

# 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.

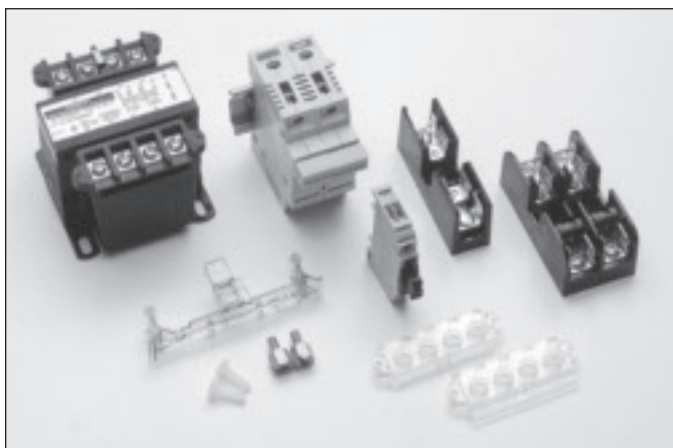


Industrial Control Power Transformers are specifically designed and built to provide adequate voltage to the load while accommodating the high current levels present at inrush. These transformers deliver excellent secondary voltage regulation and meet or exceed the standards established by NEMA, ANSI, 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.

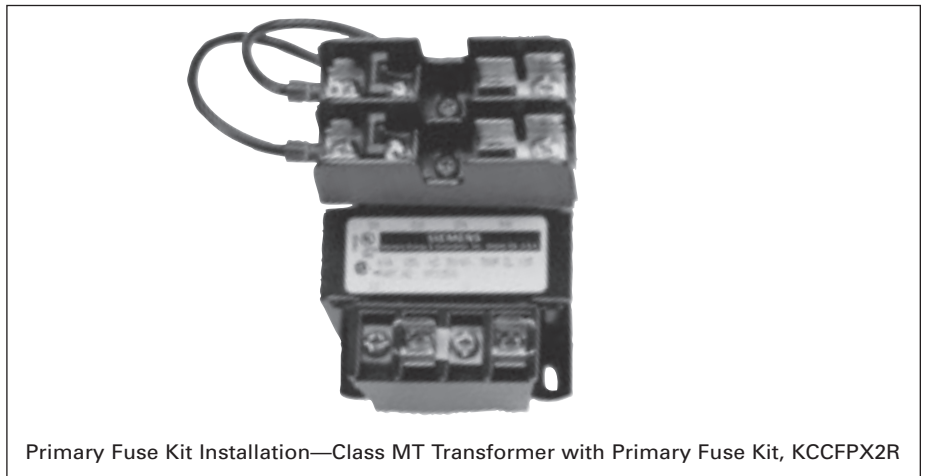
#### Regulation Data Chart

| 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

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|  | Ordering Information   | Voltage Table  |  |        |
|--|--|--|--|--------|
|  | <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> | Primary Volts 50/60 Hz                                     | Secondary Volts                                | Letter |
|  |  | 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>②③</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                        | 128.00        | 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.