Hammond Transformers

Hammond Power Solutions

Imperator

Fortress

Spartan

Get years of reliable service from a quality transformer at a practical price

HPS Imperator™ control transformers for industrial applications

HPS Imperator control transformers from Hammond are designed for high inrush applications requiring reliable output voltage stability. Designed for industrial applications where electromagnetic devices such as relays, solenoids, etc. are used, they maximize inrush capability and output voltage regulation when electromagnetic devices are initially energized.

HPS Imperator control transformers use Mylar, Nomex and other high-quality insulating materials to electrically insulate turn-to-turn windings, layer-to-layer windings, primary-to-secondary windings and ground. These transformers are vacuum impregnated with VT polyester resin and oven-cured, which seals the surface and eliminates moisture. Filling the entire unit provides a strong mechanical bond and offers protection from the environment. This design utilizes superior insulation systems and is constructed with high quality silicon steel laminations, which provide optimum performance and reliability.

The custom injection-molded cover, with its unique fin-shaped design, provides excellent cooling properties while protecting the coils and terminations from moisture, dirt and other industrial airborne contaminants.

The heavy steel mounting feet are welded to the core, providing maximum strength and low noise in a compact design.

The HPS Imperator's unique terminal block design (patent pending) allows for the quick and easy installation of standard secondary or optional primary 13/32" x 1 1/2" midget/type CC fuse clips on every unit. This is the simplest and most inexpensive fusing installation provided on any industrial control transformer in the market today.

The windings and internal terminations of the HPS Imperator are encapsulated, which protects them from moisture, dirt and other airborne contaminants. The custom molded coil covers with their unique fin-shaped design combine superior transformer cooling properties with a clean bold look.

The HPS Imperator utilizes custom serrated terminals in combination with standard SEMS washer screws for easier assembly and quicker installation as well as superior connection strength when connecting with bare, solid, or stranded wire. It also allows for ring or spade termination connectors with a maximum width of 0.37 in (9.4 mm).

HPS Fortress™ commercial potted transformers

The HPS Fortress commercial potted transformers provide an innovative design with commercial applications where quality, ease of installation, and low cost are key.

All Fortress units are encapsulated with electrical grade silica sand and resin compounds, which completely enclose the core and coil to seal out moisture, airborne contaminants and eliminates corrosion and deterioration.

HPS Spartan™ open core and coil control transformers

The HPS Spartan line of industrial open-style control transformers is ideally suited for general purpose, industrial and light duty loads.

Designed for applications with lower inrush and where less demanding environmental protections are needed, HPS Spartan models offer an efficient and economical solution. They feature molded terminal blocks up to 3000VA or 30A. Optional finger guards and a fuse block adapter kit are available.

Superior quality and value

- Compact, efficient design
- Easy installation and hook-up
- Inexpensive while maintaining superior quality in materials and workmanship
- Wall mounting

Applications

- Lighting
- Motor control circuits
- HVAC
- Signal and alarm systems
- Circuit isolation
- Schools
- Office buildings

HPS Imperator™ Control Transformer Selection

Hammond Power Solutions

To select the proper transformer, you must first determine three characteristics of the load circuit. They are: total steady-state (sealed) VA, total inrush VA, and inrush load power factor.

Total steady-state "sealed" VA is the total amount of VA that the transformer must supply to the load circuit for an extended length of time. Calculate by adding the total steady-state VA of all devices in your control circuit. (The operating VA data for the devices should be available from the manufacturers.)

The inrush VA is the amount of VA that the transformer must supply for all components in the control circuit that are energized together. Consideration for the start-up sequence may be required. (Inrush VA data should be obtained from the device manufacturers.)

The inrush load power factor is difficult to determine without detailed vector analysis of all the control components. In the absence of such information, we recommend that a 40% power factor be utilized.

Six easy steps

Once the three load circuit variables have been determined, follow these steps to select the proper transformer.

1. Determine your primary (supply) and secondary (output) voltage requirements, as well as the required frequency (i.e. 60 Hz).
2. Calculate the total sealed VA of your circuit by adding the total sealed VA of all devices in the control circuit.
3. Calculate the inrush VA by adding the inrush VA of all components being energized together. Remember to add the sealed VA of all components that do not have inrush VA (lamps, timers, etc.), as they do present a load to the transformer during maximum inrush. If the inrush for your components is unknown, assume a 40% inrush power factor.
4. Calculate the total inrush VA using one of two methods as shown below. **Method B will result in selection of a slightly larger transformer.**

A $$\text{Total Inrush VA} = \sqrt{(\text{VA sealed})^2 + (\text{VA inrush})^2}$$

or

B $$\text{Total Inrush VA} = \text{VA Sealed} + \text{VA Inrush}$$

5. If the nominal supply voltage does not fluctuate more than 5%, reference the 90% secondary voltage column in the Regulation Data Table for the correct VA rating.

If the supply voltage varies up to 10%, the 95% secondary voltage column should be used to size the transformer. The 85% secondary voltage column gives minimum values for proper electromagnetic device operation and should only be used as a reference.

HPS Imperator Transformer Regulation Data Table

Continuous VA Transformer Nameplate	*Inrush VA @ 40% Power Factor*		
	85% Secondary Voltage	*90% Secondary Voltage*	*95% Secondary Voltage*
50	330	259	192
75	350	258	170
100	620	467	321
150	895	699	512
250	1596	1229	880
350	2464	1889	1345
500	3939	2854	1819
750	6422	4778	3228
1000	9842	7102	4530
1500	12797	9018	5489

Note: It is recommended that a control transformer be sized at a 40% power factor. Some components in a circuit, such as electromagnetic devices, typically operate at that level due to their inherently lower power factor. Selecting a transformer at 40% power factor will more than adequately size the unit for all the various loads in the circuit.

6. Using the regulation data table below, select the appropriate VA rated transformer:
   - **A.** With a continuous VA rating that is equal to or greater than the value in Step 2.
   - **B.** With a maximum inrush VA equal to or greater than the value obtained in Step 4.

Note: See over-current protection chart for transformers at the end of this section.

Voltage regulation in transformers

Voltage regulation in transformers is the difference between the "No-Load voltage" and the "Full-Load voltage." This is expressed in terms of percentage.

$$\text{Regulation Percentage} = \frac{E_{\text{No-Load}} - E_{\text{Full Load}}}{E_{\text{Full Load}}} (100\%)$$

The secondary voltages (nominal) listed in these pages are at Full-Load, meaning the point at which the transformer is operating at maximum permissible secondary current. No-Load voltage can increase 4 to 6%.

Warning:
Secondary voltages of transformers may damage some loads. For example, a transformer connected as 480/120 Volt but applied 495 Volt primary can produce at No-Load a voltage of 134 Volts which will damage the inputs of a PLC D0-06AA, whose maximum input voltage is 132 Volt. Notice that the current of D0-06AA input is 10mA, making it very close to No-Load.

HPS Imperator™ 480x240 / 240x120 VAC Control Transformers

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Features

- 600V class, machine tool rated industrial control transformers
- 50/60 Hz VA range from 50VA up to 1500VA
- Constructed with high-quality silicon steel laminations that provide optimum performance and reliability
- Encapsulated coils encased in a custom injection molded cover which protects coils and terminations from moisture, dirt and other industrial airborne contaminants
- Temperature range: -20°C (-4°F) to 40°C (104°F)
- Terminated with #8-32 slot/Phillips terminal screws complete with SEMS washer (suitable for 18AWG to 14AWG solid or 14AWG stranded wire)
- Insulation system:
  - **50 - 150VA:** Temperature rise 55°C (131°F), insulation class 105°C (221°F)
  - **250 - 1500VA:** Temperature rise 80°C (176°F), insulation class 130°C (266°F)
- SEMS (standard machine screw with lock washer) standard
- Standard secondary fuse kits utilizing 13/32 in x 1.5 in fuse clips included with all transformers. Fuses are not included. (See Edison fuse section for MEN fuses.)
- Optional primary fuse kits available utilizing 13/32 in x 1.5 in fuse clips (See Edison HCTR series fuses at automationdirect.com.)
- Optional finger-safe terminal covers LIFETIME warranty (limited to manufacturing defects)

Agency Approvals

- UL Listed (approved for U.S. and Canada) File E50394
- CE Mark standard on all units

c UL us CE

HPS Imperator 480x240 / 240x120 Control Transformer Specifications

Part Number	Price	Volt-Amp Rating*	Mtg. Fig.	Primary Voltage (VAC)(50/60Hz)	Secondary Voltage (VAC) (Nominal)	Output Current (A) 120/240 VAC	Impedance %		Total Heat Dissipation (W)**	Weight lb (kg)
							VA	%z		
PH50MQMJ	$72.00	50	A	240x480 230x460 220x440	120x240 115x230 110x220	0.42/0.21	50	8.3	11	3.50 (1.59)
PH75MQMJ	$82.00	75	A			0.63/0.31	75	8.7	14	3.54 (1.61)
PH100MQMJ	$95.00	100	A			0.83/0.42	100	8.4	14	4.50 (2.04)
PH150MQMJ	$120.00	150	B			1.25/0.63	150	8.0	18	5.70 (2.59)
PH250MQMJ	$152.00	250	B			2.08/1.04	250	7.8	29	7.50 (3.40)
PH350MQMJ	$175.00	350	B			2.92/1.46	350	7.0	33	10.1 (4.58)
PH500MQMJ	$222.00	500	B			4.17/2.08	500	5.0	40	14.2 (6.44)
PH750MQMJ	$300.00	750	B			6.25/3.13	750	4.9	54	16.6 (7.53)
PH1000MQMJ	$336.00	1000	B			8.33/4.17	1000	3.9	69	23.6 (10.70)
PH1500MQMJ	$430.00	1500	B			12.5/6.25	1500	3.9	101	34.0 (15.42)

*Note: *VA capacity rated at the output of the transformer.*
*** Heat dissipation calculated based on full rated load on transformer.*

Dimensions

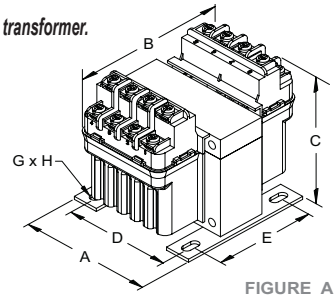

FIGURE A
(100VA and less)

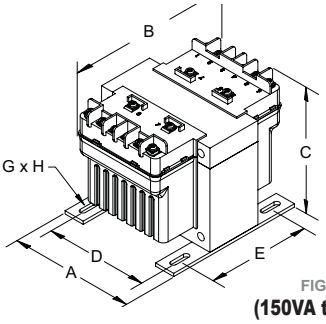

FIGURE B
(150VA to 1500VA)

HPS Imperator 480x240 / 240x120 Control Transformer Dimensions

Part Number	Mtg. Fig.	Overall Dimensions (in [mm])			Mounting Centers (in [mm])		Mounting Slot (in [mm])	Height [C] with Finger Guard (in [mm])	Depth [B] with Finger Guard (in [mm])
		A	B	C	D	E	G x H		
PH50MQMJ	A	3.00 [76.2]	4.38 [111.3]	3.19 [81.0]	2.50 [63.5]	2.25 [57.2]	0.22 x 0.44 [5.6 x 11.2]	4.00 [101.6]	5.82 [147.8]
PH75MQMJ	A	3.25 [82.6]	3.88 [85.9]	3.56 [90.4]	2.63 [66.8]	2.50 [63.5]	0.22 x 0.44 [5.6 x 11.2]	4.37 [111.0]	5.32 [135.1]
PH100MQMJ	A	3.25 [82.6]	4.19 [106.4]	3.63 [92.2]	2.63 [66.8]	2.63 [66.8]	0.22 x 0.44 [5.6 x 11.2]	4.44 [112.8]	5.63 [143.0]
PH150MQMJ	B	4.00 [101.6]	4.94 [125.5]	3.81 [96.8]	3.38 [85.9]	2.75 [69.9]	0.22 x 0.75 [5.6 x 19.1]	4.31 [109.5]	6.44 [163.6]
PH250MQMJ	B	4.50 [114.3]	5.44 [138.2]	3.81 [96.8]	3.75 [95.3]	3.13 [79.5]	0.22 x 0.75 [5.6 x 19.1]	4.31 [109.5]	6.94 [176.3]
PH350MQMJ	B	4.50 [114.3]	5.19 [131.8]	4.44 [112.8]	3.75 [95.3]	3.75 [95.3]	0.22 x 0.75 [5.6 x 19.1]	4.94 [125.5]	6.69 [169.9]
PH500MQMJ	B	4.75 [120.7]	5.94 [150.9]	4.31 [109.5]	4.06 [103.1]	3.81 [96.8]	0.31 x 0.94 [7.9 x 23.9]	4.81 [122.2]	7.44 [189.0]
PH750MQMJ	B	5.13 [130.3]	6.69 [169.9]	4.31 [109.5]	4.38 [111.3]	4.31 [109.5]	0.31 x 0.81 [7.9 x 20.6]	4.81 [122.2]	8.19 [208.1]
PH1000MQMJ	B	5.25 [133.4]	6.81 [173.0]	4.94 [125.5]	4.50 [114.3]	4.44 [112.8]	0.31 x 0.81 [7.9 x 20.6]	5.44 [138.2]	8.31 [211.1]
PH1500MQMJ	B	5.25 [133.4]	8.19 [208.0]	4.94 [125.5]	4.50 [114.3]	6.06 [153.9]	0.38 x 1.00 [9.7 x 25.4]	5.44 [138.2]	9.69 [246.1]

Note: All dimensions are ±0.06 in unless otherwise noted.

HPS Imperator™ 480x240 / 240x120 VAC Control Transformers

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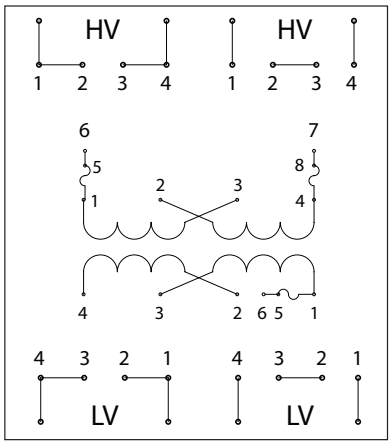
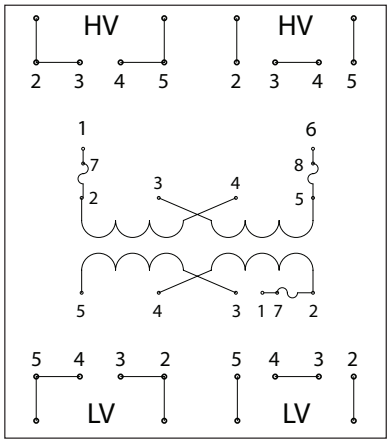
Wiring



PH***MQMJ Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)			Install Jumpers/Links Between Lines	Supply Lines Connect To	Install Fuse Clips To
240	230	220	1-2, 3-4	1, 4	
480	460	440	2-3	1, 4	
240	230	220	1-2, 3-4	6, 7	1-5, 4-8
480	460	440	2-3	6, 7	1-5, 4-8
Low Voltage (LV) (Secondary Volts)			**Install Jumpers/Links Between Lines**	**Load Lines Connect To**	**Install Fuse Clips To**
120	115	110	3-4, 1-2	1, 4	
240	230	220	2-3	1, 4	
120	115	110	3-4, 1-2	4, 6	1-5
240	230	220	2-3	4, 6	1-5



PH***MQMJ Schematic for 150VA to 1500VA Units

High Voltage (HV) (Primary Volts)			Install Jumpers/Links Between Lines	Supply Lines Connect To	Install Fuse Clips To
240	230	220	2-3, 4-5	2, 5	
480	460	440	3-4	2, 5	
240	230	220	2-3, 4-5	1, 6	2-7, 5-8
480	460	440	3-4	1, 6	2-7, 5-8
Low Voltage (LV) (Secondary Volts)			**Install Jumpers/Links Between Lines**	**Load Lines Connect To**	**Install Fuse Clips To**
120	115	110	4-5, 2-3	2, 5	
240	230	220	3-4	2, 5	
120	115	110	4-5, 2-3	1, 5	2-7
240	230	220	3-4	1, 5	2-7

Notes

- *FUSES NOT INCLUDED (see Edison HCTR series fuses at automationdirect.com).*
- *Secondary fuse clips supplied but not installed. Order fuses and primary fuse clips separately.*
- *Jumper links to make primary/secondary series/parallel connections supplied, but not installed.*

HPS Imperator™ 380x277x208 / 240x120 VAC Control Transformers

Hammond Power Solutions

Features

- 600V class, machine tool rated industrial control transformers
- 50/60 Hz
- VA range from 50VA up to 1000VA
- Constructed with high-quality silicon steel laminations that provide optimum performance and reliability
- Encapsulated coils encased in a custom injection molded cover which protects coils and terminations from moisture, dirt and other industrial airborne contaminants
- Temperature range: -20°C (-4°F) to 40°C (104°F)
- Terminated with #8-32 slot/Phillips terminal screws complete with SEMS washer (suitable for 18AWG to 14AWG solid or 14AWG stranded wire)
- Insulation system:
  - **50 - 150VA:** Temperature rise 55°C (131°F), insulation class 105°C (221°F)
  - **250 - 500VA:** Temperature rise 80°C (176°F), insulation class 130°C (266°F)
- SEMS (standard machine screw with lock washer) standard
- Standard secondary fuse kits utilizing 13/32 in x 1.5 in fuse clips included with all transformers. Fuses are not included. (See Edison fuse section for MEN fuses.)
- Optional primary fuse kits available utilizing 13/32 in x 1.5 in fuse clips (See Edison HCTR series fuses at automationdirect.com).
- Optional finger-safe terminal covers
- LIFETIME warranty (limited to manufacturing defects)

Agency Approvals

- UL Listed (approved for U.S. and Canada) File E50394
- CE Mark standard on all units

HPS Imperator 380x277x208 / 240x120 Control Transformer Specifications										
Part Number	*Price*	*Volt-Amp Rating**	*Mtg. Fig.*	*Primary Voltage (VAC) (50/60 Hz)*	*Secondary Voltage (VAC) (Nominal)*	*Output Current (Amps) 120/240 VAC*	*Impedance %*		*Total Heat Dissipation (Watts)***	*Weight lb [kg]*
							VA	*%z*		
PH50MGJ	$90.00	50	A	208x277x380	120x240	0.42/0.21	50	8.3	12	3.5 [1.59]
PH75MGJ	$91.00	75	A			0.63/0.31	75	8.7	14	4.5 [2.04]
PH100MGJ	$101.00	100	A			0.83/0.42	100	8.4	15	5.2 [2.36]
PH150MGJ	$132.00	150	B			1.25/0.63	150	8.0	25	7.6 [3.45]
PH250MGJ	$186.00	250	B			2.08/1.04	250	7.8	35	8.3 [3.76]
PH350MGJ	$222.00	350	B			2.92/1.46	350	7.0	47	11.0 [4.99]
PH500MGJ	$287.00	500	B			4.17/2.08	500	5.0	52	16.3 [7.39]
PH1000MGJ	$384.00	1000	B			8.33/4.17	1000	3.9	81	25.5 [11.57]

*Note: *VA capacity rated at the output of the transformer.*
*** Heat dissipation calculated based on full rated load on transformer.*

HPS Imperator™ 380x277x208 / 240x120 VAC Control Transformers

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Dimensions

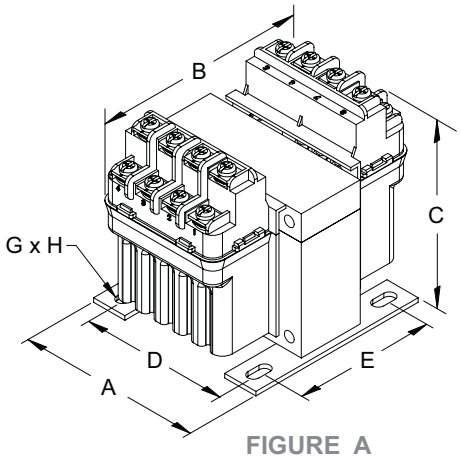

FIGURE A
(100VA and less)

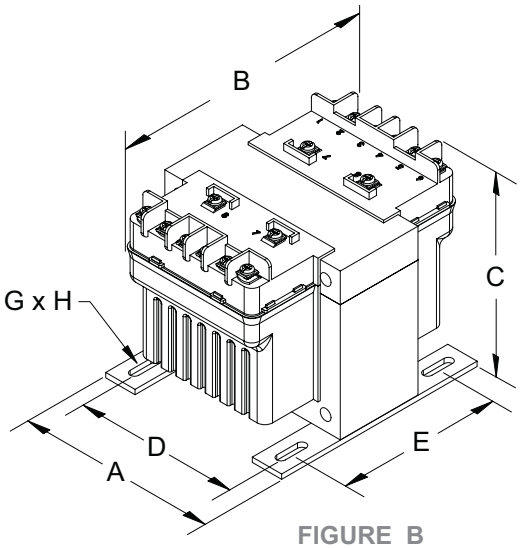

FIGURE B
(150VA to 1000VA)

HPS Imperator 380x277x208 / 240x120 Control Transformer Dimensions									
Part Number	*Mtg. Fig.*	*Overall Dimensions in (mm)*			*Mounting Centers (in [mm])*		*Mounting Slot (in [mm])*	*Height with Finger Guard (in [mm])*	*Depth with Finger Guard (in [mm])*
		A	*B*	*C*	*D*	*E*	*G X H*		
PH50MGJ	A	3.25 [82.6]	3.88 [98.6]	3.56 [90.4]	2.63 [66.8]	2.50 [63.5]	0.22 x 0.44 [5.6 x 11.2]	4.37 [111.0]	5.32 [135.1]
PH75MGJ	A	3.25 [82.6]	4.19 [106.4]	3.63 [92.2]	2.63 [66.8]	2.63 [66.8]	0.22 x 0.44 [5.6 x 11.2]	4.44 [112.8]	5.63 [143.0]
PH100MGJ	A	3.25 [82.6]	4.69 [119.1]	3.63 [92.2]	2.63 [66.8]	2.63 [66.8]	0.22 x 0.44 [5.6 x 11.2]	4.44 [112.8]	6.13 [155.7]
PH150MGJ	B	4.00 [101.6]	5.44 [138.2]	3.81 [96.8]	3.38 [85.9]	2.75 [69.9]	0.22 x 0.75 [5.6 x 19.1]	4.50 [114.3]	6.94 [176.3]
PH250MGJ	B	4.50 [114.3]	4.88 [124.0]	4.44 [112.8]	3.75 [95.3]	3.75 [95.3]	0.22 x 0.75 [5.6 x 19.1]	4.94 [125.5]	6.38 [162.1]
PH350MGJ	B	4.50 [114.3]	5.56 [141.2]	4.44 [112.8]	3.75 [95.3]	3.75 [95.3]	0.22 x 0.75 [5.6 x 19.1]	4.94 [125.5]	7.06 [179.3]
PH500MGJ	B	4.75 [120.7]	6.69 [169.9]	4.31 [109.5]	4.06 [103.1]	4.50 [114.3]	0.31 x 0.94 [7.9 x 23.9]	4.81 [122.2]	8.19 [208.0]
PH1000MGJ	B	5.25 [133.4]	7.25 [184.2]	4.94 [125.5]	4.50 [114.3]	4.83 [122.7]	0.31 x 0.81 [7.9 x 20.6]	5.56 [141.2]	9.69 [246.1]

Note: All dimensions are ±0.06 in unless otherwise noted.

HPS Imperator™ 380x277x208 / 240x120 VAC Control Transformers

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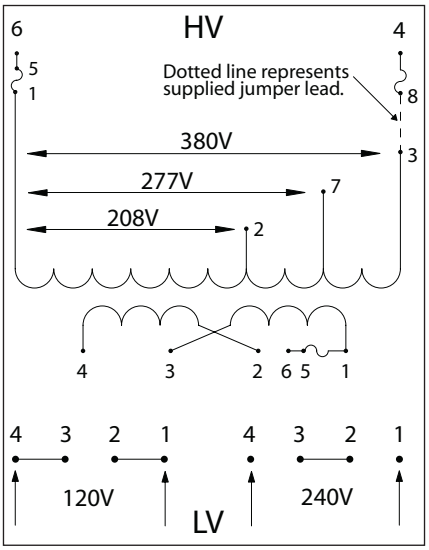
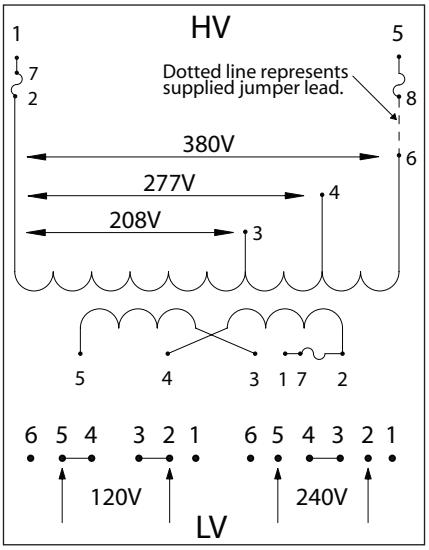
Wiring



PH***MGJ Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)	Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
380	None	1, 3	Unfused
277	None	1, 7	Unfused
208	None	1, 2	Unfused
380	3-8	6, 4	1-5, 4-8
277	8-7	6, 4	1-5, 4-8
208	2-8	6, 4	1-5, 4-8

Low Voltage (LV) (Secondary Volts)	Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120	3-4, 1-2	1, 4	Unfused
240	2-3	1, 4	Unfused
120	3-4, 1-2	4, 6	1-5
240	2-3	4, 6	1-5



PH***MGJ Schematic for 150VA to 1000VA Units

High Voltage (HV) (Primary Volts)	Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
380	None	2, 6	Unfused
277	None	2, 4	Unfused
208	None	2, 3	Unfused
380	8-6	1, 5	2-7, 5-8
277	4-8	1, 5	2-7, 5-8
208	3-8	1, 5	2-7, 5-8

Low Voltage (LV) (Secondary Volts)	Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120	4-5, 2-3	2, 5	Unfused
240	3-4	2, 5	Unfused
120	4-5, 2-3	1, 5	2-7
240	3-4	1, 5	2-7

Notes

- *FUSES NOT INCLUDED (see Edison HCTR series fuses at automationdirect.com).*
- *Secondary fuse clips supplied but not installed. Order fuses and primary fuse clips separately.*
- *Jumper links to make primary/secondary series/parallel connections supplied, but not installed.*

HPS Imperator™ 240x120 / 24x12 VAC Control Transformers

Hammond Power Solutions

Features

- 600V class, machine tool rated industrial control transformers
- 50/60 Hz
- VA range from 50VA up to 1000VA
- Constructed with high-quality silicon steel laminations that provide optimum performance and reliability
- Encapsulated coils encased in a custom injection molded cover which protects coils and terminations from moisture, dirt and other industrial airborne contaminants
- Temperature range: -20°C (-4°F) to 40°C (104°F)
- Terminated with #8-32 slot/Phillips terminal screws complete with SEMS washer (suitable for 18AWG to 14AWG solid or 14AWG stranded wire, not on PH750PG or PH1000PG). A ring or spade connector (maximum width 0.37 in [9.4 mm]) must be used on larger size wire.
- Insulation system:
- 50 - 150VA: Temperature rise 55°C (131°F), insulation class 105°C (221°F)
- 250 - 1000VA: Temperature rise 80°C (176°F), insulation class 130°C (266°F)
- Standard secondary fuse kits utilizing 13/32 in x 1.5 in CC fuse clips included with all transformers. Fuses are not included (see
- Edison fuse section for MEN fuses).
- Optional primary fuse kits available utilizing 13/32 in x 1.5 in fuse clips (See Edison HCTR series fuses at automationdirect.com)
- Optional finger-safe terminal covers
- LIFETIME warranty (limited to manufacturing defects)

Agency Approvals

- UL Listed (approved for U.S. and Canada) File E50394
- CE Mark standard on all units

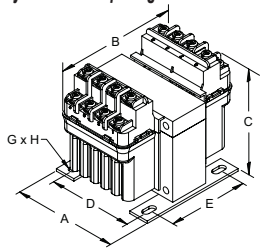
c UL us CE

HPS Imperator 240x120 / 24x12 Control Transformer Specifications

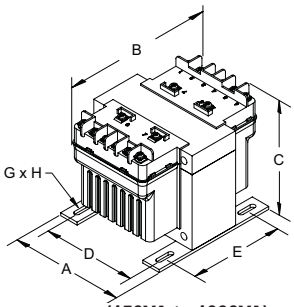
Part Number	Price	Volt-Amp Rating*	Mtg. Fig.	Primary Voltage (VAC) (50/60 Hz)	Secondary Voltage (VAC) (Nominal)	Output Current (Amps) 12/24 VAC	Impedance %		Total Heat Dissipation (Watts)**	Weight (lb [kg])
							VA	%z		
PH50PG	$76.00	50	A	120x240 115x230 110x220	12x24 11.5x23 11x22	4.17/2.08	50	8.3	11	3.5 [1.59]
PH75PG	$78.00	75	A			6.25/3.13	75	8.7	14	3.5 [1.59]
PH100PG	$90.00	100	A			8.33/4.17	100	8.4	14	4.5 [2.04]
PH150PG	$120.00	150	B			12.5/6.25	150	8.0	18	5.7 [2.59]
PH250PG	$152.00	250	B			20.8/10.4	250	7.8	29	7.5 [3.40]
PH350PG	$175.00	350	B			29.2/14.6	350	7.0	33	10.1 [4.58]
PH500PG	$222.00	500	B			41.7/20.8	500	5.0	40	14.2 [6.44]
PH750PG***	$297.00	750	B			62.5/31.3	750	4.9	54	16.6 [7.53]
PH1000PG***	$336.00	1000	B			83.3/41.7	1000	3.9	69	23.6 [10.70]

*Note: *VA capacity rated at the output of the transformer.*
*** Heat dissipation calculated based on full rated load on transformer.*
**** Terminated with 1/4-20 screw on secondary side to accept ring terminal connector*

Dimensions



(100VA and less)



(150VA to 1000VA)

HPS Imperator 240x120 / 24x12 Control Transformer Dimensions

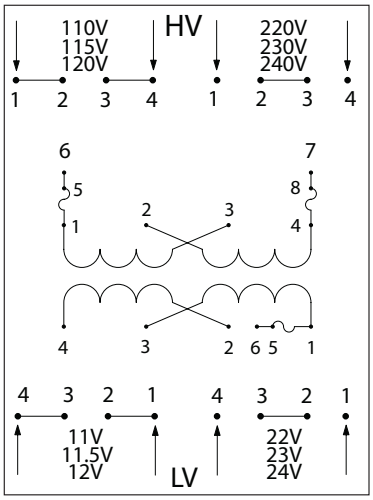
Part Number	Mtg. Fig.	Overall Dimensions (in [mm])			Mounting Centers (in [mm])		Mounting Slot (in [mm])	Height with Finger Guard (in [mm])	Depth with Finger Guard (in [mm])
		A	B	C	D	E	G X H		
PH50PG	A	3.00 [76.2]	4.38 [111.3]	3.19 [81.0]	2.50 [63.5]	2.25 [57.2]	0.22 x 0.44 [5.6 x 11.2]	4.00 [101.6]	5.82 [147.8]
PH75PG	A	3.25 [82.6]	3.88 [85.9]	3.56 [90.4]	2.63 [66.8]	2.50 [63.5]	0.22 x 0.44 [5.6 x 11.2]	4.37 [111.0]	5.32 [135.1]
PH100PG	A	3.25 [82.6]	4.19 [106.4]	3.63 [92.2]	2.63 [66.8]	2.63 [66.8]	0.22 x 0.44 [5.6 x 11.2]	4.44 [112.8]	5.63 [143.0]
PH150PG	B	4.00 [101.6]	4.94 [125.5]	3.81 [96.8]	3.38 [85.9]	2.75 [69.9]	0.22 x 0.75 [5.6 x 19.1]	4.31 [109.5]	6.44 [163.6]
PH250PG	B	4.50 [114.3]	5.44 [138.2]	3.81 [96.8]	3.75 [95.3]	3.13 [79.5]	0.22 x 0.75 [5.6 x 19.1]	4.31 [109.5]	6.94 [176.3]
PH350PG	B	4.50 [114.3]	5.19 [131.8]	4.44 [112.8]	3.75 [95.3]	3.75 [95.3]	0.22 x 0.75 [5.6 x 19.1]	4.94 [125.5]	6.69 [169.9]
PH500PG	B	4.75 [120.7]	5.94 [150.9]	4.31 [109.5]	4.06 [103.1]	3.81 [96.8]	0.31 x 0.94 [7.9 x 23.9]	4.81 [122.2]	7.44 [189.0]
PH750PG	B	5.13 [130.3]	6.69 [169.9]	4.31 [109.5]	4.38 [111.3]	4.31 [109.5]	0.31 x 0.81 [7.9 x 20.6]	4.81 [122.2]	8.19 [208.1]
PH1000PG	B	5.25 [133.4]	6.81 [173.0]	4.94 [125.5]	4.50 [114.3]	4.44 [112.8]	0.31 x 0.81 [7.9 x 20.6]	5.44 [138.2]	8.31 [211.1]

Note: All dimensions are ±0.06 inches unless otherwise noted.

HPS Imperator™ 240x120 / 24x12 VAC Control Transformers

Hammond Power Solutions

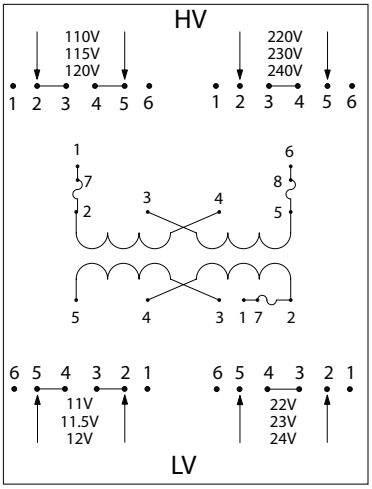
Wiring



PH***PG Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
120	115	110	1-2, 3-4	1, 4	Unfused
240	230	220	2-3	1, 4	Unfused
120	115	110	1-2, 3-4	6, 7	1-5, 4-8
240	230	220	2-3	6, 7	1-5, 4-8

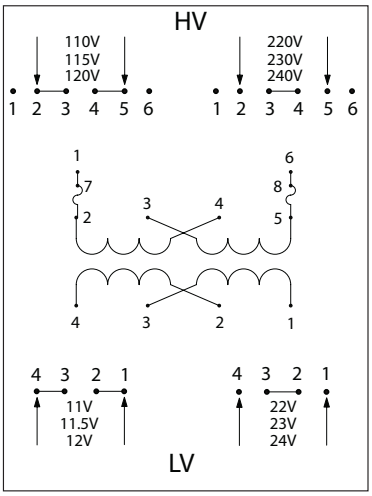
Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
12	11.5	11	3-4, 1-2	1, 4	Unfused
24	23	22	2-3	1, 4	Unfused
12	11.5	11	3-4, 1-2	4, 6	1-5
24	23	22	2-3	4, 6	1-5



PH***PG Schematic for 150VA to 500VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
120	115	110	2-3, 4-5	2, 5	Unfused
240	230	220	3-4	2, 5	Unfused
120	115	110	2-3, 4-5	1, 6	2-7, 5-8
240	230	220	3-4	1, 6	2-7, 5-8

Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
12	11.5	11	4-5, 2-3	2, 5	Unfused
24	23	22	3-4	2, 5	Unfused
12	11.5	11	4-5, 2-3	1, 5	2-7
24	23	22	3-4	1, 5	2-7



PH***PG Schematic for 750VA and 1000VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
120	115	110	2-3, 4-5	2, 5	Unfused
240	230	220	3-4	2, 5	Unfused
120	115	110	2-3, 4-5	1, 6	2-7, 5-8
240	230	220	3-4	1, 6	2-7, 5-8

Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
12	11.5	11	3-4, 1-2	1, 4	Unfused
24	23	22	2-3	1, 4	Unfused

Note: secondary fuse clips not available on PH750PG or PH1000PG.

Notes

- *FUSES NOT INCLUDED (see Edison HCTR series fuses at automationdirect.com).*
- *Jumper links to make primary/secondary series/parallel connections supplied, but not installed.*
- *Secondary fuse clips supplied but not installed. Order fuses and primary fuse clips separately.*

HPS Imperator™ 480x240 / 120x25 VAC Control Transformers

Hammond Power Solutions

Features

- 600V class, machine tool rated industrial control transformers
- 50/60 Hz
- VA range from 50VA up to 1000VA
- Constructed with high-quality silicon steel laminations that provide optimum performance and reliability
- Encapsulated coils encased in a custom injection molded cover which protects coils and terminations from moisture, dirt and other industrial airborne contaminants
- Temperature range: -20°C (-4°F) to 40°C (104°F)
- Terminated with #8-32 slot/Phillips terminal screws complete with SEMS washer (suitable for 18AWG to 14AWG solid or 14AWG stranded wire)
- Insulation system:
  - **50 - 150VA:** Temperature rise 55°C (131°F), insulation class 105°C (221°F)
  - **250 - 500VA:** Temperature rise 80°C (176°F), insulation class 130°C (266°F)
- SEMS (standard machine screw with lock washer) standard
- Standard secondary fuse kits utilizing 13/32 in x 1.5 in fuse clips included with all transformers. Fuses are not included (see Edison fuse section for MEN fuses).
- Optional primary fuse kits available utilizing 13/32 in x 1.5 in fuse clips (See Edison HCTR series fuses at automationdirect.com).
- Optional finger-safe terminal covers
- LIFETIME warranty (limited to manufacturing defects)

Agency Approvals

- UL Listed (approved for U.S. and Canada) File E50394
- CE Mark standard on all units
- RoHS Compliant

c UL us CE

HPS Imperator 480x240 / 120x25 Control Transformer Specifications

Part Number	Price	Volt-Amp Rating*	Mtg. Fig.	Primary Voltage (VAC) (50/60Hz)	Secondary Voltage (VAC) (Nominal)	Output Current (Amps) 25/120 VAC	Impedance %		Total Heat Dissipation (Watts)**	Weight lb (kg)
							VA	%z		
PH50MLI	$90.00	50	A	240x480 208x230x460 200x220x440	25x120 24x115 23x110	2.0/0.47	50	8.3	11	4.0 (1.81)
PH100MLI	$101.00	100	A			4.0/0.83	100	6.9	14	5.2 (2.36)
PH150MLI	$122.00	150	B			6.25/1.30	150	8.4	25	7.6 (3.45)
PH250MLI	$186.00	250	B			10.0/2.08	250	7.8	29	10.1 (4.58)
PH350MLI	$222.00	350	B			14.0/2.92	350	7.0	33	11.0 (4.99)
PH500MLI	$287.00	500	B			20.0/4.17	500	5.0	40	16.3 (7.39)
PH750MLI	$302.00	750	C			31.25/6.52	750	4.9	70	21.0 (9.53)
PH1000MLI	$384.00	1000	C			41.67/8.70	1000	3.7	81	31.2 (14.15)

*Note: *VA capacity rated at the output of the transformer.*
*** Heat dissipation calculated based on full rated load on transformer.*

HPS Imperator™ 480x240 / 120x25 VAC Control Transformers

Hammond Power Solutions

Dimensions

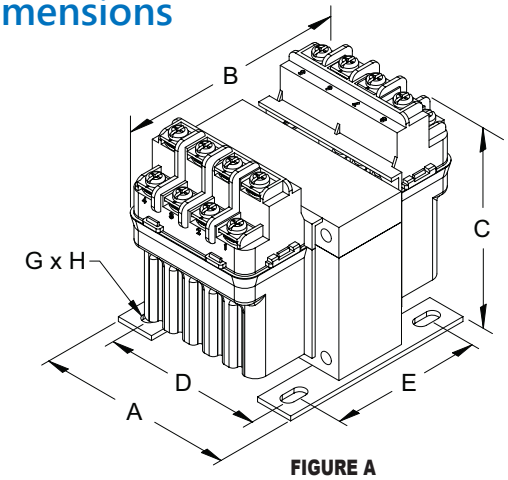


FIGURE A
(100VA and less)

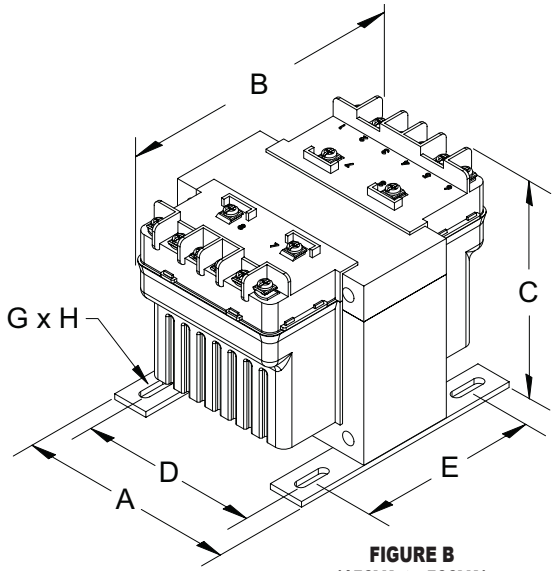


FIGURE B
(150VA to 500VA)

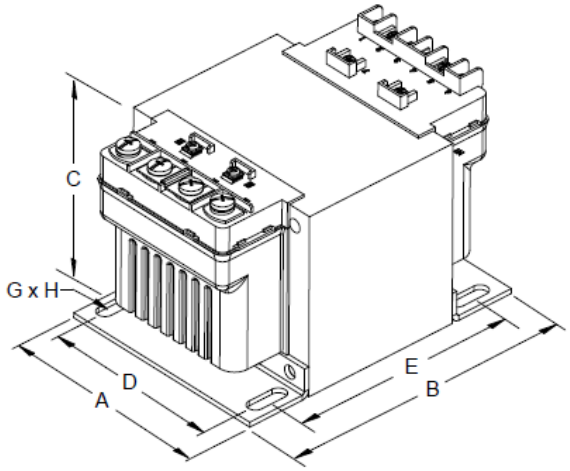


FIGURE C
(750VA to 1000VA)

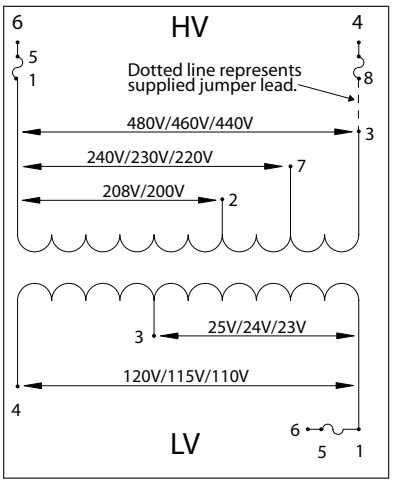
HPS Imperator 480x240 / 120x25 Control Transformer Dimensions									
Part Number	*Mtg. Fig.*	*Overall Dimensions in (mm)*			*Mounting Centers in (mm)*		*Mounting Slot in (mm)*	*Height with Finger Guard in (mm)*	*Depth with Finger Guard in (mm)*
		A	*B*	*C*	*D*	*E*	*G X H*		
PH50MLI	A	3.25 (82.6)	4.06 (103.1)	3.56 (90.4)	2.63 (66.8)	2.50 (63.5)	0.22 x 0.44 (5.6 x 11.2)	4.37 (111.0)	5.32 (135.1)
PH100MLI	A	3.25 (82.6)	4.69 (119.1)	3.63 (92.2)	2.63 (66.8)	2.63 (66.8)	0.22 x 0.44 (5.6 x 11.2)	4.44 (112.8)	6.13 (155.7)
PH150MLI	B	4.00 (101.6)	5.44 (138.2)	3.81 (96.8)	3.38 (85.9)	2.75 (69.9)	0.22 x 0.75 (5.6 x 19.1)	4.50 (114.3)	6.94 (176.3)
PH250MLI	B	4.50 (114.3)	5.19 (131.8)	4.44 (112.8)	3.75 (95.3)	3.75 (95.3)	0.22 x 0.75 (5.6 x 19.1)	4.94 (125.5)	6.38 (162.1)
PH350MLI	B	4.50 (114.3)	5.56 (141.2)	4.44 (112.8)	3.75 (95.3)	3.75 (95.3)	0.22 x 0.75 (5.6 x 19.1)	4.94 (125.5)	7.06 (179.3)
PH500MLI	B	4.75 (120.7)	6.69 (169.9)	4.31 (109.5)	4.06 (103.1)	4.50 (114.3)	0.31 x 0.94 (7.9 x 23.9)	4.81 (122.2)	8.19 (208.0)
PH750MLI	C	5.25 (133.4)	6.50 (165.1)	4.94 (125.5)	4.50 (114.3)	4.13 (104.9)	0.31 x 0.81 (7.9 x 20.6)	5.56 (141.2)	8.31 (211.1)
PH1000MLI	C	5.25 (133.4)	8.19 (208.0)	4.94 (125.5)	4.50 (114.3)	5.81 (147.6)	0.31 x 0.81 (7.9 x 20.6)	5.56 (141.2)	9.69 (246.1)

Note: All dimensions are ±0.06 in unless otherwise noted.

HPS Imperator™ 480x240 / 120x25 VAC Control Transformers

Hammond Power Solutions

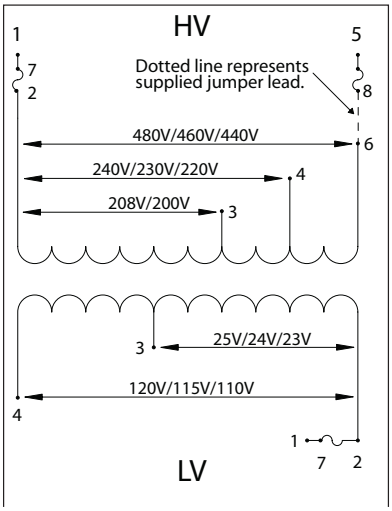
Wiring



PH***MLI Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
480	460	440	None	1, 3	Unfused
240	230	220	None	1, 7	Unfused
	208	200	None	1, 2	Unfused
480	460	440	3-8	6, 4	1-5, 4-8
240	230	220	8-7	6, 4	1-5, 4-8
	208	200	2-8	6, 4	1-5, 4-8

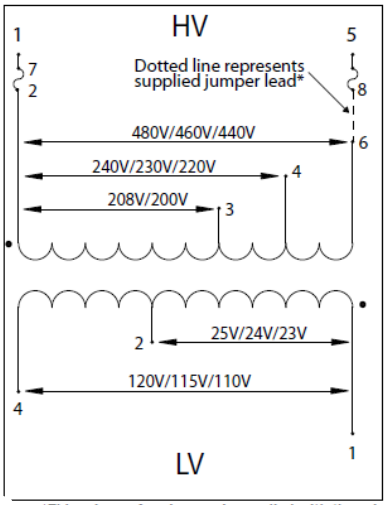
Low Voltage (LV) (Secondary Volts)			Install Supplied Jumpers Between Terminals	Load Lines Connect To	Install Fuse Clips To
120	115	110	None	1, 4	Unfused
25	24	23	None	1, 3	Unfused
120	115	110	None	4, 6	1-5
25	24	23	None	3, 6	1-5



PH***MLI Schematic for 150VA to 500VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
480	460	440	None	2, 6	Unfused
240	230	220	None	2, 4	Unfused
	208	200	None	2, 3	Unfused
480	460	440	8-6	1, 5	2-7, 5-8
240	230	220	4-8	1, 5	2-7, 5-8
	208	200	3-8	1, 5	2-7, 5-8

Low Voltage (LV) (Secondary Volts)			Install Supplied Jumpers Between Terminals	Load Lines Connect To	Install Fuse Clips To
120	115	110	None	2, 4	Unfused
25	24	23	None	2, 3	Unfused
120	115	110	None	1, 4	2-7
25	24	23	None	1, 3	2-7



*This primary fuse jumper is supplied with the primary fuse kit only.

PH***MLI Schematic for 750VA and 1000VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
480	460	440	None	2, 6	Unfused
240	230	220	None	2, 4	Unfused
	208	200	None	2, 3	Unfused
480	460	440	8-6	1, 5	2-7, 5-8
240	230	220	4-8	1, 5	2-7, 5-8
	208	200	3-8	1, 5	2-7, 5-8

Low Voltage (LV) (Secondary Volts)			Install Supplied Jumpers Between Terminals	Load Lines Connect To	Install Fuse Clips To
120	115	110	None	1, 4	Unfused
25	24	23	None	1, 2	Unfused

Note: secondary fuse clips for 24V tap not available on the PH750MLI or PH1000MLI

Notes

- *FUSES NOT INCLUDED (see Edison HCTR series fuses at automationdirect.com).*
- *Secondary fuse clips supplied but not installed. Order fuses and primary fuse clips separately.*
- *Jumper links to make primary/secondary series/parallel connections supplied, but not installed.*
- *Transformers secondary is NOT designed for dual voltages. Secondary voltage is either 25/24/23V or 120/115/110V.*

HPS Imperator™ Transformers Accessories - Terminal Covers and Fuse Kits

Hammond Power Solutions

Finger-safe terminal covers

These one-piece molded terminal covers are a quick and easy way to provide safety and protection in the workplace. They protect operators from potential shock hazards and guard against accidental contact with the fuses.

Fuse Kits

These optional primary side fuse kits contain four fuse clips, four mounting screws, and complete instructions. The table below makes it easy to choose the correct terminal covers and fuse kits for your Hammond control transformer.

Transformer	Finger-Safe Terminal Covers				Primary Side Fuse Kits		
Part Number	Part #	Pcs/Pkg	Price	Description	Part #	Pcs/Pkg	Price
PH50MQMJ PH50PG	FG1	1 cover	$6.50	Finger-safe cover for MQMJ and PG series 50VA **unfused** control transformers. Cover fits primary side or secondary side.	PFK1	4 fuse clips, 4 mounting screws	$12.50
	FGF1	1 cover	$7.00	Finger-safe cover for MQMJ and PG series 50VA **fused** control transformers. Cover fits primary side or secondary side.			
PH75MQMJ PH75PG PH100MQMJ PH100PG	FG2	1 cover	$6.50	Finger-safe cover for all 75VA, all 100VA, PH50MLI and PH50MGJ **unfused** control transformers. Cover fits primary or secondary side.			
	FGF2	1 cover	$7.50	Finger-safe cover for 75VA, all 100VA, PH50MLI and PH50MGJ **fused** control transformers. Cover fits primary or secondary side.			
PH150MQMJ PH150PG PH250MQMJ PH250PG	FG3	1 cover	$7.00	Finger-safe cover for all 150VA, PH250MQMJ and PH250PG **fused** and **unfused** control transformers. Cover fits primary or secondary side.	PFK2	4 fuse clips, 4 mounting screws	$12.50
PH350MQMJ PH350PG PH500MQMJ PH500PG PH750MQMJ	FG4	1 cover	$7.00	Finger-safe cover for all 350VA, 500VA, PH250MLI, PH250MGJ, and PH750MQMJ **fused** and **unfused** control transformers. Cover fits primary or secondary side.	PFK3	4 fuse clips, 4 mounting screws	$12.50
PH1000MQMJ PH750PG PH1500MQMJ PH1000PG	FG5	1 cover	$7.00	Finger-safe cover for all 750VA, 1000VA, 1500VA **fused** and **unfused** control transformers. Cover fits primary or secondary side.			
PH50MLI PH50MGJ	FG2	1 cover	$6.50	Finger-safe cover for all 75VA, all 100VA, PH50MLI and PH50MGJ **unfused** control transformers. Cover fits primary or secondary side.	PFK4	4 fuse clips, 4 mounting screws 1 cover 1 jumper wire	$12.50
	FGF2	1 cover	$7.50	Finger-safe cover for 75VA, all 100VA, PH50MLI and PH50MGJ **fused** control transformers. Cover fits primary or secondary side.			
PH100MLI PH75MGJ PH100MGJ	FG2	1 cover	$6.50	Finger-safe cover for all 75VA, all 100VA, PH50MLI and PH50MGJ **unfused** control transformers. Cover fits primary or secondary side.	PFK5	4 fuse clips, 4 mounting screws 1 cover 1 jumper wire	$12.50
	FGF2	1 cover	$7.50	Finger-safe cover for 75VA, all 100VA, PH50MLI and PH50MGJ **fused** control transformers. Cover fits primary or secondary side.			
PH150MGJ PH150MLI	FG3	1 cover	$7.00	Finger-safe cover for all 150VA, PH250MQMJ and PH250PG **fused** and **unfused** control transformers. Cover fits primary or secondary side.	PFK6	4 fuse clips, 4 mounting screws 1 jumper wire	$13.00
PH250MLI PH250MGJ	FG4	1 cover	$7.00	Finger-safe cover for all 350VA, 500VA, PH250MLI, PH250MGJ, and PH750MQMJ **fused** and **unfused** control transformers. Cover fits primary or secondary side.			
PH350MLI PH350MGJ PH500MLI PH500MGJ			$7.00	Finger-safe cover for all 350VA, 500VA, PH250MLI, PH250MGJ, and PH750MQMJ **fused** and **unfused** control transformers. Cover fits primary or secondary side.	PFK7	4 fuse clips, 4 mounting screws 1 jumper wire	$13.00
PH750MLI PH1000MLI PH1000MGJ	FG5	1 cover	$7.00	Finger-safe cover for all 1000VA, 1500VA, PH750PG, and PH750MLI **fused** and **unfused** control transformers. Cover fits primary or secondary side.			

1. Torque all terminal screws between 12 and 14 lb•in (1.36 and 1.58 N•m)

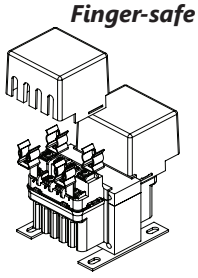
2. For all bare wire connections, the recommended wire size range is 18AWG to 14AWG for solid wire and 14AWG for stranded. A ring or spade connector (maximum width 0.37 in [9.4 mm]) must be used if using a wire size outside the range listed above.

3. Ensure mounting screws used for transformer installation (not supplied) are properly sized for transformer weight.

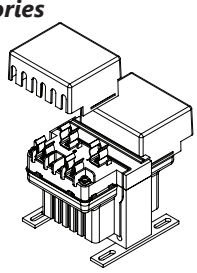
4. When mounting fuse clips, remove the appropriate captive washer screw(s) from terminal block and install fuse clip(s) and new terminal screw(s).

5. Please refer to wiring instructions included with the Hammond control transformer for connection details.

Finger-safe Cover accessories

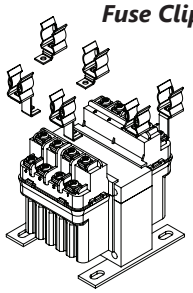


Sample Assembly Drawing for Finger Guard Installation (for 50, 75 and 100VA)

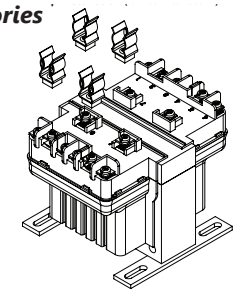


Sample Assembly Drawing for Finger Guard Installation (for 150VA to 1500VA)

Fuse Clips accessories



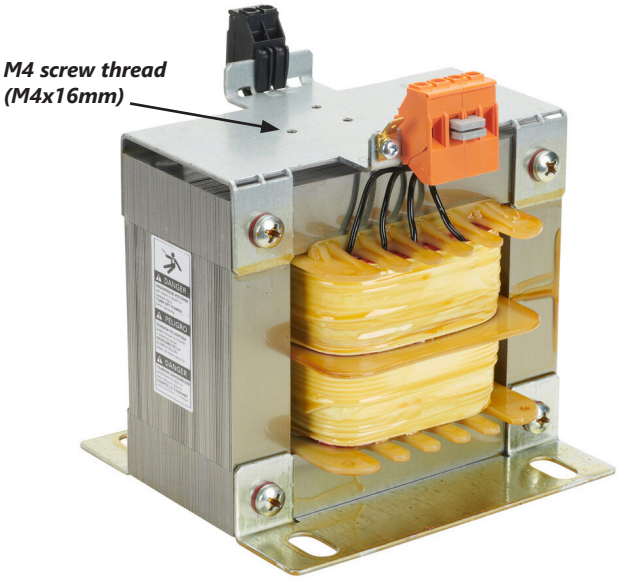
Sample Assembly Drawing for Fuse Clip Installation (for 50, 75 and 100VA)



Sample Assembly Drawing for Fuse Clip Installation (for 150VA to 1500VA)

Standard secondary fuse kits utilizing 13/32" x 1 ½" fuse clips included with all transformers. Fuses are not included. (See Edison fuse section for MEN fuses.)

BLOCK CT Series
Control Power Transformers



CT-075-048-12-0

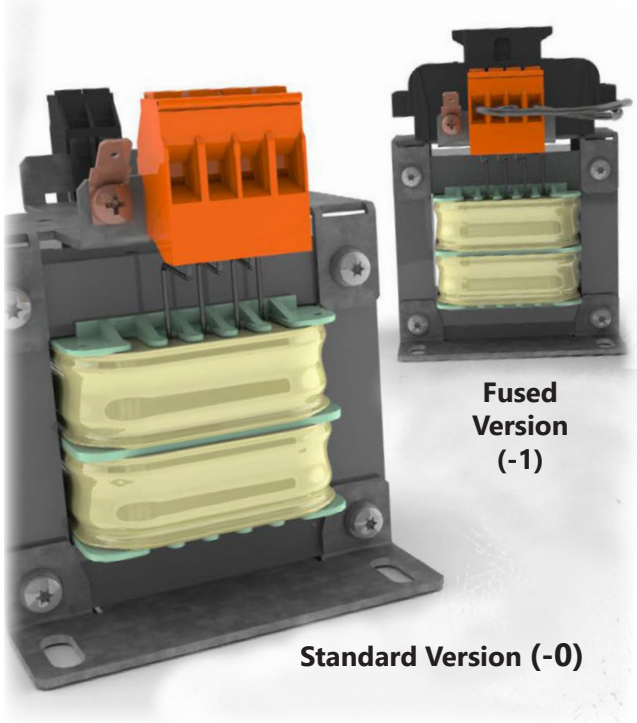
CT-075-048-12-1

Control power transformers for a variety of applications

BLOCK's new CT series of control power transformers is the perfect choice for general purpose and industrial applications. Primarily engineered for isolation, lighting or signal systems, the CT series provides an economical and efficient solution under regular and even under abnormal conditions. With a robust design, these transformers ensure continuous supply of power for your control circuits.

Features

- 50 to 2500VA
- Input voltage 240x480 VAC or 600VAC, 50-60 Hz
- Ambient temperature 104°F Insulation Class B (266°F)
- Fused versions available (on select units)
- Jumpers included for primary voltage selection (on select units)
- Approvals UL 5085-1/-2, CSA 22.2, IEC 61558-1, IEC 61558-21
- XPTQ2.E103521 - Transformers, General Purpose, Display as Type/Model EI



INSULATION CLASS B (266°F)	**INPUT VOLTAGE** 240x480 VAC or 600VAC	**POWER** 50 to 2500 VA
AMBIENT TEMPERATURE 104°F	**APPROVALS** UL 5085-1/-2 CSA 22.2 IEC 61558-1 IEC 61558-21	**FREQUENCY** 50-60 HZ

BLOCK CT Series
Control Power Transformers

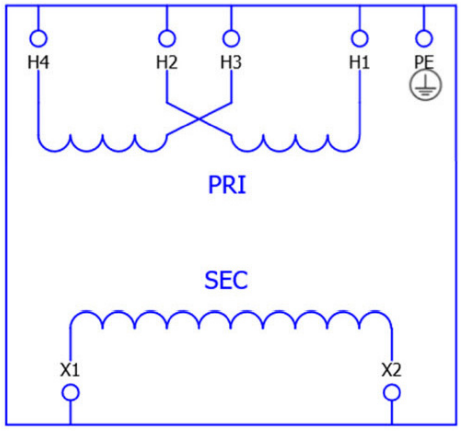
BLOCK Control Transformers Selection Guide									
Part Number	Price	Volt-Amp Rating	Primary Voltage (VAC)(50/60Hz)	Secondary Voltage (VAC) (Nominal)	Output Current (A)	Impedance %	Total Heat Dissipation (W)	Weight lb [kg]	Drawing
CT-005-048-12-0	$62.00	50	240x480	120	0.42	12.7	11	2.2	PDF
CT-005-048-24-0	$62.00			24	2.08	12.7	11		PDF
CT-005-060-12-0	$53.00		600	120	0.42	12.1	11.1		PDF
CT-005-060-24-0	$53.00			24	2.08	12.1	11		PDF
CT-007-048-12-0	$65.00	75	240x480	120	0.63	14.7	16.5	2.43	PDF
CT-007-048-12-1*	$85.00					14.7	16.5		PDF
CT-007-048-24-0	$65.00			24	3.12	14.7	16.5		PDF
CT-007-060-12-0	$57.00		600	120	0.63	14.7	16.5		PDF
CT-007-060-24-0	$56.00			24	3.12	14.7	16.5		PDF
CT-010-048-12-0	$71.00	100	240x480	120	0.83	12.3	18.7	3.31	PDF
CT-010-048-24-0	$72.00			24	4.17	12.3	18.7		PDF
CT-010-060-12-0	$62.00		600	120	0.83	12.2	18.7		PDF
CT-010-060-24-0	$62.00			24	4.17	12.3	18.7		PDF
CT-015-048-12-0	$83.00	150	240x480	120	1.25	11.8	22.9	4.85	PDF
CT-015-048-12-1*	$102.00					11.8	22.9		PDF
CT-015-048-24-0	$83.00			24	6.25	11.8	22.9		PDF
CT-015-060-12-0	$74.00		600	120	1.25	11.8	22.9		PDF
CT-015-060-12-1*	$93.00					11.8	22.9		PDF
CT-025-048-12-0	$103.00	250	240x480	120	2.08	8.7	31	7.72	PDF
CT-025-048-12-1*	$122.00					8.7	31		PDF
CT-025-048-24-0	$103.00			24	10.4	8.7	31		PDF
CT-025-060-12-0	$92.00		600	120	2.08	8.7	31		PDF
CT-025-060-12-1*	$111.00					8.7	31		PDF
CT-025-060-24-0	$93.00			24	10.4	8.7	31		PDF
CT-035-048-12-0	$124.00	350	240x480	120	2.92	9	38	11.02	PDF
CT-035-048-12-1*	$143.00					9	38		PDF
CT-035-048-24-0	$125.00			24	14.6	9	38		PDF
CT-035-060-12-0	$115.00		600	120	2.92	9	36		PDF
CT-035-060-24-0	$116.00			24	14.6	9	38		PDF
CT-050-048-12-0	$152.00	500	240x480	120	4.17	7.6	46	14.99	PDF
CT-050-048-12-1*	$171.00					7.6	46		PDF
CT-050-060-12-0	$141.00		600			7.6	46		PDF
CT-050-060-12-1*	$161.00					7.6	46		PDF
CT-075-048-12-0	$199.00	750	240x480	120	6.25	9.1	58.8	21.61	PDF
CT-075-048-12-1*	$218.00					9.1	58.8		PDF
CT-075-060-12-0	$191.00		600			9.1	58.8		PDF
CT-100-048-12-0	$248.00	1000	240x480	120	8.33	14.9	71.6	24.69	PDF
CT-100-048-12-1*	$267.00					14.9	71.6		PDF
CT-100-060-12-0	$238.00		600			14.9	71.6		PDF
CT-100-060-12-1*	$258.00					14.9	71.6		PDF
CT-150-048-12-0	$336.00	1500	240x480	120	12.5	2.7	93.1	36.82	PDF
CT-150-060-12-0	$327.00		600			2.7	93.1		PDF
CT-200-048-12-0	$417.00	2000	240x480	120	16.7	2.2	106	46.3	PDF
CT-200-060-12-0	$418.00		600			2.2	106		PDF
CT-250-048-12-0	$497.00	2500	240x480	120	20.8	1.9	118	56.88	PDF
CT-250-060-12-0	$487.00		600			1.9	118		PDF

** Models ending in "-1" include integral 3-pole fuseblock.*

BLOCK CT Series
Control Power Transformers

CT-*-048-*-0/1 Wiring Diagram

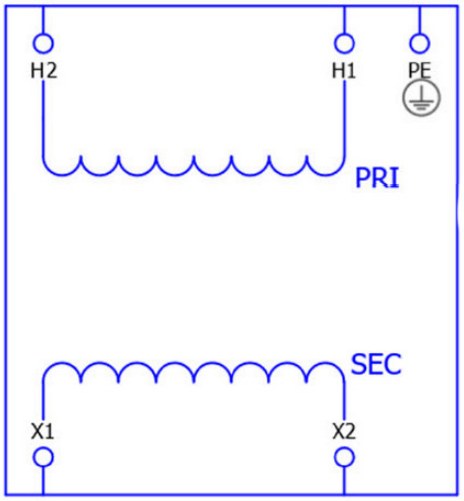
CT-*-048-*-0/1



For Primary	Connect To	Position Jumper
240V	H1-H4	H1-H3 & H2-H4
480V	H1-H4	H2-H3

For Secondary	Connect To	Position Jumper
120V	X1-X2	–
24V	X1-X2	–

CT-*-060-*-0 Wiring Diagram



For Primary	Connect To	Position Jumper
600V	H1-H2	–

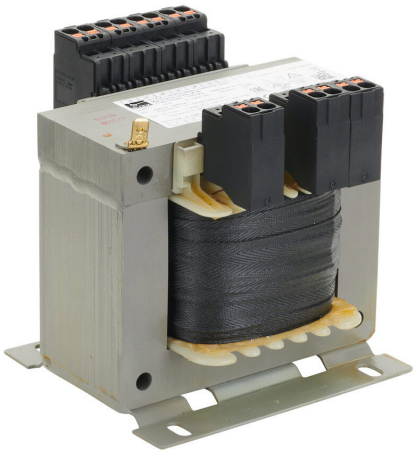
For Secondary	Connect To	Position Jumper
120V	X1-X2	–

For Primary	Connect To	Position Jumper
600V	H1-H2	–

For Secondary	Connect To	Position Jumper
24V	X1-X2	–

NOTE: Please refer to tables for specific connection points.

BLOCK USTE Series
Voltage Control/Isolating Transformers



USTE400/2X115

USTE Voltage Control/Isolating Transformers provide universal voltage adjustment and safe separation of the input and output circuits.

In addition, these transformers meet the requirements of safety isolating or safety isolating transformers.

The safety isolating transformer has electrically separated windings in accordance with EN (IEC) 61558-2-6 and is normally used to supply SELV circuits complying with EN (IEC) 61140 and EN (IEC) 60364-4-41. Safety isolating transformers are designed for the protective measure "Safety Extra Low Voltage" to prevent dangerous touch voltages in the event of a single fault.

Features

- Low inrush current
- DIN rail and panel mount up to 250VA
- Universal input voltage range
- Minimal noise
- Push-in terminals for quick installation
- Large input voltage range 208-600 V
- UL Listed XPTQ.E103521 - Transformers, General Purpose

BLOCK Voltage Control / Isolating Transformers Selection Guide

Part Number	Price	Volt-Amp Rating (VA)		Primary Voltage (VAC) (50/60Hz)	Secondary Voltage (VAC) (Nominal)	Output Current (A)	Impedance %	Total Heat Dissipation (W)	Weight lb [kg]	Drawing
		Power factor=1	Power factor=0.5							
USTE100/2X115	$88.00	100	310	208-600	115x230	0.43	9	15.5	4.6 [2.1]	PDF
USTE100/2X12	$78.00				12x24	4.17	9.5	16.1	4.6 [2.1]	PDF
USTE1000/2X115	$295.00	1000	5000		115x230	4.35	4.2	71	30.9 [14.0]	PDF
USTE1600/2X115	$391.00	1600	7800		115x230	6.96	3.3	87	41.7 [18.9]	PDF
USTE250/2X115	$116.00	250	850		115x230	2x1.09	7.7	25.3	7.9 [3.6]	PDF
USTE250/2X12	$116.00	250	850		12x24	10.4	8	28.9	7.9 [3.6]	PDF
USTE2500/2X115	$664.00	2500	12500		115x230	10.8	2.7	125	63.3 [28.7]	PDF
USTE3200/2X115	$882.00	3200	14400		115x230	13.91	2.9	131	92.6 [42.0]	PDF
USTE40/2X12	$64.00	40	100		12x24	1.67	7	6.5	3.1 [1.4]	PDF
USTE400/2X115	$158.00	400	1440		115x230	1.74	6.5	36.4	11.7 [5.3]	PDF
USTE400/2X12	$154.00	400	1440		12x24	16.7	6.4	35.9	11.7 [5.3]	PDF
USTE500/2X115	$188.00	500	2000		115x230	2.17	3.6	37.7	17.4 [7.9]	PDF
USTE800/2X115	$203.00	800	3400		115x230	3.48	4	58.5	23.1 [10.5]	PDF

BLOCK Control Transformers Jumper

Part Number	Price	Description
PQI-4/2/PTKS	$10.50	Voltage selection jumper, push-in type, 2-pole. Package of 10.

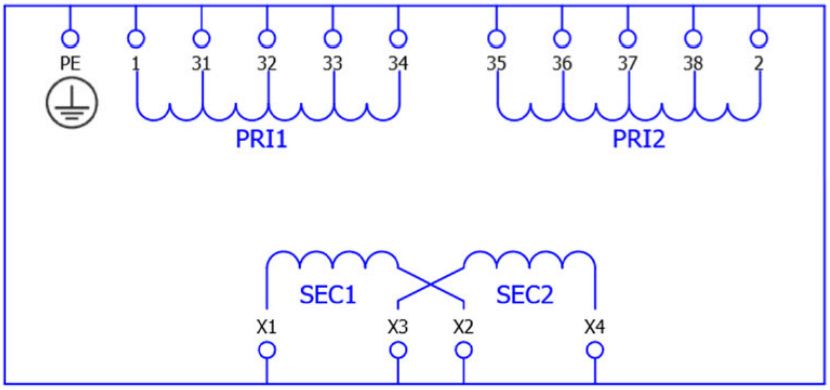
PQI-4/2/PTKS

USTE Series Connecting/Disconnecting Push-in Terminals

UL Wire Cross-Section Single-Core (Rigid) AWG, Max	10
UL Wire Cross-Section Single-Core (Rigid) AWG, Min	20
UL Wire Cross-Section Stranded AWG, Max	10
UL Wire Cross-Section Stranded AWG, Min	20
UL Wire Material	Cu
KEMA Wire Cross-Section Single-Core (Rigid) AWG, Max	0.5 mm^2
KEMA Wire Cross-Section Single-Core (Rigid) AWG, Min	6mm^2
KEMA Wire Cross-Section Stranded With/Without Ferrules, Max	4mm^2
KEMA Wire Cross-Section Stranded With/Without Ferrules, Min	0.5 mm^2

BLOCK USTE Series
Voltage Control/Isolating Transformers

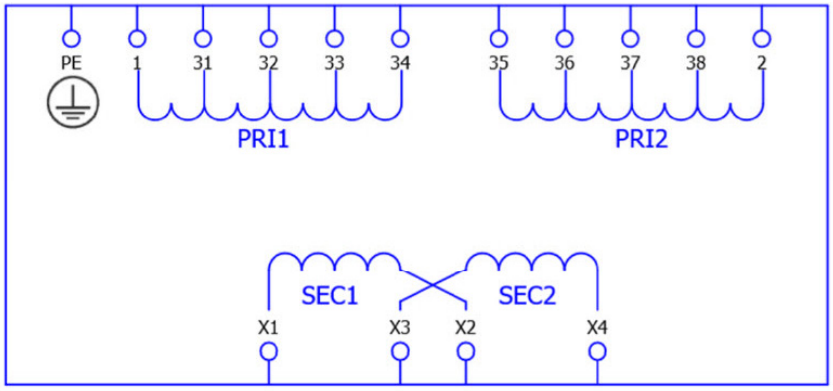
USTE */2X12 Wiring Diagram



Jumper Between	Connect To	For Pri
1-37 & 2-31	1-2	208V
1-36 & 2-32		230V
31-38		380V
32-38		400V
31-37		415V
32-37		440V
32-36		460V
33-36		480V
34-36		500V
31-35		525V
32-35		550V
33-35		575V
34-35		600V

Jumper Between	Connect To	For Sec
X1-X3 & X2-X4	X1-X4	12V
X2-X3		24V

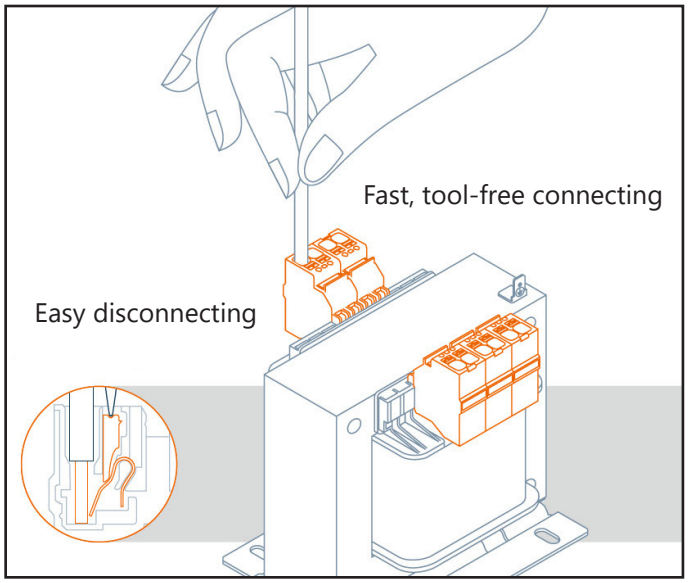
USTE */2X115 Wiring Diagram

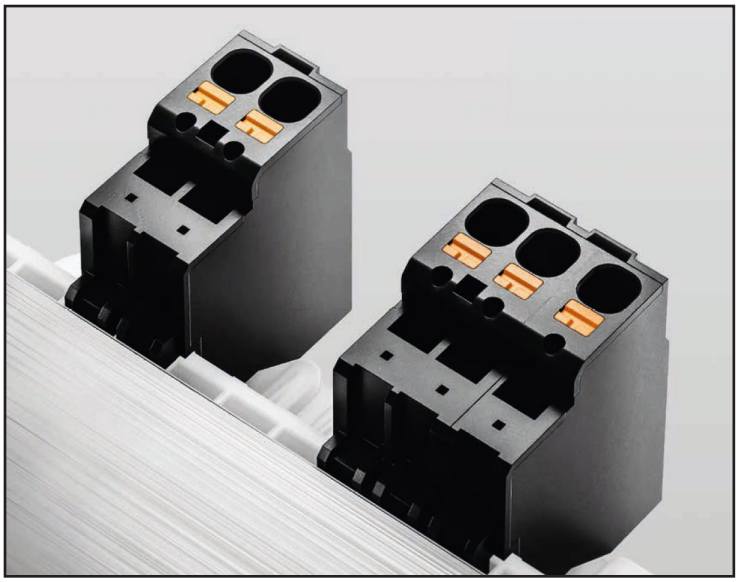


Jumper Between	Connect To	For Pri
1-37 & 2-31	1-2	208V
1-36 & 2-32		230V
31-38		380V
32-38		400V
31-37		415V
32-37		440V
32-36		460V
33-36		480V
34-36		500V
31-35		525V
32-35		550V
33-35		575V
34-35		600V

Jumper Between	Connect To	For Sec
X1-X3 & X2-X4	X1-X4	115V
X2-X3		230V

Fast and Easy Tool-Free Connecting/Disconnecting





Murrelektronik Control Transformers With Multi-Voltage Input

MURR ELEKTRONIK

stay connected

86143

86158

Murrelektronik's transformers offer another option to switch-mode power supplies.

Plant and system manufacturers with international customers are familiar with the problem of different mains voltages. The new Murrelektronik transformers with multi-voltage inputs can handle input voltages from 208V to 550V. This is ideal for companies who have customers all over the world.

The new Murrelektronik transformers with multi-voltage inputs feature a flexible selection of input voltages and can be adapted to the different mains voltages using simple quick-connect jumpers. A total of eleven different input voltages are pre-configured.

The new Murrelektronik transformers are available with two times 115V or – with series connection – 230V. This makes it possible to conveniently handle the various operating voltages of the machines.

Features

- Tool-free quick-connect primary/secondary jumpers (below 3kVA)
- Electrostatic shield
- Finger-safe terminal connections
- Panel mount (convenient keyhole slots, 1.6kvA and below)
- DIN-rail mounting clips (100 & 160VA units)
- Resin impregnated under vacuum
- Operating temperature range -20°C (-4°F) to +40°C (104°F)
- Global agency approvals
- 1 year warranty

Agency Approvals

c UL us

TYPE APPROVED PRODUCT DNV·GL DNVGL.COM/AF

CE

Murrelektronik Control Transformers Selection Guide

Part Number	Price	Volt-Amp Rating (VA)	CE Volt-Amp (VA)	Primary Voltage (VAC) (50/60 Hz)	Secondary Voltage (VAC) (Nominal)	Output Current (Amps) 120/230 VAC	Impedance %		Total Head Dissipation (Watts)	Weight lb [kg]	Drawing
							VA	%z			
86143	$94.00	100	100	208/230/380/400/420/440/460/480/500/525/550	2 x 115VAC 115x230 VAC	0.86 / 0.43	100	7.40	7.2	4.6 [2.1]	PDF
86144	$107.00	160	160			1.4 / 0.7	160	7.70	10	6.4 [2.9]	PDF
86145	$124.00	250	250			2.18 / 1.09	250	5.60	12.8	8.8 [4.0]	PDF
86147	$166.00	400	400			3.48 / 1.74	400	4.50	17	13.9 [6.3]	PDF
86148	$207.00	500	500			4.34 / 2.17	500	4.05	30	18.5 [8.4]	PDF
86149	$237.00	630	630			5.48 / 2.74	630	3.50	25	20.9 [9.5]	PDF
86150	$277.00	800	800			7.0 / 3.5	800	3.44	42	29.8 [13.5]	PDF
86151	$312.00	1000	1000			8.7 / 4.35	1000	3.44	68	29.8 [13.5]	PDF
86152	$430.00	1600	1600			13.9 / 6.95	1600	1.92	50	45.2 [20.5]	PDF
86153	$570.00	2000	2000			17.4 / 8.7	2000	2.15	62	60.6 [27.5]	PDF
86154	$726.00	2500	2500			21.6 / 10.8	2500	1.80	33	58.0 [26.3]	PDF
86155	$871.00	3000	3000			26 / 13	300	2.70	34	65.0 [29.5]	PDF
86156	$999.00	4000	4000			34.8 / 17.4	4000	2.10	57	75.0 [34.0]	PDF
86157	$1,100.00	5000	5000			43.4 / 21.7	5000	1.86	67	82.7 [37.5]	PDF
86158	$1,507.00	6300	6300			54.8 / 27.4	6300	2.20	29	103.6 [47.0]	PDF

Murrelektronik Control Transformers With Multi-Voltage Input

MURR ELEKTRONIK

stay connected

Murrelektronik Control Transformers Specifications (Electrical)				
Part Number	***86143***	***86144***	***86145***	***86147***
Nominal Voltage (VAC)	208 / 230 / 380 / 400 / 420 / 440 / 460 / 480 / 500 / 525 / 550			
Vector Group	Iii0			
Nominal Current (AAC)	0.57 / 0.52 / 0.31 / 0.30 / 0.28 / 0.27 / 0.26 / 0.25 / 0.24 / 0.23 / 0.22	0.96 / 0.87 / 0.53 / 0.50 / 0.48 / 0.45 / 0.43 / 0.42 / 0.40 / 0.38 / 0.36	1.36 / 1.23 / 0.74 / 0.71 / 0.67 / 0.64 / 0.61 / 0.59 / 0.57 / 0.54 / 0.51	2.12 / 1.92 / 1.16 / 1.10 / 1.05 / 1.00 / 0.96 / 0.92 / 0.88 / 0.84 / 0.80
Tappings	–	–	–	–
Nominal Frequency	50/60 Hz			
Inrush Current (Max) (AAC)	9.9 / 8.95 / 5.42 / 5.15 / 4.9 / 4.68 / 4.48 / 4.29 / 4.12 / 3.92 / 3.74	14.20 / 12.84 / 7.77 / 7.38 / 7.03 / 6.71 / 6.42 / 6.15 / 5.91 / 5.63 / 5.37	26.0 / 23.5 / 14.2 / 13.5 / 12.9 / 12.3 / 11.8 / 11.3 / 10.8 / 10.3 / 9.8	38 / 34 / 21 / 20 / 19 / 18 / 17 / 16 / 16 / 15 / 14
Short-Circuit Current (AAC)	7.6 / 6.87 / 4.16 / 3.95 / 3.76 / 3.59 / 3.44 / 3.29 / 3.16 / 3.01 / 2.87	12.50 / 11.30 / 6.84 / 6.50 / 6.19 / 5.91 / 5.65 / 5.42 / 5.20 / 4.95 / 4.73	25.0 / 22.6 / 13.7 / 13.0 / 12.4 / 11.8 / 11.3 / 10.8 / 10.4 / 9.9 / 9.5	47 / 43 / 26 / 24 / 23 / 22 / 21 / 20 / 20 / 19 / 18
Short-Circuit Voltage	7.4%	7.7%	5.6%	4.5%
Idle Current (Max) (AAC)	0.16 / 0.14 / 0.09 / 0.08 / 0.08 / 0.08 / 0.07 / 0.07 / 0.07 / 0.06 / 0.06	0.32 / 0.29 / 0.18 / 0.17 / 0.16 / 0.15 / 0.14 / 0.14 / 0.13 / 0.13 / 0.12	0.24 / 0.22 / 0.13 / 0.12 / 0.12 / 0.11 / 0.11 / 0.1 / 0.1 / 0.1 / 0.09	0.26 / 0.24 / 0.14 / 0.14 / 0.13 / 0.12 / 0.12 / 0.11 / 0.11 / 0.10 / 0.10
Nominal Losses (At Load CosΦ=1)	17W	29W	31W	41W
Idle Losses	7.2 W	10W	12.8 W	17W
Efficiency (At Load CosΦ=1)	86%	85%	89%	91%
Output 115VAC				
Nominal Voltage (VAC)	115	115	115	115
No-Load Voltage (VAC)	125	126.5	123	121
Nominal Current (AAC)	0.86	1.4	2.18	3.48
Nominal Power (VA) (Acc. to EN 61558)	100	160	250	400
Nominal Power (VA) (According to UL)	100	144	225	360
Duty Cycle	100%	100%	100%	100%
Output 230VAC				
Nominal Voltage (VAC)	230	230	230	230
No-Load Voltage (VAC)	250	253	246	242
Nominal Current (AAC)	0.43	0.7	1.09	1.74
Nominal Power (VA) (Acc. to EN 61558)	100	160	250	400
Nominal Power (VA) (According to UL)	100	144	225	360
Duty Cycle	100%	100%	100%	100%
Output 2 x 115VAC				
Nominal Voltage (VAC)	2 X 115	2 X 115	2 X 115	2 X 115
No-Load Voltage (VAC)	2 X 125	2 X 126.5	2 X 123	2 X 121
Nominal Current (AAC)	2 X 0.43	2 X 0.7	2 X 1.09	2 X 1.74
Nominal Power (VA) (Acc. to EN 61558)	2 X 50	2 X 80	2 X 125	2 X 200
Nominal Power (VA) (Acc. to UL)	2 X 50	2 X 72	2 X 112.5	2X 180
Duty Cycle	100%	100%	100%	100%
Output				
Total Instantaneous Power (At CosΦ=0.5) (VA)	227	360	610	1036
Maximum Total Power (Acc. to EN 61558) (VA)	100	160	250	400
Maximum Total Power (Acc. to UL) (VA)	100	144	225	360
Insulation Class				
Acc. to EN 61558	B			
Acc. to UL 508	ISC Class 105 (A)			

Murrelektronik Control Transformers With Multi-Voltage Input

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Murrelektronik Control Transformers Specifications (Electrical, continued)				
Part Number	***86148***	***86149***	***86150***	***86151***
Nominal Voltage (VAC)	208 / 230 / 380 / 400 / 420 / 440 / 460 / 480 / 500 / 525 / 550			
Vector Group	Iii0			
Nominal Current (AAC)	2.8 / 2.5 / 1.5 / 1.4 / 1.4 / 1.3 / 1.3 / 1.2 / 1.2 / 1.2 / 1.1	3.30 / 2.98 / 1.81 / 1.72 / 1.63 / 1.56 / 1.49 / 1.43 / 1.37 / 1.31 / 1.25	4.2 / 3.8 / 2.3 / 2.2 / 2.1 / 2.0 / 1.9 / 1.8 / 1.8 / 1.7 / 1.6	5.3 / 4.8 / 2.9 / 2.7 / 2.6 / 2.5 / 2.4 / 2.3 / 2.2 / 2.1 / 2.0
Tappings	–	–	–	–
Nominal Frequency	50/60 Hz			
Inrush Current (Max) (AAC)	81 / 73 / 44 / 42 / 40 / 38 / 37 / 35 / 34 / 32 / 31	60 / 54 / 33 / 31 / 30 / 28 / 27 / 26 / 25 / 24 / 23	96 / 87 / 53 / 50 / 48 / 45 / 43 /42 / 40 / 38 / 36	77 / 70 / 42 / 40 / 38 / 36 / 35 / 33 / 32 / 31 / 29
Short-Circuit Current (AAC)	68 / 62 / 37 / 35 / 34 / 32 / 31 / 29 / 28 / 27 / 26	93 / 84 / 51 / 48 / 46 / 44 / 42 / 40 / 39 / 37 / 35	123 / 111 / 67 / 64 / 61 / 58 / 56 / 53 / 51 / 49 / 47	154 / 139 / 84 / 80 / 76 / 73 / 70 / 67 / 64 / 61 / 58
Short-Circuit Voltage	4.05 %	3.5 %	3.44 %	3.44 %
Idle Current (Max) (AAC)	1.10 / 0.99 / 0.60 / 0.57 / 0.54 / 0.52 / 0.50 / 0.48 / 0.46 / 0.44 / 0.42	0.36 / 0.33 / 0.2 / 0.19 / 0.18 / 0.17 / 0.16 / 0.16 / 0.15 / 0.14 / 0.14	0.72 / 0.65 / 0.39 / 0.37 / 0.36 / 0.34 / 0.33 / 0.31 / 0.30 / 0.29 / 0.27	0.7 / 0.6 / 0.4 / 0.4 / 0.4 / 0.3 / 0.3 / 0.3 / 0.3 / 0.3 / 0.3
Nominal Losses (At Load CosΦ=1)	59W	54W	79W	91W
Idle Losses	30W	25W	42W	68W
Efficiency (At Load CosΦ=1)	89%	92%	91%	91%
Output 115VAC				
Nominal Voltage (VAC)	115	115	115	115
No-Load Voltage (VAC)	120.5	120	120	119.5
Nominal Current (AAC)	4.34	5.48	7.0	8.7
Nominal Power (VA) (Acc. to EN 61558)	500	630	800	1000
Nominal Power (VA) (According to UL)	450	568	720	900
Duty Cycle	100%	100%	100%	100%
Output 230VAC				
Nominal Voltage (VAC)	230	230	230	230
No-Load Voltage (VAC)	241	240	240	239
Nominal Current (AAC)	2.17	2.74	3.5	4.35
Nominal Power (VA) (Acc. to EN 61558)	500	630	800	1000
Nominal Power (VA) (According to UL)	450	568	720	900
Duty Cycle	100%	100%	100%	100%
Output 2 x 115VAC				
Nominal Voltage (VAC)	2 X 115	2 X 115	2 X 115	2 X 115
No-Load Voltage (VAC)	2 X 120.5	2 X 120	2 X 120	2 X 119.5
Nominal Current (AAC)	2 X 2.17	2X 2.74	2 X 3.5	2 X 4.35
Nominal Power (VA) (Acc. to EN 61558)	2 X 250	2 X 315	2 X 400	2 X 500
Nominal Power (VA) (Acc. to UL)	2 X 225	2 X 284	2 X 360	2 X 450
Duty Cycle	100%	100%	100%	100%
Output				
Total Instantaneous Power (At CosΦ=0.5) (VA)	1462	1807	2448	2800
Maximum Total Power (Acc. to EN 61558) (VA)	500	630	800	1000
Maximum Total Power (Acc. to UL) (VA)	450	568	720	900
Insulation Class				
Acc. to EN 61558	B			
Acc. to UL 508	ISC Class 105 (A)			

Murrelektronik Control Transformers With Multi-Voltage Input

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Murrelektronik Control Transformers Specifications (Electrical, continued)				
Part Number	***86152***	***86153***	***86154***	***86155***
Nominal Voltage (VAC)	208 / 230 / 380 / 400 / 420 / 440 / 460 / 480 / 500 / 525 / 550			
Vector Group	Iii0			
Nominal Current (AAC)	8.8 / 8.0 / 4.8 / 4.6 / 4.4 / 4.2 / 4.0 / 3.8 / 3.7 / 3.5 / 3.3	10.2 / 9.2 / 5.5 / 5.3 / 5.0 / 4.8 / 4.6 / 4.4 / 4.2 / 4.0 / 3.9	12.50 / 11.30 / 6.84 / 6.50 / 6.19 / 5.91 / 5.65 / 5.42 / 5.20 / 4.95 / 4.73	14.9 / 13.5 / 8.2 / 7.7 / 7.4 / 7.0 / 6.7/ 6.5 / 6.2 / 5.9 / 5.6
Tappings	–	–	–	–
Nominal Frequency	50/60 Hz			
Inrush Current (Max) (AAC)	182 / 165 / 100 / 95 / 90 / 86 / 82 / 79 / 76 / 72 / 69	179 / 162 / 98 / 93 / 89 / 85 / 81 / 78 / 74 / 71 / 68	363 / 328 / 199 / 189 / 180 / 172 / 164 / 157 / 151 / 144 / 137	273 / 247 / 149 / 142 / 135 / 129 b/ 123 / 118 / 114 / 108 / 104
Short-Circuit Current (AAC)	460 / 416 / 252 / 239 / 228 / 217 / 208 / 199 / 191 / 182 / 174	473 / 428 / 259 / 246 / 234 / 224 / 214 / 205 / 197 / 187 / 179	670 / 606 / 367 / 348 / 332 / 317 / 303 / 290 / 279 / 265 / 253	553 / 500 / 303 / 288 / 274 / 261 / 250 / 240 / 230 / 219 / 209
Short-Circuit Voltage	1.92 %	2.15 %	1.8 %	2.7 %
Idle Current (Max) (AAC)	2.1 / 1.9 / 1.2 / 1.1 / 1.0 / 1.0 / 1.0 / 0.9 / 0.9 / 0.8 / 0.8	0.74 / 0.67 / 0.41 / 0.38 / 0.37 / 0.35 / 0.33 / 0.32 / 0.31 / 0.29 / 0.28	2.12 / 1.92 / 1.16 / 1.10 / 1.05 / 1.00 / 0.96 / 0.92 / 0.88 / 0.84 / 0.80	0.44 / 0.4 / 0.24 / 0.23 / 0.22 / 0.21 / 0.2 / 0.19 / 0.18 / 0.17 / 0.17
Nominal Losses (At Load CosΦ=1)	84W	113W	113W	140W
Idle Losses	50W	62W	33W	34W
Efficiency (At Load CosΦ=1)	95%	95%	95%	95.5%
Output 115VAC				
Nominal Voltage (VAC)	115	115	115	115
No-Load Voltage (VAC)	116.5	118	116	119
Nominal Current (AAC)	13.9	17.4	21.6	26
Nominal Power (VA) (Acc. to EN 61558)	1600	2000	2500	3000
Nominal Power (VA) (According to UL)	1440	1600	2000	2640
Duty Cycle	100%	100%	100%	100%
Output 230VAC				
Nominal Voltage (VAC)	230	230	230	230
No-Load Voltage (VAC)	233	236	232	238
Nominal Current (AAC)	6.95	8.7	10.8	13
Nominal Power (VA) (Acc. to EN 61558)	1600	2000	2500	3000
Nominal Power (VA) (According to UL)	1440	1600	2000	2640
Duty Cycle	100%	100%	100%	100%
Output 2 x 115VAC				
Nominal Voltage (VAC)	2 X 115	2 X 115	2 X 115	2 X 115
No-Load Voltage (VAC)	2 X 116.5	2 X 118	2 X 116	2 X 119
Nominal Current (AAC)	2 X 6.95	2 X 8.7	2 X 10.8	2 X 13
Nominal Power (VA) (Acc. to EN 61558)	2 X 800	2 X 1000	2 X 1250	2 X 1500
Nominal Power (VA) (Acc. to UL)	2 X 720	2 X 800	2 X 1000	2 X 1320
Duty Cycle	100%	100%	100%	100%
Output				
Total Instantaneous Power (At CosΦ=0.5) (VA)	6340	6470	9260	9860
Maximum Total Power (Acc. to EN 61558) (VA)	1600	2000	2500	3000
Maximum Total Power (Acc. to UL) (VA)	1440	1600	2000	2640
Insulation Class				
Acc. to EN 61558	B			
Acc. to UL 508	ISC Class 105 (A)			

Murrelektronik Control Transformers With Multi-Voltage Input

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Murrelektronik Control Transformers Specifications (Electrical, continued)			
Part Number	***86156***	***86157***	***86158***
Nominal Voltage (VAC)	208 / 230 / 380 / 400 / 420 / 440 / 460 / 480 / 500 / 525 / 550		
Vector Group	Iii0		
Nominal Current (AAC)	20.0 / 18.3 / 11.1 / 10.5 / 10.0 / 9.6 / 9.1/ 8.8 / 8.4 / 8.0 / 7.7	25.4 / 22.8 / 13.8 / 13.1 / 12.4 / 11.9 / 11.3 / 11.1 / 10.9 / 10.0 / 9.6	31.0 / 28.0 / 17.0 / 16.1 / 15.4 / 14.7 / 14.0 / 13.4 / 12.9 / 12.3 / 11.7
Tappings	–	–	–
Nominal Frequency	50/60 Hz		
Inrush Current (Max) (AAC)	372 / 336 / 204 / 193 / 184 / 176 / 168 / 161 / 155 / 147 / 141	378 / 342 / 207 / 197 / 187 / 179 / 171 / 164 / 157 / 150 / 143	585 / 529 / 320 / 304 / 290 / 277 / 265 / 254 / 243 / 232 / 220
Short-Circuit Current (AAC)	960 / 868 / 525 / 499 / 475 / 454 / 434 / 416 / 399 / 380 / 367	1362 / 1232 / 746 / 708 / 675 / 644 / 616 / 590 / 567 / 540 / 515	1433 / 1296 / 784 / 745 / 710 / 677 / 648 / 621 / 596 / 568 / 542
Short-Circuit Voltage	2.1 %	1.86%	2.2 %
Idle Current (Max) (AAC)	0.99 / 0.90 / 0.54 / 0.51 / 0.49 / 0.47 / 0.45 / 0.43 / 0.41 / 0.39 / 0.38	1.7 / 1.5 / 0.9 / 0.9 / 0.8 / 0.8 / 0.7 / 0.7 / 0.7 / 0.7 / 0.7	0.48 / 0.43 / 0.26 / 0.25 / 0.24 / 0.23 / 0.22 / 0.21 / 0.20 / 0.19 / 0.18
Nominal Losses (At Load CosΦ=1)	162W	196W	206W
Idle Losses	57W	67W	29W
Efficiency (At Load CosΦ=1)	96%	96%	97%
Output 115VAC			
Nominal Voltage (VAC)	115	115	115
No-Load Voltage (VAC)	118	117.7	118
Nominal Current (AAC)	34.8	43.4	54.8
Nominal Power (VA) (Acc. to EN 61558)	4000	5000	6300
Nominal Power (VA) (According to UL)	3400	4000	5040
Duty Cycle	100%	100%	100%
Output 230VAC			
Nominal Voltage (VAC)	230	230	230
No-Load Voltage (VAC)	236	235.4	236
Nominal Current (AAC)	17.4	21.7	27.4
Nominal Power (VA) (Acc. to EN 61558)	4000	5000	6300
Nominal Power (VA) (According to UL)	3400	4000	5040
Duty Cycle	100%	100%	100%
Output 2 x 115VAC			
Nominal Voltage (VAC)	2 x 115	2 x 115	2 x 115
No-Load Voltage (VAC)	2 x 118	2 x 117.7	2 x 118
Nominal Current (AAC)	2 x 17.4	2 x 21.7	2 x 27.4
Nominal Power (VA) (Acc. to EN 61558)	2 x 2000	2 x 2500	2 x 3150
Nominal Power (VA) (Acc. to UL)	2 x 1700	2 x 2000	2 x 2520
Duty Cycle	100%	100%	100%
Output			
Total Instantaneous Power (At CosΦ=0.5) (VA)	13440	21354	22187
Maximum Total Power (Acc. to EN 61558) (VA)	4000	5000	6300
Maximum Total Power (Acc. to UL) (VA)	3400	4000	5040
Insulation Class			
Acc. to EN 61558	B		
Acc. to UL 508	ISC Class 105 (A)		

Murrelektronik Control Transformers With Multi-Voltage Input

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Murrelektronik Control Transformers Specifications (Electrical, continued)					
	86143	***86144***	***86145***	***86147***	***86148***
Input Protection					
Recommended External Circuit Breaker For Short-Circuit Protection Or Current Limiting Fuses Such As Class CC and J	208V: 3RV2811-0GD10 230V: 3RV2811-0GD10 380V: 3RV2811-0DD10 400V: 3RV2811-0DD10 420V: 3RV2811-0DD10 440V: 3RV2811-0DD10 460V: 3RV2811-0DD10 480V: 3RV2811-0CD10 500V: 3RV2811-0CD10 525V: 3RV2811-0CD10 550V: 3RV2811-0CD10	208V: 3RV2811-0JD10 230V: 3RV2811-0JD10 380V: 3RV2811-0GD10 400V: 3RV2811-0FD10 420V: 3RV2811-0FD10 440V: 3RV2811-0FD10 460V: 3RV2811-0FD10 480V: 3RV2811-0FD10 500V: 3RV2811-0ED10 525V: 3RV2811-0ED10 550V: 3RV2811-0ED10	208V: 3RV2811-1AD10 230V: 3RV2811-0KD10 380V: 3RV2811-0HD10 400V: 3RV2811-0HD10 420V: 3RV2811-0HD10 440V: 3RV2811-0HD10 460V: 3RV2811-0GD10 480V: 3RV2811-0GD10 500V: 3RV2811-0GD10 525V: 3RV2811-0GD10 550V: 3RV2811-0GD10	208V: 3RV2811-1CD10 230V: 3RV2811-1BD10 380V: 3RV2811-0KD10 400V: 3RV2811-0KD10 420V: 3RV2811-0KD10 440V: 3RV2811-0JD10 460V: 3RV2811-0JD10 480V: 3RV2811-0JD10 500V: 3RV2811-0JD10 525V: 3RV2811-0JD10 550V: 3RV2811-0HD10	208V: 3RV2811-1ED10 230V: 3RV2811-1CD10 380V: 3RV2811-1AD10 400V: 3RV2811-1AD10 420V: 3RV2811-1AD10 440V: 3RV2811-1AD10 460V: 3RV2811-1AD10 480V: 3RV2811-0KD10 500V: 3RV2811-0KD10 525V: 3RV2811-0KD10 550V: 3RV2811-0KD10
Internal Device Protection	NA	NA	NA	NA	NA
Output Protection					
Recommended External Protection Device For Overload and Short-Circuit Protection	115V: 3RV2811-0JD10 230V: 3RV2811-0FD10 2x 115V: 2x 3RV2811-0FD10	115V: 3RV2811-1AD10 230V: 3RV2811-0HD10 2x 115V: 2x 3RV2811-0HD10	115V: 3RV2811-1CD10 230V: 3RV2811-0KD10 2x 115V: 2x 3RV2811-0KD10	115V: 3RV2811-1ED10 230V: 3RV2811-1BD10 2x 115V: 2x 3RV2811-1BD10	115V: 3RV2811-1FD10 230V: 3RV2811-1CD10 2x 115V: 2x 3RV2811-1CD10
Internal Protection Device					
Dielectric Strength Type Test Voltage According To IEC 61558					
Input - Output	6.3 kVAC	6.3 kVAC	6.3 kVAC	6.3 kVAC	6.3 kVAC
Input - PE	3.2 kVAC	3.2 kVAC	3.2 kVAC	3.2 kVAC	3.2 kVAC
Output - PE	2.5 kVAC	2.5 kVAC	2.5 kVAC	2.5 kVAC	2.5 kVAC
Output-Output	1.7 kVAC	1.7 kVAC	1.6 kVAC	1.6 kVAC	1.6 kVAC
Dielectric Strength Type Test Voltage According to UL 5085					
Input - Output	3.0 kVAC	3.0 kVAC	4.8 kVAC	4.8 kVAC	4.8 kVAC
Input - PE	3.0 kVAC	3.0 kVAC	4.8 kVAC	4.8 kVAC	4.8 kVAC
Output - PE	1.8 kVAC	3.0 kVAC	3.0 kVAC	3.0 kVAC	3.0 kVAC
Output-Output	1.8 kVAC	1.8 kVAC	3.0 kVAC	3.0 kVAC	3.0 kVAC

Murrelektronik Control Transformers With Multi-Voltage Input

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Murrelektronik Control Transformers Specifications (Electrical, continued)					
	86149	**86150**	**86151**	**86152**	**86153**
Input Protection					
Recommended External Circuit Breaker For Short-Circuit Protection Or Current Limiting Fuses Such As Class CC and J	208V: 3RV2811-1DD10 230V: 3RV2811-1DD10 380V: 3RV2811-1BD10 400V: 3RV2811-1BD10 420V: 3RV2811-1AD10 440V: 3RV2811-1AD10 460V: 3RV2811-1AD10 480V: 3RV2811-1AD10 500V: 3RV2811-1AD10 525V: 3RV2811-1AD10 550V: 3RV2811-1AD10	208V: 3RV2811-1FD10 230V: 3RV2811-1ED10 380V: 3RV2811-1CD10 400V: 3RV2811-1CD10 420V: 3RV2811-1CD10 440V: 3RV2811-1CD10 460V: 3RV2811-1BD10 480V: 3RV2811-1BD10 500V: 3RV2811-1BD10 525V: 3RV2811-1BD10 550V: 3RV2811-1BD10	208V: 3RV2811-1GD10 230V: 3RV2811-1FD10 380V: 3RV2811-1DD10 400V: 3RV2811-1DD10 420V: 3RV2811-1DD10 440V: 3RV2811-1CD10 460V: 3RV2811-1CD10 480V: 3RV2811-1CD10 500V: 3RV2811-1CD10 525V: 3RV2811-1CD10 550V: 3RV2811-1CD10	208V: 3RV2811-1JD10 230V: 3RV2811-1HD10 380V: 3RV2811-1FD10 400V: 3RV2811-1FD10 420V: 3RV2811-1FD10 440V: 3RV2811-1FD10 460V: 3RV2811-1ED10 480V: 3RV2811-1ED10 500V: 3RV2811-1ED10 525V: 3RV2811-1ED10 550V: 3RV2811-1ED10	208V: 3RV2811-1JD10 230V: 3RV2811-1JD10 380V: 3RV2811-1GD10 400V: 3RV2811-1GD10 420V: 3RV2811-1FD10 440V: 3RV2811-1FD10 460V: 3RV2811-1FD10 480V: 3RV2811-1FD10 500V: 3RV2811-1FD10 525V: 3RV2811-1ED10 550V: 3RV2811-1ED10
Internal Device Protection	NA	NA	NA	NA	NA
Output Protection					
Recommended External Protection Device For Overload and Short-Circuit Protection	115V: 3RV2811-1GD10 230V: 3RV2811-1DD10 2x 115V: 2x 3RV2811-1DD10	115V: 3RV2811-1HD10 230V: 3RV2811-1ED10 2x 115V: 2x 3RV2811-1ED10	115V: 3RV2811-1JD10 230V: 3RV2811-1FD10 2x 115V: 2x 3RV2811-1FD10	115V: 3RV2811-4AD10 230V: 3RV2811-1HD10 2x 115V: 2x 3RV2811-1HD10	115V: 3RV2821-4BD10 230V: 3RV2811-1JD10 2x 115V: 2x 3RV2811-1JD10
Internal Protection Device	NA	NA	NA	NA	NA
Dielectric Strength Type Test Voltage According To IEC 61558					
Input - Output	6.3 kVAC	6.3 kVAC	6.3 kVAC	6.3 kVAC	6.3 kVAC
Input - PE	3.2 kVAC	3.2 kVAC	3.2 kVAC	3.2 kVAC	3.2 kVAC
Output - PE	2.5 kVAC	2.5 kVAC	2.5 kVAC	2.4 kVAC	2.4 kVAC
Output-Output	1.6 kVAC	1.6 kVAC	1.6 kVAC	1.6 kVAC	1.6 kVAC
Dielectric Strength Type Test Voltage According to UL 5085					
Input - Output	4.8 kVAC	4.8 kVAC	4.8 kVAC	4.8 kVAC	4.8 kVAC
Input - PE	4.8 kVAC	4.8 kVAC	4.8 kVAC	4.8 kVAC	4.8 kVAC
Output - PE	3.0 kVAC	3.0 kVAC	3.0 kVAC	3.0 kVAC	3.0 kVAC
Output-Output	3.0 kVAC	3.0 kVAC	3.0 kVAC	3.0 kVAC	3.0 kVAC

Murrelektronik Control Transformers With Multi-Voltage Input

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Murrelektronik Control Transformers Specifications (Electrical, continued)					
	86154	**86155**	**86156**	**86157**	**86158**
Input Protection					
Recommended External Circuit Breaker For Short-Circuit Protection Or Current Limiting Fuses Such As Class CC and J	208V: 3RV2811-1KD10 230V: 3RV2811-1KD10 380V: 3RV2811-1HD10 400V: 3RV2811-1HD10 420V: 3RV2811-1GD10 440V: 3RV2811-1GD10 460V: 3RV2811-1GD10 480V: 3RV2811-1GD10 500V: 3RV2811-1GD10 525V: 3RV2811-1FD10 550V: 3RV2811-1FD10	208V: 3RV2811-4AD10 230V: 3RV2811-4AD10 380V: 3RV2811-1JD10 400V: 3RV2811-1HD10 420V: 3RV2811-1HD10 440V: 3RV2811-1HD10 460V: 3RV2811-1HD10 480V: 3RV2811-1HD10 500V: 3RV2811-1GD10 525V: 3RV2811-1GD10 550V: 3RV2811-1GD10	208V: 3RV2821- 4CD10 230V: 3RV2821- 4CD10 380V: 3RV2811-1KD10 400V: 3RV2811-1KD10 420V: 3RV2811-1JD10 440V: 3RV2811-1JD10 460V: 3RV2811-1JD10 480V: 3RV2811-1JD10 500V: 3RV2811-1JD10 525V: 3RV2811-1HD10 550V: 3RV2811-1HD10	208V: 3RV1742-5ED10 230V: 3RV2821-4CD10 380V: 3RV2811-4AD10 400V: 3RV2811-4AD10 420V: 3RV2811-1KD10 440V: 3RV2811-1KD10 460V: 3RV2811-1KD10 480V: 3RV2811-1KD10 500V: 3RV2811-1KD10 525V: 3RV2811-1JD10 550V: 3RV2811-1JD10	208V: 3RV1742-5FD10 230V: 3RV2821-5ED10 380V: 3RV2821-4BD10 400V: 3RV2821-4BD10 420V: 3RV2821-4BD10 440V: 3RV2811-4AD10 460V: 3RV2811-4AD10 480V: 3RV2811-4AD10 500V: 3RV2811-4AD10 525V: 3RV2811-1KD10 550V: 3RV2811-1KD10
Internal Device Protection	NA	NA	NA	NA	NA
Output Protection					
Recommended External Protection Device For Overload and Short-Circuit Protection	115V: 3RV2821-4CD10 230V: 3RV2811-1KD10 2x 115V: 2x 3RV2811-1KD10	115V: 3RV1742-5ED10 230V: 3RV2811-4AD10 2x 115V: 2x 3RV2811-4AD10	115V: 3RV1742- 5FD10 230V: 3RV2821- 4BD10 2x 115V: 2x 3RV2821- 4BD10	115V: 3RV1742- 5HD10 230V: 3RV2821- 4CD10 2x 115V: 2x 3RV2821- 4CD10	115V: 3RV1742- 5LD10 230V: 3RV1742- 5ED10 2x 115V: 2x 3RV1742- 5ED10
Internal Protection Device	NA	NA	NA	NA	NA
Dielectric Strength Type Test Voltage According To IEC 61558					
Input - Output	6.3 kVAC	6.3 kVAC	6.3 kVAC	6.3 kVAC	6.3 kVAC
Input - PE	3.2 kVAC	3.2 kVAC	3.2 kVAC	3.2 kVAC	3.2 kVAC
Output - PE	2.4 kVAC	2.4 kVAC	2.4 kVAC	2.4 kVAC	2.4 kVAC
Output-Output	1.5 kVAC	1.6 kVAC	1.6 kVAC	1.6 kVAC	1.6 kVAC
Dielectric Strength Type Test Voltage According to UL 5085					
Input - Output	4.8 kVAC	4.8 kVAC	4.8 kVAC	4.8 kVAC	4.8 kVAC
Input - PE	4.8 kVAC	4.8 kVAC	4.8 kVAC	4.8 kVAC	4.8 kVAC
Output - PE	3.0 kVAC	3.0 kVAC	3.0 kVAC	3.0 kVAC	3.0 kVAC
Output-Output	3.0 kVAC	3.0 kVAC	3.0 kVAC	3.0 kVAC	3.0 kVAC

Murrelektronik Control Transformers With Multi-Voltage Input

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Murrelektronik Control Transformers Specifications (Mechanical)

Part Number		86143	86144	86145	86147	86148	86149	86150	86151	86152	86153	86154	86155	86156	86157	86158
Protection Class		According to EN 61558: 1														
Protection Degree		EN 61558 IP00		EN 61558 IP00 EN 60529 IP20 EN 61558 IP00 EN 60529 IP20												
Core Weight (kg)		NA	NA	NA	NA	NA	NA	NA	8.9	15.1	20.1	14.9	17.1	20.5	22.9	24.9
Core Type		NA	NA	NA	NA	NA	NA	NA	Fe	Fe	Fe	Fe	Fe	Fe	Fe	Fe
Winding Weight (kg)		NA	NA	NA	NA	NA	NA	NA	3.4	4.2	6.1	9.8	11.0	12.4	14.4	21.5
Winding Type		NA	NA	NA	NA	NA	NA	NA	Cu	Cu	Cu	Cu	Cu	Cu	Cu	Cu
Total Weight (kg)		2.1	2.9	4.0	6.3	8.4	9.5	13.5	13.5	20.5	27.5	26.3	29.5	34.0	37.5	47.0
Cooling		Natural convection														
Mounting and Fitting																
Fastening		4x M4		4xM5			4xM6				4xM8					
Suitable for DIN-Rail (Acc. to EN 60715)		Yes (TH 35)		NA												
Input Terminals																
Tightening Torque (Recommended Tool Size 0.8x4.0 mm)		0.6 N•m (±0.1) [5.3 lbf•in (±0.9)]											1.7 N•m (±0.1) [14.6 lbf•in (±0.9)]			
Conductor Size	Solid	0.25-6 mm² (24-10AWG)											0.2-10 mm² (24-8 AWG)			
	Stranded	0.25-4 mm² (24-12AWG)											0.2-6 mm² (24-12AWG)			
	Stranded w/ferrule	0.25-4 mm² (24-12AWG)											0.25-6 mm² (24-12AWG)			
Stripping Length		10mm [0.39 in]														
Wire Temperature Class		>70°C														
Terminal Type		Screw connection + male FastOn 6.3 x 0.8 mm [0.25 in]											Screw connection			
PE Terminals																
Tightening Torque (PH2 / 1.0x6.0 mm Recommended Tool Size)		1.5 N•m (±0.1) [13.3 lbf•in (±0.9)]														0.7 N•m (±0.1) [6.2 lbf•in (±0.9)]
Conductor Size	Solid	0.25 - 6mm² (24-10AWG)														0.2-4 mm² (24-12 AWG)
	Stranded	0.25 - 4mm² (24-12AWG)														
	Stranded w/ferrule	0.25 - 4mm² (24-12AWG)														0.25-2.5 mm² (24-14 AWG)
Stripping Length		10mm [0.39 in]														9mm
Wire Temperature Class		>70°C														
Terminal Type		Screw connection														
Output Terminals 115VAC																
Tightening Torque (Recommended Tool Size 0.8x4.0 mm)		0.6 N•m (±0.1) [5.3 lbf•in (±0.9)]											1.7 N•m (±0.1) [14.6 lbf•in (±0.9)]			
Conductor Size	Solid	0.25 - 6mm² (24-10AWG)											0.2-10 mm² (24-8 AWG)			
	Stranded	0.25 - 4mm² (24-12AWG)											0.2-6 mm² (24-12 AWG)			
	Stranded w/ferrule	0.25 - 4mm² (24-12AWG)											0.25-6 mm² (24-12 AWG)			
Stripping Length		10mm [0.39 in]														
Wire Temperature Class		>70°C														
Terminal Type		Screw connection + male FastOn 6.3 x 0.8 mm [0.25 in]											Screw connection			

Murrelektronik Control Transformers With Multi-Voltage Input

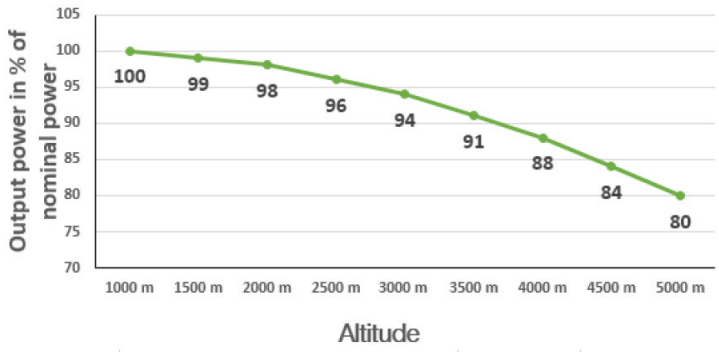
MURR ELEKTRONIK
stay connected

Murrelektronik Control Transformers Specifications (Mechanical, continued)																
Part Number		***86143***	***86144***	***86145***	***86147***	***86148***	***86149***	***86150***	***86151***	***86152***	***86153***	***86154***	***86155***	***86156***	***86157***	***86158***
Output Terminals 230VAC																
Tightening Torque (Recommended Tool Size 0.8x4.0 mm)		0.6 N•m (±0.1) [5.3 lbf•in (±0.9)]											1.7 N•m (±0.1) [14.6 lbf•in (±0.9)]			
Conductor Size	***Solid***	0.25 - 6mm² (24-10AWG)											0.2-10 mm² (24-8 AWG)			
	Stranded	0.25 - 4mm² (24-12AWG)											0.2-6 mm² (24-12 AWG)			
	Stranded w/ferrule	0.25 - 4mm² (24-12AWG)											0.25-6 mm² (24-12 AWG)			
Stripping Length		10mm [0.39 in]														
Wire Temperature Class		>70°C														
Terminal Type		Screw connection + male FastOn 6.3 x 0.8 mm [0.25 in]											Screw connection			
Output Terminals 2x115VAC																
Tightening Torque (Recommended Tool Size 0.8x4.0 mm)		0.6 N•m (±0.1) [5.3 lbf•in (±0.9)]											1.7 N•m (±0.1) [14.6 lbf•in (±0.9)]			
Conductor Size	***Solid***	0.25 - 6mm² (24-10AWG)											0.2-10 mm² (24-8 AWG)			
	Stranded	0.25 - 4mm² (24-12AWG)											0.2-6 mm² (24-12 AWG)			
	Stranded w/ferrule	0.25 - 4mm² (24-12AWG)											0.25-6 mm² (24-12 AWG)			
Stripping Length		10mm [0.39 in]														
Wire Temperature Class		>70°C														
Terminal Type		Screw connection + male FastOn 6.3 x 0.8 mm [0.25 in]											Screw connection			

Murrelektronik Control Transformers With Multi-Voltage Input

MURR ELEKTRONIK

stay connected

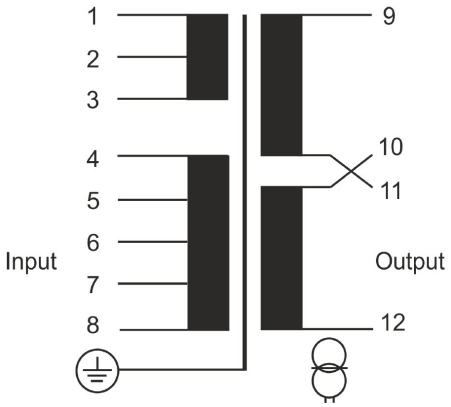
Murrelektronik Control Transformers Specifications (Environmental)	
Ambient Temperature	-20°C (-4°F) to +40°C (104°F)
Ambient Temperature (Acc. to UL)	-20°C (-4°F) to +40°C (104°F)
Storage Temperature	-30°C (-22°F) to +80°C (176°F)
Relative Humidity	5 to 95%
Maximum Altitude	5000m [16,404ft]
Altitude Derating (>1000m)	
Overvoltage Category (Acc. to EN 61558)	OVC 3
Pollution Degree (Acc. to EN 61558)	P3
MTBF (Acc. to DIN EIN 61709:1999-01; SN 29500; DIN EN ISO 13849-1:2008-12	>20,000,000 h @ 40°C
Vacuum Impregnated	Yes
Approvals	
EU Declaration of Conformity EMC Directive 2014/30/EU LVD Directive 2014/35/EU WEEE 2012/19/EU RoHs Directive Exemption 6(c) Reach China RoHs II UKCA EAC UL Recognized DNV-GL	
Standards	
EN 61558-1	Safety of transformers, reactors, power supply units and combinations thereof - Part 1:General requirements and tests
EN 61558-2-4	Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V - Part 2-4: Particular requirements and tests for isolating transformers and power supply units incorporating isolating transformers
EN 62041	Transformers, power supplies, reactors and similar products - EMC requirements; Category 0
UL 5085-1, UL 5085-2 CSA C22.2 No. 66-1-06, CSA C22.2 No. 66-2-06	File: E182075; Category: XPTQ2/8 (General Purpose)

Murrelektronik Control Transformers With Multi-Voltage Input

MURR ELEKTRONIK

stay connected

Wiring

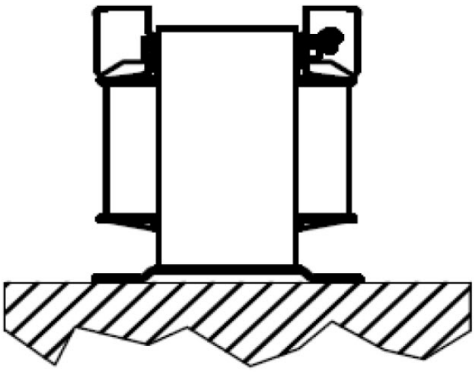


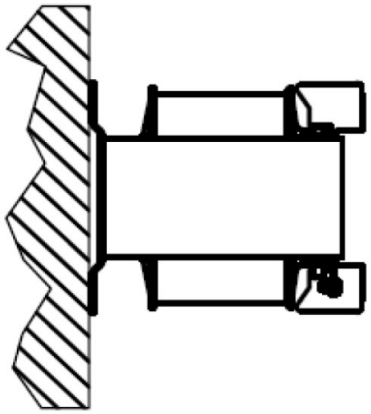
Connection Table				
	Voltage	***In (A)***	***Connect to***	***Jumper***
Input	208	5.3	1-2	1+4 / 3+7
	230*	4.8	5-7	1+4 / 3+7
	380	2.9	1-6	2+5
	400	2.7	1-6	2+4
	420	2.6	1-6	3+5
	440	2.5	1-6	3+4
	460	2.4	1-7	2+4
	480	2.3	1-7	3+5
	500	2.2	1-7	3+4
	525	2.1	1-8	3+5
	550	2.0	1-8	3+4
Output	2 x 115	4.4	9-11 / 10-12	–
	115	8.7	9-12	9+10 / 11+12
	230	4.4	9-12	10+11

**** Factory Preset***

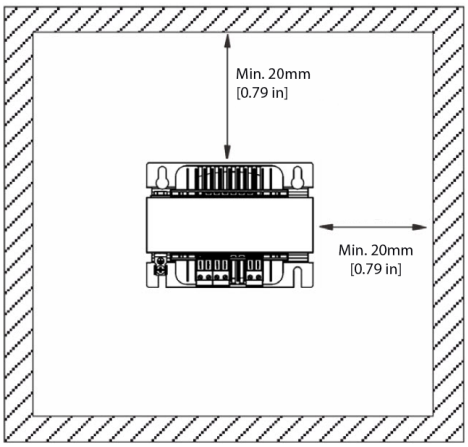
Mounting Position

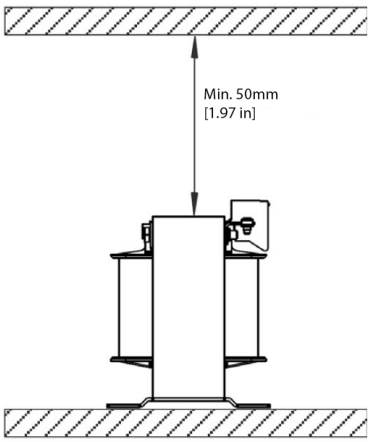
Standing on the floor or perpendicular to the wall





Clearance





HPS Spartan™ Open Core and Coil Control Transformer Selection

Hammond Power Solutions

Control transformer selection

To select the proper transformer, you must first determine three characteristics of the load circuit. They are: total steady-state (sealed) VA, total inrush VA, and inrush load power factor.

Total steady-state "sealed" VA is the total amount of VA that the transformer must supply to the load circuit for an extended length of time. Calculate by adding the total steady-state VA of all devices in your control circuit. *(The operating VA data for the devices should be available from the manufacturers.)*

The inrush VA is the amount of VA that the transformer must supply for all components in the control circuit that are energized together. Consideration for the start-up sequence may be required. *(Inrush VA data should be obtained from the device manufacturers.)*

The inrush load power factor is difficult to determine without detailed vector analysis of all the control components. In the absence of such information, we recommend that a 40% power factor be utilized.

Six easy steps

Once the three load circuit variables have been determined, follow these steps to select the proper transformer.

1. Determine your primary (supply) and secondary (output) voltage requirements, as well as the required frequency (i.e. 60 Hz).
2. Calculate the total sealed VA of your circuit by adding the total sealed VA of all devices in the control circuit.
3. Calculate the inrush VA by adding the inrush VA of all components being energized together. Remember to add the sealed VA of all components that do not have inrush VA (lamps, timers, etc.), as they do present a load to the transformer during maximum inrush. If the inrush for your components is unknown, assume a 40% inrush power factor.
4. Calculate the total inrush VA using one of two methods as shown below. **Method B will result in selection of a slightly larger transformer.**
5. If the nominal supply voltage does not fluctuate more than 5%, reference the 90% secondary voltage column in the Regulation Data Table for the correct VA rating.

If the supply voltage varies up to 10%, the 95% secondary voltage column should be used to size the transformer. The 85% secondary voltage column gives minimum values for proper

A $$\text{Total Inrush VA} = \sqrt{(\text{VA sealed})^2 + (\text{VA inrush})^2}$$

or

B $$\text{Total Inrush VA} = \text{VA Sealed} + \text{VA Inrush}$$

HPS Spartan Transformer Regulation Data Table

Continuous VA Transformer Nameplate	*Inrush VA @ 40% Power Factor*		
	85% Secondary Voltage	*90% Secondary Voltage*	*95% Secondary Voltage*
50	177	139	102
100	350	275	203
150	715	554	400
250	1653	1264	895
350	2604	1947	1321
500	4004	3023	2090
750	6933	5088	3352
1000	10087	7340	4764
1500	14178	10232	6508
2000	17604	12669	8080
3000	39213	27539	16780
5000	68344	47498	28803

Note: It is recommended that a control transformer be sized at a 40% power factor. Some components in a circuit, such as electromagnetic devices, typically operate at that level due to their inherently lower power factor. Selecting a transformer at 40% power factor will more than adequately size the unit for all the various loads in the circuit.

electromagnetic device operation and should only be used as a reference.

6. Using the regulation data table below, select the appropriate VA rated transformer:
   A. With a continuous VA rating that is equal to or greater than the value in Step 2.
   B. With a maximum inrush VA equal to or greater than the value obtained in Step 4.

Note: See over-current protection chart for transformers at the end of this section.

Voltage regulation in transformers

Voltage regulation in transformers is the difference between the "No-Load voltage" and the "Full-Load voltage." This is expressed in terms of percentage.The secondary voltages (nominal) listed in these pages are at Full-Load, meaning the point at which the transformer is operating at maximum permissible secondary current. No-Load voltage can increase 4 to 6%.

$$\text{Regulation Percentage} = \frac{E_{\text{No-Load}} - E_{\text{Full Load}}}{E_{\text{Full Load}}} (100\%)$$

Warning:
Secondary voltages of transformers may damage some loads. For example, a transformer connected as 480/120 Volt but applied 495 Volt primary can produce at No-Load a voltage of 134 Volts which will damage the inputs of a PLC D0-06AA, whose maximum input voltage is 132 Volt. Notice that the current of D0-06AA input is 10mA, making it very close to No-Load.

HPS Spartan™ 600/480 / 120x240 VAC Open Core and Coil Control Transformers

Hammond Power Solutions

Features

- Multi-voltage primary and secondary models increase range of application per unit
- Standard molded terminal blocks or primary and secondary up to 3000VA (30A) units
- Solid terminal block with standard combination screw connection
- 60Hz
- Copper-wound coils with high dielectric strength insulation
- Bolted core construction
- Bolt-on mounting brackets
- Vacuum impregnated with polyester resin and oven cured
- Seismically certified in accordance with IBC 2009; Section 1613 Earthquake Loads, for SDS ≤ 2.00g , z/h = 1.0, and IP = 1.5
- Superior insulating materials. The HPS Spartan series transformers offer the following insulation systems:
- 130°C (80°C rise) up to 1500 VA
- 180°C (115°C rise) 2000 VA to 5000 VA
- Temperature range: -20°C (-4°F) to 40°C (104°F)
- All terminal blocks utilize a combination slot/ Phillips #6-32 screw with a SEMS washer (suitable for 18 AWG to 14 AWG for solid wire and 18 AWG to 12 AWG for stranded wire).
- Coil face terminations utilize a ¼-20 UNC X 0.50 in combination slot/Phillips screw and a spring lock washer.
- All units supplied with primary and secondary voltage links/jumpers
- Optional finger guards available, up to and including 3000VA or 30 amps
- Optional fuse block adapter kit available, up to and including 3000VA or 30 amps
- Supplied with trilingual installation and wiring instruction sheets
- 15 year warranty

Agency Approvals

- UL Listed (approved for U.S. and Canada) File E50394 (Models/Type 3AH)
- CE Mark standard on all units
- CSA LR3902
- RoHS Compliant

HPS Spartan 600/480 / 120x240 Open Core and Coil Control Transformer Specifications

Part Number	Price	Volt-Amp Rating	CE Volt-Amp	Mtg. Fig.	Primary Voltage (VAC) (60 Hz)	Secondary Voltage (VAC) (Nominal)	Output Current (Amps) 120/240 VAC	Impedance %		Total Heat Dissipation (Watts)**	Weight lb [kg]
								VA	%z		
SP50ACP	$52.00	50	50	A	600/480 575/460 550/440	120X240 115X230 110X220	0.42/0.21	50	8.3	14	2.2 [1.00]
SP100ACP	$62.00	100	100	A			0.83/0.42	100	6.9	24	3.3 [1.50]
SP150ACP	$73.00	150	150	A			1.25/0.63	150	8.4	29	4.4 [2.00]
SP250ACP	$101.00	250	160	A			2.08/1.04	250	7.8	40	6.4 [2.90]
SP350ACP	$132.00	350	250	A			2.92/1.46	350	7.0	48	7.5 [3.40]
SP500ACP	$159.00	500	300	A			4.17/2.08	500	5.0	61	11 [4.99]
SP750ACP	$217.00	750	500	A			6.25/3.13	750	4.9	75	18 [8.16]
SP1000ACP	$243.00	1000	650	A			8.33/4.17	1000	3.7	90	21 [9.53]
SP1500ACP	$317.00	1500	1000	A			12.5/6.25	1500	3.9	122	28 [12.70]
SP2000ACP	$458.00	2000	1300	A			16.7/8.33	2000	4.0	194	34 [15.42]
SP3000ACP	$748.00	3000	2000	A			25.0/12.5	3000	2.5	206	80 [36.29]
SP5000ACP	$1,179.00	5000	3000	B			41.7/20.8	5000	2.5	319	93 [42.18]

*Note: *VA capacity rated at the output of the transformer.*
*** Heat dissipation calculated based on full rated load on transformer.*
Note: The impedance values listed in the table above are calculated typical values only. Actual measured impedance values may vary based on a specific design.

HPS Spartan™ 600/480 / 120x240 VAC Open Core and Coil Control Transformers

Hammond Power Solutions

Dimensions

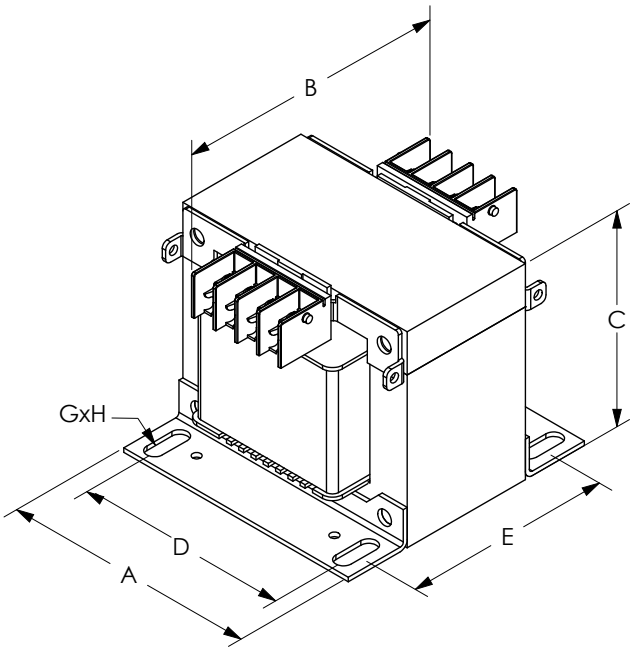


Figure A

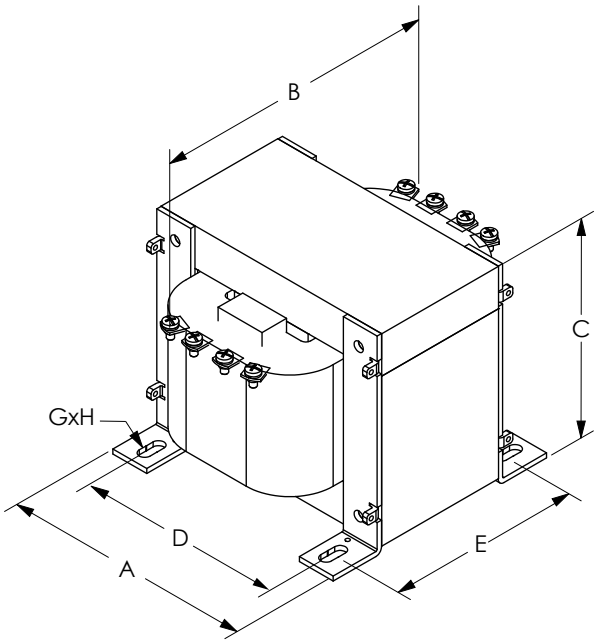


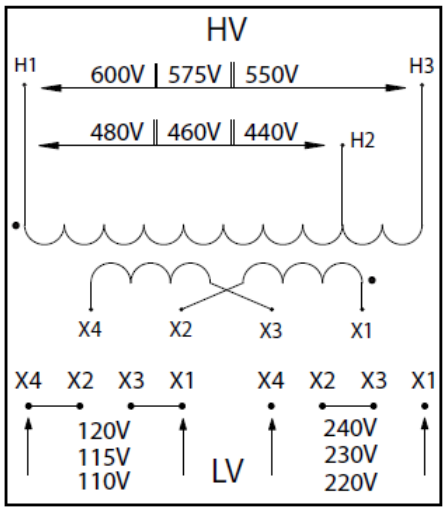
Figure B

HPS Spartan 600/480 / 120x240 Open Core and Coil Control Transformer Dimensions									
Part Number	Mtg. Fig.	Overall Dimensions in [mm]			Mounting Centers in [mm]		Mounting Slot in [mm]	Height with Finger Guard, in [mm]	Height with Fuse Block Adapter in [mm]
		A	B	C	D	E	G X H		
SP50ACP	A	2.60 [66.04]	3.82 [97.03]	2.60 [66.04]	2.13 [54.10]	2.64 [67.06]	0.22 x 0.44 [5.59x11.18]	2.98 [75.69]	2.79 [70.87]
SP100ACP	A	2.99 [75.95]	3.74 [95.00]	2.85 [72.39]	2.52 [64.01]	2.60 [66.04]	0.22 x 0.44 [5.59x11.18]	3.23 [82.04]	3.04 [77.22]
SP150ACP	A	2.99 [75.95]	4.29 [108.97]	2.85 [72.39]	2.52 [64.01]	3.15 [80.01]	0.22 x 0.44 [5.59x11.18]	3.23 [82.04]	3.04 [77.22]
SP250ACP	A	3.78 [96.01]	4.09 [103.89]	3.40 [86.36]	3.31 [84.07]	2.99 [75.95]	0.22 x 0.44 [5.59x11.18]	3.78 [96.01]	3.59 [91.19]
SP350ACP	A	3.78 [96.01]	4.49 [114.05]	3.40 [86.36]	3.31 [84.07]	3.39 [86.11]	0.22 x 0.44 [5.59x11.18]	3.78 [96.01]	3.59 [91.19]
SP500ACP	A	4.49 [114.05]	4.69 [119.13]	3.78 [96.01]	3.78 [96.01]	3.66 [92.96]	0.31 x 0.81 [7.87x20.57]	4.16 [105.66]	3.97 [100.84]
SP750ACP	A	5.25 [133.35]	5.08 [129.03][1]	4.37 [111.00]	4.50 [114.30]	4.06 [103.12]	0.31 x 0.81 [7.87x20.57]	4.75 [120.65]	4.56 [115.82]
SP1000ACP	A	5.25 [133.35]	5.47 [138.94][1]	4.37 [111.00]	4.50 [114.30]	4.45 [113.03]	0.31 x 0.81 [7.87x20.57]	4.75 [120.65]	4.56 [115.82]
SP1500ACP	A	5.25 [133.35]	6.85 [173.99][1]	4.37 [111.00]	4.50 [114.30]	5.83 [148.08]	0.31 x 0.81 [7.87x20.57]	4.56 [115.82]	4.37 [111.00]
SP2000ACP	A	6.38 [162.05]	5.87 [149.10][1]	5.31 [134.87]	5.75 [146.05]	4.84 [122.94]	0.31 x 0.81 [7.87x20.57]	5.69 [114.53]	5.50 [139.70]
SP3000ACP	A	7.50 [190.50]	7.50 [190.50]	6.50 [165.10]	6.30 [160.02]	6.85 [173.99]	0.44 x 1.00 [11.18x25.4]	6.50 [165.10]	6.50 [165.10]
SP5000ACP	B	8.98 [228.09]	9.88 [250.95]	7.76 [197.10]	7.40 [187.96]	7.13 [181.10]	0.44 x 1.00 [11.18x25.4]	N/A	N/A

Note: All dimensions are ±0.06 in unless otherwise noted.
1: For 750 through 2000 VA units actual overall depth is 0.24" plus the value in column B.

HPS Spartan™ 600/480 / 120x240 VAC Open Core and Coil Control Transformers

Wiring



SP*ACP Schematic Connections for 600/480 to 120 X 240**

High Voltage (HV) (Primary Volts)			Install Supplied Jumpers Between Terminals	Supply Lines Connect To
600	575	550	None	H1, H3
480	460	440	None	H1, H2

Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To
120	115	110	X1-X3, X2-X4	X1, X4
240	230	220	X2-X3	X1, X4

HPS Spartan™ 240x480 / 120x240 VAC Open Core and Coil Control Transformers

Hammond Power Solutions

Features

- Multi-voltage primary and secondary models increase range of application per unit
- Standard molded terminal blocks or primary and secondary up to 3000VA (30A) units
- Solid terminal block with standard combination screw connection
- 50/60 Hz
- Copper-wound coils with high dielectric strength insulation
- Bolted core construction
- Bolt-on mounting brackets
- Vacuum impregnated with polyester resin and oven cured
- Seismically certified in accordance with IBC 2009; Section 1613 Earthquake Loads, for SDS ≤ 2.00g , z/h = 1.0, and IP = 1.5
- Superior insulating materials. The HPS Spartan series transformers offer the following insulation systems:
- 130°C (80°C rise) up to 1500 VA
- 180°C (115°C rise) 2000 VA to 5000 VA
- Temperature range: -20°C (-4°F) to 40°C (104°F)
- All terminal blocks utilize a combination slot/Phillips #6-32 screw with a SEMS washer (suitable for 18 AWG to 14 AWG for solid wire and 18 AWG to 12 AWG for stranded wire). Coil face terminations utilize a ¼-20 UNC X 0.50 in combination slot/Phillips screw and a spring lock washer.
- All units supplied with primary and secondary voltage links/jumpers
- Optional finger guards available, up to and including 3000VA or 30 amps
- Optional fuse block adapter kit available, up to and including 3000VA or 30 amps
- Supplied with trilingual installation and wiring instruction sheets
- **15 year warranty**

Agency Approvals

- UL Listed (approved for U.S. and Canada) File E50394 (Models/Type 3AH)
- CE Mark standard on all units
- CSA LR3902
- RoHS Compliant

HPS Spartan 240x480 / 120x240 Open Core and Coil Control Transformer Specifications

Part Number	Price	Volt-Amp Rating	CE Volt-Amp	Mtg. Fig.	Primary Voltage (VAC) (50/60 Hz)	Secondary Voltage (VAC) (Nominal)	Output Current (Amps) 120/240 VAC	Impedance %		Total Heat Dissipation (Watts)**	Weight lb [kg]
								VA	%z		
SP50MQMJ	$52.00	50	50	A	240x480 230x460 220x440	120x240 115x230 110x220	0.42/0.21	50	8.3	14	1.7 [0.77]
SP100MQMJ	$62.00	100	100	A			0.83/0.42	100	6.9	24	3 [1.36]
SP150MQMJ	$73.00	150	150	A			1.25/0.63	150	8.4	29	4.3 [1.95]
SP250MQMJ	$99.00	250	160	A			2.08/1.04	250	7.8	40	6.5 [2.95]
SP350MQMJ	$132.00	350	250	A			2.92/1.46	350	7.0	48	8.2 [3.72]
SP500MQMJ	$159.00	500	300	A			4.17/2.08	500	5.0	61	11 [4.99]
SP750MQMJ	$217.00	750	500	A			6.25/3.13	750	4.9	75	16 [7.26]
SP1000MQMJ	$243.00	1000	650	A			8.33/4.17	1000	3.7	90	21 [9.53]
SP1500MQMJ	$317.00	1500	1000	A			12.5/6.25	1500	3.9	122	28 [12.70]
SP2000MQMJ	$461.00	2000	1300	A			16.7/8.33	2000	4.0	194	35 [15.88]
SP3000MQMJ	$742.00	3000	2000	A			25.0/12.5	3000	2.5	206	64 [29.03]
SP5000MQMJ	$1,181.00	5000	3000	B			41.7/20.8	5000	2.5	319	97 [44.00]

*Note: *VA capacity rated at the output of the transformer.*
*** Heat dissipation calculated based on full rated load on transformer.*
Note: The impedance values listed in the table above are calculated typical values only. Actual measured impedance values may vary based on a specific design.

HPS Spartan™ 240x480 / 120x240 VAC Open Core and Coil Control Transformers

Hammond Power Solutions

Dimensions

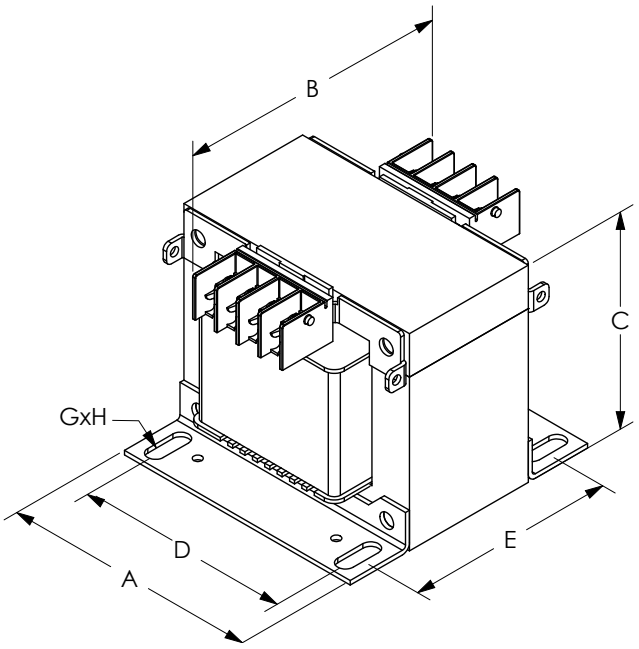


Figure A

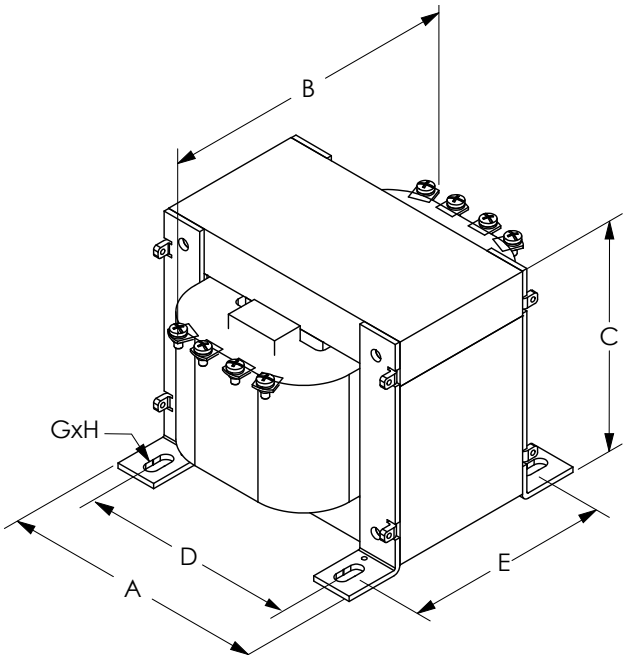


Figure B

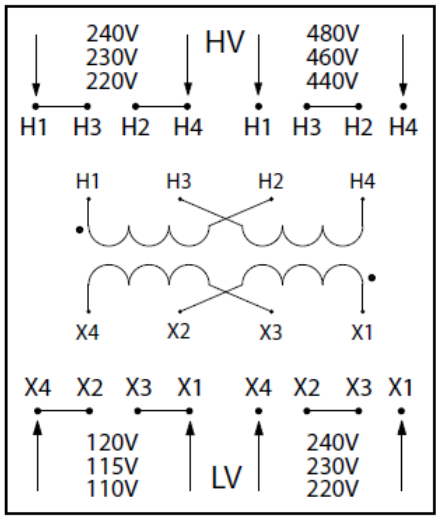
HPS Spartan 240x480 / 120x240 Open Core and Coil Control Transformer Dimensions									
Part Number	*Mtg. Fig.*	*Overall Dimensions in [mm]*			*Mounting Centers in [mm]*		*Mounting Slot in [mm]*	*Height with Finger Guard in [mm]*	*Height with Fuse Block Adapter in [mm]*
		A	*B*	*C*	*D*	*E*	*G X H*		
SP50MQMJ	A	2.60 [66.04]	3.35 [85.09]	2.60 [66.04]	2.13 [54.10]	2.17 [55.12]	0.22 x 0.44 [5.59x11.18]	2.98 [75.69]	2.79 [70.87]
SP100MQMJ	A	2.99 [75.95]	3.74 [95.00]	2.85 [72.39]	2.52 [64.01]	2.60 [66.04]	0.22 x 0.44 [5.59x11.18]	3.23 [82.04]	3.04 [77.22]
SP150MQMJ	A	2.99 [75.95]	4.29 [108.97]	2.85 [72.39]	2.52 [64.01]	3.15 [80.01]	0.22 x 0.44 [5.59x11.18]	3.23 [82.04]	3.04 [77.22]
SP250MQMJ	A	3.78 [96.01]	4.09 [103.89]	3.40 [86.36]	3.31 [84.07]	2.99 [75.95]	0.22 x 0.44 [5.59x11.18]	3.78 [96.01]	3.59 [91.19]
SP350MQMJ	A	3.78 [96.01]	4.69 [119.13]	3.40 [86.36]	3.31 [84.07]	3.58 [90.93]	0.22 x 0.44 [5.59x11.18]	3.78 [96.01]	3.59 [91.19]
SP500MQMJ	A	4.49 [114.05]	4.69 [119.13]	3.78 [96.01]	3.78 [96.01]	3.66 [92.96]	0.31 x 0.81 [7.87x20.57]	4.16 [105.66]	3.97 [100.84]
SP750MQMJ	A	5.25 [133.35]	4.69 [119.13][1]	4.37 [111.00]	4.50 [114.30]	3.66 [92.96]	0.31 x 0.81 [7.87x20.57]	4.75 [120.65]	4.56 [115.82]
SP1000MQMJ	A	5.25 [133.35]	5.47 [138.94][1]	4.37 [111.00]	4.50 [114.30]	4.45 [113.03]	0.31 x 0.81 [7.87x20.57]	4.75 [120.65]	4.56 [115.82]
SP1500MQMJ	A	5.25 [133.35]	6.85 [173.99][1]	4.37 [111.00]	4.50 [114.30]	5.83 [148.08]	0.31 x 0.81 [7.87x20.57]	4.75 [120.65]	4.56 [115.82]
SP2000MQMJ	A	6.38 [162.05]	5.87 [149.10][1]	5.31 [134.87]	5.75 [146.05]	4.84 [122.94]	0.31 x 0.81 [7.87x20.57]	5.50 [139.70]	5.31 [134.87]
SP3000MQMJ	A	7.50 [190.50]	7.50 [190.50]	6.50 [165.10]	6.30 [160.02]	7.28 [184.91]	0.44 x 1.00 [11.18x25.4]	6.50 [165.10]	6.50 [165.10]
SP5000MQMJ	B	8.98 [228.09]	9.88 [250.95]	7.76 [197.10]	7.40 [187.96]	7.28 [184.91]	0.44 x 1.00 [11.18x25.4]	N/A	N/A

Note: All dimensions are ±0.06 in unless otherwise noted.
1: For 750 through 2000 VA units actual overall depth is 0.24" plus the value in column B.

HPS Spartan™ 240x480 / 120x240 VAC Open Core and Coil Control Transformers

Hammond Power Solutions

Wiring



SP*MQMJ Schematic Connections for 240 X 480 to 120 X 240**

High Voltage (HV) (Primary Volts)			Install Supplied Jumpers Between Terminals	Supply Lines Connect To
240	230	220	H1-H3, H2-H4	H1, H4
480	460	440	H2-H3	H1, H4

Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To
120	115	110	X1-X3, X2-X4	X1, X4
240	230	220	X2-X3	X1, X4

HPS Spartan™ 120x240 / 12x24 VAC Open Core and Coil Control Transformers

Hammond Power Solutions

Features

- Multi-voltage primary and secondary models increase range of application per unit
- Standard molded terminal blocks or primary and secondary up to 3000VA (30A) units
- Solid terminal block with standard combination screw connection
- 50/60 Hz
- Copper-wound coils with high dielectric strength insulation
- Bolted core construction
- Bolt-on mounting brackets
- Vacuum impregnated with polyester resin and oven cured
- Seismically certified in accordance with IBC 2009; Section 1613 Earthquake Loads, for SDS ≤ 2.00g , z/h = 1.0, and IP = 1.5
- Superior insulating materials. The HPS Spartan series transformers offer the following insulation systems:
- 130°C (80°C rise) up to 1500 VA
- 180°C (115°C rise) 2000 VA to 5000 VA
- Temperature range: -20°C (-4°F) to 40°C (104°F)
- All terminal blocks utilize a combination slot/Phillips #6-32 screw with a SEMS washer (suitable for 18 AWG to 14 AWG for solid wire and 18 AWG to 12 AWG for stranded wire). Coil face terminations utilize a ¼-20 UNC X 0.50 in combination slot/Phillips screw and a spring lock washer.
- All units supplied with primary and secondary voltage links/jumpers
- Optional finger guards available, up to and including 3000VA or 30 amps
- Optional fuse block adapter kit available, up to and including 3000VA or 30 amps
- Supplied with trilingual installation and wiring instruction sheets
- **15 year warranty**

Agency Approvals

- UL Listed (approved for U.S. and Canada) File E50394 (Models/Type 3AH)
- CE Mark standard on all units
- CSA LR3902
- RoHS Compliant

HPS Spartan 120x240 / 12x24 Open Core and Coil Control Transformer Specifications

Part Number	Price	Volt-Amp Rating	CE Volt-Amp	Mtg. Fig.	Primary Voltage (VAC) (50/60 Hz)	Secondary Voltage (VAC) (Nominal)	Output Current (Amps) 12/24 VAC	Impedance %		Total Heat Dissipation (Watts)**	Weight lb [kg]
								VA	%z		
SP50PR	$52.00	50	50	A	120x240 115x230 110x220	12x24 11.5x23 11x22	4.17/2.08	50	8.3	14	1.7 [0.77]
SP100PR	$62.00	100	100	A			8.33/4.17	100	6.9	24	3 [1.36]
SP150PR	$75.00	150	150	A			12.5/6.25	150	8.4	29	4.3 [1.95]
SP250PR	$99.00	250	160	A			20.8/10.4	250	7.8	40	5.9 [2.68]
SP350PR	$129.00	350	250	A			29.2/14.6	350	7.0	48	8.2 [3.72]
SP500PR	$158.00	500	300	B			41.7/20.8	500	5.0	61	11 [4.99]

*Note: *VA capacity rated at the output of the transformer.*
*** Heat dissipation calculated based on full rated load on transformer.*
Note: The impedance values listed in the table above are calculated typical values only. Actual measured impedance values may vary based on a specific design.

HPS Spartan™ 120x240 / 12x24 VAC Open Core and Coil Control Transformers

Hammond Power Solutions

Dimensions

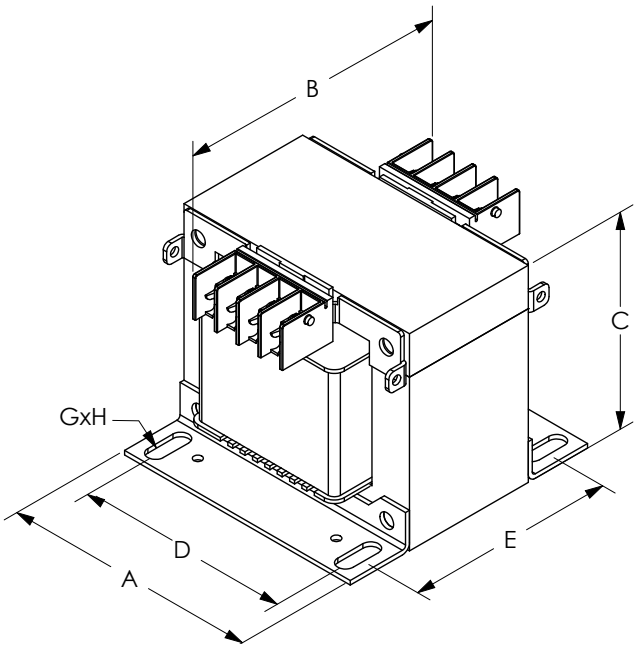


Figure A

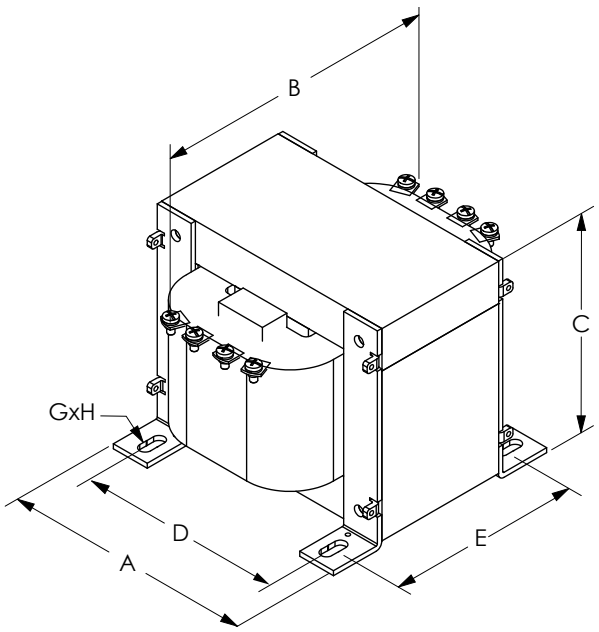


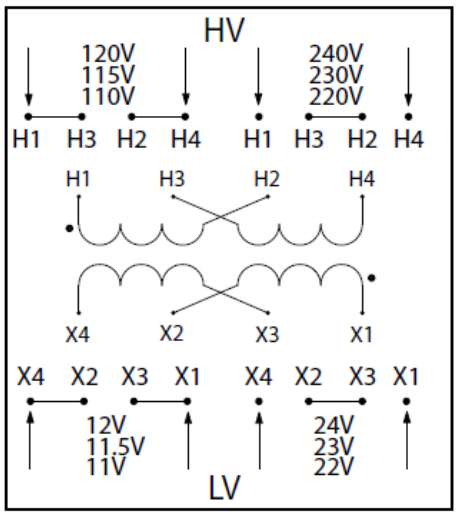
Figure B

HPS HPS Spartan 120x240 / 12x24 Open Core and Coil Control Transformer Dimensions									
Part Number	*Mtg. Fig.*	*Overall Dimensions in [mm]*			*Mounting Centers in [mm]*		*Mounting Slot in [mm]*	*Height with Finger Guard in [mm]*	*Height with Fuse Block Adapter in [mm]*
		A	*B*	*C*	*D*	*E*	*G X H*		
SP50PR	A	2.60 [66.04]	3.35 [85.09]	2.60 [66.04]	2.13 [54.10]	2.17 [55.12]	0.22 x 0.44 [5.59x11.18]	2.98 [75.69]	2.79 [70.87]
SP100PR	A	2.99 [75.95]	3.74 [95.00]	2.85 [72.39]	2.52 [64.01]	2.60 [66.04]	0.22 x 0.44 [5.59x11.18]	3.23 [82.04]	3.04 [77.22]
SP150PR	A	2.99 [75.95]	4.29 [108.97]	2.85 [72.39]	2.52 [64.01]	3.15 [80.01]	0.22 x 0.44 [5.59x11.18]	3.23 [82.04]	3.04 [77.22]
SP250PR	A	3.78 [96.01]	3.90 [99.10]	3.40 [86.36]	3.31 [84.07]	2.80 [71.12]	0.22 x 0.44 [5.59x11.18]	3.78 [96.01]	3.59 [91.19]
SP350PR	A	3.78 [96.01]	4.69 [119.13]	3.40 [86.36]	3.31 [84.07]	3.58 [90.93]	0.22 x 0.44 [5.59x11.18]	3.78 [96.01]	3.59 [91.19]
SP500PR	B	4.49 [114.05]	5.47 [138.94]	3.78 [96.01]	3.78 [96.01]	3.66 [92.96]	0.31 x 0.81 [7.87x20.57]	4.16 [105.66]	3.97 [100.84]

Note: All dimensions are ±0.06 in unless otherwise noted.

HPS Spartan™ 120x240 / 12x24 VAC Open Core and Coil Control Transformers

Wiring



SP*PR Schematic Connections for 120 X 240 to 12 X 24**

High Voltage (HV) (Primary Volts)			Install Supplied Jumpers Between Terminals	Supply Lines Connect To
120	115	110	H1-H3, H2-H4	H1, H4
240	230	220	H2-H3	H1, H4

Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To
12	11.5	11	X1-X3, X2-X4	X1, X4
24	23	22	X2-X3	X1, X4

HPS Spartan™ 208x416 / 120x240 VAC Open Core and Coil Control Transformers

Hammond Power Solutions

Features

- Multi-voltage primary and secondary models increase range of application per unit
- Standard molded terminal blocks or primary and secondary up to 3000VA (30A) units
- Solid terminal block with standard combination screw connection
- 50/60 Hz
- Copper-wound coils with high dielectric strength insulation
- Bolted core construction
- Bolt-on mounting brackets
- Vacuum impregnated with polyester resin and oven cured
- Seismically certified in accordance with IBC 2009; Section 1613 Earthquake Loads, for SDS ≤ 2.00g , z/h = 1.0, and IP = 1.5
- Superior insulating materials. The HPS Spartan series transformers offer the following insulation systems:
- 130°C (80°C rise) up to 1500 VA
- 180°C (115°C rise) 2000 VA to 5000 VA
- Temperature range: -20°C (-4°F) to 40°C (104°F)
- All terminal blocks utilize a combination slot/ Phillips #6-32 screw with a SEMS washer (suitable for 18 AWG to 14 AWG for solid wire and 18 AWG to 12 AWG for stranded wire). Coil face terminations utilize a ¼-20 UNC X 0.50 in combination slot/Phillips screw and a spring lock washer.
- All units supplied with primary and secondary voltage links/jumpers
- Optional finger guards available, up to and including 3000VA or 30 amps
- Optional fuse block adapter kit available, up to and including 3000VA or 30 amps
- Supplied with trilingual installation and wiring instruction sheets
- 15 year warranty

Agency Approvals

- UL Listed (approved for U.S. and Canada) File E50394 (Models/Type 3AH)
- CE Mark standard on all units
- CSA LR3902
- RoHS Compliant

HPS Spartan 208x416 / 120x240 Open Core and Coil Control Transformer Specifications

Part Number	Price	Volt-Amp Rating	CE Volt-Amp	Mtg. Fig.	Primary Voltage (VAC) (50/60 Hz)	Secondary Voltage (VAC) (Nominal)	Output Current (Amps) 120/240 VAC	Impedance %		Total Heat Dissipation (Watts)**	Weight lb [kg]
								VA	%z		
SP100SP	$62.00	100	100	A	208X416 200X400 190X380	120X240 115X230 110X220	0.83/0.42	100	6.9	24	3 [1.36]
SP150SP	$75.00	150	150	A			1.25/0.63	150	8.4	29	4.3 [1.95]
SP250SP	$101.00	250	160	A			2.08/1.04	250	7.8	40	6.5 [2.95]
SP350SP	$132.00	350	250	A			2.92/1.46	350	7.0	48	8.3 [3.76]
SP500SP	$159.00	500	300	A			4.17/2.08	500	5.0	61	11 [4.99]
SP750SP	$214.00	750	500	A			6.25/3.13	750	4.9	75	16 [7.26]
SP1000SP	$243.00	1000	650	A			8.33/4.17	1000	3.7	90	20 [9.07]
SP1500SP	$327.00	1500	1000	A			12.5/6.25	1500	3.9	122	27 [12.25]

*Note: *VA capacity rated at the output of the transformer.*
*** Heat dissipation calculated based on full rated load on transformer.*
Note: The impedance values listed in the table above are calculated typical values only. Actual measured impedance values may vary based on a specific design.

HPS Spartan™ 208x416 / 120x240 VAC Open Core and Coil Control Transformers

Hammond Power Solutions

Dimensions

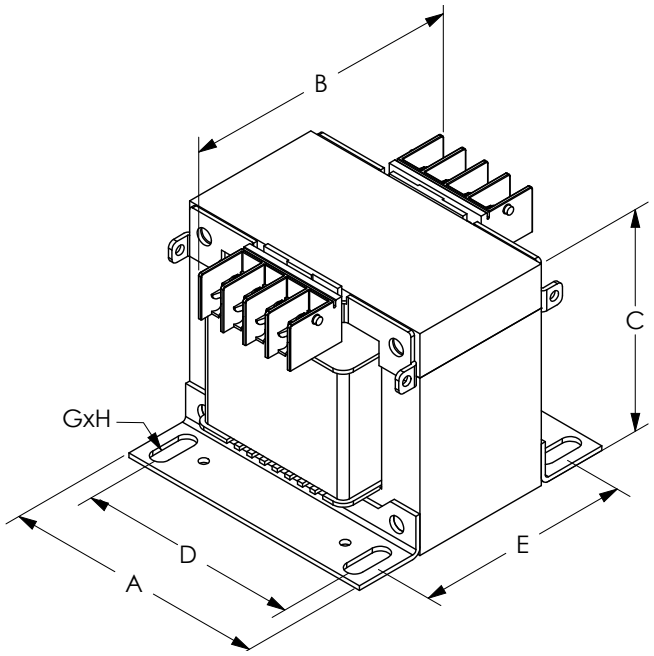


Figure A

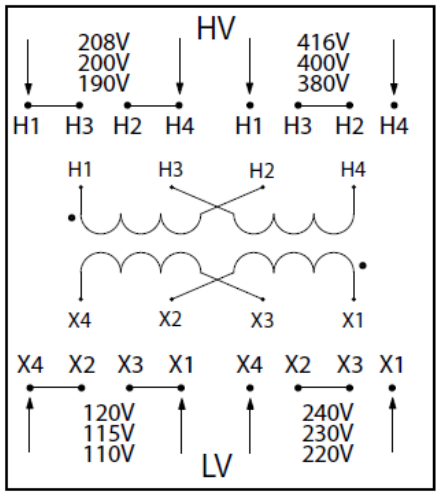
HPS Spartan 208x416 / 120x240 Open Core and Coil Control Transformer Dimensions									
Part Number	*Mtg. Fig.*	*Overall Dimensions in [mm]*			*Mounting Centers in [mm]*		*Mounting Slot in [mm]*	*Height with Finger Guard in [mm]*	*Height with Fuse Block Adapter in [mm]*
		A	*B*	*C*	*D*	*E*	*G X H*		
SP100SP	A	2.99 [75.95]	3.54 [89.92]	2.85 [72.39]	2.52 [64.01]	2.40 [60.96]	0.22 x 0.44 [5.59x11.18]	3.23 [82.04]	2.85 [72.39]
SP150SP	A	2.99 [75.95]	4.29 [108.97]	2.85 [72.39]	2.52 [64.01]	3.15 [80.01]	0.22 x 0.44 [5.59x11.18]	3.23 [82.04]	2.85 [72.39]
SP250SP	A	3.78 [96.01]	4.09 [103.89]	3.40 [86.36]	3.31 [84.07]	2.99 [75.95]	0.22 x 0.44 [5.59x11.18]	3.78 [96.01]	3.40 [86.36]
SP350SP	A	3.78 [96.01]	4.69 [119.13]	3.40 [86.36]	3.31 [84.07]	3.58 [90.93]	0.22 x 0.44 [5.59x11.18]	3.78 [96.01]	3.40 [86.36]
SP500SP	A	4.49 [114.05]	4.69 [119.13]	3.78 [96.01]	3.78 [96.01]	3.66 [92.96]	0.31 x 0.81 [7.87x20.57]	4.16 [105.66]	3.78 [96.01]
SP750SP	A	5.25 [133.35]	4.69 [119.13][1]	4.37 [111.00]	4.50 [114.30]	3.66 [92.96]	0.31 x 0.81 [7.87x20.57]	4.75 [120.65]	4.75 [120.65]
SP1000SP	A	5.25 [133.35]	5.47 [138.94][1]	4.37 [111.00]	4.50 (114.30)	4.45 [113.03]	0.31 x 0.81 [7.87x20.57]	4.75 [120.65]	4.75 [120.65]
SP1500SP	A	6.38 [162.05]	4.88 [123.95][1]	5.31 [134.87]	5.75 [146.05]	3.86 [98.04]	0.31 x 0.81 [7.87x20.57]	4.75 [120.65]	5.69 [144.53]

Note: All dimensions are ±0.06 in unless otherwise noted.
1: For 750 through 2000 VA units actual overall depth is 0.24 in. plus the value in column B.

HPS Spartan™ 208x416 / 120x240 VAC Open Core and Coil Control Transformers

Hammond Power Solutions

Wiring



SP*SP Schematic Connections for 208 X 416 to 120 X 240**

High Voltage (HV) (Primary Volts)			Install Supplied Jumpers Between Terminals	Supply Lines Connect To
208	200	190	H1-H3, H2-H4	H1, H4
416	400	380	H2-H3	H1, H4

Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To
120	115	110	X1-X3, X2-X4	X1, X4
240	230	220	X2-X3	X1, X4

HPS Spartan™ Transformers Accessories – Fuse Block Adapter Kit and Finger Guards

Hammond Power Solutions

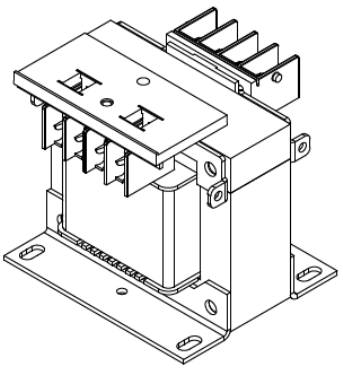
Fuse Block Adapter Kit

HPS Spartan industrial control transformers up to and including 3000VA or 30A are available with optional fuse block adapter kits. The Fuse block Adapter Kit is designed to allow for the installation of any third-party or aftermarket fuse block assembly onto the industrial control transformer. The transformer must be a unit that incorporates a molded terminal block on either the primary or secondary side.

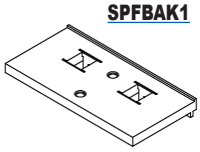
No jumpers or appropriate fuses are provided for any aftermarket fuse block you install on an HPS Spartan industrial control transformer.

Note that the HPS Fuse Block Adapter Kit provides only the mechanical means of attaching a third-party aftermarket fuse block.

The Fuse Block Adapter Kit is not available on SP5000ACP and SP5000MQMJ standard units.



SPFBAK1



Fuse Block Adapter Kit for HPS Spartan Transformers					
Part Number	*Price*	*Description*	*Pieces per package*	*For use with part number suffixes*	*Applicable VA rating*
SPFBAK1	$15.00	Fuse Block Adapter Kit for use with HPS Spartan transformers	1 adapter	PR	50 to 500
				SP	50 to 1500
				ACP, MQMJ	50 to 3000

Notes: Only 1 fuse block adapter kit is required per transformer.
Add 0.38 in per fuse block adapter to overall depth (column B) on units from 750VA to 3000VA when optional fuse block adapter is installed.
Fuse block adapter not for use when finger guards are installed.

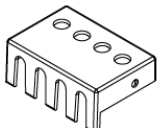
Finger Guards

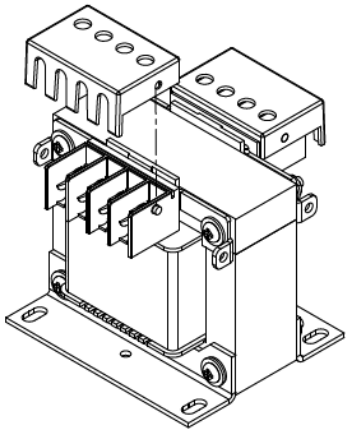
HPS Spartan industrial control transformers up to and including 3000VA or 30A are available with optional finger guards.

Each Finger Guard supplies either the primary or secondary side.

The Finger Guard option is not available on SP5000ACP and SP5000MQMJ units.

SPFG1





Finger Guards for HPS Spartan Transformers					
Part Number	*Price*	*Description*	*Pieces per package*	*For use with part number suffixes*	*Applicable VA rating*
SPFG1	$5.50	Finger Guard for use with HPS Spartan transformers	1 cover	PR	50 to 350
				SP	50 to 1500
				ACP, MQMJ	50 to 3000

Notes: Add 0.38 in per finger guard to overall depth (column B) on units from 50VA to 500VA and 0.31 in to units from 750VA to 2000VA when finger guard is installed.
Finger guard not for use when fuse block adapter is installed.

HPS Sentinel Energy Efficient Distribution Transformers

Hammond Power Solutions

Designed for efficiency

HPS Sentinel G ventilated stand-up distribution transformers meet the latest energy efficiency standards as outlined by DOE and NRCan. These transformers offer significant energy savings as well as a variety of environmental benefits.

Designed and manufactured using industry-leading design solutions, technology and materials, they feature higher efficiency which translates into increased profitability due to lower operating costs, decreased cost of ownership over the lifetime of the transformer, and reduced air conditioning costs due to lower heat emissions.

AutomationDirect offers HPS Sentinel models rated up to 75kVA, and the standard 10kV BIL rating provides increased reliability and protection against critical equipment failure (including protection against voltage spikes and other line transients).

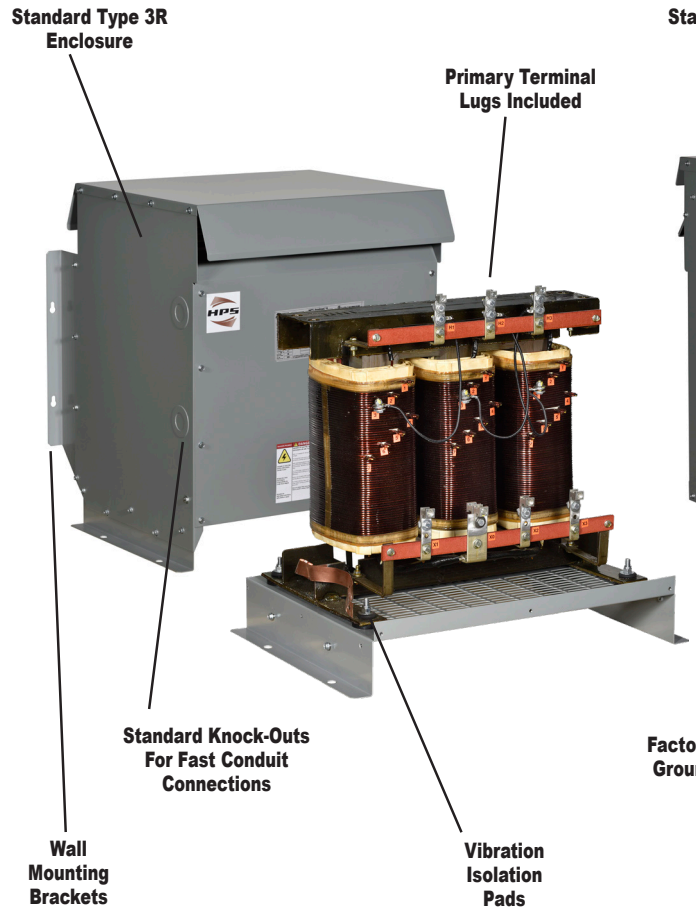
Additionally, faster installation on models up to 45kVA is made possible through the use of standard integral floor and wall mounting brackets.

All models utilize a uniform 220°C insulation system with a 150°C temperature rise.

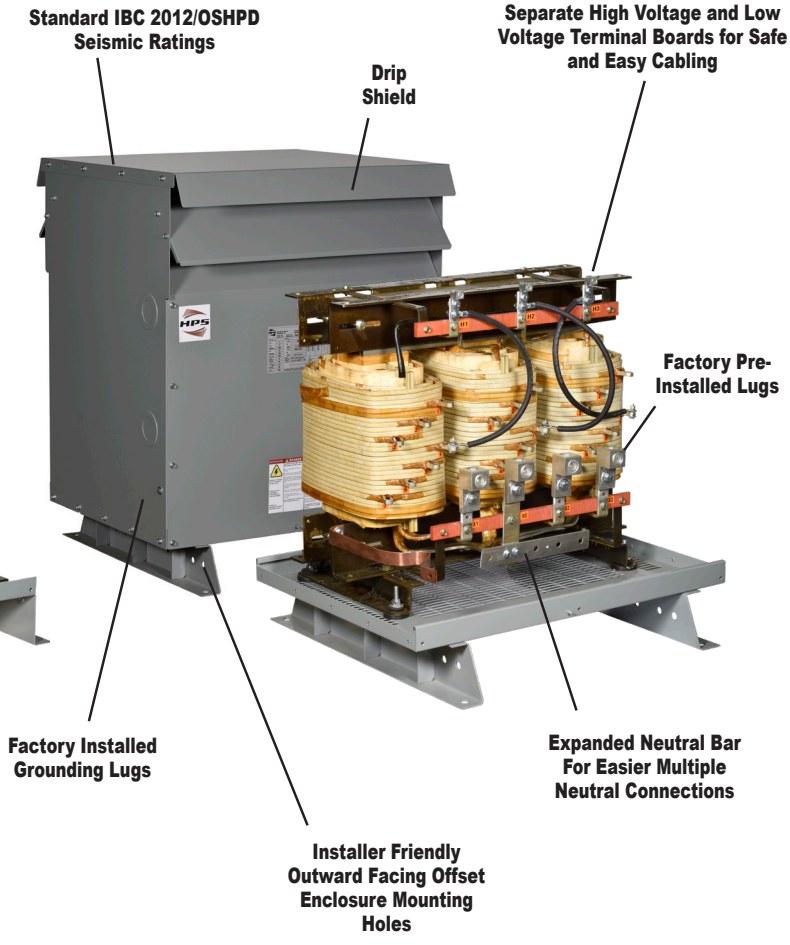
Features

- Advanced core and coil construction
- Core is manufactured from quality non-aging, cold-rolled, silicon steel laminations using state-of-the-art equipment.
- Cores are precision cut to close tolerances which eliminates burrs and improves performance.
- Core is coated to prevent the ingress of moisture.
- Precision wound aluminum conductors are electrically balanced to minimize axial forces during short-circuit conditions.
- Temperature rise 150°C.
- Robust interface between core and coils for better short circuit performance.

15-45 kVA Models



75 kVA Models



HPS Sentinel Energy Efficient Distribution Transformers

Hammond Power Solutions

Features

- Type 3R enclosures
- Integrated wall mounting brackets (up to 45kVA)
- Factory installed primary, secondary and neutral lugs (up to 75kVA)
- Expanded neutral bar for multiple neutral connections
- Factory installed main grounding lugs
- Removable lugs provide for easy field lug size changes or repairs
- Separate HV and LV terminal boards for easy cable installation
- All taps individually labelled for easy installation
- Conduit knockouts
- Bottom cable entry area
- Outward facing base mounting holes for quick and easy installation
- Captive pem-nuts for reliable and easy removal of front/back panels
- 10kV BIL on all 3-phase LV distribution transformers
- Dual UL and CSA certification
- Standard IBC 2012-OSHPD Seismic ratings (floor mount only)
- 10-year warranty

Agency Approvals

UL Listed File: E112313 Type K
CSA Certified File: LR3902

HPS Sentinel Energy Efficient Distribution Transformer Specifications

Part Number	Price	kVA Rating	Wiring Diagram	Primary Voltage (VAC)(60Hz)	Secondary Voltage (VAC) (Nominal)	3-Phase Output Current (Amps) 208/240 VAC	Impedance %		Typical Heat Dissipation (Watts)	Weight lb [kg]
							kVA	%z		
SG3A0015KB	$1,525.00	15kVA	SCD19	480 Delta	208Y/120	41.6 A / n/a	15	1.8-6	420	200 [90.72]
SG3A0030KB	$2,120.00	30kVA				83.3 A / n/a	30	1.8-6	840	335 [151.95]
SG3A0045KB	$2,412.00	45kVA				125A / n/a	45	1.8-6	1110	380 [172.37]
SG3A0075KB	$3,179.00	75kVA				208A / n/a	75	2-6	1490	575 [260.82]
SG3C0015KD	$1,497.00	15kVA	SCD21		240 Delta/120 CT (CenterTap)*	n/a / 36.1	15	1.8-6	420	175 [79.38]
SG3C0030KD	$2,184.00	30kVA				n/a / 72.2	30	1.8-6	840	305 [138.35]
SG3C0045KD	$2,484.00	45kVA				n/a / 108	45	1.8-6	1110	385 [174.63]
SG3C0075KD	$3,274.00	75kVA				n/a / 180	75	2-6	1490	535 [242.67]

*** Note: Center-tap is rated for 5% of the overall kVA of system. Example: On a 75kVA transformer, the center-tap is rated at 3.75 kVA.**

SG3A0015KB

SG3A0045KB

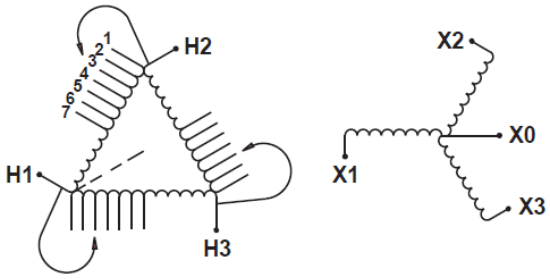
SG3A0075KB

HPS Sentinel Energy Efficient Distribution Transformers

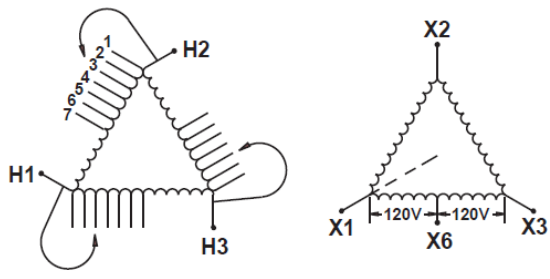
Hammond Power Solutions

Wiring Diagrams

SCD19

Schematic	Connections			
	*% Voltage*	*Primary Volts*	*Connect lines to*	*Inter-connect*
	105.0%	504	H1, H2, H3	H1-1, H2-1, H3-1
	102.5%	492	H1, H2, H3	H1-2, H2-2, H3-2
	100%	480	H1, H2, H3	H1-3, H2-3, H3-3
	97.5%	468	H1, H2, H3	H1-4, H2-4, H3-4
	95%	456	H1, H2, H3	H1-5, H2-5, H3-5
	92.5%	444	H1, H2, H3	H1-6, H2-6, H3-6
	90%	432	H1, H2, H3	H1-7, H2-7, H3-7
		Secondary Volts	*Connect lines to*	*Inter-connect*
		208	X1, X2, X3	
		120	X1, X0 X2, X0 X3, X0	

SCD21

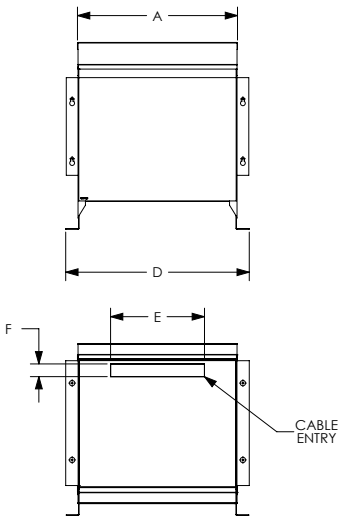
Schematic	Connections			
	*% Voltage*	*Primary Volts*	*Connect lines to*	*Inter-connect*
	105.0%	504	H1, H2, H3	H1-1, H2-1, H3-1
	102.5%	492	H1, H2, H3	H1-2, H2-2, H3-2
	100%	480	H1, H2, H3	H1-3, H2-3, H3-3
	97.5%	468	H1, H2, H3	H1-4, H2-4, H3-4
	95%	456	H1, H2, H3	H1-5, H2-5, H3-5
	92.5%	444	H1, H2, H3	H1-6, H2-6, H3-6
	90%	432	H1, H2, H3	H1-7, H2-7, H3-7
		Secondary Volts	*Connect lines to*	*Inter-connect*
		240	X1, X2, X3	
		120	X1, X6 X3, X6	

HPS Sentinel Energy Efficient Distribution Transformers

Hammond Power Solutions

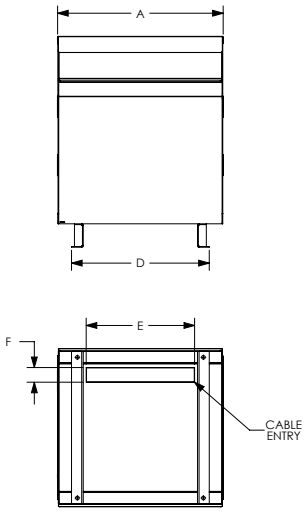
Dimensions

15-45 kVA Models



15-45 kVA Models

75 kVA Models



75 kVA Models

HPS Sentinel Energy Efficient Distribution Transformer Dimensions								
Part Number	*Volt-Amp Rating*	*Overall Dimensions [in (mm)]*				*Cable Entry [in (mm)]*		*Knockout (in [mm])*
		A	*B*	*C*	*D*	*E*	*F*	*G*
SG3A0015KB	15kVA	18.75 [476.3]	20.12 [511.1]	21.88 [555.6]	21.50 [546.2]	11.00 [279.4]	1.49 [37.8]	1.38 [35.1] or 1.75 [44.5]
SG3A0030KB	30kVA	23.25 [590.6]	23.80 [604.6]	28.67 [728.2]	25.75 [653.9]	16.75 [425.5]	1.75 [44.5]	1.75 [44.5] or 2.50 [63.5]
SG3A0045KB	45kVA	23.25 [590.6]	23.80 [604.6]	28.67 [728.2]	25.75 [653.9]	16.75 [425.5]	1.75 [44.5]	1.75 [44.5] or 2.50 [63.5]
SG3A0075KB	75kVA	28.32 [719.3]	27.00 [685.9]	36.00 [914.3]	23.50 [596.9]	18.50 [469.9]	2.50 [63.5]	2.00 [50.8] or 3.00 [76.2]
SG3C0015KD	15kVA	18.75 [476.3]	20.12 [511.1]	21.88 [555.6]	21.50 [546.2]	11.00 [279.4]	1.49 [37.8]	1.38 [35.1] or 1.75 [44.5]
SG3C0030KD	30kVA	23.25 [590.6]	23.80 [604.6]	28.67 [728.2]	25.75 [653.9]	16.75 [425.5]	1.75 [44.5]	1.75 [44.5] or 2.50 [63.5]
SG3C0045KD	45kVA	23.25 [590.6]	23.80 [604.6]	28.67 [728.2]	25.75 [653.9]	16.75 [425.5]	1.75 [44.5]	1.75 [44.5] or 2.50 [63.5]
SG3C0075KD	75kVA	28.32 [719.3]	27.00 [685.9]	36.00 [914.3]	23.50 [596.9]	18.50 [469.9]	2.50 [63.5]	2.00 [50.8] or 3.00 [76.2]

Recommendations for Overcurrent Protection UL and CSA (North American) Standards

UL and CSA (North American) Standards

North American standards, including UL 508, National Electric Code 450, and the Canadian Electrical Code, Part 1, require overcurrent protection on all control circuit transformers. There are two options for overcurrent protection:

Option 1 (Primary only Protection)

Provide an overcurrent device in the primary circuit rated to the current of the transformer. The overcurrent limits are as follows:

- Primary 9 Amps or more: no more than 125% of rated current
- Primary 2 to 9 Amps: no more than 167% of rated current
- Primary less than 2 Amps: no more than 300% of rated current for power circuits; no more than 500% of rated current for control circuits

Note: This method is considered less desirable, as start-up inrush to the transformer can frequently surpass the current rating of the device and result in nuisance interruptions.

Option 2 (Primary and Secondary Protection)

The second option is to install overcurrent devices in both the primary and secondary circuits of the transformer. In this option, the secondary device must be rated no more than 125% of rated current of the transformer and the primary no more than 250%. The Canadian Electrical Code permits 300% overcurrent on the primary for this option.

In both options listed, it is recommended that time delay fuses be considered to avoid unnecessary interruptions.

REFERENCES:
UL 508
UL 845
NEC 430-72
NEC 450-3
CEC Part 1, 26-256

Recommendations for Overcurrent Protection UL and CSA (North American) Standards, continued

PRIMARY (UL and CSA)

To assist in the selection of fuses, the following chart recommends the maximum primary fuse rating in amperes. The first number shown is the maximum overcurrent protection when the primary current is less than 2 amps and the overcurrent protection device is rated for 300%. The second number (shown in brackets) is recommended when the primary is less than 2 amps and the overcurrent device is to be rated at 500% of rated current. Where only one number is indicated, the primary is 2 amps or more and one rating of overcurrent protection is shown as optimal. Choose the next higher fuse rating if these numbers do not correspond with standard fuse selections.

HCTR Current Limiting Class CC Fuses

Part Number	AMP Rating	Pcs/Pkg	Weight	Price
HCTR-25	0.25	10/1	0.2 lb	$195.00
HCTR-5	0.5	10/1	0.2 lb	$167.00
HCTR-75	0.75	10/1	0.2 lb	$211.00
HCTR1	1	10/1	0.2 lb	$167.00
HCTR1-25	1.25	10/1	0.2 lb	$211.00
HCTR1-5	1.5	10/1	0.2 lb	$169.00
HCTR2	2	10/1	0.2 lb	$169.00
HCTR2-5	2.5	10/1	0.2 lb	$187.00
HCTR3	3	10/1	0.2 lb	$167.00
HCTR3-5	3.5	10/1	0.2 lb	$211.00
HCTR4	4	10/1	0.2 lb	$182.00
HCTR5	5	10/1	0.2 lb	$169.00
HCTR6	6	10/1	0.2 lb	$187.00
HCTR7-5	7.5	10/1	0.2 lb	$203.00
HCTR8	8	10/1	0.2 lb	$187.00
HCTR10	10	10/1	0.2 lb	$182.00
HCTR15	15	10/1	0.2 lb	$172.00
HCTR20	20	10/1	0.2 lb	$180.00
HCTR25	25	10/1	0.2 lb	$180.00
HCTR30	30	10/1	0.2 lb	$180.00

Note: See HCTR fuse catalog page for characteristic curves.

Recommended Maximum Primary Fuse Ratings in Amps Where Primary Current is less than 2 Amps.

Primary Voltage	Overload Protection	Hammond Transformers VA RATING												
		50	75	100	150	250	350	500	750	1000	1500	2000	3000	5000
115	300%	1.25	1.8	2.5	3.5	4.0	5.0	8.0	10.0	15.0	20.0	25.0	–	–
	500%	[2.0]	[3.2]	[4.0]	[6.5]	–	–	–	–	–	–	–	–	–
120	300%	1.25	1.8	2.25	3.5	4.0	5.0	8.0	10.0	15.0	15.0	20.0	–	–
	500%	[2.0]	[3.2]	[4.0]	[6.5]	–	–	–	–	–	–	–	–	–
220	300%	0.6	1 .0	1.25	2 .0	3.2	4.5	4.0	6.0	8.0	12.0	15.0	20.0	30.0
	500%	[1.125]	[1.6]	[2.25]	[3.2]	[5.6]	[7.5]	–	–	–	–	–	–	–
208	300%	0.6	1.0	1.4	2.0	3.5	5.0	4.0	6.0	8.0	12.0	15.0	20.0	30.0
	500%	[1.125]	[1.8]	[2.25]	[3.5]	[6.0]	[8.0]	–	–	–	–	–	–	–
230	300%	0.6	0.8	1.25	1.8	3. 2	4.5	4.0	6.0	8.0	10.0	15.0	20.0	30.0
	500%	[1.0]	[1.6]	[2.0]	[3.2]	[5.0]	[7.5]	–	–	–	–	–	–	–
240	300%	0.6	0.8	1.25	1.8	3.0	4.0	3.5	5.0	7.0	10.0	15.0	15.0	30.0
	500%	[1.0]	[1.5]	[2.0]	[3.0]	[5.0]	[7.0]	–	–	–	–	–	–	–
277	300%	0.5	0.8	1.0	1.6	2.5	3.5	5.0	5.0	6.0	9.0	12.0	15.0	25.0
	500%	[0.8]	[1.25]	[1.8]	[4.5]	[6.25]	[9.0]	–	–	–	–	–	–	–
380	300%	0.3	0.5	0.75	1.125	1.8	2.5	3.5	5.6	4.5	6.25	9.0	15.0	20.0
	500%	[0.6]	[0.8]	[1.25]	[1.8]	[3.2]	[4.5]	[6.25]	[9.0]	–	–	–	–	–
440	300%	0.3	0.5	0.6	1 .0	1.6	2.25	3.2	5.0	4.0	6.0	8.0	12.0	15.0
	500%	[0.5]	[0.8]	[1.125]	[1.6]	[2.8]	[3.5]	[5.6]	[8.0]	–	–	–	–	–
460	300%	0.3	0.4	0.6	0.8	1.6	2.25	3.2	4.5	3.5	6.0	8.0	12.0	15.0
	500%	[0.5]	[0.8]	[1.0]	[1.6]	[2.5]	[3.5]	[5.0]	[8.0]	–	–	–	–	–
480	300%	0.3	0.4	0.6	0.8	1.5	2.0	3.0	4.5	3.5	5.0	7.0	10.0	15.0
	500%	[0.5]	[0.75]	[1.0]	[1.5]	[2.5]	[3.5]	[5.0]	[7.5]	–	–	–	–	–

Recommendations for Overcurrent Protection UL and CSA (North American) Standards, continued

SECONDARY

The overcurrent protection listed below, in amperes, is 125% of the rated current of the transformer. Choose the next higher fuse rating if these numbers do not correspond with standard fuse selections.

MEN General Purpose Midget Class Fuses				
Part Number	*AMP Rating*	*Pcs/Pkg*	*Weight*	*Price*
MEN-5	0.5	10/1	0.2 lb	$86.00
MEN-6	0.6	10/1	0.2 lb	$86.00
MEN1	1	10/1	0.2 lb	$82.00
MEN1-4	1.4	10/1	0.2 lb	$106.00
MEN1-5	1.5	10/1	0.2 lb	$110.00
MEN2	2	10/1	0.2 lb	$73.00
MEN2-5	2.5	10/1	0.2 lb	$84.00
MEN3	3	10/1	0.2 lb	$78.00
MEN3-5	3.5	10/1	0.2 lb	$81.00
MEN4	4	10/1	0.2 lb	$78.00
MEN5	5	10/1	0.2 lb	$73.00
MEN6	6	10/1	0.2 lb	$84.00
MEN7	7	10/1	0.2 lb	$81.00
MEN8	8	10/1	0.2 lb	$80.00
MEN10	10	10/1	0.2 lb	$73.00
MEN12	12	10/1	0.2 lb	$85.00
MEN15	15	10/1	0.2 lb	$80.00
MEN20	20	10/1	0.2 lb	$80.00
MEN25	25	10/1	0.2 lb	$90.00
MEN30	30	10/1	0.2 lb	$80.00

Note: See MEN fuse catalog page for characteristic curves.

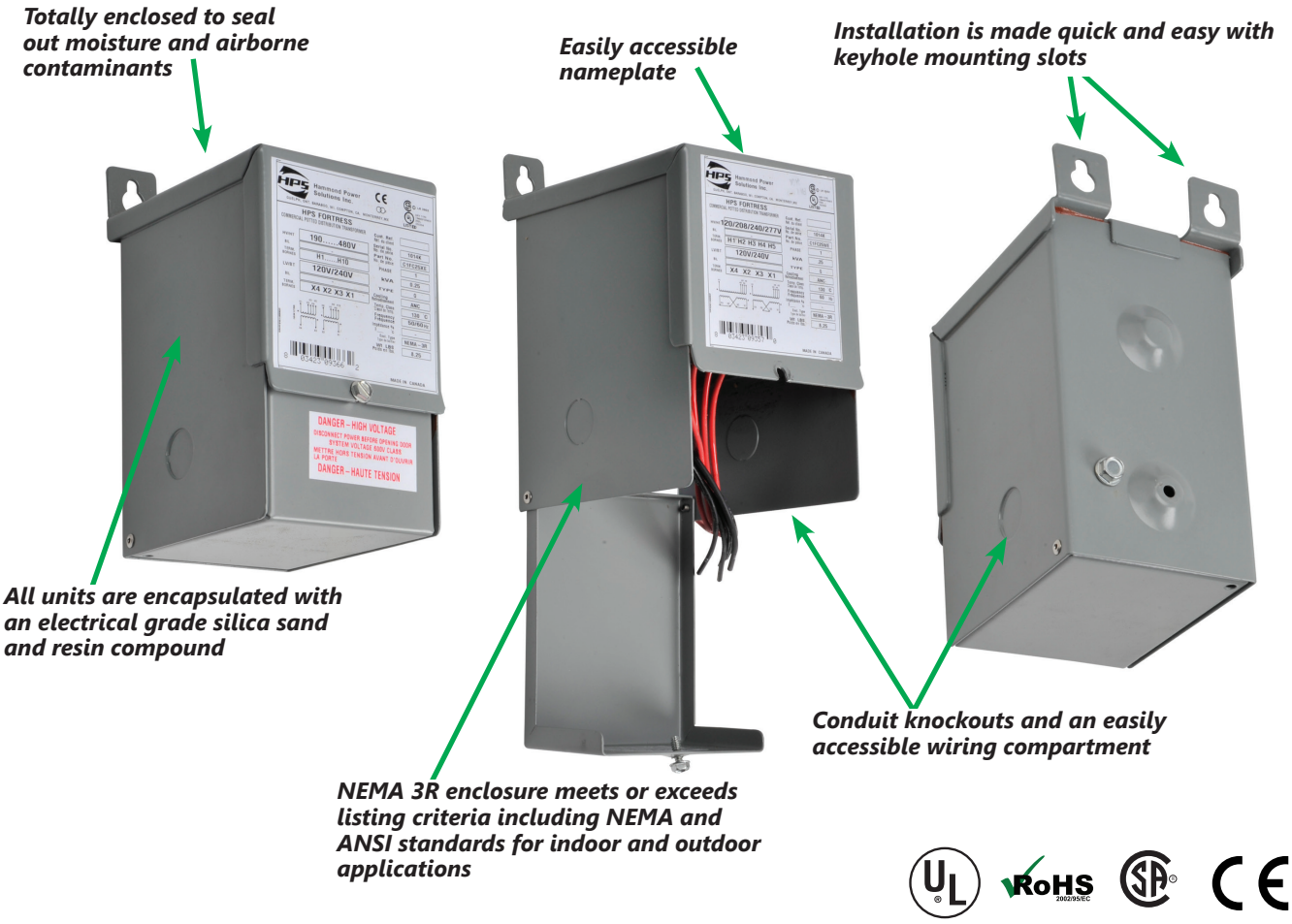
Recommended Maximum Secondary Fuse Ratings in Amps.

Secondary Voltage	Overload Protection	Hammond Transformers VA RATING												
		50	*75*	*100*	*150*	*250*	*350*	*500*	*750*	*1000*	*1500*	*2000*	*3000*	*5000*
12	125%	5.3	7.9	11.0	16.0	27.0	–	–	–	–	–	–	–	–
24	125%	2.7	4.0	5.3	7.9	14.0	19.0	27.0	–	–	–	–	–	–
110	125%	0.6	0.9	1.2	1.8	2.9	4.0	5.7	8.6	12.0	18.0	23.0	–	–
115	125%	0.6	0.9	1.1	1.7	2.8	3.9	5.5	8.2	11.0	17.0	22.0	–	–
120	125%	0.6	0.8	1.1	1.6	2.7	3.7	5.3	7.9	11.0	16.0	21.0	–	–
220	125%	0.3	0.5	0.6	0.9	1.5	2.0	2.9	4.3	5.7	8.6	12.0	18.0	29.0
230	125%	0.3	0.5	0.6	0.9	1.4	2.0	2.8	4.1	5.5	8.2	11.0	17.0	28.0

HPS Fortress™ Commercial Encapsulated Transformers

Hammond Power Solutions

Features



Voltage Regulation

Voltage regulation in transformers is the difference between the "No-Load voltage" and the "Full-Load voltage". This is expressed in terms of percentage.

$$\text{Regulation Percentage} = \frac{E_{\text{No-Load}} - E_{\text{Full Load}}}{E_{\text{Full Load}}} (100\%)$$

The secondary voltage (nominal) listed in these pages are at Full-Load, meaning the point at which the transformer is operating at maximum permissible secondary current. No-Load voltage can increase 6 to 10% max.

Warning: Secondary voltages of transformers may damage some loads. For example, a transformer connected as 480/120 Volt but applied 495 Volt primary can produce at No-Load a voltage of 134 Volts which will damage the inputs of a PLC D0-06AA, whose maximum input voltage is 132 Volt. Notice that the current of D0-06AA input is 10mA, making it very close to No-Load.

HPS Fortress™ Commercial Encapsulated Transformers Primary 480 x 240 VAC Secondary 240 x 120 VAC

Hammond Power Solutions

Features

- **Ratings:** Single phase from 0.50kVA to 25kVA; 60 Hz
- **Electrostatic Shield:** Standard on all single phase units 0.75kVA and larger
- **Quality Design:** All units are encapsulated with electrical grade silica sand and resin compounds which completely enclose the core and coil to seal out moisture, airborne contaminants and eliminates corrosion and deterioration.
- **Insulation:** Offering UL class 130°C (266°F) insulation, 95°C (203°F) temperature rise up to 1kVA on single phase; 180°C (356°F) insulation, 135°C (275°F) temperature rise on all units over 1kVA on single phase. Quiet operation with sound levels below NEMA standards.
- **Enclosures:** NEMA 3R enclosures meet or exceed listing criteria including NEMA, ANSI, and OSHA standards for indoor and outdoor service.
- To provide NEMA 3R protection (protection from falling rain), the transformer must be mounted vertically with the mounting tabs facing up.
- Rear and side entry conduit knockouts into an easily accessible and roomy wiring compartment.
- Color is ANSI 61 gray, UL50
- Taps are convenient to select output voltage.
- **Wiring compartment:** Provides tinned copper lead wire terminations up to 5kVA, terminal pad termination on 7.5KVA and larger and standard ground lug assembly for easy cable installation.
- Output voltage adjustable by taps.
- **Temperature Range:** -20°C (-4°F) to average ambient temperature 30°C (86°F), not to exceed 40°C (104°F)
- **Installation made quick and easy:** All encapsulated transformers are designed for wall mounting and include keyhole mounting slots.
- **10 year warranty** (limited to mfg. defects)

Agency Approvals

- UL Listed File No. E50394 (Type Q)
- CSA File No. LR3902 (Type Q)
- CE (up to 10 kVA)
- RoHS

C1FC50LE

C1F1C5LES

C1F005LES

HPS Fortress 480x240/240x120 Encapsulated Transformer Specifications

Part Number	Price	kVA Rating	Primary Voltage (60Hz)	Secondary Voltage (Nominal)	Output Current (Amps) 120/240	Impedance %		Total Heat Dissipation (Watts)*	Product Weight lb [kg]	Drawing
						VA	%z			
C1FC50LE	$178.00	0.50	240x480	120x240	4.17/2.08	500	7.6	35.8	15.0 [6.8]	PDF
C1FC75LES	$225.00	0.75			6.25/3.13	750	5.6	57.2	18.0 [8.2]	PDF
C1F1C0LES	$270.00	1.0			8.33/4.17	1000	4.8	75.3	22.0 [10.0]	PDF
C1F1C5LES	$323.00	1.5			12.5/6.25	1500	4.1	100.0	25.0 [11.3]	PDF
C1F002LES	$395.00	2.0			16.7/8.33	2000	4.3	121.6	40.0 [18.1]	PDF
C1F003LES	$497.00	3.0			25.0/12.5	3000	3.7	160.8	55.0 [25.0]	PDF
C1F005LES	$727.00	5.0			41.7/20.8	5000	4.2	314.0	88 [39.9]	PDF
C1F007LES	$1,079.00	7.5			62.5/31.3	7500	3.6	402.0	145 [65.98	PDF
C1F010LES	$1,246.00	10			83.3/41.6	10000	3.7	525.0	165 [74.8]	PDF
C1F015LES**	$1,602.00	15			125/62.5	15000	2.4	585.0	286 [129.7]	PDF
C1F025LES**	$1,993.00	25			208.3/104.2	25000	2.0	838.0	346 [156.9]	PDF

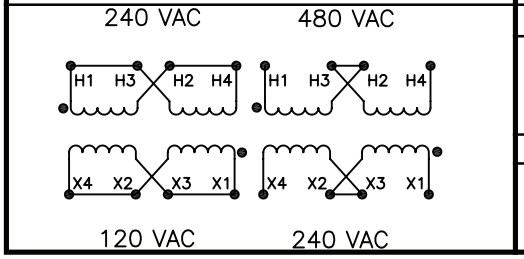
** Heat dissipation calculated based on full rated load on transformer.*
*** Not CE*

HPS Fortress™ Commercial Encapsulated Transformers Primary 480 x 240 VAC Secondary 240 x 120 VAC

Hammond Power Solutions

Wiring Diagram - For 500VA to 5kVA

SCHEMATIC



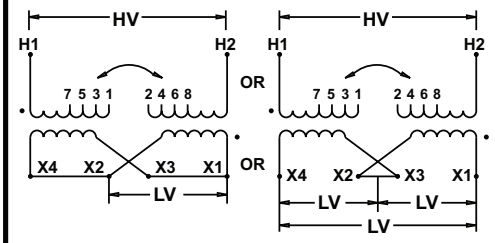
CONNECTIONS

Primary Volts	Connect lines to	Inter-connect
480	H1, H4	H2-H3
240	H1, H4	H1-H3, H2-H4

Secondary Volts	Connect lines to	Inter-connect
240	X1, X4	X2-X3
120/240	X1, X2, X4	X2-X3
120	X1, X2	X2-X4, X1-X3

Wiring Diagram - For 7.5kVA to 25kVA

SCHEMATIC



CONNECTIONS

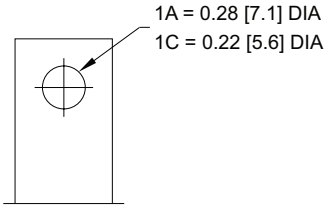
Primary Volts	Connect lines to	Inter-connect
504	H1, H2	1-2
492	H1, H2	2-3
480	H1, H2	3-4
468	H1, H2	4-5
456	H1, H2	5-6
444	H1, H2	6-7
432	H1, H2	7-8
	H1, H2	H1-2, H2-1
240	H1, H2	H1-4, H2-3
228	H1, H2	H1-6, H2-5
216	H1, H2	H1-8, H2-7

Secondary Volts	Connect lines to	Inter-connect
240	X1, X4	X2- X3
120	X1, X2	X2-X4, X1-X3
120/240	X1, X2, X4	X2-X3

Termination*		
Part No.	***HV***	***LV***
C1FC50LE	#18 AWG Leads	#18 AWG Leads
C1FC75LES	#18 AWG Leads	#14 AWG Leads
C1F1C0LES	#18 AWG Leads	#14 AWG Leads
C1F1C5LES	#14 AWG Leads	#14 AWG Leads
C1F002LES	#14 AWG Leads	#14 AWG Leads
C1F003LES	#14 AWG Leads	#14 AWG Leads
C1F005LES	#14 AWG Leads	#12 AWG Leads
C1F007LES	#12 AWG Leads	Terminal Pad 1C
C1F010LES	Mechanical lug #14-2 AWG	Mechanical lug #14-2 AWG
C1F015LES	Terminal Pad 1A	Terminal Pad 1A
C1F025LES	Mechanical Lug #14-2/0 AWG	Mechanical Lug 6-250MCM

** Transformers are provided with copper leads, terminal pads or mechanical lugs.*

Terminal Pad Diagram



Dimensions (in [mm])

HPS Fortress™ Commercial Encapsulated Transformers Primary 277/240/208/120 VAC Secondary 240 x 120 VAC

Hammond Power Solutions

Features

- **Ratings:** Single phase from 100VA to 5kVA; 60 Hz
- **Electrostatic Shield:** Standard on all single phase units 0.75kVA and larger
- **Quality Design:** All units are encapsulated with electrical grade silica sand and resin compounds which completely enclose the core and coil to seal out moisture, airborne contaminants and eliminates corrosion and deterioration.
- **Insulation:** Offering UL class 130°C (266°F) insulation, 80°C (176°F) temperature rise up to 1kVA on single phase; 180°C (356°F) insulation, 135°C (275°F) temperature rise on all units over 1kVA on single phase. Quiet operation with sound levels below NEMA standards.
- **Enclosures:** NEMA 3R enclosures meet or exceed listing criteria including NEMA, ANSI, and OSHA standards for indoor and outdoor service.
- Rear and side entry conduit knockouts into an easily accessible and roomy wiring compartment.
- Color is ANSI 61 gray, UL50
- **Wiring compartment:** Provides tinned copper lead wire terminations and standard ground lug assembly for easy cable installation.
- Taps are convenient to select output voltage.
- Output voltage adjustable by taps.
- **Temperature Range:** -20°C (-4°F) to average ambient temperature 30°C (86°F), not to exceed 40°C (104°F)
- **Installation made quick and easy:** All encapsulated transformers are designed for wall mounting and include keyhole mounting slots.
- **10 year warranty** (limited to mfg. defects)

Agency Approvals

- UL Listed File No. E50394 (Type Q)
- CSA File No. LR3902 (Type Q)
- CE
- RoHS

C1FC10WE

C1F1C0WES

C1F005WES

HPS Fortress Encapsulated Transformer Specifications									
Part Number	*Price*	*kVA Rating*	*Primary Voltage (60Hz)*	*Secondary Voltage (Nominal)*	*Output Current (Amps) 120/240*	*Impedance %*		*Total Heat Dissipation (Watts)**	*Product Weight (lb)*
						VA	*%z*		
C1FC10WE	$161.00	0.10	120/208/240/277	120/240	0.83/0.42	100	12.6	27	6.36
C1FC25WE	$199.00	0.25			2.08/1.04	250	12.2	52	8.25
C1FC50WE	$230.00	0.50			4.16/2.08	500	8.9	71	14.0
C1F1C0WES	$334.00	1.0			8.33/4.16	1000	5.4	91	22.0
C1F002WES	$516.00	2.0			16.67/8.33	2000	3.8	130	50.0
C1F003WES	$666.00	3.0			25.0/12.5	3000	4.3	138	86.0
C1F005WES	$944.00	5.0			41.67/20.83	5000	4.3	380	150.0

*Note: * Heat dissipation calculated based on full rated load on transformer.*

HPS Fortress™ Commercial Encapsulated Transformers Primary 277/240/208/120 VAC Secondary 240 x 120 VAC

Hammond Power Solutions

Dimensions (in [mm])

Figure A - 100VA to 2kVA

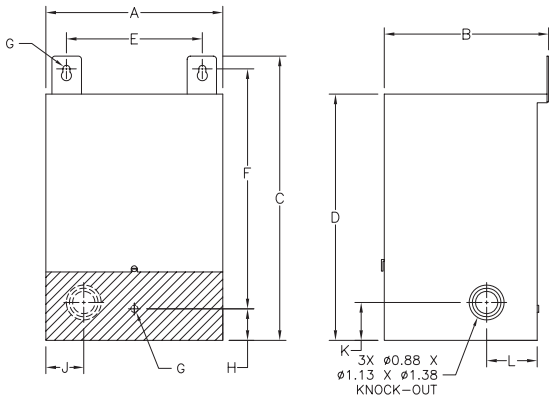
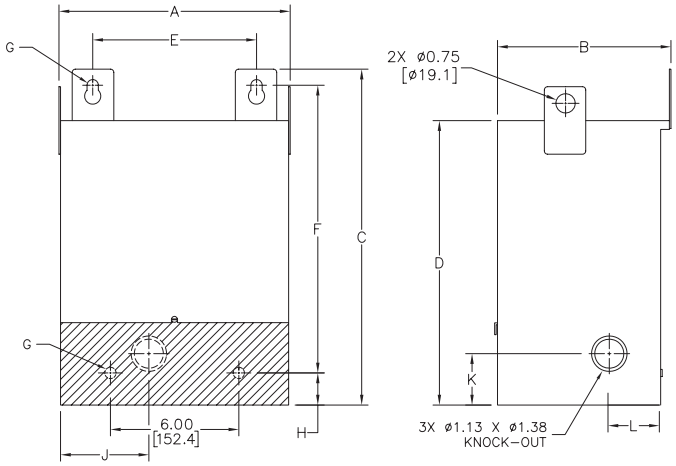


Figure B - 3kVA to 5kVA



** Front bottom panel is hinged for access to terminals, shaded areas show view of rear mounting holes and knockout.*

HPS Fortress Encapsulated Transformer Dimensions												
Part Number	Mtg. Fig.	Overall Dimensions in [mm]				Mounting Holes in [mm]		Mounting Hole Dia. in [mm]	Knock Out Dimensions in [mm]			
		A	B	C	D	E	F	G	H	J	K	L
C1FC10WE	A	3.75 [95.3]	5.25 [133.4]	7.25 [184.2]	6.25 [158.8]	2.50 [63.5]	5.63 [143.0]	0.22 [5.6]	1.25 [31.8]	N/A	1.50 [38.1]	2.00 [50.8]
C1FC25WE	A	3.75 [95.3]	5.25 [133.4]	7.25 [184.2]	6.25 [158.8]	2.50 [63.5]	5.63 [143.0]	0.22 [5.6]	1.25 [31.8]	0.8 [20.3]	1.50 [38.1]	2.00 [50.8]
C1FC50WE	A	5.00 [127.0]	4.75 [120.7]	9.25 [234.9]	8.25 [209.5]	3.88 [98.5]	7.75 [196.9]	0.22 [5.6]	1.25 [31.8]	1.00 [25.4]	1.50 [38.1]	2.00 [50.8]
C1F1C0WES	A	5.88 [149.4]	5.50 [139.7]	10.00 [254.0]	8.50 [215.9]	4.13[104.9]	8.25 [209.6]	0.28 [7.1]	1.25 [31.8]	1.25 [31.8]	1.50 [38.1]	2.00 [50.8]
C1F002WES	A	7.00 [177.8]	6.50 [165.1]	11.75 [298.5]	10.30 [261.6]	5.38 [136.7]	10.00 [254.0]	0.28 [7.1]	1.25 [31.8]	1.50 [38.1]	1.75 [44.5]	2.00 [50.8]
C1F003WES	B	10.00 [254.0]	7.75 [196.9]	17.25 [438.2]	15.25 [387.4]	7.38 [187.5]	15.38 [390.7]	0.44 [11.2]	1.25 [31.8]	4.00 [101.6]	2.00 [50.8]	2.00 [50.8]
C1F005WES	B	10.00 [254.0]	7.75 [196.9]	17.25 [438.2]	15.25 [387.4]	7.38 [187.5]	15.38 [390.7]	0.44 [11.2]	1.25 [31.8]	4.00 [101.6]	2.00 [50.8]	2.00 [50.8]

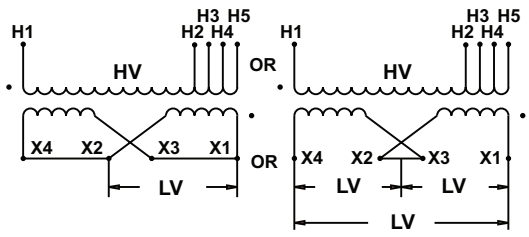
Note: All dimensions have a tolerance of ±0.06 inches unless otherwise noted.
To provide NEMA 3R protection (protection from falling rain), the transformer must be mounted vertically with the mounting tabs facing up.
Additional information in installation insert.

HPS Fortress™ Commercial Encapsulated Transformers Primary 277/240/208/120 VAC Secondary 240 x 120 VAC

Hammond Power Solutions

Wiring Diagram - For 100VA to 2kVA

SCHEMATIC



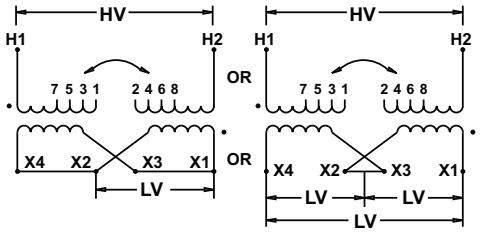
CONNECTIONS

Primary Volts	Connect lines to	Inter-connect
277	H1, H5	-
240	H1, H4	-
208	H1, H3	-
120	H1, H2	-

Secondary Volts	Connect lines to	Inter-connect
240	X1, X4	X2-X3
120/240	X1, X2, X4	X2-X3
120	X1, X2	X2-X4, X1-X3

Wiring Diagram - For 3kVA and 5kVA

SCHEMATIC



CONNECTIONS

Primary Volts	Connect lines to	Inter-connect
277	H1, H2	1-2
240	H1, H2	3-4
208	H1, H2	5-6
120	H1, H2	7-8

Secondary Volts	Connect lines to	Inter-connect
240	X1, X4	X2- X3
120	X1, X2	X2-X4, X1-X3
120/240	X1, X2, X4	X2-X3

Termination*		
Part No.	*HV*	*LV*
C1FC10WE	#18 AWG Leads	#18 AWG Leads
C1FC25WE	#18 AWG Leads	#18 AWG Leads
C1FC50WE	#18 AWG Leads	#18 AWG Leads
C1F1C0WES	#14 AWG Leads	#14 AWG Leads
C1F002WES	#14 AWG Leads	#14 AWG Leads
C1F003WES	#10 and #14 AWG Leads	#14 AWG Leads
C1F005WES	#6 AWG Leads	#12 AWG Leads

** Transformers are provided with copper leads.*

HPS Fortress™ Commercial Encapsulated Transformers Primary 480**/440/416/400/380 x 240**/220/208/200/190VAC Secondary 240 x 120 VAC

Hammond Power Solutions

Features

- **Ratings:** Single phase from 0.25kVA to 5kVA; 50/60 Hz**
- **Electrostatic Shield:** Standard on all single phase units 0.75kVA and larger
- **Quality Design:** All units are encapsulated with electrical grade silica sand and resin compounds which completely enclose the core and coil to seal out moisture, airborne contaminants and eliminates corrosion and deterioration.
- **Insulation:** Offering UL class 130°C (266°F) insulation, 95°C (203°F) temperature rise up to 1kVA on single phase; 180°C (356°F) insulation, 135°C (275°F) temperature rise on all units over 1kVA on single phase. Quiet operation with sound levels below NEMA standards.
- **Enclosures:** NEMA 3R enclosures meet or exceed listing criteria including NEMA, ANSI, and OSHA standards for indoor and outdoor service.
- Rear and side entry conduit knockouts into an easily accessible and roomy wiring compartment.
- **Wiring compartment:** Provides tinned copper lead wire terminations and standard ground lug assembly for easy cable installation.
- Taps are convenient to select output voltage.
- Output voltage adjustable by taps.
- **Temperature Range:** -20°C (-4°F) to average ambient temperature 30°C (86°F), not to exceed 40°C (104°F)
- **Installation made quick and easy:** All encapsulated transformers are designed for wall mounting and include keyhole mounting slots.
- **10 year warranty** (limited to mfg. defects)

Agency Approvals

- UL Listed File No. E50394 (Type Q)
- CSA File No. LR3902 (Type Q)
- CE
- RoHS

C1FC25XE

C1F1C0XES

C1F005XES

HPS Fortress Encapsulated Transformer Specifications

Part Number	Price	kVA Rating	Primary Voltage (50/60Hz)**	Secondary Voltage (Nominal)	Output Current (Amps) 120/240	Impedance %		Total Heat Dissipation (Watts)*	Product Wt/Lbs
						VA	%z		
C1FC25XE	$199.00	0.25	190/200/208/ 220/240 x 380/400/416/ 440/480	120/240	2.08/1.04	250	13.0	76	8.25
C1FC50XE	$230.00	0.50			4.16/2.08	500	10.7	95	14.0
C1F1C0XES	$346.00	1.0			8.33/4.16	1000	5.4	110	26.0
C1F002XES	$530.00	2.0			16.67/8.33	2000	4.5	140	52.0
C1F003XES	$689.00	3.0			25.0/12.5	3000	4.3	145	65.0
C1F005XES	$969.00	5.0			41.67/20.83	5000	4.3	351	115.0

** Heat dissipation calculated based on full rated load on transformer.*
*** The primary voltage ratio of 240 or 480 is available at 60Hz only with a secondary voltage of approximately 130/262V*

HPS Fortress™ Commercial Encapsulated Transformers Primary 480/440/416/400/380 x 240/220/208/200/190 VAC Secondary 240 x 120 VAC

Hammond Power Solutions

Dimensions (in [mm])

Figure A - 250VA to 2kVA

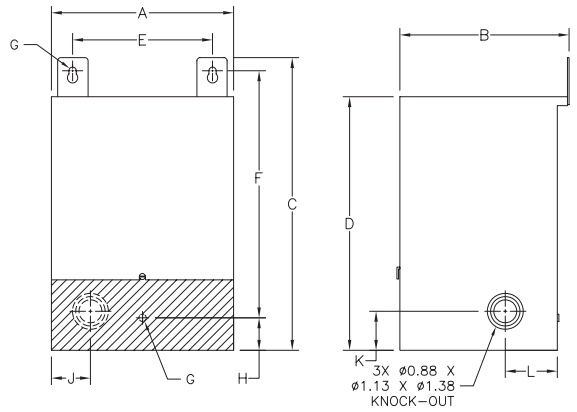
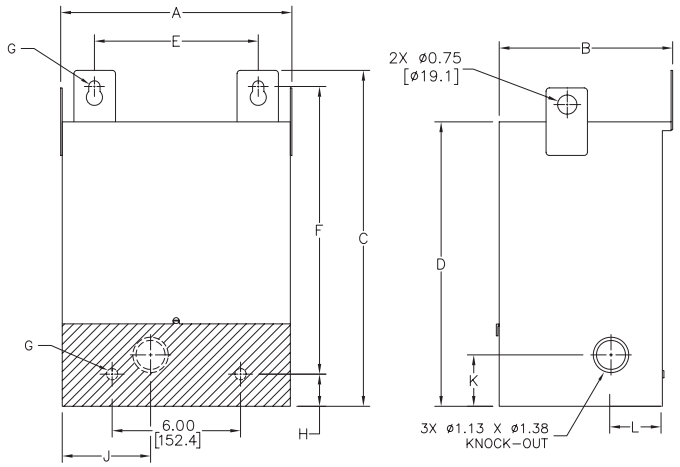


Figure B - 3kVA to 5kVA



** Front bottom panel is hinged for access to terminals, shaded areas show view of rear mounting holes and knockout.*

HPS Fortress Encapsulated Transformer Dimensions												
Part Number	*Mtg. Fig.*	*Overall Dimensions in (mm)*				*Mounting Holes in (mm)*		*Mounting Hole Dia. in (mm)*	*Knock Out Dimensions in (mm)*			
		A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*J*	*K*	*L*
C1FC25XE	A	3.75 (95.3)	5.25 (133.4)	7.25 (184.2)	6.25 (158.8)	2.50 (63.5)	5.63 (143.0)	0.22 (5.6)	1.25 (31.8)	N/A	1.50 (38.1)	2.00 (50.8)
C1FC50XE	A	4.50 (114.3)	5.75 (146.1)	7.25 (184.2)	6.25 (158.8)	3.13 (79.5)	5.63 (143.0)	0.22 (5.6)	1.25 (31.8)	0.81 (20.6)	1.50 (38.1)	2.00 (50.8)
C1F1C0XES	A	5.88 (149.4)	5.50 (139.7)	10.00 (254.0)	8.50 (215.9)	4.13 (104.9)	8.25 (209.6)	0.28 (7.1)	1.25 (31.8)	1.25 (31.8)	1.50 (38.1)	2.00 (50.8)
C1F002XES	A	7.00 (177.8)	6.50 (165.1)	11.75 (298.5)	10.25 (260.4)	5.38 (136.7)	9.50 (241.3)	0.28 (7.1)	1.25 (31.8)	1.50 (38.1)	15.0 (381.0)	2.00 (50.8)
C1F003XES	B	10.00 (254.0)	7.75 (196.9)	17.25 (438.2)	15.25 (387.5)	7.38 (187.5)	15.38 (390.7)	0.44 (11.2)	1.25 (31.8)	4.00 (101.6)	2.00 (50.8)	2.00 (50.8)
C1F005XES	B	10.00 (254.0)	7.75 (196.9)	17.25 (438.2)	15.25 (387.5)	7.38 (187.5)	15.38 (390.7)	0.44 (11.2)	1.25 (31.8)	4.00 (101.6)	2.00 (50.8)	2.00 (50.8)

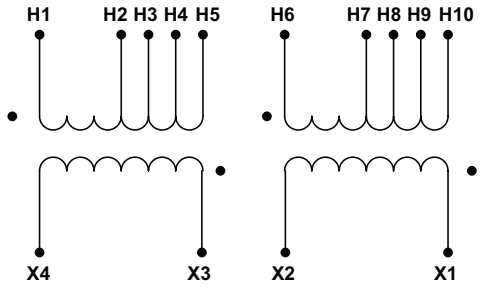
Note: All dimensions have a tolerance of ±0.06 inches unless otherwise noted.
To provide NEMA 3R protection (protection from falling rain), the transformer must be mounted vertically with the mounting tabs facing up.
Additional information in installation insert.

HPS Fortress™ Commercial Encapsulated Transformers Primary 480/440/416/400/380 x 240/220/208/200/190 VAC Secondary 240 x 120 VAC

Hammond Power Solutions

Wiring Diagram - For 250VA to 2kVA

SCHEMATIC



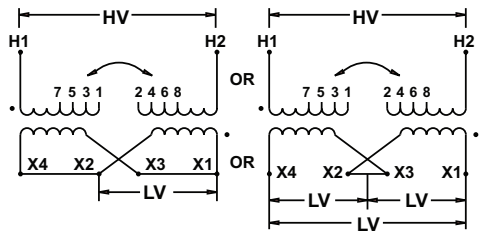
CONNECTIONS

Primary Volts	Connect lines to	Inter-connect
480 (60Hz)	H1, H10	H5-H6
440 (50/60Hz)	H1, H10	H5-H6
416 (50/60Hz)	H1, H9	H4-H6
400 (50/60Hz)	H1, H8	H3-H6
380 (50/60Hz)	H1, H7	H2-H6
240 (60 Hz)	H1, H10	H1-H6, H5-H10
220 (50/60Hz)	H1, H10	H1-H6, H5-H10
208 (50/60Hz)	H1, H9	H1-H6, H4-H9
200 (50/60Hz)	H1, H8	H1-H6, H3-H8
190 (50/60Hz)	H1, H7	H1-H6, H2-H7

Secondary Volts	Connect lines to	Inter-connect
240	X1, X4	X2-X3
120/240	X1, X2, X4	X2-X3
120	X1, X4	X2-X4, X1-X3

Wiring Diagram - For 3kVA and 5kVA

SCHEMATIC



CONNECTIONS

Primary Volts	Connect lines to	Inter-connect
440 or 480	H1, H2	1-2
416	H1, H2	3-4
400	H1, H2	5-6
380	H1, H2	7-8
220 or 240	H1, H2	H1-2, H2-1
208	H1, H2	H1-4, H2-3
200	H1, H2	H1-6, H2-5
190	H1, H2	H1-8, H2-7

Secondary Volts	Connect lines to	Inter-connect
240	X1, X4	X2- X3
120	X1, X2	X2-X4, X1-X3
120/240	X1, X2, X4	X2-X3

Termination*		
Part No.	*HV*	*LV*
C1FC25XE	#18 AWG Leads	#18 AWG Leads
C1FC50XE	#18 AWG Leads	#18 AWG Leads
C1F1C0XES	#18 AWG Leads	#14 AWG Leads
C1F002XES	#14 AWG Leads	#14 AWG Leads
C1F003XES	#14 AWG Leads	#14 AWG Leads
C1F005XES	#14 AWG Leads	#12 AWG Leads

** Transformers are provided with copper leads.*

Hammond HPS Drive Isolation Transformers

Hammond Power Solutions

HPS Drive Isolation Transformers are designed to meet the rugged demands of AC and DC variable speed drives and also to provide the required voltage change. The separate primary and secondary windings provide electrical isolation between the incoming line and the VFD input. The windings are designed to withstand over-current of 150% of the rated load for 60 seconds or 200% of the rated load for 30 seconds. (A duty cycle of one start for every two hours is permitted.)

DM007JJ

DM063JJ

Benefits

- Standard Type 3R enclosure suitable for indoor or outdoor applications.
- Standard integral floor mounting brackets up to 220kVA allow for faster installation.
- All units utilize a uniform 220°C insulation system with 80°C, 115°C, or 150°C temperature rise.
- Industry-leading design solutions, technology and materials continue the legacy of quality and reliability in all HPS products.

Features

- Winding monitoring thermostat included.
- Primary taps to compensate for voltage variations.
- Core & Coil Construction:
  - Manufactured from quality non-aging, cold-rolled, silicon steel laminations using state-of-the-art equipment.
  - Cores are precision cut to close tolerances which eliminates burrs and improves performance.
  - Core is coated to prevent the ingress of moisture.
  - Precision wound with copper or aluminum conductors that are electrically balanced to minimize axial forces during short-circuit conditions.
  - Robust interface between core and coils for better short-circuit performance.
- Conductor Material: Copper or aluminum (see transformer nameplate for details).
- Temperature Rise: 150ºC typical (low rise options available).
- Insulation System: 220°C

Agency Approvals

- UL Listed: File 112313
- CSA Certified: File: LR3902

Hammond Drive Isolation Transformers Selection Guide
Aluminum Wound, Three Phase
460 Delta Primary Volts, 460Y Secondary Volts, 60Hz

Part Number	Price	kVA	Case Style	Weight (lb [kg])	Mounting Type	Wiring Diagram	Drawing
DM007JJ	$1,270.00	7.5	NH5	150 [68.0]	Floor or Wall*	SCD8	PDF
DM011JJ	$1,412.00	11	NH5	160 [72.0]	Floor or Wall*	SCD8	PDF
DM014JJ	$1,439.00	14	NH5	170 [77.0]	Floor or Wall*	SCD8	PDF
DM020JJ	$1,794.00	20	NH6	240 [108.0]	Floor or Wall*	SCD7	PDF
DM027JJ	$1,932.00	27	NH6	300 [135.0]	Floor or Wall*	SCD7	PDF
DM034JJ	$2,092.00	34	NH6	330 [149.0]	Floor or Wall*	SCD7	PDF
DM040JJ	$2,221.00	40	NH6	350 [158.0]	Floor or Wall*	SCD7	PDF
DM051JJ	$2,442.00	51	NH6	430 [194.0]	Floor or Wall*	SCD7	PDF
DM063JJ	$3,074.00	63	NH3	530 [239.0]	Floor or Wall*	SCD7	PDF
DM075JJ	$3,128.00	75	NH3	580 [261.0]	Floor or Wall*	SCD7	PDF
DM093JJ	$3,686.00	93	NH3	630 [284.0]	Floor or Wall*	SCD7	PDF
DM118JJ	$4,113.00	118	NH3	730 [329.0]	Floor or Wall*	SCD7	PDF
DM145JJ	$5,034.00	145	NH4	830 [374.0]	Floor	SCD7	PDF
DM175JJ	$5,893.00	175	NH4	930 [419.0]	Floor	SCD7	PDF
DM220JJ	$6,721.00	220	NH4	1350 [610.0]	Floor	SCD9	PDF

** Integral wall mounting included on units up to 51 kVA (430lb [194.0 kg]). Additional wall mounting kits and or/drip plate kits not sold by AutomationDirect.com. Purchase from Hammond Power Solutions.*

Hammond HPS Drive Isolation Transformers

Hammond Power Solutions

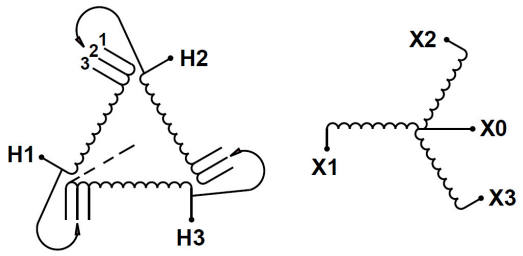
Hammond Drive Isolation Transformers Specifications Aluminum Wound, Three Phase – 460 Delta Primary Volts, 460Y Secondary Volts		
	 ***7.5 to 175 kVA***	 ***220 kVA***
UL Listed	File: E112313	File: E112313
CSA Certified	File: LR3902	File: LR3902
Frequency	60Hz	60Hz
Insulation System	220°C [150°C rise] 200°C (130°C rise) on some copper units up to 40kVA	220°C [150°C rise]
Enclosure Type	Heavy-duty ventilated type 3R	Heavy-duty ventilated type 3R
Enclosure Finish	ANSI 61 Grey, UL50	ANSI 61 Grey, UL50
Neutral	Neutral terminal for field connection (on applicable units)	Neutral terminal for field connection (on applicable units)
Standard Primary Taps	Refer to wiring diagrams for details	Refer to wiring diagrams for details
Termination	Front accessible separate high- and low-voltage terminations suitable for copper and aluminum are provided for easy cable installation	Front accessible separate high- and low-voltage terminations suitable for copper and aluminum are provided for easy cable installation
Thermostat	Standard on all units (NC contacts rated 5.0 A / 120VAC 2.5 A / 240VAC)	Standard on all units (NC contacts rated 5.0 A / 120VAC 2.5 A / 240VAC)
Conduit Knock-Outs	Standard on all units (no knock-outs on stainless steel enclosures)	Standard on all units (no knock-outs on stainless steel enclosures)
Impedance	Typically 3% to 6%	Typically 3% to 6%
Mounting	Floor mounting available on all units. Wall and ceiling mount available on units up to 750lb [340.2 kg]. Purchase from Hammond Power Solutions.	Floor mounting only
Short-Circuit Withstand	Meets UL and CSA short-circuit withstand requirements	Meets UL and CSA short-circuit withstand requirements

Hammond HPS Drive Isolation Transformers

Hammond Power Solutions

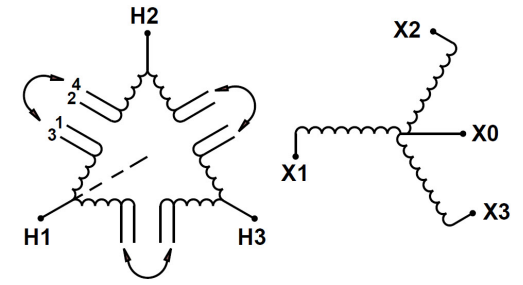
Wiring Diagrams

Schematic SCD7



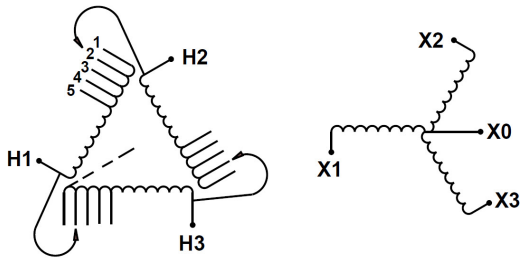
Connections		
Primary volts	***Connect lines to***	***Inter-connect***
208 218 242 252 437 480 483	H1, H2, H3	1
198 208 230 240 416 456 460	H1, H2, H3	2
187 198 219 228 395 432 437	H1, H2, H3	3
Secondary volts	***Connect lines to***	
208 230 240 380 416 460	X1, X2, X3	
120 133 139 220 240 265	X1, X0 X2, X0 X3, X0	

Schematic SCD8



Connections		
Primary volts	***Connect lines to***	***Inter-connect***
218 242 252 437 483	H1, H2, H3	1-2
208 230 240 416 460	H1, H2, H3	2-3
198 219 228 395 437	H1, H2, H3	3-4
Secondary volts	***Connect lines to***	
208 230 240 380 416 460	X1, X2, X3	
120 133 139 220 240 265	X1, X0 X2, X0 X3, X0	

Schematic SCD9



Connections		
Primary volts	***Connect lines to***	***Inter-connect***
218 242 252 437 483	H1, H2, H3	1
213 236 246 426 472	H1, H2, H3	2
208 230 240 416 460	H1, H2, H3	3
203 224 234 406 449	H1, H2, H3	4
198 219 228 395 437	H1, H2, H3	5
Secondary volts	***Connect lines to***	***Inter-connect***
208 380 416 460	X1, X2, X3	–
120 220 240 266	X1, X0 X2, X0 X3, X0	–

Hammond HPS Drive Isolation Transformers

Hammond Power Solutions

Termination Type

Three-Phase, Aluminum and Copper Termination (460V)	
kVA	***Termination***
7.5	Lugs
11	Lugs
14	Lugs
20	Lugs
27	Lugs
34	Lugs
40	Lugs
51	Lugs
63	Lugs
75	Lugs
93	Lugs
118	Lugs
145	Lugs
175	Lugs
220	Diagram 1

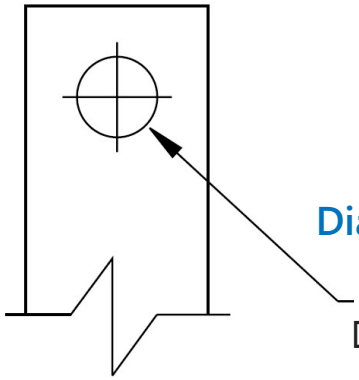


Diagram 1

Diameter 0.437 in [11.10 mm]

Selecting the Drive Isolation Transformer

Select the Drive Isolation Transformer according to the **recommendations from the motor drive system manufacturer or supplier**. If this information is unavailable, use the table below as a guide for selecting the transformer kVA for a required motor horsepower.

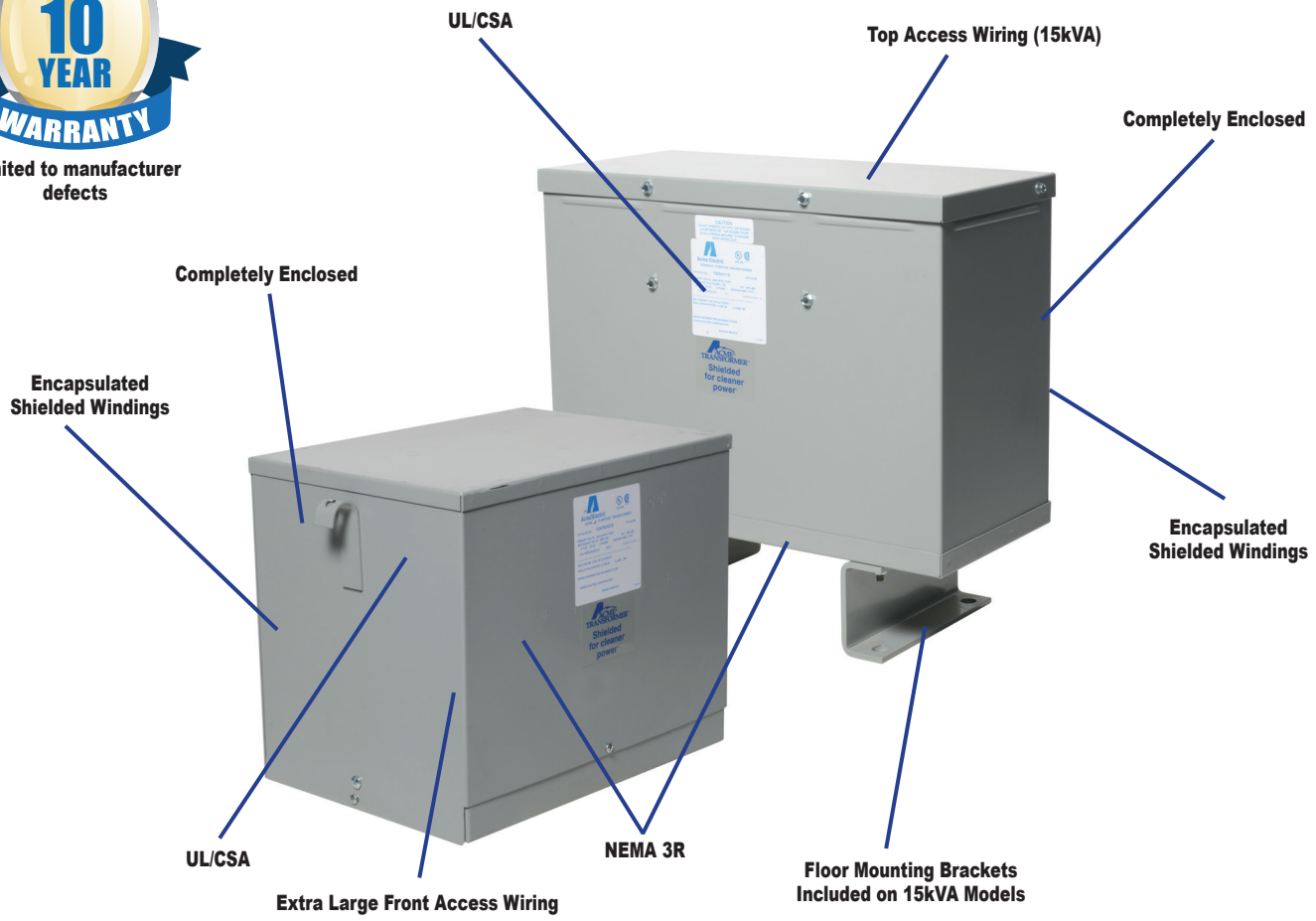
Motor HP to Transformer kVA Selection Table	
Motor HP	***Transformer kVA***
5	7.5
7.5	11
10	14
15	20
20	27
25	34
30	40
40	51
50	63
60	75
75	93
100	118
125	145
150	175
200	220
250	275
300	330
400	440
500	550
600	660

Thermostat Contacts Connection

Dry-type Encapsulated 3-Phase Distribution Transformers

10 YEAR WARRANTY

Limited to manufacturer defects



Applications

- Excellent for dust or lint laden atmosphere
- Suitable for indoor/outdoor Service

Agency Approvals

- UL Listed File E79947 (Style SR)
- CSA File No. LR7357 (Type SR)
- RoHS

Features

- UL listed, CSA certified and UL type 3R enclosure meets or exceeds all listing criteria including NEMA, ANSI and OSHA standards.
- UL Class 180°C insulation system. 115°C rise.
- Extra large front access wiring compartment through 9kVA; top access for easier installation and cooler case temperatures for 15kVA models.
- Completely enclosed — suitable for indoor/outdoor service. Consult selection charts for details. Excellent for dust or lint laden atmosphere.
- Encapsulated — electrical grade silica and resin compound completely encloses the core and coil. Encapsulation seals out all moisture and air, eliminating corrosion and insulation deterioration.
- High efficiency and excellent regulation.
- Sound levels below NEMA standards.
- Keyhole mounting slots permit installation of mounting bolts prior to hanging transformer and are accessible from the front. Lifting ears for easy installation (up to 9kVA).
- Wiring connections can be made outside of wiring compartment due to the use of flexible leads.
- 3-9 kVA provided with dual size knockouts in sides and bottom of wiring compartment.
- Termination — copper lead wire.
- Electrostatic shielding provided on all 60Hz isolation transformers.

RoHS 2011/65/EU

Acme Transformer Selection

Three Phase Loads

1. Determine electrical load

A. Voltage required by load.

B. Amperes or kVA required by load.

C. Frequency in Hz (cycles per second).

D. Verify load is designed to operate on 3-phase.

All the above information is standard data normally obtained from equipment nameplates or instruction manuals.

2. Determine supply voltage

A. Voltage of supply (source).

B. Frequency in Hz (cycles per second).

The frequency of the line supply and electrical load must be the same. A 3-phase transformer is selected which is designed to operate at this frequency having a primary (input) equal to the supply voltage and a secondary (output) equal to the voltage required by the load.

3. If the load nameplate expresses a rating in kVA, a transformer can be directly selected from the charts. Choose from the group of transformers with primary and secondary voltages matching that which you have just determined.

A. Select a transformer with a standard kVA capacity equal to or greater than that needed to operate the load.

B. Primary taps are available on most models to compensate for line voltage variations.

C. When load ratings are given only in amperes, tables 1, 2 and 3 or the following formulas may be used to determine proper kVA size for the required transformer.

(1) To determine **3-phase** kVA when volts and amperes are known:

$$\text{3-Phase kVA} = \frac{\text{Volts x Amps x 1.73}}{1000}$$

(2) To determine **Amperes** when kVA and volts are known:

$$\text{Amps} = \frac{\text{3-Phase kVA x 1000}}{\text{Volts x 1.73}}$$

Three Phase Example

Question: Select a transformer to fulfill the following conditions. Load is a 3-phase induction motor, 25hp @ 240V, 60Hz and a heater load of 4kW @ 240V single phase. The supply voltage is 480Y/277, 3-phase, 4 wire.

Answer: Compute the kVA required. Motor—From Table 2 the current is 68A.

$$\frac{\text{240V x 68A x 1.73}}{1000} = 28.2 \text{ kVA}$$

(The kVA can also be obtained from Table 3)

Heater – 4kVA

A 3-phase transformer must be selected so that any one phase is not overloaded. Each phase should have the additional 4kVA rating required by the heater even though the heater will operate on one phase only. So, the transformer should have a minimum kVA rating of 28.2 + 4 + 4 + 4 or 40.2 kVA. Refer to the appropriate selection chart. A 480 delta primary — 240 delta secondary transformer may be used on a 4 wire, 480Y/277 volt supply. The fourth wire (neutral) is not connected to the transformer. To not overload the transformer, a 45kVA transformer should be selected.

Note: Any two wires of the 240V, 3-phase developed by the secondary of the transformer may be used to supply the heater.

Any 2 wires of a 3-phase system is single phase.

Acme Transformer Selection

Table 1 - Full Load Current (A) Three-phase Circuits						
kVA	***208V***	***240V***	***380V***	***440V***	***480V***	***600V***
3	8.3	7.2	4.6	3.9	3.6	2.9
4.5	12.5	10.8	6.8	5.9	5.4	4.3
6	16.6	14.4	9.1	7.8	7.2	5.8
9	25	21.6	13.7	11.8	10.8	8.6
15	41	36	22.8	19.6	18.0	14.4

Table 2 - Full Load Current (A) Single-phase Circuits		
kVA	***120V***	***277V***
3	25	10.8
6	50	21.6
9	75	32.5
15	125	54

Table 3 - Full Load Current (A) 3-Phase AC Motors[1]					
hp	***208V***	***230V***	***460V***	***575V***	***Minimum Transformer kVA***
1/2	2.2	2.0	1.0	0.8	0.9
3/4	3.1	2.8	1.4	1.1	1.2
1	4.0	3.6	1.8	1.4	1.5
2	7.5	6.8	3.4	2.7	2.7
3	10.7	9.6	4.8	3.9	3.8
5	16.7	15.2	7.6	6.1	6.3
10	31	28	14	11	11.2
15	46	42	21	17	16.6
20	59	54	27	22	21.6
25	75	68	34	27	26.6
30	88	80	40	32	32.4
40	114	104	52	41	43.2
50	143	130	65	52	52
60	170	154	77	62	64
75	213	192	96	77	80
100	273	248	124	99	103
125	342	312	156	125	130
150	396	360	180	144	150
200	528	480	240	192	200

1) When motor service factor is greater than 1, increase full load amps proportionally.

Example: If service factor is 1.15, increase above amp values by 15%.

$$\text{3-Phase kVA} = \frac{\text{Volts x Amps x 1.73}}{1000}$$

Note: If motors are started more than once per hour, increase minimum transformer kVA by 20%.

Acme Encapsulated 3-Phase Transformers

Features

- Fully encapsulated core and coil
- UL Type 3R epoxy encapsulated
- Grounding studs for use with non-metallic conduit
- Copper lead wire terminations
- Electrostatic shield standard

General Specifications

- Temperature range: -20°C [-4°F] to average ambient temperature 30°C [86°F], not to exceed 40°C [104°F] without derating the transformer.
- Maximum temperature rise: 115°C [239°F]
- BNFC (below normal full capacity) taps: 2
- Taps 5% per step
- Frequency: 60Hz
- For proper overcurrent protection, refer to NEC 450.3, 2014

Approvals

- UL 506
- UL File E79947 (Style SR)
- CSA Standard C22.2 No. 47
- CSA file LR7357-32 (Type SR)

To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

Acme Encapsulated 3-Phase Transformers*

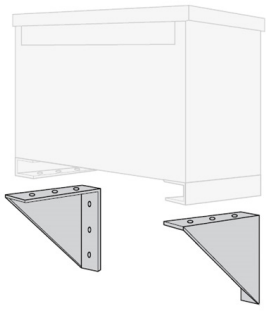
Part Number	Price	kVa Rating	Primary Volts	Secondary Volts	Impedance %Z (Ω)	Total Heat Dissipation (W)	Mounting Type	Weight lb [kg]	Wiring Diagram	Drawing #
T2A533081S[1]	$729.00	3.0	480 Delta	208Y/120	3.7	143.7	Wall Mount	75 [34.0]	A	1
T2A533091S[1]	$1,040.00	6.0			2.42	257.76	Wall Mount	140 [63.5]		1
T2A533101S[1]	$1,357.00	9.0			2.57	325.02	Wall Mount	180 [81.6]		1
T3533111S[1]	$1,627.00	15.0			2.91	296.19	Floor Mount[3]	250 [113.0]		2
T2A533281S[1]	$753.00	3.0	480 Delta	240 Delta/ 120Tap[2]	3.68	143.59	Wall Mount	75 [34.0]	B	1
T2A533291S[1]	$1,008.00	6.0			2.64	245.77	Wall Mount	140 [63.5]		1
T2A533401S[1]	$1,329.00	9.0			2.96	329.04	Wall Mount	180 [81.6]		1
T3533411S[1]	$1,777.00	15.0			3.02	297.49	Floor Mount[3]	250 [113.0]		2
T2A793301S	$986.00	3.0	600 Delta	208Y/120	3.73	145.8	Wall Mount	75 [34.0]	C	1
T2A793311S	$1,261.00	6.0			2.55	245.27	Wall Mount	140 [63.5]		1
T2A793321S	$1,723.00	9.0			1.86	323.4	Wall Mount	180 [81.6]		1
T3793331S	$1,938.00	15.0			2.5	296.63	Floor Mount[3]	250 [113.0]		2
T2A795161S	$1,003.00	3.0	600 Delta	480Y/277	3.91	146.29	Wall Mount	75 [34.0]	D	1
T2A795171S	$1,257.00	6.0			2.65	244.14	Wall Mount	140 [63.5]		1
T2A795181S	$1,682.00	9.0			2.69	166.74	Wall Mount	180 [81.6]		1
T3795191S	$1,822.00	15.0			3.17	213	Floor Mount[3]	250 [113.0]		2

** DOE 2016 exempt encapsulated unit.*
[1] May be used on a 4-wire 480Y/277V supply.
[2] Provided with 120V lighting tap limited to 5% of nameplate kVA rating.
[3] Wall mounting brackets are available for these sizes.

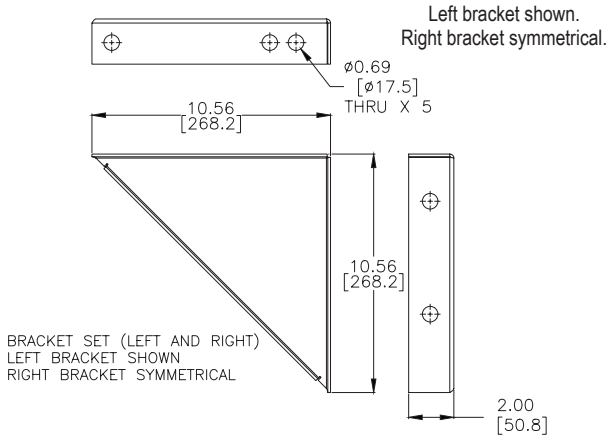
Wall Mounting Bracket

Part Number	Price	Description
PL79911	$99.00	Transformer wall mounting brackets for use with Acme 15kVA encapsulated 3-phase transformers. Package contains one (1) each left and right bracket. Cold rolled steel. Weight 13lb/5.9 kg.

Hardware not included. Important, check the weight of the unit and confirm that the wall and the fasteners (not supplied with the kit) can support the unit.



in [mm]



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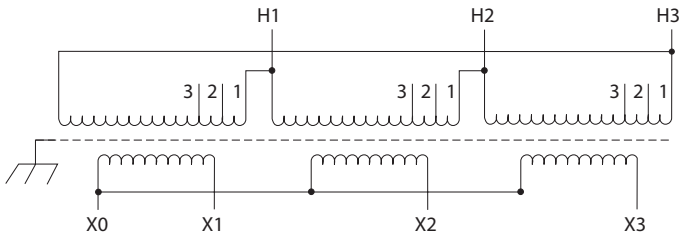
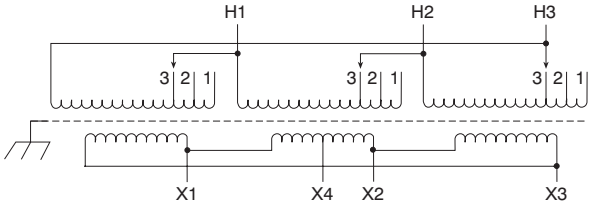
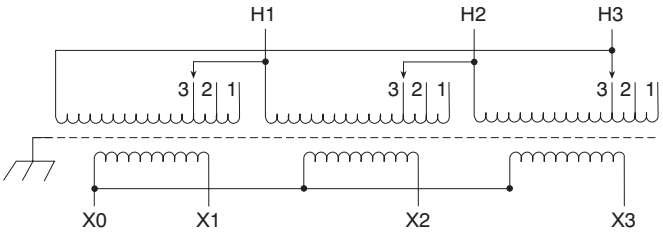
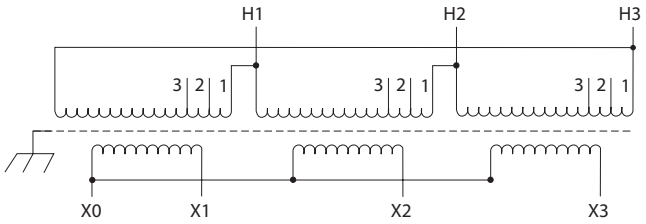
Acme Encapsulated 3-Phase Transformers

WIRING DIAGRAM A	Primary Volts	Connect Lines To	Inter-connect
	480	H1, H2, H3	1-H1, 1-H2, 1-H3
	456	H1, H2, H3	2-H1, 2-H2, 2- H3
	432	H1, H2, H3	3-H1, 3-H2, 3- H3
	Secondary Volts	**Connect Lines To**	**Inter-connect**
	208	X1, X2, X3	
	120 (1-phase)	X1, X0 X2, X0 X3, X0	

WIRING DIAGRAM B	Primary Volts	Connect Lines To	Inter-connect
	480	H1, H2, H3	1-H1, 1-H2,1-H3
	456	H1, H2, H3	2-H1, 2-H2, 2-H3
	432	H1, H2, H3	3-H1, 3-H2, 3-H3
	Secondary Volts	**Connect Lines To**	**Inter-connect**
	240	X1, X2, X3	
	120	X1, X4 or X2, X4	

WIRING DIAGRAM C	Primary Volts	Connect Lines To	Inter-connect
	600	H1, H2, H3	1-H1, 1-H2,1-H3
	570	H1, H2, H3	2-H1, 2-H2, 2-H3
	540	H1, H2, H3	3-H1, 3-H2, 3-H3
	Secondary Volts	**Connect Lines To**	**Inter-connect**
	208	X1, X2, X3	
	120 (1-phase)	X1, X0 X2, X0 X3, X0	

WIRING DIAGRAM D	Primary Volts	Connect Lines To	Inter-connect
	600	H1, H2, H3	1-H1, 1-H2,1-H3
	570	H1, H2, H3	2-H1, 2-H2, 2-H3
	540	H1, H2, H3	3-H1, 3-H2, 3-H3
	Secondary Volts	**Connect Lines To**	**Inter-connect**
	480	X1, X2, X3	
	277 (1-phase)	X1, X0 X2, X0 X3, X0	

Termination Wire Size (AWG) - Lead Type Connections

Part Number	HV	LV
T2A533081S	#14 CLP	#14 CLP
T2A533091S	#14 CLP	#12 CLP
T2A533101S	#14 CLP	#10 CLP
T3533111S	#14 CLP	#8 CLP
T2A533281S	#14 CLP	#14 CLP
T2A533291S	#14 CLP	#14 CLP
T2A533401S	#14 CLP	#14 CLP
T3533411S	#14 CLP	#10 CLP
T2A793301S	#14 CLP	#14 CLP
T2A793311S	#14 CLP	#12 CLP
T2A793321S	#14 CLP	#14 CLP
T3793331S	#14 CLP	#8 CLP
T2A795161S	#14 CLP	#14 CLP
T2A795171S	#14 CLP	#14 CLP
T2A795181S	#14 CLP	#14 CLP
T3795191S	#14 CLP	#14 CLP

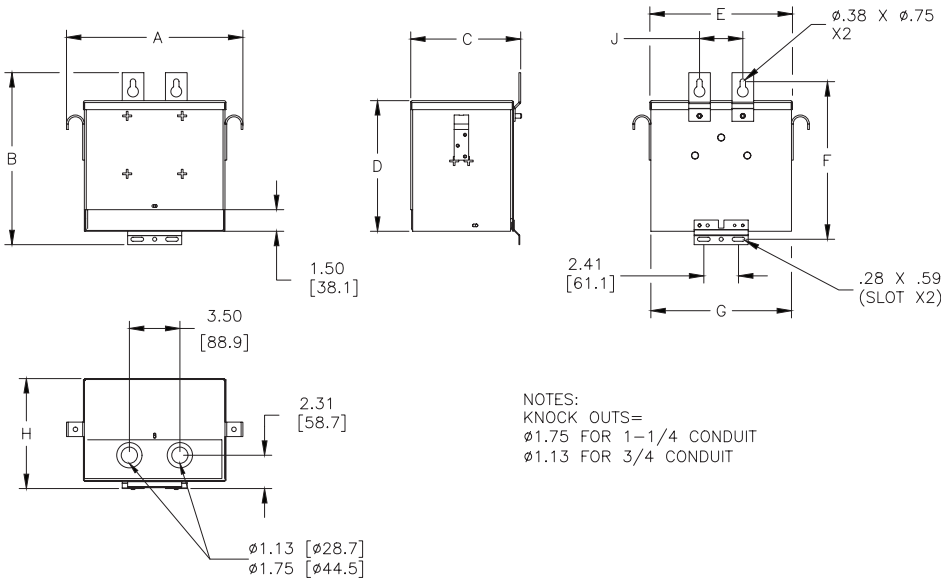
CLP = Cross-linked Polyethylene (cable insulation material)

Acme Encapsulated 3-Phase Transformers

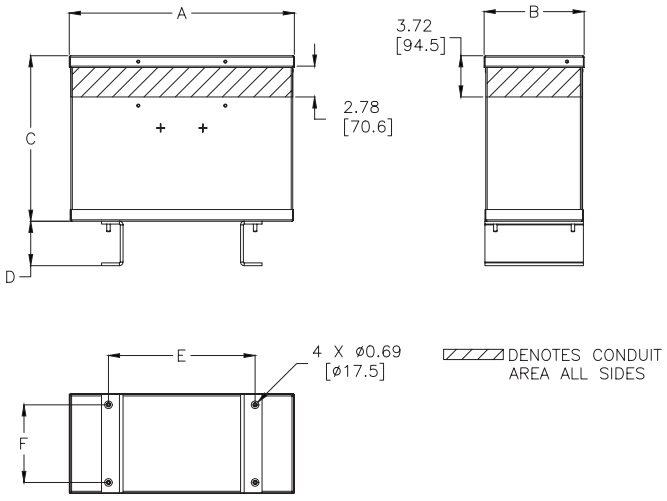
Dimensions

in [mm]

Drawing 1



Drawing 2



See our website: www.AutomationDirect.com for complete engineering drawings

Acme Encapsulated Transformer Dimensions - in [mm]										
Part Number	***Dwg***	***A***	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***J***
T2A533081S	1	12.23 [310.6]	11.93 [303.0]	7.13 [181.1]	9.06 [230.1]	9.88 [251.0]	10.93 [277.6]	9.75 [247.7]	7.63 [193.8]	3.63 [92.2]
T2A533281S	1									
T2A793301S	1									
T2A795161S	1									
T2A533091S	1	14.03 [356.4]	12.84 [326.1]	8.48 [215.4]	9.97 [253.2]	11.68 [296.7]	11.84 [300.7]	11.55 [293.4]	8.98 [228.1]	3.63 [92.2]
T2A533291S	1									
T2A793311S	1									
T2A795171S	1									
T2A533101S	1	17.63 [447.8]	15.57 [395.5]	11.18 [284.0]	12.70 [322.6]	15.28 [388.1]	14.57 [370.1]	15.15 [384.8]	11.63 [295.4]	3.63 [92.2]
T2A533401S	1									
T2A793321S	1									
T2A795181S	1									
T3533111S	2	20.29 [515.4]	9.02 [229.1]	14.93 [379.2]	4.00 [101.6]	13.22 [335.8]	7.00 [177.8]	–	–	–
T3533411S	2									
T3795191S	2									
T3793331S	2									

Acme Transformers Frequently Asked Questions

1. Can transformers be used in parallel?

Single phase transformers can be used in parallel only when their impedances and voltages are equal. If unequal voltages are used, a circulating current exists in the closed network between the two transformers, which will cause excess heating and result in a shorter life of the transformer. In addition, impedance values of each transformer must be within 7.5% of each other. For example: Transformer A has an impedance of 4%, transformer B, which is to be parallel to A, must have an impedance between the limits of 3.7% and 4.3%. When paralleling 3-phase transformers, the same precautions must be observed as listed above, plus the angular displacement and phasing between the two transformers must be identical.

2. Can Acme Transformers be reverse connected?

ACME dry-type distribution transformers can be reverse connected without a loss of kVA rating, but there are certain limitations. Transformers rated 3kVA and larger can be reverse connected without any adverse effects or loss in kVA capacity. The reason for this limitation in kVA size is that the turns ratio is the same as the voltage ratio. Example: A transformer with a 480V input, 240V output can have the output connected to a 240V source and thereby become the primary or input to the transformer, then the original 480V primary winding will become the output or 480V secondary. The transformer will not be damaged if used in a reverse connection; however, the output voltage will be lower than is indicated by the nameplate.

3. What is meant by regulation in a transformer?

Voltage regulation in transformers is the difference between the no load voltage and the full load voltage. This is usually expressed in terms of percentage. For example: A transformer delivers 100V at no load and the voltage drops to 95V at full load, the regulation would be 5%. ACME dry-type distribution transformers generally have regulation from 2% to 4%, depending on the size and the application for which they are used.

4. Why is impedance important?

It is used for determining the interrupting capacity of a circuit breaker or fuse employed to protect the primary of a transformer. Example: Determine a minimum circuit breaker trip rating and interrupting capacity for a 10kVA single phase transformer with 4% impedance, to be operated from a 480V 60Hz source. Calculate as follows:

$$\text{Normal Full Load Current} = \frac{\text{Nameplate Volt Amps}}{\text{Line Volts}} = \frac{10{,}000\text{VA}}{480\text{V}} = 20.8\text{ A}$$

$$\text{Maximum Short Circuit Amps} = \frac{\text{Full Load Amps}}{4\%} = \frac{20.8\text{ A}}{4\%} = 520\text{A}$$

The breaker or fuse would have a minimum interrupting rating of 520A at 480V.

Example: Determine the interrupting capacity, in amperes, of a circuit breaker or fuse required for a 75kVA, 3-phase transformer, with a primary of 480V delta and secondary of 208Y/120 V. The transformer impedance (Z) = 5%. If the secondary is short circuited (faulted), the following capacities are required:

$$\text{Normal Full Load Current} = \frac{\text{Volt Amps}}{\sqrt{3} \times \text{Line Volts}} = \frac{75{,}000\text{VA}}{\sqrt{3} \times 480\text{V}} = 90\text{A}$$

$$\text{Maximum Short Circuit Amps} = \frac{\text{Full Load Amps}}{5\%} = \frac{90\text{A}}{5\%} = 1{,}800\text{A}$$

The breaker or fuse would have a minimum interrupting rating of 1,800 amps at 480 volts.

Note: The secondary voltage is not used in the calculation. The reason is the primary circuit of the transformer is the only winding being interrupted.

5.Can 60Hz transformers be used at higher frequencies?

ACME transformers can be used at frequencies above 60Hz up to 400Hz with no limitations provided nameplate voltages are not exceeded. However, 60Hz transformers will have less voltage regulation at 400Hz than at 60Hz.

Acme Transformers
Frequently Asked Questions

6. What color are ACME Dry-Type Transformers?

ASA 61 (NEMA) light gray is used on all enclosed transformers from 0.050 to 1000kVA

7. How do you select a transformer to operate in an ambient higher than 40°C?

When the ambient exceeds 40°C use the following chart for de-rating standard transformers.

Maximum Ambient Temperature	*Maximum Percentage of Loading*
40°C (104°F)	100%
50°C (122°F)	92%
60°C (140°F)	84%

Instead of ordering custom built transformers to operate in ambients higher than 40°C, it is more economical to use a standard transformer of a larger kVA rating.

Dry-Type Encapsulated Single-Phase Distribution Transformers

TF252795S

T2536171S

T2535183S

TF279740S

TF279746S

Acme Electric offers a complete range of Dry-type Distribution Transformers optimized to provide long life in general-purpose applications. Dry-type transformers are smaller and easier to maintain than liquid-filled transformers. These 600V class and below single-phase transformers are listed as Styles SR and ER.

Applications

- Healthcare facilities, educational facilities, theaters, stadiums, and entertainment venues
- Lighting
- Motors
- C&C equipment
- Power loads from power distribution systems

Agency Approvals

cULus (file no. E79947). Standard UL 506, listed in UL file as Style SR and ER for units 150VA and below.

CE (RoHS Directive 2011/65/EU and 2015/863/EU). Export models.

General Specifications

- Keyhole mounting slots for mounting bolts prior to installation.
- Mounting slots are accessible from the front.
- Flexible copper lead wire terminations for easy connections outside the front access wiring compartment.
- Frequency: 60Hz on standard models and 50/60 Hz on CE models.
- Winding material:
  - 5kVA and below - Cu
  - 7.5 kVA and above - Al

Features

- Lifting ears are included on 3 to 25 kVA units.
- Dual size knockouts in both sides and the bottom of the wiring compartment for greater wiring convenience and flexibility.
- UL and cUL listed and UL-3R enclosures meet or exceed all listing criteria, including NEMA, ANSI and OSHA standards.
- Shielded for cleaner power.
- Encapsulated and completely enclosed design electrical grade silica and resin compounds completely enclose the core and coil to seal out all moisture and air. UL Type 3R enclosure for indoor or outdoor service. Encapsulation eliminates corrosion and insulation deterioration.
- Quiet operation with sound levels well below NEMA standards.
- Long life UL class 155°C insulation system. 115°C rise through 0.750 kVa, 180°C insulation system, 115°C rise, 1kVa and above.

Dry-Type Encapsulated Single-Phase Distribution Transformers

How to Compute the kVA Required (Single-Phase Loads):

1. Determine electrical load

A. Voltage required by load.
B. Amperes or kVA capacity required by load.
C. Frequency in Hz (cycles per second).
D. Verify load is designed to operate on a single-phase supply.

The above information is standard data normally obtained from equipment nameplates or instruction manuals.

2. Determine supply voltage

A. Voltage of supply (source).
B. Frequency in Hz (cycles per second).

The frequency of the line supply and electrical load must be the same. Select single-phase transformer designed to operate at this frequency, having a primary (input) equal to the supply voltage and a secondary (output) equal to the voltage required by the load.

3. If the load nameplate expresses a rating in kVA, a transformer can be directly selected from the charts. Choose from a group of transformers with primary and secondary voltages matching those you have just determined.

A. Select a transformer with a standard kVA capacity equal to or greater than that needed to operate the load.
B. Primary taps are available on most models to compensate for line voltage variations.

Full Load Current (A) – Single-Phase Circuits

kVA	120V	208 V	240 V	277 V	380 V	440V	480 V	600V
0.25	2.0	1.2	1.0	0.9	0.6	0.5	0.5	0.4
0.50	4.2	2.4	2.1	1.8	1.3	1.1	1.0	0.8
0.75	6.3	3.6	3.1	2.7	2.0	1.7	1.6	1.3
1.0	8.3	4.8	4.2	3.6	2.6	2.3	2.1	1.7
1.5	12.5	7.2	6.2	5.4	3.9	3.4	3.1	2.5
2.0	16.7	9.6	8.3	7.2	5.2	4.5	4.2	3.3
3.0	25	14.4	12.5	10.8	7.9	6.8	6.2	5.0
5.0	41	24.0	20.8	18.0	13.1	11.3	10.4	8.3
7.5	62	36	31	27	19.7	17	15.6	12.5
10	83	48	41	36	26	22.7	20.8	16.7
15	125	72	62	54	39	34	31	25
25	208	120	104	90	65	57	52	41

Full Load Current (A) – Single-Phase AC Motors[1]

Horsepower	115V	208V	230V	Minimum Transformer kVa
1/6	4.4	2.4	2.2	0.53
1/4	5.8	3.2	2.9	0.70
1/3	7.2	4.0	3.6	0.87
1/2	9.8	5.4	4.9	1.18
3/4	13.8	7.6	6.9	1.66
1	16	8.8	8	1.92
1.5	20	11.0	10	2.40
2.0	24	13.2	12	2.88
3.0	34	18.7	17	4.10
5.0	56	30.8	28	6.72
7.5	80	44	40	9.6
10	100	55	50	12.0

1) When motor service factor is greater than 1, increase full load amps proportionally. Example: If service factor is 1.15, increase above amp values by 15%.

Note: If motors are started more than once per hour, increase minimum transformer kVA by 20%.

$$\text{1 Phase kVA} = \frac{\text{Volts x Amps}}{1000}$$

C. When load ratings are given only in amperes, tables 1 and 2 or the following formulas may be used to determine proper kVA size for the required transformer.

(1) To determine kVA when volts and amps are known:

$$\text{kVA} = \frac{\text{Volts x Amps}}{1000}$$

(2) To determine Amperes when volts and amps are known:

$$\text{Amps} = \frac{\text{kVA x 1000}}{\text{Volts}}$$

Single-Phase Example

Select a transformer to meet the following conditions:

- Load is single-phase lighting using incandescent lamps.
- Each fixture requires 1.3 amps @ 120 volts, 1 phase, 60 Hz, power factor of unity.
- The installation requires a total of 52 100-watt fixtures.
- The desired circuit distributing power to the light fixtures is 120/240 volt, three wire, single-phase. The supply voltage is 460 volt, 3 phase.

To compute the kVA required:

$$\frac{\text{1.3 Amps x 120V}}{1000} = \text{0.156 kVA for each lighting fixture}$$

Always use amps x volts to compute VA; never use lamp wattage. 0.156 kVA/fixture x 52 fixtures = 8.11 kVA. The two sizes (kVA nearest 8.11 kVA) are 7.5 kVA and 10 kVA. Use the 10 kVA. This will not overload the transformer and allows some capacity (1.89 kVA) for future loads. Since the supply is 460V (not 480V), use the 456V tap. This will produce approximately 120V on output. If the tap is not used, the output will be 115V compared to the desired 120V. Note the transformer selected is single-phase, but the supply is 480V, three-phase. Single-phase is obtained by using any two wires of the three-phase supply.

For the latest prices, please check AutomationDirect.com.

Dry-Type Encapsulated Single-Phase Distribution Transformers

HUBBELL® Acme Electric®

Acme Dry-Type Encapsulated Single-Phase Distribution Transformers Selection Guide

Part Number	Price	kVA Rating	Primary (Volts)	Secondary (Volts)	Impedance %Z	Total Heat Dissipation (W)	Mounting Type	Weight lb [kg]	Wiring Diagram	Drawing
T253007S	$118.00	0.25	240X480 50/60 Hz	120/240	11.84%	154.50	Wall	10 (4.5)	A	PDF
T253008S	$137.00	0.50			8.74%	249.49		15 (6.8)	A	PDF
T253009S	$183.00	0.75			6.93%	326.77		19 (8.6)	A	PDF
T253010S	$211.00	1.0	240X480 60Hz	120/240	7.04%	367.85	Wall	24 (10.9)	A	PDF
T253011S	$235.00	1.5			4.33%	419.71		30 (13.6)	A	PDF
T253012S	$291.00	2.0			4.00%	529.47		38 (17.2)	A	PDF
T2530134S	$468.00	3.0			3.74%	704.34		55 (24.9)	B	PDF
T2530144S	$658.00	5.0			2.61%	1023.12		75 (34.0)	B	PDF
T2535153S	$874.00	7.5			2.16%	665.31		115 (52.2)	C	PDF
T2535163S	$980.00	10			3.48%	1371.04		125 (56.7)	C	PDF
T2535173S	$1,183.00	15			3.29%	971.81		170 (77.1)	C	PDF
T2535183S	$1,657.00	25			1.31%	1263.63		250 (113.0)	C	PDF
T253108S	$181.00	0.50	600 50/60 Hz	120/240	8.62%	248.12	Wall	15 (6.8)	D	PDF
T253109S	$242.00	0.75			7.08%	330.86		19 (8.6)	D	PDF
T253110S	$252.00	1.0	600 60Hz	120/240	7.14%	371.98	Wall	24 (10.9)	D	PDF
T253111S	$343.00	1.5			5.15%	471.47		30 (13.6)	D	PDF
T253112S	$389.00	2.0			4.05%	533.57		38 (17.2)	D	PDF
T2531131S	$500.00	3.0			3.28%	659.44		55 (24.9)	E	PDF
T2531141S	$719.00	5.0			2.42%	1028.79		75 (34.0)	E	PDF
T2536151S	$1,011.00	7.5			4.10%	642.00		115 (52.2)	E	PDF
T2536161S	$1,212.00	10			2.71%	727.64		125 (56.7)	E	PDF
T2536171S	$1,610.00	15			3.35%	911.31		170 (77.1)	E	PDF
T279740S	$298.00	1.0	120/208/240/277 60Hz	120/240	5.22%	317.32	Wall	23 (10.4)	G	PDF
T279741S	$385.00	1.5			3.83%	246.41		30 (13.6)	G	PDF
T279742S	$466.00	2.0			3.24%	527.53		37 (16.8)	G	PDF
T279743S	$712.00	3.0			2.86%	613.24		55 (24.9)	G	PDF
T279744S	$888.00	5.0			2.27%	970.30		75 (34.0)	G	PDF
T279745S	$1,152.00	7.5			2.69%	483.00		105 (47.6)	H	PDF
T279746S	$1,340.00	10			1.78%	594.71		124 (56.2)	H	PDF

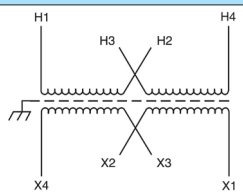
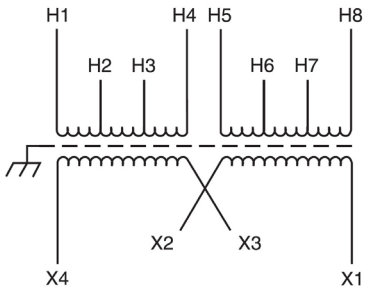
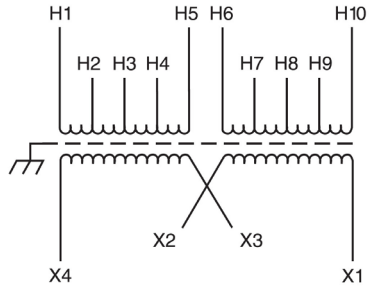
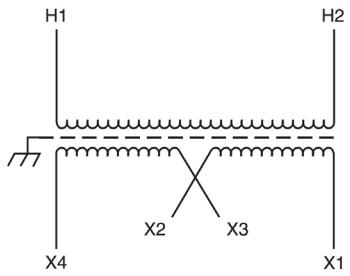
CE Marked Export Models Selection Guide

TF217437S	$360.00	1.0	190/200/208/220 x 380/400/416/440 50/60 Hz	120/240	8.08%	398.83	Wall	24 (10.9)	F	PDF
TF217439S	$477.00	2.0			4.67%	630.16		38 (17.2)	F	PDF
TF249873S	$749.00	3.0			3.49%	748.83		55 (24.9)	F	PDF
TF252520S	$948.00	5.0			2.95%	1159.36		75 (34.0)	F	PDF
TF252794S	$1,377.00	7.5			2.86%	695.40		115 (52.2)	F	PDF
TF252795S	$1,467.00	10			3.01%	827.48		125 (56.7)	F	PDF

Note: A wall mounting bracket is included with each transformer. The bracket ships loose and is located in the wiring compartment.

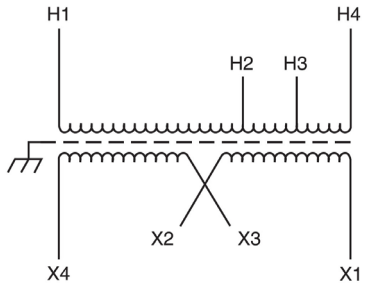
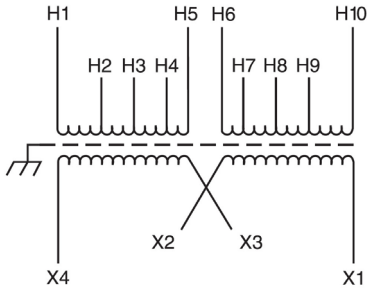
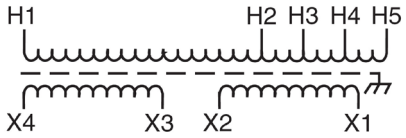
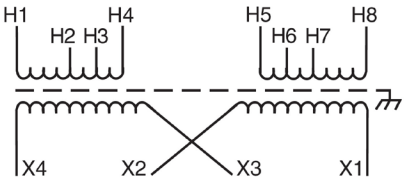
Dry-Type Encapsulated Single-Phase Distribution Transformers

Wiring Diagrams

WIRING DIAGRAM A ***Primary: 240x480*** ***Secondary:120/240*** ***Taps: None***	***Primary Volts***	***Connect Primary Lines To***	***Inter-connect***	***Connect Secondary Lines To***
	480	H1-H4	H2 to H3	–
	240	H1-H3 & H2-H4	–	–
	***Secondary Volts***	***Connect Lines To***	***Inter-connect***	
	240	–	X2 to X3	X1-X4
	120/240	–	X2 to X3	X1-X2-X4
	120	–	X1 to X3, X2 to X4	X1-X4
WIRING DIAGRAM B ***Primary: 240x480*** ***Secondary: 120/240*** ***Taps: 2, 2.5% ANFC, 2, 2.5% BNFC***	***Primary Volts***	***Connect Lines To***	***Inter-connect***	
	252	H1-H8	H1 to H5, H4 to H8	–
	240	H1-H7	H1 to H5, H3 to H7	–
	228	H1-H6	H1 to H5,H2 to H6	–
	504	H1-H8	H4 to H5	–
	492	H1-H8	H3 to H5	–
	480	H1-H7	H3 to H5	–
	468	H1-H7	H2 to H5	–
	456	H1-H6	H2 to H5	–
	Secondary Volts	***Connect Lines To***	***Inter-connect***	
	240	–	X2 to X3	X1-X4
	120/240	–	X2 to X3	X1-X2-X4
	120	–	X1 to X3, X2 to X4	X1-X4
WIRING DIAGRAM C ***Primary: 240x480*** ***Secondary: 120/240*** ***Taps: 2, 2.5% ANFC, 4, 2.5% BNFC***	***Primary Volts***	***Connect Lines To***	***Inter-connect***	
	216	H1-H10	H1 to H9, H10 to H2	–
	228	H1-H10	H1 to H8, H10 to H3	–
	240	H1-H10	H1 to H7, H10 to H4	–
	252	H1-H10	H1 to H6, H10 to H5	–
	432	H1-H10	H2 to H9	–
	444	H1-H10	H3 to H9	–
	456	H1-H10	H3 to H8	–
	468	H1-H10	H4 to H8	–
	480	H1-H10	H4 to H7	–
	492	H1-H10	H5 to H7	–
	504	H1-H10	H5 to H6	–
	Secondary Volts	***Connect Lines To***	***Inter-connect***	
	240	–	X2 to X3	X1-X4
	120/240	–	X2 to X3	X1-X3-X4
	120	–	X1 to X3, X2 to X4	X1-X4
WIRING DIAGRAM D ***Primary: 600*** ***Secondary: 120/240*** ***Taps: None***	***Primary Volts***	***Connect Lines To***	***Inter-connect***	
	600	H1-H2	–	–
	Secondary Volts	***Connect Lines To***	***Inter-connect***	
	240	–	X2 to X3	X1-X4
	120/240	–	X2 to X3	X1-X2-X4
	120	–	X1 to X3, X2 to X4	X1-X4

Dry-Type Encapsulated Single-Phase Distribution Transformers

Wiring Diagrams (continued)

WIRING DIAGRAM E ***Primary: 600*** ***Secondary:120/240*** ***Taps: 2, 5% BNFC***	***Primary Volts***	***Connect Primary Lines To***	***Inter-connect***	***Connect Secondary Lines To***
	600	H1-H4	–	–
	570	H1-H3	–	–
	540	H1-H2	–	–
	Secondary Volts	***Connect Lines To***	***Inter-connect***	
	240	–	X2 to X3	X1-X4
	120/240	–	X2 to X3	X1-X2-X4
	120	–	X1 to X3, X2 to X4	X1-X4
WIRING DIAGRAM F ***Primary: 190-220 x 380-440*** ***Secondary: 120/240***	***Primary Volts***	***Connect Lines To***	***Inter-connect***	
	190	H1 & H7	H1 to H6, H2 to H7	–
	200	H1 & H8	H1 to H6, H3 to H8	–
	208	H1 & H9	H1 to H6, H4 to H9	–
	220	H1 & H10	H1 to H6, H5 to H10	–
	380	H1 & H7	H2 & H6	–
	400	H1 & H8	H3 & H6	–
	416	H1 & H9	H4 & H6	–
	440	H1 & H10	H5 & H6	–
	Secondary Volts	***Connect Lines To***	***Inter-connect***	
	240	–	X2 to X3	X1-X4
	120/240	–	X2 to X3	X1-X2-X4
	120	–	X1 to X3, X2 to X4	X1-X4
WIRING DIAGRAM G ***Primary: 120/208/240/277*** ***Secondary: 120/240***	***Primary Volts***	***Connect Lines To***	***Inter-connect***	
	277	H1, H5	–	–
	240	H1, H4	–	–
	208	H1, H3	–	–
	120	H1, H2	–	–
	Secondary Volts	***Connect Lines To***	***Inter-connect***	
	120		X1 to X3, X2 to X4	X1-X4
	120/240		X2 to X3	X1-X2-X4
	240		X2 to X3	X1-X4
WIRING DIAGRAM H ***Primary: 120/208/240/277*** ***Secondary: 120/240***	***Primary Volts***	***Connect Lines To***	***Inter-connect***	
	120	H1 & H8	H1 to H6, H3 to H8	–
	208	H1 & H8	H2 to H7	–
	240	H1 & H8	H3 to H6	–
	277	H1 & H8	H4 to H5	–
	Secondary Volts	***Connect Lines To***	***Inter-connect***	
	240	–	X2 to X3	X1 & X4
	120/240	–	X2 to X3	X1, X3, X4
	120	–	X1 to X3, X2 to X4	X1 & X4

Buck-Boost Single-Phase Transformers

Encapsulated models from 0.05 to 10.0 kVA

Electrical/electronic equipment operates on standard supply voltage. Proper voltage is critical for a variety of applications, including AC motor loads, resistive heating loads, incandescent lighting or low voltage lighting. But when the supply voltage is constantly 5-20% too low ("brownout" conditions) or too high, equipment fails to operate at maximum efficiency. This can cause potentially serious problems.

Acme Electric Buck-boost transformers (autotransformers) provide a simple and economical means of correcting off-standard voltages. They offer tremendous capabilities and flexibility in kVA sizes and input/output voltage combinations. You essentially get 75 different transformers in one convenient package.

Any time a line voltage change in the 5-20% range is required, a buck-boost transformer should be considered as your first line of defense.

Where are buck-boost transformers used?

A typical buck-boost application is 120V in, 12V out for low voltage lighting or control circuitry. In most applications, this low voltage transformer is field connected as an autotransformer. Buck-boost transformers provide tremendous capabilities and flexibility in kVA sizes and input/output voltage combinations. Basically, you get 75 different transformers, all in one convenient package.

Other buck-boost applications include the following:

- Where low supply voltage exists because equipment is installed at the end of a bus system
- Where the supply system is operating at or over its design capacity
- Where overall consumer demands may be so high that the utility cuts back the supply voltage to the consumer, causing a "brownout."

Why use buck-boost instead of another type transformer ?

Take a look at this chart to see the advantages and disadvantages of using a buck-boost transformer (autotransformer) compared to a standard isolation transformer of the proper size and voltage combination.

Advantages and Disadvantages of Buck-Boost Transformers

Advantages	*Disadvantages*
• More efficient • Smaller and lighter • 5 to 10 times increase in kVA • Versatile and suitable for many applications • Lower cost compared to other approaches	• No circuit isolation • Cannot create a neutral • Application voltages and kVA don't match the nameplate voltages and kVA

Proper voltage is critical

With nearly two-thirds of all electrical loads being AC motor loads, maintenance of the proper voltage to that motor is very important. If the supply line voltage is not maintained, motor winding current is increased causing reduced motor torque and rising motor temperature, all of which results in the rapid loss of insulation life expectancy.

In addition to motor loads, the detrimental effects of low voltage on both resistive heating loads and incandescent lighting output are also illustrated in the chart.

When you have a lower than standard voltage, equipment damage and failure can result. Buck-boost transformers are an economical way to correct this potentially very serious problem.

T181050

T181058

T181065

Features

- UL and cUL listed and UL-3R enclosures meet or exceed all listing criteria including NEMA, ANSI and OSHA standards.
- Reduce (buck) or raise (boost) line voltage from 5 - 20%.
- Offer great flexibility – can be used in single-phase and three-phase configurations.
- All copper lead wire terminations.
- Long life, 80°C rise up to 0.15 kVA, and 115°C rise above 0.25 kVA.

Agency Approvals

cULus. (UL file no. E79947) Standard UL 506, listed in UL file as Style SR and ER for Units 150VA and below.

CE. Rohs Directive 2011/65/EU and 2015/863/EU)

Buck-Boost Single-Phase Transformers

Selecting a Buck-Boost Transformer

You should have the following information before selecting a buck-boost transformer.

Line Voltage
The voltage that you want to buck (decrease) or boost (increase). This voltage can be determined by measuring the supply line voltage with a voltmeter.

Load Voltage
The voltage at which your equipment is designed to operate. This is listed on the nameplate of the load equipment.

Load kVA or Load Amps
You do not need to know both – one or the other is sufficient for selection purposes. This information usually can be found on the nameplate of the equipment that you want to operate.

Frequency
The supply line frequency must be the same as the frequency of the equipment to be operated – either 50 or 60 Hz.

Phase
The supply line should be the same as the equipment to be operated – either single- or three-phase.

Using the Selection Charts – A Four-Step Process

Here's how to use the transformer selection charts on the following pages:

1. A series of LINE VOLTAGE and LOAD VOLTAGE combinations are listed across the top of each selection chart. Select a LINE VOLTAGE and LOAD VOLTAGE combination from ANY of the charts that comes closest to matching the LINE VOLTAGE and LOAD VOLTAGE of your application.
2. Read down the column you have selected until you reach either the LOAD kVA or LOAD AMPS of the equipment you want to operate. You probably will not find the exact value of LOAD kVA or LOAD AMPS, so go to the next higher rating.
3. From this point, read across the column to the far left-hand side, and you have found the catalog number of the exact buck-boost transformer you need. Refer to the PDF links for dimensional drawings.
4. CONNECT the transformer according to the connection diagram specified at the bottom of the column where you selected your LINE VOLTAGE and LOAD VOLTAGE combination. This same connection information is packed with each buck-boost transformer.
5. Note: Three-phase applications require multiple separate single-phase buck boost transformers to be wired and mounted together. See single-phase transformer quantities required at the bottom of the three-phase application selection charts.

Full Load Current in Amps Single-Phase Circuits

kVA	120V	208V	240V	277V	380V	440V	480V	600V
0.05	0.4	0.2	0.2	0.2	0.1	0.1	0.1	0.1
0.1	0.8	0.5	0.4	0.3	0.2	0.2	0.2	0.2
0.15	1.2	0.7	0.6	0.5	0.4	0.3	0.3	0.3
0.25	2	1.2	1	0.9	0.6	0.5	0.5	0.4
0.5	4.2	2.4	2.1	1.8	1.3	1.1	1	0.8
0.75	6.3	3.6	3.1	2.7	2	1.7	1.6	1.3
1	8.3	4.8	4.2	3.6	2.6	2.3	2.1	1.7
1.5	12.5	7.2	6.2	5.4	3.9	3.4	3.1	2.5
2	16.7	9.6	8.3	7.2	5.2	4.5	4.2	3.3
3	25	14.4	12.5	10.8	7.9	6.8	6.2	5
5	41	24	20.8	18	13.1	11.3	10.4	8.3
7.5	62	36	31	27	19.7	17	15.6	12.5
10	83	48	41	36	26	22.7	20.8	16.7
15	125	72	62	54	39	34	31	25
25	208	120	104	90	65	57	52	41
37.5	312	180	156	135	98	85	78	62
50	416	240	208	180	131	114	104	83
75	625	360	312	270	197	170	156	125
100	833	480	416	361	263	227	208	166
167	1391	802	695	602	439	379	347	278
250	2083	1203	1041	902	657	568	520	416

Full Load Amps Single-Phase AC Motors[1]

Horsepower	115V	208V	230V	Minimum Transformer KVA
1/6	4.4	2.4	2.2	0.53
1/4	5.8	3.2	2.9	0.7
1/3	7.2	4	3.6	0.87
1/2	9.8	5.4	4.9	1.18
3/4	13.8	7.6	6.9	1.66
1	16	8.8	8	1.92
1.5	20	11	10	2.4
2	24	13.2	12	2.88
3	34	18.7	17	4.1
5	56	30.8	28	6.72
7.5	80	44	40	9.6
10	100	55	50	12

1. When motor service factor is greater than 1, increase full load amps proportionally.

Example: If service factor is 1.15, increase above amp values by 15%.

$$\text{1 Phase kVA} = \frac{\text{Volts x Amps}}{1000}$$

Note: If motors are started more than once per hour, increase minimum transformer kVA by 20%.

Buck-Boost Single-Phase Transformers

Selection Chart

Single-Phase Application	Boosting								Bucking					
Line Voltage (Available)	95	100	105	110	189	208	215	220	125	132	230	245	250	252
Load Voltage (Output)	114	120	115	120	208	230	237	242	113	120	208	222	227	240

Buck-Boost Transformer Selection Chart

Part Number																	Drawing
T181050	Load	kVA	1.19	1.25	2.4	2.5	2.16	2.39	2.46	2.52	2.6	2.75	2.37	2.5	2.6	5.1	PDF
		Amps	10.42	10.4	20.8	20.8	10.4	10.4	10.4	10.4	22.8	22.8	11.4	11.4	11.4	21.8	
		Maximum Size of Fuse or Breaker	25	25	40	30	15	15	15	15	30	30	15	15	15	30	
T181051	Load	kVA	2.37	2.5	4.8	5	4.33	4.79	4.93	5.04	5.2	5.4	4.47	5	5.2	10.2	PDF
		Amps	20.83	20.83	41.67	41.67	20.83	20.83	20.83	20.83	46.8	46.8	22.8	22.8	22.8	43.7	
		Maximum Size of Fuse or Breaker	35	35	60	60	30	30	30	30	60	60	30	30	30	60	
T181052	Load	kVA	3.56	3.75	7.17	7.56	6.5	7.19	7.41	7.56	7.8	8.15	7.1	7.5	7.8	15.3	PDF
		Amps	31.25	31.25	62.5	62.5	31.25	31.25	31.25	31.25	68.5	69.5	34.4	34.4	34.4	65.5	
		Maximum Size of Fuse or Breaker	50	50	90	90	45	45	45	45	80	80	40	40	40	80	
T111683	Load	kVA	4.75	5	9.58	10	8.66	9.58	9.87	10	10.4	10.8	9.5	10	10	20.4	PDF
		Amps	41.67	41.67	83.31	83.31	41.67	41.67	41.67	41.67	91.5	91.5	45.8	45.8	45.8	87.5	
		Maximum Size of Fuse or Breaker	70	70	125	125	60	60	60	60	110	110	60	60	50	110	
T111684	Load	kVA	7.12	7.5	14.4	15.1	13	14.3	14.8	15.1	15	16.2	14.24	15	15.6	30.6	PDF
		Amps	62.5	62.5	125	125	62.5	62.5	62.5	62.5	138	138	68.6	68.6	68.6	132	
		Maximum Size of Fuse or Breaker	100	100	175	175	90	90	90	90	150	175	80	80	80	175	
T111685	Load	kVA	9.5	10	19.2	20.2	17.3	19.16	19.7	20.1	20.8	21.6	19	20	20.3	40.8	PDF
		Amps	83.3	83.3	166.6	166.6	83.3	83.3	83.3	83.3	183	183	91.6	91.6	91.2	175	
		Maximum Size of Fuse or Breaker	125	125	250	250	125	125	125	125	225	225	110	110	110	225	
T111686	Load	kVA	14.2	15	28.8	30	26	28.7	29.6	30.3	31.2	32.5	28.5	30	31.2	61	PDF
		Amps	125	125	250	250	125	125	125	125	275	275	136.8	136.8	136.8	263	
		Maximum Size of Fuse or Breaker	200	200	350	350	175	175	175	175	350	350	175	175	175	350	
T111687	Load	kVA	23.7	25	47.9	50	43.3	47.8	49.3	50.3	52	54	47.4	50	52	102	PDF
		Amps	208	208	416.6	416.6	208	208	208	208	457	457	228	228	228	437	
		Maximum Size of Fuse or Breaker	350	350	600	600	300	300	300	300	600	600	300	300	300	600	
CONNECTION DIAGRAM			D	D	C	C	H	H	H	H	F	F	I	I	I	E	

NOTES: (1) Inputs and Outputs may be reversed; kVA capacity remains constant. All applications above the bold line are suitable for 50/60 Hz. All applications below the bold line are suitable for 60Hz only. With larger kVA buck-boost units, it is necessary to utilize multiple conductors on the secondary (X) terminals.

Selection Chart continued on next page...

For the latest prices, please check AutomationDirect.com.

Buck-Boost Single-Phase Transformers

Selection Chart (continued)

Single-Phase Application	Boosting								Bucking					
Line Voltage (Available)	95	100	105	208	215	215	220	225	135	240	240	245	250	255
Load Voltage (Output)	120	114	119	240	244	230	235	240	119	208	225	230	234	239

Buck-Boost Transformer Selection Chart

Part Number																	Drawing
T181057	Load	kVA	0.94	1.78	1.86	1.88	1.91	3.59	3.67	3.75	2.11	1.84	3.75	3.83	3.9	3.98	PDF
		Amps	7.81	15.63	15.63	7.81	7.81	15.63	15.63	15.63	17.71	8.85	16.67	16.67	16.67	16.67	
		Maximum Size of Fuse or Breaker	15	25	25	15	15	25	25	25	20	15	20	20	20	20	
T181058	Load	kVA	1.88	3.56	3.72	3.75	3.81	7.19	7.34	7.5	4.21	3.68	7.5	7.67	7.8	7.97	PDF
		Amps	15.63	31.25	31.25	15.63	15.63	31.25	31.25	31.25	35.42	17.71	33.33	33.33	33.33	33.33	
		Maximum Size of Fuse or Breaker	25	45	45	25	25	45	45	45	40	20	40	40	40	40	
T181059	Load	kVA	2.81	5.34	5.58	5.63	5.72	10.78	11.02	11.25	6.32	5.53	11.25	11.5	11.7	11.95	PDF
		Amps	23.44	46.88	46.88	23.44	23.44	46.88	46.88	46.88	53.13	26.56	50	50	50	50	
		Maximum Size of Fuse or Breaker	40	70	70	40	40	70	70	70	60	30	60	60	60	60	
T113073	Load	kVA	3.75	7.13	7.44	7.5	7.63	14.38	14.69	15	8.43	7.37	15	15.33	15.6	15.93	PDF
		Amps	31.25	62.5	62.5	31.25	31.25	62.5	62.5	62.5	70.83	35.42	66.67	66.67	66.67	66.67	
		Maximum Size of Fuse or Breaker	50	90	90	50	50	90	90	90	80	40	80	80	80	80	
T113074	Load	kVA	5.63	10.69	11.16	11.25	11.44	21.56	22.03	22.5	12.64	11.05	22.5	23	23.4	23.9	PDF
		Amps	46.9	93.8	93.8	46.9	46.9	93.8	93.8	93.8	106.3	53.1	100	100	100	100	
		Maximum Size of Fuse or Breaker	80	150	150	70	70	125	125	125	125	60	125	125	125	125	
T113075	Load	kVA	7.5	14.25	14.88	15	15.25	28.75	29.38	30	16.86	14.73	30	30.67	31.2	31.87	PDF
		Amps	62.5	125	125	62.5	62.5	125	125	125	141.7	70.8	133.3	133.3	133.3	133.3	
		Maximum Size of Fuse or Breaker	100	200	200	90	90	175	175	175	175	80	175	175	175	175	
T113076	Load	kVA	11.25	21.38	22.31	22.5	22.88	43.13	44.06	45	25.29	22.1	45	46	46.8	47.8	PDF
		Amps	93.8	187.5	187.5	93.8	93.8	187.5	187.5	187.5	212.5	106.3	200	200	200	200	
		Maximum Size of Fuse or Breaker	150	300	300	150	150	250	250	250	250	125	250	250	250	250	
T113077	Load	kVA	18.75	35.63	37.19	37.5	38.13	71.88	73.44	75	42.15	36.83	75	76.67	78	79.67	PDF
		Amps	156.3	312.5	312.5	156.3	156.3	312.5	312.5	312.5	354.2	177.1	333.3	333.3	333.3	333.3	
		Maximum Size of Fuse or Breaker	250	450	450	225	225	450	450	450	400	200	400	400	400	400	
CONNECTION DIAGRAM			D	C	C	H	H	G	G	G	F	I	E	E	E	E	

NOTES: (1) Inputs and Outputs may be reversed; kVA capacity remains constant. All applications above the bold line are suitable for 50/60 Hz. All applications below the bold line are suitable for 60Hz only. With larger kVA buck-boost units, it is necessary to utilize multiple conductors on the secondary (X) terminals.

Selection Chart continued on next page...

Buck-Boost Single-Phase Transformers

Selection Chart (continued)

Single-Phase Application	Boosting										Bucking			
Line Voltage (Available)	230	380	416	425	430	435	440	440	450	460	277	480	480	504
Load Voltage (Output)	277	420	457	467	473	457	462	484	472	483	230	436	456	480

Buck-Boost Transformer Selection Chart

Part Number																Drawing
T181064	Load	kVA	1.44	2.19	2.38	2.43	2.46	4.76	4.81	2.52	4.92	5.03	1.44	2.5	5.23	5.5	PDF
		Amps	5.21	5.21	5.21	5.21	5.21	5.21	10.42	5.21	10.42	10.42	6.25	5.73	11.46	11.46	
		Maximum Size of Fuse or Breaker	15	10	10	10	10	15	15	10	15	15	10	10	15	15	
T181065	Load	kVA	2.89	4.38	4.76	4.86	4.93	9.52	9.62	5.04	9.83	10.06	2.88	5	10.45	11	PDF
		Amps	10.42	10.42	10.42	10.42	10.42	20.83	20.83	10.42	20.83	20.83	12.5	11.46	22.92	22.92	
		Maximum Size of Fuse or Breaker	20	15	15	15	15	30	30	15	30	30	15	15	30	30	
T181066	Load	kVA	4.33	6.56	7.14	7.3	7.39	14.28	14.44	7.56	14.75	15.09	4.31	7.49	15.68	16.5	PDF
		Amps	15.63	15.63	15.63	15.63	15.63	31.25	31.25	15.63	31.25	31.25	18.75	17.19	34.38	34.38	
		Maximum Size of Fuse or Breaker	25	25	25	25	25	45	45	25	45	45	20	20	45	45	
T137920	Load	kVA	5.77	8.57	9.52	9.73	9.85	19.04	19.25	10.08	19.67	20.13	5.75	9.99	20.9	22	PDF
		Amps	20.83	20.83	20.83	20.83	20.83	41.67	41.67	20.83	41.67	41.67	25	22.92	45.83	45.83	
		Maximum Size of Fuse or Breaker	35	30	30	30	30	60	60	30	60	60	30	30	60	60	
T137921	Load	kVA	8.66	13.13	14.28	14.59	14.78	28.56	28.88	15.13	29.5	30.19	8.63	14.99	31.35	33	PDF
		Amps	31.25	31.25	31.25	31.25	31.25	62.5	62.5	31.25	62.5	62.5	37.5	34.38	68.75	68.75	
		Maximum Size of Fuse or Breaker	50	50	45	45	45	90	90	45	90	90	40	40	90	90	
T137922	Load	kVA	11.54	17.5	19.04	19.46	19.71	38.08	38.5	20.17	39.33	40.25	11.5	19.98	41.8	44	PDF
		Amps	41.67	41.67	41.67	41.67	41.67	83.33	83.33	41.67	83.33	83.33	50	45.83	91.67	91.67	
		Maximum Size of Fuse or Breaker	70	60	60	60	60	110	110	60	110	110	60	60	110	110	
T137923	Load	kVA	17.31	26.25	28.56	29.19	29.56	57.13	57.75	30.25	59	60.38	17.25	29.98	62.7	66	PDF
		Amps	62.5	62.5	62.5	62.5	62.5	125	125	62.5	125	125	75	68.8	137.5	137.5	
		Maximum Size of Fuse or Breaker	100	90	90	90	90	175	175	90	175	175	80	80	175	175	
T137924	Load	kVA	28.9	43.8	47.6	48.6	49.3	95.2	96.2	50.4	98.3	100.6	28.8	50	104.5	110	PDF
		Amps	104.2	104.2	104.2	104.2	104.2	208.3	208.3	104.2	208.3	208.3	125	114.6	229.2	229.2	
		Maximum Size of Fuse or Breaker	175	150	150	150	150	300	300	150	300	300	150	150	300	300	
CONNECTION DIAGRAM			**D**	**H**	**H**	**H**	**H**	**G**	**G**	**H**	**G**	**G**	**J**	**I**	**E**	**E**	

NOTES: (1) Inputs and Outputs may be reversed; kVA capacity remains constant. All applications above the bold line are suitable for 50/60 Hz. All applications below the bold line are suitable for 60Hz only. With larger kVA buck-boost units, it is necessary to utilize multiple conductors on the secondary (X) terminals.

Selection Chart continued on next page...

Buck-Boost Three-Phase Transformers

Selection Chart (continued)

Three-Phase Application	Boosting							Bucking				
Line Voltage (Available)	189Y 109	196Y 113	201Y 116	208Y 120	189	208	220	219	230	250	255	264
Load Voltage (Output)	208	234	240	230	208	239	242	208	208	227	232	240

Buck-Boost Transformer Selection Chart

Part Number														Drawing
T181050	Load	kVA	7.51	4.22	4.33	8.3	3.75	4.15	4.37	7.9	4.15	4.51	4.6	4.76	PDF
		Amps	20.83	10.42	10.42	20.83	10.42	10.42	10.42	21.94	11.52	11.47	11.45	11.46	
		Maximum Size of Fuse or Breaker	30	20	20	30	15	15	15	30	15	15	15	15	
T181051	Load	kVA	15.01	8.44	8.66	16.6	7.51	8.3	8.73	15.8	8.3	9.02	9.2	9.53	PDF
		Amps	41.67	20.83	20.83	41.67	20.83	20.83	20.83	43.87	23.04	22.94	22.9	22.92	
		Maximum Size of Fuse or Breaker	60	35	35	60	30	30	30	60	30	30	30	30	
T181052	Load	kVA	22.52	12.67	12.99	24.9	11.26	12.45	13.1	23.71	12.45	13.53	13.8	14.29	PDF
		Amps	62.5	31.25	31.25	62.5	31.25	31.25	31.25	65.81	34.56	34.42	34.35	34.38	
		Maximum Size of Fuse or Breaker	90	50	50	90	45	45	45	80	40	40	40	40	
T111683	Load	kVA	30.02	16.89	17.32	33.2	15.01	16.6	17.46	31.61	16.6	18.04	18.4	19.05	PDF
		Amps	83.33	41.67	41.67	83.33	41.67	41.67	41.67	87.74	46.07	45.89	45.8	45.83	
		Maximum Size of Fuse or Breaker	125	70	70	125	60	60	60	110	60	60	60	60	
T111684	Load	kVA	45.03	25.33	25.98	49.8	22.52	24.9	26.2	47.41	24.9	27.06	27.6	28.58	PDF
		Amps	125	62.5	62.5	125	62.5	62.5	62.5	131.61	69.11	68.83	68.7	68.75	
		Maximum Size of Fuse or Breaker	175	100	100	175	90	90	90	175	80	80	80	80	
T111685	Load	kVA	60.04	33.77	34.64	66.4	30.02	33.2	34.93	63.22	33.2	36.08	36.81	38.11	PDF
		Amps	166.67	83.33	83.33	167.67	83.33	83.33	83.33	175.48	92.15	91.78	91.59	91.67	
		Maximum Size of Fuse or Breaker	250	125	125	250	125	125	125	225	110	110	110	110	
T111686	Load	kVA	90.07	50.66	51.96	99.59	45.03	49.8	52.39	94.83	49.8	54.13	55.21	57.16	PDF
		Amps	250	125	125	250	125	125	125	263.22	138.22	137.67	137.39	137.5	
		Maximum Size of Fuse or Breaker	350	200	200	350	175	175	175	350	175	175	175	175	
T111687	Load	kVA	150.11	84.44	86.6	165.99	75.06	82.99	87.32	158.05	82.99	90.21	92.02	95.26	PDF
		Amps	416.67	208.33	208.33	416.67	208.33	208.33	208.33	438.7	230.37	229.44	228.99	229.17	
		Maximum Size of Fuse or Breaker	600	350	350	600	300	300	300	600	300	300	300	300	
QUANTITY REQUIRED			**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	
CONNECTION DIAGRAM			**AA**	**FF**	**FF**	**AA**	**BB**	**BB**	**BB**	**CC**	**EE**	**EE**	**EE**	**EE**	

NOTES: (1) Inputs and Outputs may be reversed; kVA capacity remains constant. All applications above the bold line are suitable for 50/60 Hz. All applications below the bold line are suitable for 60Hz only. (2) Connection Diagrams AA and FF cannot be reverse connected.

Selection Chart continued on next page...

Buck-Boost Three-Phase Transformers

Selection Chart (continued)

Three-Phase Application	Boosting					Bucking					
Line Voltage (Available)	183Y 106	208Y 120	195	208	225	240	245	250	256	265	272
Load Voltage (Output)	208	236	208	240	240	208	230	234	240	234	240

Buck-Boost Transformer Selection Chart

Part Number														Drawing
T181057	Load	kVA	5.63	6.39	5.63	3.17	6.5	2.81	6.63	6.77	6.93	3.59	3.68	PDF
		Amps	15.63	15.63	15.63	7.81	15.63	7.81	16.64	16.69	16.67	8.85	8.85	
		Maximum Size of Fuse or Breaker	25	25	25	15	25	15	20	20	20	15	15	
T181058	Load	kVA	11.26	12.77	11.26	6.33	12.99	5.63	13.26	13.53	13.86	7.17	7.36	PDF
		Amps	31.25	31.25	31.25	15.63	31.25	15.63	33.29	33.39	33.33	17.69	17.71	
		Maximum Size of Fuse or Breaker	45	45	45	25	45	20	40	40	40	20	20	
T181059	Load	kVA	16.89	19.16	16.89	9.5	19.49	8.44	19.89	20.3	20.78	10.76	11.04	PDF
		Amps	46.88	46.88	46.88	23.44	46.88	23.44	49.93	50.08	50	26.54	26.56	
		Maximum Size of Fuse or Breaker	70	70	70	35	70	30	60	60	60	30	30	
T113073	Load	kVA	22.52	25.55	22.52	12.67	25.98	11.26	26.52	27.06	27.71	14.34	14.72	PDF
		Amps	62.5	62.5	62.5	31.25	62.5	31.25	66.58	66.67	66.67	35.39	35.42	
		Maximum Size of Fuse or Breaker	90	90	90	45	90	35	80	80	80	40	40	
T113074	Load	kVA	33.77	38.32	33.77	19	38.97	16.89	39.87	40.59	41.57	21.52	22.08	PDF
		Amps	93.75	93.75	93.75	46.88	93.75	46.88	99.86	100.16	100	53.08	53.13	
		Maximum Size of Fuse or Breaker	150	150	125	70	125	60	125	125	125	60	60	
T113075	Load	Load	45.03	51.1	45.03	25.33	51.96	22.52	53.04	54.13	55.43	28.69	29.44	PDF
			125	125	125	62.5	125	62.5	133.15	133.55	133.33	70.78	70.83	
		Maximum Size of Fuse or Breaker	200	200	175	90	175	70	175	175	175	80	80	
T113076	Load	kVA	67.55	76.64	67.55	38	77.94	33.77	79.57	81.19	83.14	43.03	44.17	PDF
		Amps	187.5	187.5	187.5	93.75	187.5	93.75	199.73	200.32	200	106.17	106.25	
		Maximum Size of Fuse or Breaker	300	300	250	150	250	110	250	250	250	125	125	
T113077	Load	kVA	112.58	127.74	112.58	63.33	129.9	56.29	132.61	135.32	138.56	71.72	73.5	PDF
		Amps	312.5	312.5	312.5	156.25	312.5	156.25	332.88	333.87	333.33	176.95	176.8	
		Maximum Size of Fuse or Breaker	450	450	450	225	450	175	400	400	400	200	200	
QUANTITY REQUIRED			**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	
CONNECTION DIAGRAM			**AA**	**AA**	**GG**	**BB**	**GG**	**DD**	**CC**	**CC**	**CC**	**EE**	**EE**	

NOTES: (1) Inputs and Outputs may be reversed; kVA capacity remains constant. All applications above the bold line are suitable for 50/60 Hz. All applications below the bold line are suitable for 60Hz only. (2) Connection Diagrams AA and FF cannot be reverse connected.

Selection Chart continued on next page...

For the latest prices, please check AutomationDirect.com.

Buck-Boost Three-Phase Transformers

Selection Chart (continued)

Three-Phase Application	Boosting								Bucking							
Line Voltage (Available)	399Y 230	380	430	440	460	460	480	480	440	440	460	460	480	480	500	500
Load Voltage (Output)	480Y 277	420	473	462	506	483	528	504	400	419	438	418	457	436	455	477

Buck-Boost Transformer Selection Chart

Part Number																		Drawing
T181064	Load	kVA	4.33	3.78	4.26	8.32	4.56	8.7	4.76	9.08	3.96	7.92	8.28	4.14	8.64	4.32	4.51	9.02	PDF
		Amps	5.2	5.2	5.2	10.4	5.2	10.4	5.2	10.4	5.72	10.92	10.92	5.72	10.92	5.72	5.72	10.92	
		Maximum Size of Fuse or Breaker	15	10	10	15	10	15	10	15	10	15	15	10	15	10	10	15	
T181065	Load	kVA	8.6	7.56	8.52	16.64	9.11	17.4	9.51	18.16	7.93	15.85	16.57	8.28	17.29	8.64	9.02	18.04	PDF
		Amps	10.4	10.4	10.4	20.8	10.4	20.8	10.4	20.8	11.44	21.84	21.84	11.44	21.84	11.44	11.44	21.84	
		Maximum Size of Fuse or Breaker	20	15	15	30	15	30	15	30	15	30	30	15	30	15	15	30	
T181066	Load	kVA	12.9	11.34	12.77	24.97	13.67	26.1	14.27	27.24	11.89	23.77	24.85	12.42	25.93	12.96	13.52	27.07	PDF
		Amps	15.6	15.6	15.6	31.2	15.6	31.2	15.6	31.2	17.16	32.76	32.76	17.16	32.76	17.16	17.16	32.76	
		Maximum Size of Fuse or Breaker	25	25	25	45	25	45	25	45	20	40	40	20	40	20	20	40	
T137920	Load	kVA	17.3	15.12	17.03	33.29	18.23	34.8	19.02	36.31	15.85	31.7	33.14	16.57	34.57	17.28	18.03	36.09	PDF
		Amps	20.8	20.8	20.8	41.6	20.8	41.6	20.8	41.6	22.88	43.68	43.68	22.88	43.68	22.88	22.88	43.68	
		Maximum Size of Fuse or Breaker	35	30	30	60	30	60	30	60	30	60	60	30	60	30	30	60	
T137921	Load	kVA	25.9	22.69	25.55	49.93	27.34	52.2	28.53	54.47	23.78	47.55	49.71	24.85	51.86	25.92	27.05	54.13	PDF
		Amps	31.2	31.2	31.2	62.4	31.2	62.4	31.2	62.4	34.32	65.52	65.52	34.32	65.52	34.32	34.32	65.52	
		Maximum Size of Fuse or Breaker	50	45	45	90	45	90	45	90	40	80	80	40	80	40	40	80	
T137922	Load	kVA	34.6	30.25	34.07	66.58	36.46	69.6	38.04	72.63	31.7	63.4	66.27	33.13	69.15	34.56	36.06	72.18	PDF
		Amps	41.6	41.6	41.6	83.2	41.6	83.2	41.6	83.2	45.76	87.36	87.36	45.76	87.36	45.76	45.76	87.36	
		Maximum Size of Fuse or Breaker	70	60	60	110	60	110	60	110	60	110	110	60	110	60	60	110	
T137923	Load	kVA	52	45.45	51.18	100.03	54.69	104.57	57.07	109.12	47.63	95.25	99.57	49.77	103.89	51.92	54.18	108.44	PDF
		Amps	62.5	62.5	62.5	125	62.5	125	62.5	125	68.75	131.25	131.25	68.75	131.25	68.75	68.75	131.25	
		Maximum Size of Fuse or Breaker	100	90	90	175	90	175	90	175	80	175	175	80	175	80	80	175	
T137924	Load	kVA	86.1	75.62	85.17	166.44	91.15	174.01	95.11	181.57	79.26	158.5	165.69	82.83	172.87	86.39	90.16	180.44	PDF
		Amps	104	104	104	208	104	208	104	208	114.4	218.4	218.4	114.4	218.4	114.4	114.4	218.4	
		Maximum Size of Fuse or Breaker	175	150	150	300	150	300	150	300	150	300	300	150	300	150	150	300	
QUANTITY REQUIRED			**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	
CONNECTION DIAGRAM			**FF**	**BB**	**BB**	**GG**	**BB**	**GG**	**BB**	**GG**	**EE**	**CC**	**CC**	**EE**	**CC**	**EE**	**EE**	**CC**	

NOTES: (1) Inputs and Outputs may be reversed; kVA capacity remains constant. All applications above the bold line are suitable for 50/60 Hz. All applications below the bold line are suitable for 60Hz only. (2) Connection Diagrams AA and FF cannot be reverse connected.

Buck-Boost Single-Phase Transformers 120x240 Primary

HUBBELL® Acme Electric®

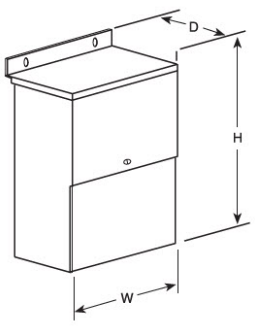
Single-Phase Buck-Boost Transformers Specifications[1] 120x240 Primary Volts – 12/24 Secondary Volts – 60Hz							
Part Number	Price	Insulating Transformer Rating (kVA)	Secondary Maximum Current Output (A)		Weight (lb [kg])	Case Design	Dimensional Drawing
			12V	24V			
T181050	$136.00	0.25	20.8	10.4	10 [4.5]	B	PDF
T181051	$174.00	0.5	41.6	20.8	15 [6.8]	B	PDF
T181052	$225.00	0.75	62.5	31.25	19 [8.6]	B	PDF
T111683	$256.00	1	83.2	41.6	24 [10.9]	B	PDF
T111684	$325.00	1.5	125	62.5	30 [13.6]	B	PDF
T111685	$420.00	2	166	83.2	38 [17.2]	B	PDF
T111686	$596.00	3	250	125	55 [24.9]	C	PDF
T111687	$912.00	5	416.6	208	75 [34]	C	PDF

1. All units have ground studs for use with non-metallic conduit. All sizes of 0.75 kVA and less are suitable for 50/60 Hz. Additional field wiring boxes may be required when using units as autotransformers. See Dimensional Drawings link for product drawings and dimensions.

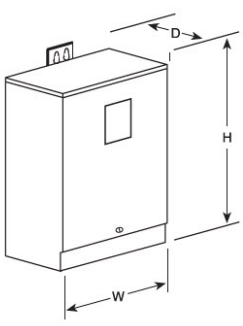
Single-Phase Buck-Boost Transformers Specifications[1] 120x240 Primary Volts – 16/32 Secondary Volts – 60Hz							
Part Number	Price	Insulating Transformer Rating (kVA)	Secondary Maximum Current Output (A)		Weight (lb [kg])	Case Design	Dimensional Drawing
			16V	32V			
T181057	$167.00	0.25	15.6	7.8	10 [4.5]	B	PDF
T181058	$186.00	0.5	31.2	15.6	15 [6.8]	B	PDF
T181059	$240.00	0.75	46.9	23.4	19 [8.6]	B	PDF
T113073	$288.00	1	62.5	31.2	24 [10.9]	B	PDF
T113074	$349.00	1.5	93.7	46.9	30 [13.6]	B	PDF
T113075	$427.00	2	125	62.5	38 [17.2]	B	PDF
T113076	$657.00	3	187.5	93.8	55 [24.9]	C	PDF
T113077	$1,111.00	5	312	156	75 [34]	C	PDF

1. All units have ground studs for use with non-metallic conduit. All sizes of 0.75 kVA and less are suitable for 50/60 Hz. Additional field wiring boxes may be required when using units as autotransformers. See Dimensional Drawings link for product drawings and dimensions.

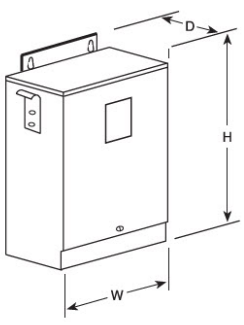
Buck-Boost Transformers Case Design



Design A



Design B

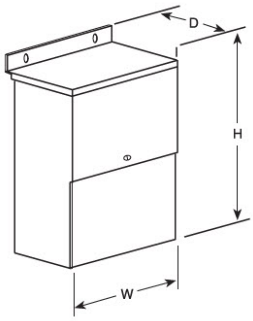


Design C

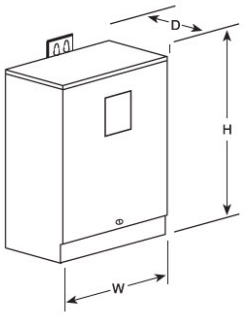
Buck-Boost Single-Phase Transformers 240x480 Primary

Single-Phase Buck-Boost Transformers Specifications 240X480 Primary Volts – 24/48 Secondary Volts – 60Hz							
Part Number	*Price*	*Insulating Transformer Rating (kVA)*	*Secondary Maximum Current Output (A)*		*Weight (lb [kg])*	*Case Design*	*Dimensional Drawing*
			24V	*48V*			
T181064	$164.00	0.25	10.4	5.2	10 [4.5]	B	PDF
T181065	$203.00	0.5	20.8	10.4	15 [6.8]	B	PDF
T181066	$263.00	0.75	31.2	15.6	19 [8.6]	B	PDF
T137920	$282.00	1	41.6	20.8	24 [10.9]	B	PDF
T137921	$353.00	1.5	62.4	31.2	30 [13.6]	B	PDF
T137922	$438.00	2	83.2	41.6	38 [17.2]	B	PDF
T137923	$648.00	3	125	62.5	55 [24.9]	C	PDF
T137924	$1,015.00	5	208	104	75 [34]	C	PDF

Buck-Boost Transformers Case Design



Design A



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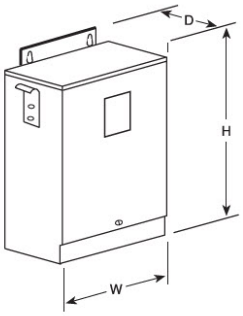


Design C

Buck-Boost Single-Phase Transformers

Wiring Diagrams

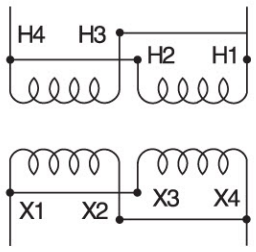
Units Rated 120x240 V Input, 12/24 V Output		
Input	*Output*	*Connection Diagram*
120	12	K
120	24	L
240	12	M
240	24	N

Units Rated 120x240 V Input, 16/32 V Output		
Input	*Output*	*Connection Diagram*
120	16	K
120	32	L
240	16	M
240	32	N

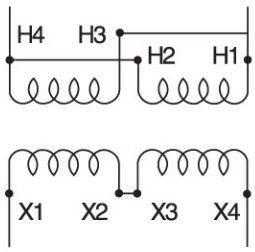
Units Rated 240x480 V Input, 24/48 V Output		
Input	*Output*	*Connection Diagram*
240	24	K
240	48	L
480	24	M
480	48	N

Low Voltage Lighting Wiring Diagrams

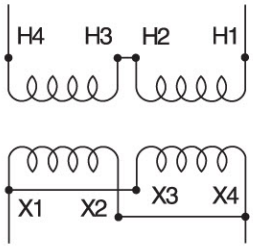
K



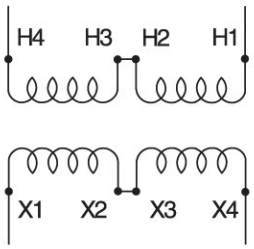
L



M



N



Buck-Boost Single-Phase Transformers

Wiring Diagrams –Single-Phase

Note: The symbol O used in these connection diagrams indicates where to field-install the over-current protective device, typically a fuse or circuit breaker.

Figure C

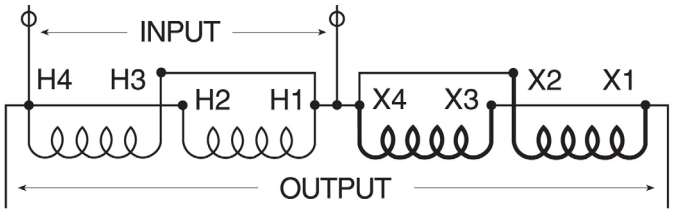


Figure D

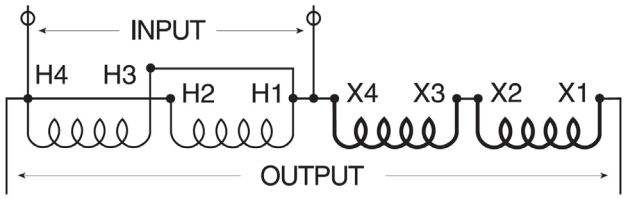


Figure E

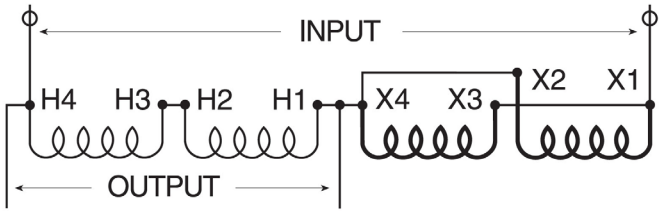


Figure F

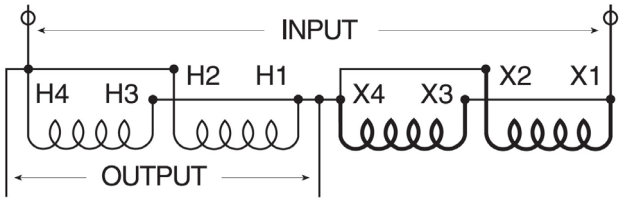


Figure G

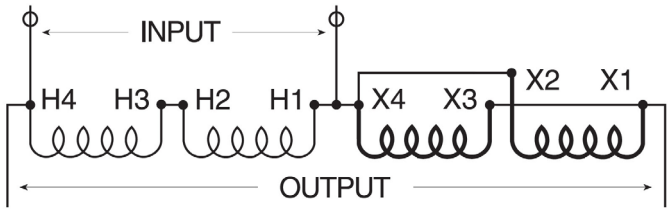


Figure H

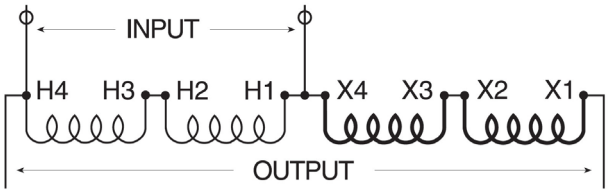


Figure I

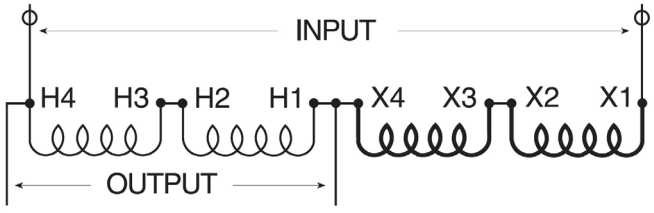
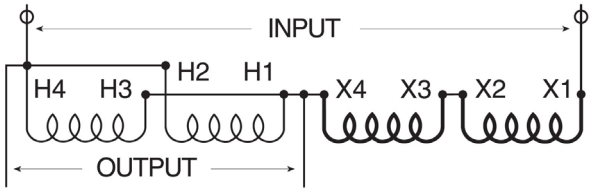


Figure J



Buck-Boost Single-Phase Transformers

Wiring Diagrams – Buck-Boost – Single-Phase for Three-Phase Applications

Note 1: The symbol O used in these connection diagrams indicates where to field-install the over-current protective device, typically a fuse or circuit breaker.

Note 2: Cannot be reverse connected.

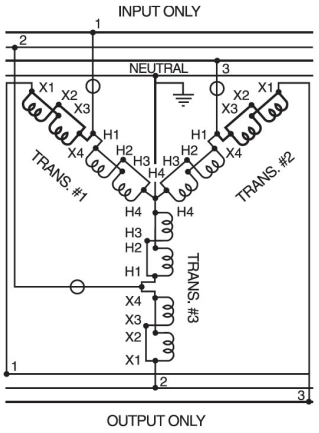


FIG. AA Note 2 **WYE**

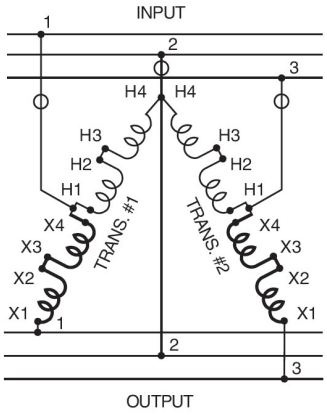


FIG. BB **OPEN DELTA**

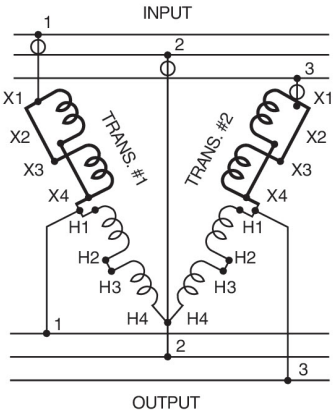


FIG. CC **OPEN DELTA**

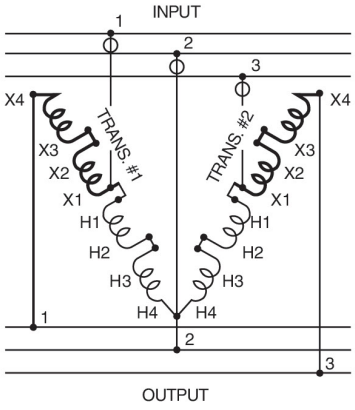


FIG. DD **OPEN DELTA**

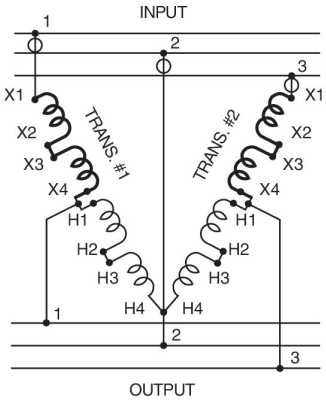


FIG. EE **OPEN DELTA**

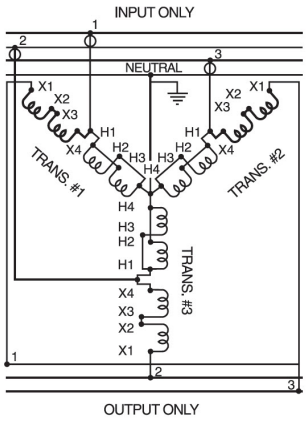


FIG. FF Note 2 **WYE**

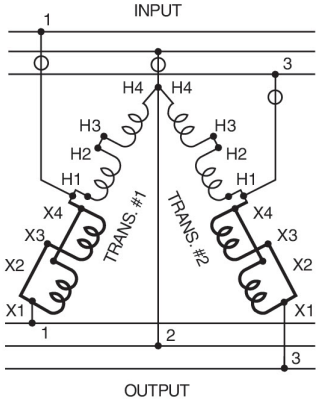


FIG. GG **OPEN DELTA**

IMPORTANT: Refer to the N.E.C. (National Electrical Code) Article 450-4 for overcurrent protection of an autotransformer. These connection diagrams are packed with each buck-boost transformer. Do not use connections other than those shown above.

STXR Series Surge Protective Devices

Expertise, our source of energy

The most popular range in the STX series offering, the Surge-Trap® Type 1 STXR meets requirements for UL1449 Fourth Edition and is ideal for the replacement of obsolete surge arrestors. The STXR Series SPD feature TPMOV® technology inside making them some of the safest products available. With a small, compact design and line or load installation flexibility the STXR series is the perfect fit for branch panel and/or individual equipment protection. Protect your sensitive equipment from costly downtime or damage with these high performance surge protective devices.

Features

- Designed with the industry leading Mersen TPMOV ® Technology
- LED status indicator (ON = Good, OFF = Replace)
- NEMA 4X enclosure for outdoor or indoor use
- Fits 3/4" knockouts with 3' leads for easy installation
- Optional mounting bracket for surface mount applications
- For use in ANSI/UL Type 1 or 2 SPD installations
- Up to 7 modes of Protection (L-N, L-L, L-G optional, N-G optional)
- 5-year warranty

Ratings

- Volts (U_n): 120-600VAC
- Nominal Discharge Current Rating (I_n): 10 - 20 kA
- Surge Capacity: 50kA
- Short-Circuit Current Rating (SCCR): 200kA

Applications

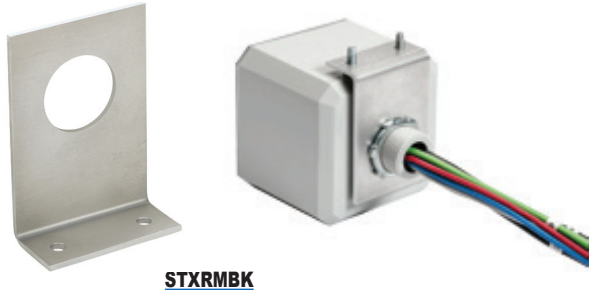
- AC Distribution
- Power supplies
- Drive protection
- Fire alarms
- Control panels
- Telecommunications
- Residential
- IT / Data centers

Approvals

- ANSI/UL 1449 4th Edition, Type 1 SPD, File E210793
- CSA C22.2, Type 1 SPD, File 162842
- ANSI/IEEE C62.41.1, C62.41.2, C62.45
- UL96A Lightning Protection

Mersen STXR Series Type 1 Surge Protective Devices

Part Number	Price	Description	Weight lb [oz]	I_n	Max Continuous Operating Voltage (MCOV)				Voltage Protection Rating (VPR)			
					L-N	L-G	L-L	N-G	L-N	L-G	L-L	N-G
STXR120P05	$151.00	120V single phase	1.45 [23.2]	20kA	150	–	–	–	700	–	–	–
STXR240S05	$188.00	240/120V split phase			150	–	300	–	700	–	1200	–
STXR208Y05N	$206.00	208/120V 3-Phase WYE			150	300	300	150	700	1200	1200	600
STXR480Y05N	$230.00	480/277V 3-Phase WYE			320	470	640	150	1200	1800	2000	700
STXR600Y05N	$288.00	600/347V 3-Phase WYE			420	690	840	270	1500	2500	2500	1000
STXR240D05	$209.00	240V 3-Phase DELTA			–	320	640	–	–	1200	2000	–
STXR480D05	$209.00	480V 3-Phase DELTA		10kA	–	550	1100	–	–	1800	3000	–
STXRMBK	$23.50	STXR Mounting bracket kit. Includes (1) 90 degree bracket and (2) 10-32 hex/slotted thread-forming mounting screws. Weight 0.05 lb [0.8 oz].										



STXRMBK

STXR Series Surge Protective Devices

Technical Specifications

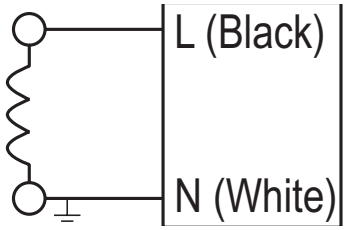
Mersen STXR Series Type 1 Surge Protective Devices General Specifications	
Short circuit current rating (SCCR)	200kA
Nominal discharge current rating (I_n)	10 - 20 kA
Surge capacity per phase (Imax)	50kA
Frequency	50/60 Hz
Connection method	Parallel, 3' (1m) 10AWG stranded copper
Circuit placement	Lineside or loadside of service overcurrent protective device
Mounting	3/4" - 14 threaded hub (includes locking washer)
Operating temperature	-40ºC to +85ºC [-40ºF to +185ºF]
Storage temperature	-40ºC to +85ºC [-40ºF to +185ºF]
Enclosure rating	NEMA 4X non-metallic*
Flammability rating	UL 94-5VA
Operating humidity	0 to 95% non-condensing
Maximum operating altitude	16,000 ft
Visual end-of-life indicator	GREEN = OK; OUT = replace
Enclosure material	Polycarbonate
Enclosure cover material	Lexan polycarbonate
Certification and SPD type	UL 1449 and CSA C22.2 Listed Type 1

**For NEMA 4x installation use appropriate customer supplied gasket, fittings and/or conduit to maintain rating.*
To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

Wiring

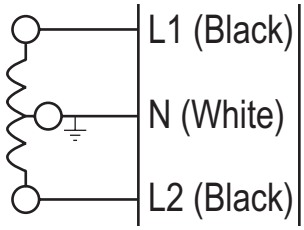
STXR120P05

Single Phase, 2-Wire



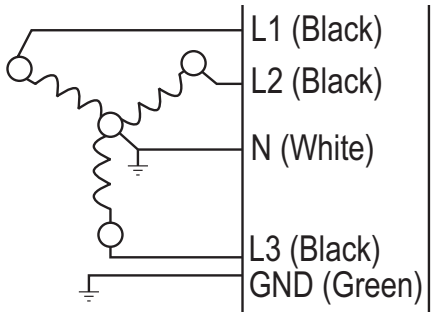
STXR240S05

Split Phase, 3-Wire



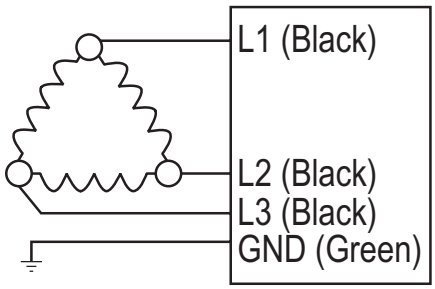
STXR208Y05N, STXR480Y05N, STXR600Y05N

3-Phase WYE, 4-Wire + Ground



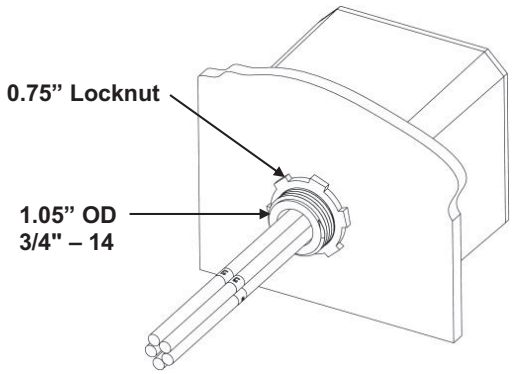
STXR240D05, STXR480D05

3-Phase DELTA, 3-Wire + Ground

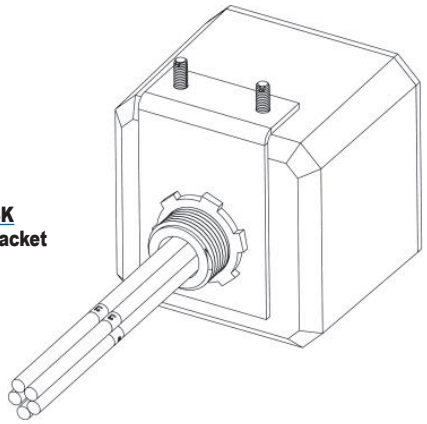


STXR Series Surge Protective Devices

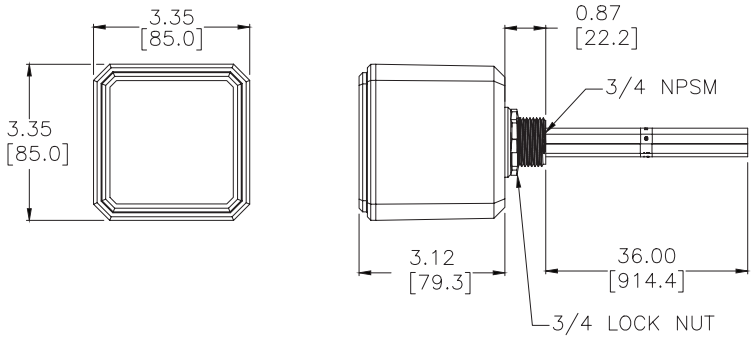
Mounting



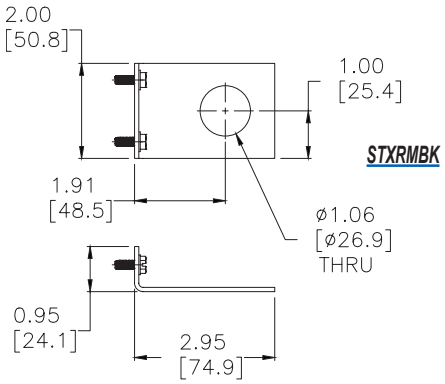
STXRMBK
Mounting Bracket



Dimensions (in [mm])



STXR Series Type 1 Surge Protective Devices



See our website: www.AutomationDirect.com for complete engineering drawings

DEHNguard MU Modular DIN-Rail Surge Protectors For Power Systems

Red / Line Surge Arrester Type 2

Features

- Prewired complete unit consisting of a base part and plug-in protection modules
- No need for additional overcurrent protection devices
- •Short circuit current rating (SCCR) 200kA
- ANSI / UL 1449 – 4th Ed. Open-Type 1 SPD
- High discharge capacity due to heavy-duty zinc oxide varistors (Imax 50kA, 8x 20µs)
- High reliability due to "Thermo Dynamic Control" SPD monitoring device

UL file numbers: E319777
CSA file number: 215727

- DEHNguard SU 1Pxxx: Modular single-pole surge arrester for application in single-phase electrical systems
- DEHNguard MU 3PYxxx: Modular surge arrester for application in 3-phase Wye electrical systems
- DEHNguard MU 3PDxxx: Modular surge arrester for application in 3-phase Delta electrical systems
- DEHNguard MU 3PHxxx: Modular surge arrester for application in 3-phase High-leg Delta systems

- The DEHNguard Red / Line SU/MUxxx surge arresters are modular DIN rail mounted SPDs that set new standards in terms of safety and user-friendliness. The SPDs are UL 1449 4th Edition certified as Type 1 and are designed for all common electrical power systems. These devices have optimized Voltage Protection Ratings and therefore provide ideal surge protection for the United States and Canadian electrical panel markets. They offer maximum discharge capacity of 50kA and a high short circuit current rating (SCCR) of 200kA without the need for additional overcurrent protection devices.
- Reliable surge protection and equipment safety are key elements of the modular DEHNguard surge arresters. The application-based product designation makes it considerably easier to choose the correct device for the relevant application, and the module locking system firmly fixes the protection modules to the base part. Neither vibration during transport nor the enormous electromagnetic forces of discharge can loosen the protection modules. Yet they can be easily replaced without tools by simply pressing the user-friendly module release buttons. Each protective circuit of the multipole surge arresters and each protection module is mechanically coded to ensure against installing an incorrect module.
- The dual "Thermo Dynamic Control" monitoring device was not only developed on the basis of national and international product standards but also reflects decades of experience in the world market of surge protective devices and considers practical applications where arresters might be damaged. As with all DEHN surge arresters with "Thermo Dynamic Control," the intensity of the discharge current and the surface temperature of the heavy-duty varistor are evaluated. The visual status indicator with green and red indicator flags shows the availability of every protective circuit.
- In addition to this standard visual indication, DEHNguard M SU/MUxxxFM devices feature a Form C contact (SPDT).
- With its floating changeover contact, the remote signal can be used as a make or break contact according to the particular circuit concept. The surge arresters of the multipole modular DEHNguard MU family feature multifunctional terminals on a standardized spacing of one module for the connection of wires and busbars, allowing easy wiring with other DIN rail mounted devices. Thus, a wide range of applications can be easily connected in series for optimal protection.

DEHNguard MU Modular DIN-Rail Surge Protectors For Power Systems

Red / Line Surge Arrester Type 2

DEHNguard MU 3PY – 3W+G R
277/480 Wye, 3-Pole SPD

DIN rail mount, pluggable surge arrester consisting of a base part and plug-in protection modules for application in 3-phase Wye electrical systems. Floating Form C (SPDT) remote status contacts.

DEHNguard MU 3PY – 3W+G R 277/480 Wye, 3-Pole SPD Selection Chart	
Type DG MUxxx	*3PY 480 3W+G R*
Part Number	*908319*
Price	$162.00
SPD Classification Acc. To ANSI/UL 1449 4th Ed.	Open-Type 1 SPD
SPD Classification Acc. To CSA - C22.2 No. 269.1-14	Type 4-1 Component Assembly
Max. Continuous Operating Voltage AC [L-G] / [L-L] (MCOV)	385VAC / 770VAC
Nominal Discharge Current (8x20µs) (I_n)	20kA
Max. Discharge Current (8/20) (I_{max})	50kA
Voltage Protection Rating [L-G] / [L-L] (VPR)	$1200V_{pk}$ / $2500V_{pk}$
Max. Mains-side Overcurrent Protection	Not needed
Approvals	UL, CSA
Remote Status Contact	Floating (dry), Form C (SPDT)
Dimensional Drawing	PDF

DEHNguard MU 3PD – 3W+G R
240V or 480V Delta, 3-Pole SPD

DIN rail mount, pluggable surge arrester consisting of a base part and plug-in protection modules for application in 3-phase Delta electrical systems. Floating Form C (SPDT) remote status contacts.

DEHNguard MU 3PD – 3W+G R 240V or 480V Delta, 3-Pole SPD Selection Chart		
Type DG MUxxx	*3PD 480 3W+G R*	*3PD 240 3W+G R*
Part Number	*908355*	*908356*
Price	$162.00	$162.00
SPD Classification Acc. To ANSI/UL 1449 4th Ed.	Open-Type 1 SPD	Open-Type 1 SPD
SPD Classification Acc. To CSA - C22.2 No. 269.1-14	Type 4-1 Component Assembly	Type 4-1 Component Assembly
Max. Continuous Operating Voltage AC [L-G] / [L-L] (MCOV)	550VAC / 1100VAC	275VAC / 550VAC
Nominal Discharge Current (8x20µs) (I_n)	20 kA	20 kA
Max. Discharge Current (8/20) (I_{max})	50 kA	50 kA
Voltage Protection Rating [L-G] / [L-L] (VPR)	$1800V_{pk}$ / $3000V_{pk}$	$800V_{pk}$ / $1500V_{pk}$
Max. Mains-side Overcurrent Protection	Not needed	Not needed
Approvals	UL, CSA	UL, CSA
Remote Status Contact	Floating (dry), Form C (SPDT)	Floating (dry), Form C (SPDT)
Dimensional Drawing	PDF	PDF

DEHNguard MU 3PY – 4W+G R
120/208, 277/480 or 347/600 Wye, 4-Pole SPD

DIN rail mount, pluggable surge arrester consisting of a base part and plug-in protection modules for application in 3-phase Wye systems. Floating Form C (SPDT) remote status contacts.

DEHNguard MU 3PY – 4W+G R 120/208, 277/480 or 347/600 Wye, 4-Pole SPD Selection Chart			
Type DG MUxxx	*3PY 208 4W+G R*	*3PY 480 4W+G R*	*3PY 600 4W+G R*
Part Number	*908345*	*908346*	*908347*
Price	$215.00	$215.00	$215.00
SPD Classification Acc. To ANSI/UL 1449 4th Ed.	Open-Type 1 SPD	Open-Type 1 SPD	Open-Type 1 SPD
SPD Classification Acc. To CSA - C22.2 No. 269.1-14	Type 4-1 Component Assembly	Type 4-1 Component Assembly	Type 4-1 Component Assembly
Max. Continuous Operating Voltage AC [L-N] / [L-G] / [L-L] / [N-G] (MCOV)	180VAC / 360VAC / 360VAC / 180VAC	385VAC / 565VAC / 770VAC / 180VAC	510VAC / 690VAC / 1020VAC / 180VAC
Nominal Discharge Current (8x20µs) (I_n)	20kA	20kA	20kA
Max. Discharge Current (8/20) (I_{max})	50kA	50kA	50kA
Voltage Protection Rating [L-N] / [L-G] / [L-L] / [N-G] (VPR)	$600V_{pk}$ / $1200V_{pk}$ / $1200V_{pk}$ / $600V_{pk}$	$1200V_{pk}$ / $1800V_{pk}$ / $2500V_{pk}$ / $600V_{pk}$	$1500V_{pk}$ / $2000V_{pk}$ / $3000V_{pk}$ / $600V_{pk}$
Max. Mains-side Overcurrent Protection	Not needed	Not needed	Not needed
Approvals	UL, CSA	UL, CSA	UL, CSA
Remote Status Contact	Floating (dry), Form C (SPDT)	Floating (dry), Form C (SPDT)	Floating (dry), Form C (SPDT)
Dimensional Drawing	PDF	PDF	PDF

DEHNguard MU Modular DIN-Rail Surge Protectors For Power Systems

Red / Line Surge Arrester Type 2

DEHNguard MU 3PH – 4W+G R
120/240 High-Leg Delta, 4-Pole SPD

DIN rail mount, pluggable surge arrester consisting of a base part and plug-in protection modules for application in split-phase systems. Floating Form C (SPDT) remote status contacts.

DEHNguard MU 3PH – 4W+G R 120/240 High-Leg Delta, 4-Pole SPD Selection Chart	
Type DG MUxxx	*3PH 240 4W+G R*
Part Number	*908348*
Price	$215.00
SPD Classification Acc. To ANSI/UL 1449 4th Ed.	Open-Type 1 SPD
SPD Classification Acc. To CSA - C22.2 No. 269.1-14	Type 4-1 Component Assembly
Max. Continuous Operating Voltage AC [L-N] / [H-N] / [L-G] / [H-G] / [L-L] / [L-H] / [N-G]	230VAC / 275VAC / 410VAC / 455VAC / 460VAC / 505VAC / 180VAC
Nominal Discharge Current (8x20µs) (I_n)	20kA
Max. Discharge Current (8/20) (I_{max})	50kA
Voltage Protection Rating [L-N] / [H-N] / [L-G] / [H-G] / [L-L] / [L-H] / [N-G] (VPR)	700V_{pk} / 800 V_{pk} / 1200 V_{pk} / 1500 V_{pk} / 1500V_{pk} / 1500V_{pk} / 600V_{pk}
Max. Mains-Side Overcurrent Protection	Not needed
Approvals	UL, CSA
Remote Status Contact	Floating (dry), Form C (SPDT)
Dimensional Drawing	PDF

DEHNguard MU SP – 3W+G R
120/240 Split-Phase, 2-Pole 3W+G (USA) SPD

DIN rail mount, pluggable surge arrester consisting of a base part and plug-in protection modules for application in split-phase systems. Floating Form C (SPDT) remote status contacts.

DEHNguard MU SP – 3W+G R 120/240 Split-Phase, 2-Pole 3W+G (USA) SPD Selection Chart	
Type DG MUxxx	*SP 240 3W+G R*
Part Number	*908195*
Price	$135.00
SPD Classification Acc. To ANSI/UL 1449 4th Ed.	Open-Type 1 SPD
SPD Classification Acc. To CSA - C22.2 No. 269.1-14	Type 4-1 Component Assembly
Max. Continuous Operating Voltage AC [L-G] / [L-L] (MCOV)	230VAC / 460VAC
Nominal Discharge Current (8x20µs) (I_n)	20kA
Max. Discharge Current (8/20) (I_{max})	50kA
Voltage Protection Rating [L-G] / [L-L] (VPR)	700V / 1500V
Max. Mains-Side Overcurrent Protection	Not needed
Approvals	UL, CSA
Remote Status Contact	Floating (dry), Form C (SPDT)
Dimensional Drawing	PDF

DEHNguard SU 1P R
120V Single-Phase, 1-Pole SPD

DIN rail mount, pluggable surge arrester consisting of a base part and plug-in protection module for application in single-phase electrical systems. Floating Form C (SPDT) remote status contacts.

DEHNguard SU 1P R 120V Single-Phase, 1-Pole SPD Selection Chart	
Type DG SUxxx	*1P 120 R*
Part Number	*908090*
Price	$62.00
SPD Classification Acc. To ANSI/UL 1449 4th Ed.	Open-Type 1 SPD
SPD Classification Acc. To CSA - C22.2 No. 269.1-14	Type 4-1 Component Assembly
Max. Continuous Operating Voltage AC [L-L] (MCOV)	230VAC
Nominal Discharge Current (8x20µs) (I_n)	20kA
Max. Discharge Current (8/20) (I_{max})	50kA
Voltage Protection Rating [L-G] / [L-L] (VPR)	700V_{pk}
Max. Mains-Side Overcurrent Protection	Not needed
Approvals	UL, CSA
Remote Status Contact	Floating (dry), Form C (SPDT)
Dimensional Drawing	PDF

DEHNrail Modular DIN-Rail Surge Protectors For Power Systems

Red / Line Surge Arrester Type 3

Features

- Two-pole surge arrester consisting of a base part and a plug-in protection module
- High discharge capacity due to heavy-duty zinc oxide varistor/spark gap combination
- Energy coordination with other arresters of the Red / Line product family
- Operating state / fault indication by green/red indicator flag in the inspection window
- Narrow (modular) design according to DIN 43880
- Easy replacement of protection modules due to module locking system with module release button
- Vibration and shock-tested according to EN 60068-2

UL file numbers: E319777
CSA file number: 215727

DEHNrail M 2Pxxx: Two-pole surge arrester consisting of a base part and a plug-in protection module
DEHNrail M 2PxxxFM: With remote signalling contact for monitoring device (floating changeover contact)

The modular devices of the DEHNrail M product family stand out due to their high performance parameters and straightforward Red / Line design. The devices combine safety and ease of use in a single module. The low voltage protection level and the comprehensive protection against common-mode and differential-mode interference make them ideal for protecting communications equipment in industrial electronics environments. The input and output terminals for series connection and the protective circuit designed for high load currents underline this concept.

The very compact design of the DEHNrail M surge arresters includes the fault-proof Y protective circuit and a combined SPD monitoring and disconnection device.

The base part and protection module are coded to ensure against installing an incorrect module.

The unique module locking system of the DEHNrail M product family fixes the protection module to the base part. Neither vibration during transport nor the electrodynamic forces of discharge can loosen the connection.

In the event of the protective circuit being overloaded, the protection modules can be easily replaced without tools by simply pressing the module release button.

In addition to the standard visual indication with green and red indicator flags, DEHNrail MxxxFM devices feature a three-pole remote signalling terminal. With its floating changeover contact, the remote signal can be used as a break or make contact according to the particular circuit concept.

DEHNrail Modular DIN-Rail Surge Protectors For Power Systems

Red / Line Surge Arrester Type 3

DEHNrail M 2P
48V Hybrid DIN LV SPD

Two-pole surge arrester consisting of a base part and a plug-in protection module.

DEHNrail M 2P 48V Hybrid DIN LV SPD Selection Chart	
Type DR M 2Pxxx	*60*
Part Number	*953202*
Price	$54.00
SPD According To EN 61643-11 / IEC 61643-11	Type 3 / Class III
SPD According To UL 1449 and CSA C22.2	UL Type 4 component assembly and CSA Type 5 component assembly
Max. Mains-side Overcurrent Protection	25A gG or B 25A (gG or B only)
Max. Continuous Operating Voltage (AC) (U_C)	60V (50/60 Hz)
Max. Continuous Operating Voltage (DC) (U_C)	60V
Nominal Discharge Current (8/20 µs) (I_n)	1kA
Nominal Load Current (AC) (I_L)	25A
Total Discharge Current (8/20 µs) [L+N-PE] (I_{total})	2kA
Voltage Protection Level [L-N] / [L/N-PE] (U_P)	≤ 350 / ≤ 730V
Approvals	KEMA, VDE, UL, CSA
Dimensional Drawing	PDF

DEHNrail M 2P – FM
24V Hybrid DIN LV SPD

Two-pole surge arrester consisting of a base part and a plug-in protection module; with floating remote signalling contact.

DEHNrail M 2P – FM 24V Hybrid DIN LV SPD Selection Chart	
Type DR M 2Pxxx	*30 FM*
Part Number	*953206*
Price	$57.00
SPD According To EN 61643-11 / IEC 61643-11	Type 3 / Class III
SPD According To UL 1449 and CSA C22.2	UL Type 4 component assembly and CSA Type 5 component assembly
Max. Mains-side Overcurrent Protection	25A gG or B 25A (gG or B only)
Max. Continuous Operating Voltage (AC) (U_C)	30V (50/60 Hz)
Max. Continuous Operating Voltage (DC) (U_C)	30V
Nominal Discharge Current (8/20 µs) (I_n)	1kA
Nominal Load Current (AC) (I_L)	25A
Total Discharge Current (8/20 µs) [L+N-PE] (I_{total})	2kA
Voltage Protection Level [L-N] / [L/N-PE] (U_P)	≤ 180 / ≤ 630V
Type of Remote Signalling Contact	Changeover contact
Approvals	KEMA, VDE, UL, CSA
Dimensional Drawing	PDF

DEHNrail M 2P – FM
150V or 230V Hybrid DIN LV SPD

Two-pole surge arrester consisting of a base part and a plug-in protection module; with floating remote signalling contact.

DEHNrail M 2P – FM 150V or 230V Hybrid DIN LV SPD Selection Chart		
Type DR M 2Pxxx	*150 FM*	*255 FM*
Part Number	*953209*	*953205*
Price	$57.00	$57.00
SPD According To EN 61643-11 / IEC 61643-11	Type 3 / Class III	Type 3 / Class III
SPD According To UL 1449 and CSA C22.2	UL Type 4 component assembly and CSA Type 5 component assembly	
Max. Mains-side Overcurrent Protection	25A gG or B 25A	25A gG or B 25A (gG or B only)
Max. Continuous Operating Voltage (AC) (U_C)	150V (50/60 Hz)	255V (50/60 Hz)
Max. Continuous Operating Voltage (DC) (U_C)	150V	255V
Nominal Discharge Current (8/20 µs) (I_n)	2kA	3kA
Nominal Load Current (AC) (I_L)	25A	25A
Total Discharge Current (8/20 µs) [L+N-PE] (I_{total})	4kA	5kA
Voltage Protection Level [L-N] / [L/N-PE] (U_P)	≤ 640 / ≤ 800V	≤ 1250 / ≤ 1500V
Type of Remote Signalling Contact	Changeover contact	Changeover contact
Approvals	KEMA, VDE, UL, CSA	KEMA, VDE, UL, CSA
Dimensional Drawing	PDF	PDF

DEHNpipe Surge Protectors For Installations and Devices

Yellow / Line SPDs for Field Devices

Features

Surge arresters to be screwed onto field devices

- Parallel connection
- Made of corrosion-resistant stainless steel
- Arrester for protecting a second interface (data or power side) available
- IP67

Types for Ex (i) and Ex (d) applications

- For protecting intrinsically safe measuring circuits and bus systems Ex (i)
- Type in a flameproof enclosure Ex (d)

Variety of approvals

- Approvals depending on the arrester: IECEx, ATEX, FISCO, CSA Hazloc

CSA file number: 215727

The devices of the DEHNpipe family are made of corrosion-resistant stainless steel and can be directly screwed onto a field device. The permanently connected lines are connected to the terminals of the field device. These surge protective devices are designed for parallel circuit connections.

Arresters for parallel connection are attached to the spare cable gland of the field devices or in the field bus distributor and are situated in parallel to the cable run. Both versions have an IP67 degree of protection.

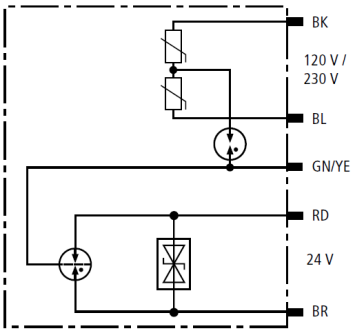
Ex(i) and Ex(d) versions are available for field devices in potentially explosive atmospheres. Depending on the type, the arresters can thus be installed on field devices in intrinsically safe measuring circuits Ex(i) or on devices with flameproof enclosure and are suitable for use in Ex zone 1 or 2.

The surge arresters are ideally suited for installation in process environments, for example on transducers or field bus devices. 4-20 mA measuring circuits or bus systems up to 30 V are typical fields of application.

DPI CD EXD 230 24 N

Power, data and signal surge protective device (SPD), 230/120 VAC 1-Phase & 24V, parallel circuit, 2 lines or 1 pair, IP67.

Surge arrester in a flameproof enclosure for protecting 120/230 V terminal equipment and 0/4-20 mA interfaces in potentially explosive atmospheres.

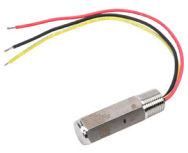


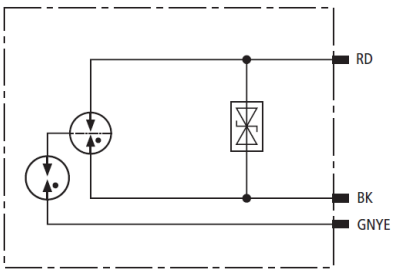
DEHNpipe DPI Power, Data and Signal Surge SPD Selection Chart	
Type DPIxxx	***CD EXD 230 24 N***
Part Number	***929970***
Price	$166.00
D1 Lightning Impulse Current (10/350 µs) Per Line (I_{imp})	1kA
C2 Total Nominal Discharge Current (8/20 µs) (I_n)	10kA
SPD Class	Type 2 P2
Max. Continuous Operating Voltage (DC) (U_C)	32V
Nominal Current At 80°C (I_L)	0.55 A
For Mounting On Field/Device Side	1/2in-14 NPSM
Approvals (Not UL)	EACEx, ATEX, IECEx, CSA & USA Hazloc, SIL
Dimensional Drawing	PDF

DPI CD EXI

Parallel Type mA Loop Arrester For Class 1 / Div 2 Haz Loc 24VDC

Surge arrester for protecting intrinsically safe measuring circuits and bus systems according to FISCO.





DEHNpipe DPI Parallel Type mA Loop Arrester SPD Selection Chart	
Type DPIxxx	***CD EXI 24 N***
Part Number	***929963***
Price	$110.00
D1 Lightning Impulse Current (10/350 µs) Per Line (I_{imp})	1kA
C2 Total Nominal Discharge Current (8/20 µs) (I_n)	10kA
SPD Class	Type 2 P1
Max. Continuous Operating Voltage (DC) (U_C)	32V
Nominal Current (I_L)	0.55 A
Cut-Off Frequency Line-PG (f_G)	67MHz
For Mounting On Field/Device Side	1/2in-14 NPSM
Approvals (Not UL)	EACEx, ATEX, IECEx, CSA & USA Hazloc, SIL
Dimensional Drawing	PDF

DEHNpatch SPDs for Telecommunication and Data Networks

Yellow / Line DEHNpatch SPDs

Features

- Cat. 6 according to ISO / IEC 11801
- CAT 6A in the channel according to ANSI / TIA / EIA-568
- Power over Ethernet IEEE 802.3 compliant (up to PoE++ / 4PPoE)
- IP66 variant for outdoor applications
- Easy to retrofit

UL file numbers: E156818
CSA file number: 215727

Surge arresters of the DEHNpatch family fulfill various requirements for a universal application for Ethernet, Industrial Ethernet, Power over Ethernet (IEEE 802.3 compliant up to PoE++ / 4PPoE) as well as general applications in structured cablings up to the Gbit range. The SPDs are suitable for indoor and outdoor installation in different environmental conditions.

The space-saving design of the DEHNpatch surge arrester as patch cable or as compact socket-socket design is especially easy to install. New systems can be equipped easily, and easy retrofitting is possible anytime. Due to its fully shielded design, DEHNpatch can be used in shielded and unshielded networks.

DEHNpatch is installed between patch panel and active component (e.g. switch). A safe equipotential bonding is provided by the surge current resistant DIN rail supporting foot with snap-in mechanism.

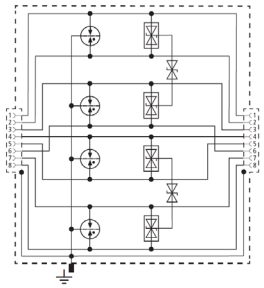
The width of the DIN rail mounting devices is similar to that of an RJ45 socket, allowing up to 24 devices to be installed next to one another in a 19in rack. For multiple application in 19in distribution boards a DEHNpatch mounting set is recommended which is available as accessory.

The IP66 version of DEHNpatch with its universal mounting device, specially developed for outdoor applications, can be installed on poles as well as on walls. The arrester is directly earthed via the metal enclosure. Screws in the enclosure cover are secured against falling out which facilitates installation also at great heights (e.g. on poles). Special cable seals enable an easy and low-effort installation of the arrester with pre-assembled patch cables. An additional effort of mounting RJ45 plugs on the building entry cable can be omitted.

DPI CLE IP66

DEHNpatch, Outdoor Ethernet

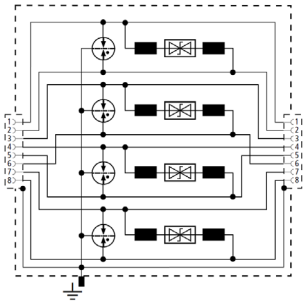
Universal surge arrester for GBit Ethernet applications, Power over Ethernet (IEEE 802.3 compliant up to PoE++ / 4PPoE) and similar applications in structured cabling systems in indoor and outdoor areas in an IP66 rated enclosure impervious to dust and water jets. Protection of all pairs with gas discharge tubes and one adapted filter matrix for each pair. Fully shielded surge protective solution with RJ 45 sockets. Universal mounting bracket for pole and wall mounting.



DEHNpatch Class E

Ethernet 48V Data Signal DIN Rail RJ45 SPD

Universal arrester ideally suited for Industrial Ethernet, Power over Ethernet (IEEE 802.3 compliant up to PoE++ / 4PPoE) and similar applications in structured cabling systems according to class E up to 250MHz. Fully shielded adapter with sockets for DIN rail mounting.



DEHNpatch Outdoor Ethernet SPD Selection Chart

Type DPAxxx	CLE IP66
Part Number	929221
Price	$359.00
D1 Lightning Impulse Current (10/350 µs) Per Line (I_{imp})	0.8 kA
C2 Total Nominal Discharge Current (8/20 µs) (I_n)	10kA
SPD Class	Type 2 P1
Max. Continuous Operating Voltage (DC) Pair-Pair (PoE) (U_C)	60V
Nominal Current (I_L)	1A
Cut-Off Frequency (f_G)	250MHz
Connection (Input/Output)	RJ45 socket / RJ45 socket
Degree of Protection (With Installed Cables)	IP66
Approvals	UL, CSA, EAC
Dimensional Drawing	PDF

DEHNpatch Class E Ethernet 48V Data Signal SPD Selection Chart

Type DPAxxx	M CLE RJ45B 48
Part Number	929121
Price	$120.00
D1 Lightning Impulse Current (10/350 µs) Per Line (Iimp)	0.5 kA
C2 Total Nominal Discharge Current (8/20 µs) Line-PG (I_n)	10kA
SPD Class	Type 2 P1
Max. Continuous Operating Voltage (DC) (U_C)	48V
Max. Continuous Operating Voltage (DC) Pair-Pair (PoE) (U_C)	57V
Nominal Current (I_L)	1A
Cut-Off Frequency (f_G)	250MHz
Connection (Input/Output)	RJ45 socket / RJ45 socket
Degree of Protection (With Installed Cables)	IP10
Approvals	CSA, UL, GHMT, EAC
Dimensional Drawing	PDF

DEHN BLITZDUCTORconnect – Compact Data and Signal Surge Protectors

Yellow / Line SPDs

Features

- Universal lightning current and surge arrester
  - For protecting data bus interfaces as well as measuring and control circuits
  - High discharge capacity of 3kA (10/350 µs), 10 kA (8/20 µs)
  - Maximum impulse current carrying capability (8/20 µs) I_{max} up to 20 kA
  - Low voltage protection level, also capable of protecting terminal equipment
- Compact arrester
  - Fast and simple cable connection thanks to push-in connection technology
  - High system availability thanks to fail-safe performance
- Function-optimized design with a width of 6mm
  - LifeCheck and visual status indication integrated in the module
  - Simple remote signaling of status when used with optional remote signaling unit
  - Vibration and shock tested for safe operation

The BLITZDUCTORconnect series of combined lightning current and surge arresters features compact design and is designed for universal use and system protection in industrial environments, at information technology signal interfaces, and in automation or measuring and control systems.

With their high lightning current discharge capacity and low voltage protection levels, these lightning current and surge arresters offer reliable protection of terminal equipment.

These arresters are available to protect two single lines sharing a common reference potential (unbalanced interfaces) or one unearthed pair (balanced interface).

Cables are connected using vibration-proof push-in connection technology. Stripped solid or flexible conductors with wire end ferrules can be clamped and contacted quickly, easily and without tools. When rewiring, the conductor is freed from the clamping point simply by pressing the release button and can be reclamped easily. Holes in the housing at each conductor terminal allow measurements of the signal circuit using test probes.

The arresters of the BLITZDUCTORconnect series are equipped with a mechanical status indicator which clearly shows the status of the arrester (via a green or red indicator flag). In the event of arrester overload, the arrester or arrester group to be replaced is identified visually (red indicator flag).

The status is reported to a higher-level control system via a floating break contact of the remote signaling unit.

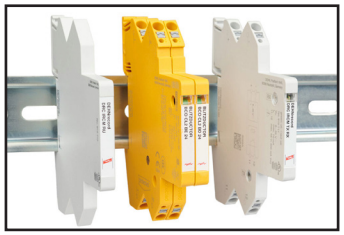
The combination of the transmitter and receiver units into a single device minimizes the wiring effort required when installing the remote signaling unit. At the same time, there is no need for additional setup of the modules.

A defined fail-safe function (fail-open) disconnects the overloaded components (decoupling impedance, fine protection) from the signal circuit. However, the signal circuit itself remains active and is not interrupted. The system circuit remains available, and operation is maintained until the arrester is replaced. In this way, plants and systems can be operated safely and are highly available at all times.

Quickly tested – at a glance
Integrated indication for easy and fast maintenance

Connect = Protect
Push-in connection technology for simple and fast cable connection

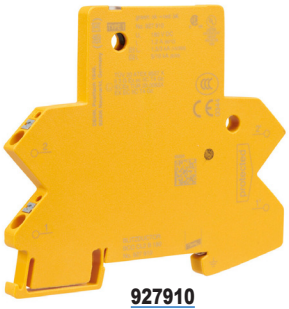
Easy maintenance
Simple status message with monitoring unit for arrester groups



Maximum system availability
Approvals for use in intrinsically safe measuring circuits

DEHN BLITZDUCTORconnect – Compact Data and Signal Surge Protectors

Yellow / Line SPDs



927910

UL file # E156818, E508234 Displayed as BCO CL2
CSA file # 80066004 Displayed as BCO CL2
SIL up to SIL3 as of October 2019

DEHN BLITZDUCTORconnect Data and Signal Surge Protectors Selection Guide

Part Number	Price	Protection	SPD Class	Maximum Continuous Operating Voltage (DC) (U_C)	Nominal Current (I_L)	D1 Lightning Impulse Current (10/350 µs) Per Line (I_{imp})	C2 Total Nominal Discharge Current (8/20 µs) (I_n)	Series Resistance Per Line	Cut-Off Frequency Line-Line (fG)	Approvals	Drawing
927910	$35.50	Two single lines for lightning equipotential bonding, as well as indirect earthing of shielded cables.	Type 1	180V	1.2 A	1.5 kA	10kA	0Ω	150MHz	UL, CSA, ATEX, IECEx, CCC SIL	PDF
927924	$63.50	Interface/signal 0-20 mA, 4-20 mA (also with HART). Two single lines sharing a common reference potential as well as unbalanced interfaces.	Type 1 (P2 per EN 61000-4-5)	33V	0.75 A	1.5 kA	10kA	1Ω	3.4 MHz	UL, CSA, ATEX, IECEx, CCC SIL	PDF
927944	$63.50	Interface/signal 4-20 mA (also with HART). One pair of unearthed balanced interfaces.	Type 1 (P2 per EN 61000-4-5)	36V	0.75 A	1.5 kA	10kA	1Ω	5.8 MHz	UL, CSA, ATEX, IECEx, CCC SIL	PDF
927971	$73.00	One pair of unearthed high-frequency bus systems as well as balanced interfaces	Type 1 (P2 per EN 61000-4-5)	8.5 V	0.75 A	1.5 kA	10kA	1Ω	100MHz	UL, CSA, ATEX, IECEx, CCC SIL	PDF

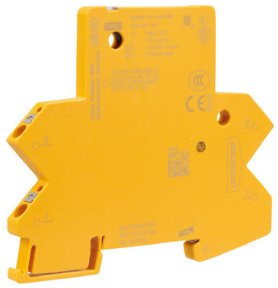
DEHN BLITZDUCTORconnect Data and Signal Surge Protectors Accessories Selection Guide

Part Number	Price	Description	Input Voltage Range (DC) (U_{IN})	Maximum Rated Current Consumption (I_{IN})	Operating Temperature Range (T_U)	Approvals	Drawing
910710	$96.00	DEHNrecord condition monitoring unit, DIN rail mounted set with integrated visual transmitter/ receiver as well as visual reverse unit for monitoring the condition of BLITZDUCTORconnect arresters with LifeCheck. Visual status indication via LED group display combined with remote signaling (break contact).	6-35 VDC	≤10mA	-30°C to 70°C [-22°F to 158°F]	UL, ATEX, IECEx	PDF

910710

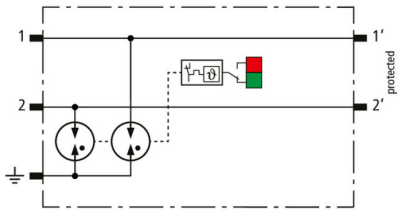
DEHN BLITZDUCTORconnect – Compact Data and Signal Surge Protectors

Yellow / Line SPDs



927910

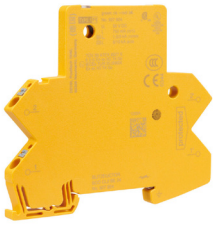
Space-saving, compact lightning current arrester with a width of 6mm [0.24 in] and push-in connection technology with status indication for protecting two single lines for lightning equipotential bonding as well as indirect grounding of shielded cables.



DEHN BLITZDUCTORconnect 927910 Data and Signal Surge Protector Specifications	
SPD Class	Type 1
Impulse Category	D1, C2, C3
Nominal Voltage (U_N)	180V
Max. Continuous Operating Voltage (DC) (U_C)	180V
Max. Continuous Operating Voltage (AC) (U_C)	127V
Nominal Current (I_L)	1.2 A
D1 Total Lightning Impulse Current (10/350 µs) (I_{imp})	3kA
D1 Lightning Impulse Current (10/350 µs) per line (I_{imp})	1.5 kA
C2 Total Nominal Discharge Current (8/20 µs) (I_n)	10kA
C2 Nominal Discharge Current (8/20 µs) per line (I_n)	5kA
Voltage Protection Line-Line for I_n C2 (U_p)	≤1100V
Voltage Protection Level Line-PG for In C2 (U_p)	≤800V
Voltage Protection Level Line-Line for 1 kV/µs C3 (U_p)	≤950V
Voltage Protection Level Line-PG for 1 kV/µs (U_p)	≤700V
Series Resistance Per Line	0Ω
Cut-off Frequency Line-Line at 100 ohms (f_G)	150MHz
Capacitance Line-Line (C)	≤10pF
Capacitance Line-PG (C)	≤13pF
Operating Temperature Range (T_U)	-40°C to 80°C [-40°F to 176°F]
Operating State / Fault Indication	Green/red
Degree of Protection	IP20
For Mounting On	35mm DIN rails acc. to EN 60715
Connection (Input / Output)	Push-in / push-in
Cross-Sectional Area, Solid	0.2-2.5 mm² (24 - 14 AWG)
Cross-Sectional Area, Flexible	0.2-2.5 mm² (24 - 14 AWG)
Grounding Via	35mm DIN rails acc. to EN 60715
Enclosure Material	Polyamide PA 6.6
Color	Yellow
Test Standards	IEC 61643-21 / EN 61643-21
Approvals	UL, CSA, ATEX, IECEx, CCC, SIL UL file # E156818 Displayed as BCO CL2 CSA file # 80066004 Displayed as BCO CL2 SIL (up to SIL3) as of October 2019
ATEX Approvals	TÜV 20 ATEX 8527 X: II 3G Ex ec IIC T4 Gc
ICECx Approvals	IECEx TUR 20.0063X: Ex ec IIC T4 Gc
China Compulsory Certification	CCC no. 2021312304001192
Discharge Current (8/20 µs) [1/2-PG], [1+2 - PG]	10kA (10x)
Voltage Protection Level Line-PG at 1 kV/µs C3 After Being Subjected to I_{max} (U_p)	≤700V
Weight	33g [1.16 oz]

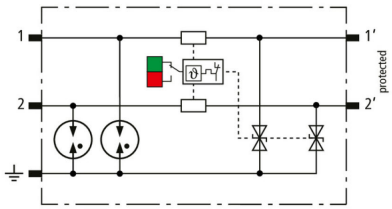
DEHN BLITZDUCTORconnect – Compact Data and Signal Surge Protectors

Yellow / Line SPDs



927924

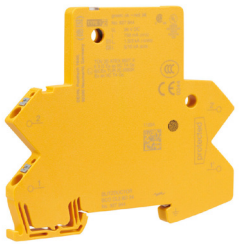
Space-saving, compact combined arrester with a width of 6mm [0.24 in] and push-in connection technology with status indication for protecting two single lines sharing a common reference potential as well as unbalanced interfaces.



DEHN BLITZDUCTORconnect 927924 Data and Signal Surge Protector Specifications	
SPD Class	Type 1 P1
Impulse Category	D1, C1, C2, C3, B2
Nominal Voltage (U_N)	24V
Max. Continuous Operating Voltage (DC) (U_C)	33V
Max. Continuous Operating Voltage (AC) (U_C)	23.3 V
Nominal Current (I_L)	0.75 A
D1 Total Lightning Impulse Current (10/350 µs) (I_{imp})	3kA
D1 Lightning Impulse Current (10/350 µs) per line (I_{imp})	1.5 kA
C2 Total Nominal Discharge Current (8/20 µs) (I_n)	10kA
C2 Nominal Discharge Current (8/20 µs) per line (I_n)	5kA
Voltage Protection Line-Line for I_n C2 (U_p)	≤90V
Voltage Protection Level Line-PG for I_n C2 (U_p)	≤75V
Voltage Protection Level Line-Line for I_n C1 (U_p)	≤90V
Voltage Protection Level Line-PG for I_n C1 (U_p)	≤75V
Voltage Protection Level Line-Line for 1kV/ µs C3 (U_p)	≤85V
Voltage Protection Level Line-PG for 1kV/ µs (U_p)	≤45V
Series Resistance Per Line	1Ω
Cut-off Frequency Line-Line (f_G)	3.4 MHz
Capacitance Line-Line (C)	≤1nF
Capacitance Line-PG (C)	≤2nF
Operating Temperature Range (T_U)	-40°C to 80°C [-40°F to 176°F]
Operating State / Fault Indication	Green/red
Degree of Protection	IP20
For Mounting On	35mm DIN rails acc. to EN 60715
Connection (Input / Output)	Push-in / push-in
Cross-Sectional Area, Solid	0.2-2.5 mm² (24 - 14 AWG)
Cross-Sectional Area, Flexible	0.2-2.5 mm² (24 - 14 AWG)
Grounding Via	35mm DIN rails acc. to EN 60715
Enclosure Material	Polyamide PA 6.6
Color	Yellow
Test Standards	IEC 61643-21 / EN 61643-21
Approvals	UL, CSA, ATEX, IECEx, CCC, SIL UL file # E156818 Displayed as BCO CL2 CSA file # 80066004 Displayed as BCO CL2 SIL (up to SIL3) as of October 2019
ATEX Approvals	TÜV 20 ATEX 8527 X: II 3G Ex ec IIC T4 Gc
ICECx Approvals	IECEx TUR 20.0063X: Ex ec IIC T4 Gc
China Compulsory Certification	CCC no. 2021312304001192
Maximum Discharge Current (8/20 µs) [1/2-PG], [1+2 - PG] (I_{max})	20kA
Discharge Current (8/20 µs) [1/2-PG], [1+2 - PG]	10kA (10x)
Voltage Protection Level Line-PG at 1 kV/µs C3 After Being Subjected to I_{max} (U_p)	≤45V
Weight	33g [1.16 oz]

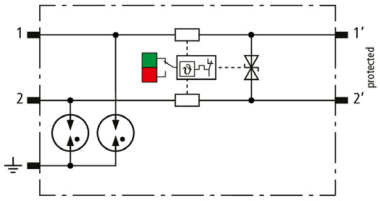
DEHN BLITZDUCTORconnect – Compact Data and Signal Surge Protectors

Yellow / Line SPDs



927944

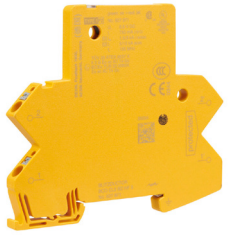
Space-saving, compact combined arrester with a width of 6mm [0.24 in] and push-in connection technology with status indication for protecting one pair of ungrounded balanced interfaces.



DEHN BLITZDUCTORconnect 927944 Data and Signal Surge Protector Specifications	
SPD Class	Type 1 P2
Impulse Category	D1, C1, C2, C3, B2
Nominal Voltage (U_N)	24V
Max. Continuous Operating Voltage (DC) (U_C)	36V
Max. Continuous Operating Voltage (AC) (U_C)	25.4 V
Nominal Current at 70°C (I_L)	0.75 A
D1 Total Lightning Impulse Current (10/350 µs) (I_{imp})	3kA
D1 Lightning Impulse Current (10/350 µs) per line (I_{imp})	1.5 kA
C2 Total Nominal Discharge Current (8/20 µs) (I_n)	10kA
C2 Nominal Discharge Current (8/20 µs) per line (I_n)	5kA
Voltage Protection Line-Line for I_n C2 (U_p)	≤57V
Voltage Protection Level Line-PG for I_n C2 (U_p)	≤600V
Voltage Protection Level Line-Line for I_n C1 (U_p)	≤57V
Voltage Protection Level Line-PG for I_n C1 (U_p)	≤600V
Voltage Protection Level Line-Line for 1kV/µs C3 (U_p)	≤46V
Voltage Protection Level Line-PG for 1kV/µs (U_p)	≤600V
Series Resistance Per Line	1Ω
Cut-off Frequency Line-Line (f_G)	5.8 MHz
Capacitance Line-Line (C)	≤1.5 nF
Capacitance Line-PG (C)	≤16pF
Operating Temperature Range (T_U)	-40°C to 80°C [-40°F to 176°F]
Operating State / Fault Indication	Green/red
Degree of Protection	IP20
For Mounting On	35mm DIN rails acc. to EN 60715
Connection (Input / Output)	Push-in / push-in
Cross-Sectional Area, Solid	0.2-2.5 mm² (24-14 AWG)
Cross-Sectional Area, Flexible	0.2-2.5 mm² (24-14 AWG)
Grounding Via	35mm DIN rails acc. to EN 60715
Enclosure Material	Polyamide PA 6.6
Color	Yellow
Test Standards	IEC 61643-21 / EN 61643-21
Approvals	UL, CSA, ATEX, IECEx, CCC, SIL UL file # E156818 Displayed as BCO CL2 CSA file # 80066004 Displayed as BCO CL2 SIL (up to SIL3) as of October 2019
ATEX Approvals	TÜV 20 ATEX 8527 X: II 3G Ex ec IIC T4 Gc
ICECx Approvals	IECEx TUR 20.0063X: Ex ec IIC T4 Gc
China Compulsory Certification	CCC no. 2021312304001192
Maximum Discharge Current (8/20 µs) [1/2-PG], [1+2 - PG] (I_{max})	20kA
Discharge Current (8/20 µs) [1/2-PG], [1+2 - PG]	10kA (10x)
Voltage Protection Level Line-PG at 1 kV/µs C3 After Being Subjected to I_{max} (U_p)	≤600V
Weight	33g [1.16 oz]

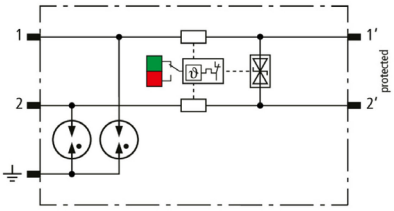
DEHN BLITZDUCTORconnect – Compact Data and Signal Surge Protectors

Yellow / Line SPDs



927971

Space-saving, compact combined arrester with a width of 6mm [0.24 in] and push-in connection technology with status indication for protecting one pair of ungrounded high-frequency bus systems as well as balanced interfaces.



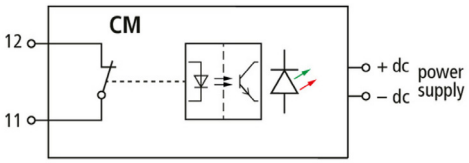
DEHN BLITZDUCTORconnect 927971 Data and Signal Surge Protector Specifications	
SPD Class	Type 1 P2
Impulse Category	D1, C1, C2, C3, B2
Nominal Voltage (U_N)	5V
Max. Continuous Operating Voltage (DC) (U_C)	8.5 V
Max. Continuous Operating Voltage (AC) (U_C)	6.0 V
Nominal Current at 70°C (I_L)	0.75 A
D1 Total Lightning Impulse Current (10/350 µs) (I_{imp})	3kA
D1 Lightning Impulse Current (10/350 µs) per line (I_{imp})	1.5 kA
C2 Total Nominal Discharge Current (8/20 µs) (I_n)	10kA
C2 Nominal Discharge Current (8/20 µs) per line (I_n)	5kA
Voltage Protection Line-Line for I_n C2 (U_p)	≤42V
Voltage Protection Level Line-PG for I_n C2 (U_p)	≤600V
Voltage Protection Level Line-Line for I_n C1 (U_p)	≤42V
Voltage Protection Level Line-PG for I_n C1 (U_p)	≤600V
Voltage Protection Level Line-Line for 1kV/µs C3 (U_p)	≤15V
Voltage Protection Level Line-PG for 1kV/µs (U_p)	≤600V
Series Resistance Per Line	1Ω
Cut-off Frequency Line-Line (f_G)	100MHz
Capacitance Line-Line (C)	≤21pF
Capacitance Line-PG (C)	≤15pF
Operating Temperature Range (T_U)	-40°C to 80°C [-40°F to 176°F]
Operating State / Fault Indication	Green/red
Degree of Protection	IP20
For Mounting On	35mm DIN rails acc. to EN 60715
Connection (Input / Output)	Push-in / push-in
Cross-Sectional Area, Solid	0.2-2.5 mm² (24-14 AWG)
Cross-Sectional Area, Flexible	0.2-2.5 mm² (24-14 AWG)
Grounding Via	35mm DIN rails acc. to EN 60715
Enclosure Material	Polyamide PA 6.6
Color	Yellow
Test Standards	IEC 61643-21 / EN 61643-21
Approvals	UL, CSA, ATEX, IECEx, CCC, SIL UL file # E156818 Displayed as BCO CL2 CSA file # 80066004 Displayed as BCO CL2 SIL (up to SIL3) as of October 2019
ATEX Approvals	TÜV 20 ATEX 8527 X: II 3G Ex ec IIC T4 Gc
ICECx Approvals	IECEx TUR 20.0063X: Ex ec IIC T4 Gc
China Compulsory Certification	CCC no. 2021312304001192
Maximum Discharge Current (8/20 µs) [1/2-PG], [1+2 - PG] (I_{max})	20kA
Discharge Current (8/20 µs) [1/2-PG], [1+2 - PG]	10kA (10x)
Voltage Protection Level Line-PG at 1 kV/µs C3 After Being Subjected to I_{max} (U_p)	≤600V
Weight	33g [1.16 oz]

DEHN BLITZDUCTORconnect – Compact Data and Signal Surge Protectors

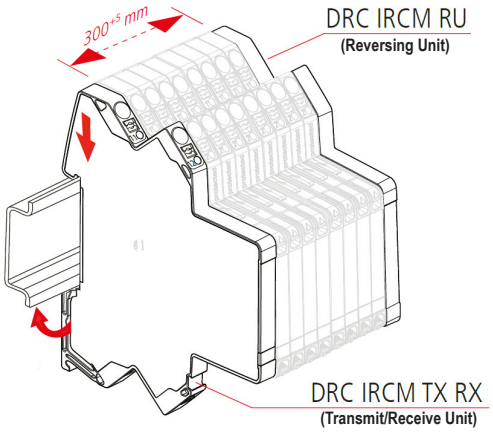
Yellow / Line SPDs

910710

Condition monitoring unit DEHNrecord, set for DIN rail mounted devices with integrated visual transmitter/receiver and visual reverse unit for monitoring the condition of BLITZDUCTORconnect arresters with LifeCheck. Visual status indication via LED group display in combination with remote signaling contact (break contact).



DEHN BLITZDUCTORconnect 910710 Surge Protector Monitoring System Specifications	
Input Voltage Range (DC) (U_{IN})	6-35 VDC
Maximum Rated Current Consumption (I_{IN})	≤10mA
Distance Between Transmitter/Receiver and Reverse Unit (Max)	≤305mm [12in]
Message: Replacing of SPD Recommended	LED, remote signaling contact (break contact)
Indicator	Two-color LED (green, red)
Type of Remote Signaling Contact	Break contact (NC)
Technical Data for Remote Signaling Contact	Contact resistance < 2.5Ω; leakage current < 1µA
Switching Capacity (DC)	48V; 500mA, P_{max} 300mW
Test Cycle	Continuous
Operating Temperature Range (T_U)	-40°C to 80°C [-40°F to 176°F]
Degree of Protection	IP20
For Mounting On	35mm DIN rails acc. to EN 60715
Connection (Input / Output)	Push-in / push-in
Cross-Sectional Area, Solid	0.2-2.5 mm^2 (24-14 AWG)
Cross-Sectional Area, Flexible	0.2-2.5 mm^2 (24-14 AWG)
Enclosure Material	Polyamide PA 6.6
Color	Gray
Test Standards	EN 61010-1
Approvals	CSA, UL UL file # E508234 CSA file # 80066004 Displayed as BCO CL2
Package Includes	Transmitter-receiver unit / reverse unit
Weight	52g [1.83 oz]



DEHN Surge Protectors Accessories Replacement Modules

Red / Line Surge Arrester Type 2

Protection Modules for DEHNguard M UL Series

The varistor based protection modules of the DEHNguard SU/MU surge arresters distinguish themselves through their outstanding performance and sophistication.

The compact protection modules incorporate the complete protective circuit as well as the monitoring and disconnection device. A green flag in the inspection window indicates the availability of the protection modules.

All protection modules are mechanically coded to ensure against installing an incorrect module. The protection modules can be easily replaced without tools by simply pressing the user-friendly module release button.

Features

- High discharge capacity due to heavy-duty zinc oxide varistors (I_{max} 50 kA, 8x20 µs)
- ANSI / UL 1449 – 4th Ed. Open-Type 1 SPD (908xxx)
- High reliability due to "Thermo Dynamic Control" SPD monitoring device

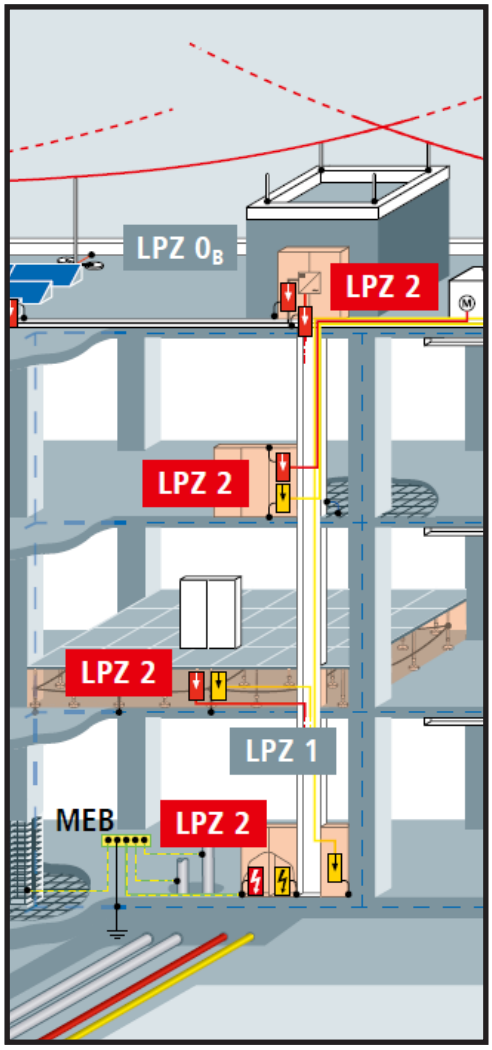
UL file numbers:
E319777
CSA file number: 215727

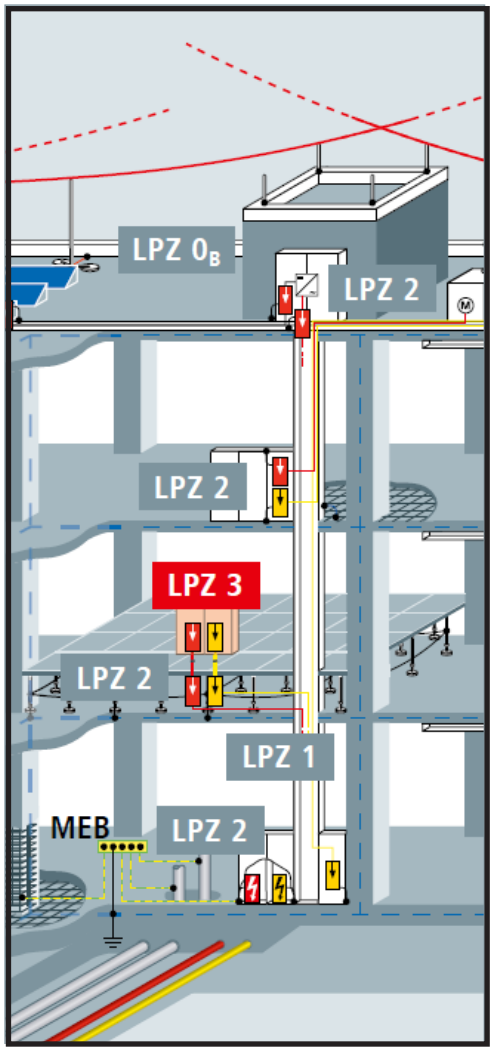
DEHNguard M UL Series Replacement Module Selection Chart						
Part Number	*Price*	*Type*	*Nominal Discharge Current (8/20 µs) (In)*	*Max. Discharge Current (Imax)*	*Max. Continuous Operating Voltage (AC) (UC)*	*Dimensional Drawing*
908011	$59.00	DG PLU 180	20kA	50kA	180V	PDF
908012	$56.00	DG PLU 230	20kA	50kA	230V	PDF
908010	$59.00	DG PLU 275	20kA	50kA	275V	PDF
908014	$59.00	DG PLU 385	20kA	50kA	385V	PDF
908013	$59.00	DG PLU 510	20kA	50kA	510V	PDF
908015	$59.00	DG PLU 550	20kA	50kA	550V	PDF

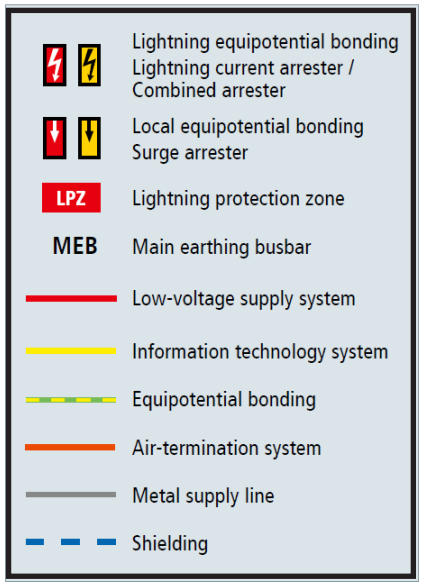
DEHNrail M 2P Series Replacement Module Selection Chart						
Part Number	*Price*	*Type*	*Nominal Discharge Current (8/20 µs) (In)*	*Total Discharge Current (8/20 µs) [L+N-PE] (Itotal)*	*Max. Continuous Operating Voltage (AC) (UC)*	*Dimensional Drawing*
953011	$42.50	DR MOD 30	1kA	2kA	30V	PDF
953012	$42.50	DR MOD 60	1kA	2kA	60V	PDF
953014	$42.50	DR MOD 150	2kA	4kA	150V	PDF
953010	$42.50	DR MOD 255	3kA	5kA	255V	PDF

DEHN Surge Protectors Definition of Terms

Lightning Protection Zones







IEC 62305-4:2010

Outer zones:

LPZ 0 Zone where the threat is due to the unattenuated lightning electromagnetic field and where the internal systems may be subjected to full or partial lightning surge current.

LPZ 0 is subdivided into the following:

LPZ 0A Zone where the threat is due to the direct lightning flash and the full lightning electromagnetic field. The internal systems may be subjected to full lightning surge current.

LPZ 0B Zone protected against direct lightning flashes but where the threat is the full lightning electromagnetic field. The internal systems may be subjected to partial lightning surge currents.

Inner zones

(protected against direct lightning flashes):

LPZ 1 Zone where the surge current is limited by current sharing and isolating interfaces and/or by SPDs at the boundary. Spatial shielding may attenuate the lightning electromagnetic field.

LPZ 2xxxn Zone where the surge current may be further limited by current sharing and isolating interfaces and/or by additional SPDs at the boundary. Additional spatial shielding may be used to further attenuate the lightning electromagnetic field.

DEHN Surge Protectors Definition of Terms

Continued

Surge Protective Devices (SPDs)
Surge protective devices are devices consisting mainly of voltage-controlled resistors (varistors, suppressor diodes) and / or spark gaps (discharge paths). Surge protective devices are used to protect other electrical equipment and installations against impermissibly high surges and/or to establish equipotential bonding.

Surge protective devices are classified as follows:

1) According to their use:

- Surge protective devices for power supply systems and equipment (Red/Line product family) for nominal voltage ranges up to 1000V
  - (According to EN 61643-11:2012 in type 1 / 2 / 3 SPDs)
  - (According to IEC 61643-11:2011 in class I / II / III SPDs)
- Surge protective devices for IT systems and equipment (Yellow/Line product family) for protecting modern electronic systems in telecommunications and signal-processing networks with nominal voltages up to 1000 VAC [root-mean-square value (rms)] and 1500 V d.c. against the indirect and direct effects of lightning strikes and other transients.
  - (According to IEC 61643-21:2012, EN 61643-21:2013 and DIN VDE 0845-3-1)
- Isolating spark gaps for earth-termination systems or equipotential bonding (Red/Line product family)
- Surge protective devices for use in photovoltaic installations (Red/Line product family) for nominal voltage ranges up to 1500 V
  - (According to EN 50539-11:2013 as type 1 / 2 SPDs)

2) According to their impulse current discharge capacity and protective effect:

- Lightning current arresters / Coordinated lightning current arresters for interference resulting from direct or nearby lightning strikes for protecting installations and equipment [for use at the boundaries between lightning protection zones (LPZ) 0A and 1].
- Surge arresters for remote lightning strikes, switching overvoltages as well as electrostatic discharges for protecting installations, equipment and terminal devices (for use at the boundaries downstream of LPZ 0B).
- Combined lightning current and surge arresters for interference resulting from direct or nearby lightning strikes for protecting installations, equipment and terminal devices (for use at the boundaries between LPZ 0A and 1 as well as 0A and 2).

Technical data
The technical data of surge protective devices comprise information defining their conditions of use according to:

- Use (e.g. installation, power supply conditions, temperature)
- Performance in case of interference (e.g. impulse current discharge capacity, follow current extinguishing capability, voltage protection level, response time)
- Performance during operation (e.g. nominal current, attenuation, insulation resistance)
- Performance in case of failure (e.g. backup fuse, disconnection device, fail-safe, remote signalling option).

Surge arrester
Term meaning as determined by the National Electrical Code® (NEC®) (www.nfpa.org), the UL listing, and applicable IEEE/ANSI standards. Surge arresters less than 1000V have been called secondary surge arresters. Going forward they are now considered a Type 1 SPD and listed in Article 242 of the 2020 NEC. Surge arresters were originally developed and applied to the power distribution system to protect utility supplied equipment and building wiring. Surge arresters were intended to protect the system structure and not necessarily the connected equipment and loads. Secondary surge arresters (now known as Type 1 SPDs) are generally intended to be installed on the line side of the main service disconnect overcurrent device (service equipment).

Breaking capacity, follow current extinguishing capability I_{fi}
The breaking capacity is the uninfluenced (prospective) r.m.s. value of the mains follow current which can automatically be extinguished by the surge protective device when connecting U_C. It can be proven in an operating duty test according to IEC/EN 61643-11.

Categories according to IEC 61643-21:2012
A number of impulse voltages and impulse currents are described in IEC 61643-21:2012 for testing the current carrying capability and voltage limitation of impulse interference. Table 3 of this standard lists these into categories and provides preferred values. In Table 2 of the IEC 61643-22 standard the sources of transients are assigned to the different impulse categories according to the decoupling mechanism. Category C2 includes inductive coupling (surges), category D1 galvanic coupling (lightning currents). The relevant category is specified in the technical data.

DEHN surge protective devices surpass the values in the specified categories. Therefore, the exact value for the impulse current carrying capability is indicated by the nominal discharge current (8/20 µs) and the lightning impulse current (10/350 µs).

Combination wave U_{OC}
A combination wave is generated by a hybrid generator (1.2/50 µs, 8/20 µs) with a fictitious impedance of 2 Ω. The open-circuit voltage of this generator is referred to as U_{OC}. U_{OC} is a preferred indicator for type 3 arresters since only these arresters may be tested with a combination wave (according to IEC/EN 61643-11).

Cut-off frequency f_G
The cut-off frequency defines the frequency-dependent behavior of an arrester. The cut-off frequency is equivalent to the frequency which induces an insertion loss (a_E) of 3 dB under certain test conditions (see EN 61643-21:2013). Unless otherwise indicated, this value refers to a 50Ω system.

Degree of protection
The IP degree of protection corresponds to the protection categories described in IEC/EN 60529.

Disconnecting time t_a
The disconnecting time is the time passing until the automatic disconnection from power supply in case of a failure of the circuit or equipment to be protected. The disconnecting time is an application-specific value resulting from the intensity of the fault current and the characteristics of the protective device.

Energy coordination of SPDs
Energy coordination is the selective and coordinated interaction of cascaded protection elements (= SPDs) of an overall lightning and surge protection concept. This means that the total load of the lightning impulse current is split between the SPDs according to their energy carrying capability. If energy coordination is not possible, downstream SPDs are insufficiently relieved by the upstream SPDs since the upstream SPDs operate too late, insufficiently or not at all. Consequently, downstream SPDs as well as terminal equipment to be protected may be destroyed.

DIN CLC/TS 61643-12:2010 describes how to verify energy

DEHN Surge Protectors Definition of Terms

Continued

coordination. Spark-gap-based type 1 SPDs offer considerable advantages due to their voltage-switching characteristic (see WAVE BREAKER FUNCTION).

Frequency range
The frequency range represents the transmission range or cut-off frequency of an arrester depending on the described attenuation characteristics.

Integrated backup fuse
According to the product standard for SPDs, overcurrent protective devices/backup fuses must be used. This, however, requires additional space in the distribution board, additional cable lengths, which should be as short as possible according to IEC 60364-5-53, additional installation time (and costs) and dimensioning of the fuse. A fuse integrated in the arrester ideally suited for the impulse currents involved eliminates all these disadvantages. The space gain, lower wiring effort, integrated fuse monitoring and the increased protective effect due to shorter connecting cables are clear advantages of this concept which is integrated in the DEHNvenCI, DEHNbloc Maxi S, DEHNguard ... CI and V(A) NH product families.

LifeCheck
Repeated discharge processes which exceed the specification of the device can overload arresters in information technology systems. In order to ensure high system availability, arresters should therefore be subjected to systematic tests. LifeCheck allows quick and easy testing of arresters.

Lightning impulse current I_{imp}
The lightning impulse current is a standardized impulse current curve with a 10/350 µs wave form. Its parameters (peak value, charge, specific energy) simulate the load caused by natural lightning currents. Lightning current and combined arresters must be capable of discharging such lightning impulse currents several times without being destroyed.

Mains-side overcurrent protection / arrester backup fuse
Overcurrent protective device (e.g. fuse or circuit breaker) located outside of the arrester on the infeed side to interrupt the power-frequency follow current as soon as the breaking capacity of the surge protective device is exceeded. No additional backup fuse is required since the backup fuse is already integrated in the SPD.

Maximum continuous operating voltage U_C
The maximum continuous operating voltage (maximum permissible operating voltage) is the r.m.s. value of the maximum voltage which may be connected to the corresponding terminals of the surge protective device during operation. This is the maximum voltage on the arrester in the defined non-conducting state, which reverts the arrester back to this state after it has tripped and discharged. The value of U_C depends on the nominal voltage of the system to be protected and the installer's specifications (IEC 60364-5-534).

Maximum discharge current Imax
The maximum discharge current is the maximum peak value of the 8/20 µs impulse current which the device can safely discharge.

Maximum transmission capacity
The maximum transmission capacity defines the maximum high-frequency power which can be transmitted via a coaxial surge protective device without interfering with the protection component.

Nominal discharge current In
The nominal discharge current is the peak value of a 8/20 µs impulse current for which the surge protective device is rated in a certain test program and which the surge protective device can discharge several times.

Nominal load current (nominal current) I_L
The nominal load current is the maximum permissible operating current which may permanently flow through the corresponding terminals.

Nominal voltage U_N
The nominal voltage stands for the nominal voltage of the system to be protected. The value of the nominal voltage often serves as type designation for surge protective devices for information technology systems. It is indicated as an RMS value for AC systems.

N-PE arrester
Surge protective devices exclusively designed for installation between the N and PE conductor.

Operating temperature range T_U
The operating temperature range indicates the range in which the devices can be used. For non-self-heating devices, it is equal to the ambient temperature range. The temperature rise for self-heating devices must not exceed the maximum value indicated.

Protective circuit
Protective circuits are multi-stage, cascaded protective devices. The individual protection stages may consist of spark gaps, varistors, semiconductor elements or gas discharge tubes (see energy coordination).

Protective conductor current I_{PE}
The protective conductor current is the current which flows through the PE connection when the surge protective device is connected to the maximum continuous operating voltage UC, according to the installation instructions and without load-side consumers.

Remote signalling contact
A remote signalling contact allows easy remote monitoring and indication of the operating state of the device. It features a three-pole terminal in the form of a floating changeover contact. This contact can be used as break and / or make contact and can thus be easily integrated in the building control system, controller of the switchgear cabinet, etc.

Response time t_A
Response times mainly characterise the response performance of individual protection elements used in arresters.

DEHN Surge Protectors Definition of Terms

Continued

Return loss
In high-frequency applications, the return loss refers to how many parts of the "leading" wave are reflected at the protective device (surge point). This is a direct measure of how well a protective device is attuned to the characteristic impedance of the system.

Series resistance
Resistance in the direction of the signal flow between the input and output of an arrester. The series resistance is normally used to coordinate the protection stages in a multi-stage SPD.

Shield attenuation
Relation of the power fed into a coaxial cable to the power radiated by the cable through the phase conductor.

Short-circuit withstand capability
The short-circuit withstand capability is the value of the prospective power-frequency short-circuit current handled by the surge protective device when the relevant maximum backup fuse is connected upstream.

Temporary overvoltage (TOV)
Temporary overvoltage may be present at the surge protective device for a short period of time due to a fault in the high-voltage system. This must be clearly distinguished from a transient caused by a lightning strike or a switching operation, which last no longer than about 1 ms. The amplitude U_T and the duration of this temporary overvoltage are specified in EN 61643-11 (200ms, 5s or 120min) and are individually tested for the relevant SPDs according to the system configuration (TN, TT, etc.). The SPD can either a) reliably fail (TOV safety) or b) be TOV-resistant (TOV withstand), meaning that it is completely operational during and following temporary overvoltages.

Thermal disconnector
Surge protective devices for use in power supply systems equipped with voltage-controlled resistors (varistors) mostly feature an integrated thermal disconnector that disconnects the surge protective device in case of overload and indicates this operating state. The disconnector responds to the "current heat" generated by an overloaded varistor and disconnects the surge protective device if a certain temperature is exceeded. The disconnector is designed to disconnect the overloaded surge protective device in time to prevent a fire. It is not intended to ensure protection against indirect contact. The function of these thermal disconnectors can be tested by means of a simulated overload / ageing of the arresters.

Total discharge current I_{total}
Current which flows through the PE, PEN or earth connection of a multipole SPD during the total discharge current test. This test is used to determine the total load if current simultaneously flows through several protective paths of a multipole SPD. This parameter is decisive for the total discharge capacity which is reliably handled by the sum of the individual paths of an SPD.

Voltage protection level U_p
The voltage protection level of a surge protective device is the maximum instantaneous value of the voltage at the terminals of a surge protective device, determined from the standardized individual tests:

- Lightning impulse sparkover voltage 1.2/50 µs (100%)
- Sparkover voltage with a rate of rise of 1 kV/µs
- Measured limit voltage at a nominal discharge current In

The voltage protection level characterizes the capability of a surge protective device to limit surges to a residual level. The voltage protection level defines the installation location with regard to the overvoltage category according to IEC 60664-1 in power supply systems. For surge protective devices to be used in information technology systems, the voltage protection level must be adapted to the immunity level of the equipment to be protected (IEC 61000-4-5: 2015).

Wave breaker function
Due to the technical design of type 1 SPDs, energy coordination of SPDs considerably varies. Experience has shown that even small amplitudes of the 10/350 µs lightning impulse current overload downstream SPDs or even destroy them if varistor-based type 1 lightning current arresters are used. In case of spark-gap-based type 1 arresters, in contrast, virtually the total current flows through the type 1 arrester. Similar to a wave breaker the energy is reduced to an acceptable level. The advantage is that the time to half value of the 10/350 µs impulse current is reduced due to the reduction of the impulse time and the switching behavior of type 1 SPDs. This considerably relieves downstream SPDs. All devices of the DEHN Red/Line and Yellow/Line product family are energy-coordinated. Moreover, all type 1 arresters of the Red/Line family are based on spark gaps and thus feature this WAVE BREAKER FUNCTION.

Yellow/Line SPD class
All DEHN arresters for use in information technology systems are categorized into a Yellow/Line SPD class and are marked with the corresponding symbol in the data sheet and on the rating plate.

Murrelektronik
Universal Surge Suppressors for Contactors

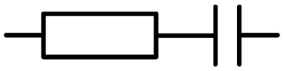
26051

Features

- Protects systems and devices from induced voltage peaks
- Install as close as possible to the source of interference
- RC elements must not be operated with a frequency converter (variable frequency drive)
- Select models can be snapped onto Siemens contactors

Murrelektronik Universal Surge Suppressors for Contactors Selection Guide

Part Number	Price	Type	Nominal Voltage	Voltage Range	Frequency	Shutdown Peak Voltage	Max Hold On Power	Max Switch Frequency	Circuit Diagram	Phases	Sub-Component Values	Weight (g [oz])	Drawing
26051	$8.75	Zener diode	≤24VDC	12-30 VDC	–	≤16VDC	15W	0.5 Hz	3	1	GP15M/ ZY15V	12 [0.42]	PDF
26180	$8.75	Varistor	≤24VDC	≤25VAC, ≤30VDC	0-60 Hz	≤55V	50W	0.1 Hz	5	1	S07	15 [0.53]	PDF
26181	$8.75	Varistor	≤48V AC/DC	24-48 VAC/VDC	0-60Hz	≤130V	70W	0.1 Hz	5	1	S14	15 [0.53]	PDF
26182	$9.00	Varistor	≤110V AC/DC	48-130 VAC/VDC	0-60 Hz	≤225V	100W	0.1 Hz	5	1	S14	15 [0.53]	PDF
26183	$9.00	Varistor	≤230V AC/DC	110-250 VAC/VDC	0-60 Hz	≤410V	200W	0.1 Hz	5	1	S14	15 [0.53]	PDF
20001	$9.25	RC	≤48V AC/DC	24-60 VAC/VDC	0-60 Hz	≤110.4 V	15W	0.5 Hz	1	1	1.6 uF/100R	13 [0.46]	PDF
22052	$9.25	RC	≤230V AC/DC	127-240 VAC/VDC	0-60 Hz	≤529 V	15W	0.1 Hz	1	1	0.22µF/100R	12 [0.42]	PDF
22051	$9.25	RC	≤110V AC/DC	48-127 VAC/VDC	0-60 Hz	≤253V	15W	0.1 Hz	1	1	0.47µF/100R	12 [0.42]	PDF
20010	$9.25	RC	≤230V AC/DC	110-230 VAC/VDC	0-60 Hz	≤460V	75W	0.5 Hz	1	1	0.68µF/220R	27 [0.95]	PDF



1 – RC

3 – Diode / Z-diode

5 – VDR

Murrelektronik Universal Surge Suppressors for Contactors Mounting and Connections

Part Number	Wire	UL Style	Mounting	Connection	Connection Size
26051	AWG22	1007	Can snap onto Siemens contactors	Pigtail with fork cable lug	M3-M4
26180	AWG22	1007	With cable ties or adhesive film	Pigtail with fork cable lug	M3-M4
26181	AWG22	1007	With cable ties or adhesive film	Pigtail with fork cable lug	M3-M4
26182	AWG22	1007	With cable ties or adhesive film	Pigtail with fork cable lug	M3-M4
26183	AWG22	1007	With cable ties or adhesive film	Pigtail with fork cable lug	M3-M4
20001	AWG22	1007	With cable ties or adhesive film	Pigtail with fork cable lug	M3-M4
22052	AWG22	1007	Can snap onto Siemens contactors	Pigtail with fork cable lug	M3-M4
22051	AWG22	1007	Can snap onto Siemens contactors	Pigtail with fork cable lug	M3-M4
20010	AWG22	1007	With cable ties or adhesive film	Pigtail with fork cable lug	M3-M4

Fork cable lug

Murrelektronik Universal Surge Suppressors Specifications

Ambient Temperature Range	-20°C to +60°C [-4°F to +140°F]
Storage Temperature	-55°C to +80°C [-67°F to 176°F]
Installation Height (above mean sea level)	≤2000 m
Relative Humidity (no condensation)	5 to 85 %
Climatic Class	3K3
Degree of Pollution	3
Overvoltage Category	III
Housing Material	Plastic
Flame Resistance	EN60695 (of low flammability)
Flammability	UL94 (V0)
Agency Approvals	CE (2011/65/EU), cURus (UL508, C22.2 No. 14-10) (E140415), RoHS (2011/65/EU & 2015/863), EAC (TR CU 004, TR CU 020) (RUC-DE.A301.B.03875), REACH (Nr. 1907/2006) (SVHC List 01.2020), WEEE (2012/19/EU), China RoHS(SJ/T 11364-2014) (e / 20 EPUP)

Murrelektronik Surge Suppressors for Motors

MURR ELEKTRONIK
stay connected

23050

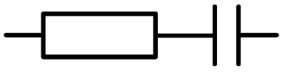
Features

- Protects systems and devices from induced voltage peaks
- Install as close as possible to the motor / source of interference
- RC elements must not be operated with a frequency converter (variable frequency drives)

c UL us

Murrelektronik Surge Suppressors for Motors Selection Guide

Part Number	Price	Type	Nominal Voltage	Voltage Range	Frequency	Shutdown Peak Voltage	Motor Rating	Max Switch Frequency	Circuit Diagram	Phases	Sub-Component Values	Weight (g [oz])	Drawing
23050	$28.50	RC	575VAC	3 x 400-575 VAC	50/60 Hz	≤850V	4kW / 5HP	1Hz	1	3	0.22µF / 220R	38 [1.34]	PDF
230563	$44.50	RC	575VAC	575...575 VAC	50/60 Hz	≤950V	7.5 kW / 10HP	0.1 Hz	1	3	0.47µF / 220R	146 [5.15]	PDF
23146	$53.00	Varistor	575VAC	575...575 VAC	10-400 Hz	≤1050V	20kW / 25HP	0.5 Hz	5	3	S20	75 [2.65]	PDF

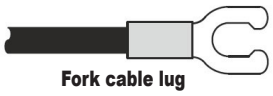


1 – RC

5 – VDR

Murrelektronik Surge Suppressors for Motors Mounting and Connections

Part Number	Wire	UL Style	Mounting	Connection	Connection Size
23050	AWG22	1015	With adhesive film or snap-on DIN rail with adapter	Fork cable lug	M4
230563	AWG20	1015	Can be snapped onto a 35mm DIN rail	Wire end ferrule Length: 10mm Cable length 250mm ±5mm	10mm
23146	AWG18	1015	M20x1.5 thread for direct connection to the terminal box of the motor Thread length: 10mm	Cable with ring lug Cable length 150mm	M6



Fork cable lug

Wire end ferrule

Ring cable lug

Murrelektronik Surge Suppressors for Motors Specifications

Ambient Temperature Range	-20°C to +60°C [-4°F to +140°F]
Storage Temperature	-55°C to +80°C [-67°F to 176°F]
Installation Height (above mean sea level)	≤2000 m
Relative Humidity (no condensation)	5 to 85 %
Climatic Class	3K3
Degree of Pollution	3
Overvoltage Category	III
Housing Material	Plastic
Flame Resistance	EN60695 (of low flammability)
Flammability	UL94 (V0)
Agency Approvals	CE (2011/65/EU), cURus (UL508, C22.2 No. 14-10) (E338196, E140415), RoHS (2011/65/EU & 2015/863), EAC (TR CU 004, TR CU 020) (RUC-DE.A301.B.03875), REACH (Nr. 1907/2006) (SVHC List 01.2020), WEEE (2012/19/EU), China RoHS(SJ/T 11364-2014) (e / 20 EPUP)

Murrelektronik
Surge Suppressors for Solenoid Valve Plugs

3124270

Features

- For valves (Form A, B, C, CI)
- Yellow LED "Supply Voltage Indicator"
- Protects systems and devices from induced voltage peaks
- Ideal for retrofit
- Mounts between valve and cable

Not UL

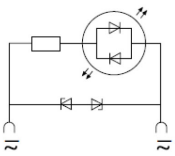
Murrelektronik Surge Suppressors for Solenoid Valve Plugs Selection Guide

Part Number	Price	Type	Nominal Voltage (VAC/VDC)	Voltage Range (VAC/VDC)	Frequency	Shutdown Peak Voltage	Max Hold On Power	Max Switch Frequency	Circuit Diagram	Drop Delay Time	Sub-Component Values	Phase	Indication	Weight g [0z]	Drawing
3124033	$11.00	Zener diode	24	18-30	0-60 Hz	50V	100W	0.1 Hz	1	20ms	ZY-47	1	LED (yellow)	15 [0.53]	PDF
3124046	$11.00	Varistor	110	48-130	0-60 Hz	220V	100W	0.1 Hz	2	20ms	S14 K130	1	LED (yellow)	25 [0.88]	PDF
3124233	$13.00	Zener diode	24	18-30	0-60 Hz	50V	100W	0.1 Hz	1	20ms	ZY-47	1	LED (yellow)	10 [0.35]	PDF
3124270	$13.00	RC	110	48-130	0-60 Hz	220V	10W	0.1 Hz	3	20ms	0.22µF/ 220R	1	LED (yellow)	10 [0.35]	PDF
3124873	$15.50	Zener diode	24	18-30	0-60 Hz	55V	100W	0.1 Hz	1	20ms	ZY-47	1	LED (yellow)	12 [0.42]	PDF
3124133	$15.50	Zener diode	24	18-30	0-60 Hz	47V	50W	0.1 Hz	1	20ms	S07 K25	1	LED (yellow)	15 [0.53]	PDF
3124170	$15.50	RC	110	95-132	0-60 Hz	165V	10W	0.1 Hz	3	20ms	0.15µF/ 220R	1	LED (yellow)	13 [0.46]	PDF
3124833	$15.50	Zener diode	24	18-30	0-60 Hz	50V	100W	0.1 Hz	1	20ms	ZY-47	1	LED (yellow)	5 [0.18]	PDF
3124832	$15.50	Zener diode	24	18-30	0-60 Hz	50V	100W	0.1 Hz	1	20ms	ZY-47	1	LED (yellow)	5 [0.18]	PDF

Murrelektronik Surge Suppressors for Solenoid Valve Plugs Mounting and Connections

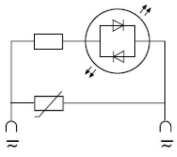
Part Number	Mounting	Orientation	Terminal Spacing (mm [in])	Connection
3124033	Attachable to valve	Vertical	18 [0.71]	For use with 18mm DIN style Form A plug
3124046		Vertical	18 [0.71]	For use with 18mm DIN style Form A plug
3124233		Vertical	11 [0.43]	For use with11mm DIN style Form B plug
3124270		Vertical	11 [0.43]	For use with 11mm DIN style Form B plug
3124873		Horizontal	10 [0.39]	For use with 10mm DIN style Form B plug
3124133		Horizontal	11 [0.43]	For use with 11mm DIN style Form B plug
3124170		Horizontal	11 [0.43]	For use with 11mm DIN style Form B plug
3124833		Vertical	8 [0.31]	For use with 8mm DIN style Form C plug
3124832		Vertical	9.4 [0.37]	For use with 9.4 mm DIN style Form CI plug

Circuit Diagrams



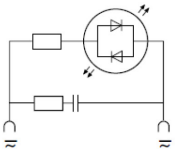
LED + Zener Diode

Diagram 1



LED + VDR

Diagram 2



LED + RC

Diagram 3

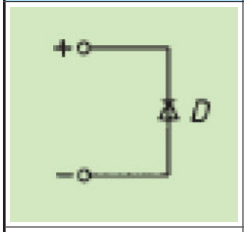
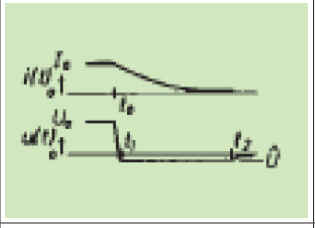
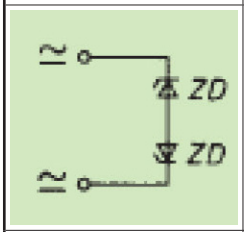
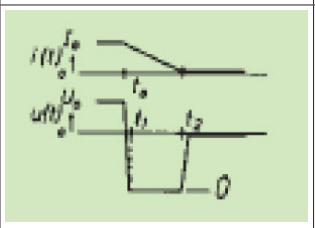
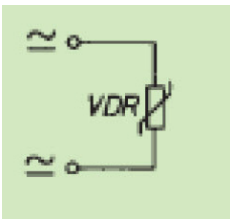
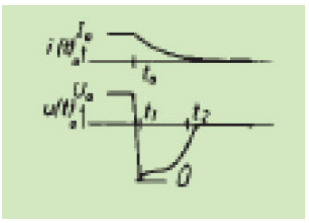
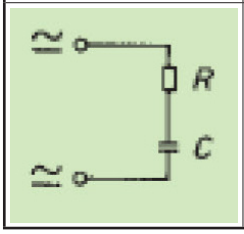
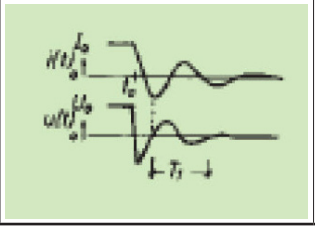
Murrelektronik Surge Suppressors for Solenoid Valve Plugs Specifications

Ambient Temperature Range	-20°C to +60°C [-4°F to +140°F]
Storage Temperature	-55°C to +80°C [-67°F to 176°F]
Installation Height (above mean sea level)	≤2000 m
Relative Humidity (no condensation)	5 to 85 %
Climatic Class	IEC/EN60721-3-3, 3K3
Degree of Protection	EN 60529 (IP65 fastened with screw when assembled), IP65
Degree of Pollution	3
Overvoltage Category	III
Housing Material	Polyamide black, flame retardant, temperature resistance up to 130°C
Flame Resistance	EN60695 (of low flammability)
Flammability	UL94 (V0)
Agency Approvals	CE (2011/65/EU) (EU-Doc), RoHS (2011/65/EU & 2015/863), EAC (TR CU 004, TR CU 020) (RUC-DE.A301.B.03875), REACH (Nr. 1907/2006) (SVHC List 01.2020), WEEE (2012/19/EU), China RoHS(SJ/T 11364-2014) (e / 20 EPUP)

Murrelektronik Surge Suppressors

MURR ELEKTRONIK
stay connected

Comparison of Different Types of Suppressors

Circuit	*Characteristics of Bad Current and Voltage*	*Incorrect Polarity Protection (Also Suitable for AC)*	*Additional Switch-off Delay*	*Back EMF Limitation*	*Damping Also Occurs Below U_{Limit}*	*Advantages and Disadvantages*
		No	Very large	1V	No	***Advantages:*** Matches wide range of loads Best possible damping Simple construction ***Disadvantages:*** Long delay time
		Yes	Small	U_{ZD}	No	***Advantages:*** Limits positive and negative voltages Suitable for AC and DC Matches wide range of loads ***Disadvantages:*** No damping below U_{ZD}
		Yes	Small	U_{VDR}	No	***Advantages:*** Matches wide range of loads High energy absorption Very simple construction ***Disadvantages:*** No damping below U_{VDR} Limited lifespan
		Yes	Small	1.5 x U_{NOM}	Yes	***Advantages:*** HF damping due to RC network Immediate de-energization Excellent results with AC ***Disadvantages:*** Must be matched to the load Limited lifespan

EATON AEGIS Powerline Filters

The AEGIS Series Powerline filters/surge protectors are specifically designed to protect against the full spectrum of transient disturbances and are engineered to filter the entire sine wave. The Powerline filters are designed to react instantly to changes in voltage regardless of phase angle or polarity. As a result, AEGIS devices are effective against both low- and high-energy transients to prevent immediate equipment damage and failure of sensitve electronic equipment over time. Select the hybrid (ADPH) when the equipment value requires the highest level of RFI/EMI protection.

Features

- Compact design
- DIN rail included 35 mm
- Meets latest UL safety standards for SPD (surge protective device) and EMI filtering protection
- Contains no replaceable parts or items that require periodic maintenance
- Alarm contact available (ADPH series only)
- 10-year warranty
- UL1449 3rd Ed – Type 2 SPD

ADPH12010

Applications

- Process control systems
- Operator interface stations
- Programmable logic controllers (PLCs)
- Scanning devices
- Automatic teller machines (ATMs)
- Cash registers
- Alarm systems
- Robotics
- Control equipment
- CAD/CAM systems

Standards and Certifications

- cURus E316410
- CSA 163545
- UL 1449 Third Edition
- UL 1283 Fifth Edition
- Built in an ISO9001 facility
- Designed and tested in accordance with:
  - IEEE C62.41.1
  - IEEE C62.41.2
  - IEEE C62.43-2005
  - IEEE C62.45-2002
  - IEEE C62.48-2005
  - IEEE C62.62-2010
- RoHS compliant

AEGIS Powerline Filters

Part Number	Description	Price
ADPV12001	120VAC input, 1A w/LED	$247.00
ADPV12003	120VAC input, 3A w/LED	$284.00
ADPV12005	120VAC input, 5A w/LED	$337.00
ADPV24001	240VAC input, 1A w/LED	$261.00
ADPV24003	240VAC input, 3A w/LED	$293.00
ADPV24005	240VAC input, 5A w/LED	$347.00
ADPH12010	Hybrid filter, 120VAC input, 10A w/LED and alarm contacts	$521.00
ADPH12015	Hybrid filter, 120VAC input, 15A w/LED and alarm contacts	$697.00
ADPH24010	Hybrid filter, 240VAC input, 10A w/LED and alarm contacts	$531.00
ADPH24015	Hybrid filter, 240VAC input, 15A w/LED and alarm contacts	$707.00

ADPV12003

EATON AEGIS Powerline Filters

Technical Specifications

AEGIS Powerline Filters Technical Specifications				
	ADPH120xx	***ADPH240xx***	***ADPV120xx***	***ADPV240xx***
Input voltage range	100-127 VAC	200-240 VAC	100-127 VAC	200-240 VAC
Amperage	10A, 15A		1A, 3A, 5A	
Frequency	50/60 Hz		50/60 Hz	
Protection modes	L-N, L-G, N-G		L-N, L-G, N-G	
Max continuous operations voltage (MCOV)	150V	275V	150V	275V
EMI/RFI filtering attenuation	75dB at 110kHz		50dB at 100kHz	
Filter bandwidth	10kHz to 100MHz		10kHz to 100MHz	
Peak surge current per phase/mode	60/30 kA		40/20 kA	
UL nominal discharge current	5kA		5kA	
(VPR) UL voltage protection rating L-N / L-G / N-G	400/330/330	700/600/600	400/330/330	700/600/600
Operating temperature	-40°C to + 50°C [-40°F to 122°F]		-40°C to + 50°C [-40°F to 122°F]	
Response time	< 1 nanosecond		< 1 nanosecond	
Status indicator	LED		LED	
Alarm contacts	Yes (form C)		No	
SCCR	5kA		5kA	
Product weight	1.77 lb [0.80 kg]		1.15 lb [0.52 kg]	
Wire gauge range	22-10 AWG stranded copper for input/output terminals		22-10 AWG stranded copper for input/output terminals	
	30-18 AWG stranded/solid copper alarm contacts		–	
Torque Specs	9 lb·in [1.02 N·m] for input/output terminals		9 lb·in [1.02 N·m] for input/output terminals	
	4 lb·in [0.45 N·m] alarm contacts terminals		–	
Environment protection ratings	NEMA 1		NEMA 1	
Component Material Type	Plastic enclosure, type 950, rated UL94 V-0		Plastic enclosure, type 950, rated UL94 V-0	
Alarm contact ratings*	8A @ 250VAC / 30VDC		–	
Input/output terminal size range for ferrules and ring/fork	#6 stud size, 1/4" OD max			
Alarm contacts terminal size range for ferrules and ring/fork terminals	#4 stud size, 3/16" OD max		–	
Mounting	(35 mm) DIN rail mountable. No mounting orientation restrictions.			

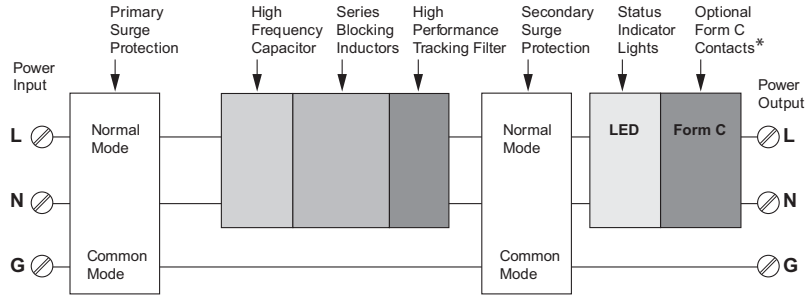
**Alarm contact and LED activation indicates power at output terminals.*

Maximum EMI/RFI Attenuation – MIL-STD-220						
Model	***10kHz***	***100kHz***	***1MHz***	***10MHz***	***100MHz***	***Max Attenuation Frequency***
ADPH120xx	30dB	74dB	76dB	37dB	36dB	101dB at 0.5 MHz
ADPV120xx	27dB	56dB	55dB	36dB	28dB	66dB at 0.085 MHz

Let-Through Voltages Based on IEEE Std. C62.62-2010 Testing Waveforms		
Model	***ADPH120xx***	***ADPV120xx***
IEEE Category A, 100kHz ring wave, 6000V, 200A	25V	30V
IEEE Category B, 100kHz ring wave, 6000V, 500A	35V	40V
IEEE Category B, 100kHz ring wave, 6000V, 3000A (UL 1449-3 VPR)	360V	370V

Note: All tests conducted on 120VAC units only.

Three-wire design has normal and common mode protection (L-N, L-G, N-G)



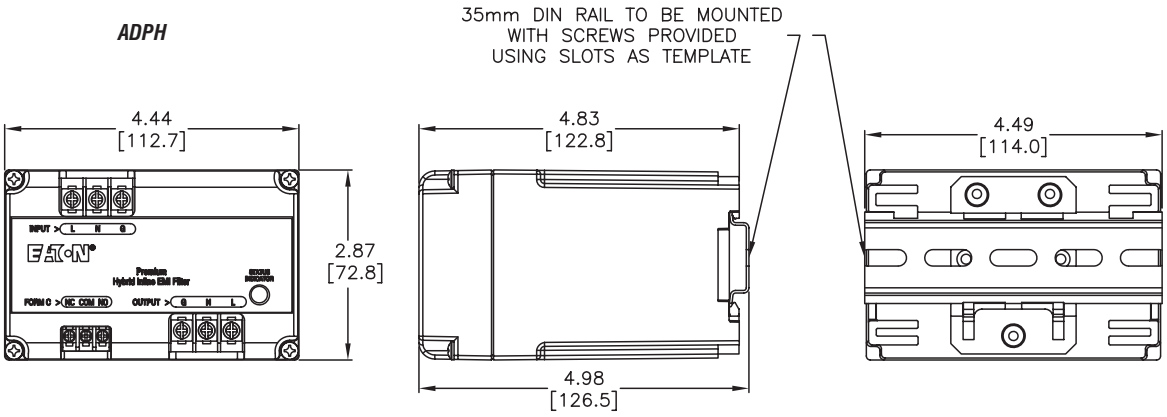
**Available on the PH series only.*

EATON AEGIS Powerline Filters

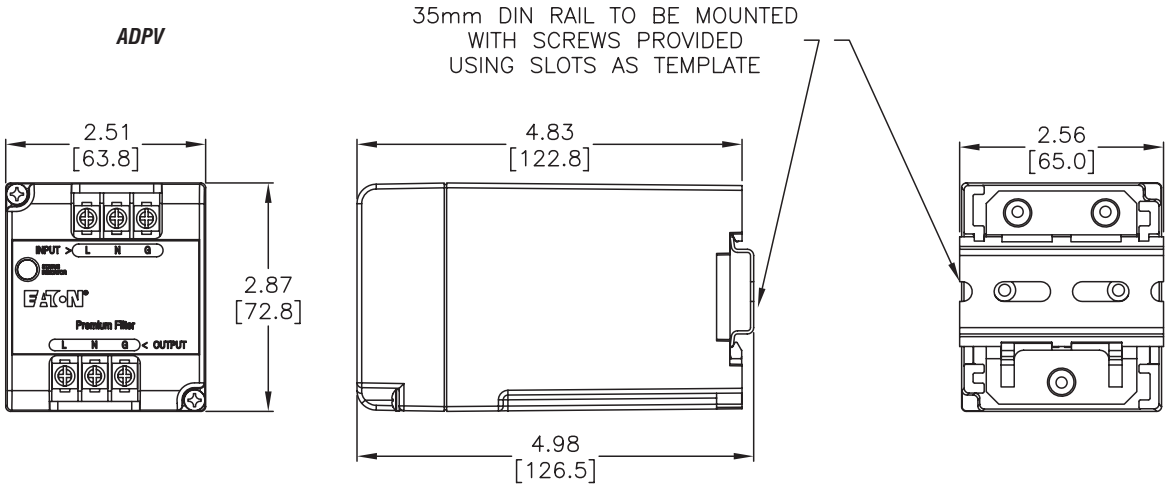
Dimensions

in [mm]

ADPH

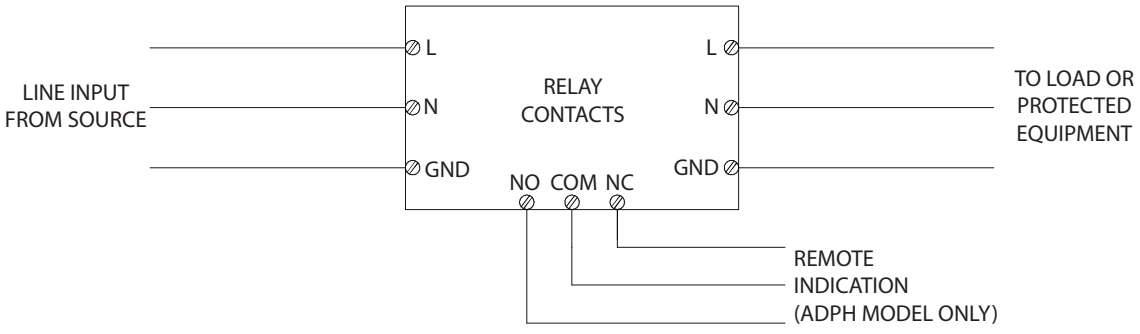


ADPV



See our website: www.AutomationDirect.com for complete engineering drawings

Wiring Diagram



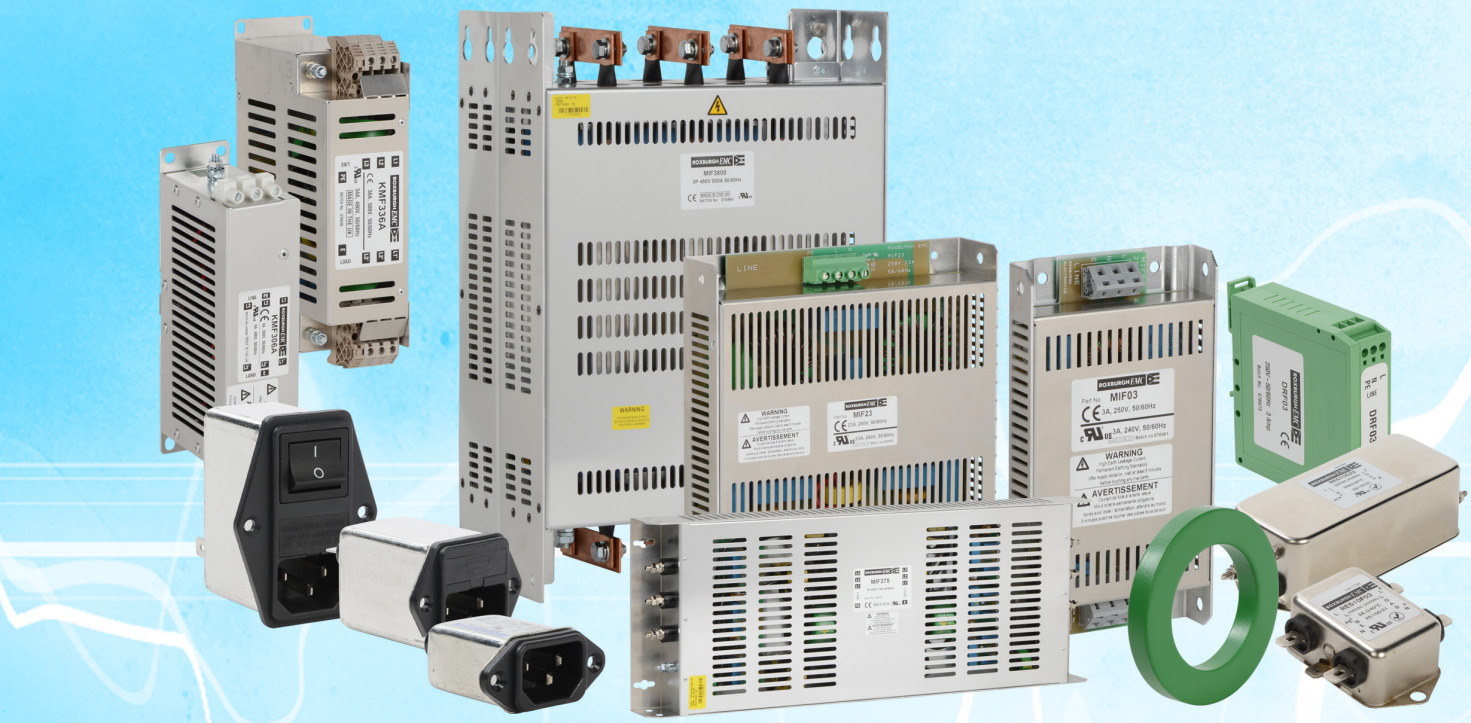
What are EMI filters and why do you need them?

EMI, or ElectroMagnetic Interference, is commonly referred to as electrical noise. RFI, or Radio Frequency Interference, is also electrical noise, but only certain frequencies.

EMI can interfere with many industrial applications involving communications, analog and digital signaling, and sensitive test and measurement equipment.

Sources of EMI noise include AC and DC drives, servo drives, switching power supplies, contactors/solenoids, lightning, static electricity, and many other devices with power electronics.

For more information on EMI and RFI, and ways to reduce their effects on your control system, please read our noise mitigation checklist: http://support.automationdirect.com/docs/emi_mitigation.pdf



One of the most effective ways of reducing EMI problems (or preventing them before they occur is to use specially designed EMI filters. We offer a wide selection of filters for most applications.

Roxburgh KMFA Series High Performance Three-phase Drive Filters

Roxburgh MIF3 Series Very High Performance Three-phase Drive Filters

Roxburgh KMFV Series High Performance 575V Three-Phase Drive Filters

Roxburgh RES90 Series Single-phase Drive Filters Roxburgh MIF Series

Very High Performance Single-phase Drive Filters Roxburgh RES10 Series

Single-phase General Purpose Filters

Roxburgh RES70 Series High Performance Single-phase General Purpose Filters

Roxburgh DRF Series DIN Rail Mount Single-phase General Purpose Filters

Roxburgh RID Series Power Entry Module with Filter

Roxburgh RIR Series Power Entry Module with Filter and Fuse

Roxburgh RIP/RIQ Series Power Entry Module with Filter, Fuse and Switch

Roxburgh Toroid Ferrite Cores General Purpose Filters

How do you choose a filter? There are several decision criteria

Single phase or 3-phase?

Many drive applications will have a filter installed above the 3-phase drive to keep noise from being introduced back into the rest of the system. Many systems will also have filters installed just in front of the critical single-phase control systems like PCs, PLCs, and sensitive measuring equipment.

Drive-rated or General Purpose?

Drive-rated filters are designed to attenuate noise typically associated with the high switching frequencies and harmonics generated by AC drives. If you have a drive in your system, you should choose a drive-rated filter for installation on the supply side of the drive. All of our GS series AC drives have specific recommendations for which filters to use (no guesswork). If your application has communication or sensitive test/measurement equipment, you should install a General Purpose filter to eliminate noise issues from other equipment reaching your sensitive components.

Performance Level

There are several performance levels for EMI filters: Standard performance, High Performance, Very High Performance. The number of stages in a filter is a good indication of how high the performance level will be. A Standard Performance filter will generally be a single-stage filter.

High Performance filters will usually be two-stage designs, and Very High Performance filters will have multi-stage designs.

How do you choose performance level? If you have access to specialized noise detection equipment (spectrum analyzer, Oscilloscope with FFT functionality, etc.), you can measure the noise in/around your application and choose a filter that will suppress that level of disturbance (see the filter data sheets for attenuation curves). This kind of measurement equipment is not something that most people have access to, so here are some guidelines to selecting the correct filter.

AutomationDirect offers two performance levels of filters in each category. If you have any of these conditions, you should probably use the higher level filter:

- Long cables between motor and drive
- Long signal cables (communication, analog signal, etc.)
- Drive and PC/PLC in the same control enclosure
- Control components located near large contactors or solenoids
- Static electricity generators nearby (certain conveyor belts or film/webbing)

The chart below is a general guideline for where to start looking for EMI filters based on your application. There is also a flowchart later in this chapter that can help guide you to the correct EMI filter for your application.

	3 Phase Drive Rated Family	Single Phase Drive Rated Family	Single Phase General Purpose Family
Very High Perfomance	MIF3	MIF	
High Performance	KMFA KMFV	RES90	RES70
Good Performance			RES10, DRF, RIR, RID, RIP, RIQ

Quality EMI filter products...

Roxburgh KMFA Series High Performance Three-phase Drive Filters

- High performance, designed for industrial drives applications
- Industrial applications include motor drives and inverters, machine tools, UPS, industrial controls, process controls and mechanical handling equipment
- 0-480 VAC, 0-60 Hz , 3-phase
- 8 current ratings from 6A to 100A
- IP20 rated screw terminal blocks
- Compact, slim profile, ventilated metal case
- Lightweight
- All products are RoHS compliant, CE, UL and cUL recognized

Roxburgh MIF3 Series Very High Performance Three-phase Drive Filters

- MIF3 series are very high performance three-phase multi-stage industrial filters
- Suitable for drives where long cable length (above 50m) is required between drive and motor
- 0-480 VAC, 0-60 Hz, 3-phase
- 11 current ratings from 10A to 800A
- Screw and stud style terminals
- Protective boots available
- Ultra compact, low profile, ventilated metal case
- Flexibility in mounting options ensure minimal panel space requirements. Can be dual mounted - flat or side
- All products are RoHS compliant, CE, UL and cUL recognized

Roxburgh KMFV Series High Performance 575V Three-Phase Drive Filters

- High performance, designed for industrial applications with harsh environments
- Industrial applications include motor drives and inverters, in industries such as petrochemical, mining and renewable energy
- 0-600 VAC, 0-60 Hz, 3-phase
- 5 current ratings from 6A to 36A
- IP20 rated screw terminal blocks
- Compact, slim profile, ventilated metal case
- Lightweight
- All products are RoHS compliant, CE, UL and cUL recognized

Roxburgh RES90 Series Single-phase Drive Filters

- Multi-stage EMI filter featuring excellent attenuation performance for single-phase supply AC drives
- Excellent for noisy applications where very high differential and common mode attenuation performance is required
- 0-250 VAC/DC, 0-400 Hz, single-phase
- 7 current ratings from 1 Amp to 30 Amps
- Ultra compact, low profile metal case
- Quick and easy chassis mounting
- All products are RoHS compliant, UL and cUL recognized

Roxburgh MIF Series Very High Performance Single-phase Drive Filters

- Single-phase, industrial multi-stage filter - Very High Performance - use with long drive-to-motor cable runs
- Typical industrial applications include motor inverter drives with long (above 50m) motor cable
- 0-250 VAC/DC, 0-60 Hz, single-phase
- 5 current ratings from 3 Amps to 23 Amps
- IP20 Rated
- Insulated screw terminal blocks
- Protective cover available
- Ultra compact, low profile metal case
- Can be dual mounted - flat or side
- All products are RoHS compliant, CE, UL and cUL recognized

Roxburgh RES10 Series Single-phase General Purpose Filters

- Single-phase range designed for general purpose filtering applications
- Excellent attenuation of conducted radio frequency interference (RFI)
- 0-250 VAC/DC, 0-400 Hz, single-phase
- 9 current ratings from 1 Amp to 30 Amps
- Ultra compact, low profile metal case
- Quick and easy chassis mounting
- All products are RoHS compliant, UL and cUL recognized

Roxburgh RES70 Series High Performance Single-phase General Purpose Filters

- Multi-stage EMI filter with high differential mode, high common mode and high frequency attenuation.
- Suitable for a broad range of applications where increased filter performance is required
- 0-250 VAC/DC, 0-400 Hz, single-phase
- 8 current ratings from 1 Amp to 36 Amps
- Ultra compact, low profile metal case
- Quick and easy chassis mounting
- All products are RoHS compliant, UL and cUL recognized

Roxburgh EMI Mains Filters

Roxburgh DRF Series DIN Rail Mount Single-phase General Purpose Filters

- Typical appplications include PLC control applications, security, test and monitoring equipment
- 0-250 VAC/DC, 0-60 Hz, single-phase
- AC and DC applications up to line voltage and frequency
- Available in 1A, 3A, 6A, 8A and 10 Amps current ratings
- Plastic-housing with slim profile
- DIN rail mounting, suitable for top hat and G-type rails
- CE and RoHS compliant

Roxburgh RID Series Power Entry Module with Filter

- General purpose IEC inlet filter
- Delivers good performance for both common mode and differential mode interference
- Typical applications are personal computers and computer peripherals, digital equipment, measuring instruments, monitors and display units, vending machines, gaming machines, printers and copiers
- Screw mount with 1/4" quick disconnect terminals
- Protective boot available for extra protection (PN: SLV45)
- 0-250 VAC, 0-60 Hz, single-phase
- Current ratings: 1A, 3A, 6A and 10A
- Compact, slim profile with metal case
- RoHS compliant, UL and CSA recognized (RID-1042-H is not CSA)

Roxburgh RIR Series Power Entry Module with Filter and Fuse*

- General purpose fused IEC inlet filter
- Delivers good performance for both common mode and differential mode interference.
- Typical applications are personal computers and computer peripherals, digital equipment, measuring instruments, monitors and display units, vending machines, gaming machines, printers and copiers
- 5mm x 20mm glass fuse included in each module; and one spare fuse in fuse tray
- Screw mount with 1/4" quick disconnect terminals
- Protective boot available for extra protection (p/n: SLV48)w
- 0-250 VAC, 0-60 Hz, single-phase
- Current ratings: 2A, 4A, and 6A
- Compact, slim profile with metal case
- RoHS compliant, CE, and UL and CSA recognized
- Replacement fuses available (See GMAxx fuses under Fuses & Fuse Holders of Circuit Protection section of our webstore: AutomationDirect.com or in Circuit Protection section of catalog)

Roxburgh EMI Mains Filters

Roxburgh RIP/RIQ Series
Power Entry Module with Filter, Fuse* and Switch

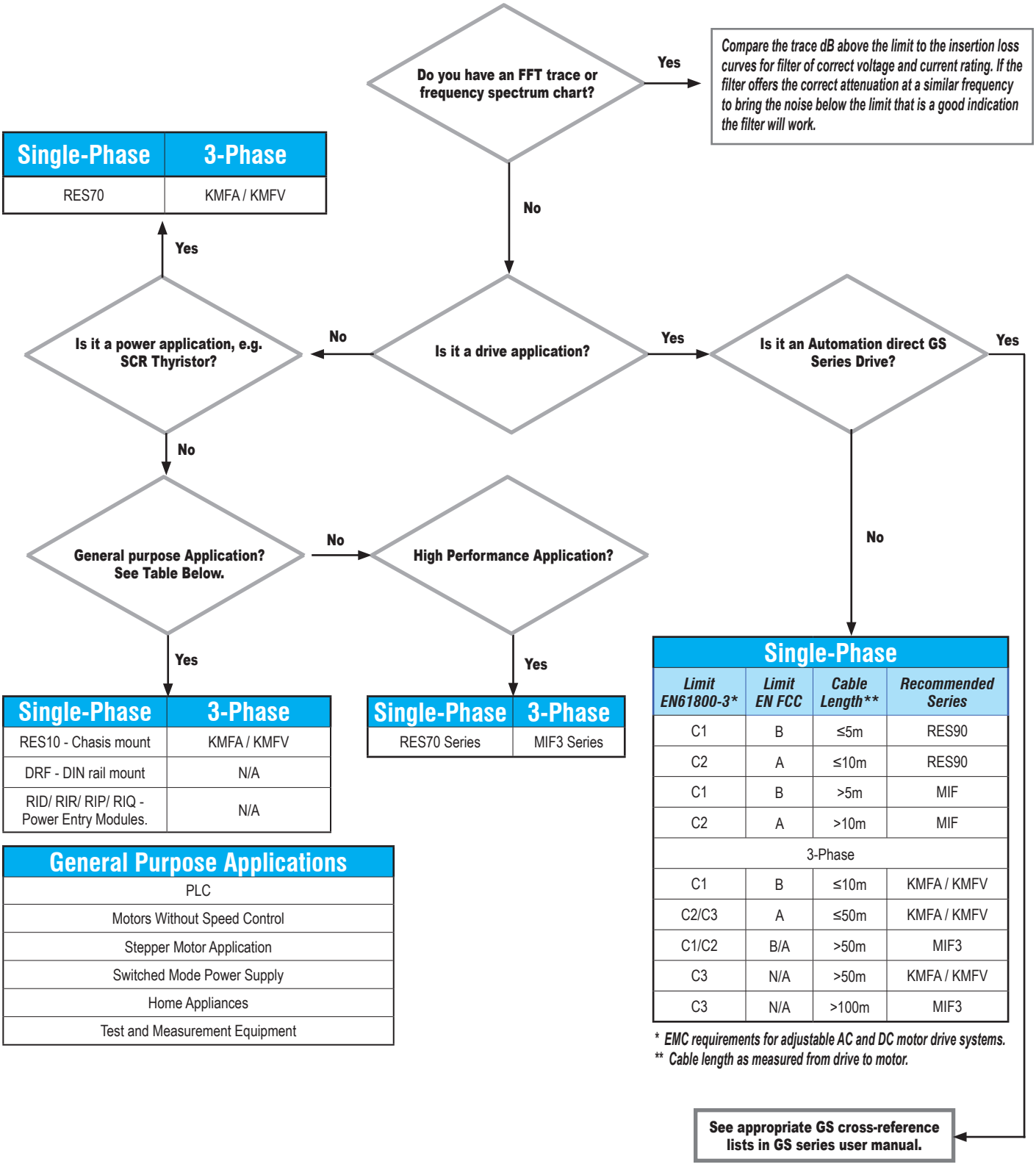
- General purpose fused and switched IEC inlet filter
- Delivers good performance for both common mode and differential mode interference.
- Typical applications are personal computers and computer peripherals, digital equipment, measuring instruments, monitors and display units, vending machines, gaming machines, printers and copiers
- Single fuse and double pole switch
- 5mm x 20mm glass fuse included in each module; and one spare fuse in fuse tray
- Snap-In or screw mount with 1/4" quick disconnect terminals
- Protective boot available for extra protection (p/n: SLV47)
- 0-250 VAC, 0-60 Hz, single-phase
- Current ratings: 2A, 4A, and 6A
- Compact, slim profile with metal case
- RoHS compliant, CE, and UL and CSA recognized
- Replacement fuses available (See GMAxx fuses under Fuses & Fuse Holders of Circuit Protection section of our webstore: AutomationDirect.com or in Circuit Protection section of catalog)

Roxburgh Toroid Ferrite Cores

- General purpose mains ferrite core chokes
- Pulse applications and AC or DC drives
- Delivers good performance for both common mode interference
- Typical applications are AC and DC drives, personal computers and computer peripherals, digital equipment, measuring instruments, monitors and display units
- RoHS compliant

Selection Guide for an EMI Filter

Many applications that utilize switching power supplies and motor drives often need a filter. A general selection guide for choosing an EMI filter is illustrated below. Start at the top diamond and follow the flow diagram as it applies to your situation.



Single-Phase	3-Phase
RES70	KMFA / KMFV

Single-Phase	3-Phase
RES10 - Chasis mount	KMFA / KMFV
DRF - DIN rail mount	N/A
RID/ RIR/ RIP/ RIQ - Power Entry Modules.	N/A

Single-Phase	3-Phase
RES70 Series	MIF3 Series

General Purpose Applications
PLC
Motors Without Speed Control
Stepper Motor Application
Switched Mode Power Supply
Home Appliances
Test and Measurement Equipment

Single-Phase			
*Limit EN61800-3**	*Limit EN FCC*	*Cable Length***	*Recommended Series*
C1	B	≤5m	RES90
C2	A	≤10m	RES90
C1	B	>5m	MIF
C2	A	>10m	MIF
3-Phase			
C1	B	≤10m	KMFA / KMFV
C2/C3	A	≤50m	KMFA / KMFV
C1/C2	B/A	>50m	MIF3
C3	N/A	>50m	KMFA / KMFV
C3	N/A	>100m	MIF3

** EMC requirements for adjustable AC and DC motor drive systems.*
*** Cable length as measured from drive to motor.*

Roxburgh KMFA Series EMI Filters

Three-phase Drive Rated EMI Filters - High Performance

The Roxburgh KMFA Series filters are economically priced and specifically designed as a line filter for 230/460 VAC, 3-phase devices. The two-stage design provides good performance for both common mode and differential mode interference and are rated from 6A to 100A at up to 500V. KMFA high performance three-phase industrial mains filters are designed for all drives applications including servos and AC or DC drives. The filters are designed to be mounted in a cabinet.

Features

- 230/460 VAC, 0-60 Hz, three-phase
- 6A - 100A models
- Rugged metal case
- Screw terminals
- Threaded GND lug
- Lightweight side mounting
- Panel mount

Filter performance curves are available at www.AutomationDirect.com

Applications

- Drives applications
- Electrically noisy applications requiring high filter performance
- Ideally suited for products that must conform to part 15, FCC regulations
- Industrial applications include motor drives and inverters, machine tools, UPS, industrial controls, digital electronics, process controls and mechanical handling equipment, etc.

Standards and Certifications

c UL us CE RoHS

KMFA EMI Filters		
Part Number	***Price***	***Description***
KMF306A	$131.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 6A
KMF310A	$131.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 10A
KMF318A	$160.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 18A
KMF325A	$172.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 25A
KMF336A	$215.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 36A
KMF350A	$314.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 50A
KMF370A	$327.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 70A
KMF3100A	$341.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 100A

General Specifications	
Voltage Rating	230/460 VAC, 0-60 Hz
Voltage Max.	528V
Voltage Withstand	2900VDC/ 60 secs.
Phase	3
UL/IEC Pollution Class	Degree II
Humidity	93% RH (non-condensing)
Overload Current	135% 2Hrs, 150% 60s
Insulation Resistance	500VDC >3.5M Ohms
Climate Class (IEC 60068-1)	-25/85/21
Temperature Rise	45°C
Temperature Rating	-13 to 185°F, -25 to 85°C
Flammability (UL94)	V-2
Case Material	Aluminum
Altitude*	1000m (3000m with derating)
Mounting Clearance	≥50mm gap
Agency Approvals**	CE (EN 60939-1), cURus: File# E191581 (Standard: UL1283 & C22.2 No.8)

** Derate 1% per 100m after 1000m; Max 3000m.*
***To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific component part number web page.*

Temperature Derating Chart above 40°C*									
	Part Number	***Ambient °C***								
		40	***45***	***50***	***55***	***60***	***65***	***70***	***75***	***80***
Continuous Ampacity at Ambient °C	***KMF306A***	6.00	5.60	5.19	4.76	4.31	3.82	3.28	2.65	1.86
	KMF310A	10.00	9.34	8.65	7.94	7.18	6.36	5.46	4.42	3.10
	KMF318A	18.00	16.81	15.57	14.29	12.92	11.45	9.83	7.96	5.58
	KMF325A	25.00	23.34	21.63	19.84	17.95	15.91	13.66	11.05	7.75
	KMF336A	26.00	24.28	22.50	20.63	18.66	16.55	14.20	11.50	8.06
	KMF350A	50.00	46.69	43.26	39.68	35.89	31.82	27.31	22.11	15.50
	KMF370A	70.00	65.36	60.56	55.55	50.25	44.55	38.24	30.95	21.70
	KMF3100A	100.00	93.37	86.52	79.36	71.79	63.64	54.63	44.22	31.00

** NOTE: Using these filters above 40°C would comprise a non-UL application of device.*

Roxburgh KMFA Series EMI Filters

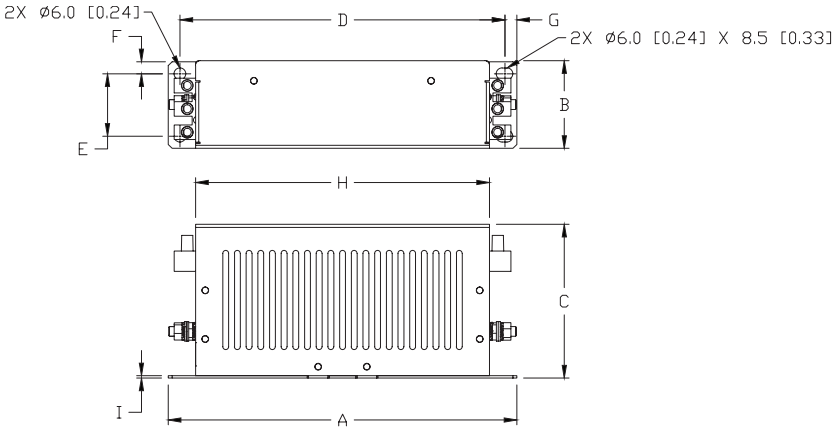
Specifications									
	Parameter	KMF306A	KMF310A	KMF318A	KMF325A	KMF336A	KMF350A	KMF370A	KMF3100A
	Max Power, kW [max/ph]	5 [1.4]	8.3 [2.4]	14.9 [4.3]	20.8 [6]	29.9 [8.6]	41.5 [12]	58.1 [16.8]	83 [24]
	Current Rating (A)	6	10	18	25	36	50	70	100
	SCCR Rating (kA)	5					10	5	10
	Ingress Protection	IP20							
GND Terminal	Terminal Style	M5x15 Stud (SS)				M6x20 Stud (SS)	M8x23 Stud (SS)		
GND Terminal	Torque, lb·in (N·m)	17.7 (2)				35.4 (4)	53.1 (6)		
GND Terminal	Ring Terminal Size	M5 (#10)				M6 (1/4)	M8 (5/16)		
Wire Terminal	Terminal Style	Screw							
Wire Terminal	Torque, lb·in [N·m]	7 [0.8]		17.7 [2]			44.2 [5]		
Wire Terminal	Max Wire Gauge (AWG)	10		8			2		
	Operational Leakage Current (mA)	7.2	6.8	7.2	13.5	17.6	22.8	21.4	30.6
	Total Resistance (Line to Load) (mΩ/ph)	33	14	11.4	4.2	4.12	2.1	1.3	0.96
	Residual Voltage (V@5s)	204V@5s	116V@5s	204V@5s	204V@5s	463V@5s	463V@5s	544V@5s	544V@5s
	Heat Dissipation (W/ph)	1.2	1.4	3.7	2.6	5.34	5.25	6.4	9.6
	Weight (lb [kg])	1.5 [0.7]	1.7 [0.8]	2.7 [1.25]	3.59 [1.63]	4.2 [1.9]	7.3 [3.3]	8.6 [3.9]	9 [4.1]

Roxburgh KMFA Series EMI Filters

Dimensions

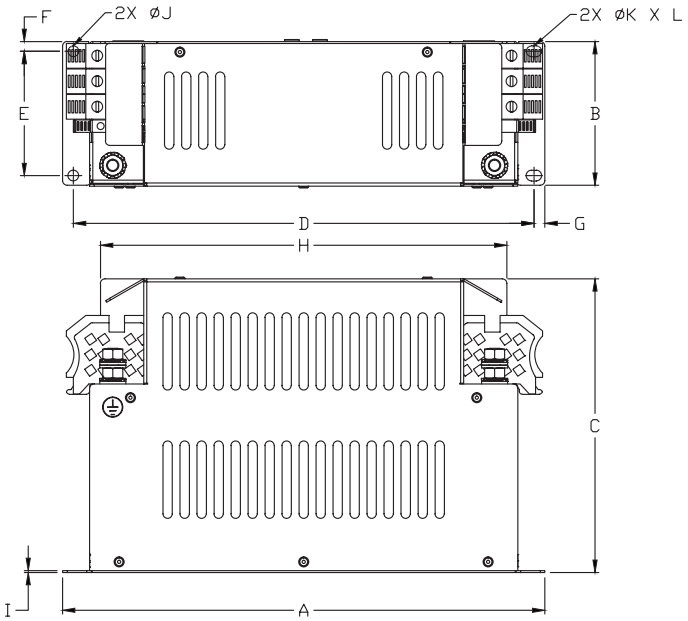
mm [inches]

KMF306A
KMF310A
KMF318A
KMF325A



PART NUMBER	A	B	C	D	E	F	G	H	I
KMF306A	179.0 [7.04]	45.0 [1.77]	79.0 [3.11]	167.0 [6.57]	32.0 [1.26]	6.3 [0.25]	6.3 [0.25]	151.0 [5.94]	1.2 [0.05]
KMF310A	179.0 [7.04]	45.0 [1.77]	79.0 [3.11]	167.0 [6.57]	32.0 [1.26]	6.3 [0.25]	6.3 [0.25]	151.0 [5.94]	1.2 [0.05]
KMF318A	229.0 [9.01]	55.2 [2.17]	115.5 [4.55]	217.0 [8.54]	42.0 [1.65]	5.6 [0.22]	6.0 [0.24]	201.0 [7.91]	1.2 [0.05]
KMF325A	229.0 [9.01]	55.2 [2.17]	115.5 [4.55]	217.0 [8.54]	42.0 [1.65]	5.6 [0.22]	6.0 [0.24]	201.0 [7.91]	1.2 [0.05]

KMF336A
KMF350A
KMF370A
KMF3100A



PART NUMBER	A	B	C	D	E	F	G	H	I	øJ	øK	L
KMF336A	269.0 [10.59]	73.2 [2.88]	162.2 [6.38]	258.0 [10.15]	60.0 [2.36]	5.9 [0.23]	7.0 [0.28]	226.0 [8.89]	1.2 [0.05]	6.5 [0.26]	6.5 [0.26]	9.5 [0.37]
KMF350A	312.0 [12.28]	93.5 [3.68]	190.0 [7.48]	298.0 [11.73]	79.0 [3.11]	7.8 [0.31]	7.0 [0.28]	263.0 [10.35]	1.2 [0.05]	7.0 [0.28]	7.0 [0.28]	10.0 [0.39]
KMF370A	312.0 [12.28]	93.5 [3.68]	190.0 [7.48]	298.0 [11.73]	79.0 [3.11]	7.8 [0.31]	7.0 [0.28]	263.0 [10.35]	1.2 [0.05]	7.0 [0.28]	7.0 [0.28]	10.0 [0.39]
KMF3100A	312.0 [12.28]	93.5 [3.68]	190.0 [7.48]	298.0 [11.73]	79.0 [3.11]	7.8 [0.31]	7.0 [0.28]	263.0 [10.35]	1.2 [0.05]	7.0 [0.28]	7.0 [0.28]	10.0 [0.39]

Roxburgh MIF3 Series EMI Filters

Three-phase Drive Rated EMI Filters - Very High Performance

The MIF3 Series industrial multi-stage EMI filters are most suitable for drives applications requiring long cable lengths between the drive and motor, as well as a variety of other industrial applications. The multi-stage filters provide higher attenuation performance than two-stage KMF series filters (See respective filter attenuation curves in datasheet online for specific noise mitigation). All MIF3 series filters are installed on the line side, ahead of the drive, and provide effective filtering for supply voltages from 0-500V and frequencies of 0-60Hz. Ideal for 230V or 460V drives as well as DC applications.

The MIF3 filters are available in 11 current ratings from 10 Amps to 800 Amps. The ultra-compact design offers flat or side mounting (MIF3800- side mounting only), a ventilated metal case, and screw or stud terminations. All products are RoHS compliant, include UL and cUL approvals, and are CE.

Features

- 230/460 VAC, 50/60 Hz, 3-phase
- 10A - 800A models
- Panel mount, flat and side
- Ultra-compact, low profile ventilated metal case
- Screw or stud terminals

Filter performance curves are available on item page at www.AutomationDirect.com

Applications

- AC Drives applications requiring long cable lengths between drive and motor
- Electrically noisy applications requiring high filter performance.

Standards and Certifications

MIF3 Series Filters			
Part Number	***Price***	***Description***	***Line & Load Side Protective Boot****
MIF310	$208.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 10A	N/A
MIF316	$217.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 16A	
MIF323	$251.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 23A	
MIF330B	$337.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 30A	SLV37 - 3pk
MIF350	$805.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 50A	SLV38 - 3pk
MIF375	$577.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 75A	SLV39 - 3pk
MIF3100	$706.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 100A	
MIF3150	$1,137.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 150A	SLV40 - 3pk
MIF3180	$1,128.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 180A	
MIF3400B	$1,971.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 400A	N/A
MIF3800	$3,594.00	EMI Input Filter for 3-phase AC drives, 230/460 VAC, 800A	

Roxburgh MIF3 Series EMI Filters

General Specifications

Voltage Rating	230/460 VAC, 0-60 Hz
Voltage Max.	528V
Voltage Withstand	2900VDC/ 60 secs.
Phase	3
UL/IEC Pollution Class	Degree II
Humidity	93% RH (non-condensing)
Overload Current	135% 2Hrs, 150% 60s
Insulation Resistance	500VDC >3.5 MΩ
Climate Class (IEC 60068-1)	-25/85/21
Temperature Rise	45°C
Temperature Rating	-13 to 185°F (-25 to 85°C)
Flammability (UL94)	V-2
Case Material	Aluminum
Altitude*	1000m (3000m with derating)
Mounting Clearance	≥50mm gap
Agency Approval**	CE (EN 60939-1), cURus: File# E191581 (Standard: UL1283 & C22.2 No.8)

** Derate 1% per 100m after 1000m; Max 3000m.*

***To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific component part number web page.*

Temperature Derating Chart above 40°C*

	Part Number	Ambient °C								
		40	45	50	55	60	65	70	75	80
Continuous Ampacity at Ambient °C	MIF310	10.00	9.34	8.65	7.94	7.18	6.36	5.46	4.42	3.10
	MIF316	16.00	14.94	13.84	12.70	11.49	10.18	8.74	7.08	4.96
	MIF323	23.00	21.48	19.90	18.25	16.51	14.64	12.56	10.17	7.13
	MIF330B	30.00	28.01	25.96	23.81	21.54	19.09	16.39	13.27	9.30
	MIF350	50.00	46.69	43.26	39.68	35.89	31.82	27.31	22.11	15.50
	MIF375	75.00	70.03	64.89	59.52	53.84	47.73	40.97	33.16	23.25
	MIF3100	100.00	93.37	86.52	79.36	71.79	63.64	54.63	44.22	31.00
	MIF3150	150.00	140.06	129.78	119.04	107.68	95.45	81.94	66.33	46.50
	MIF3180	180.00	168.07	155.74	142.85	129.22	114.55	98.33	79.59	55.80
	MIF3400B	400.00	373.50	346.08	317.45	287.15	254.55	218.51	176.88	124.01
	MIF3800	800.0	747.00	692.17	634.89	574.31	509.09	437.02	353.75	248.02

** NOTE: Using these filters above 40°C would comprise a non-UL application of device.*

Specifications

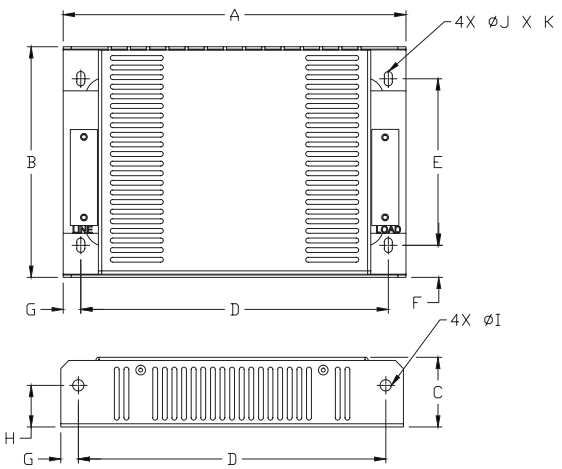
	Parameter	MIF310	MIF316	MIF323	MIF330B	MIF350	MIF375	MIF3100	MIF3150	MIF3180	MIF3400B	MIF3800
	Max Power, kW [max/ph]	8.3 [2.4]	13.3 [3.8]	19.1 [5.5]	24.9 [7.2]	41.5 [12]	62.3 [18]	83 [24]	124.6 [36]	149.5 [43.2]	332.2 [96]	664.3 [192]
	Current Rating (A)	10	16	23	30	50	75	100	150	180	400	800
	SCCR Rating (kA)	5				10					30	
	Ingress Protection	IP20			IP00							
GND Terminal	Terminal Style	Screw			Stud M5	Stud M8					Stud M10	
	Torque, lb·in [N·m]	4.4 [0.5]			17.7 [2]	53.1 [6]					221.2 [25]	
	Ring Terminal Size	N/A			M5 (#10)	M8 (5/16")					M10 (3/8")	
Wire Terminal	Terminal Style	Screw			Stud M5	Stud M8			Stud M10		Stud M12	
	Torque, lb·in [N·m]	4.4 [0.5]			17.7 [2]	39.8 [4.5]	53.1 [6]		177 [20]		265.5 [30]	
	Max Wire Gauge (AWG)	12			N/A							
	Ring Terminal Size	N/A			M5 (#10)	M8 (5/16")			M10 (3/8")		M12 (1/2")	
	Operational Leakage Current (mA)	4.2	8.9	8.9	15.0	7.3	10.4	15.0	22.6		663.4	884.5
	Total Resistance (Line to Load) (mΩ/ph)	44	13.3	12.7	14.1	3.4	3.4	2.5	1.23	1.63	88µΩ/ph	31µΩ/ph
	Residual Voltage (V@5s)	1	44		391	19	126	132	288		595V@5s, 0V @270s	615V@5s, 0V @300s
	Heat Dissipation (W/ph)	4.4	3.4	6.7	12.7	8.47	19	25	27.7	52.7	14.1	20
	Weight (lb [kg])	1.8 [0.8]	3.4 [1.5]	3.0 [1.4]	5.3 [2.4]	11.9 [5.3]	13.4 [6.1]	20.2 [9.2]	38.8 [17.6]	32.2 [14.6]	48.7 [22.12]	74.2 [33.7]

Roxburgh MIF3 Series EMI Filters

Dimensions

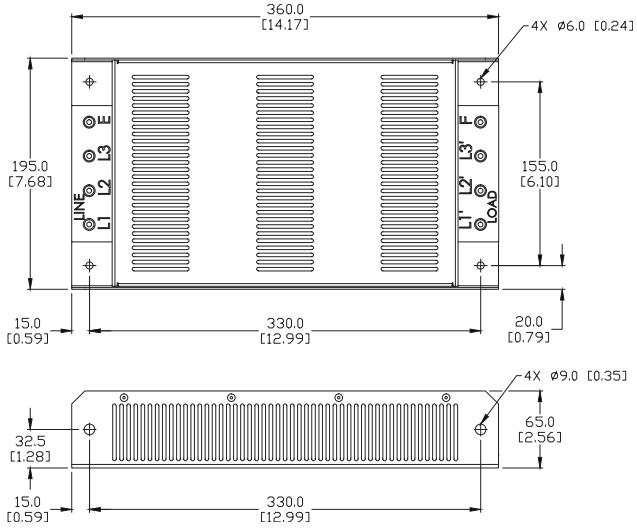
mm [inches]

MIF310
MIF316
MIF323



PART NUMBER	A	B	C	D	E	F	G	H	øI	øJ	K
MIF310	214.0 [8.42]	144.0 [5.67]	43.5 [1.71]	192.0 [7.56]	104.0 [4.09]	20.0 [0.79]	11.0 [0.43]	26.0 [1.02]	7.0 [0.28]	5.0 [0.20]	9.0 [0.35]
MIF316	214.0 [8.42]	204.0 [8.03]	50.0 [1.97]	192.0 [7.56]	164.0 [6.45]	20.0 [0.79]	11.0 [0.43]	27.5 [1.08]	7.0 [0.28]	5.0 [0.20]	N/A]
MIF323	214.0 [8.42]	204.0 [8.03]	50.0 [1.97]	192.0 [7.56]	164.0 [6.45]	20.0 [0.79]	11.0 [0.43]	27.5 [1.08]	7.0 [0.28]	5.0 [0.20]	N/A

MIF330B

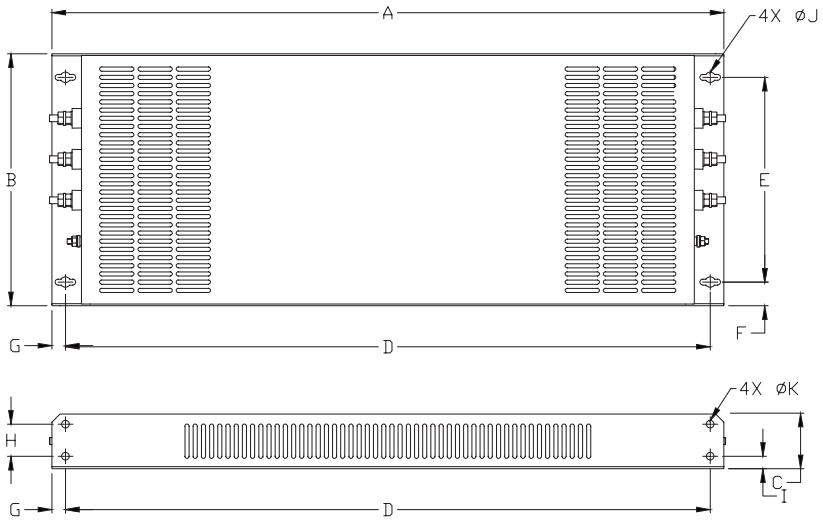


Roxburgh MIF3 Series EMI Filters

Dimensions

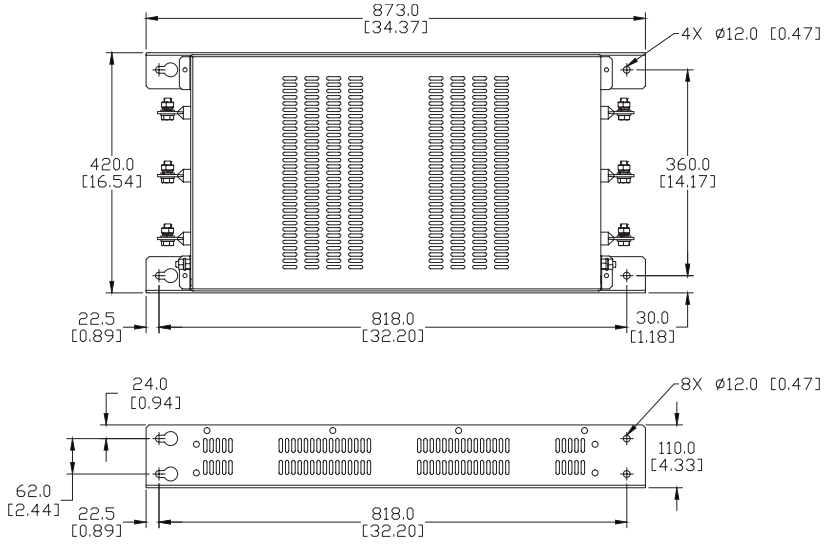
mm [inches]

MIF350
MIF375
MIF3100
MIF3150
MIF3180



PART NUMBER	A	B	C	D	E	F	G	H	I	ØJ	ØK
MIF350	618.0 [24.32]	229.0 [9.01]	68.2 [2.68]	578.0 [22.75]	160.0 [6.30]	34.5 [1.36]	20.0 [0.79]	35.0 [1.38]	18.2 [0.72]	11.0 [0.43]	7.0 [0.28]
MIF375	686.0 [27.00]	260.9 [10.27]	68.2 [2.68]	646.0 [25.42]	192.0 [7.56]	34.5 [1.36]	20.0 [0.79]	35.0 [1.38]	18.2 [0.72]	12.7 [0.50]	9.0 [0.35]
MIF3100	785.0 [30.89]	274.8 [10.81]	80.2 [3.16]	741.0 [29.16]	215.0 [8.46]	29.9 [1.18]	22.0 [0.87]	47.0 [1.85]	18.2 [0.72]	13.0 [0.51]	9.0 [0.35]
MIF3150	984.0 [38.72]	369.0 [14.52]	81.4 [3.20]	944.0 [37.15]	300.0 [11.81]	34.5 [1.36]	20.0 [0.79]	47.0 [1.85]	18.2 [0.72]	15.0 [0.59]	11.0 [0.43]
MIF3180	984.0 [38.72]	369.0 [14.52]	81.4 [3.20]	944.0 [37.15]	300.0 [11.81]	34.5 [1.36]	20.0 [0.79]	47.0 [1.85]	18.2 [0.72]	15.0 [0.59]	11.0 [0.43]

MIF3400B

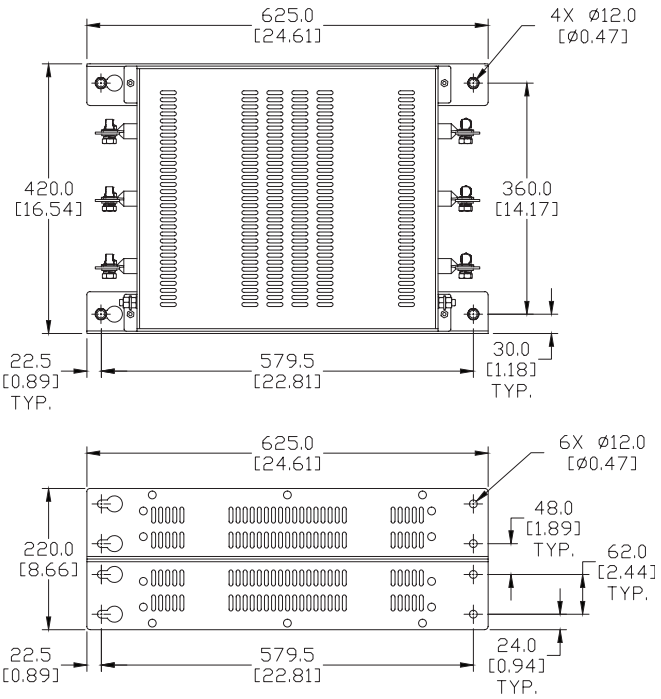


Roxburgh MIF3 Series EMI Filters

Dimensions

mm [inches]

MIF3800

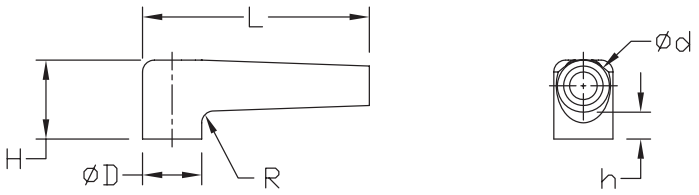


Protective Boot for MIF3 Series

One set of protective boots is included with filter order where applicable. Table below contains replacement protective boot part numbers for the associated MIF3 Series Filters.

Dimensions

mm [inches]



For Use With	*Sleeve Part Number*	*ØD*	*H*	*L*	*h*	*Ød*	*R*
MIF330B	*SLV37-3PK*	12.0 [0.47]	20.0 [0.79]	50.0 [1.97]	7.0 [0.28]	7.0 [0.28]	3.0 [0.12]
MIF350	*SLV38-3PK*	17.0 [0.67]	30.0 [1.18]	60.0 [2.36]	10.0 [0.39]	10.0 [0.39]	5.0 [0.20]
MIF375 *MIF3100*	*SLV39-3PK*	22.0 [0.87]	35.0 [1.38]	70.0 [2.75]	12.0 [0.47]	15.0 [0.59]	6.0 [0.24]
MIF3150 *MIF3180*	*SLV40-3PK*	28.0 [1.10]	40.0 [1.57]	70.0 [2.75]	12.0 [0.47]	15.0 [0.59]	8.0 [0.31]

Roxburgh KMFV Series EMI Filters

Three-phase Drive Rated EMI Filters up to 600V - High Performance

The KMFV high performance, two-stage, three-phase industrial filters are designed for industrial drives applications in harsh environments such as the petrochemical industry. The Roxburgh KMFV Series filters are specifically designed as a line filter for 3-phase, 575VAC devices. They provide good performance for both common mode and differential mode interference and are rated up to 600V. The filters are designed to be mounted in a cabinet.

Features

- 0-600 VAC, 0-60 Hz, 3-phase
- 6A- 36A models
- Metal case
- Screw terminals
- Separate GND lug
- Panel mount, horizontal or vertical

Filter performance curves are available on item page at www.AutomationDirect.com

Applications

- Ideally suited for products that must conform to part 15, FCC regulations
- Industrial AC drives
- Digital electronics

Standards and Certifications

KMFV EMI Filters		
Part Number	***Price***	***Description***
KMF306V	$131.00	EMI Input Filter for 3-phase AC drives, 575VAC, 6A
KMF310V	$154.00	EMI Input Filter for 3-phase AC drives, 575VAC, 10A
KMF318V	$167.00	EMI Input Filter for 3-phase AC drives, 575VAC, 18A
KMF325V	$198.00	EMI Input Filter for 3-phase AC drives, 575VAC, 25A
KMF336V	$256.00	EMI Input Filter for 3-phase AC drives, 575VAC, 36A

Filter General Specifications	
Voltage Rating	600VAC
Voltage Max.	630V
Voltage Withstand	3100VDC/ 60 secs.
Phase	3
UL/IEC Pollution Class	Degree II
Humidity	93% RH (non-condensing)
Overload Current	135% 2Hrs, 150% 60s
Insulation Resistance	500V DC, >3.5M Ohms
Climate Class (IEC 60068-1)	-25/85/21
Temperature Rise	45°C
Temperature Rating	-13 to 185°F, -25 to 85°C
Flammability (UL94)	V-2
Case Material	Aluminum
Altitude*	1000m (3000m with derating)
Mounting Clearance	≥50mm gap
Agency Approval**	CE (EN 60939-1), cURus: File# E191581 (Standard: UL1283 & C22.2 No.8)

** Derate 1% per 100m after 1000m; Max 3000m.*
***To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific component part number web page.*

Roxburgh KMFV Series EMI Filters

Specifications						
	Parameter	KMF306V	KMF310V	KMF318V	KMF325V	KMF336V
	Max Power kW (max/ph)	6.2 (1.4)	10.4 (2.4)	18.7 (4.3)	26 (6)	37 (8.6)
	Current Rating (A)	6	10	18	25	36
	SCCR Rating (kA)	5				
	Ingress Protection	IP20				
GND Terminal	Terminal Style	M5x15 Stud (SS)				M6x20 Stud (SS)
GND Terminal	Torque, lb·in (N·m)	17.7 (2)				35.4 (4)
GND Terminal	Ring Terminal Size	M5 (#10)				M6 (1/4)
Wire Terminal	Terminal Style	Screw				
Wire Terminal	Torque, lb·in (N·m)	7 (0.8)		17.7 (2)		
Wire Terminal	Max Wire Gauge (AWG)	10		8		
	Operational Leakage Current (mA)	6		19.8		26.4
	Total Resistance, Line to Load (mΩ/ph)	33	14	11.4	4.2	4.12
	Residual Voltage (V@5s)	48V@5s		306V@5s	305V@5s	299V@5s
	Heat Dissipation (W/ph)	1.2	1.4	3.7	2.6	5.34
	Weight lbs. (kg)	1.1 (0.5)	1.5 (0.7)	3.5 (1.6)	4.2 (1.9)	4.8 (2.2)

Temperature Derating Chart above 40°C*										
	Part Number	Ambient °C								
		40	45	50	55	60	65	70	75	80
Continuous Ampacity at Ambient °C	KMF306V	6.00	5.60	5.19	4.76	4.31	3.82	3.28	2.65	1.86
Continuous Ampacity at Ambient °C	KMF310V	10.00	9.34	8.65	7.94	7.18	6.36	5.46	4.42	3.10
Continuous Ampacity at Ambient °C	KMF318V	18.00	16.81	15.57	14.29	12.92	11.45	9.83	7.96	5.58
Continuous Ampacity at Ambient °C	KMF325V	25.00	23.34	21.63	19.84	17.95	15.91	13.66	11.05	7.75
Continuous Ampacity at Ambient °C	KMF336V	36.00	24.28	22.50	20.63	18.66	16.55	14.20	11.50	8.06

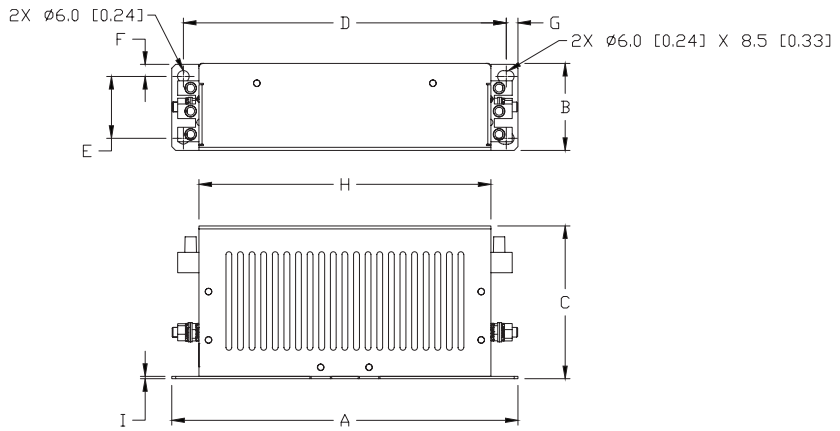
** NOTE: Using these filters above 40°C would comprise a non-UL application of device.*

Roxburgh KMFV Series EMI Filters

Dimensions

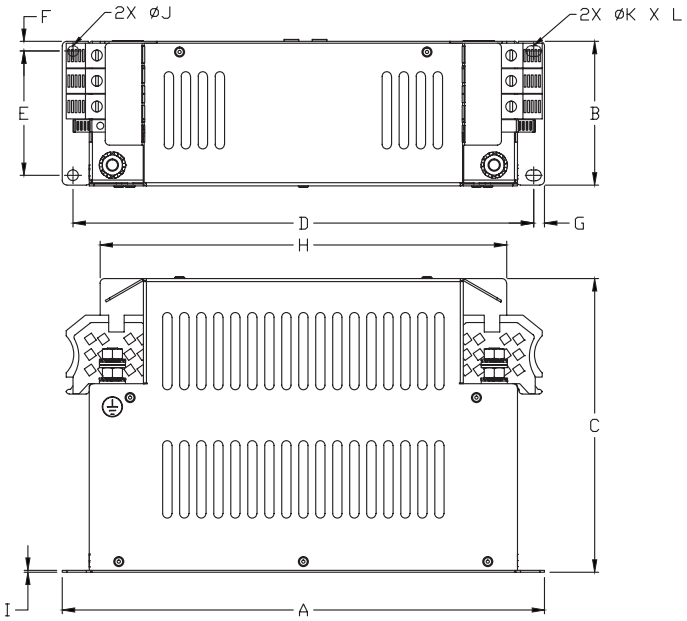
mm [inches]

KMF306V
KMF310V
KMF318V
KMF325V



PART NUMBER	A	B	C	D	E	F	G	H	I
KMF306V	179.0 [7.04]	45.0 [1.77]	79.0 [3.11]	167.0 [6.57]	32.0 [1.26]	6.3 [0.25]	6.3 [0.25]	151.0 [5.94]	1.2 [0.05]
KMF310V	179.0 [7.04]	45.0 [1.77]	79.0 [3.11]	167.0 [6.57]	32.0 [1.26]	6.3 [0.25]	6.3 [0.25]	151.0 [5.94]	1.2 [0.05]
KMF318V	229.0 [9.01]	55.2 [2.17]	115.5 [4.55]	217.0 [8.54]	42.0 [1.65]	5.6 [0.22]	6.0 [0.24]	201.0 [7.91]	1.2 [0.05]
KMF325V	229.0 [9.01]	55.2 [2.17]	115.5 [4.55]	217.0 [8.54]	42.0 [1.65]	5.6 [0.22]	6.0 [0.24]	201.0 [7.91]	1.2 [0.05]

KMF336V



PART NUMBER	A	B	C	D	E	F	G	H	I	øJ	øK	L
KMF336V	272.0 [10.70]	73.2 [2.88]	162.2 [6.38]	258.0 [10.15]	60.0 [2.36]	5.9 [0.23]	7.0 [0.28]	226.0 [8.89]	1.2 [0.05]	6.5 [0.26]	6.5 [0.26]	9.5 [0.37]

Roxburgh RES90 Series EMI Filters

Single-phase Drive Rated EMI Filters

The Roxburgh RES90 Series filters feature excellent attenuation performance suitable for noisy applications where increased filter performance is required. They are specifically designed as line filters for single-phase 120/240V AC and DC drives.

RES90 Series are a multi-stage EMC filter with very high differential and common mode attenuation rated up to 250V. The filters can be integrally mounted in cabinet or chassis hardware. Available in 1/4" quick disconnect type (RES90F) and screw terminal type (RES90S).

Features

- 0-240VAC/DC, 0-400 Hz, single-phase
- 1A - 30A models
- Very high performance type in a metal case
- 1/4" quick connect or screw terminals
- Panel mount

Filter performance curves are available on item page at www.AutomationDirect.com

Applications

- Ideally suited for products that must conform to part 15, FCC regulations
- Single-phase AC and DC drives
- Digital electronics
- Personal computers and peripherals
- Office automation
- Building automation
- Monitors and display units
- Household and consumer devices
- Machinery design

Standards and Certifications

RES90 EMI Filters		
Part Number	***Price***	***Description***
RES90F01	$50.00	EMI Input filter, 1-phase 120/240VAC, multi-stage drive grade, 1A
RES90F03	$52.00	EMI Input filter, 1-phase 120/240VAC, multi-stage drive grade, 3A
RES90F06	$68.00	EMI Input filter, 1-phase 120/240VAC, multi-stage drive grade, 6A
RES90F10	$96.00	EMI Input filter, 1-phase 120/240VAC, multi-stage drive grade, 10A
RES90F16	$107.00	EMI Input filter, 1-phase 120/240VAC, multi-stage drive grade, 16A
RES90S20	$132.00	EMI Input filter, 1-phase 120/240VAC, multi-stage drive grade, 20A
RES90S30	$178.00	EMI Input filter, 1-phase 120/240VAC, multi-stage drive grade, 30A

General Specifications	
Voltage Rating	0-240V AC/DC, 0-400 Hz
Voltage Max.	250V
Voltage Withstand	3000VDC/2 sec
Phase	1
UL/IEC Pollution Class	Degree II
Humidity	93% RH (non-condensing)
Overload Current	135% 2Hrs, 150% 60s
Insulation Resistance	500VDC >3.5 MΩ
Climate Class (IEC 60068-1)	25/100/21
Temperature Rise	60°C
Temperature Rating	-13 to 212°F (-25 to 100°C)
Flammability (UL94)	V-2
Case Material	Nickel Plated Steel
Altitude*	1000m (3000m with derating)
Mounting Clearance	>50mm Gap
Agency Approval*	cURus: File# E191581 (Standard: UL1283 & C22.2 No.8)

** Derate 1% per 100m after 1000m; Max 3000m.*

***To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific component part number web page.*

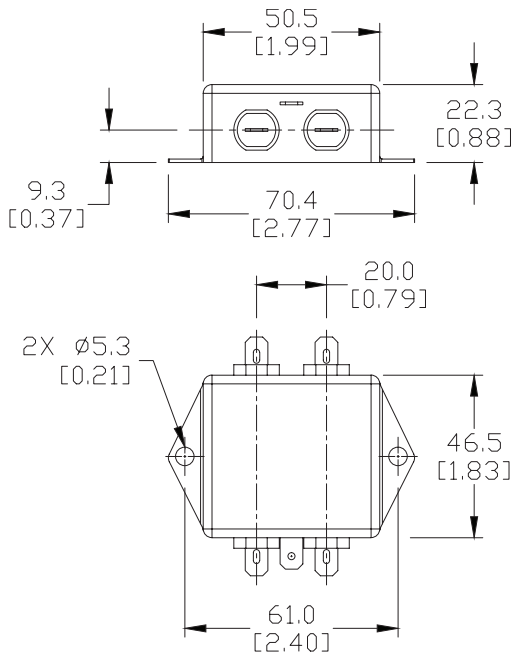
Roxburgh RES90 Series EMI Filters

Specifications							
Parameter	*RES90F01*	*RES90F03*	*RES90F06*	*RES90F10*	*RES90F16*	*RES90S20*	*RES90S30*
Max. Power (kW)	0.25	0.75	1.5	2.5	4	5	7.5
Current Rating (A)	1	3	6	10	16	20	30
SCCR Rating (kA)	5						
Ingress Protection	IP20						
Terminal Style	1/4" Quick Disconnect					M4 Stud	
Torque (lb·in [N·m])	N/A					11.5 [1.3]	
Operational Leakage Current (mA)	0.5		0.67		1.02		
Total Resistance (Line to Load) (mΩ)	750	250	100	500	15	50	300
Residual Voltage (V@5s)	1V@5s						
Heat Dissipation (W)	0.75	2.25	3.6	5	12.8	20	7.2
Weight (lb [kg])	0.18 [0.08]	0.44 [0.20]		1.0 [0.45]	0.92 [0.42]		1.2 [0.55]

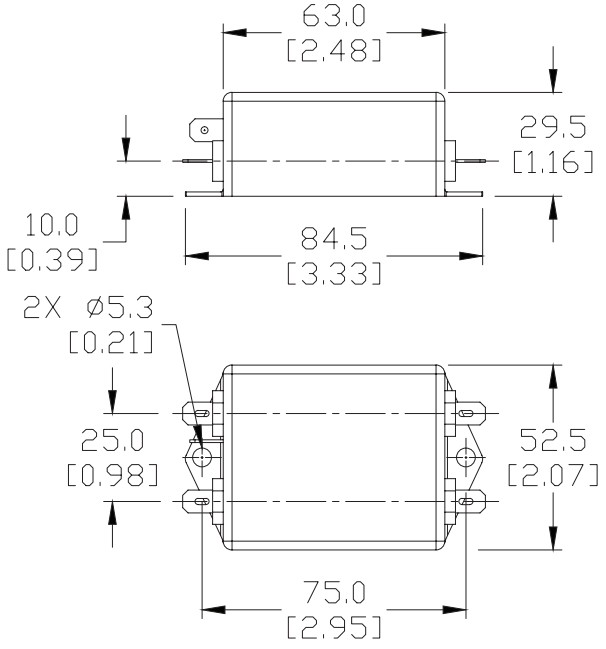
Dimensions

mm [inches]

RES90F01



RES90F03
RES90F06

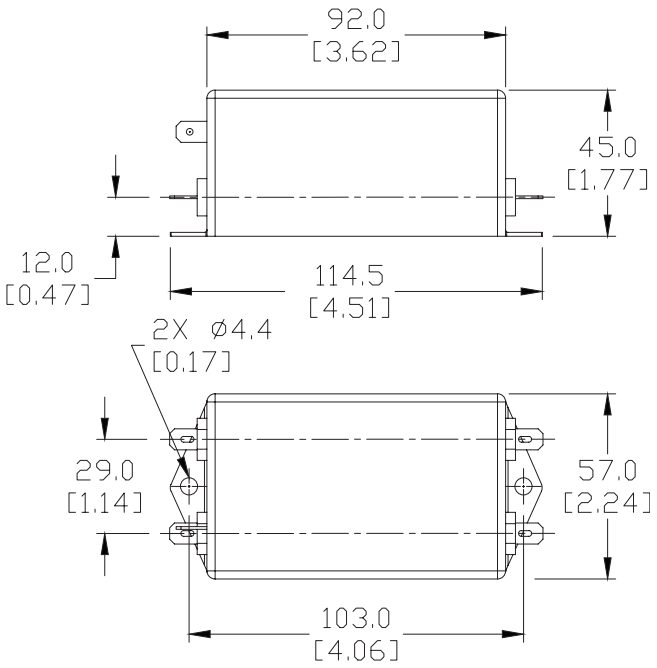


Roxburgh RES90 Series EMI Filters

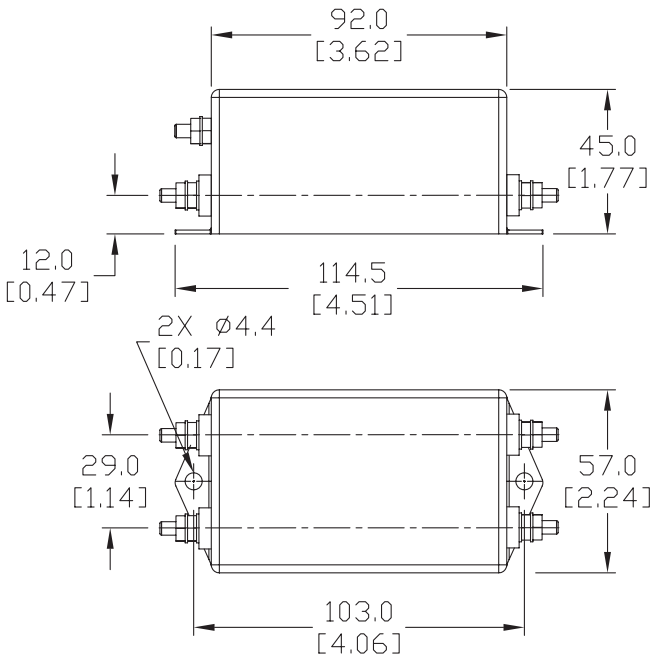
Dimensions

mm [inches]

RES90F10
RES90F16



RES90S20
RES90S30



Roxburgh MIF Series EMI Filters

Single-phase Drive Rated EMI Filters - Very High Performance

The MIF series industrial multi-stage EMI filters offer very high performance for use in a variety of applications. Rated at 250V and installed on the supply (line) side of the drive; these filters are used for single-phase motor drives where long motor supply cable runs (above 50m) are necessary, and where compliance with industrial and residential noise limits is required.

The MIF series filters are compact and cost-effective, offering flexibility in mounting options while ensuring minimal panel space requirements.

All products are RoHS compliant, include UL and cUL approvals, and are CE labeled.

Features

- 0-250 VAC/VDC, 0-60 Hz, single-phase
- 3A - 23A models
- Metal case
- Insulated screw terminal blocks
- Panel mount, dual mounted - flat or side

Filter performance curves are available on item page at www.AutomationDirect.com

Applications

- Ideally suited for products that must conform to part 15, FCC regulations
- Single-phase AC and DC drives
- Machinery design

Standards and Certifications

c UL us CE RoHS 2002/95/EC

MIF Series EMI Filters		
Part Number	***Price***	***Description***
MIF03	$118.00	EMI Input filter, 120/240 VAC, 1-phase, Very High Performance Filter, 3A
MIF06	$115.00	EMI Input filter, 120/240 VAC, 1-phase, Very High Performance Filter, 6A
MIF10	$147.00	EMI Input filter, 120/240 VAC, 1-phase, Very High Performance Filter, 10A
MIF16	$156.00	EMI Input filter, 120/240 VAC, 1-phase, Very High Performance Filter, 16A
MIF23	$196.00	EMI Input filter, 120/240 VAC, 1-phase, Very High Performance Filter, 23A

General Specifications	
Voltage Rating	115/230 VAC, 0-60 Hz
Voltage Max.	250V
Voltatge Withstand	2100VDC/60 sec
Phase	1
UL/IEC Pollution Class	Degree II
Humidity	93% RH (non-condensing)
Overload Current	135% 2Hrs, 150% 60s
Insulation Resistance	500VDC >3.5 MΩ
Climate Class (IEC 60068-1)	-25/85/21
Temperature Rise	45°C
Temperature Rating	-13 to 185°F; -25 to 85°C
Flammability (UL94)	V-2
Case Material	Aluminum
Altitude*	1000m (3000m with derating)
Mounting Clearance	≥50mm gap
Agency Approval**	CE (EN 60939-1), cURus: File# E191581 (Standard: UL1283 & C22.2 No.8)

** Derate 1% per 100m after 1000m; Max 3000m.*

***To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific component part number web page.*

Roxburgh MIF Series EMI Filters

Specifications						
	Parameter	MIF03	MIF06	MIF10	MIF16	MIF23
	Max. Power (kW)	0.7	1.4	2.4	3.8	5.5
	Current Rating (A)	3	6	10	16	23
	SCCR Rating (kA)	5				
	Ingress Protection	IP20				
GND Terminal	Terminal Style	Spring		Screw		
GND Terminal	Torque, (lb·in [N·m])	N/A		4.4 [0.5]		
GND Terminal	Wire Gauge (AWG)	12				
Wire Terminal	Terminal Style	Spring		Screw		
Wire Terminal	Torque, (lb·in [N·m])	N/A		4.4 [0.5]		
Wire Terminal	Max. Wire Gauge (AWG)	12				
	Operational Leakage Current (mA)	2.6		45		90
	Total Resistance, Line to Load (mΩ/ph)	55	48.6	13.5	13.7	9.5
	Residual Voltage (V@5s)	2		1		9
	Heat Dissipation (W/ph)	0.5	1.75	1.35	3.5	5
	Weight (lb [kg])	0.7 [0.3]		1.6 [0.7]	2.2 [1.0]	2.6 [1.2]

Temperature Derating Chart above 40°C*										
	Part Number	Ambient °C								
		40	45	50	55	60	65	70	75	80
Continuous Ampacity at Ambient °C	MIF03	3.00	2.80	2.60	2.38	2.15	1.91	1.64	1.33	0.93
	MIF06	6.00	5.60	5.19	4.76	4.31	3.82	3.28	2.65	1.86
	MIF10	10.00	9.34	8.65	7.94	7.18	6.36	5.46	4.42	3.10
	MIF16	16.00	14.94	13.84	12.70	11.49	10.18	8.74	7.08	4.96
	MIF23	23.00	21.48	19.90	18.25	16.51	14.64	12.56	10.17	7.13

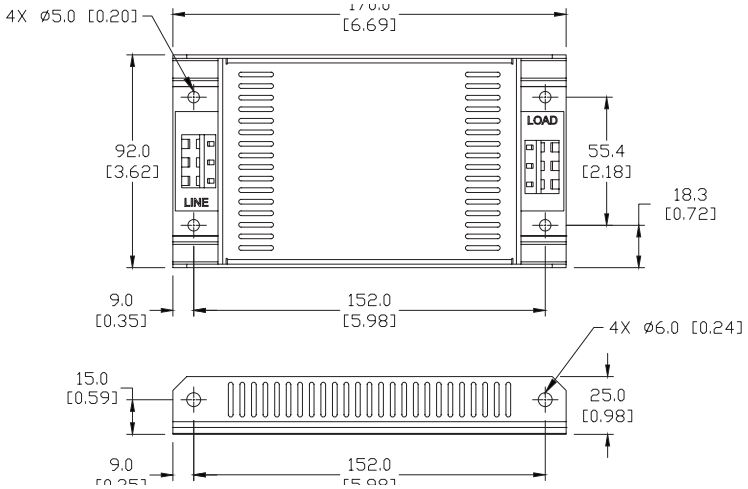
** NOTE: Using these filters above 40° C would comprise a non-UL application of device.*

Roxburgh MIF Series EMI Filters

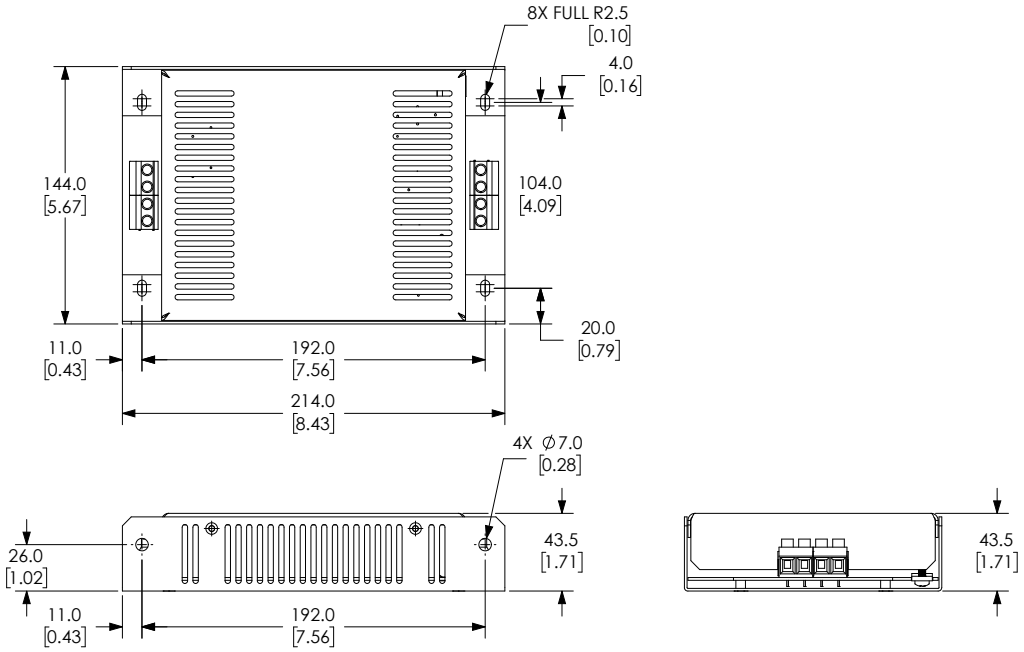
Dimensions

mm [inches]

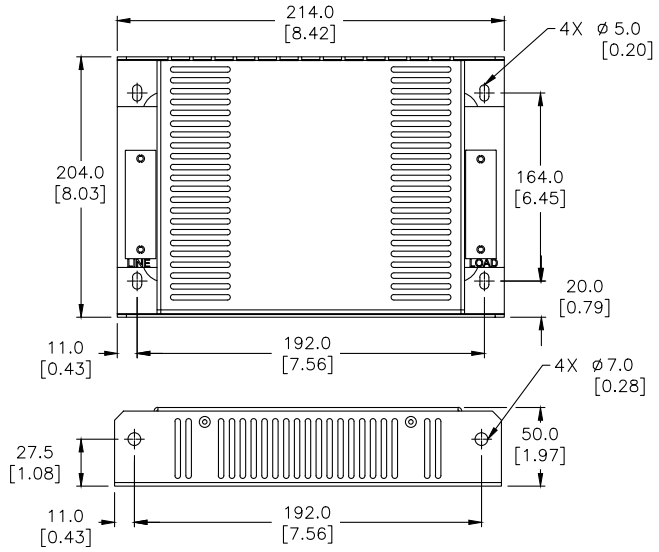
MIF03
MIF06



MIF10
MIF16



MIF23



Roxburgh RES10 Series EMI Filters

Single-Phase General Purpose EMI Filters

The Roxburgh RES10 Series single-stage filters are specifically designed as line filters for 120/240 VAC devices. RES10 Series provide excellent attenuation performance for RFI and general purpose filtering applications. The filters are designed for fast and easy integral mounting on chassis hardware.

Features

- 0-240 VAC/DC, 0-400 Hz, single-phase
- 1A- 30A models
- Metal case, miniature type
- 1/4" quick disconnect or screw terminals
- Quick and easy mounting

Filter performance curves are available on item page at www.AutomationDirect.com

Applications

- Ideally suited for products that must conform to part 15, FCC regulations
- Digital electronics
- Personal computers and peripherals
- Office automation
- Building automation
- Monitors and display units
- Household and consumer devices
- Machinery design

Standards and Certifications

c UL us

RoHS 2002/95/EC

RES EMI Filters		
Part Number	***Price***	***Description***
RES10F01	$30.00	EMI Input Filter 120/240 VAC, 1-ph, 1A
RES10F03	$33.00	EMI Input Filter 120/240 VAC, 1-ph, 3A
RES10F06	$34.00	EMI Input Filter 120/240 VAC, 1-ph, 6A
RES10F10	$34.00	EMI Input Filter 120/240 VAC, 1-ph, 10A
RES10F12	$43.00	EMI Input Filter 120/240 VAC, 1-ph, 12A
RES10F13	$43.00	EMI Input Filter 120/240 VAC, 1-ph, 13A
RES10F16	$47.00	EMI Input Filter 120/240 VAC, 1-ph, 16A
RES10S20	$57.00	EMI Input Filter 120/240 VAC, 1-ph, 20A
RES10S30	$110.00	EMI Input Filter 120/240 VAC, 1-ph, 30A

General Specifications	
Voltage Rating	0-240V AC/DC, 0-400 Hz
Voltage Max.	250V
Voltage Withstand	3000VDC/2 sec
Phase	1
UL/IEC Pollution Class	Degree II
Humidity	93% RH (non-condensing)
Overload Current	135% 2Hrs, 150% 60s
Insulation Resistance	500VDC >3.5 MΩ
Climate Class (IEC 60068-1)	25/100/21
Temperature Rise	60°C
Temperature Rating	-13 to 212°F (-25 to 100°C)
Flammability (UL94)	V-2
Case Material	Nickel Plated Steel
Altitude*	1000m (3000m with derating)
Mounting Clearance	>50mm Gap
Agency Approval*	cURus: File# E191581 (Standard: UL1283 & C22.2 No.8)

** Derate 1% per 100m after 1000m; Max 3000m.*

***To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific component part number web page.*

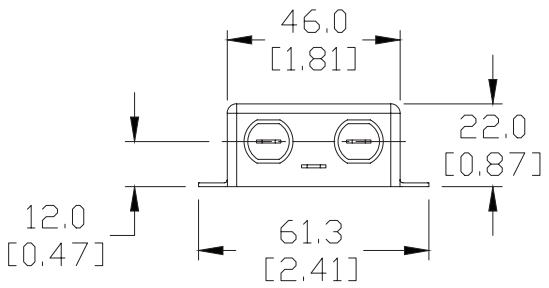
Roxburgh RES10 Series EMI Filters

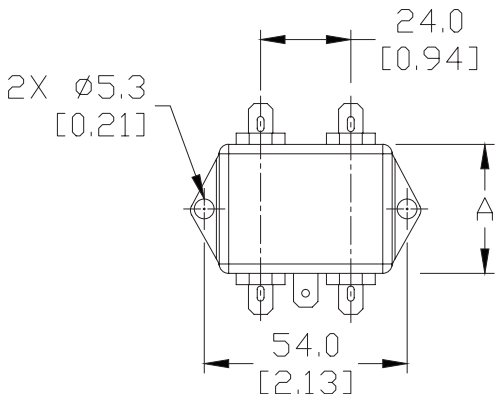
Specifications									
Parameter	*RES10F01*	*RES10F03*	*RES10F06*	*RES10F10*	*RES10F12*	*RES10F13*	*RES10F16*	*RES10S20*	*RES10S30*
Max. Power (kW)	0.25	0.75	1.5	2.5	3	3.25	4	5	7.5
Current Rating (A)	1	3	6	10	12	13	16	20	30
SCCR Rating (kA)	5								
Ingress Protection	IP20								
Terminal Style	1/4" Quick Disconnect							M4 Stud	
Torque, (lb·in [N·m])	N/A							11.5 [1.3]	
Operational Leakage Current (mA)	0.74								0.87
Total Resistance, Line to Load (mΩ)	300	100	25	50	45	25	50		25
Residual Voltage (V@5s)	1V@5s								
Heat Dissipation (W)	0.6	0.9		5	6.48	4.23	12.8	20	22.5
Weight (lb [kg])	0.15 [0.07]			0.2 [0.09]		0.15 [0.07]	0.29 [0.13]	0.46 [0.21]	1.0 [0.42]

Dimensions

mm [inches]

RES10F01
RES10F03
RES10F06
RES10F13





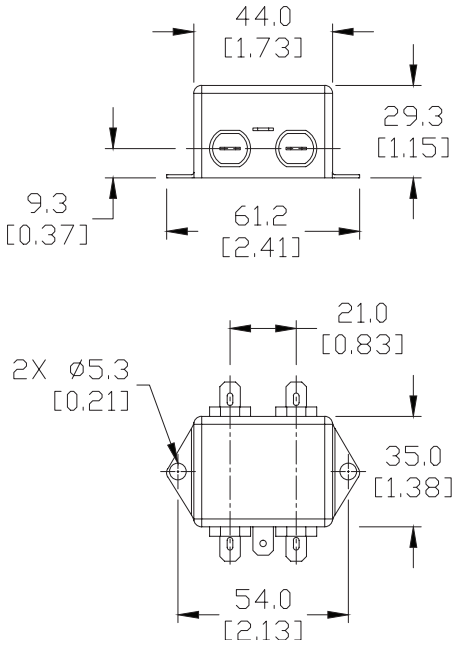
PART NUMBER	A
RES10F01	34.3 [1.35]
RES10F03	32.0 [1.26]
RES10F06	32.0 [1.26]
RES10F13	34.3 [1.35]

Roxburgh RES10 Series EMI Filters

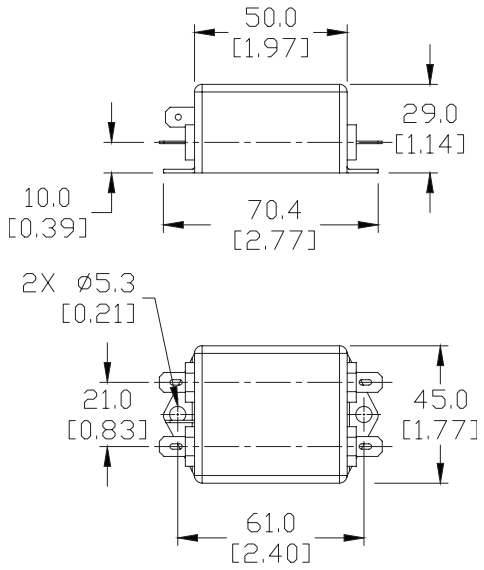
Dimensions

mm [inches]

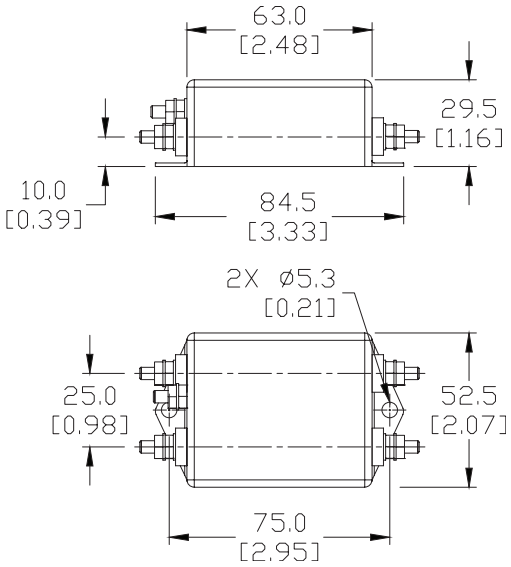
RES10F10
RES10F12



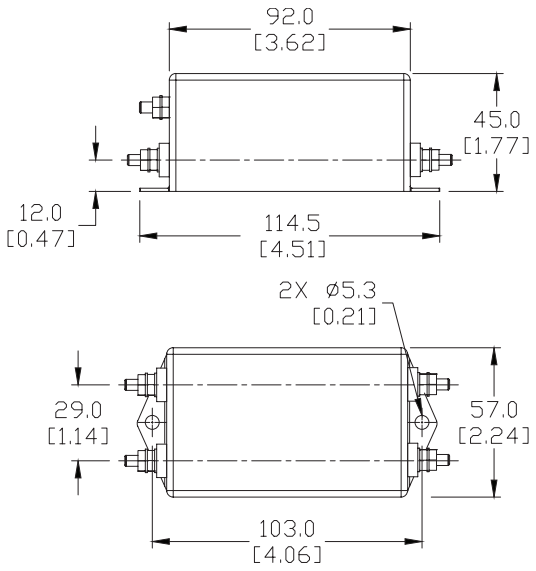
RES10F16



RES10S20



RES10S30



Roxburgh RES70 Series EMI Filters

Single-phase General Purpose EMI Filters - High Performance

The Roxburgh RES70 Series filters are specifically designed as line filters for 120/240V AC devices. RES70 Series filters provide high performance for both common mode and differential mode interference and are rated up to 250V. The filters are chassis mount and should be installed inside a cabinet or enclosure.

Features

- 0-240VAC/DC, 0-400 Hz, single-phase
- 1A - 36A models
- Metal case, miniature type
- 1/4" quick disconnect or screw terminals
- Panel mount

Filter performance curves are available on item page at www.AutomationDirect.com

Applications

- Ideally suited for products that must conform to part 15, FCC regulations
- Digital electronics
- Personal computers and peripherals
- Measuring instruments
- For monitors and display units

Standards and Certifications

c UL us

RoHS 2002/95/EC

RES EMI Filters

Part Number	Price	Description
RES70F01	$52.00	EMI Input filter, 120/240 VAC, 1-phase, two-stage, 1A
RES70F03	$53.00	EMI Input filter, 120/240 VAC, 1-phase, two-stage, 3A
RES70F06	$114.00	EMI Input filter, 120/240 VAC, 1-phase, two-stage, 6A
RES70F10	$143.00	EMI Input filter, 120/240 VAC, 1-phase, two-stage, 10A
RES70F12	$143.00	EMI Input filter, 120/240 VAC, 1-phase, two-stage, 12A
RES70F16	$149.00	EMI Input filter, 120/240 VAC, 1-phase, two-stage, 16A
RES70S25	$214.00	EMI Input filter, 120/240 VAC, 1-phase, two-stage, 25A
RES70S36	$215.00	EMI Input filter, 120/240 VAC, 1-phase, two-stage, 36A

General Specifications

Voltage Rating	0-240VAC/DC, 0-400 Hz
Voltage Max.	250V
Voltage Withstand	3000VDC/2 sec
Phase	1
UL/IEC Pollution Class	Degree II
Humidity	93% RH (non-condensing)
Overload Current	135% 2Hrs, 150% 60s
Insulation Resistance	500VDC >3.5 MΩ
Climate Class (IEC 60068-1)	25/100/21
Temperature Rise	60°C
Temperature Rating	-13 to 212°F (-25 to 100°C)
Flammability (UL94)	V-2
Case Material	NIckel Plated Steel
Altitude*	1000m (3000m with derating)
Mounting Clearance	>50mm Gap
Agency Approval**	cURus: File# E191581 (Standard: UL1283 & C22.2 No.8)

** Derate 1% per 100m after 1000m; Max 3000m.*

***To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific component part number web page.*

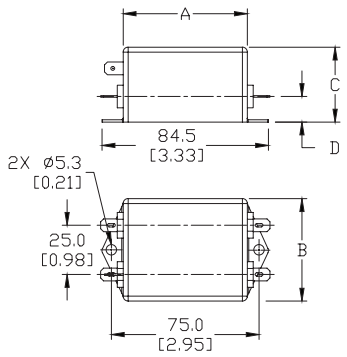
Roxburgh RES70 Series EMI Filters

Specifications								
Parameter	*RES70F01*	*RES70F03*	*RES70F06*	*RES70F10*	*RES70F12*	*RES70F16*	*RES70S25*	*RES70S36*
Max. Power (kW)	0.25	0.75	1.5	2.5	3	4	6.25	9
Current Rating (A)	1	3	6	10	12	16	25	36
SCCR Rating (kA)	5							
Ingress Protection	IP20							
Terminal Style	1/4" Quick Disconnect						M4 Stud	
Torque, lbs in (N·m)	N/A						11.5 (1.3)	
Operational Leakage Current (mA)	0.734			0.002	0.734			0.867
Total Resistance, Line to Load (mΩ)	800	325	200	50		100		
Residual Voltage (V@5s)	1V@5s							
Heat Dissipation (W)	0.8	2.925	7.2	5	7.2	25.6	62.5	129.6
Weight, lbs (kg)	0.042 (0.19)	0.55 (0.25)	1.0 (0.45)	1.43 (0.65)	1.47(0.67)	1.32 (0.6)	1.74 (0.79)	

Dimensions

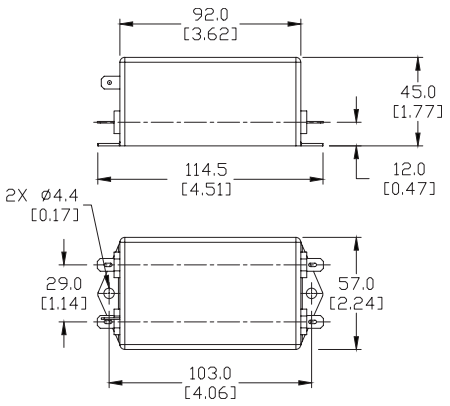
mm [inches]

RES70F01
RES70F03

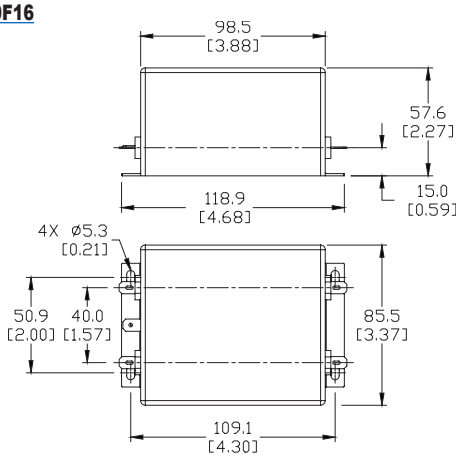


PART NUMBER	A	B	C	D
RES70F01	64.0 [2.52]	52.0 [2.05]	30.0 [1.18]	10.0 [0.39]
RES70F03	63.0 [2.48]	51.0 [2.01]	38.0 [1.50]	12.0 [0.47]

RES70F06



RES70F16

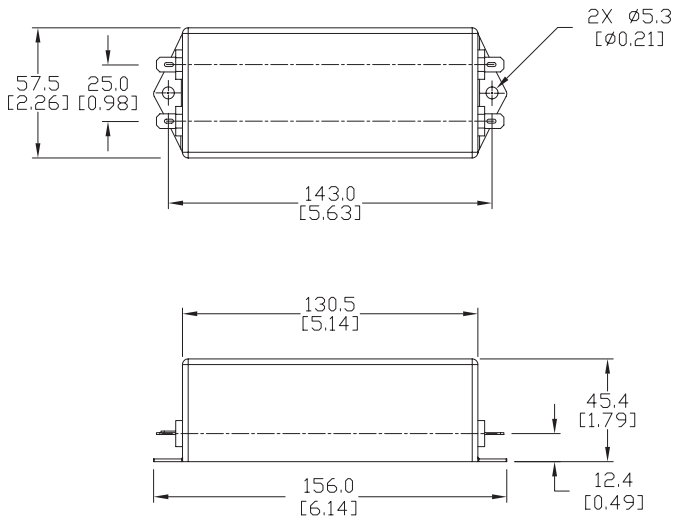


Roxburgh RES70 Series EMI Filters

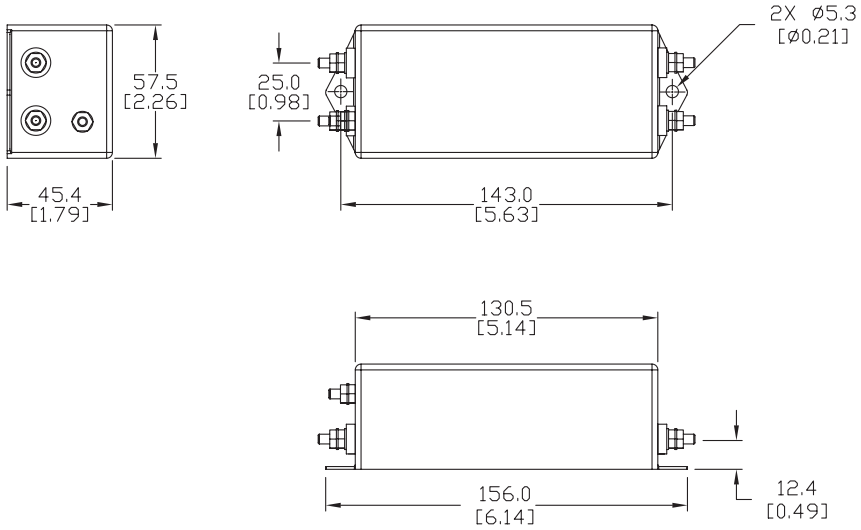
Dimensions

mm [inches]

RES70F10
RES70F12



RES70S25
RES70S36



Roxburgh DRF Series EMI Filters

Single-phase General Purpose EMI Filters - DIN Rail Mount

The Roxburgh DRF (DIN Rail Filter) Series single-stage filters are specifically designed as line filters for 120/240 VAC devices. Provides good performance for both common mode and differential mode interference and are rated up to 250V. The DRF filters snap on to 35mm DIN rail for ease of mounting in cabinet hardware.

Features

- 0-250 VAC/DC, 0-60 Hz, single-phase
- 1A - 10A models
- Molded plastic case
- Screw terminals
- 35mm DIN rail mount

Filter performance curves are available on item page at www.AutomationDirect.com

Applications

- Ideally suited for products that must conform to part 15, FCC regulations
- Digital electronics
- Control power
- Measuring instruments
- Industrial and commercial controls and instrumentation

Standards and Certifications

CE RoHS 2002/95/EC

DRF Series Filters		
Part Number	***Price***	***Description***
DRF01	$62.00	EMI Input Filter 120/240VAC, 1-ph, 1A
DRF03	$62.00	EMI Input Filter 120/240VAC, 1-ph, 3A
DRF06	$62.00	EMI Input Filter 120/240VAC, 1-ph, 6A
DRF08	$59.00	EMI Input Filter 120/240VAC, 1-ph, 8A
DRF10	$62.00	EMI Input Filter 120/240VAC, 1-ph, 10A

General Specifications	
Voltage Rating	0-240V AC/DC, 0-60 Hz
Voltage Max.	250V
Voltage Withstand	2100V AC/1 min
Phase	1
UL/IEC Pollution Class	Degree II
Humidity	93% RH (non-condensing)
Overload Current	135% 2 hrs, 150% 60s
Insulation Resistance	500VDC >3.5 M Ohms
Climate Class (IEC 60068-1)	-25/85/21
Temperature Rise	45°C
Temperature Rating	-13 to 185°F, -25°C to 85°C
Flammability (UL94)	V-2
Material	Plastic Polyamide
Altitude*	1000m (3000m with derating)
Mounting Clearance	>50mm Gap
Agency Approval**	CE (EN60939-1)

** Derate 1% per 100m after 1000m; Max 3000m.*

***To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific component part number web page.*

Roxburgh DRF Series EMI Filters

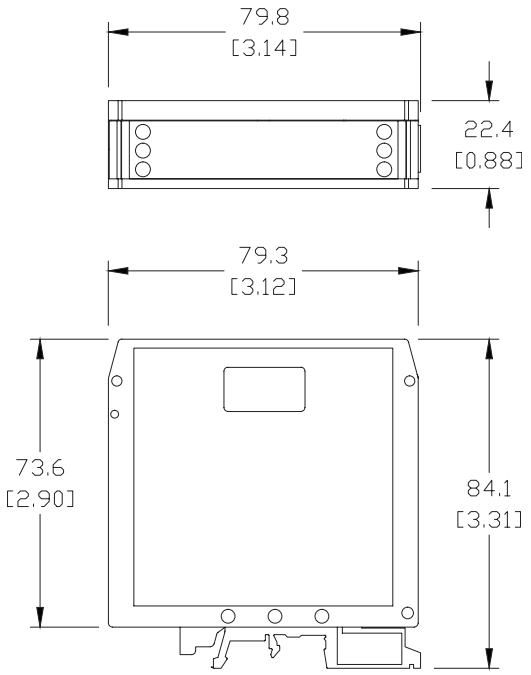
Specifications					
Parameter	*DRF01*	*DRF03*	*DRF06*	*DRF08*	*DRF10*
Max. Power (kW)	0.2	0.7	1.4	1.9	2.4
Current Rating (A)	1	3	6	8	10
SCCR Rating (kA)	5				
Ingress Protection	IP20				
Terminal Style	Screw				
Torque (lb·in [N·m])	4.4 [0.5]				
Max. Wire Gauge (mm² [AWG])	2.5 [14]				
Operational Leakage Current (mA)	0.75				
Total Resistance, Line to Load (mΩ)	640	71	19	15	12
Residual Voltage (V@5s)	1V@5s				
Heat Dissipation (W)	0.64		0.66	0.96	1.2
Weight, lb [kg]	0.23 [0.105]	0.21 [0.098]	0.21 [0.099]	0.23 [0.105]	0.22 [0.10]

Temperature Derating Chart above 40°C*										
Continuous Ampacity at Ambient °C	*Part Number*	*Ambient °C*								
		40	*45*	*50*	*55*	*60*	*65*	*70*	*75*	*80*
	DRF01	1.00	0.93	0.87	0.79	0.72	0.64	0.55	0.44	0.31
	DRF03	3.00	2.80	2.60	2.38	2.15	1.91	1.64	1.33	0.93
	DRF06	6.00	5.60	5.19	4.76	4.31	3.82	3.28	2.65	1.86
	DRF08	8.00	7.47	6.92	6.35	5.74	5.09	4.37	3.54	2.48
	DRF10	10.00	9.34	8.65	7.94	7.18	6.36	5.46	4.42	3.10

** NOTE: Using thes filters above 40C would comprise a non-UL application of device.*

Dimensions

mm [inches]



Roxburgh RID Series EMI Filters

Single-phase Power Entry Module with Filter

The Roxburgh RID Series Power Entry Modules are general purpose single-stage filters specifically designed as line filters for 120/240 VAC devices. They provide good performance for both common mode and differential mode interference and are rated at 250V. These filters are designed to be through-hole mounted in a cabinet or enclosure.

Features

- Rated at 0-250 VAC, 0-60 Hz, single-phase
- 1A - 10A models
- Metal case, miniature type
- Through-hole mount flange
- 1/4" quick disconnect terminals

Filter performance curves are available on item page at www.AutomationDirect.com

Applications

- Ideally suited for products that must conform to part 15, FCC regulations
- Digital electronics
- Personal computers and peripherals
- Measuring instruments
- Small equipment applications
- Monitors and display devices

Standards and Certifications

*** RID-1042-H is not CSA**

RID Module

RID Module Protective Sleeve SLV45

RID Power Entry Modules		
Part Number	***Price***	***Description***
RID-0142-H	$10.50	IEC Inlet Filter 120/240VAC, 1-ph, 1A
RID-0342-H	$13.00	IEC Inlet Filter 120/240VAC, 1-ph, 3A
RID-0642-H	$13.00	IEC Inlet Filter 120/240VAC, 1-ph, 6A
RID-1042-H	$13.00	IEC Inlet Filter 120/240VAC, 1-ph, 10A
SLV45	$4.00	Protective Boot For RID Series

General Specifications	
Voltage Rating	0-240V AC/DC 0-60 Hz
Voltage Max.	250V
Voltage Withstand	1500VAC
Phase	1
UL/IEC Pollution Class	Degree II
Humidity	93% RH (non-condensing)
Overload Current	135% 2 hrs, 150% 60s
Insulation Resistance	500VDC >3.5M Ohms
Climate Class (IEC 60068-1)	-25/85/21
Temperature Rating	-13 to 185°F, -25° to 85°C
Flammability (UL94)	V-0
Material	Tin Plated Steel
Altitude*	1000m (3000m with derating)
Mounting Clearance	>50mm Gap
Agency Approval**	UR: File# E191581 (Standard: UL1283) CSA: File# 207414 (Standard: C22.2 No.8)

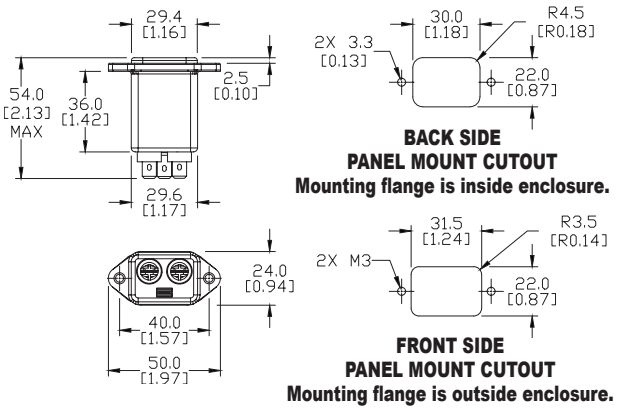
** Derate 1% per 100m after 1000m; Max 3000m.*
***To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific component part number web page.*

Roxburgh RID Series EMI Filters

Specifications				
Parameter	*RID-0142-H*	*RID-0342-H*	*RID-0642-H*	*RID-1042-H*
Power (kW)	0.25	0.75	1.5	2.5
Current Rating (A)	1	3	6	10
SCCR Rating (kA)	5			
Ingress Protection	IP20			
Temperature Rise	30°C		45°C	
Terminal Style	1/4" quick disconnect			
Operational Leakage Current (mA)	0.35			
Total Resistance, Line to Load (mΩ)	1000	300	170	1000
Residual Voltage (V@5s)	1V@5s			
Heat Dissipation (W)	1	2.7	6.12	100
Weight, lbs (kg)	0.1 (0.45)			

Dimensions

mm [inches]



Roxburgh RIR Series EMI Filters

Single-phase Power Entry Module with Filter and Fuse

The Roxburgh RIR Series Power Entry Modules are specifically designed as single-stage line filters for 120/240 VAC devices where fusing is desired. They provide good performance for both common mode and differential mode interference. The filters are rated at 250V and are designed to be through-hole, flange mounted in cabinet or chassis hardware.

Features

- 0-250VAC, 0-60 Hz, single-phase
- 2A, 4A and 6A models
- One replaceable 5mm x 20mm glass fuse included in each module
- One spare 5mm x 20mm glass fuse included in each module fuse tray
- Metal case, miniature type
- Through-hole flange mount
- 1/4 inch quick disconnect terminals

Filter performance curves are available on item page at www.AutomationDirect.com

Applications

- Ideally suited for products that must conform to part 15, FCC regulations
- Digital electronics
- Personal computers and peripherals
- Measuring instruments
- Small equipment applications
- Monitors and display units

Standards and Certifications

RIR Module

RIR Module with fuse tray removed

RIR Module Protective Sleeve SLV48

RIR Power Entry Modules

Part Number	Price	Description
RIR-0222-H	$26.00	IEC Inlet Filter 120/240VAC, 1-ph, 2A, Fused
RIR-0422-H	$26.00	IEC Inlet Filter 120/240VAC, 1-ph, 4A, Fused
RIR-0622-H	$21.00	IEC Inlet Filter 120/240VAC, 1-ph, 6A, Fused
SLV48	$3.00	Protective boot for RIR series

General Specifications

Voltage Rating	0-240V AC/DC 0-60 Hz
Voltage Max.	250V
Voltage Withstand	1500VAC
Phase	1
UL/IEC Pollution Class	Degree II
Humidity	93% RH (non-condensing)
Overload Current	135% 2 hrs, 150% 60s
Insulation Resistance	500VDC >3.5 M Ohms
Climate Class (IEC 60068-1)	-25/85/21
Temperature Rating	-13 to 185°F, -25° to 85°C
Flammability (UL94)	V-0
Material	Tin Plated Steel
Altitude*	1000m (3000m with derating)
Mounting Clearance	>50mm Gap
Agency Approval**	CE (EN 60939-1), UR: File# E191581 (Standard: UL1283), CSA: File# 207414 (Standard: C22.2 No.8)

** Derate 1% per 100m after 1000m; Max 3000m.*

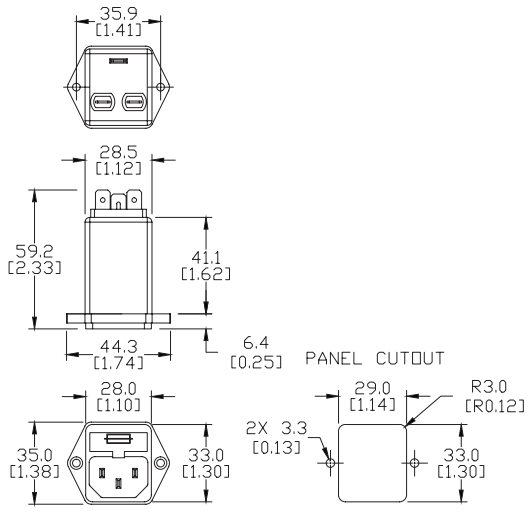
***To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific component part number web page.*

Roxburgh RIR Series EMI Filters

Specifications			
Parameter	*RIR-0222-H*	*RIR-0422-H*	*RIR-0622-H*
Max. Power (kW)	0.5	1	1.5
Current Rating (A)	2	4	6
SCCR Rating (kA)	5		
Ingress Protection	IP20		
Temp Rise	30°C		
Terminal Type	1/4" quick disconnect		
Operation Leakage Current (mA)	0.35		
Total Resistance, Line to Load (mΩ)	500	250	170
Residual Voltage (V@5s)	1V@5s		
Heat Dissipation (W)	2	4	6.12
Weight (lb [kg])	0.17 [0.78]		

Dimensions

mm [inches]



Roxburgh RIP/RIQ Series EMI Filters

Single-phase Power Entry Module with Filter, Fuse and Switch

The Roxburgh RIP/RIQ Series Power Entry Modules are specifically designed as single-stage line filters for 120/240V AC devices where fusing and a power switch are desired. They provide good performance for both common mode and differential mode interference and are rated at 250V. RIP filters are thru-hole flange mounted with screws. RIQ modules are designed to be through-hole snap-in style.

Features

- 120/240V AC/DC, 50/60 Hz, single-phase
- 2A, 4A and 6A models
- One replaceable 5mm x 20mm glass fuse included in each module
- One spare 5mm x 20mm glass fuse included in each module fuse tray
- Metal case, miniature type
- Through-hole mount – Snap-in or Flanged
- 1/4" quick disconnect
- ON – OFF DPST switch
- Filter performance curves are available on item page at: **www.automationdirect.com**

Applications

- Ideally suited for products that must conform to part 15, FCC regulations
- Digital Electronics
- Personal computers and peripherals
- • Measuring instruments
- • Small equipment applications
- • Monitors and display units

Standards and Certifications

RIP Module

RIQ Module

RIP Module with fuse tray removed

RIP/RIQ Module Protective Sleeve SLV47

RIP/RIQ Power Entry Modules

Part Number	Price	Description
RIP-0242-H2	$47.00	IEC Inlet Filter 120/240VAC, 1-ph, 2A, SW/Fused, screw fix
RIP-0442-H2	$49.00	IEC Inlet Filter 120/240VAC, 1-ph, 4A, SW/Fused, screw fix
RIP-0642-H2	$46.00	IEC Inlet Filter 120/240VAC, 1-ph, 6A, SW/Fused, screw fix
RIQ-0242-H2	$43.00	IEC Inlet Filter 120/240VAC, 1-ph, 2A, SW/Fused, snap
RIQ-0442-H2	$44.00	IEC Inlet Filter 120/240VAC, 1-ph, 4A, SW/Fused, snap
RIQ-0642-H2	$47.00	IEC Inlet Filter 120/240VAC, 1-ph, 6A, SW/Fused, snap
SLV47	$4.00	Protective boot for RIP/RIQ series

General Specifications

Voltage Rating	0-240V AC/DC 0-60 Hz
Voltage Max.	250V
Voltage Withstand	1500VAC
Phase	1
UL/IEC Pollution Class	Degree II
Humidity	93% RH (non-condensing)
Overload Current	135% 2 hrs, 150% 60s
Insulation Resistance	500V DC >3.5 M Ohms
Climate Class (IEC 60068-1)	-25/85/21
Temperature Rating	-13 to 185°F, -25° to 85°C
Flammability (UL94)	V-0
Material	Nickel Plated Steel
Altitude*	1000m (3000m with derating)
Mounting Clearance	>50mm Gap
Agency Approval**	CE (EN 60939-1), UR: File# E191581 (Standard: UL1283), CSA: File# 207414 (Standard: C22.2 No.8)

** Derate 1% per 100m after 1000m; Max 3000m.*

***To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific component part number web page.*

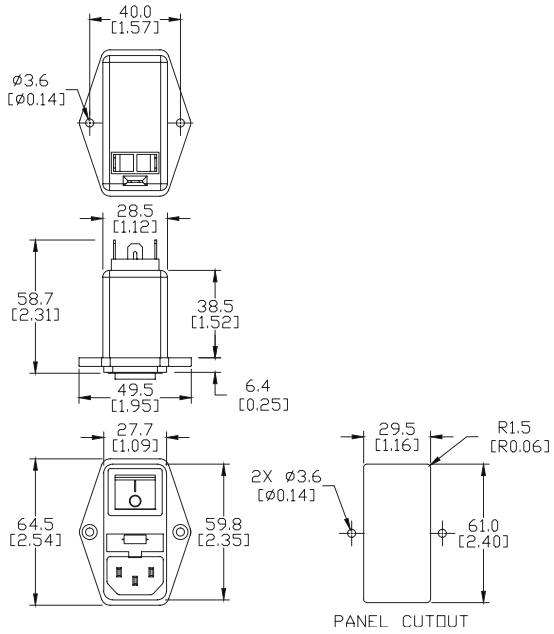
Roxburgh RIP/RIQ Series EMI Filters

Specifications						
Parameter	*RIP-0242-H2*	*RIP-0442-H2*	*RIP-0642-H2*	*RIQ-0242-H2*	*RIQ-0442-H2*	*RIQ-0642-H2*
Max. Power (kW)	0.5	1.0	1.5	0.5	1.0	1.5
Current Rating (A)	2	4	6	2	4	6
SCCR Rating (kA)	5					
Ingress Protection	IP20					
Temperature Rise	40°C	45°C		40°C	45°C	
Terminal Style	1/4" quick disconnect					
Operational Leakage Current (mA)	0.35					
Total Resistance, Line to Load (mΩ)	500	250	170	500	250	170
Residual Voltage (V@5s)	1V@5s					
Heat Dissipation (W)	2	4	6.12	2	4	6.12
Weight (lb [kg])	0.1 [0.045]					

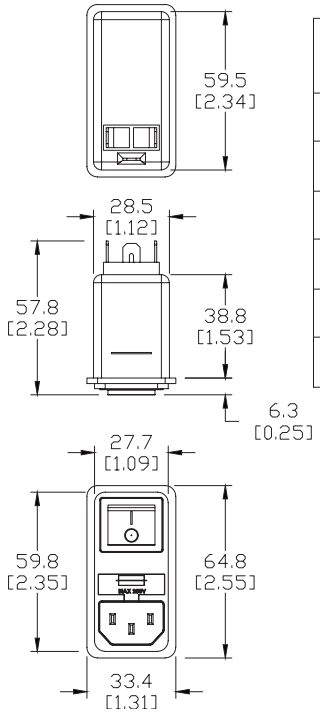
Dimensions

mm [inches]

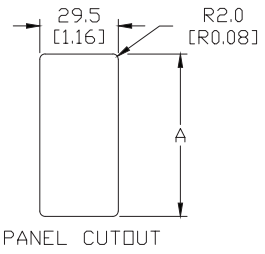
RIP Filter (Flanged)



RIQ Filter (Snap-In)



PANEL THICKNESS mm	CUTOUT HEIGHT "A" mm
0.8	61.8
1.0	62.2
1.2	62.6
1.5	62.8
1.8	62.9
2.0	63.0



Roxburgh TOR Series Toroids

Drive Rated Toroids for Single and Three-phase Applications

The Roxburgh TOR Series ferrite core chokes are specifically designed to aid in the reduction of common mode noise for AC and DC devices. Provides acceptable performance where excessive EMI and RF noise is evident on load side of the drive or device.

Features

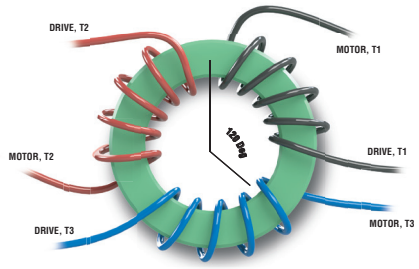
- Delivers good performance common mode interference
- Dielectric breakdown voltage strength 2kV DC
- Epoxy coating thickness 0.25 mm

Applications

- AC and DC drives
- General purpose mains filter and pulse

RoHS 2002/95/EC

Single-phase use



Three-phase use*

***NOTE: When all three phases are wrapped onto a single toroid, space the wires at 120 degrees apart. Start each phase wire in the same direction wrapping from top surface and completing the wrap on the bottom surface; whether wrapping once or multiple times.**

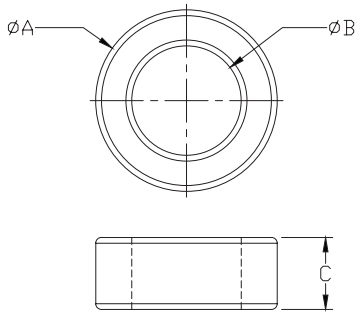
Toroid Filters			
Part Number	***Price***	***Description***	***Weight kg [lb]***
TOR221	$25.00	Toroid: for all AC drives	0.236 [0.52]
TOR254	$44.00	Toroid: for all AC drives	0.327 [0.7]

Toroid common mode chokes (ferrite cores) are normally installed on the output of an AC/DC drive to help reduce harmful EMI interference from affecting other equipment. The toroid cores should be mounted as close to the drive as possible. Do not run ground wire through the toroid. Do not allow the toroid core to touch a grounding point such as an unpainted backplane. This can cause EMI to propagate onto the ground plane. Wrap the motor wiring through the toroid at least four times as shown above for both single and three-phase applications.

For very large wire gauge applications, wrapping a wire once around multiple cores is equivalent to wrapping a wire multiple times around one core. If possible try to attain at least one wrap from each phase around the stack of cores.

Dimensions

mm [inches]



PART NUMBER	øA	øB	C
TOR221	63.0 [2.48]	38.0 [1.50]	25.0 [0.98]
TOR254	102.0 [4.01]	65.8 [2.59]	15.0 [0.59]