

**TRANSMITTAL OF SUBMITTAL**

DATE: 3/3/23

**TO: Scott Miller**

CMG - City of Atlanta  
2528 Chattahoochee Circle  
Atlanta, GA 30318

New X-Submittal    Resubmittal

Project: East Area Water Quality Control Facility Improvements

Specification Section No. : 16451

Supplier/Vendor/Subcontractor: Contessa

**FROM: LAKESHORE ENGINEERING**

\_\_\_\_\_  
1259 Ellsworth Drive  
\_\_\_\_\_  
Atlanta, GA 30318  
\_\_\_\_\_

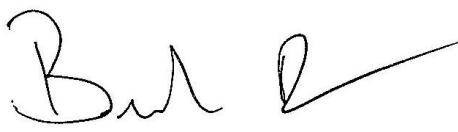
Manufacturer: EATON

**The following items are hereby submitted:**

Number of Copies	Description of Item Submitted (Type, Size, Model Number, Etc.)	Submittal number	Submittal Type	Contains Variation to Contract	
				No	Yes
Email	Dry type transformers	16451-55.00	Product Data	X	

**Comments/Variation:**

CONTRACTOR hereby certifies that (i) CONTRACTOR has complied with the requirements of Contract Documents in preparation, review, and submission of designated Submittal and (ii) the Submittal is complete and in accordance with the Contract Documents and requirements of laws and regulations and governing agencies.

By:  \_\_\_\_\_  
Brandon Dow

**Project Name:** East Area Water Control Facility  
**General Order No:** MAT0011132

**Negotiation No:** AT130311X0K1  
**Alternate No:** R003

Item No.	Qty	Product	Description
026	1	Dry Type Transformers	Transformer Type: General Purpose Vented 3 Phase, 30 KVA, 1 K-Factor 480 Primary Volts 240/120 Secondary Volts Temperature Rise 150C with 220C Insulation System Aluminum Winding Material Sound Reduction : 0 NEMA ST-20 Audible Sound Level: 45 Efficiency : DOE 10 CFR Part 431 (2016) UL Listed : Y Enclosure Type: NEMA 2 (for N3R, select Weather Shield in Mods tab) Operating Frequency: 60 HZ  <b>Catalog No</b> V48M22T3016 <b>Designation</b> TX-LSDB
		<b>Qty</b>	<b>List of Materials</b>
		1	3 Phase, 30 KVA, 480 Primary Volts, 240/120 Secondary Volts, 150C with 220C Insulation System Temperature Rise, Aluminum Winding Material, 60 HZ
		1	TRANSFORMER WEATHERSHIELD KIT FITS FRAME FR940

Item No.	Qty	Product	Description
028	1	Dry Type Transformers	Transformer Type: General Purpose Vented 3 Phase, 15 KVA, 1 K-Factor 480 Primary Volts 208Y/120 Secondary Volts Temperature Rise 150C with 220C Insulation System Aluminum Winding Material Sound Reduction : 0 NEMA ST-20 Audible Sound Level: 45 Efficiency : DOE 10 CFR Part 431 (2016) UL Listed : Y Enclosure Type: NEMA 2 (for N3R, select Weather Shield in Mods tab) Operating Frequency: 60 HZ  <b>Catalog No</b> V48M28T1516 <b>Designation</b> TX-LSB
		<b>Qty</b>	<b>List of Materials</b>
		1	3 Phase, 15 KVA, 480 Primary Volts, 208Y/120 Secondary Volts, 150C with 220C Insulation System Temperature Rise, Aluminum Winding Material, 60 HZ
		1	TRANSFORMER WEATHERSHIELD KIT FITS FRAME FR939

**Project Name:** East Area Water Control Facility  
**General Order No:** MAT0011132

**Negotiation No:** AT130311X0K1  
**Alternate No:** R003

Item No.	Qty	Product	Description
030	1	Dry Type Transformers	Transformer Type: General Purpose Encapsulated 3 Phase, 6 KVA, 1 K-Factor 480 Primary Volts 208Y/120 Secondary Volts Temperature Rise 115C Aluminum Winding Material Sound Reduction : 0 NEMA ST-20 Audible Sound Level: 45 Enclosure Type: NEMA 4X Stainless Steel Operating Frequency: 60 HZ Stainless Steel (316) Enclosure
		<b>Catalog No</b>	Y48G28T06S64X
		<b>Designation</b>	TX-SP2
	<b>Qty</b>	<b>List of Materials</b>	
	1		3 Phase, 6 KVA, 480 Primary Volts, 208Y/120 Secondary Volts, 115C Temperature Rise, Aluminum Winding Material, 60 HZ

Item No.	Qty	Product	Description
031	1	Dry Type Transformers	Transformer Type: General Purpose Encapsulated 3 Phase, 9 KVA, 1 K-Factor 480 Primary Volts 208Y/120 Secondary Volts Temperature Rise 115C Aluminum Winding Material Sound Reduction : 0 NEMA ST-20 Audible Sound Level: 45 UL Listed : Y Enclosure Type: NEMA 4X Stainless Steel Operating Frequency: 60 HZ Stainless Steel (316) Enclosure
		<b>Catalog No</b>	Y48G28T09S64X
		<b>Designation</b>	TX-SP1
	<b>Qty</b>	<b>List of Materials</b>	
	1		3 Phase, 9 KVA, 480 Primary Volts, 208Y/120 Secondary Volts, 115C Temperature Rise, Aluminum Winding Material, 60 HZ

**Project Name:** East Area Water Control Facility  
**General Order No:** MAT0011132

**Negotiation No:** AT130311X0K1  
**Alternate No:** R003

Item No.	Qty	Product	Description
032	1	Dry Type Transformers	Transformer Type: Mini Power Centers 3 Phase, 15 KVA, 1 K-Factor 480 Primary Volts 208Y/120 Secondary Volts Temperature Rise 115C Copper Winding Material Sound Reduction : 0 NEMA ST-20 Audible Sound Level: 50 UL Listed : Y Enclosure Type: NEMA 4X Stainless Steel Operating Frequency: 60 HZ Stainless Steel (316) Enclosure
		<b>Catalog No</b>	P48G28T1524CUBS64X
		<b>Designation</b>	LVPC
	<b>Qty</b>	<b>List of Materials</b>	
	1		3 Phase, 15 KVA, 480 Primary Volts, 208Y/120 Secondary Volts, 115C Temperature Rise, Copper Winding Material, 60 HZ

Item No.	Qty	Product	Description
033	1	Safety Switches	Safety Switches
		<b>Catalog No</b>	DH366UWKN
		<b>Designation</b>	SS-HSDB
	<b>Qty</b>	<b>List of Materials</b>	
	1		Single Throw - Heavy Duty - Non-Fusible with Neutral, 3-Pole, 600 VAC, 600 A, NEMA 4X (304 Stainless)
	1		Neutral Assembly (Factory Installed)

Item No.	Qty	Product	Description
034	6	Safety Switches	Safety Switches
		<b>Catalog No</b>	DH361UWK
		<b>Designation</b>	SS-30/3/NF/N4X
	<b>Qty</b>	<b>List of Materials</b>	
	1		Heavy Duty Switch - Non-Fusible, 3-Pole, 600 VAC, 30 A, NEMA 4X (304 Stainless)

Item No.	Qty	Product	Description
035	14	HEAVY DUTY SAFETY SW	Safety Switch Access/Elec Interlock 30-800A 1NO-1N
		<b>Catalog No</b>	DS200EK1
	<b>Qty</b>	<b>List of Materials</b>	
	14		Safety Switch Access/Elec Interlock 30-800A 1NO-1N



*Powering Business Worldwide*

**EATON**

*Powering Business Worldwide*

**EATON**

*Powering Business Worldwide*

**Project Name:** East Area Water Control Facility  
**General Order No:** MAT0011132

**Negotiation No:** AT130311X0K1  
**Alternate No:** R003

Item No.	Qty	Product	Description
024	1	Dry Type Transformers	Transformer Type: General Purpose Vented 3 Phase, 30 KVA, 1 K-Factor 480 Primary Volts 208Y/120 Secondary Volts Temperature Rise 150C with 220C Insulation System Aluminum Winding Material Sound Reduction : 0 NEMA ST-20 Audible Sound Level: 45 Efficiency : DOE 10 CFR Part 431 (2016) UL Listed : Y Enclosure Type: NEMA 2 (for N3R, select Weather Shield in Mods tab) Operating Frequency: 60 HZ  <b>Catalog No</b> V48M28T3016 <b>Designation</b> TX-LSP  <b>Qty List of Materials</b> 1 3 Phase, 30 KVA, 480 Primary Volts, 208Y/120 Secondary Volts, 150C with 220C Insulation System Temperature Rise, Aluminum Winding Material, 60 HZ 1 TRANSFORMER WEATHERSHIELD KIT FITS FRAME FR940

Item No.	Qty	Product	Description
026	1	Dry Type Transformers	Transformer Type: General Purpose Vented 3 Phase, 30 KVA, 1 K-Factor 480 Primary Volts 240/120 Secondary Volts Temperature Rise 150C with 220C Insulation System Aluminum Winding Material Sound Reduction : 0 NEMA ST-20 Audible Sound Level: 45 Efficiency : DOE 10 CFR Part 431 (2016) UL Listed : Y Enclosure Type: NEMA 2 (for N3R, select Weather Shield in Mods tab) Operating Frequency: 60 HZ  <b>Catalog No</b> V48M22T3016 <b>Designation</b> TX-LSDB  <b>Qty List of Materials</b> 1 3 Phase, 30 KVA, 480 Primary Volts, 240/120 Secondary Volts, 150C with 220C Insulation System Temperature Rise, Aluminum Winding Material, 60 HZ 1 TRANSFORMER WEATHERSHIELD KIT FITS FRAME FR940



**Project Name:** East Area Water Control Facility  
**General Order No:** MAT0011132

**Negotiation No:** AT130311X0K1  
**Alternate No:** R003

Item No.	Qty	Product	Description
028	1	Dry Type Transformers	Transformer Type: General Purpose Vented 3 Phase, 15 KVA, 1 K-Factor 480 Primary Volts 208Y/120 Secondary Volts Temperature Rise 150C with 220C Insulation System Aluminum Winding Material Sound Reduction : 0 NEMA ST-20 Audible Sound Level: 45 Efficiency : DOE 10 CFR Part 431 (2016) UL Listed : Y Enclosure Type: NEMA 2 (for N3R, select Weather Shield in Mods tab) Operating Frequency: 60 HZ  <b>Catalog No</b> V48M28T1516 <b>Designation</b> TX-LSB  <b>Qty List of Materials</b> 1 3 Phase, 15 KVA, 480 Primary Volts, 208Y/120 Secondary Volts, 150C with 220C Insulation System Temperature Rise, Aluminum Winding Material, 60 HZ 1 TRANSFORMER WEATHERSHIELD KIT FITS FRAME FR939

Item No.	Qty	Product	Description
030	1	Dry Type Transformers	Transformer Type: General Purpose Encapsulated 3 Phase, 6 KVA, 1 K-Factor 480 Primary Volts 208Y/120 Secondary Volts Temperature Rise 115C Aluminum Winding Material Sound Reduction : 0 NEMA ST-20 Audible Sound Level: 45 Enclosure Type: NEMA 4X Stainless Steel Operating Frequency: 60 HZ Stainless Steel (316) Enclosure  <b>Catalog No</b> Y48G28T06S64X <b>Designation</b> TX-SP2  <b>Qty List of Materials</b> 1 3 Phase, 6 KVA, 480 Primary Volts, 208Y/120 Secondary Volts, 115C Temperature Rise, Aluminum Winding Material, 60 HZ

**Project Name:** East Area Water Control Facility  
**General Order No:** MAT0011132

**Negotiation No:** AT130311X0K1  
**Alternate No:** R003

Item No.	Qty	Product	Description
031	1	Dry Type Transformers	Transformer Type: General Purpose Encapsulated 3 Phase, 9 KVA, 1 K-Factor 480 Primary Volts 208Y/120 Secondary Volts Temperature Rise 115C Aluminum Winding Material Sound Reduction : 0 NEMA ST-20 Audible Sound Level: 45 UL Listed : Y Enclosure Type: NEMA 4X Stainless Steel Operating Frequency: 60 HZ Stainless Steel (316) Enclosure
		<b>Catalog No</b>	Y48G28T09S64X
		<b>Designation</b>	TX-SP1
	<b>Qty</b>	<b>List of Materials</b>	
	1		3 Phase, 9 KVA, 480 Primary Volts, 208Y/120 Secondary Volts, 115C Temperature Rise, Aluminum Winding Material, 60 HZ

Item No.	Qty	Product	Description
032	1	Dry Type Transformers	Transformer Type: Mini Power Centers 3 Phase, 15 KVA, 1 K-Factor 480 Primary Volts 208Y/120 Secondary Volts Temperature Rise 115C Copper Winding Material Sound Reduction : 0 NEMA ST-20 Audible Sound Level: 50 UL Listed : Y Enclosure Type: NEMA 4X Stainless Steel Operating Frequency: 60 HZ Stainless Steel (316) Enclosure
		<b>Catalog No</b>	P48G28T1524CUBS64X
		<b>Designation</b>	LVPC
	<b>Qty</b>	<b>List of Materials</b>	
	1		3 Phase, 15 KVA, 480 Primary Volts, 208Y/120 Secondary Volts, 115C Temperature Rise, Copper Winding Material, 60 HZ

Eaton Selling Policy 25-000 applies.

All orders must be released for manufacture within 90 days of date of order entry. If approval drawings are required, drawings must be returned approved for release within 60 days of mailing. If drawings are not returned accordingly, and/or if shipment is delayed for any reason, the price of the order will increase by 1.0% per month or fraction thereof for the time the shipment is delayed.

Seller shall not be responsible for any failure to perform, or delay in performance of, its obligations resulting from the COVID-19 pandemic or any future epidemic, and Buyer shall not be entitled to any damages resulting thereof.

**EATON**

*Powering Business Worldwide*

### Dry-Type Transformers General Information

- Standard Transformer Catalog Number: V48M28T3016
- Transformer Type: General Purpose Vented
- Phase: 3
- kVA: 30
- Primary Volts: 480
- Secondary Volts: 208Y/120
- Temperature Rise: 150C with 220C Insulation System
- Winding Material: Aluminum
- Enclosure Type: NEMA 2 (for N3R, select Weather Shield in Mods tab)
- Frequency (Hz): 60
- Frame: 940
- Wiring Diagram: 280B
- Weight (lbs.): 360
- Impedance (%): 3.91
- UL Listed: Y
- Max Practical Inrush (Amps): 342
- X/R: 1.18
- No Load Losses (Watts): 122
- Total Losses (Watts): 984

### Standard Values

- K-Factor: 1
- TAPS: 2@+2.5%, 4@-2.5%
- Sound Reduction (dB): 0
- NEMA ST20 Sound Level (dB): 45
- DOE 10 CFR Part 431 (2016) Efficient: Y
- Infrared Viewing Window: None

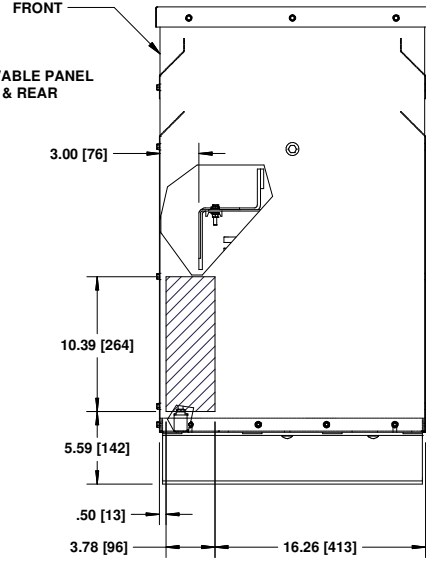
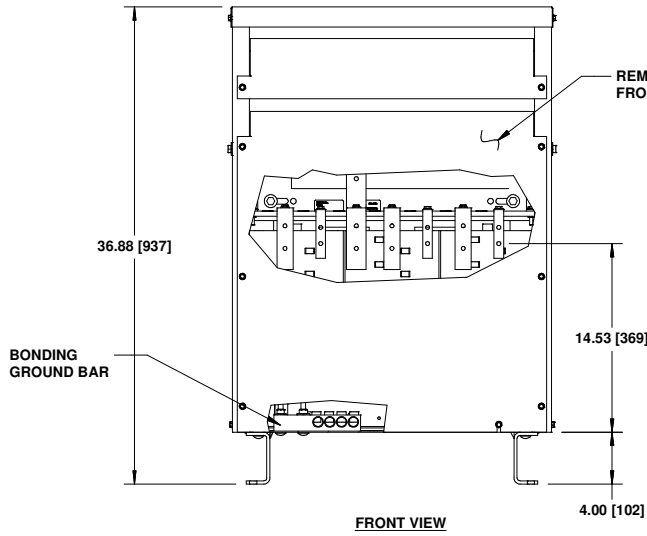
### Field-Installed Accessories Included

- Lug Kit: Not Included
- Weather Shield: WS58

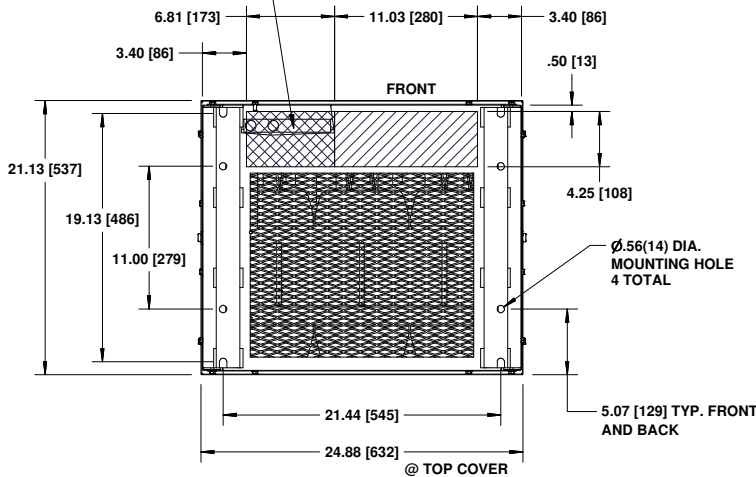
<b>The information on this document is created by Eaton. It is disclosed in confidence and it is only to be used for the purpose in which it is supplied.</b>	PREPARED BY NICHOLAS NATALE	DATE 2/16/2023	<b>Eaton</b>		
	APPROVED BY	DATE	JOB NAME East Area Water Control Facility	DESIGNATION TX-LSP	
	VERSION 1.0.0.4	TYPE Dry-Type Transformer	DRAWING TYPE Customer Appr.		
NEG-ALT Number AT130311X0K1-R003	REVISION 0	DWG SIZE A	G.O. MAT0011132	ITEM 024	SHEET 1 of 1

**NOTE:**

1. ALL UNITS ARE DESIGNED IN ACCORDANCE WITH APPLICABLE NEMA, UL, ANSI, AND IEEE STANDARDS.
2. DRY-TYPE VENTILATED, CLASS AA, NEMA TYPE 2 ENCLOSURE.
3. FOR NEMA 3R OUTDOOR APPLICATION, USE WEATHERSHIELD # WS58.
4. TRANSFORMERS ARE FLOOR-MOUNTED. USE WALL-MOUNT BRACKET WMB05 FOR WALL-MOUNTING.
5. 220°C CLASS INSULATION SYSTEM.
6. PAINT COLOR IS ANSI #61.
7. ALUMINUM UNITS HAVE ALUMINUM WINDINGS AND TERMINATIONS. COPPER UNITS HAVE COPPER WINDINGS AND TERMINATIONS.
8. TRANSFORMER CAN BE INSTALLED AT A MIN. DISTANCE TO BACK AND SIDE WALLS OF 2 INCHES AND TO A 6 INCHES MIN. DISTANCE TO BACK WALLS WHEN WEATHERSHIELDS ARE NEEDED. WALLMOUNT BRACKETS CANNOT BE USED IN COMBINATION WITH WEATHERSHIELDS.
9. DIMENSIONS IN INCHES[mm].



IF CABLE ENTRY IS REQUIRED IN THIS AREA BONDING GROUND BAR MAY NEED TO BE RELOCATED BY INSTALLER.

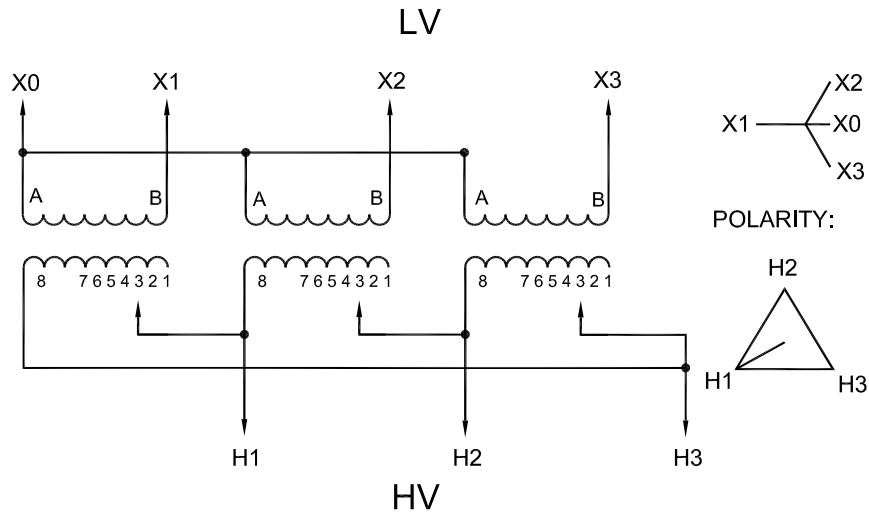


USE 10.39[264] x 3.78[96] BOTH SIDES, AND (11.03[280]+6.81[173]) x 4.25[108] ON BOTTOM AS RECOMMENDED CABLE ENTRY LOCATIONS.

PRODUCT CODE: -		FEDERAL ID NO. -		DFTR	DATE	THE INFORMATION ON THIS DOCUMENT WAS CREATED BY EATON CORPORATION. IT WAS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT WAS SUPPLIED.				
7	CO-0204443	J.C.S.	D.G.	31/03/2021	J.C.S.	29/10/2015	TITLE		DRY TYPE TRANSFORMER	
6	ECO-164756	J.C.S.	C.B.	07/05/2019	APPD	D.G.	29/10/2015	OUTLINE		
5	ECO-133517	J.G.	C.B.	15/01/2018	S.O.			TYPE		
REV		DESCRIPTION	DFTR	APPD	DATE	REVISION		G.O.	DWG	SHEET
						7				1 OF 1
		REVISIONS							<b>FR940</b>	

GO/NEG-Alt-Date: MAT0011132-R003-2/16/2023		Job Name: East Area Water Control Facility	
Item Number: 024	Catalog Number: V48M28T3016	Designation: TX-LSP	

VOLTS	TAP
504	1
492	2
480	3
468	4
456	5
444	6
432	7



PRODUCT CODE: TRANSFORMERS		FEDERAL ID NO.		DFTR	DATE	THE INFORMATION ON THIS DOCUMENT WAS CREATED BY EATON CORPORATION. IT WAS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT WAS SUPPLIED.		<b>EATON</b>	
HEG				APPD	DATE	TITLE			
EER				12/01/01		DRY TYPE TRANSFORMER WIRING SCHEMATIC			
S.O.						TYPE		WIRING	
4		UPDATE FORMAT EATON & CHANGE DESC. TO HV/LV		J.C.S.	C.B.	10/JUN/14	DRY TYPE TRANSFORMER		
REV	DESCRIPTION	DFTR	APPD	DATE	REVISION	G.O.	DWG	SHEET	
					04		280B	1 OF 01	

GO/NEG-Alt-Date: MAT0011132-R003-2/16/2023		Job Name: East Area Water Control Facility	
Item Number: 024	Catalog Number: V48M28T3016	Designation: TX-LSP	

### Dry-Type Transformers General Information

- Standard Transformer Catalog Number: V48M22T3016
- Transformer Type: General Purpose Vented
- Phase: 3
- kVA: 30
- Primary Volts: 480
- Secondary Volts: 240/120
- Temperature Rise: 150C with 220C Insulation System
- Winding Material: Aluminum
- Enclosure Type: NEMA 2 (for N3R, select Weather Shield in Mods tab)
- Frequency (Hz): 60
- Frame: 940
- Wiring Diagram: 282B
- Weight (lbs.): 399
- Impedance (%): 2.58
- UL Listed: Y
- Max Practical Inrush (Amps): 213
- X/R: 0.53

### Standard Values

- K-Factor: 1
- TAPS: 2@+2.5%, 4@-2.5%
- Sound Reduction (dB): 0
- NEMA ST20 Sound Level (dB): 45
- DOE 10 CFR Part 431 (2016) Efficient: Y
- Infrared Viewing Window: None

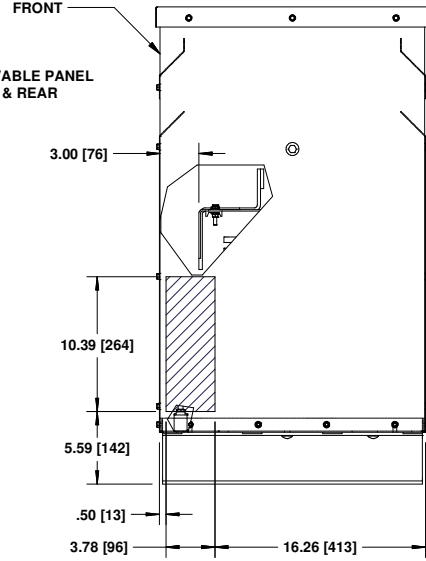
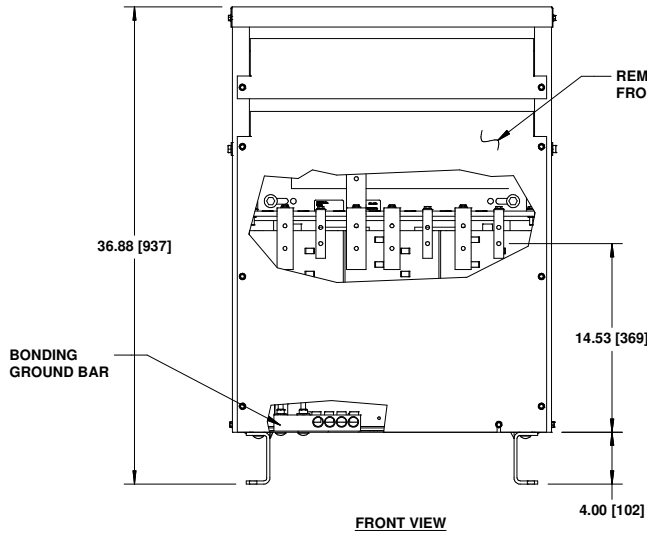
### Field-Installed Accessories Included

- Lug Kit: Not Included
- Weather Shield: WS58

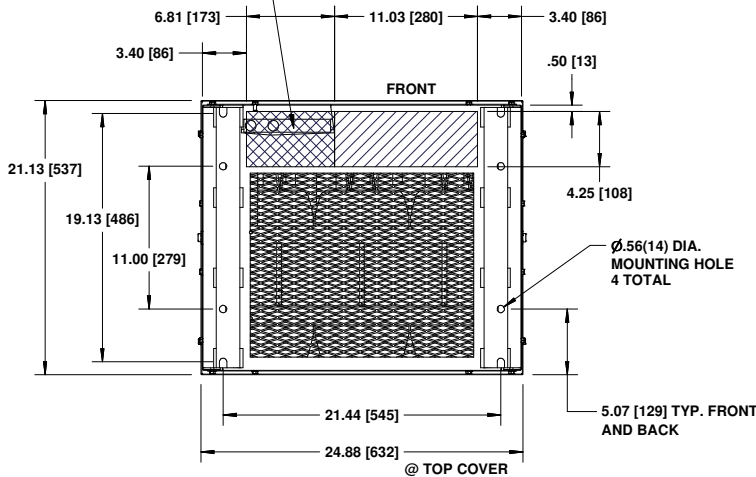
<b>The information on this document is created by Eaton. It is disclosed in confidence and it is only to be used for the purpose in which it is supplied.</b>	PREPARED BY NICHOLAS NATALE	DATE 2/16/2023	<b>Eaton</b>		
	APPROVED BY	DATE	JOB NAME East Area Water Control Facility	DESIGNATION TX-LSDB	
	VERSION 1.0.0.4	TYPE Dry-Type Transformer	DRAWING TYPE Customer Appr.		
NEG-ALT Number AT130311X0K1-R003	REVISION 0	DWG SIZE A	G.O. MAT0011132	ITEM 026	SHEET 1 of 1

**NOTE:**

1. ALL UNITS ARE DESIGNED IN ACCORDANCE WITH APPLICABLE NEMA, UL, ANSI, AND IEEE STANDARDS.
2. DRY-TYPE VENTILATED, CLASS AA, NEMA TYPE 2 ENCLOSURE.
3. FOR NEMA 3R OUTDOOR APPLICATION, USE WEATHERSHIELD # WS58.
4. TRANSFORMERS ARE FLOOR-MOUNTED. USE WALL-MOUNT BRACKET WMB05 FOR WALL-MOUNTING.
5. 220°C CLASS INSULATION SYSTEM.
6. PAINT COLOR IS ANSI #61.
7. ALUMINUM UNITS HAVE ALUMINUM WINDINGS AND TERMINATIONS. COPPER UNITS HAVE COPPER WINDINGS AND TERMINATIONS.
8. TRANSFORMER CAN BE INSTALLED AT A MIN. DISTANCE TO BACK AND SIDE WALLS OF 2 INCHES AND TO A 6 INCHES MIN. DISTANCE TO BACK WALLS WHEN WEATHERSHIELDS ARE NEEDED. WALLMOUNT BRACKETS CANNOT BE USED IN COMBINATION WITH WEATHERSHIELDS.
9. DIMENSIONS IN INCHES[mm].



IF CABLE ENTRY IS REQUIRED IN THIS AREA BONDING GROUND BAR MAY NEED TO BE RELOCATED BY INSTALLER.



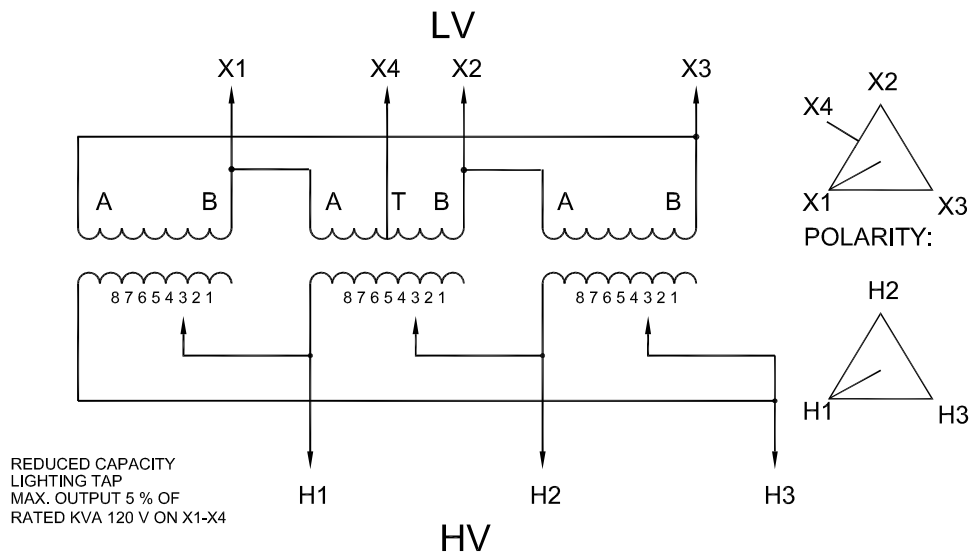
USE 10.39[264] x 3.78[96] BOTH SIDES, AND (11.03[280]+6.81[173]) x 4.25[108] ON BOTTOM AS RECOMMENDED CABLE ENTRY LOCATIONS.

PRODUCT CODE: -		FEDERAL ID NO. -		DFTR	DATE	THE INFORMATION ON THIS DOCUMENT WAS CREATED BY EATON CORPORATION. IT WAS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT WAS SUPPLIED.			
7	CO-0204443	J.C.S.	D.G.	31/03/2021	J.C.S.	29/10/2015	TITLE		
6	ECO-164756	J.C.S.	C.B.	07/05/2019	APPD	DATE	DRY TYPE TRANSFORMER OUTLINE		
5	ECO-133517	J.G.	C.B.	15/01/2018	S.O.	.	TYPE	DRY TYPE TRANSFORMER OUTLINE	
REV	DESCRIPTION	DFTR	APPD	DATE	REVISION		G.O.	DWG	
REVISIONS					<b>7</b>		<b>FR940</b>		SHEET
									1 OF 1

GO/NEG-Alt-Date: MAT0011132-R003-2/16/2023		Job Name: East Area Water Control Facility	
Item Number: 026	Catalog Number: V48M22T3016	Designation: TX-LSDB	



VOLTS	TAP
504	1
492	2
480	3
468	4
456	5
444	6
432	7



PRODUCT CODE: TRANSFORMER		FEDERAL ID NO.		DFTR HEG	DATE 12/01/01	THE INFORMATION ON THIS DOCUMENT WAS CREATED BY EATON CORPORATION. IT WAS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT WAS SUPPLIED.	<b>EATON</b>	
APPD EER		DATE 12/01/01		TITLE DRY TYPE TRANSFORMER WIRING SCHEMATIC				
S.O.		TYPE DRY TYPE TRANSFORMER		WIRING				
04	UPDATE FORMAT EATON & CHANGE DESC. TO HV/LV	J.C.S.	C.B.	10/JUN/14	REVISION 04	G.O.	DWG 282B	SHEET 1 OF 01
REV	DESCRIPTION	DFTR	APPD	DATE	REVISIONS			

GO/NEG-Alt-Date: MAT0011132-R003-2/16/2023		Job Name: East Area Water Control Facility	
Item Number: 026	Catalog Number: V48M22T3016	Designation: TX-LSDB	

### Dry-Type Transformers General Information

- Standard Transformer Catalog Number: V48M28T1516
- Transformer Type: General Purpose Vented
- Phase: 3
- kVA: 15
- Primary Volts: 480
- Secondary Volts: 208Y/120
- Temperature Rise: 150C with 220C Insulation System
- Winding Material: Aluminum
- Enclosure Type: NEMA 2 (for N3R, select Weather Shield in Mods tab)
- Frequency (Hz): 60
- Frame: 939
- Wiring Diagram: 280B
- Weight (lbs.): 245
- Impedance (%): 3.74
- UL Listed: Y
- Max Practical Inrush (Amps): 70
- X/R: 0.49
- No Load Losses (Watts): 69
- Total Losses (Watts): 570

### Standard Values

- K-Factor: 1
- TAPS: 2@+2.5%, 4@-2.5%
- Sound Reduction (dB): 0
- NEMA ST20 Sound Level (dB): 45
- DOE 10 CFR Part 431 (2016) Efficient: Y
- Infrared Viewing Window: None

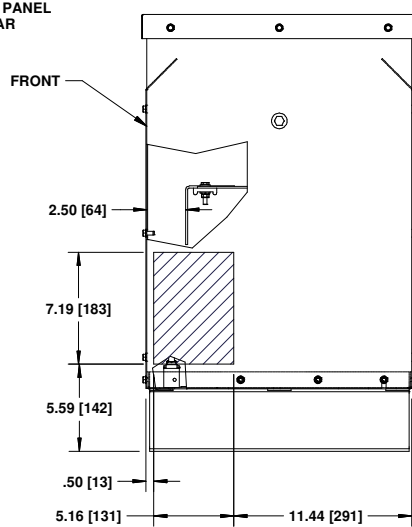
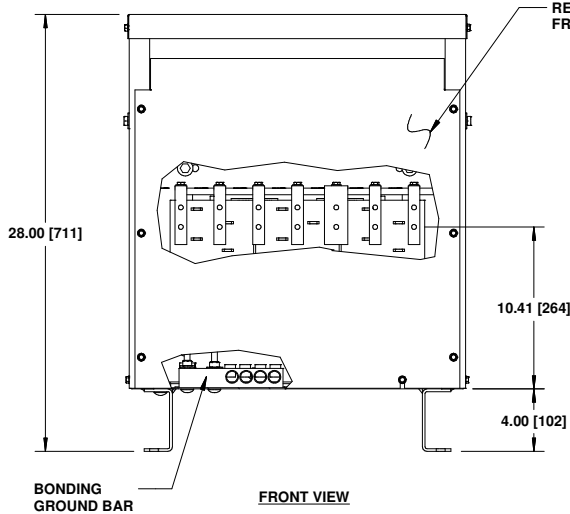
### Field-Installed Accessories Included

- Lug Kit: Not Included
- Weather Shield: WS57

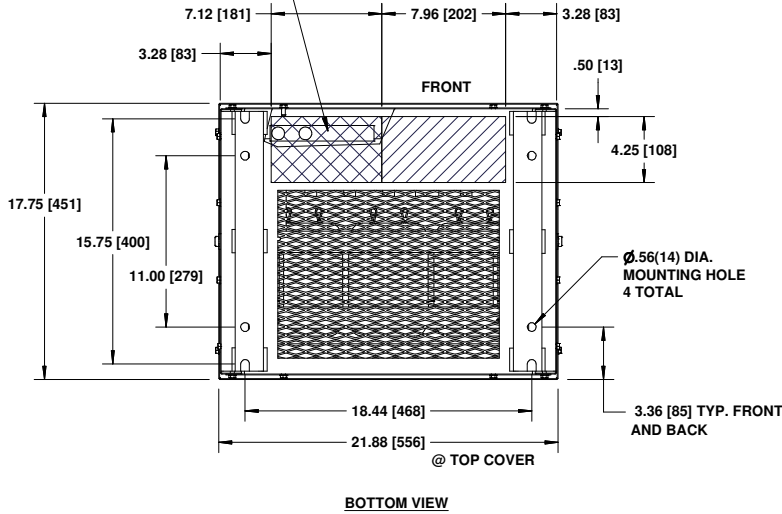
<b>The information on this document is created by Eaton. It is disclosed in confidence and it is only to be used for the purpose in which it is supplied.</b>	PREPARED BY NICHOLAS NATALE	DATE 2/16/2023	<b>Eaton</b>		
	APPROVED BY	DATE	JOB NAME East Area Water Control Facility	DESIGNATION TX-LSB	
	VERSION 1.0.0.4	TYPE Dry-Type Transformer	DRAWING TYPE Customer Appr.		
NEG-ALT Number AT130311X0K1-R003	REVISION 0	DWG SIZE A	G.O. MAT0011132	ITEM 028	SHEET 1 of 1

**NOTE:**

1. ALL UNITS ARE DESIGNED IN ACCORDANCE WITH APPLICABLE NEMA, UL, ANSI, AND IEEE STANDARDS.
2. DRY-TYPE VENTILATED, CLASS AA, NEMA TYPE 2 ENCLOSURE.
3. FOR NEMA 3R OUTDOOR APPLICATION, USE WEATHERSHIELD # WS57
4. TRANSFORMERS ARE FLOOR-MOUNTED. USE WALL-MOUNT BRACKET WMB05 FOR WALL-MOUNTING.
5. 220°C CLASS INSULATION SYSTEM.
6. PAINT COLOR IS ANSI #61.
7. ALUMINUM UNITS HAVE ALUMINUM WINDINGS AND TERMINATIONS. COPPER UNITS HAVE COPPER WINDINGS AND TERMINATIONS.
8. TRANSFORMER CAN BE INSTALLED AT A MIN. DISTANCE TO BACK AND SIDE WALLS OF 2 INCHES AND TO A 6 INCHES MIN. DISTANCE TO BACK WALLS WHEN WEATHERSHIELDS ARE NEEDED. WALLMOUNT BRACKETS CANNOT BE USED IN COMBINATION WITH WEATHERSHIELDS.
9. DIMENSIONS IN INCHES[mm].



IF CABLE ENTRY IS REQUIRED IN THIS AREA BONDING GROUND BAR MAY NEED TO BE RELOCATED BY INSTALLER.

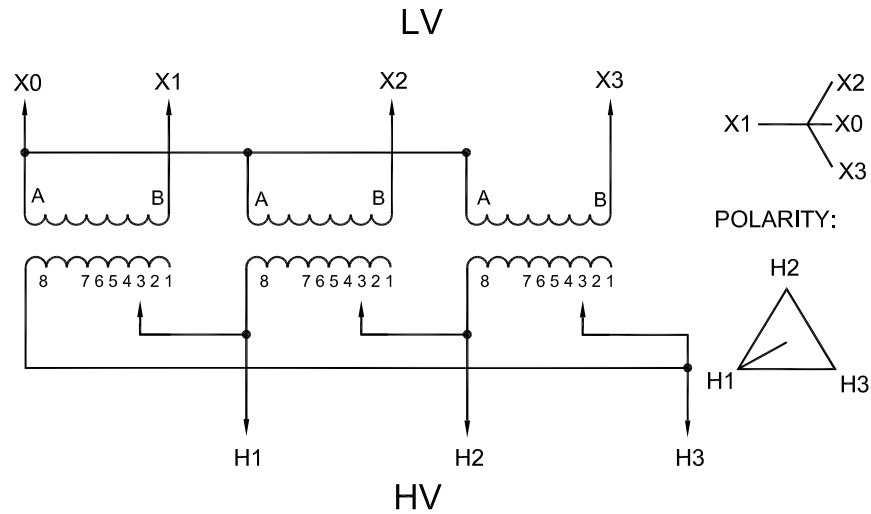


USE 7.19[183] x 5.16[131] BOTH SIDES, AND (7.96[202]+7.12[181]) x 4.25[108] ON BOTTOM AS RECOMMENDED CABLE ENTRY LOCATIONS.

PRODUCT CODE: -		FEDERAL ID NO. -			DFTR	DATE	THE INFORMATION ON THIS DOCUMENT WAS CREATED BY EATON CORPORATION. IT WAS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT WAS SUPPLIED.			
6	CO-0204443	J.C.S.	D.G.	31/03/2021	J.C.S.	29/10/2015	TITLE DRY TYPE TRANSFORMER OUTLINE			
5	ECO-164756	J.C.S.	C.B.	07/05/2019	APPD	DATE	TYPE DRY TYPE TRANSFORMERS			OUTLINE
4	ECO-133392	J.C.SOTO	C.B.	15/01/2018	D.G.	29/10/2015	G.O.			DWG
REV	DESCRIPTION	DFTR	APPD	DATE	REVISION	FR939			SHEET	
REVISIONS					6				1 OF 1	

GO/NEG-Alt-Date: MAT0011132-R003-2/16/2023		Job Name: East Area Water Control Facility	
Item Number: 028	Catalog Number: V48M28T1516	Designation: TX-LSB	

VOLTS	TAP
504	1
492	2
480	3
468	4
456	5
444	6
432	7



PRODUCT CODE: TRANSFORMERS		FEDERAL ID NO.		DFTR	DATE	THE INFORMATION ON THIS DOCUMENT WAS CREATED BY EATON CORPORATION. IT WAS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT WAS SUPPLIED.		<b>EATON</b>	
HEG					12/01/01	TITLE		DRY TYPE TRANSFORMER WIRING SCHEMATIC	
APPD				EER	DATE	TYPE		DRY TYPE TRANSFORMER	
EER					12/01/01	WIRING		WIRING	
S.O.						G.O.		DWG	
4		UPDATE FORMAT EATON & CHANGE DESC. TO HV/LV		J.C.S.	C.B.	10/JUN/14	280B		SHEET 1 OF 01
REV	DESCRIPTION	DFTR	APPD	DATE	REVISION				
REVISIONS					04				

GO/NEG-Alt-Date: MAT0011132-R003-2/16/2023		Job Name: East Area Water Control Facility	
Item Number: 028	Catalog Number: V48M28T1516	Designation: TX-LSB	

## Dry-Type Transformers General Information

Custom Transformers must be approved by TRC - Avery Creek

This is a custom-manufactured product. Once it is released for manufacturing, it cannot be cancelled. This product cannot be returned for credit.

- Custom Transformer Style Number: Y48G28T06S64X
- Transformer Type: General Purpose Encapsulated
- Phase: 3
- kVA: 6
- Primary Volts: 480
- Secondary Volts: 208Y/120
- Temperature Rise: 115C
- Winding Material: Aluminum
- Enclosure Type: NEMA 4X Stainless Steel
- Frequency (Hz): 60

### Standard Values

- K-Factor: 1
- TAPS: 2@-5%
- Sound Reduction (dB): 0
- NEMA ST20 Sound Level (dB): 45
- Infrared Viewing Window: None

### Field-Installed Accessories Included

- Lug Kit: Not Included

### Customized Values

The information on this document is created by Eaton. It is disclosed in confidence and it is only to be used for the purpose in which it is supplied.	PREPARED BY	DATE	<b>Eaton</b>		
	NICHOLAS NATALE	2/16/2023			
	APPROVED BY	DATE	JOB NAME	East Area Water Control Facility	
			DESIGNATION	TX-SP2	
	VERSION	TYPE		DRAWING TYPE	
	1.0.0.4	Dry-Type Transformer		Customer Appr.	
NEG-ALT Number	REVISION	DWG SIZE	G.O.	ITEM	SHEET
AT130311X0K1-R003	0	A	MAT0011132	030	1 of 1

## Custom Transformer

Frame Drawing is unavailable from Bidman.  
Please contact TRC in Avery Creek at 1-877-ETN-CARE (1- 877-386-2273)  
Option 2, then Option 1 prior to quoting this transformer to confirm  
availability and pricing.

GO/NEG-Alt-Date: MAT0011132-R003-2/16/2023		Job Name: East Area Water Control Facility
Item Number: 030	Catalog Number: Y48G28T06S64X	Designation: TX-SP2

## Custom Transformer

Wiring Diagram is unavailable from Bidman.  
Please contact TRC in Avery Creek at 1-877-ETN-CARE (1- 877-386-2273)  
Option 2, then Option 1 prior to quoting this transformer to confirm  
availability and pricing.

GO/NEG-Alt-Date: MAT0011132-R003-2/16/2023		Job Name: East Area Water Control Facility
Item Number: 030	Catalog Number: Y48G28T06S64X	Designation: TX-SP2

### Dry-Type Transformers General Information

- Standard Transformer Catalog Number: Y48G28T09S64X
- Transformer Type: General Purpose Encapsulated
- Phase: 3
- kVA: 9
- Primary Volts: 480
- Secondary Volts: 208Y/120
- Temperature Rise: 115C
- Winding Material: Aluminum
- Enclosure Type: NEMA 4X Stainless Steel
- Frequency (Hz): 60
- UL Listed: Y

### Standard Values

- K-Factor: 1
- TAPS: 2@-5%
- Sound Reduction (dB): 0
- NEMA ST20 Sound Level (dB): 45
- Infrared Viewing Window: None

### Field-Installed Accessories Included

- Lug Kit: Not Included

<p><b>The information on this document is created by Eaton. It is disclosed in confidence and it is only to be used for the purpose in which it is supplied.</b></p>	PREPARED BY NICHOLAS NATALE	DATE 2/16/2023	<b>Eaton</b>		
	APPROVED BY	DATE	JOB NAME East Area Water Control Facility	DESIGNATION TX-SP1	
	VERSION 1.0.0.4	TYPE Dry-Type Transformer	DRAWING TYPE Customer Appr.		
NEG-ALT Number AT130311X0K1-R003	REVISION 0	DWG SIZE A	G.O. MAT0011132	ITEM 031	SHEET 1 of 1



## Custom Transformer

Frame Drawing is unavailable from Bidman.  
Please contact TRC in Avery Creek at 1-877-ETN-CARE (1- 877-386-2273)  
Option 2, then Option 1 prior to quoting this transformer to confirm  
availability and pricing.

GO/NEG-Alt-Date: MAT0011132-R003-2/16/2023		Job Name: East Area Water Control Facility
Item Number: 031	Catalog Number: Y48G28T09S64X	Designation: TX-SP1

## Custom Transformer

Wiring Diagram is unavailable from Bidman.  
Please contact TRC in Avery Creek at 1-877-ETN-CARE (1- 877-386-2273)  
Option 2, then Option 1 prior to quoting this transformer to confirm  
availability and pricing.

GO/NEG-Alt-Date: MAT0011132-R003-2/16/2023		Job Name: East Area Water Control Facility
Item Number: 031	Catalog Number: Y48G28T09S64X	Designation: TX-SP1

### Dry-Type Transformers General Information

- Standard Transformer Catalog Number: P48G28T1524CUBS64X
- Transformer Type: Mini Power Centers
- Phase: 3
- kVA: 15
- Primary Volts: 480
- Secondary Volts: 208Y/120
- Temperature Rise: 115C
- Winding Material: Copper
- Enclosure Type: NEMA 4X Stainless Steel
- Frequency (Hz): 60
- Frame: 2914X
- Wiring Diagram: M48G1H
- Weight (lbs.): 708
- Impedance (%): 1.49
- UL Listed: Y

### Standard Values

- K-Factor: 1
- TAPS: 2@-5%
- Sound Reduction (dB): 0
- NEMA ST20 Sound Level (dB): 50
- Infrared Viewing Window: None

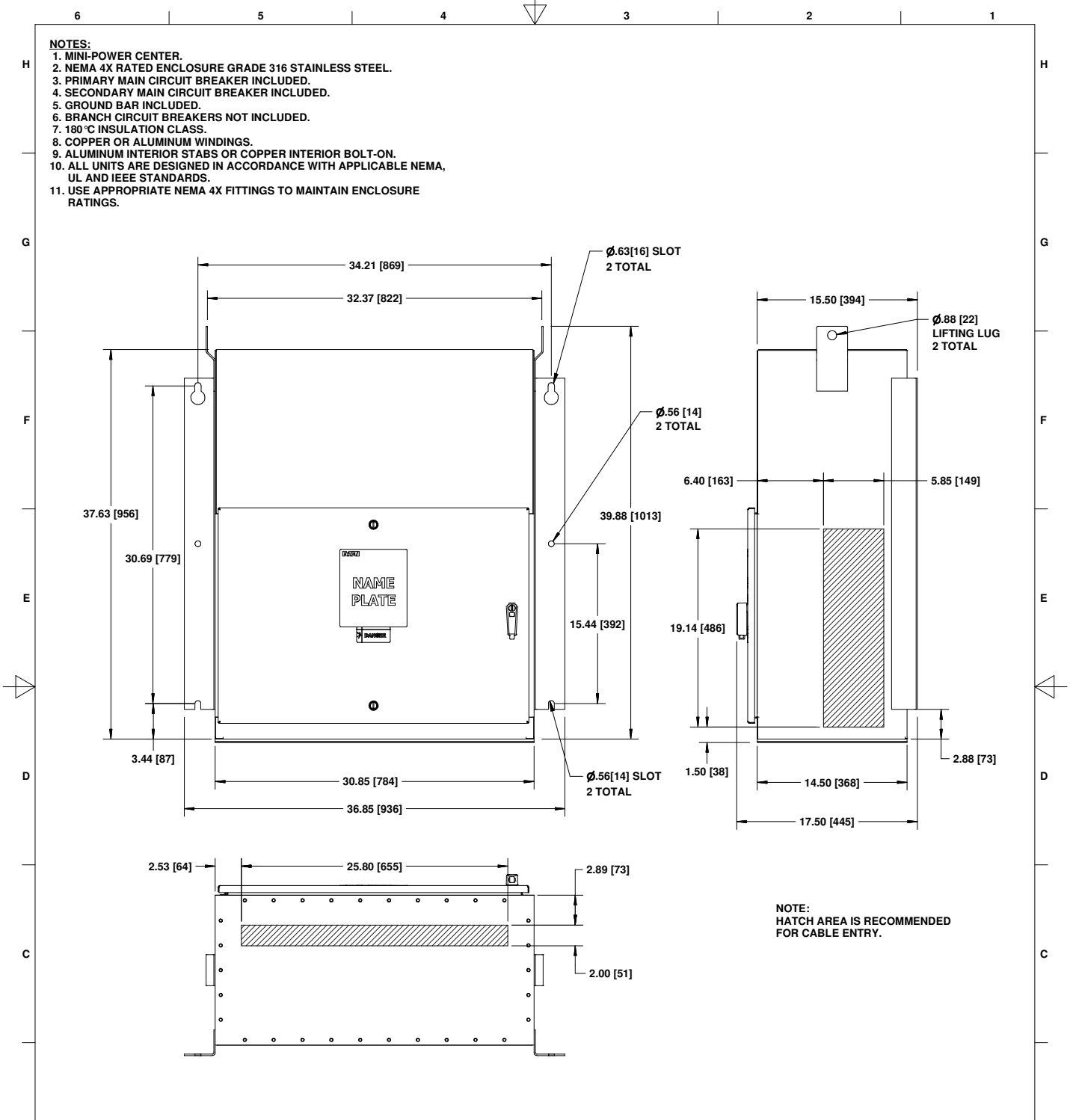
### Field-Installed Accessories Included

- Lug Kit: Not Included

<b>The information on this document is created by Eaton. It is disclosed in confidence and it is only to be used for the purpose in which it is supplied.</b>	PREPARED BY NICHOLAS NATALE	DATE 2/16/2023	<b>Eaton</b>		
	APPROVED BY	DATE	JOB NAME East Area Water Control Facility	DESIGNATION LVPC	
	VERSION 1.0.0.4	TYPE Dry-Type Transformer	DRAWING TYPE Customer Appr.		
NEG-ALT Number AT130311X0K1-R003	REVISION 0	DWG SIZE A	G.O. MAT0011132	ITEM 032	SHEET 1 of 1

**NOTES:**

1. MINI-POWER CENTER.
2. NEMA 4X RATED ENCLOSURE GRADE 316 STAINLESS STEEL.
3. PRIMARY MAIN CIRCUIT BREAKER INCLUDED.
4. SECONDARY MAIN CIRCUIT BREAKER INCLUDED.
5. GROUND BAR INCLUDED.
6. BRANCH CIRCUIT BREAKERS NOT INCLUDED.
7. 180°C INSULATION CLASS.
8. COPPER OR ALUMINUM WINDINGS.
9. ALUMINUM INTERIOR STABS OR COPPER INTERIOR BOLT-ON.
10. ALL UNITS ARE DESIGNED IN ACCORDANCE WITH APPLICABLE NEMA, UL AND IEEE STANDARDS.
11. USE APPROPRIATE NEMA 4X FITTINGS TO MAINTAIN ENCLOSURE RATINGS.



NOTE:  
HATCH AREA IS RECOMMENDED  
FOR CABLE ENTRY.

THIS DIMENSION DRAWING IS FOR REFERENCE ONLY.  
IT IS NOT TO BE REGARDED AS INDICATING THE EXACT DETAILS OF CONSTRUCTION.

DIMENSIONS IN INCHES [mm]

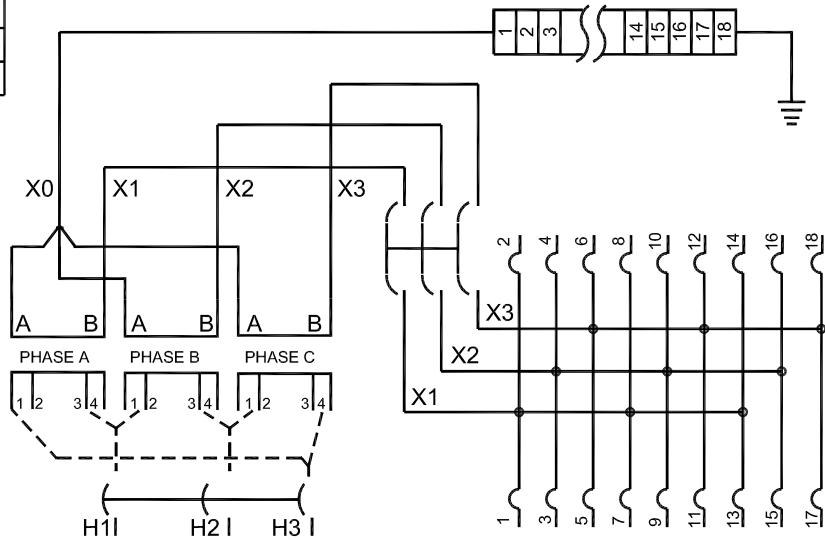
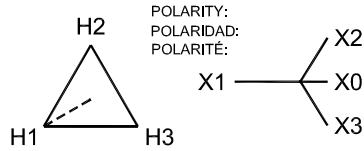
PRODUCT CODE: -		FEDERAL ID NO. -		DFTR	DATE	THE INFORMATION ON THIS DOCUMENT WAS CREATED BY EATON CORPORATION. IT WAS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT WAS SUPPLIED.		
				S.BELTRAN.	5/9/2018	TITLE DRY TYPE TRANSFORMER OUTLINE		
				APPD	DATE	TRANSFORMERS		OUTLINE
				A.SANDOVAL	5/9/2018	G.O.		DWG
				S.O.		FR2914X		SHEET
2		CABLE ENTRY LOCATIONS ADDED, ECO-154412	S.B.R	A.S	12/12/2018			1 OF 1
REV	DESCRIPTION	DFTR	APPD	DATE	REVISION			
					2			

GO/NEG-Alt-Date: MAT0011132-R003-2/16/2023		Job Name: East Area Water Control Facility	
Item Number: 032	Catalog Number: P48G28T1524CUBS64X	Designation: LVPC	

VOLTS	CONN. CONEC. CONN.	LINE LINEA LIGNE	CURR. CORR. COUR.
480	1 - 4	H1 [ H2 [ H3	18.0
456	2 - 4		19.0
432	2 - 3		20.0

208 VOLTS 3 Ø LINE TO LINE  
 120 VOLTS LINE TO NEUTRAL (X0)  
 208 VOLTS 3 Ø LINEA A LINEA  
 120 VOLTS LINEA A NEUTRO (X0)  
 208 VOLTS 3 Ø LIGNE À LIGNE  
 120 VOLTS LIGNE À NEUTRE (X0)

MAXIMUM LV CURRENT PER LINE 40 AMPS  
 MAXIMA CORRIENTE EN EL LV POR LINEA 40 AMPS  
 COURANT LV MAXIMAL PAR LIGNE DE 40 A.



PRODUCT CODE: OL		FEDERAL ID NO.		DFTR	DATE	THE INFORMATION ON THIS DOCUMENT WAS CREATED BY EATON CORPORATION. IT WAS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT WAS SUPPLIED.	<b>EATON</b>
				E. CARDENAS	MAY/17/2018		
				APPD	DATE	TITLE DRY TYPE TRANSFORMER	
				A. SANDOVAL	MAY/17/2018	TRANSFORMER WIRING DIAGRAM #M48G1H	
				S.O.		TYPE TRANSFORMER	
REV	DESCRIPTION	DFTR	APPD	DATE	REVISION	G.O.	DWG
	REVISIONS				01		M48G1H
							SHEET 1 OF 01

GO/NEG-Alt-Date: MAT0011132-R003-2/16/2023		Job Name: East Area Water Control Facility	
Item Number: 032	Catalog Number: P48G28T1524CUBS64X	Designation: LVPC	

**EATON**

*Powering Business Worldwide*

Use table for catalog number breakdown only.  
Do not use to create catalog numbers because all combinations may not be valid.

**General-Purpose, NEMA TP-1 Energy-Efficient, Mini-Power Center, Shielded Isolation, Nonlinear K-Factor, Buck-Boost, Marine Duty Transformers—Example: S20N11S05A**

**S 20 N 11 S 05 A**

**Prefix Options**

**C** = CSA labeled ventilated transformer

**Marine Duty**

**Q** = EPM marine (1-Ph encapsulated)

**L** = EPTM Marine (3-Ph encapsulated)

**R** = DS-3M marine (1-Ph ventilated)

**M** = DT-3M marine (3-Ph ventilated)

**Primary Voltage**

**13** = 110 x 220

**12** = 120

**10** = 120 x 240

**29** = 208

**72** = 200

**25** = 220

**23** = 230

**24** = 240

**20** = 240 x 480

**27** = 277

**38** = 380

**39** = 400

**43** = 416

**44** = 440

**45** = 450

**48** = 480

**57** = 575

**60** = 600

**42** = 2400

**46** = 4160

**49** = 4800

**40** = Export model

**54** = 120/208/240/277

**kVA**

<b>81</b> = 0.05	<b>03</b> = 3	<b>37</b> = 37.5	<b>52</b> = 250
<b>85</b> = 0.075	<b>05</b> = 5	<b>45</b> = 45	<b>33</b> = 300
<b>82</b> = 0.10	<b>06</b> = 6	<b>50</b> = 50	<b>54</b> = 333
<b>83</b> = 0.15	<b>07</b> = 7.5	<b>75</b> = 75	<b>55</b> = 500
<b>26</b> = 0.25	<b>09</b> = 9	<b>99</b> = 100	<b>60</b> = 600
<b>51</b> = 0.50	<b>10</b> = 10	<b>12</b> = 112.5	<b>77</b> = 750
<b>76</b> = 0.75	<b>15</b> = 15	<b>49</b> = 150	<b>11</b> = 1000
<b>01</b> = 1	<b>21</b> = 22.5	<b>67</b> = 167	<b>14</b> = 1500
<b>16</b> = 1.5	<b>25</b> = 25	<b>22</b> = 225	
<b>02</b> = 2	<b>30</b> = 30		

**Suffix Options**

**A...Y** = ①

**CU** = ②

**SS** = ③

**ZZ** = ④

**NV** = ⑤

**X** = ⑥

**LS** = ⑦

**AF** = ⑧

**TR** = ⑨

**SR** = ⑩

**CE** = ⑪

**T** = ⑫

**E3** = ⑬

**SS4X** = ⑭

**Z** = ⑮

**S6** = ⑯

**I2** = ⑰

**I3** = ⑱

**I4** = ⑲

**ES** = ⑳

**DE** = ㉑

**DN** = ㉒

**EE** = ㉓

**E6** = ㉔

**EE6** = ㉕

**Type**

**S** = EP (single-phase encapsulated)

**Y** = EPT (three-phase encapsulated)

**T** = DS-3 (single-phase ventilated)

**V** = DT-3 (three-phase ventilated)

**P** = Mini-power center

**Z** = Class 1 Division 2 Groups A, B, C, D

**Nonlinear**

**H** = KT-4 (three-phase ventilated)

**B** = KT-9 (three-phase ventilated)

**N** = KT-13 (three-phase ventilated)

**G** = KT-20 (three-phase ventilated)

**J** = KT-30 (three-phase ventilated)

**HT** = KT-4 (single-phase ventilated)

**NT** = KT-13 (single-phase ventilated)

**GT** = KT-20 (single-phase ventilated)

**Temperature Rise**

**T** = 150°C rise with 220°C insulation system (ventilated); 115°C rise with 180°C insulation system (encapsulated and MPC three-phase)

**F** = 115°C rise with 220°C insulation system (ventilated)

**B** = 80°C rise with 220°C insulation system (ventilated); 80°C rise with 180°C insulation system (encapsulated)

**H** = 130°C rise with 200°C insulation system (ventilated)

**G** = 115°C rise with 200°C insulation system (ventilated)

**J** = 80°C rise with 200°C insulation system (ventilated)

**P** = 115°C rise with 130°C insulation system (encapsulated single-phase ≤2 kVA)

**S** = 115°C rise with 180°C insulation system (encapsulated and MPC single-phase); 150°C rise with 220°C insulation system (ventilated single-phase)

**E** = Electrostatically shielded

**Taps**

**D** = 2 at +2.5%, 2 at -2.5%

**E** = 1 at +5%, 1 at -5%

**F** = 1 at -10%

**G** = 2 at -5%

**J** = 4 at -2.5%

**K** = 1 at -10% x 2 at -5%

**L** = 2 at -5% x 4 at -2.5%

**M** = 2 at +2.5%, 4 at -2.5%

**N** = None

**R** = 1 at +5%, 2 at -5%

**P** = 1 at +5%, 2 at -5% x 2 at +2.5%, 4 at -2.5%

**T** = 1 at +4.2%, 1 at -4.2%

**U** = 1 at +2.5%, 3 at -2.5%

**W** = 1 at +3.5%, 1 at -3.5%

**X** = 2 at +3.1%, 2 at -3.1%

**Secondary Voltage**

<b>04</b> = 12/24	<b>31</b> = 220Y/127	<b>35</b> = 440Y/254
<b>06</b> = 16/32	<b>26</b> = 220 delta/110 midtap	<b>62</b> = 460Y/266
<b>08</b> = 24/48	<b>22</b> = 240 delta/120 midtap	<b>47</b> = 480Y/277
<b>14</b> = 110/220	<b>64</b> = 240Y/139	<b>48</b> = 480 delta
<b>12</b> = 120	<b>24</b> = 240 delta	<b>60</b> = 600 delta
<b>11</b> = 120/240	<b>21</b> = 240/480	<b>61</b> = 600Y/346
<b>54</b> = 127/254	<b>27</b> = 277	<b>42</b> = 2400
<b>19</b> = 190Y/110	<b>38</b> = 380 delta	<b>41</b> = 4160Y/2400
<b>28</b> = 208Y/120	<b>37</b> = 380Y/220	<b>46</b> = 4160
<b>29</b> = 208	<b>34</b> = 400Y/231	<b>49</b> = 4800
<b>25</b> = 220 delta	<b>51</b> = 416Y/240	

**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 Easy install base.
  - 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.
- 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.

The Eaton logo consists of the word "EATON" in a bold, blue, sans-serif font. The letter "O" is stylized as a white circle with a blue dot in the center, creating a visual effect of a power symbol or a stylized letter.

*Powering Business Worldwide*



# Eaton DOE 2016 efficient distribution transformers



## DOE 2016 efficiency guidelines

The U.S. Department of Energy (DOE) is tasked with periodically reviewing energy efficiency requirements of many appliances, including distribution transformers. The latest DOE ruling, originally published on April 18, 2013, mandates new, higher, energy efficiency levels for liquid-filled and dry-type distribution transformers. This new ruling, 10 CFR Part 431, commonly referred to as DOE 2016, requires that distribution transformers manufactured starting on January 1, 2016 that are intended for sale or installation in the U.S. and U.S. Territories meet the new minimum efficiency levels.

Eaton is proud to support this new legislation that will have long-lasting positive environmental benefits lasting for decades into the future.

For low-voltage dry-type distribution transformers, the new minimum energy efficiency levels, required effective January 1, 2016 are:

**Table 1. DOE 2016 minimum efficiency levels for low-voltage dry-type distribution transformers**

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
		1,000	99.28

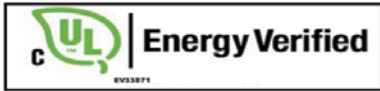


Powering Business Worldwide

There are several types of transformers specifically excluded from the scope of low-voltage dry-type distribution transformer efficiency requirements. The most common transformers excluded from the low-voltage standard are motor drive isolation transformers, control transformers, encapsulated transformers (including mini-power centers), and totally enclosed non-ventilated (TENV) transformers.

Eaton has completely redesigned their ventilated transformer product offering to meet the new DOE 2016 requirements. As part of this redesign, several enhancements were made to the product.

- Bonding ground bar added to the bottom panel as standard for compliance with NEC® 450.10 (A)
- Lower center of gravity to help minimize freight damage
- Minimum of 4 inches clearance between bottom panel and the floor to facilitate ease of moving the transformer with a variety of equipment
- Minimum clearance between front and back panels of just 2 inches when installed indoors without weathershields
- Larger wire bending space for ease of connection
- Larger recommended conduit entry locations in the enclosure
- OSHPD approved designs. 150 kVA and smaller are OSHPD approved for wall-mounting applications
- Third-party efficiency verification so customers can be sure their Eaton transformer meets the new DOE 2016 minimum efficiency requirements



## Product scope

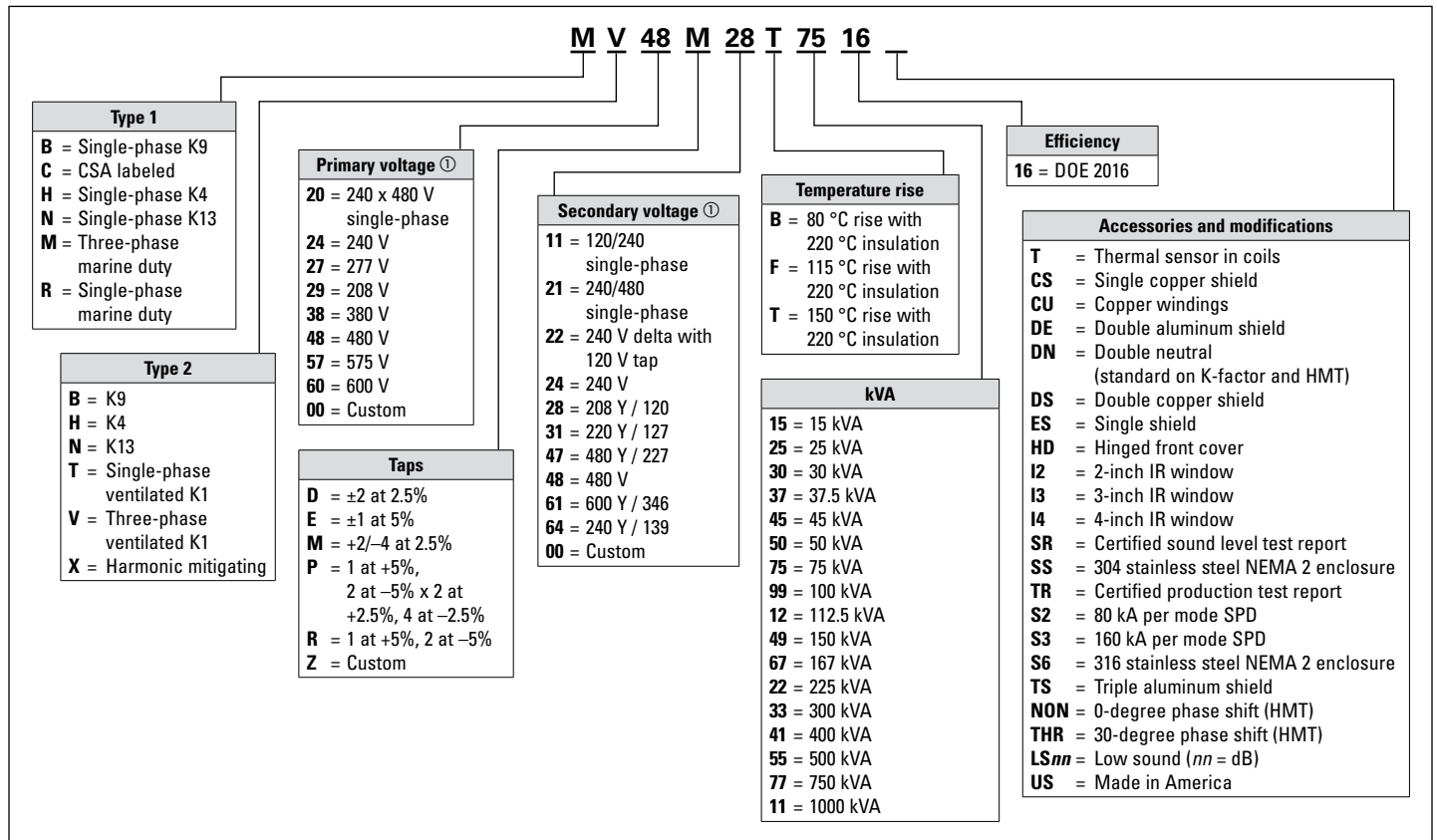
Eaton manufactures a diverse family of DOE 2016 compliant transformers, including:

- 150 °C temperature rise standard, 115 °C and 80 °C rise optional
- General purpose, K-factor, harmonic mitigating, and marine-duty transformers
- K-factor rating of K4, K9, K13, K20, K30
- Aluminum windings standard, copper windings optional
- Wide variety of accessories and custom options
  - Custom voltage combinations
  - Hinged front covers
  - Surge protective devices
  - Custom paint colors
  - IR viewing windows
  - Primary or secondary circuit protective devices
  - Custom electrostatic shielding options
  - And more

## Technical specifications

- 15–167 kVA single-phase
- 15–500 kVA three-phase
- 150 °C temperature rise standard, 115 °C or 80 °C optional
- UL® Listed 220 °C insulation system
- 10 kV BIL on three-phase units
- NEMA® Type 2 enclosures; NEMA 3R when proper weathershield is installed
- Enclosure finish: ANSI 61 grey
- Upright mounting only
- Frequency: 60 Hz
- Short-term overload capability as required by ANSI
- Meet NEMA ST-20 audible sound levels
- UL 1561 Listed, UL File E78389
- cUL® energy efficiency verified EV33871
- Designed, manufactured, and tested per applicable portions of standards:
  - NFPA® (NEC)
  - UL 1561
  - NEMA ST-20
  - NEMA 250
  - 10 CFR Part 431
  - ANSI C57.12.70
  - ANSI C57.12.91
  - OSHPD California
  - Uniform Building Code
  - International Building Code
  - American Bureau of Shipping (marine-duty transformers)

Table 2. DOE 2016 catalog numbering system



① The most common voltages are listed. Contact Eaton for additional voltage combinations.

## General construction features of DOE 2016 efficient transformers rated 600 V and below

### General description

Eaton's single-phase and three-phase general purpose dry-type ventilated transformers are of the two-winding type, self-cooled, and are available in a variety of primary and secondary voltage combinations.

Eaton's transformers are designed, manufactured, and tested in accordance with all of the latest applicable ANSI, NEMA, and IEEE® standards. All 600 V class ventilated transformers with ratings through 1500 kVA are UL listed and bear the UL label. Open core and coil assemblies are UL recognized (UR) labeled products.

These transformers are designed for continuous operation at rated kVA for 24 hours a day, 365 days a year, with a normal life expectancy as defined in ANSI C57.96.

### Efficiency validation

Eaton-manufactured transformers in compliance with 10 CFR Part 431 (2016), "DOE 2016 efficient" bear the UL Energy Efficiency Verification Mark to confirm that the transformer meets the minimum energy efficiency requirements set forth in federal law 10 CFR Part 431.

### Insulation system

The design life of transformers having different insulation systems is the same; the lower temperature systems are designed to have the same life as the higher rated temperature systems.

Most Eaton ventilated transformers, regardless of their temperature rise, are manufactured using a 220 °C insulation system. Required performance is obtained without exceeding the insulation system rating at rated temperature rise in a 40 °C maximum ambient, with an average of 30 °C over a 24-hour period. Transformers manufactured with 220 °C insulation system meet the requirements of NEC 450.21(b) Exception No. 2. It is not necessary to install them in a special, fire-resistant room.

All insulation materials used are flame-retardant and do not support combustion, as defined in ASTM Standard Test Method D635.

### 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. The BIL (basic impulse level) for all 600 V-class windings is 10 kV. The core and coil assembly is installed on neoprene vibration-absorbing pads. Coils are treated with a varnish that does not support the growth of fungus.

Ventilated transformers with wye-connected secondaries have the neutral brought out to a separate terminal or busbar.

The core and coil assembly is grounded to the transformer enclosure by means of a flexible copper ground strap. The copper ground strap is sized per the NEC to be a grounding conductor.

Eaton 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 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 30 dBA minimum at 1.5 kHz to 10 kHz.

Primary to secondary capacitance of 24.74 to 18.06 picofarads over the range 100 to 20 kHz.

### Taps

Primary taps are available on most Eaton ventilated transformers to allow compensation for source voltage variations.

### Winding terminations

Primary and secondary windings are terminated in the wiring compartment. Ventilated transformers have leads brought out to aluminum or copper pads that are pre-drilled to accept Al/Cu lugs. Aluminum-wound transformers have aluminum pads; copper-wound transformers have copper pads. Lugs are not supplied with Eaton transformers; however, lug kits are available as a field-installed accessory. Eaton recommends external cables be rated 75 °C for ventilated designs.

### Enclosures

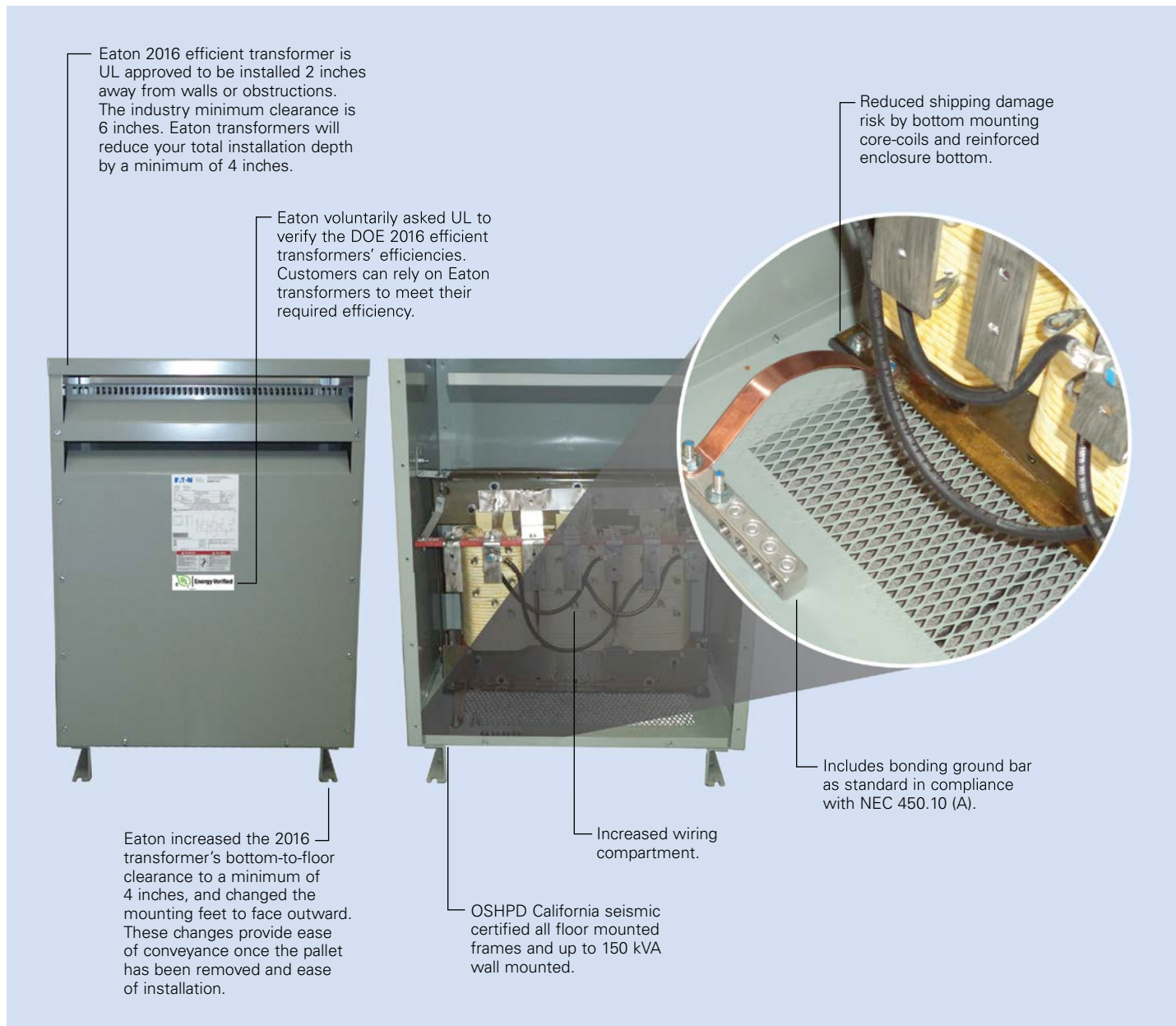
The transformer enclosure is made of heavy-gauge steel and is finished using a continuous process of degreasing, cleaning, and phosphatizing, followed by electrostatic deposition of a thermosetting polyester powder coating and subsequent baking. The coating color is ANSI 61 grey and is UL-recognized for indoor or outdoor use. In compliance with NEMA ST-20, Eaton's ventilated transformers are designed such that the maximum temperature on the top of the enclosure does not exceed 50 °C rise above the ambient temperature.

For ventilated transformers, the enclosure standard construction is drip-proof, NEMA 2, with lifting provisions on the top of the core. All ventilation openings are protected against falling dirt. Proper installation of weathershields makes the enclosure NEMA 3R rated and suitable for outdoor use.

To ensure proper ventilation and cooling of the transformer, follow manufacturer's recommended clearance around ventilation openings.

### Installation clearances

Eaton's transformers should be installed with a minimum clearance around the transformer enclosure to prevent accidental contact with flammable or combustible materials.



Eaton 2016 efficient transformer

## Selection tables

### Aluminum wound, single-phase,

**Table 3. 240 x 480 primary volts, 120/240 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	<b>T20P11S1516</b>	842	196	3XA	WS45	WMB01
25	<b>T20P11S2516</b>	842	261	3XA	WS45	WMB01
37.5	<b>T20P11S3716</b>	843	304	3XA	WS43	—
50	<b>T20P11S5016</b>	843	410	3XA	WS43	—
75	<b>T20P11S7516</b>	844	688	3XA	WS44	—
100	<b>T20P11S9916</b>	844	699	3XA	WS44	—
167	<b>T48M11S6716</b> ③	814	1294	288A	WS13	—

① Frame drawings on page 14 and page 15.

② Wiring diagrams on page 16 through page 20.

③ 480 V primary only.

### Copper wound, single-phase

**Table 4. 240 x 480 primary volts, 120/240 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	<b>T20P11S1516CU</b>	816	270	3XA	WS11	WMB01
25	<b>T20P11S2516CU</b>	818	406	3XA	WS11	WMB01
37.5	<b>T20P11S3716CU</b>	818	453	3XA	WS11	WMB01
50	<b>T20P11S5016CU</b>	819	657	3XA	WS16	WMB01
75	<b>T20P11S7516CU</b>	820	803	3XA	WS16	—
100	<b>T20P11S9916CU</b>	821	960	3XA	WS13	—
167	<b>T48M11S6716CU</b> ③	814E	1665	288A	WS13	—

① Frame drawings on page 14 and page 15.

② Wiring diagrams on page 16 through page 20.

③ 480 V primary only.

### Aluminum wound, three-phase

**Table 5. 208 delta primary volts, 208Y/120 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	<b>V29M28T1516</b>	939	225	280E	WS57	WMB05
30	<b>V29M28T3016</b>	940	409	280E	WS58	WMB05
45	<b>V29M28T4516</b>	940	416	280E	WS58	WMB05
75	<b>V29M28T7516</b>	942	602	280E	WS59	WMB04
112.5	<b>V29R28T1216</b>	943	976	324A	WS60	WMB04
150	<b>V29R28T4916</b>	943	1239	324A	WS60	WMB04
225	<b>V29R28T2216</b>	944	1624	289D	WS61	—
300	<b>V29R28T3316</b>	945	2283	289D	WS62	—
500	<b>V29E28T5516</b>	③	③	③	—	—
750	<b>V29N28T7716</b>	③	③	③	—	—
1000	<b>V29N28T1116</b>	③	③	③	—	—

① Frame drawings on page 14 and page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**Aluminum wound, three-phase**

**Table 6. 208 delta primary volts, 480Y/277 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	V29M47T1516	939	229	E0342B	WS57	WMB05
30	V29M47T3016	940	407	E0342B	WS58	WMB05
45	V29M47T4516	940	438	E0342B	WS58	WMB05
75	V29M47T7516	942	505	E0342B	WS59	WMB04
112.5	V29R47T1216	943	973	E0351A	WS60	WMB04
150	V29R47T4916	943	1233	E0351A	WS60	WMB04
225	V29R47T2216	944	1624	E0351A	WS61	—
300	V29R47T3316	945	2083	E0351A	WS62	—
500	V29E47T5516	③	③	③	—	—
750	V29E47T7716	③	③	③	—	—
1000	V29E47T1116	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**Table 7. 480 delta primary volts, 208Y/120 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	V48M28T1516	FR939	236	280B	WS57	WMB05
30	V48M28T3016	FR940	418	280B	WS58	WMB05
45	V48M28T4516	FR940	450	280B	WS58	WMB05
75	V48M28T7516	FR942	626	280B	WS59	WMB04
112.5	V48M28T1216	FR943	999	280B	WS60	WMB04
150	V48M28T4916	FR943	1257	280B	WS60	WMB04
225	V48M28T2216	FR944	1655	280B	WS61	—
300	V48M28T3316	FR945	2222	280B	WS62	—
500	V48M28T5516	③	③	③	—	—
750	V48M28T7716	③	③	③	—	—
1000	V48D28T1116	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**Table 8. 480 delta primary volts, 240 delta with 120 V center tap secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	V48M22T1516	FR939	230	282B	WS57	WMB05
30	V48M22T3016	FR940	399	282B	WS58	WMB05
45	V48M22T4516	FR940	437	282B	WS58	WMB05
75	V48M22T7516	FR942	593	282B	WS59	WMB04
112.5	V48M22T1216	FR943	972	282B	WS60	WMB04
150	V48M22T4916	FR943	1232	282B	WS60	WMB04
225	V48M22T2216	FR944	1679	282B	WS61	—
300	V48M22T3316	FR945	2200	282B	WS62	—
500	V48M22T5516	③	③	③	—	—
750	V48M22T7716	③	③	③	—	—
1000	V48D22T1116	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**Aluminum wound, three-phase**

**Table 9. 480 delta primary volts, 480Y/277 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	V48M47T1516	FR939	208	280B	WS57	WMB05
30	V48M47T3016	FR940	395	280B	WS58	WMB05
45	V48M47T4516	FR940	436	280B	WS58	WMB05
75	V48M47T7516	FR942	576	280B	WS59	WMB04
112.5	V48M47T1216	FR943	976	280B	WS60	WMB04
150	V48M47T4916	FR943	1241	280B	WS60	WMB04
225	V48M47T2216	FR944	1630	280B	WS61	—
300	V48M47T3316	FR945	2294	280B	WS62	—
500	V48M47T5516	③	③	③	—	—
750	V48M47T7716	③	③	③	—	—
1000	V48D47T1116	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**Copper wound, three-phase**

**Table 10. 208 delta primary volts, 208Y/120 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	V29M28T1516CU	939	250	280E	WS57	WMB05
30	V29M28T3016CU	940	415	280E	WS58	WMB05
45	V29M28T4516CU	940	478	280E	WS58	WMB05
75	V29M28T7516CU	942	678	280E	WS59	WMB04
112.5	V29R28T1216CU	943	1263	324A	WS60	WMB04
150	V29R28T4916CU	943	1410	324A	WS60	WMB04
225	V29R28T2216CU	944	1760	289D	WS61	—
300	V29R28T3316CU	945	2361	289D	WS62	—
500	V29E28T5516CU	③	③	③	—	—
750	V29N28T7716CU	③	③	③	—	—
1000	V29N28T1116CU	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**Table 11. 208 delta primary volts, 480Y/277 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	V29M47T1516CU	939	254	E0342B	WS57	WMB05
30	V29M47T3016CU	940	427	E0342B	WS58	WMB05
45	V29M47T4516CU	940	503	E0342B	WS58	WMB05
75	V29M47T7516CU	942	570	E0342B	WS59	WMB04
112.5	V29R47T1216CU	943	1255	E0351A	WS60	WMB04
150	V29R47T4916CU	943	1406	E0351A	WS60	WMB04
225	V29E47T2216CU	③	③	③	—	—
300	V29E47T3316CU	③	③	③	—	—
500	V29E47T5516CU	③	③	③	—	—
750	V29E47T7716CU	③	③	③	—	—
1000	V29E47T1116CU	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.



**Copper wound, three-phase**

**Table 12. 480 delta primary volts, 208Y/120 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	V48M28T1516CU	FR939	262	280B	WS57	WMB05
30	V48M28T3016CU	FR940	415	280B	WS58	WMB05
45	V48M28T4516CU	FR940	478	280B	WS58	WMB05
75	V48M28T7516CU	FR942	676	280B	WS59	WMB04
112.5	V48M28T1216CU	FR943	1289	280B	WS60	WMB04
150	V48M28T4916CU	FR943	1432	280B	WS60	WMB04
225	V48M28T2216CU	FR944	1787	280B	WS61	—
300	V48M28T3316CU	FR945	2289	280B	WS62	—
500	V48M28T5516CU	③	③	③	—	—
750	V48M28T7716CU	③	③	③	—	—
1000	V48D28T1116CU	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**Table 13. 480 delta primary volts, 240 delta with 120 V center tap secondary volts, 150 °C temperature rise, 60 H**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	V48M22T1516CU	FR939	255	282B	WS57	WMB05
30	V48M22T3016CU	FR940	419	282B	WS58	WMB05
45	V48M22T4516CU	FR940	463	282B	WS58	WMB05
75	V48M22T7516CU	FR942	640	282B	WS59	WMB04
112.5	V48M22T1216CU	FR943	1254	282B	WS60	WMB04
150	V48M22T4916CU	FR943	1404	282B	WS60	WMB04
225	V48M22T2216CU	FR944	1813	282B	WS61	—
300	V48M22T3316CU	FR945	2266	282B	WS62	—
500	V48M22T5516CU	③	③	③	—	—
750	V48M22T7716CU	③	③	③	—	—
1000	V48D22T1116CU	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**Table 14. 480 delta primary volts, 480Y/277 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	V48M47T1516CU	FR939	231	280B	WS57	WMB05
30	V48M47T3016CU	FR940	415	280B	WS58	WMB05
45	V48M47T4516CU	FR940	457	280B	WS58	WMB05
75	V48M47T7516CU	FR942	673	280B	WS59	WMB04
112.5	V48M47T1216CU	FR943	1260	280B	WS60	WMB04
150	V48M47T4916CU	FR943	1415	280B	WS60	WMB04
225	V48M47T2216CU	FR944	1760	280B	WS61	—
300	V48M47T3316CU	FR945	2363	280B	WS62	—
500	V48M47T5516CU	③	③	③	—	—
750	V48M47T7716CU	③	③	③	—	—
1000	V48D47T1116CU	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**K-factor 4, aluminum wound, three-phase**

**Table 15. 480 delta primary volts, 208Y/120 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	H48M28T1516	FR940	407	283B	WS58	WMB05
30	H48M28T3016	FR940	437	283B	WS58	WMB05
45	H48M28T4516	FR940	439	283B	WS58	WMB05
75	H48M28T7516	FR942	599	283B	WS59	WMB04
112.5	H48M28T1216	FR943	987	283B	WS60	WMB04
150	H48M28T4916	FR944	1637	283B	—	—
225	H48M28T2216	FR944	1642	283B	—	—
300	H48M28T3316	FR945	2394	283B	—	—
500	H48M28T5516	③	③	③	—	—
750	H48M28T7716	③	③	③	—	—
1000	H48D28T1116	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**Table 16. 480 delta primary volts, 240 delta with 120 V center tap secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	H48M22T1516	FR940	407	284B	WS58	WMB05
30	H48M22T3016	FR940	437	284B	WS58	WMB05
45	H48M22T4516	FR940	439	284B	WS58	WMB05
75	H48M22T7516	FR942	599	284B	WS59	WMB04
112.5	H48M22T1216	FR943	987	284B	WS60	WMB04
150	H48M22T4916	FR944	1637	284B	—	—
225	H48M22T2216	FR944	1642	284B	—	—
300	H48M22T3316	FR945	2394	284B	—	—
500	H48M22T5516	③	③	③	—	—
750	H48M22T7716	③	③	③	—	—
1000	H48D22T1116	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**Table 17. 480 delta primary volts, 480Y/277 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	H48M47T1516	FR940	407	283B	WS58	WMB05
30	H48M47T3016	FR940	437	283B	WS58	WMB05
45	H48M47T4516	FR940	439	283B	WS58	WMB05
75	H48M47T7516	FR942	599	283B	WS59	WMB04
112.5	H48M47T1216	FR943	987	283B	WS60	WMB04
150	H48M47T4916	FR944	1637	283B	—	—
225	H48M47T2216	FR944	1642	283B	—	—
300	H48M47T3316	FR945	2394	283B	—	—
500	H48M47T5516	③	③	③	—	—
750	H48M47T7716	③	③	③	—	—
1000	H48D47T1116	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**K-factor 4, copper wound, three-phase**

**Table 18. 480 delta primary volts, 208Y/120 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	H48M28T1516CU	FR940	418	283B	WS58	WMB05
30	H48M28T3016CU	FR940	458	283B	WS58	WMB05
45	H48M28T4516CU	FR942	677	283B	WS59	WMB04
75	H48M28T7516CU	FR943	1274	283B	WS60	WMB04
112.5	H48M28T1216CU	FR943	1818	283B	WS60	WMB04
150	H48M28T4916CU	FR944	1883	283B	—	—
225	H48M28T2216CU	FR945	2674	283B	—	—
300	H48M28T3316CU	FR945	2845	283B	—	—
500	H48M28T5516CU	③	③	③	—	—
750	H48M28T7716CU	③	③	③	—	—
1000	H48D28T1116CU	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**Table 19. 480 delta primary volts, 240 delta with 120 V center tap secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	H48M22T1516CU	FR940	418	284B	WS58	WMB05
30	H48M22T3016CU	FR940	458	284B	WS58	WMB05
45	H48M22T4516CU	FR942	677	284B	WS59	WMB04
75	H48M22T7516CU	FR943	1274	284B	WS60	WMB04
112.5	H48M22T1216CU	FR943	1818	284B	WS60	WMB04
150	H48M22T4916CU	FR944	1883	284B	—	—
225	H48M22T2216CU	FR945	2674	284B	—	—
300	H48M22T3316CU	FR945	2845	284B	—	—
500	H48M22T5516CU	③	③	③	—	—
750	H48M22T7716CU	③	③	③	—	—
1000	H48D22T1116CU	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**Table 20. 480 delta primary volts, 480Y/277 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	H48M47T1516CU	FR940	418	283B	WS58	WMB05
30	H48M47T3016CU	FR940	458	283B	WS58	WMB05
45	H48M47T4516CU	FR940	485	283B	WS58	WMB05
75	H48M47T7516CU	FR942	1274	283B	WS59	WMB04
112.5	H48M47T1216CU	FR943	1448	283B	WS60	WMB04
150	H48M47T4916CU	FR944	1883	283B	—	—
225	H48M47T2216CU	FR945	2641	283B	—	—
300	H48M47T3316CU	FR945	2845	283B	—	—
500	H48M47T5516CU	③	③	③	—	—
750	H48M47T7716CU	③	③	③	—	—
1000	H48D47T1116CU	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**K-factor 13, aluminum wound, three-phase**

**Table 21. 480 delta primary volts, 208Y/120 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	<b>N48M28T1516</b>	FR940	412	283B	WS58	WMB05
30	<b>N48M28T3016</b>	FR940	416	283B	WS58	WMB05
45	<b>N48M28T4516</b>	FR942	594	283B	WS59	WMB04
75	<b>N48M28T7516</b>	FR943	1012	283B	WS60	WMB04
112.5	<b>N48M28T1216</b>	FR943	1297	283B	WS60	WMB04
150	<b>N48M28T4916</b>	FR944	1425	283B	—	—
225	<b>N48M28T2216</b>	FR945	2341	283B	—	—
300	<b>N48M28T3316</b>	③	③	③	—	—
500	<b>N48M28T5516</b>	③	③	③	—	—
750	<b>N48M28T7716</b>	③	③	③	—	—
1000	<b>N48D28T1116</b>	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**Table 22. 480 delta primary volts, 240 delta with 120 V center tap secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	<b>N48M22T1516</b>	FR940	412	284B	WS58	WMB05
30	<b>N48M22T3016</b>	FR940	416	284B	WS58	WMB05
45	<b>N48M22T4516</b>	FR942	594	284B	WS59	WMB04
75	<b>N48M22T7516</b>	FR943	1012	284B	WS60	WMB04
112.5	<b>N48M22T1216</b>	FR943	1297	284B	WS60	WMB04
150	<b>N48M22T4916</b>	FR944	1425	284B	—	—
225	<b>N48M22T2216</b>	FR945	2341	284B	—	—
300	<b>N48M22T3316</b>	③	③	③	—	—
500	<b>N48M22T5516</b>	③	③	③	—	—
750	<b>N48M22T7716</b>	③	③	③	—	—
1000	<b>N48D22T1116</b>	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**Table 23. 480 delta primary volts, 480Y/277 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	<b>N48M47T1516</b>	FR940	412	283B	WS58	WMB05
30	<b>N48M47T3016</b>	FR940	416	283B	WS58	WMB05
45	<b>N48M47T4516</b>	FR940	594	283B	WS58	WMB05
75	<b>N48M47T7516</b>	FR942	1012	283B	WS59	WMB04
112.5	<b>N48M47T1216</b>	FR943	1297	283B	WS60	WMB04
150	<b>N48M47T4916</b>	FR944	1425	283B	—	—
225	<b>N48M47T2216</b>	FR944	2341	283B	—	—
300	<b>N48M47T3316</b>	③	③	③	—	—
500	<b>N48M47T5516</b>	③	③	③	—	—
750	<b>N48M47T7716</b>	③	③	③	—	—
1000	<b>N48D47T1116</b>	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**K-factor 13, copper wound, three-phase**

**Table 24. 480 delta primary volts, 208Y/120 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	<b>N48M28T1516CU</b>	FR940	420	283B	WS58	WMB05
30	<b>N48M28T3016CU</b>	FR940	480	283B	WS58	WMB05
45	<b>N48M28T4516CU</b>	FR942	658	283B	WS59	WMB04
75	<b>N48M28T7516CU</b>	FR943	1115	283B	WS60	WMB04
112.5	<b>N48M28T1216CU</b>	FR943	1500	283B	WS60	WMB04
150	<b>N48M28T4916CU</b>	FR944	2132	283B	—	—
225	<b>N48M28T2216CU</b>	FR945	2628	283B	—	—
300	<b>N48M28T3316CU</b>	③	③	③	—	—
500	<b>N48M28T5516CU</b>	③	③	③	—	—
750	<b>N48M28T7716CU</b>	③	③	③	—	—
1000	<b>N48D28T1116CU</b>	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**Table 25. 480 delta primary volts, 240 delta with 120 V center tap secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	<b>N48M22T1516CU</b>	FR940	420	284B	WS58	WMB05
30	<b>N48M22T3016CU</b>	FR940	480	284B	WS58	WMB05
45	<b>N48M22T4516CU</b>	FR942	658	284B	WS59	WMB04
75	<b>N48M22T7516CU</b>	FR943	1115	284B	WS60	WMB04
112.5	<b>N48M22T1216CU</b>	FR943	1500	284B	WS60	WMB04
150	<b>N48M22T4916CU</b>	FR944	2132	284B	—	—
225	<b>N48M22T2216CU</b>	FR945	2628	284B	—	—
300	<b>N48M22T3316CU</b>	③	③	③	—	—
500	<b>N48M22T5516CU</b>	③	③	③	—	—
750	<b>N48M22T7716CU</b>	③	③	③	—	—
1000	<b>N48D22T1116CU</b>	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

**Table 26. 480 delta primary volts, 480Y/277 secondary volts, 150 °C temperature rise, 60 Hz**

kVA	Catalog number	Frame ①	Weight (lb)	Wiring diagram ②	Type 3R WS	Wallmount bracket
15	<b>N48M47T1516CU</b>	FR940	420	283B	WS58	WMB05
30	<b>N48M47T3016CU</b>	FR940	480	283B	WS58	WMB05
45	<b>N48M47T4516CU</b>	FR942	658	283B	WS59	WMB04
75	<b>N48M47T7516CU</b>	FR943	1115	283B	WS60	WMB04
112.5	<b>N48M47T1216CU</b>	FR943	1500	283B	WS60	WMB04
150	<b>N48M47T4916CU</b>	FR944	2741	283B	—	—
225	<b>N48M47T2216CU</b>	FR945	3100	283B	—	—
300	<b>N48M47T3316CU</b>	③	③	③	—	—
500	<b>N48M47T5516CU</b>	③	③	③	—	—
750	<b>N48M47T7716CU</b>	③	③	③	—	—
1000	<b>N48D47T1116CU</b>	③	③	③	—	—

① Frame drawings on page 15.

② Wiring diagrams on page 16 through page 20.

③ Contact local Eaton representative.

### Enclosure drawings

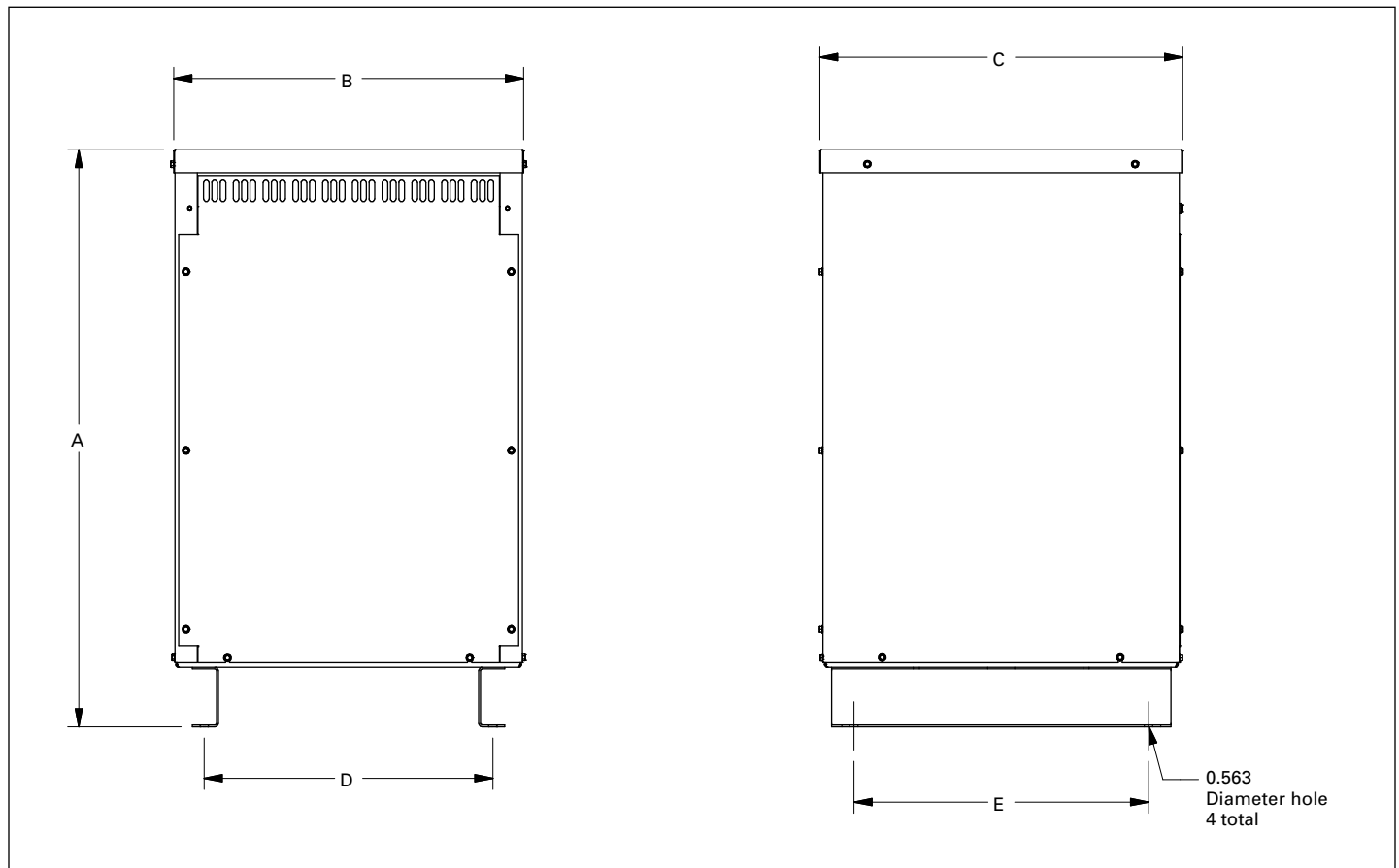


Figure 1. Single-phase enclosures—dimensions in inches (mm)

Frame	A	B	C	D	E
FR842	33.75 (857)	22.45 (570)	17.40 (442)	18.56 (471)	12.76 (324)
FR843	38.70 (983)	23.51 (597)	24.38 (619)	19.39 (493)	19.80 (503)
FR844	44.92 (1141)	26.27 (667)	27.12 (689)	23.21 (590)	22.50 (572)
FR814	62.91 (1598)	29.97 (761)	33.97 (863)	28.00 (711)	26.50 (673)
FR816	31.30 (795)	22.89 (579)	18.39 (467)	20.87 (530)	12.00 (304)

Frame	A	B	C	D	E
FR818	37.59 (955)	22.87 (581)	20.36 (517)	20.91 (531)	14.00 (355)
FR819	42.03 (1068)	24.22 (615)	23.84 (606)	22.35 (567)	19.20 (487)
FR820	42.02 (1067)	24.22 (615)	23.84 (606)	22.25 (565)	18.82 (478)
FR821	62.88 (1597)	29.97 (761)	33.97 (863)	28.00 (711)	26.50 (673)
FR814E	62.91 (1598)	29.97 (761)	33.97 (863)	28.00 (711)	26.50 (673)

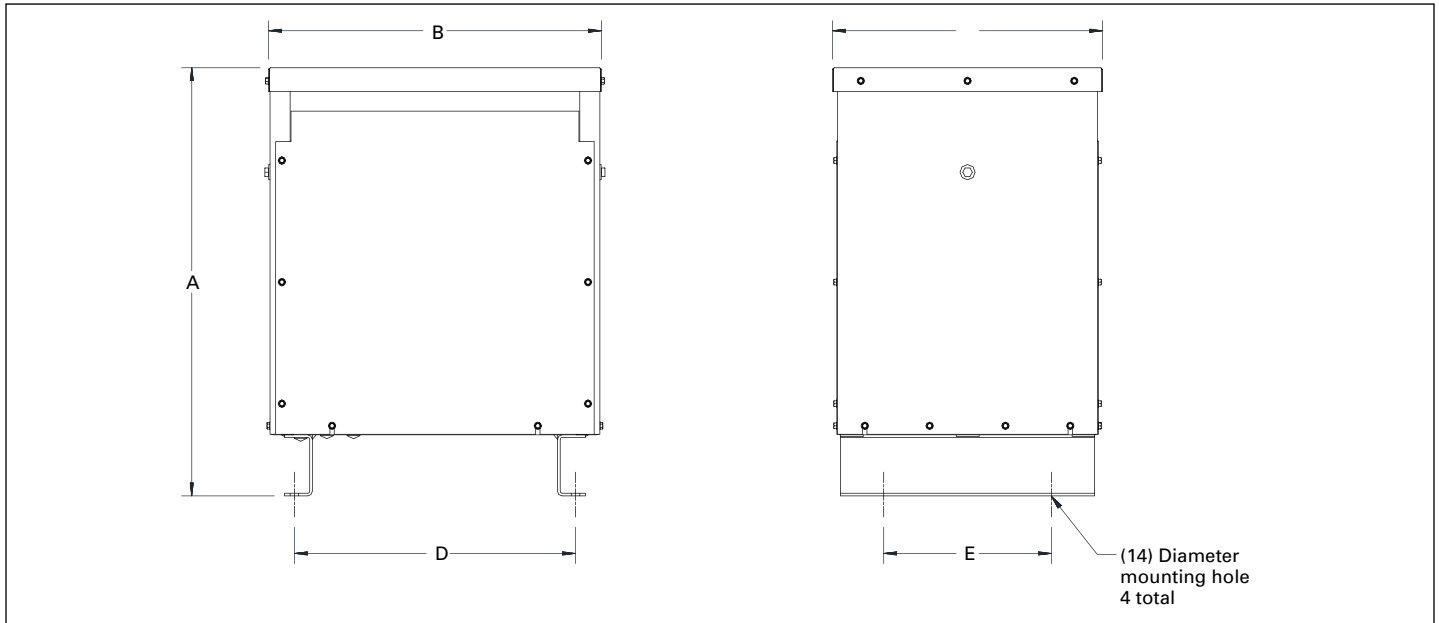


Figure 2. Three-phase enclosure FR939—dimensions in inches (mm)

Frame	A	B	C	D	E
FR939	28.00 (711)	21.88 (556)	17.75 (451)	18.44 (468)	11.00 (279)

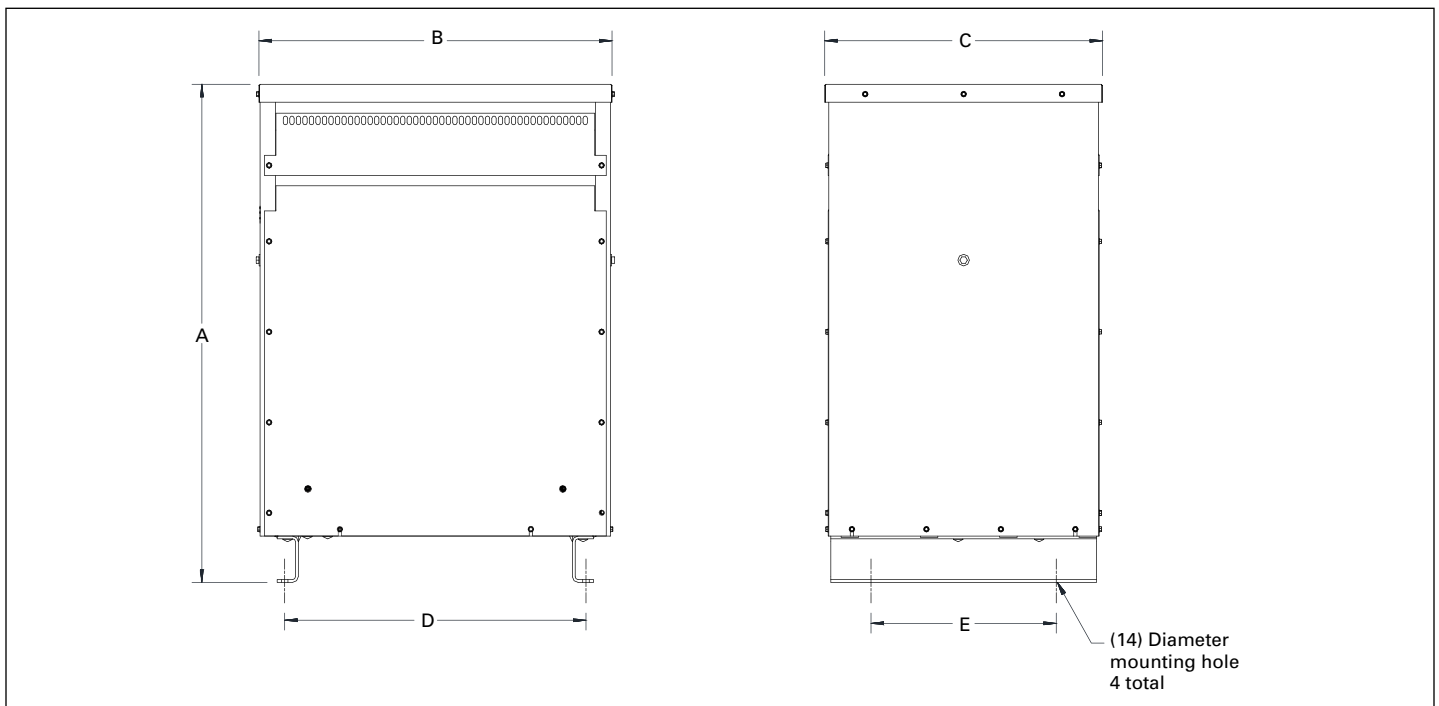
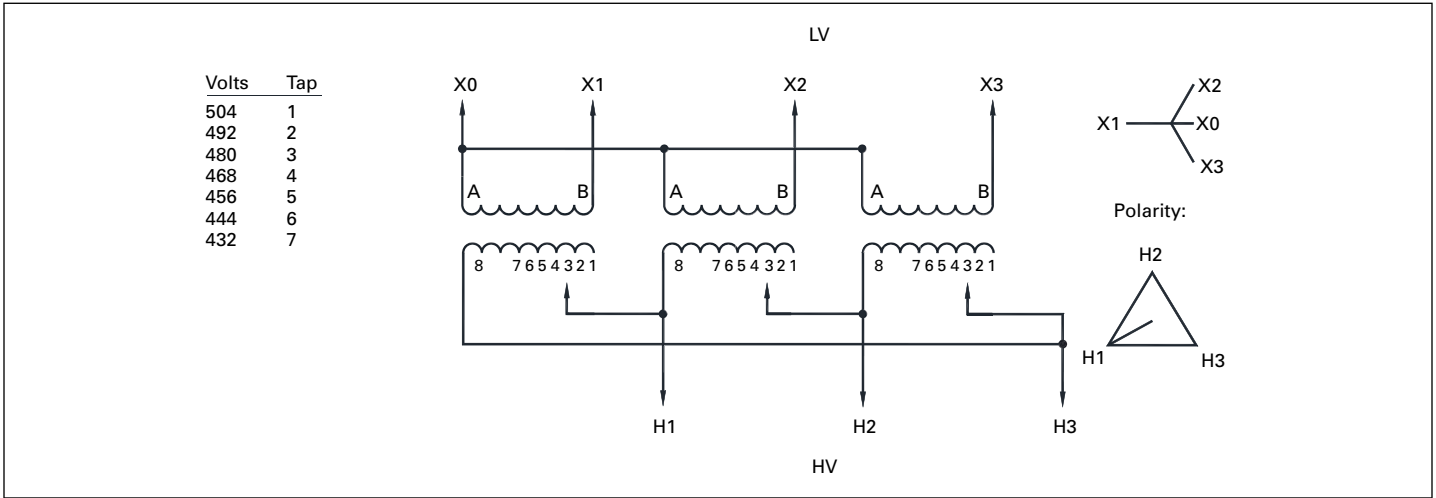


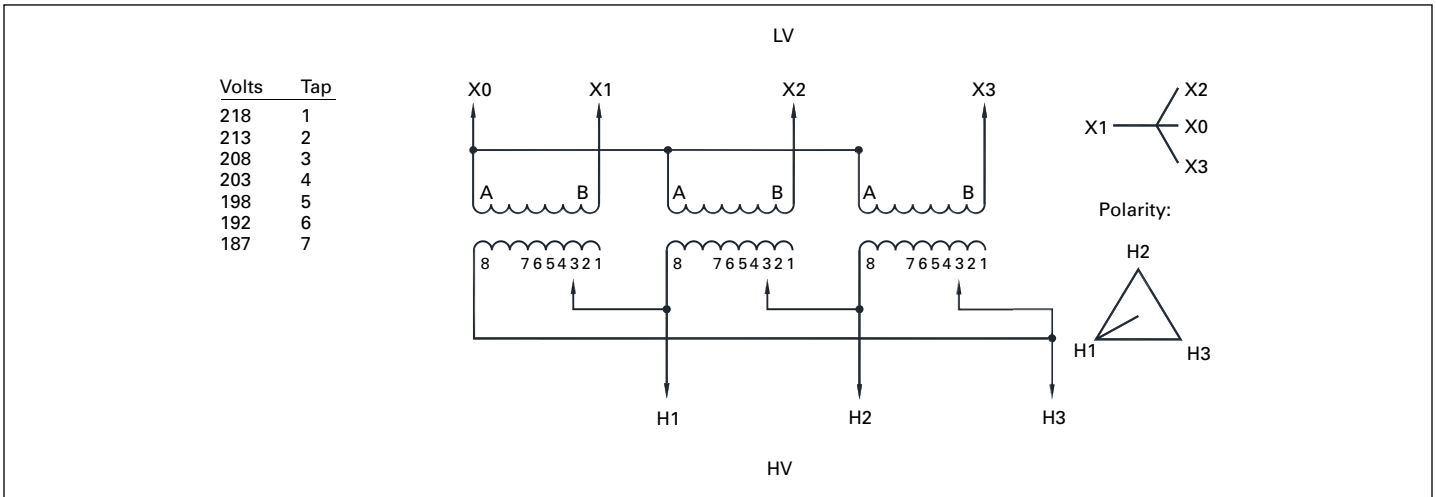
Figure 3. Three-phase enclosures FR940 to FR945—dimensions in inches (mm)

Frame	A	B	C	D	E
FR940	36.88 (937)	24.88 (6320)	21.13 (537)	21.44 (545)	11.00 (279)
FR942	43.00 (1092)	30.50 (775)	24.00 (610)	26.03 (661)	16.00 (406)
FR943	51.00 (1295)	34.50 (876)	31.50 (800)	31.19 (792)	18.82 (478)
FR944	60.00 (1524)	38.00 (965)	33.70 (856)	33.83 (859)	24.88 (632)
FR945	66.18 (1681)	42.18 (1071)	33.50 (851)	35.39 (899)	24.88 (632)

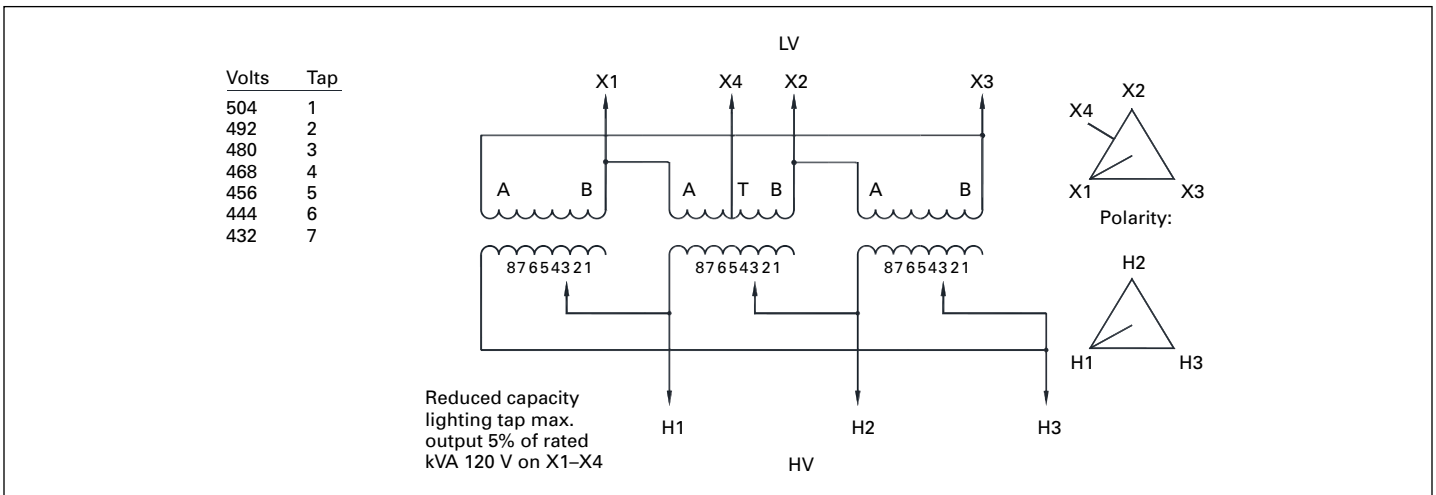
**Wiring diagrams**



**Figure 4. 280B**



**Figure 5. 280E**



**Figure 6. 282B**



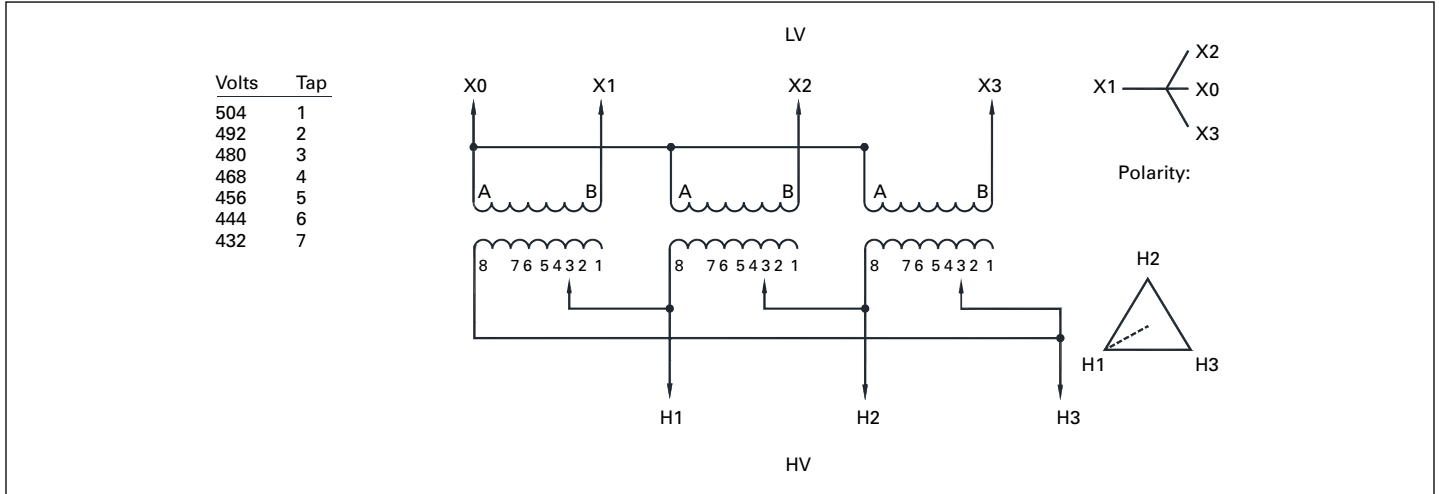


Figure 7. 283B

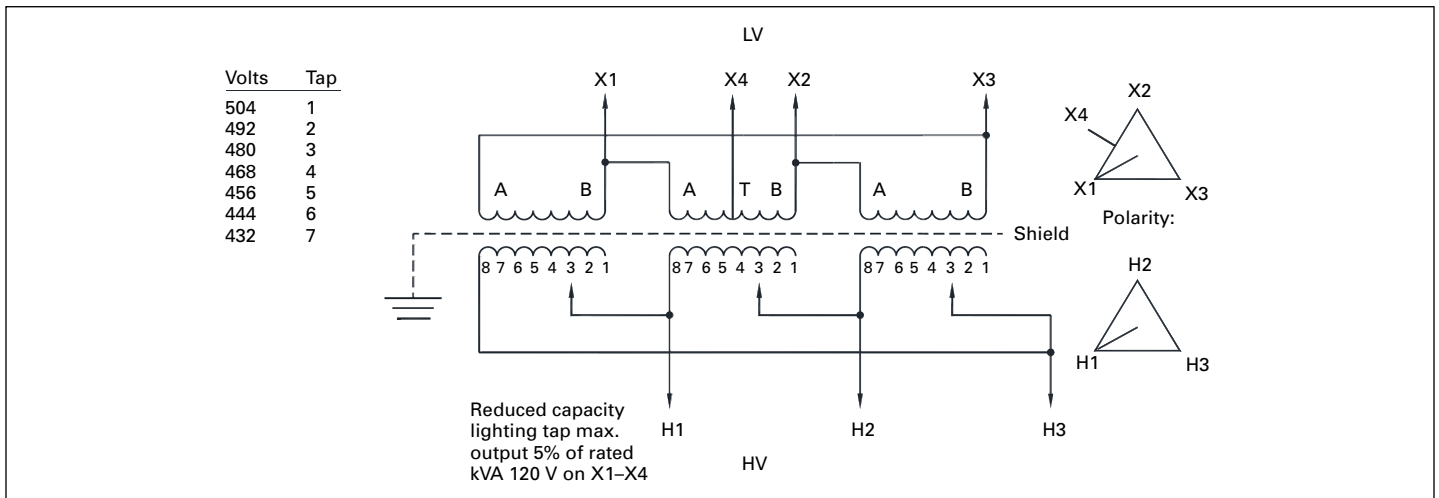


Figure 8. 284B

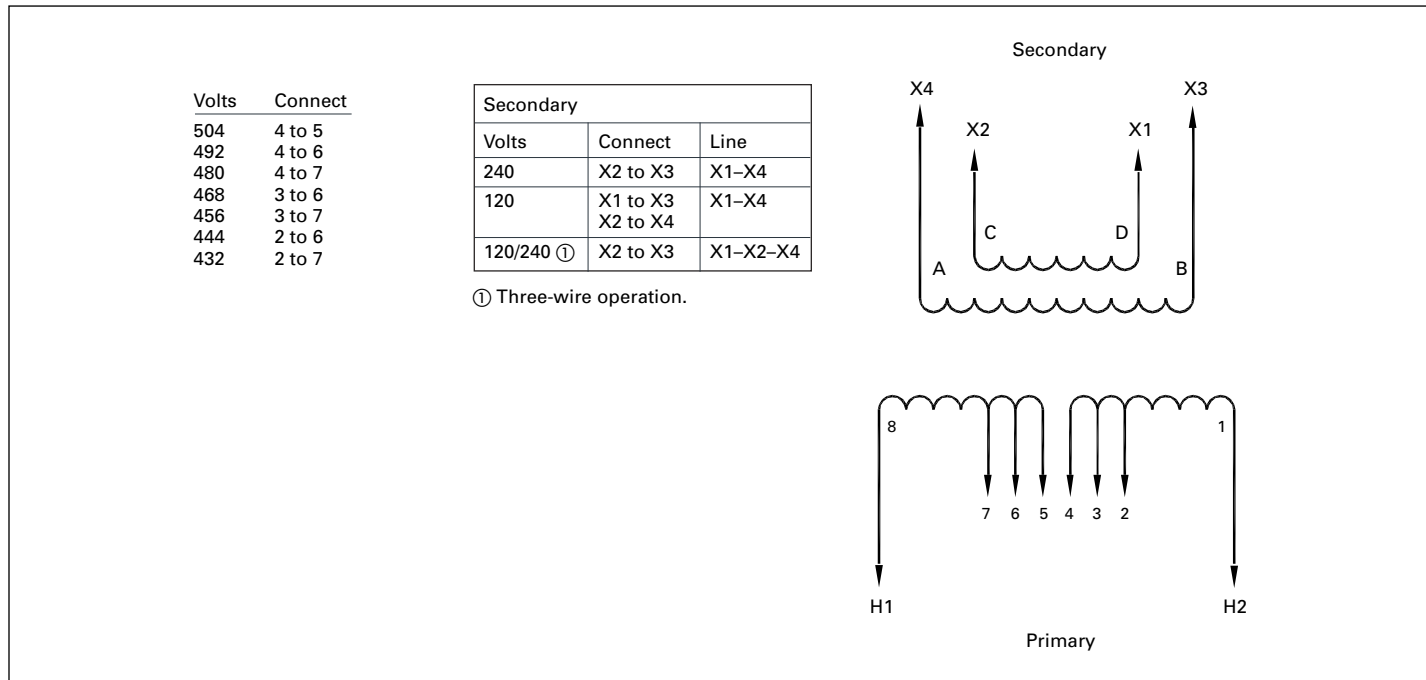


Figure 9. 288A

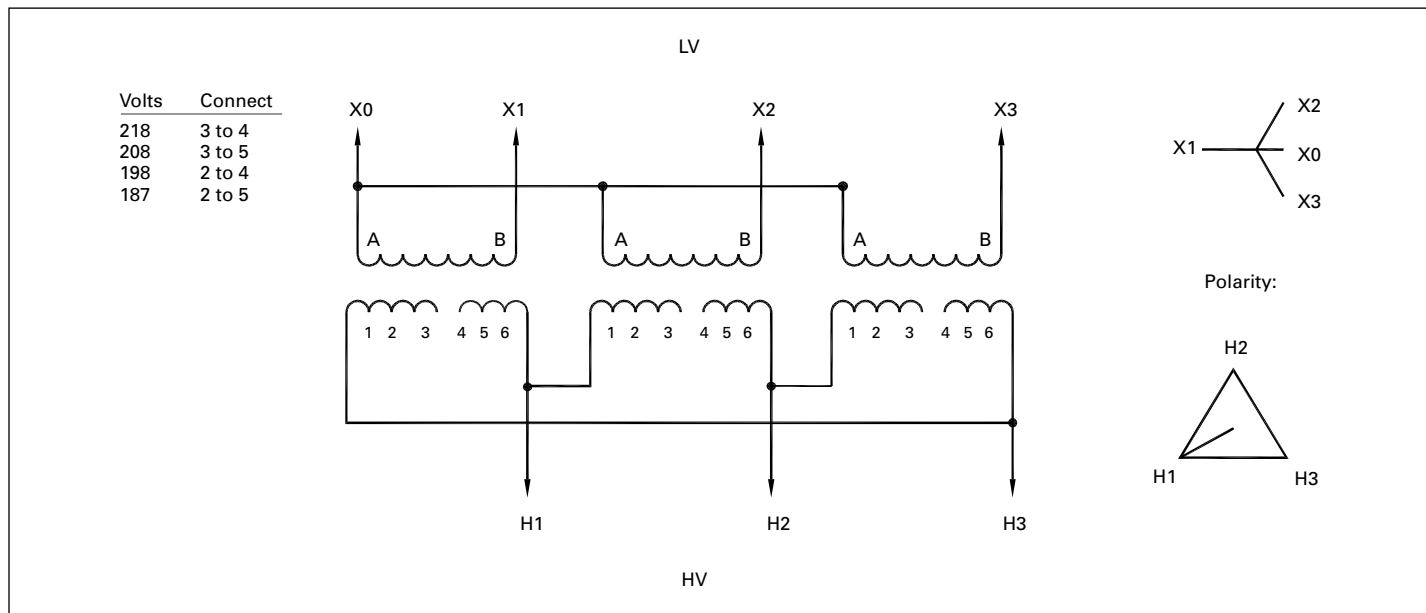


Figure 10. 289D

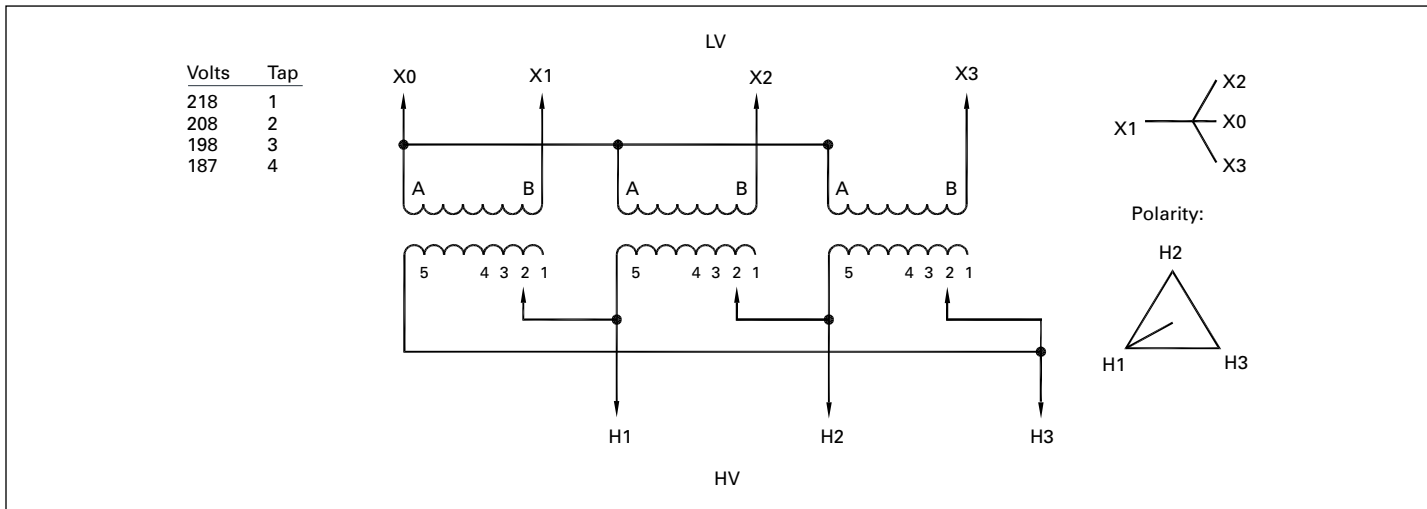


Figure 11. 324A

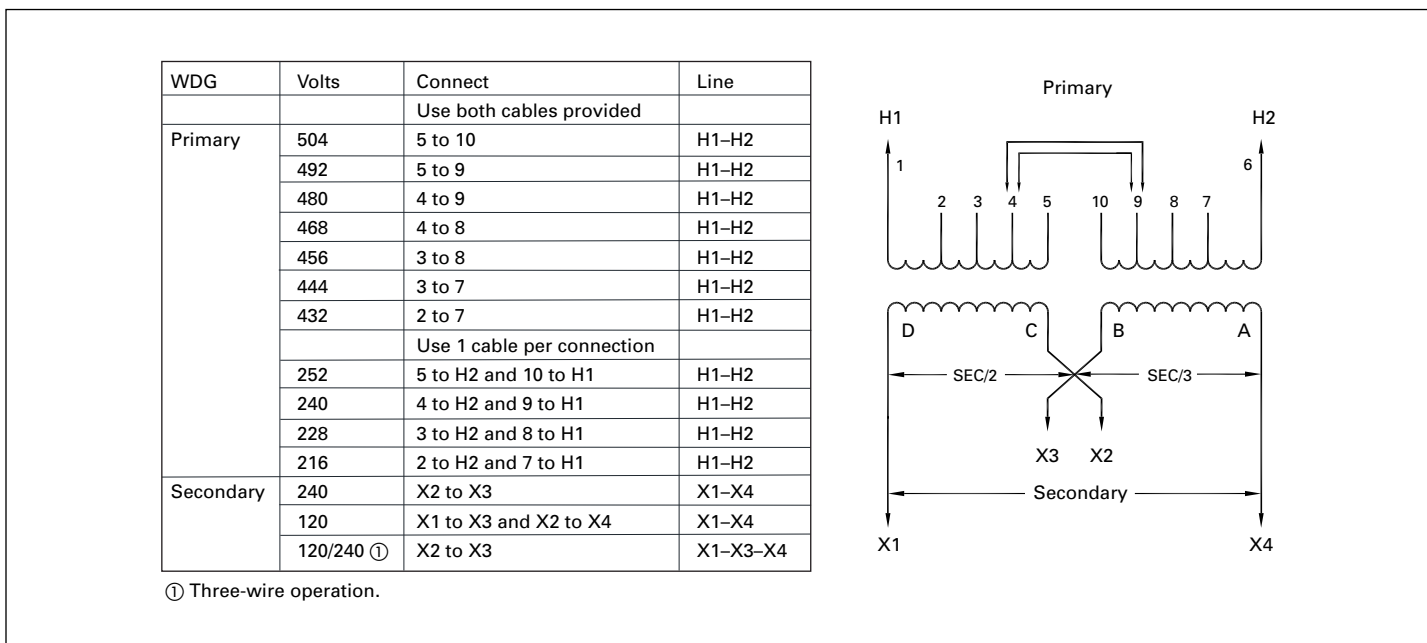


Figure 12. 3XA

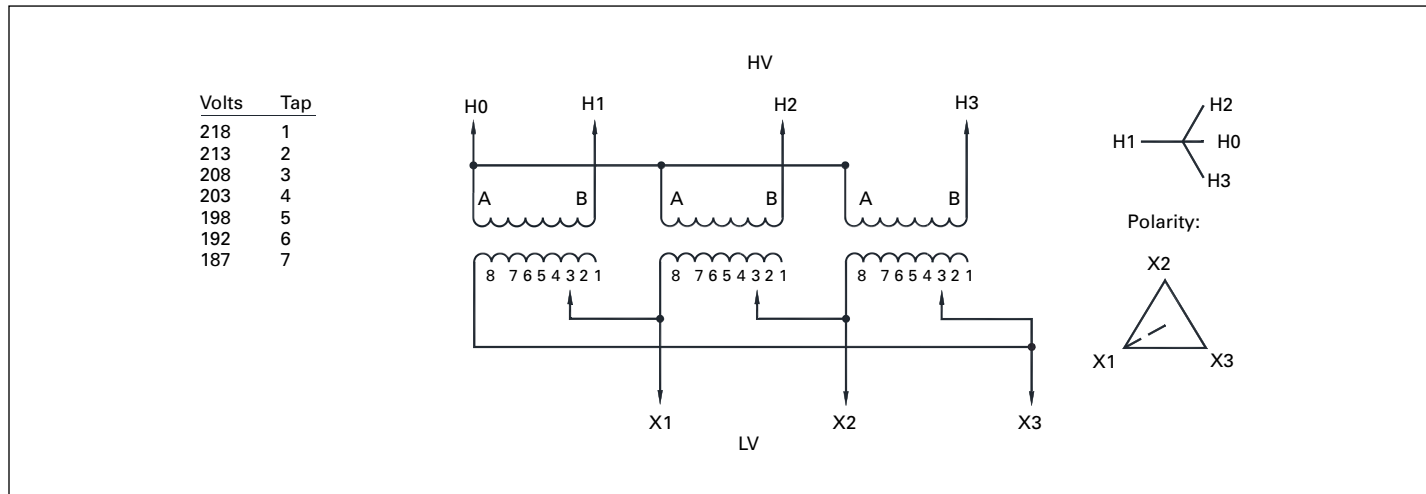


Figure 13. E0342B

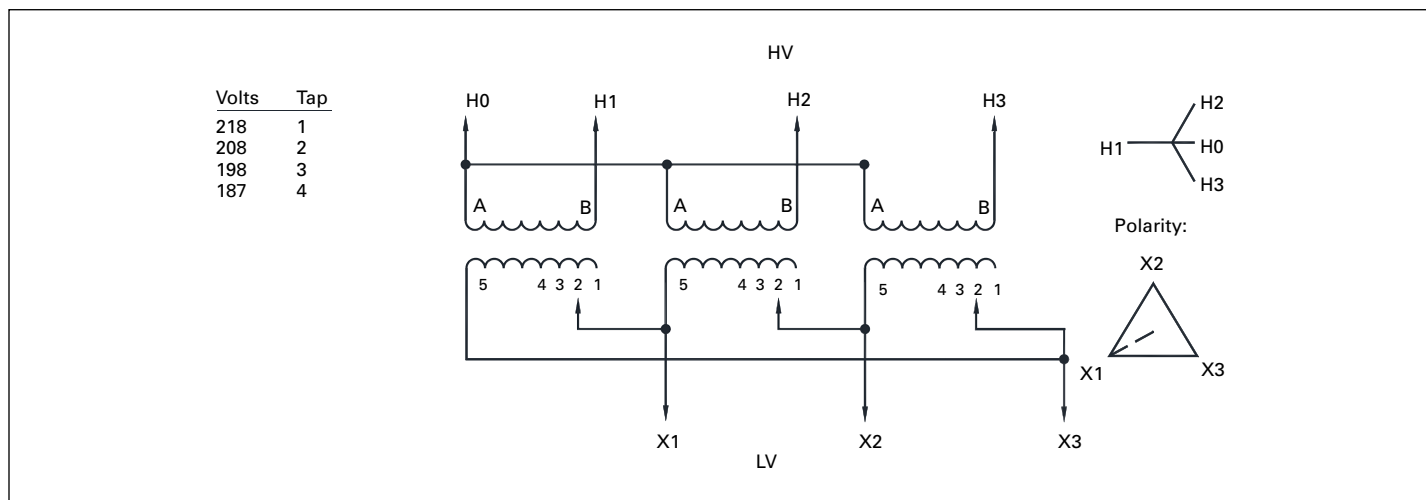


Figure 14. E0351A

**Eaton**  
 1000 Eaton Boulevard  
 Cleveland, OH 44122  
 United States  
 Eaton.com

© 2016 Eaton  
 All Rights Reserved  
 Printed in USA  
 Publication No. MZ009002EN / Z18308  
 July 2016



Eaton is a registered trademark.

All other trademarks are property of their respective owners.

The Eaton logo consists of the word "EATON" in a bold, blue, sans-serif font. The letter "O" is stylized as a white circle with a blue dot in the center, creating a visual effect of a power symbol or a stylized letter.

*Powering Business Worldwide*

**Type EP and EPT****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 NEMA 3R rated
- 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 ANSI
- 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, ANSI 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.

## Accessories

Please refer to Section 2.7 **Page V2-T2-167**.

## 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 ANSI. 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 ANSI C57.96-01.250 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 transformers, 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-T2-171**.

### 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.

## 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 ANSI. 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 ANSI C57.96-01.250 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 transformers—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—Types EP, EPT, EPZ and EPTZ—and totally enclosed, non-ventilated (Types DS-3E and DT-3E) transformers 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

### 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

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.



### Typical Specifications— General-Purpose (1000 kVA and Below)

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 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 ANSI, 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 ANSI C57.96.

#### 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. BIL (basic impulse level) 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 ANSI and NEMA levels for self-cooled ratings measured in accordance with NEMA ST-20.

The Eaton logo consists of the word "EATON" in a bold, blue, sans-serif font. The letter "O" is stylized as a white circle with a blue dot in the center, creating a visual effect of a power symbol or a stylized letter.

*Powering Business Worldwide*

Mini-Power Centers



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.

- Encapsulated design
- Suitable for indoor or outdoor applications
- 180°C insulation system
- 115°C rise standard; 80°C rise optional

Application Description

A mini-power center combines three individual components into one NEMA Type 3R enclosure: a main breaker, an encapsulated single-phase (Type EP) or three-phase (EPT) dry-type transformer, and a secondary distribution loadcenter with main breaker. Interconnecting wiring is completed at the factory. Mini-power centers are used wherever there is a 480 volt or 600 volt distribution system and loads requiring 208Y/120 volt, three-phase or 120/240 volt 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
- Mini-power centers are encapsulated transformers and are outside the scope of U.S. DOE energy efficiency requirements

Features, Benefits and Functions

- 60 Hz operation
- Indoor/outdoor, NEMA 3R
- Primary main breaker
- Secondary main breaker (Type BR plug-in and Type BAB bolt-on branch breakers not included)
- 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 BR plug-in 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 also available
  - Copper windings and bolt-on loadcenter chassis available

- Short-term overload capability as required by ANSI
- 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, ANSI 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-T2-162**.

2

**Product Selection**Additional Product Selection information begins on **Page V2-T2-165**.**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 <sup>(2)(3)</sup>			Max. Amp	Catalog Number
					Primary <sup>(1)</sup>	Secondary	Single-Pole	Two-Pole			
3	2 at -5%	FR283	97A3K	105 (47)	EHD2015	BR215	8	4		12	P48G11S03P
5	2 at -5%	FR284	110A5K	110 (50)	EHD2020	BR225	12	6		20	P48G11S05P
7.5	2 at -5%	FR284	109A7K	125 (56)	EHD2030	BR230	12	6		30	P48G11S07P
10	2 at -5%	FR285	108A10K	180 (82)	EHD2040	BR250	12	6		40	P48G11S10P
15	2 at -5%	FR286	107A15K	215 (98)	EHD2060	BR270	20	10		60	P48G11S15P
25	2 at -5%	FR287	106A25K	373 (169)	EHD2100	BR2125	26	13		100	P48G11S25P

**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 <sup>(2)(3)</sup>			Max. Amp	Catalog Number
					Primary <sup>(1)</sup>	Secondary	Single-Pole	Two-Pole			
5	2 at -5%	FR284	110B5K	110 (50)	FDB2015	BR225	12	6		20	P60G11S05P
7.5	2 at -5%	FR284	109B7K	125 (56)	FDB2030	BR230	12	6		30	P60G11S07P
10	2 at -5%	FR285	108B10K	180 (82)	FDB2040	BR250	12	6		40	P60G11S10P
15	2 at -5%	FR286	107B15K	215 (98)	FDB2060	BR270	20	10		60	P60G11S15P
25	2 at -5%	FR287	106B25K	373 (169)	FDB2100	BR2125	26	13		100	P60G11S25P

**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 <sup>(2)(3)</sup>			Max. Amp	Catalog Number
					Primary	Secondary	Single-Pole	Two-Pole	Three-Pole		
15	2 at -5%	FR289A	105A15K	320 (145)	EHD3040	BR350	18	9	6	40	P48G28T15P
22.5	2 at -5%	FR290A	103A21K	565 (256)	EHD3070	BR370	18	9	6	60	P48G28T21P
30	2 at -5%	FR291A	104A30K	635 (288)	EHD3090	BR3100	24	12	8	80	P48G28T30P

**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 <sup>(2)(3)</sup>			Max. Amp	Catalog Number
					Primary	Secondary	Single-Pole	Two-Pole	Three-Pole		
15	2 at -5%	FR289A	105D15K	320 (145)	FDB3030	BR350	18	9	6	40	P60G28T15P
22.5	2 at -5%	FR290A	103B21K	565 (256)	FDB3050	BR370	18	9	6	60	P60G28T21P
30	2 at -5%	FR291A	104B30K	635 (288)	FDB3070	BR3100	24	12	8	80	P60G28T30P

**Notes**

- <sup>(1)</sup> Primary breakers with higher interrupting capacity available. For HFD breaker, add suffix "H." For FD breaker, add suffix "F." For FDC breaker, add suffix "C."  
Main breakers are fixed only.
- <sup>(2)</sup> Combinations can be selected.
- <sup>(3)</sup> Branch breakers not included. Use Eaton's Type BR.

For 304 grade stainless steel enclosure, replace 10th character of catalog number with an "SS" suffix, e.g., P48G11S03SS, or add "SS" suffix before the addition of "CUB."  
For 316 grade stainless steel enclosure, replace 10th character of catalog number with an "S6" suffix, e.g., P48G11S03S6, or add "S6" suffix before the addition of "CUB."  
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-T2-204**.

**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 <sup>②③</sup>			Max. Amp	Catalog Number
					Primary <sup>①</sup>	Secondary	Single-Pole	Two-Pole	Three-Pole		
3	2 at -5%	FR306	97A3K	105 (47)	EHD2015L	BAB2015	8	4		12	P48G11S03CUB
5	2 at -5%	FR307	110A5K	110 (50)	EHD2020L	BAB2025	12	6		20	P48G11S05CUB
7.5	2 at -5%	FR307	109A7K	110 (50)	EHD2030L	BAB2030	12	6		30	P48G11S07CUB
10	2 at -5%	FR308	108A10K	180 (82)	EHD2040L	BAB2050	12	6		40	P48G11S10CUB
15	2 at -5%	FR309	108A15K	215 (98)	EHD2060L	BAB2070	24	12		60	P48G11S15CUB
25	2 at -5%	FR310	106A25K	385 (175)	EHD2100L	BAB2125	26	13		100	P48G11S25CUB

**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 <sup>②③</sup>			Max. Amp	Catalog Number
					Primary <sup>①</sup>	Secondary	Single-Pole	Two-Pole	Three-Pole		
3	2 at -5%	FR306	97B3K	105 (47)	FDB2015L	BAB2015	8	4		12	P60G11S03CUB
5	2 at -5%	FR307	110B5K	110 (50)	FDB2020L	BAB2025	12	6		20	P60G11S05CUB
7.5	2 at -5%	FR307	109B7K	110 (50)	FDB2030L	BAB2030	12	6		30	P60G11S07CUB
10	2 at -5%	FR308	108B10K	180 (82)	FDB2040L	BAB2050	12	6		40	P60G11S10CUB
15	2 at -5%	FR309	108B15K	215 (98)	FDB2060L	BAB2070	24	12		60	P60G11S15CUB
25	2 at -5%	FR310	106B25K	385 (175)	FDB2100L	BAB2125	26	13		100	P60G11S25CUB

**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 <sup>②③</sup>			Max. Amp	Catalog Number
					Primary	Secondary	Single-Pole	Two-Pole	Three-Pole		
15	2 at -5%	FR289A	105A15K	320 (145)	EHD3040L	BAB3050H	18	9	6	40	P48G28T15CUB
22.5	2 at -5%	FR290A	103A21K	565 (257)	EHD3070L	BAB3070H	18	9	6	60	P48G28T21CUB
30	2 at -5%	FR291A	104A30K	635 (288)	EHD3090L	BAB3100H	24	12	8	80	P48G28T30CUB

**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 <sup>②③</sup>			Max. Amp	Catalog Number
					Primary	Secondary	Single-Pole	Two-Pole	Three-Pole		
15	2 at -5%	FR289A	105D15K	320 (145)	FDB3030L	BAB3050H	18	9	6	40	P60G28T15CUB
22.5	2 at -5%	FR290A	103B21K	565 (257)	FDB3050L	BAB3070H	18	9	6	60	P60G28T21CUB
30	2 at -5%	FR291A	104B30K	635 (288)	FDB3070L	BAB3100H	24	12	8	80	P60G28T30CUB

**Notes**

- ① Primary breakers with higher interrupting capacity available. For HFD breaker, add suffix "H." For FD breaker, add suffix "F." For FDC breaker, add suffix "C."  
Main breakers are fixed only. UL Listed only, not CSA.
- ② Combinations can be selected.
- ③ Branch breakers not included. Use Eaton's Type BAB.

For 304 grade stainless steel enclosure, replace 10th character of catalog number with an "SS" suffix, e.g., P48G11S03SS, or add "SS" suffix before the addition of "CUB."  
For 316 grade stainless steel enclosure, replace 10th character of catalog number with an "S6" suffix, e.g., P48G11S03S6, or add "S6" suffix before the addition of "CUB."  
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-T2-204**.

### Mini-Power Centers

#### Accessories

Please refer to Section 2.7  
Page V2-T2-167.

### Technical Data and Specifications

#### 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 ANSI. 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 ANSI C57.96-01.250 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	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. The following pages provide listings for most standard transformer ratings and styles. For all-copper and bolt-on-breaker designs, contact Eaton.

The Eaton logo consists of the word "EATON" in a bold, blue, sans-serif font. The letter "O" is stylized as a white circle with a blue dot in the center, creating a visual effect of a power symbol or a stylized letter.

*Powering Business Worldwide*

## Options and Accessories

(Order separately)

### 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	<b>WS11</b>
814, 814E	<b>WS13</b>
815	<b>WS15</b>
819, 820	<b>WS16</b>
808, 908, 909, 910, 911, 912, 910A, 911A, 912A	<b>WS31</b>
912B, 912Z, 912D	<b>WS38</b>
812, 813, 913A, 913B, 914A, 915A, 916, 914B, 915B	<b>WS33</b>
914D, 915D, 914F, 915F, 914Z, 915Z	<b>WS39</b>
916A, 916B, 912Z	<b>WS19</b>
917, 918, 918A	<b>WS34</b>
919, 920, 919E, 919EX, 920E, 920EX	<b>WS35</b>
922	<b>WS36</b>
923	<b>WS37</b>
842	<b>WS45</b>
842A	<b>WS45A</b>
843	<b>WS43</b>
843A	<b>WS43A</b>
844	<b>WS44</b>
844A	<b>WS44A</b>
939	<b>WS57</b>
940	<b>WS58</b>
942	<b>WS59</b>
943	<b>WS60</b>
944	<b>WS61</b>
945	<b>WS62</b>

### Terminal Extension Kit

A terminal extension kit is used to allow front access to the rear terminals on most 500 and 750 kVA transformers (transformers on frames 919 and 920) when insufficient space is available at the rear of the transformer. Eaton recommends a minimum 6-inch clearance from the wall to maintain proper ventilation.

#### Terminal Extension Kit

Fits Frame Size(s) ①	Bus Material	Catalog Number
919	Aluminum	<b>EXT55AL</b>
919	Copper	<b>EXT55CU</b>
920	Aluminum	<b>EXT77AL</b>
920	Copper	<b>EXT77CU</b>

### 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
<b>Type DS-3 (Single-Phase Compatible)</b>	
809, 810, 811, 812, 813, 815, 816, 817, 818, 835, 836, 837, 814A, 842	<b>WMB01</b>
<b>Type DT-3, K-Factor, Drive Isolation (Three-Phase Compatible)</b>	
908, 909, 910, 911, 912, 910A, 911A, 912A, 912B, 912D, 913A, 913B, 914A, 914B, 914D, 915D, 915A, 915B, 914F, 915F, 912Z, 914Z, 915Z	<b>WMB01</b>
842A, 939, 940	<b>WMB05</b>
843A, 844A, 942, 943	<b>WMB04</b>

#### Notes

- ① Effective June 1, 2001, frame numbers will 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	#14–#2	8	1/4-20 x 3/4	8	LKS1
15–45 kVA three-phase	#6–250 kcmil	4			
50–75 kVA single-phase	#6–250 kcmil	12	1/4-20 x 3/4	8	LKS2
75–112.5 kVA three-phase			1/4-20 x 1-3/4	8	
100–167 kVA single-phase	#6–250 kcmil	3	1/4-20 x 3/4	3	LKS3
150–300 kVA three-phase	#2–600 kcmil	22	3/8-16 x 2	16	
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 Effective June 1, 2001, frame numbers will have a prefix of FR, e.g., **FR819**. Dimensions, accessories and so on are still applicable as if the FR did not exist.