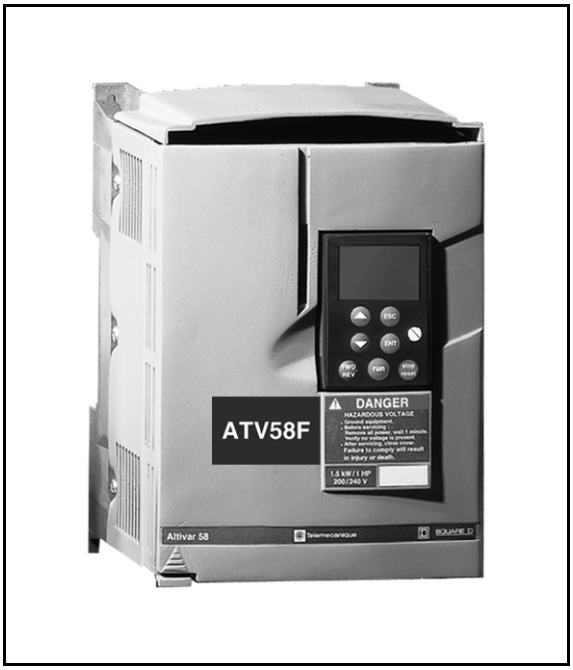
VVDED399093US
October 2000
Raleigh, NC, USA

Instruction Bulletin

ALTIVAR® 58 Adjustable Speed Drive Controllers

Installation Guide
Type FVC Controllers

Retain for future use.



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⚠ DANGER

HAZARDOUS VOLTAGE

- Read and understand this bulletin in its entirety before installing or operating ALTIVAR 58 drive controllers. Installation, adjustment, repair, and maintenance of the drive controllers must be performed by qualified personnel.
- Disconnect all power including external control power that may be present before servicing the drive controller. WAIT THREE MINUTES for the DC bus capacitors to discharge. Then follow the DC bus voltage measurement procedure on page 20 to verify that the DC voltage is less than 45 V. The drive controller LEDs are not accurate indicators of the absence of DC bus voltage.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Install and close all covers before applying power or starting and stopping the drive controller.
- User is responsible for conforming to all applicable code requirements with respect to grounding all equipment.
- Many parts in this drive controller, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.

Before servicing the drive controller:

- Disconnect all power.
- Place a “DO NOT TURN ON” label on the drive controller disconnect.
- Lock disconnect in open position.

Electrical shock will result in death or serious injury.

INTRODUCTION

The ALTIVAR 58 Type FVC family of adjustable frequency AC drive controllers is used for controlling three-phase asynchronous motors. They range from:

- 1 to 75 hp (0.75 to 55 kW) constant torque, 400/460 V, three-phase input

ALTIVAR 58 Type FVC drive controllers in the 30–75 hp (400/460 V) range have built-in line reactors. A 25 hp (400/460 V) product is also available with the built-in line reactor.

All ALTIVAR 58 Type FVC drive controllers have a built-in EMC filter. The filter reduces conducted and radiated emissions and complies with IEC product standards IEC 61800-3 and EN 61800-3 for drive controllers.

This instruction bulletin covers the technical characteristics, specifications, installation, and wiring of all ALTIVAR 58 Type FVC drive controllers.

For information on programming and troubleshooting the drive controller, refer to the keypad display instruction bulletin, VVDED399094US.

Many option kits are available for the ALTIVAR 58 Type FVC drive controller. Refer to Appendix A for a list of the option kits.

REVISION LEVEL

This is a new document.

RECEIVING AND PRELIMINARY INSPECTION

Before installing the drive controller, read this manual and follow all precautions.

Before removing the drive controller from its packing material, verify that it is not damaged from shipping. Damage to the packing carton usually indicates improper handling. If any damage is found, notify the carrier and your Square D representative.

After removing the drive controller from its packaging, inspect the exterior for shipping damage. If any shipping damage is found, notify the carrier and your sales representative. Verify that the drive controller nameplate and label conform to the packing slip and corresponding purchase order.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Do not operate or install any drive controller that appears damaged.

Failure to follow this instruction can result in injury or equipment damage.

STORING AND SHIPPING

If the drive controller is not being immediately installed, store it in a clean, dry area where the ambient temperature is between -13 to +149 °F (-25 to +65 °C). If the drive controller must be shipped to another location, use the original shipping material and carton to protect the drive controller.

TECHNICAL CHARACTERISTICS

Tables 1 and 2 show the ratings of the ALTIVAR 58 Type FVC drive controllers.

Table 1: Constant Torque, 400 /460 V Ratings, Three-Phase Input • Three-Phase Output, Switching Frequency: ATV58FHU18N4–D46N4 @ 4 kHz, ATV58FHD54N4–D79N4 @ 2 kHz

Product Frame Size	Drive Controller Catalog Number	Motor Power		Rated Output Current In	Transient Output Current	Total Dissipated Power @ Rated Load
		400 V kW	460 V Hp	A	A	W
2	ATV58FHU18N4KU	0.75	1	2.3	3.1	57
2	ATV58FHU29N4KU	1.5	2	4.1	5.6	97
2	ATV58FHU41N4KU	2.2	3	5.8	7.9	120
3	ATV58FHU54N4KU	3	4	7.8	10.6	170
3	ATV58FHU72N4KU	4	5	10.5	14.3	210
3	ATV58FHU90N4KU	5.5	7.5	13	17.7	295
4	ATV58FHD12N4KU	7.5	10	17.6	23.9	360
4	ATV58FHD16N4KU	11	15	24.2	32.9	480
5	ATV58FHD23N4KU	15	20	33	44.9	590
6	ATV58FHD28N4KU	18.5	25	40.7	55.4	421
6	ATV58FHD33N4KU	22	30	48.4	65.8	491
6	ATV58FHD46N4KU	30	40	66	89.8	625
7	ATV58FHD54N4KU	37	50	79.2	107.7	677
7	ATV58FHD64N4KU	45	60	93.5	127.2	837
7	ATV58FHD79N4KU	55	75	115.5	157.1	1090

Table 2: Constant Torque Low Noise, 400/460 V Ratings, Three-Phase Input • Three-Phase Output, Switching Frequency: ATV58FHD28N4–D46N4 @ 8 kHz, ATV58FHD54N4–D79N4 @ 4 kHz

Product Frame Size	Drive Controller Catalog Number	Motor Power		Rated Output Current	Transient Output Current	Total Dissipated Power @ Rated Load
		400 V kW	460 V Hp	A	A	W
6	ATV58FHD28N4KU	15	20	33	44.9	429
6	ATV58FHD33N4KU	18.5	25	40.7	55.4	524
6	ATV58FHD46N4KU	22	30	48.4	65.8	561
7	ATV58FHD54N4KU	30	40	66	89.8	627
7	ATV58FHD64N4KU	37	50	79.2	107.7	677
7	ATV58FHD79N4KU	45	60	93.5	127.2	1007

SPECIFICATIONS

Table 3: Environmental Specifications

Enclosure type	ATV58FHU18N4 to U90N4: IP20/open type controllers according to Standard EN50178. ATV58FHD12N4 to D79N4: Type 1 with conduit connection kit.
Resistance to vibrations	According to IEC 60068-2-6: 1.5 mm zero to peak from 3 to 13 Hz 1 gn from 13 to 200 Hz
Resistance to shocks	According to IEC 60068-2-27: 15 g, 11 ms
Ambient pollution degree	ATV58FHU18N4–D23N4: Pollution degree 2 conforming to IEC 60664-1, EN50718 and NEMA ICS-1 Annex A. ATV58FHD28N4–D79N4: Pollution degree 3 according to IEC 60664-1, EN50718 and NEMA ICS-1 Annex A. Protect the drive controller against dust, corrosive gas, and falling liquid.
Maximum relative humidity	95% maximum, non-condensing and without dripping according to IEC 60068-2-3. Provide heating system if there is condensation.
Maximum ambient temperature	Storage: -25 to +65 °C (-13 to +149 °F) Operation: Drive controllers ATV58FHU18N4 to U90N4: -10 to +50 °C (+14 to 122 °F) without derating -10 to +60 °C (+14 to 140 °F) with fan kit [1] and derating of the current 2.2% per °C above 50 °C Drive controllers ATV58FHD12N4 to D79N4: -10 to +40 °C (+14 to 104 °F) without derating -10 to +50 °C (+14 to 122 °F) with fan kit [1] and derating of the current 2.2% per °C above 40 °C
Altitude	3300 ft (1000 m) maximum without derating; derate the output current by 1% for each additional 330 ft (100 m)
Operational position	Vertical, ±10°, with power terminals at the bottom.
[1] See Appendix A for list of accessories.	

NOTE: Discoloration of drive controller plastic pieces will occur if exposed to direct sunlight.

Table 4: Electrical Specifications

Input voltage	380 V -10% to 500 V +10% three phase input
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, supplies)
Output frequency	0.0 to 450 Hz
Switching frequency	4 kHz, configurable with programming options [1] ATV58FHU18N4–D23N4: 0.5 - 1 - 2 - 4 kHz without derating 8 - 12 - 16 kHz with derating in steady state 8 - 12 - 16 kHz without derating and with reduced duty cycle [2] ATV58FHD28N4–D46N4: 0.5 - 1 - 2 - 4 kHz without derating 8 - 12 kHz with derating in steady state 8 - 12 kHz without derating and with reduced duty cycle [2] ATV58FHD54N4–D79N4: 0.5 - 1 - 2 kHz without derating 4 - 8 kHz with derating in steady state 4 - 8 kHz without derating and with reduced duty cycle [2]
Speed range	1:100 open loop 1:1000 closed loop
Speed regulation	±1.0% of rated motor speed without adjustments or feedback. ±0.1% of rated motor speed with optional analog I/O card and appropriate tachometer feedback. [1] ±0.01% of rated motor speed with encoder feedback. [1]
Efficiency	97% at full load typical.
Displacement power factor	98% through speed range.
Motor control algorithm	Sensorless flux vector control with a pulse width modulated (PWM) output waveform. Flux vector control with encoder feedback.
Braking torque	30% of nominal motor torque without dynamic braking (typical value). Up to 150% with dynamic braking option.
Transient output current	160% of nominal NEC rated motor current for 60 seconds (for constant torque ratings).
Transient motor torque	200% of nominal motor torque (typical value at ±10%) for 2 seconds. 170% of nominal motor torque (typical value at ±10%) for 60 seconds.

[1] See Appendix A for list of accessories.

[2] The drive controller can be configured to reduce switching frequency if the drive thermal state reaches 95%. When the drive thermal state returns to 70%, the switching frequency returns to the set value. If the duty cycle (drive controller run time) does not exceed 60% (36 second maximum for a 60 second cycle) derating is not required.

[3] Motor power rating must be between 25% minimum, 136% maximum, of drive controller rating.

Table 4: Electrical Specifications (Continued)

Drive controller protection	Protection against short circuits: • between output phases • between output phases and ground • on outputs of internal supplies Thermal protection against overheating and overcurrent. Undervoltage and overvoltage faults. Protection against single-phase input operation on the three-phase drive controllers.
Motor protection	Thermal protection integrated in the drive controller by continuous calculation of I^2t, taking motor speed into account.[3] Motor thermal state is retained during loss of power. Motor thermal protection can be modified with a programming option to correspond to the type of motor cooling. [1] Protection against motor phase loss. Protection by motor thermal sensors with analog option card. [1]
Codes and standards	UL Listed per UL 508C as incorporating electronic overload protection: UL File E164874 CCN NMMS ATV58FHU18N4 to D79N4 CSA Certified to CSA C22.2 No. 14. CSA File LR96921 Class 3211 06 ATV58FHU18N4 to D79N4 CE Marked Conforms to applicable NEMA ICS, NFPA, IEC, and ISO 9001 standards.

[1] See Appendix A for list of accessories.

[2] The drive controller can be configured to reduce switching frequency if the drive thermal state reaches 95%. When the drive thermal state returns to 70%, the switching frequency returns to the set value. If the duty cycle (drive controller run time) does not exceed 60% (36 second maximum for a 60 second cycle) derating is not required.

[3] Motor power rating must be between 25% minimum, 136% maximum, of drive controller rating.

DIMENSIONS

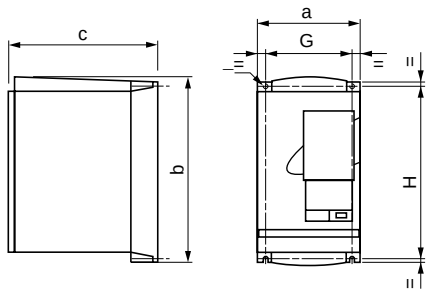


Figure 1: ATV58FH••••• Dimensions

Table 5: ATV58FH••••• Dimensions

Product Frame Size	Catalog No. ATV58FH•••••	a in. (mm)	b in. (mm)	c in. (mm)	G in. (mm)	H in. (mm)	Ø in. (mm)	Weight lb (kg)
2	U18N4, U29N4, U41N4	5.91 (150)	9.06 (230)	7.24 (184)	5.20 (133)	8.27 (210)	0.20 (5)	8.4 (3.8)
3	U54N4, U72N4, U90N4	6.89 (175)	11.26 (286)	7.24 (184)	6.10 (155)	10.63 (270)	0.22 (5.5)	15.2 (6.9)
4	D12N4, D16N4	9.06 (230)	12.80 (325)	8.27 (210)	7.9 (200)	12.20 (310)	0.22 (5.5)	28.7 (13)
5	D23N4	9.06 (230)	16.35 (415)	8.27 (210)	7.9 (200)	15.75 (400)	0.22 (5.5)	33.2 (15)

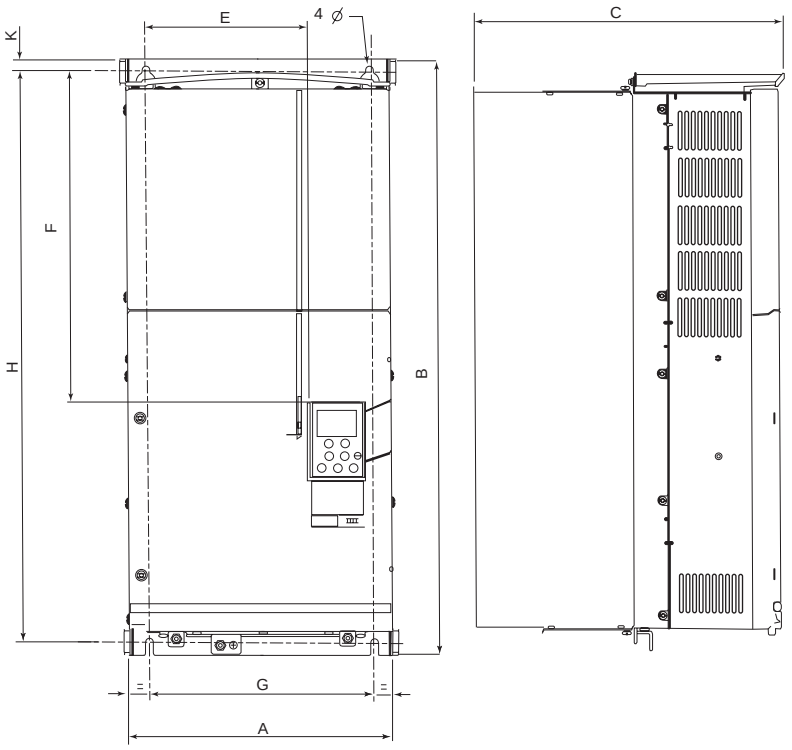


Figure 2: ATV58FH••••• Dimensions

Table 6: ATV58FH••••• Dimensions

Product Frame Size	Catalog No. ATV58FH•••••	A in. (mm)	B in. (mm)	C in. (mm)	E in. (mm)	F in. (mm)	G in. (mm)	H in. (mm)	K in. (mm)	Ø in. (mm)	Weight lb (kg)
6	D28N4 D33N4 D46N4	9.45 (240)	21.65 (550)	11.14 (283)	5.75 (146)	12.05 (306)	8.07 (205)	20.87 (530)	0.39 (10)	0.28 (7)	75 (34)
7	D54N4 D64N4 D79N4	13.78 (350)	25.59 (650)	11.97 (304)	9.29 (236)	15.35 (390)	11.81 (300)	24.37 (619)	0.39 (10)	0.36 (9)	126 (57)

INSTALLATION PRECAUTIONS

- The ALTIVAR 58 Type FVC drive controller must be installed in a suitable environment. The environment around the drive controller must not exceed pollution degree requirements as defined in NEMA ICS-1 Annex A or IEC 60664. Refer to the ambient pollution degree ratings in Table 3.
- Install the drive controller vertically, +/- 10°, with the power terminals at the bottom. Avoid placing the drive controller near any heat sources.
- Leave at least 0.4 in. (10 mm) in front of the drive controller.
- Verify that the voltage and frequency characteristics of the input line match the drive controller nameplate rating.
- Installation of a disconnect switch between the input line and the drive controller should be in accordance with national and local codes.
- Overcurrent protection is required. Refer to Table 15 on page 37 for recommended fuses.

⚠ DANGER

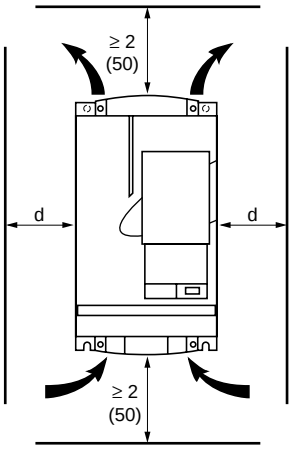
HAZARDOUS VOLTAGE

Before working on this equipment:

- Turn off all power supplying this equipment.
- Place a “DO NOT TURN ON” label on the drive controller disconnect.
- Lock the disconnect in the open position.

Failure to follow this instruction will result in death or serious injury.

- Figure 3 shows the minimum clearances required around each drive controller for unobstructed air flow. These clearances should not be used as minimum enclosure size for proper thermal dissipation.



Dimensions:
inches (millimeters).

Figure 3: Minimum Clearances

Mounting and Temperature Conditions (Refer to Figure 3)

Refer to Fig. 3 for dimension "d".

ATV58FHU18N4 to U90N4:

- From -10 to 40 °C (+14 to 104 °F)

  For d ≥ 2 in. (50 mm): no special precautions.

  For d < 2 in.: remove the protective cover from the top of the drive controller as shown in Figure 4 on page 12.

- From 40 to 50 °C (104 to 122 °F):

  For d ≥ 2 in. (50 mm): remove the protective cover from the top of the drive controller as shown in Figure 4.

  For d < 2 in.: add the control ventilation kit VW3A5882• (see catalog 8806CT9901).

- From 50 to 60 °C (122 to 140 °F):

  For d ≥ 2 in. (50 mm): add the ventilation fan. See Appendix A for a list of accessories. Derate the output current available from the drive controller by 2.2% per °C above 50 °C.

Refer to Fig. 3 for dimension "d".

ATV58FHD12N4 to D79N4:

- From -10 to 40 °C (+14 to 104 °F):

  For d ≥ 2 in. (50 mm): no special precautions.

  For d < 2 in.: remove the protective cover from the top of the drive controller as shown in Figure 4.

- From 40 to 50 °C (104 to 122 °F):

  For d ≥ 2 in. (50 mm): remove the protective cover from the top of the drive controller as shown in Figure 4. Derate the output current available from the drive controller by 2.2% per °C above 40 °C.

  For d < 2 in.: add the ventilation fan. See Appendix A for a list of accessories. Derate the output current available from the drive controller by 2.2% per °C above 40 °C.

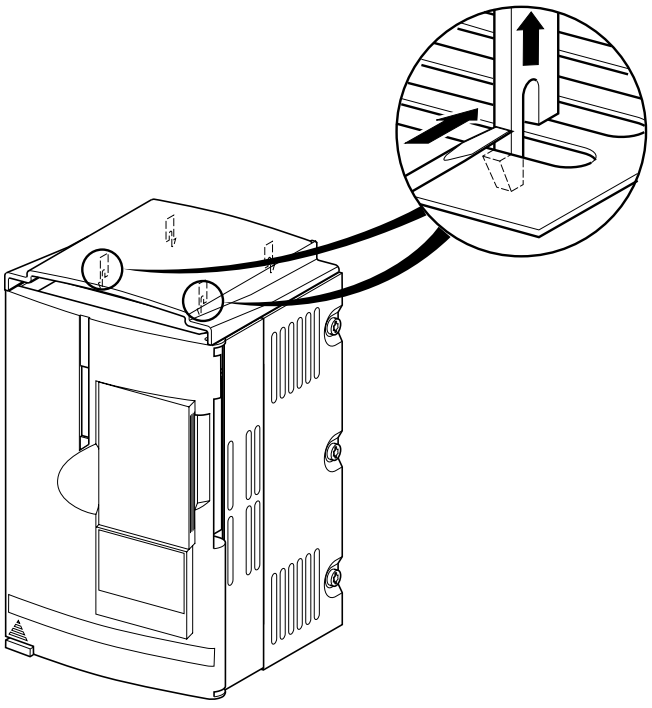


Figure 4: Removing the Protective Cover

MOUNTING IN A GENERAL PURPOSE METAL ENCLOSURE

Follow the installation precautions given on pages 10 to 11.

To ensure sufficient air circulation in the drive controller:

- Provide ventilation inlets and outlets in the enclosure as shown in Figure 5.
- If the enclosure does not provide sufficient free air flow, an enclosure ventilation fan is required to exhaust the heat outside of the enclosure. Ensure that the enclosure fan has a greater fan flow rate than the drive controller fan flow rate listed in Table 7.
- If a ventilation fan is required, use IP54/NEMA 12 filters.

If there is a possibility of condensation, keep the control supply switched on during periods when the motor is not running, or install thermostatically controlled strip heaters.

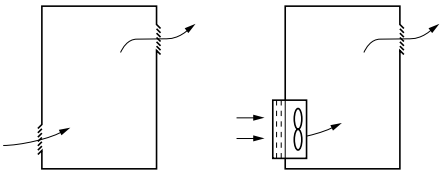


Figure 5: Ventilation for General Purpose Enclosures

Table 7: ALTIVAR 58 Type FVC Fan Flow Rates

Drive Controller	Fan Flow Rate	
ATV58FHU29N4, U41N4, U54N4	36 m^3/hour	21 CFM
ATV58FHU72N4, U90N4	72 m^3/hour	42 CFM
ATV58FHD12N4, D16N4, D23N4	72 m^3/hour	42 CFM
ATV58FHD28N4, D33N4, D46N4	292 m^3/hour	172 CFM
ATV58FHD54N4, D64N4, D79N4	492 m^3/hour	290 CFM

MOUNTING IN A TYPE 12 OR IP54 METAL ENCLOSURE

Certain conditions may require Type 12 or IP54 protection, such as dust, corrosive gas, high humidity with the risk of condensation, and dripping water.

When mounting in a Type 12 or IP54 enclosure, follow the installation precautions on pages 10 and 11.

To prevent hot spots in the drive controller if it is non-ventilated, use a stirring fan to circulate the air inside the enclosure. The maximum temperature inside the enclosure can then be 60 °C. Derate the output current available from the drive controller by 2.2% per °C above 50 °C. If there is the possibility of condensation, keep the power supply switched on during periods when the motor is not running, or install thermostatically controlled strip heaters.

Calculating Enclosure Size

The equation for calculating Rth (°C/W), the maximum allowable thermal resistance of the enclosure, is:

$$Rth = \frac{T_i - T_o}{P}$$

T_i = Max. internal ambient temp. (°C) around drive controller
T_o = Max. external temp. (°C) around enclosure
P = Total power dissipated in enclosure (W)

Useful heat exchange surface area, S (in^2), of a wall-mounted enclosure generally consists of the sides, top, and front. The minimum surface area required for a drive controller enclosure is calculated as follows.

NOTE: Contact enclosure manufacturer for K factors.

$$S = \frac{K}{Rth}$$

Rth = Thermal resistance of the enclosure (calculated previously)
K = Thermal resistance per square inch of the enclosure

Consider the following points when sizing the enclosure:

- Use only metallic enclosures, since they have good thermal conduction.
- This procedure does not consider radiant or convected heat load from external sources. Do not install enclosures where external heat sources (such as direct sunlight) can add to enclosure heat load.

- If additional devices are present inside the enclosure, consider the heat load of the devices in the calculation.
- The actual useful area for convection cooling of the enclosure will vary depending upon the method of mounting. The method of mounting must allow for free air movement over all surfaces considered for convection cooling.

Example

The following example illustrates calculation of the enclosure size for an ATV58FHU29N4 (2 hp) drive controller mounted in a Type 12 enclosure.

- Maximum external temperature: T_o = 25 °C
- Power dissipated inside enclosure: P = 97 W (from Table 1)
- Maximum internal temperature: T_i = 40 °C
- Thermal resistance per square inch of enclosure: K = 186
- Calculate maximum allowable thermal resistance, Rth:

$$Rth = \frac{40\ °C - 25\ °C}{97\ W} = 0.16\ °C/W$$

- Calculate minimum useful heat exchange surface area, S:

$$S = \frac{186}{0.16} = 1162.5\ in^2$$

Useful heat exchange surface area (S) of the proposed wall-mounted enclosure:

- Height: 24 in (610 mm)
- Width: 20 in (508 mm)
- Depth: 12 in (305 mm)

$$S = \underset{\text{front area}}{(24 \times 20)} + \underset{\text{top area}}{(20 \times 12)} + \underset{\text{side area}}{2(24 \times 12)} = 1296\ in^2$$

If the selected enclosure does not provide the required surface area or does not meet application needs, consider the following:

- Use a larger enclosure.
- Add a passive heat exchanger to the enclosure.
- Add an air conditioning unit to the enclosure.

WIRING

Before wiring the drive controller, first perform the bus voltage measurement procedure on page 20.

Figure 6 shows the location of the terminal strips.

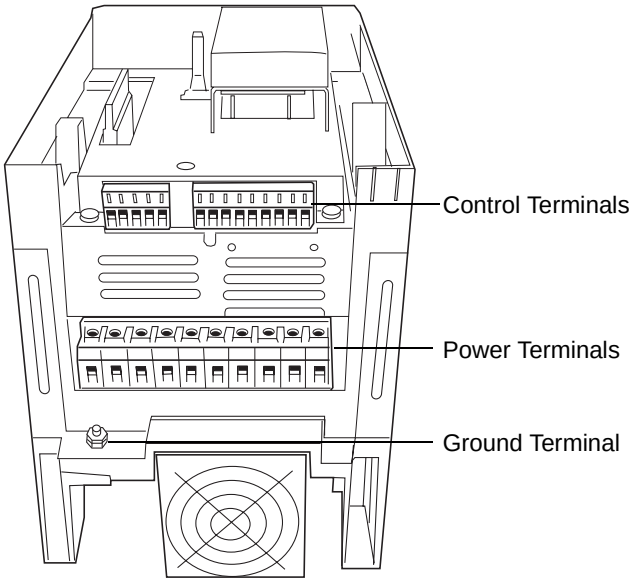


Figure 6: Terminal Locations (Product Frame Sizes 2 and 3)

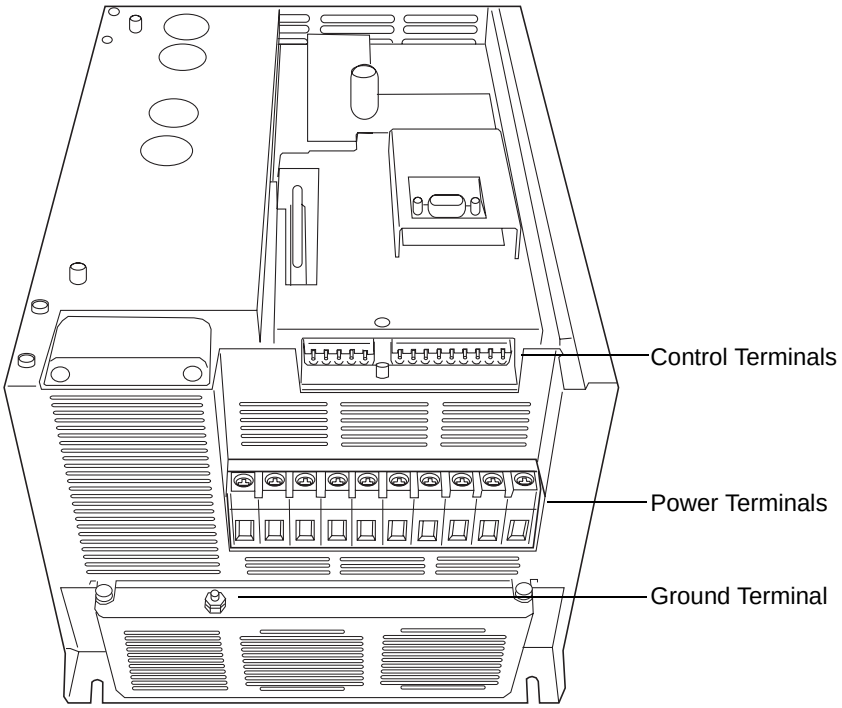


Figure 7: Terminal Locations (Product Frame Sizes 4 and 5)

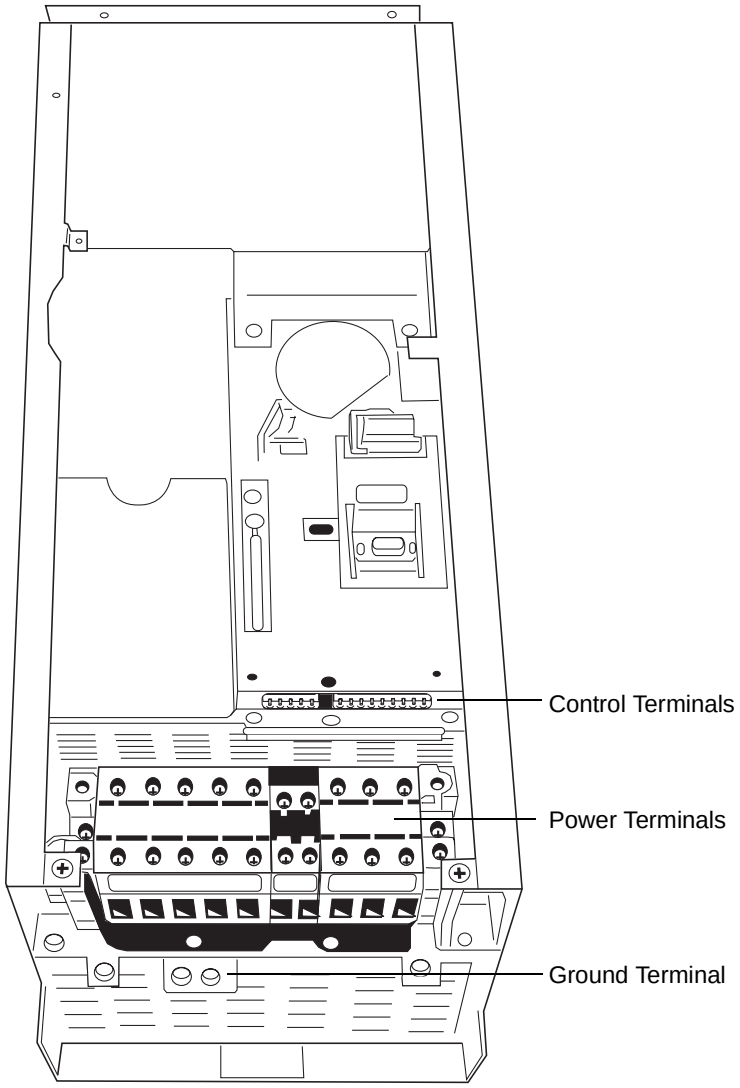


Figure 8: Terminal Locations (Product Frame Size 6)

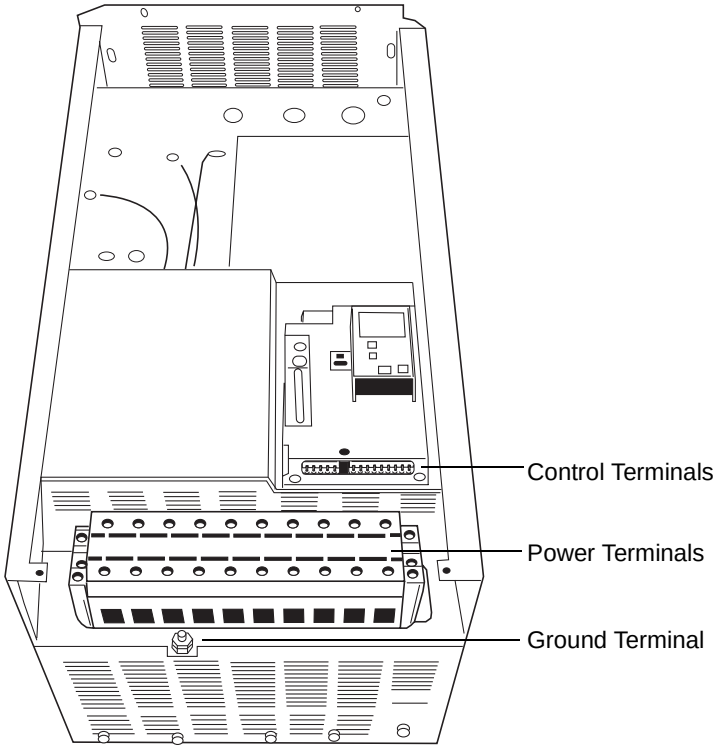


Figure 9: Terminal Locations (Product Frame Size 7)

Bus Voltage Measurement Procedure

⚠ DANGER

HAZARDOUS VOLTAGE

- Read and understand the bus voltage measurement procedure before performing the procedure. Measurement of the bus capacitor voltage must be performed by qualified personnel.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Many parts in this drive controller, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.

Electrical shock will result in death or serious injury.

The DC bus voltage level is determined by monitoring the (+) and (-) measurement points. Their location varies by drive controller model number as listed in Table 8 and shown in Figure 10 on page 21. The drive controller model number is listed on its nameplate.

Table 8: Bus Voltage (+) and (-) Measurement Points

Drive Controller ATV58FH•••••	(+) Measurement Point		(-) Measurement Point	
	Terminal Block or Connector	Terminal Designation	Terminal Block or Connector	Terminal Designation
U18N4• to D23N4•	J2	PA	J18	7
D28N4• to D79N4•	J2	(+)	J2	(-)

To measure the DC bus capacitor voltage:

1. Disconnect all power from the drive controller including external control power that may be present on the control board and the option board terminals.
2. Wait three minutes for the DC bus capacitors to discharge.
3. Read the model number of the drive controller from the nameplate and identify the corresponding (+) and (-) measurement points from Table 8 and Figure 10.
4. Open the door or cover of the drive controller.
5. Set the voltmeter to the 1000 Vdc scale. Measure the voltage between the (+) and (-) measurement points identified in step 3. Verify

that the DC bus voltage has discharged below 45 V before servicing the drive controller.

6. If the DC bus capacitors will not discharge below 45 V, contact your local Square D representative. **Do not operate the drive controller.**
7. Replace all of the covers after servicing the drive controller.

The J18 connector is in the upper left hand corner of the main control board behind the flexible shield. Use a thin probe to access the connector pin.

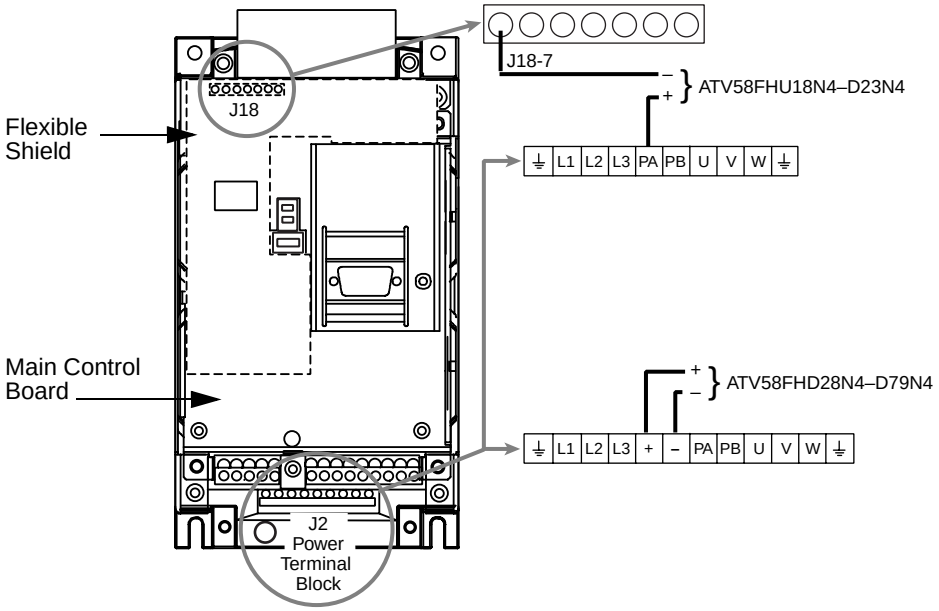


Figure 10: DC Bus Measurement Terminals

General Wiring Practices

Good wiring practice requires the separation of control circuit wiring from all power wiring. Power wiring to the motor must have the maximum possible separation from all other power wiring, whether from the same drive controller or other drive controllers; **do not run power and/or control or multiple power wiring in the same conduit.** This separation reduces the possibility of coupling electrical transients from power circuits into control circuits or from motor power wiring into other power circuits.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Follow wiring practices described in this document in addition to those already required by the National Electric Code and local electrical codes.

Failure to follow this instruction can result in injury or equipment damage.

Follow the practices below when wiring enclosed ALTIVAR 58 Type FVC drive controllers:

- When using metallic conduit, use metal conduit kits. See Appendix A for a list of the conduit kits.
- Use metallic conduit for all drive controller wiring. Do not run control and power wiring in the same conduit.
- Separate metallic conduits carrying power wiring or low-level control wiring by at least 3 in. (76 mm).
- Separate non-metallic conduits or cable trays used to carry power wiring from metallic conduit carrying low-level control wiring by at least 12 in. (305 mm).
- Whenever power and control wiring cross, the metallic conduits and non-metallic conduits or trays must cross at right angles.
- Equip all inductive circuits near the drive (relays, contactors, solenoid valves) with noise suppressors or connect them to a separate circuit.

Electromagnetic Compatibility

This section focuses on applications requiring compliance to the European Community EMC directive. The ALTIVAR 58 Type FVC drive controller is considered to be a component. It is neither a machine nor a piece of equipment ready for use in accordance with the European Community directives (machinery directive or electromagnetic compatibility directive). It is the user's responsibility to ensure that the machine meets these standards.

A metal EMC plate is available for ALTIVAR 58 Type FVC drive controllers to assist in meeting the European Community EMC directives. This kit is for integrators and end users who are including the drive controller as part of a machine to be exported to Europe requiring compliance to these directives.

See Appendix A for a list of accessories. Instruction bulletin no. 30072-450-04 ships with the EMC plate kit and contains information about its use.

ALTIVAR 58 Type FVC drive controllers are marked with the CE European Community mark.

Installation Precautions for Meeting EN55011 Class A

- Ensure that the grounds of the drive controller, the motor, and the cable shields are at high frequency equal potential.
- Use shielded cables with the shields connected to ground at both ends of the motor cable, control cables, and the braking resistor (if used). Conduit or metal ducting can be used for part of the shielding length, provided that there is no break in continuity.
- Ensure maximum separation between the power supply cable (line supply) and the motor cable.

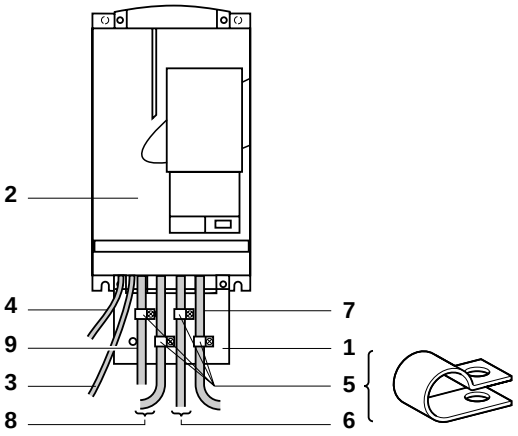


Figure 11: Installation Diagram

Description of parts in Figure 11:

1. Sheet metal grounded casing supplied with the drive controller, to be fitted as indicated on the diagram.
2. ALTIVAR 58 Type FVC drive controller.
3. Non-shielded power supply wires or cables.
4. Non-shielded wires for the output of the safety relay contacts.
5. Cable 6, 7, 8, and 9 shields must be attached and connected to ground as close as possible to the drive controller. Strip the shields. Use clamps of an appropriate size on the stripped portion of the shields for fastening to the sheet metal. Clamps should be stainless steel. The shields must be well clamped to the sheet metal in order to have a good contact.
6. Shielded cable for connection to the motor, with shielding connected to ground at both ends. This shielding must not be interrupted. If intermediate terminal blocks are used, they must be in EMC-shielded metal boxes.
7. Shielded cable for connection to encoder. This shielding must not be interrupted. If intermediate terminal blocks are used, they must be in EMC-shielded metal boxes.
8. Shielded cable for connecting the braking resistor, if used. The shielding must be connected to ground at both ends. This shielding must be unbroken, and if there are intermediate terminals, they must be in EMC shielded metal boxes.
9. Shielded cable for connection to control/command. For applications which require a large number of conductors, small cross-sections must be used (20 AWG, 0.5 mm^2). This shielding must not be interrupted. If intermediate terminal blocks are used, they must be in EMC-shielded metal boxes.

NOTES:

If an additional input filter is used, it should be mounted on the drive controller and connected directly to the line supply by an unshielded cable. Connection 3 on the drive controller is then made using the filter output cable.

Although there is an HF equipotential ground connection between the drive controller, the motor, and the cable shielding, it is still necessary to connect the PE protective conductors (green-yellow) to the appropriate terminals on each of the devices.

It may be necessary to disconnect the shield at the motor end for very long cable runs to alleviate noise generation.

Branch Circuit Connections

Refer to NEC Article 430 for sizing the branch circuit conductors. All branch circuit components and equipment (such as transformers, feeder cables, disconnect devices, and protective devices) must be rated for the input current of the ALTIVAR 58 Type FVC drive controller, or the rated output current, whichever value is larger. The input current of the controller depends on the impedance of the power distribution system and the available fault current at the drive input terminals.

Select the input current corresponding to the available fault current capability or the line impedance present. If the branch circuit available fault current capability is limited by fuses or circuit breakers (not system impedance), use the available fault current capability on the line side of the fuses or circuit breakers to select the drive controller input current. The input current values for the constant torque drive controller ratings are based on drive controller rated output currents. Tables 9 and 10 on page 27 provide input current information to optimally size branch circuit conductors.

NOTE: The branch circuit feeder protection rating should not be less than the rated output current of the drive controller.

⚠ WARNING

OVERCURRENT PROTECTIVE DEVICES MUST BE PROPERLY COORDINATED

- The National Electrical Code requires branch circuit protection. Use the fuses recommended in Table 15 on page 37 of this manual to achieve published fault withstand current ratings.
- Do not connect the drive controller to a power feeder whose short circuit capacity exceeds the drive controller withstand fault rating listed on the drive controller nameplate or in Tables 9 and 10 on page 27.

Failure to follow this instruction can result in death, serious injury or equipment damage.

Table 9: Input Line Currents, Constant Torque, 400 /460 V Ratings, Three-Phase Input • Three-Phase Output, Switching Frequency: ATV58FHU18N4–D46N4 @ 4 kHz, ATV58FHD54N4–D79N4 @ 2 kHz

NOTE: The input conductor ampacity rating should not be less than the ampacity rating selected based on the rated controller output current.

Drive Controller Catalog Number	Motor Power		Rated Output Current	Input Line Current							
				5000 AIC		10000 AIC		22000 AIC		w/ Additional 3% Line Impedance	
	400 V kW	460 V Hp	A	400 V A	460 V A	400 V A	460 V A	400 V A	460 V A	400 V A	460 V A
ATV58FHU18N4KU	0.75	1	2.3	3.4	2.6	—	—	—	—	1.9	1.6
ATV58FHU29N4KU	1.5	2	4.1	6.0	4.5	—	—	—	—	3.3	3.0
ATV58FHU41N4KU	2.2	3	5.8	7.8	6	—	—	—	—	4.8	4.2
ATV58FHU54N4KU	3	4	7.8	10.2	7.8	—	—	—	—	6.3	5.6
ATV58FHU72N4KU	4	5	10.5	13.0	10.1	—	—	—	—	8.6	7.2
ATV58FHU90N4KU	5.5	7.5	13	17.0	13.2	—	—	—	—	11.8	10.1
ATV58FHD12N4KU	7.5	10	17.6	20.7	18.2	22.7	19.9	26.5	21	16	13.2
ATV58FHD16N4KU	11	15	24.2	28.8	25.3	31.4	27.6	35.4	28	23.6	19.5
ATV58FHD23N4KU	15	20	33	36.5	32	39.6	34.7	44.7	35.6	30.6	25.8
ATV58FHD28N4KU	18.5	25	40.7	37.3	38.3	37.9	39.2	38.9	40.1	38.7	40.0
ATV58FHD33N4KU	22	30	48.4	44.4	44.8	45.9	46.7	46.5	47.6	46.4	47.6
ATV58FHD46N4KU	30	40	66	59.1	59.9	61.2	61.9	62.0	61.9	62.1	63.7
ATV58FHD54N4KU	37	50	79.2	70.6	71.4	73.3	74.7	74.7	74.7	74.9	76.3
ATV58FHD64N4KU	45	60	93.5	84.3	84.8	88.8	89.7	92.3	89.7	92.3	93.8
ATV58FHD79N4KU	55	75	115.5	102.7	103.3	106.4	108.6	111.6	108.6	112.1	112.7

Table 10: Input Line Currents, Constant Torque Low Noise, 400/460 V Ratings, Three-Phase Input • Three-Phase Output, Switching Frequency: ATV58FHD28N4–D46N4 @ 8 kHz, ATV58FHD54N4–D79N4 @ 4 kHz

NOTE: The input conductor ampacity rating should not be less than the ampacity rating selected based on the rated controller output current.

Drive Controller Catalog Number	Motor Power		Rated Output Current	Input Line Current							
				5000 AIC		10000 AIC		22000 AIC		w/ Additional 3% Line Impedance 22000 AIC	
	400 V kW	460 V Hp	A	400 V A	460 V A	400 V A	460 V A	400 V A	460 V A	400 V A	460 V A
ATV58FHD28N4KU	15	20	33	31.7	32.4	32.4	33.1	33.1	33.7	33.0	33.6
ATV58FHD33N4KU	18.5	25	40.7	37.9	39.3	39.4	40.1	40.4	40.7	40.3	41.0
ATV58FHD46N4KU	22	30	48.4	46.3	47.0	48.2	48.7	49.0	49.8	49.1	49.4
ATV58FHD54N4KU	30	40	66	60.9	60.4	63.2	63.0	64.4	65.4	64.7	64.8
ATV58FHD64N4KU	37	50	79.2	73.0	74.3	77.9	78.8	80.2	82.1	81.0	81.7
ATV58FHD79N4KU	45	60	93.5	65.3	65.8	90.6	91.7	94.6	95.0	94.4	94.9

Output Wiring Precautions

⚠ WARNING

DRIVE CONTROLLER DAMAGE

The drive controller will be damaged if input line voltage is applied to output terminals (U, V, W). Check power connections before energizing the drive controller.

Failure to follow this instruction can result in death, serious injury, or equipment damage.

The drive controller is sensitive to the amount of capacitance (either phase-to-phase or phase-to-ground) present on the output power conductors. If excessive capacitance is present, the drive controller may trip on overcurrent. Follow the guidelines below when selecting output cable:

- Cable type: the cable selected must have a low capacitance phase-to-phase and to ground. Do not use mineral-impregnated cable because it has a very high capacitance. Immersion of cables in water increases capacitance.
- Cable length: the longer the cable, the greater the capacitance. Cable lengths greater than 100 ft (30.5 m) may affect controller performance.
- Proximity to other output cables: because of high frequency switching and increased capacitance, the drive controller may fault under some conditions.
- **Do not use lightning arrestors or capacitors on the output of drive controller.**

Wiring needs a minimum inductance to protect the drive controller output from short circuits. Provide at least 20 in. (500 mm) of cable at the drive controller output (U, V, W).

⚠ CAUTION

DRIVE CONTROLLER SWITCH FAILURE

For proper drive controller short circuit protection, certain values of inductance may be required in the output power wiring. Inductance can be supplied by the power wiring or auxiliary inductors.

Failure to follow this instruction can result in injury or equipment damage.

Grounding

For safe, dependable operation, ground the drive controller according to National Electrical Code and all local codes. To ground the drive controller:

- Connect a copper wire from the ground terminal on the drive controller (see Figures 6 through 9 on pages 16 through 19) to the power system ground conductor. Wire size is determined by the drive controller size and by national and local codes.
- Verify that resistance to ground is one ohm or less. Improper grounding causes intermittent and unreliable operation.

⚠ DANGER

HAZARDOUS VOLTAGE

Ground equipment using the provided ground connecting point as shown in Figures 6 through 9 on pages 16 through 19. The drive controller panel must be properly grounded before power is applied.

Do not use metallic conduit as a ground conductor.

Electrical shock will result in death or serious injury.

Ground multiple drive controllers as shown in Figure 12. Use one grounding conductor per device. Do not loop ground conductors or install them in series.

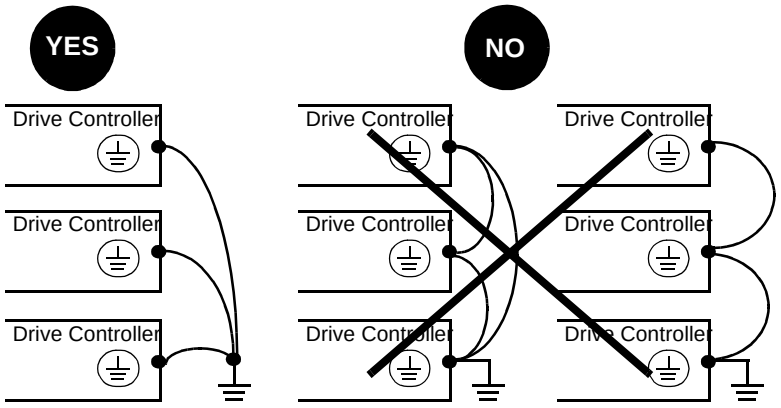
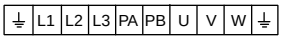


Figure 12: Grounding Multiple Drive Controllers

Power Terminals

ATV58FHU18N4–D23N4



ATV58FHD28N4–D79N4

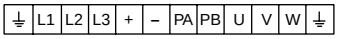


Table 11: Function of Power Terminals

Terminal	Function	For ATV58FH•••••
⏚	Ground terminal	All models
L1 L2 L3	Input power connections	
+ -	DC bus terminals	D28N4 to D79N4
PA PB	Connection for DB resistor	All models
U V W	Output connections to motor	
⏚	Ground terminal	

Table 12: Power Terminal Wire Size and Torque

Drive Controller ATV58FH•••••	Maximum Wire Size [1] AWG (mm^2)	Torque lb-in (N•m)
U18N4, U29N4, U41N4	8 (6)	7.5 (0.85)
U54N4, U72N4, U90N4	8 (6)	7.5 (0.85)
D12N4, D16N4, D23N4	6 (10)	20 (2.26)
D28N4, D33N4, D46N4	2/0 (35)	88 (10)
D54N4, D64N4, D79N4	4/0 (70)	170 (19)

[1] 75 °C copper.

Control Terminals

The control terminal strip contains four pull-apart terminal blocks, one for the relay outputs and three for the low level inputs and outputs. Two screws are available, one on either side of the control terminal strip, for connecting the shields of the multi-conductor shielded cables used to make connections to the analog inputs, outputs, logic inputs, and encoder signals. An appropriately sized ring lug terminal should be used to terminate the shield wires to these points. The maximum wire size for all control terminals is 16 AWG (1.5 mm^2). The maximum tightening torque is 2.21 lb-in (0.25 N•m).

Figure 13 shows the location of the control terminals and shielding connection screws.

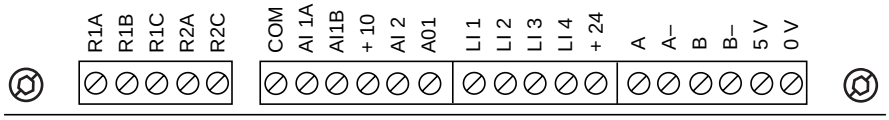


Figure 13: Location of Control Terminals

Table 13: Control Terminal Characteristics

Terminal	Function	Characteristics
R1A R1B R1C	Fault relay contacts R1B to R1C is N.C. R1A to R1C is N.O.	Minimum switching capacity: 10 mA, 24 Vdc Maximum switching capacity of inductive load: 1.5 A for 250 Vac and 30 Vdc Maximum response time: 20 ms
R2A R2C	N.O. contact of programmable relay	
COM	Common for logic and analog inputs	
AI1A AI1B	±10 Vdc differential analog input	± 10 V, Impedance = 40 kΩ in differential mode, 20 kΩ in common mode Maximum permissible voltage: ± 30 V Resolution: 11 bits + sign. Accuracy: ± 0.5% of the maximum value Sampling time: 2 ms maximum
+10	Supply for reference potentiometer with resistance = 1 to 10 kΩ	10 V + 10%, 10 mA maximum Protected against short circuits and overloads
AI2	Analog input with programmable current scaling	X to Y mA, with X and Y programmable from 0 to 20 mA; Factory setting: 0 to 20 mA Impedance = 100 Ω Maximum permissible current: 50 mA Resolution: 0.02 mA Accuracy: ±1% of the maximum value Linearity: ±0.5% of the maximum value Sampling time: 2 ms maximum
AO1	Programmable analog output with current scaling	X to Y mA, with X and Y programmable from 0 to 20 mA; Factory setting: 0 to 20 mA Impedance = 500 Ω maximum Resolution: 0.02 mA Accuracy: ±1% of the maximum value Linearity: ±0.5% of the maximum value Sampling time: 2 ms maximum
LI1 LI2 LI3 LI4	Programmable logic inputs	Impedance = 3.5 kΩ Supplied by +24 Vdc Vmax = 30 V State 0 if < 5 V, state 1 if > 11 V Sampling time: 2 ms maximum
+24	Power supply for logic inputs	+24 V protected against short circuits and overloads Minimum 18 V, maximum 30 V Maximum current: 120 mA

Table 13: Control Terminal Characteristics (Continued)

Terminal	Function	Characteristics
A A- B B-	Incremental logic inputs	For incremental optical encoder with RS422 compatible differential outputs Impedance = 330 Ω maximum Maximum 5000 pulses/revolution Minimum 100 pulses/revolution Maximum frequency: 200 kHz at high speed
+5 V 0 V	Power supply for encoder	5 V (maximum 5.5 V) protected against short-circuits and overloads Maximum current: 200 mA

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

LI1 has priority. If LI1 is closed while LI2 is active, the controller will respond to LI1. If the LI1 input is lost while LI2 is active, the controller will respond to LI2 and reverse directions. The logic inputs must be programmed appropriately for the application to prevent the motor from spinning in an unintended direction.

Failure to follow this instruction can result in death or serious injury.

Selecting the Encoder

The ALTIVAR 58 Type FVC drive controller has inputs designed for use with an incremental optical encoder with RS422 compatible 5 V differential outputs. When selecting an encoder, for optimum accuracy choose the maximum standard resolution within the following limits:

- Electrical limit: maximum frequency of 200 kHz at high speed
- Programmable values limit: 100 to 5000 pulses per revolution.

For example:

- Motor: 1500 rpm, 50 Hz
- High speed: 60 Hz or 1800 rpm or 30 rps
- Maximum signal frequency: 200 kHz
- Calculated maximum number of pulses per revolution: 200,000 / 30 = 6666
- Encoder selection: 5,000 pulses per revolution. The maximum standard resolution within calculated the limit of 6,666 pulses per revolution and programming limit of 5,000 pulses per revolution.

Wiring the Encoder

To wire the encoder, use a shielded cable consisting of three twisted pairs with a pitch between 25 and 50 mm. Connect the shielding to ground at both ends. The minimum cross section of the conductors must comply with the values listed in Table 14 to limit the line voltage drop.

Table 14: Encoder Cable Sizes

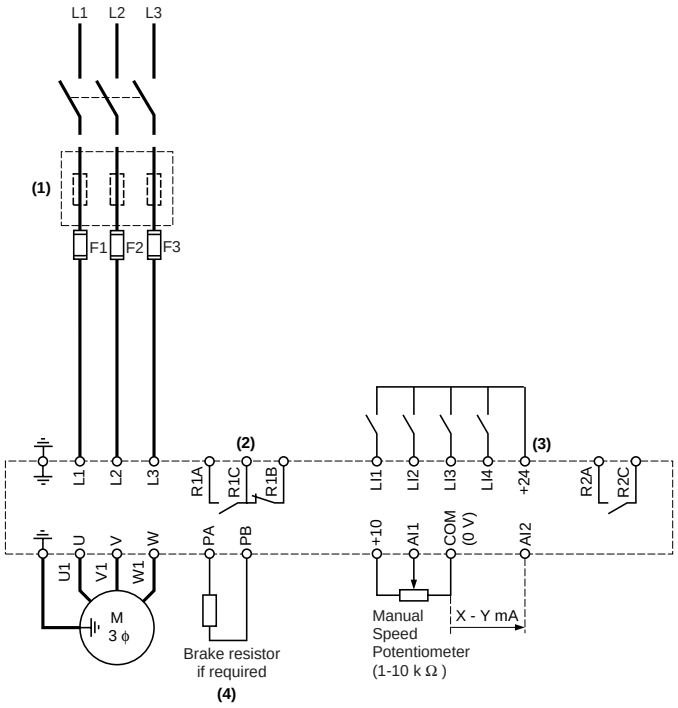
Maximum Cable Length	Maximum Consumption Current of Encoder	Minimum Cross Section of Conductors
10 m	100 mA	0.2 mm^2 or AWG 24
	200 mA	0.2 mm^2 or AWG 24
50 m	100 mA	0.5 mm^2 or AWG 20
	200 mA	0.75 mm^2 or AWG 18
100 m	100 mA	0.75 mm^2 or AWG 18
	200 mA	1.5 mm^2 or AWG 16

Matching Encoder Outputs

There is no need to load the encoder output signals or the drive controller's incremental encoder inputs with matching impedances. Where several loads (drive controller, axis control modules, etc.) are connected in parallel to the encoder outputs, the resulting impedance must not be below 100 Ω.

WIRING DIAGRAMS

Three-Phase Input



(1) Line inductor if required. See catalog 8806CT9801 for recommendations.
(2) Fault relay contacts for remote signalling of the drive controller state.
Contact state shown with the drive controller deenergized or faulted.
(3) Internal +24 V. When using +24 V external supply, connect the 0 V to the COM terminal.
Do not use the +24 terminal on the control board, but connect the logic inputs to the external +24 V.
(4) See Appendix A for available braking resistor kits.

Figure 14: Three-Phase Wiring Diagram

Table 15: Recommended Line Power Fusing for 400/460 V Three-Phase Drive Controllers

Motor		Constant Torque Drive Controller	F1-F2-F3 Line Power Fuses
hp	kW	ATV58FH•••••	A
1	0.75	U18N4	5 [1]
2	1.5	U29N4	10 [1]
3	2.2	U41N4	12 [1]
—	3	U54N4	15 [1]
5	4	U72N4	20 [1]
7.5	5.5	U90N4	25 [1]
10	7.5	D12N4	40 [1]
15	11	D16N4	50 [1]
20	15	D23N4	70 [1]
25	18.5	D28N4	70 [2]
30	22	D33N4	80 [2]
40	30	D46N4	100 [2]
50	37	D54N4	125 [2]
60	45	D64N4	150 [2]
75	55	D79N4	175 [2]

[1] Fast-acting or time delay Class J fuses are acceptable. Class CC fuses may be used if recommended fuse rating is 30 A or lower.

[2] Fast-acting Class J fuses.

Table 16: Minimum Ohmic Value of Dynamic Braking Resistors

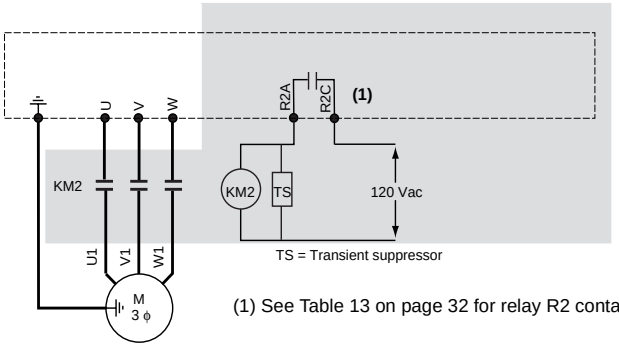
ATV58•••••	**U18N4 U29N4 U41N4 U54N4**	**U72N4**	**U90N4**	**D12N4**	**D16N4 D23N4**	**D28N4 D33N4 D46N4**	**D54N4**	**D64N4 D79N4**
Min. Resistance Ω	85	57	47	53	19	14	8	5

USING A LINE CONTACTOR

When controlling the incoming power with a line isolation contactor, avoid frequently opening and closing the line contactor as this could cause premature failure of the drive controller. Use logic inputs LI1 to LI4 to start and stop the drive controller. Limit cycling of the line contactor to less than once per minute.

Output Contactor Wiring Diagram

Relay R2 is typically used for the “Output Contactor Command” function. Refer to keypad display instruction bulletin VVDED399094US for more information on this function. In the wiring diagram, the shaded portion is to be added to the three-phase input wiring diagram (Figure 14 on page 36).



(1) See Table 13 on page 32 for relay R2 contact ratings.

Figure 15: Output Contactor Wiring Diagram

NOTE: Use transient suppression on all inductive circuits (such as relays, contactors, and solenoids) near the drive controller and connected on the same circuit.

Table 17: Recommended Output Contactors

ATV58FH•••••	KM2 LC1-
U18N4	D2510•• [1]
U29N4	D2510•• [1]
U41N4	D2510•• [1]
[1] Refer to the Square D Digest for control voltages.	

Table 17: Recommended Output Contactors (Continued)

ATV58FH•••••	KM2 LC1-
U72N4	D2510•• [1]
U90N4	D2510•• [1]
D12N4	D2510•• [1]
D16N4	D2510•• [1]
D23N4	D4011•• [1]
D28N4	D4010•• [1]
D33N4	D5010•• [1]
D46N4	D8010•• [1]
D54N4	D8010•• [1]
D64N4	F115•• [1]
D79N4	F115•• [1]

[1] Refer to the Square D Digest for control voltages.

EXTERNAL 24 V SUPPLY

An external 24 V power supply can be used for the logic inputs. In this case, the +24 terminal on the drive controller is not used. Figure 16 shows the wiring diagram when an external supply is used.

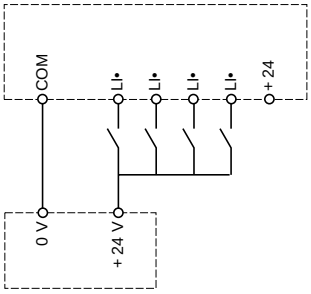


Figure 16: External Supply Wiring Diagram

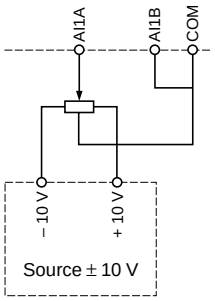


Figure 17: Bi-Polar Speed Reference

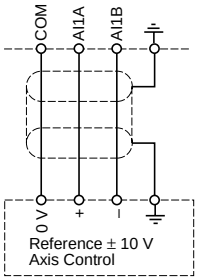


Figure 18: Speed Reference Using Axis Control

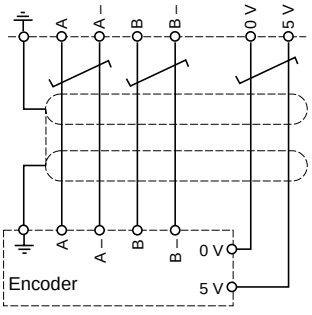


Figure 19: Closed Loop Control: Encoder Wiring

FAULT RELAY

The fault relay is energized whenever there is power to the drive controller and there is no fault. It provides a normally-open and a normally-closed contact.

To reset the drive controller after a fault, turn the power off and allow the red LED to extinguish. Reapply power after eliminating the cause of the fault.

AVAILABLE MOTOR TORQUE

Continuous duty:

- For self-cooled motors, motor cooling depends on the motor speed.
- Continuous duty results in derating of the motor overload function for speeds less than 50% of the nameplate motor speed.

Operation in overspeed:

- In overspeed operation, the voltage no longer increases with the frequency, resulting in reduced induction in the motor which translates into loss of torque. Consult the motor manufacturer to ensure that the motor can operate in overspeed.
- For a special motor, the nominal frequency and the maximum frequency can be adjusted between 40 and 450 Hz using the Keypad Display or Test & Commissioning Software. See Appendix A for a list of accessories.

⚠ CAUTION

MACHINERY OVERSPEED

Some motors and/or loads may not be suited for operation above the nameplate motor speed and frequency. Consult the motor manufacturer before operating the motor above rated speed.

Failure to follow this instruction can result in injury or equipment damage.

The available motor overtorque is a function of the motor design category. For typical NEMA Design B motors, the ALTIVAR 58 Type FVC controller can deliver 200% of the nominal motor torque for 2 seconds, and 170% for 60 seconds.

Motor power rating must be at least 25% of the drive rated power for the drive controller to properly operate the motor.

Figures 20 and 21 show the typical torque characteristics of the ALTIVAR 58 Type FVC drive controller.

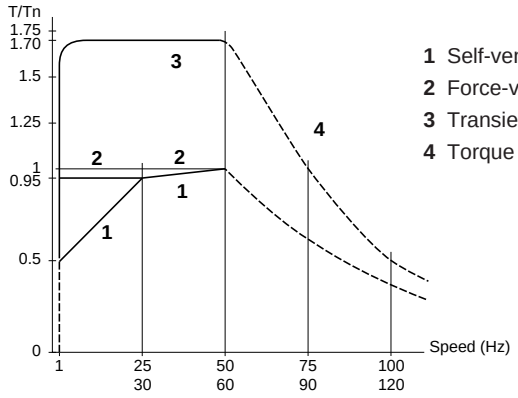


Figure 20: Typical Torque Characteristics: Open Loop

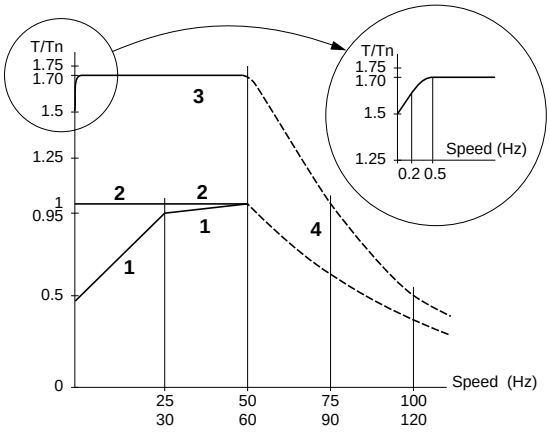


Figure 21: Typical Torque Characteristics: Closed Loop

FACTORY SETTINGS

The ALTIVAR 58 Type FVC drive controller is preset for constant torque applications and open loop control. Table 18 lists the factory settings. See Appendix A for available configuration tools to alter factory settings.

Table 18: Factory Settings

Function	Setting
Base frequency	50/60 Hz [1]
Motor voltage	400/460 V [1]
Acceleration and deceleration ramps	3 s
Low speed	0 Hz
High speed	50/60 Hz [1]
Maximum frequency	60/72 Hz [1]
Motor thermal current	0.9 times rated drive controller output current
DC braking current at stop	0.63 times rated drive controller output current for 0.5 s
Control type	2-wire control
Logic inputs	LI1: Run Forward; LI2: Run Reverse **LI3** **LI4** **Preset speed** 0 0 Low speed + reference 1 0 10 Hz 0 1 15 Hz 1 1 High speed
Analog inputs	AI1: +/- 10 V speed reference AI2: 4 to 20 mA speed reference Analog inputs set for reference summing
Analog output	AO1: output frequency
Relay outputs	R1: fault relay (cannot be reassigned) R2: not assigned
Switching frequency	4 kHz

[1] Depending on the position of the 50/60 Hz switch. Switch is factory-set to 50 Hz.

START UP

⚠ DANGER

HAZARDOUS VOLTAGE

- Read and understand this bulletin in its entirety before installing or operating ALTIVAR 58 Type FVC drive controllers. Installation, adjustment, repair, and maintenance of these drive controllers must be performed by qualified personnel.
- Disconnect all power before servicing the drive controller. WAIT THREE MINUTES until the DC bus capacitors discharge, then follow the bus voltage measurement procedure on page 20 to verify that the DC voltage is less than 45 V. The drive controller LEDs are not accurate indicators of the absence of DC bus voltage.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- The user is responsible for conforming to all applicable code requirements with respect to grounding all equipment.
- Many parts in this drive controller, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.

Electrical shock will result in death or serious injury.

Before powering up the drive controller, the 50/60 Hz switch must be set to correspond with the frequency of the incoming power. Unlock and open the cover to access the 50/60 Hz switch on the control board. Set the switch to the position matching the mains frequency.

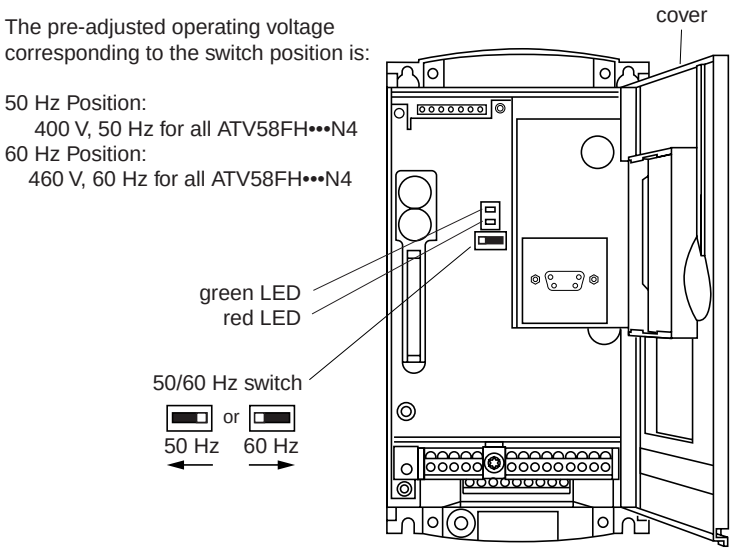


Figure 22: Setting the 50/60 Hz Switch

Use one of the following tools to aid you in starting up the ALTIVAR 58 Type FVC drive controller:

- Keypad Display, VW3A58101U
- Test & Commissioning Software, VW3A8104, ordered separately

Consult the documentation provided with each of these tools in order to start up and maintain the drive controller.

If your drive controller has an I/O extension card or communication card, also consult the documentation provided with that card.

LIGHT EMITTING DIODES (LEDs)

The LEDs on the front of the ALTIVAR 58 Type FVC drive controller indicate several states as shown in Figure 23.

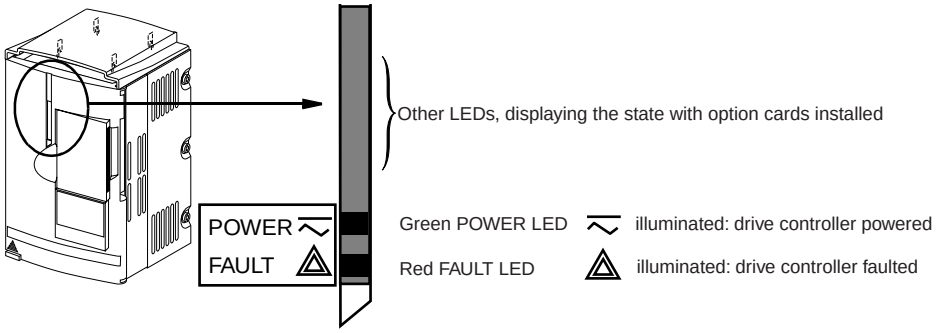


Figure 23: LED States

PREVENTIVE MAINTENANCE

The following steps should be done at regular intervals:

- Check the condition and tightness of the connections.
- Make sure ventilation is effective and temperature around the drive controller remains at an acceptable level.
- Remove dust and debris from the drive controller, if necessary.

TROUBLESHOOTING AND MAINTENANCE

When a fault is detected, the drive controller trips, the red fault LED illuminates, and the fault relay deenergizes.

After performing the “Bus Voltage Measurement Procedure” on page 20, check the supply voltage (Procedure 1 on page 47) and the peripheral components (Procedure 2 on page 47). If no problem is found with the supply voltage and peripheral equipment, install a keypad display for additional fault information. The faults are identified in the keypad display manual, VVDED399094US.

Procedure 1: Checking Supply Voltage

To determine if the voltage is within the drive controller tolerance:

1. Perform the Bus Voltage Measurement procedure (see “Bus Voltage Measurement Procedure” on page 20).
2. Attach meter leads to L1 and L2. Set the voltmeter to the 600 Vac scale.
3. Reapply power and check for the correct line voltage, shown on the drive controller nameplate rating.
4. Remove power and repeat the procedure for L2 and L3, and L1 and L3.
5. When all phases have been measured, remove power. Remove leads and replace all covers.

Procedure 2: Checking the Peripheral Equipment

The following equipment may need to be checked. Follow the manufacturers’ procedures when checking this equipment.

1. A protective device such as a circuit breaker may have tripped or a fuse may have blown.
2. A switching device such as a contactor may not be closing at the correct time.
3. Conductors may require repair or replacement.
4. Connection cables to the motor or high resistance connections to ground may need to be checked. Follow NEMA standard procedure WC-53.
5. Motor insulation may need to be checked. Follow NEMA standard procedure MG-1. Do not apply high voltage to drive controller terminals U, V, or W. Do not connect the high potential dielectric test equipment or insulation resistance testers to the drive controller since the test voltages used may damage the drive controller. Always disconnect the drive controller from the conductors or motor while performing such tests.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Do not perform high potential dielectric tests on circuits while the circuits are connected to the drive controller.

Any circuit requiring high potential dielectric tests must be disconnected from the drive controller prior to performing the test.

Failure to follow this instruction can result in injury or equipment damage.

Fault Storage

When a fault is detected, the drive controller trips and the fault relay deenergizes. The first fault detected is saved and displayed on the keypad if power is maintained.

To reset the fault:

1. Remove power from the drive controller.
2. Before switching power back on, identify and correct the cause of the fault.
3. Restore power. This will reset the fault if it has been corrected.

In certain cases, if automatic restart has been enabled, the drive can be automatically restarted after the cause of the fault has disappeared.

The Test & Commissioning software can be used to view the last eight faults recorded by the drive controller. See Appendix A for the part number.

APPENDIX A: OPTIONS AND ACCESSORIES

The following table shows the accessories available for ALTIVAR 58 Type FVC drive controllers.

Catalog No.	Description
VW3A58101U	Keypad
VW3A58103	Remote Mounting Kit
VW3A8104	Test & Commissioning Software
VW3A58201U	Analog I/O Option Card
VW3A58202U	Digital I/O Option Card
VW3A58302U	MODBUS® Plus Communication Card
VW3A58303U	MODBUS/UNITELWAY™ Communication Card
VW3A58304EU	Interbus S Communication Card. Requires external power supply.
VW3A58306U	RS485 Cable w/ MODBUS Mapping Guide
VW3A58307U	Profibus DP Communication Card
VW3A58311U	FIPIO® Communication Card
VW3A58701	DB Transistor
VW3A58822	Fan Kit for ATV58FHU18N4 to U41N4
VW3A58823	Fan Kit for ATV58FHU54N4 to U90N4
VW3A58824	Fan Kit for ATV58FHD12N4 to D23N4
VW3A58825	Fan Kit for ATV58FHD28N4 to D46N4
VW3A58826	Fan Kit for ATV58FHD54N4 to D79N4
VW3A58832	EMC Kit for ATV58FHU18N4 to U41N4
VW3A58833	EMC Kit for ATV58FHU54N4 to U90N4
VW3A58834	EMC Kit for ATV58FHD12N4 to D23N4
VW3A58843	Conduit Box Kit for ATV58FHU18N4 to U41N4
VW3A58844	Conduit Box Kit for ATV58FHU54N4 to U90N4
VW3A58845	Conduit Box Kit for ATV58FHD12N4 to D23N4
VW3A58846	Conduit Box for ATV58FHD28N4 to D46N4
VW3A58847	Conduit Box for ATV58FHD54N4 to D79N4
VW3A66711	DB Resistor Kit for ATV58FHU18N4 to U72N4
VW3A66712	DB Resistor Kit for ATV58FHU90N4, D12N4
VW3A66713	DB Resistor Kit for ATV58FHD16N4, D23N4
VW3A66714	DB Resistor Kit for ATV58FHD28N4 to D46N4
VW3A66715	DB Resistor Kit for ATV58FHD54N4
VW3A66716	DB Resistor Kit for ATV58FHD64N4, D79N4

Numerics

A

B

C

D

E

F

G

H

I

K

L

M

Square D Company
8001 Hwy 64 East
Knightdale, NC 27545 USA
1-888-Square D (778-2733)
www.squared.com

Bulletin No. VVDED399093US dated 10/00.