

# Industrial Control Power Transformers

## Class MT

### General

#### Features

- Epoxy-encapsulated (50–750VA); epoxy resin impregnated (1.0–5.0 KVA). Completely seals the transformer coils against moisture, dust, dirt and industrial contaminants for maximum protection in hostile and industrial environments.
- Fuse clips (most models). Factory mounted for integral fusing on the secondary side to save panel space, save wiring time and save the cost of buying an add-on fuse block or kit.
- Integrally molded barriers. Between terminals and transformer, protect against electrical creepage. Up to 30% greater terminal contact area permits low-loss connections. Extra-deep barriers reduce the chance of shorts from frayed leads or careless wiring.
- Terminals. Molded into the transformer, are difficult to break during wiring. A full quarter-inch of thread on the 10-32 terminal screws prevents stripping and pullout.
- Jumpers supplied. Two jumper links are standard with all transformers which can be wired for dual primary voltages.

#### Operation

Industrial control circuits and motor control loads typically require more current when they are initially energized than under normal operating conditions. This period of high current demand, referred to as inrush, may be as great as ten times the current required under steady state (normal) operating conditions, and can last up to 40 milliseconds. A transformer in a circuit subject to inrush will typically attempt to provide the load with the required current during the inrush period. However, it will be at the expense of the secondary voltage stability by allowing the voltage to the load to decrease as the current increases. This period of secondary voltage instability, resulting from increased current, can be of such magnitude that the transformer is unable to supply sufficient voltage to energize the load. The transformer must therefore be designed and constructed to accommodate the high inrush current, while maintaining secondary voltage stability. According to NEMA standards, the secondary voltage would typically be at 85% of the rated voltage.

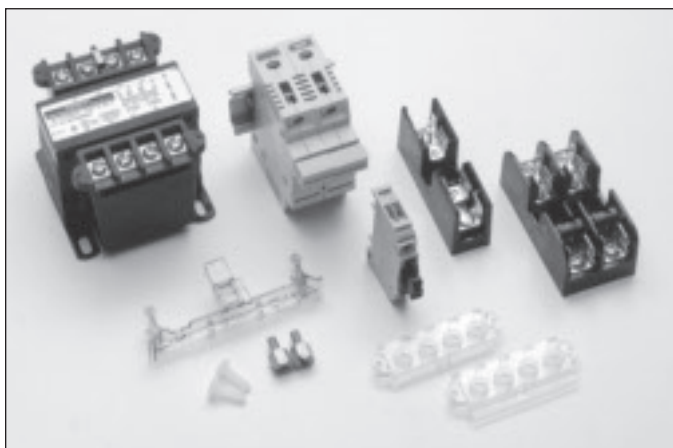


Industrial Control Power Transformers are specifically designed and built to provide adequate voltage to the load while accommodating the high current levels present at inrush. These transformers deliver excellent secondary voltage regulation and meet or exceed the standards established by NEMA, ANSI, UL and CSA. Their rugged construction and excellent electrical characteristics ensure reliable operation of electromagnetic devices and trouble-free performance.

#### Specifications

- Laminations are built with silicon steel to minimize core losses and to increase optimum performance and efficiency.
- Copper magnet wire of the highest quality assures efficient operation.
- Factory mounted type "K" fuse clips are standard on all secondary transformers where possible.
- Two jumper links are standard with all transformers which can be wired for dual primary voltages.
- UL listed and CSA certified.
- 50/60 Hz rated.
- Insulation materials are of the highest rating available for the temperature class.

- Mounting brackets are heavy gauge steel to add strength to core construction and provide stable mounting. Slotted mounting feet permit easy installation.
- Attractive black finish; easy-to-read nameplate with complete rating data and wiring diagram.
- Class 105°C (221°F) insulation system. 55°C (131°F) temperature rise. (50–750VA typical)
- Class 180°C (356°F) insulation system. 120°C (248°F) temperature rise. (1000–5000VA typical)
- Optional field mounted 2-pole primary Class CC fuse block is available.



## Features

- Class MTG Industrial Control Transformers are 100% certified for all domestic and International Applications.
- The MTG line has full compliance with IEC Safety standards EN 61 558.
- CE Mark in accordance with requirements for EN 61 558.
- Meets IP-20 specifications per IEC 529 for finger-safe protection when used with Siemens Touch Safe snap on terminal cover kits. Meets IP-00 specifications when covers are not used.
- UL Listed (File # E46323)
- CSA Certified (File #LR27533)
- Exceeds applicable requirements for control transformers as determined by NEMA and ANSI.
- Insulation requirements is twice that of UL506.
- Proven Epoxy-encapsulated coils operate cooler and completely seal the transformer coils against moisture, dust, dirt and industrial contaminants for maximum protection in hostile and industrial environments.
- Available in 50 to 750 VA sizes, in all standard voltage combinations.
- Class 105°C (221°F) insulation system. 55°C (131°F) temperature rise. (50–750VA typical)
- Class 180°C (356°F) insulation system. 120°C (248°F) temperature rise. (1000–5000VA typical)
- Primary and secondary fusing capability available as field installed kits for domestic or international fusing.
- Integrally-molded terminals and barriers between terminals make breakage virtually impossible during wiring. The MTG transformer construction is the same as our High Quality Class MT transformers.

### Optional Field Installed Fuse Clip Kits For Panel Mounting

- 2-Pole primary Class CC fuse block
- 1-Pole secondary midget fuse block for  $1\frac{3}{32} \times 1\frac{1}{2}$  fuses
- 2-Pole primary international type fuse blocks
- 1-Pole secondary international type fuse blocks

### Optional Touch-Safe Snap-On Terminal Cover Kits

The Touch-Safe terminal covers are designed to comply with IEC 742 and IP 20 requirements. When installed,

the covers prevent contact with current carrying parts on the transformer and are available for 4 terminal configurations. The international fuse block kits have inherent touch safe terminals and fuse clips.

### Siemens Meets International Standards

CSA (Canadian Standards Association) was utilized as a Competent Body in reviewing, interpreting and properly complying with the requirements of IEC-742 to place a CE mark on its MTG Series product. As a National Certification Body, CSA also has the proper documentation and reports on file for MTG Series to utilize the CB Scheme ensuring acceptance throughout the world.

The standard Siemens MTG product is available with terminal covers which meets the requirements of IEC-529, IP20 degree of protection and meets the applicable requirements for covers per IEC-742.

### IEC-742

The requirements for industrial control circuit transformers to be used in the European Common Market are identified by the International Electrotechnical Commission (IEC) and specified under IEC-742, Non-Short Circuit Proof Isolating Transformers, under the Low Voltage Directive 73/23/EEC. Manufacturers of control transformers indicate compliance with these requirements by placing a CE mark on the product.

- Winding to winding insulation requirements may be twice that for IEC-742 compared to UL506.
- The electrical clearances between current carrying parts are one-third greater to comply with IEC-742 requirements for units up to 250VA with voltages up to 440 volts ac.
- Transformers manufactured to IEC-742 requirements will have a minimum of 10% higher overload capacity than those manufactured only to UL506 requirements.

While no requirement exists in IEC-742 for the electrical connections to be either finger safe or touch proof, the specification does state that IF a transformer is supplied with a cover to prevent incidental contact with current carrying parts, that cover must utilize two separate methods or places of securing it to the component, with neither being dependent upon the other. Additionally, one of these methods MUST require a tool to remove it.

### IEC-529

The requirements for finger-safe or touch-proof electrical connections are identified by the International Electrotechnical Commission (IEC) under specification 529, Classification of Degrees of Protection Provided by Enclosures. These various degrees of protection are identified and differentiated by IP ratings.

The IP specification which most closely approximates protection to a human finger is IP20. This IP rating would be the most common degree of touch-proof connection for electrical components such as transformers.

### EN 61 558

The requirements for industrial control transformers to be used in the European Common Market are identified by the IEC and specified in EN 61 558, Safety of Power Control Transformers, under Low Voltage Directive 73/23/EEC. CE mark on the product indicates compliance.

# Industrial Control Power Transformers

## Class MT, MTG

### General

#### Transformer Selection Process

Selecting a transformer for industrial control circuit applications requires knowledge of the following terms:

**Inrush VA** is the product of load voltage (V) multiplied by the current (A) that is required during circuit start-up. It is calculated by adding the inrush VA requirements of all devices (contactors, timers, relays, pilot lights, solenoids, etc.), which will be energized together. Inrush VA requirements are best obtained from the component manufacturer.

**Sealed VA** is the product of load voltage (V) multiplied by the current (A) that is required to operate the circuit after initial start-up or under normal operating conditions. It is calculated by adding the sealed VA requirements of all electrical components of the circuit that will be energized at any given time. Sealed VA requirements are best obtained from the component manufacturer. Sealed VA is also referred to as steady state VA.

**Primary Voltage** is the voltage available from the electrical distribution system and its operational frequency, which is connected to the transformer supply voltage terminals.

**Secondary Voltage** is the voltage required for load operation which is connected to the transformer load voltage terminals.



Fuse Clip Kit KCCFPX2R

#### Primary Fuse Kit

In addition to factory installed secondary fusing, Siemens offers a primary fuse kit for class MT transformers Size 50–750 VA for field installation. The primary fuse kit includes a 2-pole class CC fuse block, instructions and all associated mounting and wiring hardware. Additionally, this fuse kit will fit most competitors' units. To order this kit, use catalog number **KCCFPX2R**. The primary fuse kit, when installed, will add a maximum of 0.69 in. (18 mm) to the transformer "A" dimension and 1.94 in. (49 mm) to the "C" dimension.

Once the circuit variables have been determined, transformer selection is a simple 5-step process as follows:

1. Determine the Application Inrush VA by using the following industry accepted formula:  

$$\text{Application Inrush VA} = \sqrt{(\text{Inrush VA})^2 + (\text{Sealed VA})^2}$$
2. Refer to the Regulation Chart. If the primary voltage is basically stable and does not vary by more than 5% from nominal, the 90% secondary voltage column should be used. If the primary voltage varies between 5% and 10% of nominal, the 95% secondary voltage column should be used.
3. After determining the proper secondary voltage column, read down until a value equal to or greater than the Application Inrush VA is found. In no case should a figure less than the Application Inrush VA be used.
4. Read left to the Transformer VA Rating column to determine the proper transformer for this application. As a final check, make sure that the Transformer VA Rating is equal to or greater than the total sealed requirements. If not, select a transformer with a VA rating equal to or greater than the total sealed VA.
5. Refer to the following pages to determine the proper catalog number based on the transformer VA, and primary and secondary voltage requirements.

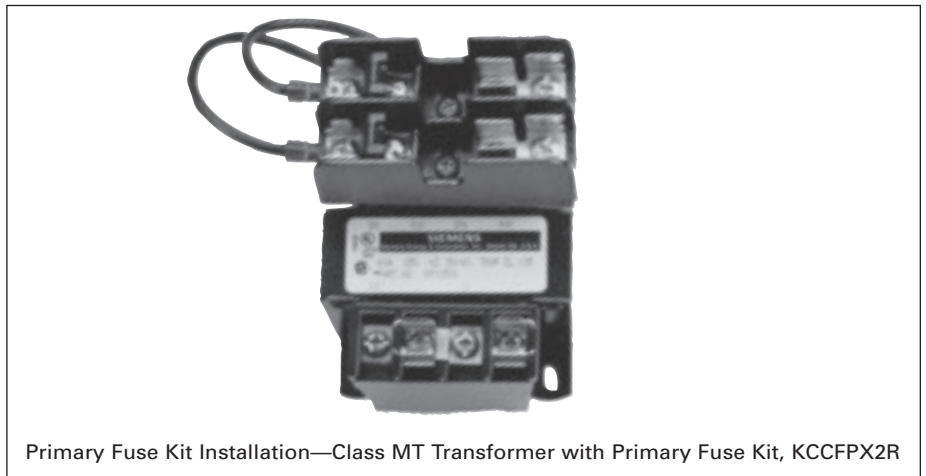
#### Regulation Data Chart

Transformer VA Ratings	Inrush VA At 20% Power Factor		
	NEMA/IEC 95% Sec Voltage	NEMA/IEC 90% Sec Voltage	NEMA/IEC 85% Sec Voltage
25	100/—	130/—	150/—
50	170/190	200/220	240/270
75	310/350	410/460	540/600
100	370/410	540/600	730/810
150	780/860	930/1030	1150/1270
200	810/900	1150/1270	1450/1600
250	1400/1540	1900/2090	2300/2530
300	1900/2090	2700/2970	3850/4240
350	3100/3410	3650/4020	4800/5280
500	4000/4400	5300/5830	7000/7700
750	8300/9130	11000/12100	14000/15400
1000 <sup>①</sup>	15000/—	21000/—	27000/—
1000 <sup>②</sup>	9000/—	13000/—	18500/—
1500	10500/—	15000/—	205000/—
2000	17000/—	25500/—	34000/—
3000	24000/—	36000/—	47500/—
5000	55000/—	92500/—	115000/—

To comply with NEMA standards, which require all magnetic devices to operate successfully at 85% of rated voltage, the 90% secondary voltage column is most often used in selecting a transformer.

① For units with Class 105°C insulation systems.

② For units with Class 180°C insulation systems.




Primary Fuse Kit Installation—Class MT Transformer with Primary Fuse Kit, KCCFPX2R

# Industrial Control Power Transformers

## Domestic, Class MT

Selection

1  
2  
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8

	<b>Ordering Information</b>	<b>Voltage Table</b>		
	<ul style="list-style-type: none"> <li>▶ Use the Voltage Table to determine the primary and secondary voltage required.</li> <li>▶ Technical data see <a href="http://www.sea.siemens.com">www.sea.siemens.com</a></li> <li>▶ Field Modifications see page 8/79.</li> <li>▶ Dimensions see page 8/114.</li> <li>▶ Wiring Diagrams see page 8/144.</li> </ul>	<b>Primary Volts 50/60 Hz</b>	<b>Secondary Volts</b>	<b>Letter</b>
		240 X 480, 230 X 460, 220 X 440	120/115/110	A
		240 X 480	24	B
		120 X 240	24	C
		115 X 230	24	D
		550/575/600	110/115/120	E
		208/277	120	F
		208/230/460	115	G
		230/460/575	95/115	H
		380/400/415	110 X 220	I
		208/230/460, 200/220/440,240/480	24 X 115, 23 X 110, 25 X 120	J
		240/416/480/600, 230/400/460/575, 220/380/440/550, 208/500	99/120/130, 95/115/125, 91/110/120, 85/100/110	L
		240 X 480	120 X 240	M

VA Rating	Voltage Letter A <sup>①②</sup>		Voltage Letter B <sup>②③</sup>		Voltage Letter C <sup>②③</sup>		Voltage Letter D <sup>②③</sup>		Voltage Letter E <sup>①②</sup>		Voltage Letter F <sup>①②</sup>	
	Catalog No	List Price \$	Catalog No	List Price \$	Catalog No	List Price \$	Catalog No	List Price \$	Catalog No	List Price \$	Catalog No	List Price \$
50	MT0050A	41.50	MT0050B	48.00	MT0050C	48.00	MT0050D	48.00	MT0050E	48.00	MT0050F	48.00
75	MT0075A	49.00	MT0075B	58.00	MT0075C	58.00	MT0075D	58.00	MT0075E	56.00	MT0075F	51.00
100	MT0100A	55.00	MT0100B	64.00	MT0100C	64.00	MT0100D	64.00	MT0100E	59.00	MT0100F	59.00
150	MT0150A	59.00	MT0150B	82.00	MT0150C	82.00	MT0150D	82.00	MT0150E	70.00	MT0150F	70.00
200	MT0200A	73.00	MT0200B	103.00	MT0200C	103.00	MT0200D	103.00	MT0200E	87.00	MT0200F	87.00
250	MT0250A	85.00	MT0250B	122.00	MT0250C	122.00	MT0250D	122.00	MT0250E	108.00	MT0250F	108.00
300	MT0300A	94.00	MT0300B	128.00	MT0300C	128.00	MT0300D	128.00	MT0300E	128.00	MT0300F	128.00
350	MT0350A	101.00	MT0350B	134.00	MT0350C	134.00	MT0350D	134.00	MT0350E	137.00	MT0350F	135.00
500	MT0500A	124.00	MT0500B	168.00	MT0500C	168.00	MT0500D	168.00	MT0500E	146.00	MT0500F	146.00
750	MT0750A	172.00	MT0750B	150.00	—	—	—	—	MT0750E	166.00	MT0750F	154.00
1000	MT1000A	209.00	—	—	—	—	—	—	MT1000E	257.00	—	—
1500	MT1500A	298.00	—	—	—	—	—	—	—	—	—	—
2000	MT2000A	362.00	—	—	—	—	—	—	—	—	—	—
3000	MT3000A	503.00	—	—	—	—	—	—	—	—	—	—
5000	MT5000A	845.00	—	—	—	—	—	—	—	—	—	—


VA Rating	Voltage Letter G <sup>①②</sup>		Voltage Letter H <sup>②④</sup>		Voltage Letter I <sup>②④</sup>		Voltage Letter J <sup>②③</sup>		Voltage Letter L <sup>①②</sup>		Voltage Letter M <sup>②④</sup>	
	Catalog No	List Price \$	Catalog No	List Price \$	Catalog No	List Price \$	Catalog No	List Price \$	Catalog No	List Price \$	Catalog No	List Price \$
50	MT0050G	67.00	MT0050H	67.00	MT0050I	48.00	MT0050J	67.00	MT0050L	69.00	MT0050M	69.00
75	MT0075G	71.00	MT0075H	71.00	MT0075I	58.00	MT0075J	71.00	—	—	MT0075M	73.00
100	MT0100G	75.00	MT0100H	75.00	MT0100I	64.00	MT0100J	75.00	MT0100L	77.00	MT0100M	77.00
150	MT0150G	97.00	MT0150H	97.00	MT0150I	82.00	MT0150J	97.00	MT0150L	101.00	MT0150M	101.00
200	MT0200G	125.00	MT0200H	125.00	MT0200I	103.00	MT0200J	125.00	—	—	MT0200M	130.00
250	MT0250G	132.00	MT0250H	132.00	MT0250I	122.00	MT0250J	132.00	MT0250L	137.00	MT0250M	137.00
300	MT0300G	155.00	MT0300H	155.00	MT0300I	128.00	MT0300J	155.00	—	—	MT0300M	161.00
350	MT0350G	162.00	MT0350H	—	MT0350I	134.00	MT0350J	162.00	MT0350L	168.00	MT0350M	168.00
500	MT0500G	181.00	MT0500H	181.00	MT0500I	168.00	MT0500J	181.00	MT0500L	189.00	MT0500M	189.00
750	MT0750G	252.00	MT0750H	252.00	MT0750I	211.00	—	—	MT0750L	262.00	MT0750M	262.00
1000	MT1000G	297.00	MT1000H	297.00	MT1000I	297.00	—	—	—	—	—	—
1500	MT1500G	385.00	MT1500H	385.00	MT1500I	334.00	—	—	—	—	—	—
2000	MT2000G	514.00	MT2000H	514.00	MT2000I	514.00	—	—	—	—	—	—
3000	MT3000G	642.00	MT3000H	642.00	MT3000I	642.00	—	—	—	—	—	—
5000	MT5000G	1027.00	MT5000H	1027.00	—	—	—	—	—	—	—	—

① Includes secondary fuse clip on sizes 50–750VA  
 ② A 2-pole Primary Class CC Fuse Kit is available for Field installation. See page 8/79 for details. Catalog Number: KCCFPX2R.  
 ③ Includes secondary fuse clip on sizes 50–500VA  
 ④ Does not include secondary fuse clip on any size.

# Industrial Control Power Transformers

## International, Class MTG

### Selection

	<b>Ordering Information</b> <ul style="list-style-type: none"> <li>▶ Use the Voltage Table to determine the primary and secondary voltage required.</li> <li>▶ Technical data see <a href="http://www.sea.siemens.com">www.sea.siemens.com</a></li> <li>▶ Field Modifications see page 8/79.</li> <li>▶ Dimensions see page 8/114.</li> <li>▶ Wiring Diagrams see page 8/144.</li> </ul>	<b>Voltage Table</b>																									
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VA Rating	Voltage Letter A		Voltage Letter B		Voltage Letter C		Voltage Letter E		Voltage Letter I		Voltage Letter J		Voltage Letter P	
	Catalog No	List Price \$	Catalog No	List Price \$	Catalog No	List Price \$	Catalog No	List Price \$	Catalog No	List Price \$	Catalog No	List Price \$	Catalog No	List Price \$
50	MTG0050A	55.00	MTG0050B	64.00	MTG0050C	64.00	MTG0050E	64.00	MTG0050I	89.00	MTG0050J	65.00	MTG0050P	64.00
75	MTG0075A	65.00	MTG0075B	77.00	MTG0075C	77.00	MTG0075E	71.00	MTG0075I	94.00	MTG0075J	72.00	MTG0075P	77.00
100	MTG0100A	73.00	MTG0100B	86.00	MTG0100C	86.00	MTG0100E	78.00	MTG0100I	99.00	MTG0100J	99.00	MTG0100P	86.00
150	MTG0150A	78.00	MTG0150B	109.00	MTG0150C	109.00	MTG0150E	94.00	MTG0150I	130.00	MTG0150J	137.00	MTG0150P	109.00
200	MTG0200A	98.00	MTG0200B	139.00	MTG0200C	139.00	MTG0200E	134.00	MTG0200I	141.00	MTG0200J	164.00	MTG0200P	139.00
250	MTG0250A	112.00	MTG0250B	163.00	MTG0250C	163.00	MTG0250E	167.00	MTG0250I	178.00	MTG0250J	173.00	MTG0250P	163.00
300	MTG0300A	126.00	MTG0300B	172.00	MTG0300C	172.00	MTG0300E	172.00	MTG0300I	196.00	MTG0300J	221.00	MTG0300P	172.00
350	MTG0350A	134.00	MTG0350B	195.00	MTG0350C	195.00	MTG0350E	205.00	MTG0350I	217.00	MTG0350J	231.00	MTG0350P	195.00
500	MTG0500A	166.00	MTG0500B	225.00	MTG0500C	225.00	MTG0500E	225.00	MTG0500I	243.00	MTG0500J	243.00	MTG0500P	225.00
750	MTG0750A	230.00	MTG0750B	316.00	MTG0750C	316.00	MTG0750E	316.00	MTG0750I	338.00	MTG0750J	462.00	MTG0750P	316.00
1000	MTG1000A	276.00	MTG1000B	411.00	MTG1000C	—	—	—	—	—	MTG1000J	514.00	—	—
1500	MTG1500A	379.00	—	—	—	—	—	—	—	—	—	—	—	—
2000	MTG2000A	424.00	—	—	—	—	—	—	—	—	—	—	—	—
3000	MTG3000A	616.00	—	—	—	—	—	—	—	—	—	—	—	—
5000	MTG5000A	924.00	—	—	—	—	—	—	—	—	—	—	—	—