Altivar™ 980 Regenerative Process Drive

Instruction Bulletin

QGH27523 Rev. 02
10/2024

www.se.com

Legal Information

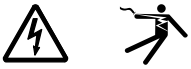
The information provided in this document contains general descriptions, technical characteristics and/or recommendations related to products/solutions.

This document is not intended as a substitute for a detailed study or operational and site-specific development or schematic plan. It is not to be used for determining suitability or reliability of the products/solutions for specific user applications. It is the duty of any such user to perform or have any professional expert of its choice (integrator, specifier or the like) perform the appropriate and comprehensive risk analysis, evaluation and testing of the products/solutions with respect to the relevant specific application or use thereof.

Table of Contents

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.

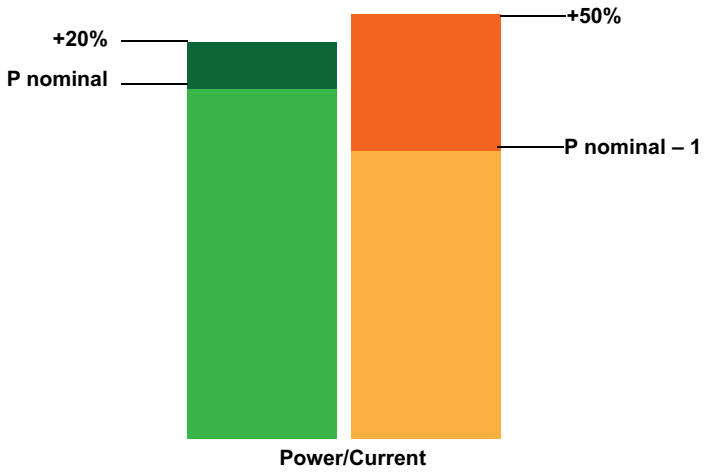
Introduction

Application Considerations

Altivar 980 Regenerative 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 980 (ATV980) Regenerative Process Drives. 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.

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 Altivar 980 Regenerative Process Drives.
- Bypass, or integral bypass starter, refers to the optional, integrated full-voltage combination starter in the 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 980 Regenerative Drive System is a packaged, high-performance solution for regenerative applications. This active front end (AFE) drive features a three-level input switching stage which reduces common mode voltage and improves performance and efficiency due to custom designed filtering and the three-level design. As such, it provides reduced motor bearing currents and improves the average motor lifespan.

This regenerative drive is highly efficient four-quadrant technology for speed control in both energy directions.

The basic equipment contains active in-feed modules and filter components as well as frequency inverter modules, semiconductor fuses, a main switch, a dv/dt filter choke from 300 hp (200 kW) for the protection of the motor, and spacious mains and bus bars for connection of power cables.

This new technology reaches a total distortion factor, THD(i), of around 2% and therefore fulfills the requirements according to IEEE 519 of THD(i) < 5% in the case of distorted mains voltage.

This robust, adjustable speed drive system is UL 508A Listed for all ratings, with selectable control and power configurations. It is available in Types 1 and 12, in the following ranges. See Component Locations, Dimensions, and Schematics, page 51 for frame dimensions.

- Frame 1a: 150–250 hp (110–160 kW) ND and 125–200 hp (90–130 kW) HD
- Frame 2a: 300–500 hp (200–310 kW) ND and 250–400 hp (160–250 kW) HD
- Frame 3a: 600–700 hp (400–500 kW) ND and 500–500 hp (310–400 kW) HD
- Frame 4a: 900 hp (630 kW) ND and hp (500 kW) HD

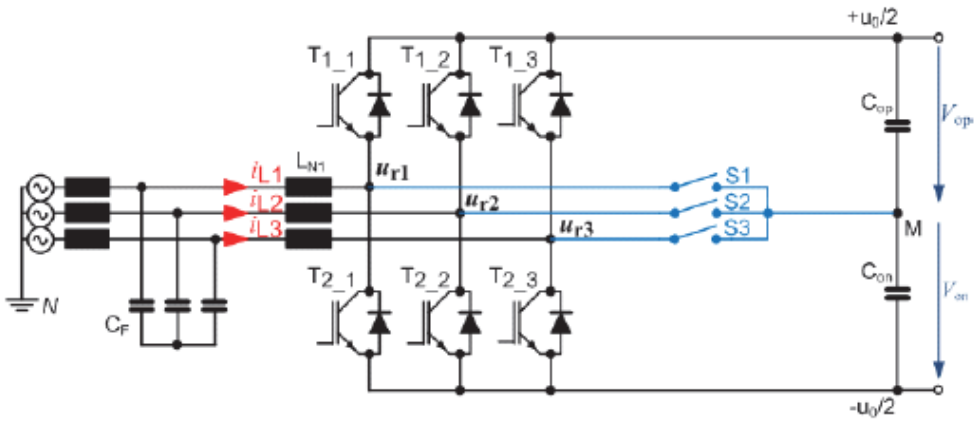
Three-Level Approach

The three-level input switching stage shares many features with two-level active front ends, but with the addition of some important features. The third level is created by the connection of switches between the mains voltage and midpoint of the DC bus (see Three-Level Input Switching, page 10), allowing for a third level of switching:

- 0 V
- One-half of the DC bus voltage and
- Full DC bus voltage.

The result is better command and control of the currents flowing to and from the drive.

Figure 2 - Three-Level Input Switching



- Three switches (S1, S2, S3) from each phase to capacitor midpoint
- Three voltage levels available for current shaping

Benefits

- Four-quadrant operation in modern three-level design
- Significant speed and torque accuracy, with and without encoder feedback
- Total current distortion factor THD(i) ~2%
- Compliant with IEEE 519 even in distorted networks
- Extended motor life due to reduction of isolation stress on factor 2
- Excellent performance for all common motor types
- Enhanced efficiency compared to the classic 2-level AFE design
- Compact dimensions due to optimized filter components

Figure 3 - Altivar 980 Regenerative Process Drive, 150–900 hp, Available in Types 1 and 12

Type 12
250 hp (160 kW)

Type 1
500 hp (310 kW) ND

Standard Features

Process Drive without Bypass (150–900 hp ND and 125–700 hp HD)

The following are standard features for the process drive without bypass, when no options are ordered:

- Robustness of high overload capacity, with overload capability of 20%
- An Ethernet port maximizes services such as connection to the control room and full process transparency.
- Circuit breaker disconnect
- Four enclosure frame sizes
- 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 the process drive 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
- 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 Instructions

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read and understand the instructions 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.
- DO NOT short across terminals PA/+ and PC/-, the DC bus capacitors, or the braking resistor terminals.
- Many components of the product, including the printed circuit boards, operate with mains voltage. DO NOT TOUCH. Use only electrically insulated tools.
- DO NOT touch unshielded components or terminal strip screw connections with voltage present.
- Motors can generate voltage when the shaft is rotated. Before performing any type of work on the drive system, block the motor shaft to prevent rotation.
- Before servicing the enclosed drive:
- Disconnect all power including external control power that may be present.
- Always use a properly rated voltage sensing device to confirm power is off.
- Place a “DO NOT TURN ON” label on all power disconnects.
- Lock all power disconnects in the opened position.
- WAIT 15 MINUTES to allow the DC bus capacitors to discharge. Then follow the “DC Bus Voltage Measurement Procedure” and “DC Bus Voltage Measurement Procedure for Altivar Process 660/680/960/980” in bulletin NHA60269, Drives Systems Installation and Maintenance, to verify that the DC voltage is less than 42 V. The drive LED is not an indicator of the absence of DC bus voltage.
- Before applying voltage to the drive system:
- If the mains input terminals and the motor output terminals have been grounded, remove the ground on the mains input terminals and the motor output terminals.
- Replace all devices, doors, and covers before turning on power to this equipment or starting and stopping the drive.

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 Instructions

⚠⚠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® 70 E® – Standard for Electrical Safety Requirements for Employee Workplaces®
- CSA Z462 – Workplace Electrical Safety
- OSHA Standards – 29 CFR Part 1910 Subpart S Electrical
- NOM-029-STPS – Maintenance of Electrical Installation 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.
- 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™, CSA Z462, NOM-029-STPS, 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 ATV680 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 lead and lead compounds, which are known to the State of California to cause cancer and 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 20). The catalog number is coded to describe the configuration of the drive.

Use Catalog Number Description, page 18 to translate the catalog number into a description of the process drive. The example in Catalog Number Example: ATV980C16T4N2ANWAANAG, page 18 translates the catalog number shown on Nameplate, page 20.

For descriptions of the options listed in Catalog Number Description, page 18, refer to Control Options, page 46.

Table 1 - Catalog Number Example: ATV980C16T4N2ANWAANAG

Field											
01–02	**03–04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**
ATV980	C16	T4	N	2	A	N	W	A	A	N	A,G
Altivar 980 Process-Drive	250 hp	460 V,3 phase	Normal Duty Power Rating	UL Listed	UL Type 12 Enclo-sure	Active Front End	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

Table 2 - Catalog Number Description

Field	Digit	Characteristic	Description	
01–02	1–6	Drive Style	Altivar 980 Regenerative Process Drive, 4-quadrant	
03–04	7–9	Power Rating (hp)	Normal Duty 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 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	T4 = 460 V, Three Phase	
06	12	Duty Rating	N = Normal Duty H = Heavy Duty	
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	
09	15	Line Harmonic Mitigation	N = Active Front End	
10	16	Power Circuit	W = without Bypass Y = Integral Full-Voltage Bypass	

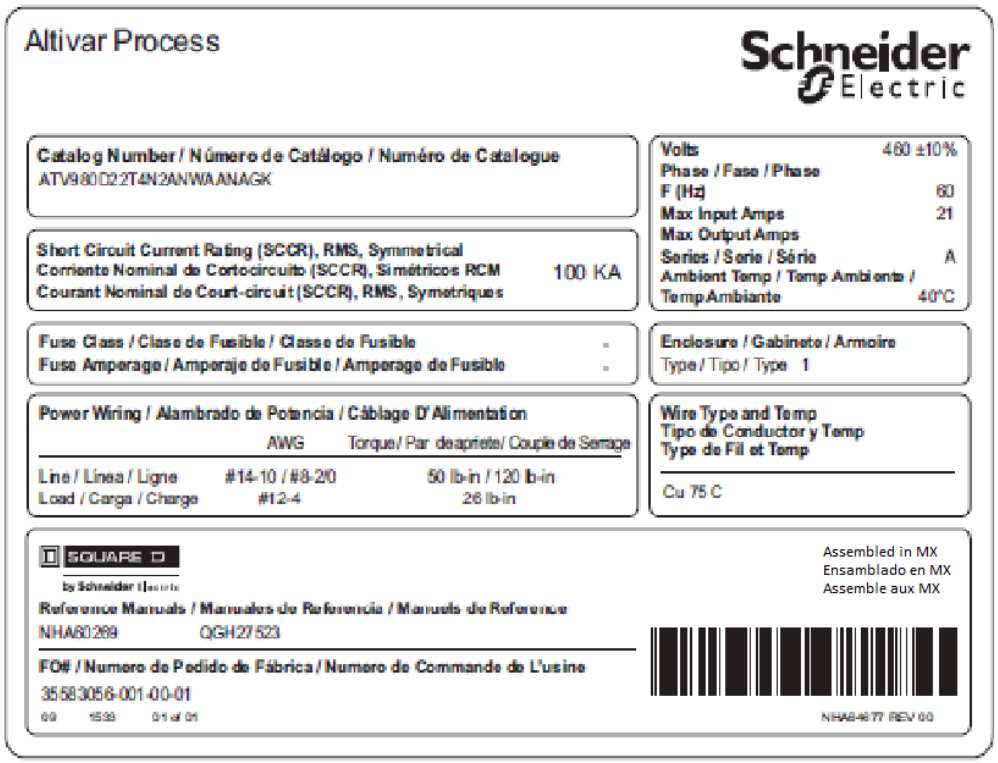
Table 2 - Catalog Number Description (Continued)

Field	Digit	Characteristic	Description
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	N = None A = Profibus DP V1 B = CANopen Daisy Chain C = DeviceNet D = CANopen SUB-D E = CANopen Open Style F = ProfiNet G = Ethernet TCP/IP H = EtherCat
14	Varies	Miscellaneous Options	A = Ethernet Port in Front Door B = Line Contactor D = Relay Output Card E = 0–10 V Auto Speed Reference G = Surge Protective Device (SPD) (Type 1) H = SPD (Type 2) K = Additional 150 VA Control Power L = Push-to-Test Pilot Lights Q = Door-Mounted Overload Reset Push Button U = Top Entry Cubical (when available) X = dV/dt Filter (1000 ft) Y = Seismic Certification

Nameplate Identification

The nameplate for the Altivar 980 Regenerative Process Drive is on the inside of the enclosure door. See Nameplate, page 20. The nameplate identifies the drive type and modification options. When identifying or describing the Altivar 980 Regenerative Process Drive, use the data from this nameplate.

Figure 4 - Nameplate



Short-Circuit Ratings

All Altivar 980 Regenerative Process Drives include a circuit breaker as a disconnect device and have a short-circuit rating of 100,000 A, 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.

Table 3 - Minimum Short-Circuit Current Ratings

Rating		Minimum Prospective Short-Circuit Current (kA)
hp	kW	
150	110	3
200	132	3.5

Table 3 - Minimum Short-Circuit Current Ratings (Continued)

Rating		Minimum Prospective Short-Circuit Current (kA)
hp	kW	
250	160	4
300	200	5.5
400	250	7
500	315	8
600	400	11
700	500	13
900	630	17

Generator Application Consideration

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Do not enable regenerative mode operation on equipment supplied by generator sourced mains voltage.
- Ensure that the generator is of sufficient size, and regulated to the appropriate voltage and frequency before connecting the drive system to generator power.

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

When ATV980 drive systems are applied on an electrical power system where power is supplied by a generator, adhere to the following recommendations and practices:

- The generator's rated power must be, at minimum, equal to or greater than the drive system's rated power. When multiple drive systems are applied on the same system, the total sum of all the drives' power ratings must be accounted for in sizing the generator.
- The output of the generator (voltage and frequency) must fall within the operating specifications of the drive system before closing the main disconnect switch.
- 4th quadrant (regeneration) mode must be inhibited in software when operating on generator supply.
- The generator must be sized and configured to operator under a constant power load equal to the sum of the rated power of all the drives connected to the generator.

Technical Characteristics

Table 4 - Electrical Specification

Input voltage	460 Vac ± 10%, three phase
Short circuit current rating (AC symmetrical)	100 kA
Control voltage	24 Vdc, 115 Vac ± 10% (control power transformer included)
Displacement power factor	Unity power factor (above 30% rated power) (in AFC operation mode)

Table 4 - Electrical Specification (Continued)

Input frequency	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	0.1–500 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: 20% 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 5 - Environmental Specifications

Storage temperature	-13 to +149°F (-25 to +65°C)
Operating temperature 125–700 hp HD, 150–900 hp ND 460 V	+14 to +122°F (-10 to +50°C) Below 32°F (0°C) with additional enclosure heating, above 104°F (+40°C) with derating. See Maximum Ambient Temperature, page 23 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 6,561 ft. (2000 m) maximum • Up to 12,467 ft. (3800 m) maximum (TN, TT, or IT systems only—no corner grounded delta systems allowed) • 125–250 hp: up to 15,747 ft. (4800 m) maximum (TN/TT systems only—no delta connected systems allowed) • Above 250 hp: up to 13,123 ft. (4000 m) maximum (TN/TT systems only—no delta connected systems allowed
Enclosure	UL Type 1: General indoor (ventilated); UL Type 12: Indoor dust-tight (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 National Safe Transit Association® test for packages.
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 Conforms to applicable NEMA ICS, NFPA, and IEC standards; Manufactured under ISO 9001 standards.

Table 6 - 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 kΩ. 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 5% TDDi
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	96% (or greater) at full load typical, assuming minimum motor efficiency of 88%
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 bulletin EAV64318, Altivar Process Programming Manual, available online at www.se.com.

Table 7 - 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 185°F (85°C)
Functional Safety:	
Functional safety of the drive	The function Safe Torque Off (STO)[2] 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[3] SIL 3 and IEC/EN 61800-5-2.
Response time	≤ 100 ms at STO (Safe Torque Off)[2]

Maximum Ambient Temperature

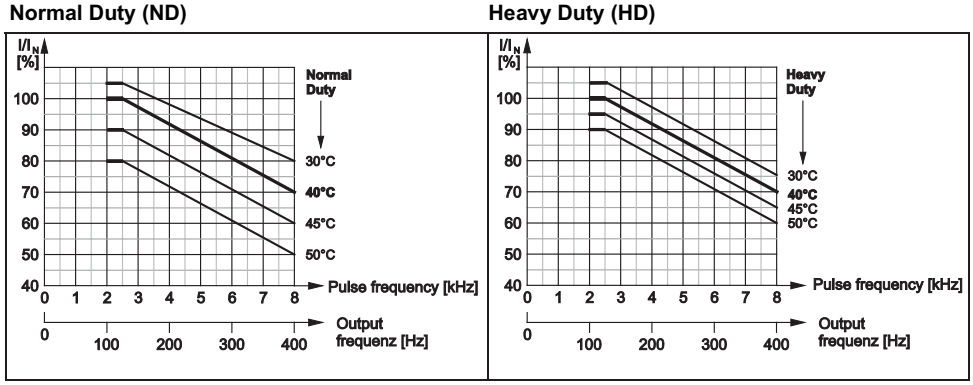
Derating may be necessary depending on the pulse frequency, the maximum ambient temperature, and the desired output frequency. Consult Current Reduction Depending on Ambient Temperature, Pulse Frequency, and Output, page 24 and follow these guidelines:

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

- 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 104°F (40°C).
- The overload capability of the enclosed drive is also reduced due to the reduction of the output current.
- At higher pulse frequencies, the length of the motor cable 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 8 - Input and Output Current Ratings and Dissipated Heat

VAC	Rating		Maximum Input Current (A)	Output Current Drive Only (A)	Typical Dissipated Power at Rated Load (W)
	hp	kW			
460	150	110	160	211	4220
	200	130	197	250	5110
	250	160	245	302	6400
	300	200	292	370	7890
	400	250	388	477	9910
	500	310	485	590	13060
	600	400	578	730	15850
	700	500	705	900	20800
	900	630	863[4]	1140	25630

4. Consult Schneider Electric for maximum input current.

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.

Table 9 - Approximate Weight

Voltage	hp	Basic AFE Drive System Weight lb (kg)
460	150–250	800 (360)
	300–500	1550 (700)
	600–700	2535 (1150)
	900	3200 (1450)

Electrical Installation

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read and understand the instructions 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 10 - Power Terminal Wire Range and Torque Requirements, Normal Duty, Line Side

Voltage	hp	Circuit Breaker	Line(L1, L2, L3)	
			Wire Range AWG (mm^2)	Torque lb-in. (N•m)
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)	442 (50)
460	500	PLP34100U44ASARE10	(4) 3/0–500 (95–240)	442 (50)

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

Voltage	hp	Circuit Breaker	Line(L1, L2, L3)	
			Wire Range AWG (mm²)	Torque lb-in. (N•m)
460	600–700	PLP34120U44ASARE10	(4) 3/0–500 (95–240)	442 (50)
460	900	PLP34120U44ASARE10	(4) 3/0–500 (95–240)	442 (50)

Normal Duty, Load Side

Table 11 - 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)
460	150–250	(2) 4–500 (25–240)	500 (56.5)	(2) 4–500 (25–240)	500 (56.5)
460	300–500	(3) 4–500 (25–240)	500 (56.5)	Consult Schneider Electric for wire range and torque	Consult Schneider Electric for wire range and torque
460	600–700	(6) 3/0–750 (95–400)	550 (62)	Consult Schneider Electric for wire range and torque	Consult Schneider Electric for wire range and torque
460	900	(8) 3/0–750 (95–400)	550 (62)	Consult Schneider Electric for wire range and torque	Consult Schneider Electric for wire range and torque

Heavy Duty, Line Side

Table 12 - 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)
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)	442 (50)
460	500	PLP34100U44ASARE10	(3) 3/0–500 (95–240)	442 (50)
460	600–700	PLP34120U44ASARE10	(4) 3/0–500 (95–240)	442 (50)

Heavy Duty, Load Side

Table 13 - 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)
460	125–200	(2) 4–500 (25–240)	500 (56.5)	(2) 4–500 (25–240)	500 (56.5)
460	250–400	(3) 4–500 (25–240)	500 (56.5)	[5]	[5]
460	500–600	(6) 3/0–750 (95–400)	550 (62)	[5]	[5]
460	700	(8) 3/0–750 (95–400)	550 (62)	[5]	[5]

Grounding Bar and Lugs

Table 14 - Table 14 — 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)
460	150–900	8–250 (10–120)	200 (22.5)

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 27 for wire sizes and tightening torques.

NOTE: The user terminals are designated on the wiring diagrams provided with the equipment.

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[6] AWG (mm²)	Maximum AWG (mm²)	Minimum[6] AWG (mm²)	Maximum AWG (mm²)	
All terminals	20 (0.5)	12 (2.5)	18 (1)	12 (2.5) one-wire16 (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

5. Consult Schneider Electric for wire range and torque.
6. The value corresponds to the minimum permissible cross section of the terminal.

Table 16 - TB1 User Terminal Connections (Continued)

Function	Terminal	
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	

Programming and Setup

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read and understand the instructions 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.

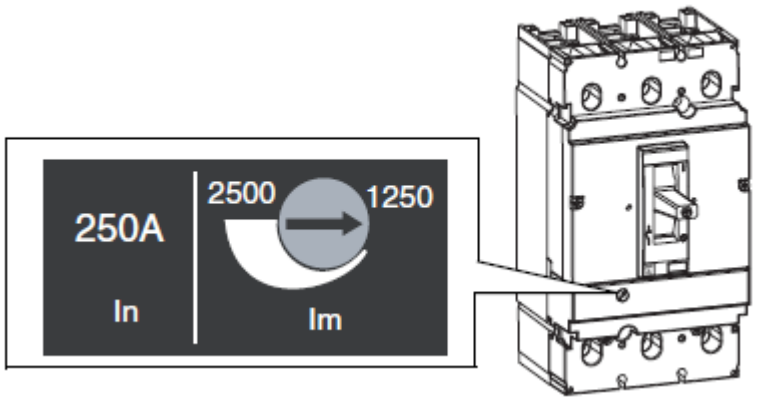
Factory Settings

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.

Figure 6 - 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 30 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	460 V
150	132–220
200	200–330
250	200

Circuit Operation and Options

Precautions

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read and understand the instructions 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 ATV980 process drive:

- Read and understand bulletin EAV64318, Altivar Process Programming Manual, before changing any parameters from the factory defaults.
- If the ATV980 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 (Mod Y10), Drive System Configured For Heavy Duty (Mod H06), and Drive System Configured for 0-10 V Speed Reference (Mod E14).
- 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 (Mod Y10), Drive System Configured For Heavy Duty (Mod H06), and Drive System Configured for 0-10 V Speed Reference (Mod E14) in the order in 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.
- 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.

Undervoltage

In the event of short-time mains voltage sag, operation is possible under the following conditions:

Table 18 - Table 18 — Undervoltage Behavior

Mains Undervoltage	Restriction
-10% of nominal voltage	Starting the drive and continuous operation[7]
-15% of nominal voltage	Starting the drive and operation[7] for 10 s per 100 s
-20% of nominal voltage	Operation[7] for less than 1 s
-30% of nominal voltage	Operation[7] for less than 0.5 s
-50% of nominal voltage	Operation[7] for less than 0.2 s

Mains Current Harmonics / Mains Voltage Distortion

The ATV980 Low Harmonic Process Drive is equipped with an active mains supply converter, so typical harmonic currents associated with six-pulse diode bridge topologies are not generated on the mains side of the equipment.

The 3-level technology converter generates a total harmonic distortion factor TDD(i) (total demand distortion) of around 2% and meets the requirements of IEEE 519-2015 TDD(i) < 5%. This performance level is possible when operating in either motoring or generating modes.

In addition, the active converter always operates at unity power (> 30% Pn) and helps to reduce the mains current as a result.

Table 19 shows typical values of the individual current harmonics at operation with the ATV980 Low Harmonic Process Drives.

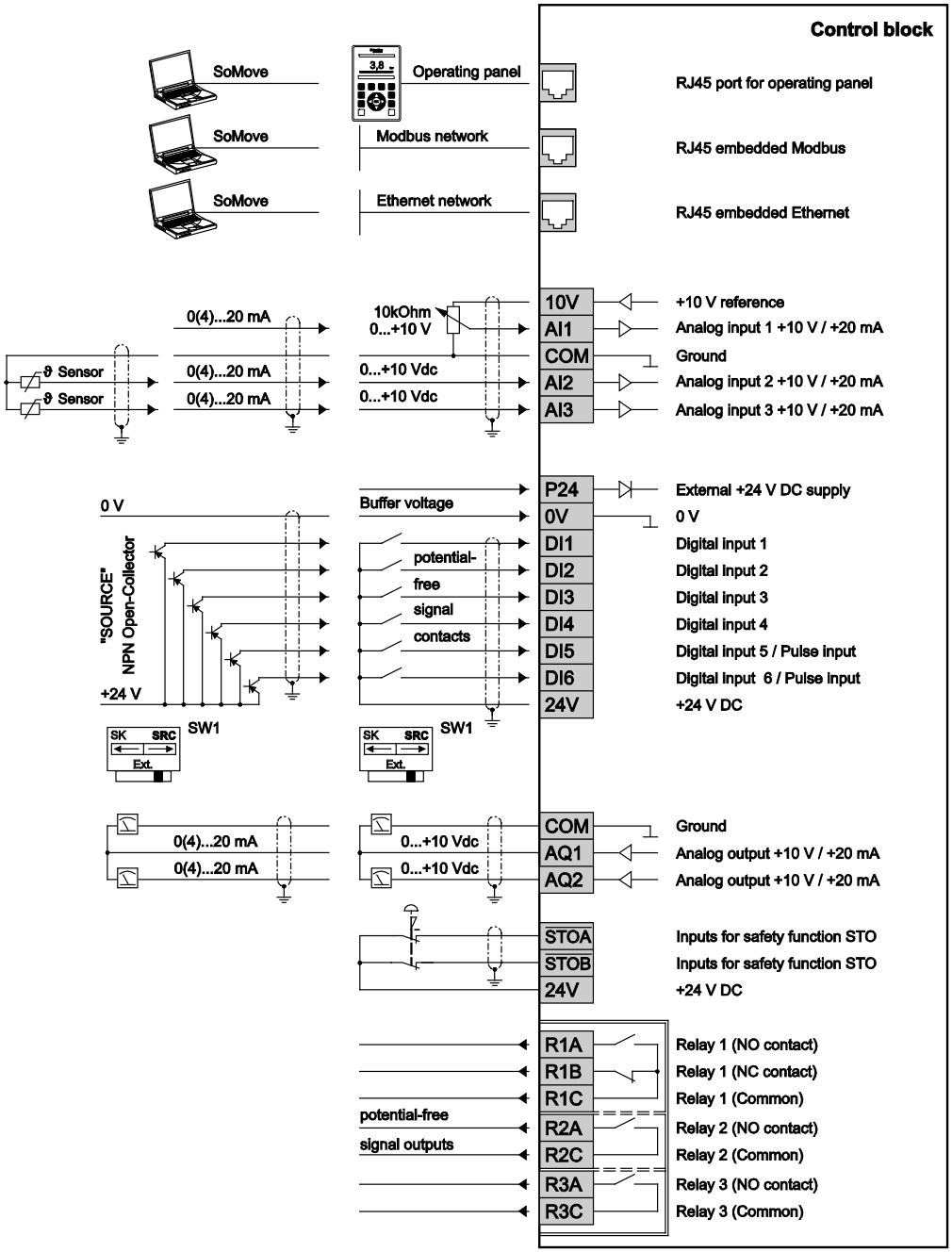
Table 19 - Current Harmonics

Operating Mode	Current Harmonics in %[8]										
	H1	H5	H7	H11	H13	H17	H19	H23	H25	H29	THD
Motor	100	1.29	1.05	0.38	0.21	0.2	0.19	0.34	0.19	0.11	2.2
Generator	100	1.26	0.78	0.39	0.33	0.69	0.6	0.28	0.4	0.22	2.1

7. With normal current.
8. Values are valid for operation at nominal load and sinusoidal mains voltage.

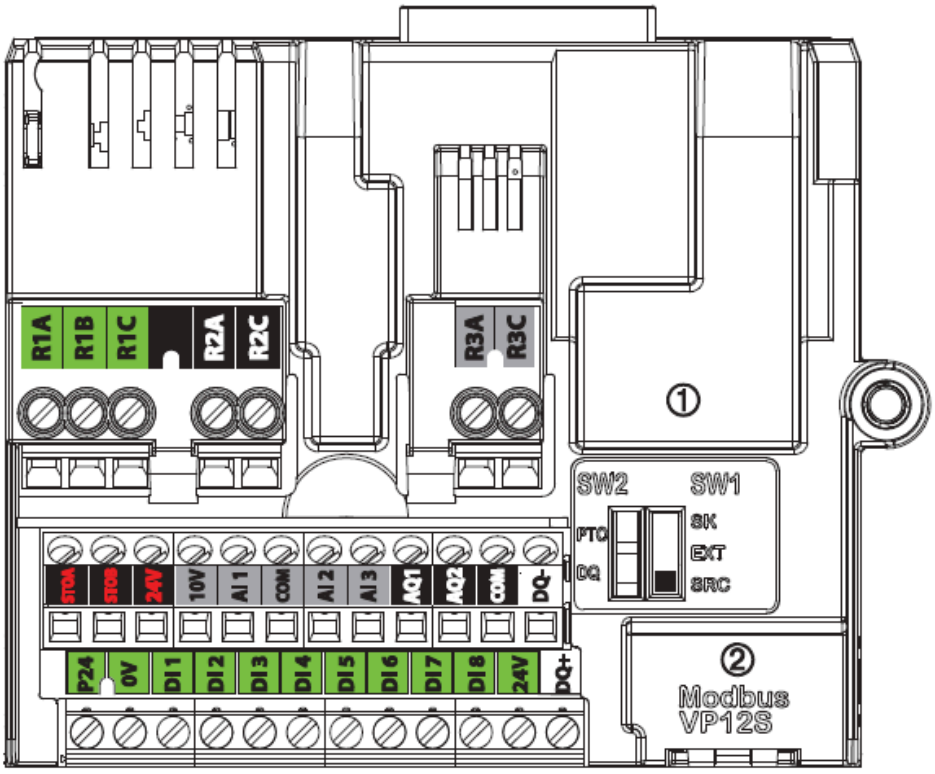
Control Terminals

Figure 7 - Control Terminals at the Control Block



Control Terminal Specifications

Figure 8 - Control Terminals



① Ethernet Modbus™ TCP
② Serial Modbus

Ethernet Modbus™ TCP

Serial Modbus

NOTE: Modbus VP12S: This is the standard Modbus serial link marking. VP.S means connector with power supply, where 12 stands for the 12 Vdc supply voltage.

Maximum Cable Length

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

Wiring Characteristics

Table 20 - Table 20 — Wire Sizes and Tightening Torque

Control Terminals	Relay Output Wire Cross Section		Other Wire Cross Section		Tightening Torque
	Minimum[9]	Maximum	Minimum	Maximum	
	AWG (mm^2)	AWG (mm^2)	AWG (mm^2)	AWG (mm^2)	lb-in. (N•m)
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.

Control Terminal Electrical Characteristics

- For a description of the terminal arrangement, refer to Control Block Ports, page 39.
- For factory setting I/O assignments, refer to the Programming Manual or the documentation supplied with your enclosed drive.

Table 21 - 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	

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

Table 21 - Electrical Characteristics (Continued)

Terminal	Description	I/O Type	Electrical characteristics
R3A	NO contact of relay R3	O	Output Relay 3
R3C	Common point contact of relay R3	O	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
STOA, STOB	STO inputs	I	Safety Function STO Inputs Refer to the Safety Functions Manual (NHA80947) available on www.se.com
24V	Output power supply for digital inputs and safety function STO inputs	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

Table 21 - 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 kW - Overheat trigger threshold: 2.9 kW ± 0.2 kW - Overheat reset threshold: 1.575 kW ± 0.75 kW - Threshold for low impedance detection: 50 kW –10 W/+20 W - Protected for low impedance < 1000 W
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 kW Maximum sampling time: 1 ms ± 1 ms Resolution 12 bits Accuracy: ± 0.6% for a temperature variation of 60℃ (140℉) 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 W Current analog output X–Y mA by programming X and Y from 0–20 mA, maximum load impedance 500 W 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 21 - 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 kW 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 9 - Control Block Ports

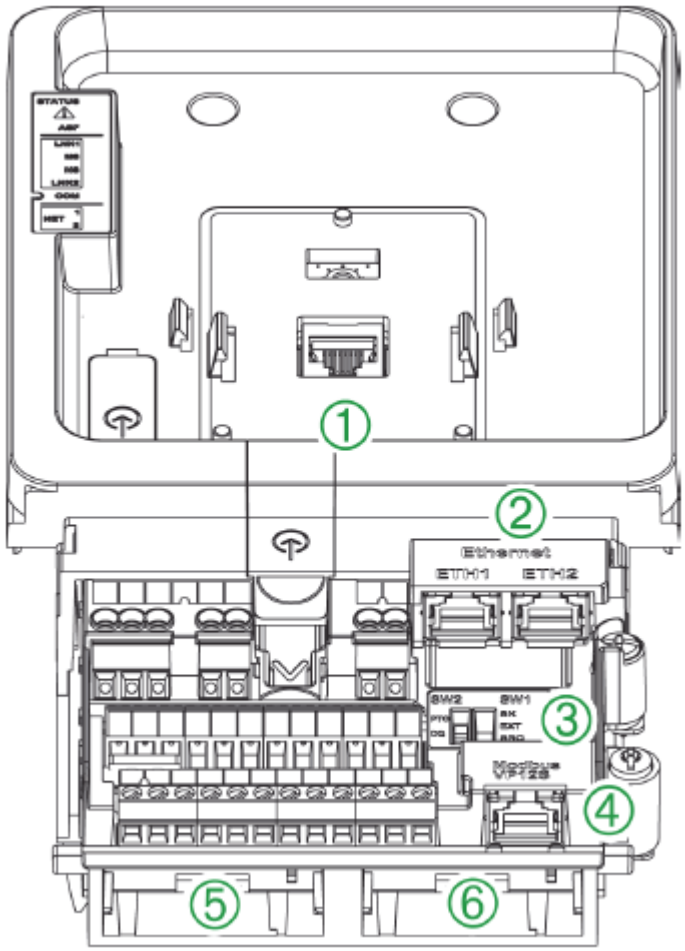


Table 22 - Control Block Terminal Ports

Marking	Description
1	RJ45 port for Graphic display terminal
2	RJ45 ports for Ethernet embedded
3	Sink-Ext-Source switch PTO-DQ switch
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 three RJ45 ports. They allow you to connect:

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

- 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 defined in Wiring Characteristics.

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.

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® 79 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 39.

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

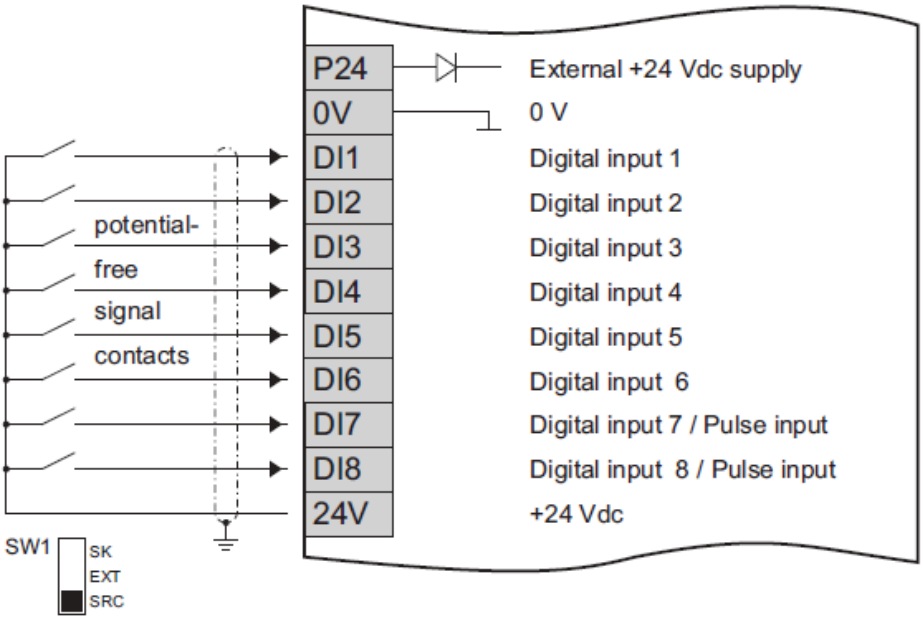
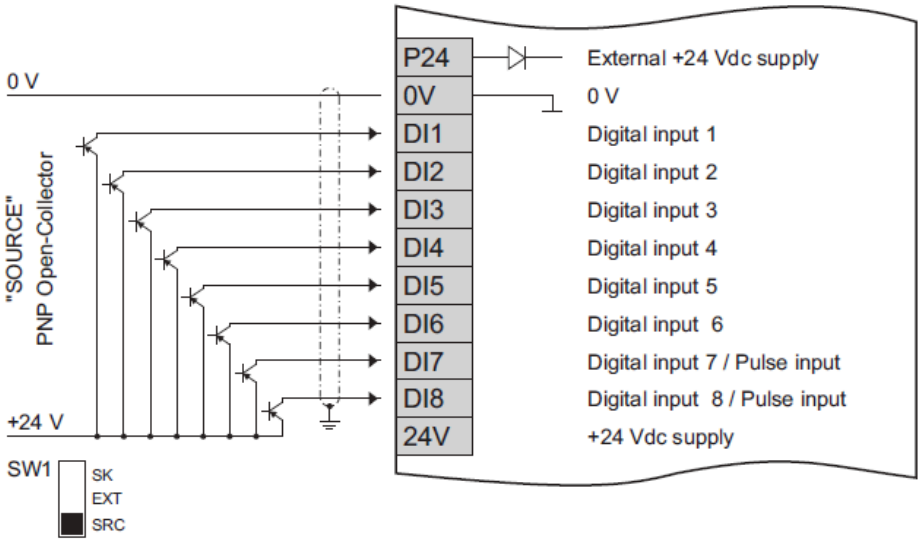


Figure 11 - Selector Switch in Position SRC (Source) and External Voltage Supply of the Digital Inputs



Programming the Power Converter

The ATV980 process drive is factory configured as shown in Drive System without Full-Voltage Bypass, page 42. Be sure to configure the drive's motor full-load current as shown on the motor nameplate. For additional information, see bulletin EAV64318, Altivar Process 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 42. Space is provided in the table for noting changes to the factory settings for your records.

Table 23 - 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 (Mod Y10), page 43, Drive System Configured For Heavy Duty (Mod H06), page 43, and Drive System Configured for 0-10 V Speed Reference (Mod E14), page 43 if these optional features are included with the equipment.

Table 24 - Drive System with Integral Full-Voltage Bypass (Mod Y10)

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

Table 25 - Drive System Configured For Heavy Duty (Mod H06)

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

Table 26 - Drive System Configured for 0-10 V Speed Reference (Mod E14)

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

Electromagnetic Compatibility

This product meets the EMC requirements according to 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 instructions 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 an IT mains or corner-grounded delta configuration, the EMC ground reference must be moved according to the instructions in Configuration, page 44.

The enclosed drives have a built-in EMC/RFI filter board. 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 positioning the setting bolts as shown Configuration, page 44. In this configuration, the product does not meet the EMC requirements according to standard IEC 61800-3.

Configuration

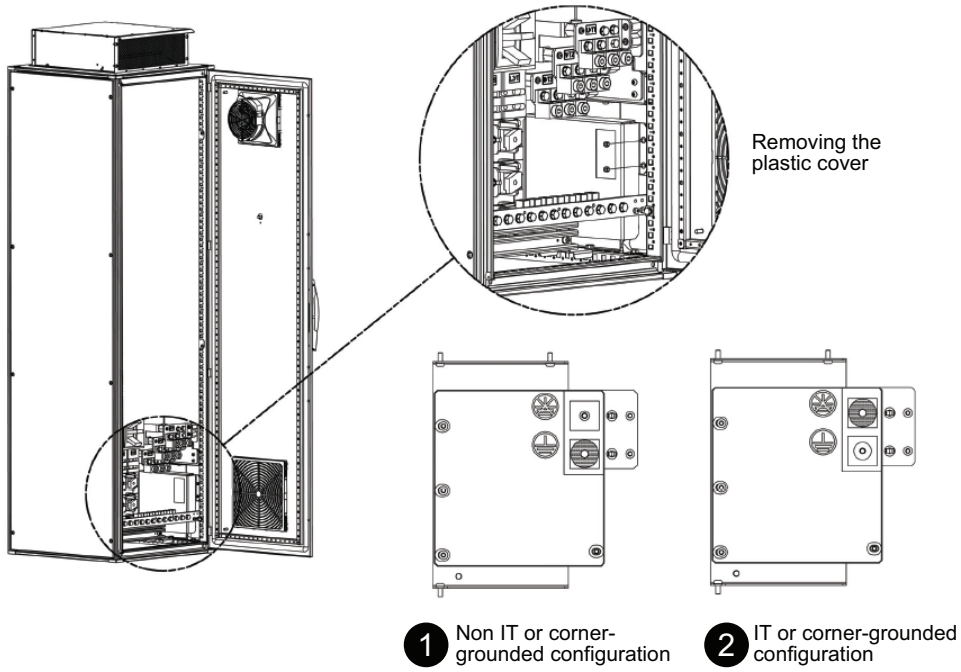
1. Remove all power from the enclosed drive.
2. Turn the circuit breaker and handle assembly to the Off position and open the enclosure door.
3. Test for the absence of voltage.

   NOTE: Verify that the voltage tester is functioning properly before and after testing for the absence of voltage.
4. Locate the EMC/RFI filter board. It is typically located in the lower right corner of the enclosure. See Settings for 125–700 hp HD, 150–900 hp ND, 460 V Enclosed Drives, page 45.
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 45.
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 45, detail 1. Tighten the bolt to 49 lb-in. (5.5 N•m).

   NOTE: Take care when you remove the bolt, as the EMC/RFI filter 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 45, detail 2. Tighten the bolt to 49 lb-in. (5.5 N•m).
8. Replace the clear plastic cover. Reinstall the two nuts and tighten them 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 12 - 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 (Mod Y10): 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 - Zelio™ Smart Relay Ladder Logic, page 72 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. This provides even better 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 Integral 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.

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 Ethernet Port

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

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 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. Requires an additional 15.75 in. (400 mm) cubicle.

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. Requires an additional 15.75 in. (400 mm) cubicle.

Mod L14: Push-to-Test Pilot Lights

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

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 U14: Top Entry Cubicle

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

Mod X14: dv/dt Filter

Mod X14 provides a factory mounted and wired dv/dt filter on the drive output for long motor lead lengths in excess of published guidelines. It is available as an option for 150–250 hp ND and 125-200 hp HD rated process drives. It is included as standard on all higher horsepower ratings, 300–900 hp ND and 250–700 hp HD.

Table 27 - Maximum Cable Lengths

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

Mod Y14: Seismic Certification

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

Drive Communications and Expansion Cards

ATV980 process drives come factory configured with integrated 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 RJ45 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 RJ45 ports.

Mod G13: Ethernet TCP/IP

Mod G13 provides factory-installed plug-in Ethernet TCP/IP card (VW3A3720). Connect to the Ethernet card with two RJ45 ports.

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: Relay Output Card

Provides a factory installed VW3A3601 card.

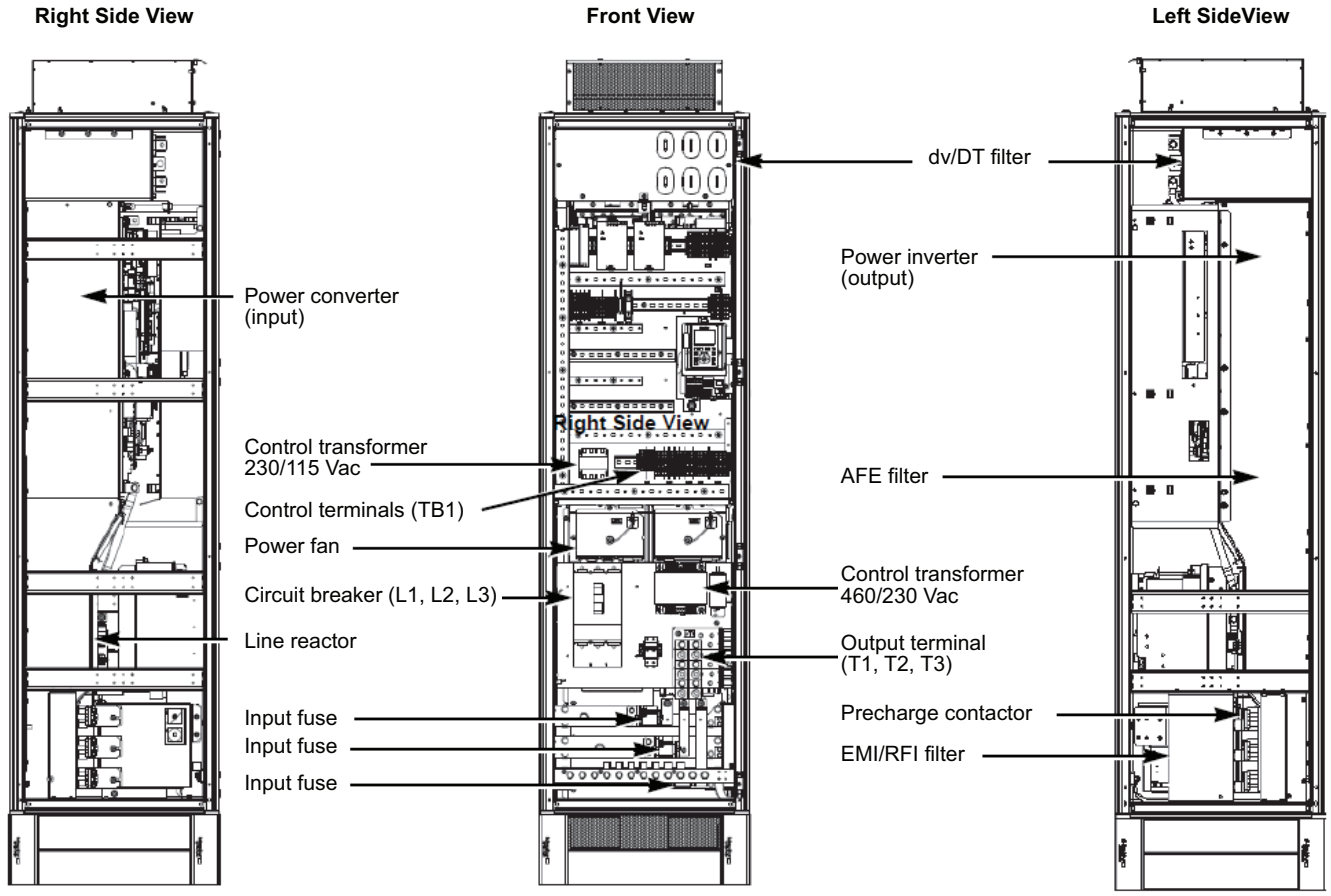
Component Locations, Dimensions, and Schematics

Component Locations

150–250 hp (110–160 kw) @ 460 V, ND

125–200 hp (90–130 kw) @ 460 V, HD

Figure 13 - Floor-Mounted Enclosures



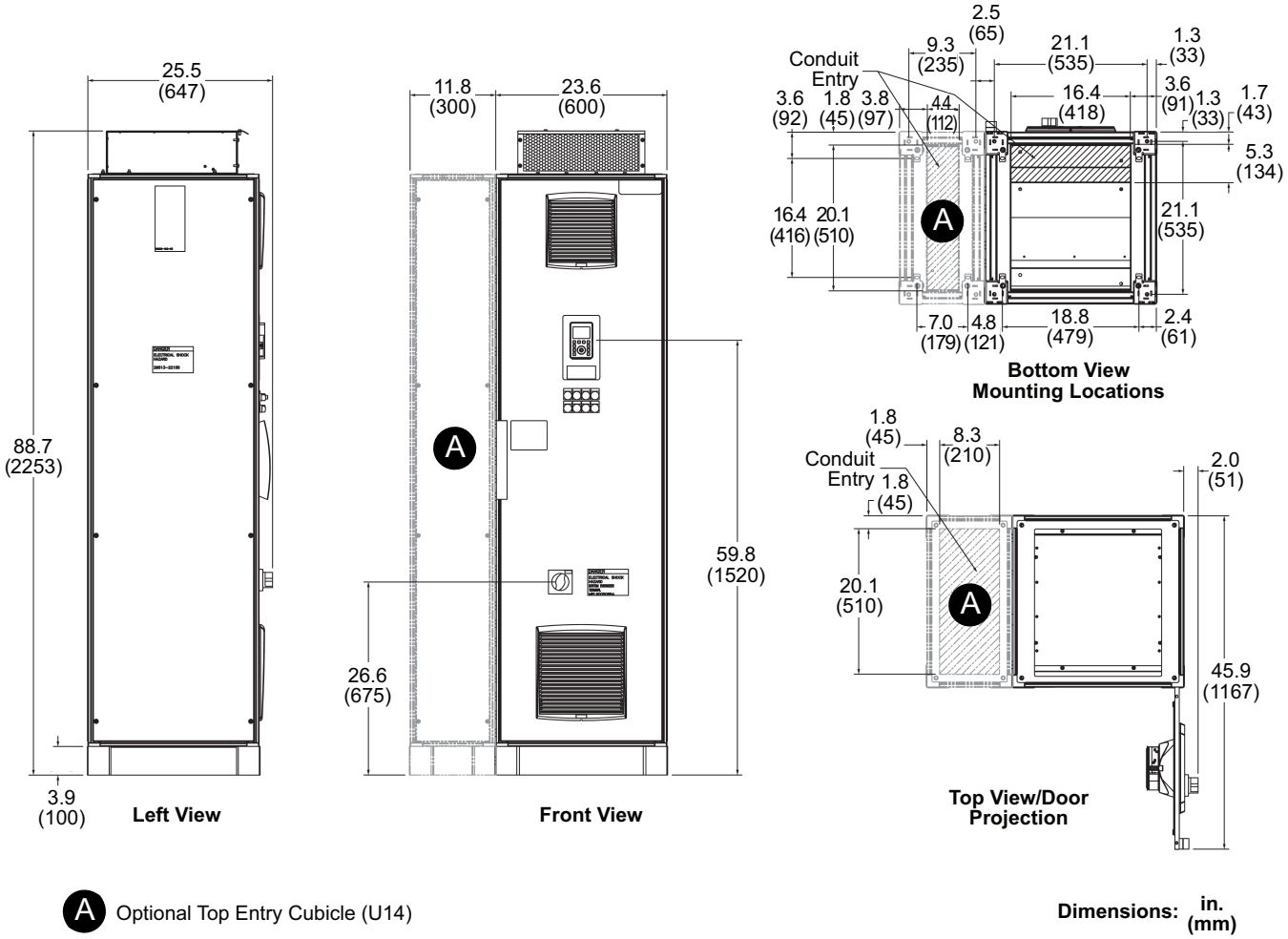
Dimensions

150–250 hp (110–160 kw) @ 460 V

ND 125–200 hp (90–130 kw) @ 460 V, HD

NOTE: Mod Y10, Bypass, is available from 150–250 hp ND and 125–200 hp HD @ 460 V.

Figure 14 - Type 1, Frame 1A



A Optional Top Entry Cubicle (U14)

Dimensions: in. (mm)

150–250 hp (110–160 kw) @ 460 V

ND 125–200 hp (90–130 kw) @ 460 V, HD

NOTE: Mod Y10, Bypass, is available from 150–250 hp HD and 125–200 hp ND @ 460 V.

Figure 15 - Type 12, Frame 1A

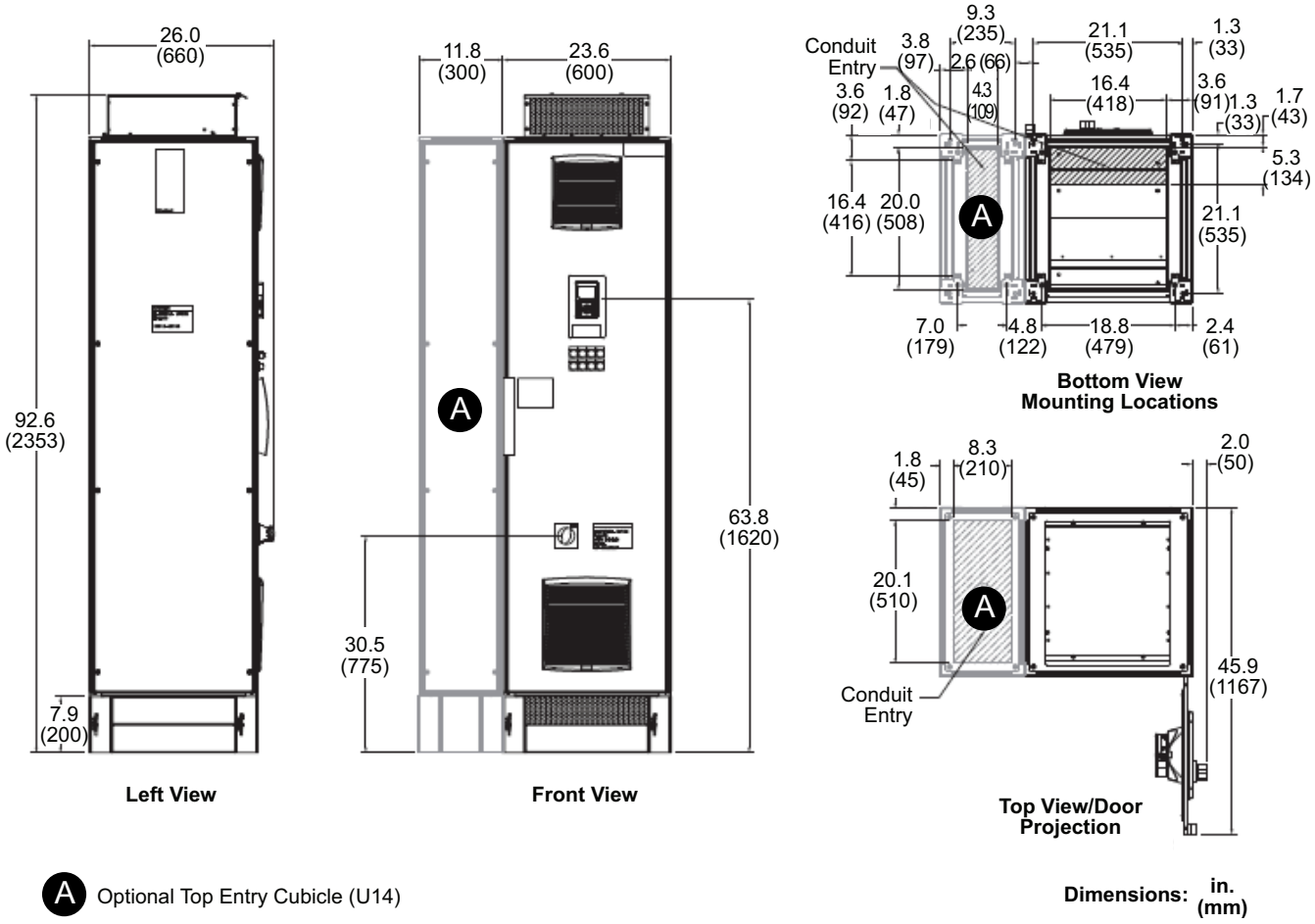


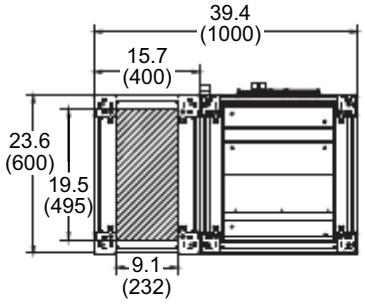
Figure 16 - Conduit Entry and Weights, 150–250 hp ND and 150–200 hp HD @ 460 V, Types 1 and 12

Conduit entry is shown as cross-hatched area.

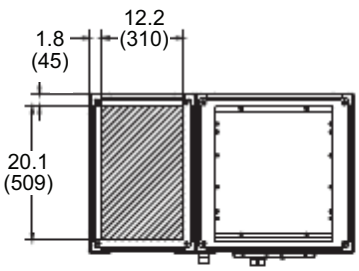
Any of the following or combinations of the following: Full Voltage Bypass, Type 2 SPD, and 150 VA, which may include Top Entry Cubicle

Approximate weight of option: 135 lb (61 kg)

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



Bottom View, Front of Unit



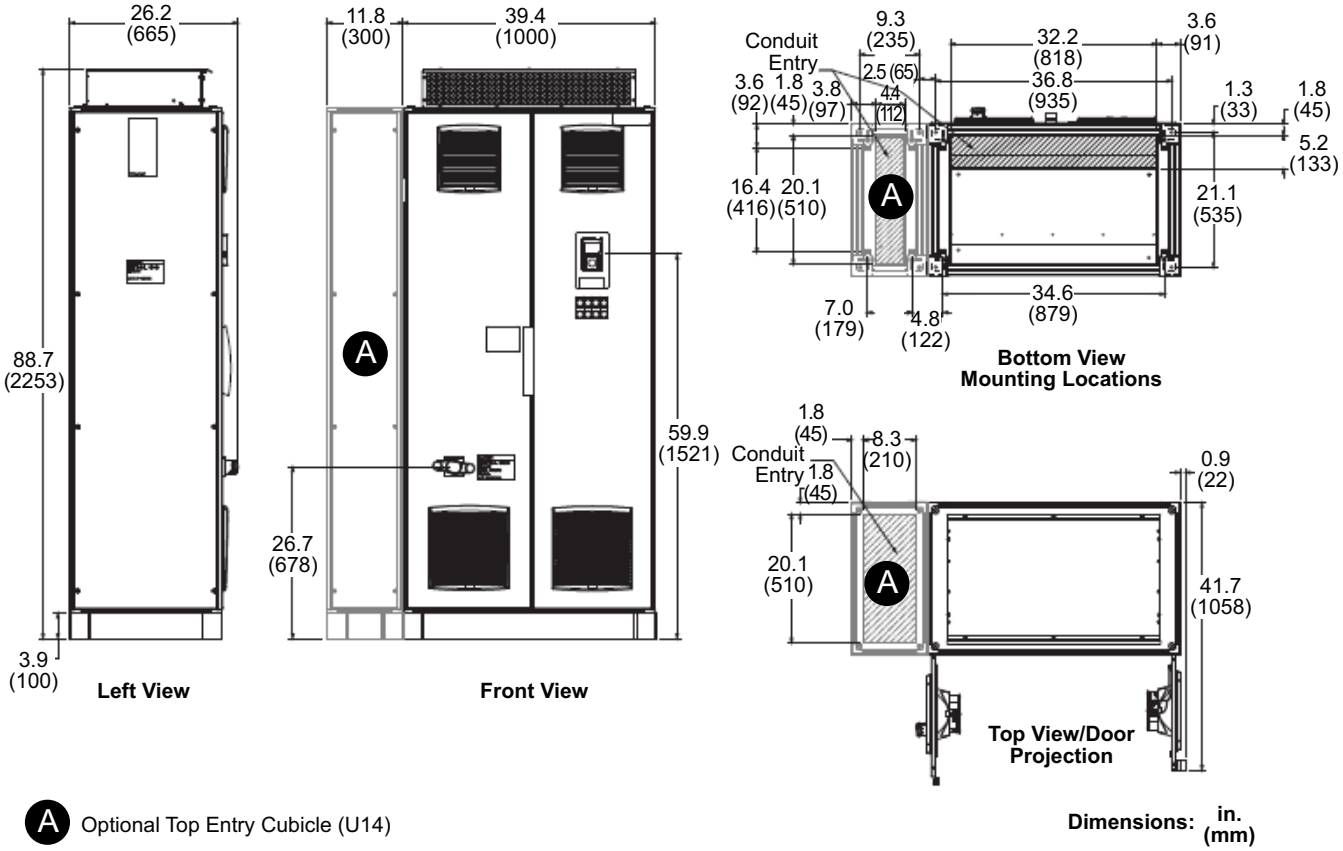
Top View, Front of Unit

300–500 hp (200–310 kw) @ 460 V ND

250–400 hp (160–250 kw) @ 460 V, HD

NOTE: Mod Y10, Bypass, is available for 250 hp HD at @ 460 V.

Figure 17 - Type 1, Frame 2A



300–500 hp (200–310 kw) @ 460 V, ND

250–400 hp (160–250 kw) @ 460 V, HD

NOTE: Mod Y10, Bypass, is available for 250 hp HD at @ 460 V.

Figure 18 - Type 12, Frame 2A

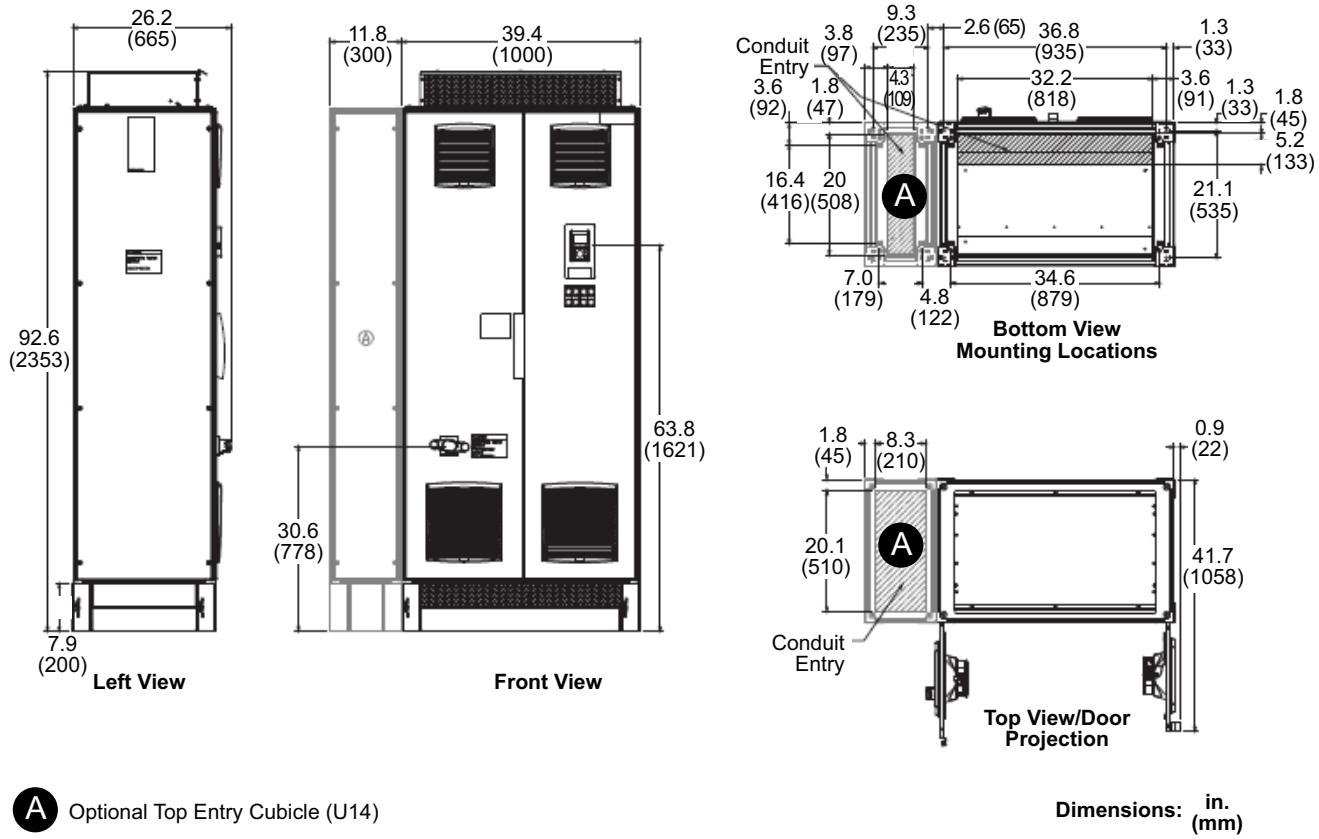


Figure 19 - Conduit Entry and Weights, 300–500 hp ND and 250–400 hp HD @ 460 V, Types 1 and 12

Conduit entry is shown as cross-hatched area.

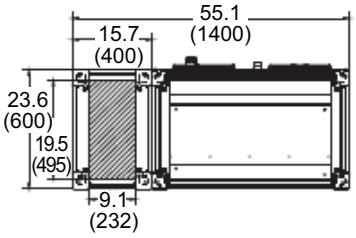
Any of the following or combinations of:
Type 2 SPD, and 150 VA, which may include Top Entry Cubicle

Approximate weight of option: 325 lb (147 kg)

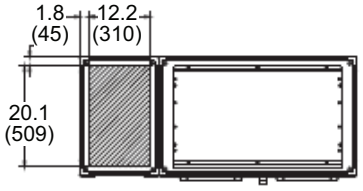
The combination of Full Voltage Bypass with any of the following:
Type 2 SPD and 150 VA, which may include Top Entry Cublicle
250 hp HD @ 460 V

Approximate weight of option: 345 lb (156 kg)

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



Bottom View, Front of Unit

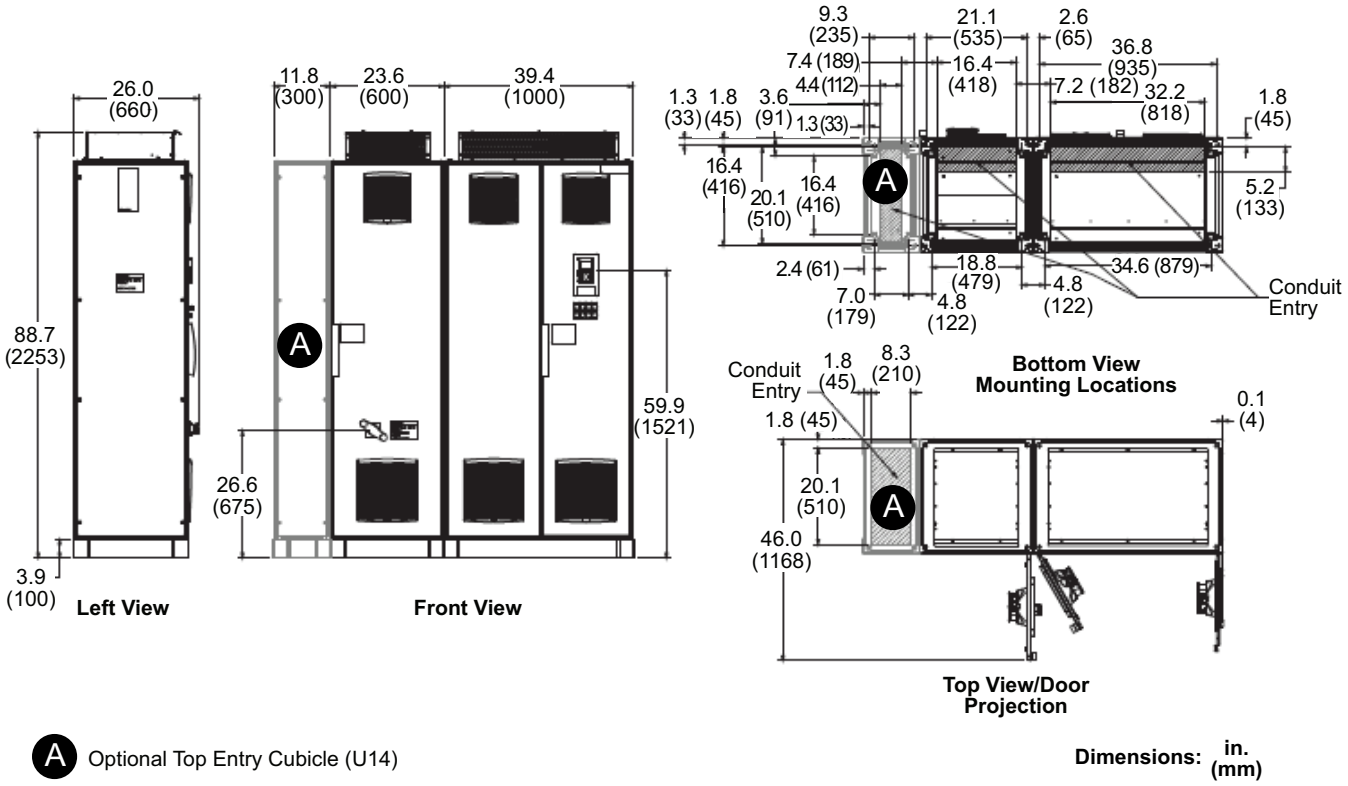


Top View, Front of Unit

600–700 hp (400–500 kw) @ 460 V, ND

500–600 hp (310–400 kw) @ 460 V, HD

Figure 20 - Type 1, Frame 3A



600–700 hp (400–500 kw) @ 460 V, ND

500–600 hp (310–400 kw) @ 460 V, HD

Figure 21 - Type 12, Frame 3A

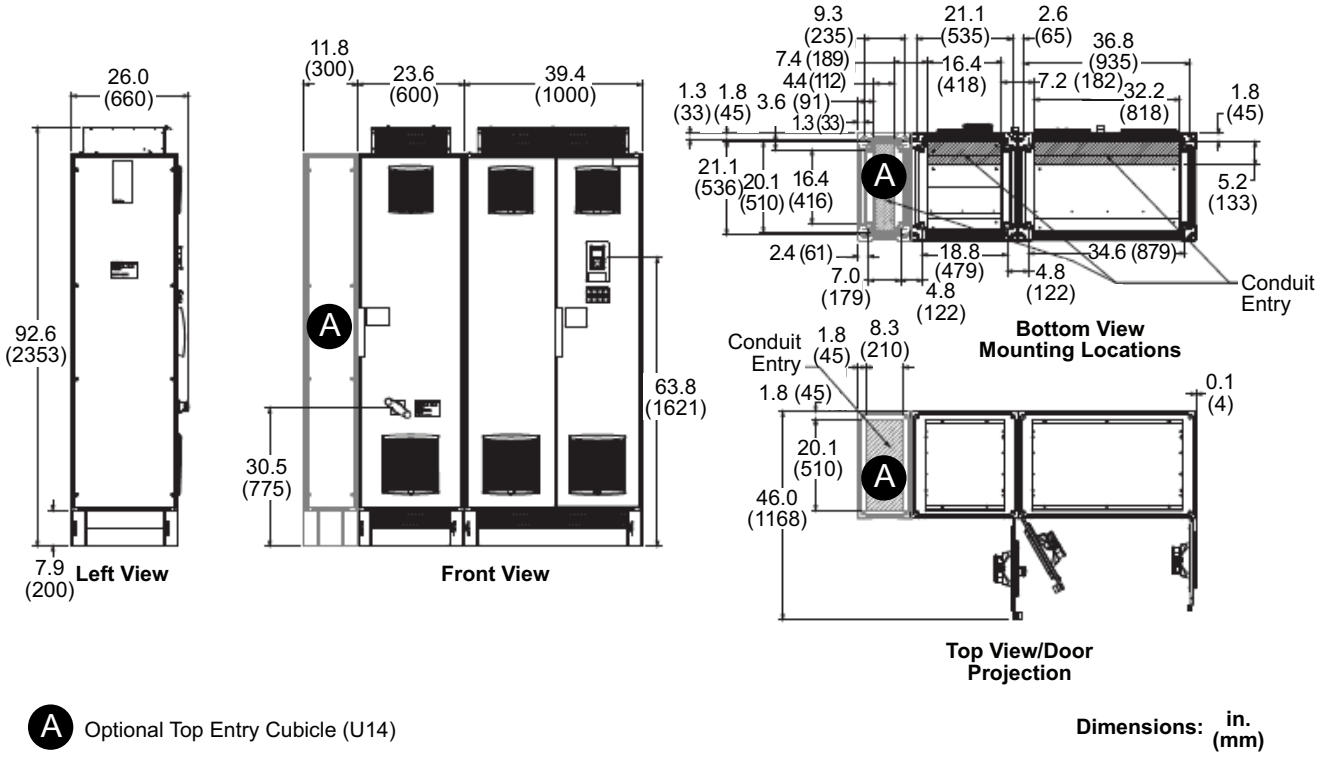
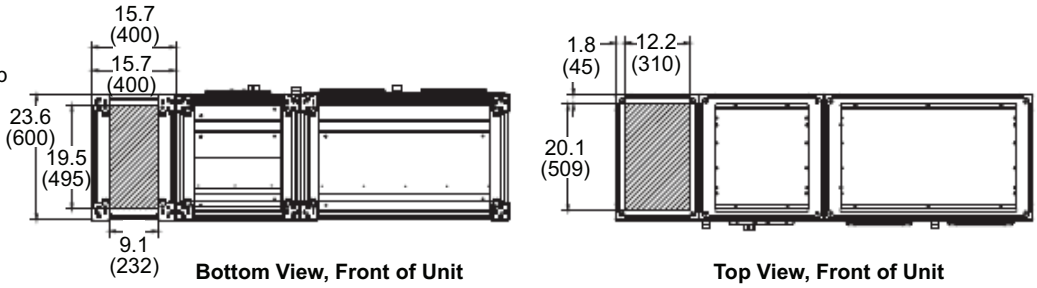


Figure 22 - Conduit Entry and Weights, 600–700 hp ND and 500–600 hp HD @ 460 V, Types 1 and 12

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

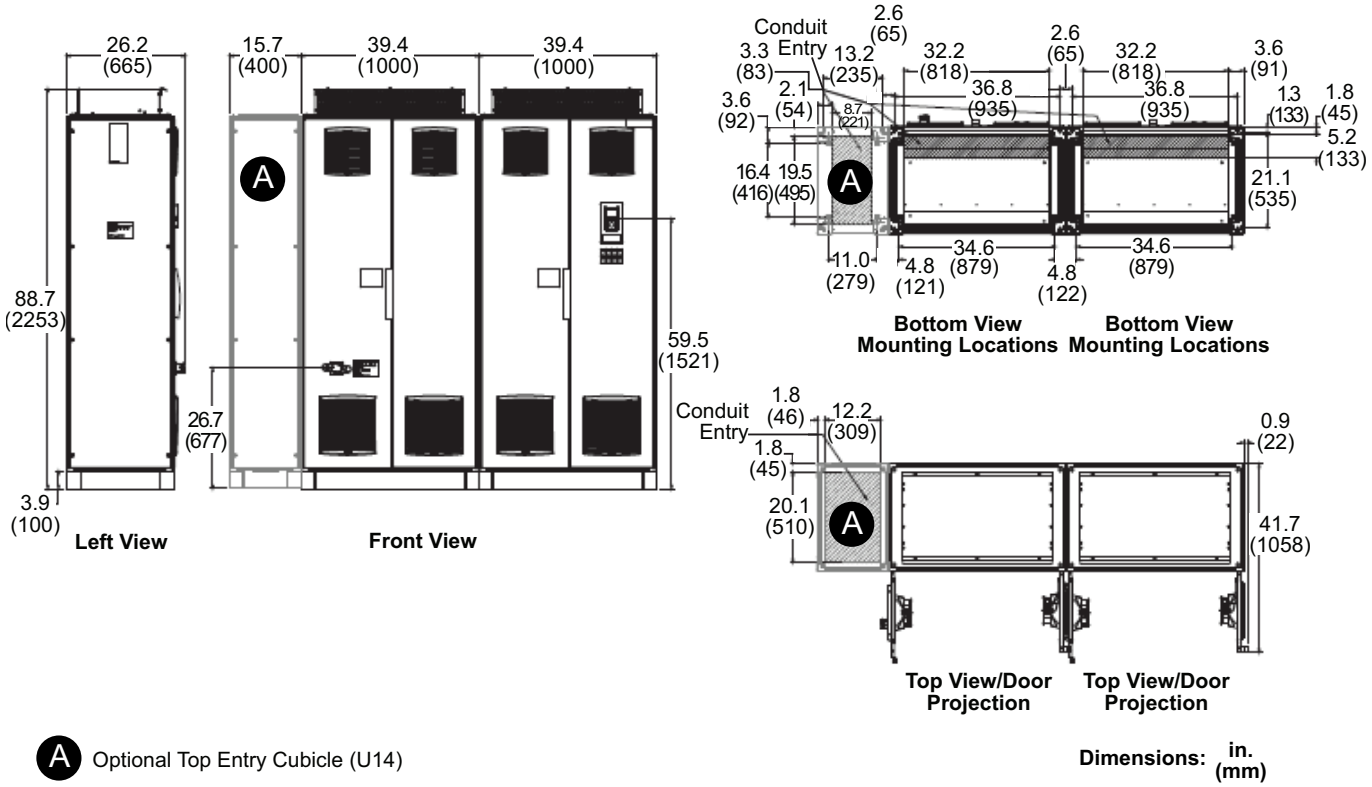
Approximate weight of option:
150 lb
(68 kg)



900 hp (630 kw) @ 460 V, ND

700 hp (500 kw) @ 460 V, HD

Figure 23 - Type 1, Frame 4A



900 hp (630 kw) @ 460 V, ND

700 hp (500 kw) @ 460 V, HD

Figure 24 - Type 12, Frame 4A

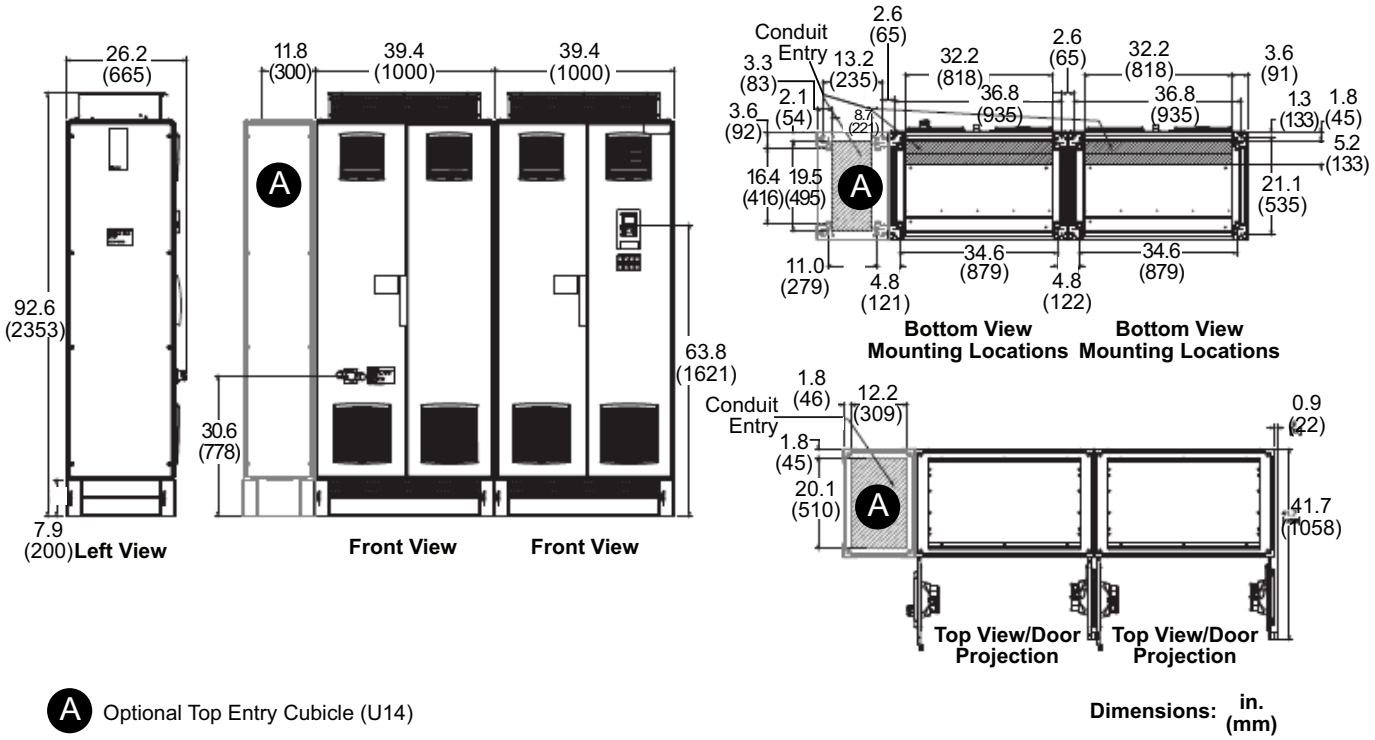


Figure 25 - Conduit Entry and Weights, 900 hp ND and 700 hp HD @ 460 V, Types 1 and 12

Conduit entry is shown as cross-hatched area.

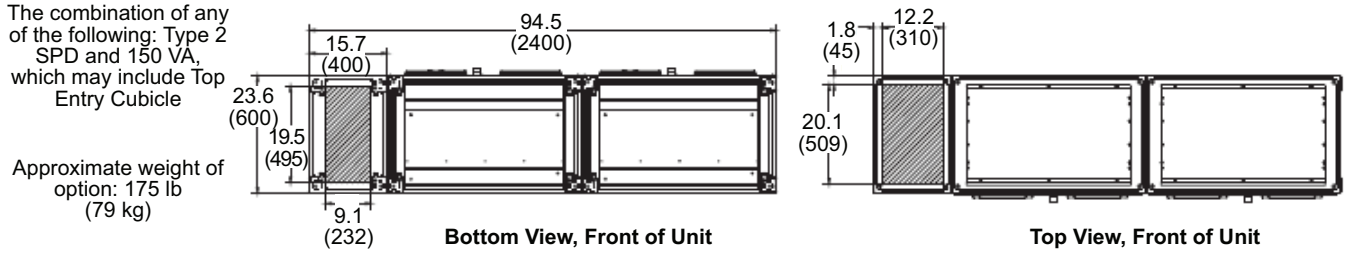


Table 28 - Overall Dimensions

hp (Normal Duty)	460 V	Width		Depth		Height [10]	
		in.	mm	in.	mm	in.	mm
150–250	X	23.6	600	25.5	647	93.0	2362
300–500	X	39.4	1000	25.5	647	93.0	2362
600–700	X	63.0	1600	25.5	647	93.0	2362
900	X	78.7	2000	25.5	647	93.0	2362

10. Type 12 enclosure.

Schematics

Figure 26 - Power Circuit W (without Bypass): Hand-Off-Auto and Speed Potentiometer

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

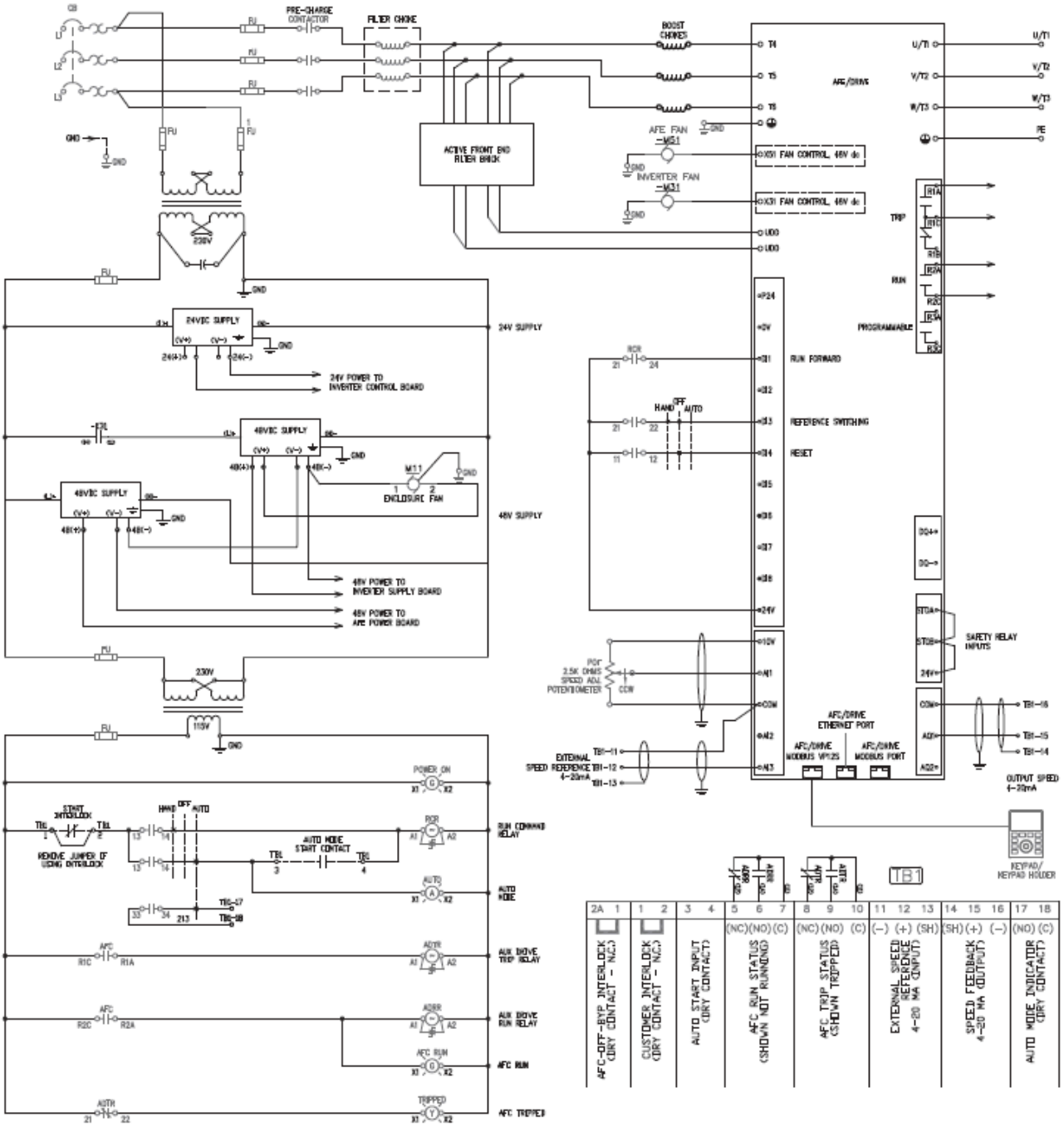


Figure 27 - Power Circuit W (without Bypass) Factory Configurations

ATV980 FACTORY CONFIGURATION- VARIATIONS FROM DEFAULT						
MENU	TAB	SUBMENU	DESCRIPTION	SETTING	CODE	ADJ
1	S. START	----------	2/3 WIRE CONTROL	2C	TCC	2C
1	S. START	----------	BASIC FREQUENCY	60HZ NEMA	BFR	60
1	S. START	----------	MAX FREQUENCY	60	TFR	60
1	S. START	----------	LOW SPEED	3	LSP	3
1	S. START	----------	ACCELERATION	10	ACC	10
1	S. START	----------	DECELERATION	10	DEC	10
5.2	----------	SWITCHING FREQUENCY	SWITCHING FREQUENCY	2.5	SFR	2.5
5.5	----------	----------	REF. FREQ 1 CONFIG	AI3	FR1	AI3
5.5	----------	----------	FREQ SWITCH ASSIGN	DI3	RFC	DI3
5.5	----------	----------	2-WIRE TYPE	LEVEL	TCT	LEL
5.5	----------	----------	REF. FREQ 2 CONFIG	AI1	FR2	AI1
5.5	----------	CONTROL MODE	MIXED MODE CONFIG	CONTROL MODE I/O PROFILE	CHCF	IO
5.5	----------	COMMAND SWITCHING	COMMAND SWITCHING	DI3	CCS	DI3
5.5	----------	CMD CHANNEL 1	CMD CHANNEL 1	TERMINAL	CD1	TER
5.5	----------	CMD CHANNEL 2	CMD CHANNEL 2	TERMINAL	CD2	TER
5.11	AI/AQ	AI3 CONFIGURATION	AI3 TYPE	CURRENT	AI3T	0A
5.11	AI/AQ	AI3 CONFIGURATION	AI3 MIN VALUE	4	CRL3	4
5.11	AI/AQ	AQ1 CONFIGURATION	AQ1 ASSIGNMENT	MOTOR FREQUENCY	AO1	OFR
5.11	AI/AQ	AQ1 CONFIGURATION	AQ1 MIN OUTPUT	4	AOL1	4
5.11	RELAY	R1 CONFIGURATION	R1 ASSIGNMENT	OPERATING STATE	R1	FLT
5.11	RELAY	R2 CONFIGURATION	R2 ASSIGNMENT	DRIVE RUNNING	R2	RUN
5.12	----------	CATCH ON THE FLY	CATCH ON THE FLY	YES	FLR	YES
5.12	----------	FAULT (TRIP) RESET	FAULT (TRIP) RESET	DI4	RSF	DI4

Replacement Parts and Maintenance

Replacement Parts

Schneider Electric provides a limited number of replacement parts for the ATV980 Process drive. Before replacing any parts, consult your Schneider Electric sales representative. Replacement parts must be installed by qualified personnel familiar with the equipment being replaced.

NOTE: Shading designates replacement parts that are only available through Schneider Electric Services. Contact Schneider Electric for these parts.

Table 29 - Replacement Parts

Description	Catalog Number
Profinet I/O(1)	VW3A3627
Profibus DP(1)	VW3A3607
CANopen 2XRJ45(1)	VW3A3608
DeviceNet (1)	VW3A3609
CANopen SUB-D9(1)	VW3A3618
CANopen open style with screw terminals(1)	VW3A3628
Extended I/O module(1)	VW3A3203
Extended relay module(1)	VW3A3204
Bacnet MS/TP	VW3A3725
EtherCat	VW3A3601
AC coil for LC1F150	LX1FF095
AC coil for LC1F185	LX1FG095
AC coil for LC1F225 (precharge contactor)	LX1FG187
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 25501-00004 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 25501-00005 LED
	65170-166-39Trip 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
	ZB5AW0G15 25501-00005 LED
	65170-166-42 AFC Run legend plate
	ZBZ32 Legend plate holder

Table 29 - Replacement Parts (Continued)

Description	Catalog Number
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
	(2) ZBE205 Contact blocks (1 N.C. and 1 N.O.)
	65170-166-17 Hand-Off-Auto legend plate
	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
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)	1167715405511
Door fan filter, 320 mm x 320 mm, pack of 5	1861160003711
Roof fan, 470 mm x 470 mm (when supplied)	1168115205511
Roof fan filter, 470 mm x 470 mm, pack of 20	1861160003911
Advanced drive keypad (not suitable for installation outdoors)	VW3A1111
Remote keypad adapter (not suitable for installation outdoors)	VW3A1112
Zelio USB Cable	SR2USB01
ATV900 control block, all ratings[12]	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

11. These are Pfannenberg part numbers and need to be ordered externally.
12. Shading designates renewable parts that are only available through Schneider Electric Services. Contact Schneider Electric for these parts.

Table 29 - Replacement Parts (Continued)

Description	Catalog Number
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[13]	25430-20100[14] (no bypass 125 hp and lower, bypass 15 hp and lower) 25430-20250[15] (bypass 20–125 hp) 25430-20320[16] (any 150–500 hp) 25430-20700[17](any 600–900 hp)
Secondary control fuses standard 460 V, Type 1 and 12[13]	25430-20140[18] (no bypass 125 hp and lower, bypass 15 hp and lower) 25430-20350[19] (bypass 20–125 hp) 25430-20400[20] (any 150–250 hp) 25430-20700[21] (any 300–500 hp) 25430-21000[22] (any 600–900 hp)
Primary control fuses standard 460 V with Mod K14 (additional 150 VA), Type 1 and 12[13]	25430-20250 [23] (no bypass 125 hp and lower, bypass 15 hp and lower) 25430-20320[24](any 150–250 hp and 900 hp) 25430-20500[25] (bypass 20–125 hp) 25430-20700[17](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[13]	25430-20350[19] (no bypass 125 hp and lower, bypass 15 hp and lower) 25430-20400[20](any 150–250 hp) 25430-20700[21](any 300–500 hp) 25430-21000[22](any 600–900 hp) 25430-20500 [25](900 hp)

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

Maintenance Intervals

Table 30 - Recommended Maintenance Intervals

Component	Interval:[27]	
	In Operating Hours	In Years
Power part fan	35,000	4
Enclosure door fan	35,000	4
Filter mats	—	Clean once every six months, replace all every four years.

Electronic Door Interlock

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read and understand the instructions 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.

27. 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.
- DO NOT short across terminals PA/+ and PC/- or across the DC bus capacitors.
- 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.
- Motors can generate voltage when the shaft is rotated. Before performing any type of work on the drive system, block the motor shaft to prevent rotation.
- Before servicing the equipment:
- Disconnect the power, including the external control power that may be present.
- Always use a properly rated voltage sensing device to confirm power is off..
- Place a “DO NOT TURN ON” label on all power disconnects.
- Lock all power disconnects in the opened position.
- WAIT 15 MINUTES to allow the DC bus capacitors to discharge. Then follow the “DC Bus Voltage Measurement Procedure” and “DC Bus Voltage Measurement Procedure for Altivar Process 660/680/960/980” in bulletin NHA60269, Drives Systems Installation and Maintenance, to verify that the DC voltage is less than 42 V. The drive LED is not an indicator of the absence of DC bus voltage.
- Before applying voltage to the drive system:
- If the mains input terminals and the motor output terminals have been grounded, remove the ground on the mains input terminals and the motor output terminals.
- Replace all devices, doors, and covers before turning on power to this equipment or starting and stopping the drive.

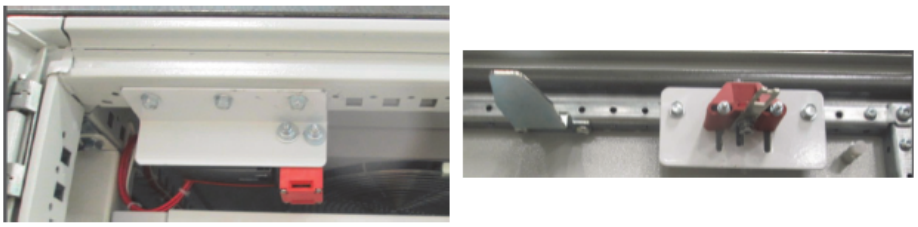
Failure to follow these instructions will result in death or serious injury.

Electronic door interlocks, when provided, electrically lock the enclosure doors when control power is present. See Electronic Door Interlocks, page 66. 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 28 - Electronic Door Interlocks



Servicing the Front Fan Filters

⚠⚠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.

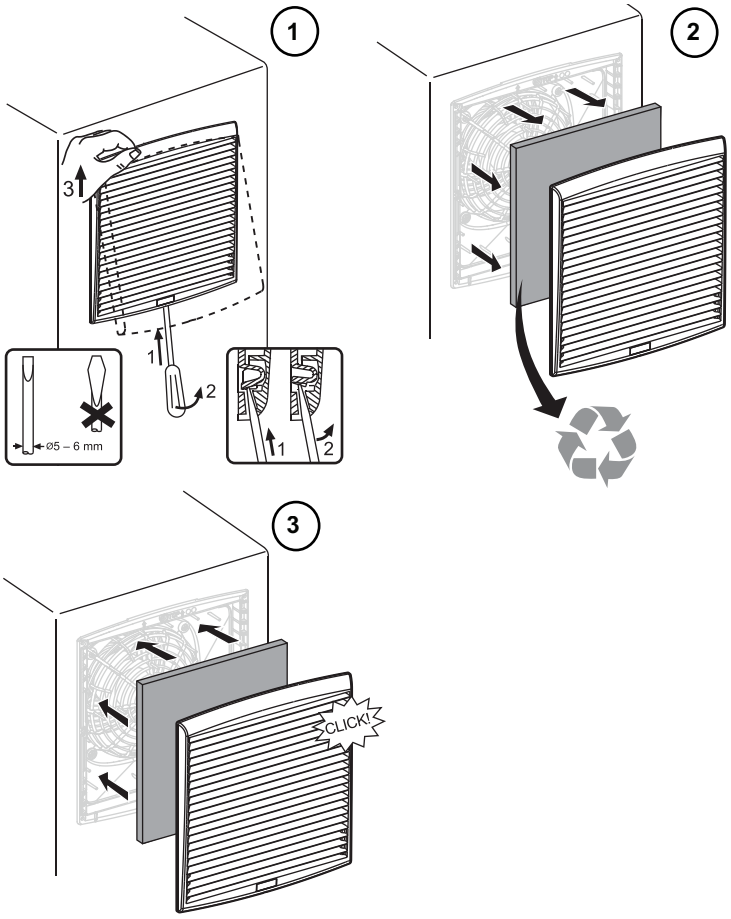
Failure to follow these instructions will result in death or serious injury.

The ATV680 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 a 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. Verify that the voltage tester is functioning properly before and after testing for the absence of voltage.
5. Unlock the air outlet grill with a flat head screwdriver and lift the grill to the top. See Changing Front Filters, page 68.
6. Remove the grill and filter mat. Discard the filter mat.
7. Press the new filter mat and air outlet grill into the cutout until the grill locks with an audible noise.

Figure 29 - Changing Front Filters



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 69.
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 69.
7. Reconnect the fan's power supply and the grounding cable.

Figure 30 - Removing the Door Fan

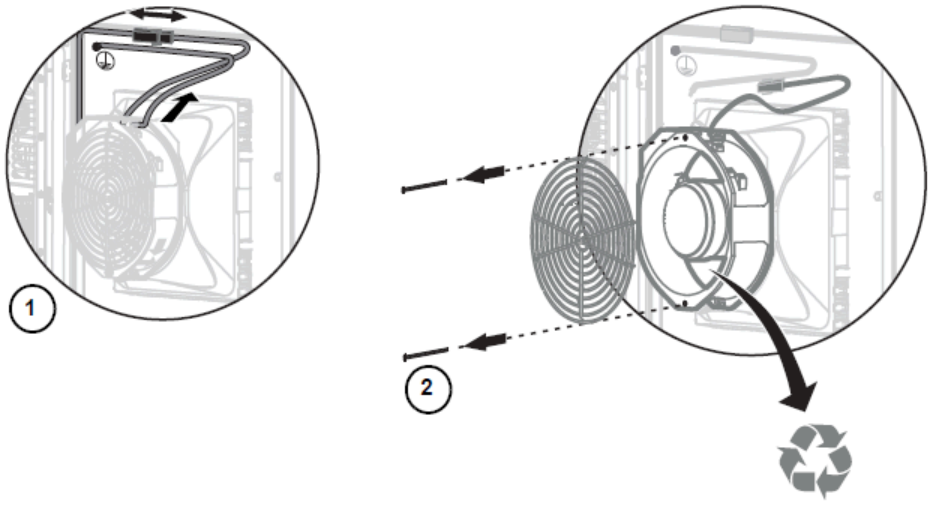
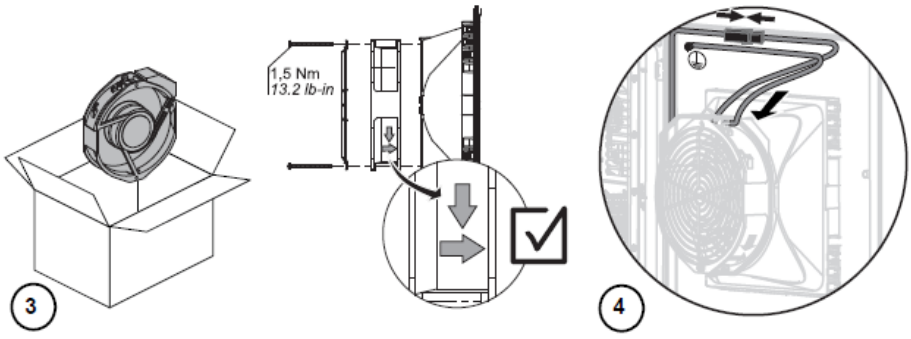


Figure 31 - Installing the New Door Fan



Replacing the Power Fan

⚠⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

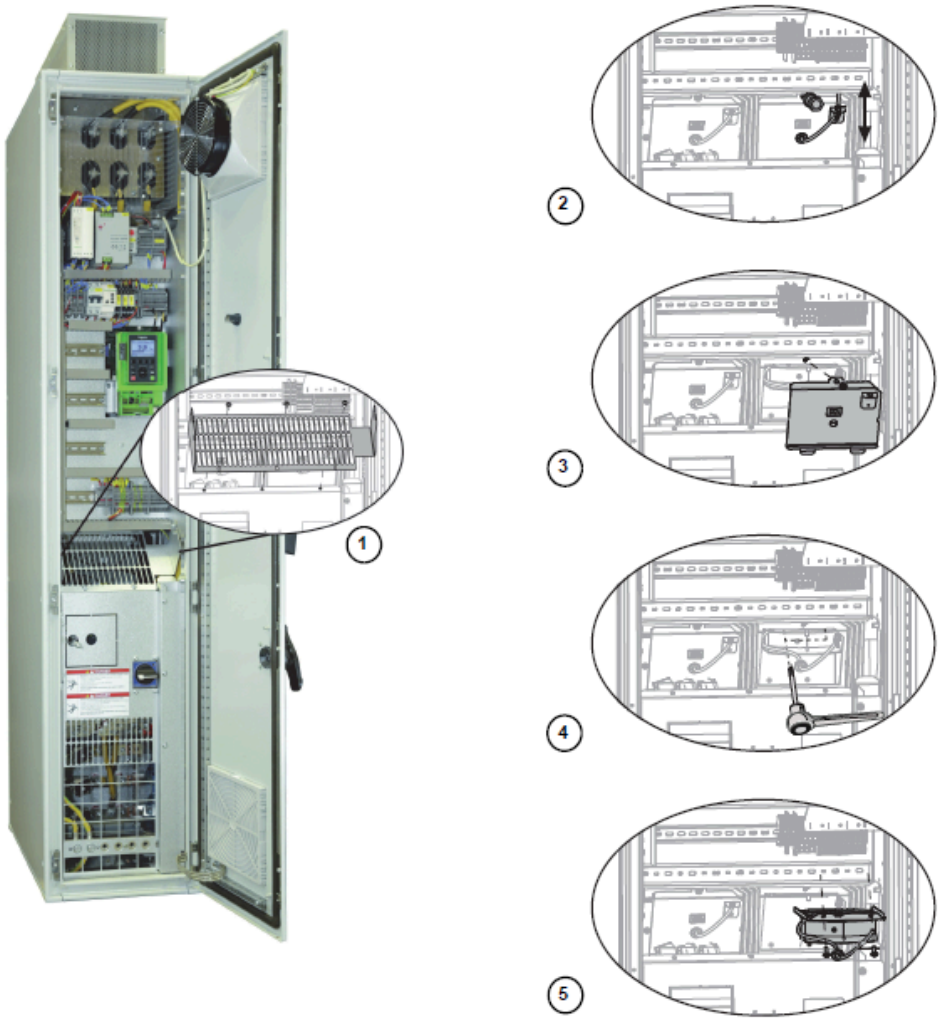
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA® 70E® Standard for Electrical Safety in the Workplace®, NOM-029-STPS – Maintenance of Electrical Installations in the Workplace, Safety Conditions, or CSA Z462 or local equivalent.
- This equipment 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 71:

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 71, Step 1.
3. Test for the absence of voltage.
4. Verify that the voltage tester is functioning properly before and after testing for the absence of voltage.
5. If the motor fan has a protective cover, remove the three screws attaching the cover to the fan housing. See Installing the Power Fan, page 71, Step 1.
6. Disconnect the power cable from the fan and the protective cover. Loosen the Torx® screw from the cover. See Installing the Power Fan, page 71, Steps 2 and 3.
7. Swivel the fan cover forward and remove it. 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 71, Step 3.
8. Loosen the two M6 Torx® screws at the fan housing. See Installing the Power Fan, page 71, Step 4.
9. After loosening the Torx® screws, pull the fan to the front. See Installing the Power Fan, page 71, Step 5.
10. 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 32 - 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 Mod Y10, Bypass, is selected. Zelio Smart Relay Program, page 73 contains a diagram of the default Zelio Smart Relay program. See Zelio Smart Relay Ladder Logic Timers, page 72 for a timing chart, Zelio Smart Relay Discrete Inputs, page 72 for the discrete inputs, and Zelio Smart Relay Discrete Outputs, page 72 for the discrete outputs.

Custom requests may result in a program that differs from the one illustrated in Zelio Smart Relay Program, page 73. If you have requested custom programming, review the drawings supplied with the process drive.

Table 31 - Zelio Smart Relay Ladder Logic Timers

Timer	Description	Function	Time (s)
T1	Power on delay	A: Active, control held down	6.0
T2	Open delay	C: Off delay	2.0
T3	AFC run delay	A: Active, control held down	5.0
T4	AFC contactor time delay	A: Active, control held down	3.0
T5	Bypass contactor time delay	A: Active, control held down	3.0
T6	Drive trip signal delay	A: Active, control held down	2.0
T7	Start with Line contactor	B: On pulse one shot	6.0

Table 32 - 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 33 - 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 33 - Zelio Smart Relay Program

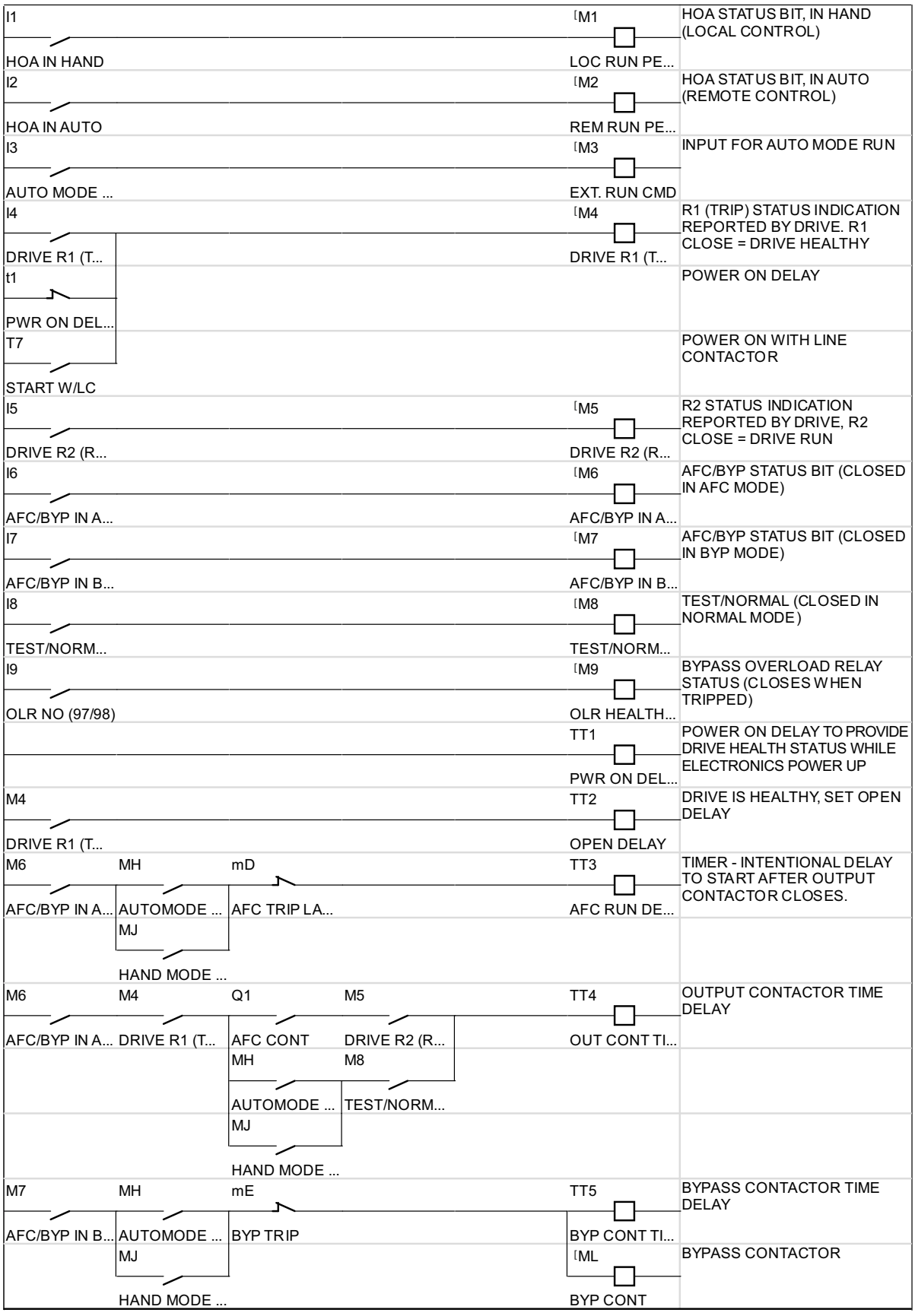
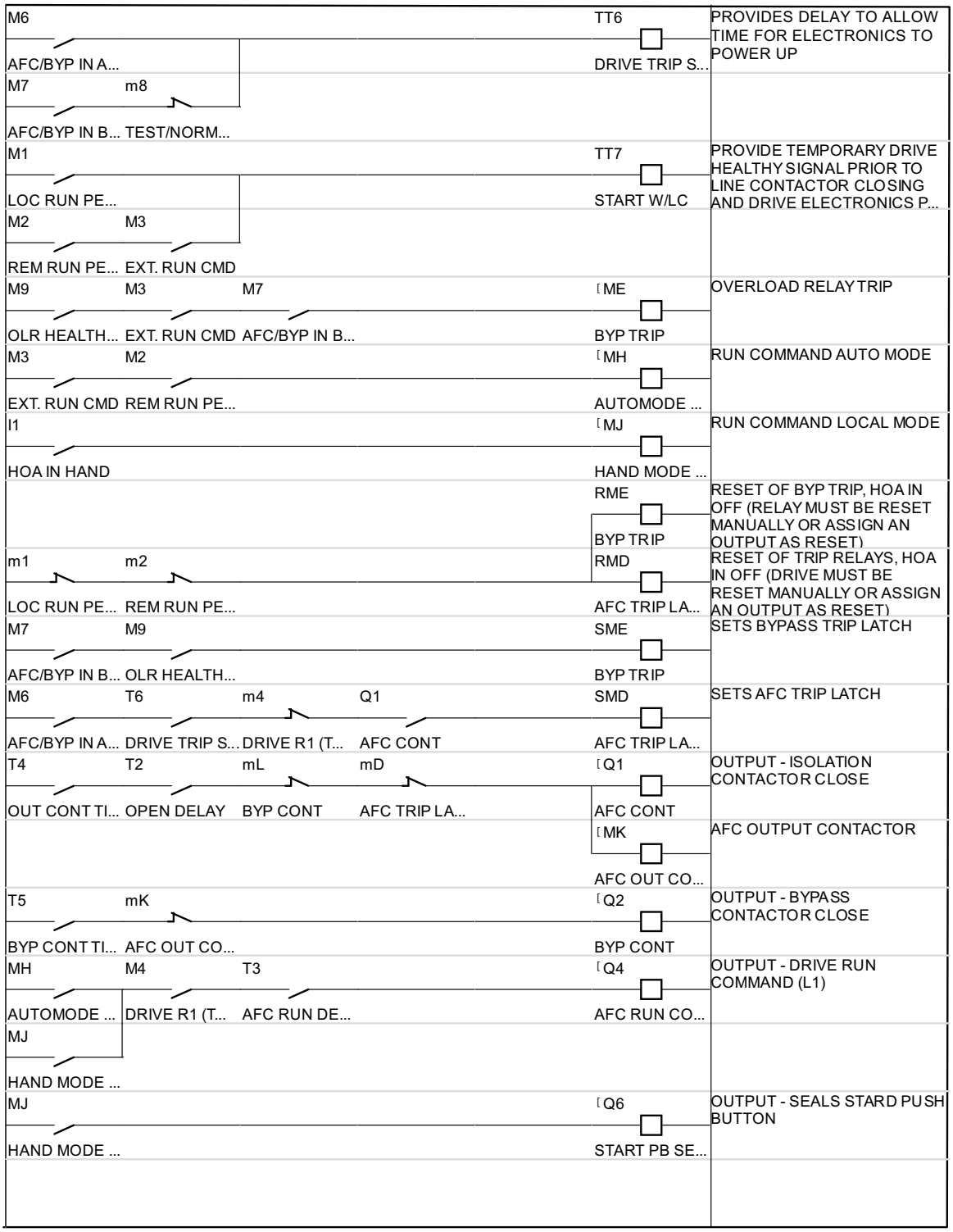


Figure 34 - Zelio Smart Relay Program



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