Altivar™ 630 Outdoor Drive

Instruction Bulletin

NVE78950
04/2017

Retain for future use.

ENGLISH

Bulletin NHA60269, *Drives Systems Installation and Maintenance*, contains important information on installation, operation, service, and maintenance of this product. Read NHA60269 before performing any work on or with this product.

Schneider Electric™

Hazard Categories and Special Symbols

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this bulletin 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. The safety alert symbol is not used with this signal word.

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.

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Section 1— Introduction

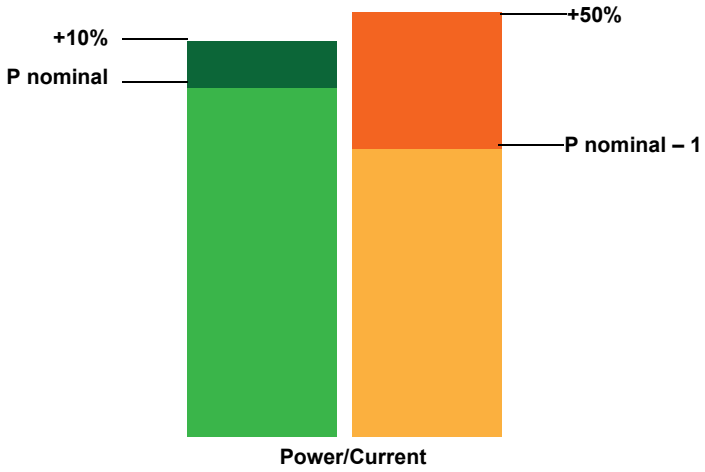
Application Considerations

The Schneider Electric™ Altivar 630 Outdoor Drive is tailored for outdoor applications such as irrigation, oil, and gas pumping.

Altivar 630 Outdoor 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 110%) 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 630 (ATV630) Outdoor Drives. The following document is also available from the Download Center at www.schneider-electric.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 Download Center at www.schneider-electric.us or contact your local Schneider Electric field office.

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Terminology

The following terminology is used in this instruction bulletin:

- Enclosed drive refers to the combination of the drive, enclosure, and the power and control circuits that constitute the ATV630 Outdoor Drive.
- Drive or power converter refers to the ATV630 component.
- Bypass, or integral bypass starter, refers to the optional, integrated full-voltage combination starter in the enclosed 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.

Standard Features

Altivar 630 Outdoor Drives without bypass are available up to 200 hp HD / 250 hp ND @ 460 V. The following are standard features for enclosed drives without bypass, when no options are ordered:

- +14 to +122 °F (-10 °C to +50 °C)
- Door-on-door arrangement
- 3% impedance
- Cabinet heater
- UL 508A Listed
- Non-bypass
- Type 1 surge protection (40 kA peak per phase)
- Assembled in the U.S.
- UL Type 3R enclosure
- Thermostatically controlled cooling fans
- Service entrance rated
- 120 V control power transformer
- Hand-Off-Auto switch with manual speed potentiometer
- 22 mm pilot lights
- Additional space for customer’s use
- Forced ventilation with washable filter

Options

- Class 9001 Type K, 30 mm, heavy-duty multifunction operators in lieu of standard 22 mm operators
- 5% impedance
- Passive harmonic filter
- Floor stand kit
- -25 °C cold weather operation
- Emergency stop push button
- Irrigation (PID ready)
- Custom engineered to order (ETO) options available on request. Contact your local Schneider Electric field office for a quotation

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” on and “DC Bus Voltage Measurement Procedure for Altivar Process 660/680/960/980” in document NHA60269 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.

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⚠ WARNING

DAMAGED ENCLOSED DRIVE

- 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 can result in death, serious injury, or equipment damage.

⚠ 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” and “DC Bus Voltage Measurement Procedure for Altivar Process 660/680/960/980” in document NHA60269.

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

⚠ DANGER

UNQUALIFIED PERSONNEL

- 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 70 E®, 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 ATV630 Outdoor 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.

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

⚠ 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.

Section 2— Product Characteristics

Catalog Number Description

The catalog number is on the nameplate attached to the inside of the enclosed drive door (see Figure 2 on page 13). The catalog number is coded to describe the configuration of the drive.

Use Table 2 on page 12 to translate the catalog number into a description of the enclosed drive. The example in Table 1 translates the catalog number AO6KH4NWAANJ.

For descriptions of the options listed in Table 2, refer to Section 4 beginning on page 31.

Table 1 – Catalog Number Example: AO6KH4NWAANJ

	Field								
01	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**
AO6	**K**	**H**	**4**	**N**	**W**	**A**	**A**	**N**	**J**
Altivar 630 Outdoor Drive	20 hp	UL Type 3R Enclosure	460 V, 3 Phase	Normal Duty Power Rating	Without Bypass	22 mm Operators	Red Power On, Yellow Tripped, Green AFC Run	No Communication Card	Floor-Standing Kit

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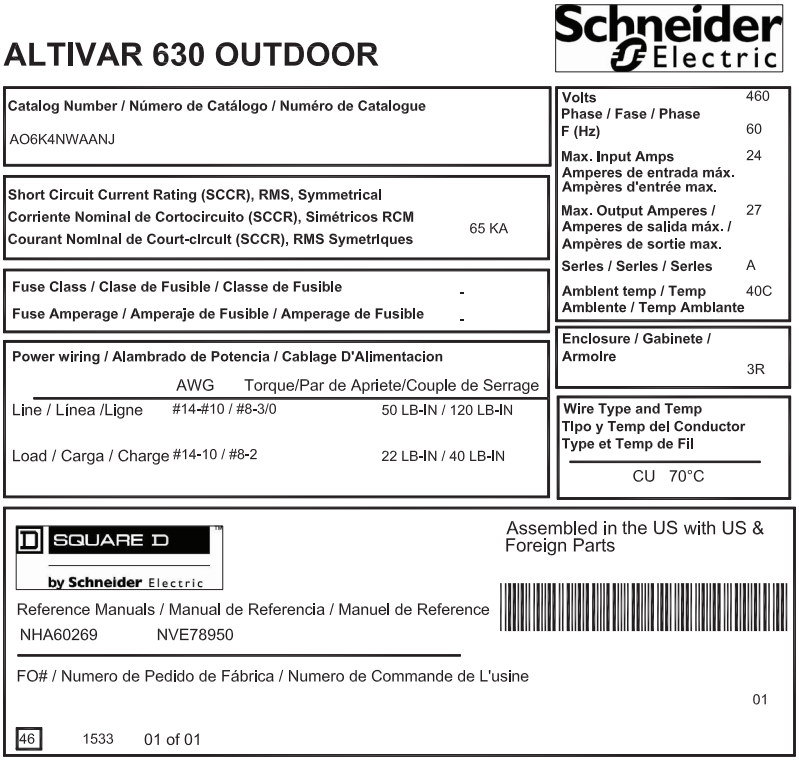
Table 2 – Catalog Number Description

Field	Digit	Characteristic	Description
01	1–3	Drive Style	Altivar 630 Outdoor Drive
02	4	Power Rating (hp)	K = 20 hp L= 25 hp M = 30 hp N = 40 hp P = 50 hp Q = 60 hp R = 75 hp S = 100 hp T = 125 hp U = 150 hp W = 200 hp X = 250 hp
03	5	Enclosure Type	H = Type 3R Outdoor
04	6	Voltage Class	4 = 460 V, Three Phase
05	7	Duty Rating	N = Normal Duty H = Heavy Duty
06	8	Power Options	W = Enclosed Drive Only (No Bypass) Y= Integrated Bypass
07	9	Control Options	A = 22 mm D = 30 mm
08	10	Light Options	A = Power On, AFC Run, Tripped N = None
09	11	Communication Card	N = None F = DeviceNet G = Profibus DP V1 R = Ethernet IP S = CANopen Daisy Chain T = CANopen Sub-D U = CANopen Open Style V = ProfiNet
10	Varies	Miscellaneous Options	A = 5% Effective Impedance H = SPD (Type 2) J = Floor Stand Kit K = E Stop Button L = Cold Weather Option (-25 °C to 50 °C) P = Passive Harmonic Filter Q = Agg / Irrigation Ready

Nameplate Identification

The nameplate for the Altivar 630 Outdoor Drive is on the inside of the enclosure door. See Figure 2. The nameplate identifies the drive type and modification options. When identifying or describing the enclosed drive, use the data from this nameplate.

Figure 2 – Nameplate



Short-Circuit Ratings

All Altivar 630 Outdoor Drives include a circuit breaker as a disconnect device and have a short-circuit rating of 65,000 A at up to 480 V.

⚠ WARNING

IMPROPER OVERCURRENT COORDINATION

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

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

Technical Characteristics

Table 3 – Electrical Specifications

Input voltage	460 Vac ±10%, three phase Other voltages available on request
Short circuit current rating (AC symmetrical)	65 kA
Control voltage	24 Vdc, 115 Vac +10%/-15% (control power transformer included)
Displacement power factor	98% through speed range (in AFC operation mode)
Input frequency	50/60 Hz ± 5%
Output voltage	Three-phase output, maximum voltage equal to input voltage
Galvanic isolation	Galvanic isolation between power and control (inputs, outputs, and power supplies)
Output frequency range of power converter	0.1–599 Hz (factory setting of 60 Hz)
Torque/Overtorque	Normal Duty: 110% of nominal motor torque for 60 s Heavy Duty: 150% of nominal motor torque for 60 s
Current (transient)	Normal Duty: 110% of drive rated current for 60 s Heavy Duty: 150% of drive rated current for 60 s
Switching frequency	Selectable from 0.5–8 kHz. Factory setting: 2.5 kHz The drive reduces the switching frequency automatically in the event of excessive heatsink temperature.

Table 4 – Environmental Specifications

Storage temperature	-13 to +149 °F (-25 to +65 °C)
Operating temperature	+14 to +122 °F (-10 to +50 °C) -13 to +122 °F (-25 to +50 °C) (Cold Weather Option)
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.) • up to 15,747 ft (4800 m) maximum (TN, TT systems only. No delta connected systems.)
Enclosure	UL Type 3R: outdoor (ventilated)
Pollution degree	Pollution degree 2 (Types 1 and 3R) or 3 (Type 12) per NEMA ICS-1 Annex A and IEC 61800-5-1
Operational test vibration	Conforming to IEC/EN 60068-2-6 1.5 mm at 3–10 Hz, 0.6 g at 10–200 Hz 3M3 conforming to IEC/EN 60721-3-3
Transit shock test	Conforming to National Safe Transit Association and International 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 cUL Listed per C22.2 No. 14-13 IEEE519 compliant (passive harmonic filter required); Conforms to applicable NEMA ICS, NFPA, and IEC standards; Manufactured under ISO 9001 standards.

Table 5 – Operation and Control

Maximum current	ND: 110% 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. **AI3:** Factory setting: 4–20 mA. Impedance = 242 kΩ (reassignable, X–Y range with graphic display terminal).
Frequency resolution in analog reference	0.1 for 100 Hz (11 bits)
Harmonics	Less than 48% TDDi standard. Less than 5% TDDi with harmonic filter
Speed regulation	V/*f* control: equal to the motor's rated slip. Sensorless flux vector control (SFVC): 10% of the motor's rated slip from 20–100% of nominal motor torque
Efficiency	95% (or greater) at full load typical
Reference sample time	2 ms ±0.5 ms
Acceleration and deceleration ramps	Drive: 0.1–999.9 s (definition in 0.1 s increments)
Graphic display terminal	Self diagnostics with trip indication messages in three languages. Refer to the Programming Manuals available online at www.schneider-electric.com.

Table 6 – Protection

Motor and Pump:	
Thermal overload	Class 10 electronic overload protection (drive) Class 10 bypass overload protection (drive with bypass)
Drive System:	
Overcurrent protection	An overcurrent protection device (OCPD) provides Type 1 coordination to the short-circuit current ratings.
Overtemperature protection	Protection if heatsink temperature exceeds 85 °C (185 °F)
Functional Safety:	
Functional safety of the drive	The function Safe Torque Off (STO) 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 SIL 3 and IEC/EN 61800-5-2.
Response time	≤ 100 ms at STO (Safe Torque Off)

Ratings

Table 7 – Input and Output Current Ratings and Dissipated Heat

VAC	Rating		Maximum Input Current (A)	Maximum Output Current (A)	Typical Dissipated Power at Rated Load (W)
	hp	kW			
460	20	15	24.4	27	515
	25	18	29.9	34	680
	30	22	35.8	40	739
	40	30	48.3	52	898
	50	37	59	65	1072
	60	45	71.8	77	1324
	75	55	86.9	96	1418
	100	75	118.1	124	1823
	125	90	156	156	2120
	150	110	184	180	2530
	200	130	218	240	3150
	250	160	280	302	4030

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 safety strap.

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

Table 8 – Approximate Weight

Voltage	hp	Weight (lb)	
		Basic 6-Pulse Drive System	Drive System with Passive Harmonic Filter
460	20–50	550	950
460	60–125	750	1100
460	150–250	900	1500

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 9 – Power Terminal Wire Range and Torque Requirements, ND Line Side

Voltage	hp	Circuit Breaker	Line (L1, L2, L3)	
			Wire Range AWG (mm^2)	Torque lb-in (N•m)
460	20	HLL36060	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	25	HLL36070	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	30	HLL36080	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	40	HLL36100	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	50	HLL36125	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	60	HLL36150	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	75	JJL36175	4–4/0 (25–95)	225 (25)
460	100	JJL36200	3/0–350 (95–185)	225 (25)
460	125	JJL36250	3/0–350 (95–185)	225 (25)
460	150	LJL36400U31X	(2) 2/0–500 (70–240)	275 (31)
460	200–250	LJL36600U31X	(2) 2/0–500 (70–240)	275 (31)

Normal Duty, Load Side

Table 10 – Power Terminal Wire Range and Torque Requirements, ND, Load Side

Voltage	hp	Load, Enclosed Drive Only (T1, T2, T3)		Load with Bypass (T1, T2, T3)	
		Wire Range AWG (mm^2)	Torque lb-in (N•m)	Wire Range AWG (mm^2)	Torque lb-in (N•m)
460	20	14–10 (2.5–6)	22 (2.5)	14–8 (2.5–10)	22.1 (2.1)
		8–2 (10–35)	40 (4.5)	—	—
460	25–30	14–10 (2.5–6)	22 (2.5)	10–2 (6–35)	100 (11.3)
		8–2 (10–35)	40 (4.5)	—	—
460	40	6–2 (16–35)	44 (5)	10–2 (6–35)	100 (11.3)
		1–1/0 (35–50)	97 (11)	—	—
460	50	6–2 (16–35)	44 (5)	10–2 (6–35)	100 (11.3)
		1–1/0 (35–50)	97 (11)	—	—
460	60	6–2 (16–35)	44 (5)	10–2 (6–35)	100 (11.3)
		1–1/0 (35–50)	97 (11)	—	—
460	75	4–1/0 (25–50)	88 (10)	8–250 (10–130)	100 (11.3)
		2/0–300 (70–150)	159 (18)	—	—
460	100	4–1/0 (25–50)	88 (10)	8–250 (10–130)	100 (11.3)
		2/0–300 (70–150)	159 (18)	—	—
460	125	4–1/0 (25–50)	88 (10)	6–300 (16–150)	274 (31)
		2/0–300 (70–150)	159 (18)	—	—
460	150	(2) 6–300 (16–150)	274 (31)	6–300 (16–150)	274 (31)
460	200	(2) 6–300 (16–150)	274 (31)	4–500 (25–240)	500 (56.5)
460	250	(2) 6–300 (16–150)	274 (31)	—	—

Heavy Duty, Line Side

Table 11 – Power Terminal Wire Range and Torque Requirements, HD, Line Side

Voltage	hp	Circuit Breaker	Line (L1, L2, L3)	
			Wire Range AWG (mm^2)	Torque lb-in (N•m)
460	20	HLL36060	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	25	HLL36080	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	30	HLL36100	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	40	HLL36125	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	50	HLL36150	14–10 (2.5–6)	50 (6)
			8–3/0 (10–95)	120 (14)
460	60	JJL36175	4–4/0 (25–95)	225 (25)
460	75	JJL36200	4–4/0 (25–95)	225 (25)
460	100	JJL36250	4–4/0 (25–95)	225 (25)
460	125	LJL36250U31X	2–600 (31–300)	275 (31)
460	150	LJL36400U31X	(2) 2/0–500 (70–240)	275 (31)
460	200	LJL36600U31X	(2) 2/0–500 (70–240)	275 (31)

Heavy Duty, Load Side

Table 12 – Power Terminal Wire Range and Torque Requirements, HD, Load Side

Voltage	hp	Load, Enclosed Drive Only (T1, T2, T3)		Load with Bypass (T1, T2, T3)	
		Wire Range AWG (mm^2)	Torque lb-in (N•m)	Wire Range AWG (mm^2)	Torque lb-in (N•m)
460	20	14–10 (2.5–6)	22 (2.5)	14–8 (2.5–10)	22.1 (2.1)
		8–2 (10–35)	40 (4.5)	—	—
460	25–30	6–2 (16–35)	44 (5)	10–2 (6–35)	100 (11.3)
		1–1/0 (35–50)	97 (11)	—	—
460	40	6–2 (16–35)	44 (5)	10–2 (6–35)	100 (11.3)
		1–1/0 (35–50)	97 (11)	—	—
460	50	6–2 (16–35)	44 (5)	10–2 (6–35)	100 (11.3)
		1–1/0 (35–50)	97 (11)	—	—
460	60	4–1/0 (25–50)	88 (10)	10–2 (6–35)	100 (11.3)
		2/0–300 (70–150)	159 (18)		
460	75	4–1/0 (25–50)	88 (10)	8–250 (10–130)	100 (11.3)
		2/0–300 (70–150)	159 (18)	—	—
460	100	4–1/0 (25–50)	88 (10)	8–250 (10–130)	100 (11.3)
		2/0–300 (70–150)	159 (18)	—	—
460	125	(2) 6–300 (16–150)	274 (31)	6–300 (16–150)	274 (31)
460	150	(2) 6–300 (16–150)	274 (31)	6–300 (16–150)	274 (31)
460	200	(2) 6–300 (16–150)	274 (31)	4–500 (25–240)	500 (56.5)

Grounding Bar and Lugs

Table 13 – Grounding Bar Wire Range and Torque Requirements

Voltage	hp (Normal Duty)	Grounding Bar and Grounding Lugs	
		Wire Range AWG (mm²)	Torque lb-in (N•m)
460	20–30	14–10 (2.5–6)	20 (2.25)
		8 (10)	25 (2.8)
		6–4 (16–25)	35 (4)
460	40–100	14–10 (2.5–6)	20 (2.25)
		8 (10)	25 (2.8)
		6–4 (16–25)	35 (4)
		6–2/0	50 (5.7)
460	125–250	14–10 (2.5–6)	20 (2.25)
		8 (10)	25 (2.8)
		6–4 (16–25)	35 (4)
		6–350	200 (22.5)

Service Entrance

Table 14 – Service Entrance Wire Range and Torque Requirements

Voltage	hp	Main Neutral		Ground	
		Wire Range AWG (mm²)	Torque lb-in (N•m)	Wire Range AWG (mm²)	Torque lb-in (N•m)
460	20–60	12–1/0 Al (4–50 Al)	75 (8.5)	12–1/0 Al (4–50 Al)	50 (5.6)
		14-1/0 Cu (2.5–50 Cu)	75 (8.5)	14-1/0 Cu (2.5–50 Cu)	
460	75–125	4–300 (25–150)	250 (120)	8 (10)	40 (4.5)
				6–4 (16–25)	45 (5.1)
460	150–250	4–300 (25–150)	250 (120)	8 (10)	40 (4.5)
				6–4 (16–25)	45 (5.1)

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Control Wiring

Connect the control wiring to terminal block TS-1. The control terminals are rated 600 V, 30 A. Refer to Table 15 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 TS-1

Control Terminals	Wire Cross Section		Tightening Torque lb-in (N•m)
	Minimum[1] AWG (mm^2)	Maximum AWG (mm^2)	
All terminals	20 (0.5)	10 (4)	5.3 (0.6)

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

Table 16 – TS-1 User Terminal Connections

Function	Terminal	
Customer interlock (120 Vac) (+)	203	
Customer interlock (120 Vac)	205	
Auto mode remote start	208	209
AFC run status (N.C.)	232	233
AFC run status (N.O.)	233	234
AFC trip status (N.C.)	229	230
AFC trip status (N.O.)	230	231
4–20 mA (0-10 V) speed reference (common)	109	
4–20 mA (0-10 V) speed reference (+)	108	
4–20 mA (0-10 V) speed reference SHLD/GRD	107	
4–20 mA DC output speed SHLD/GRD	110	
4–20 mA DC output speed (+)	112	
4–20 mA DC output speed (common)	111	
Auto mode status (N.O.)	206	207
Bypass status (N.O.)	235	236

Section 3— 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.

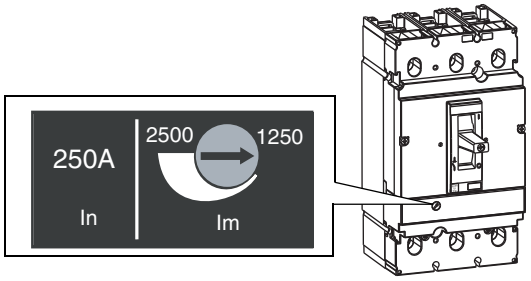
Factory Settings

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

The trip settings of some circuit breakers 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 Download Center at www.schneider-electric.us.

Figure 3 – 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.

Table 17 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
20	23–32
25	30–40
30	37–50
40	48–65
50	55–70
60	63–80
75	60–100
100	90–150
125	132–220
150	132–220
200	200–330

Proportional-Integral-Derivative Control

⚠ WARNING

UNANTICIPATED EQUIPMENT OPERATION

Verify that activating this function does not result in unsafe conditions.

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

Introduction

This section provides programming instructions for using Proportional-Integral-Derivative (PID) control on the drive.

PID control provides a method for controlling a process variable using a closed loop feedback system. The PID regulator calculates the error between the desired setpoint and feedback process variable and provides continuous corrective action to control the process output. From an application standpoint, the drive output adjusts the speed of the motor to reduce the error to zero. Closed loop control eliminates the cycling normally associated with open loop on-off control methods. PID control aims to regulate the process consistently under changing conditions at a maximum rate with minimum waste and minimum cost of operation.

Process variables such as temperature, pressure, and level can be monitored by the drive as a current or voltage analog feedback signal. The PID regulator calculates the error between the setpoint and feedback for a closed loop, then applies an appropriate reference to adjust the motor speed.

There are three functions for control:

1. Proportional (P): The Proportional function determines the responsiveness of control or how quickly the output reacts to the error.
2. Integral (I): The Integral function determines the reaction based on the sum of recent errors and its absence may prevent the system from reaching its target value.
3. Derivative (D): The Derivative function determines the reaction to the rate at which the error has been changing and is very sensitive to measurement noise.

The weighted sum of P, I, and D functions is used to correct the process variable.

By tuning these three functions, the system performance including responsiveness (time to correct the error), overshoot (overage from the reference setpoint), and oscillations (cycling between the highest and lowest point until signal stabilization) can be controlled.

With PID control the relationship between speed and process variable (pressure, level, or temperature) is often misunderstood. For example, users may expect a certain motor speed at a given system variable. This is not correct because the speed is not directly related to the system variable. Instead the PID calculations adjust the speed as needed to maintain the setpoint. As system dynamics change (valves, dampers, ambient temperature, flow rate, and other processes), the speed required to maintain the setpoint will differ. Base PID performance on its ability to maintain the setpoint, not on motor speed.

Figure 4 – PID Control Concept

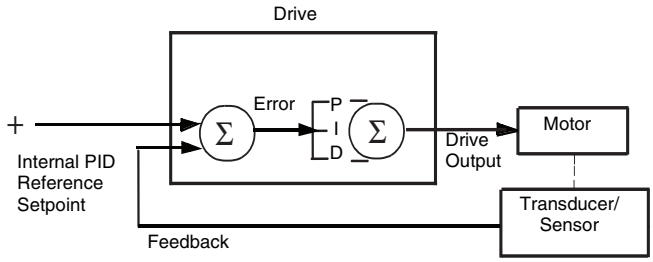
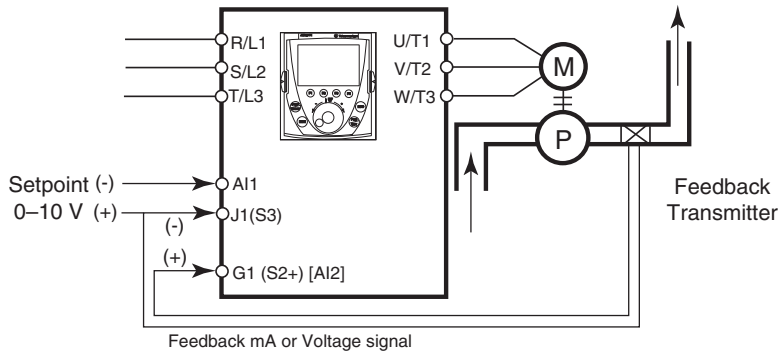


Figure 5 – PID Setup for Drive



Scaling PID Parameters

Scaling of PID parameters is required to suit your application or the range of the sensor input device providing the feedback signal or both. Some examples of PID parameters and their ranges are pressure (0–20 psi), flow (0–500 gpm), and temperature (-100 °F to +300 °F).

PID REFERENCE (Min., Max.) parameters must be within the sensor range, for example, PID FEEDBACK (Min., Max.) parameters. Parameter INTERNAL PID REF setpoint is entered as a percentage of the PID FEEDBACK range demonstrated in the following examples. The scaling parameters cannot exceed a value of ± 32,767. To simplify the setup, use the values as close as possible to this maximum limit, but remain within powers of 10 with respect to the actual values

For example:

- To maintain a pressure of 40 psi for a pressure transducer with 0–100 psi range with an input signal of 4–20 mA, enter the MIN PID FEEDBACK as 0 (corresponding to 0 psi) and the MAX PID FEEDBACK as 1000 (corresponding to 100 psi). As 40 psi equals 40% of the sensor range with 0–100 psi, therefore set the INTERNAL PID REF setpoint to 400.
- If a temperature device is scaled at -100 to +300 °F, enter the Minimum PID Feedback as 0 (corresponding to -100 °F) and the Maximum PID Feedback as 1000 (corresponding to +300 °F). An 80 °F setpoint is 45% of the range from -100 to +300°F; therefore set the INTERNAL PID REF setpoint to 450.

PID Tuning

Tuning of the P, I, and D control functions is required to optimize the process performance based on application needs. There are several methods for tuning including manual, Ziegler-Nichols, and by using several software tools available in the market. The PID proportional gain (rPG), Integral gain (rIG) and derivative gain (rdG) parameters can be adjusted to allow the PID regulator to be tuned for a specific application.

NOTE: Follow the instructions in the Drive Configuration on page 29 to set up the P, I, and D control functions and access the parameters for gains adjustment

In many cases the factory settings for these parameters are sufficient. However, if necessary, adjustments should be gradual and independent. If the system is unstable with the factory settings or if the PID reference (setpoint) is not achieved, use the manual method described below:

- Set the integral gain (rIG) to minimum.
- Leave the derivative gain (rdG) at 0.
- Vary the load or PID reference setpoint a number of times and observe the PID regulator response.
- Set the proportional gain (rPG) in order to obtain the best compromise between response time and stability.
- Once stable, if the steady state response varies from the preset value (setpoint), gradually increase the integral gain (rIG), reduce the proportional gain (rPG) in the event of instability (pump applications), and find a compromise between response time and precision.
- Typically, the derivative gain (rdG) is not required, but may permit the reduction of overshoot and the improvement of response time. This can make it more difficult to obtain a compromise in terms of stability since this depends on 3 gains. If rdG is adjusted then the rPg and rIg may require re-adjustment.

Figure 6 on page 28 illustrates the system performance with adjustments in P, I, and D gains.

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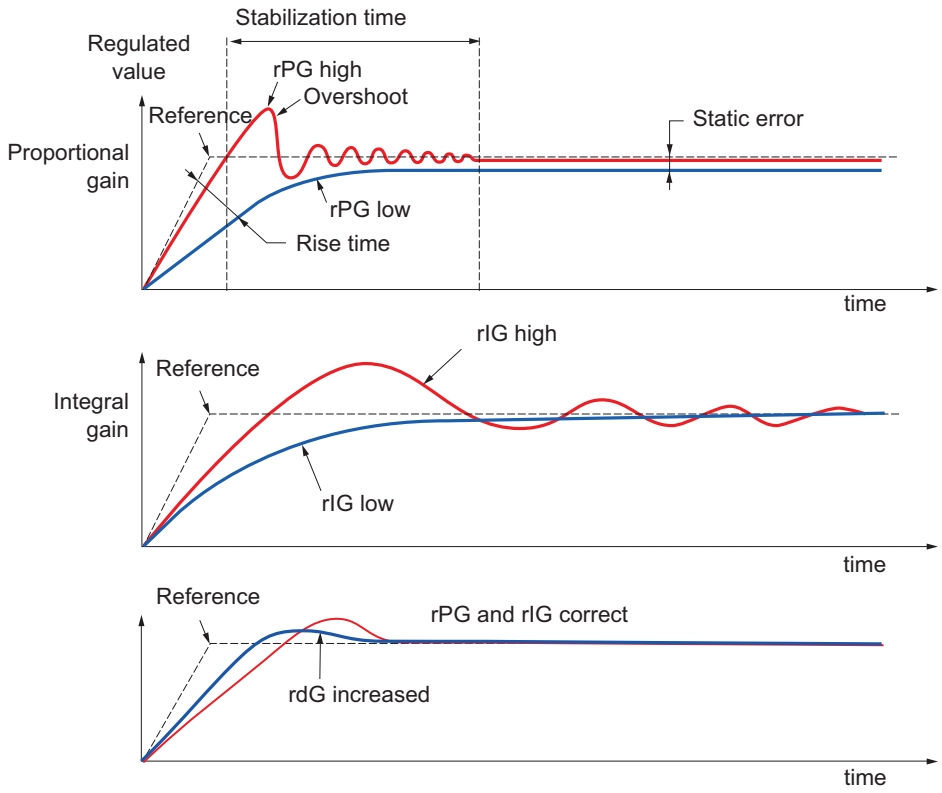
Figure 6 – System Performance With Adjustments in P, I, and D Gains



The oscillation frequency depends on the system kinematics.

Parameter	Rise time	Overshoot	Stabilization time	Static error
rPG ↗	↘↘	↗	=	↘
rIG ↗	↘	↗↗	↗	↘↘
rdG ↗	=	↘	↘	=

Setting PID Control

PID control with a Hand-Off-Auto selector switch can be set using the following positions:

- In the Auto position the drive speed reference follows the PID regulator.
- In the Hand position the drive speed reference follows the graphic display terminal (HMI).

PID control for analog inputs with voltage (0–10 V) or current (4–20 mA) signal is possible.

Drive Configuration

Ensure that the factory settings for the enclosed drive and motor parameters are set. For more information, refer to the applicable Altivar programming manual corresponding to the drive shipped with the equipment

NOTE: During programming changes, a warning message may appear indicating that an input is already assigned to another function. Press Enter to acknowledge this warning and continue programming the drive.

Use the graphic display terminal (HMI) provided with the drive to change the following settings:

Table 18: Programmable Settings

Parameters	Description
ACCESS LEVEL	From the My Preferences menu, select ACCESS LEVEL > EXPERT.
SET THE ANALOG FEEDBACK SIGNAL	Configure the customer supplied analog feedback signal using the following rules: AI1 is configured for voltage or current AI2 is configured for voltage or current AI3 is configured for voltage or current
DRIVE CONFIGURATION	From the My Preferences menu, select COMPLETE SETTINGS > PUMP FUNCTIONS > PID CONTROLLER > FEEDBACK.
SET TYPE OF SIGNAL	Select AI1, AI2, or AI3 to supply the analog feedback signal. Note that AI4 and AI5 are only available if the optional I/O expansion card is installed.
SET THE MIN-MAX VALUES	Continue in the menu above and configure the drive based on the type of feedback transducer used. Set the AIX Min. Value and AIX Max. Value. For example, if the device has a 4–20 mA input, set AIX Min. Value to 4 and AIX Max. Value to 20. Also, if the device has a 0–10 Vdc input, set AI1X Min. Value to 0 and AIX Max. Value to 10.
SET REFERENCE CHANNEL	From the My Preferences menu select COMPLETE SETTINGS > PUMP FUNCTIONS > PID CONTROLLER > REFERENCE FREQUENCY. Configure the drive based on the reference command to be followed in the PID loop control.
SET PID REGULATOR PARAMETERS	From the My Preferences menu select COMPLETE SETTINGS > PUMP FUNCTIONS > PID CONTROLLER > SETTINGS.
PID PROPORTIONAL GAIN [rPG]	For more information about PID tuning and adjusting gains, see page 27.
PID INTEGRAL GAIN [rIG]	
PID DERIVATIVE GAIN [rdG]	
PID RAMP [PrP]	PID acceleration/deceleration ramp times can be adjusted from 0–99.9 s.
PID MIN OUTPUT [PoL]	Min value of regulator output in Hz. Factory setting is 0 Hz.
PID MAX OUTPUT [PoH]	Max value of regulator output in Hz. Factory setting is 60 Hz.
PID INVERSION	Setting this value to No increases the motor speed when the error is positive (for example, pressure control with a pump). Setting this value to Yes decreases the motor speed when the error is positive (for example, temperature controls using a cooling tower fan). Error = Setpoint (PID Reference)–Process Variable (PID Feedback). A positive error occurs when the process variable is below the setpoint. **NOTE:** Most applications work best with this value set to No.

Section 4— Circuit Operation and Options

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

Before operating the ATV630 process drive:

- Read and understand document EAV64318, *Altivar Process Variable Speed Drives ATV630, ATV650, ATV660, ATV680 Programming Manual*, before changing any parameters from the factory defaults.
- If the ATV630 drive is re-initialized using the total or partial factory setting function, the drive must be reprogrammed to the values listed in Tables 22–25 (pages 38–39).
- If the drive or the main control board of the drive is replaced, the drive must be reprogrammed to the values listed in Tables 22–25 (pages 38–39) and in the order which they are given.

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

Voltage Supply and Auxiliary Voltage

- All drive systems are equipped with a control transformer matching the mains voltage and the required power.
- 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 (not included as standard).

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

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

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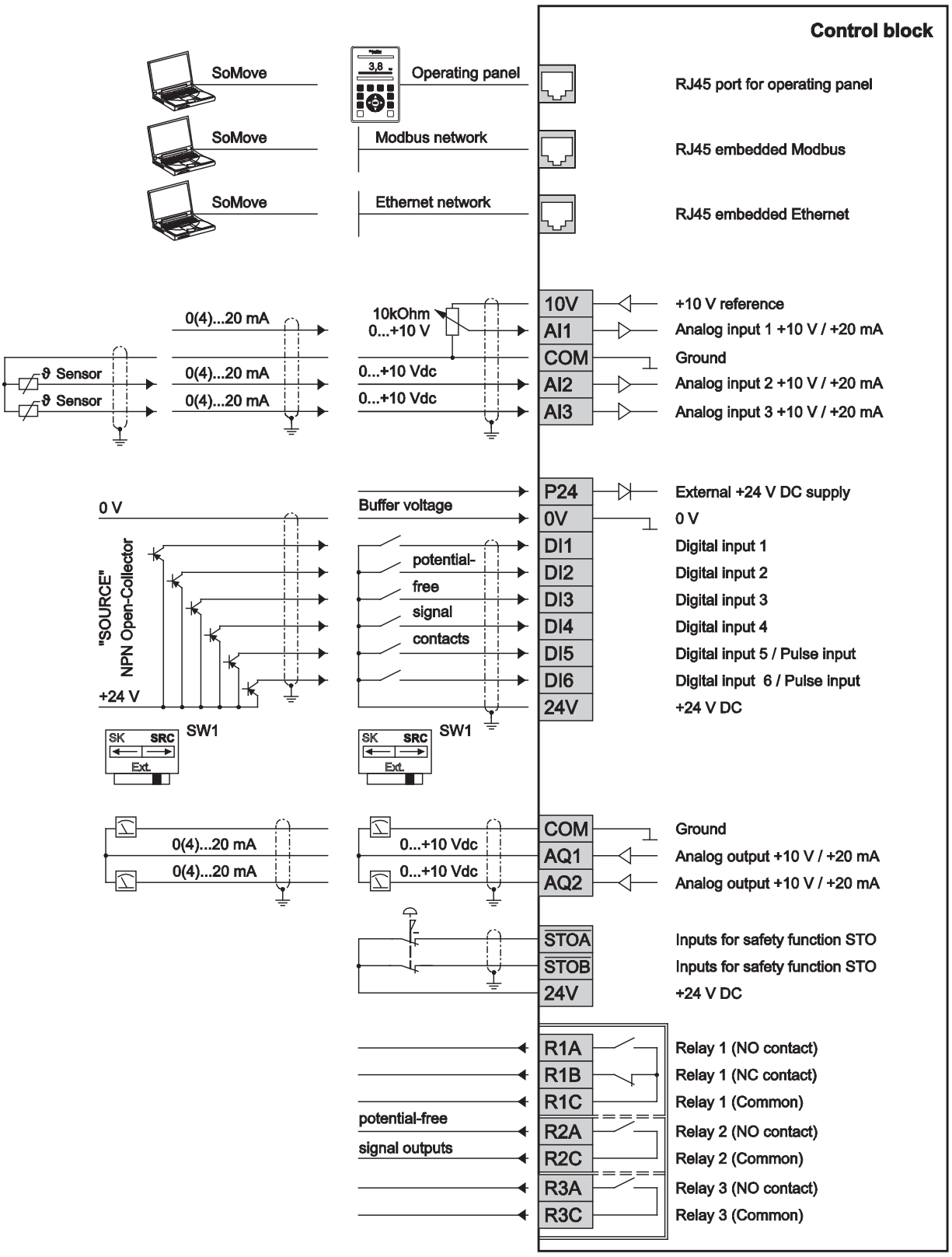
Control Terminals

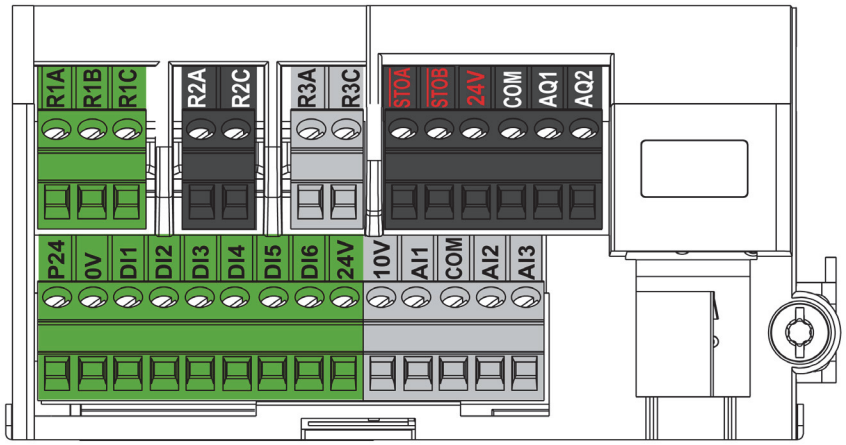
Figure 7 – Control Terminals at the Control Block



Control Block Terminals and Communication and I/O Ports

The control terminal blocks are the same for all drive frame sizes. See Figure 8.

Figure 8 – Control Terminal Arrangement



Maximum Cable Length

- AI•, AQ•, DI•, DQ•: 50 m shielded
- $\overline{\text{STOA}}$, $\overline{\text{STOB}}$: 30 m

Wiring Characteristics

Table 19 – Wire Sizes and Tightening Torque

Control Terminals	Relay Output Wire Cross Section		Other Wire Cross Section		Tightening Torque
	Minimum[1]	Maximum	Minimum[1]	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)

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

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

Electrical Characteristics

- For a description of the terminal arrangement, see “Control Block Ports” on page 36.
- For factory setting I/O assignments, refer to bulletin EAV64318, *Altivar Process Programming Manual*, or the documentation supplied with your enclosed drive.

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Table 20 – 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 φ = 1): 3 A for 250 Vac and 30 Vdc • Maximum switching current on inductive load: (cos φ = 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 φ = 1): 5 A for 250 Vac and 30 Vdc • Maximum switching current on inductive load: (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 Vac and 30 Vdc • Refresh time: 5 ms ± 0.5 ms • Service life: - 100,000 operations at maximum switching power - 500,000 operations at 0.5 A for 30 Vdc - 1,000,000 operations at 0.5 A for 48 Vac
R2C	Common point contact of relay R2	O	
R3A	NO contact of relay R3	O	**Output Relay 3** • Minimum switching capacity: 5 mA for 24 Vdc • Maximum switching current on resistive load: (cos φ = 1): 5 A for 250 Vac and 30 Vdc • Maximum switching current on inductive load: (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 Vac and 30 Vdc • Refresh time: 5 ms ± 0.5 ms • Service life: - 100,000 operations at maximum switching power - 500,000 operations at 0.5 A for 30 Vdc - 1,000,000 operations at 0.5 A for 48 Vac
R3C	Common point contact of relay R3	O	
$\overline{\text{STOA}}$, $\overline{\text{STOB}}$	STO inputs	I	**Safety Function STO Inputs** Refer to bulletin NHA80947, *Safety Functions Manual,* available on www.schneider-electric.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
COM	Analog I/O common	I/O	0 V for Analog outputs
AQ1	Analog output	O	AQ: Analog output software-configurable for voltage or current • Voltage analog output 0–10 Vdc, minimum. Minimum load impedance 470 Ω • Current analog output X–Y mA by programming X and Y from 0–20 mA, maximum load impedance 500 Ω • Maximum sampling time: 5 ms ± 1 ms • Resolution 10 bits • Accuracy: ± 1% for a temperature variation of 60 °C (140°F) • Linearity ± 0.2%
AQ2	Analog output	O	
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

Table 20 – Electrical Characteristics *(continued)*

Terminal	Description	I/O Type	Electrical characteristics
DI1-DI6	Digital inputs	I	8 programmable logic inputs 24 Vdc, comply with IEC/EN 61131-2 logic type 1 • Positive logic (Source): State 0 if ⩽ 5 Vdc or logic input not wired, state 1 if ⩾ 11 Vdc • Negative logic (Sink): State 0 if ⩾ 16 Vdc or logic input not wired, state 1 if ⩽ 10 Vdc • Impedance 3.5 kΩ • Maximum voltage: 30 Vdc • Maximum sampling time: 2 ms ± 0.5 ms Multiple assignment makes it possible to configure several functions on one input (example: DI1 assigned to forward and preset speed 2, DI3 assigned to reverse and preset speed 3).
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
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 kΩ • Current analog input X–Y mA by programming X and Y from 0–20 mA, with impedance 250 Ω • Maximum sampling time: 1 ms ± 1 ms • Resolution 12 bits • Accuracy: ± 0.6% for a temperature variation of 140 °F (60 °C) • 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 –4 to 392 °F (–20 to 200 °C) - 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 –4 to 392 °F (–20 to 200 °C) - Accuracy ± 4 °C (7.2 °F) for a temperature variation of 60 °C (140 °F) • **KTY84** - 1 thermal sensor - Sensor current: 1 mA - Range –4 to 392 °F (–20 to 200 °C) - Accuracy ± 4 °C (7.2 °F) for a temperature variation of 60 °C (140 °F) • **PTC** - 6 sensors maximum mounted in series - Sensor current: 1 mA - Nominal value: < 1.5 kΩ - Overheat trigger threshold: 2.9 kΩ ± 0.2 kΩ - Overheat reset threshold: 1.575 kΩ ± 0.75 kΩ - Threshold for low impedance detection: 50 kΩ –10 Ω/+20 Ω - Protected for low impedance < 1000 Ω
AI2	Analog input	I	Voltage bipolar analog input –10 to +10 Vdc, impedance 31.5 kΩ • Maximum sampling time: 1 ms ± 1 ms • Resolution 12 bits • Accuracy: ± 0.6% for a temperature variation of 60 °C (140 °F) • Linearity ± 0.15% of maximum value

Control Block Ports

Figure 9 – Control Block Ports

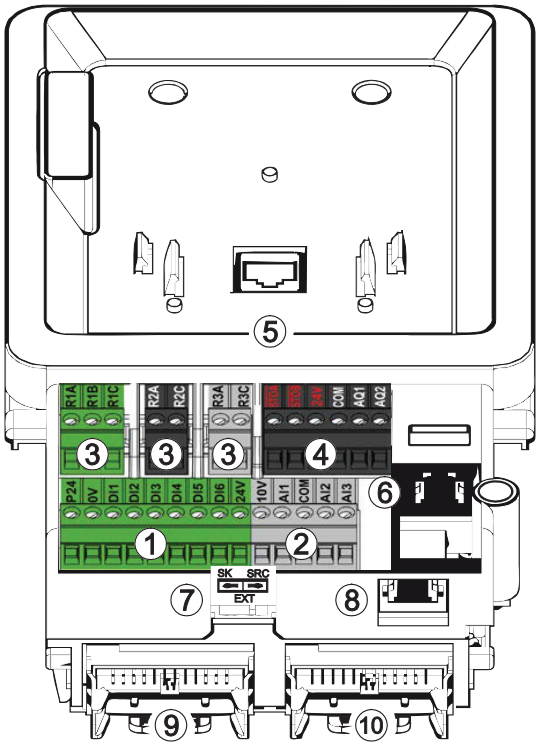

Table 21 – Control Block Terminal Ports

Marking	Description
1	Control terminals for digital inputs
2	Control terminals for analog inputs
3	Control terminals for relay outputs
4	Control terminals for STO (Safe Torque Off) and analog outputs
5	RJ45 port for graphic keypad door mounting kit
6	RJ45 port for Modbus TCP
7	Sink-Ext-Source selector switch
8	RJ45 port for serial Modbus
9	Slot for I/O expansion card
10	Slot for communication card or I/O expansion card

RJ45 Communication Ports

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

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

NOTE:

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

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Ensure that the temperature sensors in the motor have protective separation to all parts carrying live voltage according to IEC 60664.
- Ensure that all connected equipment fulfills the PELV conditions.

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

⚠ CAUTION

MISOPERATION DUE TO INTERFERENCES

- Use shielded signal wires in order to avoid misoperation.
- Take care that the signal wires do not exceed the specified maximum cable length. See page 33.

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

Programming the Power Converter

The ATV630 Outdoor Drive is factory configured as shown in Table 22 on page 38. Be sure to configure the drive's motor full-load current as shown on the motor nameplate. For additional information, see the Programming Manual available online at www.schneider-electric.com.

⚠ WARNING

LOSS OF CONTROL

Changes to the factory-set parameters must be completed in the sequence given in Table 22 on page 38.

Failure to follow these instructions will 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 Table 22 on page 38. Space is provided in the table for noting changes to the factory settings for your records.

Table 22 – 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 Tables 23–25 if these optional features are included with the equipment.

Table 23 – Drive System with Integral Full-Voltage Bypass (Y10)

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

Table 24 – Drive system with Integral Passive Harmonic Filter (M09)

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

Table 25 – Drive System Configured For Heavy Duty (H06)

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

Electromagnetic Compatibility

This product meets EMC requirements according to standard IEC 61800-3 when 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.

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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 beginning on page 7 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 removed according to the instructions in “Configuration” below.

The enclosed drives have a built-in EMC filter. As a result they exhibit leakage current to ground. If the leakage current creates compatibility problems with your installation, you can reduce the leakage current. Refer to the instructions for configuring the equipment on an IT or corner-grounded system in document EAV64301, *Altivar Process Variable Speed Drives ATV630, ATV650 Installation Manual*. In this configuration the product does not meet the EMC requirements according to the standard IEC 61800-3.

Power Circuit W: Without Bypass

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

Power Circuit Y: With Integral Full-Voltage Bypass

The bypass power circuit provides a coordinated drive and circuit breaker package and the flexibility and security of a full-voltage bypass motor drive that is available at any time.

A number of possible power circuit additions—including selection of harmonic and transient mitigation methods and options like the field service disconnect and line isolation contactor—are available in this power circuit configuration, allowing for even greater reliability and serviceability.

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

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

NOTICE
HAZARD OF EQUIPMENT DAMAGE 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 could result in equipment damage.**

Mod A10: 5% Inductance

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

Mod P10: Passive Harmonic Filter

This solution results in a single packaged solution that is compliant with the harmonic current requirements of IEEE 519-2014 where the point of common coupling (PCC) is defined as the input terminals of the circuit breaker feeding the drive system.

Control Options

Mod A07: 22 mm Operator Devices

This option provides 22 mm selector switches and pilot devices.

Mod B07: 30 mm Operator Devices

This option provides Class 9001 Type K, 30 mm, heavy-duty operators in lieu of standard 22 mm selector switches and pilot devices.

Hand-Off-Auto Selector Switch

All Altivar 630 Outdoor Drives are provided with 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).

Pilot Light Cluster Options

Mod A08: Pilot Light Cluster 1

Mod A08 provides red Power On, green Run, and yellow Trip pilot lights as status indicators.

Mod N08: No Pilot Lights

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

Miscellaneous Options

Mod H10: Type 2 Surge Protective Device

Mod H10 provides an integrated Type 2 supplementary voltage surge protective device (SPD) to protect equipment in the event of transient voltage surges associated with some electrical power distribution systems. The SPD is suitable for peak surge currents up to 80 kA.

Mod J10: Floor-Standing Kit

Enclosure frames 2 and 3 are suitable for mounting on a wall or free standing frame. This option provides an enclosure floor-standing kit suitable for mounting the drive as freestanding equipment.

Mod L10: Cold Weather Operation

Mod L10 provides a ambient equipment rating lower than the standard minimum rating of -10 °C (14 °F)—down to a minimum operating temperature of -25 °C (-13 °F). This modification requires derating to the current ratings shown in Table 7 on page 16.

Drive Communications and Expansion Cards

ATV630 Outdoor Drives come factory configured with integral Modbus and Ethernet communications for the drive. The optional expansion cards described in this section are available for additional communication systems and feature configurations.

Mod A09: Profibus DP V1

Mod A09 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 B09: CANopen Daisy Chain

Mod B09 provides a factory installed plug-in CANopen daisy chain card (VW3A3608). Connect to the CANopen daisy chain card with two RJ-45 ports.

Mod C09: DeviceNet

Mod C09 provides a factory installed plug-in DeviceNet card (VW3A3609). Connect to the DeviceNet card with one five-point terminal block.

Mod D09: CANopen SUB-D

Mod D09 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 E09: CANopen Open Style

Mod E09 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 F09: ProfiNet

Mod F09 provides a factory installed plug-in ProfiNet card (VW3A3627). Connect to the ProfiNet card with two RJ-45 ports.

Mod G09: Ethernet TCP/IP

Mod G09 provides a factory installed plug-in Ethernet TCP/IP dual port (VW3A36720). Connect to the Ethernet card with two RJ-45 ports.

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Section 5— Component Locations, Dimensions, and Schematics

Component Locations

Figure 10 – Enclosure Interior

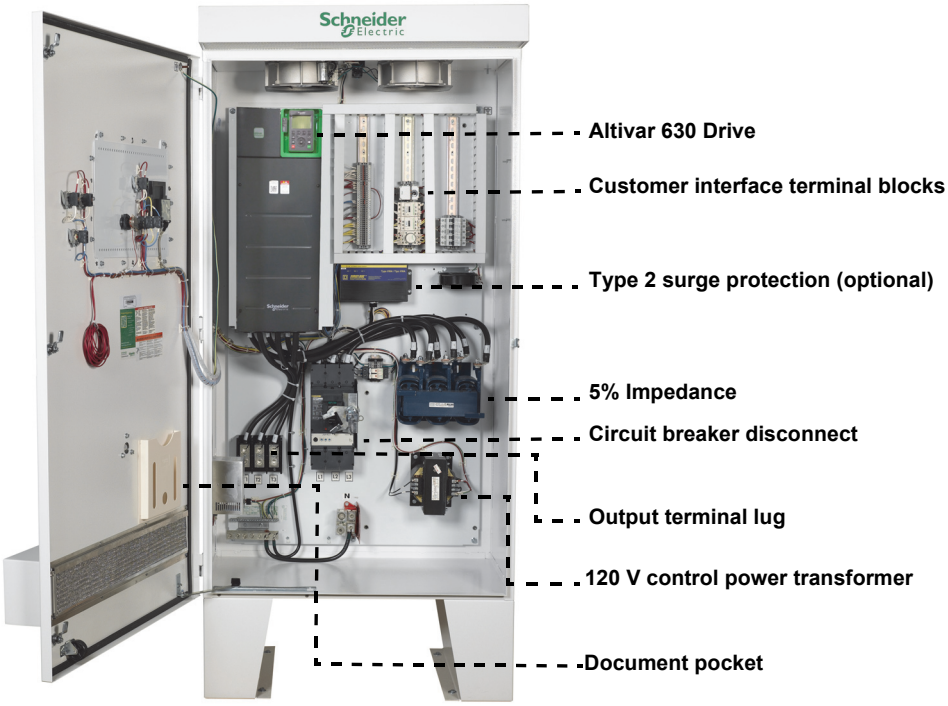

Figure 11 – Enclosure Exterior

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Dimensions

Figure 12 – Frame 2 with Optional Floor Mount Kit Installed

20–60 hp @ 460 V, ND
20–50 hp @ 460 V, HD

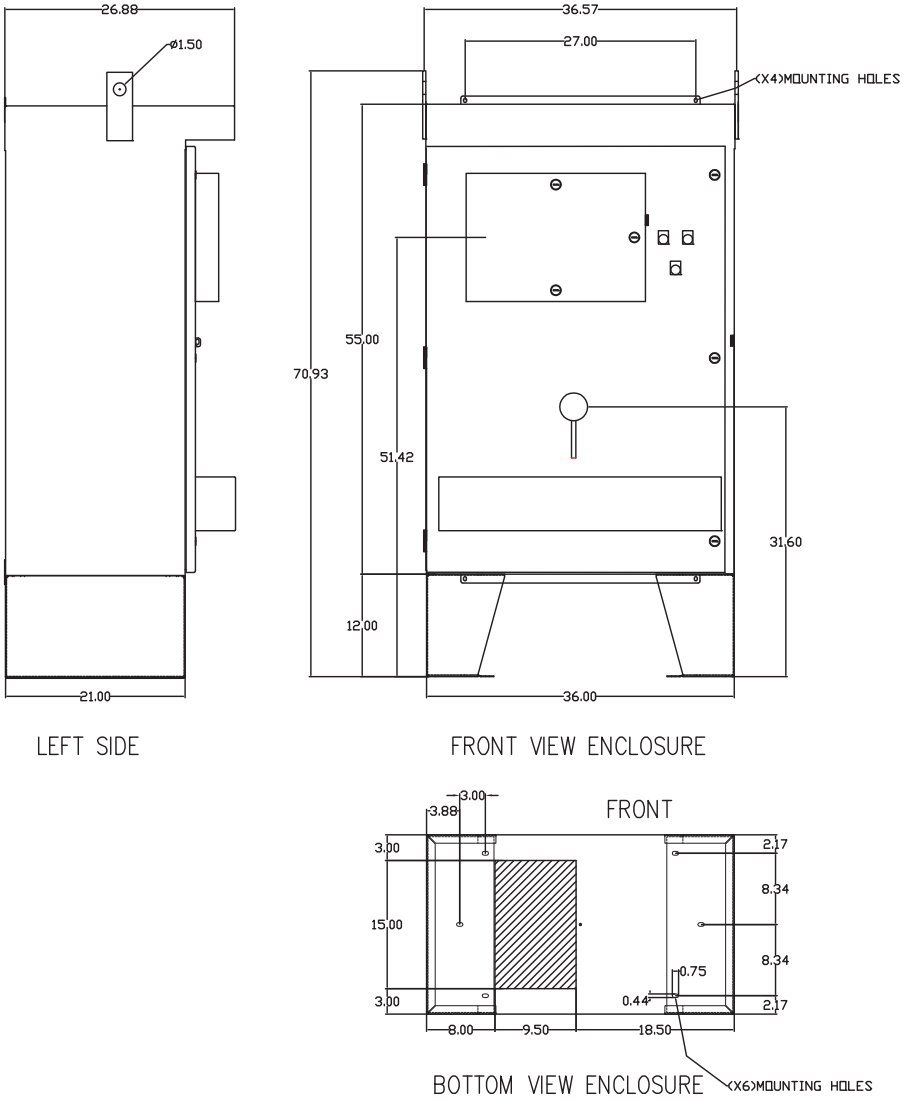
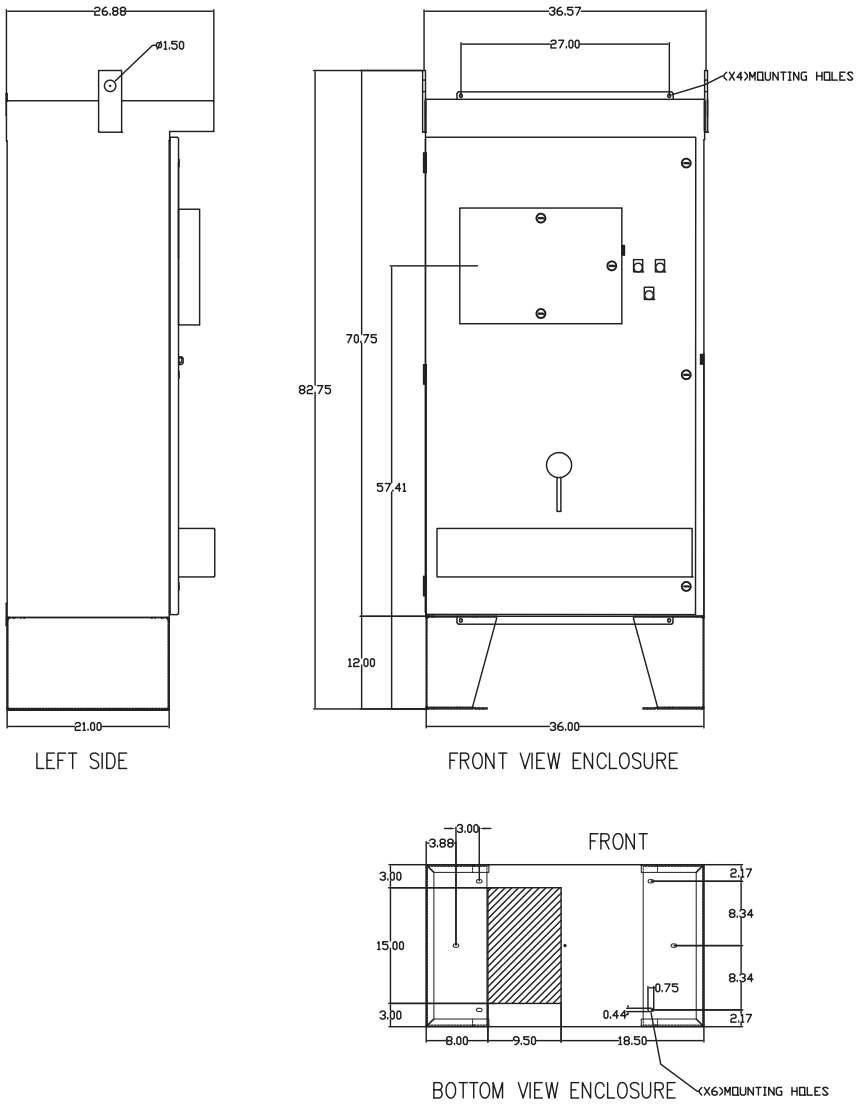


Figure 13 – Frame 3 with Optional Floor Mount Kit Installed

75–125 hp @ 460 V, ND
75–100 hp @ 460 V, HD



NOTE: If a passive harmonic filter is selected for 125 hp ND, the enclosure size increases to frame 4. See Figure 14.

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Figure 14 – Frame 4

150–250 hp (0.75–11 kw) @ 460 V, ND
125–250 hp (0.37–7.5 kw) @ 460 V, HD

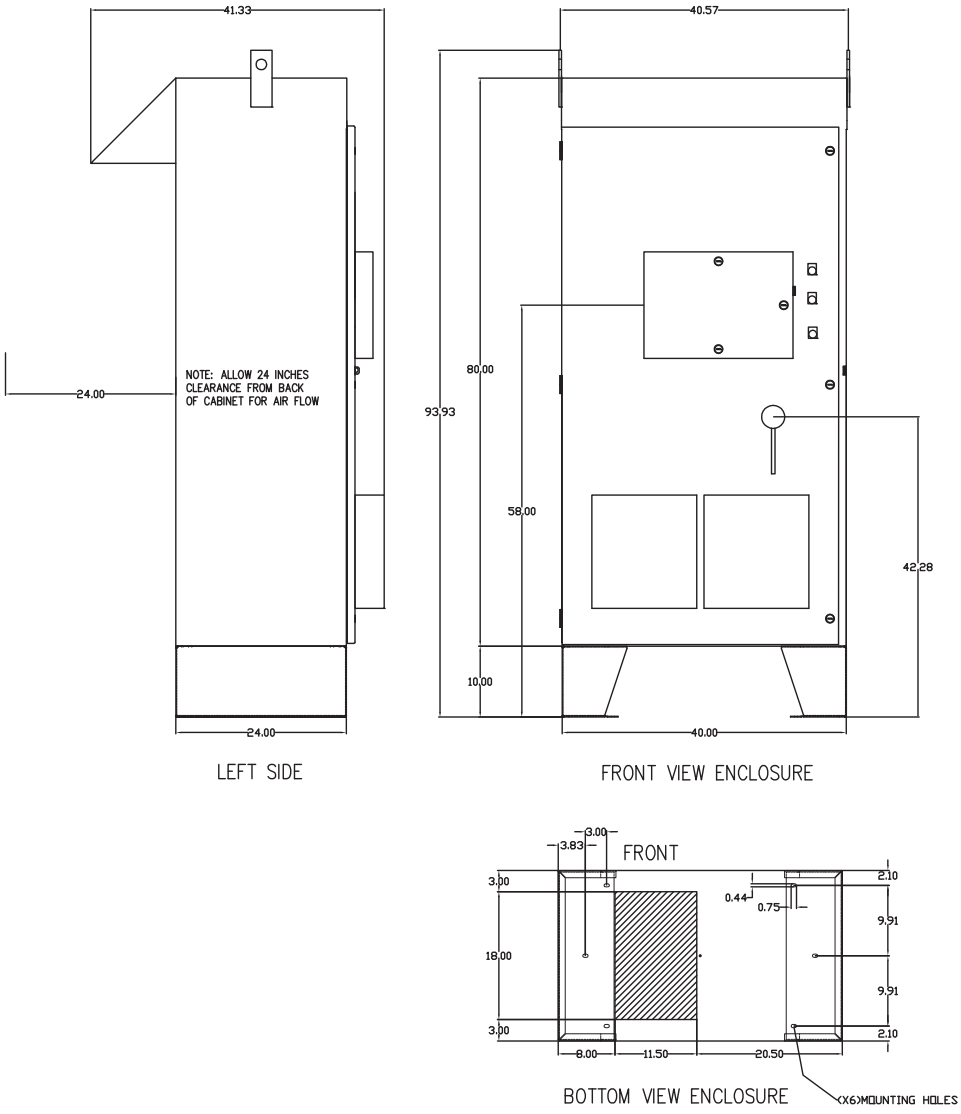

Table 26 – Overall Dimensions

Enclosure Size	hp (Normal Duty)	Width		Depth		Height	
		mm	in.	mm	in.	mm	in.
Frame 2 (without floor mounting kit)	20–60	930	36.6	683	26.9	1801	70.9
Frame 3 (without floor mounting kit)[1]	75–125	930	36.6	683	26.9	2101	82.7
Frame 4	150–250	1031	40.6	1049	41.3	2385	93.9

[1] If a passive harmonic filter is selected for 125 hp ND, the enclosure size increases to frame 4.

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Schematics

Figure 15 – Power Circuit Y (with 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.

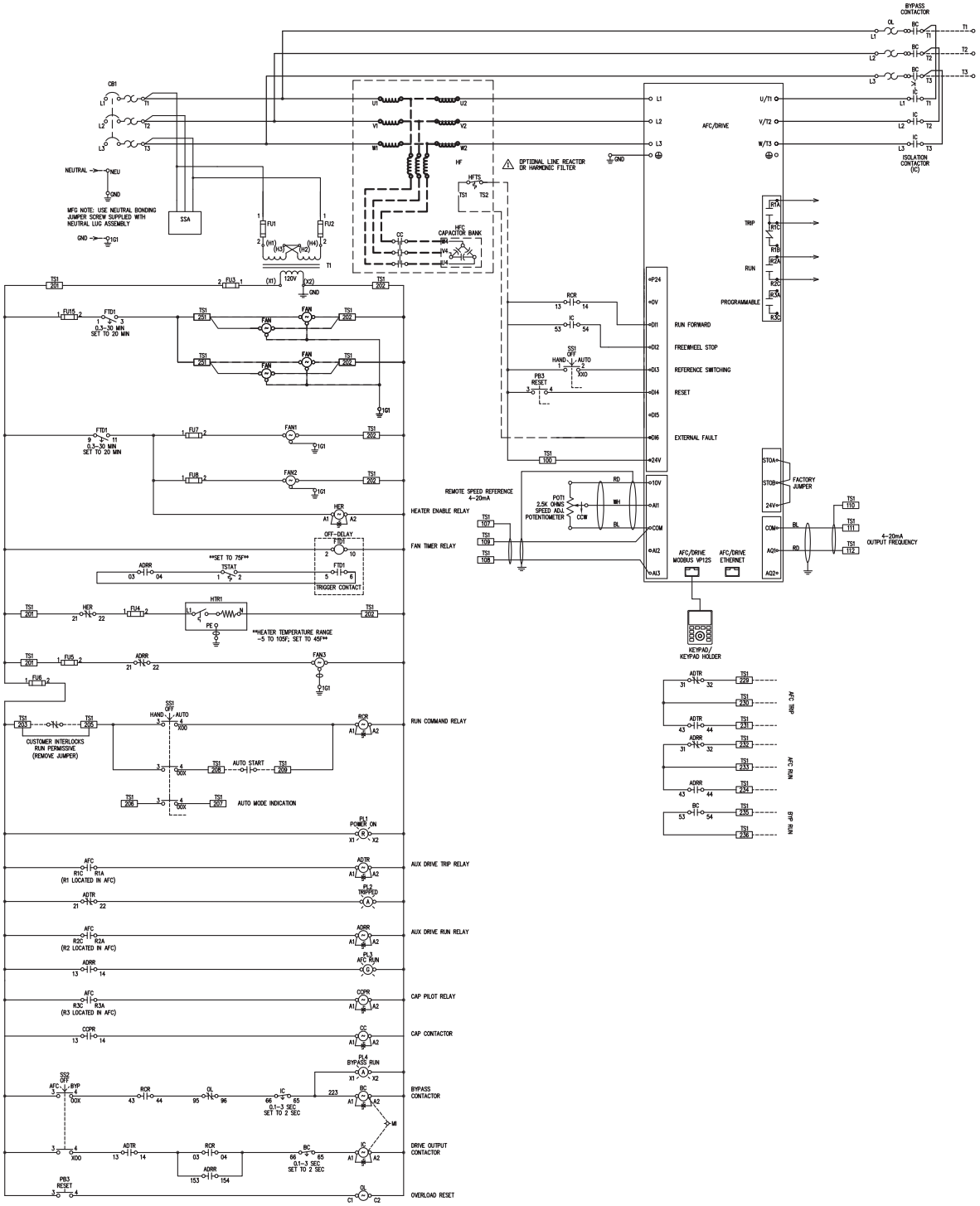

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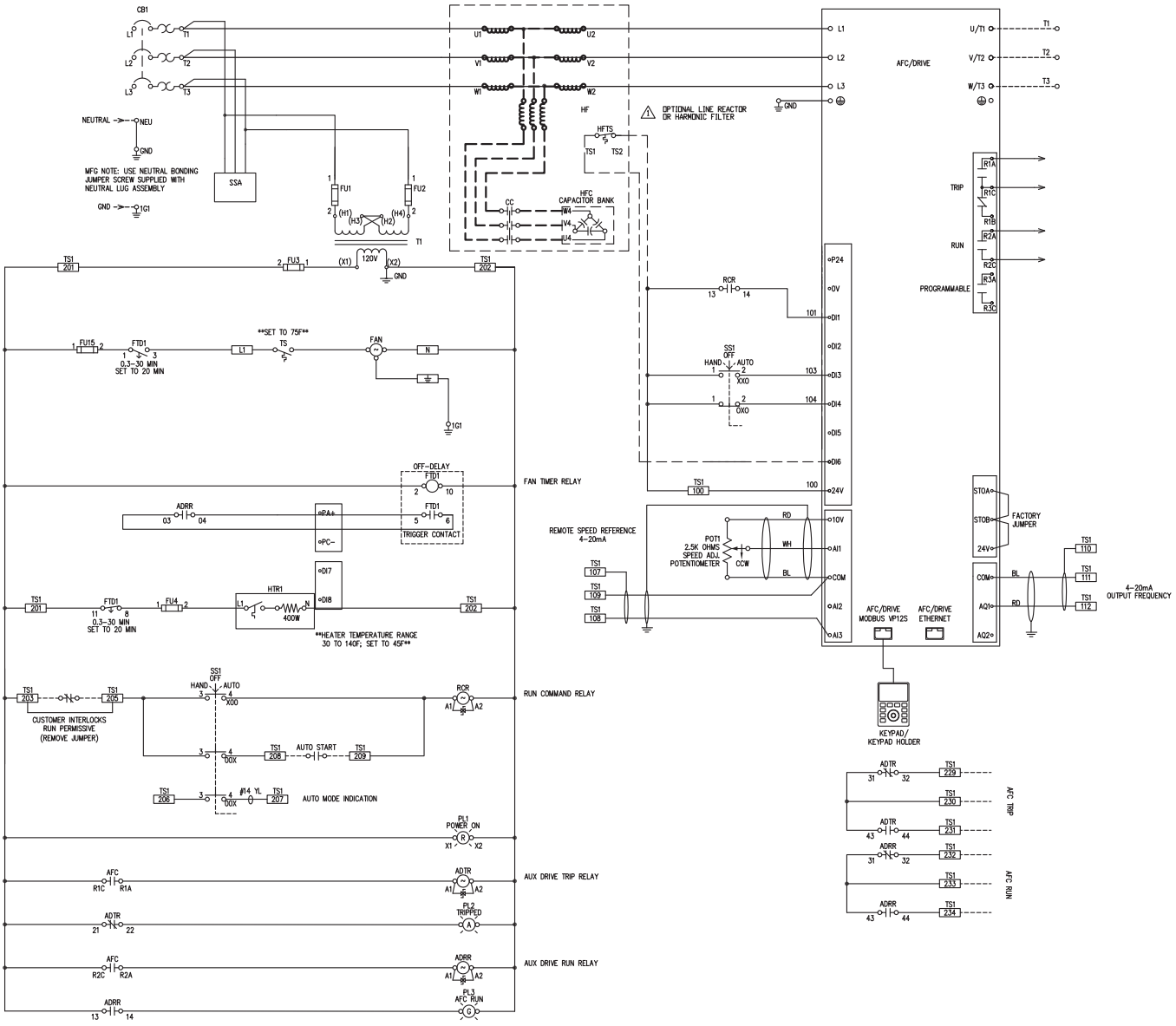
Figure 16 – Power Circuit W (without Bypass): Hand-Off-Auto and Speed Potentiometer

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



Section 6— Renewable Parts and Maintenance

Renewable Parts

Schneider Electric provides a limited number of renewable parts for the ATV630 Outdoor Drive. Before replacing any parts, consult your local field sales representative. Renewable parts must be installed by qualified personnel familiar with the equipment being replaced.

Table 27 – Renewable 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
VW3A3720	Dual port Ethernet IP card
VW3A3721	Dual port Ethernet IP card with multi-VFD functions
AC coil for LC1F150	LX1FF095
AC coil for LC1F185	LX1FG095
AC coil for LC1F265	LX1FH1272
AC coil for LC1F330	LX1FH1272
AC coil for LC1F400	LX1FJ110
Pilot light, red Power On	ZB5AV04 Red pilot light head
	ZB5AV6 Mounting collar with light module
	25501-00003 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
	25501-00004 LED
	65170-166-39 Trip legend plate
	or 65170-166-08 Auto legend plate
	ZBZ32 Legend plate holder
Pilot light, green AFC Run	ZB5AV03 Green pilot light head
	ZB5AV6 Mounting collar with light module
	25501-00005 LED
	65170-166-42 AFC Run legend plate
	ZBZ32 Legend plate holder
Pilot light mounting collar with light module	ZB5AV6
Pilot light mounting collar with light module, and 1 N.O. and 1 N.C. contact for p-t-t	ZB5AW065

Table 27 – Renewable Parts *(continued)*

Description	Catalog Number
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	80442-273-02 Speed potentiometer assembly ZB5AD922 Speed potentiometer operator
Roof Fan 20–125 hp @ 460 V, ND 20–100 hp @ 460 V, HD	A10EFN
Door Fan 150–250 hp @ 460 V, ND 125–200 hp @ 460 V, HD	11667154055
Rear Fan 150–250 hp @ 460 V, ND 125–200 hp @ 460 V, HD	A10EFN
Fan Filter 20–125 hp @ 460 V, ND 20–100 hp @ 460 V, HD	WFF2
Fan Filter 150–250 hp @ 460 V, ND 125–200 hp @ 460 V, HD	18681500005
Advanced drive keypad	VW3A1111
Remote keypad adapter	VW3A1112
Primary control fuses, standard (Class CC)	23430-20400, 4 A, (125 hp and lower, ND)
	23430-20400, 4 A, (100 hp and lower, HD)
	25430-20500, 5 A, (150–250 hp, ND)
	25430-20500, 5 A, (125–200 hp, HD)
Secondary control fuses, standard, (Class CC)	23430-21000, 10 A, (125 hp and lower, ND)
	23430-21000, 10 A, (100 hp and lower, HD)
	25430-21500, 15 A, (150–250 hp, ND)
	25430-21500, 15 A, (125–200 hp, HD)
Primary control fuses standard with Mod L10, Cold Weather Option, (Class CC)	25430-21500, 15 A
Secondary control fuses standard with Mod L10, Cold Weather Option (Class CC)	25430-21500, 15 A
Power converter ND 20 hp, HD 15 hp, 460 V	ATV630D15N4
Power converter ND 25 hp, HD 20 hp, 460 V	ATV630D18N4
Power converter ND 30 hp, HD 25 hp, 460 V	ATV630D22N4
Power converter ND 40 hp, HD 30 hp, 460 V	ATV630D30N4
Power converter ND 50 hp, HD 40 hp, 460 V	ATV630D37N4
Power converter ND 60 hp, HD 50 hp, 460 V	ATV630D45N4
Power converter ND 75 hp, HD 60 hp, 460 V	ATV630D55N4
Power converter ND 100 hp, HD 75 hp, 460 V	ATV630D75N4
Power converter ND 125 hp, HD 100 hp, 460 V	ATV630D90N4
Power converter ND 150 hp, HD 125 hp, 460 V	ATV630C11N4

Table 27 – Renewable Parts *(continued)*

Description	Catalog Number
Power converter ND 200 hp, HD 150 hp, 460 V	ATV630C13N4
Power converter ND 250 hp, HD 200 hp, 460 V	ATV630C16N4

Maintenance Intervals

Table 28 – Recommended Maintenance Intervals(1)

Component	Interval:	
	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.

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

Replacing the Roof Fans (20–125 hp ND and 20–100 hp HD)

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70 E®, CSA Z462, NOM-029-STPS, and other applicable regulations defining safe electrical work practices.
- 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 the 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.
5. Remove the ceiling panel by removing the three 3/8 in. retaining bolts located on the front edge. See Figure 17 on page 55.
6. Removing the ceiling panel exposes the 5/16 in. hex head screws fastening the fan to the ceiling panel. Remove the fan by removing the four hex head screws. See Figure 18 on page 55.
7. Check the airflow directional arrow indicators to confirm that the air will be drawn out of the enclosure. Affix the replacement fan to the ceiling panel using the four 5/16 in. hex head screws removed in Step 6. See Figure 18 on page 55.
8. Affix the ceiling panel back on the enclosure with the three 3/8 in. retaining bolts removed in Step 5. See Figure 17 on page 55.
9. Reconnect the fan's power supply and the grounding cable.
10. Check the airflow to confirm that the air is exhausting out of the enclosure.

Figure 17 – Roof Fan Fastener Locations

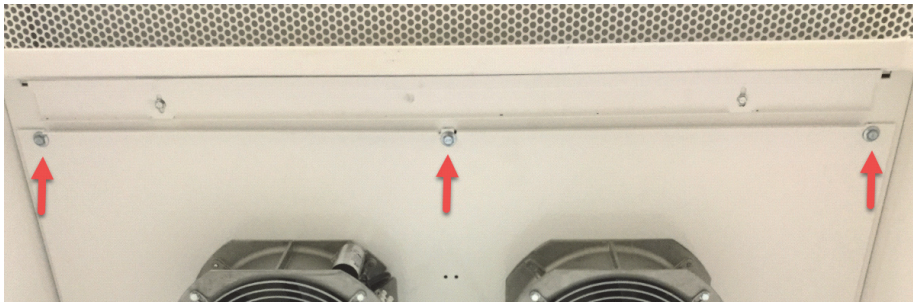
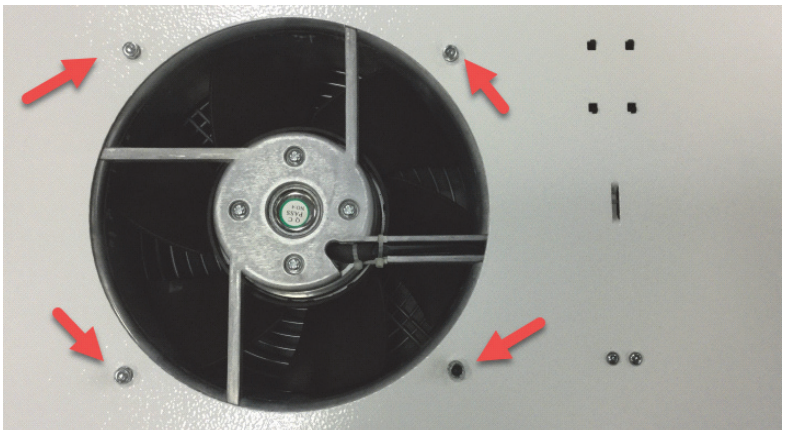


Figure 18 – Roof Fan Fastener Locations



Replacing the Door Fans (150–250 hp ND and 125–200 hp HD)

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70 E®, CSA Z462, NOM-029-STPS, and other applicable regulations defining safe electrical work practices.
- 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 Figure 19 on page 57.
5. Remove the fan rain hoods mounted to the front door by removing the four retaining screws located on the sides of the hoods.
6. Remove four screws holding the fan to the door, remove the fan from the enclosure opening, and remove the fan from the housing. Discard the fan but save the grill and screws to reinstall with the new fan.
7. Check the airflow directional arrow indicators to confirm that air will be drawn into the enclosure. Position the new fan so that the direction arrows point to the fan housing.

   Affix the replacement fan assembly and grill to the enclosure housing using the four screws removed in Step 6. See Figure 20 on page 57.
8. Reconnect the fan's power supply and the grounding cable. See Figure 20 on page 57.
9. Check the airflow to confirm that air is blowing into the enclosure.

Figure 19 – Removing the Door Fan

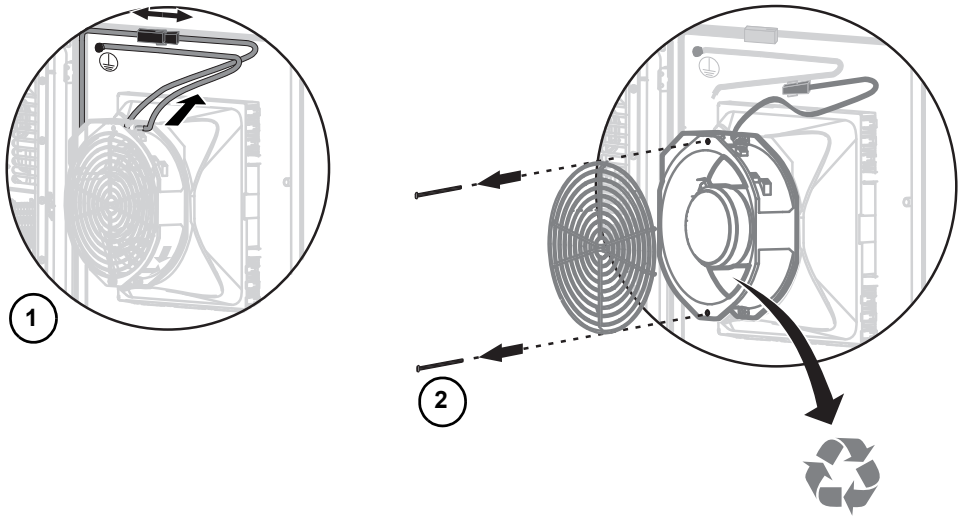
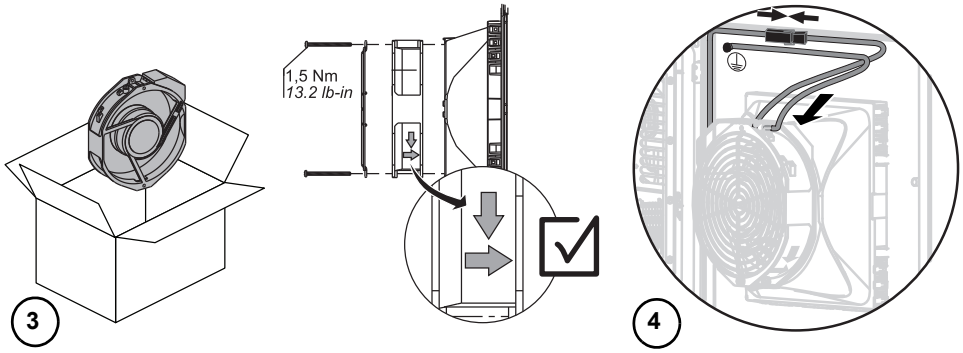


Figure 20 – Installing the New Door Fan



Replacing the Rear Fans (150–250 hp ND, 125–200 hp HD)

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70 E®, CSA Z462, NOM-029-STPS, and other applicable regulations defining safe electrical work practices.
- 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.
5. Remove the bug screen on the rear exhaust hood by removing the twelve Phillips head retaining screws around the edge. See Figure 21 on page 58.
6. Remove the fan by removing the four 5/16 in. hex head mounting screws.
7. Check the airflow directional arrow indicators to confirm air will be drawn out of the enclosure. Affix the replacement fan to the enclosure using the four 5/16 in. hex head screws removed in Step 6. See Figure 22 on page 59.
8. Affix the bug screen on the rear exhaust hood with the twelve retaining screws removed in Step 5. See Figure 21 on page 58.
9. Reconnect the fan's power supply and the grounding cable.
10. Check airflow to confirm air is exhausting out of the enclosure.

Figure 21 – Bug Screen Fastener Locations

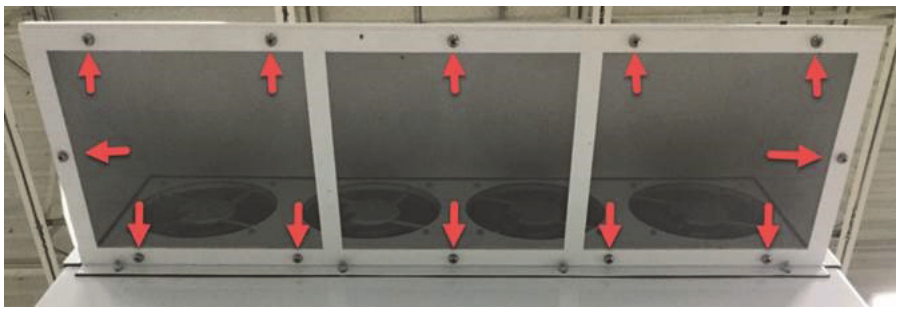
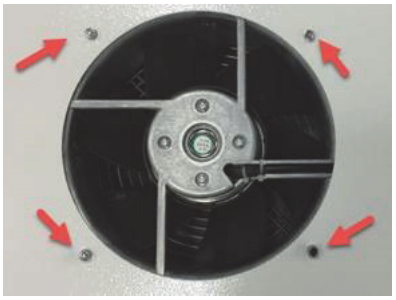


Figure 22 – Rear Fan Fastener Locations



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Technical Support

For product post sale technical support, please contact the Drive Products Support Group between the hours of 8:00 am and 8:00 pm Eastern time, Monday through Friday, excluding holidays.

EMERGENCY technical phone support is available for inoperable machinery 24 hours a day, 365 days a year.

Toll free	1-888-778-2733 Option # 1 (Technical Support) and then Option # 4 (AC Drives and Soft Starters)
E-mail	drive.products.support@schneider-electric.com
Fax	919-217-6508

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