30072-450-47A
July 2002
Raleigh, NC, USA

Instruction Bulletin

ALTIVAR®FLEX58 *TRX* Adjustable Speed Chassis Drive Controllers

Installation Guide

Retain for future use.

SQUARE D

⚠ DANGER

HAZARDOUS VOLTAGE

- Read and understand this bulletin in its entirety before installing or operating FLEX58 *TRX* chassis drive controllers. Installation, adjustment, repair, and maintenance of the drive controllers must be performed by qualified personnel.
- 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.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Before servicing the drive controller:
  - — Disconnect all power including external control power that may be present before servicing the drive controller.
  - — Place a “DO NOT TURN ON” label on the drive controller disconnect.
  - — Lock the disconnect in open position.
  - — WAIT TEN MINUTES for the DC bus capacitors to discharge. Then follow the DC bus voltage measurement procedure on page 32 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.
- Install and close all covers before applying power or starting and stopping the drive controller.

Electrical shock will result in death or serious injury.

INTRODUCTION

The ALTIVAR FLEX58 *TRX* chassis drive controller is a family of adjustable frequency AC drive controllers rated for North American voltages only. The FLEX58 *TRX* chassis drive controller is offered as a component and is used to control three-phase asynchronous motors. The purchaser is responsible for mounting and installing the FLEX58 *TRX* chassis drive controller inside an enclosure.

The controllers range from:

- 1 to 75 hp (0.75 to 55 kW) constant torque (100 hp variable torque), 460 V, three-phase input
- 1 to 40 hp (1.5 to 30 kW) constant torque (50 hp variable torque), 208/230 V, three-phase input.

The following FLEX58 *TRX* drive controllers have built-in line reactors:

- 15–50 hp (208/230 V, VT)
- 30–100 hp (460 V, VT)
- 15–40 hp (208/230 V, CT)
- 25–75 hp (460 V, CT)

This instruction bulletin covers the technical characteristics, specifications, installation, and wiring of all FLEX58 *TRX* chassis drive controllers.

For information on programming and troubleshooting the drive controller, refer to the keypad display instruction bulletin, VVDED397047US.

Many option kits are available for the FLEX58 *TRX* chassis drive controller. Refer to Appendix A for a list of the option kits.

REVISION LEVEL

This document replaces 30072-450-47 dated July 2001.

FACTORY CONFIGURATION SETTINGS

Refer to Table 27 on page 53.

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 the packing carton 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 it for 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 and +149 °F (-25 and +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 through 6 show the ratings of the FLEX58 *TRX* chassis drive controllers.

Table 1: Constant Torque, 208 V Ratings, Three-Phase Input • Three-Phase Output, Switching Frequency: 4 kHz

Drive Controller Catalog Number	Motor Power 208 V	Rated Output Current [1]	Transient Output Current	Dissipated Power from the Controller Heatsink @ Rated Load	Dissipated Power from the Control Boards @ Rated Load
	hp	A	A	W	W
FLEX58U29M2	1	4.6	7.4	35.5	17.5
FLEX58U29M2	2	7.5	12	71.7	35.3
FLEX58U41M2	3	10.6	17	107.2	52.8
FLEX58U72M2	5	16.7	26.7	160.8	79.2
FLEX58U90M2	7.5	24.2	38.7	170.8	84.2
FLEX58D12M2	10	30.8	49.3	234.5	115.5
FLEX58D16M2	15	46.2	73.9	560.6	184.4
FLEX58D23M2	20	59.4	94	673.5	221.5
FLEX58D28M2	25	74.8	119.7	677.2	222.8
FLEX58D33M2	30	88	140.8	775.1	254.9
FLEX58D46M2	40	114	182.4	989.5	325.5

[1] The FLEX58 *TRX* chassis drive controller nameplate rating is per NEC table 430-150.

Table 2: Constant Torque, 230 V Ratings, Three-Phase Input • Three-Phase Output, Switching Frequency: 4 kHz

Drive Controller Catalog Number	Motor Power 230 V	Rated Output Current [1]	Transient Output Current	Dissipated Power from the Controller Heatsink @ Rated Load	Dissipated Power from the Control Boards @ Rated Load
	hp	A	A	W	W
FLEX58U29M2	1	4.2	6.7	35.5	17.5
FLEX58U29M2	2	6.8	10.9	71.7	35.3
FLEX58U41M2	3	9.6	15.4	107.2	52.8
FLEX58U72M2	5	15.2	24.3	160.8	79.2
FLEX58U90M2	7.5	22	35.2	170.8	84.2
FLEX58D12M2	10	28	44.8	234.5	115.5
FLEX58D16M2	15	42	67.2	560.6	184.4
FLEX58D23M2	20	54	86.4	673.5	221.5
FLEX58D28M2	25	68	108.8	677.2	222.8
FLEX58D33M2	30	80	128	775.1	254.9
FLEX58D46M2	40	104	166.4	989.5	325.5

[1] The FLEX58 *TRX* chassis drive controller nameplate rating is per NEC table 430-150.

Table 3: Variable Torque, 208 V Ratings, Three-Phase Input • Three-Phase Output, Switching Frequency: 8 kHz

Drive Controller Catalog Number	Motor Power 208 V	Rated Output Current [1]	Transient Output Current	Dissipated Power from the Controller Heatsink @ Rated Load	Dissipated Power from the Control Boards @ Rated Load
	hp	A	A	W	W
FLEX58U29M2	1	4.6	5.1	35.5	17.5
FLEX58U29M2	2	7.5	8.3	71.7	35.3
FLEX58U41M2	3	10.6	11.7	105.9	52.1
FLEX58U72M2	5	16.7	18.4	132.7	65.3
FLEX58U90M2	7.5	24.2	26.6	157.4	77.6
FLEX58D12M2	10	30.8	33.9	216.4	106.6
FLEX58D16M2	15	46.2	50.8	413.9	136.1
FLEX58D16M2	20	59.4	65.3	560.6	184.4
FLEX58D23M2	25	74.8	82.3	673.5	221.5
FLEX58D28M2	30	88	96.8	677.2	222.8
FLEX58D33M2	40	114	125.4	775.1	254.9
FLEX58D46M2	50	143	157.3	989.5	325.5

[1] The FLEX58 *TRX* chassis drive controller nameplate rating is per NEC table 430-150.

Table 4: Variable Torque, 230 V Ratings, Three-Phase Input • Three-Phase Output, Switching Frequency: 8 kHz

Drive Controller Catalog Number	Motor Power 230 V	Rated Output Current [1]	Transient Output Current	Dissipated Power from the Controller Heatsink @ Rated Load	Dissipated Power from the Control Boards @ Rated Load
	hp	A	A	W	W
FLEX58U29M2	1	4.2	4.6	35.5	17.5
FLEX58U29M2	2	6.8	7.5	71.7	35.3
FLEX58U41M2	3	9.6	10.5	105.9	52.1
FLEX58U72M2	5	15.2	16.7	132.7	65.3
FLEX58U90M2	7.5	22	24.2	157.4	77.6
FLEX58D12M2	10	28	30.8	216.4	106.6
FLEX58D16M2	15	42	46.2	413.9	136.1
FLEX58D16M2	20	54	59.4	560.6	184.4
FLEX58D23M2	25	68	74.8	673.5	221.5
FLEX58D28M2	30	80	88	677.2	222.8
FLEX58D33M2	40	104	114.4	775.1	254.9
FLEX58D46M2	50	130	143	989.5	325.5

[1] The FLEX58 *TRX* chassis drive controller nameplate rating is per NEC table 430-150.

Table 5: Constant Torque, 460 V Ratings, Three-Phase Input • Three-Phase Output, Switching Frequency: 4 kHz

Drive Controller Catalog Number	Motor Power 460 V	Rated Output Current [1]	Transient Output Current	Dissipated Power from the Controller Heatsink @ Rated Load	Dissipated Power from the Control Boards @ Rated Load
	hp	A	A	W	W
FLEX58KU18N4	1	2.1	3.4	38.2	18.8
FLEX58KU29N4	2	3.4	5.4	65	32.0
FLEX58KU41N4	3	4.8	7.7	80.4	39.6
FLEX58KU72N4	5	7.6	12.2	140.7	69.3
FLEX58KU90N4	7.5	11	17.6	197.6	97.4
FLEX58KD12N4	10	14	22.4	241.2	118.8
FLEX58KD16N4	15	21	33.6	321	158.4
FLEX58KD23N4	20	27	43.2	395.3	194.7
FLEX58KD28N4	25	34	54.4	316.8	104.2
FLEX58KD33N4	30	40	64	369.5	121.5
FLEX58KD46N4	40	52	83.2	470.3	154.7
FLEX58KD54N4	50	65	104	509.4	167.6
FLEX58KD64N4	60	77	123.2	629.8	207.2
FLEX58KD79N4	75	96	153.6	820.2	269.8

[1] The FLEX58 *TRX* chassis drive controller nameplate rating is per NEC table 430-150.

Table 6: Variable Torque, 460 V Ratings, Three-Phase Input • Three-Phase Output, Switching Frequency: 8 kHz

Drive Controller Catalog Number	Motor Power 460 V	Rated Output Current [1]	Transient Output Current	Dissipated Power from the Controller Heatsink @ Rated Load	Dissipated Power from the Control Boards @ Rated Load
	hp	A	A	W	W
FLEX58KU18N4	1	2.1	2.3	38.2	18.8
FLEX58KU29N4	2	3.4	3.7	65	32.0
FLEX58KU41N4	3	4.8	5.3	79.7	39.3
FLEX58KU54N4	5	7.6	8.4	140	69.0
FLEX58KU72N4	7.5	11	12.1	195	96.0
FLEX58KU90N4	10	14	15.4	235.8	116.2
FLEX58KD12N4	15	21	23.1	316.2	155.8
FLEX58KD16N4	20	27	29.7	391.3	192.7
FLEX58KD23N4	25	34	37.4	438.2	215.8
FLEX58KD28N4	30	40	44.0	465	153.0
FLEX58KD33N4	40	52	57.2	536.5	176.5
FLEX58KD46N4	50	65	71.5	579.4	190.6
FLEX58KD54N4	60	77	84.7	742.7	244.3
FLEX58KD64N4	75	96	105.6	808.9	266.1
FLEX58KD79N4	100	124	136.4	1082.8	356.2

[1] The FLEX58 *TRX* chassis drive controller nameplate rating is per NEC table 430-150.

SPECIFICATIONS

Table 7: Environmental Specifications

Enclosure type	FLEX58 *TRX* chassis drive controller is IP00. Purchaser installation inside an enclosure.
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	FLEX58U29M2–D12M2 and FLEX58KU18N4–D23N4: Pollution degree 2 conforming to IEC 60664-1, EN50718, and NEMA ICS-1. FLEX58D16M2–D46M2 and FLEX58KD28N4–D79N4: Pollution degree 3 according to IEC 60664-1, EN50718, and NEMA ICS-1. 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 a heating system if there is possible condensation.
User-supplied enclosure maximum ambient temperature	Storage: -13 to +149 °F (-25 to +65 °C) Operation: +14 to +104 °F (-10 to +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 heatsink fins vertical.

Table 8: Electrical Specifications

Input voltage	208 V ±10% 230 V ±10% 460 V ±10%
Input frequency	60 Hz ±5%
Output voltage	Three-phase output, maximum voltage equal to input voltage
Galvanic isolation	Galvanic isolation between power and control (inputs, outputs, and power supplies)
Output frequency	0.1 to 500 Hz (factory setting of 60 Hz maximum)
Switching frequency	All FLEX58 *TRX* chassis drive controllers ship from the factory set for variable torque at 8 kHz. The ratings published in this instruction bulletin and listed on the nameplate are based on: Variable torque at 8 kHz Constant torque at 4 kHz Above the listed rating, select the next largest size chassis drive controller. If the duty cycle does not exceed 60% (36 seconds maximum for a 60 second cycle), this is not necessary.
Speed range	1:100 open loop (for example 0.6 Hz to 60 Hz or 5 Hz to 500 Hz)
Speed regulation	1% 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] ±0.02% of rated motor speed with optional digital I/O card and appropriate 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 wave form.
DC injection braking	Automatically on stopping as soon as frequency drops below 0.1 Hz for 0.5 seconds.
Braking torque	30% of nominal motor torque without dynamic braking (typical value). Up to 150%, for constant torque ratings, with the dynamic braking option.
Transient output current	160% of nominal NEC rated motor current for 60 seconds (for constant torque ratings). 110% of nominal motor current for 60 seconds (for variable torque ratings).
Transient motor torque	200% of nominal motor torque (typical value at ±10%) for 2 seconds. (for constant torque ratings) 170% of nominal motor torque (typical value at ±10%) for 60 seconds. (for constant torque ratings)

[1] See Appendix A for a list of accessories.

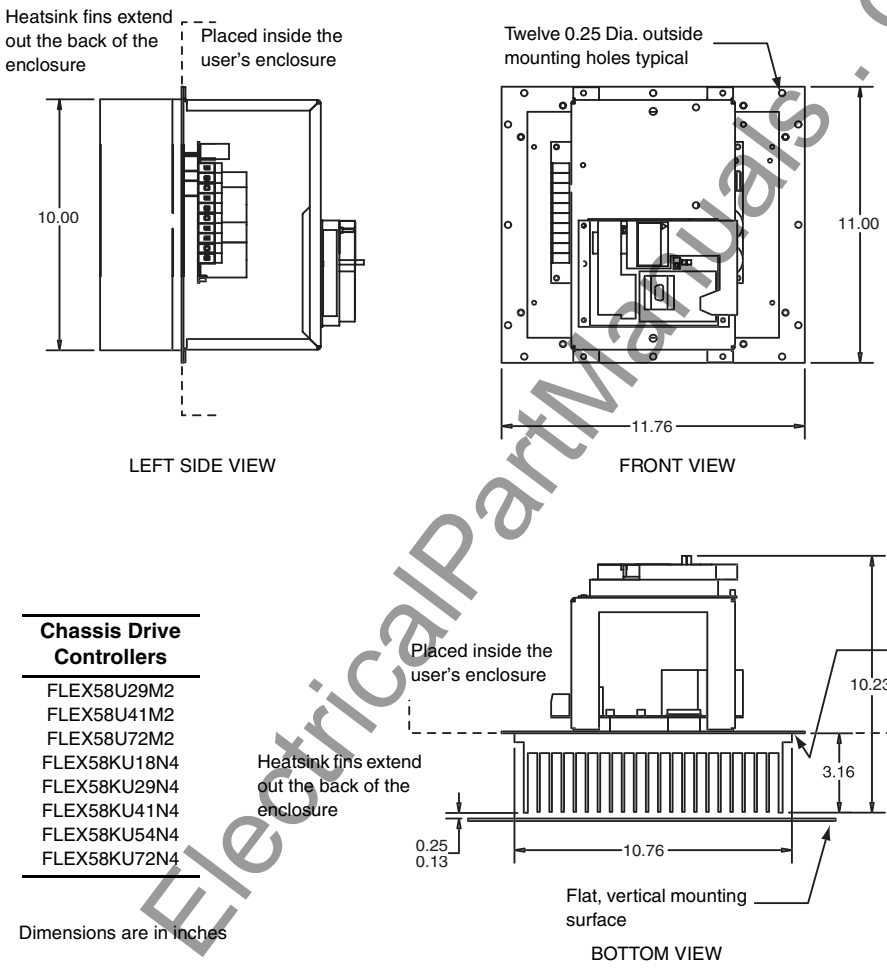
[2] Motor thermal protection can be set between 25 and 136% of the drive controller rating.

Table 8: 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.[2] 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 cUL certified Conforms to applicable NEMA ICS, NFPA, IEC, and ISO 9001 standards.

[1] See Appendix A for a list of accessories.
[2] Motor thermal protection can be set between 25 and 136% of the drive controller rating.

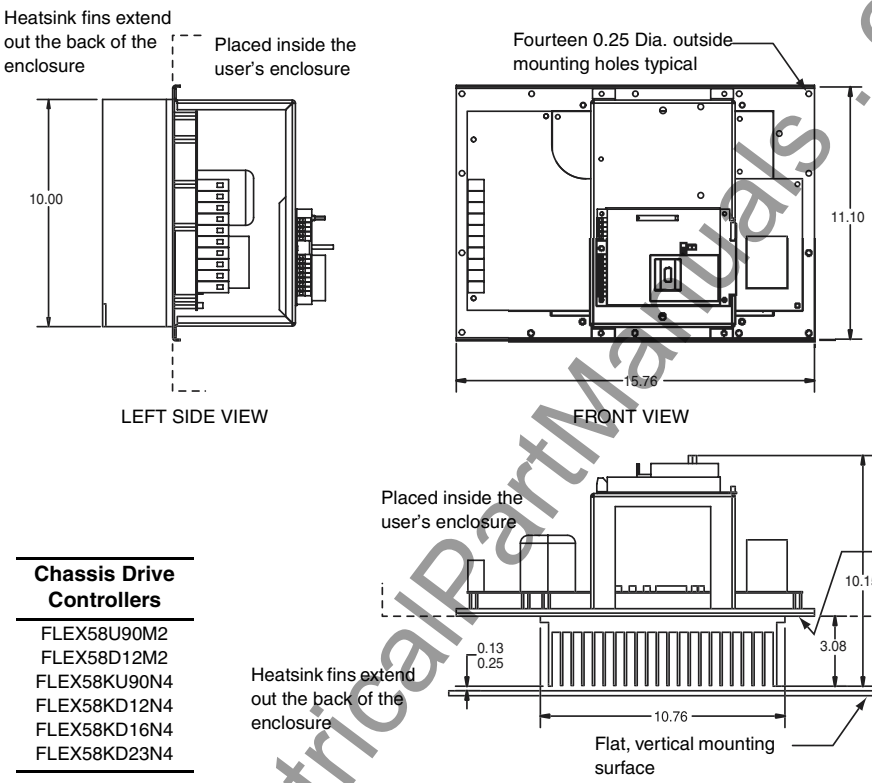
DIMENSIONS



Chassis Drive Controllers
FLEX58U29M2
FLEX58U41M2
FLEX58U72M2
FLEX58KU18N4
FLEX58KU29N4
FLEX58KU41N4
FLEX58KU54N4
FLEX58KU72N4

Dimensions are in inches

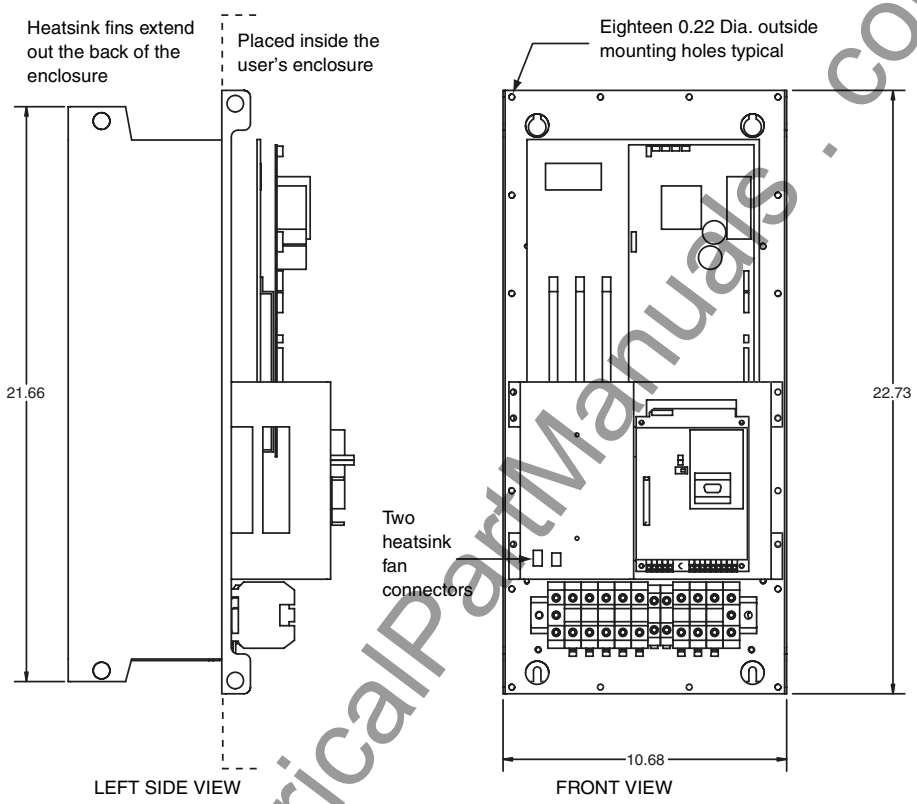
Figure 1: FLEX58U29M2–U72M2 and FLEX58KU18N4–KU72N4



Chassis Drive Controllers
FLEX58U90M2
FLEX58D12M2
FLEX58KU90N4
FLEX58KD12N4
FLEX58KD16N4
FLEX58KD23N4

Dimensions are in inches

Figure 2: FLEX58U90M2, FLEX58D12M2, and FLEX58KU90N4–KD23N4



Chassis Drive Controllers
FLEX58D16M2
FLEX58D23M2
FLEX58KD28N4
FLEX58KD33N4
FLEX58KD46N4

Dimensions are in inches

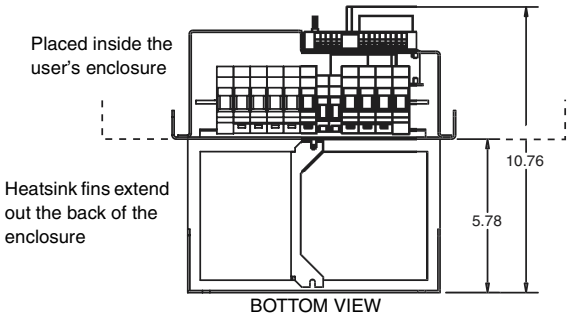
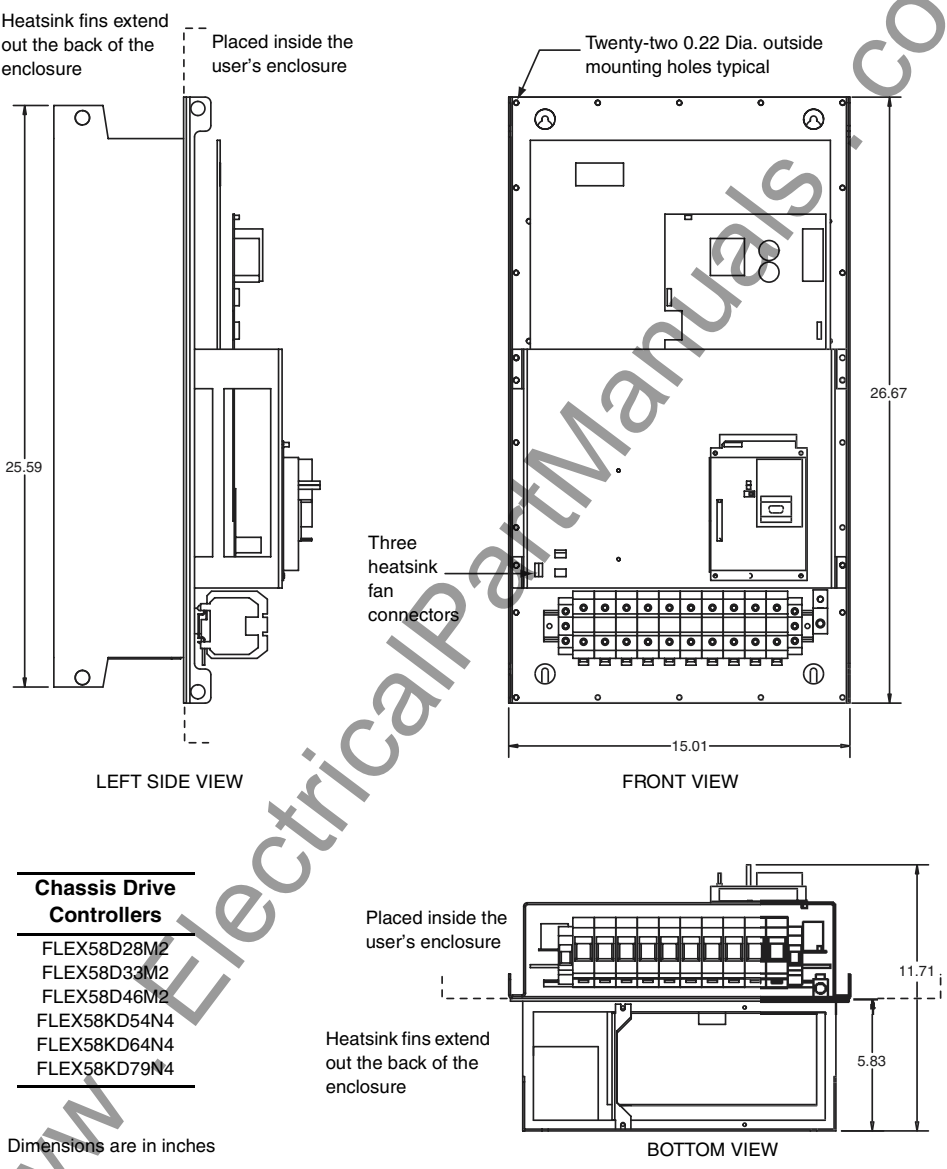


Figure 3: FLEX58D16M2, FLEX58D23M2, and FLEX58KD28N4–KD46N4



Chassis Drive Controllers
FLEX58D28M2
FLEX58D33M2
FLEX58D46M2
FLEX58KD54N4
FLEX58KD64N4
FLEX58KD79N4

Dimensions are in inches

Figure 4: FLEX58D28M2–D46M2 and FLEX58KD54N4–KD79N4

INSTALLATION PRECAUTIONS

- The FLEX58 *TRX* chassis drive controller must be installed inside an enclosure. The environment around the drive controller must not exceed pollution degree requirements as defined in NEMA ICS-1 or IEC 60664. Refer to the ambient pollution degree ratings in Table 7.
- Install the drive controller with the heatsink fins vertical and the power terminals in the orientation shown in Figures 9–12 on pages 28–31.
- 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 based on the drive controller input current.
- Overcurrent protection is required. Refer to Tables 20–25 on pages 47–50 for recommended fuses.

⚠ DANGER

HAZARDOUS VOLTAGE

Before working on this equipment:

- Turn off all power.
- 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.

- Refer to Figures 5–8 on pages 22–25 for minimum clearance and component mounting areas.
- Heatsink fans shall be properly located and connected to the FLEX58 *TRX* chassis drive controller for thermal management.
- For the FLEX58 *TRX* chassis drive controllers illustrated in Figures 3 and 4 on pages 18 and 19:

  Connect the heatsink fan connectors properly to the FLEX58 *TRX* chassis drive controller, or the controller may cycle on and off or may not function.
- For the FLEX58 *TRX* chassis drive controllers illustrated in Figures 1 and 2 on pages 16 and 17:

Mount the heatsink fins within 0.13–0.25 in. away from a flat, vertical surface. This spacing directs airflow through the fins to prevent the drive controller from overheating.

- Mount the enclosure on a flat, solid, noncombustible vertical surface.
- Use transient suppression on all inductive circuits near the drive controller or on the same circuit, such as relays, contactors, and solenoids.

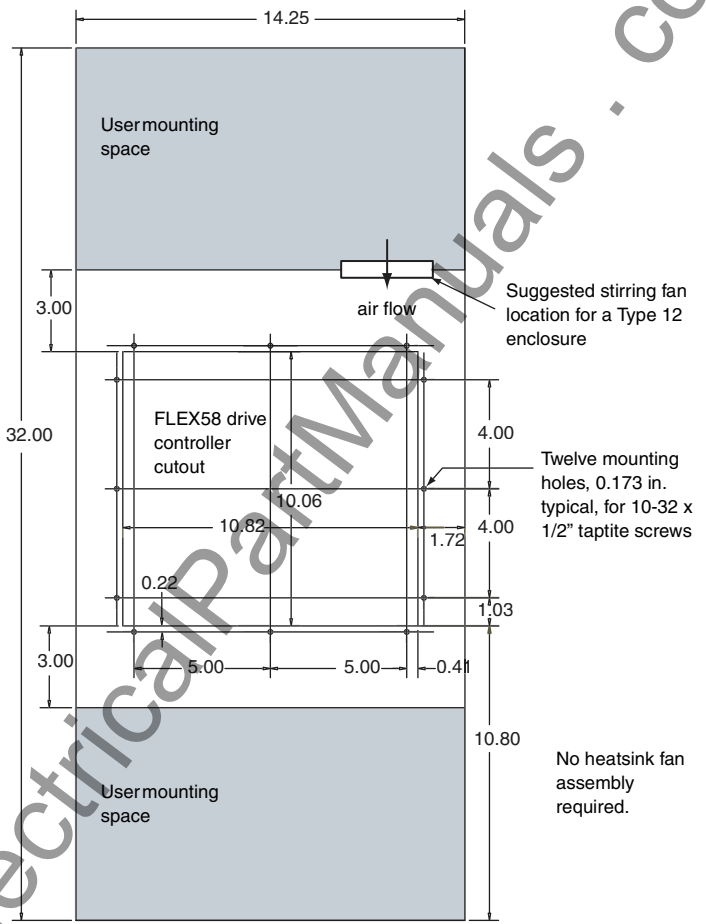
MOUNTING IN A GENERAL PURPOSE METAL ENCLOSURE

Follow the installation precautions given on page 20.

- Provide cutout and mounting holes for the FLEX58 *TRX* drive controller and heatsink fan assembly. Refer to Figures 5–8 on pages 22–25.
- If the enclosure does not provide sufficient free air flow, a stirring fan may be required. The stirring fan should provide a fan flow rate greater than or equal to 105 CFM. Figures 5–8 show suggested stirring fan locations for customer use.

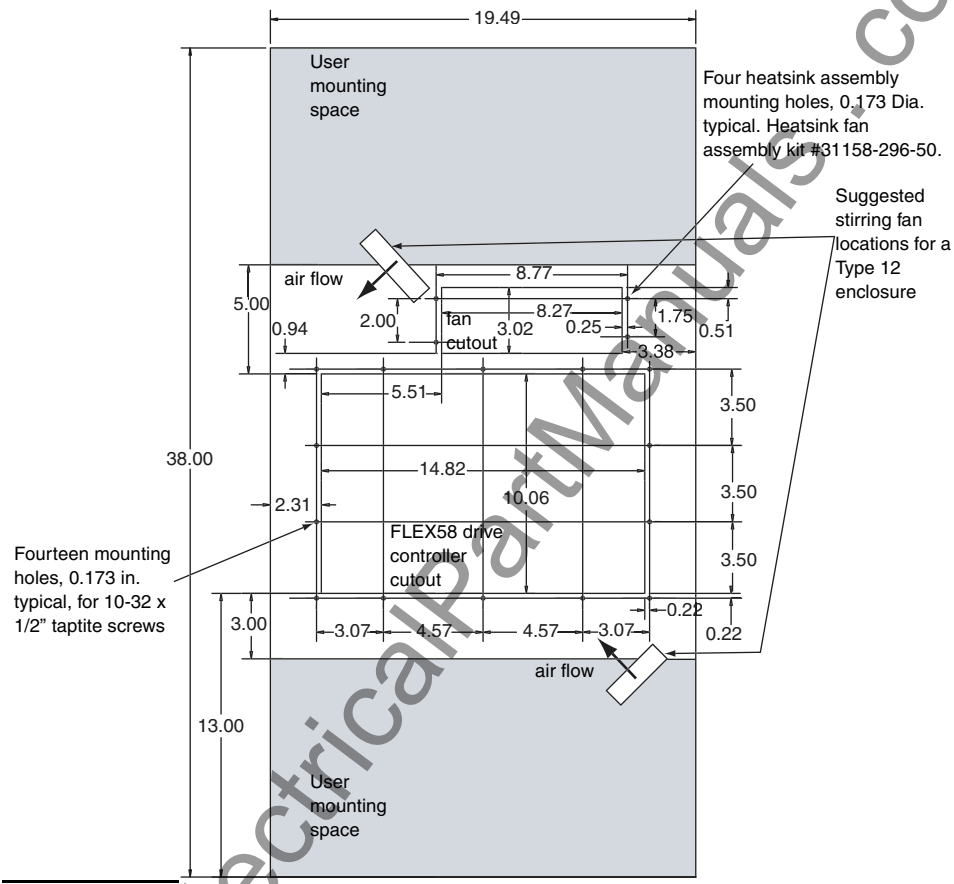
If there is a possibility of condensation, keep the control supply switched on during periods when the motor is not running, or install thermostatically controlled space heaters.

CUTOUT AND MOUNTING HOLE DIMENSIONS



Chassis Drive Controllers
FLEX58U29M2
FLEX58U41M2
FLEX58U72M2
FLEX58KU18N4
FLEX58KU29N4
FLEX58KU41N4
FLEX58KU54N4
FLEX58KU72N4

Figure 5: FLEX58U29M2–U72M2 and FLEX58KU18N4–KU72N4

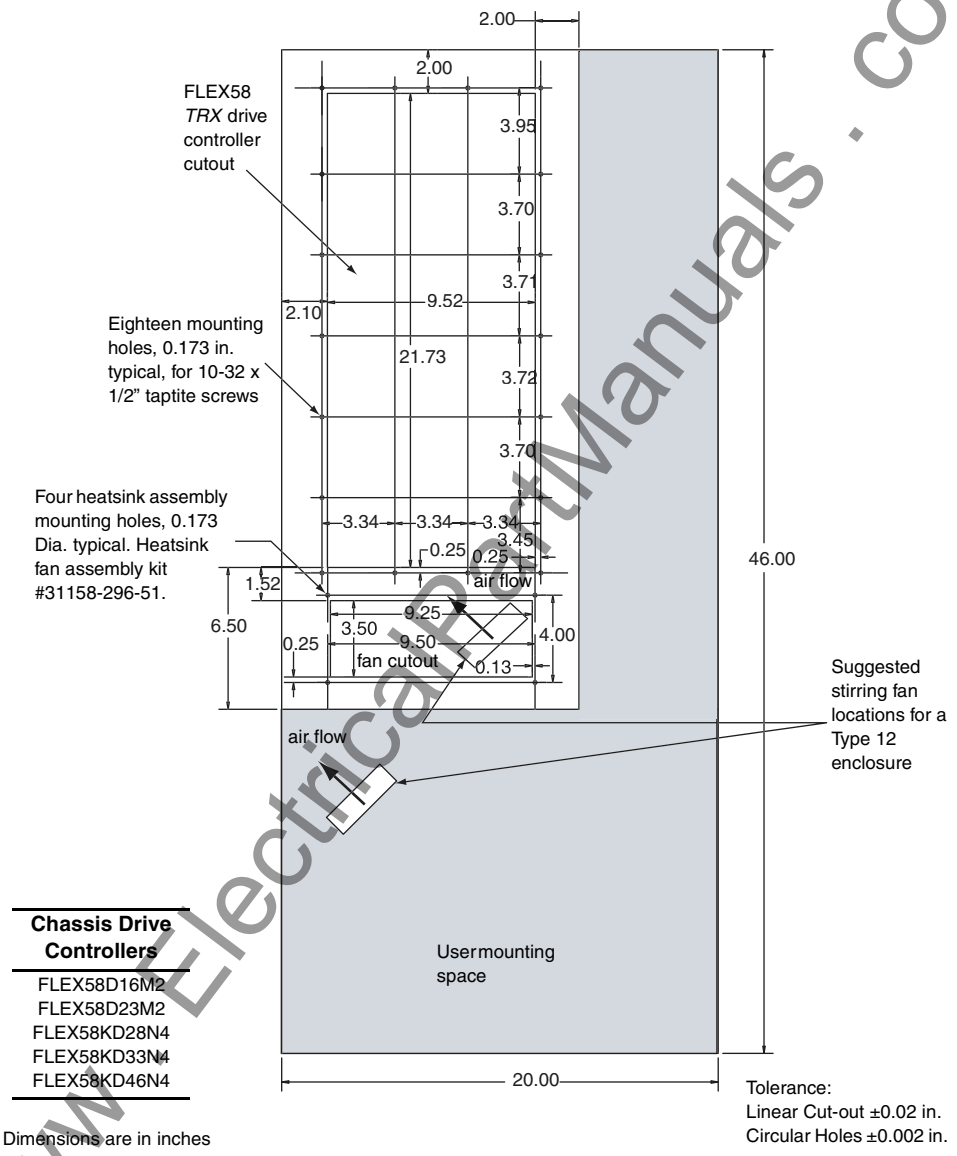


Chassis Drive Controllers
FLEX58U90M2
FLEX58D12M2
FLEX58KU90N4
FLEX58KD12N4
FLEX58KD16N4
FLEX58KD23N4

Tolerance:
Linear Cut-out ±0.02 in.
Circular Holes ±0.002 in.

Dimensions are in inches

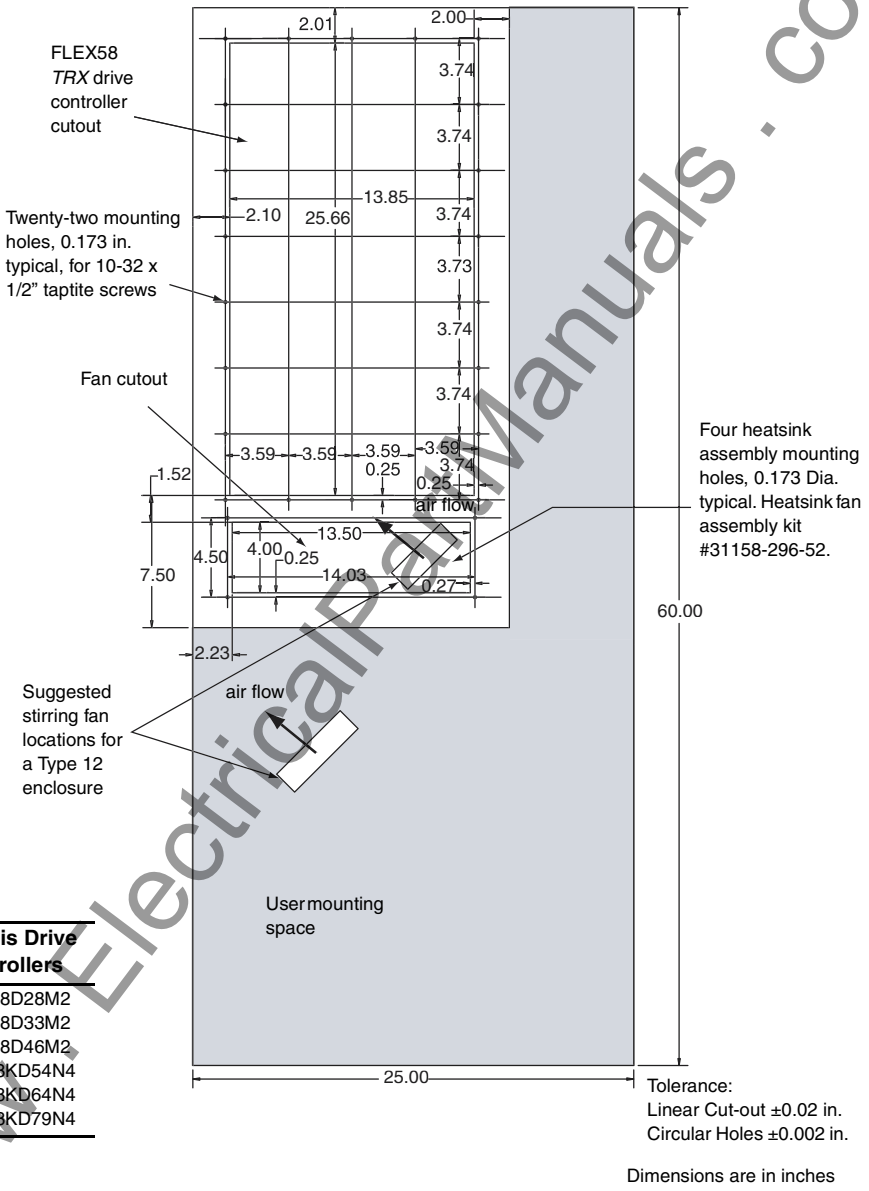
Figure 6: FLEX58U90M2, FLEX58D12M2, and FLEX58KU90N4–KD23N4



Chassis Drive Controllers
FLEX58D16M2
FLEX58D23M2
FLEX58KD28N4
FLEX58KD33N4
FLEX58KD46N4

Dimensions are in inches

Figure 7: FLEX58D16M2, FLEX58D23M2, and FLEX58KD28N4–KD46N4



Chassis Drive Controllers
FLEX58D28M2
FLEX58D33M2
FLEX58D46M2
FLEX58KD54N4
FLEX58KD64N4
FLEX58KD79N4

Figure 8: FLEX58D28M2–D46M2 and FLEX58KD54N4–KD79N4

MOUNTING IN A TYPE 12 OR IP54 METAL ENCLOSURE

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

When mounting the controller in a Type 12 or IP54 enclosure, follow the installation precautions beginning on page 20.

1. Provide cutout and mounting holes for the FLEX58 *TRX* drive controller and heatsink fan assembly. Refer to Figures 5–8 on pages 22–25.
2. Install a gasket (supplied in the heatsink fan kit) on the enclosure for the heatsink fan assembly. Refer to instruction bulletin 30072-450-46 that ships with the heatsink fan kit.
3. Install the four rubber sealing plugs included in the heatsink fan kit into the four corners of the chassis drive controller. For plug locations refer to Figures 11 and 12 on pages 30 and 31.
4. To prevent hot spots in the drive controller, use a stirring fan to circulate the air inside the enclosure. For suggested stirring fan locations refer to Figures 5–8. The stirring fan should provide a fan flow rate greater than or equal to 105 CFM. The maximum allowable temperature inside the enclosure is 60 °C. Derate the current used by 2.2% per °C above 40 °C for enclosure ambient temperatures. 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

Minimum enclosure dimensions are listed in Table 9 and Figures 5–8. Refer to Tables 1–6 on pages 7–12 for chassis drive controller dissipated watts.

Table 9: Minimum Enclosure Dimensions

Chassis Drive Controller		Height (in.)	Width (in.)	Depth (in.)	Distance Between Mounting Plate and Mounting Surface (in.)
208/230 V	460 V				
FLEX58U29M2 FLEX58U41M2 FLEX58U72M2	FLEX58KU18N4 FLEX58KU29N4 FLEX58KU41N4 FLEX58KU54N4 FLEX58KU72N4	32	14.25	8.62	3.25 [1]
FLEX58U90M2 FLEX58D12M2	FLEX58KU90N4 FLEX58KD12N4 FLEX58KD16N4 FLEX58KD23N4	38	19.49	8.62	3.25 [1]
FLEX58D16M2 FLEX58D23M2	FLEX58KD28N4 FLEX58KD33N4 FLEX58KD46N4	46	20	8.62	6
FLEX58D28M2 FLEX58D33M2 FLEX58D46M2	FLEX58KD54N4 FLEX58KD64N4 FLEX58KD79N4	60	25	8.62	6

[1] Dimension from the back of the enclosure to the flat, vertical mounting surface. Refer to Figures 1 and 2 on pages 16 and 17. This spacing directs airflow through the heatsink fins to prevent the drive controller from overheating.

WIRING

⚠ DANGER

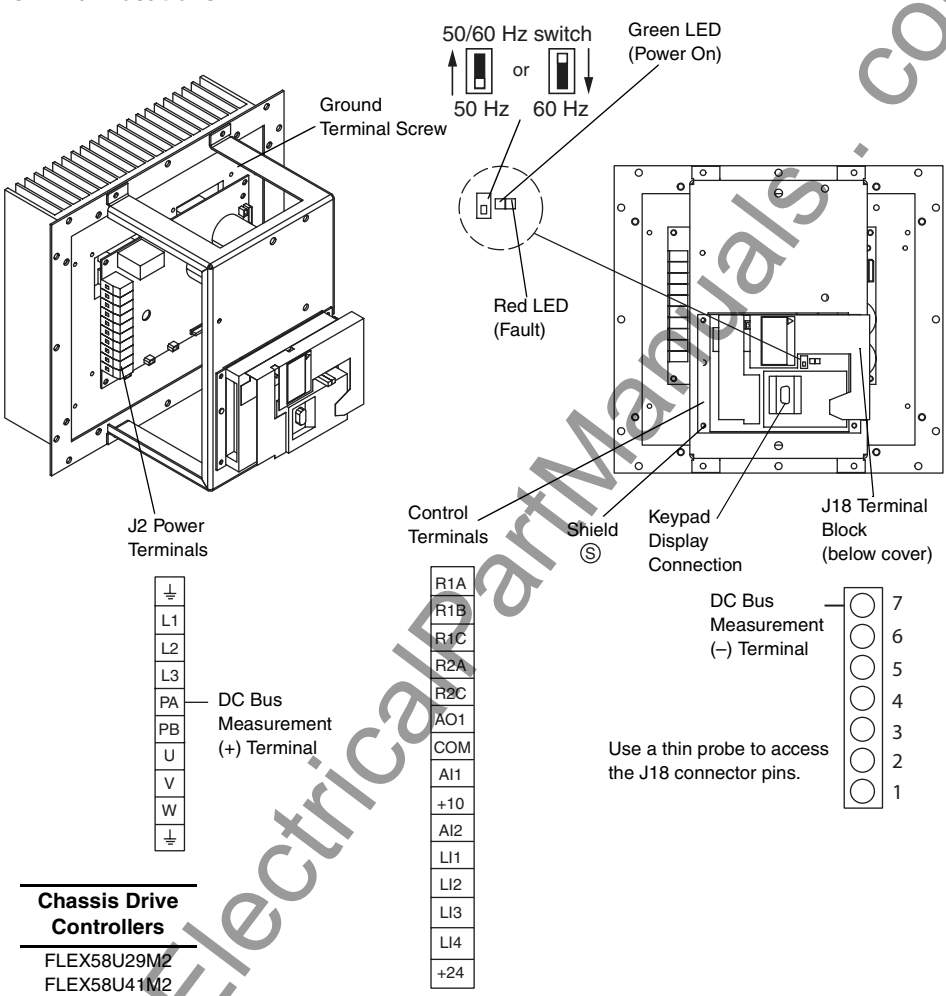
HAZARDOUS VOLTAGE

Turn off all power supplying this equipment before working on it.

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

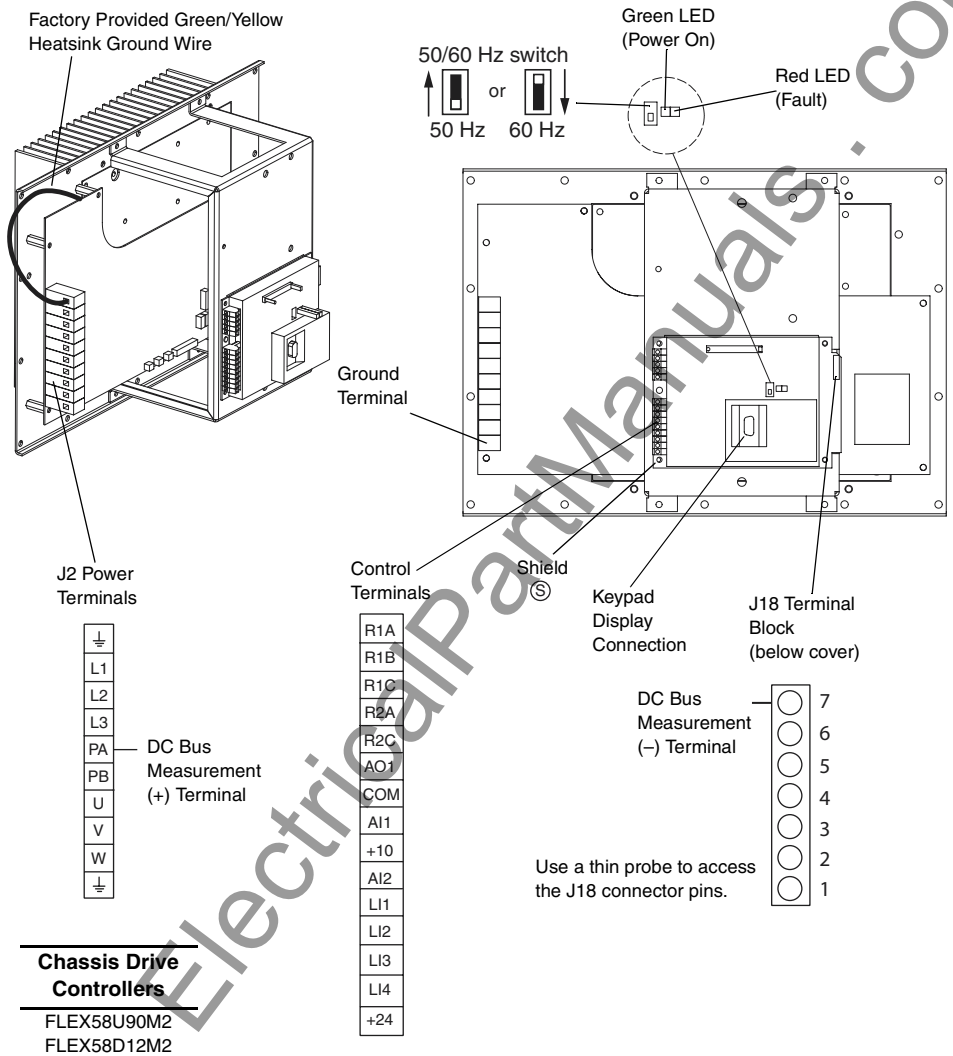
Before wiring the drive controller, first perform the bus voltage measurement procedure on page 32.

Terminal Locations



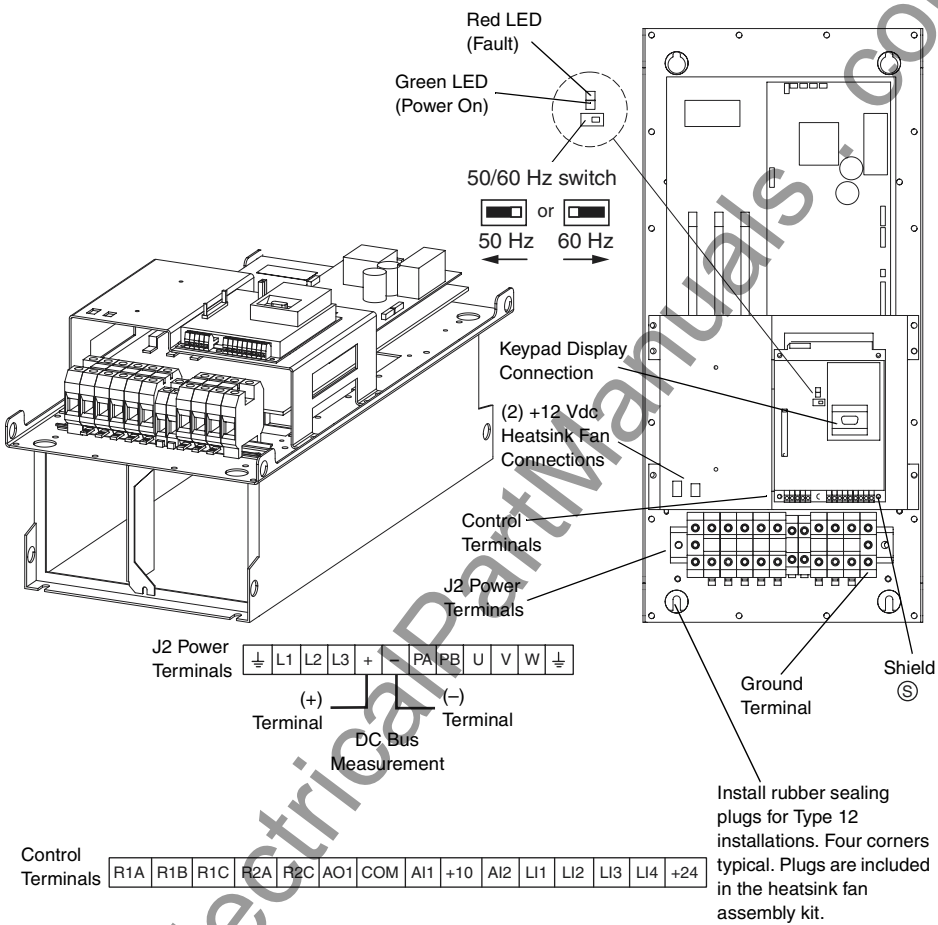
Chassis Drive Controllers
FLEX58U29M2
FLEX58U41M2
FLEX58U72M2
FLEX58KU18N4
FLEX58KU29N4
FLEX58KU41N4
FLEX58KU54N4
FLEX58KU72N4

Figure 9: FLEX53U29M2–U72M2 and FLEX58KU18N4–KU72N4



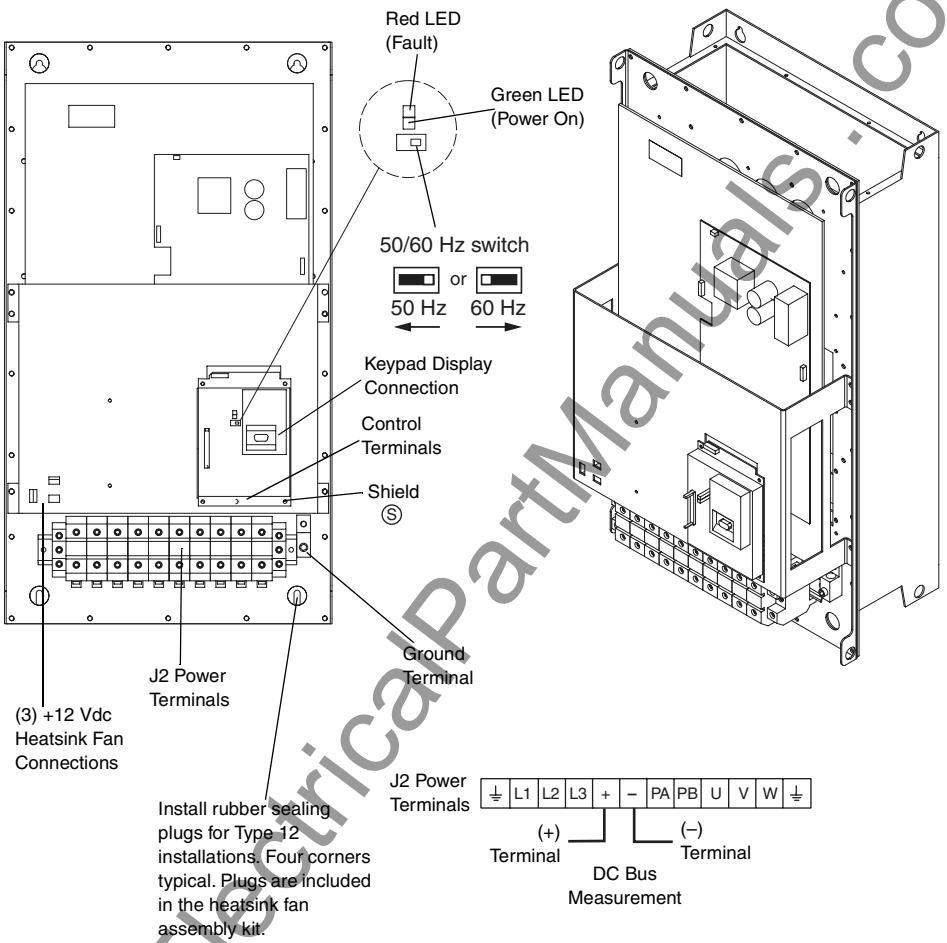
Chassis Drive Controllers
FLEX58U90M2
FLEX58D12M2
FLEX58KU90N4
FLEX58KD12N4
FLEX58KD16N4
FLEX58KD23N4

Figure 10: FLEX58U90M2, FLEX58D12M2, and FLEX58KU90N4–KD23N4



Chassis Drive Controllers
FLEX58D16M2
FLEX58D23M2
FLEX58KD28N4
FLEX58KD33N4
FLEX58KD46N4

Figure 11: FLEX58D16M2, FLEX58D23M2, and FLEX58KD28N4–KD46N4



Chassis Drive Controllers
FLEX58D28M2
FLEX58D33M2
FLEX58D46M2
FLEX58KD54N4
FLEX58KD64N4
FLEX58KD79N4

Control Terminals

R1A	R1B	R1C	R2A	R2C	AO1	COM	AI1	+10	AI2	LI1	LI2	LI3	LI4	+24

Figure 12: FLEX58D28M2–D46M2 and FLEX58KD54N4–KD79N4

Bus Voltage Measurement Procedure

⚠ DANGER

HAZARDOUS VOLTAGE

- Read and understand the bus voltage measurement procedure before performing the procedure. Measurement of 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 10. The drive controller model number is listed on its nameplate.

Table 10: (+) and (-) Measurement Points

FLEX58 *TRX* Chassis Drive Controller		Refer to Figure	(+) Measurement Point		(-) Measurement Point	
208/230 V	460 V		Terminal Block or Connector	Terminal Designation	Terminal Block or Connector	Terminal Designation
FLEX58U29M2 FLEX58U41M2 FLEX58U72M2	FLEX58KU18N4 FLEX58KU29N4 FLEX58KU41N4 FLEX58KU54N4 FLEX58KU72N4	9 on page 28	J2	PA	J18	7
FLEX58U90M2 FLEX58D12M2	FLEX58KU90N4 FLEX58KD12N4 FLEX58KD16N4 FLEX58KD23N4	10 on page 29				
FLEX58D16M2 FLEX58D23M2	FLEX58KD28N4 FLEX58KD33N4 FLEX58KD46N4	11 on page 30	J2	(+)	J2	(-)
FLEX58D28M2 FLEX58D33M2 FLEX58D46M2	FLEX58KD54N4 FLEX58KD64N4 FLEX58KD79N4	12 on page 31				

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 10 and Figures 9–12 on pages 28–31.
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.

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**
>
> **IMPROPER WIRING PRACTICES**
>
> Follow wiring practices described in this document in addition to those already required by the national Electrical Code and local electrical codes.
>
> **Failure to follow this instruction can result in injury or equipment damage.**

Follow the practices below when wiring enclosed FLEX58 *TRX* chassis drive controllers:

- 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.

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 line current of the FLEX58 *TRX* chassis drive controller, or the rated output current, whichever value is larger. The input line current of the controller depends on the impedance of the power distribution system and the available fault current at the drive controller input terminals.

Tables 11–16 on pages 36–39 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

IMPROPER OVERCURRENT COORDINATION

- Protective devices must be properly coordinated.
- The National Electrical Code requires branch circuit protection. Use the circuit breakers or fuses recommended in Tables 20 to 25 on pages 47 to 50 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 Tables 11 to 16.

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

Table 11: Input Line Currents, Constant Torque, 208 V Ratings, Three-Phase Input • Three-Phase Output, Switching Frequency: 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 208 V (hp)	Rated Output Current (A)	Input Line Current 5000 AIC 208 V (A)
FLEX58U29M2	1	4.6	4.9
FLEX58U29M2	2	7.5	9.7
FLEX58U41M2	3	10.6	13.4
FLEX58U72M2	5	16.7	22.4
FLEX58U90M2	7.5	24.2	30
FLEX58D12M2	10	30.8	39.7
FLEX58D16M2	15	46.2	42.4
FLEX58D23M2	20	59.4	58
FLEX58D28M2	25	74.8	70.2
FLEX58D33M2	30	88	82.3
FLEX58D46M2	40	114	100.8

Table 12: Input Line Currents, Constant Torque, 230 V Ratings, Three-Phase Input • Three-Phase Output, Switching Frequency: 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 230 V (hp)	Rated Output Current (A)	Input Line Current 5000 AIC 230 V (A)
FLEX58U29M2	1	4.2	4.3
FLEX58U29M2	2	6.8	8.3
FLEX58U41M2	3	9.6	11.4
FLEX58U72M2	5	15.2	19.5
FLEX58U90M2	7.5	22	26.4
FLEX58D12M2	10	28	35
FLEX58D16M2	15	42	43.1
FLEX58D23M2	20	54	58.5
FLEX58D28M2	25	68	70.4
FLEX58D33M2	30	80	82.7
FLEX58D46M2	40	104	102.2

Table 13: Input Line Currents, Variable Torque, 208 V Ratings, Three-Phase Input • Three-Phase Output, Switching Frequency: 8 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 208 V (hp)	Rated Output Current (A)	Input Line Current 5000 AIC 208 V (A)
FLEX58U29M2	1	4.6	5.3
FLEX58U29M2	2	7.5	9.4
FLEX58U41M2	3	10.6	13
FLEX58U72M2	5	16.7	21.4
FLEX58U90M2	7.5	24.2	29
FLEX58D12M2	10	30.8	38.3
FLEX58D16M2	15	46.2	42.7
FLEX58D16M2	20	59.4	55.5
FLEX58D23M2	25	74.8	67
FLEX58D28M2	30	88	80.5
FLEX58D33M2	40	114	107.6
FLEX58D46M2	50	143	134.8

Table 14: Input Line Currents, Variable Torque, 230 V Ratings, Three-Phase Input • Three-Phase Output, Switching Frequency: 8 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 230 V (hp)	Rated Output Current (A)	Input Line Current 5000 AIC 230 V (A)
FLEX58U29M2	1	4.2	4.9
FLEX58U29M2	2	6.8	8.6
FLEX58U41M2	3	9.6	11.8
FLEX58U72M2	5	15.2	19.5
FLEX58U90M2	7.5	22	26.4
FLEX58D12M2	10	28	35
FLEX58D16M2	15	42	39
FLEX58D16M2	20	54	50.5
FLEX58D23M2	25	68	61.8
FLEX58D28M2	30	80	73.3
FLEX58D33M2	40	104	97.9
FLEX58D46M2	50	130	121.2

Table 15: Input Line Currents, Constant Torque, 460 V Ratings, Three-Phase Input • Three-Phase Output, Switching Frequency: 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 460 V (hp)	Rated Output Current (A)	Input Line Current 5000 AIC 460 V (A)
FLEX58KU18N4	1	2.1	2.6
FLEX58KU29N4	2	3.4	4.5
FLEX58KU41N4	3	4.8	6
FLEX58KU72N4	5	7.6	10.1
FLEX58KU90N4	7.5	11	13.2
FLEX58KD12N4	10	14	18.2
FLEX58KD16N4	15	21	25.3
FLEX58KD23N4	20	27	32
FLEX58KD28N4	25	34	38.3
FLEX58KD33N4	30	40	44.8
FLEX58KD46N4	40	52	59.9
FLEX58KD54N4	50	65	71.4
FLEX58KD64N4	60	77	84.8 [1]
FLEX58KD79N4	75	96	103.3 [1]

[1] 10 kAIC

Table 16: Input Line Currents, Variable Torque, 460 V Ratings, Three-Phase Input • Three-Phase Output, Switching Frequency: 8 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 460 V (hp)	Rated Output Current (A)	Input Line Current 5000 AIC 460 V (A)
FLEX58KU18N4	1	2.1	2.8
FLEX58KU29N4	2	3.4	4.8
FLEX58KU41N4	3	4.8	6.5
FLEX58KU54N4	5	7.6	10
FLEX58KU72N4	7.5	11	14.3
FLEX58KU90N4	10	14	18.1
FLEX58KD12N4	15	21	25.8
FLEX58KD16N4	20	27	32.4
FLEX58KD23N4	25	34	38.9
FLEX58KD28N4	30	40	38.1
FLEX58KD33N4	40	52	49.3
FLEX58KD46N4	50	65	61.8
FLEX58KD54N4	60	77	75.2 [1]
FLEX58KD64N4	75	96	96.3 [1]
FLEX58KD79N4	100	124	122.6 [1]

[1] 10 kAIC

Output Wiring Precautions

⚠ WARNING

IMPROPER WIRING
CAN CAUSE 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 cause ground faults. For installation where cable capacitances may be a problem, installing a reactor between the drive controller and the motor will increase inductance and decrease capacitance between cable conductors.
- 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 power factor correction capacitors on output of the 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**
>
> **INSUFFICIENT OUTPUT INDUCTANCE**
>
> 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 the 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 9–12 on pages 28–31) to the power system ground conductor. Wire size is determined by the drive controller size and by national and local codes.
- Verify that the resistance to ground is one ohm or less. Improper grounding causes intermittent and unreliable operation.

> **⚠ DANGER**
>
> **HAZARDOUS VOLTAGE**
>
> Ground the equipment using the provided ground connecting point as shown in Figures 9–12 on pages 28–31. 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 13 on page 42. Use one grounding conductor per device. Do not loop ground conductors or install them in series.

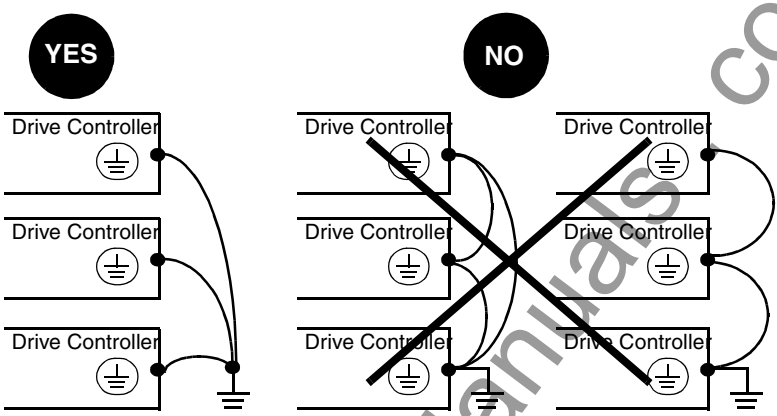


Figure 13: Grounding Multiple Drive Controllers

Power Terminals

Refer to Figures 9–12 on pages 28–31 for terminal location.

Table 17: Function of Power Terminals

Terminal	Function
⏚	Ground terminal
L1 L2	Input power
L3	
PA PB	Connection for DB resistor
U V W	Output connections to motor
⏚	Ground terminal

Table 18: Power Terminal Wire Size and Torque

FLEX58 *TRX* Chassis Drive Controller		Maximum Wire Size [1]	Torque
208/230 V	460 V	AWG (mm^2)	lb-in (N•m)
FLEX58U29M2 FLEX58U41M2	FLEX58KU18N4 FLEX58KU29N4 FLEX58KU41N4 FLEX58KU54N4	8 (6)	7.5 (0.85)
FLEX58U72M2	FLEX58KU72N4 FLEX58KU90N4	8 (6)	7.5 (0.85)
FLEX58U90M2 FLEX58D12M2	FLEX58KD12N4 FLEX58KD16N4 FLEX58KD23N4	6 (10)	20 (2.26)
FLEX58D16M2 FLEX58D23M2	FLEX58KD28N4 FLEX58KD33N4 FLEX58KD46N4	2/0 (35)	88 (10)
FLEX58D28M2 FLEX58D33M2 FLEX58D46M2	FLEX58KD54N4 FLEX58KD64N4 FLEX58KD79N4	4/0 (70)	170 (19)

[1] 75 °C copper.

Control Terminals

The control terminal strip contains two pull-apart terminal blocks, one for the relay outputs and one for the low level inputs and outputs. The S terminal is used for the shield connection. Maximum wire size for all control terminals is 14 AWG (1.5 mm^2). The tightening torque is 3.5 lb-in (0.4 N•m). Refer to Figures 9–12 on pages 28–31 for control terminal locations.

Table 19: Control Terminals Characteristics

Terminal	Function	Characteristics
R1A R1B R1C	R1A to R1C is a N.O. contact. When the drive controller is powered with no fault, the contact is closed. R1B to R1C is a N.C. contact. When the drive controller is powered with no fault, the contact is open.	Minimum: 10 mA, 24 Vdc Maximum: inductive load of 1.5 A for 250 Vac and 30 Vdc Maximum resistive load: 5 A for 250 Vac or 30 Vdc
R2A R2C	N.O. programmable relay R2	
AO1	Analog output 1 (current)	X to Y mA, with X and Y being programmable from 0 to 20 mA; Factory setting: 0 to 20 mA Impedance = 500 Ω Resolution: 0.04 mA (9 bit) Linearity: ± 0.1 mA Accuracy: ±0.2 mA Update time: 5 ms
COM	Common for logic and analog inputs	
AI1	Analog input 1 (voltage) Used for speed reference input	0 to 10 Vdc, Impedance = 30 kΩ Frequency resolution analog reference: high speed / 1024 Hz (10 bit). Accuracy ±1%, linearity ±0.5% of the maximum output frequency. Sampling time: 5 ms
+10	Supply for reference potentiometer (1 to 10 kΩ potentiometer)	10 V ± 1%, protected against short circuits and overloads 10 mA maximum
AI2	Analog input 2 (current) Used for speed reference input or feedback, depending on configuration.	X to Y mA, with X and Y being programmable from 0 to 20 mA; Factory setting: 0 to 20 mA Impedance = 100 Ω Frequency resolution analog reference: high speed / 1024 Hz (10 bit). Accuracy ±1%, linearity ±0.5% of the maximum output frequency. Sampling time: 5 ms

Table 19: Control Terminals Characteristics (Continued)

Terminal	Function	Characteristics
LI1 LI2 LI3 LI4	Logic inputs Function depends on configuration. See Table 27 on page 53 for factory settings.	Supplied by +24 Vdc State 0 if < 5 V, state 1 if > 11 V Vmax = 30 Vdc Impedance = 3.5 kΩ Sampling time: 5 ms
+24	Power supply for logic inputs	+24 Vdc protected against short circuits and overloads Minimum 20 Vdc, maximum 30 Vdc 200 mA maximum
S	Shield connection	

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

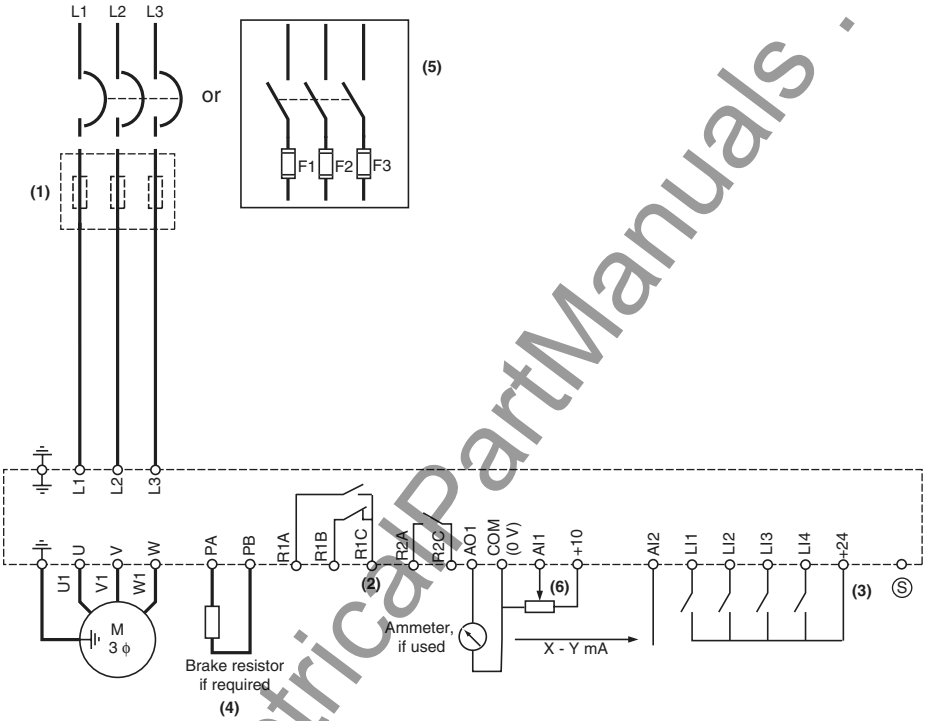
LI1 has priority:

- 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.

Three-Phase Input



(1) Line reactor if required. See catalog 8806CT9801 for recommendations.
(2) Fault relay contacts for remote signalling of the drive controller state.
Contact state shown with 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 logic inputs to external +24 V.
(4) See Appendix A for available braking resistor kits.
(5) Fuses are optional.
(6) Manual speed potentiometer (1–10 kΩ)

Figure 14: Three-Phase Wiring Diagram

RECOMMENDED CIRCUIT BREAKERS OR FUSES

The FLEX58 *TRX* chassis drive controller is rated for use with a circuit breaker or fuses. Refer to Tables 20–25 for circuit breaker part numbers, and fuse sizing.

Table 20: Circuit Breaker or Fuse Selections for 208 V Constant Torque Chassis Drive Controllers

Chassis Drive Controllers	hp	Circuit Breaker	F1-F2-F3 Fuses [1]
FLEX58U29M2	1	GJL36007M02	15
FLEX58U29M2	2	GJL36015M03	15
FLEX58U41M2	3	GJL36030M04	20
FLEX58U72M2	5	GJL36030M04	35
FLEX58U90M2	7.5	GJL36050M05	60
FLEX58D12M2	10	GJL36075M06	70
FLEX58D16M2	15	GJL36075M06	70
FLEX58D23M2	20	FAL36100-18M	90
FLEX58D28M2	25	FAL36100-18M	110
FLEX58D33M2	30	KAL36250-25M	125
FLEX58D46M2	40	KAL36250-26M	175

[1] Input power fuses are Class J or Class T fast-acting. Class CC fuses may be used if the recommended fuse rating is 30 A or lower.

Table 21: Circuit Breaker or Fuse Selections for 230 V Constant Torque Chassis Drive Controllers

Chassis Drive Controllers	hp	Circuit Breaker	F1-F2-F3 Fuses [1]
FLEX58U29M2	1	GJL36007M02	15
FLEX58U29M2	2	GJL36015M03	15
FLEX58U41M2	3	GJL36030M04	20
FLEX58U72M2	5	GJL36030M04	35
FLEX58U90M2	7.5	GJL36050M05	60
FLEX58D12M2	10	GJL36050M05	70
FLEX58D16M2	15	GJL36075M06	70
FLEX58D23M2	20	GJL36075M06	90

[1] Input power fuses are Class J or Class T fast-acting. Class CC fuses may be used if the recommended fuse rating is 30 A or lower.

Table 21: Circuit Breaker or Fuse Selections for 230 V Constant Torque Chassis Drive Controllers (Continued)

Chassis Drive Controllers	hp	Circuit Breaker	F1-F2-F3 Fuses [1]
FLEX58D28M2	25	FAL36100-18M	110
FLEX58D33M2	30	FAL36150-24M	125
FLEX58D46M2	40	KAL36250-26M	175

[1] Input power fuses are Class J or Class T fast-acting. Class CC fuses may be used if the recommended fuse rating is 30 A or lower.

Table 22: Circuit Breaker or Fuse Selections for 460 V Constant Torque Chassis Drive Controllers

Chassis Drive Controllers	hp	Circuit Breaker	F1-F2-F3 Fuses [1]
FLEX58KU18N4	1	GJL36007M02	5
FLEX58KU29N4	2	GJL36007M02	10
FLEX58KU41N4	3	GJL36015M03	12
FLEX58KU72N4	5	GJL36030M04	20
FLEX58KU90N4	7.5	GJL36030M04	25
FLEX58KD12N4	10	GJL36030M04	40
FLEX58KD16N4	15	GJL36050M05	50
FLEX58KD23N4	20	GJL36050M05	70
FLEX58KD28N4	25	GJL36075M06	70
FLEX58KD33N4	30	GJL36075M06	80
FLEX58KD46N4	40	FAL36100-18M	100
FLEX58KD54N4	50	FAL36100-18M	125
FLEX58KD64N4	60	KAL36250-25M	150
FLEX58KD79N4	75	KAL36250-26M	175

[1] Input power fuses are Class J or Class T fast-acting. Class CC fuses may be used if the recommended fuse rating is 30 A or lower.

Table 23: Circuit Breaker or Fuse Selections for 208 V Variable Torque Chassis Drive Controllers

Chassis Drive Controllers	hp	Circuit Breaker	F1-F2-F3 Fuses [1]
FLEX58U29M2	1	GJL36007M02	15
FLEX58U29M2	2	GJL36015M03	15
FLEX58U41M2	3	GJL36030M04	20
FLEX58U72M2	5	GJL36030M04	35
FLEX58U90M2	7.5	GJL36050M05	60
FLEX58D12M2	10	GJL36075M06	70
FLEX58D16M2	15	GJL36075M06	70
FLEX58D16M2	20	FAL36100-18M	90
FLEX58D23M2	25	FAL36100-18M	125
FLEX58D28M2	30	KAL36250-25M	150
FLEX58D33M2	40	KAL36250-26M	175
FLEX58D46M2	50	KAL36250-30M	200

[1] Input power fuses are Class J or Class T fast-acting. Class CC fuses may be used if the recommended fuse rating is 30 A or lower.

Table 24: Circuit Breaker or Fuse Selections for 230 V Variable Torque Chassis Drive Controllers

Chassis Drive Controllers	hp	Circuit Breaker	F1-F2-F3 Fuses [1]
FLEX58U29M2	1	GJL36007M02	15
FLEX58U29M2	2	GJL36015M03	15
FLEX58U41M2	3	GJL36030M04	20
FLEX58U72M2	5	GJL36030M04	35
FLEX58U90M2	7.5	GJL36050M05	60
FLEX58D12M2	10	GJL36050M05	70
FLEX58D16M2	15	GJL36075M06	70
FLEX58D16M2	20	GJL36075M06	90
FLEX58D23M2	25	FAL36100-18M	125
FLEX58D28M2	30	KAL36250-25M	150
FLEX58D33M2	40	KAL36250-26M	175
FLEX58D46M2	50	KAL36250-30M	200

[1] Input power fuses are Class J or Class T fast-acting. Class CC fuses may be used if the recommended fuse rating is 30 A or lower.

Table 25: Circuit Breaker or Fuse Selections for 460 V Variable Torque Chassis Drive Controllers

Chassis Drive Controllers	hp	Circuit Breaker	F1-F2-F3 Fuses [1]
FLEX58KU18N4	1	GJL36007M02	5
FLEX58KU29N4	2	GJL36007M02	10
FLEX58KU41N4	3	GJL36015M03	12
FLEX58KU54N4	5	GJL36015M03	20
FLEX58KU72N4	7.5	GJL36030M04	25
FLEX58KU90N4	10	GJL36030M04	40
FLEX58KD12N4	15	GJL36050M05	50
FLEX58KD16N4	20	GJL36050M05	70
FLEX58KD23N4	25	GJL36075M06	70
FLEX58KD28N4	30	GJL36075M06	90
FLEX58KD33N4	40	GJL36075M06	110
FLEX58KD46N4	50	FAL36100-18M	150
FLEX58KD54N4	60	FAL36100-18M	175
FLEX58KD64N4	75	KAL36250-25M	200
FLEX58KD79N4	100	KAL36250-29M	200

[1] Input power fuses are Class J or Class T fast-acting. Class CC fuses may be used if the recommended fuse rating is 30 A or lower.

USING A LINE CONTACTOR

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

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 15 shows the wiring diagram when an external supply is used.

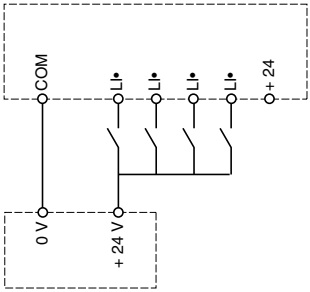


Figure 15: External Supply Wiring Diagram

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 reset after a fault, cycle the power allowing the red LED to turn off.

AVAILABLE MOTOR TORQUE

Continuous duty:

- For self-ventilated motors, motor cooling depends on the speed.
- Continuous duty results in derating 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 500 Hz using the keypad display, handheld programmer, 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 nameplate motor speed and frequency. Consult the motor manufacturer before operating motor above rated speed.

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

The available overtorque is a function of the motor design category. For typical NEMA Design B motors, the FLEX58 *TRX* chassis drive controller can deliver 200% of the nominal motor torque for 2 seconds, and 170% for 60 seconds.

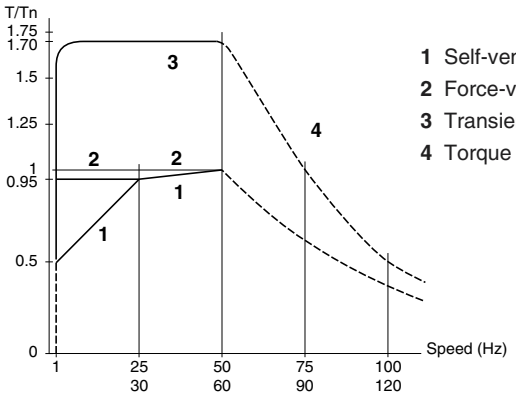
Motor power rating must be at least 25% of drive controller rated power for the drive controller to properly operate the motor.

Figure 16 on page 53 shows the typical torque characteristics of the FLEX58 *TRX* chassis drive controller.

Table 26: Minimum Ohmic Value of Resistors

FLEX58	U29M2 U41M2	U54M2	U72M2	U72M2 D12M2	D16M2	D23M2	D28M2	D33M2	D46M2
Min. Resistance (Ω)	38	31	25	13	8	8	4	2.67	2.67

FLEX58K	U18N4, U29N4 U41N4, U54N4	U72N4	U90N4	D12N4	D16N4 D23N4	D16N4, D28N4 D33N4, D46N4	D54N4	D64N4 D79N4
Min. Resistance (Ω)	85	57	47	53	19	14	8	5



1 Self-ventilated motor, continuous duty
2 Force-ventilated motor, continuous duty
3 Transient overtorque for 60 seconds maximum
4 Torque in overspeed at constant power

Figure 16: Typical Torque Characteristics

FACTORY CONFIGURATION SETTINGS

The FLEX58 *TRX* chassis drive controller is preset for variable torque applications. The drive controller ships from the factory with the changes to settings of the variable torque macro listed in Table 27.

Table 27: Factory Settings

Menu	Code	Adj.	Description
Sup	rFr		Display Parameter: Output Frequency
Macro	CFG	VT [1]	Variable Torque Application
CtL	tCC	2W	Two Wire Control
CtL	tCt	LEL	Two Wire Control, Maintained
I-O	NST	LI2	Freewheel Stop
I-O	RFC	LI3	Reference Switching, Auto/Manual
I-O	RST	LI4	Fault Reset
I-O	RUN	R2	Drive Controller Running
SEt	ACC	10	Acceleration Time, In Seconds
SEt	dEC	10	Deceleration Time, In Seconds
SEt	LSP	3	Low Speed, In Hz
drC	SFt	HFI	High Switching Frequency w/Foldback
drC	SFr	8	8 kHz Switching Frequency
FLt	FLr	Yes	Catch on Fly

[1] After programming is complete, Macro description will read “Customized”.

START UP

⚠ DANGER

HAZARDOUS VOLTAGE

- Read and understand this bulletin in its entirety before installing or operating FLEX58 *TRX* chassis drive controllers. Installation, adjustment, repair, and maintenance of the drive controllers must be performed by qualified personnel.
- 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.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Before servicing the drive controller:
  - — Disconnect all power including external control power that may be present before servicing the drive controller.
  - — Place a “DO NOT TURN ON” label on the drive controller disconnect.
  - — Lock the disconnect in open position.
  - — WAIT TEN MINUTES for the DC bus capacitors to discharge. Then follow the DC bus voltage measurement procedure on page 32 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.
- Install and close all covers before applying power or starting and stopping the drive controller.

Electrical shock will result in death or serious injury.

The FLEX58 *TRX* chassis drive controller has been configured at the factory. Refer to Table 27 on page 53 for factory settings. Minor adjustments to complete the field installation may be required based upon the application requirements. Verify that the 50/60 Hz switch is in the 60 Hz position. Refer to Figures 9–12 on pages 28–31 for location and switch position.

A keypad display must be used to perform the initial startup procedure. The keypad display must be in Total Unlock position to perform any drive controller programming. The keypad display access switch is located on the back of the keypad display. To set the keypad display to Total Unlock, move the switch all the way to the right. To lock the keypad display after programming, move the switch all the way to the left.

If the FLEX58 *TRX* chassis drive controller is a replacement, the programming parameters must be reset.

In addition, after installing an option card, previously-saved parameters downloaded from the keypad display or PC software will not be correct because they do not include the additional parameters available with the card.

NOTE: The factory program can be saved in the keypad display. Refer to instruction bulletin VVDED397047US, ALTIVAR 58 Adjustable Speed Drive Controllers Keypad Display VW3A58101 *for saving and retrieving factory settings.*

Consult the documentation provided with the keypad display to start up and maintain the drive controller. Also, consult the provided documentation if installing an option card.

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 the 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 and the fault relay deenergizes.

After performing the “Bus Voltage Measurement Procedure” on page 32, check the supply voltage (Procedure 1 on page 56) and the peripheral components (Procedure 2 on page 56).

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, VVDED397047US.

Procedure 1: Checking Supply Voltage

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

1. Perform the bus voltage measurement procedure on page 32.
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 fuse or circuit breaker may have tripped.
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 U, V, or W. Do not connect the high potential dielectric test equipment or insulation resistance tester 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**
>
> **DIELECTRIC TESTS, WHEN CONNECTED, CAN CAUSE EQUIPMENT DAMAGE**
>
> 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

The first fault detected is saved and displayed on the keypad display if power is maintained. The drive controller trips and the fault relay opens.

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 controller can be automatically restarted after the cause of the fault has disappeared.

APPENDIX A: OPTIONS AND ACCESSORIES

The following table shows the accessories available for FLEX58 *TRX* chassis drive controllers.

Catalog No.	Description
VW3A8104	PowerSuite Test & Commissioning Software on CD for use with Microsoft® Windows 95, 98, and NT™ and Windows CE v3.0 for Pocket PCs
VW3A8108US	PowerSuite Pak includes: HP® JORNADA® 525, PowerSuite CD VW3A8104, and connection cable VW3A8111
VW3A8111	Cable and RS-232 to RS-485 adaptor for connection of an HP JORNADA 525 Pocket PC to an ATV58 controller
VW3A58101U	Keypad Display
VW3A58103	Remote Mounting Kit for Keypad (IP65 rated)
VW3A58201U	Analog I/O Option Card
VW3A58202U	Digital I/O Option Card
VW3A58210U	Pump Switching Card
VW3A58253U	General Purpose Option Card
VW3A58301U	FIPIO® Communication Card
VW3A58302U	MODBUS® Plus Communication Card
VW3A58303U	MODBUS/UNITELWAY™ Communication Card
VW3A58304EU	Interbus S Communication Card. Requires external power supply.
VW3A58306U	RS-485 Cable w/ MODBUS Mapping Guide
VW3A58307U	Profibus DP Communication Card
VW3A58701	DB Transistor for ATV58HU09M2 and U18M2
VW3A66711	DB Resistor Kit for ATV58HU09M2, U18M2, U18N4 to U72N4
VW3A66712	DB Resistor Kit for ATV58HU29M2, U41M2, U90N4, D12N4
VW3A66713	DB Resistor Kit for ATV58HU54M2, U72M2, D16N4, D23N4
VW3A66714	DB Resistor Kit for ATV58HU90M2, D12M2, and D28N4 to D46N4
VW3A66715	DB Resistor Kit for ATV58HD16M2, D23M2, D54N4
VW3A66716	DB Resistor Kit for ATV58HD28M2, D33M2, D46M2, D64N4, and D79N4
31158-296-50	FLEX58 *TRX* Heatsink Fan Kit Assembly (see table on next page)
31158-296-51	FLEX58 *TRX* Heatsink Fan Kit Assembly (see table on next page)
31158-296-52	FLEX58 *TRX* Heatsink Fan Kit Assembly (see table on next page)
31158-297-50	0–10 V Converter

The following ALTIVAR accessories are not compatible with the FLEX58 *TRX* Chassis Drive Controller:

- Fan Kits VW3A58821, VW3A58822, VW3A58823, VW3A58824, VW3A58825, and VW3A58826
- EMC Kits VW3A58831, VW3A58832, VW3A58833, and VW3A58834
- Conduit Box Kit VW3A58842, VW3A58843, VW3A58844, VW3A58845, VW3A58846, and VW3A58847

Heatsink Fan Assembly Selection

FLEX58 *TRX* Chassis Controller		Heatsink Fan Assembly Kit
208/230 V	460 V	
FLEX58U29M2 FLEX58U41M2 FLEX58U72M2	FLEX58KU18N4 FLEX58KU29N4 FLEX58KU41N4 FLEX58KU54N4 FLEX58KU72N4	N/A
FLEX58U90M2 FLEX58D12M2	FLEX58KU90N4 FLEX58KD12N4 FLEX58KD16N4 FLEX58KD23N4	31158-296-50
FLEX58D16M2 FLEX58D23M2	FLEX58KD28N4 FLEX58KD33N4 FLEX58KD46N4	31158-296-51
FLEX58D28M2 FLEX58D33M2 FLEX58D46M2	FLEX58KD54N4 FLEX58KD64N4 FLEX58KD79N4	31158-296-52

APPENDIX B: DRIVE CONTROLLER ACCESSORY CROSS-REFERENCE

The following table shows which FLEX58 *TRX* chassis drive controller spare parts and accessories are comparable to the following ALTIVAR 58 open drive controller spare parts and accessories.

Table 1: AC Drive Controller Cross-Reference

ATV58 *TRX* Open	FLEX58 *TRX* Chassis
ATV58HU29M2	FLEX58U29M2
ATV58HU41M2	FLEX58U41M2
ATV58HU54M2	N/A
ATV58HU72M2	FLEX58U72M2
ATV58HU90M2	FLEX58U90M2
ATV58HD12M2	FLEX58D12M2
ATV58HD16M2	FLEX58D16M2
ATV58HD23M2	FLEX58D23M2
ATV58HD28M2	FLEX58D28M2
ATV58HD33M2	FLEX58D33M2
ATV58HD46M2	FLEX58D46M2
ATV58HU18N4	FLEX58KU18N4
ATV58HU29N4	FLEX58KU29N4
ATV58HU41N4	FLEX58KU41N4
ATV58HU54N4	FLEX58KU54N4
ATV58HU72N4	FLEX58KU72N4
ATV58HU90N4	FLEX58KU90N4
ATV58HD12N4	FLEX58KD12N4
ATV58HD16N4	FLEX58KD16N4
ATV58HD23N4	FLEX58KD23N4
ATV58HD28N4	FLEX58KD28N4
ATV58HD33N4	FLEX58KD33N4
ATV58HD46N4	FLEX58KD46N4
ATV58HD54N4	FLEX58KD54N4
ATV58HD64N4	FLEX58KD64N4
ATV58HD79N4	FLEX58KD79N4

Numerics

A

B

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D

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H

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K

L

M

O

P

FLEX58 *TRX* Chassis Drive Controller

30072-450-47A

Square D
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www.SquareD.com

Bulletin No. 30072-450-47A dated July 2002 replaces 30072-450-47 dated 07/2001