ACCESSORIES

CONTENTS OF THIS CHAPTER

ACCESSORIES PART NUMBERING

With the exception of EMI filters, RF filters, and LR series line reactors, 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 below shows the accessory part numbering system.

GS - 22P0 - BR - 3PH

Description Code (optional)
1PH: Single phase   **3PH**: Three phase
ENC: Enclosure
Blank: For reactor, blank = 3-phase

Accessory Code
BR: Braking resistor   **BZL**: Bezel   **CBL**: Cable
DBU: Dynamic Brake Unit   **EDRV**: Ethernet board
FB: Feedback board   **FKIT**: Fuse Kit
FUSE: Replacement fuses for FKIT   **KPD**: Keypad
RS: Recommended Standard

Horsepower Rating
Example: **2P0** = 2.0 hp   **7P5** = 7.5 hp   **010** = 10 hp

Voltage Rating
1: 115V   **2**: 230V   **4**: 460V   **5**: 575V

Series
GS: All GS and DURApulse Series Drives
GS1: GS1 Series   **GS2**: GS2 Series
GS3: GS3 DURApulse Series
GS4: GS4 DURApulse Series

LINE REACTORS

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

Output line (load) reactors protect the motor insulation against AC drive short circuits and IGBT reflective wave damage, and also allow the motor to run cooler by "smoothing" the motor current waveform. They are recommended for operating "non-inverter-duty" motors, and for any motors where the length of wiring between the AC drive and motor is less than or equal to 100 feet. For AC drive-to-motor wiring distances over 100 feet, use of the VTF series output filter is recommended.

There are two types of AutomationDirect line reactors that can be used with GS1 AC Drives:

1)   the original GS series reactors (legacy),
2)   and the newer LR(2) series reactors.

LR(2) series reactors have differing mounting options depending on the model. Some have universal mounting feet with multiple slots, while others have direct bolt on or optional accessories for mounting. Review the specific mounting for each model.

LINE REACTOR SPECIFICATIONS – LR(2) SERIES

Line Reactors – LR(2) Series								
Part Number	**Dimension Drawing #**	**Rated Amps**	**Imped -ance**	**Watt Loss**	**System Voltage [1]**	**Phase – Use [1]**	**GS1 Drive Model**	**Drive HP**
LR-10P2-1PH [2][3]	1	5.8		8.0	120	1 – In	GS1-10P2	0.25
LR2-10P2-1PH [2]	13	10		21				
LR-10P5-1PH [2][3]	1	9.8		11.7			GS1-10P5	0.5
LR2-10P5-1PH [2]	13	12		29				
LR-20P5-1PH [2][3]	1	4.9		11.2	240	1 – In	GS1-20P2	0.25
LR2-20P5-1PH [2][4]	17	7.6		39			GS1-20P5	0.5
LR-20P5 [3]	3	2.4	3%	7	208/240	3 – Out	GS1-10P2	0.25
							GS1-10P5	0.5
LR2-20P5 [4]	16	5		30.6	240	3 – I/O	GS1-20P2	0.25
							GS1-20P5	0.5
LR-21P0-1PH [2]	1	8		15.9	240	1 – In	GS1-21P0	1
LR-21P0 [3]	3	4.6		11	208/240	3 – I/O		
LR2-21P0 [4]	17	11.6		64	240			
LR-22P0-1PH [2]	2	12		24.3	240	1 – In	GS1-22P0	2
LR-22P0 [3]	3	7.5		21	208/240	3 – I/O		
LR2-22P0 [4]	17	11.6		64	240			

1) Use (side of drive): In = input only; Out = output only; I/O = input or output.
   GS1-1xxx drives require 115V class input line reactors and 230V class output line reactors.
2) Single-phase line reactors are used only on the input side of GS1-1xxx drives. Single-phase line reactors should NOT be installed on the output side of AC drives.
3) This reactor is recommended for existing installations only; product will be discontinued after existing stock is depleted.
4) Optional mounting accessories are available for these models. See "LR2 Series Line Reactor Mounting Adapters" (below).

Part Number (repeated)	Wire Range (AWG)	Terminal Torque (lb·in)	Fasteners	Temperature Range		Environment
				Operating	**Storage**	
LR-10P2-1PH	18-12	10	#6-32x5/16in flathead screw	-40 – 104 °F [-40 – 40 °C]	-40 – 149 °F [-40 – 65 °C]	NEMA: open IP00 no corrosive gases
LR-10P5-1PH						
LR-20P5-1PH						
LR-20P5			#6-32x5/16in flathead screw			
LR-21P0-1PH						
LR-21P0						
LR-22P0-1PH		20				
LR-22P0		10				
LR2-10P2-1PH	18-12	10	6/40 x 5/16 flathead	104° [40°C] max		
LR2-10P5-1PH						
LR2-20P5-1PH	22-12	9	n/a - captive	122°F [50°C] max		
LR2-20P5						
LR2-21P0						
LR2-22P0						

| LR2 Series Line Reactor Mounting Adapters		
Part Number	**Description**	**Dimension Drawing**
LR2-AP1	Adapter Plate Kit; includes 2 flange nuts (10-32); Dimensions 4.45" x 2.63"	16a
LR2-AP2	Adapter Plate Kit; includes 2 flange nuts (10-32); Dimensions 4.45" x 3.51"	16b
LR2-DR1	DIN Rail Mounting Clips and Hardware Kit; includes 2 screws (M5-0.8 x 8mm), 2 washers, 2 clips	16c
LR2-DR2	DIN Rail Mounting Plate and Hardware Kit; includes 4 bolts (0.25-20 x 0.50) and 4 flange nuts	17a

LINE REACTOR DIMENSIONS – LR(2) SERIES

(UNITS = IN [MM])   SEE OUR WEBSITE: WWW.AUTOMATIONDIRECT.COM FOR COMPLETE ENGINEERING DRAWINGS

1) LR(2) Line Reactors Dimension Drawing #1
LR-10P2-1PH, LR-10P5-1PH, LR-20P5-1PH, LR-21P0-1PH
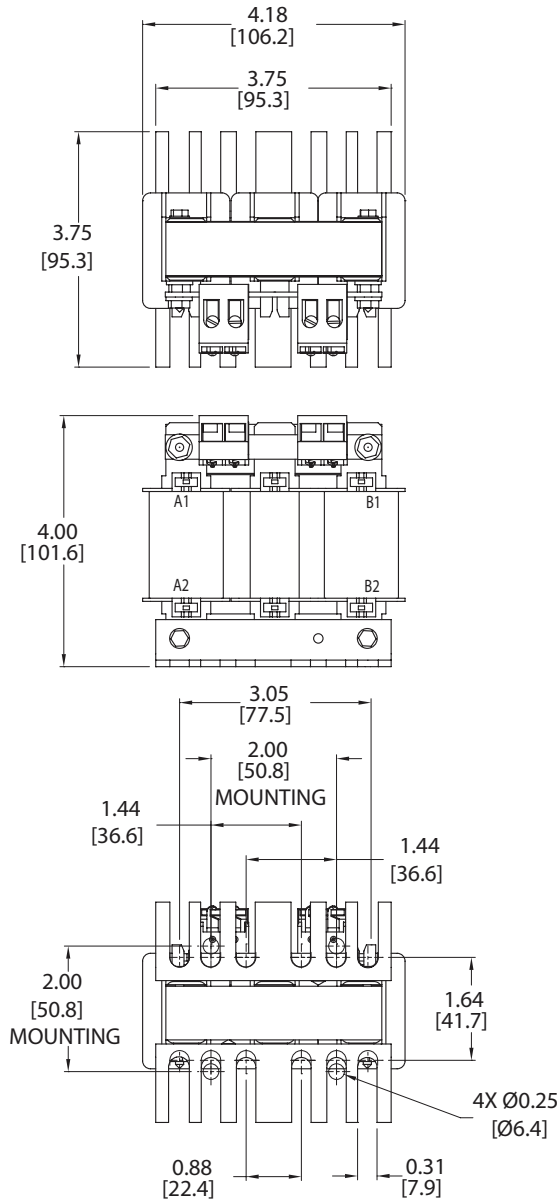
2) LR(2) Line Reactors Dimension Drawing #2
LR-22P0-1PH
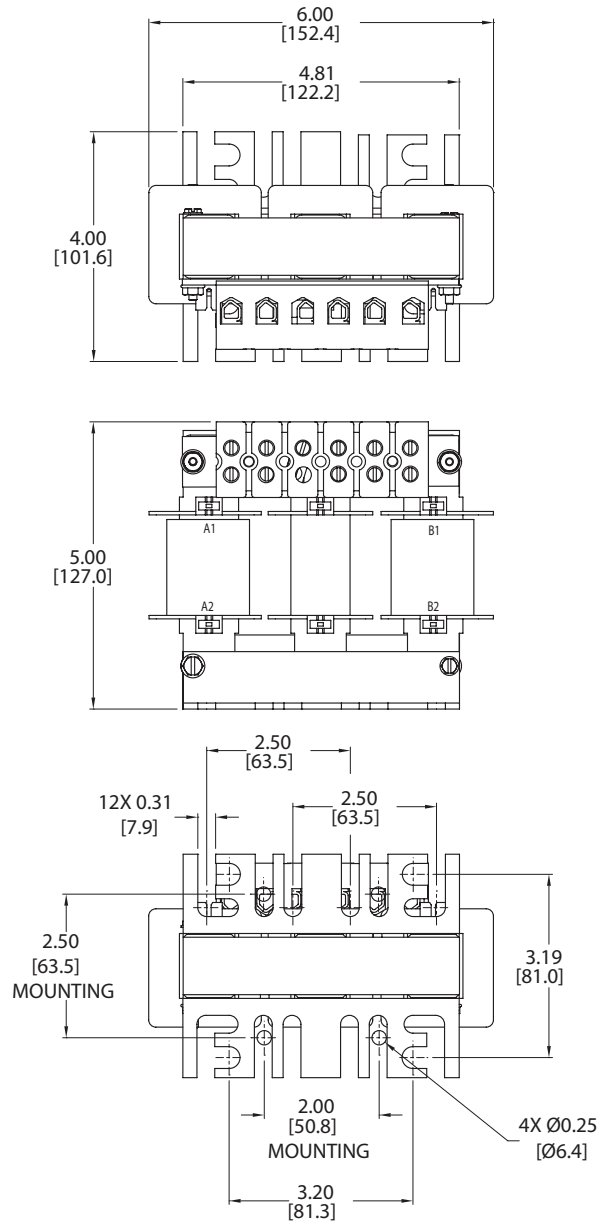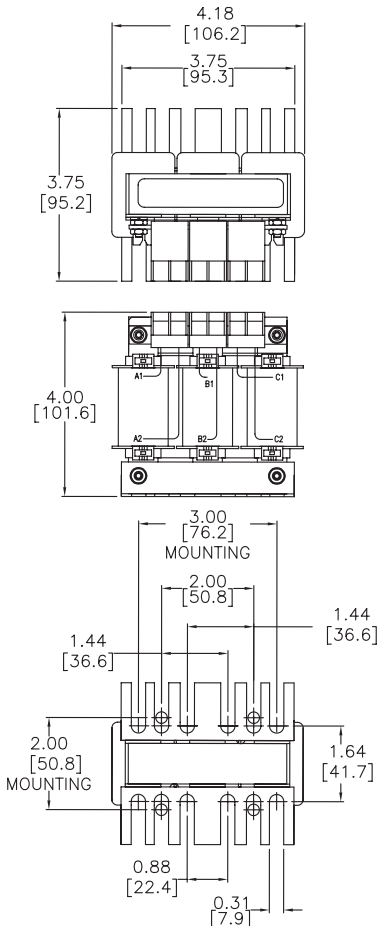
LINE REACTOR DIMENSIONS – LR(2) SERIES

(UNITS = IN [MM])   *SEE OUR WEBSITE: WWW.AUTOMATIONDIRECT.COM FOR COMPLETE ENGINEERING DRAWINGS*

4) LR(2) Line Reactors Dimension Drawing #4 through
12) LR(2) Line Reactors Dimension Drawing #12

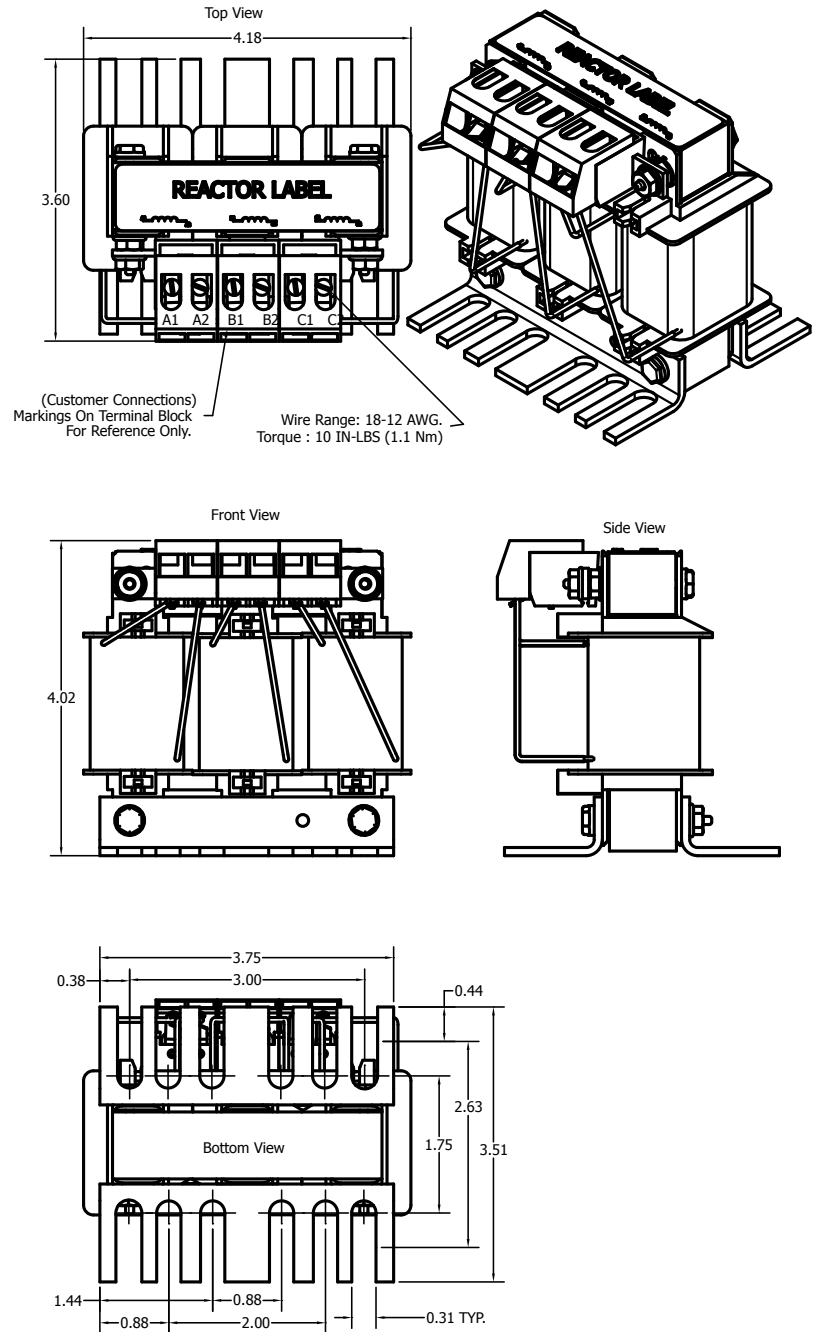*not applicable for GS1 AC Drives*

3) LR(2) Line Reactors Dimension Drawing #3
LR-20P5, LR-21P0, LR-22P0

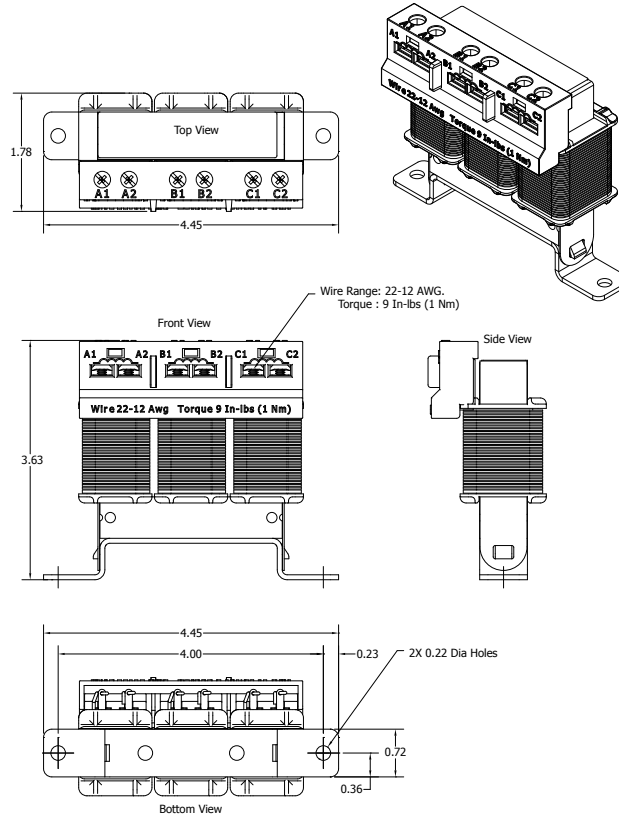**13) LR(2) Line Reactors Dimension Drawing #13**
LR2-10P2-1PH, LR2-10P5-1PH

Top View

4.18

REACTOR LABEL

A1 A2 B1 B2 C1 C

(Customer Connections)
Markings On Terminal Block
For Reference Only.

Wire Range: 18-12 AWG.
Torque : 10 IN-LBS (1.1 Nm)

Front View

Side View

Bottom View
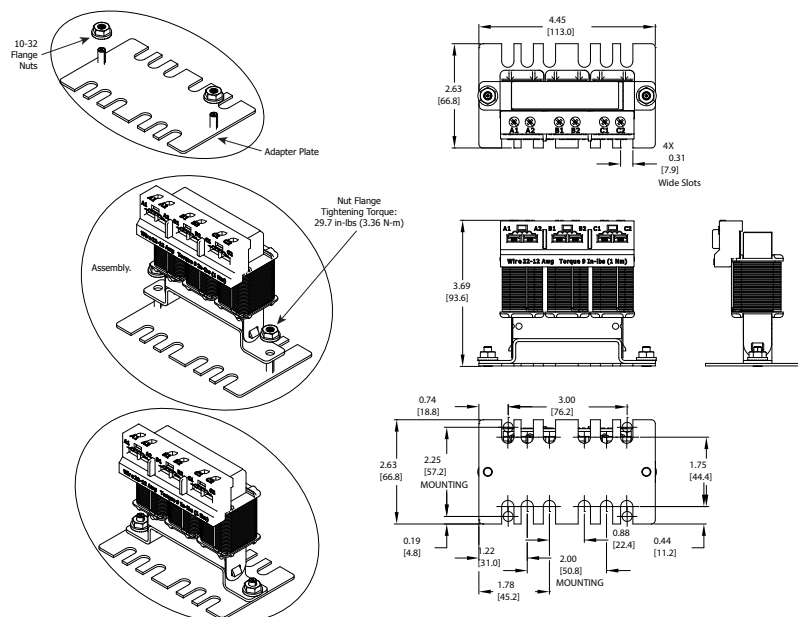
LINE REACTOR DIMENSIONS – LR(2) SERIES

(UNITS = IN [MM])   *SEE OUR WEBSITE: WWW.AUTOMATIONDIRECT.COM FOR COMPLETE ENGINEERING DRAWINGS*

14) LR(2) Line Reactors Dimension Drawing #14 through
15) LR(2) Line Reactors Dimension Drawing #15 _not applicable_ **for GS1 AC Drives**

16) LR(2) Line Reactors Dimension Drawing #16
LR2-52P0

16a) LR(2) Line Reactors Dimension Drawing #16a
LR2-AP1 Adapter Plate for Universal Mounting for: LR2-20P5
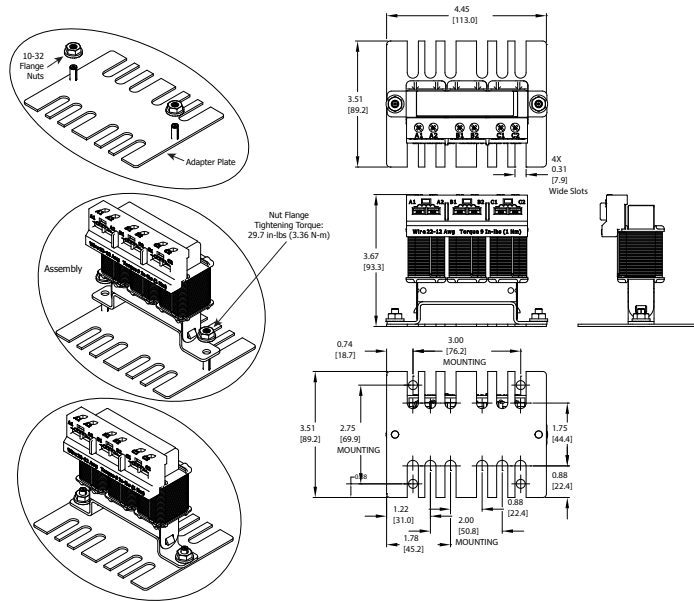
LINE REACTOR DIMENSIONS – LR(2) SERIES

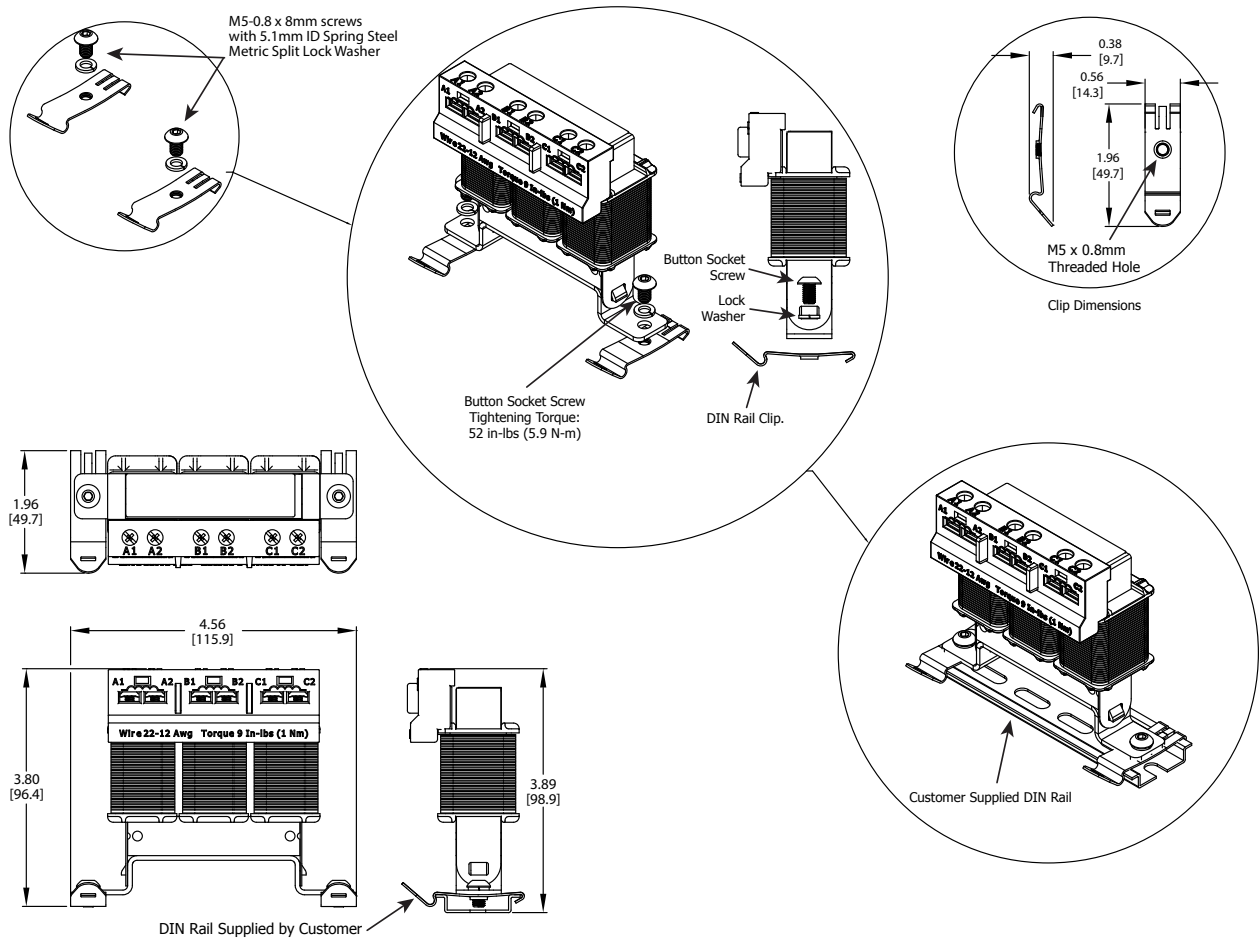*(UNITS = IN [MM])*   *SEE OUR WEBSITE: WWW.AUTOMATIONDIRECT.COM FOR COMPLETE ENGINEERING DRAWINGS*

16b) LR(2) Line Reactors Dimension Drawing # 16b
LR2-AP2 *Adapter Plate for Universal Mounting for:* LR2-20P5

16c) LR(2) Line Reactors Dimension Drawing #16c
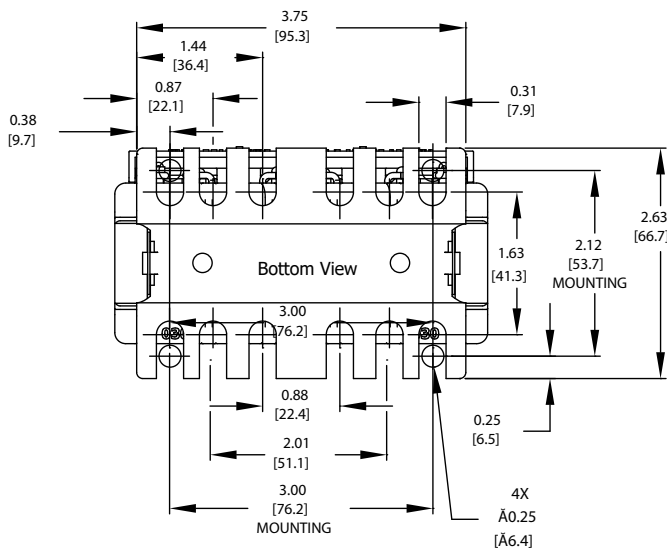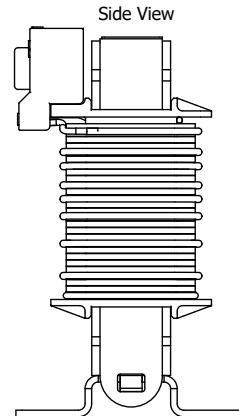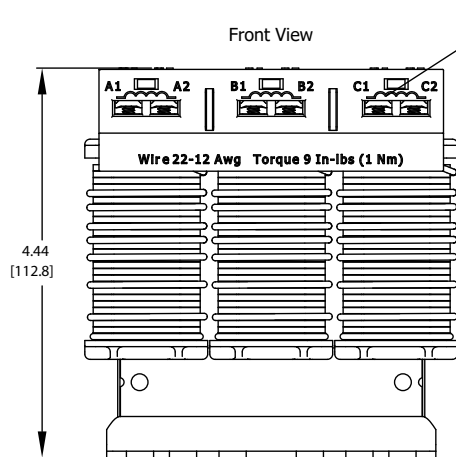**LR2-DR1** *Hardware Kit for DIN Rail Mounting for:* LR2-20P5

LINE REACTOR DIMENSIONS – LR(2) SERIES

(UNITS = IN [MM])   *SEE OUR WEBSITE: WWW.AUTOMATIONDIRECT.COM FOR COMPLETE ENGINEERING DRAWINGS*

17) LR(2) Line Reactors Dimension Drawing #17
LR2-20P5-1PH, LR2-21P0, LR2-22P0

4.25
[107.9]

2.64
[67.1]

Top View

A1 A2   B1 B2   C1 C2

A1 A2
B1 B2
C1 C2

Wire 22-12 Awg   Torque 9 In-lbs (1 Nm)

Front View

Wire Range: 22-12 AWG.
Torque : 9 In-lbs (1 Nm)

Side View

A1   A2   B1   B2   C1   C2

Wire 22-12 Awg   Torque 9 In-lbs (1 Nm)

4.44
[112.8]

3.75
[95.3]

1.44
[36.4]

0.87
[22.1]

0.31
[7.9]

0.38
[9.7]

Bottom View

2.63
[66.7]

1.63
[41.3]

2.12
[53.7]
MOUNTING

3.00
[76.2]

0.88
[22.4]

0.25
[6.5]

2.01
[51.1]

3.00
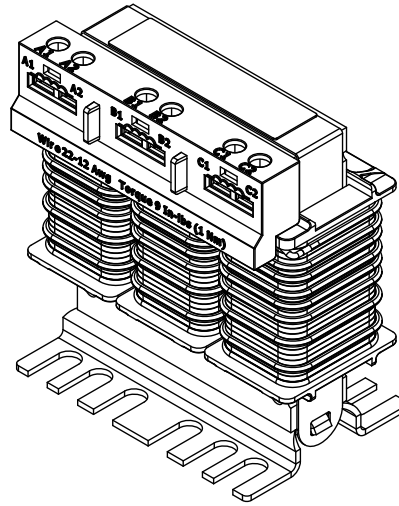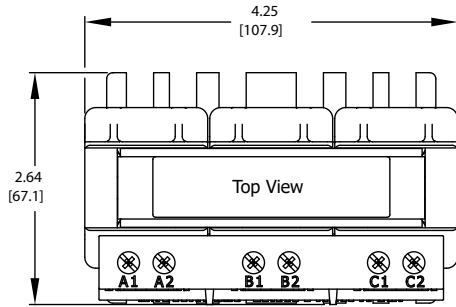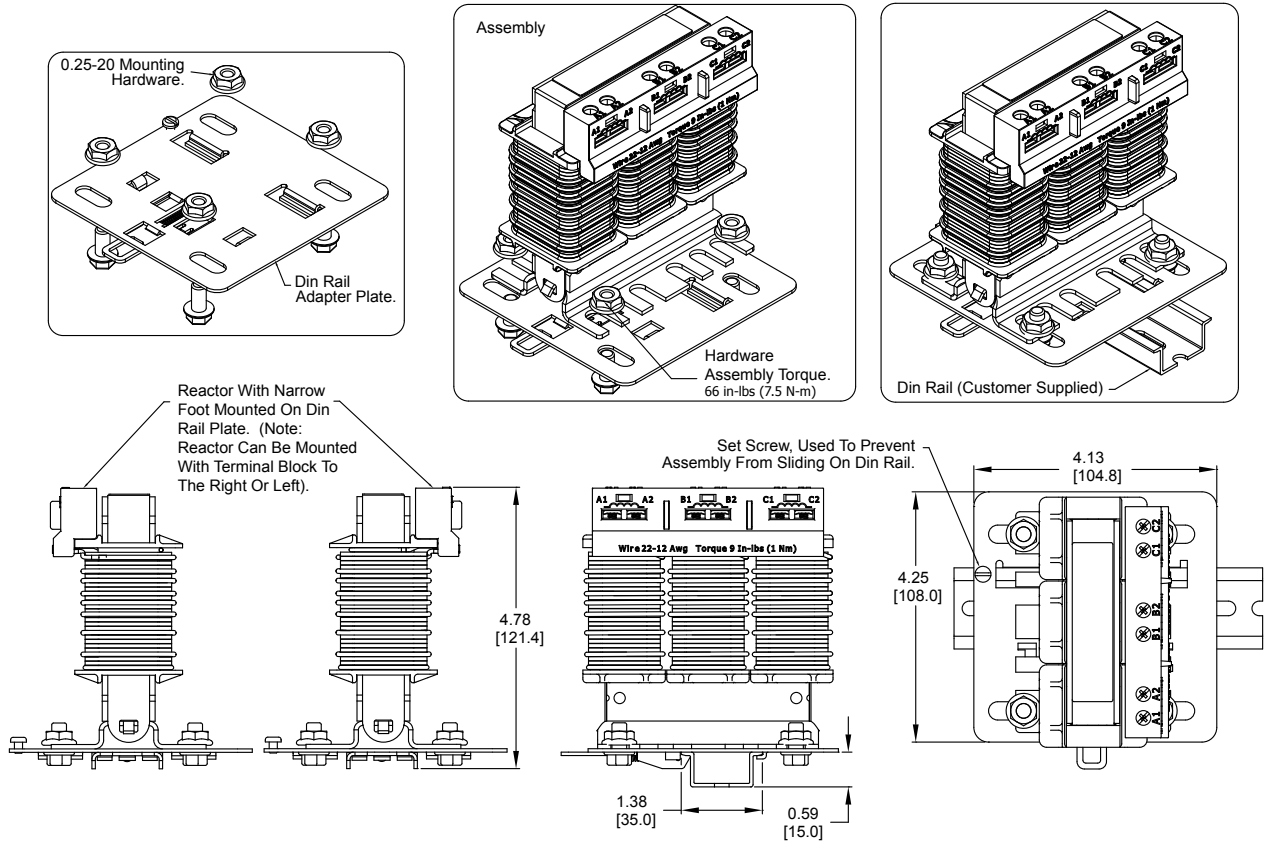[76.2]
MOUNTING

4X
Ã0.25
[Ã6.4]

LINE REACTOR DIMENSIONS – LR(2) SERIES

(UNITS = IN [MM])   SEE OUR WEBSITE: WWW.AUTOMATIONDIRECT.COM FOR COMPLETE ENGINEERING DRAWINGS

17a) LR(2) Line Reactors Dimension Drawing #17a
     LR2-DR2 *Hardware Kit for DIN Rail Mounting for:* LR2-20P5-1PH, LR2-21P0, LR2-22P0

0.25-20 Mounting Hardware.

Din Rail Adapter Plate.

Assembly

Hardware Assembly Torque. 66 in-lbs (7.5 N-m)

Din Rail (Customer Supplied)

Reactor With Narrow Foot Mounted On Din Rail Plate. (Note: Reactor Can Be Mounted With Terminal Block To The Right Or Left).

4.78 [121.4]

Set Screw, Used To Prevent Assembly From Sliding On Din Rail.

A1   A2   B1   B2   C1   C2

Wire 22-12 Awg   Torque 9 In-lbs (1 Nm)

1.38 [35.0]

0.59 [15.0]

4.13 [104.8]

4.25 [108.0]

C1 C2

B1 B2

A1 A2

### LINE REACTOR APPLICATIONS AND CONNECTIONS

INPUT SIDE OF AC 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 reactors will also reduce harmonic distortion from the AC Drive onto the line. Units are installed in front of the AC Drive as shown.
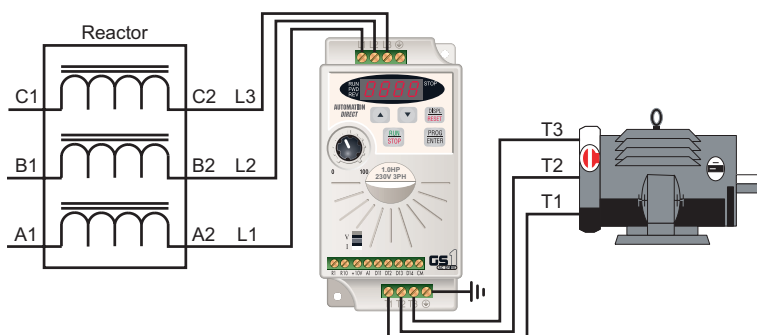
OUTPUT SIDE OF AC DRIVE

When installed on the output side of the AC Drive, line (load) 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.
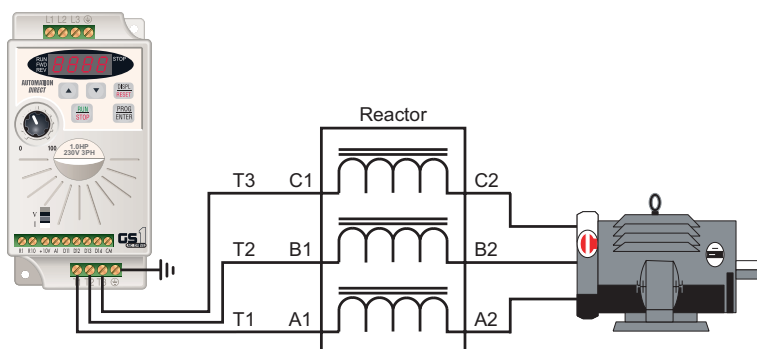
Single-phase line reactors should NOT be installed on the output of the AC Drive. Use only three-phase reactors on drive outputs, and only for three-phase motors.

If installing a line reactor on the output side of the drive, especially with motor lead lengths in excess of 75 feet, lower the drive PWM output carrier frequency to 4kHz in order to protect the line reactor from excess heating and possible damage.

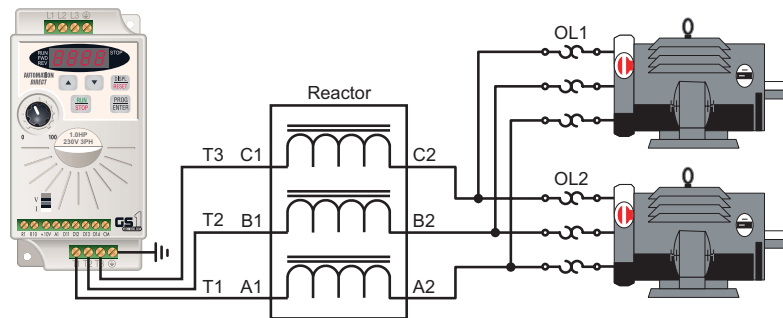*LINE REACTOR APPLICATIONS AND CONNECTIONS (CONTINUED)*

MULTIPLE AC DRIVES

Individual line reactors are recommended when installing multiple AC 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.
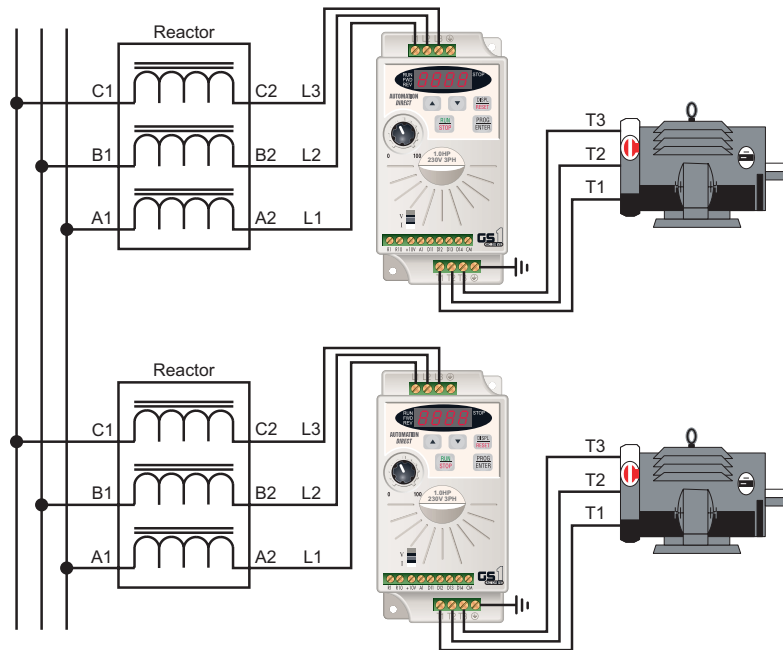
MULTIPLE MOTORS

A single output (load) reactor can be used for multiple motors on the same AC Drive, but only if the motors operate simultaneously. Size the reactor based upon the total horsepower of all the motors, and select a reactor with a current rating greater than the sum of the motor full-load currents. Overload relays are recommended for use in multi-motor applications.


A single reactor should be used with multiple motors ONLY when the motors will operate simultaneously from a single AC drive. OVERLOAD RELAYS are recommended for use in multiple motor applications.

LINE REACTOR APPLICATIONS AND CONNECTIONS (CONTINUED)

SINGLE-PHASE APPLICATIONS

Some of the line reactors are listed for use with single-phase input power. Follow the connection diagram shown below. Make sure that terminals B1 and B2, if present, are properly insulated before any connections are made.
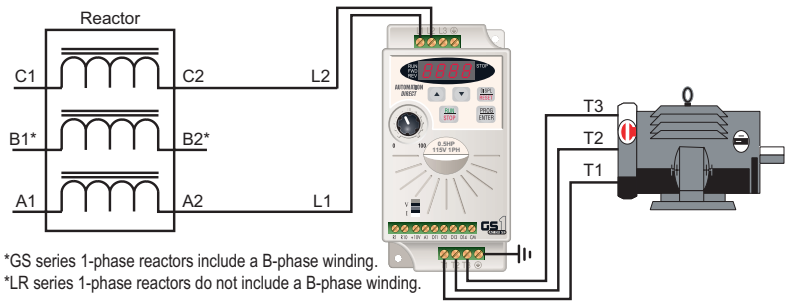
*GS series 1-phase reactors include a B-phase winding.
*LR series 1-phase reactors do not include a B-phase winding.

⚠ **WARNING:** *ENSURE THAT YOU PROPERLY INSULATE TERMINALS **B1** AND **B2** BEFORE MAKING ANY CONNECTIONS TO SINGLE-PHASE POWER.*

DRIVE OUTPUT FILTER

Extend the life of your motors and cables by reducing the harmful effects of voltage spikes due to voltage wave reflection. Voltage wave reflection is a function of the voltage rise time (dV/dT) and the length of the motor cables.

AutomationDirect VTF series drive output filters protect motors and cables by combining a patented dampening circuit with a low pass filter to increase the voltage rise time (dT out of dV/dT), thereby preventing voltage spikes from exceeding 1,000V.

- *Protect cable runs and reduce motor heating, noise, and vibration.*
- *Prevent motor failure with protection against motor insulation breakdown.*
- *Reduce Common Mode by a minimum of 30%.*
- *Improve system productivity and increase bearing life and up-time.*
- *Protect long lead lengths up to 1,000 feet.*

NOTE: Install Drive Output Filters on the output side of the AC Drive.

Drive Output Filters – VTF Series								
Part Number	**Rated HP**			**Max Rated Amps**	**Max Rated Voltage**	**Phases**	**GS1 Drive**		**Drive HP**
	230V	**460V**	**575V**				**w 1Ø Input**	**w 3Ø Input**	
VTF-46-DE	–	0.75	1	2	600	3	**GS1-10P2** **GS1-20P2**	**–** **GS1-20P2**	0.25 0.25
VTF-246-CFG	0.5	1.5	2	3			**GS1-10P5** **GS1-20P5**	**–** **GS1-20P5**	0.5 0.5
VTF-24-FH	1.5	3	–	6			**GS1-21P0**	**GS1-21P0**	1
VTF-246-GJJ	2	5	5	8			**–**	**GS1-22P0**	2

Part Number (repeated)	Wire Range (AWG)	Terminal Torque (lb·in)	Fasteners	Weight (lb)
VTF-46-DE	14–12	10	6/40 x 5/16 flathead	8
VTF-246-CFG				
VTF-24-FH				
VTF-246-GJJ				

DRIVE OUTPUT FILTER DIMENSIONS – VTF SERIES

(Units = in [mm])   See our website: www.AutomationDirect.com for complete engineering drawings

VTF-46-DE, VTF-246-CFG,   VTF-24-FH, VTF-246-GJJ
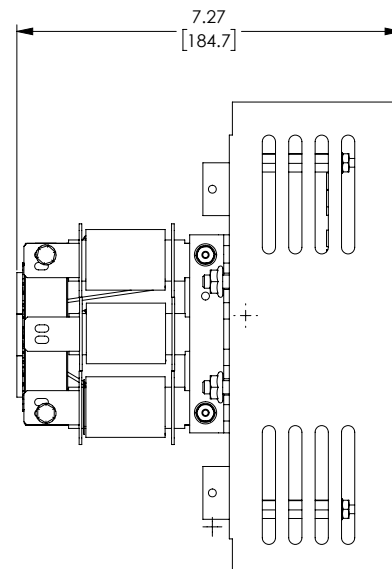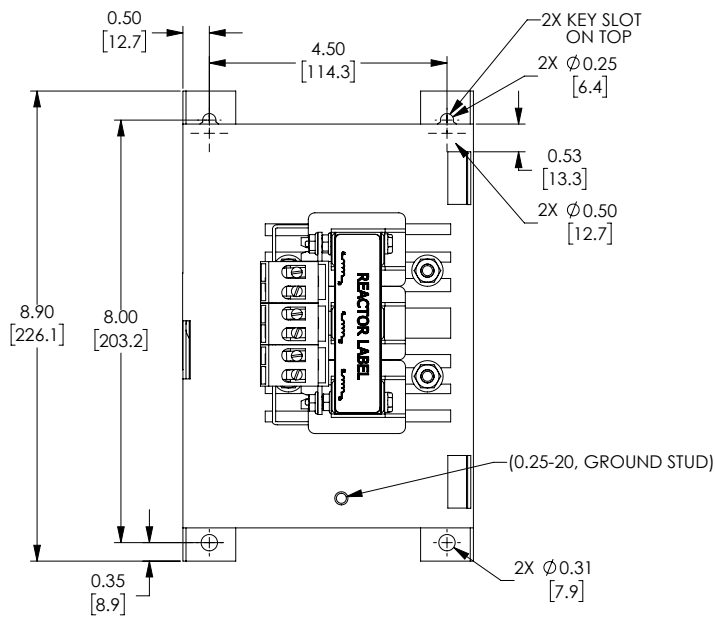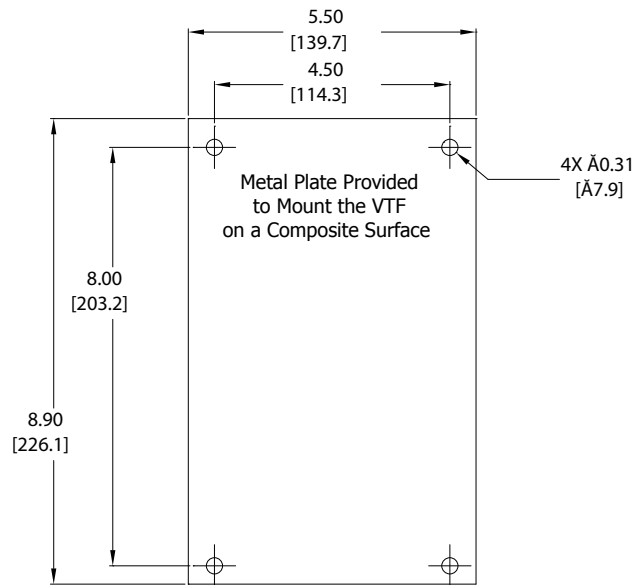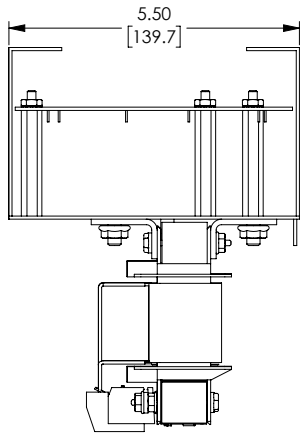
RF FILTER

RF Filter Part #: RF220X00A

RF Filters are used to reduce the radio frequency interference or noise on the input or output side of the drive. RF Filter RF220X00A can be used with all GS model drives.

RF FILTER DIMENSIONS

Units: inches[mm]

2.70 [68.5]
1.38 [35.0]
1.42 [36.0]
0.98 [25.0]
3.54 [90.0]
3.15 [80.0]
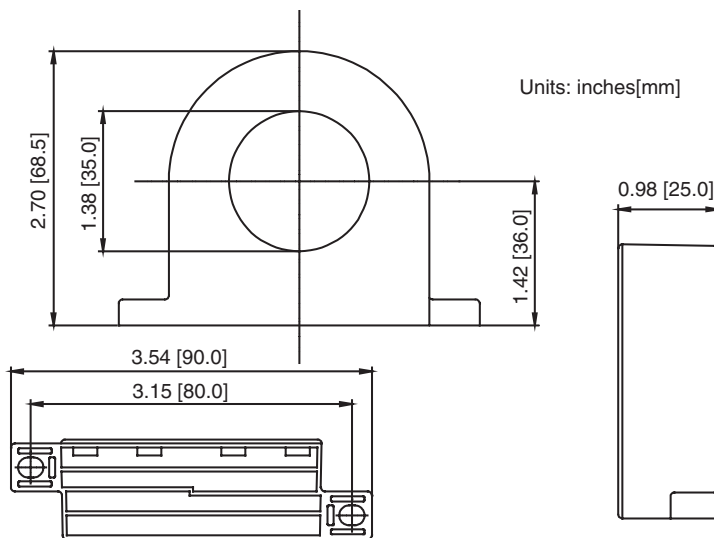
RF FILTER WIRING

Wind each wire four times around the core. The RF filter should be located as close as possible to the output side of the drive.

AC Drive

Power Supply

L1   T1
L2   T2
L3   T3

MOTOR

FUSES AND FUSE KITS

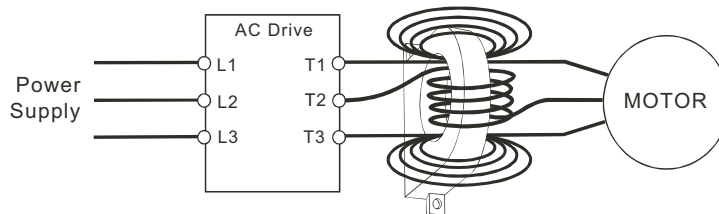Short-circuit and ground fault protection devices are essential to prevent costly damage to your AC Drive application equipment. Fuse kits are available from AutomationDirect for 115V and 230V GS1 AC Drives.

⚠️ **WARNING:** *THE FUSE KITS PROVIDE PROTECTION ONLY FOR THE SEMICONDUCTOR COMPONENTS INSIDE THE AC DRIVE. MOTOR BRANCH CIRCUIT OVERCURRENT PROTECTION SHOULD BE SEPARATELY PROVIDED PER APPLICABLE LOCAL CODES.*

The following fuse kits consist of one fuse block and fuses sized to match each GS1 Series AC Drive. Replacement fuses are also available, and their part numbers are listed in the table below.

Fuse Kit Specifications (for 115V & 230V GS1 drive models)								
Part Number	Drive Model / Phase	Fuse Block	Wire Size	Wire Connector Torque	Fuse Type	Dimen-sions	Fuse Rating	Replacement Fuses
GS-10P2-FKIT-1P*	GS1-10P2 / 1	2 pole				Figure 1	300V@20A	GS-10P2-FUSE-1P
GS-10P5-FKIT-1P*	GS1-10P5 / 1	2 pole				Figure 1	300V@30A	GS-10P5-FUSE-1P
GS-20P2-FKIT-1P	GS1-20P2 / 1	2 pole				Figure 1	300V@15A	GS-20P2-FUSE-1P
GS-20P2-FKIT-3P	GS1-20P2 / 3	3 pole				Figure 2	300V@10A	GS-20P2-FUSE-3P
GS-20P5-FKIT-1P	GS1-20P5 / 1	2 pole	Al/Cu #2-14	20 lb·in	A3T	Figure 1	300V@20A	GS-20P5-FUSE-1P
GS-20P5-FKIT-3P	GS1-20P5 / 3	3 pole				Figure 2	300V@10A	GS-20P5-FUSE-3P
GS-21P0-FKIT-1P	GS1-21P0 / 1	2 pole				Figure 1	300V@30A	GS-21P0-FUSE-1P
GS-21P0-FKIT-3P	GS1-21P0 / 3	3 pole				Figure 2	300V@20A	GS-21P0-FUSE-3P
GS-22P0-FKIT-3P	GS1-22P0 / 3	3 pole				Figure 2	300V@25A	GS-22P0-FUSE-3P

Short Circuit Current Rating (SCCR) = 200 kA
* Single-phase fuse kits contain a 2-pole fuseblock. Per NEC 240.22, fusing is correct only for the hot leg of a source; not for an intentionally grounded source conductor. The hot leg of a grounded 115VAC supply is the only supply line that should be fused.

FUSE BLOCK DIMENSIONS

Figure 1   (units = in [mm])   *Figure 2*
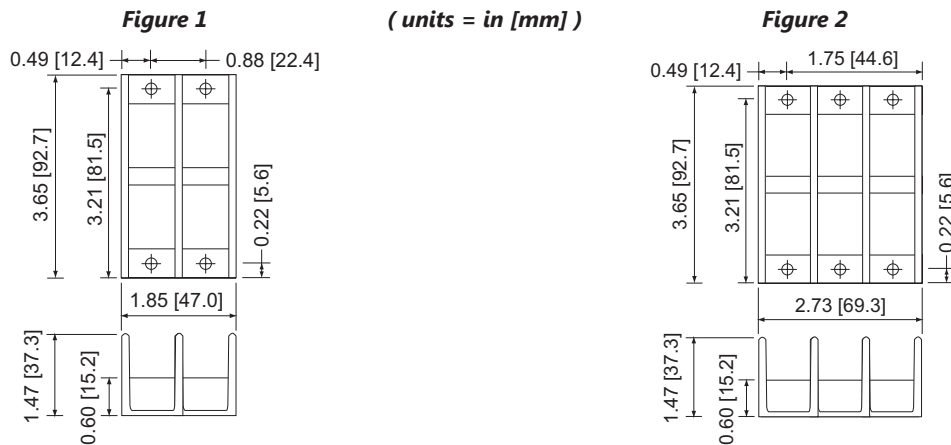
FUSE BLOCK SINGLE-PHASE 115VAC WIRING

⚠️ **WARNING:** *THE SINGLE-PHASE FUSE KITS CONTAIN A 2-POLE FUSE BLOCK. PER NEC 240.22, FUSING IS CORRECT ONLY FOR THE HOT LEG OF A SOURCE; NOT FOR AN INTENTIONALLY GROUNDED SOURCE CONDUCTOR. THE HOT LEG OF A GROUNDED 115VAC SUPPLY IS THE ONLY SUPPLY LINE THAT SHOULD BE FUSED.*
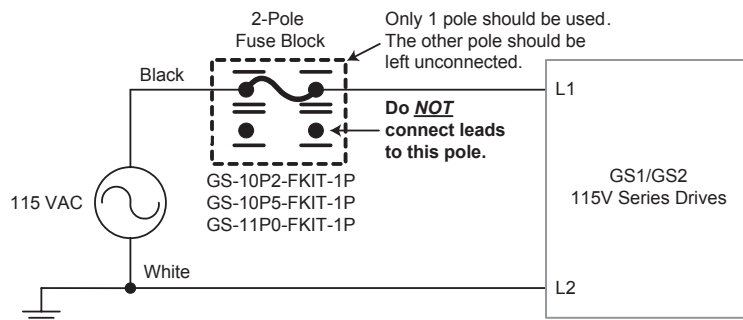
ETHERNET INTERFACE

GS-EDRV(xxx) Specifications			
Part Number	**Input Voltage**	**Input Current**	**Ethernet Communication**
GS-EDRV	10-33 VDC	90-135 mA	10BaseT
GS-EDRV100	10-36 VDC	50-220 mA	10/100Mbps
Can be used with all GS and DURAPULSE AC drives.			

GS-EDRV(xxx) Ethernet Interfaces provide low-cost, high-performance Ethernet links between control systems and any GS/DURAPULSE series AC Drives. With the appropriate cable connections and, if needed, Ethernet switches or hubs, the GS-EDRV(xxx) allows you to communicate with your AC drives over qualified Ethernet networks.

The control systems can be any of the following:

- *DL205 CPU, DL405 CPU, or a WinPLC, with the appropriate Ethernet Remote Master module (H2-ERM or H4-ERM).*
- *Productivity CPUs with Remote I/O Ethernet port.*
- *A PC running Entivity's ThinknDo software, a PC using a custom device driver that was developed using our Ethernet SDK, or a PC running KEPDirect EBC or OPC Server.*
- *Any independent I/O controller with a Modbus TCP/IP driver.*

The control function is performed by one of the control systems mentioned above. The I/O mapping function is performed by an H2(4)-ERM module (purchased separately). The H2(4)-ERM module is configured with the ERM Workbench Utility which is part of the DirectSOFT PLC programming software.

The functions of the GS-EDRV(xxx) interface are as follows:

- *process input signals from the AC drive*
- *format these signals to conform to the Ethernet standard*
- *transmit converted signals to the control system*
- *receive and translate output signals from the control system*
- *distribute the output signals to the appropriate drive*
- *DIN-rail mounting*
- *built-in web browser allows users to configure and control the drive from any web browser via the IP address of the GS-EDRV(xxx).*

The GS-EDRV(xxx) requires an external 24 VDC power supply.

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

Refer to the "GS Series AC Drive Ethernet Interface User Manual" or www.AutomationDirect.com for detailed information.

ZIPLink™ Cables for RS-485 Modbus RTU

ZIPLink communication cables make it very easy to set up RS-485 Modbus RTU control of a single GS1 AC drive from a DirectLOGIC DL06 or D2-260 PLC.

GS-485HD15-CBL-2

PLC Connections for RS-485 Modbus RTU Control of GS1 Drive					
Drive	*PLC **	*PLC Port **	*Communication*	*Direct Cable*	*Length*
GS1	CLICK	3	RS-485	ZL-RJ12-CBL-2P ***	2m [6.6 ft] ***
	DL05	2 **	RS-232 – RS-485 **	N/A **	
	DL06 D0-DCM	2	RS-485	**GS-485HD15-CBL-2 *****	2m [6.6 ft] ***
	D2-DCM D2-250(-1)	2 **	RS-232 – RS-485 **	N/A **	
	D2-260	2	RS-485	**GS-485HD15-CBL-2 *****	2m [6.6 ft] ***
	D4-450	3 **	RS-232 – RS-485 **	N/A **	
* If a PLC type or port is not listed in this chart, it cannot function as a Modbus RTU master.* *** Requires RS-232–RS-485 converter & generic cabling options described later in this chapter.* *** Termination resistors not required due to short cable length.*					

In addition to these GS-specific cables, the ZIPLink product line also includes other components which can be useful for Modbus wiring. Refer to Ch5 "GS1 Modbus Communications" for more information.

GS DRIVE CONFIGURATION SOFTWARE

SOFTWARE FUNCTIONS

GSoft is the optional configuration software for the AutomationDirect GS family of drives. It allows you to connect a personal computer to GS1 drives via RS-485, and perform a variety of functions:

- *Upload/download drive configurations*
- *Create new drive configurations using Quick Start, Detailed, or Schematic Views*
- *Edit drive configurations*
- *Archive/store multiple drive configurations on your PC*
- *Trend drive operation parameters*
- *Tune the drive PID loop (PID not applicable for GS1 drives)*
- *View real time key operating parameters*
- *Start/Stop drive and switch directions, provided drive is set up for remote operation*
- *View drive faults*
- *Print a schematic representation of the drive configuration*
- *Print a tabular report of the current drive configuration.*

GS Series AC Drive Software	
Part Number	**Description**
GSOFT	GS drives configuration software
GS-232CBL	GSOFT programming cable (3m [9.8 ft])
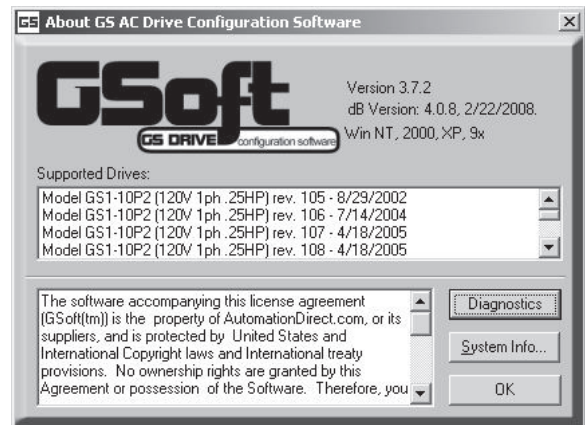
GSoft includes an integral help file with software instructions.

SYSTEM REQUIREMENTS

GSoft will run on PCs that meet the following requirements:

- *Windows 95, 98, Me, NT, 2000, XP, Vista (32-bit), and 7 (32-bit)*
- *Internet Explorer 4.0 or higher (for HTML help support)*
- *24 MB of available memory*
- *8MB hard drive space*
- *Available RS-232 serial port*

CONFIGURATION CABLE

USB-485M serial adapter cable (sold separately)

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