Technical Data **TD158040EN**

Effective October 2019
Supersedes January 2019

Power-Suppress 600

Contents

⚠ IMPORTANT

SAVE THESE INSTRUCTIONS. PLEASE READ THIS MANUAL BEFORE USING EQUIPMENT.

General description

Eaton's Power-Suppress 600 series are high efficiency, K-rated, power conditioning transformers specifically designed to provide a high degree of electrical noise attenuation and transient voltage suppression to sensitive electronic loads. In addition, the Power-Suppress 600 is offered with a K-factor rating of K13 for full compatibility with harmonic-rich, nonlinear loads.

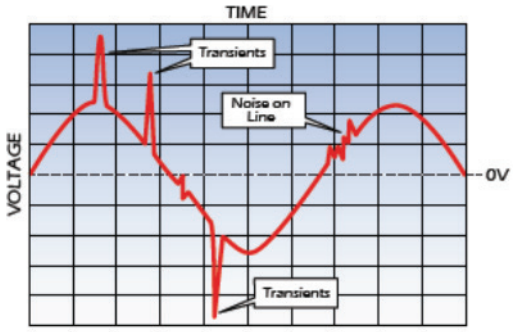
The Power-Suppress 600 series meets and exceeds the high efficiency levels defined by the U.S. Department of Energy (DOE) 2016 Standard, thus providing true energy savings under both linear and nonlinear loads.

Powering Business Worldwide

Electrical noise and voltage transients

Electrical noise is a high-frequency, low-energy signal that travels on the power and ground lines of an electrical distribution system. While conditions external to a facility can cause electrical noise and impulses, the majority of these disturbances are generated by electronic and electrical equipment within the facility. Examples of this equipment include photocopiers, lighting controls, variable speed drives, and motor loads.

The electrical noise produced by this equipment can harm digital circuitry, because the high frequencies can easily be coupled into the signal path and cause data corruption. This corruption often results in system upset, unexpected restarts, and nuisance equipment behavior. In addition to electrical noise and impulses, high-energy transients may also exist that lead to component failure within critical electronics and controls.



Electrical noise and voltage transients illustrated

Power-Suppress 600 benefits

Eaton's Power-Suppress 600 is designed with two full-length electrostatic shields that provide 126 dB common mode noise attenuation. An optional third shield is available that increases attenuation by 20 db for a total of 146 db. The Power-Suppress 600 not only attenuates noise from input to output, but also prohibits system back-feed from noise generating loads. In addition, an optional pre-wired, high-frequency filter and category C3 surge protection device (SPD) provide your critical loads with optimum protection from noise and impulses, as well as high-energy voltage transients.

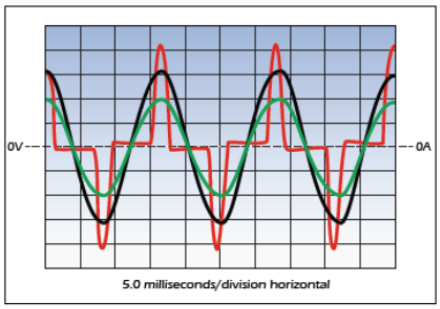
The Power-Suppress 600's noise attenuation is critical for any application in which digital circuitry is used to scan, measure or monitor critical data, control a critical process, or reproduce high-quality audio/video signals.

Isolation shield benefit levels

Harmonics and K-Factor ratings

Commercial and industrial facilities contain a myriad of electronic and electrical equipment that represent nonlinear loads. Examples include non-PFC power supplies found in computers and lighting, as well as high-powered electronic controls. Linear loads draw current throughout the entire 60 Hz waveform, tracking the applied voltage. Nonlinear loads draw current in short intervals with extraordinarily high magnitudes (see illustration below), generating harmonics (multiples of the fundamental 60 Hz). These harmonics create additional heat within the transformer windings, and may increase the output neutral current up to 200% on three-phase models with line-to-neutral loading.

To overcome this safety problem, a Power-Suppress 600 transformer is designed specifically to handle the harmonics, heating effects, and increased output neutral current created by nonlinear loads. Its K13 rating allows it to be properly applied for both linear and nonlinear loads.



Voltage and Current Waveforms:
Output Voltage
Linear Load Current
Non-linear Load Current

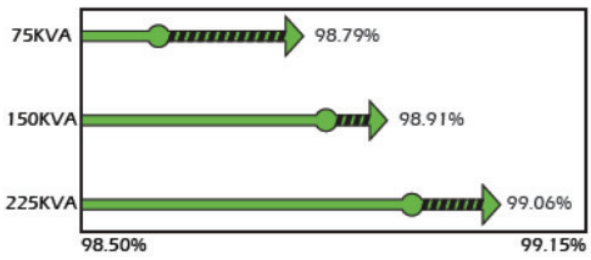
High efficiency advantage

The Power-Suppress 600 is uniquely designed to provide efficiencies that meet and exceed the DOE 2016 Standard.

Energy savings are easily seen when comparing the power losses of the Power-Suppress 600 to a transformer only meeting the DOE minimum efficiency. For example, Eaton's 150 kVA Power-Suppress 600 tested 99% efficient at 35% load; that's only 530 W of losses compared to the minimum required efficiency of 98.83%, which represents 621 W of losses. The Power-Suppress 600 power losses were 17% lower, which reflect a decrease in operating costs over the life of the transformer.

Efficiency for a given kVA size will vary from transformer to transformer, but the Power-Suppress 600's design allows its efficiency to still exceed the minimum DOE mandated level.

Power-Suppress 600 efficiency examples



Note: The chart above illustrates the efficiency measured on three sample transformers. The "green dots" are positioned to reflect the DOE minimum efficiencies in comparison to the Power-Suppress 600 efficiencies measured.

DOE 2016 minimum efficiency levels at 35% of nameplate-rated load with a transformer operating temperature of 75 °C: 45 kVA (98.40%); 75 kVA (98.60%); 150 kVA (98.83%).

Specifications

Table 1. Specifications

Description	Specification	
Three-phase power output		
kVA	15, 30, 45, 75, 112, 150, 225, 300, 500	
Operating frequency		
Frequency	60 Hz ±5% **Note:** 50 Hz models available; consult factory.	
Electrical input		
Three-phase 15–150 kV 225–500 kVA	 208, 240, 480, or 600 Vac (delta) 480, 600 Vac (delta)	
Voltage taps 15–300 kVA (exception) 112–150 kVA at 208 Vac or 240 Vac 500 kVA	 (2) taps 2.5% full capacity above nominal (4) taps 2.5% full capacity below nominal (1) tap 5% full capacity above nominal (2) taps 5% full capacity below nominal (1) tap 3.5% full capacity above nominal (2) taps 3.5% full capacity below nominal	
Note: Special voltages available.		
Electrical output		
Three-phase	208/120, 480/277, or 600/347 Vac (wye) **Note:** Special voltages available; consult factory.	
Output impedance	2% to 3.5% typical	
Output distortion	Less than 1.0% THD added under linear load	
Load regulation	2% typical, no load to full load	
Overload	Up to 500% for 10 seconds, 1000% for 1 cycle	
Isolated neutral	Establishes a new neutral to ground bond on the transformer's output	
Noise attenuation		
Common mode	126 dB—Standard double (2) shield 146 dB—Optional triple (3) shield	
Transverse mode	3 dB down at 10 kHz, decaying 20 dB per decade; decaying 40 dB with "SPD with high frequency" option	
Environmental conditions		
Operating ambient	–25 °C to +40 °C	
Temperature relative humidity	0 to 95% noncondensing	
Altitude	Up to 5000 feet above sea level without de-rating	
Audible noise	45 to 55 dBA at 1 meter, depending on kVA size	
Efficiency		
U.S.	Meets and exceeds U.S. Department of Energy (DOE) 2016 high efficiency standards identified under DOE 10 CFR Part 431	
Canada	Meets and exceeds CSA® Standard C802.2-12	
K-factor ratings		
Ratings	K13	
Neutral size	Twice the ampacity of the secondary phase conductor on three-phase models	
Harmonic handling capability		
Designed to handle the following percentages of fundamental and harmonic currents, without exceeding temperature rise limits.		
	K13	
Fundamental 60 Hz	100%	
Harmonics	3rd Harmonic: 40%	11th Harmonic: 10%
	5th Harmonic: 42%	13th Harmonic: 8%
	7th Harmonic: 25%	15th Harmonic: 3%
	9th Harmonic: 7%	17th Harmonic: 2%
Harmonic elimination		
Protects the loads from voltage and current distortions caused from triplen harmonics (3rd, 9th, 15th, 21st, etc.)		

Description	Specification
General	
Transformer construction	All copper winding and conductor construction, dry-type transformer with M3, grain-oriented silicon steel
Electrical connection	Copper bus provided for hardwired input and output. **Note:** Customer to provide lugs.
Basic impulse level	10 kV
Temperature rise	135 °C rise above ambient, under nonlinear loading per UL® 1561 standard
Cooling	Convection cooled
Enclosure	Standard, floor mounted: NEMA® 2 up to 225 kVA; NEMA 1 at 300 kVA and 500 kVA **Note:** Optional NEMA 3R outdoor enclosure available up to 225 kVA.
Certifications	
Safety	UL 1561 Listed, labeled for operation with or below a specific K-factor rating; cUL® listed to CSA Standard C22.2, No. 47-13
RoHS	Compliant
Quality	ISO 9001:2015

Table 2. Linear losses

	Load %	Eff	Core	Load	BTU/hr
15 kVA	25	97.91	57.97	23.95	279
	50	98.08	57.59	92.50	512
	75	97.70	57.17	213.89	924
	100	97.11	56.69	400.53	1559
30 kVA	25	98.30	91.31	39.85	447
	50	98.39	90.79	158.60	850
	75	98.02	90.21	369.51	1568
	100	97.48	89.54	695.40	2677
45 kVA	25	98.57	106.07	59.76	565
	50	98.50	105.46	242.49	1187
	75	98.06	104.76	571.78	2307
	100	97.45	103.93	1092.98	4081
75 kVA	25	98.78	163.40	73.01	806
	50	98.81	162.63	297.52	1569
	75	98.51	161.74	704.06	2952
	100	98.06	160.75	1352.52	5160
112.5 kVA	25	98.81	255.81	91.77	1185
	50	98.93	254.85	371.58	2136
	75	98.72	253.78	867.18	3822
	100	98.40	252.55	1630.04	6420
225 kVA	25	98.95	435.50	164.19	2045
	50	99.03	433.82	670.33	3765
	75	98.82	431.92	1576.93	6850
	100	98.50	429.84	2997.47	11687
300 kVA	25	99.00	563.00	175.00	2515
	50	99.20	561.00	709.00	4331
	75	99.00	560.00	1651.00	7537
	100	98.80	558.00	3089.00	12435

Isolated output neutral

The Power-Suppress 600 establishes a new neutral to ground bond on the transformer's output, meeting the definition of a separately derived power source as defined in NFPA 70, Article 250.20 (D). Its isolated wye secondary provides a new single point ground reference to which critical load neutral and ground conductors are wired, thus preventing potential N-G circulating currents.

Application note

The Power-Suppress 600 may be paired with a transformer-less uninterruptible power system (UPS). This is critical if the input neutral to the UPS is shared with other electrical noise-producing loads, creating noise voltage with respect to ground. The transformer provides an isolated, clean neutral bond for IT/data center equipment. Locating the transformer at the input or output of the UPS is dictated by the UPS configuration and grounding requirements. In either case, the Power-Suppress 600 ensures that the critical load is provided with the highest power quality, even when the UPS is in bypass mode.

Application support

If you are having trouble understanding a problem related to power quality, reliability, or energy management, call an application engineer at 1-800-809-2772 (option 4, sub-option 2).

Options

Output SPD with high-frequency filter

Surge protection device (SPD) network comprised of high-energy MOVs with <5 nanosecond response time and a maximum peak surge current capacity of 40 kA (8/20 µs) per mode. High-frequency filter increases transverse mode noise attenuation to 3 dB down at 10 kHz, decaying 40 dB per decade. A single status indicator light (pictured on NEMA 2 enclosure shown) is provided to show that the SPD and filter are fully operational and functioning properly.

Note: SPD with peak surge current capacity ratings up to 100 kA, UL 1449 Listed, Type 2. Includes EMI/RFI filtering, Form C relay contacts, and LED protection status indicators. Contact factory for specifications. Not available for 300 kVA and 500 kVA models.

High/overtemperature alarm contacts

Thermal warning alarm contacts for customer's hardwired connection. Thermal sensors at 180 °C and 200 °C.

Note: Not available for 300 kVA and 500 kVA models.

NEMA 3R enclosure

UL Listed NEMA 3R enclosure for outdoor installations. Enclosure is constructed using 14-gauge galvanized steel and provided with a durable powder coat paint finish.

Note: Not available for 300 kVA and 500 kVA models.

IR scanning window

Infrared, transparent polymer IR window(s) for safe routine thermal scanning of transformer connections under load, without exposing personnel to arc flash hazards. Durable IR windows are industrial-grade with a patented reinforced grill, fully impact-resistant, and UL and cUL Listed. This option adds 2 inches to the depth of the 112 kVA–225 kVA enclosure.

Note: Not available for 300 kVA and 500 kVA models.

Special designs

Special voltage configurations are available, including "high leg delta" designs.

Note: Not available for 300 kVA and 500 kVA models.

Warranty

Seller warrants the Power-Suppress 600 to be free from failure due to defects in workmanship and material for one (1) year from the date of installation of the product or eighteen (18) months from the date of shipment of the product, whichever occurs first.

These units are sold in accordance to Eaton Selling Policy 25-000.

Product selection

Table 3. Catalog numbering system

T 600 X X-XXX X X X

Nominal voltage

Delta input: L, L, L, G

- **B** = 208
- **C** = 240
- **H** = 400
- **D** = 480
- **E** = 600

Nominal output voltage

Wye output: L, L, L, N, G

- **L** = 120/208
- **M** = 230/400
- **N** = 277/480
- **P** = 347/600

kVA rating and dimensions

kVA	Weight (lb)	Cabinet size (W x D x H) Dimensions in inches (mm)
015	370	23 x 20 x 28 (584.2 x 508.0 x 711.2)
030	495	23 x 20 x 28 (584.2 x 508.0 x 711.2)
045	700	23 x 20 x 28 (584.2 x 508.0 x 711.2)
075	830	23 x 20 x 28 (584.2 x 508.0 x 711.2)
112	1210	38 x 32 x 57 (965.2 x 812.8 x 1447.8)
150	1470	38 x 32 x 57 (965.2 x 812.8 x 1447.8)
225	1880	38 x 32 x 57 (965.2 x 812.8 x 1447.8)
300	2656	56 x 41.5 x 48 (1422.4 x 1045.1 x 1219.2)
500	4820	45 x 48 x 62.5 (1143.0 x 1219.2 x 1593.8)

Frequency

- **5** = 50 Hz
- **6** = 60 Hz

Enclosure

- **N** = NEMA 2/1 ①
- **R** = NEMA 3R

Options

- **Blank** = No options
- **A** = Third shield
- **B** = Surge protector ②
- **C** = IR window ②
- **D** = Third shield, surge protector ②
- **E** = Third shield, IR window ②
- **F** = Surge protector, IR window ②
- **G** = Third shield, surge protector, IR window ②

① 225 kVA and below NEMA 2, 300 kVA and 500 kVA available in NEMA 1 only.

② Not available for 300 kVA or 500 kVA models.

Technical drawings

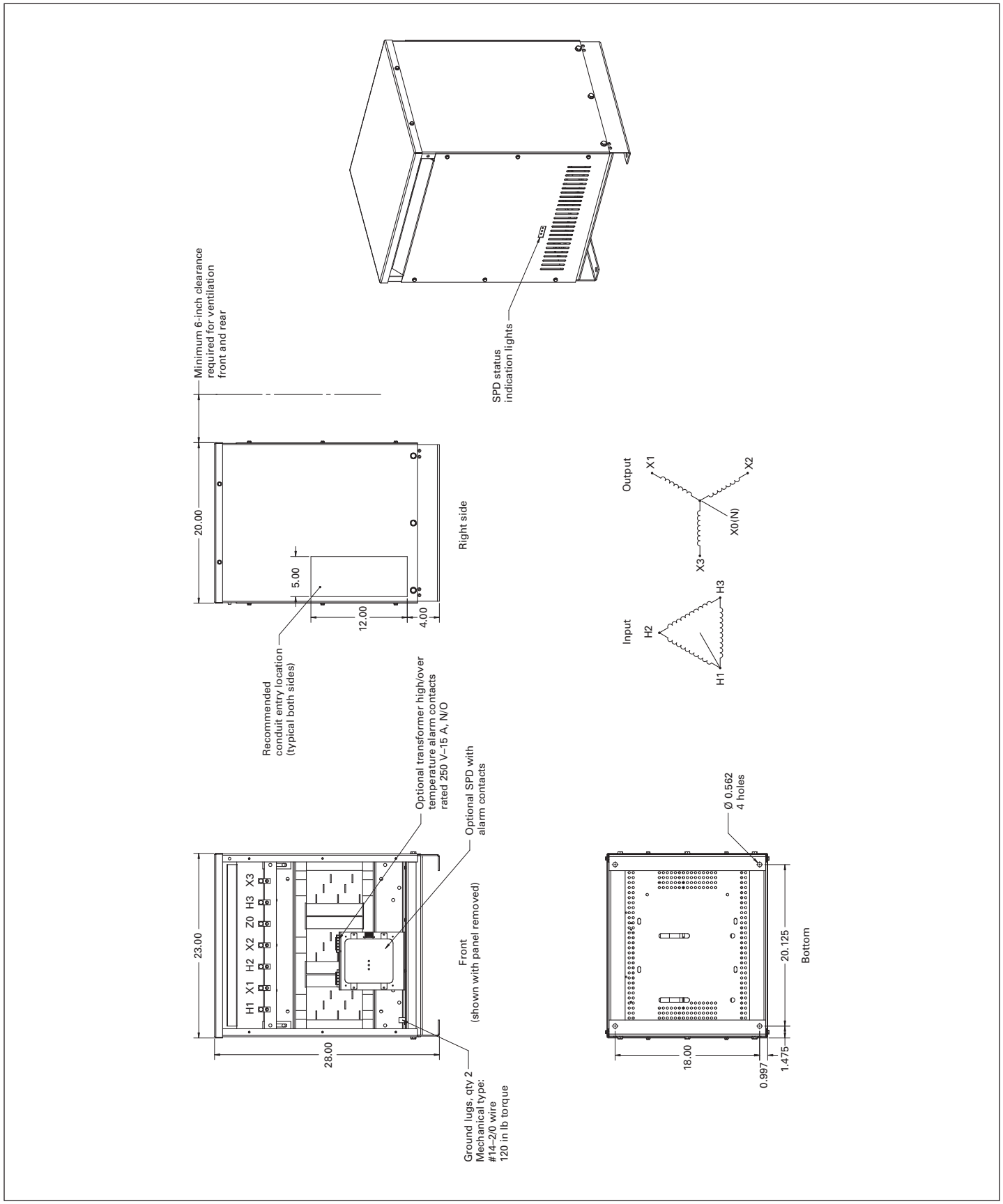


Figure 1. 15–30 kVA NEMA 2 SPD alarm contacts

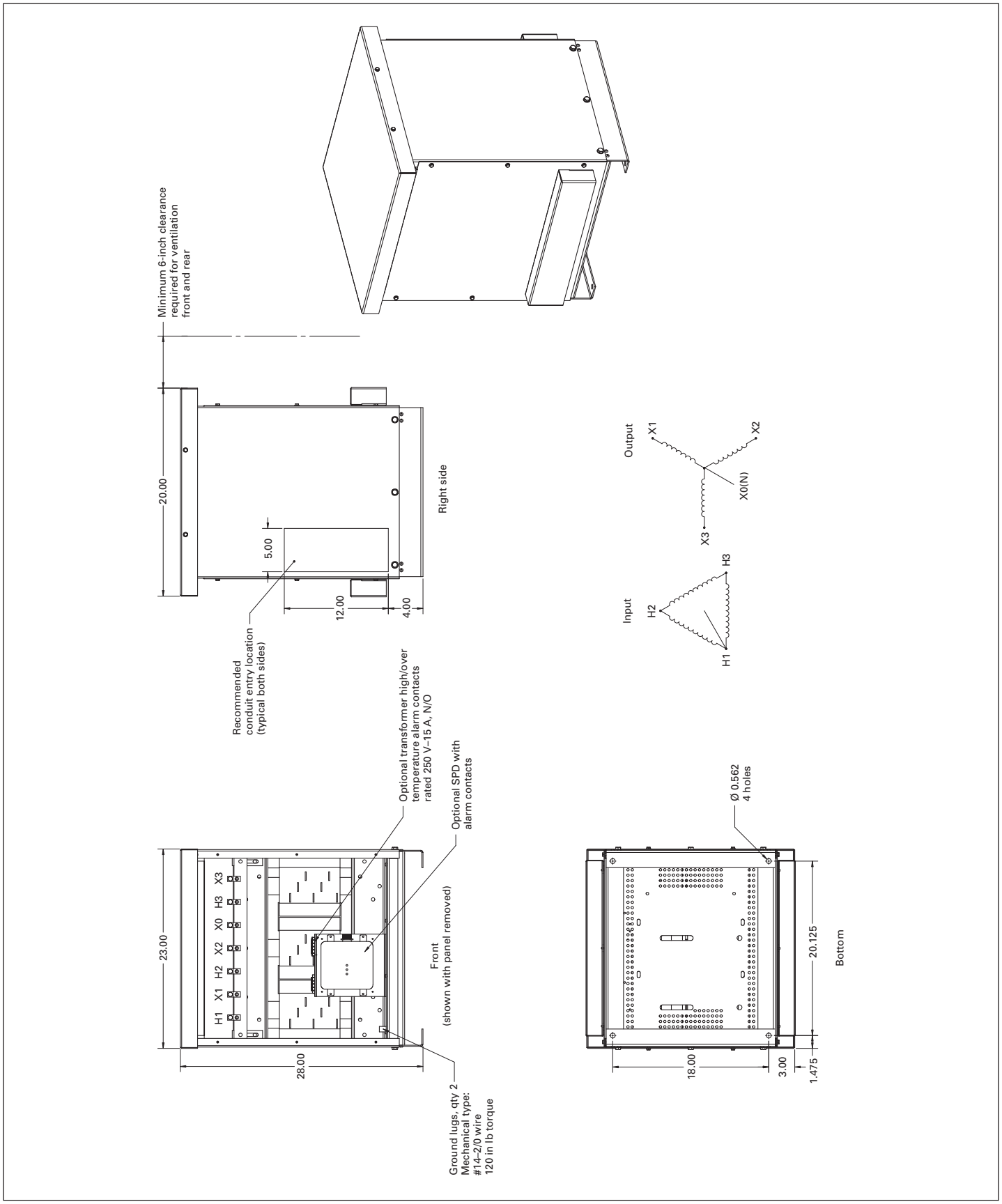


Figure 2. 15–30 kVA NEMA 3R SPD alarm contacts

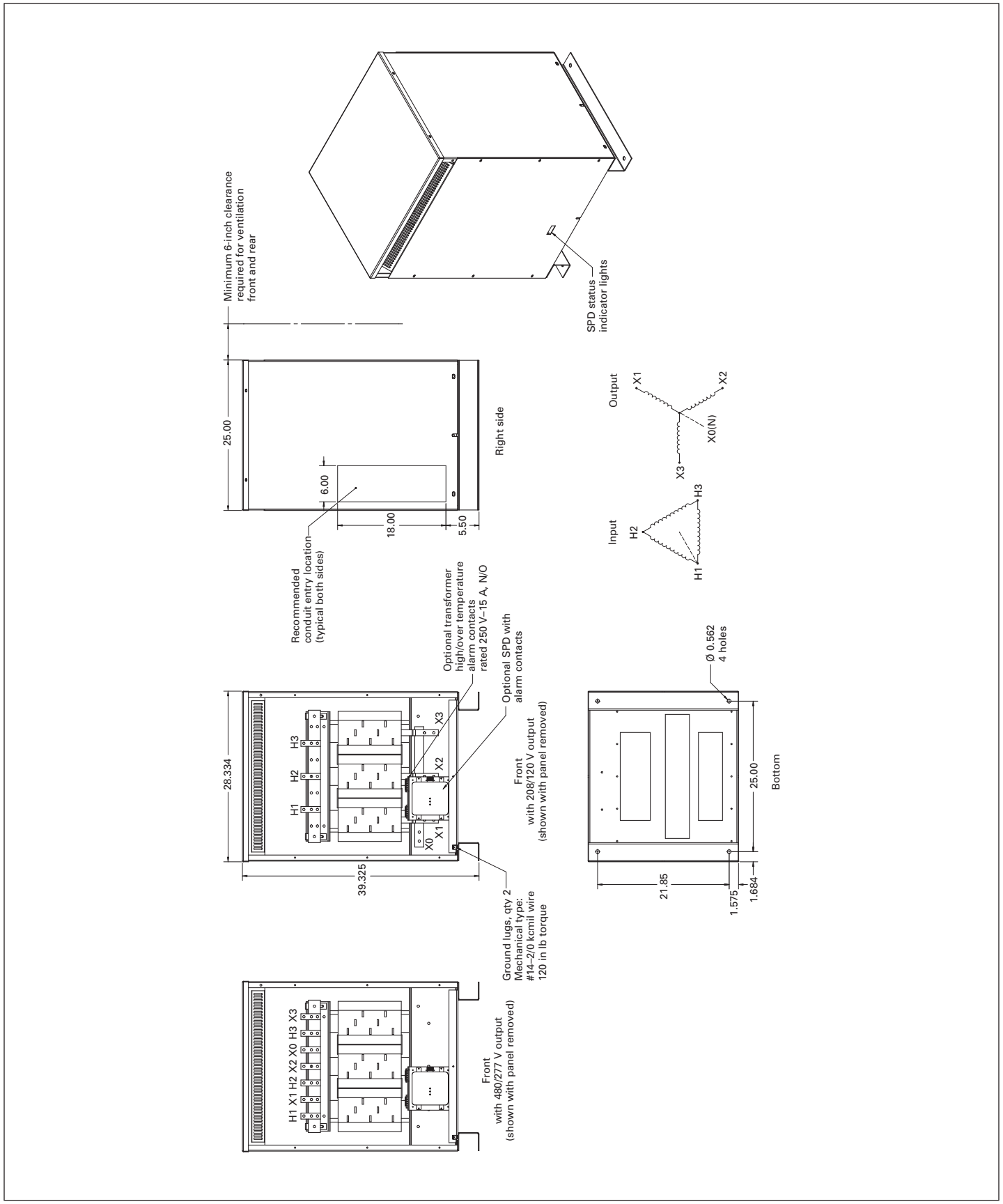


Figure 3. 45–75 kVA NEMA 2 SPD alarm contacts

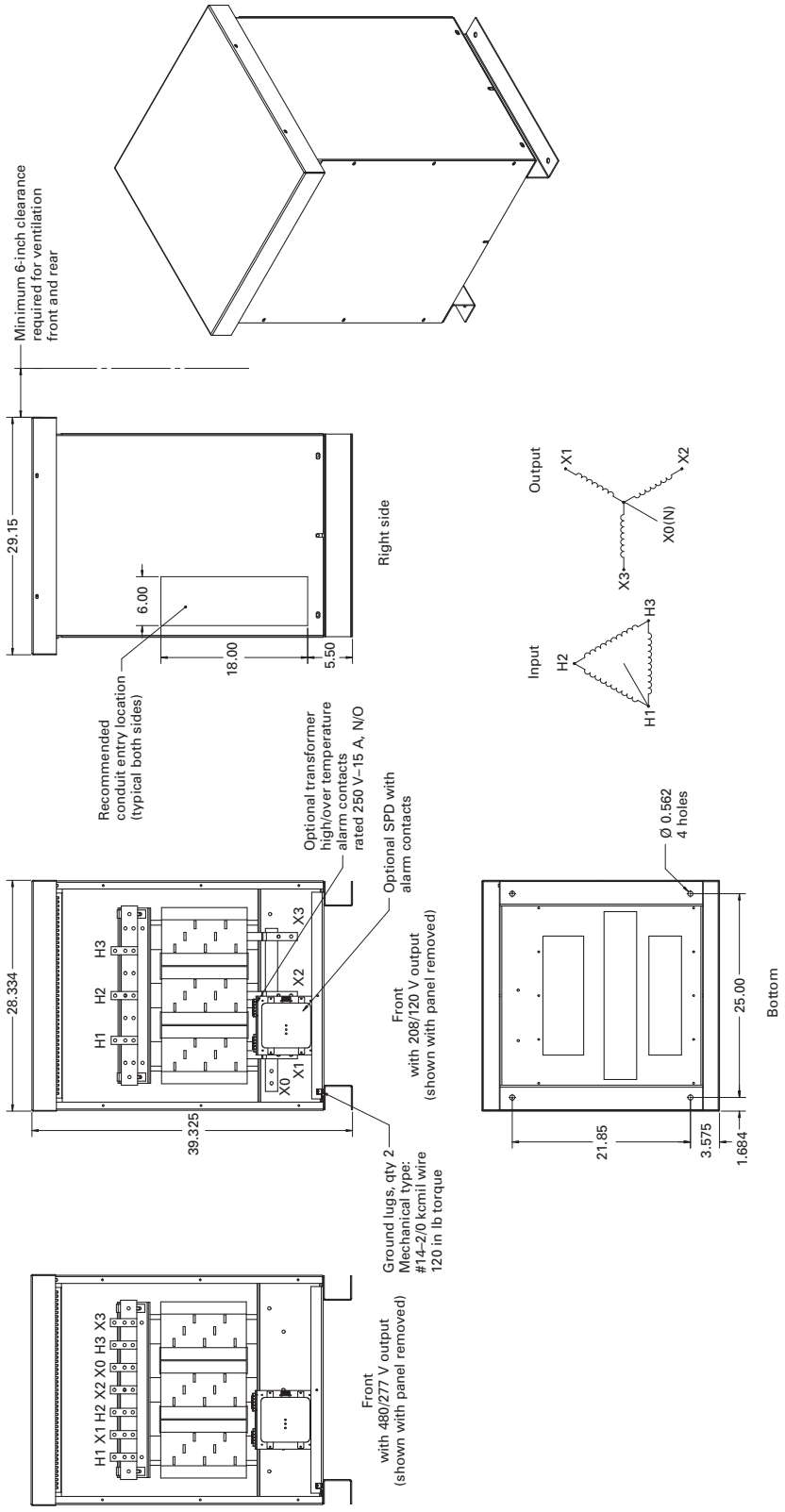


Figure 4. 45–75 kVA NEMA 3R SPD alarm contacts

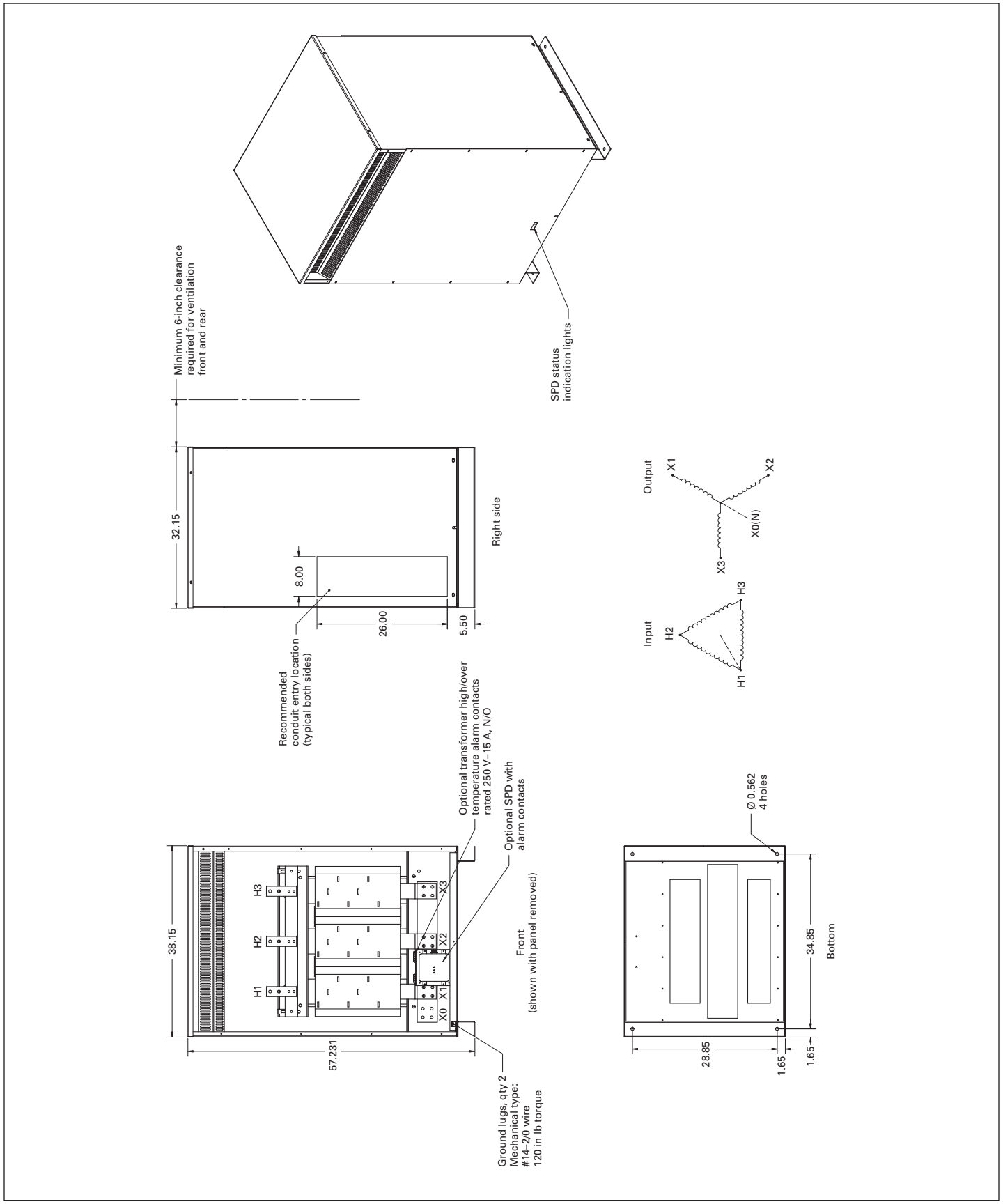


Figure 5. 112–225 kVA NEMA 2 SPD alarm contacts

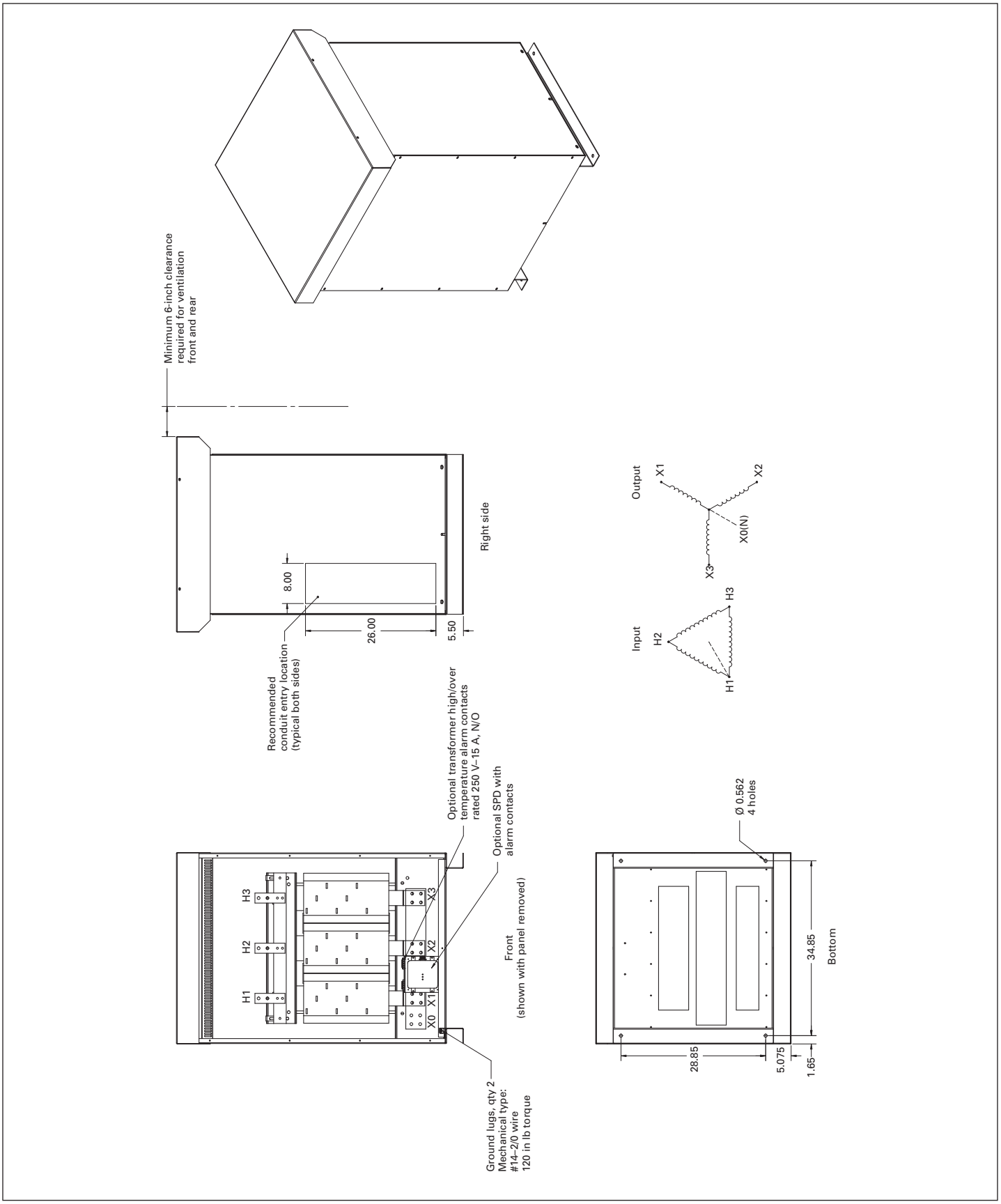


Figure 6. 112–225 kVA NEMA 3R SPD alarm contacts

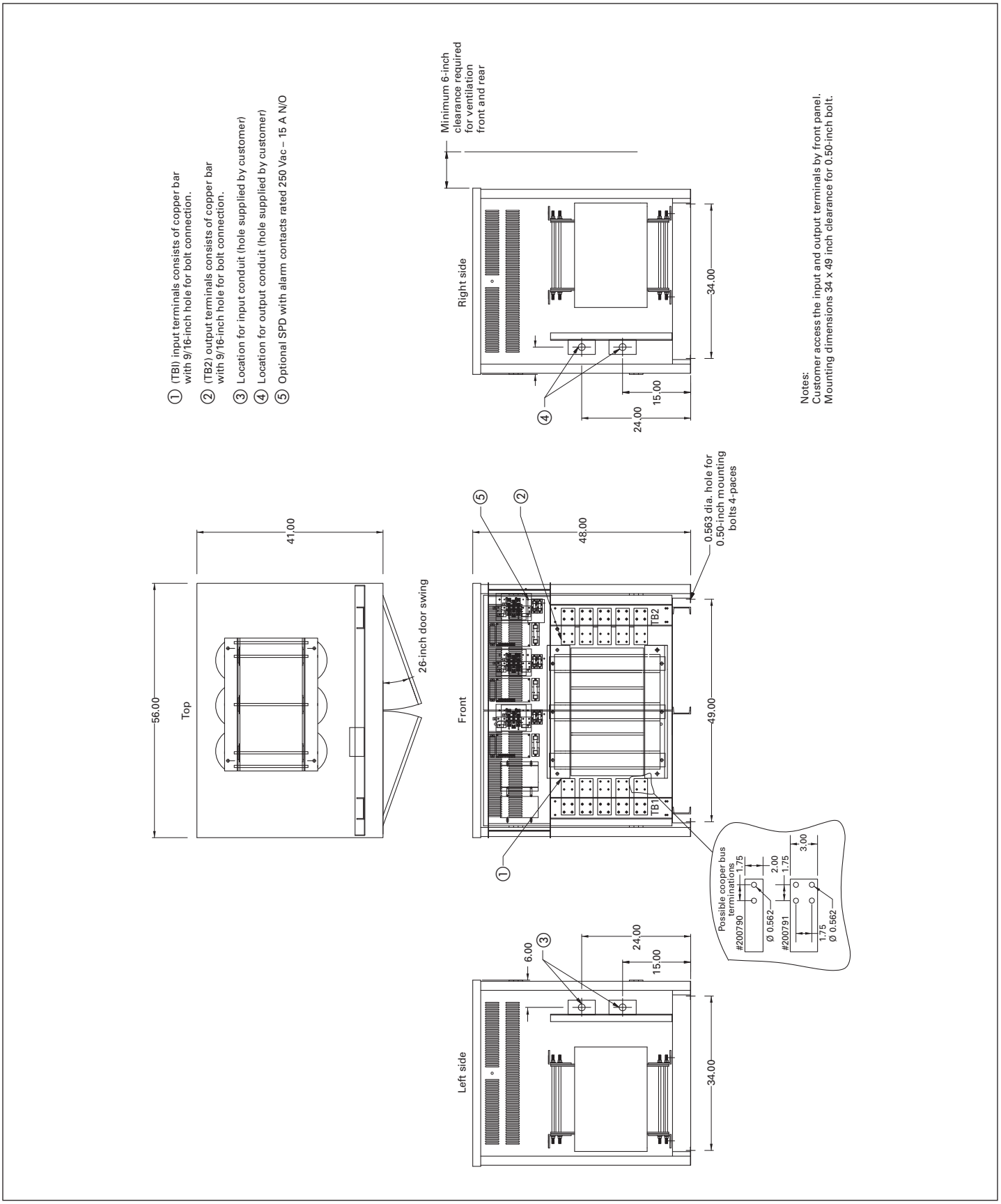


Figure 7. 300 kVA NEMA 1

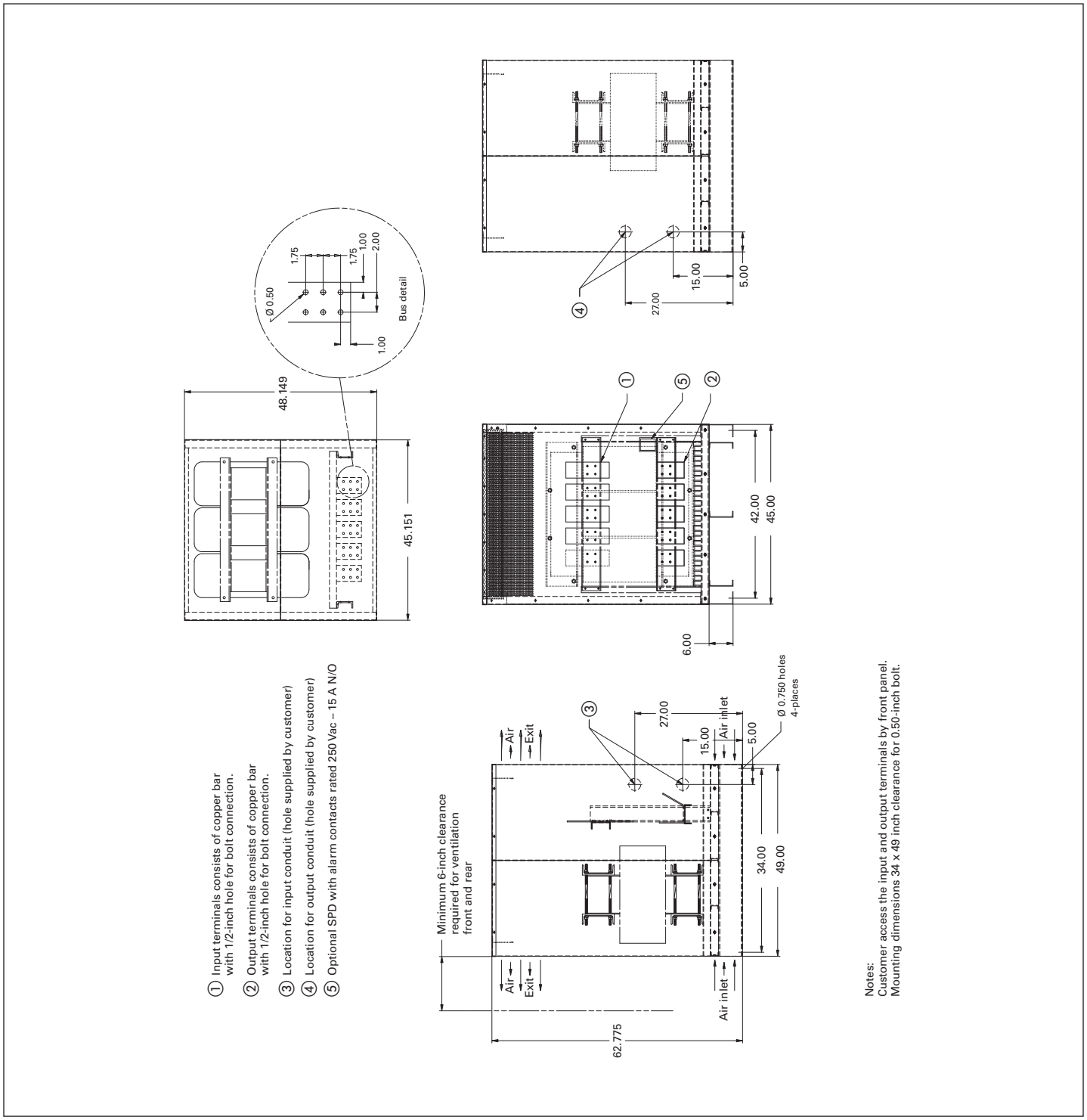


Figure 8. 500 kVA NEMA 1

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