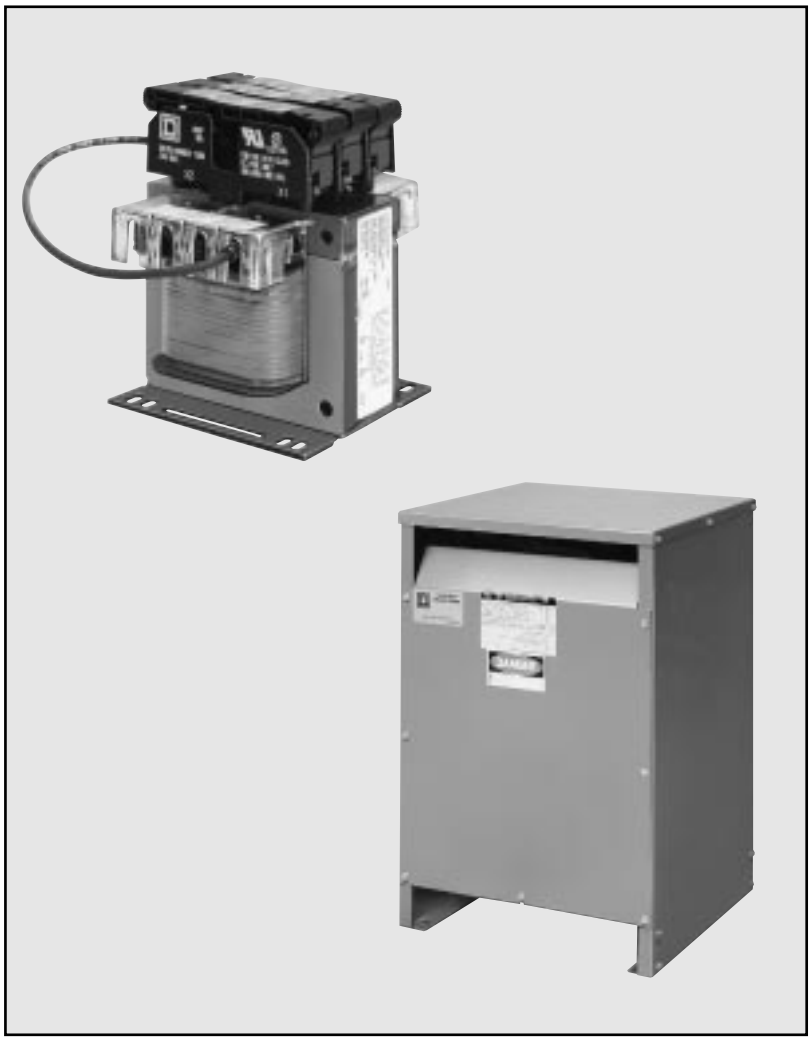
Low Voltage Transformers
Selection Guide



SQUARE D
GROUPE SCHNEIDER

Non-Ventilated Transformers

For use in contaminated or dust-laden environments, indoor or outdoor.

Export Model Transformers

Designed to accommodate voltage systems world-wide.

Stainless Steel Enclosed Transformers

Built for the most severe environments; featuring superior corrosion resistance.

Shielded Isolation Transformers

Protect sensitive loads from damaging transients and electrical noise. Models with filters combine the protection of shielding with enhanced low-pass filters to help control the most severe electrical noise and transients.

Buck and Boost Transformers

Economical space-saving design for providing small changes in voltages to match load requirements.

Drive Isolation Transformers

Specifically designed for the rigorous demands of ac and dc motor drive loads.

Mini Power-Zone® Transformers

Combine transformer and circuit breaker distribution panel into one space and labor saving unit.

NL and NLP Transformers for Non-Linear Loads

K-factor rated specifically to withstand harmonic heating and high neutral currents associated with computer equipment and other single phase electronic loads.

General Purpose Transformers

General Purpose Transformers

High quality standard transformers for the majority of routine lighting and power applications.

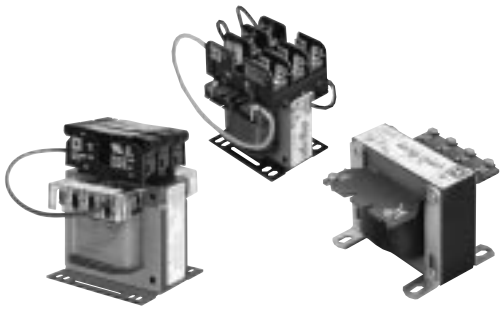
WATCHDOG® Energy-Efficient Transformers

Low temperature rise for energy savings and longer life.

Copper-Wound Transformers

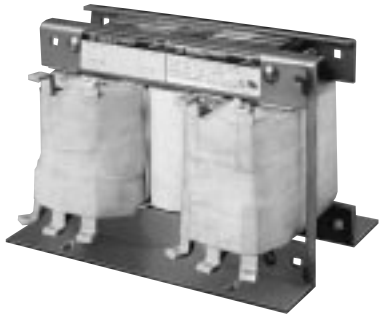
To meet specifications or when copper windings are preferred.

Other Transformer Products



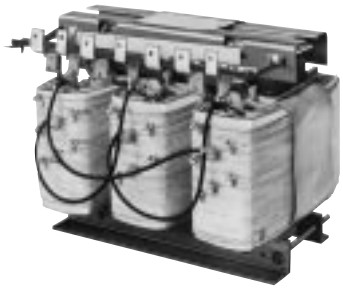
Control Power Transformers

Designed to handle high inrush current associated with contactors and relays; available in a variety of designs to meet the needs of panel builders and machinery OEMs.



Motor Starting Autotransformers

Designed for medium-duty motor starting service. Available in a two- or three-coil design.

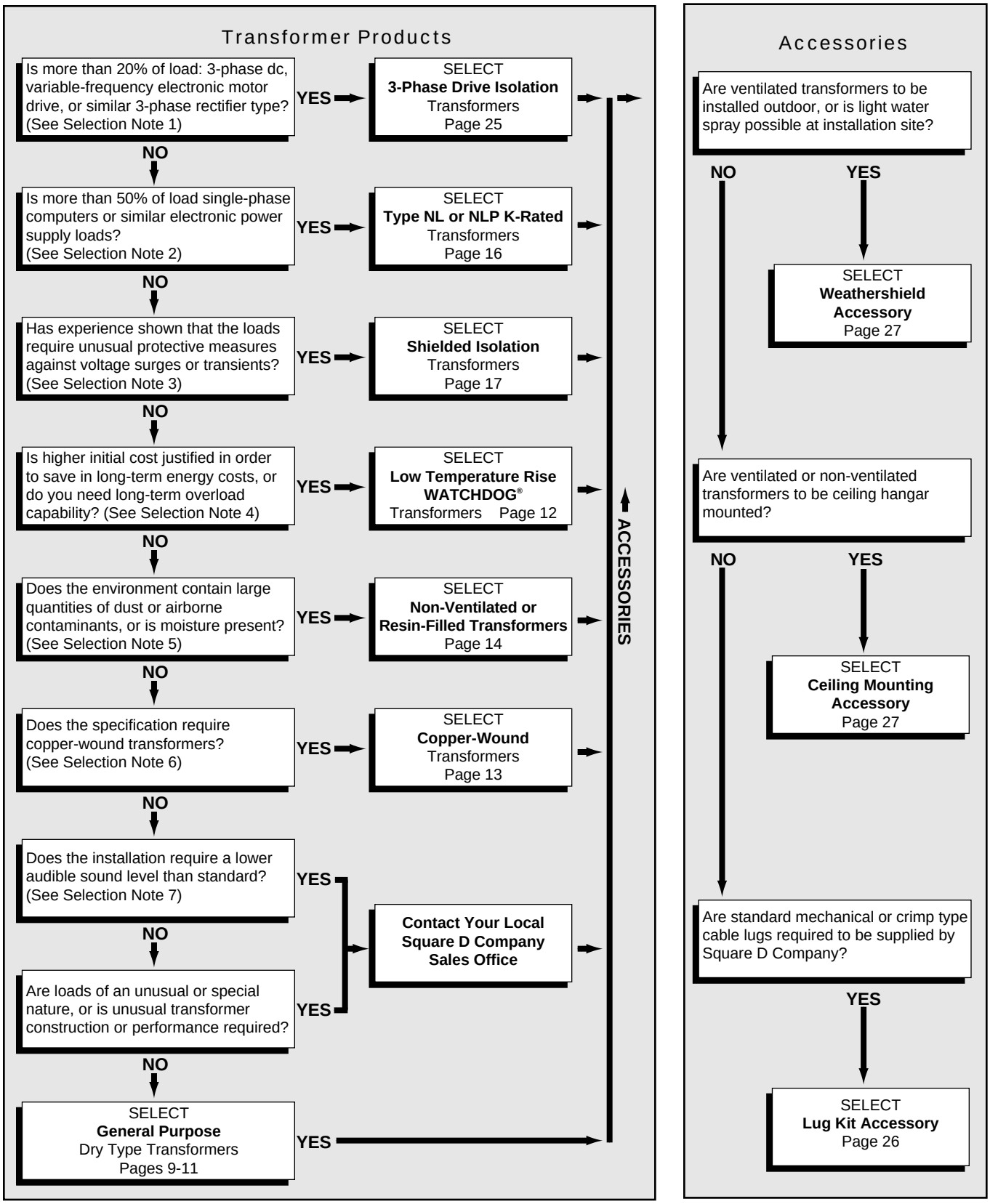


Open Core and Coil Transformers

Space-saving, compact design for general applications. Available in single- and three- phase.

Transformer Disconnects

A convenient source of 120V power that can be used for auxiliary or isolated loads such as panel lighting, portable power tools, and programmable controller equipment.


Transformer Products
Is more than 20% of load: 3-phase dc, variable-frequency electronic motor drive, or similar 3-phase rectifier type? (See Selection Note 1)
YES
SELECT **3-Phase Drive Isolation** Transformers Page 25
NO
Is more than 50% of load single-phase computers or similar electronic power supply loads? (See Selection Note 2)
YES
SELECT **Type NL or NLP K-Rated** Transformers Page 16
NO
Has experience shown that the loads require unusual protective measures against voltage surges or transients? (See Selection Note 3)
YES
SELECT **Shielded Isolation** Transformers Page 17
NO
Is higher initial cost justified in order to save in long-term energy costs, or do you need long-term overload capability? (See Selection Note 4)
YES
SELECT **Low Temperature Rise WATCHDOG®** Transformers Page 12
NO
Does the environment contain large quantities of dust or airborne contaminants, or is moisture present? (See Selection Note 5)
YES
SELECT **Non-Ventilated or Resin-Filled Transformers** Page 14
NO
Does the specification require copper-wound transformers? (See Selection Note 6)
YES
SELECT **Copper-Wound** Transformers Page 13
NO
Does the installation require a lower audible sound level than standard? (See Selection Note 7)
YES
NO
Are loads of an unusual or special nature, or is unusual transformer construction or performance required?
YES
Contact Your Local Square D Company Sales Office
NO
SELECT **General Purpose** Dry Type Transformers Pages 9-11
YES
ACCESSORIES
Accessories
Are ventilated transformers to be installed outdoor, or is light water spray possible at installation site?
NO
YES
SELECT **Weathershield Accessory** Page 27
Are ventilated or non-ventilated transformers to be ceiling hangar mounted?
NO
YES
SELECT **Ceiling Mounting Accessory** Page 27
Are standard mechanical or crimp type cable lugs required to be supplied by Square D Company?
YES
SELECT **Lug Kit Accessory** Page 26

Note 1: Drive Isolation Transformers

Drive isolation transformers help reduce voltage distortion caused by ac and dc motor drives. To help reduce drive current distortion, a minimum of 4% reactance should be specified. In addition, the isolation created by separate, electrically insulated secondary windings allows grounding of the load-side neutral. Grounding helps prevent drive generated common-mode electrical noise from passing upstream into the primary system as it would with simple line reactors. Three-phase ac and dc drives cause distorted current to flow in the windings of transformers, creating additional heating. DC drives in particular have high current pulses that cause system voltage notching and stress in transformer windings. Consider this resulting additional heat and mechanical stress when specifying drive isolation transformers.

Selection Criteria Drive Isolation Transformer:
The use of standard, general purpose lighting transformers is not recommended for this application. Make sure that your drive transformer has been specifically compensated and tested per UL 1561 procedure for the typical harmonic spectrum for phase converters defined in IEEE-519. In addition, drive transformers must be capable of supplying the drive overload requirements defined as Class B in IEEE-597, and be suitable for 150% load for one minute occurring once per hour.

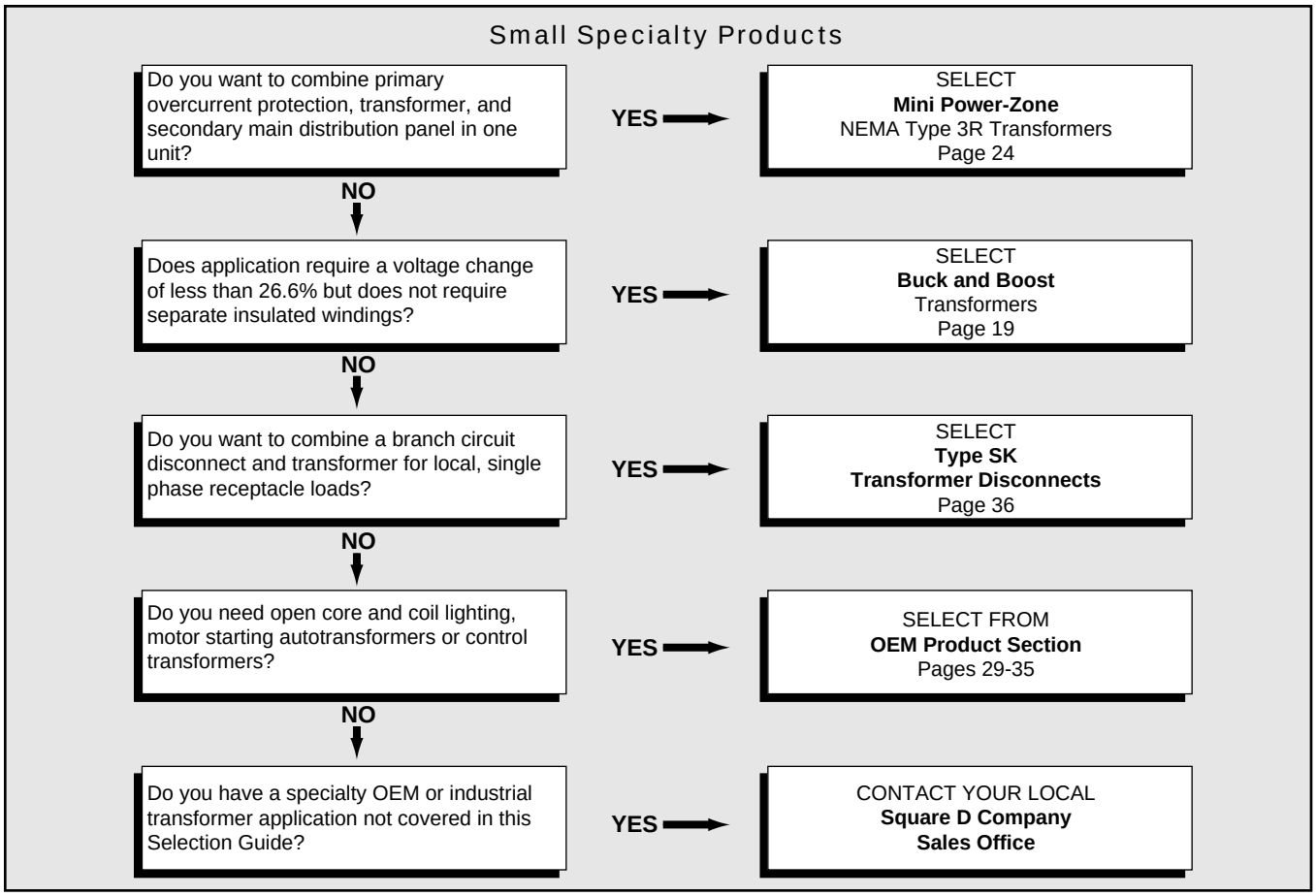
Note 2: K-Rated Transformers for Non-Linear Loads

Many types of single-phase loads cause distorted current waveforms. These loads include common office automation equipment such as personal computers, copiers, facsimile machines, and printers. Other similar loads include single-phase process control systems, lighting controls, UPS systems, and discharge lighting. If the current distortion is high enough, it can cause overheating of system neutrals and transformers. To prevent shortened transformer life expectancy when high harmonic current conditions exist, K-rated transformers are recommended.

Selection Criteria K-Rated Transformer for Non-Linear Load:

K-rated transformers should never be specified for three-phase non-linear loads such as motor drives, three phase UPSs, or any three-phase device with SCR phase-control or static-diode input circuits. K-rated transformers are evaluated only for the heating effects of harmonic currents, not for the thermal and mechanical stress of drive loads. These transformers have double-size neutral terminals and, therefore, are intended only for use in high 3rd harmonic-single phase non-linear loads. For transformers specifically designed for high 5th and 7th harmonics and current pulse stress of three-phase converter loads, see Note 1: *Drive Isolation Transformers*.

Small Specialty Products



Note 3: Shielded Isolation Transformers

Electrostatic shields in transformers divert some types of electrical noise and transients to ground, providing a moderate amount of load protection from some surges and line disturbances. The addition of secondary filters and primary MOV type surge suppressors provides significant additional protection, particularly from very high-level transient energies.

Selection Criteria Shielded Isolation Transformer:

No industry standards exist for testing the performance of electrostatic shields. Many manufacturers use unrealistic test methods using “dry circuit” unenergized transformers and adjust the method to provide the best data for their product. Importantly, the supplier must perform both ring wave and short rise time impulse injection tests in actual, energized, loaded, and grounded installation conditions. NOTE: Isolation transformers without shields provide excellent transient and noise reduction when the secondary is grounded in accordance with the National Electrical Code.

The introduction of shields in transformers improves transient and surge protection for some frequencies, but testing has shown shields can introduce resonances and parasitic oscillations at other frequencies, particularly in the 150 kHz range typically found in industrial applications. *In those ranges, shields can actually amplify the noise and transients, possibly making power quality problems worse.* For this reason, shielded transformers are not recommended to be routinely supplied in all applications. Restrict shield use to protecting loads such as computers, process controls, or other electronic loads from lighting and switching impulses that have much higher frequency components. Use caution in selecting shielded transformers when the loads share feeders with motor controls, switches, contactors, or any load generating arcing type transients on the line. Contact your local Square D field office for application assistance.

Note 4: Low Temperature Rise Transformers

Transformers can be designed with lower temperature rise than the maximum allowed for the insulation system used in the windings. This creates the benefits of 1) lower conductor loss, potentially lowering the cost of transformer operation, and 2) continuous overload capacity if future expansion is planned, or for temporary loads, such as summertime air conditioning, which will cause the average load to exceed the nameplate rating.

Insulation System	Temp. Rise (Deg. C.)	Continuous Overload Capacity
180	115	0%
180	80	15%
220	150	0%
220	115	15%
220	80	30%

Selection Criteria Low Temperature Rise Transformer:

When calculating energy savings for low temperature rise transformers, consider the importance of the average loading of the transformer. Low temperature rise transformers can have significantly higher core losses. Lowered conductor loss typically can overcome the disadvantage of higher core loss only if the load, on average, exceeds 50–70% of the nameplate rating. Statistical estimates show that 75% of all installed transformers, on average, never carry more than a 50% load. Under these light loading conditions, 150°C rise transformers can actually have lower total loss than lower temperature rise designs. Contact your local Square D field office for loss data to properly evaluate your energy costs.

Note 5: Environmental Considerations

One of the greatest dangers to ventilated, dry type transformers is the moisture content or presence of contamination in the cooling air that passes through the coil ducts and around the coil conductors. High quantities of airborne fibers or lint can clog air ducts and prevent cooling air from reaching the conductors. Conductive material, such as carbon, metal, or coal dust in the surrounding air, should also be a major concern in transformer selection. Non-ventilated or resin-filled dry type transformers do not have ventilation openings, and therefore provide superior protection from many moisture and contamination problems, in both indoor and outdoor applications.

Selection Criteria Environmental Considerations:

Non-ventilated or resin-filled transformers are not gasketed and are not intended to meet requirements of NEMA Type 4 or NEMA Type 12. Non-ventilated or resin-filled transformers can be located outdoor without the addition of weathershields or other accessories.

Note 6: Copper-Wound Transformers

Copper-wound transformers are significantly higher in price and weight than the more popular aluminum wound transformers. On average, the losses are equivalent between copper and aluminum transformers. Therefore, the major reason for specification of copper-wound transformers is either preference for copper connections or dimensional restrictions that can only be met by copper windings.

Selection Criteria Copper-Wound Transformer:

Before investing in the additional cost of copper-wound transformers, examine the reasons for copper preference in your specifications. Although copper-wound transformers can theoretically be made smaller than aluminum-wound transformers, most manufacturers supply aluminum-wound and copper-wound transformers in the same enclosure size. Many specifier preferences stem from fear that installers will not employ the required installation practices and hardware necessary to make reliable aluminum connections. Aluminum connections are now commonplace in electrical installations. Aluminum-wound transformers are chosen in the majority of United States specifications.

Note 7: Transformer Sound Levels

All transformers produce some sound as a necessary part of operation. Standards limit the allowable sound levels to those shown in the following table and are based on the nameplate kVA rating. If sound level is a concern in the location of the transformer, such as near offices, living areas, theater stages, or seating, reduced sound level designs are available to meet your specifications. Contact your local Square D sales office for these special applications.

kVA	NEMA Standard Sound Level
0–9	40 db
10–50	45 db
51–150	50 db
151–300	55 db
301–500	60 db

Selection Criteria Transformer Sound Levels:

Apparent sound level is typically reduced by half for every 3 db of sound level reduction. Sound level testing is specified by NEMA standards under special conditions that are not usually present at the job site installation. The presence of reflective surfaces within 10 feet of the transformer can add to the apparent sound of a transformer. In extremely unfavorable installations, such as a theater designed for high acoustical efficiency, the apparent sound of a transformer can be as much as 20 db higher than when tested under NEMA standard conditions. Reduced sound level transformers can represent a significant increase in cost for your project. In addition, reduction beyond 8–10 db is not practical. Make sure to compare this additional cost with either relocation of transformers into different areas or providing better equipment room acoustic treatments. Consider the type of environment where the transformer will be located and choose the construction that best suits the requirement.

Table 1: AC Motor Full-Load Running Currents

Horsepower HP	110–120 Volts		220–240 Volts		440–480 Volts		550–600 Volts	
	Single-Phase	Three-Phase	Single-Phase	Three-Phase	Single-Phase	Three-Phase	Single-Phase	Three-Phase
	A★	A	A	A	A	As	A	A
0.5	9.8	4.0	4.9	2.0	2.5	1.0	2.0	0.8
0.75	13.8	5.6	6.9	2.8	3.5	1.4	2.8	1.1
1	16.0	7.2	8.0	3.6	4.0	1.8	3.2	1.4
1.5	20.0	10.4	10.0	5.2	5.0	2.6	4.0	2.1
2	24.0	13.6	12.0	6.8	6.0	3.4	4.8	2.7
3	34.0	19.2	17.0	9.6	8.5	4.8	6.8	3.9
5	56.0	30.4	28.0	15.2	14.0	7.6	11.2	6.1
7.5	80.0	44.0	40.0	22.0	21.0	11.0	16.0	9.0
10	100.0	56.0	50.0	28.0	26.0	14.0	20.0	11.0
15	135.0	84.0	68.0	42.0	34.0	21.0	27.0	17.0
20	—	108.0	88.0	54.0	44.0	27.0	35.0	22.0
25	—	136.0	110.0	68.0	55.0	34.0	44.0	27.0
30	—	160.0	136.0	80.0	68.0	40.0	54.0	32.0
40	—	208.0	176.0	104.0	88.0	52.0	70.0	41.0
50	—	260.0	216.0	130.0	108.0	65.0	86.0	52.0
60	—	—	—	154.0	—	77.0	—	62.0
75	—	—	—	192.0	—	96.0	—	77.0
100	—	—	—	248.0	—	124.0	—	99.0

★ A= Amperes

Table 2: Single-Phase, Full Load Currents

kVA Rating	120V	208V	240V	277V	480V	600V
	Amperes					
0.050	0.416	0.240	0.208	0.181	0.104	0.083
0.075	0.625	0.360	0.312	0.270	0.156	0.125
0.100	0.833	0.480	0.417	0.361	0.208	0.167
0.150	1.25	0.721	0.625	0.541	0.313	0.250
0.250	2.08	1.20	1.04	0.902	0.521	0.417
0.500	4.16	2.40	2.08	1.80	1.04	8.33
0.750	6.25	3.60	3.13	2.70	1.56	1.25
1	8.33	4.81	4.17	3.61	2.08	1.67
1.5	12.5	7.21	6.25	5.42	3.13	2.50
2	16.7	9.62	8.33	7.22	4.17	3.33
3	25.0	14.4	12.5	10.8	6.25	5.0
5	41.6	24.0	20.8	18.0	10.4	0.833
7.5	62.5	36.1	31.3	27.1	15.6	12.5
10	83.3	48.1	41.7	36.1	20.8	16.7
15	125	72.1	62.5	54.2	31.3	25.0
25	208	120	104	90.3	52.1	41.7
37.5	313	180	156	135	78	62.5
50	416	240	208	181	104	83.3
75	625	361	313	271	156	125
100	833	481	417	361	208	167
167	1392	803	695	603	348	278
200	1667	962	833	722	417	333
250	2083	1202	1042	903	521	417

Table 3: Three-Phase, Full Load Currents

kVA Rating	208V	240V	480V	600V
	Amperes			
3	8.34	7.23	3.61	2.89
6	16.6	14.4	7.2	5.8
9	25.0	21.7	10.8	8.67
15	41.7	36.1	18.1	14.5
30	83.4	72.3	36.1	28.9
45	125	108	54.2	43.4
75	208	181	90.3	72.3
112.5	313	271	135	108
150	417	361	181	145
225	625	542	271	217
300	831	723	361	289
500	1390	1204	602	482
750	2082	1804	902	722
1000	2776	2406	1203	962
1500	4164	3609	1804	1443
2000	5552	4811	2406	1925
2500	6940	6014	3007	2406
3750	10409	9021	4511	3609

Ventilated
15–750 kVA

Resin-Filled
0.05–30 kVA

Application

General purpose standard transformers are intended for power, heating, and lighting applications.

Ventilated-Type

All ventilated transformers have core and coil assemblies mounted on rubber isolation pads to minimize the sound level. Vented openings in the enclosure allow air to flow directly over the core-and-coil assembly for cooling. Each is manufactured and tested to meet or exceed IEEE, NEMA and ANSI standards. Their compact size permits installation near the load being supplied. Adding weathershields allows these normally indoor rated units to be used outdoors.

Resin-Filled

Resin-filled general purpose transformers are epoxy encapsulated. The enclosure has no openings, making resin-filled transformers ideal for use indoor or outdoor where airborne particles or contaminants could be detrimental to operation. The core-and-coil assembly is embedded in an epoxy resin compound and wall mounted for maximum protection. These units can be used outdoor without accessories.

Single Phase

kVA	Catalog Number	Full Capacity Taps★	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
240 x 480 Volts Primary 120/240 Volts Secondary 60 Hz						
0.050	**50SV1A**	None	55	4.2	1A	1
0.100	**100SV1A**	None	55	4.5	2A	1
0.150	**150SV1A**	None	55	6.2	3A	1
0.250	**250SV1B**	None	80	10.5	4A	1
0.500	**500SV1B**	None	80	13.8	5A	1
0.750	**750SV1F**	None	115	15.5	6A	1
1	**1S1F**	None	115	21.2	7A	1
1.5	**1.5S1F**	None	115	30.1	8A	1
2	**2S1F**	None	115	39.1	9A	1
3	**3S1F**	None	115	55.2	10A	1
5	**5S1F**	None	115	115	13B	1
7.5	**7S1F**	None	115	150	13B	1
10	**10S1F**	None	115	165	13B	1
15	**15S1H**	None	150	200	17D	1
25	**25S3H**	6–2.5%2+4-▲	150	230	17D	3
37.5	**37S3H**	6–2.5%2+4-▲	150	325	18D	3
50	**50S3H**	6–2.5%2+4-▲	150	350	18D	3
75	**75S3H**	6–2.5%2+4-▲	150	495	21D	3
100	**100S3H**	6–2.5%2+4-▲	150	705	22D	3
167	**167S3H**	6–2.5%2+4-▲	150	1020	24D	3

Note: Boldface catalog numbers indicate in-stock transformers.
★ (FCBN) Full Capacity Taps Below Normal where noted.
■ For enclosure styles, see **Dimensions Table**, Page 27.
♦ See **Wiring Diagrams**, Page 41.
▲ When 240V connection is used there will be 3-5% taps, 1 above and 2 below 240 volts.

Single Phase

kVA	Catalog Number	Full Capacity Taps★	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
480 Volts Primary, 120/240 Volts Secondary 60 Hz						
3	**3S40F**	2—5%FCBN	115	55.2	10A	28
5	**5S40F**	2—5%FCBN	115	115	13B	28
7.5	**7S40F**	2—5%FCBN	115	150	13B	28
10	**10S40F**	2—5%FCBN	115	165	13B	28
15	**15S40F**	2—5%FCBN	115	320	15B	28
15	**15S40H**	2—5%FCBN	150	200	17D	18
25	**25S40F**	2—5%FCBN	115	385	15B	28
600 Volts Primary, 120/240 Volts Secondary 60 Hz						
0.050	**50SV51A**	None	55	4.2	1A	6
0.100	**100SV51A**	None	55	4.5	2A	6
0.150	**150SV51A**	None	55	6.2	3A	6
0.250	**250SV51B**	None	80	10.5	4A	6
0.500	**500SV51B**	None	80	13.8	5A	6
0.750	**750SV51F**	None	115	15.5	6A	6
1	**1S51F**	None	115	21.2	7A	6
1.5	**1.5S51F**	None	115	30.1	8A	6
2	**2S51F**	None	115	39.1	9A	6
3	**3S4F**	2–5%FCBN	115	55.2	10A	28
5	**5S4F**	2–5%FCBN	115	115	13B	28
7.5	**7S4F**	2–5%FCBN	115	150	13B	28
10	**10S4F**	2–5%FCBN	115	165	13B	28
15	**15S5H**	4–2.5%FCBN	150	200	17D	19
25	**25S5H**	4–2.5%FCBN	150	230	17D	19
37.5	**37S5H**	4–2.5%FCBN	150	325	18D	19
50	**50S5H**	4–2.5%FCBN	150	350	18D	19
75	75S5H	4–2.5%FCBN	150	495	21D	19
100	100S5H	4–2.5%FCBN	150	705	22D	19
167	167S5H	4–2.5%FCBN	150	1020	24D	19

Three Phase

kVA	Catalog Number	Full Capacity Taps★	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
480 Volts Delta Primary 208Y/120 Volts Secondary 60 Hz						
3	**3T2F**	2—5%FCBN	115	125	12C	8
6	**6T2F**	2—5%FCBN	115	150	12C	8
9	**9T2F**	2—5%FCBN	115	265	14C	8
15	**15T2F**	2—5%FCBN	115	335	14C	8
15	**15T68F**	4—2.5%2+2-	115	335	14C	9
15	**15T3H**	6—2.5%2+4-	150	200	17D	10
30	**30T2F**	2—5%FCBN	115	775	16C	29
30	**30T3H**	6—2.5%2+4-	150	250	17D	10
45	**45T3H**	6—2.5%2+4-	150	340	18D	10
75	**75T3H**	6—2.5%2+4-	150	500	19D	10
112.5	**112T3H**	6—2.5%2+4-	150	750	21D	10
150	**150T3H**	6—2.5%2+4-	150	1020	22D	10
225	**225T3H**	6—2.5%2+4-	150	1275	24D	10
300	**300T3H**	6—2.5%2+4-	150	1680	25D	10
500	**500T68H**	4—2.5%2+2-	150	2460	30D	11
750	750T90H	4—3.5%2+2-	150	3250	31D	11
1000	1000T77H	2—5%1+1-	150	6300	33F	16
480 Volts Delta Primary 240 Volts Delta Secondary 60 Hz						
6	**6T5F**	2—5%FCBN	115	150	12C	12
9	**9T75F**	4—2.5%FCBN	115	265	14C	13
15	**15T75F**	4—2.5%FCBN	115	335	14C	13
15	**15T6H**	6—2.5%2+4-	150	200	17D	14
30	**30T6H**	6—2.5%2+4-	150	250	17D	14
45	**45T6H**	6—2.5%2+4-	150	340	18D	14
75	**75T6H**	6—2.5%2+4-	150	500	19D	14
112.5	**112T6H**	6—2.5%2+4-	150	750	21D	14
150	**150T6H**	6—2.5%2+4-	150	1020	22D	14
225	**225T6H**	6—2.5%2+4-	150	1275	24D	14
300	**300T6H**	6—2.5%2+4-	150	1680	25D	14
500	**500T63H**	4—2.5%2+2-	150	2460	30D	15
750	750T91H	4—3.5%2+2-	150	3250	31D	15
1000	1000T78H	2—5%1+1-	150	6000	33F	17

Three Phase

kVA	Catalog Number	Full Capacity Taps★	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
480 Volts Delta Primary 240 Volts Delta Secondary 120 Volts CENTER TAP 60 Hz						
30	**30T6HCT**	6—2.5%2+4-	150	250	17D	20
45	**45T6HCT**	6—2.5%2+4-	150	340	18D	20
75	**75T6HCT**	6—2.5%2+4-	150	500	19D	20
112.5	**112T6HCT**	6—2.5%2+4-	150	750	21D	20
150	**150T6HCT**	6—2.5%2+4-	150	1020	22D	20
225	**225T6HCT**	6—2.5%2+4-	150	1275	24D	20
300	**300T6HCT**	6—2.5%2+4-	150	1680	25D	20
500	500T63HCT	4—2.5%2+2-	150	2460	30D	33
750	750T91HCT	4—3.5%2+2-	150	3250	31D	26
1000	1000T78HCT	2—5%1+1-	150	6300	33F	27
480 Volts Delta Primary 480Y/277 Volts Secondary 60 Hz						
15	**15T76H**	4—2.5%2+ 2-	150	200	17D	11
30	**30T76H**	4—2.5%2+ 2-	150	250	17D	11
45	**45T76H**	4—2.5%2+ 2-	150	340	18D	11
75	**75T76H**	4—2.5%2+ 2-	150	500	19D	11
112.5	**112T76H**	4—2.5%2+ 2-	150	750	21D	11
150	**150T76H**	4—2.5%2+ 2-	150	1020	22D	11
225	225T76H	4—2.5%2+ 2-	150	1275	24D	11
300	300T76H	4—2.5%2+ 2-	150	1680	25D	11
500	500T76H	4—2.5%2+ 2-	150	2460	30D	11
480 Volts Delta Primary 380Y/220 Volts Secondary 60 Hz						
15	**15T96H**	4—2.5%2+ 2-	150	200	17D	11
30	**30T96H**	4—2.5%2+ 2-	150	250	17D	11
45	**45T96H**	4—2.5%2+ 2-	150	340	18D	11
75	**75T96H**	4—2.5%2+ 2-	150	500	19D	11
112.5	112T96H	4—2.5%2+ 2-	150	750	21D	11
150	150T96H	4—2.5%2+ 2-	150	1020	22D	11
225	225T96H	4—2.5%2+ 2-	150	1275	24D	11
300	300T96H	4—2.5%2+ 2-	150	1680	25D	11
500	500T96H	4—2.5%2+ 2-	150	2460	30D	11

Note: Boldface Catalog Numbers indicate in-stock transformers.
★ (FCBN) Full Capacity Taps Below Normal where noted.
■ For enclosure styles see **Dimensions Table** Page 27.
♦ See **Wiring Diagrams** Page 41.

Three Phase

kVA	Catalog Number	Full Capacity Taps★	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
600 Volts Delta Primary 208Y/120 Volts Secondary 60 Hz						
6	**6T7F**	2—5%FCBN	115	150	12C	8
9	**9T7F**	2—5%FCBN	115	265	14C	8
15	**15T7F**	2—5%FCBN	115	335	14C	8
15	15T8H	4—2.5%FCBN	150	200	17D	11
30	**30T8H**	4—2.5%FCBN	150	250	17D	11
45	**45T8H**	4—2.5%FCBN	150	340	18D	11
75	**75T8H**	4—2.5%FCBN	150	500	19D	11
112.5	112T8H	4—2.5%FCBN	150	750	21D	11
150	150T8H	4—2.5%FCBN	150	1020	22D	11
225	225T8H	4—2.5%FCBN	150	1275	24D	11
300	300T8H	4—2.5%FCBN	150	1680	25D	11
500	500T8H	4—2.5%FCBN	150	2460	30D	11
750	750T8H	4—2.5%FCBN	150	3250	31D	11
1000	1000T88H	4—3.5%FCBN	150	6000	33F	11
600 Volts Delta Primary 480Y/277 Volts Secondary 60 Hz						
15	15T74H	4—2.5%FCBN	150	200	17D	11
30	30T74H	4—2.5%FCBN	150	250	17D	11
45	45T74H	4—2.5%FCBN	150	340	18D	11
75	75T74H	4—2.5%FCBN	150	500	19D	11
112.5	112T74H	4—2.5%FCBN	150	750	21D	11
150	150T74H	4—2.5%FCBN	150	1020	22D	11
225	225T74H	4—2.5%FCBN	150	1275	24D	11
300	300T74H	4—2.5%FCBN	150	1680	25D	11
500	500T74H	4—2.5%FCBN	150	2460	30D	11
600 Volts Delta Primary 240 Volts Delta Secondary 60 Hz						
15	15T10H	4—2.5%FCBN	150	200	17D	15
30	30T10H	4—2.5%FCBN	150	250	17D	15
45	45T10H	4—2.5%FCBN	150	340	18D	15
75	75T10H	4—2.5%FCBN	150	500	19D	15
112.5	112T10H	4—2.5%FCBN	150	750	21D	15
150	150T10H	4—2.5%FCBN	150	1020	22D	15
225	225T10H	4—2.5%FCBN	150	1275	24D	15
300	300T10H	4—2.5%FCBN	150	1680	25D	15
500	500T10H	4—2.5%FCBN	150	2460	30D	15

Three Phase

kVA	Catalog Number	Full Capacity Taps★	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
208 Volts Delta Primary 480Y/277 Volts Secondary 60 Hz						
15	**15T64H**	2—5%FCBN	150	200	17D	30
30	**30T64H**	2—5%FCBN	150	250	17D	30
45	**45T64H**	2—5%FCBN	150	340	18D	30
75	**75T64H**	2—5%FCBN	150	500	19D	30
112.5	**112T64H**	2—5%FCBN	150	750	21D	30
150	**150T64H**	2—5%FCBN	150	1020	22D	30
225	225T64H	2—5%FCBN	150	1275	24D	30
300	300T64H	2—5%FCBN	150	1680	25D	30
500	500T64H	2—5%FCBN	150	2460	30D	30
240 Volts Delta Primary 208Y/120 Volts Secondary 60 Hz						
15	**15T12H**	4—2.5%2+ 2-	150	200	17D	11
30	**30T12H**	4—2.5%2+ 2-	150	250	17D	11
45	**45T12H**	4—2.5%2+ 2-	150	340	18D	11
75	**75T12H**	4—2.5%2+ 2-	150	500	19D	11
112.5	**112T12H**	4—2.5%2+ 2-	150	750	21D	11
150	**150T12H**	4—2.5%2+ 2-	150	1020	22D	11
225	225T11H	2—5%FCBN	150	1275	24D	16
300	300T11H	2—5%FCBN	150	1680	25D	16
500	500T11H	2—5%FCBN	150	2460	30D	16

Note: Boldface Catalog Numbers indicate in-stock transformers.
★ (FCBN) Full Capacity Taps Below Normal where noted.
■ For enclosure styles see **Dimensions Table** Page 27.
♦ See **Wiring Diagrams** Page 41.

Typical Dry Type General Purpose Energy Saving Premium WATCHDOG® Type

Energy saving WATCHDOG® transformers have these special features:

- Designed for higher efficiency at minimum operating cost.
- Constructed for an extra-long life expectancy using 220°C insulation system designed for full load operation at a maximum temperature rise of 115°C or 80°C above 40°C ambient, instead of 150° rise.
- Capable of continuous emergency overload at 15% on 115°C rise, 30% on 80°C rise.

Single Phase

kVA	Catalog Number	Full Capacity Taps	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
240 x 480 Volts Primary, 120/240 Volts Secondary 60 Hz						
15	**15S3HF**	6—2.5%2+4-▲	115	230	17D	3
25	**25S3HF**	6—2.5%2+4-▲	115	325	18D	3
37.5	**37S3HF**	6—2.5%2+4-▲	115	350	18D	3
50	**50S3HF**	6—2.5%2+4-▲	115	495	21D	3
75	75S3HF	6—2.5%2+4-▲	115	705	22D	3
100	100S3HF	6—2.5%2+4-▲	115	1020	24D	3
240 x 480 Volts Primary, 120/240 Volts Secondary 60 Hz						
15	**15S3HB**	6—2.5%2+4-▲	80	230	17D	3
25	**25S3HB**	6—2.5%2+4-▲	80	325	18D	3
37.5	**37S3HB**	6—2.5%2+4-▲	80	350	18D	3
50	**50S3HB**	6—2.5%2+4-▲	80	495	21D	3
75	75S3HB	6—2.5%2+4-▲	80	705	22D	3
100	100S3HB	6—2.5%2+4-▲	80	1020	24D	3

Three Phase

kVA	Catalog Number	Full Capacity Taps	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
480 Volts Delta Primary, 208Y/120 Volts Secondary 60 Hz						
15	**15T3HF**	6—2.5%2+4-	115	250	17D	10
30	**30T3HF**	6—2.5%2+4-	115	340	18D	10
45	**45T3HF**	6—2.5%2+4-	115	500	19D	10
75	**75T3HF**	6—2.5%2+4-	115	650	21D	10
112.5	**112T3HF**	6—2.5%2+4-	115	1020	22D	10
150	**150T3HF**	6—2.5%2+4-	115	1275	24D	10
225	**225T3HF**	6—2.5%2+4-	115	1680	25D	10
300	**300T3HF**	6—2.5%2+4-	115	2460	30D	10
500	500T90HF	4—3.5%2+2-	115	3250	31D	11
480 Volts Delta Primary, 208Y/120 Volts Secondary 60 Hz						
15	**15T3HB**	6—2.5%2+4-	80	250	17D	10
30	**30T3HB**	6—2.5%2+4-	80	340	18D	10
45	**45T3HB**	6—2.5%2+4-	80	500	19D	10
75	**75T3HB**	6—2.5%2+4-	80	750	21D	10
112.5	**112T3HB**	6—2.5%2+4-	80	1020	22D	10
150	**150T3HB**	6—2.5%2+4-	80	1275	24D	10
225	**225T3HB**	6—2.5%2+4-	80	1680	25D	10
300	**300T3HB**	6—2.5%2+4-	80	2460	30D	10
500	500T90HB	4—3.5%2+2-	80	3250	31D	11

Note: Boldface Catalog Numbers indicate in-stock transformers.
■ For enclosure styles see **Dimensions Table** Page 27.
♦ See **Wiring Diagrams** Page 41.
▲ When 240V connection is used there will be 3-5% taps, 1 above and 2 below 240 volts.

Typical Dry Type General Purpose Transformer with Copper Windings

Aluminum windings in general purpose transformers can be replaced with copper windings which are preferred by some customers.

Three Phase

kVA	Catalog Number	Full Capacity Taps	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
480 Volts Delta Primary 208Y/120 Volts Secondary 60 Hz						
15	**15T3HCU**	6—2.5%2+4-	150	240	17D	10
30	**30T3HCU**	6—2.5%2+4-	150	300	17D	10
45	**45T3HCU**	6—2.5%2+4-	150	385	18D	10
75	**75T3HCU**	6—2.5%2+4-	150	600	19D	10
112.5	**112T3HCU**	6—2.5%2+4-	150	780	21D	10
150	**150T3HCU**	6—2.5%2+4-	150	1080	22D	10
225	**225T3HCU**	6—2.5%2+4-	150	1520	24D	10
300	**300T3HCU**	6—2.5%2+4-	150	1920	25D	10
500	500T68HCU	4—2.5%2+2-	150	2550	30D	11
750	750T90HCU	4—3.5%2+2-	150	3800	31D	11
480 Volts Delta Primary 240 Volts Delta Secondary 60 Hz						
15	15T6HCU	6—2.5%2+4-	150	240	17D	14
30	30T6HCU	6—2.5%2+4-	150	300	17D	14
45	45T6HCU	6—2.5%2+4-	150	385	18D	14
75	75T6HCU	6—2.5%2+4-	150	600	19D	14
112.5	112T6HCU	6—2.5%2+4-	150	780	21D	14
150	150T6HCU	6—2.5%2+4-	150	1080	22D	14
225	225T6HCU	6—2.5%2+4-	150	1520	24D	14
300	300T6HCU	6—2.5%2+4-	150	1920	25D	14
500	500T63HCU	4—2.5%2+2-	150	2550	30D	15

Three Phase

kVA	Catalog Number	Full Capacity Taps	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
600 Volts Delta Primary 208Y/120 Volts Secondary 60 Hz						
15	15T79HCU	4—2.5%2+2-	150	240	17D	11
30	30T79HCU	4—2.5%2+2-	150	300	17D	11
45	45T79HCU	4—2.5%2+2-	150	385	18D	11
75	75T79HCU	4—2.5%2+2-	150	600	19D	11
112.5	112T79HCU	4—2.5%2+2-	150	780	21D	11
150	150T79HCU	4—2.5%2+2-	150	1080	22D	11
225	225T79HCU	4—2.5%2+2-	150	1520	24D	11
300	300T79HCU	4—2.5%2+2-	150	1920	25D	11
500	500T79HCU	4—2.5%2+2-	150	2550	30D	11
750	750T79HCU	4—2.5%2+2-	150	3800	31D	11
600 Volts Delta Primary 240 Volts Delta Secondary 60 Hz						
15	15T129HCU	4—2.5%2+2-	150	240	17D	15
30	30T129HCU	4—2.5%2+2-	150	300	17D	15
45	45T129HCU	4—2.5%2+2-	150	385	18D	15
75	75T129HCU	4—2.5%2+2-	150	600	19D	15
112.5	112T129HCU	4—2.5%2+2-	150	780	21D	15
150	150T129HCU	4—2.5%2+2-	150	1080	22D	15
225	225T129HCU	4—2.5%2+2-	150	1520	24D	15
300	300T129HCU	4—2.5%2+2-	150	1920	25D	15
500	500T129HCU	4—2.5%2+2-	150	2550	30D	15

Note: Boldface Catalog Numbers indicate in-stock transformers.
■ For enclosure styles see **Dimensions Table** Page 27.
♦ See **Wiring Diagrams** Page 41.

Typical Non-Ventilated Transformer

Non-ventilated transformers are intended for use in contaminated or dust-laden environments, indoor or outdoor.

Single Phase

kVA	Catalog Number	Full Capacity Taps★	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
240 x 480 Volts Primary 120/240 Volts Secondary 60 Hz						
15	15S3HNV	6—2.5%2+4-▲	150	230	17E	3
25	25S3HNV	6—2.5%2+4-▲	150	310	18E	3
37.5	37S3HNV	6—2.5%2+4-▲	150	350	18E	3
50	50S3HNV	6—2.5%2+4-▲	150	495	21E	3
75	75S3HNV	6—2.5%2+4-▲	150	1020	24E	3
100	100S3HNV	6—2.5%2+4-▲	150	1220	25E	3
600 Volts Primary 120/240 Volts Secondary 60 Hz						
15	15S5HNV	4—2.5%FCBN	150	230	17E	19
25	25S5HNV	4—2.5%FCBN	150	310	18E	19
37.5	37S5HNV	4—2.5%FCBN	150	350	18E	19
50	50S5HNV	4—2.5%FCBN	150	495	21E	19
75	75S5HNV	4—2.5%FCBN	150	1020	24E	19
100	100S5HNV	4—2.5%FCBN	150	1220	25E	19

Note: Boldface Catalog Numbers indicate in-stock transformers.
★ (FCBN) Full Capacity Taps Below Normal where noted.
■ For enclosure styles see **Dimensions Table** Page 27.
♦ See **Wiring Diagrams** Page 41.
▲ When 240V connection is used there will be 3-5% taps, 1 above and 2 below 240V.

Three Phase

kVA	Catalog Number	Full Capacity Taps★	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
480 Volts Delta Primary 208Y/120 Volts Secondary 60 Hz						
15	**15T68F**	4—2.5%2+2-	115	335	14C	9
30	**30T2F**	2—5%FCBN	115	775	16C	29
30	**30T3HNV**	6—2.5%2+4-	150	340	19E	10
45	**45T3HNV**	6—2.5%2+4-	150	510	19E	10
75	**75T3HNV**	6—2.5%2+4-	150	1020	22E	10
112.5	112T3HNV	6—2.5%2+4-	150	1275	24E	10
150	150T3HNV	6—2.5%2+4-	150	1680	25E	10
225	225T3HNV	6—2.5%2+4-	150	2100	23E	10
300	300T3HNV	6—2.5%2+4-	150	3300	28E	10
480 Volts Delta Primary 240 Volts Delta Secondary 60 Hz						
15	**15T75F**	4—2.5%FCBN	115	335	14C	13
30	30T6HNV	6—2.5%2+4-	150	340	19E	14
45	45T6HNV	6—2.5%2+4-	150	510	19E	14
75	75T6HNV	6—2.5%2+4-	150	1020	22E	14
112.5	112T6HNV	6—2.5%2+4-	150	1275	24E	14
150	150T6HNV	6—2.5%2+4-	150	1680	25E	14
225	225T6HNV	6—2.5%2+4-	150	2100	23E	14
300	300T6HNV	6—2.5%2+4-	150	3300	28E	14
600 Volts Delta Primary 208Y/120 Volts Secondary 60 Hz						
15	**15T7F**	2—5%FCBN	115	335	14C	8
30	30T8HNV	4—2.5%FCBN	150	340	19E	11
45	45T8HNV	4—2.5%FCBN	150	510	19E	11
75	75T8HNV	4—2.5%FCBN	150	1020	22E	11
112.5	112T8HNV	4—2.5%FCBN	150	1275	24E	11
150	150T8HNV	4—2.5%FCBN	150	1680	25E	11
225	225T8HNV	4—2.5%FCBN	150	2100	23E	11
300	300T8HNV	4—2.5%FCBN	150	3300	28E	11

Typical Export Model Transformer

Typical Stainless Steel Enclosure

Export model transformers are designed to accommodate voltage systems world-wide.

Export model transformers 10kVA and smaller are certified by TUV (file no. E9571881.01) to meet EN standard EN60-742 in addition to being UL Listed. Original equipment is eligible for the "CE" mark if transformer components meet the EN60-742 standard. Because the EN standard has a more severe overload requirement, the 1S67F has a UL rating of 1kVA but an EN rating of 0.750kVA.

Single Phase

kVA	Catalog Number	Full Capacity Taps	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
190/200/208/220 x 380/400/416/440 Volts Primary 110/220 Volts Secondary 50/60 Hz						
1✱	**1S67F**	None	115	21.2	9A	31
2	**2S67F**	None	115	39.1	11A	31
3	**3S67F**	None	115	55.2	11A	31
5	**5S67F**	None	115	135	13B	31
7.5	**7S67F**	None	115	165	13B	31
10	**10S67F**	None	115	165	13B	31
15	15S67H	None	150	225	17D	32
25	25S67H	None	150	260	17D	32

Note: Boldface Catalog Numbers indicate in-stock transformers.
✱ 0.750kVA EN rating.
★ (FCBN) Full Capacity Taps Below Normal where noted.
■ For enclosure styles see **Dimensions Table** Page 27.
♦ See **Wiring Diagrams** Page 41.

Stainless steel enclosures provide better corrosion resistance than standard painted enclosures. Square D has an entire line of resin-filled transformers available with #316 stainless steel enclosures to meet demands for extra protection in environments where harsh chemicals or corrosive materials such as acids, food products, gasoline, organic solvents, or salt water are present.

Square D transformers with #316 stainless steel have a higher nickel content than #304 stainless steel, making them even more resistant to harsh environments.

Units are painted with standard ANSI 49 gray and have a NEMA Type 3R rating. Additional voltages not listed below are available. Contact your local Square D field office for details.

Single Phase

kVA	Catalog Number	Full Capacity Taps★	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
240 x 480 Volts Primary 120/240 Volts Secondary 60 Hz						
1	1S1FSS	None	115	21	7A	1
1.5	1.5S1FSS	None	115	30	8A	1
2	2S1FSS	None	115	39	9A	1
3	3S1FSS	None	115	55.2	10A	1
5	5S1FSS	None	115	115	13B	1
7.5	7S1FSS	None	115	150	13B	1
10	10S1FSS	None	115	165	13B	1
15	15S1FSS	None	115	320	15B	1
25	25S1FSS	None	115	385	15B	1
480 Volts Primary 120/240 Volts Secondary 60 Hz						
3	3S40FSS	2–5% FCBN	115	55.2	10A	28
5	5S40FSS	2–5% FCBN	115	115	13B	28
7.5	7S40FSS	2–5% FCBN	115	150	13B	28
10	10S40FSS	2–5% FCBN	115	165	13B	28
15	15S40FSS	2–5% FCBN	115	320	15B	28
25	25S40FSS	2–5% FCBN	115	385	15B	28

Three Phase

480 Volts Primary 208Y/120 Volts Secondary 60 Hz						
3	3T2FSS	2–5% FCBN	115	125	12C	8
6	6T2FSS	2–5% FCBN	115	150	12C	8
9	9T2FSS	2–5% FCBN	115	265	14C	8
15	15T2FSS	2–5% FCBN	115	335	14C	8
30	30T2FSS	2–5% FCBN	115	775	16C	29

Transformers for Non-Linear Loads
Standard NL Model and Premium NLP Model

Application

Type NL and NLP are dry type transformers intended to feed applications such as computers, copiers, printers, FAX machines, video display terminals and other equipment having switching-mode power supplies. These transformers are specially built to handle high harmonics associated with such loads. Type NLP is designed particularly for more severe non-linear applications and has reduced sound levels three decibels below NEMA standards.

Features

Features for typical non-linear load service include:

- Three-phase, dry type transformers, 480 Delta – 208Y/120
- Electrostatic shield
- Class 220 installation
- Reduced core flux to compensate for harmonic voltage distortion
- 200% neutral with double size neutral terminal for additional customer neutral cables
- Additional coil capacity to compensate for higher non-linear load loss
- Temperature rise of 115°C
- Heavy-gauge ventilated indoor enclosures (weather shields available)
- UL Listed

Type NL Transformers for typical non-linear load service and Type NLP Transformers for more severe non-linear load service.

Three Phase Standard NL Model 60 Hz

kVA	Catalog Number	Full Capacity Taps	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
480 Volts Delta Primary 208Y/120 Volts Secondary 60 Hz			**Aluminum Wound UL K-4 Rated**			
15	**15T3HFISNL**	6—2.5%2+4-	115	240	17D	10
30	**30T3HFISNL**	6—2.5%2+4-	115	300	18D	10
45	**45T3HFISNL**	6—2.5%2+4-	115	500	19D	10
75	**75T3HFISNL**	6—2.5%2+4-	115	725	21D	10
112.5	**112T3HFISNL**	6—2.5%2+4-	115	950	22D	10
150	**150T3HFISNL**	6—2.5%2+4-	115	1290	24D	10
225	225T3HFISNL	6—2.5%2+4-	115	1900	25D	10
300	300T68HFISNL	4—2.5%2+2-	115	2100	25D	11
500	500T90HFISNL	4—3.5%2+2-	115	3600	29D	11
480 Volts Delta Primary 208Y/120 Volts Secondary 60 Hz			**Copper Wound UL K-4 Rated**			
15	15T3HFISCUNL	6—2.5%2+4-	115	330	18D	10
30	**30T3HFISCUNL**	6—2.5%2+4-	115	380	18D	10
45	**45T3HFISCUNL**	6—2.5%2+4-	115	475	18D	10
75	**75T3HFISCUNL**	6—2.5%2+4-	115	865	21D	10
112.5	112T3HFISCUNL	6—2.5%2+4-	115	1090	22D	10
150	150T3HFISCUNL	6—2.5%2+4-	115	1450	24D	10
225	225T3HFISCUNL	6—2.5%2+4-	115	2065	25D	10
300	300T68HFISCUNL	4—2.5%2+2-	115	2200	25D	11
500	500T90HFISCUNL	4—3.5%2+2-	115	4300	29D	11

Note: Boldface Catalog Numbers indicate in-stock transformers.
■ For enclosure styles see **Dimensions Table** Page 27.
♦ See **Wiring Diagrams** Page 41.

Three Phase Premium NLP Model

kVA	Catalog Number	Full Capacity Taps	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
480 Volts Delta Primary 208Y/120 Volts Secondary 60 Hz			**Aluminum Wound UL K-13 Rated**			
15	**15T3HFISNLP**	6—2.5%2+4-	115	245	17D	10
30	**30T3HFISNLP**	6—2.5%2+4-	115	350	18D	10
45	**45T3HFISNLP**	6—2.5%2+4-	115	600	19D	10
75	**75T3HFISNLP**	6—2.5%2+4-	115	780	22D	10
112.5	**112T3HFISNLP**	6—2.5%2+4-	115	1025	22D	10
150	**150T3HFISNLP**	6—2.5%2+4-	115	1390	25D	10
225	**225T3HFISNLP**	6—2.5%2+4-	115	2010	25D	10
300	300T68HFI8NLP	4—2.5%2+2-	115	2100	30D	11
500	500T90HFISNLP	4—3.5%2+2-	115	3600	32F	11
480 Volts Delta Primary 208Y/120 Volts Secondary 60 Hz			**Copper Wound UL K-13 Rated**			
15	15T3HFISCUNLP	6—2.5%2+4-	115	330	18D	10
30	**30T3HFISCUNLP**	6—2.5%2+4-	115	380	18D	10
45	**45T3HFISCUNLP**	6—2.5%2+4-	115	600	19D	10
75	**75T3HFISCUNLP**	6—2.5%2+4-	115	865	22D	10
112.5	**112T3HFISCUNLP**	6—2.5%2+4-	115	1250	22D	10
150	150T3HFISCUNLP	6—2.5%2+4-	115	1955	25D	10
225	225T3HFISCUNLP	6—2.5%2+4-	115	2450	25D	10
300	300T68HFISCUNLP	4—2.5%2+2-	115	2400	30D	11
500	500T90HFISCUNLP	4—3.5%2+2-	115	5000	33F	11

Typical Shielded Isolation Transformer

How to Order Single Phase

Select the voltage required from the chart below and insert the voltage code in place of the parentheses ( ) in the catalog number.

Voltage Code	Primary	Secondary	Wiring♦
6	120x240	120/240	1
7	208	120/240	6
8	277	120/240	6
9	208	208	7

Single Phase

kVA	Catalog Number	Full Capacity Taps	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■
480 Volts Primary 120/240 Volts Secondary (with Electrostatic Shield) 60 Hz					
1	1S( )FIS	None	115	21.2	7A
1.5	1.5S( )FIS	None	115	30.1	8A
2	2S( )FIS	None	115	39.1	9A
3	3S( )FIS	None	115	55.2	10A
5	5S( )FIS	None	115	115	13B
7.5	7S( )FIS	None	115	150	13B
10	10S( )FIS	None	115	165	13B
15	15S( )HIS	None	150	200	17D
25	25S( )HIS	None	150	230	17D

Note: Boldface Catalog Numbers indicate in-stock transformers.
Single phase stocked in voltage codes 6 and 7, from 1 through 25kVA.
★ (FCBN) Full Capacity Taps Below Normal where noted.
■ For enclosure styles see **Dimensions Table** Page 27.
♦ See **Wiring Diagrams** Page 41.

Application

Although any transformer with two windings is an “isolating” transformer, because the internal primary winding is isolated and insulated from the secondary winding, isolation transformers have a special function. They isolate electrical power from the normal **supply source** to reduce the effect of power surges. For example, applications such as electronic motor controls, X-ray machines, and computers benefit from the use of shielded isolation transformers.

Accessories

- **Electrostatic shields** — Isolation transformers can be equipped with electrostatic shields between the primary and secondary to reduce line interference or undesirable frequencies; critical equipment may require this added protection. An electrostatic shield is indicated by “IS” at the end of the catalog number, such as 3S6FIS.
- **Filters** — Primary surge suppression and secondary filters can be added to shielded isolation transformers for additional reduction of transient and across-the-line surges. Surge suppression and filters are indicated by “FIL” at the end of the catalog number, such as 15T3HISFIL.

Three Phase

kVA	Catalog Number	Full Capacity Taps★	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
480 Volts Delta Primary 208Y/120 Volts Secondary (With Electrostatic Shield) 60 Hz						
9	**9T2FIS**	2—5%FCBN	115	265	14C	8
15	**15T3HIS**	6—2.5%2+4-	150	200	17D	10
30	**30T3HIS**	6—2.5%2+4-	150	250	17D	10
45	**45T3HIS**	6—2.5%2+4-	150	340	18D	10
75	**75T3HIS**	6—2.5%2+4-	150	500	19D	10
112.5	**112T3HIS**	6—2.5%2+4-	150	750	21D	10
150	**150T3HIS**	6—2.5%2+4-	150	1020	22D	10
225	**225T3HIS**	6—2.5%2+4-	150	1275	24D	10
300	**300T3HIS**	6—2.5%2+4-	150	1680	25D	10
500	500T68HIS	4—2.5%2+2-	150	2460	30D	11
208 Volts Delta Primary 208Y/120 Volts Secondary (With Electrostatic Shield) 60 Hz						
9	**9T85FIS**	2—5%FCBN	115	265	14C	8
15	**15T85HIS**	2—5%FCBN	150	200	17D	16
30	**30T85HIS**	2—5%FCBN	150	250	17D	16
45	**45T85HIS**	2—5%FCBN	150	340	18D	16
75	**75T85HIS**	2—5%FCBN	150	500	19D	16
112.5	112T85HIS	2—5%FCBN	150	750	21D	16
150	150T85HIS	2—5%FCBN	150	1020	22D	16
225	225T85HIS	2—5%FCBN	150	1275	24D	16
300	300T85HIS	2—5%FCBN	150	1680	25D	16
500	500T85HIS	2—5%FCBN	150	2460	30D	16

Isolation Transformers Shielded and Filtered

Typical Shielded Isolation Transformer With Filter

Three Phase

kVA	Catalog Number	Full Capacity Taps	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
480 Volts Delta Primary 208Y/120 Volts Secondary (With Shield and Filter) 60 Hz						
15	**15T3HISFIL**	6—2.5%2+4-	150	265	19D	10
30	**30T3HISFIL**	6—2.5%2+4-	150	330	19D	10
45	**45T3HISFIL**	6—2.5%2+4-	150	390	19D	10
75	**75T3HISFIL**	6—2.5%2+4-	150	525	21D	10
112.5	112T3HISFIL	6—2.5%2+4-	150	840	22D	10
150	150T3HISFIL	6—2.5%2+4-	150	1125	25D	10
225	225T3HISFIL	6—2.5%2+4-	150	1365	26D	10

Note: Boldface Catalog Numbers indicate in-stock transformers.
★ (FCBN) Full Capacity Taps Below Normal where noted.
■ For enclosure styles see **Dimensions Table** Page 27.
♦ See **Wiring Diagrams** Page 41.

Three Phase

kVA	Catalog Number	Full Capacity Taps★	Deg. C. Temp. Rise	Wt. (lbs)	Encl. ■	Wiring ♦
480 Volts Delta Primary 208Y/120 Volts Secondary (With Shield and Filter) 60 Hz						
15	15T85HISFIL	2—5%FCBN	150	265	19D	16
30	30T85HISFIL	2—5%FCBN	150	330	19D	16
45	45T85HISFIL	2—5%FCBN	150	390	19D	16
75	75T85HISFIL	2—5%FCBN	150	525	21D	16
112.5	112T85HISFIL	2—5%FCBN	150	840	22D	16
150	150T85HISFIL	2—5%FCBN	150	1125	25D	16
225	225T85HISFIL	2—5%FCBN	150	1365	26D	16

Buck & Boost Transformer

Application

Buck and Boost transformers are isolating transformers that have 120 x 240 volt primaries and either 12/24 or 16/32 volt secondaries. When used as isolating transformers, they carry the full load stated on the nameplate. However, their primary use and value is that the primary and secondary can be interconnected for use as an autotransformer. When used as an autotransformer to slightly step up or down voltage, the Buck and Boost transformer can carry loads in excess of its nameplate rating. Using the transformer in this way is one of the most economical and compact means of slightly adjusting voltage.

How to Make a Selection

Refer to the Tables 1–10 that follow for guidelines in selecting the correct transformer that supplies the required voltage for a specific kVA load.

Single Phase Loads – If load voltages of 115V, 120V, 230V or 240V are required, refer to Tables 1, 2, 3 or 4 respectively.

Three Phase Loads – (For power or lighting, but available voltage must be a 3-phase, 4-wire system with neutral for lighting.) If load voltages of 230V, 240V, 460V or 480V are required, refer to Tables 5, 6, 7 or 8 respectively.

Three Phase Loads – (Open delta connection for 3-wire power loads only. Requires only 3-phase, 3-wire available voltage.) If load voltages of 230V or 240V are required, refer to Tables 9 or 10 respectively.

To use Tables 1–10 in this section, do the following:

1. Calculate LOAD kVA:

$$\text{Single Phase kVA} = \frac{\text{Load Volts x Load Amperes}}{1000}$$

$$\text{Three Phase kVA} = \frac{\text{Load Volts x Load Amperes x 1.73}}{1000}$$

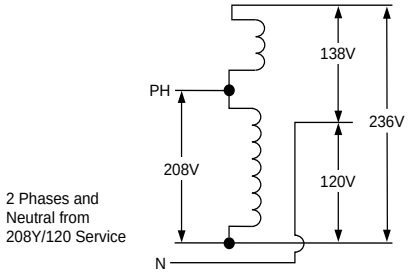
2. Select the **Desired Load Voltage** table nearest the voltage required.
3. Check for the nearest **Available Voltage** to the actual voltage measured.
4. Follow down the vertical column of the voltage measured and select a load kVA value **equal to or greater than** calculated (*never smaller*), then move horizontally to the left and select the transformer catalog number.

   Note: For 3-phase loads, two or three transformers may be required as shown in the table heading.
5. Refer to the correct wiring diagram number at the bottom of the "Load kVA" column for the load kVA you have chosen.

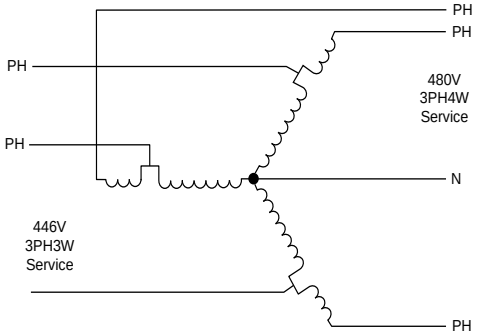
Common "Mis-Applications"

Using Buck and Boost transformers incorrectly can be avoided by observing both common sense and the restrictions for autotransformers in the National Electrical Code. The following are some examples of incorrect use.

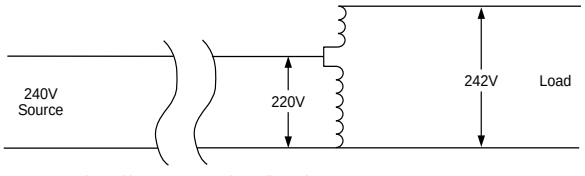
- Creating a 240/120 single phase service from 208Y/120 source.
  This creates unbalanced line-to-line neutral voltages. This application is proper only for 240V 2-wire loads.



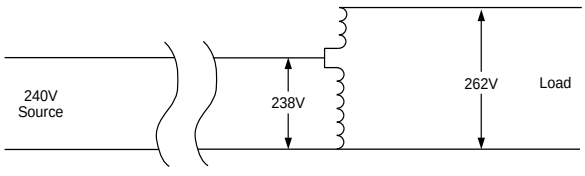
- Bucking or boosting 3-phase, 3-wire systems for 3-phase, 4-wire loads.
  This uses three Buck and Boost transformers in a 3-phase wye connection. The neutral created by this connection is not stable and will not yield proper line-to-neutral voltages under load. This connection violates NEC Article 210-9, Exception No.1. The wye connection can be used for 3-wire to 3-wire, 4-wire to 3-wire, and 4-wire to 4-wire applications.



- Correcting long-line voltage drop where load fluctuates.
  Line drop will vary with load. If Buck and Boost transformers are used to correct voltage drop during peak load cycle, dangerously high voltages may result under lightly loaded conditions.



Long Line With 20V Drop Under Full Load



Long Line With 2V Drop Under Light Load

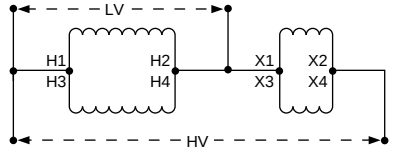
Table 1: Desired Load Voltage: 115V Single Phase, 60 Hz One Transformer Required

Transformer Catalog Numbers	Available Voltage							
	91	96	101	105	127	130	138	146
	Single Phase Load kVA							
50SV43A	—	0.25	—	0.5	0.5	—	0.25	—
50SV46A	0.18	—	0.37	—	—	0.37	—	0.18
100SV43A	—	0.5	—	1	1	—	0.5	—
100SV46A	0.37	—	0.75	—	—	0.75	—	0.37
150SV43A	—	0.75	—	1.5	1.5	—	0.75	—
150SV46A	0.56	—	1.12	—	—	1.12	—	0.56
250SV43B	—	1.25	—	2.5	2.5	—	1.25	—
250SV46B	0.94	—	1.88	—	—	1.88	—	0.94
500SV43B	—	2.5	—	5	5	—	2.5	—
500SV46B	1.88	—	3.75	—	—	3.75	—	1.88
750SV43F	—	3.75	—	7.5	7.5	—	3.75	—
750SV46F	2.81	—	5.62	—	—	5.62	—	2.81
1S43F	—	5	—	10	10	—	5	—
1S46F	3.75	—	7.5	—	—	7.5	—	3.75
1.5S43F	—	7.5	—	15	15	—	7.5	—
1.5S46F	5.62	—	11.25	—	—	11.25	—	5.62
2S43F	—	10	—	20	20	—	10	—
2S46F	7.5	—	15	—	—	15	—	7.5
3S43F	—	15	—	30	30	—	15	—
3S46F	11.25	—	22.5	—	—	22.5	—	11.25
Wiring Diagram	2	2	1	1	1	1	2	2

Table 2: Desired Load Voltage: 120V Single Phase, 60 Hz One Transformer Required

Transformer Catalog Numbers	Available Voltage							
	95	100	106	109	132	136	144	152
	Single Phase Load kVA							
50SV43A	—	0.25	—	0.5	0.5	—	0.25	—
50SV46A	0.18	—	0.37	—	—	0.37	—	0.18
100SV43A	—	0.5	—	1	1	—	0.5	—
100SV46A	0.37	—	0.75	—	—	0.75	—	0.37
150SV43A	—	0.75	—	1.5	1.5	—	0.75	—
150SV46A	0.56	—	1.12	—	—	1.12	—	0.56
250SV43B	—	1.25	—	2.5	2.5	—	1.25	—
250SV46B	0.94	—	1.88	—	—	1.88	—	0.94
500SV43B	—	2.5	—	5	5	—	2.5	—
500SV46B	1.88	—	3.75	—	—	3.75	—	1.88
750SV43F	—	3.75	—	7.5	7.5	—	3.75	—
750SV46F	2.81	—	5.62	—	—	5.62	—	2.81
1S43F	—	5	—	10	10	—	5	—
1S46F	3.75	—	7.5	—	—	7.5	—	3.75
1.5S43F	—	7.5	—	15	15	—	7.5	—
1.5S46F	5.62	—	11.25	—	—	11.25	—	5.62
2S43F	—	10	—	20	20	—	10	—
2S46F	7.5	—	15	—	—	15	—	7.5
3S43F	—	15	—	30	30	—	15	—
3S46F	11.25	—	22.5	—	—	22.5	—	11.25
Wiring Diagram	2	2	1	1	1	1	2	2

1



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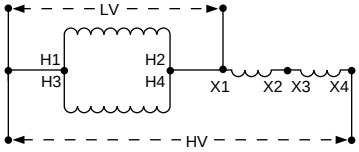
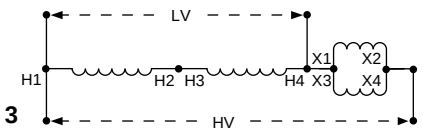


Table 3: Desired Load Voltage: 230V Single Phase, 60 Hz One Transformer Required

Transformer Catalog Numbers	Available Voltage							
	203	208	216	219	242	245	253	261
	Single Phase Load kVA							
50SV43A	—	0.5	—	1	1	—	0.5	—
50SV46A	0.37	—	0.75	—	—	0.75	—	0.37
100SV43A	—	1	—	2	2	—	1	—
100SV46A	0.75	—	1.5	—	—	1.5	—	0.75
150SV43A	—	1.5	—	3	3	—	1.5	—
150SV46A	1.12	—	2.25	—	—	2.25	—	1.12
250SV43B	—	2.5	—	5	5	—	2.5	—
250SV46B	1.88	—	3.75	—	—	3.75	—	1.88
500SV43B	—	5	—	10	10	—	5	—
500SV46B	3.75	—	7.5	—	—	7.5	—	3.75
750SV43F	—	7.5	—	15	15	—	7.5	—
750SV46F	5.62	—	11.25	—	—	11.25	—	5.62
1S43F	—	10	—	20	20	—	10	—
1S46F	7.5	—	15	—	—	15	—	7.5
1.5S43F	—	15	—	30	30	—	15	—
1.5S46F	11.25	—	22.5	—	—	22.5	—	11.25
2S43F	—	20	—	40	40	—	20	—
2S46F	15	—	30	—	—	30	—	15
3S43F	—	30	—	60	60	—	30	—
3S46F	22.5	—	45	—	—	45	—	22.5
Wiring Diagram	4	4	3	3	3	3	4	4

Table 4: Desired Load Voltage: 240V Single Phase, 60 Hz One Transformer Required

Transformer Catalog Numbers	Available Voltage							
	212	218	225	229	252	256	264	272
	Single Phase Load kVA							
50SV43A	—	0.5	—	1	1	—	0.5	—
50SV46A	0.37	—	0.75	—	—	0.75	—	0.37
100SV43A	—	1	—	2	2	—	1	—
100SV46A	0.75	—	1.5	—	—	1.5	—	0.75
150SV43A	—	1.5	—	3	3	—	1.5	—
150SV46A	1.12	—	2.25	—	—	2.25	—	1.12
250SV43B	—	2.5	—	5	5	—	2.5	—
250SV46B	1.88	—	3.75	—	—	3.75	—	1.88
500SV43B	—	5	—	10	10	—	5	—
500SV46B	3.75	—	7.5	—	—	7.5	—	3.75
750SV43F	—	7.5	—	15	15	—	7.5	—
750SV46F	5.62	—	11.25	—	—	11.25	—	5.62
1S43F	—	10	—	20	20	—	10	—
1S46F	7.5	—	15	—	—	15	—	7.5
1.5S43F	—	15	—	30	30	—	15	—
1.5S46F	11.25	—	22.5	—	—	22.5	—	11.25
2S43F	—	20	—	40	40	—	20	—
2S46F	15	—	30	—	—	30	—	15
3S43F	—	30	—	60	60	—	30	—
3S46F	22.5	—	45	—	—	45	—	22.5
Wiring Diagram	4	4	3	3	3	3	4	4



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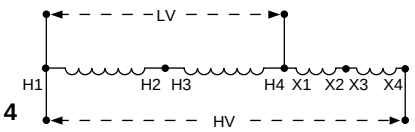

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Table 5: Desired Load Voltage: 230Y/133 Three Phase, 60 Hz, Three Transformers Required

Transformer Catalog Numbers	Available Voltage			
	181Y/105	192Y/111	203Y/117	208Y/120
	Three Phase Load kVA			
50SV43A	—	0.75	—	1.5
50SV46A	0.56	—	1.12	—
100SV43A	—	1.5	—	3
100SV46A	1.12	—	2.25	—
150SV43A	—	2.25	—	4.5
150SV46A	1.69	—	3.38	—
250SV43B	—	3.75	—	7.5
250SV46B	2.81	—	5.62	—
500SV43B	—	7.5	—	15
500SV46B	5.62	—	11.25	—
750SV43F	—	11.25	—	22.5
750SV46F	8.45	—	16.9	—
1S43F	—	15	—	30
1S46F	11.25	—	22.5	—
1.5S43F	—	22.5	—	45
1.5S46F	16.9	—	33.8	—
2S43F	—	30	—	60
2S46F	22.5	—	45	—
3S43F	—	45	—	90
3S46F	33.8	—	67.6	—
Wiring Diagram	8	8	7	7

Table 6: Desired Load Voltage: 240Y/138 Three Phase, 60 Hz, Three Transformers Required

Transformer Catalog Numbers	Available Voltage			
	189Y/109	200Y/115	212Y/122	218Y/126
	Three Phase Load kVA			
50SV43A	—	0.75	—	1.5
50SV46A	0.56	—	1.12	—
100SV43A	—	1.5	—	3
100SV46A	1.12	—	2.25	—
150SV43A	—	2.25	—	4.5
150SV46A	1.69	—	3.38	—
250SV43B	—	3.75	—	7.5
250SV46B	2.81	—	5.62	—
500SV43B	—	7.5	—	15
500SV46B	5.62	—	11.25	—
750SV43F	—	11.25	—	22.5
750SV46F	8.45	—	16.9	—
1S43F	—	15	—	30
1S46F	11.25	—	22.5	—
1.5S43F	—	22.5	—	45
1.5S46F	16.9	—	33.8	—
2S43F	—	30	—	60
2S46F	22.5	—	45	—
3S43F	—	45	—	90
3S46F	33.8	—	67.6	—
Wiring Diagram	8	8	7	7

Table 7: Desired Load Voltage: 460Y/265 Three Phase, 60 Hz, Three Transformers Required

Transformer Catalog Numbers	Available Voltage			
	406Y/235	418Y/242	432Y/250	438Y/253
	Three Phase Load kVA			
50SV43A	—	1.5	—	3
50SV46A	1.12	—	2.25	—
100SV43A	—	3	—	6
100SV46A	2.25	—	4.5	—
150SV43A	—	4.5	—	9
150SV46A	3.38	—	6.76	—
250SV43B	—	7.5	—	15
250SV46B	5.62	—	11.25	—
500SV43B	—	15	—	30
500SV46B	11.25	—	22.5	—
750SV43F	—	22.5	—	45
750SV46F	16.9	—	33.8	—
1S43F	—	30	—	60
1S46F	22.5	—	45	—
1.5S43F	—	45	—	90
1.5S46F	33.8	—	67.6	—
2S43F	—	60	—	120
2S46F	45	—	90	—
3S43F	—	90	—	180
3S46F	67.6	—	135	—
Wiring Diagram	10	10	9	9

Table 8: Desired Load Voltage: 480Y/277 Three Phase, 60 Hz, Three Transformers Required

Transformer Catalog Numbers	Available Voltage			
	424Y/245	436Y/252	450Y/260	457Y/264
	Three Phase Load kVA			
50SV43A	—	1.5	—	3
50SV46A	1.12	—	2.25	—
100SV43A	—	3	—	6
100SV46A	2.25	—	4.5	—
150SV43A	—	4.5	—	9
100SV46A	3.38	—	6.76	—
250SV43B	—	7.5	—	15
250SV46B	5.62	—	11.25	—
500SV43B	—	15	—	30
500SV46B	11.25	—	22.5	—
750SV43F	—	22.5	—	45
750SV46F	16.9	—	33.8	—
1S43F	—	30	—	60
1S46F	22.5	—	45	—
1.5S43F	—	45	—	90
1.5S46F	33.8	—	67.6	—
2S43F	—	60	—	120
2S46F	45	—	90	—
3S43F	—	90	—	180
3S46F	67.6	—	135	—
Wiring Diagram	10	10	9	9

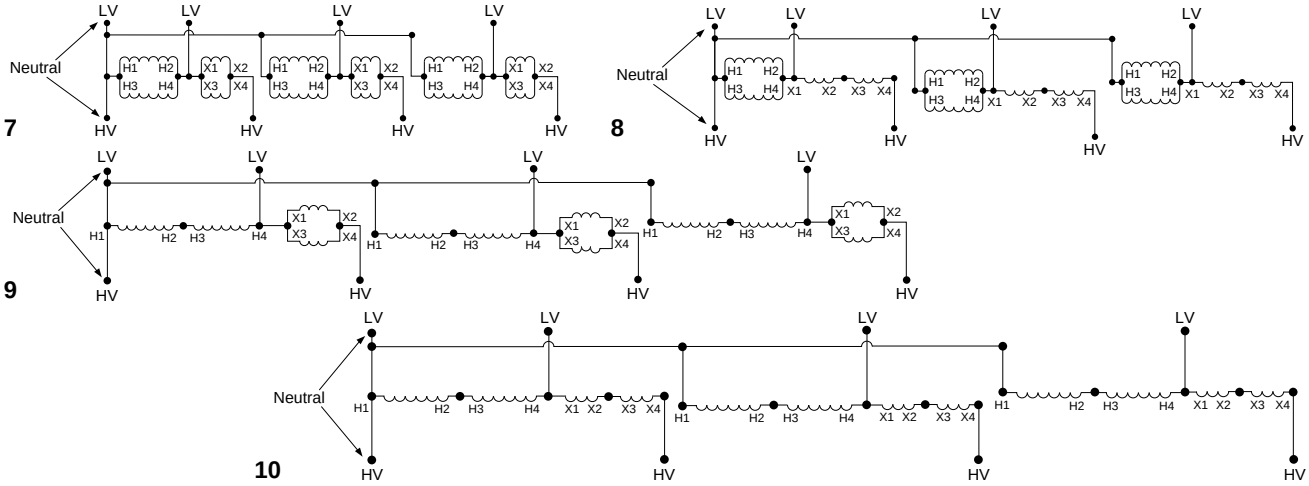
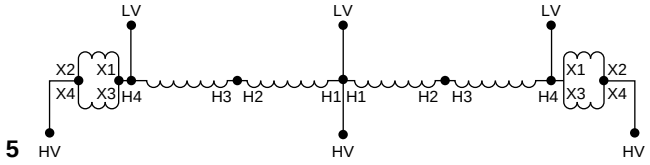


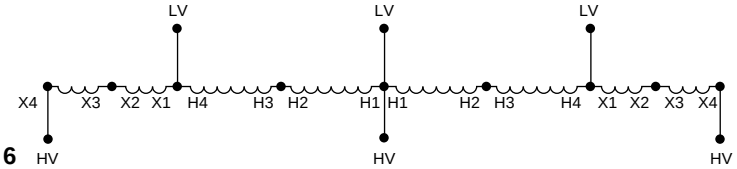
Table 9: Desired Load Voltage: 230V, Three Phase, 60 Hz, (Open Delta-Power Loads Only) Two Transformers Required

Transformer Catalog Numbers	Available Voltage							
	203	209	216	219	242	245	253	260
	Three Phase Load kVA							
50SV43A 50SV46A 100SV43A 100SV46A 150SV43A	— 0.64 — 1.29 —	0.86 — 1.72 — 2.58	— 1.29 — 2.58 —	1.72 — 3.43 — 5.16	1.72 — 3.43 — 5.16	— 1.29 — 2.58 —	0.86 — 1.72 — 2.58	— 0.64 — 1.29 —
150SV46A 250SV43B 250SV46B 500SV43B 500SV46B	1.94 — 3.23 — 6.45	— 4.3 — 8.6 —	3.88 — 6.45 — 12.9	— 8.6 — 17.2 —	— 8.6 — 17.2 —	3.38 — 6.45 — 12.9	— 4.3 — 8.6 —	1.94 — 3.23 — 6.45
750SV43F 750SV46F 1S43F 1S46F 1.5S43F	— 9.7 — 12.9 —	12.9 — 17.2 — 25.8	— 19.4 — 25.8 —	25.8 — 34.3 — 51.6	25.8 — 34.3 — 51.6	— 19.4 — 25.8 —	12.9 — 17.2 — 25.8	— 9.7 — 12.9 —
1.5S46F 2S43F 2S46F 3S43F 3S46F	19.4 — 25.8 — 38.8	— 34.3 — 51.6 —	38.8 — 51.6 — 77.6	— 68.8 — 103.2 —	— 68.8 — 103.2 —	38.8 — 51.6 — 77.6	— 34.3 — 51.6 —	19.4 — 25.8 — 38.8
Wiring Diagram	6	6	5	5	5	5	6	6

Table 10: Desired Load Voltage: 240V, Three Phase, 60 Hz, (Open Delta-Power Loads Only) Two Transformers Required

Transformer Catalog Numbers	Available Voltage							
	212	218	225	229	252	256	264	272
	Three Phase Load kVA							
50SV43A 50SV46A 100SV43A 100SV46A 150SV43A	— 0.64 — 1.29 —	0.86 — 1.72 — 2.58	— 1.29 — 2.58 —	1.72 — 3.43 — 5.16	1.72 — 3.43 — 5.16	— 1.29 — 2.58 —	0.86 — 1.72 — 2.58	— 0.64 — 1.29 —
150SV46A 250SV43B 250SV46B 500SV43B 500SV46B	1.94 — 3.23 — 6.45	— 4.3 — 8.6 —	3.88 — 6.45 — 12.9	— 8.6 — 17.2 —	— 8.6 — 17.2 —	3.38 — 6.45 — 12.9	— 4.3 — 8.6 —	1.94 — 3.23 — 6.45
750SV43F 750SV46F 1S43F 1S46F 1.5S43F	— 9.7 — 12.9 —	12.9 — 17.2 — 25.8	— 19.4 — 25.8 —	25.8 — 34.3 — 51.6	25.8 — 34.3 — 51.6	— 19.4 — 25.8 —	12.9 — 17.2 — 25.8	— 9.7 — 12.9 —
1.5S46F 2S43F 2S46F 3S43F 3S46F	19.4 — 25.8 — 38.8	— 34.3 — 51.6 —	38.8 — 51.6 — 77.6	— 68.8 — 103.2 —	— 68.8 — 103.2 —	38.8 — 51.6 — 77.6	— 34.3 — 51.6 —	19.4 — 25.8 — 38.8
Wiring Diagram	6	6	5	5	5	5	6	6





MINI POWER-ZONE Power Supply

Application

The MINI POWER-ZONE® packaged power supply is the low voltage (600 volts and below) version of our POWER-ZONE® package unit substation. The MINI POWER-ZONE provides a compact power supply for small loads and is suitable for service equipment. This unit is a space-saving substitute for an individual main breaker, transformer, and secondary distribution panel that are connected via conduit. Proper coordination of primary breaker and transformer is assured to prevent nuisance tripping on power-on inrush. The MINI POWER-ZONE power supply is UL Listed for both indoor and outdoor use.

Features

The MINI POWER-ZONE package includes these features:

- A transformer with a maximum full load temperature rise of 115°C using a 180°C insulation system. The core and coil is encapsulated in an epoxy resin-sand combination.
- A circuit breaker section enclosed in a weather-resistant, steel enclosure.
- Enclosures use an electrostatically applied, ANSI 49 color, powder coating to protect both the transformer and panel board section and to provide extra corrosion resistance. This construction provides an exceptionally durable unit for use in wet, dirty, or dusty applications.
- Unique two-part construction uses removable transformers that can be replaced without disturbing external panelboard wiring. All sizes are furnished from Square D warehouse stock, complete with the transformer main primary and main seondary circuit breakers sized in accordance with National Electrical Code requirements.
- Accommodates standard Square D plug-on branch circuit breakers and QUIK-GARD® ground fault circuit breakers.
- Shunt trip capability on the primary breaker is available by special order if local code requires remote tripping when the package is used as service equipment.
- Electrostatic shield and bolt-on panel are available by special order.

480 Volts Primary **Single Phase**
120/240 Volts Secondary 60 Hz

kVA	Catalog Number	Dimensions					
		Height		Width		Depth	
		IN	mm	IN	mm	IN	mm
5	**MPZ5S40F**	32.7	831	12.0	305	11.9	303
7.5	**MPZ7S40F**	32.7	831	12.0	305	11.9	303
10	**MPZ10S40F**	32.7	831	12.0	305	11.9	303
15	**MPZ15S40F**	42.9	1090	17.4	442	13.5	343
25	**MPZ25S40F**	42.9	1090	17.4	442	13.5	343
480 Volts Delta Primary **Three Phase** **208Y/120 Volts Secondary 60 Hz**							
15	**MPZ15T2F**	44.6	1133	27.4	696	13.6	345
22.5	**MPZ22T2F**	44.6	1133	27.4	696	13.6	345
30	**MPZ30T2F**	44.6	1133	27.4	696	13.6	345

Single Phase

480 Volts Primary
120/240 Volts Secondary 60 Hz

kVA	Catalog Number	Wt. Lbs.	Primary Main Circuit Breaker	Feeder Breakers		
				Secondary Main Circuit Breaker	Max. No. 1 Pole or 2 Pole	Max. Amperes
5	**MPZ5S40F**	175	FAL24020 20A	QO-230 30A	6 or 3	20
7.5	**MPZ7S40F**	200	FAL24030 30A	QO-240 40A	8 or 4	30
10	**MPZ10S40F**	215	FAL24040 40A	QO-260 60A	10 or 5	40
15	**MPZ15S40F**	350	FAL24060 60A	QO-280 80A	16 or 8	60
25	**MPZ25S40F**	425	FAL24100 100A	QO-2125 125A	24 or 12	100

Three Phase

480 Volts Delta Primary
208Y/120 Volts Secondary 60 Hz

kVA	Catalog Number	Wt. Lbs.	Primary Main Circuit Breaker	Feeder Breakers		
				Secondary Main Circuit Breaker	Max. No. 1 Pole or 2 pole	Max. Amperes
15	**MPZ15T2F**	710	FAL34040 40A	QO-360 60A	12 or 4	40
22.5	**MPZ22T2F**	725	FAL34070 70A	QO-380 80A	18 or 6	60
30	**MPZ30T2F**	755	FAL34090 90A	QO-3100 100A	24 or 8	80

Note: Boldface Catalog Numbers indicate in-stock transformers.

Drive Isolation Transformer

How to Order

To complete the catalog number, select the voltage required from the chart and insert the voltage code in place of the parentheses ( ) in the catalog number.

Voltage Code	Primary	Secondary
142	230 Delta	230Y/132
143	230 Delta	460Y/265
144	460 Delta	230Y/132
145	460 Delta	460Y/265
146	575 Delta	230Y/132
147	575 Delta	460Y/265

Application

Square D drive isolation transformers are designed for the special requirements of ac and dc motor drives, and allow for high-surge, harmonic, and offset currents. *Drive isolation transformers* should not be confused with *isolation transformers* (see Page 17). Drive isolation transformers reduce transient generation into a supply power and buffer SCR current surges.

The main function of drive isolation transformers is to provide the following:

- **Voltage Change** — if necessary, these units adjust the voltage to match the motor drive voltage requirements.
- **Isolated Secondary Winding** — normally the secondary is grounded to a new isolated building ground to provide greater insurance against drive "noise" coupling back into the primary system and affecting other equipment on the same service.
- **Reactive Buffer** — tends to ease the rate of current change in the solid-state switching elements contained in the drive.

Features

- Evaluated according to UL Standard 1561 for effects of harmonic heating.
- Designed for typical harmonics per IEEE 519-1992.
- Meets 4% minimum reactance for 150°C temperature rise designs.
- Conforms to IEEE-597 Class B overload, which requires 150% of load for one minute per hour.
- Designed for the mechanical stress of dc drive current spikes.
- Designed for the thermal and mechanical stress of highly-cyclic process control applications.

Three Phase 60 Hz

kVA	Catalog Number	Full Capacity Taps	Deg. C. Temp. Rise	Wt. (lbs.)	Encl.■	Wiring♦
7.5	7T( )HDIT	2—5%1+1-	150	180	17D	16
11	11T( )HDIT	2—5%1+1-	150	180	17D	16
15	15T( )HDIT	2—5%1+1-	150	190	17D	16
20	20T( )HDIT	2—5%1+1-	150	210	17D	16
27	27T( )HDIT	2—5%1+1-	150	250	17D	16
34	34T( )HDIT	2—5%1+1-	150	295	18D	16
40	40T( )HDIT	2—5%1+1-	150	350	18D	16
51	51T( )HDIT	2—5%1+1-	150	445	20D	16
63	63T( )HDIT	2—5%1+1-	150	465	20D	16
75	75T( )HDIT	2—5%1+1-	150	550	20D	16
93	93T( )HDIT	2—5%1+1-	150	845	22D	16
118	118T( )HDIT	2—5%1+1-	150	920	22D	16
145	145T( )HDIT	2—5%1+1-	150	1025	22D	16
175	175T( )HDIT	2—5%1+1-	150	1325	25D	16
220	220T( )HDIT	2—5%1+1-	150	1400	25D	16
275	275T( )HDIT	2—5%1+1-	150	1560	25D	16
330	300T( )HDIT	2—5%1+1-	150	1550	25D	16
440	440T( )HIDT	2—5%1+1-	150	1900	25D	16
550	550T( )HDIT	2—5%1+1-	150	2500	30D	16

Note: Transformers are in stock for voltage code 145 through 275kVA and voltage code 144 through 93kVA.
■ For enclosure styles see **Dimensions Table** Page 27.
♦ See **Wiring Diagrams** Page 41.

Transformer Lug Kits

VERSAtile® Compression Equipment Lugs – UL Listed

Transformer kVA Size and Phase	Tool Type	Terminal Lugs		Hardware Included		Kit Catalog Number
		Qty.	Catalog Number	Qty.	Type	
15-37.5 1-Phase 15-45 3-Phase	VC6	8 5	VCEL-021-14S1 VCEL030-516H1	8 1	.25" x 1" Cap Screws .25" x 2" Cap Screws	VCEL-SK1
50-75 1-Phase 75-112.5 3-Phase		13	VCEL030-516H1	8 8	.25" x 1" Cap Screws .25" x 2" Cap Screws	VCEL-SK2
100-167 1-Phase 150-300 3-Phase	VC6FT	3 26	VCEL-030-516H1 VCEL-075-12H1	3 16	.25" x .75" Cap Screws .37" x 2" Cap Screws	VCEL-SK3
100-167 1-Phase 150-300 3-Phase		3 26	VCEL-030-516H1 VCEL-075-12H1	3 16	.25" x 1" Cap Screws .37" x 2" Cap Screws	VCEL-SK3-050
500 3-Phase	VC6FT VC8	34	VCEL-075-12H1	21	.37" x 2" Cap Screws	VCEL-SK4

Mechanical Set – Screw Type Lugs

Transformer kVA Size	Terminal Lugs		Hardware Included		Kit Catalog Number
	Qty.	Catalog Number	Qty.	Type	
15-37.5 1-Phase 15-45 3-Phase	8 5	DA-2 DA-250	9	.25" x .75" Cap Screws	DA-SK1
50-75 1-Phase 75-112.5 3-Phase	13	DA-250	8 8	.25" x .75" Cap Screws .25" x 1.75" Cap Screws	DA-SK2
100-167 1-Phase 150-300 3-Phase	3 26	DA-250 DA600	3 16	.25" x .75" Cap Screws .37" x 2" Cap Screws	DA-SK3
500 3-Phase	34	DA-600	21	.37" x 2" Cap Screws	DA-SK4

Table 1: Enclosure Dimensions and Accessories

Enclosure Number/Style		Height		Width		Depth		Mounting	Weathershield	Wall Mounting Bracket	Ceiling Mounting Bracket
		IN	mm	IN	mm	IN	mm				
1	A	5	127	4.47	114	3.44	87	Wall	—	—	
2	A	5.5	140	4.47	114	3.44	87	Wall	—	—	—
3	A	5	127	4.85	123	3.75	95	Wall	—	—	—
4	A	5.5	140	5.23	133	4.06	103	Wall	—	—	—
5	A	6.19	157	6.19	157	4.69	119	Wall	—	—	—
6	A	6.69	170	6.19	157	4.69	119	Wall	—	—	—
7	A	8.13	270	6.94	176	5.31	135	Wall	—	—	—
8	A	8.25	210	8.68	220	6.56	167	Wall	—	—	—
9	A	9.56	243	8.68	220	6.56	167	Wall	—	—	—
10	A	10.5	267	8.62	219	6.5	165	Wall	—	—	—
11	A	12.56	319	8.62	219	6.5	165	Wall	—	—	—
12	C	13.5	343	14.75	375	9	229	Wall	—	—	—
13	B	14.75	375	9.75	248	11.75	298	Wall	—	—	—
14	C	14.75	375	19.1	485	12.25	311	Wall	—	—	—
15	B	20	508	15	381	13.5	343	Wall	—	—	—
16	C	22	559	25	635	13.5	343	Wall	—	—	—
17	D	27	686	20	508	16	406	Floor	WS363	WMB361–362	CMB363
	E	27	686	20	508	16	406	Floor	N/A	WMB361–362	CMB363
18	D	30	762	20	508	20	508	Floor	WS363	WMB363–364	CMB363
	E	30	762	20	508	20	508	Floor	N/A	WMB363–364	CMB363
19	D	30	762	30	762	20	508	Floor	WS364	WMB363–364	CMB364
	E	30	762	30	762	20	508	Floor	N/A	WMB363–364	CMB364
20	D	37	940	30	762	20	508	Floor	WS364	WMB363–364	CMB364
	E	37	940	30	762	20	508	Floor	N/A	WMB363–364	CMB364
21	D	37	940	30	762	24	610	Floor	WS364	N/A	CMB364
	E	37	940	30	762	24	610	Floor	N/A	N/A	CMB364
22	D	43.75	1111	32	813	27	686	Floor	WS380	N/A	CMB380
	E	43.75	1111	32	813	27	686	Floor	N/A	N/A	CMB380
23	D	48	1219	48	1219	29.5	749	Floor	WS368	N/A	N/A
	E	48	1219	48	1219	29.5	749	Floor	N/A	N/A	N/A
24	D	49.5	1257	35	889	28.5	724	Floor	WS381	N/A	CMB381
	E	49.5	1257	35	889	28.5	724	Floor	N/A	N/A	CMB381
25	D	49.5	1257	41	1041	32	813	Floor	WS382	N/A	N/A
	E	49.5	1257	41	1041	32	813	Floor	N/A	N/A	N/A
26	D	57.5	1461	41	1041	32	813	Floor	WS382	N/A	N/A
	E	57.5	1461	41	1041	32	813	Floor	N/A	N/A	N/A
27	D	58	1473	48	1219	29.5	749	Floor	WS368	N/A	N/A
	E	58	1473	48	1219	29.5	749	Floor	N/A	N/A	N/A
28	D	60	1524	56	1422	36	914	Floor	WS370A	N/A	N/A
	E	60	1524	56	1422	36	914	Floor	N/A	N/A	N/A
29	D	68	1727	56	1422	36	914	Floor	WS370A	N/A	N/A
	E	68	1727	56	1422	36	914	Floor	N/A	N/A	N/A
30	D	71	1803	48	1219	36	914	Floor	WS383	N/A	N/A
	E	71	1803	48	1219	36	914	Floor	N/A	N/A	N/A
31	D	74	1880	56	1422	40.5	1029	Floor	WS384	N/A	N/A
	E	74	1880	56	1422	40.5	1029	Floor	N/A	N/A	N/A
32	F	91.5	2324	56	1422	54	1372	Floor	N/A	N/A	N/A
33	F	91.5	2324	72	1829	54	1372	Floor	N/A	N/A	N/A
34	F	91.5	2324	84	2134	54	1372	Floor	N/A	N/A	N/A

Enclosure Style and Accessories

Enclosure Style A

Enclosure Style B

Enclosure Style C

Enclosure Style D

Enclosure Style E

Enclosure Style F

Transformer with Added Weathershield

Application

Square D manufactures three lines of general purpose control power transformers, a high-efficiency line, a standard line, and an international line. All three lines are specifically designed to handle high inrush associated with contactors and relays for applications such as conveyor systems, paint lines, punch presses, or overhead cranes.

Type T and TF control power transformers, designed for international markets, are rated for 50/60 Hz. They are the best choice when size and cost are of concern for 50-1000 VA and when products need to meet the CE mark for international standards.

The Type T, like the Type K, also offers various temperature classes:

- 50-150 VA with a 55°C Temperature Rise
- 200-350 VA with a 80°C Temperature Rise
- 500-1000 VA with a 115°C Temperature Rise

Separate Fingersafe® accessory kits may be purchased and installed to meet EN60-742 for CE approval. The Type T and TF line meets requirements of UL, CSA, CE, and NOM. They are UL Listed under E61239, Guide XPTQ2, CSA certified under LR37055, Guide 184-N-90, CE marked under EN60742, and NOM117.

The standard line, Type K (1000-5000 VA) transformers, are the best choice if size and cost are of concern. These standard units use the most advanced insulating materials, making it possible to offer the advantages of different temperature classes:

- 50 VA- 250 VA with a 55˚C Temperature Rise
- 300 VA- 350 VA with a 80˚C Temperature Rise
- 500 VA - 5000 VA with a 115˚C Temperature Rise

Type K control transformers are UL Listed under UL File No.E61239, Guide XPTQ2 and CSA certified under CSA File No. LR37055, Guide 184–N–90. The standard line includes Type KF designed with a top-mounted fuse block to accommodate two primary Class CC time delay fuses and one secondary 1.5" x 13/32" size fuse.

Type E control transformers are high-efficiency units with a 55˚C temperature rise. This is the best choice when low heat contribution is required. These high-efficiency units provide extra regulation and lower energy losses. Type E control transformers are UL listed under File E61239 and also CSA certified under File No.LR37055, Guide 184–N–90.

All Square D control transformers are copper-wound, vacuum impregnated with varnish and fully tested in strict compliance with ANSI, CSA, and UL codes. Windings are additive polarity. Jumper cables are supplied with each transformer.

Enhancements for Special Applications

The standard, high-efficiency, and international models all have designs adapted to meet the needs of special applications:

- **Top-mounted fuse block** —indicated as type KF, TF, or EOF.
- **Leads** — instead of terminal boards, are available on limited sizes. Indicated as type KL or EL.
- **Secondary fuse protection kits** — are available for 25-750 VA standard and 50-1000 VA for high efficiency. Indicated as type S if factory installed or AP if field installed.
- **Shorting bars** — for interconnnecting terminals of dual-voltage transformers are included, extras available in separate kits. Indicated as type SB.
- **Special sizes and voltage combinations** are available.
- **Transformer kits** — for factory or field installation in combination starters. Indicated as type GO or GFT.

Enhancements for Type T and TF Line Only

- **Fingersafe® Covers** — snap on to meet CE requirements (FSC-1 50-200 VA, FSC-2 250-1000 VA, and FSC-23 special 6 terminal applications)
- **Fuse Pullers Kit —** offers finger protection from fuse block for CE requirements and facilitates every fuse change out. (FP-1)
- **Secondary Fuse Protection Kits —** now available field-installable. Indicated as SF type.

Regulation

Class 9070 transformers are designed with low impedance windings for excellence voltage regulation. This allows Class 9070 transformers to accommodate the high momentary inrush current caused when electromechanical devices such as contactors, relays and solenoids are energized. The secondary voltage drop between no load and momentary overload is low, helping to assure satisfactory operation of magnetic components.

Selection Guide

1. Determine inrush and sealed VA of each coil in the control circuit.
2. Total the sealed VA of all coils.
3. Total the inrush VA of all coils at 100% secondary voltage. Add this value to the total sealed VA present (if any) when inrush occurs.
4. If the supply voltage is stable and varies no more than ±5%, refer to the 90% secondary voltage column. If the voltage varies as much as ±10%, use the 95% voltage column.
5. Using the regulation chart, select a transformer:
   A. With a continuous VA rating equal to or greater than the value obtained in step 2
   B. With a maximum inrush VA equal to or greater than the value obtained in step 3

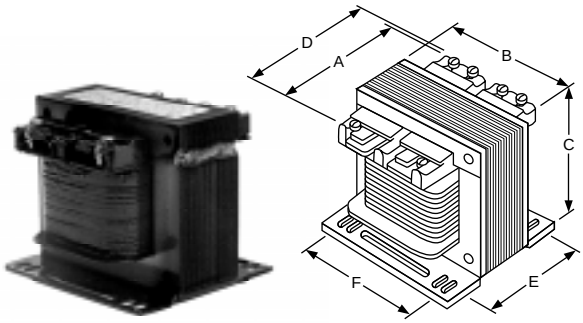
Regulation Chart — Inrush VA@ 30% Power Factor

VA	95% Secondary Voltage			90% Secondary Voltage			85% Secondary Voltage		
	Type E	Type K	Type T	Type E	Type K	Type T	Type E	Type K	Type T
25	72	N/A	161	109	N/A	221	131	N/A	281
50	171	161	161	235	221	221	299	281	281
75	327	244	244	390	337	337	554	437	437
100	382	307	307	553	440	440	722	575	575
150	468	521	521	735	765	765	997	1014	1014
200	1065	1065	759	1538	1538	1060	2163	2163	1369
250	1290	1290	1190	1949	1949	1660	2680	2680	2120
300	1700	1237	1335	2489	1775	1845	3384	2299	2350
350	2500	1480	1610	4115	2104	2270	5393	2712	2910
500	3600	1836	2650	4836	2651	3500	6900	3441	4340
750	6250	3482	3270	8583	5042	4895	13183	6564	6530
1000	8750	4244	5350	13275	6345	7675	19462	8388	9935
1500	16500	10023	N/A	22863	14735	N/A	35378	19304	N/A
2000	24300	12744	N/A	36688	19202	N/A	54737	25450	N/A
3000	28900	18176	N/A	44789	28096	N/A	98007	37797	N/A
5000	78500	29868	N/A	116406	48349	N/A	187579	66541	N/A

Control Power Transformers
Type T, Type K

Type T

- Rated for IEC, UL, CSA and NOM
- Tri-lingual markings (English, Spanish and French)
- Fingersafe® cover accessories allow OEMs to apply “CE” mark on their machinery
- Declaration of Conformity to EN60 742
- All the Features of the Type K



9070T150D1

Figure 1

Type T D1= 240/480V-120V, 230/460V-115V, 220/440V-110V, 50/60 Hz

Type & Voltage Code▲	UL VA Rating	IEC VA Rating	Dim./Accs. Code♦
T25D1	25	25	T1
T50D1	50	50	T1
T75D1	75	75	T2
T100D1	100	100	T3
T150D1	150	150	T4
T200D1	200	200	T5
T250D1	250	160	T6
T300D1	300	200	T7
T350D1	350	250	T8
T500D1	500	300	T9
T750D1	750	500	T10
T1000D1	1000	630	T11

Type T

Type & Voltage Code (D18, 20, 32)	UL VA Rating	IEC VA Rating	Dim./Accs. Code♦
T25	25	25	T2
T50	50	50	T2
T75	75	75	T4
T100	100	100	T4
T150	150	150	T5
T200	200	200	T7
T250	250	160	T8
T300	300	200	T8
T350	350	250	T9
T500	500	300	T10
T750	750	500	T11
T1000	1000	630	N/A

▲ The following voltage codes will have the same dimensions as their respective VA sizes from the D1 codes: D1, D2, D3, D4, D5, D12, D13, D14, D15, D23, D31, D33.
♦ See table below for dimensions.

Type T

Type & Voltage Code	Dimensions – See Figure 1						Terminal Covers	Slot	Wt. (lbs)
	A	B	C	D★	E	F			
T1	3.09	3.00	2.58	3.84	2.00	2.50	FSC-1	.20 x .38	2.6
T2	3.34	3.38	2.89	4.09	2.38	2.81	FSC-1	.20 x .48	3.6
T3	3.34	3.38	2.89	4.09	2.38	2.81	FSC-1	.20 x .48	3.6
T4	3.59	3.75	3.20	4.34	2.88	3.13	FSC-1	.20 x .38	5.1
T5	3.59	3.75	3.20	4.34	2.88	3.13	FSC-1	.20 x .38	5.1
T6	5.25	3.75	3.25	6.05	2.88	3.13	FSC-2	.20 x .38	7.3
T7	4.70	4.50	3.80	5.50	2.56	3.75	FSC-2	.20 x .38	8.6
T8	5.09	4.50	3.80	5.89	3.00	3.75	FSC-2	.20 x .38	9.9
T9	5.46	4.50	3.80	6.26	3.56	3.75	FSC-2	.20 x .38	11.5
T10	5.66	5.25	4.43	6.46	3.43	4.38	FSC-2	.28 x .56	16.9
T11	6.04	5.25	4.43	6.84	4.31	4.38	FSC-2	.28 x .56	19.3

★ Width dimensions with fingersafe covers on.

Type K

- Vacuum Impregnated
- Flexible Mounting Plates
- Copper magnet wire

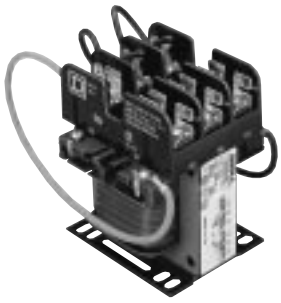
Type K, Standard Single Phase D1=240/480V-120V, 230/460V-115V, 220/440V-110V, 50/60 Hz

Type and Voltage Code	VA	Dimensions — See Figure 1						Weight
		A	B	C	E	F	Slot	
K50D1	50	3.09	3.00	2.58	2.00	2.50	.20 x .38	2.6
K75D1	75	3.34	3.38	2.89	2.38	2.81	.20 x .48	3.2
K100D1	100	3.34	3.38	2.89	2.38	2.81	.20 x .48	3.6
K150D1	150	3.59	3.75	3.20	2.88	3.13	.20 x .48	5.1
K200D1	200	4.81	4.50	3.75	2.50	3.75	.20 x .38	7.8
K250D1	250	5.19	4.50	3.75	2.88	3.75	.20 x .38	9.2
K300D1	300	4.88	4.50	3.75	2.56	3.75	.20 x .38	8.0
K350D1	350	5.31	4.50	3.75	3.00	3.75	.20 x .38	10.0
K500D1	500	5.88	4.50	3.75	3.56	3.75	.20 x .38	12.2
K750D1	750	5.56	5.25	4.38	3.44	4.38	.28 x .41	15.4
K1000D1	1000	6.50	5.25	4.38	4.31	4.38	.28 x .41	20.3
K1500D1	1500	6.62	7.06	6.56	4.13	5.81	.28 x .56	30.0
K2000D1	2000	6.94	7.06	6.56	4.44	5.81	.28 x .56	35.0
K3000D1	3000	7.91	9.00	9.50	4.63	7.63	.44 x .69	52.0
K5000D1	5000	9.63	9.00	9.50	6.56	7.63	.44 x .69	84.0

Types shown in bold type are normally stocked items.
★ The following voltage codes will have the same dimension as their respective VA sizes from the D1 codes: D1, D2, D3, D4, D5, D12, D13, D14, D15, D23, D31, D33.

Type TF and KF

Type TF KF transformers can help panel builders and machinery OEMs comply with the revised UL Standard 508 and NEC 450. The primary fuse clips accommodate Class CC time delay, rejection type fuses. The secondary fuse clips use a midget 1.5" x 13/32") fuse. Type TF and KF transformers help to free up space, reduce labor and additional costs associated with purchasing, stocking and installing separate fuse blocks. The Type TF transformers, with the use of the Fingersafe® cover accessories and fuse pullers, comply with "CE" requirements.



9070TF150D1

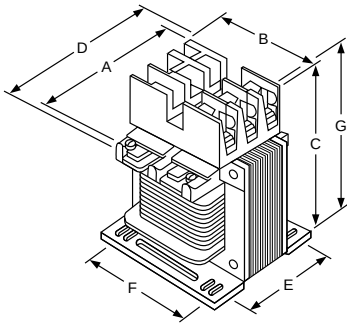


Figure 2

Type TF (with top mounted fuse block) D1=240/480V-120V, 50/60 Hz

Type & Voltage Code▲	UL VA Rating	IEC VA Rating	Dim./Accs. Code♦
TF25D1	25	25	TF1
TF50D1	50	50	TF1
TF75D1	75	75	T2F
TF100D1	100	100	TF3
TF150D1	150	150	TF4
TF200D1	200	200	TF5
TF250D1	250	160	TF6
TF300D1	300	200	TF7
TF350D1	350	250	TF8
TF500D1	500	300	TF9
TF750D1	750	500	TF10
TF1000D1	1000	630	TF11

Type TF (with top mounted fuse block)

Type & Voltage Code (D18, 20, 32)	UL VA Rating	IEC VA Rating	Dim./Accs. Code♦
TF25	25	25	TF2
TF50	50	50	TF2
TF75	75	75	TF4
TF100	100	100	TF4
TF150	150	150	TF5
TF200	200	200	TF7
TF250	250	160	TF8
TF300	300	200	TF8
TF350	350	250	TF9
TF500	500	300	TF10
TF750	750	500	TF11
TF1000	1000	630	N/A

▲ The following voltage codes will have the same dimensions as their respective VA sizes from the D1 codes: D1, D2, D3, D4, D5, D12, D13, D14, D15, D23, D31, D33.
♦ See table below for dimensions.

Type TF

Type & Voltage Code	Dimensions — See Figure 2							Terminal Covers	Slot	Wt. (lbs)
	A	B	C	D★	E	F	G■			
T1	3.09	3.00	4.00	3.84	2.00	2.50	4.20	FSC-1	.20 x .38	2.9
T2	3.34	3.38	4.25	4.09	2.38	2.81	4.45	FSC-1	.20 x .48	3.9
T3	3.34	3.38	4.25	4.09	2.38	2.81	4.45	FSC-1	.20 x .48	3.9
T4	3.59	3.75	4.55	4.34	2.88	3.13	4.75	FSC-1	.20 x .38	5.4
T5	3.59	3.75	4.55	4.34	2.88	3.13	4.75	FSC-1	.20 x .38	5.4
T6	5.25	3.75	4.55	6.05	2.88	3.13	4.75	FSC-2	.20 x .38	7.6
T7	4.70	4.50	5.10	5.50	2.56	3.75	5.30	FSC-2	.20 x .38	8.9
T8	5.09	4.50	5.10	5.89	3.00	3.75	5.30	FSC-2	.20 x .38	10.2
T9	5.46	4.50	5.10	6.26	3.56	3.75	5.30	FSC-2	.20 x .38	11.8
T10	5.66	5.25	5.73	6.46	3.43	4.38	5.93	FSC-2	.28 x .56	17.2
T11	6.04	5.25	5.73	6.84	4.31	4.38	5.93	FSC-2	.28 x .56	19.6

★ Width dimensions with fingersafe covers on.
■ Height dimensions with fingersafe covers on.

Type KF D1=240/480V-120V, 50/60 Hz

Type and Voltage Code	VA	Dimensions — See Figure 2						Weight
	60 Hz	A	B	C	E	F	Slot	
KF50D1	50	3.09	3.00	3.87	2.00	2.50	.20 x .38	2.9
KF75D1	75	3.34	3.38	4.19	2.38	2.81	.20 x .48	3.5
KF100D1	100	3.34	3.38	4.19	2.38	2.81	.20 x .48	3.9
KF150D1	150	3.59	3.75	4.50	2.88	3.13	.20 x .38	5.4
KF200D1	200	4.81	4.50	5.06	2.50	3.75	.20 x .38	8.1
KF250D1	250	5.19	4.50	5.06	2.88	3.75	.20 x .38	9.5
KF300D1	300	4.88	4.50	5.06	2.56	3.75	.20 x .38	8.3
KF350D1	350	5.31	4.50	5.06	3.00	3.75	.20 x .38	10.3
KF500D1	500	5.88	4.50	5.06	3.56	3.75	.20 x .38	12.5
KF750D1	750	5.56	5.25	5.69	3.44	4.38	.28 x .41	15.7
KF1000D1	1000	6.50	5.25	5.69	4.31	4.38	.28 x .41	20.6

★ The following voltage codes will have the same dimension as their respective VA sizes from the D1 codes: D1, D2, D3, D4, D5, D12, D13, D14, D15, D23, D31, D33.

Type E D1=240/480V-120V

Type	VA		Dimensions — See Figure 3						Weight	Dim./ Accessory Code★
	60 Hz	50 Hz	A	B	C	E	F	Slot		
EO17D1	25	25	3.31	3.00	2.50	1.75	2.50	.20 x .38	1.9	EF1
EO1D1	50	35	3.31	3.00	2.50	2.00	2.50	.20 x .38	2.2	EF2
EO18D1	75	75	3.78	3.38	2.81	2.19	2.81	.20 x .38	3.5	EF3
EO2D1	100	70	3.78	3.38	2.81	2.38	2.81	.20 x .38	3.8	EF4
EO3D1	150	120	4.44	3.75	3.13	2.88	3.13	.20 x .38	6.0	EF5
EO4D1	300	240	5.56	4.50	3.75	3.25	3.75	.20 x .38	10.5	EF6
EO16D1	350	280	6.19	4.50	3.75	3.81	3.75	.20 x .38	13.2	EF7
EO51D1	500	400	6.56	5.25	4.38	3.81	4.38	.28 x .41	17.2	EF8
EO61D1	750	500	7.94	5.25	4.38	5.13	4.38	.28 x .41	24.5	EF9
EO71D1	1000	900	7.94	6.00	5.00	4.75	5.00	.28 x .63	30.5	EF10
EO81D1	1500	1300	8.59	7.06	6.03	5.88	5.81	.44 x .69	45.0	EF11
EO91D1	2000	1800	9.22	7.06	6.03	6.50	5.81	.44 x .69	56.0	EF12
EO10D1	3000	3000	9.44	9.00	8.38	5.88	7.63	.44 x .69	72.0	EF13
EO11D1	5000	5000	12.06	9.00	8.38	8.50	7.63	.44 x .69	115.0	EF14

★ The following voltage codes will have the same dimension as their respective VA sizes from the D1 codes: D1, D2, D3, D4, D5, D12, D13, D14, D15, D23, D31, D33.

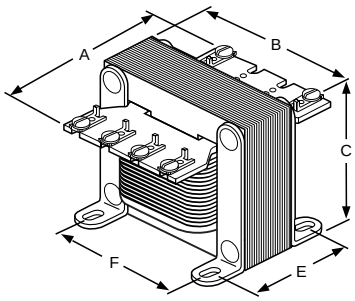
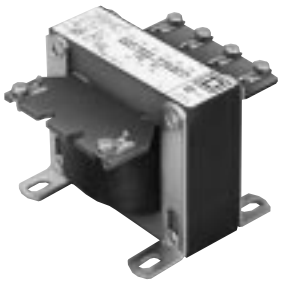


Figure 3



Type EO3D1

Cross Reference★

EO1	K50
EO18	K75
EO2	K100
EO3	K150
EO19	K200
EO15	K250
EO4	K300
EO16	K350
EO51	K500
EO61	K750
EO71	K1000
EO81	K1500
EO91	K2000
EO10	K3000
EO11	K5000

★ Cross reference is for VA size only. Type E is not directly replaceable by Type K in all sizes. Please compare dimensions.

Type T Field Installable Accessories

Part No.	Description	Notes
FP-1	Fuse puller Kit, used on all TF units	3 pullers/kit, 10 kit minimum, available in bulk packaging of 150 pullers by adding a B to the end of the catalog number.
FSC-1 FSC-2	Finger-protected cover kit to be used on 25VA to 200VA Finger-protected cover kit to be used on 250VA to 1000VA	2 covers/kit, 10 kit minimum, available in bulk packaging of 100 covers by adding a B to the end of the catalog number.
FSC-23	Finger-protected cover kit to be used with all VAs with voltage codes D19, D35, D40 or D41	2 covers/kit, 1 kit minimum.
SF25A✱ SF25B✱	Secondary fuse block kit to be used on 25VA to 200VA Secondary fuse block kit to be used on 250VA to 1000VA	Accommodates 1¼" x 13/32" size fuse.
SF41A✱ SF41B✱	Secondary fuse block kit to be used on 25VA to 200VA Secondary fuse block kit to be used on 250VA to 1000VA	Accommodates a midget 1½" x 13/32" size fuse.
FB-1A● FB-1B●	1-Pole non-rejection fuse block, and FSC-1 1-Pole non-rejection fuse block, and FSC-2	Accommodates a 1½" x 13/32" size fuse.
FB-2A● FB-2B●	2-Pole non-rejection fuse block, and FSC-1 2-Pole non-rejection fuse block, and FSC-2	Accommodates a 1½" x 13/32" size fuse.
FB-3A● FB-3B●	3-Pole, 2 rejection and 1 non-rejection fuse block, and FSC-1 3-Pole, 2 rejection and 1 non-rejection fuse block, and FSC-2	Accommodates a 1½" x 13/32" size fuse.

✱ Cannot be used when CE is required, can also be factory installed by adding to end of catalog number, i.e. 9070T50D1SF25.
● Can be used with the FP-1 and one additional cover to meet CE requirements.

Other Field Installable Secondary Fusing

Part No.	Description
AP1	2" x 9/16" fuse size used on Type EO, 25 to 500VA; Type K, 50 to 500VA; and Type T 25 to 500VA
AP2	1¼" x ¼" fuse size used on Type EO, 25 to 350VA; Type K, 50 to 500VA; and Type T 25 to 500VA
AP3	1¼" x ¼" fuse size used on Type EO, 25 to 150VA and Type K, 50 to 150VA⬧
AP4	1¼" x ¼" fuse size used on Type EO, 200 to 750VA and Type K, 200 to 1000VA

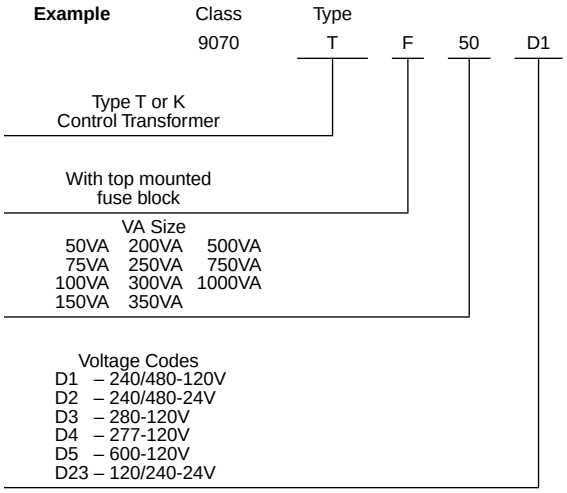
⬧ Use AP4 kit for 9070K150D18, D19, D20 and D32.

Voltage Codes for Wiring Diagrams

Voltage Code	Primary-Secondary Voltage	Circuit Diagram
D1	220/440-110 230/460-115 240/480-120	2
D2	240/480-24	2
D3	208-120	1
D4	277-120	1
D5	550-110 575-115 600-120	1
D6	380-110	1
D8 ●	220-110 230-115 240-120	1
D9 ●	440-110 460-115 480-120	1
D12	440-220 460-230 480-240	1
D13	120-12/24	7
D14	208-24	1
D15	240/480-24/120	5
D16	600-24	1
D17	415-110	1
D18	208/277/380-95/115	32
D19 ★	208/240/277/380/480-24	20
D20	208/230/460-115	13
D22	480-277	1
D23	120/240-24	2
D24	110-110 115-115 120-120	1
D25	277-24	1
D26	208/240/416/480-120	. . .
D27	208/240/480-120	13
D31	220/440-110/220 230/460-115/230 240/480-120/240	5
D32	220/440/550-90/110 230/460/575-95/115 240/480/600-100/120	32
D33	380/400/415-115/230	21
D34	208/480/575-120	13
D35 ★	208/230/380/440/460-110/115	. . .
D36	600-12/24	7
D37	600-120/240	7
D38	240/480-12	2
D39	208/380/416-95/115	32
D40 ★	208/240/380/416/480-120	. . .
D41 ★	208/230/400/440/460-110/115	. . .

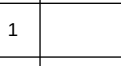
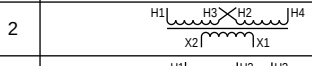
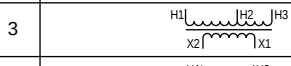
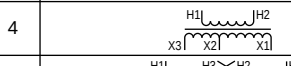
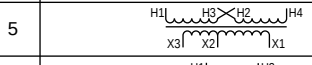
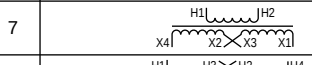
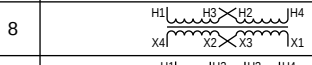
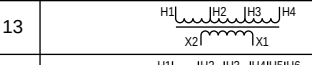
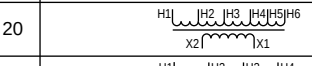
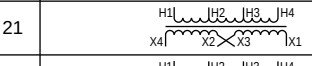
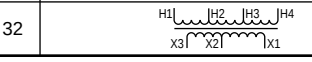
● Use Codes D8 and D9 on transformers with leads only. On other requests with these voltages please use the stocked Code D1.
★ Use Finger-protected cover kit FSC-23.

Ordering Information



Wiring Diagrams

Circuit diagrams below represent transformer connection configuration for voltage codes listed below. Specific voltage arrangements are included on the label of each control transformer.

C.D.	Wiring Diagram	Price	Sec
1		Single V.	Single V.
2		Dual V.	Single V.
3		With 1 Tap	Single V.
4		Single V.	With 1 Tap
5		Dual V.	With 1 Tap
7		Single V.	Dual V.
8		Dual V.	Dual V.
13		With 2 Tap	Single V.
20		With 4 Tap	Single V.
21		With 2 Tap	Dual V.
32		With 2 Tap	With 1 Tap

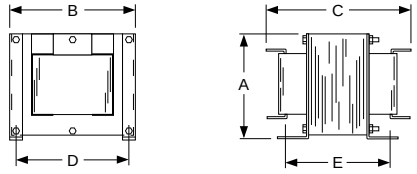


Figure 1

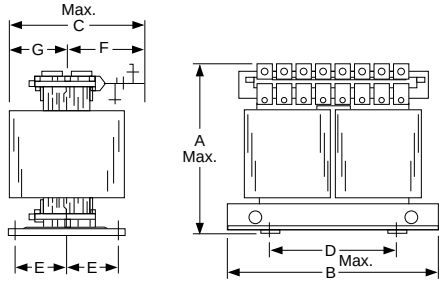


Figure 2

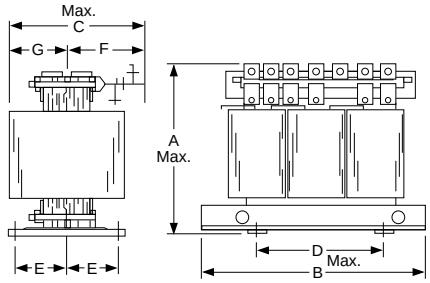
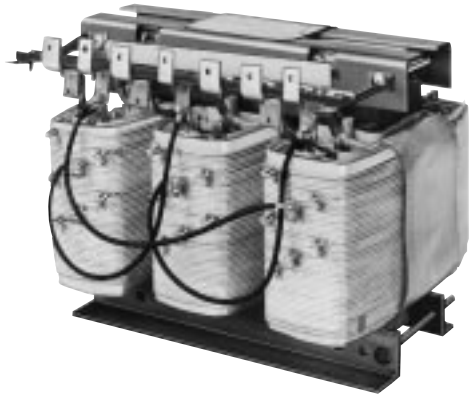


Figure 3



Dry Type Open Core and Coil

The compact space-saving design of Square D's open core and coil dry type transformers can be used in general applications. Additional features of open core and coil transformers include:

- Class 220°C insulation with 150° temperature rise.
- Aluminum windings
- Top terminated
  Available in single phase from 5-75 kVA and 3-phase from 9-112.5 kVA
- UL component recognized

Single Phase

kVA	Catalog Number	Full Capacity Taps	Dimensions (IN)							Wt. (lbs)	Wiring ♦	Figure
			A	B	C	D	E	F	G			
240x480 Volts Primary 120/240 Volts Secondary 60 Hz												
5	5S1HFOC●	None	8.0	9.0	11.0	8.0	7.75	—	—	66	1	1
7.5	7S1HOC	None	8.0	9.0	14.25	8.0	8.50	—	—	80	1	1
10	10S1HOC	None	8.0	9.0	14.25	8.0	8.50	—	—	100	1	1
15	15S1HOC	None	16.0	16.5	12.5	13.0	4.50	6.5	6.0	110	1	2
25	25S3HOC	6—2.5%2+4-▲	16.0	16.5	13.0	13.0	4.50	7.0	6.0	120	3	2
37.5	37S3HOC	6—2.5%2+4-▲	19.0	16.5	16.0	13.0	5.50	9.5	6.5	230	3	2
50	50S3HOC	6—2.5%2+4-▲	19.0	18.0	17.0	13.0	6.50	9.5	6.5	260	3	2
75	75S3HOC	6—2.5%2+4-▲	19.0	18.0	17.0	13.0	6.50	9.5	7.5	335	3	2

Three Phase 60 Hz

kVA	Catalog Number	Dimensions (IN) – See Figure 3							Wt. (lbs)
		A	B	C	D	E	F	G	
9	9T( )HOC	13.0	18.0	12.5	16.0	4.0	6.5	6.0	120
15	15T( )HOC	13.0	18.0	12.5	16.0	4.0	6.5	6.0	120
30	30T( )HOC	16.0	18.0	12.5	16.0	4.5	6.5	6.0	170
45	45T( )HOC	16.0	18.0	16.0	16.0	4.5	8.5	7.5	260
75	75T( )HOC	19.5	21.0	16.0	16.0	6.5	8.5	7.5	365
112.5	112T( )HOC	19.5	21.0	19.5	16.0	8.0	9.0	10.5	565

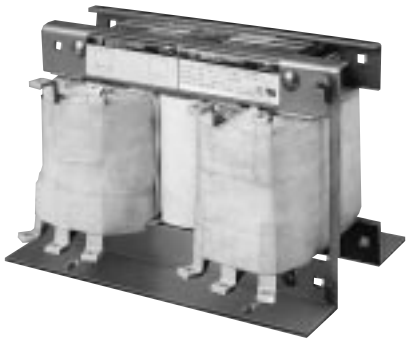
How to Order Three Phase

To complete the catalog number, select the voltage required from Table 1 and insert the voltage code in place of the parentheses ( ) in the catalog number.

Table 1

Voltage Code	Primary Voltage	Secondary Voltage	Full Capacity Taps★	Wiring ♦
12	240 Delta	208Y/120	4-2.5% 2+2-	11
3	480 Delta	208Y/120	6-2.5% 2+4-	10
8	600 Delta	208Y/120	4-2.5% FCBN	11

● 115°C temperature rise
♦ See Wiring Diagrams, Page 41.
▲ When 240V connection is used there will be 3-5% taps, 1 above and 2 below 240 volts.
★ FCBN full capacity taps below normal where noted.



Motor Starting Autotransformer

Application

Square D motor starting autotransformers offer a space-saving design for medium-duty motor starting service. Features of open core and coil transformers include:

- Class 220°C insulation
- Available in two-coil and three-coil designs
- 10-400 Horse Power
- 50%, 65%, 80%, 100% Taps

How to Order

To complete the catalog number, select the voltage required from Table 1 and insert the voltage code in place of the parentheses ( ) in the catalog number.

Table 1 Voltage Codes

Voltage Code	Primary Voltage
200	208
201	240
202	480
203	600

Two-Coil Motor Starting Autotransformer 60 Hz

Horse Power	Catalog Number	Dimensions (IN) - See Figure 1					Weight (lbs)	Fig.
		A	B	C	D	E		
10	MSA10T( )H2	7.5	10.5	8.0	9.0	6.0	45	1
20	MSA20T( )H2	7.5	10.5	8.0	9.0	6.0	45	1
30	MSA30T( )H2	7.5	10.5	10.0	9.0	7.5	65	1
50	MSA50T( )H2	7.5	10.5	10.0	9.0	7.5	65	1
75	MSA75T( )H2	8.5	12.25	10.25	9.0	7.5	95	1
100	MSA100T( )H2	8.5	12.25	10.25	9.0	7.5	95	1
125	MSA125T( )H2	11.0	14.5	10.5	9.0	7.5	125	1
150	MSA150T( )H2	11.0	14.5	10.5	9.0	7.5	125	1
200	MSA200T( )H2	11.0	14.5	10.5	9.0	7.5	145	1
250	MSA250T( )H2	14.25	17.0	9.0	9.0	9.0	160	1
300	MSA300T( )H2	14.25	17.0	12.25	9.0	9.0	180	1
400	MSA400T( )H2	16.0	19.25	13.0	9.0	9.0	225	1

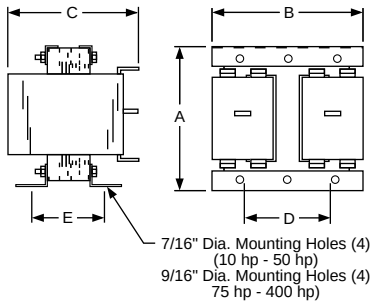


Figure 1
Two-Coil Autotransformer

Three-Coil Motor Starting Autotransformer 60 Hz

Horse Power	Catalog Number	Dimensions (IN) - See Figure 2					Weight (lbs)	Fig.
		A	B	C	D	E		
10	MSA10T( )H3	7.5	10.5	7.0	9.0	4.0	37	2
20	MSA20T( )H3	7.5	10.5	7.0	9.0	4.0	37	2
30	MSA30T( )H3	8.25	13.0	7.25	9.0	6.0	55	2
50	MSA50T( )H3	8.25	13.0	7.25	9.0	6.0	55	2
75	MSA75T( )H3	12.0	14.5	9.5	9.0	7.25	85	2
100	MSA100T( )H3	12.0	14.5	9.5	9.0	7.25	85	2
125	MSA125T( )H3	12.0	14.5	9.5	9.0	7.25	135	2
150	MSA150T( )H3	14.0	15.5	10.0	9.0	7.5	135	2
200	MSA200T( )H3	14.0	15.5	10.0	9.0	7.5	135	2
250	MSA250T( )H3	14.0	15.5	10.5	9.0	7.62	145	2
300	MSA300T( )H3	14.0	15.5	10.5	9.0	9.12	210	2
400	MSA400T( )H3	14.75	18.25	12.0	9.0	9.12	230	2

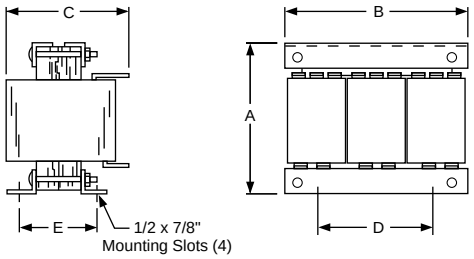


Figure 2
Three-Coil Autotransformer

Transformer Disconnects

Application

Transformer disconnects mount inside or outside a control system enclosure and provide power to auxiliary single-phase loads when the main three-phase disconnect is either “on” or “off”. The transformer disconnect is normally wired to the line side of the control panel's main disconnect. This convenient source of 120 volt power can be used for auxiliary or isolated loads, such as panel lighting, portable power tools, and programmable controller equipment.

Standard Features

The standard NEMA Type 1 enclosure is lockable for general purpose applications. The disconnect switch is rated at 45 amperes, 600 volts and has an external handle mechanically interlocked with the enclosure cover. The handle can lock in the “off” position. A standard fused and grounded transformer secondary is also included.

Primary fuse holders and secondary fuse holders for branch circuit protection are standard, complying with National Electrical Code requirements (two Class CC rejection-type fuse holders are supplied on the primary).

Square D offers two models of transformer disconnects:

- **Model MN** — Mini disconnect has a smaller enclosure with a pre-drilled standard outlet hole. (100 through 500VA)
- **Model SK** — Standard disconnect is available in small and large sizes (250 through 3000VA).

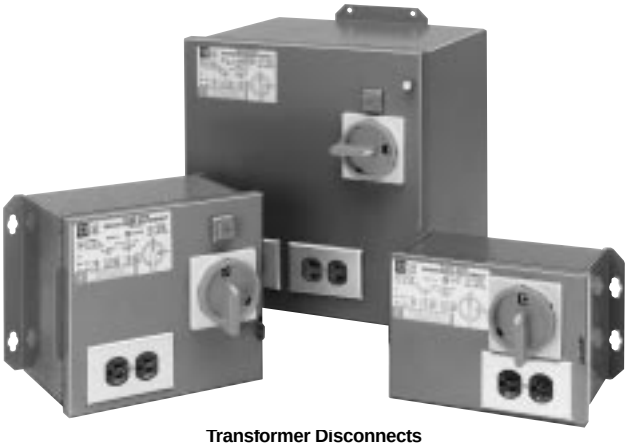
Standard features for both models include:

- **UL Listed:** File E137621. NEMA Type 1 & 12 enclosures.
- **CSA Certified:** File LR37055. NEMA 1 enclosures only.
- **Disconnect Switch** — Rated at 600V, 45A. Short-circuit withstand integrated rating of 100,000A when protected by Class CC fuses.
- **Enclosure** — NEMA Type 1 Rated.
- **Type KF or TF Transformer** — A Square D 230/460-115V Control Power Transformer provided with a top mounted fuse block that accepts two Class CC time delay primary fuses and one secondary fuse 1½ in. x $^{13}/_{32}$ in.
- **Knockouts** — Conveniently located.
- **Ground Terminal.**
- **Flanges** — External mounting flanges with slotted holes provided for “hook and hang” mounting.
- **90° Access Cover Stop.**
- **Wide variety of units are stocked.**

Variations of Standard SK Model

The SK Model can have the following factory modifications (See Factory Modifications Table, Page 37):

- Add one or two outlet receptacles, either duplex, ground fault protected, or twist-lock.
- Substitute a 55°C rise high efficiency transformer or a shielded transformer.
- Add a red warning pilot light.
- Add an additional secondary fuse.
- Replace standard primary fuse blocks with 5 inch Class “R” fuse blocks.
- Substitute special voltage transformers.



Transformer Disconnects

How to Order

To Order Specify:	Catalog Number					
• Class No. 9070 • Type Number • VA Rating • Enclosure • Factory Modifications • Voltage	Class	Type#	VA	Enclosure(s) Rating	Factory Modification	Voltage
	9070	SK	1000	G1	P1	230/460-115

Cross Reference

Old Square D Number	New Square D Number
SK5271M	MN100GOD1
SK5271N	MN250GOD1
SK5271Q, R	SK250G1D1
SK5271S, J	SK500G1D1
SK5271T, K	SK750G1D1
SK5271U	SK1000G1D1
SK5271V	SK1500G2D1
SK5271W	SK2000G2D1
SK5271X	SK3000G2D1

NEMA Type 1 Rated Transformer Disconnect

230/460 – 115V, 50/60Hz, Standard

Catalog Number	Transformer Continuous VA	Enclosure Size
MN100G0D1	100	0
MN250G0D1	250	0
MN500G0D1	500	0
SK250G1D1	250	1
SK500G1D1	500	1
SK750G1D1	750	1
SK1000G1D1	1000	1
SK1500G2D1	1500	2
SK2000G2D1	2000	2
SK3000G2D1	3000	2

NEMA Type 12 Rated Transformer Disconnect*

230/460 – 115V, 50/60Hz

Catalog Number	VA
SK250A2D1	250
SK500A2D1	500
SK750A2D1	750
SK1000A2D1	1000
SK1500A2D1	1500
SK2000A2D1	2000
SK3000A2D1	3000

* Rated NEMA Type 3R by adding form N3.

Fusing – Now Standard in Type MN & SK Units

Standard fuse holders accommodate:	
2 Primary	1½ in. x 13/32 in. Class CC rejection-type
1 Secondary	1½ in. x 13/32

Factory Modifications for NEMA Type 1 and NEMA Type 12 Rated Transformer Disconnect▾

Model No.	Modification	Available on Sizes
G13▲	Duplex Receptacle, Door-Mounted	G0,G1,G2 & A2
G14▲★	Class A Ground Fault Protected Receptacle, Door-Mounted	G0,G1,G2 & A2
G15▲	Twist-Lock Receptacle, Door-Mounted	G1 & G2
G16▲	Two Duplex Receptacles, Door-Mounted	G2 & A2
E23■	Electrostatically-Shielded Transformer	G0,G1,G2 & A2
P1	"ON" Red Warning Pilot Light	G1,G2 & A2
C♦	55°C Rise Transformer	G1,G2 & A2
F11■	Additional Fusible Secondary Circuit	G0,G1,G2 & A2
F30	Replace Standard 13/32 in. x 1½ in. Class CC	G2 & A2
	Primary Fuse Holders with 13/16 in. x 5 in.	
	Primary Fuse Holders	
N3	Convert NEMA Type 12 to NEMA Type 3R	A2
Special Voltages (see voltage chart)		G0, G1,G2,A2

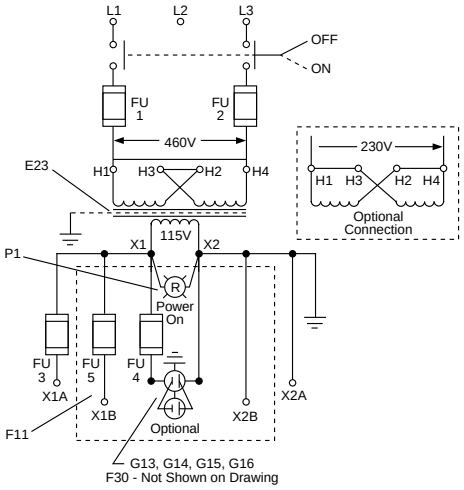
Note: If either Model No. F30 or G16, or the combination of Model No. E23 and F11 are ordered on SK250G1 through SK1000G1, the Size 2 enclosure must be supplied. Therefore, the catalog numbers change to SK2501000G2 and a list price adder will apply.

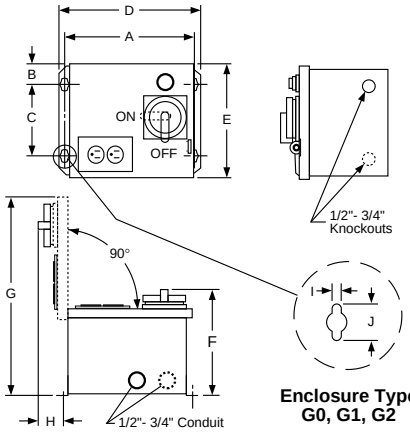
▲ Not available with other receptacle options.
● Consult factory for inrush data.
■ E23 and F11 not available together in Size 1 enclosure.
★ Must specify if CSA required.
♦ 55° rise transformer is standard in MN100G0, MN250G0, and SK250G1 units. Form "C" is not available on 3000VA units.
▼ Mini enclosure is limited to only one modification, restricted to E23, F11, G13, or G14.

Voltage Codes

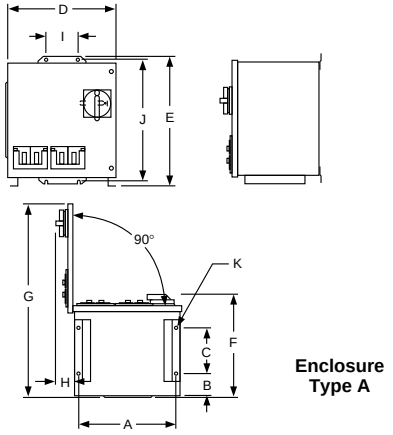
Voltage Code	Primary Voltage	Secondary Voltage
D1	220/440 230/460 240/480	110 115 120
D3	208	120
D4	277	120
D5	550 575 600	110 115 120
D6	380	110
D17	415	110
D24	110 115 120	110 115 120

Please Contact Local Square D Field Office for other Voltages





Enclosure Type G0, G1, G2



Enclosure Type A

Dimensions

Enclosure	A		B		C		D		E		F		G		H		I		J		K (DIA.)	
	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm
G0	10.30	261	2.00	51	2.65	67	11.30	286	7.00	177	7.81	198	15.25	386	2.09	53	0.32	8	1.00	25	. . .	. . .
G1	10.80	274	1.70	43	6.00	152	11.80	300	9.40	239	8.96	228	16.81	427	2.09	53	0.32	8	1.00	25	. . .	. . .
G2	13.80	351	1.70	43	10.00	254	14.80	376	13.40	340	12.21	310	23.06	586	2.09	53	0.32	8	1.00	25	. . .	. . .
A2	13.50	342	2.86	72	6.00	152	14.50	367	16.50	417	13.49	341	25.56	647	2.44	62	4.25	108	15.75	398	.32	8

Transformer Installation

Installation Clearances

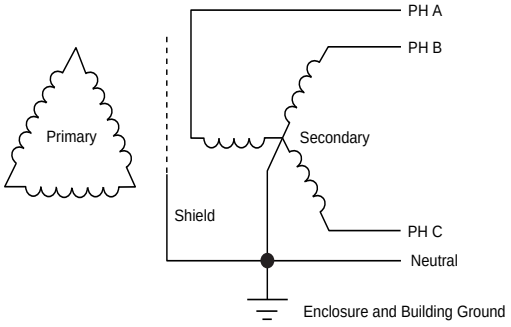
A dry type ventilated transformer depends on the free flow of air for cooling and proper operation. Ventilation openings must be at least 6 inches from any wall or obstruction. Local code restrictions may require different installation clearances.

Enclosure Grounding

The core and coil assembly of a ventilated transformer rests on rubber isolation pads within the enclosure. This mimimizes noise transmission and isolates the transformer from the enclosure. The core assembly is grounded to the enclosure at the factory. For proper installation, the enclosure must be solidly grounded to prevent electrical hazard.

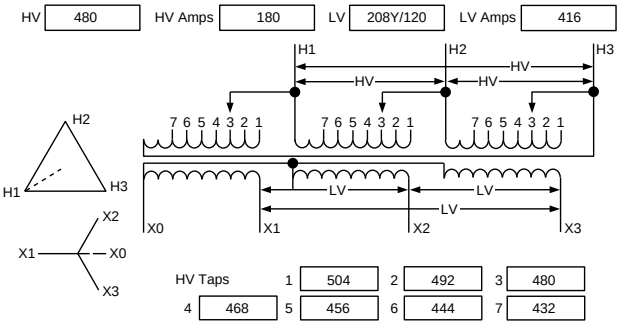
Neutral Grounding

The load side of a transformer is considered a separately derived source. If one of the conductors on the load side is a neutral, the National Electrical Code requires the conductor to be solidly grounded to an available building ground. When comparing phase-to-ground and phase-to-neutral voltage readings, significant differences in those readings may indicate improper neutral grounding. Grounding of transformer secondaries without neutrals is not necessary. In such cases, phase-to-ground voltage measurements are unpredictable and normally insignificant.



Proper Use and Selection of Taps

Taps are usually supplied on the primary winding to allow matching of the supply voltage to the voltage rating of the transformer connection. Selection of a tap position above the nominal connection will lower the secondary output and vice-versa. Taps should not be used to raise a secondary output voltage that has fallen due to temporary loading situations. When the loads return to normal a high voltage condition can cause equipment damage.



Electrostatic Shield Grounding

For most applications the shield, secondary neutral, and enclosure grounding must be grounded to an available building ground. Some special installations require non-standard shield connections. Such circumstances must be completely specified by the electrical designer.

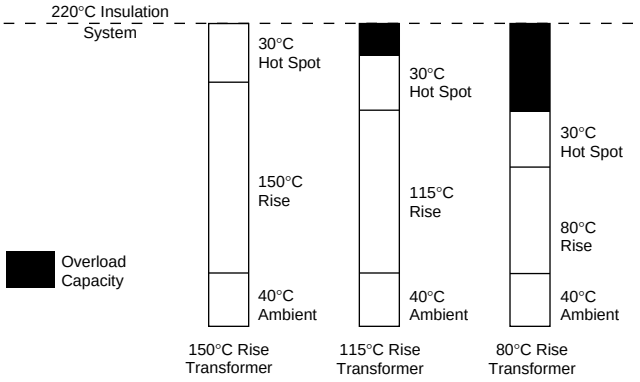
Loads and Transformer Temperature

Overloading of Transformers

In general, a dry type transformer *cannot* be overloaded without damaging the insulation system and reducing the transformer's life. Complete failure of the transformer is possible depending on the severity of an overload.

Temperature Rise vs. Overload Capacity

Reduced temperature rise is the only valid way to provide continuous overload capabilities. Square D's WATCHDOG® transformers are designed with additional capacity beyond their nameplate rating. The 115°C rise units have 15% extra capacity, while the 80°C rise transformers have an extra 30% capacity.



Effects of Non-Linear Loads

Transformers generate heat which raises the external temperature of the enclosure. Standards define enclosure temperature as the sum of the ambient temperature and the temperature rise of the enclosure. Enclosure temperatures as high as 90°C are considered normal.

- **Drive Isolation Applications** – AC and DC drives cause distorted current to flow in the windings of transformers supplying power to the drives. The resulting additional heating and mechanical stress must be allowed for in the transformer design. Use of standard general purpose lighting transformers for this application is not recommended. Square D stocks a complete line of drive isolation transformers specifically designed for AC and DC drive application.
- **Other Electronic Load Applications** – Many types of loads cause distorted current waveforms. Some of these loads are common office automation equipment such as personal computers, copiers, FAX machines and printers. Others are SCR controlled process systems, lighting controls, UPS systems and discharge lighting. If the current

distortion is high enough, it can cause overheating of system neutrals and transformers. Square D offers application assistance and measurement and analysis services.

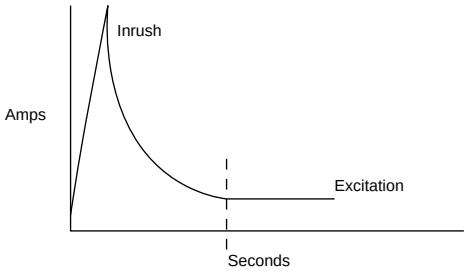
Overcurrent Protection for Lighting Transformers

The National Electrical Code, Article 450-3 requires both primary and secondary overcurrent protection, either in the form of circuit breakers or fuses. Square D offers application assistance in breaker and fuse sizing.

Transformer Performance Considerations

Inrush and Excitation Current

- **Definitions** – Inrush is a high, initial peak of current occurring during the first few cycles of transformers energization. Excitation current is the steady-state current that keeps the transformer energized after the inrush has dissipated.



- **Inrush problems when backfeeding transformers** – The magnitude of the inrush is significantly increased when backfeeding a transformer (the amount of increase is dependent on the individual design). This high inrush can cause breakers to trip unnecessarily or fuses to blow. Increasing the rating of the primary overcurrent protection may be necessary.

  Note: When operating Delta-Wye transformers in reverse, the neutral connection must not be connected or grounded when the Wye side is used as a primary.

Impedance

- **Definition** – Impedance, usually designated as %IZ, is a way of expressing the amount of current-limiting effect the transformer will represent if the load side of the transformer becomes short-circuited. Considered along with the X/R ratio, the information is used for systems analysis to determine proper interrupting ratings and coordination of protective devices.
- **Use of impedance to determine interrupting capacity** – Knowing the maximum current available on the load side of a transformer is necessary to properly choose current interrupting values for disconnects and overcurrent protective devices. Here is a simple method of estimating short circuit current:

$$\text{SECONDARY SHORT CIRCUIT CURRENT} = \frac{\text{TRANSFORMER SECONDARY FULL LOAD RATING}}{\text{TRANSFORMER IMPEDANCE}}$$

EXAMPLE: A TRANSFORMER WITH 208 AMPERES FULL LOAD CURRENT AND 5% IMPEDANCE

$$\text{SECONDARY SHORT CIRCUIT} = \frac{208}{.05} = 4160 \text{ AMPERES}$$

Other factors besides impedance affect short circuit current. Primary system capacity and motor current contribution from the load side will change the short circuit value obtained using the above simplified method. Make sure to take all factors into account to ensure that device interrupting ratings are properly coordinated. Contact your local Square D representative for information on system analysis service.

Transformer Performance Considerations

Impedance

- **When not to specify impedance** – Transformer impedance will vary depending on transformer size, voltage, winding material and many other factors. Although non-standard impedances are obtainable, they usually require additional cost. Only a specific reason should prompt specifying impedance, allowing manufacturers to supply their standard designs is more cost effective.

Transformer Voltage Regulation

- **Definition** – Transformer regulation is defined as the percentage difference between voltage at the secondary terminals under no-load condition and voltage under full load. This value depends on the load power factor and is usually reported at 1.0 PF and 0.8 PF.
- **Motor Starting Calculations** – The starting current of a motor can be as high as six or seven times the full-load running current. This initial high current can cause excessive voltage drop because of transformer regulation. Reduced voltage can cause the motor to fail to start and remain in a stalled condition, or it can cause the starter coil to release or “chatter”. A typical goal is to allow 10-12% maximum voltage drop at start. The voltage decrease during motor starting can be estimated as follows::

$$\text{VOLTAGE DROP (\%)} = \frac{\text{MOTOR LOCKED ROTOR CURRENT}}{\text{TRANSFORMER SECONDARY FULL LOAD RATING}} \text{ X IMPEDANCE (\%)}$$

EXAMPLE: TRANSFORMER HAS 833 AMPERES FULL LOAD CURRENT AND 6.3% IMPEDANCE AND IS SUPPLYING A MOTOR WITH 2500 AMPERES LOCKED ROTOR CURRENT

$$\text{VOLTAGE DROP (\%)} = \frac{2500}{833} \text{ X } 6.3 = 18.9\%$$

- **Other High Inrush Load Applications** – Certain control voltage requirements, such as magnetic starters and contactors, require better transformer regulation than that available with standard lighting transformers. Square D offers a full line of control power transformers designed for these high inrush applications.

Transformer Loss and Cost of Operation

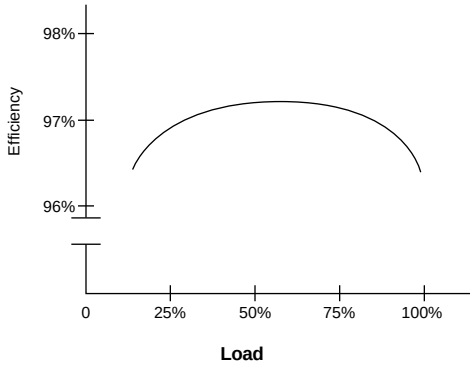
Energy Savings with Low Temperature Rise Transformers

The phrase “lower losses” means reduced electrical costs to keep the units energized and running, reduced heat generation,

and lower air conditioning costs. Less heat also translates into longer transformer life. The WATCHDOG® transformers are low temperature rise units (80°C and 115°C). Their energy losses have been significantly reduced to achieve the lower temperature rise.

Maximize Efficiency

Maximum transformer efficiencies can be obtained when the average loading is kept in the 60-80% range. Therefore, carefully review the required load profile before determining the kVA size of the transformer to be installed.



Typical Questions

Q. *What is the humming sound that occurs when a transformer is energized and how can it be minimized?*

A. A phenomenon know as "magnetostriction" causes the hum. Core steel lamination lengthens and shortens as it reacts to the alternating magnetic field producing the sound. The humming noise is minimized by a quality manufacturing process and the use of sound dampening pads between the core and coil assembly and the enclosure mounting bars. Permissible sound levels are limited by standards and vary depending on transformer kVA size. If an application calls for sound levels below these standards, special transformer construction is required.

Q. *Can a transformer manufactured for use at 60 Hz be operated at 50 Hz?*

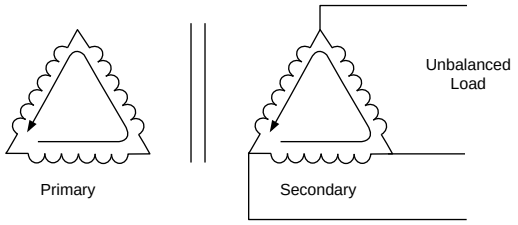
A. Lighting general purpose transformers with 60 Hz nameplate ratings should not be used for 50 Hz applications. However, transformers rated at 50 Hz or 50/60 Hz can be operated at 60 Hz.

Q. *Can transformers with Delta (3-wire) primaries be used on Wye (4-wire) systems?*

A. Yes, the neutral wire of the 4-wire service is simply not hooked up. Installing a Wye primary transformer on a Wye service is not necessary.

Q. *Why is there a 5% limit for single phase loading on Delta-Delta connected transformers with 240/120 center tapped secondaries?*

A. Delta-Delta connected transformers are intended to supply balanced three-phase loads, such as motors. Unbalanced loading will cause a circulating current to flow in the windings. This additional current is like a "hidden" load within transformer windings and can severely de-rate or even overload the transformer. Adding a center tap on the secondary for a combination of a 240V three-phase and 120V single-phase loads will create an unbalance. The amount of unbalance is limited to 5% to prevent excessive circulating currents.



Q. *What is the difference between "isolating" and "insulating" transformers?*

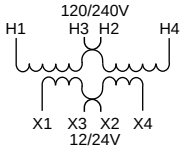
A. Insulating and isolating are both terms used to describe transformers with electrically separate primary and secondary windings. The windings are insulated from one another making the current within each winding closed off from the other. All transformers with electrically separate primary and secondary windings are both insulating and isolating. Isolation transformers may or may not have electrostatic shields.

Q. *Can transformers be used to convert single phase to three phase?*

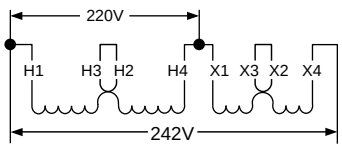
A. No, transformers cannot convert single-phase power to three-phase power. That conversion can only be done by motor generators, rotary phase converters, or electronic converters. Single-phase transformers can be connected to three-phase systems by simply connecting two-phase lines, or a single-phase and neutral to the primary of the transformer.

Q. *What are buck and boost transformers?*

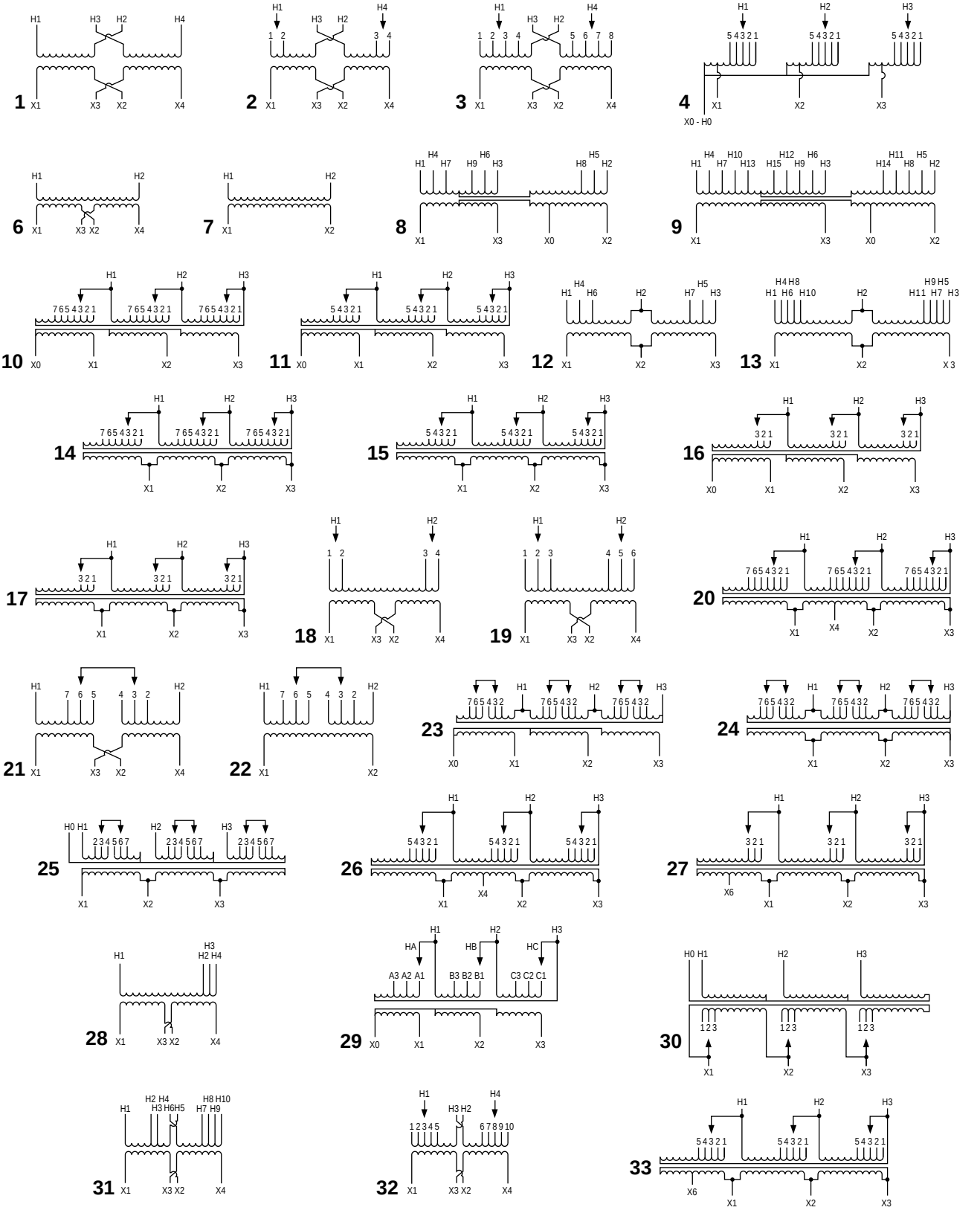
A Buck and boost transformers are small isolating transformers that, connected as autotransformers, allow small corrections in voltage.



Buck Boost Transformer



Same Transformer Connected As Autotransformer


1
H1 H3 H2 H4
X1 X3 X2 X4
2
H1 H4 H3 H2
1 2 3 4
X1 X3 X2 X4
3
H1 H4 H3 H2
1 2 3 4 5 6 7 8
X1 X3 X2 X4
4
H1 H2 H3
5 4 3 2 1
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X0 - H0
6
H1 H2
X1 X3 X2 X4
7
H1 H2
X1 X2
8
H4 H6 H5
H1 H7 H9 H3 H8 H2
X1 X3 X0 X2
9
H4 H10 H12 H6 H11 H5
H1 H7 H13 H15 H9 H3 H14 H8 H2
X1 X3 X0 X2
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7 6 5 4 3 2 1
X0 X1 X2 X3
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X1 X2 X3
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H1 H2 H3
5 4 3 2 1
X1 X4 X2 X3
27
H1 H2 H3
3 2 1
X6 X1 X2 X3
28
H1 H3 H2 H4
X1 X3 X2 X4
29
H1 H2 H3
HA HB HC
A3 A2 A1 B3 B2 B1 C3 C2 C1
X0 X1 X2 X3
30
H0 H1 H2 H3
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X1 X2 X3
31
H1 H2 H4 H3 H6 H5 H8 H10 H7 H9
X1 X3 X2 X4
32
H1 H4 H3 H2
1 2 3 4 5 6 7 8 9 10
X1 X3 X2 X4
33
H1 H2 H3
5 4 3 2 1
X6 X1 X2 X3

Transformers—large and small, look to Square D.

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