PIONEER
DRY-TYPE TRANSFORMERS

JEFFERSON
ELECTRIC

BEMAG
TRANSFORMER

Dry Type Transformers
Full Line Catalog

jeffersonelectric.com

The Transformer Authority

PIONEER TRANSFORMERS: Why us?

Scale

We produce over 100,000 transformers every year. With this high level of production comes buying power, a broad knowledge base and rapid work flow to meet our customers' magnetic needs.

- Purchasing power for economic solutions
- Large engineering staff for quick design turnaround and delivery
- Best delivery of custom options to meet customer deadlines

Pioneer Transformers has a large, constantly expanding product offering, growing with our customers' changing demands.

Highest Standards

Our products are backed by a strict ISO-based quality assurance system. Each unit is thoroughly tested before leaving the plant to ensure proper operation. All products are designed to conform to the appropriate NEMA, ANSI, UL, and CSA standards.

Certifications

Seismic, ABS, UL, CSA, CE, C802

Support

Our application engineers are available toll-free to help customers select the best transformer to meet their needs and assist in answering installation questions.

Customer service representatives are available to assist in placing and tracking orders, expediting shipments and answering order processing questions.

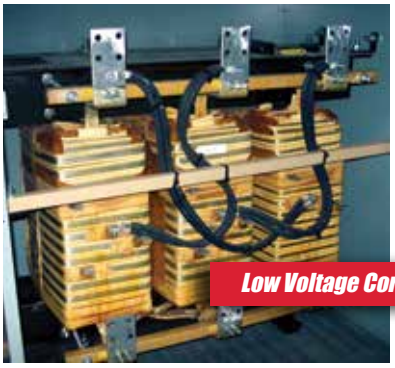
Contact Us

We're ready to help fulfill your transformer needs

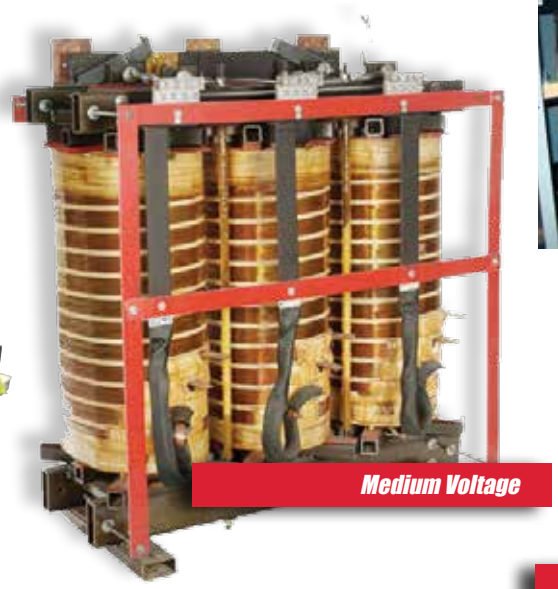
Phone: 800-892-3755

Email: info@jeffersonelectric.com

Website: jeffersonelectric.com

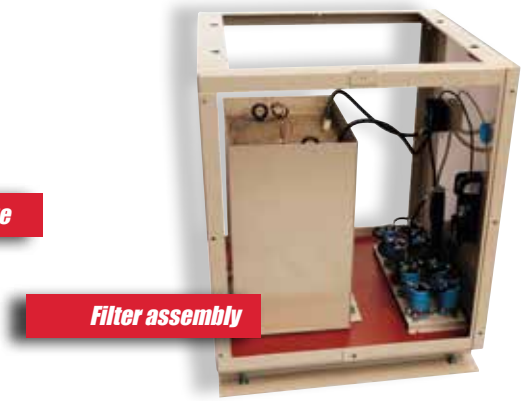


Low Voltage Core & Coil



Medium Voltage

18-Pulse



Filter assembly

Introduction

The information in this catalog is organized to help you find the proper transformer for your application. We've increased the depth and breadth of our offerings so please review the list below to find a transformer to meet your need.

Chapter sections include:

- General product description, specifications, options
- Enclosure figures, catalog number definition
- Representative models with kVA, size, shipping weight or other information
- Wiring diagrams

Table of Contents, printed catalog

Online only

Go to **jeffersonelectric.com/literature** to access PDFs of the full catalog and these Reference sections.

Product Overview

1 Single-Phase Ventilated
- General purpose
- DOE / C802
- 15 to 667 kVA
- NEMA3R enclosures
- Industrial and commercial applications

2 Three-Phase Ventilated
- General purpose
- DOE / C802
- 15 to 2500 kVA
- NEMA3R enclosures
- Industrial and commercial applications

3 Non-Linear, K-Factor
- Non-linear loads
- DOE / C802
- 15 to 1,000 kVA
- Electrostatic shields
- Meet the load demands of solid state devices including ballast, computers and communication equipment

4 Drive Isolation
- Drive and motor loads
- Standard efficiency / C802
- 3 to 990 kVA
- Meets the demands of AC and DC variable speed drives

5 Totally Enclosed Non Ventilated
- TENV, industrial applications
- Standard efficiency
- 15 to 500 kVA
- NEMA3R, 4 / 4X / 12 / 12X
- For use in adverse ambient environments

6 Industrial Control Transformers
- Single-phase transformers for industrial control applications
- Standard efficiency
- 50 to 5,000 VA
- For use in industrial and commercial control applications

7 Single-Phase Encapsulated
- General purpose
- Standard efficiency
- 50 VA to 50 kVA
- NEMA3R enclosures
- Lighting, industrial and commercial applications

8 Three-Phase Encapsulated
- General purpose
- Standard efficiency
- 3 to 75 kVA
- NEMA3R enclosures
- Industrial applications

9 Buck-Boost
- General purpose
- Standard efficiency
- Encapsulated autotransformer
- 50 VA to 10 kVA
- Steps voltage up or down to solve over/under voltage problems economically
- Lighting and commercial applications

10 Class I, Division 2
- For use in hazardous conditions
- Encapsulated with electrical grade resin
- 1 to 25 kVA, Single Phase
- 3 to 75 kVA Three Phase
- T3C temperature classification
- NEMA3R enclosures


Buck-Boost Models


Ventilated Family


Industrial Control


Encapsulated Transformers

Custom Solutions

11 18-Pulse

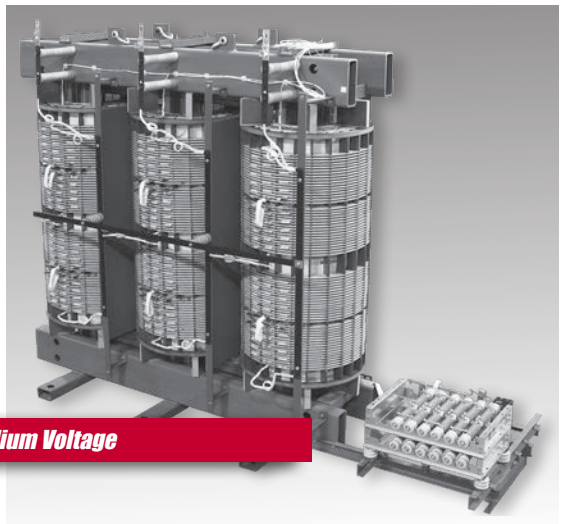
- Special purpose multi-pulse units manufactured to meet specific requirements
- Three-phase, 15 to 500 kVA
- Core and coil
- With or without reactor

12 Medium Voltage

- Medium voltage dry-type
- DOE / C802
- Through 10,000 kVA
- 5 to 35 kV primaries
- Switchgear, traction, mining and marine duty available

13 Power Quality

- Products to mitigate harmonics and non-linear loads
- Harmonic Mitigating/Zig-Zag units to reduce current harmonics
- Harmonic Suppression Systems developed specifically to reduce harmonics and voltage distortion
- DOE / C802
- 15 to 1,500 kVA



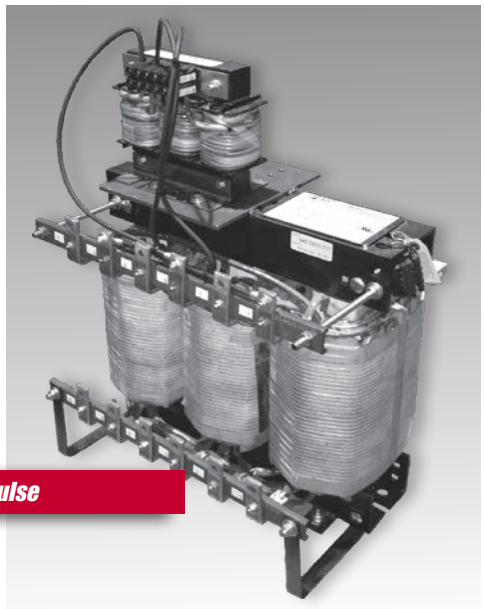
Medium Voltage

We design to meet your requirements

- Power: 50 VA through 10,000 kVA
- Input and output voltages through 35 kV
- Multiple primaries and secondaries, and phase angles
- Frequencies (Hz): 60, 50, 400 or special
- Primary tap configurations
- Core and winding material options
- Specific ambient temperature and temperature rises
- Impedance
- Inrush
- Electrical noise attenuation
- Harmonic content and mitigation
- Rectifier / inverter duty: 6, 12 and 18 pulse configurations
- Altitude
- Reduced sound level
- Forced air cooling
- Efficiency at specified loads
- Environmental requirements
- Enclosure style and color: NEMA1, 3R, 4, 4X, 12, 12X
- Accessories: terminal blocks, fusing, disconnects

Filters, Reactors and Chokes

- Armature chokes and ripple filter assemblies to reduce the audible motor noise produced by DC drives
- Line and load reactors used in power factor control and regeneration



18-Pulse

PIONEER DRY-TYPE TRANSFORMERS
JEFFERSON ELECTRIC
BEMAG TRANSFORMER

Single-Phase Ventilated

15 to 1,650 kVA

Applications

- For general loads, including lighting, industrial and commercial applications

Specifications

- Meets DOE-2016 and C802 standards for energy efficiency
- 60 Hz operation
- Aluminum windings
- 150ºC temperature rise
- 220ºC insulation class standard
- NEMA3R rated enclosures standard
- Heat-cured ASA-61 gray powder coat finish
- Cores of high quality electrical steel
- Primary taps
- Lugs provided for units up to and including 50 kVA on catalog items

Features, Functions, Benefits

- Large connection compartment for ease of wiring and installation
- Many sizes in stock and available for immediate shipment
- Quiet operation for installation flexibility
- Seismic certification for all units

Standards

- Meets DOE-2016 standard Part 431, Subpart K for energy efficiency
- Built in accordance with NEMA, ANSI, UL and CSA standards

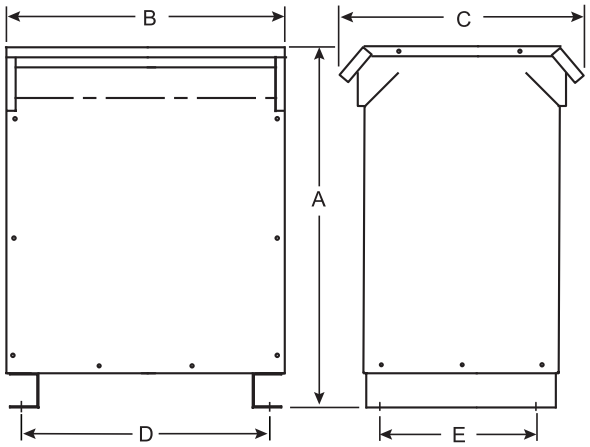
Options and Accessories

- Other sizes, voltages and temperature rises available
- Copper windings
- CE Marked units available as custom
- Wall brackets available for units up to 75 kVA

Approvals

Enclosure Figure

Figure 24



Wall Mounting Bracket Kits

Part Number	Description	Max Unit Wgt (lbs)
223-7008-030	For 15 kVA units, 150°C rise	250
223-7008-075	For 16 to 75 kVA units, 150°C rise	750

Wall Mounting Bracket Kits with Drip Pans

400-4701-222	For Single Phase units, 15″ width	250
400-4701-223	For Single Phase units, 17″ width	750
400-4701-224	For Single Phase units, 20″ width	750
400-4701-225	For Single Phase units, 22″ width	750

Lugs

Part Number	kVA	Primary Lug	Qty	Secondary Lug	Qty
4PT-2007-LUG	15	#14 - 2	2	#2/0 - 6	2
4PT-2017-LUG	25	#14 - 2	2	250MCM - 6	2
4PT-2008-LUG	37.5	#14 - 2	2	350MCM - 6	2
4PT-2009-LUG	50	#2/0 - 6	2	600MCM - 6	2
4PT-2018-LUG*	75	#2/0 - 6	2	600MCM - 6	4

* Must be ordered, not included on stock units

Model Numbers Defined

421-TXXY-ABC

Single-Phase, Ventilated Floor Mount

Type

C802 compliant	2
DOE compliant	9

kVA Rating / XX

15	16	112.5	25
20	17	150	26
25	18	167	27
30	19	200	28
37.5	20	225	29
45	21	250	30
50	22	300	31
75	23	333	32
100	24		

Up to 1,650 kVA available as specials

Primary	Secondary	
120x240	120/240	1
208	120/240	2
Custom		3
277	120/240	4
240x480	120/240	5
120 Min 600 Max	120 Min 600 Max	6
120x240	120/240	7
600	120/240	8
Custom		9

Wiring

Aluminum	0
Copper	8

Temperature Rise

150°C	0
115°C	1
80°	8

Shield

No shield	0
Shield	5

Single-Phase General Purpose Transformers – DOE Compliant

150°C Temperature Rise • Aluminum Windings • NEMA3R Enclosures

Taps: 2 @ 2.5% FCAN & 4 @ 2.5% FCBN

240 x 480V — 120/240V

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	Est Ship Wgt	Wiring Diagram	Wall Mounting Bracket Kit
15	421-9165-000	24	27	15	20.5	12.5	11	190	S480F	223-7008-030
25	421-9185-000	24	29	17	22.5	14	13	265	S480F	223-7008-075
37.5	421-9205-000	24	31	20	23.5	16.9	14	330	S480F	223-7008-075
50	421-9225-000	24	32	22	25.5	19	16	465	S480F	223-7008-075
75	421-9235-000	24	34	22	27.5	19	16	555	S480F	223-7008-075
100	421-9245-000	24	36	22	29.5	19	18	690	S480F	n/a
150	421-9265-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S480F	n/a
167	421-9275-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S480F	n/a
200	421-9285-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S480F	n/a
250	421-9305-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S480F	n/a
300	421-9315-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S480F	n/a
333	421-9325-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S480F	n/a

150°C Temperature Rise • Aluminum Windings • NEMA3R Enclosures

Taps: 2 @ 2.5% FCAN & 2 @ 2.5% FCBN

600V — 120/240V

15	421-9168-000	24	27	15	20.5	12.5	11	190	S600E	223-7008-030
25	421-9188-000	24	29	17	22.5	14	13	265	S600E	223-7008-075
37.5	421-9208-000	24	31	20	23.5	16.9	14	330	S600E	223-7008-075
50	421-9228-000	24	32	22	25.5	19	16	405	S600E	223-7008-075
75	421-9238-000	24	34	22	27.5	19	16	620	S600E	223-7008-075
100	421-9248-000	24	36	22	29.5	19	18	725	S600E	n/a
150	421-9268-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S600E	n/a
167	421-9278-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S600E	n/a
200	421-9288-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S600E	n/a
250	421-9308-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S600E	n/a
300	421-9318-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S600E	n/a
333	421-9328-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S600E	n/a

See website for additional kVA, copper windings and temperature options.
Housing dimensions subject to change without notice. Consult website or factory where dimensions are critical.
Use the “Find a Product” tool for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Single-Phase General Purpose Transformers – C802 Compliant

150°C Temperature Rise • Aluminum Windings • NEMA3R Enclosures

Taps: 2 @ 2.5% FCAN & 4 @ 2.5% FCBN

240 x 480V — 120/240V

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	Est Ship Wgt	Wiring Diagram	Wall Mounting Bracket Kit
15	421-2165-000	24	27	15	20.5	12.5	11	190	S480F	223-7008-030
25	421-2185-000	24	29	17	22.5	14	13	265	S480F	223-7008-075
37.5	421-2205-000	24	31	20	23.5	16.9	14	330	S480F	223-7008-075
50	421-2225-000	24	32	22	25.5	19	16	465	S480F	223-7008-075
75	421-2235-000	24	34	22	27.5	19	16	555	S480F	223-7008-075
100	421-2245-000	24	36	22	29.5	19	18	690	S480F	n/a
150	421-2265-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S480F	n/a
167	421-2275-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S480F	n/a
200	421-2285-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S480F	n/a
250	421-2305-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S480F	n/a
300	421-2315-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S480F	n/a
333	421-2325-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S480F	n/a

150°C Temperature Rise • Aluminum Windings • NEMA3R Enclosures

Taps: 2 @ 2.5% FCAN & 2 @ 2.5% FCBN

600V — 120/240V

15	421-2168-000	24	27	15	20.5	12.5	11	190	S600E	223-7008-030
25	421-2188-000	24	29	17	22.5	14	13	265	S600E	223-7008-075
37.5	421-2208-000	24	31	20	23.5	16.9	14	330	S600E	223-7008-075
50	421-2228-000	24	32	22	25.5	19	16	405	S600E	223-7008-075
75	421-2238-000	24	34	22	27.5	19	16	620	S600E	223-7008-075
100	421-2248-000	24	36	22	29.5	19	18	725	S600E	n/a
150	421-2268-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S600E	n/a
167	421-2278-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S600E	n/a
200	421-2288-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S600E	n/a
250	421-2308-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S600E	n/a
300	421-2318-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S600E	n/a
333	421-2328-000	24	TBD	TBD	TBD	TBD	TBD	TBD	S600E	n/a

See website for additional kVA, copper windings and temperature options.
Housing dimensions subject to change without notice. Consult website or factory where dimensions are critical.
Use the “Find a Product” tool for detailed specification sheets.
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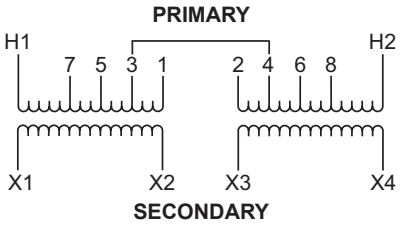
Wiring Diagrams

S480F Wiring Diagram & Connections

Wiring Diagram

Primary: 240 x 480 Volts Delta
Secondary: 120/240 Volts



Connections

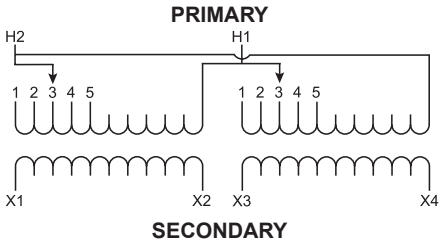
Primary Volts	Jumpers Between Taps Left Coil	Right Coil	Primary Lines Connect To
504	1	2	H1, H2
492	3	2	H1, H2
480	3	4	H1, H2
468	5	4	H1, H2
456	5	6	H1, H2
444	7	6	H1, H2
432	7	8	H1, H2
252	H2, 1	H1, 2	H1, H2
240	H2, 3	H1, 4	H1, H2
228	H2, 5	H1, 6	H1, H2
216	H2, 7	H1, 8	H1, H2

Secondary Volts	Interconnect	Secondary Lines Connect To
240	X2 to X3	X1, X4
120/240	X2 to X3	X1, X2, X4
120	X1 to X3 X2 to X4	X1, X4

S600E Wiring Diagram & Connections

Wiring Diagram

Primary: 600 Volts Delta
Secondary: 120/240 Volts



Connections

Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
630	1	H1, H2
615	2	H1, H2
600	3	H1, H2
585	4	H1, H2
570	5	H1, H2

Secondary Volts	Interconnect	Secondary Lines Connect To
240	X2 to X3	X1, X4
120/240	X2 to X3	X1, X2, X4
120	X1 to X3 X2 to X4	X1, X4

More wiring diagrams can be found in catalog's appendix, section 15.
Use the "Find a Product" tool on our website for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

15 to 2,500 kVA

Applications

- For general loads, including lighting, industrial and commercial applications

Specifications

- Meets DOE-2016 and C802 standards for energy efficiency
- 60 Hz operation
- Aluminum windings
- 150ºC temperature rise
- 220ºC insulation class standard
- NEMA3R rated enclosures standard
- Heat-cured ASA-61 gray powder coat finish
- Cores of high quality electrical steel
- Primary taps
- Lugs provided for units up to and including 75 kVA on catalog items

Features, Functions, Benefits

- Large connection compartment for ease of wiring and installation
- Many sizes in stock and available for immediate shipment
- Quiet operation for installation flexibility
- Seismic certification for all units

Standards

- Meets DOE-2016 standard Part 431, Subpart K for energy efficiency
- Built in accordance with NEMA, ANSI, UL and CSA standards

Options and Accessories

- Other sizes, voltages and temperature rises available
- Copper windings
- CE Marked units available as custom
- Wall brackets available for units up to 75 kVA

Approvals

Enclosure Figures

Figure 22

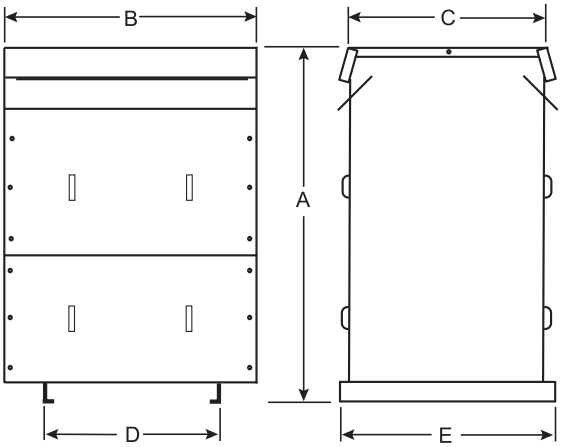
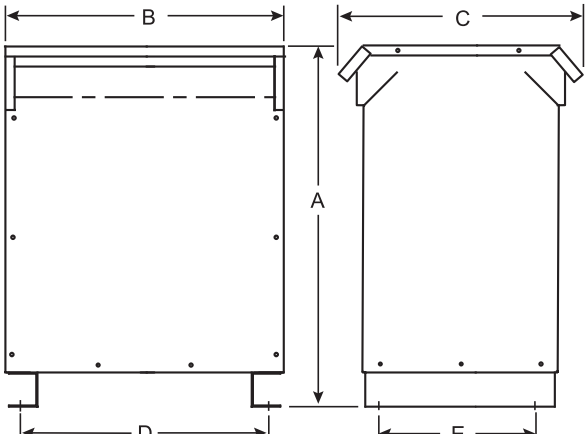


Figure 24



Wall Mounting Bracket Kits

Part Number	Description	Max Unit Wgt (lbs)
223-7008-030	For 15 kVA units, 150°C rise	250
223-7008-075	For 16 to 75 kVA units, 150°C rise	750

Wall Mounting Bracket Kits with Drip Pans

400-4701-226	For Three Phase units, 19″ width	750
400-4701-227	For Three Phase units, 22″ width	750
400-4701-228	For Three Phase units, 25″ width	750
400-4701-229	For Three Phase units, 27″ width	750

Lugs

Part Number	kVA	Primary Lug	Qty	Secondary Lug	Qty
4PT-2007-LUG	15	#14 - 2	2	#2/0 - 6	2
4PT-2017-LUG	25	#14 - 2	2	250MCM - 6	2
4PT-2008-LUG	37.5	#14 - 2	2	350MCM - 6	2
4PT-2009-LUG	50	#2/0 - 6	2	600MCM - 6	2
4PT-2018-LUG*	75	#2/0 - 6	2	600MCM - 6	4

* Must be ordered, not included on stock units

Model Numbers Defined

423-TXXY-ABC

Three-Phase, Ventilated

Type

C802 compliant	2
DOE compliant	9

kVA Rating / XX

15	16	250	30
20	17	300	31
25	18	333	32
30	19	400	33
37.5	20	500	34
45	21	667	35
50	22	750	36
75	23	833	37
100	24	1,000	39
112.5	25	1,250	43
150	26	1,500	47
167	27	2,000	51
200	28	2,500	53
225	29		

Primary	Secondary	
208	480Y/277	1
240	208Y/120	2
240	480Y/277	3
480	208Y/120	4
480	480Y/277	5
Specials*		6
480	240 w/ 120 CT	7
208	208Y/120	8
600	208Y/120	9

Wiring

Aluminum	0
Copper	8

Temperature Rise

150°C Rise	0
115°C Rise	1
80°C Rise	8

Shields

No shield	0
Shield	5

*Suffix defined incrementally

Three-Phase General Purpose Transformers – DOE compliant

150°C Temperature Rise • Aluminum Windings • NEMA3R Enclosures

Taps: 15 to 300 kVA: 2 @ 2.5% FCAN & 4 @ 2.5% FCBN • 500 to 1,000 kVA: 2 @ 2.5% FCAN & 2 @ 2.5% FCBN

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	Est Ship Wgt (lbs)	Wiring Diagram	Wall Mounting Bracket Kit
480V Delta — 208Y/120V										
15	423-9164-000	24	22	19	21	15.8	12	215	T480E	223-7008-030
30	423-9194-000	24	25	22	22	18.1	13	330	T480E	223-7008-075
45	423-9214-000	24	28	25	23.5	19.5	14.5	415	T480E	223-7008-075
75	423-9234-000	24	32	27	26	23.5	16	585	T480E	223-7008-075
112.5	423-9254-000	24	38	29	29	25.5	18	785	T480E	n/a
150	423-9264-000	24	42	33	32.5	30.0	21	1,035	T480E	n/a
225	423-9294-000	24	46	35	37	30.8	25	1,430	T480E	n/a
300	423-9314-000	24	52	35	37	30.8	25	1,755	T480E	n/a
500	423-9344-000	24	60	48	43.5	42.0	27	2,760	T480M	n/a
750	423-9364-000	22	72	52	44	34.0	42	4,150	T480M	n/a
1,000	423-9394-000	22	81	66	61	60.5	38.5	6,000	T480M	n/a
480V Delta — 240V Delta / 5% 120V CT										
15	423-9167-000 *	24	22	19	21	15.8	12	215	T480G	223-7008-030
30	423-9197-000 *	24	25	22	22	18.1	13	335	T480G	223-7008-075
45	423-9217-000 *	24	28	25	23.5	19.5	14.5	415	T480G	223-7008-075
75	423-9237-000 *	24	32	27	26	23.5	16	585	T480G	223-7008-075
112.5	423-9257-000 *	24	38	29	29	25.5	18	785	T480G	n/a
150	423-9267-000 *	24	42	33	32.5	30.0	21	1,035	T480G	n/a
225	423-9297-000 *	24	46	35	37	30.8	25	1,430	T480G	n/a
300	423-9317-000 *	24	52	35	37	30.8	25	1,755	T480G	n/a
500	423-9347-000 *	24	60	48	43.5	42.0	27	2,760	T480N	n/a
750	423-9367-000 *	22	72	52	44	34.0	42	4,150	T480N	n/a
1,000	423-9397-000 *	22	81	66	61	60.5	38.5	6,000	T480N	n/a

150°C Temperature Rise • Aluminum Windings • NEMA3R Enclosures

Taps: 2 @ 2.5% FCAN & 2 @ 2.5% FCBN

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	Est Ship Wgt (lbs)	Wiring Diagram	Wall Mounting Bracket Kit
600V Delta — 208Y/120V										
15	423-9169-000	24	22	19	21	15.8	12	215	T600G	223-7008-030
30	423-9199-000	24	25	22	22	18.1	13	335	T600G	223-7008-075
45	423-9219-000	24	28	25	23.5	19.5	14.5	415	T600G	223-7008-075
75	423-9239-000	24	32	27	26	23.5	16	585	T600G	223-7008-075
112.5	423-9259-000	24	38	29	29	25.5	18	785	T600G	n/a
150	423-9269-000	24	42	33	32.5	30.0	21	1,035	T600G	n/a
225	423-9299-000	24	46	35	37	30.8	25	1,430	T600G	n/a
300	423-9319-000	24	52	35	37	30.8	25	1,755	T600G	n/a
500	423-9349-000	24	60	48	43.5	42.0	27	2,760	T600G	n/a
750	423-9369-000	22	72	52	44	34.0	42	4,150	T600G	n/a
1,000	423-9399-000	22	81	66	61	60.5	38.5	6,000	T600G	n/a

See website for additional kVA, copper windings and temperature options.
Housing dimensions subject to change without notice. Consult website or factory where dimensions are critical.
Use the “Find a Product” tool for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

* **CAUTION:** When using the 120V center tap for single-phase applications, the single-phase load should not exceed 5% of the three-phase kVA rating. Connect the X3 “high leg” to the “B” phase per NEC 384-3 (do not use X3 leg for 120V lighting). A separate single-phase transformer should be used if the single-phase load is in excess of 5%. Fuse input side per current NEC requirements.

Three-Phase General Purpose Transformers – C802 Compliant

150°C Temperature Rise • Aluminum Windings • NEMA3R Enclosures

Taps: 15 to 300 kVA: 2 @ 2.5% FCAN & 4 @ 2.5% FCBN • 500 to 1,000 kVA: 2 @ 2.5% FCAN & 2 @ 2.5% FCBN

480V Delta — 208/120Y										
kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	Est Ship Wgt (lbs)	Wiring Diagram	Wall Mounting Bracket Kit
15	423-2164-000	24	22	19	21	15.8	12	215	T480E	223-7008-030
30	423-2194-000	24	25	22	22	18.1	13	330	T480E	223-7008-075
45	423-2214-000	24	28	25	23.5	19.5	14.5	415	T480E	223-7008-075
75	423-2234-000	24	32	27	26	23.5	16	585	T480E	223-7008-075
112.5	423-2254-000	24	38	29	29	25.5	18	785	T480E	n/a
150	423-2264-000	24	42	33	32.5	30.0	21	1,035	T480E	n/a
225	423-2294-000	24	46	35	37	30.8	25	1,430	T480E	n/a
300	423-2314-000	24	52	35	37	30.8	25	1,755	T480E	n/a
500	423-2344-000	24	60	48	43.5	42.0	27	2,460	T480M	n/a
750	423-2364-000	22	72	52	44	34.0	42	4,055	T480M	n/a
1,000	423-2394-000	22	81	66	61	60.5	38.5	5,500	T480M	n/a
480V Delta — 240V Delta / 5% 120V CT										
15	423-2167-000 *	24	22	19	21	15.8	12	215	T480G	223-7008-030
30	423-2197-000 *	24	25	22	22	18.1	13	335	T480G	223-7008-075
45	423-2217-000 *	24	28	25	23.5	19.5	14.5	415	T480G	223-7008-075
75	423-2237-000 *	24	32	27	26	23.5	16	585	T480G	223-7008-075
112.5	423-2257-000 *	24	38	29	29	25.5	18	785	T480G	n/a
150	423-2267-000 *	24	42	33	32.5	30.0	21	1,035	T480G	n/a
225	423-2297-000 *	24	46	35	37	30.8	25	1,430	T480G	n/a
300	423-2317-000 *	24	52	35	37	30.8	25	1,755	T480G	n/a
500	423-2347-000 *	24	60	48	43.5	42.0	27	2,460	T480G	n/a
750	423-2367-000 *	22	72	52	44	34.0	42	4,055	T480N	n/a
1,000	423-2397-000 *	22	81	66	61	60.5	38.5	5,500	T480N	n/a

150°C Temperature Rise • Aluminum Windings • NEMA3R Enclosures

Taps: 2 @ 2.5% FCAN & 2 @ 2.5% FCBN

600V Delta — 208Y/120V										
15	423-2169-000	24	22	19	21	15.8	12	215	T600G	223-7008-030
30	423-2199-000	24	25	22	22	18.1	13	335	T600G	223-7008-075
45	423-2219-000	24	28	25	23.5	19.5	14.5	415	T600G	223-7008-075
75	423-2239-000	24	32	27	26	23.5	16	585	T600G	223-7008-075
112.5	423-2259-000	24	38	29	29	25.5	18	785	T600G	n/a
150	423-2269-000	24	42	33	32.5	30.0	21	1,035	T600G	n/a
225	423-2299-000	24	46	35	37	30.8	25	1,430	T600G	n/a
300	423-2319-000	24	52	35	37	30.8	25	1,755	T600G	n/a
500	423-2349-000	24	60	48	43.5	42.0	27	2,460	T600G	n/a
750	423-2369-000	22	72	52	44	34.0	42	4,055	T600G	n/a
1,000	423-2399-000	22	81	66	61	60.5	38.5	5,500	T600G	n/a

See website for additional kVA, copper windings and temperature options.
Housing dimensions subject to change without notice. Consult website or factory where dimensions are critical.
Use the “Find a Product” tool for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

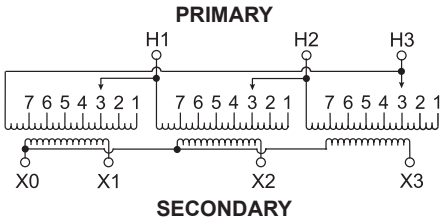
* **CAUTION**: When using the 120V center tap for single-phase applications, the single-phase load should not exceed 5% of the three-phase kVA rating. Connect the X3 “high leg” to the “B” phase per NEC 384-3 (do not use X3 leg for 120V lighting). A separate single-phase transformer should be used if the single-phase load is in excess of 5%. Fuse input side per current NEC requirements.

Wiring Diagrams

T480E Wiring Diagram & Connections

Wiring Diagram

Primary: 480 Volts Delta
Secondary: 208Y/120 Volts



Connections

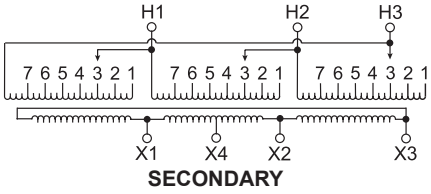
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
504	1	H1, H2, H3
492	2	H1, H2, H3
480	3	H1, H2, H3
468	4	H1, H2, H3
456	5	H1, H2, H3
444	6	H1, H2, H3
432	7	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
208	X1, X2, X3
120 1 phase	Between X0 and X1 or X2 or X3

T480G Wiring Diagram & Connections

Wiring Diagram

Primary: 480 Volts Delta
Secondary: 240 Volts Delta/120 Volts



Connections

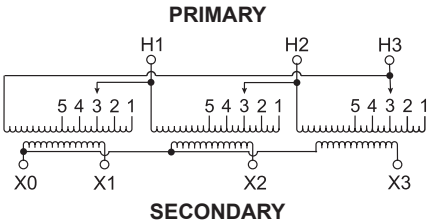
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
504	1	H1, H2, H3
492	2	H1, H2, H3
480	3	H1, H2, H3
468	4	H1, H2, H3
456	5	H1, H2, H3
444	6	H1, H2, H3
432	7	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
240	X1, X2, X3
120 1 phase	X1 and X4 or X2 or X4

T480M Wiring Diagram & Connections

Wiring Diagram

Primary: 480 Volts Delta
Secondary: 208Y/120 Volts



Connections

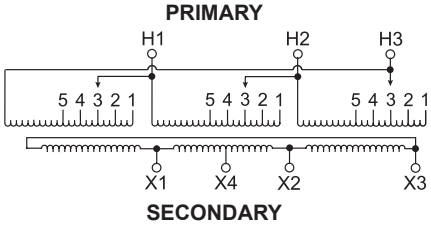
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
504	1	H1, H2, H3
492	2	H1, H2, H3
480	3	H1, H2, H3
468	4	H1, H2, H3
456	5	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
208	X1, X2, X3
120 1 phase	Between X0 and X1 or X2 or X3

T480N Wiring Diagram & Connections

Wiring Diagram

Primary: 480 Volts Delta
Secondary: 240 Volts Delta/120 Volts



Connections

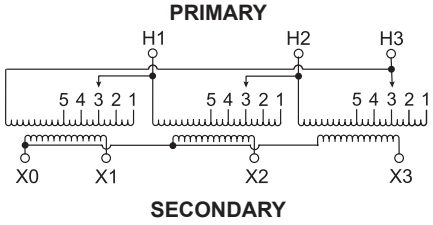
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
504	1	H1, H2, H3
492	2	H1, H2, H3
480	3	H1, H2, H3
468	4	H1, H2, H3
456	5	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
240	X1, X2, X3
120 1 phase	X1 and X4 or X2 or X4

T600G Wiring Diagram & Connections

Wiring Diagram

Primary: 600 Volts Delta
Secondary: 208Y/120 Volts



Connections

Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
630	1	H1, H2, H3
615	2	H1, H2, H3
600	3	H1, H2, H3
585	4	H1, H2, H3
570	5	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
208	X1, X2, X3
120 1 phase	Between X0 and X1 or X2 or X3

More wiring diagrams can be found in catalog's appendix, section 15.
Use the "Find a Product" tool on our website for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

15 to 500 kVA

Applications

- To meet the demands of non-linear loads caused by modern office equipment

Specifications

- K-4, K-13, and K-20 rated units standard
- Meets DOE-2016 and C802 standards for energy efficiency
- 60 Hz operation
- Aluminum windings
- 150ºC temperature rise
- 220ºC insulation class units
- NEMA3R rated enclosures
- Heat-cured ASA-61 gray powder coat finish
- Cores of high quality electrical steel
- Electrostatic shield
- Primary taps
- Lugs provided for units up to and including 75 kVA on catalog items

Features, Functions, Benefits

- Large connection compartment for ease of wiring and installation
- Many sizes in stock and available for immediate shipment
- Quiet operation for installation flexibility
- Seismic certification for all units

Standards

- Meets DOE-2016 standard Part 431, Subpart K for energy efficiency
- Built in accordance with NEMA, ANSI, UL and CSA standards

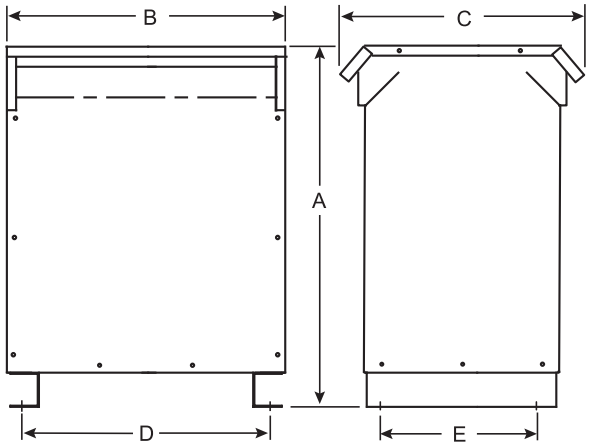
Options and Accessories

- Other sizes, voltages and temperature rises available
- Copper windings
- CE Marked units available as custom
- Wall brackets available for units up to 75 kVA

Approvals

Enclosure Figure

Figure 24



K-factor

K-factor is a rating devised by Underwriters Laboratories to provide a uniform standard for transformers designed to handle non-linear loads. The more harmonic currents present, the higher the K-factor specified in sizing the transformer.

To calculate the K-factor, multiply the square of the percentage of harmonic current by the square of the harmonic order and add the results. For example, if a load is 60% of the fundamental, 65% of the third harmonic, 30% of the fifth harmonic, and 35% of the seventh harmonic, the resulting K-factor would be 12.42:

$(.6)^2$ 1 + $(.65)^2(3)^2$ + $(.30)^2(5)^2$ + $(.35)^2(7)^2$ = 12.42

In this example, a transformer with a K-factor of 13 should be specified. The K-factor rating defines the transformer's ability to withstand odd-harmonic currents while operating within its insulation class.

For more information, see catalog Section 13 on Power Quality.

See Lug and Mounting Bracket information on page 3-4.

Model Numbers Defined

424-TXXY-ABC

3 Phase Ventilated
Non-Linear Floor Mount
All models with electrostatic shield

Type

C802 compliant	2
DOE compliant	9

kVA Rating / XX		kVA Rating / XX	
15.0	16	150	26
20	17	167	27
25	18	200	28
30	19	225	29
37.5	20	250	30
45	21	300	31
50	22	333	32
75	23	400	33
100	24	500	34
112.5	25		

Primary	Secondary	
208	480Y/277	1
240	208Y/120	2
240	480Y/277	3
480	208Y/120	4
480	480Y/277	5
Specials*		6
Not assigned		7
208	208Y/120	8
600	208Y/120	9

Wiring

Aluminum	0
Copper	8

Temperature Rise

150°C Rise	0
115°C Rise	1
80°C Rise	8

K-Factor

K=4	1
K=13	2
K=20	3

* Suffix defined incrementally

Three-Phase General Purpose Non-Linear Transformers – DOE Compliant

Standard Application Voltages • K-13 • Electrostatic Shield
150°C Temperature Rise • Aluminum Windings • NEMA3R Enclosures

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	Est Ship Wgt	Wall Mounting Bracket Kit	Wiring Diagram
480V Delta — 208Y/120V • Taps: 2 @ 2.5% FCAN & 4 @ 2.5% FBCN										
15	424-9164-002	24	25	22	22	18.2	13	310	223-7008-030	T480E
30	424-9194-002	24	28	25	23.5	19.1	14.5	400	223-7008-075	T480E
45	424-9214-002	24	32	27	26	23.5	16	585	223-7008-075	T480E
75	424-9234-002	24	38	29	29	25.5	18	775	n/a	T480E
112.5	424-9254-002	24	42	33	32.5	30.0	21	1,000	n/a	T480E
150	424-9264-002	24	46	35	37	30.8	25	1,530	n/a	T480E
225	424-9294-002	24	52	35	37	30.8	25	1,660	n/a	T480E
300	424-9314-002	24	60	48	43.5	42	27	2,460	n/a	T480E
600V Delta — 208Y/120V • Taps: 2 @ 2.5% FCAN & 2 @ 2.5% FBCN										
15	424-9169-002	24	25	22	22	18.2	13	310	223-7008-030	T600G
30	424-9199-002	24	28	25	23.5	19.1	14.5	400	223-7008-075	T600G
45	424-9219-002	24	32	27	26	23.5	16	585	223-7008-075	T600G
75	424-9239-002	24	38	29	29	25.5	18	775	n/a	T600G
112.5	424-9259-002	24	42	33	32.5	30.0	21	1,000	n/a	T600G
150	424-9269-002	24	46	35	37	30.8	25	1,530	n/a	T600G
225	424-9299-002	24	52	35	37	30.8	25	1,660	n/a	T600G
300	424-9319-002	24	60	48	43.5	42	27	2,460	n/a	T600G

Three-Phase General Purpose Non-Linear Transformers – C802 Compliant

Standard Application Voltages • K-13 • Electrostatic Shield
150°C Temperature Rise • Aluminum Windings • NEMA3R Enclosures

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	Est Ship Wgt	Mounting Kit	Wiring Diagram
480V Delta — 208Y/120V • Taps: 2 @ 2.5% FCAN & 4 @ 2.5% FBCN										
15	424-2164-002	24	25	22	22	18.2	13	310	223-7008-030	T480E
30	424-2194-002	24	28	25	23.5	19.1	14.5	400	223-7008-075	T480E
45	424-2214-002	24	32	27	26	23.5	16	585	223-7008-075	T480E
75	424-2234-002	24	38	29	29	25.5	18	775	n/a	T480E
112.5	424-2254-002	24	42	33	32.5	30.0	21	1,000	n/a	T480E
150	424-2264-002	24	46	35	37	30.8	25	1,530	n/a	T480E
225	424-2294-002	24	52	35	37	30.8	25	1,660	n/a	T480E
300	424-2314-002	24	60	48	43.5	42	27	2,460	n/a	T480E
600V Delta — 208Y/120V • Taps: 2 @ 2.5% FCAN & 2 @ 2.5% FBCN										
15	424-2169-002	24	25	22	22	18.2	13	310	223-7008-030	T600G
30	424-2199-002	24	28	25	23.5	19.1	14.5	400	223-7008-075	T600G
45	424-2219-002	24	32	27	26	23.5	16	585	223-7008-075	T600G
75	424-2239-002	24	38	29	29	25.5	18	775	n/a	T600G
112.5	424-2259-002	24	42	33	32.5	30.0	21	1,000	n/a	T600G
150	424-2269-002	24	46	35	37	30.8	25	1,530	n/a	T600G
225	424-2299-002	24	52	35	37	30.8	25	1,660	n/a	T600G
300	424-2319-002	24	60	48	43.5	42	27	2,460	n/a	T600G

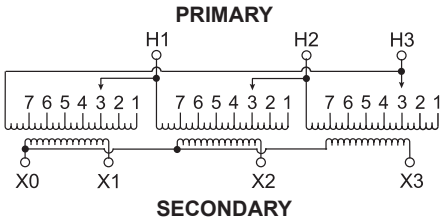
See website for additional kVA, copper windings and temperature options.
Housing dimensions subject to change without notice. Consult website or factory where dimensions are critical.
Use the “Find a Product” tool for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Enclosure Figures

T480E Wiring Diagram & Connections

Wiring Diagram

Primary: 480 Volts Delta
Secondary: 208Y/120 Volts



Connections

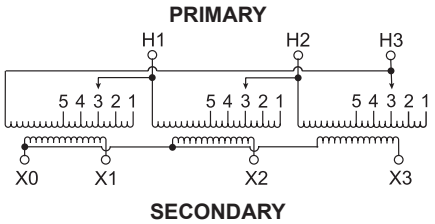
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
504	1	H1, H2, H3
492	2	H1, H2, H3
480	3	H1, H2, H3
468	4	H1, H2, H3
456	5	H1, H2, H3
444	6	H1, H2, H3
432	7	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
208	X1, X2, X3
120 1 phase	Between X0 and X1 or X2 or X3

T600G Wiring Diagram & Connections

Wiring Diagram

Primary: 600 Volts Delta
Secondary: 208Y/120 Volts



Connections

Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
630	1	H1, H2, H3
615	2	H1, H2, H3
600	3	H1, H2, H3
585	4	H1, H2, H3
570	5	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
208	X1, X2, X3
120 1 phase	Between X0 and X1 or X2 or X3

More wiring diagrams can be found in catalog's appendix, section 15.
Use the "Find a Product" tool on our website for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Lugs

Part Number	*kVA*	*Primary Lug*	*Qty*	*Secondary Lug*	*Qty*
4PT-2007-LUG	15	#14 - 2	2	#2/0 - 6	2
4PT-2017-LUG	25	#14 - 2	2	250MCM - 6	2
4PT-2008-LUG	37.5	#14 - 2	2	350MCM - 6	2
4PT-2009-LUG	50	#2/0 - 6	2	600MCM - 6	2
4PT-2018-LUG*	75	#2/0 - 6	2	600MCM - 6	4

* Must be ordered, not included on stock units

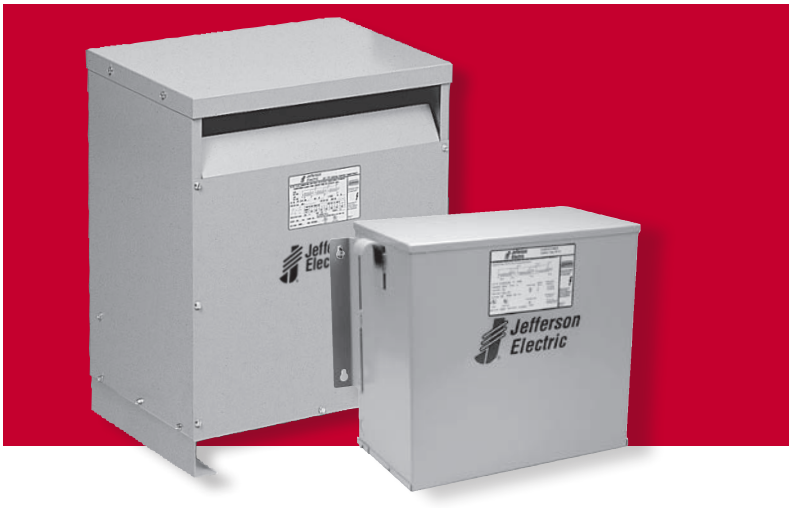
Wall Mounting Bracket Kits

Part Number	*Description*	*Max Unit Wgt (lbs)*
223-7008-030	For 15 kVA units, 150°C rise	250
223-7008-075	For 16 to 75 kVA units, 150°C rise	750

Wall Mounting Bracket Kits with Drip Pans

400-4701-226	For Three Phase units, 19″ width	750
400-4701-227	For Three Phase units, 22″ width	750
400-4701-228	For Three Phase units, 25″ width	750
400-4701-229	For Three Phase units, 27″ width	750

3 to 990 kVA



Applications

- For industrial and commercial applications with SCR-controlled adjustable speed motor drives, and AC adjustable frequency or DC drives

Specifications

- NEMA1 rated enclosures
- Three-Phase Encapsulated 3 through 11 kVA
- Three-Phase Ventilated 14 through 990 kVA
- 60 Hz operation
- Aluminum windings
- 150ºC temperature rise
- 220°C insulation class units
- Electrostatic shield
- Heat-cured ASA-61 gray powder coat finish
- Cores of high quality electrical steel
- Primary taps

Features, Functions, Benefits

- Large connection compartment for ease of wiring and installation
- Complete kVA range to cover standard drive systems
- Internally braced for short circuit stress protection
- Low impedance for better voltage regulation
- Low flux density to minimize core saturation
- Tap arrangements provided to compensate for input voltage variation
- Quiet operation for installation flexibility
- Seismic certification for all units

Standards

- Built in accordance with NEMA, ANSI, UL and CSA standards

Options and Accessories

- 50/60 Hz optional
- Other sizes, voltages and temperature rises available
- Copper windings
- Wall mount brackets available through 75 kVA

Approvals

Enclosure Figures

Figure 4

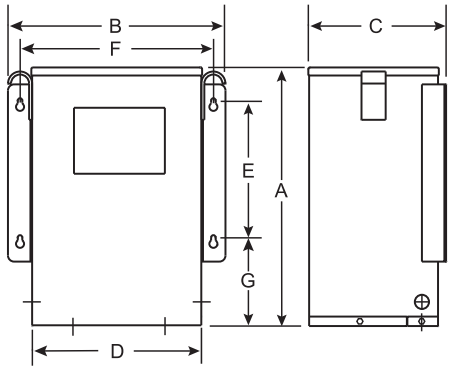
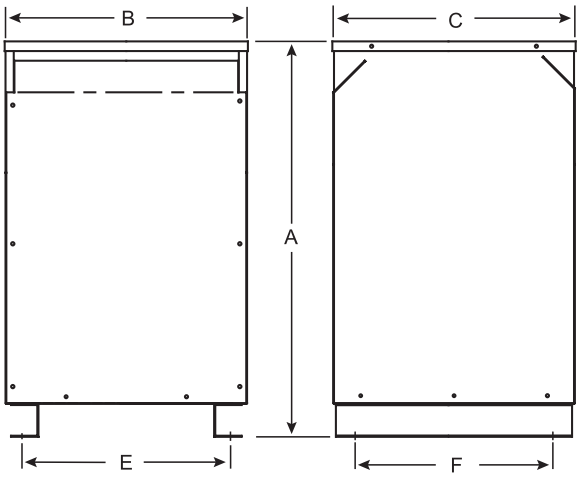


Figure 7



Wall Mounting Bracket Kits

Part Number	Description	Capacity (lbs)
223-7008-030	For 14 to 20 kVA units, 150°C rise	250
223-7008-075	For 27 to 75 kVA units, 150°C rise	750

Drive Selection

To determine the proper size drive isolation transformer, locate the HP of the motors to be operated in the left hand column. The corresponding figure in the right hand column is the recommended transformer kVA. Use the Product Selector on our website to find your model.

Drive Selector Chart

HP	kVA
2	3
3	6
5	7.5
7.5	11
10	14
15	20
20	27
25	34
30	40
40	51
50	63
60	75
75	93
100	118
125	145
150	175
200	220
250	275
300	330
400	440
500	550

Drive Isolation Transformers

Designed for use with motor drives, the drive isolation transformer must isolate the motor from the line and handle the added loads of the drive-created harmonics. Jefferson Electric's drive isolation transformers are custom engineered for both AC adjustable frequency and DC motor drives. They are specifically designed to accommodate the electrical and mechanical stresses, regenerative current reversals and frequent short circuits inherent in severe drive duty cycles.

Following is a representative list of the models available:

Primary	Secondary	Taps	Wiring Diagram
US Standard Efficiency			
230V Delta	230Y/133V	1 @ 5% FCAN & 1 @ 5% FBCN	DIT CC
230V Delta	460Y/266V	1 @ 5% FCAN & 1 @ 5% FBCN	DIT CG
460V Delta	230Y/133V	1 @ 5% FCAN & 1 @ 5% FBCN	DIT GC
460V Delta	460Y/266V	1 @ 5% FCAN & 1 @ 5% FBCN	DIT GG
575V Delta	230Y/133V	1 @ 5% FCAN & 1 @ 5% FBCN	DIT LC
575V Delta	460Y/266V	1 @ 5% FCAN & 1 @ 5% FBCN	DIT LG
Canadian C802 Compliant			
240V Delta	240Y/139V	1 @ 5% FCAN & 1 @ 5% FBCN	DIT DD
240V Delta	480Y/277V	1 @ 5% FCAN & 1 @ 5% FBCN	DIT DH
480V Delta	240Y/139V	1 @ 5% FCAN & 1 @ 5% FBCN	DIT HD
480V Delta	480Y/277V	1 @ 5% FCAN & 1 @ 5% FBCN	DIT HH
600V Delta	240Y/139V	1 @ 5% FCAN & 1 @ 5% FBCN	DIT MD
600V Delta	480Y/277V	1 @ 5% FCAN & 1 @ 5% FBCN	DIT MH

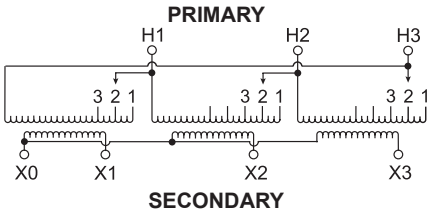
See website for kVA, copper windings and temperature options.
Use the "Find a Product" tool for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Wiring Diagrams US Standard Efficiency

DIT CC Wiring Diagram & Connections

Wiring Diagram

Primary: 230 Volts Delta
Secondary: 230Y/133 Volts



Connections

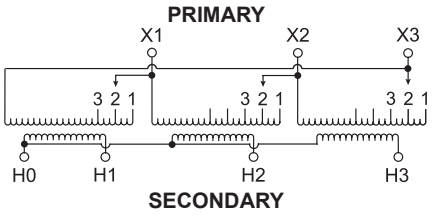
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
242	1	H1, H2, H3
230	2	H1, H2, H3
218	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
230	X1, X2, X3
133 1 Phase	Between X0 and X1 or X2 or X3

DIT CG Wiring Diagram & Connections

Wiring Diagram

Primary: 230 Volts Delta
Secondary: 460Y/266 Volts



Connections

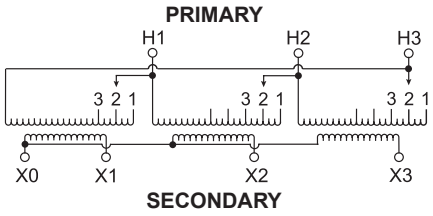
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
242	1	X1, X2, X3
230	2	X1, X2, X3
218	3	X1, X2, X3

Secondary Volts	Secondary Lines Connect To
460	H1, H2, H3
266 1 Phase	Between H0 and H1 or H2 or H3

DIT GC Wiring Diagram & Connections

Wiring Diagram

Primary: 460 Volts Delta
Secondary: 230Y/133 Volts



Connections

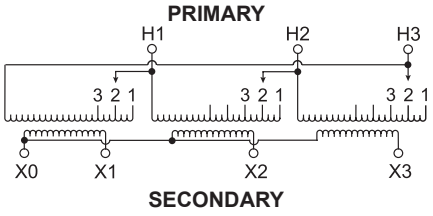
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
483	1	H1, H2, H3
460	2	H1, H2, H3
437	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
230	X1, X2, X3
133 1 Phase	Between X0 and X1 or X2 or X3

DIT GG Wiring Diagram & Connections

Wiring Diagram

Primary: 460 Volts Delta
Secondary: 460Y/266 Volts



Connections

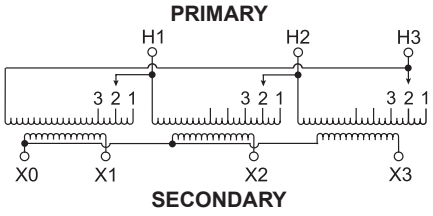
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
483	1	H1, H2, H3
460	2	H1, H2, H3
437	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
460	X1, X2, X3
266 1 Phase	Between X0 and X1 or X2 or X3

DIT LC Wiring Diagram & Connections

Wiring Diagram

Primary: 575 Volts Delta
Secondary: 230Y/133 Volts



Connections

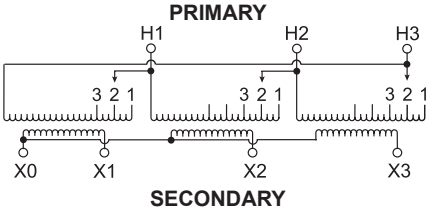
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
604	1	H1, H2, H3
575	2	H1, H2, H3
546	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
230	X1, X2, X3
133 1 Phase	Between X0 and X1 or X2 or X3

DIT LG Wiring Diagram & Connections

Wiring Diagram

Primary: 575 Volts Delta
Secondary: 460Y/266 Volts



Connections

Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
604	1	H1, H2, H3
575	2	H1, H2, H3
546	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
460	X1, X2, X3
266 1 Phase	Between X0 and X1 or X2 or X3

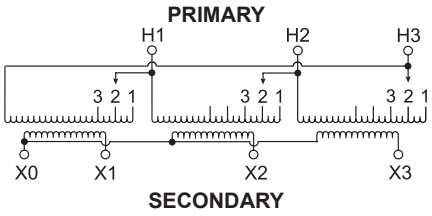
More wiring diagrams can be found in catalog's appendix, section 15.
Use the "Find a Product" tool on our website for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Wiring Diagrams Canadian C802 Standard Efficiency

DIT DD Wiring Diagram & Connections

Wiring Diagram

Primary: 240 Volts Delta
Secondary: 240Y/139 Volts



Connections

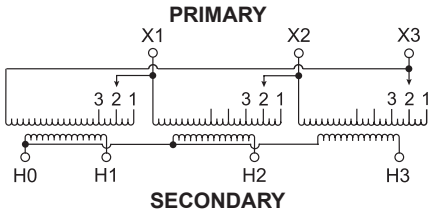
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
252	1	H1, H2, H3
240	2	H1, H2, H3
228	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
240	X1, X2, X3
139 1 Phase	Between X0 and X1 or X2 or X3

DIT DH Wiring Diagram & Connections

Wiring Diagram

Primary: 240 Volts Delta
Secondary: 480Y/277 Volts



Connections

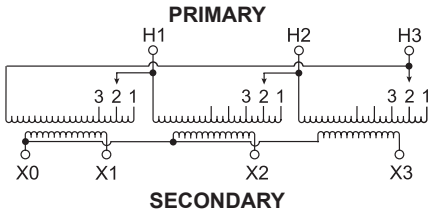
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
252	1	H1, H2, H3
240	2	H1, H2, H3
228	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
480	X1, X2, X3
277 1 Phase	Between X0 and X1 or X2 or X3

DIT HD Wiring Diagram & Connections

Wiring Diagram

Primary: 480 Volts Delta
Secondary: 240Y/139 Volts



Connections

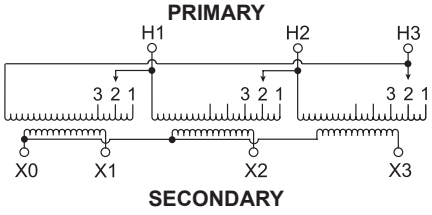
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
504	1	H1, H2, H3
480	2	H1, H2, H3
456	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
240	X1, X2, X3
139 1 Phase	Between X0 and X1 or X2 or X3

DIT HH Wiring Diagram & Connections

Wiring Diagram

Primary: 480 Volts Delta
Secondary: 480Y/277 Volts



Connections

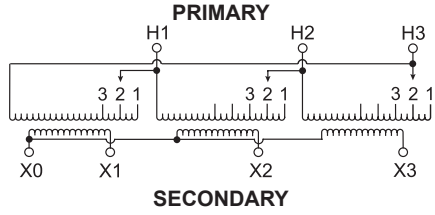
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
504	1	H1, H2, H3
480	2	H1, H2, H3
456	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
480	X1, X2, X3
277 1 Phase	Between X0 and X1 or X2 or X3

DIT MD Wiring Diagram & Connections

Wiring Diagram

Primary: 600 Volts Delta
Secondary: 240Y/139 Volts



Connections

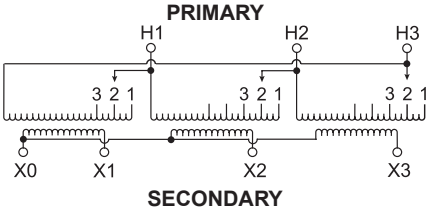
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
630	1	H1, H2, H3
600	2	H1, H2, H3
570	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
240	X1, X2, X3
139 1 Phase	Between X0 and X1 or X2 or X3

DIT MH Wiring Diagram & Connections

Wiring Diagram

Primary: 600 Volts Delta
Secondary: 480Y/277 Volts



Connections

Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
630	1	H1, H2, H3
600	2	H1, H2, H3
570	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
480	X1, X2, X3
277 1 Phase	Between X0 and X1 or X2 or X3

More wiring diagrams can be found in catalog's appendix, section 15.
Use the "Find a Product" tool on our website for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

15 to 500 kVA

Applications

- Designed for commercial and industrial loads in challenging environments

Specifications

- NEMA3R rated enclosure
- Single Phase units 15 through 100 kVA
- Three Phase units 15 through 500 kVA
- 60 Hz operation
- Aluminum windings
- 150ºC temperature rise
- 220ºC insulation class units
- Heat-cured ASA-61 gray powder coat finish
- Cores of high quality electrical steel
- Primary taps
- Lugs provided for units up to and including 75 kVA on catalog items

Features, Functions, Benefits

- Large connection compartment with knockouts for ease of wiring and installation
- Completely enclosed for use in harsh environments
- Quiet operation for installation flexibility
- Seismic certification for all units

Standards

- DOE and C802 exempt, standard efficiency
- Built in accordance with NEMA, ANSI, UL and CSA standards

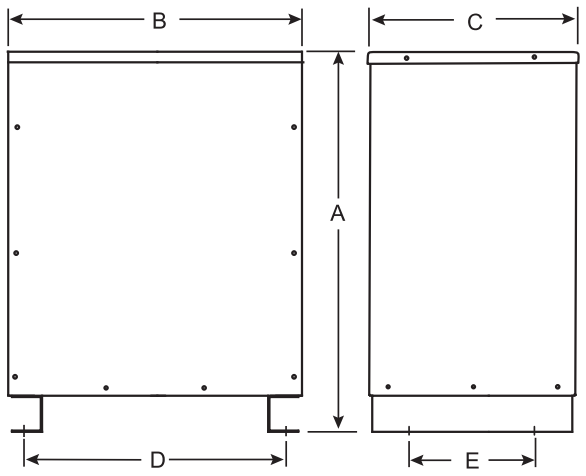
Options and Accessories

- NEMA4/4X (stainless), 12/12X enclosures
- 50/60 Hz optional
- Other sizes, voltages and temperature rises available
- Copper windings
- Electrostatic shield
- CE Marked units available as custom

Approvals

Three-Phase Enclosure Figure

Figure 23



Enclosure Options

Jefferson Electric can meet NEMA standards or build enclosures to suit your special needs. Contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com.

Frequent variations include:

- NEMA4, 4x, 12 and 12X enclosures
- Stainless steel construction
- Custom colors and materials

Wall Mounting Bracket Kits

Part Number	Description	Max Unit Wgt (lbs)
223-7008-075	For 16 to 50 kVA units, 150°C rise	750

Model Numbers Defined

433-TXXY-ABC

3 Phase
Totally Enclosed Non-Ventilated
Single Phase units available; see page 5-6 or website for details

Enclosure Type
NEMA3R enclosure 6

kVA Rating	/ XX	kVA Rating	/ XX
15.0	16	150	26
20	17	167	27
25	18	200	28
30	19	225	29
37.5	20	250	30
45	21	300	31
50	22	333	32
75	23	400	33
100	24	500	34
112.5	25		

Primary	Secondary	
208	480Y/277	1
240	208Y/120	2
240	480Y/277	3
480	208Y/120	4
480	480Y/277	5
120 Min 600 Max	120 Min 600 Max	6
480	240 Delta	7
208	208Y/120	8
600	208Y/120	9

Wiring

Aluminum	0
Copper	8

Temperature Rise

150°C Rise	0
115°C Rise	1
80°C Rise	8

Shield

No shield	0
Shield	5

Three-Phase Totally Enclosed Non-Ventilated Transformers

Commercial & Industrial Loads • 150°C Temperature Rise with 25° Ambient • Aluminum Windings • NEMA3R Enclosures
Taps: 15 to 225 kVA 2 @ 2.5% FCAN & 4 @ 2.5% FBCN / 300 to 500 kVA 2 @ 2.5% FCAN & 2 @ 2.5% FBCN

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	Est Ship Wgt	Wall Mounting Bracket Kit	Wiring Diagram
480V Delta — 208Y/120V										
15	433-6164-000	23	25	22	17	18.1	13	310	223-7008-075	T480E
30	433-6194-000	23	32	27	21	23.5	16	585	223-7008-075	T480E
45	433-6214-000	23	38	29	23	25.5	18	775		T480E
75	433-6234-000	23	42	33	26	28.8	21	1,000		T480E
112.5	433-6254-000	23	46	35	30	30.8	25	1,315		T480E
150	433-6264-000	23	52	35	30	30.8	25	1,660		T480E
225	433-6294-000	23	60	48	33	42	27	2,460		T480E
300	433-6314-000	23	72	52	40	34	42	4,055		T480M
500	433-6344-000	23	81	66	44	60.5	38.5	6,195		T480M
480V Delta — 240V Delta / 5% 120V CT										
15	433-6167-000 *	23	25	22	17	18.1	13	310	223-7008-075	T480G
30	433-6197-000 *	23	32	27	21	23.5	16	585	223-7008-075	T480G
45	433-6217-000 *	23	38	29	23	25.5	18	775		T480G
75	433-6237-000 *	23	42	33	26	28.8	21	1,000		T480G
112.5	433-6257-000 *	23	46	35	30	30.8	25	1,315		T480G
150	433-6267-000 *	23	52	35	30	30.8	25	1,660		T480G
225	433-6297-000 *	23	60	48	33	42	27	2,460		T480G
300	433-6317-000 *	23	72	52	40	34	42	4,055		T480N
500	433-6347-000 *	23	81	66	44	60.5	38.5	6,195		T480N

Taps: 2 @ 2.5% FCAN & 2 @ 2.5% FBCN

600V Delta — 208Y/120V										
15	433-6169-000	23	25	22	17	18.1	13	310	223-7008-075	T600G
30	433-6199-000	23	32	27	21	23.5	16	585	223-7008-075	T600G
45	433-6239-000	23	38	29	23	25.5	18	775		T600G
75	433-6259-000	23	42	33	26	28.8	21	1,000		T600G
112.5	433-6259-000	23	46	35	30	30.8	25	1,315		T600G
150	433-6269-000	23	52	35	30	30.8	25	1,660		T600G
225	433-6299-000	23	60	48	33	42	27	2,460		T600G
300	433-6319-000	23	72	52	40	34	42	4,055		T600G
500	433-6349-000	23	81	66	44	60.5	38.5	6,195		T600G
600V Delta — 480Y/277V										
15	TBD	23	25	22	17	18.1	13	310	223-7008-075	T600I
30	TBD	23	32	27	21	23.5	16	585	223-7008-075	T600I
45	TBD	23	38	29	23	25.5	18	775		T600I
75	TBD	23	42	33	26	28.8	21	1,000		T600I
112.5	TBD	23	46	35	30	30.8	25	1,315		T600I
150	TBD	23	52	35	30	30.8	25	1,660		T600I
225	TBD	23	60	48	33	42	27	2,460		T600I
300	TBD	23	72	52	40	34	42	4,055		T600I
500	TBD *	23	81	66	44	60.5	38.5	6,195		T600I

See website for additional kVA, copper windings and temperature options.
Housing dimensions subject to change without notice. Consult website or factory where dimensions are critical.
Use the “Find a Product” tool for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

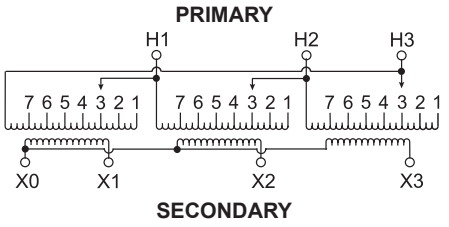
* **CAUTION**: When using the 120V center tap for single-phase applications, the single-phase load should not exceed 5% of the three-phase kVA rating. Connect the X3 “high leg” to the “B” phase per NEC 384-3 (do not use X3 leg for 120V lighting). A separate single-phase transformer should be used if the single-phase load is in excess of 5%. Fuse input side per current NEC requirements.

Three-Phase Wiring Diagrams

T480E Wiring Diagram & Connections

Wiring Diagram

Primary: 480 Volts Delta
Secondary: 208Y/120 Volts



Connections

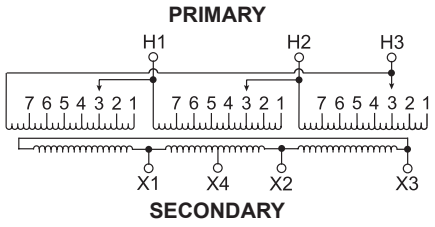
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
504	1	H1, H2, H3
492	2	H1, H2, H3
480	3	H1, H2, H3
468	4	H1, H2, H3
456	5	H1, H2, H3
444	6	H1, H2, H3
432	7	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
208	X1, X2, X3
120 1 phase	Between X0 and X1 or X2 or X3

T480G Wiring Diagram & Connections

Wiring Diagram

Primary: 480 Volts Delta
Secondary: 240 Volts Delta/120 Volts



Connections

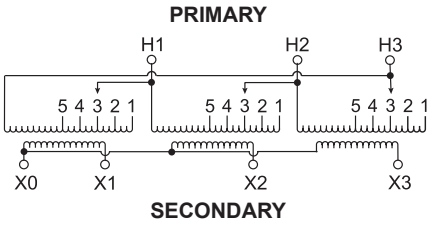
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
504	1	H1, H2, H3
492	2	H1, H2, H3
480	3	H1, H2, H3
468	4	H1, H2, H3
456	5	H1, H2, H3
444	6	H1, H2, H3
432	7	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
240	X1, X2, X3
120 1 phase	X1 and X4 or X2 or X4

T480M Wiring Diagram & Connections

Wiring Diagram

Primary: 480 Volts Delta
Secondary: 208Y/120 Volts



Connections

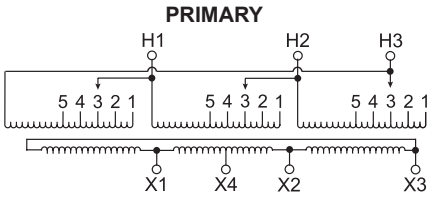
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
504	1	H1, H2, H3
492	2	H1, H2, H3
480	3	H1, H2, H3
468	4	H1, H2, H3
456	5	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
208	X1, X2, X3
120 1 phase	Between X0 and X1 or X2 or X3

T480N Wiring Diagram & Connections

Wiring Diagram

Primary: 480 Volts Delta
Secondary: 240 Volts Delta/120 Volts



Connections

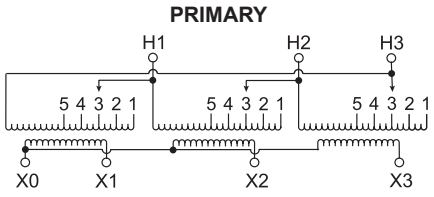
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
504	1	H1, H2, H3
492	2	H1, H2, H3
480	3	H1, H2, H3
468	4	H1, H2, H3
456	5	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
240	X1, X2, X3
120 1 phase	X1 and X4 or X2 or X4

T600G Wiring Diagram & Connections

Wiring Diagram

Primary: 600 Volts Delta
Secondary: 208Y/120 Volts



Connections

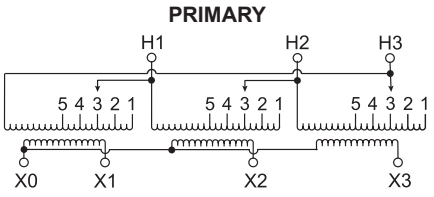
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
630	1	H1, H2, H3
615	2	H1, H2, H3
600	3	H1, H2, H3
585	4	H1, H2, H3
570	5	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
208	X1, X2, X3
120 1 phase	Between X0 and X1 or X2 or X3

T600I Wiring Diagram & Connections

Wiring Diagram

Primary: 600 Volts Delta
Secondary: 480Y/277 Volts



Connections

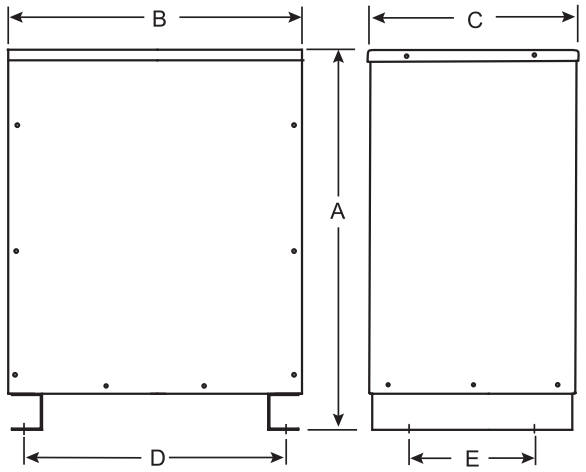
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
630	1	H1, H2, H3
615	2	H1, H2, H3
600	3	H1, H2, H3
585	4	H1, H2, H3
570	5	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
480	X1, X2, X3
277 1 phase	Between X0 and X1 or X2 or X3

More wiring diagrams can be found in catalog's appendix, section 15.
Use the "Find a Product" tool on our website for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Single-Phase Enclosure Figure

Figure 23



Enclosure Options

Jefferson Electric can meet NEMA standards or build enclosures to suit your special needs. Contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com.

Frequent variations include:

- NEMA4, 4x, 12 and 12X enclosures
- Stainless steel construction
- Custom colors and materials

Wall Mounting Bracket Kits

Part Number	Description	Max Unit Wgt (lbs)
223-7008-075	For 16 to 50 kVA units, 150°C rise	750

Model Numbers Defined

431-TXXY-ABC

1 Phase
Totally Enclosed Non-Ventilated
Three-Phase units available; see page 5-2 or website for details

Enclosure Type
NEMA3R enclosure 6

kVA Rating / XX		kVA Rating / XX	
15.0	16	45	21
20	17	50	22
25	18	75	23
30	19	100	24
37.5	20		

Primary	Secondary	
120x240	120/240	1
208	120/240	2
Reserved for special items		3
277	120/240	4
240x480	120/240	5
120 Min 600 Max	120 Min 600 Max	6
480	120/240	7
600	120/240	8

Wiring

Aluminum	0
Copper	8

Temperature Rise

150°C Rise	0
115°C Rise	1
80°C Rise	8

Shield

No shield	0
Shield	5

Single-Phase Totally Enclosed Non-Ventilated Transformers

Commercial & Industrial Loads • 150°C Temperature Rise with 25° Ambient • Aluminum Windings • NEMA3R Enclosures

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	Est Ship Wgt	Wall Mounting Bracket Kit	Wiring Diagram
240x480V — 120/240V • Taps: 2@2.5% FCAN, 4@2.5% FBCN										
15	431-6165-000	23	25	22	17	17.4	13	330	223-7008-075	S480F
25	431-6185-000	23	32	27	21	23.5	16	405	223-7008-075	S480F
37.5	431-6205-000	23	38	29	23	25.5	18	535	223-7008-075	S480F
50	431-6225-000	23	42	33	26	29.5	21	690	223-7008-075	S480F
75	431-6235-000	23	42	33	26	29.5	21	1,235		S480F
100	431-6245-000	23	46	35	30	31.5	25	2,001		S480F
600V — 120/240V • Taps: 2@2.5% FCAN, 2@2.5% FBCN										
15	431-6168-000	23	25	22	17	17.4	13	330	223-7008-075	S600E
25	431-6188-000	23	32	27	21	23.5	16	405	223-7008-075	S600E
37.5	431-6208-000	23	38	29	23	25.5	18	535	223-7008-075	S600E
50	431-6228-000	23	42	33	26	29.5	21	690	223-7008-075	S600E
75	431-6238-000	23	42	33	26	29.5	21	1,235		S600E
100	431-6248-000	23	46	35	30	31.5	25	2,001		S600E

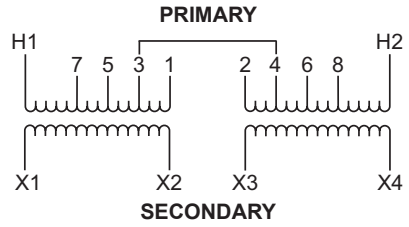
See website for additional kVA, copper windings and temperature options.
Housing dimensions subject to change without notice. Consult website or factory where dimensions are critical.
Use the “Find a Product” tool for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Single-Phase Wiring Diagrams

S480F Wiring Diagram & Connections

Wiring Diagram

Primary: 240 x 480 Volts Delta
Secondary: 120/240 Volts



Connections

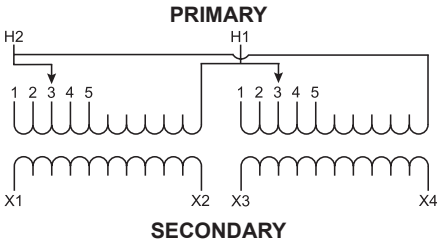
Primary Volts	Jumpers Between Taps Left Coil	Right Coil	Primary Lines Connect To
504	1	2	H1, H2
492	3	2	H1, H2
480	3	4	H1, H2
468	5	4	H1, H2
456	5	6	H1, H2
444	7	6	H1, H2
432	7	8	H1, H2
252	H2, 1	H1, 2	H1, H2
240	H2, 3	H1, 4	H1, H2
228	H2, 5	H1, 6	H1, H2
216	H2, 7	H1, 8	H1, H2

Secondary Volts	Interconnect	Secondary Lines Connect To
240	X2 to X3	X1, X4
120/240	X2 to X3	X1, X2, X4
120	X1 to X3 X2 to X4	X1, X4

S600E Wiring Diagram & Connections

Wiring Diagram

Primary: 600 Volts Delta
Secondary: 120/240 Volts



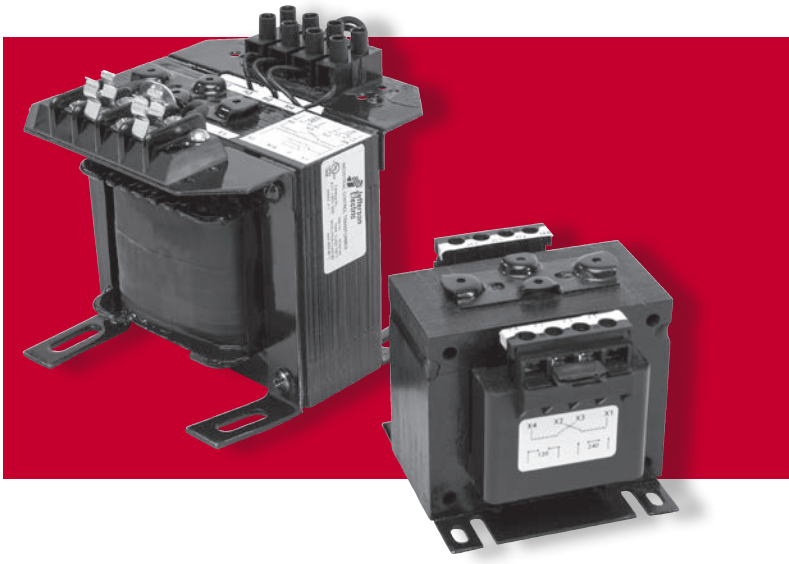
Connections

Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
630	1	H1, H2
615	2	H1, H2
600	3	H1, H2
585	4	H1, H2
570	5	H1, H2

Secondary Volts	Interconnect	Secondary Lines Connect To
240	X2 to X3	X1, X4
120/240	X2 to X3	X1, X2, X4
120	X1 to X3 X2 to X4	X1, X4

More wiring diagrams can be found in catalog appendix, section 15.
Use the “Find a Product” tool on our website for detailed spec sheet.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

50 to 5,000 VA



Applications

- For commercial and industrial control applications including; control panels, conveyor systems, machine tool equipment, pump systems, and commercial air conditioning applications

Specifications

- Core and coil
- 50/60 Hz operation
- Machine wound copper coils
- Cores of high grade silicon steel
- 55ºC temperature rise for 50 – 100 VA, insulation class of 105°C

  80ºC temperature rise for 150 – 750 VA, insulation class of 130°C

  115ºC temperature rise for 1,000 – 5,000 VA, insulation class of 180°C
- Phil-Slot-Hex head terminal screws
- Cores of high quality electrical steel
- Finger safe terminals on <=2kVA units (without secondary fuse clips)

Features, Functions, Benefits

- Permanently affixed wiring diagram
- Finger safe terminals on units 350 VA and below
- Slotted mounting holes for quick and easy mounting
- Secondary fuse clips standard on most units. The fuse clip is for a 13/32 x 1-1/2 midget fuse. The secondary fuse style is a matter of customer preference usually either time delay or fast acting.
- Wall mount design through 25 kVA
- Many sizes in stock and available for immediate shipment
- Units 2,000 VA and less are UPS shippable

Standards

- Built in accordance with ANSI, and UL standards
- UL and cUL listed

Options and Accessories

- Other sizes and voltages available
- Units can be ordered with primary fuse blocks and covers factory installed
- Optional primary fuse block for 3/32 x 1-1/2 class cc rejection fuse available
- CE Marked units available

Approvals

Enclosure Figures

Figure 30

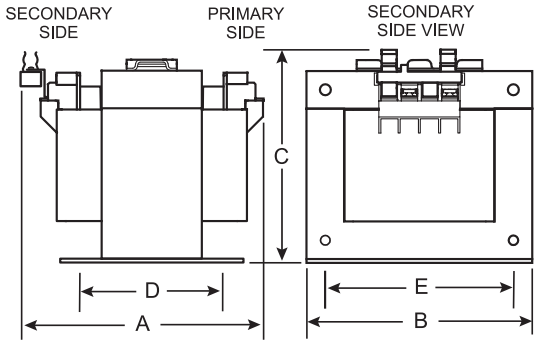
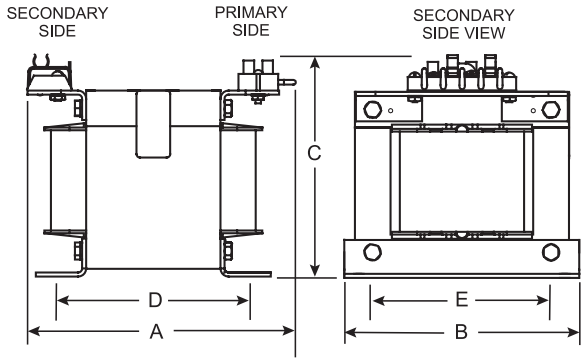


Figure 31



NOTE: Models with catalog numbers ending in "301" do not have a secondary fuseclip

Model Numbers Defined

631-XXYY-ABC

Single-Phase, Encapsulated

kVA Rating / XX		kVA Rating / XX	
0.050	11	0.500	19
0.075	12	0.750	20
0.100	13	1.000	21
0.150	14	1.500	22
0.200	15	2.000	23
0.250	16	3.000	24
0.300	17	4.000	25
0.350	18	5.000	26

Primary	Secondary	
none	none	00
220/230/240 x440/460/480	110/115/120	01
240x480	24	02
120x240	24	03
550/575/600	110/115/120	04
277x208	120	05
460x230x208	115	06
230x460x575	95, 115	07
380x400x415	110x220	08
200/208 x220/230/240 x440/460/480	23/24/25, 110/115/120	09
240x480	120x240	10
208-600	85-130	11
220/230/240	110/115/120	12
x440/460/480 240x347x380	x220/230/240 120x240	13

Variations

Secondary fuseclip included	300
No secondary fuseclip possible	301
Primary fuse kit installed with secondary fuseclip	500
Primary fuse kit installed without secondary fuseclip	501

Industrial Control Transformers

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	Est Ship Wgt	Temp Rise	Insulation	Wiring Diagram
Primary: 220/230/240x440/460/480 V Secondary:110/115/120 V											
0.05	631-1101-300	30	3.64	3	3.46	2	2.5	2.6	55	180°C	Group AA
0.075	631-1201-300	30	4.1	3	3.46	2.5	2.5	3.5	55	180°C	Group AA
0.1	631-1301-300	30	4.1	3.31	3.46	2.38	2.81	4.2	55	180°C	Group AA
0.15	631-1401-300	30	4.54	3.75	3.94	2.88	3.13	6.7	80	180°C	Group AA
0.2	631-1501-300	30	4.37	4.5	4.46	2.5	3.75	8.5	80	180°C	Group AA
0.25	631-1601-300	30	4.87	4.5	4.47	2.88	3.75	10	80	180°C	Group AA
0.3	631-1701-300	30	4.87	4.5	4.47	3.25	3.75	11.3	80	180°C	Group AA
0.35	631-1801-300	30	5.6	4.5	4.47	3.75	3.75	13.6	80	180°C	Group AA
0.5	631-1901-300	31	5.53	5.25	5.66	3.88	4.38	19.2	80	180°C	Group AA
0.75	631-2001-300	31	6.77	5.25	5.66	5.38	4.38	28.1	80	180°C	Group AA
1	631-2101-300	31	6.02	6.37	6.57	4	6.13	28.1	115	180°C	Group AA
1.5	631-2201-300	31	7.16	6.75	6.57	4.5	6.13	30	115	180°C	Group AA
2	631-2301-300	31	8.01	7.0	6.64	5.37	6.13	38	115	180°C	Group AA
3	631-2401-301	31	7.01	9	8.94	4.25	6.5	53	115	180°C	Group AA
5	631-2601-301	31	8	9	8.94	7.25	7.5	89	115	180°C	Group AA
Primary: 240 x 480 V Secondary: 24 V											
0.05	631-1102-300	30	3.64	3	3.46	2	2.5	2	55	180°C	Group BB
0.075	631-1202-300	30	4.1	3	3.46	2.5	2.5	2.5	55	180°C	Group BB
0.1	631-1302-300	30	4.1	3.31	3.46	2.38	2.81	2.38	55	180°C	Group BB
0.15	631-1402-300	30	4.54	3.75	3.94	2.88	3.13	2.88	80	180°C	Group BB
0.2	631-1502-300	30	4.37	4.5	4.46	2.5	3.75	2.5	80	180°C	Group BB
0.25	631-1602-300	30	4.87	4.5	4.47	2.88	3.75	2.88	80	180°C	Group BB
0.3	631-1702-300	30	4.87	4.5	4.47	3.25	3.75	3.25	80	180°C	Group BB
0.35	631-1802-300	30	5.6	4.5	4.47	3.75	3.75	3.75	80	180°C	Group BB
0.5	631-1902-300	31	5.53	5.25	5.66	3.88	4.38	3.88	80	180°C	Group BB
0.75	631-2002-301	31	6.77	5.25	5.66	5.38	4.38	5.38	80	180°C	Group BB
Primary: 120 x 240 V Secondary: 24 V											
0.05	631-1103-300	30	3.64	3	3.46	2	2.5	2	55	180°C	Group CC
0.075	631-1203-300	30	4.1	3	3.46	2.5	2.5	2.5	55	180°C	Group CC
0.1	631-1303-300	30	4.1	3.31	3.46	2.38	2.81	2.38	55	180°C	Group CC
0.15	631-1403-300	30	4.54	3.75	3.94	2.88	3.13	2.88	80	180°C	Group CC
0.2	631-1503-300	30	4.37	4.5	4.46	2.5	3.75	2.5	80	180°C	Group CC
0.25	631-1603-300	30	4.87	4.5	4.47	2.88	3.75	2.88	80	180°C	Group CC
0.3	631-1703-300	30	4.87	4.5	4.47	3.25	3.75	3.25	80	180°C	Group CC
0.35	631-1803-300	30	5.6	4.5	4.47	3.75	3.75	3.75	80	180°C	Group CC
0.5	631-1903-300	31	5.53	5.25	5.66	3.88	4.38	3.88	80	180°C	Group CC
0.75	631-2003-301	31	6.77	5.25	5.66	5.38	4.38	5.38	80	180°C	Group CC

See website for additional kVA, copper windings and temperature options.
Housing dimensions subject to change without notice. Consult website or factory where dimensions are critical.
Use the “Find a Product” tool for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Industrial Control Transformers

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	Est Ship Wgt	Temp Rise °C	Insulation	Wiring Diagram
Primary: 550/575/600 V Secondary: 110/115/120 V											
0.05	631-1104-300	30	3.64	3	3.46	2	2.5	2.6	55	180°C	Group EE
0.075	631-1204-300	30	4.1	3	3.46	2.5	2.5	3.5	55	180°C	Group EE
0.1	631-1304-300	30	4.1	3.31	3.46	2.38	2.81	4.2	55	180°C	Group EE
0.15	631-1404-300	30	4.54	3.75	3.94	2.88	3.13	6.7	80	180°C	Group EE
0.2	631-1504-300	30	4.37	4.5	4.46	2.5	3.75	8.5	80	180°C	Group EE
0.25	631-1604-300	30	4.87	4.5	4.47	2.88	3.75	10	80	180°C	Group EE
0.3	631-1704-300	30	4.87	4.5	4.47	3.25	3.75	11.3	80	180°C	Group EE
0.35	631-1804-300	30	5.6	4.5	4.47	3.75	3.75	13.6	80	180°C	Group EE
0.5	631-1904-300	31	5.53	5.25	5.66	3.88	4.38	19.2	80	180°C	Group EE
0.75	631-2004-300	31	6.77	5.25	5.66	5.38	4.38	28.1	80	180°C	Group EE
Primary: 208 x 277 V Secondary: 120 V											
0.05	631-1105-300	30	3.64	3	3.46	2	2.5	2.6	55	180°C	Group FF
0.075	631-1205-300	30	4.1	3	3.46	2.5	2.5	3.5	55	180°C	Group FF
0.1	631-1305-300	30	4.1	3.31	3.46	2.38	2.81	4.2	55	180°C	Group FF
0.15	631-1405-300	30	4.54	3.75	3.94	2.88	3.13	6.7	80	180°C	Group FF
0.2	631-1505-300	30	4.37	4.5	4.46	2.5	3.75	8.5	80	180°C	Group FF
0.25	631-1605-300	30	4.87	4.5	4.47	2.88	3.75	10	80	180°C	Group FF
0.3	631-1705-300	30	4.87	4.5	4.47	3.25	3.75	11.3	80	180°C	Group FF
0.35	631-1805-300	30	5.6	4.5	4.47	3.75	3.75	13.6	80	180°C	Group FF
0.5	631-1905-300	31	5.53	5.25	5.66	3.88	4.38	19.2	80	180°C	Group FF
0.75	631-2005-300	31	6.77	5.25	5.66	5.38	4.38	28.1	80	180°C	Group FF
Primary: 208 x 230 x 460 V Secondary: 115 V											
0.05	631-1106-300	30	3.64	3	3.46	2	2.5	2.6	55	180°C	Group GG
0.075	631-1206-300	30	4.1	3.31	3.46	2.38	2.81	4.2	55	180°C	Group GG
0.1	631-1306-300	30	4.1	3.31	3.46	2.38	2.81	4.2	55	180°C	Group GG
0.15	631-1406-300	30	4.54	3.75	3.94	2.88	3.13	6.7	80	180°C	Group GG
0.2	631-1506-300	30	4.87	4.5	4.47	2.88	3.75	10	80	180°C	Group GG
0.25	631-1606-300	30	4.87	4.5	4.47	3.25	3.75	11.3	80	180°C	Group GG
0.3	631-1706-300	30	5.6	4.5	4.47	3.75	3.75	13.6	80	180°C	Group GG
0.35	631-1806-300	30	5.6	4.5	4.47	4.75	3.75	15.6	80	180°C	Group GG
0.5	631-1906-300	31	6.53	5.25	5.66	4.38	4.38	21.5	80	180°C	Group GG
0.75	631-2006-300	31	7.25	5.25	5.66	5.88	4.38	30	80	180°C	Group GG
1	631-2106-300	31	6.02	6.37	6.57	4	6.13	28.1	115	180°C	Group GG
1.5	631-2206-300	31	6.02	6.37	6.57	4	6.13	28.1	115	180°C	Group GG
2	631-2306-300	31	7.79	6.37	6.57	5.13	6.13	38	115	180°C	Group GG
3	631-2406-301	31	7.01	9	8.74	4.25	6.5	53	115	180°C	Group GG
5	631-2606-301	31	8	9	8.74	7.25	7.5	89	115	180°C	Group GG
Primary: 230 x 460 x 575 V Secondary: 95, 115 V											
1	631-2107-301	31	6.02	6.37	6.57	4	6.13	28.1	115	180°C	Group HH
1.5	631-2207-301	31	7.79	6.37	6.57	5.13	6.13	38	115	180°C	Group HH
2	631-2307-301	31	7.01	9	8.74	4.25	6.5	53	115	180°C	Group HH
3	631-2407-301	31	8	9	8.74	7.25	7.5	89	115	180°C	Group HH
5	631-2607-301	31	9	9	8.74	8.25	7.5	100	115	180°C	Group HH

See website for additional kVA, copper windings and temperature options.
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For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Industrial Control Transformers

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	Est Ship Wgt	Temp Rise °C	Insulation	Wiring Diagram
Primary: 380 x 400 x 415 V Secondary: 110 x 220 V											
0.05	631-1108-301	30	3.64	3	3.46	2	2.5	2.6	55	180°C	Group II
0.075	631-1208-301	30	4.1	3	3.46	2.5	2.5	3.5	55	180°C	Group II
0.1	631-1308-301	30	4.1	3.31	3.46	2.38	2.81	4.2	55	180°C	Group II
0.15	631-1408-301	30	4.54	3.75	3.94	2.88	3.13	6.7	80	180°C	Group II
0.2	631-1508-301	30	4.37	4.5	4.46	2.5	3.75	8.5	80	180°C	Group II
0.25	631-1608-301	30	4.87	4.5	4.47	2.88	3.75	10	80	180°C	Group II
0.3	631-1708-301	30	4.87	4.5	4.47	3.25	3.75	11.3	80	180°C	Group II
0.35	631-1808-301	30	5.6	4.5	4.47	3.75	3.75	13.6	80	180°C	Group II
0.5	631-1908-301	31	5.53	5.25	5.66	3.88	4.38	19.2	80	180°C	Group II
0.75	631-2008-301	31	6.77	5.25	5.66	5.38	4.38	28.1	80	180°C	Group II
Primary: 200/208x220/230/240x440/460/480 V Secondary: 23/24/25 (Full Load),110/115/120 V											
0.05	631-1109-301	30	4.6	3	3.46	2.88	2.5	4.2	55	180°C	Group JJ
0.075	631-1209-301	30	4.54	3.75	3.94	2.88	3.13	6.7	55	180°C	Group JJ
0.1	631-1309-301	30	4.54	3.75	3.94	2.88	3.13	6.7	55	180°C	Group JJ
0.15	631-1409-301	30	4.54	3.75	3.94	2.88	3.13	6.7	80	180°C	Group JJ
0.2	631-1509-301	30	4.87	4.5	4.47	2.88	3.75	10	80	180°C	Group JJ
0.25	631-1609-301	30	5.6	4.5	4.47	3.75	3.75	13.6	80	180°C	Group JJ
0.3	631-1709-301	31	5.53	5.25	5.66	3.88	4.38	19.2	80	180°C	Group JJ
0.35	631-1809-301	31	5.53	5.25	5.66	3.88	4.38	19.2	80	180°C	Group JJ
0.5	631-1909-301	31	6.53	5.25	5.66	4.38	4.3	21.5	80	180°C	Group JJ
Primary: 240 x 480 V Secondary: 120/240 V											
0.05	631-1110-301	30	3.64	3	3.46	2	2.5	2.6	55	180°C	Group KK
0.075	631-1210-301	30	4.1	3	3.46	2.5	2.5	3.5	55	180°C	Group KK
0.1	631-1310-301	30	4.1	3.31	3.46	2.38	2.81	4.2	55	180°C	Group KK
0.15	631-1410-301	30	4.54	3.75	3.94	2.88	3.13	6.7	80	180°C	Group KK
0.2	631-1510-301	30	4.37	4.5	4.46	2.5	3.75	8.5	80	180°C	Group KK
0.25	631-1610-301	30	4.87	4.5	4.47	2.88	3.75	10	80	180°C	Group KK
0.3	631-1710-301	30	4.87	4.5	4.47	3.25	3.75	11.3	80	180°C	Group KK
0.35	631-1810-301	30	5.6	4.5	4.47	3.75	3.75	13.6	80	180°C	Group KK
0.5	631-1910-301	31	5.53	5.25	5.66	3.88	4.38	19.2	80	180°C	Group KK
0.75	631-2010-301	31	6.77	5.25	5.66	5.38	4.38	28.1	80	180°C	Group KK
1	631-2110-301	31	5.78	6.75	5.57	4	6.13	28.1	115	180°C	Group KK
1.5	631-2210-301	31	6.79	6.75	6.57	4.5	6.13	30	115	180°C	Group KK
3	631-2410-301	31	6.01	9	8.75	4.25	6.25	53	115	180°C	Group KK
Primary: 208-600 V Secondary: 85 - 130 V											
0.05	631-1111-301	30	4.1	3.31	3.46	2.38	2.81	4.2	55	180°C	Group LL
0.1	631-1311-301	30	4.54	3.75	3.94	2.88	3.13	6.7	55	180°C	Group LL
0.15	631-1411-301	30	4.87	4.5	4.47	2.88	3.75	10	80	180°C	Group LL
0.25	631-1611-301	30	5.53	5.25	5.66	3.88	4.38	19.2	80	180°C	Group LL
0.35	631-1811-301	31	6.53	5.25	5.66	4.38	4.38	21.5	80	180°C	Group LL
0.5	631-1911-301	31	7.25	5.25	5.66	5.88	4.38	30	80	180°C	Group LL
0.75	631-2011-301	31	6.02	6.37	6.57	4	6.13	28.1	80	180°C	Group LL

See website for additional kVA, copper windings and temperature options.
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Industrial Control Transformers

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	Est Ship Wgt	Temp Rise °C	Insulation	Wiring Diagram
Primary: 220/230/240x440/460/480 V Secondary: 110/115/120x220/230/240 V											
1	631-2112-301	31	6.77	5.25	5.66	5.38	4.38	28.1	115	180°C	Group MM
1.5	631-2212-301	31	6.02	6.37	6.57	4	6.13	28.1	115	180°C	Group MM
2	631-2312-301	31	7.79	6.37	6.57	5.13	6.13	38	115	180°C	Group MM
3	631-2412-301	31	7.01	9	8.74	4.25	6.5	53	115	180°C	Group MM
5	631-2612-301	31	8	9	8.74	7.25	7.5	89	115	180°C	Group MM
Primary: 240 x 347 x 380 V Secondary: 120/240 V											
1	631-2113-301	31	6.02	6.37	6.57	4	6.13	28.1	115	180°C	Group NN
1.5	631-2213-301	31	6.02	6.37	6.57	4	6.13	28.1	115	180°C	Group NN
2	631-2313-301	31	7.79	6.37	6.57	5.13	6.13	38	115	180°C	Group NN
3	631-2413-301	31	7.01	9	8.74	4.25	6.5	53	115	180°C	Group NN
5	631-2613-301	31	8	9	8.74	7.25	7.5	89	115	180°C	Group NN

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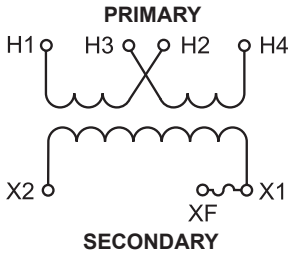
Wiring Diagrams

Group AA Wiring Diagram & Connections

Wiring Diagram

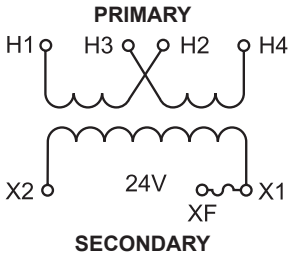


Connections

Primary Volts	Interconnect	Primary Lines Connect To
240/230/220	H1-H3, H2-H4	H1, H4
480/460/440	H2-H3	H1, H4
Secondary Volts		**Secondary Lines Connect To**
120/115/110		X2, XF

Group BB Wiring Diagram & Connections

Wiring Diagram

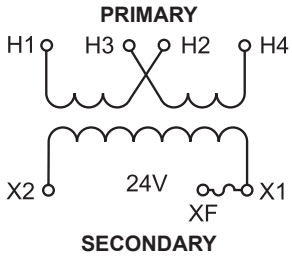


Connections

Primary Volts	Interconnect	Primary Lines Connect To
480	H2-H3	H1, H4
240	H1-H3, H2-H4	H1, H4
Secondary Volts		**Secondary Lines Connect To**
24		X2, XF

Group CC Wiring Diagram & Connections

Wiring Diagram



Connections

Primary Volts	Interconnect	Primary Lines Connect To
240	H2-H3	H1, H4
120	H1-H3, H2-H4	H1, H4
Secondary Volts		**Secondary Lines Connect To**
24		X2, XF

More wiring diagrams can be found in catalog’s appendix, section 15.
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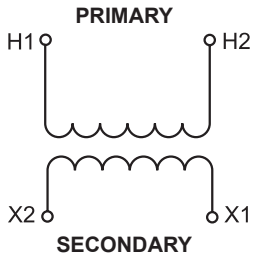
Wiring Diagrams

Group EE Wiring Diagram & Connections

Wiring Diagram

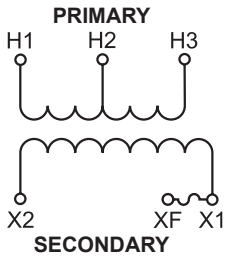


Connections

Primary Volts	Primary Lines Connect To
600/575/550	H1, H2
Secondary Volts	**Secondary Lines Connect To**
120/115/110	X2, X1

Group FF Wiring Diagram & Connections

Wiring Diagram

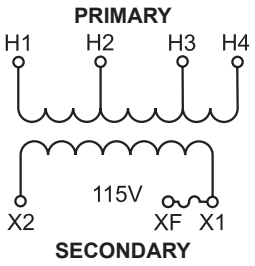


Connections

Primary Volts	Primary Lines Connect To
277	H1, H3
208	H2, H3
Secondary Volts	**Secondary Lines Connect To**
120	X2, XF

Group GG Wiring Diagram & Connections

Wiring Diagram

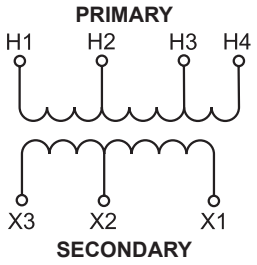


Connections

Primary Volts	Primary Lines Connect To
460	H1, H4
230	H2, H4
208	H3, H4
Secondary Volts	**Secondary Lines Connect To**
115	X2, XF

Group HH Wiring Diagram & Connections

Wiring Diagram

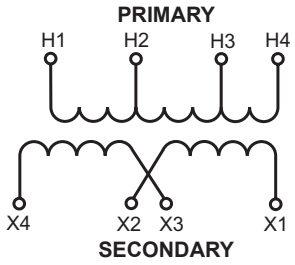


Connections

Primary Volts	Primary Lines Connect To
575	H1, H4
460	H2, H4
230	H3, H4
Secondary Volts	**Secondary Lines Connect To**
115	X1, X3
95	X2, X3

Group II Wiring Diagram & Connections

Wiring Diagram

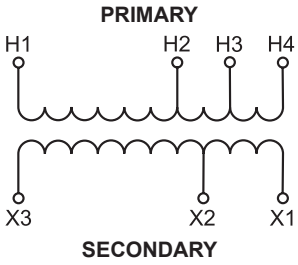


Connections

Primary Volts		Primary Lines Connect To
415		H1, H4
400		H2, H4
380		H3, H4
Secondary Volts		**Secondary Lines Connect To**
110	X1-X3, X2-X4	X1, X4
220	X2-X3	X1, X4

Group JJ Wiring Diagram & Connections

Wiring Diagram



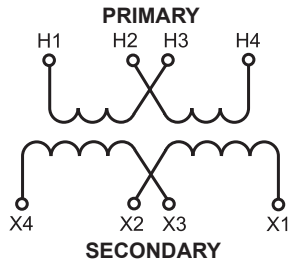
Connections

Primary Volts	Primary Lines Connect To
480/460/440 V	H1, H4
240/230/220 V	H2, H4
208/200 V	H3, H4
Secondary Volts	**Secondary Lines Connect To**
120/115/110 V	X1, X3
25/24/23 V	X2, X3

Wiring Diagrams

Group KK Wiring Diagram & Connections

Wiring Diagram

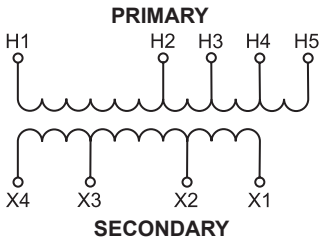


Connections

Primary Volts	Interconnect	Primary Lines Connect To
480	H2-H3	H1, H4
240	H1-H3, H2-H4	H1, H4
Secondary Volts	**Interconnect**	**Secondary Lines Connect To**
120	X1-X3, X2-X4	X1, X4
240	X2-X3	X1, X4

Group LL Wiring Diagram & Connections

Wiring Diagram

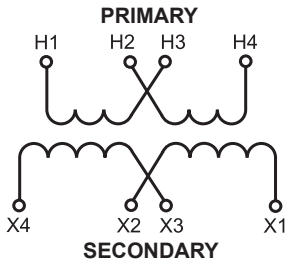


Connections

Primary Volts	Primary Lines Connect To
240/230/220/208	H2, H1
416/400/380	H3, H1
480/460/440	H4, H1
600/575/550/500	H5, H1
Secondary Volts	**Secondary Lines Connect To**
130/125/120/110	X4, X1
120/115/110/100	X3, X1
99/95/91/85	X2, X1

Group MM Wiring Diagram & Connections

Wiring Diagram

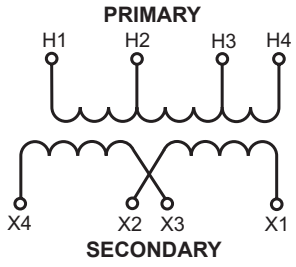


Connections

Primary Volts	Interconnect	Primary Lines Connect To
480/460/440	H2-H3	H1, H4
240/230/220	H1-H3, H2-H4	H1, H4
Secondary Volts	**Interconnect**	**Secondary Lines Connect To**
120/115/110	X1-X3, X2-X4	X2, X4
240/230/220	X2-X3	X1, X4

Group NN Wiring Diagram & Connections

Wiring Diagram



Connections

Primary Volts		Primary Lines Connect To
380		H1, H4
347		H2, H4
240		H3, H4
Secondary Volts		**Secondary Lines Connect To**
120	X1-X3, X2-X4	X1, X4
240	X2-X3	X1, X4

More wiring diagrams can be found in catalog's appendix, section 15.
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technical_services@jeffersonelectric.com

Accessories

Item	Catalog Number	Figure	Dimensions	Estimated Shipping Wgt	Description
Primary Fuse Kit (Maximum 2,000 VA)	631-0000-301	16	Adds approx 1.38″ to C dimension	0.35 lbs.	Fuse kit for one transformer
Primary Fuse Covers +	631-0000-302	17	Adds approx .25″ to C dimension (1.65″ total with fuse kit)	0.10 lbs.	Cover for one fuse kit
Finger Safe Terminal Covers	631-0000-303	32	Adds approx .25″ to C dimension	0.10 lbs.	Covers for one transformer for units larger than 350 VA
Secondary Fuse Cover	631-0000-307		Adds approx .25″ to C dimension	0.10 lbs.	Cover for one transformer 350 VA and smaller

Figure 16

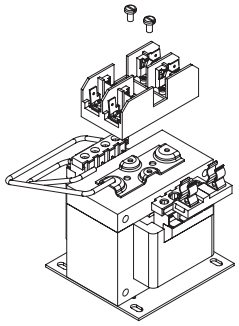


Figure 17

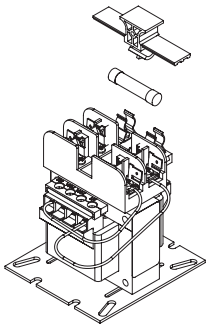
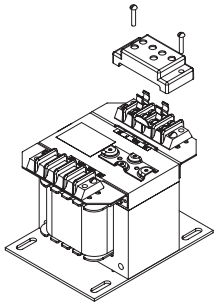


Figure 32



- The optional primary fuse block is for a 13/32 x 1-1/2 class cc rejection fuse. The primary fuse should always have a time delay, slow blow properly sized for the application.
- The standard secondary fuse clip is for a 13/32 x 1-1/2 midget fuse. The secondary fuse style is a matter of customer preference usually either time delay or fast acting.

50 VA to 25 kVA

Applications

- For general loads, indoors or out, including lighting, industrial and commercial applications
- Units may be banked for 3-Phase operations
- For transformers to use with submersible fixtures, see page 7-5

Specifications

- NEMA3R-rated enclosures
- 60 Hz operation
- Aluminum windings
- 95ºC temperature rise for 0.5 to 1 kVA
  135ºC temperature rise for 1.5 to 25 kVA
- Encapsulated with electrical grade resin
- Heat-cured ASA-61 gray powder coat finish
- Cores of high quality electrical steel
- Primary taps on some models

Features, Functions, Benefits

- Large connection compartment with knockouts for ease of wiring and installation
- Slotted mounting holes for quick and easy mounting
- Lifting hooks above 5 kVA
- Wall mount design through 25 kVA
- Many sizes in stock and available for immediate shipment
- Quiet operation for installation flexibility
- Seismic qualification certification for all units

Standards

- Built in accordance with NEMA, ANSI, UL and CSA standards
- International units are CE Marked

Options and Accessories

- 50/60 Hz optional
- Other sizes, voltages and temperature rises available
- Copper windings
- CE Marked units available as custom
- Class I Div 2 units available

Approvals

Enclosure Figures

Figure 2

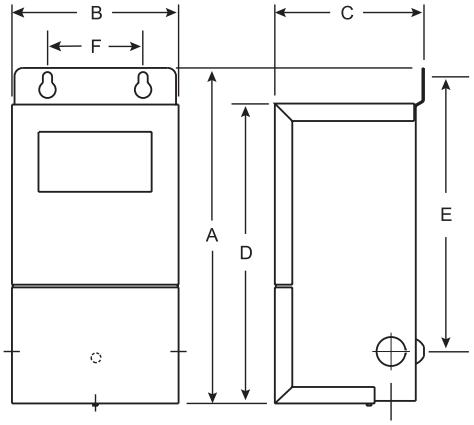


Figure 3

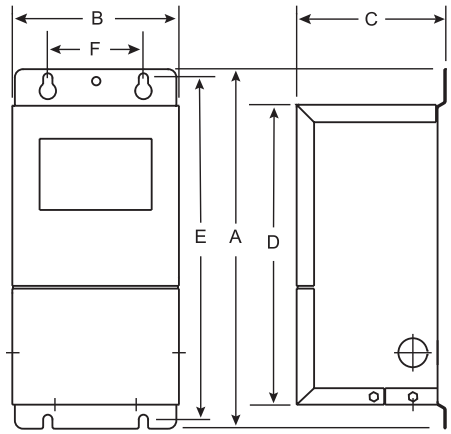
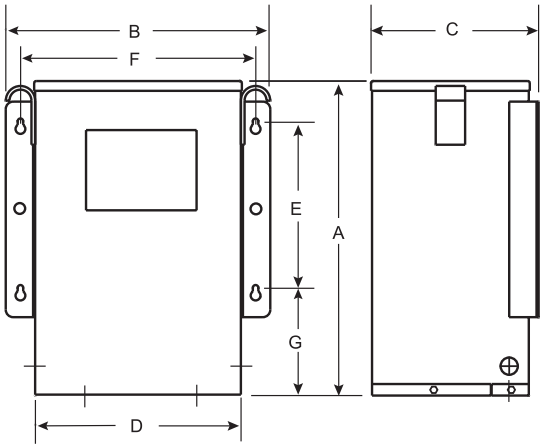


Figure 4



Model Numbers Defined

411-TXXY-ABC

Single-Phase, Encapsulated Wall Mount

Standard	411
International	511

Type

Updated style	1
Class I, Div 2	2

kVA Rating / XX

0.5	05	6.0	12
0.75	06	7.5	13
1.0	07	9.0	14
1.5	08	10.0	15
2.0	09	15.0	16
3.0	10	20.0	17
5.0	11	25.0	18

Primary	Secondary	
120x240	120/240	1
208	120/240	2
240x480	120/240	3
277	120/240	4
600	120/240	5
600 Max	120 Min 600 Max	6
480	120/240	7

Wiring

Default	0
Copper	8

Temperature Rise, Shields

135°C Rise*, no shield	0
135°C Rise*, with shield	1
95°C Rise*, no shield	2
95°C Rise*, with shield	3
80°C Rise*, no shield	4
80°C Rise*, with shield	5
115°C Rise#, no shield	6
115°C Rise#, no shield	7

** 25°C ambient # 40°C ambient*

Taps

No taps	0
2@2.5% FCBN	1
2@2.5% FCAN, 2@2.5 FCBN	2
4@2.5% FCBN	3
2@5% FCBN	4
1@5% FCAN, 1@5% FCBN	5
2@5% FCAN, 4@2.5 FCBN	6

Single-Phase Encapsulated General Purpose Transformers

.050 - 1 kVA, 95°C Temperature Rise, 1.5 - 25 kVA, 135°C Temperature Rise

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	(F) inches	(G) inches	Est Ship Wgt	Shield	Wiring Diagram
120 x 240V — 120/240V • Taps: None												
.50	411-0051-120	2	10.2	5.1	4.6	9.1	8.4	2.25		15	YES	S240A
1.0	411-0071-120	2	10.2	5.1	4.6	9.1	8.4	2.25		18	YES	S240A
2.0	411-0091-120	3	12.5	6.7	5.4	10.6	12	2.25		41	YES	S240A
3.0	411-0101-120	3	14.6	7.6	7.2	12.7	14.1	3.5		68	YES	S240A
5.0	411-0111-120	3	14.6	7.6	7.2	12.7	14.1	3.5		98	NO	S240A
7.5	411-0131-120	4	16.1	13.5	8.6	10.6	8.25	5.5	12.0	130	NO	S240A
10	411-0151-120	4	16.1	13.5	8.6	10.6	8.25	5.5	12.0	155	NO	S240A
15	411-0161-120	4	21.1	16.5	10.1	13.7	12.5	6.25	15.0	255	NO	S240A
25	411-0181-120	4	21.1	16.5	10.1	13.7	12.5	6.25	15.0	291	NO	S240A
240 x 480V — 120/240V • Taps: None												
0.05	411-0001-000	2	8.1	3.3	3.1	6.8	6.2	2.3		6	YES	S480A
0.10	411-0021-000	2	8.1	3.3	3.1	6.8	6.2	2.3		6	YES	S480A
0.15	411-0031-000	2	8.1	3.3	3.1	6.8	6.2	2.3		6	YES	S480A
0.25	411-0041-000	2	8.1	3.3	3.1	6.8	6.2	2.3		7	YES	S480A
0.50	411-0051-000	2	10.2	5.1	4.6	9.1	8.4	2.3		15	NO	S480A
0.75	411-0061-000	2	10.2	5.1	4.6	9.1	8.4	2.3		18	NO	S480A
1.0	411-0071-000	2	10.2	5.1	4.6	9.1	8.4	2.3		19	NO	S480A
1.5	411-0081-000	3	12.5	6.7	5.3	10.6	12.0	2.3		33	NO	S480A
2.0	411-0091-000	3	12.5	6.7	5.3	10.6	12.0	2.3		41	NO	S480A
3.0	411-0101-000	3	14.6	7.6	7.2	12.7	14.1	3.5		68	NO	S480A
5.0	411-0111-000	3	14.6	7.6	7.2	12.7	14.1	3.5		93		S480A
7.5	411-0131-000	4	16.1	13.5	8.6	10.6	8.3	5.5	12.0	130		S480A
10.0	411-0151-000	4	16.1	13.5	8.6	10.6	8.3	5.5	12.0	155		S480A
15.0	411-0161-000	4	21.1	16.5	10.1	13.7	12.5	6.3	15.0	255		S480A
25.0	411-0181-000	4	21.1	16.5	10.1	13.7	12.5	6.3	15.0	291		S480A
240 x 480V — 120/240V • Taps: 2–2.5% FCAN + 2–2.5% FCBN												
3.0	411-0104-300	3	14.6	7.6	7.2	12.7	14.1	3.5		68	YES	S480B
5.0	411-0114-300	3	14.6	7.6	7.2	12.7	14.1	3.5		93	YES	S480B
7.5	411-0134-300	4	16.1	13.5	8.6	10.6	8.3	5.5	12.0	130	YES	S480B
10.0	411-0154-300	4	16.1	13.5	8.6	10.6	8.3	5.5	12.0	155	YES	S480B
15.0	411-0164-300	4	21.1	16.5	10.1	13.7	12.5	6.3	15.0	255	NO	S480B
25.0	411-0184-300	4	21.1	16.5	10.1	13.7	12.5	6.3	15.0	291	NO	S480B

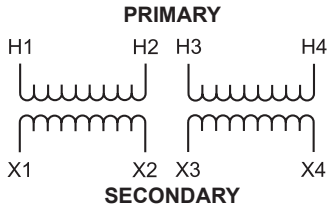
See website for additional kVA, copper windings and temperature options.
Housing dimensions subject to change without notice. Consult website or factory where dimensions are critical.
Use the “Find a Product” tool for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Wiring Diagrams

S240A Wiring Diagram & Connections

Wiring Diagram

Primary: 120 x 240 Volts Delta
Secondary: 120/240 Volts



Connections

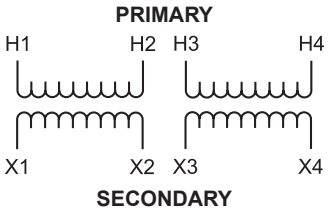
Primary Volts	Interconnect	Primary Lines Connect To
240	H2 to H3	H1, H4
120	H1 to H3 H2 to H4	H1, H4

Secondary Volts	Interconnect	Secondary Lines Connect To
240	X2 to X3	X1, X4
120/240	X2 to X3	X1, X2, X4
120	X1 to X3 X2 to X4	X1, X4

S480A Wiring Diagram & Connections

Wiring Diagram

Primary: 240 x 480 Volts Delta
Secondary: 120/240 Volts



Connections

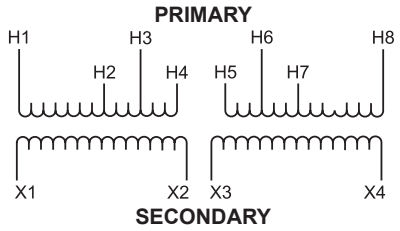
Primary Volts	Interconnect	Primary Lines Connect To
480	H2 to H3	H1, H4
240	H1 to H3 H2 to H4	H1, H4

Secondary Volts	Interconnect	Secondary Lines Connect To
240	X2 to X3	X1, X4
120/240	X2 to X3	X1, X2, X4
120	X1 to X3 X2 to X4	X1, X4

S480B Wiring Diagram & Connections

Wiring Diagram

Primary: 240 x 480 Volts Delta
Secondary: 120/240 Volts



Connections

Primary Volts	Interconnect	Primary Lines Connect To
504	H4 to H5	H1 and H8
492	H3 to H5	H1 and H8
480	H3 to H6	H1 and H8
468	H2 to H6	H1 and H8
456	H2 to H7	H1 and H8
252	H1 to H5 H4 to H8	H1 and H8
240	H1 to H6 H3 to H8	H1 and H8
228	H1 to H7 H2 to H8	H1 and H8

Secondary Volts	Interconnect	Secondary Lines Connect To
240	X2 to X3	X1 and X4
120/240	X2 to X3	X1, X2, X4
120	X1 to X3 X2 to X4	X1, X4

More wiring diagrams can be found in catalog's appendix, section 15.
Use the "Find a Product" tool on our website for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755,
technical_services@jeffersonelectric.com

Pool and Spa Lighting
100-1000 Watts

Applications

- For use with submersible fixtures including swimming pools, water fountains, low voltage circuits near water or other shock hazards
- Transformers themselves are not submersible

Specifications

- NEMA3R-rated enclosures
- 60 Hz operation
- Aluminum windings
- Cores of high quality electrical steel
- Encapsulated with electrical grade resin
- Electrostatic shields
- 12, 13, 14 volt taps to compensate for voltage drop on long electrical runs
- Heat-cured ASA-61 gray powder coat finish

Features, Functions, Benefits

- Resettable power circuit breakers to interrupt if a short or over-voltage occurs
- Wall mount design
- Quiet operation for installation flexibility

Standards

- Built in accordance with NEMA, ANSI, UL and CSA standards

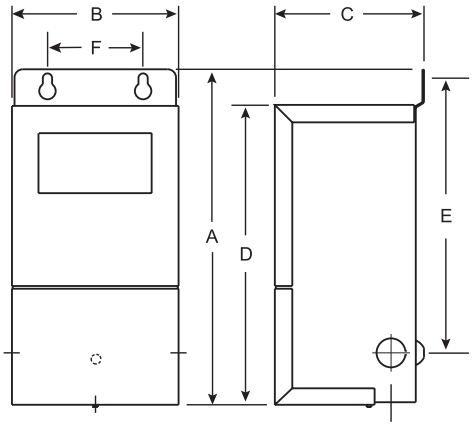
Options and Accessories

- Other sizes, voltages and temperature rises available
- Copper windings
- CE Marked units available as custom

Approvals

Enclosure Figure

Figure 2



Model Numbers Defined

411-TXXY-ABC

Single-Phase, Encapsulated Wall Mount
Standard 411
International 511

Type
Original style 0

kVA Rating, Primary, Voltage / XXY
0.10, 120V, 12/13/14V 938
0.30, 120V, 12/13/14V 949
0.50, 120V, 12/13/14V 940
1.00, 120V, 12/13/14V 941

Wiring
Copper 0

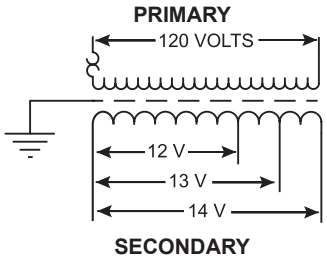
Temperature Rise, Shields
135°C Rise*, with shield 5

Taps
1@5% FCAN, 1@5% FCBN 5

Wiring Diagram

S120A Wiring Diagram & Connections

Wiring Diagram



Connections

Primary Volts	Primary Lines Connect To
120	H1, H2

Secondary Volts	Secondary Lines Connect To
12	± and 12V
13	± and 13V
14	± and 14V

More wiring diagrams can be found in catalog's appendix, section 15.
Use the "Find a Product" tool on our website for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Pool & Spa Lighting Transformers

.050 - 1 kVA, 135°C Temperature Rise

120V — 12/13/14V Encapsulated for submersible fixtures • electrostatic shield

Lamp Watts	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	(F) inches	Est Ship Wgt	Wiring Diagram
100	411-0938-055	2	10.2	5.1	4.6	9	8.4	2.25	12.5	S120A
300	411-0939-055	2	10.2	5.1	4.6	9	8.4	2.25	13.0	S120A
500	411-0940-055	2	10.2	5.1	4.6	9	8.4	2.25	14.0	S120A
1,000	411-0941-055	2	10.2	5.1	4.6	9	8.4	2.25	18.0	S120A

See website for additional kVA, copper windings and temperature options.
Housing dimensions subject to change without notice. Consult website or factory where dimensions are critical.
Use the "Find a Product" tool for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

3 to 75 kVA

Applications

- For general loads, indoors or out, including lighting, industrial and commercial applications

Specifications

- NEMA3R-rated enclosures
- 60 Hz operation
- Aluminum windings
- 135ºC temperature rise for 3 to 75 kVA
- Encapsulated with electrical grade resin
- Heat-cured ASA-61 gray powder coat finish
- Cores of high quality electrical steel
- Primary taps

Features, Functions, Benefits

- Large connection compartment with knockouts for ease of wiring and installation
- Slotted mounting holes for quick and easy mounting
- Convenient wall mount design with lifting hooks up to 15 kVA
- Many sizes in stock and available for immediate shipment
- Quiet operation for installation flexibility
- Seismic qualification certification for all units

Standards

- Built in accordance with NEMA, ANSI, UL and CSA standards

Options and Accessories

- 50/60 Hz optional
- Other sizes, voltages and temperature rises available
- Copper windings
- CE Marked units available as custom
- Class I Div 2 units available

Approvals

Enclosure Figures

Figure 4

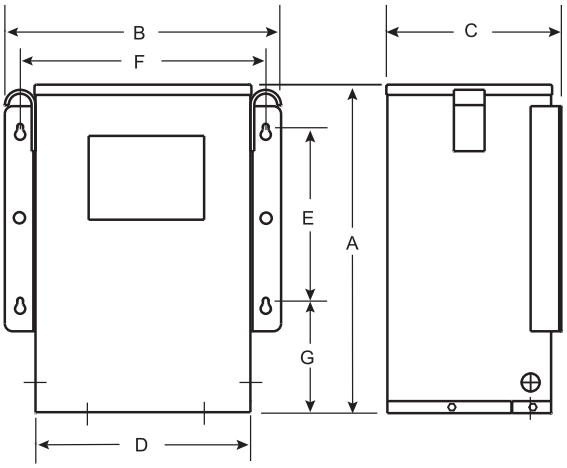
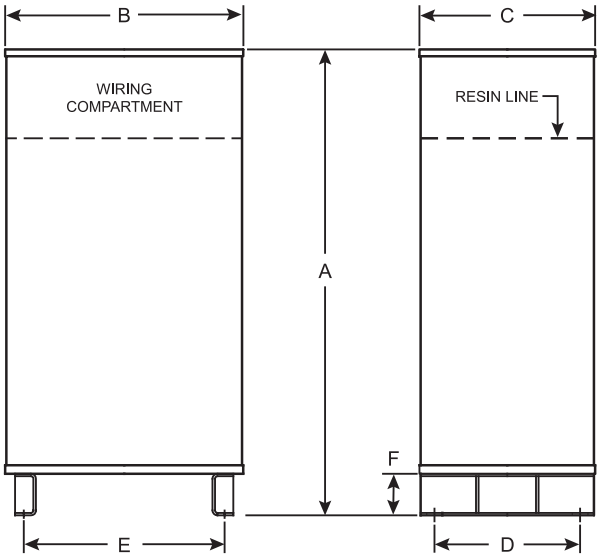


Figure 21



Model Numbers Defined

413-TXXY-ABC

Three-Phase, Encapsulated

Standard	413
50/60 Hz	513

Type

Standard	1
Updated style	3
Class I, Div 2	2

kVA Rating / XX

3.0	10	20	17
5.0	11	25	18
6.0	12	30	19
7.5	13	37.5	20
9.0	14	45	21
10.0	15	50	22
15.0	16	75	23

Primary	Secondary	
208	480Y/277	1
240	208Y/120	2
240	480Y/277	3
480	208Y/120	4
480	480Y/277	5
Specials*		6
480	240 Delta	7
480	240 Delta	8
600	208Y/120	9
Reserved for special items		0

Wiring

Default	0
Copper	8

Temperature Rise

135°C Rise	0
115°C Rise	1
70°C Rise	7
80°C Rise	8
95°C Rise	9

Shields

No shield	0
Shield	5

* Suffix defined incrementally

Three-Phase Encapsulated General Purpose Transformers

135°C Temperature Rise with 25° Ambient • NEMA3R Enclosures • Taps: 2 @ 5% FCBN

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	(F) inches	(G) inches	Est Ship Wgt	Wiring Diagram
480V — 208Y/120V											
3	413-1104-000	4	13.1	15.1	8.1	12.3	5.3	5.5	13.6	82	T480A
6	413-1124-000	4	13.1	15.1	8.1	12.3	5.3	5.5	13.6	119	T480A
9	413-1144-000	4	15.1	19	9.1	16.1	8.3	5.1	17.5	157	T480A
15	413-1164-000	4	15.1	19	9.1	16.1	8.3	5.1	17.5	228	T480A
30	413-3194-000	21	33	23	9.5	7	20.5	3		875	T480A
45	413-3214-000	21	36	25	11	8.5	21.75	3		980	T480A
75	413-3234-000	21	37	25	12.5	10.5	22.5	3		1100	T480A
480V — 240V											
3	413-1107-000	4	13.1	15.1	8.1	12.3	5.3	5.5	13.6	82	T480B
6	413-1127-000	4	13.1	15.1	8.1	12.3	5.3	5.5	13.6	119	T480B
9	413-1147-000	4	15.1	19	9.1	16.1	8.3	5.1	17.5	157	T480B
15	413-1167-000	4	15.1	19	9.1	16.1	8.3	5.1	17.5	228	T480B
30	413-1197-000	21	33	23	9.5	7	20.5	3		875	T480B
45	413-1217-000	21	36	25	11	8.5	21.75	3		980	T480B
75	413-1237-000	21	37	25	12.5	10.5	22.5	3		1100	T480B
600V — 208Y/120V											
3	413-1109-000	4	13.1	15.1	8.1	12.3	5.3	5.5	13.6	82	T600A
6	413-1129-000	4	13.1	15.1	8.1	12.3	5.3	5.5	13.6	119	T600A
9	413-1149-000	4	15.1	19	9.1	16.1	8.3	5.1	17.5	157	T600A
15	413-1169-000	4	15.1	19	9.1	16.1	8.3	5.1	17.5	228	T600A
30	413-1199-000	21	33	23	9.5	7	20.5	3		875	T600A
45	413-1219-000	21	36	25	11	8.5	21.75	3		980	T600A
75	413-1239-000	21	37	25	12.5	10.5	22.5	3		1100	T600A
600V — 480Y/277V											
3	413-110B-000	4	13.1	15.1	8.1	12.3	5.3	5.5	13.6	82	T600H
6	413-112B-000	4	13.1	15.1	8.1	12.3	5.3	5.5	13.6	119	T600H
9	413-114B-000	4	15.1	19	9.1	16.1	8.3	5.1	17.5	157	T600H
15	413-116B-000	4	15.1	19	9.1	16.1	8.3	5.1	17.5	228	T600H
30	413-119B-000	21	33	23	9.5	7	20.5	3		875	T600H
45	413-121B-000	21	36	25	11	8.5	21.75	3		980	T600H
75	413-123B-000	21	37	25	12.5	10.5	22.5	3		1100	T600H

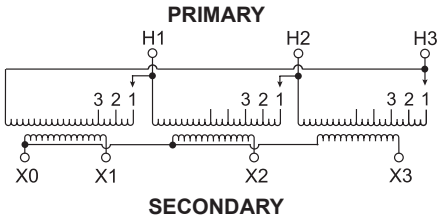
See website for additional kVA, copper windings and temperature options.
Housing dimensions subject to change without notice. Consult website or factory where dimensions are critical.
Use the “Find a Product” tool for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Enclosure Figures

T480A Wiring Diagram & Connections

Wiring Diagram

Primary: 480 Volts Delta
Secondary: 208Y/120 Volts



Connections

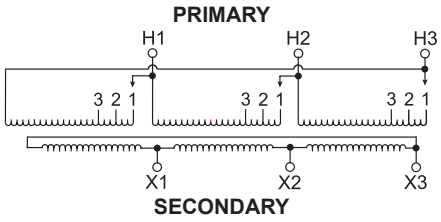
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
480	1	H1, H2, H3
456	2	H1, H2, H3
432	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
208	X1, X2, X3
120 1 Phase	Between X0 and X1 or X2 or X3

T480B Wiring Diagram & Connections

Wiring Diagram

Primary: 480 Volts Delta
Secondary: 240 Volts Delta



Connections

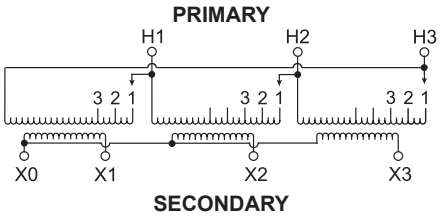
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
480	1	H1, H2, H3
456	2	H1, H2, H3
432	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
240	X1, X2, X3

T600A Wiring Diagram & Connections

Wiring Diagram

Primary: 600 Volts Delta
Secondary: 208Y/120 Volts



Connections

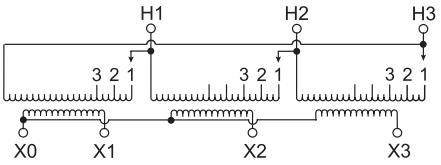
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
600	1	H1, H2, H3
570	2	H1, H2, H3
540	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
208	X1, X2, X3
120 1 phase	BetweenX0 and X1 or X2 or X3

T600H Wiring Diagram & Connections

Wiring Diagram

Primary: 600 Volts Delta
Secondary: 480Y/277 Volts



Connections

Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
600	1	H1, H2, H3
570	2	H1, H2, H3
540	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
480	X1, X2, X3
277 1 phase	Between X0 and X1 or X2 or X3

More wiring diagrams can be found in catalog's appendix, section 15.
Use the "Find a Product" tool on our website for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

50 VA to 10 kVA

Applications

- A comprehensive line of transformers for low voltage applications.
- Economical for stepping voltages up or down
- Solve over/under voltage problems efficiently
- Low voltage lighting applications
- International voltage adaptation

Specifications

- Encapsulated with electrical grade resin
- 60 Hz standard
- Single-phase encapsulated isotransformer / autotransformer
  - 120 x 240V— 12/24V
  - 120 x 240V— 16/32V
  - 240 x 480V— 24/48V
- Three phase autotransformer configurations, using multiple single phase units
- 95ºC temperature rise for 0.5 to 1 kVA
  135ºC temperature rise for 1.5 to 10 kVA
- 180ºC insulation class
- NEMA3R-rated enclosures
- Heat-cured ASA-61 gray powder coat finish
- Cores of high quality electrical steel

Features, Functions, Benefits

- Slotted mounting holes for quick and easy installation
- Convenient wall mount design with lifting hooks for units 5 kVA and above
- **NOTE: Buck-Boost transformers do not compensate for fluctuating line voltages**

Standards

- Built in accordance with NEMA, ANSI, UL and CSA standards

Options and Accessories

- Other sizes, voltages available
- 50/60 Hz options
- Copper windings
- CE Marked units available as custom

Approvals

Buck-Boost transformers are low voltage isolation transformers that can be connected in an autotransformer arrangement to provide a convenient and economical way to raise or lower single and three-phase voltages from 5-20%. The autotransformer arrangement allows smaller and less expensive Buck-Boost transformers to supply large power loads.

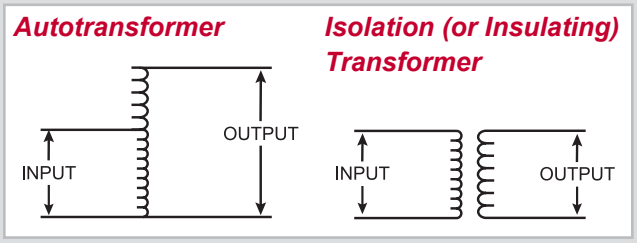
Solve over/under line voltage problems efficiently and economically.

Electrical equipment is manufactured to operate most efficiently when the line voltage is close to the nameplate rating of the equipment. A motor operated at a voltage substantially under its nameplate rating may run constantly on the starting windings, resulting in overheating and possible burn-out. The same motor operated at a voltage substantially over its nameplate rating is subject to excessive heat rise, often higher than the insulation temperature limits, which may eventually cause the motor to burn out.

The difference between an autotransformer and an isolation transformer.

In an autotransformer, the input (or primary) and the output (or secondary) are electrically connected. In an isolation transformer they are completely separated, as shown to the right.

Only a portion of the electrical energy is changed in an autotransformer, the remainder flows directly between the primary and secondary. In an isolation transformer, all the energy is transformed. For these reasons, an autotransformer is smaller, lighter and less costly than a comparable isolation transformer.



Caution: Buck-Boost transformers will not compensate for fluctuating line voltages. They should only be used when line voltage is relatively constant.

Model Numbers Defined

416-YYXX-ABC

Buck-Boost Models

Primary	Secondary	
120x240	12/24	11
120x240	16/32	12
240x480	24/48	14
120x240	12/24	21
120x240	16/32	22
240x480	24/48	24

kVA Rating

YY = 11, 12, 14

Digit XX	kVA
00	0.05
01	0.10
11	0.15
21	0.25
31	0.50
41	0.75
51	1.00
61	1.50
71	2.00
81	3.00
91	5.00

YY = 21, 22, 24

Digit XX	kVA
01	7.50
11	10.00

Wiring

Default	0
Copper	8

Temperature Rise

135°C	0
115°C	1

Shield

No shield	0
Shield	5

How to Use the Buck-Boost Rapid Selector Charts

You will need the following information:

Line voltage:
This can be determined by measuring the supply line voltage with a voltmeter.

Load voltage:
The voltage at which your equipment was designed to operate. Usually listed on the equipment nameplate.

Load kVA or load amps:
One of these will usually be listed on the nameplate. You do not need both.

Supply line and equipment frequencies:
This will be either 50 or 60 Hertz. The supply line frequency must be the same as the frequency of the equipment to be operated.

Supply line and equipment phase:
Either single-phase or three-phase. The line phase must be the same as the equipment.

The type of electrical configuration:
Delta or Wye.

Follow These Five Easy Steps:

1. Find the appropriate single-phase, three-phase delta or three-phase wye table.
2. Read down the voltage column and find the nearest ratio of required load voltage to line voltage for the application desired. (High and low voltage may be either input or output voltage depending on the circumstances.)
3. Reading horizontally across the line beginning with your application voltage ratio, locate in one of the kVA columns a kVA capacity equal to or larger than your load requirement.
4. Note the two digit number at the top of the kVA column listing the kVA capacity you require.
5. In the catalog number column, add these two digits to the catalog number next to the voltage ratio you found in step one.

Example:

Assume the following information

1. A reasonably constant line voltage of 440 volts.
2. A required equipment voltage of 480 volts.
3. 26.0 kVA load capacity needed.
4. Single-phase line and equipment.

In the voltage column, 437 is closest to our line voltage of 440. The 480 high voltage meets our requirements exactly.

Reading horizontally across this line, find 30.0 kVA, the closest larger kVA to our required 26.0.

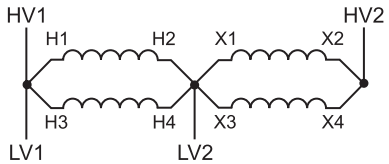
Going to the very top of this column, take the two digit number, 81, and add it on the end of the catalog number on the same line as our high/low voltage. The catalog number 416-14, with 81 added on the end, is 416-1481.

Single-phase kVA capacity of encapsulated Buck-Boost autotransformers

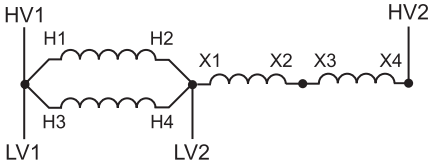
Maximum load capabilities

Low Voltage (LV)	High Voltage (HV)	Catalog Number	Load Required	01 .100 kVA	11 .150 kVA	21 .250 kVA	31 .500 kVA	41 .750 kVA	51 1.0 kVA	61 1.5 kVA	71 2.0 kVA	81 3.0 kVA	91 5.0 kVA	Wiring Diagram
Enclosure Figures				Use Figure 2							Use Figure 3			
95	120	416-12XX	kVA	.37	.56	.94	1.8	2.8	3.7	5.6	7.5	11.2	18.8	2
			AMPS	3.95	5.93	9.89	19.7	29.6	39.5	59.3	79.1	118	197	
100	120	416-11XX	kVA	.50	.75	1.25	2.50	3.7	5.0	7.5	10.0	15.0	25.0	2
			AMPS	5.0	7.5	12.5	25.0	37.0	50.0	75.0	100	150	250	
106	120	416-12XX	kVA	.75	1.12	1.87	3.7	5.6	7.5	11.2	15.0	22.5	37.0	1
			AMPS	7.07	10.5	17.6	34.9	52.8	70.7	105	141	212	349	
109	120	416-11XX	kVA	1.00	1.50	2.50	5.0	7.5	10.0	15.0	20.0	30.0	50.0	1
			AMPS	9.17	13.7	22.9	45.8	68.8	91.7	137	183	275	458	
120	132	416-11XX	kVA	1.10	1.65	2.75	5.5	8.2	11.0	16.5	22.0	33.0	55.0	1
			AMPS	9.17	13.7	22.9	45.8	68.6	91.7	137	183	275	458	
120	136	416-12XX	kVA	.85	1.27	2.12	4.2	6.3	8.5	12.7	17.0	25.5	42.0	1
			AMPS	7.08	10.5	17.6	35.0	52.5	70.8	105	141	212	350	
120	144	416-11XX	kVA	.60	.90	1.50	3.0	4.5	6.0	9.0	12.0	18.0	30.0	2
			AMPS	5.0	7.5	12.5	25.0	37.5	50.0	75.0	100	150	250	
120	152	416-12XX	kVA	.47	.71	1.18	2.3	3.5	4.7	7.1	9.5	14.2	23.0	2
			AMPS	3.91	5.91	9.83	19.1	29.1	39.1	59.1	79.1	118	191	
200	240	416-14XX	kVA	.50	.75	1.25	2.5	3.7	5.0	7.5	10.0	15.0	25.0	2
			AMPS	2.50	3.75	6.25	12.5	18.7	25.0	37.5	50.0	75.0	125	
208	236	416-12XX	kVA	.7	1.10	1.84	3.6	5.5	7.3	11.0	14.7	22.1	36.8	4
			AMPS	3.53	5.28	8.82	17.4	26.4	35.3	52.8	70.7	106	174	
212	240	416-12XX	kVA	.75	1.12	1.87	3.7	5.6	7.5	11.2	15.0	22.5	37	4
			AMPS	3.53	5.28	8.82	17.4	26.4	35.3	52.8	70.7	106	174	
208	230	416-11XX	kVA	.95	1.4	2.3	4.7	7.1	9.5	14.3	19.0	28.6	47.6	4
			AMPS	4.58	6.88	11.4	22.9	34.4	45.8	68.8	91.7	137	229	
218	240	416-11XX	kVA	1.00	1.5	2.5	5.0	7.5	10.0	15.0	20.0	30.0	50.0	4
			AMPS	4.58	6.88	11.4	22.9	34.4	45.8	68.8	91.7	137	229	
225	240	416-12XX	kVA	1.5	2.25	3.75	7.5	11.2	15.0	22.5	30.0	45.0	75.0	3
			AMPS	6.66	10.0	16.6	33.3	49.7	66.6	100	133	200	333	
230	276	416-14XX	kVA	.57	.86	1.43	2.8	4.3	5.7	8.6	11.5	17.2	28.7	2
			AMPS	2.50	3.75	6.25	12.5	18.7	25.0	37.5	45.0	75.0	124	
240	252	416-11XX	kVA	2.1	3.15	5.25	10.5	15.7	21.0	31.5	42.0	63.0	105	3
			AMPS	8.75	13.1	21.8	43.7	65.4	87.5	131	175	262	437	
240	264	416-11XX	kVA	1.1	1.65	2.75	5.5	8.2	11.0	16.5	22.0	33.0	55.0	4
			AMPS	4.58	6.87	11.4	22.9	34.1	45.8	68.7	91.6	137	229	
240	272	416-12XX	kVA	.85	1.27	2.12	4.2	6.3	8.5	12.7	17.0	25.5	42.0	4
			AMPS	3.54	5.29	8.83	17.5	26.2	35.4	52.9	70.8	106	175	
240	288	416-14XX	kVA	.60	.90	1.50	3.0	4.5	6.0	9.0	12.0	18.0	30.0	2
			AMPS	2.5	3.75	6.25	12.5	18.7	25.0	37.5	50.0	75.0	125	
437	480	416-14XX	kVA	1.00	1.50	2.50	5.0	7.5	10.0	15.0	20.0	30.0	50.0	4
			AMPS	2.28	3.43	5.72	11.4	17.1	22.8	34.3	45.7	68.6	114	
457	480	416-14XX	kVA	2.0	3.0	5.0	10.0	15.0	20.0	30.0	40.0	60.0	100	3
			AMPS	4.37	6.56	10.9	21.8	32.8	43.7	65.6	87.5	131	218	
480	504	416-14XX	kVA	2.1	3.15	5.25	10.5	15.7	21.0	31.5	42.0	63.0	105	3
			AMPS	4.37	6.56	10.9	21.8	32.8	43.7	65.6	87.5	131	218	
480	528	416-14XX	kVA	1.1	1.65	2.75	5.5	8.2	11.0	16.5	22.0	33.0	55.0	4
			AMPS	2.29	3.43	5.72	11.4	17.0	22.9	34.3	45.8	68.7	114	

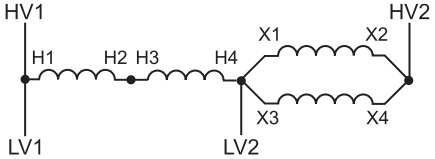
Wiring Diagram 1



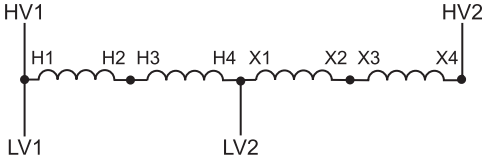
Wiring Diagram 2



Wiring Diagram 3



Wiring Diagram 4

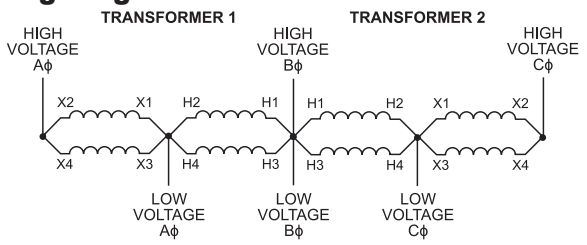


Three-phase kVA capacity of encapsulated Buck-Boost autotransformers connected in open-delta

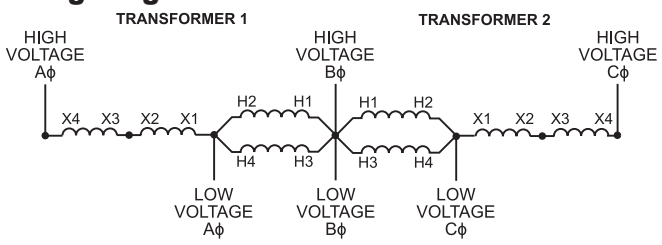
Maximum load capabilities requiring two Buck-Boost Transformers

Low Voltage (LV)	High Voltage (HV)	Catalog Number	Load Required	01 .100 kVA	11 .150 kVA	21 .250 kVA	31 .500 kVA	41 .750 kVA	51 1.0 kVA	61 1.5 kVA	71 2.0 kVA	81 3.0 kVA	91 5.0 kVA	Wiring Diagram
Enclosure Figures				Use Figure 2							Use Figure 3			
200	240	416-14XX	kVA	.86	1.29	2.1	4.3	6.4	8.6	12.9	17.2	25.0	43.0	10
			AMPS	2.1	3.1	5.1	10.3	15.4	20.7	31.0	41.4	60.1	103.4	
208	236	416-12XX	kVA	1.27	1.91	3.1	6.3	9.5	12.7	19.1	25.5	38.2	63.7	12
			AMPS	3.1	4.7	7.6	15.4	23.2	31.1	46.7	62.4	93.4	155.8	
212	240	416-12XX	kVA	1.29	1.94	3.2	6.4	9.7	12.9	19.4	25.8	38.0	64.0	12
			AMPS	3.1	4.7	7.7	15.4	23.3	31.0	46.7	62.1	91.4	154.0	
208	230	416-11XX	kVA	1.65	2.47	4.1	8.2	12.3	16.5	24.7	33.0	49.5	82.5	12
			AMPS	4.1	6.2	10.3	20.6	30.9	41.4	62.0	82.8	124.3	207.1	
218	240	416-11XX	kVA	1.73	2.59	4.3	8.6	12.9	17.3	25.9	34.6	51.0	86.0	12
			AMPS	4.2	6.2	10.3	20.7	31.0	41.6	62.3	83.2	122.7	206.9	
225	240	416-12XX	kVA	2.59	3.89	6.4	12.9	19.4	25.9	38.9	51.9	77.0	129	11
			AMPS	6.2	9.4	15.4	31.0	46.7	62.3	93.6	124.8	185.2	310.3	
229	240	416-11XX	kVA	3.46	5.18	8.6	17.3	25.9	34.6	51.8	69.2	103	173	11
			AMPS	8.3	12.5	20.7	41.6	62.3	83.2	124.6	166.5	247.8	416.2	
230	253	416-14XX	kVA	1.81	2.72	4.5	9.0	13.6	18.1	27.2	36.3	54.0	90.0	9
			AMPS	4.1	6.2	10.3	20.5	31.0	41.3	62.1	82.8	123.2	205.4	
230	276	416-14XX	kVA	0.99	1.49	2.4	4.9	7.4	9.9	14.9	19.9	29.0	49.0	10
			AMPS	2.1	3.1	5.0	10.2	15.5	20.7	31.2	41.6	60.7	102.5	
240	252	416-11XX	kVA	3.64	5.47	9.1	18.2	27.2	36.4	54.7	72.8	109	182	11
			AMPS	8.3	12.5	20.8	41.7	62.3	83.4	125.3	166.8	249.7	417.0	
240	264	416-11XX	kVA	1.9	2.86	4.7	9.5	14.2	19.0	28.6	38.1	57.0	95.0	12
			AMPS	4.2	6.3	10.3	20.8	31.1	41.6	62.5	83.3	124.7	207.8	
240	272	416-12XX	kVA	1.47	2.2	3.6	7.3	11.0	14.7	22.0	29.4	44.1	73.6	12
			AMPS	3.1	4.7	7.6	15.5	23.3	31.2	46.7	62.4	93.6	156.2	
240	288	416-14XX	kVA	1.03	1.55	2.5	5.1	7.7	10.3	15.5	20.7	31.0	51.0	10
			AMPS	2.1	3.1	5.0	10.2	15.4	20.6	31.1	41.5	62.3	102.2	
437	480	416-14XX	kVA	1.73	2.59	4.3	8.6	12.9	17.3	25.9	34.6	51.0	86.0	12
			AMPS	2.1	3.1	5.2	10.3	15.5	20.8	31.2	41.6	61.3	103.4	
457	480	416-14XX	kVA	3.46	5.18	8.6	17.3	25.9	34.6	51.8	69.2	103	173	11
			AMPS	4.2	6.2	10.3	20.8	31.2	41.6	62.3	83.2	123.9	208.1	
480	504	416-14XX	kVA	3.64	5.47	9.1	18.2	27.2	36.4	54.7	72.8	109	183	11
			AMPS	4.2	6.3	10.4	20.8	31.2	41.7	62.7	83.4	124.9	209.6	
480	528	416-14XX	kVA	1.9	2.86	4.7	9.5	14.2	19.0	28.6	38.1	57.0	95.0	12
			AMPS	2.1	3.1	5.1	10.4	15.5	20.8	31.3	41.7	62.3	103.9	

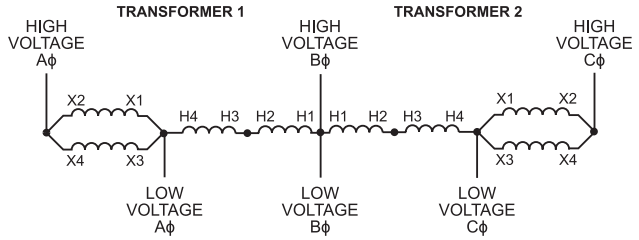
Wiring Diagram 9



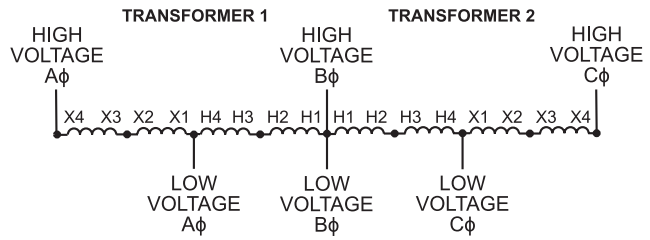
Wiring Diagram 10



Wiring Diagram 11



Wiring Diagram 12



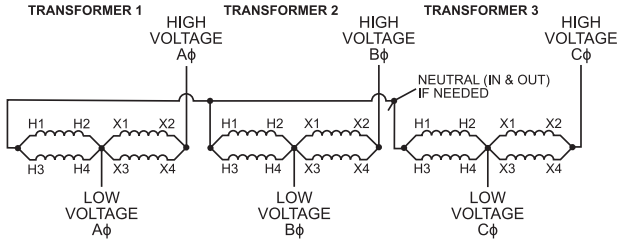
PIONEER DRY-TYPE TRANSFORMERS
JEFFERSON ELECTRIC
BEMAG TRANSFORMER

Three-phase kVA capacity of encapsulated Buck-Boost autotransformers connected in Wye

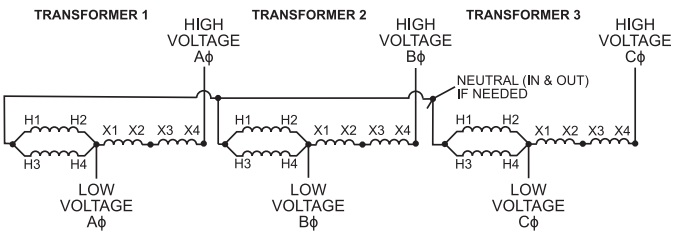
Maximum load capabilities requiring three Buck-Boost Transformers

Low Voltage (LV)	High Voltage (HV)	Catalog Number	Load Required	01 .100 kVA	11 .150 kVA	21 .250 kVA	31 .500 kVA	41 .750 kVA	51 1.0 kVA	61 1.5 kVA	71 2.0 kVA	81 3.0 kVA	91 5.0 kVA	Wiring Diagram
Enclosure Figures				Use Figure 2							Use Figure 3			
164	208	416-12XX	kVA	1.1	1.7	2.8	5.6	8.4	11.2	16.8	22.0	34.0	56.0	6
			AMPS	3.89	5.89	9.79	18.9	29.4	38.9	58.9	78.9	117	197	
173	208	416-11XX	kVA	1.5	2.2	3.7	7.5	11.2	15.0	22.5	30.0	45.5	75.0	6
			AMPS	5.0	7.5	12.5	25.0	37.0	50.0	75.0	100	150	250	
183	208	416-12XX	kVA	2.2	3.3	5.6	11.2	16.8	22.5	33.7	45.0	67.0	112	5
			AMPS	7.07	10.5	17.6	34.9	52.8	70.7	105	141	212	354	
189	208	416-11XX	kVA	3.0	4.5	7.5	15.0	22.5	30.0	45.0	60.0	90.0	150	5
			AMPS	9.17	13.7	22.9	45.8	68.8	91.7	137	183	275	458	
208	229	416-11XX	kVA	3.3	4.9	8.2	16.5	24.7	33.0	49.5	66.0	99.0	165	5
			AMPS	9.17	13.7	22.9	45.8	68.8	91.7	137	183	275	458	
208	235	416-12XX	kVA	2.5	3.8	6.3	12.7	19.1	25.5	38.2	51.0	76.5	127	5
			AMPS	7.08	10.5	17.6	35.0	52.5	70.8	105	141	212	350	
208	249	416-11XX	kVA	1.8	2.7	4.5	9.0	13.5	18.0	27.0	36.0	54.0	90.0	6
			AMPS	5.0	7.5	12.5	25.0	37.5	50.0	75.0	100	150	250	
208	263	416-12XX	kVA	1.4	2.1	3.5	7.1	10.6	14.2	21.4	28.0	42.0	71.0	6
			AMPS	3.91	5.91	9.83	19.1	29.1	39.1	59.1	79.1	118	191	
346	416	416-14XX	kVA	1.5	2.2	3.7	7.5	11.2	15.0	22.5	30.0	45.0	75.0	6
			AMPS	2.5	3.75	6.25	12.5	18.5	25.0	37.5	50.0	75.0	125	
367	416	416-12XX	kVA	2.2	3.3	5.6	11.2	16.8	22.5	33.7	45.0	67.0	112	8
			AMPS	3.53	5.28	8.82	17.4	26.4	35.3	52.8	70.7	106	174	
378	416	416-11XX	kVA	3.0	4.5	7.5	15.0	22.5	30.0	45.0	60.0	90.0	150	8
			AMPS	4.58	6.88	11.4	22.9	34.4	45.8	68.8	91.7	137	229	
390	416	416-12XX	kVA	4.5	6.7	11.2	22.5	33.7	45.0	67.5	90.0	135	225	7
			AMPS	6.66	10.0	16.6	33.3	49.7	66.6	100	133	200	333	
397	416	416-11XX	kVA	6.0	9.0	15.0	30.0	45.0	60.0	90.0	120	180	300	7
			AMPS	8.73	13.1	21.8	43.6	65.5	87.3	131	174	262	436	
398	438	416-14XX	kVA	3.1	4.7	7.8	15.7	23.6	31.5	47.2	63.0	94.0	157	5
			AMPS	4.56	6.82	11.3	22.6	33.9	45.6	68.2	91.3	136	229	
398	478	416-14XX	kVA	1.7	2.5	4.3	8.6	12.9	17.2	25.9	34.0	51.0	86.0	6
			AMPS	2.50	3.75	6.25	12.5	18.7	25.0	37.5	50.0	75.0	125	
416	437	416-11XX	kVA	6.3	9.4	15.7	31.5	47.2	63.0	94.5	126	189	315	7
			AMPS	8.75	13.1	21.8	43.7	65.4	87.5	131	175	262	437	
416	443	416-12XX	kVA	4.8	7.2	12.0	24.0	36.0	48.0	72.0	96.0	144	240	7
			AMPS	6.66	10.0	16.6	33.3	50.0	66.6	100	133	200	333	
416	457	416-11XX	kVA	3.3	4.9	8.2	16.5	24.7	33.0	49.5	66.0	99.0	165	8
			AMPS	4.58	6.87	11.4	22.9	34.1	45.8	68.7	91.6	137	229	
416	471	416-12XX	kVA	2.5	3.8	6.3	12.7	19.1	25.5	38.2	51.0	76.5	127	8
			AMPS	3.54	5.29	8.83	17.5	26.2	35.4	52.9	70.8	106	175	
416	498	416-14XX	kVA	1.8	2.7	4.5	9.0	13.5	18.0	27.0	36.0	54.0	90.0	6
			AMPS	2.5	3.75	6.25	12.5	18.7	25.0	37.5	50.0	75.0	125	

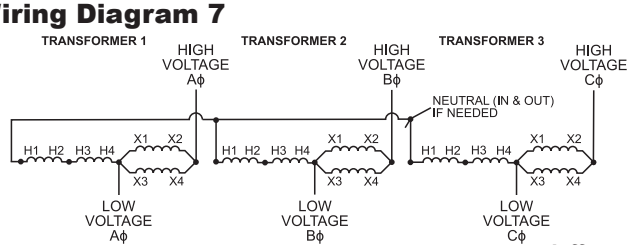
Wiring Diagram 5



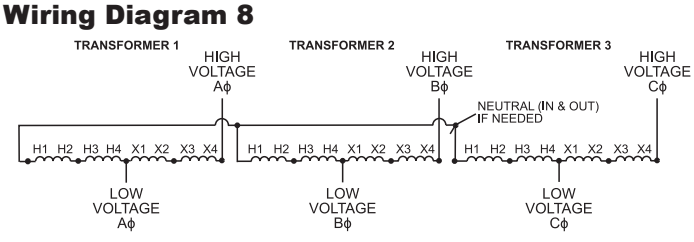
Wiring Diagram 6



Wiring Diagram 7



Wiring Diagram 8



Single-Phase — 600V Class Isolation Transformers

.050 – 1 kVA: 130°C Insulation Class • 1.5 – 10 kVA: 180°C Insulation Class

120 x 240V — 12/24V 60 Hz

kVA	Catalog Number	Temp Rise	Enclosure Figure	Height (A)	Width (B)	Depth (C)	(D)	(E)	(F)	Est Ship Wgt	Wiring Diagram
0.05	416-1100-000	95	2	8.03	3.31	3.08	6.81	6.19	2.25	4	
0.1	416-1101-000	95	2	8.03	3.31	3.08	6.81	6.19	2.25	5	
0.15	416-1111-000	95	2	8.03	3.31	3.08	6.81	6.19	2.25	8	
0.25	416-1121-000	95	2	8.03	3.31	3.08	6.81	6.19	2.25	6	
0.5	416-1131-000	95	2	10.19	5.06	4.59	9.06	8.38	2.25	12	
0.75	416-1141-000	95	2	10.19	5.06	4.59	9.06	8.38	2.25	17	
1	416-1151-000	95	2	10.19	5.06	4.59	9.06	8.38	2.25	17.8	S240B
1.5	416-1161-000	135	3	12.5	6.69	5.34	10.56	12.0	2.25	26.8	
2	416-1171-000	135	3	12.5	6.69	5.34	10.56	12.0	2.25	33.4	
3	416-1181-000	135	3	14.56	7.56	7.15	12.68	14.12	3.5	62	
5	416-1191-000	135	3	14.56	7.56	7.15	12.68	14.12	3.5	90	
7.5	416-2101-000	135	4	16.12	13.5	8.55	10.62	8.25	5.5	144	
10	416-2111-000	135	4	16.12	13.5	8.55	10.62	8.25	5.5	178	

120 x 240V — 16/32V 60 Hz

kVA	Catalog Number	Temp Rise	Enclosure Figure	Height (A)	Width (B)	Depth (C)	(D)	(E)	(F)	Est Ship Wgt	Wiring Diagram
0.1	416-1201-000	135	2	8.03	3.31	3.08	6.81	6.19	2.25	5	
0.15	416-1211-000	95	2	8.03	3.31	3.08	6.81	6.19	2.25	5	
0.25	416-1221-000	95	2	8.03	3.31	3.08	6.81	6.19	2.25	6	
0.5	416-1231-000	95	2	10.19	5.06	4.59	9.06	8.38	2.25	15	
0.75	416-1241-000	95	2	10.19	5.06	4.59	9.06	8.38	2.25	17	
1	416-1251-000	95	2	10.19	5.06	4.59	9.06	8.38	2.25	18	S240C
1.5	416-1261-000	135	3	12.5	6.69	5.34	10.56	12.0	2.25	26.8	
2	416-1271-000	135	3	12.5	6.69	5.34	10.56	12.0	2.25	33.4	
3	416-1281-000	135	3	14.56	7.56	7.15	12.68	14.12	3.5	58	
5	416-1291-000	135	3	14.56	7.56	7.15	12.68	14.12	3.5	95	
7.5	416-2201-000	135	4	16.12	13.5	8.55	10.62	8.25	5.5	144	
10	416-2211-000	135	4	16.12	13.5	8.55	10.62	8.25	5.5	178	

240 x 480V — 24/48V 60 Hz

kVA	Catalog Number	Temp Rise	Enclosure Figure	Height (A)	Width (B)	Depth (C)	(D)	(E)	(F)	Est Ship Wgt	Wiring Diagram
0.1	416-1401-000	95	2	8.03	3.31	3.08	6.81	6.19	2.25	4	
0.15	416-1411-000	95	2	8.03	3.31	3.08	6.81	6.19	2.25	5	
0.25	416-1421-000	95	2	8.03	3.31	3.08	6.81	6.19	2.25	6	
0.5	416-1431-000	95	2	10.19	5.06	4.59	9.06	8.38	2.25	15	
0.75	416-1441-000	95	2	10.19	5.06	4.59	9.06	8.38	2.25	17	
1	416-1451-000	95	2	10.19	5.06	4.59	9.06	8.38	2.25	17.8	S480E
1.5	416-1461-000	135	3	12.5	6.69	5.34	10.56	12.0	2.25	26.8	
2	416-1471-000	135	3	12.5	6.69	5.34	10.56	12.0	2.25	33.4	
3	416-1481-000	135	3	14.56	7.56	7.15	12.68	14.12	3.5	58	
5	416-1491-000	135	3	14.56	7.56	7.15	12.68	14.12	3.5	88	
7.5	416-2401-000	135	4	16.12	13.5	8.55	10.62	8.25	5.5	144	
10	416-2411-000	135	4	16.12	13.5	8.55	10.62	8.25	5.5	178	

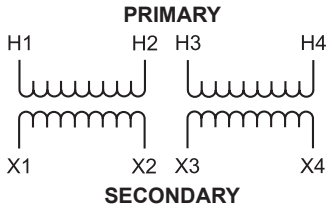
See website for additional kVA, copper windings and temperature options.
Housing dimensions subject to change without notice. Consult website or factory where dimensions are critical.
Use the “Find a Product” tool for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Buck-Boost Isolation Transformer Wiring Diagrams

S240B Wiring Diagram & Connections

Wiring Diagram

Primary: 120 x 240 Volts
Secondary: 12/24 Volts



Connections

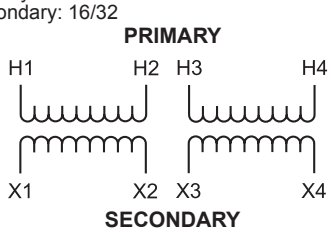
Primary Volts	Interconnect	Primary Lines Connect To
240	H2 to H3	H1, H4
120	H1 to H3 H2 to H4	H1, H4

Secondary Volts	Interconnect	Secondary Lines Connect To
24	X2 to X3	X1, X4
12	X1 to X3 X2 to X4	X1, X4

S240C Wiring Diagram & Connections

Wiring Diagram

Primary: 120 x 240 Volts
Secondary: 16/32



Connections

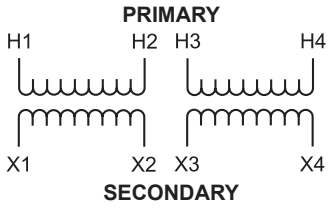
Primary Volts	Interconnect	Primary Lines Connect To
240	H2 to H3	H1, H4
120	H1 to H3 H2 to H4	H1. H4

Secondary Volts	Interconnect	Secondary Lines Connect To
32	X2 to X3	X1, X4
16	X1 to X3 X2 to X4	X1, X4

S240E Wiring Diagram & Connections

Wiring Diagram

Primary: 240 x 480 Volts
Secondary: 24/48 Volts



Connections

Primary Volts	Interconnect	Primary Lines Connect To
480	H2 to H3	H1, H4
240	H1 to H3 H2 to H4	H1, H4

Secondary Volts	Interconnect	Secondary Lines Connect To
48	X2 to X3	X1, X4
24	X1 to X3 X2 to X4	X1, X4

More wiring diagrams can be found in catalog's appendix, section 15.
Use the "Find a Product" tool on our website for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Enclosure Figures

Figure 2

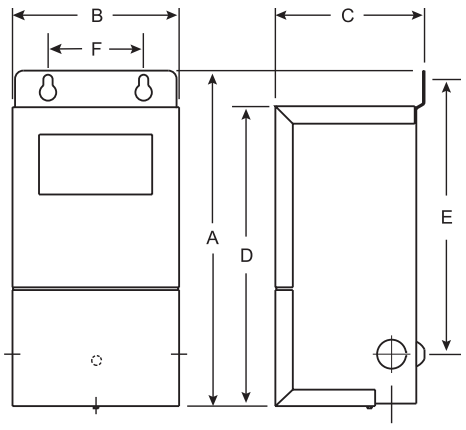


Figure 3

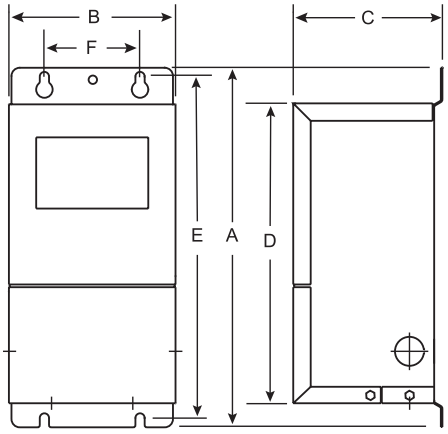
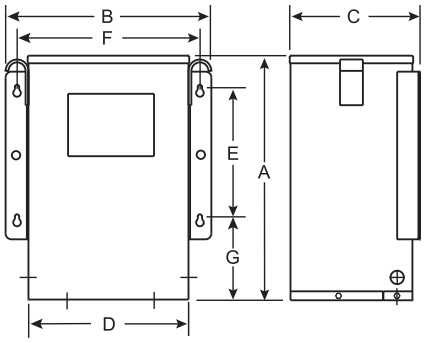


Figure 4



1 to 25 kVA

Applications

- Class I Division 2 units are used in hazardous locations to maintain a safe environment.

Specifications

- Class I Division 2, Groups A, B, C, D
- T3C temperature classification
- 60 Hz operation
- Single Phase: 1 – 25 kVA
- Three Phase: 3 – 75 kVA
- Aluminum windings
- 115ºC temperature rise with 40°C ambient
- 180ºC insulation class
- Encapsulated with electrical grade resin
- NEMA3R-rated enclosures
- Cores of high quality electrical steel
- Heat-cured ASA-61 gray powder coat finish

Features, Functions, Benefits

- Large connection compartment with knockouts for ease of wiring and installation
- Slotted mounting holes for quick and easy mounting
- Lifting hooks above 5 kVA
- Wall mount design through 25 kVA
- Seismic certification for all units

Standards

- Built in accordance with NEMA, ANSI, and CSA standards

Options and Accessories

- 50/60 Hz optional
- Other sizes, voltages available
- Copper windings
- 304 or 316 grade stainless steel enclosure to meet corrosion resistance requirements.
- CE Marked units available as custom

Approvals

Enclosure Figures

Figure 2

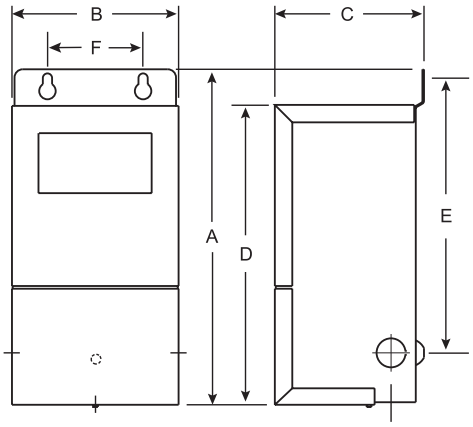


Figure 3

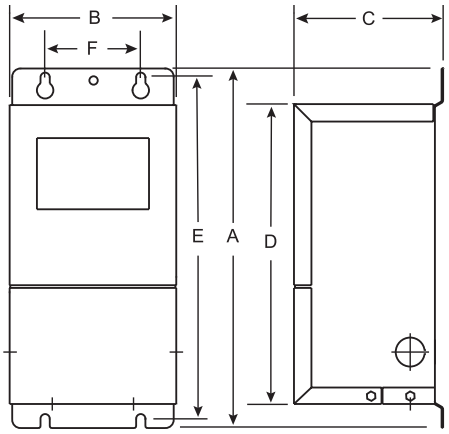
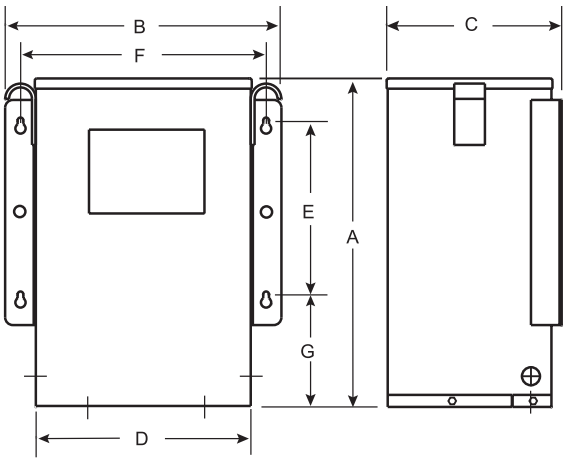


Figure 4



Model Numbers Defined

411-2XXY-ABC

Single-Phase, Encapsulated Wall Mount

Standard	411
International	511

Type

Class I, Div 2	2

kVA Rating / XX

0.5	05	6.0	12
0.75	06	7.5	13
1.0	07	9.0	14
1.5	08	10.0	15
2.0	09	15.0	16
3.0	10	20.0	17
5.0	11	25.0	18

Primary	Secondary	
120x240	120/240	1
208	120/240	2
240x480	120/240	3
277	120/240	4
600	120/240	5
120 Min 600 Max	120 Min 600 Max	6
480	120/240	7

Wiring

Default	0
Copper	8

Temperature Rise, Shields all models 40°C ambient

135°C Rise, no shield	0
135°C Rise, with shield	1
95°C Rise, no shield	2
95°C Rise, with shield	3
80°C Rise, no shield	4
80°C Rise, with shield	5
115°C Rise, no shield	6
115°C Rise, no shield	7

Taps

No taps	0
2@2.5% FCBN	1
2@2.5% FCAN, 2@2.5 FCBN	2
4@2.5% FCBN	3
2@5% FCBN	4
1@5% FCAN, 1@5% FCBN	5
2@5% FCAN, 4@2.5 FCBN	6

Class I Division 2, Single Phase

115°C Temperature Rise, 40°C ambient

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	(F) inches	(G) inches	Est Ship Wgt	Wiring Diagram
120 x 240V — 120/240V, Taps: None											
1.0	411-2071-060	2	10.2	5.1	4.6	9.1	8.4	2.25		18	S240A
2.0	411-2091-060	3	12.5	6.7	5.4	10.6	12	2.25		41	S240A
3.0	411-2101-060	3	14.6	7.6	7.2	12.7	14.1	3.5		68	S240A
5.0	411-2111-060	3	16.1	13.5	8.6	10.6	8.25	5.5	12.0	98	S240A
7.5	411-2131-060	4	16.1	13.5	8.6	10.6	8.25	5.5	12.0	130	S240A
10.0	411-2151-060	4	21.1	16.5	10.1	13.7	12.5	6.25	15.0	255	S240A
15.0	411-2161-060	4	21.1	16.5	10.1	13.7	12.5	6.25	15.0	255	S240A
25.0	411-2181-060	4	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	S240A
208V — 120/240V, Taps: None											
1.0	411-2072-060	2	10.2	5.1	4.6	9.1	8.4	2.3		19	S208A
1.5	411-2082-060	3	12.5	6.7	5.3	10.6	12.0	2.3		33	S208A
2.0	411-2092-060	3	12.5	6.7	5.3	10.6	12.0	2.3		41	S208A
3.0	411-2102-060	3	14.6	7.6	7.2	12.7	14.1	3.5		68	S208A
5.0	411-2112-060	3	14.6	7.6	7.2	12.7	14.1	3.5		93	S208A
7.5	411-2132-060	4	16.1	13.5	8.6	10.6	8.3	5.5	12.0	130	S208A
10.0	411-2152-060	4	16.1	13.5	8.6	10.6	8.3	5.5	12.0	155	S208A
15.0	411-2162-060	4	21.1	16.5	10.1	13.7	12.5	6.3	15.0	255	S208A
25.0	411-2182-060	4	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	S208A
240 x 480V — 120/240V • Taps: None											
1.0	411-2073-060	2	10.2	5.1	4.6	9.1	8.4	2.3		19	S480A
2.0	411-2093-060	3	12.5	6.7	5.3	10.6	12.0	2.3		41	S480A
3.0	411-2103-060	3	14.6	7.6	7.2	12.7	14.1	3.5		68	S480A
5.0	411-2113-060	3	14.6	7.6	7.2	12.7	14.1	3.5		93	S480A
7.5	411-2133-060	4	16.1	13.5	8.6	10.6	8.3	5.5	12.0	130	S480A
10.0	411-2153-060	4	16.1	13.5	8.6	10.6	8.3	5.5	12.0	155	S480A
15.0	411-2163-060	4	21.1	16.5	10.1	13.7	12.5	6.3	15.0	255	S480A
25.0	411-2183-060	4	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	S480A

See website for additional kVA, copper windings and temperature options.
Housing dimensions subject to change without notice. Consult website or factory where dimensions are critical.
Use the “Find a Product” tool for detailed specification sheets.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Class I Division 2, Single Phase

115°C Temperature Rise, 40°C ambient

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	(F) inches	(G) inches	Est Ship Wgt	Wiring Diagram
240 x 480V — 120/240V • Taps: 2 @ 2.5% FCAN + 2 @ 2.5% FCBN											
3	411-2103-062	3	14.6	7.6	7.2	12.7	14.1	3.5		68	S480B
5	411-2113-062	3	14.6	7.6	7.2	12.7	14.1	3.5		93	S480B
7.5	411-2133-062	4	16.1	13.5	8.6	10.6	8.25	5.5	12.0	130	S480B
10	411-2153-062	4	16.1	13.5	8.6	10.6	8.25	5.5	12.0	155	S480B
15	411-2163-062	4	21.1	16.5	10.1	13.7	12.5	6.3	15.0	255	S480B
25	411-2183-062	4	21.1	16.5	10.1	13.7	12.5	6.3	15.0	291	S480B
277V — 120/240V • Taps: 2 @ 2.5% FCBN											
1	411-2074-061	2	10.2	5.1	4.6	9.1	8.4	2.3		19	S277A
2	411-2094-061	3	12.5	6.7	5.3	10.6	12.0	2.3		41	S277A
3	411-2104-061	3	14.6	7.6	7.2	12.7	14.1	3.5		68	S277A
5	411-2114-061	3	14.6	7.6	7.2	12.7	14.1	3.5		93	S277A
7.5	411-2134-061	4	16.1	13.5	8.6	10.6	8.25	5.5	12.0	130	S277A
10	411-2154-061	4	16.1	13.5	8.6	10.6	8.25	5.5	12.0	155	S277A
15	411-2164-061	4	21.1	16.5	10.1	13.7	12.5	6.3	15.0	255	S277A
25	411-2184-061	4	21.1	16.5	10.1	13.7	12.5	6.3	15.0	291	S277A
600V — 120/240V • Taps: 2 @ 2.5% FCAN + 2 @ 2.5% FCBN											
1	411-2075-062	2	10.2	5.1	4.6	9.1	8.4	2.3		19	S600B
2	411-2095-062	3	12.5	6.7	5.3	10.6	12.0	2.3		41	S600B
3	411-2105-062	3	14.6	7.6	7.2	12.7	14.1	3.5		68	S600B
5	411-2115-062	3	14.6	7.6	7.2	12.7	14.1	3.5		93	S600B
7.5	411-2135-062	4	16.1	13.5	8.6	10.6	8.25	5.5	12.0	130	S600B
10	411-2155-062	4	16.1	13.5	8.6	10.6	8.25	5.5	12.0	155	S600B
15	411-2165-062	4	21.1	16.5	10.1	13.7	12.5	6.3	15.0	255	S600B
25	411-2185-062	4	21.1	16.5	10.1	13.7	12.5	6.3	15.0	291	S600B

See website for additional kVA, copper windings and temperature options.
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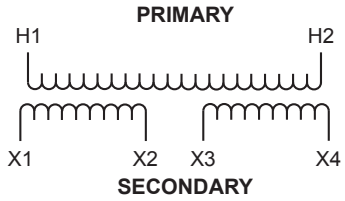
Wiring Diagrams

S208A Wiring Diagram & Connections

Wiring Diagram

Primary: 208 Volts Delta
Secondary: 120/240 Volts



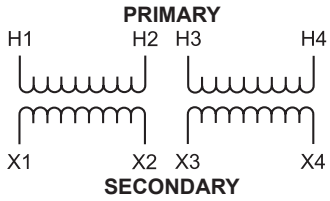
Connections

Primary Volts		Primary Lines Connect To
208		H1, H2
Secondary Volts	**Interconnect**	**Secondary Lines Connect To**
240	X2 to X3	X1, X4
120/240	X2 to X3	X1, X2, X4
120	X1 to X3 X2 to X4	X1, X4

S240A Wiring Diagram & Connections

Wiring Diagram

Primary: 120 x 240 Volts Delta
Secondary: 120/240 Volts



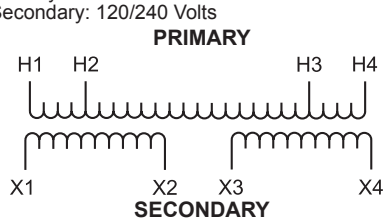
Connections

Primary Volts	Interconnect	Primary Lines Connect To
240	H2 to H3	H1, H4
120	H1 to H3 H2 to H4	H1, H4
Secondary Volts	**Interconnect**	**Secondary Lines Connect To**
240	X2 to X3	X1, X4
120/240	X2 to X3	X1, X2, X4
120	X1 to X3 X2 to X4	X1, X4

S277A Wiring Diagram & Connections

Wiring Diagram

Primary: 277 Volts Delta
Secondary: 120/240 Volts



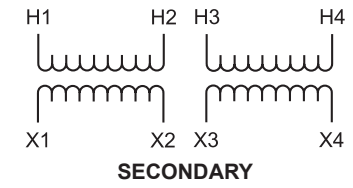
Connections

Primary Volts		Primary Lines Connect To
277		H1, H4
270		H1, H3
263		H1, H4
Secondary Volts	**Interconnect**	**Secondary Lines Connect To**
240	X2 to X3	X1, X4
120/240	X2 to X3	X1, X2, X4
120	X1 to X3 X2 to X4	X1, X4

S480A Wiring Diagram & Connections

Wiring Diagram

Primary: 240 x 480 Volts Delta
Secondary: 120/240 Volts



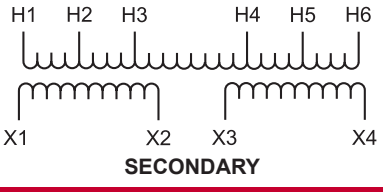
Connections

Primary Volts	Interconnect	Primary Lines Connect To
480	H2 to H3	H1, H4
240	H1 to H3 H2 to H4	H1, H4
Secondary Volts	**Interconnect**	**Secondary Lines Connect To**
240	X2 to X3	X1, X4
120/240	X2 to X3	X1, X2, X4
120	X1 to X3 X2 to X4	X1, X4

S600B Wiring Diagram & Connections

Wiring Diagram

Primary: 600 Volts Delta
Secondary: 120/240 Volts



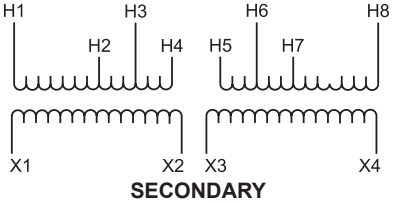
Connections

Primary Volts		Primary Lines Connect To
600		H1, H6
585		H1, H5
570		H2, H5
555		H2, H4
540		H3, H4
Secondary Volts	**Interconnect**	**Secondary Lines Connect To**
240	X2 to X3	X1, X4
120/240	X2 to X3	X1, X2, X4
120	X1 to X3 X2 to X4	X1, X4

S480B Wiring Diagram & Connections

Wiring Diagram

Primary: 240 x 480 Volts Delta
Secondary: 120/240 Volts



Connections

Primary Volts	Interconnect	Primary Lines Connect To
504	H4 to H5	H1 and H8
492	H3 to H5	H1 and H8
480	H3 to H6	H1 and H8
468	H2 to H6	H1 and H8
456	H2 to H7	H1 and H8
252	H1 to H5 H4 to H8	H1 and H8
240	H1 to H6 H3 to H8	H1 and H8
228	H1 to H7 H2 to H8	H1 and H8
Secondary Volts	**Interconnect**	**Secondary Lines Connect To**
240	X2 to X3	X1 and X4
120/240	X2 to X3	X1, X2, X4
120	X1 to X3 X2 to X4	X1, X4

More wiring diagrams can be found in catalog's appendix, section 15.

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For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

PIONEER DRY-TYPE TRANSFORMERS JEFFERSON ELECTRIC BEMAG TRANSFORMER

Enclosure Figures

Figure 4

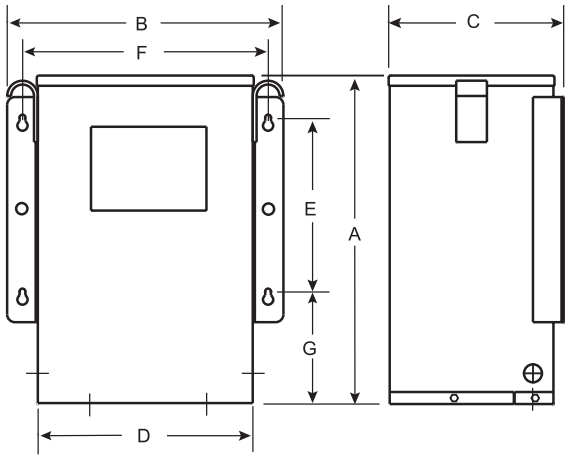
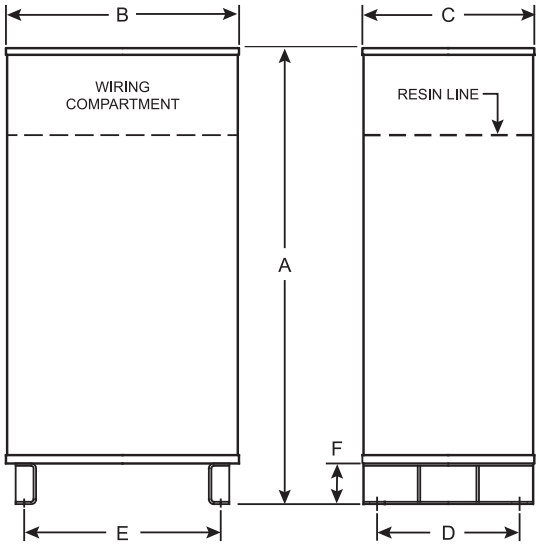


Figure 21



Model Numbers Defined

413-2XXY-ABC

Three-Phase, Encapsulated

Type

Class I, Div 2	2

kVA Rating / XX

3	10	20	17
5	11	25	18
6	12	30	19
7.5	13	37.5	20
9	14	45	21
10	15	50	22
15	16	75	23

Primary	Secondary	
208	480-Y/277	1
240	208Y/120	2
240	480Y/277	3
480	208Y/120	4
480	480Y/277	5
120 Min 600 Max	120 Min 600 Max	*6
480	120/240	7
208	208Y/120	8
600	208Y/120	9

* Unit is special. Suffix will not break down per this chart

Wiring

Default	0
Copper	8

Temperature Rise (40°C ambient)

135°C Rise	0
115°C Rise	1
70°C Rise	7
80°C Rise	8
95°C Rise	9

Shield

Shield	0
No shield	5

Class I Division 2, Three Phase

115°C Temperature Rise, 40°C ambient

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	(F) inches	(G) inches	Est Ship Wgt	Wiring Diagram
208 Volts - 208/120 Volts • Taps: 2 @ 5% FCBN											
3	413-2108-010	4	13.1	15.1	8.1	12.3	5.25	5.5	13.6	110	T208H
6	413-2128-010	4	13.1	15.1	8.1	12.3	5.25	5.5	13.6	140	T208H
9	413-2148-010	4	15.1	19	9.1	16.1	8.25	5.1	17.5	190	T208H
15	413-2168-010	4	15.1	19	9.1	16.1	8.25	5.1	17.5	245	T208H
30	413-2198-010	21	33	23	9.5	7	20.5	3	1.5	890	T208H
45	413-2218-010	21	36	25	12.5	8.5	21.75	3	1.5	790	T208H
75	413-2238-010	21	37	25	12.5	10.5	22.5	3	1.5	1,050	T208H
208 Volts - 480/277 Volts • Taps: 2 @ 5% FCBN											
3	413-2101-010	4	13.1	15.1	8.1	12.3	5.25	5.5	13.6	110	T208A
6	413-2121-010	4	13.1	15.1	8.1	12.3	5.25	5.5	13.6	140	T208A
9	413-2141-010	4	15.1	19	9.1	16.1	8.25	5.1	17.5	190	T208A
15	413-2161-010	4	15.1	19	9.1	16.1	8.25	5.1	17.5	245	T208A
30	413-2191-010	21	33	23	9.5	7	20.5	3	1.5	890	T208A
45	413-2211-010	21	36	25	12.5	8.5	21.75	3	1.5	790	T208A
75	413-2231-010	21	37	25	12.5	10.5	22.5	3	1.5	1,050	T208A
240 Volts - 208Y/120 Volts • Taps: 2 @ 5% FCBN											
3	413-2102-010	4	13.1	15.1	8.1	12.3	5.25	5.5	13.6	110	T240A
6	413-2122-010	4	13.1	15.1	8.1	12.3	5.25	5.5	13.6	140	T240A
9	413-2142-010	4	15.1	19	9.1	16.1	8.25	5.1	17.5	190	T240A
15	413-2162-010	4	15.1	19	9.1	16.1	8.25	5.1	17.5	245	T240A
30	413-2192-010	21	33	23	9.5	7	20.5	3	1.5	890	T240A
45	413-2212-010	21	36	25	12.5	8.5	21.75	3	1.5	790	T240A
75	413-2232-010	21	37	25	12.5	10.5	22.5	3	1.5	1,050	T240A
240 Volts - 480/277 Volts • Taps: 2 @ 5% FCBN											
3	413-2103-010	4	13.1	15.1	8.1	12.3	5.25	5.5	13.6	110	T240G
6	413-2123-010	4	13.1	15.1	8.1	12.3	5.25	5.5	13.6	140	T240G
9	413-2143-010	4	15.1	19	9.1	16.1	8.25	5.1	17.5	190	T240G
15	413-2163-010	4	15.1	19	9.1	16.1	8.25	5.1	17.5	245	T240G
30	413-2193-010	21	33	23	9.5	7	20.5	3	1.5	890	T240G
45	413-2213-010	21	36	25	12.5	8.5	21.75	3	1.5	790	T240G
75	413-2233-010	21	37	25	12.5	10.5	22.5	3	1.5	1,050	T240G

See website for additional kVA, copper windings and temperature options.
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Use the “Find a Product” tool for detailed specification sheets.
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Class I Division 2, Three Phase

115°C Temperature Rise, 40°C ambient

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	(F) inches	(G) inches	Est Ship Wgt	Wiring Diagram
480 Volts - 208Y/120 Volts • Taps: 2 @ 5% FCBN											
3	413-2104-010	4	13.1	15.1	8.1	12.3	5.25	5.5	13.6	110	T480A
6	413-2124-010	4	13.1	15.1	8.1	12.3	5.25	5.5	13.6	140	T480A
9	413-2144-010	4	15.1	19	9.1	16.1	8.25	5.1	17.5	190	T480A
15	413-2164-010	4	15.1	19	9.1	16.1	8.25	5.1	17.5	245	T480A
30	413-2194-010	21	33	23	9.5	7	20.5	3	1.5	890	T480A
45	413-2214-010	21	36	25	12.5	8.5	21.75	3	1.5	790	T480A
75	413-2234-010	21	37	25	12.5	10.5	22.5	3	1.5	1,050	T480A
480 Volts - 240 Volts • Taps: 2 @ 5% FCBN											
3	413-2107-010	4	13.1	15.1	8.1	12.3	5.25	5.5	13.6	110	T480B
6	413-2127-010	4	13.1	15.1	8.1	12.3	5.25	5.5	13.6	140	T480B
9	413-2147-010	4	15.1	19	9.1	16.1	8.25	5.1	17.5	190	T480B
15	413-2167-010	4	15.1	19	9.1	16.1	8.25	5.1	17.5	245	T480B
30	413-2197-010	21	33	23	9.5	7	20.5	3	1.5	890	T480B
45	413-2217-010	21	36	25	12.5	8.5	21.75	3	1.5	790	T480B
75	413-2237-010	21	37	25	12.5	10.5	22.5	3	1.5	1,050	T480B
480 Volts - 480/277 Volts • Taps: 2 @ 5% FCBN											
3	413-2105-010	4	13.1	15.1	8.1	12.3	5.25	5.5	13.6	110	T480C
6	413-2125-010	4	13.1	15.1	8.1	12.3	5.25	5.5	13.6	140	T480C
9	413-2145-010	4	15.1	19	9.1	16.1	8.25	5.1	17.5	190	T480C
15	413-2165-010	4	15.1	19	9.1	16.1	8.25	5.1	17.5	245	T480C
30	413-2195-010	21	33	23	9.5	7	20.5	3	1.5	890	T480C
45	413-2215-010	21	36	25	12.5	8.5	21.75	3	1.5	790	T480C
75	413-2235-010	21	37	25	12.5	10.5	22.5	3	1.5	1,050	T480C
600 Volts - 208/120 Volts • Taps: 2 @ 5% FCBN											
3	413-2109-010	4	13.1	15.1	8.1	12.3	5.25	5.5	13.6	110	T600A
6	413-2129-010	4	13.1	15.1	8.1	12.3	5.25	5.5	13.6	140	T600A
9	413-2149-010	4	15.1	19	9.1	16.1	8.25	5.1	17.5	190	T600A
15	413-2169-010	4	15.1	19	9.1	16.1	8.25	5.1	17.5	245	T600A
30	413-2199-010	21	33	23	9.5	7	20.5	3	1.5	890	T600A
45	413-2219-010	21	36	25	12.5	8.5	21.75	3	1.5	790	T600A
75	413-2239-010	21	37	25	12.5	10.5	22.5	3	1.5	1,050	T600A

See website for additional kVA, copper windings and temperature options.
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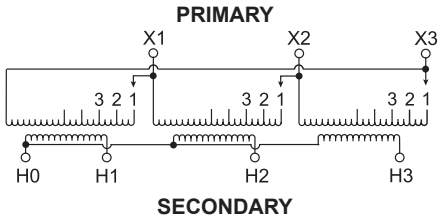
Wiring Diagrams

T208A Wiring Diagram & Connections

Wiring Diagram

Primary: 208 Volts Delta
Secondary: 480Y/277 Volts



Connections

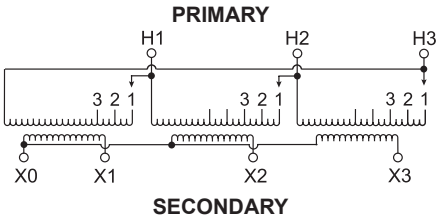
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
208	1	X1, X2, X3
198	2	X1, X2, X3
187	3	X1, X2, X3

Secondary Volts	Secondary Lines Connect To
480	H1, H2, H3
277 1 Phase	Between H0 and H1 or H2 or H3

T208H Wiring Diagram & Connections

Wiring Diagram

Primary: 208 Volts Delta
Secondary: 208Y/120 Volts



Connections

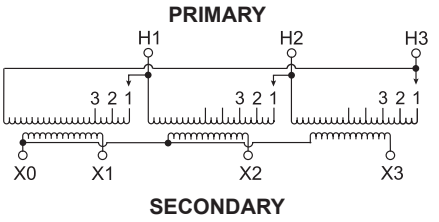
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
208	1	H1, H2, H3
198	2	H1, H2, H3
187	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
208	X1, X2, X3
120 1 Phase	Between X0 and X1 or X2 or X3

T240A Wiring Diagram & Connections

Wiring Diagram

Primary: 240 Volts Delta
Secondary: 208Y/120 Volts



Connections

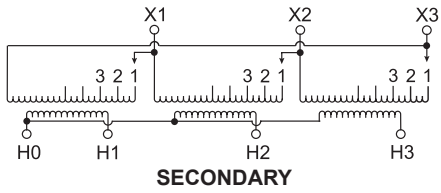
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
240	1	H1, H2, H3
228	2	H1, H2, H3
216	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
208	X1, X2, X3
120 1 Phase	Between X0 and X1 or X2 or X3

T240G Wiring Diagram & Connections

Wiring Diagram

Primary: 240 Volts Delta
Secondary: 480Y/277 Volts



Connections

Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
240	1	X1, X2, X3
228	2	X1, X2, X3
216	3	X1, X2, X3

Secondary Volts	Secondary Lines Connect To
480	H1, H2, H3
277 1 Phase	Between H0 and H1 or H2 or H3

More wiring diagrams can be found in catalog's appendix, section 15.
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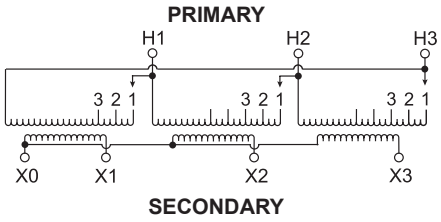
technical_services@jeffersonelectric.com

Wiring Diagrams

T480A Wiring Diagram & Connections

Wiring Diagram

Primary: 480 Volts Delta
Secondary: 208Y/120 Volts



Connections

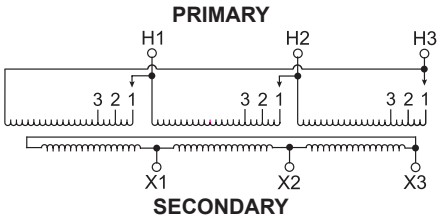
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
480	1	H1, H2, H3
456	2	H1, H2, H3
432	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
208	X1, X2, X3
120 1 Phase	Between X0 and X1 or X2 or X3

T480B Wiring Diagram & Connections

Wiring Diagram

Primary: 480 Volts Delta
Secondary: 240 Volts Delta



Connections

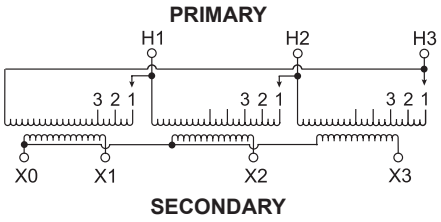
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
480	1	H1, H2, H3
456	2	H1, H2, H3
432	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
240	X1, X2, X3

T480C Wiring Diagram & Connections

Wiring Diagram

Primary: 480 Volts Delta
Secondary: 480Y/277 Volts



Connections

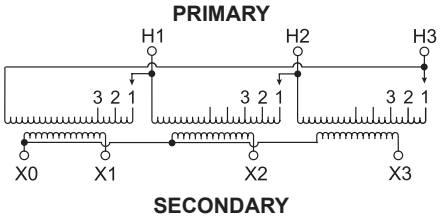
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
480	1	H1, H2, H3
456	2	H1, H2, H3
432	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
480	X1, X2, X3
277 1 Phase	Between X0 and X1 or X2 or X3

T600A Wiring Diagram & Connections

Wiring Diagram

Primary: 600 Volts Delta
Secondary: 208Y/120 Volts



Connections

Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
600	1	H1, H2, H3
570	2	H1, H2, H3
540	3	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
208	X1, X2, X3
120 1 phase	BetweenX0 and X1 or X2 or X3

More wiring diagrams can be found in catalog's appendix, section 15.
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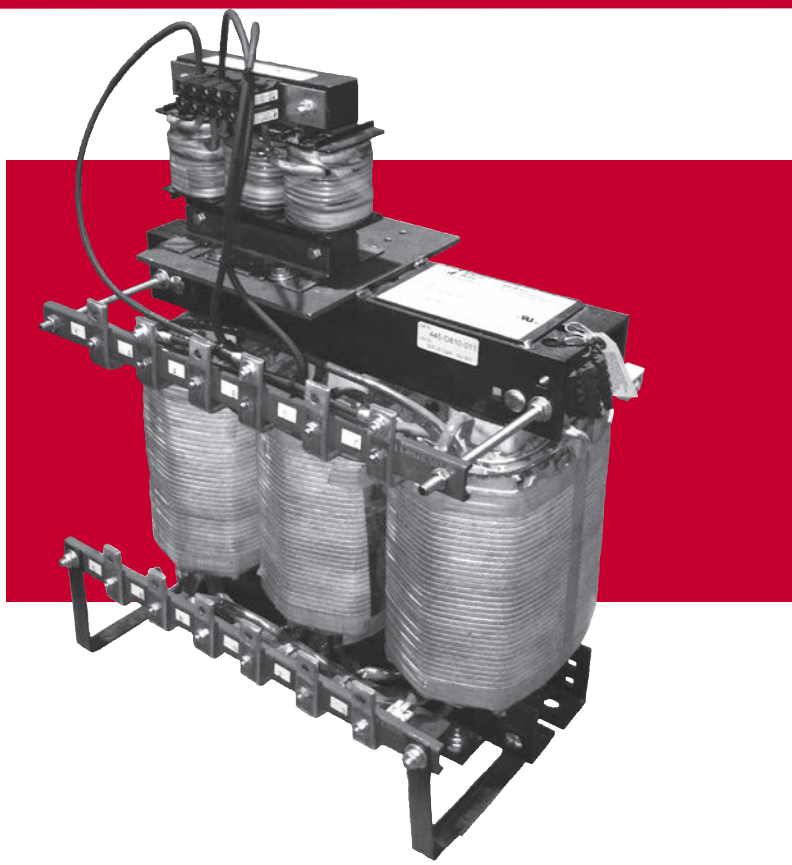
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

15 to 500 HP



Special purpose multi-pulse magnetics can be manufactured to meet specific requirements of your application. Each autotransformer reduces the harmonic current at the input of the transformer as well as harmonic voltage distortion from non-linear loads applied to the outputs.

Applications

- Multi-pulse units are key in designing systems to mitigate the harmonic distortion generated by variable frequency drives and other digital equipment.
- Frequently used in large projects where harmonics increase heat and power usage. Savings can be generated with the proper application of these specially developed units.
- Typical applications for multi-pulse transformers
  - Water and wastewater treatment facilities
  - HVAC installations
  - Pump lift stations.

Specifications

- Core and coil
- 60 Hz operation
- Three Phase: 15 – 500 kVA
- Aluminum windings
- 150ºC temperature rise with 40°C ambient (customer supplied forced air cooling)
- 220°C insulation class
- Cores of high quality electrical steel

Features, Functions, Benefits

- Reduces the neutral current and harmonic distortion generated by triplen harmonics

Standards

- Built in accordance with NEMA, ANSI, UL and CSA standards

Options and Accessories

- 50 Hz
- Copper windings
- Other sizes and temperature rises available
- NEMA1 enclosures

Approvals

Enclosure Figures

Figure 35 without reactor

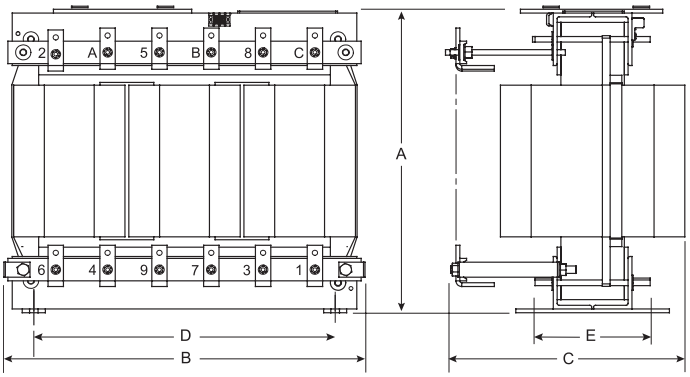
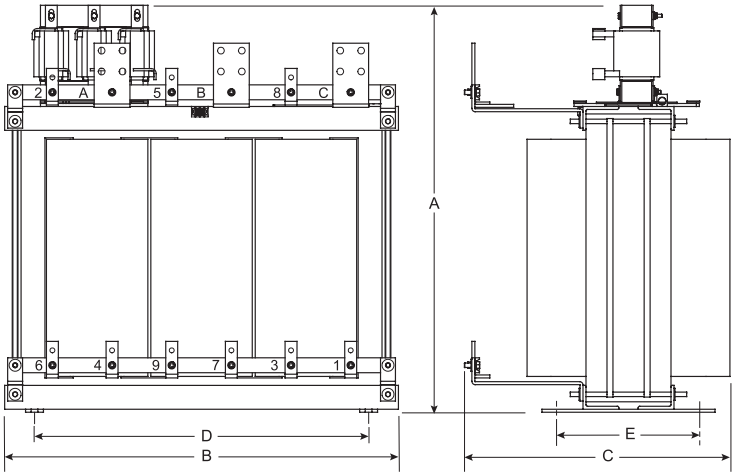


Figure 36 with reactor



Model Numbers

Model numbers for these units are developed to match unique needs. Contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com for more information.

Wiring Diagrams

18-P A Wiring Diagram & Connections

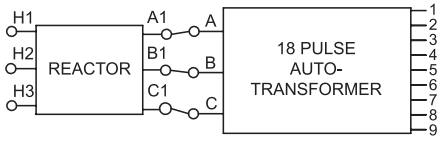
Wiring Diagram

Connections

Primary Volts	Primary Lines Connect To
480	A, B, C
Secondary Volts	**Secondary Lines Connect To**
421	1-9

18-P B Wiring Diagram & Connections

Wiring Diagram



Connections

Primary Volts	Primary Lines Connect To
480	H1, H2, H3
Secondary Volts	**Secondary Lines Connect To**
421	1-9

For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

18-Pulse Autotransformer

3-Phase, 60 Hz, 480V, Aluminum windings

18-pulse Autotransformer (3 output: 421V) without reactor. Fan assist required

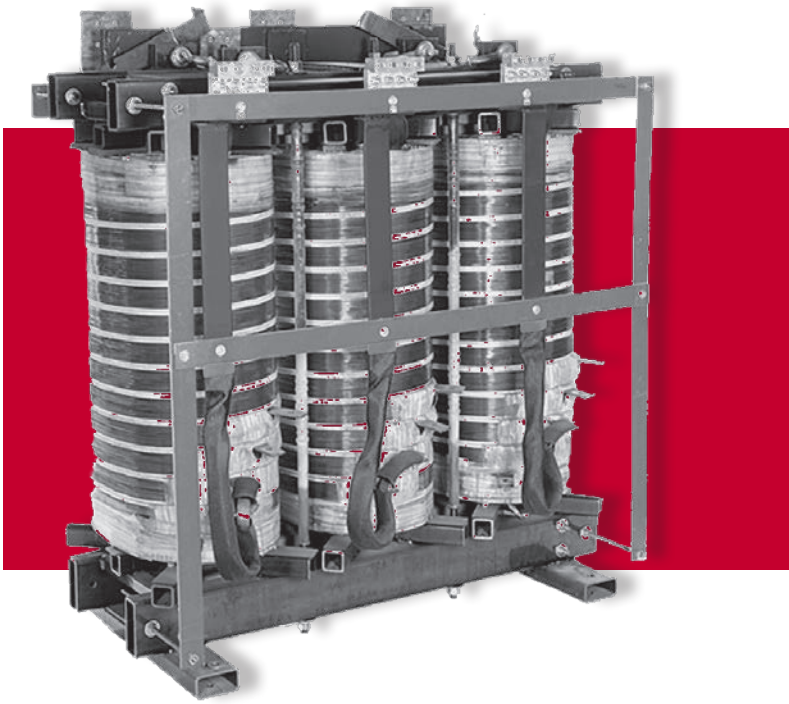
HP / kVA	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	Est Ship Wgt	Wiring Diagram	Air Flow Req'd
15	35	12.75	22.9	12.2	18	6	150	18-P A	300 LFM
20	35	13	21	23	18	6	167	18-P A	300 LFM
25	35	12.7	17.9	12.7	15.9	7.5	207	18-P A	300 LFM
30	35	12.7	17.9	12.7	15.9	7.5	211	18-P A	300 LFM
40	35	15	20.25	14.4	16	6	251	18-P A	300 LFM
50	35	18.5	19.6	12.6	14	5.75	304	18-P A	300 LFM
60	35	16.75	20.1	11.75	14	6.5	400	18-P A	300 LFM
75	35	17.8	20.1	13.25	16.1	6.9	425	18-P A	300 LFM
100	35	20.6	22.9	13.25	18	6.5	450	18-P A	300 LFM
125	35	21.5	22.9	13.6	16	7.5	541	18-P A	300 LFM
150	35	20	23.6	15.5	19.6	7.6	665	18-P A	300 LFM
200	35	22.4	28.3	16	24	8	643	18-P A	300 LFM
250	35	23.6	28.3	16.1	24	8.5	747	18-P A	300 LFM
300	35	38.75	28.1	29	24	9	1,066	18-P A	300 LFM
350	35	39.75	29.25	29	24	10	1,175	18-P A	500 LFM
400	35	26.9	29.75	17.5	25	10	1,357	18-P A	500 LFM
450	35	48.5	32	29	25	10	1,357	18-P A	500 LFM
500	35	51	32.5	29	28	10	1,495	18-P A	500 LFM

18-pulse Autotransformer (3 output: 421V) with reactor. Fan assist required

HP / kVA	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	Est Ship Wgt	Wiring Diagram	Air Flow Req'd
15	36	17.75	22.9	12.2	18	6	157	18-P B	300 LFM
20	36	25.75	18.75	23	TBD	TBD	182	18-P B	300 LFM
25	36	18.43	17.9	12.7	15.9	7.5	222	18-P B	300 LFM
30	36	18.9	17.9	12.7	15.9	7.5	227	18-P B	300 LFM
40	36	22	20.25	14.4	16	6	276	18-P B	300 LFM
50	36	25.5	19.6	12.6	14	5.75	329	18-P B	300 LFM
60	36	23.75	20.1	11.75	14	6.5	425	18-P B	300 LFM
75	36	26.8	20.1	13.25	16.1	6.9	470	18-P B	300 LFM
100	36	29.6	22.9	13.25	18	6.6	502	18-P B	300 LFM
125	36	30.5	22.9	13.62	16	7.5	596	18-P B	300 LFM
150	36	29	23.6	15.5	19.6	7.6	720	18-P B	300 LFM
200	36	31.4	28.3	16	24	8	713	18-P B	300 LFM
250	36	35.1	23.4	16.1	24	8.5	857	18-P B	300 LFM
300	36	50.1	28.1	29	24	9	1161	18-P B	300 LFM
350	36	51.1	29.25	29	24	10	1275	18-P B	500 LFM
400	36	38.3	29.75	17.5	25	10	1467	18-P B	500 LFM
450	36	59.9	32	29	25	10	1467	18-P B	500 LFM
500	36	62.4	32.5	29	28	10	1615	18-P B	500 LFM

See website for additional kVA, copper windings and temperature options.
Housing dimensions subject to change without notice. Consult website or factory where dimensions are critical.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

150 to 10,000 kVA



Applications

- An economical and environmentally friendly alternative to liquid filled for industrial facilities and large commercial applications
- Designed for indoor or outdoor installations
- Wide voltage class range:
  5 kV Class: 150 to 10,000 kVA
  15 kV Class: 150 to 10,000 kVA
  25 kV Class: 300 to 10,000 kVA
  35 kV Class: 500 to 10,000 kVA

Specifications

- NEMA1-rated enclosures
- Energy efficient (meets DOE-2016 or C802)
- 60 Hz operation
- Aluminum windings
- 150ºC temperature rise, 220°C insulation
- Miter/step lapped core construction

Features, Functions, Benefits

- Custom, application specific designs
- Vacuum Pressure Impregnation process ensures the encapsulant penetrates windings and eliminates air-pockets. This improves mechanical strength and heat dissipation, prolonging the life of the unit.
- Custom terminations

Standards

- Built in accordance with NEMA, ANSI, UL and CSA standards

Approvals

Options and Accessories

- NEMA3R enclosures
- 50/60 Hz optional
- Custom kVA and voltages
- Copper windings
- 80°C and 115°C temperature rise available
- Lightning arrestors
- Neutral grounding resistor
- Digital thermometer and monitor
- Forced air cooling
- Multiple secondaries
- Rectifier, excitation and mining duty
- Non-linear load (K-Factor)
- Kirk Key interlocks
- Enclosure filters
- Space heaters
- Ground bus
- Thermocouples

Coil and Core Construction

Coil

- Coils are layer, disk or section wound depending on the voltage class
- All windings designed with wire or foil conductors to minimize eddy losses and provide the highest short circuit strength
- Multi-section barrel or disk designs to reduce short circuit stress
- Designed to maximize cooling characteristics
- Core and coil isolated with neoprene pads to reduce vibration and noise

Core

- Miter core step lap construction
- Core laminations are free of burrs and stacked minimizing the lamination joint gaps
- Cores are bolted to ensure uniform pressure to minimize noise and maximize durability
- Uniform pressing and stiffness ensure low noise level

Assembling

- The coils are held rigidly in place between high compression insulators for the highest ability to resist short circuit forces
- Low voltage bus bars bolted to the upper and lower core clamps with standoff insulators
- Uniform core lamination, coil compacting and strong mechanical structure ensures low noise level for the transformer during lifetime operation
- Heavy gauge sheet steel enclosures

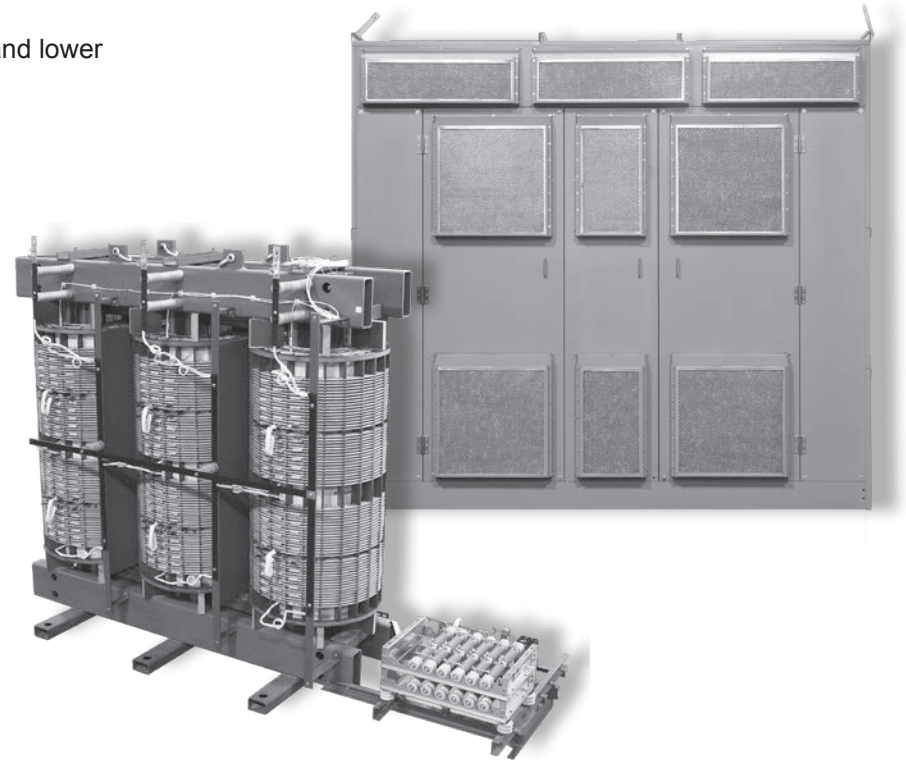
Standard Production Tests

All Power Transformers tested in accordance with the CSA, UL and IEEE standards

- Winding resistance measurements
- Voltage ratio measurements
- Applied and induced voltage test
- Polarity
- Excitation current
- No load losses
- Load loss and impedance voltage
- Tested to UL and CSA standards

Optional Available Tests

- Temperature rise
- Sound level
- Basic impulse level (BIL)
- Partial discharge



Power Transformers

Three Phase • Aluminum Windings

kVA	Imp. %	Weight		Dimensions (Enclosure)						Dimensions (Core & Coil)					
				Height		Width		Depth		Height		Width		Depth	
		lbs	kg	inch	cm	inch	cm	inch	cm	inch	cm	inch	cm	inch	cm
5kV Class — 30 kV/BIL															
150	4.0	1,580	718	56	142.2	44	111.8	30	76.2	31	78.7	37	94.0	20	49.5
225	4.5	1,920	873	56	142.2	44	111.8	30	76.2	35	88.9	38	96.5	19	47.0
300	5.0	2,316	2,053	62	157.5	50	127.0	35	88.9	34	86.4	42	106.7	21	53.3
450	5.5	3,104	1,411	62	157.5	50	127.0	35	88.9	35	88.9	44	111.8	23	57.2
500	6.0	3,262	1,583	62	157.5	50	127.0	35	88.9	34	86.4	44	111.8	25	63.5
600	6.0	3,762	1,710	72	182.9	62	157.6	40	101.6	43	109.2	47	119.4	23	58.4
750	6.0	4,506	2,048	72	182.9	62	157.5	40	101.6	43	109.2	50	127.0	25	62.2
1,000	6.5	5,410	2,459	72	182.9	62	157.5	40	101.6	53	133.4	48	121.9	25	63.5
1,500	6.5	6,980	3,173	80	203.2	68	172.7	48	121.9	55	139.7	53	134.6	25	63.5
2,000	7.0	9,700	4,409	80	203.2	80	203.2	54	137.2	58	147.3	61	154.9	32	81.3
15kV Class — 60 kV/BIL															
300	5.5	4,430	2,014	80	203.2	80	203.2	54	137.2	49	124.5	61	154.9	23	584
450	6.0	4,950	2,250	80	203.2	80	203.2	54	137.2	51	129.5	64	162.6	24	610
500	6.0	5,150	2,341	80	203.2	80	203.2	54	137.2	52	132.1	69	175.3	25	635
600	6.0	5,750	2,614	80	203.2	80	203.2	54	137.2	53	134.6	65	165.1	26	660
750	6.5	6,600	3,000	90	228.6	90	228.6	60	152.4	52	132.1	72	182.9	37	940
1,000	6.5	7,300	3,318	90	228.6	90	228.6	60	152.4	52	132.1	73	185.4	37	940
1,500	6.5	9,220	4,191	90	228.6	90	228.6	66	167.6	52	132.1	75	190.5	38	965
2,000	7.0	10,500	4,773	100	254.0	100	254.0	66	167.6	62	157.5	75	190.5	38	965
2,500	7.0	11,700	5,318	100	254.0	100	254.0	72	182.9	71	180.3	76	193.0	39	991
3,000	7.0	12,300	5,591	100	254.0	100	254.0	72	182.9	70	177.8	76	193.0	39	991
25kV Class — 125 kV/BIL															
500	6.0	5,813	2,642	80	203.2	100	254.0	60	152.4	54	137.2	73	185.4	38	96.5
600	6.0	6,150	2,795	90	228.6	100	254.0	60	152.4	60	152.4	75	190.5	38	96.5
750	6.5	7,100	3,227	90	228.6	100	254.0	60	152.4	56	142.2	80	203.2	39	99.1
1,000	6.5	8,550	3,886	90	228.6	110	279.4	66	167.6	62	157.5	83	210.8	40	101.6
1,500	6.5	10,500	4,773	90	228.6	110	279.4	72	182.9	62	157.5	87	221.0	42	106.7
2,000	7.0	13,100	5,955	100	254.0	110	279.4	72	182.9	70	177.8	90	228.6	43	109.2
2,500	7.0	14,800	6,727	110	279.4	110	279.4	72	182.9	73	185.4	90	228.6	43	109.2
3,000	7.0	15,800	7,182	120	304.8	110	279.4	72	182.9	80	203.2	90	228.6	43	109.2
4,000	7.0	18,300	8,318	130	330.2	120	304.8	80	203.2	95	241.3	92	233.7	45	114.3

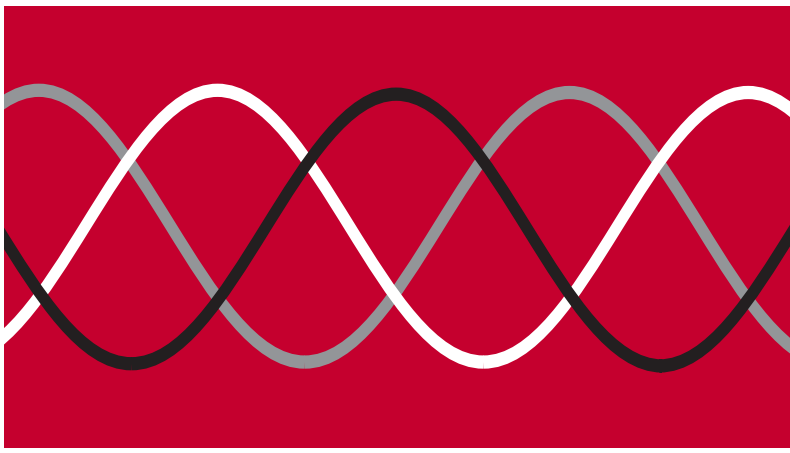
See website for additional kVA, copper windings and temperature options.
Dimensions subject to change without notice. Consult website or factory where dimensions are critical.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Answering Today's Power Challenges

Jefferson Electric is continually updating its product line to remain on the forefront of transformer technology. Electrical harmonics have become a real world problem to many of our customers, especially those with high energy usage and very stable voltage needs. For these customers, we have a solution.

This section of our catalog contains our products line developed to mitigate harmonics.

For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com



Why Your Existing Transformer May Be Inadequate

Traditional transformers were designed to handle the purely linear electrical loads created by standard lighting and motors. The currents drawn by these loads are sinusoidal in shape, as is the waveshape of the supply voltage. When loads are linear and balanced, as in a typical three-phase system, the neutral current flow is zero. This is because the three-phase currents are 120 degrees out of phase with each other and cancel in the neutral. The sinusoidal current waveshape is the foundation for wire-size calculations, determining how to balance loads to reduce neutral currents, and reducing the size of neutral conductors to reduce material costs.

The Phenomenon of Odd Harmonics

Electronic equipment today is powered by SMSPs (switch mode power supplies) that convert AC current to DC current. SMSPs use rectifiers and capacitors drawing current in sharps bursts which distorts the sinusoidal waveform. It is now non-linear.

Non-linear loads, are rich in odd harmonics (3, 5, 7, etc.), which are multiples of the fundamental 60 Hertz frequency. The major components of harmonic currents in switched mode power supplies are the third and fifth harmonics. The 3rd harmonic current (180Hz) due to the design of the 3-phase system, is additive in the neutral and can result in a neutral current twice the phase current, even in a balanced system.

How Harmonics Affect Transformers

When odd-harmonic currents are present, winding losses increase. The I^2R, conductor losses, are higher because harmonics increase the current. Stray losses in windings also increase losses due to additional eddy currents circulating within the conductors. The combination of these additional losses generate excess heat in the transformer coils. Transformer insulation systems are designed to accommodate temperature increases due to normal stray losses. However, when required to carry non-linear loads, the heat generated may exceed the designed rating, reducing the life of the transformer and creating the possibility of premature failure.

De-rating is Not the Answer

De-rating a traditional linear transformer to compensate for heat build-up requires higher installation costs and provide poor energy efficiency due to increased core losses.

K-Factor Type of Load

K-1 Resistance heating
Incandescent lighting
Motors
Transformers
- Control
- Distribution

K-4 Welders
Induction heaters
HID lighting
Fluorescent lighting
Solid state controls

K-13 Telecommunications equipment
Branch circuits in classrooms and healthcare facilities

K-20 Mainframe computers
Variable speed drives
Branch circuits with exclusive loads of data processing equipment

Harmonic Mitigation

Harmonic Mitigating Transformers (HMT/Zig-Zag) and K-rate transformers accommodate the flow of the third harmonic current. They dissipate the extra current as heat (I^2R loses) in the transformer.

Because they are so common to our product line, we included K-rated transformers (Chapter 3, Non-Linear Transformers) in our standard catalog.

The Harmonic Mitigating Transformer (HMT / Zig-Zag) line is defined in on the following pages.

Harmonic Suppression

Instead of filtering third harmonic currents from the line after they are generated, our patented Harmonics Suppression System (HSS™) works at the source to prevent the generation of these currents.

The HSS is extremely reliable, is UL certified, and is fully compliant with the National Electrical Code. It is the only harmonic mitigation system that "prevents" the formation of third harmonic currents throughout the electrical distribution system, rather than just "accommodating" these currents after they are formed. It is the only harmonic mitigation system that reduces wasted energy and has an energy payback. It is clearly the technology of choice for solving third harmonic current problems in electrical systems that power multiple computer and electronic loads.

SysteMax™ is a stand alone third harmonic suppression filter that installs on the neutral of an existing distribution transformer. It is sized to the transformer (15 to 1,000 kVA). Enclosure type is UL/NEMA Type 1, steel with ANSI–61 gray paint.

While SysteMax can be installed on any transformer, Harmonics Limited recommends it be placed on at least a high efficiency DOE compliant transformer. If the existing transformer does not meet DOE-2016 specifications then replacement with a TransMax is advised.

TransMax™ is harmonic suppression technology incorporated in a single enclosure with a high efficiency transformer. The basic transformer has a 480V primary, 208Y/120V secondary, with copper or aluminum windings, 115°C rise and electrostatic shielding. Standard sizes range from 30 kVA to 500 kVA. More information can be found in on page 13-7.

GenMax™ addresses issues arising when multiple generators of different pitch are paralleled. Each pitch has a slight variation in the voltage waveform which can cause excessive 3rd harmonic current to flow in the system.

Harmonic Mitigating (Zig-Zag)

HMT Three-Phase Zig-Zag Transformers

The HMT (Harmonic Mitigating Transformer) is a three phase transformer with 0° or -30° displacement between the primary and the secondary.

An HMT is used to reduce current harmonics on the primary side of a transformer and voltage distortion on the secondary. A single HMT reduces the flow of triplen harmonics, 3rd, 9th, 15th, 21st, etc into the transformer primary. Used together on the same power line a 0° and -30° HMT will also reduce the 5th and 7th harmonics.

These transformers are designed to reduce voltage distortion when powering non-linear loads.

Applications

- For use in environments with non-linear loads such as computers, printers and communication equipment where stable load and operation is necessary
- Medical facilities including hospitals
- Data centers
- Office buildings
- Schools

Specifications

- K-13 standard
- DOE-2016 efficiency
- NEMA3R enclosure
- 3 phase, 60 Hz
- 480V primary
- Zig-Zag secondary design voltage 208Y/120V
- 0º and -30º phase shifts
- 15 – 1,500 kVA range
- Aluminum windings
- 150ºC temperature rise
- 220ºC insulation class
- Heat-cured ASA-61 gray powder coating finish
- Electrostatic shield
- Cores of high quality electrical steel

Standards

- Built in accordance with NEMA, ANSI, UL and CSA standards
- UL and CSA Listed

Options and Accessories

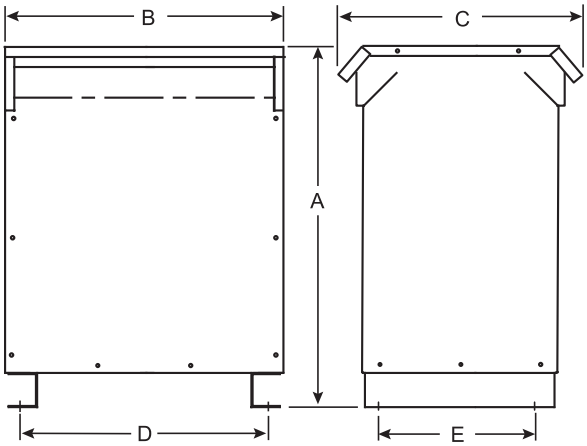
Consult factory for more information

- 50 Hz
- Other sizes, voltages and temperature rises available
- Copper windings
- K-4 and K-20
- Dual electrostatic shields
- 115ºC, 80ºC temperature rise

Approvals

Enclosure Figures

Figure 24



Mounting Brackets

Part Number	Description	Max Unit Wgt (lbs)
223-7008-030	For 15 kVA units, 150°C rise	250
223-7008-075	For 16 to 50 kVA units, 150°C rise	750

Lugs

Part Number	kVA	Primary Lug	Qty	Secondary Lug	Qty
4PT-2007-LUG	15	#14 - 2	2	#2/0 - 6	2
4PT-2017-LUG	25	#14 - 2	2	250MCM - 6	2
4PT-2008-LUG	37.5	#14 - 2	2	350MCM - 6	2
4PT-2009-LUG	50	#2/0 - 6	2	600MCM - 6	2
4PT-2018-LUG*	75	#2/0 - 6	2	600MCM - 6	4

* Must be ordered, not included on stock units

Model Numbers Defined

424-TXXY-ABC

3 Phase Ventilated Non-Linear Zig-Zag
All models with electrostatic shield

Enclosure Type

DOE-2016	9

kVA Rating / XX

15.0	16	150	26
20	17	167	27
25	18	200	28
30	19	225	29
37.5	20	250	30
45	21	300	31
50	22	333	32
75	23	400	33
100	24	500	34
112.5	25		

Primary	Secondary	
208	480Y/277	1
240	208Y/120	2
240	480Y/277	3
480	208Y/120	4
480	480Y/277	5
Specials*		6
Not assigned		7
208	208Y/120	8
600	208Y/120	9

Wiring

Aluminum	0
Copper	8

Temperature Rise

150°C Rise	0
115°C Rise	1
80°C Rise	8

Third Harmonic

K=4, Zig-Zag, -30 degrees	4
K=13, Zig-Zag, -30 degrees	5
K=20, Zig-Zag, -30 degrees	6
K=4, Zig-Zag, 0 degrees	7
K=13, Zig-Zag, 0 degrees	8
K=20, Zig-Zag, 0 degrees	9

* Suffix defined incrementally

Three-Phase Harmonic Mitigation (Zig-Zag) Transformers–DOE Compliant

K-13 • Electrostatic Shields • 150°C Temperature Rise • Aluminum Windings • NEMA3R Enclosures
Taps: 2@2.5% FCAN, 2@2.5% FBCN

480V Delta — 208Y/120V

kVA	Catalog Number	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	(D) inches	(E) inches	Est Ship Wgt	Mounting Kit	Wiring Diagram
15	424-9164-008	24	25	22	22	17.4	13	310	223-7008-030	T480M
30	424-9194-008	24	28	25	23.5	20.8	14.5	400	223-7008-075	T480M
45	424-9214-008	24	32	27	26	23.5	16	585	223-7008-075	T480M
75	424-9234-008	24	38	29	29	25.5	18	775	n/a	T480M
112.5	424-9254-008	24	42	33	32.5	29.5	21	1,000	n/a	T480M
150	424-9264-008	24	46	35	37	31.5	24	1,530	n/a	T480M
225	424-9294-008	24	52	35	37	31.5	24	1,660	n/a	T480M
300	424-9314-008	24	60	48	43.5	42.0	27	2,460	n/a	T480M
500	424-9344-008	24	72	52	44	35.0	42	3,750	n/a	T480M

Three-Phase Harmonic Mitigation (Zig-Zag) Transformers–C802 Compliant

K-13 • Electrostatic Shields • 150°C Temperature Rise • Aluminum Windings • NEMA3R Enclosures
Taps: 2@2.5% FCAN, 2@2.5% FBCN

600V Delta — 208Y/120V

15	424-9169-008	24	25	22	22	17.4	13	310	223-7008-030	T600G
30	424-9199-008	24	28	25	23.5	20.8	14.5	400	223-7008-075	T600G
45	424-9219-008	24	32	27	26	23.5	16	585	223-7008-075	T600G
75	424-9239-008	24	38	29	29	25.5	18	775	n/a	T600G
112.5	424-9259-008	24	42	33	32.5	29.5	21	1,000	n/a	T600G
150	424-9269-008	24	46	35	37	31.5	24	1,530	n/a	T600G
225	424-9299-008	24	52	35	37	31.5	24	1,660	n/a	T600G
300	424-9319-008	24	60	48	43.5	42.0	27	2,460	n/a	T600G
500	424-9349-008	24	72	52	44	35.0	42	3,750	n/a	T600G

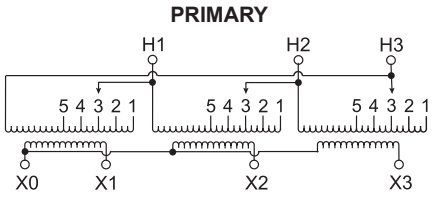
See website for additional kVA, copper windings and temperature options.
Housing dimensions subject to change without notice. Consult website or factory where dimensions are critical.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Wiring Diagrams

T480M Wiring Diagram & Connections

Wiring Diagram

Primary: 480 Volts Delta
Secondary: 208Y/120 Volts



Connections

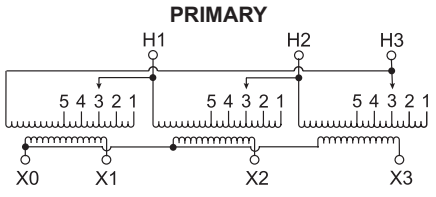
Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
504	1	H1, H2, H3
492	2	H1, H2, H3
480	3	H1, H2, H3
468	4	H1, H2, H3
456	5	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
208	X1, X2, X3
120 1 phase	Between X0 and X1 or X2 or X3

T600G Wiring Diagram & Connections

Wiring Diagram

Primary: 600 Volts Delta
Secondary: 208Y/120 Volts



Connections

Primary Volts	On Each Coil Jumper Taps To	Primary Lines Connect To
630	1	H1, H2, H3
615	2	H1, H2, H3
600	3	H1, H2, H3
585	4	H1, H2, H3
570	5	H1, H2, H3

Secondary Volts	Secondary Lines Connect To
208	X1, X2, X3
120 1 phase	Between X0 and X1 or X2 or X3

More wiring diagrams can be found in catalog's appendix, section 15.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

Harmonic Suppression System

Solutions for Harmonics in the Power System

The Harmonic Suppression System (HSS™) eliminates the harmful 3rd harmonic current generated by the operation of electronic power supplies. An HSS eliminates the 3rd harmonic current, removing it from the distribution system.

Patented HSS technology allows transformers to be sized to the load. There is no need to de-rate or oversize panels, reducing installation costs and energy consumption and increasing equipment life. ROI can be less than 24 months.

Three Options

SysteMax™ is a stand alone 3rd harmonic suppression filter that is connected to the neutral of an existing distribution transformer. It is sized to the transformer (15 kVA to 1,000 kVA).

TransMax™ is a SysteMax filter incorporated in an enclosure with a high efficiency transformer. The basic transformer is 480V primary, 208Y/120V secondary, with either copper or aluminum windings, 115°C rise and electrostatic shielding. Options include 80°C rise, low noise (-3dB) and 208V primary. Enclosure type is UL/NEMA Type 1, ANSI–61 gray paint. Standard sizes range from 30 kVA to 500 kVA.

GenMax™ is a passive, tuned harmonic suppression system for generators. This new technology allows generators with different winding pitches to operate at full capacity by reducing circulating 3rd harmonic ground currents.

Applications

- Where there is a large amount of computer, printer and communication equipment load, and stable operation is necessary
- Where there are slight differences in the pitch of the paralleled generators
- Medical facilities including hospitals
- Call, data and technology centers
- Office and commercial buildings
- Gaming industry
- Schools

Features, Functions, Benefits

- Patented HSS technology allows transformers to be sized exactly to the load. No need to de-rate or oversize panels.
- Lower installation costs
- Reduced energy consumption
- Longer equipment life
- ROI can be less than 24 months

Standards

- Built in accordance with NEMA, ANSI, UL and CSA standards
- UL and CSA Listed

Options and Accessories

Consult factory for more information

- 50 Hz
- Other sizes, voltages and temperature rises available
- Aluminum windings
- Dual electrostatic shield
- 115ºC, 80ºC temperature rise

Approvals

Enclosure Figures

Figure 37

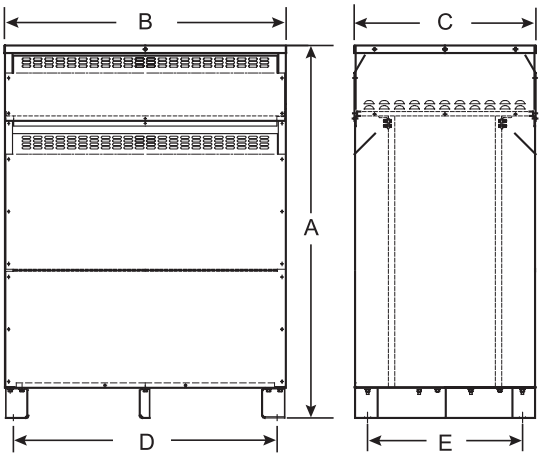


Figure 33

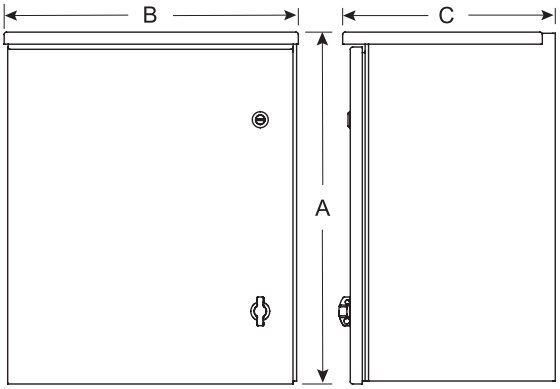
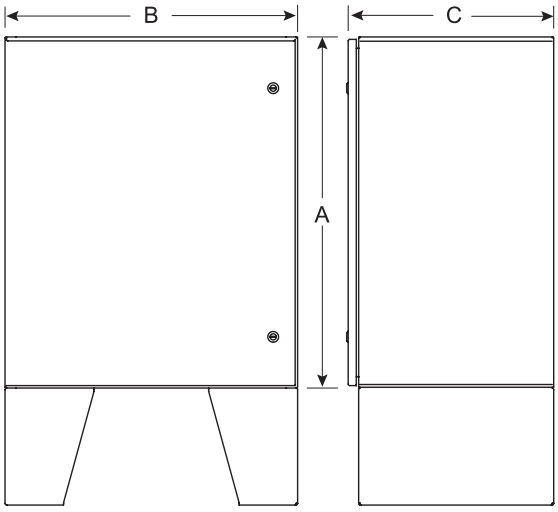


Figure 34



Model Numbers

Model numbers for these units are developed to match unique needs. Contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com for more information.

TransMax™

Three Phase • Harmonic Suppression System + Transformer • Electrostatic Shields
115°C Temperature Rise • Copper Windings • NEMA1 Enclosures

480V Delta — 208Y/120V • Taps: 2@2.5% FCAN, 2@2.5% FBCN, DOE-2016 compliant

kVA	Amp Rating	Catalog Number	Model	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	Est Ship Wgt
30	83	423-4900-130	HLTM030	32	46	24	18	500
45	125	423-4900-131	HLTM045	32	46	24	18	570
75	208	423-4900-132	HLTM075	32	55	28	23	900
112	311	423-4900-133	HLTM112	32	63	28	23	1,200
150	416	423-4900-134	HLTM150	32	63	28	23	1,350
225	625	423-4900-135	HLTM225	32	71	35	30	2,150
300	833	423-4900-136	HLTM300	32	71	35	30	2,475
400	1,108	423-4900-137	HLTM400	32	74	56	36	3,290
500	1,388	423-4900-138	HLTM500	32	74	56	36	4,100

SysteMax™

Three Phase • Harmonic Suppression System • NEMA1 Enclosures

kVA	Amp Rating	Catalog Number	Model	Enclosure Figure	Height (A) inches	Width (B) inches	Depth (C) inches	Est Ship Wgt
30	83	300-4600-140	HLSM0030	33	20	16	15	132
45	125	300-4600-141	HLSM0045	33	20	16	15	147
75	208	300-4600-142	HLSM0075	33	24	20	15	218
112	311	300-4600-143	HLSM0112	33	30	24	15	300
150	416	300-4600-144	HLSM0150	33	30	24	15	327
225	625	300-4600-145	HLSM0225	34	60	30	21	565
300	833	300-4600-146	HLSM0300	34	60	30	21	644
500	1,388	300-4600-148	HLSM0500	34	72	48	25	1,350
750	2,080	300-4600-855	HLSM0750	34	84	60	25	1,960
1,000	2,780	300-4600-856	HLSM01000	34	84	60	25	2,900

* Legs typically add 12 inches to overall height, may vary. Call for exact dimensions if critical.

Housing dimensions subject to change without notice. Consult website or factory where dimensions are critical.
For further information, contact an Application Engineer at 800-892-3755, technical_services@jeffersonelectric.com

GenMax™

GenMax is available for generators from 100kW to 2,000kW (208V, 480V and 600V) with ampacity ratings from 50 to 2,800 amps.

GenMax is sized to the generator, phase current and connected loads.

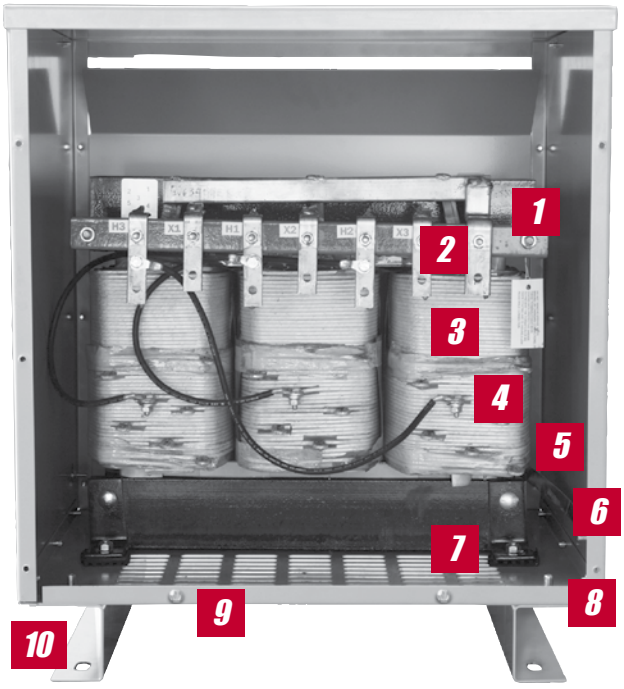
Consult the factory with your application for a specific recommendation on the GenMax to meet your needs.

Guide to this section

This information is provided to ensure you select the unit that best suits your needs and to show you how to maintain it for a long life.

Transformer Construction

Jefferson Electric transformers are built to the highest industry standards. Each unit is fully tested before it is shipped. We stand behind each unit we sell with a strong customer service department and Application Engineers knowledgeable in the use of transformers.



1. Fiberglass terminal board
2. Tightly stacked electrical steel core provides lower losses and low noise
3. Standard aluminum coils
4. Front loop taps are staggered for easy connection
5. Flexible core ground strap
6. Ground stud bolt
7. Vibration isolation pads provide quiet operation
8. Side or bottom conduit access for convenient mounting options
9. Bolt locations to hold front cover during installation loosen, don't remove
10. Easy access mounting holes

General Dry Type Transformers

Following is a list of our product line. For more information see the catalog section noted.

1 Single-Phase Ventilated
15 to 667 kVA
For all general loads, indoors or out, including lighting, industrial and commercial applications. Units may be banked for three phase operation.

2 Three-Phase Ventilated
15 to 2,500 kVA
For all general three phase loads, indoors or out, including lighting, industrial and commercial applications.

3 Non-Linear Three-Phase
15 to 1,000 kVA
Built to handle electronic loads to meet non-linear demands caused by modern office equipment. For indoor and outdoor applications.

4 Drive Isolation
3 to 990 kVA
For industrial and commercial applications with SCR-controlled adjustable speed motor drives, and AC adjustable frequency or DC drives.

5 Totally Enclosed Non-Ventilated
15 to 500 kVA
Single- and three-phase designed for use in challenging manufacturing environments.

6 Industrial Control
50 to 5,000 VA
For control panels, conveyor systems, machine tooling equipment, commercial sewing machines, pumping system panels, and commercial air conditioning applications.

7 Single-Phase Encapsulated
50 VA to 25 kVA
For all general loads, indoors or out, including lighting, industrial and commercial applications. Units may be banked for three phase operation.
Pool & Spa Lighting
Lamp Watts 100 through 1,000
For low voltage circuits near water or other shock hazards.

8 Three-Phase Encapsulated
3 to 75 kVA
For all general three phase loads, indoors or out, including lighting, industrial and commercial applications.

9 Buck-Boost
50 VA to 10 kVA
For correcting voltage line drops, landscape lighting, low voltage lighting, international voltage adaptation and motor applications. Buck-boost transformers do not compensate for fluctuating line voltages.

10 Class I Division 2 Encapsulated transformers
1 to 25 kVA, Single Phase
3 to 75 kVA, Three Phase
Class I Division 2 units are key in hazardous locations in maintaining a safe environment.

11 18-Pulse
15 to 500 HP
Multi-pulse units are key in designing systems to mitigate the harmonic distortion generated by variable frequency drives and other digital equipment.

12 Medium Voltage
5 kV to 25 kV Class
Designs for industrial facilities and process lines, drilling and mining installations and commercial power applications. Each unit customized to your specifications.

13 Power Quality

13a HMT / Zig-Zag 15 to 1,500 VA
These transformers cancel 3rd harmonic currents in the secondary winding eliminating them from the primary winding.

13b Harmonic Suppression System (HSS)
This system eliminates, not accommodates, the 3rd harmonic current, removing it from the distribution system.

■ **Medium Voltage Industrial Control**
.5 to 5 kVA
See website for more information
For the demands of industrial control applications, even rugged conditions.

Specifying the Correct Transformer

Contact an Application Engineer at 800-892-3755 if you have questions regarding performance, design or installation. You can email them at technical_services@jeffersonelectric.com

- **Transformer size is determined by the kVA of the load.**
- **Load voltage, or secondary voltage, is the voltage needed to operate the load.**
- **Line voltage, or primary voltage, is the voltage from the source.**
- **Single-Phase has two lines of AC power.**
- **Three-Phase has three lines of AC power, each line 120 degrees out of phase with the other two.**
- **kVA is kilovolt ampere or thousand volt amperes. This is how transformers are rated.**

NOTE: If motors are started more than once per hour, increase minimum transformer kVA by 20%.

To determine the size of the transformer you need, use this handy formula, or the chart at the right.

Determine the Load Voltage

Load Voltage =

Determine the Load Current (Amps)

Load Current/Amps =

Determine the Line Voltage

Line Voltage =

Size and Select a Transformer

1. Determine the proper kVA based on the required load voltage, line voltage and load current.

   For an example: Load voltage = 480 volts, Load current = 80 Amps and Line voltage = 208 volts. Using the calculation yields a 66 kVA transformer.

Transformer Selection Formulas

Single-Phase Transformers

$$\frac{\text{Volts} \times \text{Amps}}{1000} = \text{kVA}$$

Plug your numbers into the formula:

$$\frac{\text{Volts} \_\_\_\_ \times \text{Amps} \_\_\_\_}{1000} = \_\_\_\_ \text{kVA}$$

Three-Phase Transformers

$$\frac{\text{Volts} \times \text{Amps} \times 1.732}{1000} = \text{kVA}$$

Plug your numbers into the formula:

$$\frac{\text{Volts} \_\_\_\_ \times \text{Amps} \_\_\_\_ \times 1.732}{1000} = \_\_\_\_ \text{kVA}$$

2. Choose the appropriate style of transformer for the application. See page 14-2. For example, if you need a transformer for a three phase industrial application you can choose the Three Phase Ventilated style.
3. Go to the appropriate section in the catalog.
4. Select the options such as mounting brackets to assist your installation.

Full Load Currents (in Amperes), Voltage (line to line)

Single-Phase Transformers

kVA	120V	208V	240V	277V	480V	600V
.50	.42	.24	.21	.18	.10	.08
.75	.63	.36	.31	.27	.16	.13
.10	.83	.48	.42	.36	.21	.17
.15	1.25	.72	.63	.54	.31	.25
.25	2.08	1.20	1.04	.90	.52	.42
.50	4.16	2.40	2.08	1.8	1.04	.83
.75	6.25	3.60	3.13	2.7	1.56	1.25
1.0	8.3	4.8	4.2	3.6	2.1	1.7
1.5	12.5	7.2	6.2	5.4	3.1	2.5
2.0	16.7	9.6	8.3	7.2	4.2	3.3
3.0	25	14.4	12.5	10.8	6.2	5.0
5.0	41.7	24	20.8	18.0	10.4	8.3
7.5	62.5	36.1	31.2	27	15.6	12.5
10.0	83.4	48	41.6	36	20.8	16.7
15.0	125	72	62.5	54	31.2	25
25.0	208	120	104	90	52	41.7
37.5	312	180	156	135	78	62.5
50.0	417	240	208	180	104	83.5
75.0	625	361	312	270	156	125
100.0	834	480	416	361	208	167
167.0	1,396	805	698	602	349	279

Three-Phase Transformers

kVA	208V	240V	480V	600V
3	8.3	7.2	3.6	2.9
6	16.6	14.4	7.2	5.8
9	25	21.6	10.8	8.7
15	41.6	36.0	18.0	14.4
30	83	72	36	29
45	125	108	54	43
75	208	180	90	72
112.5	312	270	135	108
150	416	360	180	144
225	625	542	271	217
300	830	720	360	290
500	1,390	1,200	600	480
750	2,080	1,800	900	720

For other single-phase kVA ratings or voltages:

$$\text{Amperes} = \frac{\text{kVA} \times 1000}{\text{Volts}}$$

For other three-phase kVA ratings or voltages:

$$\text{Amperes} = \frac{\text{kVA} \times 1000}{\text{Volts} \times 1.732}$$

Source: EASA Handbook

Recommended Copper Wire and Transformer Size

HP	Transformer kVA	Distance — Motor to Transformer in Feet				
		100	150	200	300	500
Single-Phase Motors, 230V						
1½	3	10	8	8	6	4
2	3	10	8	8	6	4
3	5	8	8	6	4	2
5	7-1/2	6	4	4	2	0
7½	10	6	4	3	1	0

HP	Volts	Transformer kVA	Distance — Motor to Transformer in Feet				
			150	150	200	300	500
Three-Phase Motors, 230 & 460V							
1½	230	3	12	12	12	12	10
1½	460	3	12	12	12	12	12
2	230	3	12	12	12	10	8
2	460	3	12	12	12	12	12
3	230	5	12	10	10	8	6
3	460	5	12	12	12	12	10
5	230	7½	10	8	8	6	4
5	460	7½	12	12	12	10	8
7½	230	10	8	6	6	4	2
7½	460	10	12	12	12	10	8
10	230	15	6	4	4	4	1
10	460	15	12	12	12	10	8
15	230	20	4	4	4	2	0
15	460	20	12	10	10	8	6
20	230	Consult Local Power Company	4	2	2	1	000
20	460		10	8	8	6	4
25	230		2	2	2	0	000
25	460		8	8	6	6	4
30	230		2	1	1	00	0000
30	460		8	6	6	4	2
40	230		1	0	00	0000	300
40	460		6	6	4	2	0
50	230		1	0	00	0000	300
50	460		4	4	2	2	0
60	230		1	00	000	250	500
60	460		4	2	2	0	00
75	230		0	000	0000	300	500
75	460		4	2	0	00	000

Enclosures

Our standard enclosure is rated NEMA3R. Other enclosures are available. Let us help you specify the one to meet your exact needs.

NEMA Transformer Enclosure Definitions

Standard	*Description*
Type 1	General purpose – indoor.
Type 2	Drip-proof – indoor.
Type 3	Wind blown dust and water – indoor/outdoor.
Type 3R	Rainproof and sleet/ice resistant – outdoor.
Type 3S	Dust-tight, rain-tight, and sleet/ice proof – outdoor.
Type 4	Water-tight and dust-tight – indoor/outdoor.
Type 4X	Water-tight, dust-tight and corrosion resistant – outdoor.
Type 5	Dust-tight – indoor.
Type 6	Submersible, water-tight, dust-tight and sleet/ice resistant – indoor/outdoor.
Type 7	Class I, Group (S) A,B,C and/or D – indoor hazardous locations, air-break equipment
Type 8	Class I, Group (S) A,B,C and/or D – indoor hazardous locations
Type 9	Class II, Group (S) E,F and/or D – indoor hazardous locations - air-break equipment
Type 10	Bureau of Mines
Type 11	Drip-proof and corrosion resistant
Type 12	Industrial use dust-tight and drip-tight – indoor.
Type 13	Oil-tight and dust-tight – indoor.

Source: NEMA Pub. No. ST20

Transformer NEMA Maximum * Single- and Three-Phase db Ratings

kVA Rating	*600V*
0 - 9	40
10 - 50	45
51 - 150	50
151 - 300	55
301 - 500	60
501 - 700	62
701 - 1000	64

* K-Factor, low temp and special transformer sound rating = kVA of equivalent design at 150°C rise and K-1

Protective Equipment

The importance of protecting your power delivery system cannot be overstated. The system must be protected against short circuits, surges caused by lightning, switching and overheating. Equipment is available to provide this protection, but it must also be adequately sized and properly installed. Failure to do so could damage the transformer and invalidate its warranty.

Protective equipment includes circuit breakers and fuses.

The selection and placement of protective equipment within the system is the responsibility of the end user.

Circuit Breakers

When any component of a circuit fails, there is nothing to limit current flow except the resistance of the circuit conductors and the resistance of the fault itself. The currents in these situations can be extremely large and destructive, making it imperative to interrupt the circuit as quickly as possible.

Circuit breakers are designed to react to a fault by making a physical separation in the current carrying or conducting element by inserting an insulating medium. Breakers come in different types, depending on the insulating medium used. While the most common insulation is oil, air is used in some 600 Volt class circuits. For higher voltages and larger capacities, the insulating medium might be a vacuum or and inert gas such as sulphur hexafluoride.

Specifications for a circuit breaker will depend on the operating voltage of the circuit, the normal operating or maximum load current, and the maximum abnormal or fault current to be interrupted.

Circuit breakers are rated in kVA or mVA and express the ability of the breaker to withstand short circuit forces.

Circuit breakers must withstand large inrush currents that result when voltage is initially switched on. These currents can be 20 to 30 times the rated transformer current even with no-load. Therefore, breakers must have built-in time delay for the first 5 to 10 cycles to avoid tripping under “turn-on” currents.

Fuses

The most common protective device in use, the fuse is basically a circuit breaker that works only once and then must be replaced. When current exceeds the predetermined current value, a fusible link melts, opening the circuit.

When voltage is initially switched on, a large inrush current results, being greatest in the first half-cycle of operation, or approximately .01 second. This current becomes less severe over the next few cycles, or approximately .1 second until the transformer is operating normally. Because of inrush current, fuses are often selected to withstand as much as 25 times primary rated current for .01 second, and 12 times primary rated current for .1 second.

Storage should be avoided, but if this is not possible, the transformer must be protected against moisture and contaminants.

Condensation and moisture can be reduced with heaters. If the transformer has been subjected to moisture, it should be baked out before energizing. This is especially important in transformers of 5 kV or higher.

Fuse Selection

The tables provide guidance for selecting fuses when the maximum voltage in the circuit is 600 Volts or less. These tables are included in Article 450-3 of the National Electrical Code covering over-current protection of transformers.

If primary protection only is required, use Table 1. If both primary and secondary protection are required, refer to Table 2.

IMPORTANT: *These tables are to be used as a guide only. The final determination of application is the responsibility of the end user.*

Table 1—Primary Fuse Only

Transformer Primary Amperes	Maximum Primary Fuse % Rating
9 or more	125*
2 or 9	167
Less than 2	300

If 125% does not correspond to a standard ampere rating, the next higher standard rating described in NEC Article 240-6 shall be permitted.

Table 2—Primary and Secondary Fuses

Transformer Secondary Amperes	Maximum % Rating	
	Primary Fuse	Secondary Fuse
9 or more	250	125*
Less than 9	250	167

Primary Fuse Selection

Primary fuse selection is made according to rated primary current (Ipri). To determine Ipri, the transformer rating (VA or kVA) and primary voltage (Vpri) must be known as well as whether the transformer is single- or three-phase. With this information, use the appropriate formula to determine Ipri.

Once Ipri is known, select fuses according to or 2 above.

Secondary Fuse Selection

Secondary fuse selection is made according to rated secondary current (Isec). To determine Isec, the transformer rating (VA or kVA) and secondary voltage (Vsec) must be known as well as whether the transformer is single- or three-phase. With this information, use the appropriate formula to determine Isec.

Once Isec is known, select fuses according to Table 2 above.

Primary Fuse Formulas

Single-Phase Transformers

$$I_{pri} = \frac{\text{Transformer VA}}{V_{pri}}$$

OR

$$I_{pri} = \frac{\text{Transformer VA}}{V_{pri}} \times 1000$$

Three-Phase Transformers

$$I_{pri} = \frac{\text{Transformer VA}}{1.73 \times V_{pri}} \times 1000$$

Secondary Fuse Formulas

Single-Phase Transformers

$$I_{sec} = \frac{\text{Transformer VA}}{V_{sec}}$$

OR

$$I_{sec} = \frac{\text{Transformer VA}}{V_{sec}} \times 1000$$

Three-Phase Transformers

$$I_{sec} = \frac{\text{Transformer VA}}{1.73 \times V_{sec}} \times 1000$$

Temperature Considerations

Insulation and Temperature

All transformers are designed and manufactured with the best quality insulation available. There are classes of insulation systems for different temperatures as defined by NEMA and ANSI. Insulation classes are rated in °C rise above a specific ambient of 40°C maximum. A transformer having a specific class of insulation, for example Class 220, can have an average winding temperature rise of 150°C with a maximum hot spot temperature rise of 180°C. If the room ambient temperature is 40°C, then the total temperature of the hottest spot would be 220°C.

Our transformers are designed to operate at rated load and voltage in maximum room ambient temperatures of 40°C, average room ambient temperature not to exceed 30°C, and at altitudes not to exceed 3300 feet in accordance with NEMA standards.

Insulating Classifications

The designations for insulation systems are numerical classifications based on temperature ratings. Transformer ratings are based on temperature rise. The accompanying table shows the designations.

Transformer and Insulation System Ratings

Insulation Class	Temperature Rise	Ambient Temperature	Hot Spot Allowance
Ventilated			
105	55°C	40°C	10°C
150	80°C	40°C	30°C
180	110°C	40°C	30°C
220	150°C	40°C	30°C
Encapsulated			
105	70°C	25°C	10°C
130	95°C	25°C	10°C
180	135°C	25°C	20°C
Control Transformers			
105	55°C	40°C	10°C
130	80°C	40°C	10°C
135	100°C	40°C	15°C
180	120°C	40°C	20°C

Overloads

Overloads exceeding the maximum allowable insulation temperature can be tolerated, provided the overload is of short duration and is preceded and followed by a period of operation at less than rated kVA (refer to ANSI C57.96-1989, Tables 5,6,7). Overloading should be avoided unless approval is obtained from the Jefferson Electric engineering department.

High Ambient Temperatures

Ambient temperatures above 30°C average over a 24-hour period and 40°C maximum require either a larger kVA rating or a special low temperature rise transformer. A 150°C rise air cooled transformer can also be derated using the formula of .4% kVA reduction for each degree centigrade above 30°C ambient temperature.

Altitude Correction

For transformers above 3300 feet, reduce the kVA rating .3% for each 330 feet above 3300 feet.

Taps

If the transformer comes supplied with taps, they will generally have a full capacity rating. A common tap arrangement is two 2.5% taps above FCAN and four 2.5% taps below FCBN nominal voltage. Transformers are shipped with the taps connected for nominal voltage, that is, 480 volts for a 480 volt transformer. The installing electrician must change the taps if the supply voltage differs from the nominal voltage rating.

Safety and Installation

Transformers are provided with access covers to facilitate installation and service. They must be kept securely in place at all times when the transformer is operating.

CAUTION: *Normal operating voltages can be extremely hazardous. Only qualified personnel should install, inspect or service transformers. Disconnect the power before opening the cover or touching any internal parts.*

Connections and Circuits

The transformer should be connected only as described on the nameplate or the wiring diagram inside the wiring compartment cover, or as otherwise specifically authorized.

Transformers without terminal boards, usually the smaller size transformers, provide leads for connections.

IMPORTANT: *Any unused taps or leads must be insulated from each other and taped*

Encapsulated transformers, 2 kVA and smaller, have their turns ratio compensated for losses so that their open circuit voltage is somewhat higher than the load voltage. Machine tool transformers are compensated up to 5 kVA. Using transformers in the reverse direction from which it is designed would result in lower than expected output voltage.

Mounting and Spacing

Dry-type transformers depend on air for cooling, and must be placed so that room air can circulate freely around them. Cabinet style transformers must be mounted so that air can pass freely through the ventilation openings. The transformer space should be kept clear.

Transformers should be spaced at least six inches apart. Transformers rated 30 kVA and larger should be kept at least six inches from walls and ceilings.

Transformers should never be mounted near heat-generating equipment or near heat-sensitive equipment. Transformers should never be placed in a room with hazardous processes, or where flammable gasses or combustible materials are present. Particular care must be taken when mounting in unventilated plenums or in closets with no ventilation. In areas without free moving air, ambient temperatures can rise above acceptable limits, causing the transformer to overheat.

Storage

Transformers should be stored in a warm, dry location of uniform temperature and in their original packing. If the transformer has been unpacked, all ventilating openings should be covered to keep out dust. Outdoor storage should be avoided, but if this is not possible, the transformer must be protected against moisture and contaminants.

Condensation and moisture can be reduced with heaters. If the transformer has been subjected to moisture, it should be baked out before energizing. This is especially important in transformers of 5 kV or higher.

Care and Maintenance

Periodic inspection of the transformer should be made, depending on conditions. In most clean, dry installations, once a year is usually sufficient.

After disconnecting the transformer from the power, the cover should be removed and any dirt cleaned out. Screens covering the ventilating openings should be cleaned.

Inspect for loose connections, terminal and splice conditions and for signs of overheating, rust or deteriorating paint.

Troubleshooting Guide

Condition	Possible Cause	Suggested Remedy
Hot Transformer	High ambient temperature	Improve ventilation or relocate unit to cooler location.
	Overload	Reduce load; reduce amperes by improving power factor with capacitors; check for circulating currents for paralleled transformers (different ratios or impedances); check for open phase in delta bank.
	High voltage	Change circuit voltage, taps.
	Insufficient cooling	If other than naturally cooled, check fans, pumps, valves and other units in cooling systems.
	Winding failure – incipient fault	See “No voltage - unsteady voltage” below.
	Short-circuited core	Test for exciting current and no-load loss; if high, inspect core, remove and repair; check core bolt, clamps and tighten; check insulation between laminations; if welded together, return to factory for repair or replacement.
	High harmonic loads	Measure neutral current - replace with K-rated transformer.
Noisy transformer	Overload	See “Hot transformer” above.
	Metal part ungrounded, loose connection	Determine part and reason; check clamps, cores and parts normally grounded for loose or broken connections, missing bolts or nuts, etc.; tighten loose clamps, bolts, nuts; replace missing ones.
	External parts and accessories in resonant vibration	Tighten items as above; in some cases, loosen to relieve pressure causing resonance and install shims.
	Incipient fault – core or winding	See above under “Hot transformer.”
No voltage – unsteady voltage	Winding failure - lightning; overload; short-circuit from foreign object or low strength dielectric	Check winding; remove foreign object or damaged material; repair or replace parts of insulation materials.
Rust and paint deterioration	Weather, pollution, corrosive or salt atmosphere; overloads	Remove rust and deteriorated paint; clean surfaces; repaint with proper paints and sufficient coatings.
	Excessive heating discoloration	If excessive heating discoloration occurs, check sizing, input voltage, or loading amps.
Hot neutral line	Overload	Too small neutral conductor: replace. Severe unbalance between phase: rebalance and equalize loads.
	One leg of wye bank open	Check associated fuse. If blown, remove cause and replace. Check for open circuit in winding of transformer in bank. Measure odd harmonic amps with RMS meter.
Voltage unbalanced	Open neutral unbalanced loads	Check neutral connections. See “Hot neutral line” above.
Voltages high and unbalanced	Open neutral on wye bank ground in winding of one transformer in wye	Check neutral connections and load balance. Check values of voltages between phases and phase-to-ground voltages. Vector should indicate source of trouble.

Condition	Possible Cause	Suggested Remedy
Hot neutral line	Overload	Too small neutral conductor: replace. Severe unbalance between phase: rebalance and equalize loads.
	One leg of wye bank open	Check associated fuse. If blown, remove cause and replace. Check for open circuit in winding of transformer in bank. Measure odd harmonic amps with RMS meter.
Voltages unbalanced	Open neutral unbalanced loads	Check neutral connections. See “Hot neutral line” above.
No voltage – one phase of delta connected bank	Grounds on two legs of delta (delta collapse - loads “single phasing”)	Remove grounds from at least one leg of delta source.
Overloads on two delta bank	Open in third transformer of bank; operating in open delta	Check fuses on supply to their bank; check winding of transformers in third transformer for continuity.
Low voltage on two phases of delta	Open in one phase of delta supply; two transformers now connected across one same phase	Check fuse on supply; check supply circuit back to source for open circuit.

Certifications

Underwriters Laboratories Listing Mark
Samples of the product have met UL's safety requirements primarily based on UL's own published Standards of Safety.

UL Recognized Component Mark
This mark means that the component alone meets the requirements for a limited, specified use.

C-UL Listing Mark
Products with this type of mark have been evaluated to Canadian safety requirements by UL, which may be somewhat different than U.S. safety requirements.

CSA International Mark (formerly Canadian Standards Association)
This mark may appear alone, or with other qualifiers. If it appears alone, it means that the product is certified for the Canadian market, to the applicable Canadian standards.

Conformité Européenne
To market electrical products within the European Union (EU), product conformity and the proper use of the CE mark on machines and control equipment is critical. As a major supplier to global companies serving customers in the EU, Jefferson Electric pays special attention to meeting the EU specification and certification requirements. These global companies need the guarantee of free trade of goods, elimination of trade restrictions and harmonization of technical regulations to sell their products to EU member countries. All Jefferson Electric products that meet or exceed the requirements of these directives are designated by the CE mark.

To request CE certified equivalents for products not already certified, please contact our Technical Support department at 800-892-3755.

ETL Intertek Verified
United States and Canada require general purpose transformers to meet specific energy efficiency standards. Jefferson Electric has contracted with Intertek ETL SEMKO an independent organization to test and certify our products. The ETL logo on our products indicates that the transformer meets the energy efficiency standards as defined by the NEMA TP-3R standard.

Seismic
In order to meet seismic qualifications, products must go through rigorous testing to meet the International Building Code and the California Building Code requirements. Each test must also be met in accordance with ICC-ES AC156 seismic qualifications.

ABS Qualified
ABS (American Bureau of Shipping) approved for use on marine vessels including off-shore oil rigs.

Glossary

A

AA An ANSI (American National Standard Institute) cooling class designation indicating open, natural draft ventilated transformer construction, usually for dry-type transformers.

Air-Cooled A transformer cooled by the natural circulation of air over and/or through the core and coils.

Alternating Current (or voltage) Current that alternates regularly in direction, is periodic and has an average value (over a period of time) of zero.

Ambient Noise Level The existing or inherent sound level of the area surrounding a transformer installation. Measured in decibels.

Ambient Temperature The temperature of the surrounding atmosphere into which the heat of the transformer is dissipated.

Ampacity The current-carrying capacity of an electrical conductor or device.

Ampere The practical unit of electric current.

ANSI American National Standards Institute. An organization that provides written standards on transformers [6OOv and below (ANSI C89.1), 601~ and above (ANSI C57.12)].

Attenuation Decrease in signal voltage or power.

Autotransformer A transformer in which part of the winding is common to both the primary and the secondary circuits.

B

BIL Basic Insulation Level. The crest (peak) value that the insulation is required to withstand without failure. For example, a 600 volt class transformer has a 10 kV BIL rating.

Banked Two or more single-phase transformers connected together, or banked, to supply power. Three single-phase transformers banked together will produce a kVA capacity of three times the nameplate rating of the individual single-phase transformers. For example, three 5 kVA single-phase transformers connected together for a three-phase load will have a 15 kVA capacity.

Bushing An electrical insulator (porcelain, epoxy, etc.) that is used to control the high voltage stresses that occur when an energized cable must pass through a grounded barrier.

Buck transformer Step down the Voltage from Primary Winding to Secondary Winding i.e. 460V to 230V.

Boost transformer Step up the Voltage from Primary Winding to Secondary Winding i.e. 230V to 460V.

C

Cast-coil Transformer A transformer with high-voltage coils cast in an epoxy resin. *Usually used with 5 to 15 kV transformers.*

CE Mark to indicate third party approved or self-certification to European Community requirements.

CSA Canadian Standards Association. The Canadian equivalent of Underwriter's Laboratories (UL).

CUL Mark to indicate UL certification to CSA standards.

Celsius Same as Centigrade. To convert Centigrade to Fahrenheit, use the following formula: °F = 1.8 x °C + 32.

Coil A number of turns of conductor wound as a coil.

Compensated Transformer A transformer with a turns ratio which provides a higher rated voltage at no-load and rated voltage at rated load. Normally used on units rated 2 kVA or smaller.

Continuous Duty The service requirement that demands operation at a constant load for an indefinite period of time.

Continuous Rating Gains the constant load that a transformer can carry at rated primary voltage and frequency without exceeding the specified temperature rise.

Control Transformer Usually referred to as an Industrial Control Transformer. Designed for good voltage regulation characteristics when low power factor and/or large inrush currents are drawn (5 to 15 times normal).

Conductor Losses Losses in the transformer winding that are incidental to the carrying of the load. These losses include those due to resistance as well as to stray and eddy currents.

Copper Losses See Load Losses.

Core The steel that carries the magnetic flux in a transformer.

Core-Form Construction A type of core construction where the winding materials completely enclose the core.

Core Loss Losses caused by a magnetization of the core and its resistance to magnetic flux.

Current Transformer A transformer generally used in instrumentation circuits that measure or control current.

Cycle One complete sequence of values of an alternating quantity, including a rise to maximum in one direction, a return to zero, a rise to a maximum in the opposite direction, and a return to zero.

D

Decibel (db) A unit used to express the magnitude of a change in signal or sound level, either an increase or a decrease.

Delta A standard three-phase connection with the ends of each phase winding connected in series to form a closed loop with each phase 120 degrees from the other. Sometimes referred to as 3-wire.

Delta Wye The method of connection for both primary and secondary windings of a three-phase transformer bank.

Dielectric Tests A series of tests conducted at a much higher than rated nameplate voltage to assure the integrity of insulating materials and electrical clearances.

Distribution Transformer Those rated 5 to 120 kV on the high-voltage side and normally used in secondary distribution systems. An applicable standard is ANSI C-57.12.

Double Wound Transformer See “Isolating Transformer”

Dripproof Constructed or protected so that successful operation is not interfered with by falling moisture or dirt. A transformer in which the transformer core and coils are not immersed in liquid.

Drive Isolation Transformer A transformer designed to withstand the additional heat and mechanical stress caused by DC drives.

Dry Type Transformer A transformer cooled by a medium other than a liquid, usually through the circulation of air.

Dual Winding A winding that consists of two separate windings which can be connected in series to handle a specific voltage and kVA or in parallel to handle the same kVA at one-half the series connected voltage.

E

Eddy Currents Additional currents caused by a time varying magnetic field.

Effective Voltage or Current 0.707 times the peak value of AC voltage or current. Effective value is also designated RMS value (Root Mean Square). When AC voltage is referred to, the effective value is understood unless otherwise noted. Symbols “E” and “I” without subscripts indicate effective values.

Efficiency The efficiency of a transformer is the ratio of its power output to its total power input.

Electrostatic Shield A grounded conductor placed between the primary and secondary winding to greatly reduce or eliminate line-to-line or line-to-ground noise. Often referred to as a “Faraday shield.”

Excitation Current (No-load Current) Current that flows in any winding used to excite the transformer when all other windings are open-circuited. It is usually expressed in percent of the rated current of a winding in which it is measured.

Excitation Wattage The no-load loss of a transformer.

F

FA An ANSI cooling class designation indicating a forced air ventilated transformer, usually for dry type transformers and typically to increase the transformer’s KVA rating above the natural ventilation or AA rating.

Fan Cooled Cooled mechanically to stay within rated temperature rise by addition of fans internally and/or externally. *Normally used on large transformers only.*

FCAN and FCBN Taps Full Capacity Above Nominal and Full Capacity Below Nominal. The FCAN designation is used to indicate that a transformer will deliver rated

kVA when connected to a voltage source which is higher than rated voltage. The FCBN designation indicates that a transformer will deliver rated kVA when connected to a voltage source which is lower than rated voltage.

FOA An ANSI cooling class designation indicating forced oil cooling using pumps to circulate the oil for increased cooling capacity.

FL Full-load

FOW An ANSI cooling class designation indicating forced oil water cooling using a separate water loop in the oil to take the heat to a remote heat exchanger. Typically used where air cooling is difficult such as underground.

Frequency On AC circuits, designate number of times that polarity alternates from positive to negative and back again, *such as 60 hertz* (cycles per second).

Fuse An overcurrent protective device with a circuit-opening fusible member which is directly heated and severed by the passage of overcurrent through it, or by a fault.

G

Grounds or Grounding Connecting one side of a circuit to the earth through low-resistance or low-impedance paths. This helps prevent transmitting electrical shock to personnel. Also aids in the dissipation or mitigation of Noise (High frequency or other).

Grounded Connected to the earth or some other conductor.

Ground Strap A Flat Strap of varying density, width and length to aid in the dissipation of High frequency noise, commonly generated by Switching Power Supplies, Lighting Ballasts, Inverters or Variable Frequency Drives.

H

HP Horsepower. Energy required to raise 33,000 pounds one foot in one minute. Equals 746 watts, or .746 KW.

Harmonic A sinusoidal waveform with a frequency that is an integral multiple of the fundamental 60 Hz frequency.

HZ	Harmonic
60	Fundamental
120	2nd Harmonic
180	3rd Harmonic
240	4th Harmonic

etc...

Current waveforms from non-linear loads appear distorted because the non-linear waveform is the result of adding harmonic components to the fundamental current.

High-voltage and Low-voltage Windings Terms used to distinguish the wind that has the greater voltage rating from that having the lesser in two-winding transformers. The terminations on the high-voltage windings are identified by H1, H2, etc., and on the low-voltage by X1, X2, etc.

I

Impedance Retarding forces of current flow in AC circuits.

Indoor transformer A transformer that, because of its construction, is not suitable for outdoor service.

Insulating Materials Those materials used to electrically insulate the transformer windings from each other and to ground. Usually classified by degree of strength or voltage rating (0, A, B, C, and H).

Inductance That property of a circuit or circuit element opposing a change in current flow (symbol L). Measured in Henrys.

Input The power or signal fed into an electrical device, or to the terminals involved.

Inrush Current The initial high peak of current during the first few cycles of energization which can be 30 to 40 times the rated current.

Isolation transformer For the purpose of isolating the Source Supply from the consumer(s), aids in prevention of noise transmission, adds impedance and can also provide an isolated Ground on the secondary.

Insulation Material with high electrical resistance.

Insulating Materials Those materials used to electrically insulate the transformer windings from each other and to ground. Usually classified by degree of strength or voltage rating (0, A, B, C, and H).

Insulator Device used for supporting or separating conductors of electricity.

Insulating Transformer Another term for isolation transformer.

K

K-Factor A numerical value taking into account both the magnitude and frequency of the component of a current waveform. Used to indicate a full-rated transformer specifically designed to handle non-linear loads.

Kilowatt (KW) 1,000 Watts.

KWH Kilowatt hour, one kilowatt for one hour.

kVA or Volt-ampere Output Rating The kVA or volt-ampere output rating designates the output that a transformer can deliver for a specified time at rated secondary voltage and rated frequency without exceeding the specified temperature rise *(1 kVA = 1000 VA)*.

L

Linear Loads Loads where the current waveform conforms to that of the applied voltage, or loads where a change in current is directly proportional to a change in applied voltage. For example: resistance heating, incandescent lighting, water heater.

Lamination Thin sheets of steel making up the core of the transformer.

Line Voltage The voltage of the power line.

Liquid-immersed Transformer A transformer with the core and coils immersed in liquid (as opposed to a dry-type transformer).

Load The amount of electricity, in kVA or volt-amperes, supplied by the transformer. Loads are expressed as a function of the current flowing in the transformer, and not according to the watts consumed by the equipment the transformer feeds.

Load Losses Those losses in a transformer that are incident to load carrying. Load losses include the I2R loss in the winding, core clamps, etc., and the circulating currents (if any) in parallel windings.

M

Mid-tap A reduced-capacity tap midway in a winding – usually the secondary.

Moisture-resistant Constructed or treated so as to reduce harm by exposure to a moist atmosphere.

N

Natural-draft or Natural-draft Ventilated An open transformer cooled by the draft created by the chimney effect of the heated air in its enclosure.

No-load Losses (Excitation Losses) Loss in a transformer that Is excited at its rated voltage and frequency, but which is not supplying load. No-load losses include core loss, dielectric loss, and copper loss in the winding due to exciting current.

Non-Linear Loads Loads where the current waveform does not conform to that of the applied voltage, or where a change in current is not proportional to change in applied voltage. For example: computer power supplies, motor drives, fluorescent lighting.

Non-Ventilated Construction The core and coil assembly is mounted inside an enclosure which has no ventilation openings.

O

OA An ANSI cooling class designation indicating an *oil filled transformer*.

P

Parallel Operation Single and three-phase transformers having appropriate terminals may be operated in parallel by connecting similarly-marked terminals, provided their ratios, voltages, resistances, reactances, and ground connections are designed to permit paralleled operation and provided their angular displacements are the same in the case of three-phase transformers.

Polarity Test A standard test performed on transformers to determine instantaneous direction of the voltages in the primary compared to the secondary (see Transformer Tests).

Poly-phase More than one phase.

Potential (Voltage) Transformer A transformer used in instrumentation circuits that measure or control voltage.

Potted The core and coil assembly is completely encapsulated (contained within protecting material) with a resin-sand compound and contained in a metal enclosure.

Power Factor (PF) The ratio of watts to volt-amps in a circuit.

Peak Voltage The voltage or current of an AC sinusoidal wave when it reaches its peak or maximum level. This occurs twice and lasts for only a fraction of the cycle. Direct current voltage is peak voltage at all times.

Primary Taps Taps added in the primary winding (see Tap).

Primary Voltage Rating Designates the input circuit voltage for which the primary tiding is designed.

Primary Winding The primary winding on the energy input (supply) side.

R

Rating The output or input and any other characteristic, such as primary and secondary voltage, current, frequency, power factor and temperature rise assigned to the transformer by the manufacturer.

Ratio Test A standard test of transformers used to determine the ratio of the primary to the secondary voltage.

Reactance The effect of inductive and capacitive components of the circuit producing other than unity power factor.

Reactor A device for introducing *inductive reactance* into a circuit for: *motor starting, operating transformers in parallel,* and *controlling current*.

S

Scott Connection Connection for polyphase transformers. Usually used to change from two-phase to three-phase to three-phase to two-phase.

Sealed Transformer A transformer completely sealed from outside atmosphere and usually contains an inert gas that is slightly pressurized.

Secondary Taps Taps located in the secondary winding (*see Taps*).

Secondary Voltage Rating Designates the load-circuit voltage for which the secondary winding (winding on the output side) is designed.

Series/Multiple A winding of two similar coils that can be connected for series operation or multiple (parallel) operation.

Shell-type Construction A type of transformer construction where the core completely surrounds the coil.

Short Circuit A low resistance connection, usually accidental, across part of a circuit, resulting in excessive current flow.

Sinusoidal Having the form of a sine (or cosine) wave.

Star Connection Same as wye connections.

Step-down Transformer A transformer in which the energy transfer is from the high-voltage winding to the low-voltage winding or windings.

Step-up transformer A transformer in which the energy transfer is from the low-voltage winding to a high-voltage winding or windings.

T

T-Connection Use of Scott Connection for three-phase operation. A connection brought out of a winding at some point between its extremities, usually to permit changing the voltage or current ratio.

Taps Incoming plant voltage varies according to the distance from the substation and other factors. Taps allow a distribution transformer to provide secondary voltage as close as possible to the desired operating voltage. Taps are usually supplied on the primary winding to allow matching of the supply voltage to the voltage rating of the transformer connection. A tap position above the nominal connection will lower the secondary output and vice-versa.

Temperature Rise The increase over ambient temperature of the winding due to energizing and loading the transformer.

Total Losses The losses represented by the sum of the no-load and the load losses.

Transformer An electrical device, without continuously moving parts, which, by electro-magnetic induction, transforms energy from one or more circuits to other circuits at the same frequency, usually with changed values of voltage and current.

Transformer Regulation The percentage difference between voltage at the secondary terminals under no-load condition versus voltage under full-load. This value depends on the load power factor and is usually reported at 1.0 PF and 0.8 PF.

Turns Ratio (of a transformer) The ratio of turns in the primary winding to the number of turns in the secondary winding.

U

UL Underwriter's Laboratories. A non-profit safety testing organization.

V

Ventilated Providing circulation of external air.

Ventilated Enclosure Enclosure with openings which allow air to flow directly over the core and coil assembly for cooling.

Volt-amperes Circuit volts multiplied by circuit amperes.

Voltage Ratio (of a transformer) The ratio of the RMS primary terminal voltage to the RMS secondary terminal voltage under specified conditions of load.

Voltage Regulation (of a transformer) The change in secondary voltage that occurs when the load is reduced from rated value to zero, with the values of all other quantities remaining unchanged. The regulation may be expressed in percent (or per unit) on the basis of the rated secondary voltage at full load.

W

Watt Unit of electrical power when the current in the circuit is one ampere and the voltage is one volt.

Weathershields When added to ventilated enclosures, allow indoor-rated units to be situated outdoors, changing the enclosure rating to NEMA 3R.

Winding Losses See Load Losses.

Winding Voltage Rating Designates the voltage for which the winding is designed

Wye Connection (Y) A standard three-phase connection with similar ends of the single-phase coils connected to a common point. This common point forms the electrical neutral point and may be grounded.

Reference: Power transformer maintenance and accepting testing – Department of the Army™ 5686

Limited Warranty

Jefferson Electric, Inc. (Jefferson) warrants to original Purchaser that any products provided by Jefferson hereunder shall be free from defects in material and/or workmanship under normal use and operation; matches functional specifications; and the final product meets industry standards during the warranty period, provided conditions of operation have been normal at all times, and that the product has not been subjected to abnormal stresses, including, but not limited to, such causes as incorrect primary voltage or frequency or improper ventilation. The warranty will not be extended to any product which has been subject to misuse, negligence, accident, improper installation or operation, nor does it extend to any product which has been repaired or altered by any party other than Jefferson.

The warranty provided herein is non-transferable. It is available only for the Purchaser.

Jefferson's liability and the Purchaser's exclusive remedy for claims for defective products, if promptly made in writing to Jefferson within the warranty period, provided such products are returned to the factory, and such claims which are found, after verification by an authorized Jefferson employee, in his or her reasonable judgment, to be defective, shall be limited to repair, replacement or refund of original purchase price, at Jefferson sole and absolute discretion. No products shall be returned to Jefferson without prior written consent. Please contact Jefferson for details of the Return Goods Authorization procedure.

The foregoing is the sole and exclusive warranty of Jefferson. All other warranties written or oral, statutory, expressed or implied, including, without limitation, any implied warranty of merchantability or fitness for any particular purpose, are hereby disclaimed by Jefferson and excluded from the terms of sale.

This Warranty excludes all costs related to removal, installation and proper selection of products. In no event shall Jefferson or its suppliers be liable for any special, indirect, incidental or consequential damages including, but not limited to loss of profit or revenues, loss of use of the products provided or any associated products or equipment, damages to associated products or equipment, cost of capital, cost of substitute products or equipment, facilities downtime costs, labor or associated expenses, or claims of Customers, end users or contractors for such costs.

Warranty Period	
Standard catalog transformers:	Ten Years – limited from date of manufacture
Custom quoted products:	One year from date of manufacture
Products manufactured by third party, including specialty transformers, and accessories	See original manufacturers warranty

Jefferson Electric History

1915 – 1920

- Toy and bell ringing transformers
- Sign transformers
- Automotive transformers, regulators, battery switches, ignition coils
- Vibrating coils
- Spark plug and auto lamp testers

1921 – 1930

- Magneto lamp regulators
- Radio transformers
- Oil burner ignition transformers
- Neon sign transformers
- Industrial, commercial, residential and auto fuses; switch and outlet boxes; powerlets

1931 – 1940

- Power circuit transformers
- Airport lighting transformers
- Fluorescent ballasts
- Mercury street lighting transformers (HID)

1941 – 1950

- Radar and gunfire transformers
- Capacitors
- Saf-T Lag fuses
- Golden Hour clocks

1951 – 1960

- Pulse transformers
- Washing machine solenoids
- Machine tool transformers; magnetic amplifiers; saturable reactors
- Three-phase transformers; weather-proof fluorescent ballasts; high ambient mercury ballasts
- Neon window transformers with built-in flasher

1961 – 1970

- crop drier transformer
- 500 kVA transformer; solid state controls for theatre dimmers
- UL approved Class F & Class H high temperature insulation systems

1971 – 1980

- Low voltage lighting transformers
- Buck-Boost transformers
- Medium voltage transformers

1981 – 1990

- Drive isolation transformers
- Non-linear transformers

1991 – 2000

- Harmonic filters
- AC line/load reactors
- Three-phase lighting transformers
- Stackable filters/transformers

- Universal mounting industrial control transformer

2001 – 2010

- Tanning bed transformers
- TP1 efficiency transformers
- Canadian High efficiency certification received
- Encapsulated line expanded to 75kVA
- Ventilated line expanded to 1000kVA
- Seismic approval of transformers
- Totally enclosed non-ventilated units added
- Merger with Pioneer Power Systems

2011 – present

- Class I Division 2 transformers added
- ABS certification obtained
- Medium voltage product line added through 10,000 kVA
- 18 pulse transformers line developed

- DOE-2016 efficiency transition
- Development of harmonic mitigating transformers and patented Harmonic Suppression Systems
- Low voltage vsentilated line expanded to 2500kVA

PIONEER
DRY-TYPE TRANSFORMERS

JEFFERSON
ELECTRIC

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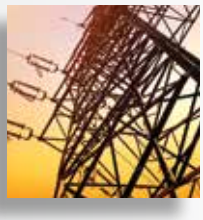
TRANSFORMER

The experience and capability to satisfy your unique magnetic needs





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