

GS series and *DURAPULSE* AC Drives

Section 13



Soft Starters

Section 14



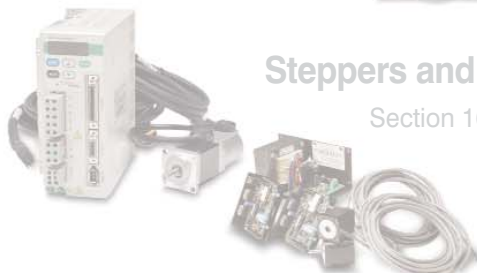
General Purpose Motors, Inverter Duty Motors, Worm Gearboxes, DC Motors

Section 15

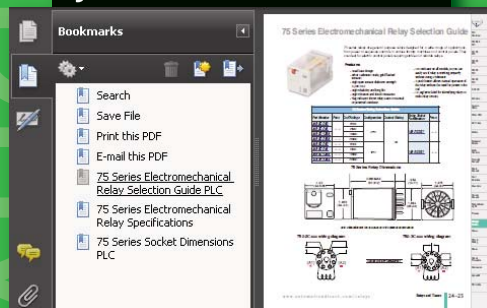


Steppers and Servos

Section 16



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GS Series AC Drives



GS1 AC minidrive

¼ and ½ hp, 115 VAC single-phase
¼, ½ and 1 hp, 230 VAC single-phase/3-phase
2 hp, 230 VAC 3-phase

- Simple Volts/Hertz control
- 130% starting torque at 5 Hz
- Electronic overload protection
- Use of integrated potentiometer or keypad for local speed setting
- External analog input (0-10V, 0-20 mA or 4-20 mA)
- Three preset speeds
- Four programmable digital inputs
- One programmable relay output
- RS485 Modbus communications up to 19.2K
- Optional Ethernet communications DIN-rail mountable
- Two-year replacement warranty*
- UL, CUL, CE-listed



GS2 AC microdrive

¼ hp to 1 hp, 115 VAC single-phase
½ hp to 7.5 hp, 230 VAC
1 to 10 hp, 460 VAC
1 to 10 hp, 575 VAC

- Simple Volts/Hertz control
- 150% starting torque
- Dynamic braking circuit
- Electronic overload protection
- Use of integrated potentiometer or keypad for local speed setting
- External analog input (0-10V, 0-20 mA or 4-20 mA)
- Removable keypad
- Seven preset speeds
- CE Listed (except 575V model)
- Six programmable digital inputs
- Two programmable relay outputs
- PID control
- RS-232/RS-485 Modbus communications up to 38.4K
- Optional Ethernet communications
- Two-year replacement warranty*
- UL, CUL

GSoft configuration software
available for \$50 -

<http://support.automationdirect.com/products/gsoft.html>



DuraPulse® Series AC Drives

DURAPULSE AC sensorless vector drives

1 hp to 50 hp, 230 VAC, 3-phase only
1 hp to 100 hp, 460 VAC

The *DURAPULSE* series is a line of autotuning and sensorless vector control AC drives. All parameters are programmable via a removable keypad that will store up to four different application programs. The PWM output of the drive is controlled by a 16-bit microprocessor with an output frequency from 0.1 to 400 Hz.

- V/Hz or sensorless vector control modes
- 150% starting torque
- Removable keypad
- Three analog inputs - (0-10V, -10 to +10 VDC or 4-20 mA/0 - 20 mA)
- 16 preset speeds
- 11 programmable digital inputs
- Four programmable outputs
- Optional encoder feedback card
- RS-485 Modbus communications up to 38.4K
- Optional Ethernet communications
- Two-year replacement warranty*
- UL, CE listed

*Failures due to misuse or mis-application are not covered.

Stellar™ Series Compact Soft Starters



5-40A models @ 208-460V

- 24 VDC control voltage
- Easily and separately adjustable motor start and stop times up to 30 seconds
- Adjustable start pedestal voltage from 30 to 100%
- Two-phase control
- Internal bypass contacts for Run
- Six error/trip indications: AC Supply, Control Supply, Overheated, Bypass Failure, Shear Pin, Overcurrent
- Two standard-size widths: 45 and 55mm
- DIN rail mounting

IronHorse® AC Motors up to 300 hp



High-quality general purpose motors

You asked for general purpose motors, so we sourced this high-quality motor line from a manufacturer who has over three decades of solid experience and reliability in the North American motor market.

Choose from 56C, T, and TC-frame motors in a variety of sizes and speed ratings, including 1200, 1800 and 3600 RPM. Complete your motor installation with an IronHorse worm gearbox and STABLE motor base. And all these components are in stock and ready to ship.

56C Frame Permanent Magnet DC motors

IronHorse DC motors are designed for use on unfiltered SCR (Thyristor) type rectified AC input. They may also be used with PWM (pulse width modulated) type DC adjustable speed drives.

Choose from TENV or TEFC 56C-Frame DC motors with rolled steel frames, flange mount and removable mounting bases; sizes range from 0.33 to 2 hp.

Marathon Electric® AC Motors up to 100 hp

Inverter-duty motors matched with drives



Marathon Electric has over 20 years experience in the design, manufacturing and application of AC variable speed motors, and well over 15,000 hours of laboratory testing in their state-of-the-art facilities. Their expertise in the application of AC drives with induction motors is unsurpassed.

The Marathon Electric motor lines have been carefully selected to be performance-matched with the DURApulse and GS series AC drives. The offering includes models ranging from ¼ hp to 100 hp, that feature dual 230/460 VAC voltages and a base speed of 1,200 or 1,800 RPM.

Worm Gearboxes and Motor Bases for IronHorse and Marathon motors



SureStep® Stepping Systems



The SureStep™ stepping family features nine standard "high-torque" motors that employ the latest technology to achieve the best torque-to-volume ratio, and therefore handle a wide range of automation applications. Frame sizes include NEMA 17, 23, and 34, with holding torque ranges from 61 oz-in to 1,291 oz-in. Advanced microstepping drives are software configurable and feature an internal indexer.

SureServo® Servo Systems

100W to 3 kW systems with flexible features

start on page
16-19



The SureServo family of brushless servo systems from AutomationDirect is fully digital and offers a rich set of features at dynamite prices. Choose from eight standard servo motors (100W to 3 kW) that can be used with one of three standard servo drives. For configuration, tuning and diagnostics, use the drives' integrated keypad/display or take advantage of the free SureServo Pro™ PC-based software, which can be downloaded online at <http://support.automationdirect.com/products/sureservo.html>.

Tune the system easily with adaptive auto-tuning selections or a manual mode. Adapt to diverse applications with configurable I/O, including 8 digital inputs, 5 digital outputs, 2 analog monitors and a scalable encoder output.

GS1 and GS2 Series AC Drives



CHECK OUT OUR PRICES

GS1 Drives

AutomationDirect
GS1

VS.

Allen-Bradley
Powerflex 4M™

.25 hp

\$99.00
GS1-10P2



\$295.00
22F-V1P6N103



2 hp

\$160.25
GS1-22P0



\$375.00
22F-B8P0N103



All prices are U.S. published prices. AutomationDirect prices are from March 2010 Price List. A-B prices taken from <http://www.rockwellautomation.com/en/e-tools/2/1/1/10>. Prices subject to change without notice.

Simple communications

Each drive has a built-in Modbus RTU RS-485 communications port (RS-232/485 configurable on the GS2 series). An optional Ethernet communications module is a snap to integrate on a network with our PLCs and operator interfaces.

GS1 AC minidrive

¼ and ½ hp, 115 VAC single-phase
¼, ½ and 1 hp, 230 VAC single/
three-phase
2 hp, 230 VAC three-phase

Features:

- Simple Volts/Hertz control
- Pulse Width Modulation(PWM)
- 3 - 10 kHz carrier frequency
- IGBT technology
- 130% starting torque at 5 Hz
- 130% rated current for 1 minute
- Electronic overload protection and stall prevention
- Adjustable accel and decel ramps
- S-curve settings for acceleration and deceleration
- Automatic torque and slip compensation
- DC braking
- Three skip frequencies
- Trip history
- Integral keypad and speed potentiometer
- Programmable jog speed
- Three programmable preset speeds
- Four programmable digital inputs, one programmable relay output
- Programmable analog input
- RS-485 Modbus communications up to 19.2K
- Optional Ethernet communications
- UL/CUL listed; CE

High quality

The GS series is manufactured exclusively for **AutomationDirect** with reliable IGBT technology. We started with a proven design and made it even better and easier to use.

Simple programming

The GS series can be programmed by the average technician. Default values were carefully selected so the drives run "out of the box" for most applications. Parameters are intelligently grouped into menu structures that make sense.



GS1 Mini AC Inverters

Part Number	Input Voltage	Output Voltage	hp	Output Amps	Price (US\$)
GS1-10P2	115V, 1ph	230V, 3ph	0.25	1.6 A	\$99.00
GS1-10P5	115V, 1ph	230V, 3ph	0.5	2.5 A	\$113.75
GS1-20P2	230V, 1ph/3ph	230V, 3ph	0.25	1.6 A	\$108.50
GS1-20P5	230V, 1ph/3ph	230V, 3ph	0.5	2.5 A	\$113.75
GS1-21P0	230V, 1ph/3ph	230V, 3ph	1.0	4.2 A	\$130.00
GS1-22P0	230V, 3ph	230V, 3ph	2.0	7.0 A	\$160.25

GS2 Micro AC Inverters

Part Number	Input Voltage	Output Voltage	hp	Output Amps	Price (US\$)
GS2-10P2	115V, 1ph/3ph	230V, 3ph	0.25	1.6	\$152.00
GS2-10P5	115V, 1ph/3ph	230V, 3ph	0.5	2.5	\$162.00
GS2-11P0	115V, 1ph/3ph	230V, 3ph	1.0	4.2	\$181.75
GS2-20P5	230V, 1ph/3ph	230V, 3ph	0.5	2.5	\$154.25
GS2-21P0	230V, 1ph/3ph	230V, 3ph	1.0	5.0	\$172.50
GS2-22P0	230V, 1ph/3ph	230V, 3ph	2.0	7.0	\$244.50
GS2-23P0	230V, 1ph/3ph	230V, 3ph	3.0	10.0	\$300.50
GS2-25P0	230V, 3ph	230V, 3ph	5.0	17.0	\$353.25
GS2-27P5	230V, 3ph	230V, 3ph	7.5	25.0	\$451.75
GS2-41P0	460V, 3ph	460V, 3ph	1.0	3.0	\$253.75
GS2-42P0	460V, 3ph	460V, 3ph	2.0	4.0	\$295.25
GS2-43P0	460V, 3ph	460V, 3ph	3.0	5.0	\$347.25
GS2-45P0	460V, 3ph	460V, 3ph	5.0	8.2	\$399.00
GS2-47P5	460V, 3ph	460V, 3ph	7.5	13.0	\$569.50
GS2-4010	460V, 3ph	460V, 3ph	10	18.0	\$704.50
GS2-51P0	575V, 3ph	575V, 3ph	1	1.7	\$272.00
GS2-52P0	575V, 3ph	575V, 3ph	2	3.0	\$309.50
GS2-53P0	575V, 3ph	575V, 3ph	3	4.2	\$367.50
GS2-55P0	575V, 3ph	575V, 3ph	5	6.6	\$477.00
GS2-57P5	575V, 3ph	575V, 3ph	7.5	9.9	\$701.25
GS2-5010	575V, 3ph	575V, 3ph	10	12.2	\$789.75

Removable keypad (GS2)

The removable keypad includes an LED display for parameters and data, programming keys and a potentiometer for direct setpoint adjustment. The keypad can be remotely mounted (with optional keypad cable).

Two-year warranty

The standard two-year warranty for the GS series is the best in the industry.

GS2 AC microdrive

1/4 hp to 1 hp, 115 VAC single/three-phase
1/2 hp to 3 hp, 230 VAC single/three-phase
5 and 7.5 hp, 230 VAC three-phase
1 to 10 hp, 460 VAC
1 to 10 hp, 575 VAC

Features:

- All GS1 features, plus:
- 1-12 kHz carrier frequency
- 150% starting torque
- Dynamic braking circuit
- Seven programmable preset speeds
- Integral PID control
- Removable keypad with potentiometer
- Programmable analog input and output
- Six programmable digital inputs, two programmable relay outputs
- RS-232/485 Modbus communications up to 38.4K
- UL/CUL listed
- CE Listed (except 575V model)

**CHECK OUT OUR PRICES**

GS2 Drives	AutomationDirect GS2	VS.	Allen-Bradley Powerflex 4
2 hp 230V	\$244.50 GS2-22P0		\$435.00 22A-B8P0N104
5 hp	\$353.25 GS2-25P0		\$600.00 22A-B017N104
5 hp 460V	\$399.00 GS2-45P0		\$775.00 22A-D8P7N104
10 hp	\$704.50 GS2-4010		Not available

All prices are U.S. published prices. AutomationDirect prices are from March 2010 Price List. Allen-Bradley prices taken from <http://www.rockwellautomation.com/en-e-tools/2/11/10>. Prices subject to change without notice.

DURAPULSE AC Drives

DURAPULSE builds on the GS series

The *DURAPULSE* series builds on the simplicity and flexibility of the GS1 and GS2 series, incorporating feedback from our customers and extensive research and testing in our own drives lab. While the GS1 offers simple Volts per Hertz control, and the GS2 adds PID functionality and dynamic braking, *DURAPULSE* offers sensorless vector control and autotuning, as well as optional encoder feedback for enhanced speed control. *DURAPULSE* configuration settings are a superset of the GS series, so programming for the same parameters is identical across all series.



DURA PULSE

Visit: www.durapulse.com

Durability guaranteed

DURAPULSE drives are backed by the same 2-year warranty as the GS series!

Features

- Simple Volts/Hertz control
- Sensorless vector control with autotune
- Sensorless vector control with optional encoder feedback card, for tighter speed control
- Variable carrier frequency, depending on model
- IGBT technology
- 150% starting torque
- 150% rated current for one minute
- Internal dynamic braking circuit for models under 20 hp
- Automatic torque and slip compensation
- Programmable jog speed
- Removable smart keypad with parameter upload/download
- Easy-to-understand parameter text labels
- HIM keypad with memory to store up to four programs of any DURApulse drive
- Three analog inputs and one analog output
- Eleven digital inputs
- Four programmable outputs: Three digital and one relay
- One digital frequency pulse output
- RS-485 Modbus communications
- Ethernet communication optional
- UL/CE listed
- Optional software package with full programmability, trending and application setup

Little programming required

Default values were carefully selected so the drives run "out of the box" for most applications, with default values set for the U.S. industrial market. Keypad can store up to 4 configuration programs for any *DURAPULSE* drive. This is great for maintenance backup as well as OEM programming ease.

U.S. operating parameters

DURAPULSE drives are specifically designed to operate with U.S. voltage levels.

Encoder feedback

Optional encoder feedback module allows additional control routine for speed control



Sensorless Vector Technology up to 100 hp

DURAPULSE AC Inverters

Hp	Part Number	Output Amps	Price (US\$)	Part Number	Output Amps	Price (US\$)
1.0	GS3-21P0	5	\$240.00	GS3-41P0	2.7	\$319.75
2.0	GS3-22P0	7	\$285.25	GS3-42P0	4.2	\$350.25
3.0	GS3-23P0	11	\$337.00	GS3-43P0	5.5	\$374.50
5.0	GS3-25P0	17	\$388.75	GS3-45P0	8.5	\$415.25
7.5	GS3-27P5	25	\$534.00	GS3-47P5	13	\$595.75
10	GS3-2010	33	\$678.00	GS3-4010	18	\$713.50
15	GS3-2015	49	\$864.75	GS3-4015	24	\$930.75
20	GS3-2020	65	\$1,073.75	GS3-4020	32	\$1,133.75
25	GS3-2025	75	\$1,262.75	GS3-4025	38	\$1,345.00
30	GS3-2030	90	\$1,445.25	GS3-4030	45	\$1,527.50
40	GS3-2040	120	\$2,117.25	GS3-4040	60	\$1,945.75
50	GS3-2050	145	\$2,565.00	GS3-4050	73	\$2,370.00
60	n/a	n/a	n/a	GS3-4060	91	\$2,712.00
75	n/a	n/a	n/a	GS3-4075	110	\$3,044.00
100	n/a	n/a	n/a	GS3-4100	150	\$3,402.25

Accessories

- AC line reactors
- EMI filters
- Braking resistors
- Fuse kits and replacement fuses
- RF filter
- GS3-FB feedback card
- Ethernet interface
- GSoft drive configuration software
- Replacement keypads
- Remote panel adapter
- Keypad cables in 1, 3 and 5 meter lengths
- Four and eight-port communication boards

LCD Display

LCD display for real language programming. No need to have a manual to understand parameter configuration.

The lit LED Indicators will blink when there is a Fault or a Warning.



Remote mounting of keypad

Standard keypad mounted on unit's face can also be remote mounted for easy access to data and parameters. Requires remote cable.



The DURAPULSE Digital Keypad

The digital keypad includes a 2 line x 16 character LCD display, 5 status LED Indicators, and 9 function keys. The diagram to the right shows all of the features of the digital keypad and an overview of their functions.

The standard smart keypad (aka HIM or Human Interface Module) is designed with defaults for the North American customer and allows you to configure the drive, set the speed, start and stop the drive, and monitor critical parameters for your application. In addition, this keypad has internal memory that allows four complete programs to be stored and transferred to any DURAPULSE drive.

CHECK OUT OUR PRICES

Drives	AutomationDirect DURAPULSE	VS.	Allen-Bradley Powerflex 40	Schneider ATV31 series	Our Price vs AB	Our Price vs Schneider
2 hp, 240V GS3-22P0	\$285.25		\$665.00	\$422.25	57% Savings	32% Savings
10 hp, 240V GS3-2010	\$678.00		\$1,535.00	\$1,065.00	56% Savings	36% Savings
5 hp, 460V GS3-45P0	\$415.25		\$995.00	\$723.50	58% Savings	43% Savings
10 hp, 460V GS3-4010	\$713.50		\$1,515.00	\$1,107.00	53% Savings	36% Savings

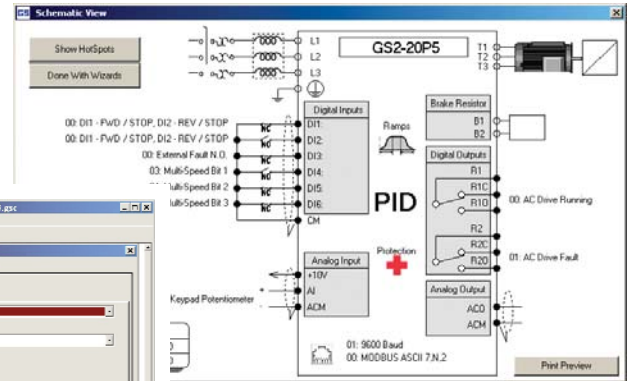
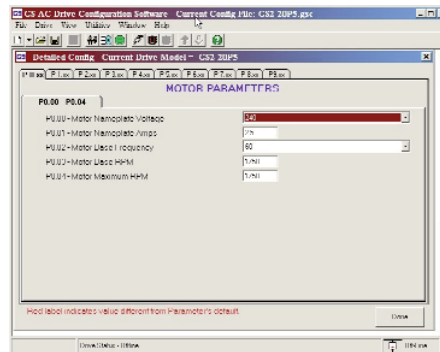
All prices are U.S. published prices. AutomationDirect prices are from March 2010 Price List. Allen-Bradley prices taken from <http://www.rockwellautomation.com/en/e-tools/2/11/10>. Schneider prices taken from www.grainger.com 2/11/10. Specifications may vary by dealer and configuration. Prices subject to change without notice.

GSoft Configuration Software

GSoft configuration software, available for \$50.00 or download after purchase (see below) is a Windows-based package that allows connection from a PC to any GS or *DURAPULSE* drive for easy configuration and tuning. You can create new drive configurations, upload and download archived configurations, and tune the drive's PID loop with intuitive screens.

GSoft configuration software
available for \$50 -

[http://support.automationdirect.com/
products/gsoft.html](http://support.automationdirect.com/products/gsoft.html)



Networking AC Drives with Built-in Modbus Communications

AUTOMATIONDIRECT's AC drives offer "out-of-the-box" RS-485 and RS-232 (GS2 series only) serial connectivity. Modbus RTU is the onboard standard protocol used for control and monitoring. This can be used to connect several Modbus masters like AUTOMATIONDIRECT's family of *Direct*LOGIC PLCs, Think & Do Studio or Live!, and any OPC server that has a Modbus driver such as Kepware or Software Toolbox.

Imagine getting all the parameter settings and control functionality on one cable, even when the information is not readily available by any other means. This flexibility offers cost savings, standardization, smaller PLC usage, and less development time.



RS-485 Modbus Network

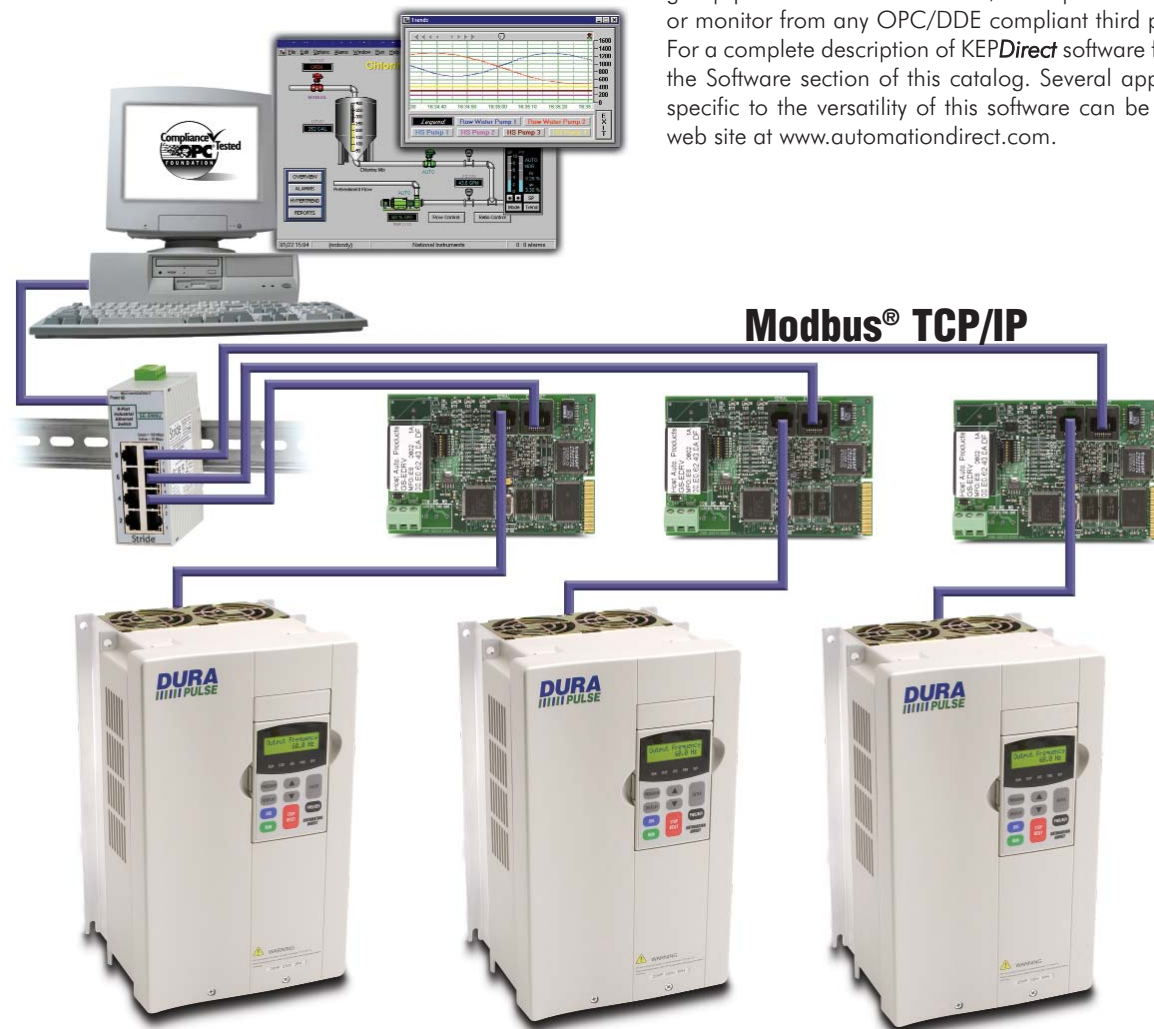
Add Ethernet Connectivity for Advanced Functionality

Add Ethernet connectivity and open up the path to the most advanced functionality today.

The GS-EDRV provides a high-performance Ethernet link between a control system and a **DURAPULSE** or GS drive. It mounts on DIN rail and connects a drive to an Ethernet hub or PC. The GS-EDRV processes signals to and from the drive and formats them to conform with the Ethernet standard to the H2-ERM or H4-ERM, **KEPDirect** EBC I/O server (as shown below), or independent controller with the Modbus TCP/IP driver. This allows for greater connectivity to many control system architectures.

An additional feature is the built-in Web server, which allows users to configure and control the drive from any web browser via the IP address of the GS-EDRV card. The **DURAPULSE** and GS series drives have a provision for shutting down control or power to the inverter in the event of a communications timeout. This function can be set up through the drive parameter group 9 on all the drive platforms.

The **KEPDirect** EBC I/O server software is a 32-bit application that provides a way to connect your favorite Windows client software to **AUTOMATIONDIRECT** Ethernet I/O through our Ethernet base controllers. It provides GS series drive support via the GS-EDRV Ethernet interface, as shown in the diagram below. **KEPDirect** allows the user a direct line into the drive parameter group just like an Ethernet field I/O drop. The user can control or monitor from any OPC/DDE compliant third party software. For a complete description of **KEPDirect** software features, go to the Software section of this catalog. Several application notes specific to the versatility of this software can be found on our web site at www.automationdirect.com.



3 Steps to Selecting the Right AC Drive



STEP 1 - Select The Right Model

A. Determine motor voltage, horsepower and full-load amperage

	AC drive models		
	GS1	GS2	DURAPULSE
Horsepower	1/4 - 2	1/4 - 10*	1 - 100**
Input voltage	115/230 VAC	115/230/460 VAC	230/460/575 VAC
Motor voltage	230 VAC	230/460 VAC	230/460/575 VAC
		* 230V up to 7.5 hp 460V up to 10 hp 575V up to 10 hp	** 230V up to 50 hp 460V up to 100 hp

Check the nameplate on the motor for specs needed:

Motor horsepower		Inverter Duty Motor					
Motor voltage		HP	1	Volts	460	PHASE	3
Motor amperage		RPM	1725	AMPS	2.6	HZ	60
		DESIGN	B	AMB	40°C	INSUL CLASS	F
		DUTY	CONT	ENCL	TEFC	CODE	K

Motor voltage, horsepower, and amperage can be found on the motor's nameplate.

Note: Most motors can be connected for multiple voltages and will have multiple amperages listed.

In the example to the left the motor can be connected for 460V only. The 460V amperage is 2.6.

B. Select your application and/or control mode

	AC Drive Models		
	GS1	GS2	DURAPULSE
Volts/Hertz Control	✓	✓	✓
Sensorless Vector Control			✓
Closed Loop Control			Optional
Encoder Feedback			Optional
Integral PID Control		✓	✓
Integral Dynamic Braking Unit		✓	15 HP*
	Conveyor	Conveyor	Conveyor
	Pump	Pump	Pump
	Fan	Fan	Fan
	Shop tools	Material handling	Material handling
		HVAC	HVAC
		Mixing	Mixing
		Compressor	Compressor
		Shop tools	Shop tools

Either choose your application from those listed or select the control mode that meets your application's requirements. For applications not listed, either select the control mode that offers the same or higher level of performance as the existing control, or call us and ask for assistance.

	Control Mode		
	Volts/Hertz	Sensorless Vector	Closed-Loop Control
Complexity	Low	Moderate	Complex
Performance	Good	Good	High
1 min. Overload	150%	150%	150%
Starting Torque	175%	200%	200%
Speed Regulation	+/- 2%	+/- 1%	+/- 0.2%

>15 hp requires external braking units

C. Determine the I/O requirements of the AC drive

	AC Drive Models		
	GS1	GS2	DURAPULSE
Digital Inputs	4	6	11
Digital Outputs - Transistor	0	0	3
Digital Outputs - Relay	1	2	1
Digital Output - Frequency pulse			1
Analog Input - 0-10VDC/4-20mA	1	1	3
Analog Output - 0 - 10 VDC	0	1	1

Digital inputs are used to interface the AC drive with devices such as pushbuttons, selector switches and PLC digital output modules, either DC or relay. These signals are typically used for functions such as Start/Stop, Forward/Reverse, External Fault, Preset Speed selection, Fault Reset, etc.

Digital outputs are typically used to connect the AC drive to devices such as pilot lights, alarms, auxiliary relays, solenoids,

and PLC digital input modules. Relay outputs are rated for both AC and DC voltages. Transistor outputs are rated for only DC voltages.

The analog input is used to interface the AC drive with an external 0-10 VDC or 4-20 mA signal. This signal can represent either a speed setpoint or if available, PID feedback.

D. Determine location of AC drive's keypad

	AC Drive Models		
	GS1	GS2	DURAPULSE
Removable Keypad		✓	✓

The keypad of the GS2, DURApulse are removable and can be remotely mounted. If the AC drive is installed in a location that the operator cannot easily access, its keypad could be relocated

to a more suitable location. Remote mounting would require the purchase of the appropriate cable. Also available for the DURApulse drives is a remote, panel-mount bezel.

E. Determine communications requirements

	AC Drive Models		
	GS1	GS2	DURAPULSE
MODBUS Communications	✓	✓	✓
Ethernet Communications	Optional	Optional	Optional

A serial communication interface can be used to connect the AC drive to other devices that have the capability to function as a master device. The master device can control the AC drive with this interface instead of using the digital and analog I/O. The master can also use this interface to monitor the status of various AC drive parameters, speed, current, fault status, etc.

The GS1, GS2 and DURApulse AC drives have a standard Modbus RS-485 interface.

The GS1, GS2, and DURApulse drives also have the optional capability to communicate through an Ethernet interface. Please refer to the technical section of each model to determine the required Ethernet interface adapter and compatible Ethernet devices.

F. Select the proper series

After you have selected the AC drive series that meets your requirements, you need to determine the correct rating. Turn the page and proceed to Step two.

STEP 2

STEP 2 - Select the Proper Rating

A. Determine motor full load amperage (FLA)

Motor FLA is located on the nameplate of the motor.

Note: FLA of motors that have been rewound may be higher than stated.

B. Determine overload requirements

Many applications experience temporary overload conditions due to starting requirements or impact loading. Most AC drives are designed to operate at 150% overload for 60 seconds. If the application requires an overload greater than 150% or longer than 60 seconds, the AC drive must be oversized. NOTE: Applications that require replacement of existing motor starters with AC drives may require up to 600% overload.

C. Installation altitude

AC drives rely upon the cooling properties of air for cooling. As the altitude increases, the air becomes less dense. This decrease in air density decreases the cooling properties of the air. Therefore, the AC drive must be oversized to compensate for the decrease in cooling. Most AC drives are designed to operate at 100% capacity up to altitudes of 1000 m. Above 1000 m, the AC drive must be derated.

D. Determine max enclosure internal temp

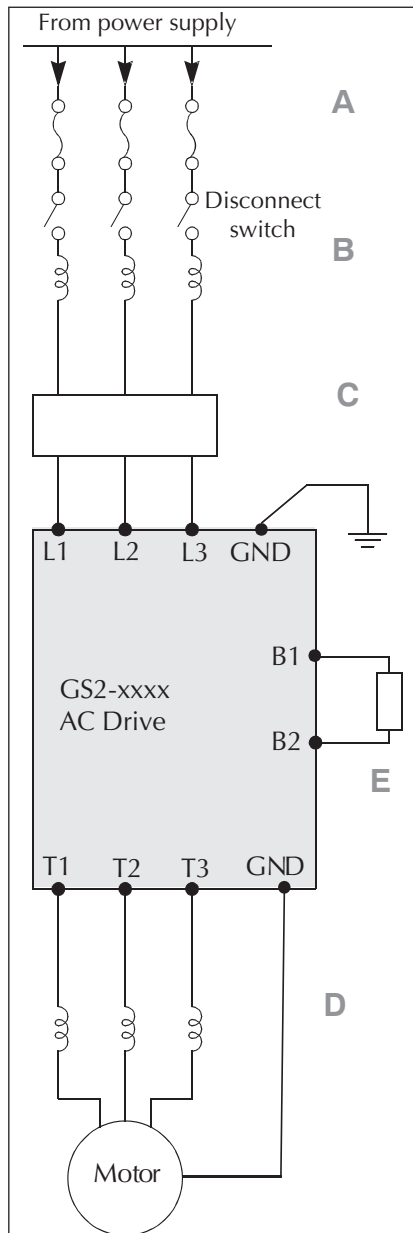
AC drives generate a significant amount of heat and will cause the internal temperature of an enclosure to exceed the rating of the AC drive, even when the ambient temperature is less than 104 degrees F (40 degrees C). Enclosure ventilation and/or cooling may be required to maintain a maximum internal temperature of 104 degrees F (40 degrees C) or less. Ambient temperature measurements/calculations should be made for the maximum expected temperature.

E. Calculate required output amperage

Use the chart below to calculate the required FLA of the AC drive. Select the rating that equals the motor's voltage and equals or exceeds the calculated amperage.

		Example 1	Example 2
		GS Series	DURAPULSE
		6	8
Overload Derate (overload %)	If Overload is less than 150% and less than 60 seconds, Then ENTER 1		
	If Overload is greater than 150% and less than 60 seconds, Then ENTER (overload/150%)	1.333	
	If Overload is greater than 60 seconds, Then ENTER (overload/100%) Multiply FLA x overload entry (This entry is the overload result)	8	10.8
Altitude Derate (meters)	If Altitude is less than 1000m Then ENTER 1	1	
	If Altitude is more than 1000m and less than 3000m Then ENTER 1 + ((altitude-1000) x 0.0001) Multiply overload result x altitude entry (This entry is the altitude result)	8	10.91
Ambient Temperature (Celsius)	If Max enclosure internal temperature (MEIT) is less than 40°C Then ENTER 1		1
	If 40°C < MEIT < 50°C and GS series AC drive up to 5 hp Then ENTER 1	1	
	If 40°C < MEIT < 50°C and GS Series >5 hp or DURAPULSE series AC drive Then ENTER 1.2		
Multiply altitude result x MEIT entry (This result is the required drive FLA)		8	10.91

STEP 3 - Options, Options, and more Options



A. Input fuses

Input fuses protect the AC drive from excessive input current due to line surges, short circuits, and ground faults. They are recommended for all installations and may be required for UL-listed installations. Input fuse kits and replacement fuses are available for GS series and *DURAPULSE* AC drives.

B. Input line reactor

Input line reactors protect the AC drive from transient overvoltage conditions, typically caused by utility capacitor switching. The input line reactor also reduces the harmonics associated with AC drives. Input line reactors are recommended for all installations.

C. Input EMI filter

Input EMI filters reduce electromagnetic interference or noise on the input side of the inverter. They are required for CE compliance and recommended for installations prone to or sensitive to electromagnetic interference.

D. Output line reactor

Output line reactors protect the motor insulation against drive short circuits and IGBT reflective wave damage. Output line reactors also "smooth" the motor current waveform, allowing the motor to run cooler. The line reactor can be used for either input or output applications.

Output line reactors are recommended for operating "noninverter-duty" motors and when the length of wiring between the AC drive and motor is larger than the recommended max length of a given motor model. Inverter-duty rated motors support longer lead length than do non-inverter duty motors.

E. Dynamic braking

Dynamic braking allows the AC drive to produce additional braking (stopping) torque. AC drives can typically produce between 15% and 20% braking torque without the addition of any external components. The GS2, *DURAPULSE*, AC drives have built-in braking circuits on all units below 15 hp. These drives still require the addition of a braking resistor to increase their braking torque capability. Ratings larger than 15 hp require separate braking units in addition to the braking resistors to increase their braking torque capability.

Dynamic braking may be required for applications requiring rapid deceleration or high inertia loads.

GS1 Series Introduction



GS1 Series Drives					
Motor Rating	Hp	.25	.5	1	2
	kW	0.2	0.4	0.75	1.5
115 Volt Single-Phase Input/230 Volt Three-Phase Output		✓	✓		
230 Volt Single-Phase Input/230 Volt Three-Phase Output		✓	✓	✓	
230 Volt Three-Phase Input/Output					✓

Overview

The GS1 series of AC drives is our most affordable and compact inverter, offering V/Hz control with general purpose application features. These drives can be configured using the built-in digital keypad (which also allows you to set the drive speed, start and stop, and monitor specific parameters) or with the standard RS-485 serial communications port. Standard GS1 features include one analog input, four programmable digital inputs and one programmable normally open relay output.

Features

- Simple Volts/Hertz control
- Pulse Width Modulation (PWM)
- 3 – 10 kHz carrier frequency
- IGBT technology
- 130% starting torque at 5Hz
- 150% rated current for one minute
- Electronic overload protection
- Stall prevention
- Adjustable accel and decel ramps
- S-curve settings for acceleration and deceleration
- Manual torque boost
- Automatic slip compensation
- DC braking
- Built-in EMI filter
- Three skip frequencies
- Trip history
- Integral keypad and speed potentiometer
- Programmable jog speed
- Three programmable preset speeds
- Four programmable digital inputs
- One programmable analog input
- One programmable relay output
- RS-485 Modbus communications up to 19.2K
- Optional Ethernet communications
- UL/cUL/CE listed

Accessories

- AC line reactors
- RF filter
- Ethernet interface
- Four and eight port RS-485 multi-drop termination board
- KE**P***Direct* I/O Server
- GSoft drive configuration software
- GS-485HD15-CBL - **ZI**PLink RS485 Communication cable for connection to the DL06 and D2-260 15-pin ports.

*Detailed descriptions and specifications for the accessories are available in the "GS/DURA**PULSE** Accessories" section.*

Typical Applications

- Conveyors
- Fans
- Pumps
- Shop tools

GS1 series part numbering system

GS1 - 2 0P5

Applicable Motor Capacity

0P2: 1/4hp 0P5: 1/2hp
1P0: 1hp 2P0: 2hp

Input Voltage

1: 100-120VAC
2: 200-240VAC

Series Name

GS1 Series Specifications

115V/230V CLASS GS1 Series							
Model		GS1-10P2	GS1-10P5	GS1-20P2	GS1-20P5	GS1-21P0	GS1-22P0
Price		<--->	<--->	<--->	<--->	<--->	<--->
Motor Rating	HP	1/4 hp	1/2 hp	1/4 hp	1/2 hp	1hp	2hp
	kW	0.2 kW	0.4 kW	0.2 kW	0.4 kW	0.7 kW	1.5 kW
Rated Output Capacity (200V) kVA		0.6	1.0	0.6	1.0	1.6	2.7
Rated Input Voltage		Single-phase 100-120 VAC ±10%, 50/60 Hz ±5%		Single/three-phase: 200-240 VAC±10%, 50/60 Hz ±5%			Three-phase: 200- 240 VAC±10%, 50/60 Hz ±5%
Rated Output Voltage		Three-phase corresponds to double the input voltage		Three-phase corresponds to the input voltage			
Rated Input Current (A)		6	9	4.9/1.9	6.5/2.7	9.7/5.1	9
Rated Output Current (A)		1.6	2.5	1.6	2.5	4.2	7.0
Watt Loss @ 100% I (W)		19.2	19.2	18.4	26.8	44.6	73
Weight: kg (lb)		2.10	2.20	2.20	2.20	2.20	2.20
Dimensions (HxWxD) (mm [in])		132.0 x 68.0 x128.1 [5.20 x 2.68 x 5.04]					
Accessories							
Ethernet Communications module for GS Series Drives (DIN rail mounted)		GS-EDRV					
Four port RS-485 multi-drop termination board		GS-RS485-4					
Eight port RS-485 multi-drop termination board		GS-RS485-8					
Software		GSoft / KEP <i>Direct</i>					
OPC Server		KEP <i>Direct</i>					

GS1 General Specifications

General Specifications			
Control Characteristics			
Control System		Sinusoidal Pulse Width Modulation, carrier frequency 3kHz - 10kHz	
Rated Output Frequency		1.0 to 400.0 Hz limited to 9999 motor rpm	
Output Frequency Resolution		0.1 Hz	
Overload Capacity		150% of rated current for 1 minute	
Torque Characteristics		Includes manual torque boost, auto-slip compensation, starting torque 130% @ 5.0Hz	
DC Braking		Operation frequency 60-0Hz, 0-30% rated voltage. Start time 0.0-5.0 seconds. Stop time 0.0-25.0 seconds	
Acceleration/Deceleration Time		0.1 to 600 seconds (can be set individually)	
Voltage/Frequency Pattern		V/F pattern adjustable. Settings available for Constant Torque - low and high starting torque, Variable Torque - low and high starting torque, and user configured	
Stall Prevention Level		20 to 200% or rated current	
Operation Specification			
Inputs	Frequency Setting	Keypad	Setting by <UP> or <DOWN> buttons or potentiometer
		External Signal	Potentiometer - 5kΩ 0.5W, 0 to 10 VDC (input impedance 47kΩ), 0 to 20 mA / 4 to 20 mA (input impedance 250Ω), Multi-function inputs 1 to 3 (3 steps, JOG, UP/DOWN command), RS485 communication setting
	Operation Setting	Keypad	Setting by <RUN>, <STOP> buttons
		External Signal	DI1, DI2, DI3, DI4 can be combined to offer various modes of operation, RS485 communication port
Outputs	Multi-Function Input Signal		Multi-step selection 0 to 3, Jog, Accel/decel inhibit, First/second accel/decel switch, Counter, PLC operation, External base block (N.C., N.O.) selection
	Multi-Function Output Signal		AC drive operating, Frequency attained, Non zero speed, Base Block, Fault indication, Local/remote indication, PLC operation indication
	Operating Functions		Automatic voltage regulation, S-curve, Over-voltage stall prevention, DC braking, Fault records, Adjustable carried frequency, Starting frequency setting of DC braking, Over-current stall prevention, Momentary power loss restart, Reverse inhibition, Frequency limits, Parameter lock/reset
Protective Functions		Overcurrent, overvoltage, undervoltage, electronic thermal motor overload, Overheating, Overload, Self testing	
Operator Interface	Operator Devices		5-key, 4-digit, 7-segment LED, 3 status LEDs, potentiometer
	Programming		Parameter values for setup and review, fault codes
	Parameter Monitor		Master Frequency, Output Frequency, Scaled Output Frequency, Output Voltage, DC Bus Voltage, Output Direction, Trip Event Monitor, Trip History Monitor
	Key Functions		RUN/STOP, DISPLAY/RESET, PROGRAM/ENTER, <UP>, <DOWN>
Environment	Enclosure Rating		Protected chassis, IP20
	Ambient Operating Temperature		-10° to 40°C (14°F to 104°F) w/o derating
	Storage Temperature		-20° to 60 °C (-4°F to 140°F) during short-term transportation period)
	Ambient Humidity		0 to 90% RH (non-condensing)
	Vibration		9.8 m/s²(1G), less than 10Hz. 5.88 m/s² (0.6G) 20 to 50 Hz
	Installation Location		Altitude 1000m or lower above sea level, keep from corrosive gas, liquid and dust
Options		Programming Software (GSOFT)	

GS1 Specifications - Installation

Understanding the installation requirements for your GS1 drive will help to ensure that it will operate within its environmental and electrical limits.

NOTE:

Never use only this catalog for installation instructions or operation of equipment; refer to the user manual, GS1-M.

Environmental Specifications	
Protective Structure	IP20
Ambient Operating Temperature²	-10 to 40°C
Storage Temperature³	-20 to 60°C
Humidity	to 90% (no condensation)
Vibration⁴	5.9 m/s ² (0.6g), 10 to 55 Hz
Location	Altitude 1,000 m or less, indoors (no corrosive gases or dust)

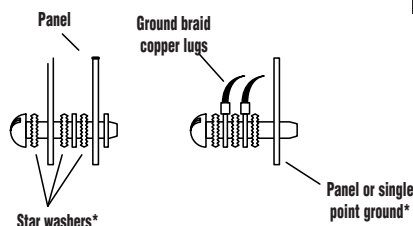
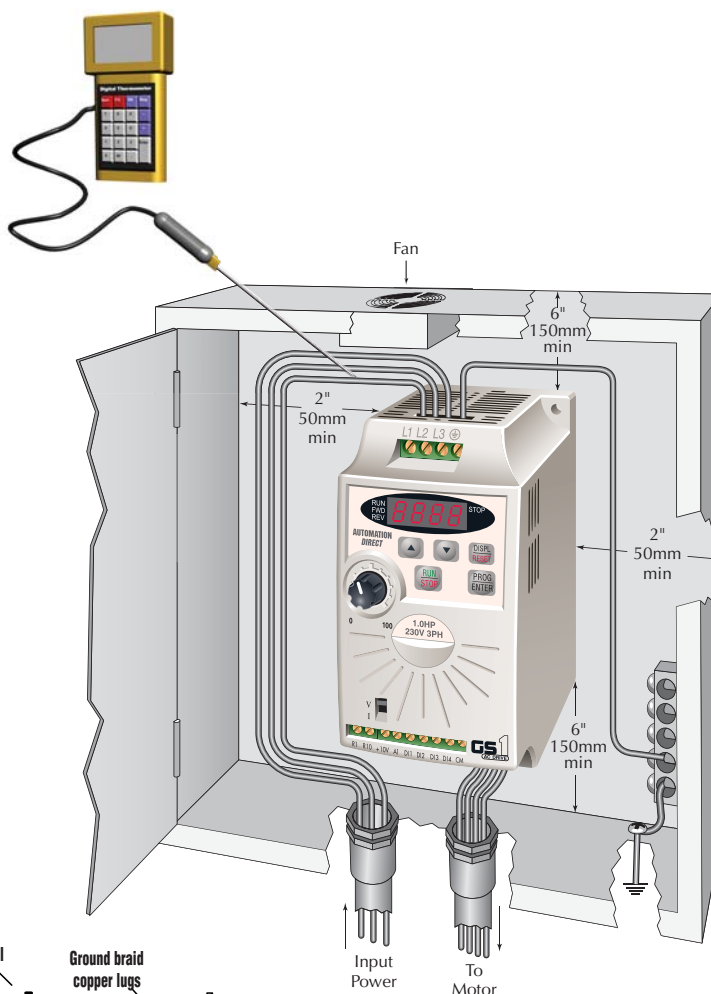
1: Protective structure is based upon EN60529

2: The ambient temperature must be in the range of -10° to 40° C. If the range will be up to 50° C, you will need to set the carrier frequency to 2.1 kHz or less and derate the output current to 80% or less. See our Web site for derating curves.

3: The storage temperature refers to the short-term temperature during transport.

4: Conforms to the test method specified in JIS C0911 (1984)

Watt-loss Chart	
GS1 Drive Model	At full load
GS1-10P2	19.2
GS1-10P5	19.2
GS1-20P2	18.4
GS1-20P5	26.8
GS1-21P0	44.6
GS1-22P0	73



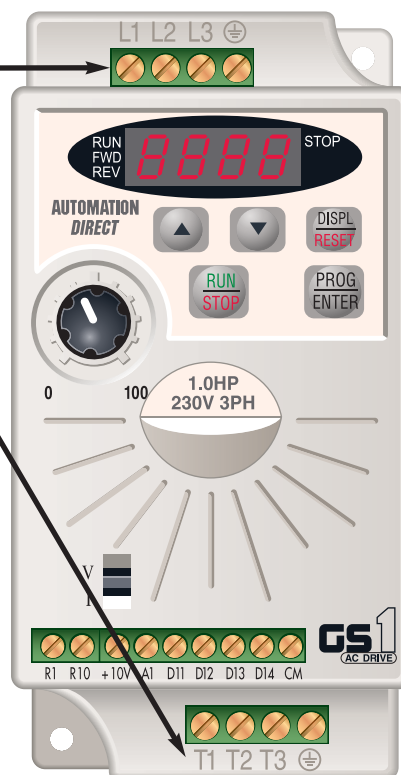
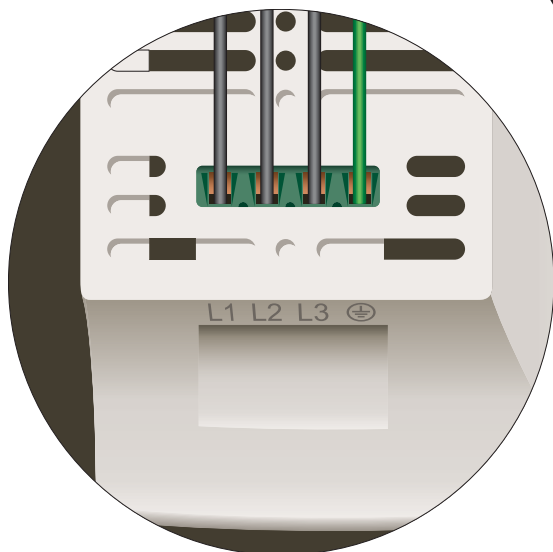
*** FOR PAINTED SUB-PANELS,
SCRAPE THE PAINT FROM UNDER-
NEATH THE STAR WASHERS
BEFORE TIGHTENING THEM.**



Warning: AC drives generate a large amount of heat, which may damage the AC drive. Auxiliary cooling methods are typically required in order to not exceed maximum ambient temperatures.

GS1 Specifications - Terminals

Main Circuit Wiring	
Terminal	Description
L1, L2, L3	Input power
T1, T2, T3	AC drive output
⊕	Ground



Control Circuit Terminals	
Terminal Symbol	Description
R10	Relay output 1 normally open
R1	Relay output 1 common
DI1	Digital input 1
DI2	Digital input 2
DI3	Digital input 3
DI4	Digital input 4
AI ¹	Analog input
+10V	Internal power supply (10 mA @ 10 VDC)
CM	Common

¹ 0 to +10 VDC, 0 to 20 mA, or 4 to 20 mA input represents zero to maximum output frequency.

Note: Use twisted-shielded, twisted-pair or shielded-lead wires for the control signal wiring. It is recommended all signal wiring be run in a separate steel conduit. The shield wire should only be connected at the drive. Do not connect shield wire on both ends.

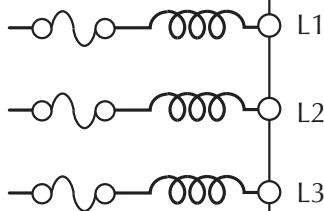
GS1 Specifications - Basic Wiring Diagram

Note: Users **MUST** connect wiring according to the circuit diagram shown below. (Refer to user manual GS1-M for additional specific wiring information.)

Note: Refer to the following pages for explanations and information regarding line reactors and RF filters: 13-50, 13-67.

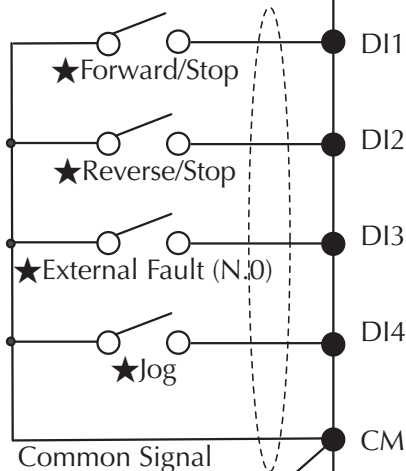
Power Source 3-phase*

100-120V \pm 10%
(50/60Hz \pm 5%)
200-240V \pm 10%
(50/60Hz \pm 5%)

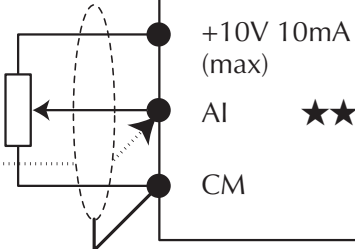


* Use terminals L1 and L2 for 120V, or select any two of the power terminals for 240V single-phase models

Grounding resistance
less than 0.1 Ω



Analog voltage
0-10VDC
Potentiometer
3~5k Ω
Analog current
0-20mA; 4-20mA



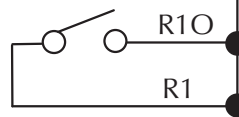
GS1-xxxx

T1
T2
T3

AC Motor

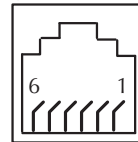


Multi-function output contacts
120VAC/24VDC @5A
230VAC @2.5A



★Fault Indication

RJ-12 (6P4C)



RJ-12 Serial Comm Port*
Interface (See Warning)

RS-485

2: GND
3: SG-
4: SG+
5: +5V

*Optional ZIPLink RS485
Communication cable GS-485HD15-
CBL available for connection to the
DL06 and D2-260 15-pin
ports. See page 12-75.



★ Factory default setting

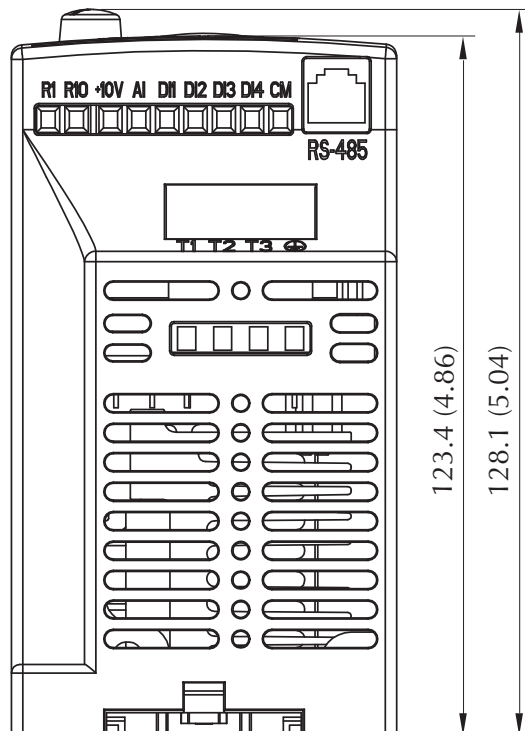
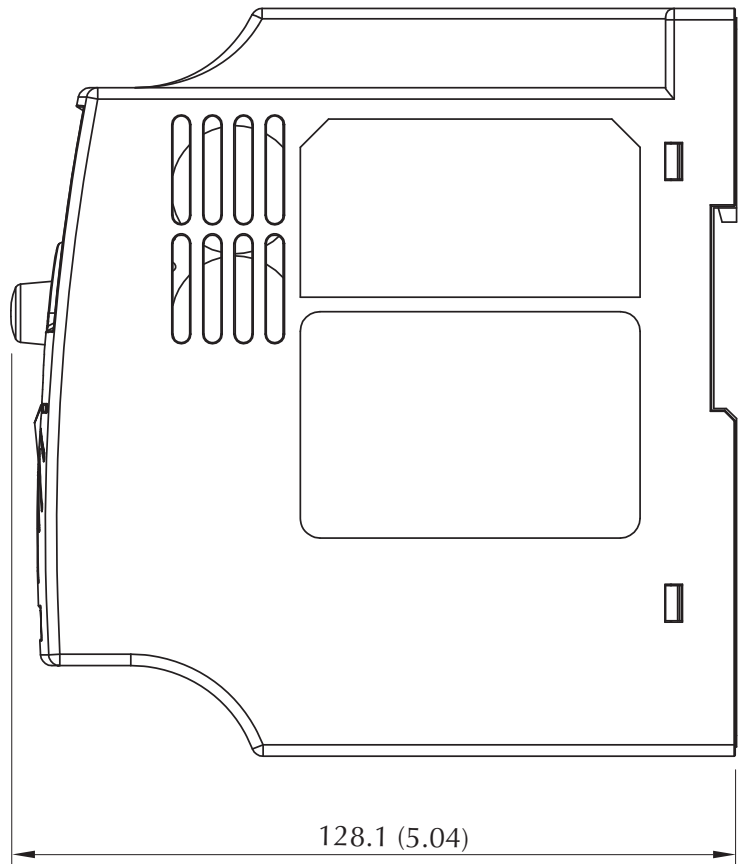
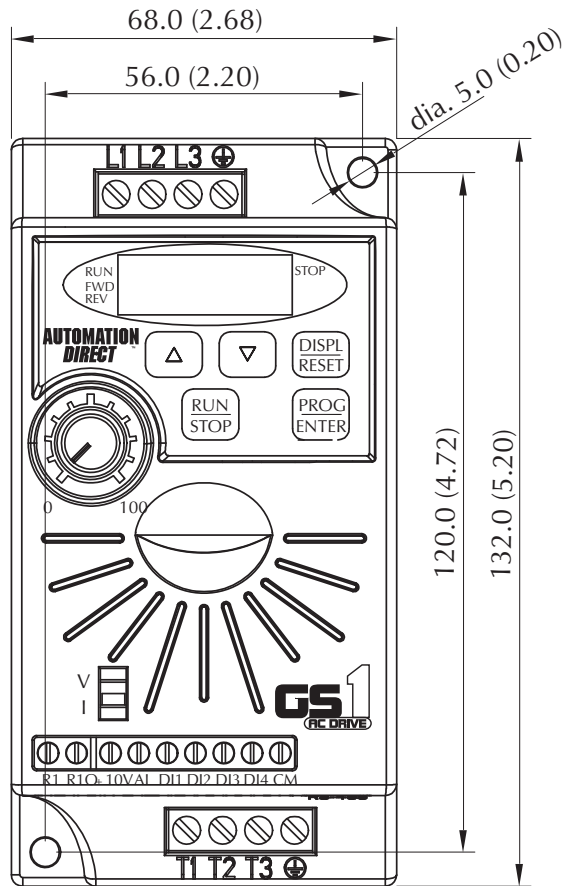
★★ Factory default source of frequency command is via the keypad potentiometer

○ Main circuit (power) terminals ● Control circuit terminal ⊕ Shielded leads



WARNING: Do not plug a modem or telephone into the GS1 RJ-12 Serial Comm Port, or permanent damage may result.
Terminals 2 and 5 should not be used as a power source for your communication connection.

GS1 Specifications - Dimensions



Unit: mm (in)



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GS2 Series - Introduction



Overview

The GS2 series of AC drives offers all of the features of our GS1 drive plus dynamic braking, PID and a removable keypad. The drive can be configured using the built-in digital keypad or with the standard RS-232/RS-485 serial communications port. The standard keypad allows you to configure the drive, set the speed, start and stop the drive, command forward and reverse direction of motor shaft, and monitor specific parameters during operation. Each GS2 features one analog and six programmable digital inputs, and one analog and two programmable relay outputs.

GS2 Series Drives									
Motor Rating	Hp	.25	.5	1	2	3	5	7.5	10
	kW	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5
Single-Phase 115 Volt Class		✓	✓	✓					
Single/Three-Phase 230 Volt Class			✓	✓	✓	✓			
Three-Phase 230 Volt Class							✓	✓	
Three-Phase 460 Volt Class				✓	✓	✓	✓	✓	✓
Three-Phase 575 Volt Class				✓	✓	✓	✓	✓	✓

Features

- Simple Volts/Hertz control
- Sinusoidal Pulse Width Modulation (PWM)
- 1-12 kHz carrier frequency
- IGBT technology
- Starting torque: 125% at 0.5 Hz/150% at 5 Hz
- 150% rated current for one minute
- Electronic overload protection
- Stall prevention
- Adjustable accel and decel ramps
- S-curve settings for acceleration and deceleration
- Automatic torque compensation
- Automatic slip compensation
- Dynamic braking circuit
- DC braking
- Three skip frequencies
- Trip history
- Programmable jog speed
- Integral PID control
- Removable keypad with speed potentiometer
- Programmable analog input
- Programmable analog output
- Six programmable digital inputs
- Two programmable relay outputs
- RS-232/485 Modbus communications up to 38.4 Kbps.
- Optional Ethernet communications
- UL/cUL/CE* listed
- * GS2-5xxx 575V drives NOT CE compliant

Accessories

- AC line reactors
- EMI filters
- RF filters
- Braking resistors
- Fuse kits and replacement fuses
- Ethernet interface
- Replacement keypads
- Keypad cables in 1, 3, and 5 meter lengths
- Four and eight-port serial communication breakout boards
- KEPServer I/O Server
- GSoft drive configuration software
- GS-485HD15-CBL /GS-RJ12-CBL-2 ZIPLink RS232 and RS485 Communication cables for connection to the DL05, DL06, D2-250-1 and D2-260 ports.

Detailed descriptions and specifications for the accessories are available in the "GS/DURAPULSE Accessories" section.

Typical Applications

- Conveyors
- Fans
- Pumps
- Compressors
- HVAC
- Material handling
- Mixing
- Shop tools

GS2 series part numbering system

GS2- 4 7P5

Applicable Motor Capacity

0P2: 0.25HP 0P5: 0.5HP
 1P0: 1.0HP 2P0: 2.0HP
 3P0: 3.0HP 5P0: 5.0HP
 7P5: 7.5HP 010: 10HP

Input Voltage

1: 100-120VAC
 2: 200-240VAC
 4: 380-480VAC
 5: 500-600VAC

Series Name

GS2 Series Specifications

115V CLASS GS2 SERIES				
Model		GS2-10P2	GS2-10P5	GS2-11P0
Price		<--->	<--->	<--->
Motor Rating	HP	1/4hp	1/2hp	1hp
	kW	0.2kW	0.4kW	0.75kW
Rated Output Capacity (kVA)		0.6	1.0	1.6
Rated Input Voltage		Single-phase : 100 to 120 VAC ±10% 50/60 Hz ±5%		
Rated Output Voltage		Three-phase, two times proportion to input voltage		
Rated Input Current (A)		6	9	16
Rated Output Current (A)		1.6	2.5	4.2
DC Braking		Frequency 60-0 Hz, 0-100% rated current, start time 0.0-5.0 seconds, Stop Time 0.0-25.0 seconds		
Protective Structure		Protected chassis IP20		
Ambient Operating Temperature		-10°C to 50°C (14°F to 122°F) without derating		
Storage Temperature		-20° to 60°C (-4° to 140°F) during short term transportation period		
Humidity		20 to 90% Humidity (no condensation)		
Vibration		9.8 m/s² (1G) at less than 10 Hz; 5.9 m/s² (0.6G) 10 to 60 Hz		
Location		Altitude 1,000m or less, Keep from corrosive gases liquids or dust		
Watt Loss @ 100% I (W)		24	34	46
Weight (lb)		3.5	3.6	3.7
Dimensions*** (HxWxD) (mm [in])		151.0 x 100.0 x 140.5 [5.94 x 3.94 x 5.53]		
Accessories				
Line Reactor	Input side of drive (1 Phase)*	GS-10P2-LR	GS-10P5-LR	GS-11P0-LR
	Output side of drive (3 Phase)*	GS-20P5-LR-3PH	GS-20P5-LR-3PH	GS-21P0-LR-3PH
Braking Resistor		GS-20P5-BR	GS-20P5-BR	GS-21P0-BR
EMI Filter		20DRT1W3S		
Fuse Kit	Single Phase**	GS-10P2-FKIT-1P	GS-10P5-FKIT-1P	GS-11P0-FKIT-1P
Replacement Fuses	Single Phase**	GS-10P2-FUSE-1P	GS-10P5-FUSE-1P	GS-11P0-FUSE-1P
Spare Keypad, GS2 Series Drive		GS2-KPD		
Keypad Cable, GS2 Series, 1 meter		GS-CBL2-1L		
Keypad Cable, GS2 Series, 3 meter		GS-CBL2-3L		
Keypad Cable, GS2 Series, 5 meter		GS-CBL2-5L		
Ethernet Communications module for GS2 Series Drives (DIN rail mounted)		GS-EDRV		
Four port RS-485 multi-drop termination board		GS-RS485-4		
Eight port RS-485 multi-drop termination board		GS-RS485-8		
Software		GSoft / KEP <i>Direct</i>		
OPC Server		KEP <i>Direct</i>		
*Note: GS2-1xxx drives require 115V class input line reactors and 230V class output line reactors.				
**Note: Single phase fuse kits and fuses are used only with GS2-1xxx drives.				
***Note: Height dimension does not include external ground terminal, which adds 10 to 15 mm. Refer to dimensional drawings for details.				

GS2 Series Specifications

230V CLASS GS2 SERIES							
Model		GS2-20P5	GS2-21P0	GS2-22P0	GS2-23P0	GS2-25P0	GS2-27P5
Price		<--->	<--->	<--->	<--->	<--->	<--->
Motor Rating	HP	1/2hp	1hp	2hp	3hp	5hp	7.5hp
	kW	0.4kW	0.75kW	1.5kW	2.2kW	3.7kW	5.5kW
Rated Output Capacity (kVA)		1.0	1.9	2.7	3.8	6.5	9.5
Rated Input Voltage		Single/Three-phase : 200/208/220/230/240 VAC ±10%, 50/6 0Hz ±5%				Three-phase : 200/208/220/230/240 VAC ±10%, 50/60 Hz ±5%	
Rated Output Voltage		Three-phase : Corresponds to input voltage					
Rated Input Current (A)		6.3/2.9	11.5/6.3	15.7/8.8	27.0/12.5	19.6	28
Rated Output Current (A)		2.5	5.0	7.0	10	17	25
DC Braking		Frequency 60-0 Hz, 0-100% rated current, start time 0.0-5.0 seconds, Stop Time 0.0-25.0 seconds					
Protective Structure		Protected chassis IP20					
Ambient Operating Temperature		-10°C to 50°C (14°F to 122°F) without derating					-10°C to 40°C (14°F to 104°F) without derating
Storage Temperature		-20° to 60°C (-4° to 140°F) during short term transportation period					
Humidity		20 to 90% Humidity (no condensation)					
Vibration		9.8 m/s² (1G) at less than 10 Hz; 5.9 m/s² (0.6G) 10 to 60 Hz					
Location		Altitude 1,000m or less, Keep from corrosive gases liquids or dust					
Watt Loss @ 100% I (W)		34	57	77	111	185	255
Weight (lb)		3.5	3.6	3.7	8.5	8.5	8.5
Dimensions* (HxWxD) (mm [in])		151.0 x 100.0 x 140.5 [5.94 x 3.94 x 5.53]			220.0 x 125.0 x 189.5 [8.66 x 4.92 x 7.46]		
Accessories							
Line Reactor	Single-Phase	GS-20P5-LR-1PH	GS-21P0-LR-1PH	GS-22P0-LR-1PH	GS-23P0-LR-1PH	N/A	N/A
	Three-Phase	GS-20P5-LR-3PH	GS-21P0-LR-3PH	GS-22P0-LR-3PH	GS-23P0-LR-3PH	GS-25P0-LR	GS-27P5-LR
Braking Resistor		GS-20P5-BR	GS-21P0-BR	GS-22P0-BR	GS-23P0-BR	GS-25P0-BR	GS-27P5-BR
EMI Filter (single phase input)		20DRT1W3S			32DRT1W3C	40TDS4W4B	
Fuse Kit	Single-Phase	GS-20P5-FKIT-1P	GS-21P0-FKIT-1P	GS-22P0-FKIT-1P	GS-23P0-FKIT-1P	N/A	N/A
	Three-Phase	GS-20P5-FKIT-3P	GS-21P0-FKIT-3P	GS-22P0-FKIT-3P	GS-23P0-FKIT-3P	GS-25P0-FKIT-3P	GS-27P5-FKIT
Replacement Fuses	Single-Phase	GS-20P5-FUSE-1P	GS-21P0-FUSE-1P	GS-22P0-FUSE-1P	GS-23P0-FUSE-1P	N/A	N/A
	Three-Phase	GS-20P5-FUSE-3P	GS-21P0-FUSE-3P	GS-22P0-FUSE-3P	GS-23P0-FUSE-3P	GS-25P0-FUSE	GS-27P5-FUSE
Spare Keypad, GS2 Series Drive		GS2-KPD					
Keypad Cable, GS2 Series, 1 meter		GS-CBL2-1L					
Keypad Cable, GS2 Series, 3 meter		GS-CBL2-3L					
Keypad Cable, GS2 Series, 5 meter		GS-CBL2-5L					
Ethernet Communications module for GS2 Series Drives (DIN rail mounted)		GS-EDRV					
Four port RS-485 multi-drop terminaton board		GS-RS485-4					
Eight port RS-485 multi-drop terminaton board		GS-RS485-8					
Software		GSoft / KEP <i>Direct</i>					
OPC Server		KEP <i>Direct</i>					
*Note: Height dimension does not include external ground terminal, which adds 10 to 15 mm. Refer to dimensional drawings for details.							

GS2 Series Specifications

Company Information

Systems Overview

Programmable Controllers

Field I/O

Software

C-more & other HMI

Drives

Soft Starters

Motors & Gearbox

Steppers/ Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temperature Sensors

Pushbuttons/ Lights

Process

Relays/ Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

Enclosures

Tools

Pneumatics

Appendix

Product Index

Part # Index

460V CLASS GS2 SERIES							
Model		GS2-41P0	GS2-42P0	GS2-43P0	GS2-45P0	GS2-47P5	GS2-4010
Price		<--->	<--->	<--->	<--->	<--->	<--->
Motor Rating	HP	1hp	2hp	3hp	5hp	7.5hp	10hp
	kW	0.8kW	1.5kW	2.2kW	4kW	5.5kW	7.5kW
Rated Output Capacity (kVA)		2.3	3.1	3.8	6.2	9.9	13.7
Rated Input Voltage		Three-phase: 380/400/415/440/460/480 VAC ±10%, 50/60 Hz ±5%					
Rated Output Voltage		Corresponds to input voltage					
Rated Input Current (A)		4.2	5.7	6.0	8.5	14	23
Rated Output Current (A)		3.0	4.0	5.0	8.2	13	18
DC Braking		Frequency 60-0 Hz, 0-100% rated current, Start Time 0.0-5.0 seconds, Stop Time 0.0-25.0 seconds					
Protective Structure		Protected chassis IP20					
Ambient Operating Temperature		-10°C to 50°C (14°F to 122°F)				-10°C to 40°C(14°F to 104°F)	
Storage Temperature		-20°C to 60°C (-4°F to 140°F) during short term transportation period					
Humidity		20 to 90% Humidity (no condensation)					
Vibration		9.8 m/s² (1G) at less than 10Hz, 5.9 m/s² (0.6G)10 to 60 Hz					
Location		Altitude 1,000m or less, Keep from corrosive gases liquids or dust					
Watt Loss @ 100% I (W)		73	86	102	170	240	255
Weight (lb)		3.5	3.6	3.7	8.5	8.5	8.5
Dimensions* (HxWxD) (mm [in])		151.0 x 100.0 x 140.5 [5.94 x 3.94 x 5.53]			220.0 x 125.0 x 189.5 [8.66 x 4.92 x 7.46]		
Accessories							
Line Reactor		GS-41P0-LR	GS-42P0-LR	GS-43P0-LR	GS-45P0-LR	GS-47P5-LR	GS-4010-LR
Braking Resistor		GS-41P0-BR	GS-42P0-BR	GS-43P0-BR	GS-45P0-BR	GS-47P5-BR	GS-4010-BR
EMI Filter		11TDT1W4S			17TDT1W44		26TDT1W4B4
Fuse Kit		GS-41P0-FKIT	GS-42P0-FKIT	GS-43P0-FKIT	GS-45P0-FKIT	GS-47P5-FKIT	GS-4010-FKIT
Replacement Fuses		GS-41P0-FUSE	GS-42P0-FUSE	GS-43P0-FUSE	GS-45P0-FUSE	GS-47P5-FUSE	GS-4010-FUSE
Spare Keypad, GS2 Series Microdrive		GS2-KPD					
Keypad Cable, GS2 Series, 1 meter		GS-CBL2-1L					
Keypad Cable, GS2 Series, 3 meter		GS-CBL2-3L					
Keypad Cable, GS2 Series, 5 meter		GS-CBL2-5L					
Ethernet Communications Module for GS Series Drives (DIN rail mounted)		GS-EDRV					
Four port RS-485 multi-drop terminaton board		GS-RS485-4					
Eight port RS-485 multi-drop terminaton board		GS-RS485-8					
Software		GSoft / KEP <i>Direct</i>					
OPC Server		KEP <i>Direct</i>					
*Note: Height dimension does not include external ground terminal, which adds 10 to 15 mm. Refer to dimensional drawings for details.							

GS2 Series Specifications

575V CLASS GS2 SERIES							
Model		GS2-51P0	GS2-52P0	GS2-53P0	GS2-55P0	GS2-57P5	GS2-5010
Price		<--->	<--->	<--->	<--->	<--->	<--->
Motor Rating	HP	1hp	2hp	3hp	5hp	7.5hp	10hp
	kW	0.75kW	1.5kW	2.2kW	3.7kW	5.5kW	7.5kW
Rated Output Capacity (kVA)		1.7	3.0	4.2	6.6	9.9	12.2
Rated Input Voltage		Three-phase: 500 to 600 VAC -15/+10%, 50/60 Hz ±5%					
Rated Output Voltage		Corresponds to input voltage					
Rated Input Current (A)		2.4	4.2	5.9	7.0	10.5	12.9
Rated Output Current (A)		1.7	3.0	4.2	6.6	9.9	12.2
DC Braking		Frequency 60-0 Hz, 0-100% rated current, Start Time 0.0-5.0 seconds, Stop Time 0.0-25.0 seconds					
Protective Structure		Protected chassis IP20					
Ambient Operating Temperature		-10°C to 50°C (14°F to 122°F)				-10°C to 40°C(14°F to 104°F)	
Storage Temperature		-20°C to 60°C (-4°F to 140°F) during short term transportation period					
Humidity		20 to 90% Humidity (no condensation)					
Vibration		9.8 m/s² (1G) at less than 10Hz, 5.9 m/s² (0.6G)10 to 60 Hz					
Location		Altitude 1,000m or less, Keep from corrosive gases liquids or dust					
Watt Loss @ 100% I (W)		30	58	83	132	191	211
Weight (lb)		3.3	3.3	4.4	7.0	7.0	7.3
Dimensions* (HxWxD) (mm [in])		151.0 x 100.0 x 140.5 [5.94 x 3.94 x 5.53]			220.0 x 125.0 x 189.5 [8.66 x 4.92 x 7.46]		
Accessories							
Line Reactor		GS-51P0-LR	GS-52P0-LR	GS-42P0-LR	GS-43P0-LR	GS-47P5-LR	
Braking Resistor		GS-42P0-BR		GS-42P0-BR x (2) in parallel			GS-4010-BR x (2) in series
EMI Filter		not available					
Fuse Block (Edison 3-pole part #)		BC6033PQ or CHCC3D or CHCC3DI					
Replacement Fuses (Edison Fuse part #)		HCLR6 (10 fuses per pack)	HCLR10 (10 fuses per pack)	HCLR15 (10 fuses per pack)		HCLR20 (10 fuses per pack)	HCLR30 (10 fuses per pack)
Spare Keypad, GS2 Series Microdrive		GS2-KPD					
Keypad Cable, GS2 Series, 1 meter		GS-CBL2-1L					
Keypad Cable, GS2 Series, 3 meter		GS-CBL2-3L					
Keypad Cable, GS2 Series, 5 meter		GS-CBL2-5L					
Ethernet Communications Module for GS Series Drives (DIN rail mounted)		GS-EDRV					
Four port RS-485 multi-drop terminaton board		GS-RS485-4					
Eight port RS-485 multi-drop terminaton board		GS-RS485-8					
Software		GSoft / KEP <i>Direct</i>					
OPC Server		KEP <i>Direct</i>					
*Note: Height dimension does not include external ground terminal, which adds 10 to 15 mm. Refer to dimensional drawings for details.							

GS2 Series — General Specifications

General Specifications			
Control Characteristics			
Control System		Sinusoidal Pulse Width Modulation, carrier frequency 1kHz - 12kHz	
Output Frequency Resolution		0.1 Hz	
Overload Capacity		150% of rated current for 1 minute	
Torque Characteristics		Includes auto-torque boost, auto-slip compensation, starting torque 125% @ 0.5Hz/150% @ 5.0Hz	
Braking Torque		20% without dynamic braking resistor, 125% with optional braking resistor	
DC Braking		Operation frequency 60-0Hz, 0-100% rated current. Start time 0.0-5.0 seconds. Stop time 0.0-0 25.0 seconds	
Acceleration/Deceleration Time		0.1 to 600 seconds (linear or non-linear acceleration/deceleration), second acceleration/deceleration available	
Voltage/Frequency Pattern		V/F pattern adjustable. Settings available for Constant Torque - low and high starting torque, Variable Torque - low and high starting torque, and user configured	
Stall Prevention Level		20 to 200% or rated current	
Operation Specifications			
Inputs	Frequency Setting	Keypad	Setting by <UP> or <DOWN> buttons or potentiometer
		External Signal	Potentiometer - 3k to 5k Ω /2W, 0 to 10VDC (input impedance 10k Ω), 0 to 20mA / 4 to 20 mA (input impedance 250 Ω), Multi-speed inputs 1 to 3, Serial Communication RS232 and RS485 (Modbus RTU)
	Operation Setting	Keypad	Setting by <RUN>, <STOP> buttons
		External Signal	Forward/Stop, Reverse/Stop (run/stop, fwd/rev), 3-wire control, Serial Communication RS232 and RS485 (Modbus RTU)
	Input Terminals	Digital	6 user-programmable: FWD/STOP, REV/STOP, RUN/STOP, REV/FWD, Run momentary (N.O.), STOP momentary (N.C.), External Fault (N.O./N.C.), External Reset, Multi-Speed Bit (1-3), Jog, External Base Block (N.O./N.C.), Second Accel/Decel Time, Speed Hold, Increase Speed, Decrease Speed, Reset Speed to Zero, PID Disable (N.O.), PID Disable (N.C.), Input Disable
		Analog	1 user-configurable, 0 to 10VDC (input impedance 10k Ω) or 0 to 20mA / 4 to 20mA (input impedance 250 Ω), 10 bit resolution Frequency setpoint or PID process variable PV
Outputs	Output Terminals	Digital	2 user-programmable; Inverter Running, Inverter Fault, At Speed, Zero Speed, Above Desired Frequency, Below Desired Frequency, At Maximum Speed, Over Torque Detected, Above Desired Current, Below Desired Current, PID Deviation Alarm
		Analog	1 user-programmable: 0 to 10VDC (max load 2mA), 8 bit resolution frequency, current, process variable PV
	Operating Functions		Automatic voltage regulation, voltage/frequency characteristics selection, non-linear acceleration/deceleration, upper and lower frequency limiters, 7-stage speed operation, adjustable carrier frequency (1 to 12 kHz), PID control, skip frequencies, analog gain & bias adjustment, jog, electronic thermal relay, automatic torque boost, trip history, software protection
Protective Functions		Electronic Thermal, Overload Relay, Auto Restart after Fault, Momentary Power Loss, Reverse Operation Inhibit, Auto Voltage Regulation, Over-Voltage Trip Prevention, Auto Adjustable Accel/Decel, Over-Torque Detection Mode, Over-Torque Detection Level, Over-Torque Detection Time, Over-Current Stall Prevention during Acceleration, Over-Current Stall Prevention during Operation	
Operator Interface	Operator Devices		8-key, 4-digit, 7-segment LED, 14 status LEDs, potentiometer
	Programming		Parameter values for setup and review, fault codes
	Status Display		Actual Operating Frequency, RPM, Scaled Frequency, Amps, % Load, Output Voltage, DC Bus Voltage, Process Variable, Set-point Frequency
	Key Functions		RUN, STOP/RESET, FWD/REV, PROGRAM, DISPLAY, <UP>, <DOWN>, ENTER
Environment	Enclosure Rating		Protected chassis, IP20
	Ambient Temperature		-10° to 50°C (14°F to 122°F)
			-10° to 40°C (14°F to 104°F) For models 7.5Hp (5.5kW) and higher
	Storage Temperature		-20° to 60 °C (-4°F to 140°F) - during short-term transportation period
	Ambient Humidity		20 to 90% RH (non-condensing)
	Vibration		9.8 m/s ² (1G), less than 10Hz, 5.9 m/s ² (0.6G) 10 to 60 Hz
Installation Location		Altitude 1000m or lower above sea level, keep from corrosive gas, liquid and dust	
Options		Noise filter, input AC reactor, output AC reactor, cable for remote operator, programming software (GSOFT), Dynamic braking resistor, input fuses, ethernet interface (GS-EDRV), EMI filters	

GS2 Specifications — Installation

Understanding the installation requirements for your GS2 drive will help to ensure that it operates within its environmental and electrical limits.

Note: Never use only this catalog for installation instructions or operation of equipment; refer to the user manual, GS2-M.

Environmental Specifications	
Protective Structure¹	IP20
Ambient Operating Temperature²	-10 to 50°C (14°F to 122°F) - 10 to 40°C (14°F to 104°F) for models 7.5HP and higher
Storage Temperature³	-20 to 60°C (-4°F to 140°F)
Humidity	To 90% (no condensation)
Vibration⁴	5.9 m/s ² (0.6g), 10 to 55 Hz
Location	Altitude 1,000 m or less, indoors (no corrosive gases or dust)

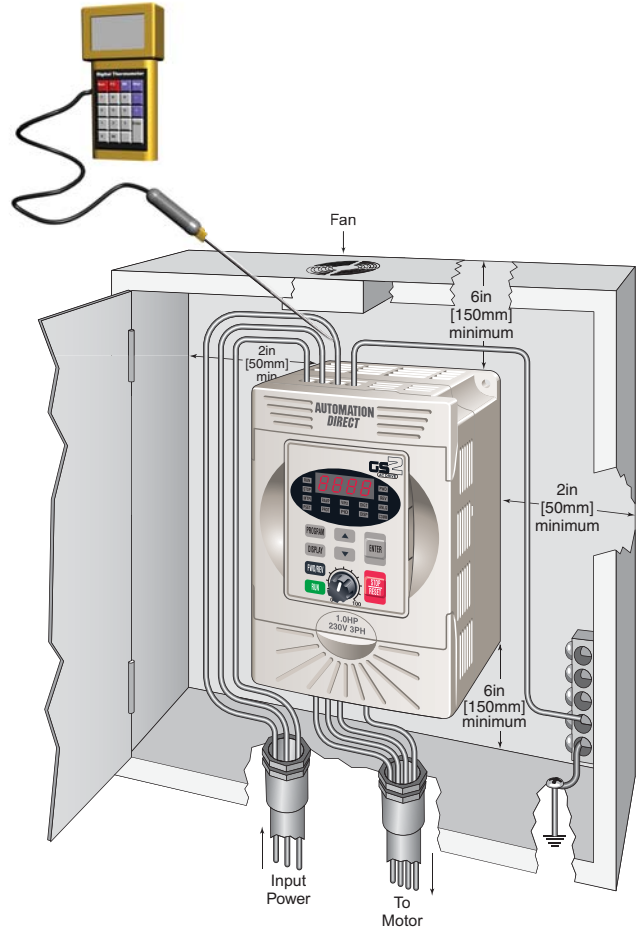
1: Protective structure is based upon EN60529

2: The ambient temperature must be in the range of -10° to 40° C. If the range will be up to 50° C, you will need to set the carrier frequency to 2.1 kHz or less and derate the output current to 80% or less. See our Web site for derating curves.

3: The storage temperature refers to the short-term temperature during transport.

4: Conforms to the test method specified in JIS C0911 (1984)

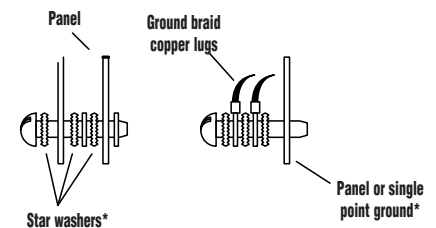
Watt-loss Chart	
GS2 Drive Model	At full load
GS2-10P2	24
GS2-10P5	34
GS2-11P0	46
GS2-20P5	34
GS2-21P0	57
GS2-22P0	77
GS2-23P0	111
GS2-25P0	185
GS2-27P5	255
GS2-41P0	73
GS2-42P0	86
GS2-43P0	102
GS2-45P0	170
GS2-47P5	240
GS2-4010	255
GS2-51P0	30
GS2-52P0	58
GS2-53P0	83
GS2-55P0	132
GS2-57P5	191
GS2-5010	211



Warning: Maximum ambient temperatures must not exceed 50°C (122°F), or 40°C (104°F) for models 7.5 hp (5.5 kW) and higher!




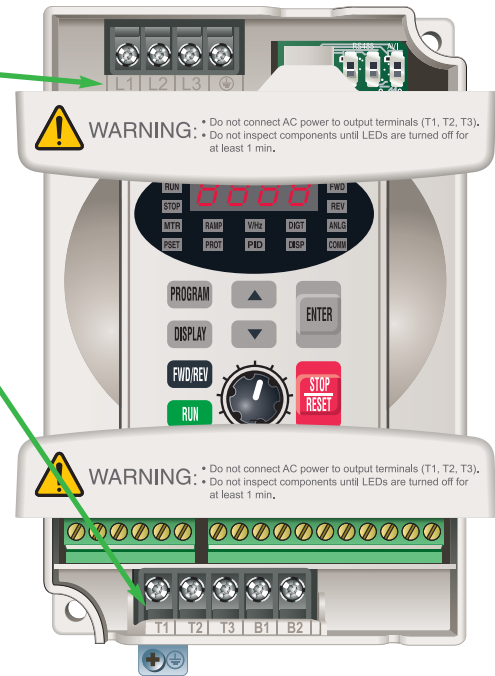
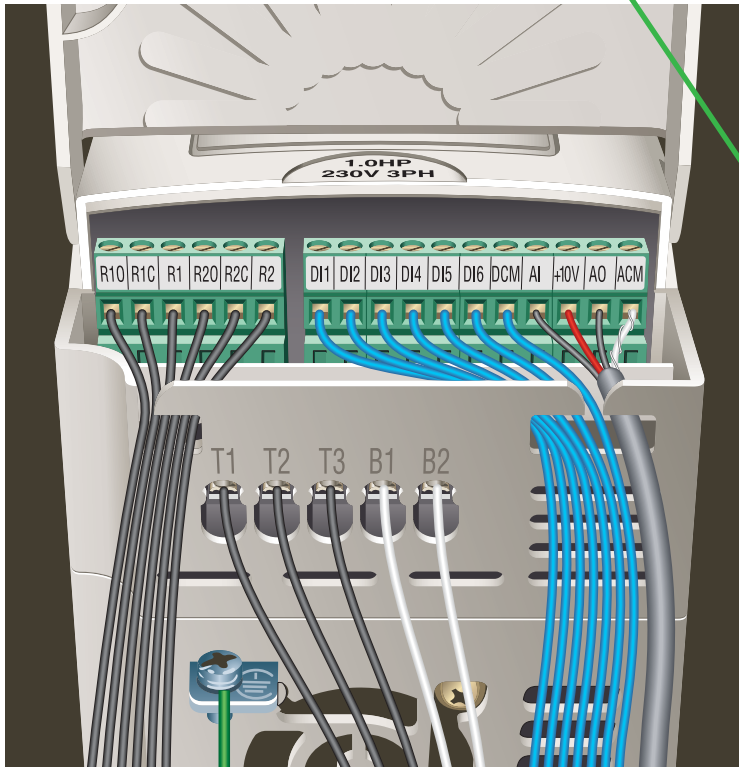
Warning: AC drives generate a large amount of heat which may damage the AC drive. Auxiliary cooling methods are typically required in order not to exceed maximum ambient temperatures.



*** FOR PAINTED SUB-PANELS, SCRAPE THE PAINT FROM UNDERNEATH THE STAR WASHERS BEFORE TIGHTENING THEM.**

GS2 Specifications — Terminals

Main Circuit Wiring	
Terminal	Description
L1, L2, L3	Input power
T1, T2, T3	AC drive output
B1, B2	DB resistor input
	Ground



Control Circuit Terminals	
Terminal Symbol	Description
R10	Relay output 1 normally open
R1C	Relay output 1 normally closed
R1	Relay output 1 common
R20	Relay output 2 normally open
R2C	Relay output 2 normally closed
R2	Relay output 2 common
DI1	Digital input 1
DI2	Digital input 2
DI3	Digital input 3
DI4	Digital input 4
DI5	Digital input 5
DI6	Digital input 6
DCM	Digital common
AI	Analog input
+10V	Internal power supply (DC 10V) @ 10 mA
AO	Analog output
ACM	Analog common

Note: Use twisted-shielded, twisted-pair or shielded-lead wires for the control signal wiring. It is recommended to run all signal wiring in a separate steel conduit. The shield wire should only be connected at the drive. Do not connect shield wire on both ends.

GS2 Specifications — Basic Wiring Diagram

Note: Users **MUST** connect wiring according to the circuit diagram shown below. (Refer to user manual GS2-M for additional specific wiring information.)

Note: Refer to the following pages for explanations and information regarding line reactors, braking resistors, EMI and RF filters, and fuses:
13-50, 13-56, 13-61, 13-67, 13-68.

Power Source*

100-120V $\pm 10\%$

200-240V $\pm 10\%$

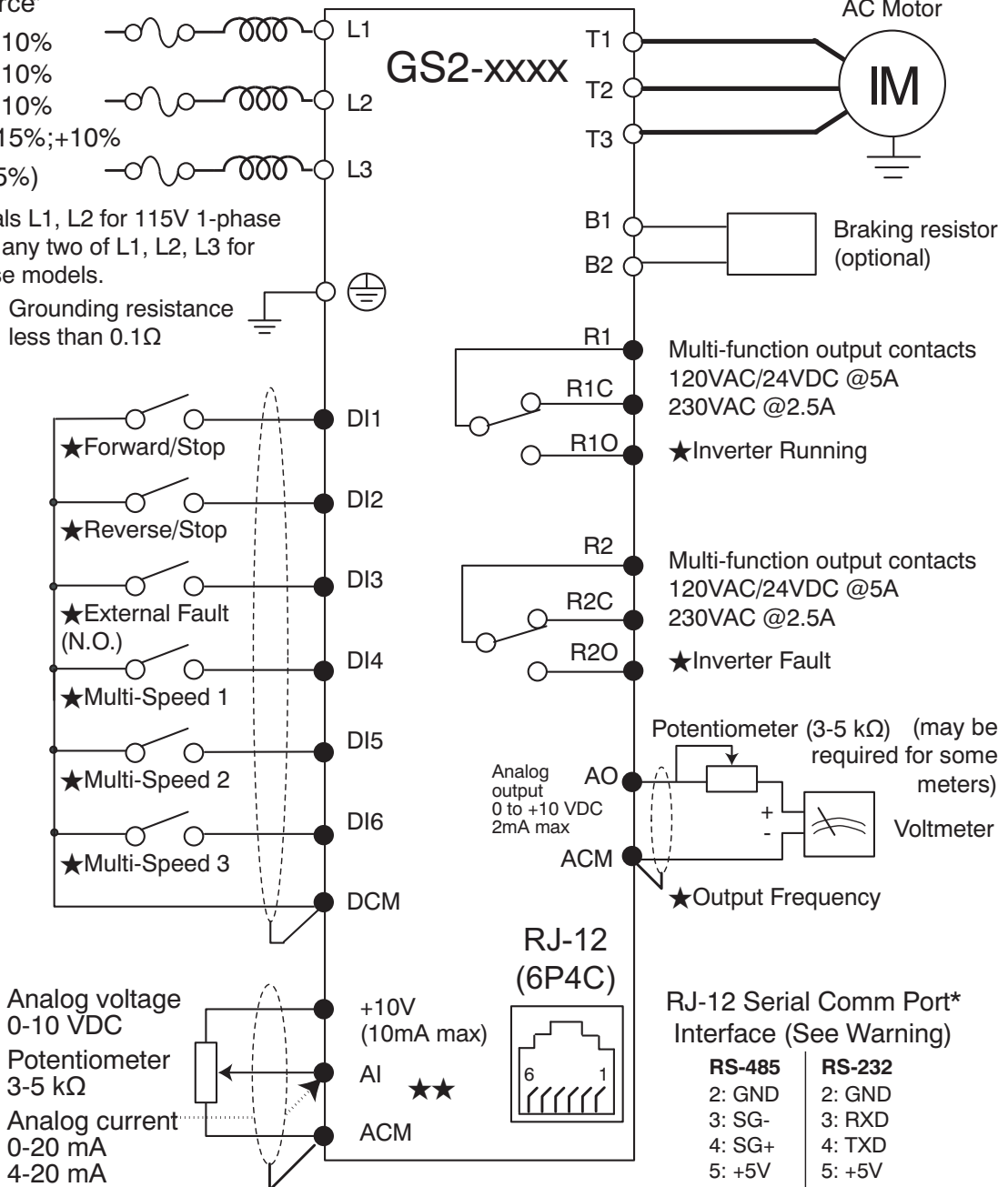
380-480V $\pm 10\%$

500-600V -15%;+10%

(50,60Hz $\pm 5\%$)

* Use terminals L1, L2 for 115V 1-phase models; use any two of L1, L2, L3 for 230V 1-phase models.

Grounding resistance
less than 0.1 Ω



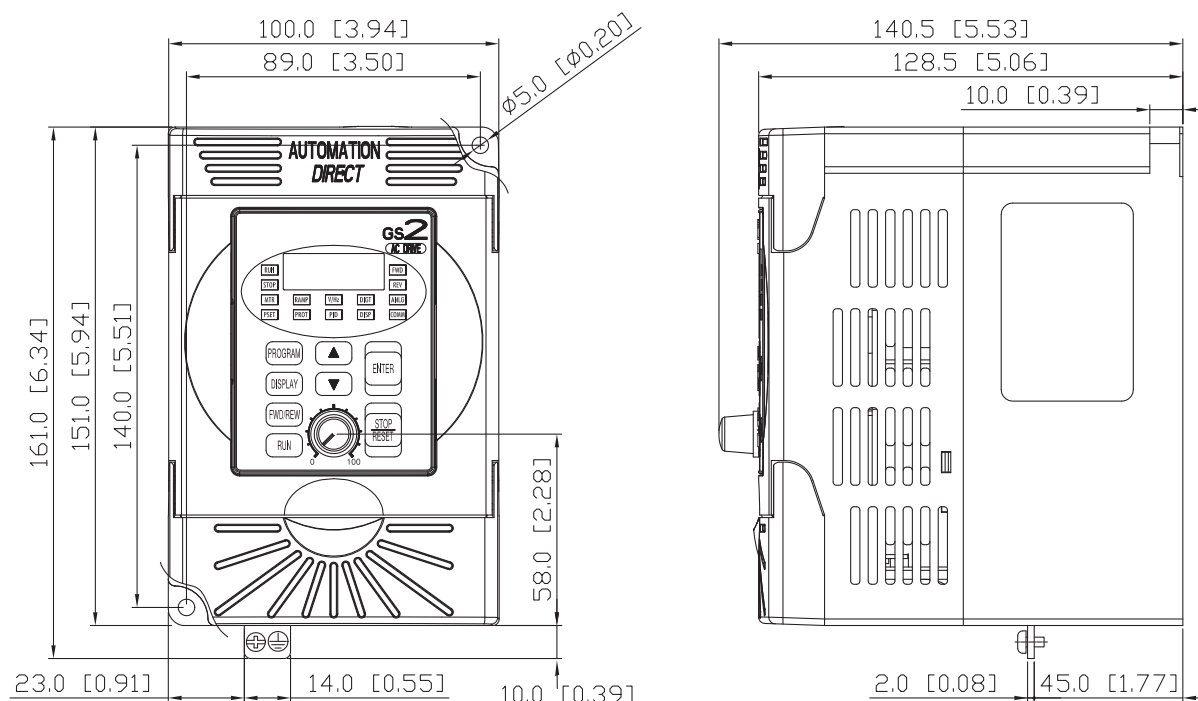
*Optional ZIPLink RS232 Communication cable GS-RJ12-CBL-2 and RS485 Communication cable GS-485HD15-CBL are available for connection to the DL05, DL06, D2-250-1 and D2-260 ports. See page 12-75.



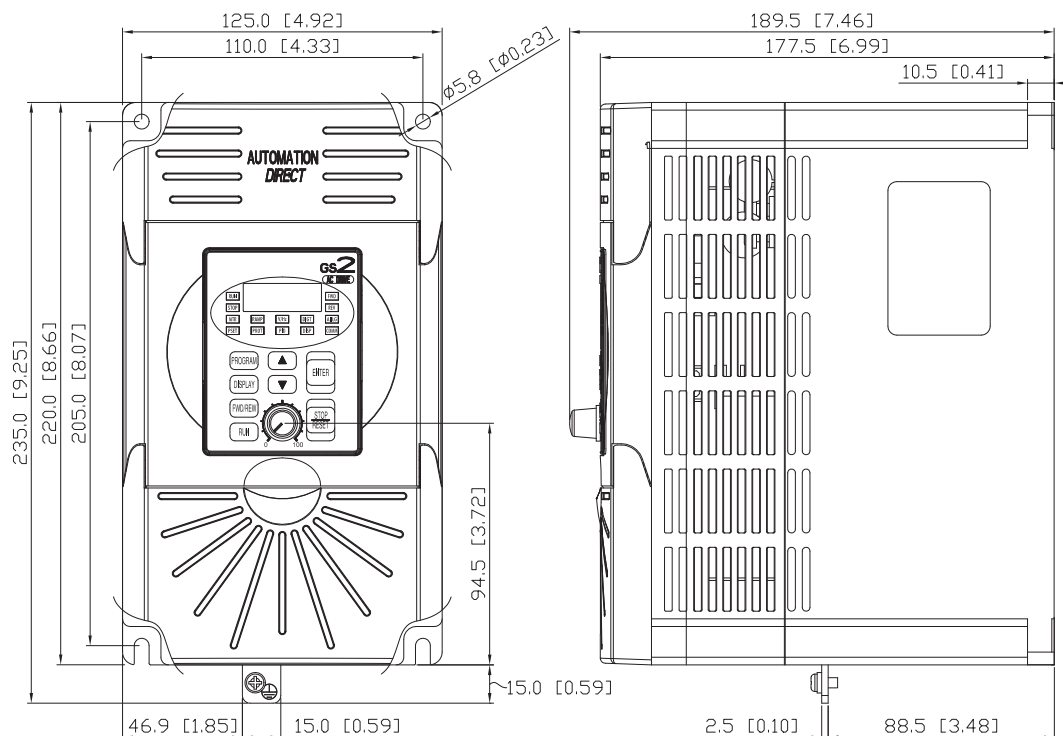
WARNING: Do not plug a modem or telephone into the GS2 RJ-12 Serial Comm Port, or permanent damage may result.
Terminals 2 and 5 should not be used as a power source for your communication connection.

GS2 Specifications — Dimensions

**GS2-10P2, GS2-10P5, GS2-11P0; GS2-20P5, GS2-21P0, GS2-22P0;
GS2-41P0, GS2-42P0, GS2-43P0; GS2-51P0, GS2-52P0, GS2-53P0**



**GS2-23P0, GS2-25P0, GS2-27P5;
GS2-45P0, GS2-47P5, GS2-4010; GS2-55P0, GS2-57P5, GS2-5010**



DURAPULSE AC Drives – Introduction



Overview

The **DURAPULSE** series of AC drives offers all of the features of our GS2 series of drives including dynamic braking, PID, removable keypad and RS-485 Modbus communication. The **DURAPULSE** AC drive also offers sensorless vector control with the option of encoder feedback for enhanced speed control. The standard **smart** keypad (aka HIM or Human Interface Module) is designed with defaults for the North American customer and allows you to configure the drive, set the speed, start and stop the drive, and monitor critical parameters for your application. In addition, this keypad has internal memory that allows **four** complete programs to be stored and transferred to any **DURAPULSE** drive. The **DURAPULSE** series offers three analog inputs, eleven digital inputs, and one SPDT relay output.

DURApulse Drives																
Motor Rating	Hp	1	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100
	kW	.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75
Single/Three-Phase 230 Volt		✓	✓	✓												
Three-Phase 230 Volt Class					✓	✓	✓	✓	✓	✓	✓	✓	✓			
Three-Phase 460 Volt Class		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Features

- Simple Volts/Hertz control
- Sensorless vector control with autotune
- Sensorless vector control with optional encoder feedback card, for better speed control
- Sinusoidal pulse width modulation (PWM)
- Variable carrier frequency, depending on model
- IGBT technology
- Starting torque: 125% @ 0.5 Hz/150% @ 1Hz
- 150% rated current for one minute
- Electronic overload protection
- Stall prevention
- Adjustable accel and decel ramps with linear and S-curve settings
- Automatic torque and slip compensation
- Internal dynamic braking circuit for models under 20 hp; optional braking units available for models 20 hp and above
- DC braking
- Five skip frequencies
- Trip history
- Programmable jog speed
- Integral PID control
- Removable **smart** keypad with parameter upload/download
- **HIM** Keypad with memory to store up to four programs of any **DURAPULSE** drive

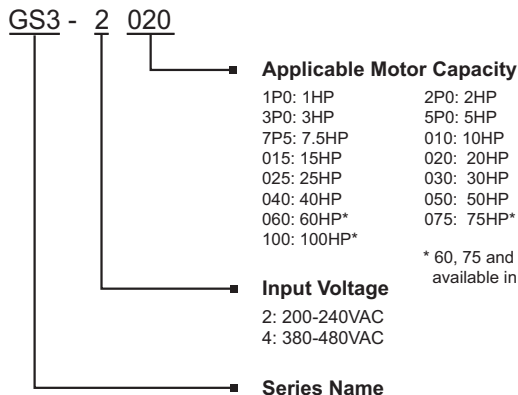
- Eleven programmable digital inputs
- Three programmable analog inputs
- Three digital and one SPDT relay programmable outputs
- One programmable analog output
- One digital frequency output
- RS-485 Modbus communications
- Ethernet communication optional
- UL/cUL/CE listed

Accessories

- AC line reactors
- EMI filters
- RF filters
- Braking resistors
- Braking units (for models 20 hp and above)
- Fuse kits and replacement fuses
- Ethernet interface
- Replacement keypad
- Remote panel adapter
- Keypad cables in 1, 3, and 5 meter lengths
- Four and eight port RS-485 multi-drop termination boards
- **KEPDirect** I/O Server
- GSoft drive configuration software
- GS3-FB feedback card
- GS-485HD15-CBL **ZIPLink** RS485 Communication cable for connection to the DL06 and D2-260 15-pin ports

Detailed descriptions and specifications for the accessories are available in the "GS/DURAPULSE Accessories" section.

DURAPULSE part numbering system



Typical Applications

- Conveyors
- Fans
- Pumps
- Compressors
- HVAC
- Material handling
- Mixing
- Shop tools
- Extruding
- Grinding

DURApULSE AC Drives Specifications

230V Class														
Model Name: GS3-xxx			21P0	22P0	23P0	25P0	27P5	2010	2015	2020	2025	2030	2040	2050
Price			<--->	<--->	<--->	<--->	<--->	<--->	<--->	<--->	<--->	<--->	<--->	<--->
Output Rating	Maximum Motor Output	HP	1.0	2.0	3.0	5.0	7.5	10	15	20	25	30	40	50
		kW	.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37
	Rated Output Current (A)		5	7	11	17	25	33	49	65	75	90	120	145
	Maximum Output Voltage		Three-phase 200 to 240V (proportional to input voltage)											
	Rated Frequency		0.1 to 400 Hz											
* Input Rating	Rated Voltage/Frequency		Single/Three-phase			Three-phase								
			200/208/220/230/240 VAC, 50/60Hz											
	Rated Input Current (A)		11.9 / 5.7	15.3 / 7.6	22 / 15.5	20.6	26	34	50	60	75	90	110	142
Voltage/Frequency Tolerance			Voltage: ± 10% Frequency: ± 5%											
Watt Loss @ 100% I (W)			60	82	130	194	301	380	660	750	920	1300	1340	1430
Weight (lb [kg])			4.5 [2.034]	4.5 [2.034]	9.4 [4.24]	9.4 [4.24]	13.3 [6.031]	13.3 [6.031]	14.3 [6.487]	26.5 [12]	26.5 [12]	26.5 [12]	77.2 [35]	77.2 [35]
* All DURApulse drives require a symmetrical 3-phase power source. Do not connect any DURApulse drives to grounded, center-tapped delta transformers (which are typically used for lighting circuits).														

460V Class – Three-Phase																	
Model Name: GS3-xxx			41P0	42P0	43P0	45P0	47P5	4010	4015	4020	4025	4030	4040	4050	4060	4075	4100
Price			<--->	<--->	<--->	<--->	<--->	<--->	<--->	<--->	<--->	<--->	<--->	<--->	<--->	<--->	<--->
Output Rating	Maximum Motor Output	HP	1	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100
		kW	.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75
	Rated Output Current (A)		2.7	4.2	5.5	8.5	13	18	24	32	38	45	60	73	91	110	150
	Maximum Output Voltage		Three-phase 380 to 480V (proportional to input voltage)														
	Rated Frequency		0.1 to 400 Hz														
*Input Rating	Rated Voltage/Frequency		Three-phase, 380/400/415/440/460/480VAC, 50/60Hz														
	Rated Input Current (A)		3.2	4.3	5.9	11.2	14	19	25	32	39	49	60	63	90	130	160
Voltage/Frequency Tolerance			Voltage: ± 10% Frequency: ± 5%														
Watt Loss @ 100% I (W)			70	102	132	176	250	345	445	620	788	1290	1420	1680	2020	2910	3840
Weight (lb [kg])			3.9 [1.759]	4.4 [1.994]	4.1 [1.857]	9.4 [4.24]	13.2 [6.002]	13.5 [6.106]	14.4 [6.525]	26.5 [12]	26.5 [12]	26.5 [12]	77.2 [35]	77.2 [35]	77.2 [35]	116.8 [53]	116.8 [53]
* All DURApulse drives require a symmetrical 3-phase power source. Do not connect any DURApulse drives to grounded, center-tapped delta transformers (which are typically used for lighting circuits).																	

DURAPULSE AC Drives General Specifications

General Specifications			
Control Characteristics			
Control System		Pulse Width Modulation, Carrier frequency adjustable from 1k - 15kHz depending on the model. This system determines the control methods of the AC drive. 00: V/Hz open loop control 01: V/Hz closed loop control 02: Sensorless Vector 03: Sensorless Vector with external feedback	
Rated Output Frequency		0.1 to 400.0 Hz	
Output Frequency Resolution		0.1 Hz	
Overload Capacity		150% of rated current for 1 minute	
Torque Characteristics		Includes auto-torque boost, auto-slip compensation, starting torque 125% @ 0.5 Hz / 150% @ 1.0 Hz	
Braking Torque		20% without braking resistor, 125% with optional braking resistor (braking circuit built-in only for units under 20 hp)	
DC Braking		Operation frequency 60-0 Hz, 0 - 100% rated current, Start time 0.0 - 5.0 seconds, Stop time 0.0 - 25.0 seconds	
Acceleration/Deceleration Time		0.1 to 600 seconds (linear or non-linear acceleration/deceleration), second acceleration/deceleration available	
Voltage/Frequency Pattern		Settings available for Constant Torque - low & high starting torque, Variable Torque - low & high starting torque, and user configured	
Stall Prevention Level		20 to 200% of rated current	
Operation Specification			
Inputs	Frequency Setting	Keypad	Setting by <UP> or <DOWN> buttons
		External Signal	Potentiometer - 3 to 5 k Ω , 0 to 10 VDC (input impedance 10 k Ω), -10 to +10 VDC, 4 to 20 mA (input impedance 250 Ω), 0 to 20 mA; Multi-Speed Inputs 1 to 4, RS-232C/RS-485 communication interface
	Operation Setting	Keypad	Setting by <RUN>, <STOP>, <JOG>, <FWD>, <REV> buttons
		External Signal	Forward/Stop, Reverse/Stop (run/stop, fwd/rev), 3-wire control, Serial Communication RS-232C & RS-485 (Modbus RTU)
	Input Terminals	Digital Sink/Source Selectable	11 user-programmable: FWD/STOP, REV/STOP, RUN/STOP, REV/FWD, RUN momentary (N.O.), STOP momentary (N.C.), External Fault (N.O./N.C.), External Reset, Multi-Speed Bit (1-4), Manual Keyboard Control, Jog, External Base Block (N.O./N.C.), Second Accel/Decel Time, Speed Hold, Increase Speed, Decrease Speed, Reset Speed to Zero, PID Disable (N.O.), PID Disable (N.C.), Input Disable
		Analog	3 user-configurable, 0 to 10V (input impedance 10 k Ω), 0 to 20 mA, 4 to 20 mA (input impedance 250 Ω), 10 bit resolution -10V to +10V, 10 bit resolution
Outputs	Output Terminals	Digital 3 transistors 1 relay	4 user-programmable: Inverter Running, Inverter Fault, At Speed, Zero Speed, Above Desired Frequency, Below Desired Frequency, At Maximum Speed, Over Torque Detected, Above Desired Current, Below Desired Current, PID Deviation Alarm, Heatsink Overheat Warning (OH), Soft Braking Signal, Above desired Frequency 2, Below desired Frequency 2, Encoder Loss
		Digital Square Wave	One digital square wave output representing drive frequency
		Analog	1 user-programmable, 0 to 10V, 8 bit resolution frequency, current, process variable PV
Operating Functions		Automatic voltage regulation, voltage/frequency characteristics selection, non-linear acceleration/deceleration, upper and lower frequency limiters, 15-stage speed operation, adjustable carrier frequency (1 to 15 kHz), PID control, 5 skip frequencies, analog gain & bias adjustment, jog, electronic thermal relay, automatic torque boost, trip history, software protection	
Protective Functions		Electronic Thermal, Overload Relay, Auto Restart after Fault, Momentary Power Loss, Reverse Operation Inhibit, Auto Voltage Regulation, Over-Voltage Stall Prevention, Auto Adjustable Accel/Decel, Over-Torque Detection Mode, Over-Torque Detection Level, Over-Torque Detection Time, Over-Current Stall Prevention during Acceleration, Over-Current Stall Prevention during Operation	
Operator Interface	Operator Devices		9-key, 2 line x 16 character LCD display, 5 status LEDs
	Programming		Parameter values for setup and review, fault codes
	Status Display		Output Frequency, Motor Speed, Scaled Frequency, Output Current, Motor Load, Output Voltage, DC Bus Voltage, PID Setpoint, PID Feedback, Frequency Setpoint
	Key Functions		RUN, STOP/RESET, FWD/REV, PROGRAM, DISPLAY, <UP>, <DOWN>, ENTER
Environment	Enclosure Rating		Protected Chassis, IP20
	Ambient Temperature		-10°C to 40°C (14°F to 104°F)
	Storage Temperature		-20°C to 60°C (-4°F to 140°F) – during short term transportation period
	Ambient Humidity		20 to 90% RH (non-condensing)
	Vibration		9.8 m/s ² (1G) less than 10 Hz, 5.9 m/s ² (0.6G) 10 to 60 Hz
Installation Location		Altitude 1000m or lower above sea level, keep from corrosive gas, liquid and dust	
Options		Noise filter, input AC reactor, output AC reactor, cable for remote operator, programming software, dynamic braking resistor, dynamic braking unit; RF filter; remote panel adapter; Ethernet interface; four and eight port RS-485 multi-drop termination boards, replacement keypads, fuse kits and replacement fuses	

DURAPULSE Drives Specifications – Installation

Understanding the installation requirements for your **DURAPULSE** AC drive will help to ensure that it operates within its environmental and electrical limits.

Note: Never use only this catalog for installation instructions or operation of equipment; refer to the user manual, **GS3-M**.

Environmental Specifications	
Protective Structure¹	IP20
Ambient Operating Temperature²	-10 to 40°C (14°F to 104°F) f
Storage Temperature³	-20 to 60°C (-4°F to 140°F)
Humidity	To 90% (no condensation)
Vibration⁴	9.8 m/s ² (1g), less than 10 Hz 5.9 m/s ² (0.6g), 10 to 60 Hz
Location	Altitude 1,000 m or less, indoors (no corrosive gases, liquids or dust)

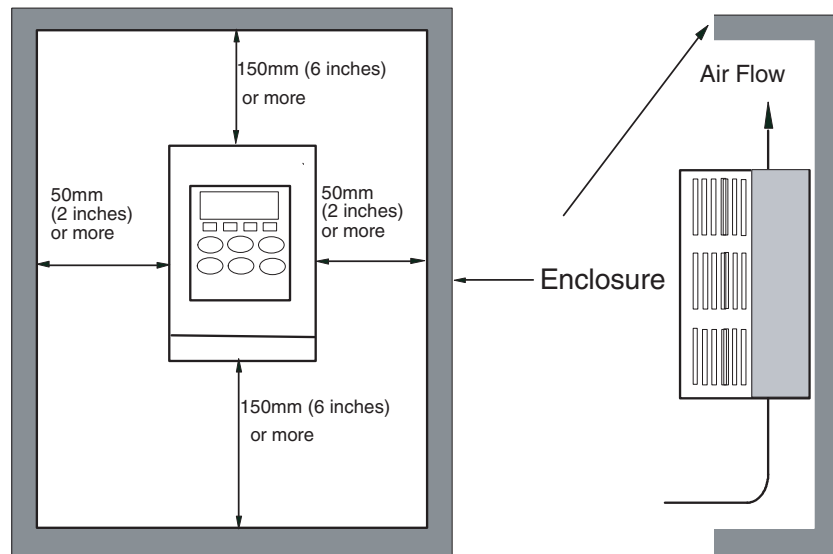
1: Protective structure is based upon **EN60529**

2: The ambient temperature must be in the range of -10° to 40°C. If the range will be up to 50°C, you will need to set the carrier frequency to 2.1 kHz or less and derate the output current to 80% or less.

3: The storage temperature refers to the short-term temperature during transport.

4: Conforms to the test method specified in **JIS C0911 (1984)**

Watt-loss Chart	
GS3 Drive Model	At full load
GS3-21P0	60
GS3-22P0	82
GS3-23P0	130
GS3-25P0	194
GS3-27P5	301
GS3-2010	380
GS3-2015	660
GS3-2020	750
GS3-2025	920
GS3-2030	1300
GS3-2040	1340
GS3-2050	1430
GS3-41P0	70
GS3-42P0	102
GS3-43P0	132
GS3-45P0	176
GS3-47P5	250
GS3-4010	345
GS3-4015	445
GS3-4020	620
GS3-4025	788
GS3-4030	1290
GS3-4040	1420
GS3-4050	1680
GS3-4060	2020
GS3-4075	2910
GS3-4100	3840



Minimum Clearances and Air Flow




Warning: AC drives generate a large amount of heat which may damage the AC drive. Auxiliary cooling methods are typically required in order not to exceed maximum ambient temperatures.



Warning: Maximum ambient temperatures must not exceed 50°C (122°F), or 40°C (104°F) for models 7.5 hp (5.5 kW) and higher!

DURAPULSE AC Drives Specifications — Terminals

Main Circuit Terminals	
Terminal	Description
L1, L2, L3	Input Power
T1, T2, T3	AC Drive Output
B1, B2	Braking Resistor Connection (Under 20HP)
+2, – (negative)	External Dynamic Brake Unit (20HP & Over)
	Ground



GS3-4030 shown

Control Circuit Terminals		
Terminal Symbol	Description	Remarks
+24V	DC Voltage Source	(+24V, 20mA), used only for AC drive digital inputs wired for source mode operation
DI1	Digital Input 1	Input Voltage: Internally Supplied (see Warning below) Sink Mode: Low active, VinL Min = 0V, VinL Max = 15V, Iin Min = 2.1mA, Iin Max = 7.0mA Source Mode: High active, VinH Min = 8.5V, VinH Max = 24V, Iin Min = 2.1mA, Iin Max = 7.0mA Input response: 12 - 15 msec Also see "Basic Wiring Diagram" on the next pages.
DI2	Digital Input 2	
DI3	Digital Input 3	
DI4	Digital Input 4	
DI5	Digital Input 5	
DI6	Digital Input 6	
DI7	Digital Input 7	
DI8	Digital Input 8	
DI9	Digital Input 9	
DI10	Digital Input 10	
DI11	Digital Input 11	
DCM	Digital Common	
+10V	Internal Power Supply	+10VDC (10mA maximum load)
AI1	Analog Input	0 to +10 V input only
AI2	Analog Input	0 to 20mA / 4 to 20mA input
AI3	Analog Input	-10 to +10 V input only
ACM	Analog Common	
R10	Relay Output 1 Normally Open	Resistor Load: 240VAC - 5A (N.O.) / 3A (N.C.) 24VDC - 5A (N.O.) / 3A (N.C.) Inductive Load: 240VAC - 1.5A (N.O.) / 0.5A (N.C.) 24VDC - 1.5A (N.O.) / 0.5A (N.C.) See P 3.01 to P 3.03
R1C	Relay Output 1 Normally Closed	
R1	Relay Output 1 Common	
DO1	Photocoupled digital output	Maximum 48VDC, 50mA
DO2	Photocoupled digital output	
DO3	Photocoupled digital output	
DOC	Digital Output Common	
AO	Analog Output	0 to +10 V 2mA Output
FO	Digital Frequency Output	Square wave pulse train output



WARNING: Do NOT connect external voltage sources to the digital inputs. Permanent damage may result.



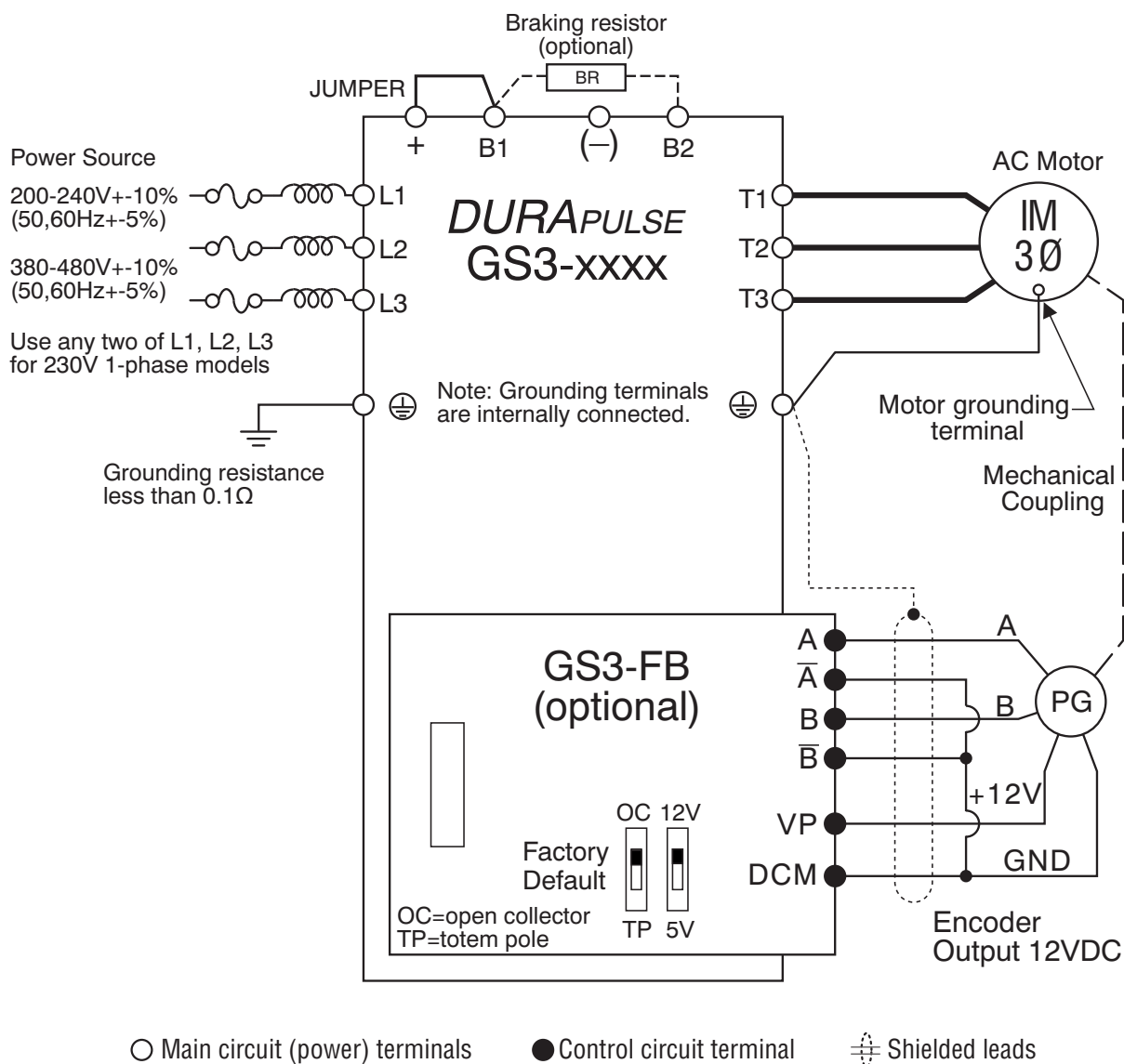
NOTE: USE TWISTED-SHIELDED, TWISTED-PAIR OR SHIELDED-LEAD WIRES FOR THE CONTROL SIGNAL WIRING. IT IS RECOMMENDED TO RUN ALL SIGNAL WIRING IN A SEPARATE STEEL CONDUIT. THE SHIELD WIRE SHOULD ONLY BE CONNECTED AT THE AC DRIVE. DO NOT CONNECT SHIELD WIRE ON BOTH ENDS.

***DURAPULSE* AC Drives – Basic Wiring Diagram**

Power Wiring Diagram - drives under 20 hp

Note: Users **MUST** connect wiring according to the circuit diagram shown below. (Refer to user manual GS3-M for additional specific wiring information.)

Note: Refer to the following pages for explanations and information regarding feedback cards, line reactors, braking resistors, EMI and RF filters, and fuses:
13-48, 13-50, 13-56, 13-61, 13-67, 13-68.



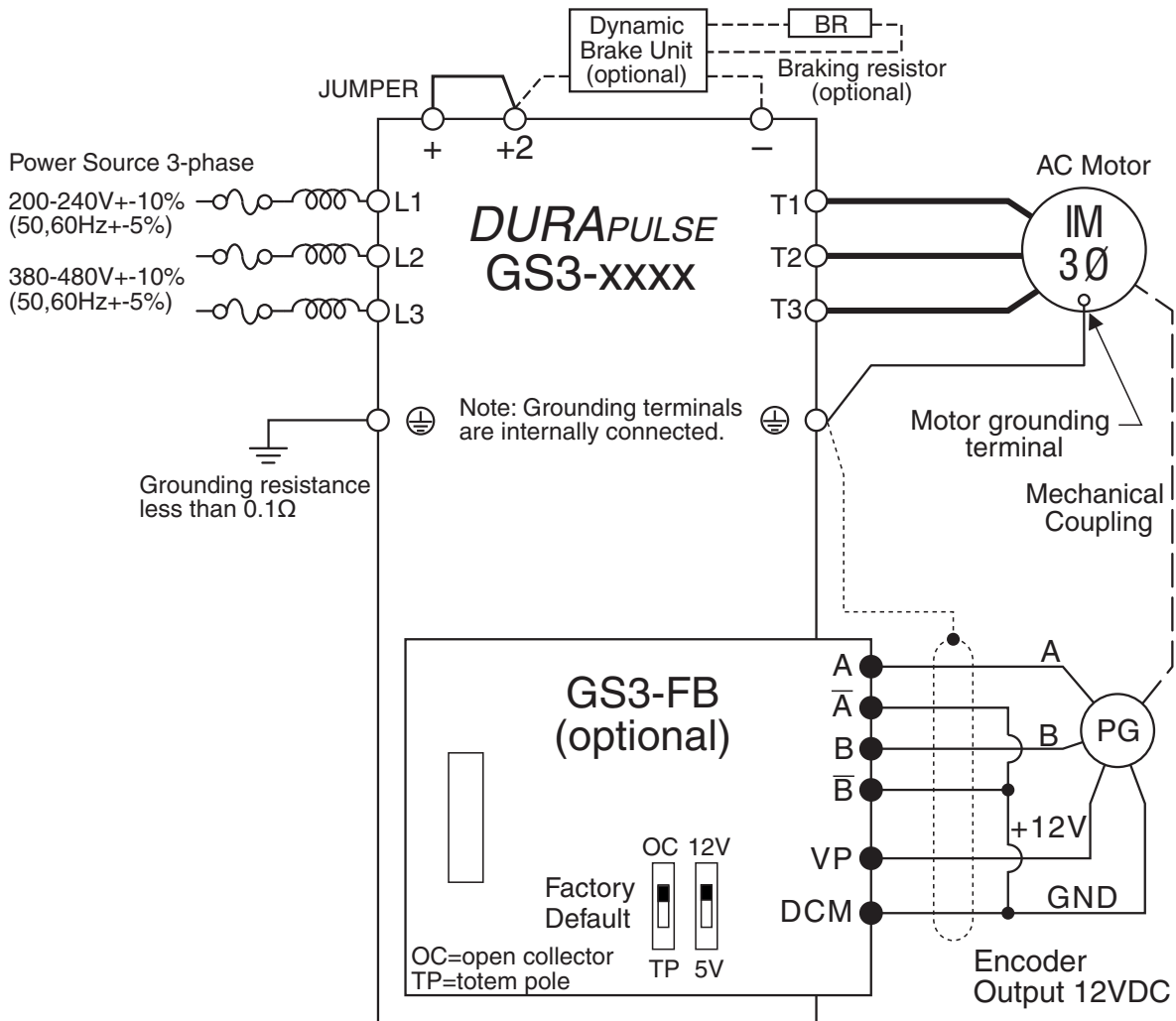
WARNING: Do not plug a modem or telephone into the GS3/DURAPULSE RJ-12 Serial Comm Port, or permanent damage may result. Terminals 2 and 5 should not be used as a power source for your communication connection.

DURAPULSE AC Drives – Basic Wiring Diagram

Power Wiring Diagram – 20 to 30 hp (230 VAC) & 20 to 60 hp (460 VAC)

Note: Users **MUST** connect wiring according to the circuit diagram shown below. (Refer to user manual GS3-M for additional specific wiring information.)

Note: Refer to the following pages for explanations and information regarding feedback cards, line reactors, braking units and resistors, EMI and RF filters, and fuses: 13-48, 13-50, 13-54, 13-56, 13-61, 13-67, 13-68.



○ Main circuit (power) terminals

● Control circuit terminal

⊘ Shielded leads



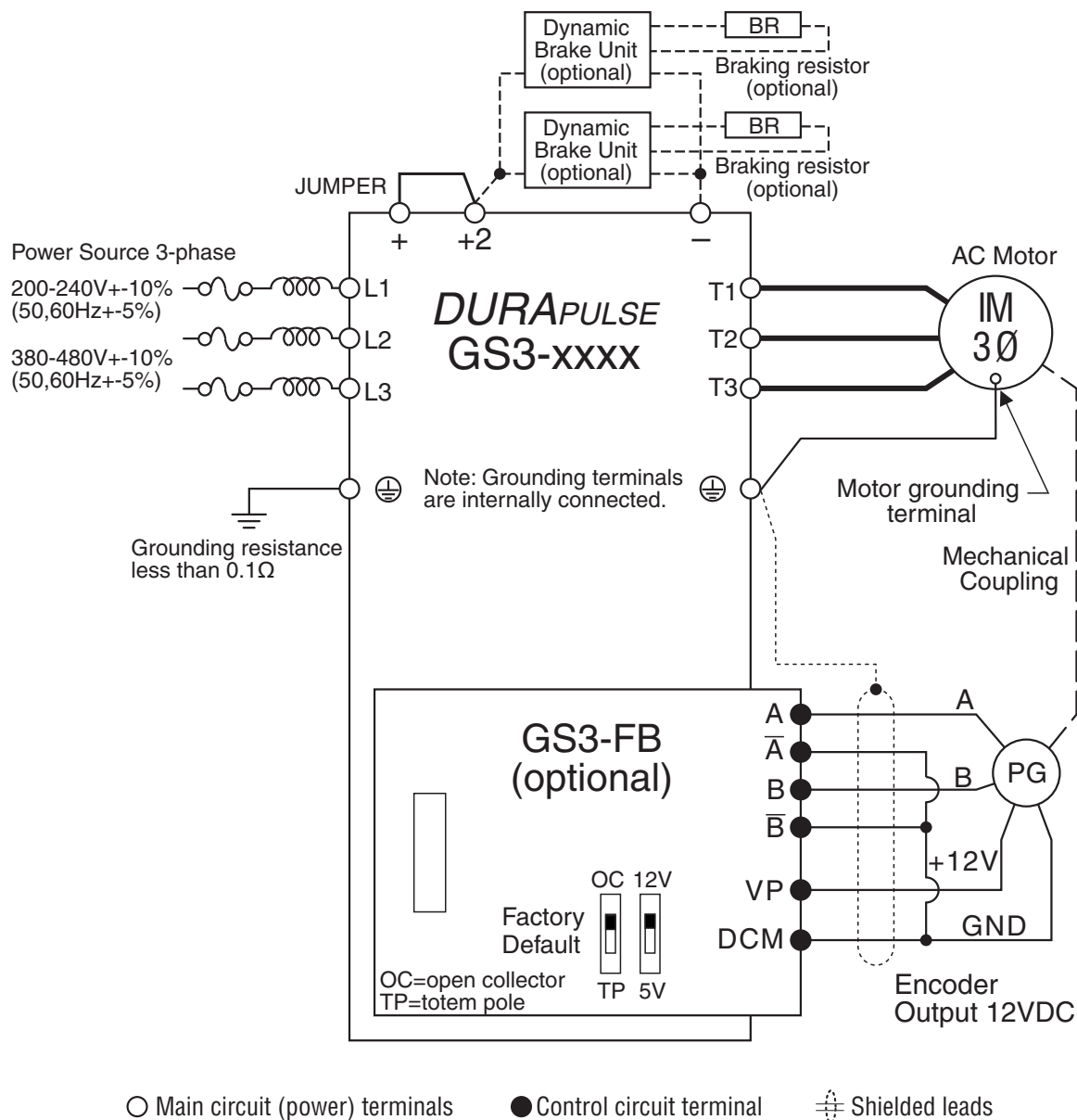
WARNING: Do not plug a modem or telephone into the GS3/DURAPULSE RJ-12 Serial Comm Port, or permanent damage may result. Terminals 2 and 5 should not be used as a power source for your communication connection.

DURAPULSE AC Drives – Basic Wiring Diagram

Power Wiring Diagram - 40 to 50 hp (230 VAC) & 75 to 100 hp (460 VAC)

Note: Users **MUST** connect wiring according to the circuit diagram shown below. (Refer to user manual GS3-M for additional specific wiring information.)

Note: Refer to the following pages for explanations and information regarding feedback cards, line reactors, braking units and resistors, EMI and RF filters, and fuses: 13-48, 13-50, 13-54, 13-56, 13-61, 13-67, 13-68.

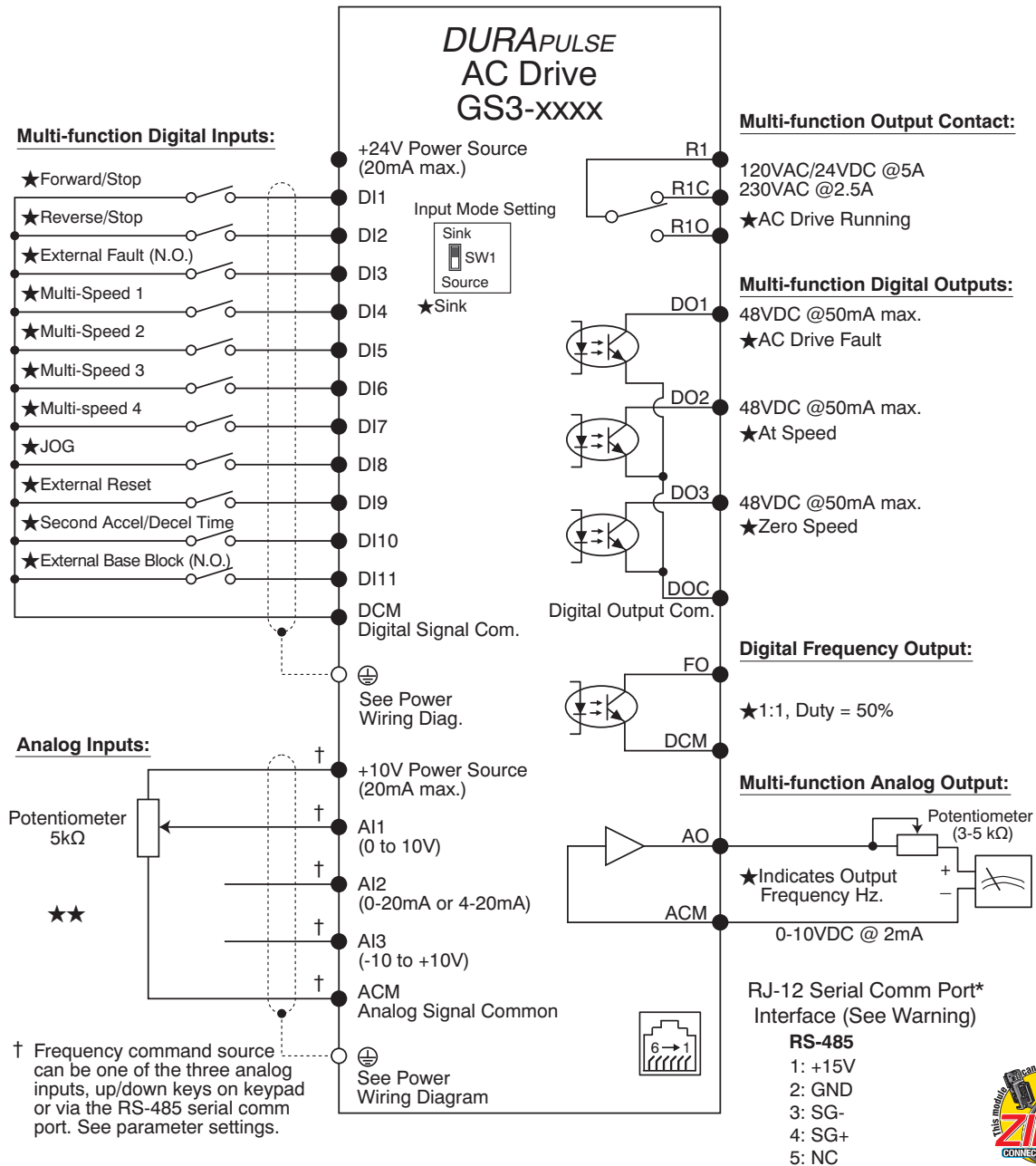


WARNING: Do not plug a modem or telephone into the GS3/DURAPULSE RJ-12 Serial Comm Port, or permanent damage may result. Terminals 2 and 5 should not be used as a power source for your communication connection.

Control Wiring Diagram - Digital Input Connections to Sinking Output Devices



NOTE: USERS MUST CONNECT WIRING ACCORDING TO THE CIRCUIT DIAGRAM SHOWN BELOW.



★ Factory default setting

★★Factory default source of frequency command is via the keypad up/down keys

○ Main circuit (power) terminals ● Control circuit terminal ≡ Shielded leads

RJ-12 Serial Comm Port*
Interface (See Warning)

RS-485

1: +15V

2: GND

3: SG-

4: SG+

5: NC

***Optional ZIPLink RS485**
Communication cable GS-
485HD15-CBL available for
connection to the DL06 and
D2-260 15-pin ports. See
page 12-75.



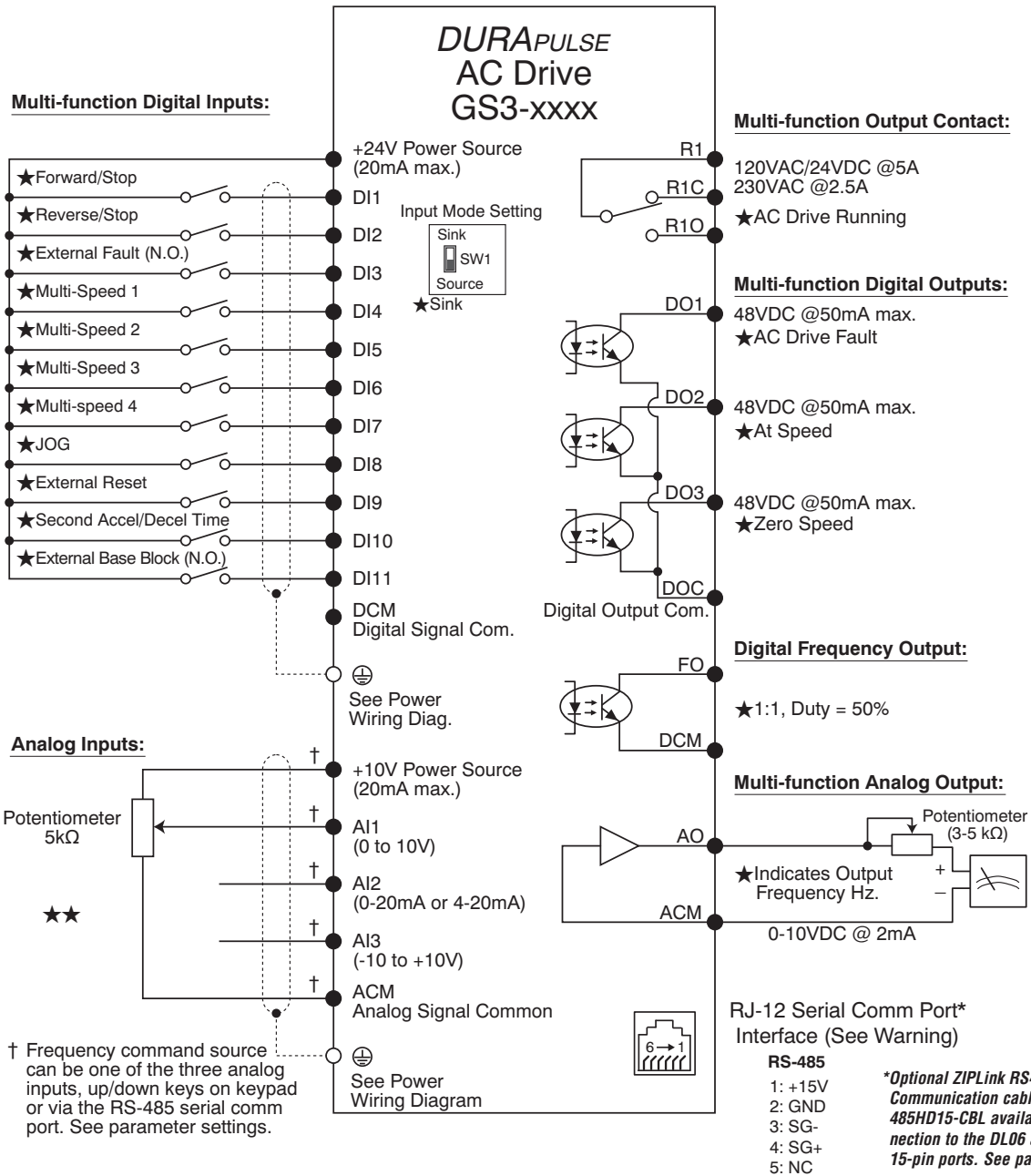
WARNING: Do not plug a modem or telephone into the *DURAPULSE* RJ-12 Serial Comm Port, or permanent damage may result.

DURAPULSE AC Drives – Control Wiring Diagram – DI Connections to Sourcing Outputs

Control Wiring Diagram - Digital Input Connections to Sourcing Output Devices



NOTE: USERS MUST CONNECT WIRING ACCORDING TO THE CIRCUIT DIAGRAM SHOWN BELOW.



★ Factory default setting

★★ Factory default source of frequency command is via the keypad up/down keys

○ Main circuit (power) terminals ● Control circuit terminal ⊕ Shielded leads

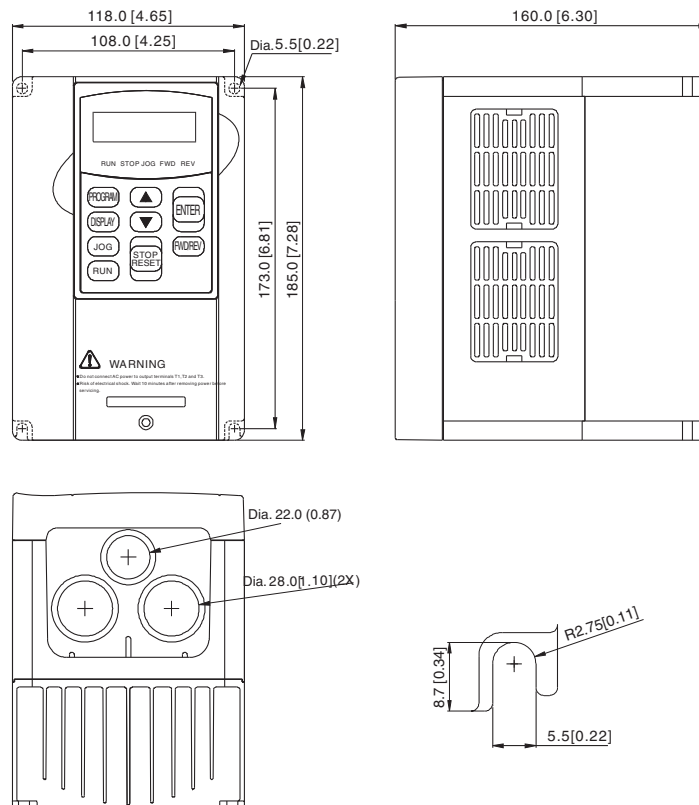


WARNING: Do not plug a modem or telephone into the DURAPULSE RJ-12 Serial Comm Port, or permanent damage may result.

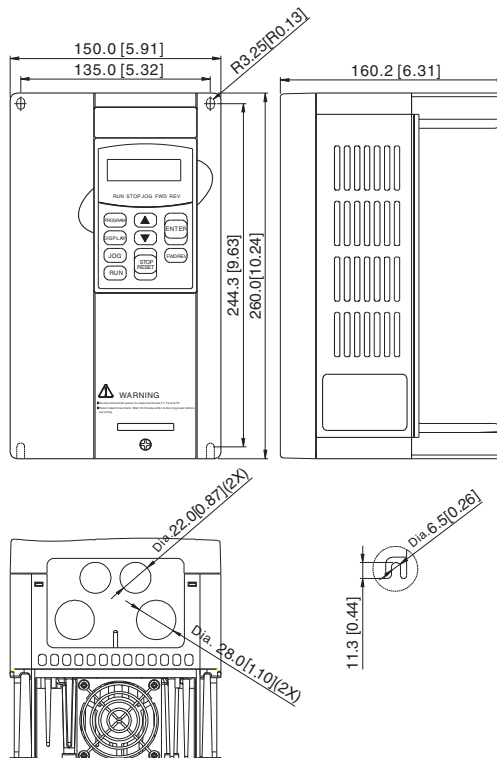


DURAPULSE AC Drives — Dimensions

GS3-21P0, GS3-22P0, GS3-41P0, GS3-42P0



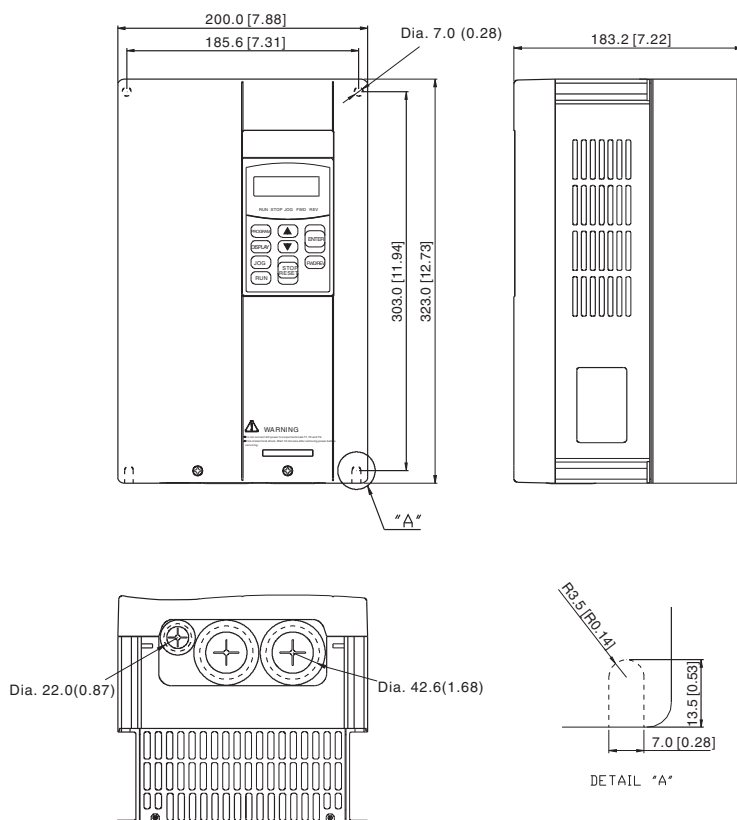
GS3-23P0, GS3-25P0, GS3-45P0



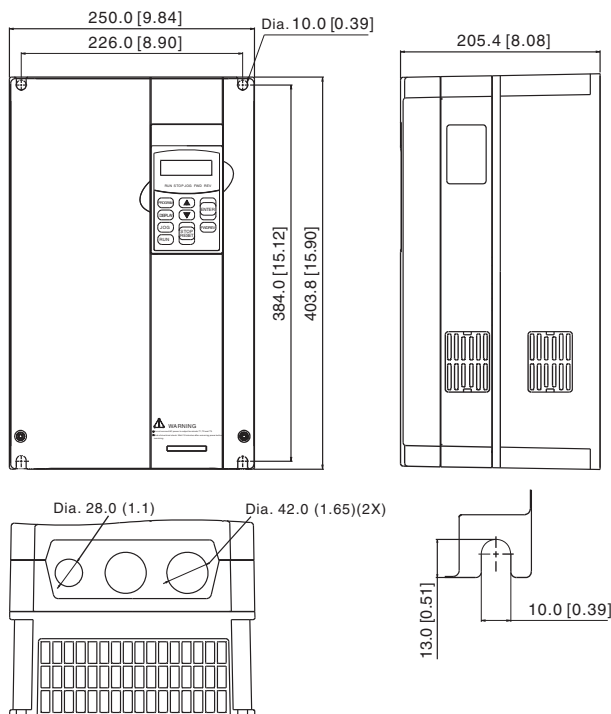
unit: mm(in)

DURAPULSE AC Drives — Dimensions

GS3-27P5, GS3-2010, GS3-2015, GS3-47P5, GS3-4010, GS3-4015



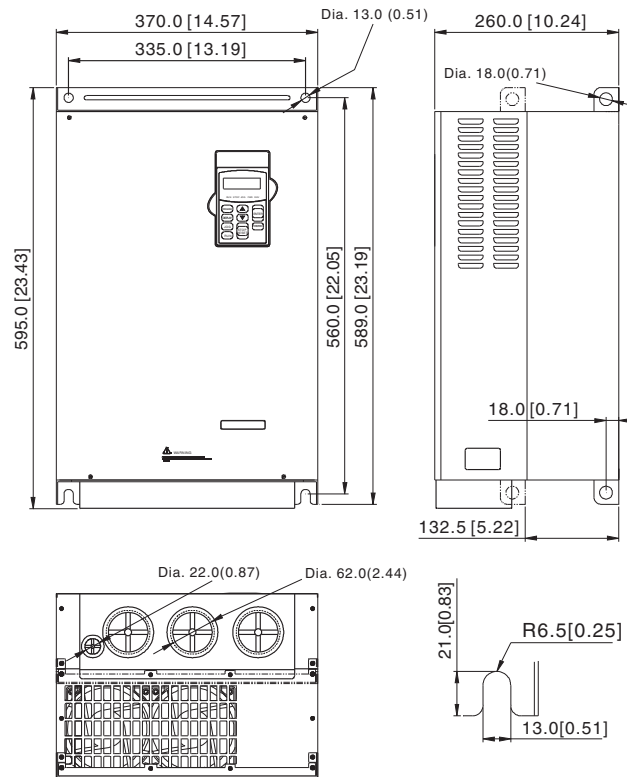
GS3-2020, GS3-2025, GS3-2030, GS3-4020, GS3-4025, GS3-4030



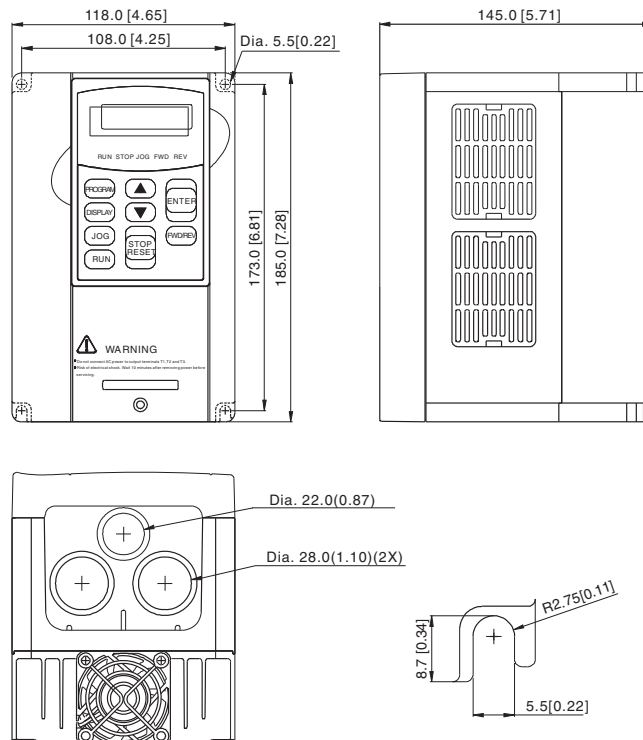
unit: mm(in)

DURAPULSE AC Drives — Dimensions

GS3-2040, GS3-2050, GS3-4040, GS3-4050, GS3-4060



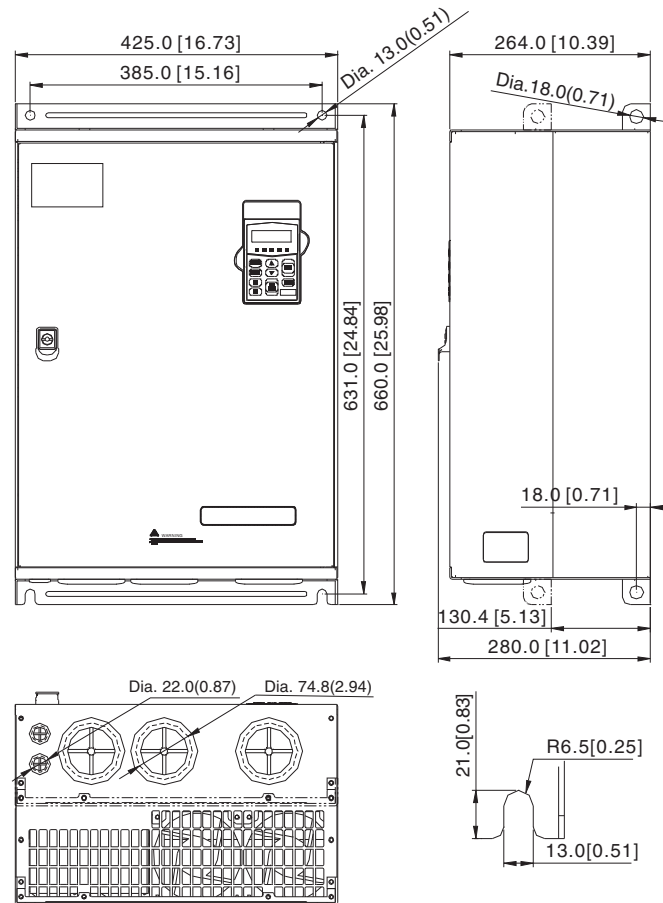
GS3-43P0



unit: mm(in)

DURAPULSE AC Drives — Dimensions

GS3-4075, GS3-4100

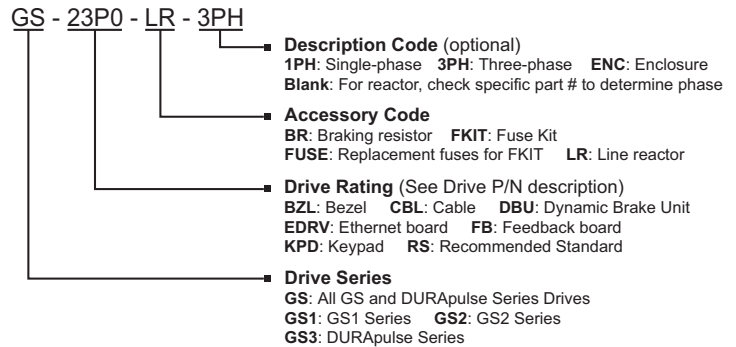


unit: mm(in)

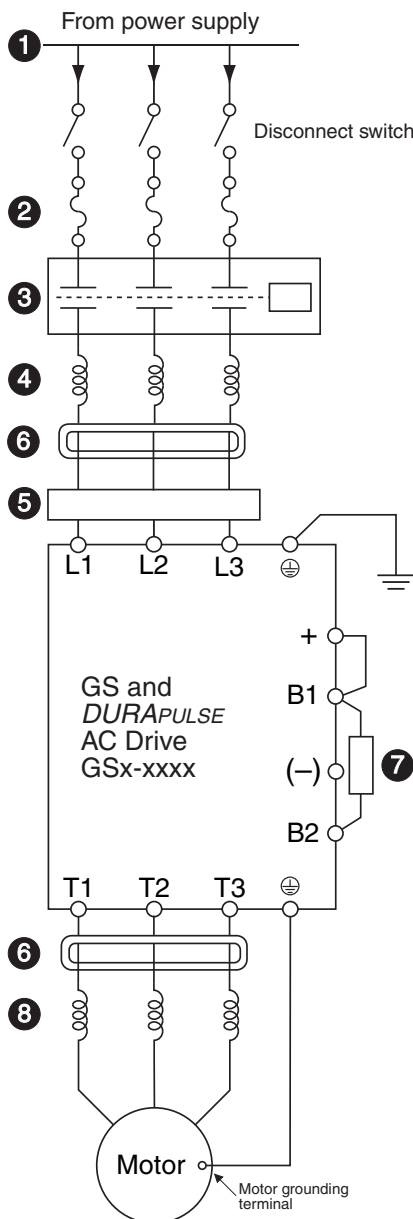
GS/DURAPULSE Accessories – Overview

Accessories part numbering system

Note: With the exception of the EMI filters and RF filters, each accessory part number begins with GS, followed by the AC Drive rating, and then the relevant accessory code. Following the accessory code, you will find a description code when applicable. The diagram at right shows the accessory part numbering system.



Under 20hp



1 Power Supply

Please follow the specific power supply requirements shown in Chapter 1 and the Warning section of the applicable GS or *DURAPULSE* AC Drives User Manual.

2 Fuses (Refer to page 13-68.)

Input fuses protect the AC drive from excessive input current due to line surges, short circuits, and ground faults. They are recommended for all installations and may be required for UL-listed installations. (*AutomationDirect fuses are not available for GS1 drives.*)

3 Contactor (Optional) (Refer to the Motor Controls section.)

Do not use a contactor or disconnect switch for run/stop control of the AC drive and motor. This will reduce the operating life cycle of the AC drive. Cycling a power circuit switching device while the AC drive is in run mode should be done only in emergency situations.

4 Input Line Reactor (Optional) (Refer to page 13-50.)

Input line reactors protect the AC drive from transient overvoltage conditions, typically caused by utility capacitor switching. The input line reactor also reduces the harmonics associated with AC drives. Input line reactors are recommended for all installations.

5 EMI filter (Optional) (Refer to page 13-61.)

Input EMI filters reduce electromagnetic interference or noise on the input side of the AC drive. They are required for CE compliance and recommended for installations prone to or sensitive to electromagnetic interference. (*Separate EMI filters are not necessary for GS1 drives.*)

6 RF filter (Optional) (Refer to page 13-67.)

RF filters reduce the radio frequency interference or noise on the input or output side of the inverter.

7 Braking Resistor (Optional) (Refer to page 13-56.)

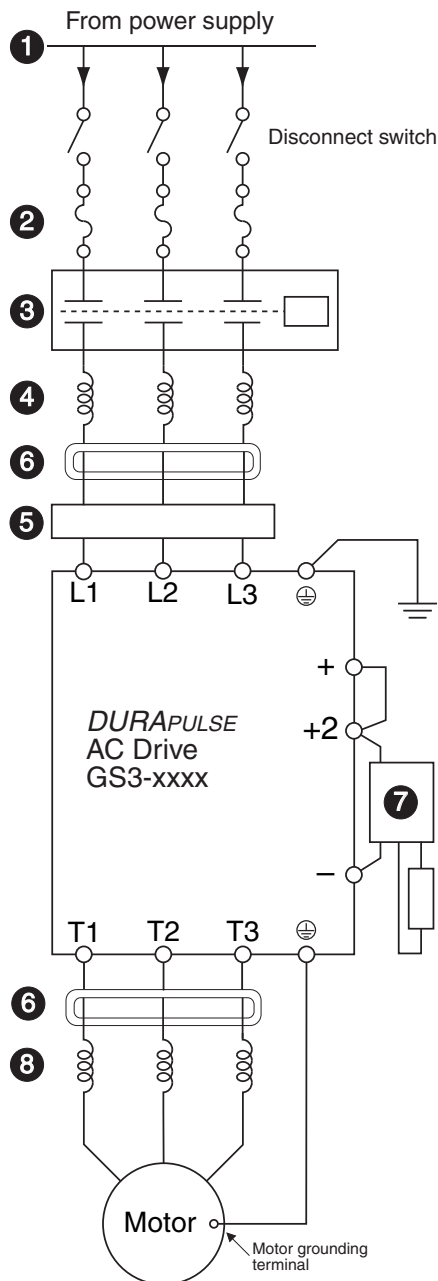
Dynamic braking allows the AC drive to produce additional braking (stopping) torque. AC drives can typically produce between 15% & 20% braking torque without the addition of any external components. The addition of optional braking may be required for applications that require rapid deceleration or high inertia loads. (*Braking resistors are not available for GS1 drives.*)

8 Output Line Reactor (Optional) (Refer to page 13-50.)

Output line reactors protect the motor insulation against AC drive short circuits and IGBT reflective wave damage, and also “smooth” the motor current waveform, allowing the motor to run cooler. They are **recommended for operating “non-inverter-duty” motors** and when the **length of wiring between the AC drive and motor exceeds 75 feet**.

GS/DURAPULSE Accessories – Overview

20hp & Over
(DURAPULSE only)



1 Power Supply

Please follow the specific power supply requirements shown in Chapter 1 of the *DURAPULSE AC Drives User Manual*.

2 Fuses (Refer to page 13-68.)

Input fuses protect the AC drive from excessive input current due to line surges, short circuits, and ground faults. They are recommended for all installations and may be required for UL-listed installations.

3 Contactor (Optional) (Refer to the Motor Controls section.)

Do not use a contactor or disconnect switch for run/stop control of the AC drive and motor. This will reduce the operating life cycle of the AC drive. Cycling a power circuit switching device while the AC drive is in run mode should be done only in emergency situations.

4 Input Line Reactor (Optional) (Refer to page 13-50.)

Input line reactors protect the AC drive from transient overvoltage conditions, typically caused by utility capacitor switching. The input line reactor also reduces the harmonics associated with AC drives. Input line reactors are recommended for all installations.

5 EMI filter (Optional) (Refer to page 13-61.)

Input EMI filters reduce electromagnetic interference or noise on the input side of the AC drive. They are required for CE compliance and recommended for installations prone to or sensitive to electromagnetic interference.

6 RF filter (Optional) (Refer to page 13-67.)

RF filters reduce the radio frequency interference or noise on the input or output side of the inverter.

7 Braking Unit & Braking Resistor (Optional) (pg 13-54)

Dynamic braking allows the AC drive to produce additional braking (stopping) torque. AC drives can typically produce between 15% & 20% braking torque without the addition of any external components. The addition of optional braking may be required for applications that require rapid deceleration or high inertia loads.

8 Output Line Reactor (Optional) (Refer to page 13-50.)

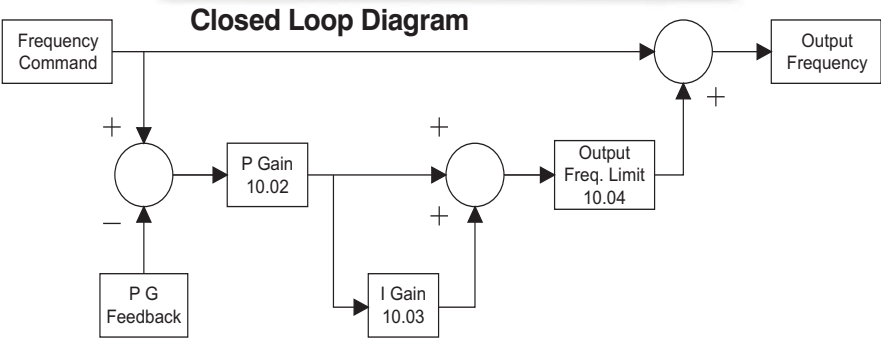
Output line reactors protect the motor insulation against AC drive short circuits and IGBT reflective wave damage, and also "smooth" the motor current waveform, allowing the motor to run cooler. They are **recommended for operating "non-inverter-duty" motors** and when the **length of wiring between the AC drive and motor exceeds 75 feet**.

GS/DURAPULSE Accessories – Feedback Card

Feedback Card for <i>DURAPULSE</i> AC Drives		
Part Number	Price	Drive Model
GS3-FB	<--->	GS3-xxxx
The GS3-FB feedback card is for use only with <i>DURApulse</i> AC drives.		

Description

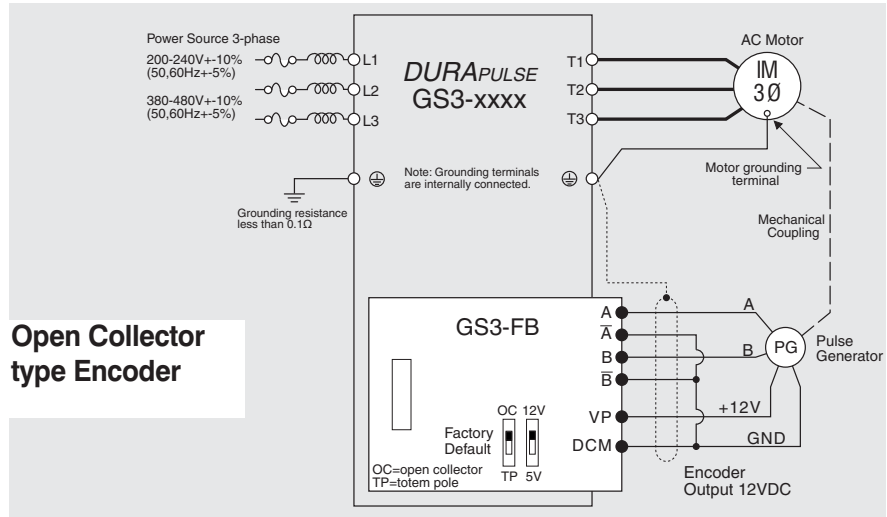
The GS3-FB card is used to add another layer of precision control to the already precise control algorithm utilized in the *DURAPULSE* drive series. This added control is activated by selecting control modes V/Hz closed loop control or sensorless vector with external feedback. The feedback mechanism uses pulses generated by an external encoder or pulse generator. Unlike other feedback types, the GS3-FB accommodates the four most common encoder signal types: output voltage, open collector, line driver, and complimentary.



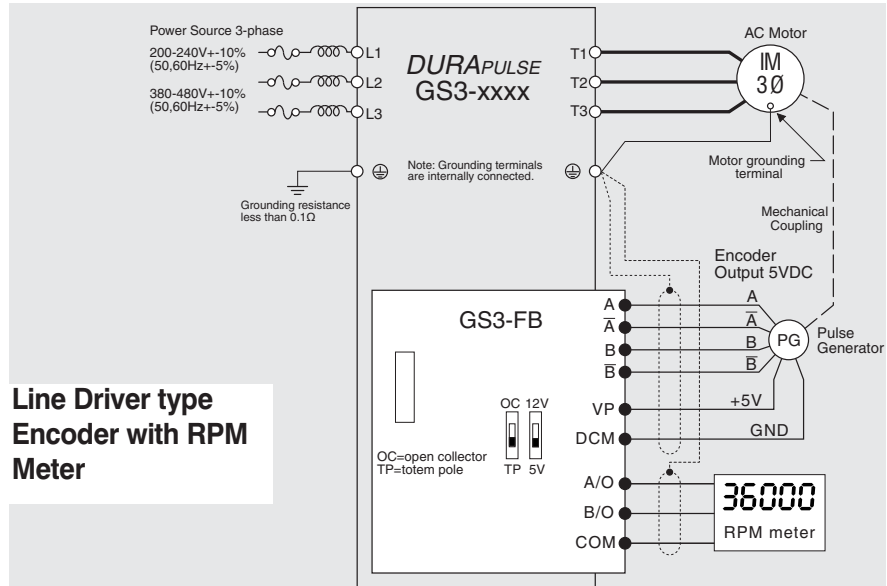
Types of Encoders		SW1 and SW2 switches	
		5V	12V
Output Voltage			
Open collector			
Line driver			
Complimentary			

GS/DURAPULSE Accessories – Feedback Card

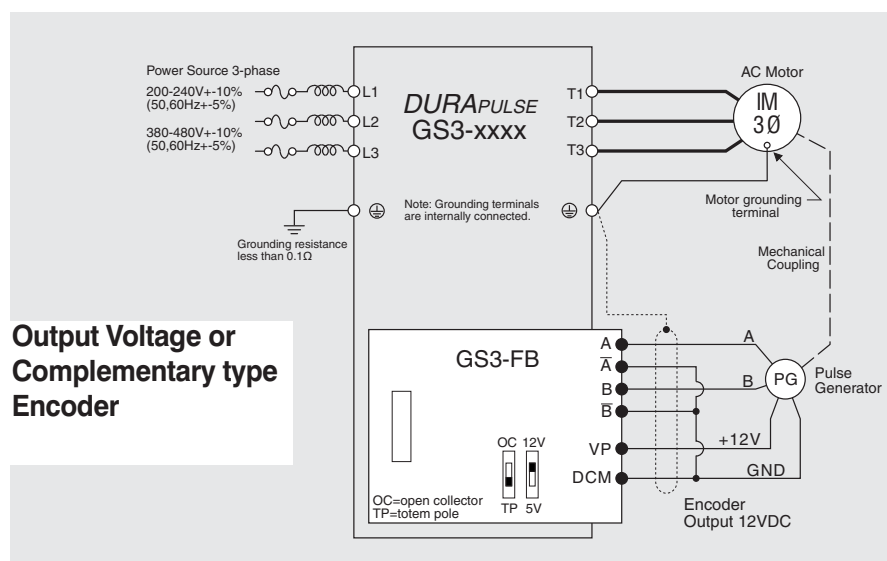
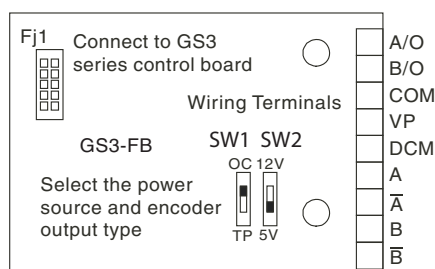
Wiring Diagrams



Terminal Symbols	Description
VP	Power source of GS3-FB (SW1 can be switched to 12V or 5V) Output Voltage: (+12VDC ±5% 200mA) or (+5VDC ±2% 400mA)
DCM	Power source (VP) and input signal (A, B) common
A, NOT A, B, NOT B	Input signal from Encoder. Input type is selected by SW2; Maximum 500KP/sec
A/O, B/O	GS3-FB output signal for use with RPM Meter. (Open Collector) Maximum DC24V 100mA
COM	GS3-FB output signal (A/O, B/O) common



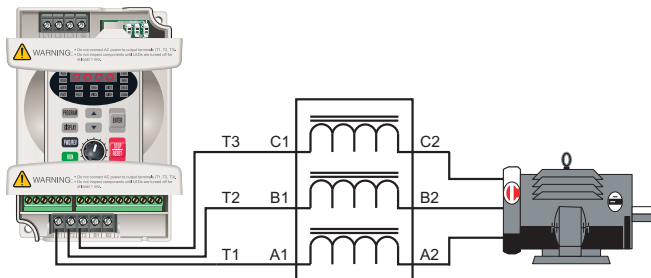
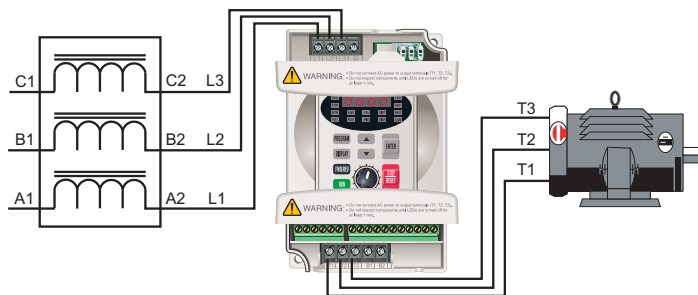
Control Terminals Block Designations



GS/DURAPULSE Drives Accessories – Line Reactors

Input side of the drive

When installed on the input side of the AC drive, line reactors will reduce line notching, and limit current and voltage spikes and surges from the incoming line. The line reactor will also reduce harmonic distortion from the drive onto the line. Units are installed in front of the AC drive as shown.



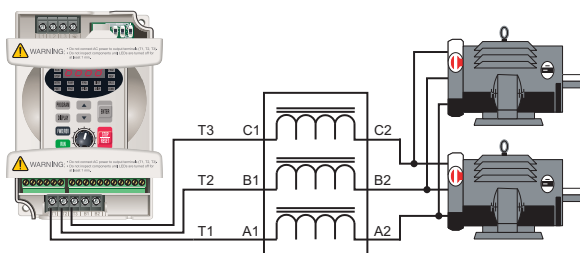
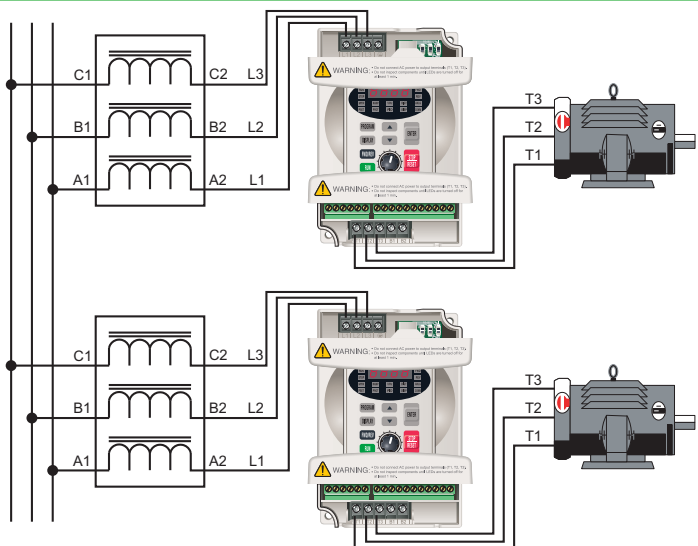
Output side of the drive

When installed on the output side of the drive, line reactors protect the drive from short circuits at the load. Voltage and current waveforms from the drive are enhanced, reducing motor overheating and noise emissions.

Note: Single phase line reactors should not be installed on the output of the AC Drive. Use three-phase only.

Multiple drives

Individual line reactors are recommended when installing multiple drives on the same power line. Individual line reactors eliminate cross talk between multiple drives and provide isolated protection for each drive for its own specific load.



Multiple motors

A single reactor can be used when the application calls for multiple motors on the same drive. The reactor is sized based upon the total horsepower of all the motors. **Overload relays** (not shown) are recommended for use in multi-motor applications.

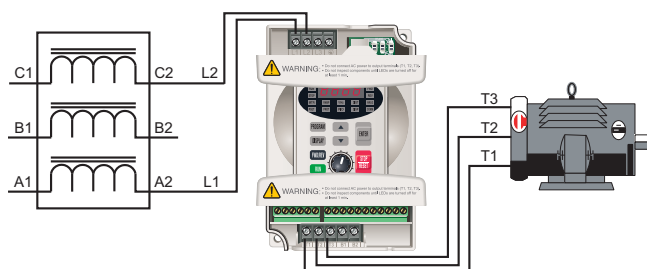
Note: A single reactor should only be used with multiple motors when the motors will always operate simultaneously.

Single phase applications

Some of the line reactors are listed for use with single-phase input power. Follow the connection diagram to the left. Make sure that terminals B1 and B2 are properly insulated before any connections are made.



WARNING: Please ensure that terminals B1 and B2 are properly insulated before making any connections to single-phase power.



GS/DURAPULSE Drives Accessories – Line Reactors

115 Volt Single-Phase Input Reactors

NOTE: Single phase line reactors should not be installed on the output of the AC Drive.

Part Number	Price	Rated Amps	Impedance	Inductance	Watt Loss	Drive Model and Side / Phase / Volts	Drive hp
GS-10P2-LR	<--->	18	3%	0.80 mH	19	GS1-10P2 (input) / 1ph / 115V GS2-10P2 (input) / 1ph / 115V	0.25
GS-10P5-LR	<--->	25	3%	0.50 mH	23	GS1-10P5 (input) / 1ph / 115V GS2-10P5 (input) / 1ph / 115V	0.5
GS-11P0-LR	<--->	35	3%	0.40 mH	36	GS2-11P0 (input) / 1ph / 115V	1

230 Volt Single-Phase Input Reactors

NOTE: Single phase line reactors should not be installed on the output of the AC Drive.

Part Number	Price	Rated Amps	Impedance	Inductance	Watt Loss	Drive Model and Side / Phase / Volts	Drive hp
GS-20P5-LR-1PH	<--->	8	3%	6.50 mH	13	GS1-20P5 (input) / 1ph / 230V GS2-20P5 (input) / 1ph / 230V	0.5
GS-21P0-LR-1PH	<--->	12	3%	6.50 mH	13	GS1-21P0 (input) / 1ph / 230V GS2-21P0 (input) / 1ph / 230V GS3-21P0 (input) / 1ph / 230V	1
GS-22P0-LR-1PH	<--->	18	3%	3.00 mH	25	GS2-22P0 (input) / 1ph / 230V GS3-22P0 (input) / 1ph / 230V	2
GS-23P0-LR-1PH	<--->	35	3%	2.50 mH	26	GS2-23P0 (input) / 1ph / 230V GS3-23P0 (input) / 1ph / 230V	3

230 Volt Three-Phase Input / Output Reactors

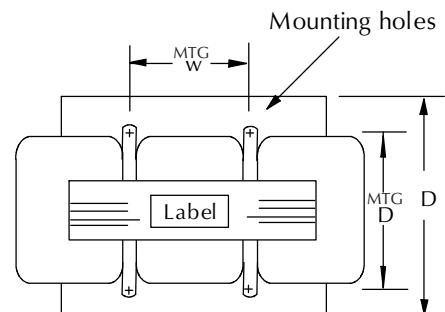
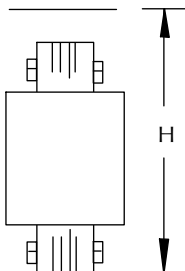
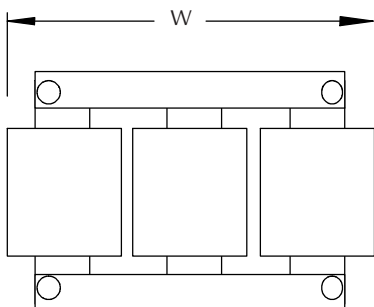
Part Number	Price	Rated Amps	Impedance	Inductance	Watt Loss	Drive Model and Side / Phase / Volts	Drive hp
GS-20P5-LR-3PH	<--->	4	3%	6.50 mH	13	GS1-10P5 (output) / 3ph / 230V GS1-20P5 (in/out) / 3ph / 230V GS2-20P5 (in/out) / 3ph / 230V	0.5
GS-21P0-LR-3PH	<--->	4	3%	3.00 mH	7	GS1-21P0 (in/out) / 3ph / 230V GS2-21P0 (in/out) / 3ph / 230V GS3-21P0 (in/out) / 3ph / 230V	1
GS-22P0-LR-3PH	<--->	8	3%	1.50mH	11	GS1-22P0 (in/out) / 3ph / 230V GS2-22P0 (in/out) / 3ph / 230V GS3-22P0 (in/out) / 3ph / 230V	2
GS-23P0-LR-3PH	<--->	12	3%	1.30mH	23	GS2-23P0 (in/out) / 3ph / 230V GS3-23P0 (in/out) / 3ph / 230V	3
GS-25P0-LR	<--->	18	3%	0.80mH	19	GS2-25P0 (in/out) / 3ph / 230V GS3-25P0 (in/out) / 3ph / 230V	5
GS-27P5-LR	<--->	25	3%	0.50mH	23	GS2-27P5 (in/out) / 3ph / 230V GS3-27P5 (in/out) / 3ph / 230V	7.5
GS-2010-LR	<--->	35	3%	0.40mH	36	GS3-2010 (in/out) / 3ph / 230V	10
GS-2015-LR	<--->	45	3%	0.30mH	33	GS3-2015 (in/out) / 3ph / 230V	15
GS-2020-LR	<--->	55	3%	0.25mH	39	GS3-2020 (in/out) / 3ph / 230V	20
GS-2025-LR	<--->	80	3%	0.20mH	88	GS3-2025 (in/out) / 3ph / 230V	25
GS-2030-LR	<--->	80	3%	0.20mH	88	GS3-2030 (in/out) / 3ph / 230V	30
GS-2040-LR	<--->	130	3%	0.10mH	95	GS3-2040 (in/out) / 3ph / 230V	40
GS-2050-LR	<--->	130	3%	0.10mH	95	GS3-2050 (in/out) / 3ph / 230V	50

GS/DURAPULSE Drives Accessories – Line Reactors

460 & 575 Volt Three-Phase Input / Output Reactors							
Part Number	Price	Rated Amps	Impedance	Inductance	Watt Loss	Drive Model and Side / Phase / Volts	Drive hp
GS-41P0-LR	<--->	2	3%	12.0 mH	7	GS2-41P0 (in/out) / 3ph / 460V GS3-41P0 (in/out) / 3ph / 460V	1
GS-42P0-LR	<--->	4	3%	6.50 mH	13	GS2-42P0 (in/out) / 3ph / 460V GS2-53P0 (in/out) / 3ph / 575V GS3-42P0 (in/out) / 3ph / 460V	2 3 2
GS-43P0-LR	<--->	8	3%	5.00 mH	31	GS2-43P0 (in/out) / 3ph / 460V GS2-55P0 (in/out) / 3ph / 575V GS3-43P0 (in/out) / 3ph / 460V	3 5 3
GS-45P0-LR	<--->	8	3%	3.00 mH	25	GS2-45P0 (in/out) / 3ph / 460V GS3-45P0 (in/out) / 3ph / 460V	5
GS-47P5-LR	<--->	12	3%	2.50 mH	26	GS2-47P5 (in/out) / 3ph / 460V GS2-57P5 (in/out) / 3ph / 575V GS2-5010 (in/out) / 3ph / 575V GS3-47P5 (in/out) / 3ph / 460V	7.5 7.5 10 7.5
GS-4010-LR	<--->	18	3%	1.50 mH	29	GS2-4010 (in/out) / 3ph / 460V GS3-4010 (in/out) / 3ph / 460V	10
GS-4015-LR	<--->	25	3%	1.20 mH	44	GS3-4015 (in/out) / 3ph / 460V	15
GS-4020-LR	<--->	35	3%	0.80 mH	51	GS3-4020 (in/out) / 3ph / 460V	20
GS-4025-LR	<--->	35	3%	0.80 mH	51	GS3-4025 (in/out) / 3ph / 460V	25
GS-4030-LR	<--->	45	3%	0.70 mH	64	GS3-4030 (in/out) / 3ph / 460V	30
GS-4040-LR	<--->	55	3%	0.50 mH	75	GS3-4040 (in/out) / 3ph / 460V	40
GS-4050-LR	<--->	80	3%	0.40 mH	138	GS3-4050 (in/out) / 3ph / 460V	50
GS-4060-LR	<--->	80	3%	0.40 mH	138	GS3-4060 (in/out) / 3ph / 460V	60
GS-4075-LR	<--->	110	3%	0.30 mH	123	GS3-4075 (in/out) / 3ph / 460V	75
GS-4100-LR	<--->	130	3%	0.20 mH	115	GS3-4100 (in/out) / 3ph / 460V	100
GS-51P0-LR	<--->	2	3%	20.0 mH	9	GS2-51P0 (in/out) / 3ph / 575V	1
GS-52P0-LR	<--->	4	3%	9.10 mH	15	GS2-52P0 (in/out) / 3ph / 575V	2

GS/DURAPULSE Drives Accessories – Line Reactors

AC Line Reactor Dimensions (inches)							
Part Number	H	W	D	Mtg D	Mtg W	Mtg Slot Hole Size	Weight (lbs)
GS-10P2-LR	4.80	6.00	3.30	2.09	2.00	0.28 x 0.63	7.10
GS-10P5-LR	5.7	6.00	3.09	2.09	3.00	0.28 x 0.63	7.00
GS-11P0-LR	5.7	6.00	3.34	2.34	3.00	0.28 x 0.63	8.90
GS-20P5-LR-1PH	3.40	4.40	2.83	1.77	1.44	0.28 x 0.63	2.80
GS-20P5-LR-3PH	3.40	4.40	2.83	1.77	1.44	0.28 x 0.63	2.80
GS-21P0-LR-1PH	3.40	4.40	2.83	1.77	1.44	0.28 x 0.63	2.80
GS-21P0-LR-3PH	3.40	4.40	2.83	1.77	1.44	0.28 x 0.63	2.30
GS-22P0-LR-1PH	4.80	6.00	3.30	2.09	2.00	0.28 x 0.63	7.10
GS-22P0-LR-3PH	3.40	4.40	2.83	1.77	2.00	0.28 x 0.63	2.80
GS-23P0-LR-1PH	4.80	6.00	3.30	2.09	2.00	0.28 x 0.63	7.50
GS-23P0-LR-3PH	3.40	4.40	2.83	1.77	2.00	0.28 x 0.63	2.90
GS-25P0-LR	4.80	6.00	3.30	2.09	2.00	0.28 x 0.63	7.10
GS-27P5-LR	5.70	6.00	3.09	2.09	3.00	0.28 x 0.63	7.00
GS-2010-LR	5.70	6.00	3.34	2.34	3.00	0.28 x 0.63	9.00
GS-2015-LR	5.70	6.00	3.84	2.84	3.00	0.28 x 0.63	13.0
GS-2020-LR	5.70	6.00	3.84	2.84	3.00	0.28 x 0.63	12.0
GS-2025-LR	6.88	8.50	4.37	3.12	3.60	0.44 x 1.00	26.0
GS-2030-LR	6.88	8.50	4.37	3.12	3.60	0.44 x 1.00	26.0
GS-2040-LR	6.88	8.50	4.37	3.12	3.00	0.44 x 1.00	27.0
GS-2050-LR	6.88	8.50	4.37	3.12	3.00	0.44 x 1.00	27.0
GS-41P0-LR	3.40	4.40	2.83	1.77	1.44	0.28 x 0.63	2.30
GS-42P0-LR	3.40	4.40	2.83	1.77	1.44	0.28 x 0.63	2.80
GS-43P0-LR	3.40	4.40	3.39	2.39	2.00	0.28 x 0.63	4.30
GS-45P0-LR	3.40	4.40	2.83	1.77	2.00	0.28 x 0.63	3.10
GS-47P5-LR	4.80	6.00	3.30	2.09	2.00	0.28 x 0.63	7.50
GS-4010-LR	4.80	6.30	3.55	2.34	2.00	0.28 x 0.63	9.10
GS-4015-LR	5.70	6.00	3.34	2.34	3.00	0.28 x 0.63	10.0
GS-4020-LR	5.61	6.90	3.95	2.75	3.00	0.38 x 0.63	17.0
GS-4025-LR	5.61	6.90	3.95	2.75	3.00	0.38 x 0.63	17.0
GS-4030-LR	5.61	6.90	4.45	3.25	3.00	0.38 x 0.63	22.0
GS-4040-LR	6.88	8.50	4.37	3.12	3.00	0.44 x 1.00	26.0
GS-4050-LR	6.88	8.50	4.87	3.62	3.60	0.44 x 1.00	36.0
GS-4060-LR	6.88	8.50	4.87	3.62	3.60	0.44 x 1.00	36.0
GS-4075-LR	8.29	10.50	5.35	3.73	3.60	0.44 x 1.25	52.0
GS-4100-LR	8.29	10.50	5.35	3.73	3.60	0.44 x 1.25	41.0
GS-51P0-LR	3.40	4.40	2.83	1.77	1.44	0.28 x 0.63	3
GS-52P0-LR	3.40	4.40	2.83	1.77	1.44	0.28 x 0.63	3



GS/DURApULSE Drives Accessories – Braking Units

Overview



BRAKING UNITS ARE AVAILABLE ONLY FOR DURApULSE DRIVES.

Braking units are applied to absorb the motor regeneration energy when the three-phase induction motor stops by deceleration.

GS-2DBU and GS-4DBU, used with GS series braking resistors, provide optimum braking performance.



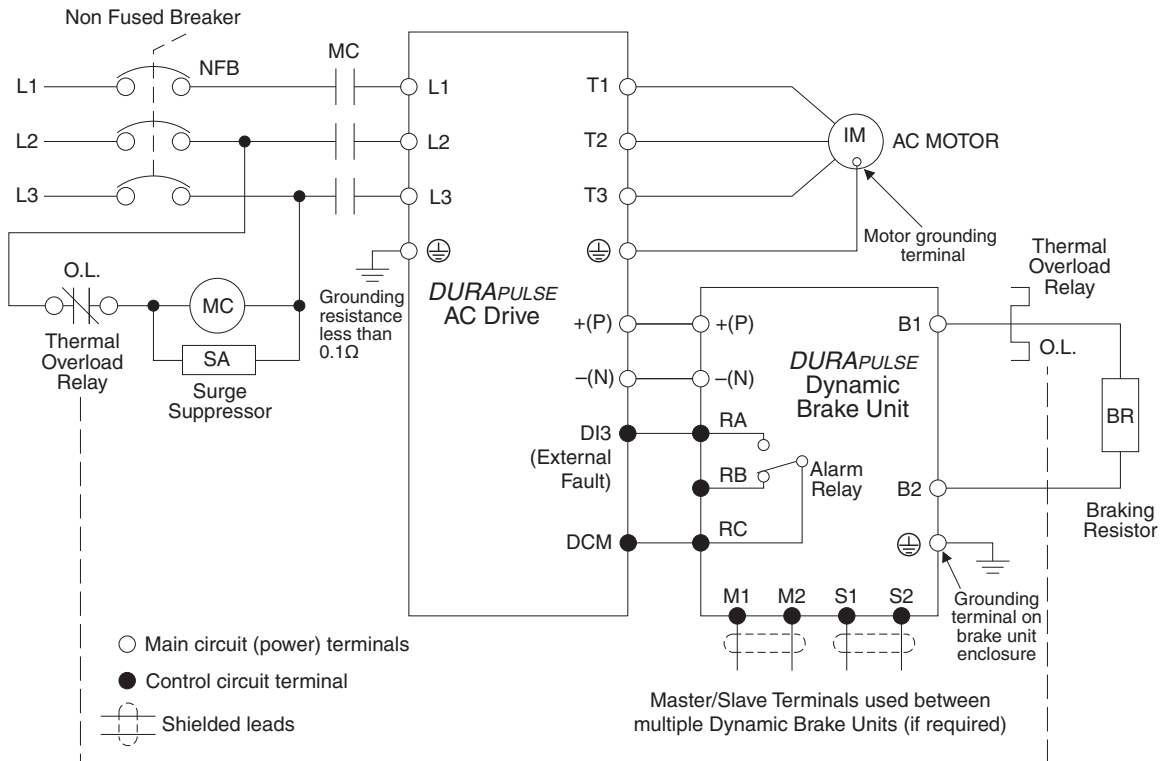
To avoid injury or mechanical damage, please refer to user manual GS3-DB-M before wiring.



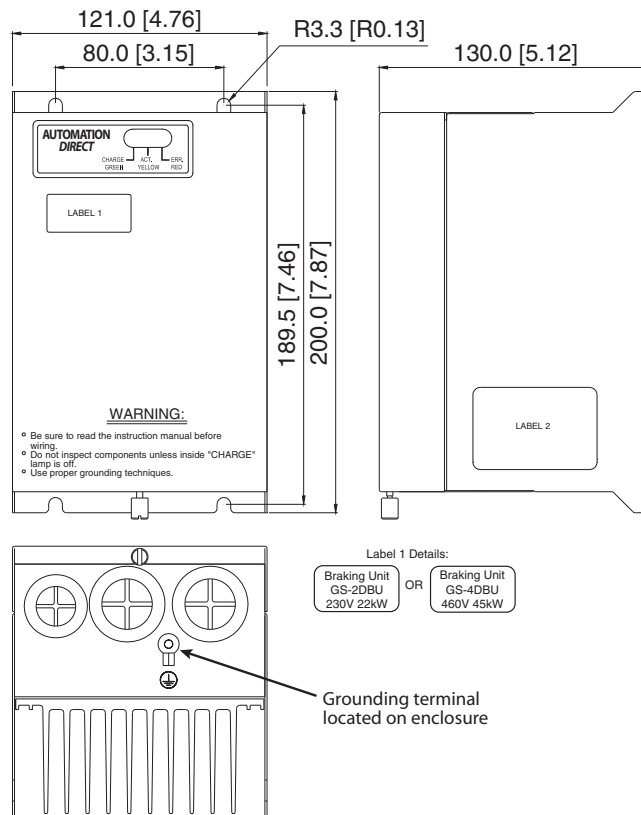
DURApulse AC Drive Braking Units									
AC Drive		Brake Unit			Braking Resistor			Braking Torque 10% Duty Cycle	Typical Thermal Overload Relay Value
Voltage	AC Drive Part No.	QTY	Brake Unit Part No.	Price	QTY	Resistor Part No.	Resistor Specification for Each Braking Unit		
230V	GS3-2020	1	GS-2DBU	<--->	1	GS-2020-BR-ENC	3000 W / 10Ω	125%	30A
	GS3-2025	1			1	GS-2025-BR-ENC	4800 W / 8Ω	125%	35A
	GS3-2030	1			1	GS-2030-BR-ENC	4800 W / 6.8Ω	125%	40A
	GS3-2040	2			2	GS-2040-BR-ENC	3000 W / 10Ω	125%	30A
	GS3-2050	2			2	GS-2050-BR-ENC	3000 W / 10Ω	100%	30A
460V	GS3-4020	1	GS-4DBU	<--->	1	GS-4020-BR-ENC	1500 W / 40Ω	125%	15A
	GS3-4025	1			1	GS-4025-BR-ENC	4800 W / 32Ω	125%	15A
	GS3-4030	1			1	GS-4030-BR-ENC	4800 W / 27.2Ω	125%	20A
	GS3-4040	1			1	GS-4040-BR-ENC	6000 W / 20Ω	125%	30A
	GS3-4050	1			1	GS-4050-BR-ENC	9600 W / 16Ω	125%	40A
	GS3-4060	1			1	GS-4060-BR-ENC	9600 W / 13.6Ω	125%	50A
	GS3-4075	2			2	GS-4075-BR-ENC	6000 W / 20Ω	125%	30A
	GS3-4100	2			2	GS-4100-BR-ENC	9600 W / 13.6Ω	125%	50A

GS/DURAPULSE Drives Accessories – Braking Units

Wiring Diagram (DURApulse only)



Dimensions



units: mm(in)

GS/DURAPULSE Accessories – Braking Resistors

Overview

Braking resistors are used to increase the control torque of the AC drive, for frequently repeated ON-OFF cycles of the AC drive, or for decelerating a load with large inertia.



FOR DURAPULSE DRIVE MODELS 20 HP AND ABOVE, A DYNAMIC BRAKING UNIT MUST BE USED IN CONJUNCTION WITH THE BRAKING RESISTOR, AS SHOWN IN THE DURAPULSE AC DRIVE BRAKING UNITS TABLE.

For additional information, please refer to the dynamic braking manual, GS3-DB-M.



GS-25P0-BR



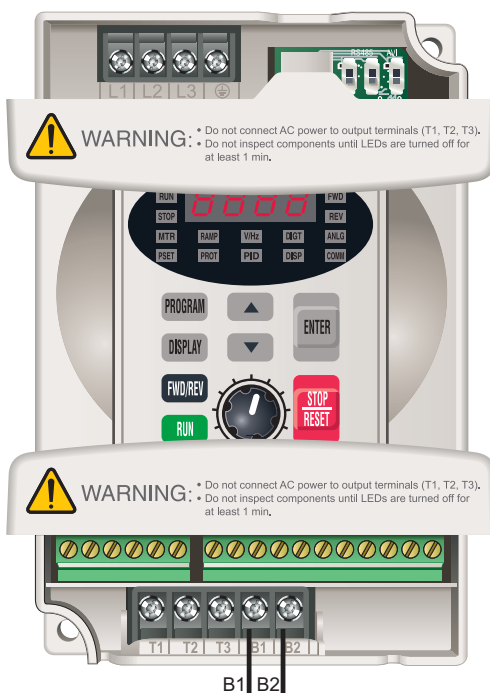
GS-27P5-BR



GS-2020-BR-ENC



GS-2020-BR-ENC without Cover



GS2 braking resistor connection;

Refer to user manuals GS3-M and GS3-DB-M for DURAPULSE resistor connection information.

GS/DURAPULSE Accessories – Braking Resistors

Dynamic Braking Resistors								
Part Number	Quantity Required and Wiring	Price Each	Drive Model	Motor V / hp	Braking Torque ED 10%	Resistance (Ω)	Power (W)	Duty Cycle
GS-20P5-BR	1	<--->	GS2-10P2 GS2-10P5 GS2-20P5	115 / 0.25 115 / 0.5 230 / 0.5	270%	200Ω	80	10%
GS-21P0-BR	1	<--->	GS2-11P0 GS2/3-21P0	115 / 1 230 / 1	125%	200Ω	80	10%
GS-22P0-BR	1	<--->	GS2/3-22P0	230 / 2	125%	100Ω	300	10%
GS-23P0-BR	1	<--->	GS2/3-23P0	230 / 3	125%	70Ω	300	10%
GS-25P0-BR	1	<--->	GS2/3-25P0	230 / 5	125%	40Ω	400	10%
GS-27P5-BR	1	<--->	GS2/3-27P5	230 / 7.5	125%	30Ω	500	10%
GS-2010-BR-ENC	1	<--->	GS3-2010	230 / 10	125%	20Ω	1000	10%
GS-2015-BR-ENC	1	<--->	GS3-2015	230 / 15	125%	13.6Ω	2400	10%
GS-2020-BR-ENC	1	<--->	GS3-2020	230 / 20	125%	10Ω	3000	10%
GS-2025-BR-ENC	1	<--->	GS3-2025	230 / 25	125%	8Ω	4800	10%
GS-2030-BR-ENC	1	<--->	GS3-2030	230 / 30	125%	6.8Ω	4800	10%
GS-2040-BR-ENC	2 (also 2 DBU)	<--->	GS3-2040	230 / 40	125%	10Ω x 2	3000 x 2	10%
GS-2050-BR-ENC	2 (also 2 DBU)	<--->	GS3-2050	230 / 50	125%	8Ω x 2	4800 x 2	10%
GS-41P0-BR	1	<--->	GS2/3-41P0	460 / 1	125%	750Ω	80	10%
GS-42P0-BR	1	<--->	GS2/3-42P0 GS2-51P0 GS2-52P0	460 / 2 575 / 1 575 / 2	125%	400Ω	300	10%
	2 / parallel		GS2-53P0 GS2-55P0 GS2-57P5	575 / 3 575 / 5 575 / 7.5				
GS-43P0-BR	1	<--->	GS2/3-43P0	460 / 3	125%	250Ω	300	10%
GS-45P0-BR	1	<--->	GS2/3-45P0	460 / 5	125%	150Ω	400	10%
GS-47P5-BR	1	<--->	GS2/3-47P5	460 / 7.5	125%	100Ω	500	10%
GS-4010-BR	1	<--->	GS2/3-4010	460 / 10	125%	75Ω	1000	10%
	2 / series		GS2-5010	575 / 10				
GS-4015-BR-ENC	1	<--->	GS3-4015	460 / 15	125%	50Ω	1000	10%
GS-4020-BR-ENC	1	<--->	GS3-4020	460 / 20	125%	40Ω	1500	10%
GS-4025-BR-ENC	1	<--->	GS3-4025	460 / 25	125%	32Ω	4800	10%
GS-4030-BR-ENC	1	<--->	GS3-4030	460 / 30	125%	27.2Ω	4800	10%
GS-4040-BR-ENC	1	<--->	GS3-4040	460 / 40	125%	20Ω	6000	10%
GS-4050-BR-ENC	1	<--->	GS3-4050	460 / 50	125%	16Ω	9600	10%
GS-4060-BR-ENC	1	<--->	GS3-4060	460 / 60	125%	13.6Ω	9600	10%
GS-4075-BR-ENC	2 (also 2 DBU)	<--->	GS3-4075	460 / 75	125%	20Ω x 2	6000 x 2	10%
GS-4100-BR-ENC	2 (also 2 DBU)	<--->	GS3-4100	460 / 100	125%	13.6Ω x 2	9600 x 2	10%
NOTE: Dynamic braking resistors not available for GS1 series AC drives.								
NOTE: The use of dynamic braking resistors with GS2 series AC drives requires no parameter setup. The AC drive will automatically sense the presence of a braking resistor.								
NOTE: For DURAPULSE GS3 series AC drives 20 hp and above, dynamic braking units must be used in conjunction with braking resistors.								

GS/DURAPULSE Accessories – Braking Resistors

Dimensions

Braking Resistors Dimensions								
Part Number	Enclosure	Figure	Weight (g)	L1 (mm)	L2 (mm)	H (mm)	D (mm)	W (mm)
GS-20P5-BR	none	1	160	140	125	20	5.3	40
GS-21P0-BR			160	140	125	20	5.3	60
GS-22P0-BR			750	215	200	30	5.3	60
GS-23P0-BR			750	215	200	30	5.3	60
GS-25P0-BR			930	265	250	30	5.3	60
GS-27P5-BR		2	1100	335	320	30	53	60
GS-2010-BR-ENC	GCE3	3	dimensions shown in diagram					
GS-2015-BR-ENC	GCE6	4						
GS-2020-BR-ENC								
GS-2025-BR-ENC	GCE9	5						
GS-2030-BR-ENC								
GS-2040-BR-ENC	GCE6	4						
GS-2050-BR-ENC	GCE9	5						
GS-41P0-BR	none	1	160	140	125	20	5.3	60
GS-42P0-BR			750	215	200	30	5.3	60
GS-43P0-BR			750	215	200	30	5.3	60
GS-45P0-BR			930	265	250	30	5.3	60
GS-47P5-BR		2	1100	335	320	30	5.3	60
GS-4010-BR			2800	400	385	50	5.3	100
GS-4015-BR-ENC	GCE3	3	dimensions shown in diagram					
GS-4020-BR-ENC	GCE4	6						
GS-4025-BR-ENC	GCE12	7						
GS-4030-BR-ENC								
GS-4040-BR-ENC								
GS-4050-BR-ENC	GCE15	8						
GS-4060-BR-ENC								
GS-4075-BR-ENC	GCE12	7						
GS-4100-BR-ENC	GCE15	8						
Note: For DURAPULSE drive models 20HP and above, a dynamic braking unit must be used in conjunction with the braking resistor, as shown in the Braking Units and Braking Resistors tables. For additional information, refer to the dynamic braking manual, GS3-DB-M.								

GS/DURAPULSE Accessories – Braking Resistors

Figure 1

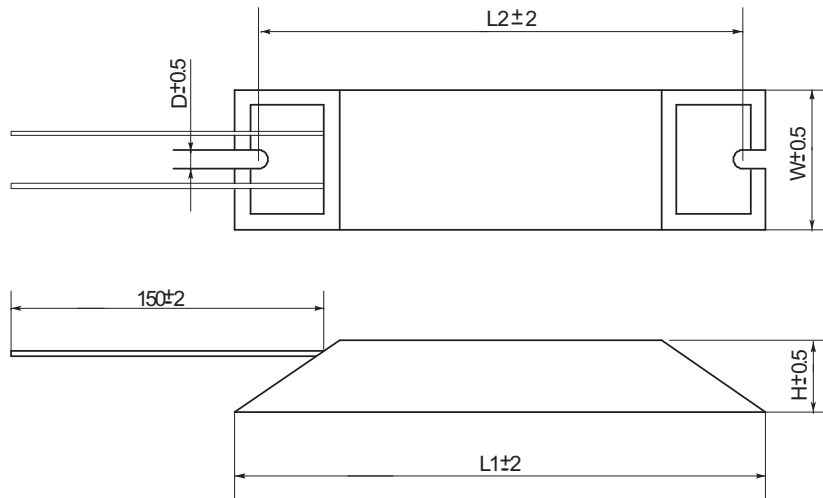


Figure 2

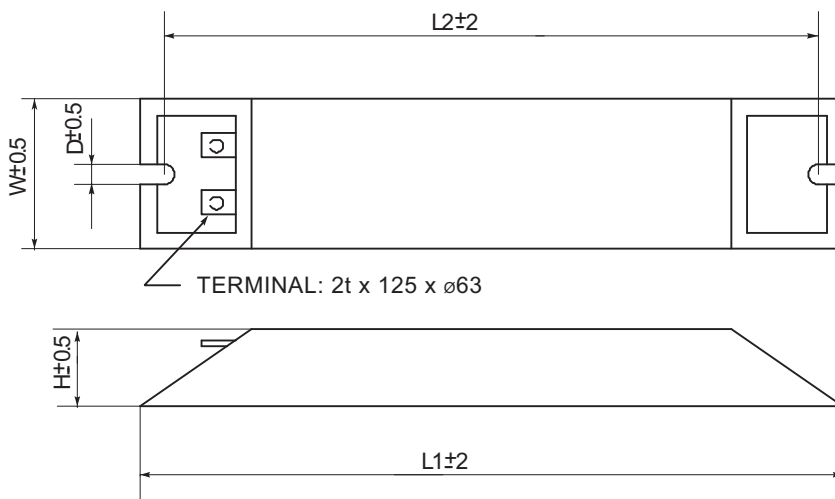


Figure 3

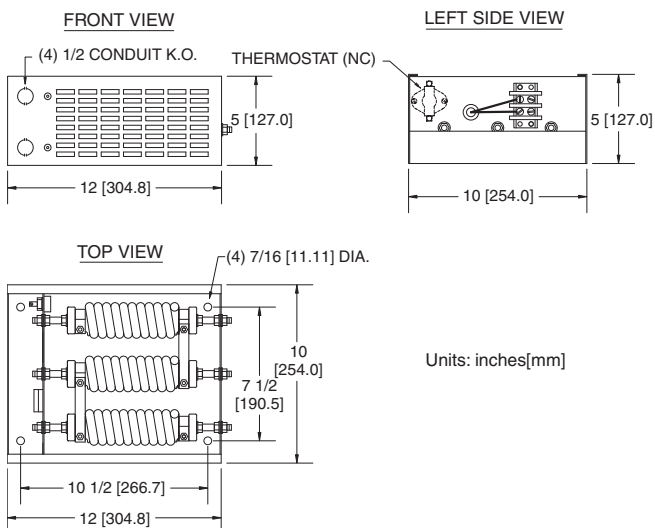
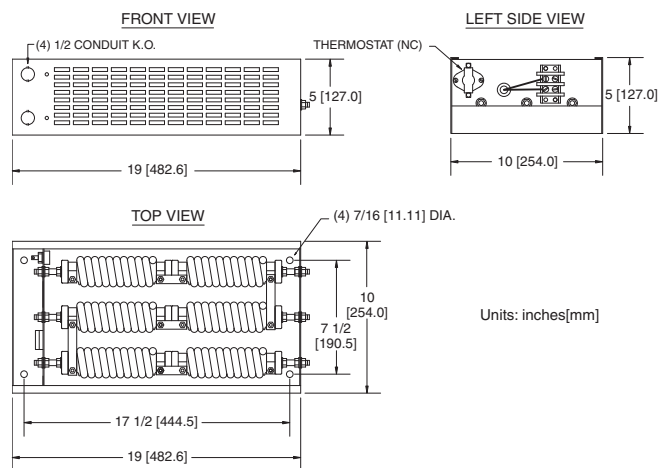


Figure 4



GS/DURAPULSE Accessories – Braking Resistors

Figure 5

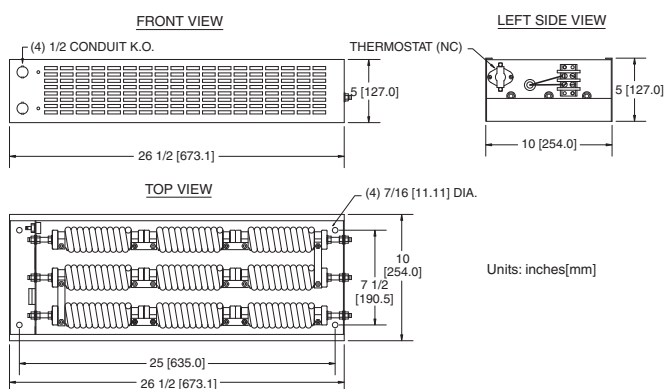


Figure 6

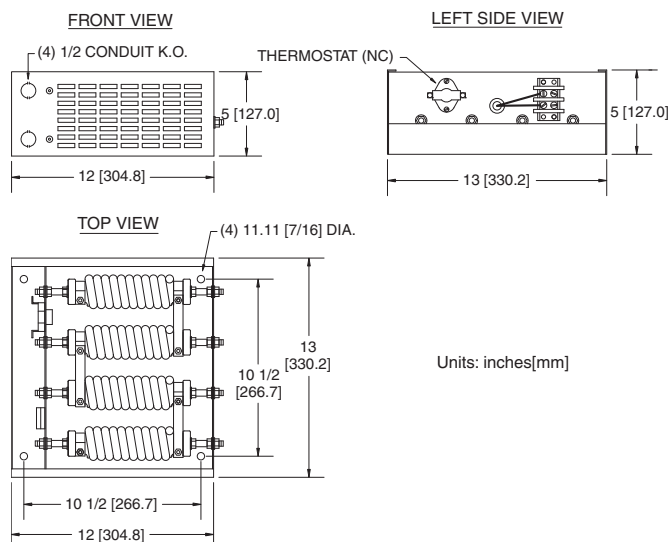


Figure 7

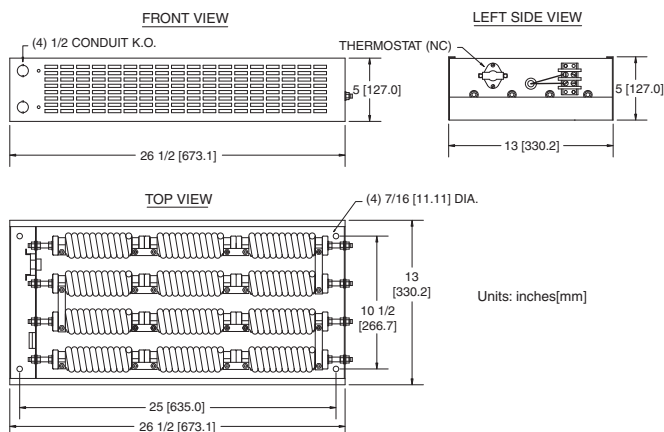
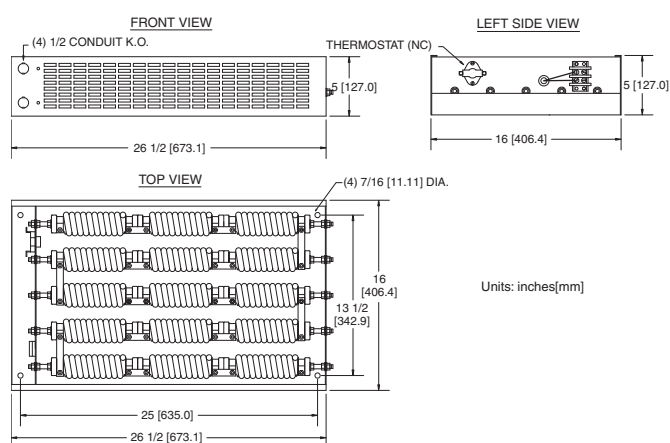


Figure 8

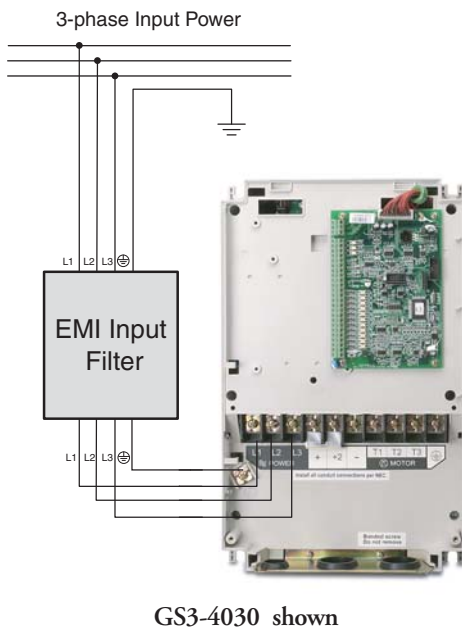


GS/DURAPULSE Accessories – EMI Filters

Overview

The CE Declaration of Conformity for the GS2 and *DURAPULSE* AC drives was completed in conjunction with the EMI filters listed. Use the following table to specify the corresponding EMI filter for each AC drive model.

CE compliance requires the use of EMI filters for GS2 and *DURAPULSE* AC drives. GS1 AC drives have internal EMI filtering, and do not require separate filters.



EMI Input Filter Specifications					
AC Drive 115V / 230V	AC Drive 460V / 575V	EMI Filter	Price	Input Power	Dimensions
GS2-1xxx	-	20DRT1W3S	<--->	1-phase, 20A	Figure 1
GS2-20P5 (1-ph)					
GS2-21P0 (1-ph)					
GS2-22P0 (1-ph)					
GS3-21P0 (1-ph)					
GS3-22P0 (1-ph)					
GS2-23P0 (1-ph)	-	32DRT1W3C	<--->	1-phase, 32A	Figure 2
GS3-23P0 (1-ph)					
GS2-25P0	-	40TDS4W4B	<--->	3-phase, 40A	Figure 3
GS2-27P5					
-	GS2-41P0	11TDT1W4S	<--->	3-phase, 11A	Figure 4
-	GS2-42P0				
-	GS2-43P0				
-	GS2-45P0	17TDT1W44	<--->	3-phase, 17A	Figure 5
-	GS2-47P5				
-	GS2-4010	26TDT1W4B4	<--->	3-phase, 26A	Figure 6
GS2-20P5 (3-ph)	GS2-5xxx	not available	n/a		
GS2-21P0 (3-ph) (note 1)	-	10TDT1W4C	<--->	3-phase, 10A	Figure 7
GS2-22P0 (3-ph) (note 1)					
GS3-21P0					
GS3-22P0	-	26TDT1W4C	<--->	3-phase, 26A	Figure 8
GS2-23P0 (3-ph) (note 1)					
GS3-23P0					
GS3-25P0					
GS3-27P5	GS3-4020	50TDS4W4C	<--->	3-phase, 50A	Figure 9
GS3-2010	GS3-4025				
GS3-2015	GS3-4030	100TDS84C	<--->	3-phase, 100A	Figure 10
GS3-2020	GS3-4040				
-	GS3-4050	150TDS84C	<--->	3-phase, 150A	Figure 11
GS3-2025	GS3-4060				
GS3-2030	-				
GS3-2040	-	180TDS84C	<--->	3-phase, 180A	Figure 12
GS3-2050					
-	GS3-41P0	RF022B43AA	<--->	3-phase, 5.9A	Figure 13
-	GS3-42P0				
-	GS3-43P0				
-	GS3-45P0	RF037B43BA	<--->	3-phase, 11.2A	Figure 14
-	GS3-47P5	RF110B43CA	<--->	3-phase, 25A	Figure 15
-	GS3-4010				
-	GS3-4015				
-	GS3-4075	200TDDS84C	<--->	3-phase, 200A	Figure 16
-	GS3-4100				

Note 1: EMI filters 10TDT1W4C and 26TDT1W4C mount underneath DURApulse, but do NOT mount underneath GS2 drives.

GS/DURAPULSE Accessories – EMI Filters

Dimensions

Figure 1 [units = mm]

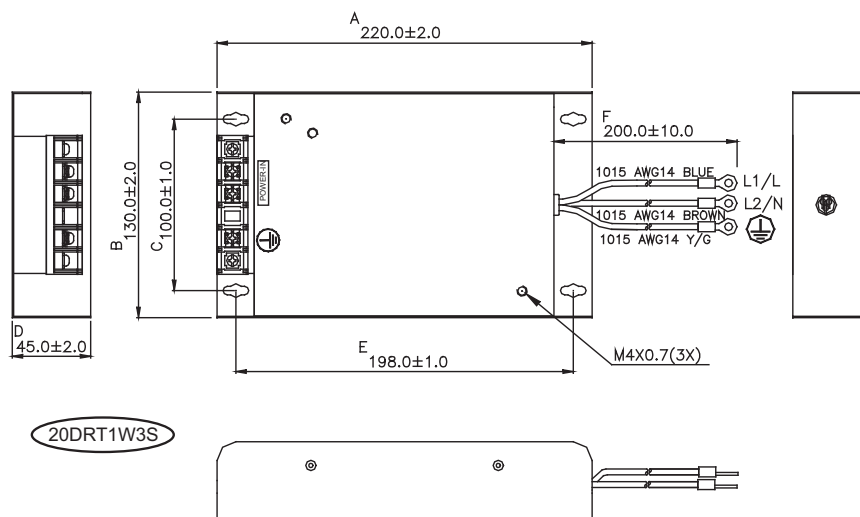


Figure 2 [units = mm]

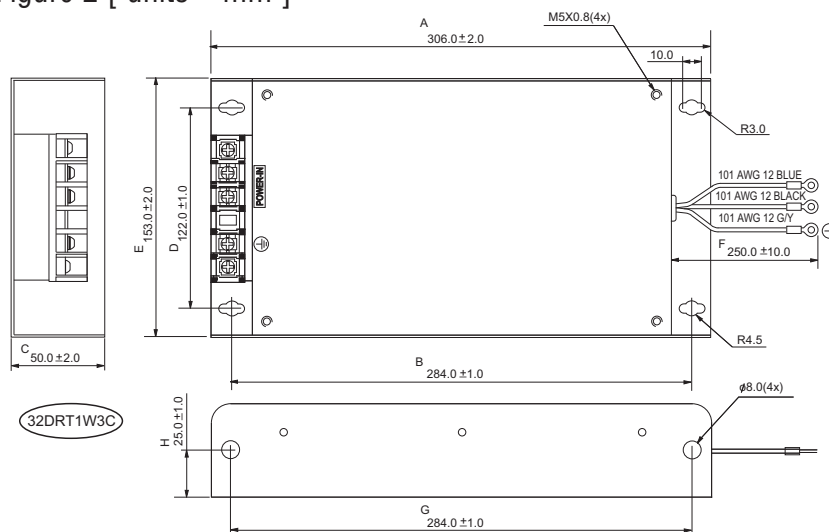
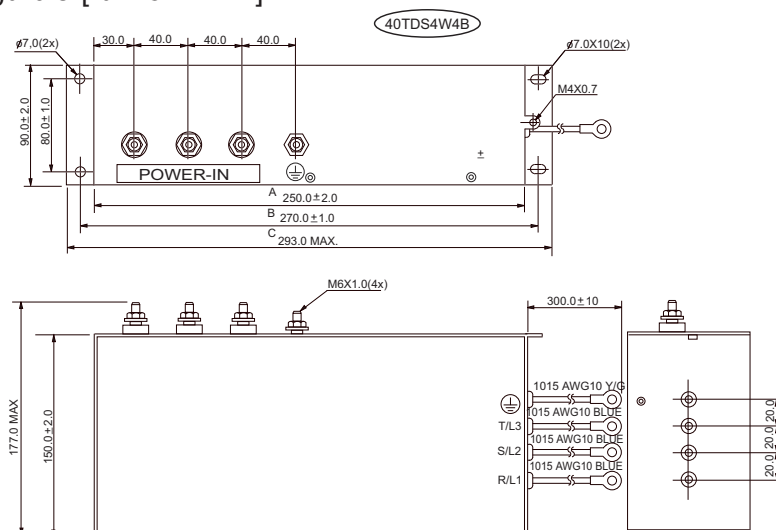


Figure 3 [units = mm]



GS/DURAPULSE Accessories – EMI Filters

Figure 4 [units = mm]

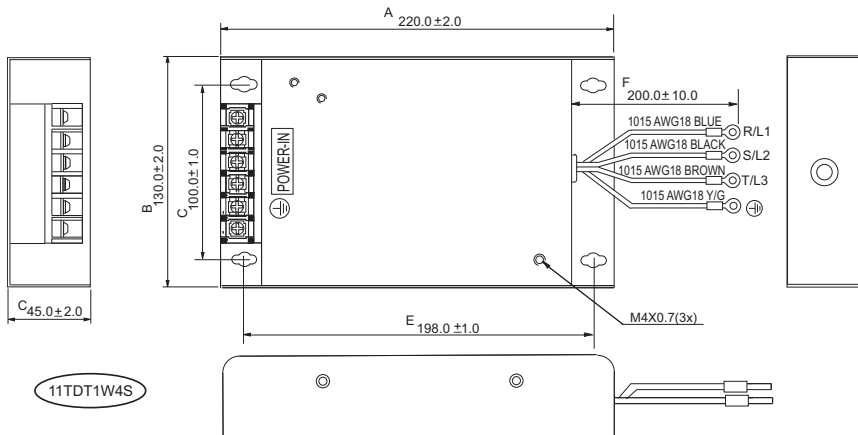


Figure 5 [units = mm]

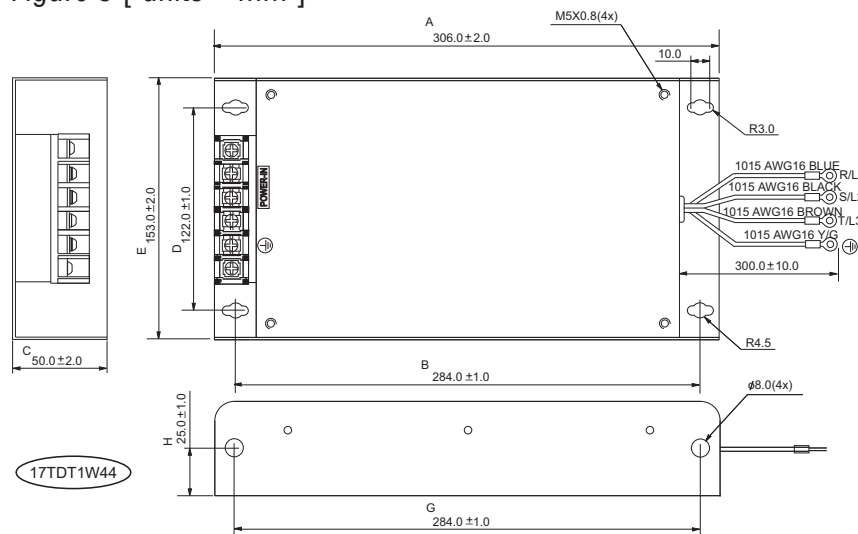
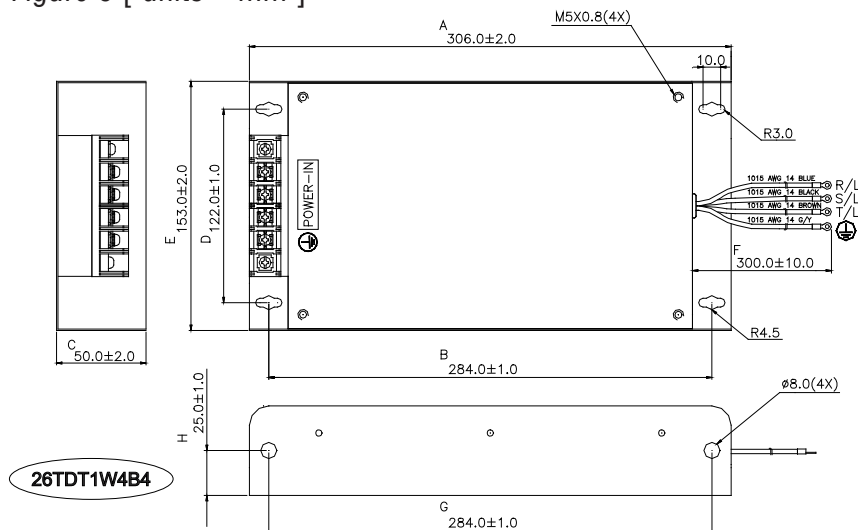


Figure 6 [units = mm]



GS/DURAPULSE Accessories – EMI Filters

Figure 7 [units = mm (in)]

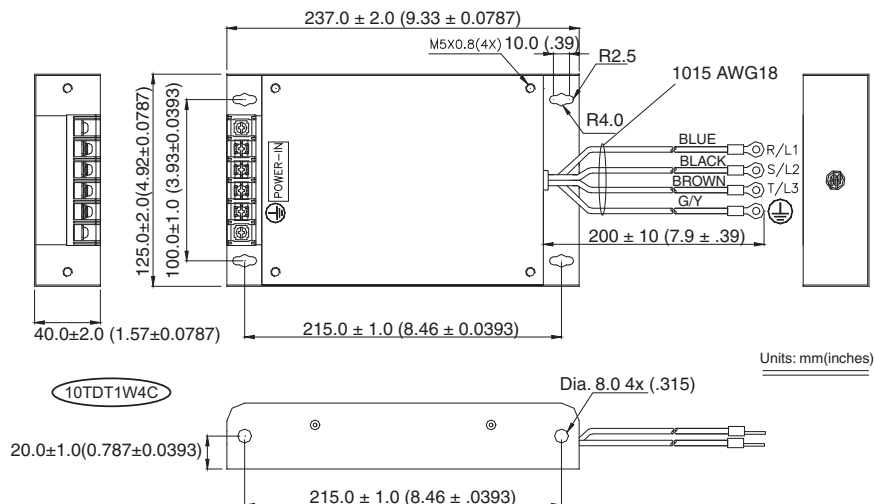


Figure 8 [units = mm (in)]

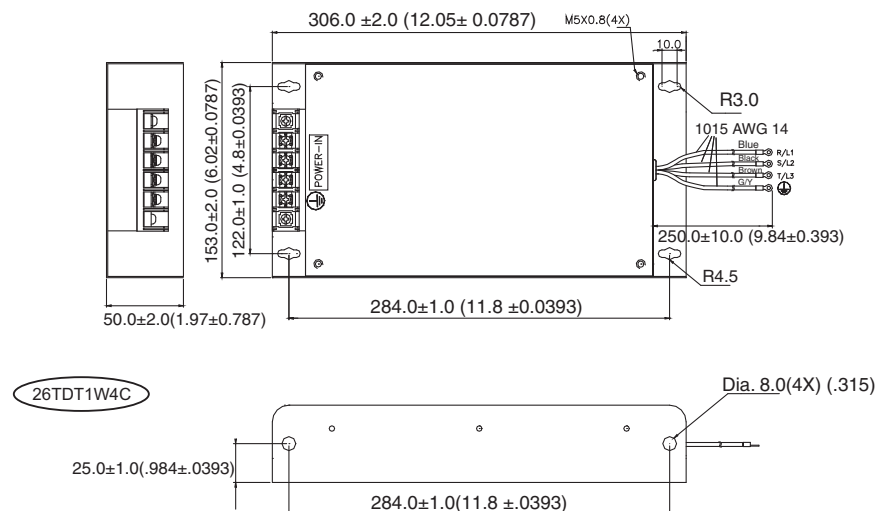
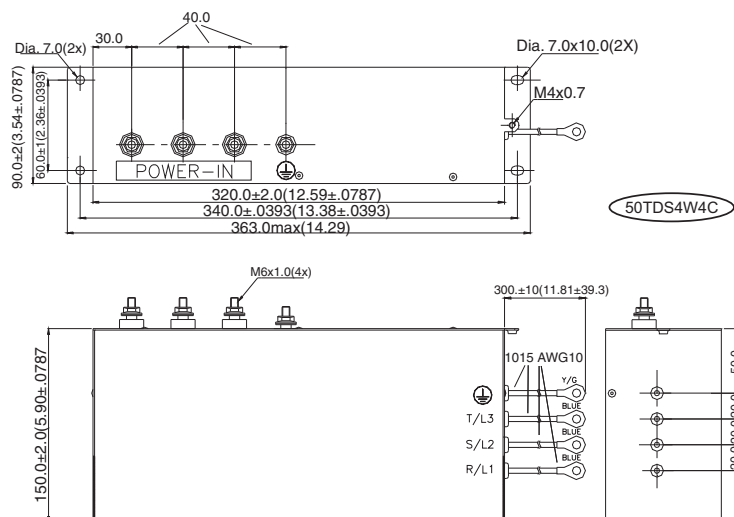


Figure 9 [units = mm (in)]



GS/DURAPULSE Accessories – EMI Filters

Figure 10 [units = mm (in)]

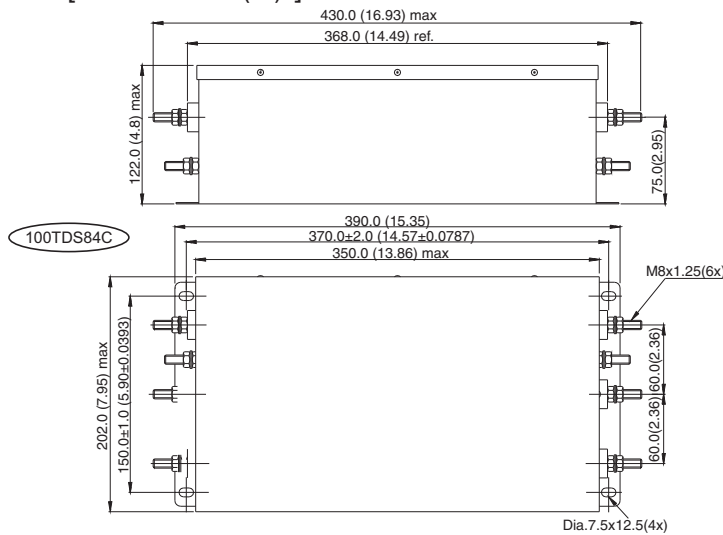


Figure 11 [units = mm (in)]

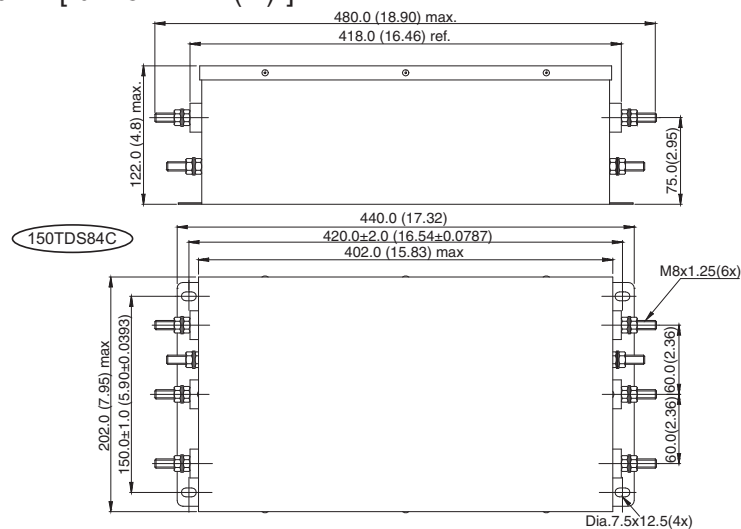
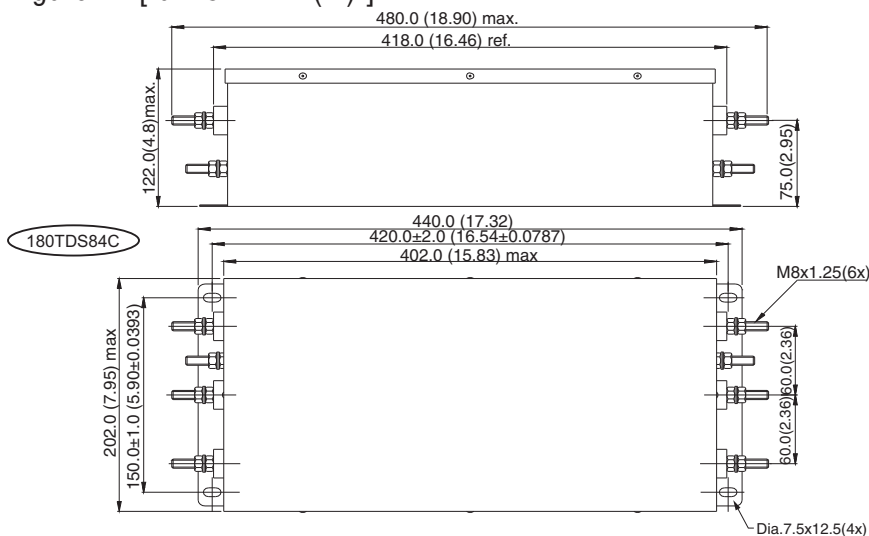


Figure 12 [units = mm (in)]



GS/DURAPULSE Accessories – EMI Filters

Figure 13 [units = mm (in)]

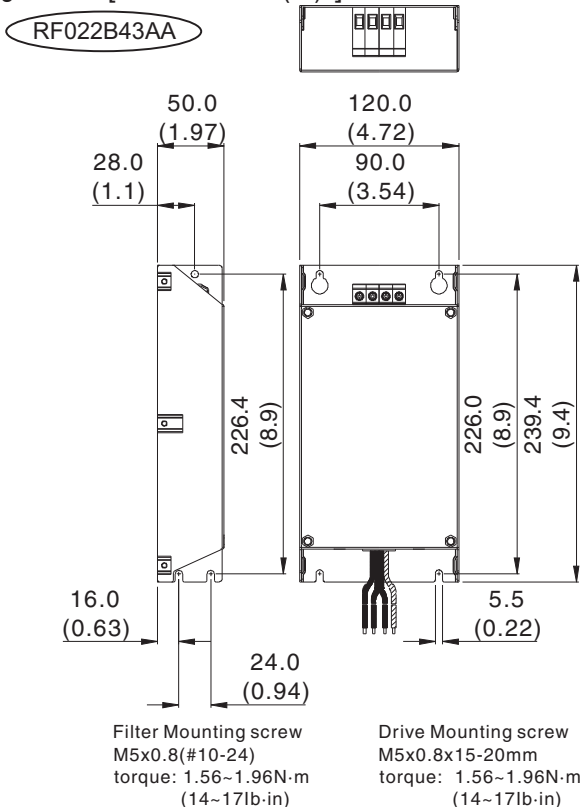


Figure 14 [units = mm (in)]

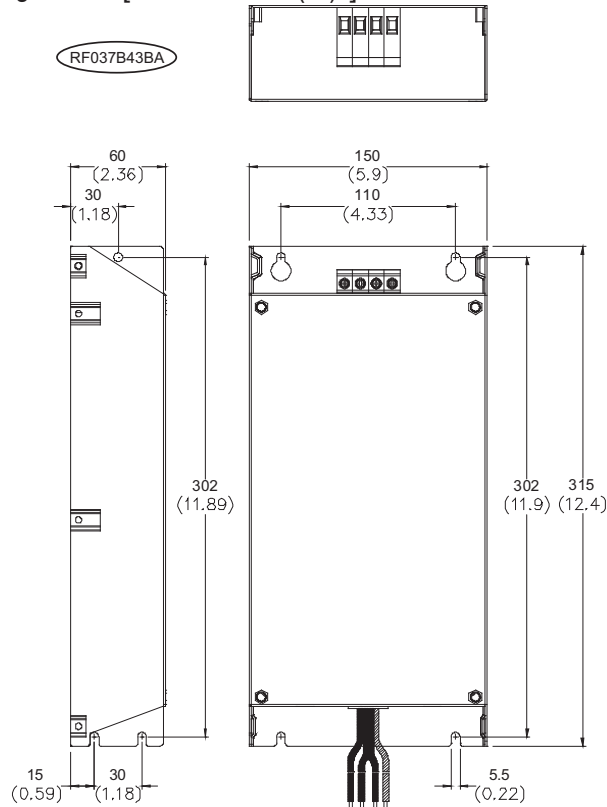


Figure 15 [units = mm (in)]

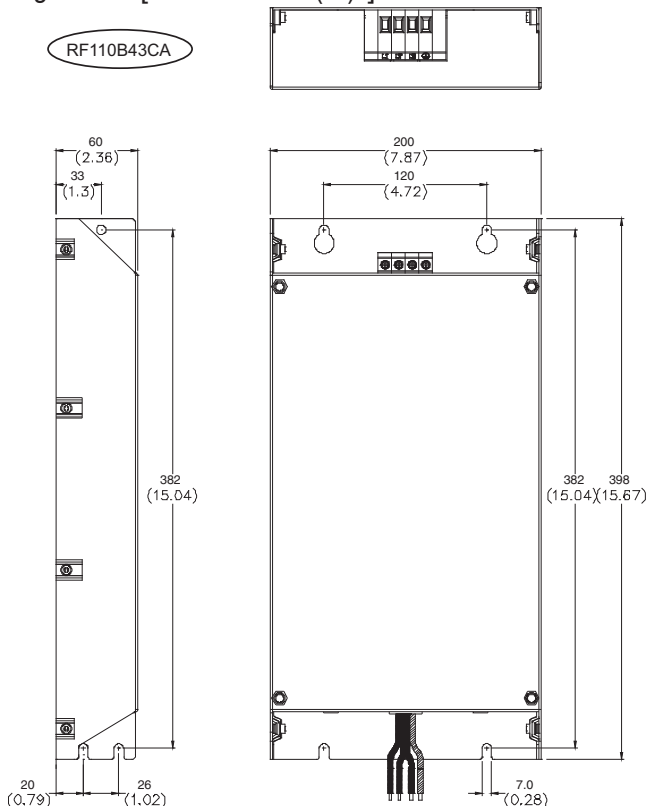
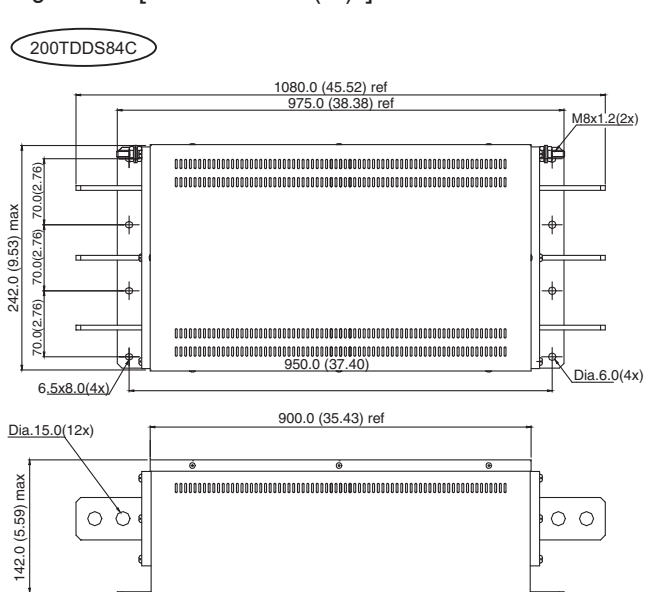


Figure 16 [units = mm (in)]



GS/DURAPULSE Accessories – RF Filter

RF Filter for GS/DURAPULSE AC Drives

Part Number	Price	Drive Model
RF220X00A	<--->	GSx-xxxx

Can be used with all series GS/DURAPULSE AC drives

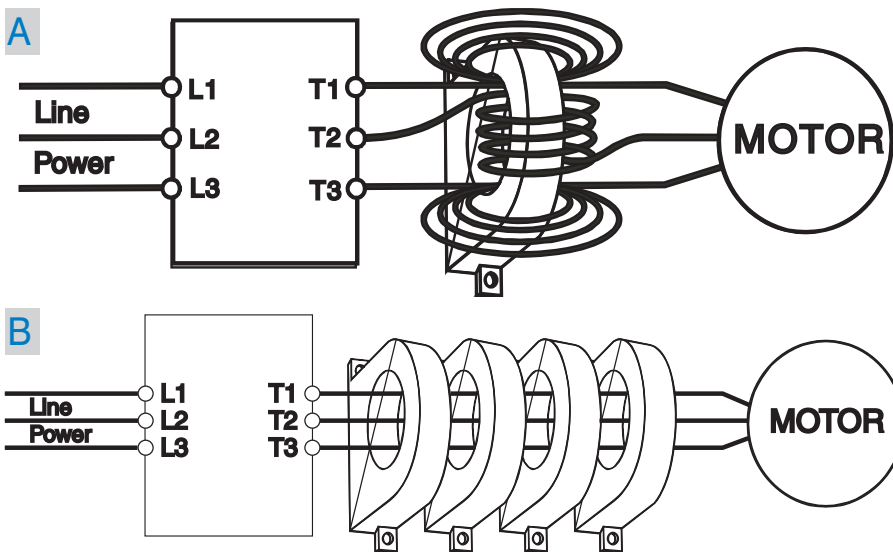
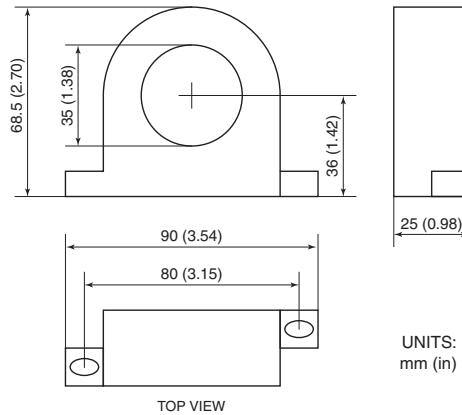
Description

Zero phase reactors, (aka RF noise filters) help reduce radiated noise from the inverter wiring. The wiring must go through the opening to reduce the RF component of the electrical noise. Loop the wires three times (four turns) to attain the full RF filtering effect. For larger wire sizes, place multiple zero-phase reactors (up to four) side by side for a greater filtering effect. These are effective for noise reduction on both the input and output sides of the inverter. Attenuation quality is good in a wide range from AM band to 10 Mhz.

Wiring Method

Wind each wire four times around the core, as shown in diagram A to the right. The reactor must be put at inverter side as closely as possible.

If you are unable to wire as above due to wire size or another aspect of your application, put all wires through four cores in series without winding, as in diagram B to the right.



GS/DURAPULSE Accessories – Fusing

Fusing Overview

Circuit protection devices are essential to prevent costly damage to your AC drive application equipment. Fuses and fuse kits are available from AUTOMATIONDIRECT for the GS2 and DURAPULSE AC drives. (AutomationDirect GS style fuses and fuse

kits are NOT available for GS1 drives at this time.)

The fuse specifications are shown in the table below. Each fuse kit consists of one fuse block and fuses sized to handle the inrush current while providing superior protection for the corresponding GS2 or DURAPULSE AC drive. The larger drives in

the DURAPULSE family require three fuse kits (one per phase). Their part numbers are marked in the table with a double asterisk.

Replacement fuses are also available, and listed in the table next to their companion fuse kits.

Fuse Kit Specifications for GS2 and DURAPULSE 115~460V Drives									
Fuse Kit *	Price	Fuse Block Type	Wire Range	Fuse Type	Fuse Block Dimensions	Fuse Rating	Replacement Fuses (5 fuses per package)	Price	
GS-10P2-FKIT-1P**	<---	Two-pole	Al/Cu #2-14	A3T	Figure 1	300V@20A	GS-10P2-FUSE-1P	<---	
GS-10P5-FKIT-1P**	<---					300V@20A	GS-10P5-FUSE-1P	<---	
GS-11P0-FKIT-1P**	<---					300V@20A	GS-11P0-FUSE-1P	<---	
GS-20P5-FKIT-1P	<---					300V@20A	GS-20P5-FUSE-1P	<---	
GS-20P5-FKIT-3P	<---	Three-pole			Figure 2	300V@10A	GS-20P5-FUSE-3P	<---	
GS-21P0-FKIT-1P	<---	Two-pole			Figure 1	300V@30A	GS-21P0-FUSE-1P	<---	
GS-21P0-FKIT-3P	<---	Three-pole			Figure 2	300V@20A	GS-21P0-FUSE-3P	<---	
GS-22P0-FKIT-1P	<---	Two-pole			Figure 1	300V@45A	GS-22P0-FUSE-1P	<---	
GS-22P0-FKIT-3P	<---	Three-pole			Figure 2	300V@25A	GS-22P0-FUSE-3P	<---	
GS-23P0-FKIT-1P	<---	Two-pole			Figure 1	300V@60A	GS-23P0-FUSE-1P	<---	
GS-23P0-FKIT-3P	<---				Al/Cu 2/0-#6	Figure 2	300V@40A	GS-23P0-FUSE-3P	<---
GS-25P0-FKIT	<---						300V@60A	GS-25P0-FUSE	<---
GS-27P5-FKIT	<---					Figure 9	300V@100A	GS-27P5-FUSE	<---
GS-2010-FKIT	<---					Figure 4	300V@125A	GS-2010-FUSE	<---
GS-2015-FKIT	<---	300V@175A			GS-2015-FUSE		<---		
GS-2020-FKIT	<---		Al/Cu 2/0-#6		Figure 5	300V@250A	GS-2020-FUSE	<---	
GS-2025-FKIT	<---					300V@300A	GS-2025-FUSE	<---	
GS-2030-FKIT	<---					300V@350A	GS-2030-FUSE	<---	
GS-2040-FKIT***	<---	One-pole			Figure 6 ***	300V@450A	GS-2040-FUSE	<---	
GS-2050-FKIT***	<---	One-pole				300V@500A	GS-2050-FUSE	<---	
GS-41P0-FKIT	<---	Three-pole	Al/Cu #2-14	A6T	Figure 7	600V@10A	GS-41P0-FUSE	<---	
GS-42P0-FKIT	<---					600V@15A	GS-42P0-FUSE	<---	
GS-43P0-FKIT	<---					600V@20A	GS-43P0-FUSE	<---	
GS-45P0-FKIT	<---					600V@30A	GS-45P0-FUSE	<---	
GS-47P5-FKIT	<---		Figure 8		600V@50A	GS-47P5-FUSE	<---		
GS-4010-FKIT	<---		Figure 9		600V@70A	GS-4010-FUSE	<---		
GS-4015-FKIT	<---				600V@90A	GS-4015-FUSE	<---		
GS-4020-FKIT	<---		Figure 10		600V@125A	GS-4020-FUSE	<---		
GS-4025-FKIT	<---				600V@150A	GS-4025-FUSE	<---		
GS-4030-FKIT	<---	600V@175A			GS-4030-FUSE	<---			
GS-4040-FKIT***	<---	One-pole	Al/Cu 2/0-#6		Figure 11 ***	600V@225A	GS-4040-FUSE	<---	
GS-4050-FKIT***	<---					600V@250A	GS-4050-FUSE	<---	
GS-4060-FKIT***	<---					600V@350A	GS-4060-FUSE	<---	
GS-4075-FKIT***	<---					600V@400A	GS-4075-FUSE	<---	
GS-4100-FKIT***	<---					600V@600A	GS-4100-FUSE	<---	
					Figure 12 ***	600V@600A	GS-4100-FUSE	<---	
NOTES:									
* - AutomationDirect GS style fuses and fuse kits are NOT available at this time for GS1 drives.									
** - Single phase 115V fuse kits are for use only with GS2 drives.									
*** - Kit includes three single-pole fuse blocks and three fuses.									

GS/DURAPULSE Accessories – Fusing

Company
Information

Systems
Overview

Programmable
Controllers

Field I/O

Software

C-more &
other HMI

Drives

Soft
Starters

Motors &
Gearbox

Steppers/
Servos

Motor
Controls

Proximity
Sensors

Photo
Sensors

Limit
Switches

Encoders

Current
Sensors

Pressure
Sensors

Temperature
Sensors

Pushbuttons/
Lights

Process

Relays/
Timers

Comm.

Terminal
Blocks &
Wiring

Power

Circuit
Protection

Enclosures

Tools

Pneumatics

Appendix

Product
Index

Part #
Index

Fuse Specifications for GS2 575V Drives					
GS2 Drive Model	Edison Fuse Block	Fuse Block Type	Fuse Class	Fuse Rating	Edison Fuses (10 fuses per pack)
GS2-51P0	BC6033PQ or CHCC3D or CHCC3DI	3-pole or 3-pole modular or 3-pole modular indicating	CC	6A@600V	HCLR6
GS2-52P0				10A@600V	HCLR10
GS2-53P0				15A@600V	HCLR15
GS2-55P0				20A@600V	HCLR20
GS2-57P5				30A@600V	HCLR30
GS2-5010					
NOTE: Refer to the Edison Fuses section of this catalog for pricing, specifications, and dimensions.					

Fuse Block Dimensions

Units = inches

Figure 1

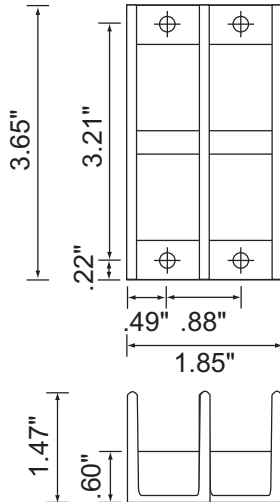


Figure 2

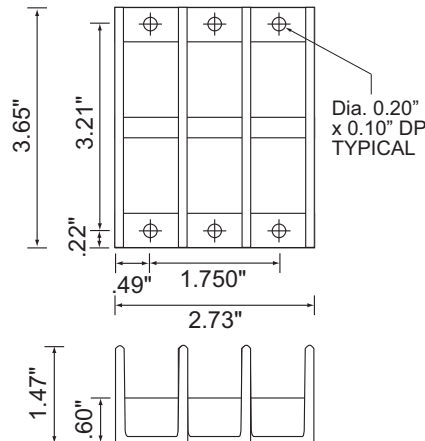


Figure 3

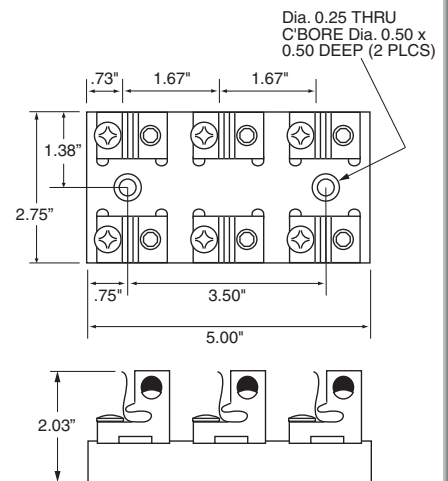


Figure 4

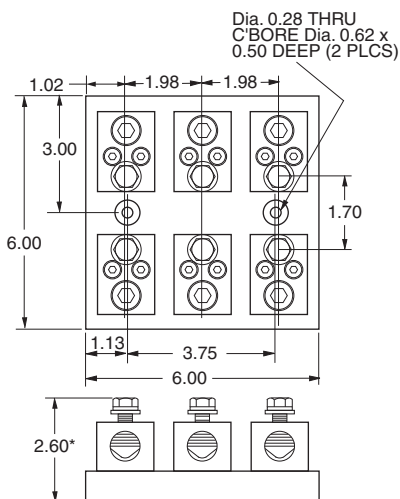


Figure 5

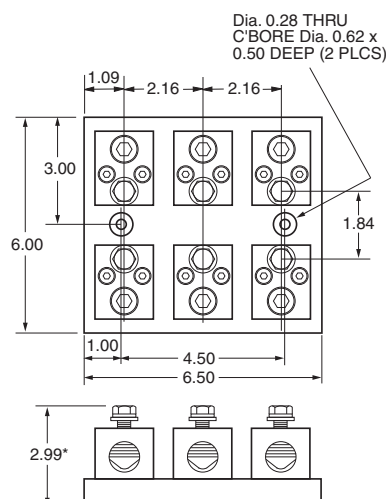
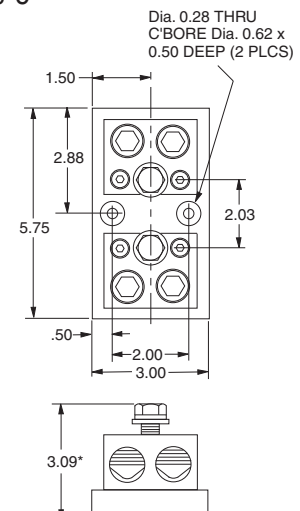


Figure 6



GS/DURAPULSE Accessories – Fusing

Fuse Block Dimensions

Units = inches

Figure 7

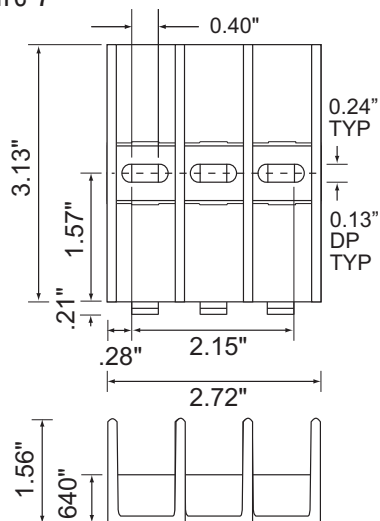


Figure 8

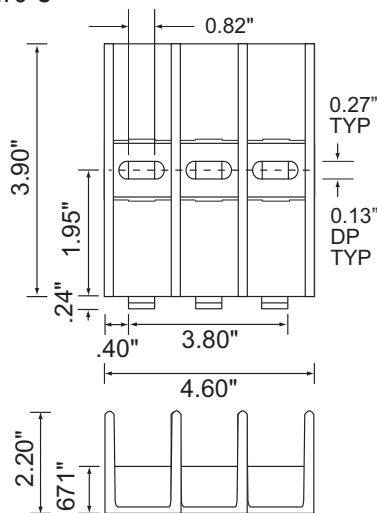


Figure 9

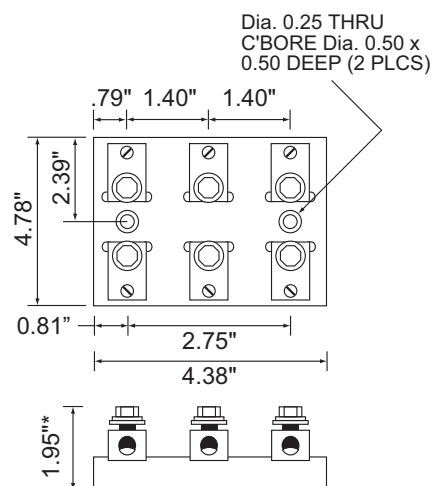


Figure 10

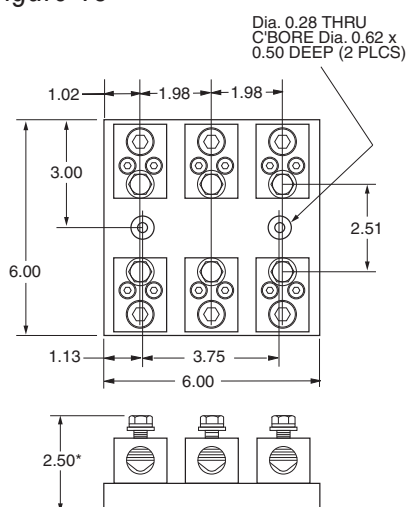


Figure 11

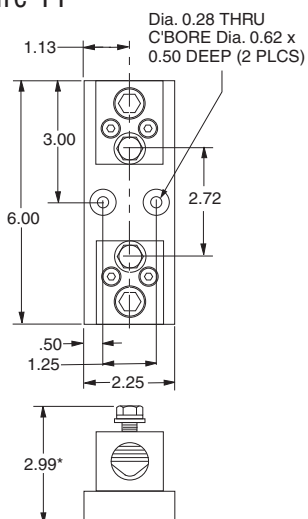
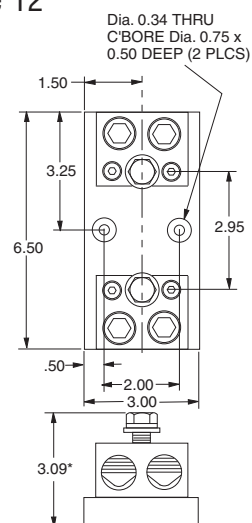


Figure 12



* Height includes nominal fuse blade thickness.

Volume 13

e13-70

Drives/Motors/Motion

1 - 800 - 633 - 0405

GS/DURAPULSE Accessories – Ethernet Interface

Overview

The GS-EDRV Ethernet interface provides a high-performance Ethernet link between a control system and any GS or *DURAPULSE* AC drive. The GS-EDRV processes signals to and from the drive, mounts on a DIN rail, and connects the drive to an Ethernet hub or PC. It formats signals to conform with the Ethernet standard to the H2-ERM or H4-ERM, *KEPDirect* EBC I/O server (as shown on the following page), or independent controller with a Modbus TCP/IP driver. This allows for greater connectivity to many control system architectures.

An additional feature is the built-in web browser which allows users to configure and control the drive from any web browser via the IP address of the GS-EDRV card.

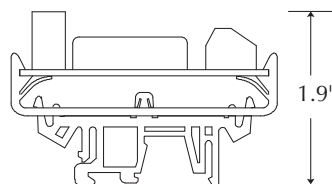
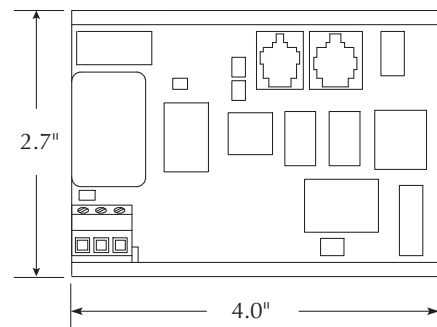
Note: The GS-EDRV requires an external 24 VDC power supply.

Automatic power shut-down

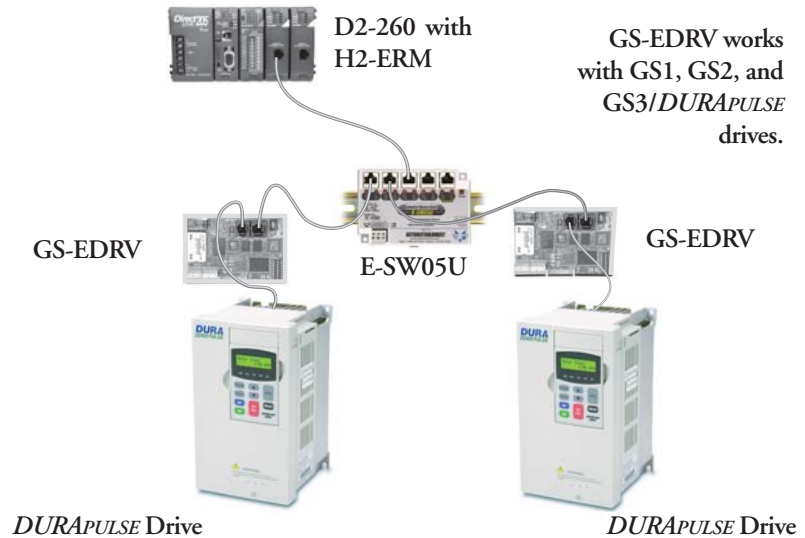
The GS series drives have a provision for shutting down control or power to the inverter in the event of a communications time-out. This function can be set up through the drive parameter group 9.

Specifications	
Part Number	GS-EDRV
Price	<--->
Input Voltage	10-33 VDC
Input Current	90-135 mA
Can be used with all series GS/DURAPULSE AC drives	

Dimensions

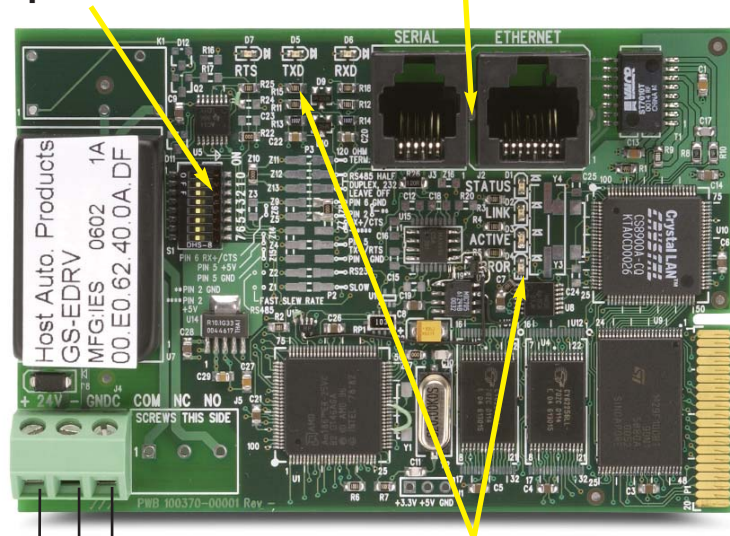


units: inches



Dip Switches

Communication Ports



LED Indicators

- Power Terminals
- Chassis or system ground connection
- Negative connection (-) or 0VDC
- Positive connection (+) or +24 VDC

GS/DURAPULSE Accessories – Software

KEPDirect I/O Server Overview

The KEPDirect EBC I/O server software is a 32-bit application that provides a way to connect your favorite Windows client software to AUTOMATIONDIRECT Ethernet I/O through our Ethernet base controllers. It provides GS/DURAPULSE series drive support via the GS-EDRV Ethernet interface, as shown in the diagram below. KEPDirect allows the user a direct line into the drive parameter group just like an Ethernet field I/O drop. The user can control or monitor from any OPC/DDE compliant third party software. For a complete description of KEPDirect software features, go to the Software section of this catalog. *Several application notes specific to the versatility of this software can be found on our web site at www.automationdirect.com.*

KEPDirect I/O Server Software		
Part Number	Description	Price
PC-KEPEBC-3	Supports up to three GS-EDRV or EBC nodes	<--->
PC-KEPEBC-7	Supports up to seven GS-EDRV or EBC nodes	<--->
PC-KEPEBC-8P	Supports eight or more GS-EDRV or EBC nodes	<--->
PC-KEPEBC-UPG	Upgrade to next larger package	<--->

Can be used with all series GS/DURAPULSE AC drives;
Requires GS-EDRV Ethernet interface.

CMMS and Condition Monitoring of Drives and Hardware Applications

Condition monitoring is usually the last part of CMMS (Computer Maintenance Management Software) implementation to be explored. It is expensive and difficult to use. Traditionally, the CMMS companies have used custom built data acquisition (DAQ) boards to monitor systems for values like vibration or temperature.

Technologies such as KEPDirect, GS/DURAPULSE drives, and Terminator field I/O are perfect matches to allow the user to dispose of expensive proprietary DAQ boards. In addition to the cost savings, the intuitive set-up will reduce implementation.

These will become the standard tools that monitor control loop performance on-line and in real time. These tools enable continuous monitoring of control loops, and instant notification of operational deviations as they occur. Using OPC to tie these systems into CMMS provides tracking and automatic evaluation of your soft and hard assets. It also enables easy tracking of true operational and maintenance costs associated with those assets. Personnel can focus on fixing the cause of the problem, and not just the symptom.

Larger Scale Asset Management Applications

On a larger scale, such as Asset Management Software, there is too much information to directly link to the software (many of them are OPC/DDE compliant). There must be a buffer of some type. Usually this buffer is a SCADA type package that handles distribution of information gathered by condition monitoring field devices. KEPDirect and Terminator field I/O can connect as easily to the SCADA software as to any OPC compliant software.

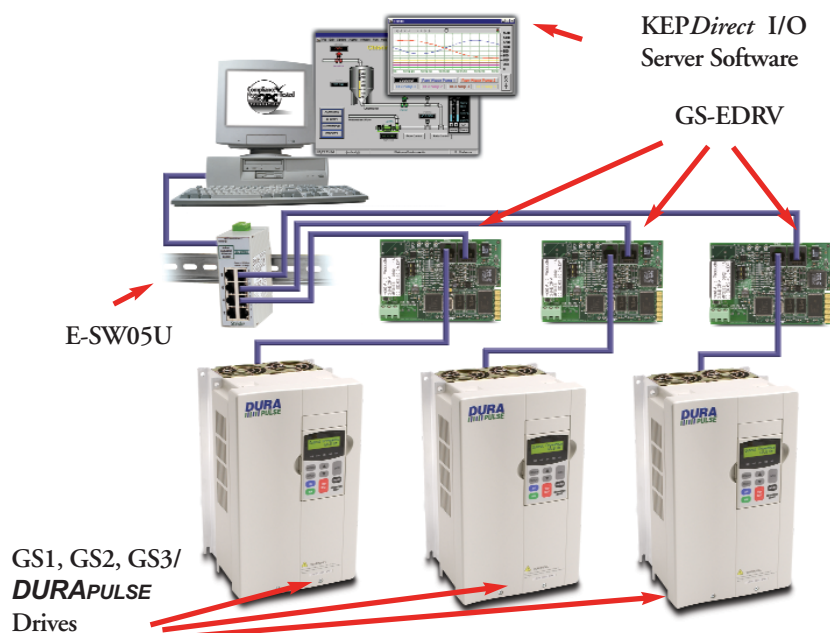
Major OPC Clients supported

- Rockwell Software RSVIEW32®
- GE's Cimplicity®
- Iconics' Genesis32®
- Cutler Hammer's PanelMate PC Pro
- Think & Do Live!
- Think & Do Studio
- Wonderware's In Touch® and OPLink®
- Intellution's Fix Dynamics® and OPC Power Tool®
- Siemens' WinCC®
- Kepware's OPC QuickClient
- BizWareDirect's DataNet OPC

System Requirements

To run KEPDirect I/O Server, your PC must meet the following requirements:

- Pentium CPU, 400 Mhz clock speed
- Windows 98, NT 4.0 SP5, 2000 or XP
- 64 MB free RAM and 10 MB free hard disk space



GS/DURAPULSE Accessories – Software



Overview

GSoft, the configuration software for the GS/DURAPULSE drives, allows a personal computer to be directly connected to the drives via RS-232 or RS-485 (RS-485 requires FA-ISOCAN or user supplied converter). You can perform a variety of functions to allow easy, intuitive, and secure set-up of any application that is required using GSoft.

System Requirements

To run GSoft, your PC must meet the following requirements:

- Windows 95, 98, Me, NT, 2000 or XP
- Internet Explorer 4.0 or higher (for HTML help support)
- 24 Mb of available memory
- 8Mb hard drive space
- Available RS-232 serial port

Features

- Create new drive configurations using one of three views:
 - Quick Start - Allows for just the basic set-up to get quick and simple applications up and running ASAP.
 - Detailed - The complete set-up of all parameters in the drive.
 - Schematic Views - Set up the drive using the interactive schematic view. Create a printable cad-like drawing at the same time for future documentation and maintenance-friendly activities.
- Upload/download drive configurations.
- Edit drive configuration.
- Archive/store multiple drive configurations on your PC.
- Trend drive operation parameters in real time.
- Maintenance keypad will allow the user to commission the drive from the PC, check rotation, and run a basic cycle.
- Live PID tuning with active tuning control. Take the difficulty out of PID tuning with a real time trend.
- View drive faults.
- OPC client with KEPDirect EBC I/O server over the Ethernet with the GS-EDRV option card
- Have a large system with KEPDirect already being used to supply information to your SCADA system? Now program online with drive changes.

GS/DURAPULSE AC Drive Software

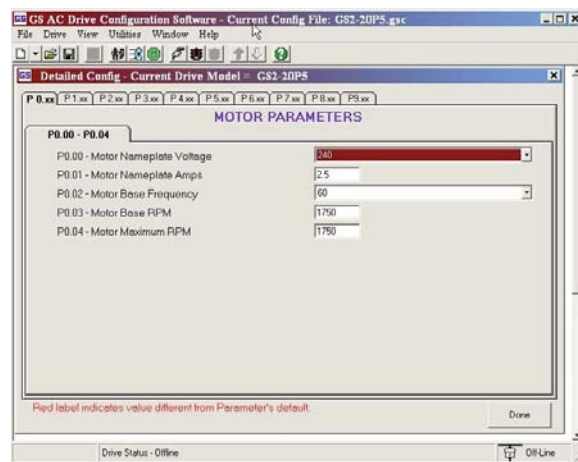
Part Number	Price	Description
GSOFT	<--->	configuration software
GS-232CBL	<--->	RS-232 cable
FA-ISOCAN	<--->	RS-232 to RS-422/485 converter with ANTE

Can be used with all series GS/DURAPULSE drives; FA-ISOCAN required for GS1 and DURAPULSE drives.

GSoft offers three software configuration methods

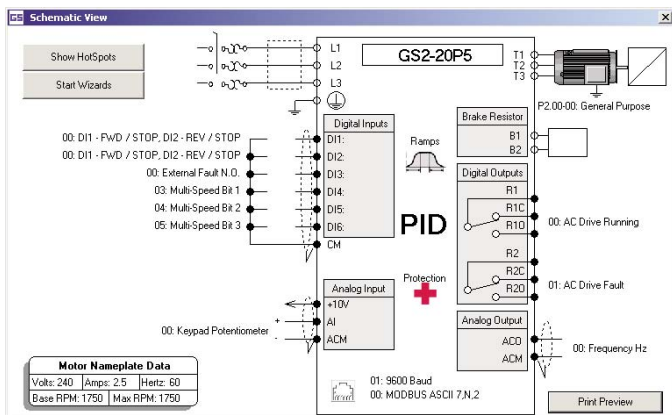
Detailed Configuration

The Detailed Configuration method provides AC drive parameter access in a tabbed dialog format. Detailed Configuration can be used for new or existing configurations.



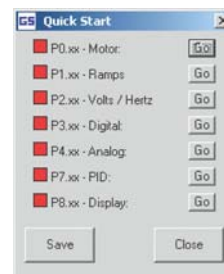
Schematic View Configuration

The Schematic View Configuration method uses a schematic picture of the AC drive and external connections to guide you through the setup of the AC drive. The Schematic View method can be used for new or existing configurations.



Quick Start Configuration

The Quick Start Configuration method guides you through the most commonly used AC drive parameters. Quick Start Configuration may ONLY be used to create a new configuration. Once created and saved, subsequent editing is done using the Detailed or Schematic View methods.



GS/DURApULSE Accessories – Miscellaneous



GS3-KPD



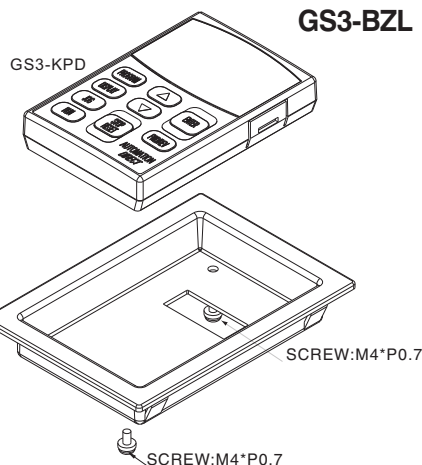
GS2-KPD



ZL-CDM-RJ12x4



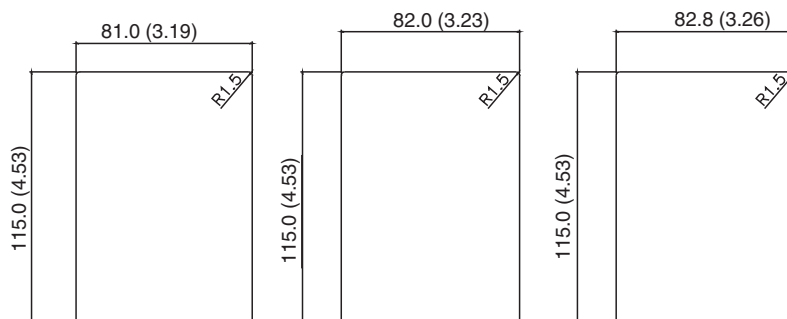
ZL-CDM-RJ12x10



GS3-BZL

The GS3-BZL Flush Mount Bezel Kit allows remote mounting of the DURApULSE removable keypad. The Bezel Kit has a Protected Chassis, IP20 enclosure rating. The thickness of the panel will determine required hole dimensions:

$$t = 1.0 (.0393) - 1.4 (.0551) \quad t = 1.6 (.629) - 2.0 (.0787) \quad t = 2.2 (.0866) - 3.0 (.1181)$$



GS-CBL2-1L



GS-CBL2-3L



GS-CBL2-5L

GS/DURApULSE Drives Miscellaneous Accessories

Part Number	Drive Model	Description	Price
GS-232CBL	GS1, GS2, GS3/DURApulse	Configuration Cable required for GSoft configuration software	<--->
GS-CBL2-1L	GS2, GS3/DURApulse	One meter keypad cable (installation screws included)	<--->
GS-CBL2-3L	GS2, GS3/DURApulse	Three meter keypad cable (installation screws included)	<--->
GS-CBL2-5L	GS2, GS3/DURApulse	Five meter keypad cable (installation screws included)	<--->
GS2-KPD	GS2	Spare or replacement keypad for GS2 AC drives	<--->
GS3-KPD	GS3/DURApulse	Spare or replacement keypad for DURApulse AC drives; great for maintenance or back-up programs	<--->
GS3-BZL	GS3/DURApulse	Flush Mount Bezel Kit for remote mounting of the DURApulse removable keypad	<--->
ZL-CDM-RJ12x4	GS1, GS2, GS3/DURApulse	ZIPLink 4-port communication distribution module, 4 RJ12 ports, and 1 screw terminal port	<--->
ZL-CDM-RJ12x10	GS1, GS2, GS3/DURApulse	ZIPLink 10-port communication distribution module, 10 RJ12 ports, and 1 screw terminal port	<--->

It is easier than you think to control the GS series and *DURAPULSE* drives from a *DirectLOGIC* or *CLICK* controller using Modbus RTU serial communications.

Step 1: Select a Drive

Using the chart below select the drive that fits your application needs.

Step 2: Select the Network/Protocol

Select the Network/Protocol that the drive uses.

Step 3: Select the PLC and Communication Port

Select the PLC and Communication port that works with the drive selected.

Step 4: Select a Cable

Select the cable (and adapter if needed) listed in the chart.

Note: If a PLC type or PLC port is not listed in the selection charts, it does not support Modbus RTU.

Step1	Step 3	CLICK	DL05	DL06	
		Port 2	Port 2	Port 1	Port 2
GS1	Step 2	Step 4			
		RS485 Modbus RTU	Not Possible	Not Possible	Not Possible
GS2	Step 2	RS232 Modbus RTU	Not Possible	GS-RJ12-CBL-2	Not Possible
		RS485 Modbus RTU	Not Possible	Not Possible	GS-485HD15-CBL
DuraPulse	Step 2	RS485 Modbus RTU	Not Possible	Not Possible	GS-485HD15-CBL

Step1	Step 3	D2-250-1	D2-260		D4-450
		Port 2	Port 1	Port 2	Port 1
GS1	Step 2	Step 4			
		RS485 Modbus RTU	Not Possible	Not Possible	GS-485HD15-CBL-2
GS2	Step 2	RS232 Modbus RTU	FA-15HD + GS-RJ12-CBL-2	Not Possible	FA-15HD + GS-RJ12-CBL-2
		RS485 Modbus RTU	Not Possible	Not Possible	GS-485HD15-CBL-2
DuraPulse	Step 2	RS485 Modbus RTU	Not Possible	Not Possible	GS-485HD15-CBL-2

ZIPLinks Connector Module and Cable specifications found in Section 29.

Note: GS and DURAPulse drives can be interfaced to the Productivity3000 controller either via serial Modbus line (see Web site for current Port Compatibility Chart) or via Ethernet using the EDRV module.



GS-RJ12-CBL-2



GS-485HD15-CBL-2



FA-15HD

Hitachi Drives Cross References

To find a suitable replacement for an SJ300 Hitachi drive, use the chart to the right to determine control mode(s) required, and the tables below to determine possible replacement part numbers. Suggested replacements do not necessarily have all control modes of the original, so appropriate drives will be application-dependent. Please call Tech Support if there are any replacement questions.

Drive Series	Volts/Hz	PID	Sensorless Vector	Full Flux Vector
L100	✓	✓		
SJ100	✓	✓	✓	
GS1	✓			
GS2	✓	✓		
DuraPulse (GS3)	✓	✓	✓	
SJ300	✓	✓	✓	✓

Hitachi SJ300 Cross Reference

Hitachi SJ300 AC Drives			Possible Replacements					
	Part No.	Horsepower	GS1	Price	GS2	Price	DuraPulse (GS3)	Price
230V	SJ300-004LFU	0.5 hp	GS1-20P5	<--->	GS2-20P5	<--->	GS3-21P0 * **	<--->
	SJ300-007LFU	1.0 hp	GS1-21P0	<--->	GS2-21P0	<--->	GS3-21P0 *	<--->
	SJ300-015LFU	2.0 hp	GS1-22P0 *	<--->	GS2-22P0	<--->	GS3-22P0 *	<--->
	SJ300-022LFU	3.0 hp			GS2-23P0	<--->	GS3-23P0 *	<--->
	SJ300-037LFU	5.0 hp			GS2-25P0 *	<--->	GS3-25P0 *	<--->
	SJ300-055LFU	7.5 hp			GS2-27P5 *	<--->	GS3-27P5 *	<--->
	SJ300-075LFU	10 hp					GS3-2010 *	<--->
	SJ300-110LFU	15 hp					GS3-2015 *	<--->
	SJ300-150LFU	20 hp					GS3-2020 *	<--->
	SJ300-185LFU	25 hp					GS3-2025 *	<--->
	SJ300-220LFU	30 hp					GS3-2030 *	<--->
460V	SJ300-007HFU	1.0 hp			GS2-41P0 *	<--->	GS3-41P0 *	<--->
	SJ300-015HFU	2.0 hp			GS2-42P0 *	<--->	GS3-42P0 *	<--->
	SJ300-022HFU	3.0 hp			GS2-43P0 *	<--->	GS3-43P0 *	<--->
	SJ300-040HFU	5.0 hp			GS2-45P0 *	<--->	GS3-45P0 *	<--->
	SJ300-055HFU	7.5 hp			GS2-47P5 *	<--->	GS3-47P5 *	<--->
	SJ300-075HFU	10 hp			GS2-4010 *	<--->	GS3-4010 *	<--->
	SJ300-110HFU	15 hp				<--->	GS3-4015 *	<--->
	SJ300-150HFU	20 hp				<--->	GS3-4020 *	<--->
	SJ300-185HFU	25 hp				<--->	GS3-4025 *	<--->
	SJ300-220HFU	30 hp				<--->	GS3-4030 *	<--->

Notes: Replacement drives do not necessarily have the same physical dimensions, mounting hole patterns or wiring terminal arrangements.

* = All SJ300 drives are specified for use with 3-phase power (but can be installed in single phase applications). GS drives in red require 3-phase power. Ensure the existing SJ application uses 3-phase input power, or that 3-phase power is available.

** = Replacement drive is higher horsepower than existing drive. Output power of new drive can be parameter-limited to the smaller horsepower.

Hitachi Drives Cross References

To find a suitable replacement for an L100 or SJ100 Hitachi drive, use the chart to the right to determine control mode(s) required, and the tables below to determine possible replacement part numbers. Suggested replacements do not necessarily have all control modes of the original, so appropriate drives will be application-dependent. Please call Tech Support if there are any replacement questions.

Drive Series	Volts/Hz	PID	Sensorless Vector	Full Flux Vector
L100	✓	✓		
SJ100	✓	✓	✓	
GS1	✓			
GS2	✓	✓		
DuraPulse	✓	✓	✓	
SJ300	✓	✓	✓	✓

Hitachi L100 Cross Reference

Hitachi L100 AC Drives			Possible Replacements					
	Part No.	Horsepower	GS1	Price	GS2	Price	DuraPulse	Price
230V	L100-002NFU	0.25 hp	GS1-20P2	<--->	GS2-20P5 **	<--->	GS3-21P0 * **	<--->
	L100-004NFU	0.5 hp	GS1-20P5	<--->	GS2-20P5	<--->	GS3-21P0 * **	<--->
	L100-007NFU	1.0 hp	GS1-21P0	<--->	GS2-21P0	<--->	GS3-21P0 *	<--->
	L100-015NFU	2.0 hp	GS1-22P0 *	<--->	GS2-22P0	<--->	GS3-22P0 *	<--->
	L100-022NFU	3.0 hp			GS2-23P0	<--->	GS3-23P0 *	<--->
	L100-037LFU	5.0 hp			GS2-25P0	<--->	GS3-25P0	<--->
	L100-055LFU	7.5 hp			GS2-27P5	<--->	GS3-27P5	<--->
	L100-075LFU	10 hp					GS3-2010	<--->
460V	L100-004HFU	0.5 hp			GS2-41P0 **	<--->	GS3-41P0 **	<--->
	L100-007HFU	1.0 hp			GS2-41P0	<--->	GS3-41P0	<--->
	L100-015HFU	2.0 hp			GS2-42P0	<--->	GS3-42P0	<--->
	L100-022HFU	3.0 hp			GS2-43P0	<--->	GS3-43P0	<--->
	L100-040HFU	5.0 hp			GS2-45P0	<--->	GS3-45P0	<--->
	L100-055HFU	7.5 hp			GS2-47P5	<--->	GS3-47P5	<--->
	L100-075HFU	10 hp			GS2-4010	<--->	GS3-4010	<--->

Notes: Replacement drives do not necessarily have the same physical dimensions, mounting hole patterns or wiring terminal arrangements.

* = Replacement drive requires 3-phase input power. Ensure the existing application uses 3-phase input power, or that 3-phase power is available.

** = Replacement drive is higher horsepower than existing drive. Output power of new drive can be parameter-limited to the smaller horsepower.

Hitachi SJ100 Cross Reference

Hitachi SJ100 AC Drives			Possible Replacements					
	Part No.	Horsepower	GS1	Price	GS2	Price	DuraPulse	Price
230V	SJ100-002NFU	0.25 hp	GS1-20P2	<--->	GS2-20P5 **	<--->	GS3-21P0 * **	<--->
	SJ100-004NFU	0.5 hp	GS1-20P5	<--->	GS2-20P5	<--->	GS3-21P0 * **	<--->
	SJ100-007NFU	1.0 hp	GS1-21P0	<--->	GS2-21P0	<--->	GS3-21P0 *	<--->
	SJ100-015NFU	2.0 hp	GS1-22P0	<--->	GS2-22P0	<--->	GS3-22P0 *	<--->
	SJ100-022NFU	3.0 hp			GS2-23P0	<--->	GS3-23P0 *	<--->
	SJ100-037LFU	5.0 hp			GS2-25P0	<--->	GS3-25P0	<--->
	SJ100-055LFU	7.5 hp			GS2-27P5	<--->	GS3-27P5	<--->
	SJ100-075LFU	10 hp					GS3-2010	<--->
460V	SJ100-004HFU	0.5 hp			GS2-41P0 **	<--->	GS3-41P0 **	<--->
	SJ100-007HFU	1.0 hp			GS2-41P0	<--->	GS3-41P0	<--->
	SJ100-015HFU	2.0 hp			GS2-42P0	<--->	GS3-42P0	<--->
	SJ100-022HFU	3.0 hp			GS2-43P0	<--->	GS3-43P0	<--->
	SJ100-040HFU	5.0 hp			GS2-45P0	<--->	GS3-45P0	<--->
	SJ100-055HFU	7.5 hp			GS2-47P5	<--->	GS3-47P5	<--->
	SJ100-075HFU	10 hp			GS2-4010	<--->	GS3-4010	<--->

Notes: Replacement drives do not necessarily have the same physical dimensions, mounting hole patterns or wiring terminal arrangements.

* = Replacement drive requires 3-phase input power. Ensure the existing application uses 3-phase input power, or that 3-phase power is available.

** = Replacement drive is higher horsepower than existing drive. Output power of new drive can be parameter-limited to the smaller horsepower.

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