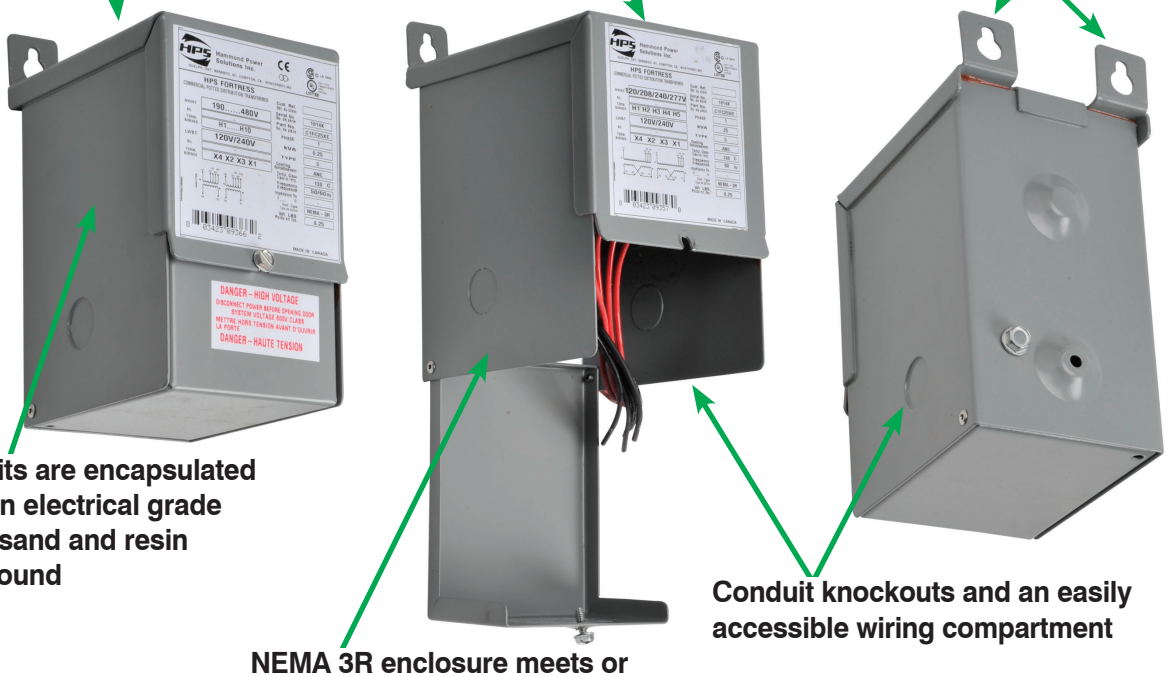
HPS Fortress™ Commercial Encapsulated Transformers

Features

Totally enclosed to seal out moisture and airborne contaminants

Easily accessible nameplate

Installation is made quick and easy with keyhole mounting slots



All units are encapsulated with an electrical grade silica sand and resin compound

NEMA 3R enclosure meets or exceeds listing criteria including NEMA and ANSI standards for indoor and outdoor applications

Conduit knockouts and an easily accessible wiring compartment

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

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 Wt/Lbs
						VA	%z		
C1FC50LE	$116.00	0.50	240x480	120x240	4.17/2.08	500	7.6	35.8	15.0
C1FC75LES	$145.00	0.75			6.25/3.13	750	5.6	57.2	18.0
C1F1C0LES	$175.00	1.0			8.33/4.17	1000	4.8	75.3	22.0
C1F1C5LES	$209.00	1.5			12.5/6.25	1500	4.1	100.0	25.0
C1F002LES	$259.00	2.0			16.7/8.33	2000	4.3	121.6	40.0
C1F003LES	$319.00	3.0			25.0/12.5	3000	3.7	160.8	55.0
C1F005LES	$459.00	5.0			41.7/20.8	5000	4.2	314.0	88
C1F007LES	$585.00	7.5			62.5/31.3	7500	3.6	402.0	145
C1F010LES	$675.00	10			83.3/41.6	10000	3.7	525.0	165
C1F015LES**	$869.00	15			125/62.5	15000	2.4	585.0	286
C1F025LES**	$1,069.00	25			208.3/104.2	25000	2.0	838.0	346

** 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

Dimensions

Figure A - 500VA to 3kVA

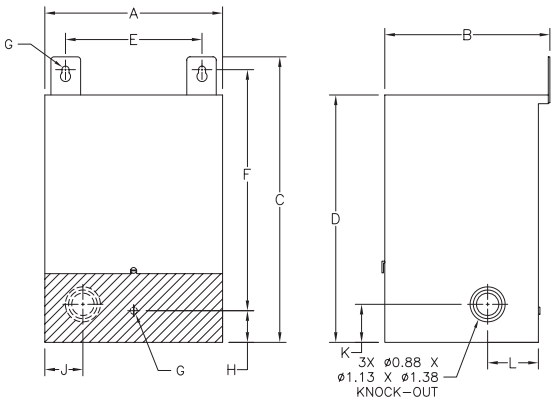
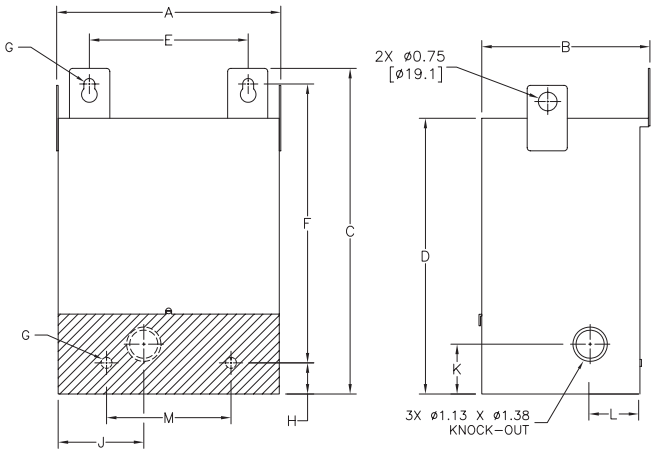


Figure B - 5kVA to 25kVA



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

Dimensions inches [mm]

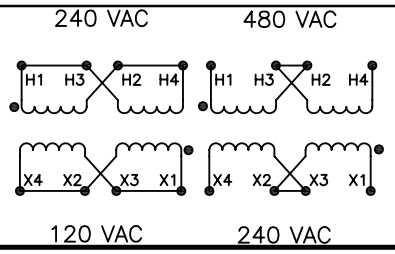
HPS Fortress 480x240/240x120 Encapsulated Transformer Dimensions													
Part Number	Mtg. Fig.	Overall Dimensions in (mm)				Mounting Holes in (mm)		Mtg. Hole Dia. in (mm)	Knock Out Dimensions in (mm)				Rear Mtg. Holes in (mm)
		A	B	C	D	E	F	G	H	J	K	L	M
C1FC50LE	A	5.00 (127.0)	4.75 (120.7)	9.25 (235.0)	8.25 (209.6)	3.88 (98.6)	7.75 (196.9)	0.22 (5.6)	1.25 (31.8)	1.00 (25.4)	1.50 (38.1)	2.00 (50.8)	N/A
C1FC75LES	A	5.00 (127.0)	4.75 (120.7)	9.25 (235.0)	8.25 (209.6)	3.88 (98.6)	7.75 (196.9)	0.22 (5.6)	1.25 (31.8)	1.00 (25.4)	1.50 (38.1)	2.00 (50.8)	
C1F1C0LES	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)	
C1F1C5LES	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)	
C1F002LES	A	7.00 (177.8)	6.50 (165.1)	11.25 (285.8)	9.75 (247.7)	5.38 (136.7)	9.50 (241.3)	0.28 (7.1)	1.25 (31.8)	1.50 (38.1)	1.50 (38.1)	2.00 (50.8)	
C1F003LES	A	7.00 (177.8)	6.50 (165.1)	11.25 (285.8)	9.75 (247.7)	5.38 (136.7)	9.50 (241.3)	0.28 (7.1)	1.25 (31.8)	1.50 (38.1)	1.50 (38.1)	2.00 (50.8)	
C1F005LES	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)	6.00 (152.4)
C1F007LES	B	12.25 (311.2)	9.25 (234.9)	17.63 (447.8)	15.56 (395.2)	9.38 (238.3)	14.88 (377.9)	0.44 (11.2)	2.00 (50.8)	5.00 (127.0)	2.00 (50.8)	2.00 (50.8)	8.00 (203.2)
C1F010LES	B	12.25 (311.2)	9.25 (234.9)	20.88 (530.4)	18.88 (479.6)	9.38 (238.3)	18.13 (460.5)	0.44 (11.2)	2.00 (50.8)	5.00 (127.0)	2.00 (50.8)	2.00 (50.8)	8.00 (203.2)
C1F015LES	B	14.50 (368.3)	10.75 (273.1)	21.38 (543.1)	19.38 (492.3)	11.63 (295.4)	18.63 (473.2)	0.44 (11.2)	2.00 (50.8)	6.00 (152.4)	2.00 (50.8)	2.00 (50.8)	10.00 (254.0)
C1F025LES	B	14.50 (368.3)	10.75 (273.1)	27.38 (695.5)	24.88 (631.9)	11.13 (282.7)	24.50 (622.3)	0.56 (14.2)	2.00 (50.8)	6.00 (152.4)	2.00 (50.8)	2.00 (50.8)	10.00 (254.0)

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 x 240 VAC
Secondary 240 x 120 VAC

Wiring Diagram - For 500VA to 5kVA

SCHEMATIC



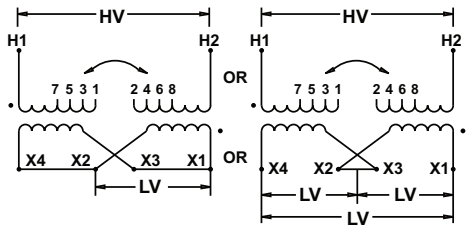
CONNECTIONS

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

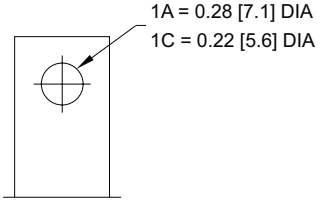
Primary Volts	Connect lines to	Inter-connect
504	H1, H2	1-2
492	H1, H2	2-3
480	H1, H2	3-4
468	H1, H2	4-5
456	H1, H2	5-6
444	H1, H2	6-7
432	H1, H2	7-8
	H1, H2	H1-2, H2-1
240	H1, H2	H1-4, H2-3
228	H1, H2	H1-6, H2-5
216	H1, H2	H1-8, H2-7

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	#10 AWG Leads	Terminal Pad 1C
C1F015LES	#8 AWG Leads	Terminal Pad 1A
C1F025LES	#6 AWG Leads	Terminal Pad 1A

**** Transformers are provided with copper leads or copper terminal pads.***

Terminal Pad Diagram



Dimensions inches [mm]

Control Transformer Selection

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:
   Method B will result in slightly larger transformer selected.

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%, then 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.
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.

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.

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 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.