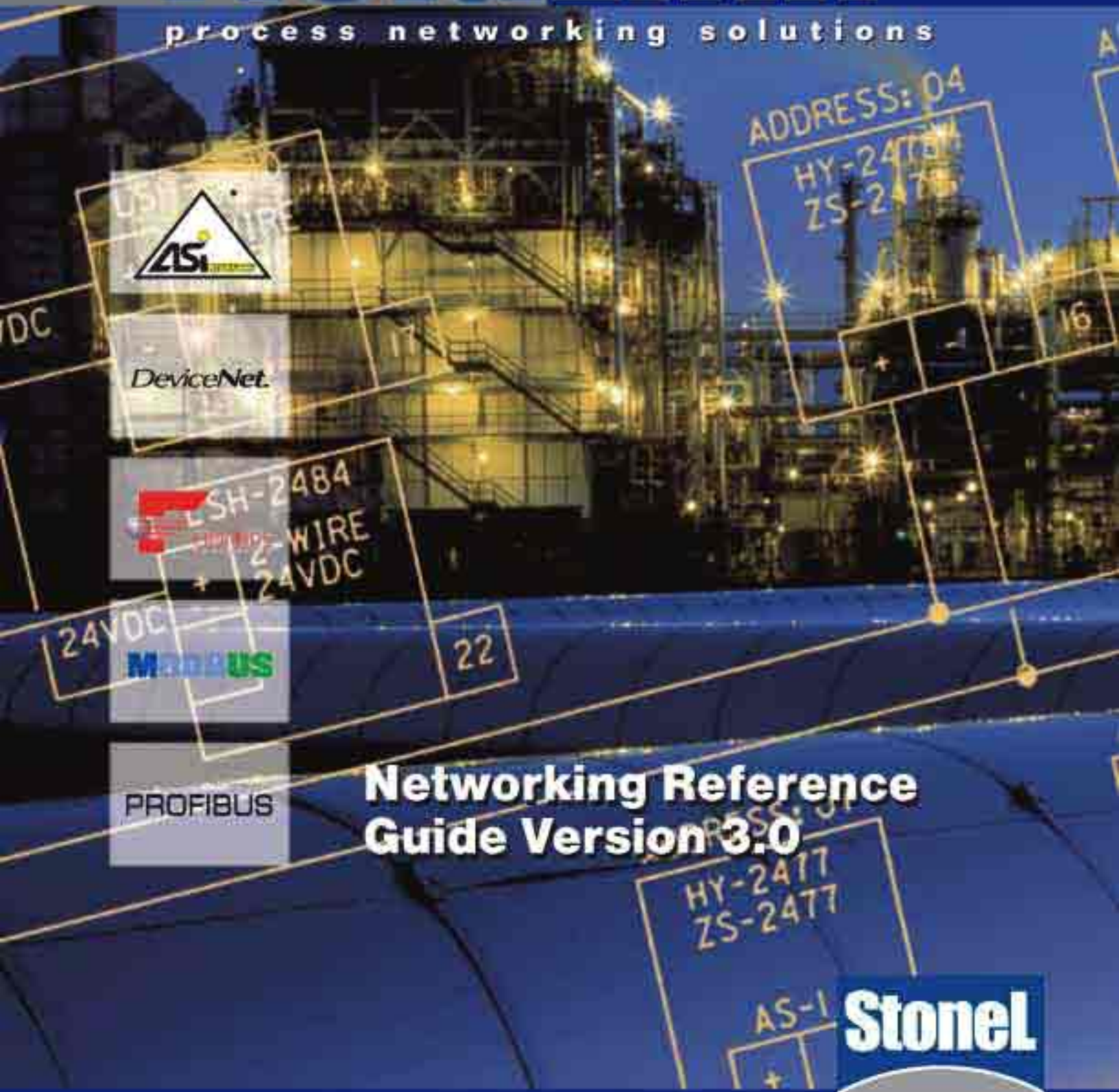
FieldLink®

process networking solutions



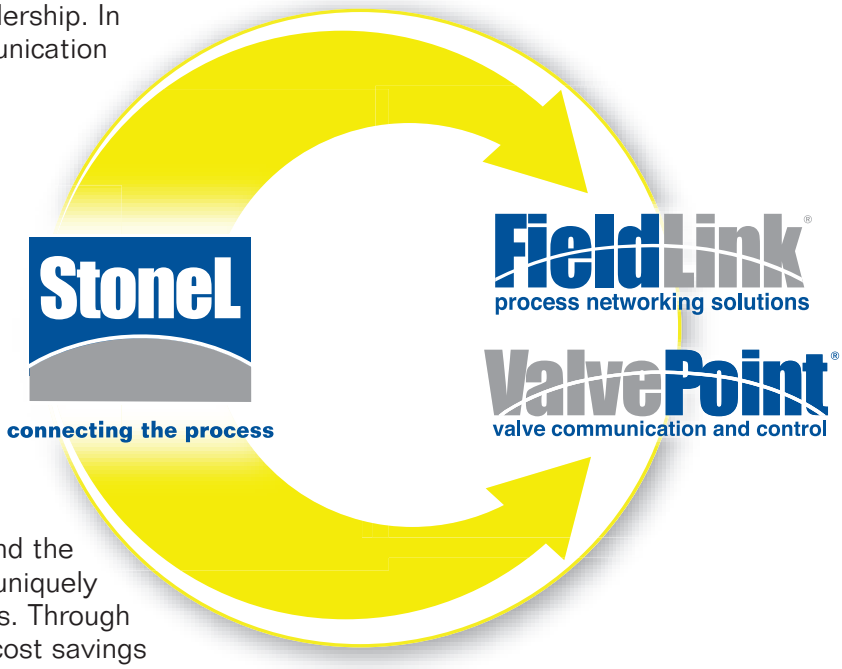
Networking Reference Guide Version 3.0

StoneL

connecting the process

Our Focus is to enable you to cut installation costs and improve process operating performance by effectively utilizing communication networking technology.

Since our founding in 1989, StoneL has become a leader in valve monitoring systems because of our reputation for reliability, overall quality and technological leadership. In 1998 StoneL launched a series of valve communication and control products to make process valves communicate (ValvePoint) and, at the same time, introduced the FieldLink program. FieldLink enables process customers to interconnect plant instrumentation and valve communication terminals with new and existing control systems using standardized, proven field based protocols.



FieldLink networking products and related support services are designed to reliably and cost effectively link your computer control architecture and process instrumentation together. As communication networking evolves, StoneL continues to expand the FieldLink program with new products that are uniquely suited for the demanding process environments. Through the FieldLink program, you will realize further cost savings and improved plant throughput with optimized hazard protection and enabled instrument diagnositcs. And, the FieldLink program offers the application and training support services to assist you in making it all work together effectively.

FieldLink Networking Reference Guide

has been designed to enable you to:

- *Stay current on process networking technology*
- *Understand hazardous area protection concepts as they apply to process networking*
- *Build an optimized field based network architecture for your applications*
- *Review and specify a broad array of networking products*

By connecting your process using StoneL's FieldLink program you will go to the next level in asset utilization and process productivity!

StoneL Approvals and Certifications

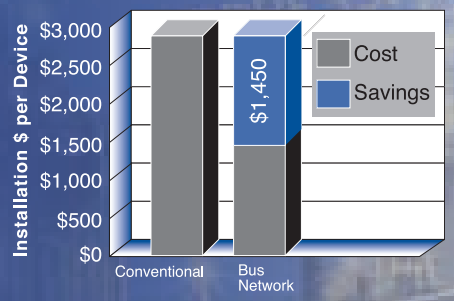
ISO 9001-2000 Certified

See more about FieldLink process networking solutions at **www.stonel.com**

Delivering Installation Cost Savings and Improved Plant Performance

Communication Networking Systems

- Reduced Wiring Cost
- Faster Set-up and commissioning time
- Lower Infrastructure Cost



FieldLink®
process networking solutions

Optimized Hazard Protection

- Greater Flexibility
- Improved Safety
- Easier Maintenance
- Faster Repairs

Enabled Instrument Diagnostics

- Lower Maintenance Costs
- Increased Plant Up-Time
- Greater Access to Critical Information

FieldLink Value Propositions

Full Array of Communication Networking Products

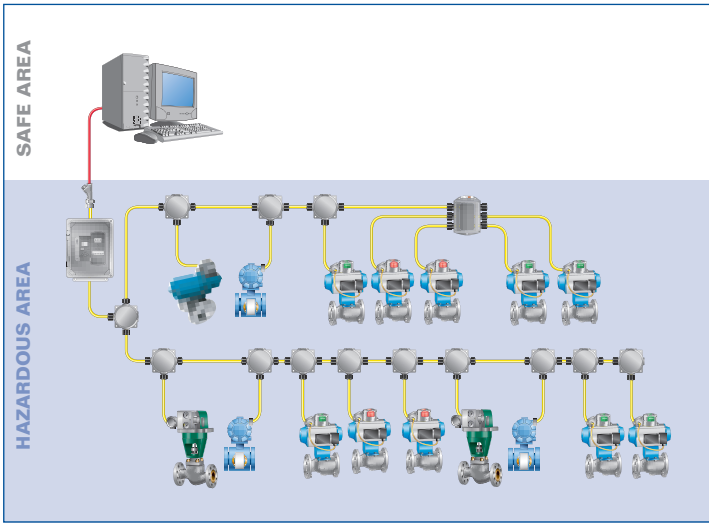
FieldLink supports most field based protocols with a broad array of products designed to make your entire network operate reliably in the rigorous process environments.

- Complete bus networking solutions from masters/gateways and power supplies to drop/spur connectors, terminators, I/O modules, field cabling, handhelds and commissioning kits.
- Drop leg switching and short circuit protection.
- Current-limited and Class I & II Division 2 approved power supplies.
- A wide variety of durable, corrosion proof and vapor tight enclosures for hazardous and general purpose areas.

Safer, Lower Cost Protection for Hazardous Areas

In addition to cutting costs with bus networking, FieldLink enables you to optimize your protection concepts in hazardous areas to reap even greater savings while improving plant safety.

- Take advantage of explosion proof, nonincendive, power limited and intrinsically safe protection concepts.
- NEC and IEC compliant systems for North American and International sites.



Instrument Diagnostics Cut Maintenance Costs

By using standardized communication protocols supported with StoneL's FieldLink program you can take advantage of the capabilities of smart field instruments. A single field instrument may more accurately control/monitor multi-process variables while simultaneously evaluating its operational health. As a result these smart field devices, when effectively integrated into the plant's communication architecture:

- Improve your process performance
- Predictively determine maintenance requirements
- Eliminate unforeseen process shut-downs

StoneL Certified Integrators Make It All Work Effectively for You

Each of StoneL's integration partners has the capabilities to interface field networks with process control architecture. And they have been trained to properly apply and support communcation networks in the process industries using FieldLink components and systems.

- Network design, commissioning and service support.
- Local back-up.
- Communication networking and hazard protection training.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24VDC
LSH-2484
2-WIRE
24VDC
24VDC
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HY-2477
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FieldLink®

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Protocol Guide

StoneL offers a complete array of networking products. Please use this guide to locate the components needed for your network based on protocol and product type.

Protocol	Network Descriptions	Masters and Gateways	Power Supplies	Input/Output Modules
ASi INTERFACE	pages 34-37	pages 38-59	pages 60-65	pages 71-80
DeviceNet™	pages 100-101		pages 102-103	pages 104-105
Fieldbus Foundation	pages 114-115		pages 116, 168-174	pages 117-120
PROFIBUS	pages 130-131		pages 168-174	
MODBUS	page 144		pages 168-174	pages 145-146

Enclosure Guide

StoneL offers a variety of enclosures to protect components from the process environment. Match the components with the appropriate enclosure using the chart below.

Enclosure	Enclosure Descriptions	Masters and Gateways	Power Supplies	Input/Output Modules
Junction Module JM 	pages 154-159			
FieldBlock FB 	pages 160-165			
FieldRack FR 	pages 166-167			

Drop Connectors	Power Conditioners and Repeaters	Cabling	Accessories (Tuners, Terminators, Handhelds etc.)	Accessories (Commissioning Kits and Software)
pages 81-87	pages 66-67	page 94	pages 68-70, 95	page 88-94
pages 106-108		page 110	page 111	page 109
pages 121-125	page 116	page 127	page 126	
pages 132-139		pages 140-141		
pages 147-149				page 150

Drop Connectors	Power Conditioners and Repeaters	Special Models	Type
			•Explosion proof and nonincendive equipment •Nema 4, 4x, and 6
			•Nonincendive equipment •Nema 4, 4x, and 6
			•Nonincendive equipment •Nema 4, 4x, and 6

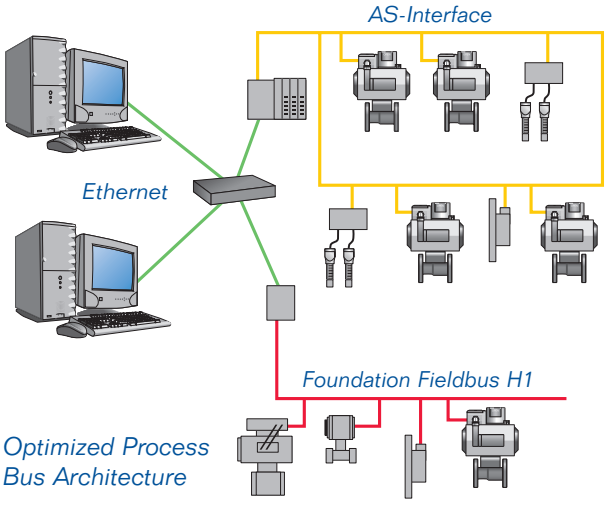
Process Networks and FieldLink

Standardized communication networks are linking intelligent field devices to enterprise systems to offer unparalleled benefits to the process industries. Benefits include dramatic reductions in installation costs, reduced maintenance and commissioning costs and improved process performance. FieldLink, StoneL's process networking products and support services program, facilitates the implementation of your field network. The following section describes how the FieldLink program can help you implement and optimize contemporary field communication networks for your specific application.

Optimized Process Control Architecture

An optimized network may consist of two or three communication protocols which seamlessly and economically link sophisticated process instruments and simple, discrete devices into the process control architecture. ***Figure 1*** illustrates a fieldbus and sensor bus being directly attached to the process control/enterprise system. Although one higher level protocol may be capable of directly connecting all of the field devices with the control architecture, area classifications, reliability, and economic considerations make the layered approach preferable.

Figure 1



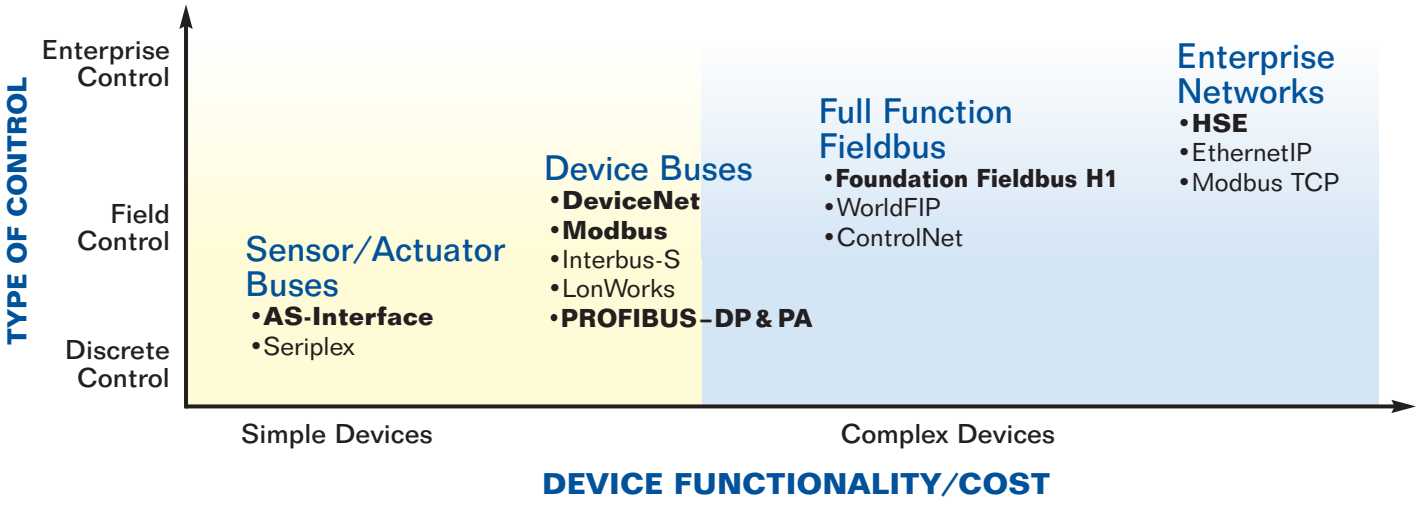
Enterprise Networks

Ethernet with TCP/IP is the de facto standard for linking computer control and business systems together. Field level protocols are now being plugged into the enterprise networks by sliding the application layers from the field protocol onto the Ethernet network. As a result, the following Ethernet based protocols have emerged at the control system level:

- Profinet - Ethernet with Profibus
- Ethernet IP - Ethernet with ControlNet/DeviceNet
- HSE - Ethernet with Foundation Fieldbus
- Modbus TCP - Ethernet with Modbus

Ethernet with OPC (OLE for Process Control) clients/servers promises to offer universal translation for each of the different protocols' application layers to seamlessly interact with windows-based software.

Process Bus Networking Hierarchy



Fieldbus Networks

Analog process control instrumentation, which requires unique interfacing for loop control algorithms and hazardous area compliance, is best networked using "full function fieldbus" protocols.

Foundation Fieldbus is supported widely by instrument manufacturers around the world and is the de facto standard for "analog" process control networks in North America. It features a number of process oriented attributes including object oriented function blocks, process variable time stamping, and field based PID control.

The most popular protocol at this level is Foundation Fieldbus (H1). This protocol uses the IEC 61158-2 physical layer which has been designed to replace 4 to 20mA control loops and may be used in intrinsically safe circuits.

Device Bus Networks

Device bus networks offer the functionality to connect both analog and discrete instruments into the process control architecture. Modbus, DeviceNet, and PROFIBUS are popular device bus protocols used in the process industries.

Modbus has been the traditional standard for tying remote I/O and PLCs into a plant's DCS systems. Legacy control systems typically interface readily to Modbus networks, making this protocol ideal for retrofit applications.

DeviceNet is used in numerous applications where Allen Bradley PLCs and integration support are prevalent.

PROFIBUS-DP offers exceptional performance for high speed applications with its low bit stream overhead and fast baud rate. PROFIBUS is the dominant network in European markets and is also supported throughout North America. PROFIBUS-PA, which uses the IEC 61158-2 physical layer, interfaces directly into PROFIBUS-DP networks.

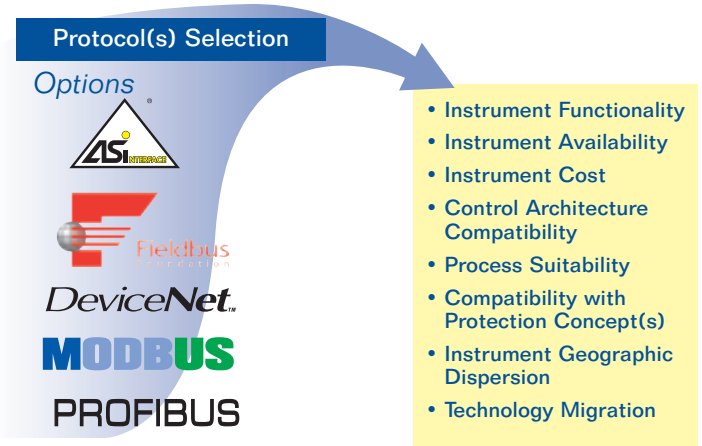
Interbus-S is a protocol used extensively in Europe over the past 15 years. Although quite popular in Europe, it has not been used significantly in North America so it is not supported well in this market. LonWorks, which uses the neuron chip, was developed by Echelon Corporation and has been primarily used in HVAC applications.

Sensor/Actuator Networks

Discrete process devices may be conveniently and economically interfaced into a plant's control architecture using sensor actuator networks.

AS-Interface is the dominant protocol used for discrete applications throughout the world in the process industries. It offers dramatic installation savings, is simple to install, integrates conveniently into most other higher level protocols, and is easy to maintain.

They offer end-users a convenient, reliable method of taking advantage of the benefits of bus networking technology on nearly all discrete applications. Seriplex, although an early contender in this market, has not been used extensively in the process industries.



Field Protocol Overview

The Protocol Quick Reference Chart below is a brief overview of the most widely accepted field networks used in the process industries. Since the specifications are not fully comprehensive, we suggest further research before selecting the optimal protocol for your specific application. Please refer to more detailed protocol descriptions throughout the FieldLink reference guide and/or consult with a StoneL Network Solutions specialist.

Network Protocols

Protocol	Topology	Max Distance[1]	Max # Devices	Cabling	Power Delivery[2]	Hazardous Area Wiring	Data Transfer Size	Bus Access Method
pages 32-97 ASi INTERFACE	Not Limited	100m (328 ft) 300m (984 ft) with 2 repeaters Additional distance with multiple parallel repeaters. Tuners and terminators available for special extensions	31 62 with extended addressing	Unshielded, Untwisted Pair	Current; up to 8 Amps Voltage Range; 26.5 to 31.6 VDC	Explosion Proof and Nonincendive Devices; Conduit, Tray cabling and Nonincendive Wiring	4 Bits	Cyclic polling
pages 98-111 DeviceNet™	Trunk/Drop with Branching	500m@125Kbit/s[4] 250m@250Kbit/s[4] 100m@500Kbit/s[4]	62	(2) 2-wire with Shield (5-wire bundle)	Current; up to 8 Amps Voltage Range; 11 to 25 VDC	Explosion Proof and Nonincendive Devices; Conduit and Tray cabling	1 Byte Variable up to 8 Bytes	Selectable: cyclic polling, change of state and more (device specific)
pages 112-127 Fieldbus Foundation *H1 Level*	Trunk with Branching or Chicken Foot	1900m (6200ft) 120m spur[5] Using FISCO 1000m	32 (16)[6]	Shielded Twisted Pair	Current; up to 500 mA Voltage Range; 9 to 32 VDC	Intrinsically Safe (I.S.), Explosion Proof and Nonincendive Devices; Conduit, I.S., Tray cabling and Nonincendive Wiring	2 Bytes Discrete 5 Bytes Analog Variable	Publisher-Subscriber method with data transfer. Token passing client-server for calibration and diagnostics
pages 128-141 PROFIBUS *DP, RS-485*	Trunk/Drop	1200m@94Kb/s 400m@500Kb/s 100m@12Mb/s	32 up to 126	Shielded Twisted Pair	Current; up to 8[7] Amps Voltage Range; 11 to 25 VDC	Explosion Proof and Nonincendive Devices; Conduit and Tray cabling	1 Byte Variable up to 244 Bytes	Token passing for multi-master, cyclic polling for data to master; acyclic for diagnostic and calibration
pages 128-141 PROFIBUS *PA*	Trunk with Branching or Chicken Foot	1900m (6200ft) 120m spur Using FISCO 1000m	32	Shielded Twisted Pair	Current; up to 500 mA Voltage Range; 9 to 32 VDC	Intrinsically Safe (I.S.), Explosion Proof and Nonincendive Devices; Conduit, I.S., Tray cabling and Nonincendive Wiring	1 Byte Variable, up to 244 Bytes	Transparent to PROFIBUS-DP with coupler. Cyclic polling for data and acyclic for diagnostics and calibration with link master.
pages 142-151 MODBUS *RS-485*	Trunk/Drop	1200m (4000 ft)	32	Shielded Twisted Pair	Current; up to 8[7] Amps Voltage Range; 11 to 25 VDC	Explosion Proof and Nonincendive Devices; Conduit and Tray cabling	1 Byte Variable (RTU Mode)	Synchronous and asynchronous poll and response

1. Maximum length is given due to communication limitations. Bus length may be further limited due to voltage drop from high power transfer.
2. Typical maximum power delivered via the network.
3. Approximate speed for 64 I/O points distributed over 16 field devices using cyclic data exchange. Accessing method varies with protocol operation and will affect cycle time significantly.
4. Maximum length based on thick cable. Maximum spur length limited to 6m; cumulative spur length varies inversely with baud rate.
5. Maximum spur length reduced with more than 12 devices per segment.
6. Typical maximum is 16. Theoretical maximum is 32.
7. Power supplied on separate wires from communication signal.

Transmission Rate	Approximate Cycle Time[3]	Special Features	Strengths	Weaknesses	Optimal Applications
167Kbit/s	3ms Varies with number of devices and times scanned	Analog available with 2.1 version masters with multi-scan 3.0 version offers diagnostic and data transfer capabilities	• Low cost • Easy to install • Easy to support • Fast • Supports high power • Flexible topology	• Short bus length • Limited data/node	Use for discrete I/O where low cost and simplicity are important. May readily interface with most PLC, DCS Systems. Gateways conveniently to high level protocols.
125Kbit/s 250Kbit/s 500Kbit/s	9ms 6ms 3ms	EDS file used for device parameters and rapid start-up	• Interfaces to A-B • Flexible implementation • Flexible data capabilities • Supports high power • ODVA marketing	• 4-20mA instrumentation not widely available	Use for discrete I/O into Allen Bradley PLCs. Also may be desirable for motor control applications.
31.25Kbit/s (IEC 61158-2)	200ms	Function blocks used for process control may be distributed into field devices. Time stamping of data optimizes control	• Long length • Well supported • Convenient user objects • Extensive diagnostics • Capable of being I.S.	• Moderate speed • Expensive field devices • Limited bus power	Use for analog I/O in process or discrete I/O over long distance. Use for IS analog & discrete I/O. Supported by many process instrument manufacturers throughout the world.
9.6Kbit/s to 12Mbit/s	0.5ms @ 12Mb/s	GSD file used for device parameters	• Long length • Very fast • Well supported in Europe and North America	• Must have auxiliary power	Use for analog and discrete I/O with high speed requirements. Used extensively for variable speed drives. Well supported by European manufacturers. Ideal for high speed AS-Interface Gateway applications.
31.25Kbit/s (IEC 61158-2)	100ms	Couples directly to DP in transparent manner (DP limited to 45Kbit/sec) or links to DP as a slave/master to PA	• Long length • Well supported in Europe • Capable of being I.S.	• Moderate speed • Limited bus power • Must be connected to control system via PROFIBUS-DP	Use for analog I/O in process or discrete I/O over long distance. Use for IS analog and Discrete I/O/ Bridges readily into PROFIBUS-DP. Supported by many European process instrument manufacturers.
9.Kbit/s to 56Kbit/s	75ms @ 38.4Kbit/s	—	• Easy to install • Easy to support • Widely used on existing DCS systems • Long length	• Moderate speed • Must have auxiliary power	Use for discrete and analog I/O where large amounts of data on multiple field devices over long distance. Most common existing I/O bus. Common with AS-Interface gateways.

Protection Concepts Overview

Proper installation of bus networks in hazardous areas is critical to fully realize cost savings and improve plant safety. Below is a summary of the protection concepts suitable for networking applications to aid in selecting the optimal methodology for your requirements. Before making a final decision in hazardous area conformance methodologies, please consult with your local inspection authority.

Protection Concepts

	Protection Concept	Brief Description	Applicable Areas
pages 16-17	Explosion/Flame Proof **Ex**	• Contain ignition inside conduit system. • Cool vented gases to prevent ignition outside containment vessel.	NEC - Class I & II, Division 1 & 2 IEC - Ex d, Zone 1 & 2
pages 18-19	Nonincendive Equipment **NIE**	• Nonincendive equipment must not create arcs or sparks or must have arcing components contained in an hermetically sealed chamber. • Nonincendive equipment must not have surface temperatures exceeding vapor-air or dust-air ignition temperatures.	NEC - Class I & II, Division 2 IEC - Ex nA, Zone 2 Ex nC, Zone 2
pages 20-21	Tray Cabling **Tr Cbl**	• Current and voltage limited power supplies. • Cabling is rated for ITC and/or PLTC and supported by cable tray or with special mechanical means. • IEC allows elastomiric and thermoplastic sheathed cable.	NEC - Class I & II, Division 2 IEC - Ex n, Zone 2
pages 22-23, 28	Nonincendive Wiring Drops & Associated Apparatus **NIW**	• PLTC/ITC systems (above) may be combined with nonincendive field wiring. • Nonincendive field wiring and associated apparatus are not capable, under normal operation, of igniting the gas, vapor or dust-air mixture under normal conditions. Normal conditions include opening, shorting or grounding the field wiring. • Energy storage in nonincendive wiring associated apparatus must be limited and coordinated with nonincendive current and voltage limiting device.	NEC - Class I & II, Division 2 IEC - Ex nL, Zone 2
pages 24-27	Intrinsically Safe **IS**	• Prevents ignition of gas, vapor or dust-air mixture under normal and abnormal conditions. • Energy limited into circuits under fault conditions by barriers. • Potential inductive and capacitive energy in circuit components must be limited and coordinated with barrier. • Fieldbus intrinsically safe concept (FISCO) allows more flexibility and higher energy levels in bus networks.	NEC - Class I & II, Division 1 & 2 IEC - Ex ia, Zone 0, 1 & 2 Ex ib, Zone 1 & 2

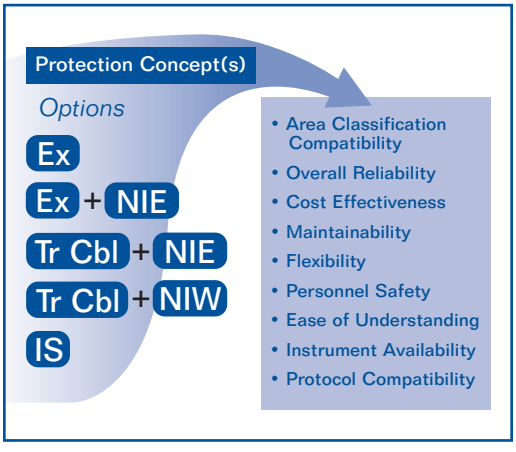
Hazardous Area Protection Concepts

PROTECTION CONCEPTS	DIVISION 1 AREAS		DIVISION 2 AREAS
	ZONE 0	ZONE 1	ZONE 2
Ex		●	●
NIE			●
Tr Cbl			●
NIW			●
IS ia	●	●	●
IS ib		●	●

Fieldbus Protocols	Segment Power Availability	Enclosure Requirements	Conduit/Cabling Requirements	Cost Analysis/Comments
All	Not Limited	Explosion Proof/Flameproof Housing with Approvals	• Rigid metal conduit • MI (Mineral Insulated, Metal Sheathed) or MC (Metal Clad) where flexibility required • Sealing components for all enclosures (except those with special ratings)	Wiring costs are high. However, number of devices per segment is maximized holding down installation cost per device. Device power must be removed for maintenance. Seal components must be used if removing individual device from network.
All	Not Limited	• Nema 4/IP54 Enclosures with Nonincendive Component Approvals • IP54 or better with Ex nA or Ex nC component ratings	• Rigid metal conduit • MI, MC or Liquidtight Flexible conduit • IEC allows thermoplastic or elastomiric sheathed cable	Wiring costs are moderate and number of devices per segment is maximized, dramatically reducing installed cost per device. Devices may be opened under power but power must be removed before manipulating wiring. Field devices may be removed without sealing off remainder of network.
All	• PLTC: 100 watts or 3.3 Amps @ 30VDC • ITC: may be up to 5 Amps • IEC cable maybe up 6 Amps	• Same as Nonincendive Equipment or Explosion Proof • Compression fitting may be used on enclosures with terminations for ITC or PLTC cable	• PLTC or ITC in Cable Tray • PLTC or ITC as open wiring up to 15m (50 ft) protected by angles, struts or messenger wire. • MC Flexible conduit or Liquidtight where flexibility is required. • No restictions on IEC	Wiring costs are low. Number of devices per segment is typically not limited, resulting in very low installed cost per device. Current limited power supplies are required for PLTC and ITC.
• AS-Interface • Foundation Fieldbus H1 • Profibus PA	• Typically up to 100mA @ 30VDC	• Nema 4/IP54 with Nonincedive Wiring Associated Apparatus Approvals • IP 54 with Ex nL energy limited components per entity or FNICO	• General purpose cabling • IEC cabling less restrictive	Wiring costs are very low. Voltage and current limiting are required with “entity” parameters coordinated with field devices. Installed device cost is very low. Field device wiring may be manipulated and devices removed without dropping power.
• Foundation Fieldbus H1 • Profibus PA	• Typically up to 100mA @ 24VDC with FISCO method	• Nema 4/IP54 Enclosure with Intrinsically Safe Apparatus approvals • IP 54 with Ex ib or ia rated components per entity or FISCO	• General purpose cabling	Wiring costs are low. However, number of devices per segment is typically a maximum of 4 to 6 (Power Delivery Limitations) and IS barriers are required for each segment resulting in higher installation costs per device.

Optimize Protection Concepts to Reduce Costs and Increase Safety

Different protection concepts may be used in the plant’s hazardous areas to improve the communication network’s performance. For example in a zone 2 area tray cabling may be used for the bus trunk and nonincendive field wiring and associated apparatus used for each individual drop. The trunk, which is rarely disconnected, carries up to 5 amps with the individual drops limited to less than 100mA for safety and wiring flexibility. See the “Protection Concepts” section (pages 16 to 29) to review common protection combinations used for communication networks in hazardous areas.



Protection Concepts

Protection Concepts

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Explosion Proof/ Flame Proof

Ex

Area Classifications (NEC)
Class I Groups A, B, C, D Divisions 1 & 2
Class II Groups E, F, G Divisions 1 & 2

Area Classifications (IEC)
Ex d IIC, IIB, IIA Zones 1 & 2

Compatible Protocols
Most Field Based Protocols are suitable for use in explosion proof systems provided proper installation methods are used.

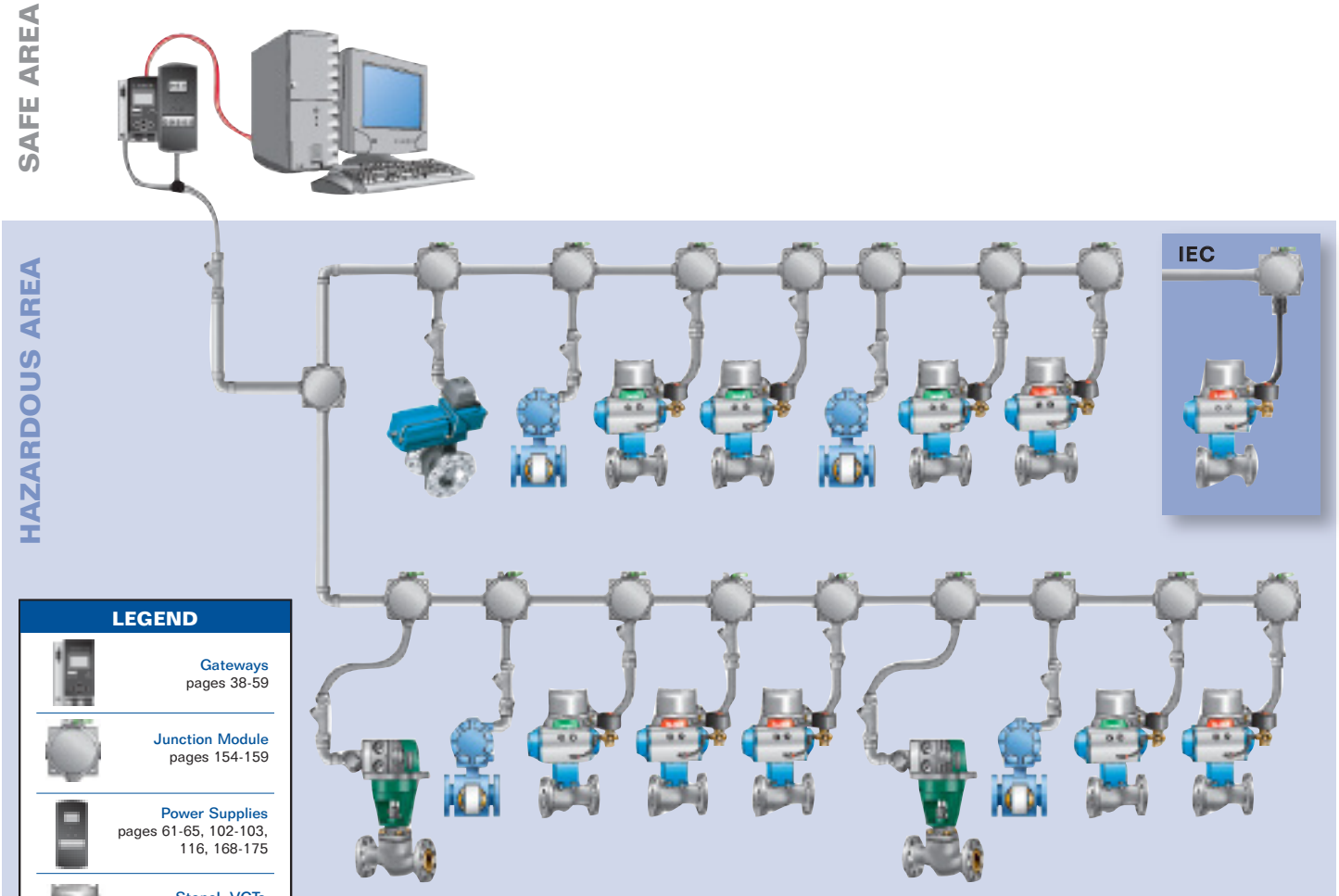
The explosion proof/flame proof philosophy of hazard protection focuses on gas ignition containment. If ignition occurs within instrument enclosures and the conduit system, it is prevented from propogating into the atmosphere. Instrument enclosures and conduit assemblies must be designed to contain pressures well in excess of ignition pressure levels for the gases and dusts to which they will be exposed. Mating surfaces must also be designed so exhausting gases will be sufficiently cooled before being vented into the atmosphere. Sealing components must be used throughout the conduit system to prevent pressure piling from one section of the conduit system into another.

Basic Concept
- Contain ignition inside conduit system and enclosures.
- Cool vented gases to prevent ignition outside of containment vessels.

Advantages
- Well understood in North America and Asia-Pacific markets.
- Unlimited power for instrumentation/bus circuits.

Disadvantages
- Deterioration of conduit and/or housing may degrade protection.
- Enclosures may not be opened with circuits energized.
- Bulky conduit and enclosures are expensive, space consuming and inflexible.

Explosion Proof Network
(Class I & II, Div. 1 and 2; Ex d, Zones 1 and 2)



Consult StoneL's web site at www.stonel.com/fieldlink/approvals for the latest approval information on illustrated StoneL products.

Explosion Proof/ Flame Proof

Ex

NEC References

Field Enclosures: Articles 501.2, 501.3, 501.5, 501.6, and 501.7

Field Wiring: Articles 501.4, 501.5, 501.11, and 501.14

Connections: Articles 501.4, 501.5, 501.12, and 501.13

Field Instrument Components: Articles 501.3, 501.6, 501.7, and 501.10

IEC References

Field Enclosures: IEC 60079-1

Field Wiring: IEC 60079-14

Networking Guidelines (Class I)

Field Enclosures

- Enclosures with suitable construction must comply with explosion standards including threading standards, burst pressure requirements and other requirements as established in NEC Article 501.
- Conduit seals must be installed within 18" from the enclosure unless specifically exempted (enclosures containing nonincendive components and capable of withstanding pressure piling from external ignition may be exempted from use of seal fittings).
- Enclosures may not be opened without deenergizing circuits.

Field Wiring

- Threaded rigid metal conduit or threaded steel intermediate conduit is used with threaded joints having at least 5 threads fully engaged.
- Type MI (Mineral Insulated, metal sheathed) and MC (Metal Clad) cable with suitable termination fittings may be used for flexibility requirements.

Connections

- All fittings must be explosion proof approved. Quick connectors are not suitable for explosion proof applications.

Field Instrument Components

- Meters, instruments and relays may be used inside enclosures suitable for explosion proof applications and identified as a complete assembly.
- Switches, circuit breakers, motor controllers and fuses must be contained within an explosion proof enclosure and identified as a complete assembly.

Economic Analysis

Installation Cost Comparison (calculated per field device)

	Conventional	AS-Interface	FF*
Computer I/O; Master/Gateway	$ 70	$ 50	$ 160
Conduit, Cable Tray, Wiring and Fittings	$1,600	$ 350	$ 380
Valve Monitor/VCT and Pneumatic Valve	$ 420	$ 590	$ 900
Switched Protected Drop Connector	NA	$ 170	$ 170
Installation and Commissioning Labor	$ 800	$ 350	$ 350
Power Supply	$ 50	$ 30	$ 60
Total Installed Cost	$2,940	$1,540	$2,020

*Foundation Fieldbus is not directly comparable. Analog instruments may require less adder over conventional 4 to 20 mA instruments making this system cost effective when combining analog and discrete field instruments on the same segment. Functionality for FOUNDATION Fieldbus devices is also significantly greater, offering increased diagnostic and operational capabilities.

Total Installation savings
$1,400 per field device or
$22,400 for a 16 device segment

Basic Assumptions:

- Number of field devices on the segment is not limited by electrical energy to the segment.
- One network segment consists of 16 field devices.
- Field devices are located in a cluster located an average distance of 200 feet (61m) from marshalling cabinet.
- Total bus network is 300 feet (91m) long.
- All network drop legs are short circuit protected and may be deenergized in the field.
- Seal fittings are required in order to remove field devices from deenergized drop leg if bus remains energized.
- Costs may vary depending on specific application.

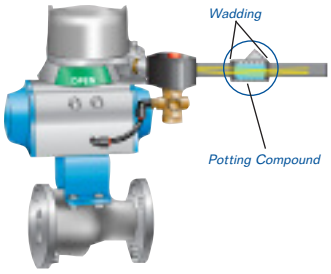
Additional Savings with Bus Network Installation:

- Conduit, wiring and marshalling enclosures consume less space.
- Less infrastructure is required to support conduit and enclosures.
- Devices may be added later or system changed for minimal cost (may use up to 31 devices with AS-Interface; 62 devices with extended addressing).
- Field devices may be capable of providing diagnostics for maintenance.
- Multi-point variables may be included in one field device, dramatically reducing instrument costs.

*A Special Note on Seal-Offs (Division 1 and 2)

Seal-Offs or seal fittings are used to prevent the propagation of ignited gases into other parts of the conduit system. StoneL components are designed to operate safely without seal fittings in both Division 1 and 2 areas.

Cost savings for eliminating seal-offs are estimated to be $100 per installation.



Explosion Proof with Nonincendive Equipment

Ex + NIE

Area Classifications (NEC)
Class I Groups A, B, C, D Division 2
Class II Groups E, F, G Division 2

Area Classifications (IEC)
Ex nA IIC, IIB, IIA Zone 2

Compatible Protocols
Most Field Based Protocols are suitable for use in explosion proof systems with nonincendive equipment provided proper installation methods are used and nonincendive components are properly certified.

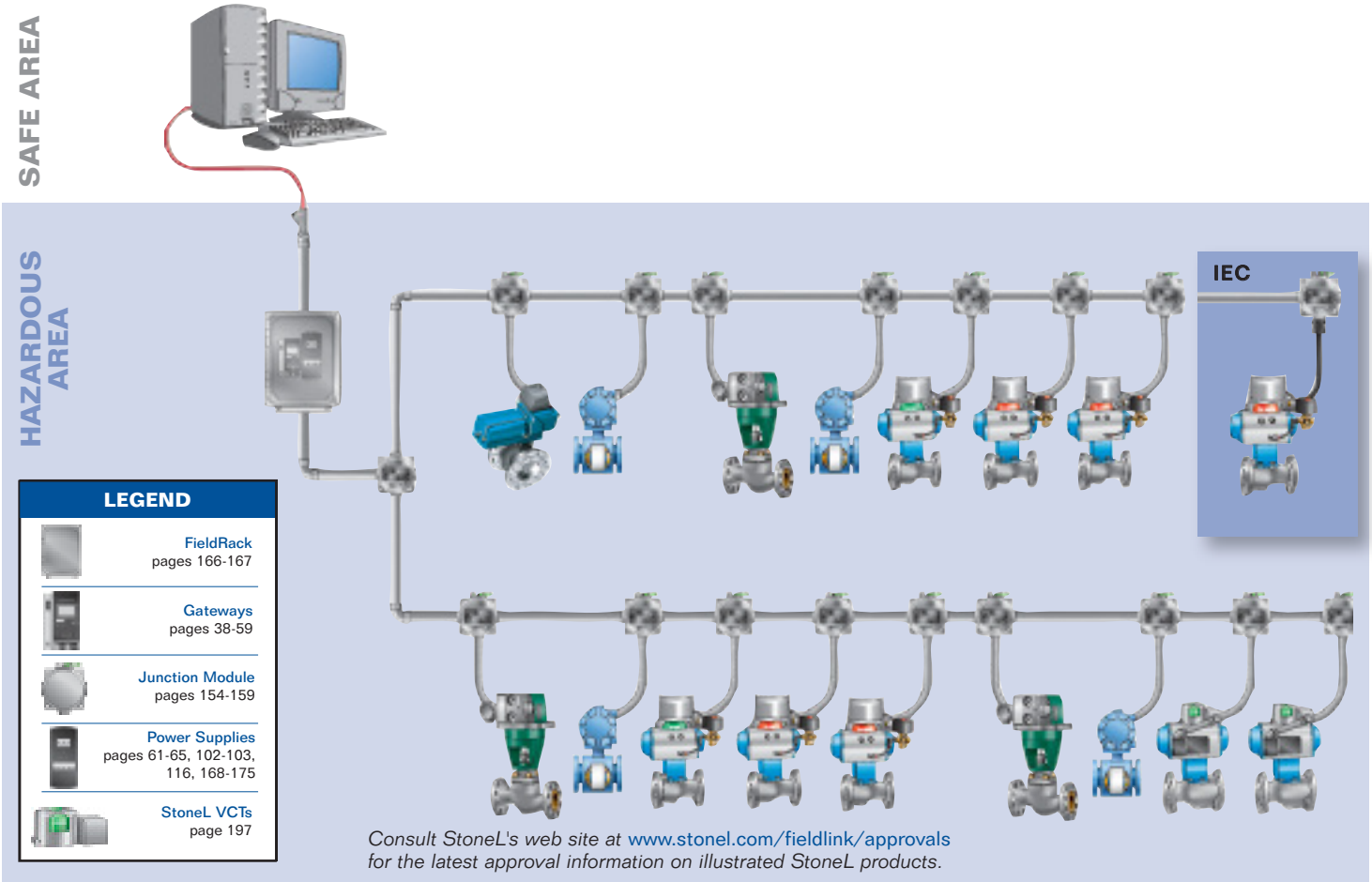
In division 2/zone 2 areas nonincendive devices may be installed in explosion proof systems. Division 2/zone 2 explosion proof conduit systems may also be installed with less robust enclosures and conduits. Since the combustible gases are present under abnormal conditions the probability of ignition is reduced significantly. As a result fewer precautions are needed in order to assure safe operation.

Basic Concept
- Used as part of an explosion proof system in division 2/zone 2 areas.
- Enclosures may be general purpose and must be rated as nonincendive equipment.
- Nonincendive components must not create arcs or sparks (solid state) or have arcs contained within an hermetically sealed chamber. Component surface temperatures must not exceed ignition levels of gas-air mixture or cause excessive dehydration or carbonization which may spontaneously ignite dust-air mixture.

Advantages
- Lower cost enclosures.
- Less space consumed.
- Enclosures may be opened with circuits energized.
- No seal-offs are required on nonincendive devices.
- Non-metallic enclosures are acceptable.
- Substantial electric power is available for instrumentation.

Disadvantages
- Circuits have electric shock hazard.
- Division 2/zone 2 areas only.

Explosion Proof and Nonincendive Network
(Class I and II, Div. 2; Ex nA, Zone 2)



Consult StoneL's web site at www.stonel.com/fieldlink/approvals for the latest approval information on illustrated StoneL products.

Explosion Proof with Nonincendive Equipment

Ex + NIE

NEC References

Field Enclosures: Articles 501.2, 501.3, 501.5, 501.6, and 501.7

Field Wiring: Articles 501.4, 501.5, 501.11, and 501.14

Connections: Articles 501.3 (B)(6), 501.4, 501.12, and 501.13

Field Instrument Components: Articles 501.3, 501.6, 501.7, and 501.10

IEC References

Electrical Apparatus: 60079-15

Electrical Installations: 60079-14

Networking Guidelines (Class I)

Field Enclosures

- General purpose enclosures (NEMA 4, IP54 or better) are suitable for use with nonincendive components (nonincendive equipment).
- Conduit seals are not required for nonincendive equipment.
- Enclosures may be opened without deenergizing circuits. However, wiring may not be manipulated while circuits are energized.

Field Wiring

- Threaded rigid metal conduit with a minimum of 5 threads of engagement.
- Type MI (mineral insulated, metal sheathed) and MC (metal clad) cable with suitable termination fittings.
- Liquidtight may be used where flexibility is required
- Flexible cord listed for extra-hard usage and provided with listed bushed fittings.

Connections

- Approved explosion proof fittings.
- Quick connectors are suitable provided all of the following conditions are met:
  1. Power is removed from the circuit before plugging or unplugging.
  2. Current does not exceed 3 amps @ 120VAC.
  3. Cord is listed for hard usage with receptacle and plug of the locking and grounding type.
  4. A label is attached to the receptacle warning against unplugging while energized.

Field Instrument Components

- Nonincendive components consist of:
  1. Current interrupting contacts which are hermetically sealed against external gases.
  2. Non-arcing (e.g. solid state) where the maximum operating surface temperature does not exceed 80% of the ignition temperature of the exposed gases.

Economic Analysis

Installation Cost Comparison (calculated per field device)

	Conventional	AS-Interface	FF*
Computer I/O; Master/Gateway	$ 70	$ 50	$ 160
Conduit, Cable Tray, Wiring and Fittings	$1,400	$ 290	$ 290
Valve Monitor/VCT and Pneumatic Valve	$ 315	$ 450	$1,025
Switched Protected Drop Connector	NA	$ 160	$ 160
Installation and Commissioning Labor	$ 600	$ 250	$ 250
Power Supply	$ 50	$ 30	$ 30
Total Installed Cost	$2,435	$1,230	$1,915

*Foundation Fieldbus is not directly comparable. Analog instruments may require less adder over conventional 4 to 20 mA instruments making this system cost effective when combining analog and discrete field instruments on the same segment. Functionality for Foundation Fieldbus devices is also significantly greater, offering increased diagnostic and operational capabilities.

Total Installation savings
$1,205 per field device or
$19,280 for a 16 device segment

Basic Assumptions

- Number of field devices on segment is not limited by electrical energy to the segment.
- One network segment consists of 16 field devices.
- Field devices are located in a cluster located an average distance of 200 feet (61m) from marshalling cabinet.
- Total bus network is 300 feet (91m) long.
- All network drop legs are short circuit protected and may be deenergized in the field.
- Seal fittings are not required at field devices.
- While bus remains energized field devices may be removed by switching off drop circuit.
- Costs may vary depending on specific application.

Additional Savings with Bus Network Installation

- Conduit, wiring and marshalling enclosures consume less space.
- Less infrastructure is required to support conduit and enclosures.
- Devices may be added later or system changed for minimal cost (number of devices per segment protocol dependent)
- Field devices may be capable of providing diagnostics for maintenance.
- Multi-point variables may be included in one field device, dramatically reducing instrument costs.

Tray Cabling with Nonincendive Equipment

Tr Cbl + NIE

Area Classifications (NEC)
Class I Groups A, B, C, D Division 2
Class II Groups E, F, G Division 2

Area Classifications (IEC)
Ex nA, IIC, IIB, IIA Zone 2

Compatible Protocols
Most Field Based Protocols are suitable for use with ITC or PLTC wiring and nonincendive equipment provided proper installation methods are used and nonincendive components are properly certified.

Significant power may be provided using these tray type cable systems enabling bus networks to operate at up to 5 amps for ITC and 3 amps for PLTC. When using either PLTC or ITC, structual support must be provided for the cabling with trays or other means and the power supply must be current limiting. Cabling may be connected into nonincendive equipment using compression fittings or connectors designed for hazardous division 2/zone 2 applications.

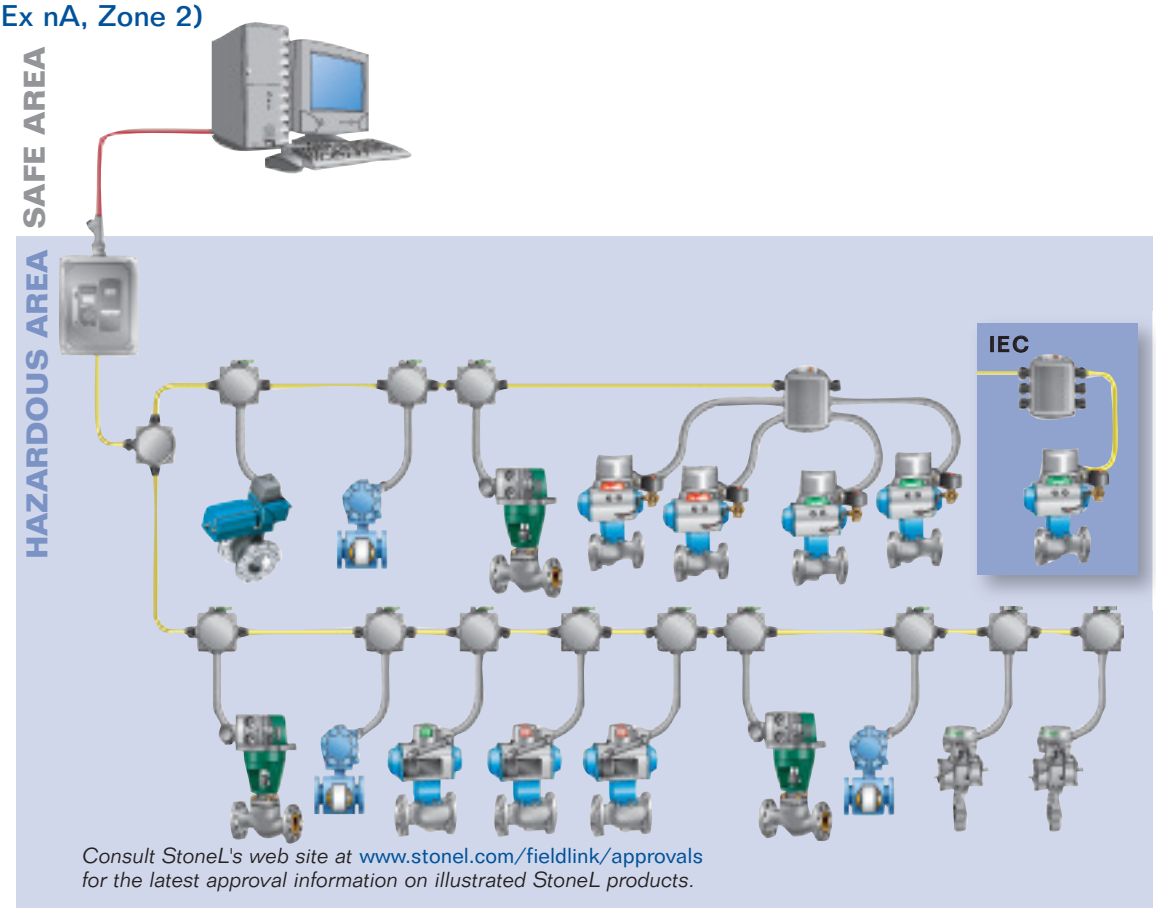
IEC requirements are less stringent than NEC standards with current limited to 6 amps and voltages not to exceed 250V.

Basic Concept
- ITC limited to 5 amps with 20 gauge or larger wiring using standard networking voltages; PLTC limited to 100 watts (e.g. 3.3 amps @ 30VDC or 4.1 amps @ 24VDC).
- Cabling must be PLTC or ITC and must be supported by cable tray, angles, struts, channels, messenger wire or other mechanical means.
- Circuits must have a current limited power supply (class 2 approved power supply is required for PLTC.
- IEC allows thermoplastic or elastomoric sheathed cable for fixed wiring installations. No specific support structures are required.

Advantages
- Significant power for bus networks.
- Low cost wiring and instrument enclosures.
- Limited shock and ignition hazard (using class 2 power supply).
- Suitable for all fieldbus protocols.

Disadvantages
- PLTC and ITC wiring concepts are not well known.
- Limited to division 2/zone 2 areas.

Tray Cabling with Nonincendive Equipment Network
(Class I and II, Div. 2; Ex nA, Zone 2)



LEGEND

FieldBlock pages 160-165
FieldRack pages 166-167
Gateways pages 38-59
Junction Module pages 154-159
Power Supplies pages 61-65, 102-103, 116, 168-175
StoneL VCTs page 197

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Tray Cabling with Nonincendive Equipment

Tr Cbl + NIE

NEC References

Field Enclosures: Article 501.3 (B)(4)

Field Wiring:
PLTC - Article 725 (26 to 71)
ITC - Article 727

Connections: Articles 501.3 (B)(6), 501.4, 501.12, and 501.13

Field Instrument Components: Articles 501.3, 501.6, 501.7, and 501.10

IEC References

Electrical Apparatus: 60079-15

Electrical Installations: 60079-14

Networking Guidelines (Class I)

Field Enclosures

- Same as those described on page 19 for NIE.

Field Wiring

- ITC (Instrument Tray Cable) must be limited to 150 volts and 5 amps for 20 gauge wire or larger or 3 amps for 22 gauge.
- ITC applications must have a power supply with overcurrent protection that does not exceed current limits for respective wire gauges.
- PLTC (Power Limited Tray Cable) must be limited to 100 watts and 60 VDC (e.g. 3.3 amps @ 30VDC or 4.1 amps @ 24 VDC).
- PLTC applications must have a class 2 approved power supply.
- PLTC and ITC used in cable tray systems must have a separation of at least 2 in. (5 cm) or a mechanical barrier from higher power circuits.
- PLTC and ITC may be used as open wiring between cable tray and instruments for up to 15m (50 ft.) and must be mechanically protected by angles, struts, channels or other mechanical means or supported by messenger wire.
- PLTC and ITC may be used as open wiring between cable tray and instruments for up to 15m (50 ft.) where cable complies with MC (metal clad) and is identified for such use.
- May also use field wiring as described on page 19.

Connections

- Same connections described on page 19.
- PLTC and ITC may be connected using compression type fittings installed in a manner to avoid tensile stress at the termination points.
- Flexible cord and quick connectors are suitable provided all conditions are met as described on page 19 for Class I Division 2 locations.

Field Instrument Components

- Same as nonincendive components described on page 19.

Economic Analysis

Installation Cost Comparison (calculated per field device)

	Conventional	AS-Interface	FF*
Computer I/O; Master/Gateway	$ 70	$ 50	$ 160
Conduit, Cable Tray, Wiring and Fittings	$ 750	$ 160	$ 160
Valve Monitor/VCT and Pneumatic Valve	$ 315	$ 450	$1,025
Switched Protected Drop Connector	NA	$ 100	$ 100
Installation and Commissioning Labor	$ 500	$ 150	$ 150
Power Supply	$ 50	$ 30	$ 30
Total Installed Cost	$1,685	$ 940	$1,625

*Foundation Fieldbus is not directly comparable. Analog instruments may require less adder over conventional 4 to 20 mA instruments making this system cost effective when combining analog and discrete field instruments on the same segment. Functionality for Foundation Fieldbus devices is also significantly greater, offering increased diagnostic and operational capabilities.

Total Installation savings
$745 per field device or
$11,920 for a 16 device segment

Basic Assumptions

- Number of field devices on segment is not limited by electrical energy to the segment
- One network segment consists of 16 field devices.
- Field devices are located in a cluster located an average distance of 200 feet (61m) from marshalling cabinet.
- Total bus network is 300 feet (91m) long.
- All network drop legs are short circuit protected and may be deenergized in the field
- Seal fittings are not required at field devices.
- Field devices may be removed by switching off drop circuit while bus remains energized.
- Costs may vary depending on specific application.

Additional Savings with Bus Network Installation

- Conduit, wiring and marshalling enclosures consume less space.
- Less infrastructure is required to support conduit and enclosures.
- Devices may be added later or system changed for minimal cost (number of devices per segment protocol dependent).
- Field devices may be capable of providing diagnostics for maintenance.
- Multi-Point variables may be included in one field device dramatically reducing instrument costs.

Tray Cabling with Nonincendive Wiring Drops and Associated Apparatus

Tr Cbl + NIW

Area Classifications (NEC)
Class I Groups A, B, C, D Division 2
Class II Groups E, F, G Division 2

Area Classifications (IEC)
Ex nL, IIC, IIB, IIA Zone 2

Compatible Protocols
Foundation Fieldbus, Profibus PA and AS-Interface are compatible with PLTC or ITC and nonincendive wiring concepts.

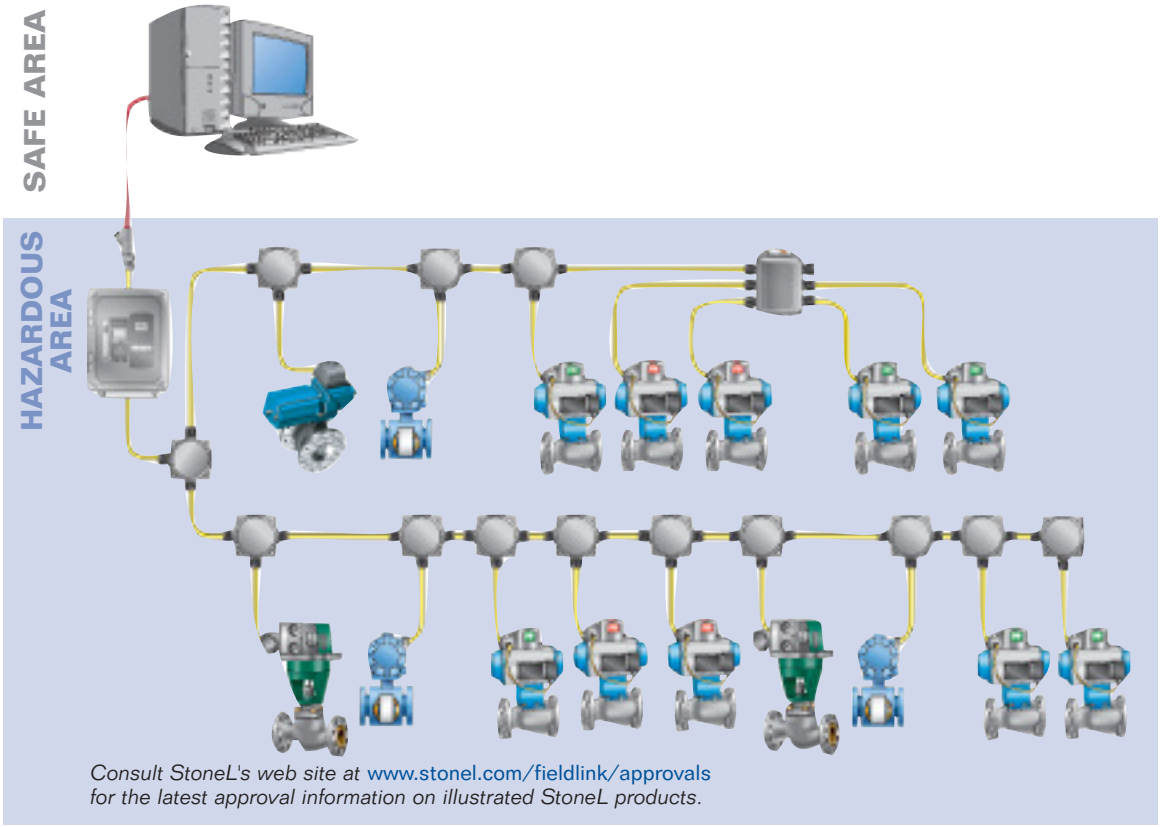
When using Tray Cabling (PLTC, ITC or IEC flexible cabling) concepts on the bus trunk with nonincendive field wiring drop legs, cabling system may be built for the entire bus structure maximizing flexibility and minimizing costs. Nonincendive field wiring and associated apparatus must not have sufficient energy to ignite the gas-air or dust-air mixture under normal conditions. Energy must be limited to the nonincendive field wiring and energy storage of the associated apparatus (field instruments) must be limited. The bus trunk using Tray Cabling concepts may carry 5 amps (IEC 6 amps) and the drop leg, using nonincendive field wiring concepts, may carry up to 0.15 amps at bus level voltages. This provides ample power for multiple drops and individual devices.

Basic Concept
- Utilize Tray Cabling concepts for trunk infrastructure (See pages 20 & 21).
- Utilize nonicendive field wiring and associated apparatus for drop connections and field devices.
- Nonincendive field wiring and associated apparatus are not capable, under normal operation, of igniting the gas, vapor or dust-air mixture. (Normal operation includes opening, shorting or grounding the field wiring.)

Advantages
- High power to bus trunk with few limitations (5 amps; IEC 6 amps)
- Relatively high power to each device (typically 130mA @ 30VDC)
- Limited shock and ignition hazard
- Low cost wiring and instrumentation enclosures
- May use general purpose wiring from protected drop connector to field device
- Takes advantages of best of both protection concepts to optimize safety, hazard protection and minimize costs
- Nonincendive wiring apparatus (field device) may have wiring manipulated while hot.

Disadvantages
- PLTC, ITC and nonincendive wiring techniques are not well known
- Limited to division 2, zone 2 areas
- Limited product availability
- Limited availability of nonincendive wiring associated apparatus (May use IS devices).

Tray Cabling with Nonincendive Wiring Drops Network
(Class I and II, Div. 2; Ex nL, Zone 2)



Consult StoneL's web site at www.stonel.com/fieldlink/approvals for the latest approval information on illustrated StoneL products.

LEGEND


FieldRack
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StoneL VCTs
page 197

Tray Cabling with Nonincendive Wiring Drops and Associated Apparatus

Tr Cbl + NIW

NEC References

Field Enclosures
Nonincendive Equipment in Trunk: Articles 501.2, 501.3, 501.5, 501.6 and 501.7
Nonincendive Wiring Apparatus in Drop Leg: Articles 500.1, 500.2, and 501.4(B)(3); also refer to FM document Class Number 3611 section 7

Field Wiring
Trunk: Articles 501.4(B)(4 & 5), Articles 725 (26 to 71), and Article 727
Drop Leg: Articles 500.2 and 501.4(B)(3); also refer to FM document Class Number 3611 section 7

Connections
Trunk: Articles 501.3(B)(6) and 501.4(B)(2)
Drop Leg: Article 501.4(B)(3)

Field Instrument Components:
Trunk: Article 501.3 (B)(1,2,3 & 5)
Drop Leg: Articles 500.1 and 500.2

IEC References

Electrical Apparatus: 60079-15

Electrical Installations: 60079-14

Economic Analysis

Installation Cost Comparison (calculated per field device)

	Conventional	AS-Interface	FF*
Computer I/O; Master/Gateway	$ 70	$ 50	$ 160
Barriers	$ 100	$ 0	$ 0
Conduit, Cable Tray, Wiring and Fittings	$ 600	$ 110	$ 110
Valve Monitor/VCT and Pneumatic Valve	$ 415	$ 505	$ 850
Voltage and Current Limiting Drop Connector**	$ 0	$ 70	$ 70
Installation and Commissioning Labor	$ 350	$ 100	$ 100
Power Supply	$ 10	$ 30	$ 30
Total Installed Cost	$1,545	$ 865	$1,320

*Foundation Fieldbus is not directly comparable. Analog instruments may require less adder over conventional 4 to 20 mA instruments making this system cost effective when combining analog and discrete field instruments on the same segment. Functionality for FOUNDATION Fieldbus devices is also significantly greater, offering increased diagnostic and operational capabilities.

** Drop connector acts as a barrier for nonincendive drops.

Total Installation savings
$680 per field device or
$10,880 for a 16 device segment

Basic Assumptions

- Number of field devices on the segment not limited by electrical energy to segment.
- One network segment consists of 16 field devices.
- Field devices are in a cluster, located an average distance of 200 feet (61m) from marshalling cabinet.
- Total bus network is 300 feet (91m) long.
- Field devices may be removed while bus is energized.
- Cost may vary depending on specific application.

Installation Guidelines (Class I)

Field Enclosures

- Trunk: Nonincendive equipment with general purpose enclosures.
- Drop leg: General purpose equipment (NEMA 4, IP54 or better) may be used.

Field Wiring

- Trunk: utilize PLTC or ITC concepts as described on page 21 for Tray Cable.
  - Power supply must be suitable for PLTC or ITC concepts (see page 21).
- Drop leg: utilize nonincendive field wiring concepts which allows general purpose wiring. Cable capacitance and inductance is negligible for 20 gauge wire and larger with lengths under 300 meters (984 feet).

Connections

- Trunk: utilize standard connections suitable for PLTC and ITC (see page 21)
  - Quick connectors may be used on trunk with limitations as specified on page 19 for Class I and II, Division 2 locations.
- Drop leg: current limiting and voltage protected device must supply drop which coordinates with maximum possible associated apparatus operating voltage. Short circuit current at maximum possible operating voltage must not be capable of igniting gas or dusts in the atmosphere.
  - Quick connectors may be used for nonincendive wiring drops without limitation.

Field Instrument Components

- Trunk components must be nonincendive as described on page 19 for NIE.
- Drop connectors must be rated as nonincendive equipment and have drop leg voltage and current limiting capability.
- Drop connector and field instrument (associated apparatus) parameters must coordinate as follows:

Drop Connector		Field Instrument
Voc	<	Vmax
Isc	<	Imax

- Field instrument capacitance and inductance must be limited. At 38VDC allowable capacitance and inductance is as follows:
  Ci< 738 nF
  Li< 20 mH @ 200mA
- Intrinsically safe apparatus may be used as nonincendive wiring apparatus.

Additional Savings with Bus Network Installation

- Conduit, wiring and marshalling enclosures consume less space.
- Less infrastructure is required to support conduit and enclosures.
- Devices may be added later or system changed for minimal cost (number of devices per segment protocol dependent).
- Field devices may be capable of providing diagnostics for maintenance.
- Multi-Point variables may be included in one field device dramatically reducing instrument costs.

Intrinsically Safe

IS

Area Classifications (NEC)
Class I Groups A, B, C, D Division 1 & 2
Class II Groups E, F, G Division 1 & 2

Area Classifications (IEC)
Ex ia IIC, IIB, IIA Zones 0, 1 & 2

Compatible Protocols
Foundation Fieldbus and Profibus PA

NEC References
Field Enclosures: Articles 504.10, 504.30 (A)(3), and 517.64

Field Wiring: Articles 504.2, 504.30, 504.50, 504.7, and 504.80

Connections: Article 504.80

Field Instrument Components: Articles 504.2, 504.4, and 504.10

IEC References
Electrical Apparatus: 60079-11, 60079-27 (FISCO and FNICO)

Electrical installations: 60079-14, 60079-25, 61158-2

Simple devices include:
- RTDs
- Thermal Couples
- Switches (must not generate low voltage and current)
- LEDs

Intrinsically Safe devices include:
- Transmitters
- Positioners
- Solenoid Valves
- Any Communication Enabled Field Device

In an intrinsically safe (IS) circuit, electrical and thermal energies are limited under normal and abnormal conditions to levels incapable of igniting hazardous mixtures when present in their most ignitable concentrations. Therefore electrical energy into the circuit and energy storage in the circuit must be limited under normal operating conditions and under single fault conditions. An IS barrier is used to limit energy into the electrical circuit under fault conditions. Total capacitance and inductance must also be kept below published limits in order to prevent energy stored in the cabling and field devices from causing ignition.

Basic Concept
- Prevents ignition of gases.
- No ignition under normal or abnormal circumstances.
- Limits electrical energy input into the circuit.
- Limits energy storage in the circuit.
- Circuit has over-voltage and short circuit protection.

Advantages
- Low cost wiring and instrumentation enclosures.
- No shock hazard.
- Instruments may be serviced while hot (may require protected drop connectors to prevent faults from disrupting bus communication).

Disadvantages
- Limited power delivery holding maximum number of devices per segment to 4 or 5.
- Use of barriers reduces available voltage to instruments.
- Communication protocols limited to those with physical layer 61158-2 (Foundation Fieldbus H1 and Profibus PA).

Installation Guidelines (Class I; Ex ia)

Field Enclosures
- General purpose enclosures may be used with intrinsically safe components.

Field Wiring
- General purpose cabling requirements apply.
- Intrinsic safety barriers are required, which limit voltage and current under open circuit and short circuit fault conditions.
- Current levels are limited depending on IS methodology used.
- Cable capacitance and inductance must be held below established levels (FISCO) or combined with field devices (Entity) to determine suitability.

Connections
- No connector restrictions on intrinsically safe wiring.

Field Instrument Components
- Must be classified IS or simple.
- IS device must be approved.

Instrinsically Safe Field Devices

Intrinsically safe field devices are classified as simple or intrinsically safe. Simple devices must not generate more than 1.5 V, O.10 A and 25mW or if a passive component, must not dissipate more than 1.3 watts.

Simple devices may be connected to an IS barrier without special considerations since they do not generate or store significant electrical energy.

Intrinsically safe apparatus have electrical parameters in excess of the values for simple apparatus. They are considered to be energy storing and require evaluation by an appropriate testing agency. Consult the product manufacturer if there is any doubt whether a device is simple or intrinsically safe.

Intrinsically Safe

IS

Bus Network Wiring

↓

Use Fieldbus Intrinsically Safe Concept (FISCO)

Conventional Point-to-Point Wiring

↓

Use Entity Concept

Figure 1

Intrinsically Safe Methodologies

Two methods used to properly construct an IS bus networking circuit are the Entity Concept and the FISCO model. The Entity Concept may be used in conventional and bus networking installations. The FISCO model may be used only for buses with the 61158-2 physical layer and offers greater flexibility for these applications.

Because FISCO has been designed around bus networking applications it promises to be used more widely as understanding of the concept grows. The following is a discussion of the two models in bus networking applications.

The Entity Concept

The entity concept has traditionally been used on point-to-point wiring systems in the process industries. Key criteria of the Entity Concept include:

- Barrier and field device entity parameters must match.
- Cable inductance and capacitance are considered concentrated and must be added to total circuit values.
- Barriers are typically limited to 60mA and 1.2W for hydrogen environments, significantly restricting the number of field devices on the network segment.

Intrinsically Safe Apparatus		Associated Apparatus
Lowest Vmax in segment	>	Voc (open circuit voltage)
Lowest Imax in segment	>	Isc (short circuit current)
Lowest Pmax in segment	>	Pt (transfer power)
Total of Cin devices + C cable	<	Ca (allowed capacitance)
Total of Lin devices	<	La (allowed inductance)

Parameter Evaluation to Determine Barrier for the Intrinsically Safe Entity Concept

Tag	Vmax	Imax	Pmax	Ci	Li	Inom
T1	24 V	250 mA	1.5 W	.05 µF	.08 mH	16 mA
T2	28 V	250 mA	1.2 W	.08 µF	.02 mH	18 mA
T3	26 V	250 mA	1.4 W	.02 µF	.10 mH	24 mA
Cable				.03 µF		
	Voc	**Isc**	**Pt**	**Ca**	**La**	**Inom**
Barrier Match	24 V	250 mA	1.2 W	.18 µF	.2 mH	58 mA

Entity Parameter Matching

In order to properly apply the entity concept the IS Barrier (associated apparatus) must be properly matched with the field devices (instrinsically safe apparatus) and cabling. ***Figure 1*** is a table for proper matching of the entity parameters.

Intrinsically Safe Entity Concept Example (Class I, Div. 1 and 2; Ex ia, Zones 0, 1, and 2)

The parameters for each of the devices must be evaluated to determine the appropriate barrier for the segment as follows:

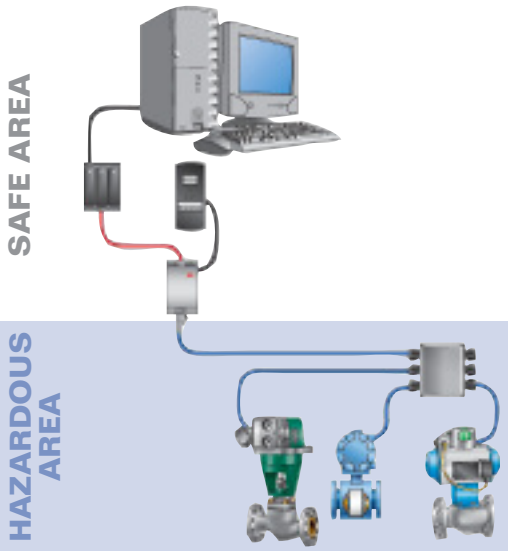
The Barrier selected must have the following parameters:

Voc	<	24 Volts
Isc	<	250 milliamps
Pt	<	1.2 Watts
Ca	>	0.18 microFarads
La	>	0.20 millihenries

Before making a final barrier selection the voltage drop must be determined taking into account the barrier resistance, cable resistance and nominal current. See page 30 for special note on voltage drop for bus network circuits.

Intrinsically Safe Entity Concept Bus Network

(Class I, II and III, Div. 1 and 2; Ex ia IIC, Zones 0, 1 and 2)



LEGEND


Power Supplies
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Intrinsically Safe

IS

The FISCO Model

The FISCO (Fieldbus Intrinsically Safe Concept) model was developed based on emperical studies performed on IEC 61158-2 installations by PTB in Germany. The test results have been accepted worldwide and are now being used by most testing bodies. With the FISCO model greater flexibility is allowed provided the field devices and cabling meet specific parameters.

FISCO Model Features

- Device entity parameters for inductance and capacitance are considered negligible (must be less than .01mH and .005μF respectively).
- Cable inductance and capacitance are not considered concentrated so are not added to calculations (R loop must be 15Ω to 150Ω/km; L must be .4 to 1mH/km and C must be .045 to .2 μF/km).
- Maximum cable span limited to 60m for drops and trunk to 1km lengths for IIC (Groups A-D) and 5km length for IIB (Groups C-D).
- Barriers typically are limited to 100mA and 1.8W for hydrogen environments enabling use of more field devices per segment.

Intrinsically Safe FISCO Model Example

Using the FISCO model, inductance and capacitance for both cabling and field devices do not have to be considered, provided they fall within the above defined parameters.

Parameter Evaluation to Determine Barrier for the FISCO Model

Tag	Vmax	Imax	Pmax	Inom
T1	24 V	250 mA	2 W	16 mA
T2	28 V	220 mA	2 W	18 mA
T3	26 V	250 mA	2.4 W	24 mA
T4	28 V	220 mA	2.2 W	20 mA

	Voc	Isc	Po	Inom
Barrier Match	24 V	220 mA	2 W	78 mA

The Barrier selected must have the following parameters:

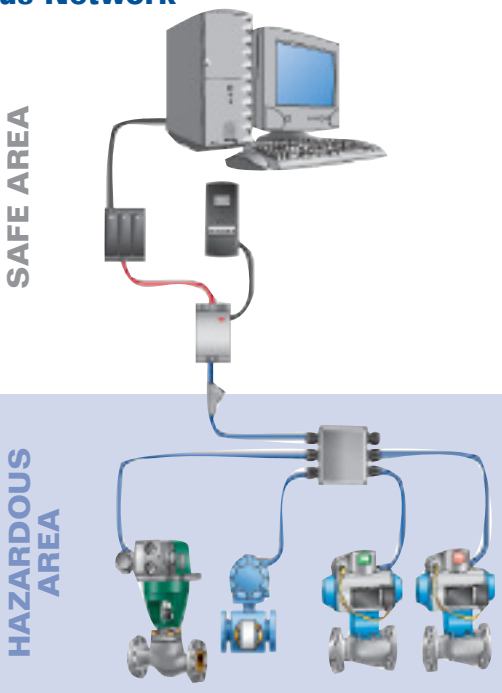
Connection to Fieldbus per FISCO

Voc	<	24 Volts
Isc	<	220 milliamps
Po	<	2 Watts

Voltage drop must also be considered before making a final determination on the proper barrier. See the example on page 30 for proper voltage drop determinations. As a general rule the FISCO model allows more flexibility using a repeater barrier because the supply voltage after the barrier does not drop linearly with current flow.

Intrinsically Safe FISCO Bus Network

(Class I, Div. 1 and 2;
Ex ia IIC, Zones 0, 1 and 2)



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Consult StoneL's web site at www.stonel.com/fieldlink/approvals for the latest approval information on illustrated StoneL products.

Intrinsically Safe

IS

Basic Assumptions

- FISCO IS model is used.
- One host and one power supply 4 segments each with 4 devices.
- Field devices are located in a cluster located an average distance of 200 feet (61m) from marshalling cabinet.
- Each segment is 200 feet (61m) long.
- All network drop legs are short circuit protected.
- Field devices may be removed while bus is energized.

Economic Analysis

Installation Cost Comparison (calculated per field device)

	Conventional	FF
Computer I/O; Master/Gateway	$ 70	$ 160
Barriers	$ 100	$ 190
Conduit, Cable Tray, Wiring and Fittings	$ 600	$ 220
Valve Monitor/VCT and Pneumatic Valve	$ 415*	$ 850*
Switched Drop Connector	$ 0	$ 70
Installation and Commissioning Labor	$ 350	$ 150
Power Supply	$ 10	$ 30
Total Installed Cost	$1,545	$1,670

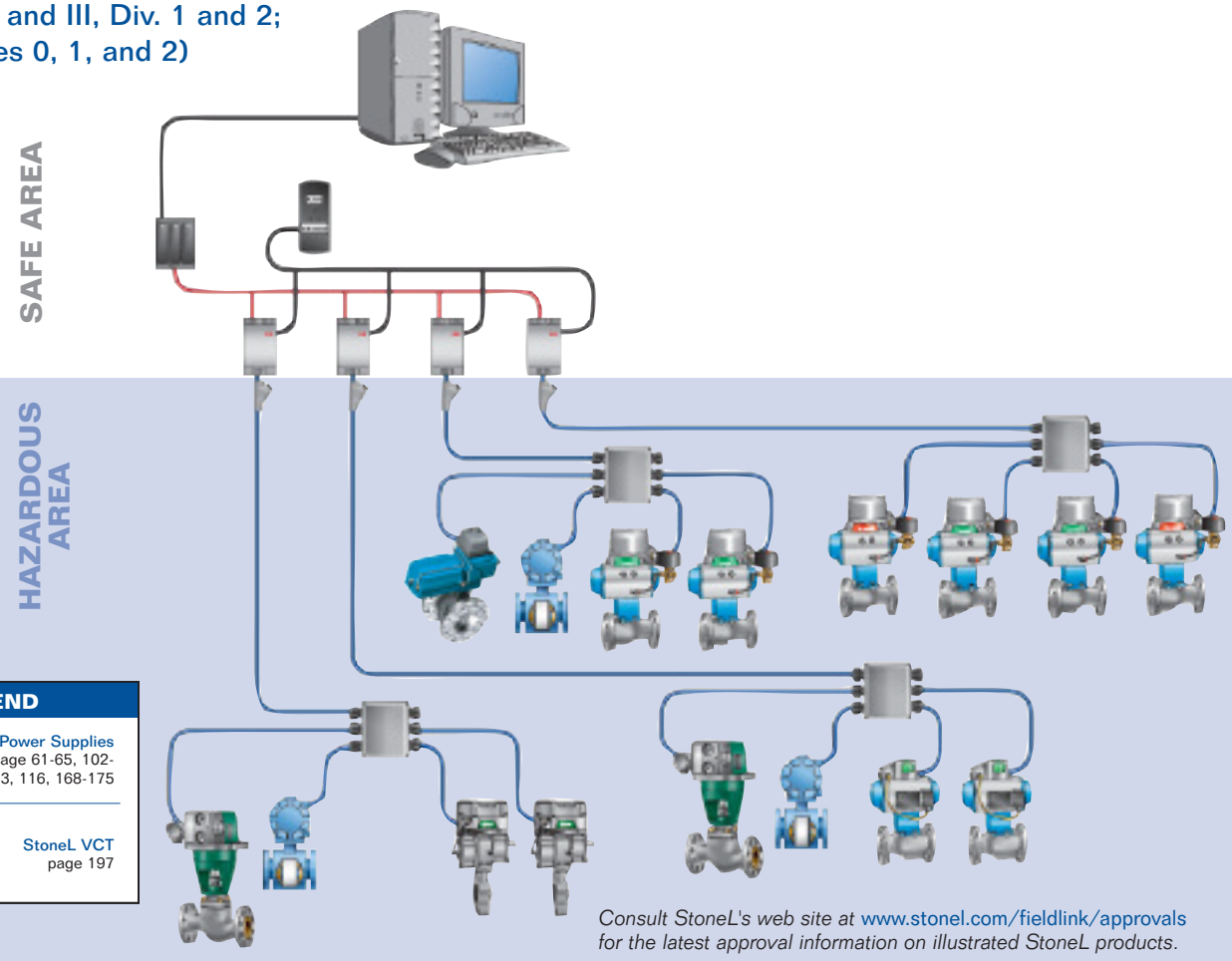
* Analysis with analog devices may result in lower differential costs between conventional and FOUNDATION Fieldbus insturments.

Additional Savings with Bus Network Installation

- Wiring and marshalling enclosures consume less space.
- Less infrastructure is required to support conduit and enclosures.
- Field devices are cabable of providing diagnostics for maintenance.
- Multi-Point variables may be included in one field device dramatically reducing instrument costs.

Intrinsically Safe Bus Network

(Class I, II and III, Div. 1 and 2; Ex ia, Zones 0, 1, and 2)



Consult StoneL's web site at www.stonel.com/fieldlink/approvals for the latest approval information on illustrated StoneL products.

Nonincendive Wiring

NIW

Area Classifications (NEC)
Class I Groups A, B, C, D Division 1
Class II Groups E, F, G Division 2

Area Classifcations (IEC)
Ex nL IIC, IIB, IIA Zones 0, 1 & 2

Compatible Protocols
Foundation Fieldbus H1 and Profibus PA

NEC References: 500.2, 501.4,

IEC References: 60079-27, 60079-15

The FNICO (Fieldbus Nonincendive Concept) model

Like FISCO, FNICO was developed based on studies of the 61158-2 physical layer standard in division 2, zone 2 areas combining multiple devices on a single segment topology. When considering ignition hazards more flexibility is allowed than single point to point wiring provided standard parameters are met for field instruments (associated apparatus) and cabling.

FNICO Requirements

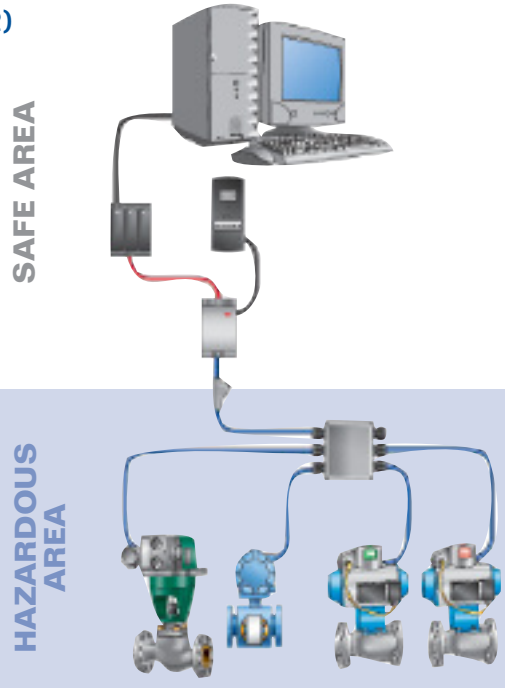
- Device input parameters are considered negligible (Ci must be less than .005µF and Li less than 20µH)
- Field devices must be suitable for IIC group temperature classified in accordance with Ex nL (Nonincendive field wiring associated apparatus)
- Cable inductance and capacitance are not considered. (Same as FISCO)
- Typical power on the network is limited to 200 mA @ 14v for hydrogen enviroments.

FNICO evaluation is the same as FISCO evaluation illustrated on page 26.

Special Application Note

When considering division 2, zone 2 applications, a system combining tray cabling and nonincendive field wiring (Tr Cbl + NIW) drops may provide greater flexibility and enable the network to operate with higher trunk current flows (see pages 22-23). However, FNICO used on the entire network will allow the trunk cable network to be manipulated without removing power.

Nonincendive FNICO Bus Network
(Class I, Div. 2; Ex nL, Zone 2)



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Consult StoneL's web site at www.stonel.com/fieldlink/approvals for the latest approval information on illustrated StoneL products.

Network Length and Voltage Drop

The two primary factors limiting a fieldbus segment length are (1) the protocol communication limits and (2) the acceptable voltage drop. Each of the protocols limits the segment and, in some protocols, the drop lengths. (See the protocol specifications in each section on length for each of the protocols.) However, another limiting factor, which must be taken into account, is the voltage drop experienced from current flow over the network.

Figure 1

Protocol	Operating Voltage Range
AS-Interface	26.5 to 31.6 VDC
DeviceNet	11 to 25 VDC[1]
Profibus PA	9 to 32 VDC
Foundation Fieldbus H1	9 to 32 VDC

1. Power supplied on separate wires from communication signal.

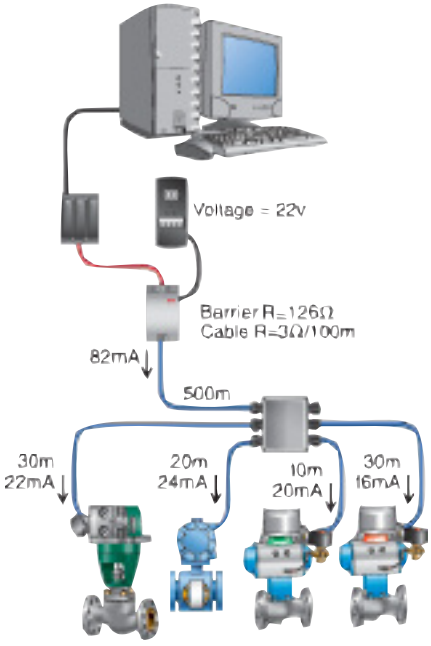
Factors affecting voltage drop include:
- Current flow over the network
- Barrier voltage output (repeaters) or resistance (zener barrier)
- Cable and connector resistance

The acceptable voltage range of the protocol also dictates the amount of voltage drop that can be tolerated. Operating voltage ranges for FieldLink supported protocols are listed in ***Figure 1***.

Protocols such as Modbus RS485, DeviceNet and PROFIBUS-DP have a pair of wires for signal and a separate pair for powering the device and auxiliary outputs. For these protocols the acceptable voltage drop may be dictated by the auxiliary load requirements (solenoids, relays, etc.) and the manufacturer's specific requirements for the device.

Protocols such as AS-Interface, PROFIBUS-PA and Foundation Fieldbus H1 have the signal overlaid onto the power carrying wires (2-wire network). Voltage levels on these protocols are dictated by the requirements of the standard

Intrinsically Safe Network Example
(FF H1 and PROFIBUS-PA)



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Using the 61158-2 physical layer (Foundation Fieldbus H1 and Profibus PA) with an instrinsic safety barrier, the voltage drop is calculated as follows:

- Barrier voltage drop
  126Ω x .082A = 10.3V
- Cable voltage drop (generalized worst case)
  (530m/100m) x 3Ω x .082A = 1.3V
- Total voltage drop
  (barrier drop + cable drop + protected drop connector)
  10.3V + 1.3V + 1.0 = 12.6V

Minimum voltage available to the network is 9.4V, (22V – 12.6V). Since the minimum voltage allowed is 9V (see ***Figure 1***) this is marginal.

By substituting field devices with an average current draw of 16 mA, the voltage drop is re-calculated as follows:

4 devices x 16mA/device = 64mA

- Barrier voltage drop
  126Ω x .064A = 8.1V
- Cable voltage drop
  (530m/100m) x 3Ω x .064A = 1.0V
- Total voltage drop
  (barrier + cable + protected drop connector)
  8.1V + 1.0V + 1V = 10.1V

Minimum voltage available to the network is 11.9 V. This is above the 9V minimum and is acceptable.

AS-Interface Voltage Drop Example

Current Level for Quartz VCTs

AS-I module operating current: 20mA max.
AS-I module output current to solenoid:
Given - 2.4 watt coil @ 24VDC (other vendor)
Given - 28VDC AS-I module output voltage
- Standard coil current → 2.4W/24V = 0.100A
- Coil resistance → 24V/.100A = 240Ω
- AS-I output current → 28V/240Ω = 0.117A

Total AS-I Current:
0.020A + 0.117A = 0.137A or 137 mA

Current Level for Axiom VCTs

AS-I module operating current: 20mA max.
AS-I module output current to solenoid:
Given - 0.50 watt coil @ 24VDC (integral)
Given - 28VDC AS-I module output voltage
- Standard coil current → .05W/24V = 0.021A
- Coil resistance 24V/.021A – 1143Ω
- AS-I output current → 28V/1143Ω = 0.025A

Total AS-I Current:
0.020A + 0.025A = 0.045A or 45 mA

The AS-I network is able to carry significant current levels enabling field devices to control conventional coils for solenoid and relay operation. Voltage drop due to cable length becomes a consideration at higher current levels.

The voltage drop calculations for the network below are as follows:

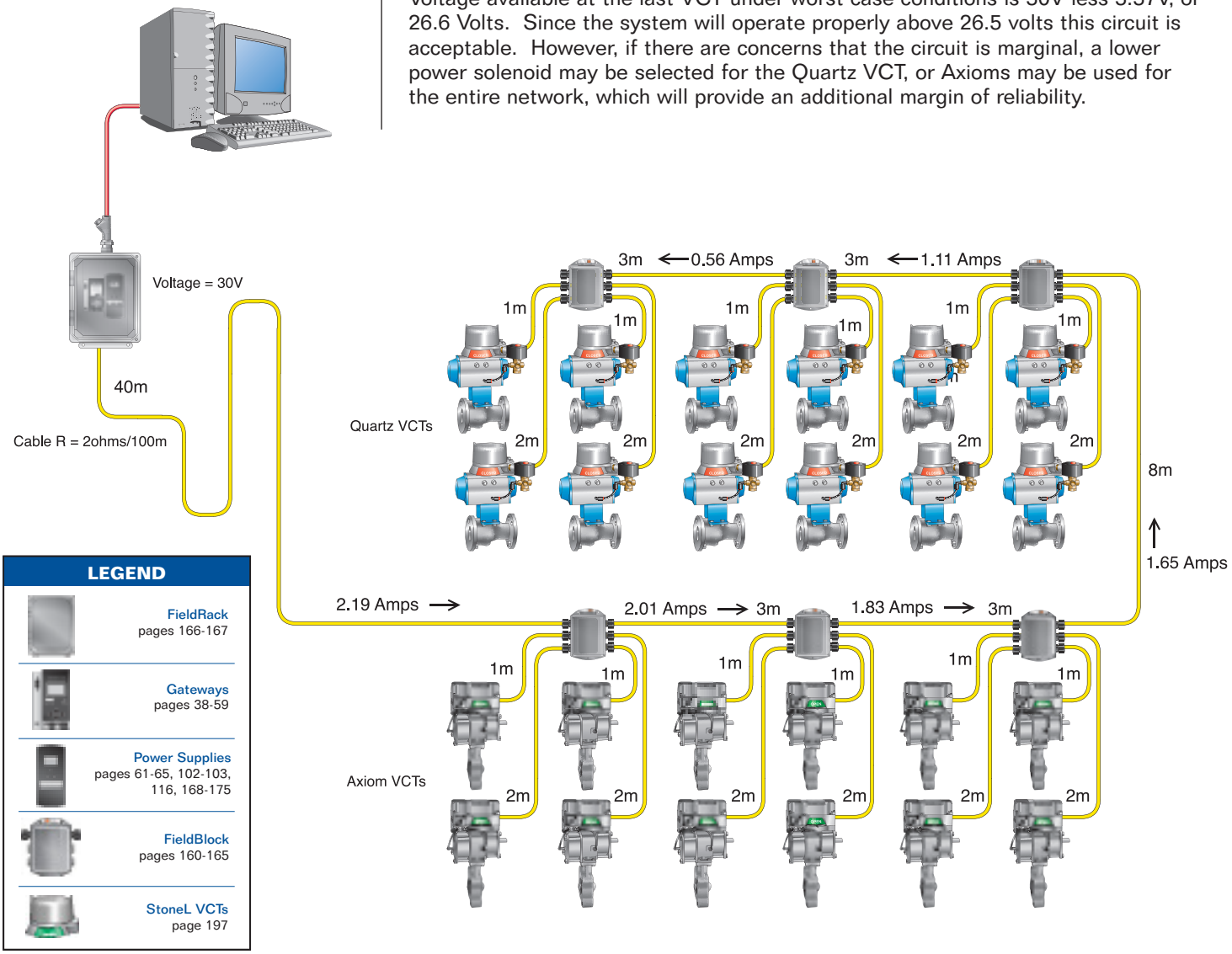
Total current consumption on network
12 x .137A (Quartz VCTs) + 12 x .045A (Axiom VCTs) = 2.19A

- **Cable voltage drop**
  to 1st drop connector → 2.19A x 40m x (2Ω/100m) = 1.75V
  to 2nd drop connector → 2.01A x 3m x (2Ω/100m) + 1.75V = 1.87V
  …to 6th drop connector → 1.87V + 1.83A x 3m x (.02) + 1.65A x 8m x (.02) + 1.11A x 3m x (.02) + .56A x 3m x (.02) = 2.36 volts

- **Drop connector voltage drop**
  → 1.0V (protected drop connector) + .137A x 2m x (.02) = 1.01V

- **Total voltage drop** (worst case)
  (Cable drop + connector drop)
  → 2.36V + 1.01V = 3.37V

Voltage available at the last VCT under worst case conditions is 30V less 3.37V, or 26.6 Volts. Since the system will operate properly above 26.5 volts this circuit is acceptable. However, if there are concerns that the circuit is marginal, a lower power solenoid may be selected for the Quartz VCT, or Axioms may be used for the entire network, which will provide an additional margin of reliability.



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FieldBlock
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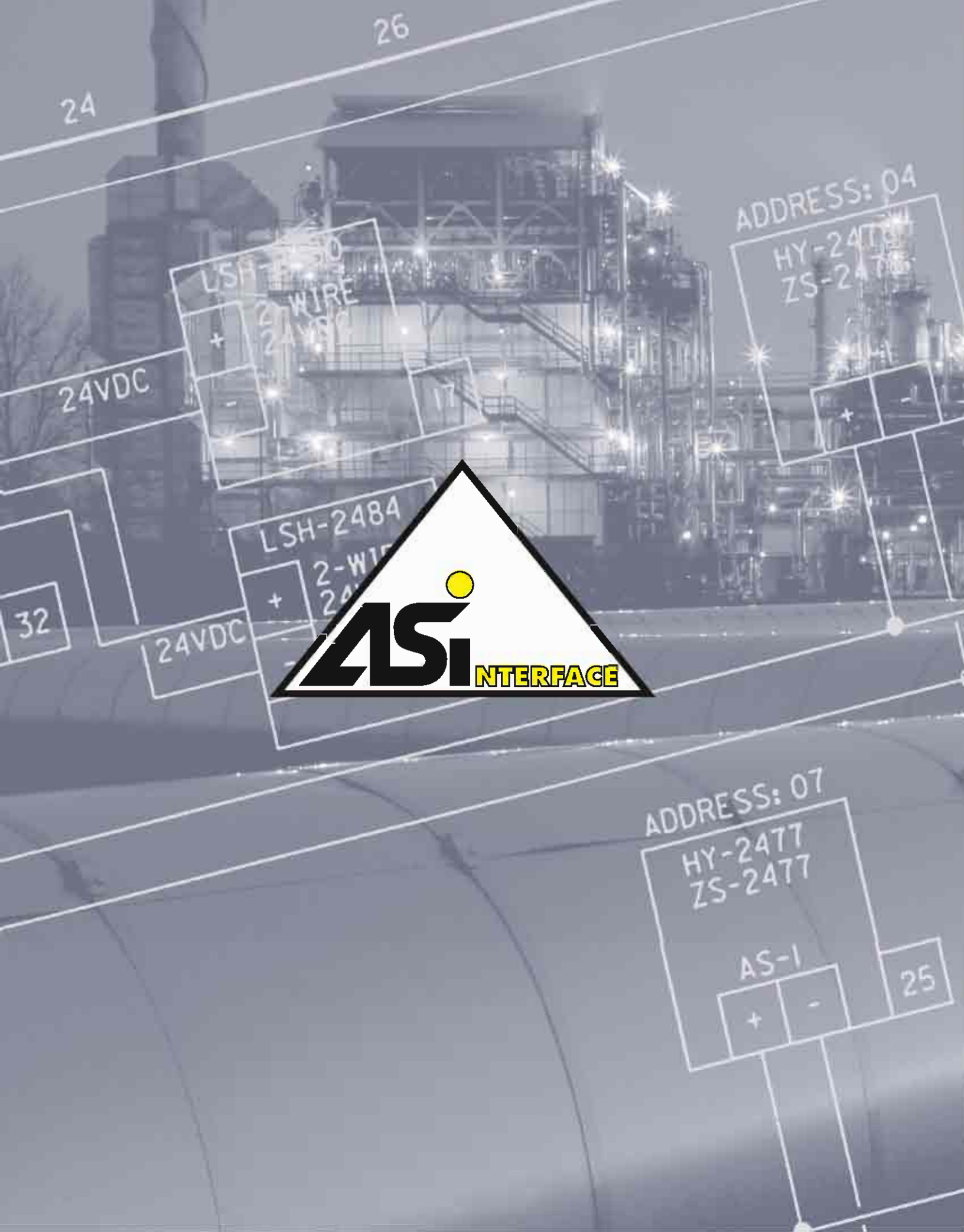
26
24
ADDRESS: 04
HY-24
ZS-24
LSH-
WIRE
24VDC
LSH-2484
2-WI
24VDC
32
ADDRESS: 07
HY-2477
ZS-2477
AS-I
25

AS-Interface

CONTENTS

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Fax: 480-483-7202
www.as-interface.net

AS-Interface Overview and Analysis

StoneL's AS-Interface networking products are part of the FieldLink line and are fully compliant with AS-Interface bus specifications. AS-Interface networks up to 62 field devices onto a single pair of wires that delivers both signal and power.

Actuator Sensor Interface, or AS-Interface, was developed by a group of sensor manufacturers and introduced into the market in 1994. Since that time, it has become the de facto standard for discrete sensors in process industries throughout the world.

AS-Interface Features

- Ideally suited for on/off batch process valves and other discrete applications.
- 62 field devices per network master.
- Simple electronics for economical and robust performance.
- Transfer medium is unshielded two-wire cable for both data and power supply.
- Signal transmission has high tolerance to EMI.
- Easy to install providing the greatest cost savings with the least complexity.
- Free choice of network topology allows optimized wiring network.
- Variety of gateways available to seamlessly tie into high level bus networks.

AS-Interface Offers An Easy Path For Network Upgrades

AS-Interface gateways may be easily replaced for new upgrades in your plant fieldbus network. For example, you may network your current AS-Interface bus into a Modbus network. However, if you migrate to an Ethernet backbone later, you may install a new gateway and conveniently tie your entire AS-Interface network into the Ethernet network.

AS-Interface Is Reliable

The AS-Interface Alternating Pulse Modulation (APM) with Manchester II coding and decoding minimizes electromagnetic emissions and is highly tolerant of electromagnetic interference. AS-Interface has a very high level of data integrity and is classified as I3 according to DIN 19244. These networks are robust and perform reliably under the most strenuous environments. AS-Interface networks are recommended for "mission critical" applications.

AS-Interface vs Conventional System

AS-Interface is a versatile, low cost alternative to traditional hard wired I/O. It can replace traditional point-to-point wiring with a better, more flexible solution that is easier to install, operate and maintain and easier to re-configure.

Conventional System

Typical batching valve wiring networks attach each of the inputs and outputs (I/O) to a central location resulting in multiple wire runs for each field device. ***See figure 1***. Large expenditures are needed for cabling conduit, installation and I/O points. Space for I/O racks and cabling must be accommodated in order to attach only a few field devices.

AS-Interface Network

A simple gateway interfaces the network into the field communication bus. ***See figure 2.*** Data and power are transferred over the two-wire network to each of the AS-Interface compatible field devices.

Each valve communication module contains an AS-Interface ASIC and other electronics to gather open or closed position status and power solenoid or other ancillary devices on or off. Other AS-Interface modules are available to gather inputs and switch power outputs.

Figure 1
Conventional System

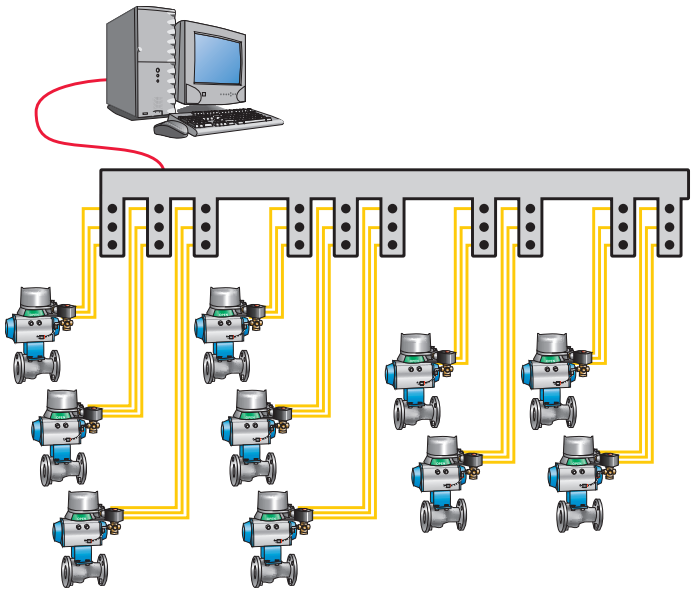
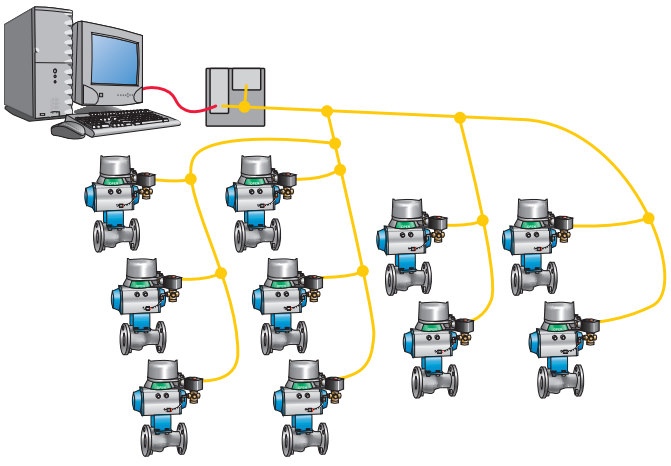


Figure 2
AS-Interface Network



AS-Interface Economic Analysis

Using a network with 16 valve communication terminals (VCTs), the following economic analysis may be performed (costs are listed in the amount per automated valve):

Installation Cost Comparison
(calculated per field device)

	Conventional	AS-Interface
Computer I/O; Master/Gateway	$ 70	$ 50
Conduit, Cable Tray, Wiring and Fittings	$ 1,400	$ 290
Valve Monitor/VCT and Pneumatic Valve	$ 315	$ 450
Switched Protected Drop Connector	NA	$ 160
Installation and Commissioning Labor	$ 600	$ 250
Power Supply	$ 50	$ 30
Total Installed Cost	$ 2,435	$1,230

Total Installation Savings

$1,205 per automated valve

*Refer to page 21 for more detailed analysis.

There is a net savings of $1,245 per automated valve with AS-Interface communication over the conventional system (51.5% reduction in installed cost). This savings does not include other cost reductions due to less space consumption for wiring, conduit and I/O racks, as well as greater flexibility in adding field devices or reconfiguring later.

Technical Information

Power and Data

In an AS-Interface network, data and power are carried over a single two-wire cable that links up to 62 field devices. Each of the field devices may have up to 4 inputs and 4 outputs for a total of 248 binary inputs and outputs per string. Analog Inputs and Outputs are also available. StoneL AS-Interface I/O modules have 4 inputs and 4 outputs (power output for up to four solenoids or other power consuming accessories).

Transmission Media

Two-wire unshielded, untwisted cable, 2 x 1.5 mm2 (16 AWG) is recommended for data and power in the process environment.

Conductor Length

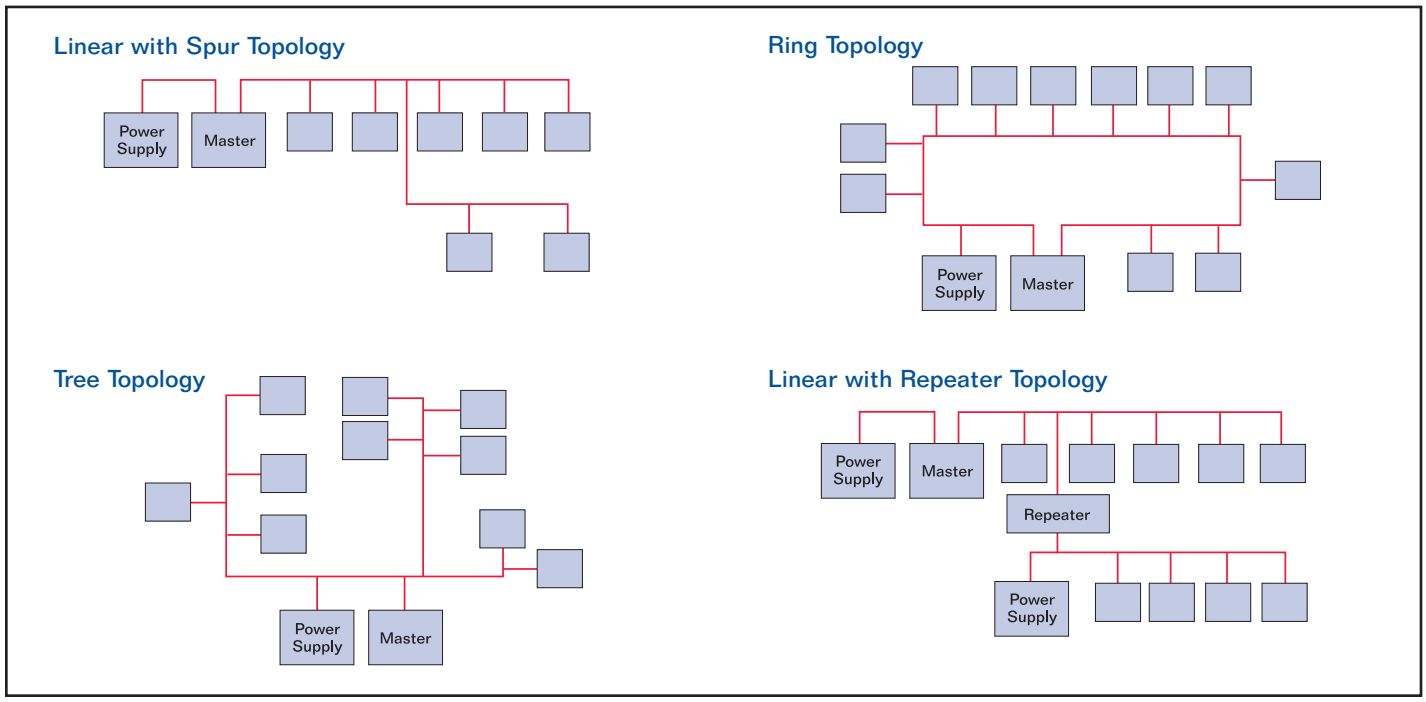
100 meters (328 feet) total length of cabling may be used for each master/gateway. Additional length of 100 meters for each repeater with up to two repeaters. Total length with repeaters may be up to 300 meters (984 feet). Total number of field devices must remain at 62 regardless of number of repeaters for each master.

In addition to the repeater, some new devices have been created that allow you to add distance to your AS-i network. The AS-i Terminator is a passive device that can be placed near the end of a segment to extend the AS-i network up to 200m without repeaters. The terminator places a specially designed impedance at the end of the AS-i segment which serves to optimize the signal and therefore increase the network length. The Tuner is a device that actively looks at the network signal and determines the best impedance level to optimize the signal. It also has diagnostic LED's to show signal level quality. The Tuner can allow networks to extend up to 300m without repeaters and has diagnostic LED's. Please note that it is important that voltage drop be considered when extending networks with these new tools.

Topologies

AS-Interface is capable of supporting any topology. Any combinations of Star, Ring, Tree and Linear are possible. ***See figure 3.*** Use of a Repeater in a ring is not permitted.

Figure 3



AS-Interface System Specifications

Topology	Linear, Star, Tree or Ring
# Field Devices	62 per Network, maximum
Addressing	AS-i Master or Handheld
Cabling	Unshielded 2-wire for Data & Power (30VDC up to 8 Amps) Standard Round or AS-i Flat
Cable Length	100 meters per master or 300 meters with two repeaters
Transmission Rate	167 kbits/second
Signal Coding	Manchester type with Alternating Pulse Modulation
Cycle Time	10 msec. max. with 62 Devices
Data Per Message	4 bit bi-directional
Access Procedure	Master/Slave
Error Detection	1 parity bit + signal quality monitoring

Data Integrity

When classifying the bus in terms of data integrity (according to EN608 70-5-4-DIN), the AS-Interface network falls into the highest data integrity class even with a bit error rate of 10^{-3}. Such accuracy is suitable for the transmission of mission critical information.

Standards And User Groups

AS-Interface technology has been standardized in EN 50295 and IEC 62026-2. There are over 400 different products available from 50+ vendors. And, as of this writing, there are estimated to be over 12,000,000 installed nodes (field devices) throughout the world.

AS-interface Protocol Version History and Interoperability

As-i has continued to improve over the years and has resulted in several versions of the communication protocol. AS-Interface has been careful to revise the standards to allow for improvements without adversely affecting current users or products/systems that are of older versions. They have made these versions both forward and backward compatible. Here are some of the key differences:

- 2.0-This is the first version of AS-i that had significant usage in the processs industries. It featured 31 devices per segment and only discrete device profiles were possible (4 bits per device).
- 2.1-This version added the capability for up to 8bits of discrete I/O and also analog I/O profiles. It also allowed for optional extended addressing feature (A/B slaves) so that up to 62 devices could be on a single AS-interface network. Multi-scans are possible with a special prefix bit enabling analog (16 bit resolution) input and output devices to also reside on the network.
- 3.0-This is the latest version. It allows for many new device profiles for greater flexibility

AS-Interface Master/Gateway Functions

The AS-Interface Master/Gateway controls and operates the sensor bus network. All of the slaves (field devices) respond to the master and rely on the master for control of the network. Gateways perform all of the same functions as the master and, additionally, interface with higher level bus networks. Common functions of masters/gateways include the following:

- Initialization of the network
- Identification of field devices
- Diagnosis of bus and AS-Interface field devices
- Sends error messages to the host
- Automatically assigns active addresses to replaced field devices

Addressing

Each field device has a defined address. The address is set offline by the master/gateway or by a hand held addressing device. Automatic on-line addressing is available for field device replacements.

Error Detection and Correction

Single bit parity check and bit repetition is used for error detection. Incorrect messages are identified and repeat requested by the master/gateway.

Single Power Supply Feature

Several of the new StoneL Dual Channel Stainless Steel Gateways are available with a feature that simplifies design and saves money. These dual channel gateways can operate 2 AS-Interface networks with a single 30VDC power supply. These gateways have the data decoupling circuitry inside, so only a standard 30VDC power supply is needed.

Diagnostics Port Feature

Several of the new StoneL Stainless Steel Gateways are available with a Diagnostics port feature that simplifies commisioning, testing and diagnosting networks. These gateways feature a serial communication port that can be accessed with a special cable and software. This software allows users to configure networks, set addresses and view diagnsotic detail from a laptop computer.

StoneL AS-Interface Gateways

AS-Interface gateways seamlessly interface the AS-Interface network to a higher level fieldbus. For communication, the protocol of the respective fieldbus (Modbus, PROFIBUS, DeviceNet, etc.) will be used. To configure a gateway using an RS485 interface, only a simple RS232C/RS485 converter is needed. In this fashion, the gateway can be operated with a notebook PC via the respective fieldbus interface without need for additional hardware or software.

The operation of all StoneL AS-Interface gateways is identical. Complete configuration and debugging of the network can be accomplished with the included push-buttons, LED and display. Slave addresses can be programmed, faulty AS-Interface field devices can be detected and actual configuration of the AS-Interface network can be stored.

AS-Interface is NOT a competitor to higher-level field-buses. AS-Interface is a complementary system to them. ***See Figure 4.*** Please contact StoneL for availability since new gateways are becoming available regularly.

Figure 4

AS-Interface Gateways are readily available to the following high level field buses:

- MODBUS (RS485)
- MODBUS+
- PROFIBUS (DP)
- ProfiNet
- DeviceNet
- Ethernet (TCP/IP)
- Ethernet/IP

Dual Channel Gateways are available for many of these protocols allowing greater efficiency.

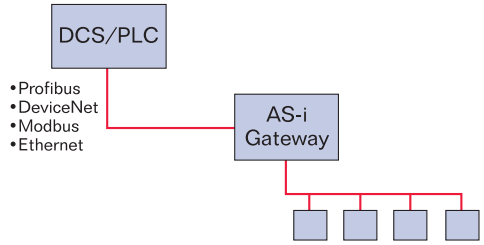
Host Computer Interface

AS-Interface can be easily interfaced with standard PC, PLC and DCS platforms. Variations are as follows:

AS-Interface Gateway to Higher Level Protocol

Many PLCs and DCSs have communication cards available that utilize protocols such as Profibus, DeviceNet, Modbus, Modbus+, Ethernet, etc. The appropriate AS-Interface gateway would simply act as a node on the higher level network. ***See figure 5.***

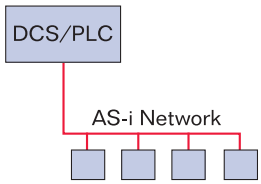
Figure 5
AS-Interface Gateway to Higher Level Protocol



AS-Interface Master in DCS/PLC

Many PLCs have AS-Interface scanners available, which enable direct connection without an AS-Interface gateway. ***See figure 6.***

Figure 6
AS-Interface Master in DCS/PLC



PC

An AS-Interface ISA card may be installed directly into the PC, which acts as the AS-Interface master. Or, a gateway can be used if the PC has the ability to communicate via Modbus, Modbus+, DeviceNet, PROFIBUS, etc.

Masters and Gateways

StoneL Model 458102

Enclosure Option

FR

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AS-Interface to PROFIBUS-DP Basic Gateway

The AS-Interface/PROFIBUS gateway interfaces the AS-Interface to PROFIBUS-DP. The gateway acts as a master for AS-Interface and as a slave for PROFIBUS. AS-Interface functions can be called up via PROFIBUS. Commissioning can be accomplished with a handheld addressing unit or with the push-buttons on the gateway.

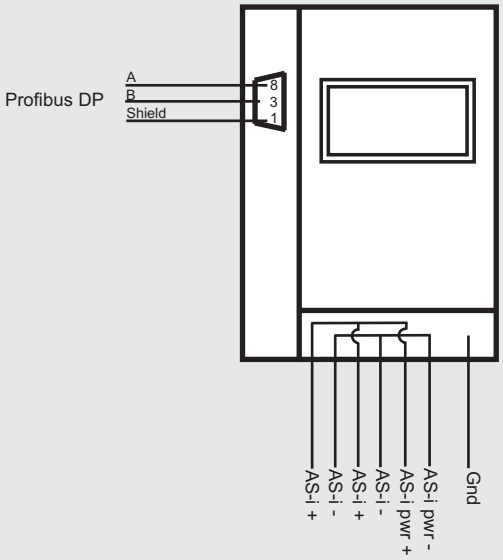
Features

- Version 2.1 master-compatible with all 2.0 and 2.1 slaves and 7.3 profile analog modules

Specifications

AS-Interface Master Version	• 2.1
Interface	• PROFIBUS-DP
Operating Current	• 200mA (from AS-Interface circuit)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power supply)
Baud Rate	• 9.6k - 12000k Baud (automatic recognition)
AS-Interface Cycle Time	• Cycle Time = 150 microsec. x (AS-Interface Slaves +2)
Displays	• LCD Display • Power on, green LED • Serial communication active, green LED • Configuration error, red LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Stainless steel, DIN rail mounting
Dimensions (L,W,H)	• 120mm, 75mm, 83mm
Ingress Protection	• IP20, field enclosure required
Weight	• 460g (1.0 pounds)

Schematic Drawing



Graphical Display

The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the "AS-Interface Control Tools" software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458104

Enclosure Option

FR

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Dual Channel AS-Interface to PROFIBUS-DP Basic Gateway

The AS-Interface/PROFIBUS gateway interfaces two (2) AS-Interface networks to PROFIBUS-DP. The gateway acts as a master for two (2) AS-Interface networks and as a single slave for PROFIBUS. AS-Interface functions can be called up via PROFIBUS. Commissioning can be easily accomplished with the use of a handheld addressing unit or with the push-buttons on the gateway.

Features

- AS-Interface peripheral fault diagnostics
- Version 2.1 master-compatible with all 2.0 and 2.1 slaves and 7.3 profile analog modules

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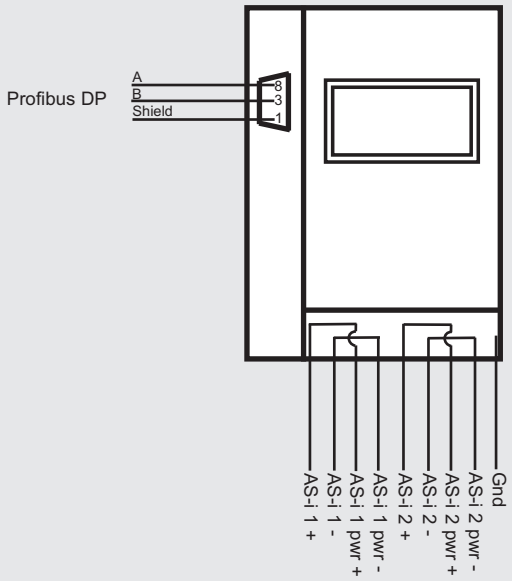
Specifications

AS-Interface Master Version	• 2.1
Interface	• PROFIBUS-DP
Operating Current	• 200mA (from AS-Interface 1) • 70mA (from AS-Interface 2)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power supply)
Baud Rate	• 9.6k - 12000k Baud (automatic recognition)
AS-Interface Cycle Time	• Cycle Time = 150 microsec. x (AS-Interface Slaves +2)
Displays	• LCD Display • Display Network1/Network2, green LED • Serial communication active, green LED • Configuration error, red LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Stainless steel, DIN rail mounting
Dimensions (L, W, H)	• 120mm, 75mm, 83mm (L, W, H)
Ingress Protection	• IP20, field enclosure required
Weight	• 460g (1.0 pounds)

Schematic Drawing



Graphical Display

The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the "AS-Interface Control Tools" software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458078, 458110

Enclosure Option

FR

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AS-Interface to PROFIBUS-DP Gateway

The AS-Interface/PROFIBUS gateway interfaces the AS-Interface to PROFIBUS-DP. The gateway acts as a master for AS-Interface and as a slave for PROFIBUS. AS-Interface functions can be called up via PROFIBUS. Commissioning can be accomplished with a handheld addressing unit or with the push-buttons on the gateway.

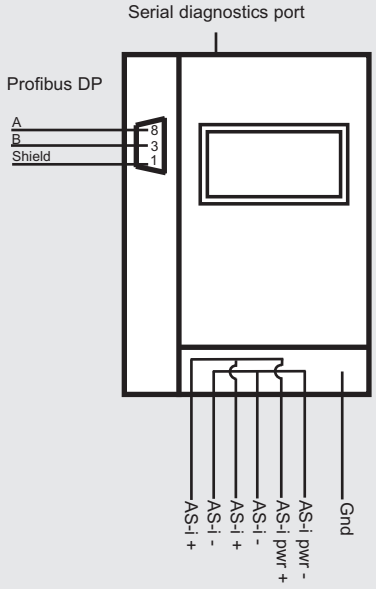
Features

- Duplicate address detection
- Version 3.0 master-compatible with all 2.0-3.0 slaves and 7.3 profile analog modules
- AS-Interface peripheral fault diagnostics
- Serial Diagnostics Port: See 462008 for software and cable
- ETL approved for Class I Division 2 (458110)

Specifications

AS-Interface Master Version	• 3.0
Interface	• PROFIBUS-DP
Diagnostic Interface	• Serial RS232
Operating Current	• 200mA (from AS-Interface circuit)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power supply)
Baud Rate	• 9.6k - 12000k Baud (automatic recognition)
AS-Interface Cycle Time	• Cycle Time = 150 microsec. x (AS-Interface Slaves +2)
Displays	• LCD Display • Power on, green LED • Serial communication active, green LED • Configuration error, red LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Stainless steel, DIN rail mounting
Dimensions (L, W, H)	• 120mm, 75mm, 83mm (L, W, H)
Ingress Protection	• IP20, field enclosure required
Weight	• 460g (1.0 pounds)
Approvals (458110)	• ETL approved Class 1 Division 2, Groups A,B,C,D

Schematic Drawing



Graphical Display

The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the "AS-Interface Control Tools" software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458080, 458112

Enclosure Option

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Dual Channel AS-Interface to PROFIBUS-DP

The AS-Interface/PROFIBUS gateway interfaces two (2) AS-Interface networks to PROFIBUS-DP. The gateway acts as a master for two (2) AS-Interface networks and as a single slave for PROFIBUS. AS-Interface functions can be called up via PROFIBUS. Commissioning can be easily accomplished with the use of a handheld addressing unit or with the push-buttons on the gateway.

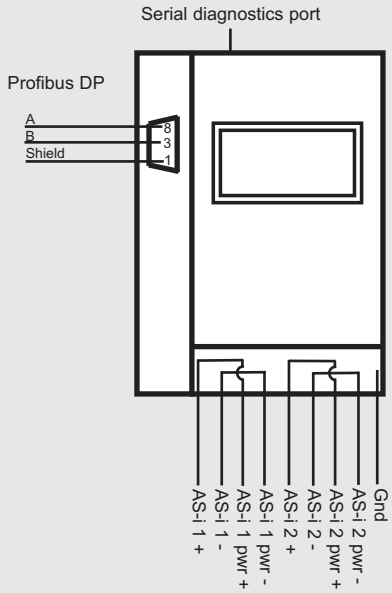
Features

- Duplicate address detection
- Version 3.0 master-compatiable with all 2.0-3.0 slaves and 7.3 profile analog modules
- AS-Interface peripheral fault diagnostics
- Serial Diagnostics Port: see 462008 for software and cable
- ETL Approved for Class I Division 2 (458112)

Specifications

AS-Interface Master Version	• 3.0
Interface	• PROFIBUS-DP
Operating Current	• 200mA (from AS-Interface 1) • 70mA (from AS-Interface 2)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power supply)
Baud Rate	• 9.6k - 12000k Baud (automatic recognition)
AS-Interface Cycle Time	• Cycle Time = 150 microsec. x (AS-Interface Slaves +2)
Displays	• LCD Display • Display Network1/Network2, green LED • Serial communication active, green LED • Configuration error, red LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +82°C (-13° to +185°F)
Housing	• Stainless steel, DIN rail mounting
Dimensions (L, W, H)	• 120mm, 75mm, 83mm
Ingress Protection	• IP20, field enclosure required
Weight	• 460g (1.0 pounds)
Approvals (458112)	• ETL Approved Class 1 Division 2 Groups A,B,C,D

Schematic Drawing



Graphical Display

The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the “AS-Interface Control Tools” software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458108, 458114

Enclosure Option FR

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Dual Channel AS-Interface to PROFIBUS-DP with Graphical Display and Single Power Supply Feature

The AS-Interface/PROFIBUS gateway interfaces two (2) AS-Interface networks to PROFIBUS-DP. The gateway acts as a master for two (2) AS-Interface networks and as a single slave for PROFIBUS. AS-Interface functions can be called up via PROFIBUS. Commissioning can be easily accomplished with the use of a handheld addressing unit or with the push-buttons on the gateway.

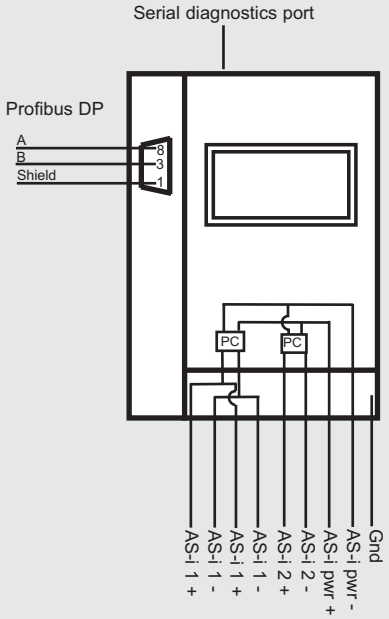
Features

- AS-Interface peripheral fault diagnostics
- Duplicate address detection
- Version 3.0 master-compatible with all 2.0-3.0 slaves and 7.3 profile analog modules
- Serial Diagnostics Port: see 462008 for software and cable
- ETL Approved for Class I Division 2 (458114)
- Single power supply for 2 networks

Specifications

AS-Interface Master Version	• 3.0
Interface	• PROFIBUS-DP
Operating Current	• 250mA
Operating Voltage	• 30 VDC requires (1) 30 VDC power supply, see 459040, 459042, 459044 and 459046
Baud Rate	• 9.6k - 12000k Baud (automatic recognition)
AS-Interface Cycle Time	• Cycle Time = 150 microsec. x (AS-Interface Slaves +2)
Displays	• LCD Display • Display Network1/Network2, green LED • Serial communication active, green LED • Configuration error, red LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Stainless steel, DIN rail mounting
Dimensions (L, W, H)	• 120mm, 75mm, 83mm (L, W, H)
Ingress Protection	• IP20, field enclosure required
Weight	• 460g (1.0 pounds)
Approvals (458114)	• ETL approved Class I Division 2, Groups A,B,C,D

Schematic Drawing



Graphical Display

The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the "AS-Interface Control Tools" software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458116

Enclosure Option

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AS-Interface to PROFINET with Graphical Display

The AS-Interface/PROFINET gateway interfaces the AS-Interface to PROFINET. The gateway acts as a master for AS-Interface and as a slave for PROFINET. AS-Interface functions can be called up via PROFINET. Commissioning can be accomplished with a handheld addressing unit or with the push-buttons on the gateway.

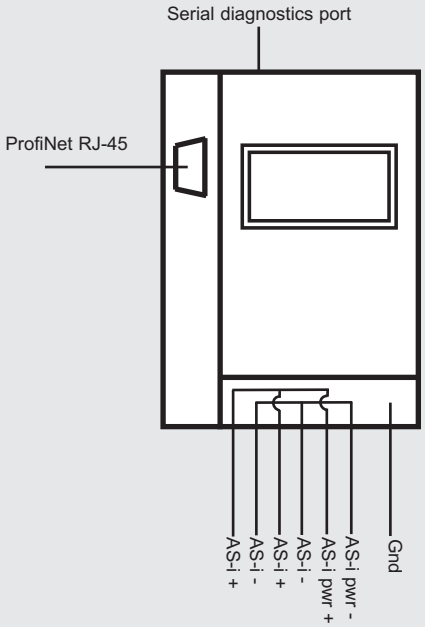
Features

- Duplicate address detection
- Version 3.0 master-compatible with all 2.0 and 3.0 slaves and 7.3 profile analog modules
- AS-Interface peripheral fault diagnostics
- Serial Diagnostics Port: see 462008 for software and cable

Specifications

AS-Interface Master Version	• 3.0
Interface	• PROFINET (RJ-45 Ethernet)
Operating Current	• 300mA (from AS-Interface circuit)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power supply)
Baud Rate	• 10/100m Baud (automatic recognition)
AS-Interface Cycle Time	• Cycle Time = 150 microsec. x (AS-Interface Slaves +2)
Displays	• LCD Display • Power on, green LED • Serial communication active, green LED • Configuration error, red LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Stainless steel, DIN rail mounting
Dimensions (L, W, H)	• 120mm, 100mm, 83mm (L, W, H)
Ingress Protection	• IP20, field enclosure required
Weight	• 550g (1.2 pounds)

Schematic Drawing



Graphical Display

The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the "AS-Interface Control Tools" software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458094, 458118

Enclosure Option

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AS-Interface to DeviceNet

The AS-Interface/DeviceNet gateway serves to connect the AS-Interface to a DeviceNet network. The gateway acts as a complete master for the AS-Interface and as a slave for DeviceNet (Group 2 slave only). All AS-Interface functions can be called up via DeviceNet.

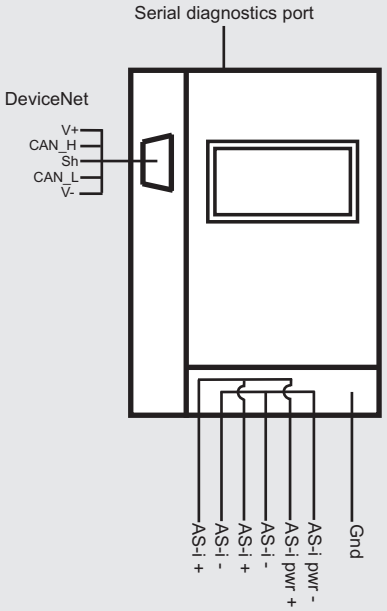
Features

- Duplicate address detection
- AS-Interface peripheral fault diagnostics
- Version 3.0 master-compatible with all 2.0-3.0 slaves and 7.3 profile analog modules
- Serial diagnostics Port: see 462008 for software and cable
- ETL approved Class I Division 2 (458118)

Specifications

AS-Interface Master Version	• 3.0
Interface	• DeviceNet (5 Pin Plug)
Operating Current	• 200mA (from AS-Interface)
Operating Voltage	• 30 VDC AS-Interface Voltage
AS-Interface Cycle Time	• Cycle time = 150 microsec. x (AS-Interface Slaves +2)
Displays	• LCD Display • DeviceNet voltage on, green LED • AS-Interface power on, green LED • Module/Net Status (MNS), green/red LED • Serial communication active, green LED • Configuration error, red LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Stainless Steel, DIN rail mounting
Dimensions (L, W, H)	• 120mm, 85mm, 83mm
Ingress Protection	• IP20, field enclosure required
Weight	• 520g (1.1 pounds)
Approvals (458118)	• ETL approved Class I Division 2, Groups A,B,C,D

Schematic Drawing



Graphical Display

The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the "AS-Interface Control Tools" software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458098, 458120

Enclosure Option

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Dual Channel AS-Interface to DeviceNet with Graphical Display

The Dual Channel AS-Interface/DeviceNet gateway serves to connect the AS-Interface to a DeviceNet network. The gateway acts as a complete master for two (2) AS-Interface networks and as a slave for DeviceNet (Group 2 slave only). All AS-Interface functions can be called up via DeviceNet.

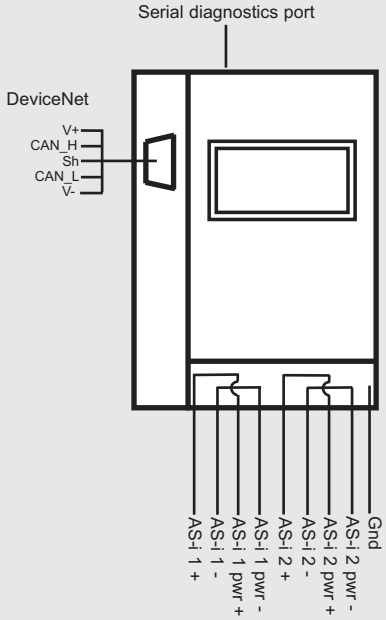
Features

- Duplicate address detection
- AS-Interface peripheral fault diagnostics
- Version 3.0 master-compatible with all 2.0-3.0 slaves and 7.3 profile analog modules
- Serial Diagnostics Port: see 462008 for software and cable
- ETL Approved for Class 1 Division 2 (458120)

Specifications

AS-Interface Master Version	• 3.0
Interface	• DeviceNet (5 Pin Plug)
Operating Current	• 200mA (from AS-Interface) 70mA (from AS-Interface 2)
Operating Voltage	• 30 VDC AS-Interface Voltage
AS-Interface Cycle Time	• Cycle time = 150 microsec. x (AS-Interface Slaves +2)
Displays	• LCD Display • DeviceNet voltage on, green LED • AS-Interface power on, green LED • Module/Net Status (MNS), green/red LED • Serial communication active, green LED • Configuration error, red LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Stainless Steel, DIN rail mounting
Dimensions (L, W, H)	• 120mm, 85mm, 83mm
Ingress Protection	• IP20, field enclosure required
Weight	• 520g (1.1 pounds)
Approvals (458120)	• ETL approved Class I Division 2, Groups A,B,C,D

Schematic Drawing



Graphical Display

The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the "AS-Interface Control Tools" software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458096, 458122

Enclosure Option

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Dual Channel AS-Interface to DeviceNet with Graphical Display and Single Power Supply Feature

The Dual Channel AS-Interface/DeviceNet gateway serves to connect the AS-Interface to a DeviceNet network. The gateway acts as a complete master for two (2) AS-Interface networks and as a slave for DeviceNet (Group 2 slave only). All AS-Interface functions can be called up via DeviceNet.

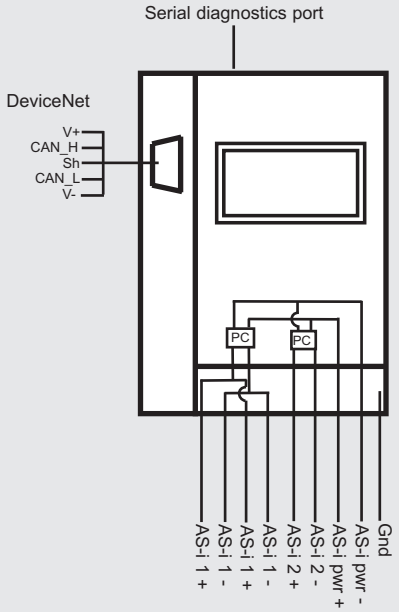
Features

- Duplicate address detection
- AS-Interface peripheral fault diagnostics
- Version 3.0 master-compatible with all 2.0-3.0 slaves and 7.3 profile analog modules
- Serial Diagnostics Port: see 462008 for cable and software
- ETL approved Class I Division 2 (458122)
- Single power supply for 2 networks

Specifications

AS-Interface Master Version	• 3.0
Interface	• DeviceNet
Operating Current	• 250mA
Operating Voltage	• 30 VDC, Requires (1) 300 VDC power supply see 459040, 459042, 459044, 459046
AS-Interface Cycle Time	• Cycle time = 150 microsec. x (AS-Interface Slaves +2)
Displays	• LCD Display • DeviceNet voltage on, green LED • AS-Interface power on, green LED • Module/Net Status (MNS), green/red LED • Serial communication active, green LED • Configuration error, red LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Stainless steel, DIN rail mounting
Dimensions (L, W, H)	• 120mm, 85mm, 83mm
Ingress Protection	• IP20, field enclosure required
Weight	• 590g (1.3 pounds)
Approvals (458122)	• ETL approved Class I Division 2, Groups A,B,C,D

Schematic Drawing



Graphical Display

The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the "AS-Interface Control Tools" software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458086, 458126

Enclosure Option

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AS-Interface to Modbus RS485 Gateway

Serial AS-Interface master with Modbus communication protocol for operation with host

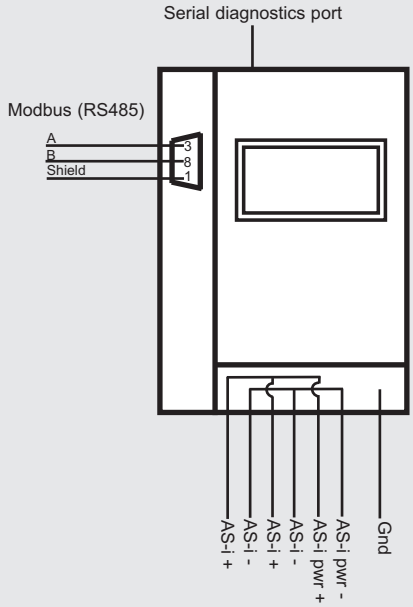
Features

- Version 3.0 Master, compatible with all 2.0-3.0 slaves and 7.3 profile analog modules
- Duplicate address detection
- AS-Interface peripheral fault diagnositcs
- Serial Diagnostics Port: see 462008 for cable and software
- ETL approved Class I Division 2 (458126)

Specifications

AS-Interface Master Version	• 3.0
Serial Interface	• RS485 (9-pin female DB9)
Operating Current	• 200mA (from AS-Interface circuit)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power supply)
Baud Rate	• 1200k - 115000 Baud
AS-Interface Cycle Time	• Cycle time = 150 microsec. x (AS-Interface Slaves +2)
Displays	• LCD Display • Power on, green LED • Serial communication active, green LED • Configuration error, red LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Buttons	• 4
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Stainless Steel, DIN rail mounting
Dimensions (L, W, H)	• 120mm, 75mm, 83mm
Ingress Protection	• IP20, field enclosure required
Weight	• 460g (1 pound)
Approvals (458126)	• ETL approved Class I Division 2, Groups A,B,C,D

Schematic Drawing



Graphical Display

The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the “AS-Interface Control Tools” software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458088, 458128

Dual Channel AS-Interface to Modbus RS485 Gateway

Serial AS-Interface master with Modbus communication protocol for operation with host

Features

- Version 3.0 Master, compatible with all 2.0-3.0 slaves and 7.3 profile analog modules
- Duplicate address detection
- AS-Interface peripheral fault diagnositcs
- Serial Diagnostics Port: see 462008 for cable and software
- ETL approved Class I Division 2 (458128)

Enclosure Option

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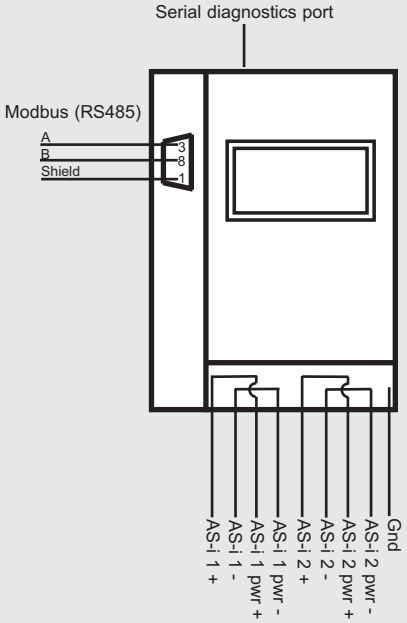
Specifications

AS-Interface Master Version	• 3.0
Serial Interface	• RS485 (9-pin female DB9)
Operating Current	• 200mA (from AS-Interface circuit 1) • 70mA (from AS-Interface circuit 2)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power supply)
Baud Rate	• 1200k - 115,000 Baud
AS-Interface Cycle Time	• Cycle time = 150 microsec. x (AS-Interface Slaves +2)
Displays	• Slave addresses and error messages LE • Power on, green LED • Serial communication active, green LED • Configuration error, red LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Buttons	• 4
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Stainless Steel, DIN rail mounting
Dimensions (L, W, H)	• 120mm, 75mm, 83mm
Ingress Protection	• IP20, field enclosure required
Weight	• 460g (1 pound)
Approvals (458126)	• ETL approved Class I Division 2, Groups A,B,C,D

Schematic Drawing



Graphical Display

The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the “AS-Interface Control Tools” software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458124, 458130

Dual Channel AS-Interface to Modbus RS485 Gateway with Single Power Supply Feature

Serial Dual Channel AS-Interface master with Modbus communication protocol for operation with host

Enclosure Option

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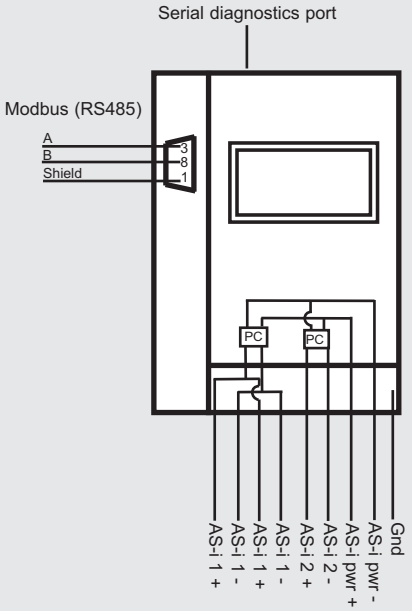
Features

- Version 3.0 Master, compatible with all 2.0-3.0 slaves and 7.3 profile analog modules
- Duplicate address detection
- AS-Interface peripheral fault diagnositcs
- Serial Diagnostics Port: see 462008 for cable and software
- ETL approved Class I Division 2 (458130)
- Single power supply for 2 networks

Specifications

AS-Interface Master Version	• 3.0
Serial Interface	• RS485 (9-pin female DB9)
Operating Current	• 250mA (from AS-Interface circuit)
Operating Voltage	• 30 VDC Requires (1) 30VDC power supply see 459040, 459042, 459044, 459046
Baud Rate	• 1200k - 115,000 Baud
AS-Interface Cycle Time	• Cycle time = 150 microsec. x (AS-Interface Slaves +2)
Displays	• Slave addresses and error messages LCD • Power on, green LED • Serial communication active, green LED • Configuration error, red LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Buttons	• 4
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Stainless Steel, DIN rail mounting
Dimensions (L, W, H)	• 120mm, 75mm, 83mm
Ingress Protection	• IP20
Weight	• 460g (1 pound)
Approvals (458130)	• ETL approved Class I Division 2, Groups A,B,C,D

Schematic Drawing



Graphical Display

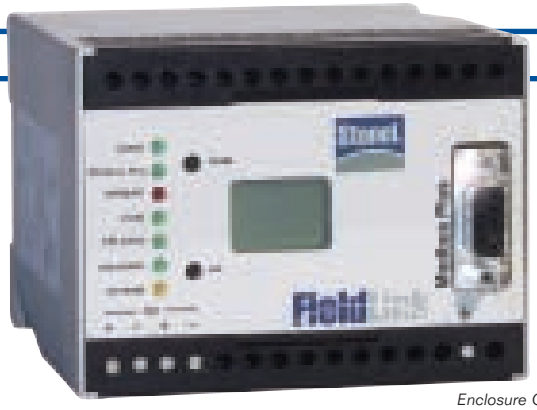
The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the "AS-Interface Control Tools" software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458132



Enclosure Option

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AS-Interface to Modbus+

Serial AS-Interface master with Modbus+ protocol for operation with the host.

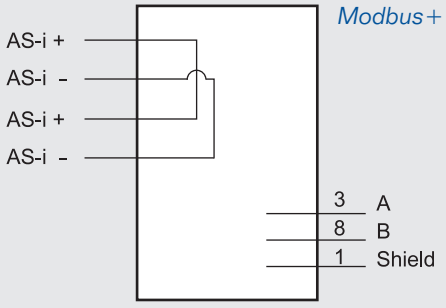
Features

- Direct connection into Modbus+ protocol
- No special software with standard Modbus+ drivers
- Easy programming for slave addresses
- Error diagnostics

Specifications

AS-Interface Master Version	• 2.1
Interface	• RS485 (9-pin DB9)
Operating Current	• 200mA (from AS-Interface circuit)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power supply)
Baud Rate	• 1 Mbit/sec - Modbus+
AS-Interface Cycle Time	• Cycle time = 150 microsec. x (AS-Interface Slaves +1)
Displays	• Slave addresses and error messages, 2 digit LCD • Power on, green LED • Serial communication active, green LED • Configuration error, red LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +82°C (-13° to +180°F)
Housing	• Engineered Resin, DIN rail mounting
Dimensions (L, W, H)	• 75mm, 100mm, 110mm
Ingress Protection	• IP20, field enclosure required
Weight	• 420g (0.93 pounds)

Schematic Drawing



Masters and Gateways

StoneL Model 458090, 458136

Enclosure Option

FR

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AS-Interface to Ethernet TCP/IP with Graphical Display

The AS-Interface/Ethernet gateway interfaces the AS-Interface networks to Ethernet TCP/IP. The gateway acts as a master for the AS-Interface network and as an Ethernet node.

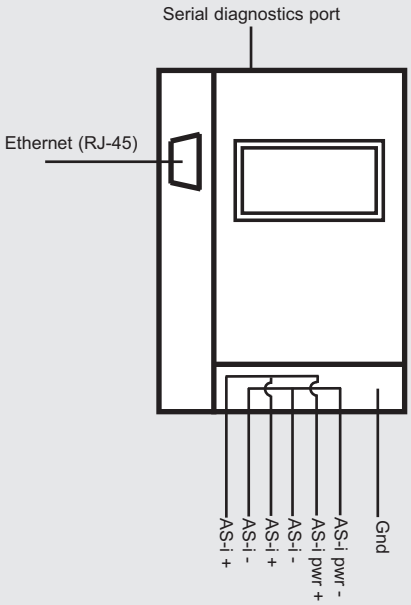
Features

- Direct connection into Ethernet TCP/IP networks
- Version 3.0 master-compatible with all 2.0 and-3.0 slaves and 7.3 profile analog modules
- Modbus/TCP protocol
- AS-Interface peripheral fault diagnostics
- Serial Diagnostics Port: see 462008 for cable and software
- ETL approved Class I Division 2 (458136)

Specifications

AS-Interface Master Version	• 3.0
Interface	• 10BaseT (RJ-45 Connector) per IEEE 802.3
Operating Current	• 200mA (from AS-Interface)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power Supply)
Baud Rate	• 10/100 MBaud
AS-Interface Cycle Time	• Cycle time = 150 microsec. x (AS-Interface Slaves +2)
Displays	• LCD Display • Power on, green LED • Ethernet active, green LED • Configuration error, red LED • Power on, green LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Stainless Steel, DIN rail mounting
Dimensions (L, W, H)	• 120mm, 100mm, 83mm
Ingress Protection	• IP20, field enclosure required
Weight	• 550g (1.2 pounds)
Approvals (458136)	• ETL approved Class I Division 2, Groups A,B,C,D

Schematic Drawing



Graphical Display

The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the "AS-Interface Control Tools" software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458092, 458138

Enclosure Option

FR

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Dual Channel AS-Interface to Ethernet TCP/IP

The Dual Channel AS-Interface/Ethernet gateway interfaces two (2) AS-Interface networks to Ethernet TCP/IP. The gateway acts as a master for two (2) AS-Interface networks and as an Ethernet node.

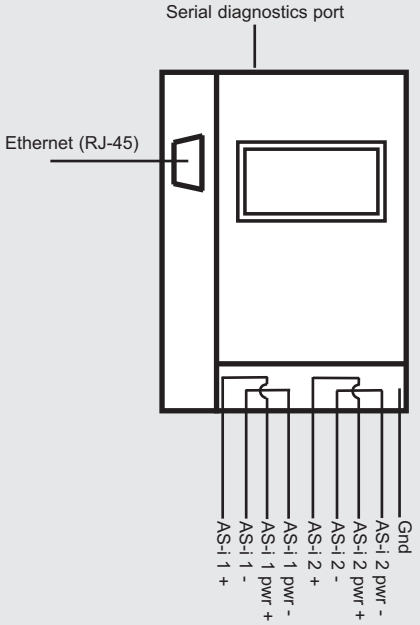
Features

- Direct connection into Ethernet TCP/IP networks
- Modbus/TCP protocol
- Version 3.0 master-compatible with all 2.0 and -3.0 slaves and 7.3 profile analog modules
- AS-Interface peripheral fault diagnostics.
- Serial Diagnostics Port: see 462008 for cable and software
- ETL approved Class I Division 2 (458138)

Specifications

AS-Interface Master Version	• 3.0
Interface	• 10BaseT (RJ-45 Connector) per IEEE 802.3
Operating Current	• 200mA (from AS-Interface 1) • 70mA (from AS-Interface 2)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power Supply)
Baud Rate	• 10/100 MBaud
AS-Interface Cycle Time	• Cycle time = 150 microsec. x (AS-Interface Slaves +2)
Displays	• Slave addresses and error messages, 2 digit LCD • AS-Interface Network 1/ AS-Interface Network 2, green LED • Ethernet active, green LED • Configuration error, red LED • Power on, green LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Stainless Steel, DIN rail mounting
Dimensions (L, W, H)	• 120mm, 100mm, 85mm
Ingress Protection	• IP20, field enclosure required
Weight	• 550g (1.2 pounds)
Approvals (458138)	• ETL approved Class I Division 2, Groups A,B,C,D

Schematic Drawing



Graphical Display

The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the "AS-Interface Control Tools" software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458134, 458140

Enclosure Option

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Dual Channel AS-Interface to Ethernet TCP/IP with Single Power Supply Feature

The Dual Channel AS-Interface/Ethernet gateway interfaces two (2) AS-Interface networks to Ethernet TCP/IP. The gateway acts as a master for two (2) AS-Interface networks and as an Ethernet node.

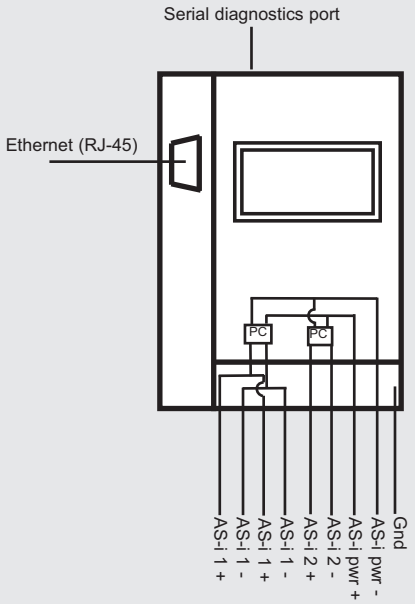
Features

- Direct connection into Ethernet TCP/IP networks
- Modbus/TCP protocol
- Version 3.0 master-compatible with all 2.0 and -3.0 slaves and 7.3 profile analog modules
- AS-Interface peripheral fault diagnostics
- Serial Diagnostics Port: see 462008 for cable and software
- ETL approved Class I Division 2 (458140)
- Single power supply for 2 networks

Specifications

AS-Interface Master Version	• 3.0
Interface	• 10BaseT (RJ-45 Connector) per IEEE 802.3
Operating Current	• 250mA
Operating Voltage	• 30 VDC Requires (1) 30VDC power supply see 459040, 459042, 459044, 459046
Baud Rate	• 10/100 MBaud
AS-Interface Cycle Time	• Cycle time = 150 microsec. x (AS-Interface Slaves +2)
Displays	• Slave addresses and error messages, 2 digit LCD • AS-Interface Network 1/ AS-Interface Network 2, green LED • Ethernet active, green LED • Configuration error, red LED • Power on, green LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +82°C (-13° to +180°F)
Housing	• Stainless Steel, DIN rail mounting
Dimensions (L, W, H)	• 120mm, 100mm, 83mm
Ingress Protection	• IP20, field enclosure required
Weight	• 550g (1.2 pounds)
Approvals (458140)	• ETL approved Class I Division 2, Groups A,B,C,D

Schematic Drawing



Graphical Display

The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the "AS-Interface Control Tools" software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458142, 458148

Enclosure Option

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AS-Interface to Ethernet/IP

The AS-Interface/Ethernet gateway interfaces the AS-Interface network to Ethernet/IP. The gateway acts as a master for the AS-Interface network and as an Ethernet node.

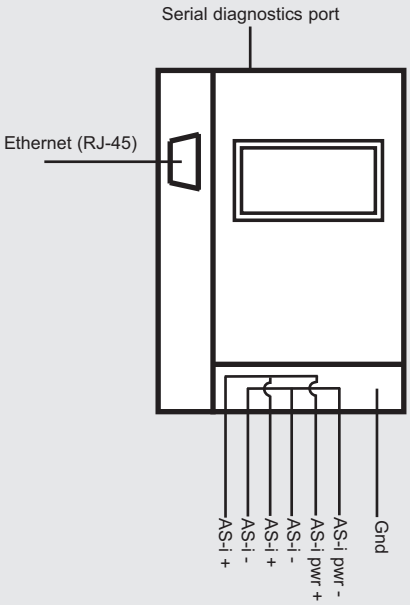
Features

- Direct connection into Ethernet/IP networks
- Version 3.0 master-compatible with all 2.0 and -3.0 slaves and 7.3 profile analog modules
- AS-Interface peripheral fault diagnostics
- Serial Diagnostics Port: see 462008 for cable and software
- ETL approved Class I Division 2 (458148)

Specifications

AS-Interface Master Version	• 3.0
Interface	• RJ-45 Connector
Operating Current	• 300mA (from AS-Interface)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power Supply)
Baud Rate	• 10/100 MBaud
AS-Interface Cycle Time	• Cycle time = 150 microsec. x (AS-Interface Slaves +1)
Displays	• LCD Display • Power on, green LED • Ethernet active, green LED • Configuration error, red LED • Power on, green LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Engineered Resin, DIN rail mounting
Dimensions (L, W, H)	• 120mm, 100mm, 83mm
Ingress Protection	• IP20, field enclosure required
Weight	• 550g (1.2 pounds)
Approvals (458148)	• ETL approved Class I Division 2, Groups A,B,C,D

Schematic Drawing



Graphical Display

The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the "AS-Interface Control Tools" software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458144, 458150

Enclosure Option

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Dual Channel AS-Interface to Ethernet/IP

The Dual Channel AS-Interface/Ethernet gateway interfaces two (2) AS-Interface networks to Ethernet/IP. The gateway acts as a master for two (2) AS-Interface networks and as an Ethernet/IT node.

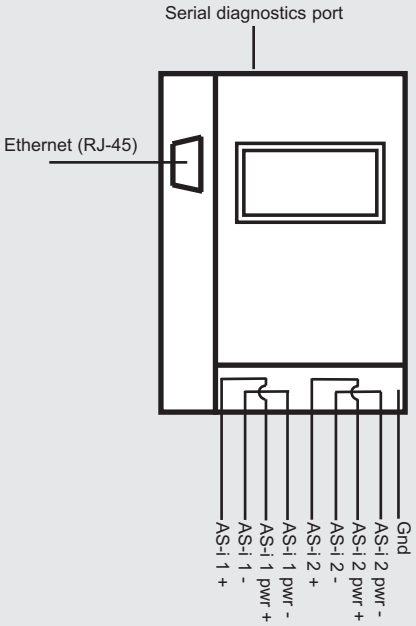
Features

- Direct connection into Ethernet/IP networks
- Version 3.0 master-compatible with all 2.0 and -3.0 slaves and 7.3 profile analog modules
- AS-Interface peripheral fault diagnostics
- Serial Diagnostics Port: see 462008 for cable and software
- ETL approved Class I Division 2 (458150)

Specifications

AS-Interface Master Version	• 3.0
Interface	• RJ-45 Connector
Operating Current	• 300mA (from AS-Interface)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power Supply)
Baud Rate	• 10/100 MBaud
AS-Interface Cycle Time	• Cycle time = 150 microsec. x (AS-Interface Slaves +2)
Displays	• Slave addresses and error messages, 2 digit LCD • AS-Interface Network 1/ AS-Interface Network 2, green LED • Ethernet active, green LED • Configuration error, red LED • Power on, green LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Stainless Steel, DIN rail mounting
Dimensions (L, W, H)	• 120mm, 100mm, 83mm
Ingress Protection	• IP20, field enclosure required
Weight	• 550g (1.2 pounds)
Approvals (458150)	• ETL approved Class I Division 2, Groups A,B,C,D

Schematic Drawing



Graphical Display

The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the "AS-Interface Control Tools" software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458146, 458152

Dual Channel AS-Interface to Ethernet/IP with Single Power Supply Feature

The Dual Channel AS-Interface/Ethernet gateway interfaces two (2) AS-Interface networks to Ethernet TCP/IP. The gateway acts as a master for two (2) AS-Interface networks and as an Ethernet node.

Features

- Direct connection into Ethernet TCP/IP networks
- Version 3.0 master-compatible with all 2.0 and -3.0 slaves and 7.3 profile analog modules
- AS-Interface peripheral fault diagnostics
- Serial Diagnostics Port: see 458126 for cable and software
- ETL approved Class I Division 2 (458152)
- Single power supply for 2 networks

Enclosure Option

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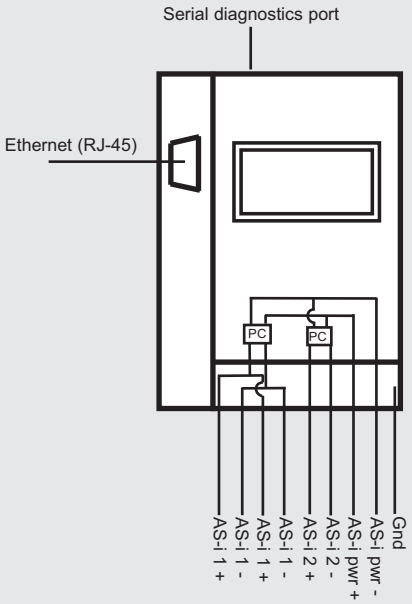
Specifications

AS-Interface Master Version	• 3.0
Interface	• RJ-45 Connector
Operating Current	• 200mA (from AS-Interface 1) • 70mA (from AS-Interface 2)
Operating Voltage	• 30 VDC Requires (1) 30VDC power supply see 459040, 459042, 459044, 459046
Baud Rate	• 10/100 MBaud
AS-Interface Cycle Time	• Cycle time = 150 microsec. x (AS-Interface Slaves +2)
Displays	• LCD Display • Voltage on, green LED • Ethernet active, green LED • Configuration error, red LED • Power on, green LED • AS-Interface voltage normal, green LED • AS-Interface normal operation, green LED • Automatic address program enabled, green LED • Master in configuration mode, yellow LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Stainless Steel, DIN rail mounting
Dimensions (L, W, H)	• 120mm, 100mm, 83mm (L, W, H)
Ingress Protection	• IP20, field enclosure required
Weight	• 550g (1.2 pounds)

Schematic Drawing



Graphical Display

The new interactive graphical display on this gateway enables the entire AS-Interface network to be commissioned and the connected devices to be completely tested without a PC, PLC or host system. It also enables the user to complete all tasks previously requiring the "AS-Interface Control Tools" software package or handheld. This allows for simpler and faster commissioning.

Features

- Set device addresses
- Test inputs and outputs
- Perform network diagnostics
- View error counter

Masters and Gateways

StoneL Model 458043

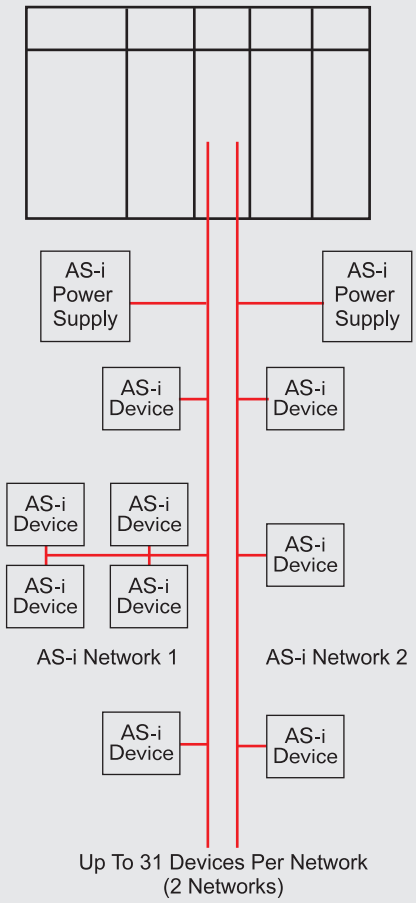
AS-Interface for Allen Bradley SLC500 PLC

The AS-Interface scanner module serves to connect the AS-Interface to an Allen Bradley SLC 5/03 or later. The scanner takes one slot of the PLC backplane and acts as a complete master for two (2) AS-Interface networks. All I/O data is mapped to the SLC's I/O files and all status bits are mapped to the M0 and M1 files. The module also features an RS232 serial port for uploading configuration files.

Specifications

AS-Interface Master Version	• 2.1
PLC Chassis	• SLC 5/03 or later
AS-Interface Channels	• 2
Maximum I/O	• I/O: 32 Words In, 32 Words Out • MO File: Words In-Typical (113) Max (461) • M1 File: Words In-Typical (113) Max (461)
Communication Ports	• 2- 4pin Phoenix connectors (1 per Network) • 1- 9pin Serial Configuration Port
Displays	• Fault LED, Overall Scanner Status • Comm LED (Channel 1), Status of Network • Comm LED (Channel 2), Status of Network 2
Backplane Current	• 500mA @ 5 VDC
Processor	• Intel 80C188
RAM	• 28K Bytes
Flash Memory	• 512K Bytes (Firmware and Config Storage)
Operating Temp.	• 0° to +60°C (32° to +140°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)

Schematic Drawing



Masters and Gateways

StoneL Model GW459076A

AS-Interface for Allen Bradley CompactLogix and MicroLogix 1500 PLCs

The AS-Interface scanner module serves to connect the AS-Interface to Allen Bradley CompactLogix and MicroLogix1500 PLCs. The scanner takes one slot of the PLC and acts as a complete master for one (1) AS-Interface network. All I/O data and status bits are mapped to the PLC's I/O files.

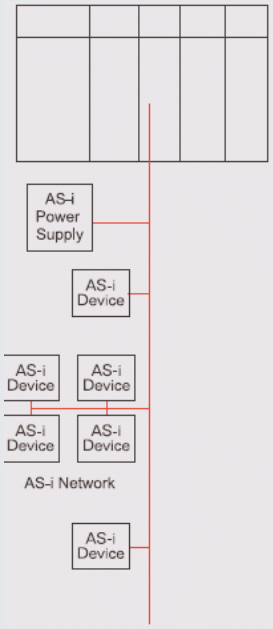
Features

• Serial Diagnostics Port: see 462006 for cable and software

Specifications

AS-Interface Master Version	• 3.0
PLC Chassis	• CompactLogix or MicroLogix 1500
AS-Interface Channels	• 1
Operating Current	• 100mA (from AS-Interface) • 450mA (from PLC Backplane)
Operating Voltage	• 30.5VDC (AS-Interface Voltage)
AS-Interface Cycle time	• 150 microsec. x (# of AS-interface slaves + 2)
Displays	• Slave addresses and error Messages, 2 digit LED • AS-Interface power on, Green LED • Communication Active, Green LED • Communication Error, Red LED • AS-I Voltage OK, Green LED • AS-I OK, Green LED • Auto Address Enabled • Master in Config Mode, Yellow LED
Operating Temp.	• 0° to +55°C (32° to +131°F)
Stock Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Engineered Resin, PLC Rack Mount
Dimensions	• 102mm, 35mm, 132mm
Ingress Protection	• IP20, field enclosure required
Weight	• 420g (0.93 pounds)

Schematic Drawing



Masters and Gateways

StoneL Model 458074, 458100

AS-Interface for Allen Bradley ControlLogix PLC's

The AS-Interface scanner module serves to connect the AS-Interface to Allen Bradley ControlLogix PLCs. The scanner takes one slot of the PLC and acts as a complete master for two (2) AS-Interface networks. All I/O data and status bits are mapped to the PLC's I/O files.

Features

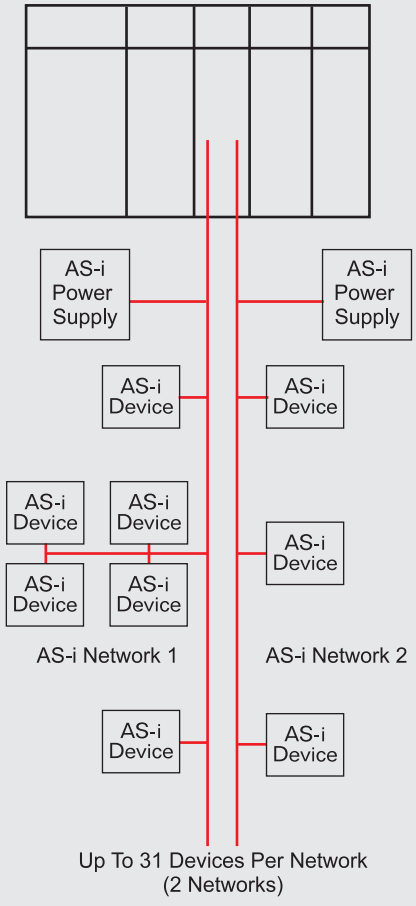
- Serial Diagnostics Port: see 462006 for cable and software
- ETL Approved Class I Division 2 (458100)

CE

Specifications

AS-Interface Master Version	• 2.1
PLC Chassis	• ControlLogix
AS-Interface Channels	• 2
Operating Current	• 70mA (from AS-Interface 1) • 70mA (from AS-Interface 2)
Operating Voltage	• 30 VDC AS-Interface Voltage
AS-Interface Cycle Time	• Cycle time = 150 microsec. x (AS-Interface Salves +2)
Displays	• Slave addresses and error messages, 2 digit LED
	• AS-Interface power on, green LED
	• Communication active, green LED
	• Communication errror, red LED
	• AS-Interface voltage normal, green LED
	• AS-Interface normal operation, green LED
	• Automatic address program enabled, green LED
	• Master in configuration mode, yellow LED
Operating Temp.	• -0° to +55°C (-32° to +131°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Engineered Resin, DIN rail mounting
Dimensions (L, W, H)	• 146mm, 35mm, 132mm
Ingress Protection	• IP20, field enclosure required
Weight	• 420g (0.93 pounds)
Approvals (458100)	• ETL approved Class I Division 2, Groups A,B,C,D

Schematic Drawing



Power Supplies

StoneL Model 459015

2.8 Amp AS-Interface Power Supply

This power supply is designed for use with AS-Interface systems where power and data share the same wires. It provides power to the AS-Interface bus for operation of masters, slaves, and output devices. Integrated into the supply is a power conditioner which decouples data from the power supply enabling signal and power to be carried on the same pair of wires.

Enclosure Option

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Features

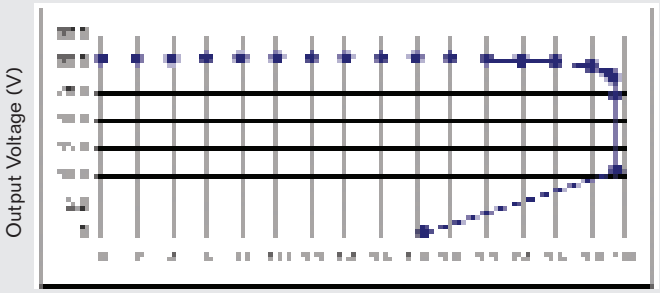
- NEC Class 2
- Current limited/short circuit protected
- Regulated to ± 3.4%
- Power decoupled from communication signal

FM APPROVED

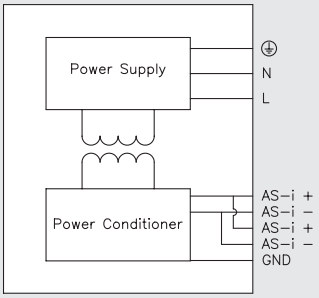
Specifications

Output Voltage	• 30.55 VDC ± 3.4%
Output Impedance	• Per AS-Interface specifications
Output Current	• 2.8 Amps
Input Voltage	• 105–240VAC (Universal Input)
Displays	• Power on, green LED • Output ok, green LED • Output low, red LED
Current Limits	• 2.8 Amp (min)
Operating Temp.	• -40° to +60°C (-40° to +140°F)
Storage Temp.	• -40° to +60°C (-40° to +140°F)
Housing	• Polycarbonate, DIN rail mounting
Dimensions	• 61mm, 156mm, 123mm (L, W, H)
Ingress Protection	• IP20, field enclosure required
Weight	• 635g (1.4 pounds)
Approvals	• FM and CSA approved Class I, Division 2, Groups A,B,C,D • NEC Class 2 power supply

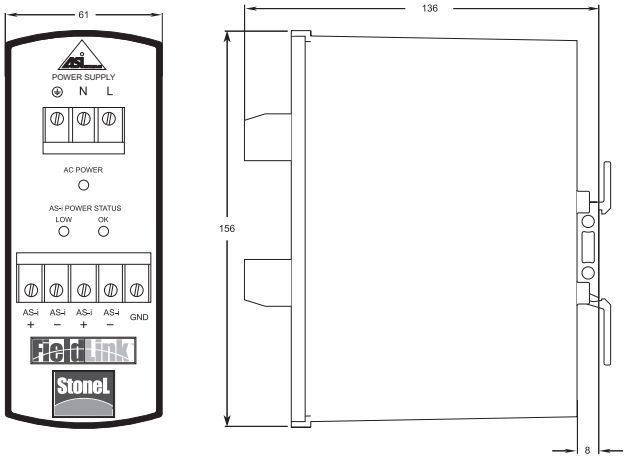
Output Characteristic



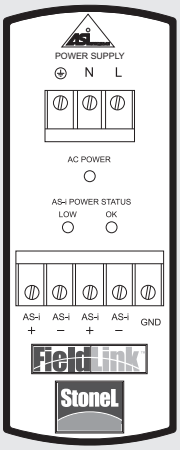
Schematic Drawing



Dimensions (in mm)



Wiring Diagram



Power Supplies

StoneL Model 459002

Enclosure Option

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2.8 Amp AS-Interface Power Supply

This compact power supply is designed for use with AS-Interface systems where power and data share the same wires. The 2.8 Amp power supply provides power to the AS-Interface bus for operation of masters and slaves for output devices. Integrated into the supply is a power conditioner which decouples data from the power supply enabling signal and power to be carried on the same pair of wires.

Features

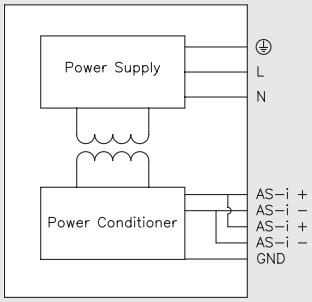
- Current limited/short circuit protected
- Regulated to ± 3%
- Power decoupled from communication signal

CE

Specifications

Output Voltage	• 30.55 VDC ± 3%
Output Current	• 2.8 Amps (85 Watts)
Output Inductance	• 100 mH ± 10 %
Input Voltage	• Selectable 120 / 240 VAC (47-63 Hz)
Displays	• Power on, green LED
Current Limits	• 3.2 Amp (min) 4.6 Amp (max)
Operating Temp.	• -10° to +70°C (-14° to +158°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Al/Mg Alloy, DIN rail mounting
Dimensions (L, W, H)	• 124mm, 49mm, 112mm
Ingress Protection	• IP20, field enclosure required
Weight	• 500g (1.1 pounds)

Schematic Drawing



Power Supplies

StoneL Model 459004

8.0 Amp AS-Interface Power Supply

This compact power supply is designed for use with AS-Interface systems where power and data share the same wires. The 8.0 Amp power supply provides power to the AS-Interface bus for operation of masters and slaves for output devices. Integrated into the supply is a power conditioner which decouples data from the power supply enabling signal and power to be carried on the same pair of wires.

Enclosure Option

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Features

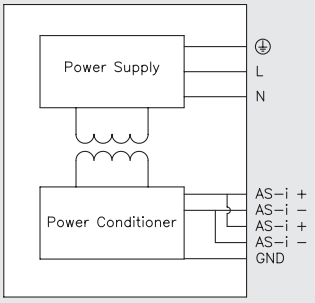
- Current limited/short circuit protected
- Regulated to ± 3%
- Power decoupled from communication signal

CE

Specifications

Output Voltage	• 30.55 VDC ± 3%
Output Current	• 8.0 Amps (244 Watts)
Output Inductance	• 100 mH ± 10 %
Input Voltage	• Selectable 120 / 240 VAC (47-63 Hz)
Displays	• Power on, green LED
Current Limits	• 8.4 Amp (min)
Operating Temp.	• -10° to +70°C (-14° to +158°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Al/Mg Alloy, DIN rail mounting
Dimensions (L, W, H)	• 124mm, 91mm, 112mm
Ingress Protection	• IP20, field enclosure required
Weight	• 890g (2.0 pounds)

Schematic Drawing



Power Supplies

StoneL Model 459006

Dual 4.0 Amp Power Supply

This AS-Interface Power Supply is designed to provide power to two (2) independent AS-Interface networks for operation of masters and slaves. It also provides data decoupling, which allows for data and power to be carried in the same wire. This power supply can supply 4.0 Amps to two (2) AS-Interface networks.

Features

- Current limited/short circuit protection for both AS-Interface networks
- Regulation to ± 3%
- Power decoupled from communication signal

Enclosure Option

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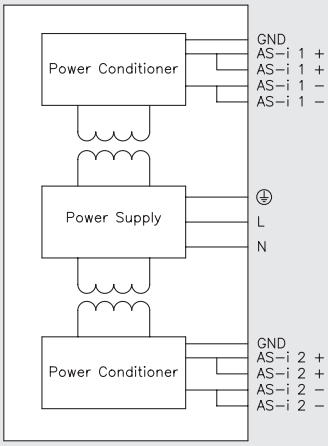
Specifications

Output Voltage	• 30.55 VDC ± 3%
Output Current	• 2 channels x 4.0 Amps (122 Watts per channel)
Output Inductance	• 100mH ± 10%
Input Voltage	• Selectable 120/240VAC (47-63Hz)
Displays	• Power On, Green LED (1 per Channel)
Current Limits	• 4.2 Amp (min) 6.5 Amp (max)
Operating Temp.	• -25°C to +85°C (-13°F to +185°F)
Housing	• Al/Mg Alloy DIN rail mounting
Dimensions	• 120mm, 134mm, 112.5mm (L, W, H)
Ingress Protection	• IP20, field enclosure required
Weight	• 1200g (2.65 pounds)

Schematic Drawing



Power Supplies

StoneL Model 459044

4.0 Amp 30VDC Power Supply

This compact power supply is designed for use with AS-Interface Gateways with single power supply feature. The 4.0 Amp power supply provides power to both AS-I channels.

Enclosure Option

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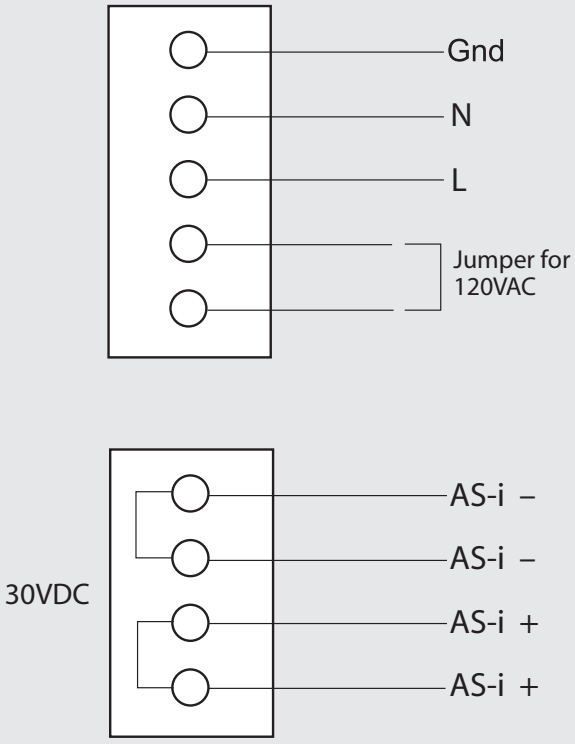
Features

- Current limited/short circuit protected
- Regulated to ± 1%
- ETL approved for Class I Division 2

Specifications

Output Voltage	• 30.05 VDC ± 1%
Output Current	• 4.0 Amps
Input Voltage	• 120 / 240 VAC (47-63 Hz)
Displays	• Power on, green LED overload, red LED
Current Limits	• 6.0 Amp (max)
Operating Temp.	• 0° to +60°C (-32° to +140°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Al/Mg Alloy, DIN rail mounting
Dimensions (L, W, H)	• 132mm, 70mm, 139mm
Ingress Protection	• IP20, field enclosure required
Weight	• 550g (1.21 pounds)
Approvals	• ETL Approved Class I, Division 2, Groups A, B, C, D

Schematic Drawing



Power Supplies

StoneL Model 459042, 459046

8.0 Amp 30 VDC Power Supply

This compact power supply is designed for use with Dual Channel AS-Interface Gateways with single power supply feature. The 8.0 Amp power supply provides power to both AS-Interface channels.

Features

- Current limited/short circuit protected
- Regulated to ± 1%
- ETL approved for Class I Division 2 (459046)

Enclosure Option

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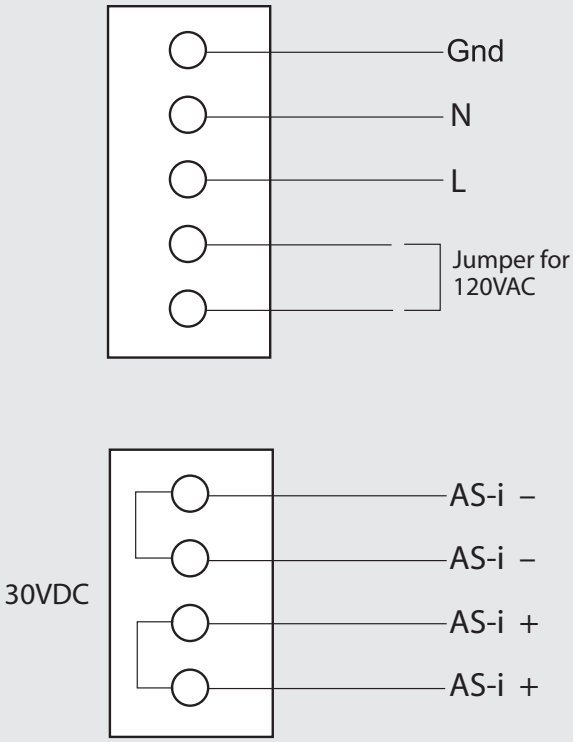
Specifications

Output Voltage	• 30.05 VDC ± 1%
Output Current	• 8.0 Amps
Input Voltage	• 120 / 240 VAC (47-63 Hz)
Displays	• Power on, green LED
Current Limits	• 12.0 Amp (max)
Operating Temp.	• 0° to +60°C (+32° to +140°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Al/Mg Alloy, DIN rail mounting
Dimensions (L,W, H)	• 148mm, 70mm, 154mm
Ingress Protection	• IP20, field enclosure required
Weight	• 1200g (2.65 pounds)
Approvals (459046)	• ETL Approved Class I, Division 2, Groups A, B, C, D

Schematic Drawing



Power Conditioners

StoneL Model 461089, 465024 (DIN), 461090, 465025 (DIN)

AS-Interface Power Conditioner

The AS-Interface Power Conditioner converts any 30VDC power source to an AS-Interface Power supply by providing the data decoupling function. It may be used to power an AS-Interface segment with redundant power supplies or with remote placement of power supply.

This device can be used for:

- Redundant power supplies for single AS-Interface segment
- Remote location of power supply (distance from power supply to power conditioner does not add to AS-I network length)
- Power multiple segments with 1 power supply

Enclosure Option

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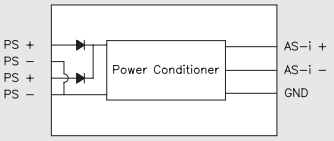
Specifications

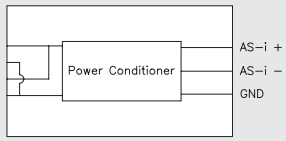
Model Numbers	• Redundant 461089, 465024 (DIN) • Daisy Chain 461090, 465025 (DIN)
Connection	• Redundant inputs (diode protection) • Daisy Chain inputs (common terminals)
Max Voltage	• 35 VDC
Max Current	• 3 Amps
Input Voltage	• 26 VDC to 32 VDC
Indication	• Green LED indicates bus power is good (>= 26V) • Red LED indicates bus power is low (<26V)
Dimensions	• 75mm, 26mm, 41mm (L, W, H)
Operating Temp.	• -40° to +85°C (-40° to +185°F)

Schematic Diagram

Redundant



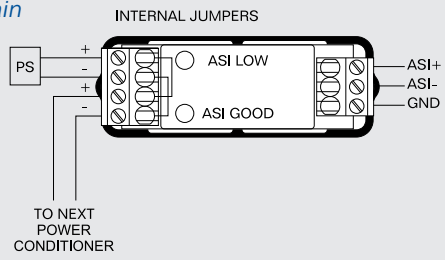
Daisy Chain



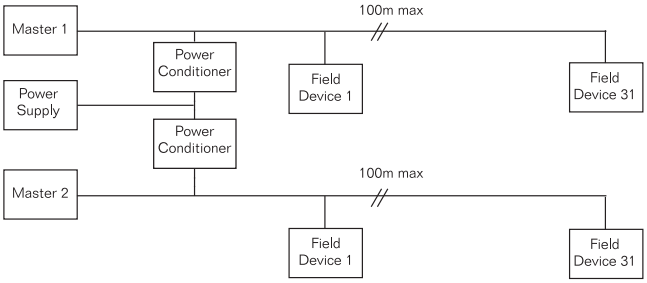
Wiring Diagram

Redundant

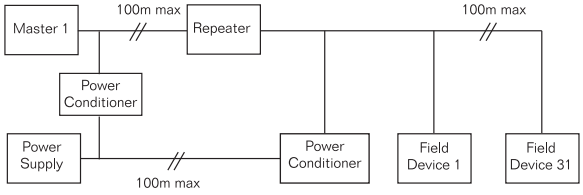
Daisy Chain



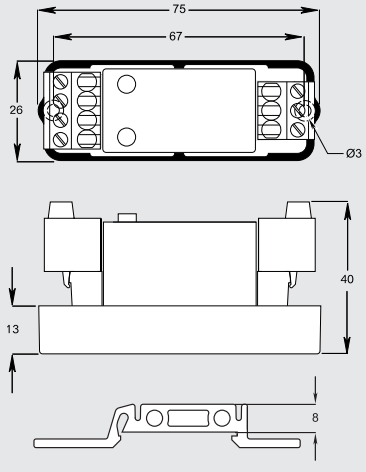
Network 1



Network 2



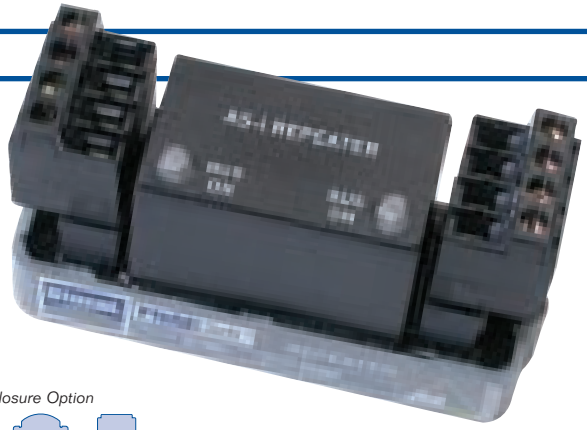
Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465024 or 465025

Repeaters/Network Tuners

StoneL Model 461091, 465026 (DIN)



AS-Interface Repeater

The AS-Interface Repeater extends the AS-Interface network by 100 meters. The repeater requires no configuration and has no address on the bus. The repeater requires an AS-Interface power supply.

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Enclosure Option

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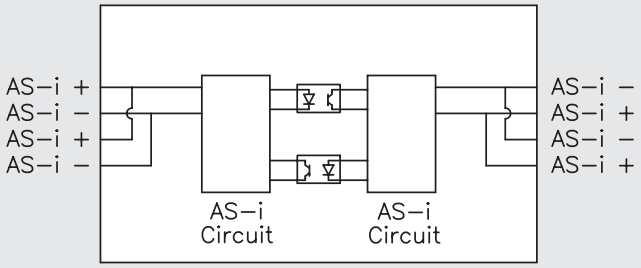
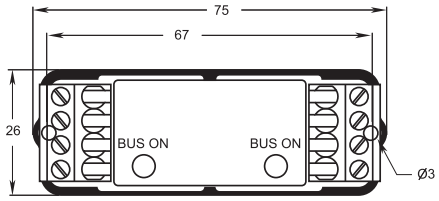
Specifications

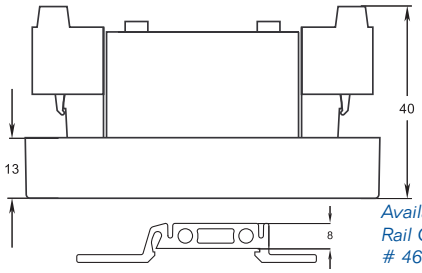
Model Numbers	• 461091, 465026 (DIN)
Operating Voltage	• AS-Interface voltage
Operating Current	• 60mA (per segment) 120mA total
AS-Interface Cycle time	• 0.15ms X (AS-i Slaves +1)
Indication	• Green LED indicates bus power on each segment
Dimensions:	• 75mm, 26mm, 40mm (L, W, H)
Operating Temp.	• -40° to + 85°C (-40° to 185°F)

Schematic Drawing



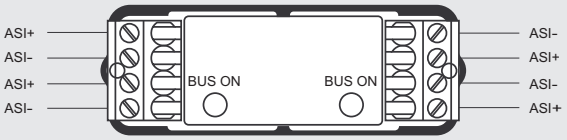
Dimensions (in mm)



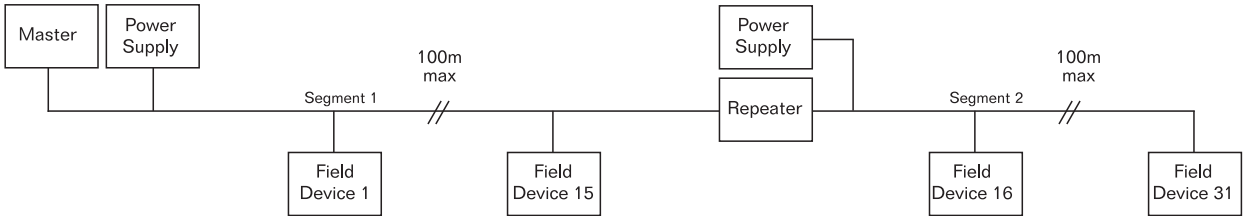


Available with DIN Rail Clip. Specify model # 465026

Wiring Diagram



Network



Repeaters/Network Tuners

StoneL Model 461142, 461150 (DIN)

AS-Interface Network Tuner

The AS-Interface Tuner enables longer cable length and improves network communication quality. This tuner monitors the telegram traffic and adjusts it's Capacitive, Inductive, and Resistive characteristics to optimize communication. LED's display network signal quality.

Features

- Extend AS-i Networks
- Improve signal quality
- LED Indication
- Easy commissioning
- DIN rail mounting
- IP65

Enclosure Option

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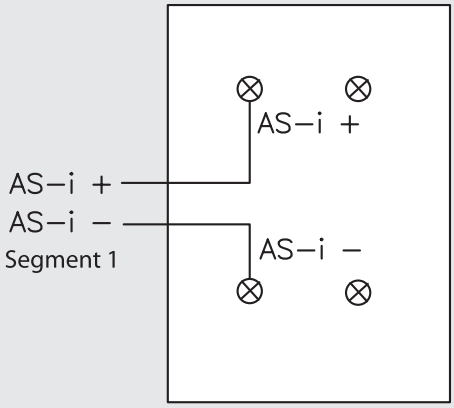
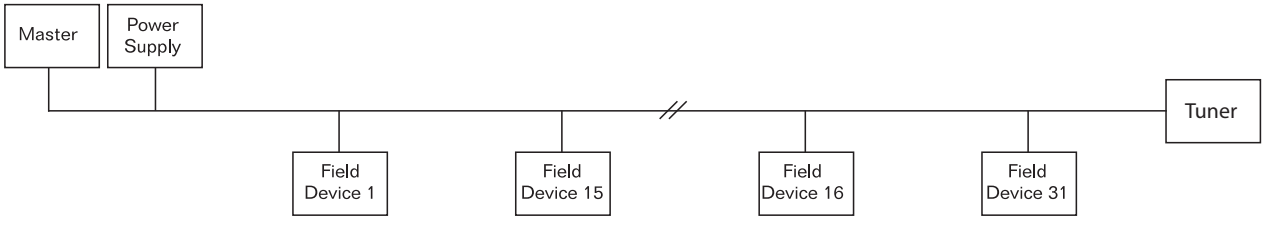
Specifications

Device Profile	• Passive (No address)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power supply)
Operating Current	• 60mA
Displays	• Power: Voltage OK green LED • Tuning Active: green LED • Error, red LED • Warning: Yellow LED • Green: Green LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +75°C (-13° to +167°F)
Housing	• Engineered Resin, DIN rail mounting
Housing Dimensions	• 80mm, 115mm, 65mm (L, W, H)
Ingress Protection	• IP65
Weight	• 244g (0.54 pounds)

Schematic Diagram



Network



Repeaters/Network Tuners

StoneL Model 461144

Enclosure Option

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AS-Interface Network Terminator

The AS-Interface Terminator enables longer cable length and improves network communication quality. The terminator applies a fixed Capacitive, Inductive, and Resistive component to the network to optimize communication. Signal quality should be verified by an AS-Interface Analyzer.

Features

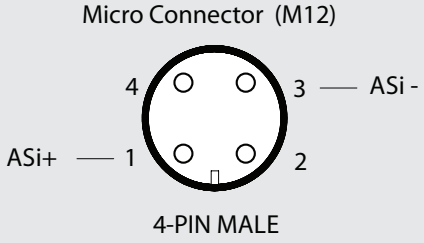
- Extend AS-i Networks
- Improve Signal quality
- Simple LED Indication
- M12 4pin connector
- IP65 housing

CE

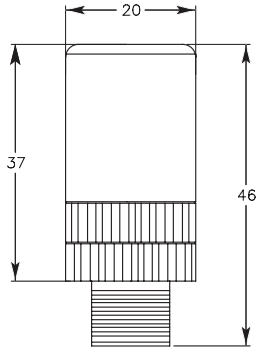
Specifications

Device Profile	• Passive (No Address)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power supply)
Operating Current	• 10mA
Displays	• AS-i Voltage > 26V : green LED • AS-i Voltage >18.5V : yellow LED
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +75°C (-13° to +167°F)
Housing	• Engineered Resin, DIN rail mounting
Housing Dimensions	• 20mm, 46mm (Diameter, Length)
Ingress Protection	• IP20
Weight	• 44g (0.10 pounds)

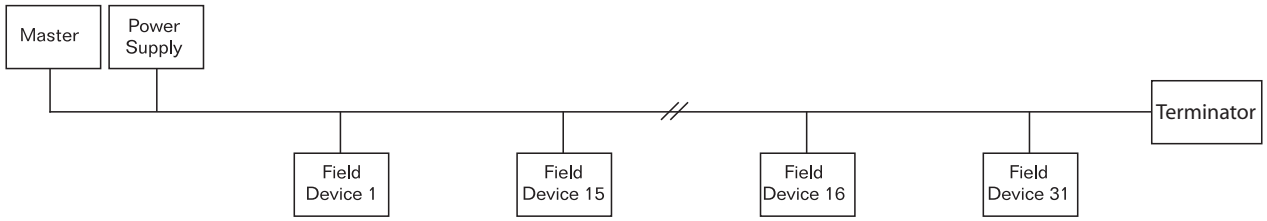
Schematic Diagram



Dimensions (in mm)



Network



Addressing Units

StoneL Model 460002

Handheld Addressing Unit

The handheld addressing unit is a compact device for quickly addressing AS-Interface slave devices. The LCD display provides visual address verification. The connection to the slave devices is short-circuit and overload protected.

Features

- Compact
- Durable
- Easy to use

CE

Specifications

Display	• LCD
Keypad	• 5 key membrane keypad
Power Supply	• Battery powered (charger included)
Charger Power	• 120 VAC
Operating Temp.	• 0° to +50°C (+32° to +125°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Dimensions	• 80mm, 30mm, 209mm (L,W,H)
Ingress Protection	• IP20
Weight	• 550g (1.21 pounds)

Handheld Addressing Unit Keypad

↑ = Increment slave address

↓ = Decrement slave address

PRG = Program new address

ADR = Current slave address

Display

The LCD shows address of currently connected slave or an error code.

Error Codes

F1 = Short circuit or overload

F2 = Slave not connected or faulty slave

F3 = Programming error

LOBAT = Low battery

Operation

To view current slave address: Press ADR.

To program new address:
Press ↑ or ↓ to select desired address then press PRG to assign address, then press ADR to confirm changed.

To assign address "0":
Press and hold ADR and PRG simultaneously.

Input/Output Modules

StoneL Model 461050, 465011 (DIN)

The I/O Module is designed to function as an AS-Interface slave device with termination points for connecting switches/sensors as well as output devices, such as solenoid valves and relays.

Enclosure Option

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Features

- Four (4) discrete inputs
- Four (4) power outputs
- LED input status displays (inputs 3&4)
- Direct mount or DIN rail mount available

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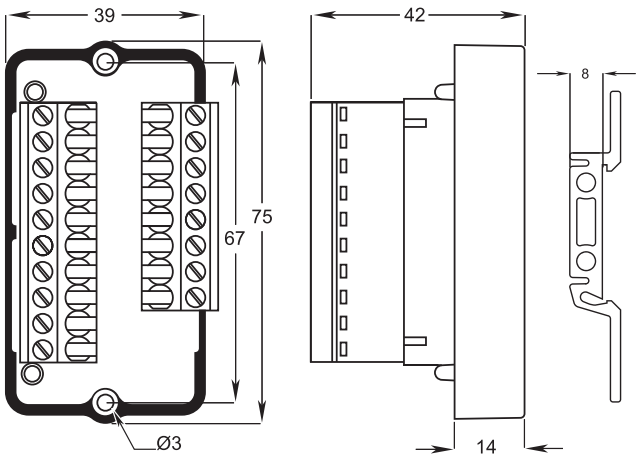
Specifications

Model Numbers	• 461050, 465011 (DIN)
AS-Interface Profile	• ID Code = F I/O Code = 7 (4DI,4DO)
Inputs	• (4) 3mA @ 28VDC; gold contact mechanical, low power reed, or proximity sensor
Outputs	• (4) 28VDC (4 Watts total power available)
Operating Voltage	• AS-Interface Voltage
Current Consumption	• <40mA (with no outputs energized)
Dimensions	• 75mm, 39mm, 41mm (L, W, H)
Indication	• Input 3 = Green LED Input 4 = Red LED
Operating Temp.	• -25° to +70°C (-13° to +158°F)
Stock Temp.	• -25° to +70°C (-13° to +158°F)
Weight	• 90g (0.2 pounds), with DIN

AS-Interface Profile and Data locations

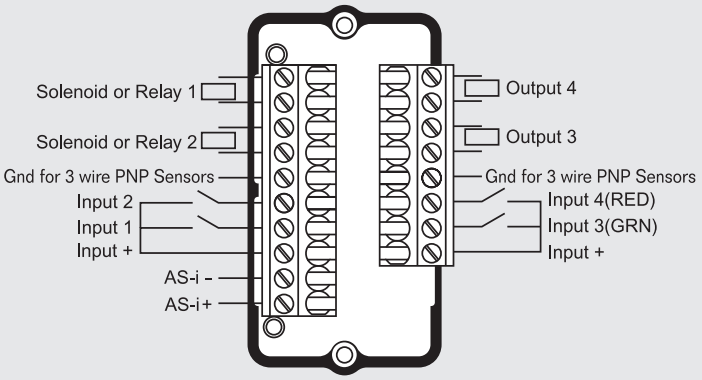
Input Data	Output Data
Input 1 = DI0	Output 1 = DO2
Input 2 = DI1	Output 2 = DO3
Input 3 = DI2	Output 3 = DO0
Input 4 = DI3	Output 4 = DO1

Dimensions (in mm)



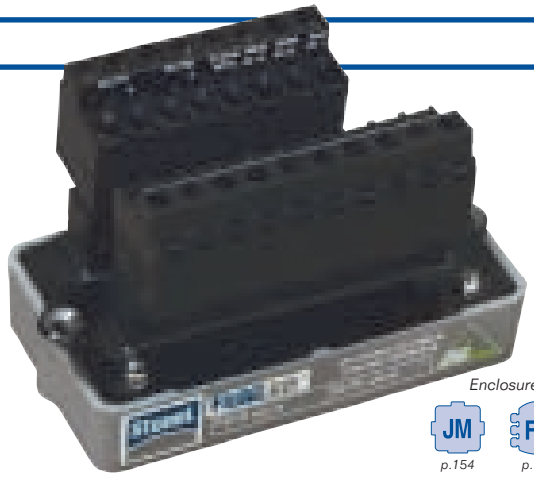
Available with DIN Rail Clip. Specify model # 465011

Wiring Diagram



Input/Output Modules

StoneL Model 461136, 465029 (DIN)



Input/Output Module with Extended Addressing Feature

The I/O Module is designed to function as an AS-Interface slave device with termination points for connecting switches/sensors as well as output devices, such as solenoid valves and relays.

Features

- Four (4) discrete inputs
- Three (3) power outputs
- LED input status displays (inputs 3&4)
- Direct mount or DIN rail mount available
- Extended addressing feature (A/B Addresses) 62 per Network

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Enclosure Option

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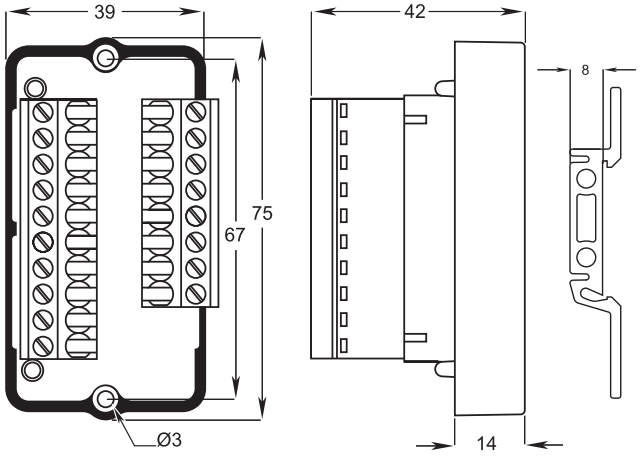
Specifications

Model Numbers	• 461136, 465029 (DIN)
AS-Interface Profile	• ID Code = A I/O Code = 7 (4DI,4DO)
Inputs	• (4) 3mA @ 28VDC; gold contact mechanical, low power reed, or proximity sensor
Outputs	• (4) 28VDC (4 Watts total power available)
Operating Voltage	• AS-Interface Voltage
Current Consumption	• <40mA (with no outputs energized)
Dimensions	• 75mm, 39mm, 41mm (L, W, H)
Indication	• Input 3 = Green LED Input 4 = Red LED
Operating Temp.	• -25° to +70°C (-13° to +158°F)
Stock Temp.	• -25° to +70°C (-13° to +158°F)
Weight	• 90g (0.2 pounds), with DIN

AS-Interface Profile and Data locations

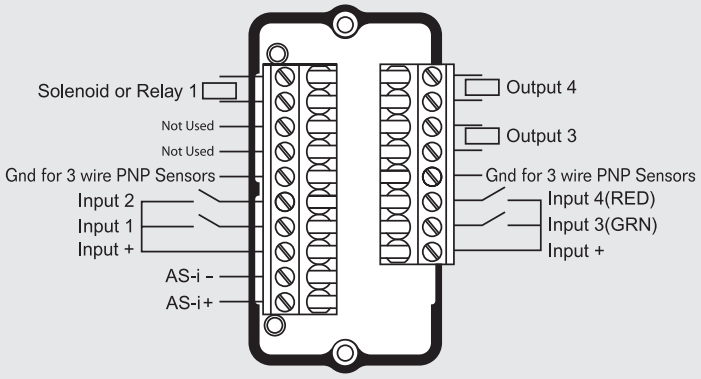
Input Data	Output Data
Input 1 = DI0	Output 1 = DO2
Input 2 = DI1	Output 2 = Not Used
Input 3 = DI2	Output 3 = DO0
Input 4 = DI3	Output 4 = DO1

Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465029

Wiring Diagram



Input/Relay Output Modules

StoneL Model 461081, 465016 (DIN), 461082, 465017 (DIN)

Input/Output Module with Externally Powered Relay Outputs

This I/O module is designed to function as an AS-Interface node with termination points for connecting switches/sensors, as well as relay outputs to operate devices like motors and other high power devices. Outputs may be interlocked to operate AC motors, or independent to operate independent AC loads.

Enclosure Option

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Features

- Four (4) discrete inputs
- Two (2) discrete outputs
- Two (2) discrete (relay) outputs
- LED input displays (inputs 3 & 4)
- Direct mount or DIN rail mount available

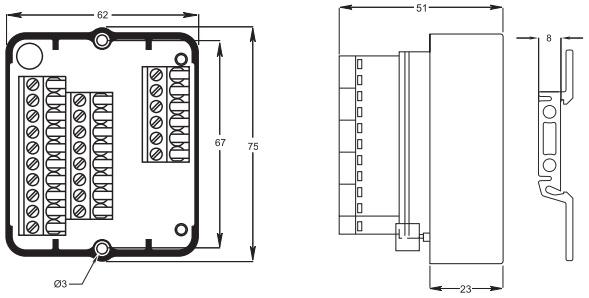
Specifications

Model Numbers	• Interlocking 461081, 465016 (DIN) • Independent 461082, 465017 (DIN)
AS-Interface Profile	• ID Code = F I/O Code = 7(4DI, 3DO)
Inputs	• (4) 3mA @ 28VDC; gold contact mechanical, low power reed, or proximity sensor
Relay Outputs	• Interlocking: (2) 120/250VAC fused @ 2A interlocked for motor operation • Independent: (2) 120/250VAC fused @ 2A independent for other AC loads
Bus powered outputs	• (2) 28VDC (4 Watts total power available)
Operating Voltage	• AS-Interface Voltage
External Voltage	• Up to 250 VAC; 30 VDC (for relay outputs)
Indication	• Input 3 = Green LED Input 4 = Red LED
Dimensions	• 75mm, 62mm, 51mm (L, W, H)
Operating Temp.	• -25° to +70°C (-13° to +158°F)

AS-Interface Profile and Data locations

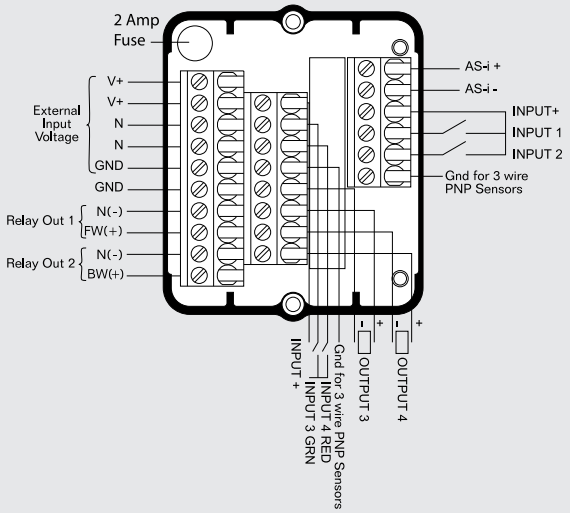
Input Data	Output Data
Input 1 = DI0	Output 1 = DO2
Input 2 = DI1	Output 2 = DO3
Input 3 = DI2	Output 3 = DO0
Input 4 = DI3	Output 4 = DO1

Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465030 or 465031

Wiring Diagram



Input/Relay Output Modules

StoneL Model 461137, 465030 (DIN), 461138, 465031 (DIN)

Input/Output Module with Externally Powered Relay Outputs and Extended Addressing Feature

This I/O module is designed to function as an AS-Interface node with termination points for connecting switches/sensors, as well as relay outputs to operate devices like motors and other high power devices. Outputs may be interlocked to operate AC motors, or independent to operate independent AC loads.

Features

- Four (4) discrete inputs
- One (1) discrete outputs
- Two (2) discrete (relay) outputs
- LED input displays (inputs 3 & 4)
- Direct mount or DIN rail mount available
- Extended addressing feature (A/B Addresses) 62 per Network

Enclosure Option

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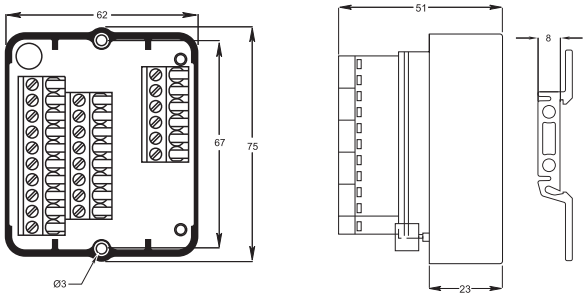
Specifications

Model Numbers	• Interlocking 461137, 465030 (DIN) • Independent 461138, 465031 (DIN)
AS-Interface Profile	• ID Code = A I/O Code = 7(4DI, 3DO)
Inputs	• (4) 3mA @ 28VDC; gold contact mechanical, low power reed, or proximity sensor
Relay Outputs	• Interlocking: (2) 120/250VAC fused @ 2A interlocked for motor operation • Independent: (2) 120/250VAC fused @ 2A independent for other AC loads
Bus powered outputs	• (2) 28VDC (4 Watts total power available)
Operating Voltage	• AS-Interface Voltage
External Voltage	• Up to 250 VAC; 30 VDC (for relay outputs)
Indication	• Input 3 = Green LED Input 4 = Red LED
Dimensions	• 75mm, 62mm, 51mm (L, W, H)
Operating Temp.	• -25° to +70°C (-13° to +158°F)

AS-Interface Profile and Data locations

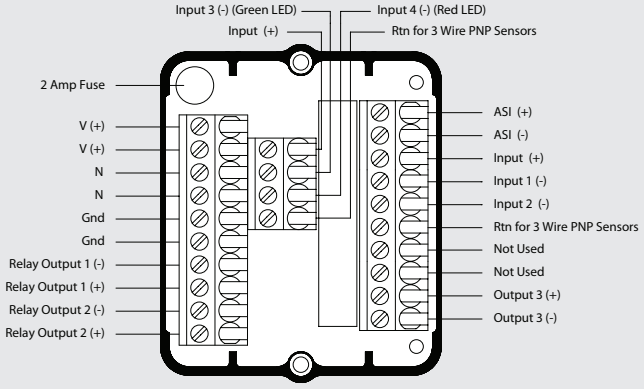
Input Data	Output Data
Input 1 = DI0	Output 1 = DO0
Input 2 = DI1	Output 2 = DO1
Input 3 = DI2	Output 3 = DO2
Input 4 = DI3	Output 4 = Not Used

Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465030 or 465031

Wiring Diagram



Input/Output Modules

StoneL Model 461096

Analog Input Module (IP20)

The AS-Interface analog input module enables 4-20mA analog signals to be monitored via AS-Interface. Once described as a bus for discrete I/O only, AS-Interface has devised a method to send these signals via AS-Interface using the new device profile (7.3).

Enclosure Option

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Features

- Two (2) analog 4-20mA inputs
- 16 bit resolution
- Peripheral fault indication
- Easy commissioning via AS-Interface
- DIN rail mounting
- IP20

CE

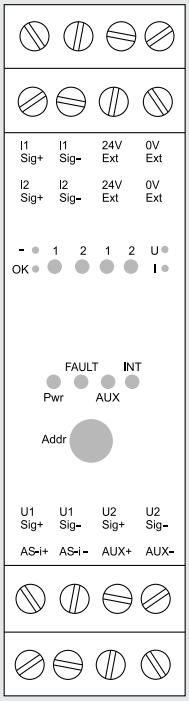
Specifications

Device Profile	• ID=3, ID2=D, I/0 = 7
Master Requirement	• AS-Interface Version 2.1 Master Required
Inputs	• 2 Analog inputs (4-20mA)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power supply)
Operating Current	• <80mA
Voltage Supply, Sensors	• Via AS-Interface or External 24VDC
Internal Resistance	• 50 Ohms
Max Current Per Input	• 40mA
Resolution	• 16bit (4000 - 20000)
AS-Interface Cycle Time	• Cycle Time = 150 microsec. x (AS-Interface Slaves +1)
Displays	• Analog Signal 1 (Analog 1), green LED • Analog Signal 2 (Analog 2), green LED • Power on (AUX), green LED • AS-Interface Voltage (PWR), green LED • AS-Interface Communication Error (Fault), red LED
Operating Temp.	• 0° to +70°C (+32° to +158°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Engineered Resin, DIN rail mounting
Housing Dimensions	• 99mm, 23mm, 92mm (L, W, H)
Ingress Protection	• IP20
Weight	• 118g (0.26 pounds)

Programming

- Parameter P0
  - 0: 60hz filter in A/D Converter
  - 1: 50hz filter in A/D Converter
- Parameter P1
  - 0: Channel 2 not enabled
  - 1: Channel 2 enabled
- Parameter P2
  - 0: Peripheral Fault not enabled
  - 1: Peripheral Fault enabled
- Parameter P3
  - Not Used

Schematic Drawing



I1Sig +	(+) Analog Input Ch 1
I1 Sig -	(-) Analog Input Ch1
24 V Ext	(+) 24 Vdc Ext. Power Input
0 V Ext	(-) 24 Vdc Ext. Power Input
I2 Sig +	(+) Analog Input Ch2
I2 Sig -	(-) Analog Input Ch 2
24 V Ext	(+) 24 Vdc Ext. Power Input
0 V Ext	(-) 24 Vdc Ext. Power Input
U1 Sig +	
U1 Sig -	
U2 Sig +	
U2 Sig -	
AS-i +	AS-i +
AS-i -	AS-i -
AUX +	
AUX -	

Input/Output Modules

StoneL Model 461098

Analog Output Module (IP20)

The AS-Interface analog output module enables 0-20mA analog signals to be sent via AS-Interface. Once described as a bus for discrete I/O only, AS-Interface has devised a method to send these signals via AS-Interface using the new device profile (7.3).

Enclosure Option

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Features

- Two (2) analog 0-20mA outputs
- 16 bit resolution
- Peripheral fault indication
- Easy commissioning via AS-Interface
- DIN rail mounting
- IP20 housing

CE

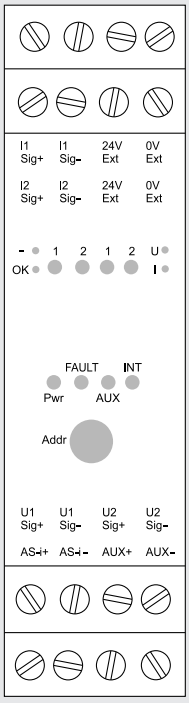
Specifications

Device Profile	• ID=3, ID2=5, I/0 = 7
Master Requirement	• AS-Interface Version 2.1 Master Required
Outputs	• 2 Analog outputs (0-20mA)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power supply)
Operating Current	• <80mA
Voltage Supply, Sensors	• Via AS-Interface or External 24VDC
Resolution	• 16bit (0 - 20000)
AS-Interface Cycle Time	• Cycle Time = 150 microsec. x (AS-Interface Slaves +1)
Displays	• Analog Signal 1 (Analog 1), green LED • Analog Signal 2 (Analog 2), green LED • Power on (AUX), green LED • AS-Interface Voltage (PWR), green LED • AS-Interface Communication Error (Fault), red LED
Operating Temp.	• 0° to +70°C (+32° to +158°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Engineered Resin, DIN rail mounting
Housing Dimensions	• 99mm, 23mm, 92mm (L, W, H)
Ingress Protection	• IP20
Weight	• 118g (0.26 pounds)

Programming

- Parameter P0
  Not Used
- Parameter P1
  Not Used
- Parameter P2
  0: Peripheral Fault not enabled
  1: Peripheral Fault enabled
- Parameter P3
  Not Used

Schematic Drawing



I1Sig +	(+) Analog Output Ch 1
I1 Sig -	(-) Analog Output Ch1
24 V Ext	(+) 24 Vdc Ext. Power Input
0 V Ext	(-) 24 Vdc Ext. Power Input
I2 Sig +	(+) Analog Output Ch2
I2 Sig -	(-) Analog Output Ch 2
24 V Ext	(+) 24 Vdc Ext. Power Input
0 V Ext	(-) 24 Vdc Ext. Power Input
U1 Sig +	
U1 Sig -	
U2 Sig +	
U2 Sig -	
AS-i +	AS-i +
AS-i -	AS-i -
AUX +	
AUX -	

Input/Output Modules

StoneL Model 461124

Analog Input Module (IP20)

The AS-Interface analog input module enables 4-20mA analog signals to be monitored via AS-Interface. Once described as a bus for discrete I/O only, AS-Interface has devised a method to send these signals via AS-Interface using the new device profile (7.3).

Features

- Four (4) analog 4-20mA inputs
- 16 bit resolution
- Peripheral fault indication
- Easy commissioning via AS-Interface
- DIN rail mounting
- IP20

Enclosure Option

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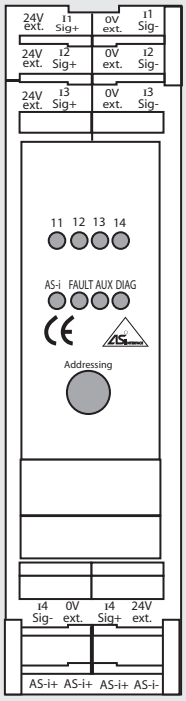
Specifications

Device Profile	• ID=3, ID2=E, I/O = 7
Master Requirement	• AS-Interface Version 2.1 Master Required
Inputs	• 4 Analog inputs (4-20mA)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power supply)
Operating Current	• <80mA
Voltage Supply, Sensors	• Via AS-Interface or External 24VDC
Internal Resistance	• 50 Ohms
Max Current Per Input	• 40mA
Resolution	• 16bit (4000 - 20000)
Displays	• AS-Interface Voltage (AS-i), green LED • AS-Interface Communication Error (Fault), red LED • Voltage supply 24VDC (AUX), green LED • Diagnostics (DIAG), yellow LED • Analog Signal 1 (I1), yellow LED • Analog Signal 2 (I2), yellow LED • Analog Signal 3 (I3), yellow LED • Analog Signal 4 (I4), yellow LED
Operating Temp. Storage Temp.	• 0° to +70°C (+32° to +158°F) • -25° to +85°C (-13° to +185°F)
Housing	• Engineered Resin, DIN rail mounting
Housing Dimensions	• 105mm, 23mm, 114mm (L, W, H)
Ingress Protection	• IP20

Schematic Drawing



Programming

- Parameter P0
  - 0: 60hz filter in A/D Converter
  - 1: 50hz filter in A/D Converter
- Parameter P1 & P2

  Indicates which AI channels to enable

P1	P2	AI1	AI2	AI3	AI4
0	0	on	off	off	off
0	1	on	on	off	off
1	0	on	on	on	off
1	1	on	on	on	on

- Parameter P3
  - 0: Peripheral Fault not enabled
  - 1: Peripheral Fault enabled

Input/Output Modules

StoneL Model 461122

Analog Output Module (IP20)

The AS-Interface analog output module enables 0-20mA analog signals to be sent via AS-Interface. Once described as a bus for discrete I/O only, AS-Interface has devised a method to send these signals via AS-Interface using the new device profile (7.3).

Kit Contents

- Four (4) analog 0-20mA outputs
- 16 bit resolution
- Peripheral fault indication
- Easy commissioning via AS-Interface
- DIN rail mounting
- IP20 housing

Enclosure Option

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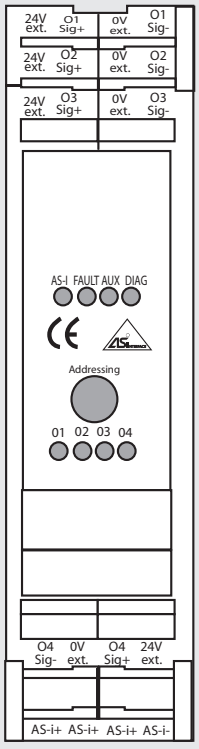
CE

Specifications

Device Profile	• ID=3, ID2=6, I/0 = 7
Master Requirement	• AS-Interface Version 2.1 Master Required
Outputs	• 4 Analog outputs (0-20mA)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power supply)
Operating Current	• <80mA
Voltage Supply, Sensors	• Via AS-Interface or External 24VDC
Resolution	• 16bit (0 - 20000)
Displays	• AS-Interface Voltage (AS-i), green LED • AS-Interface Communication Error (Fault), red LED • Voltage supply 24VDC (AUX), green LED • Diagnostics (DIAG), yellow LED • Analog Signal 1 (O1), yellow LED • Analog Signal 2 (O2), yellow LED • Analog Signal 3 (O3), yellow LED • Analog Signal 4 (O4), yellow LED
Operating Temp.	• 0° to +70°C (+32° to +158°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Engineered Resin, DIN rail mounting
Housing Dimensions	• 105mm, 23mm, 114mm (L, W, H)
Ingress Protection	• IP20

Schematic Drawing



Programming

- Parameter P0
  - 0: Profile 7.3 is not monitored
  - 1: Profile 7.3 is monitored
- Parameter P1
  - Not Used
- Parameter P2
  - 0: Peripheral Fault not enabled
  - 1: Peripheral Fault enabled
- Parameter P3
  - Not Used

Input/Output Modules

StoneL Model 461062

Analog Input Module (IP65)

The AS-Interface analog input module enables 4-20mA analog signals to be monitored via AS-Interface. Once described as a bus for discrete I/O only, AS-Interface has devised a method to send these signals via AS-Interface using the new device profile (7.3).

Enclosure Option

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Features

- Two (2) analog 4-20mA inputs
- 16 bit resolution
- Peripheral fault indication
- Easy commissioning via AS-Interface
- DIN rail mounting
- IP65 housing

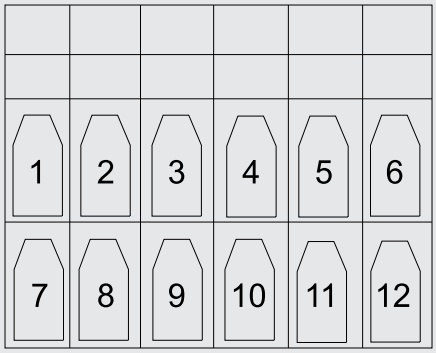
Specifications

Device Profile	• ID=3, ID2=D, I/0 = 7
Master Requirement	• AS-Interface Version 2.1 Master Required
Inputs	• 2 Analog inputs (4-20mA)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power supply)
Operating Current	• <80mA
Voltage Supply, Sensors	• Via AS-Interface or External 24VDC
Internal Resistance	• 50 Ohms
Max Current Per Input	• 40mA
Resolution	• 16bit
AS-Interface Cycle Time	• Cycle Time = 150 microsec. x (AS-Interface Slaves +1)
Displays	• Analog Signal 1 (Analog 1), green LED • Analog Signal 2 (Analog 2), green LED • Power on (AUX), green LED • AS-Interface Voltage (PWR), green LED • AS-Interface Communication Error (Fault), red LED
Operating Temp.	• 0° to +70°C (+32° to +158°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Engineered Resin, DIN rail mounting
Housing Dimensions	• 90mm, 80mm, 70mm (L, W, H)
Ingress Protection	• IP65
Weight	• 355g (0.78 pounds)

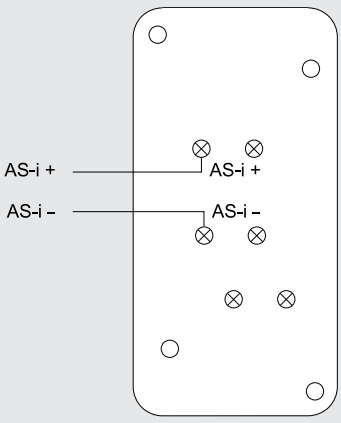
Programming

- Parameter P0
  - 0: 60hz filter in A/D Converter
  - 1: 50hz filter in A/D Converter
- Parameter P1
  - 0: Channel 2 not enabled
  - 1: Channel 2 enabled
- Parameter P2
  - 0: Peripheral Fault not enabled
  - 1: Peripheral Fault enabled
- Parameter P3
  - Not Used

Schematic Drawing



1	(+) 24 Vdc Ext. Power Input	7	(+) 24 Vdc. Ext. Power Input
2	(+) Analog Input Ch 2	8	(+) Analog Input Ch 1
3	(-) 24 Vdc Ext. Power Input	9	(-) 24 Vdc Ext. Power Input
4	(-) Analog Input Ch 2	10	(-) Analog Input Ch 1
5	Shield	11	Function Ground
6	Shield	12	Function Ground



Input/Output Modules

StoneL Model 461094

Analog Output Module (IP65)

The AS-Interface analog output module enables 0-20mA analog signals to be sent via AS-Interface. Once described as a bus for discrete I/O only, AS-Interface has devised a method to send these signals via AS-Interface using the new device profile (7.3).

Enclosure Option

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Features

- Two (2) analog 0-20mA outputs
- 16 bit resolution
- Peripheral fault indication
- Easy commissioning via AS-Interface
- DIN rail mounting
- IP65, housing

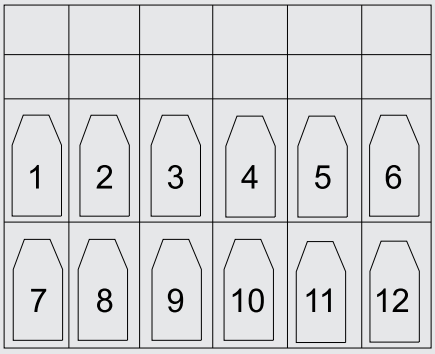
Specifications

Device Profile	• ID=3, ID2=5, I/0 = 7
Master Requirement	• AS-Interface Version 2.1 Master Required
Outputs	• 2 Analog outputs (0-20mA)
Operating Voltage	• 30 VDC AS-Interface Voltage (AS-Interface power supply)
Operating Current	• <80mA
Voltage Supply, Sensors	• Via AS-Interface or External 24VDC
Resolution	• 16 bit
AS-Interface Cycle Time	• Cycle Time = 150 microsec. x (AS-Interface Slaves +1)
Displays	• Analog Signal 1 (Analog 1), green LED • Analog Signal 2 (Analog 2), green LED • Power on (AUX), green LED • AS-Interface Voltage (PWR), green LED • AS-Interface Communication Error (Fault), red LED
Operating Temp.	• 0° to +70°C (32° to +158°F)
Storage Temp.	• -25° to +85°C (-13° to +185°F)
Housing	• Engineered Resin, DIN rail mounting
Housing Dimensions	• 90mm, 80mm, 70mm (L, W, H)
Ingress Protection	• IP65
Weight	• 355g (0.78 pounds)

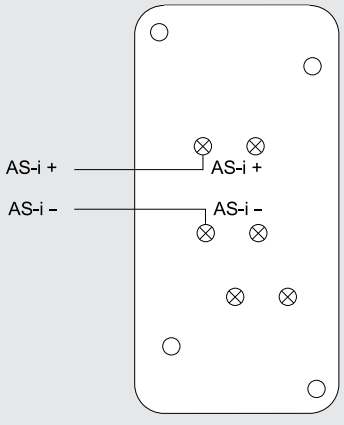
Programming

- Parameter P0
  Not Used
- Parameter P1
  Not Used
- Parameter P2
  0: Peripheral Fault not enabled
  1: Peripheral Fault enabled
- Parameter P3
  Not Used

Schematic Drawing



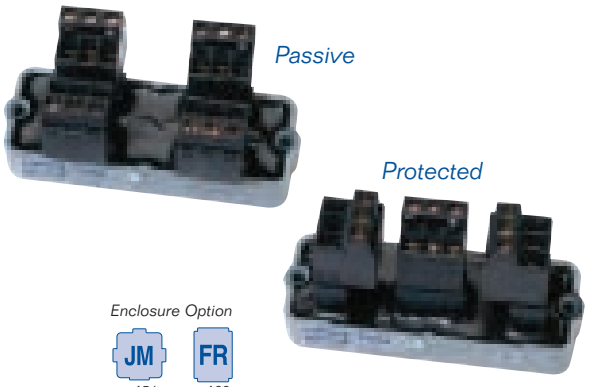
1	(+) 24 Vdc Ext. Power Input	7	(+) 24 Vdc. Ext. Power Input
2	(+) Analog Output Ch 2	8	(+) Analog Output Ch 1
3	(-) 24 Vdc Ext. Power Input	9	(-) 24 Vdc Ext. Power Input
4	(1) Analog Output Ch 2	10	(1) Analog Output Ch 1
5	Shield	11	Function Ground
6	Shield	12	Function Ground



Drop Connectors

StoneL Model 461059, 465001 (DIN), 461017, 465005 (DIN)

Drop connectors provide a reliable, safe method of connecting slave devices to the bus cable. Protected drop connectors limit the current passing from the bus to the drop leg to prevent fault conditions on the drop from affecting the bus.



Passive (2 Drops)
- 8 Amp capacity
- Direct mount or DIN rail mount available

Protected (1 Drop)
- 8 Amp capacity on bus trunk line
- Short circuit protection (240mA)
- LED indicates drop fault
- Automatically resets when drop fault is cleared

Enclosure Option

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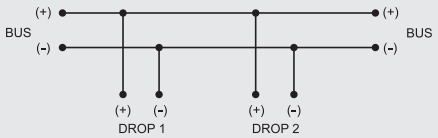
CE FM APPROVED

Specifications

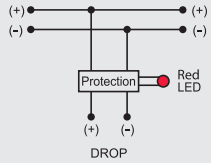
Model Numbers	• Passive: 461059, 465001 (DIN) • Protected: 461017, 465005 (DIN)
Protocol	• AS-Interface
Maximum Voltage	• 35VDC
Max. Current, Bus Trunk line	• 8 Amps
Trip Current, Drop	• Passive: No Trip Current • Protected: 240mA
Voltage Drop, Bus Leg	• Negligible
Voltage Drop, Drop Leg	• Passive: Negligible • Protected: 1 Volt Max.
Holding Current (After Trip)	• Protected: 28mA
Reset Current Level	• Current falls below 28mA
Dimensions (L, W, H)	• 75mm, 36mm, 40mm
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)

Schematic Drawing

Passive

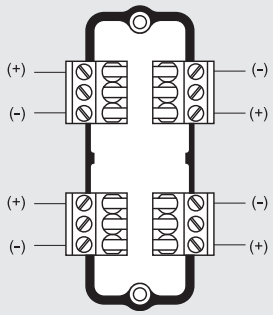


Protected

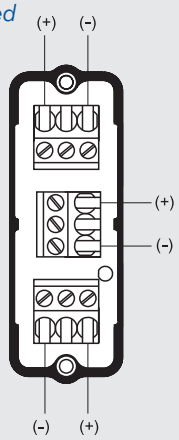


Wiring Diagram

Passive

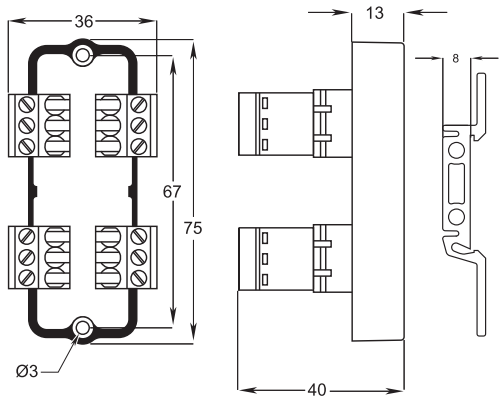


Protected



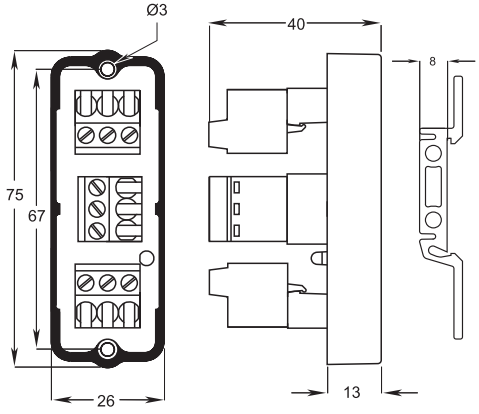
Dimensions (in mm)

Passive



Available with DIN Rail Clip. Specify model # 465001

Protected



Available with DIN Rail Clip. Specify model #465005

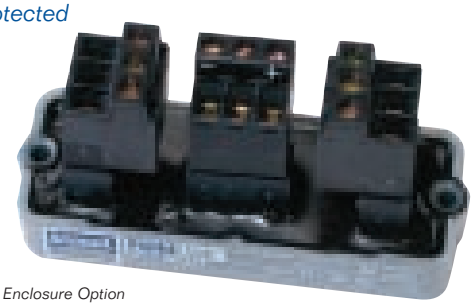
Drop Connectors

StoneL Model 461145, 465032 (DIN)

Protected Drop Connector (1 Drop)

Drop connectors provide a reliable, safe method of connecting slave devices to the bus cable. Protected drop connectors limit the current passing from the bus to the drop leg to prevent fault conditions on the drop from affecting the bus.

Protected



Enclosure Option

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Features

- 8 Amp capacity on bus trunk line
- Short circuit protection (100mA)
- LED indicates drop fault
- Automatically resets when drop fault is cleared

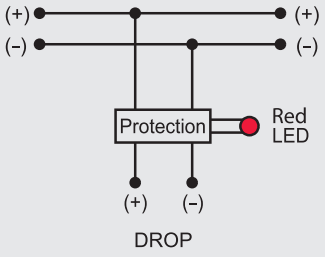
CE FM APPROVED

Specifications

Model Numbers	• Protected: 461017, 465005 (DIN)
Protocol	• AS-Interface
Maximum Voltage	• 35VDC
Max. Current, Bus Trunk line	• 8 Amps
Trip Current, Drop	• Protected: 100mA
Voltage Drop, Bus Leg	• Negligible
Voltage Drop, Drop Leg	• Protected: 1 Volt Max.
Holding Current (After Trip)	• Protected: 28mA
Reset Current Level	• Current falls below 28mA
Dimensions (L, W, H)	• 75mm, 26mm, 40mm
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)

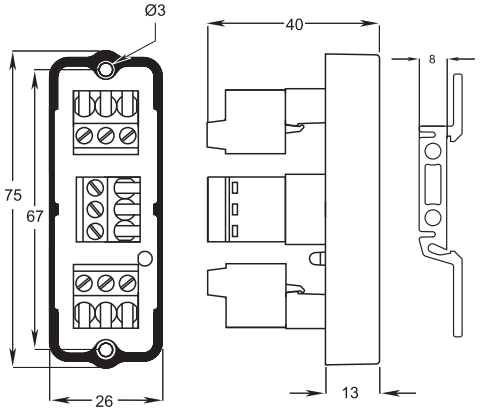
Schematic Drawing

Protected



Dimensions (in mm)

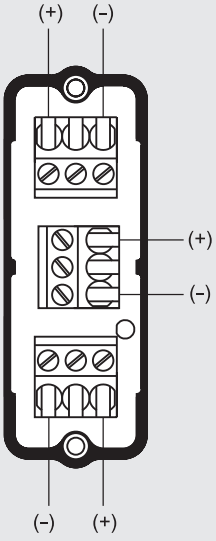
Protected



Available with DIN Rail Clip. Specify model #465005

Wiring Diagram

Protected



Drop Connectors

StoneL Model 461066, 465007 (DIN)

Protected Drop Switch (1 Drop)

Designed for AS-Interface Networks, this switched drop connector offers a very convenient method to remove, replace, or repair a device while the balance of the network remains on-line. It allows the user to disconnect a drop segment from the rest of the bus by flipping a switch.

Features

- Disconnects segment
- Compact modular design
- Short circuit protection (240mA)
- LED indicates drop fault
- Direct mount and DIN rail mount available

FM APPROVED

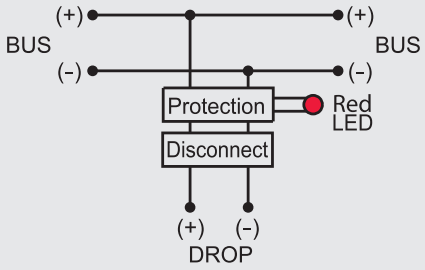
Enclosure

JM p.154 FR p.166

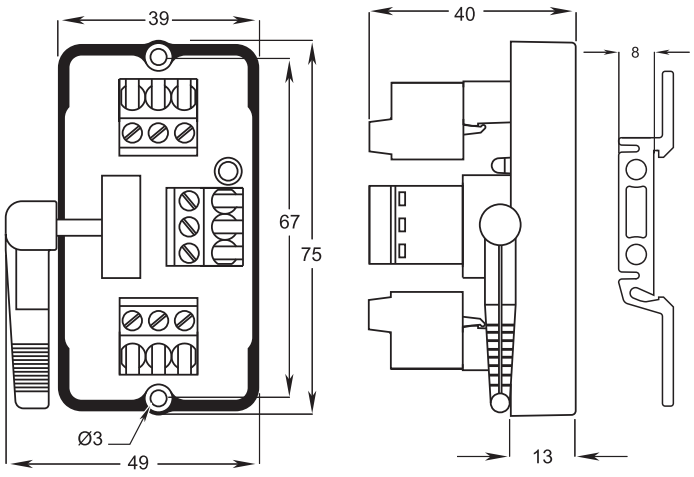
Specifications

Model Numbers	• 461066, 465007 (DIN)
Maximum Voltage	• 35VDC
Max. Current, Bus Trunk line	• 8 Amps
Trip Current, Drop	• 240mA
Voltage Drop, Bus Leg	• Negligible
Voltage Drop, Drop Leg	• 1 Volt Max
Holding Current	• 28mA (After Trip)
Reset Current Level	• Current falls below 28mA
Dimensions (L, W, H)	• 75mm, 49mm, 40mm
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)

Schematic Drawing

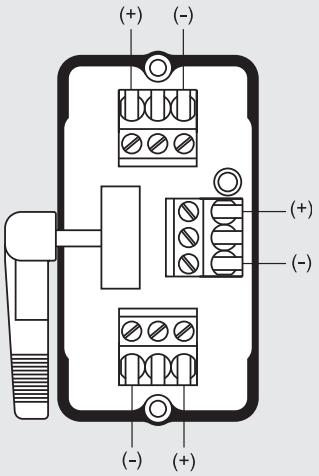


Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465007

Wiring Diagram

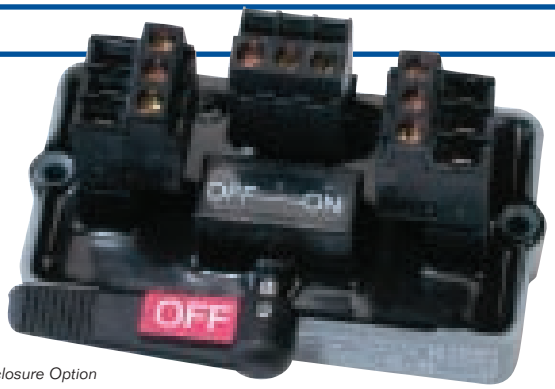


Drop Connectors

StoneL Model 461146, 465033

Protected Drop Switch (1 Drop)

Designed for AS-Interface Networks, this switched drop connector offers a very convenient method to remove, replace, or repair a device while the balance of the network remains on-line. It allows the user to disconnect a drop segment from the rest of the bus by flipping a switch.



Enclosure Option

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Features

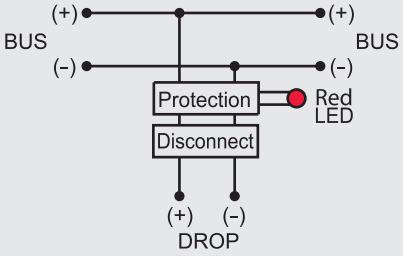
- Disconnects segment
- Compact modular design
- Direct mount and DIN rail mount available
- Short circuit protection (100mA)
- LED indicates drop fault

FM APPROVED

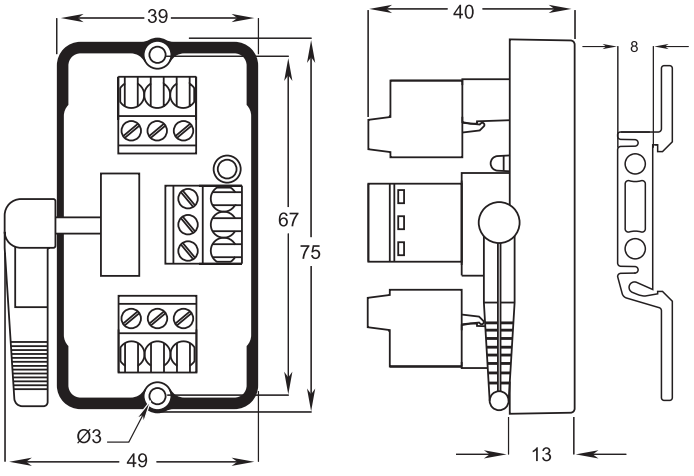
Specifications

Model Numbers	• 461146, 465033
Maximum Voltage	• 35VDC
Max. Current, Bus Trunk line	• 8 Amps
Trip Current, Drop	• 100mA
Voltage Drop, Bus Leg	• Negligible
Voltage Drop, Drop Leg	• 1 Volt Max
Holding Current	• 28mA (After Trip)
Reset Current Level	• Current falls below 28mA
Dimensions (L, W, H)	• 75mm, 49mm, 40mm
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)

Schematic Drawing

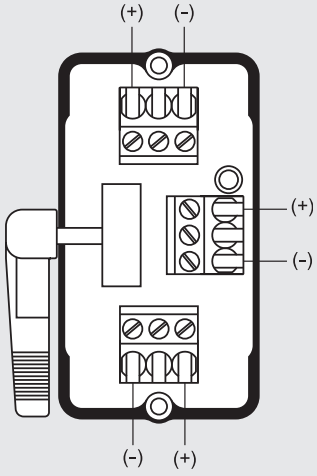


Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465033

Wiring Diagram



Drop Connectors

StoneL Model 461075

Passive Multi-drop Connector (4 Drops)

This AS-Interface Multi-drop connector is compact with DIN rail mount for wiring AS-Interface networks. It provides terminations for Bus In, Bus Out, and four (4) individual drops or spurs.

Features

- AS-Interface power status LED
- DIN rail mounting
- IP20 housing

Enclosure Option

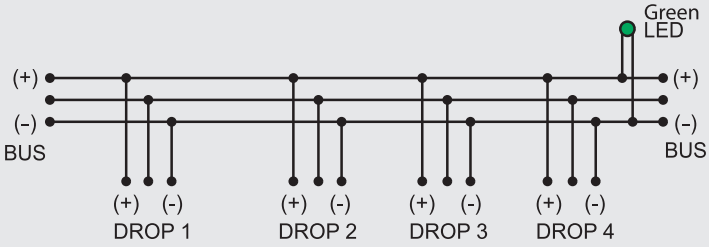
FB p.160 FR p.166

CE

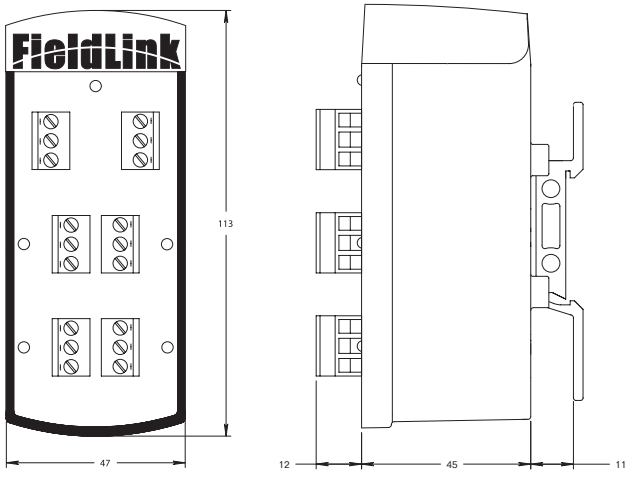
Specifications

Protocol	• AS-Interface
Max Spurs (Drops)	• 4
Type	• Passive Drops
Max Current	• 8 Amp
Voltage Drop, Bus Trunk	• Negligible
Voltage Drop, Spur	• Negligible
Max Voltage	• 35VDC
Current Consumption	• 2mA
Displays	• AS-Interface power status, green LED
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)
Housing	• Engineered resin, DIN rail mounting
Housing Dimensions	• 113mm, 47mm, 68mm (L, W, H)
Ingress Protection	• IP20

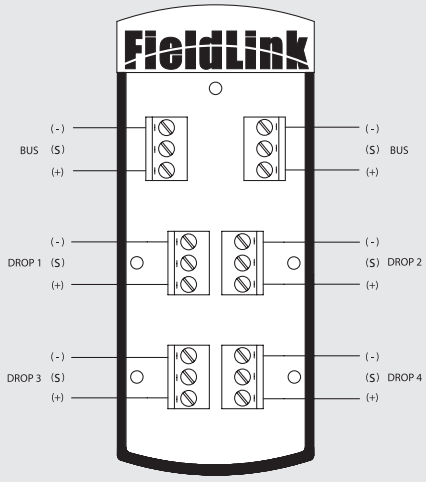
Schematic Drawing



Dimensions (in mm)



Wiring Diagram



Drop Connectors

StoneL Model 461072

Protected Multi-drop Connector (4 Drops)

This protected multi-drop connector is compact with DIN rail mount for wiring AS-Interface networks. It provides terminations for Bus In, Bus Out, and four (4) individual drops or spurs. Each drop has a protection circuit, ensuring that a short circuit on a drop will not affect the rest of the bus.

Features

- AS-Interface power status LED
- Short circuit protection
- LED indication of short circuits
- DIN rail mounting
- IP20 housing

Enclosure Option

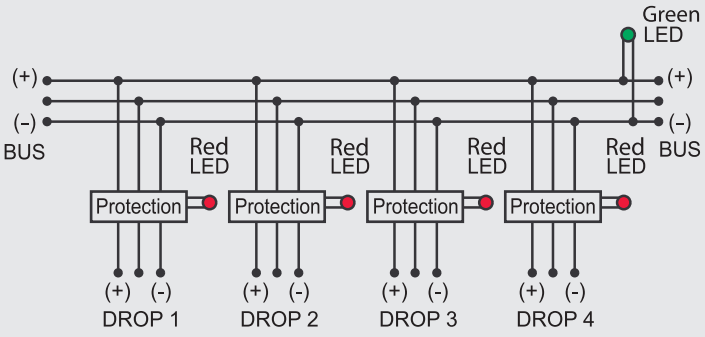
FB p.160 FR p.166

CE

Specifications

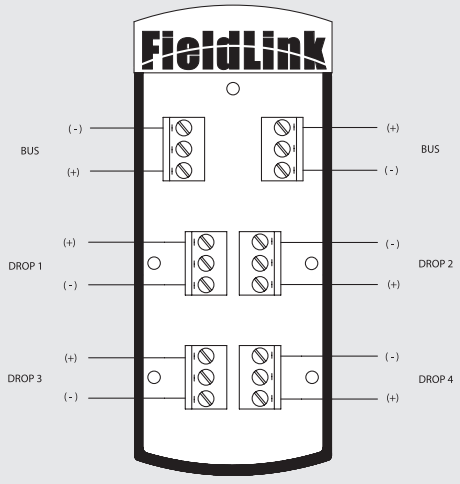
Protocol	• AS-Interface
Max Spurs (Drops)	• 4
Type	• Protected drops
Max Current, Bus Trunk	• 8 Amp
Voltage Drop, Bus Trunk	• Negligible
Voltage Drop, Spur	• 1 VDC max
Trip Current	• 240 mA
Holding Current	• 28 mA
Reset Current	• 28 mA
Max Voltage	• 35 VDC
Current Consumption	• 4mA
Displays	• AS-Interface power status, green LED drop short indication, (4) Red LED
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)
Housing	• Engineered resin, DIN rail mounting
Housing Dimensions	• 113mm, 47mm, 68mm (L, W, H)
Ingress Protection	• IP20

Schematic Drawing

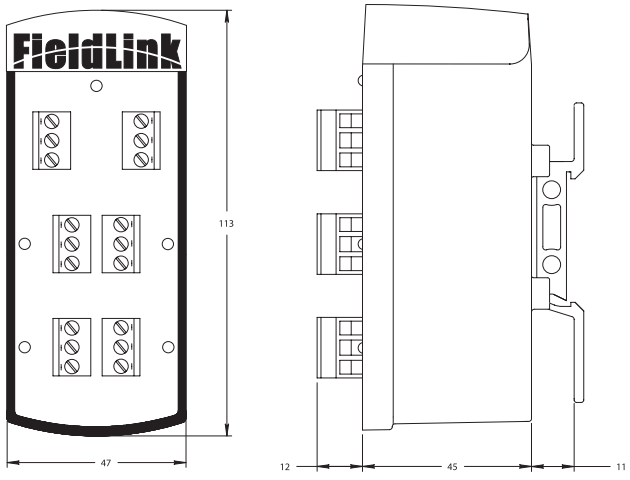


LEDs light when fault is detected

Wiring Diagram



Dimensions (in mm)



Drop Connectors

StoneL Model 461078

Switched Protected Multi-drop Connector (4 Drops)

This protected Multi-drop connector is compact with DIN rail mount for wiring AS-Interface networks. It provides terminations for Bus In, Bus Out, and four (4) individual drops or spurs. Each drop has a protection circuit, ensuring that a short circuit on a drop will not affect the rest of the bus. This device also has a disconnect switch capable of cutting power and data to all four (4) spurs.

Features

- AS-Interface power status LED
- Short circuit protection
- LED indication of short circuits
- Disconnect switch
- 240 mA trip current
- DIN rail mounting
- IP20 housing

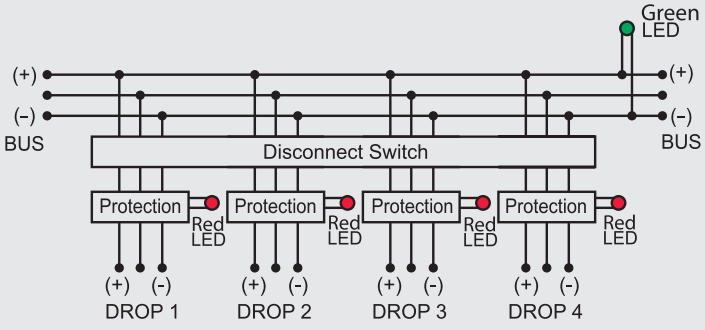
Enclosure Option

FB p.160 FR p.166

Specifications

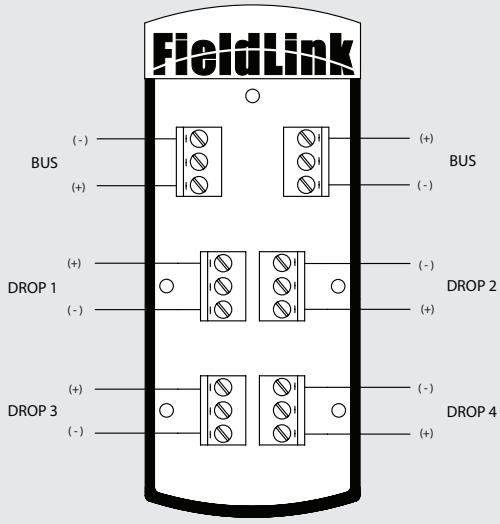
Protocol	• AS-Interface
Max Spurs (Drops)	• 4
Type	• Switched protected drops
Max Current, Bus Trunk	• 8 Amp
Voltage Drop, Bus Trunk	• Negligible
Voltage Drop, Spur	• 1 VDC max
Trip Current	• 240mA
Holding Current	• 28mA
Reset Current	• 28mA
Max Voltage	• 35VDC
Current Consumption	• 4mA
Displays	• AS-Interface Power Status, green LED • Drop Short Indication, (4) Red LED
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)
Housing	• Engineered resin, DIN rail mounting
Housing Dimensions	• 113mm, 47mm, 68mm (L, W, H)
Ingress Protection	• IP20

Schematic Diagram

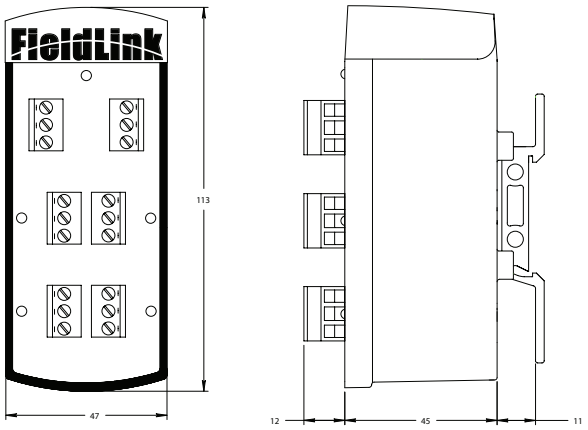


LEDs light when fault is detected

Wiring Diagram



Dimensions (in mm)



Training and Demo Kit

StoneL Model DCFL01

This AS-Interface training and demo kit is a convenient tool for training and demostrating the capabilities of AS-Interface. It contains all the hardware and software needed to demonstate a fully functional AS-Interface Network. (laptop computer not included)

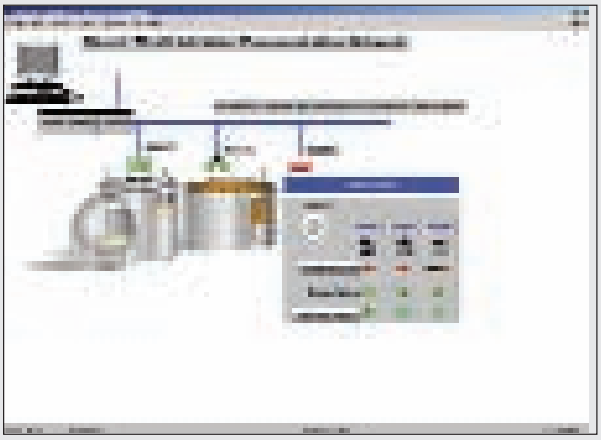
Kit Contents

- Modbus RS485 gateway
- 2.8 Amp AS-Interface power supply
- Handheld addressing unit
- RS485/232 converter
- Serial cable
- Demonstration software
- Eclipse module (ECN96)
- AS-Interface dual module
- I/O module
- 2 Hawkeye sensors
- LEDs simulate solenoid status

Specifications

Gateway	• 458086 Modbus RS485/ AS-Interface Gateway
Power Supply	• 459002 AS-Interface 2.8 Amp
Handheld Addressing Unit	•460002
Software	• FieldLink Demonstration Software
Operating Temp.	• -25° to +70°C (-13° to +158°F)

Lookout Screen



Commissioning Kits and Software

StoneL Model 464001

AS-Interface Commissioning Kit

This AS-Interface commissioning kit contains all the hardware and software needed to fully configure and test AS-Interface devices. This kit can be used to bench test single AS-Interface devices or commission entire segments. This kit is a must for shop testing and for stroke testing AS-Interface devices.

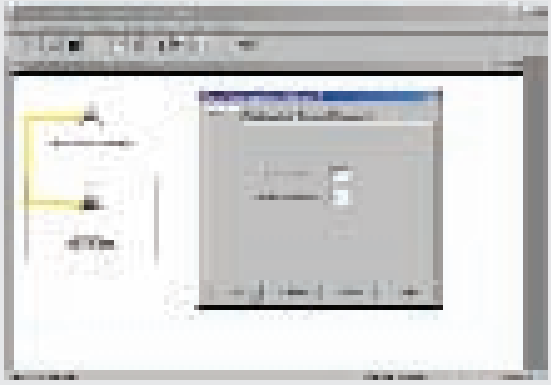
Kit Contents

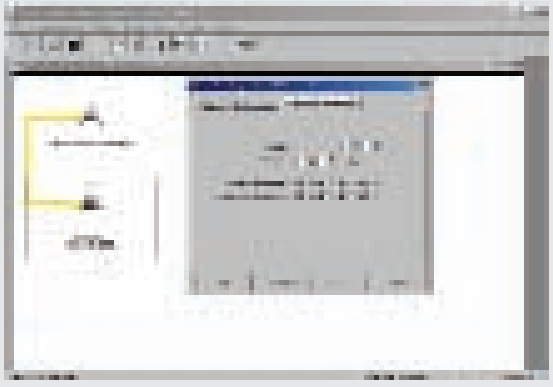
- Modbus RS485 Gateway
- 2.8 Amp AS-Interface power supply
- AS-Interface Control Tools Software
- Serial Cable
- Cable

Specifications

Gateway	• 458086 Modbus RS485/ AS-Interface Gateway
Power Supply	• 459015 AS-Interface 2.8 Amp
Cable Description	• 6' 9-pin male x 9pin female serial cable
Software	• AS-Interface control tools
Operating Temp.	• -25° to +55°C (-13° to +131°F)

AS-Interface Control Tools Screen





Commissioning Kits and Software

StoneL Model 464010

AS-Interface Analyzer

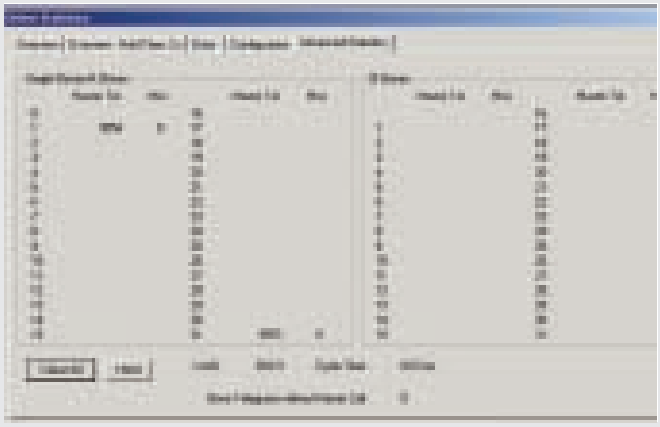
This AS-Interface Analyzer tool allows for Diagnostics and network verification tests. This device can be used to help diagnose network problems and verify network integrity. Works with a Windows PC

Functions

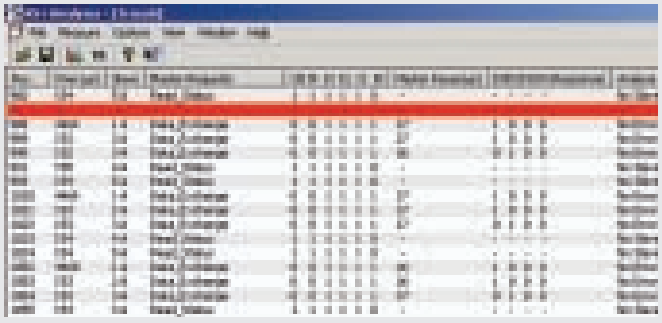
- Statistics mode: Statistical analysis of all telegrams sent on the network. Provides detail
- Data mode: Provides I/O values for each slave for
- Trace Mode: This mode records all network traffic for analysis with a PC

Specifications

Interface	• RS232 Interface with cable
Operating Systems	• Windows 98, Me, 2000, XP, NT4
Type	• Passive AS-i member
Memory	• 256,000 telegrams
Operating current	• 70ma out of AS-i
Indication LED's	• Power On, • RS232 Active • Test Mode
Power Supply	• 30 VDC From AS-i
Software	• AS-i Analyzer
Operating Temp.	• 0° to +55°C (32° to +131°F)



Trace Mode



Commissioning Kits and Software

StoneL Model 462002, 462004

AS-Interface Control Tools Software

462002 Software for configuration and testing AS-Interface Networks.

462004 AS-i control tools with advanced diagnostics.

Kit Contents

- Software CD

Specifications

Operating Systems	• Windows 98, Me, 2000, XP, NT4
Compatible with StoneL Gateways	• Profibus • Modbus • DeviceNet • Ethernet TCP/IP
Functions (462002 and 462004)	• Graphical or text view of AS-i Network • Set device addresses • Read inputs • Write outputs • Write parameters
Diagnostics Functions (462004 only)	• Show slaves that have caused configuration errors • Show error counters for all devices

Commissioning Kits and Software

StoneL Model 462008

AS-Interface Control Tools Software with Cable for Stainless Steel Gateways

Software and cable for configuration and testing AS-Interface Networks.

Kit Contents

- Software CD
- Serial connection cable for StoneL stainless steel gateways

Specifications

Operating Systems	• Windows 98, Me, 2000, XP, NT4
Compatible with StoneL Gateways	• Profibus • Modbus • DeviceNet • Ethernet TCP/IP
Functions	• Graphical or text view of AS-i Network • Set device addresses • Read inputs • Write outputs • Write parameters
Diagnostics Functions	• Show slaves that have caused configuration errors • Show error counters for all devices
Cable	• Serial cable for connection to StoneL stainless steel gateways with commissioning port (see gateways for details)

Commissioning Kits and Software

StoneL Model 462006

AS-Interface Control Tools Software with Cable for AB Masters

Software and cable for configuration and testing AS-Interface Networks

Kit Contents

- Software CD
- Serial connection cable for AB Masters (458076, 458074, 458100)

Specifications

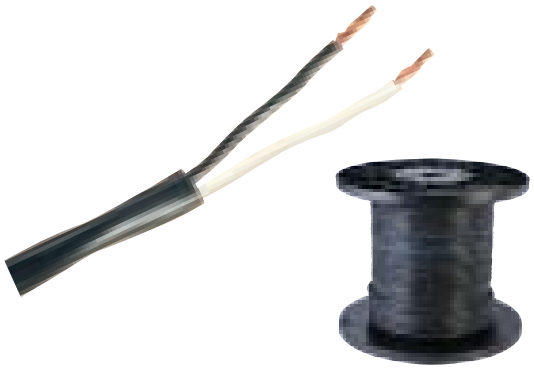
Operating Systems	• Windows 98, Me, 2000, XP, NT4
Compatible with StoneL AB Masters	• Control Logix • Compact Logix/MicroLogix • SLC 500
Functions	• Graphical or text view of AS-i Network • Set device addresses • Read inputs • Write outputs • Write parameters
Diagnostics Functions	• Show slaves that have caused configuration errors • Show error counters for all devices
Cable	• Serial cable for connection to StoneL AB Masters (458076, 458074, 458100)

Cable and Wiring

StoneL Model 463002

AS-Interface Bus Cable

This cable is selected for its rugged design and specifications favorable for use with the AS-Interface communication Protocol. The cable is constructed of sunlight resistant PVC and is UL type Power Limited Tray Cable (PLTC).



Kit Contents

- Two (2) conductor cable for AS-Interface networks
- Rugged PVC construction
- UL type PLTC

Specifications

Conductors	• 2 (Stranded Copper)
Length	• 100m (328')
Wire Gauge	• 16 AWG
Max Voltage	• 300 V RMS
DC Resistance	• 0.012 Ohms/m (@ 20°C)
Nominal Capacitance	• 65.6 pf/m (@ 1khz)
Nominal Inductance	• 0.59mH/m
Jacket Material	• Sunlight resistant PVC
Max Pulling Tension	• 71.4 lbs
Cable Diameter	• 6mm
Applicable Specifications	• UL Type PLTC, ITC, CMG, CL2, CL3 • C(UL) CMG, FT4
Weight	• 6.4 kg (14 lbs)

Converters and Adapters

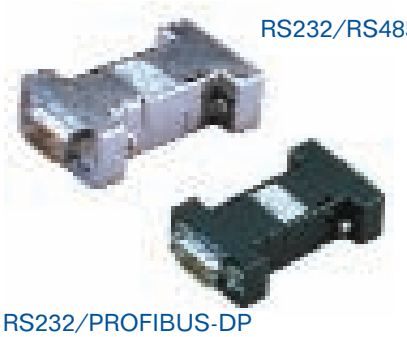
StoneL Model 461006 (RS232C/RS485), 461004 (RS232C/PROFIBUS-DP)

RS232 C/RS485

The RS232C/RS485 converter is the ideal interface between the RS232 interface of the PC and the master with RS485 interface. The converter is very compact and does not need an external power supply.

RS232 C/PROFIBUS-DP

The PROFIBUS converter is the ideal interface between the RS232 interface of the PC and the PROFIBUS gateway. The converter is very compact and does not need an external power supply, making it suitable for use with a laptop. Simply insert the connector between the PROFIBUS gateway and the RS232 connector cable. This converter contains a micro-controller that can correct and maintain the telegram timing needed by PROFIBUS that a PC cannot maintain. In addition, it converts from RS232 to RS485.

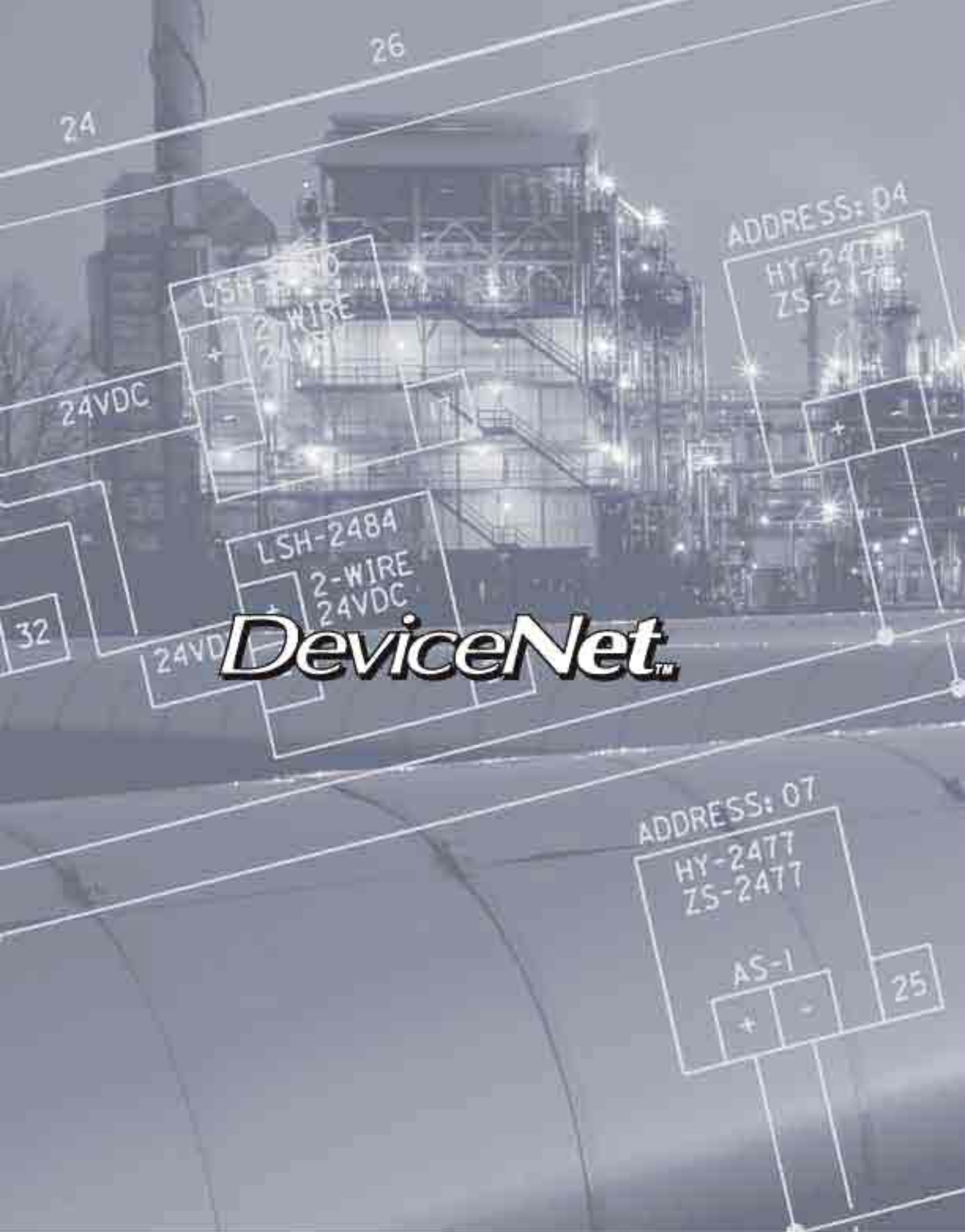


RS232/RS485

RS232/PROFIBUS-DP

Specifications

Type	• 461006: RS232/RS485 converter • 461004: RS232/PROFIBUS-DP converter for AS-Interface/ PROFIBUS gateway
Dimensions (L, W, H)	• 63 mm, 34 mm, 17 mm
Interfaces (d-Sub)	• RS232 (9-pin female) RS485 (9-pin male)
Operating Current	• < 6 mA from RS232
Length of Cables	• RS232: max. 2m, RS485: max. 2m
Operating Temp.	• 0° to +55°C (+32° to +131°F)
Storage Temp.	• -25° to +70°C (-13° to +150°F)
Baud Rate	• 461006: <= 57600 Baud • 461004: 19200 Baud


26
24
ADDRESS: 04
24VDC
LSH-2484
2-WIRE
24VDC
32
ADDRESS: 07
HY-2477
ZS-2477
AS-1
25

DeviceNet™

DeviceNet

CONTENTS

DeviceNet.

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Fax: 734-922-0027
www.odva.org

DeviceNet™ Overview and Analysis

The DeviceNet protocol dramatically reduces costs by integrating up to 62 devices on a 4-wire trunk network. Communications data is carried over two wires with a second pair of wires carrying power. Discrete and analog devices may be connected into the DeviceNet protocol.

DeviceNet is based on CAN (Controller Area Network) technology originally developed by Bosch to replace expensive wire harnesses with low cost network cable in automotive applications. The fast response and high reliability of the CAN system makes it ideal for "mission critical" applications.

DeviceNet has high noise immunity, and the communication electronics are available with wide temperature ranges, making the protocol desirable for industrial and process automation. Systems may be installed in hazardous environments by using acceptable explosion proof wiring or power limited wiring practices with nonincendive or explosion-proof enclosures. Plug-in connectors are readily available for heavy wash down, general purpose environments.

DeviceNet System Features

- More than 30% savings in installation costs over conventional systems.
- Capability to handle both analog and discrete valve and instrument applications.
- Power and communication supplied over the 4-wire bus. Capability to install up to 62 devices on the same bus network.
- Electronic Data Sheet provides accurate device configuration details.
- Hot insertion of field devices without dropping power. (General purpose environments.)
- Message prioritizing to enable fast throughput rate for critical information.
- Technology with proven reliability in millions of mission critical applications.

DeviceNet vs Conventional Systems

The DeviceNet protocol uses a trunk wiring network that may directly connect to field devices containing analog as well as discrete information. PLCs and/or PCs may also be attached directly to the trunk network.

Conventional Systems

Conventional systems have racks of inputs and outputs (I/O) located in distributed panels or in a centrally located control room. ***See figure 1.*** Discrete automated control valves typically have individual output control and feedback wiring from the I/O. When installing instruments and controls in a conventional system, substantial costs may be incurred for:

1. Design layout time for I/O cabinetry and conduit runs.
2. Space allocation for cabinets and conduit.
3. Conduit, wiring and fittings cost and installation time.
4. System commissioning and troubleshooting time.

DeviceNet Systems

In a DeviceNet system, up to 62 valve communication terminals, process instruments and PLC/PCs may be connected via drops or branches on a trunk network. ***See figure 2.*** Power and signal are carried over the four wire network. Each device has its own address and it may have several I/O points. Any discrete or analog instruments may be connected into the network provided it is DeviceNet compatible. Passive field devices may also connect into the network via StoneL DeviceNet VCTs and I/O modules, which have provisions for auxiliary inputs and outputs.

DeviceNet Economic Analysis

Sizable installation savings are realized over conventional systems when installing a DeviceNet network. The following is an estimate of installation costs of a conventional system versus DeviceNet (costs are listed in the amount per device):

Figure 1
Conventional System

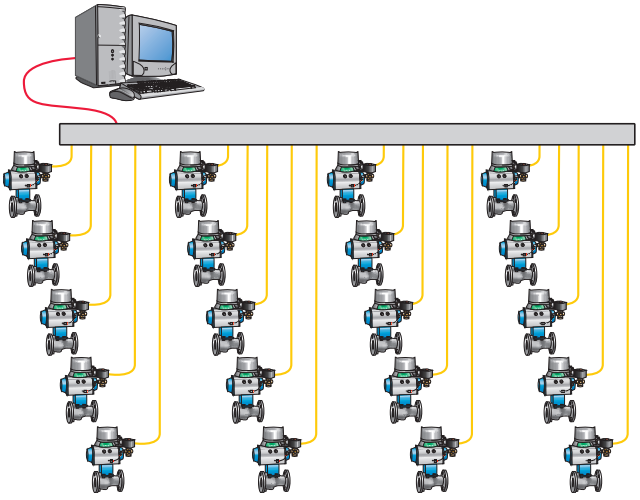
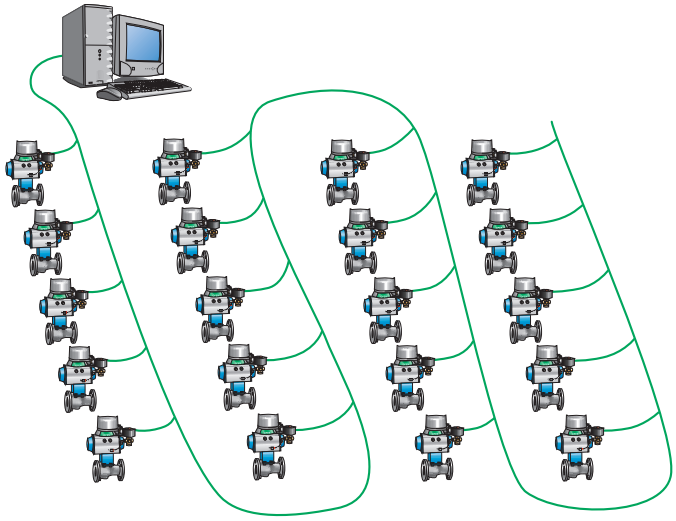


Figure 2
DeviceNet System



Installation Cost Comparison:

	Conventional	DeviceNet
Valve Monitor; VCT and Solenoid	$ 525	$ 675
Conduit and Wiring ($8/ft)	$1,200	$ 160
I/O Cards; DeviceNet Scanner	$ 30	$ 100
Power Supply	$ 10	$ 10
	$1,765	$ 945

Total Installation Savings
$820 per Device

This analysis is typical of an installation of 20 automated valve systems located in a cluster approximately 150 feet from the I/O rack. Each of the automated valves is located 20 feet apart in the cluster.

The StoneL DeviceNet I/O module and VCT have an auxiliary 4 to 20mA input that is bus powered. (No additional power is needed.) Other analog instrumentation such as flow meters, level controls, pressure sensors, etc. may be wired directly into the module, cutting installation costs further.

DeviceNet Analog Point Addition to StoneL VCTs or I/O Modules

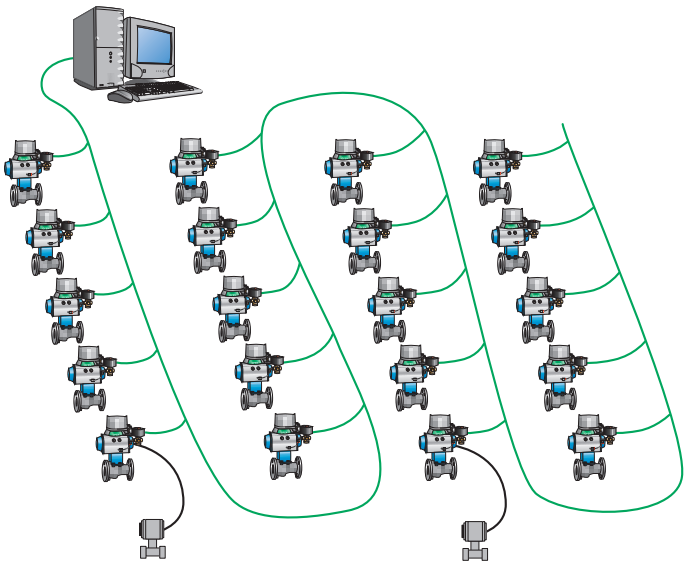
When adding an analog device to an existing StoneL DeviceNet VCT, a convenient connection may be made to the nearest device. In the example in ***figure 3***, the level control was 20 feet from the StoneL DeviceNet VCT and 150 feet from the central controller.

Analog Installation Cost Comparison:

	Conventional	DeviceNet
Conduit and Wiring ($8/ft)	$1,200	$ 160
Analog Input Point	$ 30	$ —
	$1,230	$ 160

Total Installation Savings
$1,070 per added Analog Device

Figure 3
DeviceNet Analog Point Addition



As mentioned earlier, there are several other considerations that have not been quantified as follows:

- Design time may be cut in half.
- Conduit and cabinetry space may be cut by two-thirds.
- Right first-time wiring may become the norm and trouble-shooting time dramatically reduced during commissioning.
- StoneL DeviceNet modules have onboard diagnostics to help maintain equipment.

DeviceNet Network Specifications

Topology	Trunk line with drops and/or branches
Cabling	Two separate shielded twisted pairs contained in one shielded cable; may be thick trunk, thin trunk or flat cable
Base Technology	CAN (Controller Area Network)
Number of Devices	62 per network
Data Delivery	8 bytes of data for I/O; more if device supports fragmentation
Power; Thick Cable Thin Cable	 8 Amps @ 24 VDC 4 Amps @ 24 VDC
Cable Length (Thick)	Dependent on data rate and cable type (see table below)

		Drop Length	
Data Rate	Trunk Length	Maximum	Cumulative
125 Kbaud	500m(1,640ft)	6m(20ft)	156m(512ft)
250 Kbaud	250m(820ft)	6m(20ft)	78m(256ft)
500 Kbaud	100m(328ft)	6m(20ft)	39m(129ft)

Cable Length (Thin)	100m (328ft)
Communication Methods	• Master/Slave Polling • Cyclic Polling • Change of State • Strobed I/O • Explicit Messaging
Data Signal	Square wave digital with non return to zero encoding
Error Detection	Automatic retransmission of corrupted messages and autonomous switching off of defective nodes
Address Setting	On-line via DeviceNet configuration software and PC interface module; off-line with dip switches
Support Organization	Open DeviceNet Vendor Assn. www.odva.org

Power Supplies

StoneL Model 459038

8.0 Amp Power Supply

This Power Supply is designed to provide power to the DeviceNet Network and attached devices. This power supply meets all ODVA specifications for use with thick or thin cable.

Features

- NEC Class 1 and UL Class I, Division 2 Approved
- Spring Clamp terminals
- DC output ok (dry contact)

Enclosure Option

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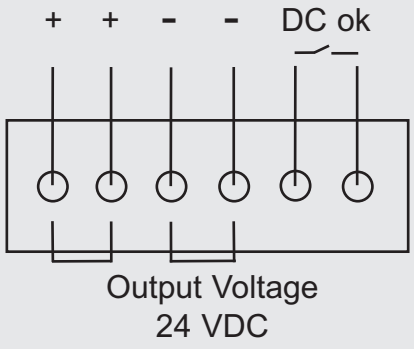
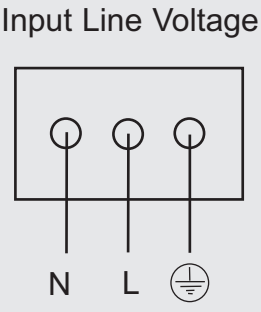
Specifications

Output Voltage	• 24.1 VDC ±0.2%
Output Current	• 8.0 Amps
Output Ripple	• 50mVpp (max)
Input Voltage	• Universal 100 - 240VAC (50-60Hz)
Input Current	• 2.3A - 1.0A (100VAC / 240VAC)
Power Factor	• 0.99 / 0.92 (100VAC / 240VAC)
Efficiency	• 92.3% / 92.7% (100VAC / 240VAC)
Over Voltage Protection	• 29.5 VDC (max)
Over Current Protection	• 9.5Amp (max)
Turn-on Time	• 85ms
Turn-on Delay	• 600ms
Holdup Time	• 32ms
NEC Power Class	• NEC Class 1
Area Approvals	• Class I, Div 2; T4; Groups A,B,C,D
Displays	• Power OK, Green LED • Overload, Red LED
Operating Temp.	• -25°C to +70°C (+14°F to +140°F)
Storage Temp.	• -40°C to +85°C (-40°F to +185°F)
Housing	• Al/Mg Alloy DIN rail mounting
Dimensions	• 124mm, 60mm, 117mm (L, W, H)
Ingress Protection	• IP20, field enclosure required
Approvals	• UL508, UL1950, cULus, CE
Weight	• 900g (2.0 pounds)

Schematic Drawing





Power Supplies

StoneL Model 459036

3.8 Amp Power Supply

This DeviceNet Power Supply is designed to provide power to the DeviceNet Network and attached devices. This power supply meets all ODVA specifications for use with thick or thin cable. This supply carries the Class 2 limited power source rating necessary for installations to meet National Electric Code (NEC) or Canadian Electric Code (CEC) without the need for secondary fusing.

Features

- NEC Class 2 and UL Class I, Division 2 Approved
- Spring Clamp terminals
- DC output ok (dry contact)

Enclosure Option

FR

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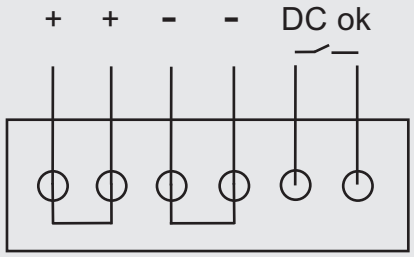
Specifications

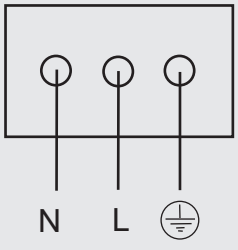
Output Voltage	• 24.1 VDC ±0.2%
Output Current	• 3.8 Amps
Output Ripple	• 50mVpp (max)
Input Voltage	• Universal 100 - 240VAC (50-60Hz)
Input Current	• 1.1A / 0.5A (100VAC / 240VAC)
Power Factor	• 0.99 / 0.91 (100VAC / 240VAC)
Efficiency	• 91.9% / 92.4% (100VAC / 240VAC)
Over Voltage Protection	• 29 VDC (max)
Over Current Protection	• 4.15Amp (max)
Turn-on Time	• 100ms
Turn-on Delay	• 200ms
Holdup Time	• 44ms
NEC Power Class	• NEC Class 2
Area Approvals	• Class I, Div 2; T4; Groups A,B,C,D
Displays	• Power OK, Green LED • Overload, Red LED
Operating Temp.	• -25°C to +70°C (+14°F to +140° F)
Storage Temp.	• -40°C to +85°C (-40°F to +185° F)
Housing	• Al/Mg Alloy DIN rail mounting
Dimensions	• 124mm, 40mm, 117mm (L, W, H)
Ingress Protection	• IP20, field enclosure required
Approvals	• UL508, UL1950, cULus, CE, Class 2
Weight	• 620g (1.4 pounds)

Schematic Drawing



Output Voltage
24 VDC

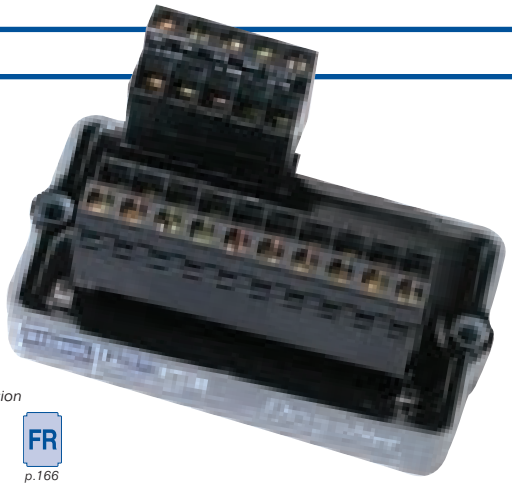
Input Line Voltage



Input/Output Modules

StoneL Model 461007, 465012 (DIN)

This I/O module is designed to function as a DeviceNet node (Group 2 slave) with termination points for connecting switches/sensors as well as output devices such as solenoid valves and relays. Outputs can be configured to fail on or off.



Inputs and Outputs
- Two (2) Discrete inputs
- Two (2) Discrete outputs
- One (1) Analog (4 to 20 mA) input

Other Data
- Cycle count
- Date of last service
- Pre-determined output fail state

Enclosure Option

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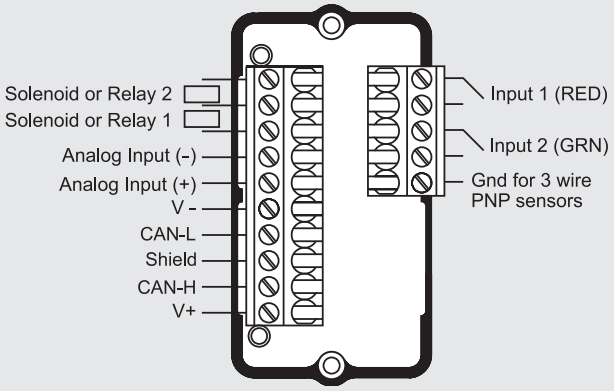
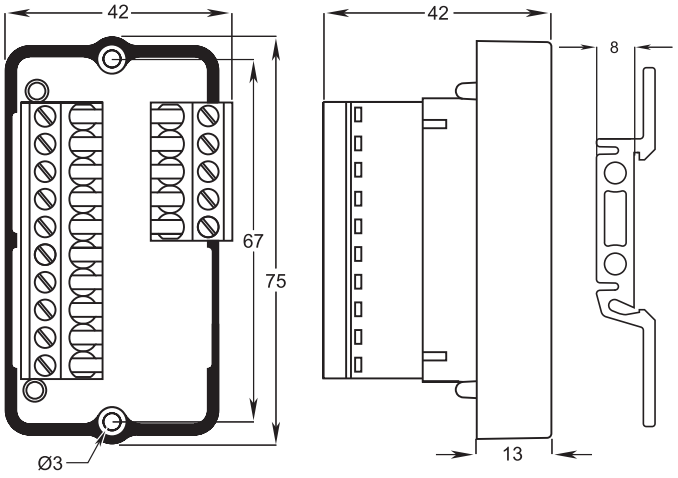
Specifications

Inputs	• (2) 7mA @ 24 VDC gold contact mechanical, low power reed, or proximity sensor
Outputs	• (2) 24 VDC (4 watts total power available)
Analog Input	• (1) Analog (4-20mA) input 8 bit resolution (0.1%)
Operating Voltage	• 24 VDC via DeviceNet voltage
Current Consumption	• <60mA (with no outputs energized)
Indication	• 2 LED's indicate input status (Red/Green)
Dimensions	• 75mm, 42mm, 42mm (L, W, H)
Operating Temp.	• -40° to +85°C (-40° to +185°F)

Wiring Diagram



Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465012

DeviceNet Features

Device Type	Generic
Explicit peer-to-peer messaging	N
I/O peer-to-peer messaging	N
Configuration consistency value	N
Faulted node recovery	N
Baud rates	125K, 250K, 500K
Master/Scanner	N

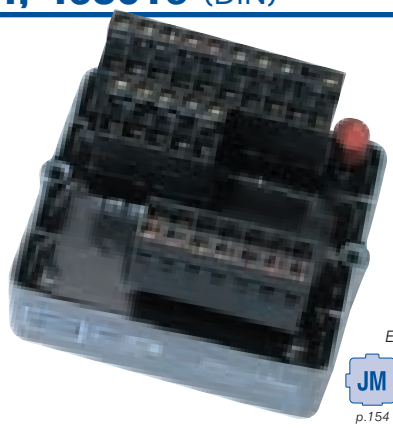
I/O Slave Messaging

Bit strobe	N
Polling	Y
Cyclic	Y
Change of state	Y

Input/Relay Output Modules

StoneL Model 461083, 465018 (DIN), 461084, 465019 (DIN)

This I/O module is designed to function as a DeviceNet node with termination points for connecting switches/sensors as well as relay outputs to operate devices like motors and other high power devices. Outputs can be interlocked to operate AC motors or independent to operate independent AC loads. Outputs can be configured to fail on or off.



Enclosure Option

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Inputs and Outputs

- Two (2) Discrete inputs
- Two (2) Discrete (relay) outputs
- One (1) Analog Input

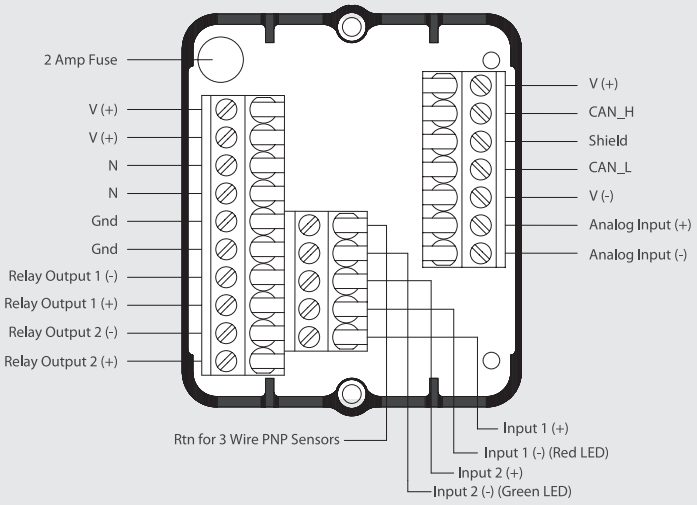
Other Data

- Cycle count
- Date of last service
- Pre-determined output fail state

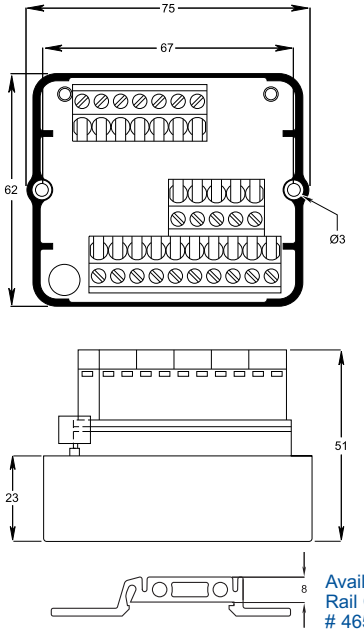
Specifications

Model Numbers	• Interlocking: 461083, 465018(DIN) • Independent: 461084, 465019(DIN)
Inputs	• (2) 7mA @ 24VDC, gold contact mechanical, low power reed, or proximity sensor
Outputs	• Interlocking: (2) 120/250VAC @ 2A interlocked for motor operation • Independent: (2) 120/250VAC @ 2A independent for other AC loads
Operating Voltage	• 24 VDC via DeviceNet Voltage
Current Consumption	• <60mA (with no outputs energized)
Analog Input	• (1) Analog (4-20mA) input 8 bit resolution (0.1%)
External Voltage	• 120/250 VAC (for relay outputs)
Indication	• 2 LEDs indicate input status (Red/Green)
Dimensions	• 75mm, 62mm, 51mm (L, W, H)
Operating Temp.	• -40° to +85°C (-40° to +185°F)

Wiring Diagram



Dimensions (in mm)



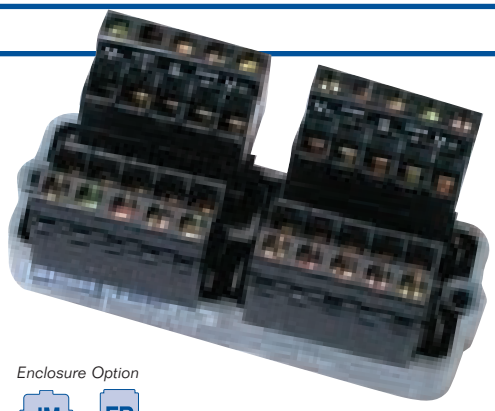
Available with DIN Rail Clip. Specify model # 465018 or 4655019

Drop Connectors

StoneL Model 461053, 465002 (DIN)

Passive Multi-drop Connector (2 Drops)

This Multi-drop Connector is compact with direct-mount for wiring DeviceNet networks. This device provides terminations for Bus In, Bus Out, and two (2) individual drops or spurs.



Features

- IP20 housing
- Direct mount or DIN rail mount available

Enclosure Option

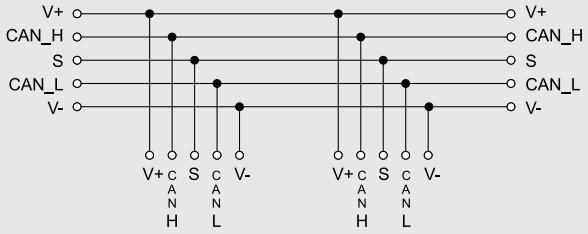
JM p.154 FR p.166

CE

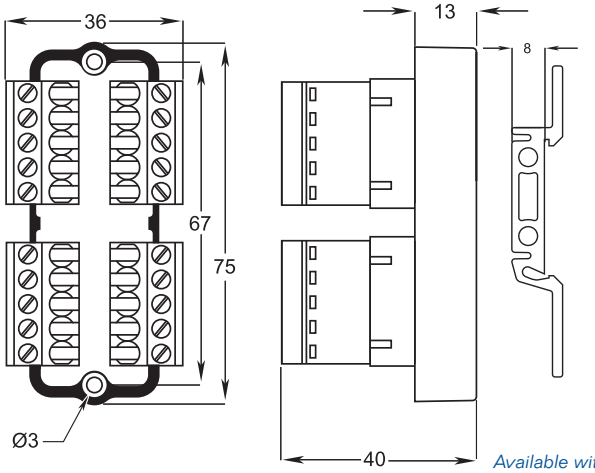
Specifications

Protocol	• DeviceNet
Max Spurs (Drops)	• 2
Type	• Passive Drops
Max Current	• 8 Amps
Voltage Drop, Bus Trunk	• Negligible
Voltage Drop, Spur	• Negligible
Maximum Voltage	• 35VDC
Current Consumption	• None
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)
Housing	• Engineered resin, direct mount
Housing Dimensions	• 75mm, 36mm, 40mm (L, W, H)

Schematic Drawing

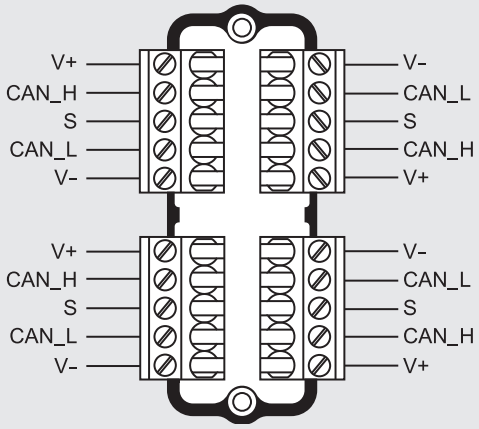


Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465002

Wiring Diagram



Drop Connectors

StoneL Model 461077

Passive Multi-drop Connector (4 Drops)

This Multi-drop Connector is compact with DIN rail mount for wiring DeviceNet networks. This device provides terminations for Bus In, Bus Out, and four (4) individual drops or spurs.

Features

- DeviceNet power status LED
- DIN rail mounting
- IP20 housing

Enclosure Option

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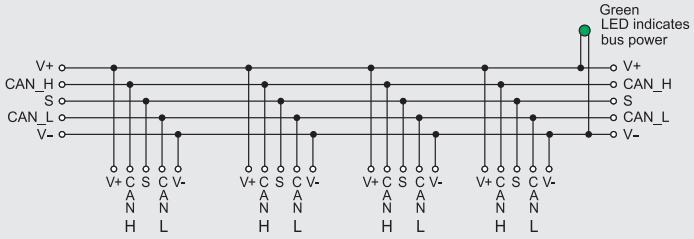
CE

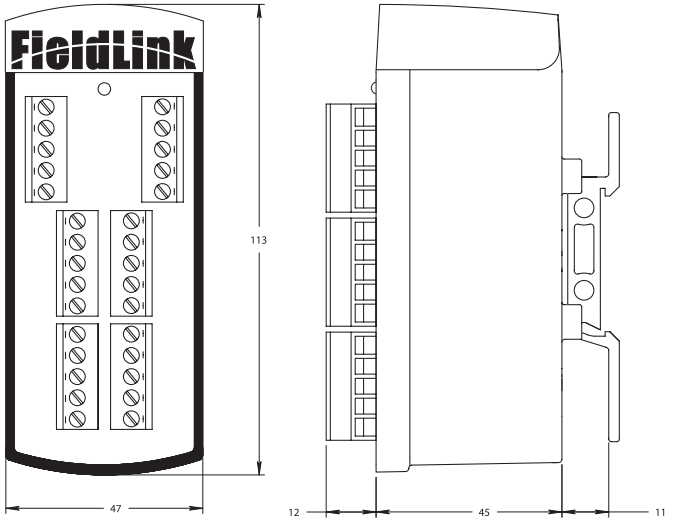
Specifications

Protocol	• DeviceNet
Max Spurs (Drops)	• 4
Type	• Passive drops
Bus Trunk Max Current/Drops	• 8 Amps
Voltage Drop, Bus Trunk	• Negligible
Voltage Drop, Spur	• Negligible
Max Voltage	• 35 VDC
Current Consumption	• 2 mA
Displays	• DeviceNet power status, green LED
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)
Housing	• Engineered Resin, DIN rail mounting
Housing Dimensions	• 113mm, 47mm, 68mm (L, W, H)
Ingress Protection	• IP20

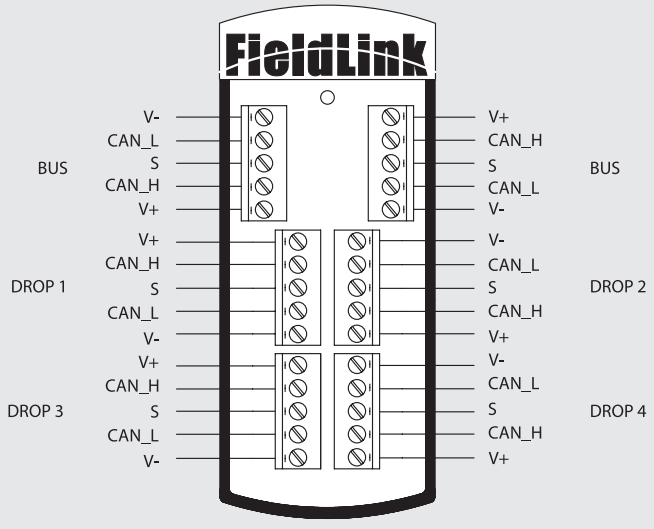
Schematic Drawing



Dimensions (in mm)



Wiring Diagram

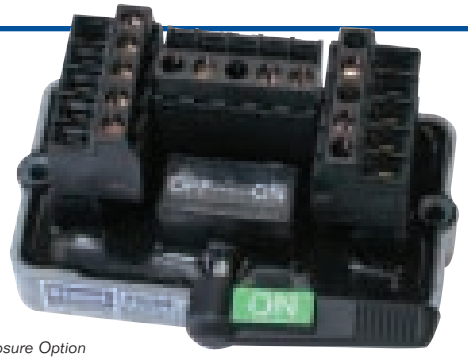


Drop Connectors

StoneL Model 461117, 465009 (DIN)

Power Protected Drop Switch (1 Drop)

This disconnect switch is a compact drop connector for wiring DeviceNet networks. It has a disconnect switch that allows the user to disconnect a drop from the trunk. This device also provides current limiting on the power leg to prevent power losses.



Enclosure Option

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Features

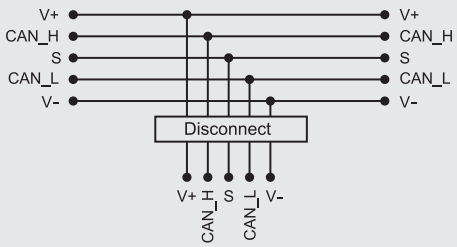
- Current limit on power drop
- Disonnects bus segment
- Direct mount or DIN rail mount available

CE

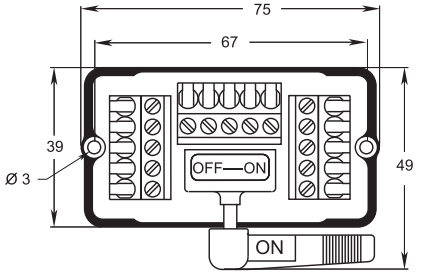
Specifications

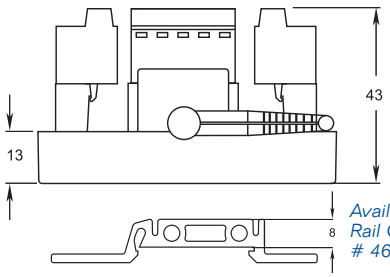
Model Numbers	• 461117, 465009 (DIN)
Protocol	• DeviceNet
Max Devices per Drop	• 1
Type	• Passive Drop Switch
Max Current (Trunk)	• 8 Amp
Max Current (Drop)	• 0.2 Amp
Max Voltage	• 35 VDC
Voltage Drop (Trunk)	• Negligible
Voltage Drop (Drop)	• <1V
Current Consumption	• None
Displays	• None
Operating Temp.	• -40° to +85°C (-40° to 185°F)
Storage Temp.	• -40° to +85°C (-40° to 185°F)
Housing	• Engineered Resin
Housing Dimensions	• 75mm, 49mm, 43mm (L, W, H)
Ingress Protection	• IP20

Schematic Drawing



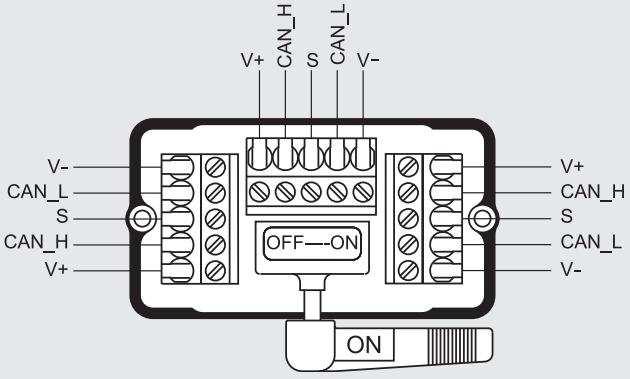
Dimensions (in mm)





Available with DIN Rail Clip. Specify model # 465009

Wiring Diagram



Commissioning Kits and Software

StoneL Model 464002

DeviceNet Commissioning Kit

This DeviceNet commissioning kit contains all the hardware and software needed to fully configure and test DeviceNet devices. This kit can be used to bench test and commission single DeviceNet devices. This kit is a must for shop testing and for stroke testing DeviceNet devices.

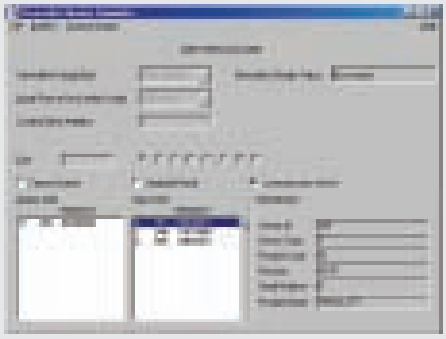
Kit Contents

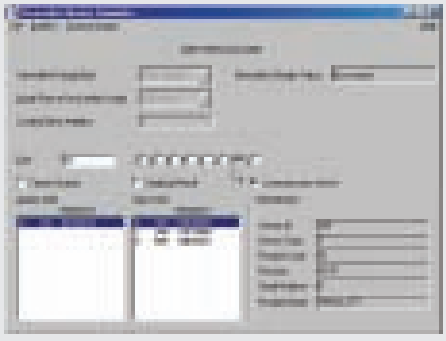
- DeviceNet commissioning cable assembly
- Portable 24VDC power supply
- DeviceNet master simulator software
- Carrying case

Specifications

Hardware	• Master simulator hardware (USB Interface)
Power Supply	• 120VAC input (24VDC 0.75A output)
Software	• DeviceNet master simulator
Operating Temp.	• -0° to +55°C (-32° to +131°F)

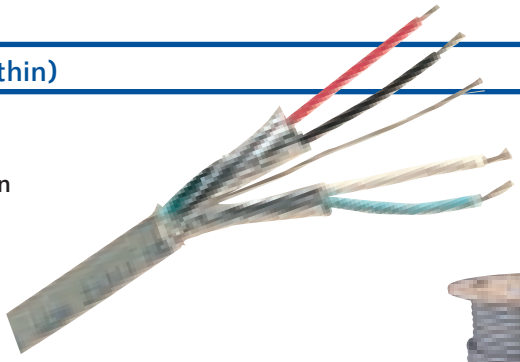
DeviceNet Master Simulator Screen





Cable and Wiring

StoneL Model 463006 (thick), 463004 (thin)



DeviceNet Bus Cable

These cables were selected for their rugged design and specifications favorable for use with the DeviceNet communication protocol. The cables are constructed of sunlight resistant PVC and are UL type Power Limited Tray Cable (PLTC).

Features

- 4-conductor + Shield for DeviceNet Networks
- Rugged PVC Construction
- UL Type PLTC

Specifications (463006) DeviceNet Thick Trunk Cable

Conductors	• 4 (Stranded Tinned Copper) plus Shield
Length	• 100m (328')
Wire Gauge	• 15 AWG Power pair / 18 AWG Signal pair
DC Resistance	• (15) .012 Ohms/m / (18) .023 Ohms/m
Nominal Capacitance	• 39.4 pf/m
Jacket Material	• PVC
Cable Diameter	• 12.2mm
Applicable Specifications	• DeviceNet Thick Trunk Cable • UL Type PLTC, CMG • C(UL) CMG, FT4 • CSA
Weight	• 19 kg (42 lbs)

Specifications (463004) DeviceNet Thin Drop Cable

Conductors	• 4 (Stranded Tinned Copper) plus Shield
Length	• 100m (328')
Wire Gauge	• 22 AWG Power pair / 24 gauge Signal pair
DC Resistance	• (22) .057 Ohms/m / (24) .091 Ohms/m
Nominal Capacitance	• 39.4 pf/m
Jacket Material	• PVC
Cable Diameter	• 7mm
Applicable Specifications	• DeviceNet Thin Drop Cable • UL Type PLTC, CMG CL2 • C(UL) CMG, FT4 • CSA
Weight	• 8 kg (17 lbs)

Terminator

StoneL Model 461139

This DeviceNet terminator contains the 121 Ohm resistor required for terminating a DeviceNet segment. This device is designed to be very compact and easy to use. The terminator is used to prevent reflections on the cable resulting from the ends of the segment. One terminator should be located at each end of the segment.

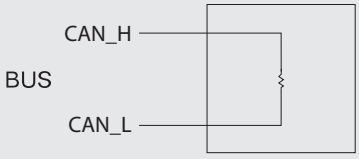
Features

- 121 Ohm resistor
- Compact, moisture resistant shell

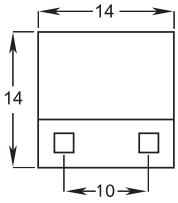
Specifications

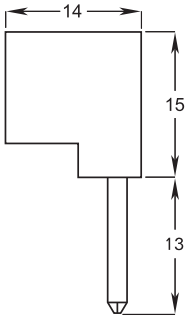
Resistor	• 121 Ohms +/-1%
Housing material	• ABS
Pins	• 2 (not polarity sensitive)
Dimensions	• 28mm, 14mm, 14mm (L, W, H)
Operating Temp.	• -40°C to + 82°C (-40°F to +180°F)

Schematic Drawing

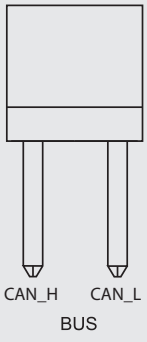


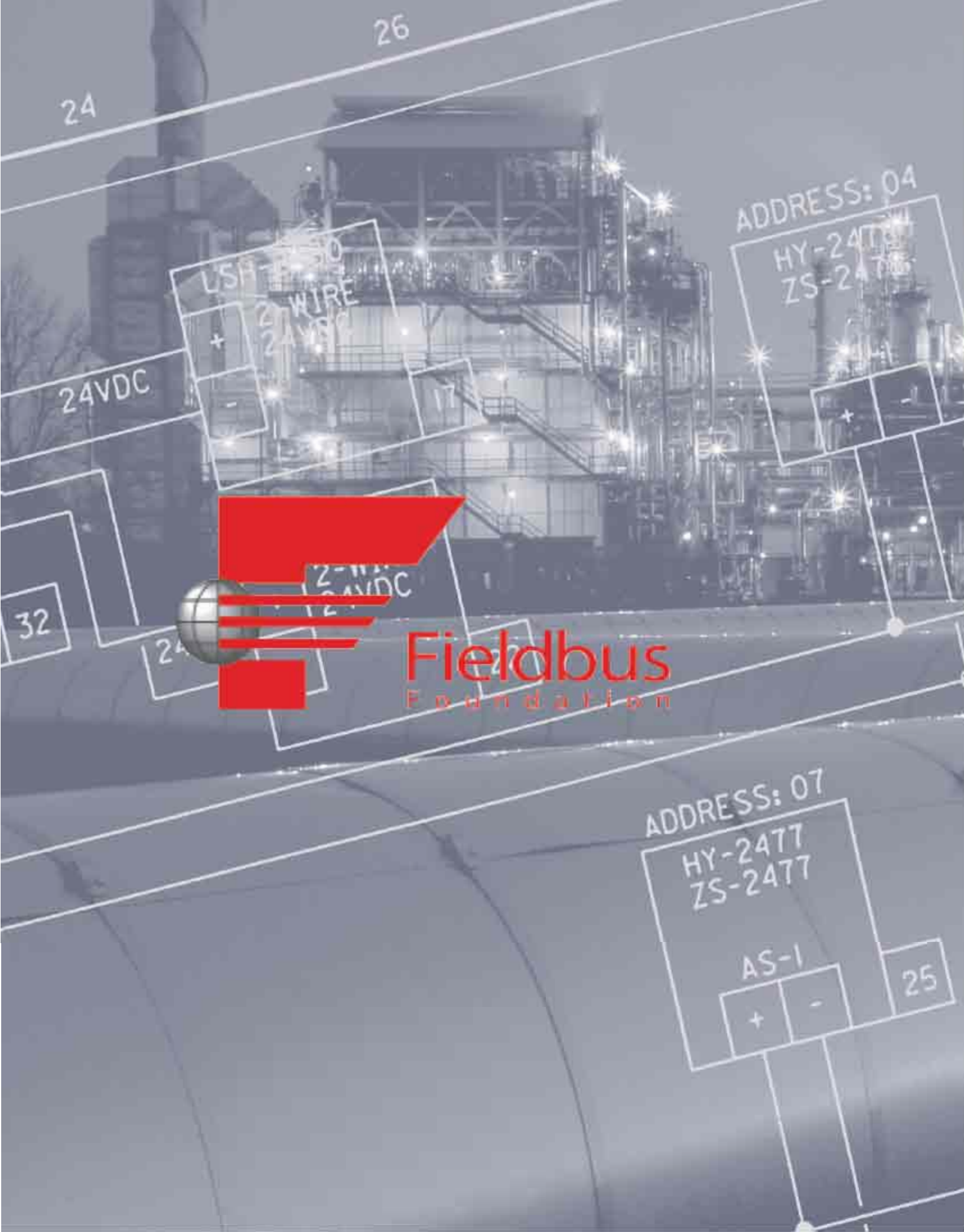
Dimensions (in mm)





Wiring Diagram




24
26
ADDRESS: 04
HY-24
ZS-24
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Foundation
ADDRESS: 07
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Foundation Fieldbus

CONTENTS

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www.fieldbus.org

Foundation Fieldbus Overview and Analysis

Foundation Fieldbus H1 level has been designed as a digital replacement of the 4 to 20mA standard in the process industries. Foundation Fieldbus is also a LAN (Local Area Network) for instruments used in both process and manufacturing automation with built-in capability to distribute the control application across the network. The physical wiring is also fully compatible with intrinsic safety (IS) or nonincendive wiring standards and may be used in hazardous, as well as general purpose areas. In hazardous areas standard explosion-proofing or power limited concepts may be used, as well as IS concepts, offering greater cabling design flexibility.

Foundation Fieldbus has a unique user layer that defines the interface by which users can communicate with devices through a set of blocks. These blocks are 1) resource blocks, 2) function blocks and 3) transducer blocks. Resource blocks provide on-line information of name, manufacturer and serial number. Function blocks describe control and I/O behavior. Transducer blocks decouple the function blocks from the functions required to read/write inputs and outputs.

With Foundation Fieldbus, the user is able to interconnect the function blocks and schedule the running of the blocks to create control algorithms. The control may reside in the field devices rather than in the centralized controller depending on the capability of the field device.

Foundation Fieldbus (FF) Features

- Reduce field wiring costs.
- Intrinsic safety wiring option available to further reduce costs in hazardous environments.
- Same bus used for analog and discrete devices.
- Control (LAS) for the segment may reside in the field devices freeing up space in central controllers.
- Time stamping of control parameters performed in field devices and coupled to control data to optimize operating performance.
- Provides greater controllability and process information.
- Standardized function blocks, representing control and I/O; speed set up.
- Long bus length of 1900m (6,175 ft) and spurs up to 120m (390 ft) span most process systems.
- Supported by over 80% of the world's process instrumentation suppliers.

Foundation Fieldbus vs Conventional Systems

The Foundation Fieldbus network may consist of 16 instruments connected to a two-wire bus. This translates into significant savings over conventional point-to-point wiring due to less expensive wiring, reduced space, and greater flexibility. In control loops, Foundation Fieldbus offers greater controllability and transfers control to the field for better reliability.

Conventional System

Analog and discrete instruments are wired individually to centralized controllers in a conventional system. Control functions are processed in the centralized controller with passive devices accepting commands and providing feedback. ***See figure 1.*** No on-line diagnostics may be performed and instrument parameters, as well as descriptive device information, is recorded manually.

Critical factors to consider in evaluating a conventional system include:

1. Design layout for I/O racks and conduit runs.
2. Space allocation for cabinets and conduit.
3. Conduit, wiring and fittings cost and installation time.
4. System commissioning and troubleshooting.

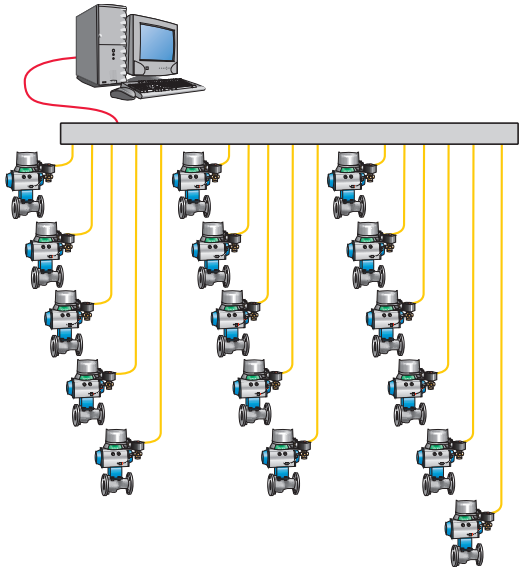
Foundation Fieldbus System

In a Foundation Fieldbus system, typically from 2 to 16 devices may be included on a common network.***See figure 2.*** One of the devices must be a Link Active Scheduler (LAS) or Link Master, which manages the communication network. There may be multiple Link Masters on the same bus. If the current LAS fails, another Link Master may take over the LAS function and the operation of the fieldbus will continue. Wiring topology may be bus or tree topology with the bus topology illustrated. Since Foundation Fieldbus has limited power delivery capability, two more power wires are used in the example to provide power for solenoid coils. Any Foundation Fieldbus compliant device may be connected into the network.

Foundation Fieldbus Economic Analysis

When using a StoneL VCT module and integrating it into the Foundation Fieldbus (FF) network illustrated, there are significant savings. This system consists of 16 automated valve systems located in a cluster approximately 200 feet from the I/O rack. Each of the automated valves is located 20 feet apart in the cluster. Following is an estimated comparison:

Figure 1
Conventional System



Installation Cost Comparison (per field device)

	Conventional	FF*
Computer I/O; Master/Gateway	$ 70	$160
Conduit, Cable Tray, Wiring and Fittings	$ 1,400	$ 290
Valve Monitor/VCT and Pneumatic Valve	$ 315	$1,025
Switched Protected Drop Connector	NA	$ 160
Installation and Commissioning Labor	$ 600	$ 250
Power Supply	$ 50	$ 30
Total Installed Cost	$ 2,435	$1,915

Total Installation Savings

$520 per device

* Foundation Fieldbus is not directly comparable. Analog instruments require minimal adder over conventional 4 to 20mA system making this system cost effective when combining analog and discrete field instruments on the same segment. Functionality for FOUNDATION Fieldbus devices is also significantly greater, offering increased diagnostic and operational capabilities.

Foundation Fieldbus Analog Point Addition to StoneL I/O Modules

The StoneL Foundation Fieldbus I/O modules have an auxiliary 4 to 20mA input and a 4 to 20mA output which is powered from the supplemental 24VDC supply bus. Additional savings may result from connecting the 4 to 20mA device directly to the StoneL I/O instead of running wires back to I/O at the controller. ***See figure 3.*** The additional analog input would be represented as an AI (Analog Input) function block as part of the StoneL device description. StoneL I/O analog 4 to 20mA point addition is illustrated.

The 4 to 20mA instrument may be conveniently wired directly into the StoneL I/O module. With a conventional system the control would need a 200 foot run back to the controller. Other savings would result from:

- Reduction in design time because of simpler conduit and cabling systems.
- Reduction in conduit and cabinetry space.
- Right first time wiring and easier troubleshooting.
- Faster commissioning.

Analog Installation Cost Comparison:

	Conventional	FF
Conduit and Wiring ($8/ft)	$1,600	$ 160
Analog Input Point	$ 30	$ 650
Total Installed Cost	$1,630	$ 810

Total Installation Savings

$320 per device

Foundation Fieldbus Network Specifications

Topology	Bus/Tree; terminators required
Cabling	Shielded twisted pair
Bus Power	Typically 20mA /device @ 9 to 32 VDC
Number of Devices	2 to 16 typical (Theoretically 32)
Data Delivery	Unlimited
Max. Cable Length	1900m (6,125ft) total of trunk length and all spurs
Spur Length	# of Devices / Max Length: 15 to 16 — 60m (197ft); 13 to 14 — 90m (295ft); 2 to 12 — 120m (394ft)
Transmission Rate	31.25 kbit/second
Cycle Time	Link Active Scheduler determines priority
Communication Method	Publisher/Subscriber: delegated token passing with cyclic and acyclic options.
Link Active Scheduler	Acts as master for bus; schedules communication; maintains live list of segment devices
Data Signal	Manchester Biphase-L with synchronous serial signaling
Error Checking	Frame check sequence comparison
Addressing	May be done off-line or performed on-line automatically by system management
Support Organization	Fieldbus Foundation www.fieldbus.org

Figure 2
Foundation Fieldbus Network

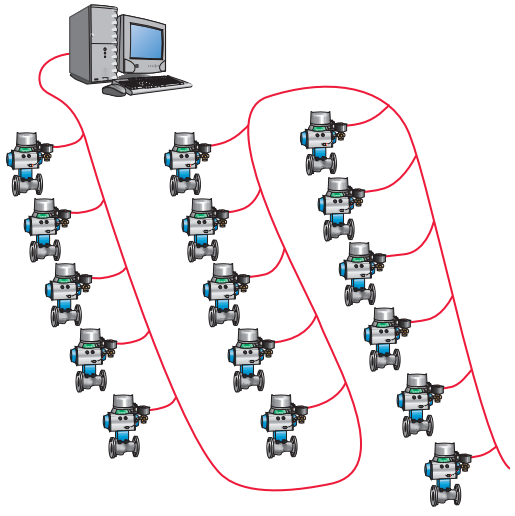
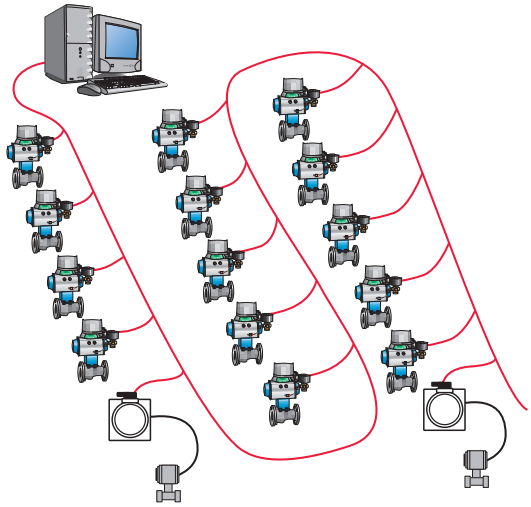
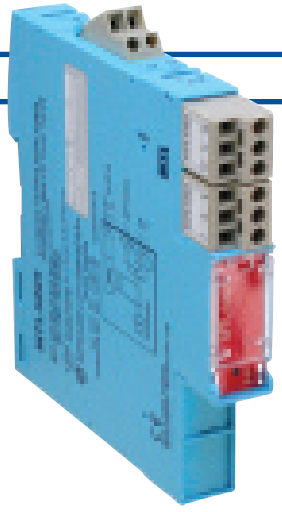


Figure 3
Foundation Fieldbus analog point addition



Power Conditioner

StoneL Model 459014



.35 Amp Power Conditioner

This Foundation Fieldbus Power Conditioner is designed to provide power to the Fieldbus Network and attached devices. This power supply meets all Foundation Fieldbus specifications and complies with the requirements of a Type 131 power supply. (Non-IS power supply) For I.S. applications it must be used with appropriate I.S. barriers.

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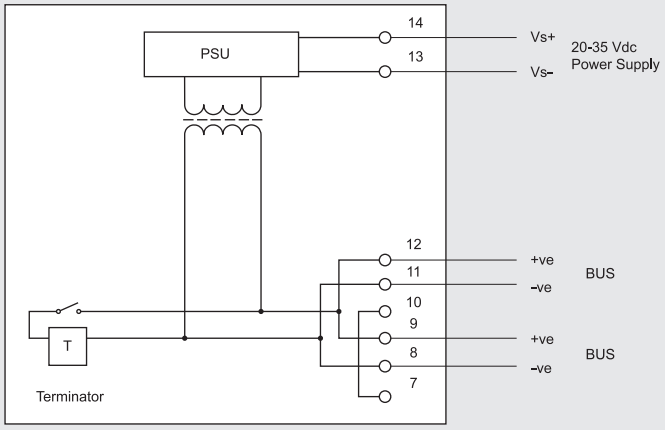
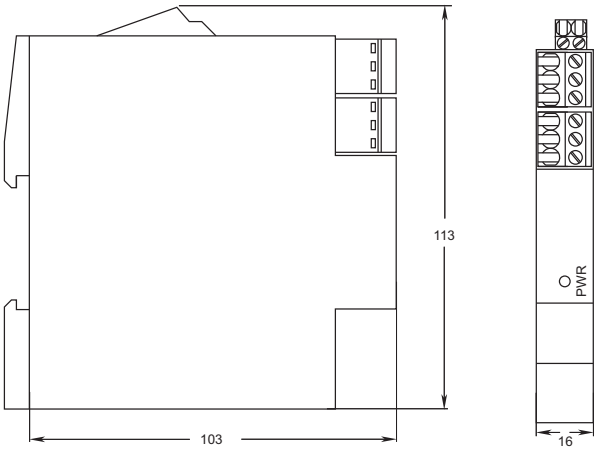
Specifications

Output Voltage	• 19 VDC +/- 2%
Output Impedance (dc)	• <2W
Output Current	• .35 Amps
Input Voltage	• 20-30VDC
Displays	• Power OK, Green LED
Operating Temp.	• -20°C to +60°C (-4° to +140°F)
Housing	• DIN rail mounting
Dimensions	• 16mm, 103mm, 113mm (L, W, H)
Ingress Protection	• IP20, field enclosure required
Approvals	• Cenelec: EEx nA IIC T4 • FM: Class 1 Division 2 Groups A,B,C,D • CSA: Class 1 Division 2 Groups A,B,C,D
Weight	136g (0.3 pounds)

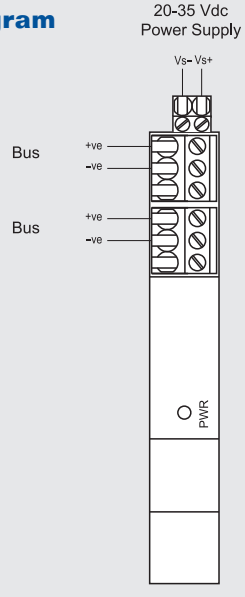
Schematic Drawing



Dimensions (in mm)

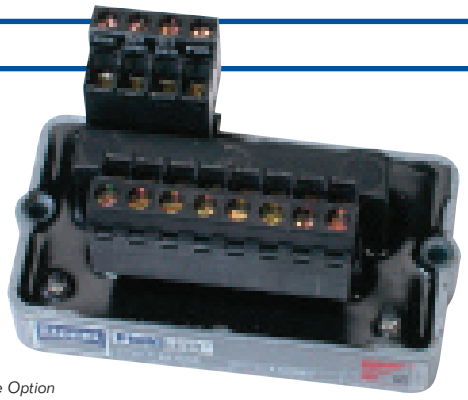


Wiring Diagram



Input/Output Modules

StoneL Model 461052, 465014 (DIN)



Input/Bus Powered Output Module

This I/O module is designed to function as a Foundation Fieldbus node with termination points for connecting switches/sensors as well as output devices such as solenoid valves and relays. Outputs can be configured to fail on or off.

Inputs and Outputs
- Two (2) Discrete inputs
- Two (2) Discrete outputs

Features
- Pre-determined output fail state

Enclosure Option

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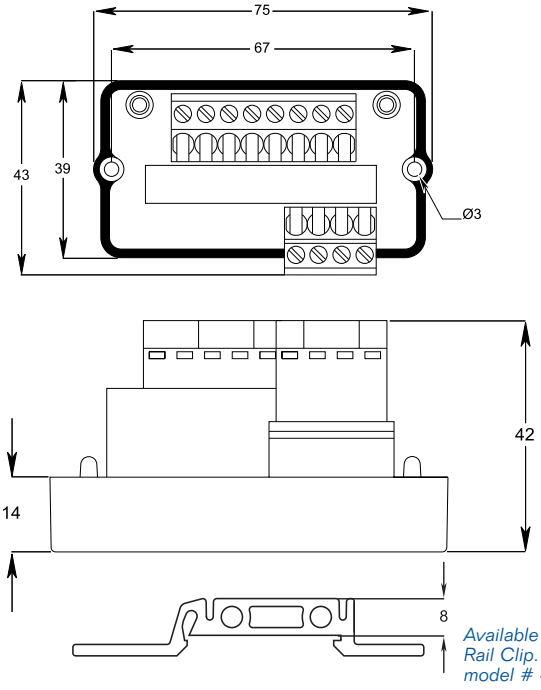
Specifications

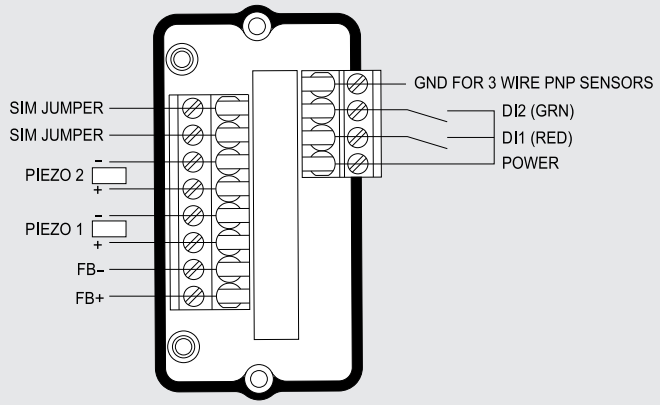
Model Numbers	• 461052, 465014 (DIN)
Inputs	• (2) 6.5 VDC <.045mA, must be low power dry contact or solid state pnp capable of operating at 6.5 VDC and <1mA.
Outputs	• (2) 6.5 VDC 2mA. Suitable for StoneL Piezo Valve
Operating Voltage	• 9 to 32 VDC via Foundation Fieldbus voltage
Indication	• (2) LEDs indicate discrete input status (Red/Green)
Approvals	• cFMus Approved Class 1 Div 2 (NI) • cFMus Approved Class 1 Div 1 (IS) (FISCO) (Entity)
Dimensions	• 75mm, 43mm, 42mm (L, W, H)
Operating Temp.	• -40° to +85°C (-40° to +185°F)

Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465014

Wiring Diagram



Input/Output Modules

StoneL Model 461054, 465015 (DIN)

Input/Externally Powered Output Module

This I/O module is designed to function as a Foundation Fieldbus node with termination points for connecting switches/sensors, as well as output devices such as solenoid valves and relays. This Module is also capable of reading one (1) analog input and controlling one (1) analog output via Foundation Fieldbus. This device requires external 24VDC power supply.

Inputs and Outputs

- Two (2) Discrete inputs
- Two (2) Discrete outputs
- One (1) Analog Input (4-20mA)
- One (1) Analog Output (4-20mA)

Features

- Pre-determined output fail state

Enclosure Option

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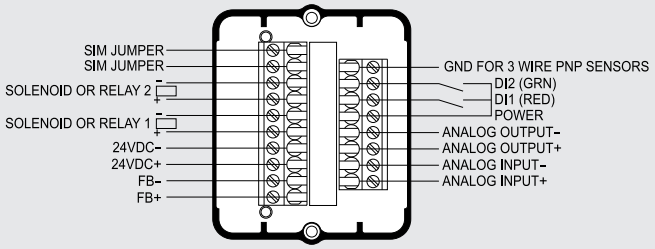
FM APPROVED

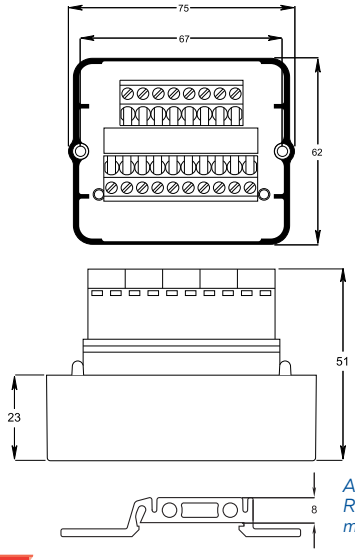
Specifications

Model Numbers	• 461054, 465015 (DIN)
Discrete Inputs	• (2) 6.5 VDC <.045mA, must be low power dry contact capable of operating at <.045mA@6.5VDC or solid state pnp capable of operating at 6.5VDC and <1mA.
Discrete Outputs	• (2) 24 VDC (4 Watts Total Power)
Analog Input	• (1) Analog (4-20mA) input 10 bit resolution (0.1%)
Analog Output	• (1) Analog (4-20mA) output 10 bit resolution (0.1%)
Operating Voltage	• 9 to 32 VDC via Foundation Fieldbus Voltage
External Voltage	• 24 VDC via External power
Indication	• 2 LEDs indicate discrete input status (Red/Green)
Approvals	• cFMus Approved Class 1 Div 2 (NI)
Dimensions	• 75mm, 62mm, 51mm (L, W, H)
Operating Temp.	• -40° to +85°C (-40° to +185°F)

Wiring Diagram



Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465015

Input/Relay Output Modules

StoneL Model 461087, 465022 (DIN), 461088, 465023 (DIN)

This I/O module is designed to function as a Foundation Fieldbus node with termination points for connecting switches/sensors, as well as relay outputs to operate devices like motors and other high power devices. Outputs can be interlocked to operate AC motors or independent to operate independent AC loads. Outputs can be configured to fail on or off.

Inputs and Outputs

- Two (2) Discrete inputs
- Two (2) Discrete (Relay) outputs
- One (1) Analog input (4-20mA)
- One (1) Analog output (4-20mA)

Features

- Pre-determined output fail state

Enclosure Option

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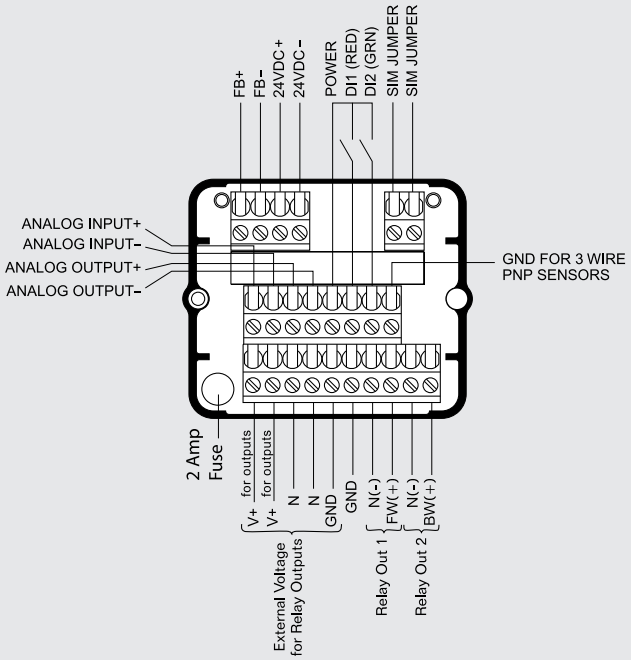
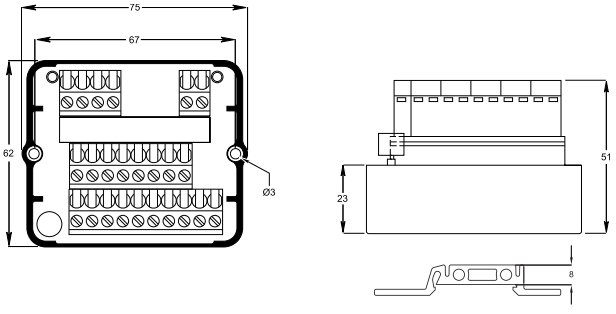
Specifications

Model Numbers	• Interlocking: 461087, 465022 (DIN) • Independent: 461088, 465023 (DIN)
Inputs	• (2) 6.5 VDC <.045mA, must be low power dry contact capable of operating at <.045mA@6.5VDC or solid state pnp capable of operating at 6.5VDC and <1mA.
Outputs	• Interlocking: (2) 120/250VAC @ 2A interlocked for motor operation • Independent: (2) 120/250VAC @ 2A independent for other AC loads
Operating Voltage	• 9 to 32 VDC via FOUNDATION Fieldbus Voltage
Analog Input	• (1) Analog (4-20mA) input 10 bit resolution (0.1%)
Analog Output	• (1) Analog (4-20mA) output 10 bit resolution (0.1%)
External Voltage	• 24 VDC via External power (for Analog I/O)
External Voltage	• 120/250 VDC/VAC (for relay outputs)
Indication	• 2 LEDs indicate discrete input status (Red/Green)
Dimensions	• 75mm, 62mm, 51mm (L, W, H)
Operating Temp.	• -40° to +85°C (-40° to +185°F)

Wiring Diagram



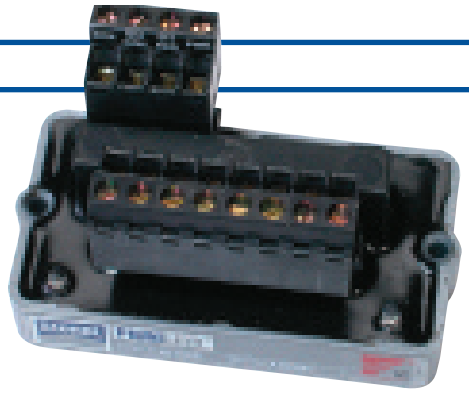
Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465022 or 465023

Input/Output Modules

StoneL Model 461134, 465027 (DIN)



Input/Externally Powered (24VDC) Output Module

This I/O module is designed to function as a Foundation Fieldbus node with termination points for connecting switches/sensors as well as output devices such as solenoid valves and relays. Outputs can be configured to fail on or off.

Inputs and Outputs
- Two (2) Discrete inputs (LED Indication)
- Two (2) Discrete 24VDC outputs (Externally powered)

Features
- Pre-determined output fail state
- Date of last service

Enclosure Option

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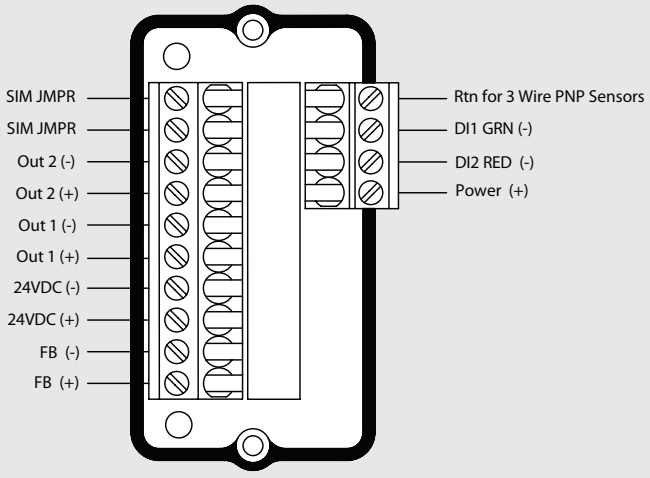
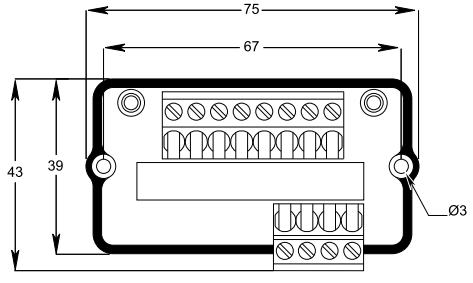
Specifications

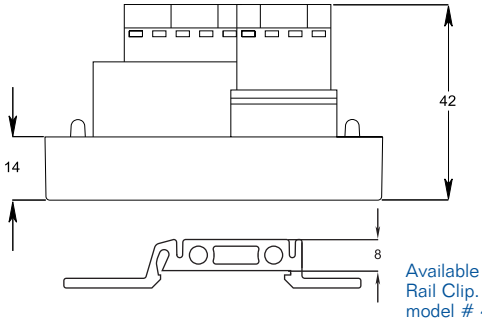
Model Numbers	• 461134, 465027 (DIN)
Inputs	• (2) 6.5 VDC <.045mA, must be low power dry contact or solid state pnp capable of operating at 6.5 VDC and <1mA.
Outputs	• (2) 24 VDC (4 Watts Total Power)
Operating Voltage	• 9 to 32 VDC via Foundation Fieldbus voltage
Operating Current	• 16mA from Foundation Fieldbus
External Voltage	• 24VDC via External Power
Indication	• (2) LEDs indicate discrete input status (Red/Green)
Dimensions	• 75mm, 43mm, 42mm (L, W, H)
Operating Temp.	• -40° to +85°C (-40° to +185°F)

Wiring Diagram



Dimensions (in mm)





Available with DIN Rail Clip. Specify model # 465027

Drop Connectors

StoneL Model 461110, 465003 (DIN) , 461057, 465006 (DIN)

Drop connectors provide a reliable, safe method of connecting slave devices to the bus cable. Protected drop connectors limit the current passing from the bus to the drop leg to prevent fault conditions on the drop from affecting the bus.

Passive

Protected

Passive (2 Drops)
- 8 Amp capacity
- Direct mount or DIN rail mount available

Protected (1 Drop)
- 8 Amp capacity on bus trunk line
- Limits currents on drop leg to protect against short circuits without affecting bus performance
- LED indicates drop fault
- Automatically resets when drop fault is cleared

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Enclosure Option

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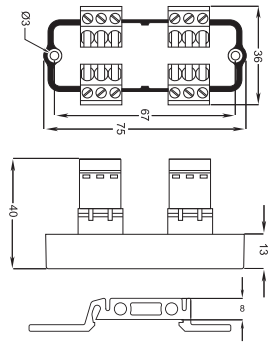
Specifications

Model Numbers	• Passive: 461110, 465003 (DIN) • Protected: 461057, 465006 (DIN)
Protocol	• Foundation Fieldbus IEC 61158-2
Max. Current, Bus Trunk line	• 8 Amps
Trip Current, Drop	• Passive: No break current • Protected: 40mA
Voltage Drop, Bus Leg	• Negligible
Voltage Drop, Drop Leg	• Passive: Negligible • Protected: 1 Volt Max.
Holding Current (After Trip)	• Protected: 28mA
Reset Current Level	• Current falls below 28mA
Dimensions (L, W, H)	• 75mm, 26mm, 40mm
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)
Maximum Voltage	• 35VDC

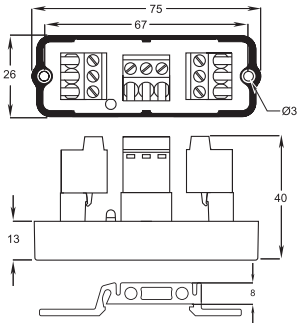
Dimensions (in mm)

Passive



Available with DIN Rail Clip. Specify model # 465003

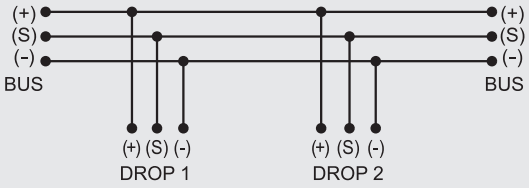
Protected



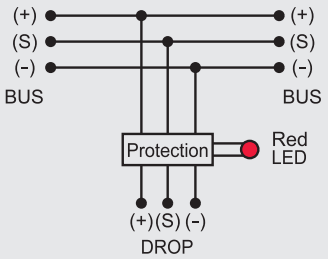
Available with DIN Rail Clip. Specify model # 465006

Schematic Drawing

Passive

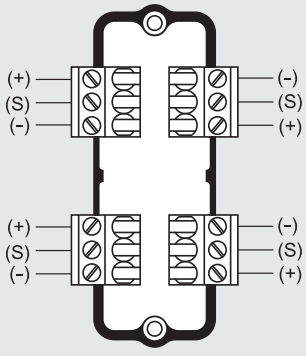


Protected

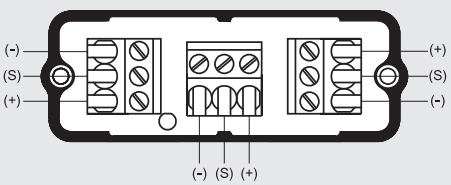


Wiring Diagram

Passive



Protected

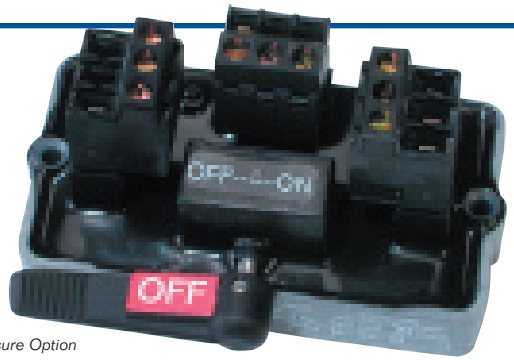


Drop Connectors

StoneL Model 461068, 465008 (DIN)

Protected Drop Switch (1 Drop)

Designed for Foundation Fieldbus Networks, this switched drop connector offers a very convenient method to remove, replace, or repair a device while the balance of the network remains on-line. It allows the user to disconnect a drop segment from the rest of the bus by flipping a switch.



Features

- Disconnect bus segments
- Short circuit protection
- LED indicates drop fault
- Direct mount or DIN rail mount available

Enclosure Option

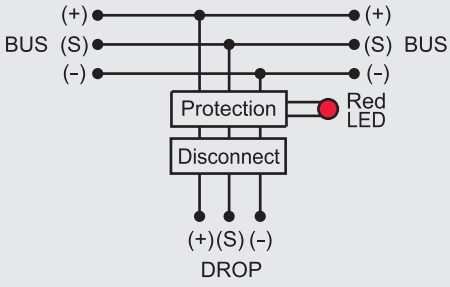
JM p.154

FR p.166

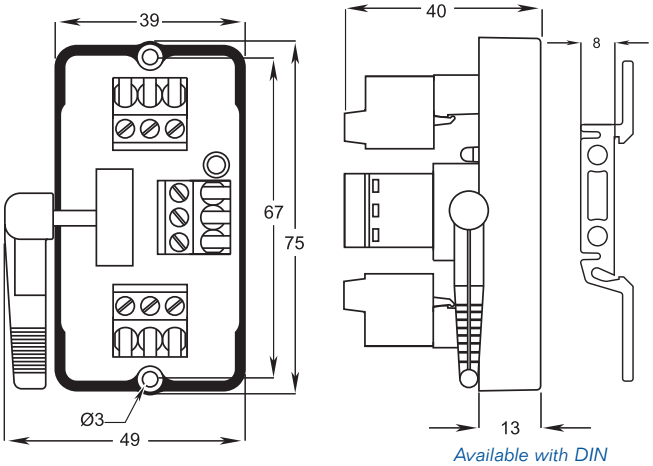
Specifications

Model Numbers	• 461068, 465008 (DIN)
Protocol	• Foundation Fieldbus IEC 61158-2
Max. Devices Per Drop	• 1
Max. Current (Trunk)	• 8 Amps
Trip Current (Drop)	• 40mA
Maximum Voltage	• 35VDC
Voltage Drop (Trunk)	• Negligible
Voltage Drop (Drop)	• 1 Volt Max.
Holding Current (After Trip)	• 28mA
Reset Current Level	• Current falls below 28mA
Housing	• Engineered resin
Ingress Protection	• IP2O
Dimensions (L, W, H)	• 75mm, 49mm, 40mm
Operating Temp.	• -40° to +85°C (-40° to +185F)
Storage Temp.	• -40° to + 85°C (-40° to +185F)

Schematic Drawing

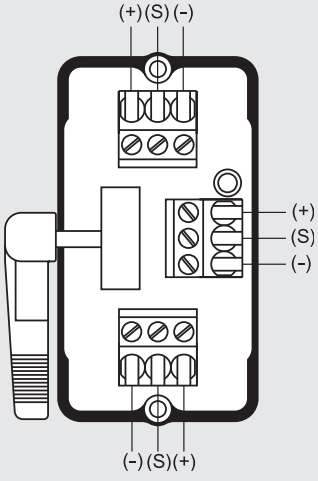


Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465008

Wiring Diagram



Drop Connectors

StoneL Model 461109

Passive Multi-drop Connector (4 Drops)

This passive multi-drop connector is compact with DIN rail mount for wiring Foundation Fieldbus networks. It provides terminations for Bus In, Bus Out, and four (4) individual drops or spurs.

Features

- Fieldbus power status LED
- DIN rail mounting
- IP20 housing

Enclosure Option

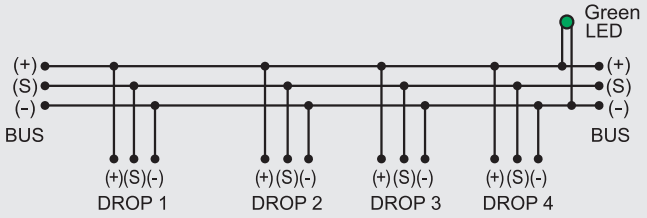
FB p.160 FR p.166

CE

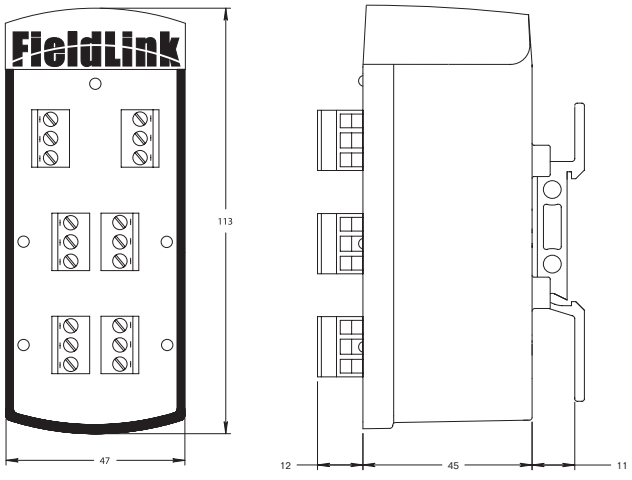
Specifications

Protocol	• Foundation Fieldbus IEC 61158-2
Max Spurs (Drops)	• 4
Type	• Passive Drops
Max Current	• 8 Amp
Voltage Drop, Bus Trunk	• Negligible
Voltage Drop, Spur	• Negligible
Maximum Voltage	• 35VDC
Current Consumption	• 2 mA
Displays	• Fieldbus power status, green LED
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)
Housing	• Engineered resin, DIN rail mounting
Housing Dimensions	• 113mm, 47mm, 68mm (L, W, H)
Ingress Protection	• IP20

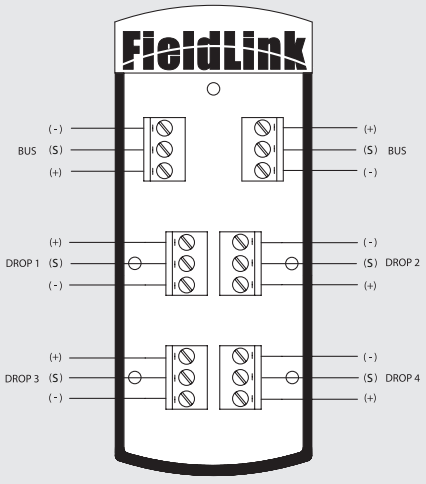
Schematic Drawing



Dimensions (in mm)



Wiring Diagram



Drop Connectors

StoneL Model 461074

Protected Multi-drop Connector (4 Drops)

This protected multi-drop connector is compact with DIN rail mount for wiring Foundation Fieldbus networks. It provides terminations for Bus In, Bus Out, and four (4) individual drops or spurs. Each drop has a protection circuit, ensuring that a short circuit on a drop will not affect the rest of the bus.

Features

- Fieldbus power status LED
- Short circuit protection
- LED indication of short circuits
- DIN rail mounting
- IP20 housing

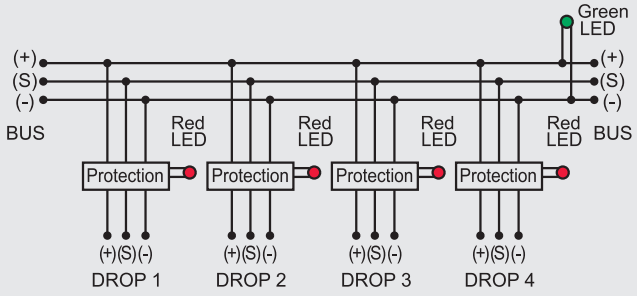
Enclosure Option

FB p.160 FR p.166

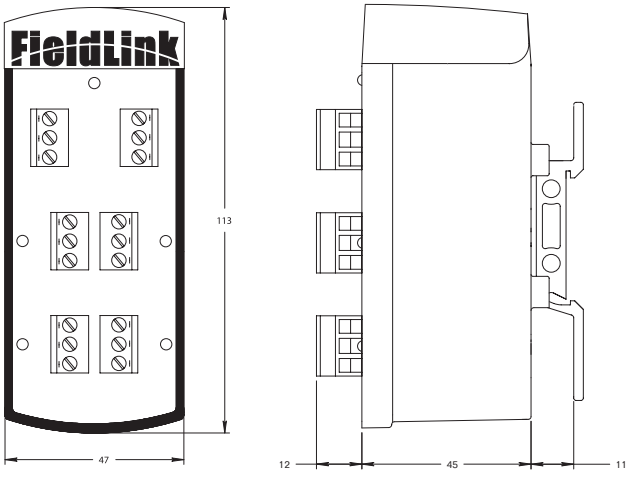
Specifications

Protocol	• Foundation Fieldbus IEC 61158-2
Max Spurs (Drops)	• 4
Type	• Protected drops
Max Current, Bus Trunk	• 8 Amp
Voltage Drop, Bus Trunk	• Negligible
Voltage Drop, Spur	• 1 VDC max
Trip Current	• 40 mA
Holding Current	• 28 mA
Reset Current	• 28 mA
Max Voltage	• 35 VDC
Current Consumption	•4 mA
Displays	• Fieldbus power status, green LED
	• Drop short indication, (4) Red LED
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)
Housing	• Engineered resin, DIN rail mounting
Housing Dimensions	• 113mm, 47mm, 68mm (L, W, H)
Ingress Protection	• IP20

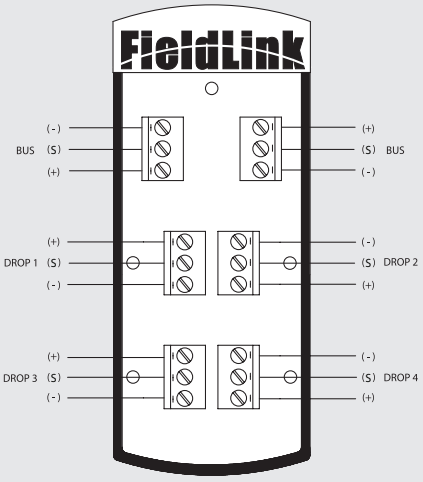
Schematic Drawing



Dimensions (in mm)



Wiring Diagram



Drop Connectors

StoneL Model 461080

Enclosure Option

FB p.160 FR p.166

Switched Protected Multi-drop Connector (4 Drops)

This Foundation Fieldbus Multi-drop Connector is compact with DIN rail mount for wiring Foundation Fieldbus networks. This device provides terminations for Bus In, Bus Out, and four (4) individual drops or spurs. Each drop has it's own protection circuit that ensure that a short circuit on a drop will not affect the rest of the bus. This device also has a disconnect switch capable of cutting power and data to all four (4) spurs.

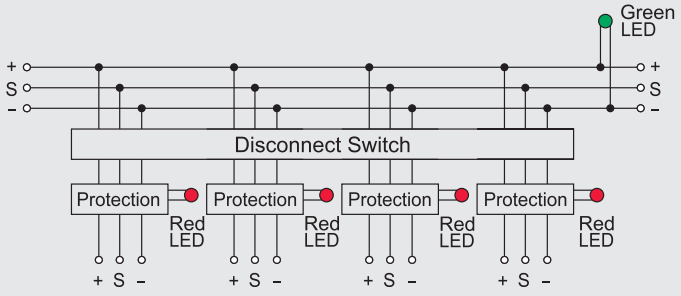
Features

- Fieldbus power status LED
- Short circuit protection
- LED indication of short circuits
- Disconnect switch
- DIN rail mounting
- IP20 housing

Specifications

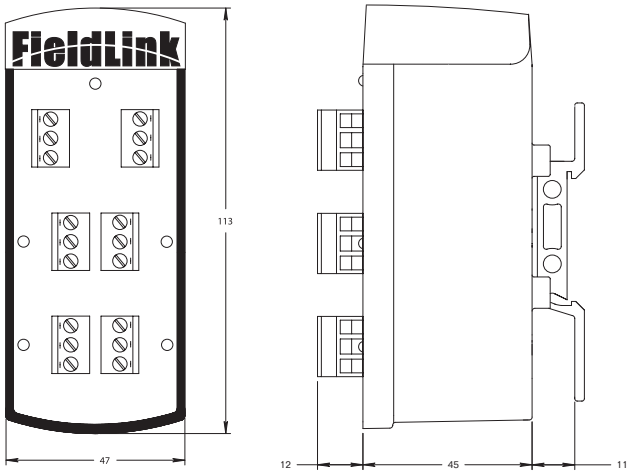
Protocol	• Foundation Fieldbus IEC 61158-2
Max Spurs (Drops)	• 4
Type	• Switched protected drops
Max Current, Bus Trunk	• 8 Amp
Voltage Drop, Bus Trunk	• Negligible
Voltage Drop, Spur	• 1 VDC max
Trip Current	• 40 mA
Holding Current	• 28 mA
Reset Current	• 28 mA
Max Voltage	• 35 VDC
Current Consumption	• 2 mA
Displays	• Fieldbus Power Status, green LED • Drop Short Indication, (4) Red LED
Operating Temp.	• -40° to +85°C (-40° to 185°F)
Storage Temp.	• -40° to +85°C (-40° to 185°F)
Housing	• Engineered Resin, DIN-rail mounting
Housing Dimensions	• 113mm, 47mm, 68mm (L, W, H)
Ingress Protection	• IP20

Schematic Drawing

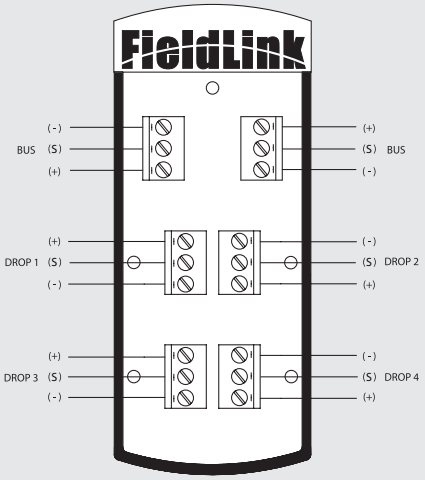


LEDs light when fault is detected

Dimensions (in mm)



Wiring Diagram



Terminator

StoneL Model 461111

This Foundation Fieldbus terminator contains all of the components required for terminating a Foundation Fieldbus segment. This device is designed to be very compact and easy to use. The terminator is used to prevent reflections on the fieldbus cable resulting from the ends of the segment. One terminator should be located at each end of the Fieldbus segment.

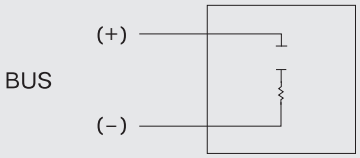
Features

- 100 Ohm resistor
- 1 microfarad Capacitor
- Compact, moisture resistant shell

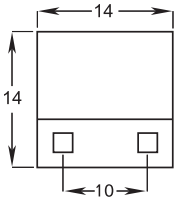
Specifications

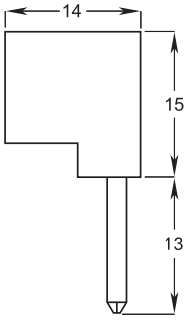
Resistor	• 100 Ohms +/-1%
Capacitor	• 1 micro farad +/- 5%
Housing material	• ABS
Pins	• 2 (not polarity sensitive)
Dimensions	• 28mm, 14mm, 14mm (L, W, H)
Operating Temp.	• -40°C to + 82°C (-40°F to +180°F)

Schematic Drawing

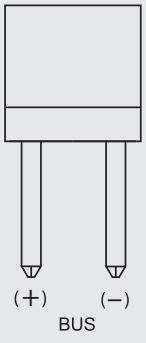


Dimensions (in mm)





Wiring Diagram

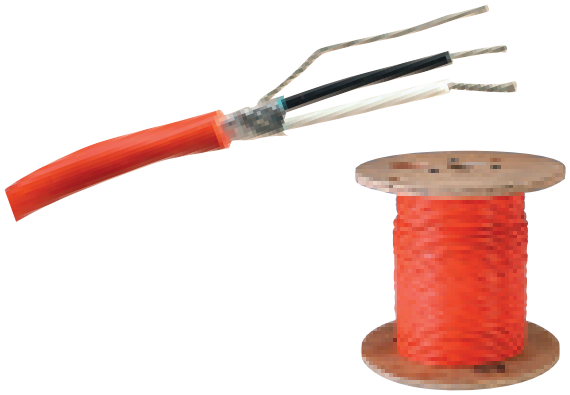


Cable and Wiring

StoneL Model 463010, 463016, 463018

Foundation Fieldbus Bus Cable

This cable is selected for its rugged design and specifications favorable for use with the Foundation Fieldbus communication protocol. The cable is constructed of PVC and is UL type Power Limited Tray Cable (PLTC) and Instrument Tray Cable (ITC).



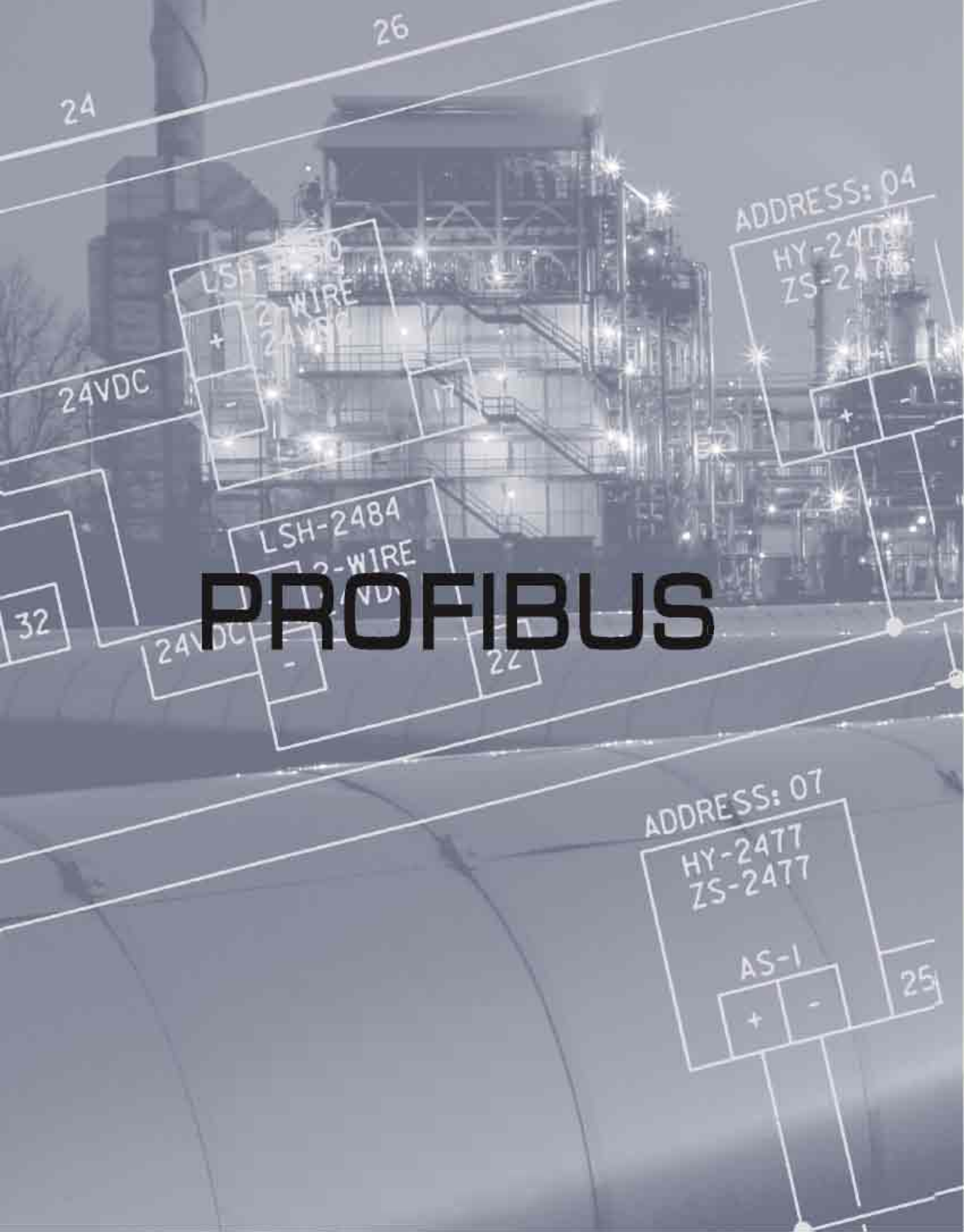
Features

- 2-conductor cable with shield for Foundation Fieldbus Networks
- Rugged PVC Construction
- UL Type PLTC, ITC

CE

Specifications

Conductors	• 2 (Stranded Tinned Copper) + Shield
Length	• 100m (328') (463010) • 100m (328') I.S. (463016) • 300m (984') (463018)
Wire Gauge	• 18 AWG
DC Resistance	• 0.025 Ohms/m (@ 20°C)
Nominal Capacitance	• 78.7 pf/m
Jacket material	• PVC (orange) • PVC (blue) (I.S 463016)
Cable Diameter	• 7mm
Applicable specifications	• UL Type PLTC, CM • C(UL) CM


26
24
ADDRESS: 04
HY-24
ZS-24
24VDC
WIRE
LSH-2484
2-WIRE
32
24VDC
22
ADDRESS: 07
HY-2477
ZS-2477
AS-I
25

PROFIBUS

Profibus

CONTENTS

PROFIBUS

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Scottsdale, AZ 85260
USA
Tel: 480-483-2456
Fax: 480-483-7202
www.profibus.com

Profibus Overview and Analysis

PROFIBUS originated in the European market and has become a worldwide standard because of its performance attributes. PROFIBUS consists of several variations which are designed for use in special applications. The two PROFIBUS versions most commonly used are PROFIBUS-DP (Distributed Peripherals) and PROFIBUS-PA (Process Automation).

PROFIBUS-DP is recognized as a high performance bus network capable of transmitting thousands of I/O point information in less than a few milliseconds. For that reason it has been used extensively for fast response control applications such as turbine servos and variable speed drives.

PROFIBUS-PA was developed to connect directly into PROFIBUS-DP and may be used in intrinsically safe applications. DP uses the RS485 physical layer while PA uses the IEC 61158-2 physical layer designed primarily for process applications.

PROFIBUS-DP Features

- High speed data access capable of handling time critical functions.
- Networks up to 32 devices (up to 126 with repeaters) on a 4-wire network; (2-wires for signal and 2-wires for power).
- Trunk network may extend up to 4,000 feet (1220 meters) per segment.
- Dramatically cuts wiring costs and commissioning over conventional applications.
- Interfaces readily into newer control systems.
- Used extensively throughout Europe with support in North America.

PROFIBUS-DP Description

The DP version of Profibus uses the RS485 physical layer with its unique data link layer and a direct data link mapper connecting the data link layer directly to application functions.

PROFIBUS uses a medium access control which includes token-passing for multimaster applications and the master slave interaction. Networks may be multi-master, multi-master with slaves, or single-master with slaves. In a multi-master network the token is passed to each master in a predetermined time frame. The master with the token is active and communicates with other masters or accesses its assigned slaves.

Communication occurs on a peer-to-peer basis for data communication or on a multi-cast basis for control commands. Cyclic polling may also be used for data communication between the master and its designated slaves. DP also offers acyclic communication services for the parameterization, operation, monitoring, and alarm-handling of intelligent field devices. These acyclic services may be handled in parallel to data transfer with the master taking some additional time to carry out this function. Acyclic extended functions are optional.

PROFIBUS-DP handles large amounts of I/O data at very high speeds. DP requires about 1 millisec to handle 1024 I/O points over 32 devices at the 12Mbit/sec rate. This is possible due to the efficient mapping of the data from the data link layer directly to the user layer by means of the SRD service of the data link layer.

For configuration of DP devices a GSD file (Electronic device data sheet) is used which describes the characteristics of a device type in a precisely defined format. Vendors provide specific GSD files to users. The system simply reads the GSD file for each device and automatically configures the bus system using this information.

An EDD (Electronic Data Description) file, which is not vendor specific, is also used to describe each device. These files, also provided by vendors, are read by the engineering tools to simplify the Profibus systems configuration, commissioning, and maintenance.

PROFIBUS-DP Specifications

Physical Layer	RS-485				
Cabling	One shielded twisted pair for signal and one pair for 24 VDC supply				
Topology	Trunk with drops				
Cable Length					
Baud Rate (Kbits/sec)	93.75	187.5	500	1500	12000
Length (meters)	1200	1000	400	200	100
Number of Devices	32 per segment; Up to 126 with 4 repeaters				
Bus Power	Must have auxiliary 24VDC supply				
Transmission Rate	9.6K to 12M bits/second				
Data Access	Token sharing for multi-masters; peer-to-peer; multicast and cyclic polling for data transfer; acyclic for asset management				
Data Transfer Size	Up to 246 Bytes of Input & 246 Bytes of Output Depending on Device Type				
Device Identity	Specific ID Number for each device				
Error Detection	HD4 CRC (Cyclic Redundancy Check)				
Support Organization	PROFIBUS Users Group (www.profibus.com)				

PROFIBUS-PA Description

PROFIBUS-PA was designed as a substitute for HART and 4 to 20mA signal transmission in the process industries. It uses function blocks designed around process industry requirements and uses the IEC 61158-2 physical layer, making it compatible with intrinsic safety circuits. ***See figure 1.***

PROFIBUS-PA links to the control architecture via PROFIBUS-DP with a segment coupler or link as shown. Segment couplers are signal converters that adapt the RS-485 signals to the 61158-2 signal level. They are transparent from the bus protocol point of view. If segment couplers are used, the baud rate on the DP (RS-485) segment must be restricted to 45 Kbits/sec. The segment coupler also injects power into the PA network for the segment instrumentation.

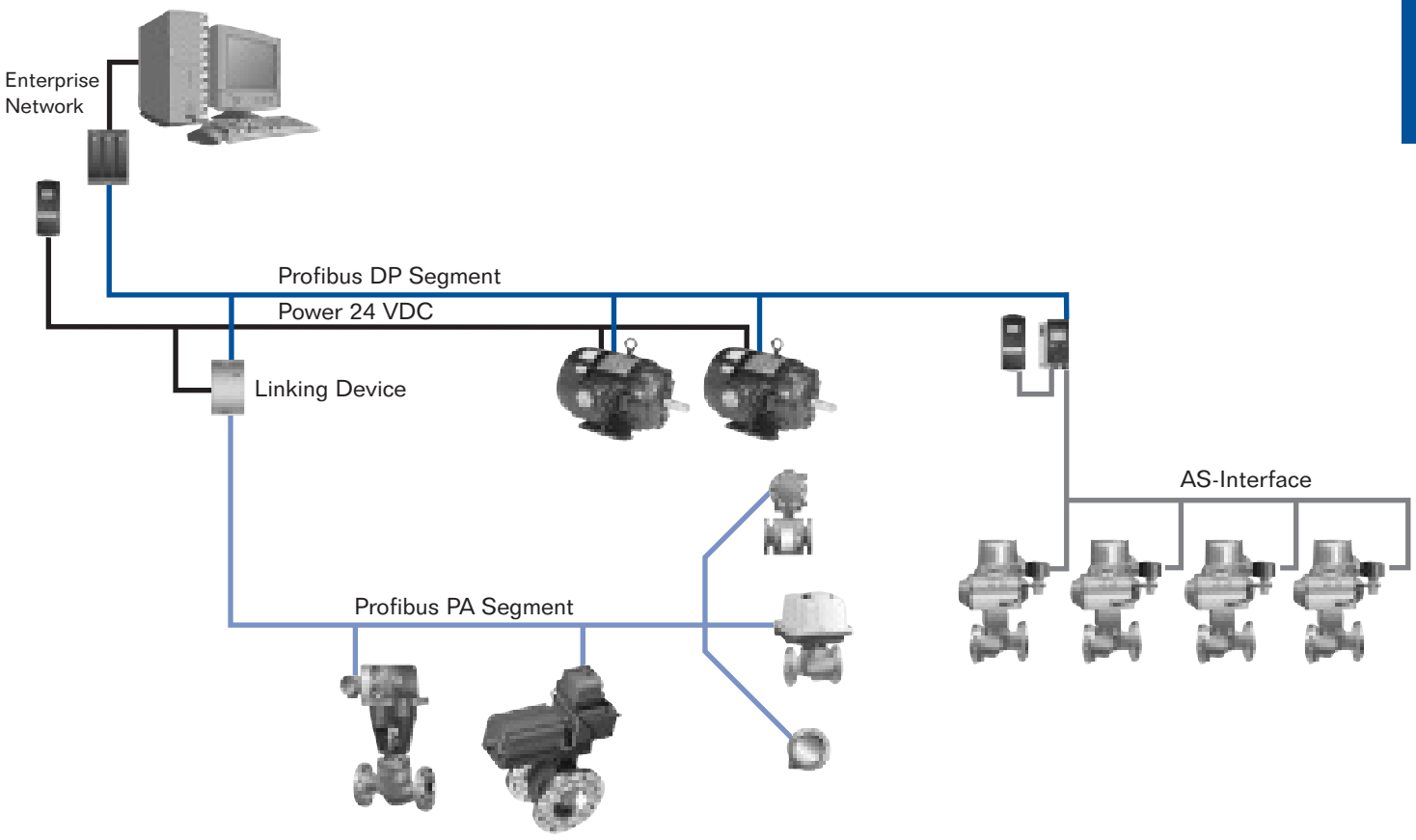
Links are independent slaves on the DP network which represent all devices connected to the 61158-2 segment. When PA segments are connected using links there is no limit to the baud rate on the DP segment which enables faster overall bus network performance.

The measured values and status of the PA devices are transmitted cyclically, with high priority between the DCS and the measuring transducers using the DP basic functions. This provides timely transfer of values into the control system. Asset management parameters are transmitted with low-priority, acyclic DP functions.

PROFIBUS-PA Specifications (different than DP)

Physical Layer	IEC 61158-2
Cabling	Shielded Twisted Pair
Cable Length	1900m (6200 ft.)
Topology	Trunk with Branching
Number of Devices	32 (Practical limit of 0.50Amp divided by current used/device)
Bus Power	Up to 0.5 A per segment
Transmission Rate	31.25 Kbits/second

Figure 1
Profibus PA



Drop Connectors

StoneL Model 461119, 465010 (DIN)

Power Protected Drop Switch (1 Drop)

This disconnect switch is a compact, drop connector for wiring Profibus-DP networks. It has a disconnect switch that allows the user to disconnect a drop from the trunk. This device also provides current limiting on the power leg to prevent power losses.

Features

- Current limit on power drop
- Direct mount or DIN rail mount available

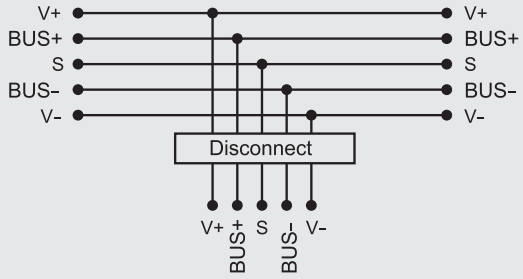
Enclosure Option

JM p.154 FR p.166

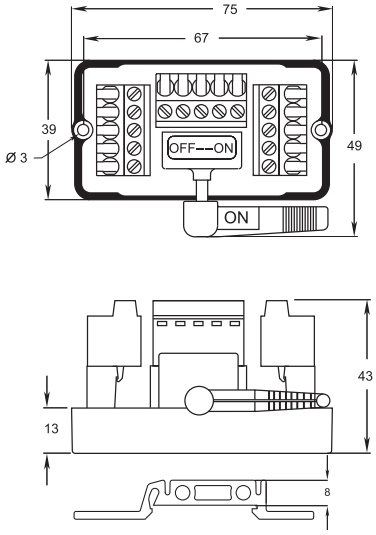
Specifications

Model Numbers	• 461119, 465010 (DIN)
Protocol	• Profibus-DP
Max Devices per Drop	• 1
Type	• Passive Drop Switch
Max Current (Trunk)	• 8 Amp
Max Current (Drop)	• 0.2 Amp
Voltage Drop (Trunk)	• Negligible
Voltage Drop (Drop)	• <1V
Current Consumption	• None
Displays	• None
Operating Temp.	• -40° to +85°C (-40° to 185°F)
Storage Temp.	• -40° to +85°C (-40° to 185°F)
Housing	• Engineered Resin
Housing Dimensions	• 75mm, 49mm, 43mm (L, W, H)
Ingress Protection	• IP20

Schematic Drawing

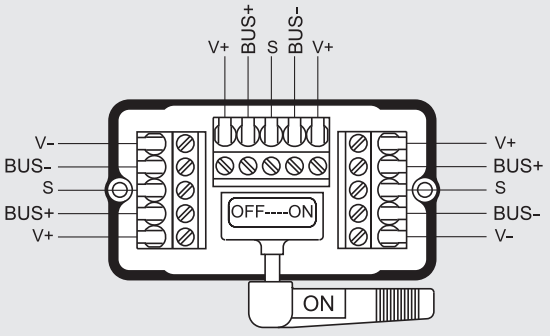


Dimensions (in mm)



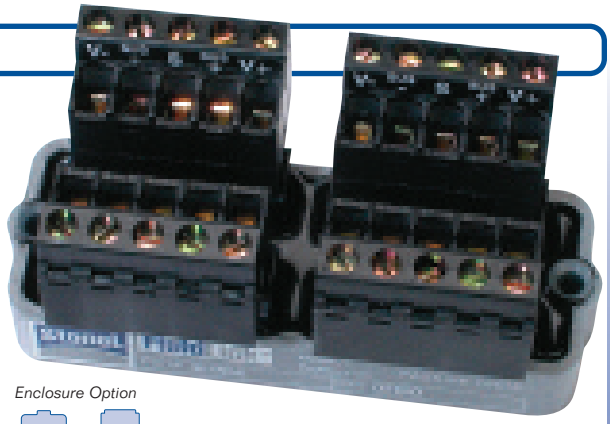
Available with DIN Rail Clip. Specify model # 465010

Wiring Diagram



Drop Connectors

StoneL Model 461056, 465004 (DIN)



Passive Multi-drop Connector (2 Drops)

This Multi-drop Connector is compact with direct mount for wiring PROFIBUS-DP networks. It provides terminations for Bus In, Bus Out, and two (2) individual drops or spurs.

Features

- Direct mount or DIN rail mount available
- IP20 housing

Enclosure Option

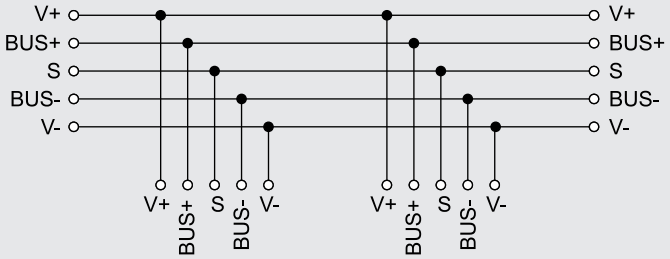
JM p.154 FR p.166

CE

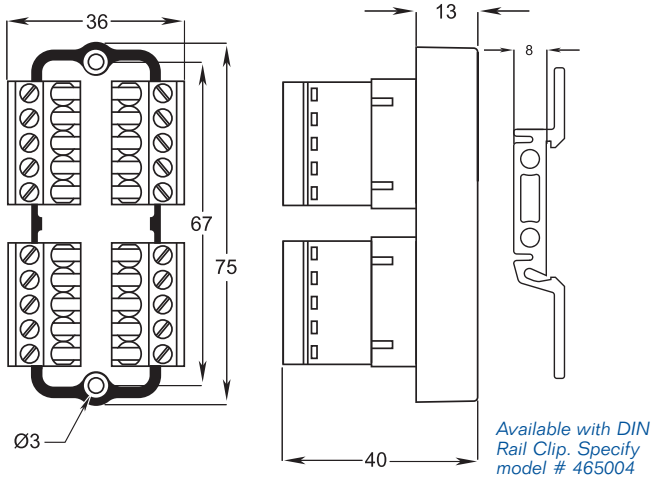
Specifications

Model Numbers	• 461056, 465004 (DIN)
Protocol	• PROFIBUS-DP RS485 with 24 VDC power
Max Spurs (Drops)	• 2
Type	• Passive drops
Max Current	• 8 Amp
Voltage Drop, Bus Trunk	• Negligible
Voltage Drop, Spur	• Negligible
Maximum Voltage	• 35VDC
Current Consumption	• None
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)
Housing	• Engineered resin
Housing Dimensions	• 75mm, 36mm, 40mm (L, W, H)

Schematic Drawing

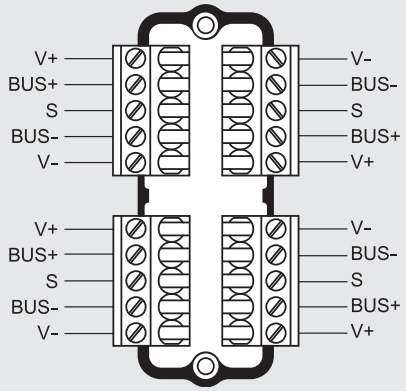


Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465004

Wiring Diagram



Drop Connectors

StoneL Model 461076

Passive Multi-drop Connector (4 Drops)

This multi-drop connector is compact with DIN rail mount for wiring PROFIBUS-DP networks. It provides terminations for Bus In, Bus Out, and four (4) individual drops or spurs.

Features

- 24VDC power status LED
- DIN rail mounting
- IP20 housing

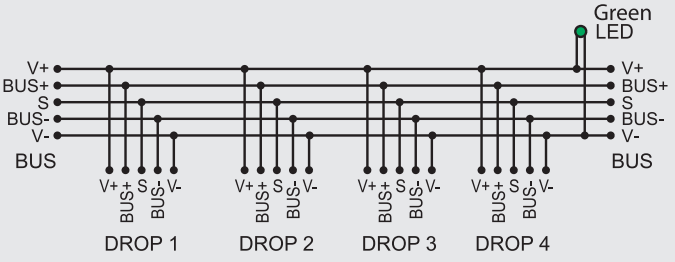
Enclosure Option

FB p.160 FR p.166

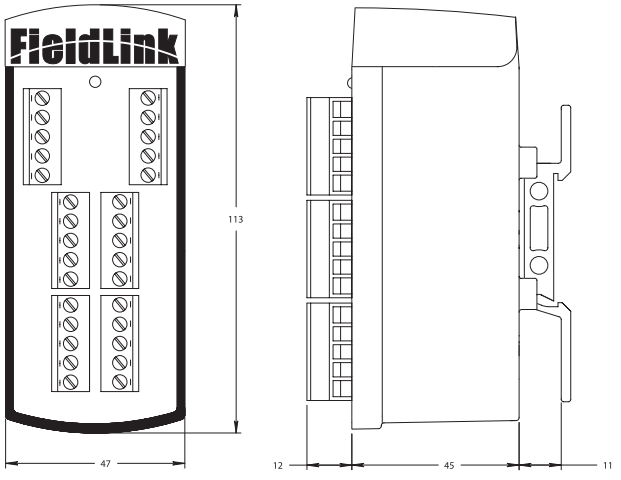
Specifications

Protocol	• PROFIBUS-DP RS485 with 24 VDC power
Max Spurs (Drops)	• 4
Type	• Passive drops
Max Current, Bus Trunk/Drops	• 8 Amp
Voltage Drop, Bus Trunk	• Negligible
Voltage Drop, Spur	• Negligible
Max Voltage	• 35 VDC
Current Consumption	• 2mA
Displays	• 24 VDC power status, green LED
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)
Housing	• Engineered resin, DIN rail mounting
Housing Dimensions	• 113mm, 47mm, 68mm (L, W, H)
Ingress Protection	• IP20

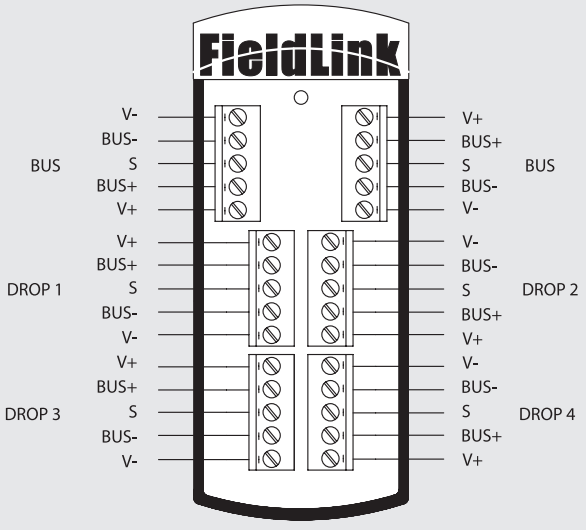
Schematic Drawing



Dimensions (in mm)



Wiring Diagram



PROFIBUS

Drop Connectors

StoneL Model 461110, 465003 (DIN), 461057, 465006 (DIN)

Drop connectors for PROFIBUS-PA networks provide a reliable, safe method of connecting slave devices to the bus cable. Protected drop connectors limit the current passing from the bus to the drop leg to prevent fault conditions on the drop from affecting the bus.

Passive

Protected

Passive (2 Drops)
- 8 Amp capacity
- Direct mount or DIN rail mount available

Protected (1 Drop)
- 8 Amp capacity on bus trunk line
- Short circuit protection (40mA)
- LED indicates drop fault
- Automatically resets when drop fault is cleared

Enclosure Option

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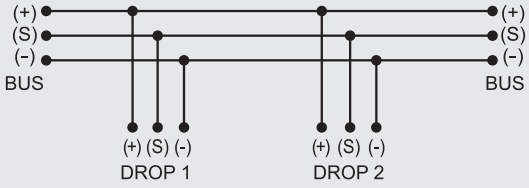
CE

Specifications

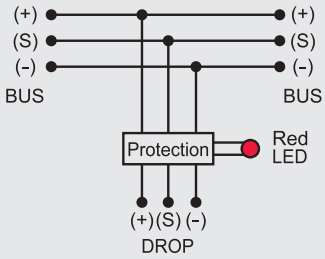
Model Numbers	• Passive: 461110, 465003 (DIN) • Protected: 461057, 465006 (DIN)
Protocol	• Profibus-PA
Max. Current, Bus Trunk line	• 8 Amps
Trip Current (Drop)	• Passive: No break current • Protected: 40mA
Voltage Drop, Bus Leg	• Negligible
Voltage Drop, Drop Leg	• Passive: Negligible • Protected: 1 Volt Max.
Holding Current (After Trip)	• Protected: 28mA
Reset Current Level	• Current falls below 28mA
Dimensions (L, W, H)	• 75mm, 36mm, 40mm
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)
Maximum Voltage	• 35 VDC

Schematic Drawing

Passive

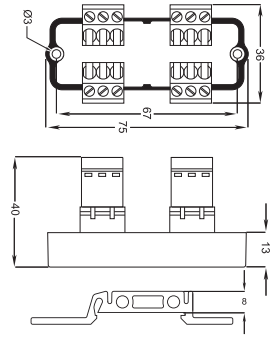


Protected



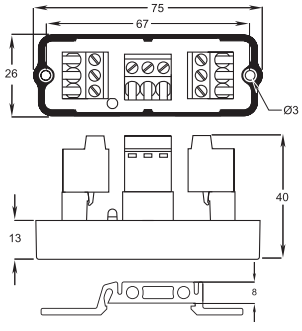
Dimensions (in mm)

Passive



Available with DIN Rail Clip. Specify model # 465003

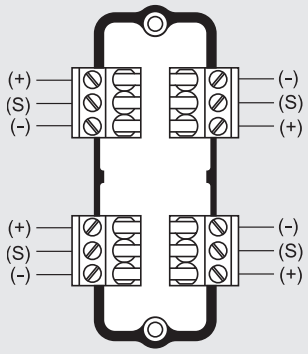
Protected



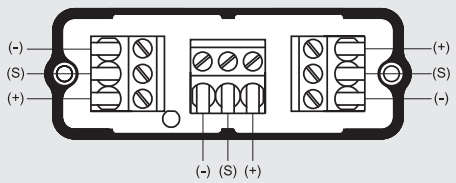
Available with DIN Rail Clip. Specify model # 465006

Wiring Diagram

Passive



Protected



Drop Connectors

StoneL Model 461068, 465008 (DIN)

Protected Drop Switch (1 Drop)

Designed for PROFIBUS-PA Networks, this switched drop connector offers a very convenient method to remove, replace, or repair a device while the balance of the network remains on-line. It allows the user to disconnect a drop segment from the rest of the bus by flipping a switch.

Features

- Disconnect bus segments
- Short circuit protection
- Direct mount or DIN rail mount available
- LED indicates drop fault

Enclosure Option

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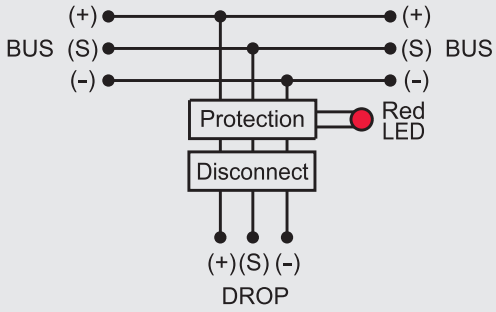
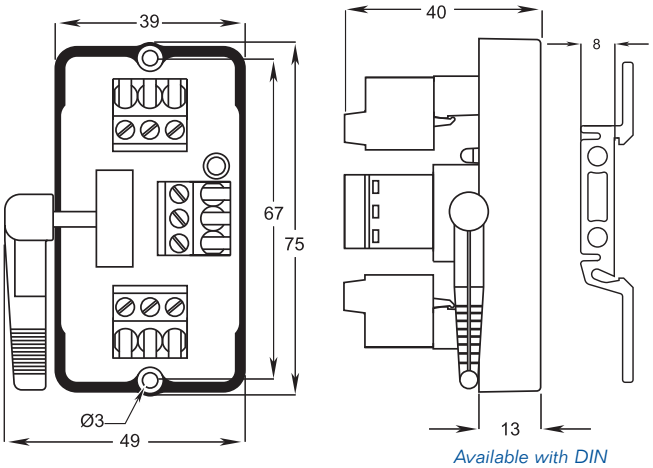
Specifications

Model Numbers	• 461068, 465008 (DIN)
Protocol	• Profibus-PA
Max. Devices Per Drop	• 1
Max. Current (Trunk)	• 8 Amps
Trip Current (Drop)	• 40mA
Maximum Voltage	• 35VDC
Voltage Drop (Trunk)	• Negligible
Voltage Drop (Drop)	• 1 Volt Max.
Holding Current (After Trip)	• 28mA
Reset Current Level	• Current falls below 28mA
Housing	• Engineered resin
Ingress Protection	• IP2O
Dimensions (L, W, H)	• 75mm, 49mm, 40mm
Operating Temp.	• -40° to +85°C (-40° to +185F)
Storage Temp.	• -40° to + 85°C (-40° to +185F)

Schematic Drawing

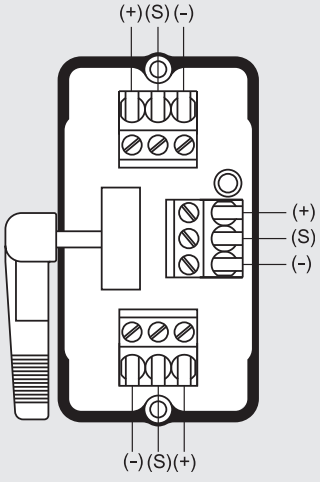


Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465008

Wiring Diagram



Drop Connectors

StoneL Model 461080

Switched Protected Multi-drop Connector (4 Drops)

This Multi-drop Connector is compact with DIN rail mount for wiring PROFIBUS-PA networks. This device provides terminations for Bus In, Bus Out, and four (4) individual drops or spurs. Each drop has it's own protection circuit that ensure that a short circuit on a drop will not affect the rest of the bus. This device also has a disconnect switch capable of cutting power and data to all four (4) spurs.

Enclosure Option

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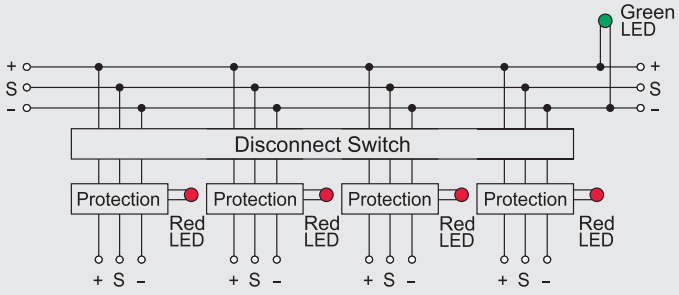
Features

- Fieldbus power status LED
- Short circuit protection
- LED indication of short circuits
- Disconnect switch
- DIN rail mounting
- IP20 housing

Specifications

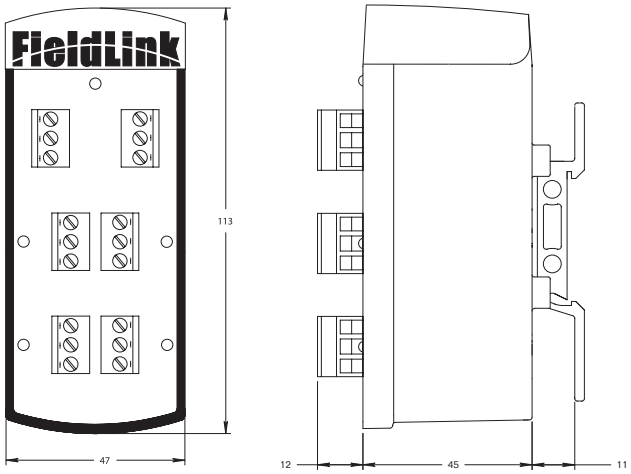
Protocol	• PROFIBUS-PA
Max Spurs (Drops)	• 4
Type	• Switched protected drops
Max Current, Bus Trunk	• 8 Amp
Voltage Drop, Bus Trunk	• Negligible
Voltage Drop, Spur	• 1 VDC max
Trip Current	• 40 mA
Holding Current	• 28 mA
Reset Current	• 28 mA
Max Voltage	• 35 VDC
Current Consumption	• 2 mA
Displays	• Fieldbus Power Status, green LED • Drop Short Indication, (4) Red LED
Operating Temp.	• -40° to +85°C (-40° to 185°F)
Storage Temp.	• -40° to +85°C (-40° to 185°F)
Housing	• Engineered Resin, DIN-rail mounting
Housing Dimensions	• 113mm, 47mm, 68mm (L, W, H)
Ingress Protection	• IP20

Schematic Drawing

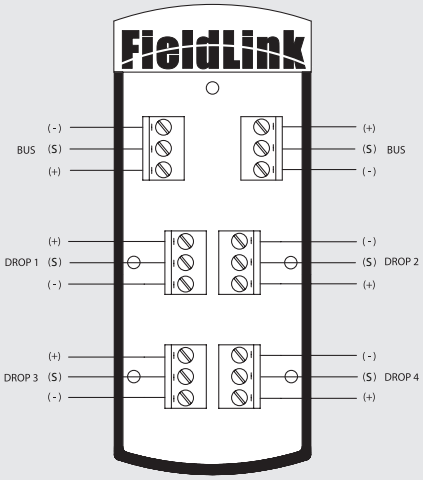


LEDs light when fault is detected

Dimensions (in mm)



Wiring Diagram



Drop Connectors

StoneL Model 461074

Protected Multi-drop Connector (4 drops)

This protected multi-drop connector is compact with DIN rail mount for wiring PROFIBUS-PA networks. It provides terminations for Bus In, Bus Out, and four (4) individual drops or spurs. Each drop has its a protection circuit, ensuring that a short circuit on a drop will not affect the rest of the bus.

Features

- Fieldbus power status LED
- Short circuit protection
- LED indication of short circuits
- DIN rail mounting
- IP20 housing

CE

Enclosure Option

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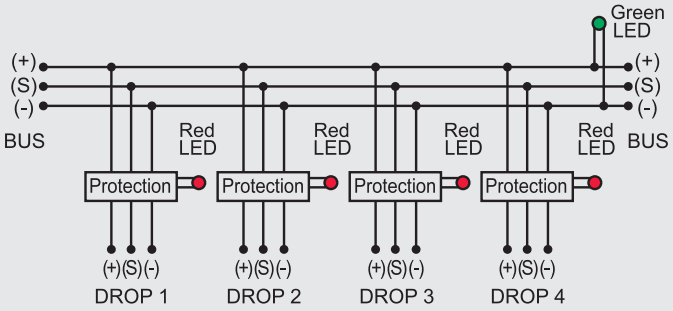
FR p.166

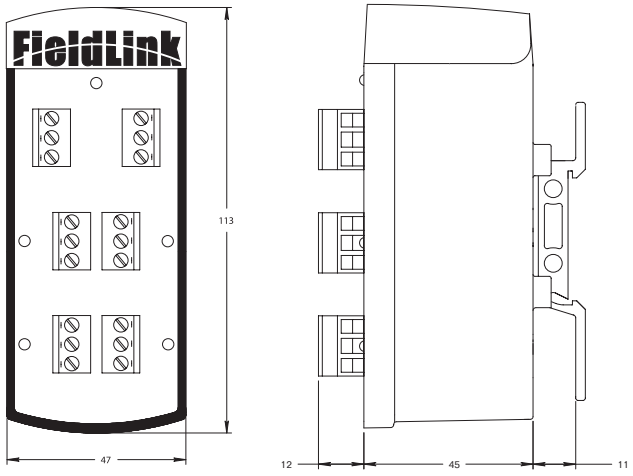
Specifications

Protocol	• PROFIBUS-PA
Max Spurs (Drops)	• 4
Type	• Protected drops
Max Current, Bus Trunk	• 8 Amp
Voltage Drop, Bus Trunk	• Negligible
Voltage Drop, Spur	• 1 VDC max
Trip Current	• 40mA
Holding Current	• 28 mA
Reset Current	• 28 mA
Max Voltage	• 35 VDC
Current Consumption	• 4 mA
Displays	• Fieldbus power status, green LED • Drop short indication, (4) Red LED
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)
Housing	• Engineered resin, DIN rail mounting
Housing Dimensions	• 113mm, 47mm, 68mm (L, W, H)
Ingress Protection	• IP20

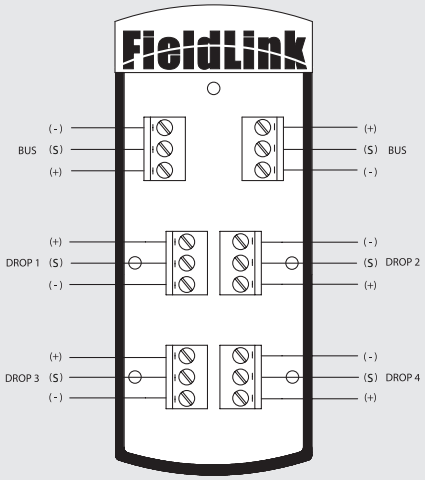
Schematic Drawing



Dimensions (in mm)



Wiring Diagram



PROFIBUS

Drop Connectors

StoneL Model 461109

Passive Multi-drop Connector (4 Drops)

This passive multi-drop connector is compact with DIN rail mount for wiring PROFIBUS-PA networks. It provides terminations for Bus In, Bus Out, and four (4) individual drops or spurs.

Features

- Fieldbus power status LED
- DIN rail mounting
- IP20 housing

Enclosure Option

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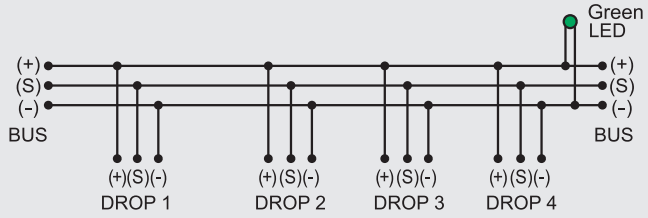
CE

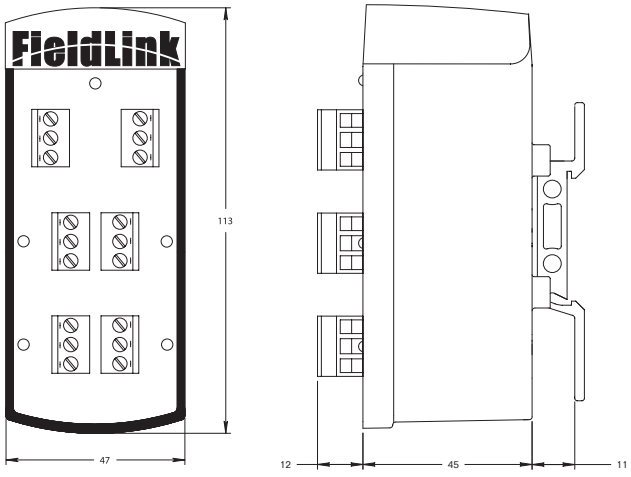
Specifications

Protocol	• PROFIBUS-PA
Max Spurs (Drops)	• 4
Type	• Passive Drops
Max Current	• 8 Amp
Voltage Drop, Bus Trunk	• Negligible
Voltage Drop, Spur	• Negligible
Maximum Voltage	• 35VDC
Current Consumption	• 2mA
Displays	• Fieldbus power status, green LED
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)
Housing	• Engineered resin, DIN rail mounting
Housing Dimensions	• 113mm, 47mm, 68mm (L, W, H)
Ingress Protection	• IP20

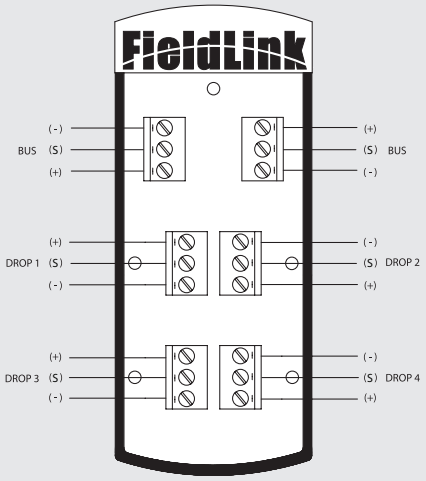
Schematic Drawing



Dimensions (in mm)



Wiring Diagram

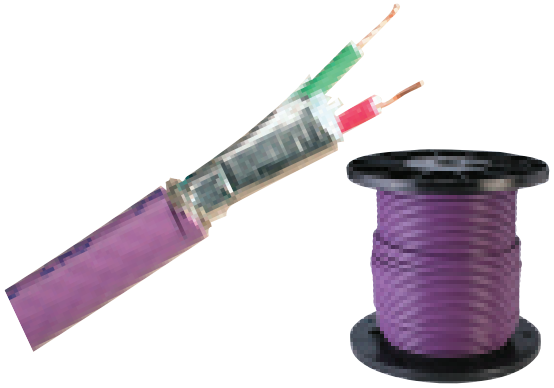


Cable and Wiring

StoneL Model 463008

PROFIBUS-DP Bus Cable

This cable is selected for its rugged design and specifications favorable for use with the PROFIBUS-DP communication protocol. The cable is constructed of PVC and is UL Type Power Limited Tray Cable (PLTC).



Features

- 2-conductor + Shield for PROFIBUS Networks
- Rugged PVC Construction
- UL Type PLTC

CE

Specifications

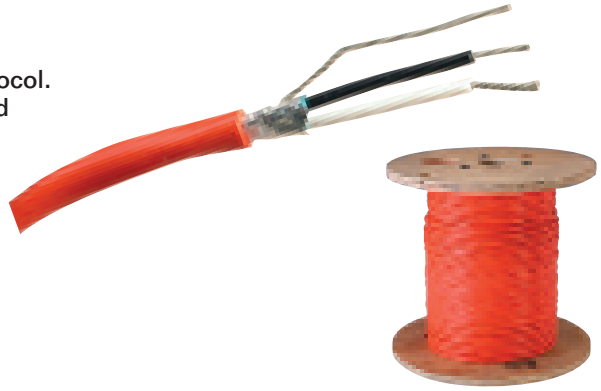
Conductors	• 2 (Solid Copper) with Shield
Length	• 100m (328')
Wire Gauge	• 22 AWG
DC Resistance	• 0.013 Ohms/m (@ 20°C)
Nominal Capacitance	• 29.5 pf/m
Jacket material	• PVC
Cable Diameter	• 8mm
Applicable specifications	• UL Type PLTC, CMG, CL2 •C(UL) CMG
Weight	• 9.5 kg (21lbs)

Cable and Wiring

StoneL Model 463010, 463016, 463018

PROFIBUS-PA Bus Cable

This cable is selected for its rugged design and specifications favorable for use with the PROFIBUS-PA communication protocol. The cable is constructed of PVC and is UL type Power Limited Tray Cable (PLTC).



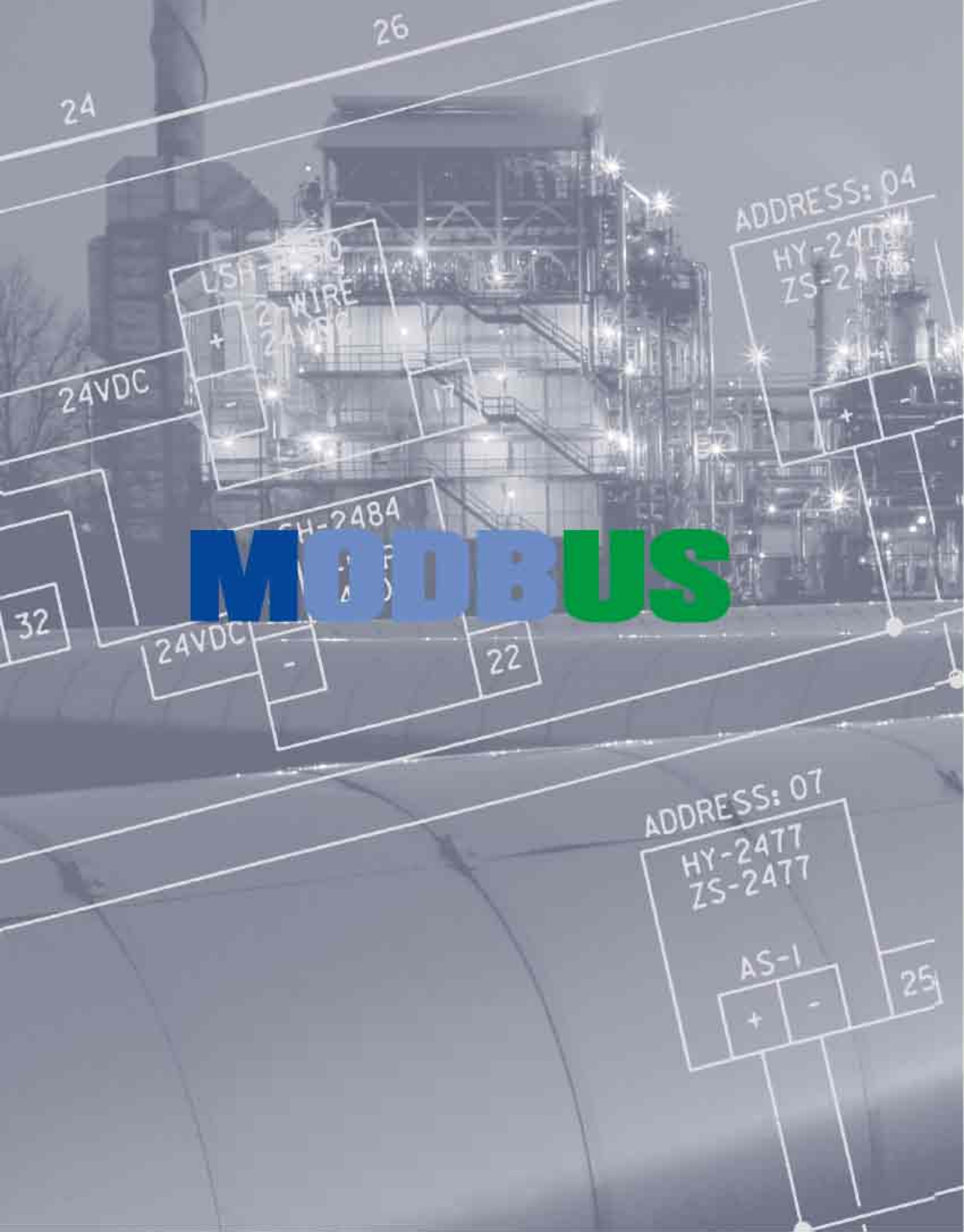
Features

- 2-conductor cable with Shield for PROFIBUS-PA Networks
- Rugged PVC Construction
- UL Type PLTC

CE

Specifications

Conductors	• 2 (Stranded Tinned Copper) + Shield
Length	• 100m (328') (463010) • 100m (328') I.S. (463016) • 300m (984') (463018)
Wire Gauge	• 18 AWG
DC Resistance	• 0.025 Ohms/m (@ 20°C)
Nominal Capacitance	• 78.7 pf/m
Jacket material	• PVC (Orange) • PVC (Blue) I.S. (463016)
Cable Diameter	• 7mm
Applicable specifications	• UL Type PLTC, CM • C(UL) CM


MODBUS
24
26
24VDC
WIRE
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H-2484
32
24VDC
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ADDRESS: 07
HY-2477
ZS-2477
AS-1
25

Modbus

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The Modbus Organization
PO Box 628
Hopkinton, MA 01748-0628
USA
Tel: 508-435-7170
www.modbus.org

Modbus Overview and Analysis

Modbus, developed by Schneider/Modicon, has been the defacto standard for interfacing remote I/O and PLCs into the process DCS system for the past 15 years. Because of this strong history, most legacy control systems interface conveniently with the Modbus standard. Numerous actuator and instrument manufacturers support the protocol, therefore, it is used extensively as a "field-bus" network as well. The following discussion focuses primarily on the protocol use for field networking purposes.

Modbus Features

- Interfaces conveniently into most existing plant control architectures
- Networks up to 32 devices on a 4-wire network (2-wires for signal and 2-wires for power)
- Trunk network may extend up to 4,000 feet (1220 meters) per segment
- Dramatically cut wiring costs and commissioning over conventional applications
- Protocol has been proven in thousands of "mission critical" process applications over the last 20 years.
- Capable of supporting both simple discrete devices as well as sophisticated analog applications
- May be supported without additional training since most plants are already using the protocol extensively
- Popular among instrument manufacturers for a wide variety of applications

Optimal Modbus Applications

Modbus is ideally suited for process applications where up to 32 devices (31 field devices and 1 master) may be connected over a 4,000 foot span into an existing control system. The RS485 version is used for multi-drop field applications with other versions, RS232 and RS422, relegated to point-to-point installations.

Modbus RS485 field devices must be separately powered since the signal wire pair does not transmit sufficient power. Signal wires may be shielded twisted pair. An additional 16 gauge pair is recommended for power transmission and may be run in the same tray or conduit with the shielded twisted signal pair.

Both discrete and analog applications are supported by the StoneL Modbus modules. So in addition to directly connecting valve communication terminals into the bus, conventional 4-20mA analog devices may be interfaced as well.

Modbus Economic Analysis

Since many PLCs and DCSs integrate a Modbus master with Modbus drivers there is minimal cost for plugging in the Modbus line and mapping I/O to the application software. A conventional 24VDC power supply may be used for powering the field devices. (Power for the master is typically incorporated into the PLC or DCS rack.)

Modbus provides significant savings in upfront wiring cost. It is recommended for long cable runs between field devices.

Installation Cost Comparison:

	Conventional	Modbus
Valve Monitor; VCT with Solenoid	$ 500	$ 650
Conduit and Wiring ($8/ft)[1]	$ 600	$ 250
I/O Cards; Modbus Master	$4,000	$ 100
Power Supply	$ 10	$ 960
Protected Drop Connectors	$ 0	$ 80
Total Installed Cost	$4,540	$1,810

1. Wiring 10 field devices that are located an average of 500 ft from the controller in a Class I Division 2 environment.

Net Installation Savings
$2,730

With the exceptional distance capabilities of the Modbus RS485 protocol there are dramatic wiring savings as noted above. Analog input capabilities further improve the economic benefits.

Modbus modules from StoneL have a 4 to 20 mA input which digitizes the signal with a resolution to 0.1%. Power for the circuit is available from the bus power pair wired to the module. Process flow, temperature, pressure, and any other 4-20mA input signal, may be input directly into the bus, eliminating wiring and input modules at the controller!

Modbus Specifications

Physical Layer Options	RS232, RS422, RS485 (RS485 recommended for field devices)		
	RS232	RS422	RS485
Max Drivers	1	1	32
Max Receivers	1	10	32
Max Cable Length	50ft.	4000ft.	4000ft
Topology (RS485)	Bus/tree, terminators required		
Cabling (RS485)	One shielded twisted pair for signal and one pair for 24 VDC supply		
Bus Power	Must have auxiliary 24VDC supply		
Transmission Rate	1.2K to 115K bits/second		
Data Access	Broadcast by master (no response by slave) or master/slave query with slave response (Cyclic polling is typically used)		
Data Transfer Size	Variable size in 1 byte increments		
Transmission Modes	RTU or ASCII (StoneL uses RTU)		
Addresses	From 1 to 255		
Approximate Cycle Time	74 msec for 32 field devices @ 32.4 kbits/second		
Error Detection	CRC (Cyclic Redundancy Check)		
Support Organization	Modbus Organization (www.modbus.org)		

Input/Output Modules

StoneL Model 461051, 465013 (DIN)

The I/O Module is designed to function as a Modbus slave device with termination points for connecting switches/sensors, as well as output devices such as solenoid valves and relays.

Enclosure Option

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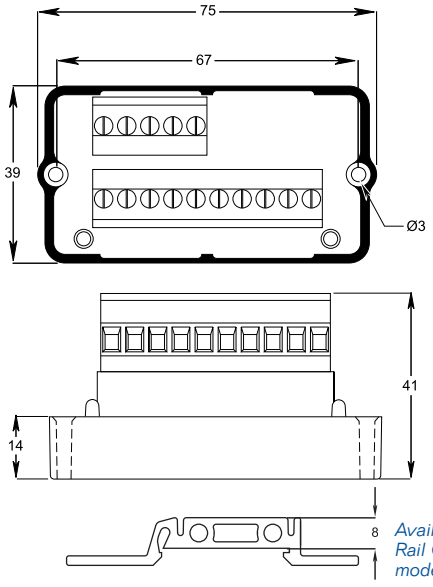
Inputs and Outputs

- Two (2) discrete inputs
- Two (2) discrete outputs
- One (1) analog input (4-20mA)

Specifications

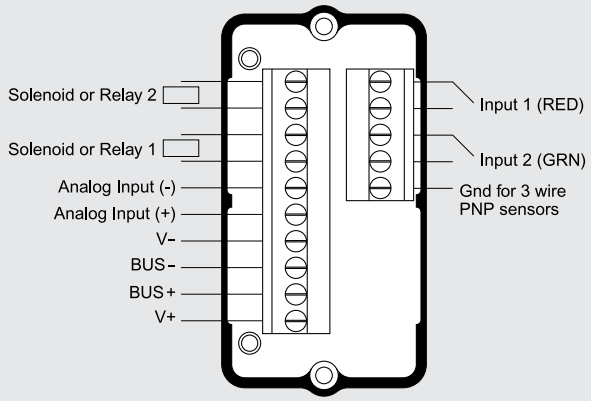
Model Numbers	• 461051,465013 (DIN)
Protocol	• Modbus RS485 (RTU)
Discrete Inputs	• (2) May be gold contact mechanical or proximity sensor
Discrete Outputs	• (2) 24VDC (4 Watts total power available)
Analog Input	• 4-20mA 10 bit resolution
Operating Voltage	• 24 VDC
Data Rate	• 9,600, 19,200, 38,400 Baud (Software Settable)
Current Consumption	• <20 mA (no outputs energized and no analog input)
Dimensions	• 75mm, 39mm, 42mm (L, W, H)
Indication	• Input 1 = Red LED; Input 2 = Green LED
Operating Temp.	• -25° to +70°C (-13° to +158°F)
Stock Temp.	• -25° to +70°C (-13° to +158°F)
Weight	• 90g (0.2 pounds)

Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465013

Wiring Diagram



Modbus Data locations

Input Data
Input 1 = 10001
Input 2 = 10002
Analog input = 30001

Output Data
Output 1 = 00001
Output 2 = 00002

Modbus Set-up

Data Rate, Device Address, and Bit framing are software settable. Software tool available from StoneL.

Input/Relay Output Modules

StoneL Model 461085, 465020 (DIN), 461086, 465021 (DIN)

This I/O module is designed to function as a Modbus (RS485) node with termination points for connecting switches/sensors as well as relay outputs to operate devices like motors and other high powered devices. Outputs can be interlocked to operate AC motors or independent to operate independent AC loads. Outputs can be configured to fail on or off.

Inputs and Outputs

- Two (2) Discrete inputs
- Two (2) Discrete (relay) outputs
- One (1) Analog Input

Features

- Pre-determined output fail state
- DIN rail available

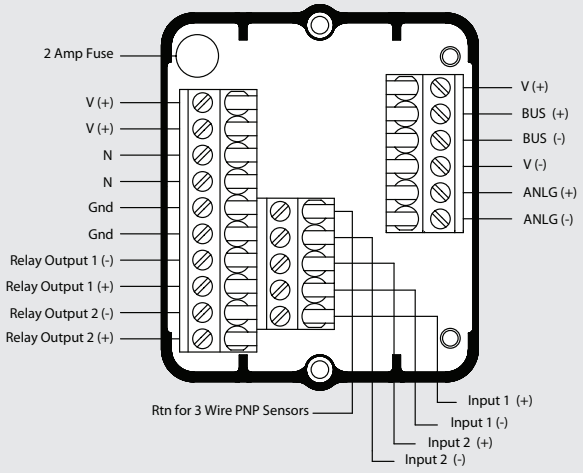
Enclosure Option

JM p.154 FB p.160 FR p.166

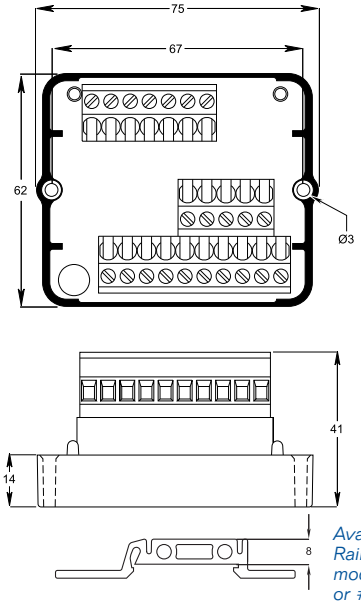
Specifications

Model Numbers	• Interlocking: 461085, 465020 (DIN)
	• Independent: 461086, 465021 (DIN)
Inputs	• (2) 7mA 24VDC, gold contact mechanical, low power reed, or proximity sensor
Outputs	• Interlocking: (2) 120/250VAC @ 2A interlocked for motor operation • Independent: (2) 120/250VAC @ 2A independent for other AC loads
Operating Voltage	• 24 VDC
Analog Input	• (1) Analog (4-20mA) input 10 bit resolution (0.1%)
External Voltage	• 120/250 VAC (for relay outputs)
Indication	• (2) LEDs indicate discrete input status (Red/Green)
Dimensions	• 75mm, 62mm, 51mm (L, W, H)
Operating Temp.	• -40° to +85°C (-40° to +185°F)

Wiring Diagram



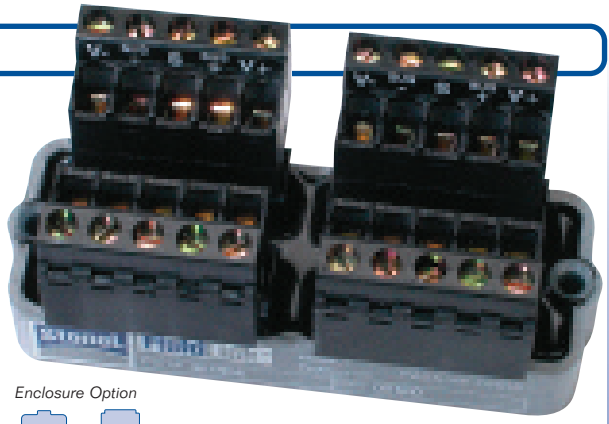
Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465020 or #465021

Drop Connectors

StoneL Model 461056, 465004 (DIN)



Passive Multi-drop Connector (2 Drops)

This Multi-drop Connector is compact with direct mount for wiring Modbus networks. It provides terminations for Bus In, Bus Out, and two (2) individual drops or spurs.

Features

- Direct mount or DIN rail mount available
- IP20 housing

Enclosure Option

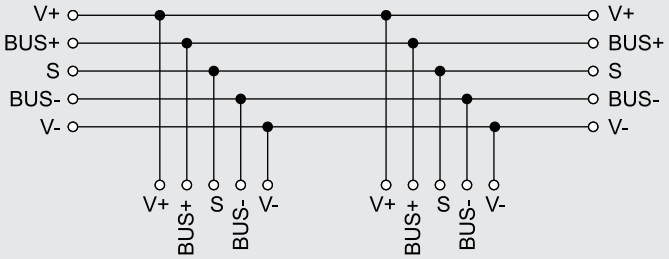
JM p.154 FR p.166

CE

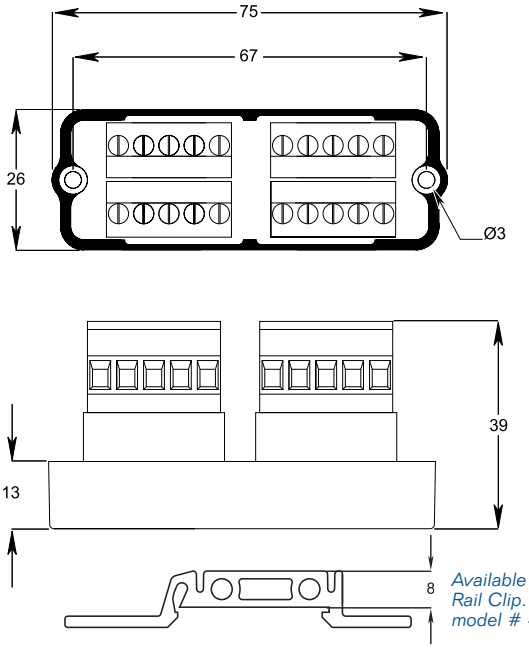
Specifications

Model Numbers	• 461056, 465004 (DIN)
Protocol	• Modbus RS485 with 24 VDC power
Max Spurs (Drops)	• 2
Type	• Passive drops
Max Current	• 8 Amp
Voltage Drop, Bus Trunk	• Negligible
Voltage Drop, Spur	• Negligible
Maximum Voltage	• 35VDC
Current Consumption	• None
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)
Housing	• Engineered resin
Housing Dimensions	• 75mm, 26mm, 39mm (L, W, H)

Schematic Drawing

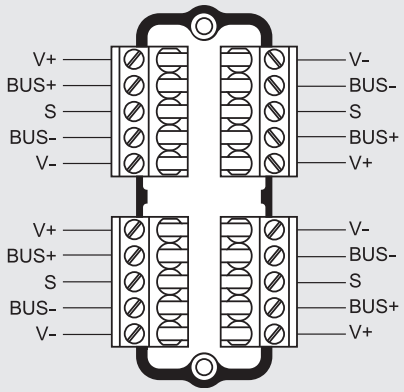


Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465004

Wiring Diagram



Drop Connectors

StoneL Model 461076

Passive Multi-drop Connector (4 Drops)

This multi-drop connector is compact with DIN rail mount for wiring Modbus networks. It provides terminations for Bus In, Bus Out, and four (4) individual drops or spurs.

Features

- 24VDC power status LED
- DIN rail mounting
- IP20 housing

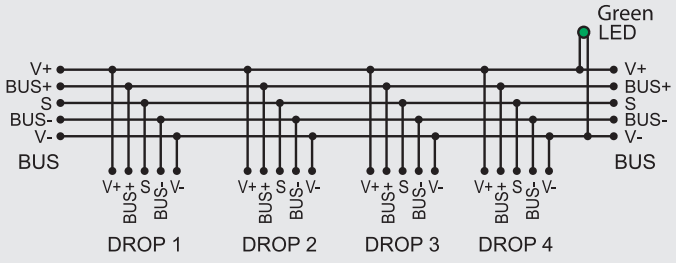
Enclosure Option

FB p.160 FR p.166

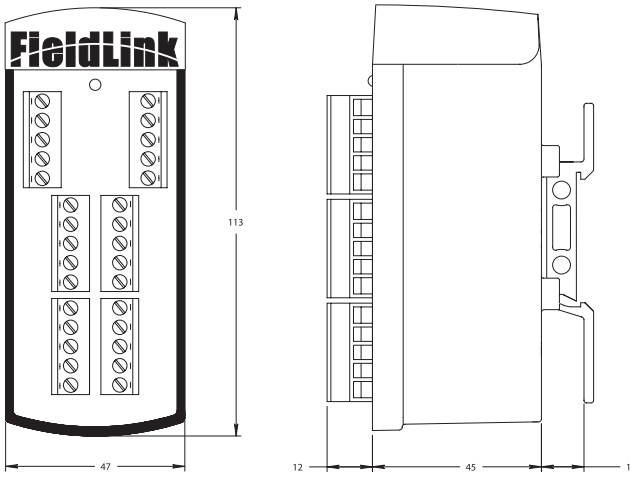
Specifications

Protocol	• Modbus RS485 with 24 VDC power
Max Spurs (Drops)	• 4
Type	• Passive drops
Max Current, Bus Trunk/Drops	• 8 Amp
Voltage Drop, Bus Trunk	• Negligible
Voltage Drop, Spur	• Negligible
Max Voltage	• 35 VDC
Current Consumption	• 2mA
Displays	• 24 VDC power status, green LED
Operating Temp.	• -40° to +85°C (-40° to +185°F)
Storage Temp.	• -40° to +85°C (-40° to +185°F)
Housing	• Engineered resin, DIN rail mounting
Housing Dimensions	• 113mm, 47mm, 68mm (L, W, H)
Ingress Protection	• IP20

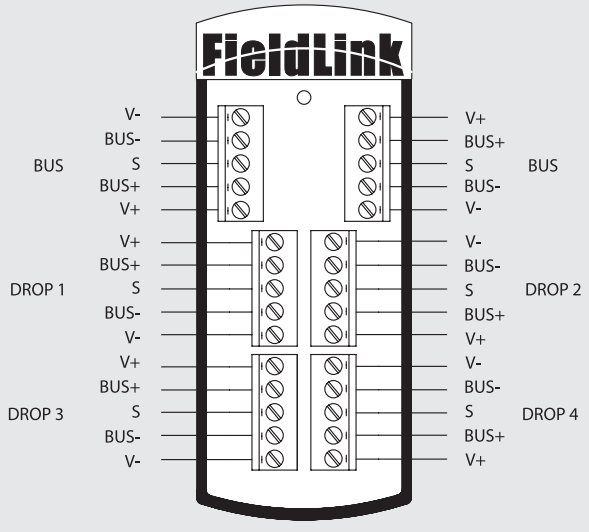
Schematic Drawing



Dimensions (in mm)



Wiring Diagram



Drop Connectors

StoneL Model 461119, 465010 (DIN)

Power Protected Drop Switch (1 Drop)

This disconnect switch is a compact drop connector for wiring Modbus networks. It has a disconnect switch that allows the user to disconnect a drop from the trunk. This device also provides current limiting on the power leg to prevent power losses.

Features

- Current limit on power drop
- Direct mount or DIN rail mount available

Enclosure Option

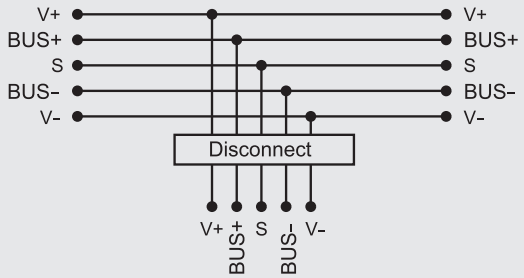
JM p.154 FR p.166

CE

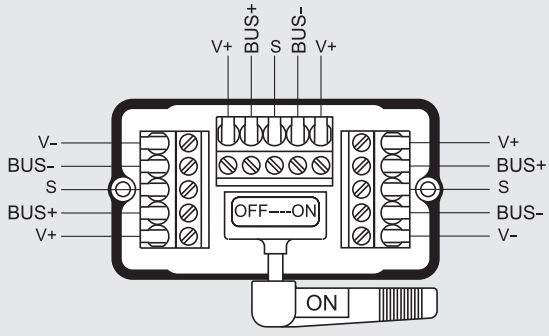
Specifications

Model Numbers	• 461119, 465010 (DIN)
Protocol	• Modbus RS-485
Max Devices per Drop	• 1
Type	• Passive Drop Switch
Max Current (Trunk)	• 8 Amp
Max Current (Drop)	• 0.2 Amp
Voltage Drop (Trunk)	• Negligible
Voltage Drop (Drop)	• <1V
Current Consumption	• None
Displays	• None
Operating Temp.	• -40° to +85°C (-40° to 185°F)
Storage Temp.	• -40° to +85°C (-40° to 185°F)
Housing	• Engineered Resin
Housing Dimensions	• 75mm, 49mm, 43mm (L, W, H)
Ingress Protection	• IP20

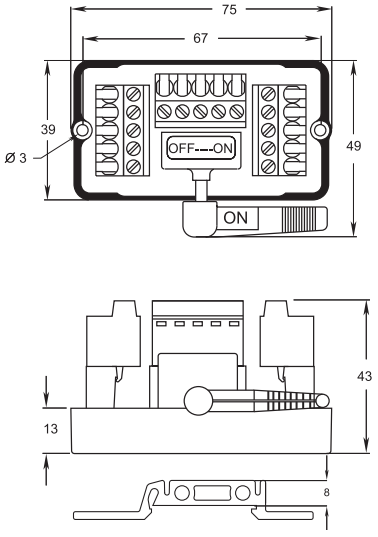
Schematic Drawing



Wiring Diagram



Dimensions (in mm)



Available with DIN Rail Clip. Specify model # 465010

Commissioning Kits and Software

StoneL Model 464003

Modbus Commissioning Kit

This Modbus Commissioning kit contains all the hardware and software needed to fully configure and test Modbus devices. This kit can be used to bench test and commission single Modbus devices. This kit is a must for shop testing and for stroke testing Modbus devices.

Kit Contents

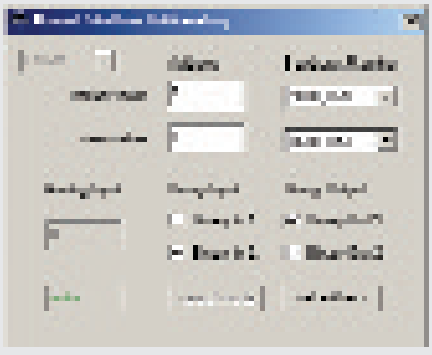
- Modbus Commissioning Cable assembly
- Portable 24VDC power supply
- ModbusADR Software
- Carrying Case

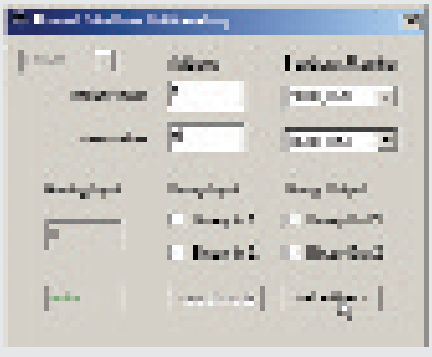
CE

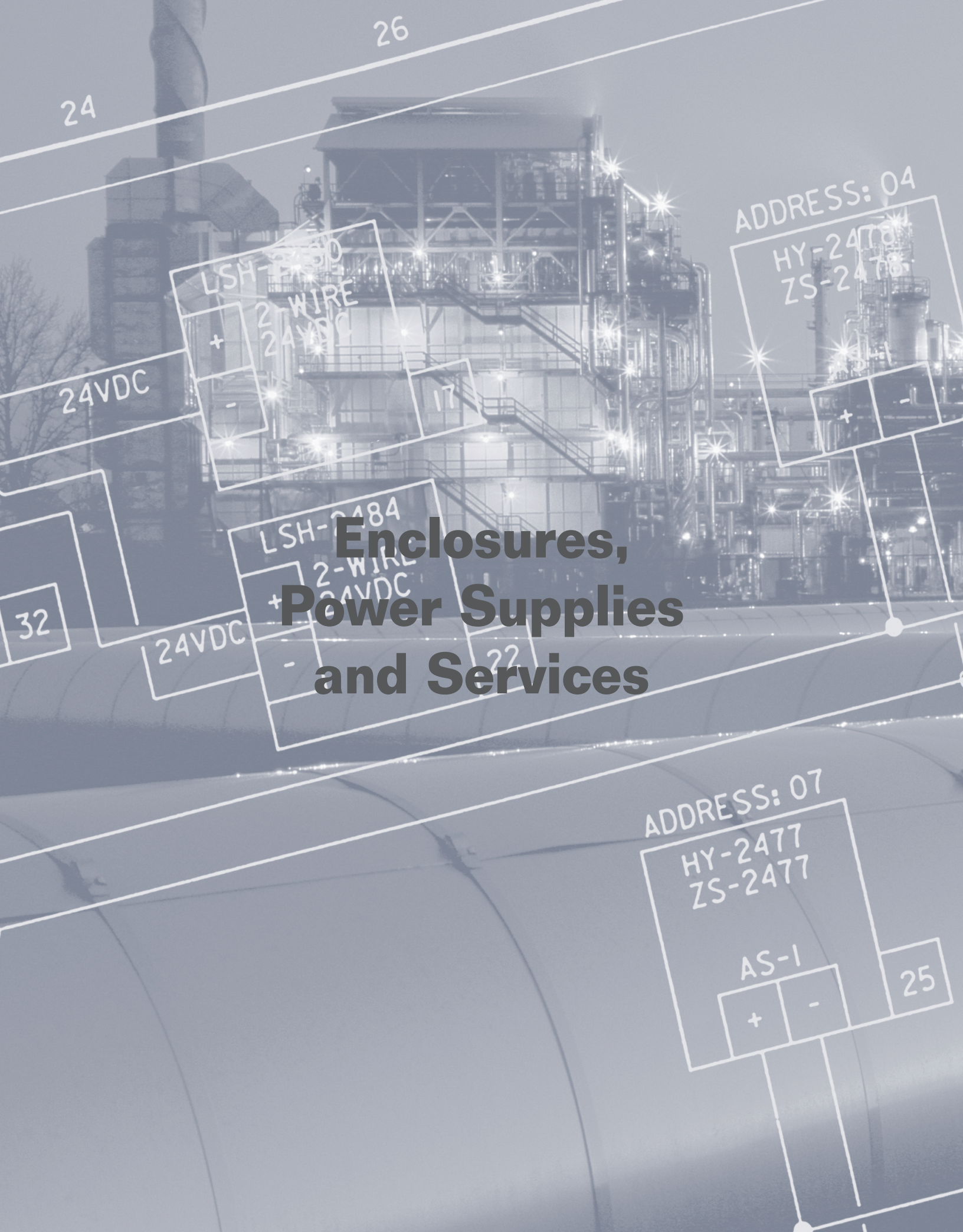
Specifications

Hardware	• Serial cable with flying leads
Power Supply	• 120VAC input (24VDC 0.75A output)
Software	• ModbusADR software
Operating Temp.	• -40° to +85°C (-40° to +185°F)

Modbus Control Tools Screen







Enclosures, Power Supplies and Services

Enclosures, Power Supplies, and Services

CONTENTS

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Email: sales@stonel.com
www.stonel.com

Junction Module (JM™) Enclosure

Overview

StoneL's Junction Module (JM) enclosure is an environmetally hardened platform which is suitable for use in the most extreme corrosive and hazardous process environments. The JM features a wide variety of bus networking capabilities for protocols used in the process industries. Because of its flexibility and functionality it has become an essential building block for bus network users in the processing industries.

No Seal-Offs in Division 1 & 2 Hazardous Areas

Eliminate costly seal fittings in Class I & II division 1 & 2 areas when installing bus networks using StoneL's JM enclosures. Because the JM enclosure has passed special pressure piling tests simulating the extreme pressures caused by remote conduit ignition, no seal offs are required in either Div 1 or Div 2 areas.

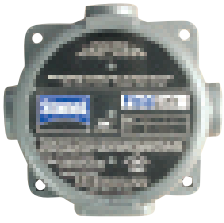
Approved for Hazardous Environments

Aluminum Cover

- Class I Groups B, C, D Divisions 1 and 2
- Class II Groups E, F, G Divisions 1 and 2

Clear Cover

- Class I Groups A, B, C, D Division 2
- Class II Groups E, F, G Division 2



JM with Aluminum Cover

Keep Bus Energized During Maintenance in Division 1 Areas

FM approved factory-sealed leads are available for the drop leg of the switched drop connector. In division 1 areas the conduit must not be opened to atmosphere when wires are energized. However, with factory-sealed leads no energized wires are exposed to the atmosphere when the drop leg is opened or removed for maintenance even though the bus trunk remains energized.

JM with Switched Drop

JM Features Include

Rugged Enclosure

This enclosure is constructed of durable, marine grade anodized aluminum with two coats of epoxy. Optional clear polycarbonate cover enables observation of circuit status without opening the enclosure.

Hazardous Approval Ratings

JM may be used in explosion proof and general purpose applications.

Quick Access

Screw-on cover enables convenient access to the enclosure.

Vapor Tight and Submersible

Rated for IP67 and NEMA 4, 4X and 6, the JM withstands rigorous wash downs and corrosive environments.

Compact Design

JM's size minimizes space requirements for wiring and conduit layout.

Wide Variety of Functions

Select from drop connectors, switched drop connectors, relay modules, I/O modules, power conditioners, and special module configurations.

Convenient Wiring

Experience quick and secure wiring with the clearly labeled, top insertion terminal strips.

JM™ Enclosure Functions

Drop Connectors

Drop connectors enable individual spurs to be conveniently wired to the bus trunk. They are available in either passive or protected versions.

Passive drop connectors directly connect bus and spur wiring via standard pre-labeled wire terminals.

Protected drop connectors include a solid state protection circuit which detects a fault condition on the spur and isolates the spur from the bus. Bus operation is unaffected yet the bus master will be able to detect the faulted spur. Local LED indication may be viewed through the clear Lexan cover indicating a fault condition.

Specifications

JMT models **(Passive)**

JMP and JMD models **(Protected)**

See pages 81, 106, 121, 133, 135 and 147 for more information.

Switched Drop Connectors

Each spur may be individually energized or de-energized using the switched drop connector. Protection circuitry comes standard in the drop connection providing fault protection for the bus while the spur is energized. The JM switched drop connector may be locked and/or tagged out assuring safe working conditions for the maintenance of field device(s) attached to the spur while the bus remains energized. The bold On and Off labeling may be seen clearly up to 20 feet away, making bus status clearly viewable in the plant environment.

Specifications JMS models

See pages 83, 108, 122, 132, 136 and 149 for more information.

Relay Modules

Independent or Interlocked relay modules are integrated with each of the I/O modules to provide high power output switching capabilities. (AS-Interface, DeviceNet, Modbus and Foundation Fieldbus externally powered I/O modules are available with relay outputs.) The 2-DO from the I/O modules drive the two relays providing high power switching operation to separate high power circuits. All other functions of the I/O modules remain the same.

Specifications

JMI models **(Independent Relays)**

JMR models **(Interlocking Relays)**

See pages 73, 74, 105, 119 and 146 for more information.

I/O Modules

Interface field devices into the bus network in hazardous environments with JM I/O modules. Connect analog 4 to 20mA instrumentation inputs and outputs or discrete inputs and outputs to the module and take advantage of incredible installation savings.

Specifications

AS-Interface, JMM96

See page 71 for more information.

AS-Interface, Extended Addressing, JMM97,

See page 72 for more information.

DeviceNet, JMM92

See page 104 for more information.

Modbus, JMM95

See page 145 for more information.

Foundation Fieldbus, Bus Powered, JMM93

See page 117 for more information.

Foundation Fieldbus, Externally Powered, JMM94

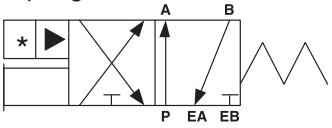
See page 118 for more information.

I/O Modules with Integral Solenoid Valve

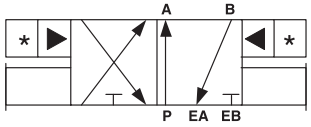
An integral Cyclone™ pneumatic valve may be selected that is electrically sized to be compatible with the I/O module outputs. An ultra low power piezo valve which may be driven directly from the bus powered Foundation Fieldbus module is also available. Total power consumption with the Piezo and FF module is less than 16mA, maximizing the number of units on any one segment!

Schematics

Spring Return



Shuttle Piston



** Solenoid or Piezo Pilots*

Cyclone Valve Specifications, JMM models

Configuration	Single Pilot, 5-way 2-Position Spring return or Double Pilot, 5-way 2-Position Shuttle piston
Flow rating	0.7 Cv (10.7 Kv)
Porting	1/4" NPT
Operating Pressure	25 to 120 psi (1.7 to 7.5 bar)
Operating Life	1 million cycles
Valve Body Material	360 Brass or 303 Stainless Steel

Solenoid Pilot

Current Requirement	75mA @ 24VDC
Operating Temperature	-18° to +50° C (-4° to 122° F)
Filtration Requirement	40 micron

Piezo Pilot

Current Requirement	2mA @6.5 VDC
Operating Temperature	-10° to +60° C (+14° to 140° F)
Filtration Requirement	5 micron, Dried
Approvals	EEx ia IIC T6

Special Modules, JMX models

A variety of other functions are available with the JM. The following options provide essential networking capabilities in hazardous or general purpose environments.

Bus Powered Foundation Fieldbus with Hawkeye Sensors

StoneL has developed ultra-low power Hawkeye sensors which are fully functional with the FF bus powered module. For applications with linear operators, or for those requiring point sensing discrete inputs in the process environment, this is an ideal solution.

Specifications

See pages 117 and 197 for more information.

AS-Interface Power Conditioner

Power for two-wire bus networks must be decoupled from the communication signal for proper operation. With the JM power conditioner, the power supply may be located in a safe area with the power conditioner located in the field.

Distance from the power supply to the power conditioner does not add to effective bus length. Two separate power supplies may be connected to the same conditioner for redundancy.

Specifications

See page 66 for more information.

AS-Interface Repeater

This repeater extends the usable length of the AS-Interface network by 100 meters. The Repeater requires no configuration and has no address on the bus. The Repeater requires one (1) AS-Interface power supply or an AS-Interface Power Conditioner.

Specifications

See page 67 for more information.

AS-Interface Combination Repeater and Power Conditioner

AS-Interface Combination Repeater and Power Conditioner extends your network length easily in hazardous and general purpose locations using our unique AS-Interface Repeater and Power Conditioner package.

Specifications

See pages 66 and 67 for more information.

JM™ Specifications and Ratings

JM Specifications and Ratings

Materials of Construction

Housing and Cover	Marine grade anodized aluminum with epoxy coating
Elastomer Seals	Buna-N
Fasteners	Stainless Steel
Clear Cover	Lexan® Polycarbonate
Enclosure Protection	NEMA 4, 4X, 6 and IP 67
Hazardous Area Ratings	Class I Groups B, C, D Div. 1 and 2 Class II Groups E, F, G Div. 1 and 2
Approvals	Most models FM approved; CSA approved

For approval information visit www.stonel.com/fieldlink/approvals or consult factory

Temperature Ratings

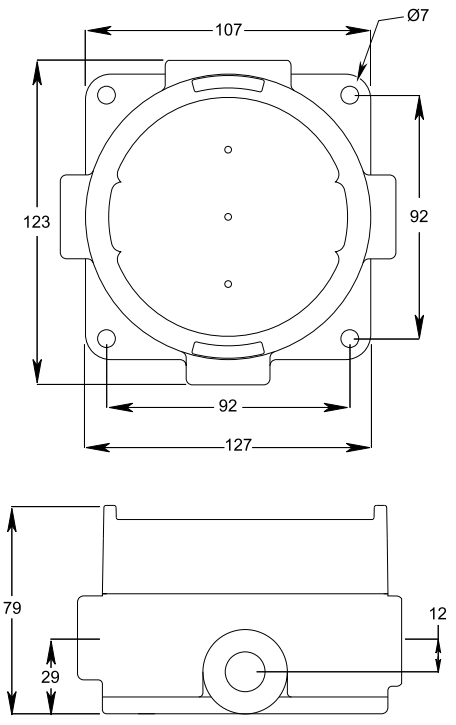
Switched Drop Connectors, Drop Connectors, and Power Conditioners	-40° to +85°C (-40° to +185°F)
I/O and Relay Modules (AS-i only)	-25° to +70°C (-13° to +158°F)
I/O and Relay Modules (other protocols)	-40° to +85°C (-40° to +185°F)
I/O w/Pneumatic Valve	See Pneumatic Valve Section
Special Modules	See Special Modules Section

Warranty

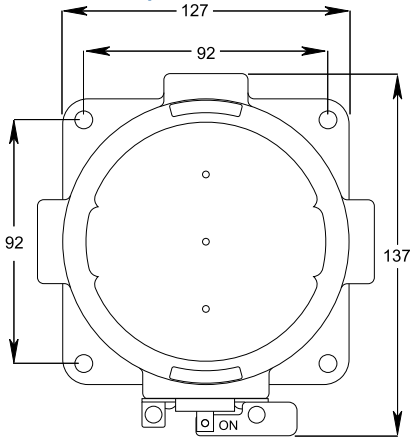
Complete Assemblies	Two years

Dimensions (in mm)

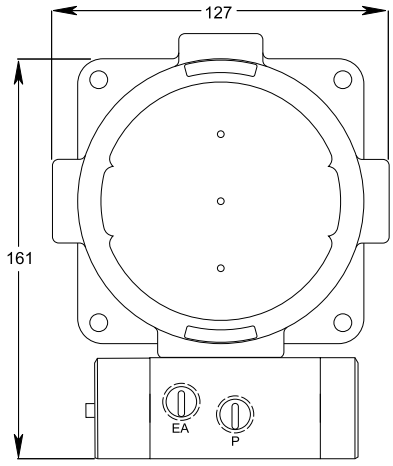
Standard Enclosure



Switched Drop Connector Enclosure



Enclosure with Pneumatic Valve



JM™ Model Numbers

Drop Connectors

Model Number Example: JM T01 11 E N

JM	Functions	Pneumatic Valve	Cover Type	Conduit Entries
	Protected **P01** FF & Profibus-PA; 1-1 *(see pg. 121 & 135 for specs)* **P03** AS-i (240mA); 1-1 *(pg. 81)* **D11** (2) FF & Profibus-PA; 1-1 *(pg. 121 & 135)* **D13** (2) AS-i (240mA); 1-1 *(pg. 81)* **Power Protected** **P04** DeviceNet; 1-1 *(pg. 108)* **Passive** **T01** AS-i; 1-2 *(pg. 81)* **T03** DeviceNet; 1-2 *(pg. 106)* **T05** Profibus-DP & Modbus; 1-2 *(pg. 133 & 147)* **T07** FF & Profibus-PA; 1-2 *(pg. 121 & 135)*	**11** No Pneumatic Valve	**C** Clear Lexan® **E** Epoxy Coated Aluminum	**3** (3) 1/2" NPT **N** (4) 1/2" NPT **9** (3) 3/4" NPT **T** (4) 3/4" NPT **6** (3) M20 **M** (4) M20 **Z** (3) 1/2" NPT with potted drop leads

Switched Drop Connectors

Model Number Example: JM S03 11 C 3

JM	Functions	Pneumatic Valve	Cover Type	Conduit Entries
	Protected **S01** FF & Profibus-PA (40mA); 1-1 *(see pg. 122 & 136 for specs)* **S03** AS-i (240mA); 1-1 *(pg. 83)* **Power Protected** **S04** DeviceNet; 1-1 *(pg. 108)* **S05** Profibus-DP & Modbus; 1-1 *(pg. 132 & 149)*	**11** No Pneumatic Valve	**C** Clear Lexan® **E** Epoxy Coated Aluminum	**3** (3) 1/2" NPT **9** (3) 3/4" NPT **6** (3) M20 **Z** (3) 1/2" NPT with potted drop leads

I/O Modules

Model Number Example: JM M93 3G C 3

JM	Functions	Pneumatic Valve	Cover Type	Conduit Entries
	M92 DeviceNet; 2-DI, 2-DO, 1-AI *(see pg. 104 for specs)* **M93** FF-H1 (Bus Powered); 2-DI, 2-DO *(pg. 117)* **M94*** FF-H1 (Externally Powered); 2-DI, 2-DO, 1-AI, 1-AO *(pg. 118)* **M95** Modbus; 2-DI, 2-DO, 1-AI *(pg. 145)* **M96** AS-i; 4-DI, 4-DO *(pg. 72)* **M97** AS-i; 4-DI, 3-DO Extended Addressing *(pg. 72)* *Not available with pneumatic valve options	Pilot / Type / Brass / SS 1-Solenoid* / 2-Postn, 5-Way / **2H** / **2B** 2-Solenoids* / 2-Postn, 5-Way / **2L** / **2E** 1-Piezo** / 2-Postn, 5-Way / **3G** / **3A** **11** No Pneumatic Valve * Use with M92, M95, M96 or M97 Functions ** Use with M93 Function	**C** Clear Lexan® **E** Epoxy Coated Aluminum	**3** (3) 1/2" NPT **N*** (4) 1/2" NPT **9** (3) 3/4" NPT **T*** (4) 3/4" NPT **6** (3) M20 **M** (4) M20 **Z** (3) 1/2" NPT with potted drop leads *Not available with pneumatic valve options

JM™ Model Numbers

Relay Modules

Model Number Example: JM R92 11 C N

	Functions	Pneumatic Valve	Cover Type	Conduit Entries
JM	**Independent Relays** **R92** DeviceNet; 2-DI, 2-DO (relay), 1-AI *(see pg. 105 for specs)* **R94** FF (Externally Powered); 2-DI, 2-DO (relay), 1-AI, 1-AO *(pg. 119)* **R95** Modbus; 2-DI, 2-DO (relay), 1-AI *(pg. 146)* **R96** AS-i; 4-DI, 2-DO, 2-DO (relay) *(pg. 73)* **R97** AS-i; 4-DI, 1-DO, 2-DO (relay; ext. addr.) *(pg. 74)* **Interlocking Relays** **I92** DeviceNet; 2-DI, 2-DO, 1-AI *(pg. 105)* **I94** FF (Externally Powered); 2-DI, 2-DO, 1-AI, 1-AO *(pg. 119)* **I95** Modbus; 2-DI, 2-DO, 1-AI *(pg. 146)* **I96** AS-i; 4-DI, 2-DO, 2-DO (relay) *(pg. 73)* **I97** AS-i; 4-DI, 1-DO, 2-DO (relay; ext. addr.) *(pg. 74)*	**11** No Pneumatic Valve	**C** Clear Lexan® **E** Epoxy Coated Aluminum	**T** (4) 3/4" NPT **N** (4) 1/2" NPT **M** (4) M20

Special Function Modules

Model Number Example: JM X04 11 C N

	Functions	Pneumatic Valve	Cover Type	Conduit Entries
JM	**X00** AS-i; Repeater *(see pg. 67 for specs)* **X01** AS-i; (1) Power Conditioner (redundant) and (1) Repeater *(pg. 66 and 67)* **X02** AS-i; Power Conditioner (redundant) *(pg. 66)* **X04** FF (Bus Powered); I/O Module with (2) FF Hawkeye Point Sensors *(p.117 and 156)* **X05** AS-i; Power Conditioner (daisy chain) *(p.67)* **X06** AS-i; (1) Power Conditioner (daisy chain) and (1) Repeater *(pg. 66 and 67)* **000** Empty Housing **B06** (6) Point Terminal Block **B12** (12) Point Terminal Block	**11** No Pneumatic Valve	**C** Clear Lexan® **E** Epoxy Coated Aluminum	**3** (3) 1/2" NPT **N** (4) 1/2" NPT **9** (3) 3/4" NPT **T** (4) 3/4" NPT **6** (3) M20 **M** (4) M20

FieldBlock Enclosure

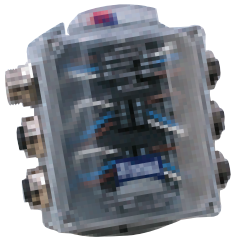
StoneL's FieldBlock enclosure is designed to be used in general purpose and nonincendive (Class I, Div 2) process applications with flexible wiring systems. With its rugged corrosion proof enclosure and a variety of module and connector configurations, it will prove invaluable for bus projects.

Flexible Wiring Systems

Cable Glands

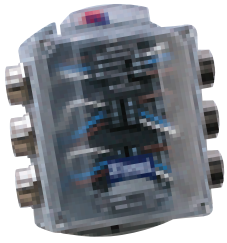
General purpose wiring may be connected into the FieldBlock via compression sealed cable glands. Glands with rubber grommets will compress wires tightly providing excellent mechanical strength and a water proof seal. Six cable glands are standard with included plugs to seal any unused entries.

Connectors



Mini-connectors designed for four wire bus networks (fifth wire for shield/ground) and micro-connectors for two wire buses (third wire for shield/ground) are standard options. Mini- and micro-connectors provide a convenient, secure method for disconnnecting spurs from the bus trunk. And with the switched drop connector, field devices may be conveniently removed without dropping power to the network.

NPT Conduit Adapters



1/2" NPT conduit hubs are available to attach conventional, conduit systems. Use the FieldBlock for PLTC/ITC cable applications on Class I, Division 2 areas and realize significant savings for standard bus applications in hazardous areas.

FieldBlock Features Include

Durable Corrosion Proof Enclosure

The enclosure is constructed of Lexan® Polycarbonate, also used for jet fighter canopies, high impact parts, and nonincendive instrumentation enclosures. The FieldBlock enclosure will withstand attack from acids, basic solutions and salts. A special coating is available for aggressive organic solvents.

Fully Sealed

The enclosure is fully sealed and may be used in heavy wash-down environments. Connectors and cable glands are static o-ring sealed.

Multiple Connector/Cable Gland Options

Select from mini-connectors, micro-connectors, cable glands, or 1/2" NPT. Special models may also be constructed for specific bus networking applications.

Convenient Wiring

Experience quick and secure wiring with the clearly labeled, terminal strips.

Space Efficient Design

The space efficient design minimizes external dimensions while providing ample internal space for wiring and function modules.

Wide Variety of Functions

Select from multi-drop connectors, switched drop connectors, I/O modules, relay modules and special module configurations.

Drop Connectors

Drop connectors enable individual spurs to be securely wired to the bus trunk. Drop connectors are available in either passive or protected versions. The FieldBlock offers 4 drops from the bus trunk as standard.

Passive Drop Connectors directly interconnect bus and wiring for all spurs with no protection circuitry.

Protected Drop Connectors include a solid state protection circuit which detects a fault condition on each of the spurs individually and isolates the affected spur from the bus. Bus operation and the other spurs are unaffected, yet the bus master will be able to detect the faulted spur. Local LED indication may be viewed through the clear Lexan cover indicating a fault condition.

Specifications (Passive), FBT models

Configuration	4 drops from bus trunk
Max. Rated Voltage	35VDC
Max. Current	8 Amps
Max. Voltage Drop	Negligible

Specifications (Protected), FBP models

Configuration	4 individual drops from bus trunk
Max. Rated Voltage	35VDC
Max. Trunk Current	8 Amps
Max. Trunk Volt Drop	Negligible
Max. Drop Current	Limited to Rated Value
Max. Drop Volt Drop	1.0 V
Rated Drop Currents	Select from 40mA or 240mA (see model numbers)
Holding Current (After Break)	28mA
Reset Current Level	Current falls below 28mA

See pages 85, 86, 107, 123, 124, 134, 138, 139 and 148 for more information.

Switched Drop Connectors

All of the spurs are simultaneously energized or deengized using the FieldBlock switched drop connector. Protection circuitry comes standard in each drop connection providing fault protection for the bus while the spurs are energized. The FieldBlock switched drop connector may be locked, and/or tagged out, assuring safe working conditions for the maintenance of field devices attached to the spurs while the bus trunk remains energized.

Specifications, FBS models

Max. Rated Voltage	35VDC
Max. Trunk Current	8 Amps
Max. Trunk Volt Drop	Negligible
Max. Drop Current	Limited to Rated Value
Max. Drop Volt Drop	1.0 V
Rated Drop Currents	Select from 40mA or 240mA (see model numbers)
Holding Current (After Break)	28mA
Reset Current Level	Current falls below 28mA

See pages 87, 125 and 137 for more information.

I/O Modules

Interface field devices into the bus network with FieldBlock I/O modules. Connect analog 4 to 20mA instrumentation inputs and outputs or discrete inputs and outputs to the modules and take advantage of incredible installation savings.

Specifications

AS-Interface, FBM96 *(See page 71 for more information.)*

Configuration	4 DI & 4 DO
Input Switching	3 mA @ 28 VDC1
Output Power	160mA @ 24 -30VDC Individual or All Combined

DeviceNet, FBM92 *(See page 104 for more information.)*

Configuration	2 DI, 2 DO, & 1 AI (4 to 20 mA)
Input Switching	7 mA @ 24 VDC1
Output Power	160mA @ 24 VDC Individual or All Combined

Modbus, FBM95 *(See page 145 for more information.)*

Configuration	2 DI, 2 DO, & 1 AI (4 to 20 mA)
Input Switching	7 mA @ 24 VDC1
Output Power	160mA @ 24 VDC Individual or All Combined

Foundation Fieldbus, Bus Powered, FBM93 *(See page 117 for more information.)*

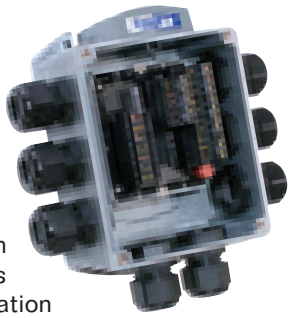
Configuration	2 DI & 2 DO
Input Switching	.045mA @ 6.5 VDC2
Output Power	20mA @ 6.5 VDC Each

Foundation Fieldbus, Externally Powered, FBM94 *(See page 118 for more information.)*

Configuration	2 DI, 2 DO and 1AI, 1AO (Both 4 to 20mA)
Input Switching	.045mA @ 6.5 VDC2
Output Power	160mA @ 24VDC Individual or All Combined

1. *May use StoneL 2-wire solid state, low power reed or gold mechanical switches.*
2. *May use StoneL 3-wire solid state or low power reed switches.*

Relay Modules



Independent or interlocked relay modules are integrated with each of the I/O modules to provide high power output switching capabilities. (AS-Interface, DeviceNet, Modbus and Foundation Fieldbus externally powered I/O modules are available with relay outputs.) The 2-DOs from the I/O modules drive the two relays providing high power switching operation to separate high power circuits. All other functions of the I/O modules remain the same.

Specifications, FBI and FBR models

Interlocking Outputs	2 A @ 125/250 VAC/VDC (Only one output will operate at a time.)
Independent Outputs	2 A @ 125/250 VAC/VDC
Operating Temperature (AS-I only)	-25° to +70°C (-13° to 158° F)
Operating Temperature (other protocols)	-40° to +85° C (-40° to 185° F)

See pages 73, 74, 105, 119 and 146 for more information.

Special Modules, FBX models

A variety of other functions are available with the FieldBlock to provide additional networking capabilities in general purpose and nonincendive process applications.

AS-Interface Power Conditioner

Power for two-wire bus networks must be decoupled from the communication signal for proper operation. With the FieldBlock power conditioner, the power supply may be located in a safe area with the power conditioner located in the field.

Distance from the power supply to the power conditioner does not add to effective bus length. Two separate power supplies may be connected to the same conditioner for redundancy.

Specifications

Configuration	DC or AS-I Power In*, AS-I Power Out, Redundant Inputs
Max Input Current	3 Amps
Max Input Voltage	32 VDC

**May use standard 30VDC power supply or AS-I power supply (integral power conditioner).*

See page 66 for more information.

AS-Interface Combination Repeater and Power Conditioner

AS-Inteface Combination Repeater and Power Conditioner extends your network length easily in hazardous (division 2) and general purpose locations using our uniqure AS-i Repeater and Power Conditioner Package.

AS-Interface Repeater

This repeater extends the usable length of the AS-Interface network by 100 meters. The Repeater requires no configuration and has no address on the bus. The Repeater requires one (1) AS-Interface power supply or an AS-Interface Power Conditioner.

AS-Interface Repeater Specifications

Operating Voltage	AS-i Voltage
Operating Current	60mA per segment
Connection	Bus in, Bus out
Indication	Power OK on Bus in (Green LED) Power OK on Bus out (Green LED)

See page 67 for more information.

Bus Powered Foundation Fieldbus with Hawkeye Sensors

StoneL has developed ultra-low power Hawkeye sensors which are fully functional with the FF bus powered module. For applications with linear operators, or for those requiring point sensing discrete inputs in the process environment, this is an ideal solution.

Specifications

Configuration	2DO, 2.5mA @ 6.5VDC (Piezo recommended) and 2DI, 2 Hawkeye inductive proximity position sensors
Sensor Ratings	Class I and II All Groups Division 2
Sensor Materials	Stainless Steel and Lexan
Sensing Distance	4 mm (0.16 inches)
Triggering Material	Any conductive metal
Operating Temperature	-40° to +85° C (-40° to +185° F)

See page 117 and 197 for more information.

Specifications and Ratings

Materials of Construction

Housing & Cover	Lexan® Polycarbonate
Elastomer Seals	Buna-N
Fasteners	Stainless Steel
Enclosure Protection	NEMA 4, 4X, 6 & IP 67

Temperature Ratings

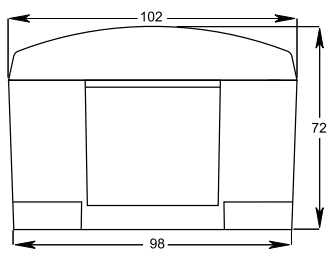
Switched Drop Connectors, Drop Connectors, and Power Conditioners	-40° to +85°C (-40° to +185°F)
I/O and Relay Modules (AS-i only)	-25° to +70°C (-13° to +158°F)
I/O and Relay Modules (other protocols)	-40° to +85°C (-40° to +185°F)
Special Modules	See Special Modules Section

Warranty

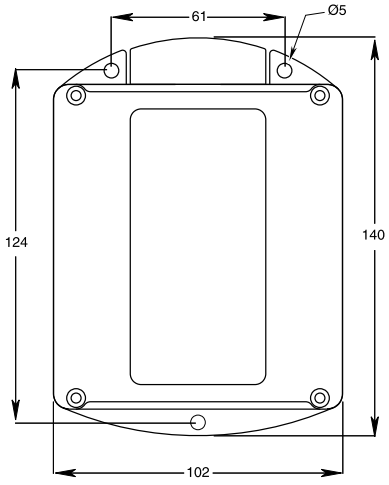
Complete Assemblies	Two years

Dimensions (in mm)

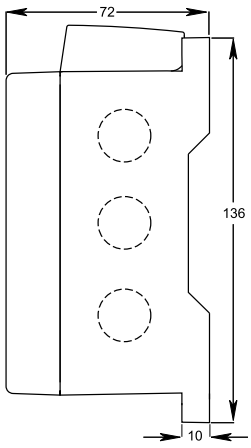
Top View



Front View



Side View



** Allow 25mm for switch cover opening clearance*

FieldBlock™ Model Numbers

Drop Connectors

Example: FBT06002

	Function	Entry Options* (Select one)
FB	**Protected**	
	P06 FF-H1 & Profibus-PA (40mA); 1-4 (see pg. 124 and 138 for specs)	**003, 004, 006, 007, 009** or **038**
	P08 AS-i (240mA); 1-4 (pg. 86)	**003, 004, 006, 007, 009** or **038**
	Passive	
	T02 AS-i; 1-4 (pg. 85)	**003, 004, 006, 007, 009** or **038**
	T04 DeviceNet; 1-4 (pg. 107)	**001, 002, 005, 007, 009** or **038**
	T06 Profibus-DP & Modbus; 1-4 (pg. 134 and 148)	**001, 002, 005, 007, 009** or **038**
	T08 FF-H1 & Profibus-PA; 1-4 (pg. 123 and 139)	**003, 004, 006, 007, 009** or **038**

*See Page 165 for Entry Option Description

Switched Drop Connectors (protected)

Example: FBS08004

	Function	Entry Options* (Select one)
FB	**S06** FF & Profibus-PA (40mA); 1-4 (see pg. 125 and 137 for specs)	**003, 004, 006, 007, 009** or **038**
	S08 AS-i (240mA); 1-4 (pg. 87)	**003, 004, 006, 007, 009** or **038**

*See Page 165 for Entry Option Description

I/O Modules

Example: FBM96013

	Function	Entry Options* (Select one)
FB	**M92** DeviceNet; 2-DI, 2-DO, 1-AI (see pg. 104 for specs)	**002, 007, 009,** or **017**
	M93 FF-H1 (Bus Powered); 2-DI, 2-DO (pg. 117)	**004, 006, 007,** or **009**
	M94 FF-H1 (Externally Powered); 2-DI, 2-DO, 1-AI, 1-AO (pg. 118)	**007, 018, 019,** or **035**
	M95 Modbus; 2-DI, 2-DO, 1-AI (pg. 145)	**002, 007, 009,** or **017**
	M96 AS-i; 4-DI, 4-DO (pg. 71)	**007, 013, 016,** or **035**
	M97 AS-i; 4-DI, 3-DO (Extended Addressing) (pg. 72)	**007, 013, 016,** or **035**

*See Page 165 for Entry Option Description

Relay Modules

Example: FBR92021

	Function	Entry Options* (Select one)
FB	**Independent Relays**	
	R92 DeviceNet; 2-DI, 2-DO (relay), 1-AI (see pg. 105 for specs)	**007, 020, 021,** or **035**
	R94 FF (Externally Powered); 2-DI, 2-DO (relay), 1-AI, 1-AO (pg. 119)	**007, 022, 023,** or **035**
	R95 Modbus; 2-DI, 2-DO (relay), 1-AI (pg. 146)	**007, 020, 021,** or **035**
	R96 AS-i; 4-DI, 2-DO, 2-DO (relay) (pg. 73)	**007, 024, 025,** or **035**
	R97 AS-i; 4-DI, 1-DO, 2-DO (relay; extended addressing) (pg. 74)	**007, 013, 016,** or **035**
	Independent Relays	
	I92 DeviceNet; 2-DI, 2-DO, 1-AI (pg. 105)	**007, 020, 021,** or **035**
	I94 FF (Externally Powered); 2-DI, 2-DO, 1-AI, 1-AO (pg. 119)	**007, 022, 023,** or **035**
	I95 Modbus; 2-DI, 2-DO, 1-AI (pg. 146)	**007, 020, 021,** or **035**
	I96 AS-i; 4-DI, 2-DO, 2-DO (relay) (pg. 73)	**007, 024, 025,** or **035**
	I97 AS-i; 4-DI, 1-DO, 2-DO (relay; extended addressing) (pg. 74)	**007, 024, 025,** or **035**

*See Page 165 for Entry Option Description

Special Function Modules

Example: FBX02033

	Function	Entry Options* (Select one)
FB	**X00** AS-i; Repeater (see pg. 67 for specs)	**007, 026, 027,** or **037**
	X01 AS-i; (1) Repeater & (1) Power Conditioner (redundant) (pg. 66 & 67)	**007, 028, 029,** or **036**
	X02 AS-i; Power Conditioner (redundant) (pg. 66)	**007, 032, 033,** or **036**
	X04 FF (Bus Powered); I/O Module with (2) FF Hawkeye Point Sensors (p.117 & 163)	**004, 006, 007,** or **009**
	X05 AS-i; Power Conditioner (daisy chain) (p.66)	**007, 030, 031,** or **036**
	X06 AS-i; (1) Repeater and (1) Power Conditioner (daisy chain) (pg. 66 and 67)	**007, 032, 033,** or **036**

*See Page 165 for Entry Option Description

FieldBlock Enclosure Entry Options

Cable Glands

009 (6) Cable Glands
035 (8) Cable Glands
036 (4) Cable Glands
037 (3) Cable Glands
038 (2) 1/2" NPT Conduit Adapters, (4) Cable Glands
Note: Cable glands suitable for cable diameters of 5mm to 9mm. Cable glands are available for cable diameters of 7mm to 12mm (consult factory for availability).

Conduit Adapters

007 (6) 1/2" NPT Stainless Steel Conduit Adapters
038 (2) 1/2" NPT Conduit Adapters, (4) Cable Glands

Mini Connectors

001 (6) 5 Pin Mini Connectors - (1) Male, (5) Female
003 (6) 4 Pin Mini Connectors - (1) Male, (5) Female
026 (3) 4 Pin Mini Connectors - (2) Male, (1) Female
028 (4) 4 Pin Mini Connectors - (3) Male, (1) Female
030 (4) 4 Pin Mini Connectors - (1) Male, (3) Female
032 (4) 4 Pin Mini Connectors - (2) Male, (2) Female

Micro Connectors

002 (6) 5 Pin Micro Connectors - (1) Male, (5) Female
004 (6) 4 Pin Micro Connectors - (1) Male, (5) Female
013 (10) 4 Pin Micro Connectors - (1) Male, (9) Female
019 (8) 4 Pin Micro Connectors - (2) Male, (6) Female
021 (8) 5 Pin Micro Connectors - (2) Male, (6) Female
023 (10) 4 Pin Micro Connectors - (3) Male, (7) Female
025 (10) 4 Pin Micro Connectors - (2) Male, (8) Female
027 (3) 4 Pin Micro Connectors - (2) Male, (1) Female
029 (4) 4 Pin Micro Connectors - (3) Male, (1) Female
031 (4) 4 Pin Micro Connectors - (1) Male, (3) Female
033 (4) 4 Pin Micro Connectors - (2) Male, (2) Female

Mini and Micro Connector Combinations

005 (6) Connectors - (1) 5 Pin Male Mini, (1) 5 Pin Female Mini, (4) 5 Pin Female Micro
006 (6) Connectors - (1) 4 Pin Male Mini, (1) 4 Pin Female Mini, (4) 4 Pin Micro female
016 (10) Connectors - (1) 4 Pin Male Mini, (1) 4 Pin Female Mini, (8) 4 Pin Micro female
017 (6) Connectors - (1) 5 Pin Male Mini, (5) 5 Pin Female Micro
018 (8) Connectors - (2) 4 Pin Male Mini, (6) 4 Pin Female Micro
020 (8) Connectors - (2) 5 Pin Male Mini, (1) 5 Pin Female Mini, (5) 5 Pin Female Micro
022 (10) Connectors - (3) 4 Pin Male Mini, (1) 4 Pin Female Mini, (6) 4 Pin Female Micro
024 (10) Connectors - (2) 4 Pin Male Mini, (8) 4 Pin Micro Female

Entry Option Quick Reference Legend

#	Category
001	Mini Connector
002	Micro Connector
003	Mini Connector
004	Micro Connector
005	Mini/Micro Combination
006	Mini/Micro Combination
007	Conduit Adapter
009	Cable Gland
013	Micro Connector
016	Mini/Micro Combination
017	Mini/Micro Combination
018	Mini/Micro Combination
019	Micro Connector
020	Mini/Micro Combination
021	Micro Connector
022	Mini/Micro Combination
023	Micro Connector
024	Mini/Micro Combination
025	Micro Connector
026	Mini Connector
027	Micro Connector
028	Mini Connector
029	Micro Connector
030	Mini Connector
031	Micro Connector
032	Mini Connector
033	Micro Connector
035	Cable Gland
036	Cable Gland
037	Cable Gland
038	NPT/Cable Gland

FieldRack Enclosure

12" x 12" x 7" FieldRack

10" x 8" x 7" FieldRack

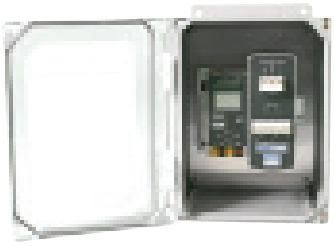
StoneL's FieldRack enclosure is designed for a multitude of wiring systems in general purpose and nonincendive process applications. With its rugged corrosion-proof enclosure and its variety of uses, the FieldRack proves invaluable for bus projects.

Field Wiring Systems

The FieldRack may be easily fitted with cable gland compression fittings, conduit hubs, and quick disconnect fittings. Just drill the appropriate clearance hole and install the desired fittings.

Available in Two Sizes

FRN1008 is a 10" x 8" x 7" polycarbonate enclosure with a side hinged clear cover. This enclosure has an aluminum back plate with 1 DIN rail attached.



10" x 8" x 7" FieldRack Shown

FRN1212 is a 12" x 12" x 7" polycarbonate enclosure with a side hinged clear cover. This enclosure has an aluminum back plate with 2 or 3 DIN Rails attached.

Configurations

Select FRN1008 for applications such as:

- 1 AS-i Gateway and 1 2.8 amp power supply
- 1 AS-i Repeater and 1 2.8 amp power supply
- Up to 4 Multi-drop Connector Modules

FRN1008

Select FRN1212 for applications such as:

- 2 AS-i Gateways and 2 2.8 amp power supplies (select configuration A)
- 2 AS-i Repeaters and 2 2.8 amp power supplies (select configuration A)
- Up to 10 Multi-drop Connector Modules (select configuration B)

FRN1212

Ratings

Nema 1, 2, 3, 3S, 4, 4X, 12

FieldRack Features Include

Durable Corrosion Proof Enclosure

The enclosure is constructed of Lexan® Polycarbonate, also used for jet fighter canopies, high impact parts, and nonincendive instrumentation enclosures. The FieldRack enclosure will withstand attack from acids, basic solutions and salts.

Wide Variety of Applications and Uses

The FieldRack provides a convenient housing for many FieldLink network components. The FieldRack may house Gateways, Power Supplies, Repeaters, and Connection Modules.

Fully Sealed

The enclosure is fully sealed and may be used in heavy wash-down environments. Complete with a side hinged clear cover, this enclosure provides excellent protection while maintaining easy access.

Space Efficient Design

The space-efficient design minimizes external dimensions while providing ample internal space for wiring and function modules. The FieldRack comes standard with an aluminum backplate inside with DIN rail attached and positioned for convenient location of FieldLink components.

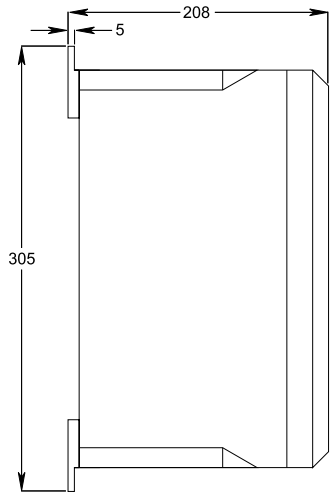
Ordering Information

	Enclosure		Size*/Configuration		
FR	N	Non-metallic	**1008**	10” x 8” x 7”	(1 Din Rail)
			1212A	12” x 12” x 7”	(3 Din Rails)
			1212B	12” x 12” x 7”	(2 Din Rails)

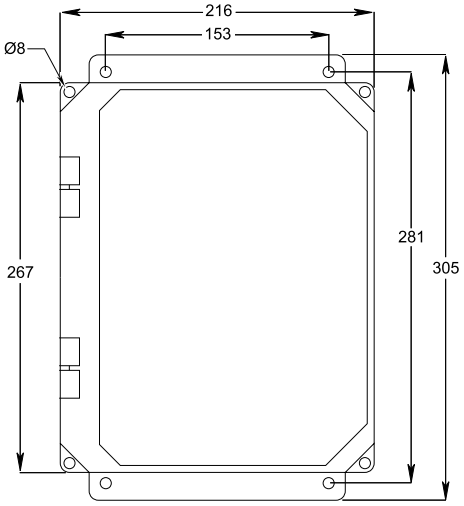
**Inside Dimensions*

Dimensions (in mm)

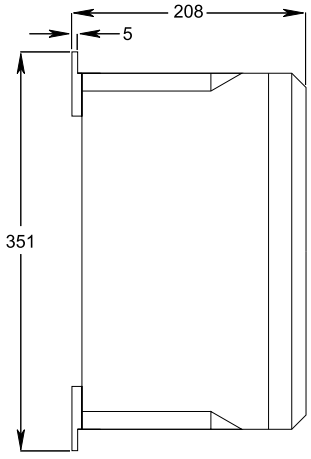
FRN1008 Side View



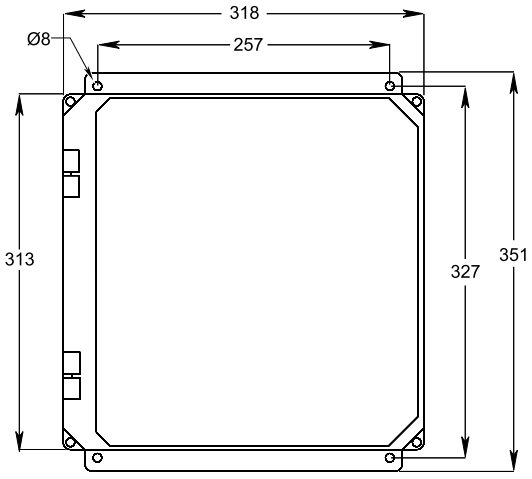
FRN1008 Front View



FRN1212 Side View

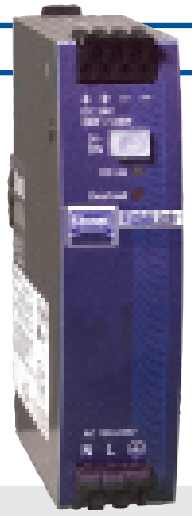


FRN1212 Front View



Power Supplies

StoneL Model 459022



3.4 Amp 24 VDC Power Supply

The latest in DIN Rail switch mode power supplies. This compact general purpose 24 VDC power supply has active filtering of input transients, extra low inrush current, and full output power up to +60°C

Features

- UL Class I, Division 2 Approved
- LED Status Indications
- Spring Clamp terminals

Enclosure Option

FR

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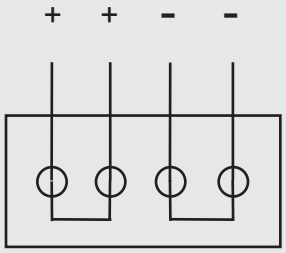
Specifications

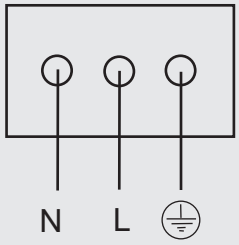
Output Voltage	• 24-28 VDC (externally adjustable)
Output Current	• 3.4 Amps
Output Ripple	• 50mVpp (max)
Input Voltage	• Universal 100 - 240VAC (50-60Hz)
Input Current	• 1.8A / 1.0A (100VAC / 240VAC)
Power Factor	• 0.55 / 0.47 (100VAC / 240VAC)
Efficiency	• 88.7% / 90.0% (100VAC /240VAC)
Over Voltage Protection	• 36 VDC (max)
Over Load Protection	• Yes
Over Temp Protection	• Yes
Holdup Time	• 28ms
Area Approvals	• Class I, Div 2; T4; Groups A,B,C,D
Displays	• Power OK, Green LED • Overload, Red LED
Operating Temp.	• -25°C to +70°C (+14°F to +140° F)
Storage Temp.	• -40°C to +85°C (-40°F to +185° F)
Housing	• Al/Mg Alloy DIN rail mounting
Dimensions	• 124mm, 32mm, 102mm (L, W, H)
Ingress Protection	• IP20, field enclosure required
Approvals	• UL508, UL1950, cULus, CE
Weight	• 420 (1.0 pounds)

Schematic Drawing



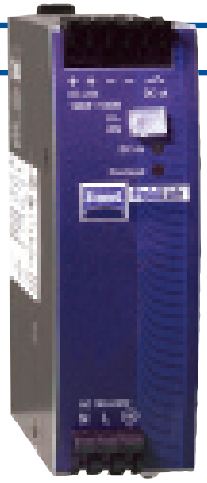
Output Voltage
24 VDC

Input Line Voltage



Power Supplies

StoneL Model 459024



5.0 Amp 24 VDC Power Supply

The latest in DIN Rail switch mode power supplies. This compact general purpose 24 VDC power supply has active filtering of input transients, extra low inrush current, and full output power up to +60°C

Features

- UL Class I, Division 2 Approved
- LED Status Indications
- DC output ok (dry contact)
- Spring Clamp terminals

Enclosure Option

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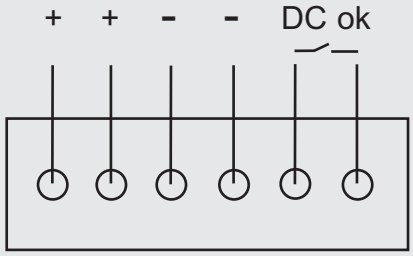
Specifications

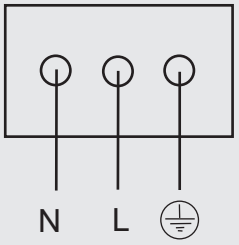
Output Voltage	• 24-28 VDC (externally adjustable)
Output Current	• 5.0 Amps
Output Ripple	• 50mVpp (max)
Input Voltage	• Universal 100 - 240VAC (50-60Hz)
Input Current	• 1.4A / 0.65A (100VAC / 240VAC)
Power Factor	• 0.99 / 0.91 (100VAC / 240VAC)
Efficiency	• 91.6% / 92.7% (100VAC / 240VAC)
Over Voltage Protection	• 36 VDC (max)
Over Load Protection	• Yes
Over Temp Protection	• Yes
Holdup Time	• 34ms
Area Approvals	• Class I, Div 2; T4; Groups A,B,C,D
Displays	• Power OK, Green LED • Overload, Red LED
Operating Temp.	• -25°C to +70°C (+14°F to +140° F)
Storage Temp.	• -40°C to +85°C (-40°F to +185° F)
Housing	• Al/Mg Alloy DIN rail mounting
Dimensions	• 124mm, 40mm, 117mm (L, W, H)
Ingress Protection	• IP20, field enclosure required
Approvals	• UL508, UL1950, cULus, CE
Weight	• 620g (1.4 pounds)

Schematic Drawing



Output Voltage
24 VDC

Input Line Voltage



Power Supplies

StoneL Model 459026

10.0 Amp 24 VDC Power Supply

The latest in DIN Rail switch mode power supplies. This compact general purpose 24 VDC power supply has active filtering of input transients, extra low inrush current, and full output power up to +60°C

Enclosure Option

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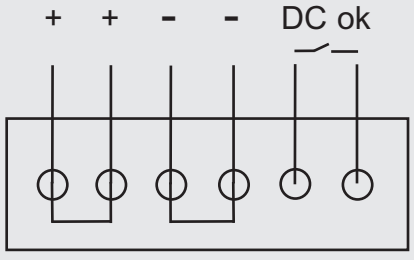
Features

- UL Class I, Division 2 Approved
- LED Status Indications
- DC output ok (dry contact)
- Spring Clamp terminals

Specifications

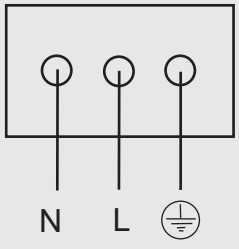
Output Voltage	• 24-28 VDC (externally adjustable)
Output Current	• 10.0 Amps
Output Ripple	• 50mVpp (max)
Input Voltage	• Universal 100 - 240VAC (50-60Hz)
Input Current	• 2.8A / 1.2A (100VAC / 240VAC)
Power Factor	• 0.99 / 0.92 (100VAC / 240VAC)
Efficiency	• 92.3% / 93.0% (100VAC / 240VAC)
Over Voltage Protection	• 39 VDC (max)
Over Load Protection	• Yes
Over Temp Protection	• Yes
Holdup Time	• 27ms
Area Approvals	• Class I, Div 2; T4; Groups A,B,C,D
Displays	• Power OK, Green LED • Overload, Red LED
Operating Temp.	• -25°C to +70°C (+14°F to +140° F)
Storage Temp.	• -40°C to +85°C (-40°F to +185° F)
Housing	• Al/Mg Alloy DIN rail mounting
Dimensions	• 124mm, 60mm, 117mm (L, W, H)
Ingress Protection	• IP20, field enclosure required
Approvals	• UL508, UL1950, cULus, CE
Weight	• 900g (2.0 pounds)

Schematic Drawing



Output Voltage
24 VDC

Input Line Voltage



Power Supplies

StoneL Model 459032

2.1 Amp 24 VDC Power Supply

This compact general purpose 24 VDC power supply has an innovative DIN rail mounting system that holds even at vibration or lateral pressure. Spring Clamp terminals are clearly arranged and user orientated.

Enclosure Option

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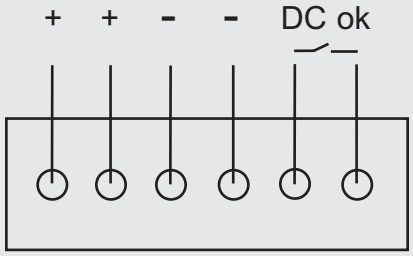
Features

- NEC Class 2 Supply
- UL Class I, Division 2 Approved
- LED Status Indication
- DC output ok (dry contact)
- Spring Clamp terminals

Specifications

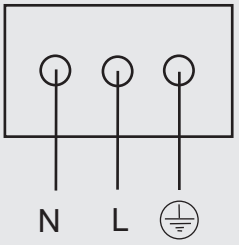
Output Voltage	• 24-28 VDC (externally adjustable)
Output Current	• 2.1 Amps
Output Ripple	• 50mVpp (max)
Input Voltage	• Universal 100 - 240VAC (50-60Hz)
Input Current	• 1.0A / 0.6A (100VAC / 240VAC)
Efficiency	• 88.5% (100VAC)
Over Voltage Protection	• 40 VDC (max)
Over Load Protection	• Yes
Over Temp Protection	• Yes
Holdup Time	• 17ms
NEC Power Class	• NEC Class 2
Area Approvals	• Class I, Div 2; T4; Groups A,B,C,D
Displays	• Power OK, Green LED
Operating Temp.	• -10°C to +70°C (+14°F to +140° F)
Storage Temp.	• -25°C to +85°C (-13°F to +185° F)
Housing	• Non-metallic; DIN rail mounting
Dimensions	• 91mm, 45mm, 75mm (L, W, H)
Ingress Protection	• IP20, field enclosure required
Approvals	•UL508, UL1950, cULus, CE, Class 2
Weight	• 240g (0.5 pounds)

Schematic Drawing



Output Voltage
24 VDC

Input Line Voltage



Power Supplies

StoneL Model 459034

4.2 Amp Power Supply

This compact general purpose 24 VDC power supply has an innovative DIN rail mounting system that holds even at vibration or lateral pressure. Spring Clamp terminals are clearly arranged and user orientated.

Enclosure Option

FR

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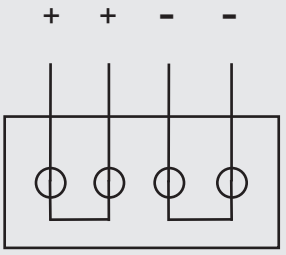
Features

- UL Class I, Division 2 Approved
- LED Status Indication
- Spring Clamp terminals

Specifications

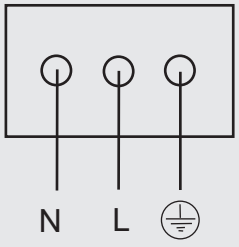
Output Voltage	• 24-28 VDC (externally adjustable)
Output Current	• 4.2 Amps
Output Ripple	• 50mVpp (max)
Input Voltage	• 100 -120/200-240VAC (selectable)
Input Current	• 2.1A / 1.0A (100VAC / 240VAC)
Efficiency	• 90.0% (100VAC)
Over Voltage Protection	• 36 VDC (max)
Over Current Protection	• Yes
Over Temp Protection	• Yes
Holdup Time	• 20ms
Area Approvals	• Class I, Div 2; T4A; Groups A,B,C,D
Displays	• Power OK, Green LED
Operating Temp.	• -10°C to +70°C (+32°F to +140° F)
Storage Temp.	• -25°C to +85°C (-13°F to +185° F)
Housing	• Non-metallic; DIN rail mounting
Dimensions	• 103mm, 73mm, 75mm (L, W, H)
Ingress Protection	• IP20, field enclosure required
Approvals	• UL508, UL1950, cULus, CE,
Weight	• 360g (0.8 pounds)

Schematic Drawing



Output Voltage
24 VDC

Input Line Voltage



Power Supplies

StoneL Model 459028

10.0 Amp Power Supply

This general purpose 24 VDC power supply has an innovative DIN rail mounting system that holds even at vibration or lateral pressure. Large robust screw terminals are clearly arranged and user orientated.

Features

- UL Class I, Division 2 Approved
- LED Status Indication

Enclosure Option

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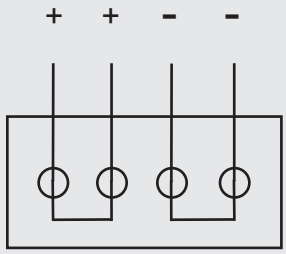
Specifications

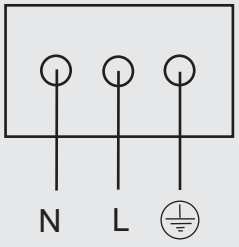
Output Voltage	• 24-28 VDC (externally adjustable)
Output Current	• 10.0 Amps
Output Ripple	• 30mVpp (max)
Input Voltage	• 100 -120/200-240VAC (selectable)
Input Current	• 6.0A / 2.8A (100VAC / 240VAC)
Efficiency	• 90.0% (100VAC)
Over Voltage Protection	• 35 VDC (max)
Over Current Protection	• Yes
Over Temp Protection	• Yes
Turn-on Time	• 200ms
Turn-on Delay	• 100ms
Holdup Time	• 25ms
Area Approvals	• Class I, Div 2; T3C; Groups A,B,C,D
Displays	• Power OK, Green LED
Operating Temp.	• 0°C to +70°C (+32°F to +140° F)
Storage Temp.	• -25°C to +85°C (-13°F to +185° F)
Housing	• Al/Mg Alloy DIN rail mounting
Dimensions	• 102mm, 120mm, 124mm (L, W, H)
Ingress Protection	• IP20, field enclosure required
Approvals	• UL508, UL1950, cULus, CE,
Weight	• 980g (2.2 pounds)

Schematic Drawing



Output Voltage
24 VDC

Input Line Voltage



Power Supplies

StoneL Model 459030

20.0 Amp Power Supply

This general purpose 24 VDC power supply has an innovative DIN rail mounting system that holds even at vibration or lateral pressure. Large robust screw terminals are clearly arranged and user orientated.

Features

- LED Status Indications

Enclosure Option

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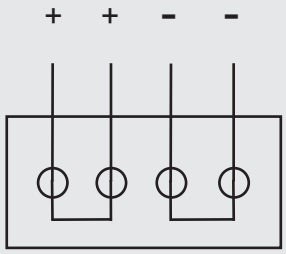
Specifications

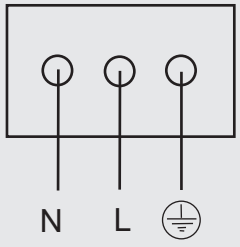
Output Voltage	• 24-28 VDC (externally adjustable)
Output Current	• 20.0 Amps
Output Ripple	• 20mVpp (max)
Input Voltage	• Universal 100 - 240VAC (50-60Hz)
Input Current	• 10.0A / 5.0A (100VAC / 240VAC)
Efficiency	• 91.0% (100VAC)
Over Voltage Protection	• 33 VDC (max)
Over Current Protection	• Yes
Over Temp Protection	• Yes
Turn-on Time	• 80ms
Turn-on Delay	• 500ms
Holdup Time	• 20ms
Displays	• Power OK, Green LED • Overload, Red LED
Operating Temp.	• 0°C to +70°C (+32°F to +140° F)
Storage Temp.	• -25°C to +85°C (-13°F to +185° F)
Housing	• Al/Mg Alloy DIN rail mounting
Dimensions	• 102mm, 220mm, 124mm (L, W, H)
Ingress Protection	• IP20, field enclosure required
Approvals	• UL508, UL1950, cULus, CE,
Weight	• 2.5kg (5.5 pounds)

Schematic Drawing



Output Voltage
24 VDC

Input Line Voltage



Training Course

This is a one day course designed to provide the background necessary to understand communication basics and most commonly used process bus protocols. Upon completion of this course, the student will have an understanding of field based networking, focused primarily on the AS-Interface, DeviceNet, Modbus, and Foundation Fieldbus protocols. The student will also become familiar with PROFIBUS PA and DP and be introduced to industrial use of Ethernet.

Prerequisites

It is recommended that the student have some knowledge of process instrumentation and control systems.

StoneL Course FL101

Course Outline

I. Communication Networks in Process Environments
- A. Basics of communication networking
  - Protocol definitions
  - OSI Model - graphical representation of the elements of a communication network
  - Protocol hierarchy
- B. Networking in Hazardous Areas
  - General purpose and nonincendive applications
  - Explosion proof applications
  - Intrinsically safe and nonincendive applications
  - Limited power applications

II. Introduction and Hands-on Applications (includes FieldLink products and services)
- A. AS-Interface
- B. Modbus
- C. DeviceNet
- D. Foundation Fieldbus

III. Introduction and Analysis of Other Protocols (strengths and weaknesses)
- A. PROFIBUS (PA and DP)
- B. Ethernet (Profinet, HSE, and others)
- C. Wireless

IV. Competence Test

Materials Provided

CD of all Presentation Materials

Breakfast, Lunch and Break Snacks

AS-Interface
Tel: 480-368-9091
Fax: 480-483-7202
www.as-interface.net

DeviceNet
Tel: 734-975-8840
www.odva.org

Fieldbus Foundation
Tel: 512-794-8890
Fax: 512-794-8893
www.fieldbus.org

MODBUS
Tel: 508-435-7170
www.modbus.org

PROFIBUS
Tel: 480-483-2456
Fax: 480-483-7202
www.profibus.com

Design and Installation

FieldLink products and services deliver streamlined and cost-effective bus connectivity of field devices.

Chances are, your plant doesn't sleep. That's why we're here with service and support 24 hours a day, seven days a week.

Small but powerful: FieldLink modules stay out of the way, yet deliver profound process networking solutions.

When you work with StoneL, you'll learn that service applies to the entire life cycle of a project: before the sale, during installation and after the sale. As part of our FieldLink program, we'll help with system design, installation and personnel training. StoneL's FieldLink program offers a variety of services designed to help you get the most out of your bus networks.

System Design Assistance

Our engineers will work with you to design the optimal fieldbus architecture for your particular process.

Specific services include:

- Economic analysis modeling
- Design layout review
- Component selection support

Installation Support

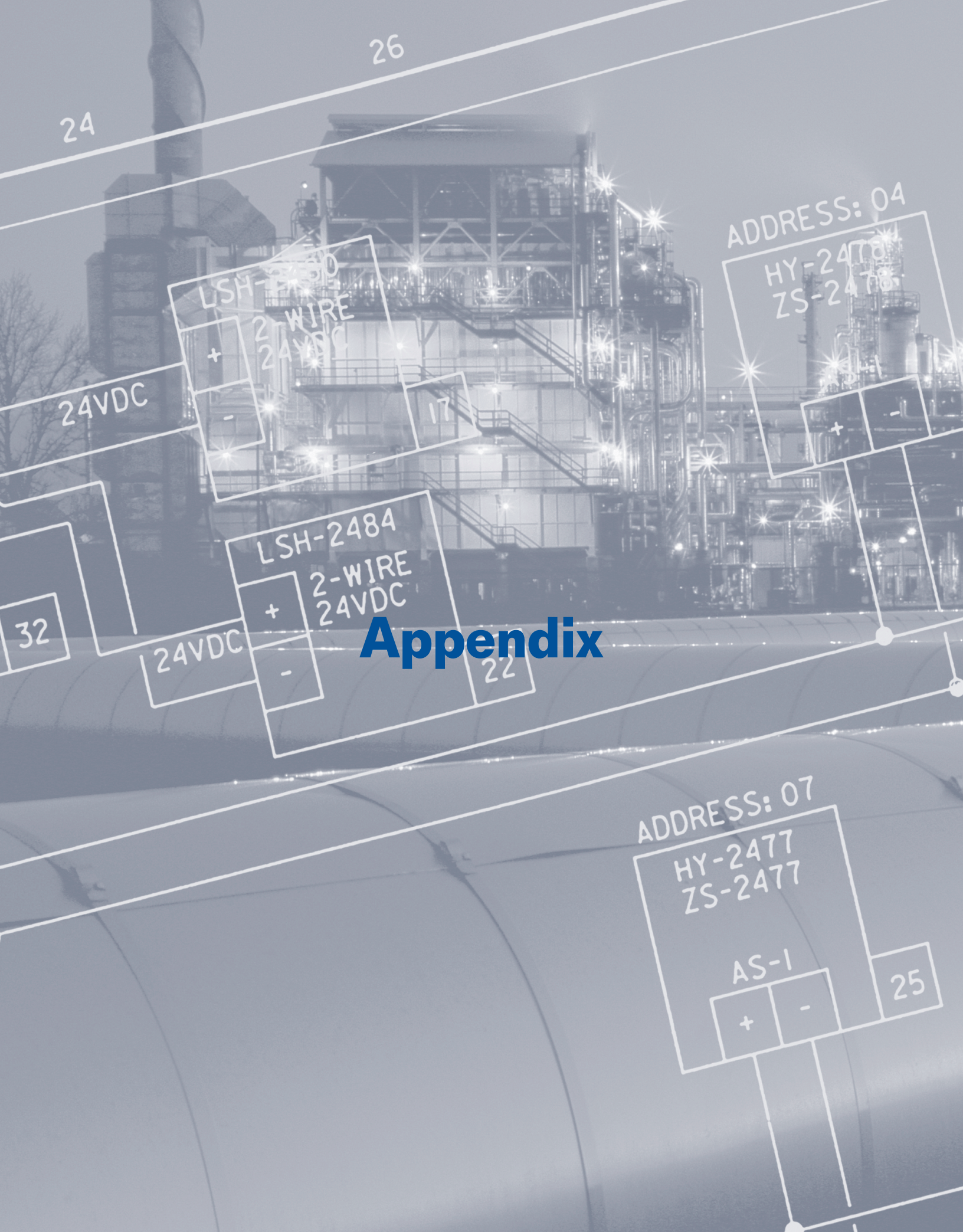
Our FieldLink engineers can travel to your site to provide hands-on bus networking support. Of course, we also offer telephone and online assistance to help with troubleshooting and other installation questions.

On site assistance includes

- I/O Mapping assistance
- Network troubleshooting
- System commissioning
- Personnel training

24/7 Local Technical Support

We have established local service integration arrangements to ensure that no matter what happens to your processing plant — and no matter when it happens — your bus network will receive the attention it deserves, 24 hours a day, seven days a week.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26
ADDRESS: 04
HY-2478
ZS-2478
LSH-2484
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17
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24VDC
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-
24VDC
22
ADDRESS: 07
HY-2477
ZS-2477
AS-I
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-
25

Appendix

Appendix

CONTENTS

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One StoneL Dr
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Fergus Falls, MN 56537
USA
Tel: 218-739-5774
Toll Free: 800-843-7866
Fax: 218-739-5776
Email: sales@stonel.com
www.stonel.com

Contact Information

	AS-i Trade Organization (ATO) 16101 N. 82nd Street, Suite 3B Scottsdale, AZ 85260 USA	Tel: 480-368-9091 Fax: 480-483-7202 **www.as-interface.net**
DeviceNet™	ODVA Headquarters Technology and Training Center 4220 Varsity Drive, Suite A Ann Arbor, MI 48108-5006 USA	Tel: 734-975-8840 Fax: 734-922-0027 **www.odva.org**
	Fieldbus Foundation 9005 Mountain Ridge Drive Bowie Bldg — Suite 190 Austin, TX 78759-5316 USA	Tel: 512-794-8890 Fax: 512-794-8893 **www.fieldbus.org**
MODBUS	The Modbus Organization PO Box 628 Hopkinton, MA 01748-0628 USA	Tel: 508-435-7170 **www.modbus.org**
PROFIBUS	PROFIBUS Trade Organization PTO 16101 N. 82nd Street, Suite 3B Scottsdale, AZ 85260 USA	Tel: 480-483-2456 Fax: 480-483-7202 **www.profibus.com**

Open Systems Interconnection (OSI) Model

Overview

The OSI reference model is used as a framework to standardize protocol definitions with a set of functional layers. Although the model consists of several layers some protocols may be completely described by using a subset of the total layer set. Only the most complex protocols will use all of the OSI layers.

OSI Model

User Layer	Application program and/or objects (Not part of OSI model)
Application Layer 7	Operating system with graphical user interface
Presentation Layer 6	Ensures that all data typing and formatting will interface with the application and session layers.
Session Layer 5	Manages and controls data flow. Schedules jobs from application layer (Through presentation layer)
Transport Layer 4	Provides reliable end-to-end communications. Strips communication data going to higher layers and vice versa for data to lower layers.
Network Layer 3	Performs end-to-end message routing
Data Link Layer 2	Provides data framing (packetizing) and error free transmission. Also determines media access control.
Physical Layer 1	Media connections (copper, fiber, wireless) between nodes. Encoding and message transfer.
Transmission Layer 0	Cable Specifications (Not part of the OSI model).

Protocols and OSI

Bus Protocol Layers

	Transmission Media	Physical Layer 1	Data Link Layer 2	Network Layer 3	Transport Layer 4	Session Layer 5	Presentation Layer 6	Application Layer 7	User Layer
AS-Interface	*	AS-I	AS-I	*	*	*	*	*	*
DeviceNet	DeviceNet	Modified CAN	Modified CAN	*	*	*	*	DeviceNet	*
Modbus RS 485	*	RS-485	Modbus	*	*	*	*	Modbus	*
PROFIBUS-DP	*	RS-485	PROFIBUS	*	*	*	*	*	PROFIBUS
PROFIBUS-PA	*	IEC 61158-2	PROFIBUS	*	*	*	*	*	PROFIBUS
FOUNDATION Fieldbus (HI)	*	IEC 61158-2	FF H1	*	*	*	*	FF	FF
FOUNDATION Fieldbus (HSE)	*	Ethernet	Ethernet	IP	UDP	*	*	FF	FF

* Not specified or used as part of protocol definition

Enclosure Standards and Protection Concepts

NEMA Enclosure Standards

NEMA (National Electrical Manufacturers' Association) has established standards for enclosures to provide protection from environmental contamination. A description of the more common standards is listed below. Type definitions are from NEMA 250-1997. For more detailed and complete information, NEMA Standards Publication 250-1997, "*Enclosures for Electrical Equipment (1000 Volts Maximum)*" should be consulted. This Standards Publication, as well as all other NEMA publications, is available from IHS at 1-800-854-7179.

Standards for Non-Hazardous Locations

Type 1: Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment and to provide a degree of protection against falling dirt.

Type 2: Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment, to provide a degree of protection against falling dirt, and to provide a degree of protection against dripping and light splashing of liquids.

Type 3: Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, and windblown dust; and that will be undamaged by the external formation of ice on the enclosure.

Type 3R: Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, and snow; and that will be undamaged by the external formation of ice on the enclosure.

Type 3S: Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, and windblown dust; and in which the external mechanism(s) remain operable when ice laden.

Type 4: Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, and hose-directed water; and that will be undamaged by the external formation of ice on the enclosure.

Type 4X: Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, hose-directed water, and corrosion; and that will be undamaged by the external formation of ice on the enclosure.

Type 5: Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against settling airborne dust, lint, fibers, and flyings; and to provide a degree of protection against dripping and light splashing of liquids.

Type 6: Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against hose-directed water and the entry of water during occasional temporary submersion at a limited depth; and that will be undamaged by the external formation of ice on the enclosure.

Type 6P: Enclosures constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against hose-directed water and the entry of water during prolonged submersion at a limited depth; and that will be undamaged by the external formation of ice on the enclosure.

Type 12: Enclosures constructed (without knockouts) for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibers, and flyings; and against dripping and light splashing of liquids.

Type 12K: Enclosures constructed (with knockouts) for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibers, and flyings; and against dripping and light splashing of liquids.

Type 13: Enclosures constructed for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt; against circulating dust, lint, fibers, and flyings; and against the spraying, splashing, and seepage of water, oil, and non-corrosive coolants.

Standards for Hazardous Locations (replaced by NEC Hazardous Area Codes, see page 184)

Type 7: Enclosures constructed for indoor use in hazardous locations classified as Class I, Division 1, Groups A, B, C, or D as defined in NFPA 70.

Type 8: Enclosures constructed for either indoor or outdoor use in hazardous locations classified as Class I, Division 1, Groups A, B, C, and D as defined in NFPA 70.

Type 9: Enclosures constructed for indoor use in hazardous locations classified as Class II, Division 1, Groups E, F, or G as defined in NFPA 70.

Type 10: Enclosures constructed to meet the requirements of the Mine Safety and Health Administration, 30 CFR, Part 18.

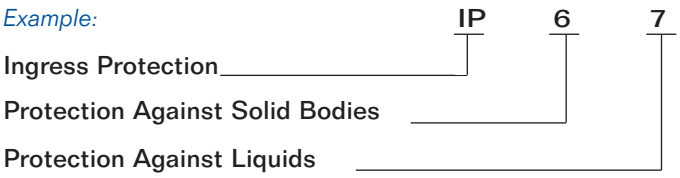
Comparison of Specific Applications of Enclosures for Outdoor Nonhazardous Locations							
	Type of Enclosure						
Provides a degree of protection against the following environmental conditions	3	3R*	3S	4	4X	6	6P
Incidental contact with the enclosed equipment	X	X	X	X	X	X	X
Rain, snow, and sleet**	X	X	X	X	X	X	X
Sleet ***	…	…	X	…	…	…	…
Windblown dust, lint, fibers, and flyings	X	…	X	X	X	X	X
Hosedown	…	…	…	X	X	X	X
Corrosive agents	…	…	…	…	X	…	X
Occasional temporary submersion	…	…	…	…	…	X	X
Occasional prolonged sumbersion	…	…	…	…	…	…	X

* *These enclosures may be ventilated.*
** *External operating mechanisms are not required to be operable when the enclosure is ice covered.*
*** *External operating mechanisms are operable when the enclosure is ice covered.*

IEC Enclosure Standards

The International Electrotechnical Commission has established enclosure standards for protection from environmental contamination as shown below. These standards are used widely in Europe, the Middle East, Africa and parts of Asia.

Example:



Protection Against Solid Bodies

0: no special protection
1: protected against solid objects greater than of 50mm ø
2: protected against solid objects greater than 12mm ø
3: protected against solid objects greater than 2.5mm ø
4: protected against solid objects greater than 1mm ø
5: dust protected
6: dust-tight

Protection Against Liquids

0: no special protection
1: protected against vertical falling water drops
2: protected against vertical falling water drops when enclosure is tilted at 15°
3: protected against sprayed water
4: protected against splashing water
5: protected against water jets
6: protected against heavy seas
7: protected from the effects of temporary immersion
8: protected from the effects of continuous immersion

Hazardous Area Descriptions

National Electrical Code (NEC) 500

Traditional standards used in North America.

Example: Class I, Div 1, Group B, C, D, T4

- Permitted Class
- Permitted Division
- Permitted Group
- Temperature Class

Permitted Class

Class I: Gas Vapors
Class II: Dusts
Class III: Fibers

Permitted Division

Division 1: Gasses or vapors exist under normal conditions

Division 2: Gasses or vapors are present but are normally contained and can escape only through accident or abnormal operation

Permitted Group

Group A: Acetylene

Group B: Hydrogen or Equivalents

Group C: Ethyl Ether, Ethylene or Cylclopropane

Group D: Gasoline, hexane, naphtha, benzene, butane, propane, alcohol, acetone, benzol, lacquer, and natural gas

Group E: Metal Dust

Group F: Carbon Black

Group G: Flour, starch, grain dusts

Temperature Class*

T1: 450°C (842°F)
T2: 300°C (572°F)
T3: 200°C (392°F)
T4: 135°C (275°F)
T5: 100°C (212°F)
T6: 85°C (185°F)

** Device may be exposed to gases whose ignition temperature is higher than this value.*

National Electrical Code (NEC) 505

North American Standards developed to harmonize with IEC standards.

Example: Class I, Zone 1, AEx d [ia] IIC T4

- Permitted Class
- Permitted Zone
- Method of Protection
- Intrinsically Safe Output
- Gas Group
- Temperature Class

Permitted Class

Class I: Gas Vapors
Class II: Dusts
Class III: Fibers

Permitted Zone

Zone 0: Gas present continuously

Zone 1: Gas present intermittently

Zone 2: Gas present under abnormal operation

Protection Method

e: Increased Safety: no arcs sparks or hot surfaces

d*: Flame proof: contain explosion and quench flame

m: Encapsulation, Zone 1: keep flammable gas out

nA: Nonsparking equipment

nC: Sparking equipment in which the contacts are suitably protected other than by restricted breathing enclosure

nR: Restricted breathing

***[ia]:** Intrinsically safe, Zone 0, 1, and 2

***[ib]:** Intrinsically safe, Zone 1 and 2

Gas Group

IIC: Acetylene

IIB + H2: Hydrogen or equivalents

IIB: Ethyl Ether, Ethylene or Cylclopropane

IIA: Gasoline, hexane, naphtha, benzine, butane, propane, alcohol, acetone, benzol, lacquer, and natural gas

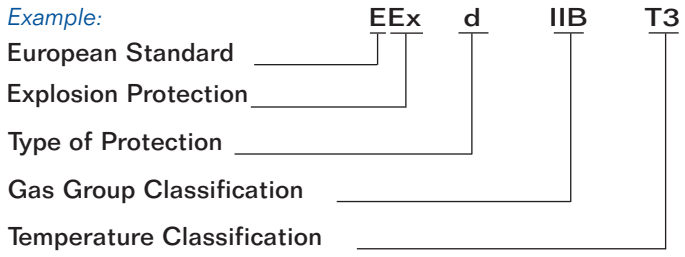
Temperature Class*

T1: 450°C (842°F)
T2: 300°C (572°F)
T3: 200°C (392°F)
T4: 135°C (275°F)
T5: 100°C (212°F)
T6: 85°C (185°F)

** Device may be exposed to gases whose ignition temperature is higher than this value.*

IEC & EU (European) Standards

The IEC (International Electrotechnical Commission) markings are as follows:



Type of Protection

- **d:** flameproof enclosure - contain explosion and quench flame
- **p:** pressurized enclosure - fill with inert gas
- **ia:** intrinsically safe for Zone 0 - limit energy
- **ib:** Intrinsically safe for Zone 1 - limit energy
- **o:** oil immersion
- **s:** special protection
- **e:** increased safety - no arcing, sparking or hot surfaces
- **m:** encapsulation - sealed arcing devices or nonarcing
- **q:** sand-filled
- **nL:** nonincendive - limited energy
- **nA:** nonincendive - nonsparking
- **me:** encapsulation/increased safety

Gas Group Classification

- **IIC:** Acetylene and hydrogen
- **IIB:** Diethel ether, ethylene, cyclopropane and others
- **IIA:** Gasoline, henane, butane, naphtha propane, isoprene and many others

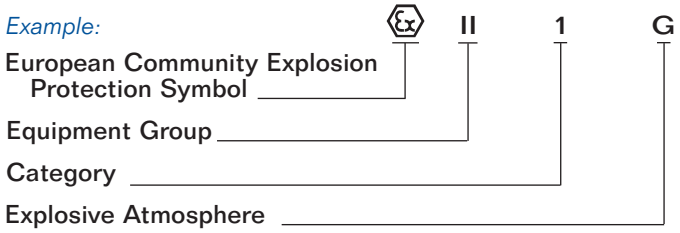
Temperature Classification*

- **T1:** 450°C (842°F)
- **T2:** 300°C (572°F)
- **T3:** 200°C (392°F)
- **T4:** 135°C (275°F)
- **T5:** 100°C (212°F)
- **T6:** 85°C (185°F)

** Device may be exposed to gases whose ignition temperature is higher than this value.*

ATEX Marking (94/9/EC)*

European requirements centered around the safety of hazardous area equipment that became mandatory on July, 1 2003. All equipment exported into European member countries must meet the ATEX hazardous and essential health and safety requirements for acceptance.



Equipment Group

- **I:** Mines
- **II:** Other than mines

Category

- **1:** Zone 0
- **2:** Zone 1
- **3:** Zone 2

Explosive Atmosphere

- **G:** Gases/Vapors
- **D:** Dusts

The ATEX markings are in addition to the standard Zone markings and indicate compliance to the new directives.

10BaseT – One of several adaptations of the Ethernet (IEEE 802.3) standard for Local Area Networks (LANs). The 10 Base-T standard (also called Twisted Pair Ethernet) uses a twisted-pair cable with maximum lengths of 100 meters.

100BaseT – An Ethernet networking standard that supports data transfer rates up to 100 Mbps (100 megabits per second).

Access Methods – The method by which a device on a network gains control in order to transmit its information.

Access Point – A device that transports data between a wireless network and a wired network infrastructure. Also referred as base station.

Acylic – A mode characterized by non-regular timing intervals.

Address – A uniquely defined location on a bus network.

Algorithm – A specific formula or method for solving a problem.

Analog – A transmission mode in which data is represented by a continuous signal e.g. 4 to 20 mA.

Antenna Gain – An antenna which has less signal loss has more antenna gain. Gain is measured with respect to an isotropic antenna. This is an ideal antenna which radiates the same amount of power equally in all directions.

AMS – (Asset Management System) A system used for calibrating, monitoring and predicting maintenance of field instruments.

ANSI – (American National Standards Institute) The principal standards development organization in the US. US's member body to the ISO.

AWG – (American Wire Gauge) A method of defining the cross sectional area of a wire.

Application Layer – The seventh layer of the OSI model which contains the operating system

ARCNET – (Attached Resource Computer NETwork) One of the oldest, simplest, and least expensive types of local-area networks, ARCnet was introduced by Datapoint Corporation in 1977. It uses a token-ring architecture, supports data rates of 2.5 Mbps, and connects up to 255 computers.

ASCII – (American Standard Code for Information Interchange) A code for representing English characters as numbers, with each letter assigned a number from 0 to 127.

ASIC – (Application Specific Integrated Circuit) An IC chip designed for a particular application.

Asynchronous – Occurring at irregular intervals.

Baud – The number of signaling elements that occur each second.

BAN – Body Area Network Interest Group.

Bandwidth – The carrying capacity of a communications channel describing the amount of information or data that can be sent over a network connection in a given period of time stated in bits per second (bps), kilobits per second (kbps), or megabits per second (mps).

Binary – A numbering system that has two unique digits, 0 & 1 which is the base 2 system. As placement expands the number is taken as a power of 2 e.g. 1001 is $1x2^3 + 0x2^2 + 0x2^1 + 1x2^0$

Bit – The smallest unit of measurement in a binary system.

Bit Rate – The number of bits that are transferred between devices in a specified amount of time, typically one second.

Block – A fixed-size grouping of bits or bytes that is transferred together.

Bluetooth – An industry specification for short range communication with data rates up to 3 Mbits/second. The physical and media access are specified in the IEEE 802.15.1 standard.

Bridge – A device that connects two local-area networks (LANs) that are running the same protocols and cabling. The bridge uses the layers 1 & 2 of the OSI model.

Broadband – A type of data transmission in which a single medium may carry several channels at once e.g. cable TV

Bus – A single cable that connects all devices on a local-area network (LAN).

Byte – Eight (8) bits of data.

CAN – (Controller Area Network) A bus protocol developed by Bosch for automotive applications. Also used in the physical and data link layers of DeviceNet.

Class 2 Circuits – Electrical circuits with power limited to a maximum of 100 watts by means of a class 2 power source.

Coaxial Cable – A type of wire that consists of a center wire surrounded by insulation and then a grounded shield of braided wire. The shield minimizes electrical and radio frequency interference.

Collision – The simultaneous data transmission from two separate devices that results in the partial destruction of some or all of the transmitted date.

Connector, Micro – A water proof, m12, quick-disconnect wiring device which may consist of several wiring points with in a single connector.

Connector, Mini – Same as a micro connector but larger in size.

CSMA/CD – (Carrier Sense Multiple Access / Collision Detection) A set of rules for determining how network devices respond when two devices attempt to use a data channel simultaneously (called a collision). Standard Ethernet networks use CSMA/CD. This standard enables devices to detect a collision. After detecting a collision, a device waits a random delay time and then attempts to re-transmit the message. If the device detects a collision again, it waits twice as long to re-transmit the message. This is known as exponential back off.

Client/Server Architecture – An arrangement where the client shares server resources and each performs portions of the whole task.

Cyclic – Communication which occurs at regular intervals.

Cyclic Redundancy Check – (CRC) A common technique for detecting data transmission errors. Data integrity of a received frame is checked via an algorithm based on the frame content and then matched to the result that is performed by the sender and included in a separate field appended to the frame.

Cyclic Polling – A repetitive sequential interaction with individual devices on the bus network

Data Hiway – A medium transmitting large amounts of data between computer systems.

Data Link Layer – Layer 2 of the OSI model, it determines data connections between devices on a network and controls access to the medium. Error checking is also performed at this level.

D/A – Digital to analog data conversion

DCS – (Distributed Control system) A networked system of client-server devices where the intelligence is distributed throughout the system to perform parts of the whole task.

DD – (Device Description) Used in the Foundation Fieldbus protocol to disclose special parameters and/or blocks used by a specific manufacturer to enable interoperability with other devices on the network.

DeviceNet – A "device level" bus protocol developed by Allen Bradley based on CAN technology to perform mission critical operations in process and factory automation. Up to 62 devices may be connected to a DeviceNet bus consisting of two power and two signal wires. Data rates may vary from 125kbs to 500kbs with cable length of 500m and 100m respectively.

Device tag – A specific physical description for identifying a particular device.

Device Configuration – Establishing the appropriate settings and loading information into a device in order to enable it to function properly on the network.

Deterministic – A network that has less than a one in 10 million chance of message loss due to noise or data collisions.

Diagnostics – The ability to analyze data to detect problems.

Digital – Describes any system based on discontinuous data or events.

DIN Standards – (Deutsches Insitut für Normung eV) A standards-setting organization for Germany.

Discrete – Transmits information for on/off or open/closed applications.

DLL – (Dynamic Link Library) A library of executable functions or data.

Domain – A group of computers and devices on a network that are administered as a unit with common rules and procedures. Within the Internet, domains are defined by the IP address. All devices sharing a common part of the IP address are said to be in the same domain.

Drop – A spur or partial segment connected to the bus network. May also be referred to as a Drop Leg or Spur.

Drop Connector – ties a drop or spur to the bus network. Connectors may be passive or protected (provides overcurrent and/or overvoltage protections to the drop or spur).

DTM – (Device Type Manager) A standardized method for providing the specific parameters and options of a field device using the Field Device Tools (FDT) concept for establishing system wide device configuration and diagnostics.

EBCDIC – (Extended Binary-Coded Decimal Interchange Code) An IBM code for representing characters as numbers.

Encryption – The translation of data into a secret code. Encryption is a method to achieve data security.

Error Detection – Refers to a class of techniques for detecting garbled messages.

Ethernet – A local-area network (LAN) architecture developed by Xerox Corporation in cooperation with DEC and Intel in 1976. Ethernet uses a bus or star topology. The Ethernet specification served as the basis for the IEEE 802.3 standard, which specifies the physical and data link layers. It is one of the most widely implemented LAN standards.

Explosion Proof Apparatus - Apparatus enclosed in a case that is capable of:

- Withstanding an explosion of a specified gas or vapor that may occur within it.
- Preventing ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes or explosion of the gas or vapor within.
- Operating at such an external temperature that a surrounding flammable atmosphere will not be ignited.

FAS – (Fieldbus Access Sublayer) A part of the application layer of Foundation Fieldbus in which virtual communication relationships are mapped to scheduled and unscheduled communication services in the data link layer.

Fault – The point of failure in a malfunctioning device or network.

Fiber Optics – A technology that uses glass (or plastic) threads (fibers) to transmit data. A fiber optic cable consists of a bundle of glass threads, each of which is capable of transmitting messages modulated onto light waves.

Field Device – an instrument that is located in the plant environment.

FDT – (Fieldbus Device Tool) Works on Microsoft COM/DCOM technology and provides a manufacturer independent basis to access all communication and application features of a device for system wide configuration and diagnostics.

FHHS – Frequency Hopping Spread Spectrum. A spread spectrum modulation that divides the 2.4 GHz band (83 MHz wide) into 79 hops, each 1 MHz wide. Every 0.4 seconds the transmitter hops to the next frequency determined by a pseudo-random sequence. Multiple channels, each creating a separate wireless LAN, are created with up to 15 different hopping sequences.

Glossary of Bus Networking Terms

Fieldbus – A multi-drop digital bus network relegated to mission critical operation in a plant environment that will handle message strings sufficient for full process control functionality.

FIP – (Factory Instrumentation Protocol) Developed from a French standard, it is a master/slave protocol with a maximum bus length of 2km and a maximum of 256 stations. It has a data rate of 31.25kbit/sec and is primarily used in discrete manufacturing.

FISCO – (Fieldbus Intrinsically Safe Concept) Developed by PTB in Germany and internationally recognized as the basic model to follow to build an intrinsically safe bus network using the 61158-2 physical layer standard.

Frame – A packet of transmitted information.

Frame Relay – A packet-switching protocol for connecting devices on a Wide Area Network (WAN). Frame Relay networks in the U.S. support data transfer rates at T-1 (1.544 Mbps) and T-3 (45 Mbps) speeds. Frame Relay is a way of utilizing existing T-1 and T-3 lines owned by a service provider. Most telephone companies provide Frame Relay service for customers who want connections at 56 Kbps to T-1 speeds. (In Europe, Frame Relay speeds vary from 64 Kbps to 2 Mbps.)

Foundation Fieldbus – A fieldbus developed for the replacement of the 4 to 20 mA standard in the process industry. It consists of two basic levels; H1 for connecting up to 32 field devices over a 1900m bus network in hazardous plant environments and HSE (High Speed Ethernet) for control applications with Ethernet as the physical and data link layers using the same application and user layer features as H1.

Full Duplex – The ability to transmit and receive at the same time

Function Block – Used as part of the Foundation Fieldbus protocol to build process control strategies. Function blocks have an internal algorithm and several parameters that perform the basic monitoring and control functionality

Function Block, Flexible – Used in Foundation Fieldbus to incorporate other programming languages into the function block control strategy (e.g. ladder logic)

Gateway – A node on one network that serves as an interface to another network.

Graphical User Interface – (GUI) A program interface that takes advantage of the computer's graphics capabilities to make the program easier to use. Well-designed graphical user interfaces can free the user from learning complex command languages.

GSD – Used in PROFIBUS to provide clear and comprehensive descriptions of the device type in a precisely defined format. Each PROFIBUS device has a GSD file provided by the manufacturer.

Half Duplex – The transmission of data in just one direction at a time. (Sending or Receiving)

HART – (Highway Addressable Remote Transducer) A point to point protocol that uses a communication signal overlaid on a 4 to 20mA circuit to communicate
data to smart instruments.

Hermetically Sealed – Equipment sealed against the entrance of an external atmosphere where the seal is made by fusion, for example, soldering, brazing, welding, or the fusion of glass to metal.

Homerun Cable – A multi-wire cable that runs from a field junction box to the I/O marshalling panel in conventional point to point wiring schemes.

Host - A computer that is connected to a TCP/IP network, including the Internet. Each host has a unique IP address.

HSE – (High Speed Ethernet) The enterprise level network used with the Foundation Fieldbus (FF) protocol. It consists of Ethernet physical and data link layers and utilizes the application and user layers of FF H1 made up of function blocks designed around process requirements.

Hub - A common connection point for devices in a network. Hubs are commonly used to connect segments of a LAN. A hub contains multiple ports. When a packet arrives at one port, it is copied to the other ports so that all segments of the LAN can see all packets. A passive hub serves as a conduit for the data, enabling it to go from one device (or segment) to another. Intelligent hubs include additional features that enable an administrator to monitor the traffic passing through the hub and to configure each port in the hub. Intelligent hubs are also called manageable hubs. A third type of hub, called a switching hub, actually reads the destination address of each packet and then forwards the packet to the correct port.

IEC – (International Electrotechnical Commission) An organization that cooperates with the International Standards organization for technology standards.

IEEE – (Institute of Electrical and Electronics Engineers) An organization composed of engineers, scientists, and students. The IEEE is known for developing standards for the computer and electronics industry.

IEEE 802 Standards - A set of network standards developed by the IEEE. They include:

- **IEEE 802.1** – Standards related to network management.
- **IEEE 802.2** – General standard for the data link layer in the OSI Reference Model. The IEEE divides this layer into two sublayers -- the logical link control (LLC) layer and the media access control (MAC) layer. The MAC layer varies for different network types and is defined by standards IEEE 802.3 through IEEE 802.5.
- **IEEE 802.3** – Defines the MAC layer for bus networks that use CSMA/CD. This is the basis of the Ethernet standard.
- **IEEE 802.4** – Defines the MAC layer for bus networks that use a token-passing mechanism (token bus networks).
- **IEEE 802.5** – Defines the MAC layer for token-ring networks.
- **IEEE 802.6** – Standard for Metropolitan Area Networks (MANs).

- **IEEE 802.11** – A family of specifications for wireless local area networks (WLANs). There are currently three specifications in the family: 802.11a, 802.11b, and 802.11g. All use the Ethernet protocol and CSMA/CA (carrier sense multiple access with collision avoidance) for path sharing.

1) 802.11a – This specification applies to wireless asynchronous transfer mode systems and is used in access hubs. It operates at radio frequencies between 5 GHz and 6 GHz and uses a modulation scheme known as orthogonal frequency-division multiplexing (OFDM) that makes possible data speeds as high as 54 megabits (Mbps), but most commonly, communications take place at 6 Mbps, 12 Mbps, or 24 Mbps.
2) 802.11b – Often called Wi-Fi, 802.11b is backward compatible with 802.11. The modulation used in 802.11 has historically been phase-shift keying (PSK). The modulation method selected for 802.11b is known as complementary code keying (CCK), which allows higher data speeds and is less susceptible to multipath-propagation interference.
3) 802.11g – This most recently approved standard offers wireless transmission over relatively short distances at up to 54 Mbps compared with the 11 Mbps of the 802.11b standard. Like 802.11b, 80211g operates in the 2.4 GHz range and is thus compatible with it.

IEEE 802.15 – The 15th working group of the IEEE 802 which specializes in Wireless PAN (Personal Area Network) standards. It includes four task groups (numbered from 1 to 4):

Task group 1 (WPAN/Bluetooth) - IEEE 802.15.1-2002 has derived a Wireless Personal Area Network standard based on the Bluetooth v1.1 specifications. It includes a medium access control and physical layer specification. An updated version, IEEE 802.15.1-2005, has been published.

Task group 2 (Coexistence) - IEEE 802.15.2-2003 addresses the issue of coexistence of wireless personal area networks (WPAN) with other wireless devices operating in unlicensed frequency band such as and wireless local area networks (WLAN).

Task group 3 (High Rate WPAN) - IEEE 802.15.3-2003 is a MAC and PHY standard for high-rate (11 to 55 Mb/s) WPANs.

3a (WPAN High Rate Alternative PHY) - IEEE 802.15.3a was an attempt to provide a higher speed UWB PHY enhancement amendment to IEEE 802.15.3 for applications which involve imaging and multimedia.

3b (MAC Amendment) - The IEEE 802.15.3.b is working on an amendment to 802.15.3 to improve implementation and interoprability of the MAC. This will include minor optimizations while preserving backward compatibility. In addition, this amendment will correct errors, clarify ambiguities, and add editorial clarifications.

3c (WPAN Millimeter Wave Alternative PHY) - This mmWave WPAN will operate in the new and clear band including 57-64 GHz unlicensed band defined by FCC 47 CFR 15.255. The millimeter-wave WPAN will allow high coexistence (close physical spacing) with all other microwave systems in the 802.15 family of WPANs. In addition, the millimeter-wave WPAN will allow very high data rate over 2 Gbit/s applications such as high speed internet access, streaming content download (video on demand, HDTV, home theater, etc.), real time streaming and wireless data bus for cable replacement. Optional data rates in excess of 3 Gbit/s will be provided.

Task group 4 (Low Rate WPAN) - IEEE 802.15.4-2003 (Low Rate WPAN) deals with low data rate but very long battery life (months or even years) and very low complexity. The first edition of the 802.15.4 standard was released in May 2003. In March 2004, after forming Task Group 4b, task group 4 put itself in hibernation. The ZigBee set of high level communication protocols is based upon the specification produced by the IEEE 802.15.4 taskgroup.

4a (WPAN Low Rate Alternative PHY) - The principle interest is in providing communications and high precision ranging / location capability (1 meter accuracy and better), high aggregate throughput, and ultra low power; as well as adding scalability to data rates, longer range, and lower power consumption and cost. In March 2005, IEEE802.15.4a selected a baseline specification. The baseline is two optional PHYs consisting of a UWB Impulse Radio (operating in unlicensed UWB spectrum) and a Chirp Spread Spectrum (operating in unlicensed 2.4GHz spectrum). The UWB Impulse Radio will be able to deliver communications and high precision ranging.

4b (Revisions and Enhancements) - The IEEE 802.15 task group 4b was chartered to create a project for specific enhancements and clarifications to the IEEE 802.15.4-2003 standard, such as resolving ambiguities, reducing unnecessary complexity, increasing flexibility in security key usage, considerations for newly available frequency allocations, and others. IEEE 802.15.4b has been apprvoed in June 2006 and is expected for publication in September.

Task group 5 (Mesh Networking) - Mesh Networking of Wireless Personal Area Networks (WPANs)

Integration – The process of knitting together multiple devices and networks into a seamless control architecture.

Internet - A global network connecting millions of computers.

Interoperability - The ability of software and hardware on different devices from different vendors to seamlessly communicate.

Intrinsic Safety (IS) – A method for preventing ignition in a hazardous area caused by electrical energy. This is accomplished by limiting the power available to the electrical circuit and the energy storage capacity within the circuit.

Intrinsic Safety Barrier – A device used to prevent excessive energy from flowing into an intrinsically safe circuit under fault conditions.

Intranet – A network based on TCP/IP protocols (an internet) belonging to an organization, usually a corporation, accessible only by the organization's members, employees, or others with authorization. An intranet's Web sites look and act just like any other Web sites, but the firewall surrounding an intranet fends off unauthorized access.

IP – Internet Protocol specifies the format of packets, also called datagrams, and the addressing scheme. Most networks combine IP with a higher-level protocol called Transmission Control Protocol (TCP), which establishes a virtual connection between a destination and a source. TCP/IP establishes a connection between two hosts so that messages can be sent back and forth for a period of time.

ISA – (Instrumentation, Systems, and Automation Society) This organization helps members, other practitioners and organizations worldwide advance and apply science, technology and the allied arts of instrumentation, systems and automation in all industries and applications.

ISDN – (Integrated Services Digital Network) An international communications standard for sending voice, video, and data over digital telephone lines or normal telephone wires. ISDN supports data transfer rates of 64 Kbps.

ISO – (International Organization for Standardization) Derives from the Greek word iso, which means equal. Founded in 1946, ISO is an international organization composed of national standards bodies from over 75 countries. For example, ANSI (American National Standards Institute) is a member of ISO.

ITC – (Instrument Tray Cable) tray cabling for application to instrumentation and control circuits operating at 150 volts or less and 5 amps or less. In tray cables or with special support provisions as open wiring, ITC may be used in hazardous division 2 areas.

Jabber – (1) An error in which a faulty device continuously transmits corrupted or meaningless data onto a network. This may halt the entire network from transmitting data because other devices will perceive the network as busy. (2) A sent data packet greater than the maximum 1518 bytes specified in IEEE 802.3. To prevent this, jabber control should be added to the hardware to make the circuitry incapable of sending information for more than 150 milliseconds (approximately 1500 bytes).

Java – A high-level programming language developed by Sun Microsystems. Java was originally called OAK, and was designed for handheld devices and set-top boxes. Oak was unsuccessful so in 1995 Sun changed the name to Java and modified the language to take advantage of the burgeoning World Wide Web.

Jitter – Generally, any distortion of a signal or image caused by poor synchronization.

LAN – (Local Area Network) A computer network that spans a relatively small area. Most LANs are confined to a single building or group of buildings.

Link – A communications circuit or transmission path connecting two points.

Link Active Scheduler – (LAS) Controls access of devices to the network and maintains time synchronization in the Foundation Fieldbus protocol.

Lithium-ion – A rechargeable battery technology, widely used in mobile phones, laptops and other mobile devices. It provides more energy capacity than Nickel Metal Hydride batteries of the same weight. Another advantage of the Lithium-ion batteries is that, unlike the Nickel-based, they do not require full discharge before being charged again.

Live List – A list of all devices that are granted permission by the LAS to use the network in Foundation Fieldbus.

Lonworks – A proprietary operating system that uses a special IC called the neuron chip. It has a data rate approaching 500 messages a second (1.25 Mbps). A complete network could have thousands of nodes. It uses a differential Manchester signaling system and a modified CSMA media access called predictive persistent which improves performance in heavily loaded buses. The protocol is used primarily in HVAC and discrete manufacturing applications.

MAC – (Media Access Control) The lower sub layer of the data link layer; controls device access to the network for transmitting data.

Manchester Encoding – Digital encoding technique in which each bit period is divided into two complementary halves. A negative to positive voltage transition in the middle of the bit period designates a binary 1 while a positive to negative transition represents a 0. This encoding technique also allows for self-clocking i.e the receiving device can recover the transmitted clock from the incoming data stream.

Master – In multipoint circuits, the unit which controls/polls the nodes. In point to point circuits the unit that controls the slave stations. In LAN technology, the unit on a token-passing ring that allows recovery from error conditions such as lost, busy or duplicate tokens.

MAU – (Media Access Unit) A transceiver connecting a device to the bus network.

Media – The medium over which information is transmitted between devices. The three types of media are copper, fiber & wireless.

Medium – Anything used for the propagation or transmission of signals.

Mesh Network – A network topology in which every device can communicate with any other device that's within range and may communicate using the same protocol.

Migration Path – A phased, organized transition to new technology.

Modbus – A protocol used extensively over the last 15 years to network remote I/O and PLCs into DCS control architecture. This is a master/slave protocol that uses a query – response access method wherein the slaves respond to the masters query. Modbus may use RS232 & RS422 for point to point transmission or RS485 for bus communication with up to 32 devices on a segment up to 4000 feet in length.

Glossary of Bus Networking Terms

Modbus+ – An updated version of Modbus with a 1Mbps data rate over an RS485 physical layer.

Mode Shedding – A characteristic of a function block where, when the operating conditions make the set target mode impossible, the actual mode will change, i.e. automatic change of mode.

Modem – (Modulator-demodulator) A device or program that enables a computer to transmit data over telephone lines. Computer information is stored digitally, whereas information transmitted over telephone lines is transmitted in the form of analog waves. A modem converts between these two forms.

Modulation – To blend data into a carrier signal. At the receiving side, a device demodulates the signals by separating the constant carrier signals from the variable data signals.

Multiplexer – A communication device that combines several signals for transmission over a single medium.

Multidrop – The capability to have multiple devices connected to the same segment of a bus network.

Multi-Tasking – The ability to execute more than one task at the same time, a task being a program. The terms multi-tasking and multi-processing are often used interchangeably, although multi-processing sometimes implies that more than one CPU is involved.

Namur – An association of users of process control technology. Two thirds of the members are located in Germany with the remainder located in Spain, Austria, Hungary, Switzerland, Belgium and the Netherlands.

NEC – (National Electrical Code) A collection of standards for electrical safety established by the National Fire Protection Association.

Network Layer – Layer 3 in the OSI model, the network layer is the logical netwok entity that services the transport layer. It is responsible for ensuring that data passed to it from the transport layer is routed and delivered through the network.

Nickel Metal Hydride – A type of battery that holds more power for their size than NiCd batteries.

Node – (1) In networks, a processing location. A node can be a computer or some other device. (2) In tree structures, a point where two or more lines meet.

Neuron Chip – The application specific integrated circuit made by Echelon Corp. that is used in the Lonworks protocol.

Nonincendive Circuit – a circuit, other than field wiring, in which any arc or thermal effect produced under intended operating conditions of the equipment is not capable, under specified test conditions, of igniting the flammable gas-air, vapor-air or dust-air mixture.

Nonincendive Component – a component having contacts for making or breaking an incendive circuit and the contacting mechanism is constructed so that the component is incapable of igniting the specified flammable gas-air or vapor-air mixture. The housing of a nonincendive component is not intended to exclude the flammable atmosphere or contain an explosion.

Nonincendive Equipment – equipment having electrical/ electronic circuitry that is incapable, under normal operating conditions of causing ignition of a specified flammable gas-air, or dust-air mixture due to arcing or thermal means.

Nonincendive Field Wiring – wiring that enters or leaves an equipment enclosure and, under normal operating conditions of the equipment is not capable, due to arcing or thermal effects, of igniting the flammable gas- air, vapor-air or dust-air mixture. Normal operation includes opening, shorting, or grounding the field wiring.

Nonincendive Field Wiring Apparatus – apparatus intended to be connected to nonincendive field wiring. Entity parameters are similar to intrinsically safe apparatus.

Object Code – The code produced by a compiler. To get from source code to machine language, programs must be transformed by a compiler. The compiler produces an intermediary form called object code.

OLE – Object Linking and Embedding is a compound document standard developed by Microsoft Corporation. It enables objects to be created with one application and then linked or embedded with a second application. Embedded objects retain their original format and links to the application that created them.

OPC – (OLE for Process Control) OPC client/server technology brings fieldbus data into the MS Windows environment.

OSI – (Open System Interconnection) An ISO standard for worldwide communications that defines a networking framework for implementing protocols in seven layers.

Packet – A piece of a message transmitted over a packet-switching network. One of the key features of a packet is that it contains the destination address in addition to the data.

Parity – The quality of being either odd or even. The fact that all numbers have a parity is commonly used in data communications to ensure the validity of data.

Peer-to-peer – A type of network in which each workstation has equivalent capabilities and responsibilities.

Physical Block – Responsible for overall management of a device such as running it or placing it out of service as well as forcing the output. It also contains general identification information and overall device diagnostics.

Physical Layer – Layer 1 of the OSI model which describes the actual means of connection to the media. This includes encoding and physically transferring messages between adjacent nodes.

PID Control – (Proportional Integral Derivative Control) A control algorithm used to provide accurate, responsive, smooth loop control functionality.

PLTC – (Power Limited Tray Cabling) tray cabling that is used in class 2 or power limited circuits of 100 watts or less and 60 volts or less. In tray cables or with special support provisions as open wiring, ITC may be used in hazardous division 2 areas.

Glossary of Bus Networking Terms

Polling – In a master/slave scenario, the master queries each slave device in turn as to whether it has any data to transmit. If the slave answers yes then the device is permitted to transmit its data. If the slave answers no then the master moves on and polls the next slave device. The process is repeated continuously.

Preamble – Bits of information that are first transmitted at the beginning of a message to alert devices on the network and allow them to synchronize their receiver to the transmitting device.

Presentation Layer – Layer 6 of the OSI model which ensures that all the data typing and formatting will interface with the applications and session layers.

PROFIBUS-DP – (PROFIBUS Distributed Peripherals) An open protocol which is optimized for speed and efficiency and is designed especially for communication between automation systems and distributed peripherals. It uses RS-485 as its physical layer and runs at data rates from 9.6 kbs to 12 Mbps (Trunk lengths vary from 1200 meters at the lower data rates down to 100 meters at the highest rate). Up to 32 field devices may be connected to the network (with repeaters up to 126).

PROFIBUS-FMS – (PROFIBUS Fieldbus Message Specification) Offers many sophisticated application functions for communication between intelligent devices. It is a "higher" level protocol (communication between PCs and PLCs) which is being relegated to a less dominant role because of the introduction of Profinet.

PROFIBUS-PA – (PROFIBUS Process Automation) Designed to be a bus replacement for the 4 to 20mA standard in the process industry. It is either coupled or linked to the control architecture using PROFIBUS DP and shares many of the DP protocol's attributes except for the physical layer. The physical layer is the IEC 61158-2 standard which enables the bus to be used in intrinsically safe applications in hazardous areas.

Profinet – A version of PROFIBUS using Ethernet and TCP/IP for the lower layers while maintaining the PROFIBUS user layer.

Protocol – An agreed-upon set of procedures that are needed for seamless transmission of data between two devices.

PTB – (Physikalisch-Technische Bundesanstalt) The national institute of natural and engineering sciences; it is the highest technical authority for metrology and physical safety engineering in Germany.

Redundancy – (1) In data transmission, the portion of a message's gross information content that canbe eliminated without losing essential information. (2) The technique for building in extra identical components to be used as back ups in case the primary components fail.

Remote Access – The ability to log onto a network from a distant location.

Repeater – A layer 1 device that regenerates (repeats) the input signal, restoring its amplitude and clock sequence.

Resource Block – Used in Foundation Fieldbus to describe the characteristics of the fieldbus device such as device name, manufacturer and serial number.

Ring Topology – Devices connected to one another in the shape of a closed loop, so that each device is connected directly to two other devices, one on either side of it.

RS-232 – (Recommended Standard-232C) A standard interface approved by the Electronic Industries Association (EIA) for connecting serial devices.

RS-422 – (Recommended Standard-422C)Standard interfaces approved by the Electronic Industries Association (EIA) for connecting serial devices. The RS-422 standards are designed to replace the older RS-232 standard because is supports higher data rates and greater immunity to electrical interference. It is capable of supporting 4000 ft lengths with one transmitting device and 32 receiving devices.

RS-485 – (Recommended Standard-485)An Electronics Industry Association (EIA) standard for multipoint communications. It supports 4000 ft. bus lengths and 32 receiving and transmitting points.

SCADA – (Supervisory Control and Data Acquisition) A computer system for gathering and analyzing real time data. SCADA systems are used to monitor and control a plant or equipment.

Segment – A section of a network that is bounded by bridges, routers or switches.

Segment Coupler – A signal converter used to connect the IEC 61158-2 signal to RS-485. (Used with PROFIBUS-DP to PROFIBUS-PA to make one network transparent to the other.)

Serial Transmission – The transmission of a character or bit of data at a time.

Session Layer – Layer 5 of the OSI model, this layer is concerned with management and control of data flow from the application layer through the presentation layer. It also synchronizes and manages activities.

Shielding – A protective grounded metal covering around the wires or cable that protects the electrical signals from outside interference and lessens the chance that information moving along the cable will interfere with adjacent cables.

Slave – Any device that is controlled by another device, called the master.

Spread Spectrum – Radio frequency modulation that spreads the radio energy across a wide frequency spectrum, reducing the power at any one frequency. This is used to reduce interference and make eavesdropping difficult. Spread spectrum is a required modulation in the 2.4 GHz band, by FCC rules.

Spur – A cable which connects the bus trunk to individual devices. Sometimes referred to as Drop or Drop Leg.

Star topology – All devices or spurs connected to a central hub or node.

Glossary of Bus Networking Terms

Subnet – A portion of a network that shares a common address component. On TCP/IP networks, subnets are defined as all devices whose IP addresses have the same prefix. For example, all devices with IP addresses that start with 100.100.100. would be part of the same subnet.

Subscriber – A device, when a message is published or broadcast over the network, that will read the broadcast message.

Surge Protection – A device that protects a power supply and communications lines from electrical surges.

Synchronous – Tied to a common clock with the clock signal being transmitted along with the data.

T1 – A dedicated phone connection supporting data rates of 1.544Mbits per second. A T-1 line consists of 24 individual channels, each of which supports 64Kbs.

T3 – A dedicated phone connection supporting data rates of about 43 Mbps. A T-3 line consists of 672 individual channels, each of which supports 64 Kbps.

Tag, device – see device tag

TCP – (Transmission Control Protocol) One of the main protocols in TCP/IP networks. Whereas the IP protocol deals only with packets, TCP enables two hosts to establish a connection and exchange streams of data. TCP guarantees delivery of data and also guarantees that packets will be delivered in the same order in which they were sent.

Terminator – A device attached to the end-points of a bus network. The purpose of the terminator is to absorb signals so that they do not reflect back down the network.

Token – A frame transmitted onto the network by the controlling device. Whichever device has the token is enabled to send a message across the network. There is only one token for each network, so that no two devices will attempt to transmit messages at the same time.

Token Ring – A network access mechanism and topology in which a supervisory frame or token is passed from station to station in sequential order. Stations wishing to gain access to the network must wait for the token to arrive before transmitting data. In a token ring, the next logical station receiving the token is also the next physical station on the ring.

Topology – The physical form of the connections, nodes and links of a network.

Totalizer – May be used as a function block which receives input from other functions and adds or subtracts input values in a preset manner.

Transport Layer – Layer 4 of the OSI model, it provides transparent reliable data transfer from end node to end node.

Transceiver – (Transmitter-Receiver) A device that both transmits and receives analog or digital signals.

Transducer – A device that is actuated by energy from one system and supplies energy usually in another form to a second system.

Transducer Block – A function block, used in Foundation Fieldbus, that decouples function blocks from the local input/output functions required to read sensors and command output hardware. It also contains information such as calibration date and sensor type. There is usually one transducer block for each input or output function block.

Tree Topology - A tree topology combines characteristics of linear bus and star topologies. It consists of groups of star-configured workstations connected to a linear bus backbone cable.

Trunk – The main network cable when using bus topology.

Twisted Pair – Two insulated conducters that are wound around each other mainly to cancel the effects of electrical noise.

UDP – (User Datagram Protocol) a connectionless protocol that, like TCP, runs on top of IP networks. Unlike TCP/IP, UDP/IP provides very few error recovery services, offering instead a direct way to send and receive datagrams over an IP network. It's used primarily for broadcasting messages over a network.

User Layer – A layer (not included in the OSI model) which resides above the application layer that defines the application program or objects that run on the application layer.

UTP – (Unshielded Twisted Pair) A popular type of cable that consists of two unshielded wires twisted around each other.

Vampire Taps – A drop connector which clamps onto the network cable and pierces the insulation with "fangs" that engage into the wire.

VFD – (Virtual Field Device) Used in Foundation Fieldbus for network and system management. All of the configuration information needed by system management, such as function block scheduling, is described by object descriptions in the network and system management VFD in each device.

WAN – (Wide Area Network) A computer network that spans a relatively large geographical area. Typically, a WAN consists of two or more local-area networks (LANs).

Wireless – A method of propagating signals through the air.

Wi-Fi – Wireless Fidelity, the brand name for IEEE 802.11a, 802.11b and 802.11g products that have passed the Wi-Fi Alliance's certification procedure.

WNG - Wireless Next Generation Standing Committee

Zigbee – The name of a specification for a suite of high level communication protocols using small, low-power digital radios based on the IEEE 802.15.4 standard for wireless personal area networks (WPANs). The relationship between IEEE 802.15.4-2003 and ZigBee is similar to that between IEEE 802.11 and the Wi-Fi Alliance. Target applications are control and monitoring systems that infrequently send small amounts of data.

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458074	59	AS-i	Master/Gateway	AS-i for Allen Bradley ControlLogix
458076	58	AS-i	Master/Gateway	AS-i for Allen Bradley CompactLogix/MicroLogix
458078	40	AS-i	Master/Gateway	AS-i to Profibus-DP
458080	41	AS-i	Master/Gateway	AS-i to Profibus-DP, Dual Channel
458086	47	AS-i	Master/Gateway	AS-i to Modbus RS485
458088	48	AS-i	Master/Gateway	AS-i to Modbus RS485, Dual Channel
458090	51	AS-i	Master/Gateway	AS-i to Ethernet TCP/IP
458092	52	AS-i	Master/Gateway	AS-i to Ethernet TCP/IP, Dual Channel
458094	44	AS-i	Master/Gateway	AS-i to DeviceNet
458096	46	AS-i	Master/Gateway	AS-i to DeviceNet, Dual Channel (1 power supply)
458098	45	AS-i	Master/Gateway	AS-i to DeviceNet, Dual Channel
458100	59	AS-i	Master/Gateway	AS-i for Allen Bradley ControlLogix, C1D2
458102	38	AS-i	Master/Gateway	AS-i to Profibus-DP, Basic Gateway
458104	39	AS-i	Master/Gateway	AS-i to Profibus-DP, Basic Gateway, Dual Channel (1 power supply)
458108	42	AS-i	Master/Gateway	AS-i to Profibus-DP, Dual Channel (1 power supply)
458110	40	AS-i	Master/Gateway	AS-i to Profibus-DP, C1D2
458112	41	AS-i	Master/Gateway	AS-i to Profibus-DP, Dual Channel, C1D2
458114	42	AS-i	Master/Gateway	AS-i to Profibus-DP, Dual Channel (1 power supply), C1D2
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458120	45	AS-i	Master/Gateway	AS-i to DeviceNet, Dual Channel, C1D2
458122	46	AS-i	Master/Gateway	AS-i to DeviceNet, Dual Channel (1 power supply), C1D2
458124	49	AS-i	Master/Gateway	AS-i to Modbus RS485, Dual Channel (1 power supply)
458126	47	AS-i	Master/Gateway	AS-i to Modbus RS485, C1D2
458128	48	AS-i	Master/Gateway	AS-i to Modbus RS485, Dual Channel, C1D2
458130	49	AS-i	Master/Gateway	AS-i to Modbus RS485, Dual Channel (1 power supply), C1D2
458132	50	AS-i	Master/Gateway	AS-i to Modbus+
458134	53	AS-i	Master/Gateway	AS-i to Ethernet TCP/IP, Dual Channel (1 power supply)
458136	51	AS-i	Master/Gateway	AS-i to Ethernet TCP/IP, C1D2
458138	52	AS-i	Master/Gateway	AS-i to Ethernet TCP/IP, Dual Channel, C1D
458140	53	AS-i	Master/Gateway	AS-i to Ethernet TCP/IP, Dual Channel (1 power supply), C1D2
458142	54	AS-i	Master/Gateway	AS-i to Ethernet IP
458144	55	AS-i	Master/Gateway	AS-i to Ethernet IP, Dual Channel
458146	56	AS-i	Master/Gateway	AS-i to Ethernet IP, Dual Channel (1 power supply)
458148	54	AS-i	Master/Gateway	AS-i to Ethernet IP, C1D2
458150	55	AS-i	Master/Gateway	AS-i to Ethernet IP, Dual Channel, C1D2
458152	56	AS-i	Master/Gateway	AS-i to Ethernet IP, Dual Channel (1 power supply), C1D2
459002	61	AS-i	Power Supply	2.8 Amp AS-i Power Supply
459004	62	AS-i	Power Supply	8.0 Amp AS-i Power Supply
459006	63	AS-i	Power Supply	Dual 4.0 Amp AS-i Power Supply
459014	116	FF	Power Supply	.35 Amp 19VDC, Power Conditioner
459015	60	AS-i	Power Supply	2.8 Amp AS-i Power Supply, FM/CSA C1D2
459022	168	24VDC	Power Supply	3.4 Amp 24VDC, C1D2
459024	169	24VDC	Power Supply	5.0 Amp 24VDC, C1D2
459026	170	24VDC	Power Supply	10.0 Amp 24VDC, C1D2
459028	173	24VDC	Power Supply	10.0 Amp 24VDC (bulk), C1D2
459030	174	24VDC	Power Supply	20.0 Amp 24VDC (bulk)
459032	171	24VDC	Power Supply	2.1 Amp 24VDC (compact), C1D2
459034	172	24VDC	Power Supply	4.2 Amp 24VDC (compact), C1D2
459036	103	DN	Power Supply	3.8 Amp DeviceNet Power Supply
459038	102	DN	Power Supply	8.0 Amp DeviceNet Power Supply
459042	65	AS-i	Power Supply	8.0 Amp 30VDC AS-i Power Supply
459044	64	AS-i	Power Supply	4.0 Amp AS-i Power Supply, C1D2
459046	65	AS-i	Power Supply	8.0 Amp 30VDC AS-i Power Supply, C1D2
460002	70	AS-i	Accessory	Handheld Addressing Unit
461004	95	AS-i	Accessory	Converter; RS232C/PB-DP
461006	95	AS-i	Accessory	Converter; RS232C/RS485
461007	104	DN	I/O Module	2DI/2DO/1AI
461017	81	AS-i	Drop Connector	Protected (1-1; 240mA)
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461053	106	DN	Drop Connector	Passive Multi-drop (1-2)
461054	118	FF	I/O Module	2DI/2DO/1AI/1AO (externally powered outputs)
461056	133	PB-DP	Drop Connector	Passive Multi-drop (1-2)
461056	147	MB	Drop Connector	Passive Multi-drop (1-2)
461057	121	FF	Drop Connector	Protected (1-1; 40mA)
461057	135	PB-PA	Drop Connector	Protected (1-1; 40mA)
461059	81	AS-i	Drop Connector	Passive (1-2; No trip current)
461062	79	AS-i	I/O Module	2AI (IP65)
461066	83	AS-i	Drop Connector	Protected Drop Switch (1-1; 240mA)
461068	122	FF	Drop Connector	Protected Drop Switch (1-1; 40mA)
461068	136	PB-PA	Drop Connector	Protected Drop Switch (1-1; 40mA)
461072	86	AS-i	Drop Connector	Protected Multi-drop (1-4; 240mA); DIN Rail
461074	124	FF	Drop Connector	Protected Multi-drop (1-4; 40mA); DIN Rail
461074	138	PB-PA	Drop Connector	Protected Multi-drop (1-4; 40mA); DIN Rail
461075	85	AS-i	Drop Connector	Passive Multi-drop (1-4); DIN Rail
461076	134	PB-DP	Drop Connector	Passive Multi-drop (1-4); DIN Rail
461076	148	MB	Drop Connector	Passive Multi-drop (1-4); DIN Rail
461077	107	DN	Drop Connector	Passive Multi-drop (1-4); DIN Rail
461078	87	AS-i	Drop Connector	Switched Protected Multi-drop (1-4; 240mA); DIN Rail
461080	125	FF	Drop Connector	Switched Protected Multi-drop (1-4; 40mA); DIN Rail
461080	137	PB-PA	Drop Connector	Switched Protected Multi-drop (1-4; 40mA); DIN Rail
461081	73	AS-i	I/O Module	4DI/4DO (2 Relay Out - Interlocking)
461082	73	AS-i	I/O Module	4DI/4DO (2 Relay Out - Independent)
461083	105	DN	I/O Module	2DI/2Relay Out/1AI (Interlocking)
461084	105	DN	I/O Module	2DI/2Relay Out/1AI (Independent)
461085	146	MB	I/O Module	2DI/2 Relay Out/1AI (Interlocking)
461086	146	MB	I/O Module	2DI/2 Relay Out/1AI (Independent)
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461094	80	AS-i	I/O Module	2AO (IP65)
461096	75	AS-i	I/O Module	2AI (IP20); DIN Rail
461098	76	AS-i	I/O Module	2AO (IP20); DIN Rail
461109	123	FF	Drop Connector	Passive Multi-drop (1-4); DIN Rail
461109	139	PB-PA	Drop Connector	Passive Multi-drop (1-4); DIN Rail
461110	121	FF	Drop Connector	Passive (1-2; No trip current)
461110	135	PB-PA	Drop Connector	Passive (1-2; No trip current)
461111	126	FF	Accessory	Terminator
461117	108	DN	Drop Connector	Power Protected Drop Switch (1-1)
461119	132	PB-DP	Drop Connector	Power Protected Drop Switch (1-1)
461119	149	MB	Drop Connector	Power Protected Drop Switch (1-1)
461122	78	AS-i	I/O Module	4AO (IP20); DIN Rail
461124	77	AS-i	I/O Module	4AI (IP20); DIN Rail
461134	120	FF	I/O Module	2DI/2DO (externally powered outputs; no analog)
461136	72	AS-i	I/O Module	4DI/3DO (extended addressing)
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462002	91	AS-i	Accessory	AS-i Control tools software
462004	91	AS-i	Accessory	AS-i Control tools software with diagnostics
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463002	94	AS-i	Cable	2 Conductor PLTC/ITC (100m)
463004	110	DN	Cable	4 Conductor Thin Drop PLTC (100m)
463006	110	DN	Cable	4 Conductor Thick Trunk PLTC (100m)
463008	140	PB-DP	Cable	2 Conductor (100m)
463010	127	FF	Cable	2 Conductor PLTC/ITC (100m)
463010	141	PB-PA	Cable	2 Conductor PLTC/ITC (100m)
463016	127	FF	Cable	2 Conductor (100m) Blue I.S.
463016	141	PB-PA	Cable	2 Conductor (100m) Blue I.S.
463018	127	FF	Cable	2 Conductor PLTC/ITC (300m)
463018	141	PB-PA	Cable	2 Conductor PLTC/ITC (300m)
464001	89	AS-i	Accessory	Commissioning Kit and Software
464002	109	DN	Accessory	Commissioning Kit and Software
464003	150	MB	Accessory	Commissioning Kit and Software
464010	90	AS-i	Accessory	Analyzer
465001	81	AS-i	Drop Connector	Passive (1-2; No trip current); DIN Rail
465002	106	DN	Drop Connector	Passive Multi-drop (1-2); DIN Rail
465003	121	FF	Drop Connector	Passive (1-2; No trip current); DIN Rail
465003	135	PB-PA	Drop Connector	Passive (1-2; No trip current); DIN Rail
465004	133	PB-DP	Drop Connector	Passive Multi-drop (1-2); DIN Rail
465004	147	MB	Drop Connector	Passive Multi-drop (1-2); DIN Rail
465005	81	AS-i	Drop Connector	Protected (1-1; 240mA); DIN Rail
465006	121	FF	Drop Connector	Protected (1-1; 40mA); DIN Rail
465006	135	PB-PA	Drop Connector	Protected (1-1; 40mA); DIN Rail
465007	83	AS-i	Drop Connector	Protected Drop Switch (1-1; 240mA); DIN Rail
465008	122	FF	Drop Connector	Protected Drop Switch (1-1; 40mA); DIN Rail
465008	136	PB-PA	Drop Connector	Protected Drop Switch (1-1; 40mA); DIN Rail
465009	108	DN	Drop Connector	Power Protected Drop Switch (1-1); DIN Rail
465010	132	PB-DP	Drop Connector	Power Protected Drop Switch (1-1); DIN Rail
465010	149	MB	Drop Connector	Power Protected Drop Switch (1-1); DIN Rail
465011	71	AS-i	I/O Module	4DI/4DO; DIN Rail
465012	104	DN	I/O Module	2DI/2DO/1AI; DIN Rail
465013	145	MB	I/O Module	2DI/2DO/1AI; DIN Rail
465014	117	FF	I/O Module	2DI/2DO (bus powered outputs); DIN Rail
465015	118	FF	I/O Module	2DI/2DO/1AI/1AO (externally powered outputs); DIN Rail
465016	73	AS-i	I/O Module	4DI/4DO (2 Relay Out - Interlocking); DIN Rail
465017	73	AS-i	I/O Module	4DI/4DO (2 Relay Out - Independent); DIN Rail
465018	105	DN	I/O Module	2DI/2Relay Out/1AI (Interlocking); DIN Rail
465019	105	DN	I/O Module	2DI/2Relay Out/1AI (Independent); DIN Rail
465020	146	MB	I/O Module	2DI/2 Relay Out/1AI (Interlocking); DIN Rail
465021	146	MB	I/O Module	2DI/2 Relay Out/1AI (Independent); DIN Rail
465022	119	FF	I/O Module	2DI/2 Relay Out/1AI/1AO (Interlocking); DIN Rail
465023	119	FF	I/O Module	2DI/2 Relay Out/1AI/1AO (Independent); DIN Rail
465024	66	AS-i	Power Conditioner	Redundant Inputs; DIN Rail
465025	66	AS-i	Power Conditioner	Daisy Chain Inputs; DIN Rail
465026	67	AS-i	Repeater	StoneL Repeater; DIN Rail
465027	120	FF	I/O Module	2DI/2DO (externally powered outputs; no analog); DIN Rail
465029	72	AS-i	I/O Module	4DI/3DO (extended addressing); DIN Rail
465030	74	AS-i	I/O Module	4DI/3DO (2 Relay Out - Interlocking; extended addressing); DIN Rail
465031	74	AS-i	I/O Module	4DI/3DO (2 Relay Out - Independent; extended addressing); DIN Rail
465032	82	AS-i	Drop Connector	Protected (1-1; 100mA); DIN Rail
465033	84	AS-i	Drop Connector	Protected Drop Switch (1-1; 100mA); DIN Rail
DCFL01	88	AS-i	Accessory	Training/Demo Kit
FB	160	StoneL	Enclosure	FieldBlock
FR	166	StoneL	Enclosure	FieldRack
JM	154	StoneL	Enclosure	Junction Module

StoneL Valve Communication and Control Products

StoneL offers a full range of monitoring, communication and control systems ideally suited for quarter-turn and linear discrete automated valve systems. Products feature state-of-the-art electronic systems integrating position sensing, switching, diagnostics, and/or communication and control capabilities in rugged industrial enclosures. As a result you can expect exceptional performance in extreme process environments. You may select from traditional switching systems or valve communication terminals (VCTs) with on-board valve diagnostics depending on your specific requirements.

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Quarter-Turn Valve/Actuator Applications

Axiom
Advanced Electronics with Integral Pneumatic Control

Featuring solid state position sensing, push button settings, integral pneumatic control and valve diagnostics, the Axiom offers the ultimate in reliability and convenience. This platform is suitable for use in most corrosive and hazardous process environments and offers a broad array of communication and electronic switching outputs.

Quartz
ExplosionProof/ Flame Proof Aluminum Enclosure

This rugged epoxy coated anodized aluminum platform is ideally suited for explosion proof areas. It is corrosion proof, temporarily submersible and approved for use in most hazardous applications. You may select from a wide variety of switching, position transmitter and communication options.

Eclipse
Compact and Modular

The Eclipse features two integral solid state position sensors and directly attaches to VDI/VDE 3845 (Namur) actuator mounting pads. This compact modular unit is constructed of durable Lexan suitable for corrosive, heavy wash down environments and is rated for use in nonincendive and intrinsically safe applications. Select from Namur sensors, switching and communication options.

Linear Valve/Actuator Applications

Hawkeye
Linear Point Sensors

These solid state point sensors are made of corrosion proof 316 stainless steel and Lexan. They may be conveniently installed on knife gates and globe valves or be attached to sense rotary valve/actuator coupling motion. Sensors feature two wire switching or Namur outputs and are rated for nonincendive and intrinsically safe applications.

Prism
Diaphragm and Angle Valve Applications

The Prism offers self adjusting switching and optionally integrates pneumatic control. Made of durable Lexan it is suitable for heavy wash down, corrosive environments and is rated for use in nonincendive and intrinsically safe applications. Electronic options include solid state Namur, switching and communication.