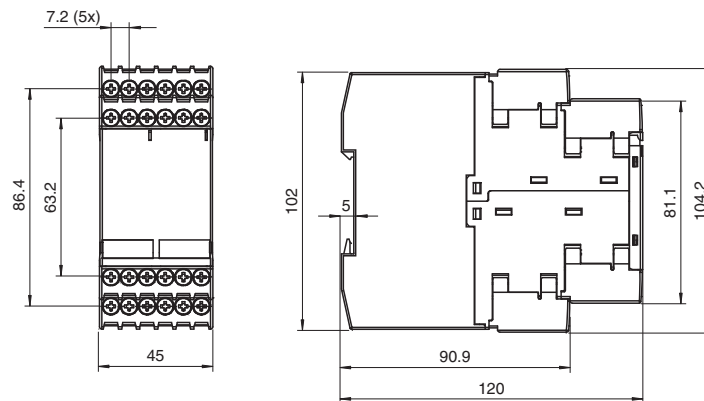


## Dimensions (mm)

**VAS-4A16L-K31**



**VAS-1A1L-K12**  
**VAS-2A1L-K12**



## Accessories

### VAZ-SW-SIMON

Configuration software for VAS-...A1L-K12 SafetyMonitors. RS-232 configuration cable included.

### VAZ-SW-SIMON+

Configuration software for VAS-4A16L-K31 SafetyMonitors. RS-232 configuration cable included.

### VAZ-SIMON-RJ45

An interface cable for downloading configuration from one monitor to another (only used with VAS-...A1L-K12 models).



See pages 201-216 for complete AS-Interface accessory listing.





## Safe Input/Output Modules

### Safety Solutions

- Available in field and enclosure mount versions
- Easily connect existing safe components to modules
- Standard outputs can be controlled by PLC or directly by module
- Connect two safe inputs for Category 2 safety
- Connect one safe input for Category 3/4 safety

### Safe Input/Output Modules Overview

SafetyNodes are I/O modules that have been designed and constructed to satisfy the rules and regulations necessary to obtain desired safety ratings. This construction includes redundancy at the inputs and internal components.

#### Safe Input modules

Typically, safe input modules are used to connect existing safety devices or muting sensors. Modules are available in a number of housing designs to accept dry contacts from an emergency stop or electronic outputs from a light curtain or muting sensor. Also safety input modules have the advantage of accepting two Category 2 inputs when a higher level of safety isn't necessary. The advantage is that two Category 2 e-stops, for example, would take up one AS-i address where two integrated AS-i e-stops would require two addresses.

#### Safe Output modules

The safety output module has the same safety output rating as a SafetyMonitor, but without programming. All of the programming and logic still resides on the SafetyMonitor itself. The safe output module should be viewed as a remote set of safe contacts controlled

by the SafetyMonitor. These are often used to control motors locally and safely. Two addresses will be programmed into the safety output module. The first is the safe data channel that will control the safe operation of the module, and the second is an A/B address that is used for EDM inputs and diagnostics. Multiple modules can have the same safe data channel if required.

Safe output nodes can also be configured so that their safe relay output is controlled by the PLC. If there is a problem, the SafetyMonitor will act as an override and release the relay.

**See pages 128-131 for Safety Solutions Safe Input/Output Modules wiring and dimensions.**

Gateways and Scanners

Power Supplies and Repeaters

I/O Modules

Safety at Work

Sensors

Cordsets

Accessories



| Specifications                     |         | Safe Input (Dry Contact)             |                                        |
|------------------------------------|---------|--------------------------------------|----------------------------------------|
| INPUTS/OUTPUTS                     |         | 2-in (safe)                          | 2-in (safe)/2-out                      |
| MODEL NUMBER(S)                    |         | VAA-2E-KE1-S                         | VAA-2E2A-KE1-S/E2                      |
| EXTENDED ADDRESSING (62 NODES)     |         | No                                   | No                                     |
| REQUIRED MASTER SPEC.              |         | —                                    | —                                      |
| OPERATING VOLTAGE AS-i             |         | 26.5-31.6 V                          | 26.5-31.6 V                            |
| OPERATING VOLTAGE V <sub>AUX</sub> |         | —                                    | 20-30 VDC                              |
| AS-i OPERATING CURRENT             |         | ≤ 70 mA                              | ≤ 70 mA                                |
| AUXILIARY CURRENT LIMIT            |         | —                                    | 1 A                                    |
| INPUTS -S                          |         | Safety, dry contacts                 | Safety, dry contacts                   |
| TYPE                               |         | 2-wire                               | 2-wire                                 |
| SUPPLY VOLTAGE                     |         | 20-30 V from AS-i, pulsed            | 20-30 V from AS-i, pulsed              |
| LOAD CURRENT                       |         | ≤ 15 mA                              | ≤ 15 mA                                |
| MAX. INPUT CABLE LENGTH            |         | 30 m each                            | 30 m each                              |
| OUTPUTS E2                         |         | —                                    | PNP, auxiliary powered                 |
| SUPPLY VOLTAGE                     |         | —                                    | ≥ (V <sub>AUX</sub> -0.5 V)            |
| CURRENT PER OUTPUT                 |         | —                                    | ≤ 0.5 A                                |
| DATA BITS                          | D0      | Input 1                              | Input 1/OUT1                           |
|                                    | D1      | Input 1                              | Input 1/OUT2                           |
|                                    | D2      | Input 2                              | Input 2                                |
|                                    | D3      | Input 2                              | Input 2                                |
| PARAMETER BITS                     | P0      | —                                    | Outputs controlled via AS-i* or inputs |
|                                    | P1      | —                                    | —                                      |
|                                    | P2      | —                                    | —                                      |
| PERIPHERAL FAULT BIT               |         | —                                    | Output overload                        |
| PROFILE S-IO.ID.ID1.ID2            |         | S-0.B.F.0                            | S-7.B.F.0                              |
| PROTECTION (IEC)                   |         | IP20                                 | IP20                                   |
| TEMPERATURE RANGE                  | WORKING | -13 °F to +122 °F (-25 °C to +50 °C) | -13 °F to +122 °F (-25 °C to +50 °C)   |
|                                    | STORAGE | -13 °F to +185 °F (-25 °C to +85 °C) | -13 °F to +185 °F (-25 °C to +85 °C)   |
| HOUSING MATERIAL                   |         | PA 66-FR                             | PA 66-FR                               |
| WEIGHT                             |         | 80 g (2.8 oz)                        | 80 g (2.8 oz)                          |
| APPROVALS                          |         | NFPA 79                              | NFPA 79                                |
| AS-INTERFACE CONNECTION            |         | Yellow removable terminals           | Yellow removable terminals             |
| AUXILIARY POWER CONNECTION         |         | —                                    | Gray removable terminals               |
| I/O CONNECTION                     |         | Black removable terminals            | Black removable terminals              |

\* Default setting



| Specifications                          |         | Safe Input (Dry Contact)                                                                                                                                                                                        |                                                                                                                                                                                                                    |                                                                                                    |
|-----------------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| INPUTS/OUTPUTS                          |         | 2-in (safe)                                                                                                                                                                                                     | 2-in (safe)/2-out                                                                                                                                                                                                  |                                                                                                    |
| MODEL NUMBER(S)                         |         | VAA-2E-G2-S                                                                                                                                                                                                     | VAA-2E2A-G2-S/EA2                                                                                                                                                                                                  | VAA-2E2A-G12-SAJ/EA2L                                                                              |
| BASES                                   |         | U-G3FF                                                                                                                                                                                                          | U-G3FF                                                                                                                                                                                                             | Included                                                                                           |
| EXTENDED ADDRESSING (62 NODES)          |         | No                                                                                                                                                                                                              | No                                                                                                                                                                                                                 |                                                                                                    |
| REQUIRED MASTER SPEC.                   |         | —                                                                                                                                                                                                               | —                                                                                                                                                                                                                  |                                                                                                    |
| OPERATING VOLTAGE AS-i                  |         | 26.5-31.6 V                                                                                                                                                                                                     | 26.5-31.6 V                                                                                                                                                                                                        |                                                                                                    |
| OPERATING VOLTAGE V <sub>AUX</sub>      |         | —                                                                                                                                                                                                               | 20-30 VDC                                                                                                                                                                                                          |                                                                                                    |
| AS-i OPERATING CURRENT                  |         | ≤ 70 mA                                                                                                                                                                                                         | ≤ 70 mA                                                                                                                                                                                                            |                                                                                                    |
| AUXILIARY CURRENT LIMIT                 |         | —                                                                                                                                                                                                               | 2 A                                                                                                                                                                                                                | 4 A                                                                                                |
| INPUTS <small>-S, -SAJ</small>          |         | Safety, dry contacts                                                                                                                                                                                            | Safety, dry contacts                                                                                                                                                                                               |                                                                                                    |
| TYPE                                    |         | 2-wire                                                                                                                                                                                                          | 2-wire                                                                                                                                                                                                             |                                                                                                    |
| SUPPLY VOLTAGE                          |         | 20-30 V from AS-i, pulsed                                                                                                                                                                                       | 20-30 V from AS-i, pulsed                                                                                                                                                                                          |                                                                                                    |
| LOAD CURRENT                            |         | ≤ 15 mA                                                                                                                                                                                                         | ≤ 15 mA                                                                                                                                                                                                            |                                                                                                    |
| MAX. INPUT CABLE LENGTH                 |         | 30 m each                                                                                                                                                                                                       | 30 m each                                                                                                                                                                                                          |                                                                                                    |
| OUTPUTS <small>EA2, EA2L</small>        |         | —                                                                                                                                                                                                               | PNP, auxiliary powered                                                                                                                                                                                             |                                                                                                    |
| SUPPLY VOLTAGE                          |         | —                                                                                                                                                                                                               | ≥ (V <sub>AUX</sub> - 0.5 V)                                                                                                                                                                                       |                                                                                                    |
| CURRENT PER OUTPUT                      |         | —                                                                                                                                                                                                               | ≤ 1 A                                                                                                                                                                                                              | ≤ 2 A                                                                                              |
| DATA BITS                               | D0      | Input 1                                                                                                                                                                                                         | Input 1/OUT1                                                                                                                                                                                                       |                                                                                                    |
|                                         | D1      | Input 1                                                                                                                                                                                                         | Input 1/OUT2                                                                                                                                                                                                       |                                                                                                    |
|                                         | D2      | Input 2                                                                                                                                                                                                         | Input 2                                                                                                                                                                                                            |                                                                                                    |
|                                         | D3      | Input 2                                                                                                                                                                                                         | Input 2                                                                                                                                                                                                            |                                                                                                    |
| PARAMETER BITS                          | P0      | —                                                                                                                                                                                                               | Outputs controlled via AS-i* or inputs                                                                                                                                                                             | Watchdog on*/off                                                                                   |
|                                         | P1      | —                                                                                                                                                                                                               | —                                                                                                                                                                                                                  | Outputs controlled via AS-i* or inputs                                                             |
|                                         | P2      | —                                                                                                                                                                                                               | —                                                                                                                                                                                                                  |                                                                                                    |
| PERIPHERAL FAULT BIT                    |         | —                                                                                                                                                                                                               | Output overload                                                                                                                                                                                                    |                                                                                                    |
| PROFILE <small>S-IO.ID1.ID1.ID2</small> |         | S-0.B.F.0                                                                                                                                                                                                       | S-7.B.F.0                                                                                                                                                                                                          |                                                                                                    |
| PROTECTION (IEC)                        |         | IP67                                                                                                                                                                                                            | IP67                                                                                                                                                                                                               |                                                                                                    |
| TEMPERATURE RANGE                       | WORKING | -13 °F to +131 °F (-25 °C to +55 °C)                                                                                                                                                                            | -13 °F to +131 °F (-25 °C to +55 °C)                                                                                                                                                                               |                                                                                                    |
|                                         | STORAGE | -13 °F to +185 °F (-25 °C to +85 °C)                                                                                                                                                                            | -13 °F to +185 °F (-25 °C to +85 °C)                                                                                                                                                                               |                                                                                                    |
| HOUSING MATERIAL                        |         | PBT-FR                                                                                                                                                                                                          | PBT-FR                                                                                                                                                                                                             | PBT                                                                                                |
| WEIGHT                                  |         | 100 g (3.5 oz)                                                                                                                                                                                                  | 100 g (3.5 oz)                                                                                                                                                                                                     |                                                                                                    |
| APPROVALS                               |         |   TÜV approved up to cat.4 / SIL3 NFPA 79 |   TÜV approved up to cat.4 / SIL3 NFPA 79 |                                                                                                    |
| AS-INTERFACE CONNECTION                 |         |  Flat yellow cable                                                                                                           |  Flat yellow cable                                                                                                            |                                                                                                    |
| AUXILIARY POWER CONNECTION              |         | —                                                                                                                                                                                                               |  Flat black cable                                                                                                             |                                                                                                    |
| I/O CONNECTION                          |         |  M12 quick disconnect                                                                                                        |  M12 quick disconnect                                                                                                           |  M12 SPEEDCON |

\* Default setting

Gateways and Scanners

Power Supplies and Repeaters

I/O Modules

Safety at Work

Sensors

Cordsets

Accessories



| Specifications                                |                | Safe Input (Electronic)                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>INPUTS/OUTPUTS</b>                         |                | <b>2-in (safe)</b>                                                                                                                                                                                                                                                                                                                              |
| <b>MODEL NUMBER(S)</b>                        |                | <b>VAA-2E-G4-SE</b>                                                                                                                                                                                                                                                                                                                             |
| <b>BASES</b>                                  |                | U-G1FFA, U-G1PP                                                                                                                                                                                                                                                                                                                                 |
| <b>EXTENDED ADDRESSING (62 NODES)</b>         |                | No                                                                                                                                                                                                                                                                                                                                              |
| <b>REQUIRED MASTER SPEC.</b>                  |                | —                                                                                                                                                                                                                                                                                                                                               |
| <b>OPERATING VOLTAGE AS-i</b>                 |                | 26.5-31.6 V                                                                                                                                                                                                                                                                                                                                     |
| <b>OPERATING VOLTAGE <math>V_{AUX}</math></b> |                | 21.4-27.6 VDC                                                                                                                                                                                                                                                                                                                                   |
| <b>AS-i OPERATING CURRENT</b>                 |                | ≤ 30 mA                                                                                                                                                                                                                                                                                                                                         |
| <b>AUXILIARY CURRENT LIMIT</b>                |                | 2 A                                                                                                                                                                                                                                                                                                                                             |
| <b>INPUTS</b> <small>-SE</small>              |                | Safety, electronic auxiliary powered                                                                                                                                                                                                                                                                                                            |
| <b>TYPE</b>                                   |                | 3-wire, PNP                                                                                                                                                                                                                                                                                                                                     |
| <b>SUPPLY VOLTAGE</b>                         |                | $V_{AUX}$                                                                                                                                                                                                                                                                                                                                       |
| <b>LOAD CURRENT</b>                           |                | ≤ 45 mA                                                                                                                                                                                                                                                                                                                                         |
| <b>MAX. INPUT CABLE LENGTH</b>                |                | 30 m each                                                                                                                                                                                                                                                                                                                                       |
| <b>SWITCH POINT</b>                           |                | OFF ≤ 5V/2 mA, ON ≥ 11 V/6 mA                                                                                                                                                                                                                                                                                                                   |
| <b>TEST PULSE REQUIREMENTS</b>                |                | 1% duty cycle, pulse duration max. 1 ms, 16 V min.                                                                                                                                                                                                                                                                                              |
| <b>CAPACITANCE</b>                            |                | ≤ 10 nF                                                                                                                                                                                                                                                                                                                                         |
| <b>DATA BITS</b>                              | <b>D0</b>      | Input 1                                                                                                                                                                                                                                                                                                                                         |
|                                               | <b>D1</b>      | Input 1                                                                                                                                                                                                                                                                                                                                         |
|                                               | <b>D2</b>      | Input 2                                                                                                                                                                                                                                                                                                                                         |
|                                               | <b>D3</b>      | Input 2                                                                                                                                                                                                                                                                                                                                         |
| <b>PARAMETER BITS</b>                         | <b>P0</b>      | —                                                                                                                                                                                                                                                                                                                                               |
|                                               | <b>P1</b>      | —                                                                                                                                                                                                                                                                                                                                               |
|                                               | <b>P2</b>      | —                                                                                                                                                                                                                                                                                                                                               |
| <b>PERIPHERAL FAULT BIT</b>                   |                | —                                                                                                                                                                                                                                                                                                                                               |
| <b>PROFILE</b> <small>S-IO.ID1.ID2</small>    |                | S-0.B.F.E                                                                                                                                                                                                                                                                                                                                       |
| <b>PROTECTION (IEC)</b>                       |                | IP67                                                                                                                                                                                                                                                                                                                                            |
| <b>TEMPERATURE RANGE</b>                      | <b>WORKING</b> | -13 °F to +131 °F (-25 °C to +55 °C)                                                                                                                                                                                                                                                                                                            |
|                                               | <b>STORAGE</b> | -13 °F to +185 °F (-25 °C to +85 °C)                                                                                                                                                                                                                                                                                                            |
| <b>HOUSING MATERIAL</b>                       |                | PA 6 GF30                                                                                                                                                                                                                                                                                                                                       |
| <b>WEIGHT</b>                                 |                | 180 g (6.3 oz)                                                                                                                                                                                                                                                                                                                                  |
| <b>APPROVALS</b>                              |                |     |
| <b>AS-INTERFACE CONNECTION</b>                |                |  Flat yellow or round cable                                                                                                                                                                                                                                  |
| <b>AUXILIARY POWER CONNECTION</b>             |                |  Flat black or round cable                                                                                                                                                                                                                                   |
| <b>I/O CONNECTION</b>                         |                |  Cage tension spring terminals                                                                                                                                                                                                                               |

## Pepperl+Fuchs Safety Light Curtains

- Versions available for finger, hand, and perimeter access detection
- Control-reliable and self-monitoring (conform to Type 4 according to IEC61496)
- Approvals: CUL, TÜV
- CE marked
- Integral diagnostics
- Signal reserve indication
- Enclosure rating: IP67
- Available with ATEX Approval for Ex Zone 2 and 22

(Refer to the Pepperl+Fuchs Machine Safety Products Selection Guide for further details.)



| Specifications                                |                | Safe Output (Relay)                                                                                                                                                                                                                                                 |
|-----------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>INPUTS/OUTPUTS</b>                         |                | <b>4-in/1-out (safe)</b>                                                                                                                                                                                                                                            |
| <b>MODEL NUMBER(S)</b>                        |                | <b>VBA-4E1A-KE3-ZEJ/SR</b>                                                                                                                                                                                                                                          |
| <b>RESPONSE DELAY</b>                         |                | 50 ms                                                                                                                                                                                                                                                               |
| <b>EXTENDED ADDRESSING (62 NODES)</b>         |                | Yes                                                                                                                                                                                                                                                                 |
| <b>REQUIRED MASTER SPEC.</b>                  |                | M3, M4                                                                                                                                                                                                                                                              |
| <b>OPERATING VOLTAGE AS-i</b>                 |                | 26.5-31.6 V                                                                                                                                                                                                                                                         |
| <b>OPERATING VOLTAGE <math>V_{AUX}</math></b> |                | —                                                                                                                                                                                                                                                                   |
| <b>AS-i OPERATING CURRENT</b>                 |                | 30-200 mA                                                                                                                                                                                                                                                           |
| <b>AUXILIARY CURRENT LIMIT</b>                |                | —                                                                                                                                                                                                                                                                   |
| <b>INPUTS</b> <i>-ZEJ</i>                     |                | 4 PNP, AS-i powered                                                                                                                                                                                                                                                 |
| <b>TYPE</b>                                   |                | 2-, 3-wire                                                                                                                                                                                                                                                          |
| <b>SUPPLY VOLTAGE</b>                         |                | 26.5-31.6 V from AS-i                                                                                                                                                                                                                                               |
| <b>MAXIMUM CURRENT</b>                        |                | 90 mA                                                                                                                                                                                                                                                               |
| <b>SWITCH POINT</b>                           |                | OFF $\leq 2$ mA, ON $\geq 4$ mA                                                                                                                                                                                                                                     |
| <b>LOAD CURRENT</b>                           |                | 8 mA                                                                                                                                                                                                                                                                |
| <b>OUTPUTS</b> <i>SR</i>                      |                | 1 safe relay                                                                                                                                                                                                                                                        |
| <b>DRY CONTACT LOAD (Relay)</b>               |                | DC-13, 3 A @ 24 VDC<br>AC-15, 3 A @ 230 VAC                                                                                                                                                                                                                         |
| <b>DATA BITS</b>                              | <i>D0</i>      | IN1/LED alarm                                                                                                                                                                                                                                                       |
|                                               | <i>D1</i>      | IN2/Safe Relay (if P1=0)                                                                                                                                                                                                                                            |
|                                               | <i>D2</i>      | IN3 or output status (ID1=7 or F)                                                                                                                                                                                                                                   |
|                                               | <i>D3</i>      | 1.Y1                                                                                                                                                                                                                                                                |
| <b>PARAMETER BITS</b>                         | <i>P0</i>      | —                                                                                                                                                                                                                                                                   |
|                                               | <i>P1</i>      | Output controlled by PLC and safe output channel or by Safe output channel only*                                                                                                                                                                                    |
|                                               | <i>P2</i>      | D2 set on relay open* or D2 standard input (ID1 must be 7 or F to use P2 otherwise P2 not used)                                                                                                                                                                     |
| <b>PERIPHERAL FAULT BIT</b>                   |                | Input overload                                                                                                                                                                                                                                                      |
| <b>PROFILE</b> <i>S-IO.ID.ID1.ID2</i>         |                | S.7.A.5**.F                                                                                                                                                                                                                                                         |
| <b>PROTECTION (IEC)</b>                       |                | IP20                                                                                                                                                                                                                                                                |
| <b>TEMPERATURE RANGE</b>                      | <i>WORKING</i> | +32 °F to +131 °F (0 °C to +55 °C)                                                                                                                                                                                                                                  |
|                                               | <i>STORAGE</i> | -13 °F to +185 °F (-25 °C to +85 °C)                                                                                                                                                                                                                                |
| <b>HOUSING MATERIAL</b>                       |                | PA 66-FR                                                                                                                                                                                                                                                            |
| <b>WEIGHT</b>                                 |                | 170 g (6.0 oz)                                                                                                                                                                                                                                                      |
| <b>APPROVALS</b>                              |                |    NFPA 79 |
| <b>AS-INTERFACE CONNECTION</b>                |                |  Yellow removable terminals                                                                                                                                                      |
| <b>AUXILIARY POWER CONNECTION</b>             |                | —                                                                                                                                                                                                                                                                   |
| <b>I/O CONNECTION</b>                         |                |  Black removable terminals                                                                                                                                                       |

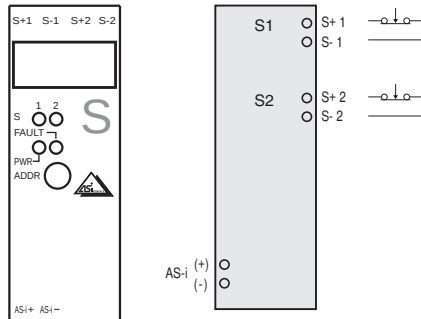
\* Default setting

\*\* ID1 is 5 then D2 is used as a standard input.  
If ID1 is 7 or F then D2 is used to show the status of the safe relays.

## Wiring Diagrams

**Note:** Wiring diagrams show terminal numbers.

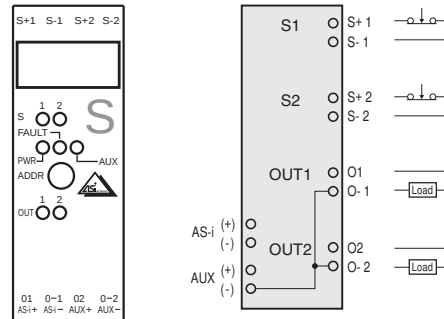
VAA-2E-KE1-S



### LED Indicators

**IN:** Yellow (solid or flashing very fast): Input on  
**PWR:** Green: AS-Interface powered  
**FAULT:** Red (solid): Address 0 or no communication

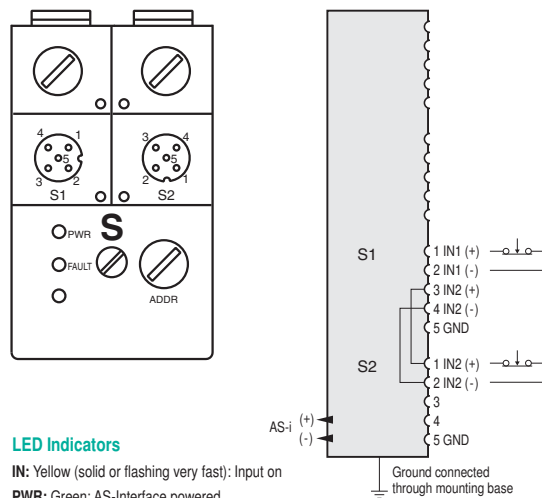
VAA-2E2A-KE1-S/E2



### LED Indicators

**IN:** Yellow (solid or flashing very fast): Input on  
**OUT:** Yellow: Output on  
**PWR:** Green: AS-Interface powered  
**FAULT:** Red (solid): Address 0 or no communication  
 Red (flashing): Overload of outputs  
**AUX:** Green: Auxiliary powered

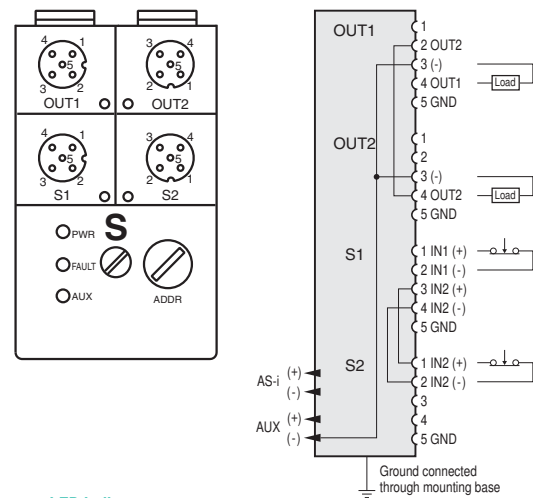
VAA-2E-G2-S



### LED Indicators

**IN:** Yellow (solid or flashing very fast): Input on  
**PWR:** Green: AS-Interface powered  
**FAULT:** Red (solid): Address 0 or no communication

VAA-2E2A-G2-S/EA2



### LED Indicators

**IN:** Yellow (solid or flashing very fast): Input on  
**OUT:** Yellow: Output on  
**PWR:** Green: AS-Interface powered  
**FAULT:** Red (solid): Address 0 or no communication  
 Red (flashing): Overload of outputs  
**AUX:** Green: Auxiliary powered



**Note:** Wiring diagrams show terminal numbers.



**IN:** Yellow (solid or flashing very fast): Input on

**OUT:** Yellow: Output on  
Red: Output overload

**PWR:** Green (solid): AS-Interface powered  
Green (flashing): Address 0

**FAULT:** Red (solid): Address 0 or no communication  
Red (flashing): Overload of outputs

**AUX:** Green: Auxiliary powered

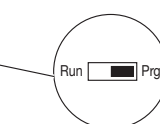
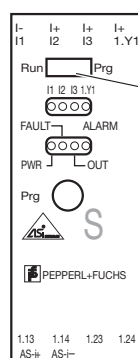


SE: Yellow: Input on

**AUX:** Green: Auxiliary powered

**FAULT:** Red (solid): Address 0 or no communication

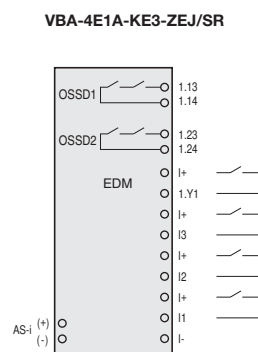
**PWR:** Green: AS-Interface powered



Set switch:

Prg = Programming of safe output channel address enabled. Protected mode not possible.

Run = Programming of standard A/B address enabled. Protected mode possible



## LED Indicators

**PWR:** Off: No power  
Green (solid): Power on  
Green (flashing): Power on and address 0

**FAULT:** Red: No communication

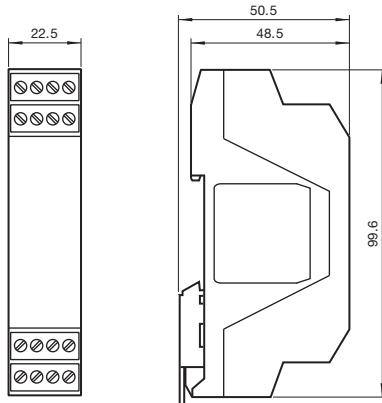
**OUT:** Yellow (solid): Relay contact closed  
Yellow (flashing, 1 Hz): restart inhibited, waiting for start signal  
Yellow (flashing, 8 Hz): device locked in error, Waiting for "reset of error condition" signal

**ALARM:** Red (solid): Output D0 has been turned on

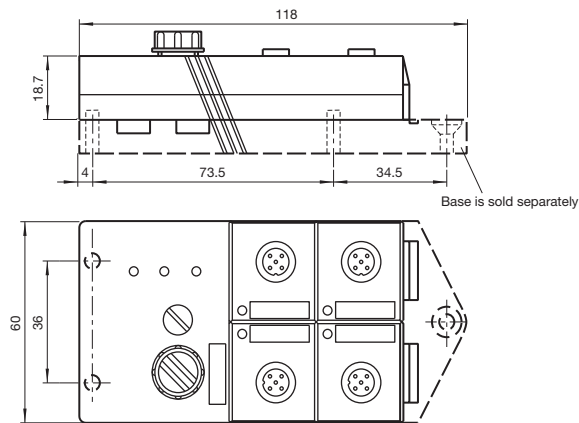
I, 1.Y1: Yellow: Input on

## Dimensions (mm)

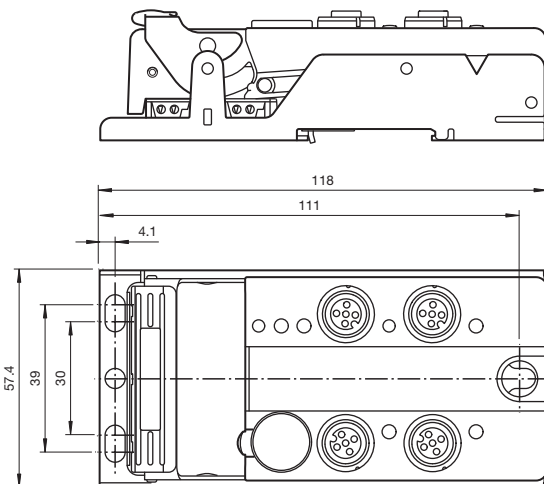
**VAA-2E-KE1-S**  
**VAA-2E2A-KE1-S/E2**



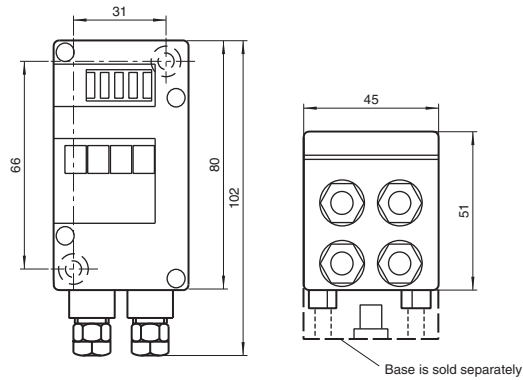
**VAA-2E-G2-S**  
**VAA-2E2A-G2-S/EA2**



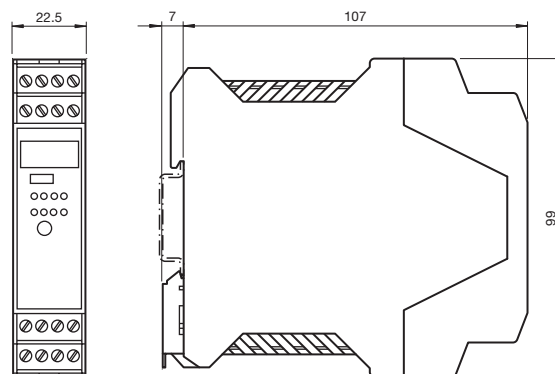
**VAA-2E2A-G12-SAJ/EA2L**



**VAA-2E-G4-SE**



**VBA-4E1A-KE3-ZEJ/SR**



## Accessories

### Accessories for VAA-2E2A-G2-S/EA2 or VAA-2E-G2-S

#### U-G3FF

Mounting base for 4-port flat modules



#### V1-CLIP

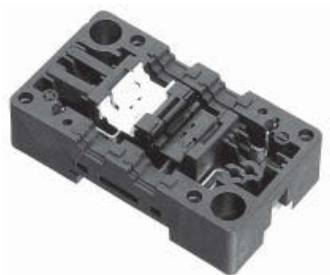
Prevents quick disconnects from being disconnected easily



### Accessories for VAA-2E-G4-SE

#### U-G1FFA

Flat cable mounting base for black and yellow cables with addressing jack



#### U-G1PP

Round cable base with external power terminals



See pages 201-216 for complete AS-Interface accessory listing.

## Emergency Stops Safety Solutions

- Connects directly to AS-i cable
- Illuminated and non-illuminated versions
- Field mount and panel mount housings available
- Field mount e-stops with M12 quick disconnect
- Twist or pull to release
- Completely powered off AS-Interface

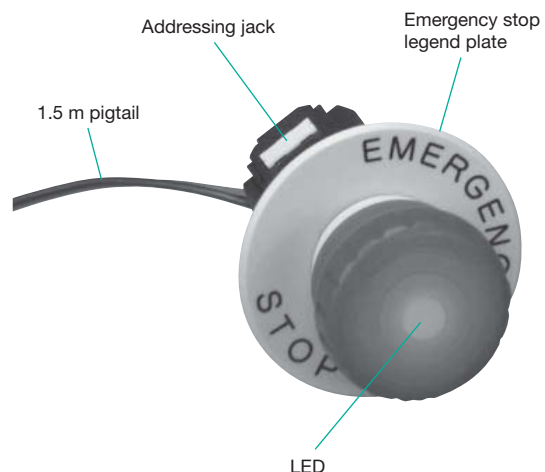


### Emergency Stop Overview

These emergency stops connect directly to the AS-i cable for easy mounting. Because the AS-i safety module is integrated into the e-stop itself, the wiring between the two is eliminated. This reduces the overall wiring/complexity of your machine.

The four versions available are illuminated panel mount, non-illuminated panel mount, illuminated field mount, and non-illuminated field mount.

**See page 134 for Emergency Stop wiring and dimensions.**





| Specifications                           | Panel Mount                                                          | Field Mount          | Field Mount                                                |
|------------------------------------------|----------------------------------------------------------------------|----------------------|------------------------------------------------------------|
| <b>INPUTS/OUTPUTS</b>                    | <b>1 e-stop/1 LED (optional)</b>                                     |                      | <b>1 e-stop, 1 start, 1 stop/3 LEDs</b>                    |
| <b>MODEL</b> <i>Non-illuminated</i>      | VAA-2E-PM-S                                                          | VAA-2E-F85A-S-V1     |                                                            |
| <b>NUMBER(S)</b> <i>Illuminated</i>      | VAA-2E1A-PM-S                                                        | VAA-2E1A-F85A-S-V1   | VAA-4E3A-F85B-S-V1                                         |
| <b>EXTENDED ADDRESSING (62 NODES)</b>    | No                                                                   |                      | 3 addr.(e-stop no, start yes, stop yes)*                   |
| <b>REQUIRED MASTER SPEC.</b>             | —                                                                    |                      | M3, M4                                                     |
| <b>OPERATING VOLTAGE AS-i</b>            | 26.5-31.6 V                                                          |                      | 26.5-31.6 V                                                |
| <b>OPERATING VOLTAGE V<sub>AUX</sub></b> | —                                                                    |                      | —                                                          |
| <b>AS-i OPERATING CURRENT</b>            | ≤ 25 mA (non-illuminated models)<br>≤ 40 mA (illuminated models)     |                      | ≤ 75 mA                                                    |
| <b>AUXILIARY CURRENT LIMIT</b>           | —                                                                    |                      | —                                                          |
| <b>INPUTS</b> <i>-S</i>                  | Safety                                                               |                      | Safety, pushbuttons                                        |
| <b>TYPE</b>                              | E-stop                                                               |                      | 1 e-stop, 2 momentary pushbuttons                          |
| <b>SUPPLY VOLTAGE</b>                    | From AS-Interface                                                    |                      | From AS-Interface                                          |
| <b>MECHANICAL ACTIVATIONS</b>            | > 250,000                                                            |                      | > 250,000                                                  |
| <b>OUTPUTS (Illuminated models)</b>      | LED, red                                                             |                      | LED, e-stop (red), start (green), stop (red)               |
| <b>SUPPLY VOLTAGE</b>                    | From AS-Interface                                                    |                      | From AS-Interface                                          |
| <b>CURRENT PER OUTPUT</b>                | ≤ 15 mA                                                              |                      | ≤ 15 mA                                                    |
| <b>DATA BITS</b> <i>D0</i>               | Contact 1                                                            |                      | Contact 1/LED e-stop                                       |
| <i>D1</i>                                | Contact 1                                                            |                      | Contact 1/LED stop/LED start                               |
| <i>D2</i>                                | Contact 2                                                            |                      | Contact 1/stop/start                                       |
| <i>D3</i>                                | Contact 1                                                            |                      | Contact 1                                                  |
| <b>PARAMETER BITS</b> <i>P0</i>          | —                                                                    |                      | —                                                          |
| <i>P1</i>                                | —                                                                    |                      | —                                                          |
| <i>P2</i>                                | —                                                                    |                      | —                                                          |
| <b>PERIPHERAL FAULT BIT</b>              | —                                                                    |                      | —                                                          |
| <b>PROFILE</b> <i>S-IO.ID.ID1.ID2</i>    | S-0.B.F.E (non-illuminated models)<br>S-7.B.F.E (illuminated models) |                      | E-stop (S-7.B.F.E), Start (S-B.A.0.E),<br>Stop (S-B.A.0.E) |
| <b>PROTECTION (IEC)</b>                  | IP65 (when mounted)                                                  |                      | IP65                                                       |
| <b>TEMPERATURE</b> <i>WORKING</i>        | -13 °F to +131 °F (-25 °C to +55 °C)                                 |                      | -13 °F to +131 °F (-25 °C to +55 °C)                       |
| <b>RANGE</b> <i>STORAGE</i>              | -40 °F to +158 °F (-40 °C to +70 °C)                                 |                      | -40 °F to +158 °F (-40 °C to +70 °C)                       |
| <b>HOUSING MATERIAL</b>                  | PA 6 GF30                                                            |                      | PC                                                         |
| <b>WEIGHT</b>                            | 60 g (2 oz)                                                          | 195 g (7 oz)         | 590 g (21 oz)                                              |
| <b>APPROVALS</b>                         | NFPA 79                                                              |                      | NFPA 79                                                    |
| <b>AS-INTERFACE CONNECTION</b>           | Quick connect with pigtail 1.5 m long                                | M12 quick disconnect | M12 quick disconnect                                       |

\* Default addresses on delivery are: Address 1 (e-stop), Address 2B (STOP button), Address 2A (START button)

Gateways and Scanners

Power Supplies and Repeaters

I/O Modules

Safety at Work

Sensors

Cordsets

Accessories







## Mechanical Safety Interlock Switches

### Safety Solutions

- Connect directly to AS-Interface cable using M12 quick connect
- All AS-i powered versions available
- Tamper-resistant, unique key is difficult to defeat
- Power to lock and power to unlock options
- Metal head for robust and long-lasting design

## Mechanical Safety Interlock Switches

### Safety contacts

Safety switches are tasked with preventing machine operation in the event of a potential hazard. Every safety switch has two internal contacts that are safely opened when the key is removed. The safety data will immediately go to 0 when the gate is opened. This will cause the safety monitor to go into shut down and bring the machine to a safe state. Standard designs come with or without LEDs, and power to unlock or power to lock options are available.

### Tamper-resistant actuating key

Tamper-resistant, removable keys cannot be simply defeated with screwdrivers, wire or other mechanical components. Multiple key entry points are allowed from top or side. The head can be moved to allow a total of 5 different entry positions for maximum flexibility.

### Power to lock/unlock

Four models are available with the power to lock/unlock feature. A data bit on AS-i must be turned on in order to close the door, power to lock, or open the door, power to unlock. The power to lock feature prevents unintentional closing by requiring the PLC to turn the output bit on first. The power to unlock version works by prevention the key from being removed until the output is actuated.

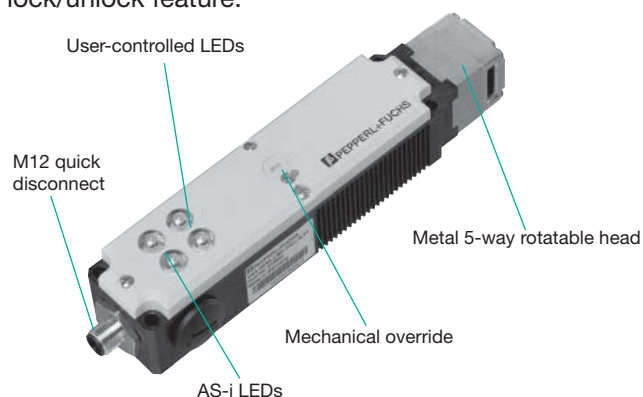
All switches include a mechanical override that can be used in the event of a power outage. The override

will act the same as sending the output bit on AS-i and will not run again until the override is put back into the locked position. Additionally, if the output that allows the unit to be locked or unlocked is left on, the switch will not be considered safe and the machine will not run.

All power to lock/unlock switches also come with two user-controlled LEDs, red and green. These are often used to show if the device is locked or unlocked giving the user permission to enter the area.

### Power options

Two power options are available: AS-i powered and auxiliary powered. The separation of power on the auxiliary powered versions allows the safety interlock switch to remain on AS-i but disable the power to lock/unlock feature.

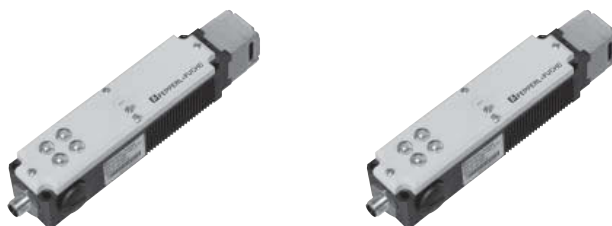


**See pages 138-140 for Mechanical Safety Interlock Switches wiring and dimensions**



## Specifications

| MODEL NUMBER(S)                | No LEDs         | VAA-2E-IM1-J-S-V1                                                                                                                                                                                                                                                   |
|--------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                | With LEDs       | VAA-2E2A-IM1-J-S-V1                                                                                                                                                                                                                                                 |
| EXTENDED ADDRESSING (62 NODES) |                 | No                                                                                                                                                                                                                                                                  |
| REQUIRED MASTER SPEC.          |                 | —                                                                                                                                                                                                                                                                   |
| OPERATING VOLTAGE AS-i         |                 | 26.5-31.6 V                                                                                                                                                                                                                                                         |
| OPERATING VOLTAGE $V_{AUX}$    |                 | —                                                                                                                                                                                                                                                                   |
| AS-i OPERATING CURRENT         |                 | 45 mA                                                                                                                                                                                                                                                               |
| AUXILIARY CURRENT LIMIT        |                 | —                                                                                                                                                                                                                                                                   |
| INPUTS                         | -S              | Safety                                                                                                                                                                                                                                                              |
| TYPE                           |                 | Mechanical Interlock                                                                                                                                                                                                                                                |
| SUPPLY VOLTAGE                 |                 | From AS-Interface                                                                                                                                                                                                                                                   |
| MECHANICAL ACTIVATIONS         |                 | 1 x 10 <sup>6</sup>                                                                                                                                                                                                                                                 |
| OUTPUTS                        |                 | —                                                                                                                                                                                                                                                                   |
| SUPPLY VOLTAGE                 |                 | —                                                                                                                                                                                                                                                                   |
| DATA BITS                      | D0              | Contact 1                                                                                                                                                                                                                                                           |
|                                | D1              | Contact 1                                                                                                                                                                                                                                                           |
|                                | D2              | Contact 2                                                                                                                                                                                                                                                           |
|                                | D3              | Contact 2                                                                                                                                                                                                                                                           |
| PERIPHERAL FAULT BIT           |                 | —                                                                                                                                                                                                                                                                   |
| PROFILE                        | S-IO.ID.ID1.ID2 | S-7.B.F.E                                                                                                                                                                                                                                                           |
| INSERTION SPEED                |                 | 20 m/min                                                                                                                                                                                                                                                            |
| MIN/MAX TRAVEL                 |                 | 24.5 mm / 29.5 mm                                                                                                                                                                                                                                                   |
| INSERTION FORCE                |                 | 25 N                                                                                                                                                                                                                                                                |
| EXTRACTION FORCE               |                 | 10 N                                                                                                                                                                                                                                                                |
| LOCKING FORCE                  |                 | —                                                                                                                                                                                                                                                                   |
| PROTECTION (IEC)               |                 | IP67                                                                                                                                                                                                                                                                |
| TEMPERATURE RANGE              | WORKING         | -4 °F to +131 °F (-20 °C to +55 °C)                                                                                                                                                                                                                                 |
|                                | STORAGE         | -4 °F to +131 °F (-20 °C to +55 °C)                                                                                                                                                                                                                                 |
| HOUSING MATERIAL               |                 | PA6-GF30, metal head                                                                                                                                                                                                                                                |
| WEIGHT                         |                 | 198 g (7 oz)                                                                                                                                                                                                                                                        |
| APPROVALS                      |                 |    NFPA 79 |
| AS-INTERFACE CONNECTION        |                 |  M12 quick disconnect                                                                                                                                                            |



## Specifications

|                                    |                 | AS-i powered                                 | AUX powered                                  |
|------------------------------------|-----------------|----------------------------------------------|----------------------------------------------|
| MODEL NUMBER(S)                    | Power to lock   | VAA-2E3A-LIM1-PL-J-S-V1                      | VAA-2E3A-LIM1-PL-L-S-V1                      |
|                                    | Power to unlock | VAA-2E3A-LIM1-PU-J-S-V1                      | VAA-2E3A-LIM1-PU-L-S-V1                      |
| EXTENDED ADDRESSING (62 NODES)     |                 | No                                           | No                                           |
| REQUIRED MASTER SPEC.              |                 | —                                            | —                                            |
| OPERATING VOLTAGE AS-i             |                 | 26.5-31.6 V                                  | 26.5-31.6 V                                  |
| OPERATING VOLTAGE V <sub>AUX</sub> |                 | —                                            | 21.6-27.6 VDC                                |
| AS-i OPERATING CURRENT             |                 | 45-300mA                                     | 45 mA                                        |
| AUXILIARY CURRENT LIMIT            |                 | —                                            | 300 mA                                       |
| INPUTS -S                          |                 | Safety                                       | Safety                                       |
| TYPE                               |                 | Mechanical Interlock                         | Mechanical Interlock                         |
| SUPPLY VOLTAGE                     |                 | From AS-Interface                            | From AS-Interface                            |
| MECHANICAL ACTIVATIONS             |                 | 1 x 10 <sup>6</sup>                          | 1 x 10 <sup>6</sup>                          |
| OUTPUTS                            |                 | Power to lock (-PL)<br>Power to unlock (-PU) | Power to lock (-PL)<br>Power to unlock (-PU) |
| SUPPLY VOLTAGE                     |                 | From AS-Interface                            | From Auxiliary                               |
| DATA BITS                          | D0              | Contact 1+solenoid monitor/solenoid          | Contact 1+solenoid monitor/solenoid          |
|                                    | D1              | Contact 1+solenoid monitor/LED Red           | Contact 1+solenoid monitor/LED Red           |
|                                    | D2              | Contact 2/LED Green                          | Contact 2/LED Green                          |
|                                    | D3              | Contact 2                                    | Contact 2                                    |
| PERIPHERAL FAULT BIT               |                 | —                                            | —                                            |
| PROFILE S-IO.ID1.ID2               |                 | S-7.B.F.E                                    | S-7.B.F.E                                    |
| INSERTION SPEED                    |                 | 20 m/min                                     | 20 m/min                                     |
| MIN/MAX TRAVEL                     |                 | 24.5 mm / 29.5 mm                            | 24.5 mm / 29.5 mm                            |
| INSERTION FORCE (Not locked)       |                 | 30 N                                         | 30 N                                         |
| EXTRACTION FORCE (Not locked)      |                 | 20 N                                         | 20 N                                         |
| LOCKING FORCE                      |                 | 2000 N (2500 N max.)                         | 2000 N (2500 N max.)                         |
| PROTECTION (IEC)                   |                 | IP67                                         | IP67                                         |
| TEMPERATURE RANGE                  | WORKING         | -4 °F to +131 °F (-20 °C to +55 °C)          | -4 °F to +131 °F (-20 °C to +55 °C)          |
|                                    | STORAGE         | -4 °F to +131 °F (-20 °C to +55 °C)          | -4 °F to +131 °F (-20 °C to +55 °C)          |
| HOUSING MATERIAL                   |                 | PA6-GF30, metal head                         | PA6-GF30, metal head                         |
| WEIGHT                             |                 | 482 g (17 oz)                                | 482 g (17 oz)                                |
| APPROVALS                          |                 | NFPA 79                                      | NFPA 79                                      |
| AS-INTERFACE CONNECTION            |                 | M12 quick disconnect                         | M12 quick disconnect                         |

Gateways and Scanners

Power Supplies and Repeaters

I/O Modules

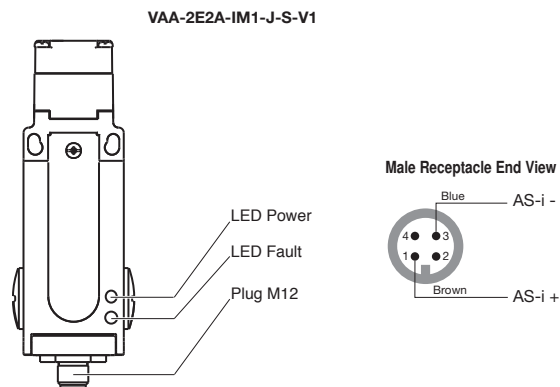
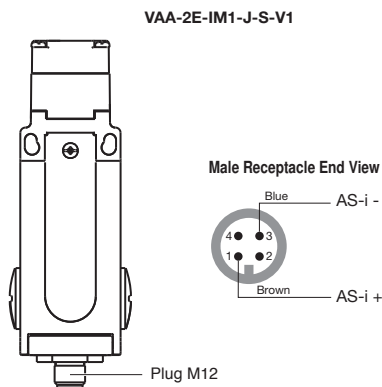
Safety at Work

Sensors

Cordsets

Accessories

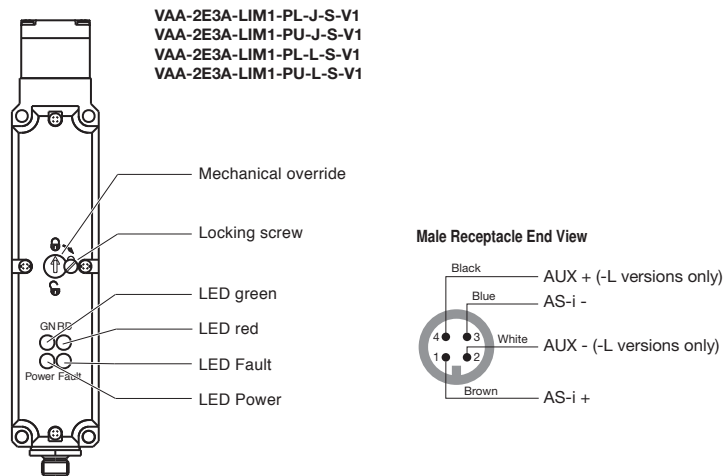
## Wiring Diagrams



### LED Indicators

**PWR:** Green: AS-Interface powered

**FAULT:** Red: Address 0 or no communication



### LED Indicators

**Power:** Green: AS-Interface powered

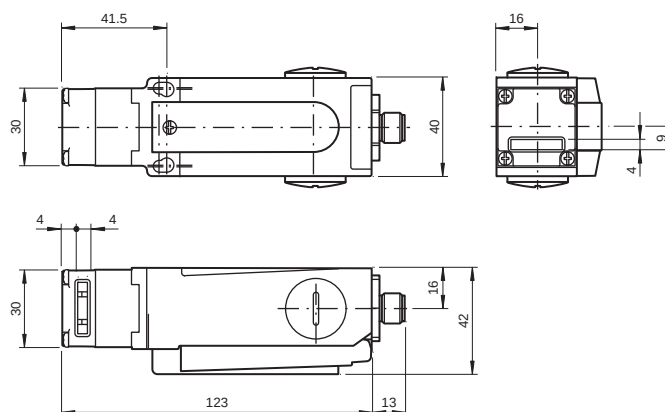
**Fault:** Red: Address 0 or no communication

**RD:** Red: User definable

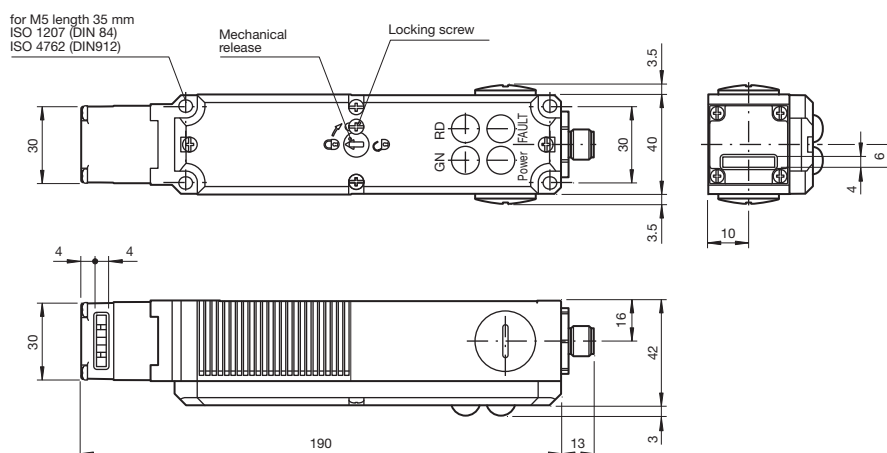
**GN:** Green: User definable

## Dimensions (mm)

VAA-2E-IM1-J-S-V1  
VAA-2E2A-IM1-J-S-V1



VAA-2E3A-LIM1-PL-J-S-V1  
VAA-2E3A-LIM1-PU-J-S-V1  
VAA-2E3A-LIM1-PL-L-S-V1  
VAA-2E3A-LIM1-PU-L-S-V1



Gateways and Scanners

Power Supplies and Repeater

I/O Modules

Safety at Work

Sensors

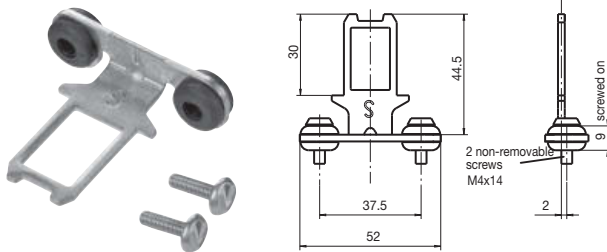
Cordsets

Accessories

## Accessories

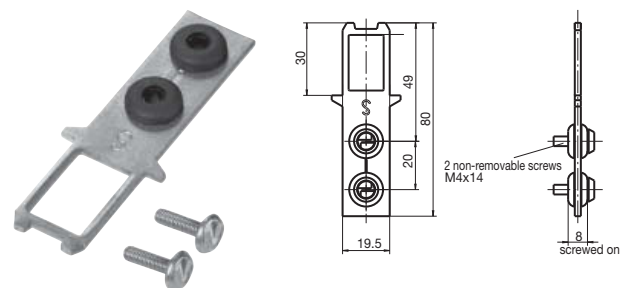
### VAZ-IM1-90°-BOLT-S

Right-angled key



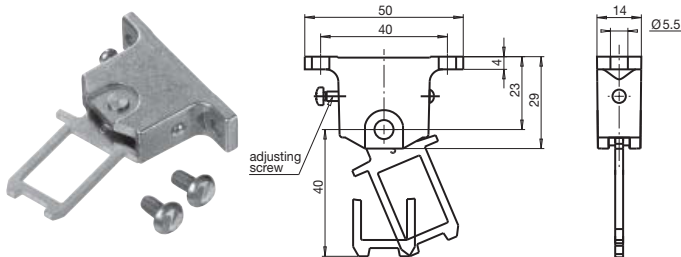
### VAZ-IM1-BOLT-S

Straight key



### VAZ-IM1-LR-RADIUS-BOLT-S

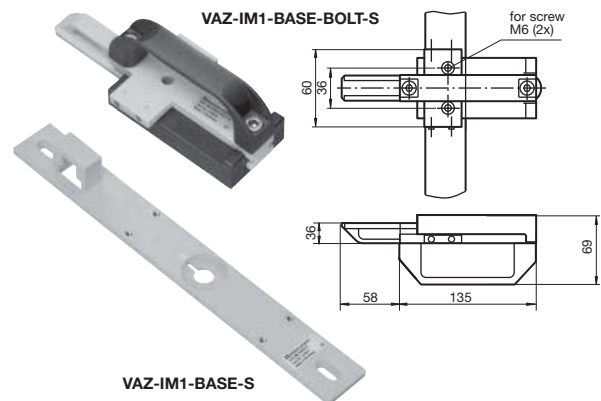
Right-angled key, adjustable



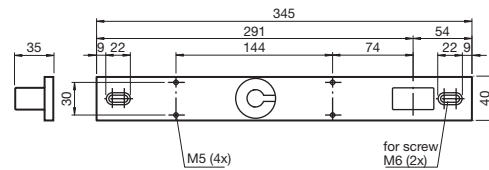
### VAZ-IM1-BASE-BOLT-S

### VAZ-IM1-BASE-S

Door handle and base for safe door locking. Key included. Design allows for lockout installation.

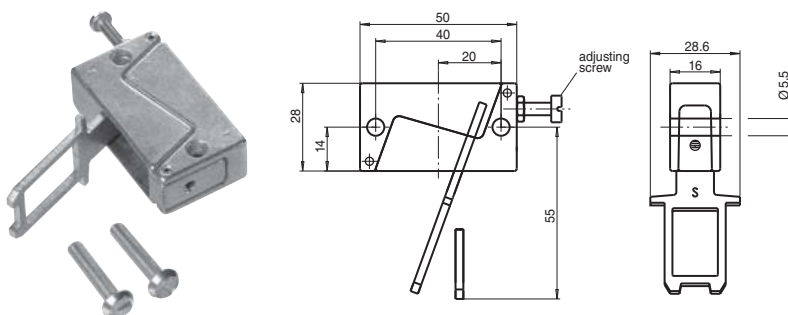


### VAZ-IM1-BASE-S



### VAZ-IM1-TD-RADIUS-BOLT-S

Key with adjustable start position and highly tolerant to close angle.



See pages 201-216 for complete AS-Interface accessory listing.





## Coded Magnetic Safety Interlock Switches

### Safety Solutions

- Tamper-resistant coded magnet actuator
- Sealed housing, good for washdown or dirty environments
- M12 quick disconnect for easy AS-Interface connection

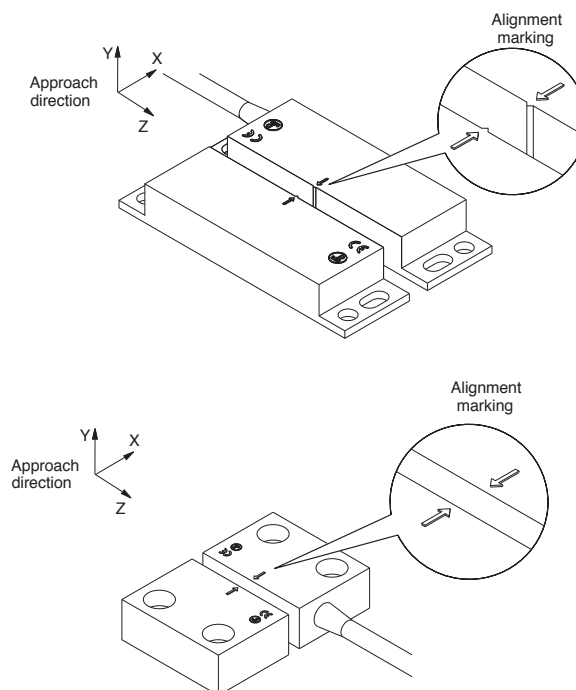
### Coded Magnetic Safety Interlock Switches Overview

Non-contact magnetic switches are designed for use on moveable machine guarding components. Their small size makes them perfect for space-limited mounting applications. Two housing designs are available depending on the space available and sensing range requirements.

Typical applications include food processing, chemical processing, packaging equipment, and robotics.

These magnetic switches are coded, meaning that a simple magnet cannot be used to bypass the safety switch. A special magnetic-coded actuator is required with this product. Because they are non-contact, they are rugged and withstand mechanical abuse and vibration. See sensing distances and mounting tolerances to find out if they are right for your application.

**See pages 142-143 for Coded Magnetic Safety Interlock Switches wiring and dimensions.**





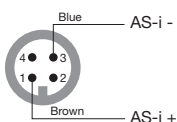
## Specifications

| OFF DISTANCE/ON DISTANCE       |                  | 12 mm/3 mm                                        | 18 mm/6 mm                                        |
|--------------------------------|------------------|---------------------------------------------------|---------------------------------------------------|
| MODEL NUMBER(S)                | Interlock Switch | VAA-2E1A-IER1-S-1M-V1                             | VAA-2E-IER2-S-1M-V1                               |
|                                | Actuator         | VAZ-IER1-ACTUATOR1-S                              | VAZ-IER2-ACTUATOR2-S                              |
| EXTENDED ADDRESSING (62 NODES) |                  | No                                                | No                                                |
| REQUIRED MASTER SPEC.          |                  | -                                                 | -                                                 |
| OPERATING VOLTAGE AS-i         |                  | 26.5-31.6 V                                       | 26.5-31.6 V                                       |
| OPERATING VOLTAGE $V_{AUX}$    |                  | -                                                 | -                                                 |
| AS-i OPERATING CURRENT         |                  | 45 mA                                             | 45 mA                                             |
| AUXILIARY CURRENT LIMIT        |                  | -                                                 | -                                                 |
| INPUTS                         |                  | Safety                                            | Safety                                            |
| TYPE                           |                  | Coded magnetic                                    | Coded magnetic                                    |
| SUPPLY VOLTAGE                 |                  | From AS-Interface                                 | From AS-Interface                                 |
| MECHANICAL ACTIVATIONS         |                  | 100 x 10 <sup>6</sup>                             | 100 x 10 <sup>6</sup>                             |
| OUTPUTS                        |                  | -                                                 | -                                                 |
| SUPPLY VOLTAGE                 |                  | -                                                 | -                                                 |
| CURRENT PER OUTPUT             |                  | -                                                 | -                                                 |
| DATA BITS                      | D0               | Contact 1                                         | Contact 1                                         |
|                                | D1               | Contact 1                                         | Contact 1                                         |
|                                | D2               | Contact 2                                         | Contact 2                                         |
|                                | D3               | Contact 2                                         | Contact 2                                         |
| PERIPHERAL FAULT BIT           |                  | -                                                 | -                                                 |
| PROFILE S-IO.ID.ID1.ID2        |                  | S-7.B.F.E                                         | S-0.B.F.E                                         |
| ALLOWABLE LATERAL OFFSET       |                  | ± 2.5 mm at 3 mm separation                       | ± 2.5 mm at 3 mm separation                       |
| PROTECTION (IEC)               |                  | IP69K                                             | IP69K                                             |
| TEMPERATURE RANGE              | WORKING          | -4 °F to +140 °F (-20 °C to +60 °C)               | -4 °F to +140 °F (-20 °C to +60 °C)               |
|                                | STORAGE          | -4 °F to +140 °F (-20 °C to +60 °C)               | -4 °F to +140 °F (-20 °C to +60 °C)               |
| HOUSING MATERIAL               |                  | PPS                                               | PPS                                               |
| WEIGHT                         |                  | 800 g (27 oz)                                     | 405 g (14 oz)                                     |
| APPROVALS                      |                  | CE cUL US TÜV approved up to cat.4 / SIL3 NFPA 79 | CE cUL US TÜV approved up to cat.4 / SIL3 NFPA 79 |
| AS-INTERFACE CONNECTION        |                  | 1 m pigtail with M12 quick disconnect             | 1 m pigtail with M12 quick disconnect             |

## Wiring Diagrams

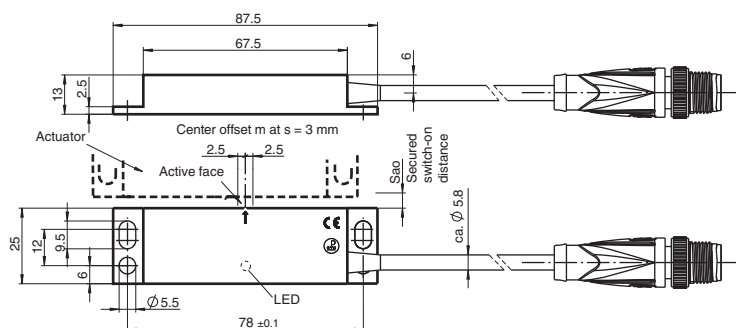
VAA-2E1A-IER1-S-V3  
VAA-2E1A-IER2-S-V3

Male Receptacle End View

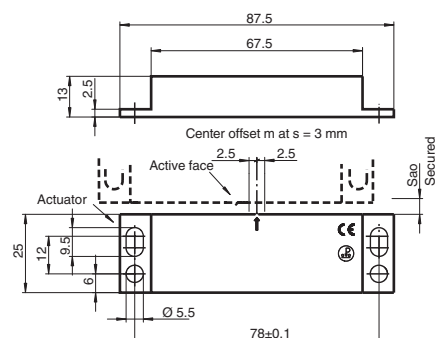


## Dimensions (mm)

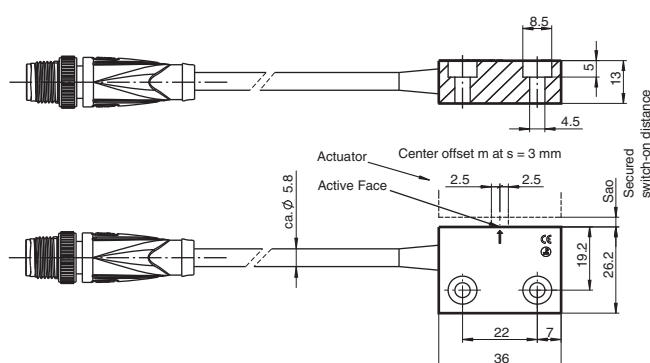
VAA-2E1A-IER1-S-V1



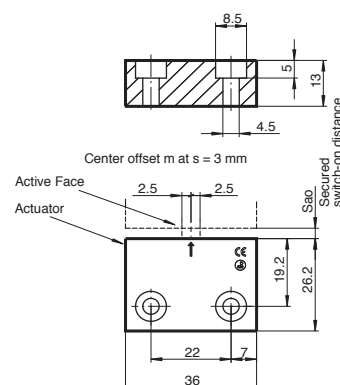
VAZ-IER1-ACTUATOR1-S



VAA-2E-IER2-S-V1



VAZ-IER2-ACTUATOR2-S



See pages 201-216 for complete AS-Interface accessory listing.

## RFID Safety Interlock Switches Safety Solutions

- Up to 4 safe read heads on one safety module
- No mechanical components to wear out
- Worry-free installation with no alignment issues
- Read heads and tags good for washdown or dirty environments
- Non-contact heads and tags great for high-vibration environments



### RFID Safety Interlock Switches Overview

RFID safety modules are unique because you can choose to connect as few as one read head, or as many as four read heads to one control module. A factory programmed read only code is embedded in every RFID tag. During the teach phase of the installation the tag code is read and associated with a specific read head channel. If any one of the heads does not see the corresponding tag, the module will safely switch to the off state and inform the SafetyMonitors on the network.

RFID read heads and tags are typically used in harsh and dirty environments where other mechanical safety switches would not hold up. Because RFID technology is used, alignment issues are

a thing of the past and the RFID-based solution offers significant improvements in high vibration environments. Other safety switches can get into states where one of its contacts are closed but the other is not. RFID readers can be off or on and no other intermediate or undetermined conditions are possible.

RFID readers cannot be bypassed or overridden by other non-contact guard switching technologies making them the safest technology in the industry.

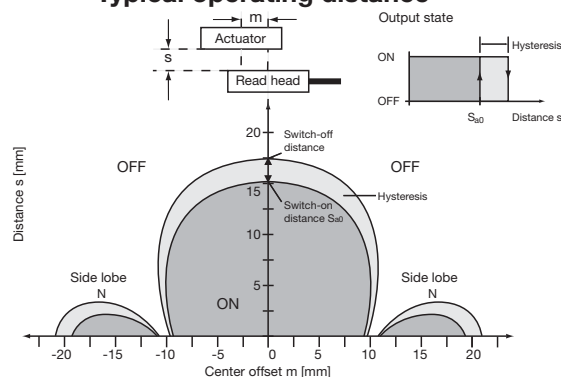
**See pages 146-147 for RFID Safety Interlock Switches wiring and dimensions**



## Specifications

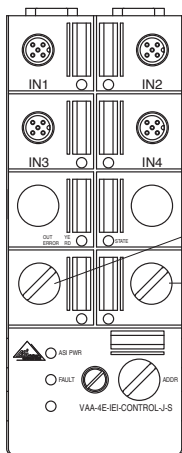
|                                |                                                                                                                    |                                                                                                       |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| MODEL NUMBER(S)                | Controller                                                                                                         | VAA-4E-IEI1-CONTROL-J-S                                                                               |
|                                | Read Head                                                                                                          | VAZ-IEI1-READER1-S-V3                                                                                 |
|                                | Tag                                                                                                                | VAZ-IEI1-TAG1-S                                                                                       |
| EXTENDED ADDRESSING (62 NODES) | No                                                                                                                 |                                                                                                       |
| REQUIRED MASTER SPEC.          | -                                                                                                                  |                                                                                                       |
| OPERATING VOLTAGE AS-i         | 26.5-31.6 V                                                                                                        |                                                                                                       |
| OPERATING VOLTAGE $V_{AUX}$    | -                                                                                                                  |                                                                                                       |
| AS-i OPERATING CURRENT         | < 130 mA                                                                                                           |                                                                                                       |
| AUXILIARY CURRENT LIMIT        | -                                                                                                                  |                                                                                                       |
| INPUTS                         | -S                                                                                                                 | Safety                                                                                                |
| TYPE                           | RFID, non-contact                                                                                                  |                                                                                                       |
| SUPPLY VOLTAGE                 | From AS-Interface                                                                                                  |                                                                                                       |
| OUTPUTS                        | -                                                                                                                  |                                                                                                       |
| SUPPLY VOLTAGE                 | -                                                                                                                  |                                                                                                       |
| DATA BITS                      | D0                                                                                                                 | Safe code sequence                                                                                    |
|                                | D1                                                                                                                 | Safe code sequence                                                                                    |
|                                | D2                                                                                                                 | Safe code sequence                                                                                    |
|                                | D3                                                                                                                 | Safe code sequence                                                                                    |
| PARAMETER BITS (read)          | P0                                                                                                                 | Head 1 tag present/absent                                                                             |
|                                | P1                                                                                                                 | Head 2 tag present/absent                                                                             |
|                                | P2                                                                                                                 | Head 3 tag present/absent                                                                             |
|                                | P3                                                                                                                 | Head 4 tag present/absent                                                                             |
| PERIPHERAL FAULT BIT           | Read head power overload                                                                                           |                                                                                                       |
| PROFILE                        | S-IO.ID1.ID2                                                                                                       | S-0.B.F.E                                                                                             |
| READ RANGE (see diagram)       | On                                                                                                                 | 15 mm                                                                                                 |
|                                | Off                                                                                                                | 17 mm                                                                                                 |
| MINIMUM READ DISTANCE          | 3 mm                                                                                                               |                                                                                                       |
| PROTECTION (IEC)               | IP67 (Read head/tag IP69K)                                                                                         |                                                                                                       |
| TEMPERATURE RANGE              | WORKING                                                                                                            | Controller: +32 °F to +122 °F (0 °C to +50 °C)<br>Read head/tag: -13 °F to +122 °F (-25 °C to +58 °C) |
|                                | STORAGE                                                                                                            | Controller: +32 °F to +122 °F (0 °C to +50 °C)<br>Read head/tag: -13 °F to +122 °F (-25 °C to +58 °C) |
| HOUSING MATERIAL               | PBT                                                                                                                |                                                                                                       |
| WEIGHT                         | 150 g (5.3 oz)                                                                                                     |                                                                                                       |
| APPROVALS                      |                                                                                                                    |                                                                                                       |
| AS-INTERFACE CONNECTION        | Flat yellow cable                                                                                                  |                                                                                                       |
| I/O CONNECTION                 | Controller: M12 quick disconnect,<br>Read head: M8 quick disconnect<br>(max. read head to module distance is 25 m) |                                                                                                       |

## Typical operating distance

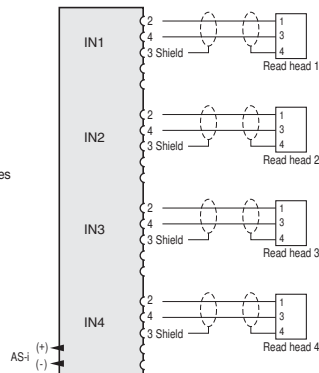


For a side approach direction for the actuator and read head, a minimum distance of  $s = 3$  mm must be maintained so that the operating distance of the side lobes is not entered.

## Wiring Diagrams



VAA-4E-IEI1-CONTROL-J-S



### LED Indicators

**FAULT:** Red (solid): Communication error or address 0  
Red (flashing): Overload of read head power

**PWR:** Green (solid): AS-Interface powered  
Green (flashing): Address 0

**IN:** Yellow: Tag in front of read head

**OUT/ERROR:** Yellow (solid): Tag in front of all read heads  
Red (solid): Device internal error, less than 0.5 s in detection zone  
Red (solid) with state blinking: Configuration error

**STATE:** Green (solid) with OUT/ERROR Red: tag not in front of all read heads  
Green (solid) with OUT/ERROR Yellow: tag in front of all read heads  
Green (flashing 15 Hz): Self test  
Green (flashing 4 Hz): Ready to teach tag  
Green (flashing 1 Hz): Teaching tag  
Green (flashing 3 times): Configuration error

VAZ-IEI1-READER1-S-V3

Male Receptacle End View



### Read head/Tag teach procedure

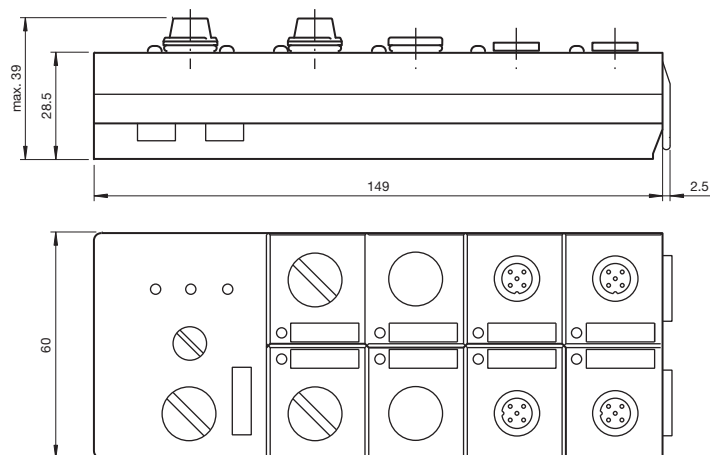
1. Disconnect node from AS-i. Remove right blank cover and turn DIP switch 1 on.
2. Remove left blank cover and set DIP switches to enable read heads to be used
 

|          |                            |
|----------|----------------------------|
| Switch 1 | ON = Read head 1 connected |
| Switch 2 | ON = Read head 2 connected |
| Switch 3 | ON = Read head 3 connected |
| Switch 4 | ON = Read head 4 connected |
3. Place tags over read heads
4. Connect node to AS-i. Wait for 10s self test, and teach to complete. Teach successful if STATE LED is off and failed if blinking 3 times.
5. Disconnect node from AS-i and wait 10s. Turn DIP switches off that are under right blank cover.
6. Connect node to AS-i.

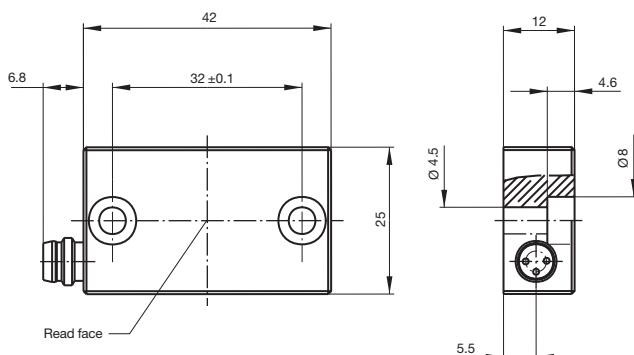


## Dimensions (mm)

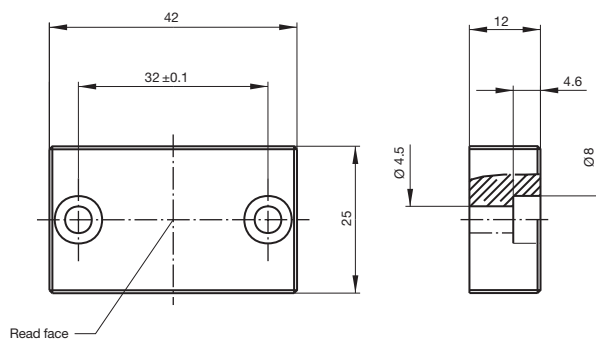
## VAA-4E-IEI1-CONTROL-J-S



## VAZ-IEI1-READER1-S-V3



## VAZ-IEI1-TAG1-S



## Accessories

**V3-GM-2M-PUR-ABG43-V1-G**

2 meter shielded cable for connection of read head to controller.

**V3-GM-5M-PUR-ABG43-V1-G**

5 meter shielded cable for connection of read head to controller.



See pages 201-216 for complete AS-Interface accessory listing.

## Enabling Switch Safety Solutions

- Ergonomic, lightweight design
- Connects directly to AS-Interface
- Three switch positions for maximum safety



### Enabling Switch Overview

Enabling switches are unique devices that allow a user to enter a potentially harmful area to do required maintenance without shutting the machine down. The three-position device (OFF-ON-OFF) must be continuously held in the center position to enable machine power. If the user senses an unsafe condition exists they can fully push or release the enabling switch to go to shut down.

Because the enabling switch has its own AS-Interface address it can be linked to any and all safety zones on the network. When the enabling switch is used with AS-i, the speed of the machine is reduced when a user enters the potentially harmful area, further reducing the risk of injury.

This device is particularly useful in robotics applications in conjunction with our 16-channel SafetyMonitor and the safe output modules. The safe output module can be used to locally interface with safe input on the robot instructing the robot controller to operate at reduced speed.

**See pages 149-150 for Enabling Switch wiring and dimensions**



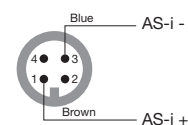
## Specifications

| Specifications                 |                                                   |
|--------------------------------|---------------------------------------------------|
| MODEL NUMBER(S)                | VAA-3E-HH30-J-S-V1                                |
| EXTENDED ADDRESSING (62 NODES) | No                                                |
| REQUIRED MASTER SPEC.          | -                                                 |
| OPERATING VOLTAGE AS-i         | 26.5-31.6 V                                       |
| OPERATING VOLTAGE $V_{AUX}$    | -                                                 |
| AS-i OPERATING CURRENT         | < 45 mA                                           |
| AUXILIARY CURRENT LIMIT        | -                                                 |
| INPUTS                         | -S Safety                                         |
| TYPE                           | Enabling switch                                   |
| SUPPLY VOLTAGE                 | From AS-Interface                                 |
| MECHANICAL ACTIVATIONS         | 1 x 10 <sup>5</sup>                               |
| DATA BITS                      |                                                   |
| D0                             | Contact 1                                         |
| D1                             | Contact 1                                         |
| D2                             | Contact 2                                         |
| D3                             | Contact 2                                         |
| PERIPHERAL FAULT BIT           | -                                                 |
| PROFILE                        | S-IO.ID1.ID2 S-7.B.F.E                            |
| PROTECTION (IEC)               | IP67                                              |
| TEMPERATURE RANGE              |                                                   |
| WORKING                        | +23 °F to +122 °F (-5 °C to +50 °C)               |
| STORAGE                        | +23 °F to +122 °F (-5 °C to +50 °C)               |
| HOUSING MATERIAL               | PA, Neoprene                                      |
| WEIGHT                         | 150 g (5.3 oz)                                    |
| APPROVALS                      | CE cUL US TÜV approved up to cat.4 / SIL3 NFPA 79 |
| AS-INTERFACE CONNECTION        | M12 quick disconnect                              |

## Wiring Diagrams

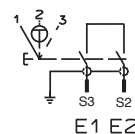
VAA-3E-HH30-J-S-V1

Male Receptacle End View



## Function of the switching element

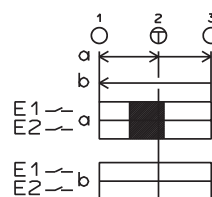
Switching element



□ Contacts open  
■ Contacts closed

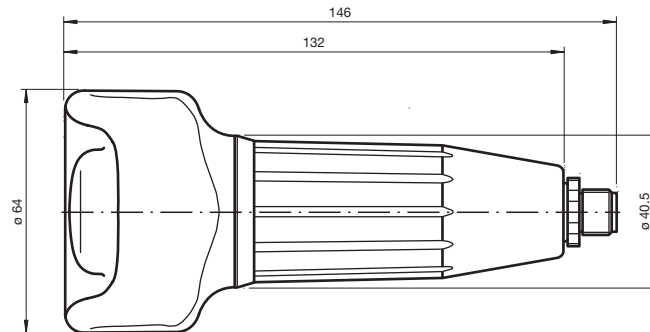
E = switching element  
⊕ = Action point

Travel diagram



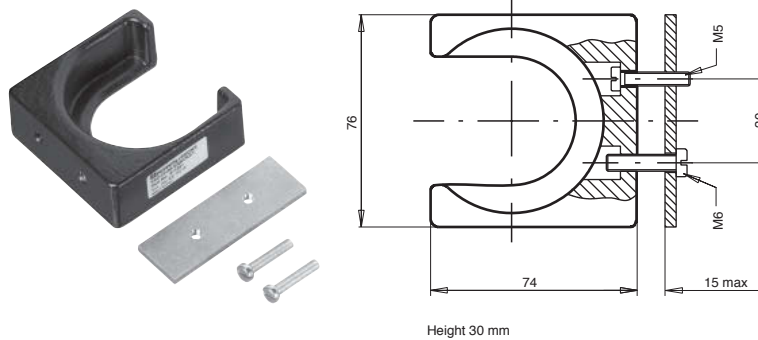
## Dimensions (mm)

VAA-3E-HH30-J-S-V1



## Accessories

VAZ-HH30-BRACKET



See pages 201-216 for complete AS-Interface accessory listing.



# Intelligent Sensors

|                                                                          |            |
|--------------------------------------------------------------------------|------------|
| <b>Cylindrical Inductive.....</b>                                        | <b>153</b> |
| <b>Limit Switch Inductive.....</b>                                       | <b>157</b> |
| <b>Rhino™ Inductive .....</b>                                            | <b>160</b> |
| <b>Rectangular Inductive .....</b>                                       | <b>162</b> |
| <b>Flat Pack Inductive .....</b>                                         | <b>164</b> |
| <b>Valve Positioning Inductive.....</b>                                  | <b>166</b> |
| <b>Series 28 Photoelectric.....</b>                                      | <b>169</b> |
| <b>BVS58/BVM58 Series Solid-Shaft<br/>Absolute Rotary Encoders.....</b>  | <b>178</b> |
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## Intelligent Inductive Sensors

Sensors can be equipped with the AS-Interface chip. Every sensor can be a module on AS-Interface and up to 62 smart sensors can be on the network at one time. Each sensor provides valuable diagnostic information. "Intelligent" sensors are self-monitoring, programmable, and transmit data over the network to a controller. An AS-Interface sensor offers many features that are not available with a standard sensor such as coil monitoring, precollision and out of range detection; and all are NO/NC programmable. Additional diagnostic capabilities available with intelligent inductive sensors include the following:

### Normally Open/Normally Closed Programmable

Stocking two sensors is no longer required. With AS-Interface intelligent sensors, OEMs have the opportunity to reduce the number of sensors on a system. Instead of stocking inductive sensors with normally open and normally closed outputs, one intelligent sensor can be used and configured to be normally open or normally closed. Each time the

sensor is plugged in, it is automatically configured to the correct setting.

### Prefailure Indication

Prefailure indication is another advanced function offered in some of the P+F AS-Interface intelligent inductive sensors. If the target is between 100% and 120% of the sensor's nominal sensing range, the prefailure bit is reported. When this situation is indicated, users can correct the mounting and/or the misalignment before the target is out of range.

### Precollision Indication

When a target gets too close to an inductive sensor face, a precollision condition is indicated. Users can reposition the sensor so that the target does not hit the sensor. This type of indication may reduce the cost of replacing a standard sensor that was damaged because of misalignment.

### Oscillator Monitoring

Repeated direct contact between sensors and their targets can cause coils and oscillators to stop running. If a sensor without oscillator monitoring stops operating, the PLC receives a failure code only once the target is missed. Using AS-Interface and intelligent sensors, a failure notice is immediately sent to the scanner/gateway in a data bit. The PLC is then notified, and the damaged sensor can be replaced quickly and easily, improving quality and reducing downtime.

### Activation Delay Filter

With activation filtering, all targets present for less than 15 ms will not be transferred to AS-Interface. This eliminates false triggering due to noise, weld fields, and other unforeseen disruptions. When the sensor is programmed for normally open, there is a 15 ms ON delay. When the sensor is programmed for normally closed, there is a 15 ms OFF delay.

There are many housing styles available. All are directly connected to the AS-Interface line, and power and communications run over the same two wires. Pepperl+Fuchs has 12 mm, 18 mm and 30 mm cylindrical, limit switch style, rectangular, Rhino, and flat packs for your AS-Interface network.

### Intelligent Photoelectric Sensors

In most applications, I/O modules bring sensor inputs back to the AS-Interface scanner/gateway and to the PLC. Modules can have up to 4 inputs (plus additional outputs), and each module takes up a full or a half address. Like modules, intelligent photoelectric sensors also take up a half address. Up to 4 input bits are available to provide valuable diagnostic information.

#### Additional Diagnostic Capabilities Available With Intelligent Photoelectric Sensors

- Weak signal indication: When photoelectric sensors are used, it is possible to detect a weak signal before the sensor stops working. Maintenance can be performed on an as-needed basis.
- Configurable light on/dark on: One intelligent sensor can be used and configured for the light on/dark on behavior. Separate sensors are not necessary.

### Absolute Rotary Encoders

In automation applications, rotary encoders are used as sensors for angle, position, speed, and acceleration. By using spindles, gear racks, measuring wheels, or cable pulls, linear movements can also be monitored by a rotary encoder. Rotary encoders convert a mechanical rotation value into an electrical signal that can be processed by counters, tachometers, logic controllers, and industrial PCs. Rotary encoders are among the most useful and versatile pieces of equipment available to the automation industry.

Pepperl+Fuchs is proud to offer the industry's only AS-Interface absolute rotary encoders. Absolute encoders provide a uniquely coded numerical value for each shaft position. They eliminate the need for expensive input components in a positioning application because they have built-in reference data.

P+F AS-Interface rotary encoders use state-of-the-art components and the latest technologies to ensure reliability and a long service life. Additionally, P+F encoders feature precision bearings for a long life and low maintenance, with wire connections that are sealed up to IP65. Durable aluminum housings and solid-state circuitry make P+F encoders suitable for rugged environments.

Our absolute rotary encoders allow an easy 2-wire connection to AS-Interface and are available in both single- and multi-turn versions. Single-turn absolute encoders divide the shaft into a defined number of steps. The maximum resolution is 13 bits, which means that up to 8192 positions can be defined. By using a multi-step gear, multi-turn absolute encoders not only provide the angular position within a revolution, but also the number of revolutions. Multi-turn encoders have a 16-bit resolution or 65,536 total measuring steps.

Four nodes are used to transmit the 16 bits of data back to the AS-Interface network, and there is an AS-Interface network gateway/scanner available for almost any system. The standard 58 mm housings are available in solid-shaft (BV series) or recessed hollow-shaft (BS series) versions and in a variety of mounting configurations.





## Cylindrical Inductive Proximity Sensors

- Oscillator monitoring
- Programmable normally open/ normally closed
- Programmable activation delay filter
- Warning outputs for target too close and too far
- M12 quick disconnect AS-Interface connection

### Cylindrical Sensors Overview

Inductive proximity sensors are inexpensive, durable, resistant to industrial contaminants, and have precise triggering characteristics. They utilize a high frequency electromagnetic field to detect metal objects. Their combination of durability, high accuracy, and quick response time makes them an invaluable tool in a wide variety of industries.

Cylindrical sensors are available that allow up to 62 intelligent sensors to be put on one AS-Interface network (2.1 compatible) and then be brought back to a controller. Pepperl+Fuchs offers these sensors in shielded (flush-mounted) or unshielded (nonflush-mounted) versions with sensing ranges from 4 mm to 15 mm in threaded stainless steel housings. All have micro (M12x1) connectors with multiple LEDs, IP67

rating, and all are programmable (normally open/ normally closed). Sensor diameters range from 12 mm to 30 mm.

Many of the cylindrical AS-Interface intelligent sensors offer oscillator monitoring, input filtering, and target too close/target too far away outputs.

A specially coated, weld immune version is available that is specifically designed to prevent weld slag accumulations and operate reliably in harsh welding conditions. The sensor coil system and control circuitry provide excellent protection from the effects of AC electromagnetic fields.

**See pages 155-156 for Cylindrical Sensors wiring and dimensions.**



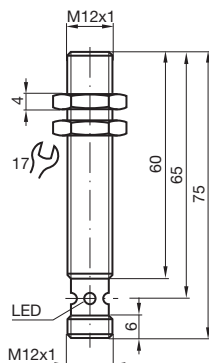
## Specifications

| SENSING RANGE                  |         | 4 mm                                 | 4 mm                                 | 5 mm                                 |
|--------------------------------|---------|--------------------------------------|--------------------------------------|--------------------------------------|
| SHIELDED                       |         | Yes                                  | No                                   | Yes                                  |
| MODEL NUMBER(S)                |         | NCB4-12GM60-B3B-V1                   | NCN4-12GM60-B3B-C2-V1                | NCB5-18GM60-B3B-V1                   |
| EXTENDED ADDRESSING (62 NODES) |         | Yes                                  | Yes                                  | Yes                                  |
| OPERATING CURRENT              |         | 30 mA                                | 30 mA                                | 30 mA                                |
| REPEATABILITY                  |         | ≤ 0.01 mm                            | ≤ 0.01 mm                            | ≤ 0.01 mm                            |
| HYSTERESIS                     |         | 1-15% (5% typical)                   | 1-15% (5% typical)                   | 1-15% (5% typical)                   |
| SWITCHING FREQUENCY            |         | 500 Hz                               | 500 Hz                               | 100 Hz                               |
| WELD FIELD IMMUNE              |         | No                                   | Yes, AC field 100 mT                 | No                                   |
| DATA BITS                      | D0      | Sensor output                        | Sensor output                        | Sensor output                        |
|                                | D1      | Not used                             | Not used                             | Target too far away output           |
|                                | D2      | Not used                             | Not used                             | Oscillator monitor                   |
|                                | D3      | Not used                             | Not used                             | Target too close output              |
| PARAMETER BIT                  | P0      | 15 ms activation delay on*/off       | 15 ms activation delay on*/off       | 15 ms activation delay on*/off       |
|                                | P1      | N.O.*/N.C. programming               | N.O.*/N.C. programming               | N.O.*/N.C. programming               |
| PROFILE S-I0.ID1.ID2           |         | S-0.A.7.E                            | S-0.A.7.E                            | S-0.A.7.E                            |
| PROTECTION (IEC)               |         | IP67                                 | IP67                                 | IP67                                 |
| TEMPERATURE RANGE              | WORKING | -13 °F to +158 °F (-25 °C to +70 °F) | -13 °F to +158 °F (-25 °C to +70 °F) | -13 °F to +158 °F (-25 °C to +70 °F) |
|                                | STORAGE | -40 °F to +185 °F (-40 °C to +85 °F) | -40 °F to +185 °F (-40 °C to +85 °F) | -40 °F to +185 °F (-40 °C to +85 °F) |
| HOUSING MATERIAL               |         | PBT/stainless steel                  | PBT/stainless steel                  | PBT/stainless steel                  |
| WEIGHT                         |         | 43 g (1.5 oz)                        | 43 g (1.5 oz)                        | 57 g (2 oz)                          |
| APPROVALS                      |         | CE                                   | CE                                   | CE                                   |
| ELECTRICAL CONNECTION          |         | M12 quick disconnect                 | M12 quick disconnect                 | M12 quick disconnect                 |

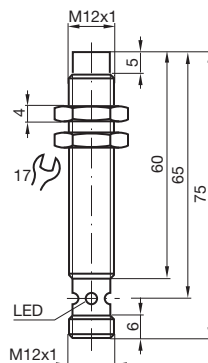
\* Default setting

## Dimensions (mm)

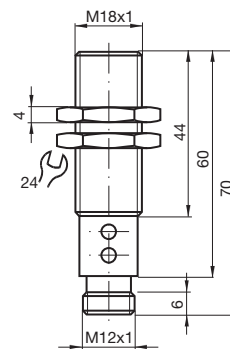
NCB4-12GM60-B3B-V1



NCN4-12GM60-B3B-C2-V1



NCB5-18GM60-B3B-V1





## Specifications

| SENSING RANGE                  |         | 8 mm                                 | 15 mm                                |
|--------------------------------|---------|--------------------------------------|--------------------------------------|
| SHIELDED                       |         | No                                   | Yes                                  |
| MODEL NUMBER(S)                |         | NCN8-18GM60-B3B-V1                   | NBB15-30GM60-B3B-V1                  |
| EXTENDED ADDRESSING (62 NODES) |         | Yes                                  | Yes                                  |
| OPERATING CURRENT              |         | 30 mA                                | 30 mA                                |
| REPEATABILITY                  |         | ≤ 0.01 mm                            | ≤ 0.01 mm                            |
| HYSTERESIS                     |         | 1-15% (5% typical)                   | 1-15% (5% typical)                   |
| SWITCHING FREQUENCY            |         | 100 Hz                               | 200 Hz                               |
| WELD FIELD IMMUNE              |         | No                                   | No                                   |
| DATA BITS                      | D0      | Sensor output                        | Sensor output                        |
|                                | D1      | Target too far away output           | Not used                             |
|                                | D2      | Oscillator monitor                   | Not used                             |
|                                | D3      | Target too close output              | Not used                             |
| PARAMETER BIT                  | P0      | 15 ms activation delay on*/off       | 15 ms activation delay on*/off       |
|                                | P1      | N.O.*/N.C. programming               | N.O.*/N.C. programming               |
| PROFILE S-IO.ID1.ID2           |         | S-0.A.7.E                            | S-0.A.7.E                            |
| PROTECTION (IEC)               |         | IP67                                 | IP67                                 |
| TEMPERATURE RANGE              | WORKING | -13 °F to +158 °F (-25 °C to +70 °F) | -13 °F to +158 °F (-25 °C to +70 °F) |
|                                | STORAGE | -40 °F to +185 °F (-40 °C to +85 °F) | -40 °F to +185 °F (-40 °C to +85 °F) |
| HOUSING MATERIAL               |         | PBT/stainless steel                  | Nickel-plated brass                  |
| WEIGHT                         |         | 57 g (2 oz)                          | 142 g (5 oz)                         |
| APPROVALS                      |         | CE AS                                | CE AS                                |
| ELECTRICAL CONNECTION          |         | M12 quick disconnect                 | M12 quick disconnect                 |

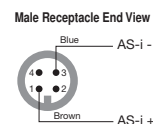
\* Default setting

## Wiring Diagrams



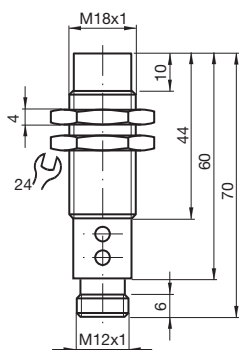
### Quick Disconnect

**Note:** Wiring diagrams show quick disconnect pin numbers

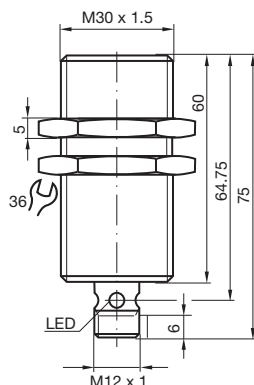


## Dimensions (mm)

NCN8-18GM60-B3B-V1



NBB15-30GM60-B3B-V1



## Accessories

(Dimensions in mm)

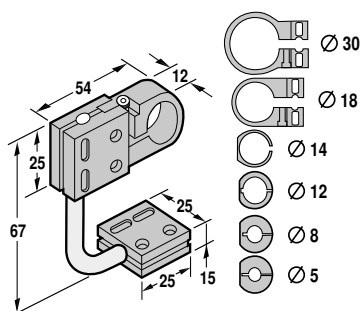
### Universal Bracket Model No. BF 5-30

- Holds inductive, photoelectric, and ultrasonic sensors of all diameters
- Easy installation
- Simple adjustment
- Secure fastening
- Flexible
- Durable



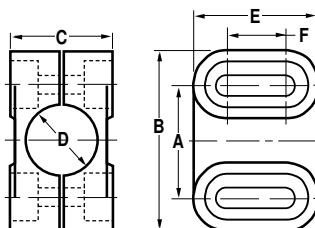
The BF 5-30 handles standard sensor sizes from 5 mm to 30 mm in diameter and provides 360° rotation on 2 axes.

**Model Number**  
BF5-30



### Adjustable Bracket

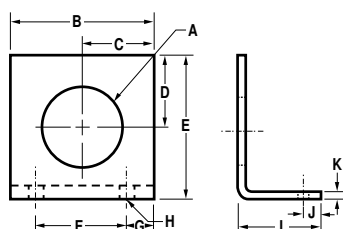
Brackets are available for cylindrical sensors of all diameters. Made of tough Crastin, the mounting bracket simplifies mounting and sensor adjustment. Order bracket by model number shown.



| Model No. | Sensor Diameter | A  | B  | C  | D  | E  | F  | Slot Width | Mounting Screws |
|-----------|-----------------|----|----|----|----|----|----|------------|-----------------|
| BF12      | 12 mm           | 24 | 36 | 19 | 12 | 30 | 16 | 4.5 mm     | #8-32           |
| BF18      | 18 mm           | 30 | 44 | 24 | 18 | 40 | 26 | 5.5 mm     | #10-24          |
| BF30      | 30 mm           | 40 | 56 | 36 | 30 | 40 | 24 | 5.5 mm     | #10-24          |

### Right Angle Bracket

Angle brackets are available in three diameter sizes and made of stainless steel. Sensors can be adjusted by using lock nuts supplied with sensor. Order by model number shown.



See pages 201-216 for complete AS-Interface accessory listing.

| Model No. and Sensor Dia. | Sensor Hole Dia.   | A                 | B                 | C                   | D                 | E                 | F              | G               | Mounting Dia. 2 Places | H               | I              | J | K |
|---------------------------|--------------------|-------------------|-------------------|---------------------|-------------------|-------------------|----------------|-----------------|------------------------|-----------------|----------------|---|---|
| AB12<br>12 mm             | 12.70<br>(1/2")    | 31.75<br>(1-1/4") | 15.87<br>(5/8")   | 17.46<br>(11/16")   | 31.75<br>(1-1/4") | 19.05<br>(3/4")   | 6.35<br>(1/4") | 4.76<br>(3/16") | 25.40<br>(1")          | 5.56<br>(7/32") | 3.17<br>(1/8") |   |   |
| AB18<br>18 mm             | 19.05<br>(3/4")    | 34.92<br>(1-3/8") | 17.46<br>(11/16") | 19.84<br>(25/32")   | 38.10<br>(1-1/2") | 22.22<br>(7/8")   | 6.35<br>(1/4") | 4.76<br>(3/16") | 25.40<br>(1")          | 5.56<br>(7/32") | 3.17<br>(1/8") |   |   |
| AB30<br>30 mm             | 30.96<br>(1-7/32") | 50.80<br>(2")     | 25.40<br>(1")     | 36.91<br>(1-29/64") | 63.50<br>(2-1/2") | 31.75<br>(1-1/4") | 9.52<br>(3/8") | 6.35<br>(1/4")  | 38.10<br>(1-1/2")      | 9.52<br>(3/8")  | 3.17<br>(1/8") |   |   |



## Limit Switch Inductive Proximity Sensors

- 5-way rotatable head
- Easy AS-Interface connection with terminal compartment
- Oscillator monitoring
- Normally open/normally closed programmable
- Programmable activation delay filter

### Limit Switch Sensors Overview

AS-Interface limit switch inductive sensors mount in the same footprint as traditional mechanical limit switches. Their sensing ranges extend from 20 mm to 40 mm. External power connections are made through a terminal compartment, and all are normally open/normally closed programmable.

All intelligent limit switch sensors are 2.1 compatible, and offer oscillator monitoring and input filtering. The 20 mm limit switch (NBB20+U1+B3B) is available in a shielded version and may be flush mounted. The NBN30+U1+B3B and the NBN40+U1+B3B are unshielded versions and cannot be flush mounted.

The housing of the sensor is made of PBT, which is resistant to abrasion and has excellent mechanical properties. Additionally, these limit switch sensors have a sensing face that is rotatable to any one of five positions, from front to top, to both sides, and to bottom.

**See pages 158-159 for Limit Switch Sensors wiring and dimensions.**

Gateways and Scanners

Power Supplies and Repeaters

I/O Modules

Safety at Work

Sensors

Cordsets

Accessories



## Specifications

| SENSING RANGE                  |         | 20 mm                                                                                                | 30 mm                                                                                                | 40 mm                                                                                                  |
|--------------------------------|---------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| SHIELDED                       |         | Yes                                                                                                  | No                                                                                                   | No                                                                                                     |
| MODEL NUMBER(S)                |         | NBB20+U1+B3B                                                                                         | NBN30+U1+B3B                                                                                         | NBN40+U1+B3B                                                                                           |
| EXTENDED ADDRESSING (62 NODES) |         | Yes                                                                                                  | Yes                                                                                                  | Yes                                                                                                    |
| OPERATING CURRENT              |         | 30 mA                                                                                                | 30 mA                                                                                                | 30 mA                                                                                                  |
| REPEATABILITY                  |         | ≤ 0.01 mm                                                                                            | ≤ 0.01 mm                                                                                            | ≤ 0.01 mm                                                                                              |
| HYSTERESIS                     |         | 1-15% (5% typical)                                                                                   | 1-15% (5% typical)                                                                                   | 1-15% (5% typical)                                                                                     |
| SWITCHING FREQUENCY            |         | 150 Hz                                                                                               | 150 Hz                                                                                               | 150 Hz                                                                                                 |
| WELD FIELD IMMUNE              |         | No                                                                                                   | No                                                                                                   | No                                                                                                     |
| DATA BITS                      | D0      | Sensor output                                                                                        | Sensor output                                                                                        | Sensor output                                                                                          |
|                                | D1      | Not used                                                                                             | Not used                                                                                             | Not used                                                                                               |
|                                | D2      | Oscillator monitor                                                                                   | Oscillator monitor                                                                                   | Oscillator monitor                                                                                     |
|                                | D3      | Not used                                                                                             | Not used                                                                                             | Not used                                                                                               |
| PARAMETER BIT                  | P0      | 15 ms activation delay on*/off                                                                       | 15 ms activation delay on*/off                                                                       | 15 ms activation delay on*/off                                                                         |
|                                | P1      | N.O.*/N.C. programming                                                                               | N.O.*/N.C. programming                                                                               | N.O.*/N.C. programming                                                                                 |
| PROFILE S-I0.ID1.ID2           |         | S-0.A.7.E                                                                                            | S-0.A.7.E                                                                                            | S-0.A.7.E                                                                                              |
| PROTECTION (IEC)               |         | IP68                                                                                                 | IP68                                                                                                 | IP68                                                                                                   |
| TEMPERATURE RANGE              | WORKING | -13 °F to +158 °F (-25 °C to +70 °F)                                                                 | -13 °F to +158 °F (-25 °C to +70 °F)                                                                 | -13 °F to +158 °F (-25 °C to +70 °F)                                                                   |
|                                | STORAGE | -40 °F to +185 °F (-40 °C to +85 °F)                                                                 | -40 °F to +185 °F (-40 °C to +85 °F)                                                                 | -40 °F to +185 °F (-40 °C to +85 °F)                                                                   |
| HOUSING MATERIAL               |         | PBT                                                                                                  | PBT                                                                                                  | PBT                                                                                                    |
| WEIGHT                         |         | 200 g (7 oz)                                                                                         | 200 g (7 oz)                                                                                         | 200 g (7 oz)                                                                                           |
| APPROVALS                      |         | CE                | CE                | CE                |
| ELECTRICAL CONNECTION          |         |  Terminal housing |  Terminal housing |  Terminal housing |

\* Default setting

## Dimensions (mm)

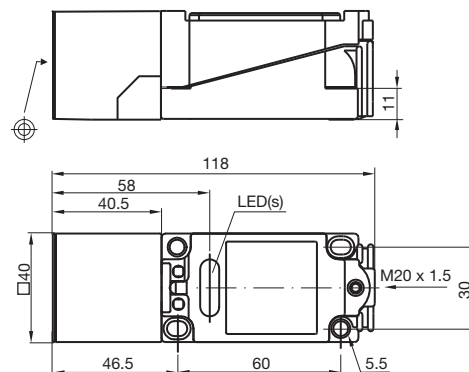
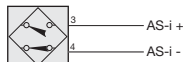
NBB20+U1+B3B  
NBN30+U1+B3B  
NBN40+U1+B3B

### Wiring Diagrams



#### Terminal Connection

Normally Open or  
Normally Closed





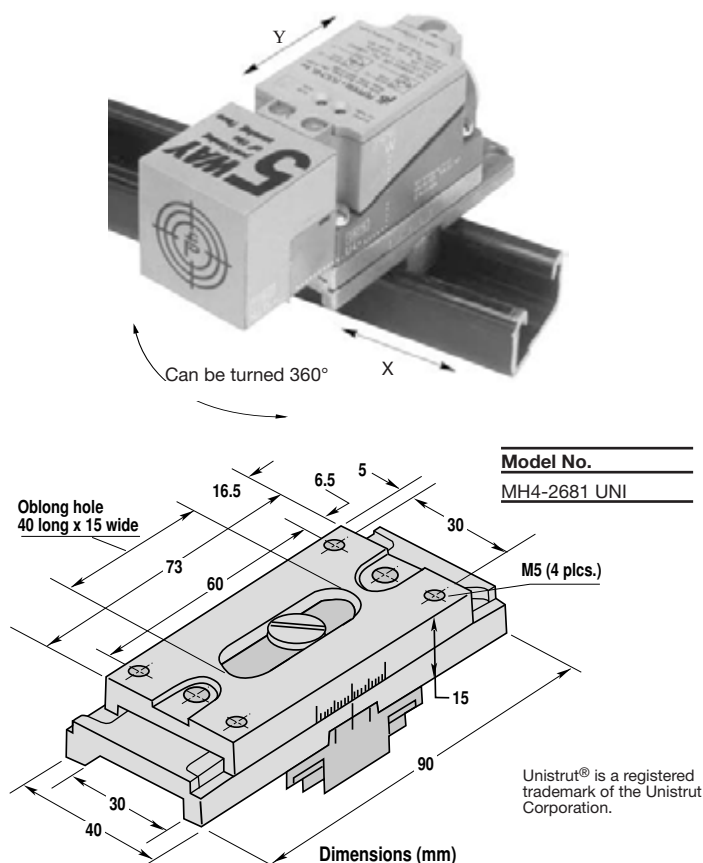
## Accessories

(Dimensions in mm)

### Adjustable Unistrut® Bracket

The adjustable Unistrut type mounting bracket is especially designed for the limit switch style sensors and can be adjusted up to 20 mm along the Y axis. It can be rotated 360° in increments of 1.87° and fits into the Unistrut. The bracket can be moved along the X axis to the full length of the Unistrut. The bracket is furnished with four M5x20 mm screws and two headless screws. The Unistrut mounting track can be ordered in lengths of 2 feet.

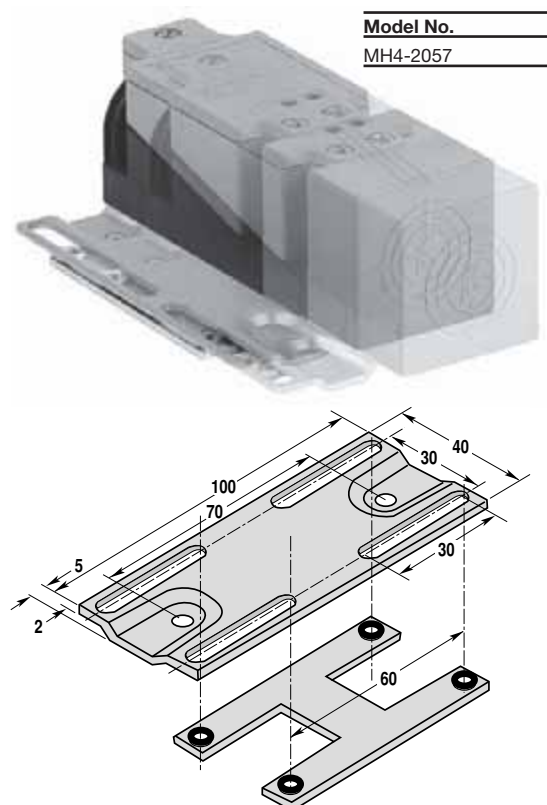
To order, specify model number **MH4-2681 UNI**.



### Adjustable Slide Bracket

With this bracket, the completely mounted and wired sensor can be moved up to 30 mm. When the M5-16 mm sensor mounting screws are loosened, the sensor can be moved back and forth easily. This allows precise adjustment of the sensing point. The sensor can be secured in the proper position by tightening the mounting screws. The bracket is made of aluminum to resist corrosion.

To order, specify model number **MH4-2057**.



**VAZ-T1-FK-M20**  
Flat cable to M20x1.5 adapter



See pages 201-216 for complete AS-Interface accessory listing.

## Rhino™ Inductive Proximity Sensors

- 25-position rotating head
- Oscillator monitoring
- Normally open/normally closed programmable
- Programmable activation delay filter
- M12 quick disconnect AS-Interface connection



### Rhino Sensors Overview

The popular Rhino series utilizes a durable, die-cast metal mounting bracket. Rhinos feature a “Quick-Pivot” sensing head, allowing tool-free configuration of the sensing face to any position. Rhino models offer sensing ranges and mounting “foot-prints” identical to inductive limit switches, but require only 1/3 the mounting space.

All of our intelligent Rhino sensors are 2.1 compatible, and offer oscillator monitoring, input filtering, and are normally open/normally closed programmable. The Rhino has a sensing range up to 30 mm. The 20 mm Rhino (NBB20-L2-B3B-V1) is available in a shielded version and may be flush mounted. The NBN30-L2-B3B-V1 and the NBN40-L2-B3B-V1 are unshielded versions and cannot be flush mounted.

**See page 161 for Rhino Sensors wiring and dimensions.**



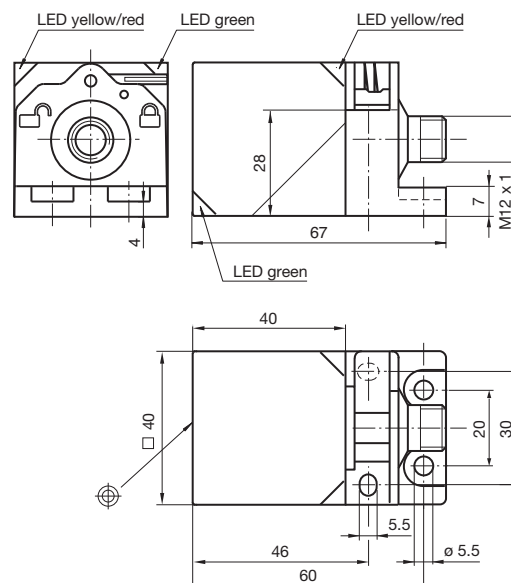
## Specifications

| SENSING RANGE                  |         | 20 mm                                | 30 mm                                | 40 mm                                |
|--------------------------------|---------|--------------------------------------|--------------------------------------|--------------------------------------|
| SHIELDED                       |         | Yes                                  | No                                   | No                                   |
| MODEL NUMBER(S)                |         | NBB20-L2-B3B-V1                      | NBN30-L2-B3B-V1                      | NBN40-L2-B3B-V1                      |
| EXTENDED ADDRESSING (62 NODES) |         | Yes                                  | Yes                                  | Yes                                  |
| OPERATING CURRENT              |         | 30 mA                                | 30 mA                                | 30 mA                                |
| REPEATABILITY                  |         | ≤ 0.01 mm                            | ≤ 0.01 mm                            | ≤ 0.01 mm                            |
| HYSTERESIS                     |         | 1-15% (5% typical)                   | 1-15% (5% typical)                   | 1-15% (5% typical)                   |
| SWITCHING FREQUENCY            |         | 100 Hz                               | 100 Hz                               | 100 Hz                               |
| WELD FIELD IMMUNE              |         | No                                   | No                                   | No                                   |
| DATA BITS                      | D0      | Sensor output                        | Sensor output                        | Sensor output                        |
|                                | D1      | Not used                             | Not used                             | Not used                             |
|                                | D2      | Oscillator monitor                   | Oscillator monitor                   | Oscillator monitor                   |
|                                | D3      | Not used                             | Not used                             | Not used                             |
| PARAMETER BIT                  | P0      | 15 ms activation delay on*/off       | 15 ms activation delay on*/off       | 15 ms activation delay on*/off       |
|                                | P1      | N.O.*/N.C. programming               | N.O.*/N.C. programming               | N.O.*/N.C. programming               |
| PROFILE S-IO.ID.ID1.ID2        |         | S-O.A.7.E                            | S-O.A.7.E                            | S-O.A.7.E                            |
| PROTECTION (IEC)               |         | IP67                                 | IP67                                 | IP67                                 |
| TEMPERATURE RANGE              | WORKING | -13 °F to +158 °F (-25 °C to +70 °F) | -13 °F to +158 °F (-25 °C to +70 °F) | -13 °F to +158 °F (-25 °C to +70 °F) |
|                                | STORAGE | -40 °F to +185 °F (-40 °C to +85 °F) | -40 °F to +185 °F (-40 °C to +85 °F) | -40 °F to +185 °F (-40 °C to +85 °F) |
| HOUSING MATERIAL               |         | PBT                                  | PBT                                  | PBT                                  |
| WEIGHT                         |         | 150 g (5 oz)                         | 150 g (5 oz)                         | 150 g (5 oz)                         |
| APPROVALS                      |         | CE                                   | CE                                   | CE                                   |
| ELECTRICAL CONNECTION          |         | M12 quick disconnect                 | M12 quick disconnect                 | M12 quick disconnect                 |

\* Default setting

## Dimensions (mm)

NBB20-L2-B3B-V1  
NBN30-L2-B3B-V1  
NBN40-L2-B3B-V1

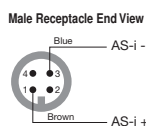


## Wiring Diagrams



### Quick Disconnect

**Note:** Wiring diagrams show quick disconnect pin numbers



See pages 201-216 for complete AS-Interface accessory listing.

## Rectangular Inductive Proximity Sensors

- Mounting holes in small flat housing
- Oscillator monitoring
- Normally open/normally closed programmable
- 2 m PVC cable for AS-Interface connection



### Rectangular Sensors Overview

Pepperl+Fuchs offers a compact surface-mount AS-Interface intelligent sensor that is only 12 mm thick, yet offers all of the features available in sensors twice the size. The NBB6-F-B3B offers oscillator monitoring, input filtering, and all are programmable (normally open/normally closed). This sensor is a shielded version and may be flush mounted. It has a protection rating of IP67.

The sensor's housing is made of PBT, which retains its dimensional stability. This rugged material is resistant to abrasion, has excellent mechanical properties, and exceptional resistance to chemicals, oils, fats, and most aqueous media.

**See page 163 for Rectangular Sensors wiring and dimensions.**



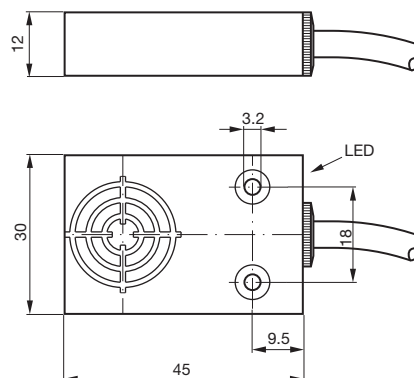
## Specifications

|                                       |                                                                                                                                     |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>SENSING RANGE</b>                  | 6 mm                                                                                                                                |
| <b>SHIELDED</b>                       | Yes                                                                                                                                 |
| <b>MODEL NUMBER(S)</b>                | NBB6-F-B3B                                                                                                                          |
| <b>EXTENDED ADDRESSING (62 NODES)</b> | Yes                                                                                                                                 |
| <b>OPERATING CURRENT</b>              | 20 mA                                                                                                                               |
| <b>REPEATABILITY</b>                  | ≤ 0.01 mm                                                                                                                           |
| <b>HYSTERESIS</b>                     | 1-15% (5% typical)                                                                                                                  |
| <b>SWITCHING FREQUENCY</b>            | ≥ 500 (P3=0), ≥ 100 (P3=1)                                                                                                          |
| <b>WELD FIELD IMMUNE</b>              | No                                                                                                                                  |
| <b>DATA BITS</b>                      |                                                                                                                                     |
| D0                                    | Sensor output                                                                                                                       |
| D1                                    | Not used                                                                                                                            |
| D2                                    | Oscillating monitor                                                                                                                 |
| D3                                    | Not used                                                                                                                            |
| <b>PARAMETER BIT</b>                  |                                                                                                                                     |
| P0                                    | 10 ms activation delay on*/off                                                                                                      |
| P1                                    | NO*/NC programming                                                                                                                  |
| <b>PROFILE</b> S-IO.ID1.ID1.ID2       | S-0.A.7.E                                                                                                                           |
| <b>PROTECTION (IEC)</b>               | IP67                                                                                                                                |
| <b>TEMPERATURE RANGE</b> WORKING      | -13 °F to +158 °F (-25 °C to +70 °F)                                                                                                |
| STORAGE                               | -40 °F to +185 °F (-40 °C to +85 °F)                                                                                                |
| <b>HOUSING MATERIAL</b>               | PBT                                                                                                                                 |
| <b>WEIGHT</b>                         | 90 g (3 oz)                                                                                                                         |
| <b>APPROVALS</b>                      | CE                                               |
| <b>ELECTRICAL CONNECTION</b>          |  2-meter cable, PVC covered, 2-conductor, #24AWG |

\* Default setting

## Dimensions (mm)

NBB6-F-B3B



## Wiring Diagrams



### Cable Connection

Normally Open or  
Normally Closed



Brown — AS-i +  
Blue — AS-i -

See pages 201-216 for complete  
AS-Interface accessory listing.

# Flat Pack Inductive Proximity Sensors

- Easy AS-Interface connection with M12 quick disconnect
- Oscillator monitoring
- Normally open/normally closed programmable
- Programmable 15 ms activation delay



## Flat Pack Overview

Pepperl+Fuchs' surface mount, flat pack inductive proximity sensors offer the longest available sensing ranges—extending to 50 mm—for your AS-Interface network. Additionally, they are offered in shielded (flush-mounted) or unshielded (nonflush-mounted) models and have an extended addressing range for up to 62 modules on one network. LEDs display power, switching state, and fault indication.

All of the intelligent flat pack sensors are 2.1 compatible, offer oscillator monitoring, input filtering, and are normally open/normally closed programmable.

**See page 165 for Flat Pack Sensors wiring and dimensions.**





## Specifications

| SENSING RANGE                  |         | 40 mm                                | 50 mm                                | 50 mm                                |
|--------------------------------|---------|--------------------------------------|--------------------------------------|--------------------------------------|
| SHIELDED                       |         | Yes                                  | Yes                                  | No                                   |
| MODEL NUMBER(S)                |         | NBB40-FP-B3B-P1-V1                   | NBB50-FP-B3B-P1-V1                   | NBN50-FP-B3B-P1-V1                   |
| EXTENDED ADDRESSING (62 NODES) |         | Yes                                  | Yes                                  | Yes                                  |
| OPERATING CURRENT              |         | 30 mA                                | 30 mA                                | 30 mA                                |
| REPEATABILITY                  |         | ≤ 0.01mm                             | ≤ 0.01 mm                            | ≤ 0.01 mm                            |
| HYSTERESIS                     |         | 1-15% (5% typical)                   | 1-15% (5% typical)                   | 1-15% (5% typical)                   |
| SWITCHING FREQUENCY            |         | 80 Hz                                | 80 Hz                                | 80 Hz                                |
| WELD FIELD IMMUNE              |         | No                                   | No                                   | No                                   |
| DATA BITS                      | D0      | Sensor output                        | Sensor output                        | Sensor output                        |
|                                | D1      | Not used                             | Not used                             | Not used                             |
|                                | D2      | Oscillator monitor                   | Oscillator monitor                   | Oscillator monitor                   |
|                                | D3      | Not used                             | Not used                             | Not used                             |
| PARAMETER BIT                  | P0      | 15 ms activation delay on*/off       | 15 ms activation delay on*/off       | 15 ms activation delay on*/off       |
|                                | P1      | N.O.*/N.C. programming               | N.O.*/N.C. programming               | N.O.*/N.C. programming               |
| PROFILE S-I.O.I.D1.ID2         |         | S-0.A.7.E                            | S-0.A.7.E                            | S-0.A.7.E                            |
| PROTECTION (IEC)               |         | IP67                                 | IP67                                 | IP67                                 |
| TEMPERATURE RANGE              | WORKING | -13 °F to +158 °F (-25 °C to +70 °F) | -13 °F to +158 °F (-25 °C to +70 °F) | -13 °F to +158 °F (-25 °C to +70 °F) |
|                                | STORAGE | -40 °F to +185 °F (-40 °C to +85 °F) | -40 °F to +185 °F (-40 °C to +85 °F) | -40 °F to +185 °F (-40 °C to +85 °F) |
| HOUSING MATERIAL               |         | PBT                                  | PBT                                  | PBT                                  |
| WEIGHT                         |         | 200 g (7 oz)                         | 200 g (7 oz)                         | 200 g (7 oz)                         |
| APPROVALS                      |         | CE AS                                | CE AS                                | CE AS                                |
| ELECTRICAL CONNECTION          |         | M12 quick disconnect                 | M12 quick disconnect                 | M12 quick disconnect                 |

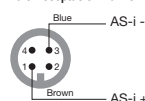
\* Default setting

## Wiring Diagrams



### Terminal Connection

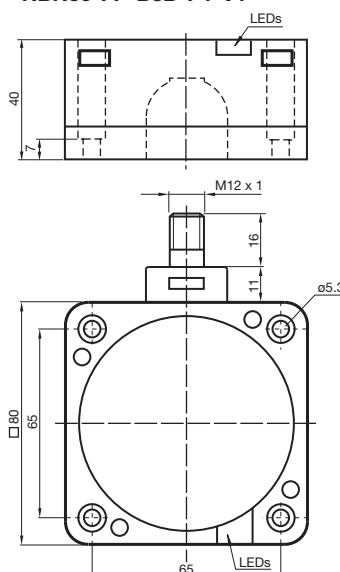
Male Receptacle End View



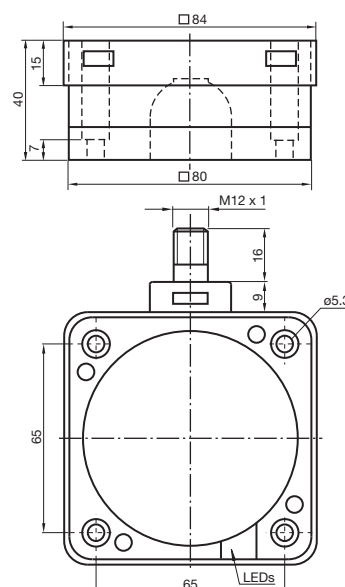
See pages 201-216 for complete AS-Interface accessory listing.

## Dimensions (mm)

NBB40-FP-B3B-P1-V1  
NBN50-FP-B3B-P1-V1



NBB50-FP-B3B-P1-V1



# Valve Positioning Inductive Proximity Sensors

- 2 integrated sensors and AS-Interface powered solenoid driver
- Lead breakage and short-circuit monitoring of the solenoid
- LED indication for inputs and output



## Valve Positioning Overview

Discrete position sensors offer valve position and AS-Interface all in a single housing. Units are available that allow up to 62 intelligent valve position indicators can be put on one AS-Interface network (2.1 compatible) and then be brought back to a controller.

This is a dual inductive sensor and solenoid driver used to indicate and control valve position. This dual sensor uses two screws to mount directly on the quarter-turn valve and requires no additional adjustment. It connects to the AS-Interface with a micro (M12x1) quick disconnect. The D1 data bit monitors the solenoid for lead breakage and short circuit. Yellow LEDs display the current switch conditions. A dual LED displays the current solenoid status, and error indication.

**See pages 167-168 for Valve Positioning wiring and dimensions.**



## Specifications

| NUMBER OF INPUTS               | 3 mm                                                      | 3 mm                                         |
|--------------------------------|-----------------------------------------------------------|----------------------------------------------|
| SHIELDED                       | Yes                                                       | Yes                                          |
| MODEL NUMBER(S)                | NCN3-F31-B3B-V1-K                                         | NCN3-F31-B3B-V1-V1                           |
| EXTENDED ADDRESSING (62 NODES) | Yes                                                       | Yes                                          |
| OPERATING CURRENT              | 50-150 mA                                                 | 50-150 mA                                    |
| REPEATABILITY                  | ≤ 0.01 mm                                                 | ≤ 0.01 mm                                    |
| HYSTERESIS                     | 1-15% (5% typical)                                        | 1-15% (5% typical)                           |
| SWITCHING FREQUENCY            | 100 Hz                                                    | 100 Hz                                       |
| WELD FIELD IMMUNE              | No                                                        | No                                           |
| OUTPUTS (SOLENOID DRIVER)      |                                                           |                                              |
| SUPPLY VOLTAGE                 | from AS-Interface                                         | from AS-Interface                            |
| POWER                          | 2.5 W                                                     | 2.5 W                                        |
| DATA BITS                      |                                                           |                                              |
| D0                             | Solenoid driver output                                    | Solenoid driver output                       |
| D1                             | Leak breakage/ short-circuit solenoid driver              | Leak breakage/ short-circuit solenoid driver |
| D2                             | Sensor 1                                                  | Sensor 1                                     |
| D3                             | Sensor 2                                                  | Sensor 2                                     |
| PARAMETER                      |                                                           |                                              |
| BIT                            |                                                           |                                              |
| P0                             | Watchdog on*/off                                          | Watchdog on*/off                             |
| P1                             | N.O./N.C.* programming sensor 1                           | N.O./N.C.* programming sensor 1              |
| P2                             | N.O./N.C.* programming sensor 2                           | N.O./N.C.* programming sensor 2              |
| PROFILE                        | S-I.O.ID1.ID2                                             | S-D.A.7.E                                    |
| PROTECTION (IEC)               | IP67                                                      | IP67                                         |
| TEMPERATURE                    |                                                           |                                              |
| RANGE                          |                                                           |                                              |
| WORKING                        | -13 °F to +158 °F (-25 °C to +70 °F)                      | -13 °F to +158 °F (-25 °C to +70 °F)         |
| STORAGE                        | -40 °F to +185 °F (-40 °C to +85 °F)                      | -40 °F to +185 °F (-40 °C to +85 °F)         |
| HOUSING MATERIAL               | PBT                                                       | PBT                                          |
| WEIGHT                         | 150 g (5 oz)                                              | 150 g (5 oz)                                 |
| APPROVALS                      | CE                                                        | CE                                           |
| ELECTRICAL CONNECTION          | M12 quick disconnect and 500 mm cable for solenoid driver | M12 quick disconnect                         |

\* Default setting

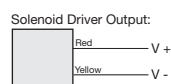
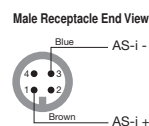
## Wiring Diagrams



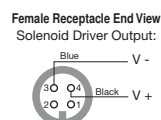
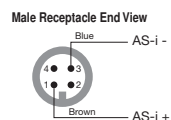
### Quick Disconnect

Note: Wiring diagrams show quick disconnect pin numbers

#### NCN3-F31-B3B-V1-K

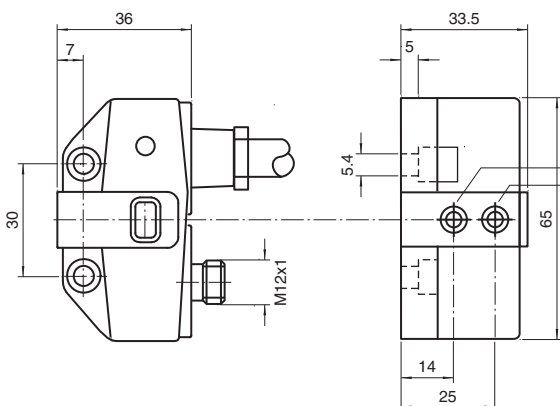


#### NCN3-F31-B3B-V1-V1

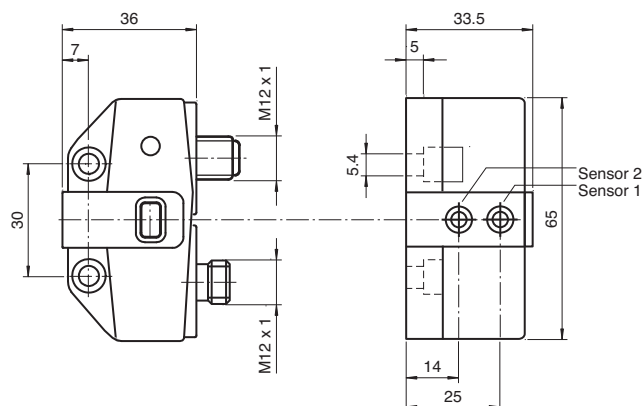


## Dimensions (mm)

#### NCN3-F31-B3B-V1-K



#### NCN3-F31-B3B-V1-V1

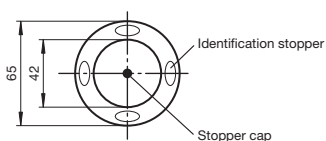
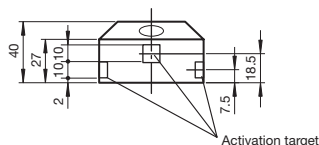


## Accessories

**BT 65**

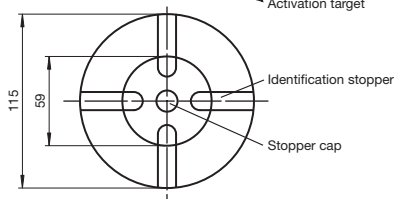
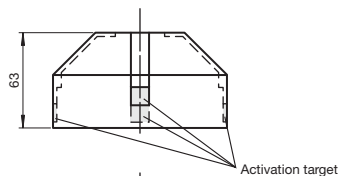
65 mm diameter valve positioning puck

- Shaft diameter < 58 mm
- Shaft height 20 mm or 30 mm
- Fixing hole pattern 30 mm x 80 mm

**BT 115A**

115 mm diameter valve positioning puck

- Shaft diameter < 90 mm
- Shaft height 30 mm or 50 mm
- Fixing hole pattern 30 mm x 130 mm



See pages 201-216 for complete AS-Interface accessory listing.



## Series 28 Photoelectric Sensors

- Extreme low temperature operation (-40 °C/F) available
- Status LEDs visible from 15 m (50')
- Extended addressing with up to 62 addresses



### Diffused Mode with Background Suppression

See page 170

**Features:**

- Sharp sensing range cut-off
- Thru-hole or dovetail mounting

**Sensing Ranges:** 700 mm



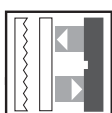
### Retro-Reflective Mode

See page 171

**Features:**

- Reliable detection of even the shiniest material
- Weak signal output available

**Sensing Ranges:** 17 m, 30 m



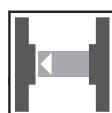
### Retro-Reflective Mode with Foreground Suppression

See page 172

**Features:**

- Glossy targets not erroneously identified as the reflector up to 200 mm away
- Reliable detection of shrink-wrapped pallets

**Sensing Range:** 13 m



### Thru-Beam Mode

See page 173

**Features:**

- Alignment LED visible through lens for faster setup
- Laser light source for long-range sensing

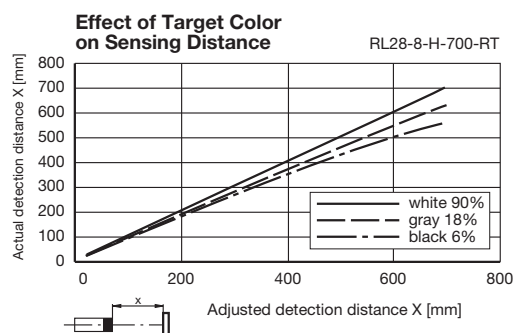
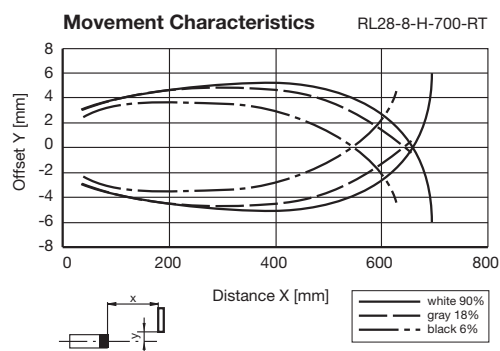
**Sensing Range:** 300 m

## Diffused Mode with Background Suppression

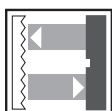
### Specifications

|                                   |                                                                                                                                                                                                                                                             |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SENSING RANGE</b>              | 20-700 mm                                                                                                                                                                                                                                                   |
| <b>SENSITIVITY ADJUSTMENT</b>     | Yes                                                                                                                                                                                                                                                         |
| <b>MODEL NUMBER(S)</b>            | RL28-8-H-700-RT-B3B/73c                                                                                                                                                                                                                                     |
| <b>OUTPUT</b> -B3B                | AS-Interface                                                                                                                                                                                                                                                |
| <b>SUPPLY VOLTAGE</b>             | from AS-Interface                                                                                                                                                                                                                                           |
| <b>LED(s)</b>                     | Yes (3)                                                                                                                                                                                                                                                     |
| <b>OPERATING MODE</b>             | Light on/dark on                                                                                                                                                                                                                                            |
| <b>RESPONSE TIME</b>              | ≤ 2 ms                                                                                                                                                                                                                                                      |
| <b>TIMER FUNCTION</b>             | One-shot (50 ms) through AS-Interface                                                                                                                                                                                                                       |
| <b>SWITCHING FREQUENCY</b>        | 250 Hz                                                                                                                                                                                                                                                      |
| <b>STANDARDS</b>                  | EN 60947-5-2                                                                                                                                                                                                                                                |
| <b>PROTECTION (IEC)</b>           | IP67                                                                                                                                                                                                                                                        |
| <b>LIGHT SPOT DIAMETER</b>        | ≈ 15 mm at a range of 700 m                                                                                                                                                                                                                                 |
| <b>LIGHT BEAM ANGLE</b>           | < 1.2° transmitter / < 2° receiver                                                                                                                                                                                                                          |
| <b>LIGHT SOURCE</b>               | Visible red LED 660 nm                                                                                                                                                                                                                                      |
| <b>AMBIENT LIGHT RESISTANCE</b>   | ≤ 50,000 lux                                                                                                                                                                                                                                                |
| <b>TEMPERATURE</b> <i>WORKING</i> | -40 °F to +140 °F (-40 °C to +60 °C)                                                                                                                                                                                                                        |
| <b>RANGE</b> <i>STORAGE</i>       | -40 °F to +167 °F (-40 °C to +75 °C)                                                                                                                                                                                                                        |
| <b>HOUSING MATERIAL</b>           | ABS                                                                                                                                                                                                                                                         |
| <b>LENS</b>                       | Plastic                                                                                                                                                                                                                                                     |
| <b>WEIGHT</b>                     | 2.5 oz                                                                                                                                                                                                                                                      |
| <b>APPROVALS</b>                  |    |
| <b>ELECTRICAL CONNECTION</b>      |  M12 quick disconnect                                                                                                                                                    |

### Sensing Characteristics





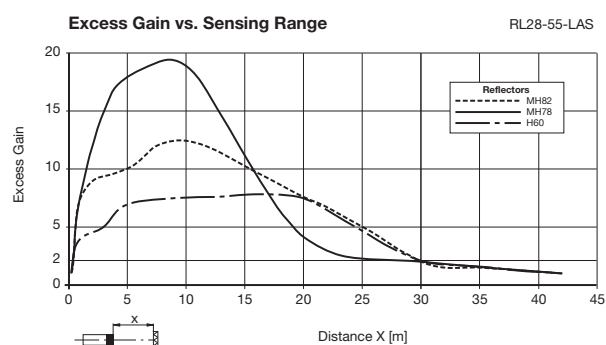
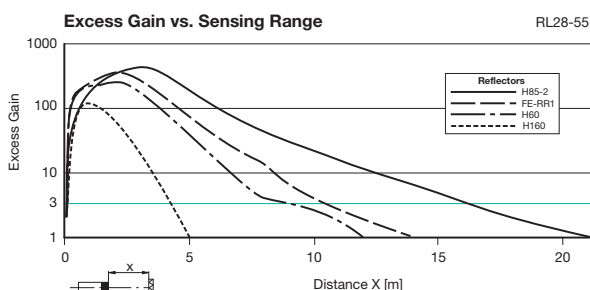
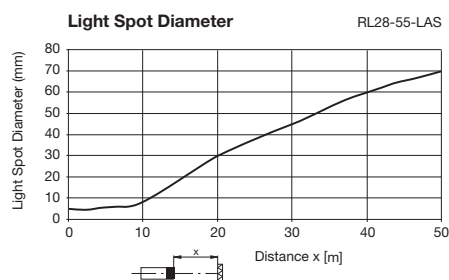
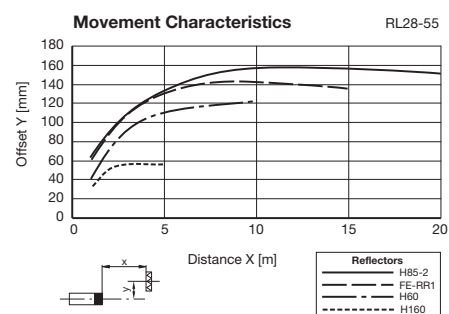


## Retro-Reflective Mode

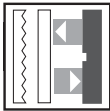
| Specifications           | Laser*                                                                                         |                                                                                               |
|--------------------------|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| SENSING RANGE            | 0-17 m                                                                                         | 0-30 m                                                                                        |
| SENSITIVITY ADJUSTMENT   | Yes                                                                                            | Yes                                                                                           |
| REFLECTOR DISTANCE       | 50 mm-17 m                                                                                     | 300 mm-30 m                                                                                   |
| POLARIZED FILTER         | Yes                                                                                            | Yes                                                                                           |
| MODEL NUMBER(S)          | RL28-55-B3B/73c                                                                                | RL28-55-LAS-B3B/73c                                                                           |
| OUTPUT                   | -B3B AS-Interface                                                                              | AS-Interface                                                                                  |
| SUPPLY VOLTAGE           | from AS-Interface                                                                              | from AS-Interface                                                                             |
| VOLTAGE RIPPLE           | —                                                                                              | ≤ 10%                                                                                         |
| LED(s)                   | Yes (3)                                                                                        | Yes (3)                                                                                       |
| OPERATING MODE           | Light on/dark on                                                                               | Light on/dark on                                                                              |
| RESPONSE TIME            | ≤ 0.5 ms                                                                                       | ≤ 0.5 ms                                                                                      |
| TIMER FUNCTION           | One-shot (50 ms) through AS-Interface                                                          | One-shot (50 ms) through AS-Interface                                                         |
| SWITCHING FREQUENCY      | 1 kHz                                                                                          | 1 kHz                                                                                         |
| TRANSMITTER FREQUENCY    | ≈ 6-20 kHz                                                                                     | ≈ 6-20 kHz                                                                                    |
| STANDARDS                | EN 60947-5-2                                                                                   | EN 60947-5-2                                                                                  |
| PROTECTION (IEC)         | IP67                                                                                           | IP67                                                                                          |
| LIGHT SPOT DIAMETER      | ≈ 290 mm at a range of 17 m                                                                    | ≈ 45 mm at a range of 30 m                                                                    |
| LIGHT BEAM ANGLE         | < 1.2° transmitter<br>< 2° receiver                                                            | < 0.1° transmitter<br>< 2° receiver                                                           |
| LIGHT SOURCE             | Visible red LED 660 nm                                                                         | Visible red laser 650 nm Class 1                                                              |
| AMBIENT LIGHT RESISTANCE | ≤ 80,000 lux                                                                                   | ≤ 50,000 lux                                                                                  |
| TEMPERATURE RANGE        | WORKING: -40 °F to +140 °F (-40 °C to +60 °C)<br>STORAGE: -40 °F to +167 °F (-40 °C to +75 °C) | WORKING: +14 °F to +122 °F (-10 °C to +50 °C)<br>STORAGE: -4 °F to +167 °F (-20 °C to +75 °C) |
| HOUSING MATERIAL         | ABS                                                                                            | ABS                                                                                           |
| LENS                     | Plastic                                                                                        | Plastic                                                                                       |
| WEIGHT                   | 2.5 oz                                                                                         | 2.8 oz                                                                                        |
| APPROVALS                | CE, UL, UL US, 45°C                                                                            | CE, UL, UL US, 45°C                                                                           |
| ELECTRICAL CONNECTION    | M12 quick disconnect                                                                           | M12 quick disconnect                                                                          |

\*Micro-structure corner-cube reflectors are recommended with laser retro-reflective mode sensors.

## Sensing Characteristics



## Retro-Reflective Mode with Foreground Suppression



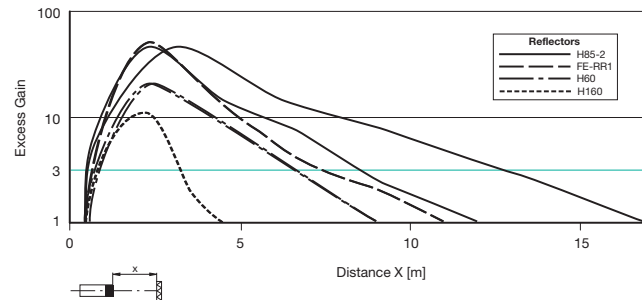
### Specifications

|                                         |                                       |
|-----------------------------------------|---------------------------------------|
| <b>SENSING RANGE</b>                    | 200 mm-13 m                           |
| <b>SENSITIVITY ADJUSTMENT</b>           | Yes                                   |
| <b>FOREGROUND SUPPRESSION RANGE</b>     | 0-200 mm                              |
| <b>REFLECTOR DISTANCE</b>               | 500 mm-13 m                           |
| <b>POLARIZED FILTER</b>                 | Yes                                   |
| <b>MODEL NUMBER(S)</b>                  | <b>RL28-55-V-B3B/73c</b>              |
| <b>OUTPUT</b> -B3B                      | AS-Interface                          |
| <b>SUPPLY VOLTAGE</b>                   | from AS-Interface                     |
| <b>VOLTAGE RIPPLE</b>                   | 10%                                   |
| <b>LED(s)</b>                           | Yes (3)                               |
| <b>OPERATING MODE</b>                   | Light on/dark on                      |
| <b>RESPONSE TIME</b>                    | ≤ 0.5 ms                              |
| <b>TIMER FUNCTION</b>                   | One-shot (50 ms) through AS-Interface |
| <b>SWITCHING FREQUENCY</b>              | 1 kHz                                 |
| <b>STANDARDS</b>                        | EN 60947-5-2                          |
| <b>PROTECTION (IEC)</b>                 | IP67                                  |
| <b>LIGHT SPOT DIAMETER</b>              | ≈ 220 mm at a range of 13 m           |
| <b>LIGHT BEAM ANGLE</b>                 | 1.2° transmitter/2° receiver          |
| <b>LIGHT SOURCE</b>                     | Visible red LED                       |
| <b>AMBIENT LIGHT RESISTANCE</b>         | ≤ 80,000 lux                          |
| <b>TEMPERATURE RANGE</b> <i>WORKING</i> | -40 °F to +140 °F (-40 °C to +60 °C)  |
| <i>STORAGE</i>                          | -40 °F to +167 °F (-40 °C to +75 °C)  |
| <b>HOUSING MATERIAL</b>                 | ABS                                   |
| <b>LENS</b>                             | Plastic                               |
| <b>WEIGHT</b>                           | 2.5 oz                                |
| <b>APPROVALS</b>                        |                                       |
| <b>ELECTRICAL CONNECTION</b>            | M12 quick disconnect                  |

### Sensing Characteristics

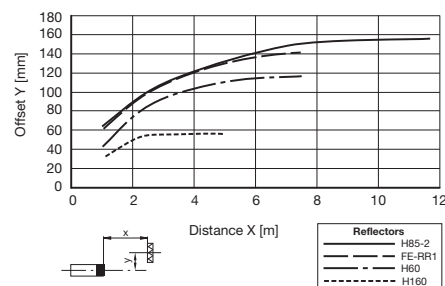
Excess Gain vs. Sensing Range

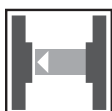
RL28-55-V



Movement Characteristics

RL28-55-V



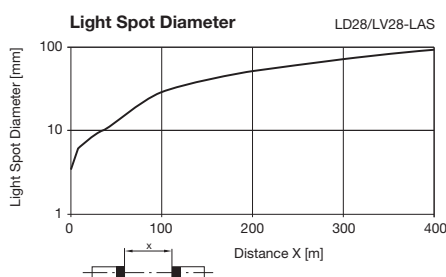
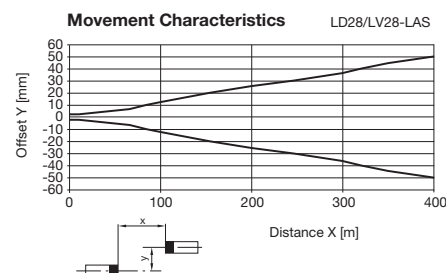
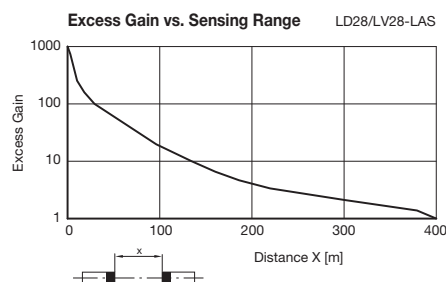


## Thru-Beam Mode

| Specifications           |             | Laser*                                                                                                                       |
|--------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------|
| SENSING RANGE            |             | 0-300 m                                                                                                                      |
| SENSITIVITY ADJUSTMENT   |             | Yes                                                                                                                          |
| MODEL NUMBER(S)          | Transmitter | LD28-LAS-F1-B3B/73c                                                                                                          |
|                          | Receiver    | LV28-LAS-F1-B3B/73c                                                                                                          |
| OUTPUT                   |             | -B3B AS-Interface                                                                                                            |
| SUPPLY VOLTAGE           |             | from AS-Interface                                                                                                            |
| LED(s)                   |             | Yes (3) plus alignment LED                                                                                                   |
| OPERATING MODE           |             | Light on/dark on                                                                                                             |
| RESPONSE TIME            |             | ≤ 0.5 ms                                                                                                                     |
| TIMER FUNCTION           |             | One-shot (50 ms) through AS-Interface                                                                                        |
| SWITCHING FREQUENCY      |             | 1 kHz                                                                                                                        |
| TRANSMITTER FREQUENCY    |             | F1=25 kHz                                                                                                                    |
| STANDARDS                |             | NEMA ICS5-2000                                                                                                               |
| PROTECTION (IEC)         |             | IP67                                                                                                                         |
| LIGHT SPOT SIZE          |             | ≈ 1 x 4.5 mm at a range of 0.1 m,<br>≈ 6 mm at a range of 5 m,<br>≈ 75 x 300 mm at a range of 300 m<br>(parallel to housing) |
| LIGHT BEAM ANGLE         |             | 0.06° transmitter/5° receiver                                                                                                |
| LIGHT SOURCE             |             | Visible red laser 650 nm Class 2                                                                                             |
| AMBIENT LIGHT RESISTANCE |             | ≤ 50,000 lux                                                                                                                 |
| TEMPERATURE RANGE        | WORKING     | +14 °F to +122 °F (-10 °C to +50 °C)                                                                                         |
|                          | STORAGE     | -4 °F to +167 °F (-20 °C to +75 °C)                                                                                          |
| HOUSING MATERIAL         |             | ABS                                                                                                                          |
| LENS                     |             | Plastic                                                                                                                      |
| WEIGHT                   |             | 2.8 oz per housing                                                                                                           |
| APPROVALS                |             | CE cULus                                                                                                                     |
| ELECTRICAL CONNECTION    |             | M12 quick disconnect                                                                                                         |

\*Micro-structure corner-cube reflectors are recommended with laser retro-reflective mode sensors.

## Sensing Characteristics



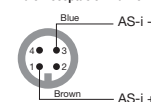
## Wiring Diagrams



### Quick Disconnect

**Note:** Wiring diagrams show quick disconnect pin numbers

Male Receptacle End View



# CAUTION



LASER RADIATION –  
DO NOT STARE INTO BEAM

650 nm LASER LIGHT  
1 mW PEAK POWER

PRODUCT CONFORMS TO 21CFR1040  
CLASS II LASER PRODUCT

AVOID EXPOSURE – Laser radiation  
is emitted from this aperture

## AS-Interface Programming

Address preset to 00; can be changed via the master or with a hand-held addressing device.

Addresses 1A-31A and 1B-31B are available

IO-Code 3

ID-Code A

ID2 1

### Data bits

| Bit | Function           | Description                                                                                                                         |
|-----|--------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| D0  | switch output      | 0 = no light received (with P1=1), 0=light received (with P1=0),<br>1 = no light received (with P1=0), 1=light received (with P1=1) |
| D1* | weak signal output | 0 = alarm<br>1 = no alarm                                                                                                           |
| D2  | test input         | 0 = transmitter active<br>1 = transmitter deactivated                                                                               |
| D3  | not used           |                                                                                                                                     |

### Parameter bits

| Bit | Function (1/0)        |                           |
|-----|-----------------------|---------------------------|
| P0  | not used              |                           |
| P1  | light on/dark on mode | (0=dark on, 1=light on)   |
| P2  | 50 ms one shot timer  | (0=timer on, 1=timer off) |
| P3  | not used              |                           |

\* not used for RL28-8-H models

## Dimensions (mm)

RL28-8-H-700-RT-B3B/73c

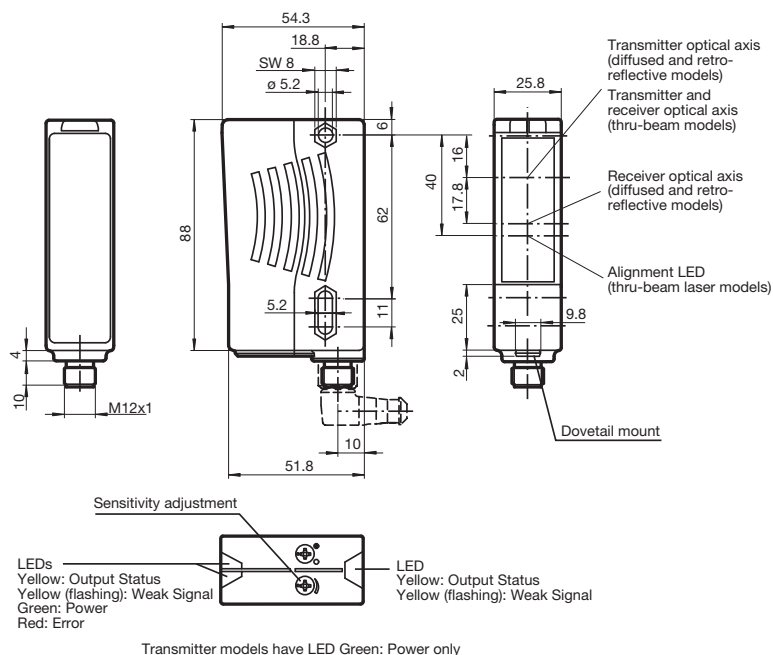
RL28-55-B3B/73c

RL28-55-LAS-B3B/73c

RL28-55-V-B3B/73c

LD28-LAS-F1-B3B/73c

LV28-LAS-F1-B3B/73c

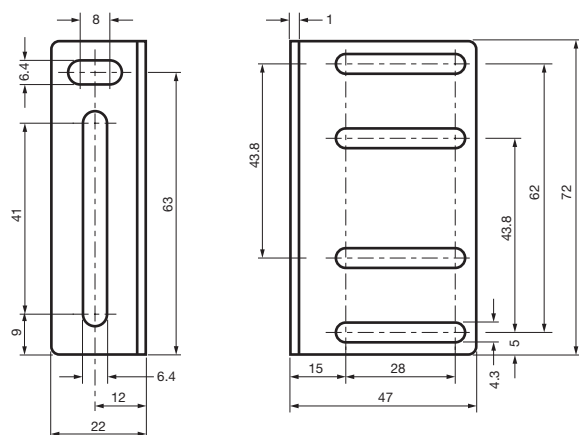


## Accessories

(Dimensions in mm)

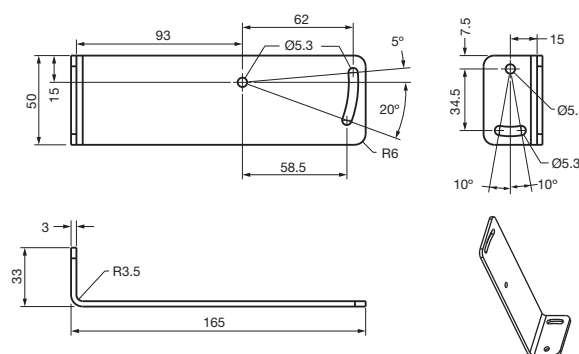
### Mounting Bracket Model OMH-RL25

Right angle mounting bracket

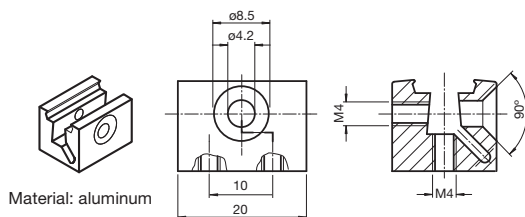


### Mounting Bracket Model OMH-21-T

High-profile right angle mounting bracket

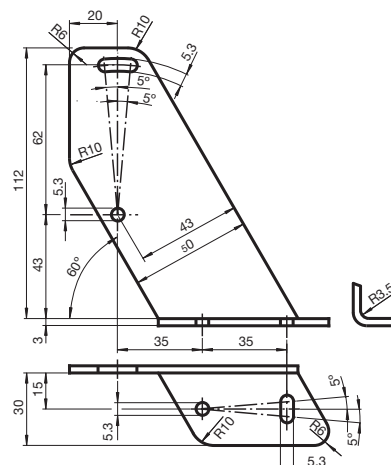


### Dovetail Mounting Clamp Model OMH-MLV11-K



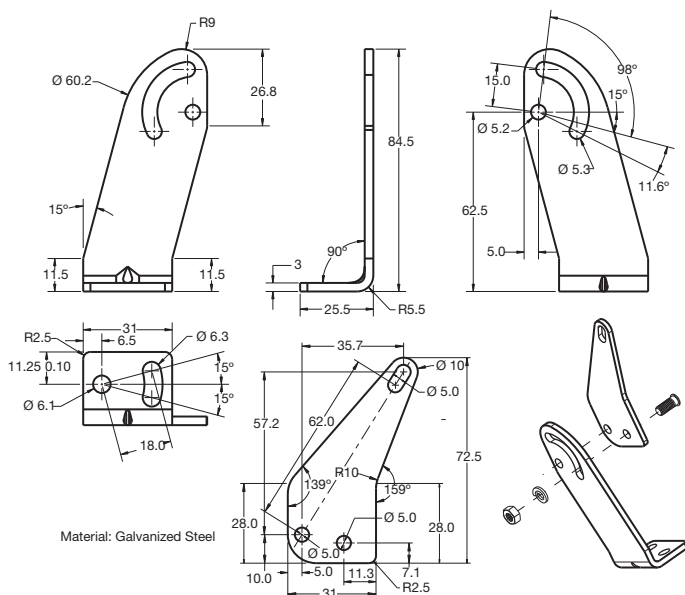
### Mounting Bracket Model OMH-21

Right angle mounting bracket



### Mounting Bracket Model OMH-RL2-H

Hinged right angle mounting bracket



See pages 201-216 for complete AS-Interface accessory listing.

Gateways and Scanners

Power Supplies and Repeater

I/O Modules

Safety at Work

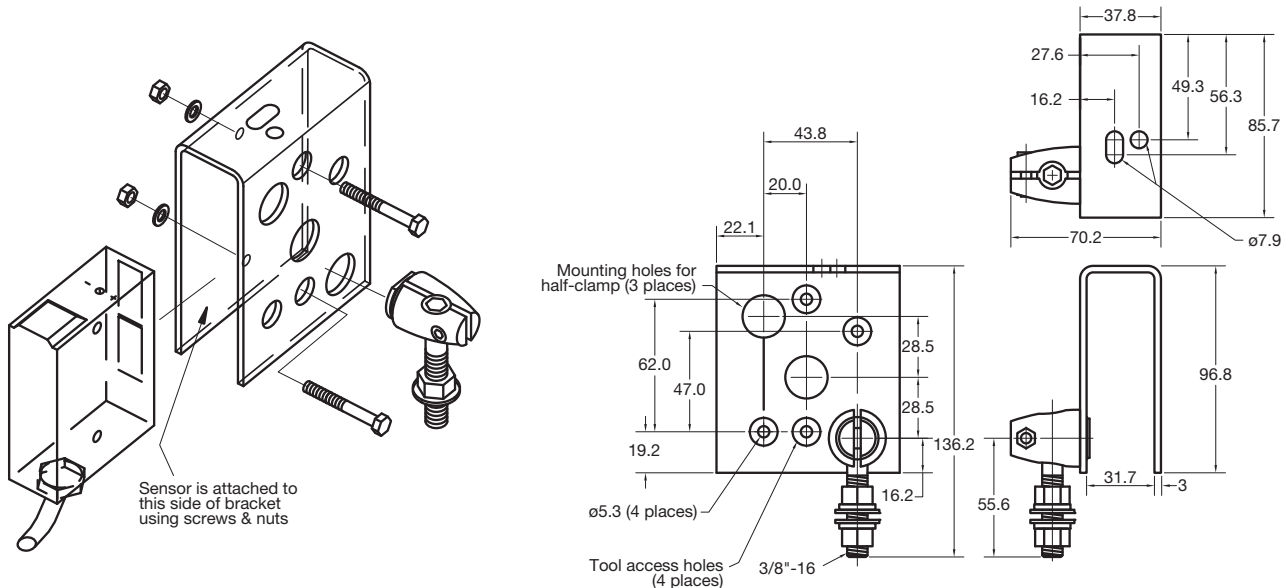
Sensors

Cordsets

Accessories

## Accessories (cont.)

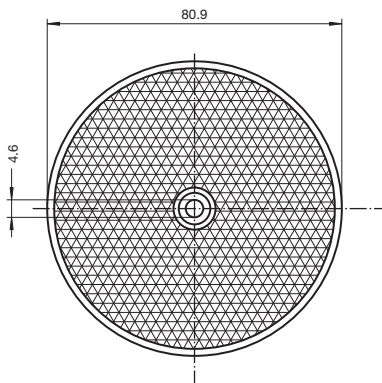
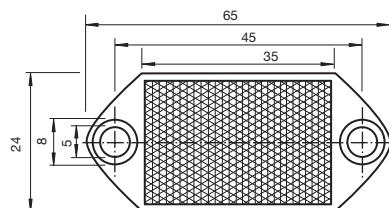
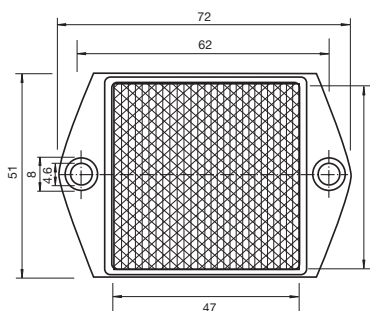
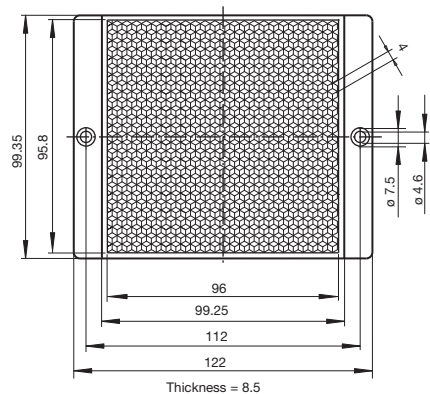
(Dimensions in mm)

**Mounting Bracket Model OMH-RL2-S***Protective shroud bracket with 360° rotatability half-clamp*

Material: Stainless steel shroud, nickel-plated zinc half-clamp, zinc-plated steel screws and nuts.

## Reflectors

## Thru-hole

**FE-RR1**Round, corner-cube reflector  
Temperature range -4 °F to +150 °F**REFLECTOR H32**Rectangular, corner-cube reflector  
Temperature range -4 °F to +185 °F**REFLECTOR H51x72**Rectangular, corner-cube reflector  
Temperature range -4 °F to +140 °F**REFLECTOR H100**Square, corner-cube reflector  
Temperature range -4 °F to +158 °F

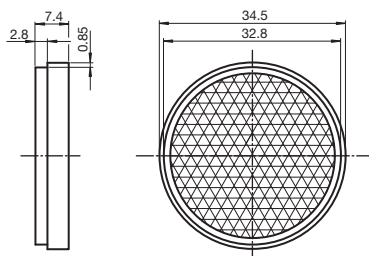
Reflectors continued on next page...



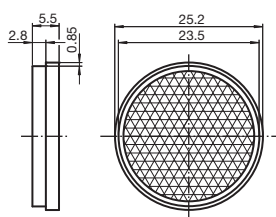
## Accessories (cont.)

(Dimensions in mm)

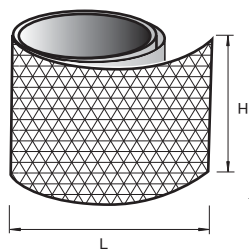
## Self Adhesive

**REFLECTOR A35**

Round, corner-cube reflector  
Temperature range -4 °F to +150 °F

**REFLECTOR A25**

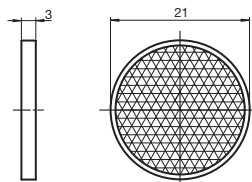
Round, corner-cube reflector  
Temperature range -4 °F to +150 °F



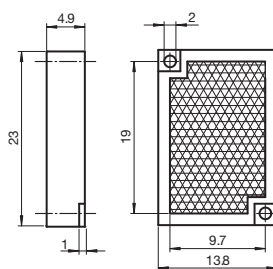
Pre-cut, corner-cube reflective tape.  
Reflective tapes can be cut.  
150' rolls are available. Contact P+F  
Temperature range -40 °F to 180 °F

| MODEL     | H    | L    |
|-----------|------|------|
| RT1 X 100 | 1.0" | 100" |
| RT1 X 2   | 1.0" | 2.0" |
| RT2 X 100 | 2.0" | 100" |
| RT3 X 100 | 3.0" | 100" |

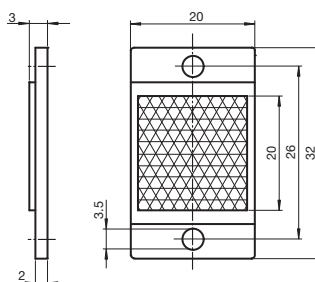
## Microstructure

**REFLECTOR MA21**

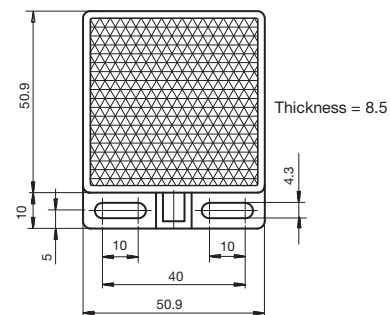
Round, microstructure, corner-cube reflector. Self-adhesive mounting.  
Temperature range -4 °F to +185 °F

**REFLECTOR MH23**

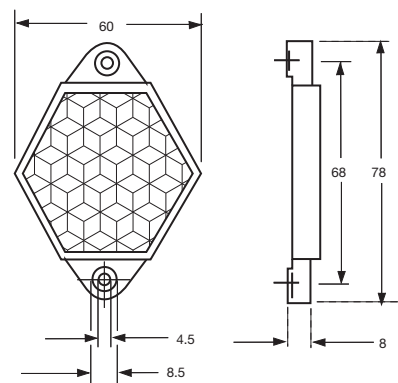
Rectangular, microstructure corner-cube reflector. Through-hole mounting.  
Temperature range -4 °F to +185 °F

**REFLECTOR MH20**

Square, microstructure corner-cube reflector. Through-hole mounting.  
Temperature range -4 °F to +185 °F

**REFLECTOR MH50**

Square, microstructure corner-cube reflector. Through-hole mounting.  
Temperature range -4 °F to +185 °F

**REFLECTOR MH78**

Rectangular, microstructure, corner-cube reflector. Through-hole mounting.  
Temperature range -4 °F to +185 °F

See pages 201-216 for complete AS-Interface accessory listing.

# BVS58/BVM58 Series Absolute Rotary Encoders

- Industrial standard 58 mm diameter housing
- Single or multi-turn
- Uses 4 AS-Interface slaves
- IP65
- Servo flange and 6 mm shaft or clamping flange and 10 mm shaft



Pepperl+Fuchs' BVS58 and BVM58 series absolute encoders communicate via AS-Interface. They are available in either single-turn with 13-bit resolution, or multi-turn with 16-bit resolution versions. The position value is output to the master within a single cycle via the 4 integrated AS-Interface chips. Each slave address can be individually set. These encoders are rated IP65 and feature a rugged aluminum housing.

## Order Code

**BV 58N-**

**AVR0NN-**

Type  
S Single-turn  
M Multi-turn

Shaft option/flange style  
011 Ø 10 mm x 20 mm with clamping flange  
032 Ø 6 mm x 10 mm with servo flange

| Resolution  | Number of<br>Revolutions | Steps per<br>Revolutions |
|-------------|--------------------------|--------------------------|
| Single-turn |                          |                          |
| 0013        | 1                        | 8192                     |
| Multi-turn  |                          |                          |
| 0313        | 8                        | 8192                     |
| 0412        | 16                       | 4096                     |
| 0511        | 32                       | 2048                     |
| 0610        | 64                       | 1024                     |
| 0709        | 128                      | 512                      |
| 0808        | 256                      | 256                      |
| 0907        | 512                      | 128                      |
| 1006        | 1024                     | 64                       |
| 1105        | 2048                     | 32                       |
| 1204        | 4096                     | 16                       |

Example: BVS58N-032AVR0NN-0013

## Technical Specifications

### Electrical

|                                     |                                      |
|-------------------------------------|--------------------------------------|
| SUPPLY VOLTAGE                      | 29.5-31.6 VDC                        |
| CURRENT CONSUMPTION                 | Starting ≤ 155 mA                    |
|                                     | Operational ≤ 65 mA                  |
| OUTPUT CODE                         | Programmable gray or binary          |
| LINEARITY                           | ±1 LSB                               |
| COUNTING DIRECTION (Shaft End View) | Programmable                         |
| INTERFACE                           | Type AS-Interface                    |
|                                     | Transfer rate ≤ 0.167 Mbaud          |
| RESOLUTION                          | Bits/steps per turn 13-bit / ≤ 8192  |
|                                     | Bits/number of turns 12-bit / ≤ 4096 |
| OVERALL RESOLUTION                  | Single-turn 13-bit                   |
|                                     | Multi-turn 16-bit                    |
| STANDARD CONFORMITY                 | AS-Interface                         |
| CERTIFICATES                        | CE                                   |

### Mechanical

|                          |              |                                                 |
|--------------------------|--------------|-------------------------------------------------|
| MATERIAL                 | Housing      | Powder-coated aluminum                          |
|                          | Flange       | Aluminum                                        |
|                          | Shaft        | Stainless steel                                 |
|                          | Code disc    | Glass                                           |
| WEIGHT                   | BVS58        | ≈ 12 oz                                         |
|                          | BVM58        | ≈ 13 oz                                         |
| ROTATIONAL SPEED         | BVS58        | ≤ 12,000 rpm                                    |
|                          | BVM58        | ≤ 6,000 rpm                                     |
| MOMENT OF INERTIA        |              | ≤ 4.3 x 10 <sup>-4</sup> oz-in-sec <sup>2</sup> |
| STARTING TORQUE AT 20 °C |              | ≤ 2.1 in-oz                                     |
| SHAFT LOADING            | Axial - BVS  | 9.8 lbs at 12,000 rpm                           |
|                          | BVM          | 40 lbs at 6,000 rpm                             |
|                          | Radial - BVS | 13.3 lbs at 12,000 rpm                          |
|                          | BVM          | 40 lbs at 6,000 rpm                             |
| BEARING WORKING LIFE     |              | > 4 x 10 <sup>9</sup> revolutions               |

### Environmental

|                       |                                      |
|-----------------------|--------------------------------------|
| STORAGE TEMPERATURE   | -25 °C to +85 °C (-13 °F to +185 °F) |
| OPERATING TEMPERATURE | -20 °C to +70 °C (-4 °F to +158 °F)  |
| HUMIDITY              | 98% RH non-condensing                |
| SHOCK RESISTANCE      | 100 g for 3 ms                       |
| VIBRATION RESISTANCE  | 10 g, 10-2,000 Hz                    |
| ENCLOSURE RATING      | IP65                                 |

### Connection Types

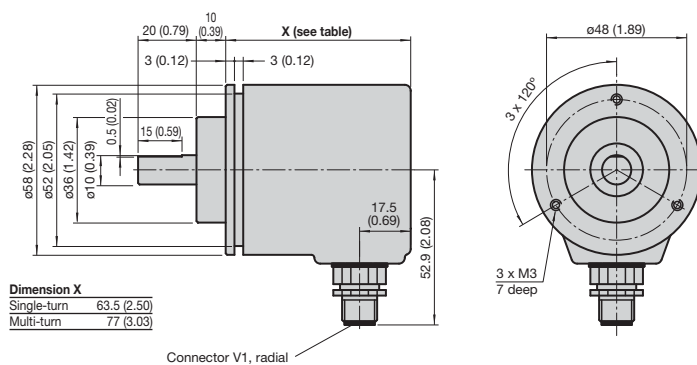
|           |                     |
|-----------|---------------------|
| CONNECTOR | Type V1, M12, 4-Pin |
|-----------|---------------------|

## Dimensions

mm (in.)

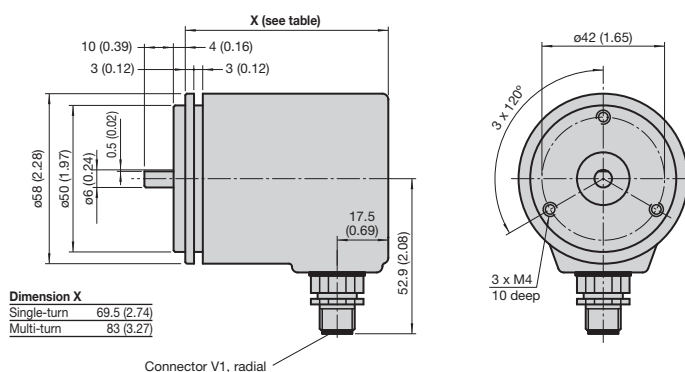
### Shaft option/flange style 011

Ø 10 mm x 20 mm with clamping flange



### Shaft option/flange style 032

Ø 6 mm x 10 mm with servo flange



## Electrical Connection

| Signal                                                                              | Type V1, 4-pin quick disconnect | Description |
|-------------------------------------------------------------------------------------|---------------------------------|-------------|
| AS-i +                                                                              | 1                               |             |
| Reserved                                                                            | 2                               | Not wired   |
| AS-i -                                                                              | 3                               |             |
| Reserved                                                                            | 4                               | Not wired   |
|  |                                 |             |

## Programming

### Addresses

|                | Slave A | Slave B | Slave C | Slave D |
|----------------|---------|---------|---------|---------|
| Preset address | 1       | 2       | 3       | 4       |
| IO code        | 7       | 0       | 0       | 0       |
| ID code        | F       | F       | F       | F       |



When using an AS-Interface master or handheld programmer to change the slave addresses, it is absolutely essential to assign a different address to each of the four slaves.

### Parameter Bits

The four parameter bits of slave A are used to set the parameters of the encoder. The parameter bits of slave B, C and D are not used.

| Status of parameter bit | Slave A     |                            |                                    |          |
|-------------------------|-------------|----------------------------|------------------------------------|----------|
|                         | P0          | P1                         | P2                                 | P3       |
| 0                       | Gray code   | Transfer with flag bits    | Count down with clockwise rotation | Not used |
| 1                       | Binary code | Transfer without flag bits | Count up with clockwise rotation   | Not used |

### Data Bits

#### From the AS-Interface master to the encoder

Data from the AS-Interface master is transferred to the encoder via slave A, which works bidirectionally. Slaves B, C and D operate unidirectionally and can only send data.

When data bits D2 and D3 are changed from 01 to 10 or vice-versa, the position data is saved in the encoder.

| Status of D0/D1 or D2/D3 | Slave A                                                    |                            |
|--------------------------|------------------------------------------------------------|----------------------------|
|                          | D0/D1                                                      | D2/D3                      |
| 00                       | Normal mode                                                | Position data is not saved |
| 01                       | Rotary encoder is set to 1/4 of the single turn resolution | Position data is saved     |
| 10                       | Rotary encoder is set to 0                                 | Position data is saved     |
| 11                       | Normal mode                                                | Position data is not saved |

#### From the encoder to the AS-Interface master

Parameter bit P1 of slave A is used to determine if the encoder transfers data to the AS-Interface master with or without flag bits.

P1 = 1: Transfer without flag bits

| Slave A |       |       |       | Slave B |       |       |       | Slave C |       |        |        | Slave D |           |    |    |
|---------|-------|-------|-------|---------|-------|-------|-------|---------|-------|--------|--------|---------|-----------|----|----|
| D0      | D1    | D2    | D3    | D0      | D1    | D2    | D3    | D0      | D1    | D2     | D3     | D0      | D1        | D2 | D3 |
| Bit 0   | Bit 1 | Bit 2 | Bit 3 | Bit 4   | Bit 5 | Bit 6 | Bit 7 | Bit 8   | Bit 9 | Bit 10 | Bit 11 | Bit 12  | Not used! |    |    |

P1 = 0: Transfer with flag bits MA, MB, MC, MD

| Slave A |       |       |    | Slave B |       |       |    | Slave C |       |       |    | Slave D |       |       |    |
|---------|-------|-------|----|---------|-------|-------|----|---------|-------|-------|----|---------|-------|-------|----|
| D0      | D1    | D2    | D3 | D0      | D1    | D2    | D3 | D0      | D1    | D2    | D3 | D0      | D1    | D2    | D3 |
| Bit 0   | Bit 1 | Bit 2 | MA | Bit 0   | Bit 1 | Bit 2 | MB | Bit 0   | Bit 1 | Bit 2 | MC | Bit 0   | Bit 1 | Bit 2 | MD |

## Programming (continued)

### Operating Modes

#### Address assignments for the four slaves

The AS-Interface master accesses all slaves sequentially within an AS-Interface cycle to transfer output data to slave A or to read input data from the slaves. The single-turn absolute encoder uses four AS-Interface chips to transfer a position of 13 bits using 4 slave addresses.

These four slaves are queried sequentially and data may originate from any one of four different sampling times. To minimize this effect, sequential addresses (n, n+1, n+2, and n+3) should be assigned to slaves A, B, C, and D.

In addition, slave A is responsible for controlling the encoder's functions. If the order of slaves is changed (D=n, C=n+1, B=n+2, A=n+3), the output word, which is supposed to be transmitted by the function control module of the absolute encoder, will not be transmitted until slaves D, C and B have been read in. A memory command would then only take effect for slave A. The command would not affect the slaves that had already been read until the next read cycle. This change of slave order will result in data inconsistency.

#### Temporary storage and transfer with flag bits

If any data from the rotary encoder is interrupted during transmission, it is possible that some of the data transferred to the controller originates from a different position in the data word. The controller can check the data integrity for a single data word by comparing the four flag bits. Each slave can transfer one flag bit making it possible for the control module to check which position data set an individual data set belongs to by comparing the 4 bits. Data bit D2 is used for this purpose. Using the flag bits reduces the size of the usable data from 16 bits to 12 bits.

| Cycle | Slave A<br>Data bit D2 | Position data |         |         |         |
|-------|------------------------|---------------|---------|---------|---------|
|       |                        | Slave A       | Slave B | Slave C | Slave D |
| 1     | 0                      | XXX0          | XXX0    | XXX0    | XXX0    |
| 2     | 1                      | XXX1          | XXX1    | XXX1    | XXX1    |
| 3     | 0                      | XXX0          | XXX0    | XXX0    | XXX0    |
| 4     | 1                      | XXX1          | XXX1    | XXX1    | XXX1    |
| etc.  |                        |               |         |         |         |

See pages 201-216 for complete AS-Interface accessory listing.

# BSS58/BSM58 Series Absolute Rotary Encoders

- Industrial standard 58 mm diameter housing
- Single or multi-turn
- Uses 4 AS-Interface slaves
- IP65
- 10 mm or 12 mm recessed hollow shaft



Pepperl+Fuchs' BSS58 and BSM58 series absolute encoders feature recessed hollow shafts and communicate via AS-Interface. Available in either single-turn with 13 bit resolution, or multi-turn with 16 bit resolution versions. The position value is output to the master within a single cycle via the 4 integrated AS-Interface chips. Each slave address can be individually set. These encoders are rated IP65 and feature a rugged aluminum housing.

## Order Code

| BS 58N-                                   |  | AVR0NN-     |  |
|-------------------------------------------|--|-------------|--|
| Type                                      |  | Resolution  |  |
| S Single-turn                             |  | Single-turn |  |
| M Multi-turn                              |  | 0013        |  |
| Shaft option                              |  | Multi-turn  |  |
| 01A Ø 10 mm x 21 mm recessed hollow shaft |  | 0313        |  |
| 02A Ø 12 mm x 21 mm recessed hollow shaft |  | 0412        |  |
|                                           |  | 0511        |  |
|                                           |  | 0610        |  |
|                                           |  | 0709        |  |
|                                           |  | 0808        |  |
|                                           |  | 0907        |  |
|                                           |  | 1006        |  |
|                                           |  | 1105        |  |
|                                           |  | 1204        |  |

Example: BVS58N-032AVR0NN-0013

## Technical Specifications

### Electrical

|                                     |                                      |
|-------------------------------------|--------------------------------------|
| SUPPLY VOLTAGE                      | 29.5-31.6 VDC                        |
| CURRENT CONSUMPTION                 | Starting ≤ 155 mA                    |
|                                     | Operational ≤ 65 mA                  |
| OUTPUT CODE                         | Programmable gray or binary          |
| LINEARITY                           | ±1 LSB                               |
| COUNTING DIRECTION (Shaft End View) | Programmable                         |
| INTERFACE                           | Type AS-Interface                    |
|                                     | Transfer rate ≤ 0.167 Mbaud          |
| RESOLUTION                          | Bits/steps per turn 13-bit / ≤ 8192  |
|                                     | Bits/number of turns 12-bit / ≤ 4096 |
| OVERALL RESOLUTION                  | Single-turn 13-bit                   |
|                                     | Multi-turn 16-bit                    |
| STANDARD CONFORMITY                 | AS-Interface                         |
| CERTIFICATES                        | CE                                   |

### Mechanical

|                          |              |                                                 |
|--------------------------|--------------|-------------------------------------------------|
| MATERIAL                 | Housing      | Powder-coated aluminum                          |
|                          | Flange       | Aluminum                                        |
|                          | Shaft        | Stainless steel                                 |
|                          | Code disc    | Glass                                           |
| WEIGHT                   |              | ≈ 12 oz                                         |
| ROTATIONAL SPEED         | BSS58        | ≤ 10,000 rpm                                    |
|                          | BSM58        | ≤ 6,000 rpm                                     |
| MOMENT OF INERTIA        |              | ≤ 4.3 x 10 <sup>-4</sup> oz-in-sec <sup>2</sup> |
| STARTING TORQUE AT 20 °C |              | ≤ 2.1 in-oz                                     |
| SHAFT LOADING            | Angle offset | 1°                                              |
|                          | Axial offset | ≤ 1 mm                                          |
| BEARING WORKING LIFE     |              | > 4 x 10 <sup>10</sup> revolutions              |

### Environmental

|                       |                                      |
|-----------------------|--------------------------------------|
| STORAGE TEMPERATURE   | -25 °C to +85 °C (-13 °F to +185 °F) |
| OPERATING TEMPERATURE | -20 °C to +70 °C (-4 °F to +158 °F)  |
| HUMIDITY              | 98% RH non-condensing                |
| SHOCK RESISTANCE      | 100 g for 3 ms                       |
| VIBRATION RESISTANCE  | 10 g, 10-2,000 Hz                    |
| ENCLOSURE RATING      | IP65                                 |

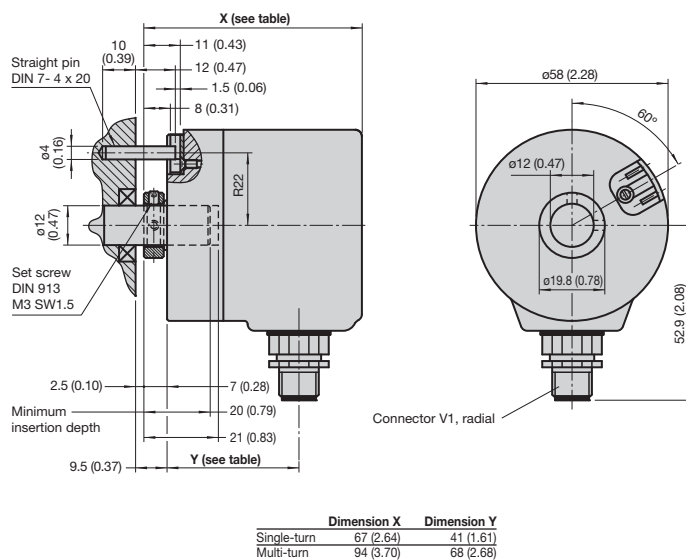
### Connection Types

|           |                     |
|-----------|---------------------|
| CONNECTOR | Type V1, M12, 4-Pin |
|-----------|---------------------|



## Dimensions

mm (in.)



## Electrical Connection

| Type V1, 4-pin quick disconnect |   |             |
|---------------------------------|---|-------------|
| Signal                          |   | Description |
| AS-i +                          | 1 |             |
| Reserved                        | 2 | Not wired   |
| AS-i -                          | 3 |             |
| Reserved                        | 4 | Not wired   |
|                                 |   |             |

## Programming

### Addresses

|                | Slave A | Slave B | Slave C | Slave D |
|----------------|---------|---------|---------|---------|
| Preset address | 1       | 2       | 3       | 4       |
| IO code        | 7       | 0       | 0       | 0       |
| ID code        | F       | F       | F       | F       |

 When using an AS-Interface master or handheld programmer to change the slave addresses, it is absolutely essential to assign a different address to each of the four slaves.

### Parameter Bits

The four parameter bits of slave A are used to set the parameters of the encoder. The parameter bits of slave B, C and D are not used.

| Status of parameter bit | Slave A     |                            |                                    |          |
|-------------------------|-------------|----------------------------|------------------------------------|----------|
|                         | P0          | P1                         | P2                                 | P3       |
| 0                       | Gray code   | Transfer with flag bits    | Count down with clockwise rotation | Not used |
| 1                       | Binary code | Transfer without flag bits | Count up with clockwise rotation   | Not used |

### Data Bits

#### From the AS-Interface master to the encoder

Data from the AS-Interface master is transferred to the encoder via slave A, which works bidirectionally. Slaves B, C and D operate unidirectionally and can only send data.

When data bits D2 and D3 are changed from 01 to 10 or vice-versa, the position data is saved in the encoder.

| Status of D0/D1 or D2/D3 | Slave A                                                    |                            |
|--------------------------|------------------------------------------------------------|----------------------------|
|                          | D0/D1                                                      | D2/D3                      |
| 00                       | Normal mode                                                | Position data is not saved |
| 01                       | Rotary encoder is set to 1/4 of the single turn resolution | Position data is saved     |
| 10                       | Rotary encoder is set to 0                                 | Position data is saved     |
| 11                       | Normal mode                                                | Position data is not saved |

#### From the encoder to the AS-Interface master

Parameter bit P1 of slave A is used to determine if the encoder transfers data to the AS-Interface master with or without flag bits.

P1 = 1: Transfer without flag bits

| Slave A |       |       |       | Slave B |       |       |       | Slave C |       |        |        | Slave D |           |    |    |
|---------|-------|-------|-------|---------|-------|-------|-------|---------|-------|--------|--------|---------|-----------|----|----|
| D0      | D1    | D2    | D3    | D0      | D1    | D2    | D3    | D0      | D1    | D2     | D3     | D0      | D1        | D2 | D3 |
| Bit 0   | Bit 1 | Bit 2 | Bit 3 | Bit 4   | Bit 5 | Bit 6 | Bit 7 | Bit 8   | Bit 9 | Bit 10 | Bit 11 | Bit 12  | Not used! |    |    |

P1 = 0: Transfer with flag bits MA, MB, MC, MD

| Slave A |       |       |    | Slave B |       |       |    | Slave C |       |       |    | Slave D |       |       |    |
|---------|-------|-------|----|---------|-------|-------|----|---------|-------|-------|----|---------|-------|-------|----|
| D0      | D1    | D2    | D3 | D0      | D1    | D2    | D3 | D0      | D1    | D2    | D3 | D0      | D1    | D2    | D3 |
| Bit 0   | Bit 1 | Bit 2 | MA | Bit 0   | Bit 1 | Bit 2 | MB | Bit 0   | Bit 1 | Bit 2 | MC | Bit 0   | Bit 1 | Bit 2 | MD |

## Programming (continued)

### Operating Modes

#### Address assignments for the four slaves

The AS-Interface master accesses all slaves sequentially within an AS-Interface cycle to transfer output data to slave A or to read input data from the slaves. The single-turn absolute encoder uses four AS-Interface chips to transfer a position of 13 bits using 4 slave addresses.

These four slaves are queried sequentially and data may originate from any one of four different sampling times. To minimize this effect, sequential addresses (n, n+1, n+2, and n+3) should be assigned to slaves A, B, C, and D.

In addition, slave A is responsible for controlling the encoder's functions. If the order of slaves is changed (D=n, C=n+1, B=n+2, A=n+3), the output word, which is supposed to be transmitted by the function control module of the absolute encoder, will not be transmitted until slaves D, C and B have been read in. A memory command would then only take effect for slave A. The command would not affect the slaves that had already been read until the next read cycle. This change of slave order will result in data inconsistency.

#### Temporary storage and transfer with flag bits

If any data from the rotary encoder is interrupted during transmission, it is possible that some of the data transferred to the controller originates from a different position in the data word. The controller can check the data integrity for a single data word by comparing the four flag bits. Each slave can transfer one flag bit making it possible for the control module to check which position data set an individual data set belongs to by comparing the 4 bits. Data bit D2 is used for this purpose. Using the flag bits reduces the size of the usable data from 16 bits to 12 bits.

| Cycle | Slave A<br>Data bit D2 | Position data |         |         |         |
|-------|------------------------|---------------|---------|---------|---------|
|       |                        | Slave A       | Slave B | Slave C | Slave D |
| 1     | 0                      | XXX0          | XXX0    | XXX0    | XXX0    |
| 2     | 1                      | XXX1          | XXX1    | XXX1    | XXX1    |
| 3     | 0                      | XXX0          | XXX0    | XXX0    | XXX0    |
| 4     | 1                      | XXX1          | XXX1    | XXX1    | XXX1    |
| etc.  |                        |               |         |         |         |

See pages 201-216 for complete AS-Interface accessory listing.





# Cordsets

|                                                |            |
|------------------------------------------------|------------|
| <b>Micro Cordsets .....</b>                    | <b>188</b> |
| <b>Micro Extension Cables .....</b>            | <b>190</b> |
| <b>3-Pin Micro Extension Cables .....</b>      | <b>192</b> |
| <b>3-Pin Crossed Micro Extension Cables...</b> | <b>193</b> |
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| <b>Nano Cordsets .....</b>                     | <b>196</b> |
| <b>Dual-Port Junction Blocks .....</b>         | <b>198</b> |

## Cordsets

To simplify your installation, P+F offers a complete line of Nano and Micro cordsets along with extension cables in a wide variety of protective jacket options to ensure reliable operation in mechanically and chemically abusive environments.

Tough, heavy-duty, oil- and weather-resistant PVC and PUR cable jackets provide superior protection and ensure a safe connection. Oil, water, metal shavings, grime, and other common contaminants cannot penetrate the molded, one-piece connector head and cable. Integrated cable stress relief allows cables to withstand heavy flexing and physical abuse without decreasing cable life.

# Gray PVC Micro Cordsets

12 mm receptacle  
DC sensor compatibility

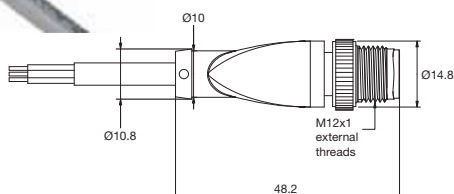
- Single key
- Gray PVC cable jacket
- #22 AWG
- Female or male connection
- 4- and 5-pin



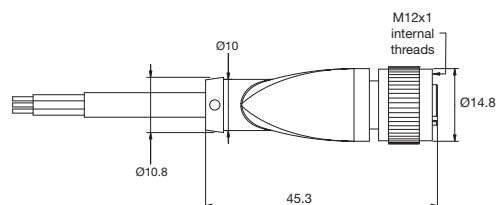
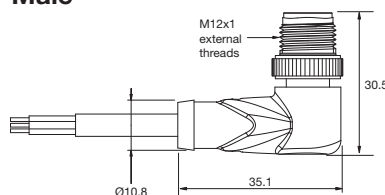
## Specifications

| MATERIAL DATA             |                                   |
|---------------------------|-----------------------------------|
| MOLDED HEAD               | Green TPU                         |
| INSERT                    | PUR                               |
| CABLE TYPE                | Gray, flexible PVC jacket         |
| CONTACTS                  | Machined copper and tin over gold |
| CONTACT PLATING           | Copper and tin over nickel        |
| SHELL                     | N/A                               |
| WIRE GAUGE                | #22 AWG                           |
| COUPLING NUT              | Copper and tin over nickel        |
| CABLE OUTER DIAMETER      | 4.5 mm                            |
| ELECTRICAL DATA           |                                   |
| CONTACT RESISTANCE        | ≤ 5 mΩ                            |
| ELECTRICAL ISOLATION      | 1500 VAC                          |
| CURRENT RATING            | 4 A                               |
| VOLTAGE RATING (4/5 pole) | 300 VDC/60 VDC                    |
| ENVIRONMENT DATA          |                                   |
| PROTECTION CLASSES        | IP68/69K                          |
| TEMPERATURE RANGE         | -13 °F to +212 °F                 |

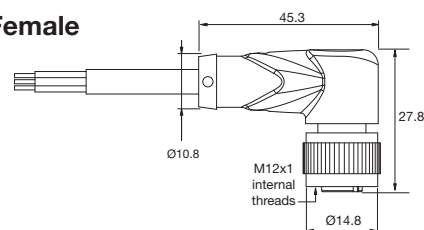
## Dimensions (mm)



Male



Female



## Model Number Selection

| Face View (female) | Color Code                                                 | Length (m)               | Female Straight                                                            | Female Right Angle                                                         | Male Straight                                    | Male Right Angle                              |
|--------------------|------------------------------------------------------------|--------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|-----------------------------------------------|
|                    | 1. Brown<br>2. White<br>3. Blue<br>4. Black<br>5. Not used | 2<br>5<br>10<br>15<br>20 | V1-G-2M-PVC<br>V1-G-5M-PVC<br>V1-G-10M-PVC<br>V1-G-15M-PVC<br>V1-G-20M-PVC | V1-W-2M-PVC<br>V1-W-5M-PVC<br>V1-W-10M-PVC<br>V1-W-15M-PVC<br>V1-W-20M-PVC | V1S-G-2M-PVC<br>V1S-G-5M-PVC<br>V1S-G-10M-PVC    | V1S-W-2M-PVC<br>V1S-W-5M-PVC<br>V1S-W-10M-PVC |
|                    | 1. Brown<br>2. White<br>3. Blue<br>4. Black<br>5. Grey     | 2<br>5<br>10             | V15-G-2M-PVC<br>V15-G-5M-PVC<br>V15-G-10M-PVC                              | V15-W-2M-PVC<br>V15-W-5M-PVC<br>V15-W-10M-PVC                              | V15S-G-2M-PVC<br>V15S-G-5M-PVC<br>V15S-G-10M-PVC |                                               |



## Specifications

| Specifications                  |                              |
|---------------------------------|------------------------------|
| <b>MATERIAL DATA</b>            |                              |
| <b>MOLDED HEAD</b>              | Yellow TPU                   |
| <b>CABLE OUTER JACKET</b>       | Yellow PVC                   |
| <b>CONTACTS</b>                 | Brass (nickel & gold plated) |
| <b>CONTACT CARRIER</b>          | TPU with 20% glass fiber     |
| <b>COUPLING NUT</b>             | Nickel-plated diecast zinc   |
| <b>WIRE GAUGE</b>               | 22 AWG                       |
| <b>CABLE OUTER DIAMETER</b>     | 5.5 mm                       |
| <b>ELECTRICAL DATA</b>          |                              |
| <b>NOMINAL CURRENT</b>          | 4 A                          |
| <b>RATED VOLTAGE (4/5 pole)</b> | 300 V/125 V                  |
| <b>CONTACT RESISTANCE</b>       | ≤ 5 mΩ                       |
| <b>ENVIRONMENT DATA</b>         |                              |
| <b>PROTECTION CLASSES</b>       | IP68/69K                     |
| <b>TEMPERATURE RANGE</b>        | -22 °F to +221 °F            |

# Yellow PVC Micro Cordsets

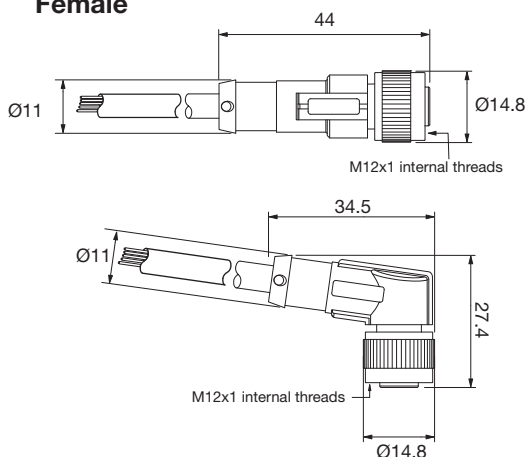
12 mm receptacle  
DC sensor compatibility

- Single key
- Yellow PVC cable jacket
- Female or male connection
- #22 AWG
- SPEEDCON compatible

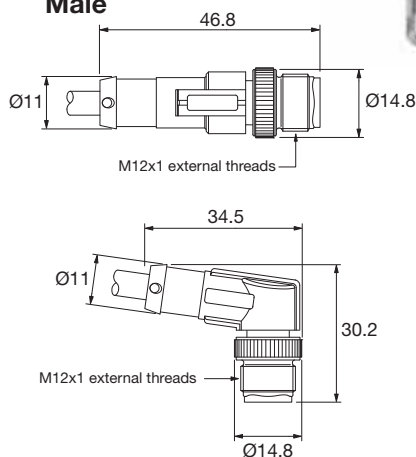


## Dimensions (mm)

## Female



## Male

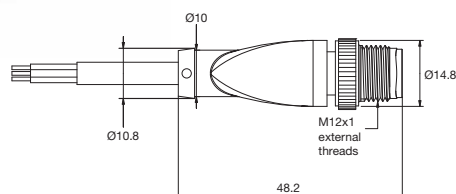


## Model Number Selection

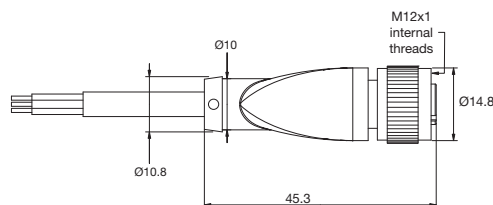
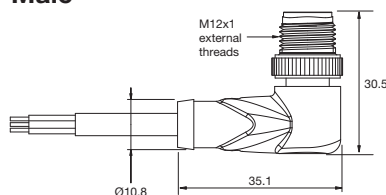
| Face View (female) | Color Code  | Length (m) | Female Straight | Female Right Angle | Male Straight   | Male Right Angle |
|--------------------|-------------|------------|-----------------|--------------------|-----------------|------------------|
|                    | 1. Brown    | 2          | V1-G-YE2M-PVC   | V1-W-YE2M-PVC      | V1-G-S-YE2M-PVC | V1-W-S-YE2M-PVC  |
|                    | 2. White    | 5          | V1-G-YE5M-PVC   | V1-W-YE5M-PVC      | V1-G-S-YE5M-PVC | V1-W-S-YE5M-PVC  |
|                    | 3. Blue     | 10         | V1-G-YE10M-PVC  | V1-W-YE10M-PVC     |                 |                  |
|                    | 4. Black    | 20         | V1-G-YE20M-PVC  | V1-W-YE20M-PVC     |                 |                  |
|                    | 5. Not used |            |                 |                    |                 |                  |
|                    | 1. Brown    | 2          | V15-G-YE2M-PVC  | V15-W-YE2M-PVC     |                 |                  |
|                    | 2. White    | 5          | V15-G-YE5M-PVC  | V15-W-YE5M-PVC     |                 |                  |
|                    | 3. Blue     |            |                 |                    |                 |                  |
|                    | 4. Black    |            |                 |                    |                 |                  |
|                    | 5. Grey     |            |                 |                    |                 |                  |

# Gray PVC or PUR DC Micro Extension Cables

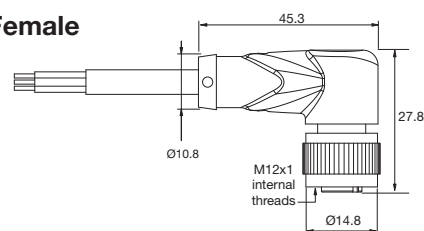
- Single key
- Gray PVC or PUR (halogen-free) cable jacket
- #22 AWG
- Male to female
- Straight or right angle heads
- 4-pin



Male



Female



## Specifications

### MATERIAL DATA

|                      |                                   |
|----------------------|-----------------------------------|
| BODY                 | Green TPU                         |
| INSERT               | PUR                               |
| CABLE TYPE           | Gray, flexible PVC or PUR jacket  |
| CONTACTS             | Machined copper and tin over gold |
| CONTACT PLATING      | Copper and tin over nickel        |
| SHELL                | N/A                               |
| WIRE GAUGE           | #22 AWG                           |
| COUPLING NUT         | Copper and tin over nickel        |
| CABLE OUTER DIAMETER | 4.5 mm                            |

### ELECTRICAL DATA

|                      |          |
|----------------------|----------|
| CONTACT RESISTANCE   | ≤ 5 mΩ   |
| ELECTRICAL ISOLATION | 1500 VAC |
| CURRENT RATING       | 4 A      |
| VOLTAGE RATING       | 250 VDC  |

### ENVIRONMENT DATA

|                    |                   |
|--------------------|-------------------|
| PROTECTION CLASSES | IP68              |
| TEMPERATURE RANGE  | -40 °F to +176 °F |

## Dimensions (mm)



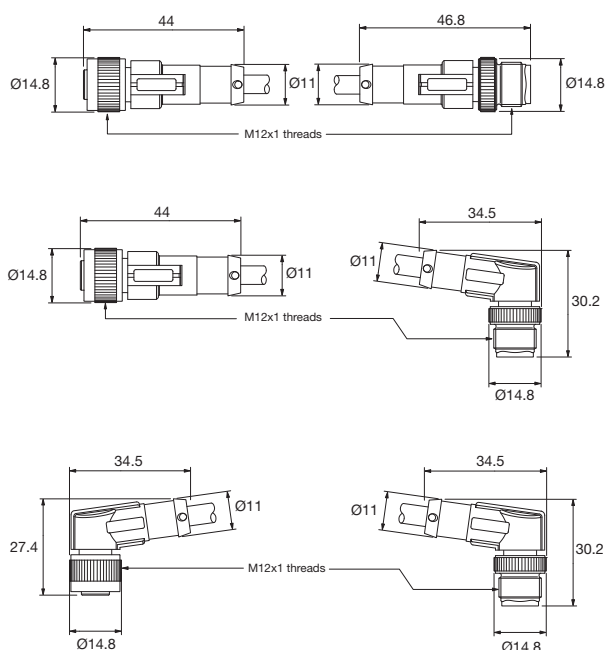
## Model Number Selection

| Face View (female) | Color Code                                                 | Length (m)          | Female Straight to Male Straight | Female Straight to Male Right Angle | Female Right Angle to Male Straight |
|--------------------|------------------------------------------------------------|---------------------|----------------------------------|-------------------------------------|-------------------------------------|
|                    | 1. Brown<br>2. White<br>3. Blue<br>4. Black<br>5. Not used | 2                   | V1-G-2M-PVC-V1-G                 | V1-G-2M-PVC-V1-W                    | V1-W-2M-PVC-V1-G                    |
|                    |                                                            | 5                   | V1-G-5M-PVC-V1-G                 | V1-G-5M-PVC-V1-W                    | V1-W-5M-PVC-V1-G                    |
|                    |                                                            | 10                  | V1-G-10M-PVC-V1-G                | V1-G-10M-PVC-V1-W                   | V1-W-10M-PVC-V1-G                   |
|                    |                                                            | 2                   | V1-G-2M-PUR-V1-G                 | V1-G-2M-PUR-V1-W                    | V1-W-2M-PUR-V1-G                    |
|                    |                                                            | 5                   | V1-G-5M-PUR-V1-G                 | V1-G-5M-PUR-V1-W                    | V1-W-5M-PUR-V1-G                    |
|                    |                                                            | 10                  | V1-G-10M-PUR-V1-G                | V1-G-10M-PUR-V1-W                   | V1-W-10M-PUR-V1-G                   |
|                    |                                                            | 0.5 to 2.5 (coiled) | V1-G-0.5/2.5M-PUR-V1-G           |                                     | V1-W-0.5/2.5M-PUR-V1-G              |

## Specifications

| MATERIAL DATA        |                              |
|----------------------|------------------------------|
| MOLDED HEAD          | Yellow TPU                   |
| CABLE OUTER JACKET   | Yellow PVC                   |
| CONTACTS             | Brass (nickel & gold plated) |
| CONTACT CARRIER      | TPU with 20% glass fiber     |
| COUPLING NUT         | Nickel-plated diecast zinc   |
| WIRE GAUGE           | 22 AWG                       |
| CABLE OUTER DIAMETER | 5.5 mm                       |
| ELECTRICAL DATA      |                              |
| NOMINAL CURRENT      | 4 A                          |
| RATED VOLTAGE        | 300 V                        |
| CONTACT RESISTANCE   | ≤ 5 mΩ                       |
| ENVIRONMENT DATA     |                              |
| PROTECTION CLASSES   | IP68/69K                     |
| TEMPERATURE RANGE    | -22 °F to +221 °F            |

## Dimensions (mm)



## Model Number Selection

| Face View (female) | Color Code                                                 | Length (m)   | Female Straight to Male Straight                                | Female Straight to Male Right Angle                             | Female Right Angle to Male Right Angle                          |
|--------------------|------------------------------------------------------------|--------------|-----------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|
|                    | 1. Brown<br>2. White<br>3. Blue<br>4. Black<br>5. Not used | 2<br>5<br>10 | V1-G-YE2M-PVC-V1-G<br>V1-G-YE5M-PVC-V1-G<br>V1-G-YE10M-PVC-V1-G | V1-G-YE2M-PVC-V1-W<br>V1-G-YE5M-PVC-V1-W<br>V1-G-YE10M-PVC-V1-W | V1-W-YE2M-PVC-V1-W<br>V1-W-YE5M-PVC-V1-W<br>V1-W-YE10M-PVC-V1-W |

## Yellow PVC DC Micro Extension Cables

- Single key
- Yellow PVC cable jacket
- #22 AWG
- Male to female
- Straight or right angle heads
- SPEEDCON compatible



Gateways and Scanners

Power Supplies and Repeaters

I/O Modules

Safety at Work

Sensors

Cordsets

Accessories

# Gray PVC DC 3-Pin Micro Extension Cables

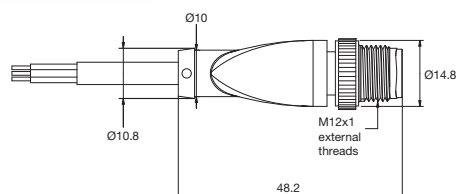
- Single key
- Gray PVC (halogen-free) cable jacket
- #22 AWG
- Male to female
- Straight heads
- 3-pin



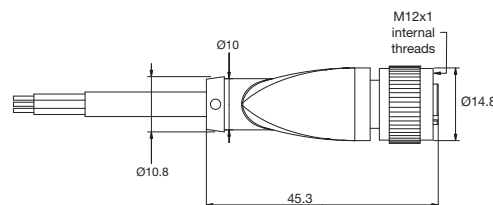
## Specifications

| Specifications          |                                   |
|-------------------------|-----------------------------------|
| <b>MATERIAL DATA</b>    |                                   |
| BODY                    | Green TPU                         |
| INSERT                  | PUR                               |
| CABLE TYPE              | Gray, flexible PVC jacket         |
| CONTACTS                | Machined copper and tin over gold |
| CONTACT PLATING         | Copper and tin over nickel        |
| SHELL                   | N/A                               |
| WIRE GAUGE              | #22 AWG                           |
| COUPLING NUT            | Copper and tin over nickel        |
| CABLE OUTER DIAMETER    | 4,5 mm                            |
| <b>ELECTRICAL DATA</b>  |                                   |
| CONTACT RESISTANCE      | ≤ 5 mΩ                            |
| ELECTRICAL ISOLATION    | 1500 VAC                          |
| CURRENT RATING          | 4 A                               |
| VOLTAGE RATING          | 250 VDC                           |
| <b>ENVIRONMENT DATA</b> |                                   |
| PROTECTION CLASSES      | IP68                              |
| TEMPERATURE RANGE       | -40 °F to +176 °F                 |

## Dimensions (mm)



Male



Female



## Model Number Selection

| Face View (female) | Color Code  | Length (m) | Female Straight to Male Straight |
|--------------------|-------------|------------|----------------------------------|
|                    | 1. Brown    | 1          | V11-G-1M-PVC-V11-G               |
|                    | 2. Not used | 2          | V11-G-2M-PVC-V11-G               |
|                    | 3. Blue     | 3          | V11-G-3M-PVC-V11-G               |
|                    | 4. Black    | 4          | V11-G-4M-PVC-V11-G               |
|                    | 5. Not used | 5          | V11-G-5M-PVC-V11-G               |
|                    |             | 6          | V11-G-6M-PVC-V11-G               |
|                    |             | 7          | V11-G-7M-PVC-V11-G               |
|                    |             | 8          | V11-G-8M-PVC-V11-G               |
|                    |             | 10         | V11-G-10M-PVC-V11-G              |

## Specifications

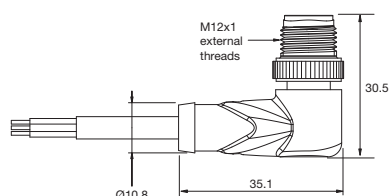
| MATERIAL DATA        |                                   |
|----------------------|-----------------------------------|
| BODY                 | Green TPU                         |
| INSERT               | PUR                               |
| CABLE TYPE           | Gray, flexible PVC jacket         |
| CONTACTS             | Machined copper and tin over gold |
| CONTACT PLATING      | Copper and tin over nickel        |
| SHELL                | N/A                               |
| WIRE GAUGE           | #22 AWG                           |
| COUPLING NUT         | Copper and tin over nickel        |
| CABLE OUTER DIAMETER | 4.5 mm                            |
| ELECTRICAL DATA      |                                   |
| CONTACT RESISTANCE   | ≤ 5 mΩ                            |
| ELECTRICAL ISOLATION | 1500 VAC                          |
| CURRENT RATING       | 4 A                               |
| VOLTAGE RATING       | 250 VDC                           |
| ENVIRONMENT DATA     |                                   |
| PROTECTION CLASSES   | IP68                              |
| TEMPERATURE RANGE    | -40 °F to +176 °F                 |

# Gray PVC DC 3-Pin Crossed Micro Extension Cables

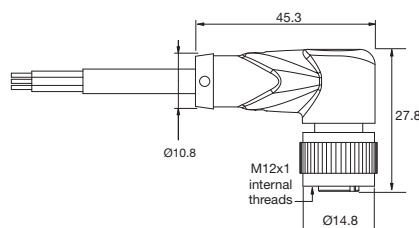
- Single key
- Gray PVC (halogen-free) cable jacket
- #22 AWG
- Male to female
- Right angle heads
- 3-pin



## Dimensions (mm)

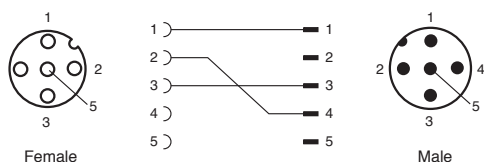


Male



Female

## Wiring Diagram



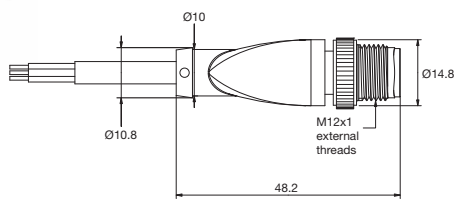
## Model Number Selection

| Face View (female) | Color Code                                                    | Length (m) | Female Right Angle to Male Right Angle       | Face View (male) | Color Code                                                    |
|--------------------|---------------------------------------------------------------|------------|----------------------------------------------|------------------|---------------------------------------------------------------|
|                    | 1. Brown<br>2. Black<br>3. Blue<br>4. Not used<br>5. Not used | 2<br>5     | V1-W-42-2M-PVC-V11-W<br>V1-W-42-5M-PVC-V11-W |                  | 1. Brown<br>2. Not used<br>3. Blue<br>4. Black<br>5. Not used |

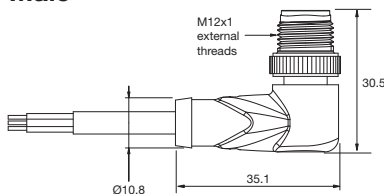


# Gray DC 4-Pin Nano to Micro Adapter Cables

- Single key
- Gray PVC or PUR (halogen-free) cable jacket
- #22 AWG
- Male to female
- Straight or right angle heads



Male



## Specifications

### MATERIAL DATA

|                      |                                   |
|----------------------|-----------------------------------|
| BODY                 | Green TPU                         |
| INSERT               | PUR                               |
| CABLE TYPE           | Gray, flexible PVC or PUR jacket  |
| CONTACTS             | Machined copper and tin over gold |
| CONTACT PLATING      | Copper and tin over nickel        |
| SHELL                | N/A                               |
| WIRE GAUGE           | #22 AWG                           |
| COUPLING NUT         | Copper and tin over nickel        |
| CABLE OUTER DIAMETER | 4.5 mm                            |

### ELECTRICAL DATA

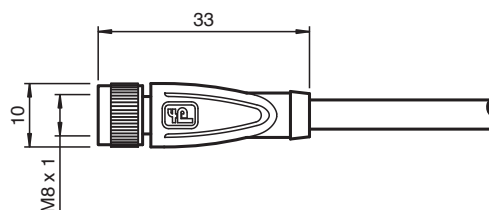
|                      |          |
|----------------------|----------|
| CONTACT RESISTANCE   | ≤ 5 mΩ   |
| ELECTRICAL ISOLATION | 1500 VAC |
| CURRENT RATING       | 4 A      |
| VOLTAGE RATING       | 250 VDC  |

### ENVIRONMENT DATA

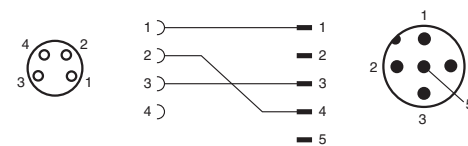
|                    |                   |
|--------------------|-------------------|
| PROTECTION CLASSES | IP68              |
| TEMPERATURE RANGE  | -40 °F to +176 °F |

## Dimensions (mm)

Female



## Wiring Diagram (...-42... models)



## Model Number Selection

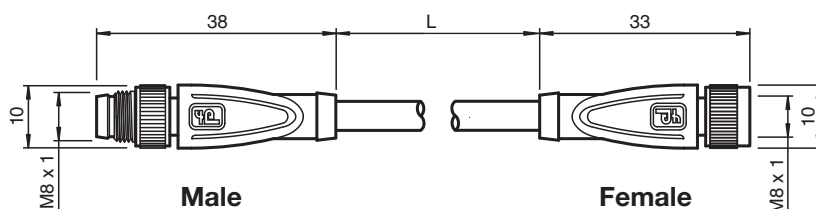
| Face View (female) | Color Code                                     | Length (m) | Female Straight to Male Straight    | Face View (male) | Color Code                                                    |
|--------------------|------------------------------------------------|------------|-------------------------------------|------------------|---------------------------------------------------------------|
|                    | 1. Brown<br>2. White<br>3. Blue<br>4. Black    | 0.1        | V31-GM-0.1M-PUR-V1-G                |                  | 1. Brown<br>2. White<br>3. Blue<br>4. Black<br>5. Not used    |
| Face View (female) | Color Code                                     | Length (m) | Female Straight to Male Right Angle | Face View (male) | Color Code                                                    |
|                    | 1. Brown<br>2. White<br>3. Blue<br>4. Not used | 2          | V31-GM-42-2M-PVC-V11-W              |                  | 1. Brown<br>2. Not used<br>3. Blue<br>4. Black<br>5. Not used |

## Specifications

| MATERIAL DATA        |                           |
|----------------------|---------------------------|
| BODY                 | Green TPU                 |
| INSERT               | PUR                       |
| CABLE TYPE           | Gray, flexible PUR jacket |
| CONTACTS             | Machined copper and tin   |
| CONTACT PLATING      | Gold                      |
| SHELL                | N/A                       |
| WIRE GAUGE           | #22 AWG                   |
| COUPLING NUT         | Die-cast zinc             |
| CABLE OUTER DIAMETER | 4.8 mm                    |
| ELECTRICAL DATA      |                           |
| CONTACT RESISTANCE   | ≤ 5 mΩ                    |
| ELECTRICAL ISOLATION | 1500 VAC                  |
| CURRENT RATING       | 4 A                       |
| VOLTAGE RATING       | 60 VDC                    |
| ENVIRONMENT DATA     |                           |
| PROTECTION CLASSES   | IP68                      |
| TEMPERATURE RANGE    | -22 °F to +212 °F         |

## Gray PUR DC Nano Extension Cables

- Single key
- Gray PUR cable jacket
- #24 AWG
- Male to female
- 3-pin
- Straight connection



## Model Number Selection

| Face View (female) | Color Code | Length (m) | Female Straight to Male Straight |
|--------------------|------------|------------|----------------------------------|
|                    | 1. Brown   | 1          | V3-GM-1M-PUR-V3-GM               |
|                    | 3. Blue    | 2          | V3-GM-2M-PUR-V3-GM               |
|                    | 5          | 5          | V3-GM-5M-PUR-V3-GM               |
|                    | 4. Black   | 10         | V3-GM-10M-PUR-V3-GM              |
|                    |            |            |                                  |



# Nano Cordsets

8 mm receptacle  
DC sensor compatibility

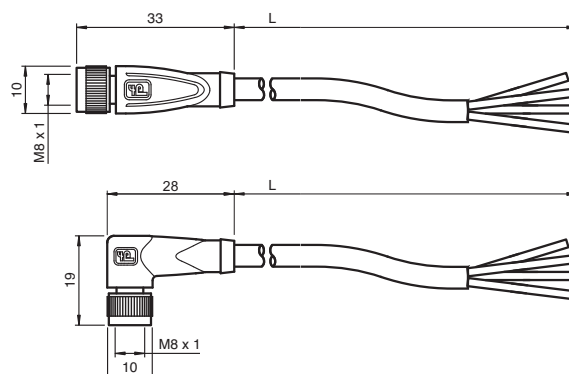
- Single key
- Gray PVC or PUR cable jacket
- #24 AWG
- Female version
- 3- and 4-pin
- Straight or right angle connection



## Specifications

| MATERIAL DATA        |                                  |
|----------------------|----------------------------------|
| BODY                 | Green TPU                        |
| INSERT               | PVC                              |
| CABLE TYPE           | Gray, flexible PVC or PUR jacket |
| CONTACTS             | Machined copper and tin          |
| CONTACT PLATING      | Gold                             |
| SHELL                | N/A                              |
| WIRE GAUGE           | #22 AWG                          |
| COUPLING NUT         | Die-cast zinc                    |
| CABLE OUTER DIAMETER | 4.8 mm                           |
| ELECTRICAL DATA      |                                  |
| CONTACT RESISTANCE   | ≤ 5 mΩ                           |
| ELECTRICAL ISOLATION | 1500 VAC                         |
| CURRENT RATING       | 4 A                              |
| VOLTAGE RATING       | 60 VDC                           |
| ENVIRONMENT DATA     |                                  |
| PROTECTION CLASSES   | IP68                             |
| TEMPERATURE RANGE    | -22 °F to +212 °F                |

## Dimensions (mm)



## Model Number Selection

| Face View (female) | Color Code                                  | Length (m)   | Straight (PVC)                                   | Right Angle (PVC)                                | Straight (PUR)                                   | Right Angle (PUR)                                |
|--------------------|---------------------------------------------|--------------|--------------------------------------------------|--------------------------------------------------|--------------------------------------------------|--------------------------------------------------|
|                    | 1. Brown<br>3. Blue<br>4. Black             | 2<br>5<br>10 | V3-GM-2M-PVC<br>V3-GM-5M-PVC<br>V3-GM-10M-PVC    | V3-WM-2M-PVC<br>V3-WM-5M-PVC<br>V3-WM-10M-PVC    | V3-GM-2M-PUR<br>V3-GM-5M-PUR<br>V3-GM-10M-PUR    | V3-WM-2M-PUR<br>V3-WM-5M-PUR<br>V3-WM-10M-PUR    |
|                    | 1. Brown<br>2. White<br>3. Blue<br>4. Black | 2<br>5<br>10 | V31-GM-2M-PVC<br>V31-GM-5M-PVC<br>V31-GM-10M-PVC | V31-WM-2M-PVC<br>V31-WM-5M-PVC<br>V31-WM-10M-PVC | V31-GM-2M-PUR<br>V31-GM-5M-PUR<br>V31-GM-10M-PUR | V31-WM-2M-PUR<br>V31-WM-5M-PUR<br>V31-WM-10M-PUR |

## Specifications

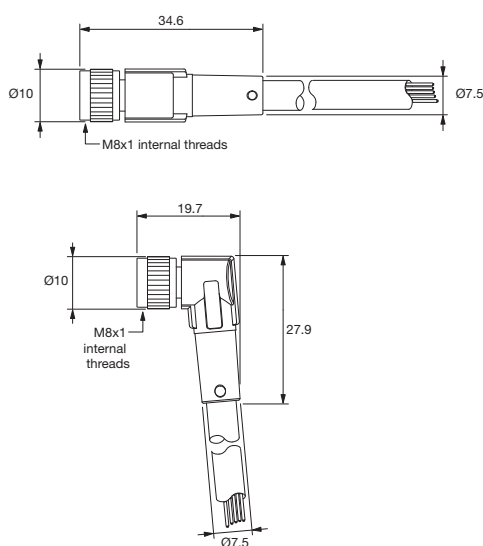
| Specifications          |                              |
|-------------------------|------------------------------|
| <b>MATERIAL DATA</b>    |                              |
| MOLDED HEAD             | Yellow TPU                   |
| CABLE OUTER JACKET      | Yellow PVC                   |
| CONTACTS                | Brass (nickel & gold plated) |
| CONTACT CARRIER         | TPU with 20% glass fiber     |
| COUPLING NUT            | Nickel-plated diecast zinc   |
| WIRE GAUGE              | 24 AWG                       |
| <b>ELECTRICAL DATA</b>  |                              |
| NOMINAL CURRENT         | 4 A                          |
| RATED VOLTAGE           | 125 V                        |
| CONTACT RESISTANCE      | ≤ 5 mΩ                       |
| <b>ENVIRONMENT DATA</b> |                              |
| PROTECTION CLASSES      | IP68/69K                     |
| TEMPERATURE RANGE       | -22 °F to +221 °F            |

# Thread-Lock Nano Cordsets

8 mm receptacle  
DC sensor compatibility

- Yellow PVC cable jacket
- Female version
- #24 AWG
- 3- and 4-pin
- Straight and right angle connection

## Dimensions (mm)



## Model Number Selection

| Face View (female) | Color Code                                  | Outer Diameter (mm) | Length (m)   | Straight                                               | Right Angle                                            |
|--------------------|---------------------------------------------|---------------------|--------------|--------------------------------------------------------|--------------------------------------------------------|
|                    | 1. Brown<br>3. Blue<br>4. Black             | 5.0                 | 2<br>5<br>10 | V3-GM-YE2M-PVC<br>V3-GM-YE5M-PVC<br>V3-GM-YE10M-PVC    | V3-WM-YE2M-PVC<br>V3-WM-YE5M-PVC<br>V3-WM-YE10M-PVC    |
|                    | 1. Brown<br>2. White<br>3. Blue<br>4. Black | 5.2                 | 2<br>5<br>10 | V31-GM-YE2M-PVC<br>V31-GM-YE5M-PVC<br>V31-GM-YE10M-PVC | V31-WM-YE2M-PVC<br>V31-WM-YE5M-PVC<br>V31-WM-YE10M-PVC |

# DC Micro Dual-Port Junction Blocks

## 12 mm receptacle

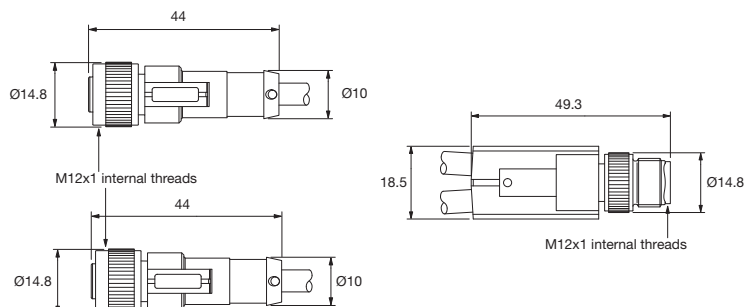
- Single key
- PVC cable jacket
- #18 AWG
- 4-pin



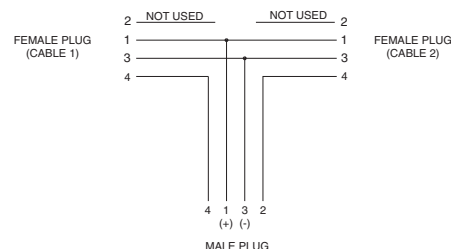
### Specifications

| MATERIAL DATA        |                              |
|----------------------|------------------------------|
| MOLDED HEAD          | Yellow TPU                   |
| CABLE OUTER JACKET   | Irradiated PUR               |
| CONTACTS             | Brass (nickel & gold plated) |
| CONTACT CARRIER      | TPU with 20% glass fiber     |
| COUPLING NUT         | Nickel-plated diecast zinc   |
| WIRE GAUGE           | 22 AWG                       |
| CABLE OUTER DIAMETER | 5.2 mm                       |
| ELECTRICAL DATA      |                              |
| NOMINAL CURRENT      | 3 A                          |
| RATED VOLTAGE        | 300 V                        |
| CONTACT RESISTANCE   | ≤ 5 mΩ                       |
| ENVIRONMENT DATA     |                              |
| PROTECTION CLASSES   | IP68/IP69K                   |
| TEMPERATURE RANGE    | -40 °F to +176 °F            |

### Dimensions (mm)



### Wiring Diagram



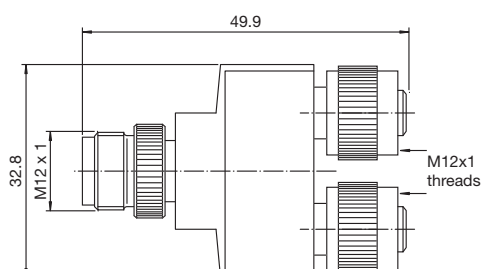
### Model Number Selection

| Face View (female) | Color Code                                                 | Length (m) | Model Number       |
|--------------------|------------------------------------------------------------|------------|--------------------|
|                    | 1. Brown<br>2. White<br>3. Blue<br>4. Black<br>5. Not Used | 0.3        | V1-G-.3M-T-0M-V1-G |

## Specifications

| Specifications          |                              |
|-------------------------|------------------------------|
| <b>MATERIAL DATA</b>    |                              |
| CONNECTOR               | TPU                          |
| CONTACTS                | Brass (nickel & gold plated) |
| CONTACT CARRIER         | TPU with 20% glass fiber     |
| COUPLING NUT            | Nickel-plated diecast zinc   |
| <b>ELECTRICAL DATA</b>  |                              |
| NOMINAL CURRENT         | 3 A                          |
| RATED VOLTAGE           | 24 V                         |
| CONTACT RESISTANCE      | ≤ 5 mΩ                       |
| <b>ENVIRONMENT DATA</b> |                              |
| PROTECTION CLASSES      | IP67                         |
| TEMPERATURE RANGE       | -13 °F to +194 °F            |

## Dimensions (mm)



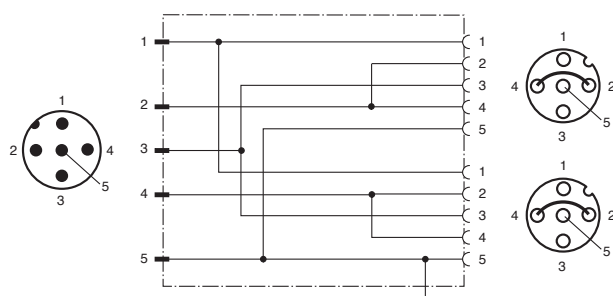
# DC Micro Dual-Port Junction Blocks

## 12 mm receptacle

- Single key
- For dual-input multiport junction blocks
- 5-pin



## Wiring Diagram



## Model Number Selection

| Face View (female) | Color Code                                             | Model Number |
|--------------------|--------------------------------------------------------|--------------|
|                    | 1. Brown<br>2. White<br>3. Blue<br>4. Black<br>5. Grey | V15S-T-V15   |

# DC Micro Network Splitters

## 12 mm receptacle

- Single key
- One male input and two female outputs
- 5-pin

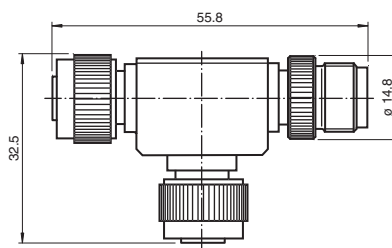


### Specifications

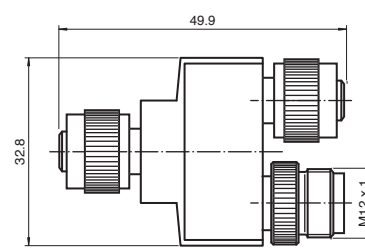
| MATERIAL DATA      |                              |
|--------------------|------------------------------|
| CONNECTOR          | TPU                          |
| CONTACTS           | Brass (nickel & gold plated) |
| CONTACT CARRIER    | TPU with 20% glass fiber     |
| COUPLING NUT       | Nickel-plated diecast zinc   |
| ELECTRICAL DATA    |                              |
| NOMINAL CURRENT    | 3 A                          |
| RATED VOLTAGE      | 24 V                         |
| CONTACT RESISTANCE | ≤ 5 mΩ                       |
| ENVIRONMENT DATA   |                              |
| PROTECTION CLASSES | IP67                         |
| TEMPERATURE RANGE  | -13 °F to +194 °F            |

### Dimensions (mm)

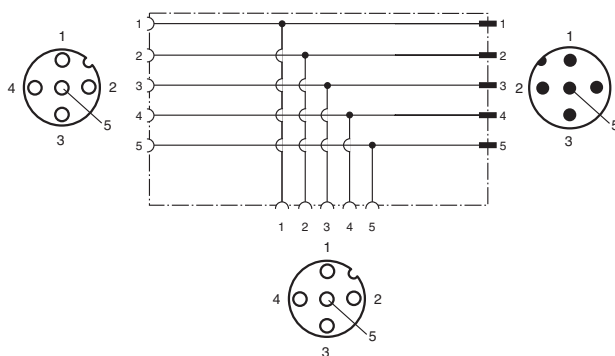
V15S-TEE-V15



V15S-YEE-V15

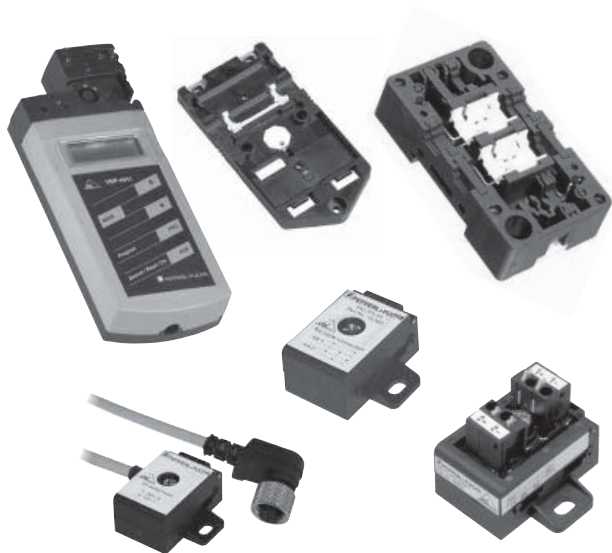


### Wiring Diagram



### Model Number Selection

| Face View (female)                                                                  | Color Code                                             | Model Number                 |
|-------------------------------------------------------------------------------------|--------------------------------------------------------|------------------------------|
|  | 1. Brown<br>2. White<br>3. Blue<br>4. Black<br>5. Grey | V15S-TEE-V15<br>V15S-YEE-V15 |



# Accessories

## Accessories

Pepperl+Fuchs offers a complete line of accessories for your AS-Interface network—everything from cordsets and connectors to AS-Interface flat cable, and module bases. As a guarantee of our quality, our products are produced according to the ISO 9001 International Standard and carry all of the national and international certifications and registrations. That means that every Pepperl+Fuchs product, from a part as simple as a wiring tee to a hand-held AS-Interface addressing device, will meet the demands of your most challenging applications, no matter where you are.

Whether it is for a replacement component or a complete AS-Interface system, Pepperl+Fuchs has the right part and the right solution. Get the parts you need at Pepperl+Fuchs.

|                                                                       |            |
|-----------------------------------------------------------------------|------------|
| <b>Handheld Programmer.....</b>                                       | <b>202</b> |
| <b>Software and Cables .....</b>                                      | <b>203</b> |
| <b>Diagnostic Tools .....</b>                                         | <b>204</b> |
| <b>Master Simulators .....</b>                                        | <b>205</b> |
| <b>AS-Interface Terminator and Tuner .....</b>                        | <b>206</b> |
| <b>Bases .....</b>                                                    | <b>207</b> |
| <b>AS-Interface Cable .....</b>                                       | <b>208</b> |
| <b>Flat Cable Adapters and Splitters.....</b>                         | <b>209</b> |
| <b>Bulkhead Connectors, Cordgrips,<br/>and Conduit Adapters .....</b> | <b>212</b> |
| <b>Covers and Mounting Accessories.....</b>                           | <b>213</b> |
| <b>AC Input Accessories.....</b>                                      | <b>214</b> |
| <b>Passive and Protected Tees .....</b>                               | <b>215</b> |
| <b>PROFIBUS Accessories .....</b>                                     | <b>216</b> |

## Handheld Programmer

The handheld programmer can be used to program any IO module on the network. It can also be used as a diagnostic tool to read the slave profile, set parameters, read inputs, and set outputs.

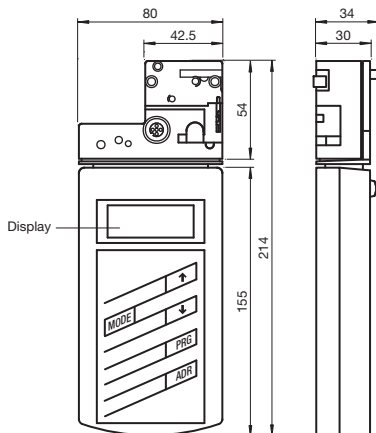


| Model            | Description                                                                                                                                                     |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VBP-HH1-V3.0     | Handheld programming and diagnostic tool, runs on battery and included power supply                                                                             |
| VAZ-PK-1.5M-V1-G | Cable to connect handheld to module with programming jack. All G2, G12, KE, KE1, KE2, PM and A type bases support this cable                                    |
| V1-G-2M-PVC-V1-G | Cable to connect handheld to module with male M12 quick disconnect, 2m long. All G16, photoeyes, cylindrical inductive, F85A and L2 type modules use this cable |
| V1S-G-2M-PVC     | Cable with flying leads to connect programmer to devices with only AS-i terminal connections (eg. CB1 module)                                                   |
| VAZ-9VDC-CHRG    | Replacement battery charger                                                                                                                                     |

### Specifications

|                          |         |                                     |
|--------------------------|---------|-------------------------------------|
| <b>PROTECTION (IEC)</b>  |         | IP20                                |
| <b>TEMPERATURE RANGE</b> | Working | 32 °F to +104 °F (0 °C to +40 °C)   |
|                          | Storage | -4 °F to +104 °F (-20 °C to +40 °C) |

Dimensions in mm



### Buttons

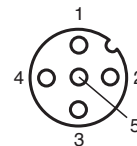
- ↑ : Moves up to select options like data, address, and parameter
- ↓ : Moves down to select options like data, address, and parameter
- PRG**: Sets address, temporarily sets parameter, sets ID1 code, sets outputs
- ADR**: Searches for AS-i slaves, reads inputs, turns programmer on, scans network
- MODE**: Selects between mode of operation (ADDR, ID, IO, ID1, ID2, PERI, PARA, Data)

### Modes of Operation

- ADDR**: Read all AS-i addresses on network, program AS-i node address
- ID**: Read ID code of selected address
- ID1**: Read ID1 code of selected address. This code can also be written
- ID2**: Read ID2 code of selected address
- PERI**: Show the state of the peripheral fault bit sent by the AS-i master
- PARA**: Reads and writes parameters of selected address, all parameter setting is temporary
- DATA**: Reads inputs and sets outputs on the selected address

### Display

Shows addresses 1-29, 1-29a, 1-29b, all modes of operation, 2-7 segment display for data read/write



- 1 AS-Interface +
- 2 reserved (do not connect)
- 3 AS-Interface -
- 4 reserved (do not connect)
- 5 reserved (do not connect)





## Software and Cables

All Pepperl+Fuchs software need only be purchased one time. As newer versions are available and features are added, an updated copy can be sent from the factory to you free of charge. The Control Tools software includes all cables required to connect to the K20 AS-Interface gateways. Extra cable is required when using this software with the Compact I/O or ControlLogix cards. The safety software also includes a cable to connect directly to the safety monitor.

### Control Tools Software and Cables

#### Features

- Configuration screen to setup network
- Diagnostic counters for network troubleshooting
- Fault detector shows extra diagnostics
- Address Assistant to aid in configuring nodes
- Safety monitor diagnostic interface
- Stand-alone control programming/simulating tool (Gateways must support it or have purchased VAZ-CTR unlock code.)



| Model        | Description                                                                                                                                       |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| VAZ-SW-ACT32 | Control Tools diagnostic and configuration software for all gateways except SST-ASI-SLC. RS-232 cable for all K20, K30 and K31 gateways included. |
| K-ADP2       | Cable required to use Control Tools with ControlLogix (VBM-CLX-DM) or Compact I/O (VBM-MLX/CPLX) cards                                            |

### Safety Software and Cables

#### Features

- Easy Programming of e-stops, light curtains, and gate switches
- OR, AND, Logic devices available
- On delay and Off delay safe time functions
- Supports safe coupling to other networks
- Supports debounced safety contacts
- 1 (SIMON) or 16 (SIMON+) safe output channels
- Device index assignment
- Selection of 1, 2, or 3 simulated slaves
- Start via standard or safety slave, monitor input or automatic
- Safety devices with local acknowledge and startup test
- Immediate stop or on time delay for safe shutdown



| Model                   | Description                                                                                                                                                                                                                   |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VAZ-SW-SIMON            | Safety software for use with all VAS-...A1L-K12 type safety monitors, up to 48 programming blocks available, includes VAZ-SIMON-R2 cable                                                                                      |
| VAZ-SIMON-R2            | Replacement cable for upload, download, and diagnostic connections to monitor, included with software                                                                                                                         |
| VAZ-SIMON-RJ45          | Cable to connect two monitors together in the event one has failed. Automatically transfers data from unpowered failed monitor to replacement monitor. Replacement monitor must be new or have program that is not validated. |
| VAZ-SW-SIMON+           | Safety software for use with all ...-4A16L-... safety monitors. Up to 256 programming blocks available                                                                                                                        |
| VAZ-SIMON+-R2-1.8M-PS/2 | Replacement serial cable with PS/2 on one side and DB9 on other. Used for all K20, K30, K31 gateways with RS-232 port.                                                                                                        |

## Diagnostic Tools

The network analyzer is used to determine the quality of the network. It is indispensable tool for diagnosing problems and troubleshooting the network. Two modes of operation allow you to get online statistics to gauge the health of the network or trace the network to look at individual AS-Interface transactions. Kit includes analyzer, USB to serial adapter, screwdriver and software.

### Analyzer Features

- RS-232 connection for PC
- Trigger input, 24V
- Trigger output, TTL level
- Statistical mode for easy health status of network
- Advanced Trace mode for details of traffic analysis

| Model        | Description                                                                                              |
|--------------|----------------------------------------------------------------------------------------------------------|
| VAZ-ANALYZER | AS-i network analyzing tool to make sure that network was routed and wired correctly during installation |

### Analyzer Specifications

|                   |                                              |
|-------------------|----------------------------------------------|
| OPERATING CURRENT | 70 mA                                        |
| POWER SUPPLY      | from AS-i                                    |
| AS-i CONNECTOR    | Terminals                                    |
| MEMORY            | 256,000 AS-i telegrams                       |
| PROTECTION (IEC)  | IP20                                         |
| TEMPERATURE RANGE | Working +32 °F to +131 °F (0 °C to +55 °C)   |
|                   | Storage -13 °F to +158 °F (-25 °C to +70 °C) |



There are two modes of operation. The first is online statistics where the overall health of the network is read. The second is trace mode where individual AS-i telegrams are recorded, filtered, and viewed for later analysis. This mode is often used to track down specific input, output or timing problems.

### Online Statistics

Advance statistics (check for)

- Little or no missing telegrams
- No slave telegrams without master call

Consecutive errors

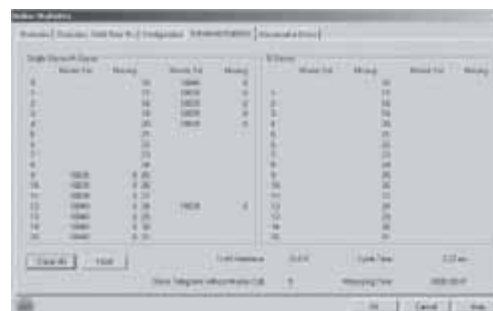
- Make sure consecutive errors are kept to a minimum. (6x = configuration error)

Network overview

- Check to make sure all connected nodes are green

I/O data

- Verify that the input and output data is correct
- Find out if a certain input is flickering or turning on for a short time by running a trace on that input



## Master Simulators

These simulators can emulate or convert a network like DeviceNet, PROFIBUS, or RS-485 for easy connection to your PC. These devices can be useful when trying to see how the I/O is mapped or exchanged on the network or as a simple diagnostic tool to make sure the upper level bus connection on the gateway is still functioning. These can be used with any PROFIBUS, DeviceNet or RS-485 device like RFID controllers, I/O modules, network couplers, encoders or any device that can connect to the network. The DeviceNet and PROFIBUS simulators also come with a simple software package and convenient drivers for use with a PC. If using AS-Interface gateways, Control Tools software must also be purchased separately.

### DeviceNet Specifications

|                      |                                              |
|----------------------|----------------------------------------------|
| OPERATING CURRENT    | < 60 mA                                      |
| POWER SUPPLY         | 5 V from USB                                 |
| MAX CABLE LENGTH     | < 2 m DeviceNet                              |
| DEVICENET CONNECTOR  | 9-pin D-sub connector                        |
| BAUD RATES SUPPORTED | 125, 250, or 500 kbps                        |
| TEMPERATURE RANGE    | Working +32 °F to +131 °F (0 °C to +55 °C)   |
|                      | Storage -13 °F to +158 °F (-25 °C to +70 °C) |

### PROFIBUS Specifications

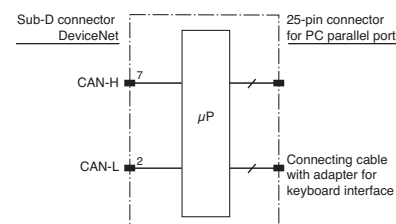
|                      |                                              |
|----------------------|----------------------------------------------|
| OPERATING CURRENT    | < 60 mA                                      |
| POWER SUPPLY         | 5 V from RS-232 port                         |
| MAX CABLE LENGTH     | 2 m RS-232, 2 m PROFIBUS                     |
| DEVICENET CONNECTOR  | 9-pin D-sub connector                        |
| BAUD RATES SUPPORTED | 19200 bps                                    |
| TEMPERATURE RANGE    | Working +32 °F to +131 °F (0 °C to +55 °C)   |
|                      | Storage -13 °F to +158 °F (-25 °C to +70 °C) |

### RS-485 Specifications

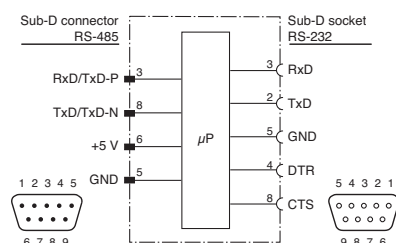
|                      |                                              |
|----------------------|----------------------------------------------|
| OPERATING CURRENT    | < 60 mA                                      |
| POWER SUPPLY         | 5 V from RS-232 port                         |
| MAX CABLE LENGTH     | 2m RS-232, 2m RS-485                         |
| DEVICENET CONNECTOR  | 9-pin DSUB connector                         |
| BAUD RATES SUPPORTED | up to 57600 bps                              |
| TEMPERATURE RANGE    | Working +32 °F to +131 °F (0 °C to +55 °C)   |
|                      | Storage -13 °F to +158 °F (-25 °C to +70 °C) |

| Model          | Description                                                                                    |
|----------------|------------------------------------------------------------------------------------------------|
| VAZ-DN-SIM-USB | DeviceNet to USB converter, connects any DeviceNet slave to a PC, simulator software included  |
| VAZ-PB-SIM     | PROFIBUS to RS-232 converter, connects any PROFIBUS slave to a PC, simulator software included |
| VAZ-R4-R2      | RS-485 to RS-232 converter, connects any RS-485 device to a PC                                 |

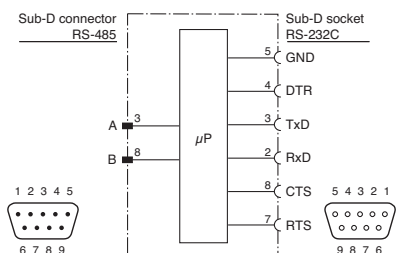
#### VAZ-DN-SIM-USB



#### VAZ-PB-SIM



#### VAZ-R4-R2



## AS-Interface Terminator and Tuner

A number of AS-Interface tools are available to extend the network past the 100 m limit without the use of a repeater. The AS-Interface terminator is placed at the end of the network farthest away from the AS-Interface gateway/scanner and is used to stabilize the network when the cable length has been exceeded. Network segments can be extended to 200 m. The AS-Interface tuner, which has the terminator built-in, is also placed at the end of the network. It can extend the AS-Interface network segment up to 300 m. The terminator and tuner can only extend a network which is correctly wired, using specified AS-Interface cable, and is free from noise. We recommend using an analyzer to identify network problems (see page 202). If repeaters are used use only advanced repeaters. Their fast response times are required for long AS-i cable runs.

| Model     | Description                                                     |
|-----------|-----------------------------------------------------------------|
| VAZ-TERM  | AS-i Terminator, extends AS-i network up to 200 m, place at end |
| VAZ-TUNER | AS-i Tuner, extends AS-i network up to 300 m, place at end      |

### Terminator Specifications

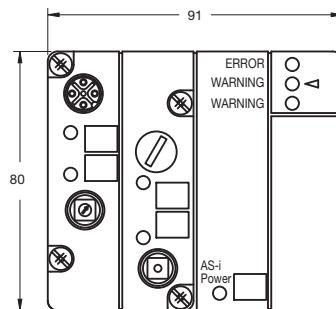
|                   |                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------|
| OPERATING CURRENT | 10 mA                                                                                        |
| POWER SUPPLY      | from AS-i                                                                                    |
| AS-i CONNECTOR    | M12 connector male                                                                           |
| PROTECTION (IEC)  | IP65                                                                                         |
| TEMPERATURE RANGE | Working: +32 °F to +131 °F (0 °C to +55 °C)<br>Storage: -13 °F to +167 °F (-25 °C to +75 °C) |

### Tuner Specifications

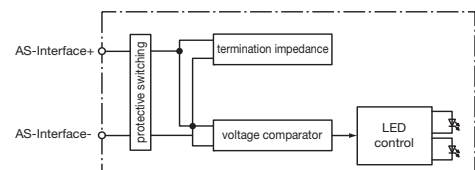
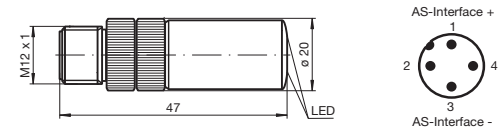
|                   |                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------|
| OPERATING CURRENT | 60 mA                                                                                        |
| POWER SUPPLY      | from AS-i                                                                                    |
| AS-i CONNECTOR    | M12 connector female and flat cable                                                          |
| PROTECTION (IEC)  | IP65                                                                                         |
| TEMPERATURE RANGE | Working: +32 °F to +131 °F (0 °C to +55 °C)<br>Storage: -13 °F to +167 °F (-25 °C to +75 °C) |

Dimensions in mm

### VAZ-TUNER



### VAZ-TERM



#### LEDs

Green: AS-i voltage > 26 V

Yellow: AS-i voltage > 18.5 V

**The VAR-KE3-TERM repeater has an integrated termination switch that can extend the total length of the network to 300 m. See page 67.**

#### LEDs (diagnostic)

**ERROR:** Red: errors > 5% within 1 s or configuration error

**WARNING:** Yellow: errors < 1% but less than 5% within 1 s

**GREEN:** < 1% errors in 1 second

**AS-i Power:** Green (solid): AS-i powered  
Green (blinking): Voltage low

#### Rotary Switch, MODE

**0:** Not tuning and no termination active

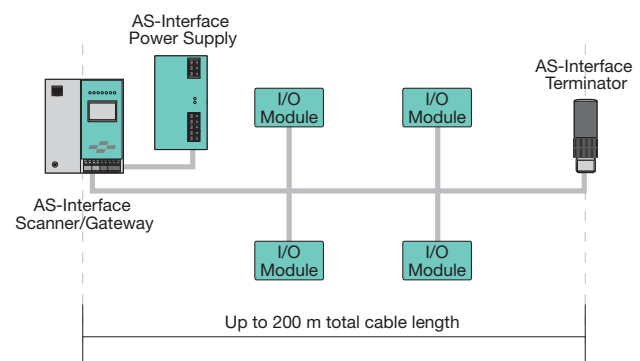
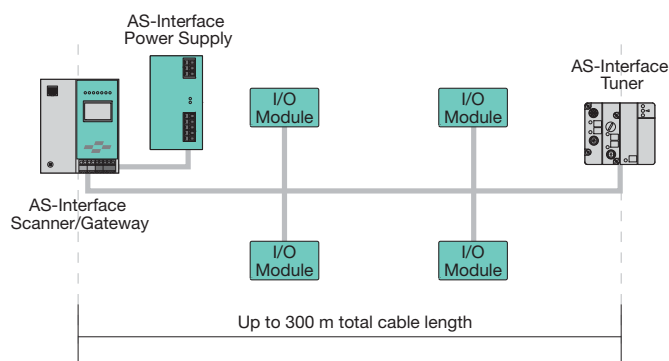
**1:** Use fixed termination, no tuning

**2:** Tune the network (AS-i gateway/scanner must be in config. mode; Error, Warning and Green LEDs will strobe while tuning)

**3:** Run program, used after tuning is complete

#### Button

**Set:** Press and hold for > 5 s to tune (Must be in tune mode), press once to clear diagnostic LEDs



## Bases

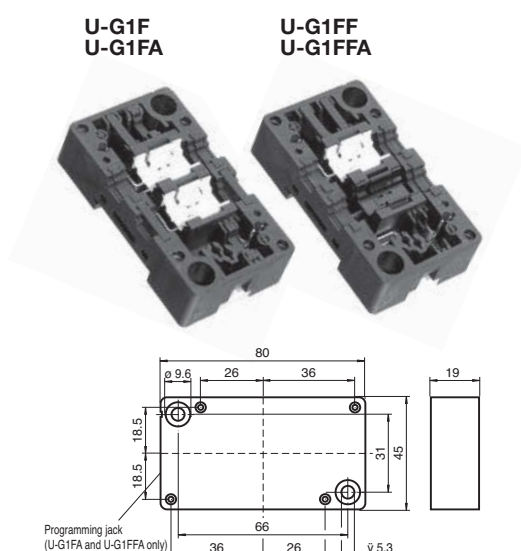
Bases are used to mount the AS-Interface module to the machine and also hold the flat cable in place. Most bases are sold separately so you can choose the version that best fits the application. The bases with addressing jacks, U-G1FA, U-G1FFA should be used where ever possible because of the ease of programming and diagnostics without having to remove the module from the base.

| Model      | Description                                                                                                    |
|------------|----------------------------------------------------------------------------------------------------------------|
| U-G3FF     | Base to connect yellow and black cable to all 4 port G2 modules                                                |
| U-G3FF-DIN | Base to connect yellow and black cable to all 4 port G2 modules, with DIN rail clip                            |
| U-G2FF     | Base to connect yellow and black cable to all 8 port G2 modules                                                |
| U-G2FF-DIN | Base to connect yellow and black cable to all 8 port G2 modules, with DIN rail clip                            |
| U-G1F      | Connection of up to 2 yellow flat cables to any module that supports this base type                            |
| U-G1FA     | Connection of up to 2 yellow flat cables to any module that supports this base type, with addressing jack      |
| U-G1FF     | Connection of 1 yellow and 1 black flat cable to any module that supports this base type                       |
| U-G1FFA    | Connection of 1 yellow and 1 black flat cable to any module that supports this base type, with addressing jack |
| U-G1PP     | Round cable base to connect AS-Interface and auxiliary power to any module that supports this base type        |
| VAZ-DK-G1  | Cover for any U-G1... base                                                                                     |

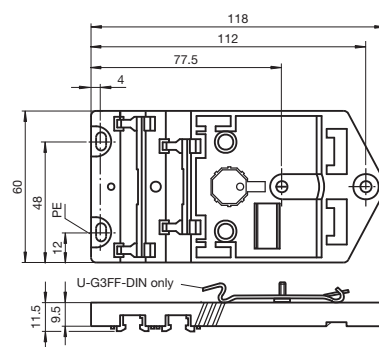
### Base Specifications

|                   |                                      |
|-------------------|--------------------------------------|
| PROTECTION (IEC)  | IP67 (with top connected)            |
| HOUSING MATERIAL  | PBT                                  |
| TEMPERATURE RANGE |                                      |
| Working           | -13 °F to +131 °F (-25 °C to +60 °C) |
| Storage           | -40 °F to +185 °F (-40 °C to +85 °C) |

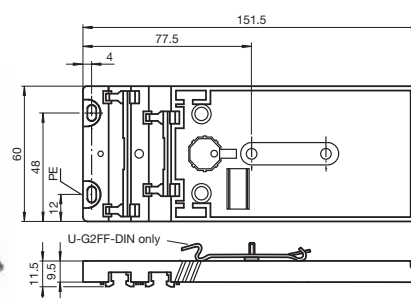
Dimensions in mm



U-G3FF  
U-G3FF-DIN



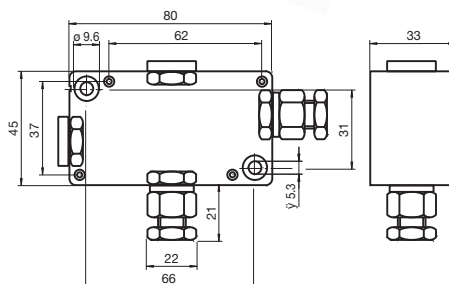
U-G2FF  
U-G2FF-DIN



U-G1PP



VAZ-DK-G1



Gateways and Scanners

Power Supplies and Repeater

I/O Modules

Safety at Work

Sensors

Cordsets

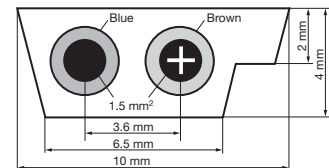
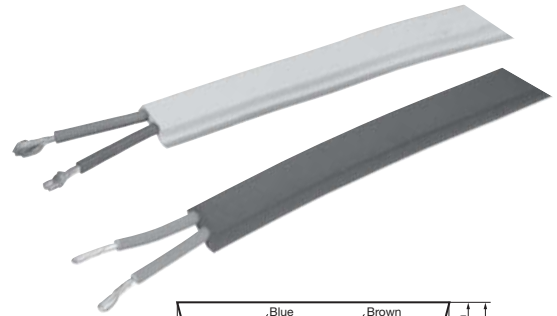
Accessories



## AS-Interface Cable

AS-Interface cable can either be flat or round and has certain impedance characteristics specifically for AS-Interface. AS-Interface was designed without a shield and for use with a flat cable profile. Flat cable piercing technology means no more stripping, cutting, or buying of special length AS-Interface cable. It is the least expensive network technology on the market and the quickest to install.

| Model              | Description                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------|
| VAZ-FK-S-YE        | Yellow flat cable with a standard rubber jacket, 100 m roll                                       |
| VAZ-FK-S-BK        | Black flat cable with a standard rubber jacket, 100 m roll                                        |
| VAZ-FK-R-YE        | Yellow flat cable with an oil resistant jacket, 100 m roll                                        |
| VAZ-FK-R-YE-1000M  | Yellow flat cable with an oil resistant jacket, 1000 m spool                                      |
| VAZ-FK-R-BK        | Black flat cable with an oil resistant jacket, 100 m roll                                         |
| VAZ-FK-R-BK-1000M  | Black flat cable with an oil resistant jacket, 1000 m spool                                       |
| VAZ-FK-S-YE-SAFETY | Yellow flat cable with a standard rubber jacket, 100 m roll, Red "Safety" text included on jacket |
| VAZ-RK-PVC-Y904028 | 4-conductor round cable with shield, 100 m roll                                                   |
| VAZ-FK-R-STRIPPER  | Flat cable stripper for use with any flat cable type                                              |



Dimensions in mm

### Flat Cable Specifications

|                           |                                                                                                      |
|---------------------------|------------------------------------------------------------------------------------------------------|
| WIRE GAUGE                | 16 AWG                                                                                               |
| CURRENT CARRYING CAPACITY | 8 A                                                                                                  |
| VOLTAGE RATING            | 300 V                                                                                                |
| JACKET MATERIAL           | VAZ-FK-S-... TPE, PVC<br>VAZ-FK-R-... Rubber compound                                                |
| UV RESISTANCE             | Only black cable is approved for use outdoors                                                        |
| BEND RADIUS               | 10 mm on broad side                                                                                  |
| CONDUCTORS                | 2, brown, blue                                                                                       |
| OPERATING TEMPERATURE     | At Standstill -40 °F to +185 °F (-40 °C to +85 °C)<br>In Motion -13 °F to +185 °F (-25 °C to +85 °C) |
| APPROVALS                 | VAZ-FK-S-... CE, UL, 45°C<br>VAZ-FK-R-... CE, UL, 45°C                                               |



VAZ-RK-PVC-Y904028

### Round Cable Specifications

|                                      |                                           |
|--------------------------------------|-------------------------------------------|
| WIRE GAUGE                           | 16 AWG                                    |
| OUTSIDE DIAMETER                     | 0.318"                                    |
| SHIELDING (for mechanical strength)* | Braided tinned copper shield 90% coverage |
| CURRENT CARRYING CAPACITY            | > 8 A                                     |
| VOLTAGE RATING                       | 300 V                                     |
| JACKET MATERIAL                      | Gray PVC jacket, insulation polyethylene  |
| CONDUCTORS                           | 4, black, white, red, green               |
| OPERATING TEMPERATURE                | 167 °F (+75 °C)                           |

\* Because of shielding, the AS-Interface line should be limited to 70 m of total cable length.

Any round cable will work for AS-Interface as long as it meets the following electrical characteristics. A two-conductor PLTC cable from Belden, 1035A for example, is often used for round cable applications. Electrical characteristics should be evaluated at 167 kHz, and shielding should be avoided if possible.

|                                         |                   |
|-----------------------------------------|-------------------|
| GAUGE                                   | 16 AWG            |
| NOM. CONDUCTOR DC RESISTANCE            | < 4.2 Ohm/1000 ft |
| NOM. CAPACITANCE CONDUCTOR TO CONDUCTOR | < 24 pF/ft        |
| NOM. INDUCTANCE                         | 0.121-0.395 µH/ft |



VAZ-FK-R-STRIPPER

## Flat Cable Adapters and Splitters

AS-Interface was designed around the flat cable concept. To make wiring easier, new and innovative flat cable adapters were designed to connect to IO modules, junction boxes, valves, and other devices on the network. All flat cable connections are watertight and tested and designed to AS-Interface specifications.

### Flat Cable to M12 Adapters

| Model         | Description                                                                               |
|---------------|-------------------------------------------------------------------------------------------|
| VAZ-T1-FK-V1  | Connects the AS-i yellow cable to an M12 quick disconnect                                 |
| VAZ-2T1-FK-V1 | Connects the AS-i yellow and black cable to M12 quick disconnect                          |
| VAZ-2T5-G2    | Connects the AS-i yellow and black cable to 5 M12 quick disconnects, base sold separately |

### VAZ-T1-FK-V1 AND VAZ-2T1-FK-V1 Specifications

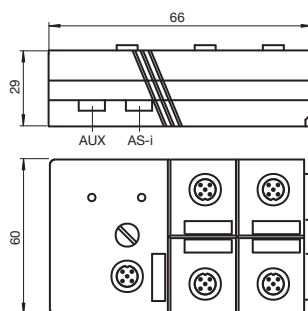
|                         |                                                                                                |
|-------------------------|------------------------------------------------------------------------------------------------|
| RATED OPERATING CURRENT | 4 A                                                                                            |
| PROTECTION (IEC)        | IP69K                                                                                          |
| HOUSING MATERIAL        | PA 6 GF 25 Ultradid                                                                            |
| TEMPERATURE RANGE       | Working: -13 °F to +167 °F (-25 °C to +75 °C)<br>Storage: -13 °F to +185 °F (-25 °C to +85 °C) |
| SCREW MOUNTING TORQUE   | 7 in-lb                                                                                        |
| CONTACTS                | Gold plated pins, 4 per tray                                                                   |
| FLAT CABLE CONNECTIONS  | T1(1), 2T1(2)                                                                                  |

### VAZ-2T5-G2 Specifications

|                            |                                                                                                |
|----------------------------|------------------------------------------------------------------------------------------------|
| RATED OPERATING CURRENT    | 4 A per connector, 6 A total                                                                   |
| BASE (PURCHASE SEPARATELY) | U-G3FF, U-G3FF-DIN                                                                             |
| PROTECTION (IEC)           | IP67                                                                                           |
| HOUSING MATERIAL           | PBT                                                                                            |
| TEMPERATURE RANGE          | Working: -13 °F to +158 °F (-25 °C to +70 °C)<br>Storage: -13 °F to +185 °F (-25 °C to +85 °C) |
| CONTACTS                   | Gold plated pins, 4 per tray                                                                   |
| FLAT CABLE CONNECTIONS     | 2                                                                                              |

Dimensions in mm

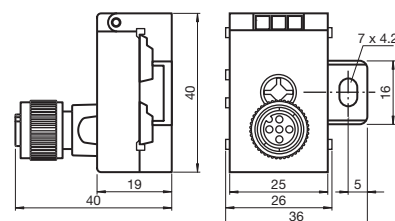
### VAZ-2T5-G2



#### LED Indicators

**AS-i:** Green: AS-i powered  
Red: Polarity reversed  
**AUX:** Green: Auxiliary powered  
Red: Polarity reversed

### VAZ-T1-FK-V1 VAZ-2T1-FK-V1



### VAZ-T1-FK-V1

AS-Interface +

1 BN

3 BU

AS-Interface -

AS-Interface -

### VAZ-2T1-FK-V1

AS-Interface +

1 BN

4 BK AUX +

2 WH AUX -

3 BU

AS-Interface -

AS-Interface -

### 5 quick disconnects M12x1

AS-Interface +

1 BN

4 BK AUX +

2 WH AUX -

3 BU

AS-Interface -

AS-Interface -



## Flat Cable Adapters and Splitters (cont.)

### Single Flat Yellow to Flying Lead

| Model            | Length |
|------------------|--------|
| VAZ-T1-FK-2M-PUR | 2 m    |

### Single Flat Yellow to M12 Pigtail Straight

| Model                   | Length |
|-------------------------|--------|
| VAZ-T1-FK-0.3M-PUR-V1-G | 300 mm |
| VAZ-T1-FK-1M-PUR-V1-G   | 1 m    |
| VAZ-T1-FK-2M-PUR-V1-G   | 2 m    |

### Single Flat Yellow to M12 Pigtail Right Angle

| Model                   | Length |
|-------------------------|--------|
| VAZ-T1-FK-0.5M-PUR-V1-W | 500 mm |
| VAZ-T1-FK-1M-PUR-V1-W   | 1 m    |
| VAZ-T1-FK-2M-PUR-V1-W   | 2 m    |

### Single Flat Yellow to M8 Pigtail Right Angle

| Model                    | Length |
|--------------------------|--------|
| VAZ-T1-FK-0.5M-PUR-V3-WR | 500 mm |
| VAZ-T1-FK-1M-PUR-V3-WR   | 1 m    |

### Dual Flat Yellow and Black to M12 Pigtail Straight

| Model                  | Length |
|------------------------|--------|
| VAZ-2T1-FK-1M-PUR-V1-G | 1 m    |
| VAZ-2T1-FK-2M-PUR-V1-G | 2 m    |
| VAZ-2T1-FK-3M-PUR-V1-G | 3 m    |
| VAZ-2T1-FK-4M-PUR-V1-G | 4 m    |
| VAZ-2T1-FK-5M-PUR-V1-G | 5 m    |

### Dual Flat Yellow and Black to M12 Pigtail Right Angle

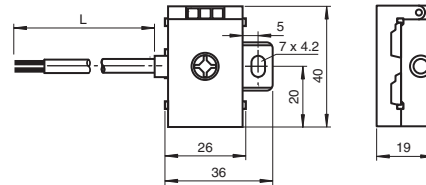
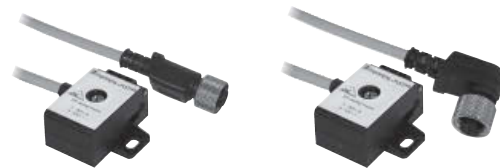
| Model                    | Length |
|--------------------------|--------|
| VAZ-2T1-FK-0.3M-PUR-V1-W | 300 mm |
| VAZ-2T1-FK-0.5M-PUR-V1-W | 500 mm |
| VAZ-2T1-FK-1M-PUR-V1-W   | 1 m    |
| VAZ-2T1-FK-2M-PUR-V1-W   | 2 m    |
| VAZ-2T1-FK-5M-PUR-V1-W   | 5 m    |

### Specifications

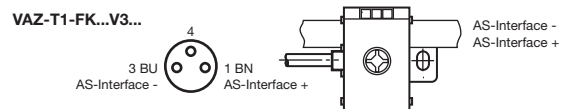
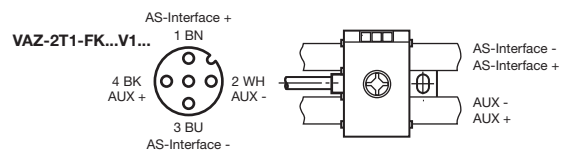
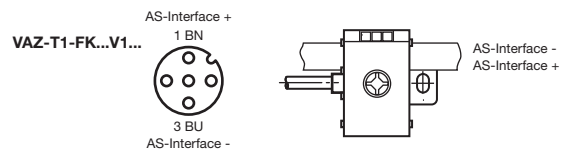
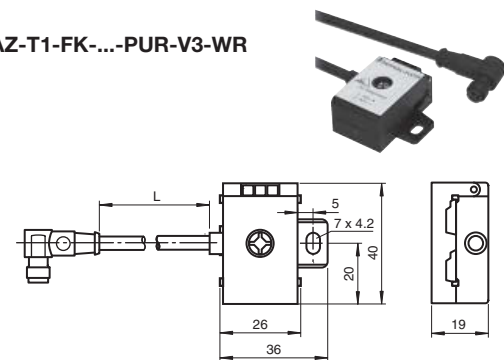
|                                |                                                                                                                                       |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>RATED OPERATING CURRENT</b> | 4 A                                                                                                                                   |
| <b>PROTECTION (IEC)</b>        | IP69K                                                                                                                                 |
| <b>HOUSING MATERIAL</b>        | PA 6 GF 35                                                                                                                            |
| <b>CABLE MATERIAL</b>          | PUR, gray                                                                                                                             |
| <b>WIRE GAUGE</b>              | 22 AWG                                                                                                                                |
| <b>TEMPERATURE RANGE</b>       | <div>Working</div> <div>Storage</div> <div>-13 °F to +167 °F (-25 °C to +75 °C)</div> <div>-13 °F to +185 °F (-25 °C to +85 °C)</div> |
| <b>SCREW MOUNTING TORQUE</b>   | 7 in-lb                                                                                                                               |
| <b>CONTACTS</b>                | Gold plated pins, 4 per tray                                                                                                          |
| <b>FLAT CABLE TRAYS</b>        | T1 (1), 2T1 (2)                                                                                                                       |

Dimensions in mm

VAZ-T1-FK-2M-PUR

VAZ-T1-FK-...-PUR-V1-G  
VAZ-2T1-FK-...-PUR-V1-GVAZ-T1-FK-...-PUR-V1-W  
VAZ-2T1-FK-...-PUR-V1-W

VAZ-T1-FK-...-PUR-V3-WR



## Flat Cable Adapters and Splitters (cont.)

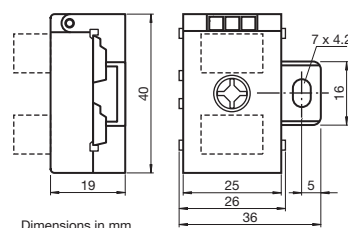
### Splitters

| Model             | Description                                                                                             |
|-------------------|---------------------------------------------------------------------------------------------------------|
| VAZ-2FK-B3        | Flat cable splitter, two trays are connected together                                                   |
| VAZ-T1-FK-CLAMP1  | Flat cable splitter, two trays are connected together, also connects the flat cable to spring terminals |
| VAZ-2T1-FK-CLAMP1 | Connects both the yellow and black flat cable to spring terminals                                       |

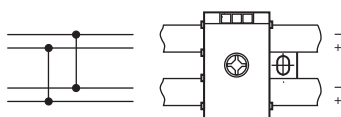
### Specifications

|                         |         |                                            |
|-------------------------|---------|--------------------------------------------|
| RATED OPERATING CURRENT |         | 8 A                                        |
| PROTECTION (IEC)        |         | IP69K, CLAMP1 style only IP20              |
| HOUSING MATERIAL        |         | PA 6 GF 35                                 |
| TEMPERATURE RANGE       | Working | -13 °F to +167 °F (-25 °C to +75 °C)       |
|                         | Storage | -13 °F to +185 °F (-25 °C to +85 °C)       |
| SCREW MOUNTING TORQUE   |         | 7 in-lb                                    |
| WIRE GAUGE              |         | CLAMP1 only (24 AWG - 16 AWG, strip 10 mm) |
| CONTACTS                |         | Gold plated pins, 4 per tray               |
| FLAT CABLE TRAYS        |         | 2                                          |

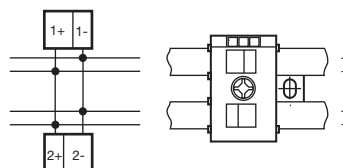
VAZ-2FK-B3

VAZ-T1-FK-CLAMP1  
VAZ-2T1-FK-CLAMP1

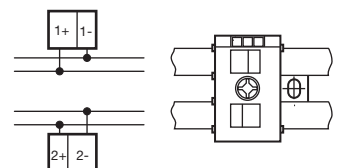
VAZ-2FK-B3



VAZ-T1-FK-CLAMP1



VAZ-2T1-FK-CLAMP1

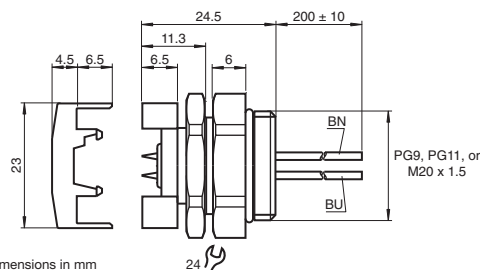


## Bulkhead Connectors, Cordgrips, and Conduit Adapters

These accessories are often used to connect flat cable to a junction box or enclosure. Drill a hole with the appropriate mounting hole clearances and mount the accessory in the box.

| Model          | Description                                                                   |
|----------------|-------------------------------------------------------------------------------|
| VAZ-T1-FK-PG9  | Flat cable bulkhead adapter with PG9 threads, 0.606" mounting hole clearance  |
| VAZ-T1-FK-PG11 | Flat cable bulkhead adapter with PG11 threads, 0.740" mounting hole clearance |
| VAZ-T1-FK-M20  | Flat cable bulkhead adapter with M20 threads, 0.807" mounting hole clearance  |
| PG11 CORD GRIP | Cord grip for round cable, PG11 threads, 0.740" mounting hole clearance       |
| VAZ-PG11-FKD   | Inserts to seal around flat cable, fits into PG11 cord grip, bag of 10        |
| PG11-1/2NPT    | Adapter to convert a PG11 opening like on U-G1PP to a 1/2" NPT opening        |

VAZ-T1-FK-PG9  
VAZ-T1-FK-PG11  
VAZ-T1-FK-M20



Dimensions in mm

### VAZ-T1-FK-... Specifications

|                         |                                                                                                |
|-------------------------|------------------------------------------------------------------------------------------------|
| RATED OPERATING CURRENT | 2 A                                                                                            |
| PROTECTION (IEC)        | IP67                                                                                           |
| HOUSING MATERIAL        | PUR and Ni-Brass                                                                               |
| TEMPERATURE RANGE       | Working: -13 °F to +140 °F (-25 °C to +60 °C)<br>Storage: -13 °F to +185 °F (-25 °C to +85 °C) |
| WIRE GAUGE              | 22 AWG                                                                                         |
| WIRE LENGTH             | 200 mm                                                                                         |

PG11 CORD GRIP



VAZ-PG11-FKD



PG11-1/2NPT

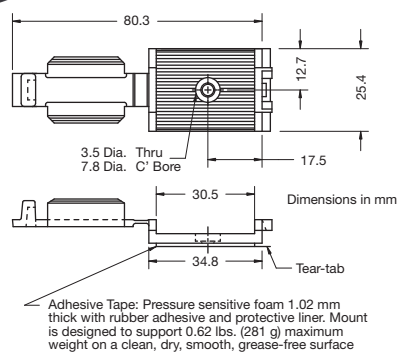


## Power Supplies and Repeaters

## I/O Modules



**VAZ-2FK-CL2**



VAZ-FR-ST1

## AC Input Accessories

All standard IO modules in this catalog are for DC inputs. If you want AC inputs for a new project, or to retrofit a job, then these accessories are what you need. Inputs are for 120 VAC/DC inputs and outputs connect directly to the IO module. If multiple optocouplers are used, the shorting rail will save you a great deal of installation time. All of the DC positives and AC neutrals can be jumpered together.

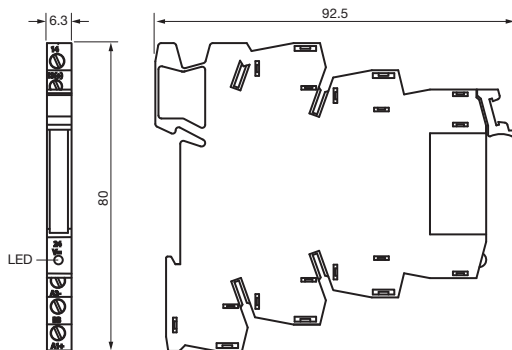
| Model                          | Description                                                                      |
|--------------------------------|----------------------------------------------------------------------------------|
| VAZ-PLC-OSC-120UC/48DC/100/SEN | Optocoupler, converts 120 VAC inputs to DC for input to any AS-i module          |
| VAZ-FBST 500-PLC GY            | Shorting rail will connect AC Neutrals or AS-i + together on module, 500 mm long |

### Specifications

| INPUT DATA          |                         |
|---------------------|-------------------------|
| VOLTAGE RANGE       | 96-132 VAC / 88-121 VDC |
| CURRENT CONSUMPTION | 3.5 mA                  |
| RESPONSE TIME       | 6 ms                    |
| TURN OFF TIME       | 10 ms                   |
| FREQUENCY           | 10 Hz                   |
| OUTPUT DATA         |                         |
| VOLTAGE RANGE       | 3 VDC - 48 VDC          |
| VOLTAGE DROP        | ≤ 1 V                   |
| CURRENT LIMIT       | 100 mA                  |
| CURRENT CONSUMPTION | ≈ 0 mA                  |

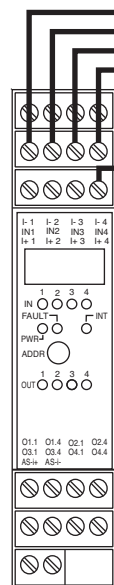
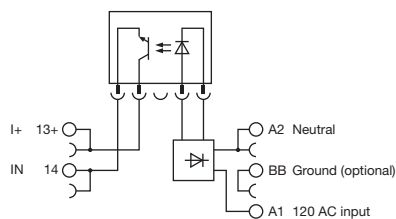


Dimensions in mm

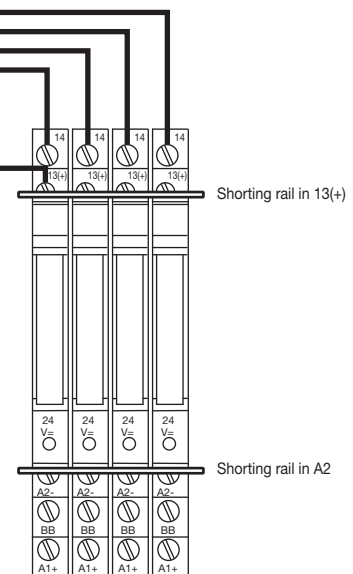


#### LED Indicators

Yellow: Input on



VAA-4E4A-KE-ZE/R



4 x VAZ-PLC-OSC-120UC/48DC/100/SEN

## Passive and Protected Tees

These protected and unprotected Tees allow for easy splitting of the AS-Interface round cable. The protected Tees will shut off the drop on overload or short circuit. The drop autorecovers when the short is removed. Each protected drop can be for up to one I/O module each.

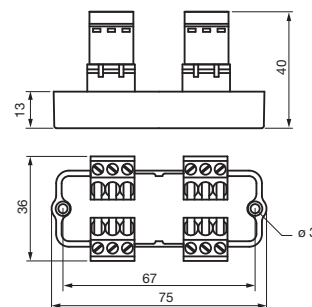
| Model           | Description                                                                   |
|-----------------|-------------------------------------------------------------------------------|
| VAZ-RK-TEE      | Passive drop connector, 2 drops, trunk in, trunk out                          |
| VAZ-RK-4TEE     | Passive drop connector, 4 drops, trunk in, trunk out                          |
| VAZ-RK-P-TEE    | Protected drop connector, 1 drop, trunk in, trunk out                         |
| VAZ-RK-P-TEE-S  | Protected drop connector, 1 drop, trunk in, trunk out, with disconnect switch |
| VAZ-RK-P-4TEE   | Protected drop connector, 4 drop, trunk in, trunk out                         |
| VAZ-RK-P-4TEE-S | Protected drop connector, 4 drop, trunk in, trunk out, with disconnect switch |

### Specifications

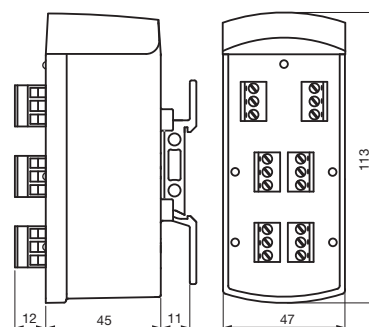
|                                   |                                      |
|-----------------------------------|--------------------------------------|
| <b>PASSIVE DROP CONNECTORS</b>    |                                      |
| <b>MAX CURRENT</b>                | 8 A                                  |
| <b>PROTECTED DROP CONNECTORS</b>  |                                      |
| <b>MAX CURRENT (TRUNK)</b>        | 8 A                                  |
| <b>TRIP CURRENT</b>               | 240 mA                               |
| <b>HOLDING CURRENT AFTER TRIP</b> | 28 mA                                |
| <b>RESET CURRENT</b>              | < 28 mA                              |
| <b>VOLTAGE DROP</b>               | < 1 V                                |
| <b>TEMPERATURE RANGE</b>          | -40 °F to +185 °F (-40 °C to +85 °C) |

Dimensions in mm

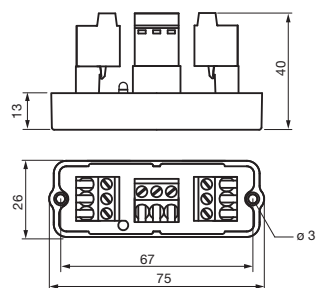
VAZ-RK-TEE



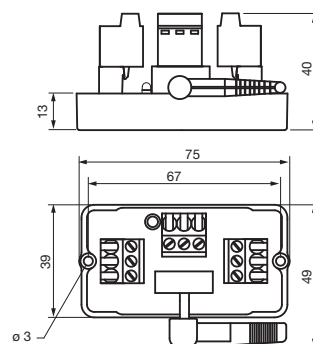
VAZ-RK-4TEE



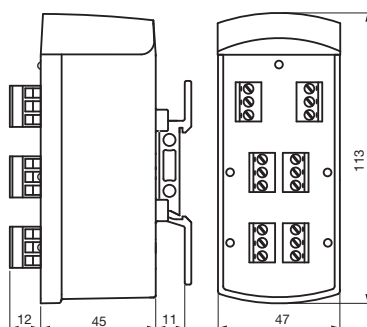
VAZ-RK-P-TEE



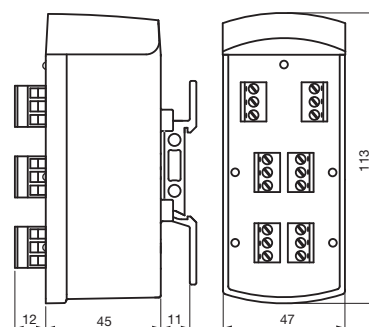
VAZ-RK-P-TEE-S



VAZ-RK-P-4TEE



VAZ-RK-P-4TEE-S



Gateways and Scanners

Power Supplies and Repeater

I/O Modules

Safety at Work

Sensors

Cordsets

Accessories

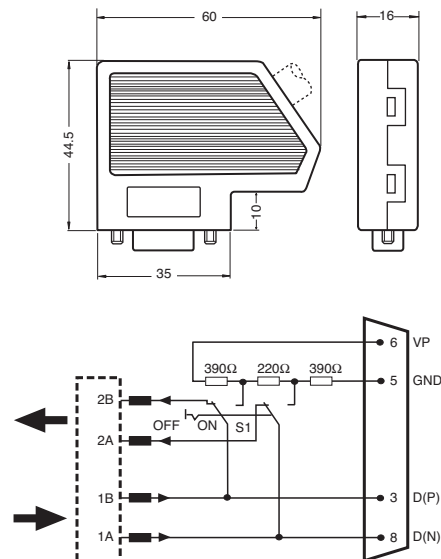
## PROFIBUS Accessories

| Model        | Description                                    |
|--------------|------------------------------------------------|
| VAZ-PB-DB9-W | DB9 PROFIBUS connector with termination switch |

### Specifications

|                           |                                         |
|---------------------------|-----------------------------------------|
| <b>MATERIAL DATA</b>      |                                         |
| <b>BODY</b>               | Metal plated ABS                        |
| <b>CABLE DIAMETER</b>     | Accepts cables from 7.6 mm...8.4 mm DIA |
| <b>TERMINATION</b>        | Yes, switchable                         |
| <b>ELECTRICAL DATA</b>    |                                         |
| <b>BAUD RATE</b>          | Max 12 Mbps                             |
| <b>CURRENT RATING</b>     | 4 A                                     |
| <b>VOLTAGE RATING</b>     | 125 VDC                                 |
| <b>ENVIRONMENTAL DATA</b> |                                         |
| <b>PROTECTION CLASS</b>   | IP40                                    |
| <b>TEMPERATURE RANGE</b>  | -4 °F to +158 °F (-20 °C to +70 °C)     |

Dimensions in mm





## Glossary

**Address**

The identification number of a module. The default setting for AS-Interface modules is 0 and can be set to values between 1A-31A or 1B-31B. There is no limit to the number of times the address can be changed.

**Actuator**

A simple output device that carries out a movement (e.g., contactor or valve control).

**Analog Profile 7.3**

A device profile that provides 4-16 bit analog signals to be transferred to or from the AS-Interface scanner. The scanner/gateway and the module must both support the Analog Profile 7.3 for communication to take place.

**APM**

An abbreviation for alternating pulse modulation. A stream of 2 bits on the AS-Interface cable where each bit represents a  $\sin^2$  pulse. Each positive pulse follows a negative pulse and vice versa. Alternative pulse modulation is highly resistant to interference.

**AS-Interface 2.0 specification**

AS-Interface accommodates 31 I/O modules where each module uses one, complete address between 1 and 31.

**AS-Interface 2.1 specification**

Allows I/O modules to take up only one half of an address. Therefore, scanners/gateways that support this addressing scheme are able to communicate with up to 62 modules on a network.

**AS-Interface 3.0 specification**

The latest specification that amongst others includes profiles allowing up to 62 4 in/4 out modules on one network. All profiles of earlier specifications are supported.

**ASIC**

Application Specific Integrated Circuit. Every module contains an AS-Interface ASIC.

**Automatic Addressing**

With the system in operation, a new module can be connected to replace an existing module. The new module will automatically assume the address of the one it is replacing. The address of the new module must be 0 and auto addressing must be enabled.

**Bit error rate**

The statistical mean of the errors occurring during transmission.

**Configuration data**

The display of all current I/O modules determines the actual status of the network. The profiles (I/O, ID, ID1, ID2) are stored in the list of the detected slaves (LDS).

**Cycle time**

The time span between two I/O transfers on a single module. The fewer the nodes, the shorter the cycle time.

**Data integrity**

A measure of the error free operation of data transfer.

**Enhanced logic functionality**

In addition to providing additional logic operations, SafetyMonitors with enhanced versions offer increased functionality allowing users to create configurations with more complex rules and procedures.

**Forward and backward compatibility**

Any scanner/gateway can communicate with any type of node with the specifications of 2.0, 2.1, and 3.0.

**Galvanic isolation**

Transformer isolation between two AS-Interface segments.

**Gateway**

A device that controls all AS-Interface communications and is a single drop on a higher level bus system.

**Ground fault detection**

An AS-Interface cable must not be grounded under any circumstances. Grounding the cable would lead to faults that may cause the system to become unstable and disrupt the noise immunity of the network. All power supplies with EFD in their model number have ground fault detection. Any AS-Interface gateway with K20 in the model number can also detect this problem.

**I/O code**

The I/O code, stored in the module, specifies to the master/scanner how many inputs and outputs the module has.

**I/O module**

This device connects directly to AS-Interface and accepts up to 4 inputs and 4 outputs from standard devices.

**ID-code**

Identifies the type of module. The manufacturer sets this value.

**ID1**

Part of the device profile. A freely configurable code between 0 and F.

**ID2**

Part of the device subprofile. Determines how a module will act on the network.

**Insulation displacement**

An electrical connection to the AS-Interface flat cable made without the use of a cutting tool.

**Intelligent sensor**

A sensor with an AS-Interface ASIC that uses one address.

**Interoperability**

Two modules or scanner/modules from different manufacturers are able to work together.

**Mechanical profile**

Guarantees a correct connection of the yellow cable every time by eliminating the danger of reversing polarity.

**Message**

A complete group of bits that presents information.

**Operating current**

Current needed by the device for proper operation.

## Glossary

### OSSDs

Output signal switching devices (OSSDs), the safety relays in a SafetyMonitor.

### Parameter bits

A four-bit code indicating how the I/O module will function. Examples: N.C./N.O., light-on/dark-on for photoelectric sensors. Parameter bits can be changed as needed and are set on power up.

### Parity check

Simple error checking of the sum of the user bits contained in one telegram (address, data, control bits, parity bit) which must be even in AS-Interface.

### Passive module

A device that connects one or more intelligent devices to AS-Interface. It does not require an address.

### Plug and Play

Automatic installation of hardware components on Windows based operating systems.

### Projected data

The current stored configuration of AS-Interface. The I/O and ID codes are permanently stored in the gateway/scanner. The gateway/scanner compares the current configuration and default configuration to detect improperly connected or missing modules.

### Redundant piercing connection technology

Two flat cable pierce connections that nestle tightly and securely among the copper strands in the core of each of the conductors.

### Release circuit

Release circuits are safe output contacts, controlled by logic in the AS-Interface SafetyMonitor. A single SafetyMonitor can up to 16 independent release circuits. This means that up to 16 independent shut-off states can be realized. Dependent release circuits operate in tandem.

### Remaining error probability

Indicates the number of errors that could occur during a transmission based on the average of previous error detections.

### Safe Remote Output

A set of safe contacts that are not located inside the SafetyMonitor but are mounted remotely on the network. Multiple safe remote outputs can switch simultaneously (dependent release circuits) or independently (independent release circuits).

### Safety at Work

The safety components of AS-Interface in applications up to category 4, SIL 3.

### SafetyMonitor

A monitoring device that contains output signal switching devices (OSSDs) replacing safety relays. Evaluates all data sent across the AS-Interface network.

### SafetyNode

I/O modules constructed to satisfy the rules and regulations necessary to obtain the desired safety ratings.

### Scanner Cards

Directly mounted in the PLC rack and appearing in the PLC configuration as large I/O cards. Also any PC card that connects to the ISA, PCI, or PC104 busses.

### Sensor

A device that indicates the presence of something and relays the information back to a controller. Some of the most common types of sensors are inductive, capacitive, photoelectric, and ultrasonic.

### Telegram

A message sent by the master and answered by an I/O module.

### Transmission (Baud) rate

The transmission speed of a bit on the AS-Interface cable measured in bits per second (bps). AS-Interface's baud rate is approximately 167 kbps.

### Watchdog

Switches outputs to their deenergized state when there is no communication for more than 40 ms on the AS-Interface network.

## Trademark Information

AS-Interface™ is a trademark of AS-International.

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## Chemical Resistivity Charts

A= excellent

B= good

C= moderate

D= nonresistive

## METALS

This chemical resistance chart rates the effect of chemicals on metals used in the construction of Pepperl+Fuchs' products. Concentration of chemicals listed are 100%, unless otherwise specified.

|                            | 302/304 SS | 316 SS | Hastelloy | Titanium | Aluminum | Tantalum |
|----------------------------|------------|--------|-----------|----------|----------|----------|
| Citric acid                | A          | A      | A         | A        | C        | -        |
| Copper chloride            | C          | D      | A         | A        | D        | -        |
| Cresols 2                  | A          | A      | -         | -        | B        | A        |
| Detergents                 | A          | A      | -         | -        | A        | A        |
| Diesel fuel                | A          | A      | -         | -        | A        | -        |
| Dyes                       | A          | A      | -         | -        | B        | -        |
| Ethyl acetate              | A          | A      | B         | -        | B        | -        |
| Ferric chloride            | D          | D      | B         | A        | D        | -        |
| Ferric sulfate             | A          | C      | A         | A        | D        | A        |
| Formic acid                | C          | B      | A         | C        | D        | -        |
| Fuel oils                  | A          | A      | A         | A        | A        | A        |
| Gasoline                   | A          | A      | A         | D        | A        | -        |
| Grease 4                   | A          | A      | -         | -        | A        | -        |
| Hydraulic oil              | A          | A      | -         | -        | A        | -        |
| Hydrochloric acid (20%)    | -          | D      | B         | C        | D        | -        |
| Hydrofluoric acid(20%)     | -          | D      | B         | D        | D        | -        |
| Hydrogen peroxide (10%)    | -          | C      | A         | C        | A        | -        |
| Hydrogen sulfide (aqueous) | -          | A      | A         | A        | C        | -        |
| Isopropyl acetate          | -          | B      | -         | -        | C        | -        |
| Kerosene 2                 | A          | A      | A         | A        | A        | A        |
| Lubricants                 | -          | A      | A         | A        | A        | -        |
| Magnesium sulfate          | B          | -      | B         | A        | B        | -        |
| Methyl acetate             | A          | A      | A         | -        | A        | -        |
| Methyl alcohol             | A          | A      | A         | B        | A        | -        |
| Methylene chloride         | B          | B      | B         | B        | A        | -        |
| Nitric acid (20%)          | A          | A      | A         | A        | D        | -        |
| Oil (soybean)              | A          | A      | A         | A        | B        | A        |
| Phosphoric acid (40%)      | A          | B      | A         | B        | C        | -        |
| Potassium sulfide          | B          | A      | -         | A        | -        | -        |
| Propane (liquified)        | A          | A      | A         | -        | A        | -        |
| Sodium carbonate           | B          | A      | A         | A        | D        | -        |
| Sodium hydroxide (20%)     | B          | A      | B         | A        | D        | -        |
| Sodium sulfate             | B          | B      | B         | A        | A        | -        |
| Sulfuric acid (10-75%)     | D          | D      | B         | D        | D        | -        |
| Xylene                     | A          | A      | A         | A        | A        | A        |

## PLASTICS

This chemical resistance chart rates the effect of chemicals on plastics used in the construction of Pepperl+Fuchs' products. Concentration of chemicals listed are 100%, unless otherwise specified.

|                            | PVC | PUR | Hypalon (CSM) | Teflon | Polyethylene | Polypropylene | Viton |
|----------------------------|-----|-----|---------------|--------|--------------|---------------|-------|
| Citric acid                | B   | A   | A             | A      | B            | B             | A     |
| Copper chloride            | A   | A   | A             | A      | B            | A             | A     |
| Cresols 2                  | D   | D   | D             | A      | D            | C             | A     |
| Detergents                 | A   | D   | -             | A      | B            | A             | A     |
| Diesel fuel                | -   | D   | -             | A      | -            | D             | A     |
| Dyes                       | B   | -   | -             | -      | -            | -             | A     |
| Ethyl acetate              | D   | D   | D             | A      | C            | C             | D     |
| Ferric chloride            | A   | B   | B             | A      | B            | A             | A     |
| Ferric sulfate             | A   | -   | A             | A      | -            | A             | A     |
| Formic acid                | D   | -   | -             | A      | B            | A             | B     |
| Fuel oils                  | A   | D   | D             | A      | D            | B             | A     |
| Gasoline                   | C   | B   | B             | A      | D            | C             | A     |
| Grease 4                   | A   | A   | -             | A      | -            | -             | A     |
| Hydraulic oil              | A   | -   | B             | A      | -            | D             | A     |
| Hydrochloric acid (20%)    | A   | -   | A             | A      | A            | A             | A     |
| Hydrofluoric acid(20%)     | D   | B   | A             | A      | C            | A             | A     |
| Hydrogen peroxide (10%)    | A   | -   | -             | A      | A            | -             | -     |
| Hydrogen sulfide (aqueous) | A   | -   | B             | A      | B            | A             | B     |
| Isopropyl acetate          | B   | D   | -             | -      | -            | -             | D     |
| Kerosene 2                 | A   | B   | -             | A      | D            | D             | A     |
| Lubricants                 | A   | C   | D             | A      | -            | A             | A     |
| Magnesium sulfate          | A   | -   | A             | A      | B            | A             | A     |
| Methyl acetate             | -   | -   | D             | A      | -            | -             | D     |
| Methyl alcohol             | A   | D   | A             | A      | A            | A             | D     |
| Methylene chloride         | D   | D   | -             | A      | C            | B             | B     |
| Nitric acid (20%)          | A   | D   | D             | A      | C            | A             | A     |
| Oil (soybean)              | B   | A   | B             | A      | A            | A             | A     |
| Phosphoric acid (40%)      | A   | A   | -             | A      | A            | A             | A     |
| Potassium sulfide          | A   | C   | B             | A      | A            | A             | A     |
| Propane (liquified)        | A   | D   | B             | -      | C            | B             | A     |
| Sodium carbonate           | -   | A   | A             | A      | B            | A             | A     |
| Sodium hydroxide (20%)     | A   | C   | A             | A      | A            | A             | B     |
| Sodium sulfate             | A   | A   | A             | A      | A            | A             | A     |
| Sulfuric acid (10-75%)     | A   | -   | C             | A      | A            | A             | A     |
| Xylene                     | D   | D   | D             | A      | C            | C             | A     |

These charts are a general guide and do not guarantee chemical compatibility.  
Pepperl+Fuchs, Inc. assumes no responsibility for the use of this information.

## IP Ratings

### Definition:

The first numeral defines the amount of protection against penetration of solid objects into the housing.

The second numeral defines the amount of protection against liquids penetrating the housing. Additional information on ratings can be found in the following chart or the 1976 IEC Publication, Classification of Degrees of Protection Provided by Enclosures.

### Example: What is IP67?

Complete protection of live parts. Protection against the penetration of dust and water immersion.

### Testing Criteria:

1. Test Class: IP67 test  
 Conditions: 1 m head of water over the test piece for a duration of 30 minutes.  
 Room temperature  $\pm 5^\circ\text{C}$   
 Test: Insulation and operation
2. Test Class: IP68 test (Encapsulated products)  
 Conditions: 1m head of water over the test piece for 24 hours of operation under water, with cyclical activation and deactivation under nominal loading. Cycle time 2 hours. Room temperature  $\pm 5^\circ\text{C}$   
 Test: Insulation and operation
3. Test Class: IP69K test  
 Conditions: Protection against ingress of water from jets at a pressure of 1450 psi and at temperatures of up to  $80^\circ\text{C}$ . This is the level of pressure and temperature required for thorough cleaning of meat, fish, poultry and dairy precessing lines.

# IP

#### Degree of Protection Against Contact and Entrance of Solid Foreign Bodies

| <u>Numeral</u> | <u>Degree of Protection</u>                                                                                  |
|----------------|--------------------------------------------------------------------------------------------------------------|
| 0              | No protection against contact or entry of solids                                                             |
| 1              | Protection against accidental contact by hand, but not deliberate contact. Protection against large objects. |
| 2              | Protection against contact by fingers. Protection against medium-size foreign objects.                       |
| 3              | Protection against contact by most tools, wires and small objects.                                           |
| 4              | Protection against contact by small tools, wires and small objects.                                          |
| 5              | Protection against contact with energized or moving parts, and against deposits of dust.                     |
| 6              | Protection from energized or moving parts, and against penetration of dust.                                  |

#### Degree of Protection Against Ingress of Liquid

| <u>Numeral</u> | <u>Degree of Protection</u>                                                                                                          |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 0              | No protection                                                                                                                        |
| 1              | Protection against drops of condensed water. Condensed water falling on housing shall have no effect.                                |
| 2              | Protection against drops of liquid. Drops of falling liquid shall have no effect when housing is tilted to $15^\circ$ from vertical. |
| 3              | Protection against rain. No harmful effect from rain at angle less than $60^\circ$ from vertical.                                    |
| 4              | Protection against splashing from any direction.                                                                                     |
| 5              | Protection against water jets from any direction.                                                                                    |
| 6              | Protection against conditions on ship decks. Water from heavy seas will not enter.                                                   |
| 7              | Protection against immersion in water for the stated conditions.                                                                     |
| 8              | Protection against indefinite immersion in water at a specified pressure.                                                            |
| 9K             | Protection against high pressure, high temperature washdown.                                                                         |

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