Transformers
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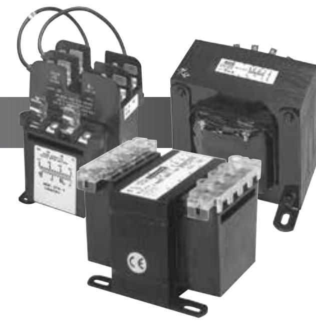
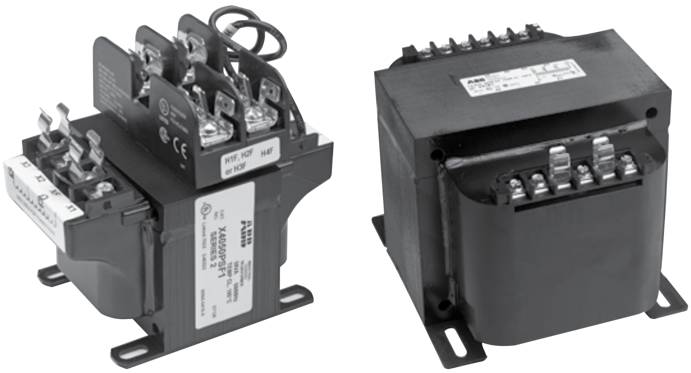


13 - Transformers

ABB Transformers



Description

- Epoxy encapsulated coils up through 750VA
- Epoxy resin impregnated coils 1 kVA to 5 kVA
- Provides stepped down voltages for machine tool control devices and industrial control panels
- Laminations of high quality silicon steel
- Minimum core loss
- Optimized performance
- Copper magnet wire providing the highest quality and efficient operation
- Molded-in terminals
- 80°C rise, 130°C insulation system
- 50/60 Hz
- UL File # E175311
- CSA File #LR27533
- IP 20 Touch safe covers available as an option

General information
Catalog number explanation

X 4 100 P S F1 /C

T - Industrial control transformer

X - New generation industrial control transformer

Primary voltage rating ①
4 - 460V, 230V & 208V
6 - 575V & 600V

VA rating

045 = 45VA	350 = 350VA
050 = 50VA	500 = 500VA
075 = 75VA	750 = 750VA
100 = 100VA	1K = 1000VA
150 = 150VA	1.5K = 1500VA
200 = 200VA	2K = 2000VA
250 = 250VA	3K = 3000VA
300 = 300VA	5K = 5000VA

Accessories
C = Primary fuse covers and IP 20 terminal covers
F = Primary fuse covers only

IP 20 Terminal covers
Meets finger safe or touch safe requirements for IEC specification 529. Available 50VA thru 750VA

Secondary voltage(s) ②
F = 24V
1 = 115V
F1 = 115/24V dual secondary ②

Fuse blocks
S = Secondary fuse clip (13/32" x 1 1/2", less fuse)
P = Primary fuse block (2 pole Class CC, less fuses)

Example: **X4050PSF1**

- ABB Industrial control transformer
- Primary voltage: 460V, 230V and 208V
- 50 VA rating
- Primary & secondary fuse blocks provided
- Secondary voltage 115/24V
- Optional IP 20 terminal covers

① Consult factory for applications with different voltages.
② Whenever both secondary voltages are to be used at the same time, remove the secondary fuse clip and use a separate mounted 2 pole fuse block.

General information
Regulation

Regulation

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.

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 Data 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 transformer selection pages to determine the proper catalog number based on the transformer VA, and primary and secondary voltage requirements.

Inrush

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) operation 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 a magnitude that the transformer is unable to supply sufficient voltage to energize the load.

This 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 should typically be at 85% of the rated voltage.

Industrial Control Circuit Transformers by ABB Control Inc. 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 hearty construction and excellent electrical characteristics assure reliable operation of electromagnetic devices and trouble-free performance.

Regulation Data Chart

Transformer VA rating	Inrush VA at 20% power factor		
	95% secondary voltage	90% secondary voltage	85% secondary voltage
25	100	130	150
50	170	200	240
75	310	410	540
100	370	540	730
150	780	930	1150
200	810	1150	1450
250	1400	1900	2300
300	1900	2700	3850
350	3100	3650	4800
500	4000	5300	7000
750	8300	11000	14000
1000 ①	15000	21000	27000
1000 ②	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.

NOTE
For UL overcurrent protection, see page 13.9

① For units with class 105°C insulation systems.
② For units with class 180°C insulation systems.

General information
IEC-742, CB Scheme

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.

In addition to being able to handle the inrush requirements of industrial control circuits and motor loads, transformers built to the requirements of IEC-742 will exhibit several major construction differences from those manufactured in accordance with UL506. These construction differences will typically increase not only the physical size of the transformer when compared to those built only to UL requirements, but the inrush capability as well.

- The winding insulation thickness requirements, depending upon electrical currents, are comparable layer to layer for IEC-742 versus UL506. Winding to winding insulation requirements, however, 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.

- The dielectric strength (hipot) test voltages are twice as long in duration to comply with IEC-742 compared to UL506 for all units and up to one-and-a-half times greater in magnitude on smaller VA sizes.

- Transformers manufactured to IEC-742 requirements will have a minimum of 10% higher overload capacity than those manufactured only to UL506 requirements.

l IEC-742 requires that transformers in a failure mode under excessive current (10 times the unit rating) must not exhibit flame or molten material. There is no comparable requirement under UL506.

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.

A variety of IP ratings are defined in IEC-529 ranging from IP00, which provides no protection from contact, to IP68, which identifies dust-proof and water-proof protection. Optionally, IP ratings may contain additional and supplementary designators. 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.

IEC-529 protection requirements would most commonly apply to products which fall under the requirements of the Machinery Directive 89/392/EEC, as opposed to the Low Voltage Directive 73/23/EEC, which covers components such as control transformers. Over time, however, users subject to the requirements of the Machinery Directive and/or IEC-529 have expanded their interpretation of finger-safe or touch-proof electrical connections to include the components of the equipment, such as transformers.

CB Scheme
A CE mark indicates compliance to the applicable requirements of a particular product as outlined by the International Electrotechnical Commission (IEC) and by mutual agreement is recognized throughout the European Union. By itself, however, the CE mark may not necessarily be accepted as evidence of product compliance in countries outside of the European Union. Additionally, even countries within the European Union may require their own country's approval mark in addition to the CE mark. To that end, a system of mutual recognition and reciprocal acceptance has been developed which would allow product acceptance outside of the European Union and the ability to obtain the approval mark of countries within it.

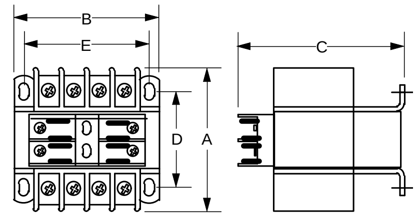
The official title for this mutual acceptance agreement is The Scheme of the IECEE for Recognition of Results of Testing to Standards for Safety of Electrical Equipment (CB Scheme for short). The basis of the CB Scheme is a CB Test Certificate providing evidence that representative samples of a particular product have been tested to a particular IEC standard and successfully passed the required tests.

Each country participating in the CB Scheme, currently over 50, including East and West Europe, the Middle and Far East, and the Pacific Rim, has a representative agency, referred to as a National Certification Body, in the IECEE. Each participant has agreed that they will accept the test results of other members if such results are based on a reasonably harmonized IEC standard. Thus, by utilizing the CB Scheme, a manufacturer of product carrying a CE mark may be able to have that product accepted throughout the world, or obtain additional listing marks, with no further product testing being required.

To utilize the CB Scheme, a manufacturer must present the appropriate test reports, along with a CB Test Certificate prepared by the National Certification Body responsible for the original product listing, to the National Certification Body of the country to which the product is being supplied. At such time as the reports are accepted, the product manufacturer may place the certification mark of the country on the product without the need for additional testing.

Transformers
45 - 500 VA

X4050PSF1



Top View   Side View

45 - 500 VA
Primary Voltage - 460/230/208V, 480/240V, 440/220/200V
Secondary Voltage - 115/24V, 120/25V, 110/23V

VA Rating	Catalog number	Number of Terminals	Output Amps 24/115	Included		Dimensions						
				Primary Fuse Block	Secondary Fuse Clip		A	B	C	D	E	Mounting Slots
45	X4045SF1	4	1.90/0.39	Y	Y ①	Inches	4 1/2	3 1/8	3 1/8	2 7/8	2 1/2	3/16 x 7/16
						mm	115	76	80	72	64	5 x 12
50	X4050PSF1	4	2.08/0.44	Y	Y	Inches	4 1/2	3	4	2 7/8	2 1/2	3/16 x 7/16
						mm	115	76	102	72	64	5 x 12
75	X4075PSF1	4	3.13/0.65	Y	Y	Inches	4 1/2	3 3/8	4 3/8	2 3/4	2 3/4	3/16 x 7/16
						mm	114	86	110	71	71	5 x 12
100	X4100PSF1	4	4.17/0.87	Y	Y	Inches	4 1/2	3 3/4	4 5/8	3	3 1/8	3/16 x 7/16
						mm	115	95	118	76	80	5 x 12
150	X4150PSF1	4	6.25/1.30	Y	Y	Inches	5	3 3/4	4 5/8	3 1/8	3 1/8	3/16 x 7/16
						mm	128	95	118	80	80	5 x 12
200	X4200PSF1	4	8.33/1.74	Y	Y	Inches	4 3/8	4 1/2	5 1/4	3 3/4	3 3/4	3/16 x 7/16
						mm	111	114	134	76	95	5 x 12
250	X4250PSF1	4	10.42/2.17	Y	Y	Inches	4 3/4	4 1/2	5 1/4	3 3/4	3 3/4	3/16 x 7/16
						mm	120	114	134	76	95	5 x 12
300	X4300PSF1	4	12.50/2.61	Y	Y	Inches	6 1/8	5 1/4	6	3 7/8	4 3/8	5/16 x 1 1/16
						mm	155	133	151	98	111	8 x 27
350	X4350PSF1	6	14.58/3.04	Y	Y	Inches	6 1/8	5 1/4	6	3 7/8	4 3/8	5/16 x 1 1/16
						mm	155	133	151	98	111	8 x 27
500	X4500PSF1	6	20.84/4.35	Y	Y	Inches	7 1/8	5 1/4	5 1/8	5 3/8	4 3/8	5/16 x 1 1/16
						mm	155	133	131	136	111	8 x 27

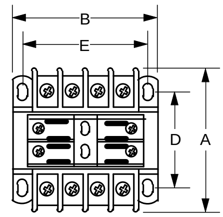
Primary and secondary fusing

Primary Fuse Block	2 pole, Class CC, less fuses
Secondary Fuse Clip	13/32" x 1 1/2", Class CC, less fuse
Primary & Secondary Fusing	Class CC, for sizing see chart of page 13.11

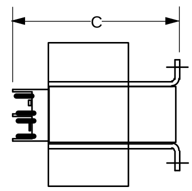
① When both secondary voltages are to be used simultaneously, remove the secondary fuse clip and us a separately mounted, 2-pole fuse block.

Transformers
750 VA - 5 kVA

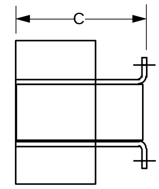
X41K1



Top View



Side View



Side View

750 VA - 5 kVA
Primary Voltage - 460/230/208V, 480/240V, 440/220/200V
Secondary Voltage - 115V, 120V, 110V

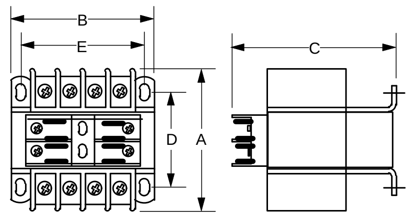
VA Rating	Catalog number	Number of Terminals	Output Amps	Included		Dimensions						
				Primary Fuse Block	Secondary Fuse Clip		A	B	C	D	E	Mounting Slots
750	X4750PS1	6	6.52	Y	Y	Inches	7 5/8	5 1/4	6	5 3/4	4 3/8	5/16 x 1 1/16
						mm	193	133	151	146	111	8 x 27
1000	X41K1	6	8.70	N	Y	Inches	7 1/8	6 3/8	5 3/8	4 1/2	5 5/16	5/16 x 11/16
						mm	181	162	137	114	135	8 x 17
1500	X41.5K1	6	13.04	N	Y	Inches	7 1/2	6 3/4	5 11/16	4 7/16	6 1/16	9/32 x 9/16
						mm	191	171	144	113	154	7 x 14
2000	X42K1	6	17.39	N	Y	Inches	8 1/4	6 3/4	5 11/16	5 1/4	6 1/16	9/32 x 9/16
						mm	210	171	144	133	154	7 x 14
3000	X43K1	6	26.09	N	Y	Inches	8 9/16	9	7 1/2	5 3/4	7 1/2	7/16 x 3/4
						mm	217	229	191	147	191	11 x 19
5000	X45K1	6	43.48	N	Y	Inches	10 1/2	9	10 3/16	6 1/2	6 1/2	7/16 x 3/4
						mm	267	229	259	165	165	11 x 19

Primary and secondary fusing

Primary Fuse Block	2 pole, Class CC, less fuses
Secondary Fuse Clip	13/32" x 1 1/2", Class CC, less fuse
Primary & Secondary Fusing	Class CC, for sizing see chart of page 13.11

Transformers
45-750 VA

T6045S1



Top View   Side View

45-750 VA
Primary Voltage - 600/575/550V
Secondary Voltage - 120V, 115V, 110V
Use Class CC fuse

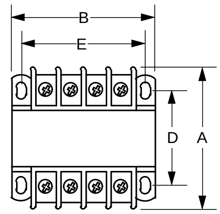
VA Rating	Catalog number	Number of Terminals	Output Amps	Included		Dimensions						
				Primary Fuse Block	Secondary Fuse Clip		A	B	C	D	E	Mounting Slots
45	T6045S1	4	0.43	Y	Y	Inches	3	3	2 9/16	2	2 1/2	13/64 x 3/8
						mm	76	76	65	51	64	5 x 10
50	T6050PS1	4	0.43	Y	Y	Inches	3	3	3 15/16	2	2 1/2	13/64 x 3/8
						mm	76	76	100	51	64	5 x 10
75	T6075PS1	4	0.65	Y	Y	Inches	3 1/2	3	3 15/16	2 1/2	2 1/2	13/64 x 3/8
						mm	89	76	100	64	64	5 x 10
100	T6100PS1	4	0.87	Y	Y	Inches	3 3/8	3 3/8	4 1/4	2 3/8	2 13/16	13/64 x 3/8
						mm	86	86	108	60	71	5 x 10
150	T6150PS1	4	1.3	Y	Y	Inches	4	3 3/4	4 9/16	2 7/8	3 1/8	13/64 x 3/8
						mm	102	95	116	73	79	5 x 10
200	T6200PS1	4	1.74	Y	Y	Inches	4	4 1/2	5 3/16	2 1/2	3 3/4	13/64 x 3/8
						mm	102	114	132	64	95	5 x 10
250	T6250PS1	4	2.17	Y	Y	Inches	4 3/8	4 3/8	5 3/16	2 7/8	3 3/4	13/64 x 3/8
						mm	111	111	132	73	95	5 x 10
300	T6300PS1	4	2.61	Y	Y	Inches	4 3/4	4 1/2	5 3/16	3 1/4	3 3/4	13/64 x 3/8
						mm	121	114	132	83	95	5 x 10
350	T6350PS1	6	3.04	Y	Y	Inches	5 1/4	4 1/2	5 3/16	3 3/4	3 3/4	13/64 x 3/8
						mm	133	114	132	95	95	5 x 10
500	T6500PS1	6	4.35	Y	Y	Inches	5 3/8	5 1/4	6 1/8	4 1/8	4 3/8	5/16 x 11/16
						mm	137	133	156	105	111	8 x 17
750	T6500PS1	6	6.52	Y	Y	Inches	7	5 1/4	6 1/8	4 3/8	4 3/8	5/16 x 11/16
						mm	178	133	156	146	111	8 x 17

Primary and secondary fusing

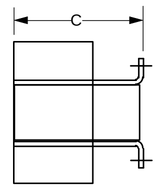
Primary Fuse Block	2 pole, Class CC, less fuses
Secondary Fuse Clip	13/32" x 1 1/2", Class CC, less fuse
Primary & Secondary Fusing	Class CC, for sizing see chart of page 13.11

Transformers
1 - 5 kVA

T61K1



Top View



Side View

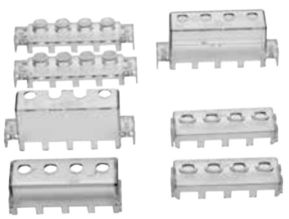
1 - 5 kVA
Primary Voltage - 575/460/230V
Secondary Voltage - 115 - 95V
Use Class CC fuse

VA Rating	Catalog number	Number of Terminals	Output Amps	Included		Dimensions						
				Primary Fuse Block	Secondary Fuse Clip		A	B	C	D	E	Mounting Slots
1000	T61K1	6	6.52	N	Y	Inches	7 1/8	6 3/8	5 3/8	4 1/2	5 3/16	5/16 x 11/16
						mm	184	162	137	114	135	8 x 17
1500	T61.5K1	6	8.70	N	Y	Inches	8 1/4	6 3/4	5 11/16	5 1/4	6 1/16	9/32 x 9/16
						mm	210	171	144	133	154	7 x 14
2000	T62K1	6	13.04	N	Y	Inches	7 9/16	9	7 9/16	4 3/16	6 1/2	7/16 x 3/4
						mm	192	229	192	106	165	11 x 19
3000	T63K1	6	17.39	N	Y	Inches	8 5/8	9	7 9/16	5 1/4	6 1/2	7/16 x 3/4
						mm	219	229	192	133	165	11 x 19
5000	T65K1	6	26.09	N	Y	Inches	13 1/2	9	10 3/16	8 1/4	6 1/2	7/16 x 3/4
						mm	343	229	259	210	165	11 x 19

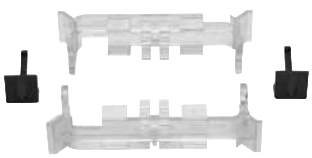
Primary and secondary fusing

Primary Fuse Block	2 pole, Class CC, less fuses
Secondary Fuse Clip	13/32" x 1 1/2", Class CC, less fuse
Primary & Secondary Fusing	Class CC, for sizing see chart of page 13.11

Accessories



TPTC-1001



IP20 Terminal covers

Description	Catalog number
4-Terminal cover (45-300VA)	TPTC-1001
6-Terminal cover (350-5KVA)	TPTC-1002
Primary fuse cover (45-5KVA)	TPTC-1006

Meets finger safe or touch safe requirements for IEC specification 529. Available 50VA thru 750VA.

Class CC fuse blocks

Description	Catalog number
Primary fuse block kit	FKTP-1001

Technical data

Transformer terminology and FAQs

What is a transformer?

A transformer is a passive electrical device which is designed to change one voltage to another by magnetic induction.

What is an isolation transformer?

An isolation transformer, also referred to as an insulating transformer, is one where the primary and secondary windings are separate, as opposed to an autotransformer where the primary and secondary share a common winding.

What is a control transformer?

A control transformer is an isolation transformer designed to provide a high degree of secondary voltage stability (regulation) during a short period overload condition typically referred to as inrush. Control transformers are also referred to as Industrial Control Transformers, Machine Tool Transformers or Control Power Transformers (CPTs).

Can a control transformer be reversed connected?

A control transformer can be reverse connected. However, the output voltage will be less than nameplate due to the compensation factor of the windings.

Can a single phase transformer be used with a three phase source?

A single phase transformer can be used with a three phase source by connecting the primary leads to any two wires of the three phase system. The transformer output will be single phase.

Can a transformer be used at higher frequencies?

A transformer designed for 50/60HZ operation can be utilized at frequencies up to 400 HZ. However, at 400 HZ, the inrush capability will be reduced.

What is regulation?

Regulation is the change in output voltage when the load is reduced from rated value (full load) to zero (no load) with input voltage remaining constant.

Can transformers be used at ambients other than 40°C?

Transformers may be used at ambients less than 40°C at full nameplate capacity. For ambients above 40°C, they must be derated as follows:

Max. ambient temperature	Max. percent of load	
	180°C Units	105°C Units
40°C	100%	100%
50°C	90%	78%
60°C	79%	50%

What is the effect of altitude on a transformer?

A transformer may be used at full nameplate capacity up to 3300 feet (1000 meters). Above that altitude, the capacity of the transformer should be derated by 0.3% for each 300 feet of elevation above 3300 feet.

What is the effect of load on a control transformer?

A control transformer is designed to provide rated output voltage at full VA. As the load decreases, the output voltage will go up. Conversely, increases in load will result in lower output voltages. Typically, the smaller the VA size of the unit, the greater difference there is between no-load and full-load voltage.

What is temperature class?

Temperature class is the rating of the transformer insulation system. It is determined by adding the ambient temperature, temperature rise and hottest spot temperature. The standard insulation system classification per UL506, are as follows:

Ambient temperature	Average winding temperature rise*	Hot spot temperature	Temperature class
40°c	55°C	10°C	105°C
40°c	80°C	10°C	130°C
40°c	100°C	15°C	155°C
40°c	120°C	20°C	180°C

*Measured by change-in-resistance method

What is temperature rise?

Temperature rise is the difference between the average temperature of the transformer windings and the ambient temperature.

What is hot spot?

The hot spot is an allowance selected to approximate the difference between the highest temperature inside the transformer coil and the average temperature of the transformer coil.

Is one insulation system better than another?

One insulation system is not necessarily better than another. Each will typically provide a comparable life expectancy. The choice of an insulation system depends upon application, performance and cost considerations.

Why is a control transformer needed?

A control transformer is required to supply voltage to a load which requires significantly more current when initially energized than under normal steady state operating conditions. A control transformer is designed to provide secondary voltage stability under a short period of specific overload referred to as inrush.

Are control transformers current limiting?

A control transformer is not current limiting and will allow as much current to pass through as is demanded by the load. As such, a secondary overcurrent device should be utilized.

Will a control transformer regulate output voltage?

Control transformers are not voltage regulating. Because voltage changes are a function of the transformer's turns ratio, variations in input voltage will be proportionally reflected to the output.

What is duty cycle?

Duty cycle is the period and duration when a transformer will be loaded. The transformer is designed to run continuously at full load without exceeding the temperature limits. Transformers may also be operated for short time duty. Depending upon the time and cycle of the maximum load, the transformer VA size may be smaller than for continuous duty.

What is the value of encapsulation in control transformers?

Encapsulating the coils of a control transformer will help to protect the unit from moisture, dust, dirt and industrial contaminants. Encapsulation helps provide maximum protection in hostile environments while allowing the unit to run cooler than a non-encapsulated unit.

What effect does a control transformer have on electrical disturbances found on the line?

Because a control transformer has isolated primary and secondary windings, it will provide some degree of "clean-up" with regard to electrical noise, spikes, surges and transients. It will not, however, provide the same degree of power conditioning found in products designed for that purpose.

Technical data
UL Overcurrent protection
Primary & secondary

Overcurrent protection on both the primary and secondary sides of transformers are specified in UL508 and the National Electrical Code. The maximum acceptable ratings are shown below. Due to the high inrush currents present when a transformer is initially energized, it is recommended that the primary fuse be time delay, to prevent nuisance trips during startup.

Acceptable rating of primary overcurrent protection in amps

Primary voltage	VA Rating 50	75	100	150	200	250	300	350	500	750
115	1-1/4 (2)	1-8/10 (3-2/10)	2-1/2 (4)	3-1/2 (6-1/4)	5 (8)	5	6-1/4	7-1/2	10	15
120	1-1/4 (2)	1-8/10 (3)	2-1/4 (4)	3-1/2 (6-1/4)	5 (8)	5	6-1/4	7	10	15
200	3/4 (1-1/4)	1-1/8 (1-8/10)	1-1/2 (2-1/2)	2-1/4 (3-1/2)	3 (5)	3-1/2 (6-1/4)	4-1/2 (7-1/2)	5 (8)	6-1/4	9
208	6/10 (1-1/8)	1 (1-8/10)	1-4/10 (2-1/4)	2 (3-1/2)	2-8/10 (4-1/2)	3-1/2 (6)	4 (7)	5 (8)	6	9
220	6/10 (1-1/8)	1 (1-6/10)	1-1/4 (2-1/4)	2 (3-2/10)	2-1/2 (4-1/2)	3-2/10 (5-6/10)	4 (6-1/4)	4-1/2 (7-1/2)	5-6/10	8
230	6/10 (1)	8/10 (1-6/10)	1-1/4 (2)	1-8/10 (3-2/10)	2-1/2 (4)	3-2/10 (5)	3-1/2 (6-1/4)	4-1/2 (7-1/2)	5	8
240	6/10 (1)	8/10 (1-1/2)	1-1/4 (2)	1-8/10 (3)	2-1/4 (4)	3 (5)	3-1/2 (6-1/4)	4 (7)	5	7-1/2
277	1/2 (8/10)	8/10 (1-1/4)	1 (1-8/10)	1-6/10 (2-1/2)	2 (3-1/2)	2-1/2 (4-1/2)	3-2/10 (5)	3-1/2 (6-1/4)	5 (9)	6-1/4
380	3/10 (6/10)	1/2 (8/10)	3/4 (1-1/4)	1-1/8 (1-8/10)	1-1/2 (2-1/2)	1-8/10 (3-2/10)	2-1/4 (3-1/2)	2-1/2 (4-1/2)	3-1/2 (6-1/4)	5-6/10 (9)
400	3/10 (6/10)	1/2 (8/10)	3/4 (1-1/4)	1-1/8 (1-8/10)	1-1/2 (2-1/2)	1-8/10 (3)	2-1/4 (3-1/2)	2-1/2 (4)	3-1/2 (6-1/4)	5-6/10 (9)
415	3/10 (6/10)	1/2 (8/10)	6/10 (1-1/8)	1 (1-8/10)	1-4/10 (2-1/4)	1-8/10 (3)	2 (3-1/2)	2-1/2 (4)	3-1/2 (6)	5 (9)
440	3/10 (1/2)	1/2 (8/10)	6/10 (1-1/8)	1 (1-6/10)	1-1/4 (2-1/4)	1-6/10 (2-8/10)	2 (3-2/10)	2-1/4 (3-1/2)	3-2/10 (5-6/10)	5 (8)
460	3/10 (1/2)	4/10 (8/10)	6/10 (1)	8/10 (1-6/10)	1-1/4 (2)	1-6/10 (2-1/2)	1-8/10 (3-2/10)	2-1/4 (3-1/2)	3-2/10 (5)	4-1/2 (8)
480	3/10 (1/2)	4/10 (3/4)	6/10 (1)	8/10 (1-1/2)	1-1/4 (2)	1-1/2 (2-1/2)	1-8/10 (3)	2 (3-1/2)	3 (5)	4-1/2 (7-1/2)
550	1/4 (4/10)	4/10 (6/10)	1/2 (8/10)	8/10 (1-1/4)	1 (1-8/10)	1-1/4 (2-1/4)	1-6/10 (2-1/2)	1-8/10 (3)	2-1/2 (4-1/2)	4 (6-1/4)
575	1/4 (4/10)	3/10 (6/10)	1/2 (8/10)	3/4 (1-1/4)	1 (1-6/10)	1-1/4 (2)	1-1/2 (2-1/2)	1-8/10 (3)	2-1/2 (4)	3-1/2 (6-1/4)
600	2/10 (4/10)	3/10 (6/10)	1/2 (8/10)	3/4 (1-1/4)	8/10 (1-6/10)	1-1/4 (2)	1-1/2 (2-1/2)	1-6/10 (2-8/10)	2-1/4 (4)	3-1/2 (6-1/4)

The maximum rating of the overcurrent device is indicated in ( ).
All figures assume secondary overcurrent protection per UL/NEC.
Reference: NEC 430 - 72(c) exception #2, 450-3(b) 1 & 2, UL508 32.7, UL845 11.16 & 11.17.

Acceptable rating of secondary overcurrent protection in amps

Secondary voltage	VA Rating 50	75	100	150	200	250	300	350	500	750
23	3-1/2	5	7	10	12	15	20	20	30	45
24	3-2/10	5	6-1/4	10	12	15	20	20	30	40
25	3-2/10	5	6-1/4	10	12	15	15	20	25	40
90	8/10	1-1/4	1-8/10	2-1/2	3-1/2	4-1/2	5	6-1/4	9	12
95	8/10	1-1/4	1-6/10	2-1/2	3-1/2	4	5	6	8	12
100	8/10	1-1/4	1-6/10	2-1/2	3-2/10	4	5	5-6/10	8	12
110	3/4	1-1/8	1-1/2	2-1/4	3	3-1/2	4-1/2	5	7-1/2	10
115	6/10	1	1-4/10	2	2-8/10	3-1/2	4	5	7	10
120	6/10	1	1-1/4	2	2-1/2	3-2/10	4	4-1/2	6-1/4	10
220	3/10	1/2	3/4	1-1/8	1-1/2	1-8/10	2-1/4	2-1/2	3-1/2	5-6/10
230	3/10	1/2	6/10	1	1-4/10	1-8/10	2	2-1/2	3-1/2	5
240	3/10	1/2	6/10	1	1-1/4	1-6/10	2	2-1/4	3-2/10	5

If the rated secondary current is less than 9 amps, the maximum rating of the overcurrent device is 167%; 9 amps or more, the maximum rating of the overcurrent device is 125%. If 125% does not correspond to a standard fuse rating, the next highest standard rating may be used.
Reference: NEC 430 - 72(c) exception #2, 450-3(b) 1 & 2, UL508 32.7, UL845 11.16 & 11.17.

Technical data
Power loss

VA	Temp class	Watts loss
50	I2 105	16.2
75	I2 105	18.6
100	I2 105	21
150	I2 130	33.7
200	I2 130	40.1
250	I2 130	43.4
300	I2 130	48.4
350	I2 130	47.9
500	I2 130	57.1
750	I2 130	71.2
1000	180	99
1500	180	123.7
2000	180	147.3
3000	180	183.4
5000	180	241.2

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