

Dry-Type Transformer Family



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Type DT-3

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Product Description

Note: The following pages provide listings for most standard transformer ratings and catalog numbers. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Types DS-3, DT-3

- Ventilated, NEMA® 2 enclosure standard
- Suitable for indoor applications, outdoors when weathershields are also installed
- Upright mounting only
- 220 °C insulation system
- 150 °C rise standard; 115 °C or 80 °C rise optional
- Available in single-phase ratings 15–167 kVA, 600 volts primary (DS-3)
- Available in three-phase ratings 15–1500 kVA and up to 600 volts primary (DT-3)

Application Description

DOE 2016 compliant energy-efficient transformers are specifically designed to meet the energy efficiency standards set forth in “CFR Title 10 Chapter II Part 431, Appendix A of Subpart K 2016.” Surveys have shown that the average loading of low-voltage dry-type distribution transformers, over a 24-hour period, is approximately 35%. DOE 2016 compliant transformers are optimized to offer maximum efficiency at 35% of nameplate rating.

The range of products covered by DOE 2016 is:

DOE 2016 Product Range

Rating	Voltage Class	Voltage
	Primary voltage	34.5 kV and below
	Secondary voltage	600 V and below
Low-Voltage Dry-Type Rating	Single-phase	10–833 kVA
	Three-phase	15–2500 kVA
Liquid Rating	Single-phase	10–833 kVA
	Three-phase	15–2500 kVA

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Transformers that are currently specifically excluded from the scope of CFR Title 10 Chapter II Part 431, Appendix A of Subpart K 2016 include:

- Liquid-filled transformers below 10 kVA
- Low-voltage dry-type transformers below 15 kVA
- AC and DC drives transformers
- Rectifier transformers designed for high harmonics
- Autotransformers
- Non-distribution transformers, such as UPS transformers
- Special impedance or regulation transformers
- Regulating transformers
- Sealed and non-ventilated transformers
- Machine tool transformers
- Welding transformers
- Transformers with tap ranges greater than 15%
- Transformers with a frequency other than 60 Hz
- Grounding transformers
- Testing transformers

Efficiency levels set forth in DOE 2016.

DOE 2016 Efficiency Levels

Low-Voltage Dry-Type Distribution Transformers (600 V and below)

Single-Phase		Three-Phase	
kVA	Efficiency	kVA	Efficiency
15	97.70	15	97.89
25	98.00	30	98.23
37.5	98.20	45	98.40
50	98.30	75	98.60
75	98.50	112.5	98.74
100	98.60	150	98.83
167	98.70	225	98.94
250	98.80	300	99.02
333	98.90	500	99.14
—	—	750	99.23
—	—	1000	99.28

Features, Benefits and Functions

- 60 Hz operation (except as noted)
- Short-term overload capability as required by IEEE
- Meet NEMA ST-20 sound levels
- Transformer core and coil covered with a fungus-resistant varnish to seal out moisture and other contaminants, and prevent the growth of fungus
- The core and coil assembly is grounded to the transformer enclosure by means of a visible flexible copper ground strap. The copper ground strap is sized per the NEC[®] to be a grounding conductor. Three-phase DOE 2016 efficient transformers are provided with a bonding ground bar attached to the bottom panel for compliance with NEC 450.10(A)
- Transformers manufactured in enclosures 939, 940, 942, 943, 944 and 945 are UL[®] Listed to be installed indoors (without weathershields) with just 2 inches of clearance on the sides and behind the transformer
- Double neutral
- Meet federal energy efficiency requirements for low-voltage dry-type distribution transformers effective as of January 1, 2016
- cUL[®] Energy Verified in accordance with energy standards: CFR Title 10 Chapter II Part 431, Appendix A of Subpart K and CSA[®] C802.2-12 Update No. 1 May 2013 by Underwriters Laboratories Inc.

Standards and Certifications

- UL listed



Industry Standards

All Eaton low-voltage dry-type distribution transformers are built and tested in accordance with applicable NEMA and IEEE standards. All 600 volt class transformers are UL listed unless otherwise noted.

Seismically Qualified

Eaton manufactured low-voltage dry-type distribution transformers are seismically qualified and exceed requirements of the Uniform Building Code (UBC), International Building Code (IBC) and California Code Title 24.

Catalog Number Selection

Please refer to Section 2.7 **Page V2-T2-165**.

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Product Selection

Additional Product Selection information begins on **Page V2-T2-168**.

Single-Phase—Type DS-3 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

208 Volts to 120/240 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ^①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR842A	E0260A	200 (91)	WS45A	WMB05	T29M11S1516
25		FR842A		275 (125)	WS45A	WMB05	T29M11S2516
37.5		FR843A		310 (141)	WS43A	WMB04	T29M11S3716
50		FR843A		390 (177)	WS43A	WMB04	T29M11S5016
75		FR844A	E0551A	650 (295)	WS44A	WMB04	T29R11S7516
100		FR844A	EA29R11	690 (313)	WS44A	WMB04	T29R11S9916

277 Volts to 120/240 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ^①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR842A	262C	210 (95)	WS45A	WMB05	T27M11S1516
25		FR842A		289 (131)	WS45A	WMB05	T27M11S2516
37.5		FR843A		326 (148)	WS43A	WMB04	T27M11S3716
50		FR843A		410 (186)	WS43A	WMB04	T27M11S5016
75		FR844A		683 (310)	WS44A	WMB04	T27M11S7516
100		FR844A		725 (329)	WS44A	WMB04	T27M11S9916

600 Volts to 120/240 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ^①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR842A	262B	212 (96)	WS45A	WMB05	T60M11S1516
25		FR842A		292 (133)	WS45A	WMB05	T60M11S2516
37.5		FR843A		329 (149)	WS43A	WMB04	T60M11S3716
50		FR843A		413 (188)	WS43A	WMB04	T60M11S5016
75		FR844A		689 (313)	WS44A	WMB04	T60M11S7516
100		FR844A		731 (332)	WS44A	WMB04	T60M11S9916

Notes

^① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Single-Phase—Type DS-3 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

208 x 416 Volts to 120/240 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ^①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR842A	E03XF	204 (93)	WS45A	WMB05	T18P11S1516
25		FR842A		281 (128)	WS45A	WMB05	T18P11S2516
37.5		FR843A		316 (143)	WS43A	WMB04	T18P11S3716
50		FR843A		398 (181)	WS43A	WMB04	T18P11S5016
75		FR844A		663 (301)	WS44A	WMB04	T18P11S7516
100		FR844A		704 (320)	WS44A	WMB04	T18P11S9916

240 x 480 Volts to 120/240 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ^①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR842A	3XA	210 (95)	WS45A	WMB05	T20P11S1516
25		FR842A		289 (131)	WS45A	WMB05	T20P11S2516
37.5		FR843A		326 (148)	WS43A	WMB04	T20P11S3716
50		FR843A		410 (186)	WS43A	WMB04	T20P11S5016
75		FR844A		683 (310)	WS44A	WMB04	T20P11S7516
100		FR844A		725 (329)	WS44A	WMB04	T20P11S9916
167		FR814E	288A	1665 (756)	WS13	—	T48M11S6716
15	115	FR842A	3XA	212 (96)	WS45A	WMB05	T20P11F1516
25		FR842A		292 (133)	WS45A	WMB05	T20P11F2516
37.5		FR843A		329 (149)	WS43A	WMB04	T20P11F3716
50		FR843A		414 (188)	WS43A	WMB04	T20P11F5016
75		FR844A		689 (313)	WS44A	WMB04	T20P11F7516
100		FR844A		732 (332)	WS44A	WMB04	T20P11F9916
15	80	FR842A	3XA	289 (131)	WS45A	WMB05	T20P11B1516
25		FR843A		326 (148)	WS43A	WMB04	T20P11B2516
37.5		FR843A		410 (186)	WS43A	WMB04	T20P11B3716
50		FR844A		683 (310)	WS44A	WMB04	T20P11B5016
75		FR844A		725 (329)	WS44A	WMB04	T20P11B7516

Notes

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Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Single-Phase—Type DS-3 60 Hz DOE 2016 Energy-Efficient—Copper Windings

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208 Volts to 120/240 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR842A	E0260A	216 (98)	WS45A	WMB05	T29M11S1516CU
25		FR842A		295 (134)	WS45A	WMB05	T29M11S2516CU
37.5		FR843A		440 (200)	WS43A	WMB04	T29M11S3716CU
50		FR843A		450 (204)	WS43A	WMB04	T29M11S5016CU
75		FR844A	E0551A	890 (404)	WS44A	WMB04	T29R11S7516CU
100		FR844A		950 (431)	WS44A	WMB04	T29R11S9916CU

277 Volts to 120/240 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR842A	262C	238 (108)	WS45A	WMB05	T27M11S1516CU
25		FR842A		326 (148)	WS45A	WMB05	T27M11S2516CU
37.5		FR843A		485 (220)	WS43A	WMB04	T27M11S3716CU
50		FR843A		497 (225)	WS43A	WMB04	T27M11S5016CU
75		FR844A		982 (446)	WS44A	WMB04	T27M11S7516CU
100		FR844A		1048 (476)	WS44A	WMB04	T27M11S9916CU

600 Volts to 120/240 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR842A	262B	241 (109)	WS45A	WMB05	T60M11S1516CU
25		FR842A		329 (149)	WS45A	WMB05	T60M11S2516CU
37.5		FR843A		490 (222)	WS43A	WMB04	T60M11S3716CU
50		FR843A		501 (227)	WS43A	WMB04	T60M11S5016CU
75		FR844A		991 (450)	WS44A	WMB04	T60M11S7516CU
100		FR844A		1058 (480)	WS44A	WMB04	T60M11S9916CU

Notes

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Single-Phase—Type DS-3 60 Hz DOE 2016 Energy-Efficient—Copper Windings

208 x 416 Volts to 120/240 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ^①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR842A	E03XF	246 (112)	WS45A	WMB05	T18P11S1516CU
25		FR842A		336 (153)	WS45A	WMB05	T18P11S2516CU
37.5		FR843A		500 (227)	WS43A	WMB04	T18P11S3716CU
50		FR843A		511 (232)	WS43A	WMB04	T18P11S5016CU
75		FR844A		1011 (459)	WS44A	WMB04	T18P11S7516CU
100		FR844A		1079 (490)	WS44A	WMB04	T18P11S9916CU

240 x 480 Volts to 120/240 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ^①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR842A	3XA	258 (117)	WS45A	WMB05	T20P11S1516CU
25		FR842A		353 (160)	WS45A	WMB05	T20P11S2516CU
37.5		FR843A		525 (238)	WS43A	WMB04	T20P11S3716CU
50		FR843A		537 (244)	WS43A	WMB04	T20P11S5016CU
75		FR844A		1062 (482)	WS44A	WMB04	T20P11S7516CU
100		FR844A		1133 (514)	WS44A	WMB04	T20P11S9916CU
167		FR814E	288A	1748 (794)	WS13	—	T48M11S6716CU
15	115	FR842A	3XA	218 (99)	WS45A	WMB05	T20P11F1516CU
25		FR842A		298 (135)	WS45A	WMB05	T20P11F2516CU
37.5		FR843A		444 (202)	WS43A	WMB04	T20P11F3716CU
50		FR843A		455 (207)	WS43A	WMB04	T20P11F5016CU
75		FR844A		899 (408)	WS44A	WMB04	T20P11F7516CU
100		FR844A		960 (436)	WS44A	WMB04	T20P11F9916CU
15	80	FR842A	3XA	353 (160)	WS45A	WMB05	T20P11B1516CU
25		FR843A		525 (238)	WS43A	WMB04	T20P11B2516CU
37.5		FR843A		537 (244)	WS43A	WMB04	T20P11B3716CU
50		FR844A		1062 (482)	WS44A	WMB04	T20P11B5016CU
75		FR844A		1133 (514)	WS44A	WMB04	T20P11B7516CU

Notes

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Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

208 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR939	280E	233 (106)	WS57	WMB05	V29M28T1516	
30		FR940		400 (182)	WS58	WMB05	V29M28T3016	
45		FR940		442 (201)	WS58	WMB05	V29M28T4516	
75		FR942		602 (273)	WS59	WMB04	V29M28T7516	
112.5		FR943	324A	976 (443)	WS60	WMB04	V29R28T1216	
150		FR943		1254 (569)	WS60	WMB04	V29R28T4916	
225		FR944		1624 (737)	WS61	—	V29R28T2216	
300		Contact local Eaton representative						V29E28T3316
500								V29E28T5516
15	115	FR939	280E	243 (110)	WS57	WMB05	V29M28F1516	
30		FR940		419 (190)	WS58	WMB05	V29M28F3016	
45		FR940		450 (205)	WS58	WMB05	V29M28F4516	
75		FR942		635 (288)	WS59	WMB04	V29M28F7516	
112.5		FR943	324A	1031 (468)	WS60	WMB04	V29R28F1216	
150		FR943		1316 (597)	WS60	WMB04	V29R28F4916	
225		FR944		1715 (778)	WS61	—	V29R28F2216	
300		Contact local Eaton representative						V29R28F3316
500								V29E28F5516
15	80	FR939	280E	249 (113)	WS57	WMB05	V29M28B1516	
30		FR940		455 (206)	WS58	WMB05	V29M28B3016	
45		FR942		599 (272)	WS59	WMB04	V29M28B4516	
75		FR943		1031 (468)	WS60	WMB04	V29M28B7516	
112.5		FR943	324A	1338 (607)	WS60	WMB04	V29R28B1216	
150		FR944		1709 (776)	WS61	—	V29R28B4916	
225		Contact local Eaton representative						V29R28B2216
300								V29R28B3316

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings**208 Delta Volts to 480Y/277 Volts**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR939	E0342B	225 (102)	WS57	WMB05	V29M47T1516	
30		FR940		402 (183)	WS58	WMB05	V29M47T3016	
45		FR940		436 (198)	WS58	WMB05	V29M47T4516	
75		FR942		623 (283)	WS59	WMB04	V29M47T7516	
112.5		FR943	E0351A	987 (448)	WS60	WMB04	V29R47T1216	
150		FR943		1253 (569)	WS60	WMB04	V29R47T4916	
225		FR944		2257 (1025)	WS61	—	V29R47T2216	
300		Contact local Eaton representative						V29E47T3316
500								V29E47T5516
15	115	FR939	E0342B	250 (114)	WS57	WMB05	V29M47F1516	
30		FR940		442 (201)	WS58	WMB05	V29M47F3016	
45		FR940		598 (271)	WS58	WMB05	V29M47F4516	
75		FR942		617 (280)	WS59	WMB04	V29M47F7516	
112.5		FR943	E0351A	977 (444)	WS60	WMB04	V29R47F1216	
150		FR943		2257 (1025)	WS60	WMB04	V29R47F4916	
225		FR944		2450 (1112)	WS61	—	V29R47F2216	
300		Contact local Eaton representative						V29E47F3316
500								V29E47F5516
15	80	FR939	E0342B	249 (113)	WS57	WMB05	V29M47B1516	
30		FR940		455 (206)	WS58	WMB05	V29M47B3016	
45		FR942		599 (272)	WS59	WMB04	V29M47B4516	
75		FR943		1031 (468)	WS60	WMB04	V29M47B7516	
112.5		FR943	E0351A	1338 (607)	WS60	WMB04	V29R47B1216	
150		FR944		1709 (776)	WS61	—	V29R47B4916	
225		Contact local Eaton representative						V29R47B2216
300								V29E47B3316

Notes

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Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

240 Delta Volts to 208Y/120 Volts

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kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR939	280C	236 (107)	WS57	WMB05	V24M28T1516
30		FR940		402 (183)	WS58	WMB05	V24M28T3016
45		FR940		448 (203)	WS58	WMB05	V24M28T4516
75		FR942		622 (282)	WS59	WMB04	V24M28T7516
112.5		FR943	324B	1022 (464)	WS60	WMB04	V24R28T1216
150		FR943		1191 (541)	WS60	WMB04	V24R28T4916
225		FR944		1678 (762)	WS61	—	V24R28T2216
300		FR945		2415 (1096)	WS62	—	V24R28T3316
500		Contact local Eaton representative					V24E28T5516
15	115	FR939	280C	243 (110)	WS57	WMB05	V24M28F1516
30		FR940		419 (190)	WS58	WMB05	V24M28F3016
45		FR940		450 (205)	WS58	WMB05	V24M28F4516
75		FR942		635 (288)	WS59	WMB04	V24M28F7516
112.5		FR943	324B	1031 (468)	WS60	WMB04	V24R28F1216
150		FR943		1316 (597)	WS60	WMB04	V24R28F4916
225		Contact local Eaton representative					V24E47F2216
300							V24R28F3316
500							V24E28F5516
15	80	FR939	280C	249 (113)	WS57	WMB05	V24M28B1516
30		FR940		455 (206)	WS58	WMB05	V24M28B3016
45		FR942		599 (272)	WS59	WMB04	V24M28B4516
75		FR943		1031 (468)	WS60	WMB04	V24M28B7516
112.5		FR943	324B	1338 (607)	WS60	WMB04	V24R28B1216
150		FR944		1709 (776)	WS61	—	V24R28B4916
225		Contact local Eaton representative					V24E28B2216
300							V24E28B3316

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings**240 Delta Volts to 480Y/277 Volts**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR939	E0317A	224 (102)	WS57	WMB05	V24M47T1516	
30		FR940		422 (192)	WS58	WMB05	V24M47T3016	
45		FR940		444 (202)	WS58	WMB05	V24M47T4516	
75		FR942		635 (288)	WS59	WMB04	V24M47T7516	
112.5		FR943	E0351C	1017 (462)	WS60	WMB04	V24R47T1216	
150		FR943		1275 (579)	WS60	WMB04	V24R47T4916	
225		FR944		2274 (1032)	WS61	—	V24R47T2216	
300		Contact local Eaton representative						V24E47T3316
500								V24E47T5516
15	115	FR939	E0317A	243 (110)	WS57	WMB05	V24M47F1516	
30		FR940		419 (190)	WS58	WMB05	V24M47F3016	
45		FR940		450 (205)	WS58	WMB05	V24M47F4516	
75		FR942		635 (288)	WS59	WMB04	V24M47F7516	
112.5		FR943	E0351C	1031 (468)	WS60	WMB04	V24R47F1216	
150		FR943		1316 (597)	WS60	WMB04	V24R47F4916	
225		Contact local Eaton representative						V24E47F2216
300								V24E47F3316
500								V24E47F5516
15	80	FR939	E0317A	249 (113)	WS57	WMB05	V24M47B1516	
30		FR940		455 (206)	WS58	WMB05	V24M47B3016	
45		FR942		599 (272)	WS59	WMB04	V24M47B4516	
75		FR943		1031 (468)	WS60	WMB04	V24M47B7516	
112.5		FR943	E0351C	1338 (607)	WS60	WMB04	V24R47B1216	
150		FR944		1709 (776)	WS61	—	V24R47B4916	
225		Contact local Eaton representative						V24E47B2216
300								V24E47B3316

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

2

480 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR939	280B	225 (102)	WS57	WMB05	V48M28T1516
30		FR940		409 (186)	WS58	WMB05	V48M28T3016
45		FR940		416 (189)	WS58	WMB05	V48M28T4516
75		FR942		545 (247)	WS59	WMB04	V48M28T7516
112.5		FR943		976 (443)	WS60	WMB04	V48M28T1216
150		FR943		1239 (563)	WS60	WMB04	V48M28T4916
225		FR944		1624 (737)	WS61	—	V48M28T2216
300		FR945		2283 (1036)	WS62	—	V48M28T3316
500		Contact local Eaton representative					V48M28T5516
750							V48D28T7716
1000							V48D28T1116
15	115	FR939	280B	231 (105)	WS57	WMB05	V48M28F1516
30		FR940		399 (181)	WS58	WMB05	V48M28F3016
45		FR940		429 (195)	WS58	WMB05	V48M28F4516
75		FR942		605 (275)	WS59	WMB04	V48M28F7516
112.5		FR943		982 (446)	WS60	WMB04	V48M28F1216
150		FR943		1253 (569)	WS60	WMB04	V48M28F4916
225		FR944		1633 (741)	WS61	—	V48M28F2216
300		FR945		2104 (955)	WS62	—	V48M28F3316
500		Contact local Eaton representative					V48M28F5516
15	80	FR939	280B	237 (108)	WS57	WMB05	V48M28B1516
30		FR940		433 (197)	WS58	WMB05	V48M28B3016
45		FR942		570 (259)	WS58	WMB05	V48M28B4516
75		FR943		982 (446)	WS59	WMB04	V48M28B7516
112.5		FR943		1274 (578)	WS60	WMB04	V48M28B1216
150		FR944		1628 (739)	WS60	WMB04	V48M28B4916
225		FR945		2207 (1002)	WS61	—	V48M28B2216
300		FR924		2877 (1306)	WS40	—	V48M28B3316
500		Contact local Eaton representative					V48M28B5516

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings**480 Delta Volts to 240 Delta Volts with 120 Volt Lighting Tap on Phase B ^①**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ^②	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR939	282B	231 (105)	WS57	WMB05	V48M22T1516
30		FR940		399 (181)	WS58	WMB05	V48M22T3016
45		FR940		426 (193)	WS58	WMB05	V48M22T4516
75		FR942		581 (264)	WS59	WMB04	V48M22T7516
112.5		FR943		964 (438)	WS60	WMB04	V48M22T1216
150		FR943		1275 (579)	WS60	WMB04	V48M22T4916
225		FR944		1618 (735)	WS61	—	V48M22T2216
300		FR945		2437 (1106)	WS62	—	V48M22T3316
500		Contact local Eaton representative					V48M22T5516
750							V48D22T7716
1000							V48D22T1116
15	115	FR939	282B	250 (114)	WS57	WMB05	V48M22F1516
30		FR940		405 (184)	WS58	WMB05	V48M22F3016
45		FR940		428 (194)	WS58	WMB05	V48M22F4516
75		FR942		612 (278)	WS59	WMB04	V48M22F7516
112.5		FR943		975 (443)	WS60	WMB04	V48M22F1216
150		FR943		1300 (590)	WS60	WMB04	V48M22F4916
225		FR944		1732 (786)	WS61	—	V48M22F2216
300		FR945		1732 (786)	WS62	—	V48M22F3316
500		Contact local Eaton representative					V48M22F5516
15	80	FR939	282B	249 (113)	WS57	WMB05	V48M22B1516
30		FR940		455 (206)	WS58	WMB05	V48M22B3016
45		FR942		599 (272)	WS59	WMB04	V48M22B4516
75		FR943		1031 (468)	WS60	WMB04	V48M22B7516
112.5		FR943		1338 (607)	WS60	WMB04	V48M22B1216
150		FR944		1709 (776)	WS61	—	V48M22B4916
225		FR945		2317 (1052)	WS62	—	V48M22B2216
300		Contact local Eaton representative					V48M22B3316
500							V48M22B5516

Notes

^① Lighting tap limited to 5% of nameplate full load capacity.

^② Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

480 Delta Volts to 400Y/231 Volts

2

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR939	280B	233 (106)	WS57	WMB05	V48M34T1516
30		FR940		399 (181)	WS58	WMB05	V48M34T3016
45		FR940		416 (189)	WS58	WMB05	V48M34T4516
75		FR942		614 (279)	WS59	WMB04	V48M34T7516
112.5		FR943		984 (447)	WS60	WMB04	V48M34T1216
150		FR943		1240 (563)	WS60	WMB04	V48M34T4916
225		FR944		1723 (782)	WS61	—	V48M34T2216
300		FR945		2347 (1066)	WS62	—	V48M34T3316
500		Contact local Eaton representative					V48M34T5516
15	115	FR939	280B	243 (110)	WS57	WMB05	V48M34F1516
30		FR940		419 (190)	WS58	WMB05	V48M34F3016
45		FR940		450 (205)	WS58	WMB05	V48M34F4516
75		FR942		635 (288)	WS59	WMB04	V48M34F7516
112.5		FR943		1031 (468)	WS60	WMB04	V48M34F1216
150		FR943		1316 (597)	WS60	WMB04	V48M34F4916
225		FR944		1715 (778)	WS61	—	V48M34F2216
300		FR945		2209 (1003)	WS62	—	V48M34F3316
500		Contact local Eaton representative					V48M34F5516
15	80	FR939	280B	249 (113)	WS57	WMB05	V48M34B1516
30		FR940		455 (206)	WS58	WMB05	V48M34B3016
45		FR942		599 (272)	WS59	WMB04	V48M34B4516
75		FR943		1031 (468)	WS60	WMB04	V48M34B7516
112.5		FR943		1338 (607)	WS60	WMB04	V48M34B1216
150		FR944		1709 (776)	WS61	—	V48M34B4916
225		FR945		2317 (1052)	WS62	—	V48M34B2216
300		FR924		1971 (895)	WS40	—	V48M34B3316

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings**480 Delta Volts to 480Y/277 Volts**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR939	280B	227 (103)	WS57	WMB05	V48M47T1516
30		FR940		395 (179)	WS58	WMB05	V48M47T3016
45		FR940		433 (197)	WS58	WMB05	V48M47T4516
75		FR942		576 (262)	WS59	WMB04	V48M47T7516
112.5		FR943		970 (440)	WS60	WMB04	V48M47T1216
150		FR943		1253 (569)	WS60	WMB04	V48M47T4916
225		FR944		1912 (868)	WS61	—	V48M47T2216
300		FR945		2294 (1041)	WS62	—	V48M47T3316
500		Contact local Eaton representative					V48M47T5516
15	115	FR939	280B	243 (110)	WS57	WMB05	V48M47F1516
30		FR940		419 (190)	WS58	WMB05	V48M47F3016
45		FR940		450 (205)	WS58	WMB05	V48M47F4516
75		FR942		635 (288)	WS59	WMB04	V48M47F7516
112.5		FR943		1031 (468)	WS60	WMB04	V48M47F1216
150		FR943		1316 (597)	WS60	WMB04	V48M47F4916
225		FR944		1715 (778)	WS61	—	V48M47F2216
300		FR945		2209 (1003)	WS62	—	V48M47F3316
500		Contact local Eaton representative					V48M47F5516
15	80	FR939	280B	249 (113)	WS57	WMB05	V48M47B1516
30		FR940		455 (206)	WS58	WMB05	V48M47B3016
45		FR942		599 (272)	WS59	WMB04	V48M47B4516
75		FR943		1031 (468)	WS60	WMB04	V48M47B7516
112.5		FR943		1338 (607)	WS60	WMB04	V48M47B1216
150		FR944		1709 (776)	WS61	—	V48M47B4916
225		FR945		2317 (1052)	WS62	—	V48M47B2216
300		FR924		1971 (895)	WS40	—	V48M47B3316

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

600 Delta Volts to 208Y/120 Volts

2

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR939	280A	226 (103)	WS57	WMB05	V60M28T1516
30		FR940		396 (180)	WS58	WMB05	V60M28T3016
45		FR940		433 (197)	WS58	WMB05	V60M28T4516
75		FR942		610 (277)	WS59	WMB04	V60M28T7516
112.5		FR943		1000 (454)	WS60	WMB04	V60M28T1216
150		FR943		1250 (568)	WS60	WMB04	V60M28T4916
225		FR944		1650 (749)	WS61	—	V60M28T2216
300		FR945		2300 (1044)	WS62	—	V60M28T3316
500		Contact local Eaton representative					V60M28T5516
15	115	FR939	280A	243 (110)	WS57	WMB05	V60M28F1516
30		FR940		419 (190)	WS58	WMB05	V60M28F3016
45		FR940		450 (205)	WS58	WMB05	V60M28F4516
75		FR942		635 (288)	WS59	WMB04	V60M28F7516
112.5		FR943		1031 (468)	WS60	WMB04	V60M28F1216
150		FR943		1316 (597)	WS60	WMB04	V60M28F4916
225		FR944		1715 (778)	WS61	—	V60M28F2216
300		FR945		2209 (1003)	WS62	—	V60M28F3316
500		Contact local Eaton representative					V60M28F5516
15	80	FR939	280A	249 (113)	WS57	WMB05	V60M28B1516
30		FR940		455 (206)	WS58	WMB05	V60M28B3016
45		FR942		599 (272)	WS59	WMB04	V60M28B4516
75		FR943		1031 (468)	WS60	WMB04	V60M28B7516
112.5		FR943		1338 (607)	WS60	WMB04	V60M28B1216
150		FR944		1709 (776)	WS61	—	V60M28B4916
225		FR945		2317 (1052)	WS62	—	V60M28B2216
300		FR924		1971 (895)	WS40	—	V60M28B3316

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings**600 Delta Volts to 480Y/277 Volts**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR939	280A	250 (114)	WS57	WMB05	V60M47T1516	
30		FR940		435 (197)	WS58	WMB05	V60M47T3016	
45		FR940		476 (216)	WS58	WMB05	V60M47T4516	
75		FR942		634 (288)	WS59	WMB04	V60M47T7516	
112.5		FR943		1067 (484)	WS60	WMB04	V60M47T1216	
150		FR943		1378 (626)	WS60	WMB04	V60M47T4916	
225		FR944		2103 (955)	WS61	—	V60M47T2216	
300		FR945		2523 (1145)	WS62	—	V60M47T3316	
500		Contact local Eaton representative						V60M47T5516
15	115	FR939	280A	243 (110)	WS57	WMB05	V60M47F1516	
30		FR940		419 (190)	WS58	WMB05	V60M47F3016	
45		FR940		450 (205)	WS58	WMB05	V60M47F4516	
75		FR942		635 (288)	WS59	WMB04	V60M47F7516	
112.5		FR943		1031 (468)	WS60	WMB04	V60M47F1216	
150		FR943		1316 (597)	WS60	WMB04	V60M47F4916	
225		FR944		1715 (778)	WS61	—	V60M47F2216	
300		FR945		2209 (1003)	WS62	—	V60M47F3316	
500		Contact local Eaton representative						V60M47F5516
15	80	FR939	280A	249 (113)	WS57	WMB05	V60M47B1516	
30		FR940		455 (206)	WS58	WMB05	V60M47B3016	
45		FR942		599 (272)	WS59	WMB04	V60M47B4516	
75		FR943		1031 (468)	WS60	WMB04	V60M47B7516	
112.5		FR943		1338 (607)	WS60	WMB04	V60M47B1216	
150		FR944		1709 (776)	WS61	—	V60M47B4916	
225		FR945		2317 (1052)	WS62	—	V60M47B2216	
300		FR924		1971 (895)	WS40	—	V60M47B3316	

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Copper Windings

2

208 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR939	280E	237 (108)	WS57	WMB05	V29M28T1516CU	
30		FR940		424 (192)	WS58	WMB05	V29M28T3016CU	
45		FR940		499 (227)	WS58	WMB05	V29M28T4516CU	
75		FR942		678 (308)	WS59	WMB04	V29M28T7516CU	
112.5		FR943	324A	1292 (587)	WS60	WMB04	V29R28T1216CU	
150		FR943		1410 (640)	WS60	WMB04	V29R28T4916CU	
225		FR944		1760 (799)	WS61	—	V29R28T2216CU	
300		FR945		2361 (1072)	WS62	—	V29R28T3316CU	
500		Contact local Eaton representative						V29E28T5516CU
15	115	FR939	280E	253 (115)	WS57	WMB05	V29M28F1516CU	
30		FR940		455 (206)	WS58	WMB05	V29M28F3016CU	
45		FR940		495 (225)	WS58	WMB05	V29M28F4516CU	
75		FR942		698 (317)	WS59	WMB04	V29M28F7516CU	
112.5		FR943	324A	1335 (606)	WS60	WMB04	V29R28F1216CU	
150		FR943		1493 (678)	WS60	WMB04	V29R28F4916CU	
225		FR944		2186 (992)	WS61	—	V29R28F2216CU	
300		FR945		2696 (1224)	WS62	—	V29R28F3316CU	
500		Contact local Eaton representative						V29E28F5516CU
15	80	FR939	280E	251 (114)	WS57	WMB05	V29M28B1516CU	
30		FR940		489 (222)	WS58	WMB05	V29M28B3016CU	
45		FR942		700 (318)	WS59	WMB04	V29M28B4516CU	
75		FR943		1204 (547)	WS60	WMB04	V29M28B7516CU	
112.5		FR943	324A	1454 (660)	WS60	WMB04	V29R28B1216CU	
150		FR944		1990 (903)	WS61	—	V29R28B4916CU	
225		FR945		2504 (1137)	WS62	—	V29R28B2216CU	
300		Contact local Eaton representative						V29R28B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Copper Windings**208 Delta Volts to 480Y/277 Volts**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR939	E0342B	245 (111)	WS57	WMB05	V29M47T1516CU
30		FR940		428 (194)	WS58	WMB05	V29M47T3016CU
45		FR940		503 (228)	WS58	WMB05	V29M47T4516CU
75		FR942		676 (307)	WS59	WMB04	V29M47T7516CU
112.5		FR943	E0351A	1283 (582)	WS60	WMB04	V29R47T1216CU
150		FR943		1432 (650)	WS60	WMB04	V29R47T4916CU
225		Contact local Eaton representative					V29E47T2216CU
300							V29E47T3316CU
500							V29E47T5516CU
15	115	FR939	E0342B	247 (112)	WS57	WMB05	V29M47F1516CU
30		FR940		434 (197)	WS58	WMB05	V29M47F3016CU
45		FR940		600 (272)	WS58	WMB05	V29M47F4516CU
75		FR942		682 (310)	WS59	WMB04	V29M47F7516CU
112.5		FR943	E0351A	1154 (524)	WS60	WMB04	V29R47F1216CU
150		FR943		1500 (681)	WS60	WMB04	V29R47F4916CU
225		Contact local Eaton representative					V29E47F2216CU
300							V29E47F3316CU
500							V29E47F5516CU
15	80	FR939	E0342B	251 (114)	WS57	WMB05	V29M47B1516CU
30		FR940		489 (222)	WS58	WMB05	V29M47B3016CU
45		FR942		700 (318)	WS59	WMB04	V29M47B4516CU
75		FR943		1204 (547)	WS60	WMB04	V29M47B7516CU
112.5		FR943	E0351A	1454 (660)	WS60	WMB04	V29R47B1216CU
150		FR944		1990 (903)	WS61	—	V29R47B4916CU
225		Contact local Eaton representative					V29E47B2216CU
300							V29E47B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Copper Windings

240 Delta Volts to 208Y/120 Volts

2

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR939	280C	238 (108)	WS57	WMB05	V24M28T1516CU	
30		FR940		458 (208)	WS58	WMB05	V24M28T3016CU	
45		FR940		478 (217)	WS58	WMB05	V24M28T4516CU	
75		FR942		697 (316)	WS59	WMB04	V24M28T7516CU	
112.5		FR943	324B	1103 (501)	WS60	WMB04	V24R28T1216CU	
150		FR943		1283 (582)	WS60	WMB04	V24R28T4916CU	
225		FR944		1500 (681)	WS61	—	V24R28T2216CU	
300		FR945		2700 (1226)	WS62	—	V24R28T3316CU	
500		Contact local Eaton representative						V24E28T5516CU
15	115	FR939	280C	253 (115)	WS57	WMB05	V24M28F1516CU	
30		FR940		455 (206)	WS58	WMB05	V24M28F3016CU	
45		FR940		495 (225)	WS58	WMB05	V24M28F4516CU	
75		FR942		698 (317)	WS59	WMB04	V24M28F7516CU	
112.5		FR943	324B	1335 (606)	WS60	WMB04	V24R28F1216CU	
150		FR943		1493 (678)	WS60	WMB04	V24R28F4916CU	
225		FR944		2186 (992)	WS61	—	V24R28F2216CU	
300		FR945		2696 (1224)	WS62	—	V24R28F3316CU	
500		Contact local Eaton representative						V24E28F5516CU
15	80	FR939	280C	251 (114)	WS57	WMB05	V24M28B1516CU	
30		FR940		489 (222)	WS58	WMB05	V24M28B3016CU	
45		FR942		700 (318)	WS59	WMB04	V24M28B4516CU	
75		FR943		1204 (547)	WS60	WMB04	V24M28B7516CU	
112.5		FR943	324B	1454 (660)	WS60	WMB04	V24R28B1216CU	
150		FR944		1990 (903)	WS61	—	V24R28B4916CU	
225		FR945		2504 (1137)	WS62	—	V24R28B2216CU	
300		Contact local Eaton representative						V24R28B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Copper Windings**240 Delta Volts to 480Y/277 Volts**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR939	E0317A	250 (114)	WS57	WMB05	V24M47T1516CU
30		FR940		432 (196)	WS58	WMB05	V24M47T3016CU
45		FR940		482 (219)	WS58	WMB05	V24M47T4516CU
75		FR942		700 (318)	WS59	WMB04	V24M47T7516CU
112.5		FR943		1170 (531)	WS60	WMB04	V24M47T1216CU
150		FR943		1350 (613)	WS60	WMB04	V24M47T4916CU
225		Contact local Eaton representative					V24R47T2216CU
300							V24E47T3316CU
500							V24E47T5516CU
15	115	FR939	E0317A	253 (115)	WS57	WMB05	V24M47F1516CU
30		FR940		455 (206)	WS58	WMB05	V24M47F3016CU
45		FR940		495 (225)	WS58	WMB05	V24M47F4516CU
75		FR942		698 (317)	WS59	WMB04	V24M47F7516CU
112.5		FR943	E0351C	1335 (606)	WS60	WMB04	V24R47F1216CU
150		FR943		1493 (678)	WS60	WMB04	V24R47F4916CU
225		FR944		2186 (992)	WS61	—	V24R47F2216CU
300		Contact local Eaton representative					V24R47F3316CU
500							V24E47F5516CU
15	80	FR939	E0317A	251 (114)	WS57	WMB05	V24M47B1516CU
30		FR940		489 (222)	WS58	WMB05	V24M47B3016CU
45		FR942		700 (318)	WS59	WMB04	V24M47B4516CU
75		FR943		1204 (547)	WS60	WMB04	V24M47B7516CU
112.5		FR943	E0351C	1454 (660)	WS60	WMB04	V24R47B1216CU
150		FR944		1990 (903)	WS61	—	V24R47B4916CU
225		Contact local Eaton representative					V24R47B2216CU
300							V24R47B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Copper Windings

480 Delta Volts to 208Y/120 Volts

2

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR939	280B	250 (114)	WS57	WMB05	V48M28T1516CU	
30		FR940		415 (188)	WS58	WMB05	V48M28T3016CU	
45		FR940		478 (217)	WS58	WMB05	V48M28T4516CU	
75		FR942		632 (287)	WS59	WMB04	V48M28T7516CU	
112.5		FR943		1263 (573)	WS60	WMB04	V48M28T1216CU	
150		FR943		1410 (640)	WS60	WMB04	V48M28T4916CU	
225		FR944		1883 (855)	WS61	—	V48M28T2216CU	
300		FR945		2485 (1128)	WS62	—	V48M28T3316CU	
500		Contact local Eaton representative					V48M28T5516CU	
750							V48D28T7716CU	
1000						V48D28T1116CU		
15	115	FR939	280B	241 (109)	WS57	WMB05	V48M28F1516CU	
30		FR940		433 (197)	WS58	WMB05	V48M28F3016CU	
45		FR940		471 (214)	WS58	WMB05	V48M28F4516CU	
75		FR942		665 (302)	WS59	WMB04	V48M28F7516CU	
112.5		FR943		1271 (577)	WS60	WMB04	V48M28F1216CU	
150		FR943		1422 (646)	WS60	WMB04	V48M28F4916CU	
225		FR944		2082 (945)	WS61	—	V48M28F2216CU	
300		FR945		2568 (1166)	WS62	—	V48M28F3316CU	
500		Contact local Eaton representative					V48M28F5516CU	
15		80		FR939	280B	239 (109)	WS57	WMB05
30	FR940		466 (212)	WS58		WMB05	V48M28B3016CU	
45	FR942		667 (303)	WS58		WMB05	V48M28B4516CU	
75	FR943		1147 (521)	WS59		WMB04	V48M28B7516CU	
112.5	FR943		1385 (629)	WS60		WMB04	V48M28B1216CU	
150	FR944		1895 (860)	WS60		WMB04	V48M28B4916CU	
225	FR945		2385 (1083)	WS61		—	V48M28B2216CU	
300	FR924		3002 (1363)	WS40		—	V48M28B3316ECU	
500	Contact local Eaton representative					V48M28B5516CU		

Notes

① Frames (dimensions and weights) subject to revision.

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Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Copper Windings**480 Delta Volts to 240 Delta Volts with 120 Volt Lighting Tap on Phase B ^①**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ^②	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR939	282B	253 (115)	WS57	WMB05	V48M22T1516CU	
30		FR940		485 (220)	WS58	WMB05	V48M22T3016CU	
45		FR940		475 (216)	WS58	WMB05	V48M22T4516CU	
75		FR942		691 (314)	WS59	WMB04	V48M22T7516CU	
112.5		FR943		1215 (552)	WS60	WMB04	V48M22T1216CU	
150		FR943		1366 (620)	WS60	WMB04	V48M22T4916CU	
225		FR944		2000 (908)	WS61	—	V48M22T2216CU	
300		FR945		2624 (1191)	WS62	—	V48M22T3316CU	
500		Contact local Eaton representative					V48M22T5516CU	
750							V48D22T7716CU	
1000						V48D22T1116CU		
15	115	FR939	282B	300 (136)	WS57	WMB05	V48M22F1516CU	
30		FR940		485 (220)	WS58	WMB05	V48M22F3016CU	
45		FR940		467 (212)	WS58	WMB05	V48M22F4516CU	
75		FR942		665 (302)	WS59	WMB04	V48M22F7516CU	
112.5		FR943		1200 (545)	WS60	WMB04	V48M22F1216CU	
150		FR943		1366 (620)	WS60	WMB04	V48M22F4916CU	
225		FR944		2400 (1090)	WS61	—	V48M22F2216CU	
300		FR945		3000 (1362)	WS62	—	V48M22F3316CU	
500		Contact local Eaton representative					V48M22F5516CU	
15		80		FR939	282B	251 (114)	WS57	WMB05
30	FR940		489 (222)	WS58		WMB05	V48M22B3016CU	
45	FR942		700 (318)	WS59		WMB04	V48M22B4516CU	
75	FR943		1204 (547)	WS60		WMB04	V48M22B7516CU	
112.5	FR943		1454 (660)	WS60		WMB04	V48M22B1216CU	
150	FR944		1990 (903)	WS61		—	V48M22B4916CU	
225	FR945		2504 (1137)	WS62		—	V48M22B2216CU	
300	Contact local Eaton representative					V48M22B3316CU		
500						V48M22B5516CU		

Notes

^① Lighting tap limited to 5% of nameplate full load capacity.

^② Frames (dimensions and weights) subject to revision.

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Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Copper Windings

480 Delta Volts to 400Y/231 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR939	280B	260 (118)	WS57	WMB05	V48M34T1516CU
30		FR940		490 (222)	WS58	WMB05	V48M34T3016CU
45		FR940		495 (225)	WS58	WMB05	V48M34T4516CU
75		FR942		683 (310)	WS59	WMB04	V48M34T7516CU
112.5		FR943		1250 (568)	WS60	WMB04	V48M34T1216CU
150		FR943		1370 (622)	WS60	WMB04	V48M34T4916CU
225		FR944		2100 (953)	WS61	—	V48M34T2216CU
300		FR945		2650 (1203)	WS62	—	V48M34T3316CU
500		Contact local Eaton representative					V48M34T5516CU
15	115	FR939	280B	253 (115)	WS57	WMB05	V48M34F1516CU
30		FR940		455 (206)	WS58	WMB05	V48M34F3016CU
45		FR940		495 (225)	WS58	WMB05	V48M34F4516CU
75		FR942		698 (317)	WS59	WMB04	V48M34F7516CU
112.5		FR943		1335 (606)	WS60	WMB04	V48M34F1216CU
150		FR943		1493 (678)	WS60	WMB04	V48M34F4916CU
225		FR944		2186 (992)	WS61	—	V48M34F2216CU
300		FR945		2696 (1224)	WS62	—	V48M34F3316CU
500		Contact local Eaton representative					V48M34F5516CU
15	80	FR939	280B	251 (114)	WS57	WMB05	V48M34B1516CU
30		FR940		489 (222)	WS58	WMB05	V48M34B3016CU
45		FR942		700 (318)	WS59	WMB04	V48M34B4516CU
75		FR943		1204 (547)	WS60	WMB04	V48M34B7516CU
112.5		FR943		1454 (660)	WS60	WMB04	V48M34B1216CU
150		FR944		1990 (903)	WS61	—	V48M34B4916CU
225		FR945		2504 (1137)	WS62	—	V48M34B2216CU
300		Contact local Eaton representative					V48M34B3316CU

Notes

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Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Copper Windings

480 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR939	280B	260 (118)	WS57	WMB05	V48M47T1516CU
30		FR940		431 (196)	WS58	WMB05	V48M47T3016CU
45		FR940		457 (207)	WS58	WMB05	V48M47T4516CU
75		FR942		673 (306)	WS59	WMB04	V48M47T7516CU
112.5		FR943		1110 (504)	WS60	WMB04	V48M47T1216CU
150		FR943		1432 (650)	WS60	WMB04	V48M47T4916CU
225		FR944		2100 (953)	WS61	—	V48M47T2216CU
300		FR945		2650 (1203)	WS62	—	V48M47T3316CU
500		Contact local Eaton representative					V48M47T5516CU
15	115	FR939	280B	271 (123)	WS57	WMB05	V48M47F1516CU
30		FR940		431 (196)	WS58	WMB05	V48M47F3016CU
45		FR940		485 (220)	WS58	WMB05	V48M47F4516CU
75		FR942		730 (331)	WS59	WMB04	V48M47F7516CU
112.5		FR943		1146 (520)	WS60	WMB04	V48M47F1216CU
150		FR943		1432 (650)	WS60	WMB04	V48M47F4916CU
225		FR944		2150 (976)	WS61	—	V48M47F2216CU
300		FR945		2700 (1226)	WS62	—	V48M47F3316CU
500		Contact local Eaton representative					V48M47F5516CU
15	80	FR939	280B	254 (115)	WS57	WMB05	V48M47B1516CU
30		FR940		476 (216)	WS58	WMB05	V48M47B3016CU
45		FR942		670 (304)	WS58	WMB05	V48M47B4516CU
75		FR943		1110 (504)	WS59	WMB04	V48M47B7516CU
112.5		FR943		1385 (629)	WS60	WMB04	V48M47B1216CU
150		FR944		2100 (953)	WS60	WMB04	V48M47B4916CU
225		FR945		2650 (1203)	WS61	—	V48M47B2216CU
300		Contact local Eaton representative					V48M47B3316CU

Notes

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Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Copper Windings

2

600 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR939	280A	250 (114)	WS57	WMB05	V60M28T1516CU
30		FR940		441 (200)	WS58	WMB05	V60M28T3016CU
45		FR940		460 (209)	WS58	WMB05	V60M28T4516CU
75		FR942		712 (323)	WS59	WMB04	V60M28T7516CU
112.5		FR943		1260 (572)	WS60	WMB04	V60M28T1216CU
150		FR943		1420 (645)	WS60	WMB04	V60M28T4916CU
225		FR944		1890 (858)	WS61	—	V60M28T2216CU
300		FR945		2450 (1112)	WS62	—	V60M28T3316CU
500		Contact local Eaton representative					V60M28T5516CU
15	115	FR939	280A	253 (115)	WS57	WMB05	V60M28F1516CU
30		FR940		455 (206)	WS58	WMB05	V60M28F3016CU
45		FR940		495 (225)	WS58	WMB05	V60M28F4516CU
75		FR942		698 (317)	WS59	WMB04	V60M28F7516CU
112.5		FR943		1335 (606)	WS60	WMB04	V60M28F1216CU
150		FR943		1493 (678)	WS60	WMB04	V60M28F4916CU
225		FR944		2186 (992)	WS61	—	V60M28F2216CU
300		FR945		2696 (1224)	WS62	—	V60M28F3316CU
500		Contact local Eaton representative					V60M28F5516CU
15	80	FR939	280A	251 (114)	WS57	WMB05	V60M28B1516CU
30		FR940		489 (222)	WS58	WMB05	V60M28B3016CU
45		FR942		700 (318)	WS59	WMB04	V60M28B4516CU
75		FR943		1204 (547)	WS60	WMB04	V60M28B7516CU
112.5		FR943		1454 (660)	WS60	WMB04	V60M28B1216CU
150		FR944		1990 (903)	WS61	—	V60M28B4916CU
225		FR945		2504 (1137)	WS62	—	V60M28B2216CU
300		Contact local Eaton representative					V60M28B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3 60 Hz DOE 2016 Energy-Efficient—Copper Windings

600 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR939	280A	233 (106)	WS57	WMB05	V60M47T1516CU
30		FR940		431 (196)	WS58	WMB05	V60M47T3016CU
45		FR940		472 (214)	WS58	WMB05	V60M47T4516CU
75		FR942		673 (306)	WS59	WMB04	V60M47T7516CU
112.5		FR943		1110 (504)	WS60	WMB04	V60M47T1216CU
150		FR943		1450 (658)	WS60	WMB04	V60M47T4916CU
225		FR944		1913 (869)	WS61	—	V60M47T2216CU
300		FR945		2600 (1180)	WS62	—	V60M47T3316CU
500		Contact local Eaton representative					V60M47T5516CU
15	115	FR939	280A	253 (115)	WS57	WMB05	V60M47F1516CU
30		FR940		455 (206)	WS58	WMB05	V60M47F3016CU
45		FR940		495 (225)	WS58	WMB05	V60M47F4516CU
75		FR942		698 (317)	WS59	WMB04	V60M47F7516CU
112.5		FR943		1335 (606)	WS60	WMB04	V60M47F1216CU
150		FR943		1493 (678)	WS60	WMB04	V60M47F4916CU
225		FR944		2186 (992)	WS61	—	V60M47F2216CU
300		FR945		2696 (1224)	WS62	—	V60M47F3316CU
500		Contact local Eaton representative					V60M47F5516CU
15	80	FR939	280A	251 (114)	WS57	WMB05	V60M47B1516CU
30		FR940		489 (222)	WS58	WMB05	V60M47B3016CU
45		FR942		700 (318)	WS59	WMB04	V60M47B4516CU
75		FR943		1204 (547)	WS60	WMB04	V60M47B7516CU
112.5		FR943		1454 (660)	WS60	WMB04	V60M47B1216CU
150		FR944		1990 (903)	WS61	—	V60M47B4916CU
225		FR945		2504 (1137)	WS62	—	V60M47B2216CU
300		Contact local Eaton representative					V60M47B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

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Accessories

Please refer to Section 2.7 **Page V2-T2-170**.

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Technical Data and Specifications

Frequency

Eaton standard low-voltage dry-type distribution transformers are designed for 60 Hz operation. Transformers required for other frequencies are available and must be specifically designed.

Overload Capability

Short-term overload is designed into transformers as required by IEEE. Low-voltage dry-type distribution transformers will deliver 200% nameplate load for one-half hour, 150% load for one hour and 125% load for four hours without being damaged, provided that a constant 50% load precedes and follows the overload. See IEEE C57.96 *IEEE Guide for Loading Dry-Type Distribution and Power Transformers* for additional limitations.

Continuous overload capacity is not deliberately designed into a transformer because the design objective is to be within the allowed winding temperature rise with nameplate loading.

Insulation System and Temperature Rise

Industry standards classify insulation systems and rise as shown below:

Insulation System Classification

Ambient	+ Winding Rise	+ Hot Spot	= Temp. Class
40 °C	55 °C	10 °C	105 °C
40 °C	80 °C	30 °C	150 °C
25 °C	135 °C	20 °C	180 °C
40 °C	115 °C	30 °C	185 °C
40 °C	150 °C	30 °C	220 °C

The design life of transformers having different insulation systems is the same—the lower-temperature systems are designed for the same life as the higher-temperature systems.

Enclosures

Eaton’s ventilated transformer types DS-3 and DT-3 use a NEMA 2 rated (drip-proof) enclosure as standard and are rated NEMA 3R with the addition of weathershields. Transformers manufactured in enclosures 939, 940, 942, 943, 944 and 945 are UL Listed to be installed indoors (without weathershields) with just 2 inches clearance on the sides and rear of the transformer.

Winding Terminations

Primary and secondary windings are terminated in the wiring compartment. Ventilated transformers have leads brought out to terminals that are pre-drilled to accept Cu/Al lugs. Aluminum-wound transformers have aluminum terminals; copper-wound models have copper terminals; aluminum and copper transformers include double neutral. **Lugs are not supplied with these transformers.** Eaton recommends external cables be rated 75 °C for ventilated designs.

Series-Multiple Windings

Series-multiple windings consist of two similar coils in each winding that can be connected in series or parallel (multiple). Transformers with series-multiple windings are designated with an “x” or “/” between the voltage ratings, such as voltages of “120/240” or “240 x 480.” If the series-multiple winding is designated by an “x,” the winding can be connected only for a series or parallel.

With the “/” designation, a mid-point also becomes available in addition to the series or parallel connection. As an example, a 120 x 240 winding can be connected for either 120 (parallel) or 240 (series), but a 120/240 winding can be connected for 120 (parallel), or 240 (series), or 240 with a 120 mid-point.

For additional information, please refer to Section 2.7 **Page V2-T2-170**.

Sound Levels

All Eaton 600 volt class DOE 2016 low-voltage general-purpose dry-type distribution transformers are designed to meet NEMA ST-20 sound levels listed here. These are the sound levels measured in a soundproof environment. Actual sound levels measured at an installation will likely be higher (as much as 15 dB greater) due to electrical connections and environmental conditions. Lower sound levels are available and should be specified when the transformer is going to be installed in an area where sound may be a concern.

Average Sound Levels

NEMA ST-20 Average Sound Level, dB

Equivalent Winding kVA Range	Self-Cooled Ventilated (up to 1.2 kV)		Encapsulated (up to 1.2 kV)
	K-Factor 1, 4, 9	K-Factor 13, 20	
3.00 and below	40	40	45
3.01 to 9.00	40	40	45
9.01 to 15.00	45	45	50
15.01 to 30.00	45	45	50
30.01 to 50.00	45	48	50
50.01 to 75.00	50	53	55
75.01 to 112.50	50	53	55
112.51 to 150.00	50	53	55
150.01 to 225.00	55	58	57
225.01 to 300.00	55	58	57
300.01 to 500.00	60	63	59
500.01 to 700.00	62	65	61
700.01 to 1000.00	64	67	63
Greater than 1000	Consult factory	Consult factory	Consult factory

Note

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

DOE 2016 Energy-Efficient K-Factor Rated Transformers



Product Description

Note: The following pages provide listings for most standard transformer ratings and catalog numbers. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

A common industry term for the amount of harmonics produced by a given load is the K-factor. The larger the K-factor, the more harmonics are present. Linear loads, for example, have a K-factor of 1. Transformers may carry a K-factor rating to define the transformer's ability to withstand the additional heating generated by harmonic currents.

Applications

Eaton K-Factor transformers are specifically designed to withstand the harmful overheating effects caused by harmonics generated by nonlinear (non-sinusoidal) loads. These loads include computers, laser printers, copiers and other office equipment, as well as video monitors and other electronic equipment. Eaton K-Factor transformers are not simply over-sized transformers. The core and coils of our K-Factor transformers are specially designed to have reduced induction levels, which results in a reduction in stray losses. Oversized (200% rated) neutrals and electrostatic shielding are typical features found in our K-Factor transformers. Eaton K-Factor transformers are manufactured with the same high-quality construction features as our other ventilated transformer products, including NEMA 2 enclosures as standard.

Contents

Description

DOE 2016 Energy-Efficient K-Factor Rated Transformers

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Calculating the K-Factor

All nonlinear waveforms can be broken down mathematically into a fundamental frequency and its harmonics. IEEE C57.110 establishes a direct relationship between these harmonics and transformer heating. Underwriters Laboratories has established a similar relationship, the K-factor, which is derived by summing the square of the percentage current at a given harmonic level multiplied by the square of the harmonic order.

$$K - Factor = \sum_{h=1}^{\infty} I_h (pu)^2 h^2$$

Where

I_h (pu) = the rms current at harmonic "h" (per unit of rated rms load current).

h = the harmonic order.

Transformers that carry a K-factor rating define the transformer's ability to withstand a given harmonic load while operating within the transformer's insulation class.

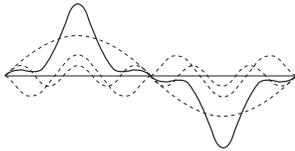
An analysis of harmonic loads and a calculation of the K-factor must be made to properly apply transformers in any building or facility. Note that the calculated K-factor is not constant because nonlinear loads change throughout the day as equipment and lighting is turned off and on. These harmonic loads also change over the life of the building or facility as equipment is added or removed.

Harmonic Currents

Harmonic currents are found in nonlinear loads. These currents are generated by various types of equipment including switching mode power supplies that abruptly switch current on and off during each line cycle. Switching mode power supplies or diode-capacitor power supplies convert AC line voltage to low-voltage DC. This process is accomplished by charging capacitors during each line cycle with narrow pulses of current that are time-coincident with line voltage peaks. Examples of this equipment include electronic ballasts for fluorescent lighting, personal computers, printers, fax machines, electronic and medical test equipment, uninterruptible power supplies and solid-state motor drives.

Note: Nonlinear is synonymous with the term non-sinusoidal.

Harmonic Currents Found in Nonlinear Loads Cause Wave Shape Distortion and Create Added Stresses on Transformers

**Features, Benefits and Functions**

- 600 volt class standard
- Three-phase, 480 delta–208Y/120 volt standard
- Single-phase, 240 x 480 volt–120/240 volt standard
- 150 °C rise standard, 80 °C and 115 °C available
- Three-phase neutrals sized for 200% of rated current
- The core and coil assembly is grounded to the transformer enclosure by means of a visible flexible copper ground strap. The copper ground strap is sized per the NEC to be a grounding conductor. Three-phase DOE 2016 efficient transformers are provided with a bonding ground bar attached to the bottom panel for compliance with NEC 450.10(A)
- Electrostatic shield

Note: Electrostatic shields do not reduce harmonic levels. However, because of the nature of switching mode loads, these shields do reduce transient noise in the system, which may affect sensitive computer loads.

- Aluminum windings (copper optional)
- Class 220 °C insulation
- Reduced core flux density

Note: Reduced core flux prevents the core from saturation and overheating due to voltage distortions caused by harmonic currents.
- Indoor enclosures (weathershields optional, for outdoor applications)
- Coils designed to minimize stray losses
- K4, K13 standard
- K9, K20, K30 optional
- Low sound level (–3 dB, –5 dB) available as options

Standards and Certifications

- UL listed

**Industry Standards**

All Eaton low-voltage dry-type distribution transformers are built and tested in accordance with applicable NEMA and IEEE standards. All 600 volt class transformers are UL listed unless otherwise noted.

Seismically Qualified

Eaton manufactured low-voltage dry-type distribution transformers are seismically qualified and exceed requirements of the Uniform Building Code (UBC), International Building Code (IBC) and California Code Title 24.

Catalog Number Selection

Please refer to Section 2.7 **Page V2-T2-165**.

Product Selection

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

K-4 480 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ^①	Type 3R WS Kit	Wallmount Bracket	Catalog Number		
15	150	FR939	283B	231 (105)	WS57	WMB05	H48M28T1521		
30		FR940		437 (198)	WS58	WMB05	H48M28T3021		
45		FR940		428 (194)	WS58	WMB05	H48M28T4521		
75		FR942		597 (271)	WS59	WMB04	H48M28T7521		
112.5		FR943		987 (448)	WS60	WMB04	H48M28T1221		
150		FR943		1462 (663)	WS60	WMB04	H48M28T4921		
225		FR944		1642 (745)	WS61	—	H48M28T2216		
300		FR945		2394 (1087)	WS62	—	H48M28T3316		
500		Contact local Eaton representative						H48M28T5516	
15	115	FR939	283B	231 (105)	WS57	WMB05	H48M28F1521		
30		FR940		437 (198)	WS58	WMB05	H48M28F3021		
45		FR940		428 (194)	WS58	WMB05	H48M28F4521		
75		FR942		597 (271)	WS59	WMB04	H48M28F7521		
112.5		FR943		1236 (561)	WS60	WMB04	H48M28F1221		
150		FR943		1462 (663)	WS60	WMB04	H48M28F4921		
225		FR944		1642 (745)	WS61	—	H48M28F2216		
300		FR945		2394 (1087)	WS62	—	H48M28F3316		
500		Contact local Eaton representative						H48M28F5516	
15	80	FR940	283B	415 (188)	WS58	WMB05	H48M28B1516		
30		FR940		437 (198)	WS58	WMB05	H48M28B3016		
45		FR942		619 (281)	WS58	WMB05	H48M28B4516		
75		FR943		1027 (466)	WS59	WMB04	H48M28B7516		
112.5		FR944		1643 (746)	WS60	WMB04	H48M28B1216		
150		FR944		1710 (776)	WS60	—	H48M28B4916		
225		FR924		2680 (1217)	WS40	—	H48M28B2216		
300		Contact local Eaton representative						H48M28B3316	

Notes

^① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

2

K-4 480 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR940	283B	427 (194)	WS58	WMB05	H48M47T1516
30		FR940		459 (208)	WS58	WMB05	H48M47T3016
45		FR940		461 (209)	WS58	WMB05	H48M47T4516
75		FR942		629 (286)	WS59	WMB04	H48M47T7516
112.5		FR943		1036 (471)	WS60	WMB04	H48M47T1216
150		FR944		1719 (780)	WS61	—	H48M47T4916
225		FR944		1724 (783)	WS61	—	H48M47T2216
300		FR945		2514 (1141)	WS62	—	H48M47T3316
500		Contact local Eaton representative					H48M47T5516
15	115	FR940	283B	422 (192)	WS58	WMB05	H48M47F1516
30		FR940		436 (198)	WS58	WMB05	H48M47F3016
45		FR942		650 (295)	WS59	WMB04	H48M47F4516
75		FR943		1033 (469)	WS60	WMB04	H48M47F7516
112.5		FR943		1298 (589)	WS60	WMB04	H48M47F1216
150		FR944		1745 (792)	WS61	—	H48M47F4916
225		FR945		2471 (1122)	WS62	—	H48M47F2216
300		FR945		2308 (1048)	WS62	—	H48M47F3316
500		Contact local Eaton representative					H48M47F5516
15	80	FR939	283B	267 (121)	WS57	WMB05	H48M47B1516
30		FR940		459 (208)	WS58	WMB05	H48M47B3016
45		FR942		650 (295)	WS59	WMB04	H48M47B4516
75		FR943		1078 (490)	WS60	WMB04	H48M47B7516
112.5		FR944		1725 (783)	WS61	—	H48M47B1216
150		FR944		1796 (815)	WS61	—	H48M47B4916
225		FR924		2814 (1278)	WS40	—	H48M47B2216
300		Contact local Eaton representative					H48M47B3316

Notes

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DOE 2016 Energy-Efficient K-Factor Rated Transformers

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

K-4 600 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lbs (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR940	283E	427 (194)	WS58	WMB05	H60M28T1516	
30		FR940		459 (208)	WS58	WMB05	H60M28T3016	
45		FR940		461 (209)	WS58	WMB05	H60M28T4516	
75		FR942		629 (286)	WS59	WMB04	H60M28T7516	
112.5		FR943		1036 (471)	WS60	WMB04	H60M28T1216	
150		FR944		1719 (780)	WS61	—	H60M28T4916	
225		FR944		1724 (783)	WS61	—	H60M28T2216	
300		FR945		2514 (1141)	WS62	—	H60M28T3316	
500		Contact local Eaton representative						H60M28T5516
15	115	FR940	283E	422 (192)	WS58	WMB05	H60M28F1516	
30		FR940		436 (198)	WS58	WMB05	H60M28F3016	
45		FR942		650 (295)	WS59	WMB04	H60M28F4516	
75		FR943		1033 (469)	WS60	WMB04	H60M28F7516	
112.5		FR943		1298 (589)	WS60	WMB04	H60M28F1216	
150		FR944		1745 (792)	WS61	—	H60M28F4916	
225		FR945		2471 (1122)	WS62	—	H60M28F2216	
300		FR945		2308 (1048)	WS62	—	H60M28F3316	
500		Contact local Eaton representative						H60M28F5516
15	80	FR939	283E	267 (121)	WS57	WMB05	H60M28B1516	
30		FR940		459 (208)	WS58	WMB05	H60M28B3016	
45		FR942		650 (295)	WS59	WMB04	H60M28B4516	
75		FR943		1078 (490)	WS60	WMB04	H60M28B7516	
112.5		FR944		1725 (783)	WS61	—	H60M28B1216	
150		FR944		1796 (815)	WS61	—	H60M28B4916	
225		FR924		2814 (1278)	WS40	—	H60M28B2216	
300		Contact local Eaton representative						H60M28B3316

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

2

K-4 600 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR940	283E	427 (194)	WS58	WMB05	H60M47T1516
30		FR940		459 (208)	WS58	WMB05	H60M47T3016
45		FR940		461 (209)	WS58	WMB05	H60M47T4516
75		FR942		629 (286)	WS59	WMB04	H60M47T7516
112.5		FR943		1036 (471)	WS60	WMB04	H60M47T1216
150		FR944		1719 (780)	WS61	—	H60M47T4916
225		FR944		1724 (783)	WS61	—	H60M47T2216
300		FR945		2514 (1141)	WS62	—	H60M47T3316
500		Contact local Eaton representative					H60M47T5516
15	115	FR940	283E	422 (192)	WS58	WMB05	H60M47F1516
30		FR940		436 (198)	WS58	WMB05	H60M47F3016
45		FR942		650 (295)	WS59	WMB04	H60M47F4516
75		FR943		1033 (469)	WS60	WMB04	H60M47F7516
112.5		FR943		1298 (589)	WS60	WMB04	H60M47F1216
150		FR944		1745 (792)	WS61	—	H60M47F4916
225		FR945		2471 (1122)	WS62	—	H60M47F2216
300		FR945		2308 (1048)	WS62	—	H60M47F3316
500		Contact local Eaton representative					H60M47F5516
15	80	FR939	283E	267 (121)	WS57	WMB05	H60M47B1516
30		FR940		459 (208)	WS58	WMB05	H60M47B3016
45		FR942		650 (295)	WS59	WMB04	H60M47B4516
75		FR943		1078 (490)	WS60	WMB04	H60M47B7516
112.5		FR944		1725 (783)	WS61	—	H60M47B1216
150		FR944		1796 (815)	WS61	—	H60M47B4916
225		FR924		2814 (1278)	WS40	—	H60M47B2216
300		Contact local Eaton representative					H60M47B3316

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

DOE 2016 Energy-Efficient K-Factor Rated Transformers

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Copper Windings**K-4 480 Delta Volts to 208Y/120 Volts**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR939	283B	305 (138)	WS57	WMB05	H48M28T1521CU	
30		FR940		458 (208)	WS58	WMB05	H48M28T3021CU	
45		FR940		480 (218)	WS58	WMB05	H48M28T4521CU	
75		FR942		758 (344)	WS59	WMB04	H48M28T7521CU	
112.5		FR943		1489 (675)	WS60	WMB04	H48M28T1221CU	
150		FR943		1712 (777)	WS60	WMB04	H48M28T4921CU	
225		FR945		2674 (1214)	WS62	—	H48M28T2216CU	
300		FR945		2737 (1243)	WS62	—	H48M28T3316CU	
500		Contact local Eaton representative						H48M28T5516CU
15	115	FR939	283B	305 (138)	WS57	WMB05	H48M28F1521CU	
30		FR940		458 (208)	WS58	WMB05	H48M28F3021CU	
45		FR940		688 (312)	WS58	WMB05	H48M28F4521CU	
75		FR942		758 (344)	WS59	WMB04	H48M28F7521CU	
112.5		FR943		1394 (633)	WS60	WMB04	H48M28F1221CU	
150		FR943		1712 (777)	WS60	WMB04	H48M28F4921CU	
225		FR945		2150 (976)	—	—	H48M28F2216CU	
300		Contact local Eaton representative						H48M28F3316CU
500								H48M28F5516CU
15	80	FR940	283B	440 (200)	WS58	WMB05	H48M28B1516CU	
30		FR940		482 (219)	WS58	WMB05	H48M28B3016CU	
45		FR942		669 (304)	WS59	WMB04	H48M28B4516CU	
75		FR943		1210 (549)	WS60	WMB04	H48M28B7516CU	
112.5		FR943		1287 (584)	WS60	WMB04	H48M28B1216CU	
150		FR944		2138 (971)	WS61	—	H48M28B4916CU	
225		FR945		2727 (1238)	—	—	H48M28B2216CU	
300		Contact local Eaton representative						H48M28B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Copper Windings

2

K-4 480 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR940	283B	439 (199)	WS58	WMB05	H48M47T1516CU
30		FR940		481 (218)	WS58	WMB05	H48M47T3016CU
45		FR940		504 (229)	WS58	WMB05	H48M47T4516CU
75		FR943		1338 (607)	WS60	WMB04	H48M47T7516CU
112.5		FR943		1909 (867)	WS60	WMB04	H48M47T1216CU
150		FR944		2210 (1003)	WS61	—	H48M47T4916CU
225		FR945		2808 (1275)	WS62	—	H48M47T2216CU
300		FR945		2874 (1305)	WS62	—	H48M47T3316CU
500		Contact local Eaton representative					H48M47T5516CU
15	115	FR940	283B	435 (197)	WS58	WMB05	H48M47F1516CU
30		FR940		438 (199)	WS58	WMB05	H48M47F3016CU
45		FR942		718 (326)	WS59	WMB04	H48M47F4516CU
75		FR943		1137 (516)	WS60	WMB04	H48M47F7516CU
112.5		FR943		1464 (665)	WS60	WMB04	H48M47F1216CU
150		FR944		2208 (1003)	WS61	—	H48M47F4916CU
225		FR945		1764 (801)	WS62	—	H48M47F2216CU
300		Contact local Eaton representative					H48M47F3316CU
500							H48M47F5516CU
15	80	FR940	283B	462 (208)	WS58	WMB05	H48M47B1516CU
30		FR940		506 (230)	WS58	WMB05	H48M47B3016CU
45		FR942		702 (319)	WS59	WMB04	H48M47B4516CU
75		FR943		1271 (577)	WS60	WMB04	H48M47B7516CU
112.5		FR943		1351 (614)	WS60	WMB04	H48M47B1216CU
150		FR944		2245 (1019)	WS61	—	H48M47B4916CU
225		FR945		2863 (1300)	WS62	—	H48M47B2216CU
300		Contact local Eaton representative					H48M47B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

DOE 2016 Energy-Efficient K-Factor Rated Transformers

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Copper Windings

K-4 600 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR940	283E	439 (199)	WS58	WMB05	H60M28T1516CU	
30		FR940		481 (218)	WS58	WMB05	H60M28T3016CU	
45		FR940		504 (229)	WS58	WMB05	H60M28T4516CU	
75		FR943		1338 (607)	WS60	WMB04	H60M28T7516CU	
112.5		FR943		1909 (867)	WS60	WMB04	H60M28T1216CU	
150		FR944		2210 (1003)	WS61	—	H60M28T4916CU	
225		FR945		2808 (1275)	WS62	—	H60M28T2216CU	
300		FR945		2874 (1305)	WS62	—	H60M28T3316CU	
500		Contact local Eaton representative						H60M28T5516CU
15	115	FR940	283E	435 (197)	WS58	WMB05	H60M28F1516CU	
30		FR940		438 (199)	WS58	WMB05	H60M28F3016CU	
45		FR942		718 (326)	WS59	WMB04	H60M28F4516CU	
75		FR943		1137 (516)	WS60	WMB04	H60M28F7516CU	
112.5		FR943		1464 (665)	WS60	WMB04	H60M28F1216CU	
150		FR944		2208 (1003)	WS61	—	H60M28F4916CU	
225		FR945		1764 (801)	WS62	—	H60M28F2216CU	
300		Contact local Eaton representative						H60M28F3316CU
500								H60M28F5516CU
15	80	FR940	283E	462 (208)	WS58	WMB05	H60M28B1516CU	
30		FR940		506 (230)	WS58	WMB05	H60M28B3016CU	
45		FR942		702 (319)	WS59	WMB04	H60M28B4516CU	
75		FR943		1271 (577)	WS60	WMB04	H60M28B7516CU	
112.5		FR943		1351 (614)	WS60	WMB04	H60M28B1216CU	
150		FR944		2245 (1019)	WS61	—	H60M28B4916CU	
225		FR945		2863 (1300)	WS62	—	H60M28B2216CU	
300		Contact local Eaton representative						H60M28B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Copper Windings

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K-4 600 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR940	283E	439 (199)	WS58	WMB05	H60M47T1516CU
30		FR940		481 (218)	WS58	WMB05	H60M47T3016CU
45		FR940		504 (229)	WS58	WMB05	H60M47T4516CU
75		FR943		1338 (607)	WS60	WMB04	H60M47T7516CU
112.5		FR943		1909 (867)	WS60	WMB04	H60M47T1216CU
150		FR944		2210 (1003)	WS61	—	H60M47T4916CU
225		FR945		2808 (1275)	WS62	—	H60M47T2216CU
300		FR945		2874 (1305)	WS62	—	H60M47T3316CU
500		Contact local Eaton representative					H60M47T5516CU
15	115	FR940	283E	435 (197)	WS58	WMB05	H60M47F1516CU
30		FR940		438 (199)	WS58	WMB05	H60M47F3016CU
45		FR942		718 (326)	WS59	WMB04	H60M47F4516CU
75		FR943		1137 (516)	WS60	WMB04	H60M47F7516CU
112.5		FR943		1464 (665)	WS60	WMB04	H60M47F1216CU
150		FR944		2208 (1003)	WS61	—	H60M47F4916CU
225		FR945		1764 (801)	WS62	—	H60M47F2216CU
300		Contact local Eaton representative					H60M47F3316CU
500							H60M47F5516CU
15	80	FR940	283E	462 (208)	WS58	WMB05	H60M47B1516CU
30		FR940		506 (230)	WS58	WMB05	H60M47B3016CU
45		FR942		702 (319)	WS59	WMB04	H60M47B4516CU
75		FR943		1271 (577)	WS60	WMB04	H60M47B7516CU
112.5		FR943		1351 (614)	WS60	WMB04	H60M47B1216CU
150		FR944		2245 (1019)	WS61	—	H60M47B4916CU
225		FR945		2863 (1300)	WS62	—	H60M47B2216CU
300		Contact local Eaton representative					H60M47B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings**K-9 480 Delta Volts to 208Y/120 Volts**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR939	283B	231 (105)	WS57	WMB05	B48M28T1521
30		FR940		416 (189)	WS58	WMB05	B48M28T3021
45		FR940		428 (194)	WS58	WMB05	B48M28T4521
75		FR942		597 (271)	WS59	WMB04	B48M28T7521
112.5		FR943		1297 (589)	WS60	WMB04	B48M28T1221
150		FR943		1462 (663)	WS60	WMB04	B48M28T4921
225		FR945		2379 (1080)	WS62	—	B48M28T2216
300		FR924		1910 (867)	WS40	—	B48M28T3316
500		Contact local Eaton representative					B48M28T5516
15	115	FR939	283B	231 (105)	WS57	WMB05	B48M28F1521
30		FR940		437 (198)	WS58	WMB05	B48M28F3021
45		FR940		428 (194)	WS58	WMB05	B48M28F4521
75		FR942		597 (271)	WS59	WMB04	B48M28F7521
112.5		FR943		1369 (621)	WS60	WMB04	B48M28F1221
150		FR943		1462 (663)	WS60	WMB04	B48M28F4921
225		FR924		1927 (875)	WS40	—	B48M28F2216
300		FR924		2894 (1314)	WS40	—	B48M28F3316
500		Contact local Eaton representative					B48M28F5516
15	80	FR940	283B	420 (191)	WS58	WMB05	B48M28B1516
30		FR940		438 (199)	WS58	WMB05	B48M28B3016
45		FR943		927 (421)	WS60	WMB04	B48M28B4516
75		FR943		1098 (498)	WS60	WMB04	B48M28B7516
112.5		FR944		1939 (880)	WS61	—	B48M28B1216
150		FR945		2400 (1090)	WS62	—	B48M28B4916
225		FR924		2816 (1278)	WS40	—	B48M28B2216
300		Contact local Eaton representative					B48M28B3316

Notes

① Frames (dimensions and weights) subject to revision.

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Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

2

K-9 480 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR940	283B	426 (194)	WS58	WMB05	B48M47T1516
30		FR940		437 (198)	WS58	WMB05	B48M47T3016
45		FR942		624 (283)	WS59	WMB04	B48M47T4516
75		FR943		1063 (482)	WS60	WMB04	B48M47T7516
112.5		FR943		1362 (618)	WS60	WMB04	B48M47T1216
150		FR944		1496 (679)	WS61	—	B48M47T4916
225		FR945		2458 (1116)	WS62	—	B48M47T2216
300		FR924		2014 (914)	WS40	—	B48M47T3316
500		Contact local Eaton representative					B48M47T5516
15	115	FR940	283B	433 (196)	WS58	WMB05	B48M47F1516
30		FR940		459 (208)	WS58	WMB05	B48M47F3016
45		FR942		650 (295)	WS59	WMB04	B48M47F4516
75		FR943		1026 (466)	WS60	WMB04	B48M47F7516
112.5		FR944		1848 (839)	WS61	—	B48M47F1216
150		FR944		1766 (802)	WS61	—	B48M47F4916
225		FR924		2023 (919)	WS40	—	B48M47F2216
300		FR924		3039 (1380)	WS40	—	B48M47F3316
500		Contact local Eaton representative					B48M47F5516
15	80	FR940	283B	420 (191)	WS58	WMB05	B48M47B1516
30		FR940		457 (207)	WS58	WMB05	B48M47B3016
45		FR943		973 (442)	WS60	WMB04	B48M47B4516
75		FR943		1153 (523)	WS60	WMB04	B48M47B7516
112.5		FR944		1939 (880)	WS61	—	B48M47B1216
150		FR945		2537 (1152)	WS62	—	B48M47B4916
225		FR924		2957 (1342)	WS40	—	B48M47B2216
300		Contact local Eaton representative					B48M47B3316

Notes

① Frames (dimensions and weights) subject to revision.

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Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings**K-9 600 Delta Volts to 208Y/120 Volts**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number		
15	150	FR940	283E	426 (194)	WS58	WMB05	B60M28T1516		
30		FR940		437 (198)	WS58	WMB05	B60M28T3016		
45		FR942		624 (283)	WS59	WMB04	B60M28T4516		
75		FR943		1063 (482)	WS60	WMB04	B60M28T7516		
112.5		FR943		1362 (618)	WS60	WMB04	B60M28T1216		
150		FR944		1496 (679)	WS61	—	B60M28T4916		
225		FR945		2458 (1116)	WS62	—	B60M28T2216		
300		FR924		2014 (914)	WS40	—	B60M28T3316		
500		Contact local Eaton representative						B60M28T5516	
15	115	FR940	283E	433 (196)	WS58	WMB05	B60M28F1516		
30		FR940		459 (208)	WS58	WMB05	B60M28F3016		
45		FR942		650 (295)	WS59	WMB04	B60M28F4516		
75		FR943		1026 (466)	WS60	WMB04	B60M28F7516		
112.5		FR944		1848 (839)	WS61	—	B60M28F1216		
150		FR944		1766 (802)	WS61	—	B60M28F4916		
225		FR924		2023 (919)	WS40	—	B60M28F2216		
300		FR924		3039 (1380)	WS40	—	B60M28F3316		
500		Contact local Eaton representative						B60M28F5516	
15	80	FR940	283E	420 (191)	WS58	WMB05	B60M28B1516		
30		FR940		457 (207)	WS58	WMB05	B60M28B3016		
45		FR943		973 (442)	WS60	WMB04	B60M28B4516		
75		FR943		1153 (523)	WS60	WMB04	B60M28B7516		
112.5		FR944		1939 (880)	WS61	—	B60M28B1216		
150		FR945		2537 (1152)	WS62	—	B60M28B4916		
225		FR924		2957 (1342)	WS40	—	B60M28B2216		
300		Contact local Eaton representative						B60M28B3316	

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

2

K-9 600 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR940	283E	426 (194)	WS58	WMB05	B60M47T1516
30		FR940		437 (198)	WS58	WMB05	B60M47T3016
45		FR942		624 (283)	WS59	WMB04	B60M47T4516
75		FR943		1063 (482)	WS60	WMB04	B60M47T7516
112.5		FR943		1362 (618)	WS60	WMB04	B60M47T1216
150		FR944		1496 (679)	WS61	—	B60M47T4916
225		FR945		2458 (1116)	WS62	—	B60M47T2216
300		FR924		2014 (914)	WS40	—	B60M47T3316
500		Contact local Eaton representative					B60M47T5516
15	115	FR940	283E	433 (196)	WS58	WMB05	B60M47F1516
30		FR940		459 (208)	WS58	WMB05	B60M47F3016
45		FR942		650 (295)	WS59	WMB04	B60M47F4516
75		FR943		1026 (466)	WS60	WMB04	B60M47F7516
112.5		FR944		1848 (839)	WS61	—	B60M47F1216
150		FR944		1766 (802)	WS61	—	B60M47F4916
225		FR924		2023 (919)	WS40	—	B60M47F2216
300		FR924		3039 (1380)	WS40	—	B60M47F3316
500		Contact local Eaton representative					B60M47F5516
15	80	FR940	283E	420 (191)	WS58	WMB05	B60M47B1516
30		FR940		457 (207)	WS58	WMB05	B60M47B3016
45		FR943		973 (442)	WS60	WMB04	B60M47B4516
75		FR943		1153 (523)	WS60	WMB04	B60M47B7516
112.5		FR944		1939 (880)	WS61	—	B60M47B1216
150		FR945		2537 (1152)	WS62	—	B60M47B4916
225		FR924		2957 (1342)	WS40	—	B60M47B2216
300		Contact local Eaton representative					B60M47B3316

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Copper Windings**K-9 480 Delta Volts to 208Y/120 Volts**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR939	283B	305 (138)	WS57	WMB05	B48M28T1521CU	
30		FR940		505 (229)	WS58	WMB05	B48M28T3021CU	
45		FR940		688 (312)	WS58	WMB05	B48M28T4521CU	
75		FR942		758 (344)	WS59	WMB04	B48M28T7521CU	
112.5		FR943		1424 (646)	WS60	WMB04	B48M28T1221CU	
150		FR943		1712 (777)	WS60	WMB04	B48M28T4921CU	
225		FR945		2628 (1193)	WS62	—	B48M28T2216CU	
300		FR924		3400 (1544)	WS40	—	B48M28T3316CU	
500		Contact local Eaton representative						B48M28T5516CU
15	115	FR939	283B	305 (138)	WS57	WMB05	B48M28F1521CU	
30		FR940		478 (217)	WS58	WMB05	B48M28F3021CU	
45		FR940		688 (312)	WS58	WMB05	B48M28F4521CU	
75		FR942		758 (344)	WS59	WMB04	B48M28F7521CU	
112.5		FR943		1489 (675)	WS60	WMB04	B48M28F1221CU	
150		FR943		1712 (777)	WS60	WMB04	B48M28F4921CU	
225		FR945		3043 (1382)	WS62	—	B48M28F2216CU	
300		Contact local Eaton representative						B48M28F3316CU
500								B48M28F5516CU
15	80	FR940	283B	434 (197)	WS58	WMB05	B48M28B1516CU	
30		FR940		507 (230)	WS58	WMB05	B48M28B3016CU	
45		FR942		703 (319)	WS59	WMB04	B48M28B4516CU	
75		FR943		1112 (505)	WS60	WMB04	B48M28B7516CU	
112.5		FR944		1927 (875)	WS61	—	B48M28B1216CU	
150		FR945		2013 (914)	WS61	—	B48M28B4916CU	
225		FR945		3345 (1519)	WS62	—	B48M28B2216CU	
300		Contact local Eaton representative						B48M28B3316CU

Notes

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Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Copper Windings

2

K-9 480 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR940	283B	452 (205)	WS58	WMB05	B48M47T1516CU
30		FR940		504 (229)	WS58	WMB05	B48M47T3016CU
45		FR942		691 (314)	WS59	WMB04	B48M47T4516CU
75		FR943		1171 (532)	WS60	WMB04	B48M47T7516CU
112.5		FR943		1495 (679)	WS60	WMB04	B48M47T1216CU
150		FR944		2239 (1016)	WS61	—	B48M47T4916CU
225		FR945		2759 (1253)	WS62	—	B48M47T2216CU
300		FR924		3400 (1544)	WS40	—	B48M47T3316CU
500		Contact local Eaton representative					B48M47T5516CU
15	115	FR940	283B	418 (190)	WS58	WMB05	B48M47F1516CU
30		FR940		502 (228)	WS58	WMB05	B48M47F3016CU
45		FR942		691 (314)	WS59	WMB04	B48M47F4516CU
75		FR943		1171 (532)	WS60	WMB04	B48M47F7516CU
112.5		FR944		2258 (1025)	WS61	—	B48M47F1216CU
150		FR944		2114 (960)	WS61	—	B48M47F4916CU
225		FR945		3195 (1451)	WS62	—	B48M47F2216CU
300		Contact local Eaton representative					B48M28F3316CU
500							B48M28F5516CU
15	80	FR940	283B	456 (207)	WS58	WMB05	B48M47B1516CU
30		FR940		532 (242)	WS58	WMB05	B48M47B3016CU
45		FR942		738 (335)	WS59	WMB04	B48M47B4516CU
75		FR943		1168 (530)	WS60	WMB04	B48M47B7516CU
112.5		FR944		2023 (919)	WS61	—	B48M47B1216CU
150		FR945		3195 (1451)	WS61	—	B48M47B4916CU
225		FR945		3512 (1595)	WS62	—	B48M47B2216CU
300		Contact local Eaton representative					B48M28B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

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DOE 2016 Energy-Efficient K-Factor Rated Transformers

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Copper Windings

K-9 600 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR940	283E	452 (205)	WS58	WMB05	B60M28T1516CU	
30		FR940		504 (229)	WS58	WMB05	B60M28T3016CU	
45		FR942		691 (314)	WS59	WMB04	B60M28T4516CU	
75		FR943		1171 (532)	WS60	WMB04	B60M28T7516CU	
112.5		FR943		1495 (679)	WS60	WMB04	B60M28T1216CU	
150		FR944		2239 (1016)	WS61	—	B60M28T4916CU	
225		FR945		2759 (1253)	WS62	—	B60M28T2216CU	
300		FR924		3400 (1544)	WS40	—	B60M28T3316CU	
500		Contact local Eaton representative						B60M28T5516CU
15	115	FR940	283E	418 (190)	WS58	WMB05	B60M28F1516CU	
30		FR940		502 (228)	WS58	WMB05	B60M28F3016CU	
45		FR942		691 (314)	WS59	WMB04	B60M28F4516CU	
75		FR943		1171 (532)	WS60	WMB04	B60M28F7516CU	
112.5		FR944		2258 (1025)	WS61	—	B60M28F1216CU	
150		FR944		2114 (960)	WS61	—	B60M28F4916CU	
225		FR945		3195 (1451)	WS62	—	B60M28F2216CU	
300		Contact local Eaton representative						B60M28F3316CU
500								B60M28F5516CU
15	80	FR940	283E	456 (207)	WS58	WMB05	B60M28B1516CU	
30		FR940		532 (242)	WS58	WMB05	B60M28B3016CU	
45		FR942		738 (335)	WS59	WMB04	B60M28B4516CU	
75		FR943		1168 (530)	WS60	WMB04	B60M28B7516CU	
112.5		FR944		2023 (919)	WS61	—	B60M28B1216CU	
150		FR945		3195 (1451)	WS61	—	B60M28B4916CU	
225		FR945		3512 (1595)	WS62	—	B60M28B2216CU	
300		Contact local Eaton representative						B60M28B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Copper Windings

K-9 600 Delta Volts to 480Y/277 Volts

2

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR940	283E	452 (205)	WS58	WMB05	B60M47T1516CU
30		FR940		504 (229)	WS58	WMB05	B60M47T3016CU
45		FR942		691 (314)	WS59	WMB04	B60M47T4516CU
75		FR943		1171 (532)	WS60	WMB04	B60M47T7516CU
112.5		FR943		1495 (679)	WS60	WMB04	B60M47T1216CU
150		FR944		2239 (1016)	WS61	—	B60M47T4916CU
225		FR945		2759 (1253)	WS62	—	B60M47T2216CU
300		FR924		3400 (1544)	WS40	—	B60M47T3316CU
500		Contact local Eaton representative					B60M47T5516CU
15	115	FR940	283E	418 (190)	WS58	WMB05	B60M47F1516CU
30		FR940		502 (228)	WS58	WMB05	B60M47F3016CU
45		FR942		691 (314)	WS59	WMB04	B60M47F4516CU
75		FR943		1171 (532)	WS60	WMB04	B60M47F7516CU
112.5		FR944		2258 (1025)	WS61	—	B60M47F1216CU
150		FR944		2114 (960)	WS61	—	B60M47F4916CU
225		FR945		3195 (1451)	WS62	—	B60M47F2216CU
300		Contact local Eaton representative					B60M47F3316CU
500							B60M47F5516CU
15	80	FR940	283E	456 (207)	WS58	WMB05	B60M47B1516CU
30		FR940		532 (242)	WS58	WMB05	B60M47B3016CU
45		FR942		738 (335)	WS59	WMB04	B60M47B4516CU
75		FR943		1168 (530)	WS60	WMB04	B60M47B7516CU
112.5		FR944		2023 (919)	WS61	—	B60M47B1216CU
150		FR945		3195 (1451)	WS61	—	B60M47B4916CU
225		FR945		3512 (1595)	WS62	—	B60M47B2216CU
300		Contact local Eaton representative					B60M47B5516CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

DOE 2016 Energy-Efficient K-Factor Rated Transformers

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

K-13 480 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR939	283B	231 (105)	WS57	WMB05	N48M28T1521	
30		FR940		416 (189)	WS58	WMB05	N48M28T3021	
45		FR940		428 (194)	WS58	WMB05	N48M28T4521	
75		FR942		597 (271)	WS59	WMB04	N48M28T7521	
112.5		FR943		1297 (589)	WS60	WMB04	N48M28T1221	
150		FR943		1462 (663)	WS60	WMB04	N48M28T4921	
225		FR945		2341 (1063)	WS62	—	N48M28T2216	
300		Contact local Eaton representative					N48M28T3316	
500							N48M28T5516	
15		115		FR939	283B	231 (105)	WS57	WMB05
30	FR940		437 (198)	WS58		WMB05	N48M28F3021	
45	FR940		428 (194)	WS58		WMB05	N48M28F4521	
75	FR942		597 (271)	WS59		WMB04	N48M28F7521	
112.5	FR943		1369 (621)	WS60		WMB04	N48M28F1221	
150	FR943		1462 (663)	WS60		WMB04	N48M28F4921	
225	FR924		1927 (875)	WS40		—	N48M28F2216	
300	Contact local Eaton representative					N48M28F3316		
500						N48M28F5516		
15	80		FR940	283B		420 (191)	WS58	WMB05
30		FR940	438 (199)		WS58	WMB05	N48M28B3016	
45		FR943	927 (421)		WS60	WMB04	N48M28B4516	
75		FR943	1098 (498)		WS60	WMB04	N48M28B7516	
112.5		FR944	1939 (880)		WS61	—	N48M28B1216	
150		FR945	2400 (1090)		WS62	—	N48M28B4916	
225		Contact local Eaton representative					N48M28B2216	
300							N48M28B3316	

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

2

K-13 480 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR940	283B	426 (194)	WS58	WMB05	N48M47T1516	
30		FR940		437 (198)	WS58	WMB05	N48M47T3016	
45		FR942		624 (283)	WS59	WMB04	N48M47T4516	
75		FR943		1063 (482)	WS60	WMB04	N48M47T7516	
112.5		FR943		1362 (618)	WS60	WMB04	N48M47T1216	
150		FR944		1496 (679)	WS61	—	N48M47T4916	
225		FR945		2458 (1116)	WS62	—	N48M47T2216	
300		Contact local Eaton representative						N48M47T3316
500								N48M47T5516
15	115	FR940	283B	433 (196)	WS58	WMB05	N48M47F1516	
30		FR940		459 (208)	WS58	WMB05	N48M47F3016	
45		FR942		650 (295)	WS59	WMB04	N48M47F4516	
75		FR943		1026 (466)	WS60	WMB04	N48M47F7516	
112.5		FR944		1848 (839)	WS61	—	N48M47F1216	
150		FR944		1766 (802)	WS61	—	N48M47F4916	
225		FR924		2023 (919)	WS40	—	N48M47F2216	
300		Contact local Eaton representative						N48M47F3316
500								N48M47F5516
15	80	FR940	283B	420 (191)	WS58	WMB05	N48M47B1516	
30		FR940		457 (207)	WS58	WMB05	N48M47B3016	
45		FR943		973 (442)	WS60	WMB04	N48M47B4516	
75		FR943		1153 (523)	WS60	WMB04	N48M47B7516	
112.5		FR944		1939 (880)	WS61	—	N48M47B1216	
150		FR945		2537 (1152)	WS62	—	N48M47B4916	
225		Contact local Eaton representative						N48M47B2216
300								N48M47B3316

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

DOE 2016 Energy-Efficient K-Factor Rated Transformers

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

K-13 600 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR940	283E	426 (194)	WS58	WMB05	N60M28T1516	
30		FR940		437 (198)	WS58	WMB05	N60M28T3016	
45		FR942		624 (283)	WS59	WMB04	N60M28T4516	
75		FR943		1063 (482)	WS60	WMB04	N60M28T7516	
112.5		FR943		1362 (618)	WS60	WMB04	N60M28T1216	
150		FR944		1496 (679)	WS61	—	N60M28T4916	
225		FR945		2458 (1116)	WS62	—	N60M28T2216	
300		Contact local Eaton representative						N60M28T3316
500								N60M28T5516
15	115	FR940	283E	433 (196)	WS58	WMB05	N60M28F1516	
30		FR940		459 (208)	WS58	WMB05	N60M28F3016	
45		FR942		650 (295)	WS59	WMB04	N60M28F4516	
75		FR943		1026 (466)	WS60	WMB04	N60M28F7516	
112.5		FR944		1848 (839)	WS61	—	N60M28F1216	
150		FR944		1766 (802)	WS61	—	N60M28F4916	
225		FR924		2023 (919)	WS40	—	N60M28F2216	
300		Contact local Eaton representative						N60M28F3316
500								N60M28F5516
15	80	FR940	283E	420 (191)	WS58	WMB05	N60M28B1516	
30		FR940		457 (207)	WS58	WMB05	N60M28B3016	
45		FR943		973 (442)	WS60	WMB04	N60M28B4516	
75		FR943		1153 (523)	WS60	WMB04	N60M28B7516	
112.5		FR944		1939 (880)	WS61	—	N60M28B1216	
150		FR945		2537 (1152)	WS62	—	N60M28B4916	
225		Contact local Eaton representative						N60M28B2216
300								N60M28B3316

Notes

① Frames (dimensions and weights) subject to revision.

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Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

K-13 600 Delta Volts to 480Y/277 Volts

2

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ^①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR940	283E	426 (194)	WS58	WMB05	N60M47T1516	
30		FR940		437 (198)	WS58	WMB05	N60M47T3016	
45		FR942		624 (283)	WS59	WMB04	N60M47T4516	
75		FR943		1063 (482)	WS60	WMB04	N60M47T7516	
112.5		FR943		1362 (618)	WS60	WMB04	N60M47T1216	
150		FR944		1496 (679)	WS61	—	N60M47T4916	
225		FR945		2458 (1116)	WS62	—	N60M47T2216	
300		Contact local Eaton representative						N60M47T3316
500								N60M47T5516
15	115	FR940	283E	433 (196)	WS58	WMB05	N60M47F1516	
30		FR940		459 (208)	WS58	WMB05	N60M47F3016	
45		FR942		650 (295)	WS59	WMB04	N60M47F4516	
75		FR943		1026 (466)	WS60	WMB04	N60M47F7516	
112.5		FR944		1848 (839)	WS61	—	N60M47F1216	
150		FR944		1766 (802)	WS61	—	N60M47F4916	
225		Contact local Eaton representative						N60M47F2216
300								N60M47F3316
500								N60M47F5516
15	80	FR940	283E	420 (191)	WS58	WMB05	N60M47B1516	
30		FR940		457 (207)	WS58	WMB05	N60M47B3016	
45		FR943		973 (442)	WS60	WMB04	N60M47B4516	
75		FR943		1153 (523)	WS60	WMB04	N60M47B7516	
112.5		FR944		1939 (880)	WS61	—	N60M47B1216	
150		FR945		2537 (1152)	WS62	—	N60M47B4916	
225		Contact local Eaton representative						N60M47B2216
300								N60M47B3316

Notes

^① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

DOE 2016 Energy-Efficient K-Factor Rated Transformers

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Copper Windings

K-13 480 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR939	283B	305 (138)	WS57	WMB05	N48M28T1521CU	
30		FR940		480 (218)	WS58	WMB05	N48M28T3021CU	
45		FR940		688 (312)	WS58	WMB05	N48M28T4521CU	
75		FR942		758 (344)	WS59	WMB04	N48M28T7521CU	
112.5		FR943		1489 (675)	WS60	WMB04	N48M28T1221CU	
150		FR943		1712 (777)	WS60	WMB04	N48M28T4921CU	
225		FR945		2628 (1193)	WS62	—	N48M28T2216CU	
300		Contact local Eaton representative						N48M28T3316CU
500								N48M28T5516CU
15	115	FR939	283B	305 (138)	WS57	WMB05	N48M28F1521CU	
30		FR940		478 (217)	WS58	WMB05	N48M28F3021CU	
45		FR940		688 (312)	WS58	WMB05	N48M28F4521CU	
75		FR942		758 (344)	WS59	WMB04	N48M28F7521CU	
112.5		FR943		1489 (675)	WS60	WMB04	N48M28F1221CU	
150		FR943		1712 (777)	WS60	WMB04	N48M28F4921CU	
225		FR945		3043 (1382)	WS62	—	N48M28F2216CU	
300		Contact local Eaton representative						N48M28F3316CU
500								N48M28F5516CU
15	80	FR940	283B	434 (197)	WS58	WMB05	N48M28B1516CU	
30		FR940		507 (230)	WS58	WMB05	N48M28B3016CU	
45		FR942		703 (319)	WS59	WMB04	N48M28B4516CU	
75		FR943		1112 (505)	WS60	WMB04	N48M28B7516CU	
112.5		FR944		1927 (875)	WS61	—	N48M28B1216CU	
150		FR945		3043 (1382)		—	N48M28B4916CU	
225		Contact local Eaton representative						N48M28B2216CU
300								N48M28B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Copper Windings

2

K-13 480 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	FR940	283B	452 (205)	WS58	WMB05	N48M47T1516CU
30		FR940		504 (229)	WS58	WMB05	N48M47T3016CU
45		FR942		691 (314)	WS59	WMB04	N48M47T4516CU
75		FR943		1171 (532)	WS60	WMB04	N48M47T7516CU
112.5		FR943		1495 (679)	WS60	WMB04	N48M47T1216CU
150		FR944		2239 (1016)	WS61	—	N48M47T4916CU
225		FR945		2759 (1253)	WS62	—	N48M47T2216CU
300		Contact local Eaton representative					N48M47T3316CU
500							N48M47T5516CU
15	115	FR940	283B	418 (190)	WS58	WMB05	N48M47F1516CU
30		FR940		502 (228)	WS58	WMB05	N48M47F3016CU
45		FR942		691 (314)	WS59	WMB04	N48M47F4516CU
75		FR943		1171 (532)	WS60	WMB04	N48M47F7516CU
112.5		FR944		2258 (1025)	WS61	—	N48M47F1216CU
150		FR944		2114 (960)	WS61	—	N48M47F4916CU
225		Contact local Eaton representative					N48M47F2216CU
300							N48M47F3316CU
500							N48M47F5516CU
15	80	FR940	283B	456 (207)	WS58	WMB05	N48M47B1516CU
30		FR940		532 (242)	WS58	WMB05	N48M47B3016CU
45		FR942		738 (335)	WS59	WMB04	N48M47B4516CU
75		FR943		1168 (530)	WS60	WMB04	N48M47B7516CU
112.5		FR944		2023 (919)	WS61	—	N48M47B1216CU
150		FR945		3195 (1451)	WS61	—	N48M47B4916CU
225		Contact local Eaton representative					N48M47B2216CU
300							N48M47B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

DOE 2016 Energy-Efficient K-Factor Rated Transformers

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Copper Windings

K-13 600 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR940	283E	452 (205)	WS58	WMB05	N60M28T1516CU	
30		FR940		504 (229)	WS58	WMB05	N60M28T3016CU	
45		FR942		691 (314)	WS59	WMB04	N60M28T4516CU	
75		FR943		1171 (532)	WS60	WMB04	N60M28T7516CU	
112.5		FR943		1495 (679)	WS60	WMB04	N60M28T1216CU	
150		FR945		2239 (1016)	WS61	—	N60M28T4916CU	
225		FR945		2759 (1253)	WS62	—	N60M28T2216CU	
300		FR924		3400 (1544)	WS40	—	N60M28T3316CU	
500		Contact local Eaton representative						N60M28T5516CU
15	115	FR940	283E	418 (190)	WS58	WMB05	N60M28F1516CU	
30		FR940		502 (228)	WS58	WMB05	N60M28F3016CU	
45		FR942		691 (314)	WS59	WMB04	N60M28F4516CU	
75		FR943		1171 (532)	WS60	WMB04	N60M28F7516CU	
112.5		FR944		2258 (1025)	WS61	—	N60M28F1216CU	
150		FR944		2114 (960)	WS61	—	N60M28F4916CU	
225		FR945		3195 (1451)	WS62	—	N60M28F2216CU	
300		Contact local Eaton representative						N60M28F3316CU
500								N60M28F5516CU
15	80	FR940	283E	456 (207)	WS58	WMB05	N60M28B1516CU	
30		FR940		532 (242)	WS58	WMB05	N60M28B3016CU	
45		FR942		738 (335)	WS59	WMB04	N60M28B4516CU	
75		FR943		1168 (530)	WS60	WMB04	N60M28B7516CU	
112.5		FR944		2023 (919)	WS61	—	N60M28B1216CU	
150		FR945		3195 (1451)	WS61	—	N60M28B4916CU	
225		FR945		3512 (1595)	WS62	—	N60M28B2216CU	
300		Contact local Eaton representative						N60M28B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

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Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Copper Windings

K-13 600 Delta Volts to 480Y/277 Volts

2

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	150	FR940	283E	452 (205)	WS58	WMB05	N60M47T1516CU	
30		FR940		504 (229)	WS58	WMB05	N60M47T3016CU	
45		FR942		691 (314)	WS59	WMB04	N60M47T4516CU	
75		FR943		1171 (532)	WS60	WMB04	N60M47T7516CU	
112.5		FR943		1495 (679)	WS60	WMB04	N60M47T1216CU	
150		FR945		2239 (1016)	WS61	—	N60M47T4916CU	
225		FR945		2759 (1253)	WS62	—	N60M47T2216CU	
300		Contact local Eaton representative						N60M47T3316CU
500								N60M47T5516CU
15	115	FR940	283E	418 (190)	WS58	WMB05	N60M47F1516CU	
30		FR940		502 (228)	WS58	WMB05	N60M47F3016CU	
45		FR942		691 (314)	WS59	WMB04	N60M47F4516CU	
75		FR943		1171 (532)	WS60	WMB04	N60M47F7516CU	
112.5		FR944		2258 (1025)	WS61	—	N60M47F1216CU	
150		FR944		2114 (960)	WS61	—	N60M47F4916CU	
225		FR945		3195 (1451)	WS62	—	N60M47F2216CU	
300		Contact local Eaton representative						N60M47F3316CU
500								N60M47F5516CU
15	80	FR940	283E	456 (207)	WS58	WMB05	N60M47B1516CU	
30		FR940		532 (242)	WS58	WMB05	N60M47B3016CU	
45		FR942		738 (335)	WS59	WMB04	N60M47B4516CU	
75		FR943		1168 (530)	WS60	WMB04	N60M47B7516CU	
112.5		FR944		2023 (919)	WS61	—	N60M47B1216CU	
150		FR945		3195 (1451)	WS61	—	N60M47B4916CU	
225		FR945		3512 (1595)	WS62	—	N60M47B2216CU	
300		Contact local Eaton representative						N60M47B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings**K-20 480 Delta Volts to 208Y/120 Volts**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	Contact local Eaton representative					G48M28T1516
30							G48M28T3016
45							G48M28T4516
75							G48M28T7516
112.5							G48M28T1216
150							G48M28T4916
225							G48M28T2216
300							G48M28T3316
500							G48M28T5516
15							115
30	G48M28F3016						
45	G48M28F4516						
75	G48M28F7516						
112.5	G48M28F1216						
150	G48M28F4916						
225	G48M28F2216						
300	G48M28F3316						
500	G48M28F5516						
15	80	Contact local Eaton representative					
30							G48M28B3016
45							G48M28B4516
75							G48M28B7516
112.5							G48M28B1216
150							G48M28B4916
225							G48M28B2216
300							G48M28B3316

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

K-20 480 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	Contact local Eaton representative					G48M47T1516
30							G48M47T3016
45							G48M47T4516
75							G48M47T7516
112.5							G48M47T1216
150							G48M47T4916
225							G48M47T2216
300							G48M47T3316
500							G48M47T5516
15	115	Contact local Eaton representative					G48M47F1516
30							G48M47F3016
45							G48M47F4516
75							G48M47F7516
112.5							G48M47F1216
150							G48M47F4916
225							G48M47F2216
300							G48M47F3316
500							G48M47F5516
15	80	Contact local Eaton representative					G48M47B1516
30							G48M47B3016
45							G48M47B4516
75							G48M47B7516
112.5							G48M47B1216
150							G48M47B4916
225							G48M47B2216
300							G48M47B3316

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings**K-20 600 Delta Volts to 208Y/120 Volts**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	Contact local Eaton representative					G60M28T1516
30							G60M28T3016
45							G60M28T4516
75							G60M28T7516
112.5							G60M28T1216
150							G60M28T4916
225							G60M28T2216
300							G60M28T3316
500							G60M28T5516
15							115
30	G60M28F3016						
45	G60M28F4516						
75	G60M28F7516						
112.5	G60M28F1216						
150	G60M28F4916						
225	G60M28F2216						
300	G60M28F3316						
500	G60M28F5516						
15	80	Contact local Eaton representative					
30							G60M28B3016
45							G60M28B4516
75							G60M28B7516
112.5							G60M28B1216
150							G60M28B4916
225							G60M28B2216
300							G60M28B3316

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

K-20 600 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	Contact local Eaton representative					G60M47T1516
30							G60M47T3016
45							G60M47T4516
75							G60M47T7516
112.5							G60M47T1216
150							G60M47T4916
225							G60M47T2216
300							G60M47T3316
500							G60M47T5516
15	115	Contact local Eaton representative					G60M47F1516
30							G60M47F3016
45							G60M47F4516
75							G60M47F7516
112.5							G60M47F1216
150							G60M47F4916
225							G60M47F2216
300							G60M47F3316
500							G60M47F5516
15	80	Contact local Eaton representative					G60M47B1516
30							G60M47B3016
45							G60M47B4516
75							G60M47B7516
112.5							G60M47B1216
150							G60M47B4916
225							G60M47B2216
300							G60M47B3316

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Copper Windings**K-20 480 Delta Volts to 208Y/120 Volts**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	Contact local Eaton representative					G48M28T1516CU
30							G48M28T3016CU
45							G48M28T4516CU
75							G48M28T7516CU
112.5							G48M28T1216CU
150							G48M28T4916CU
225							G48M28T2216CU
300							G48M28T3316CU
500							G48M28T5516CU
15							115
30	G48M28F3016CU						
45	G48M28F4516CU						
75	G48M28F7516CU						
112.5	G48M28F1216CU						
150	G48M28F4916CU						
225	G48M28F2216CU						
300	G48M28F3316CU						
500	G48M28F5516CU						
15	80	Contact local Eaton representative					
30							G48M28B3016CU
45							G48M28B4516CU
75							G48M28B7516CU
112.5							G48M28B1216CU
150							G48M28B4916CU
225							G48M28B2216CU
300							G48M28B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Copper Windings

K-20 480 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	Contact local Eaton representative					G48M47T1516CU
30							G48M47T3016CU
45							G48M47T4516CU
75							G48M47T7516CU
112.5							G48M47T1216CU
150							G48M47T4916CU
225							G48M47T2216CU
300							G48M47T3316CU
500							G48M47T5516CU
15							115
30	G48M47F3016CU						
45	G48M47F4516CU						
75	G48M47F7516CU						
112.5	G48M47F1216CU						
150	G48M47F4916CU						
225	G48M47F2216CU						
300	G48M47F3316CU						
500	G48M47F5516CU						
15	80	Contact local Eaton representative					
30							G48M47B3016CU
45							G48M47B4516CU
75							G48M47B7516CU
112.5							G48M47B1216CU
150							G48M47B4916CU
225							G48M47B2216CU
300							G48M47B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Copper Windings**K-20 600 Delta Volts to 208Y/120 Volts**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	Contact local Eaton representative					G60M28T1516CU
30							G60M28T3016CU
45							G60M28T4516CU
75							G60M28T7516CU
112.5							G60M28T1216CU
150							G60M28T4916CU
225							G60M28T2216CU
300							G60M28T3316CU
500							G60M28T5516CU
15							115
30	G60M28F3016CU						
45	G60M28F4516CU						
75	G60M28F7516CU						
112.5	G60M28F1216CU						
150	G60M28F4916CU						
225	G60M28F2216CU						
300	G60M28F3316CU						
500	G60M28F5516CU						
15	80	Contact local Eaton representative					
30							G60M28B3016CU
45							G60M28B4516CU
75							G60M28B7516CU
112.5							G60M28B1216CU
150							G60M28B4916CU
225							G60M28B2216CU
300							G60M28B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—K-Factor Rated 60 Hz DOE 2016 Energy-Efficient—Copper Windings

K-20 600 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg) ①	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	Contact local Eaton representative					G60M47T1516CU
30							G60M47T3016CU
45							G60M47T4516CU
75							G60M47T7516CU
112.5							G60M47T1216CU
150							G60M47T4916CU
225							G60M47T2216CU
300							G60M47T3316CU
500							G60M47T5516CU
15							115
30	G60M47F3016CU						
45	G60M47F4516CU						
75	G60M47F7516CU						
112.5	G60M47F1216CU						
150	G60M47F4916CU						
225	G60M47F2216CU						
300	G60M47F3316CU						
500	G60M47F5516CU						
15	80	Contact local Eaton representative					
30							G60M47B3016CU
45							G60M47B4516CU
75							G60M47B7516CU
112.5							G60M47B1216CU
150							G60M47B4916CU
225							G60M47B2216CU
300							G60M47B3316CU

Notes

① Frames (dimensions and weights) subject to revision.

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Accessories

Please refer to Section 2.7 Page V2-T2-170.

Technical Data and Specifications

Frequency

Eaton standard low-voltage dry-type distribution transformers are designed for 60 Hz operation. Transformers required for other frequencies are available and must be specifically designed.

Electrostatic Shielding

There are no industry standards for electrostatic shield performance. Eaton-manufactured transformers have been tested by an independent laboratory to meet the following attenuation levels:

- When tested per MIL-Std-220A, Method of Insertion Loss Measurement, with matched impedance no load technique:
 - Common mode noise attenuation:
 - Minus 80 dBA minimum at 0.1 kHz to 1.5 kHz; minus 55 dBA minimum at 1.51 kHz to 100 kHz
 - Normal mode (Transverse mode) noise attenuation:
 - Minus 35 dBA minimum at 1.5 kHz to 10 kHz
- Primary to Secondary Capacitance of 24.74–18.06 picofarads on the range 100–20 kHz

Insulation System and Temperature Rise

Industry standards classify insulation systems and rise as shown below:

Insulation System Classification

Ambient	+ Winding Rise	+ Hot Spot	= Temp. Class
40 °C	55 °C	10 °C	105 °C
40 °C	80 °C	30 °C	150 °C
25 °C	135 °C	20 °C	180 °C
40 °C	115 °C	30 °C	185 °C
40 °C	150 °C	30 °C	220 °C

The design life of transformers having different insulation systems is the same—the lower-temperature systems are designed for the same life as the higher-temperature systems.

Enclosures

Eaton ventilated transformers, Type KT, use a NEMA 2 rated (drip-proof) enclosure as standard, and are rated NEMA 3R with the addition of weathershields. Transformers manufactured in enclosures 939, 940, 942, 943, 944 and 945 are UL Listed to be installed indoors (without weathershields) with just 2 inches clearance on the sides and behind the transformer.

Winding Terminations

Primary and secondary windings are terminated in the wiring compartment. Ventilating transformers have leads brought out to aluminum pads that are pre-drilled to accept Cu/Al lugs. **Lugs are not supplied with these transformers.** Eaton recommends that external cables be rated 75 °C for ventilated designs.

Sound Levels

All Eaton 600 volt class general-purpose low-voltage dry-type distribution transformers are designed to meet NEMA ST-20 sound levels listed here. These are the sound levels measured in a soundproof environment. Actual sound levels measured at an installation will likely be higher due to electrical connections and environmental conditions.

Lower sound levels are available and should be specified when the transformer is going to be installed in an area where sound may be a concern.

For additional information, please refer to Section 2.7 Page V2-T2-174.

Average Sound Levels

NEMA ST-20 Average Sound Level, dB

Equivalent Winding kVA Range	Self-Cooled Ventilating (up to 1.2 kV)		Encapsulated (up to 1.2 kV)
	K-Factor 1, 4, 9	K-Factor 13, 20	
3.00 and below	40	40	45
3.01 to 9.00	40	40	45
9.01 to 15.00	45	45	50
15.01 to 30.00	45	45	50
30.01 to 50.00	45	48	50
50.01 to 75.00	50	53	55
75.01 to 112.50	50	53	55
112.51 to 150.00	50	53	55
150.01 to 225.00	55	58	57
225.01 to 300.00	55	58	57
300.01 to 500.00	60	63	59
500.01 to 700.00	62	65	61
700.01 to 1000.00	64	67	63
Greater than 1000	Consult factory	Consult factory	Consult factory

Note

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Harmonic Mitigating Transformer

2



Product Description

Note: The following pages provide listings for most standard transformer ratings and catalog numbers. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

The electrical transformer has been a staple of electrical power systems for the past 100+ years. While the types of electrical loads that are being added to our systems today have radically changed, the transformer has stayed relatively the same in design during this time frame. Eaton’s harmonic mitigating transformer (HMT) represents the evolution of the transformer into something that provides clean, energy-efficient electricity to power the loads of today and tomorrow. The recent shift of our electrical loads from predominately AC consumers (resistive heating elements, incandescent lighting, three-phase motor load) to DC consumers (such as computers, fax machines, printers and cell phone chargers) requires that our electrical infrastructure changes as well.

These new loads now introduce other currents and frequencies into our electrical power systems—commonly known as “harmonics.” Harmonic currents can cause additional heating, which may cause transformers, generators and conductors to become overloaded. Excessive heat is one of the major reasons that standard transformers and conductors fail prematurely.

These harmonic currents have various other effects (such as loss of ride-through capability, reduced lifespan and mysterious misoperation of equipment) on the components and loads of an electrical distribution system.

Eaton’s HMTs, when used properly within an electrical system, will help keep the loads operating the way the manufacturer intended and keep the facility’s electrical system free from voltage distortion.

Contents

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Three-Phase, Type DT-3 HMT, 60 Hz

- Harmonic mitigating (cancellation) transformers are a cost-effective means of treating harmful harmonics in an electrical distribution system
- Reducing harmonic content in electrical systems can result in a more reliable electrical system, lower maintenance costs, less downtime, fewer equipment malfunctions and lower cooling system capacity
- Available in a variety of phase-shift configurations that allow flexibility to target specific families of harmonics
- Harmonic treatment via electromagnetic flux cancellation
- May be installed as a stand-alone transformer, or included in Integrated Facility System™ (IFS™)
- Available in three-phase ratings, 15–500 kVA, up to 600 volts primary

Features and Benefits

- 480 volt to 208/120 volt standard. Additional voltage combinations available
- 150 °C, 115 °C or 80 °C temperature rise available
- Aluminum windings and terminals standard; copper available
- 200% rated neutral
- Single electrostatic shield for attenuation of common mode and transverse mode noise
- Approximately 98% efficient when operated in systems with 100% nonlinear load profiles
- 220 °C insulation system
- Third-party tested for harmonic performance and energy efficiency
- Meet NEMA ST-20 sound standards
- Eliminate circulating harmonic currents in primary windings of transformers
- Enclosures are NEMA 2 drip-proof. The addition of optional weather-shields makes the enclosure NEMA 3R rainproof
- Harmonic cancellation via electromagnetic flux cancellation. Filters, capacitors or other such devices are not used
- Help meet IEEE 519 harmonic limits

Standards and Certifications

- UL listed



Industry Standards

All Eaton low-voltage dry-type transformers are built and tested in accordance with applicable NEMA and IEEE standards. Harmonic mitigating transformers are UL listed.

IEEE 519-1992

Proper use of Eaton's harmonic mitigating transformers within your electrical system will help you to meet the harmonic distortion limits as proposed by IEEE 519-1992, "IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems."

Seismic Qualified

Eaton low-voltage dry-type distribution transformers are seismically qualified and exceed the requirements of the Uniform Building Code (UBC), International Building Code (IBC) and California Code Title 24.

2.3

Transformers

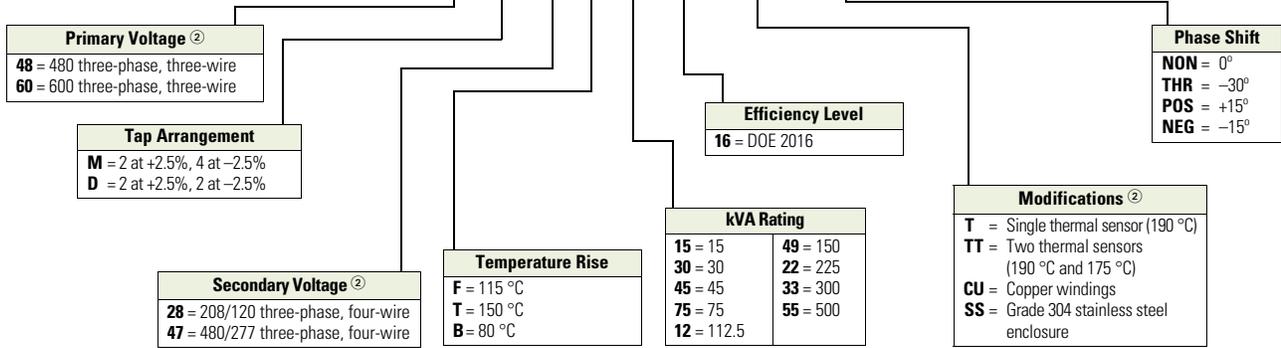
DOE 2016 Energy-Efficient Harmonic Mitigating Transformers

Catalog Number Selection ^①

DOE 2016 Energy-Efficient Harmonic Mitigating Transformers

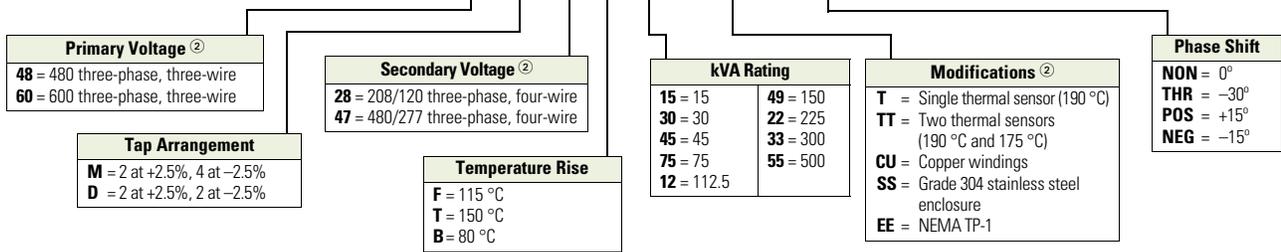
2

X 48 M 28 F 30 16 CUTT NEG



Harmonic Mitigating Transformers

X 48 M 28 F 30 TCUEE NEG



DOE 2016 Efficiency Levels

Dry-Type Distribution Transformers—Low-Voltage (600 V and below)

Three-Phase

kVA	Efficiency
15	97.89
30	98.23
45	98.40
75	98.60
112.5	98.74
150	98.83
225	98.94
300	99.02
500	99.14
750	99.23
1000	99.28

Notes

- ① Do not use to create catalog numbers because all combinations may not be valid.
- ② The most common ratings are shown. Contact Eaton for availability of additional ratings.

Product Selection

Three-Phase—Harmonic Mitigating Transformers 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

480 Delta Volts to 208/120 Volts—Type NON 0° Phase Shift

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	Contact local Eaton representative					X48M28T1516NON
30							X48M28T3016NON
45							X48M28T4516NON
75							X48M28T7516NON
112.5							X48M28T1216NON
150							X48M28T4916NON
225							X48M28T2216NON
300							X48M28T3316NON
500							X48M28T5516NON
15							115
30	X48M28F3016NON						
45	X48M28F4516NON						
75	X48M28F7516NON						
112.5	X48M28F1216NON						
150	X48M28F4916NON						
225	X48M28F2216NON						
300	X48M28F3316NON						
500	X48M28F5516NON						
15	80	Contact local Eaton representative					
30							X48M28B3016NON
45							X48M28B4516NON
75							X48M28B7516NON
112.5							X48M28B1216NON
150							X48M28B4916NON
225							X48M28B2216NON
300							X48M28B3316NON

Note

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on [Page V2-T2-207](#).

Three-Phase—Harmonic Mitigating Transformers 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

2

600 Delta Volts to 208/120 Volts—Type NON 0° Phase Shift

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	Contact local Eaton representative					X60M28T1516NON
30							X60M28T3016NON
45							X60M28T4516NON
75							X60M28T7516NON
112.5							X60M28T1216NON
150							X60M28T4916NON
225							X60M28T2216NON
300							X60M28T3316NON
500							X60M28T5516NON
15							115
30	X60M28F3016NON						
45	X60M28F4516NON						
75	X60M28F7516NON						
112.5	X60M28F1216NON						
150	X60M28F4916NON						
225	X60M28F2216NON						
300	X60M28F3316NON						
500	X60M28F5516NON						
15	80	Contact local Eaton representative					
30							X60M28B3016NON
45							X60M28B4516NON
75							X60M28B7516NON
112.5							X60M28B1216NON
150							X60M28B4916NON
225							X60M28B2216NON
300							X60M28B3316NON

Note

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Harmonic Mitigating Transformers 60 Hz DOE 2016 Energy-Efficient—Copper Windings**480 Delta Volts to 208/120 Volts—Type NON 0° Phase Shift**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	Contact local Eaton representative					X48M28T1516CUNON
30							X48M28T3016CUNON
45							X48M28T4516CUNON
75							X48M28T7516CUNON
112.5							X48M28T1216CUNON
150							X48M28T4916CUNON
225							X48M28T2216CUNON
300							X48M28T3316CUNON
500							X48M28T5516CUNON
15							115
30	X48M28F3016CUNON						
45	X48M28F4516CUNON						
75	X48M28F7516CUNON						
112.5	X48M28F1216CUNON						
150	X48M28F4916CUNON						
225	X48M28F2216CUNON						
300	X48M28F3316CUNON						
500	X48M28F5516CUNON						
15	80	Contact local Eaton representative					
30							X48M28B3016CUNON
45							X48M28B4516CUNON
75							X48M28B7516CUNON
112.5							X48M28B1216CUNON
150							X48M28B4916CUNON
225							X48M28B2216CUNON
300							X48M28B3316CUNON

Note

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Harmonic Mitigating Transformers 60 Hz DOE 2016 Energy-Efficient—Copper Windings

2

600 Delta Volts to 208/120 Volts—Type NON 0° Phase Shift

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	Contact local Eaton representative					X60M28T1516CUNON
30							X60M28T3016CUNON
45							X60M28T4516CUNON
75							X60M28T7516CUNON
112.5							X60M28T1216CUNON
150							X60M28T4916CUNON
225							X60M28T2216CUNON
300							X60M28T3316CUNON
500							X60M28T5516CUNON
15	115	Contact local Eaton representative					X60M28F1516CUNON
30							X60M28F3016CUNON
45							X60M28F4516CUNON
75							X60M28F7516CUNON
112.5							X60M28F1216CUNON
150							X60M28F4916CUNON
225							X60M28F2216CUNON
300							X60M28F3316CUNON
500							X60M28F5516CUNON
15	80	Contact local Eaton representative					X60M28B1516CUNON
30							X60M28B3016CUNON
45							X60M28B4516CUNON
75							X60M28B7516CUNON
112.5							X60M28B1216CUNON
150							X60M28B4916CUNON
225							X60M28B2216CUNON
300							X60M28B3316CUNON

Note

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Harmonic Mitigating Transformers 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings**480 Delta Volts to 208/120 Volts—Type THR 30° Phase Shift**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	Contact local Eaton representative					X48M28T1516THR
30							X48M28T3016THR
45							X48M28T4516THR
75							X48M28T7516THR
112.5							X48M28T1216THR
150							X48M28T4916THR
225							X48M28T2216THR
300							X48M28T3316THR
500							X48M28T5516THR
15							115
30	X48M28F3016THR						
45	X48M28F4516THR						
75	X48M28F7516THR						
112.5	X48M28F1216THR						
150	X48M28F4916THR						
225	X48M28F2216THR						
300	X48M28F3316THR						
500	X48M28F5516THR						
15	80	Contact local Eaton representative					
30							X48M28B3016THR
45							X48M28B4516THR
75							X48M28B7516THR
112.5							X48M28B1216THR
150							X48M28B4916THR
225							X48M28B2216THR
300							X48M28B3316THR

Note

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Harmonic Mitigating Transformers 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

600 Delta Volts to 208/120 Volts—Type THR 30° Phase Shift

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	Contact local Eaton representative					X60M28T1516THR
30							X60M28T3016THR
45							X60M28T4516THR
75							X60M28T7516THR
112.5							X60M28T1216THR
150							X60M28T4916THR
225							X60M28T2216THR
300							X60M28T3316THR
500							X60M28T5516THR
15	115	Contact local Eaton representative					X60M28F1516THR
30							X60M28F3016THR
45							X60M28F4516THR
75							X60M28F7516THR
112.5							X60M28F1216THR
150							X60M28F4916THR
225							X60M28F2216THR
300							X60M28F3316THR
500							X60M28F5516THR
15	80	Contact local Eaton representative					X60M28B1516THR
30							X60M28B3016THR
45							X60M28B4516THR
75							X60M28B7516THR
112.5							X60M28B1216THR
150							X60M28B4916THR
225							X60M28B2216THR
300							X60M28B3316THR

Note

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Harmonic Mitigating Transformers 60 Hz DOE 2016 Energy-Efficient—Copper Windings**480 Delta Volts to 208/120 Volts—Type THR 30° Phase Shift**

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	Contact local Eaton representative					X48M28T1516CUTHR
30							X48M28T3016CUTHR
45							X48M28T4516CUTHR
75							X48M28T7516CUTHR
112.5							X48M28T1216CUTHR
150							X48M28T4916CUTHR
225							X48M28T2216CUTHR
300							X48M28T3316CUTHR
500							X48M28T5516CUTHR
15							115
30	X48M28F3016CUTHR						
45	X48M28F4516CUTHR						
75	X48M28F7516CUTHR						
112.5	X48M28F1216CUTHR						
150	X48M28F4916CUTHR						
225	X48M28F2216CUTHR						
300	X48M28F3316CUTHR						
500	X48M28F5516CUTHR						
15	80	Contact local Eaton representative					
30							X48M28B3016CUTHR
45							X48M28B4516CUTHR
75							X48M28B7516CUTHR
112.5							X48M28B1216CUTHR
150							X48M28B4916CUTHR
225							X48M28B2216CUTHR
300							X48M28B3316CUTHR

Note

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Harmonic Mitigating Transformers 60 Hz DOE 2016 Energy-Efficient—Copper Windings

2

600 Delta Volts to 208/120 Volts—Type THR 30° Phase Shift

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	150	Contact local Eaton representative					X60M28T1516CUTHR
30							X60M28T3016CUTHR
45							X60M28T4516CUTHR
75							X60M28T7516CUTHR
112.5							X60M28T1216CUTHR
150							X60M28T4916CUTHR
225							X60M28T2216CUTHR
300							X60M28T3316CUTHR
500							X60M28T5516CUTHR
15	115	Contact local Eaton representative					X60M28F1516CUTHR
30							X60M28F3016CUTHR
45							X60M28F4516CUTHR
75							X60M28F7516CUTHR
112.5							X60M28F1216CUTHR
150							X60M28F4916CUTHR
225							X60M28F2216CUTHR
300							X60M28F3316CUTHR
500							X60M28F5516CUTHR
15	80	Contact local Eaton representative					X60M28B1516CUTHR
30							X60M28B3016CUTHR
45							X60M28B4516CUTHR
75							X60M28B7516CUTHR
112.5							X60M28B1216CUTHR
150							X60M28B4916CUTHR
225							X60M28B2216CUTHR
300							X60M28B3316CUTHR

Note

Additional voltage combinations are available. Contact your local Eaton sales office for assistance if the voltage you require is not included in this catalog. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Accessories

Harmonic mitigating transformers are available with the same options and accessories as general-purpose ventilated transformers. Please refer to Section 2.7
Page V2-T2-170.

Technical Data and Specifications

Frequency

Eaton standard low-voltage dry-type distribution transformers are designed for 60 Hz operation. Transformers required for other frequencies are available and must be specifically designed.

Overload Capacity

Short-term overload is designed into transformers as required by IEEE. Dry-type distribution transformers will deliver 200% nameplate load for one-half hour; 150% load for one hour and 125% load for four hours without being damaged, provided that a constant 50% load precedes and follows the overload. See IEEE C57.96 *IEEE Guide for Loading Dry-Type Distribution and Power Transformers* for additional limitations.

Continuous overload capacity is not deliberately designed into a transformer because the design objective is to be within the allowed winding temperature rise with nameplate loading.

Insulation System and Temperature Rise

Industry standards classify insulation systems and rise as shown below:

Insulation System Classification

Ambient	+ Winding Rise	+ Hot Spot	= Temp. Class
40 °C	55 °C	10 °C	105 °C
40 °C	80 °C	30 °C	150 °C
25 °C	135 °C	20 °C	180 °C
40 °C	115 °C	30 °C	185 °C
40 °C	150 °C	30 °C	220 °C

The design life of transformers having different insulation systems is the same—the lower-temperature systems are designed for the same life as the higher-temperature systems.

Enclosures

Eaton ventilated transformers use a NEMA 2 rated (drip-proof) enclosure as a standard, and are rated NEMA 3R with the addition of weathershields. Transformers manufactured in enclosures 939, 940, 942, 943, 944 and 945 are UL Listed to be installed indoors (without weathershields) with just 2 inches clearance on the sides and behind the transformer.

Sound Levels

All Eaton 600 volt class general-purpose low-voltage dry-type distribution transformers are designed to meet NEMA ST-20 levels listed here.

Lower sound levels are available and should be specified when the transformer is going to be installed in an area where sound may be a concern.

Average Sound Levels

NEMA ST-20 Average Sound Level, dB

Equivalent Winding kVA Range	Self-Cooled Ventiladed (up to 1.2 kV)		Encapsulated (up to 1.2 kV)
	K-Factor 1, 4, 9	K-Factor 13, 20	
3.00 and below	40	40	45
3.01 to 9.00	40	40	45
9.01 to 15.00	45	45	50
15.01 to 30.00	45	45	50
30.01 to 50.00	45	48	50
50.01 to 75.00	50	53	55
75.01 to 112.50	50	53	55
112.51 to 150.00	50	53	55
150.01 to 225.00	55	58	57
225.01 to 300.00	55	58	57
300.01 to 500.00	60	63	59
500.01 to 700.00	62	65	61
700.01 to 1000.00	64	67	63
Greater than 1000	Consult factory	Consult factory	Consult factory

Note

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Demystifying Harmonic Mitigating Transformer Myths

2

Aren't "power factor corrected" computer power supplies fixing all harmonics?

The use of power factor corrected computer power supplies is a great first start to reducing harmonic currents in your facility. These are becoming prevalent in server applications, but have not "crossed-over" into the laptop computer/business computer. Remember also that, once the computer power supply harmonics are addressed, you will still need to address the harmonic currents coming from the variety of other equipment in your facility.

Don't K-rated transformers fix harmonics?

The K-rated transformer was created to address the additional heat being produced by standard delta-wye transformers when feeding nonlinear loads. The goal of the K-rated transformer is to dissipate the heat produced over a larger area, thus providing the illusion of correction. The K-rated transformer does nothing to reduce the root issue of harmonic currents or correct power quality issues. Because of their larger size, they also consume additional energy to "do the same work" and are counter-productive to an energy-efficient electrical distribution design.

Don't you need two harmonic mitigating transformers (HMT) for any correction to occur?

The design of HMTs allows them to address different families of harmonic currents in different ways. A single HMT will treat the triplen (3rd, 9th, 15th and so on) harmonic currents in its secondary winding. The 5th, 7th, 17th and 19th harmonic family is treated on a system basis through a technique known as "phase shifting."

This phase shift does occur between the Type NON and Type THR, and the Type POS and Type NEG harmonic mitigating transformers—and this can also occur between a Type NON and a standard delta-wye transformer (that is probably already existing within your facility). See our Sample HMT Applications area for additional information.

The cost of HMTs is too high!

While the initial cost of HMTs is typically 1.5 to 4 times the cost of a standard transformer (due to the additional design, materials and labor involved in creating the magnetics necessary to reduce harmonic impact)—to not use an HMT in a harmonic environment can actually cost you significantly more energy loss in the transformer. Due to the relatively long life of a transformer (20–30 years), these additional energy costs easily overshadow the initial one-time first cost increment.

If I use one HMT, don't I need to change all my transformers?

Most facilities have only a percentage (typically 20–25%) of their electrical system that really requires the use of an HMT. In a typical building, only a few areas are critical (meaning high requirements for "clean" power) or have high concentrations of electronic, nonlinear loads—therefore HMTs are only required in those specific areas. The HMT is a weapon in your arsenal in providing a complete, properly designed electrical system for today and tomorrow.

Transformer Technology Table Explanation

In understanding the product placement of the HMT, it becomes useful to have some "rule of thumb" understanding to compare products. Looking at one of the aspects of an HMT—price—you can see that, if a standard delta-wye transformer had a cost of one unit, a K-13 transformer would cost about double and an HMT would cost 1.5 to 4 times the unit cost. What's important to compare is the next column of information—"Energy Savings." If the amount of energy used to power today's loads is compared against a standard delta-wye transformer (that was never designed to feed today's types of loads), you can easily see that the HMT is designed to address the issue. In the table below, you can see that it would take 30% more energy to power the same computer loads with a K-13 transformer, whereas an HMT would take 25% less energy to feed those same computer loads.

(This is due to the fact that the HMT has a different design than a standard delta-wye transformer and addresses the root issue of harmonic currents.) A good analogy is to look at compact fluorescent versus LED light bulbs—you may pay a bit more up front, but because of the large energy savings (because of the harmonic loading), you soon realize that the upfront cost pales in comparison to the potential of energy saved. Eaton can provide an estimation calculator to help you determine the amount of payback and return on investment (ROI) based on the incremental cost of the HMT. It's very typical to return the price differential between the HMT and a standard transformer with a few years—thus using the additional 20 to 30 years of energy savings to add to your bottom line.

Transformer Technology Comparison ①

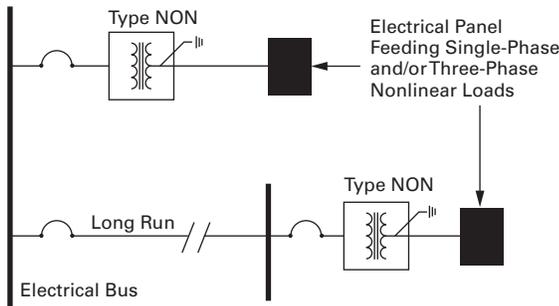
Transformer Type	Cost	Energy Savings	Power Quality
Standard delta-wye	if 1X	if 1X	Not designed for harmonics
K-13	1.5–2X	–0.3X	Bulked up—doesn't help
HMT	2.5X	2.5X	Corrects root issue

Note

① Comparing cost, energy savings and power quality performance between the "commonly used" transformer types.

Sample HMT Applications

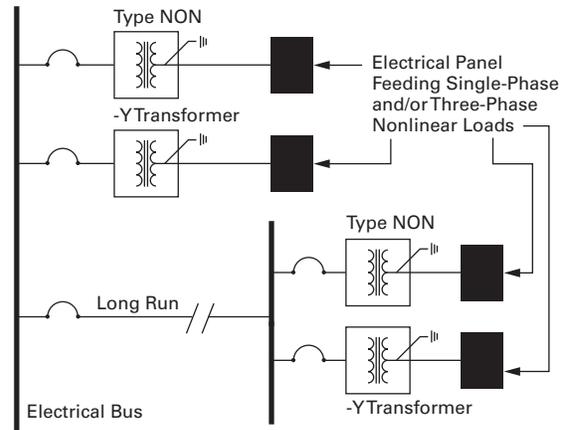
Typical Application of Type NON Transformer



Installation of a Type NON transformer provides an effective treatment of triplen (3rd, 9th, 15th and so on) harmonic currents that are generated by loads connected to the transformer. Triplen harmonic currents are treated in the secondary windings of the transformer due to the transformer's low zero sequence impedance. Type NON transformers do not need to be used in combination with other transformers to treat triplen harmonic currents. A single Type NON transformer may be installed, or multiple units can be applied.

Type NON transformers are an ideal solution for treating triplen harmonics generated by personal computers, printers, fax machines and other office equipment, as well as by single-phase electronic ballasts and single-phase electronic testing or monitoring devices.

Typical Application of Type NON Transformer with a Standard Delta-Wye Transformer



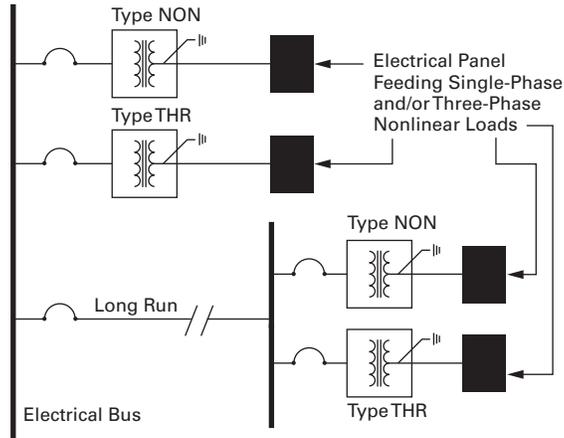
When a delta-wye transformer exists in an electrical distribution system, the addition of a Type NON transformer offers an economical solution for treating harmonic currents. The 30° phase-shift created between a Type NON harmonic mitigating transformer and a delta-wye transformer (standard transformer or K-Factor transformer) provides treatment of 5th, 7th, 17th and 19th harmonic currents. These harmonic currents are canceled in the common electrical bus that feeds the transformers.

Additionally, triplen (3rd, 9th, 15th and so on) harmonic currents generated by the loads connected to the Type NON transformer will be treated in the secondary windings of the Type NON transformer due to its low zero sequence impedance. When using two or more transformers to treat harmonics, it is better that the load be split equally between the transformers to receive the maximum benefit.

Note: Triplen currents will still circulate in the delta-wye transformer for additional waste. See figure on [Page V2-T2-78](#) to correct.

2

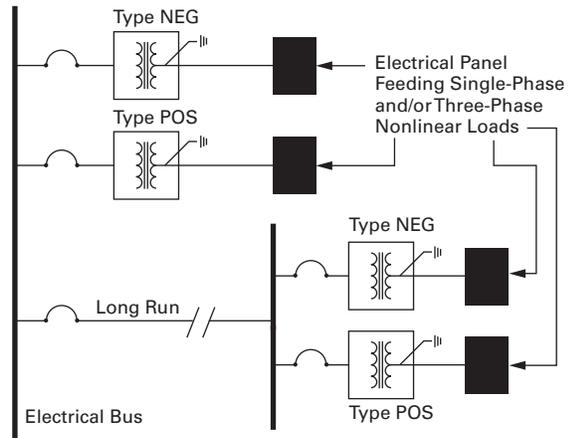
Optimum Application of Type NON and Type THR Transformers



The combination of a Type NON and Type THR transformer provides an optimum harmonic correction solution for an electrical distribution system. The 30° phase shift created between Type NON and type THR harmonic mitigating transformers provides treatment of 5th, 7th, 17th and 19th harmonic currents. These harmonic currents are canceled in the common electrical bus that feeds the transformers.

Additionally, triplen (3rd, 9th, 15th and so on) harmonic currents generated by the loads will be treated in the secondary windings of HMTs. This will ensure that these currents will not circulate in the primary of the transformer creating additional heat, voltage distortion and wasted energy loss. When using two or more transformers to treat harmonics, it is better that the load be split equally between the transformers to receive the maximum benefit.

Typical Application of Type NEG and Type POS Transformers



The combination of a Type POS (+15° phase-shift) transformer and a Type NEG (-15° phase-shift) transformer effectively treats 5th, 7th, 17th and 19th harmonic currents. These harmonic currents are canceled in the common electrical bus that feeds the transformers.

Additionally, triplen (3rd, 9th, 15th and so on) harmonic currents generated by the loads connected to these transformers will be treated in their secondary windings due to their low zero sequence impedance. When using two or more transformers to treat harmonics, it is better that the load be split equally between the transformers to receive the maximum benefit.

Type EP and EPT**Contents**

Description	Page
General-Purpose Encapsulated Transformers	
Catalog Number Selection	V2-T2-80
Product Selection	V2-T2-80
Single-Phase	V2-T2-80
Three-Phase	V2-T2-86
Accessories	V2-T2-95
Technical Data and Specifications	V2-T2-95

Product Description

Note: The following pages provide listings for most standard transformer ratings and catalog numbers. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Type EP and EPT

- Encapsulated design
- Suitable for indoor or outdoor applications
- Totally enclosed, non-ventilated enclosures
- Enclosures are rated NEMA 3R and NEMA 4X optional
- Mountable in any position indoors and upright-only outdoors
- 180 °C insulation system
- 115 °C rise standard; 80 °C optional
- Available in ratings through 37.5 kVA single-phase; 75 kVA three-phase
- Types EP and EPT encapsulated transformers are specifically excluded from the scope of U.S. DOE energy efficiency requirements

Application Description

The basic purpose of a transformer is voltage transformation as near as practically possible to the load for economy and distribution of power. Typical loads for dry-type distribution transformers include lighting, heating, air conditioners, fans and machine tools. Such loads are found in commercial, institutional, industrial and residential structures.

Features, Benefits and Functions

- 60 Hz operation (50/60 Hz optional)
- Short-term overload capability as required by IEEE
- Meet NEMA ST-20 sound levels

Standards and Certifications

- UL listed
- CSA certified

**Industry Standards**

All Eaton dry-type distribution and control transformers are built and tested in accordance with applicable NEMA and IEEE standards. All 600 volt class transformers are UL listed unless otherwise noted.

Seismically Qualified

Eaton manufactured dry-type distribution transformers are seismically qualified and exceed requirements of the Uniform Building Code (UBC), International Building Code (IBC), and California Code Title 24.

Catalog Number Selection

Please refer to Section 2.7 **Page V2-T2-165**.

2

Product Selection

Additional Product Selection information begins on **Page V2-T2-168**.

Single-Phase Encapsulated—Type EP, 60 Hz

Type EP 0.05–37.5 kVA

120 x 240 Volts to 120/240 Volts ①



kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
0.25	—	—	EP	115	FR57P	3E	13 (6)	Indoor–Outdoor	S10N11P26P
0.5	—	—			FR57P		16 (7)		S10N11P51P
0.75	—	—			FR67P		29 (13)		S10N11P76P
1	—	—			FR67P		31 (14)		S10N11P01P
1.5	—	—			FR67P		42 (19)		S10N11P16P
2	—	—			FR68P		42 (19)		S10N11P02P
3	—	—			FR176		55 (25)		S10N11S03N
5	—	—			FR177		113 (51)		S10N11S05N
7.5	—	—			FR178		123 (56)		S10N11S07N
10	—	—			FR179		193 (88)		S10N11S10N
15	—	—			FR180		216 (98)		S10N11S15N
25	—	—			FR182		375 (170)		S10N11S25N

208 Volts to 120/240 Volts ①

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
0.25	—	—	EP	115	FR57P	26A	13 (6)	Indoor–Outdoor	S29N11P26P
0.5	—	—			FR57P		16 (7)		S29N11P51P
0.75	—	—			FR67P		29 (13)		S29N11P76P
1	—	—			FR67P		31 (14)		S29N11P01P
1.5	—	—			FR67P		42 (19)		S29N11P16P
2	—	—			FR68P		42 (19)		S29N11P02P
3	—	—			FR176		65 (30)		S29N11S03N
5	—	—			FR177		113 (51)		S29N11S05N
7.5	—	—			FR178		123 (56)		S29N11S07N
10	—	—			FR179		193 (88)		S29N11S10N
15	—	—			FR180		216 (98)		S29N11S15N
25	—	—			FR182		395 (179)		S29N11S25N

Notes

① Contact Eaton for availability of 0.05–0.25 kVA designs.

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Single-Phase Encapsulated—Type EP, 60 Hz

277 Volts to 120/240 Volts ①

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
0.25	—	—	EP	115	FR57P	524A	13 (6)	Indoor–Outdoor	S27N11P26P
0.5	—	—			FR58AP		26 (12)		S27N11P51P
0.75	—	—			FR58AP		29 (13)		S27N11P76P
1	—	—			FR59AP		31 (14)		S27N11P01P
1.5	—	—			FR67P		42 (19)		S27N11P16P
2	—	—			FR176P		65 (30)		S27N11P02P
3	—	—			FR176		55 (25)		S27N11S03N
5	—	—			FR177		113 (51)		S27N11S05N
7.5	—	—			FR178		123 (56)		S27N11S07N
10	—	—			FR179		193 (88)		S27N11S10N
15	—	—			FR180		180 (82)		S27N11S15N
25	—	—			FR182		375 (170)		S27N11S25N

240 x 480 Volts to 120/240 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
0.050	—	—	EP	115	FR52	3A	7 (3)	Indoor–Outdoor	S20N11S81N
0.075	—	—			FR54		7 (3)		S20N11S85N
0.100	—	—			FR54		7 (3)		S20N11S82N
0.150	—	—			FR55		8 (4)		S20N11S83N
0.25	—	—			FR57P		12 (5)		S20N11P26P
0.5	—	—			FR57P		16 (7)		S20N11P51P
0.75	—	—			FR58AP		26 (12)		S20N11P76P
1	—	—			FR67P		31 (14)		S20N11P01P
1.5	—	—			FR67P		42 (19)		S20N11P16P
2	—	—			FR68P		42 (19)		S20N11P02P
3	—	—			FR176		65 (30)		S20N11S03N
3	②	②			FR176		65 (30)		S20K11S03N
5	—	—			FR177		113 (51)		S20N11S05N
5	②	②			FR177	9A	105 (48)		S20K11S05N
7.5	—	—			FR178	3A	105 (48)		S20N11S07N
7.5	②	②			FR178	9A	123 (56)		S20K11S07N
10	—	—			FR179	3A	193 (88)		S20N11S10N
10	②	②			FR179	9A	193 (88)		S20K11S10N
15	—	—			FR180	3A	216 (98)		S20N11S15N
15	③	③			FR180	23A	216 (98)		S20L11S15N
25	—	—			FR182	3A	385 (175)		S20N11S25N
25	③	③			FR182	23A	375 (170)		S20L11S25N
37.5	③	③			FR300A	248A	735 (334)		S20L11S37 ④

Notes

- ① Contact Eaton for availability of 0.05–0.25 kVA designs.
 ② 1 at +10% FCBN at 240 volts; 2 at –5% FCBN at 480 volts.
 ③ 2 at +5% FCBN at 240 volts; 4 at –2.5% FCBN at 480 volts.
 ④ Floor-mount only in the upright position.

Contact your local Eaton sales office for CE Mark transformer requirements.
 For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.
 Frame drawings/dimensions information begins on **Page V2-T2-207**.

Single-Phase Encapsulated—Type EP, 60 Hz

2

190/200/208/220 x 380/400/416/440 Volts to 110/220 Volts 50/60 Hz—Export Model IP 22 Rated

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
0.5	—	—	EP	115	FR67	538A	34 (15)	Indoor–Outdoor	S40N14S51CE
1	—	—			FR67		42 (19)		S40N14S01CE
1.5	—	—			FR176		46 (21)		S40N14S16CE
2	—	—			FR176		65 (30)		S40N14S02CE
3	—	—			FR177		113 (51)		S40N14S03CE
5	—	—			FR178		140 (64)		S40N14S05CE
7.5	—	—			FR179		193 (88)		S40N14S07CE
10	—	—			FR180		216 (98)		S40N14S10CE
15	—	—			FR182		375 (170)		S40N14S15CE

120/208/240/277 Volts to 120/240 Volts 60 Hz

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
1	—	—	EP	115	FR67P	①	42 (19)	Indoor–Outdoor	S54N11P01
1.5	—	—			FR176P		65 (30)		S54N11P16
2	—	—			FR176P		65 (30)		S54N11P02
3	—	—			FR177		113 (51)		S54N11S03
5	—	—			FR178		140 (64)		S54N11S05
7.5	—	—			FR179		193 (88)		S54N11S07
10	—	—			FR180		216 (98)		S54N11S10

240 x 480 Volts to 120/240 Volts Stainless Steel ②

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
1	—	—	EP	115	FR67P	3A	34 (15)	Indoor–Outdoor	S20N11P01SS
2	—	—			FR68P		46 (21)		S20N11P02SS
3	—	—			FR176		65 (30)		S20N11S03SS
5	—	—			FR177		113 (51)		S20N11S05SS
7.5	—	—			FR178		123 (56)		S20N11S07SS
10	—	—			FR179		193 (88)		S20N11S10SS
15	—	—			FR180		205 (93)		S20N11S15SS
25	—	—			FR182		375 (170)		S20N11S25SS

Notes

① Refer to your local Eaton sales office.

② NEMA 3R, 304 stainless steel enclosure; 316 stainless steel enclosure available as an option.

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Single-Phase Encapsulated—Type EP, 60 Hz

480 Volts to 120/240 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
1	—	2 at -5%	EP	115	FR67P	2D	31 (14)	Indoor—Outdoor	S48G11P01P
1.5	—	2 at -5%			FR67P		42 (19)		S48G11P16P
2	—	2 at -5%			FR68P		42 (19)		S48G11P02P
3	—	2 at -5%			FR176		65 (30)		S48G11S03N
3	2 at +2.5%	2 at -2.5%			FR176	16A	65 (30)		S48D11S03N
5	—	2 at -5%			FR177	2D	113 (51)		S48G11S05N
5	2 at +2.5%	2 at -2.5%			FR177	16A	113 (51)		S48D11S05N
7.5	—	2 at -5%			FR178	2D	123 (56)		S48G11S07N
7.5	2 at +2.5%	2 at -2.5%			FR178	16A	123 (56)		S48D11S07N
10	—	2 at -5%			FR179	2D	193 (88)		S48G11S10N
10	2 at +2.5%	2 at -2.5%			FR179	16A	193 (88)		S48D11S10N
15	—	2 at -5%			FR180	2D	216 (98)		S48G11S15N
15	2 at +2.5%	2 at -2.5%			FR180	16A	216 (98)		S48D11S15N
25	—	2 at -5%			FR182	2D	385 (175)		S48G11S25N
25	2 at +2.5%	4 at -2.5%			FR132	83A	410 (186)		S48M11S25N

480 Volts to 120/240 Volts Stainless Steel, Copper Windings ^①

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
10	2 at +2.5%	2 at -2.5%	EP	115	FR179	16A	210 (95)	Indoor—Outdoor	S48D11S10CUSS
15	2 at +2.5%	2 at -2.5%			FR180		235 (107)		S48D11S15SSCU
25	2 at +2.5%	4 at -2.5%			FR182	83A	415 (188)		S48M11S25SSCU

600 Volts to 120/240 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
0.5	—	2 at -5%	EP	115	FR57P	2I	16 (7)	Indoor—Outdoor	S60G11P51P
0.75	—	2 at -5%			FR58AP		26 (12)		S60G11P76P
1	—	2 at -5%			FR67P		31 (14)		S60G11P01P
1.5	—	2 at -5%			FR67P		42 (19)		S60G11P16P
2	—	2 at -5%			FR68P		42 (19)		S60G11P02P
3	—	2 at -5%			FR176		65 (30)		S60G11S03N
5	—	2 at -5%			FR177		105 (48)		S60G11S05N
7.5	—	2 at -5%			FR178		123 (56)		S60G11S07N
10	—	2 at -5%			FR179		193 (88)		S60G11S10N
15	—	4 at -2.5%			FR180	527A	216 (98)		S60J11S15N
25	—	4 at -2.5%			FR182		385 (175)		S60J11S25N
25	2 at +2.5%	4 at -2.5%			FR132	83B	395 (180)		S60M11S25N

Notes

^① NEMA 3R, 304 stainless steel enclosure; 316 stainless steel enclosure available as an option.

Contact your local Eaton sales office for CE Mark transformer requirements.

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Single-Phase Shielded—Type EP, 60 Hz

2

120 x 240 Volts to 120/240 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	—	EP	115	FR176	90B	50 (23)	Indoor–Outdoor	S10N11E03N
5	—	—			FR177		90 (41)		S10N11E05N
7.5	—	—			FR178		123 (56)		S10N11E07N
10	—	—			FR179		210 (95)		S10N11E10N
15	—	—			FR180		205 (93)		S10N11E15N
25	—	—			FR182		375 (170)		S10N11E25N

120 Volts to 120 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	—	EP	115	FR176	77A	60 (27)	Indoor–Outdoor	S12N12E03N
5	—	—			FR177		100 (45)		S12N12E05N
7.5	—	—			FR178		123 (56)		S12N12E07N
10	—	—			FR179		180 (82)		S12N12E10N
15	—	—			FR180		216 (98)		S12N12E15N
25	—	—			FR182		375 (170)		S12N12E25N

208 Volts to 120/240 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	—	EP	115	FR176	578A	60 (27)	Indoor–Outdoor	S29N11E03N
5	—	—			FR177		135 (61)		S29N11E05N
7.5	—	—			FR178		95 (43)		S29N11E07N
10	—	—			FR179		165 (75)		S29N11E10N
15	—	—			FR180		185 (94)		S29N11E15N
25	—	—			FR182		375 (170)		S29N11E25N

208 Volts to 208 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	—	EP	115	FR176	77B	65 (30)	Indoor–Outdoor	S29N29E03N
5	—	—			FR177		113 (51)		S29N29E05N
7.5	—	—			FR178		123 (56)		S29N29E07N
10	—	—			FR179		195 (89)		S29N29E10N
15	—	—			FR180		216 (98)		S29N29E15N
25	—	—			FR182		375 (170)		S29N29E25N

Note

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Single-Phase Shielded—Type EP, 60 Hz

240 Volts to 240 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	—	EP	115	FR176	77C	65 (30)	Indoor—Outdoor	S24N24E03N
5	—	—			FR177		113 (51)		S24N24E05N
7.5	—	—			FR178		123 (56)		S24N24E07N
10	—	—			FR179		193 (88)		S24N24E10N
15	—	—			FR180		216 (98)		S24N24E15N
25	—	—			FR182		375 (170)		S24N24E25N

277 Volts to 120/240 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	—	EP	115	FR176	513B	65 (30)	Indoor—Outdoor	S27N11E03N
5	—	—			FR177		113 (51)		S27N11E05N
7.5	—	—			FR178		75 (34)		S27N11E07N
10	—	—			FR179		162 (74)		S27N11E10N
15	—	—			FR180		216 (98)		S27N11E15N
25	—	—			FR182		375 (170)		S27N11E25N

240 x 480 Volts to 120/240 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
0.25	—	—	EP	115	FR57P	90A	12 (5)	Indoor—Outdoor	S20N11E26P
0.50	—	—			FR57P		16 (7)		S20N11E51P
0.75	—	—			FR58AP		26 (12)		S20N11E76P
1	—	—			FR67P		31 (14)		S20N11E01P
1.5	—	—			FR67P		42 (19)		S20N11E16P
2	—	—			FR68P		42 (19)		S20N11E02P
3	—	—			FR176		65 (30)		S20N11E03A
5	—	—			FR177		113 (51)		S20N11E05A
7.5	—	—			FR178		123 (56)		S20N11E07A
10	—	—			FR179		166 (75)		S20N11E10A
15	—	—			FR180		216 (98)		S20N11E15A
25	①	①			FR182	526A	375 (170)		S20L11E25A

Notes

① 2 at +5% FCBN at 240 volts; 4 at -2.5% FCBN at 480 volts.

Contact your local Eaton sales office for CE Mark transformer requirements.

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase Encapsulated—Type EPT, 60 Hz

2

Type EPT 3–75 kVA



240 Delta Volts to 208Y/120 Volts

Full Capacity Taps			Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
kVA	FCAN	FCBN							
9	—	2 at -5%	EPT	115	FR103	70C	190 (86)	Indoor–Outdoor	Y24G28T09N ①
15	—	2 at -5%			FR95				275 (125)
30	2 at +2.5%	4 at -2.5%			FR243	84C	422 (191)		Y24M28T30N
45	2 at +2.5%	4 at -2.5%			FR244				660 (299)

380 Delta Volts to 190Y/110 Volts

Full Capacity Taps			Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
kVA	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR201	70F	116 (53)	Indoor–Outdoor	Y38G19T03A ①
6	—	2 at -5%			FR200				165 (75)
9	—	2 at -5%			FR95	72R	275 (125)		Y38G19T09A ①
15	—	2 at -5%			FR95				275 (125)
30	2 at +2.5%	4 at -2.5%			FR243	84AC	422 (191)		Y38M19T30A
45	2 at +2.5%	4 at -2.5%			FR244				660 (299)
75	2 at +2.5%	4 at -2.5%			FR245		1275 (580)		Y38M19T75A ②

380 Delta Volts to 208Y/120 Volts

Full Capacity Taps			Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
kVA	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR201	70D	116 (53)	Indoor–Outdoor	Y38G28T03A ①
6	—	2 at -5%			FR200				70F
9	—	2 at -5%			FR103	70D	185 (84)		Y38G28T09A ①
15	—	2 at -5%			FR95				275 (125)
30	2 at +2.5%	4 at -2.5%			FR243	84H	422 (191)		Y38M28T30A
45	2 at +2.5%	4 at -2.5%			FR244				84R
75	2 at +2.5%	4 at -2.5%			FR245		1275 (580)		Y38M28T75A ②

Notes

- ① T-T (Scott T) connected.
- ② Floor-mount only.

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase Encapsulated—Type EPT, 60 Hz

380 Delta Volts to 220Y/127 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR201	70F	116 (53)	Indoor—Outdoor	Y38G31T03A ①
6	—	2 at -5%			FR200		165 (75)		Y38G31T06A ①
9	—	2 at -5%			FR103	70M	195 (89)		Y38G31T09A ①
15	—	2 at -5%			FR95	70F	275 (125)		Y38G31T15A ①
30	2 at +2.5%	4 at -2.5%			FR243	84R	422 (191)		Y38M31T30A
45	2 at +2.5%	4 at -2.5%			FR244		660 (299)		Y38M31T45A
75	2 at +2.5%	4 at -2.5%			FR245		1275 (580)		Y38M31T75A ②

380 Delta Volts to 220 Delta Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR201	74K	116 (53)	Indoor—Outdoor	Y38G25T03A ①
6	—	2 at -5%			FR200		180 (82)		Y38G25T06A ①
9	—	2 at -5%			FR103		195 (89)		Y38G25T09A ①
15	—	2 at -5%			FR95		275 (125)		Y38G25T15A ①
30	2 at +2.5%	4 at -2.5%			FR243	③	422 (191)		Y38M25T30A
45	2 at +2.5%	4 at -2.5%			FR244		660 (299)		Y38M25T45A
75	2 at +2.5%	4 at -2.5%			FR245	85L	1275 (580)		Y38M25T75 ②

380 Delta Volts to 380Y/220 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR201	70D	116 (53)	Indoor—Outdoor	Y38G37T03A ①
6	—	2 at -5%			FR200		165 (75)		Y38G37T06A ①
9	—	2 at -5%			FR103		180 (82)		Y38G37T09A ①
15	—	2 at -5%			FR95		275 (125)		Y38G37T15A ①
30	2 at +2.5%	4 at -2.5%			FR243	84H	422 (191)		Y38M37T30A
45	2 at +2.5%	4 at -2.5%			FR244		660 (299)		Y38M37T45A
75	2 at +2.5%	4 at -2.5%			FR245		1275 (580)		Y38M37T75A ②

380 Delta Volts to 480Y/277 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR201	70F	116 (53)	Indoor—Outdoor	Y38G47T03A ①
6	—	2 at -5%			FR200		180 (82)		Y38G47T06A ①
9	—	2 at -5%			FR103		166 (75)		Y38G47T09A ①
15	—	2 at -5%			FR95		275 (125)		Y38G47T15A ①
30	2 at +2.5%	4 at -2.5%			FR243	84AB	422 (191)		Y38M47T30A
45	2 at +2.5%	4 at -2.5%			FR244		660 (299)		Y38M47T45A
75	2 at +2.5%	4 at -2.5%			FR245		1275 (580)		Y38M47T75A ②

Notes

- ① T-T (Scott T) connected.
- ② Floor-mount only.
- ③ Refer to your Eaton sales office.

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase Encapsulated—Type EPT, 60 Hz

2

416 Delta Volts to 208Y/120 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR201	70V	116 (53)	Indoor-Outdoor	Y43G28T03A ①
6	—	2 at -5%			FR200		175 (79)		Y43G28T06A ①
9	—	2 at -5%			FR103		190 (86)		Y43G28T09A ①
15	—	2 at -5%			FR95		275 (125)		Y43G28T15A ①
30	2 at +2.5%	4 at -2.5%			FR243	84I	422 (191)		Y43M28T30A
45	2 at +2.5%	4 at -2.5%			FR244		660 (299)		Y43M28T45A
75	2 at +2.5%	4 at -2.5%			FR245		1275 (580)		Y43M28T75A ②

440 Delta Volts to 220Y/127 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR201	70G	116 (53)	Indoor-Outdoor	Y44G31T03A ①
6	—	2 at -5%			FR200		165 (75)		Y44G31T06A ①
9	—	2 at -5%			FR103		166 (75)		Y44G31T09A ①
15	—	2 at -5%			FR95		275 (125)		Y44G31T15A ①
30	2 at +2.5%	4 at -2.5%			FR243	84O	422 (191)		Y44M31T30A ②
45	2 at +2.5%	4 at -2.5%			FR244		660 (299)		Y44M31T45A
75	2 at +2.5%	4 at -2.5%			FR245		1275 (580)		Y44M31T75A ②

480 Delta Volts to 208Y/120 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR201	70A	116 (52)	Indoor-Outdoor	Y48G28T03N ①
6	—	2 at -5%			FR200		165 (75)		Y48G28T06N ①
6	2 at +2.5%	2 at -2.5%			FR200	72B	165 (75)		Y48D28T06N ①
9	—	2 at -5%			FR103	70A	166 (75)		Y48G28T09N ①
9	—	4 at -2.5%			FR103	503A	185 (84)		Y48J28T09N ①
9	2 at +2.5%	2 at -2.5%			FR103	72B	185 (84)		Y48D28T09N ①
15	—	2 at -5%			FR95	70A	275 (125)		Y48G28T15N ①
15	—	4 at -2.5%			FR95	503A	275 (125)		Y48J28T15N ①
15	2 at +2.5%	2 at -2.5%			FR95	72B	275 (125)		Y48D28T15N ①
30	2 at +2.5%	4 at -2.5%			FR243	84A	422 (191)		Y48M28T30N
45	2 at +2.5%	4 at -2.5%			FR244		720 (327)		Y48M28T45N
75	2 at +2.5%	4 at -2.5%			FR245		1275 (580)		Y48M28T75N ②

480 Delta Volts to 208Y/120 Volts—Copper Windings

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
15	2 at +2.5%	2 at -2.5%	EPT	115	FR95	72B	300 (136)	Indoor-Outdoor	Y48D28T15CU ①
30	2 at +2.5%	4 at -2.5%			FR243	84A	505 (230)		Y48M28T30CU
45	2 at +2.5%	4 at -2.5%			FR244		810 (368)		Y48M28T45CU
75	2 at +2.5%	4 at -2.5%			FR245		1450 (659)		Y48M28T75CU ②③

Notes

- ① T-T (Scott T) connected.
- ② Floor-mount only.
- ③ Not CSA certified.

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase Encapsulated—Type EPT, 60 Hz

480 Delta Volts to 208Y/120 Volts Stainless Steel ①

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR201	70A	116 (53)	Indoor–Outdoor	Y48G28T03SS ②
6	2 at +2.5%	2 at -2.5%			FR200	72B	175 (79)		Y48D28T06SS ②
9	2 at +2.5%	2 at -2.5%			FR103		185 (84)		Y48D28T09SS ②
15	2 at +2.5%	2 at -2.5%			FR95		275 (125)		Y48D28T15SS ②
30	2 at +2.5%	4 at -2.5%			FR243	84A	422 (191)		Y48M28T30SS
45	2 at +2.5%	4 at -2.5%			FR244		660 (299)		Y48M28T45SS
75	2 at +2.5%	4 at -2.5%			FR245		1275 (580)		Y48M28T75SS ③

480 Delta Volts to 208Y/120 Volts Stainless Steel—Copper Windings ①

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
15	2 at +2.5%	2 at -2.5%	EPT	115	FR95	72B	275 (125)	Indoor–Outdoor	Y48D28T15CUSS ②
30	2 at +2.5%	4 at -2.5%			FR243	84A	504 (229)		Y48M28T30CUSS
45	2 at +2.5%	4 at -2.5%			FR244		810 (368)		Y48M28T45CUSS

480 Delta Volts to 220Y/127 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR201	70K	116 (53)	Indoor–Outdoor	Y48G31T03A ②
6	—	2 at -5%			FR200		175 (79)		Y48G31T06A ②
9	—	2 at -5%			FR103	70A	185 (84)		Y48G31T09A ②
15	—	2 at -5%			FR95		275 (125)		Y48G31T15A ②
30	2 at +2.5%	4 at -2.5%			FR243	84A	422 (191)		Y48M31T30A
45	2 at +2.5%	4 at -2.5%			FR244		660 (299)		Y48M31T45A
75	2 at +2.5%	4 at -2.5%			FR245	84K	1275 (580)		Y48M31T75A ③

480 Delta Volts to 240 Delta Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR201	74A	116 (52)	Indoor–Outdoor	Y48G24T03N ②④
6	—	2 at -5%			FR200		165 (75)		Y48G24T06N ②④
9	—	4 at -2.5%			FR103	73A	185 (84)		Y48J24T09N ②④
15	—	4 at -2.5%			FR95		275 (125)		Y48J24T15N ②④
30	2 at +2.5%	4 at -2.5%			FR243	85A	422 (191)		Y48M24T30N ④
45	2 at +2.5%	4 at -2.5%			FR244		660 (299)		Y48M24T45N ④

Notes

- ① NEMA 3R, 304 stainless steel enclosure; 316 stainless steel enclosure available.
- ② T-T (Scott T) connected.
- ③ Floor-mount only.
- ④ Do not include 120 volt lighting tap.

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase Encapsulated—Type EPT, 60 Hz

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480 Delta Volts to 380Y/220 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR201	70A	116 (53)	Indoor–Outdoor	Y48G37T03A ①
6	—	2 at -5%			FR200	70R	165 (75)		Y48G37T06A ①
9	—	2 at -5%			FR103		185 (84)		Y48G37T09A ①
15	—	2 at -5%			FR95		275 (125)		Y48G37T15A ①
30	2 at +2.5%	4 at -2.5%			FR243	84A	422 (191)		Y48M37T30A
45	2 at +2.5%	4 at -2.5%			FR244		660 (299)		Y48M37T45A
75	2 at +2.5%	4 at -2.5%			FR245		1275 (580)		Y48M37T75A ②

480 Delta Volts to 380 Delta Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR201	74B	116 (53)	Indoor–Outdoor	Y48G38T03A ①
6	—	2 at -5%			FR200		165 (75)		Y48G38T06A ①
9	—	2 at -5%			FR103		185 (84)		Y48G38T09A ①
15	—	2 at -5%			FR95	74A	275 (125)		Y48G38T15A ①
30	2 at +2.5%	4 at -2.5%			FR243	85A	422 (191)		Y48M38T30A
45	2 at +2.5%	4 at -2.5%			FR244		660 (299)		Y48M38T45A
75	2 at +2.5%	4 at -2.5%			FR245		1297 (593)		Y48M38T75 ②

480 Delta Volts to 416Y/240 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR200	70A	165 (75)	Indoor–Outdoor	Y48G51T03A ①
6	—	2 at -5%			FR200		185 (84)		Y48G51T06A ①
9	—	2 at -5%			FR103	70S	185 (84)		Y48G51T09A ①
15	—	2 at -5%			FR95		275 (125)		Y48G51T15A ①
30	2 at +2.5%	4 at -2.5%			FR243	84A	422 (191)		Y48M51T30A
45	2 at +2.5%	4 at -2.5%			FR244		660 (299)		Y48M51T45A
75	2 at +2.5%	4 at -2.5%			FR245		1275 (580)		Y48M51T75A ②

480 Delta Volts to 440Y/254 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR201	70A	116 (53)	Indoor–Outdoor	Y48G35T03A ①
6	—	2 at -5%			FR200		185 (84)		Y48G35T06A ①
9	—	2 at -5%			FR103		185 (84)		Y48G35T09A ①
15	—	2 at -5%			FR95		275 (125)		Y48G35T15A ①
30	2 at +2.5%	4 at -2.5%			FR243	84A	422 (191)		Y48M35T30A
45	2 at +2.5%	4 at -2.5%			FR244		660 (299)		Y48M35T45A
75	2 at +2.5%	4 at -2.5%			FR245		1275 (580)		Y48M35T75A ②

Notes

① T-T (Scott T) connected.

② Floor-mount only.

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase Encapsulated—Type EPT, 60 Hz**480 Delta Volts to 480Y/277 Volts**

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
9	2 at +2.5%	2 at -2.5%	EPT	115	FR103	72C	190 (86)	Indoor–Outdoor	Y48D47T09N ①
15	2 at +2.5%	2 at -2.5%			FR95		275 (125)		Y48D47T15N ①
30	2 at +2.5%	4 at -2.5%			FR243	84A	422 (191)		Y48M47T30N
45	2 at +2.5%	4 at -2.5%			FR244		660 (299)		Y48M47T45N

600 Delta Volts to 208Y/120 Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
9	—	2 at -5%	EPT	115	FR103	70B	185 (84)	Indoor–Outdoor	Y60G28T09N ①
15	—	2 at -5%			FR95		275 (125)		Y60G28T15N ①
30	2 at +2.5%	4 at -2.5%			FR243	84B	422 (191)		Y60M28T30N
45	2 at +2.5%	4 at -2.5%			FR244		660 (299)		Y60M28T45N

Three-Phase Shielded—Type EPT, 60 Hz**480 Delta Volts to 208Y/120 Volts**

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	2 at +2.5%	2 at -2.5%	EPT	115	FR201	86B	116 (52)	Indoor–Outdoor	Y48D28E03A ①
6	2 at +2.5%	2 at -2.5%			FR200		165 (75)		Y48D28E06A ①
9	2 at +2.5%	2 at -2.5%			FR103		190 (86)		Y48D28E09N ①
15	2 at +2.5%	2 at -2.5%			FR95		275 (125)		Y48D28E15B ①

480 Delta Volts to 240 Delta Volts

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR201	88A	116 (52)	Indoor–Outdoor	Y48G24E03A ①
6	—	2 at -5%			FR200		165 (75)		Y48G24E06A ①
9	—	4 at -2.5%			FR103	505B	195 (89)		Y48J24E09A ①
15	—	4 at -2.5%			FR95		275 (125)		Y48J24E15A ①

Notes

① T-T (Scott T) connected.

Contact your local Eaton sales office for CE Mark transformer requirements.
For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.
Frame drawings/dimensions information begins on **Page V2-T2-207**.

NEMA Type 4X Single-Phase Encapsulated—Type EP, 60 Hz, Grade 316 Stainless Steel ①

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240 x 480 Volts to 120/240 Volts—Aluminum Windings

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
0.100 ②	—	—	EP	115	FR544X	3A	7 (3)	Indoor–Outdoor	S20N11S82S64X
0.015 ②	—	—			FR554X		9 (4)		S20N11S83S64X
0.250 ②	—	—			FR57P4X		15 (7)		S20N11P26S64X
0.500 ②	—	—			FR57P4X		14 (6)		S20N11P51S64X
0.750 ②	—	—			FR58AP4X		22 (10)		S20N11P76S64X
1 ②	—	—			FR67P4X		30 (14)		S20N11P01S64X
1.5 ②	—	—			FR67P4X		41 (19)		S20N11P16S64X
2 ②	—	—			FR68P4X		75 (34)		S20N11P02S64X
3	—	—			FR1764X		68 (31)		S20N11S03S64X
3	③	③			FR1764X	9A	67 (30)		S20K11S03S64X
5	—	—			FR1774X	3A	107 (49)		S20N11S05S64X
5	③	③			FR1774X	9A	105 (48)		S20K11S05S64X
7.5	—	—			FR1784X	3A	129 (58)		S20N11S07S64X
7.5	③	③			FR1784X	9A	130 (59)		S20K11S07S64X
10	—	—			FR1794X	3A	196 (89)		S20N11S10S64X
10	③	③			FR1794X	9A	198 (90)		S20K11S10S64X
15	—	—			FR1804X	3A	215 (98)		S20N11S15S64X
15	③	③			FR1804X	23A	215 (98)		S20L11S15S64X
25	—	—			FR1824X	3A	393 (178)		S20N11S25S64X
25	④	④			FR1824X	23A	453 (206)		S20L11S25S64X
37.5	④	④			FR300A4X	248A	735 (334)		S20L11S37S64X ⑤

Notes

- ① Grade 316 stainless steel standard. Grade 304 stainless steel available as an option. Replace suffix “S6” with suffix “SS.”
- ② Copper windings provided as standard.
- ③ 1 at +10% FCBN at 240 volts; 2 at –5% FCBN at 480 volts.
- ④ 2 at +5% FCBN at 240 volts; 4 at –2.5% FCBN at 480 volts.
- ⑤ Floor-mount only.

Contact your local Eaton sales office for voltage combinations not shown in the above table. Other voltages and custom features are available upon request.

NEMA Type 4X Single-Phase Encapsulated—Type EP, 60 Hz, Grade 316 Stainless Steel ①**240 x 480 Volts to 120/240 Volts—Copper Windings**

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
0.100 ②	—	—	EP	115	FR544X	3A	7 (3)	Indoor—Outdoor	S20N11S82S64X
0.015 ②	—	—			FR554X		9 (4)		S20N11S83S64X
0.250 ②	—	—			FR57P4X		15 (7)		S20N11P26S64X
0.500 ②	—	—			FR57P4X		14 (6)		S20N11P51S64X
0.750 ②	—	—			FR58AP4X		22 (10)		S20N11P76S64X
1 ②	—	—			FR67P4X		30 (14)		S20N11P01S64X
1.5 ②	—	—			FR67P4X		36 (16)		S20N11P16S64X
2 ②	—	—			FR68P4X		41 (19)		S20N11P02S64X
3	—	—			FR1764X		76 (34)		S20N11S03CUS64X
3	③	③			FR1764X	9A	77 (35)		S20K11S03CUS64X
5	—	—			FR1774X	3A	135 (61)		S20N11S05CUS64X
5	④	④			FR1774X	9A	121 (55)		S20K11S05CUS64X
7.5	—	—			FR1784X	3A	144 (65)		S20N11S07CUS64X
7.5	④	④			FR1784X	9A	146 (66)		S20K11S07CUS64X
10	—	—			FR1794X	3A	229 (104)		S20N11S10CUS64X
10	④	④			FR1794X	9A	219 (99)		S20K11S10CUS64X
15	—	—			FR1804X	3A	236 (107)		S20N11S15CUS64X
15	④	④			FR1804X	23A	236 (107)		S20L11S15CUS64X
25	—	—			FR300A4X	3A	388 (176)		S20N11S25CUS64X
25	④	④			FR300A4X	23A	388 (176)		S20L11S25CUS64X
37.5	④	④			FR300A4X	248A	775 (352)		S20L11S37CUS64X ⑤

Notes

- ① Grade 316 stainless steel standard. Grade 304 stainless steel available as an option. Replace suffix "S6" with suffix "SS."
 ② Copper windings provided as standard.
 ③ 1 at +10% FCBN at 240 volts; 2 at -5% FCBN at 480 volts.
 ④ 2 at +5% FCBN at 240 volts; 4 at -2.5% FCBN at 480 volts.
 ⑤ Floor-mount only.

Contact your local Eaton sales office for voltage combinations not shown in the above table. Other voltages and custom features are available upon request.

NEMA Type 4X Three-Phase Encapsulated—Type EPT, 60 Hz, Grade 316 Stainless Steel ①

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480 Delta Volts to 208Y/120 Volts—Aluminum Windings

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR2014X	70A	125 (57)	Indoor-Outdoor	Y48G28T03S64X ②
6	—	2 at -5%			FR2004X		165 (75)		Y48G28T06S64X ②
6	2 at +2.5%	2 at -2.5%			FR2004X	72B	171 (78)		Y48D28T06S64X ②
9	—	2 at -5%			FR1034X	70A	180 (82)		Y48G28T09S64X ②
9	—	4 at -2.5%			FR1034X	503A	192 (87)		Y48J28T09S64X ②
9	2 at +2.5%	2 at -2.5%			FR1034X	72B	196 (89)		Y48D28T09S64X ②
15	2 at +2.5%	2 at -2.5%			FR954X		281 (127)		Y48D28T15S64X ②
15	—	2 at -5%			FR954X	70A	269 (122)		Y48G28T15S64X ②
15	—	4 at -2.5%			FR954X	503A	268 (121)		Y48J28T15S64X ②
30	2 at +2.5%	4 at -2.5%			FR2434X	84A	539 (245)		Y48M28T30S64X
45	2 at +2.5%	4 at -2.5%			FR2444X		723 (328)		Y48M28T45S64X
75	2 at +2.5%	4 at -2.5%			FR2454X		1277 (580)		Y48M28T75S64X ③

480 Delta Volts to 208Y/120 Volts—Copper Windings

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
	FCAN	FCBN							
3	—	2 at -5%	EPT	115	FR2014X	70A	139 (63)	Indoor-Outdoor	Y48G28T03CUSS4X ②
6	—	2 at -5%			FR2004X		187 (84)		Y48G28T06CUSS4X ②
6	2 at +2.5%	2 at -2.5%			FR2004X	72B	188 (85)		Y48D28T06CUSS4X ②
9	—	2 at -5%			FR1034X	70A	226 (103)		Y48G28T09CUSS4X ②
9	—	4 at -2.5%			FR1034X	503A	226 (103)		Y48J28T09CUSS4X ②
9	2 at +2.5%	2 at -2.5%			FR1034X	72B	231 (105)		Y48D28T09CUSS4X ②
15	2 at +2.5%	2 at -2.5%			FR954X		276 (125)		Y48D28T15CUSS4X ②
15	—	2 at -5%			FR954X	70A	283 (128)		Y48G28T15CUSS4X ②
15	—	4 at -2.5%			FR954X	503A	299 (136)		Y48J28T15CUSS4X ②
30	2 at +2.5%	4 at -2.5%			FR2434X	84A	602 (273)		Y48M28T30CUSS4X
45	2 at +2.5%	4 at -2.5%			FR2444X		829 (376)		Y48M28T45CUSS4X
75	2 at +2.5%	4 at -2.5%			FR2454X		1452 (659)		Y48M28T75CUSS4X ③

Notes

① Grade 316 stainless steel standard. Grade 304 stainless steel available as an option. Replace suffix "S6" with suffix "SS."

② T-T (Scott T) connected.

③ Floor-mount only.

Contact your local Eaton sales office for voltage combinations not shown in the above table. Other voltages and custom features are available upon request.

Accessories

Please refer to Section 2.7 **Page V2-T2-170**.

Technical Data and Specifications

Frequency

Eaton standard dry-type distribution transformers are designed for 60 Hz operation. Transformers required for other frequencies are available and must be specifically designed.

Overload Capability

Short-term overload is designed into transformers as required by IEEE. Dry-type distribution transformers will deliver 200% nameplate load for one-half hour, 150% load for one hour and 125% load for four hours without being damaged, provided that a constant 50% load precedes and follows the overload. See IEEE C57.96 *IEEE Guide for Loading Dry-Type Distribution and Power Transformers* for additional limitations.

Continuous overload capacity is not deliberately designed into a transformer because the design objective is to be within the allowed winding temperature rise with nameplate loading.

Insulation System and Temperature Rise

Industry standards classify insulation systems and rise as shown below:

Insulation System Classification

Ambient	+ Winding Rise	+ Hot Spot	= Temp. Class
40 °C	55 °C	10 °C	105 °C
40 °C	80 °C	30 °C	150 °C
25 °C	135 °C	20 °C	180 °C
40 °C	115 °C	30 °C	185 °C
40 °C	150 °C	30 °C	220 °C

The design life of transformers having different insulation systems is the same—the lower-temperature systems are designed for the same life as the higher-temperature systems.

Enclosures

Eaton encapsulated transformer types EP and EPT use a NEMA 3R rated enclosure as standard. NEMA 4X enclosures (Grade 304 or 316 stainless steel) are available as an option.

Winding Terminations

Primary and secondary windings are terminated in the wiring compartment. Encapsulated units have copper leads or stabs brought out for connections. Eaton recommends that external cables be rated 90 °C (sized at 75 °C ampacity) for encapsulated designs.

Series-Multiple Windings

Series-multiple windings consist of two similar coils in each winding that can be connected in series or parallel (multiple). Transformers with series-multiple windings are designated with an “x” or “/” between the voltage ratings, such as voltages of “120/240” or “240 x 480.” If the series-multiple winding is designated by an “x,” the winding can be connected only for a series or parallel. With the “/” designation, a mid-point also becomes available in addition to the series or parallel connection. As an example, a 120 x 240 winding can be connected for either 120 (parallel) or 240 (series), but a 120/240 winding can be connected for 120 (parallel), 240 (series) or 240 with a 120 mid-point.

Sound Levels

All Eaton 600 volt class general-purpose dry-type distribution transformers are designed to meet NEMA ST-20 sound levels listed here. These are the sound levels measured in a soundproof environment. Actual sound levels measured at an installation will likely be higher due to electrical connections and environmental conditions.

Lower sound levels are available and should be specified when the transformer is going to be installed in an area where sound may be a concern.

For additional information, please refer to Section 2.7 **Page V2-T2-174**.

Average Sound Levels

NEMA ST-20 Average Sound Level, dB

Equivalent Winding kVA Range	Self-Cooled Ventilated (up to 1.2 kV)		Encapsulated (up to 1.2 kV)
	K-Factor 1, 4, 9	K-Factor 13, 20	
3.00 and below	40	40	45
3.01 to 9.00	40	40	45
9.01 to 15.00	45	45	50
15.01 to 30.00	45	45	50
30.01 to 50.00	45	48	50
50.01 to 75.00	50	53	55
75.01 to 112.50	50	53	55
112.51 to 150.00	50	53	55
150.01 to 225.00	55	58	57
225.01 to 300.00	55	58	57
300.01 to 500.00	60	63	59
500.01 to 700.00	62	65	61
700.01 to 1000.00	64	67	63
Greater than 1000	Consult factory	Consult factory	Consult factory

Note

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Distribution Transformers

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Motor Drive Isolation Transformers

Product Description

Note: The following pages provide listings for most standard transformer ratings and catalog numbers. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

- Suitable for indoor or outdoor applications (with weathershield)
- Ventilated enclosures
- 220 °C insulation system
- 150 °C rise standard (self extinguishing), 115 °C or 80 °C rise optional
- Available in ratings from 7.5 through 1500 kVA
- Motor drive isolation transformers are specifically excluded from the scope of U.S. DOE energy efficiency requirements

Application Description

Drive isolation transformers are specifically designed for use with AC and DC adjustable speed drives. Two winding drive isolation transformers provide:

- Electrical isolation between the incoming line and the drive circuitry
- Voltage conversion of input line to standard drive input voltages
- Minimized line disturbances caused by silicon controlled rectifiers (SCR) firing
- Reduced short-circuit currents and voltage line transients

Drive isolation transformers are specifically sized to the drive kVA requirements and are braced to withstand the mechanical stresses of current reversals and short circuits associated with SCR drives.

Features, Benefits and Functions

- 60 Hz operation (50/60 Hz operation available)
- Short-term overload capability as required by IEEE
- Primary and secondary terminals are front accessible for fast and easy connection
- Slotted screw mounting holes in enclosure and cover reduce installation time
- Sound dampening pads, which isolate the core and coil from the case, reduce noise levels to meet NEMA ST-20
- Core laminations of precision sheared silicon steel are hand stacked to ensure quiet operation
- Terminations are clearly marked for easy identification
- Three-phase transformers have one, 5% full capacity tap above and below nominal voltage for incoming source adjustment
- Units are suitable for continuous operation in a 40 °C ambient maximum
- Full current neutral
- Thermoguard protection embedded in coils of three-phase models to indicate that high temperatures (approximately 190 °C) are present. Thermoguards consist of a set of NC dry contacts
- Three coil delta-wye configurations are used throughout the product line

Standards and Certifications

- IEEE C89.2
- NEMA ST-20
- UL 506
- UL 1561



Seismic Qualified

All Eaton manufactured dry-type distribution transformers are seismically qualified and exceed requirements of the International Building Code (IBC) and California Code Title 24.

Catalog Number Selection

Please refer to Section 2.7 **Page V2-T2-165**.

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Product Selection

Additional Product Selection information begins on **Page V2-T2-168**.

Three-Phase Drive Isolation**208 Delta Volts to 460Y/266 Volts**

hp	kVA	Full Capacity Taps		°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
		FCAN	FCBN						
5	7.5	1 at +5%	1 at -5%	150	FR912D	347B	158 (72)	WS38	MD075E86
7.5	11				FR912D		176 (80)	WS38	MD11E86
10	14				FR912D		149 (68)	WS38	MD14E86
15	20				FR912D		240 (19)	WS38	MD20E86
20	27				FR912D		231 (15)	WS38	MD27E86
25	34				FR912D		310 (141)	WS38	MD34E86
30	40				FR912D		307 (139)	WS38	MD40E86
40	51				FR914D		480 (218)	WS39	MD51E86
50	63				FR914D		485 (220)	WS39	MD63E86
60	75				FR914D		482 (219)	WS39	MD75E86
75	93				FR915D		600 (272)	WS39	MD93E86
100	118				FR916A		658 (299)	WS19	MD118E86
125	145				FR916A		770 (350)	WS19	MD145E86
150	175				FR918A	321B	1320 (599)	WS34	MD175E86
200	220				FR918A		1436 (652)	WS34	MD220E86
250	275				FR918A		①	WS34	MD275E86
300	330				FR919E		①	WS35	MD330E86
400	440				FR920E		①	WS35	MD440E86

Notes

① Contact Eaton.

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase Drive Isolation

230 Delta Volts to 230Y/133 Volts

hp	kVA	Full Capacity Taps		°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
		FCAN	FCBN						
5	7.5	1 at +5%	1 at -5%	150	FR912D	286A	158 (72)	WS38	MD075E88
7.5	11				FR912D		156 (71)	WS38	MD11E88
10	14				FR912D		158 (72)	WS38	MD14E88
15	20				FR912D		216 (98)	WS38	MD20E88
20	27				FR912D		231 (105)	WS38	MD27E88
25	34				FR912D		310 (141)	WS38	MD34E88
30	40				FR912D		310 (141)	WS38	MD40E88
40	51				FR914D		480 (218)	WS39	MD51E88
50	63				FR914D		500 (227)	WS39	MD63E88
60	75				FR914D		538 (244)	WS39	MD75E88
75	93				FR915D		600 (272)	WS39	MD93E88
100	118				FR915D		600 (272)	WS39	MD118E88
125	145				FR916A		868 (394)	WS19	MD145E88
150	175				FR918A	318D	1320 (599)	WS34	MD175E88
200	220				FR918A		1332 (605)	WS34	MD220E88
250	275				FR918A		1350 (613)	WS34	MD275E88
300	330				FR919E		2336 (1061)	WS35	MD330E88
400	440				FR920E		①	WS35	MD440E88

230 Delta Volts to 460Y/266 Volts

hp	kVA	Full Capacity Taps		°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
		FCAN	FCBN						
5	7.5	1 at +5%	1 at -5%	150	FR912D	347A	158 (72)	WS38	MD075E89
7.5	11				FR912D		158 (72)	WS38	MD11E89
10	14				FR912D		158 (72)	WS38	MD14E89
15	20				FR912D		254 (115)	WS38	MD20E89
20	27				FR912D		231 (105)	WS38	MD27E89
25	34				FR912D		310 (141)	WS38	MD34E89
30	40				FR912D		344 (156)	WS38	MD40E89
40	51				FR914D		480 (218)	WS39	MD51E89
50	63				FR914D		457 (207)	WS39	MD63E89
60	75				FR914D		480 (218)	WS39	MD75E89
75	93				FR915D		600 (272)	WS39	MD93E89
100	118				FR916A		941 (427)	WS19	MD118E89
125	145				FR916A		770 (350)	WS19	MD145E89
150	175				FR918A	321A	1326 (602)	WS34	MD175E89
200	220				FR918A		1332 (605)	WS34	MD220E89
250	275				FR918A		1350 (613)	WS34	MD275E89
300	330				FR919E		2400 (1090)	WS35	MD330E89
400	440				FR920E		①	WS35	MD440E89

Notes

① Contact Eaton.

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase Drive Isolation**460 Delta Volts to 230Y/133 Volts**

hp	kVA	Full Capacity Taps		°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
		FCAN	FCBN						
5	7.5	1 at +5%	1 at -5%	150	FR912D	286D	193 (88)	WS38	MD075E91
7.5	11				FR912D		158 (72)	WS38	MD11E91
10	14				FR912D		158 (72)	WS38	MD14E91
15	20				FR912D		216 (98)	WS38	MD20E91
20	27				FR912D		231 (105)	WS38	MD27E91
25	34				FR912D		340 (154)	WS38	MD34E91
30	40				FR912D		339 (154)	WS38	MD40E91
40	51				FR914D		535 (243)	WS39	MD51E91
50	63				FR914D		480 (218)	WS39	MD63E91
60	75				FR914D		469 (213)	WS39	MD75E91
75	93				FR915D		727 (330)	WS39	MD93E91
100	118				FR916A		770 (350)	WS19	MD118E91
125	145				FR916A		770 (350)	WS19	MD145E91
150	175				FR917		1100 (499)	WS34	MD175E91
200	220				FR918A		1299 (590)	WS34	MD220E91
250	275				FR918A		1596 (725)	WS34	MD275E91
300	330				FR919E	318E	2234 (1014)	WS35	MD330E91
400	440				FR919E		2400 (1090)	WS35	MD440E91

460 Delta Volts to 400Y/231 Volts

hp	kVA	Full Capacity Taps		°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
		FCAN	FCBN						
5	7.5	1 at +5%	1 at -5%	150	FR912D	286D	193 (88)	WS38	MD075E75
7.5	11				FR912D		158 (72)	WS38	MD11E75
10	14				FR912D		158 (72)	WS38	MD14E75
15	20				FR912D		216 (98)	WS38	MD20E75
20	27				FR912D		231 (105)	WS38	MD27E75
25	34				FR912D		340 (154)	WS38	MD34E75
30	40				FR912D		339 (154)	WS38	MD40E75
40	51				FR914D		535 (243)	WS39	MD51E75
50	63				FR914D		480 (218)	WS39	MD63E75
60	75				FR914D		469 (213)	WS39	MD75E75
75	93				FR915D		727 (330)	WS39	MD93E75
100	118				FR916A		770 (350)	WS19	MD118E75
125	145				FR916A		770 (350)	WS19	MD145E75
150	175				FR917		1100 (499)	WS34	MD175E75
200	220				FR918A		1299 (590)	WS34	MD220E75
250	275				FR918A		1596 (725)	WS34	MD275E75
300	330				FR919E	318E	2234 (1014)	WS35	MD330E75
400	440				FR919E		2400 (1090)	WS35	MD440E75

Note

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase Drive Isolation

460 Delta Volts to 460Y/266 Volts

hp	kVA	Full Capacity Taps		°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
		FCAN	FCBN						
5	7.5	1 at +5%	1 at -5%	150	FR912D	286D	164 (74)	WS38	MD075E92
7.5	11				FR912D		161 (73)	WS38	MD11E92
10	14				FR912D		173 (79)	WS38	MD14E92
15	20				FR912D		231 (105)	WS38	MD20E92
20	27				FR912D		250 (114)	WS38	MD27E92
25	34				FR912D		310 (141)	WS38	MD34E92
30	40				FR912D		310 (141)	WS38	MD40E92
40	51				FR914D		503 (228)	WS39	MD51E92
50	63				FR914D		535 (243)	WS39	MD63E92
60	75				FR914D		535 (243)	WS39	MD75E92
75	93				FR916A		710 (322)	WS19	MD93E92
100	118				FR916A		770 (350)	WS19	MD118E92
125	145				FR916A		866 (393)	WS19	MD145E92
150	175				FR917		1100 (499)	WS34	MD175E92
200	220				FR918A		1100 (499)	WS34	MD220E92
250	275				FR918A		1469 (667)	WS34	MD275E92
300	330				FR919E	318E	2587 (1174)	WS35	MD330E92
400	440				FR919E		2500 (1135)	WS35	MD440E92

Note

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase Drive Isolation**480 Delta Volts to 240 Delta Volts**

hp	kVA	Full Capacity Taps		°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
		FCAN	FCBN						
5	7.5	1 at +5%	1 at -5%	150	FR912D	300A	193 (88)	WS38	MD075E77
7.5	11				FR912D		158 (72)	WS38	MD11E77
10	14				FR912D		158 (72)	WS38	MD14E77
15	20				FR912D		185 (84)	WS38	MD20E77
20	27				FR912D		231 (105)	WS38	MD27E77
25	34				FR912D		329 (149)	WS38	MD34E77
30	40				FR912D		339 (154)	WS38	MD40E77
40	51				FR914D		535 (243)	WS39	MD51E77
50	63				FR914D		480 (218)	WS39	MD63E77
60	75				FR914D		469 (213)	WS39	MD75E77
75	93				FR915D		727 (330)	WS39	MD93E77
100	118				FR916A		770 (350)	WS19	MD118E77
125	145				FR916A		770 (350)	WS19	MD145E77
150	175				FR917		1100 (499)	WS34	MD175E77
200	220				FR918A		1299 (590)	WS34	MD220E77
250	275				FR918A		1596 (725)	WS34	MD275E77
300	330				FR919E	348D	2234 (1014)	WS35	MD330E77
400	440				FR919E		2400 (1090)	WS35	MD440E77

480 Delta Volts to 480 Delta Volts

hp	kVA	Full Capacity Taps		°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
		FCAN	FCBN						
5	7.5	1 at +5%	1 at -5%	150	FR912D	300A	193 (88)	WS38	MD075E99
7.5	11				FR912D		158 (72)	WS38	MD11E99
10	14				FR912D		158 (72)	WS38	MD14E99
15	20				FR912D		185 (84)	WS38	MD20E99
20	27				FR912D		231 (105)	WS38	MD27E99
25	34				FR912D		329 (149)	WS38	MD34E99
30	40				FR912D		339 (154)	WS38	MD40E99
40	51				FR914D		535 (243)	WS39	MD51E99
50	63				FR914D		480 (218)	WS39	MD63E99
60	75				FR914D		469 (213)	WS39	MD75E99
75	93				FR915D		727 (330)	WS39	MD93E99
100	118				FR916A		770 (350)	WS19	MD118E99
125	145				FR916A		770 (350)	WS19	MD145E99
150	175				FR917		1100 (499)	WS34	MD175E99
200	220				FR918A		1299 (590)	WS34	MD220E99
250	275				FR918A		1596 (725)	WS34	MD275E99
300	330				FR919E	348D	2234 (1014)	WS35	MD330E99
400	440				FR919E		2400 (1090)	WS35	MD440E99

Note

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase Drive Isolation

575 Delta Volts to 460Y/266 Volts

hp	kVA	Full Capacity Taps		°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
		FCAN	FCBN						
5	7.5	1 at +5%	1 at -5%	150	FR912D	286H	158 (72)	WS38	MD075E95
7.5	11				FR912D		158 (72)	WS38	MD11E95
10	14				FR912D		158 (72)	WS38	MD14E95
15	20				FR912D		272 (123)	WS38	MD20E95
20	27				FR912D		266 (121)	WS38	MD27E95
25	34				FR912D		360 (163)	WS38	MD34E95
30	40				FR912D		310 (141)	WS38	MD40E95
40	51				FR914D		504 (229)	WS39	MD51E95
50	63				FR914D		506 (230)	WS39	MD63E95
60	75				FR914D		524 (238)	WS39	MD75E95
75	93				FR916A		730 (331)	WS19	MD93E95
100	118				FR916A		770 (350)	WS19	MD118E95
125	145				FR916A		770 (350)	WS19	MD145E95
150	175				FR917		1282 (582)	WS34	MD175E95
200	220				FR917		1201 (545)	WS34	MD220E95
250	275				FR923	318F	702 (319)	WS37	MD275E95
300	330				FR919E		2263 (1027)	WS35	MD330E95
400	440				FR919E		2400 (1090)	WS35	MD440E95

575 Delta Volts to 575Y/332 Volts

hp	kVA	Full Capacity Taps		°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Weathershield	Catalog Number
		FCAN	FCBN						
5	7.5	1 at +5%	1 at -5%	150	FR912D	286H	158 (72)	WS38	MD075E96
7.5	11				FR912D		158 (72)	WS38	MD11E96
10	14				FR912D		231 (105)	WS38	MD14E96
15	20				FR912D		231 (105)	WS38	MD20E96
20	27				FR912D		231 (105)	WS38	MD27E96
25	34				FR912D		261 (118)	WS38	MD34E96
30	40				FR912D		310 (141)	WS38	MD40E96
40	51				FR914D		480 (218)	WS39	MD51E96
50	63				FR914D		500 (227)	WS39	MD63E96
60	75				FR914D		538 (244)	WS39	MD75E96
75	93				FR916A		600 (272)	WS19	MD93E96
100	118				FR916A		948 (430)	WS19	MD118E96
125	145				FR916A		868 (394)	WS19	MD145E96
150	175				FR917		1320 (599)	WS34	MD175E96
200	220				FR917		1332 (605)	WS34	MD220E96
250	275				FR918A	318F	1350 (613)	WS34	MD275E96
300	330				FR919E		2336 (1061)	WS35	MD330E96
400	440				FR919E		2500 (1137)	WS35	MD440E96

Note

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Motor Drive Isolation Transformers

Accessories

- Copper windings
 - Non-standard voltages
 - 50/60 Hz designs
 - Delta-delta configuration
 - 80 °C or 115 °C rise designs
 - Encapsulated designs (up to 34 kVA). Thermoguards are not available on encapsulated designs
 - Totally enclosed non-ventilated
 - Electrostatic shields
- Please refer to Section 2.7 **Page V2-T2-170.**

Technical Data and Specifications

Frequency

Eaton standard dry-type distribution transformers are designed for 60 Hz operation. Transformers required for other frequencies are available and must be specifically designed.

Overload Capability

Short-term overload is designed into transformers as required by IEEE. Dry-type distribution transformers will deliver 200% nameplate load for one-half hour, 150% load for one hour and 125% load for four hours without being damaged, provided that a constant 50% load precedes and follows the overload. See IEEE C57.96 *IEEE Guide for Loading Dry-Type Distribution and Power Transformers* for additional limitations.

Continuous overload capacity is not deliberately designed into a transformer because the design objective is to be within the allowed winding temperature rise with nameplate loading.

Insulation System and Temperature Rise

Industry standards classify insulation systems and rise as shown below:

Insulation System Classification

Ambient	+ Winding Rise	+ Hot Spot	= Temp. Class
40 °C	55 °C	10 °C	105 °C
40 °C	80 °C	30 °C	150 °C
25 °C	135 °C	20 °C	180 °C
40 °C	115 °C	30 °C	185 °C
40 °C	150 °C	30 °C	220 °C

The design life of transformers having different insulation systems is the same—the lower-temperature systems are designed for the same life as the higher-temperature systems.

Enclosures

Eaton ventilated transformers, Type MD, use a NEMA 2 rated (drip-proof) enclosure as standard, and are rated NEMA 3R with the addition of weathershields.

Winding Terminations

Primary and secondary windings are terminated in the wiring compartment. Ventilating transformers have leads brought out to aluminum pads that are pre-drilled to accept Cu/Al lugs. **Lugs are not supplied with these transformers.** Eaton recommends that external cables be rated 75 °C for ventilated designs.

Sound Levels

All Eaton 600 volt class general-purpose dry-type distribution transformers are designed to meet NEMA ST-20 sound levels listed here. These are the sound levels measured in a soundproof environment. Actual sound levels measured at an installation will likely be higher due to electrical connections and environmental conditions. Lower sound levels are available and should be specified when the transformer is going to be installed in an area where sound may be a concern.

For additional information, please refer to Section 2.7 **Page V2-T2-174.**

Average Sound Levels

NEMA ST-20 Average Sound Level, dB

Equivalent Winding kVA Range	Self-Cooled Ventilated (up to 1.2 kV)		Encapsulated (up to 1.2 kV)
	K-Factor 1, 4, 9	K-Factor 13, 20	
3.00 and below	40	40	45
3.01 to 9.00	40	40	45
9.01 to 15.00	45	45	50
15.01 to 30.00	45	45	50
30.01 to 50.00	45	48	50
50.01 to 75.00	50	53	55
75.01 to 112.50	50	53	55
112.51 to 150.00	50	53	55
150.01 to 225.00	55	58	57
225.01 to 300.00	55	58	57
300.01 to 500.00	60	63	59
500.01 to 700.00	62	65	61
700.01 to 1000.00	64	67	63
Greater than 1000	Consult factory	Consult factory	Consult factory

Note

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Mini-Power Centers



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Mini-Power Centers

Product Description

Note: The following pages provide listings for most standard transformer ratings and catalog numbers. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

- A mini-power center combines three individual components into one NEMA 3R or 4X enclosure
 - Primary main breaker
 - Encapsulated single-phase EP or three-phase EPT transformer
 - Secondary distribution loadcenter or panelboard with main breaker

Note: All interconnecting wiring is performed at the factory.

- Sand and resin encapsulated core-coil assembly
- Suitable for indoor or outdoor applications
- 180 °C insulation system
- 115 °C rise standard; 80 °C rise optional
- Standard NEMA 3R indoor/outdoor enclosure ANSI 61 gray color; 316 Grade stainless steel NEMA 3R and NEMA 4X optional
- Mini-power centers are encapsulated transformers and are outside the scope of U.S. DOE energy efficiency requirements

Application Description

Mini-power centers are used wherever there is a 480 V or 600 V distribution system and loads requiring 208Y/120 V, three-phase or 120/240 V single-phase. Typical installations include:

- Industrial plant assembly lines
- Plant expansions
- Test equipment
- Temporary construction site power
- Sewage disposal plants
- Warehouses
- Car washes
- Parking lots
- Commercial buildings
- Food processing
- Petrochemical
- Water treatment facilities
- Irrigation systems

For harsh environment applications, NEMA 4X stainless steel products are recommended.

Features, Benefits and Functions

- 60 Hz operation
- Indoor/outdoor, NEMA 3R or NEMA 4X wall-mount enclosure
- Primary main circuit breakers type PDG2_F that have an interrupting rating of 25 kAIC at 480 Vac and 18 kAIC at 600 Vac
- Primary main circuit breakers with greater AIC ratings available are type PDG2_M for 65 kAIC at 480 V; 25 kAIC at 600 V or type PDG2_P for 100 kAIC at 480 V; 35 kAIC at 600 V
- Secondary main circuit breaker rated at maximum ampacity allowed by NEC (branch circuit breakers Type BR plug-in or BAB bolt-on are not included)
- Plug-on loadcenter interior accepts branch circuit breakers of Type BR family; bolt-on loadcenter interior accepts branch circuit breakers of Type BAB family
- All live parts enclosed for personnel safety
- Cover is hinged to prevent removal and can be padlocked
- Cores are grounded with a copper lead
- Ground bar is supplied to permit grounding of individual secondary circuits
- Neutral bar is grounded to case
- Branch circuits can be easily added or changed using Type BR plug-in breakers and Type BAB bolt-on
- Suitable for service entrance
- Wide range of configurations available:
 - Aluminum windings and plug-in loadcenter chassis standard
 - Copper windings and plug-in loadcenter chassis available
 - Copper windings and bolt-on loadcenter chassis available
- Short-term overload capability as required by IEEE
- Meet NEMA ST-20 sound levels

Standards and Certifications

- UL listed
- CSA certified

**Industry Standards**

All Eaton dry-type distribution and control transformers are built and tested in accordance with applicable NEMA and IEEE standards. All 600 V class transformers are UL listed unless otherwise noted.

IEEE Seismically Qualified

Eaton manufactured mini-power centers in NEMA 3R enclosures are seismically qualified and exceed requirements of the International Building Code (IBC) and California Code Title 24. See technical data TD009002EN.

Catalog Number Selection

Please refer to Section 2.7
Page V2-T2-165.

Product Selection

Additional Product Selection information begins on **Page V2-T2-168**.

Single-Phase

480 Volts to 120/240 Volts

kVA	Full Capacity Taps FCBN	Frame	Wiring Diagram Number	Weight Lb (kg)	Main Circuit Breaker		Branch Breakers Max. Number ^{②③}			Max. Amp	Catalog Number
					Primary ^①	Secondary	Single-Pole	Two-Pole	Three-Pole		
3	2 at -5%	FR284	M48G11C	120 (55)	PDG22F0015TFFJ	BR215	12	6		12	P48G11S0312
5	2 at -5%	FR284	M48G11D	166 (76)	PDG22F0020TFFJ	BR225	12	6		20	P48G11S0512
7.5	2 at -5%	FR284	M48G11E	185 (84)	PDG22F0030TFFJ	BR230	12	6		30	P48G11S0712
10	2 at -5%	FR286	M48G11G	275 (125)	PDG22F0040TFFJ	BR250	20	10		40	P48G11S1020
15	2 at -5%	FR287	M48G11H	415 (189)	PDG22F0060TFFJ	BR270	26	13		60	P48G11S1526
25	2 at -5%	FR287	M48G11K	426 (194)	PDG22F0100TFFJ	BR2125	26	13		100	P48G11S2526

600 Volts to 120/240 Volts

kVA	Full Capacity Taps FCBN	Frame	Wiring Diagram Number	Weight Lb (kg)	Main Circuit Breaker		Branch Breakers Max. Number ^{②③}			Max. Amp	Catalog Number
					Primary ^①	Secondary	Single-Pole	Two-Pole	Three-Pole		
5	2 at -5%	FR284	M60G11D	143 (65)	PDG22F0015TFFJ	BR225	12	6		20	P60G11S0512
7.5	2 at -5%	FR284	M60G11E	156 (71)	PDG22F0030TFFJ	BR230	12	6		30	P60G11S0712
10	2 at -5%	FR286	M60G11G	238 (108)	PDG22F0040TFFJ	BR250	20	10		40	P60G11S1020
15	2 at -5%	FR287	M60G11H	427 (195)	PDG22F0060TFFJ	BR270	26	13		60	P60G11S1526
25	2 at -5%	FR287	M60G11K	430 (195)	PDG22F0100TFFJ	BR2125	26	13		100	P60G11S2526

Three-Phase

480 Delta Volts to 208Y/120 Volts

kVA	Full Capacity Taps FCBN	Frame	Wiring Diagram Number	Weight Lb (kg)	Main Circuit Breaker		Branch Breakers Max. Number ^{②③}			Max. Amp	Catalog Number
					Primary ^①	Secondary	Single-Pole	Two-Pole	Three-Pole		
15	2 at -5%	FR289B	M48G1H	420 (191)	PDG23F0040TFFJ	PDG23F0050TFFJ	18	9	6	40	P48G28T1518
22.5	2 at -5%	FR291B	M48G1J	615 (280)	PDG23F0070TFFJ	PDG23F0070TFFJ	24	12	8	60	P48G28T1214
30	2 at -5%	FR291B	M48G1L	731 (332)	PDG23F0090TFFJ	PDG23F0100TFFJ	24	12	8	80	P48G28T3024

600 Delta Volts to 208Y/120 Volts

kVA	Full Capacity Taps FCBN	Frame	Wiring Diagram Number	Weight Lb (kg)	Main Circuit Breaker		Branch Breakers Max. Number ^{②③}			Max. Amp	Catalog Number
					Primary ^①	Secondary	Single-Pole	Two-Pole	Three-Pole		
15	2 at -5%	FR289B	M60G1H	414 (188)	PDG23F0030TFFJ	PDG23F0050TFFJ	18	9	6	40	P60G28T1518
22.5	2 at -5%	FR291B	M60G1J	623 (283)	PDG23F0050TFFJ	PDG23F0070TFFJ	24	12	8	60	P60G28T1214
30	2 at -5%	FR291B	M60G1L	734 (334)	PDG23F0070TFFJ	PDG23F0100TFFJ	24	12	8	80	P60G28T3024

Notes

① Primary breakers with higher interrupting capacity available. See Transformer Standards, Technical Data and Accessories section.
Secondary main breakers are fixed only. No substitutes for ampere rating.

② Combinations can be selected.

③ Branch breakers not included. Use Eaton's Type BR.

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel 304 and 316 grades), refer to Transformer Standards, Technical Data and Accessories section. Frame drawings/dimensions information begins on **Page V2-T2-207**.

All Copper, Bolt-On Breaker Designs—Single-Phase**480 Volts to 120/240 Volts**

kVA	Full Capacity Taps FCBN	Frame	Wiring Diagram Number	Weight Lb (kg)	Main Circuit Breaker		Branch Breakers Max. Number ⁽²⁾⁽³⁾			Max. Amp	Catalog Number
					Primary ⁽¹⁾	Secondary	Single-Pole	Two-Pole			
3	2 at -5%	FR307	M48G11CB	38 (63)	PDG22F0015TFFJ	BAB2015	18	9		12	P48G11S0318CUB
5	2 at -5%	FR307	M48G11DB	175 (80)	PDG22F0020TFFJ	BAB2025	18	9		20	P48G11S0518CUB
7.5	2 at -5%	FR307	M48G11EB	175 (80)	PDG22F0030TFFJ	BAB2030	18	9		30	P48G11S0718CUB
10	2 at -5%	FR309	M48G11GB	371 (169)	PDG22F0040TFFJ	BAB2050	24	12		40	P48G11S1024CUB
15	2 at -5%	FR310	M48G11HB	568 (258)	PDG22F0060TFFJ	BAB2070	30	15		60	P48G11S1530CUB
25	2 at -5%	FR310	M48G11KB	585 (266)	PDG22F0100TFFJ	BAB2125	30	15		100	P48G11S2530CUB

600 Volts to 120/240 Volts

kVA	Full Capacity Taps FCBN	Frame	Wiring Diagram Number	Weight Lb (kg)	Main Circuit Breaker		Branch Breakers Max. Number ⁽²⁾⁽³⁾			Max. Amp	Catalog Number
					Primary ⁽¹⁾	Secondary	Single-Pole	Two-Pole			
3	2 at -5%	FR307	M60G11CB	155 (70)	PDG22F0015TFFJ	BAB2015	18	9		12	P60G11S0318CUB
5	2 at -5%	FR307	M60G11DB	170 (77)	PDG22F0020TFFJ	BAB2025	18	9		20	P60G11S0518CUB
7.5	2 at -5%	FR307	M60G11EB	183 (84)	PDG22F0030TFFJ	BAB2030	18	9		30	P60G11S0718CUB
10	2 at -5%	FR309	M60G11GB	229 (104)	PDG22F0040TFFJ	BAB2050	24	12		40	P60G11S1024CUB
15	2 at -5%	FR310	M60G11HB	560 (255)	PDG22F0060TFFJ	BAB2070	30	15		60	P60G11S1530CUB
25	2 at -5%	FR310	M60G11KB	594 (270)	PDG22F0100TFFJ	BAB2125	30	15		100	P60G11S2530CUB

Three-Phase**480 Volts to 208Y/120 Volts**

kVA	Full Capacity Taps FCBN	Frame	Wiring Diagram Number	Weight Lb (kg)	Main Circuit Breaker		Branch Breakers Max. Number ⁽²⁾⁽³⁾			Max. Amp	Catalog Number
					Primary ⁽¹⁾	Secondary	Single-Pole	Two-Pole	Three-Pole		
15	2 at -5%	FR289B	M48G1H	408 (186)	PDG23F0040TFFJ	BAB3050H	18	9	6	40	P48G28T1518CUB
22.5	2 at -5%	FR291B	M48G1J	656 (298)	PDG23F0070TFFJ	BAB3070H	24	12	6	60	P48G28T2124CUB
30	2 at -5%	FR291B	M48G1L	685 (311)	PDG23F0090TFFJ	BAB3100H	24	12	8	80	P48G28T3024CUB

600 Volts to 208Y/120 Volts

kVA	Full Capacity Taps FCBN	Frame	Wiring Diagram Number	Weight Lb (kg)	Main Circuit Breaker		Branch Breakers Max. Number ⁽²⁾⁽³⁾			Max. Amp	Catalog Number
					Primary ⁽¹⁾	Secondary	Single-Pole	Two-Pole	Three-Pole		
15	2 at -5%	FR289B	M60G1H	408 (186)	PDG23F0030TFFJ	BAB3050H	18	9	6	40	P60G28T1518CUB
22.5	2 at -5%	FR291B	M60G1J	656 (298)	PDG23F0050TFFJ	BAB3070H	24	12	6	60	P60G28T2124CUB
30	2 at -5%	FR291B	M60G1L	698 (317)	PDG23F0070TFFJ	BAB3100H	24	12	8	80	P60G28T3024CUB

Notes

⁽¹⁾ Primary breakers with higher interrupting capacity available. See Transformer Standards, Technical Data and Accessories section. Secondary main breakers are fixed only. No substitutes for ampere rating. UL Listed only, not CSA.

⁽²⁾ Combinations can be selected.

⁽³⁾ Branch breakers not included. Use Eaton's Type BAB.

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel 304 and 316 grades), refer to Transformer Standards, Technical Data and Accessories section. Frame drawings/dimensions information begins on **Page V2-T2-207**.

**NEMA Type 4X Single-Phase, Plug-In Mini-Power Center, 60 Hz, Grade 316 Stainless Steel
(Aluminum-Wound Transformer and Loadcenter Chassis Standard)**

480 Volts to 120/240 Volts

kVA	Full Capacity Taps FCBN	Frame	Wiring Diagram Number	Weight Lb (kg)	Main Circuit Breaker		Branch Breakers Max. Number ⁽²⁾⁽³⁾			Max. Amp	Catalog Number
					Primary ⁽¹⁾	Secondary	Single-Pole	Two-Pole	Three-Pole		
3	2 at -5%	FR2854X	M48G11C	306 (139)	PDG22F0015TFFJ	BR215	12	6	12		P48G11S0312S64X
5	2 at -5%	FR2854X	M48G11D	306 (139)	PDG22F0020TFFJ	BR225	12	6	20		P48G11S0512S64X
7.5	2 at -5%	FR2854X	M48G11E	306 (139)	PDG22F0030TFFJ	BR230	12	6	30		P48G11S0712S64X
10	2 at -5%	FR2874X	M48G11G	546 (248)	PDG22F0040TFFJ	BR250	20	10	40		P48G11S1020S64X
15	2 at -5%	FR2874X	M48G11H	546 (248)	PDG22F0060TFFJ	BR270	26	13	60		P48G11S1526S64X
25	2 at -5%	FR2874X	M48G11K	546 (248)	PDG22F0100TFFJ	BR2125	26	13	100		P48G11S2526S64X

600 Volts to 120/240 Volts

kVA	Full Capacity Taps FCBN	Frame	Wiring Diagram Number	Weight Lb (kg)	Main Circuit Breaker		Branch Breakers Max. Number ⁽²⁾⁽³⁾			Max. Amp	Catalog Number
					Primary ⁽¹⁾	Secondary	Single-Pole	Two-Pole	Three-Pole		
5	2 at -5%	FR2854X	M60G11D	306 (139)	PDG22F0015TFFJ	BR225	12	6	20		P60G11S0512S64X
7.5	2 at -5%	FR2854X	M60G11E	306 (139)	PDG22F0030TFFJ	BR230	12	6	30		P60G11S0712S64X
10	2 at -5%	FR2874X	M60G11G	546 (248)	PDG22F0040TFFJ	BR250	20	10	40		P60G11S1020S64X
15	2 at -5%	FR2874X	M60G11H	546 (248)	PDG22F0060TFFJ	BR270	26	13	60		P60G11S1526S64X
25	2 at -5%	FR2874X	M60G11K	546 (248)	PDG22F0100TFFJ	BR2125	26	13	100		P60G11S2526S64X

**NEMA Type 4X Plug-In, Three-Phase, Mini-Power Center, 60 Hz, Grade 316 Stainless Steel
(Aluminum-Wound Transformer and Loadcenter Chassis Standard)**

480 Delta Volts to 208Y/120 Volts

kVA	Full Capacity Taps FCBN	Frame	Wiring Diagram Number	Weight Lb (kg)	Main Circuit Breaker		Branch Breakers Max. Number ⁽²⁾⁽³⁾			Max. Amp	Catalog Number
					Primary ⁽¹⁾	Secondary	Single-Pole	Two-Pole	Three-Pole		
15	2 at -5%	FR2914X	M48G11HB	728 (330)	PDG23F0040TFFJ	PDG23F0050TFFJ	24	12	8	40	P48G28T1524S64X
22.5	2 at -5%	FR2914X	M48G11J	728 (330)	PDG23F0070TFFJ	PDG23F0070TFFJ	24	12	8	60	P48G28T2124S64X
30	2 at -5%	FR2914X	M48G11L	728 (330)	PDG23F0090TFFJ	PDG23F0100TFFJ	24	12	8	80	P48G28T3024S64X

600 Delta Volts to 208Y/120 Volts

kVA	Full Capacity Taps FCBN	Frame	Wiring Diagram Number	Weight Lb (kg)	Main Circuit Breaker		Branch Breakers Max. Number ⁽²⁾⁽³⁾			Max. Amp	Catalog Number
					Primary ⁽¹⁾	Secondary	Single-Pole	Two-Pole	Three-Pole		
15	2 at -5%	FR2914X	M60G11H	728 (330)	PDG23F0030TFFJ	PDG23F0050TFFJ	24	12	8	40	P60G28T1524S64X
22.5	2 at -5%	FR2914X	M60G11J	728 (330)	PDG23F0050TFFJ	PDG23F0070TFFJ	24	12	8	60	P60G28T2124S64X
30	2 at -5%	FR2914X	M60G11L	728 (330)	PDG23F0070TFFJ	PDG23F0100TFFJ	24	12	8	80	P60G28T3024S64X

Notes

- ⁽¹⁾ Primary breakers with higher interrupting capacity available. See Transformer Standards, Technical Data and Accessories section.
- Secondary main breakers are fixed only. No substitutes for ampere rating.
- ⁽²⁾ Combinations can be selected.
- ⁽³⁾ Branch breakers not included. Use Eaton's Type BR.

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel 304 and 316 grades), refer to Transformer Standards, Technical Data and Accessories section. Frame drawings/dimensions information begins on **Page V2-T2-207**.

NEMA Type 4X Single-Phase, Bolt-On Mini-Power Center, 60 Hz, Grade 316 Stainless Steel (Copper-Wound Transformer and Loadcenter Chassis Standard)

480 Volts to 120/240 Volts

kVA	Full Capacity Taps FCBN	Frame	Wiring Diagram Number	Weight Lb (kg)	Main Circuit Breaker		Branch Breakers Max. Number ^{②③}			Max. Amp	Catalog Number
					Primary ^①	Secondary	Single-Pole	Two-Pole	Three-Pole		
3	2 at -5%	FR2874X	M48G11CB	340 (154)	PDG22F0015TFFJ	BAB2015	18	9	12	P48G11S0318CUBS64X	
5	2 at -5%	FR2874X	M48G11DB	340 (154)	PDG22F0020TFFJ	BAB2025	18	9	20	P48G11S0518CUBS64X	
7.5	2 at -5%	FR2874X	M48G11EB	340 (154)	PDG22F0030TFFJ	BAB2030	18	9	30	P48G11S0718CUBS64X	
10	2 at -5%	FR2874X	M48G11GB	340 (154)	PDG22F0040TFFJ	BAB2050	24	12	40	P48G11S1024CUBS64X	
15	2 at -5%	FR2914X	M48G11HB	650 (295)	PDG22F0060TFFJ	BAB2070	30	15	60	P48G11S1530CUBS64X	
25	2 at -5%	FR2914X	M48G11KB	650 (295)	PDG22F0100TFFJ	BAB2125	30	15	100	P48G11S2530CUBS64X	

600 Volts to 120/240 Volts

kVA	Full Capacity Taps FCBN	Frame	Wiring Diagram Number	Weight Lb (kg)	Main Circuit Breaker		Branch Breakers Max. Number ^{②③}			Max. Amp	Catalog Number
					Primary ^①	Secondary	Single-Pole	Two-Pole	Three-Pole		
3	2 at -5%	FR2874X	M60G11CB	340 (154)	PDG22F0015TFFJ	BAB2015	18	9	12	P60G11S0318CUBS64X	
5	2 at -5%	FR2874X	M60G11DB	340 (154)	PDG22F0020TFFJ	BAB2025	18	9	20	P60G11S0518CUBS64X	
7.5	2 at -5%	FR2874X	M60G11EB	340 (154)	PDG22F0030TFFJ	BAB2030	18	9	30	P60G11S0718CUBS64X	
10	2 at -5%	FR2874X	M60G11GB	340 (154)	PDG22F0040TFFJ	BAB2050	24	12	40	P60G11S1024CUBS64X	
15	2 at -5%	FR2914X	M60G11HB	650 (295)	PDG22F0060TFFJ	BAB2070	30	15	60	P60G11S1530CUBS64X	
25	2 at -5%	FR2914X	M60G11KB	650 (295)	PDG22F0100TFFJ	BAB2125	30	15	100	P60G11S2530CUBS64X	

NEMA Type 4X Bolt-on, Three-Phase Mini-Power Center, 60 Hz, Grade 316 Stainless Steel (Copper-Wound Transformer and Loadcenter Chassis Standard)

480 Delta Volts to 208Y/120 Volts

kVA	Full Capacity Taps FCBN	Frame	Wiring Diagram Number	Weight Lb (kg)	Main Circuit Breaker		Branch Breakers Max. Number ^{②③}			Max. Amp	Catalog Number
					Primary ^①	Secondary	Single-Pole	Two-Pole	Three-Pole		
15	2 at -5%	FR2914X	M48G11HB	728 (330)	PDG23F0050TFFJ	BAB3050H	24	12	8	40	P48G28T1524CUBS64X
22.5	2 at -5%	FR2914X	M48G11J	728 (330)	PDG23F0070TFFJ	BAB3070H	24	12	8	60	P48G28T2124CUBS64X
30	2 at -5%	FR2914X	M48G11L	728 (330)	PDG23F0100TFFJ	BAB3100H	24	12	8	80	P48G28T3024CUBS64X

600 Delta Volts to 208Y/120 Volts

kVA	Full Capacity Taps FCBN	Frame	Wiring Diagram Number	Weight Lb (kg)	Main Circuit Breaker		Branch Breakers Max. Number ^{②③}			Max. Amp	Catalog Number
					Primary ^①	Secondary	Single-Pole	Two-Pole	Three-Pole		
15	2 at -5%	FR2914X	M60G11H	728 (330)	PDG23F0030TFFJ	BAB3050H	24	12	8	40	P60G28T1524CUBS64X
22.5	2 at -5%	FR2914X	M60G11J	728 (330)	PDG23F0050TFFJ	BAB3070H	24	12	8	60	P60G28T2124CUBS64X
30	2 at -5%	FR2914X	M60G11L	728 (330)	PDG23F0070TFFJ	BAB3100H	24	12	8	80	P60G28T3024CUBS64X

Notes

① Primary breakers with higher interrupting capacity available. See Transformer Standards, Technical Data and Accessories section.

Secondary main breakers are fixed only. No substitutes for ampere rating.

② Combinations can be selected.

③ Branch breakers not included. Use Eaton's Type BAB.

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel 304 and 316 grades), refer to Transformer Standards, Technical Data and Accessories section. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Mini-Power Centers

Accessories

Please refer to Section 2.7
Page V2-T2-170.

Technical Data and Specifications

Primary Main Breakers

Mini-power centers are provided with PDG2_F type primary main circuit breakers that have an interrupting rating of 25 kAIC at 480 Vac and 14 kAIC at 600 Vac. Primary main circuit breakers with greater AIC ratings are available as an option.

Optional primary main breakers are PDG2_M (65 kAIC at 480 V; 25 kAIC at 600 V) or PDG2_P (100 kAIC at 480 V; 35 kAIC at 600 V).

Distribution Loadcenter

Eaton’s mini-power centers are available with a tin-plated aluminum bus loadcenter interior that accepts 1-inch plug-on branch circuit breakers Type BR family.

The all-copper mini-power center is constructed with a copper-wound transformer and tin-plated copper bus loadcenter interior that accepts 1-inch bolt-on branch breakers Type BAB family.

Dry-Type Encapsulated Transformers—Core and Coil Assemblies

The transformer core is constructed using high-grade, non-aging, silicon steel with high-magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities are substantially below the saturation point. The transformer core volume allows for efficient transformer operation at 10% above the nominal tap voltage. The core laminations are tightly clamped and compressed. Coils are wound of electrical grade aluminum or copper, and are of continuous wound construction. The BIL (basic impulse level) for all 600 V-class windings is 10 kV. In encapsulated transformers, the core and coil assembly is completely encased in a proportioned mixture of resin or epoxy, and aggregate to provide a moisture-proof, shock-resistant seal. The core and coil encapsulation system is designed to minimize the audible sound level.

Frequency

Eaton standard dry-type distribution transformers are designed for 60 Hz operation. Transformers required for other frequencies must be specifically designed.

Overload Capability

Short-term overload is designed into transformers as required by IEEE. Dry-type distribution transformers will deliver 200% nameplate load for one-half hour, 150% load for one hour and 125% load for four hours without being damaged, provided that a constant 50% load precedes and follows the overload. Refer to IEEE C57.96 *IEEE Guide for Loading Dry-Type Distribution and Power Transformers* for additional limitations.

Continuous overload capacity is not deliberately designed into a transformer because the design objective is to be within the allowed winding temperature rise with nameplate loading.

Insulation System and Temperature Rise

Industry standards classify insulation systems and rise as shown below:

Insulation System Classification

Ambient	+ Winding Rise	+ Hot Spot	= Temp. Class
40 °C	55 °C	10 °C	105 °C
40 °C	80 °C	30 °C	150 °C
25 °C	135 °C	20 °C	180 °C
40 °C	115 °C	30 °C	185 °C
40 °C	150 °C	30 °C	220 °C

The design life of transformers having different insulation systems is the same—the lower-temperature systems are designed for the same life as the higher-temperature systems.

Winding Terminations

Eaton recommends that external cables be rated 90 °C (sized at 75 °C ampacity) for encapsulated designs and 75 °C for ventilated designs.

Sound Levels

All Eaton 600 volt class general-purpose dry-type distribution transformers are designed to meet NEMA ST-20 sound levels listed here. These are the sound levels measured in a soundproof environment. Actual sound levels measured at an installation will likely be higher due to electrical connections and environmental conditions. Lower sound levels are available and should be specified when the transformer is going to be installed in an area where sound may be a concern.

Average Sound Levels

NEMA ST-20 Average Sound Level, dB

Equivalent Winding kVA Range	Encapsulated (up to 1.2 kV)
3.00 and below	45
3.01 to 9.00	45
9.01 to 15.00	50
15.01 to 30.00	50

Note

For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. The following pages provide listings for most standard transformer ratings and styles. For all-copper and bolt-on-breaker designs, contact Eaton.

Three-Phase Type DT-3E Totally Enclosed Non-Ventilated



Totally Enclosed Non-Ventilated Transformers

Product Description

Note: The following pages provide listings for most standard transformer ratings and catalog numbers. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

- Suitable for indoor or outdoor applications
- Totally enclosed, non-ventilated enclosures rated NEMA 3R
- 220 °C insulation system
- 150 °C rise standard; 115 °C or 80 °C rise optional
- Totally enclosed non-ventilated transformers are specifically excluded from the scope of U.S. DOE energy efficiency requirements

Application Description

Totally enclosed non-ventilated dry-type transformers are for special applications where, because of adverse atmospheric conditions, it is desirable to use a dry-type non-ventilated transformer instead of a ventilated standard unit—which has openings in its enclosure to allow air to flow directly over the core and coil.

The non-ventilated transformer is highly suited for atmospheres that contain conductive, corrosive or combustible materials that might damage a transformer, or have lint and dust particles that might block the ventilation passages. The transformer has no openings in the enclosure; heat is dissipated by radiating from the surface area. Consequently, the enclosures are larger than those of the standard ventilated type. Non-ventilated transformers are suited for application in the textile, chemical, automotive, petrochemical, foundry, cement, food, paper and other industries.

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Features, Benefits and Functions

- 60 Hz operation (50/60 Hz operation available)
- Short-term overload capability as required by IEEE
- Meet NEMA ST-20 sound levels

Standards and Certifications

- UL listed



Industry Standards

All Eaton dry-type distribution and control transformers are built and tested in accordance with applicable NEMA and IEEE standards.

Seismically Qualified

Eaton manufactured dry-type distribution transformers are seismically qualified and exceed requirements of the International Building Code (IBC) and California Code Title 24.

Catalog Number Selection

Please refer to Section 2.7 **Page V2-T2-165**.

Product Selection

Additional Product Selection information begins on **Page V2-T2-168**.

Single-Phase—Type DS-3E, 60 Hz ^①

240 x 480 Volts to 120/240 Volts +1–5%, –2–5% at 240 Volts Primary; +2–2.5%, –4–2.5% at 480 Volts Primary

kVA	Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Catalog Number
15	DS-3E	150	FR817N	3XA	350 (159)	T20P11S15NV
25	DS-3E	150	FR818N	3XA	350 (159)	T20P11S25NV
37.5	DS-3E	150	FR820N	3XA	600 (274)	T20P11S37NV
50	DS-3E	150	FR820N	3XA	720 (329)	T20P11S50NV

Three-Phase—Type DT-3E, 60 Hz ^①

480 Delta Volts to 208Y/120 Volts +2–2.5% FCAN, 4–2.5% FCBN Taps

kVA	Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Catalog Number
15	DT-3E	150	FR912DN	280B	480 (217)	V48M28T15NV
30	DT-3E	150	FR912DN	280B	480 (217)	V48M28T30NV
45	DT-3E	150	FR915DN	280B	600 (272)	V48M28T45NV
75	DT-3E	150	FR916AN	280B	760 (344)	V48M28T75NV
112.5	DT-3E	150	FR917N	280B	1100 (499)	V48M28T12NV
150	DT-3E	150	FR918AN	280B	1300 (589)	V48M28T49NV
225	DT-3E	150	FR919EN	275A	2400 (1088)	V48M28T22NV
300	DT-3E	150	FR920EN	275A	2900 (1315)	V48M28T33NV

Notes

^① Transformers Type EPT 75 kVA and smaller three-phase, and Type EP 37.5 kVA and smaller single-phase, are furnished in place of non-ventilated transformers as standard. See general-purpose transformers.

Contact your local Eaton sales office for availability of additional totally enclosed non-ventilated transformers. Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Totally Enclosed Non-Ventilated Transformers

Accessories

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Please refer to Section 2.7 **Page V2-T2-170**.

Technical Data and Specifications

Frequency

Eaton standard dry-type distribution transformers are designed for 60 Hz operation. Transformers required for other frequencies are available and must be specifically designed.

Overload Capability

Short-term overload is designed into transformers as required by IEEE. Dry-type distribution transformers will deliver 200% nameplate load for one-half hour, 150% load for one hour and 125% load for four hours without being damaged, provided that a constant 50% load precedes and follows the overload. Refer to IEEE C57.96 *IEEE Guide for Loading Dry-Type Distribution and Power Transformers* for additional limitations.

Continuous overload capacity is not deliberately designed into a transformer because the design objective is to be within the allowed winding temperature rise with nameplate loading.

Insulation System and Temperature Rise

Industry standards classify insulation systems and rise as shown below:

Insulation System Classification

Ambient	+ Winding Rise	+ Hot Spot	= Temp. Class
40 °C	55 °C	10 °C	105 °C
40 °C	80 °C	30 °C	150 °C
25 °C	135 °C	20 °C	180 °C
40 °C	115 °C	30 °C	185 °C
40 °C	150 °C	30 °C	220 °C

The design life of transformers having different insulation systems is the same—the lower-temperature systems are designed for the same life as the higher-temperature systems.

Enclosures

Eaton totally enclosed, non-ventilated transformer types DS-3E and DT-3E use a NEMA 3R rated enclosure as standard.

Winding Terminations

Primary and secondary windings are terminated in the wiring compartment. Totally enclosed non-ventilated transformers have leads brought out to aluminum pads that are pre-drilled to accept Cu/Al lugs. **Lugs are not supplied with these transformers.** Eaton recommends external cables be rated 75 °C for ventilated designs.

Series-Multiple Windings

Series-multiple windings consist of two similar coils in each winding that can be connected in series or parallel (multiple). Transformers with series-multiple windings are designated with an "x" or "/" between the voltage ratings, such as voltages of "120/240" or "240 x 480." If the series-multiple winding is designated by an "x," the winding can be connected only for a series or parallel. With the "/" designation, a mid-point also becomes available in addition to the series or parallel connection. As an example, a 120 x 240 winding can be connected for either 120 (parallel) or 240 (series), but a 120/240 winding can be connected for 120 (parallel), or 240 (series), or 240 with a 120 mid-point.

Note: The preceding pages provide listings for most standard transformer ratings and catalog numbers. For all-copper and bolt-on-breaker designs, contact Eaton. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Three-Phase Type EPTZ Encapsulated



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Class I, Division 2, Hazardous Location Transformers

Product Description

Note: The following pages provide listings for most standard transformer ratings and catalog numbers. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

- Encapsulated design
- Suitable for indoor or outdoor applications
- Totally enclosed, non-ventilated enclosures
- 180 °C insulation system
- 115 °C rise standard; 80 °C rise optional
- Mountable in any position indoors. Upright only outdoors
- Available in ratings up to 600 volts primary, 25 kVA single-phase, 75 kVA three-phase
- Available in NEMA Type 4X enclosure
- Encapsulated transformers, such as Class I, Division 2 transformers, are specifically excluded from the scope of U.S. DOE energy efficiency requirements

Application Description

Type EPZ and EPTZ transformers are labeled as “Suitable for use in Class I, Division 2, Groups A, B, C and D locations, as defined by NEC Article 501, with NEC-recommended installation procedures for dry-type transformers rated under 600 volts nominal operation.”

A Class I, Division 2 location per Section 500 of the NEC is defined as:

1. A location in which volatile flammable liquids or gases are handled, processed or used, but that normally will be confined within closed containers or systems from which they can escape only in case of accidental rupture or breakdown of the container or system.
2. Or, a location where ignitable concentrations of gases or vapors are normally prevented by positive mechanical ventilation and that might become hazardous through failure of the ventilation equipment.

3. Or, a location that is adjacent to a Class I, Division 1 location and ignitable concentrations of gases or vapors might occasionally enter.

Atmospheres classified by NEC Section 500 as Group A includes acetylene. Group B includes gases such as hydrogen and formaldehyde. Group C may contain gases or vapors such as ethyl ether, ethylene, or the equivalent. Atmospheres classified as Group D may contain gases or vapors such as acetone, ammonia, benzene, butane, cyclopropane, ethanol, gasoline, hexane, methanol, methane, natural gas, naphtha, propane or the equivalent.

Features, Benefits and Functions

- NEMA 3R enclosure
- 60 Hz operation
- Aluminum windings (copper optional)
- Short-term overload capability as required by IEEE
- Meet NEMA ST-20 sound levels

Standards and Certifications

- UL listed



Industry Standards

All Eaton dry-type distribution and control transformers are built and tested in accordance with applicable NEMA and IEEE standards.

Seismically Qualified

Eaton manufactured dry-type distribution transformers are seismically qualified and exceed requirements of the International Building Code (IBC) and California Code Title 24.

Catalog Number SelectionPlease refer to Section 2.7 **Page V2-T2-165**.

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Product SelectionAdditional Product Selection information begins on **Page V2-T2-168**.**Single-Phase—Type EPZ, 60 Hz****480 Volts to 120/240 Volts**

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Catalog Number
	FCAN	FCBN						
0.05	—	—	EPZ	115	FR57H	524H	13 (6)	Z48N11S51A
0.75	—	—			FR58H		21 (10)	Z48N11S76A
1	—	—			FR59H		31 (14)	Z48N11S01A
1.5	—	—			FR67H		40 (18)	Z48N11S16A
2	—	—			FR68H		40 (18)	Z48N11S02A
3	—	—			FR176H		65 (30)	Z48N11S03A
5	—	—			FR177H		113 (51)	Z48N11S05A
7.5	—	—			FR178H		123 (56)	Z48N11S07A
10	—	—			FR179H		193 (88)	Z48N11S10A
15	—	—			FR180H		234 (107)	Z48N11S15
25	—	—			FR182H		375 (170)	Z48N11S25A

Three-Phase—Type EPTZ, 60 Hz**480 Delta Volts to 208Y/120 Volts Three-Phase**

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Catalog Number
	FCAN	FCBN						
3	—	2 at -5%	EPTZ	115	FR201H	70A	116 (53)	Z48G28T03A
6	—	2 at -5%			FR200H		143 (65)	Z48G28T06A
9	—	2 at -5%			FR103H		166 (75)	Z48G28T09A
15	—	2 at -5%			FR95H		275 (125)	Z48G28T15A
30	—	2 at -5%			FR243H	66A	523 (239)	Z48G28T30
45	—	2 at -5%			FR244H		660 (299)	Z48G28T45A
75	—	2 at -5%			FR245H		1275 (580)	Z48G28T75A ①

480 Delta Volts to 240 Delta Volts with 120 Volt Lighting Tap on B Phase ②

kVA	Full Capacity Taps		Type	°C Temp. Rise	Frame	Wiring Diagram Number	Weight Lb (kg)	Catalog Number
	FCAN	FCBN						
6	—	2 at -5%	EPTZ	115	FR102H	95A	115 (52)	Z48G22T06A
9	—	2 at -5%			FR97H		160 (73)	Z48G22T09A
15	—	2 at -5%			FR195H		340 (155)	Z48G22T15A
30	—	2 at -5%			FR243H	62A	422 (191)	Z48G22T30A
45	—	2 at -5%			FR244H		660 (299)	Z48G22T45A

Notes

① Floor-mount only.

② Center Tap capacity limited to 5% of rated kVA.

For 316 Grade stainless steel enclosure, replace 10th character of catalog number with an "SS" suffix. Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton. Frame drawings/dimensions information begins on **Page V2-T2-207**.

Class I, Division 2, Hazardous Location Transformers

Accessories

Please refer to Section 2.7 **Page V2-T2-170.**

Technical Data and Specifications

Frequency

Eaton standard dry-type distribution transformers are designed for 60 Hz operation. Transformers required for other frequencies are available and must be specifically designed.

Overload Capability

Short-term overload is designed into transformers as required by IEEE. Dry-type distribution transformers will deliver 200% nameplate load for one-half hour, 150% load for one hour, and 125% load for four hours without being damaged, provided that a constant 50% load precedes and follows the overload. Refer to IEEE C57.96 *IEEE Guide for Loading Dry-Type Distribution and Power Transformers* for additional limitations.

Continuous overload capacity is not deliberately designed into a transformer because the design objective is to be within the allowed winding temperature rise with nameplate loading.

Insulation System and Temperature Rise

Industry standards classify insulation systems and rise as shown below:

Insulation System Classification

Ambient	+ Winding Rise	+ Hot Spot	= Temp. Class
40 °C	55 °C	10 °C	105 °C
40 °C	80 °C	30 °C	150 °C
25 °C	135 °C	20 °C	180 °C
40 °C	115 °C	30 °C	185 °C
40 °C	150 °C	30 °C	220 °C

The design life of transformers having different insulation systems is the same—the lower-temperature systems are designed for the same life as the higher-temperature systems.

Enclosures

Eaton encapsulated transformer types EPZ and EPTZ use a NEMA 3R rated enclosure.

Sound Levels

All Eaton 600 volt class general-purpose dry-type distribution transformers are designed to meet NEMA ST-20 sound levels listed here. These are the sound levels measured in a soundproof environment. Actual sound levels measured at an installation will likely be higher due to electrical connections and environmental conditions. Lower sound levels are available and should be specified when the transformer is going to be installed in an area where sound may be a concern.

Winding Terminations

Lugs are not supplied with these transformers. Eaton recommends that external cables be rated 90 °C (sized at 75 °C ampacity) for encapsulated designs and 75 °C for ventilated designs.

Unused tap leads must be properly insulated prior to energization. EPZ and EPTZ transformers are UL and cUL listed.

Series-Multiple Windings

Series-multiple windings consist of two similar coils in each winding that can be connected in series or parallel (multiple). Transformers with series-multiple windings are designated with an “x” or “/” between the voltage ratings, such as voltages of “120/240” or “240 x 480.” If the series-multiple winding is designated by an “x,” the winding can be connected only for a series or parallel. With the “/” designation, a mid-point also becomes available in addition to the series or parallel connection. As an example, a 120 x 240 winding can be connected for either 120 (parallel) or 240 (series), but a 120/240 winding can be connected for 120 (parallel), 240 (series) or 240 with a 120 mid-point.

Marine Duty Transformers

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Marine Duty Transformers

Product Description

Note: The following pages provide listings for most standard transformer ratings and catalog numbers. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Types EP, EPT

- Encapsulated design
- Suitable for indoor or outdoor applications
- Totally enclosed, non-ventilated enclosures
- Enclosures are NEMA 3R rated
- Mountable in any position indoors and upright-only outdoors
- 180 °C insulation system
- 115 °C rise standard; 80 °C rise optional
- Copper windings standard
- Available in single-phase ratings through 37.5 kVA (EP)
- Available in three-phase ratings through 75 kVA (EPT)

Types DS-3, DT-3

- Ventilated, NEMA 2 enclosure standard
- Suitable for indoor applications; outdoors when weathershields are also installed
- Upright mounting only
- 220 °C insulation system
- 115 °C rise standard; 150 °C or 80 °C rise optional
- Copper windings standard
- Available in single-phase ratings 15–167 kVA and up to 4160 volts primary (DS-3)
- Available in three-phase ratings 15–1500 kVA and up to 4160 volts primary (DT-3)
- cUL energy verified in accordance with energy standards: CFR title 10 Chapter II part 431, Appendix A of subpart K and CSA C802.2 by UL

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Application Description

The basic purpose of a transformer is voltage transformation as near as practically possible to the load for economy and distribution of power. Typical loads for low-voltage dry-type distribution transformers include lighting, heating, air conditioners, fans and machine tools. Such loads are found in commercial, institutional, industrial and residential structures.

Features, Benefits and Functions

- Meets ABS (American Bureau of Shipping) specification
- ABS Type Approval Certificate Number 04-TP517621-X
- 60 Hz operation
- 115 °C temperature rise standard
- Copper windings standard
- Short-term overload capability as required by IEEE
- Meet NEMA ST-20 sound levels

Standards and Certifications

- UL listed



Industry Standards

All Eaton low-voltage dry-type distribution and control transformers are built and tested in accordance with applicable NEMA and IEEE standards. All 600 volt class transformers are UL listed unless otherwise noted.

Catalog Number Selection

Please refer to Section 2.7 **Page V2-T2-165**.

Product Selection

Additional Product Selection information begins on **Page V2-T2-168**.

Single-Phase—Type DS-3M Marine Duty 60 Hz DOE 2016 Energy-Efficient

240 x 480 Volts to 120/240 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	115	Contact local Eaton representative					RT20P11F1516CU
25							RT20P11F2516CU
37.5							RT20P11F3716CU
50							RT20P11F5016CU
75							RT20P11F7516CU
100							RT20P11F9916CU

600 Volts to 120/240 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	115	Contact local Eaton representative					RT60M11F1516CU
25							RT60M11F2516CU
37.5							RT60M11F3716CU
50							RT60M11F5016CU
75							RT60M11F7516CU
100							RT60M11F9916CU

Note

Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3M Marine Duty 60 Hz DOE 2016 Energy-Efficient

208 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	115	FR939	280E	253 (115)	WS57	WMB05	MV29M28F1516CU	
30		FR940		455 (206)	WS58	WMB05	MV29M28F3016CU	
45		FR940		495 (225)	WS58	WMB05	MV29M28F4516CU	
75		FR942		698 (317)	WS59	WMB04	MV29M28F7516CU	
112.5		FR943	324A	1335 (606)	WS60	WMB04	MV29R28F1216CU	
150		FR943		1493 (678)	WS60	WMB04	MV29R28F4916CU	
225		FR944		2186 (992)	WS61	—	MV29R28F2216CU	
300		FR945		2696 (1224)	WS62	—	MV29R28F3316CU	
500		Contact local Eaton representative						MV29R28F5516CU

208 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	115	FR939	E0342B	247 (112)	WS57	WMB05	MV29M47F1516CU	
30		FR940		434 (197)	WS58	WMB05	MV29M47F3016CU	
45		FR940		600 (272)	WS58	WMB05	MV29M47F4516CU	
75		FR942		682 (310)	WS59	WMB04	MV29M47F7516CU	
112.5		FR943	E0351A	1154 (524)	WS60	WMB04	MV29R47F1216CU	
150		FR943		1500 (681)	WS60	WMB04	MV29R47F4916CU	
225		FR944		1918 (871)	WS61	—	MV29R47F2216CU	
300		Contact local Eaton representative						MV29R47F3316CU
500								MV29R47F5516CU

240 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	115	FR939	280C	253 (115)	WS57	WMB05	MV24M28F1516CU	
30		FR940		455 (206)	WS58	WMB05	MV24M28F3016CU	
45		FR940		495 (225)	WS58	WMB05	MV24M28F4516CU	
75		FR942		698 (317)	WS59	WMB04	MV24M28F7516CU	
112.5		FR943	324B	1335 (606)	WS60	WMB04	MV24R28F1216CU	
150		FR943		1493 (678)	WS60	WMB04	MV24R28F4916CU	
225		FR944		2186 (992)	WS61	—	MV24R28F2216CU	
300		FR945		2696 (1224)	WS62	—	MV24R28F3316CU	
500		Contact local Eaton representative						MV24R28F5516CU

240 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number	
15	115	FR939	E0317A	253 (115)	WS57	WMB05	MV24M47F1516CU	
30		FR940		455 (206)	WS58	WMB05	MV24M47F3016CU	
45		FR940		495 (225)	WS58	WMB05	MV24M47F4516CU	
75		FR942		698 (317)	WS59	WMB04	MV24M47F7516CU	
112.5		FR943	E0351C	1335 (606)	WS60	WMB04	MV24R47F1216CU	
150		FR943		1493 (678)	WS60	WMB04	MV24R47F4916CU	
225		FR944		2186 (992)	WS61	—	MV24R47F2216CU	
300		Contact local Eaton representative						MV24R47F3316CU
500								MV24R47F5516CU

Note

Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase—Type DT-3M Marine Duty 60 Hz DOE 2016 Energy-Efficient

440 Delta Volts to 220Y/127 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	115	Contact local Eaton representative					MV44M31F1516CU
30							MV44M31F3016CU
45							MV44M31F4516CU
75							MV44M31F7516CU
112.5							MV44M31F1216CU
150							MV44M31F4916CU
225							MV44M31F2216CU
300							MV44M31F3316CU
500							MV44M31F5516CU

480 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	115	FR939	280B	241 (109)	WS57	WMB05	MV48M28F1516CU
30		FR940		433 (197)	WS58	WMB05	MV48M28F3016CU
45		FR940		471 (214)	WS58	WMB05	MV48M28F4516CU
75		FR942		665 (302)	WS59	WMB04	MV48M28F7516CU
112.5		FR943		1271 (577)	WS60	WMB04	MV48M28F1216CU
150		FR943		1422 (646)	WS60	WMB04	MV48M28F4916CU
225		FR944		2082 (945)	WS61	—	MV48M28F2216CU
300		FR945		2568 (1166)	WS62	—	MV48M28F3316CU
500		Contact local Eaton representative					MV48M28F5516CU

480 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
15	115	FR939	280B	271 (123)	WS57	WMB05	MV48M47F1516CU
30		FR940		431 (196)	WS58	WMB05	MV48M47F3016CU
45		FR940		485 (220)	WS58	WMB05	MV48M47F4516CU
75		FR942		730 (331)	WS59	WMB04	MV48M47F7516CU
112.5		FR943		1146 (520)	WS60	WMB04	MV48M47F1216CU
150		FR943		1432 (650)	WS60	WMB04	MV48M47F4916CU
225		FR944		2150 (976)	WS61	—	MV48M47F2216CU
300		FR945		2700 (1226)	WS62	—	MV48M47F3316CU
500		Contact local Eaton representative					MV48M47F5516CU

Note

Frame drawings/dimensions information begins on **Page V2-T2-207**.

Marine Duty Transformers

Accessories

Please refer to Section 2.7 **Page V2-T2-170**.

Technical Data and Specifications

Frequency

Eaton standard low-voltage dry-type distribution transformers are designed for 60 Hz operation. Transformers required for other frequencies are available and must be specifically designed.

Overload Capability

Short-term overload is designed into transformers as required by IEEE. Dry-type distribution transformers will deliver 200% nameplate load for one-half hour, 150% load for one hour, and 125% load for four hours without being damaged, provided that a constant 50% load precedes and follows the overload. Refer to IEEE C57.96 *IEEE Guide for Loading Dry-Type Distribution and Power Transformers* for additional limitations.

Continuous overload capacity is not deliberately designed into a transformer because the design objective is to be within the allowed winding temperature rise with nameplate loading.

Insulation System and Temperature Rise

Industry standards classify insulation systems and rise as shown below:

Insulation System Classification

Ambient	+ Winding Rise	+ Hot Spot	= Temp. Class
40 °C	55 °C	10 °C	105 °C
40 °C	80 °C	30 °C	150 °C
25 °C	135 °C	20 °C	180 °C
40 °C	115 °C	30 °C	185 °C
40 °C	150 °C	30 °C	220 °C

The design life of transformers having different insulation systems is the same—the lower-temperature systems are designed for the same life as the higher-temperature systems.

Enclosures

Eaton ventilated transformer types DS-3M and DT-3M use a NEMA 2 rated (drip-proof) enclosure as standard, and are rated NEMA 3R with the addition of weathershields. Eaton encapsulated transformer types EPM and EPTM use a NEMA 3R rated enclosure. Type DT-3M transformers manufactured in enclosures 939, 940, 942, 943, 944 and 945 are UL Listed to be installed with just 2 inches clearance on the sides and rear of the transformer.

Winding Terminations

Primary and secondary windings are terminated in the wiring compartment. Encapsulated units have copper leads or stabs brought out for connections. Ventilating transformers have leads brought out to aluminum pads that are pre-drilled to accept Cu/Al lugs.

Lugs are not supplied with these transformers. Eaton recommends that external cables be rated 90 °C (sized at 75 °C ampacity) for encapsulated designs and 75 °C for ventilated designs.

Series-Multiple Windings

Series-multiple windings consist of two similar coils in each winding that can be connected in series or parallel (multiple). Transformers with series-multiple windings are designated with an "x" or "/" between the voltage ratings, such as voltages of "120/240" or "240 x 480." If the series-multiple winding is designated by an "x," the winding can be connected only for a series or parallel. With the "/" designation, a mid-point also becomes available in addition to the series or parallel connection. As an example, a 120 x 240 winding can be connected for either 120 (parallel) or 240 (series), but a 120/240 winding can be connected for 120 (parallel), 240 (series) or 240 with a 120 mid-point.

Sound Levels

All Eaton 600 volt class general-purpose low-voltage dry-type distribution transformers are designed to meet NEMA ST-20 sound levels listed here. These are the sound levels measured in a soundproof environment. Actual sound levels measured at an installation will likely be higher due to electrical connections and environmental conditions. Lower sound levels are available and should be specified when the transformer is going to be installed in an area where sound may be a concern.

For additional information, please refer to Section 2.7 **Page V2-T2-174**.

Average Sound Levels

NEMA ST-20 Average Sound Level, dB

Equivalent Winding kVA Range	Self-Cooled Ventilated (up to 1.2 kV)		Encapsulated (up to 1.2 kV)
	K-Factor 1, 4, 9	K-Factor 13, 20	
3.00 and below	40	40	45
3.01 to 9.00	40	40	45
9.01 to 15.00	45	45	50
15.01 to 30.00	45	45	50
30.01 to 50.00	45	48	50
50.01 to 75.00	50	53	55
75.01 to 112.50	50	53	55
112.51 to 150.00	50	53	55
150.01 to 225.00	55	58	57
225.01 to 300.00	55	58	57
300.01 to 500.00	60	63	59
500.01 to 700.00	62	65	61
700.01 to 1000.00	64	67	63
Greater than 1000	Consult factory	Consult factory	Consult factory

Type EP Buck-Boost Transformer



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Buck-Boost and Low-Voltage Lighting Transformers

Product Description

Note: The following pages provide listings for most standard transformer ratings and catalog numbers. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Types EP, EPT

- Encapsulated design
- Suitable for indoor or outdoor applications
- Totally enclosed, non-ventilated enclosures
- Enclosures are NEMA 3R rated
- Mountable in any position indoors and upright-only outdoors
- 180 °C insulation system
- 115 °C rise standard; 80 °C rise optional
- Available in single-phase ratings through 7.5 kVA
- Encapsulated transformers, such as buck-boost and low-voltage lighting transformers, are specifically excluded from the scope of U.S. DOE energy efficiency requirements

Application Description

A buck-boost transformer is used to provide an economical method of correcting a lower or higher voltage rating more suitable for efficient operation of electrical equipment.

Type EP buck-boost transformers are small kVA, single-phase transformers with dual primary and dual secondary windings, and are usually connected as autotransformers by using one unit for single-phase applications and either two or three units banked for three-phase operation. They are primarily used for motor operation and should not be used for motor control circuits, to correct fluctuating line voltage or to obtain a neutral on a delta system. Buck-boost transformers are ideally suited for use with low-voltage lighting systems, such as outdoor lighting.

Features, Benefits and Functions

- 60 Hz operation
- 600 volt class insulation
- Short-term overload capability as required by IEEE
- Meet NEMA ST-20 sound levels

Standards and Certifications

- UL listed
- CSA certified



Industry Standards

All Eaton dry-type distribution and control transformers are built and tested in accordance with applicable NEMA and IEEE standards. All 600 volt class transformers are UL listed unless otherwise noted.

Seismically Qualified

Eaton-manufactured dry-type distribution transformers are seismically qualified, and exceed requirements of the International Building Code (IBC) and California Code Title 24.

Catalog Number Selection

Please refer to Section 2.7
Page V2-T2-165.

Product Selection

For quick selection data, refer to the tables on this and the following pages.

Selection Requirements

You should have the following information before selecting a buck-boost transformer:

Line Voltage

The voltage that you want to buck (decrease) or boost (increase). This can be found by measuring the supply line voltage with a voltmeter.

Load Voltage

The voltage at which your equipment is designed to operate. This is listed on the nameplate of the load equipment.

Load Amperes or Load kVA

You do not need to know both—one or the other is sufficient for selection purposes. This information usually can be found on the nameplate of the equipment that you want to operate.

Frequency

The supply line frequency must be the same as the frequency of the equipment to be operated—Eaton's buck-boost transformers operate at 60 Hz only.

Phase

The supply line should be the same as the equipment to be operated—either single- or three-phase.

Transformer Interconnection

For three-phase applications, interconnections of transformers should be made in a junction box. Two or three transformers may be used depending on an open delta (2) or wye (3) connection.

5-Step Selector

The tables that follow will simplify the selection of the buck-boost transformers. There are no calculations needed; simply follow these five steps:

1. Refer to the table having the same output voltage as the equipment you want to operate. For example, if you are installing a 240 volt 6 kVA single-phase load use selection table on the page.
2. Select the available line voltage across the top of the chart that is closest to the actual supply voltage. Therefore, for example, if the available line voltage is 213 volts, use the 212 volt column.
3. Read down the column until you reach an output kVA or amps rating equal to or greater than the load requirements. Since 6 kVA, in the example, is not listed, use the next higher rating, or 7.5 kVA.
4. Read across to the far left columns for the catalog number and quantity of transformers for your application. In this case, you will need one (1) catalog number S10N06P01P.
5. Connect the buck-boost transformer(s) you have selected in accordance with the connection diagram specified at the bottom of the available line voltage column. In this example, Diagram "F" would be used.

Note: For single-phase connections and three-phase open delta connections, inputs and outputs may be reversed. kVA capacity remains constant.

Additional Product Selection information begins on **Page V2-T2-168.**

120 x 240 Volts to 12/24 Volts

kVA	°C Temp. Rise	Frame	Weight Lb (kg)	Catalog Number
0.05	115	FR52	7 (3)	S10N04A81N
0.10	115	FR54	7 (3)	S10N04A82N
0.15	115	FR55	8 (4)	S10N04A83N
0.25	115	FR57P	12 (5)	S10N04P26P
0.50	115	FR57P	13 (5)	S10N04P51P
0.75	115	FR58AP	21 (10)	S10N04P76P
1	115	FR67P	31 (14)	S10N04P01P
1.5	115	FR67P	40 (18)	S10N04P16P
2	115	FR68P	40 (18)	S10N04P02P
3	115	FR176	65 (29)	S10N04A03N
5	115	FR177	113 (51)	S10N04A05N
7.5	115	FR178	123 (55)	S10N04A07N

120 x 240 Volts to 16/32 Volts

kVA	°C Temp. Rise	Frame	Weight Lb (kg)	Catalog Number
0.05	115	FR52	7 (3)	S10N06A81N
0.10	115	FR54	7 (3)	S10N06A82N
0.15	115	FR55	8 (4)	S10N06A83N
0.25	115	FR57P	12 (5)	S10N06P26P
0.50	115	FR57P	13 (5)	S10N06P51P
0.75	115	FR58AP	21 (10)	S10N06P76P
1	115	FR67P	31 (14)	S10N06P01P
1.5	115	FR67P	40 (18)	S10N06P16P
2	115	FR68P	40 (18)	S10N06P02P
3	115	FR176	65 (29)	S10N06A03N
5	115	FR177	113 (51)	S10N06A05N
7.5	115	FR178	123 (55)	S10N06A07N

240 x 480 Volts to 24/48 Volts

kVA	°C Temp. Rise	Frame	Weight Lb (kg)	Catalog Number
0.05	115	FR52	7 (3)	S20N08A81N
0.10	115	FR54	7 (3)	S20N08A82N
0.15	115	FR55	8 (4)	S20N08A83N
0.25	115	FR57P	12 (5)	S20N08P26P
0.50	115	FR57P	13 (5)	S20N08P51P
0.75	115	FR58AP	21 (10)	S20N08P76P
1	115	FR67P	31 (14)	S20N08P01P
1.5	115	FR67P	40 (18)	S20N08P16P
2	115	FR68P	40 (18)	S20N08P02P
3	115	FR176	65 (29)	S20N08A03N
5	115	FR177	113 (51)	S20N08A05N
7.5	115	FR178	123 (55)	S20N08A07N

Note

Frame drawings/dimensions information begins on **Page V2-T2-207.**

Single-Phase 115 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage										Catalog Number
		84 Output		91 Output		96 Output		100 Output		102 Output		
		kVA	Amps	kVA	Amps	kVA	Amps	kVA	Amps	kVA	Amps	
1	0.05	—	—	—	—	0.24	2.09	—	—	—	—	S10N04A81N
1	0.05	0.13	1.14	0.18	1.56	—	—	0.31	2.70	0.36	3.13	S10N06A81N
1	0.10	—	—	—	—	0.48	4.17	—	—	—	—	S10N04A82N
1	0.10	0.26	2.29	0.36	3.12	—	—	0.62	5.41	0.72	6.25	S10N06A82N
1	0.15	—	—	—	—	0.72	6.25	—	—	—	—	S10N04A83N
1	0.15	0.39	3.44	0.54	4.69	—	—	0.93	8.12	1.08	9.37	S10N06A83N
1	0.25	—	—	—	—	1.2	10.4	—	—	—	—	S10N04P26P
1	0.25	0.659	5.73	0.899	7.81	—	—	1.56	13.5	1.8	15.6	S10N06P26P
1	0.50	—	—	—	—	2.4	20.8	—	—	—	—	S10N04P51P
1	0.50	1.32	11.5	1.8	15.6	—	—	3.11	27.1	3.59	31.2	S10N06P51P
1	0.75	—	—	—	—	3.6	31.2	—	—	—	—	S10N04P76P
1	0.75	1.98	17.2	2.7	23.4	—	—	4.67	40.6	5.39	46.8	S10N06P76P
1	1	—	—	—	—	4.79	41.7	—	—	—	—	S10N04P01P
1	1	2.64	22.9	3.59	31.2	—	—	6.23	54.1	7.19	62.5	S10N06P01P
1	1.5	—	—	—	—	7.2	62.5	—	—	—	—	S10N04P16P
1	1.5	3.95	34.4	5.39	46.9	—	—	9.34	81.2	10.8	93.7	S10N06P16P
1	2	—	—	—	—	9.58	83.3	—	—	—	—	S10N04P02P
1	2	5.27	45.8	7.19	62.5	—	—	12.5	108	14.4	125	S10N06P02P
1	3	—	—	—	—	14.37	125.1	—	—	—	—	S10N04A03N
1	3	7.92	68.7	10.77	93.6	—	—	18.69	162.3	21.57	187.5	S10N06A03N
1	5	—	—	—	—	23.95	208.5	—	—	—	—	S10N04A05N
1	5	13.2	115	18	156	—	—	31.15	270.5	35.95	312.5	S10N06A05N
1	7.5	—	—	—	—	36	312	—	—	—	—	S10N04A07N
1	7.5	19.8	172	27	234	—	—	46.7	406	53.9	468	S10N06A07N
Connection Diagram ②		D		B		B		C		A		

Notes

① Additional wiring trough may be required.

② Refer to Page V2-T2-151 for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on Page V2-T2-207.

Single-Phase 115 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage		105		127		130		138		146		Catalog Number
		Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps			
1	0.05	0.48	4.17	0.54	4.58	—	—	0.29	2.5	—	—	—	—	S10N04A81N
1	0.05	—	—	—	—	0.41	3.54	—	—	0.23	1.98	—	—	S10N06A81N
1	0.10	0.96	8.33	1.1	9.17	—	—	0.58	5.0	—	—	—	—	S10N04A82N
1	0.10	—	—	—	—	0.82	7.08	—	—	0.46	3.95	—	—	S10N06A82N
1	0.15	1.44	12.5	1.6	13.7	—	—	0.87	7.5	—	—	—	—	S10N04A83N
1	0.15	—	—	—	—	1.3	10.6	—	—	0.69	5.93	—	—	S10N06A83N
1	0.25	2.39	20.8	2.63	22.9	—	—	1.44	12.5	—	—	—	—	S10N04P26P
1	0.25	—	—	—	—	2.03	17.7	—	—	1.14	9.88	—	—	S10N06P26P
1	0.50	4.79	41.6	5.27	45.8	—	—	2.87	25	—	—	—	—	S10N04P51P
1	0.50	—	—	—	—	4.07	35.4	—	—	2.27	19.8	—	—	S10N06P51P
1	0.75	7.19	62.4	7.9	68.7	—	—	4.31	37.5	—	—	—	—	S10N04P76P
1	0.75	—	—	—	—	6.1	53.1	—	—	3.41	29.6	—	—	S10N06P76P
1	1	9.58	83.3	10.5	91.7	—	—	5.75	50	—	—	—	—	S10N04P01P
1	1	—	—	—	—	8.14	70.8	—	—	4.55	39.5	—	—	S10N06P01P
1	1.5	14.4	125	15.8	137	—	—	8.62	75	—	—	—	—	S10N04P16P
1	1.5	—	—	—	—	12.2	106	—	—	6.82	59.3	—	—	S10N06P16P
1	2	19.2	16.7	21.1	183	—	—	11.5	100	—	—	—	—	S10N04P02P
1	2	—	—	—	—	16.3	142	—	—	9.10	79.2	—	—	S10N06P02P
1	3	28.7	249.9	31.5	275.1	—	—	17.3	150	—	—	—	—	S10N04A03N
1	3	—	—	—	—	24.4	212.4	—	—	13.6	118.5	—	—	S10N06A03N
1	5	47.9	416.5	52.5	458.5	—	—	28.7	250	—	—	—	—	S10N04A05N
1	5	—	—	—	—	40.7	354	—	—	22.7	197.5	—	—	S10N06A05N
1	7.5	71.9	624	79	687	—	—	43.1	357	—	—	—	—	S10N04A07N
1	7.5	—	—	—	—	61	531	—	—	34.1	296	—	—	S10N06A07N
Connection Diagram ②		A		A		A		B		B				

Notes

① Additional wiring trough may be required.

② Refer to **Page V2-T2-151** for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

Single-Phase 120 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage		88		95		100		104		106		Catalog Number
		Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
1	0.05	—	—	—	—	0.25	2.09	—	—	—	—	—	—	S10N04A81N
1	0.05	0.14	1.15	0.19	1.56	—	—	0.33	2.70	0.38	3.13	—	—	S10N06A81N
1	0.10	—	—	—	—	0.50	4.17	—	—	—	—	—	—	S10N04A82N
1	0.10	0.28	2.29	0.38	3.12	—	—	0.65	5.41	0.75	6.25	—	—	S10N06A82N
1	0.15	—	—	—	—	0.75	6.25	—	—	—	—	—	—	S10N04A83N
1	0.15	0.41	3.44	0.56	4.69	—	—	0.98	8.12	1.12	9.37	—	—	S10N06A83N
1	0.25	—	—	—	—	1.25	10.4	—	—	—	—	—	—	S10N04P26P
1	0.25	0.687	5.73	0.937	7.81	—	—	1.62	13.5	1.87	15.6	—	—	S10N06P26P
1	0.50	—	—	—	—	2.5	20.8	—	—	—	—	—	—	S10N04P51P
1	0.50	1.37	11.5	1.87	15.6	—	—	3.25	27.1	3.75	31.2	—	—	S10N06P51P
1	0.75	—	—	—	—	3.75	31.2	—	—	—	—	—	—	S10N04P76P
1	0.75	2.06	17.2	2.82	23.4	—	—	4.87	40.6	5.62	46.8	—	—	S10N06P76P
1	1	—	—	—	—	5	41.7	—	—	—	—	—	—	S10N04P01P
1	1	2.75	22.9	3.75	31.2	—	—	6.5	54.1	7.5	62.5	—	—	S10N06P01P
1	1.5	—	—	—	—	7.5	62.5	—	—	—	—	—	—	S10N04P16P
1	1.5	4.12	34.4	5.62	46.9	—	—	9.75	81.2	11.2	93.7	—	—	S10N06P16P
1	2	—	—	—	—	10	83.3	—	—	—	—	—	—	S10N04P02P
1	2	5.5	45.8	7.5	62.5	—	—	13	108	15	125	—	—	S10N06P02P
1	3	—	—	—	—	15	125.1	—	—	—	—	—	—	S10N04A03N
1	3	8.25	68.7	11.25	93.6	—	—	19.5	162.3	22.5	187.5	—	—	S10N06A03N
1	5	—	—	—	—	25	208.5	—	—	—	—	—	—	S10N04A05N
1	5	13.75	114.5	18.75	156	—	—	32.5	270.5	37.5	312.5	—	—	S10N06A05N
1	7.5	—	—	—	—	37.5	312	—	—	—	—	—	—	S10N04A07N
1	7.5	20.6	172	28.2	234	—	—	48.7	406	56.2	468	—	—	S10N06A07N
Connection Diagram ②	D			B		B		C		A				

Notes

① Additional wiring trough may be required.

② Refer to Page V2-T2-151 for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on Page V2-T2-207.

Single-Phase 120 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage		136		144		152		Catalog Number		
		109 Output kVA	109 Output Amps	132 Output kVA	132 Output Amps	136 Output kVA	136 Output Amps	144 Output kVA	144 Output Amps		152 Output kVA	152 Output Amps
1	0.05	0.5	4.17	0.55	4.58	—	—	0.3	2.5	—	—	S10N04A81N
1	0.05	—	—	—	—	0.43	3.54	—	—	0.24	1.98	S10N06A81N
1	0.10	1.0	8.33	1.1	9.17	—	—	0.6	5.0	—	—	S10N04A82N
1	0.10	—	—	—	—	0.85	7.08	—	—	0.48	3.95	S10N06A82N
1	0.15	1.5	12.5	1.6	13.7	—	—	0.9	7.5	—	—	S10N04A83N
1	0.15	—	—	—	—	1.27	10.6	—	—	0.71	5.93	S10N06A83N
1	0.25	2.5	20.8	2.75	22.9	—	—	1.5	12.5	—	—	S10N04P26P
1	0.25	—	—	—	—	2.12	17.7	—	—	1.19	9.88	S10N06P26P
1	0.50	5	41.6	5.5	45.8	—	—	3	25	—	—	S10N04P51P
1	0.50	—	—	—	—	4.25	35.4	—	—	2.37	19.8	S10N06P51P
1	0.75	7.5	62.4	8.25	68.7	—	—	4.5	37.5	—	—	S10N04P76P
1	0.75	—	—	—	—	6.37	53.1	—	—	3.56	29.6	S10N06P76P
1	1	10	83.3	11	91.7	—	—	6	50	—	—	S10N04P01P
1	1	—	—	—	—	8.5	70.8	—	—	4.75	39.5	S10N06P01P
1	1.5	15	125	16.5	137	—	—	9	75	—	—	S10N04P16P
1	1.5	—	—	—	—	12.7	106	—	—	7.12	59.3	S10N06P16P
1	2	20	167	22	183	—	—	12	100	—	—	S10N04P02P
1	2	—	—	—	—	17	142	—	—	9.5	79.2	S10N06P02P
1	3	30	249.9	33	275.1	—	—	18	150	—	—	S10N04A03N
1	3	—	—	—	—	25.5	212.4	—	—	14.25	118.5	S10N06A03N
1	5	50	416.5	55	458.5	—	—	30	250	—	—	S10N04A05N
1	5	—	—	—	—	42.5	354	—	—	23.7	197.5	S10N06A05N
1	7.5	75	624	82.5	687	—	—	45	375	—	—	S10N04A07N
1	7.5	—	—	—	—	63.7	531	—	—	35.6	296	S10N06A07N
Connection Diagram ②		A		A		A		B		B		

Notes

① Additional wiring trough may be required.

② Refer to **Page V2-T2-151** for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

Single-Phase 230 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage										Catalog Number
		199 Output		203 Output		207 Output		209 Output		216 Output		
		kVA	Amps	kVA	Amps	kVA	Amps	kVA	Amps	kVA	Amps	
1	0.05	—	—	—	—	0.43	1.88	0.48	2.08	—	—	S10N04A81N
1	0.05	0.31	1.36	0.36	1.56	—	—	—	—	0.72	3.12	S10N06A81N
1	0.10	—	—	—	—	0.86	3.75	0.96	4.17	—	—	S10N04A82N
1	0.10	0.62	2.71	0.72	3.12	—	—	—	—	1.44	6.25	S10N06A82N
1	0.15	—	—	—	—	1.29	5.62	1.44	6.25	—	—	S10N04A83N
1	0.15	0.93	4.06	1.08	4.69	—	—	—	—	2.16	9.37	S10N06A83N
1	0.25	—	—	—	—	2.15	9.37	2.39	10.4	—	—	S10N04P26P
1	0.25	1.55	6.77	1.8	7.81	—	—	—	—	3.59	15.6	S10N06P26P
1	0.50	—	—	—	—	4.31	18.7	4.79	20.8	—	—	S10N04P51P
1	0.50	3.11	13.5	3.6	15.6	—	—	—	—	7.19	31.2	S10N06P51P
1	0.75	—	—	—	—	6.46	28.2	7.19	31.2	—	—	S10N04P76P
1	0.75	4.66	20.3	5.4	23.4	—	—	—	—	10.8	46.8	S10N06P76P
1	1	—	—	—	—	8.62	37.5	9.58	41.7	—	—	S10N04P01P
1	1	6.23	27.1	7.2	31.2	—	—	—	—	14.4	62.5	S10N06P01P
1	1.5	—	—	—	—	12.9	56.2	14.4	62.5	—	—	S10N04P16P
1	1.5	9.34	40.6	10.8	46.9	—	—	—	—	21.6	93.7	S10N06P16P
1	2	—	—	—	—	17.2	75	19.2	83.3	—	—	S10N04P02P
1	2	12.5	54.2	14.4	62.5	—	—	—	—	28.7	125	S10N06P02P
1	3	—	—	—	—	25.8	112.5	28.7	125.1	—	—	S10N04A03N
1	3	18.6	81.3	21.6	93.6	—	—	—	—	43.2	187.5	S10N06A03N
1	5	—	—	—	—	43.1	187.5	47.9	208.5	—	—	S10N04A05N
1	5	31.1	135.5	36	156	—	—	—	—	72	312.5	S10N06A05N
1	7.5	—	—	—	—	64.6	282	71.9	312	—	—	S10N04A07N
1	7.5	46.6	203	54	234	—	—	—	—	108	468	S10N06A07N
Connection Diagram ②	G			F		G		F		E		

Notes

① Additional wiring trough may be required.

② Refer to Page V2-T2-151 for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on Page V2-T2-207.

Single-Phase 230 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage		246		253		260		Catalog Number		
		219 Output kVA	219 Amps	242 Output kVA	242 Amps	246 Output kVA	246 Amps	253 Output kVA	253 Amps		260 Output kVA	260 Amps
1	0.05	0.96	4.16	1.0	4.38	—	—	0.53	2.29	—	—	S10N04A81N
1	0.05	—	—	—	—	0.77	3.34	—	—	0.41	1.77	S10N06A81N
1	0.10	1.92	8.33	2.01	8.75	—	—	1.05	4.58	—	—	S10N04A82N
1	0.10	—	—	—	—	1.53	6.67	—	—	0.82	3.54	S10N06A82N
1	0.15	2.87	12.5	3.02	13.1	—	—	1.58	6.87	—	—	S10N04A83N
1	0.15	—	—	—	—	2.3	10.0	—	—	1.22	5.31	S10N06A83N
1	0.25	4.79	20.8	5.03	21.9	—	—	2.63	11.5	—	—	S10N04P26P
1	0.25	—	—	—	—	3.83	16.7	—	—	2.04	8.85	S10N06P26P
1	0.50	9.58	41.6	10.1	43.7	—	—	5.27	22.9	—	—	S10N04P51P
1	0.50	—	—	—	—	7.67	33.3	—	—	4.07	17.7	S10N06P51P
1	0.75	14.4	62.4	15.1	65.6	—	—	7.9	34.4	—	—	S10N04P76P
1	0.75	—	—	—	—	11.5	50	—	—	6.11	26.6	S10N06P76P
1	1	19.2	83.3	20.1	87.5	—	—	10.5	45.8	—	—	S10N04P01P
1	1	—	—	—	—	15.3	66.7	—	—	8.15	35.4	S10N06P01P
1	1.5	28.7	125	30.2	131	—	—	15.8	68.7	—	—	S10N04P16P
1	1.5	—	—	—	—	23	100	—	—	12.2	53.1	S10N06P16P
1	2	38.3	167	40.2	175	—	—	21.1	91.7	—	—	S10N04P02P
1	2	—	—	—	—	30.7	133	—	—	16.3	70.8	S10N06P02P
1	3	57.6	249.9	60.3	262.5	—	—	31.5	137.4	—	—	S10N04A03N
1	3	—	—	—	—	45.9	200.1	—	—	24.4	106.2	S10N06A03N
1	5	96	416.5	100.5	437.5	—	—	52.5	229	—	—	S10N04A05N
1	5	—	—	—	—	76.5	333.5	—	—	40.7	177	S10N06A05N
1	7.5	144	624	151	656	—	—	79	344	—	—	S10N04A07N
1	7.5	—	—	—	—	115	500	—	—	61.1	266	S10N06A07N
Connection Diagram ②		E		E		E		F		F		

Notes

① Additional wiring trough may be required.

② Refer to **Page V2-T2-151** for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

Single-Phase 240 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage		208		212		216		218		225		Catalog Number
		Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
1	0.05	—	—	—	—	0.45	1.88	0.5	2.08	—	—	—	—	S10N04A81N
1	0.05	0.32	1.35	0.38	1.56	—	—	—	—	0.75	3.12	—	—	S10N06A81N
1	0.10	—	—	—	—	0.9	3.75	1.0	4.17	—	—	—	—	S10N04A82N
1	0.10	0.65	2.71	0.75	3.12	—	—	—	—	1.5	6.25	—	—	S10N06A82N
1	0.15	—	—	—	—	1.35	5.62	1.5	6.25	—	—	—	—	S10N04A83N
1	0.15	0.98	4.06	1.12	4.69	—	—	—	—	2.25	9.37	—	—	S10N06A83N
1	0.25	—	—	—	—	2.25	9.37	2.5	10.4	—	—	—	—	S10N04P26P
1	0.25	1.62	6.77	1.87	7.81	—	—	—	—	3.75	15.6	—	—	S10N06P26P
1	0.50	—	—	—	—	4.5	18.7	5	20.8	—	—	—	—	S10N04P51P
1	0.50	3.25	13.5	3.75	15.6	—	—	—	—	7.5	31.2	—	—	S10N06P51P
1	0.75	—	—	—	—	6.75	28.2	7.5	31.2	—	—	—	—	S10N04P76P
1	0.75	4.87	20.3	5.62	23.4	—	—	—	—	11.2	46.8	—	—	S10N06P76P
1	1	—	—	—	—	9	37.5	10	41.7	—	—	—	—	S10N04P01P
1	1	6.5	27.1	7.5	31.2	—	—	—	—	15	62.5	—	—	S10N06A01
1	1.5	—	—	—	—	13.5	56.2	15	62.5	—	—	—	—	S10N04P16P
1	1.5	9.75	40.6	11.2	46.9	—	—	—	—	22.5	93.7	—	—	S10N06P16P
1	2	—	—	—	—	18	75	20	83.3	—	—	—	—	S10N04P02P
1	2	13	54.2	15	62.5	—	—	—	—	30	125	—	—	S10N06P02P
1	3	—	—	—	—	27	112.5	30	125.1	—	—	—	—	S10N04A03N
1	3	19.5	81.3	22.5	93.6	—	—	—	—	45	187.5	—	—	S10N06A03N
1	5	—	—	—	—	45	187	50	208	—	—	—	—	S10N04A05N
1	5	32.5	135	37.5	156	—	—	—	—	75	312	—	—	S10N06A05N
1	7.5	—	—	—	—	67.5	282	75	312	—	—	—	—	S10N04A07N
1	7.5	48.7	203	56.2	234	—	—	—	—	112	468	—	—	S10N06A07N
Connection Diagram ②		G		F		G		F		E				

Notes

① Additional wiring trough may be required.

② Refer to Page V2-T2-151 for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on Page V2-T2-207.

Single-Phase 240 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage		229		252		256		264		272		Catalog Number
		Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
1	0.05	1.0	4.16	1.05	4.38	—	—	0.55	2.29	—	—	—	—	S10N04A81N
1	0.05	—	—	—	—	0.8	3.33	—	—	0.42	1.77	—	—	S10N06A81N
1	0.10	2.0	8.33	2.1	8.75	—	—	1.1	4.58	—	—	—	—	S10N04A82N
1	0.10	—	—	—	—	1.6	6.67	—	—	0.85	3.54	—	—	S10N06A82N
1	0.15	3.0	12.5	3.15	13.1	—	—	1.65	6.87	—	—	—	—	S10N04A83N
1	0.15	—	—	—	—	2.4	10.0	—	—	1.27	5.31	—	—	S10N06A83N
1	0.25	5	20.8	5.25	21.9	—	—	2.75	11.5	—	—	—	—	S10N04P26P
1	0.25	—	—	—	—	4	16.7	—	—	2.12	8.85	—	—	S10N06P26P
1	0.50	10	41.6	10.5	43.7	—	—	5.5	22.9	—	—	—	—	S10N04P51P
1	0.50	—	—	—	—	8	33.3	—	—	4.25	17.7	—	—	S10N06P51P
1	0.75	15	62.4	15.7	65.6	—	—	8.25	34.4	—	—	—	—	S10N04P76P
1	0.75	—	—	—	—	12	50	—	—	6.37	26.6	—	—	S10N06P76P
1	1	20	83.3	21	87.5	—	—	11	45.8	—	—	—	—	S10N04P01P
1	1	—	—	—	—	16	66.7	—	—	8.5	35.4	—	—	S10N06P01P
1	1.5	30	125	31.5	131	—	—	16.5	68.7	—	—	—	—	S10N04P16P
1	1.5	—	—	—	—	24	100	—	—	12.7	53.1	—	—	S10N06P16P
1	2	40	167	42	175	—	—	22	91.7	—	—	—	—	S10N04P02P
1	2	—	—	—	—	32	133	—	—	17	70.8	—	—	S10N06P02P
1	3	60	249.9	63	262.5	—	—	33	137.4	—	—	—	—	S10N04A03N
1	3	—	—	—	—	48	200.1	—	—	25.5	106.2	—	—	S10N06A03N
1	5	100	416.5	105	437.5	—	—	55	229	—	—	—	—	S10N04A05N
1	5	—	—	—	—	80	333	—	—	42.5	177	—	—	S10N06A05N
1	7.5	150	624	157	656	—	—	82.5	344	—	—	—	—	S10N04A07N
1	7.5	—	—	—	—	120	500	—	—	63.7	266	—	—	S10N06A07N
Connection Diagram ②		E		E		E		F		F				

Notes

① Additional wiring trough may be required.

② Refer to **Page V2-T2-151** for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase Open Delta Connection 230 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage										Catalog Number
		199		203		207		209		216		
		Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
2	0.05	—	—	—	—	0.75	1.87	0.83	2.08	—	—	S10N04A81N
2	0.05	0.54	1.35	0.62	1.56	—	—	—	—	1.24	3.12	S10N06A81N
2	0.10	—	—	—	—	1.49	3.75	1.66	4.17	—	—	S10N04A82N
2	0.10	1.08	2.71	1.24	3.12	—	—	—	—	2.49	6.25	S10N06A82N
2	0.15	—	—	—	—	2.24	5.62	2.49	6.25	—	—	S10N04A83N
2	0.15	1.62	4.06	1.87	4.69	—	—	—	—	3.73	9.37	S10N06A83N
2	0.25	—	—	—	—	3.3	9.37	4.15	10.4	—	—	S10N04P26P
2	0.25	2.7	6.77	3.11	7.81	—	—	—	—	6.22	15.6	S10N06P26P
2	0.50	—	—	—	—	7.47	18.7	8.3	20.8	—	—	S10N04P51P
2	0.50	5.39	13.5	6.22	15.6	—	—	—	—	12.4	31.2	S10N06P51P
2	0.75	—	—	—	—	11.2	28.2	12.4	31.2	—	—	S10N04P76P
2	0.75	8.09	20.3	9.33	23.4	—	—	—	—	18.7	46.8	S10N06P76P
2	1	—	—	—	—	14.9	37.5	16.6	41.7	—	—	S10N04P01P
2	1	10.8	27.1	12.4	31.2	—	—	—	—	24.9	62.5	S10N06P01P
2	1.5	—	—	—	—	22.4	56.2	24.9	62.5	—	—	S10N04P16P
2	1.5	16.2	40.6	18.7	46.9	—	—	—	—	37.3	93.7	S10N06P16P
2	2	—	—	—	—	29.9	75	33.2	83.3	—	—	S10N04P02P
2	2	21.6	54.2	24.9	62.5	—	—	—	—	49.8	125	S10N06P02P
2	3	—	—	—	—	44.7	112.5	49.8	125.1	—	—	S10N04A03N
2	3	32.4	81.3	32.7	93.6	—	—	—	—	74.7	187.5	S10N06A03N
2	5	—	—	—	—	74.7	187	83	208	—	—	S10N04A05N
2	5	53.9	135	62.2	156	—	—	—	—	124	312.5	S10N06A05N
2	7.5	—	—	—	—	112	282	124	312	—	—	S10N04A07N
2	7.5	80.9	203	93.3	234	—	—	—	—	187	468	S10N06A07N
Connection Diagram ②		L		K		L		K		I		

Notes

① Additional wiring trough may be required.

② Refer to Page V2-T2-151 for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on Page V2-T2-207.

Three-Phase Open Delta Connection 230 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage		219		242		246		253		260		Catalog Number
		Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
2	0.05	1.66	4.17	1.74	4.37	—	—	0.91	2.29	—	—	—	—	S10N04A81N
2	0.05	—	—	—	—	1.33	3.33	—	—	0.70	1.77	—	—	S10N06A81N
2	0.10	3.32	8.33	3.48	8.75	—	—	1.83	4.58	—	—	—	—	S10N04A82N
2	0.10	—	—	—	—	2.65	6.67	—	—	1.41	3.54	—	—	S10N06A82N
2	0.15	4.98	12.5	5.23	13.1	—	—	2.74	6.87	—	—	—	—	S10N04A83N
2	0.15	—	—	—	—	3.98	10.0	—	—	2.12	5.13	—	—	S10N06A83N
2	0.25	8.3	20.8	8.71	21.9	—	—	4.56	11.5	—	—	—	—	S10N04P26P
2	0.25	—	—	—	—	6.64	16.7	—	—	3.52	8.85	—	—	S10N06P26P
2	0.50	16.6	41.7	17.4	43.7	—	—	9.73	22.9	—	—	—	—	S10N04P51P
2	0.50	—	—	—	—	13.3	33.3	—	—	7.05	17.7	—	—	S10N06P51P
2	0.75	24.9	62.4	26.1	65.6	—	—	13.7	34.4	—	—	—	—	S10N04P76P
2	0.75	—	—	—	—	19.9	50	—	—	10.6	26.6	—	—	S10N06P76P
2	1	33.2	83.3	34.8	87.5	—	—	18.3	45.8	—	—	—	—	S10N04P01P
2	1	—	—	—	—	26.5	66.7	—	—	14.1	35.4	—	—	S10N06P01P
2	1.5	49.8	125	52.3	131	—	—	27.4	68.7	—	—	—	—	S10N04P16P
2	1.5	—	—	—	—	39.8	100	—	—	21.2	53.1	—	—	S10N06P16P
2	2	66.4	167	69.7	175	—	—	36.5	91.7	—	—	—	—	S10N04P02P
2	2	—	—	—	—	53.1	133	—	—	28.2	70.8	—	—	S10N06P02P
2	3	99.6	249.9	104.4	262.5	—	—	54.9	137.4	—	—	—	—	S10N04A03N
2	3	—	—	—	—	79.5	200	—	—	42.3	106.2	—	—	S10N06A03N
2	5	166	417	174	437	—	—	91.3	229	—	—	—	—	S10N04A05N
2	5	—	—	—	—	133	333	—	—	70.5	177	—	—	S10N06A05N
2	7.5	249	624	261	656	—	—	137	344	—	—	—	—	S10N04A07N
2	7.5	—	—	—	—	199	500	—	—	106	266	—	—	S10N06A07N
Connection Diagram ②		I		I		I		K		K				

Notes

① Additional wiring trough may be required.

② Refer to **Page V2-T2-151** for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase Open Delta Connection 240 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage										Catalog Number
		208 Output		212 Output		216 Output		218 Output		225 Output		
		kVA	Amps	kVA	Amps	kVA	Amps	kVA	Amps	kVA	Amps	
2	0.05	—	—	—	—	0.73	1.87	0.87	2.08	—	—	S10N04A81N
2	0.05	0.56	1.35	0.65	1.56	—	—	—	—	1.3	3.12	S10N06A81N
2	0.10	—	—	—	—	1.56	3.75	1.73	4.17	—	—	S10N04A82N
2	0.10	1.13	2.71	1.3	3.12	—	—	—	—	2.6	6.25	S10N06A82N
2	0.15	—	—	—	—	2.34	5.62	2.6	6.25	—	—	S10N04A83N
2	0.15	1.69	4.06	1.95	4.69	—	—	—	—	3.9	9.37	S10N06A83N
2	0.25	—	—	—	—	3.9	9.37	4.33	10.4	—	—	S10N04P26P
2	0.25	2.81	6.77	3.25	7.81	—	—	—	—	6.49	15.6	S10N06P26P
2	0.50	—	—	—	—	7.79	18.7	8.66	20.8	—	—	S10N04P51P
2	0.50	5.63	13.5	6.5	15.6	—	—	—	—	13	31.2	S10N06P51P
2	0.75	—	—	—	—	11.7	28.2	13	31.2	—	—	S10N04P76P
2	0.75	8.44	20.3	9.75	23.4	—	—	—	—	19.5	46.8	S10N06P76P
2	1	—	—	—	—	15.6	37.5	17.3	41.7	—	—	S10N04P01P
2	1	11.3	27.1	13	31.2	—	—	—	—	26	62.5	S10N06P01P
2	1.5	—	—	—	—	23.4	56.2	26	62.5	—	—	S10N04P16P
2	1.5	16.9	40.6	19.5	46.9	—	—	—	—	39	93.7	S10N06P16P
2	2	—	—	—	—	31.2	75	34.6	83.3	—	—	S10N04P02P
2	2	22.5	54.2	26	62.5	—	—	—	—	52	125	S10N06P02P
2	3	—	—	—	—	46.8	112.5	51.9	125.1	—	—	S10N04A03N
2	3	33.9	81.3	39	93.6	—	—	—	—	78	187.5	S10N06A03N
2	5	—	—	—	—	77.9	187	86.6	208	—	—	S10N04A05N
2	5	56.3	135	65	156	—	—	—	—	130	312	S10N06A05N
2	7.5	—	—	—	—	117	282	130	312	—	—	S10N04A07N
2	7.5	84.4	203	97.5	234	—	—	—	—	195	468	S10N06A07N
Connection Diagram ②		L		K		L		K		I		

Notes

① Additional wiring trough may be required.

② Refer to Page V2-T2-151 for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on Page V2-T2-207.

Three-Phase Open Delta Connection 240 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage		229		252		256		264		272		Catalog Number
		Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
2	0.05	1.73	4.16	1.82	4.37	—	—	0.95	2.29	—	—	—	—	S10N04A81N
2	0.05	—	—	—	—	1.38	3.33	—	—	0.74	1.77	—	—	S10N06A81N
2	0.10	3.46	8.33	3.64	8.75	—	—	1.91	4.58	—	—	—	—	S10N04A82N
2	0.10	—	—	—	—	2.77	6.67	—	—	1.47	3.54	—	—	S10N06A82N
2	0.15	5.19	12.5	5.45	13.1	—	—	2.86	6.87	—	—	—	—	S10N04A83N
2	0.15	—	—	—	—	4.15	10.0	—	—	2.21	5.31	—	—	S10N06A83N
2	0.25	8.66	20.8	9.09	21.9	—	—	4.76	11.5	—	—	—	—	S10N04P26P
2	0.25	—	—	—	—	6.92	16.7	—	—	3.68	8.85	—	—	S10N06P26P
2	0.50	17.3	41.6	18.2	43.7	—	—	9.53	22.9	—	—	—	—	S10N04P51P
2	0.50	—	—	—	—	13.8	33.3	—	—	7.36	17.7	—	—	S10N06P51P
2	0.75	26	62.4	27.3	65.6	—	—	14.3	34.4	—	—	—	—	S10N04P76P
2	0.75	—	—	—	—	20.8	50	—	—	11	26.6	—	—	S10N06P76P
2	1	34.6	83.3	36.4	87.5	—	—	19.1	45.8	—	—	—	—	S10N04P01P
2	1	—	—	—	—	27.7	66.7	—	—	14.7	35.4	—	—	S10N06P01P
2	1.5	51.9	125	54.5	131	—	—	28.6	68.7	—	—	—	—	S10N04P16P
2	1.5	—	—	—	—	41.5	100	—	—	22.1	53.1	—	—	S10N06P16P
2	2	69.3	167	72.7	175	—	—	38.1	91.7	—	—	—	—	S10N04P02P
2	2	—	—	—	—	55.4	133	—	—	29.4	70.8	—	—	S10N06P02P
2	3	103.8	249.9	109.2	262.5	—	—	57.3	137.4	—	—	—	—	S10N04A03N
2	3	—	—	—	—	83.1	200	—	—	44.1	106.2	—	—	S10N06A03N
2	5	173	416	182	437	—	—	95.3	229	—	—	—	—	S10N04A05N
2	5	—	—	—	—	138	333	—	—	73.6	177	—	—	S10N06A05N
2	7.5	260	624	273	656	—	—	143	344	—	—	—	—	S10N04A07N
2	7.5	—	—	—	—	208	500	—	—	110	266	—	—	S10N06A07N
Connection Diagram ②		I		I		I		K		K				

Notes

① Additional wiring trough may be required.

② Refer to **Page V2-T2-151** for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

WARNING! Three-phase autotransformers should never be used to obtain four-wire output with three-wire input. Four-wire output requires four-wire wye input.

On all wye connections, the source neutral must be present and connected to the transformer bank. If source neutral is not present, do not use a wye connection.

Three-Phase Wye Connection 208 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage		152		164		173		180		184		Catalog Number
		Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
3	0.05	—	—	—	—	0.75	2.08	—	—	—	—	—	—	S10N04A81N
3	0.05	0.41	1.15	0.56	1.56	—	—	0.98	2.71	1.12	3.12	—	—	S10N06A81N
3	0.10	—	—	—	—	1.50	4.17	—	—	—	—	—	—	S10N04A82N
3	0.10	0.82	2.29	1.12	3.12	—	—	1.95	5.41	2.25	6.25	—	—	S10N06A82N
3	0.15	—	—	—	—	2.25	6.25	—	—	—	—	—	—	S10N04A83N
3	0.15	1.24	3.44	1.69	4.69	—	—	2.92	8.12	3.73	9.37	—	—	S10N06A83N
3	0.25	—	—	—	—	3.75	10.4	—	—	—	—	—	—	S10N04P26P
3	0.25	2.06	5.73	2.81	7.81	—	—	4.87	13.5	5.62	15.6	—	—	S10N06P26P
3	0.50	—	—	—	—	7.5	20.8	—	—	—	—	—	—	S10N04P51P
3	0.50	4.12	11.5	5.62	15.6	—	—	9.75	27.1	11.2	31.2	—	—	S10N06P51P
3	0.75	—	—	—	—	11.2	31.2	—	—	—	—	—	—	S10N04P76P
3	0.75	6.19	17.2	8.44	23.4	—	—	14.6	40.6	16.8	46.8	—	—	S10N06P76P
3	1	—	—	—	—	15	41.7	—	—	—	—	—	—	S10N04P01P
3	1	8.25	22.9	11.2	31.2	—	—	19.5	54.1	22.5	62.5	—	—	S10N06P01P
3	1.5	—	—	—	—	22.5	62.5	—	—	—	—	—	—	S10N04P16P
3	1.5	12.4	34.4	16.9	46.9	—	—	29.2	81.2	33.7	93.7	—	—	S10N06P16P
3	2	—	—	—	—	30	83.3	—	—	—	—	—	—	S10N04P02P
3	2	16.5	45.8	22.5	62.5	—	—	39	108	45	125	—	—	S10N06P02P
3	3	—	—	—	—	45	125	—	—	—	—	—	—	S10N04A03N
3	3	24.7	68.7	33.6	93.6	—	—	58.5	162.3	67.5	187.5	—	—	S10N06A03N
3	5	—	—	—	—	75	208	—	—	—	—	—	—	S10N04A05N
3	5	41.2	115	56.2	156	—	—	97.5	271	112	312	—	—	S10N06A05N
3	7.5	—	—	—	—	112	312	—	—	—	—	—	—	S10N04A07N
3	7.5	61.9	172	84.4	234	—	—	146	406	168	468	—	—	S10N06A07N
Connection Diagram ②		P		N		N		0		M				

Notes

① Additional wiring trough may be required.

② Refer to **Page V2-T2-151** for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

WARNING! Three-phase autotransformers should never be used to obtain four-wire output with three-wire input. Four-wire output requires four-wire wye input.

2

On all wye connections, the source neutral must be present and connected to the transformer bank. If source neutral is not present, do not use a wye connection.

Three-Phase Wye Connection 208 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage		229		236		250		264		Catalog Number
		189 Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
3	0.05	1.5	4.16	1.65	4.58	—	—	0.9	2.5	—	—	S10N04A81N
3	0.05	—	—	—	—	1.27	3.54	—	—	0.71	1.98	S10N06A81N
3	0.10	3.0	8.33	3.3	9.17	—	—	1.8	5.0	—	—	S10N04A82N
3	0.10	—	—	—	—	2.55	7.08	—	—	1.42	3.95	S10N06A82N
3	0.15	4.5	12.5	4.95	13.7	—	—	2.7	7.5	—	—	S10N04A83N
3	0.15	—	—	—	—	3.82	10.6	—	—	2.14	5.93	S10N06A83N
3	0.25	7.5	20.8	8.25	22.9	—	—	4.5	12.5	—	—	S10N04P26P
3	0.25	—	—	—	—	6.35	17.7	—	—	3.56	9.88	S10N06P26P
3	0.50	15	41.6	16.5	45.8	—	—	9	25	—	—	S10N04P51P
3	0.50	—	—	—	—	12.7	35.4	—	—	7.12	19.3	S10N06P51P
3	0.75	22.5	62.4	24.7	68.7	—	—	13.5	37.5	—	—	S10N04P76P
3	0.75	—	—	—	—	19	53.1	—	—	10.7	29.3	S10N06P76P
3	1	30	83.3	33	91.7	—	—	18	50	—	—	S10N04P01P
3	1	—	—	—	—	25.5	70.8	—	—	14.2	39.5	S10N06P01P
3	1.5	45	125	49.5	137	—	—	27	75	—	—	S10N04P16P
3	1.5	—	—	—	—	38.2	106	—	—	21.4	59.3	S10N06P16P
3	2	60	167	66	183	—	—	361	100	—	—	S10N04P02P
3	2	—	—	—	—	51	142	—	—	28.5	79.2	S10N06P02P
3	3	90	249.9	99	275.1	—	—	54	150	—	—	S10N04A03N
3	3	—	—	—	—	76.5	212.4	—	—	46.2	118.5	S10N06A03N
3	5	150	416	165	458	—	—	90	250	—	—	S10N04A05N
3	5	—	—	—	—	127	354	—	—	71.2	198	S10N06A05N
3	7.5	225	624	274	687	—	—	135	375	—	—	S10N04A07N
3	7.5	—	—	—	—	190	531	—	—	107	293	S10N06A07N
Connection Diagram ②		M		M		M		N		N		

Notes

① Additional wiring trough may be required.

② Refer to **Page V2-T2-151** for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

WARNING! Three-phase autotransformers should never be used to obtain four-wire output with three-wire input. Four-wire output requires four-wire wye input.

On all wye connections, the source neutral must be present and connected to the transformer bank. If source neutral is not present, do not use a wye connection.

Three-Phase Wye Connection 230 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage										Catalog Number
		183		192		199		208		218		
		Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
3	0.05	—	—	0.83	2.08	—	—	1.65	4.58	1.66	4.17	S10N04A81N
3	0.05	0.62	1.56	—	—	0.54	1.35	—	—	—	—	S10N06A81N
3	0.10	—	—	1.66	4.17	—	—	3.3	9.17	3.32	8.35	S10N04A82N
3	0.10	1.25	3.12	—	—	1.08	2.71	—	—	—	—	S10N06A82N
3	0.15	—	—	2.49	6.25	—	—	4.95	13.7	4.98	12.5	S10N04A83N
3	0.15	1.87	4.69	—	—	1.62	4.06	—	—	—	—	S10N06A83N
3	0.25	—	—	4.15	10.4	—	—	8.2	22.9	8.3	20.9	S10N04P26P
3	0.25	3.11	7.81	—	—	2.70	6.77	—	—	—	—	S10N06P26P
3	0.50	—	—	8.3	20.8	—	—	16.5	45.8	16.6	41.7	S10N04P51P
3	0.50	6.22	15.6	—	—	5.39	13.5	—	—	—	—	S10N06P51P
3	0.75	—	—	12.4	31.2	—	—	24.7	68.8	24.9	62.6	S10N04P76P
3	0.75	9.33	23.4	—	—	8.09	20.3	—	—	—	—	S10N06P76P
3	1	—	—	16.6	41.7	—	—	33	91.7	33.2	83.5	S10N04P01P
3	1	12.5	31.2	—	—	10.8	27.1	—	—	—	—	S10N06P01P
3	1.5	—	—	24.9	62.5	—	—	49.5	137	49.8	125	S10N04P16P
3	1.5	18.7	46.9	—	—	16.2	40.6	—	—	—	—	S10N06P16P
3	2	—	—	33.2	83.3	—	—	66	183	66.4	167	S10N04P02P
3	2	24.9	62.5	—	—	21.6	54.2	—	—	—	—	S10N06P02P
3	3	—	—	49.8	125.1	—	—	99	275	99.6	250.5	S10N04A03N
3	3	37.5	93.6	—	—	32.4	81.3	—	—	—	—	S10N06A03N
3	5	—	—	83	208	—	—	165	458	166	417	S10N04A05N
3	5	62.2	156	—	—	53.9	135	—	—	—	—	S10N06A05N
3	7.5	—	—	124	312	—	—	247	688	249	626	S10N04A07N
3	7.5	93.3	234	—	—	80.9	203	—	—	—	—	S10N06A07N
Connection Diagram ②		N		N		S		M		Q		

Notes

① Additional wiring trough may be required.

② Refer to **Page V2-T2-151** for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

WARNING! Three-phase autotransformers should never be used to obtain four-wire output with three-wire input. Four-wire output requires four-wire wye input.

2

On all wye connections, the source neutral must be present and connected to the transformer bank. If source neutral is not present, do not use a wye connection.

Three-Phase Wye Connection 230 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage		242		245		253		260		265		Catalog Number
		Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
3	0.05	1.74	4.37	—	—	0.91	2.29	—	—	—	—	—	—	S10N04A81N
3	0.05	—	—	1.33	3.33	—	—	0.70	1.77	0.62	1.56	—	—	S10N06A81N
3	0.10	3.48	8.75	—	—	1.83	4.58	—	—	—	—	—	—	S10N04A82N
3	0.10	—	—	2.65	6.67	—	—	1.41	3.54	1.25	3.12	—	—	S10N06A82N
3	0.15	5.23	13.1	—	—	2.74	6.87	—	—	—	—	—	—	S10N04A83N
3	0.15	—	—	3.98	10.0	—	—	2.12	5.31	1.87	4.69	—	—	S10N06A83N
3	0.25	8.71	21.9	—	—	4.56	11.5	—	—	—	—	—	—	S10N04P26P
3	0.25	—	—	6.63	16.7	—	—	3.52	8.85	3.11	7.81	—	—	S10N06P26P
3	0.50	17.4	43.7	—	—	9.31	22.9	—	—	—	—	—	—	S10N04P51P
3	0.50	—	—	13.3	33.3	—	—	7.05	17.7	6.22	15.6	—	—	S10N06P51P
3	0.75	26.1	65.6	—	—	13.7	34.4	—	—	—	—	—	—	S10N04P76P
3	0.75	—	—	19.9	50	—	—	10.6	26.6	9.33	23.4	—	—	S10N06P76P
3	1	34.8	87.5	—	—	18.3	45.8	—	—	—	—	—	—	S10N04P01P
3	1	—	—	26.5	66.7	—	—	14.1	35.4	12.5	31.2	—	—	S10N06P01P
3	1.5	52.3	131	—	—	27.4	68.7	—	—	—	—	—	—	S10N04P16P
3	1.5	—	—	39.8	100	—	—	21.2	53.1	18.7	46.9	—	—	S10N06P16P
3	2	69.7	175	—	—	36.6	91.6	—	—	—	—	—	—	S10N04P02P
3	2	—	—	53.1	133	—	—	28.2	70.8	24.9	62.5	—	—	S10N06P02P
3	3	104.4	262.5	—	—	54.9	137.4	—	—	—	—	—	—	S10N04A03N
3	3	—	—	79.5	200	—	—	42.3	106.2	37.5	93.6	—	—	S10N06A03N
3	5	174	437	—	—	91.3	229	—	—	—	—	—	—	S10N04A05N
3	5	—	—	133	333	—	—	70.5	177	62.2	156	—	—	S10N06A05N
3	7.5	261	656	—	—	137	344	—	—	—	—	—	—	S10N04A07N
3	7.5	—	—	199	500	—	—	106	266	93.3	234	—	—	S10N06A07N
Connection Diagram ②		Q		Q		R		R		S				

Notes

① Additional wiring trough may be required.

② Refer to **Page V2-T2-151** for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

WARNING! Three-phase autotransformers should never be used to obtain four-wire output with three-wire input. Four-wire output requires four-wire wye input.

On all wye connections, the source neutral must be present and connected to the transformer bank. If source neutral is not present, do not use a wye connection.

Three-Phase Wye Connection 240 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage										Catalog Number
		190		200		208		218		228		
		Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
3	0.05	—	—	0.86	2.08	—	—	0.86	2.08	1.73	4.17	S10N04A81N
3	0.05	0.65	1.65	—	—	1.27	3.05	—	—	—	—	S10N06A81N
3	0.10	—	—	1.73	4.17	—	—	1.73	4.17	3.46	8.34	S10N04A82N
3	0.10	1.3	3.12	—	—	2.55	6.12	—	—	—	—	S10N06A82N
3	0.15	—	—	2.59	6.25	—	—	2.59	6.25	5.20	12.5	S10N04A83N
3	0.15	1.95	4.69	—	—	3.82	9.16	—	—	—	—	S10N06A83N
3	0.25	—	—	4.32	10.4	—	—	4.32	10.4	8.66	20.9	S10N04P26P
3	0.25	3.25	7.81	—	—	6.3	15.1	—	—	—	—	S10N06P26P
3	0.50	—	—	8.65	20.8	—	—	8.65	20.8	17.3	41.7	S10N04P51P
3	0.50	6.5	15.6	—	—	12.7	30.4	—	—	—	—	S10N06P51P
3	0.75	—	—	13	31.2	—	—	13	31.2	26	62.6	S10N04P76P
3	0.75	9.75	23.4	—	—	19.2	46	—	—	—	—	S10N06P76P
3	1	—	—	17.3	41.7	—	—	17.3	41.7	34.6	83.4	S10N04P01P
3	1	13	31.2	—	—	25.5	61.2	—	—	—	—	S10N06P01P
3	1.5	—	—	25.9	62.5	—	—	25.9	62.5	52	125	S10N04P16P
3	1.5	19.5	46.9	—	—	38.2	91.6	—	—	—	—	S10N06P16P
3	2	—	—	34.6	83.3	—	—	34.6	83.3	69.3	167	S10N04P02P
3	2	26	62.5	—	—	51	122.4	—	—	—	—	S10N06P02P
3	3	—	—	51.9	125.1	—	—	51.9	125.1	103.8	250.2	S10N04A03N
3	3	39	93.6	—	—	76.5	183.6	—	—	—	—	S10N06A03N
3	5	—	—	86.5	208	—	—	86.5	208	173	417	S10N04A05N
3	5	65	156	—	—	127.2	305.2	—	—	—	—	S10N06A05N
3	7.5	—	—	130	312	—	—	130	312	260	626	S10N04A07N
3	7.5	97.5	234	—	—	192	460	—	—	—	—	S10N06A07N
Connection Diagram ②		N		N		M		R		Q		

Notes

① Additional wiring trough may be required.

② Refer to **Page V2-T2-151** for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

WARNING! Three-phase autotransformers should never be used to obtain four-wire output with three-wire input. Four-wire output requires four-wire wye input.

2

On all wye connections, the source neutral must be present and connected to the transformer bank. If source neutral is not present, do not use a wye connection.

Three-Phase Wye Connection 240 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage		256		264		272		277		Catalog Number
		Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
3	0.05	1.85	4.37	—	—	0.95	2.29	—	—	—	—	S10N04A81N
3	0.05	—	—	1.39	3.33	—	—	0.74	1.77	0.65	1.56	S10N06A81N
3	0.10	3.64	8.75	—	—	1.91	4.58	—	—	—	—	S10N04A82N
3	0.10	—	—	2.77	6.67	—	—	1.47	3.54	1.3	3.12	S10N06A82N
3	0.15	5.46	13.1	—	—	2.86	6.87	—	—	—	—	S10N04A83N
3	0.15	—	—	4.16	10.0	—	—	2.21	5.31	1.95	4.69	S10N06A83N
3	0.25	9.09	21.9	—	—	4.76	11.5	—	—	—	—	S10N04P26P
3	0.25	—	—	6.93	16.7	—	—	3.68	8.85	3.25	7.81	S10N06P26P
3	0.50	18.2	43.7	—	—	9.53	22.9	—	—	—	—	S10N04P51P
3	0.50	—	—	13.9	33.3	—	—	7.36	17.7	6.5	15.6	S10N06P51P
3	0.75	27.3	65.6	—	—	14.3	34.4	—	—	—	—	S10N04P76P
3	0.75	—	—	20.8	50	—	—	11	26.6	9.75	23.4	S10N06P76P
3	1	36.4	87.5	—	—	19.1	45.8	—	—	—	—	S10N04P01P
3	1	—	—	27.7	66.7	—	—	14.7	35.4	13	31.2	S10N06P01P
3	1.5	54.6	131	—	—	28.6	68.7	—	—	—	—	S10N04P16P
3	1.5	—	—	41.6	100	—	—	22.1	53.1	19.5	46.9	S10N06P16P
3	2	72.8	175	—	—	38.1	91.7	—	—	—	—	S10N04P02P
3	2	—	—	55.4	133	—	—	29.5	70.8	26	62.5	S10N06P02P
3	3	109.2	262.5	—	—	57.3	137.4	—	—	—	—	S10N04A03N
3	3	—	—	83.1	200	—	—	44.1	106.2	39	93.6	S10N06A03N
3	5	182	437	—	—	95.3	229	—	—	—	—	S10N04A05N
3	5	—	—	139	333	—	—	73.6	177	65	156	S10N06A05N
3	7.5	273	656	—	—	143	344	—	—	—	—	S10N04A07N
3	7.5	—	—	208	500	—	—	110	266	97.5	234	S10N06A07N
Connection Diagram ②		Q		Q		R		R		S		

Notes

① Additional wiring trough may be required.

② Refer to **Page V2-T2-151** for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

WARNING! Three-phase autotransformers should never be used to obtain four-wire output with three-wire input. Four-wire output requires four-wire wye input.

On all wye connections, the source neutral must be present and connected to the transformer bank. If source neutral is not present, do not use a wye connection.

Three-Phase Wye Connection 460 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage		418		432		438		Catalog Number
		406 Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
3	0.05	—	—	1.66	2.08	—	—	3.22	4.04	S10N04A81N
3	0.05	1.25	1.57	—	—	2.49	3.12	—	—	S10N06A81N
3	0.10	—	—	3.31	4.15	—	—	6.62	8.31	S10N04A82N
3	0.10	2.49	3.12	—	—	4.97	6.24	—	—	S10N06A82N
3	0.15	—	—	4.97	6.24	—	—	9.94	12.48	S10N04A83N
3	0.15	3.73	4.68	—	—	7.46	9.36	—	—	S10N06A83N
3	0.25	—	—	8.28	10.39	—	—	16.6	20.84	S10N04P26P
3	0.25	6.22	7.81	—	—	12.4	15.56	—	—	S10N06P26P
3	0.50	—	—	16.6	20.84	—	—	33.2	41.67	S10N04P51P
3	0.50	12.5	15.69	—	—	24.69	31.25	—	—	S10N06P51P
3	0.75	—	—	24.8	31.12	—	—	49.6	62.25	S10N04P76P
3	0.75	18.7	23.47	—	—	37.3	46.82	—	—	S10N06P76P
3	1	—	—	33.1	41.54	—	—	66.2	83.09	S10N04P01P
3	1	24.9	31.25	—	—	49.7	62.38	—	—	S10N06P01P
3	1.5	—	—	49.7	62.38	—	—	99.4	124.75	S10N04P16P
3	1.5	37.3	46.94	—	—	74.6	93.63	—	—	S10N06P16P
3	2	—	—	66.3	83.22	—	—	133	166.93	S10N04P02P
3	2	49.7	62.38	—	—	99.5	124.88	—	—	S10N06P02P
3	3	—	—	99.3	124.64	—	—	198.6	249.27	S10N04A03N
3	3	74.6	93.63	—	—	149	187.01	—	—	S10N06A03N
3	5	—	—	166	208.35	—	—	322	404.16	S10N04A05N
3	5	125	156.89	—	—	249	312.53	—	—	S10N06A05N
3	7.5	—	—	248	311	—	—	496	622	S10N04A07N
3	7.5	187	235	—	—	373	468	—	—	S10N06A07N
Connection Diagram ②		R		R		Q		Q		

Notes

① Additional wiring trough may be required.

② Refer to **Page V2-T2-151** for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

WARNING! Three-phase autotransformers should never be used to obtain four-wire output with three-wire input. Four-wire output requires four-wire wye input.

2

On all wye connections, the source neutral must be present and connected to the transformer bank. If source neutral is not present, do not use a wye connection.

Three-Phase Wye Connection 460 Volt Output Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage		436		450		Catalog Number
		424 Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
3	0.05	—	1.7	2.1	—	—	—	S10N04A81N
3	0.05	1.3	1.56	—	—	2.6	3.13	S10N06A81N
3	0.10	—	—	3.5	4.2	—	—	S10N04A82N
3	0.10	2.6	3.12	—	—	5.2	6.25	S10N06A82N
3	0.15	—	—	5.2	6.25	—	—	S10N04A83N
3	0.15	3.9	4.68	—	—	7.8	9.38	S10N06A83N
3	0.25	—	—	8.7	10.4	—	—	S10N04P26P
3	0.25	6.5	7.82	—	—	13	15.6	S10N06P26P
3	0.50	—	—	17.4	20.9	—	—	S10N04P51P
3	0.50	13	15.6	—	—	26	31.2	S10N06P51P
3	0.75	—	—	26	31.2	—	—	S10N04P76P
3	0.75	19.5	23.4	—	—	39	46.9	S10N06P76P
3	1	—	—	35	42	—	—	S10N04P01P
3	1	26	31.2	—	—	52	62.5	S10N06P01P
3	1.5	—	—	52	62.5	—	—	S10N04P16P
3	1.5	39	46.8	—	—	78	93.8	S10N06P16P
3	2	—	—	69	82.9	—	—	S10N04P02P
3	2	52	62.5	—	—	104	125	S10N06P02P
3	3	—	—	104	125	—	—	S10N04A03N
3	3	78	93.8	—	—	156	187.6	S10N06A03N
3	5	—	—	174	209.2	—	—	S10N04A05N
3	5	130	156.3	—	—	260	312.7	S10N06A05N
3	7.5	—	—	260	312	—	—	S10N04A07N
3	7.5	195	234	—	—	390	469	S10N06A07N
Connection Diagram ②		R		R		Q		

Notes

① Additional wiring trough may be required.

② Refer to **Page V2-T2-151** for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

Single-Phase Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage/Output Voltage		230/277		346/380		362/380		Catalog Number
		200/240 Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
1	0.25	1.25	5.2	1.44	5.2	1.98	5.2	3.95	10.4	S20N08P26P
1	0.50	2.50	10.4	2.88	10.4	3.95	10.4	7.90	20.8	S20N08P51P
1	0.75	3.75	15.6	4.32	15.6	5.93	15.6	11.9	31.2	S20N08P76P
1	1	5.00	20.8	5.76	20.8	7.90	20.8	15.8	41.6	S20N08P01P
1	1.5	7.50	31.2	8.64	31.2	11.9	31.2	23.8	62.5	S20N08P16P
1	2	10.0	41.6	11.5	41.6	15.8	41.6	31.6	83.3	S20N08P02P
1	3	15.0	62.5	17.3	62.5	23.8	62.5	47.5	125.0	S20N08A03N
1	5	25.0	104.0	28.8	104.0	39.5	104.0	79.0	208.0	S20N08A05N
1	7.5	37.5	156.0	43.2	156.0	59.3	156.0	118.6	312.0	S20N08A07N
Connection Diagram ②		B		B		F		E		

Single-Phase Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage/Output Voltage		416/457		436/480		458/480		Catalog Number
		378/416 Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
1	0.25	2.16	5.2	2.38	5.2	2.50	5.2	4.99	10.4	S20N08P26P
1	0.50	4.33	10.4	4.76	10.4	4.99	10.4	9.98	20.8	S20N08P51P
1	0.75	6.49	15.6	7.14	15.6	7.49	15.6	15.0	31.2	S20N08P76P
1	1	8.65	20.8	9.52	20.8	9.98	20.8	20.0	41.6	S20N08P01P
1	1.5	13.0	31.2	14.3	31.2	15.0	31.2	30.0	62.5	S20N08P16P
1	2	17.3	41.6	19.0	41.6	20.0	41.6	40.0	83.3	S20N08P02P
1	3	26.0	62.5	28.6	62.5	30.0	62.5	60.0	125.0	S20N08A03N
1	5	43.3	104.0	47.6	104.0	49.9	104.0	99.8	208.0	S20N08A05N
1	7.5	64.9	156.0	71.4	156.0	74.9	156.0	149.8	312.0	S20N08A07N
Connection Diagram ②		F		F		F		E		

Notes

① Additional wiring trough may be required.

② Refer to **Page V2-T2-151** for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

Single-Phase Required, 60 Hz

Units Required ①	Unit kVA	Input Available Voltage/Output Voltage		277/230		480/456		504/480		528/480		Catalog Number
		Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	Output kVA	Amps			
1	0.25	1.44	6.26	5.23	11.4	5.47	11.4	2.75	5.72	S20N08P26P		
1	0.50	2.88	12.5	10.4	22.8	10.9	22.8	5.49	11.4	S20N08P51P		
1	0.75	4.33	18.8	15.7	34.2	16.4	34.2	8.24	17.2	S20N08P76P		
1	1	5.76	25.0	20.9	45.6	21.8	45.6	11.0	22.9	S20N08P01P		
1	1.5	8.64	37.6	31.3	68.4	32.8	68.4	16.5	34.3	S20N08P16P		
1	2	11.5	50.1	41.8	91.2	43.7	91.2	22.0	45.8	S20N08P02P		
1	3	17.3	75.3	62.7	136.0	65.2	136.0	33.0	68.8	S20N08A03N		
1	5	28.8	125.3	104.5	227.0	108.0	227.0	54.9	114.4	S20N08A05N		
1	7.5	43.2	187.9	156.8	341.0	163.0	341.0	82.4	171.6	S20N08A07N		
Connection Diagram ②		B		E		E		F				

Notes

① Additional wiring trough may be required.

② Refer to **Page V2-T2-151** for buck-boost wiring diagrams.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

Three-Phase Required, 60 Hz

Unit kVA	Input Available Voltage/Output Voltage										Catalog Number
	362/380 Output		346/416 Output		430/473 Output		400/480 Output		436/480 Output		
	kVA	Amps	kVA	Amps	kVA	Amps	kVA	Amps	kVA	Amps	
0.25	6.52	10.4	3.75	5.2	4.26	5.2	4.33	5.2	4.33	5.2	S20N08P26P
0.50	13.0	20.8	7.50	10.4	8.52	10.4	8.65	10.4	8.65	10.4	S20N08P51P
0.75	19.6	31.2	11.2	15.6	12.8	15.6	13.0	15.6	13.0	15.6	S20N08P76P
1	26.1	41.6	15.0	20.8	17.0	20.8	17.3	20.8	17.3	20.8	S20N08P01P
1.5	39.1	62.4	22.5	31.2	25.5	31.2	26.0	31.2	26.0	31.2	S20N08P16P
2	52.2	83.2	30.0	41.6	34.1	41.6	34.6	41.6	34.6	41.6	S20N08P02P
3	78.4	125.0	45.0	62.5	51.2	62.5	52.0	62.5	52.0	62.5	S20N08A03N
5	130.4	208.0	75.1	104.0	85.2	104.0	86.6	104.0	86.6	104.0	S20N08A05N
7.5	195.6	312.0	112.6	156.0	127.8	156.0	129.9	156.0	129.9	156.0	S20N08A07N
Connection Diagram ^①	I		N		K		N		K		
Units Required ^②	2		3		2		3		2		

Three-Phase Required, 60 Hz

Unit kVA	Input Available Voltage/Output Voltage								Catalog Number
	460/483 Output		457/380 Output		504/480 Output		528/480 Output		
	kVA	Amps	kVA	Amps	kVA	Amps	kVA	Amps	
0.25	8.7	10.4	4.12	6.25	9.08	10.9	4.76	5.72	S20N08P26P
0.50	17.4	20.8	8.23	12.5	18.2	21.8	9.51	11.4	S20N08P51P
0.75	26.1	31.2	12.3	18.8	27.2	32.8	14.3	17.2	S20N08P76P
1	34.8	41.6	16.5	25.0	36.3	43.7	19.0	22.9	S20N08P01P
1.5	52.2	62.4	24.7	37.5	54.5	65.5	28.5	34.3	S20N08P16P
2	69.6	83.2	32.9	50.0	72.6	87.4	38.0	45.8	S20N08P02P
3	104.6	125.0	49.5	75.2	109.7	131.3	57.2	68.8	S20N08A03N
5	174.0	208.0	82.3	125.1	181.6	218.4	95.1	114.4	S20N08A05N
7.5	261.0	312.0	123.5	187.6	272.4	327.6	142.7	171.6	S20N08A07N
Connection Diagram ^①	I		N		I		K		
Units Required ^②	2		3		2		2		

Notes

① Refer to Page V2-T2-151 for buck-boost wiring diagrams.

② Additional wiring trough may be required.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on Page V2-T2-207.

Three-Phase Open Delta Connection 480 Volt Output Required, 60 Hz

Units Required ①	Input Available Voltage		575		575		Catalog Number ②
	600 Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
2	4.3	5.1	—	—	—	—	S20N11P51P
2	—	—	—	—	4.1	4.9	S60G11P51P
2	6.5	7.8	—	—	—	—	S20N11P76P
2	—	—	—	—	6.2	7.4	S60G11P76P
2	8.6	10.3	—	—	—	—	S20N11P01P
2	—	—	—	—	8.3	9.9	S60G11P01P
2	13.0	15.6	—	—	—	—	S20N11P16P
2	—	—	—	—	12.4	14.9	S60G11P16P
2	17.2	20.6	—	—	—	—	S20N11P02P
2	—	—	—	—	16.5	19.8	S60G11P02P
2	25.8	31	—	—	—	—	S20N11S03N
2	—	—	—	—	24.8	29.8	S60G11P03P
2	43.2	51.9	—	—	—	—	S20N11S05N
2	—	—	—	—	41	49.3	S60G11S05N
2	65	78.1	—	—	—	—	S20N11S07N
2	—	—	—	—	62	74.5	S60G11S07N
2	86	103.4	—	—	—	—	S20N11S10N
2	—	—	83	99.8	—	—	S60G11S10N
2	130	156.3	—	—	—	—	S20N11S15N
2	—	—	124	149.1	—	—	S60N11S15N
2	216	259.8	—	—	—	—	T20P11S2516
2	—	—	207	248.9	—	—	S60J11S25N
2	324	389.7	—	—	—	—	T20P11S3716
2	432	519.6	—	—	—	—	T20P11S5016
Connection Diagram ③	I		J		T		

Notes

- ① Additional wiring trough may be required.
 - ② On transformers supplied with standard taps, taps must be placed at nominal settings.
 - ③ Refer to **Page V2-T2-151** for buck-boost wiring diagrams.
- Autotransformers can be used only where local electric codes permit and isolation of the two circuits is not required.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

Single-Phase 480 Volt Output Required, 60 Hz

Units Required ^①	Input Available Voltage		575		575		Catalog Number ^②
	600 Output kVA	Amps	Output kVA	Amps	Output kVA	Amps	
1	2.5	5.2	—	—	—	—	S20N11P51P
1	—	—	—	—	2.4	5	S60G11P51P
1	3.7	7.7	—	—	—	—	S20N11P76P
1	—	—	—	—	3.6	7.5	S60G11P76P
1	5.0	10.4	—	—	—	—	S20N11P01P
1	—	—	—	—	4.8	10	S60G11P01P
1	7.5	15.6	—	—	—	—	S20N11P16P
1	—	—	—	—	7.2	15	S60G11P16P
1	10	20.8	—	—	—	—	S20N11P02P
1	—	—	—	—	9.6	20	S60G11P02P
1	15	31.2	—	—	—	—	S20N11S03N
1	—	—	—	—	14.3	29.7	S60G11P03P
1	25	52	—	—	—	—	S20N11S05N
1	—	—	—	—	24	50	S60G11S05N
1	37.5	78.1	—	—	—	—	S20N11S07N
1	—	—	—	—	36	75	S60G11S07N
1	50	104.1	—	—	—	—	S20N11S10N
1	—	—	43	100	—	—	S60G11S10N
1	75	156.2	—	—	—	—	S20N11S15N
1	—	—	72	150	—	—	S60N11S15N
1	125	260.4	—	—	—	—	T20P11S2516
1	—	—	120	250	—	—	S60J11S25N
1	187	389.6	—	—	—	—	T20P11S3716
1	250	520.8	—	—	—	—	T20P11S5016
Connection Diagram ^③	E		H		U		

Notes

- ① Additional wiring trough may be required.
 - ② On transformers supplied with standard taps, taps must be placed at nominal settings.
 - ③ Refer to **Page V2-T2-151** for buck-boost wiring diagrams.
- Autotransformers can be used only where local electric codes permit and isolation of the two circuits is not required.

Output voltage for lower input voltage can be found by: $\frac{\text{Rated Output Voltage}}{\text{Rated Input Voltage}} \times \text{Input Actual Voltage} = \text{Output New Voltage}$.

Output kVA available at reduced input voltage can be found by: $\frac{\text{Actual Input Voltage}}{\text{Rated Input Voltage}} \times \text{Output kVA} = \text{New kVA Rating}$.

Frame drawings/dimensions information begins on **Page V2-T2-207**.

Buck-Boost and Low-Voltage Lighting Transformers

Accessories

Please refer to Section 2.7 **Page V2-T2-170**.

Technical Data and Specifications

Frequency

Eaton buck-boost transformers are designed for 60 Hz operation.

Overload Capability

Short-term overload is designed into transformers as required by IEEE. Dry-type distribution transformers will deliver 200% nameplate load for one-half hour, 150% load for one hour, and 125% load for four hours without being damaged, provided that a constant 50% load precedes and follows the overload. Refer to IEEE C57.96 *IEEE Guide for Loading Dry-Type Distribution and Power Transformers* for additional limitations.

Continuous overload capacity is not deliberately designed into a transformer because the design objective is to be within the allowed winding temperature rise with nameplate loading.

Insulation System and Temperature Rise

Industry standards classify insulation systems and rise as shown below:

Insulation System Classification

Ambient	+ Winding Rise	+ Hot Spot	= Temp. Class
40 °C	55 °C	10 °C	105 °C
40 °C	80 °C	30 °C	150 °C
25 °C	135 °C	20 °C	180 °C
40 °C	115 °C	30 °C	185 °C
40 °C	150 °C	30 °C	220 °C

The design life of transformers having different insulation systems is the same—the lower-temperature systems are designed for the same life as the higher-temperature systems.

Enclosures

Eaton encapsulated buck-boost transformers use a NEMA 3R rated enclosure.

Winding Terminations

Primary and secondary windings are terminated in the wiring compartment. Encapsulated units have copper leads or stabs brought out for connections. **Lugs are not supplied with these transformers.** Eaton recommends that external cables be rated 90 °C (sized at 75 °C ampacity) for encapsulated designs.

Series-Multiple Windings

Series-multiple windings consist of two similar coils in each winding that can be connected in series or parallel (multiple). Transformers with series-multiple windings are designated with an "x" or "/" between the voltage ratings, such as voltages of "120/240" or "240 x 480." If the series-multiple winding is designated by an "x," the winding can be connected only for a series or parallel. With the "/" designation, a mid-point also becomes available in addition to the series or parallel connection. As an example, a 120 x 240 winding can be connected for either 120 (parallel) or 240 (series), but a 120/240 winding can be connected for 120 (parallel), 240 (series) or 240 with a 120 mid-point.

Sound Levels

All Eaton 600 volt class general-purpose dry-type distribution transformers are designed to meet NEMA ST-20 sound levels listed here. These are the sound levels measured in a soundproof environment. Actual sound levels measured at an installation will likely be higher due to electrical connections and environmental conditions. Lower sound levels are available and should be specified when the transformer is going to be installed in an area where sound may be a concern.

For additional information, please refer to Section 2.7 **Page V2-T2-174**.

Note: When installation is to be made on a grounded system, consideration must be given to the resulting voltage. Thus, on a 208 grounded wye/120 system, the voltage can be boosted to 240 volts but the voltage to ground will be 139 volts. If 240/120 volts with a mid-point ground is needed, a standard two-winding transformer must be used.

The following formulas can be used to calculate specific requirements.

For single-phase:

$$\text{LOAD kVA} = \frac{\text{Load Voltage} \times \text{Full Line Amperes}}{1000}$$

For three-phase:

$$\text{LOAD kVA} = \frac{\text{Line Load Voltage} \times 1.73 \times \text{Full Load Amperes}}{1000}$$

Average Sound Levels

NEMA ST-20 Average Sound Level, dB

Equivalent Winding kVA Range	Self-Cooled Ventilated (up to 1.2 kV)		Encapsulated (up to 1.2 kV)
	K-Factor 1, 4, 9	K-Factor 13, 20	
3.00 and below	40	40	45
3.01 to 9.00	40	40	45
9.01 to 15.00	45	45	50
15.01 to 30.00	45	45	50
30.01 to 50.00	45	48	50
50.01 to 75.00	50	53	55
75.01 to 112.50	50	53	55
112.51 to 150.00	50	53	55
150.01 to 225.00	55	58	57
225.01 to 300.00	55	58	57
300.01 to 500.00	60	63	59
500.01 to 700.00	62	65	61
700.01 to 1000.00	64	67	63
Greater than 1000	Consult factory	Consult factory	Consult factory

Wiring Diagrams

Buck-Boost Transformers Wiring Diagrams

Diagram A

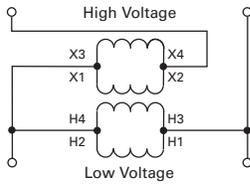


Diagram B

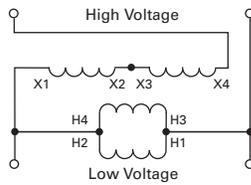


Diagram C

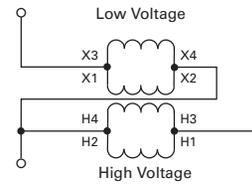


Diagram D

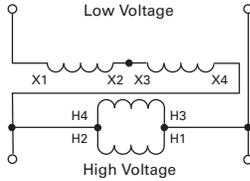


Diagram E

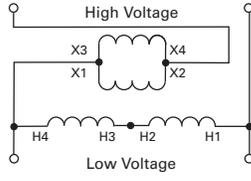


Diagram F

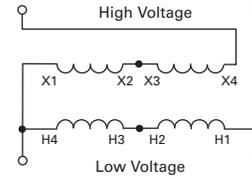


Diagram G

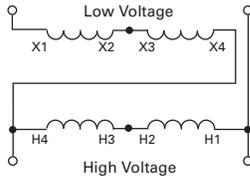


Diagram H

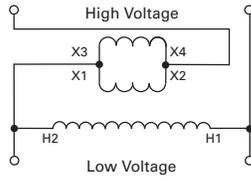


Diagram I

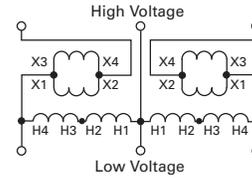


Diagram J

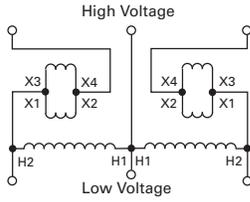


Diagram K

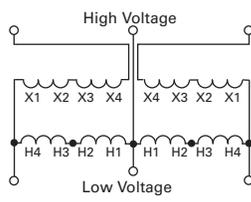


Diagram L

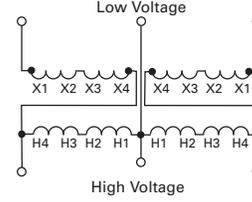


Diagram M ①

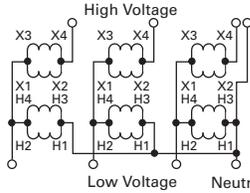


Diagram N ①

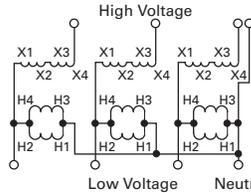


Diagram O ①

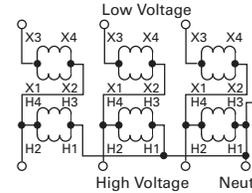


Diagram P ①

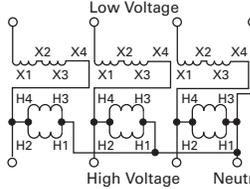


Diagram Q ①

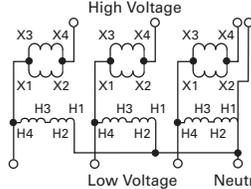


Diagram R ①

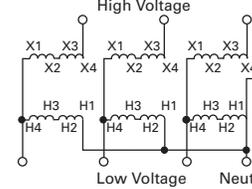


Diagram S ①

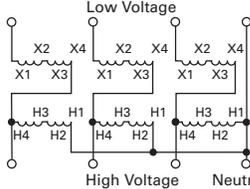


Diagram T

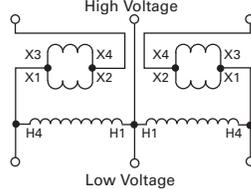
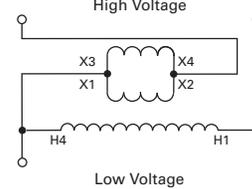


Diagram U



Note

① **WARNING!** If input is three-wire, "neutral" connection must be isolated and insulated! When used to supply a three-phase, four-wire load, the source must be three-phase, four-wire wye.

Medium-Voltage Dry-Type Distribution Transformers

2



Medium-Voltage Dry-Type Distribution Transformers

Product Description

Note: The following pages provide listings for most standard transformer ratings and catalog numbers. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Single- and Three-Phase

- Ventilated, NEMA 3R enclosure standard
- Suitable for indoor or outdoor applications
- Upright mounting only
- 220 °C insulation system
- 150 °C rise standard; 115 °C or 80 °C rise optional
- Available in single-phase ratings 15–333 kVA
- Available in three-phase ratings 15–1500 kVA

Application Description

DOE 2016 compliant energy-efficient transformers are specifically designed to meet the energy efficiency standards set forth in CFR Title 10 Chapter II Part 431, Appendix A of Subpart K 2016. Compliant transformers are optimized to offer maximum efficiency at 50% of nameplate rating.

Transformers that are currently specifically excluded from the scope of DOE 10 CFR Part 431 include:

- Liquid-filled transformers below 10 kVA
- Dry-type transformers below 15 kVA
- AC and DC drives transformers
- Rectifier transformers designed for high harmonics
- Autotransformers
- Non-distribution transformers, such as UPS transformers
- Special impedance or regulation transformers
- Regulating transformers
- Sealed and non-ventilated transformers
- Machine tool transformers
- Welding transformers
- Transformers with tap ranges greater than 15%
- Transformers with a frequency other than 60 Hz
- Grounding transformers
- Testing transformers

Contents

<i>Description</i>	<i>Page</i>
Motor Drive Isolation Transformers	V2-T2-97
Mini-Power Centers	V2-T2-105
Totally Enclosed Non-Ventilated Transformers	V2-T2-112
Class I, Division 2, Hazardous Location Transformers	V2-T2-115
Marine Duty Transformers	V2-T2-118
Buck-Boost and Low-Voltage Lighting Transformers	V2-T2-123
Medium-Voltage Dry-Type Distribution Transformers	
Features, Benefits and Functions	V2-T2-152
Standards and Certifications	V2-T2-152
Product Selection	V2-T2-153

DOE 2016 Efficiency Levels

Tables of Energy Efficiency Medium-Voltage Dry-Type Distribution Transformers—20–45 kV BIL

Single-Phase		Three-Phase	
kVA	Efficiency	kVA	Efficiency
15	98.10	15	97.50
25	98.33	30	97.90
37.5	98.49	45	98.10
50	98.60	75	98.33
75	98.73	112.5	98.52
100	98.82	150	98.65
167	98.96	225	98.82
250	99.07	300	98.93
333	99.14	500	99.09
—	—	750	99.21
—	—	1000	99.28
—	—	1500	99.37

Features, Benefits and Functions

- 60 Hz operation (except as noted)
- Short-term overload capability as required by IEEE
- Meet NEMA ST-20 sound levels
- Meet CFR Title 10 Chapter II Part 431, Appendix A of Subpart K 2016 energy efficiency requirements for dry-type transformers effective as of January 1, 2016

Standards and Certifications

- UL listed



Industry Standards

All Eaton dry-type distribution and control transformers are built and tested in accordance with applicable NEMA and IEEE standards.

Seismically Qualified

Eaton manufactured dry-type distribution transformers are seismically qualified and exceed requirements of the International Building Code (IBC) and California Code Title 24.

Product Selection

Single-Phase—Medium-Voltage Distribution Transformers 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

2400 Volts to 120/240 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
25	150						T42D11S2516Q
37.5							T42D11S3716Q
50							T42D11S5016Q
75							T42D11S7516Q
100							T42D11S9916Q
167							T42D11S6716Q
25	115						T42D11F2516Q
37.5							T42D11F3716Q
50							T42D11F5016Q
75							T42D11F7516Q
100							T42D11F9916Q
167							T42D11F6716Q
25	80						T42D11B2516Q
37.5							T42D11B3716Q
50							T42D11B5016Q
75							T42D11B7516Q
100							T42D11B9916Q
167							T42D11B6716Q

4160 Volts to 120/240 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
25	150						T46D11S2516Q
37.5							T46D11S3716Q
50							T46D11S5016Q
75							T46D11S7516Q
100							T46D11S9916Q
167							T46D11S6716Q
25	115						T46D11F2516Q
37.5							T46D11F3716Q
50							T46D11F5016Q
75							T46D11F7516Q
100							T46D11F9916Q
167							T46D11F6716Q
25	80						T46D11B2516Q
37.5							T46D11B3716Q
50							T46D11B5016Q
75							T46D11B7516Q
100							T46D11B9916Q
167							T46D11B6716Q

Note

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Single-Phase—Medium-Voltage Distribution Transformers 60 Hz DOE 2016 Energy-Efficient—Copper Windings

2400 Volts to 120/240 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
25	150	Contact local Eaton representative					T42D11S2516QCU
37.5							T42D11S3716QCU
50							T42D11S5016QCU
75							T42D11S7516QCU
100							T42D11S9916QCU
167							T42D11S6716QCU
25	115	Contact local Eaton representative					T42D11F2516QCU
37.5							T42D11F3716QCU
50							T42D11F5016QCU
75							T42D11F7516QCU
100							T42D11F9916QCU
167							T42D11F6716QCU
25	80	Contact local Eaton representative					T42D11B2516QCU
37.5							T42D11B3716QCU
50							T42D11B5016QCU
75							T42D11B7516QCU
100							T42D11B9916QCU
167							T42D11B6716QCU

4160 Volts to 120/240 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
25	150	Contact local Eaton representative					T46D11S2516QCU
37.5							T46D11S3716QCU
50							T46D11S5016QCU
75							T46D11S7516QCU
100							T46D11S9916QCU
167							T46D11S6716QCU
25	115	Contact local Eaton representative					T46D11F2516QCU
37.5							T46D11F3716QCU
50							T46D11F5016QCU
75							T46D11F7516QCU
100							T46D11F9916QCU
167							T46D11F6716QCU
25	80	Contact local Eaton representative					T46D11B2516QCU
37.5							T46D11B3716QCU
50							T46D11B5016QCU
75							T46D11B7516QCU
100							T46D11B9916QCU
167							T46D11B6716QCU

Note

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Three-Phase—Medium-Voltage Distribution Transformers 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

2400 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
45	150						V42D47T4516Q
75							V42D47T7516Q
112.5							V42D47T1216Q
150							V42D47T4916Q
225							V42D47T2216Q
300							V42D47T3316Q
500							V42D47T5516Q
750							V42D47T7716Q
45	115						V42D47F4516Q
75							V42D47F7516Q
112.5							V42D47F1216Q
150							V42D47F4916Q
225							V42D47F2216Q
300							V42D47F3316Q
500							V42D47F5516Q
750							V42D47F7716Q
45	80						V42D47B4516Q
75							V42D47B7516Q
112.5							V42D47B1216Q
150							V42D47B4916Q
225							V42D47B2216Q
300							V42D47B3316Q
500							V42D47B5516Q
750							V42D47B7716Q

Note

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Three-Phase—Medium-Voltage Distribution Transformers 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

4160 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
45	150	Contact local Eaton representative					V46D47T4516Q
75							V46D47T7516Q
112.5							V46D47T1216Q
150							V46D47T4916Q
225							V46D47T2216Q
300							V46D47T3316Q
500							V46D47T5516Q
750							V46D47T7716Q
45	115	Contact local Eaton representative					V46D47F4516Q
75							V46D47F7516Q
112.5							V46D47F1216Q
150							V46D47F4916Q
225							V46D47F2216Q
300							V46D47F3316Q
500							V46D47F5516Q
750							V46D47F7716Q
45	80	Contact local Eaton representative					V46D47B4516Q
75							V46D47B7516Q
112.5							V46D47B1216Q
150							V46D47B4916Q
225							V46D47B2216Q
300							V46D47B3316Q
500							V46D47B5516Q
750							V46D47B7716Q

Note

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Three-Phase—Medium-Voltage Distribution Transformers 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

2400 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
45	150						V42D28T4516Q
75							V42D28T7516Q
112.5							V42D28T1216Q
150							V42D28T4916Q
225							V42D28T2216Q
300							V42D28T3316Q
500							V42D28T5516Q
750							V42D28T7716Q
45	115						V42D28F4516Q
75							V42D28F7516Q
112.5							V42D28F1216Q
150							V42D28F4916Q
225							V42D28F2216Q
300							V42D28F3316Q
500							V42D28F5516Q
750							V42D28F7716Q
45	80						V42D28B4516Q
75							V42D28B7516Q
112.5							V42D28B1216Q
150							V42D28B4916Q
225							V42D28B2216Q
300							V42D28B3316Q
500							V42D28B5516Q
750							V42D28B7716Q

Note

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Three-Phase—Medium-Voltage Distribution Transformers 60 Hz DOE 2016 Energy-Efficient—Aluminum Windings

4160 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
45	150						V46D28T4516Q
75							V46D28T7516Q
112.5							V46D28T1216Q
150							V46D28T4916Q
225							V46D28T2216Q
300							V46D28T3316Q
500							V46D28T5516Q
750							V46D28T7716Q
45	115						V46D28F4516Q
75							V46D28F7516Q
112.5							V46D28F1216Q
150							V46D28F4916Q
225							V46D28F2216Q
300							V46D28F3316Q
500							V46D28F5516Q
750							V46D28F7716Q
45	80						V46D28B4516Q
75							V46D28B7516Q
112.5							V46D28B1216Q
150							V46D28B4916Q
225							V46D28B2216Q
300							V46D28B3316Q
500							V46D28B5516Q
750							V46D28B7716Q

Note

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Three-Phase—Medium-Voltage Distribution Transformers 60 Hz DOE 2016 Energy-Efficient—Copper Windings

2400 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
45	150	Contact local Eaton representative					V42D47T4516QCU
75							V42D47T7516QCU
112.5							V42D47T1216QCU
150							V42D47T4916QCU
225							V42D47T2216QCU
300							V42D47T3316QCU
500							V42D47T5516QCU
750							V42D47T7716QCU
45	115	Contact local Eaton representative					V42D47F4516QCU
75							V42D47F7516QCU
112.5							V42D47F1216QCU
150							V42D47F4916QCU
225							V42D47F2216QCU
300							V42D47F3316QCU
500							V42D47F5516QCU
750							V42D47F7716QCU
45	80	Contact local Eaton representative					V42D47B4516QCU
75							V42D47B7516QCU
112.5							V42D47B1216QCU
150							V42D47B4916QCU
225							V42D47B2216QCU
300							V42D47B3316QCU
500							V42D47B5516QCU
750							V42D47B7716QCU

Note

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Three-Phase—Medium-Voltage Distribution Transformers 60 Hz DOE 2016 Energy-Efficient—Copper Windings

4160 Delta Volts to 480Y/277 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
45	150	Contact local Eaton representative					V46D47T4516QCU
75							V46D47T7516QCU
112.5							V46D47T1216QCU
150							V46D47T4916QCU
225							V46D47T2216QCU
300							V46D47T3316QCU
500							V46D47T5516QCU
750							V46D47T7716QCU
45	115	Contact local Eaton representative					V46D47F4516QCU
75							V46D47F7516QCU
112.5							V46D47F1216QCU
150							V46D47F4916QCU
225							V46D47F2216QCU
300							V46D47F3316QCU
500							V46D47F5516QCU
750							V46D47F7716QCU
45	80	Contact local Eaton representative					V46D47B4516QCU
75							V46D47B7516QCU
112.5							V46D47B1216QCU
150							V46D47B4916QCU
225							V46D47B2216QCU
300							V46D47B3316QCU
500							V46D47B5516QCU
750							V46D47B7716QCU

Note

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Three-Phase—Medium-Voltage Distribution Transformers 60 Hz DOE 2016 Energy-Efficient—Copper Windings

2400 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
45	150						V42D28T4516QCU
75							V42D28T7516QCU
112.5							V42D28T1216QCU
150							V42D28T4916QCU
225							V42D28T2216QCU
300							V42D28T3316QCU
500							V42D28T5516QCU
750							V42D28T7716QCU
45	115						V42D28F4516QCU
75							V42D28F7516QCU
112.5							V42D28F1216QCU
150							V42D28F4916QCU
225							V42D28F2216QCU
300							V42D28F3316QCU
500							V42D28F5516QCU
750							V42D28F7716QCU
45	80						V42D28B4516QCU
75							V42D28B7516QCU
112.5							V42D28B1216QCU
150							V42D28B4916QCU
225							V42D28B2216QCU
300							V42D28B3316QCU
500							V42D28B5516QCU
750							V42D28B7716QCU

Note

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Three-Phase—Medium-Voltage Distribution Transformers 60 Hz DOE 2016 Energy-Efficient—Copper Windings

4160 Delta Volts to 208Y/120 Volts

kVA	Temperature Rise °C	Frame	Wiring Diagram	Weight Lb (kg)	Type 3R WS Kit	Wallmount Bracket	Catalog Number
45	150						V46D28T4516QCU
75							V46D28T7516QCU
112.5							V46D28T1216QCU
150							V46D28T4916QCU
225							V46D28T2216QCU
300							V46D28T3316QCU
500							V46D28T5516QCU
750							V46D28T7716QCU
45	115						V46D28F4516QCU
75							V46D28F7516QCU
112.5							V46D28F1216QCU
150							V46D28F4916QCU
225							V46D28F2216QCU
300							V46D28F3316QCU
500							V46D28F5516QCU
750							V46D28F7716QCU
45	80						V46D28B4516QCU
75							V46D28B7516QCU
112.5							V46D28B1216QCU
150							V46D28B4916QCU
225							V46D28B2216QCU
300							V46D28B3316QCU
500							V46D28B5516QCU
750							V46D28B7716QCU

Note

Contact your local Eaton sales office for CE Mark transformer requirements. For other ratings or catalog numbers not shown, or for special enclosure types (including stainless steel), refer to Eaton.

Dry-Type Distribution Transformers



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Standards and Certifications

Eaton dry-type distribution transformers are approved, listed, recognized or may comply with the following standards.

2

Engineering Standards

Catalog Product Name	UL Standard ①	UL/cUL File Number	UL Listed Control Number	cUL Energy Efficiency Verification File Number	CSA File Number	Insulation System Temp/°C	kVA Single-Phase	kVA Three-Phase	Applicable IEC Standard
Industrial Control Transformer									
MTE	5085	E46323	702X	—	—	105	0.025–1.5	N/A	61558
MTK	5085	E46323	702X	—	—	180	0.05–5	N/A	61558
Encapsulated Transformer									
AP	5085	E10156	591H	—	—	180	3–10	N/A	61558
AP	1561	E78389	591H	—	—	180	15	N/A	61558
EP	5085	E10156	591H	—	LR60545	180	0.05–10	N/A	61558
EP	1561	E78389	591H	—	LR60545 ③	180	15–37.5	N/A	61558 ④ / 726 ⑤
EPT	5085	E10156	591H	—	LR60545	180	N/A	3–9	61558 ⑥ / 726 ⑦
EPT	1561	E78389	591H	—	LR60545 ⑧	180	N/A	15–75	726
MPC	1062	E53449	591H	—	LR60546	180	3–25	15–30	—
Ventilated Transformer									
DS-3	1561	E78389	591H	EV33871 ②	—	220	7.5–167	N/A	60726
DT-3	1561	E78389	591H	EV33871 ⑥	—	220	N/A	7.5–750	60726
KT	1561	E78389	591H	EV33871 ⑥	—	220	N/A	7.5–500	N/A

Notes

- ① UL 5085 replaces UL 506.
- ② Applies to 15–167 kVA.
- ③ Applies to 25 kVA.
- ④ Applies to 15–25 kVA.
- ⑤ Applies to 37.5 kVA.
- ⑥ Applies to 3 kVA.
- ⑦ Applies to 5–9 kVA.
- ⑧ Applies to 15–300 kVA.
- ⑨ Applies to 30 kVA.

In addition to the above standards, Eaton dry-type distribution transformers are also manufactured in compliance with the applicable standards listed below.

Not all of the following standards apply to every transformer.

NEC: National Electrical Code®

NEMA ST-1: Specialty Transformers (C89.1) (control transformers).

NEMA ST-20: General-Purpose Transformers.

DOE 2016 Final Rule: CFR Title 10 Chapter II Part 431, Appendix A of Subpart K 2016.

NEMA 250: Enclosures for Electrical Equipment (1000 volts maximum).

IEEE C57.12.01: General Requirements for Dry-Type Distribution and Power Transformers (including those with solid-cast and/or resin-encapsulated windings).

IEEE C57.12.70: Terminal Markings and Connections for Distribution and Power Transformers.

IEEE C57.12.91: Standard Test Code for Dry-Type Distribution and Power Transformers.

CSA C22 No. 47-M90: Air-Cooled Transformers (Dry-Type).

CSA C9-M1981: Dry-Type Transformers.

CSA C22.2 No. 66: Specialty Transformers.

CSA 802-94: Maximum Losses for Distribution, Power and Dry-Type Transformers.

NEMA TP-1: Guide for Determining Energy Efficiency for Distribution Transformers (rescinded).

NEMA TP-2: Standard Test Method for Measuring the Energy Consumption of Distribution Transformers (rescinded).

NEMA TP-3: Standard for the Labeling of Distribution Transformer Efficiency (rescinded).

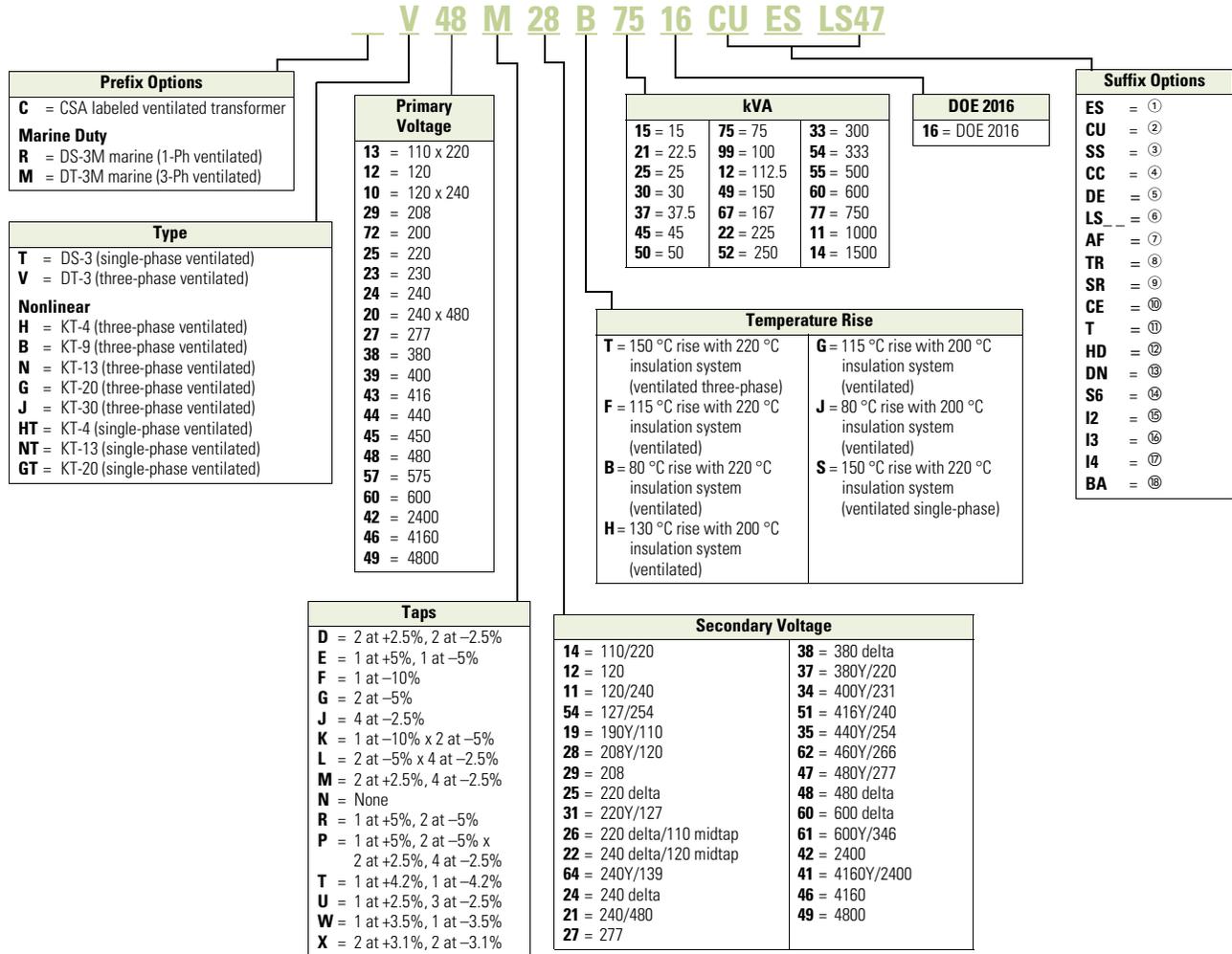


Energy Verified

Catalog Number Selection

Use table for catalog number breakdown only.
Do not use to create catalog numbers because all combinations may not be valid.

DOE 2016 Efficient Transformers, Shielded Isolation, Nonlinear K-Factor, Marine Duty Transformers—
Example: V48M28B7516CUESLS47



Notes

- ① Electrostatic shield.
- ② Copper windings.
- ③ Grade 304 stainless steel enclosure (does not imply a NEMA 4X rating).
- ④ Open type core and coil assembly.
- ⑤ Double aluminum electrostatic shield.
- ⑥ Low sound design. LS47 indicates low sound equal to 47 dB; LS42 indicates 42 dB.
- ⑦ Fungus proof.
- ⑧ Certified test report of standard production tests for the specific serial number to be shipped.

- ⑨ Certified sound level report.
- ⑩ CE Marked.
- ⑪ Thermal indicator embedded in center coil. Suffix "TT" indicates two thermal indicators of different temperature ratings, are installed.
- ⑫ Hinged front door.
- ⑬ Double neutral.
- ⑭ Grade 316 stainless steel enclosure (does not imply NEMA 4X rating).
- ⑮ Integral 2-inch infrared viewing window.
- ⑯ Integral 3-inch infrared viewing window.
- ⑰ Integral 4-inch infrared viewing window.
- ⑱ Made in America.

For Eaton's industrial control transformers catalog number selection, see Volume 7—Logic Control, Operator Interface and Connectivity Solutions, CA08100008E, Tab 7.

Contact your local Eaton sales office for voltage combinations not shown.

2.6

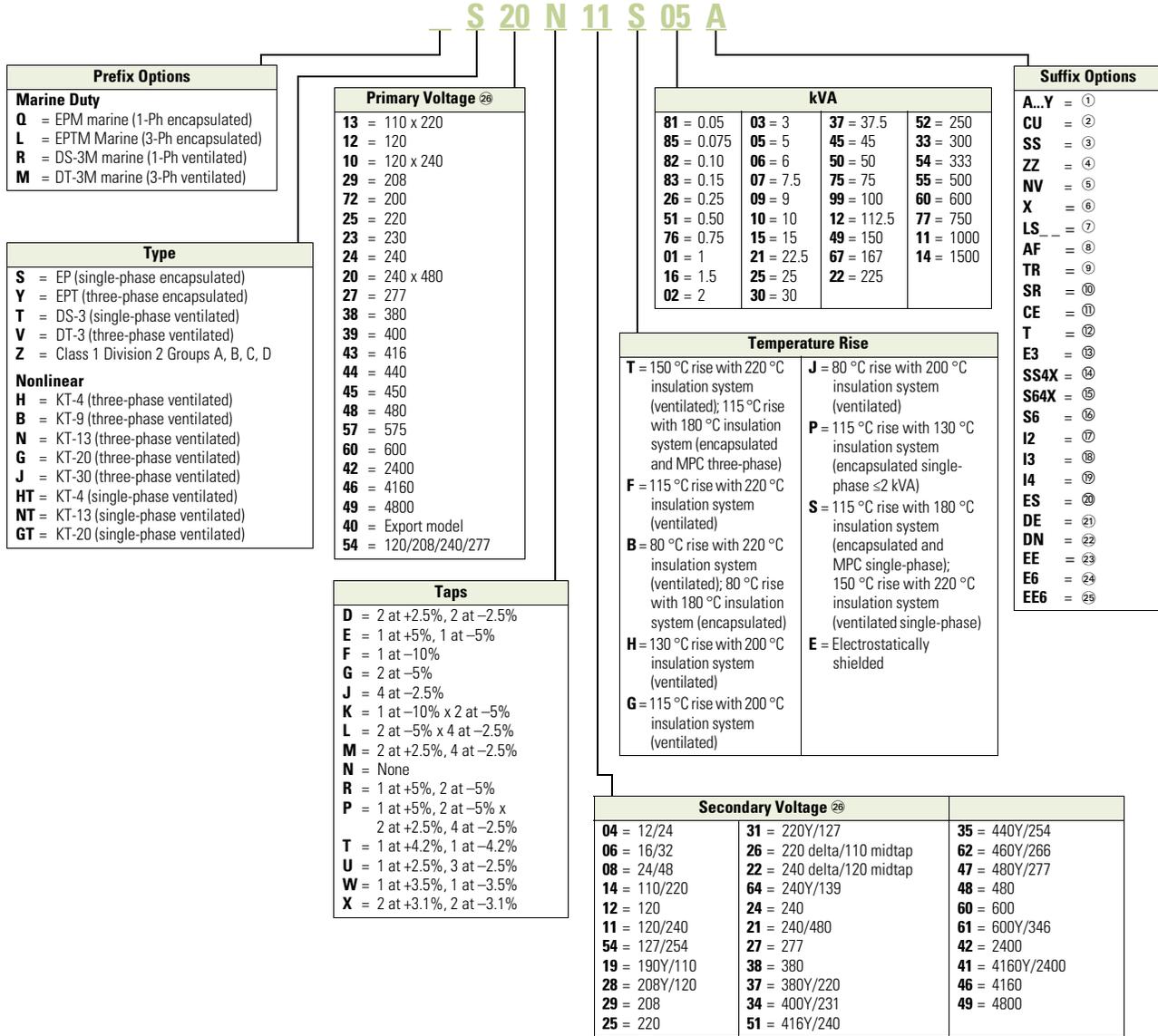
Transformers

Transformer Standards, Technical Data and Accessories

Use table for catalog number breakdown only.
Do not use to create catalog numbers because all combinations may not be valid.

2

General-Purpose, NEMA TP-1 Energy-Efficient, Shielded Isolation, Nonlinear K-Factor, Buck-Boost, Marine Duty Transformers—Example: S20N11S05A

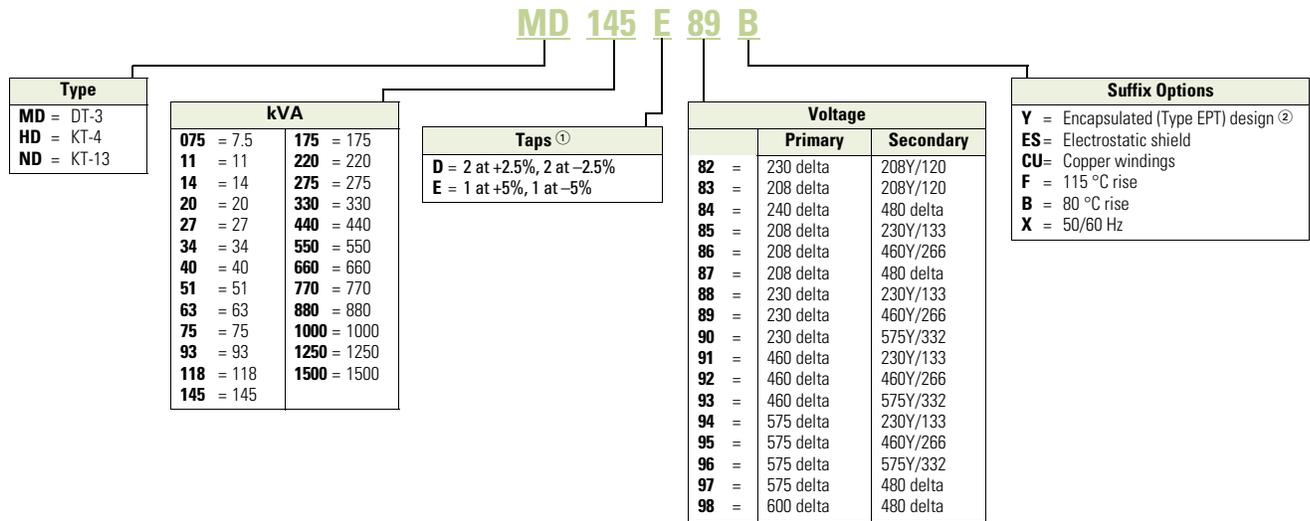


Notes

- ① Model number is not used on newly designed/redesigned transformers.
 - ② Copper windings.
 - ③ Grade 304 stainless steel enclosure (does not imply a NEMA 4X rating).
 - ④ Open type core and coil assembly.
 - ⑤ Totally enclosed non-ventilated DS-3 or DT-3.
 - ⑥ 50/60 Hz.
 - ⑦ Low sound design. LS47 indicates low sound equal to 47 dB; LS42 indicates 42 dB.
 - ⑧ Fungus proof.
 - ⑨ Certified test report of standard production tests for the specific serial number to be shipped.
 - ⑩ Certified sound level report.
 - ⑪ CE Marked.
 - ⑫ Thermal indicator embedded in center coil. Suffix "TT" indicates two thermal indicators of different temperature ratings, are installed.
 - ⑬ CSL3 DOE 2007 energy-efficient.
 - ⑭ NEMA 4X Grade 304 stainless steel enclosure.
 - ⑮ NEMA 4X Grade 316 stainless steel enclosure.
 - ⑯ Grade 316 stainless steel enclosure (does not imply NEMA 4X rating).
 - ⑰ Integral 2-inch infrared viewing window.
 - ⑱ Integral 3-inch infrared viewing window.
 - ⑲ Integral 4-inch infrared viewing window.
 - ⑳ Electrostatic shield.
 - ㉑ Double aluminum electrostatic shield.
 - ㉒ Double neutral.
 - ㉓ TP-1 energy-efficient.
 - ㉔ 2016 enclosure construction (Non-TP1 energy-efficient).
 - ㉕ TP-1 energy-efficient with 2016 enclosure construction.
 - ㉖ Single voltage value can be used for single-phase or three-phase. When three-phase, it refers to a delta configuration.
- For Eaton's industrial control transformers catalog number selection, see Volume 7—Logic Control, Operator Interface and Connectivity Solutions, **CA08100008E**, Tab 7.
- Contact your local Eaton sales office for voltage combinations not shown.

Use table for catalog number breakdown only.
Do not use to create catalog numbers because all combinations may not be valid.

Motor Drive Isolation Transformers—Example: MD145E89B



Notes

- ① For other tap combinations, contact your local Eaton sales office.
 - ② Available up to 34 kVA.
- Contact your local Eaton sales office for voltage combinations not shown.

Product Selection

Single-Phase Transformers

2

How to Select Single-Phase Units

1. Determine the primary (source) voltage—the voltage presently available.
2. Determine the secondary (load) voltage—the voltage needed at the load.
3. Determine the kVA load:
 - If the load is defined in kVA, a transformer can be selected from the tabulated data
 - If the load rating is given in amperes, determine the load kVA from the chart (below right). To determine kVA when volts and amperes are known, use the formula:

$$\text{kVA} = \frac{\text{Volts} \times \text{Amperes}}{1000}$$

- If the load is an AC motor, determine the minimum transformer kVA from the chart at the right
 - Select a transformer rating equal to or greater than the load kVA.
4. Define tap arrangements needed.
 5. Define temperature rise.

Using the above procedure, select the transformer from the listings in this catalog.

Single-Phase AC Motors

Horsepower	Full Load Amperes				Minimum Transformer kVA ^①
	115 Volts	208 Volts	220 Volts	230 Volts	
1/6	4.4	2.4	2.3	2.2	0.53
1/4	5.8	3.2	3.0	2.9	0.70
1/3	7.2	4.0	3.8	3.6	0.87
1/2	9.8	5.4	5.1	4.9	1.18
3/4	13.8	7.6	7.2	6.9	1.66
1	16	8.8	8.4	8	1.92
1-1/2	20	11.0	10.4	10	2.40
2	24	13.2	12.5	12	2.88
3	34	18.7	17.8	17	4.10
5	56	30.8	29.3	28	6.72
7-1/2	80	44	42	40	9.6
10	100	55	52	50	12.0

Full Load Current in Amperes—Single-Phase Circuits

kVA	Voltage									
	120	208	220	240	277	480	600	2400	4160	
0.25	2.0	1.2	1.1	1.0	0.9	0.5	0.4	0.10	0.06	
0.50	4.2	2.4	2.3	2.1	1.8	1.0	0.8	0.21	0.12	
0.75	6.3	3.6	3.4	3.1	2.7	1.6	1.3	0.31	0.18	
1	8.3	4.8	4.5	4.2	3.6	2.1	1.7	0.42	0.24	
1.5	12.5	7.2	6.8	6.2	5.4	3.1	2.5	0.63	0.36	
2	16.7	9.6	9.1	8.3	7.2	4.2	3.3	0.83	0.48	
3	25	14.4	13.6	12.5	10.8	6.2	5.0	1.2	0.72	
5	41	24.0	22.7	20.8	18.0	10.4	8.3	2.1	1.2	
7.5	62	36	34	31	27	15.6	12.5	3.1	1.8	
10	83	48	45	41	36	20.8	16.7	4.2	2.4	
15	125	72	68	62	54	31	25	6.2	3.6	
25	208	120	114	104	90	52	41	10.4	6.0	
37.5	312	180	170	156	135	78	62	15.6	9.0	
50	416	240	227	208	180	104	83	20.8	12.0	
75	625	360	341	312	270	156	125	31.3	18.0	
100	833	480	455	416	361	208	166	41.7	24.0	
167	1391	802	759	695	602	347	278	69.6	40.1	

Notes

^① If motors are started more than once per hour, increase minimum transformer kVA by 20%.

When motor service factor is greater than 1, increase full load amperes proportionally. Example: If service factor is 1.15, increase above ampere values by 15%.

Three-Phase Transformers

How to Select Three-Phase Units

1. Determine the primary (source) voltage—the voltage presently available.
2. Determine the secondary (load) voltage—the voltage needed at the load.
3. Determine the kVA load:
 - If the load is defined in kVA, a transformer can be selected from the tabulated data
 - If the load rating is given in amperes, determine the load kVA from the chart (below right). To determine kVA when volts and amperes are known, use the formula:

$$\text{kVA} = \frac{\text{Volts} \times \text{Amperes} \times 1.732}{1000}$$

- If the load is an AC motor, determine the minimum transformer kVA from the chart at the right
 - Select a transformer rating equal to or greater than the load kVA
4. Define tap arrangements needed.
 5. Define temperature rise.

Using the above procedure, select the transformer from the listings in this catalog.

Three-Phase AC Motors

Horsepower	Full Load Amperes					Minimum Transformer kVA ^①
	208 Volts	230 Volts	380 Volts	460 Volts	575 Volts	
0.5	2.2	2.0	1.2	1.0	0.8	0.9
3/4	3.1	2.8	1.7	1.4	1.1	1.2
1	4.0	3.6	2.2	1.8	1.4	1.5
1.5	5.7	5.2	3.1	2.6	2.1	2.1
2	7.5	6.8	4.1	3.4	2.7	2.7
3	10.7	9.6	5.8	4.8	3.9	3.8
5	16.7	15.2	9.2	7.6	6.1	6.3
7.5	24	22	14	11	9	9.2
10	31	28	17	14	11	11.2
15	46	42	26	21	17	16.6
20	59	54	33	27	22	21.6
25	75	68	41	34	27	26.6
30	88	80	48	40	32	32.4
40	114	104	63	52	41	43.2
50	143	130	79	65	52	52
60	170	154	93	77	62	64
75	211	192	116	96	77	80
100	273	248	150	124	99	103
125	342	312	189	156	125	130
150	396	360	218	180	144	150
200	528	480	291	240	192	200

Full Load Current in Amperes— Three-Phase Circuits

kVA	Voltage						
	208	240	380	480	600	2400	4160
3	8.3	7.2	4.6	3.6	2.9	0.72	0.42
6	16.6	14.4	9.1	7.2	5.8	1.4	0.83
9	25	21.6	13.7	10.8	8.6	2.2	1.2
15	41.7	36.1	22.8	18.0	14.4	3.6	2.1
22.5	62.4	54.1	34.2	27.1	21.6	5.4	3.1
30	83.4	72.3	45.6	36.1	28.9	7.2	4.2
37.5	104	90.3	57.0	45.2	36.1	9.0	5.2
45	124	108	68.4	54.2	43.4	10.8	6.3
50	139	120	76	60.1	48.1	12.0	6.9
75	208	180	114	90	72	18.0	10.4
112.5	312	270	171	135	108	27.1	15.6
150	416	360	228	180	144	36.1	20.8
225	624	541	342	270	216	54.2	31.3
300	832	721	456	360	288	72.2	41.6
500	1387	1202	760	601	481	120	69.4
750	2084	1806	1140	903	723	180	104
1000	2779	2408	1519	1204	963	241	139

Notes

① If motors are started more than once per hour, increase minimum transformer kVA by 20%.

When motor service factor is greater than 1, increase full load amperes proportionally.

Example: If service factor is 1.15, increase above ampere values by 15%.

Options and Accessories

(Order separately)

2

Weathershield Kit

A weathershield kit consisting of a front and rear cover shield must be installed on all ventilated dry-type distribution transformers when the unit is located outdoors. The shields protect the transformer top ventilation openings against rain but allow for proper ventilation.

Field installation hardware is not required. Refer to specific transformer listing for selection of weathershield kit. Proper installation provides a NEMA 3R rating.

Note: For 316 stainless steel, add the suffix 'S' to the catalog number.

Weathershield Kit



Weathershield Kit

Fits Frame Size(s) ^①	Catalog Number ^②
809, 810, 811, 816, 817, 818	WS11
814, 814E	WS13
815	WS15
819, 820	WS16
808, 908, 909, 910, 911, 912, 910A, 911A, 912A	WS31
912B, 912Z, 912D	WS38
812, 813, 913A, 913B, 914A, 915A, 916, 914B, 915B	WS33
914D, 915D, 914F, 915F, 914Z, 915Z	WS39
916A, 916B, 912Z	WS19
917, 918, 918A	WS34
919, 920, 919E, 919EX, 920E, 920EX	WS35
922	WS36
923	WS37
924	WS40
842	WS45
842A	WS45A
843	WS43
843A	WS43A
844	WS44
844A	WS44A
939	WS57
940	WS58
942	WS59
943	WS60
944	WS61
945	WS62

Wall-Mounting Bracket

Wall-mounting brackets are used to wall-mount ventilated transformers. This bracket allows the transformer to be installed with the proper clearance, as recommended by Eaton.

Wall-mounting brackets are compatible with the following frames.

Wall-Mounting Bracket



Availability Guide Wall-Mounting Brackets

Frame Sizes ^①	Catalog Number
Type DS-3 (Single-Phase Compatible)	
809, 810, 811, 812, 813, 815, 816, 817, 818, 835, 836, 837, 814A, 842	WMB01
Type DT-3, K-Factor, Drive Isolation (Three-Phase Compatible)	
908, 909, 910, 911, 912, 910A, 911A, 912A, 912B, 912D, 913A, 913B, 914A, 914B, 914D, 915D, 915A, 915B, 914F, 915F, 912Z, 914Z, 915Z	WMB01
842A, 939, 940	WMB05
843A, 844A, 942, 943	WMB04

Notes

- ① Frame numbers have a prefix of FR, e.g., **FR819**. Dimensions, accessories and so on are still applicable as if the FR did not exist.
- ② For Grade 316 stainless steel weathershields, add the suffix "S" to a catalog number, e.g., **WS31S**.

Terminal Lug Kits for Transformers ①

Typical Sizing	Terminal Lugs Cable Range	Quantity	Hardware Bolt Size	Quantity	Catalog Number
15–37.5 kVA single-phase 15–45 kVA three-phase	#14–#2 #6–250 kcmil	8 4	1/4-20 x 3/4	8	LKS1
50–75 kVA single-phase 75–112.5 kVA three-phase	#6–250 kcmil	12	1/4-20 x 3/4 1/4-20 x 1-3/4	8 8	LKS2
100–167 kVA single-phase 150–300 kVA three-phase	#6–250 kcmil #2–600 kcmil	3 22	1/4-20 x 3/4 3/8-16 x 2	3 16	LKS3
500 kVA three-phase	#2–600 kcmil	29	3/8-16 x 2	18	LKS4

Rodent Screens

Description	Frame Size(s) ②	Catalog Number
Rodent screens are used to discourage birds or rodents from entering the enclosure through the ventilation openings. Stainless steel screens are not available.	908, 909	RS01
	910A, 911, 912	RS02
	913B, 914B, 915B	RS03
	916	RS04
	917, 918, 918A	RS05
	919, 920, 919E, 919EX, 920E, 920EX	RS06
	916A, 916B	RS07
	922	RS08
	923	RS09
	814, 821, 814E	RS11
	815	RS12
	816	RS13
	817, 818	RS14
	819, 820	RS15
	842	RS45
	842A	RS45A
	843	RS43
	843A	RS43A
	844	RS44
	844A	RS44A
	912B, 912Z, 912D	RS16
	914D, 915D, 914F, 915F, 914Z, 915Z	RS17
	916Z	RS07
939	RS57	
940	RS58	
942	RS59	
943	RS60	
944	RS61	
945	RS62	

Replacement Parts for Mini-Power Centers

Frame	Deadfront Cover (Breaker Cover)	Front Cover
283	47-37503	7074C98H04
284	47-37503-2	7074C98H01
285	47-37503-3	7074C98H02
286	47-37503-4	7074C98H02
287	47-37503-5	7074C98H03
289	47-37459	7074C44H01
290	47-37459-2	7074C44H02
291	47-37459-3	7074C44H03
289A	47-42072-1	7074C44H01
290A	47-42072-2	7074C44H02
291A	47-42072-3	7074C44H03

Notes

- ① Lugs are rated Al/Cu and are suitable for use with either aluminum or copper conductors.
 ② Frame numbers have a prefix of FR, e.g., **FR819**. Dimensions, accessories and so on are still applicable as if the FR did not exist.

Case Parts for Ventilated Units

2

Frame(s) ①	Front Panel (Upper)	Front Panel (Lower)	Back Panel (Upper)	Back Panel (Lower)	Front or Back Panel (Cutout Cover Plate)	Top Cover	Side Panel (Two Required per Transformer)	Bottom
Single-Phase								
809	7073C16P03	—	7073C16P03	—	—	7073C17P01	7073C18P04	7073C14P03
810	7073C16P01	—	7073C16P01	—	—	7073C17P01	7073C18P01	7073C14P01
811	7073C16P01	—	7073C16P01	—	—	7073C17P01	7073C18P01	7073C14P01
812	7073C16P02	—	7073C16P02	—	—	7073C17P02	7073C18P02	7073C14P02
813	7073C16P02	—	7073C16P02	—	—	7073C17P02	7073C18P02	7073C14P02
814, 814E	7073C54P01	—	7073C54P01	—	—	7073C17P03	7073C18P05	7073C14P04
815	47-39433	—	47-39433	—	—	47-39431	47-39430	47-39429
816	47-40452	—	47-40452	—	—	47-40453	47-40451	47-40449
817	47-40457	—	47-40457	—	—	47-40458	47-40456	47-40454
818	47-40457	—	47-40457	—	—	47-40458	47-40456	47-40454
819	47-40574	—	47-40574	—	—	47-40575	47-40573	47-40459
820	47-40574	—	47-40574	—	—	47-40575	47-40573	47-40459
842	47-54828-2	—	47-54828-2	—	—	47-54829-2	47-54827-2	47-55335-2
842A	73-5915-1	—	73-5915-1	—	—	73-5916-1	73-5913-1	73-5914-1
843	47-54828-4	—	47-54828-4	—	—	47-54829-4	47-54827-4	47-55335-3
843A	73-5915-2	—	73-5915-2	—	—	73-5916-2	73-5913-2	73-5914-2
844	47-54828-5	—	47-54828-5	—	—	47-54829-5	47-54827-5	47-55335-5
844A	73-5915-3	—	73-5915-3	—	—	73-5916-3	73-5913-3	73-5914-3

Notes

① Frame numbers have a prefix of FR, e.g., **FR819**. Dimensions, accessories and so on are still applicable as if the FR did not exist.

Parts listed are for standard catalog listed transformers. Units with modifications may require different parts. (Frame number from transformer nameplate required.) Transformer nameplate and UL label are not field replaceable.

Case Parts for Ventilated Units, continued

Frame(s) ①	Front Panel (Upper)	Front Panel (Lower)	Back Panel (Upper)	Back Panel (Lower)	Front or Back Panel (Cutout Cover Plate)	Top Cover	Side Panel (Two Required per Transformer)	Bottom
Three-Phase								
908	7073C37P01	—	7073C37P01	—	—	1714C45P01	1714C44P03	7073C20P05
909	7073C37P01	—	7073C37P01	—	—	1714C45P01	1714C44P03	7073C20P05
910	1714C46P01	—	1714C46P01	—	—	1714C45P01	1714C44P01	7073C20P01
911	1714C46P01	—	1714C46P01	—	—	1714C45P01	1714C44P01	7073C20P01
912	1714C46P01	—	1714C46P01	—	—	1714C45P01	1714C44P01	7073C20P01
916	1714C60P01	—	1714C60P01	—	—	1714C58P01	1714C56P01	7073C20P03
917	47-44973-1	—	47-44973-1	—	—	1714C67P01	1714C64P01	7073C20P04
918	47-44973-1	—	47-44973-1	—	—	1714C67P01	1714C64P01	7073C20P04
919, 919E, 919EX	2D46331P03	2D46331P04	2D46331P03	2D46331P04	2D46331P01	2D46331P02	2D46332P01	2D46331P04
920, 920E, 920EX	2D46331P03	2D46331P04	2D46331P03	2D46331P04	2D46331P01	2D46331P02	2D46332P01	2D46331P04
922	2D46391H06	2D46391H08	2D46391H03	2D46391H08	—	2D46391H02	2D46392H01	—
923	47-45927-1	—	47-45927-1	—	—	47-45926-1	47-45925-1	47-45759-1
910A	47-40592	—	47-40592	—	—	1714C45P01	47-40591	47-40589
911A	47-40592	—	47-40592	—	—	1714C45P01	47-40591	47-40589
912A	47-40592	—	47-40592	—	—	1714C45P01	47-40591	47-40589
912B	47-49323-1	—	47-49323-1	—	—	47-49322-1	47-49321-1	47-49320-1
912D	47-55332-2	—	47-55332-2	—	—	47-55331-2	47-55329-2	47-55330-1
912DN	47-55332-4	—	47-55332-4	—	—	47-55331-2	47-55329-2	47-55330-3
913A	1714C47P03	—	1714C47P03	—	—	1714C45P02	1714C44P07	7073C30P02
913B	47-40580	—	47-40580	—	—	1714C45P02	47-40578	47-41792
914A	1714C47P03	—	1714C47P03	—	—	1714C45P02	1714C44P07	7073C30P02
914B	47-40580	—	47-40580	—	—	1714C45P02	47-40578	47-41792
914D	47-49317-1	—	47-49317-1	—	—	47-49316-1	47-49315-1	47-49314-1
914F/915F	47-56915-1	—	47-56915-1	—	—	47-56916-1	47-56917-1	47-56918-1
915A	1714C47P03	—	1714C47P03	—	—	1714C45P02	1714C44P07	7073C30P02
915B	47-40580	—	47-40580	—	—	1714C45P02	47-40578	47-41792
915D	47-49317-1	—	47-49317-1	—	—	47-49316-1	47-49315-1	47-49314-1
916A	47-41790	—	47-41790	—	—	47-41791	47-41789	47-41788
918A	47-41801	—	47-41801	—	—	47-41802	47-41800	47-41802
912Z	47-49323-1	—	47-49323-1	—	—	47-49322-1	47-49991-1	47-49989-1
915Z	47-49317-1	—	47-49317-1	—	—	47-49316-1	47-49994-1	47-49995-1
916Z	47-49992-1	—	47-49992-1	—	—	47-41791	47-49988-1	47-49987-1
939	73-5902-1	—	73-5902-1	—	—	73-5903-1	73-5900-1	73-5901-1
940	73-5902-2	—	73-5902-2	—	—	73-5903-2	73-5900-2	73-5901-2
942	73-5902-3	—	73-5902-3	—	—	73-5903-3	73-5900-3	73-5901-3
943	73-5902-4	—	73-5902-4	—	—	73-5903-4	73-5900-4	73-5901-4
944	73-5902-5	—	73-5902-5	—	—	73-5903-5	73-5900-5	73-5901-5
945	73-5902-6	—	73-5902-6	—	—	73-5903-6	73-5900-6	73-5901-6

Notes

① Frame numbers have a prefix of FR, e.g., **FR819**. Dimensions, accessories and so on are still applicable as if the FR did not exist.

Parts listed are for standard catalog listed transformers. Units with modifications may require different parts. (Frame number from transformer nameplate required.) Transformer nameplate and UL label are not field replaceable.

Technical Data and Specifications

Customer-Furnished Connecting Cables

Eaton recommends that external cables be rated 90 °C (sized at 75 °C ampacity) for encapsulated designs and 75 °C for ventilated designs.

Primary and secondary terminal lugs are not included. Lug kits are available separately.

Overload Capability

Short-term overload capacity is designed into transformers as required by IEEE. Dry-type distribution transformers will deliver 200% nameplate load for one-half hour, 150% load for one hour and 125% load for four hours without being damaged, provided that a constant 50% load precedes and follows the overload. Refer to IEEE C57.96 *IEEE Guide for Loading Dry-Type Distribution and Power Transformers* for additional limitations.

Continuous overload capacity is not deliberately designed into a transformer because the design objective is to be within the allowed winding temperature rise with nameplate loading.

Seismically Qualified

Eaton manufactured dry-type distribution transformers are seismically qualified, and exceed requirements of the Uniform Building Code (UBC) and California Code Title 24.

Taps

Primary taps are available in most ratings to allow compensation for source voltage variations.

Series-Multiple Windings

Series-multiple windings consist of two similar coils in each winding that can be connected in series or parallel (multiple). Transformers with series-multiple windings are designated with a "x" or "/" between the voltage ratings, such as voltages of "120/240" or "240 x 480." If the series-multiple winding is designated by an "x," the winding can be connected only for a series or parallel.

With the "/" designation, a midpoint also becomes available in addition to the series or parallel connection. As an example, a 120 x 240 winding can be connected for either 120 (parallel) or 240 (series), but a 120/240 winding can be connected for 120 (parallel), 240 (series) or 240 with a 120 midpoint.

Enclosures

Eaton's ventilated transformer types DS-3, DT-3, MD and KT use a NEMA 2 rated (drip-proof) enclosure as standard and are rated NEMA 3R with the addition of weathershields. Eaton encapsulated transformer types EP, EPT, EPZ and EPTZ and totally enclosed, non-ventilated transformer types DS-3E and DT-3E use a NEMA 3R rated enclosure.

Buck-Boost Transformers

An autotransformer has only one winding, and is therefore smaller and more economical than the conventional two-winding transformer. In an autotransformer, the primary and secondary are electrically and mechanically connected. The required secondary voltage is obtained by "tapping-off" from the single winding.

Buck-boost autotransformers are insulated units with 120 x 240 or 240 x 480 volt primaries and 12/24, 16/32 or 24/48 volt secondaries, and provide a very economical method for minor voltage adjustments where circuit isolation is not needed.

Autotransformers can be used only where local electrical codes permit, and isolation of the two circuits is not required.

Nonlinear Ratings

The transformers shall be specifically designed to supply circuits with a harmonic profile equal to or less than a K-factor of 4 or 13, as described in the following table, without exceeding specified temperature rise.

Nonlinear Ratings

Harmonic	K-4	K-13
Fundamental	100.0%	100.0%
3rd	34.0%	70.0%
5th	22.0%	42.0%
7th	3.0%	5.0%
9th	1.0%	3.0%
11th	0.7%	3.0%
13th	0.5%	1.0%
15th	0.3%	0.7%
17th	0.3%	0.6%

Sound Levels

All Eaton 600 volt class general-purpose dry-type distribution transformers are designed to meet NEMA ST-20 sound levels listed here. These are the sound levels measured in a soundproof environment. Actual sound levels measured at an installation will likely be higher (up to 15 dB greater) due to electrical connections and environmental conditions. Lower sound levels are available and should be specified when the transformer is going to be installed in an area where sound may be a concern.

All Eaton general-purpose dry-type distribution transformers are designed with sound levels lower than NEMA ST-20 maximum levels. However, consideration should be given to the specific location of the

transformers and their installation to minimize the potential for sound transmission to surrounding structures and sound reflection. It is suggested that the following installation methods be included:

1. If possible, mount the transformer away from corners of walls or ceilings. For installation that must be near a corner, use sound-absorbing materials on the walls and ceilings if necessary to eliminate reflection.
2. Provide a solid foundation for mounting the transformer and then use vibration dampening mounts if not already provided in the transformer. (Eaton encapsulated EP/EPT designs use a special encapsulation system and ventilated DS/DT-3 designs contain a built-in vibration dampening system to minimize and isolate sound transmission.)
3. Provide flexible conduit to make the connections to the transformer.
4. Locate the transformer as far as possible from areas where high sound levels are undesirable.

Average Sound Levels

NEMA ST-20 Average Sound Level, dB

Equivalent Winding kVA Range	Self-Cooled Ventilated (up to 1.2 kV)		Encapsulated (up to 1.2 kV)
	K-Factor 1, 4, 9	K-Factor 13, 20	
3.00 and below	40	40	45
3.01 to 9.00	40	40	45
9.01 to 15.00	45	45	50
15.01 to 30.00	45	45	50
30.01 to 50.00	45	48	50
50.01 to 75.00	50	53	55
75.01 to 112.50	50	53	55
112.51 to 150.00	50	53	55
150.01 to 225.00	55	58	57
225.01 to 300.00	55	58	57
300.01 to 500.00	60	63	59
500.01 to 700.00	62	65	61
700.01 to 1000.00	64	67	63
Greater than 1000	Consult factory	Consult factory	Consult factory

Typical Data for General-Purpose Dry-Type Distribution Transformers—Aluminum Wound ^①

Type EP 115 °C Rise

kVA	Weight Lbs		Losses in Watts		Efficiency				% Regulation		% Impedance ^②		Sound Level dB
	Al	Cu	No Load	Total	1/4 Load	1/2 Load	3/4 Load	Full Load	100% P.F.	80% P.F.	Min.	Max.	
0.05	—	7	6	9	65.3	79.6	84.3	85.6	5.9	6.4	5.5	9.5	45
0.075	—	7	7	14	66.0	79.0	82.5	82.8	9.4	9.2	7.5	11.0	45
0.10	—	7	5	15	82.4	86.9	87.7	86.5	10.3	10.6	8.0	12.0	45
0.15	—	8	7	20	83.4	88.2	88.9	87.8	9.0	9.6	8.0	12.0	45
0.25	—	12	14	29	79.0	87.2	89.5	89.6	5.9	7.5	7.5	9.5	45
0.5	—	13	20	47	85.1	90.3	91.4	91.4	5.5	7.0	5.0	7.0	45
0.75	—	20	29	57	86.0	91.3	92.7	92.9	3.9	5.0	4.0	6.0	45
1	—	30	24	60	90.8	93.9	94.5	94.4	3.8	4.9	3.8	5.8	45
1.5	65	40	30	90	92.5	94.7	95.0	94.6	4.1	5.2	2.5	4.5	45
2	113	40	30	100	94.2	95.7	95.8	95.4	3.6	4.7	3.3	5.3	45
3	—	69	61	135	92.0	95.0	95.7	95.7	2.5	3.5	2.5	4.1	45
5	—	120	104	215	91.8	95.0	95.8	95.9	2.3	3.3	2.0	4.6	45
7.5	123	133	129	250	93.2	96.0	96.7	95.9	1.5	2.4	2.4	3.4	45
10	193	208	153	295	93.9	96.3	97.0	97.2	1.5	2.5	2.0	3.3	50
15	216	235	209	435	94.4	96.6	97.1	97.2	1.6	2.8	1.6	3.6	50
25	385	414	191	440	96.8	98.0	98.3	98.4	1.1	2.5	1.6	4.2	50
37.5	735	856	225	370	97.4	98.3	98.5	98.4	1.2	2.6	2.8	4.0	50

Type EPT 115 °C Rise ^③

kVA	Weight Lbs		Losses in Watts		Efficiency				% Regulation		% Impedance ^②		Sound Level dB
	Al	Cu	No Load	Total	1/4 Load	1/2 Load	3/4 Load	Full Load	100% P.F.	80% P.F.	Min.	Max.	
3	116	123	110	165	87.3	92.6	94.3	94.9	2.1	6.1	2.4	8.0	45
6	143	153	145	275	90.9	94.5	95.5	95.7	2.2	3.1	2.9	4.9	45
9	166	178	195	375	91.6	95.0	95.9	96.1	2.0	2.8	2.0	3.6	45
15	275	300	265	545	93.0	95.7	96.5	96.6	1.9	3.1	1.9	3.9	50
30	422	504	250	665	96.5	97.7	98.0	97.9	1.5	2.5	1.8	3.8	50
45	660	745	300	740	97.2	98.2	98.4	98.5	1.0	2.1	1.8	4.0	50
75	1275	1450	400	945	97.7	98.6	98.8	98.8	0.8	1.6	1.7	3.4	55

Notes

^① Typical values for aluminum windings. Contact Eaton for values of copper windings. Up-to-date design data is available at www.eaton.com.

^② Actual impedance may be $\pm 7.5\%$.

^③ Type EPT transformers 3–15 kVA are T-T connected.

Performance data is based upon 480 volt Delta primary and a 208Y/120 volt secondary for three-phase transformers; 240 x 480 volt primary and a 120/240 volt secondary for single-phase transformers. All data is subject to future revision. Refer to Eaton for 5 kV class information. All data is subject to future revision.

Typical Data for DOE 2016 Energy-Efficient Low-Voltage Dry-Type Distribution Transformers—Aluminum Wound ^①

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Type DS-3 150 °C Rise DOE 2016 Single-Phase

kVA	Frame	Weight	Losses in Watts		Efficiency (T. Rise +20 °C)				% Regulation		% Impedance			Sound Level dB	DOE 2016 Efficiency	Practical Inrush
			No Load	Total at Rise +20 °C	1/4 Load	1/2 Load	3/4 Load	Full Load	100% P.F.	80% P.F.	% Imp.	% X	% R			
15	842A	200	54	669	97.89	97.76	96.97	95.75	4.1	4.2	4.37	1.51	4.10	45	97.70	320
25	842A	275	74	1004	98.20	98.05	97.30	96.15	3.7	3.7	3.71	1.88	3.20	45	98.00	550
37.5	843A	310	78	1328	98.60	98.34	97.65	96.59	3.3	5.6	5.86	4.82	3.33	45	98.20	930
50	843A	390	105	2005	98.48	98.16	97.37	96.20	3.8	5.7	5.84	4.43	3.80	45	98.30	360
75	844A	650	180	2330	98.54	98.42	97.86	96.99	2.9	4.1	4.15	3.00	2.87	50	98.50	820
100	844A	690	208	3028	98.67	98.50	97.93	97.07	2.8	4.9	5.13	4.29	2.82	50	98.60	760
167	814A	1610	900	4887	98.60	98.70	98.40	98.00	1.40	6.80	9.70	9.50	1.80	55	98.70	416

Type DS-3 115 °C Rise DOE 2016 Single-Phase

kVA	Frame	Weight	Losses in Watts		Efficiency (T. Rise +20 °C)				% Regulation		% Impedance			Sound Level dB	DOE 2016 Efficiency	Practical Inrush
			No Load	Total at Rise +20 °C	1/4 Load	1/2 Load	3/4 Load	Full Load	100% P.F.	80% P.F.	% Imp.	% X	% R			
15	842A	200	54	656	97.90	97.77	96.98	95.76	4.0	4.2	4.33	1.62	4.01	45	97.70	323
25	842A	275	74	984	98.21	98.06	97.31	96.16	3.6	3.2	3.67	0.50	3.64	45	98.00	556
37.5	843A	310	78	1301	98.61	98.35	97.66	96.60	3.3	5.5	5.80	4.80	3.26	45	98.20	939
50	843A	390	105	1965	98.49	98.17	97.38	96.21	3.7	5.7	5.78	4.43	3.72	45	98.30	364
75	844A	650	180	2283	98.55	98.43	97.87	97.00	2.8	4.1	4.11	3.00	2.80	50	98.50	828

Type DS-3 80 °C Rise DOE 2016 Single-Phase

kVA	Frame	Weight	Losses in Watts		Efficiency (T. Rise +20 °C)				% Regulation		% Impedance			Sound Level dB	DOE 2016 Efficiency	Practical Inrush
			No Load	Total at Rise +20 °C	1/4 Load	1/2 Load	3/4 Load	Full Load	100% P.F.	80% P.F.	% Imp.	% X	% R			
15	842A	275	74	344	97.85	98.26	98.05	97.65	1.8	2.2	2.23	1.31	1.80	45	97.70	550
25	843A	310	78	678	98.40	98.58	98.34	97.96	2.4	3.8	3.91	3.08	2.40	45	98.00	930
37.5	843A	390	105	1010	98.28	98.44	98.16	97.73	2.4	4.1	4.38	3.66	2.41	45	98.20	360
50	844A	650	180	930	98.25	98.58	98.42	98.12	1.5	2.6	2.77	2.32	1.50	45	98.30	820
75	844A	690	208	1588	98.44	98.69	98.50	98.19	1.8	3.5	3.85	3.38	1.84	50	98.50	760

Note

^① Typical values for aluminum windings. Contact Eaton for values of copper windings. Up-to-date design data is available at www.eaton.com.

Typical Data for DOE 2016 Energy-Efficient Low-Voltage Dry-Type Distribution Transformers—Aluminum Wound

Type DT-3 150 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	225	69	573	97.85	97.70	97.11	96.43	3.7	3.7	3.74	1.6	3.4	45	97.89	70
30	344	65.2	1129	98.27	97.84	97.13	96.37	4.22	4.38	4.38	2.56	3.55	45	98.23	204
45	399	87.8	1486	98.47	98.09	97.48	96.80	3.86	4.04	4.05	2.59	3.11	45	98.4	156
75	545	168	2430	98.62	98.21	97.60	96.95	2.88	4.32	4.37	3.19	2.99	50	98.60	249
112.5	976	280	2516	98.70	98.63	98.28	97.86	3.9	4.3	4.37	3.9	2.0	50	98.74	302
150	1239	350	2983	98.77	98.74	98.44	98.08	3.1	3.4	3.46	3.0	1.8	50	98.83	516
225	1624	495	4118	98.86	98.84	98.57	98.24	3.8	4.2	4.29	4.0	1.6	55	98.94	721
300	2283	640	5236	98.98	98.92	98.65	98.33	3.9	4.3	4.45	4.2	1.5	55	99.02	731

Type DT-3 115 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	231	65	521	97.94	97.86	97.35	96.74	3.4	3.5	3.54	1.8	3.0	45	97.89	70
30	420	122	691	98.10	98.35	98.12	97.79	2.1	2.2	2.21	1.1	1.9	45	98.23	196
45	429	140	1217	98.40	98.32	97.91	97.42	3.5	3.8	3.81	3.0	2.4	45	98.40	146
75	605	210	1816	98.58	98.50	98.13	97.69	3.5	3.8	3.82	3.2	2.1	50	98.60	244
112.5	982	260	2436	98.73	98.66	98.32	97.91	4.0	4.4	4.53	4.1	1.9	50	98.74	265
150	1253	350	3014	98.76	98.72	98.42	98.06	3.5	3.9	3.97	3.6	1.8	50	98.83	447
225	1633	495	3757	98.90	98.91	98.68	98.39	4.7	5.1	5.3	5.1	1.4	55	98.94	610
300	2283	600	4668	98.99	98.99	98.77	98.50	3.9	4.4	4.52	4.3	1.4	55	99.02	675

Type DT-3 80 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	237	65	508	97.97	97.90	97.41	96.82	3.6	3.8	3.81	2.4	3.0	45	97.89	70
30	433	140	557	98.13	98.54	98.46	98.25	1.9	2.1	2.15	1.6	1.4	45	98.23	165
45	570	210	724	98.25	98.70	98.66	98.51	1.7	2.0	2.04	1.7	1.1	50	98.40	270
75	982	256	1104	98.58	98.87	98.78	98.60	2.3	2.7	2.75	2.5	1.1	50	98.60	302
112.5	1274	365	1701	98.66	98.90	98.78	98.57	2.2	2.5	2.62	2.3	1.2	50	98.74	516
150	1628	414	1781	98.74	99.03	98.98	98.85	2.4	2.8	2.9	2.8	0.9	55	98.83	721
225	2207	761	3337	98.84	98.99	98.86	98.65	2.7	3.1	3.17	3.0	1.1	55	98.94	731
300	2283	565	3642	99.00	99.12	98.99	98.80	3.8	4.3	4.51	4.4	1.0	60	99.02	694

Typical Data for DOE 2016 Energy-Efficient Low-Voltage Dry-Type Distribution Transformers—Aluminum Wound

Type KT-4 150 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	407	91	324	97.51	98.18	98.15	97.96	1.7	1.8	1.77	0.9	1.6	45	97.89	70
30	437	122	755	98.08	98.26	97.98	97.59	2.5	2.7	2.66	1.6	2.1	45	98.23	196
45	439	140	1323	98.35	98.21	97.74	97.19	3.9	4.2	4.18	3.2	2.6	45	98.40	146
75	599	210	1971	98.53	98.40	97.98	97.49	3.7	4.0	4.05	3.3	2.3	50	98.60	244
112.5	987	365	1833	98.60	98.82	98.69	98.45	2.6	3.0	3.07	2.8	1.3	50	98.74	265
150	1637	495	—	—	—	—	—	—	—	—	—	—	55	98.83	447
225	1642	471	3944	98.88	98.87	98.61	98.30	4.8	5.3	5.43	5.2	1.5	55	98.94	610
300	2394	600	5069	98.99	98.94	98.68	98.38	4.4	4.8	4.99	4.8	1.5	55	99.02	675

Type KT-4 115 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	402	91	294	97.48	98.24	98.27	98.13	1.6	1.7	1.7	1.0	1.4	45	97.89	136
30	415	122	695	98.12	98.35	98.12	97.78	2.2	2.4	2.38	1.4	1.9	45	98.23	196
45	619	193	784	98.18	98.60	98.53	98.34	2.0	2.3	2.34	1.9	1.3	50	98.40	244
75	984	260	1343	98.49	98.71	98.55	98.29	2.8	3.2	3.25	2.9	1.4	50	98.60	265
112.5	1236	365	1687	98.62	98.88	98.78	98.57	2.5	2.9	2.98	2.7	1.2	50	98.74	447
150	1662	495	1974	98.65	98.96	98.90	98.75	3.0	3.4	3.57	3.4	1.0	55	98.83	610
225	2353	542	3005	98.88	99.03	98.91	98.71	3.1	3.5	3.68	3.5	1.1	55	98.94	675
300	2198	582	4188	98.88	99.00	98.84	98.61	3.2	3.6	3.73	3.5	1.2	55	99.02	1027

Type KT-4 80 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	254	65	543	97.71	97.69	97.17	96.55	3.6	3.7	3.67	1.8	3.2	45	97.89	58
30	437	140	591	98.12	98.50	98.38	98.15	2.2	2.5	2.52	2.0	1.5	45	98.23	146
45	619	180	730	98.32	98.71	98.64	98.45	2.0	2.3	2.36	2.0	1.2	50	98.40	244
75	1027	260	1159	98.49	98.80	98.70	98.51	2.7	3.1	3.18	2.9	1.2	50	98.60	265
112.5	1643	444	1213	98.50	99.00	99.06	98.99	2.1	2.5	2.64	2.5	0.7	55	98.74	610
150	1710	408	1853	98.86	99.07	98.98	98.82	2.9	3.4	3.52	3.4	1.0	55	98.83	611
225	2680	621	2405	98.78	99.09	99.07	98.96	3.0	3.5	3.67	3.6	0.8	60	98.94	757
300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Typical Data for DOE 2016 Energy-Efficient Low-Voltage Dry-Type Distribution Transformers—Aluminum Wound

Type KT-9 150 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	406	91	315	97.52	98.20	98.19	98.01	1.6	1.7	1.68	0.8	1.5	45	97.89	70
30	416	122	770	98.04	98.22	97.94	97.54	2.4	2.5	2.47	1.2	2.2	45	98.23	196
45	594	193	817	98.18	98.57	98.48	98.27	2.1	2.4	2.4	2.0	1.4	50	98.40	244
75	1012	256	1323	98.49	98.72	98.56	98.31	3.0	3.4	3.5	3.2	1.4	50	98.60	265
112.5	1297	365	1907	98.59	98.80	98.65	98.39	2.7	3.1	3.18	2.9	1.4	50	98.74	447
150	1652	385	1840	98.87	99.07	98.98	98.82	3.0	3.4	3.61	3.5	1.0	50	98.83	—
225	2379	617	3346	98.82	98.96	98.81	98.59	3.1	3.6	3.7	3.5	1.2	55	98.94	618.48
300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Type KT-9 115 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	412	91	290	97.58	98.29	98.32	98.17	1.5	1.6	1.61	0.9	1.3	45	97.89	—
30	437	140	636	98.04	98.40	98.26	97.99	2.6	2.9	2.98	2.5	1.7	45	98.23	196
45	619	193	772	98.20	98.62	98.55	98.36	2.0	2.3	2.29	1.9	1.3	50	98.40	244
75	977	260	1226	98.50	98.77	98.66	98.44	2.6	3.0	3.11	2.8	1.3	50	98.60	265
112.5	1760	495	1369	98.41	98.93	98.97	98.89	2.1	2.6	2.7	2.6	0.8	55	98.74	—
150	1800	489	1911	98.80	99.05	98.98	98.82	3.0	3.5	3.64	3.5	0.9	55	98.83	610
225	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Type KT-9 80 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
30	435	140	617	98.14	98.48	98.33	98.07	2.4	2.7	2.7	2.2	1.6	45	98.23	—
45	927	221	554	97.89	98.67	98.81	98.78	1.4	1.7	1.82	1.7	0.7	50	98.40	244
75	1098	288	883	98.42	98.91	98.95	98.87	1.6	1.9	2.01	1.8	0.8	50	98.60	447
112.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
150	2416	515	1537	98.70	99.10	99.12	99.04	1.8	2.2	2.3	2.2	0.7	55	98.83	675
225	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Typical Data for DOE 2016 Energy-Efficient Low-Voltage Dry-Type Distribution Transformers—Aluminum Wound

Type KT-13 150 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	406	91	315	97.52	98.20	98.19	98.01	1.6	1.7	1.68	0.8	1.5	45	97.89	70
30	416	122	770	98.04	98.22	97.94	97.54	2.4	2.5	2.47	1.2	2.2	45	98.23	196
45	594	193	817	98.18	98.57	98.48	98.27	2.1	2.4	2.4	2.0	1.4	53	98.40	244
75	1012	256	1323	98.49	98.72	98.56	98.31	3.0	3.4	3.5	3.2	1.4	53	98.60	265
112.5	1297	365	1907	98.59	98.80	98.65	98.39	2.7	3.1	3.18	2.9	1.4	53	98.74	447
150	1425	415	2050	98.72	98.96	98.86	98.68	3.1	3.5	3.64	3.5	1.1	53	98.83	610
225	2341	600	3072	98.86	99.02	98.89	98.70	3.2	3.6	3.75	3.6	1.1	58	98.94	675
300	2400	676	4090	98.91	99.03	98.89	98.68	4.1	4.6	4.78	4.6	1.1	63	99.02	526

Type KT-13 115 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	412	91	290	97.58	98.29	98.32	98.17	1.5	1.6	1.61	0.9	1.3	45	97.89	136
30	437	140	636	98.04	98.40	98.26	97.99	2.6	2.9	2.98	2.5	1.7	48	98.23	196
45	619	193	772	98.20	98.62	98.55	98.36	2.0	2.3	2.29	1.9	1.3	53	98.40	244
75	977	260	1226	98.50	98.77	98.66	98.44	2.6	3.0	3.11	2.8	1.3	53	98.60	265
112.5	1760	495	1369	98.41	98.93	98.97	98.89	2.1	2.6	2.7	2.6	0.8	58	98.74	610
150	1800	489	1911	98.80	99.05	98.98	98.82	3.0	3.5	3.64	3.5	0.9	58	98.83	610
225	1927	570	—	—	—	—	—	—	—	—	—	—	63	98.94	—
300	2894	620	4300	98.91	99.00	98.83	98.60	4.8	5.3	5.52	5.4	1.2	63	99.02	577.55

Type KT-13 80 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
30	435	140	617	98.14	98.48	98.33	98.07	2.4	2.7	2.7	2.2	1.6	48	98.23	244
45	927	221	554	97.89	98.67	98.81	98.78	1.4	1.7	1.82	1.7	0.7	53	98.40	344
75	1098	288	883	98.42	98.91	98.95	98.87	1.6	1.9	2.01	1.8	0.8	53	98.60	447
112.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
150	2416	515	1537	98.70	99.10	99.12	99.04	1.8	2.2	2.3	2.2	0.7	58	98.83	675
225	2816	757	2649	98.85	99.11	99.06	98.93	2.9	3.4	3.55	3.4	0.8	63	98.94	642
300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Typical Data for DOE 2016 Energy-Efficient Low-Voltage Dry-Type Distribution Transformers—Copper Wound

Type DS-3 150 °C Rise DOE 2016 Single-Phase

kVA	Frame	Weight	Losses in Watts		Efficiency (T. Rise +20 °C)				% Regulation			% Impedance		Sound Level dB	DOE 2016 Efficiency	Practical Inrush
			No Load	Total at Rise +20 °C	1/4 Load	1/2 Load	3/4 Load	Full Load	100% P.F.	80% P.F.	% Imp.	% X	% R			
15	842A	216	54	480	98.06	98.16	97.68	96.92	2.7	3.2	3.26	1.60	2.84	45	97.70	335
25	842A	295	74	961	98.32	98.32	97.80	96.98	2.6	2.9	2.98	1.22	2.72	45	98.00	267
37.5	843A	440	78	1254	98.60	98.36	97.71	96.77	3.1	5.5	5.83	4.91	3.14	45	98.20	588
50	843A	450	105	1544	98.60	98.41	97.78	96.83	2.8	4.1	4.13	2.96	2.88	45	98.30	472
75	844A	890	180	2129	98.58	98.52	98.02	97.25	2.1	3.5	3.47	2.30	2.60	50	98.50	919
100	844A	950	208	2843	98.78	98.73	98.33	97.71	1.8	4.2	4.32	3.42	2.64	50	98.60	828
167	814A	1665	570	3094	98.70	98.80	98.60	98.30	1.50	6.30	9.00	8.80	1.50	55	98.70	955

Type DS-3 115 °C Rise DOE 2016 Single-Phase

kVA	Frame	Weight	Losses in Watts		Efficiency (T. Rise +20 °C)				% Regulation			% Impedance		Sound Level dB	DOE 2016 Efficiency	Practical Inrush
			No Load	Total at Rise +20 °C	1/4 Load	1/2 Load	3/4 Load	Full Load	100% P.F.	80% P.F.	% Imp.	% X	% R			
15	842A	218	54	470	98.07	98.17	97.69	96.93	2.8	3.2	3.23	1.65	2.78	45	97.70	247
25	842A	300	74	942	98.33	98.33	97.81	96.99	3.5	2.7	2.95	0.64	2.88	45	98.00	1162
37.5	843A	450	78	1229	98.61	98.37	97.72	96.78	3.1	5.4	5.77	4.89	3.07	45	98.20	338
50	843A	464	105	1513	98.61	98.42	97.79	96.84	2.8	4.1	4.09	2.96	2.82	45	98.30	780
75	844A	900	180	2086	98.59	98.53	98.03	97.26	2.5	3.4	3.44	2.31	2.54	50	98.50	1041

Type DS-3 80 °C Rise DOE 2016 Single-Phase

kVA	Frame	Weight	Losses in Watts		Efficiency (T. Rise +20 °C)				% Regulation			% Impedance		Sound Level dB	DOE 2016 Efficiency	Practical Inrush
			No Load	Total at Rise +20 °C	1/4 Load	1/2 Load	3/4 Load	Full Load	100% P.F.	80% P.F.	% Imp.	% X	% R			
15	842A	295	74	284	97.92	98.43	98.32	98.04	1.4	1.8	1.79	1.11	1.40	45	97.70	588
25	843A	440	78	373	98.40	98.59	98.36	98.00	1.2	3.2	3.89	3.70	1.18	45	98.00	472
37.5	843A	450	105	456	98.35	98.61	98.41	98.07	0.9	2.5	3.10	2.95	0.94	45	98.20	919
50	844A	890	180	755	98.28	98.65	98.52	98.26	1.2	2.1	2.31	2.01	1.15	45	98.30	828
75	844A	950	208	856	98.51	98.84	98.73	98.52	0.9	2.6	3.24	3.12	0.86	50	98.50	955

Typical Data for DOE 2016 Energy-Efficient Low-Voltage Dry-Type Distribution Transformers—Copper Wound

Type DT-3 150 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	250	75	467	97.83	97.95	97.58	97.08	2.9	3.0	3.00	1.5	2.6	45	97.89	109
30	415	119	823	98.03	98.15	97.81	97.37	2.5	2.5	2.56	1.0	2.3	45	98.23	262
45	478	123	1288	98.44	98.27	97.80	97.26	3.2	3.4	3.44	2.3	2.6	45	98.40	181
75	632	168	2418	98.61	98.21	97.61	96.96	2.90	4.05	4.10	2.75	2.97	50	98.60	294
112.5	1263	270	2474	98.73	98.65	98.31	97.89	3.3	3.6	3.63	3.1	2.0	50	98.74	351
150	1410	360	2861	98.78	98.77	98.50	98.16	3.0	3.3	3.39	3.0	1.7	50	98.83	597
225	1883	420	4815	98.88	98.72	98.35	97.93	4.6	5.0	5.14	4.8	2.0	55	98.94	540
300	2485	515	5475	98.92	98.85	98.56	98.21	3.7	4.1	4.21	3.9	1.7	55	99.02	858

Type DT-3 115 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	241	75	445	97.89	98.03	97.69	97.23	2.7	2.8	2.77	1.3	2.5	45	97.89	109
30	433	116	747	98.09	98.27	97.99	97.60	2.2	2.3	2.3	0.9	2.1	45	98.23	235
45	471	123	1208	98.48	98.35	97.92	97.42	3.2	3.5	3.46	2.5	2.4	45	98.40	170
75	665	214	1758	98.53	98.51	98.17	97.75	2.7	3.0	2.97	2.1	2.1	50	98.60	378
112.5	1271	270	2336	98.72	98.69	98.38	98.00	3.5	3.9	4	3.6	1.8	50	98.74	307
150	1422	360	2156	98.90	99.00	98.84	98.62	3.0	3.4	3.56	3.4	1.2	50	98.83	546
225	2082	420	4567	98.90	98.77	98.43	98.03	4.8	5.3	5.41	5.1	1.8	55	98.94	455
300	2568	570	5416	98.93	98.87	98.58	98.25	4.2	4.7	4.8	4.5	1.6	55	99.02	707

Type DT-3 80 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	239	75	439	97.89	98.05	97.72	97.26	2.8	3.0	2.96	1.7	2.4	45	97.89	92
30	466	205	645	98.26	98.58	98.46	98.22	1.9	2.1	2.06	1.4	1.5	45	98.23	181
45	667	210	773	98.30	98.68	98.61	98.42	1.7	1.9	1.95	1.5	1.3	50	98.40	399
75	1147	270	1162	98.47	98.79	98.71	98.52	2.2	2.6	2.68	2.4	1.2	50	98.60	351
112.5	1385	360	1631	98.66	98.92	98.82	98.62	2.2	2.6	2.69	2.4	1.1	50	98.74	597
150	1895	420	2287	98.74	98.91	98.76	98.54	2.9	3.4	3.48	3.2	1.2	55	98.83	540
225	2385	513	2854	98.89	99.06	98.94	98.76	2.6	3.1	3.2	3.0	1.0	55	98.94	707
300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Typical Data for DOE 2016 Energy-Efficient Low-Voltage Dry-Type Distribution Transformers—Copper Wound

Type KT-4 150 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	418	86.17	351	97.62	98.15	98.05	97.79	1.9	1.9	1.9	0.7	1.8	45	97.89	154
30	458	123	644	98.13	98.42	98.24	97.94	2.2	2.4	2.38	1.6	1.7	45	98.23	170
45	480	123	757	98.17	98.56	98.47	98.25	3.0	3.4	3.52	3.2	1.4	45	98.40	168
75	1274	270	1063	98.58	98.90	98.83	98.67	1.7	2.0	2.05	1.8	1.1	50	98.60	307
112.5	1818	360	1667	98.63	98.88	98.78	98.58	2.1	2.5	2.56	2.3	1.2	50	98.74	546
150	2105	439	2394	98.71	98.87	98.71	98.48	3.4	3.8	3.98	3.8	1.3	55	98.83	455
225	2674	570	3032	98.89	99.04	98.91	98.71	3.2	3.6	3.76	3.6	1.1	55	98.94	707
300	2737	570	5057	98.99	98.94	98.68	98.37	4.6	5.0	5.2	5.0	1.5	55	99.02	720

Type KT-4 115 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	414	86	338	97.50	98.12	98.06	97.83	1.9	2.0	1.98	1.1	1.7	45	97.89	154.39
30	417	123	642	98.15	98.44	98.25	97.95	2.1	2.3	2.31	1.5	1.7	45	98.23	170
45	684	190	777	98.21	98.62	98.55	98.35	1.5	1.7	1.7	1.1	1.3	50	98.40	378
75	1083	270	1147	98.62	98.88	98.77	98.58	1.9	2.2	2.24	1.9	1.2	50	98.60	307
112.5	1394	350	1673	98.60	98.87	98.77	98.57	2.3	2.7	2.74	2.5	1.2	50	98.74	546
150	2103	420	2260	98.74	98.91	98.77	98.55	3.5	3.9	4.1	3.9	1.2	55	98.83	455
225	2150	570	2966	98.88	99.04	98.92	98.73	3.0	3.4	3.6	3.4	1.1	55	98.94	707
300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Type KT-4 80 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
30	482	110	556	98.24	98.57	98.44	98.19	1.9	2.1	2.12	1.5	1.5	45	98.23	170
45	669	195	704	98.21	98.69	98.66	98.51	1.4	1.6	1.57	1.1	1.1	50	98.40	378
75	1210	243	1124	98.49	98.81	98.72	98.54	2.4	2.7	2.83	2.6	1.2	50	98.60	307
112.5	1287	360	1653	98.65	98.91	98.80	98.60	2.3	2.7	2.76	2.5	1.1	50	98.74	546
150	2138	420	1610	98.85	99.13	99.09	98.98	2.8	3.3	3.47	3.4	0.8	55	98.83	455
225	2727	584	2996	98.88	99.04	98.92	98.73	3.1	3.5	3.7	3.5	1.1	55	98.94	693.89
300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Typical Data for DOE 2016 Energy-Efficient Low-Voltage Dry-Type Distribution Transformers—Copper Wound

2

Type KT-9 150 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	430	116	306	97.53	98.29	98.34	98.21	1.4	1.5	1.51	0.8	1.3	45	97.89	—
30	505	118	667	98.19	98.42	98.20	97.87	2.3	2.5	2.48	1.7	1.8	45	98.23	—
45	699	190	837	98.12	98.52	98.43	98.21	1.8	2.0	1.96	1.3	1.4	50	98.40	—
75	1103	245	1284	98.51	98.74	98.59	98.35	2.5	2.8	2.88	2.5	1.4	50	98.60	—
112.5	1424	380	1566	98.68	98.96	98.88	98.70	1.9	2.2	2.28	2.0	1.1	50	98.74	546
150	2132	418	2337	98.80	98.93	98.76	98.52	3.1	3.5	3.65	3.4	1.3	55	98.83	455
225	2628	561	3130	98.83	98.99	98.86	98.65	3.1	3.5	3.64	3.5	1.1	55	98.94	—
300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Type KT-9 115 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	398	116	—	—	—	—	—	—	—	—	—	—	45	97.89	—
30	478	123	612	98.28	98.54	98.36	98.07	1.9	2.1	2.1	1.3	1.6	45	98.23	170
45	658	190	773	98.17	98.61	98.54	98.35	1.6	1.8	1.82	1.3	1.3	50	98.40	378
75	1115	250	1245	98.48	98.74	98.62	98.40	2.4	2.7	2.8	2.5	1.3	50	98.60	307
112.5	2150	337	1589	98.64	98.91	98.82	98.63	3.1	3.5	3.65	3.5	1.1	55	98.74	—
150	2200	418	2488	98.72	98.85	98.67	98.41	3.4	3.8	3.9	3.6	1.4	55	98.83	455
225	3043	695	2226	98.78	99.14	99.15	99.07	2.9	3.4	3.56	3.5	0.7	55	98.94	—
300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Type KT-9 80 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	434	116	263	97.66	98.46	98.57	98.51	1.1	1.2	1.17	0.6	1.0	45	97.89	—
30	507	110	546	98.24	98.58	98.46	98.22	1.9	2.1	2.1	1.5	1.5	45	98.23	170
45	703	146	850	98.43	98.63	98.45	98.17	2.2	2.4	2.45	1.9	1.6	50	98.40	—
75	1112	290	1004	98.46	98.87	98.86	98.73	2.2	2.6	2.68	2.5	1.0	50	98.60	307
112.5	1927	380	—	—	—	—	—	—	—	—	—	—	50	98.74	—
150	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
225	3345	695	2031	98.86	99.20	99.22	99.16	2.8	3.3	3.5	3.4	0.6	—	98.94	—
300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Typical Data for DOE 2016 Energy-Efficient Low-Voltage Dry-Type Distribution Transformers—Copper Wound

Type KT-13 150 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	430	116	306	97.53	98.29	98.34	98.21	1.4	1.5	1.51	0.8	1.3	45	97.89	235
30	480	118	652	98.19	98.44	98.23	97.91	2.3	2.5	2.49	1.7	1.8	48	98.23	170
45	658	190	821	98.17	98.56	98.47	98.25	1.7	1.8	1.83	1.2	1.4	53	98.40	378
75	1115	245	1280	98.58	98.78	98.62	98.37	2.4	2.7	2.8	2.4	1.4	53	98.60	307
112.5	1424	380	1566	98.68	98.96	98.88	98.70	1.9	2.2	2.28	2.0	1.1	53	98.74	546
150	2132	418	2337	98.80	98.93	98.76	98.52	3.1	3.5	3.65	3.4	1.3	58	98.83	455
225	2628	561	3130	98.83	98.99	98.86	98.65	3.1	3.5	3.64	3.5	1.1	58	98.94	707
300	—	658	—	—	—	—	—	—	—	—	—	—	—	99.02	—

Type KT-13 115 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	398	116	289	97.65	98.39	98.45	98.35	1.4	1.5	1.51	1.0	1.2	45	97.89	235
30	478	123	612	98.28	98.54	98.36	98.07	1.9	2.1	2.1	1.3	1.6	48	98.23	170
45	658	190	773	98.17	98.61	98.54	98.35	1.6	1.8	1.82	1.3	1.3	53	98.40	378
75	1115	250	1245	98.48	98.74	98.62	98.40	2.4	2.7	2.8	2.5	1.3	53	98.60	307
112.5	2150	337	1589	98.64	98.91	98.82	98.63	3.1	3.5	3.65	3.5	1.1	58	98.74	315
150	2013	418	2488	98.72	98.85	98.67	98.41	3.4	3.8	3.9	3.6	1.4	58	98.83	455
225	3043	695	2226	98.78	99.14	99.15	99.07	2.9	3.4	3.56	3.5	0.7	58	98.94	—
300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Type KT-13 80 °C Rise DOE 2016

kVA	Weight	Loss in Watts		Efficiency (T. Rise +20 °C)			Full Load	% Regulation		% Imp. Rise +20 °C	X Rise +20 °C	R Rise +20 °C	Sound Level dB	DOE 2016 Efficiency	Inrush Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	434	116	263	97.66	98.46	98.57	98.51	1.1	1.2	1.17	0.6	1.0	45	97.89	235
30	507	110	546	98.24	98.58	98.46	98.22	1.9	2.1	2.1	1.5	1.5	48	98.23	170
45	703	146	850	98.43	98.63	98.45	98.17	2.2	2.4	2.45	1.9	1.6	53	98.40	195
75	1112	290	1004	98.46	98.87	98.86	98.73	2.2	2.6	2.68	2.5	1.0	53	98.60	307
112.5	1927	380	—	—	—	—	—	—	—	—	—	—	53	98.74	315
150	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
225	3345	695	2031	98.86	99.20	99.22	99.16	2.8	3.3	3.5	3.4	0.6	—	98.94	—
300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Typical Data for General-Purpose Dry-Type Distribution Transformers—Aluminum Wound

Type DS-3 150 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation		% Imp. Trise +20 °C	X Trise +20 °C	R Trise +20 °C	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	196	80	518	97.5	97.7	97.3	96.7	2.0	2.5	3.46	1.9	2.9	45	97.70	303
25	261	110	736	98.2	98.2	97.8	97.3	1.6	2.1	2.97	1.6	2.5	45	98.00	492
38	304	132	1141	98.3	98.1	97.7	97.1	1.8	3.8	4.85	4.0	2.7	45	98.20	352
50	396	145	1699	98.4	98.1	97.5	96.8	2.1	4.2	5.32	4.3	3.1	45	98.30	359
75	688	260	1622	98.4	98.6	98.3	97.9	1.5	2.7	3.46	2.9	1.8	50	98.50	1143
100	699	300	2527	98.5	98.4	98.1	97.6	1.9	4.0	5.17	4.7	2.2	50	98.60	865
167	1610	900	3987	68.7	98.7	98.4	98.0	1.4	6.8	9.70	9.5	1.8	55	98.70	416

Type DS-3 115 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation		% Imp. Trise +20 °C	X Trise +20 °C	R Trise +20 °C	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	246	80	519	97.8	97.8	97.3	96.8	2.1	3.1	3.9	2.6	2.9	45	97.70	244
25	373	300	766	97.7	98.1	98.0	97.7	1.4	2.8	3.3	2.8	1.9	45	98.00	367
37.5	380	125	1182	98.2	98.4	98.1	97.8	2.0	3.1	4.1	2.9	2.8	45	98.20	205
50	590	300	417	98.4	98.3	97.9	97.4	1.8	4.1	5.2	5.2	0.2	45	98.30	511
75	689	170	2356	98.5	98.2	97.6	97.0	2.7	5.6	6.9	6.3	2.9	50	98.50	572

Type DS-3 80 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation		% Imp. Trise +20 °C	X Trise +20 °C	R Trise +20 °C	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	360	115	269	97.4	98.3	98.4	98.4	0.8	1.7	2.0	1.8	1.0	45	97.70	460
25	370	120	580	97.8	98.2	98.0	97.8	1.5	3.2	3.9	3.4	1.8	45	98.00	348
37.5	565	150	834	98.1	98.4	98.1	97.8	1.5	3.3	4.1	3.6	1.8	45	98.20	490
50	680	175	1014	98.4	98.5	98.4	98.1	1.5	3.4	4.2	3.9	1.7	45	98.30	577
75	900	260	1387	98.3	98.6	98.5	98.2	1.4	3.5	4.3	4.0	1.5	50	98.50	807

Type DT-3 150 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation		% Imp. Trise +20 °C	X Trise +20 °C	R Trise +20 °C	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	204	95	778	96.6	96.7	96.0	95.1	4.8	4.0	4.8	1.4	4.6	45	97.00	127
30	291	165	1207	97.2	97.3	96.9	96.2	3.7	5.6	4.6	3.0	3.5	45	97.50	159
37.5	381	210	1428	97.5	97.5	97.0	96.4	3.5	5.5	4.5	3.1	3.2	45	97.70	161
45	351	210	1911	97.5	97.4	96.7	96.0	3.8	6.3	5.1	3.4	3.8	45	97.70	188
50	531	270	1316	97.7	98.1	97.9	97.5	2.2	4.0	3.2	2.4	2.1	45	98.00	333
75	553	300	2917	97.9	97.7	97.0	96.3	3.6	6.6	5.3	4.0	3.5	50	98.00	187
112.5	793	400	3693	98.0	98.0	97.5	96.9	3.2	7.5	6.0	5.2	2.9	50	98.20	350
150	913	490	4923	98.2	98.0	97.5	96.9	3.2	6.5	5.3	4.4	3.0	50	98.30	506
225	1343	650	6476	98.4	98.2	97.8	97.2	2.8	6.3	5.1	4.4	2.6	55	98.50	734
300	1597	750	8239	98.5	98.3	97.9	97.3	2.9	8.9	7.6	7.2	2.5	55	98.60	699
500	2590	1400	9782	98.6	98.7	98.5	98.1	1.9	8.2	7.2	7.0	1.7	60	98.70	1256
750	3340	1800	12,692	98.8	98.9	98.7	98.4	1.8	8.9	8.0	7.9	1.5	64	98.80	1507

Typical Data for General-Purpose Dry-Type Distribution Transformers—Aluminum Wound

Type DT-3 115 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation		% Imp. Trise +20 °C	X Trise +20 °C	R Trise +20 °C	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	202	100	743	96.7	96.8	96.2	95.4	4.4	3.9	4.4	1.2	4.3	45	97.00	127
30	311	165	1492	97.3	97.1	96.3	95.5	4.5	4.8	4.8	1.8	4.4	45	97.50	137
45	418	220	1458	97.8	97.9	97.5	97.0	2.8	5.4	4.6	3.7	2.8	45	97.70	183
50	556	270	1211	97.6	98.1	98.0	97.7	1.9	3.7	3.2	2.6	1.9	45	98.00	297
75	581	300	2415	97.9	97.9	97.5	96.9	3.0	6.7	5.9	5.1	2.8	50	98.00	252
112.5	829	440	3209	98.0	98.1	97.8	97.3	2.6	3.6	3.1	1.9	2.5	50	98.20	433
150	996	530	3781	98.1	98.3	97.9	97.5	2.4	5.8	5.2	4.7	2.2	50	98.30	511
225	1569	720	5205	98.4	98.4	98.1	97.8	2.2	6.8	6.2	5.8	2.0	55	98.50	631
300	1908	830	6926	98.5	98.5	98.2	97.8	2.3	6.0	5.4	4.9	2.0	55	98.60	872
500	3117	1650	6968	98.5	98.9	98.8	98.7	1.2	6.6	6.6	6.5	1.1	60	98.70	1310
750	4884	2000	9335	98.9	99.1	99.0	98.8	1.3	8.7	9.0	8.9	1.0	64	98.80	1486

Type DT-3 80 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation		% Imp. Trise +20 °C	X Trise +20 °C	R Trise +20 °C	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	276	165	551	96.7	97.4	97.2	96.8	3.4	3.9	3.5	2.3	2.6	45	97.00	119
30	350	180	904	97.3	97.8	97.6	97.2	2.5	3.9	3.4	2.5	2.4	45	97.50	112
45	540	290	1027	97.7	98.2	98.2	97.9	1.7	3.5	3.3	2.9	1.6	45	97.70	317
75	810	360	1782	97.8	98.2	98.0	97.7	0.3	3.5	4.3	3.9	1.9	50	98.00	355
112.5	944	470	2521	98.2	98.4	98.2	97.9	1.9	4.4	4.1	3.7	1.8	50	98.20	518
150	1438	650	2760	98.2	98.6	98.5	98.3	1.5	4.8	4.7	4.5	1.4	50	98.30	555
225	1746	830	4047	98.3	98.6	98.5	98.3	1.6	5.5	5.6	5.4	1.4	55	98.50	667
300	2400	1100	5338	98.6	99.0	99.0	98.9	1.6	5.9	6.1	5.9	1.4	55	98.60	885
500	3418	1800	5858	98.6	99.0	99.0	98.9	0.9	4.9	5.4	5.3	0.8	60	98.70	1487

Type KT-4 150 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation		% Imp. Trise +20 °C	X Trise +20 °C	R Trise +20 °C	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	206	100	883	96.7	96.5	95.6	94.6	5.5	5.2	5.5	1.8	5.2	45	97.00	125
30	311	165	1263	97.2	97.3	96.7	96.0	3.9	7.4	6.0	4.8	3.7	45	97.50	151
45	400	220	1554	97.7	97.7	97.3	96.7	3.2	5.9	4.8	3.8	3.0	45	97.70	236
75	547	300	2622	97.9	97.8	97.2	96.6	3.3	6.7	5.3	4.4	3.1	50	98.00	331
112.5	800	440	3525	98.0	98.0	97.6	97.0	3.0	7.4	6.0	5.3	2.7	50	98.20	360
150	1010	530	4055	98.1	98.2	97.8	97.4	2.6	6.6	5.4	4.8	2.3	50	98.30	524
225	1680	700	5879	98.3	98.3	97.9	97.5	2.6	7.6	6.3	5.9	2.3	55	98.50	647
300	2122	1100	5895	98.4	98.6	98.4	98.1	1.9	6.8	5.9	5.7	1.6	55	98.60	954
500	3201	1800	7054	98.5	98.9	98.8	98.7	1.3	5.9	5.4	5.2	1.1	60	98.70	1529

Typical Data for General-Purpose Dry-Type Distribution Transformers—Aluminum Wound

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Type KT-4 115 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation		% Imp. Trise +20 °C	X Trise +20 °C	R Trise +20 °C	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	307	135	394	96.3	97.5	97.6	97.5	1.8	2.7	2.2	1.4	1.7	45	97.00	163
30	313	165	1344	97.4	97.3	96.6	95.9	4.1	5.1	4.6	2.4	3.9	45	97.50	194
45	400	220	1463	97.8	97.9	97.5	97.0	3.0	6.1	5.2	4.4	2.8	45	97.70	197
75	587	285	2355	97.9	97.9	97.5	97.0	2.9	6.7	5.9	5.2	2.8	50	98.00	274
112.5	947	470	2910	97.9	98.1	97.9	97.5	2.4	5.0	4.3	3.7	2.2	50	98.20	482
150	1243	560	4119	98.1	98.2	97.8	97.4	2.5	6.6	5.7	5.2	2.4	50	98.30	489
225	1680	700	5413	98.3	98.3	98.1	97.7	2.3	7.5	7.0	6.7	2.1	55	98.50	573
300	2480	1100	5735	98.4	98.7	98.5	98.2	1.8	6.7	6.3	6.1	1.5	55	98.60	849

Type KT-4 80 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation		% Imp. Trise +20 °C	X Trise +20 °C	R Trise +20 °C	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	378	165	416	96.4	97.6	97.7	97.6	1.7	2.9	2.5	1.9	1.7	45	97.00	160
30	365	188	877	97.2	97.7	97.6	97.2	2.4	3.9	3.5	2.6	2.3	45	97.50	194
45	550	285	1055	97.4	98.1	98.0	97.8	1.8	3.7	3.4	2.9	1.7	45	97.70	236
75	774	360	1784	97.8	98.2	98.0	97.7	2.0	4.7	4.5	4.0	1.9	50	98.00	328
112.5	1380	550	1872	97.9	98.5	98.5	98.4	1.3	4.2	4.2	4.1	1.2	50	98.20	525
150	1604	700	2728	98.0	98.5	98.5	98.3	1.4	4.4	4.5	4.3	1.4	50	98.30	626
225	2336	850	3728	98.4	98.7	98.6	98.4	1.4	5.0	5.2	5.1	1.3	55	98.50	882
300	2689	1100	4589	98.4	98.8	98.7	98.5	1.4	5.5	5.8	5.6	1.2	55	98.60	870

Type KT-13 150 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation		% Imp. Trise +20 °C	X Trise +20 °C	R Trise +20 °C	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	271	165	604	96.7	97.3	97.0	96.5	3.1	4.2	3.6	2.1	2.9	45	97.00	126
30	365	198	977	97.1	97.6	97.3	96.9	2.7	4.3	3.5	2.4	2.6	45	97.50	188
45	545	280	1215	97.5	98.0	97.8	97.4	2.2	4.2	3.3	2.6	2.1	45	97.70	277
75	812	360	2139	97.7	98.0	97.8	97.4	2.6	5.9	4.9	4.3	2.4	50	98.00	302
112.5	920	490	3059	98.0	98.2	97.8	97.4	2.4	5.0	4.1	3.4	2.3	50	98.20	504
150	1221	530	4297	98.1	98.1	97.7	97.2	2.7	6.5	5.3	4.6	2.5	50	98.30	597
225	1960	830	4461	98.3	98.6	98.3	98.0	1.9	6.6	6.1	5.9	1.6	55	98.50	590
300	2358	1100	5931	98.4	98.6	98.4	98.2	1.9	7.2	6.3	6.0	1.6	55	98.60	847

Typical Data for General-Purpose Dry-Type Distribution Transformers—Aluminum Wound

Type KT-13 115 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation		% Imp. Trise +20 °C	X Trise +20 °C	R Trise +20 °C	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	332	165	432	96.6	97.6	97.6	97.4	1.9	3.2	2.8	2.2	1.8	45	97.00	136
30	390	200	903	97.3	97.8	97.6	97.2	2.5	4.4	3.6	2.8	2.3	45	97.50	120
45	548	280	1187	97.5	98.1	98.0	97.7	2.2	—	3.0	2.3	2.0	45	97.70	278
75	808	360	1850	97.8	98.1	97.8	97.5	2.4	5.6	4.8	4.3	2.2	50	98.00	268
112.5	990	540	2373	97.9	98.3	98.2	98.0	1.8	4.5	4.0	3.6	1.6	50	98.20	434
150	1600	650	2372	98.1	98.5	98.4	98.1	1.3	3.4	3.0	2.8	1.1	50	98.30	644
225	2306	850	4001	98.3	98.7	98.6	98.3	1.6	4.9	5.1	4.9	1.4	55	98.50	836
300	3291	1100	4583	98.4	98.8	98.7	98.5	1.3	6.2	6.3	6.2	1.2	55	98.60	950

Type KT-13 80 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation		% Imp. Trise +20 °C	X Trise +20 °C	R Trise +20 °C	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF						
15	315	165	536	96.4	97.3	97.2	96.9	2.5	3.9	3.6	2.5	2.5	45	97.00	125
30	408	188	854	97.4	97.9	97.7	97.3	2.3	4.0	3.6	2.8	2.2	45	97.50	166
45	555	280	982	97.6	98.2	98.2	98.0	1.6	3.2	3.0	2.5	1.6	45	97.70	218
75	838	400	1289	97.8	98.4	98.5	98.4	1.3	3.0	2.9	2.6	1.2	50	98.00	541
112.5	1367	550	1905	97.9	98.5	98.5	98.4	1.3	4.2	4.4	4.2	1.2	50	98.20	390
150	1607	668	2474	98.2	98.6	98.6	98.4	1.4	4.6	4.7	4.5	1.2	50	98.30	520
225	2582	850	3471	98.3	98.7	98.7	98.5	1.3	5.1	6.3	6.2	1.2	55	98.50	719
300	3228	1100	3978	98.3	98.8	98.8	98.7	1.1	4.2	4.5	4.3	1.0	55	98.60	1085

Typical Data for General-Purpose Dry-Type Distribution Transformers—Copper Wound

Type DS-3 150 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation			X	R	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF	% Imp.					
15	270	80	605	97.6	97.5	96.9	96.3	3.5	4.2	4.2	2.3	3.5	45	97.70	183
25	406	115	732	97.9	98.1	97.7	97.3	—	—	3.5	2.5	2.5	45	98.00	459
37.5	453	125	1154	98.2	98.1	97.6	97.0	2.7	3.7	4.8	4.0	2.7	45	98.20	440
50	657	160	1159	98.3	98.4	98.1	97.7	2.0	3.3	3.8	3.8	2.0	45	98.30	440
75	803	175	2259	98.5	98.3	97.7	97.1	2.8	4.8	6.5	5.8	2.8	50	98.50	711
100	960	250	2504	98.6	98.4	98.0	97.5	2.3	4.3	5.5	5.0	2.3	50	98.60	926
167	1665	570	3094	98.7	98.8	98.6	98.3	1.5	6.3	9.0	8.8	1.5	50	98.70	955

Type DS-3 115 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation			X	R	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF	% Imp.					
15	264	80	437	97.8	98.1	97.8	97.3	2.4	2.2	3.3	2.2	2.4	45	97.70	239
25	420	110	603	97.9	98.2	98.0	97.7	2.0	2.9	3.2	2.6	2.0	45	98.00	287
37.5	450	125	1217	98.2	98.0	97.5	96.9	2.9	4.5	5.9	5.1	2.9	45	98.20	433
50	703	300	1409	98.4	98.4	98.0	97.6	2.2	3.8	4.7	4.1	2.2	—	98.30	499
75	793	175	2178	98.5	98.3	97.8	97.2	2.7	4.7	6.2	5.6	2.7	50	98.50	702

Type DS-3 80 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation			X	R	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF	% Imp.					
15	407	115	293	97.3	98.2	98.3	98.2	1.2	1.7	1.8	1.4	1.2	45	97.70	125
25	430	300	679	97.9	98.4	98.3	98.1	1.5	2.6	3.0	2.6	1.5	45	98.00	164
37.5	685	300	729	98.1	98.6	98.6	98.5	1.1	2.2	2.6	2.3	1.1	45	98.20	205
50	799	180	1013	98.3	98.6	98.4	98.1	1.7	2.9	3.4	2.9	1.7	45	98.30	329
75	1042	250	1447	98.3	98.6	98.4	98.1	1.6	3.4	3.8	3.5	1.6	50	98.50	338

Type DT-3 150 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation			X	R	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF	% Imp.					
15	250	150	755	98.9	97.0	96.4	95.7	4.2	5.3	4.8	2.6	4.0	45	97.00	107
30	350	165	1100	97.3	97.5	97.0	96.5	3.2	4.5	5.2	4.1	3.1	45	97.50	204
37.5	415	210	1382	97.5	97.6	97.1	96.5	3.2	4.8	4.0	2.5	3.1	45	97.70	213
45	416	215	1786	97.4	97.4	96.9	96.2	3.6	5.5	4.6	3.0	3.5	45	97.70	212
50	647	270	1220	97.7	98.2	98.0	97.7	2.0	3.5	2.8	2.0	1.9	45	98.00	357
75	643	320	2903	97.9	97.5	97.1	96.4	3.6	7.4	4.3	2.5	3.4	50	98.00	338
112.5	876	420	3699	97.9	97.9	97.4	96.8	3.0	6.7	5.1	4.2	2.9	50	98.20	395
150	1064	530	4269	98.1	98.2	97.8	97.3	2.7	5.3	4.3	3.5	2.5	50	98.30	584
225	1569	560	7124	98.4	98.1	97.5	97.0	3.2	8.7	7.4	6.8	2.9	55	98.50	832
300	2050	730	7959	98.4	98.3	97.9	97.4	2.6	6.7	5.5	4.9	2.4	55	98.60	964
500	3681	1400	8292	98.8	98.9	98.7	98.4	1.6	7.4	6.8	6.7	1.4	60	98.70	1279

Typical Data for General-Purpose Dry-Type Distribution Transformers—Copper Wound

Type DT-3 115 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation			X	R	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF	% Imp.					
15	256	95	669	97.7	97.8	97.3	96.7	4.0	5.4	4.8	2.9	3.8	45	97.00	76
30	337	180	1077	97.7	97.8	97.3	96.8	3.0	6.2	4.6	3.5	3.0	45	97.50	144
45	446	215	1625	97.7	97.7	97.2	96.6	3.2	5.2	4.4	3.1	3.1	45	97.70	219
50	630	270	1213	97.8	98.2	98.0	97.7	2.0	3.5	3.0	2.3	1.9	45	98.00	320
75	662	320	2346	97.9	98.0	97.6	97.0	2.8	5.4	4.7	3.9	2.7	50	98.00	280
112.5	914	400	2953	98.1	98.2	97.9	97.4	2.5	5.7	5.0	4.5	2.3	50	98.20	345
150	1132	530	3364	98.3	98.5	98.2	97.8	2.0	4.8	4.4	4.0	1.9	50	98.30	535
225	2036	650	6445	98.4	98.3	97.8	97.3	2.9	8.8	8.1	7.7	2.6	55	98.50	524
300	2325	830	6038	98.6	98.7	98.4	98.1	2.0	5.7	5.2	4.9	1.7	55	98.60	620
500	3681	1400	7841	98.8	98.9	98.7	98.5	1.4	6.8	6.8	6.6	1.3	60	98.70	1344

Type DT-3 80 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation			X	R	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF	% Imp.					
15	349	135	390	96.6	97.7	97.7	97.6	1.8	2.4	2.1	1.3	1.7	45	97.00	150
30	410	210	823	97.3	97.9	97.7	97.4	2.1	3.4	3.0	2.1	2.0	45	97.50	164
45	504	200	1308	97.9	98.0	97.7	97.2	2.5	4.5	3.9	3.1	2.5	45	97.70	158
75	818	370	1837	97.9	98.2	98.0	97.7	2.0	9.3	4.3	3.8	2.0	50	98.00	312
112.5	1065	440	2409	98.1	98.3	98.0	97.6	1.8	3.8	3.3	2.8	1.8	50	98.20	584
150	1410	650	3349	98.3	98.5	98.3	97.9	1.9	3.9	3.7	3.2	1.8	50	98.30	531
225	2030	830	4096	98.4	98.7	98.5	98.3	1.6	5.4	5.4	5.2	1.5	55	98.50	856
300	3041	1100	4646	98.5	98.8	98.7	98.5	1.4	5.6	6.1	6.0	1.2	55	98.60	1251

Type KT-4 80 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation			X	R	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF	% Imp.					
15	251	100	635	96.8	97.1	96.6	96.0	3.7	5.0	4.2	2.1	3.6	45	97.00	88
30	326	165	1134	97.4	97.5	97.1	96.5	3.5	5.3	4.3	2.9	3.2	45	97.50	168
45	479	220	1505	97.6	97.8	97.3	96.8	3.0	5.6	5.0	4.1	2.9	45	97.70	223
75	463	300	2883	97.9	97.7	97.1	96.4	3.6	7.1	5.9	4.7	3.4	50	98.00	325
112.5	977	440	2952	98.1	98.2	97.9	97.5	2.6	6.6	5.6	5.1	2.2	50	98.20	344
150	1212	540	3716	98.3	98.4	98.0	97.6	2.4	6.0	5.1	4.6	2.1	50	98.30	524
225	1815	650	5420	98.4	98.5	98.1	97.7	2.4	7.6	6.5	6.2	2.1	55	98.50	565
300	2400	830	6259	98.6	98.6	98.4	98.0	2.2	6.3	5.2	4.9	1.8	55	98.60	864

Typical Data for General-Purpose Dry-Type Distribution Transformers—Copper Wound

Type KT-4 115 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation			X	R	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF	% Imp.					
15	256	95	702	96.7	96.9	96.3	95.6	4.2	5.7	5.0	2.9	4.0	45	97.00	93
30	341	165	1007	97.4	97.6	97.3	96.8	3.0	4.8	4.2	3.1	2.8	45	97.50	155
45	526	220	1200	97.9	98.1	97.9	97.5	2.3	5.0	4.1	3.5	2.2	50	97.70	211
75	759	300	1715	98.1	98.3	98.1	97.8	1.9	5.0	4.5	4.1	1.9	50	98.00	309
112.5	1030	470	2735	98.0	98.3	98.0	97.7	2.2	4.4	3.8	3.2	2.0	50	98.20	390
150	1631	650	3076	98.2	98.5	98.3	98.1	1.7	4.9	4.5	4.2	1.6	50	98.30	416
225	1965	690	4434	98.5	98.6	98.4	98.1	1.9	5.6	5.3	5.0	1.7	55	98.50	659
300	2337	830	6127	98.6	98.7	98.4	98.0	2.0	5.2	4.7	4.3	1.8	55	98.60	729

Type KT-4 80 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation			X	R	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF	% Imp.					
15	365	165	371	97.0	98.0	98.1	98.0	1.5	2.3	2.1	1.5	1.4	45	97.00	166
30	424	210	787	97.3	97.9	97.8	97.6	2.0	3.2	2.9	2.2	1.9	45	97.50	219
45	653	290	977	97.4	98.1	98.1	98.0	1.6	3.1	3.0	2.5	1.5	45	97.70	308
75	640	350	1951	97.8	98.1	97.8	97.5	2.2	5.2	4.9	4.4	2.1	50	98.00	284
112.5	1264	560	2009	98.2	98.7	98.6	98.4	1.4	4.3	4.2	4.0	1.3	50	98.20	483
150	1825	650	2873	98.5	98.7	98.5	98.2	1.6	6.1	6.4	6.3	1.5	50	98.30	429
225	2096	890	4449	98.3	98.6	98.4	98.1	1.8	6.5	6.6	6.4	1.6	55	98.50	764

Type KT-13 150 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation			X	R	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF	% Imp.					
15	346	165	461	96.2	97.4	97.5	97.3	2.1	3.0	2.5	1.6	2.0	45	97.00	176
30	390	190	908	97.2	97.7	97.5	97.1	2.6	4.0	3.3	2.3	2.4	45	97.50	193
45	623	235	1328	97.6	97.9	97.6	97.2	2.5	3.2	2.8	1.4	2.4	45	97.70	285
75	848	370	2402	97.7	97.9	97.5	97.0	2.8	5.7	4.5	3.6	2.7	50	98.00	348
112.5	1080	455	2991	98.0	98.2	97.9	97.4	2.4	4.3	3.5	2.7	2.3	50	98.20	393
150	1431	600	3686	98.2	98.3	98.1	97.7	2.3	5.1	4.2	3.7	2.1	50	98.30	416
225	2129	830	4250	98.4	98.6	98.4	98.2	2.0	6.3	5.4	5.1	1.5	55	98.50	923

Type KT-13 115 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation			X	R	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF	% Imp.					
15	341	165	378	96.6	97.8	97.9	97.9	1.5	2.4	2.1	1.6	1.4	45	97.00	157
30	444	188	824	97.1	97.8	97.6	97.3	2.2	3.6	3.1	2.2	2.1	45	97.50	206
45	598	250	1476	97.4	97.7	97.4	96.9	2.8	4.6	4.0	2.9	2.7	45	97.70	313
75	894	350	2128	97.9	98.1	97.9	97.5	1.9	5.1	4.6	4.0	2.4	50	98.00	282
112.5	1054	460	2612	98.1	98.3	98.1	97.8	2.0	4.3	3.3	2.6	1.9	50	98.20	458
150	1399	600	3185	98.2	98.5	98.3	98.0	2.0	5.9	5.4	5.1	1.7	50	98.30	460
225	2088	890	4382	98.3	98.6	98.4	98.2	1.8	6.1	5.7	5.5	1.6	55	98.50	830

Typical Data for General-Purpose Dry-Type Distribution Transformers—Copper Wound

Type KT-13 80 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation			X	R	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF	% Imp.					
15	370	165	382	96.7	97.8	97.9	97.8	1.5	2.4	2.2	1.6	1.4	45	97.00	157
30	490	188	595	97.4	98.2	98.2	98.1	1.4	3.0	2.8	2.5	1.4	45	97.50	197
45	635	290	1189	97.4	97.9	97.8	97.5	2.1	3.9	3.5	2.8	2.0	45	97.70	245
75	987	410	1351	97.7	98.9	98.4	98.3	1.4	2.8	2.6	2.3	1.3	50	98.00	530
112.5	854	560	2039	98.1	98.6	98.5	98.3	1.4	4.2	4.3	4.1	1.3	50	98.20	458
150	1807	650	3053	98.0	98.4	98.3	98.0	1.7	4.3	4.0	3.7	1.6	50	98.30	490
225	4091	1200	2364	98.2	98.9	99.1	99.1	0.6	2.7	2.9	2.8	0.5	55	98.50	1440

Type KT-13 115 °C Rise E3 Efficient

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation			X	R	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF	% Imp.					
15	3.25	78	359	97.6	98.1	98.0	97.7	2.0	3.7	3.2	2.6	1.9	45	98.00	102
30	370	125	636	98.1	98.4	98.3	98.0	1.7	2.7	2.3	1.6	1.7	45	98.30	260
45	635	135	1076	98.5	98.5	98.1	97.7	2.2	4.1	3.5	2.8	2.1	45	98.50	206
75	870	225	1529	98.5	98.6	98.4	98.0	1.9	4.9	4.4	4.1	1.7	50	98.60	331
112.5	1526	350	1768	98.6	98.8	98.7	98.5	1.3	3.5	3.1	2.8	1.3	50	98.80	816
150	1665	350	2419	97.8	98.9	98.7	98.4	1.5	4.5	4.2	3.9	1.4	50	98.90	659
225	2094	650	3650	98.9	98.9	98.8	98.5	1.5	5.4	5.2	5.1	1.3	55	99.00	895
300	3900	750	3731	98.9	99.1	99.0	98.8	1.3	5.2	5.2	5.1	1.0	55	99.04	997

Type KT-9 115 °C Rise E3 Efficient

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation			X	R	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF	% Imp.					
15	335	78	353	97.4	98.0	98.0	97.7	2.0	3.7	3.2	2.6	1.8	45	98.00	96
30	406	125	670	98.0	98.3	98.1	97.8	1.9	2.7	2.4	1.5	1.8	45	98.30	260
45	635	135	1075	98.6	98.5	98.2	97.7	2.3	4.1	3.5	2.8	2.1	45	98.50	201
75	870	210	1551	98.5	98.6	98.3	98.0	1.9	4.0	3.6	3.1	1.8	50	98.60	319
112.5	1526	350	1583	98.6	98.9	98.8	98.6	1.2	3.0	2.7	2.5	1.1	50	98.80	827
150	1665	350	2463	98.8	98.9	98.7	98.4	1.6	4.5	4.2	4.0	1.4	50	98.90	643
225	2094	650	3766	98.8	98.9	98.7	98.4	1.7	5.5	5.2	5.0	1.4	55	99.00	926

Typical Data for General-Purpose Dry-Type Distribution Transformers—Copper Wound

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Type NON HMT 115 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation			X	R	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF	% Imp.					
15	362	80	527	97.6	97.7	97.3	96.7	3.2	5.9	5.1	4.2	3.0	45	97.00	—
30	430	100	1040	98.3	98.0	97.4	96.7	3.2	6.2	5.4	4.4	3.1	45	97.50	—
45	627	170	1368	98.3	98.2	97.7	97.2	2.8	6.0	5.2	4.4	2.7	45	97.70	—
75	926	250	2096	98.4	98.3	97.9	97.4	2.6	7.0	6.2	5.7	2.5	50	98.00	—
112.5	1628	400	2515	98.4	98.5	98.3	97.9	2.0	5.5	4.9	4.5	1.9	50	98.20	—
150	2001	500	2688	98.5	98.7	98.6	98.3	1.6	5.6	5.2	5.0	1.5	50	98.30	—
225	3596	590	3310	98.8	98.9	98.8	98.6	1.5	6.2	6.0	5.9	1.2	55	98.50	—
300	3891	800	4854	98.7	98.9	98.7	98.4	1.7	7.1	7.0	6.8	1.4	55	98.60	—

Type THR HMT 115 °C Rise NEMA TP-1

kVA	Weight	Losses in Watts		Efficiency (Trise +20 °C)			Full Load	% Regulation			X	R	Sound Level dB	TP1 Efficiency	Practical Max.
		No Load	Total at Rise +20 °C	25%	50%	75%		100% PF	80% PF	% Imp.					
15	—	80	708	97.1	97.0	96.4	95.5	4.3	7.4	6.3	4.7	4.2	45	97.00	—
30	450	100	1409	98.0	97.4	96.5	95.6	4.7	8.0	6.8	5.2	4.4	45	97.50	—
45	610	170	1374	98.2	98.1	97.7	97.1	2.8	4.8	4.2	3.2	2.7	45	97.70	—
75	868	250	2341	98.2	98.1	97.6	97.0	2.9	6.6	5.8	5.0	2.8	50	98.00	—
112.5	1643	400	2685	98.3	98.4	98.1	97.7	2.2	5.5	5.0	4.6	2.0	50	98.20	—
150	—	500	3304	98.5	98.6	98.3	97.9	2.0	6.7	6.3	6.0	1.9	50	98.30	—
225	3370	590	3712	98.7	98.8	98.7	98.4	1.7	6.6	6.4	6.2	1.4	55	98.50	—
300	3894	800	4688	98.9	99.0	98.8	98.5	1.7	7.4	7.2	7.1	1.3	55	98.60	—

Typical Specifications— General-Purpose (1000 kVA and Below)

General

Furnish and install, single-phase and three-phase general-purpose individually mounted dry-type transformers of the two-winding type, self-cooled, with ratings and voltages as indicated on the drawings. Transformers shall be manufactured by Eaton.

Transformers shall be designed, manufactured and tested in accordance with all the latest applicable NEMA and IEEE standards. All 600 volt class transformers through 1000 kVA shall be UL listed and bear the UL label.

Transformers shall be designed for continuous operation at rated kVA, for operation 24 hours a day, 365 days a year, with normal life expectancy as defined in IEEE C57.96 *IEEE Guide for Loading Dry-Type Distribution and Power Transformers*.

Insulation Systems

Transformers shall be insulated as follows:

- **Type EP or EPT:**
0.050 through 75 kVA:
180 °C insulation system
- **Type DS-3 or DT-3:**
15 kVA and above: 220 °C insulation system

Required performance shall be obtained without exceeding the above indicated temperature rise in a 40 °C maximum ambient, with a 30 °C average over 24 hours.

All insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635.

Core and Coil Assemblies

Transformer core shall be constructed with high-grade, non-aging, silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities shall be substantially below the saturation point. The transformer core volume shall allow efficient transformer operation at 10% above the nominal tap voltage. The core laminations shall be tightly clamped and compressed. Coils shall be wound of electrical-grade [aluminum] [copper] and continuous wound construction. Basic impulse level (BIL) for all 600 volt class windings shall be 10 kV.

On encapsulated units rated [75 kVA and below] [15 kVA and below] [9 kVA and below], the core and coil assembly shall be completely encapsulated in a proportioned mixture of resin or epoxy and aggregate to provide a moisture-proof, shock-resistant seal. The core and coil encapsulation system shall minimize the sound level.

On ventilated units rated [15 kVA and above] [30 kVA and above] [112.5 kVA and above], the core and coil assembly shall be installed on neoprene vibration-absorbing pads.

Enclosures

The enclosure shall be made of heavy-gauge steel and shall be finished using a continuous process of degreasing, cleaning and phosphatizing, followed by electrostatic deposition of a thermosetting polyester powder coating and subsequent baking. The coating color shall be ANSI 61 and shall be UL recognized for outdoor use. The maximum temperature on top of the enclosure shall not exceed 90 °C.

On units rated [75 kVA and below] [15 kVA and below] [9 kVA and below] encapsulated, the enclosure construction shall be totally enclosed, non-ventilated, NEMA 3R, with lifting provisions.

On units rated [15 kVA and above] [30 kVA and above] [112.5 kVA and above], the enclosure construction shall be ventilated, NEMA 2, drip-proof, with lifting provisions. All ventilation openings shall be protected against falling dirt. On outdoor units, provide suitable weathershields over ventilation openings.

Average Sound Levels

NEMA ST-20 Average Sound Level, dB

Equivalent Winding kVA Range	Self-Cooled Ventilated (up to 1.2 kV)		Encapsulated (up to 1.2 kV)
	K-Factor 1, 4, 9	K-Factor 13, 20	
3.00 and below	40	40	45
3.01 to 9.00	40	40	45
9.01 to 15.00	45	45	50
15.01 to 30.00	45	45	50
30.01 to 50.00	45	48	50
50.01 to 75.00	50	53	55
75.01 to 112.50	50	53	55
112.51 to 150.00	50	53	55
150.01 to 225.00	55	58	57
225.01 to 300.00	55	58	57
300.01 to 500.00	60	63	59
500.01 to 700.00	62	65	61
700.01 to 1000.00	64	67	63
Greater than 1000	Consult factory	Consult factory	Consult factory

Tests

The following tests shall be performed as standard on all transformers:

1. Ratio tests at the rated voltage connection and at all tap connections.
2. Polarity and phase relation tests on the rated voltage connection.
3. Applied potential tests.
4. Induced potential test.
5. No-load and excitation current at rated voltage on the rated voltage connection.

Sound Levels

Transformer average sound levels shall not exceed the following IEEE and NEMA levels for self-cooled ratings measured in accordance with NEMA ST-20.

Typical Specification— DOE 2016 Energy-Efficient Transformers

2

General

Furnish and install, single- and three-phase energy-efficient dry-type transformers that comply with CFR Title 10 Chapter II Part 431, Appendix A of Subpart K 2016. Transformers shall be of the two-winding type, self-cooled, with ratings (kVA) as indicated on the drawings. Transformer's losses shall conform to 10 CFR Part 431 requirements. Transformers shall be manufactured by Eaton.

Transformers shall be designed, manufactured and tested in accordance with all the latest applicable NEMA and IEEE standards, and shall be listed by Underwriters Laboratories and bear the UL label.

Transformers shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year, with normal life expectancy as defined in IEEE C57.96 *IEEE Guide for Loading Dry-Type Distribution and Power Transformers*.

Insulation System and Temperature Rise

Transformers shall be insulated with a 220 °C insulation system. Transformers shall be 150 °C rise and shall be capable of carrying a 15% continuous overload without exceeding a 150 °C rise. Required performance shall be obtained without exceeding the above rise in a 40 °C maximum, 30 °C average ambient temperature.

All insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635.

Core and Coil Assemblies

Transformer core shall be constructed with high-grade, non-aging, silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities shall be substantially below the saturation point.

The transformer core volume shall allow efficient transformer operation at 10% above the nominal tap voltage. The core laminations shall be tightly clamped and compressed. Coils shall be wound of electrical grade [aluminum] [copper] and continuous wound construction. Basic impulse level (BIL) for all 600 volt class windings shall be 10 kV.

The core and coil assembly shall be installed on neoprene vibration-absorbing pads.

Enclosures

The enclosure shall be made of heavy-gauge steel and shall be finished utilizing a continuous process of degreasing, cleaning and phosphatizing, followed by electrostatic deposition of a thermosetting polyester powder coating and subsequent baking. The coating color shall be ANSI 61 and shall be UL recognized for outdoor use.

The enclosure construction shall be ventilated, NEMA 2, drip-proof, with lifting provisions. All ventilation openings shall be protected against falling dirt.

All transformers shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring. The maximum temperature on top of the enclosure shall not exceed 90 °C.

Tests

The following tests shall be performed as standard on all transformers:

1. Ratio tests at the rated voltage connection and at all tap connections.
2. Polarity and phase relation tests on the rated voltage connection.
3. Applied potential tests.
4. Induced potential test.
5. No-load and excitation current at rated voltage on the rated voltage connection.

Efficiency

Transformers shall be energy-efficient with minimum efficiencies as set forth per U.S. DOE 10 CFR Parts 430 and 431 when operated at 35% of full load capacity. Transformer must bear the UL Energy Efficiency Verification Mark to confirm that the unit meets the requirements of 10 CFR Part 431.

DOE 2016 Efficiency Levels

Dry-Type Distribution Transformers—Low-Voltage (600 V and below)

Single-Phase		Three-Phase	
kVA	Efficiency	kVA	Efficiency
15	97.70	15	97.89
25	98.00	30	98.23
37.5	98.20	45	98.40
50	98.30	75	98.60
75	98.50	112.5	98.74
100	98.60	150	98.83
167	98.70	225	98.94
250	98.80	300	99.02
333	98.90	500	99.14
—	—	750	99.23
—	—	1000	99.28

Sound Levels

Transformer average sound levels shall not exceed the following IEEE and NEMA levels for self-cooled ratings.

Average Sound Levels

NEMA ST-20 Average Sound Level, dB

Equivalent Winding kVA Range	Self-Cooled Ventilated (up to 1.2 kV)		Encapsulated (up to 1.2 kV)
	K-Factor 1, 4, 9	K-Factor 13, 20	
3.00 and below	40	40	45
3.01 to 9.00	40	40	45
9.01 to 15.00	45	45	50
15.01 to 30.00	45	45	50
30.01 to 50.00	45	48	50
50.01 to 75.00	50	53	55
75.01 to 112.50	50	53	55
112.51 to 150.00	50	53	55
150.01 to 225.00	55	58	57
225.01 to 300.00	55	58	57
300.01 to 500.00	60	63	59
500.01 to 700.00	62	65	61
700.01 to 1000.00	64	67	63
Greater than 1000	Consult factory	Consult factory	Consult factory

Typical Specifications— Dry-Type Transformers for Nonlinear Loads

General

Furnish and install, individually mounted dry-type transformers of the two-winding type, self-cooled, with ratings and voltages as indicated on the drawings.

Transformers shall be manufactured by Eaton.

Transformers shall be designed, manufactured and tested in accordance with all the latest applicable NEMA and IEEE standards. All 600 volt class transformers through 500 kVA shall be UL listed as suitable for non-sinusoidal current loads with K factor not to exceed [4] [13] [20].

Insulation Systems

Transformers shall be insulated with a UL recognized 220 °C insulation system. Winding temperature rise shall be [80 °C] [115 °C] [150 °C].

Required performance shall be obtained without exceeding the above indicated temperature rise in a 40 °C maximum ambient, with a 30 °C average.

All insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635.

Core and Coil Assemblies

Transformer core shall be constructed with high-grade, non-aging, silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities shall be substantially below the saturation point. The transformer core volume shall allow efficient transformer operation at 10% above the nominal tap voltage. The core laminations shall be tightly clamped and compressed.

Transformer coils shall be wound of electrical-grade [aluminum] [copper] conductor with continuous wound construction. An electrostatic shield consisting of a single turn of aluminum shall be placed between the primary and secondary winding and grounded to the transformer core. Basic impulse level (BIL) for all 600 volt class windings shall be 10 kV.

The core and coil assembly shall be installed on neoprene vibration-absorbing pads.

The neutral conductor shall be rated to carry 200% of normal phase current.

Enclosures

The enclosure shall be made of heavy-gauge steel and shall be finished utilizing a continuous process of degreasing, cleaning and phosphatizing, followed by electrostatic deposition of a polymer polyester powder coating and baking. The coating color shall be ANSI 61 and shall be UL recognized for outdoor use. The maximum temperature on top of the enclosure shall not exceed 90 °C.

The enclosure construction shall be ventilated, NEMA 2, drip-proof, with lifting provisions. All ventilation openings shall be protected against falling dirt. On outdoor units, provide suitable weathershields over ventilation openings. **To ensure proper ventilation, transformer can be installed at a minimum distance to back and side walls of 2 inches and 6 inches minimum distance to back walls when weathershields are needed.**

Nonlinear Ratings

The transformers shall be specifically designed to supply circuits with a harmonic profile equal to or less than a K-factor of 4 or 13 as described below without exceeding [80 °C] [115 °C] [150 °C] temperature rise.

Nonlinear Ratings

Harmonic	K-4	K-13
Fundamental	100.0%	100.0%
3rd	34.0%	70.0%
5th	22.0%	42.0%
7th	3.0%	5.0%
9th	1.0%	3.0%
11th	0.7%	3.0%
13th	0.5%	1.0%
15th	0.3%	0.7%
17th	0.3%	0.6%

Average Sound Levels

NEMA ST-20 Average Sound Level, dB

Equivalent Winding kVA Range	Self-Cooled Ventilated (up to 1.2 kV)		Encapsulated (up to 1.2 kV)
	K-Factor 1, 4, 9	K-Factor 13, 20	
3.00 and below	40	40	45
3.01 to 9.00	40	40	45
9.01 to 15.00	45	45	50
15.01 to 30.00	45	45	50
30.01 to 50.00	45	48	50
50.01 to 75.00	50	53	55
75.01 to 112.50	50	53	55
112.51 to 150.00	50	53	55
150.01 to 225.00	55	58	57
225.01 to 300.00	55	58	57
300.01 to 500.00	60	63	59
500.01 to 700.00	62	65	61
700.01 to 1000.00	64	67	63
Greater than 1000	Consult factory	Consult factory	Consult factory

Tests

The following tests shall be performed as standard on all transformers:

1. Ratio tests at the rated voltage connection and at all tap connections.
2. Polarity and phase relation tests on the rated voltage connection.
3. Applied potential tests.
4. Induced potential test.
5. No-load and excitation current at rated voltage on the rated voltage connection.

Sound Levels

Transformer average sound levels shall not exceed the following IEEE and NEMA levels for self-cooled ratings measured in accordance with NEMA ST-20.

Typical Specification— AC Adjustable Frequency Drive Isolation Transformers

2

General

Furnish and install, single-phase and three-phase general-purpose individually mounted dry-type transformers of the two-winding type, self-cooled, with ratings and voltages for input application as indicated on the drawings. Transformers shall be manufactured by Eaton.

Transformers shall be designed, manufactured and tested in accordance with all the latest applicable NEMA and IEEE standards. All 600 volt class transformers through 550 kVA shall be UL listed and bear the UL label.

Transformers shall be designed for continuous operation at rated kVA, for operation 24 hours a day, 365 days a year, with normal life expectancy as defined in IEEE C57.96 *IEEE Guide for Loading Dry-Type Distribution and Power Transformers*.

Insulation Systems

Transformers shall be insulated with a UL recognized 220 °C insulation system.

Required performance shall be obtained without exceeding the above indicated temperature rise in a 40 °C maximum ambient, with a 30 °C average over 24 hours.

All insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635.

Core and Coil Assemblies

Transformer core shall be constructed with high-grade, non-aging, silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities shall be substantially below the saturation point. The transformer core volume shall allow efficient transformer operation at 10% above the nominal tap voltage. The core laminations shall be tightly clamped and compressed. Coils shall be wound of electrical-grade [aluminum] [copper] and continuous wound construction. Basic impulse level (BIL) for all 600 volt class windings shall be 10 kV.

A temperature sensing device shall be imbedded in the center coil.

The core and coil assembly shall be installed on neoprene vibration-absorbing pads.

Enclosures

The enclosure shall be made of heavy-gauge steel and shall be finished using a continuous process of degreasing, cleaning, and phosphatizing, followed by electrostatic deposition of a thermosetting polyester powder coating and subsequent baking. The coating color shall be ANSI 61 and shall be UL recognized for outdoor use. The maximum temperature on top of the enclosure shall not exceed 90 °C.

The enclosure construction shall be ventilated, NEMA 2, drip-proof, with lifting provisions. All ventilation openings shall be protected against falling dirt. **To ensure proper ventilation, transformer can be installed at a minimum distance to back and side walls of 2 inches and 6 inches minimum distance to back walls when weathershields are needed.**

Sound Levels

Transformer average sound levels shall not exceed the following IEEE and NEMA levels for self-cooled ratings measured in accordance with NEMA ST-20.

The following table lists the recommended kVA size of the drive isolation transformer for a specific horsepower requirement.

Three-Phase

Horsepower AC Motor	kVA Minimum
5	7.5
7.5	11
10	14
15	20
20	27
25	34
30	40
40	51
50	63
60	75
75	93
100	118
125	145
150	175
200	220
250	275
300	330
400	440
500	550
600	660
700	770

Average Sound Levels

NEMA ST-20 Average Sound Level, dB

Equivalent Winding kVA Range	Self-Cooled Ventilated (up to 1.2 kV) K-Factor 1, 4, 9	Self-Cooled Ventilated (up to 1.2 kV) K-Factor 13, 20	Encapsulated (up to 1.2 kV)
3.00 and below	40	40	45
3.01 to 9.00	40	40	45
9.01 to 15.00	45	45	50
15.01 to 30.00	45	45	50
30.01 to 50.00	45	48	50
50.01 to 75.00	50	53	55
75.01 to 112.50	50	53	55
112.51 to 150.00	50	53	55
150.01 to 225.00	55	58	57
225.01 to 300.00	55	58	57
300.01 to 500.00	60	63	59
500.01 to 700.00	62	65	61
700.01 to 1000.00	64	67	63
Greater than 1000	Consult factory	Consult factory	Consult factory

Typical Specifications— Mini-Power Centers (3–30 kVA)

General

Furnish and install, single-phase and three-phase general-purpose individually mounted mini-power centers of the two-winding type, self-cooled, with ratings and voltages as indicated on the drawings. Mini-power centers shall be manufactured by Eaton.

Units shall be designed, manufactured and tested in accordance with all the latest applicable NEMA, IEEE, CSA and UL standards, and shall be UL listed and CSA certified and bear the UL and CSA labels.

Units shall be designed for continuous operation at rated kVA, 24 hours a day, 365 days a year, with normal life expectancy as defined in IEEE C57.96 *IEEE Guide for Loading Dry-Type Distribution and Power Transformers*.

Each mini-power center shall include a main primary breaker with an interrupting rating of 14 kA at 277/480 volts; an encapsulated dry-type transformer and a secondary panelboard with main breaker rated 10 kA interrupting rating at 120/240 volts.

1. All interconnecting wiring between the primary breaker and transformer, secondary main breaker and transformer, and distribution section shall be factory installed. Main primary, secondary and branch breakers shall be enclosed with a padlockable hinged door.
2. The secondary distribution section shall accommodate one-inch, plug-in breakers with 10 kA interrupting capacity.
3. On the all-copper, bolt-on designs, the secondary distribution section shall accommodate bolt-on breakers with 10 kA interrupting capacity.

Insulation System

Transformers shall be insulated with a 180 °C insulation system.

Required performance shall be obtained without exceeding the above indicated temperature rise in a 40 °C maximum ambient, with a 30 °C average over 24 hours.

All insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635.

Core and Coil Assemblies

Transformer core shall be constructed with high-grade, non-aging, silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities shall be substantially below the saturation point.

The transformer core volume shall allow efficient transformer operation at 10% above the nominal tap voltage. The core laminations shall be tightly clamped and compressed. Coils shall be wound of electrical-grade aluminum (copper) with continuous wound construction. Basic impulse level (BIL) for all 600 volt class windings shall be 10 kV.

The core and coil assembly shall be completely encapsulated in a proportioned mixture of resin or epoxy and aggregate to provide a moisture-proof, shock-resistant seal. The core and coil encapsulation system shall minimize the sound level.

Enclosures

The enclosure shall be made of heavy-gauge steel and shall be finished using a continuous process of degreasing, cleaning, and phosphatizing, followed by electrostatic deposition of a thermosetting polymer polyester powder coating and subsequent baking. The coating color shall be ANSI 61 and shall be UL recognized for outdoor use. Mini-power centers shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring. The maximum temperature on top of the enclosure shall not exceed 90 °C. The core of the transformer shall be grounded to the enclosure. The enclosure shall be totally enclosed, non-ventilated, NEMA 3R, with lifting eyes.

Tests

The following tests shall be performed as standard on all transformers:

1. Ratio tests at the rated voltage connection and at all tap connections.
2. Polarity and phase relation tests on the rated voltage connection.
3. Applied potential tests.
4. Induced potential test.
5. No-load and excitation current at rated voltage on the rated voltage connection.

Sound Levels

Transformer average sound levels shall not exceed the following IEEE/NEMA levels for self-cooled ratings measured in accordance with NEMA ST-20.

Average Sound Levels

kVA	NEMA Average Sound Level in dB
0–9	45
10–30	50

Typical Specification— NEMA TP-1-2002 Compliant Energy-Efficient Transformers

General

Furnish and install, three-phase energy-efficient dry-type transformers that comply with NEMA Standard TP-1-2002 and U.S. DOE 10 CFR Parts 430 and 431. Transformers shall be of the two-winding type, self-cooled, with ratings (kVA) as indicated on the drawings. Transformer's losses shall conform to NEMA TP-1 requirements. Transformers shall be manufactured by Eaton.

Transformers shall be designed, manufactured and tested in accordance with all the latest applicable NEMA and IEEE standards, and shall be listed by Underwriters Laboratories and bear the UL label.

Transformers shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year, with normal life expectancy as defined in IEEE C57.96 *IEEE Guide for Loading Dry-Type Distribution and Power Transformers*.

Insulation System and Temperature Rise

Transformers shall be insulated with a 220 °C insulation system. Transformers shall be 150 °C rise and shall be capable of carrying a 15% continuous overload without exceeding a 150 °C rise. Required performance shall be obtained without exceeding the above rise in a 40 °C maximum, 30 °C average ambient temperature.

All insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635.

Core and Coil Assemblies

Transformer core shall be constructed with high-grade, non-aging, silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities

shall be substantially below the saturation point.

The transformer core volume shall allow efficient transformer operation at 10% above the nominal tap voltage. The core laminations shall be tightly clamped and compressed. Coils shall be wound of electrical grade [aluminum] [copper] and continuous wound construction. Basic impulse level (BIL) for all 600 volt class windings shall be 10 kV.

The core and coil assembly shall be installed on neoprene vibration-absorbing pads.

Enclosures

The enclosure shall be made of heavy-gauge steel and shall be finished utilizing a continuous process of degreasing, cleaning and phosphatizing, followed by electrostatic deposition of a thermosetting polyester powder coating and subsequent baking. The coating color shall be ANSI 61 and shall be UL recognized for outdoor use.

The enclosure construction shall be ventilated, NEMA 2, drip-proof, with lifting provisions. All ventilation openings shall be protected against falling dirt. **To ensure proper ventilation, transformer can be installed at a minimum distance to back and side walls of 2 inches and 6 inches minimum distance to back walls when weathershields are needed.**

All transformers shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring. The maximum temperature on top of the enclosure shall not exceed 90 °C.

Tests

The following tests shall be performed as standard on all transformers:

1. Ratio tests at the rated voltage connection and at all tap connections.
2. Polarity and phase relation tests on the rated voltage connection.
3. Applied potential tests.
4. Induced potential test.

5. No-load and excitation current at rated voltage on the rated voltage connection.

Efficiency

Transformers shall be energy-efficient with minimum efficiencies as set forth per NEMA TP-1-2002 when operated at 35% of full load capacity.

NEMA TP-1-2002 Efficiency Levels

NEMA Class 1 Efficiency Levels Dry-Type Distribution Transformers—Low-Voltage (600 V and below)

Single-Phase		Three-Phase	
kVA	Efficiency	kVA	Efficiency
15	97.7	15	97.0
25	98.0	30	97.5
37.5	98.2	45	97.7
50	98.3	75	98.0
75	98.5	112.5	98.2
100	98.6	150	98.3
167	98.7	225	98.5
250	98.8	300	98.6
333	98.9	500	98.7
—	—	750	98.8
—	—	1000	98.9

Sound Levels

Transformer average sound levels shall not exceed the following IEEE and NEMA levels for self-cooled ratings.

Average Sound Levels

NEMA ST-20 Average Sound Level, dB

Equivalent Winding kVA Range	Self-Cooled Ventilated (up to 1.2 kV)		Encapsulated (up to 1.2 kV)
	K-Factor 1, 4, 9	K-Factor 13, 20	
3.00 and below	40	40	45
3.01 to 9.00	40	40	45
9.01 to 15.00	45	45	50
15.01 to 30.00	45	45	50
30.01 to 50.00	45	48	50
50.01 to 75.00	50	53	55
75.01 to 112.50	50	53	55
112.51 to 150.00	50	53	55
150.01 to 225.00	55	58	57
225.01 to 300.00	55	58	57
300.01 to 500.00	60	63	59
500.01 to 700.00	62	65	61
700.01 to 1000.00	64	67	63
Greater than 1000	Consult factory	Consult factory	Consult factory

Glossary of Transformer Terms

Air cooled: A transformer that is cooled by the natural circulation of air around, or through, the core and coils.

Ambient noise level: The existing or inherent sound level of the area surrounding the transformer, prior to energizing the transformer. Measured in decibels.

Ambient temperature: The temperature of the air surrounding the transformer into which the heat of the transformer is dissipated.

Ampacity: The current-carrying capacity of an electrical conductor under stated thermal conditions. Expressed in amperes.

Ampere: The practical unit of electric current.

Attenuation: A decrease in signal power or voltage. Unit of measure is dB.

Autotransformer: A transformer in which part of the winding is common to both the primary and the secondary circuits.

Banked: Two or more single-phase transformers wired together to supply a three-phase load. Three single-phase transformers can be “banked” together to support a three-phase load. For example, three 10 kVA single-phase transformers “banked” together will have a 30 kVA three-phase capacity.

BIL: Basic impulse level. The ability of a transformer’s insulation system to withstand high voltage surges. All Eaton 600 V-class transformers have a 10 kV BIL rating.

BTU: British thermal unit. In North America, the term “BTU” is used to describe the heat value (energy content) of fuels, and also to describe the power of heating and cooling systems, such as furnaces, stoves, barbecue grills and air conditioners. When used as a unit of power, BTU “per hour” (BTU/h) is understood, though this is often abbreviated to just “BTU.”

Buck-boost: The name of a standard, single-phase, two-winding transformer application with the low-voltage secondary windings connected as an autotransformer for boosting (increasing) or bucking (decreasing) voltages in small amounts. Applications can either be single-phase or three-phase.

CE: Mark to indicate third-party approved or self-certification to specific requirements of the European community.

Celsius (centigrade): Metric temperature measure.

$$^{\circ}\text{F} = (1.8 \times ^{\circ}\text{C}) + 32$$

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) / 1.8$$

Center tap: A tap at the midpoint of a winding. The center tap on three-phase delta-delta transformers is called a lighting tap. It provides 5% of the transformer’s kVA for single-phase loads.

Certified tests: Actual values taken during production tests and certified as applying to a given unit shipped on a specific order. Certified tests are serial number-specific.

Common mode: Electrical noise or voltage fluctuation that occurs between all of the line leads and the common ground, or between ground and line or neutral.

Compensated transformer: A transformer with a turns ratio that provides a higher than nameplate output (secondary) voltage at no load, and nameplate output (secondary) voltage at rated load. It is common for small transformers (2 kVA and less) to be compensated.

Conductor losses: Losses (expressed in watts) in a transformer that are incidental to carrying a load: coil resistance, stray loss due to stray fluxes in the windings, core clamps, etc., as well as circulating currents (if any) in parallel windings. Also called load losses.

Continuous rating: The load that a transformer can handle indefinitely without exceeding its specified temperature rise.

Core losses: Losses (expressed in watts) caused by magnetization of the core and its resistance to magnetic flux. Also called no-load losses or excitation losses. Core losses are always present when the transformer is energized.

CSA: Canadian Standards Association. The Canadian equivalent of Underwriters Laboratories (UL).

cUL: Mark to indicate UL Certification to specific CSA Standards.

Decibel (dB): Unit of measure used to express the magnitude of a change in signal or sound level.

Delta connection: A standard three-phase connection with the ends of each phase winding connected in series to form a closed loop with each phase 120 degrees from the other. Sometimes referred to as three-wire.

Dielectric tests: Tests that consist of the application of a voltage higher than the rated voltage for a specified time for the purpose of determining the adequacy against breakdowns of insulating materials and spacings under normal conditions.

DOE 2016 efficient: A revision to federal law 10 CFR Part 431 (2007) that mandates higher efficiency for distribution transformers manufactured for sale in the U.S. and U.S. Territories effective January 1, 2016. “TP-1” efficient transformers can no longer legally be manufactured for use in the U.S. as of this date.

Dry-type transformer: A transformer in which the core and coils are in a gaseous or dry compound insulating medium. A transformer that is cooled by a medium other than a liquid, normally by the circulation of air.

Eddy currents: The currents that are induced in the body of a conducting mass by the time variation of magnetic flux or varying magnetic field.

Efficiency: The ratio of the power output from a transformer to the total power input. Typically expressed as a %.

Electrostatic shield: Copper or other conducting sheet placed between primary and secondary windings, and grounded to reduce electrical interference and to provide additional protection from line-to-line or line-to-ground noise. Commonly referred to as “Faraday shield.”

There are no industry standards for electrostatic shield performance. Eaton-manufactured transformers have been tested by an independent laboratory to meet the following attenuation levels.

When tested per MIL-Std-220A, Method of Insertion Loss Measurement, with matched impedance no load technique:

1. Common mode noise attenuation: –80 dBA minimum at 0.1 kHz to 1.5 kHz; –55 dBA minimum at 1.51 kHz to 100 kHz.
2. Normal mode (Transverse mode) noise attenuation: –35 dBA minimum at 1.5 kHz to 10 kHz.

Primary to Secondary Capacitance of 24.74–18.06 picofarads on the range 100–20 kHz.

Encapsulated transformer:

A transformer with its core coils either dipped or cast in an epoxy resin or other encapsulating substance.

Enclosure: A surrounding case or housing used to protect the contained equipment against external conditions and prevent personnel from accidentally contacting live parts.

Environmentally preferable product:

A product that has a lesser or reduced negative effect on human health and the environment when compared to competing products that serve the same purpose. This comparison may consider raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance and disposal of the product. This term includes recyclable products, recycled products and reusable products.

EPACT: The Energy Policy Act of 1992 (EPAct) is an important piece of legislation for efficiency because it established minimum efficiency levels for dry-type distribution transformers manufactured or imported after December 2006. EPAct, which was based on NEMA standards, defined a number of terms, including what constitutes an energy-efficient transformer. The DOE issued a rule that defines these transformers and how manufacturers must comply. DOE EPAct rule: Energy Efficiency Program for Certain Commercial and Industrial Equipment: Test Procedures, Labeling, and the Certification Requirements for Electric Motors. Final Rule. 10-CFR Part 431.

Excitation current: No load current. The current that flows in any winding used to excite the transformer when all other windings are open-circuited. It is usually expressed in percent of the rated current of a winding in which it is measured. Also called magnetizing current.

FCAN: “Full Capacity Above Nominal” taps. Designates the transformer will deliver its rated kVA when connected to a voltage source which is higher than the rated primary voltage.

FCBN: “Full Capacity Below Nominal” taps. Designates the transformer will deliver its rated kVA when connected to a voltage source which is lower than the rated primary voltage.

Frequency: On AC circuits, designates the number of times that polarity alternates from positive to negative and back again per second, such as 60 cycles per second. Typically measured in Hertz (Hz).

Ground: Connecting one side of a circuit to the earth through low resistance or low impedance paths to help prevent transmitting electrical shock to personnel.

Harmonic: A sinusoidal waveform with a frequency that is an integral multiple of the fundamental frequency (60 Hz).

60 H₃ fundamental
120 H₃ 2nd harmonic
180 H₃ 3rd harmonic
240 H₃ 4th harmonic

Harmonic distortion:

Nonlinear distortion of a system characterized by the appearance of harmonic (non-sinusoidal) currents in the output, when the input is sinusoidal.

Harmonic distortion, total (THD):

The square root of the sum of the squares of all harmonic currents present in a load, excluding the fundamental 60 Hz current. Usually expressed as a percent of the fundamental.

High voltage windings:

In a two-winding transformer, the winding intended to have the greater voltage. Usually marked with “H” designations.

HMT: Harmonic Mitigating Transformer (HMT) is better able to handle the harmonic currents present in today’s electrical power system. thereby increasing system capacity, reducing distortion throughout a facility, help to minimize downtime and “mysterious” maintenance on equipment, and return the longevity of equipment life through reduced operational energy losses, thereby running cooler.

Hp: Horsepower. The energy required to raise 33,000 pounds a distance of one foot in one minute. 1 hp is equal to 746 W or 0.746 kW.

Hi pot: A standard test on dry-type transformers consisting of extra-high potentials (voltages) connected to the windings. Used to check the integrity of insulation materials and clearances.

Hottest-spot temperature:

The highest temperature inside the transformer winding. Is greater than the measured average temperature of the coil conductors, when using the resistance change method.

Hysteresis: The tendency of a magnetic substance to persist in any state of magnetization.

Impedance: The retarding forces of current in an AC circuit; the current-limiting characteristics of a transformer. Symbol = Z

Inductance: In electrical circuits, the opposition to a change in the flow of electrical current. Symbol = L

Inducted potential test:

A standard dielectric test of transformer insulation. Verifies the integrity of insulating materials and electrical clearances.

Inrush current: The initial high peak of current that occurs in the first few cycles of energization, which can be 30 to 40 times the rated current.

Insulating transformer:

Another term for an isolating transformer.

Insulation: Material with a high electrical resistance.

Insulation materials: Those materials used to insulate the transformer’s electrical windings from each other and ground.

Isolating transformer:

A transformer where the input (primary) windings are not connected to the output (secondary) windings (i.e., electrically isolated).

K-factor: A common industry term for the amount of harmonics produced by a given load. The larger the K-factor, the more harmonics that are present. Also used to define a transformer's ability to withstand the additional heating generated by harmonic currents.

kVA: Kilovolt-ampere. Designates the output that a transformer can deliver for a specified time at a rated secondary voltage and rated frequency without exceeding the specified temperature rise. When multiplied by the power factor, will give kilowatts or kW.

$$1000 \text{ VA} = 1 \text{ kVA}$$

Lamination: Thin sheets of electrical steel used to construct the core of a transformer.

Limiting temperature:

The maximum temperature at which a component or material may be operated continuously with no sacrifice in normal life expectancy.

Linear load: A load where the current waveform conforms to that of the applied voltage, or a load where a change in current is directly proportional to a change in applied voltage.

Live part: Any component consisting of an electrically conductive material that can be energized under conditions of normal use.

Load losses: I^2R losses in windings. Also see conductor losses.

Low-voltage winding: In a two-winding transformer, the winding intended to have the lesser voltage. Usually marked with "X" designations.

Mid-tap: See center tap.

Noise level: The relative intensity of sound, measured in decibels (dB). NEMA Standard ST-20 outlines the maximum allowable noise level for dry-type transformers.

Nonlinear load: A load where the current waveform does not conform to that of the applied voltage, or where a change in current is not proportional to a change in applied voltage.

Non-ventilated transformer:

A transformer where the core and coil assembly is mounted inside an enclosure with no openings for ventilation. Also referred to as totally enclosed non-ventilated (TENV).

No load losses: Losses in a transformer that is excited at rated voltage and frequency but that is not supplying a load. No load losses include core losses, dielectric losses and conductor losses in the winding due to the exciting current. Also referred to as excitation losses.

Overload capability: Short-term overload capacity is designed into transformers as required by IEEE. Continuous overload capacity is not deliberately designed into a transformer because the design objective is to be within the allowed winding temperature rise with nameplate loading.

Percent IR (% resistance):

Voltage drop due to resistance at rated current in percent of rated voltage.

Percent IX (% reactance):

Voltage drop due to reactance at rated current in percent of rated voltage.

Percent IZ (% impedance):

Voltage drop due to impedance at rated current in percent of rated voltage.

Phase: Type of AC electrical circuit; usually single-phase two- or three-wire, or three-phase three- or four-wire.

Polarity test: A standard test on transformers to determine instantaneous direction of the voltages in the primary compared to the secondary.

Primary taps: Taps added to the primary (input) winding. See Tap.

Primary voltage: The input circuit voltage.

Power factor: The cosine of the phase angle between a voltage and a current.

Ratio test: A standard test of transformers to determine the ratio of the input (primary) voltage to the output (secondary) voltage.

Reactance: The effect of inductive and capacitive components of a circuit producing other than unity power factor.

Reactor: A single winding device with an air or iron core that produces a specific amount of inductive reactance into a circuit. Normally used to reduce of control current.

Regulation: Usually expressed as the percent change in output voltage when the load goes from full load to no load.

Scott T connection:

Connection for three-phase transformers. Instead of using three sets of coils for a three-phase load, the transformer uses only two sets of coils.

Series/multiple winding:

A winding consisting of two or more sections that can be connected for series operation or multiple (parallel) operation. Also called series-parallel winding.

Short circuit: A low resistance connection, usually accidental, across part of a circuit, resulting in excessive current flow.

Sound levels: All transformers make some sound mainly due to the vibration generated in its core by alternating flux. All Eaton general-purpose dry-type distribution transformers are designed with sound levels lower than NEMA ST-20 maximum levels.

Star connection: Same as a wye connection.

Step-down transformer:

A transformer where the input voltage is greater than the output voltage.

Step-up transformer:

A transformer where the input voltage is less than the output voltage.

T-T connection: See Scott T connection.

Tap: A connection brought out of a winding at some point between its extremities, usually to permit changing the voltage or current ratio. Taps are typically used to compensate for above or below rated input voltage, in order to provide the rated output voltage. See FCAN and FCBN.

Temperature class: The maximum temperature that the insulation system of a transformer can continuously withstand. The common insulation classes are 105, 150, 180 (also 185) and 220.

Temperature rise: The increase over ambient temperature of the windings due to energizing and loading the transformer.

Total losses: The sum of the no-load losses and load losses.

Totally enclosed non-ventilated enclosure: The core and coil assembly is installed inside an enclosure that has no ventilation to cool the transformer. The transformer relies on heat to radiate from the enclosure for cooling.

Transformer tests: Per NEMA ST-20, routine transformer production tests are performed on each transformer prior to shipment. These tests are: *Ratio tests* on the rated voltage connection; *Polarity and Phase Relation tests* on the rated connection; *No-Load and Excitation Current tests* at rated voltage on the rated voltage connection and *Applied Potential and Induced Potential tests*. Special tests include sound level testing.

Transverse mode: Electrical noise or voltage disturbance that occurs between phase and neutral, or from spurious signals across metallic hot line and the neutral conductor.

Turns ratio: The ratio of the number of turns in the high voltage winding to that in the low-voltage winding.

Typical test data: Tests that were performed on similar units that were previously manufactured and tested.

UL (Underwriters Laboratories): An independent safety testing organization.

Universal taps: A combination of six primary voltage taps consisting of 2 at +2-1/2% FCAN and 4 at -2-1/2% FCBN.

Watt: A unit of electrical power when the current in a circuit is one ampere and the voltage is one volt.

Wye connection: A standard three-wire transformer connection with similar ends of single-phase coils connected together. The common point forms the electrical neutral point and may be grounded. Also referred to as three-phase four-wire. To obtain the line-to-neutral voltage, divide the line voltage by $\sqrt{3}$ (1.732).

Frequently Asked Questions About Transformers

Can 60 Hz transformers be used at other frequencies?

Transformers rated for 60 Hz can be applied to circuits with a higher frequency, as long as the nameplate voltages are not exceeded. The higher the frequency that you apply to a 60 Hz transformer, the less voltage regulation you will have. 60 Hz transformers may be used at lower frequencies but only at reduced voltages corresponding to the reduction in frequency. For example, a 480 to 120 volt 60 Hz transformer can carry rated kVA at 50 Hz but ONLY when applied as a 400 to 100 volt transformer (50/60 x 480 = 400).

Can single-phase transformers be used on a three-phase source?

Yes. Any single-phase transformer can be used on a three-phase source by connecting the primary terminals of the single-phase transformer to any two wires of a three-phase system. It does not matter whether the three-phase source is three-phase three-wire or three-phase four-wire. The output of the transformer will be single-phase.

Can transformers be used to create three-phase power from a single-phase system?

No. Single-phase transformers alone cannot be used to create the phase-shifts required for a three-phase system. Phase shifting devices (reactors or capacitors) or phase converters in conjunction with transformers are required to change single-phase power to three-phase.

What considerations need to be taken into account when operating transformers at high altitudes?

At altitudes greater than 3300 feet (1000 meters), the density of the air is less than at lower elevations. This reduces the ability of the air surrounding a transformer to cool it, so the temperature rise of the transformer is increased. Therefore, when a transformer is being installed at altitudes greater than 3300 feet above sea level, it is necessary to derate the usable capacity of the transformer. The table below lists the derating factors. As an example, a 75 kVA 480 V–208Y/120 V transformer installed at 10,000 feet needs to be derated by 4%. Instead of 208 A output, the usable current is only 199 A.

Altitude		Current Rating Factor
Feet	Meters	
3300	1000	1.00
4000	1200	0.995
5000	1500	0.99
6000	1800	0.985
7000	2100	0.98
8000	2400	0.97
9000	2700	0.965
10,000	3000	0.96
12,000	3600	0.95
14,000	4200	0.935
15,000	4500	0.93

What considerations need to be taken into account when operating transformers where the ambient temperature is high?

Eaton's dry-type transformers are designed in accordance with IEEE standards to operate in areas where the average maximum ambient temperature is 40 °C. For operation in ambient temperatures above 40 °C, there are two options:

1. Order a custom designed transformer made for the specific application.
2. Derate the nameplate kVA of a standard transformer by 8% for each 10 °C of ambient above 40 °C.

What is the normal life expectancy of a transformer?

When a transformer is operated under IEEE basic loading conditions IEEE C57.96, its normal life expectancy is 20 years. The IEEE basic loading conditions are:

- A. The transformer is continuously loaded at rated kVA and rated voltages.
- B. The average temperature of the ambient air during any 24-hour period is equal to 30 °C and at no time exceeds 40 °C.
- C. The altitude where the transformer is installed does not exceed 3300 ft (1000 m).

What are insulation classes?

Insulation classes were originally used to distinguish insulating materials operating at different temperatures. In the past, letters were used for the different designations. Insulation system temperatures (°C) have replaced the letters' designations.

Insulation Classes

Previous Designation	Insulation System Rating (°C)
Class A	105
Class B	150
Class F	180
Class H	220
Class R	220

How do you know if the enclosure temperature is too hot?

UL and CSA standards strictly regulate the highest temperature that an enclosure can reach. For ventilated transformers, the temperature of the enclosure should not increase by more than 50 °C in a 40 °C ambient at full rated current. For encapsulated transformers, the temperature of the enclosure should not increase by more than 65 °C in a 25 °C ambient at full rated current. This means that it is permissible for the temperature of the enclosure to reach 90 °C (194 °F). Although this temperature is very warm to the touch, it is within the allowed standards. A thermometer should be used to measure enclosure temperatures, not your hand.

Can transformers be reverse-connected (reverse-fed)?

Yes, with limitations. Eaton single-phase transformers rated 3 kVA and larger can be reverse-connected without any loss of kVA capacity or any adverse effects. Transformers rated 2 kVA and below, because there is a turns ratio compensation on the low-voltage winding that adjusts voltage between no load and full load conditions, should not be reverse-fed.

Three-phase transformers with either delta-delta or delta-wye configurations can also be reverse-connected for step-up operation. When reverse-feeding a delta-wye connected transformer, there are two important considerations to take into account: (1) The neutral is not connected, only the three-phase wires of the wye system are connected, and (2) the ground strap between X0 and the enclosure must be removed. Due to high inrush currents that may be created in these applications, it is recommended that you do not reverse-feed transformers rated more than 75 kVA. The preferred solution is to purchase an Eaton step-up transformer designed specifically for your application.

Can transformers be connected in parallel?

Yes, with certain restrictions. For single-phase transformers being connected in parallel, the voltages and impedances of the transformers must be equal (impedances must be within 7.5% of each other). For three-phase transformers, the same restrictions apply as for single-phase transformers, plus the phase shift of the transformers must be the same. For example, a delta-wye-connected transformer (30° phase shift) must be connected in parallel with another delta-wye-connected transformer, not a delta-delta connected-transformer (0° phase shift).

Why is the impedance of a transformer important?

The impedance of a transformer is important because it is used to determine the interrupting rating and trip rating of the circuit protection devices on the load or line side of the transformer. To calculate the maximum short circuit current on the load side of a transformer, use the following formula:

$$\frac{\text{Full Load Current (Amps)}}{\text{Transformer Impedance}}$$

Full load current for single-phase circuits is:

$$\frac{\text{Nameplate Volt-Amps}}{\text{Load (output) Voltage}}$$

And for three-phase circuits, the full load current is:

$$\frac{\text{Nameplate Volt-Amps}}{\text{Load (output) Volts} \times \sqrt{3}}$$

Example: For a standard three-phase, 75 kVA transformer, rated 480 volt delta primary and 208Y/120 volt secondary (catalog number V48M28T7516) and impedance equal to 5.1%, the full load current is:

$$\frac{75,000 \text{ VA}}{208\text{V} \times 1.732} = 208.2\text{A}$$

The maximum short circuit load current is:

$$\frac{208.2\text{A}}{0.051} = 4,082.4\text{A}$$

The circuit breaker or fuse on the secondary side of this transformer would have to have a minimum interrupting capacity of 4083 amperes at 208 volts. NEMA ST-20.

A similar transformer with lower impedance would require a primary circuit breaker or fuse with a higher interrupting capacity.

What clearances are required around transformers when they are installed?

All dry-type transformers depend upon the circulation of air for cooling; therefore, it is important that the flow of air around a transformer not be impeded. UL 1561 requires that there be no less than 2 inches clearance between any side transformer with ventilation openings and any wall or obstruction. For back walls when weather shield are needed 6 inches minimum distance will be required.

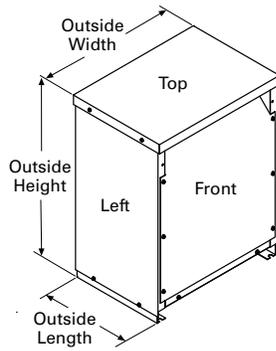
In compliance with NEC 450.9, Eaton's ventilated transformers have a note on their nameplates requiring a minimum of 6 inches (152.4 mm) clearance from the ventilation openings and walls or other obstructions. This clearance only addresses the ventilation needs of the transformer. There may be additional local codes and standards that affect installation clearances.

Transformers should not be mounted in such a manner that one unit will contribute to the additional heating of another unit, beyond allowable temperature limits, for example, where two units are mounted on a wall one above the other.

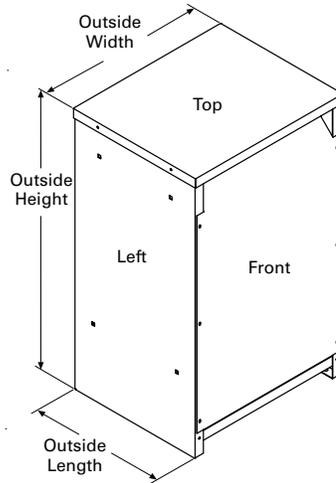
Dimensions

Approximate Dimensions in Inches (mm)

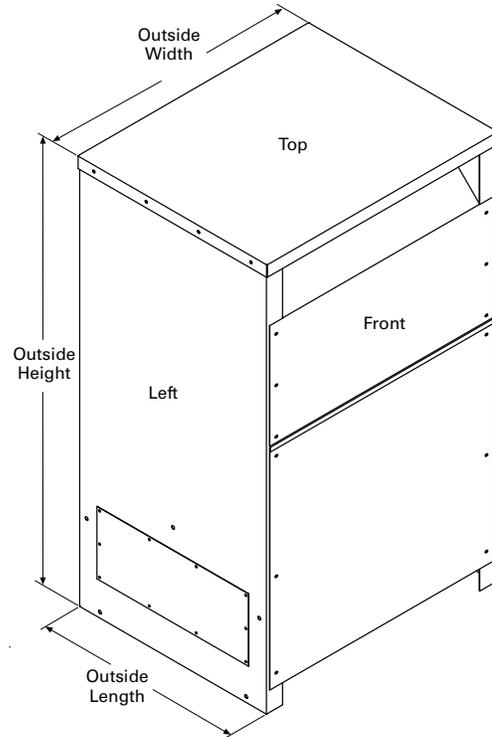
Enclosure Dimensional Drawings—Ventilated Transformers



Drawing 1



Drawing 2



Drawing 3

Frame	Drawing Number	Dimensions		
		Height	Width	Length
FR816	1	31.30 (795.0)	22.89 (581.4)	18.39 (467.2)
FR818	1	37.59 (954.8)	22.89 (581.4)	20.36 (517.1)
FR819	2	42.03 (1067.6)	24.22 (615.2)	23.84 (605.5)
FR820	2	42.03 (1067.6)	24.22 (615.2)	23.84 (605.5)
FR814	2	62.91 (1597.9)	29.97 (761.2)	33.97 (862.8)
FR842, 842A	1	33.75 (857.3)	22.45 (570.2)	17.40 (442.0)
FR843, 843A	1	38.70 (983.0)	23.51 (597.2)	24.38 (619.3)
FR844, 844A	2	44.92 (1141.0)	26.27 (667.3)	27.12 (688.8)
FR821	2	62.91 (1597.9)	29.97 (761.2)	33.97 (862.8)
FR912D	1	30.00 (762.0)	23.00 (584.2)	16.50 (419.1)
FR914D/FR914F	1	39.00 (990.6)	29.00 (736.6)	22.00 (558.8)
FR915D/FR915F	1	39.00 (990.6)	29.00 (736.6)	22.00 (558.8)
FR916A	2	48.56 (1233.4)	28.22 (716.8)	23.42 (594.9)
FR917	2	56.17 (1426.7)	31.44 (798.6)	24.67 (626.6)
FR918A	2	62.18 (1579.4)	31.44 (798.6)	30.68 (779.3)
FR923	2	57.54 (1461.5)	36.69 (931.9)	32.65 (829.3)
FR924	2	68.37 (1736.6)	44.46 (1129.3)	36.44 (925.6)
FR928	2	56.16 (1426.5)	32.93 (836.4)	27.97 (710.4)
FR929	2	59.56 (1512.8)	36.72 (932.7)	32.50 (825.5)
FR919E	3	75.00 (1905.0)	44.20 (1122.7)	36.23 (920.2)
FR920E	3	75.00 (1905.0)	44.20 (1122.7)	36.23 (920.2)
FR922	3	90.00 (2286.0)	69.26 (1759.2)	42.65 (1083.3)

2.7

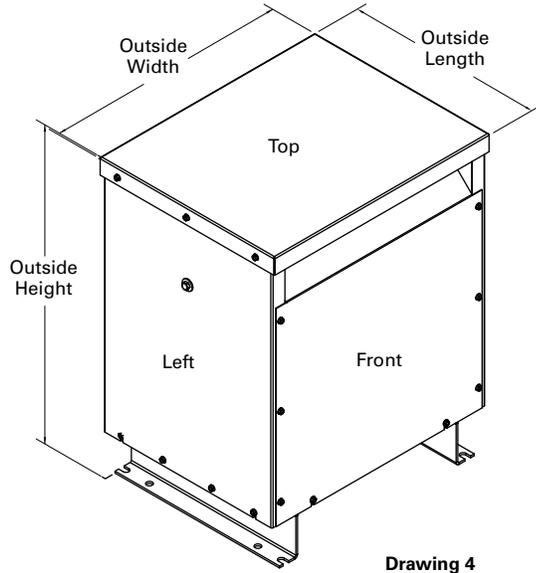
Transformers

Dimensions

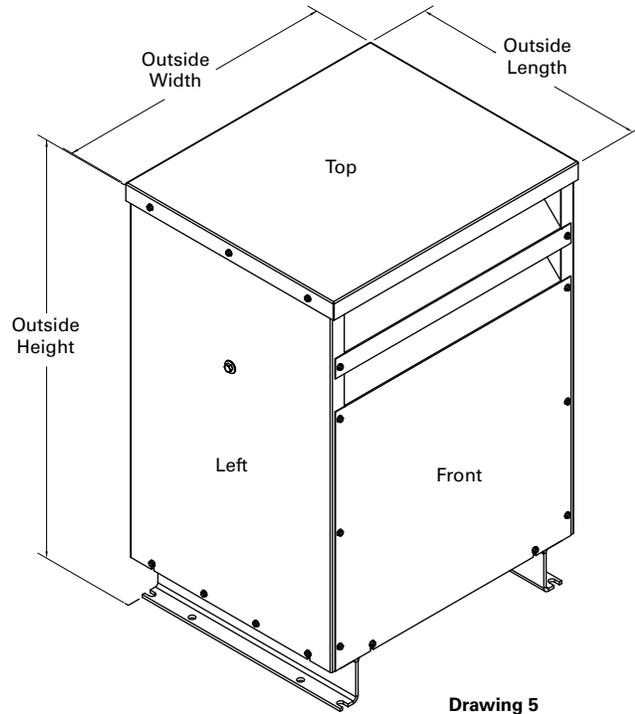
Approximate Dimensions in Inches (mm)

2

Enclosure Dimensional Drawings—Ventilated Transformers, continued



Drawing 4

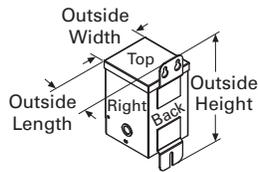


Drawing 5

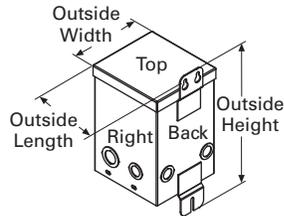
Frame	Drawing Number	Dimensions Height	Width	Length
FR939	4	28.00 (711)	21.88 (556)	17.75 (451)
FR940	5	36.88 (937)	24.88 (632)	21.13 (537)
FR942	5	43.00 (1092)	30.50 (775)	24.00 (610)
FR943	5	51.00 (1295)	34.50 (876)	31.50 (800)
FR944	5	60.00 (1524)	38.00 (965)	33.50 (851)
FR945	5	66.18 (1681)	42.18 (1071)	33.50 (851)

Approximate Dimensions in Inches (mm)

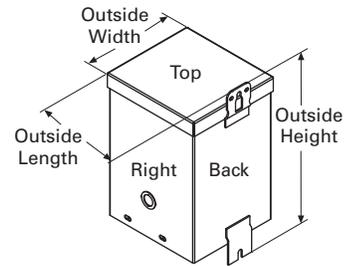
Enclosure Dimensional Drawings—Encapsulated Transformers (Type EP)



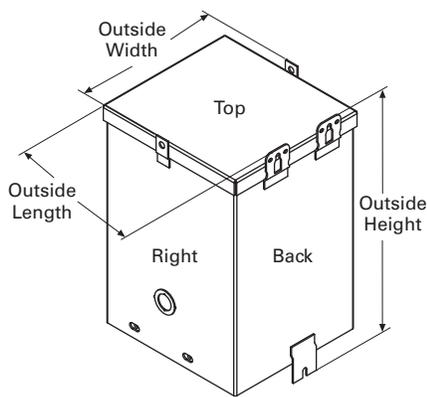
Drawing 6



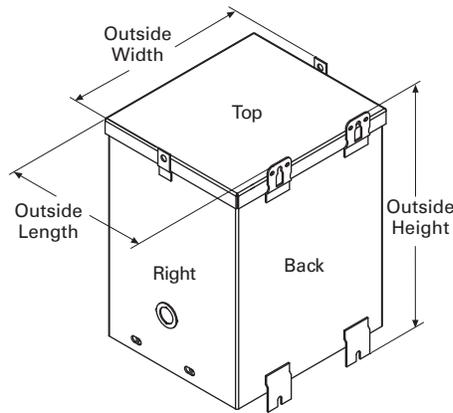
Drawing 7



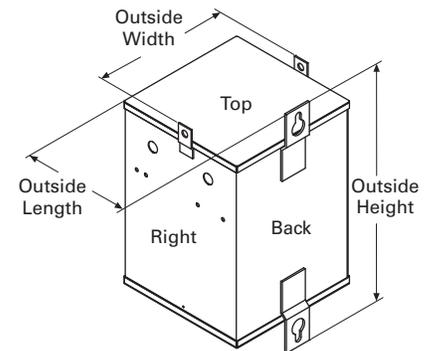
Drawing 8



Drawing 9



Drawing 10



Drawing 11

Frame	Drawing Number	Dimensions		
		Height	Width	Length
FR52	6	8.91 (226.3)	4.11 (104.4)	4.00 (101.6)
FR54	6	8.91 (226.3)	4.11 (104.4)	4.00 (101.6)
FR55	6	8.91 (226.3)	4.11 (104.4)	4.00 (101.6)
FR56	7	8.97 (227.8)	4.87 (123.7)	4.06 (103.1)
FR57	7	8.97 (227.8)	4.87 (123.7)	4.91 (124.7)
FR58A	7	11.28 (286.5)	5.99 (152.1)	5.75 (146.1)
FR59A	7	11.28 (286.5)	5.99 (152.1)	5.75 (146.1)
FR67	7	13.41 (340.6)	6.37 (161.8)	6.52 (165.6)
FR68	7	13.41 (340.6)	6.37 (161.8)	6.52 (165.6)
FR176	8	14.25 (361.9)	7.69 (195.3)	8.00 (203.2)
FR177	9	16.00 (406.4)	10.38 (263.7)	9.89 (251.2)
FR301	11	22.26 (565.4)	12.71 (322.8)	12.79 (324.9)
FR178	9	16.00 (406.4)	10.38 (263.7)	9.89 (251.2)
FR302	11	25.26 (641.6)	12.71 (322.8)	12.79 (324.9)
FR304	11	25.26 (641.6)	14.72 (373.9)	14.82 (376.4)
FR179	9	19.00 (482.6)	13.38 (339.9)	10.52 (267.2)
FR180	9	19.00 (482.6)	13.38 (339.9)	10.52 (267.2)
FR182	10	23.31 (592.1)	16.35 (415.3)	14.12 (358.6)
FR190	10	26.31 (668.3)	16.35 (415.3)	14.12 (358.6)

2.7

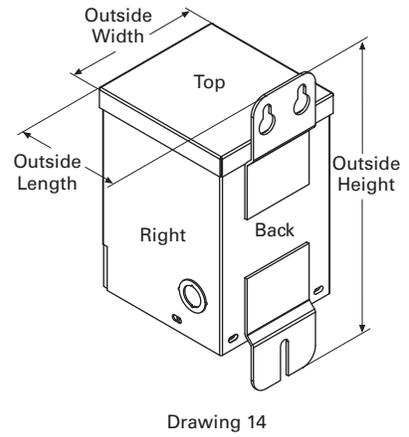
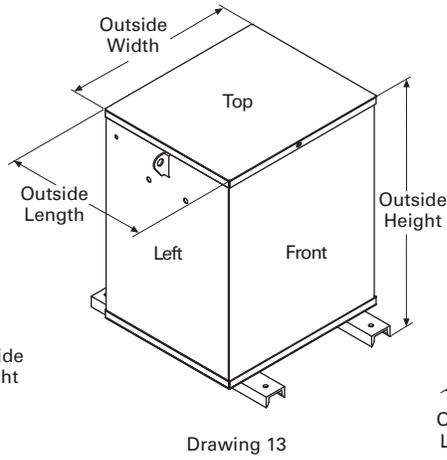
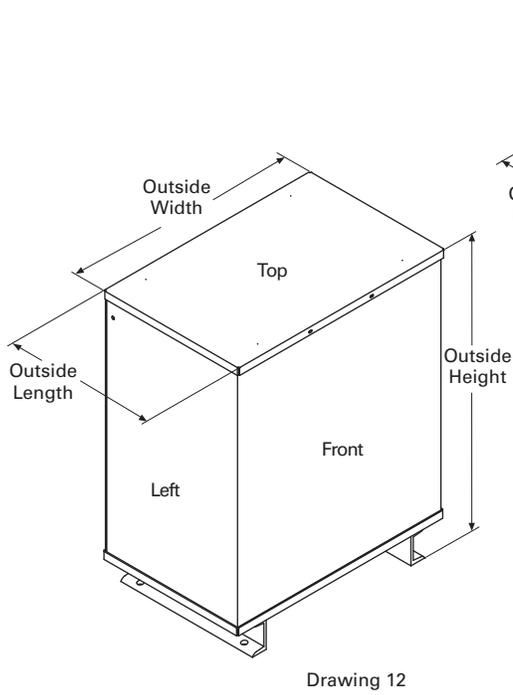
Transformers

Dimensions

Approximate Dimensions in Inches (mm)

2

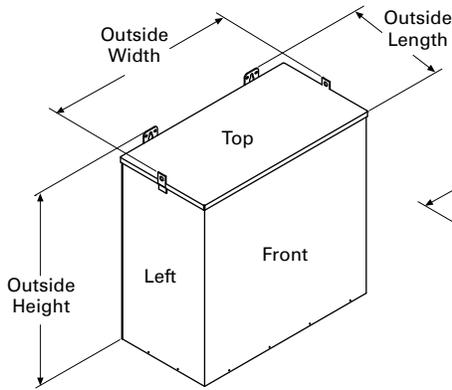
Enclosure Dimensional Drawings—Encapsulated Transformers Type EP (Single-Phase), continued



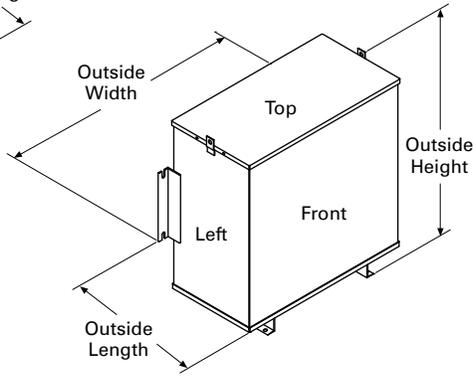
Frame	Drawing Number	Dimensions		
		Height	Width	Length
FR132	13	20.67 (525.0)	19.02 (483.1)	13.59 (345.2)
FR300A	12	28.24 (717.3)	22.42 (569.5)	14.06 (357.1)
FR57P	14	9.34 (237.2)	4.45 (113.0)	5.18 (131.6)
FR58AP	14	11.68 (296.7)	4.99 (126.7)	5.99 (152.1)
FR567P	14	13.03 (330.9)	5.74 (145.8)	6.56 (166.6)
FR568P	14	13.78 (350.0)	6.22 (158.0)	6.32 (160.5)

Approximate Dimensions in Inches (mm)

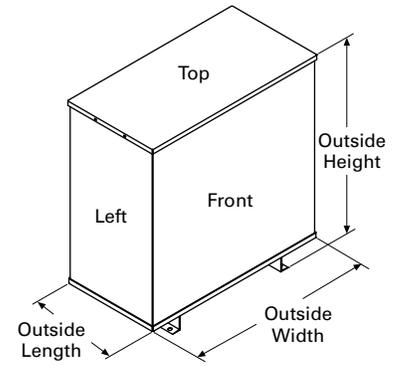
Enclosure Dimensional Drawings—Encapsulated Transformers (Type EPT)



Drawing 15



Drawing 16



Drawing 17

Frame	Drawing Number	Dimensions		
		Height	Width	Length
FR201	15	13.40 (340.4)	15.93 (404.6)	8.26 (209.8)
FR102	15	13.12 (333.2)	19.59 (497.6)	7.09 (180.1)
FR103	15	15.90 (403.9)	16.93 (430.0)	10.01 (254.3)
FR200	15	15.90 (403.9)	16.93 (430.0)	10.01 (254.3)
FR97	15	15.19 (385.8)	25.68 (652.3)	8.38 (212.9)
FR95	15	17.38 (441.5)	20.00 (508.0)	10.52 (267.2)
FR243	16	17.38 (441.5)	20.00 (508.0)	10.52 (267.2)
FR96	15	16.19 (411.2)	29.68 (753.9)	9.42 (239.3)
FR244	16	28.15 (715.0)	26.58 (675.1)	14.66 (372.4)
FR245	17	32.06 (814.3)	30.29 (769.4)	15.68 (398.3)

2.7

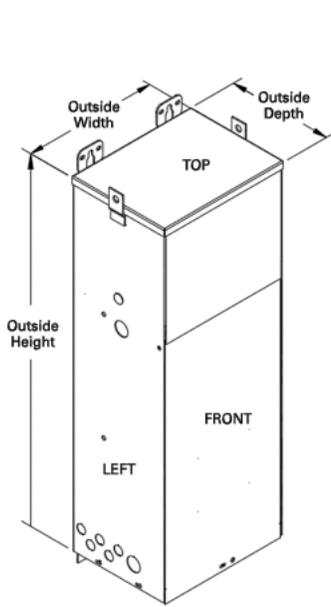
Transformers

Dimensions

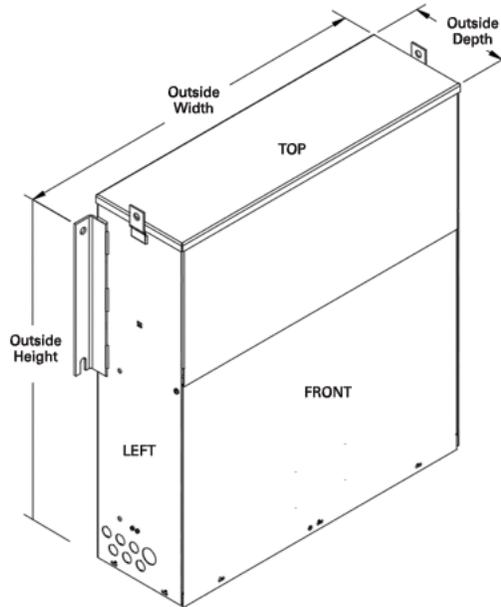
Approximate Dimensions in Inches (mm)

2

Enclosure Dimensional Drawings—Mini-Power Centers—NEMA Type 3R



DRAWING 1

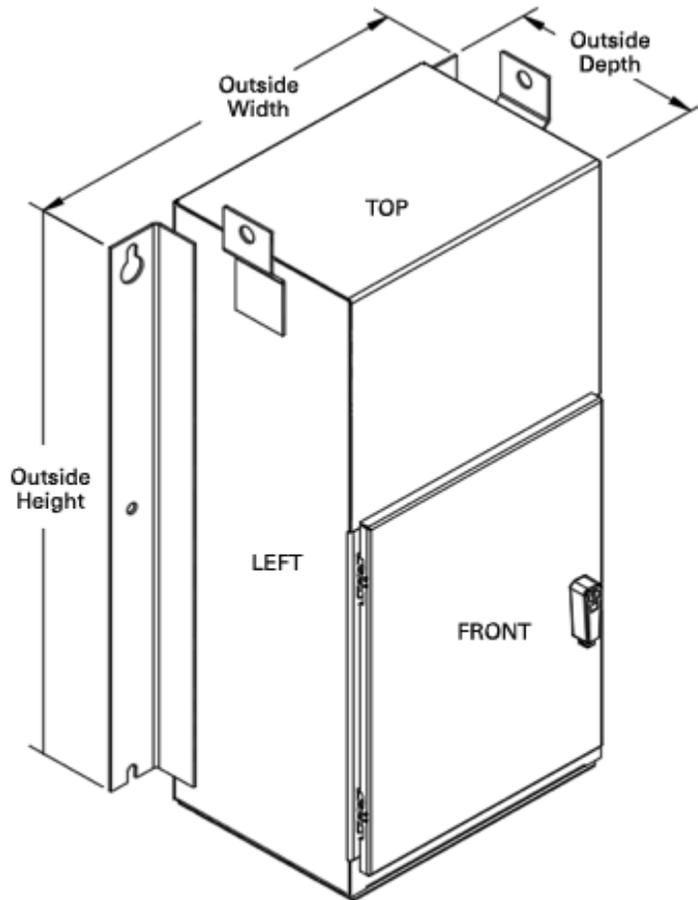


DRAWING 2

Frame	Drawing Number	Dimensions		
		Height	Width	Length
FR284	1	29.50 (749)	12.56 (319)	9.78 (248)
FR286	1	38.13 (968)	13.47 (342)	11.87 (301)
FR287	1	43.88 (1115)	16.40 (417)	14.63 (372)
FR289B	2	34.27 (871)	31.50 (800)	9.35 (237)
FR291B	2	40.01 (1016)	32.63 (829)	13.62 (346)
FR307	1	36.14 (918)	12.56 (319)	9.66 (245)
FR309	1	43.91 (1115)	14.97 (380)	11.82 (300)
FR310	1	43.37 (1102)	20.41 (518)	14.58 (370)

Approximate Dimensions in Inches (mm)

Enclosure Dimensional Drawings—Mini-Power Centers—NEMA Type 4X



Frame	Drawing Number	Dimensions		
		Height	Width	Depth
FR2854X	3	36.32 (922)	22.01 (559)	14.35 (365)
FR2874X	3	42.07 (1069)	25.75 (654)	18.94 (481)
FR2914X	3	39.88 (1013)	36.85 (936)	17.50 (445)

2.7

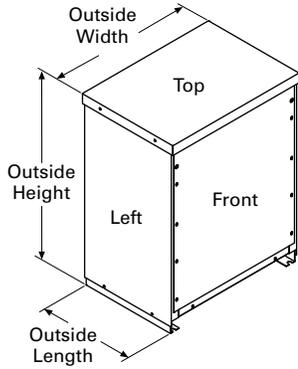
Transformers

Dimensions

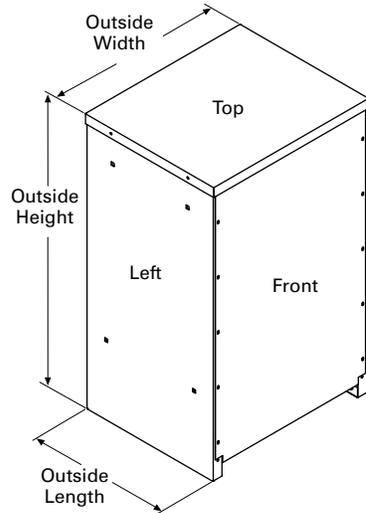
Approximate Dimensions in Inches (mm)

2

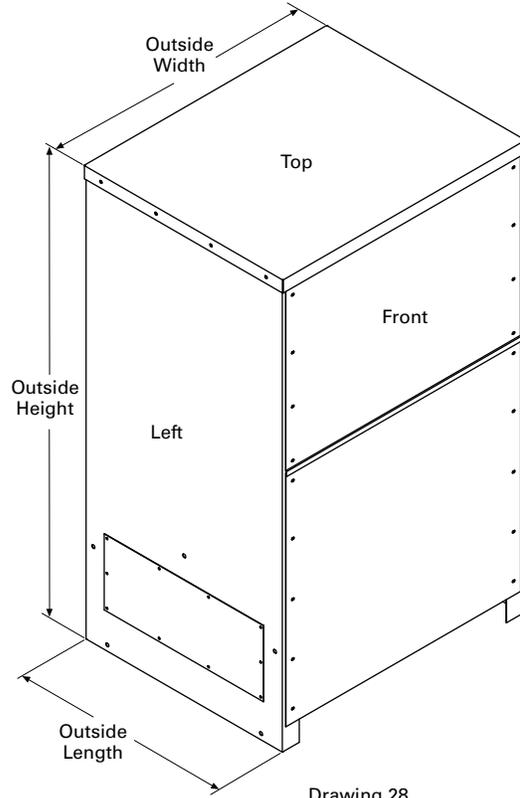
Enclosure Dimensional Drawings—Totally Enclosed Nonventilated Transformers



Drawing 26



Drawing 27

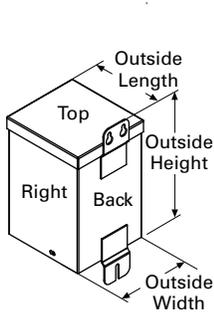


Drawing 28

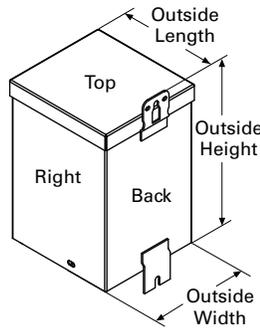
Frame	Drawing Number	Dimensions		
		Height	Width	Length
FR818N	26	37.59 (954.8)	22.89 (581.4)	20.36 (517.1)
FR819EN	27	42.03 (1067.6)	24.22 (615.2)	23.84 (605.5)
FR820EN	27	42.03 (1067.6)	24.22 (615.2)	23.84 (605.5)
FR814N	27	62.91 (1597.9)	29.97 (761.2)	33.97 (862.8)
FR912DN	26	30.00 (762.0)	23.00 (584.2)	16.50 (419.1)
FR914DN/FR914FN	26	39.18 (995.2)	29.00 (736.6)	22.00 (558.8)
FR915DN/FR915FN	26	39.18 (995.2)	29.00 (736.6)	22.00 (558.8)
FR916AN	27	46.58 (1183.1)	28.22 (716.8)	23.42 (594.9)
FR917N	27	56.18 (1427.0)	31.44 (798.6)	24.67 (626.8)
FR918AN	27	62.18 (1579.4)	31.44 (798.6)	30.68 (779.3)
FR923N	27	57.50 (1460.5)	36.69 (931.9)	32.65 (829.3)
FR919N	28	75.00 (1905.0)	44.21 (1122.9)	36.23 (920.2)
FR920N	28	75.00 (1905.0)	44.21 (1122.9)	36.23 (920.2)

Approximate Dimensions in Inches (mm)

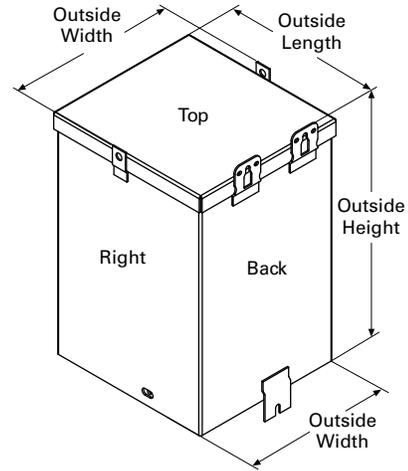
Enclosure Dimensional Drawings—Hazardous Location Transformers (Type EPZ)



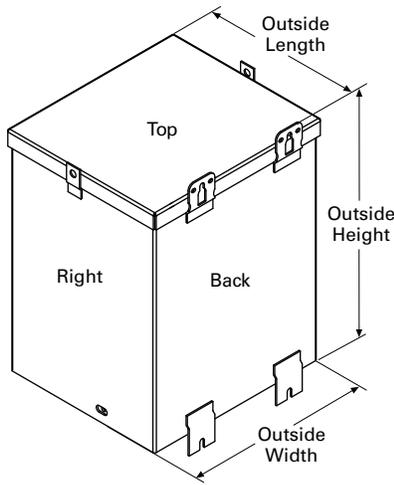
Drawing 21



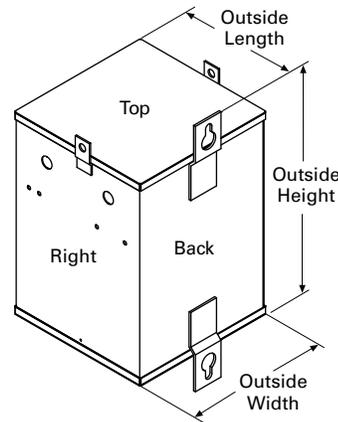
Drawing 22



Drawing 23



Drawing 24



Drawing 25

Frame	Drawing Number	Dimensions		
		Height	Width	Length
FR57H	21	8.97 (227.8)	4.87 (123.7)	4.91 (124.7)
FR58H	22	11.28 (286.5)	5.99 (152.1)	5.75 (146.1)
FR59H	22	11.28 (286.5)	5.99 (152.1)	5.75 (146.1)
FR67H	22	13.41 (340.6)	6.37 (161.8)	6.52 (165.6)
FR68H	22	13.41 (340.6)	6.37 (161.8)	6.52 (165.6)
FR176H	23	14.25 (361.9)	7.69 (195.3)	8.00 (203.2)
FR177H	24	16.00 (406.4)	10.38 (263.7)	9.89 (251.2)
FR178H	24	16.00 (406.4)	10.38 (263.7)	9.89 (251.2)
FR179H	24	19.00 (482.6)	13.38 (339.9)	10.52 (267.2)
FR180H	24	19.00 (482.6)	13.38 (339.9)	10.52 (267.2)
FR182H	25	23.31 (592.1)	16.35 (415.3)	14.12 (358.6)

2.7

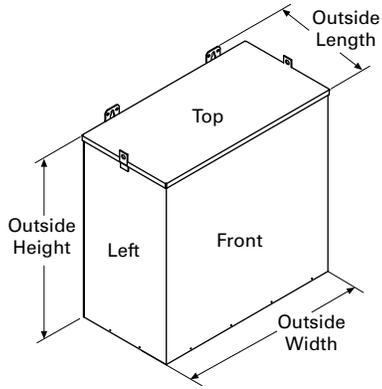
Transformers

Dimensions

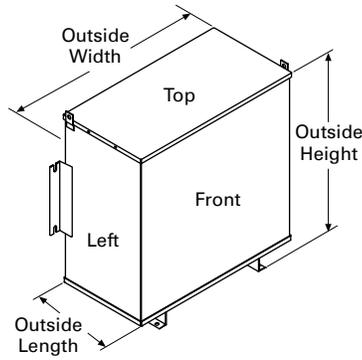
Approximate Dimensions in Inches (mm)

2

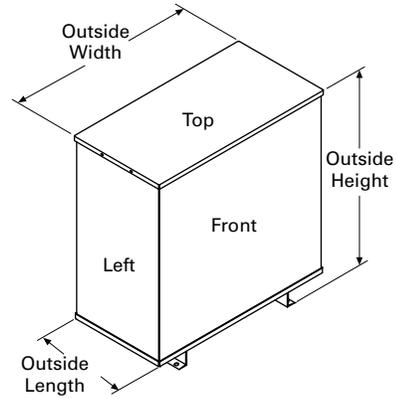
Enclosure Dimensional Drawings—Hazardous Location Transformers (Type EPTZ)



Drawing 18



Drawing 19



Drawing 20

Frame	Drawing Number	Dimensions		
		Height	Width	Length
FR201H	18	13.40 (340.4)	15.93 (404.6)	8.26 (209.8)
FR200H	18	15.90 (403.9)	16.93 (430.0)	10.01 (254.3)
FR103H	18	15.90 (403.9)	16.93 (430.0)	10.01 (254.3)
FR95H	18	17.38 (441.5)	20.00 (508.0)	10.52 (267.2)
FR243H	19	17.38 (441.5)	20.00 (508.0)	10.52 (267.2)
FR244H	19	28.15 (715.0)	26.58 (675.1)	14.66 (372.4)
FR245H	20	32.06 (814.3)	30.29 (769.4)	15.68 (398.3)