Altivar™ 960 Process Drive

Instruction Bulletin

NVE75505, Rev. 02

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www.se.com

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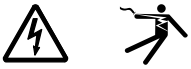
Safety Information

Read these instructions carefully and examine the equipment to become familiar with the device before attempting to install, operate, service, or maintain it. The following special messages may appear throughout this user guide or on the equipment to warn of hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

NOTE: Provides additional information to clarify or simplify a procedure.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Electrical equipment should be transported, stored, installed, and operated only in the environment for which it is designed.

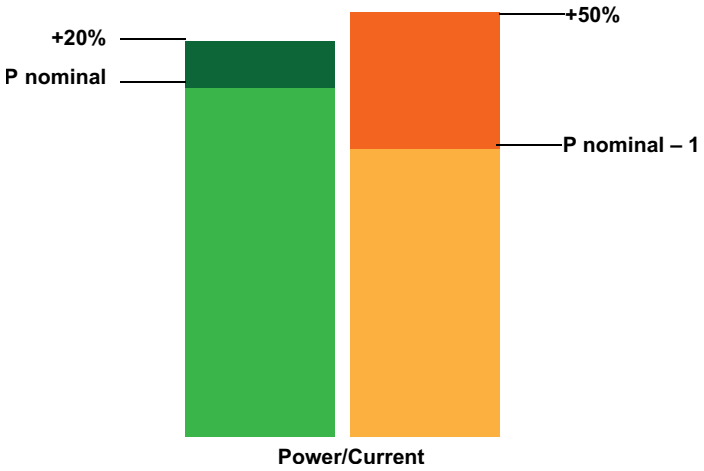
Introduction

Application Considerations

Altivar 960 Process Drives are designed for use in two operating modes that can optimize the drive nominal rating according to the system constraints:

- Normal duty (ND): Dedicated mode for applications requiring a slight overload (up to 120%) with a motor power no higher than the drive nominal power
- Heavy duty (HD): Dedicated mode for applications requiring a significant overload (up to 150%) with a motor power no higher than the drive nominal power derated by one rating.

Figure 1 - Normal Duty (Left) and Heavy Duty (Right) Modes



About this Document

This instruction bulletin contains specifications, installation, operation, and maintenance information for the Altivar 960 (ATV960) process drives. The following document is also available from the Technical Library at www.se.com:

- NHA60269, Drives Systems Installation and Maintenance

NHA60269 contains important information on installation, operation, service, and maintenance of this product. Read NHA60269 before performing any work on or with this product.

To replace documents, download them from the Technical Library at www.se.com or contact your local Schneider Electric field office.

Terminology

The following terminology is used in this instruction bulletin:

- Enclosed drive or process drive refers to the combination of the drive, enclosure, and the power and control circuits that constitute the ATV960 Process Drive.
- Drive or power converter refers to the ATV930 or ATVG60 components.

- Bypass, or integral bypass starter, refers to the optional, integrated full-voltage combination starter in the ATV960 Process Drive. When provided, the integral bypass starter may be used to start and run the motor in the unlikely event that the drive becomes inoperable.

Product Overview

The Altivar 960 Drive System is a packaged, high-performance solution ideal for commercial, industrial, and municipal applications. This robust, adjustable speed system is UL 508A listed for all ratings, with selectable control and power configurations.

Two power converters are used in the ATV960 Process Drive:

- ATV930 for 1–125 hp ND
- ATVG60 for 150–900 hp ND

This instruction bulletin contains information about the ATV960 Process Drive. Since the process drive is engineered to order, your equipment may not have the same features, functions, or characteristics described in this document. For information specific to your process drive, consult the additional documentation shipped with it.

Figure 2 - Altivar 960 Process Drive, 1–125 hp, Available in Types 1, 12, 3R

Figure 3 - Altivar 960 Process Drive, 150–500 hp, Type 12

Standard Features

Process Drive Only

Process drives without bypass are available up to 700 hp HD / 900 hp ND @ 460 V, 50 hp HD / 60 hp ND @ 230 V, or 30 hp HD / 40 hp ND @ 208V. The following are standard features for process drives without bypass, when no options are ordered:

- Robustness of high overload capacity, with overload capability of 20%
- Dual Ethernet port maximizes services such as connection to the control room and full process transparency
- Circuit breaker disconnect
- UL Listed per UL 508A
- 100,000 AIC short-circuit rating
- Disconnect handle with lockout/tagout provisions
- Door mounted keypad holder and display
- One form C AFC Trip contact
- One form C AFC Run Mode contact
- Six programmable digital inputs
- Standard 3% input impedance

- Standard color RAL735

  Controller programming
  - Acceleration (ACC): 10 s
  - Deceleration (DEC): 10 s
  - Low speed (LSP): 3 Hz
- White component mounting plate
- Removable conduit entry plate on floor-mounted enclosures
- Class 10 overload protection

Process Drive with Bypass (up to and including 250 hp)

The following are standard features for process drives with bypass when no options are ordered:

- Circuit breaker disconnect
- UL Listed per UL 508A
- 100,000 AIC short-circuit rating
- Disconnect handle with lockout/tagout provisions
- Hand-Off-Auto (H-O-A) selector switch and manual speed potentiometer
- AFC-Off-Bypass and Test-Normal selector switches
- Door-mounted keypad display
- One form C AFC Trip contact
- One form C AFC Run Mode contact
- One Form C contact for remote indication of Bypass operation
- Manual trip condition reset in Off position of H-O-A selector switch
- Interlock / Run Permissive wired to the user terminal block
- Controller programming
  - Acceleration (ACC): 10 s
  - Deceleration (DEC): 10 s
  - Low speed (LSP): 3 Hz
- White component mounting plate
- Removable conduit entry plate on floor-mounted enclosures
- Bypass with optional line contactor and communication card, including 24 V power supply to keep drive electronics live in Bypass mode
- Class 20 overload protection
- Overload Trip (yellow) and Bypass (yellow) pilot lights
- Bypass and isolation contactors with mechanical and electrical interlocking
- Bypass and isolation contactor sequencing provides true motor isolation
- Remote bypass operation using Auto Start contacts

Installation and Maintenance Precautions

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read and understand the precautions in bulletin NHA60269, Drives Systems Installation and Maintenance, before performing any procedures in this bulletin.

Failure to follow these instructions will result in death or serious injury.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand this manual before installing or operating the enclosed drive. Installation, adjustment, repair, and maintenance must be performed by qualified personnel.
- The user is responsible for compliance with national and local electrical codes with respect to grounding of all equipment.
- Many parts of this equipment, including the printed circuit boards, operate at the line voltage. DO NOT TOUCH. Use only electrically-insulated tools.
- DO NOT touch unshielded components or terminal strip screw connections with voltage present.
- DO NOT short across terminals PA/+ and PC/- or across the DC bus capacitors.
- Before servicing the equipment disconnect the power, including the external control power that may be present. The circuit breaker or disconnecting switch does not always open all circuits.
- Lock the circuit breaker or disconnecting switch in the opened position.
- Place a “DO NOT TURN ON” label on the circuit breaker or disconnect switch of the enclosed drive.
- Wait 15 minutes to allow the DC bus capacitors to discharge. Then follow the “DC Bus Voltage Measurement Procedure” in bulletin NHA60269, Drives Systems Installation and Maintenance to verify that the DC voltage is less than 42 V. The enclosed drive LED is not an indicator of the absence of DC bus voltage.
- Install and close all covers before applying power or starting and stopping the equipment.

Failure to follow these instructions will result in death or serious injury.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Do not install or operate any enclosed drive that appears damaged.
- If you find shipping damage, notify the carrier and your Schneider Electric sales representative.

Failure to follow these instructions will result in death or serious injury.

⚠CAUTION

RISK OF BURNS AND ROTATING FAN BLADES

- Make sure that the device is sufficiently cooled and that the permitted ambient conditions are maintained.
- Do not touch components inside the enclosure. Heat sinks, chokes, and transformers may remain hot after removing power.
- Before opening the enclosure, ensure that the fans are not running. After switching off the voltage supply, the device fans may continue running for some time.

Failure to follow these instructions can result in injury or equipment damage.

Operation Precautions

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Before working on this equipment, turn off all power supplying it and perform the “DC Bus Voltage Measurement Procedure” in bulletin NHA60269, Drives Systems Installation and Maintenance.

Failure to follow these instructions will result in death or serious injury.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- This equipment must be installed and serviced only by qualified personnel.
- Qualified personnel performing diagnostics or troubleshooting that requires electrical conductors to be energized must comply with:
- NFPA® 70E® Standard for Electrical Safety in the Workplace®
- CSA Z462 – Workplace Electrical Safety
- OSHA Standards – 29 CFR Part 1910 Subpart S Electrical
- NOM-029-STPS – Maintenance of Electrical Installations in the Workplace, Safety Conditions
- Other national and local electrical codes that may apply

Failure to follow these instructions will result in death or serious injury.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Properly ground the enclosed drive before applying power.
- The UPS contains an internal energy source. Hazardous voltage can be present even when disconnected from the mains supply. Before installing or servicing the UPS system, ensure that the units are OFF and that mains and batteries are disconnected. Close and secure the enclosure doors before applying power.
- Certain adjustments and test procedures require that power be applied to this enclosed drive. Exercise extreme caution as hazardous voltages exist. The enclosure door must be closed and secured while turning on power or starting and stopping this enclosed drive. Always follow practices and procedures from NFPA® 70E® Standard for Electrical Safety in the Workplace®, CSA Z462, NOM-029-STPS – Maintenance of Electrical Installations in the Workplace, Safety Conditions, and other applicable regulations defining safe electrical work practices.

Failure to follow these instructions will result in death or serious injury.

⚠WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and over travel stop.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of anticipated transmission delays or failures of the link.[1]
- Each implementation of the ATV960 Process Drive must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠CAUTION

INCOMPATIBLE LINE VOLTAGE

Before powering up and configuring the equipment, ensure that the line voltage is compatible with the supply voltage shown on the enclosed drive nameplate. The enclosed drive may be damaged if the line voltage is not compatible.

Failure to follow these instructions can result in injury or equipment damage.

⚠ **WARNING:** This product can expose you to chemicals including Nickel compounds, which are known to the State of California to cause cancer, and Bisphenol A (BPA), which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

1. For additional information, refer to NEMA ICS 1.1 (latest edition), “Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control.”

Product Characteristics

Catalog Number Description

The catalog number is on the nameplate attached to the inside of the process drive door (see Nameplate, page 17). The catalog number is coded to describe the configuration of the drive.

Use Catalog Number Description, page 15 to translate the catalog number into a description of the process drive. The example in Catalog Number Example: ATV960D22T4N2ANWAANAGK, page 15 translates the catalog number shown on the nameplate in Normal Duty (Left) and Heavy Duty (Right) Modes, page 8.

For descriptions of the options listed in Catalog Number Description, page 15, refer to Circuit Operation and Options, page 38.

Table 1 - Catalog Number Example: ATV960D22T4N2ANWAANAGK

Field											
01–02	**03–04**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
ATV960	**D22**	**T4**	**N**	**2**	**A**	**N**	**W**	**A**	**A**	**N**	**A,G,K**
Altivar 960 Process Drive	30 hp	460 V, 3 phase	Normal Duty Power Rating	UL Listed	UL Type 12K Enclosure	No Harmonic Mitigation	Without Bypass	H-O-A Speed Pot.	Red Power On, Yellow Tripped, Green AFC Run, Yellow Auto	No Comm. Card	Ethernet Port in Front Door; Type 1 SPD; Additional 150 VA Control Power

Table 2 - Catalog Number Description

Field	Digit	Characteristic	Description	
01–02	1–6	Drive Style	Altivar 960 Process Drive, 2-quadrant, 6-pulse drive	
03–04	7–9	Power Rating (kW)	**Normal Duty** U07 = 1 hp U15 = 2 hp U22 = 3 hp U40 = 5 hp U55 = 7.5 hp U75 = 10 hp D11 = 15 hp D15 = 20 hp D18 = 25 hp D22 = 30 hp D30 = 40 hp D37 = 50 hp D45 = 60 hp D55 = 75 hp D75 = 100 hp D90 = 125 hp C11 = 150 hp C13 = 200 hp C16 = 250 hp C20 = 300 hp C25 = 400 hp C31 = 500 hp C40 = 600 hp C50 = 700 hp C63 = 900 hp	**Heavy Duty** U15 = 1 hp U22 = 2 hp U30 = 3 hp U55 = 5 hp U75 = 7.5 hp D11 = 10 hp D15 = 15 hp D18 = 20 hp D22 = 25 hp D30 = 30 hp D37 = 40 hp D45 = 50 hp D55 = 60 hp D75 = 75 hp D90 = 100 hp C11 = 125 hp C13 = 150 hp C16 = 200 hp C20 = 250 hp C25 = 300 hp C31 = 400 hp C40 = 500 hp C50 = 600 hp C63 = 700 hp
05	10–11	Voltage Class	P3 = 208 V, Three Phase T4 = 460 V, Three Phase U3 = 230 V, Three Phase	
06	12	Duty Rating	N = Normal Duty H = Heavy Duty	

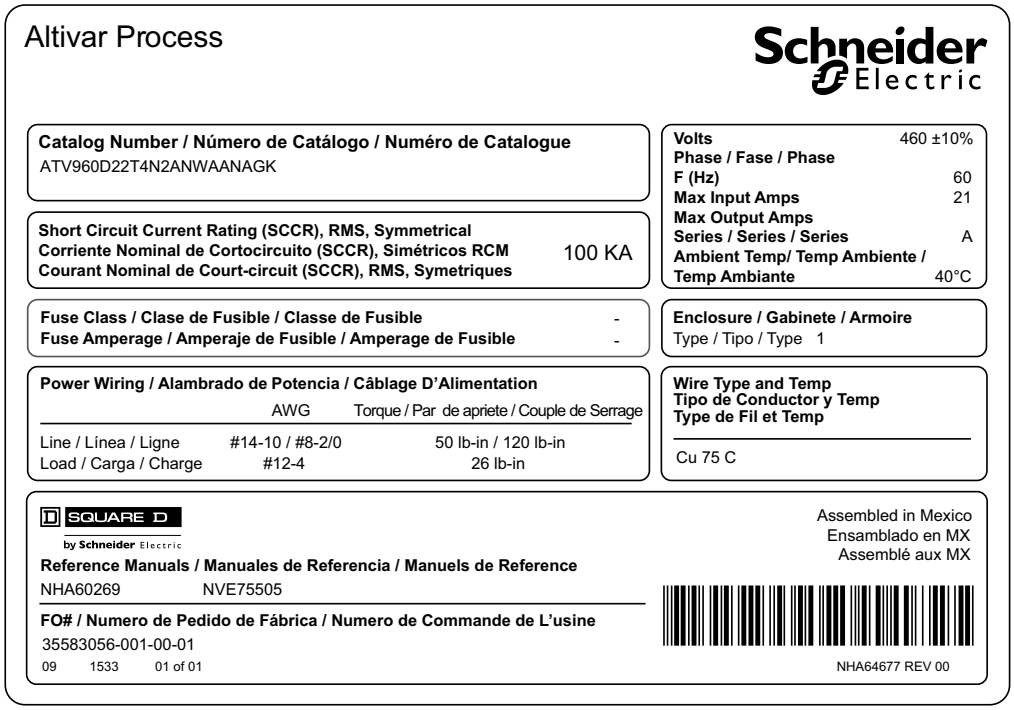
Table 2 - Catalog Number Description (Continued)

Field	Digit	Characteristic	Description
07	13	Region	2 = UL Marking 6 = cUL Marking (Canada)
08	14	Enclosure Type	G = Type 1 General Purpose A = Type 12K Industrial Use, Dust-tight/Drip-tight H = Type 3R Outdoor Use
09	15	Line Harmonic Mitigation	N = None A = 5% Impedance M = Passive Harmonic Filter
10	16	Power Circuit	W = without Bypass Y = Integral Full-Voltage Bypass
11	17	Control Options	N = Prewired for Remote H-O-A A = H-O-A, Speed Potentiometer B = H-O-A, Speed Potentiometer, Start/Stop Push Button
12	18	Light Options	N = None A = Red Power On, Yellow Tripped, Green AFC Run, Yellow Auto B = Red Power On, Yellow Tripped, Green AFC Run (Default)
13	19	Communication Card	A = Profibus DP V1 B = CANopen Daisy Chain C = DeviceNet D = CANopen SUB-D E = CANopen Open Style F = ProfiNet H=EtherCat J=Bacnet MS/TP
14	Varies	Miscellaneous Options	B = Line Contactor C = Drive I/O Extension D = Relay Output Card E = 0–10 V Auto Speed Reference F = 1 N.O. (Form A) Auxiliary Auto Mode Contact G = Surge Protective Device (SPD) (Type 1) H = SPD (Type 2) K = Additional 150 VA Control Power L = Push-to-Test Pilot Lights P = Permanent Wire Markers Q = Door-Mounted Overload Reset Push Button R = Service Entrance (3R only) S = 50°C Ambient Operation T = Service Switch U = Top Entry Cubical (when available) X = dV/dt Filter (1000 ft) Y = Seismic Certification

Nameplate Identification

The nameplate for the Altivar 960 Process Drive is on the inside of the enclosure door. See Nameplate, page 17. The nameplate identifies the drive type and modification options. When identifying or describing the Altivar 960 Process Drive, use the data from this nameplate.

Figure 4 - Nameplate



Short-Circuit Ratings

All Altivar 960 Process Drives include a circuit breaker as a disconnect device and have a short-circuit rating of 100,000 A at up to 480 V.

⚠WARNING

IMPROPER OVERCURRENT COORDINATION

- Properly coordinate all protective devices.
- Do not connect the equipment to a power feeder whose short-circuit capacity exceeds the short-circuit current rating listed on the equipment nameplate.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Technical Characteristics

Table 3 - Electrical Specifications

Input voltage	208 Vac ±10%, 230 Vac ±10%, 460 Vac ±10%, three phase Other voltages available on request
Short circuit current rating (AC symmetrical)	100 kA
Control voltage	24 Vdc, 115 Vac +10%/-15% (control power transformer included)
Displacement power factor	98% through speed range (in AFC operation mode)
Input frequency	50/60 Hz ± 5%
Output voltage	Three-phase output, maximum voltage equal to input voltage
Galvanic isolation	Galvanic isolation between power and control (inputs, outputs, and power supplies)
Output frequency range of power converter	0.1–599 Hz (factory setting of 60 Hz)
Torque/Overtorque	Normal Duty: 120% of nominal motor torque for 60 s Heavy Duty: 150% of nominal motor torque for 60 s
Current (transient)	Normal Duty: 120% of drive rated current for 60 s Heavy Duty: 150% of drive rated current for 60 s
Switching frequency	Selectable from 0.5–8 kHz. Factory setting: 2.5 kHz The drive reduces the switching frequency automatically in the event of excessive heatsink temperature.

Table 4 - Environmental Specifications

Storage temperature	-13 to +149°F (-25 to +65°C)
Operating temperature 1–100 hp HD, 1–125 hp ND 460 V; 1–50 hp HD, 1–60 hp ND 230 V 1–30 hp HD, 1–40 hp ND 208 V	+14 to +104°F (-10 to +40°C), Types 1, 12, and 3R; +14 to +122°F (-10 to +50°C), Types 1, 12, and 3R (Optional)[2]
Operating temperature 125–700 hp HD, 150–900 hp ND 460 V	+14 to +122°F (-10 to +50°C), Types 1 and 12 (below 0°C with additional enclosure heating, above +40°C with derating). See Maximum Ambient Temperature, page 20 for more information.
Humidity	95% with no condensation or dripping water, conforming to IEC 60068-2-78
Altitude	3,300 ft. (1000 m), without derating, derating of the current by 1% for each additional 330 ft. (100 m) up to 9,842 ft. (3000 m) maximum
Enclosure	UL Type 1: General indoor (ventilated); UL Type 12: Indoor dust-tight (ventilated); UL Type 3R: Outdoor (ventilated)
Pollution degree	Pollution degree 2 (Types 1 and 3R) or 3 (Type 12) per NEMA ICS-1 Annex A and IEC 61800-5-1
Operational test vibration	Conforming to IEC/EN 60068-2-6 1.5 mm at 3–10 Hz, 0.6 g at 10–200 Hz 3M3 conforming to IEC/EN 60721-3-3
Transit shock test	Conforming to International Safe Transit Association® test for packages.

2. For 50°C optional current ratings, see Input and Output Current Ratings and Dissipated Heat, page 21.

Table 4 - Environmental Specifications (Continued)

Operational shock	Conforming to IEC/EN 60068-2-27 4 g for 11 ms 3M3 conforming to IEC/EN 60721-3-3
Codes and standards	UL Listed per UL 508A IEEE519 compliant (passive harmonic filter required); Conforms to applicable NFPA® 70E® Standard for Electrical Safety in the Workplace® ICS, and IEC standards; Manufactured under ISO 9001 standards.

Table 5 - Operation and Control

Maximum current	ND: 120% for 60 seconds per 10 minutes HD: 150% for 60 seconds per 10 minutes
Speed reference	**AI1**: 0–10 V, Impedance = 30 kW. Can be used for speed potentiometer, 1–10 kΩ. **AI2**: Factory setting: 4–20 mA. Impedance = 242 kΩ (reassignable, X–Y range with graphic display terminal).
Frequency resolution in analog reference	0.1 for 100 Hz (11 bits)
Harmonics	Less than 48% TDDi standard. Less than 5% TDDi with harmonic filter
Speed regulation	V/f control: equal to the motor's rated slip. Sensorless flux vector control (SFVC): 10% of the motor's rated slip from 20–100% of nominal motor torque
Efficiency	95% (or greater) at full load typical
Reference sample time	2 ms ±0.5 ms
Acceleration and deceleration ramps	Drive: 0.1–999.9 s (definition in 0.1 s increments)
Graphic display terminal	Self diagnostics with trip indication messages in three languages. Refer to the Programming Manuals available online at www.se.com.

Table 6 - Protection

Motor and Pump:	
Thermal overload	Class 10 electronic overload protection (drive) Class 20 bypass overload protection (drive with bypass)
Drive System:	
Overcurrent protection	An overcurrent protection device (OCPD) provides Type 1 coordination to the short-circuit current ratings.
Overtemperature protection	Protection if heatsink temperature exceeds 85 °C (185 °F)
Functional Safety:	
Functional safety of the drive	The function Safe Torque Off (STO)[3] allows a controlled shut-down as well as switch-off of the power supply when at a standstill. It also helps prevent any unintended start of the motor according to ISO 13849–1, performance level PL e, according to IEC/EN 61508 safety integrity level[4] SIL 3 and IEC/EN 61800-5-2.
Response time	≤ 100 ms at STO (Safe Torque Off)

3. Safe Torque Off (STO) according to standard IEC 61800–5–2.
4. Safety Integrity Level according to standard IEC 61508.

Maximum Ambient Temperature

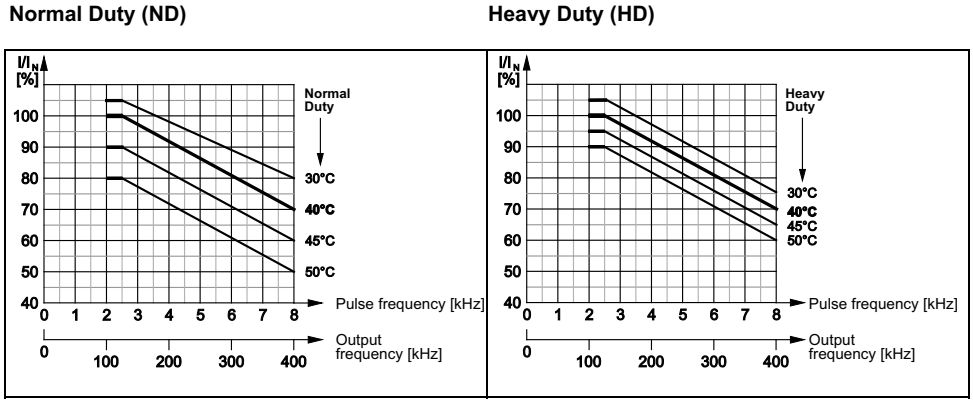
For enclosed drives rated 1–100 hp HD and 1–125 hp ND @ 460 Vac, 1–50 hp HD and 1–60 hp ND @ 230 Vac, and 1–40 hp ND @ 208 V, when 50°C option is selected, rated output current is the rated output current with bypass or with the 50°C option. See Input and Output Current Ratings and Dissipated Heat, page 21.

For Type 1 and 12 enclosed drives rated 125–700 hp HD and 150–900 hp ND at 460 V, derating may be necessary depending on the pulse frequency, the maximum ambient temperature, and the desired output frequency. Consult Maximum Ambient Temperature, page 20 and follow these guidelines:

- For output frequencies higher than 125 Hz, the pulse frequency is increased automatically. For example, at 200 Hz output frequency, the pulse frequency is increased to 4 kHz. Consequently, consider a derating of 8% at a maximum ambient temperature of 40°C.
- The overload capability of the enclosed drive is also reduced due to the reduction of the output current.
- At higher pulse frequencies, motor cable length must be reduced.

NOTE: If the ambient temperature is too high, the pulse frequency is automatically reduced, which helps to prevent an overload of the drive (except in case of operation with sinusoidal motor filters).

Figure 5 - Current Reduction Depending on Ambient Temperature, Pulse Frequency, and Output



Ratings

Table 7 - Input and Output Current Ratings and Dissipated Heat

VAC	Rating		Maximum Input Current (A)	Output Current Drive Only (A)	Output Current with Bypass or 50°C Rated (A)	Typical Dissipated Power at Rated Load (W)
	hp	kW				
230	1	0.7	3	4.6	4.2	63
	2	1.5	5.3	8	6.8	100
	3	2.2	7.6	11.2	9.6	138
	5	3	13	18.7	15.2	226
	7.5	5.5	17.1	25.4	22	289
	10	7.5	23.1	32.7	28	401
	15	11	34.3	46.8	42	651
	20	15	45.5	63.4	54	768
	25	18	54.5	78.4	68	860
	30	22	67.1	92.6	80	972
	40	30	88.6	123	104	1231
	50	37	108.5	149	130	1553
	60	45	130.4[5]	175	154	1789
208	1	0.7	3	4.6	4.6	69.93
	2	1.5	5.9	8	7.5	111
	3	2.2	8.4	11.2	10.6	153.18
	5	3	15	18.7	16.7	250.86
	7.5	5.5	20	25.4	24.2	320.79
	10	7.5	27	32.7	30.8	445.11
	15	11	39	46.8	46.2	722.61
	20	15	53	63.4	59.4	852.48
	25	18	67	78.4	74.8	954.6
	30	22	76	92.6	88	1078.92
	40	30	105	123	114	1366.41

5. Rating only for ND.

Table 7 - Input and Output Current Ratings and Dissipated Heat (Continued)

VAC	Rating		Maximum Input Current (A)	Output Current Drive Only (A)	Output Current with Bypass or 50°C Rated (A)	Typical Dissipated Power at Rated Load (W)
	hp	kW				
460	1	0.7	1.5	2.2	2.1	60
	2	1.5	2.9	4	3.4	84
	3	2.2	4	5.6	4.8	115
	5	3	7.2	9.3	7.6	173
	7.5	5.5	9.2	12.7	10	231
	10	7.5	12.5	16.5	14	272
	15	11	18.1	23.5	21	378
	20	15	24.4	31.7	27	515
	25	18	29.9	39.2	34	680
	30	22	35.8	46.3	40	739
	40	30	48.3	61.5	52	898
	50	37	59	74.5	65	1072
	60	45	71.8	88	77	1324
	75	55	86.9	106	96	1418
	100	75	118.1	145	124	1823
	125	90	156	173	156	2120
	150	110	184	211	180[6]	2530
	200	130	218	250	240[6]	3150
	250	160	280	302	302[6]	4030
	300	200	328	370	[7, 6]	4380
	400	250	427	477	[7, 6]	5750
	500	310	535	590	[7, 6]	7810
	600	400	634	730	[7, 6]	9900
	700	500	776	900	[7, 6]	13330
	900	630	968[8]	1140	[7, 6]	16250

Weights

⚠WARNING

UNSTABLE LOAD

- Use extreme care when moving heavy equipment.
- Verify that the moving equipment is rated to handle the weight.
- When removing equipment from a shipping pallet, carefully balance and secure it using a strap designed to handle the weight and stress.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

6. See Maximum Ambient Temperature, page 20 for more information on 50°C derating.
7. Consult Schneider Electric.
8. Rating only for ND.

Table 8 - Approximate Weight by Feature Set

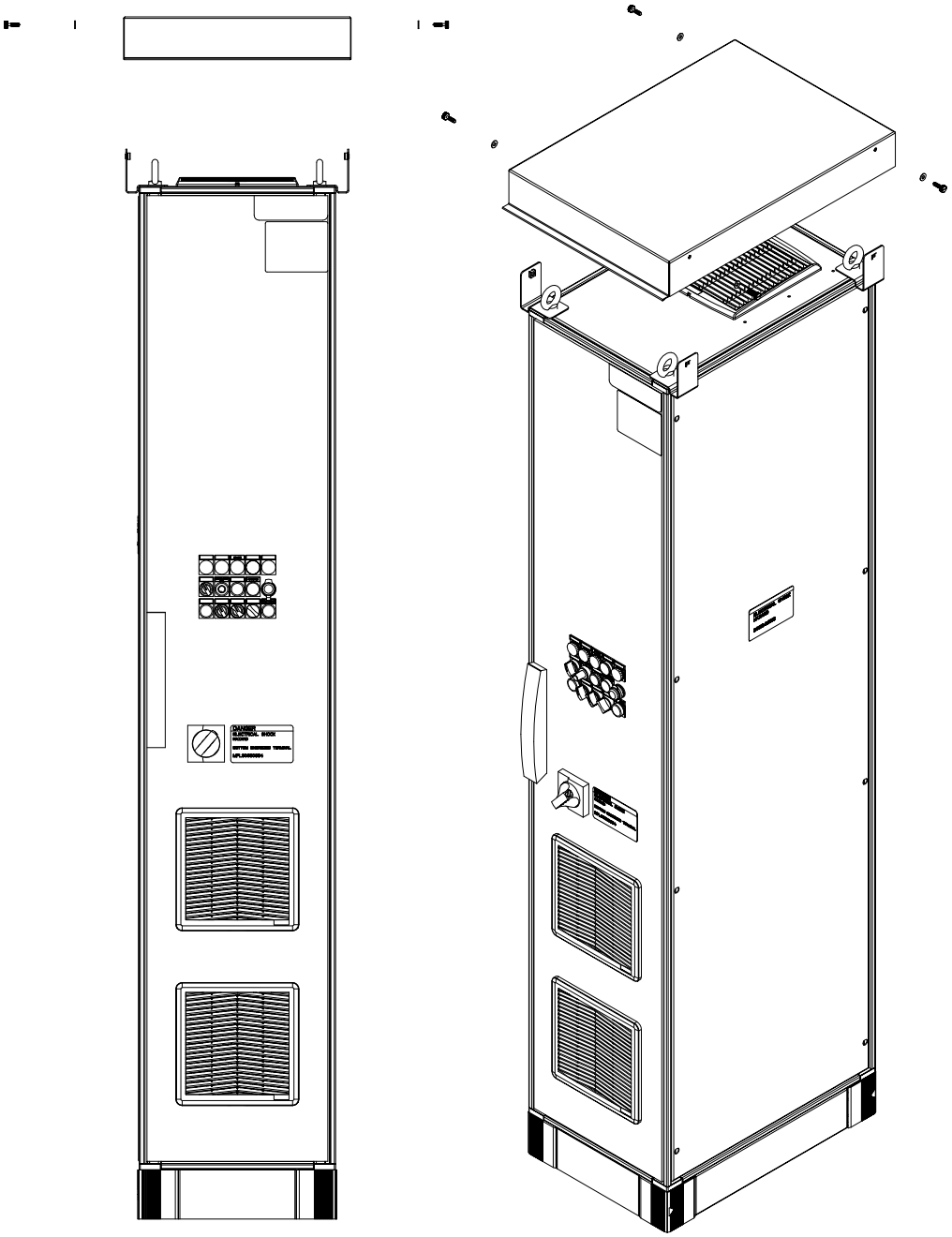
Voltage	hp	Basic 6-Pulse Drive System Weight lb (kg)
208/230	1–7.5	135 (61)
460	1–15	
208/230	10–15	175 (79.4)
460	20–30	
208/230	20–30	270 (122.5)
460	40–60	
208/230	40–60	550 (249.5)
460	75–125	
460	150–250	750 (340.2)
460	300–500	980 (444.5)
460	600–700	1550 (703.1)
460	900	2000 (907.2)

Accessing the Lifting Brackets

Type 3R floor mounted enclosed drives include a rain hood that covers the brackets provided for transporting and installing the equipment. Temporarily remove the rain hood to access the lifting brackets as follows:

1. Remove four thumb screws and lift the hood off the brackets as shown in Removing the Rain Hood, page 24.
2. After the enclosed drive is installed, replace the rain hood and hand tighten the thumb-screws.
3. For more information, refer to the instructions and precautions in “Handling the Equipment” in instruction bulletin NHA60269, Drive Systems Installation and Maintenance.

Figure 6 - Removing the Rain Hood



Electrical Installation

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read and understand the precautions in bulletin NHA60269, Drives Systems Installation and Maintenance, before performing any procedures in this bulletin.

Failure to follow these instructions will result in death or serious injury.

Wire Range and Terminal Torque Requirements

Normal Duty, Line Side

Table 9 - Power Terminal Wire Range and Torque Requirements, Normal Duty, Line Side

Voltage	hp	Circuit Breaker	Line (L1, L2, L3)	
			Wire Range AWG (mm²)	Torque lb-in. (N•m)
208/230	1	HLL36015LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	2	HLL36015LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	3	HLL36025LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	5	HLL36030LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	7.5	HLL36050LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	10	HLL36060LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	15	HLL36070LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	20	HLL36090LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	25	HLL36110LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	30	HLL36125LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	40	JLL36175LU	4–4/0 (25–95)	225 (25)
230	50	JLL36225LU	3/0–350 (95–185)	225 (25)
230	60	JLL36250LU	3/0–350 (95–185)	225 (25)
460	1	HLL36015LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	2	HLL36015LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	3	HLL36015LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	5	HLL36015LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)

Table 9 - Power Terminal Wire Range and Torque Requirements, Normal Duty, Line Side (Continued)

Voltage	hp	Circuit Breaker	Line (L1, L2, L3)	
			Wire Range AWG (mm^2)	Torque lb-in. (N•m)
460	7.5	HLL36025LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	10	HLL36030LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	15	HLL36050LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	20	HLL36060LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	25	HLL36070LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	30	HLL36080LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	40	HLL36100LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	50	HLL36125LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	60	HLL36150LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	75	JLL36175LU	4–4/0 (25–95)	225 (25)
460	100	JLL36200LU	3/0–350 (95–185)	225 (25)
460	125	JLL36250LU	3/0–350 (95–185)	225 (25)
460	150–200	LLP36400U31X	(2) 2/0–500 (70–240)	275 (31)
460	250	LLP36600U31X	(2) 2/0–500 (70–240)	275 (31)
460	300	LLP36600U31X	(2) 2/0–500 (70–240)	275 (31)
460	400	PLP34080SARE10	(3) 3/0–500 (95–240)	275 (31)
460	500	PLP34100U44ASARE10	(4) 3/0–500 (95–240)	275 (31)
460	600–700	PLP34120U44ASARE10	(4) 3/0–500 (95–240)	275 (31)
460	900	PLP34120U44ASARE10	(4) 3/0–500 (95–240)	275 (31)

Normal Duty, Load Side

Table 10 - Power Terminal Wire Range and Torque Requirements, Normal Duty, Load Side

Voltage	hp	Load, Enclosed Drive Only (T1, T2, T3)		Load with Bypass (T1, T2, T3)	
		Wire Range AWG (mm²)	Torque lb-in. (N•m)	Wire Range AWG (mm²)	Torque lb-in. (N•m)
208/230	1-7.5	14–6 (2.5–16)	15 (1.7)	14–10 (2.5–6)	15 (1.7)
208/230	10	14–10 (2.5–6)	22 (2.5)	14–8 (2.5–10)	15 (1.7)
		8–2 (10–35)	40 (4.5)	14–8 (2.5–10)	15 (1.7)
208/230	15	14–10 (2.5–6)	22 (2.5)	14–4 (2.5–25)	44 (5)
		8–2 (10–35)	40 (4.5)	2 (35)	70 (8)
208/230	20	6–2 (16–35)	44 (5)	14–4 (2.5–25)	44 (5)
		1–1/0 (35–50)	97 (11)	2 (35)	70 (8)
208/230	25	6–2 (16–35)	44 (5)	10–2 (6–35)	75 (9)
		1–1/0 (35–50)	97 (11)	10–2 (6–35)	75 (9)
208/230	30	6–2 (16–35)	44 (5)	6–3/0 (16–95)	200 (22.5)
		1–1/0 (35–50)	97 (11)	6–3/0 (16–95)	200 (22.5)
208/230	40–50	4–1/0 (25–50)	88 (10)	6–3/0 (16–95)	200 (22.5)
		2/0–300 (70–150)	159 (18)	6–3/0 (16–95)	200 (22.5)
230	60	4–1/0 (25–50)	88 (10)	[9]	[9]
		2/0–300 (70–150)	159 (18)	[9]	[9]
460	1–10	14–6 (2.5–16)	15 (1.7)	14–10 (2.5–6)	15 (1.7)
460	15	14–6 (2.5–16)	15 (1.7)	14–8 (2.5–10)	22.1 (2.5)
460	20	14–10 (2.5–6)	22 (2.5)	14–8 (2.5–10)	22.1 (2.5)
		8–2 (10–35)	40 (4.5)	14–8 (2.5–10)	22.1 (2.5)
460	25–30	14–10 (2.5–6)	22 (2.5)	14–4 (2.5–25)	44 (5)
		8–2 (10–35)	40 (4.5)	2 (35)	70 (8)
460	40	6–2 (16–35)	44 (5)	14–4 (2.5–25)	44 (5)
		1–1/0 (35–50)	97 (11)	2 (35)	70 (8)
460	50	6–2 (16–35)	44 (5)	10–2 (6–35)	75 (9)
		1–1/0 (35–50)	97 (11)	10–2 (6–35)	75 (9)
460	60	6–2 (16–35)	44 (5)	6–3/0 (16–95)	200 (22.5)
		1–1/0 (35–50)	97 (11)	6–3/0 (16–95)	200 (22.5)
460	75–100	4–1/0 (25–50)	88 (10)	6–3/0 (16–95)	200 (22.5)
		2/0–300 (70–150)	159 (18)	6–3/0 (16–95)	200 (22.5)
460	125	4–1/0 (25–50)	88 (10)	4–1/0 (25–50)	88 (10)
		2/0–300 (70–150)	159 (18)	2/0–300 (70–150)	159 (18)
460	150–250	(2) 4–500 (25–240)	500 (56.5)	(2) 4–500 (25–240)	500 (56.5)

9. Consult Schneider Electric.

Table 10 - Power Terminal Wire Range and Torque Requirements, Normal Duty, Load Side (Continued)

Voltage	hp	Load, Enclosed Drive Only (T1, T2, T3)		Load with Bypass (T1, T2, T3)	
		Wire Range AWG (mm²)	Torque lb-in. (N•m)	Wire Range AWG (mm²)	Torque lb-in. (N•m)
460	300–500	(3) 4–500 (25–240)	500 (56.5)	10	10
460	600–700	(6) 3/0–750 (95–400)	550 (62)	10	10
460	900	(8) 3/0–750 (95–400)	550 (62)	10	10

Heavy Duty, Line Side

Table 11 - Power Terminal Wire Range and Torque Requirements, Heavy Duty, Line Side

Voltage	hp	Circuit Breaker	Line (L1, L2, L3)	
			Wire Range AWG (mm²)	Torque lb-in. (N•m)
208/230	1	HLL36015LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	2	HLL36015LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	3	HLL36025LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	5	HLL36040LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	7.5	HLL36060LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	10	HLL36070LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	15	HLL36090LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	20	HLL36110LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	25	HLL36125LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
208/230	30	HLL36125LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
230	40	JLL36225LU	4–4/0 (25–95)	225 (25)
230	50	JLL36250LU	4–4/0 (25–95)	225 (25)

10. Consult Schneider Electric.

Table 11 - Power Terminal Wire Range and Torque Requirements, Heavy Duty, Line Side (Continued)

Voltage	hp	Circuit Breaker	Line (L1, L2, L3)	
			Wire Range AWG (mm²)	Torque lb-in. (N•m)
460	1	HLL36015LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	2	HLL36015LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	3	HLL36015LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	5	HLL36020LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	7.5	HLL36025LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	10	HLL36035LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	15	HLL36050LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	20	HLL36060LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	25	HLL36080LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	30	HLL36100LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	40	HLL36125LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	50	HLL36150LU	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	60	JLL36175LU	4–4/0 (25–95)	225 (25)
460	75	JLL36200LU	4–4/0 (25–95)	225 (25)
460	100	JLL36250LU	4–4/0 (25–95)	225 (25)
460	125–200	LLP36400U31X	(2) 2/0–500 (70–240)	275 (31)
460	250	LLP36600U31X	(2) 2/0–500 (70–240)	275 (31)
460	300	LLP36600U31X	(2) 2/0–500 (70–240)	275 (31)
460	400	PLP34080SARE10	(3) 3/0–500 (95–240)	275 (31)
460	500	PLP34100U44ASARE10	(3) 3/0–500 (95–240)	275 (31)
460	600–700	PLP34120U44ASARE10	(4) 3/0–500 (95–240)	275 (31)

Heavy Duty, Load Side

Table 12 - Power Terminal Wire Range and Torque Requirements, Heavy Duty, Load Side

Voltage	hp	Load, Enclosed Drive Only (T1, T2, T3)		Load with Bypass (T1, T2, T3)	
		Wire Range AWG (mm²)	Torque lb-in. (N•m)	Wire Range AWG (mm²)	Torque lb-in. (N•m)
208/230	1–5	14–6 (2.5–16)	15 (1.7)	14–10 (2.5–6)	15 (1.7)
208/230	7.5	14–6 (2.5–16)	22 (2.5)	14–8 (2.5–10)	15 (1.7)
		8–2 (10–35)	40 (4.5)	14–8 (2.5–10)	15 (1.7)
208/230	10	14–10 (2.5–6)	22 (2.5)	14–4 (2.5–25)	44 (5)
		8–2 (10–35)	40 (4.5)	2 (35)	70 (8)
208/230	15	6–2 (16–35)	44 (5)	14–4 (2.5–25)	44 (5)
		1–1/0 (35–50)	97 (11)	2 (35)	70 (8)
208/230	20	6–2 (16–35)	44 (5)	10–2 (6–35)	75 (9)
		1–1/0 (35–50)	97 (11)	10–2 (6–35)	75 (9)
208/230	25	6–2 (16–35)	44 (5)	6–3/0 (16–95)	200 (22.5)
		1–1/0 (35–50)	97 (11)	6–3/0 (16–95)	200 (22.5)
208/230	30–40	4–1/0 (25–50)	88 (10)	6–3/0 (16–95)	200 (22.5)
		2/0–300 (70–150)	159 (18)	6–3/0 (16–95)	200 (22.5)
230	50	4–1/0 (25–50)	88 (10)	6–3/0 (16–95)	200 (22.5)
		2/0–300 (70–150)	159 (18)	6–3/0 (16–95)	200 (22.5)
460	1–7.5	14–6 (2.5–16)	15 (1.7)	14–10 (2.5–6)	15 (1.7)
460	10	14–6 (2.5–16)	15 (1.7)	14–8 (2.5–10)	22.1 (2.5)
460	15	14–10 (2.5–6)	22 (2.5)	14–8 (2.5–10)	22.1 (2.5)
		8–2 (10–35)	40 (4.5)	14–8 (2.5–10)	22.1 (2.5)
460	20	14–10 (2.5–6)	22 (2.5)	14–4 (2.5–25)	44 (5)
		8–2 (10–35)	40 (4.5)	2 (35)	70 (8)
460	25–30	6–2 (16–35)	44 (5)	14–4 (2.5–25)	44 (5)
		1–1/0 (35–50)	97 (11)	2 (35)	70 (8)
460	40	6–2 (16–35)	44 (5)	10–2 (2.5–35)	75 (9)
		1–1/0 (35–50)	97 (11)	10–2 (2.5–35)	75 (9)
460	50	6–2 (16–35)	44 (5)	6–3/0 (16–95)	200 (22.5)
		1–1/0 (35–50)	97 (11)	6–3/0 (16–95)	200 (22.5)
460	60–75	4–1/0 (25–50)	88 (10)	6–3/0 (16–95)	200 (22.5)
		2/0–300 (70–150)	159 (18)	6–3/0 (16–95)	200 (22.5)
460	100	4–1/0 (25–50)	88 (10)	4–1/0 (25–50)	88 (10)
		2/0–300 (70–150)	159 (18)	2/0–300 (70–150)	159 (18)
460	125–200	(2) 4–500 (25–240)	500 (56.5)	(2) 4–500 (25–240)	500 (56.5)

Table 12 - Power Terminal Wire Range and Torque Requirements, Heavy Duty, Load Side (Continued)

Voltage	hp	Load, Enclosed Drive Only (T1, T2, T3)		Load with Bypass (T1, T2, T3)	
		Wire Range AWG (mm²)	Torque lb-in. (N•m)	Wire Range AWG (mm²)	Torque lb-in. (N•m)
460	250–400	(3) 4–500 (25–240)	500 (56.5)	[11]	[11]
460	500–600	(6) 3/0–750 (95–400)	550 (62)	[11]	[11]
460	700	(8) 3/0–750 (95–400)	550 (62)	[11]	[11]

Grounding Bar and Lugs

Table 13 - Grounding Bar Wire Range and Torque Requirements

Voltage	hp (Normal Duty)	Grounding Bar and Grounding Lugs	
		Wire Range AWG (mm²)	Torque lb-in. (N•m)
208/230	1–60	14–10 (2.5–6)	20 (2.25)
		8 (10)	25 (2.8)
		6–4 (16–25)	35 (4)
460	1–125	14–10 (2.5–6)	20 (2.25)
		8 (10)	25 (2.8)
		6–4 (16–25)	35 (4)
460	150–900	8–250 (10–120)	200 (22.5)

Service Entrance

Table 14 - Service Entrance Wire Range and Torque Requirements

Voltage	hp	Main Neutral		Ground with 3R Option	
		Wire Range AWG (mm²)	Torque lb-in. (N•m)	Wire Range AWG (mm²)	Torque lb-in. (N•m)
208/230	1–40	12–1/0 Al (4–50 Al)	75 (8.5)	12–1/0 Al (4–50 Al)	50 (5.6)
		14-1/0 Cu (2.5–50 Cu)	75 (8.5)	14-1/0 Cu (2.5–50 Cu)	
460	1–60	12–1/0 Al (4–50 Al)	75 (8.5)	12–1/0 Al (4–50 Al)	50 (5.6)
		14-1/0 Cu (2.5–50 Cu)	75 (8.5)	14-1/0 Cu (2.5–50 Cu)	
230	50–60	4–300 (25–150)	250 (120)	8 (10)	40 (4.5)
				6–4 (16–25)	45 (5.1)
460	75–125	4–300 (25–100)	250 (120)	8 (10)	40 (4.5)
				6–4 (16–25)	45 (5.1)

11. Consult Schneider Electric.

Control Wiring

Connect the control wiring to terminal block TB1. The control terminals are rated 250 V, 12 A. Refer to Wire Sizes and Tightening Torque For Terminal Block TB1, page 32 for wire sizes and tightening torques.

Table 15 - Wire Sizes and Tightening Torque For Terminal Block TB1

Control Terminals	Input/Output Speed Reference Wire Cross Section		Other Wire Cross Section		Tightening Torque lb-in. (N•m)
	Minimum[12] AWG (mm^2)	Maximum AWG (mm^2)	Minimum[12] AWG (mm^2)	Maximum AWG (mm^2)	
All terminals	20 (0.5)	12 (2.5)	18 (0.82)	12 (2.5) one-wire 16 (1.5) two-wire	4.4 (0.5)

Table 16 - TB1 User Terminal Connections

Function	Terminal	
Customer interlock (120 Vac) (+)	1	
Customer interlock (120 Vac)	2	
Customer interlock, bypass (120 Vac) (+)	1	
Customer interlock, bypass (120 Vac)	2A	
Auto mode remote start	3	4
AFC run status (N.C.)	5	7
AFC run status (N.O.)	6	7
AFC trip status (N.C.)	8	10
AFC trip status (N.O.)	9	10
4–20 mA (0-10 V) speed reference (common)	11	
4–20 mA (0-10 V) speed reference (+)	12	
4–20 mA (0-10 V) speed reference SHLD/GRD	13	
4–20 mA DC output speed SHLD/GRD	14	
4–20 mA DC output speed (+)	15	
4–20 mA DC output speed (common)	16	
Auto mode status (N.O.)	17	18
Bypass status (N.C.)	19	21
Bypass status (N.O.)	20	21
150 VA fused (3 A) (+)	22	
150 VA fused (3 A) (neutral)	23	

12. The value corresponds to the minimum permissible cross section of the terminal.

Programming and Setup

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read and understand the precautions in bulletin NHA60269, Drives Systems Installation and Maintenance, before performing any procedures in this bulletin.

Failure to follow these instructions will result in death or serious injury.

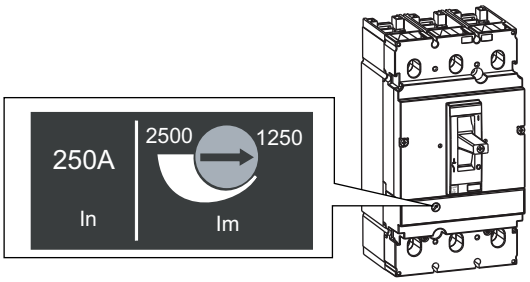
Factory Settings

If the power converter has been replaced or reset to the factory settings, you may need to adjust some parameter values. Parameter settings are included in the documentation provided with the equipment.

Adjusting the PowerPacT™ Circuit Breaker Trip Settings

Some circuit breakers have trip settings that may need adjustment according to the application and motor type. For more information on trip setting adjustment, refer to the circuit breaker instruction bulletin provided with the equipment, or available for download from the Technical Library at www.se.com/us/en.

Figure 7 - PowerPacT J FLA and Im Dial



Overload Relay Adjustment

Always verify that the overload relay setting does not exceed the motor full load current or rated power converter current found on the nameplate, whichever is less.

Overload Relay Adjustment Range for Full-Voltage Bypass Operation, page 33 provides the adjustment range for overload relays according to horsepower rating and voltage. Contact Schneider Electric if the adjustment range does not meet the intended application.

Table 17 - Overload Relay Adjustment Range for Full-Voltage Bypass Operation

hp	208 V	230 V	460 V
1	4–6	4–6	1.6–2.5
2	5.5–8	5.5–8	2.5–4

Table 17 - Overload Relay Adjustment Range for Full-Voltage Bypass Operation (Continued)

hp	208 V	230 V	460 V
3	9–13	9–13	4–6
5	12–18	12–18	5.5–8
7.5	23–32	17–24	9–13
10	37–50	23–32	12–18
15	48–65	37–50	17–24
20	63–80	48–65	23–32
25	80–104	55–70	30–40
30	90–150	60–100	30–40
40	—	90–150	48–65
50	—	90–150	55–70
60	—	[13]	60–100
75	—	—	60–100
100	—	—	90–150
125	—	—	132–220
150	—	—	132–220
200	—	—	200–330
250	—	—	200–330

Programming Access with Type 3R Enclosure

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA® 70E® Standard for Electrical Safety in the Workplace®, NOM-029-STPS – Maintenance of Electrical Installations in the Workplace, or CSA Z462 or local equivalent.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

Type 3R enclosures come with a remote keypad and cable inside the enclosure. To program the process drive with this equipment:

1. Remove all power from the enclosed drive.
2. Turn the circuit breaker and handle assembly to the Off position and open the enclosure door.

13. Consult Schneider Electric.

3. Test for the absence of voltage.

   NOTE: Verify that the voltage tester is functioning properly before and after testing for the absence of voltage.

4. Remove the remote keypad and cable from the enclosure.
5. Connect the remote keypad and cable to the drive.
6. Route the keypad cable between the bottom enclosure flange and the bottom of the door flange. See Routing the Remote Keypad on Floor Standing Enclosures, page 36 and Routing the Remote Keypad on Wall Mounted Enclosures, page 37.
7. Close and secure the enclosure door. Ensure that the keypad cable is not pinched by the door.
8. Close the disconnect means.
9. Program the drive with the keypad.
10. When programming is complete, remove all power then test for the absence of voltage.
11. Open the enclosure door and remove the remote keypad cable from the drive.
12. Place the remote keypad and cable inside the enclosure. Do not leave the remote keypad in the bottom of the enclosure.
13. Close and secure the enclosure door.

Figure 8 - Routing the Remote Keypad on Floor Standing Enclosures

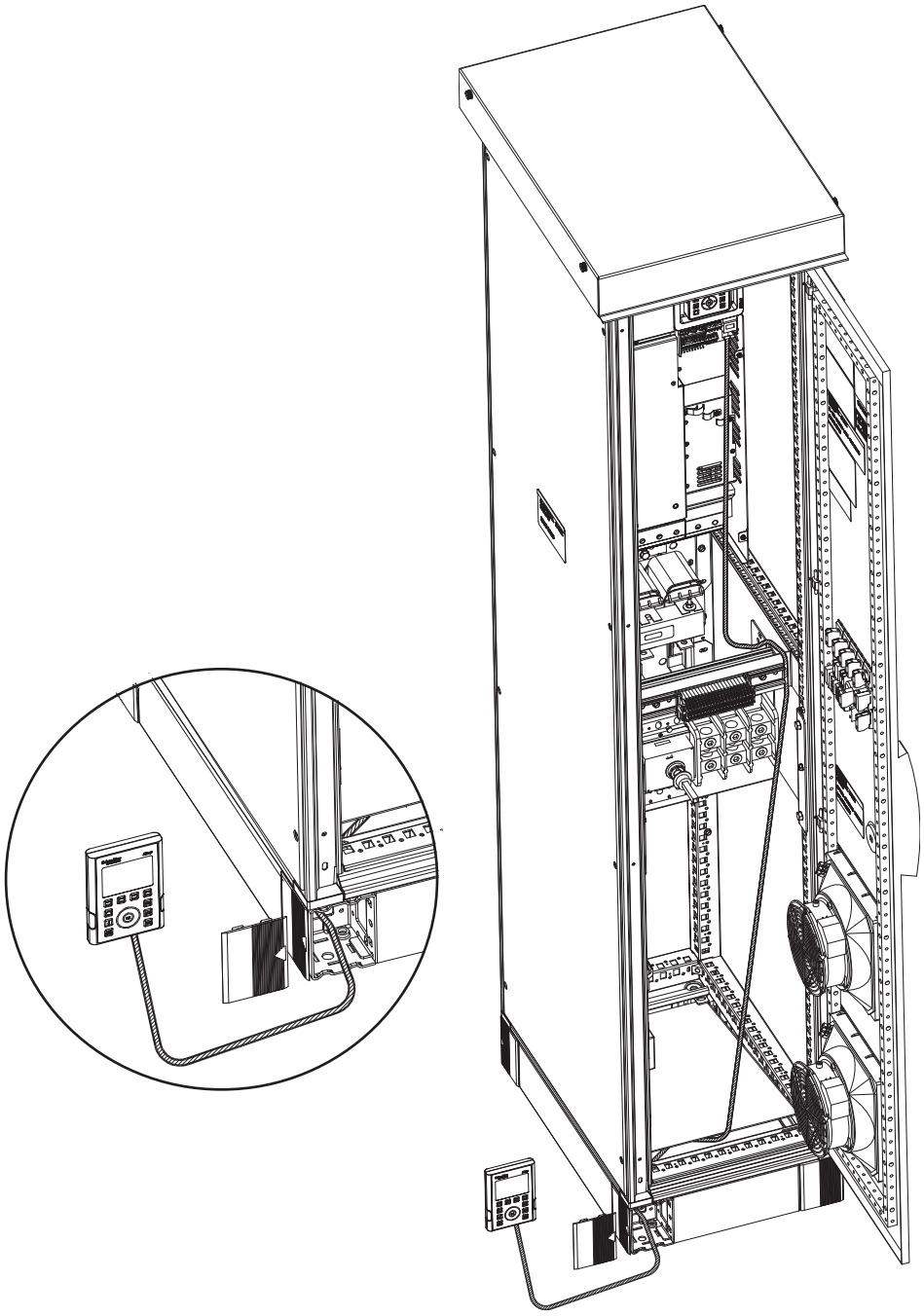
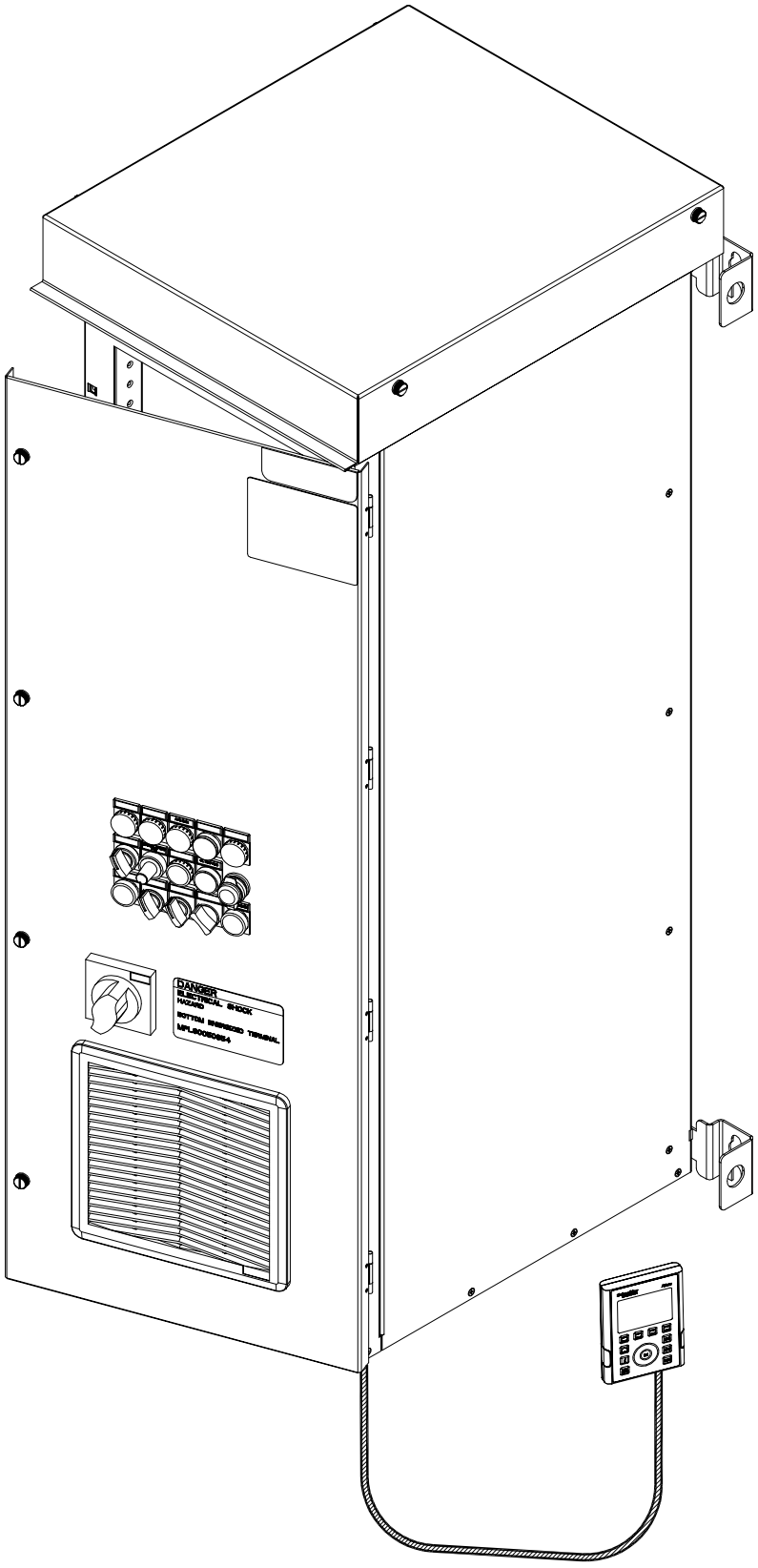


Figure 9 - Routing the Remote Keypad on Wall Mounted Enclosures



Circuit Operation and Options

Precautions

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read and understand the precautions in bulletin NHA60269, Drives Systems Installation and Maintenance, before performing any procedures in this bulletin.

Failure to follow these instructions will result in death or serious injury.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Before operating the ATV960 process drive:

- Read and understand the Altivar Process Programming Manual, EAV64318, before changing any parameters from the factory defaults.
- If the ATV960 drive is re-initialized using the total or partial factory setting function, the drive must be reprogrammed to the values listed in Drive System without Full-Voltage Bypass, Drive System with Integral Full-Voltage Bypass (Y10), Drive System with Integral Passive Harmonic Filter (M09), Drive System Configured For Heavy Duty (H06), and Drive System Configured for 0-10 V Speed Reference (E14).
- The UPS must be properly earthed/grounded and due to a high leakage current, the earthing/grounding conductor must be connected first.
- If the drive or the main control board of the drive is replaced, the drive must be reprogrammed to the values listed in Drive System without Full-Voltage Bypass, Drive System with Integral Full-Voltage Bypass (Y10), Drive System with Integral Passive Harmonic Filter (M09), Drive System Configured For Heavy Duty (H06), and Drive System Configured for 0-10 V Speed Reference (E14) and in the order which they are given.

Failure to follow these instructions will result in death or serious injury.

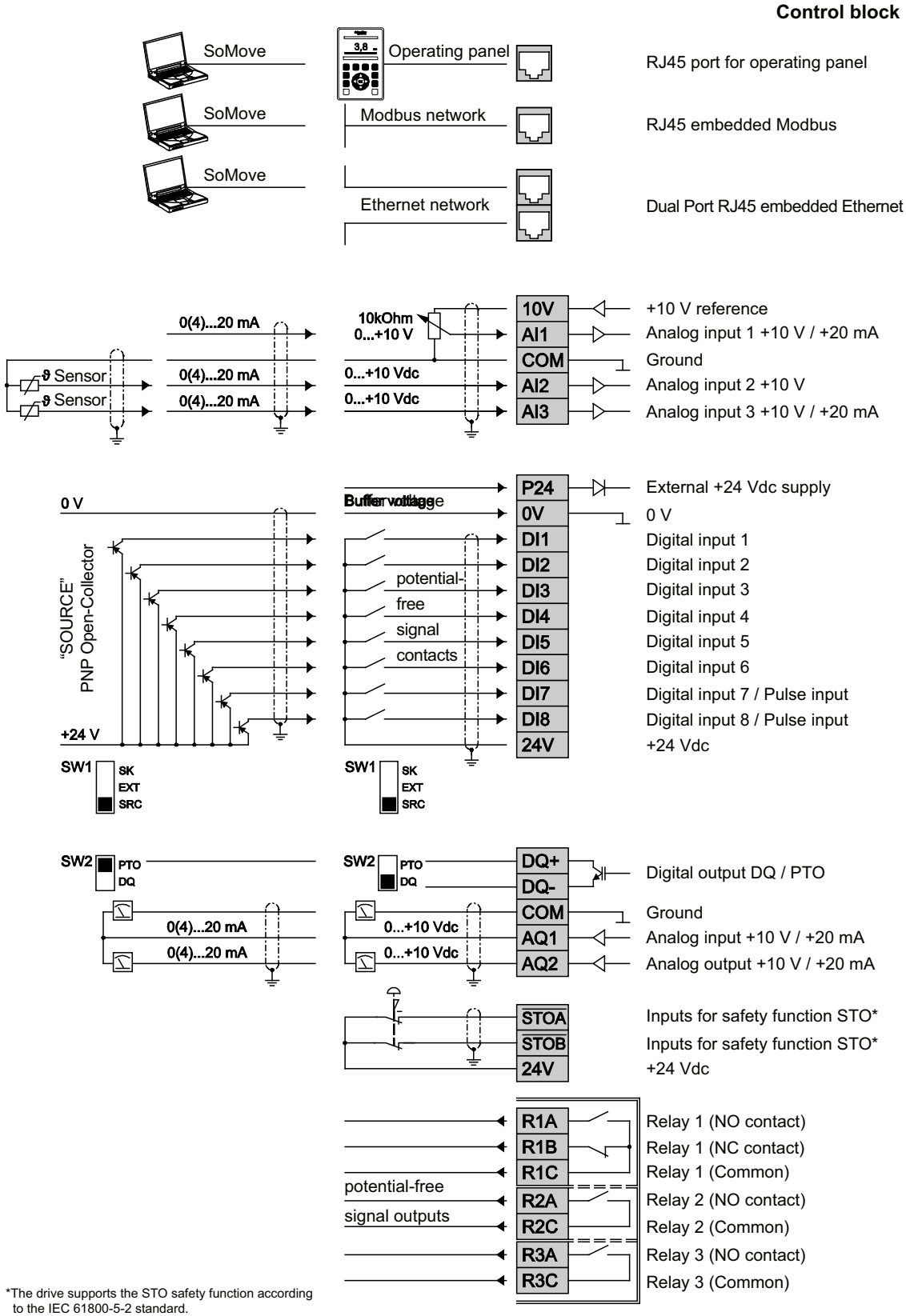
Voltage Supply and Auxiliary Voltage

- All drive systems are equipped with a control transformer matching the mains voltage and the required power.
- When equipped, the DC supply units generate 48 Vdc for the internal power fans, the fans in the drive enclosure doors, and a 24 Vdc auxiliary voltage.
- By default all control components are supplied by the 115 Vac control transformer.

NOTE: For buffering the control block and keeping communication active (for example, fieldbus), the control block can be supplied via terminals P24 and 0V externally with 24 Vdc. A 24 Vdc power supply is provided if both bypass and line contactor options are selected.

Control Terminals

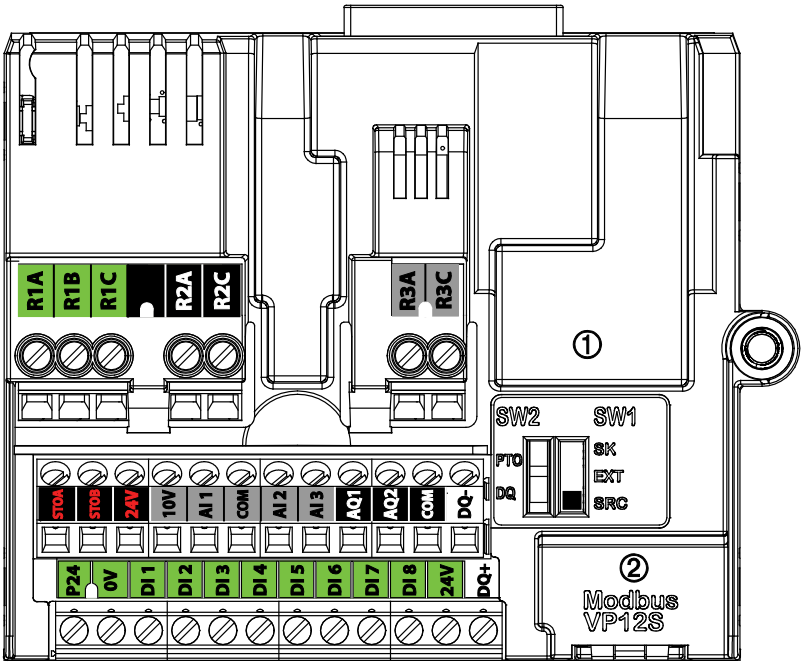
Figure 10 - Control Terminals at the Control Block



*The drive supports the STO safety function according to the IEC 61800-5-2 standard.

Control Terminal Specifications

Figure 11 - Control Terminals



1. Ethernet Modbus™ TCP
2. Serial Modbus

Maximum Cable Length

- AI•, AQ•, DI•, DQ•: 50 m shielded
- STOA, STOB: 30 m

Wiring Characteristics

Table 18 - Wire Sizes and Tightening Torque

Control Terminals	Relay Output Wire Cross Section		Other Wire Cross Section		Tightening Torque lb-in. (N•m)
	Minimum[14] AWG (mm²)	Maximum AWG (mm²)	Minimum[14] AWG (mm²)	Maximum AWG (mm²)	
All terminals	18 (0.75)	16 (1.5)	20 (0.5)	16 (1.5)	4.4 (0.5)

Consider the protective separation (PELV) when preparing the signal wires and coupling relay. A PELV system is an electrical system in which voltage cannot exceed 50 volts RMS for alternating current, or ripple-free 120 volts for direct current, under dry conditions and which can have a ground connection.

14. The value corresponds to the minimum permissible cross section of the terminal.

Control Terminal Electrical Characteristics

- For a description of the terminal arrangement, refer to Control Block Ports, page 44.
- For factory setting I/O assignments, refer to the Programming Manual or the documentation supplied with your enclosed drive.

Table 19 - Electrical Characteristics

Terminal	Description	I/O Type	Electrical characteristics
R1A	NO contact of relay R1	O	**Output Relay 1** • Minimum switching capacity: 5 mA for 24 Vdc • Maximum switching current on resistive load: (cos j = 1): 3 A for 250 Vac and 30 Vdc • Maximum switching current on inductive load: (cos j = 0.4 and L/R = 7 ms): 2 A for 250 Vac and 30 Vdc • Refresh time: 5 ms ± 0.5 ms • Service life: 100,000 operations at maximum switching current
R1B	NC contact of relay R1	O	
R1C	Common point contact of relay R1	O	
R2A	NO contact of relay R2	O	**Output Relay 2** • Minimum switching capacity: 5 mA for 24 Vdc • Maximum switching current on resistive load: (cos j = 1): 5 A for 250 Vac and 30 Vdc • Maximum switching current on inductive load: (cos j = 0.4 and L/R = 7 ms): 2 A for 250 Vac and 30 Vdc • Refresh time: 5 ms ± 0.5 ms • Service life: ◦ 100,000 operations at maximum switching power ◦ 500,000 operations at 0.5 A for 30 Vdc ◦ 1,000,000 operations at 0.5 A for 48 Vac
R2C	Common point contact of relay R2	O	
R3A	NO contact of relay R3	O	**Output Relay 3** • Minimum switching capacity: 5 mA for 24 Vdc • Maximum switching current on resistive load: (cos j = 1): 5 A for 250 Vac and 30 Vdc • Maximum switching current on inductive load: (cos j = 0.4 and L/R = 7 ms): 2 A for 250 Vac and 30 Vdc • Refresh time: 5 ms ± 0.5 ms • Service life: ◦ 100,000 operations at maximum switching power ◦ 500,000 operations at 0.5 A for 30 Vdc ◦ 1,000,000 operations at 0.5 A for 48 Vac
R3C	Common point contact of relay R3	O	
STOA, STOB	STO inputs	I	**Safety Function STO Inputs** Refer to the Safety Functions Manual (NHA80947) available on www.se.com.[15]
24V	Output power supply for digital inputs and safety function STO inputs[15]	O	• +24 Vdc • Tolerance: minimum 20.4 Vdc, maximum 27 Vdc • Current: maximum 200 mA for both 24 Vdc terminals • Terminal protected against overload and short-circuit • In the Sink Ext position, this supply is powered by the external PLC supply
10V	Output supply for Analog input	O	Internal supply for the analog inputs • 10.5 Vdc • Tolerance ± 5% • Current: maximum 10 mA • Short circuit protected

15. The drive supports the STO safety function according to the IEC 61800-5-2 standard.

Table 19 - Electrical Characteristics (Continued)

Terminal	Description	I/O Type	Electrical characteristics
AI1, AI3	Analog inputs and sensor inputs	I	Software-configurable V/A: voltage or current analog input • Voltage analog input 0–10 Vdc, impedance 31.5 kW • Current analog input X–Y mA by programming X and Y from 0–20 mA, with impedance 250 W • Maximum sampling time: 1 ms ± 1 ms • Resolution 12 bits • Accuracy: ± 0.6% for a temperature variation of 60°C (140 °F) • Linearity ± 0.15% of maximum value Software-configurable thermal sensors or water level sensor • **PT100** ◦ 1 or 3 thermal sensors mounted in series (configurable by software) ◦ Sensor current: 5 mA maximum ◦ Range –20 to 200°C (–4 to 392°F) ◦ Accuracy ± 4°C (7.2°F) for a temperature variation of 60°C (140°F) • **PT1000** ◦ 1 or 3 thermal sensors mounted in series (configurable by software) ◦ Sensor current: 1 mA ◦ Range –20 to 200°C (–4 to 392°F) ◦ Accuracy ± 4°C (7.2°F) for a temperature variation of 60°C (140°F) • **KTY84** ◦ 1 thermal sensor ◦ Sensor current: 1 mA ◦ Range –20 to 200°C (–4 to 392°F) ◦ Accuracy ± 4°C (7.2°F) for a temperature variation of 60°C (140°F) • **PTC** ◦ 6 sensors maximum mounted in series ◦ Sensor current: 1 mA ◦ Nominal value: < 1.5 kΩ ◦ Overheat trigger threshold: 2.9 kΩ ± 0.2 kΩ ◦ Overheat reset threshold: 1.575 kΩ ± 0.75 kΩ ◦ Threshold for low impedance detection: 50 kΩ –10 Ω/+20 Ω ◦ Protected for low impedance < 1000 Ω
COM	Analog I/O common	I/O	0 V for Analog outputs
AI2	Analog input	I	Voltage bipolar analog input –10 to +10 Vdc, impedance 31.5 kΩ • Maximum sampling time: 1 ms ± 1 ms • Resolution 12 bits • Accuracy: ± 0.6% for a temperature variation of 60°C (140°F) • Linearity ± 0.15% of maximum value
AQ1	Analog output	O	AQ: Analog output software-configurable for voltage or current • Voltage analog output 0–10 Vdc, minimum. Minimum load impedance 470 Ω • Current analog output X–Y mA by programming X and Y from 0–20 mA, maximum load impedance 500 Ω • Maximum sampling time: 5 ms ± 1 ms • Resolution 10 bits • Accuracy: ± 1% for a temperature variation of 60°C (140°F) • Linearity ± 0.2%
AQ2	Analog output	O	
COM	Digital and analog output Common	I/O	0 V for analog outputs and logic output

Table 19 - Electrical Characteristics (Continued)

Terminal	Description	I/O Type	Electrical characteristics
DQ–	Digital output	O	Digital output configurable by switch • Insulated • Maximum voltage: 30 Vdc • Maximum current: 100 mA • Frequency range: 0–1 kHz • Positive/Negative logic is managed by user external wiring.
DQ+	Digital output	O	
DQ+	Pulse output	O	Pulse-train output (configurable by switch) • Open collector not insulated • Maximum voltage: 30 Vdc • Maximum current: 20 mA • Frequency range: 0–30 kHz
P24	External input supply	I	+24 Vdc external input supply • Tolerance: 19–30 Vdc • Maximum current: 0.8 A
0V	0 V	I/O	0 V of P24
DI1-DI8	Digital inputs	I	8 programmable logic inputs 24 Vdc, comply with IEC/EN 61131-2 logic type 1 • Positive logic (Source): State 0 if ≤ 5 Vdc or logic input not wired, state 1 if ≥ 11 Vdc • Negative logic (Sink): State 0 if ≥ 16 Vdc or logic input not wired, state 1 if ≤ 10 Vdc • Impedance 3.5 kΩ • Maximum voltage: 30 Vdc • Maximum sampling time: 2 ms ± 0.5 ms Multiple assignment makes it possible to configure several functions on one input (example: DI1 assigned to forward and preset speed 2, DI3 assigned to reverse and preset speed 3).
DI7-DI8	Pulse inputs	I	Programmable Pulse input • Comply with level 1 PLC, IEC 65A-68 standard • State 0 if < 0.6 Vdc, state 1 if > 2.5 Vdc • Pulse counter 0–30 kHz • Frequency range: 0–30 kHz • Cyclic ratio: 50% ± 10% • Maximum input voltage 30 Vdc, < 10 mA • Maximum sampling time: 5 ms ± 1 ms

Control Block Ports

Figure 12 - Control Block Ports

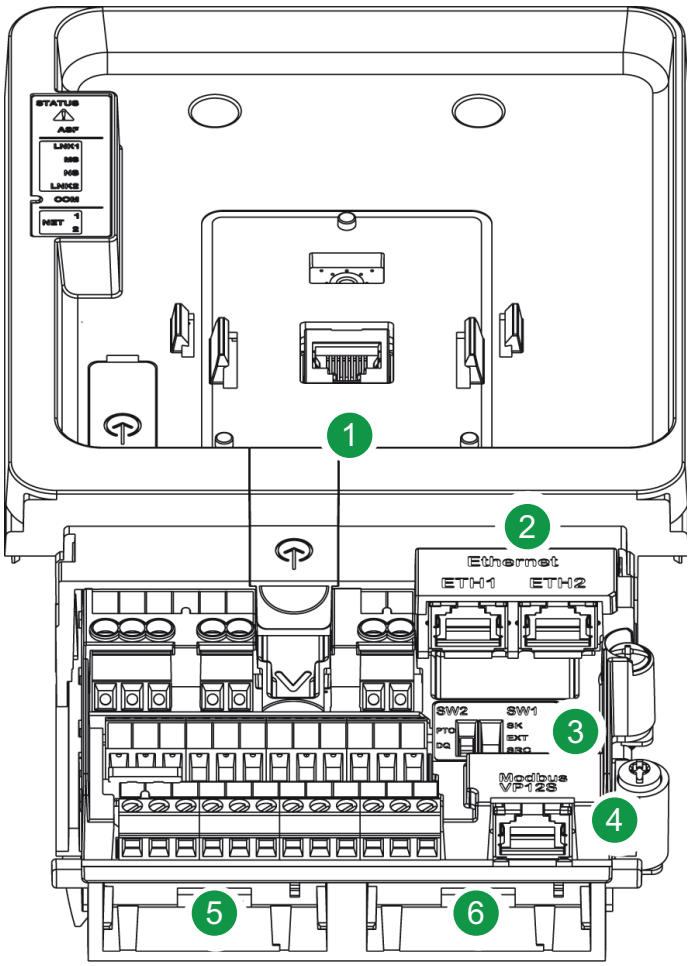


Table 20 - Control Block Terminal Ports

Marking	Description
1	RJ45 port for Graphic display terminal
2	RJ45 ports for Ethernet embedded
3	Sink-Ext-Source switch PTO-DQ switch (see Configuration of the Sink/Source Selector Switch, page 45)
4	RJ45 port for Modbus embedded
5	Slot B, for encoder interface, and I/O relay module
6	Slot A, for communication and I/O relay modules

RJ45 Communication Ports

The control block includes four RJ45 ports. They allow you to connect:

- A PC for using a commissioning software (such as SoMove™ or SoMachine™ software) to configure and monitor the drive and to access the drive webserver
- A SCADA system
- A PLC system
- A Graphic display terminal, using Modbus protocol
- A Modbus fieldbus

NOTE:

- Verify that the RJ45 cable is not damaged before connecting it to the drive, otherwise there could be interruptions in control power or loss of communication.
- Do not plug an Ethernet cable into the Modbus port or vice versa.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Electrical equipment must be installed, operated, serviced, and maintained only by qualified personnel.
- Check whether the temperature sensors in the motor have protective separation to all parts carrying live voltage according to IEC 60664.
- Ensure that all connected equipment fulfills the PELV conditions.

Failure to follow these instructions will result in death or serious injury.

⚠CAUTION

MISOPERATION DUE TO INTERFERENCES

- Use shielded signal wires in order to avoid misoperation.
- Take care that the signal wires do not exceed the specified maximum cable length. See Maximum Cable Length.

Failure to follow these instructions can result in injury or equipment damage.

Configuration of the Sink/Source Selector Switch

⚠WARNING

UNANTICIPATED EQUIPMENT OPERATION

- If the selector switch at the drive is set to Sink or Ext, do not connect the 0 V terminal to ground or protective grounding.
- Verify that accidental grounding of digital inputs configured for sink logic cannot occur (for example, due to signal cable damage).
- Follow all applicable standards and directives, such as NFPA® 70E® Standard for Electrical Safety in the Workplace® and EN 60204, for proper control circuit grounding practices.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The switch is used to adapt the operation of the digital inputs to the technology of the signal control. The switch is located below the control terminals (see Control Block Ports, page 44).

- Set the selector switch to SRC (Source) when using PLC outputs with PNP transistors (factory setting).
- Set the switch to Ext (external) when using PLC outputs with NPN transistors.

Figure 13 - Selector Switch in Position SRC (Source) and Internal Voltage Supply of the Digital Inputs

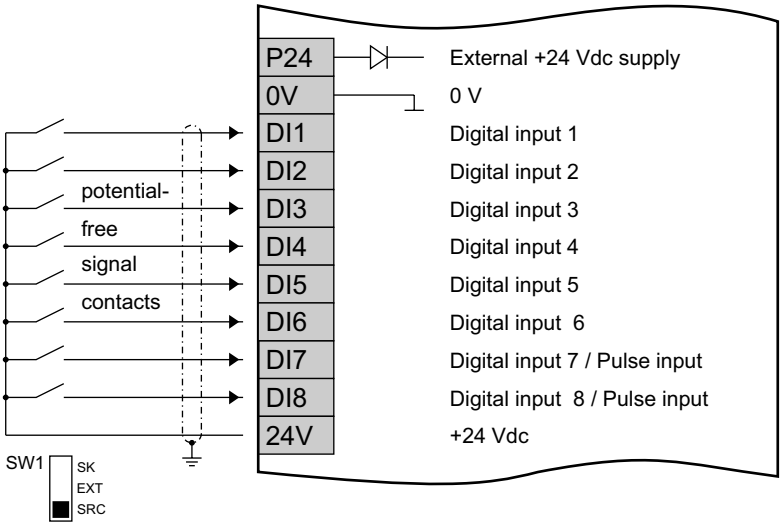
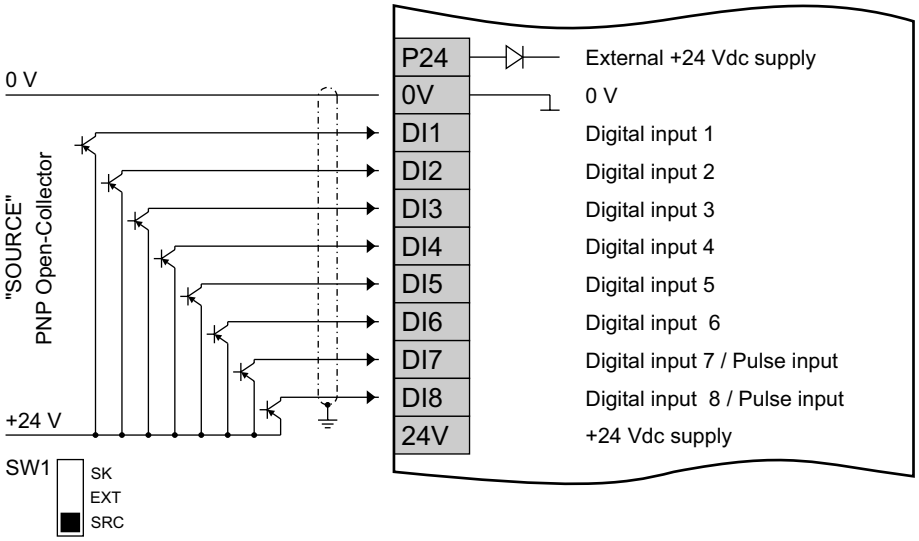


Figure 14 - Selector Switch in Position SRC (Source) and External Voltage Supply of the Digital Inputs



Programming the Power Converter

The ATV960 process drive system is factory configured as shown in Drive System without Full-Voltage Bypass, page 47. Be sure to configure the drive's motor full-load current as shown on the motor nameplate. For additional programming information, see the ATV900 Programming manual available online at www.se.com.

⚠⚠WARNING

LOSS OF CONTROL

Changes to the factory set parameters must be completed in the sequence given in Drive System without Full-Voltage Bypass.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Changes to parameter factory settings must be completed in the order in which the parameters appear in Drive System without Full-Voltage Bypass, page 47. Space is provided in the table for noting changes to the factory settings for your records.

Table 21 - Drive System without Full-Voltage Bypass

Menu	Parameter	Description	Factory Setting	Custom Setting
1	bFr	Basic Frequency	60	
1	tFr	Max Frequency	60	
1	LSP	Low Speed	3	
5.2	SFr	Switching frequency	2.5	
5.4	Fr1	REF FREQ 1 Config	AI3	
5.4	rFC	Freq Switch Assign	DI3	
5.4	tCt	2-wire type	LEL	
5.4	Fr2	REF. FREQ 2 CONFIG	AI1	
5.4	CHCF	Control Mode	IO	
5.4	CCS	Command Switching	DI3	
5.4	Cd1	CMD Channel 1	tEr	
5.4	Cd2	CMD Channel 2	tEr	
5.14	AI3T	AI3 TYPE	0A	
5.14	CrL3	AI3 min value	4	
5.14	AO1	AQ1 ASSIGNMENT	oFr	
5.14	AOL1	AQ1 min output	4	
5.14	r1	R1 ASSIGNMENT	FLt	
5.14	r2	R2 ASSIGNMENT	run	
5.16	FLr	Catch on the fly	YES	
5.16	rSF	Trip Reset	DI4	

Adjust the parameters shown in Drive System with Integral Full-Voltage Bypass (Y10), page 48, Drive System with Integral Passive Harmonic Filter (M09), page 48Drive System with Integral Passive Harmonic Filter (M09), page 48, Drive System Configured For Heavy Duty (H06), page 48, and Drive System Configured for 0-10 V Speed Reference (E14), page 48if these optional features are included with the equipment.

Table 22 - Drive System with Integral Full-Voltage Bypass (Y10)

Menu	Parameter	Description	Factory Setting	Custom Setting
5.2	nSt	DI2 (Low Level)	DI2	

Table 23 - Drive System with Integral Passive Harmonic Filter (M09)

Menu	Parameter	Description	Factory Setting	Custom Setting
5.12	Ftd	Motor Freq Thd	1	
5.14	FtA	R3 Assignment	Motor frequency high threshold	
5.14	rld	R3 Delay time	2000	
5.16	EtF	Ext Error assign	DI6 (low level)	

Table 24 - Drive System Configured For Heavy Duty (H06)

Menu	Parameter	Description	Factory Setting	Custom Setting
5.2	Drt	Dual rating	HIGH	

Table 25 - Drive System Configured for 0-10 V Speed Reference (E14)

Menu	Parameter	Description	Factory Setting	Custom Setting
5.14	AI3T	AI3 TYPE	10u	

Electromagnetic Compatibility

This product meets the EMC requirements according to the standard IEC 61800-3 if the measures described in this manual are implemented during installation. If the selected composition (the product itself, the mains filter, or other accessories and measures) does not meet the requirements of category C1, the following information applies as it appears in IEC 61800-3:

⚠⚠WARNING

RADIO INTERFERENCE

In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Operation on an IT or Corner-Grounded System

Definition

An IT system is one with an isolated or impedance grounded neutral. Use a permanent insulation monitoring device compatible with nonlinear loads, such as an XM200 type or equivalent.

A corner-grounded system has one phase grounded, for example corner-grounded delta.

Operation

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read and understand the precautions beginning with Installation and Maintenance Precautions before performing any procedure in this section.

Failure to follow these instructions will result in death or serious injury.

NOTE: If the equipment is installed on an electrical system with either IT mains or corner-grounded delta configuration, the EMC ground reference must be removed according to the instructions in “Configuration” below.

The enclosed drives have a built-in EMC filter. As a result they exhibit leakage current to ground. If the leakage current creates compatibility problems with your installation, you can reduce the leakage current by removing the screws as shown in the following section. In this configuration the product does not meet the EMC requirements according to the standard IEC 61800-3.

Configuration

For all 208/230 V enclosed drives and for enclosed drives rated 1–100 hp HD, 1–125 hp ND, @ 460 V, refer to Altivar Process Variable Speed Drives ATV930, ATV950 Installation Manual (NHA80932) for instructions on configuring the equipment for operation on an IT or corner-grounded system.

For 125–700 hp HD, 150–900 hp ND, 460 V enclosed drives, follow these steps:

1. Remove all power from the enclosed drive.
2. Turn the circuit breaker and handle assembly to the Off position and open the enclosure door.
3. Test for the absence of voltage.

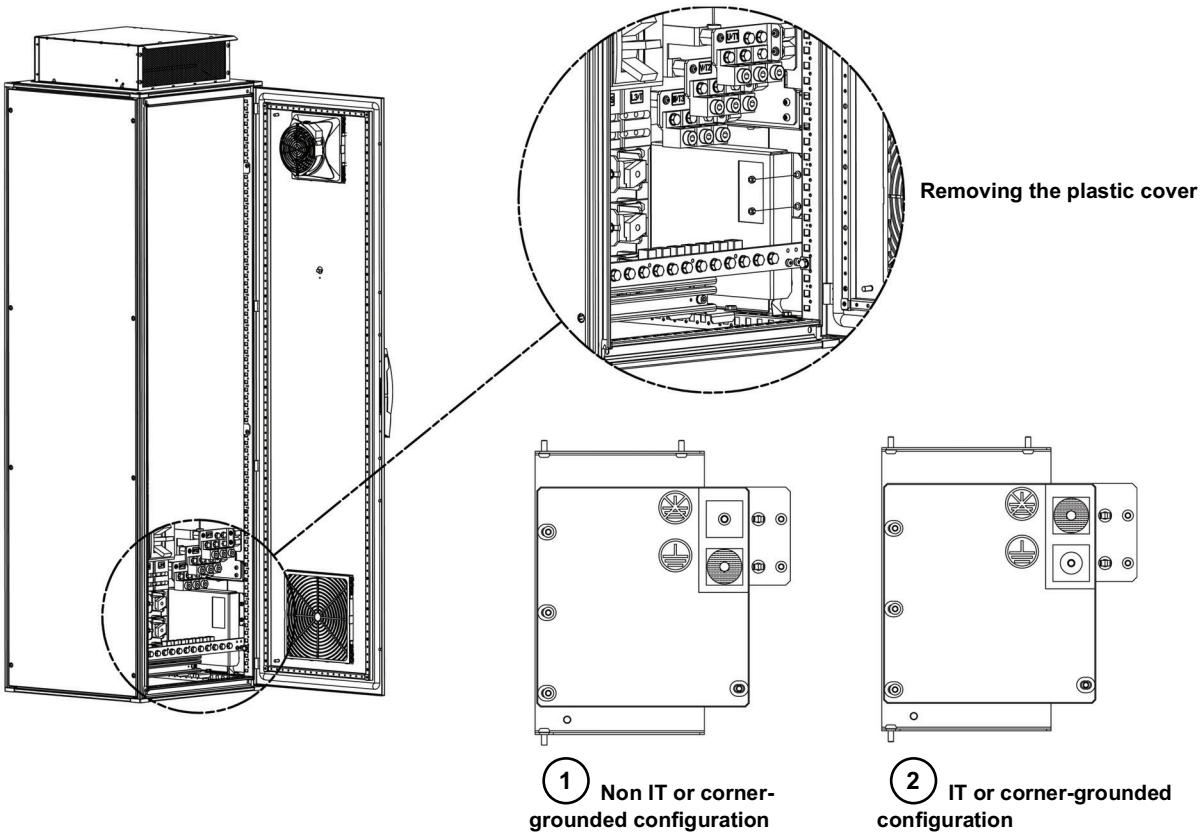
   NOTE: Verify that the voltage tester is functioning properly before and after testing for the absence of voltage.
4. Locate the EMC filter board. It is typically located in the lower right corner. See Settings for 125–700 hp HD, 150–900 hp ND, 460 V Enclosed Drives, page 50.
5. Remove two nuts and remove the clear plastic cover. See Settings for 125–700 hp HD, 150–900 hp ND, 460 V Enclosed Drives, page 50.
6. For operation on a system that is not IT or corner-grounded ⏚, position the bolt and washer as shown in Settings for 125–700 hp HD, 150–900 hp ND, 460 V Enclosed Drives, page 50, detail 1. Torque the bolt to 49 lb-in. (5.5 N•m).

   NOTE: Take care when you remove the bolt, as the EMC board can shift.

7. For operation on an IT or corner-grounded system ⏚, position the bolt and washer as shown in Settings for 125–700 hp HD, 150–900 hp ND, 460 V Enclosed Drives, page 50, detail 2. Torque the bolt to 49 lb-in. (5.5 N•m).
8. Replace the clear plastic cover. Torque the nuts to 49 lb-in. (5.5 N•m).
9. Close all doors and restore power to the enclosed drive.

NOTE: Use only the hardware supplied with the equipment. Do not operate the drive with the setting bolt removed.

Figure 15 - Settings for 125–700 hp HD, 150–900 hp ND, 460 V Enclosed Drives



Power Circuit W: Without Bypass

The non-bypass power circuit provides a coordinated drive and circuit breaker package. It includes a number of possible power circuit additions including selection of harmonic and transient mitigation methods. Additional space is provided for engineered to order options and field installable equipment.

Power Circuit Y: With Integral Full-Voltage Bypass

The bypass power circuit provides a coordinated drive and circuit breaker package and the flexibility and security of a full-voltage bypass motor drive that is available at any time. The Zelio Smart Relay coordinates the power converter's output contactor and bypass contactor. See Appendix A for more information. A number of possible power circuit additions, including selection of harmonic and transient mitigation methods and options like the field service disconnect and line isolation contactor, are available in this power circuit configuration allowing for even greater reliability and

serviceability. Additional space is provided for engineered to order options and field installable equipment.

The integral full-voltage bypass starter includes a Class 10 bimetallic or solid-state overload relay.

NOTICE
UNINTENDED EQUIPMENT OPERATION Switching between Drive mode and Bypass mode without allowing the motor to come to a complete stop is not recommended. **Failure to follow these instructions can result in equipment damage.**

Power Circuit S: With ATS22/ATS480 Softstart Bypass

This power circuit option provides additional flexibility and reliability to the bypass configuration with the option of selection between ATS22 and ATS480 softstarts.

Mod A09: 5% Impedance

This option provides a total of 5% equivalent line impedance.

Mod M09: Passive Harmonic Filter

This option includes a integrally-mounted harmonic filter, factory installed and wired between the circuit breaker disconnect means and the power converter for harmonic mitigation.

UL® Type 3R Operation

To prevent condensation on the inside of the cabinet, leave the process drive energized even when the motor is not running.

The enclosed drive has a UL 869A approved insulated ground neutral lug assembly and mounting bracket with a bonded enclosure ground wire suitable for use as service entrance rated equipment. Service Entrance Rating is not available when cUL is required.

Control Options

Mod A11: Hand-Off-Auto Selector Switch

Mod A11 provides a door-mounted Hand-Off-Auto selector switch for operating the drive system (two-wire control scheme).

- Hand mode is for local control. When Hand mode is selected, the drive starts the motor and speed command reference is provided by the door mounted speed potentiometer.
- Off mode commands the drive to stop the motor by deceleration ramp.
- Auto mode is for remote control. In Auto mode, the drive starts the motor when the user-supplied Start contact is closed between drive terminals 3 and 4. The drive stops the motor when the user-supplied Start contact is opened.
- The speed command reference is provided by the speed control reference signal supplied to AI3 (factory set for 4-20 mA input).

Mod B11: Hand-Auto Selector Switch and Start-Stop Push Buttons

⚠WARNING

INABILITY TO INITIATE A STOP

The Stop push button is only active in the Hand mode.

- To stop the controller, open the disconnect switch or set the Hand-Off-Auto switch to Off.
- Use appropriate guarding or interlocking.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Mod B11 provides a door-mounted, Hand-Off-Auto selector switch, a Start push button, and a Stop push button (mixed mode control scheme).

- Hand mode is for local control. In Hand mode:
  - The Start push button commands the drive to start the motor.
  - The Stop push button commands the drive to stop the motor by deceleration ramp.
  - The speed command reference is provided by the door-mounted speed potentiometer.
- Off mode commands the drive to stop the motor by deceleration ramp.
- Auto mode is for remote control. In Auto mode, the drive starts the motor when the user-supplied Start contact is closed between drive terminals 3 and 4. The drive stops the motor when the user-supplied Start contact is opened. In Auto mode:
  - The Start push button **does not** command the drive to start the motor locally.
  - The Stop push button **does not** command the drive to stop the motor locally.
  - The speed command reference is provided by the speed control reference signal supplied to AI3 (factory set for 4-20 mA input).

Mod N11: No Control Operators

No door-mounted control operators are provided. Omit a control option selection when ordering to receive no operators. A run command 120 Vac relay, connected to the customer terminal blocks, is provided.

Pilot Light Cluster Options

Mod A12: Pilot Light Cluster 1

Mod A12 provides red Run (On), green Run, and yellow Trip and Auto pilot lights for status enunciation.

Mod B12: Pilot Light Cluster 2

Mod B12 provides red Run (On), green Run, and yellow Trip pilot lights for status enunciation.

Mod N12: No Pilot Lights

No door-mounted lights are provided. Omit a pilot light option selection when ordering to receive no lights.

Miscellaneous Options

Mod A14: Door Mounted Ethernet Port

Provides a port on the door of the enclosed drive for making an Ethernet connection.

Mod B14: Line Contactor

This option is only available for Power Circuit Y (Bypass). It provides a factory-wired line contactor between the circuit breaker disconnect (or line reactor or harmonic filter when provided) and the power converter. When the line contactor is open, the 24 V power supply keeps serial communication enabled.

Mod E14: 0–10 V Auto Speed Reference

This option provides a 0–10 V user-supplied auto speed reference signal into the AI3 input, terminals 12 and 13 on terminal block TB1. The 0–10 V analog input is not optically isolated.

Mod F14: 1 N.O. (Form A) Auxiliary Auto Mode Contact

Mod F14 provides one Form A, normally open (N.O.) contact, rated 5 A at 120 Vac, wired to the terminal blocks. The contact(s) change state when the controller is placed in Auto (Remote) mode. This option is included with 125–700 hp HD and 150–900 hp ND enclosed drives.

Mod G14: Type 1 Surge Protective Device

Mod G14 provides an integrated Type 1 supplementary voltage surge protective device to protect equipment in the event of transient voltage surges associated with some electrical power distribution systems. The SPD is suitable for peak surge currents up to 40 kA.

Mod H14: Type 2 Surge Protective Device

Mod H14 provides an integrated Type 2 supplementary voltage surge protective device (SPD) to protect equipment in the event of transient voltage surges associated with some electrical power distribution systems. The SPD is suitable for peak surge currents up to 80 kA.

Mod K14: 150 VA Control Power

Mod K14 provides additional VA capacity of the control power transformer to power field installable equipment and control circuits.

Mod L14: Push-to-Test Pilot Lights

This option provides a push-to-test feature on all pilot lights except Power On.

Mod P14: Permanent Wire Markers

Mod P14 provides permanent wire markers for control wires for use in identification and troubleshooting of control circuits.

Mod Q14: Trip Reset

Provides a push button signal to reset a drive trip or bypass overload trip. Mod Y10 Bypass must also be selected.

Mod S14: 50°C Operation

Mod S14 provides a high ambient equipment rating above 40°C (104°F) to a maximum of 50°C (122°F). This modification requires derating to the current ratings shown in Input and Output Current Ratings and Dissipated Heat, page 21.

Mod T14: Drive Input Disconnect Switch

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Do not operate the switch with the door open.

Failure to follow these instructions will result in death or serious injury.

This option provides an input line power disconnect switch between the mains power disconnect and the power converter. The Drive Input Disconnect Switch will disconnect line power to the power converter. The motor can run in bypass mode in the unlikely event the power converter becomes inoperative.

Mod U14: Top Entry Cubicle

Mod U14 provides additional wireway space for floor-mounted equipment, especially where mains or motor conductors are feed from the top of the equipment. Available for 150–900 hp ND and 125–700 hp HD @ 460 Vac.

Mod X14: dv/dt Filter

Provides a factory mounted and wired dv/dt filter on the drive output for long motor lead lengths in excess of published guidelines.

Table 26 - Maximum Cable Lengths

Type of Cable	Maximum Cable Length
Shielded	984 ft (300 m)
Unshielded	1640 ft (500 m)

Mod Y14: Seismic Certificate

Supplies a certification label and hardware qualification to seismic rating ICC ES AC156.

Drive Communications and Expansion Cards

ATV960 process drives come factory configured with integral Modbus and Ethernet communications for the drive. The optional expansion cards described in this section are available for additional communication systems and feature configurations.

Mod A13: Profibus DP V1

Mod A13 provides a factory installed plug-in Profibus DP V1 card (VW3A3607). Connect to the Profibus DP card with one nine-pin female SUB-D connector.

Mod B13: CANopen Daisy Chain

Mod B13 provides a factory installed plug-in CANopen daisy chain card (VW3A3608). Connect to the CANopen daisy chain card with two RJ-45 ports.

Mod C13: DeviceNet

Mod C13 provides a factory installed plug-in DeviceNet card (VW3A3609). Connect to the DeviceNet card with one five-point terminal block.

Mod D13: CANopen SUB-D

Mod D13 provides a factory installed plug-in CANopen Sub-D9 card (VW3A3618). Connect to the CANopen Sub-D9 card with one nine-pin male SUB-D connector.

Mod E13: CANopen Open Style

Mod E13 provides a factory installed plug-in CANopen open style card (VW3A3628). Connect to the CANopen open style card with one five-point terminal block.

Mod F13: ProfiNet

Mod F13 provides a factory installed plug-in ProfiNet card (VW3A3627). Connect to the ProfiNet card with two RJ-45 ports.

Mod C14: I/O Extension Card

Mod C14 provides a factory installed I/O expansion card (VW3A3203). The card expands the available I/O with an additional six logic inputs, two logic outputs, and two analog inputs.

Mod D14: Relay Output Card

Mod D14 provides a factory installed relay output card (VW3A3204). The card adds three normally open contacts that may be assigned within drive logic.

Mod H13: EtherCat

Provides a factory installed VW3A3601 card.

Mod B13: Bacnet MS/TP

Provides a factory installed Bacnet MS/TP (VW3A3725) card.

Engineered to Order Options

Along with the options listed in Configured to Order list described before- there are additional Engineered to Order options available as EPMOD. If any additional feature is needed to be ordered, other than the ones listed below, please get in touch with local Drives Representative.

Other Engineered to Order Options include:

1. Emergency Stop
2. Options for customized pilot light colors and sizes
3. Additional factory wired contacts for customer use
4. Additional customer supplied or PM5000 series meters
5. Control circuit updates to including- Power On Delay, Smoke Purge/End Damper circuit, High/Low Pressure alarms, High/ Low Basin level alarms, Motor Overtemperature alarm, Additional control power for customer use, Provision for motor heater circuits etc.
6. Additional relays, current transformers, potential transformers etc.
7. Softstart bypass options with ATS22 and ATS480

Component Locations, Dimensions, and Schematics

Component Locations

Figure 16 - Wall-Mounted Enclosures

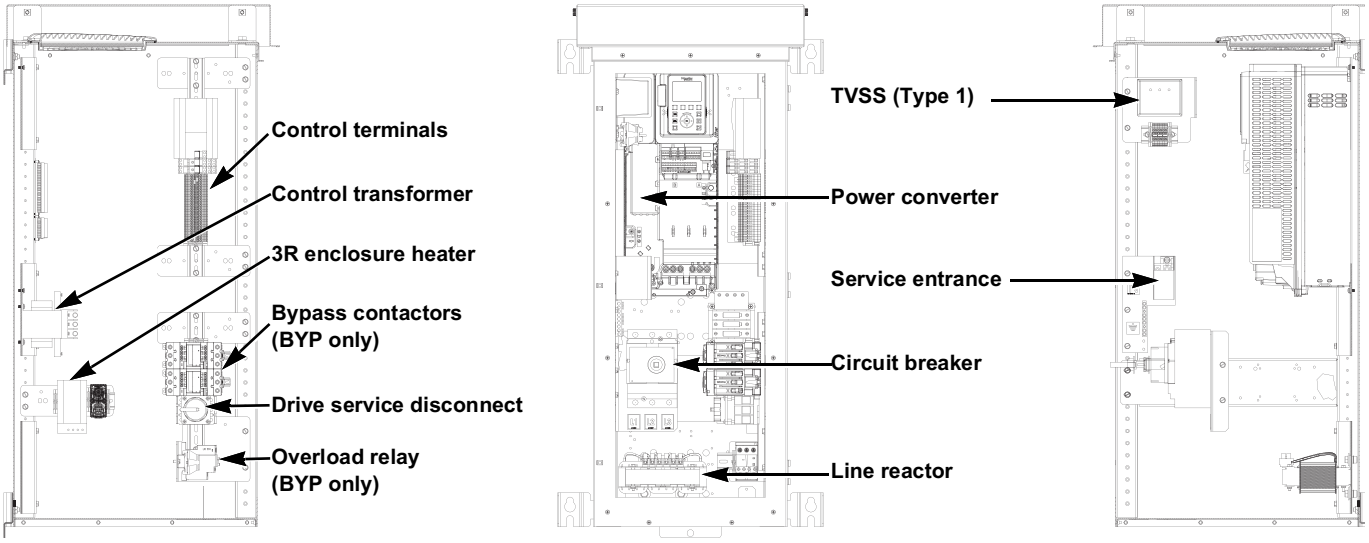


Figure 17 - Floor-Mounted Enclosures

75–125 hp (55–90 kw) @ 460 V, ND
60–100 hp (45–75 kw) @ 460 V, HD
40–60 hp (30–45 kw) @ 230 V, ND
30–50 hp (22–37 kw) @ 230 V, HD
40 hp (30 kw) @ 208 V, ND
30 hp (22 kw) @ 208 V, HD

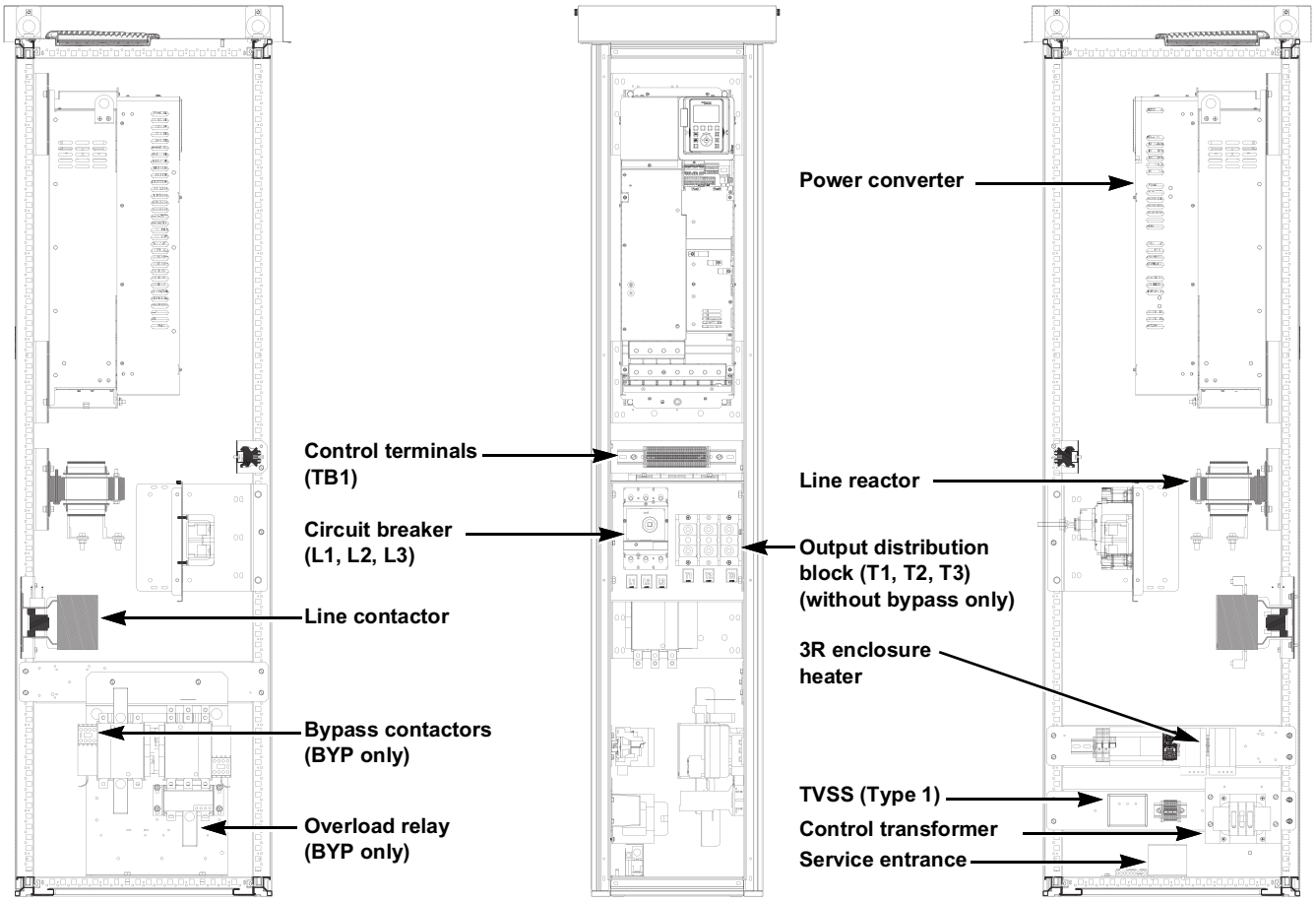
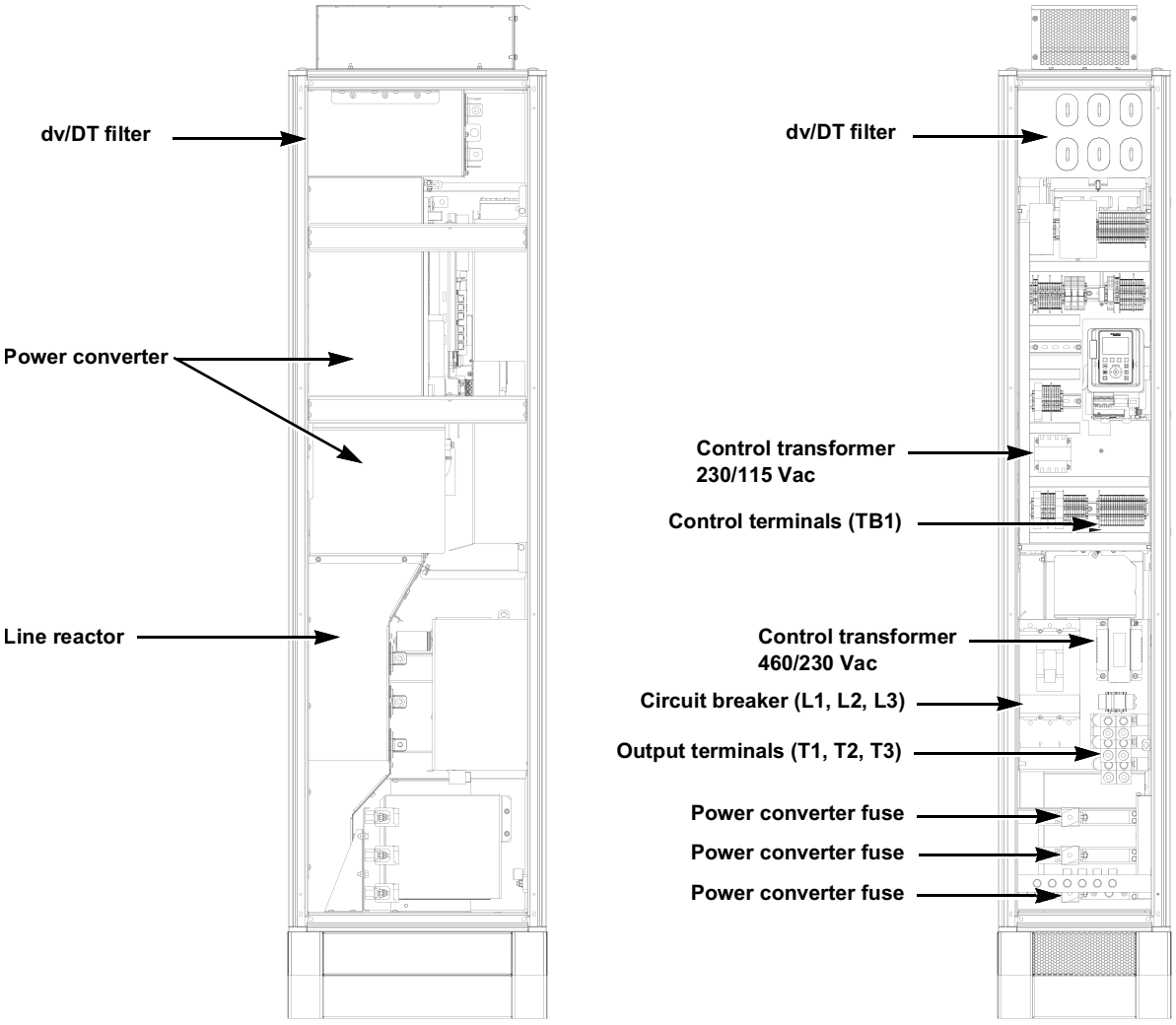


Figure 18 - Floor-Mounted Enclosures

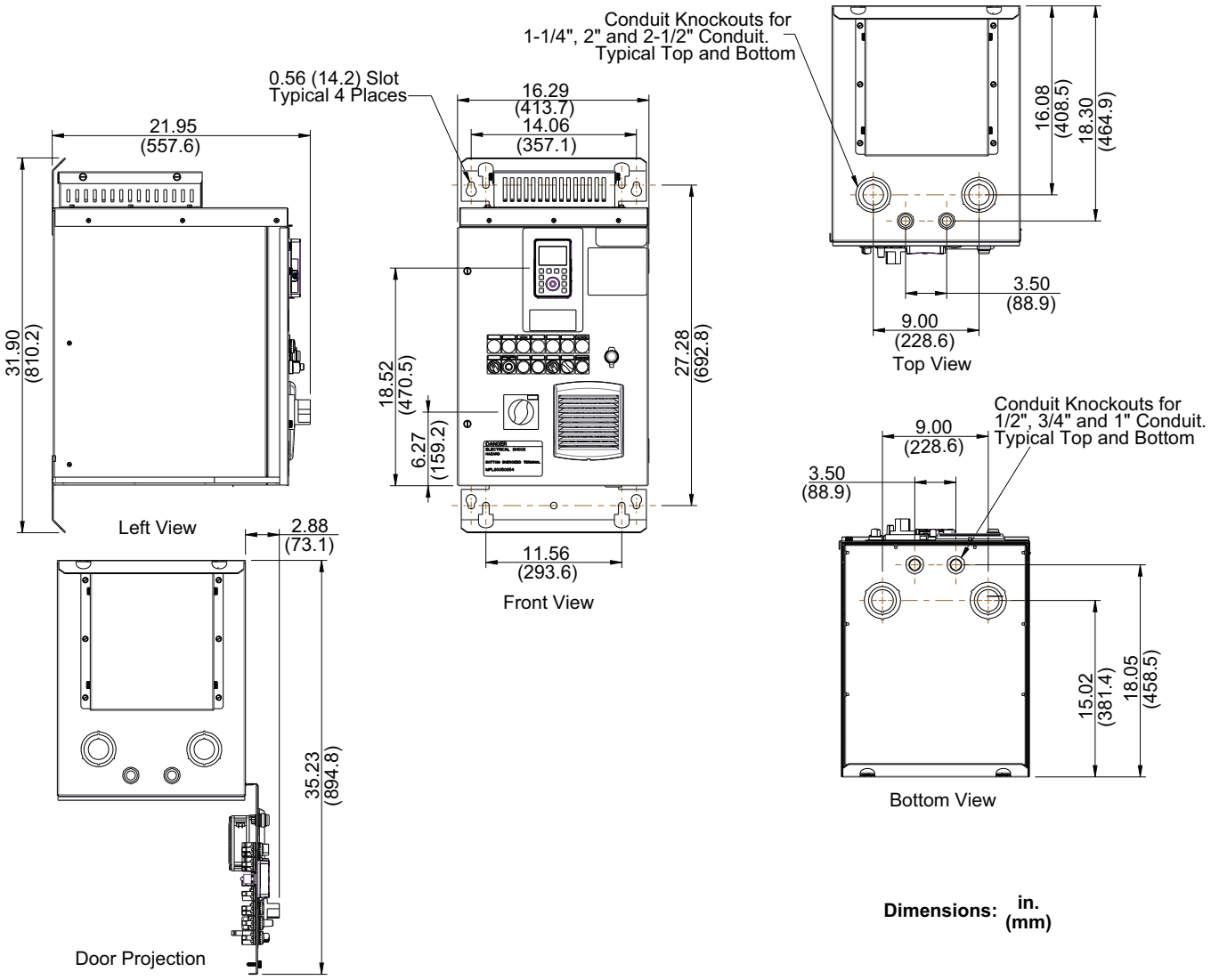
150–250 hp (110–160 kw) @ 460 V, ND
125–200 hp (90–130 kw) @ 460 V, HD



Dimensions

Figure 19 - 600 mm Enclosure: Standard Drive without Harmonic Filter, Types 1 and 12

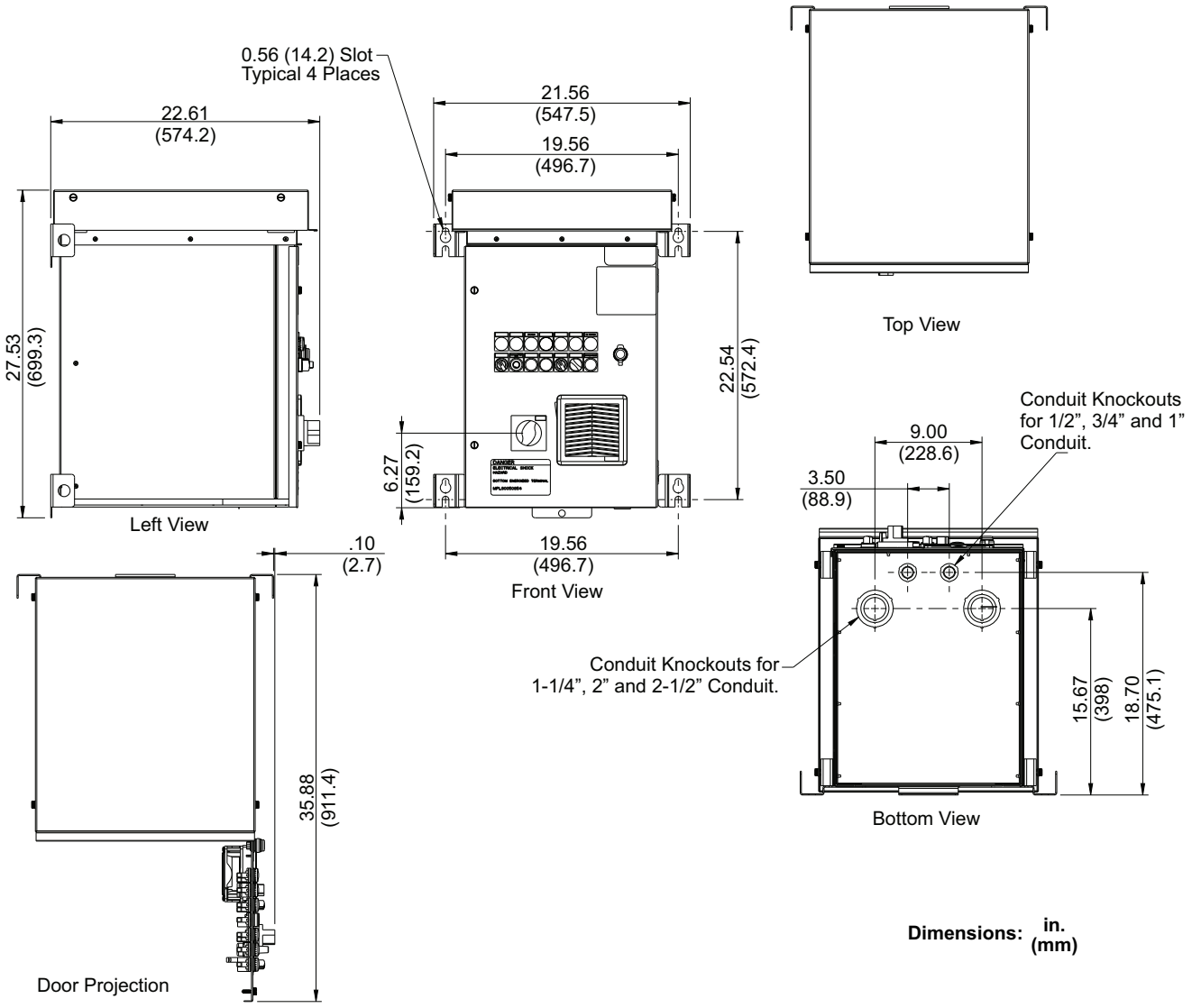
1–15 hp (0.75–11 kw) @ 460 V, ND
0.5–10 hp (0.37–7.5 kw) @ 460 V, HD
1–7.5 hp (0.75–5.5kw) @ 208/230 V, ND
0.5–5 hp (0.4–4 kw) @ 208/230 V, HD



NOTE: If a Type 2 SPD or DV/DT filter is selected, the enclosure size increases to 1000 mm.

Figure 20 - 600 mm Enclosure: Standard Drive without Harmonic Filter, Type 3R

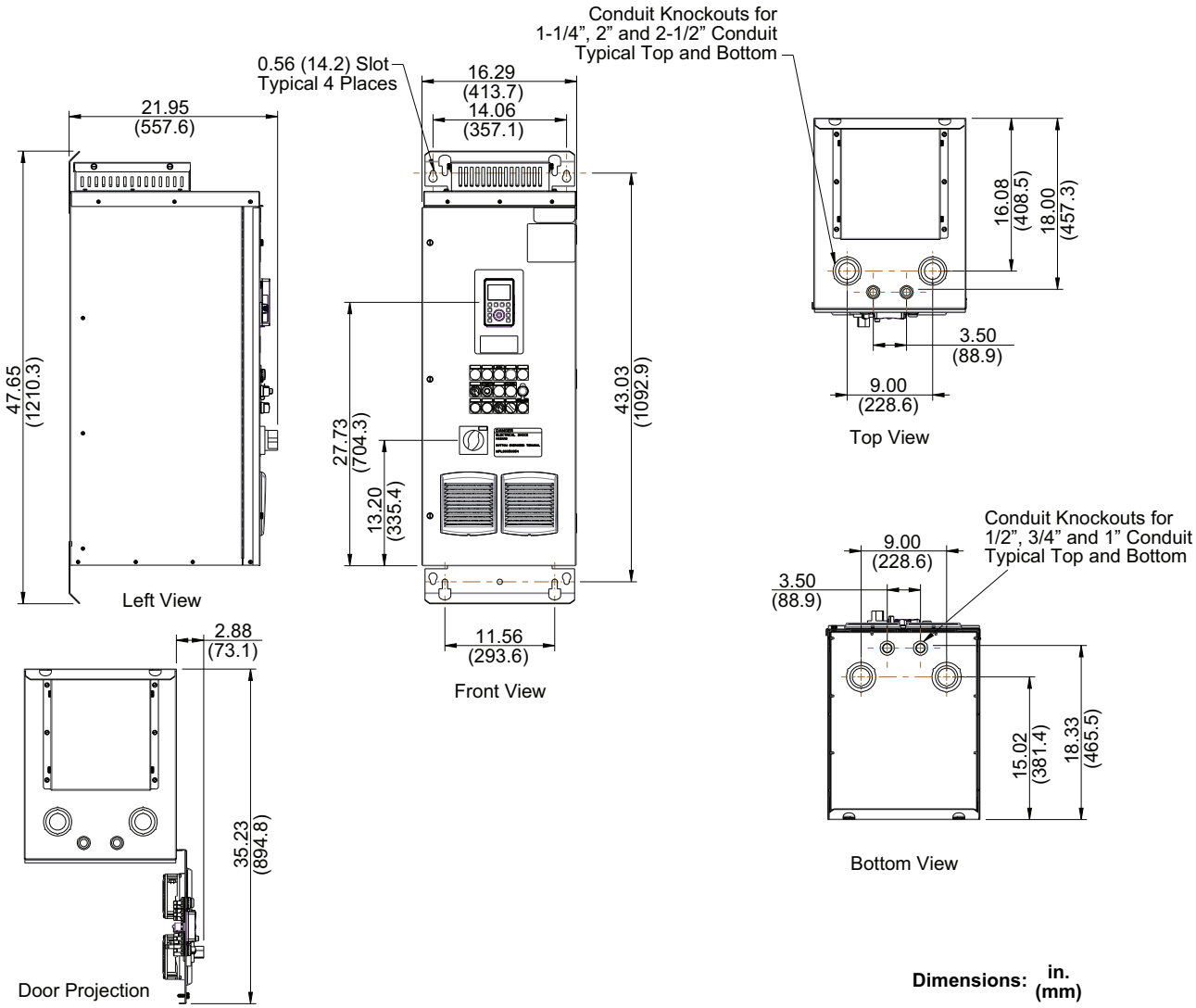
1–15 hp (0.75–11 kw) @ 460 V, ND
0.5–10 hp (0.37–7.5 kw) @ 460 V, HD
1–7.5 hp (0.75–5.5kw) @ 208/230 V, ND
0.5–5 hp (0.4–4 kw) @ 208/230 V, HD



NOTE: If a Type 2 SPD or DV/DT filter is selected, the enclosure size increases to 1000 mm.

Figure 21 - 1000 mm Enclosure: Standard Drive without Harmonic Filter, Types 1 and 12

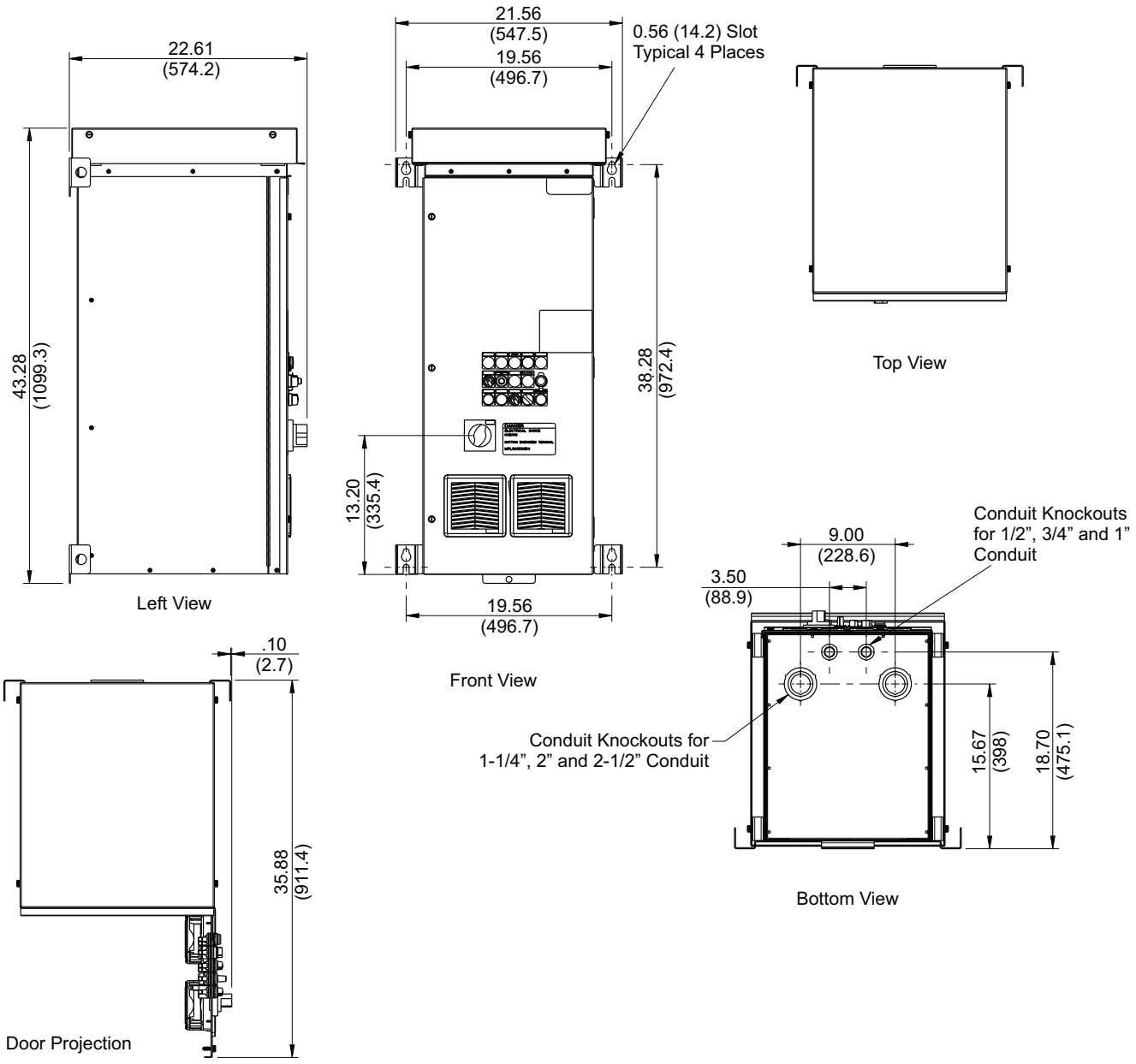
20–30 hp (15–22 kw) @ 460 V, ND
15–25 hp (11–18.5 kw) @ 460 V, HD
10–15 hp (7.5–11 kw) @ 208/230 V, ND
7.5–10 hp (5.5–7.5 kw) @ 208/230 V, HD



NOTE: If a Type 2 SPD or DV/DT filter is selected, the enclosure size increases to 1200 mm.

Figure 22 - 1000 mm Enclosure: Standard Drive without Harmonic Filter, Type 3R

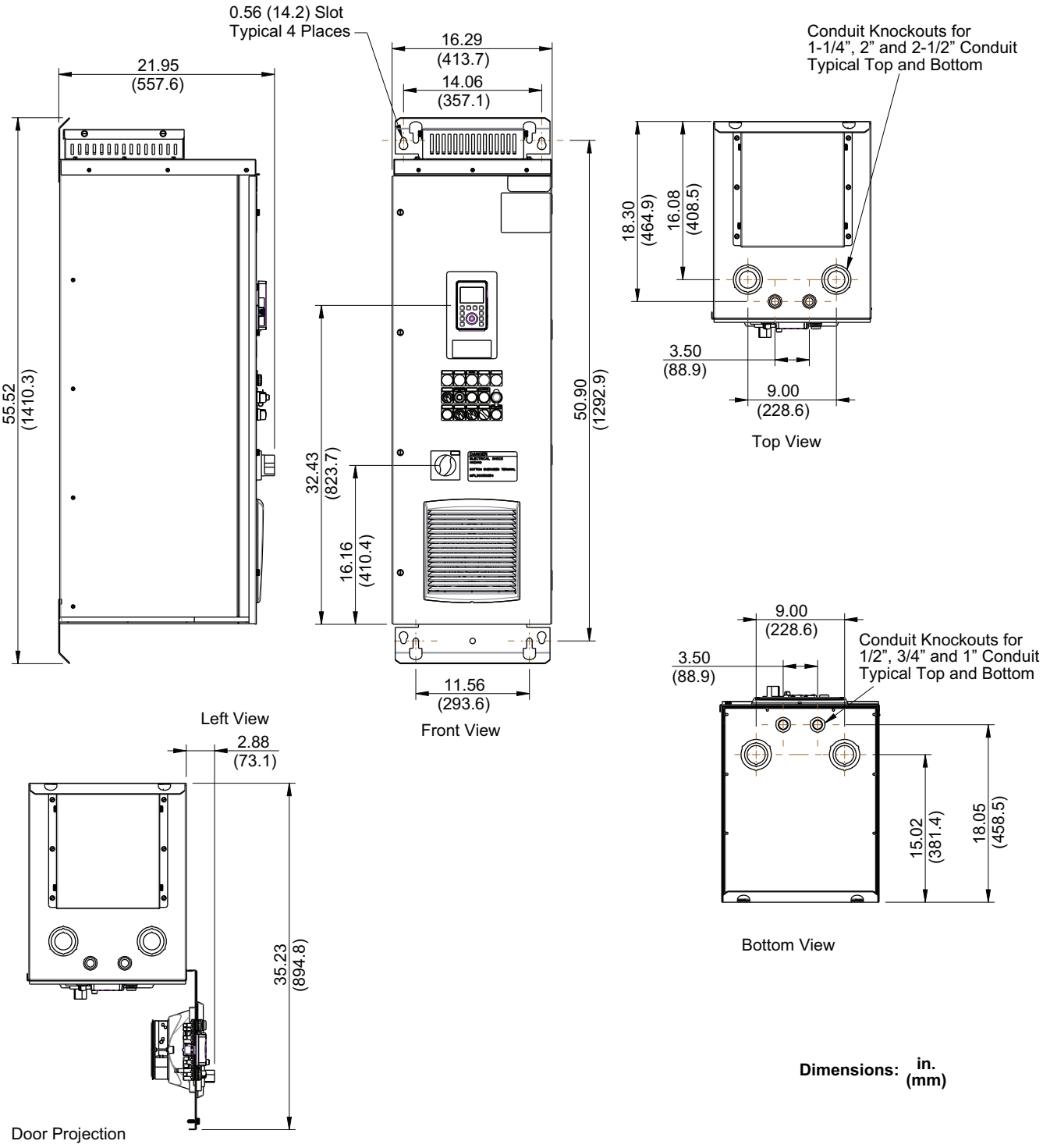
20–30 hp (15–22 kw) @ 460 V, ND
15–25 hp (11–18.5 kw) @ 460 V, HD
10–15 hp (7.5–11 kw) @ 208/230 V, ND
7.5–10 hp (5.5–7.5 kw) @ 208/230 V, HD



NOTE: If a Type 2 SPD or DV/DT filter is selected, the enclosure size increases to 1200 mm.

Figure 23 - 1200 mm Enclosure: Standard Drive without Harmonic Filter, Types 1 and 12

40–60 hp (30–45 kw) @ 460 V, ND
30–50 hp (22–37 kw) @ 460 V, HD
20–30 hp (15–22 kw) @ 208/230 V, ND
15–25 hp (11–19 kw) @ 208/230 V, HD

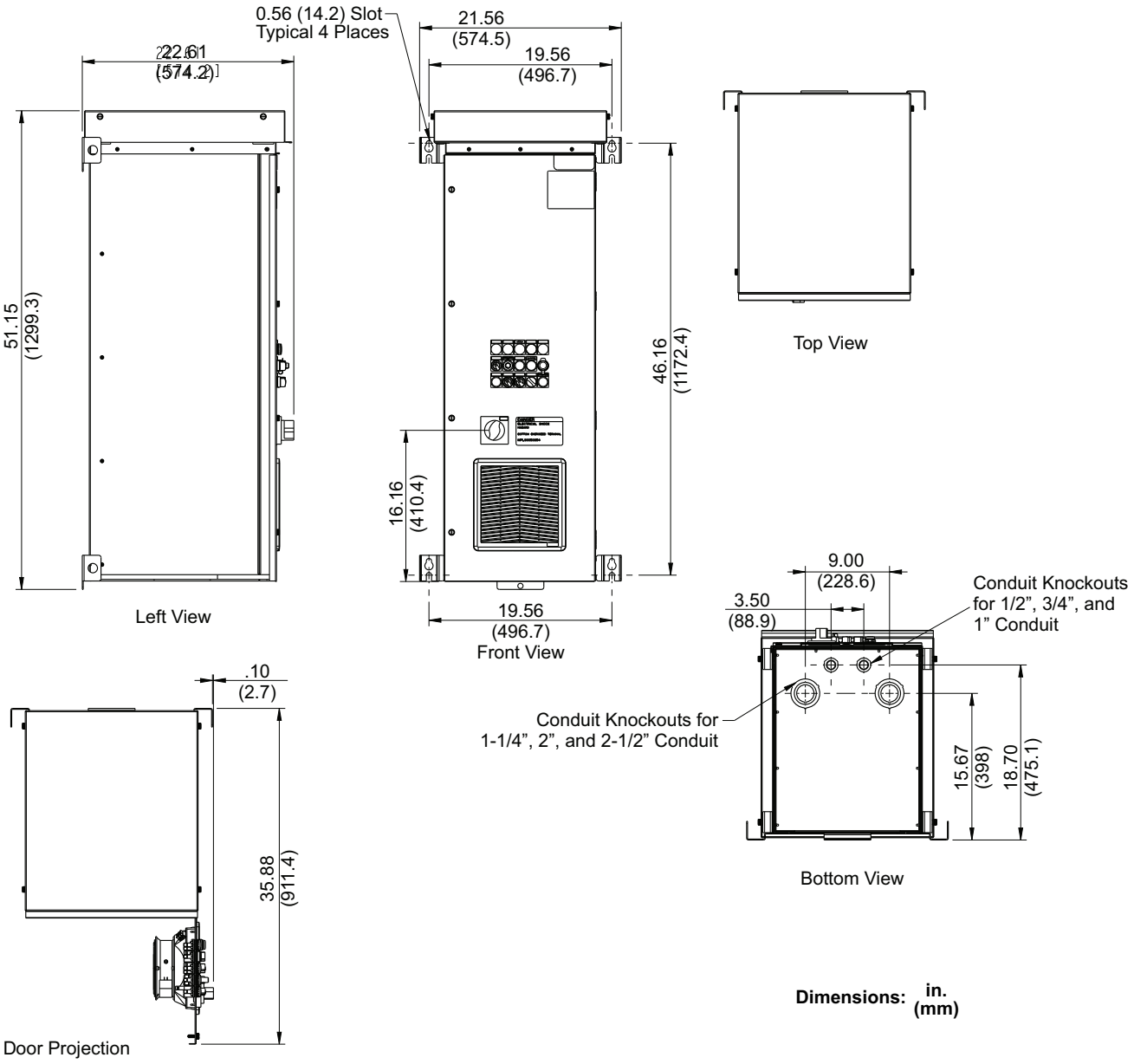


NOTE: If a Type 2 SPD or DV/DT filter is selected, the enclosure is floor standing.

For Type 1, see 2000 mm Enclosure, Standard Drive without Harmonic Filter, Type 1, page 67.
For Type 12, see 2000 mm Enclosure, Standard Drive without Harmonic Filter, Type 12, page 68.
For Type 3R, see 2000 mm Enclosure, Standard Drive without Harmonic Filter, Type 3R, page 70.

Figure 24 - 1200 mm Enclosure: Standard Drive without Harmonic Filter, Type 3R

40–60 hp (30–45 kw) @ 460 V, ND
30–50 hp (22–37 kw) @ 460 V, HD
20–30 hp (15–22 kw) @ 208/230 V, ND
15–25 hp (11–19 kw) @ 208/230 V, HD



NOTE: If a Type 2 SPD or DV/DT filter is selected, the enclosure is floor standing.

For Type 1, see 2000 mm Enclosure, Standard Drive without Harmonic Filter, Type 1, page 67.
For Type 12, see 2000 mm Enclosure, Standard Drive without Harmonic Filter, Type 12, page 68.
For Type 3R, see 2000 mm Enclosure, Standard Drive without Harmonic Filter, Type 3R, page 70.

Figure 25 - 2000 mm Enclosure, Standard Drive without Harmonic Filter, Type 1

75–125 hp (55–90 kw) @ 460 V, ND
60–100 hp (45–75 kw) @ 460 V, HD
40–60 hp (30–45 kw) @ 230 V, ND
30–50 hp (22–37 kw) @ 230 V, HD
40 hp (30 kw) @ 208 V, ND
30 hp (22 kw) @ 208 V, HD

NOTE: Harmonic Filter M09 is available from 40–100 hp HD and 40–125 hp ND @ 460 V.

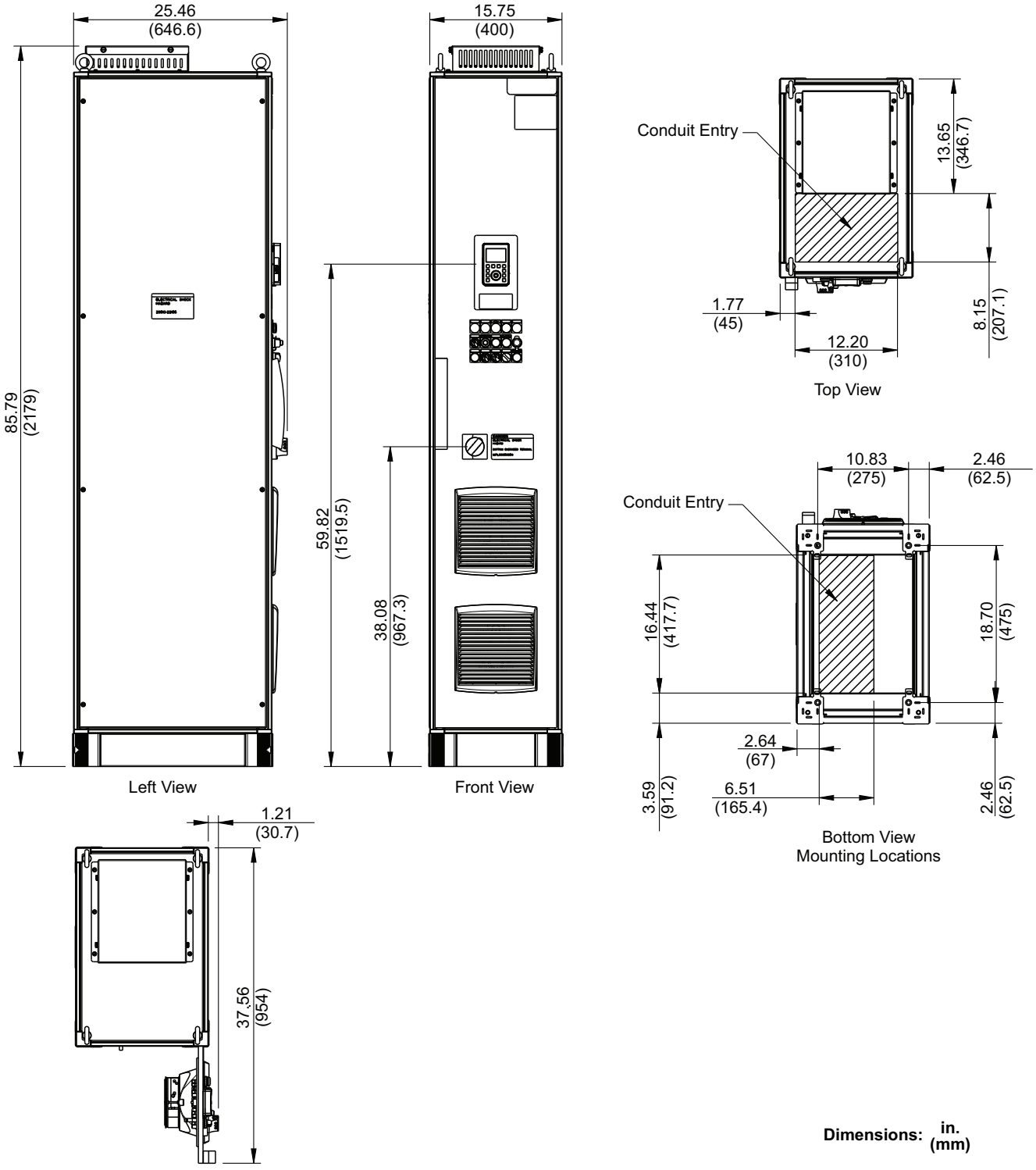


Figure 26 - 2000 mm Enclosure, Standard Drive without Harmonic Filter, Type 12

75–125 hp (55–90 kw) @ 460 V, ND
60–100 hp (45–75 kw) @ 460 V, HD
40–60 hp (30–45 kw) @ 230 V, ND
30–50 hp (22–37 kw) @ 230 V, HD
40 hp (30 kw) @ 208 V, ND
30 hp (22 kw) @ 208 V, HD

NOTE: Harmonic Filter M09 is available from 40–100 hp HD and 40–125 hp ND @ 460 V.

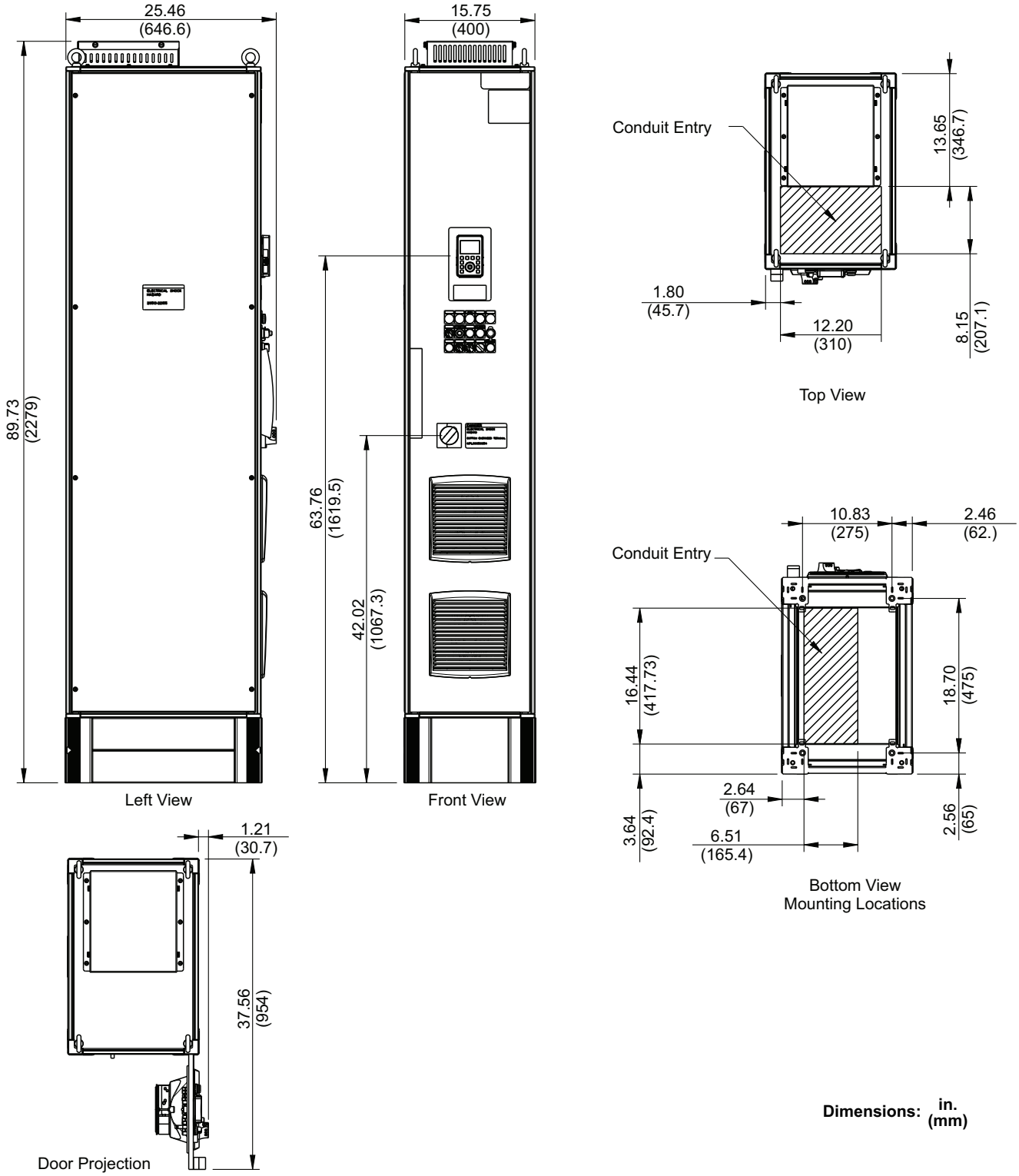
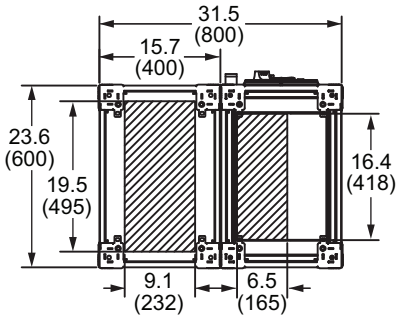


Figure 27 - Conduit Entry and Weights, 75–125 hp ND and 60–100 hp HD @ 460 V, 40–60 hp ND, 30–50 hp HD @ 230 V, and 30 hp HD @ 208 V, Types 1 and 12

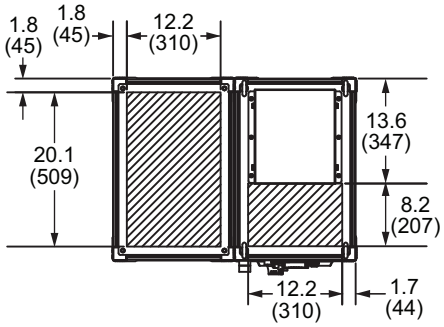
Conduit entry is shown as cross-hatched area.

The following combinations:
5% Impedance and DV/DT Filter or
Line Contactor and DV/DT Filter

Approximate weight of option: 200 lb



Bottom View, Front of Unit



Top View, Front of Unit

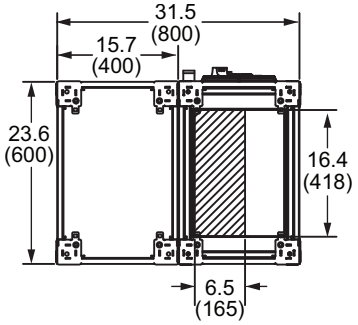
Dimensions: in. (mm)

Figure 28 - Conduit Entry and Weights, 40–125 hp ND and 40–100 hp HD @ 460 V, Types 1 and 12

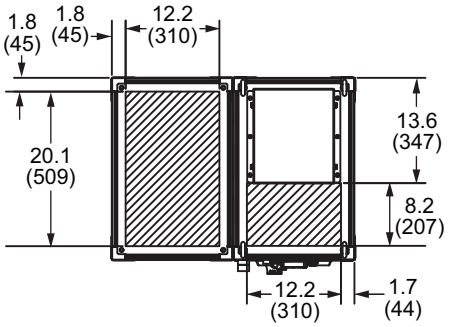
Conduit entry is shown as cross-hatched area.

Passive Harmonic Filter with any options

Approximate weight of option: 250 lb



Bottom View, Front of Unit



Top View, Front of Unit

Dimensions: in. (mm)

Figure 29 - 2000 mm Enclosure, Standard Drive without Harmonic Filter, Type 3R

75–125 hp (55–90 kw) @ 460 V, ND
60–100 hp (45–75 kw) @ 460 V, HD
40–60 hp (30–45 kw) @ 230 V, ND
30–50 hp (22–37 kw) @ 230 V, HD
40 hp (30 kw) @ 208 V, ND
30 hp (22 kw) @ 208 V, HD

NOTE: Harmonic Filter M09 is available from 40–100 hp HD and 40–125 hp ND @ 460 V.

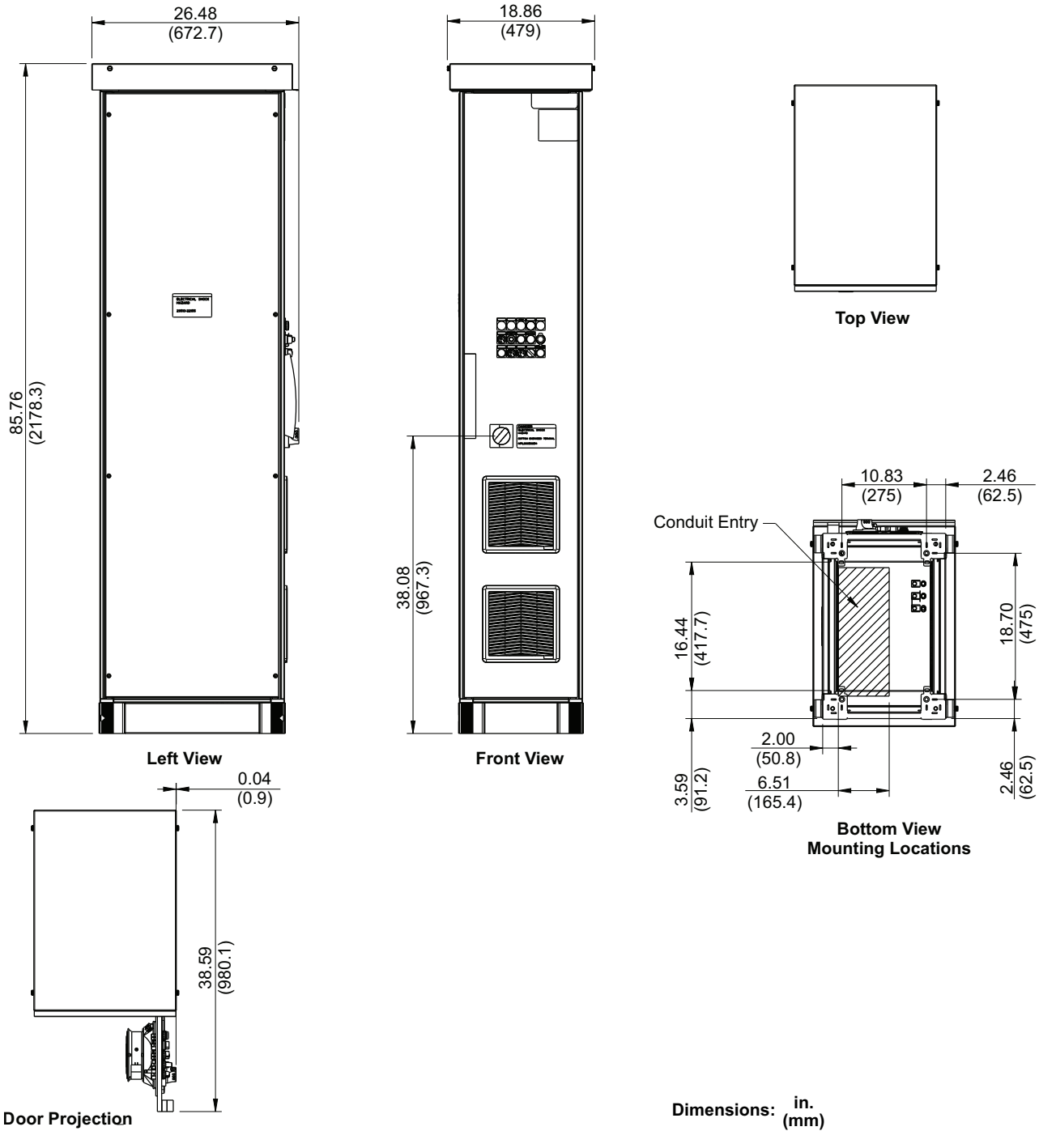


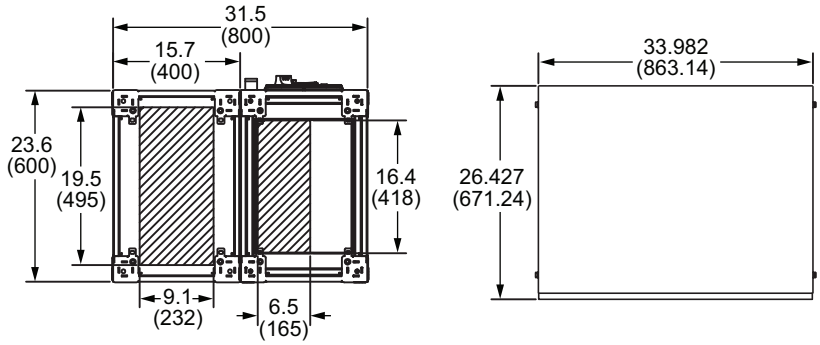
Figure 30 - Conduit Entry and Weights, 75–125 hp ND and 60–100 hp HD @ 460 V, 40–60 hp ND and 30–50 hp HD @ 230 V, and 30 hp ND @ 208 V, Type 3R

Conduit entry is shown as cross-hatched area.

The following combinations:
5% Impedance and DV/DT Filter or
Line Contactor and DV/DT Filter

Approximate weight of option: 200 lb

Dimensions: in. (mm)



Bottom View, Front of Unit **Top View, Front of Unit**

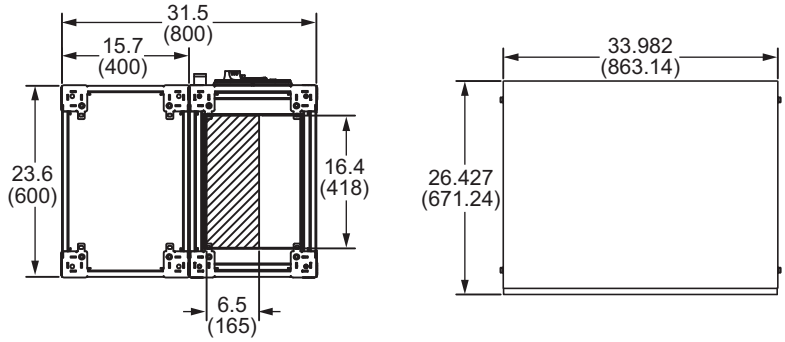
Figure 31 - Conduit Entry and Weights, 40–125 hp ND and 40–100 hp HD @ 460 V, Type 3R

Conduit entry is shown as cross-hatched area.

Passive Harmonic Filter with any options

Approximate weight of option: 250 lb

Dimensions: in. (mm)



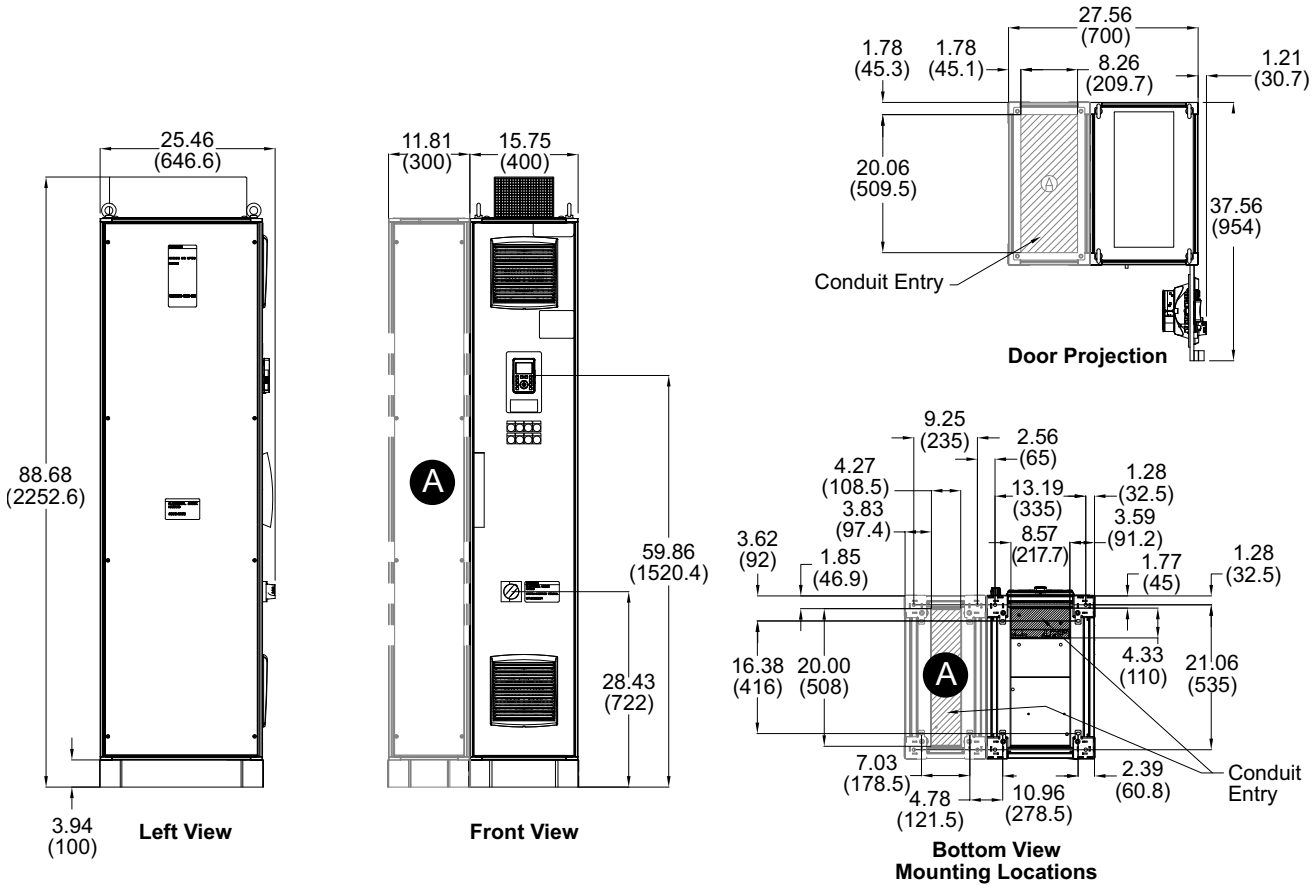
Bottom View, Front of Unit **Top View, Front of Unit**

Figure 32 - 2000 mm Enclosure, Standard Drive without Harmonic Filter, Type 1

150–250 hp (110–160 kw) @ 460 V, ND
125–200 hp (90–130 kw) @ 460 V, HD

NOTE:

- Harmonic Filter M09 is available from 125–200 hp HD and 150–250 hp ND @ 460 V.
- Bypass Y10 is available from 125–200 hp HD and 150–250 hp ND @ 460 V.



A Optional Top Entry Cubicle (U14)

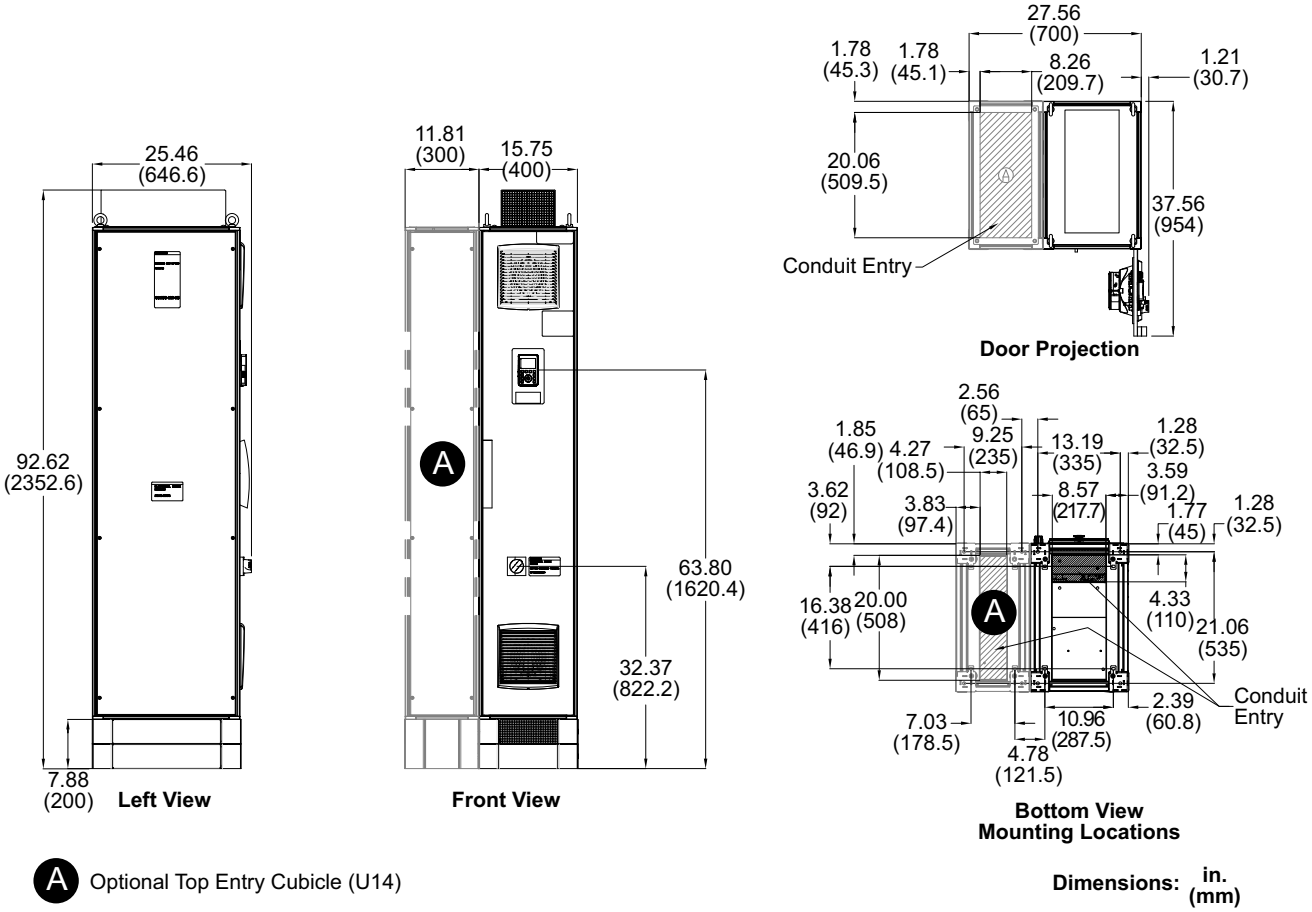
Dimensions: in. (mm)

Figure 33 - 2000 mm Enclosure, Standard Drive without Harmonic Filter, Type 12

150–250 hp (110–160 kw) @ 460 V, ND
125–200 hp (90–130 kw) @ 460 V, HD

NOTE:

- Harmonic Filter M09 is available from 125–200 hp HD and 150–250 hp ND @ 460 V.
- Bypass Y10 is available from 125–200 hp HD and 150–250 hp ND @ 460 V.



A Optional Top Entry Cubicle (U14)

Dimensions: in. (mm)

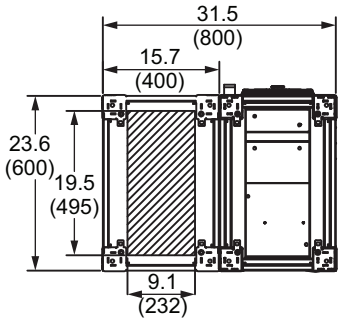
Figure 34 - Conduit Entry and Weights, 150–250 hp ND and 150–200 hp HD @ 460 V, Types 1 and 12

Conduit entry is shown as cross-hatched area.

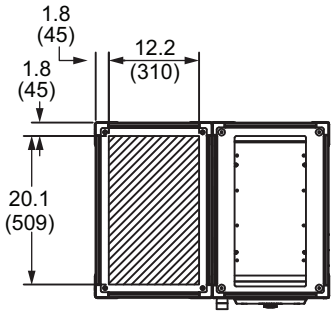
Any of the following or combinations of the following: Full Voltage Bypass, 5% Line Impedance, Type 2 SPD, 150 VA, which may include Top Entry Cubicle

Approximate weight of option: 135 lb

Top view conduit entry area decreases from 12.193 to 4.234 in. when Full Voltage Bypass is selected.



Bottom View, Front of Unit

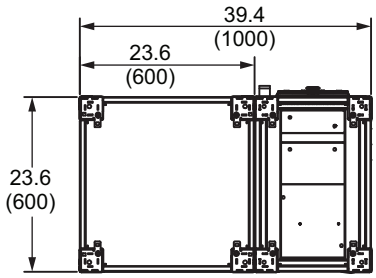


Top View, Front of Unit

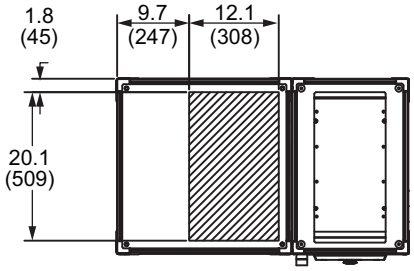
The combination of Passive Filter with any of the following: Full Voltage Bypass, Type 2 SPD, and 150 VA

The combination of Passive Filter with Top Entry Cubicle. May include Type 2 SPD and/or 150 VA.

Approximate weight of option: 300 lb



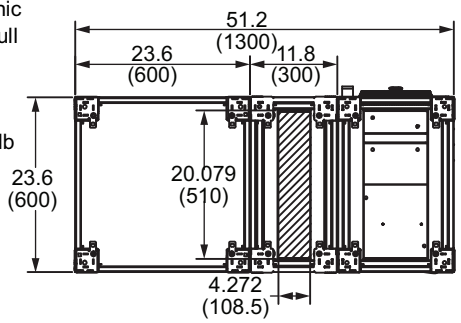
Bottom View, Front of Unit



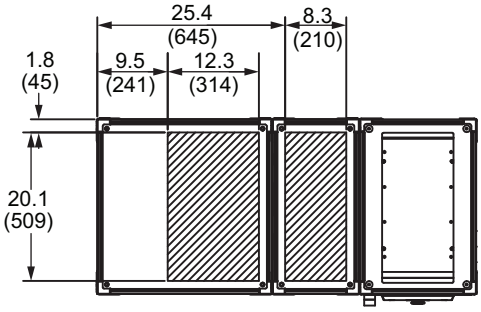
Top View, Front of Unit

The combination of Passive Harmonic Filter with Top Entry Cubicle with Full Voltage Bypass. May include Type 2 SPD, and/or 150 VA.

Approximate weight of option: 370 lb



Bottom View, Front of Unit



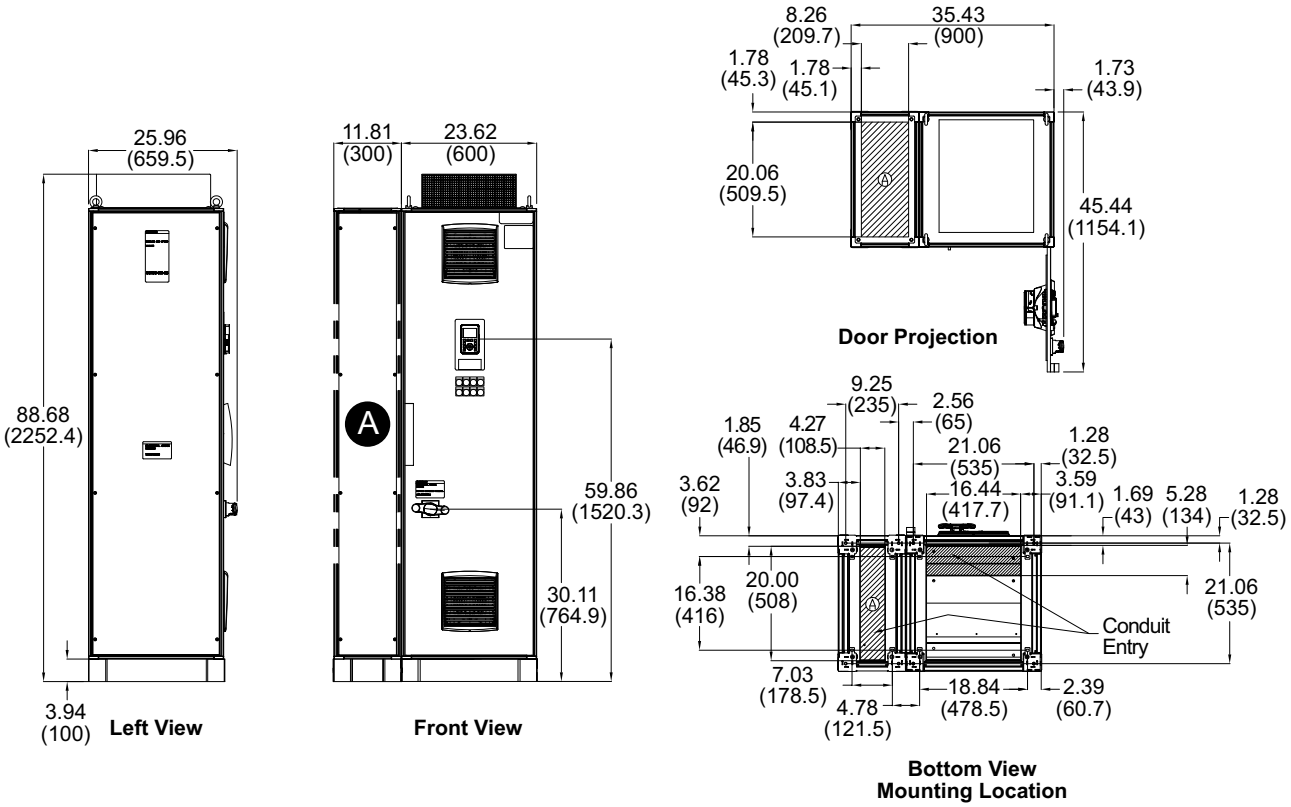
Top View, Front of Unit

Dimensions: in. (mm)

Figure 35 - 2000 mm Enclosure, Standard Drive without Harmonic Filter, Type 1

300–500 hp (200–310 kw) @ 460 V, ND
250–400 hp (160–250 kw) @ 460 V, HD

NOTE: Harmonic Filter M09 is available from 250–400 hp HD and 300–500 hp ND @ 460 V.



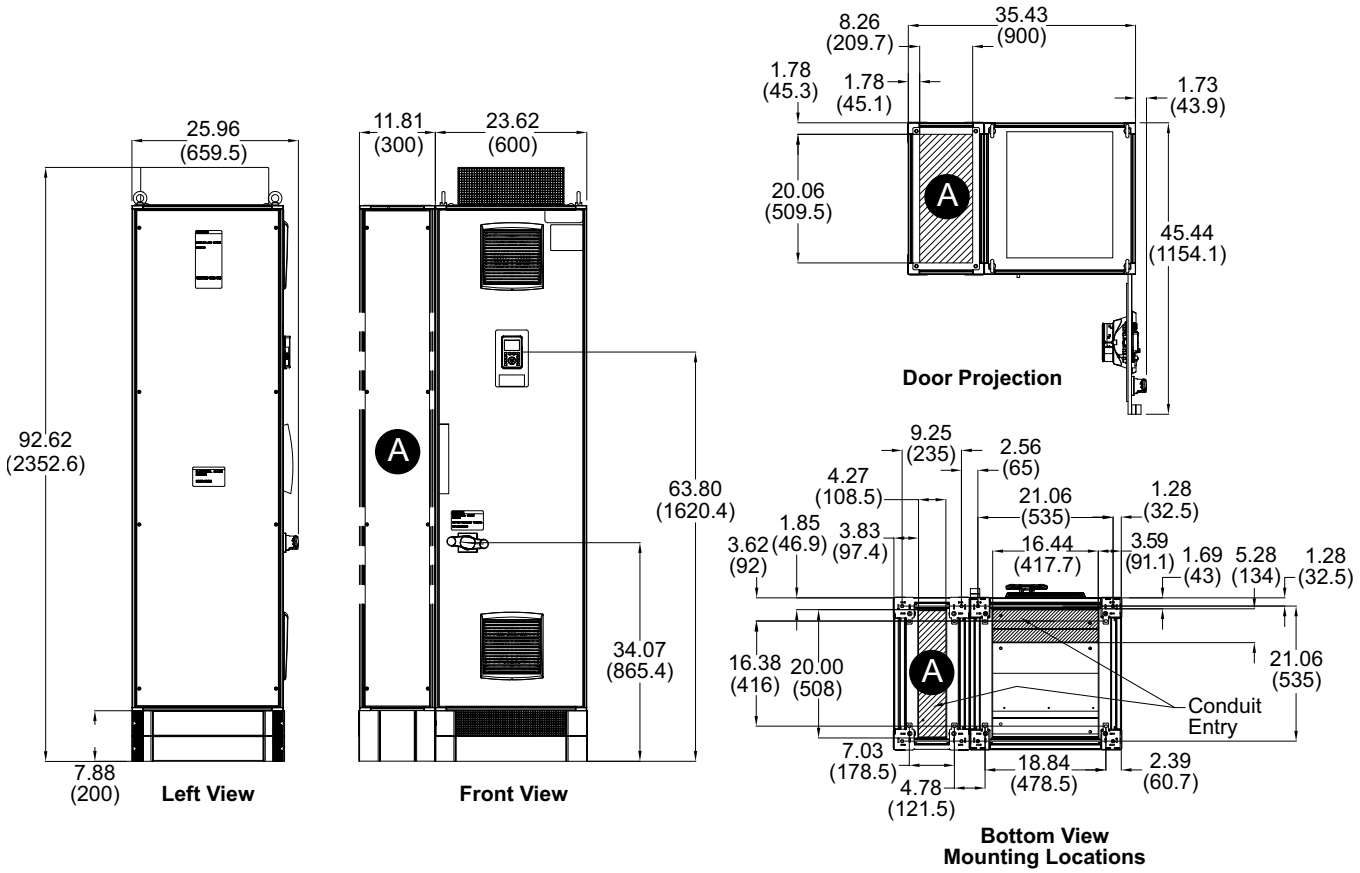
A Optional Top Entry Cubicle (U14)

Dimensions: in. (mm)

Figure 36 - 2000 mm Enclosure, Standard Drive without Harmonic Filter, Type 12

300–500 hp (200–310 kw) @ 460 V, ND
250–400 hp (160–250 kw) @ 460 V, HD

NOTE: Harmonic Filter M09 is available from 250–400 hp HD and 300–500 hp ND @ 460 V.



A Optional Top Entry Cubicle (U14)

Dimensions: in. (mm)

Figure 37 - Conduit Entry and Weights, 300–500 hp ND and 250–400 hp HD @ 460 V, Types 1 and 12

Conduit entry is shown as cross-hatched area.

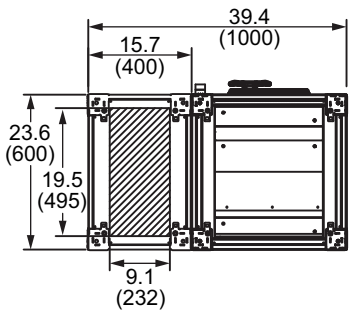
Any of the following or combinations of the following:
5% Line Impedance, Type 2 SPD, 150 VA, which may include Top Entry Cubicle

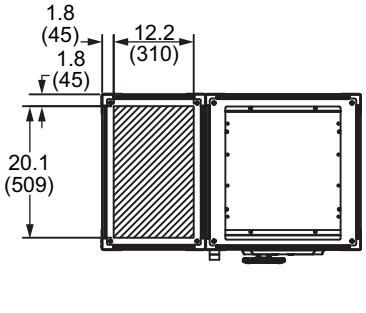
Approximate weight of option: 325 lb

The combination of Full Voltage Bypass with any of the following:
5% Line Impedance, Type 2 SPD, 150 VA which may include Top Entry Cubicle 250 hp HD @ 460 V

Approximate weight of option: 345 lb

Top view conduit entry area decreases from 12.193 to 4.234 in. when Full Voltage Bypass is selected.





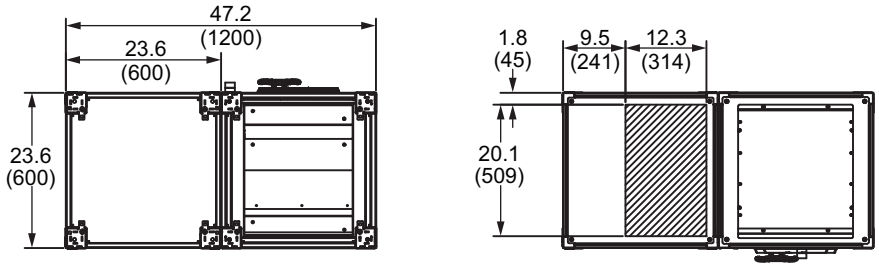
Dimensions: in. (mm)

Figure 38 - Conduit Entry and Weights, 300–400 hp ND and 250–300 hp HD @ 460 V, Types 1 and 12

Conduit entry is shown as cross-hatched area.

The combination of Passive Filter with any of the following: Type 2 SPD and 150 VA which may include Top Entry Cubicle

Approximate weight of option: 667–759 lb



Dimensions: in. (mm)

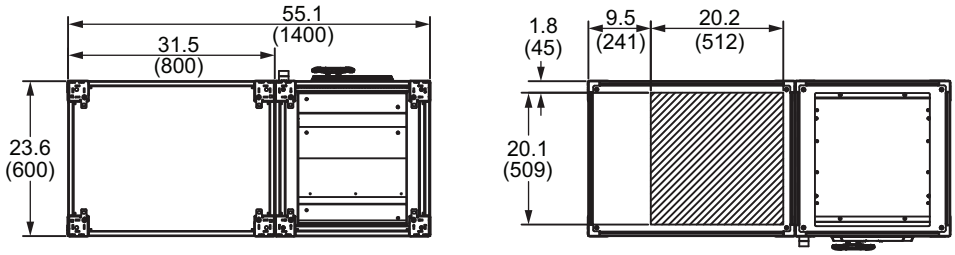
Bottom View, Front of Unit **Top View, Front of Unit**

Figure 39 - Conduit Entry and Weights, 500 hp ND and 400 hp HD @ 460 V, Types 1 and 12

Conduit entry is shown as cross-hatched area.

The combination of Passive Filter with any of the following: Type 2 SPD and 150 VA which may include Top Entry Cubicle

Approximate weight of option: 1065 lb

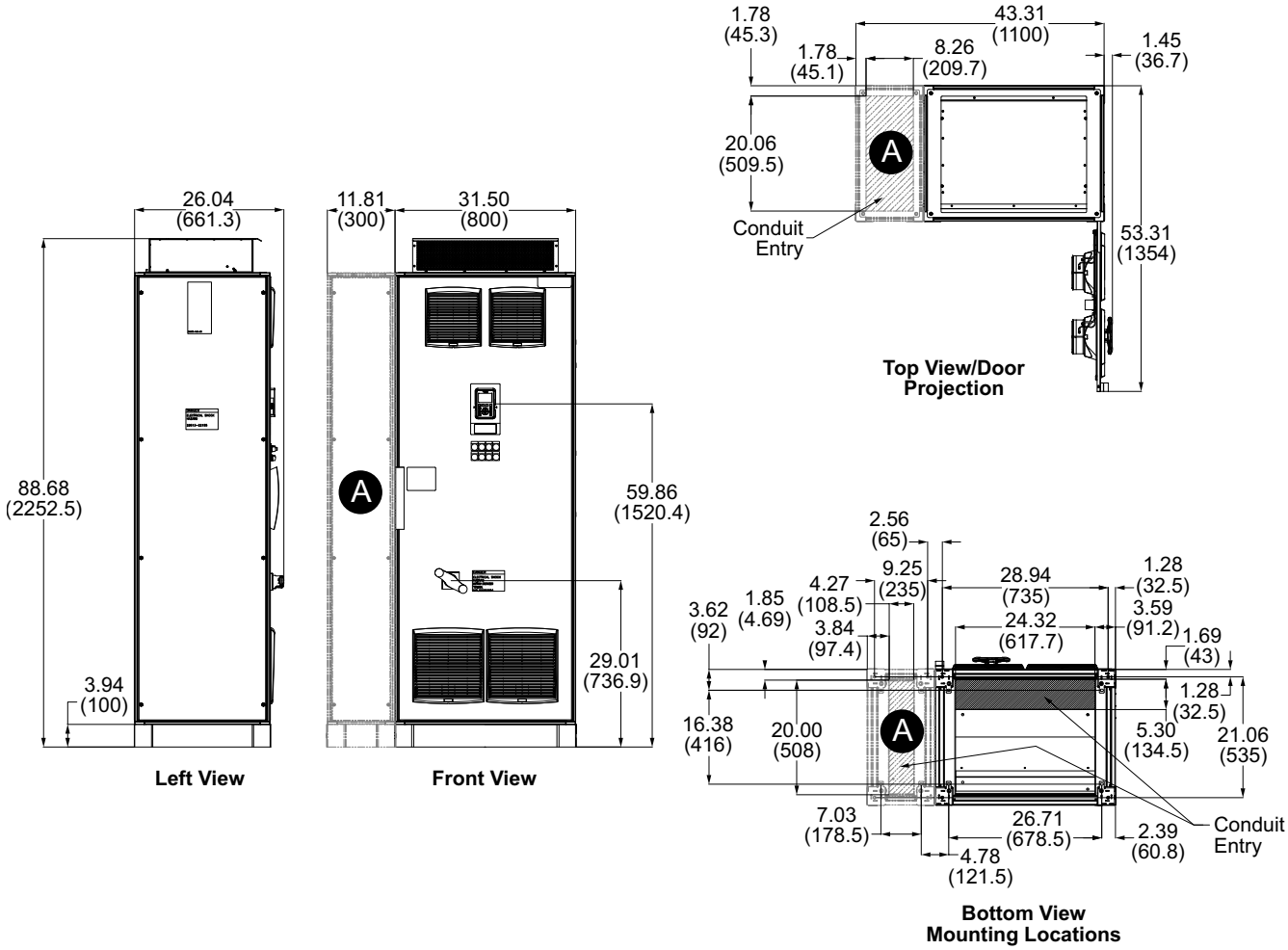


Dimensions: in. (mm)

Bottom View, Front of Unit **Top View, Front of Unit**

Figure 40 - 2000 mm Enclosure, Standard Drive without Harmonic Filter, Type 1

600–700 hp (400–500 kw) @ 460 V, ND
500–600 hp (310–400 kw) @ 460 V, HD

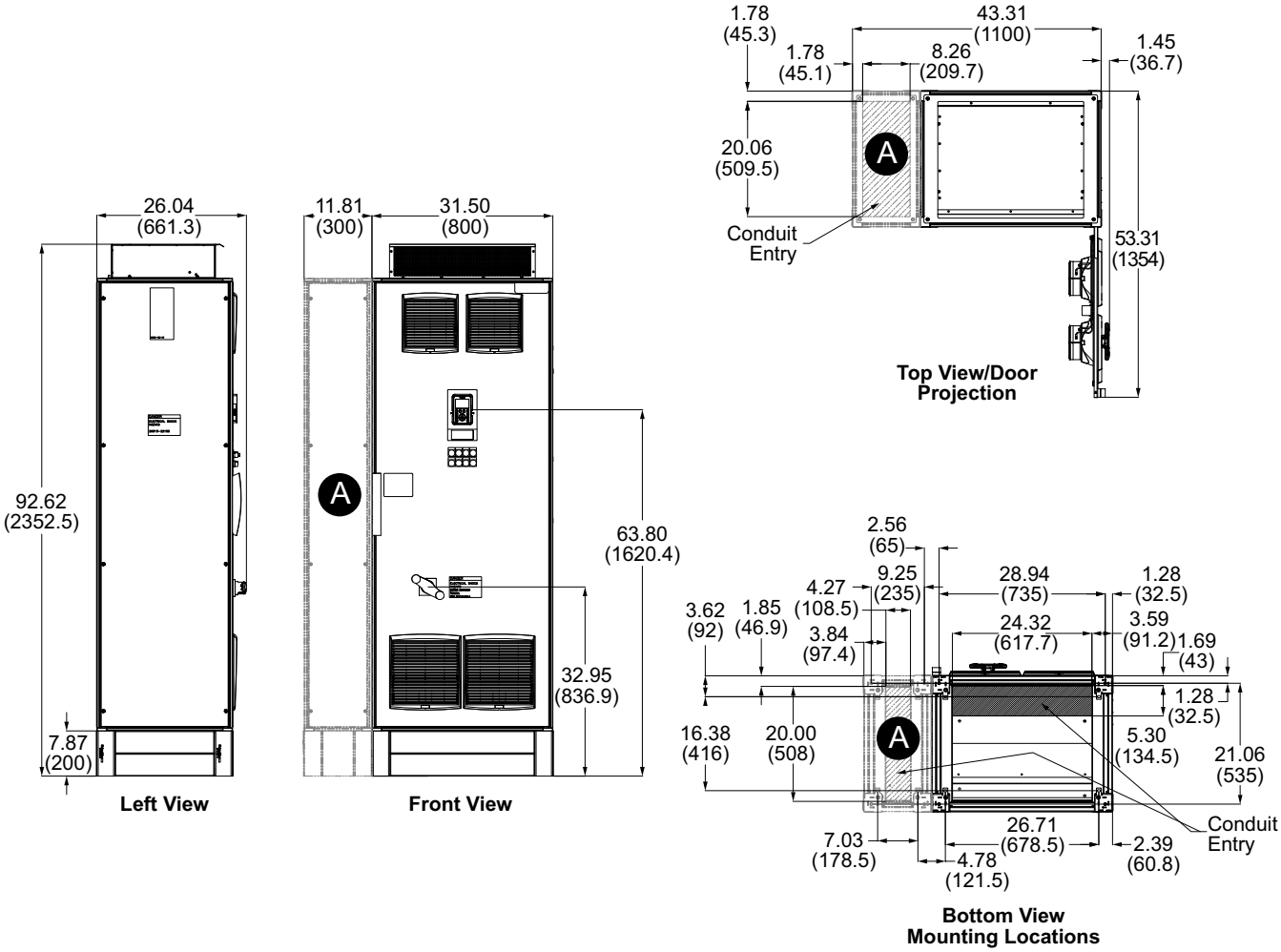


A Optional Top Entry Cubicle (U14)

Dimensions: in. (mm)

Figure 41 - 2000 mm Enclosure, Standard Drive without Harmonic Filter, Type 12

600–700 hp (400–500 kw) @ 460 V, ND
500–600 hp (310–400 kw) @ 460 V, HD



A Optional Top Entry Cubicle (U14)

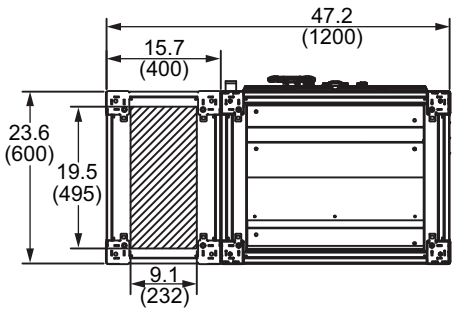
Dimensions: in. (mm)

Figure 42 - Conduit Entry and Weights, 600–700 hp ND and 500–600 hp HD @ 460 V, Types 1 and 12

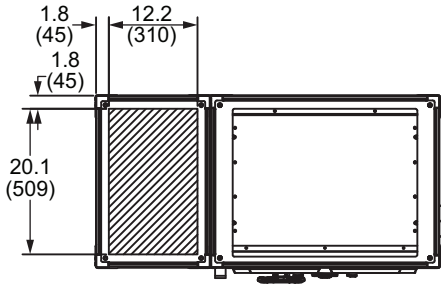
Conduit entry is shown as cross-hatched area.

The combination of any of the following: Type 2 SPD and 150 VA which may include Top Entry Cubicle

Approximate weight of option: 150 lb



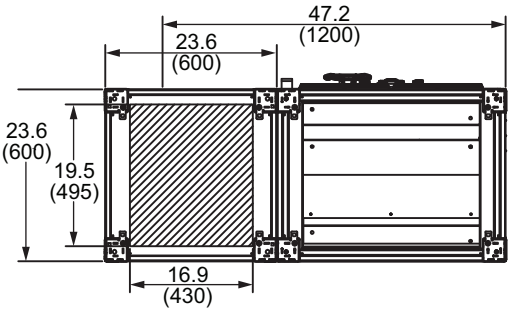
Bottom View, Front of Unit



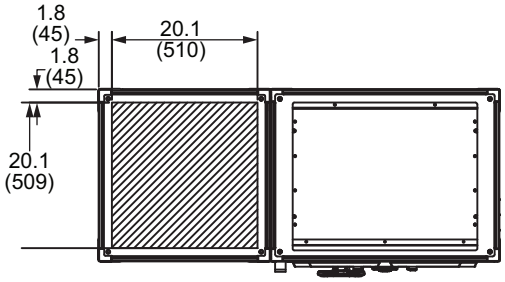
Top View, Front of Unit

The combination of 5% Line Impedance with any of the following: Type 2 SPD and 150 VA which may include Top Entry Cubicle

Approximate weight of option: 450 lb



Bottom View, Front of Unit

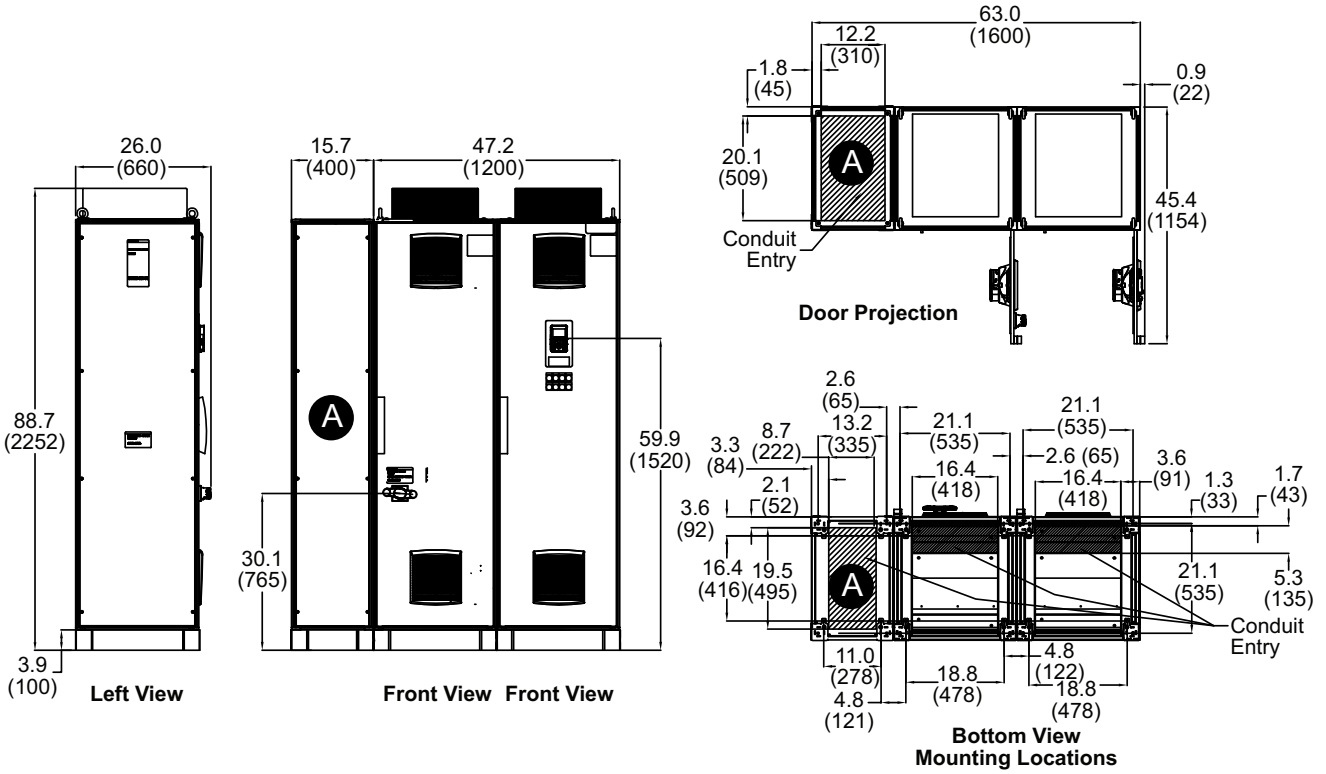


Top View, Front of Unit

Dimensions: in. (mm)

Figure 43 - 2000 mm Enclosure, Standard Drive without Harmonic Filter, Type 1

900 hp (630 kw) @ 460 V, ND
700 hp (500 kw) @ 460 V, HD



Dimensions: in. (mm)

A Optional Top Entry Cubicle (U14)

Figure 44 - 2000 mm Enclosure, Standard Drive without Harmonic Filter, Type 12

900 hp (630 kw) @ 460 V, ND
700 hp (500 kw) @ 460 V, HD

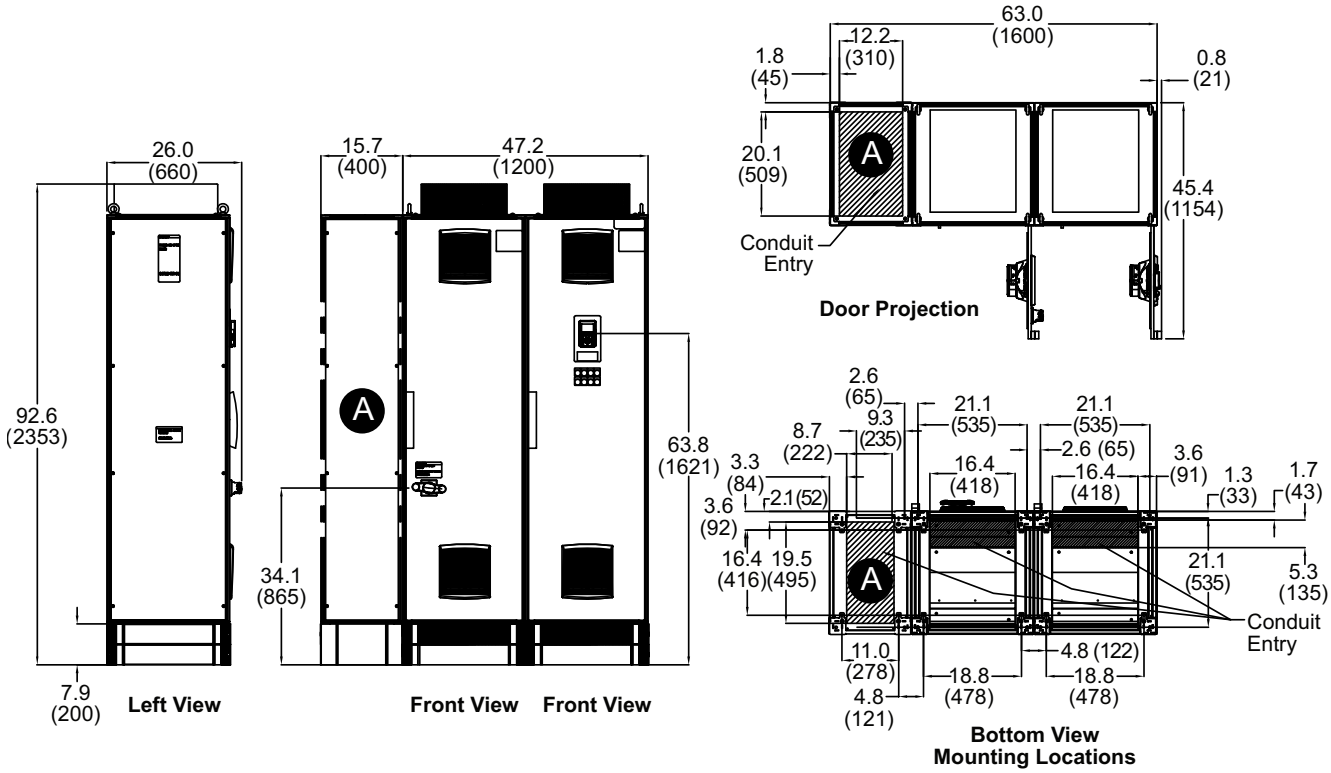
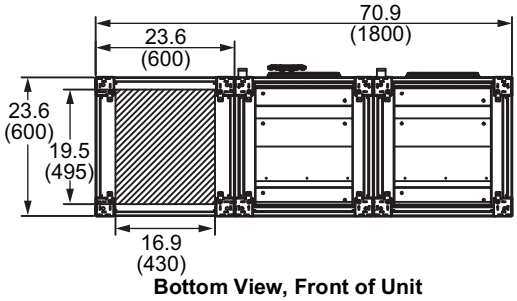


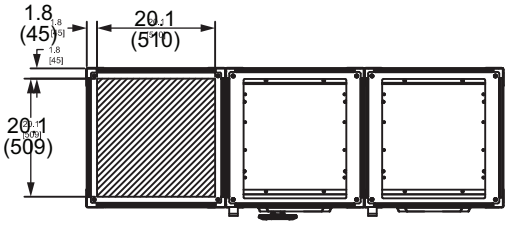
Figure 45 - Conduit Entry and Weights, 900 hp ND and 700 hp HD @ 460 V, Types 1 and 12

Conduit entry is shown as cross-hatched area.

The combination of any of the following: Type 2 SPD and 150 VA which may include Top Entry Cubicle

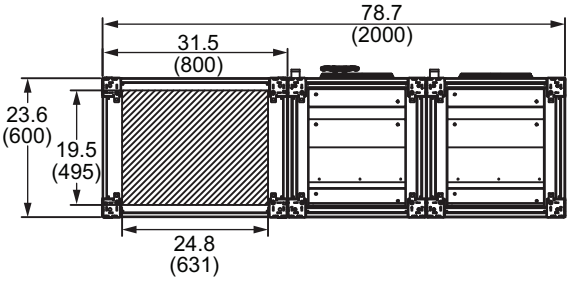
Approximate weight of option: 175 lb





The combination of 5% Line Impedance with any of the following: Type 2 SPD and 150 VA which may include Top Entry Cubicle

Approximate weight of option: 500 lb



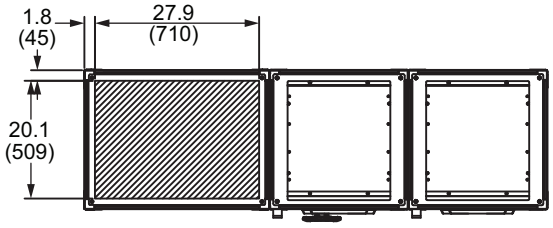


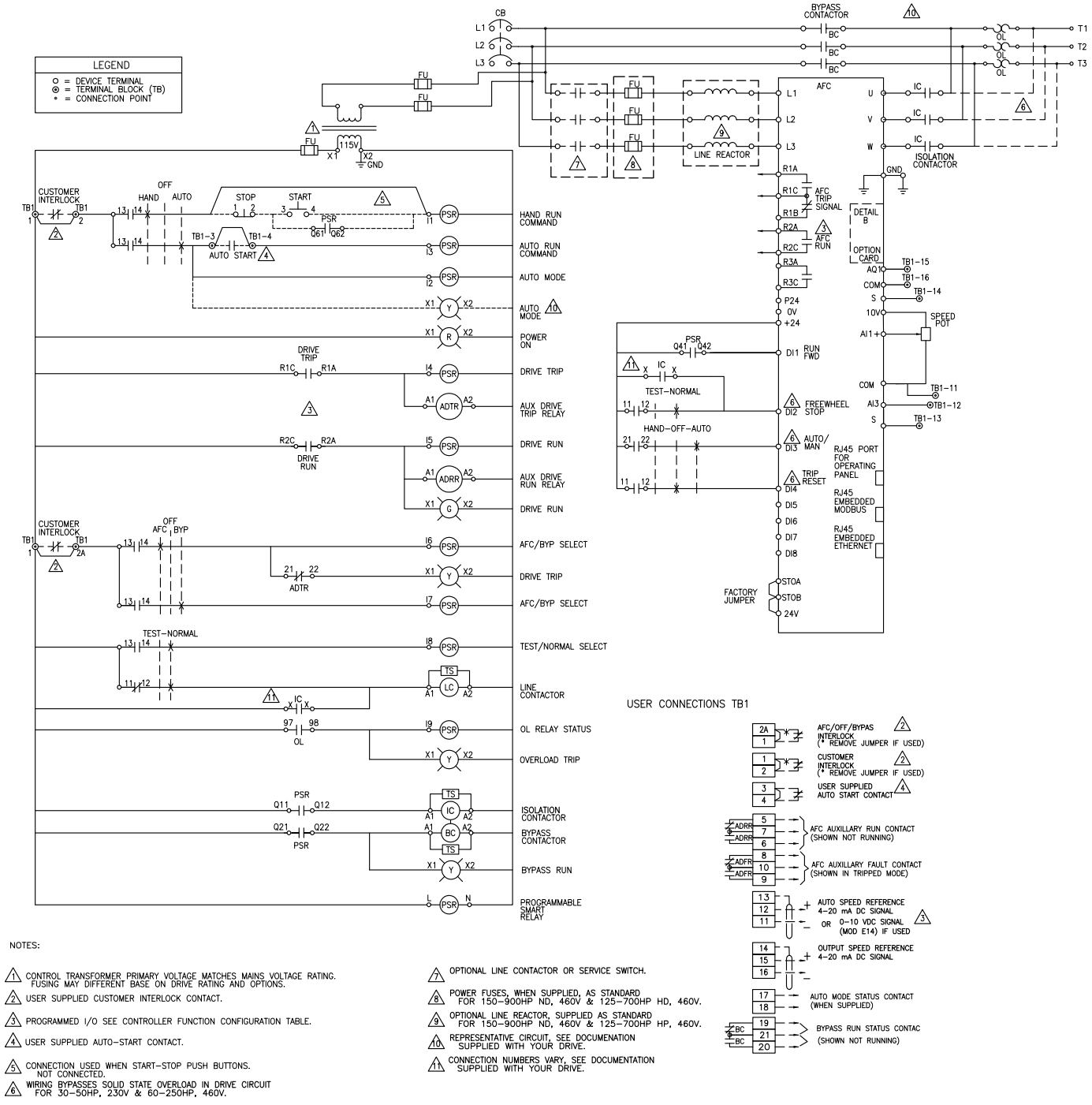
Table 27 - Overall Dimensions

hp (Normal Duty)	208/230 V	460 V	Width		Depth		Height	
			in.	mm	in.	mm	in.	mm
1–7.5	X		16.29	413.7	21.95	557.8	31.9	810.2
1–15		X	16.29	413.7	21.95	557.8	31.9	810.2
10–15	X		16.29	413.7	21.95	557.8	47.65	1210.3
20–30		X	16.29	413.7	21.95	557.8	47.65	1210.3
20–30	X		16.29	413.7	21.95	557.8	55.52	1410.3
40–60		X	16.29	413.7	21.95	557.8	55.52	1410.3
40–60	X		15.75	400	25.46	646.6	85.8	2179
75–125		X	15.75	400	25.46	646.6	85.8	2179
150–250		X	15.75	400	25.46	646.6	93	2362.2
300–500		X	23.62	600	25.46	646.6	93	2362.2
600–700		X	31.5	800	25.46	646.6	93	2362.2
900		X	47.24	1200	25.46	646.6	93	2362.2

Schematics

Figure 46 - Power Circuit Y (with Bypass): Hand-Off-Auto, Start-Stop, and Speed Potentiometer

NOTE: Representative power and control circuit elementary diagram. See the documentation supplied with the drive for a complete diagram.



NOTES:

1. CONTROL TRANSFORMER PRIMARY VOLTAGE MATCHES MAINS VOLTAGE RATING. FUSING MAY DIFFERENT BASE ON DRIVE RATING AND OPTIONS.
2. USER SUPPLIED CUSTOMER INTERLOCK CONTACT.
3. PROGRAMMED I/O SEE CONTROLLER FUNCTION CONFIGURATION TABLE.
4. USER SUPPLIED AUTO–START CONTACT.
5. CONNECTION USED WHEN START–STOP PUSH BUTTONS. NOT CONNECTED.
6. WIRING BYPASSES SOLID STATE OVERLOAD IN DRIVE CIRCUIT FOR 30–50HP, 230V & 60–250HP, 460V.
7. OPTIONAL LINE CONTACTOR OR SERVICE SWITCH.
8. POWER FUSES, WHEN SUPPLIED, AS STANDARD FOR 150–900HP ND, 460V & 125–700HP HD, 460V.
9. OPTIONAL LINE REACTOR, SUPPLIED AS STANDARD FOR 150–900HP ND, 460V & 125–700HP HP, 460V.
10. REPRESENTATIVE CIRCUIT, SEE DOCUMENATION SUPPLIED WITH YOUR DRIVE.
11. CONNECTION NUMBERS VARY, SEE DOCUMENTATION SUPPLIED WITH YOUR DRIVE.

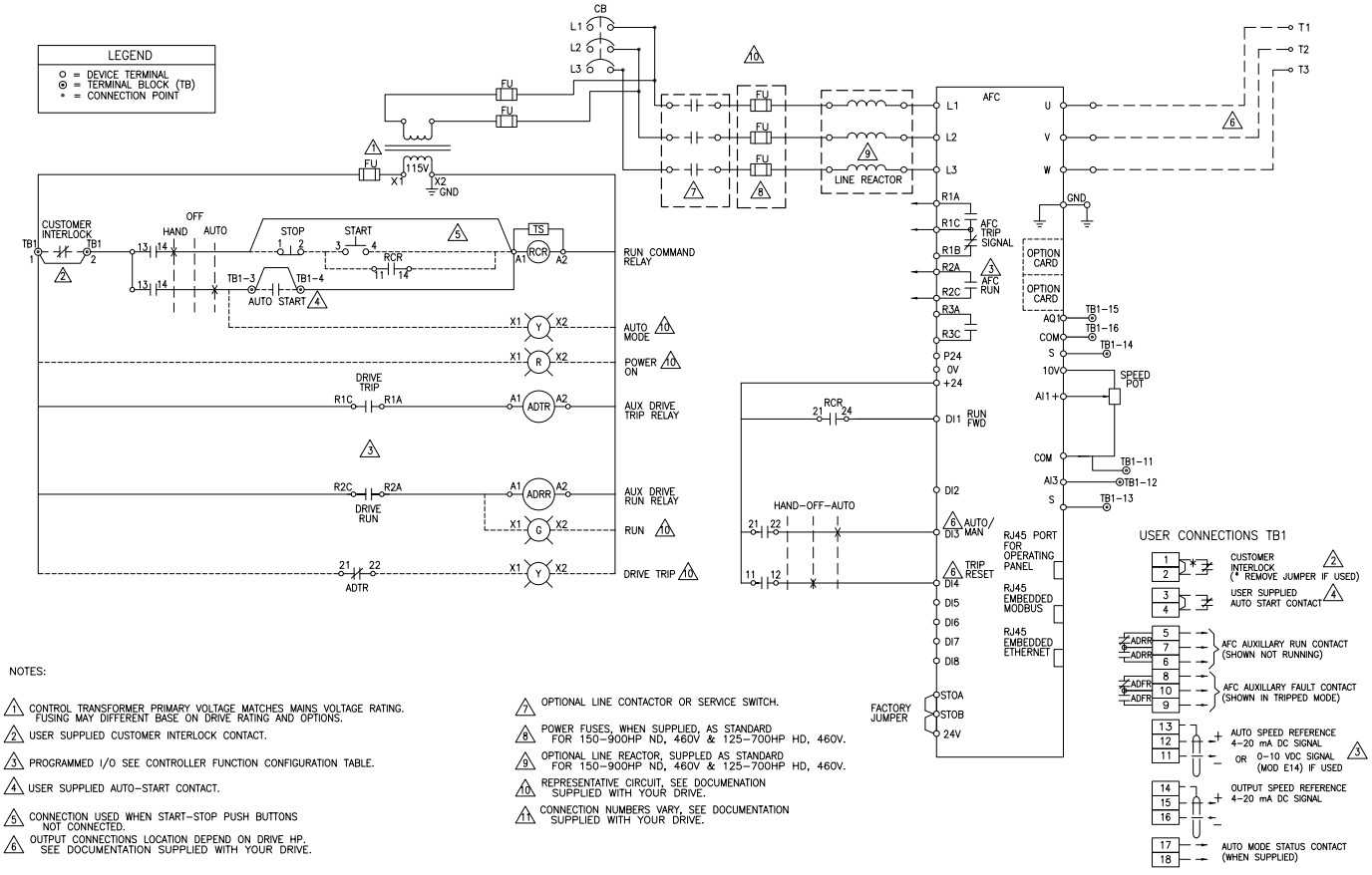
Figure 47 - Power Circuit Y (with Bypass) Factory Configurations

ALTIVAR PROCESS 960 FACTORY CONFIGURATION					
MENU	TAB	SUB–MENU	DESCRIPTION	CODE	ADJ.
1	S.START	–––	2/3 WIRE CONTROL	tCC	2C
1	S.START	–––	STANDARD MOT. FREQ (HZ)	bFr	60
1	S.START	–––	MAX MOT. FREQ (HZ)	tFr	60
1	S.START	–––	ACCELERATION (SEC)	ACC	10
1	S.START	–––	DECELERATION (SEC)	dEC	10
1	S.START	–––	LOW SPEED (HZ)	LSP	3
5.2	––	SWITCHING FREQ.	SWITCHING FREQ. (kHZ)	SFr	2.5
5.4	––	–––	2 WIRE TYPE	tCt	LEL
5.4	––	–––	REF. FREQ 2 CONFIG	Fr2	AI1
5.4	––	–––	REF. FREQ 1 CONFIG	Fr1	AI3
5.4	––	–––	FREQ. SWITCH ASSIGN	rFC	DI3
5.4	––	CONTROL MODE	I/O PROFILE	CHCF	io
5.4	––	COMMAND SWITCHING	COMMAND SWITCHING	CCS	DI3
5.4	––	CMD CHANNEL 1	CMD CHANNEL 1 – TERMINAL	Cd1	tEr
5.4	––	CMD CHANNEL 2	CMD CHANNEL 2 – TERMINAL	Cd2	tEr
5.12	––	STOP CONFIGURATION	FREEWHEEL STOP ASSIGN(DI2 LOW LVL)	nST	DI2
5.14	AI/AQ	AI3 CONFIG.	AI3 MIN. VALUE (mA)(W/O MOD E14)	CrL3	4
5.14	AI/AQ	AI3 CONFIG.	AI3 TYPE (CURRENT W/O MOD E14)	AI3T	OA
5.14	RELAY	R1 CONFIG.	R1 ASSIGN – OPERATING STATE	r1	FLt
5.14	RELAY	R2 CONFIG.	R2 ASSIGN – DRIVE RUNNING	r2	run
5.14	AI/A1	AQ1 CONFIG.	AQ1 ASSIGN – MOTOR FREQ	AO1	oFr
5.14	AI/A1	AQ1 CONFIG.	AQ1 MIN OUTPUT	AOL1	4
5.16	––	TRIP RESET	TRIP RESET	rSF	DI4
5.16	––	CATCH ON THE FLY	CATCH ON THE FLY	FLr	YES
WHEN MOD E14 SELECTED – 0–10V DC SPEED REF.					
MENU	No	SUB–MENU	DESCRIPTION	CODE	ADJ.
5.14	AI/AQ	AI3 CONFIG.	AI3 TYPE (VOLTAGE WITH MOD E140)	AI3t	10u

DESCRIPTION	TYPE 1	TYPE 12	TYPE 3R
ǂ VENTILATION FAN	ALL HP	ALL HP	ALL HP
ǂ SPACE HEATER	NA	NA	1–125HP 460V 1–60HP 230V

Figure 48 - Power Circuit W (without Bypass): Hand-Off-Auto, Start-Stop, and Speed Potentiometer

NOTE: Representative power and control circuit elementary diagram. See the documentation supplied with the drive for a complete diagram.



NOTES:

1. CONTROL TRANSFORMER PRIMARY VOLTAGE MATCHES MAINS VOLTAGE RATING. FUSING MAY DIFFERENT BASE ON DRIVE RATING AND OPTIONS.
2. USER SUPPLIED CUSTOMER INTERLOCK CONTACT.
3. PROGRAMMED I/O SEE CONTROLLER FUNCTION CONFIGURATION TABLE.
4. USER SUPPLIED AUTO–START CONTACT.
5. CONNECTION USED WHEN START–STOP PUSH BUTTONS NOT CONNECTED.
6. OUTPUT CONNECTIONS LOCATION DEPEND ON DRIVE HP. SEE DOCUMENTATION SUPPLIED WITH YOUR DRIVE.
7. OPTIONAL LINE CONTACTOR OR SERVICE SWITCH.
8. POWER FUSES, WHEN SUPPLIED, AS STANDARD FOR 150–900HP ND, 460V & 125–700HP HD, 460V.
9. OPTIONAL LINE REACTOR, SUPPLIED AS STANDARD FOR 150–900HP ND, 460V & 125–700HP HD, 460V.
10. REPRESENTATIVE CIRCUIT, SEE DOCUMENATION SUPPLIED WITH YOUR DRIVE.
11. CONNECTION NUMBERS VARY, SEE DOCUMENTATION SUPPLIED WITH YOUR DRIVE.

Figure 49 - Power Circuit W (without Bypass) Factory Configurations

ALTIVAR PROCESS 960 FACTORY CONFIGURATION					
MENU	TAB	SUB–MENU	DESCRIPTION	CODE	ADJ.
1	S.START	––––	2/3 WIRE CONTROL	tCC	2C
1	S.START	––––	STANDARD MOT. FREQ (HZ)	bFr	60
1	S.START	––––	MAX MOT. FREQ (HZ)	tFr	60
1	S.START	––––	ACCELERATION (SEC)	ACC	10
1	S.START	––––	DECELERATION (SEC)	dEC	10
1	S.START	––––	LOW SPEED (HZ)	LSP	3
5.2	––	SWITCHING FREQ.	SWITCHING FREQ. (kHZ)	SFr	2.5
5.4	––	––––	2 WIRE TYPE	tCt	LEL
5.4	––	––––	REF. FREQ 2 CONFIG	Fr2	AI1
5.4	––	––––	REF. FREQ 1 CONFIG	Fr1	AI3
5.4	––	––––	FREQ. SWITCH ASSIGN	rFC	DI3
5.4	––	CONTROL MODE	I/O PROFILE	CHCF	io
5.4	––	COMMAND SWITCHING	COMMAND SWITCHING	CCS	DI3
5.4	––	CMD CHANNEL 1	CMD CHANNEL 1 – TERMINAL	Cd1	tEr
5.4	––	CMD CHANNEL 2	CMD CHANNEL 2 – TERMINAL	Cd2	tEr
5.14	AI/AQ	AI3 CONFIG.	AI3 MIN. VALUE (mA)(W/O MOD E14)	CrL3	4
5.14	AI/AQ	AI3 CONFIG.	AI3 TYPE (CURRENT W/O MOD E14)	AI3T	OA
5.14	RELAY	R1 CONFIG.	R1 ASSIGN – OPERATING STATE	r1	FLt
5.14	RELAY	R2 CONFIG.	R2 ASSIGN – DRIVE RUNNING	r2	run
5.14	AI/A1	AQ1 CONFIG.	AQ1 ASSIGN – MOTOR FREQUENCY	AO1	oFr
5.14	AI/A1	AQ1 CONFIG.	AQ1 MIN OUTPUT	AOL1	4
5.16	––	TRIP RESET	TRIP RESET	rSF	DI4
5.16	––	CATCH ON THE FLY	CATCH ON THE FLY	FLr	YES
WHEN MOD E14 SELECTED – 0–10V DC SPEED REF.					
MENU	No	SUB–MENU	DESCRIPTION	CODE	ADJ.
5.14	AI/AQ	AI3 CONFIG.	AI3 TYPE (VOLTAGE WITH MOD E14)	AI3t	10u

DESCRIPTION	TYPE 1	TYPE 12	TYPE 3R
‡ VENTILATION FAN	ALL HP	ALL HP	ALL HP
‡ SPACE HEATER	NA	NA	1–125HP 460V 1–60HP 230V

Replacement Parts and Maintenance

Replacement Parts

Schneider Electric provides a limited number of replacement parts for the ATV960 Process drive. Before replacing any parts, consult your local field sales representative. Replacements parts must be installed by qualified personnel familiar with the equipment being replaced.

Table 28 - Replacement Parts

Description	Catalog Number
Profinet I/O[16]	VW3A3627
Profibus DP[16]	VW3A3607
CANopen 2XRJ45[16]	VW3A3608
DeviceNet[16]	VW3A3609
CANopen SUB-D9[16]	VW3A3618
CANopen open style with screw terminals[16]	VW3A3628
Extended I/O module[16]	VW3A3203
Extended relay module[16]	VW3A3204
Bacnet MS/TP	VW3A3725
EtherCAT	VW3A3601
AC coil for LC1F150	LX1FF095
AC coil for LC1F185	LX1FG095
AC coil for LC1F265	LX1FH1272
AC coil for LC1F330	LX1FH1272
AC coil for LC1F400	LX1FJ110
Pilot light, red Power On	ZB5AV04 Red pilot light head
	ZB5AV6 Mounting collar with light module
	ZB5AW0G15 LED
	65170-166-24 Power On legend plate
	ZBZ32 Legend plate holder
Pilot light, yellow Auto Mode Tripped	ZB5AV05 Amber pilot light head
	ZB5AV6 Mounting collar with light module
	ZB5AW0G15 LED
	65170-166-39 Trip legend plate or 65170-166-08 Auto legend plate
	ZBZ32 Legend plate holder
Pilot light, green AFC Run	ZB5AV03 Green pilot light head
	ZB5AV6 Mounting collar with light module
	25501-00005 LED
	65170-166-42 AFC Run legend plate

16. Field replacement of option boards resets the power converter to the factory defaults. You must reconfigure it per the elementary diagram provided.

Table 28 - Replacement Parts (Continued)

Description	Catalog Number
	ZBZ32 Legend plate holder
Pilot light mounting collar with light module	ZB5AV6
Pilot light mounting collar with light module, and 1 N.O. and 1 N.C. contact for p-t-t	ZB5AW065
Hand-Off-Auto selector switch assembly	ZB5AD3 Three-position selector switch
	ZB5AZ009 Mounting collar
	ZBE205 Contact blocks (1 N.C. and 1 N.O.)
	65170-166-17 Hand-Off-Auto legend plate
	(2) ZBZ32 Legend plate holder
Speed potentiometer	ATVPOT25K Speed potentiometer assembly
Stop/Start push buttons	ZB5AA2 Black push button
	ZB5AA4 Red push button
	ZB5AZ101 Mounting collar w/ contact block (1 N.O.)
	ZB5AZ102 Mounting collar w/ contact block (1 N.C.)
	65170-166-31 Start legend plate
	65170-166-09 Stop legend plate
	(2) ZBZ32 Legend plate holders
Fan with filter, 170 mm x 150 mm, 115 Vac 460 V / 1–30 hp ND, 1–25 hp HD, Type 1 & 12 208/230 V / 1–15 hp ND, 1–10 hp HD, Type 1 & 12	NSYCVF85M115PF
Fan with filter, 270 mm x 250 mm, 115 Vac 460 V / 40–120 hp ND, 30–100 hp HD, Type 1 & 12 208/230 V / 20–60 hp ND, 15–50 hp HD, Type 1 & 12	NSYCVF300M115PF
Fan filter, 170 mm x 150 mm 460 V / 1–30 hp ND, 1–25 hp HD 208/230 V / 1–15 hp ND, 1–10 hp HD	NSYCAF125
Fan filter, 270 mm x 250 mm 460 V / 40–900 hp ND, 30–700 hp HD 208/230 V / 20–60 hp ND, 15–50 hp HD	NSYCAF223
Enclosure grill filter, 270 mm x 250 mm 460 V / 150–250 hp ND, 125–200 hp HD	NSYCAF223
Power electronic fan kit, 48 Vdc 460 V / 150–900 hp ND 125–700 hp HD	VX5VPM001
Enclosure door fan, 270 mm x 250 mm, 48 Vdc 460 V / 150–900 hp ND 125–700 hp HD	VX5VPM003
Door fan, 320 mm x 320 mm (when supplied)	1167715405517
Door fan filter, 320 mm x 320 mm, pack of 5	186116000317
Roof fan, 470 mm x 470 mm (when supplied)	116811520517
Roof fan filter, 470 mm x 470 mm, pack of 20	186116003917
Advanced drive keypad (not suitable for installation outdoors)	VW3A1111
Remote keypad adapter (not suitable for installation outdoors)	VW3A1112

17. These are Pfannenberg part numbers and need to be ordered externally.

Table 28 - Replacement Parts (Continued)

Description	Catalog Number
Zelio USB Cable	SR2USB01
ATV900 control block, all ratings	VX4B900100
RFI filter board, 460 V /150–900 hp ND 125–700 hp HD	VX4FPMC1180N4
Inverter board, 460 V / 150 hp (110 kW)	VX4IPMC11NSCN4
Inverter board, 460 V / 200 hp (132 kW)	VX4IPMC13NSCN4
Inverter board, 460 V / 250 hp (160 kW)	VX4IPMC16NSCN4
Power board, 460 V / 150–900 hp ND, 125–700 hp HD	VX4PPMC1180N4
Supply board, 460 V / 110–630 kW 460 V / 150–900 hp ND, 125–700 hp HD	VX4XPAMC1180N4
Connection cables, CMP6 to CMI1	VX5XPM001
DC supply for fans, 48 Vdc	VX5XPM002
Inverter Brick 460 V / 150–250 hp	VX5IBPMC1116NSCN4
Rectifier Brick 460 V / 150–250 hp	VX5RBPMC1116NSCN4
Fuse set, 3 pcs, 250 A, URD30 460 V / 125 hp HD, 150 hp ND, 250 hp HD, 300 hp ND	VX5FUPM0250
Fuse set, 3 pcs, 315 A, URD30 460 V / 150 hp HD, 200 hp ND, 300 hp HD, 400 hp ND, 500 hp HD, 600 hp ND	VX5FUPM0315
Fuse set, 3 pcs, 350 A, URD30 460 V / 200 hp HD, 250 hp ND, 400 hp HD, 500 hp ND, 600 hp HD, 700 hp ND, 700 hp HD, 900 hp ND	VX5FUPM0350
Primary control fuses standard 460 V, Type 1 and 12[18]	25430-20100[19] (no bypass 125 hp and lower, bypass 15 hp and lower) 25430-20250[20] (bypass 20–125 hp) 25430-20320[21] (any 150–500 hp) 25430-20700[22] (any 600–900 hp)
Secondary control fuses standard 460 V, Type 1 and 12[18]	25430-20140[23] (no bypass 125 hp and lower, bypass 15 hp and lower) 25430-20350[24] (bypass 20–125 hp) 25430-20400[25] (any 150–250 hp) 25430-20700[22] (any 300–500 hp) 25430-21000[26] (any 600–900 hp)
Primary control fuses standard 460 V with Mod K14 (additional 150 VA), Type 1 and 12[18]	25430-20250[20] (no bypass 125 hp and lower, bypass 15 hp and lower) 25430-20500[27] (bypass 20–125 hp) 25430-20320[21] (any 150–250 hp and 900 hp) 25430-20700[22] (any 300–500 hp) 25430-21000[26] (any 600–900 hp)
Secondary control fuses standard 460 V with Mod K14 (additional 150 VA), Type 1 and 12[18]	25430-20350[24] (no bypass 125 hp and lower, bypass 15 hp and lower) 25430-20700[22] (bypass 20–125 hp) 25430-20400[25] (any 150–250 hp) 25430-20700[22] (any 300–500 hp) 25430-21000[26] (any 600–900 hp) 25430-20500[27] (900 hp)

18. Fuses can not be ordered directly from Schneider Electric. Equivalent Bussman part numbers are listed below and can be acquired externally.
19. Bussman fuse FNQ-R-1.
20. Bussman fuse FNQ-R-2-1-2.
21. Bussman fuse FNQ-R-3-2-10.
22. Bussman fuse FNQ-R-7.
23. Bussman fuse FNQ-R-1-4-10.
24. Bussman fuse FNQ-R-3-1-2.
25. Bussman fuse FNQ-R-4.
26. Bussman fuse FNQ-R-10.
27. Bussman fuse FNQ-R-5.

Table 28 - Replacement Parts (Continued)

Description	Catalog Number
Primary control fuses standard 460 V, Type 3R[28]	25430-20500[29] (any 125 hp and lower)
Secondary control fuses standard 460 V, Type 3R[28]	25430-20700[30] (any 125 hp and lower)
Primary control fuses standard 460 V with Mod K14 (additional 150 VA), Type 3R[28]	25430-20500[29] (no bypass 125 hp and lower bypass 60 hp and lower) 25430-20800[31] (bypass 70–125hp)
Secondary control fuses standard 460 V with Mod K14 (Additional 150 VA), Type 3R[28]	25430-20700[30] (no bypass 125 hp and lower, bypass 60 hp and lower) 25430-21000[32] (bypass 70–125 hp)
Primary control fuses standard 208/230 V, Type 1 and 12[28]	25430-20200[33] (no bypass, bypass 15 hp and lower) 25430-20500[29] (bypass 20 hp and up)
Secondary control fuses standard 230 V, Type 1 and 12[28]	25430-20140[34] (no bypass, bypass 15 hp and lower) 25430-20350[35] (bypass 20 hp and up)
Primary control fuses standard 208/230 V with Mod K14 (additional 150 VA), Type 1 and 12[28]	25430-20500[29] (no bypass 60 hp and lower bypass 7.5 hp and lower) 25430-20350[35] (bypass 10 hp and up)
Secondary control fuses standard 208/230 V with Mod K14 (additional 150 VA), Type 1 and 12[28]	25430-20350[35] (no bypass 60 hp and lower bypass 7.5 hp and lower) 25430-20700[30] (bypass 10 hp and up)
Primary control fuses standard 208/230 V, Type 3R[28]	25430-20350[35] (any 60 hp and lower)
Secondary control fuses standard 208/230 V, Type 3R[28]	25430-20700[30] (any 60 hp and lower)
Primary control fuses standard 208/230 V with Mod K14 (additional 150 VA), Type 3R[28]	25430-20350[35] (no bypass 60 hp and lower, bypass 30 hp and lower)
Secondary control fuses standard 208/230 V with Mod K14 (additional 150 VA), Type 3R[28]	25430-20700[30] (no bypass 60 hp and lower, bypass 30 hp and lower) 25430-21000[32] (bypass 40 hp and up)
Power converter ND 1 hp 208/230 V	ATV930U07M3
Power converter ND 2 hp, HD 1 hp, 208/230 V	ATV930U15M3
Power converter ND 3 hp, HD 2 hp, 208/230 V	ATV930U22M3
Power converter HD 3 hp 208/230 V	ATV930U30M3
Power converter ND 5 hp 208/230 V	ATV930U40M3
Power converter ND 7.5 hp, HD 5 hp, 208/230 V	ATV930U55M3
Power converter ND 10 hp, HD 7.5 hp, 208/230 V	ATV930U75M3
Power converter ND 15 hp, HD 10 hp, 208/230 V	ATV930D11M3
Power converter ND 20 hp, HD 15 hp, 208/230 V	ATV930D15M3
Power converter ND 25 hp, HD 20 hp, 208/230 V	ATV930D18M3
Power converter ND 30 hp, HD 25 hp, 208/230 V	ATV930D22M3
Power converter ND 40 hp, HD 30 hp, 208/230 V	ATV930D30M3
Power converter ND 50 hp, HD 40 hp, 208/230 V	ATV930D37M3
Power converter ND 60 hp, HD 50 hp, 230 V	ATV930D45M3

28. Fuses can not be ordered directly from Schneider Electric. Equivalent Bussman part numbers are listed below and can be acquired externally.
29. Bussman fuse FNQ-R-5.
30. Bussman fuse FNQ-R-7.
31. Bussman fuse FNQ-R-8.
32. Bussman fuse FNQ-R-10.
33. Bussman fuse FNQ-R-2.
34. Bussman fuse FNQ-R-1-4-10.
35. Bussman fuse FNQ-R-3-1-2.

Table 28 - Replacement Parts (Continued)

Description	Catalog Number
Power converter ND 1 hp 460 V	ATV930U07N4
Power converter ND 2 hp, HD 1 hp, 460 V	ATV930U15N4
Power converter ND 3 hp, HD 2 hp, 460 V	ATV930U22N4
Power converter HD 3 hp 460 V	ATV930U30N4
Power converter ND 5 hp 460 V	ATV930U40N4
Power converter ND 7.5 hp, HD 5 hp, 460 V	ATV930U55N4
Power converter ND 10 hp, HD 7.5 hp, 460 V	ATV930U75N4
Power converter ND 15 hp, HD 10 hp, 460 V	ATV930D11N4
Power converter ND 20 hp, HD 15 hp, 460 V	ATV930D15N4
Power converter ND 25 hp, HD 20 hp, 460 V	ATV930D18N4
Power converter ND 30 hp, HD 25 hp, 460 V	ATV930D22N4
Power converter ND 40 hp, HD 30 hp, 460 V	ATV930D30N4
Power converter ND 50 hp, HD 40 hp, 460 V	ATV930D37N4
Power converter ND 60 hp, HD 50 hp, 460 V	ATV930D45N4
Power converter ND 75 hp, HD 60 hp, 460 V	ATV930D55N4
Power converter ND 100 hp, HD 75 hp, 460 V	ATV930D75N4
Power converter ND 125 hp, HD 100 hp, 460 V	ATV930D90N4

Maintenance Intervals

Table 29 - Recommended Maintenance Intervals[36]

Component	Interval:	
	In Operating Hours	In Years
Power part fan	35,000	4
Enclosure door fan	35,000	4
Filter mats	—	Clean every six months, replace all every four years.

Electronic Door Interlock

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read and understand the precautions in bulletin NHA60269, Drives Systems Installation and Maintenance, before performing any procedures in this bulletin.

Failure to follow these instructions will result in death or serious injury.

36. Intervals are from date of commissioning and may vary depending on the ambient conditions.

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand this manual before installing or operating the enclosed drive. Installation, adjustment, repair, and maintenance must be performed by qualified personnel.
- The user is responsible for compliance with national and local electrical codes with respect to grounding of all equipment.
- Many parts of this equipment, including the printed circuit boards, operate at the line voltage. DO NOT TOUCH. Use only electrically-insulated tools.
- DO NOT touch unshielded components or terminal strip screw connections with voltage present.
- DO NOT short across terminals PA/+ and PC/- or across the DC bus capacitors.
- Before servicing the equipment disconnect the power, including the external control power that may be present. The circuit breaker or disconnecting switch does not always open all circuits.
- Lock the circuit breaker or disconnecting switch in the opened position.
- Place a “DO NOT TURN ON” label on the circuit breaker or disconnect switch of the enclosed drive.
- Wait 15 minutes to allow the DC bus capacitors to discharge. Then follow the “DC Bus Voltage Measurement Procedure” in document NHA60269 to verify that the DC voltage is less than 42 V. The enclosed drive LED is not an indicator of the absence of DC bus voltage.
- Install and close all covers before applying power or starting and stopping the equipment.

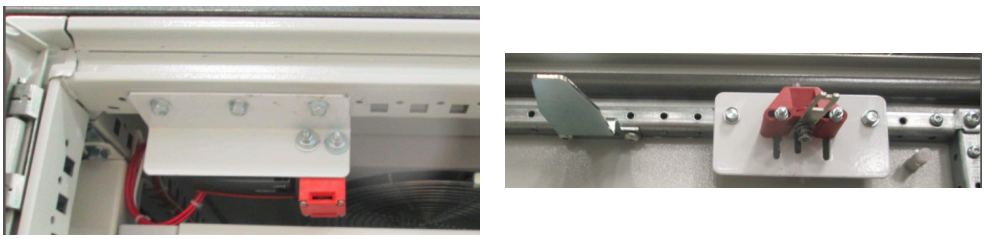
Failure to follow these instructions will result in death or serious injury.

Electronic door interlocks, when provided, electrically lock the enclosure doors when control power is present. See Electronic Door Interlocks, page 92. Electronic door interlocks are provided on a door that cannot be interlocked with a through-the-door disconnect handle, such as on a multi-door enclosed drive. A door switch on the main door, when closed, allows the electronic locks to engage.

To open the doors, turn the circuit breaker off.

To engage the electronic door interlock, close all doors and turn the circuit breaker on. Turning on the circuit breaker with a door open will cause the circuit breaker to trip.

Figure 50 - Electronic Door Interlocks



Servicing the Front Fan Filters (without Rain Hood)

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA® 70E® Standard for Electrical Safety in the Workplace®, NOM-029-STPS – Maintenance of Electrical Installations in the Workplace, Safety Conditions, or CSA Z462 or local equivalent.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

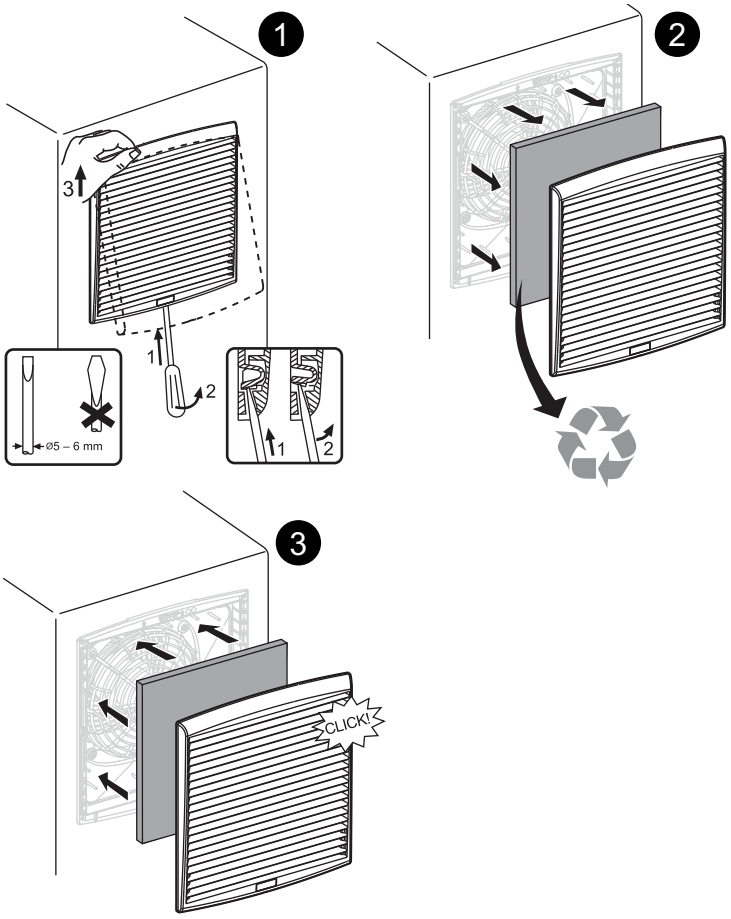
Failure to follow these instructions will result in death or serious injury.

The ATV960 process drive includes filtered forced air ventilation that prevents excess dust or debris from entering the enclosure. The filters require periodic maintenance and replacement. Replacement or cleaning of filters is suggested once every six months at minimum, but the frequency may increase depending on a number of environmental factors. Select a maintenance cycle that is appropriate for your installation conditions.

1. Remove all power from the enclosed drive.
2. Turn the circuit breaker and handle assembly to the Off position and open the enclosure door.
3. Test for the absence of voltage.

   NOTE: Verify that the voltage tester is functioning properly before and after testing for the absence of voltage.
4. Unlock the air outlet grill with a flat head screwdriver and lift the grill to the top. See Changing Front Filters, page 94.
5. Remove the grill and filter mat. Discard the filter mat.
6. Press the air outlet grill and the new filter mat into the cut out until it locks with an audible noise.

Figure 51 - Changing Front Filters



Servicing the Exhaust Fan Filter

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA® 70E® Standard for Electrical Safety in the Workplace®, NOM-029-STPS – Maintenance of Electrical Installations in the Workplace, Safety Conditions, or CSA Z462 or local equivalent.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

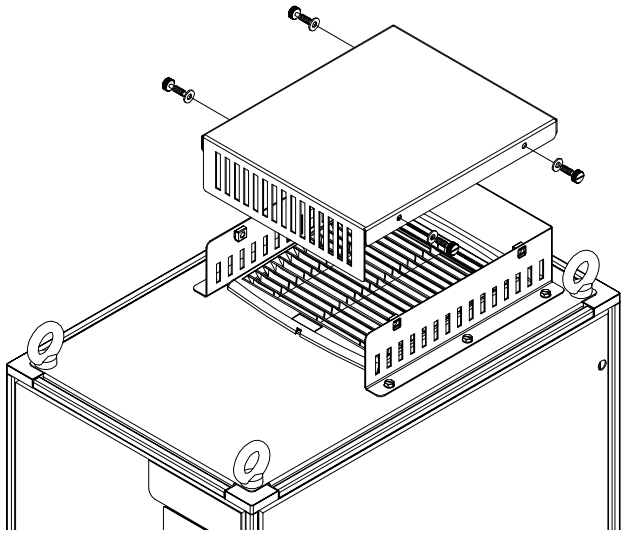
Service of the exhaust filter is typically not required unless environmental conditions are especially dusty or the equipment has not been operated for an extended period of time. To access the exhaust fan filter:

1. Remove all power from the enclosed drive.
2. Turn the circuit breaker and handle assembly to the Off position and open the enclosure door.
3. Test for the absence of voltage.

   NOTE: Verify that the voltage tester is functioning properly before and after testing for the absence of voltage.
4. For Type 3R equipment, refer to Accessing the Lifting Brackets, page 23 and follow the instructions for removing the rain hood.
5. For Type 12 equipment, remove the vent grill as illustrated in Accessing the Exhaust Fan Filters on Type 12 Equipment, page 95.

Service (clean or replace) the exhaust fan filter following the instructions in Servicing the Front Fan Filters (without Rain Hood), page 93 for the front filters. Always replace the rain hood or top cover and thumb screws after cleaning or replacing the filter.

Figure 52 - Accessing the Exhaust Fan Filters on Type 12 Equipment



Replacing the Door Fans

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA® 70E® Standard for Electrical Safety in the Workplace®, NOM-029-STPS – Maintenance of Electrical Installations in the Workplace, Safety Conditions, or CSA Z462 or local equivalent.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

1. Remove all power from the enclosed drive.
2. Turn the circuit breaker and handle assembly to the Off position and open the enclosure door.
3. Test for the absence of voltage.

   NOTE: Verify that the voltage tester is functioning properly before and after testing for the absence of voltage.
4. Remove the grounding cable and disconnect the fan's power supply. See Removing the Door Fan, page 96.
5. Remove two screws, lift the grill from the fan, and remove the fan from the housing. Discard the fan but save the grill and screws to reinstall with the new fan.
6. Position the new fan so that the direction arrows point to the fan housing. Affix the fan and grill to the housing using the two screws. See Installing the New Door Fan, page 96.
7. Reconnect the fan's power supply and the grounding cable.

Figure 53 - Removing the Door Fan

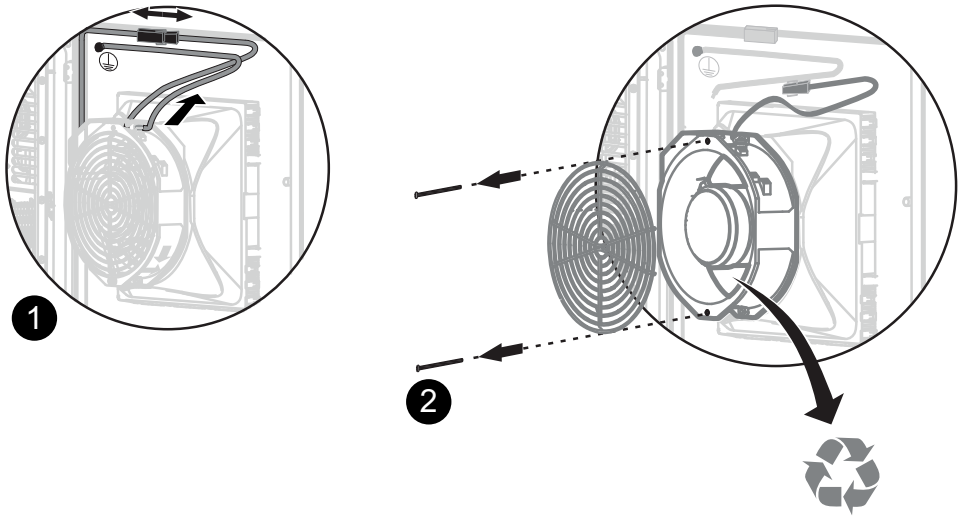
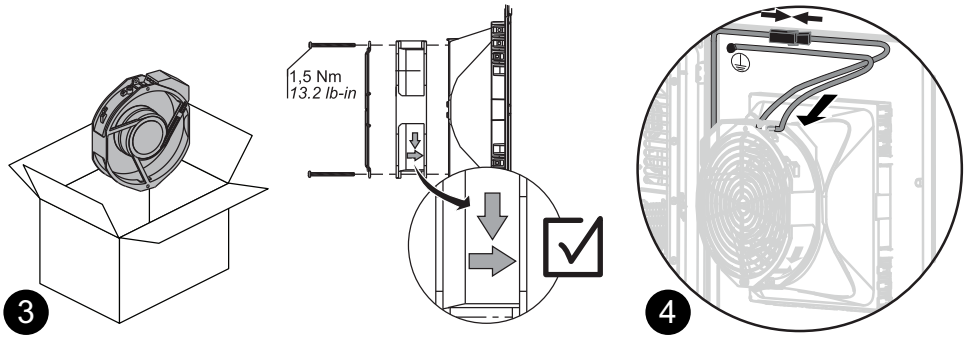


Figure 54 - Installing the New Door Fan



Replacing the Power Fan

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA® 70E® Standard for Electrical Safety in the Workplace®, NOM-029-STPS – Maintenance of Electrical Installations in the Workplace, Safety Conditions or CSA Z462 or local equivalent.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

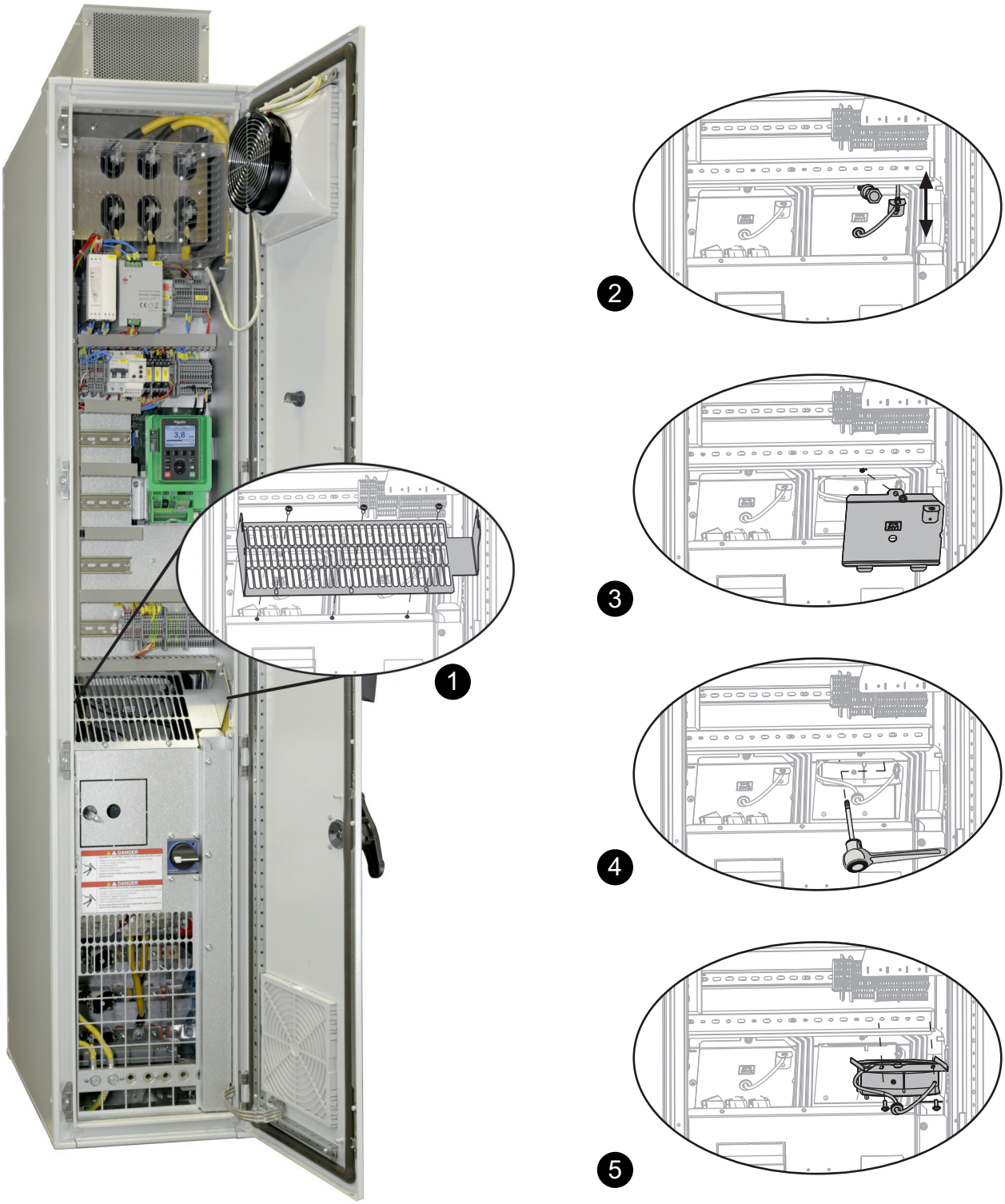
Failure to follow these instructions will result in death or serious injury.

To replace the power fan on 150 hp devices and higher (see Installing the Power Fan, page 98).

1. Remove all power from the enclosed drive.
2. Turn the circuit breaker and handle assembly to the Off position and open the enclosure door. See Installing the Power Fan, page 98, Step 1.
3. Test for the absence of voltage.

   NOTE: Verify that the voltage tester is functioning properly before and after testing for the absence of voltage.
4. Loosen the screws from the fan's protective cover, if provided. See Installing the Power Fan, page 98, Step 1.
5. Disconnect the power cable from the fan and the protective cover. Loosen the Torx® screw from the cover. See Installing the Power Fan, page 98, Steps 2 and 3.
6. Swivel the fan cover forward and remove it from the anchorage. Press the power cable, including the grommet, through the middle hole in the fan cover. Remove the fan cover. See Installing the Power Fan, page 98, Step 3.
7. Loosen the two M6 Torx screws at the fan housing. See Installing the Power Fan, page 98, Step 4.
8. After loosening the Torx screws, pull the fan to the front. See Installing the Power Fan, page 98, Step 5.
9. Install the new fan by following the preceding steps in reverse order. Secure the fan with the two M6 Torx screws. Torque the screws to 49 lb-in. (5.5 N•m).

Figure 55 - Installing the Power Fan



Technical Support

For Post Sales technical support please contact the Drive Products Support Group (DPSG).

Normal business hours are Monday through Friday, 8am to 8pm EST. Support outside normal business hours is available with Premium Support.

Toll free	Contact us via MySchneider. Or toll free call at 1-888-778-2733. Select Option 2, Technical Support, then Option 4, Drives and Soft Starters.
E-mail	drive.products.support@se.com

Appendix A

Zelio™ Smart Relay Ladder Logic

The Zelio Smart Relay controls the power converter's output contactor and the bypass contactor when Bypass (Mod Y10) is selected. Zelio Smart Relay Program, page 101contains a diagram of the default Zelio Smart Relay program. See Zelio Smart Relay Ladder Logic Timers, page 100 for a timing chart, Zelio Smart Relay Discrete Inputs, page 100 for the discrete inputs, and Zelio Smart Relay Discrete Outputs, page 100 for the discrete outputs.

Custom requests may result in a program that differs from the one illustrated in Zelio Smart Relay Program, page 101. If you have requested custom programming, review the drawings supplied with the process drive.

Table 30 - Zelio Smart Relay Ladder Logic Timers

Timer	Description	Function	Time (s)
T1	Power on delay	A: Active, control held down	6
T2	Open delay	C: Off delay	2
T3	AFC run delay	A: Active, control held down	5
T4	AFC contactor time delay	A: Active, control held down	3
T5	Bypass contactor time delay	A: Active, control held down	3
T6	Drive trip signal delay	A: Active, control held down	2
T7	Start with Line contactor	B: On pulse one shot	6

Table 31 - Zelio Smart Relay Discrete Inputs

Physical Inputs	Function	Comment
I1	Discrete input	HOA in hand mode
I2	Discrete input	HOA in auto mode
I3	Discrete input	Auto mode input
I4	Discrete input	Drive R1 (trip)
I5	Discrete input	Drive R2 (run)
I6	Discrete input	AFC/off/Bypass in AFC
I7	Discrete input	AFC/off/Bypass in Bypass
I8	Discrete input	Test/Normal mode switch
I9	Discrete input	Overload relay trip state

Table 32 - Zelio Smart Relay Discrete Outputs

Physical Outputs	Function	Comment
Q1	Discrete output	AFC contactor
Q2	Discrete output	Bypass contactor
Q4	Discrete output	AFC run command
Q6	Discrete output	Start push button seal (Mod B11)

Figure 56 - Zelio Smart Relay Program

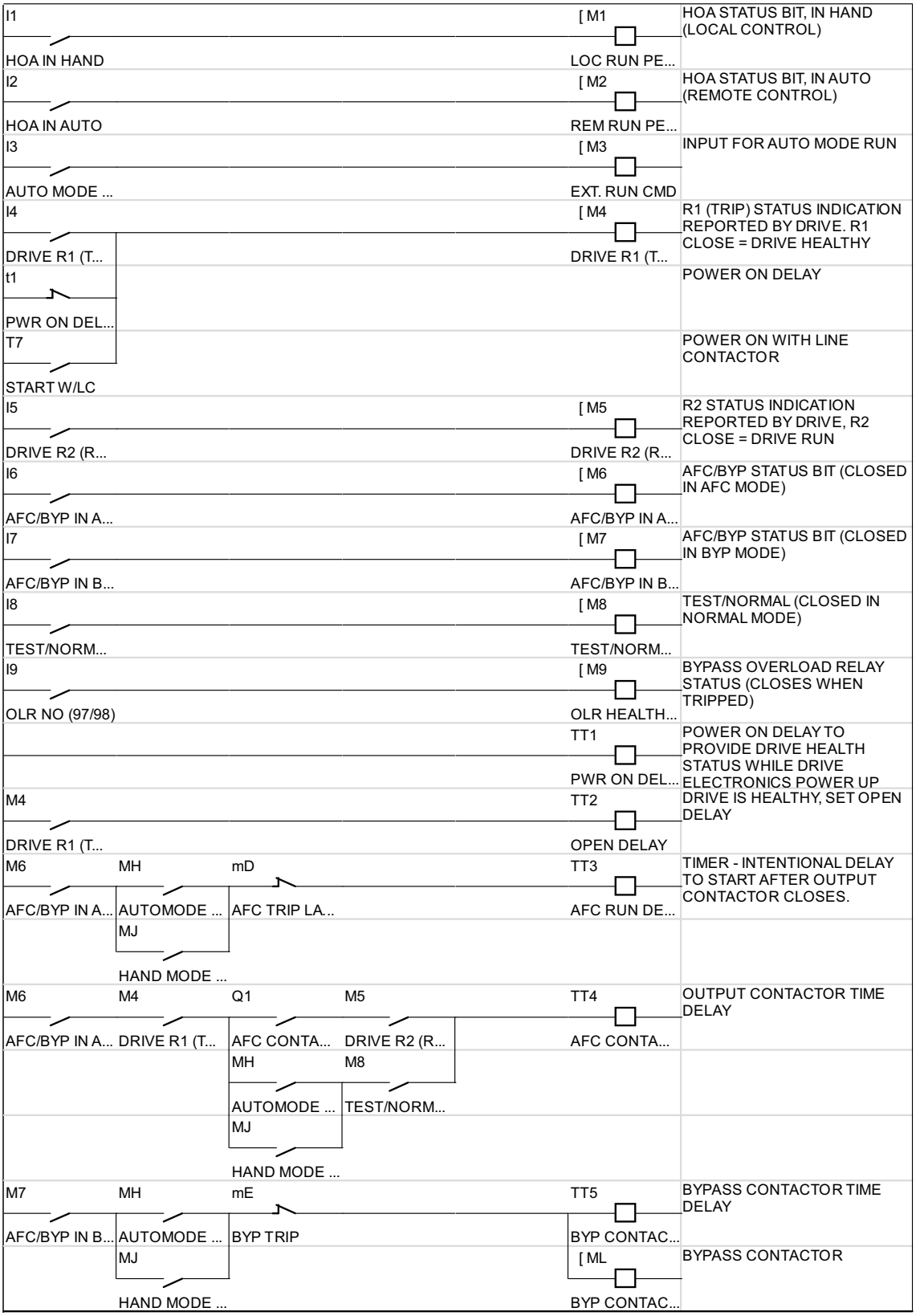
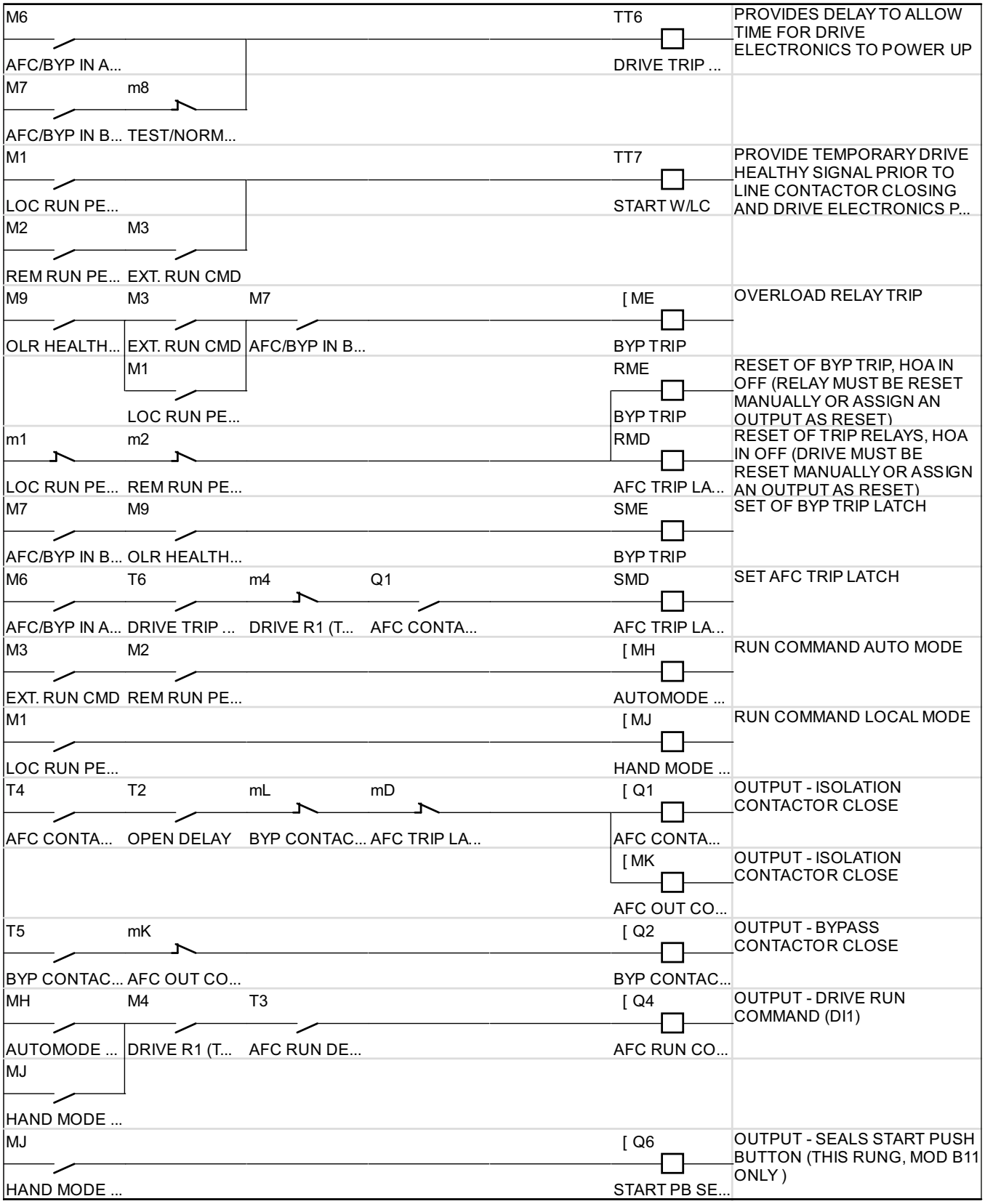


Figure 57 - Zelio Smart Relay Program



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As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

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