

Installation manual

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Powering Business Worldwide

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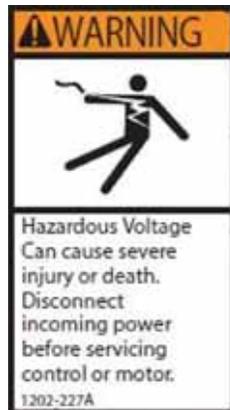
The information contained in this manual is subject to change without notice.

Cover Photo: PowerXL EHB, EHC, EHD enclosed family

Safety

Read and follow all safety information shown in the Installation Manual included in the documentation packet provided with each unit.

⚠ WARNING
DISCONNECT INCOMING POWER BEFORE SERVICING THIS CONTROL OR MOTOR.



Operation of this equipment requires detailed installation and operation instructions. This information is included in the documentation packet supplied with the unit. It should be retained with this device at all times. A hard copy of this information may be ordered at Eaton.com.

⚠ DANGER
RISK OF ELECTRIC SHOCK—WAIT 10 MINUTES BEFORE SERVICING TO ALLOW BUS CAPACITORS TO DISCHARGE.

⚠ DANGER
HIGH VOLTAGE
ALLOW 10 MINUTES FOR BUS CAPACITORS TO DISCHARGE BEFORE SERVICING UNIT.

⚠ DANGER
HEUTE TENSION
ATTENDRE 10 MINUTES POUR PERMETTRE AUX CONDENSATEURS DE SE DÉCHARGER AVANT L'ENTRETIEN

⚠ WARNING
THE OPENING OF THE BRANCH-CIRCUIT PROTECTIVE DEVICE MAY BE AN INDICATION THAT A FAULT CURRENT HAS BEEN INTERRUPTED. TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, CURRENT-CARRYING PARTS AND OTHER COMPONENTS OF THE CONTROLLER SHOULD BE EXAMINED AND REPLACED IF DAMAGED. FOR BYPASS DESIGNS, IF A BURNOUT OF THE CURRENT ELEMENT OF THE OVERLOAD RELAY OCCURS, THE COMPLETE OVERLOAD RELAY MUST BE REPLACED.

⚠ WARNING
DISCONNECT HANDLE LOCKOUT!
ON SOME UNITS RATED 100 A OR LESS THAT USE A DISCONNECT SWITCH AND FUSES AS THE BRANCH CIRCUIT PROTECTION AND THE SHO TYPE OPERATOR HANDLE (SEE PICTURE), THE PADLOCK FEATURE IN THE HANDLE DOES NOT PREVENT THE DOOR FROM OPENING OR COVER FROM BEING REMOVED. THESE UNITS ARE LABELED WITH A WARNING LABEL.



⚠ WARNING
Lockout on handle will not prevent opening door or removing cover.
⚠ AVERTISSEMENT
Verrouillage sur la poignée n'empêchera pas d'ouvrir la porte ou d'enlever le couvercle.
30-48226

General design

There are three product families: EHC, EHD and EHB. All products are enclosed VFDs that convert 3-phase AC input power into 3-phase output power for controlling motors. Some configurations incorporate bypass circuits.

All models are enclosed in either a wall-mounted or a floor-standing enclosure using Metal or Plastic cover designs.

All models contain a short-circuit protective device, fuses, thermal-magnetic circuit breaker or compact motor controller (CMC), and an associated disconnect handle/operator.

All designs are suitable for use in compartments handling conditioned air. These devices may be marked for "Service Entrance".

Operating Mode defines the type of motor control: VFD or Bypass.

VFD is when the motor is under speed control from the VFD, Bypass is when the motor is run "across the line" at fixed/full base speed.

Control mode defines the method/source used to start the motor and control the speed of the motor when operating on the VFD. The VFD can be programmed for many methods but the default control mode is HAND-OFF-AUTO. The default setup is that the HAND-OFF-AUTO selection is made from the Keypad Buttons. Other selection programming is available.

Speed Reference defines the signal that sets the speed of the motor. This applies only when using the VFD operating mode. When in bypass mode, the motor speed is fixed at base speed.

Documentation

This document provides supplement information to open VFD Installation Manual.

Inside the enclosure or inside the shipping carton of each unit is a documentation packet that includes the electrical schematic and connection diagram, Installation Manual and other component I/Ls or warranty information for the unit.

For custom drive setup and/or operation, other documents are available for review and can be found at <http://www.eaton.com>.

- Installation manual—MN040002EN
- Quick start guide—MN040039EN
- Instruction leaflet—IL040029EN
- Application manual—MN040041EN
- Option card—MN040007EN
- Com manual—MN0400010EN

Identification

Unit ID labels

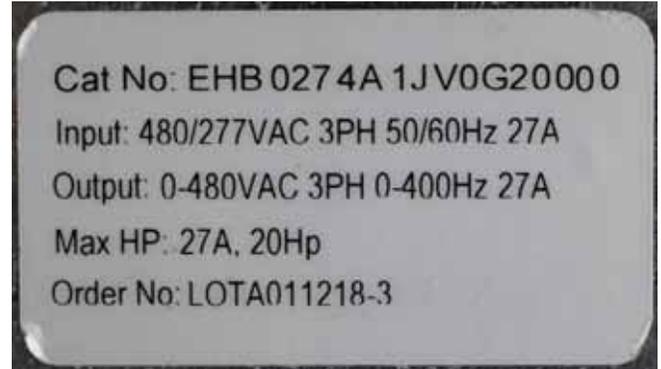
The unit is identified by a catalog number shown on a rating label located inside the door or cover.

Limited information is available under the keypad and on some models at the top of the back panel.

Figure 1. Unit ID labels (inside door)



Figure 2. Unit ID labels (back panel)

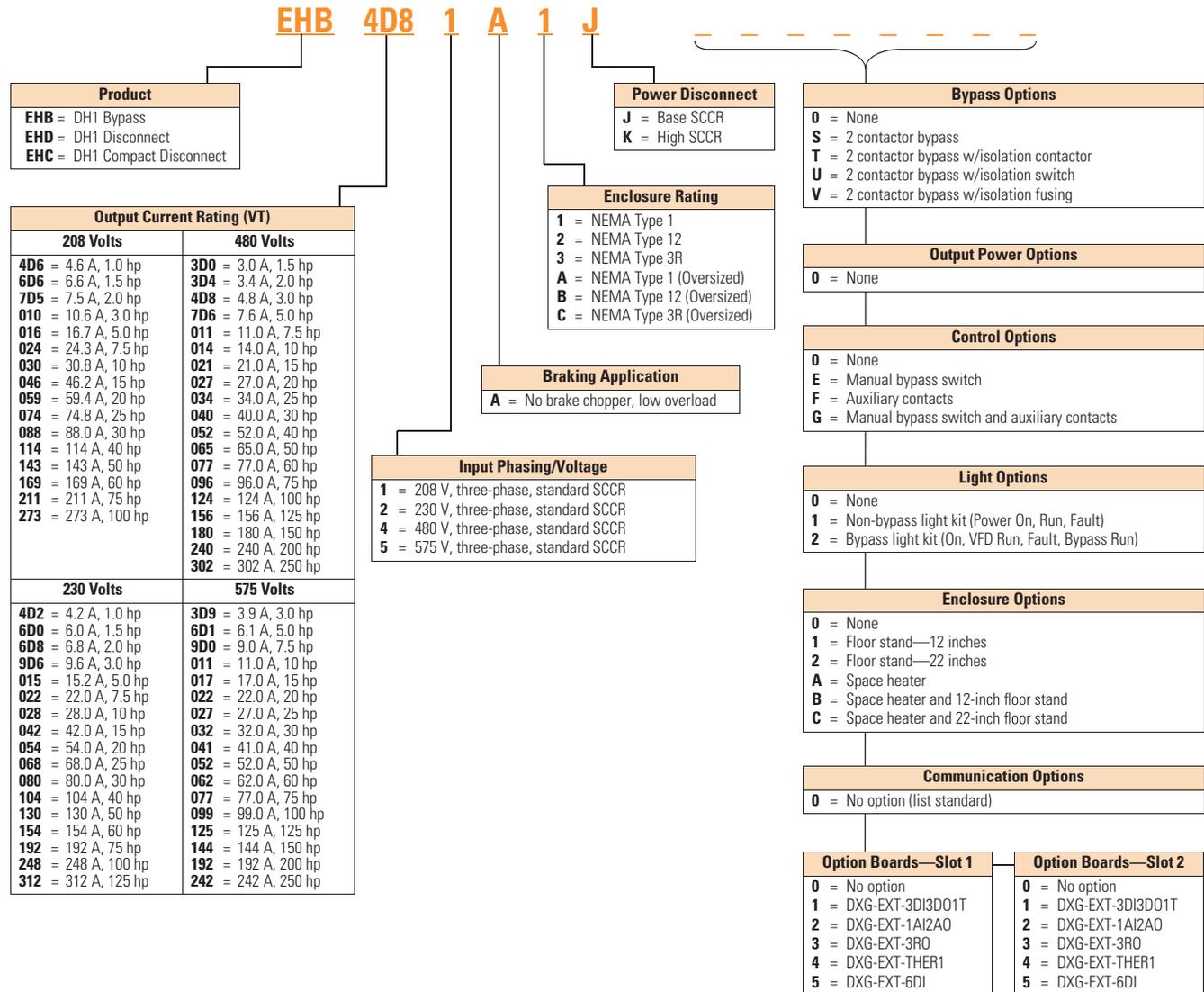


Identification

Catalog number nomenclature

Each catalog number consists of 18 digits. Each digit or combination of digits in the catalog number indicates a rating, feature or option.

Figure 3. Catalog numbering



Ratings

Electrical ratings

Input voltage (V_{IN})

Available ratings are: 208 V, 230 V, 460 V, 480Y/277 V, 575 V, and 600Y/347 V 3-phase 50/60 Hz.

Note: Not all designs are available for all voltages. In some designs the Branch Protection device requires the unit to have a slash rating instead of a straight rating.

Output voltage (V_{OUT})

Output range from 0 to input voltage (V_{in}) rating.

Output amps

Max output range 3 to 312 Amp based on Model and Input voltage ratings.

Output frequency

0–320 Hz

Short-circuit interrupting rating

See unit nameplate for SCCR ratings based on components used.

Additional branch circuit protection must be provided in accordance with the National Electrical Code® and any local codes, or equivalent.

Environmental ratings

Type 1, 3R or 12.

Maximum ambient operating temperature: 40 °C

Storage temperature: –40 to +70 °C

Product family/design type

Product family/design type

The designs are defined in the catalog number nomenclature.

EHB = Bypass Design using Eaton DH1 VFD

EHD = Disconnect Design using Eaton DH1 VFD

EHC = Compact Design using Eaton DH1 VFD

Note: Not all designs are available for all voltages.

Compact design—product family EHC

Contains a component VFD mounted directly to another enclosure that contains the main disconnect and other components.

Input Device Choices: CB or Non-fusible disconnect with separately mounted fuses

Operator Controls: None—No local operator control elements. Control from the VFD Keypad only

Operation Modes: VFD only, no bypass

Control mode: STD HOA operation via the VFD keypad and remote elements/signals.

Speed Ref for VFD: HOA operation: via VFD keypad or remote speed signal wired to VFD logic PCB

Disconnect design—product family EHD

Contains a component VFD installed within an enclosure that contains the main disconnect and other components.

Input Device Choices: MMP, CB or Non-fusible disconnect with separately mounted fuses

Operator Controls: No local operator control elements—Control from the VFD Keypad only

Light Option: Multi-color Light option: Run, Fault and Power On indications

Operation Modes: VFD only, no bypass

Control Modes: Start/Stop of VFD: Via the VFD Keypad Hand- keys and remote run contact wired directly to logic PCB

Speed Ref for VFD: HOA operation: via VFD keypad or remote speed signal wired to VFD logic PCB

Bypass design—product family EHB

Contains a VFD drive with a 24 Vdc bypass control circuit. Includes 24 Vdc power supply and 24 Vdc VFD output and bypass contactors.

Input Device Choices: MMP, CB, Non-fusible disconnect with separately mounted fuses

Operator Controls: VFD Keypad only. Optional: 3-position VFD-OFF-BYPASS selector switch and VFD Keypad

Operation Modes: Without the selector switch option, the operation mode is selected by the keypad as: Bypass, Off or VFD

With the selector switch option: The mode is determined by the selector switch on the front of the unit. VFD position—the keypad determines the mode as described above. BYPASS position—Forced Bypass mode – motor starts in bypass immediately. OFF position – Force off mode

Control Modes: Start/Stop of VFD or Bypass: Via the VFD keypad HOA keys and remote run contacts wired directly to VFD logic PCB

Speed Ref for VFD: HOA operation: via VFD keypad or remote speed signal wired to VFD logic PCB

Bypass Options: VFD Isolation contactor or VFD isolation switch or VFD isolation fuses

Light option: Single Multi-color pilot light: VFD Run, VFD Fault, Bypass Run and Bypass Run and VFD faulted.

Input power, enclosure and installation notes

Input power disconnect/branch circuit protection

The BCP methods used is based on the design and SCCR option. Type E, CMC, CB and Fuses, Disconnect and Fuses are possible. See Rating Nameplate for actual SCCR and power disconnect type provided.

Note: Disconnect and fuses may be in the form of a Non-Fusible Disconnect type and separate fuses/block or a Fusible Disconnect type with fuses.

Note: The Branch circuit protection device used determines the input voltage slash or straight rating and SCCR rating.

Enclosure

There are 18 possible enclosures sizes/styles for Type 1, 12 and 3R. They are identified by the following alpha numeric/codes: H1, H1D, H1S, H2, H2D, H2S, H3, H3D, H3X, H4, H4D, AX, BX, CX, DX, DXV2, EX and FX. The size of enclosure used is based on rating and options. Not all enclosures are available for all products. The physical dimensions are based on the enclosure frame size.

See Rating Nameplate for Enclosure type provided.

Enclosure outline dimensions and mounting details

A dimensional drawing is provided inside the documentation packet with each unit. An example of each size/drawing is included at the end of this document.

Installation and mounting notes

Important notes

IMPORTANT

- Weights and lifting provisions are shown on the dimension drawing provided with the unit.
- Attach "load-rated" hooks or shackles to lifting eyes on back panel.
- Always maintain a maximum of 45 degrees between the lifting cables and the vertical plane.
- Do not pass ropes or cables through the lifting eyes as sharp edges may cause excessive wear and possible failure.
- Select or adjust rigging lengths to compensate for unequal weight distribution of the load to keep unit in the upright position.
- Spreader bar recommended for installation.

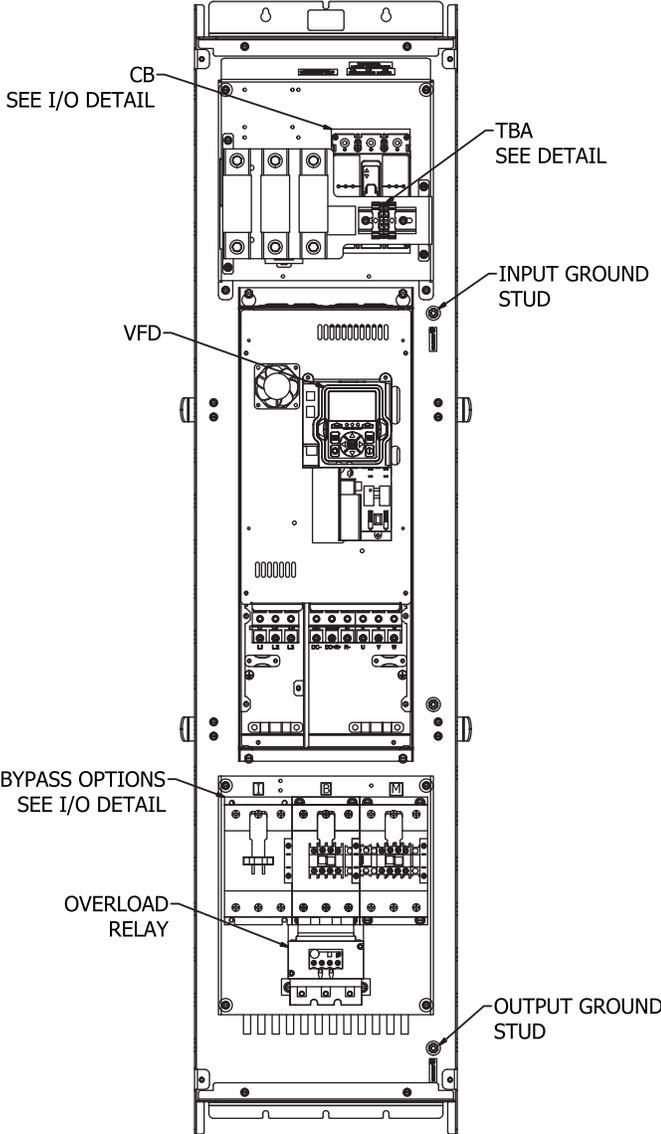
Mounting hardware

Mounting hardware is shown the drawing supplied with the unit.

Component locations

Typical locations of key components are shown on the connection diagram provided with the unit. Some examples are shown below.

Figure 4. Component locations



Wiring

A schematic and connection drawing is provided inside the documentation packet with each unit.

The drawing numbers are also shown on the unit rating plate. Examples of schematics are shown at end of section.

Important wiring notes

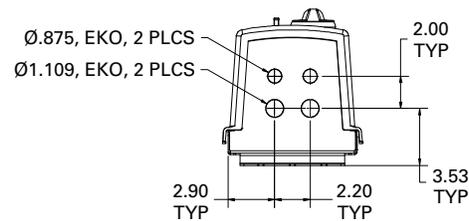
IMPORTANT

- All wires must be copper and rated 75 °C.
- See schematic provided with unit for details and control logic.
- Enclosure must be grounded using input and output studs provided.
- This equipment must be installed in compliance with the National Electrical Code and all state/local codes.
- Use multiple conduits to separate control wiring from incoming power wiring.
- Remote auto start contact and 4–20 mA auto speed signal connections are made directly to VFD control module.
- Component size and locations may be slightly different than shown.
- Motor connections that are made to VFD power terminals U, V and W, ground using clamp supplied. See VFD IL for more information.

Conduit plates

Some models have removable conduit plate for wiring ease. See outline drawing supplied with unit to determine if they have the plates. Examples below.

Figure 5. Conduit plates



Input power wiring

Input power connection are made to the disconnect device. Connect the incoming power leads to terminals L1, L2 and L3. Input wiring points have labels to help locate.

Example of labels

Figure 6. Labels

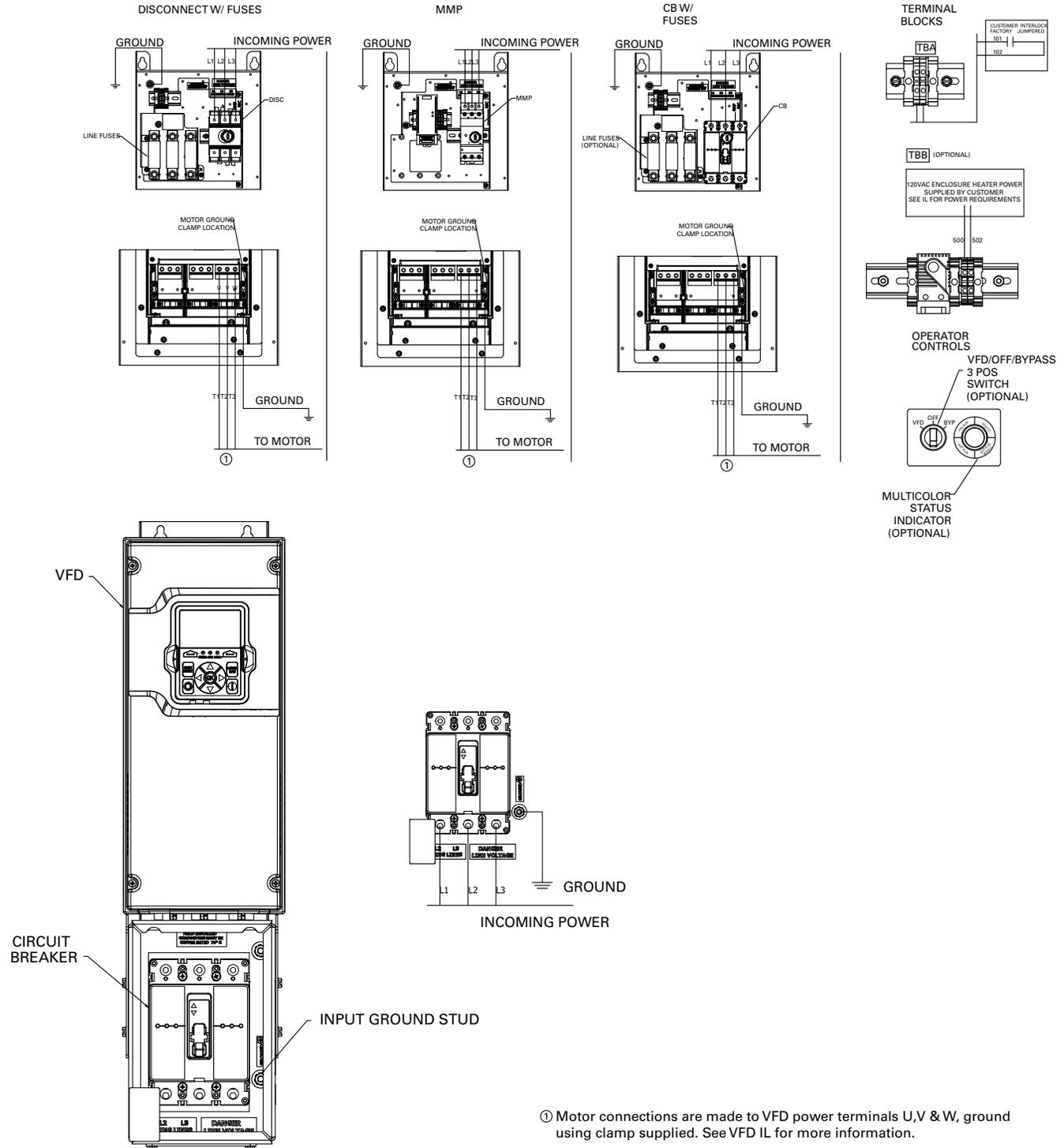


Wiring

Some examples are shown below. Actual connection points are shown on the connection diagram provided with the unit.

See technical section for TB wire range and torque information.

Figure 7. Connections



① Motor connections are made to VFD power terminals U, V & W, ground using clamp supplied. See VFD IL for more information.

Motor wiring

Disconnect models EHD/EHC wire directly to the VFD drive output.

See technical section for TB wire range, tool and torque information.

For disconnect units, also see the standard VFD Installation Manual for more details on direct connection to the VFD and VFD ground clamps.

For Bypass models, wire motor leads directly to the output contactor M, overload OL or output power TB. All bypass models have labels to help locate.

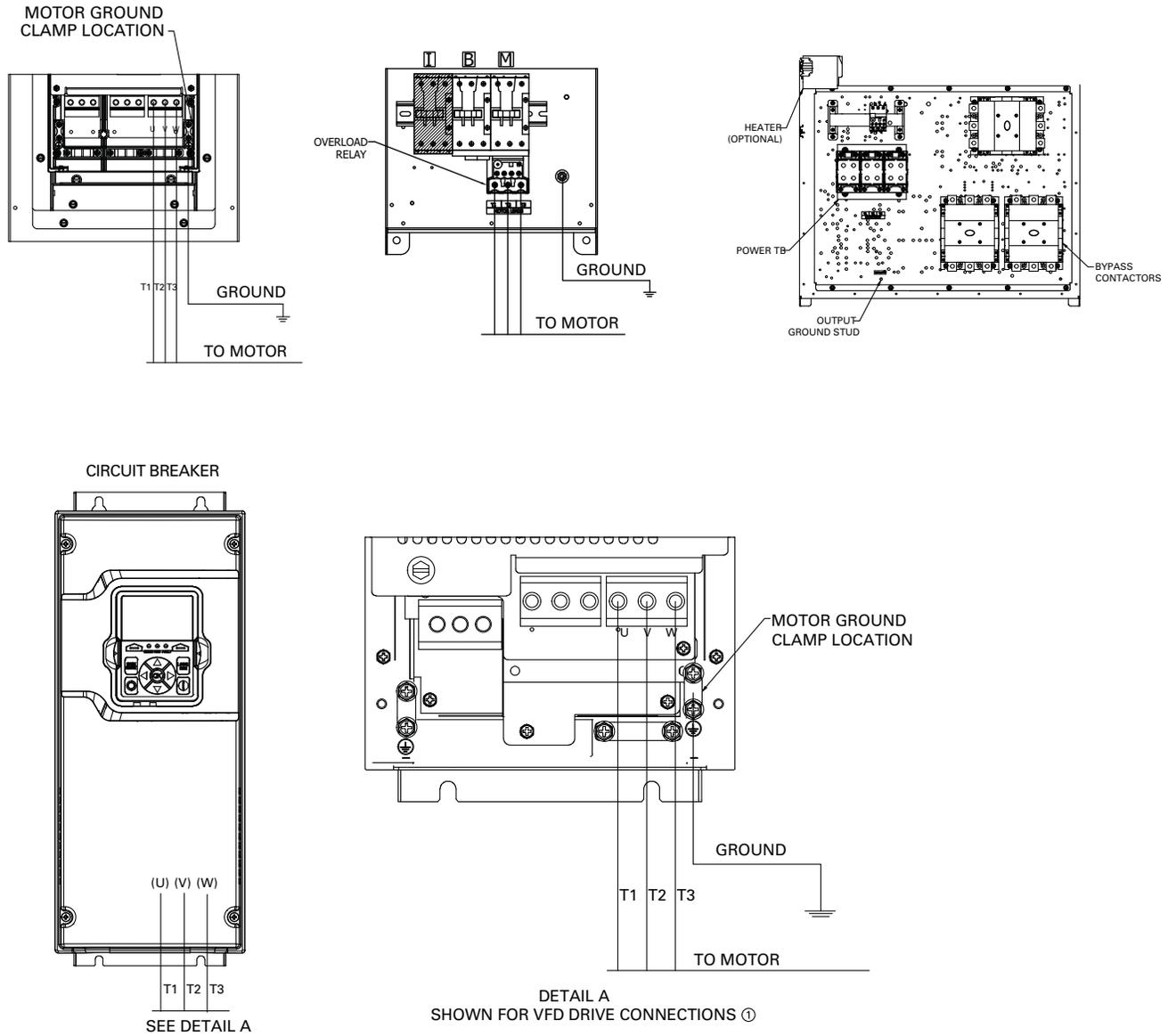
Figure 8. Bypass model labels



Wiring

Actual connections points are shown on the connection diagram provided with the unit. Some examples are shown below.

Figure 9. Bypass model connections



① Motor connections are made to VFD power terminals U, V & W, ground using clamp supplied. See VFD IL for more information.

Grounding

Input and output ground points are provided and hardware is also supplied. The locations are shown on the Connection diagrams and differ based on design, enclosure type and size.

In most designs, the grounds are also identified by a label.

Figure 10. Grounding locations



See technical section for TB wire range and torque information.

Also see the standard VFD Installation Manual for more details on direct connection to the VFD and VFD ground clamps.

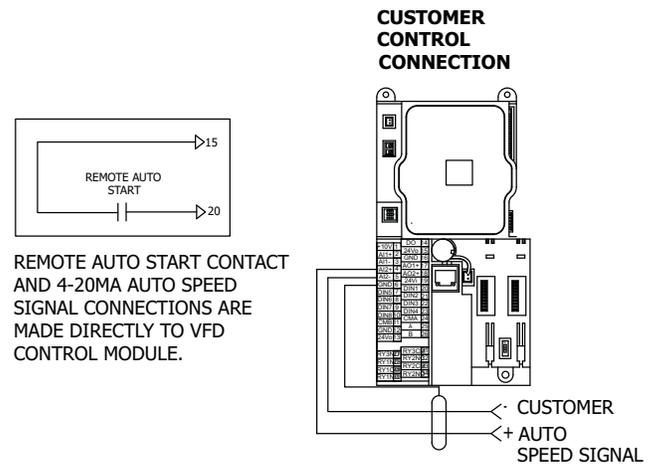
Control wiring

No additional control wiring is necessary for basic operation. See operation section for description of basic operations.

Also see schematic for Auto Start contact and Auto reference connections to control PCB terminal block if required. See diagram example below. Also see Installation and Application Manual for more information on how these features operate.

For ease of access, the control terminal blocks can be unplugged for wiring.

Figure 11. Control terminal blocks



Wiring

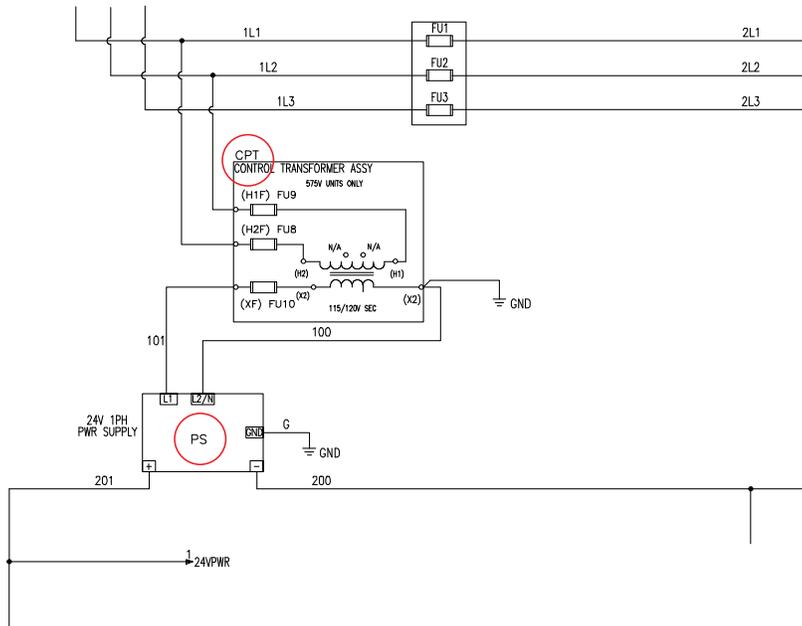
24 V power supply (PS) and control transformer CPT

All EHB bypass units have a separate 24 V power supply that provides control circuit power as well as backup power to the VFD logic. This backup power feature allows the VFD logic and keypad to remain operational when the main input power has been removed when the Isolation Contactor or Switch option is provided.

For 208/230 and 480 V models, the power supply is powered directly from the main 3-phase power. The 24 V power supply has either a 3-phase or single-phase input.

575 V bypass models have an additional control transformer and fuses (FU8, 9 and 10) to step down the line voltage to 120 Vac. A single-phase 120 Vac input supply is used.

Figure 12. Power supply and control transformer



Options

Options that are defined by the catalog number nomenclature.

Door/cover mounted VFD-OFF-BYP switch SW1 option

This option is only available on bypass units. This option provides a door or cover mounted 3-position selector switch used to select the VFD, OFF or BYPASS operating mode. Mode selection is normally selected using the VFD controls, so the main purpose of the switch is to be used when the VFD is disabled and Bypass selection cannot be made using the VFD controls (Keypad or Field Bus)

Note: The switch is included with the Isolation contactor option.

The Switch has three positions: VFD-OFF-BYPASS.

In the VFD position, control is provided by the VFD. The VFD is also enabled by the switch via input 2 to the control PCB. Motor can be powered from both the VFD (variable speed) and at full speed in bypass (across the line) as determined by the VFD controls.

In the OFF position, both the VFD and bypass functions are disabled by removing power to the contactors. The VFD is also disabled by removing the enable signal at input 2.

In the Bypass position, the bypass contactor closes immediately and the motor runs across the line at base/full speed. The VFD is still powered but has no control over the motor. The VFD Keypad will indicate the unit is in bypass. The VFD is also disabled by removing the enable signal at input 2.

See **Page 22** for more details on bypass operation.

VFD isolation contactor option

This option is only available on bypass units.

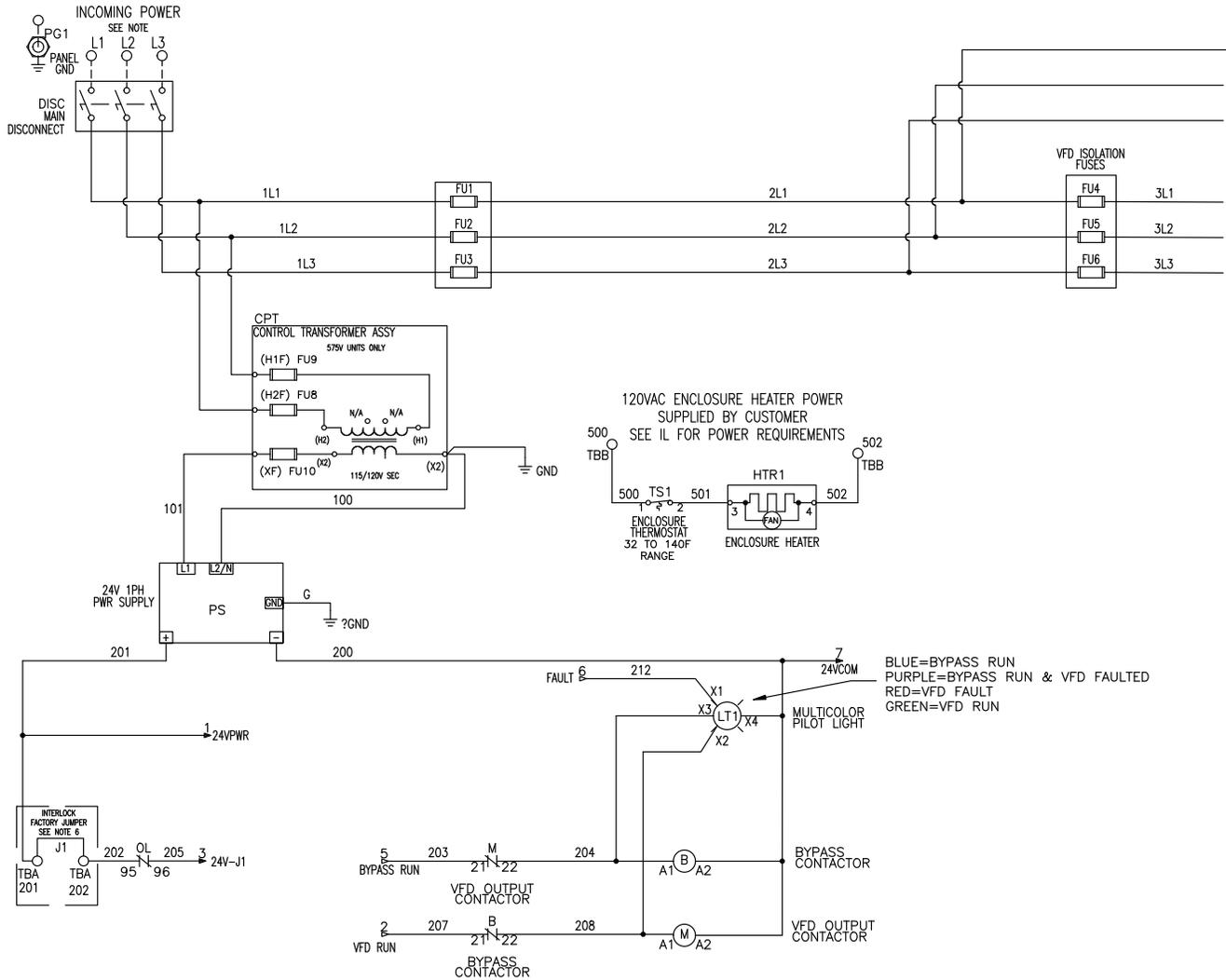
The ISO contactor supplies main power to the VFD. Its function is to isolate the VFD from the main power when needed. The VFD logic and keypad will remain operational without main power because of the external 24 V power supply.

ISO (I) contactor option will always include the door/cover mounted VFD-OFF-BYP switch SW1 (see previous section). The I contactor is powered from the 24 Vdc supply. The I contactor closes immediately when the VFD-OFF-BYP switch is in the VFD position. 24 V power from the switch (wire 206) is routed to the VFD logic PCB "BYPASS RUN" normally closed relay contact and back out to wire 211 and the coil of the I contactor. Since the R1 bypass relay is not energized, the 24 V power path is complete and the I isolation contactor energizes. The same path is broken when the VFD-OFF-BYP switch is in the OFF position or Bypass positions and the I contactor is de-energized.

Options

When SW1 is in the VFD position, the Bypass mode may also be selected via the VFD keypad. Once the bypass mode has been selected and a Bypass Run has been issued from the VFD, the normally closed R1 relay opens and removes the "BYPASS NOT RUN" signal at wire 211 and drops out the I contactor, removing main power to the VFD.

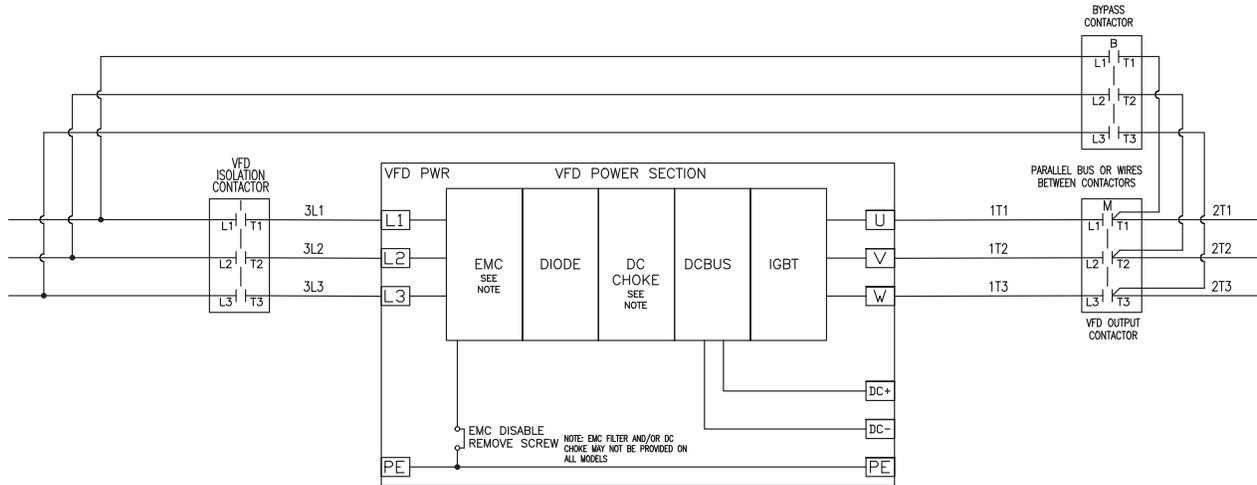
Figure 13. SW1 in VFD position



VFD isolation switch operation

This option is only available on bypass units. The ISO switch supplies main power to the VFD. Its function is the same as the Isolation contactor but is operated manually and does not use SW1.

Figure 14. VFD isolation switch operation



See technical information section for sizes and ratings of fuses.

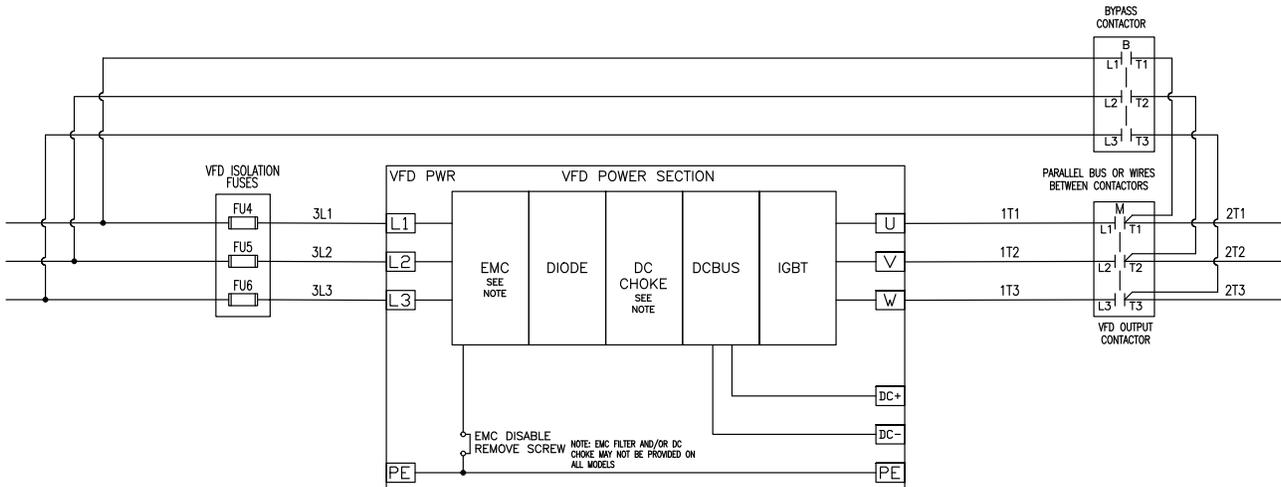
VFD isolation fuse option

This option is only available on bypass units.

This option provides additional protection for the VFD and can be used to isolated the VFD if the fuses are removed. The fuses (FU4, 5 and 6) are only in the VFD power path and do not provide any protection or isolation in the bypass path.

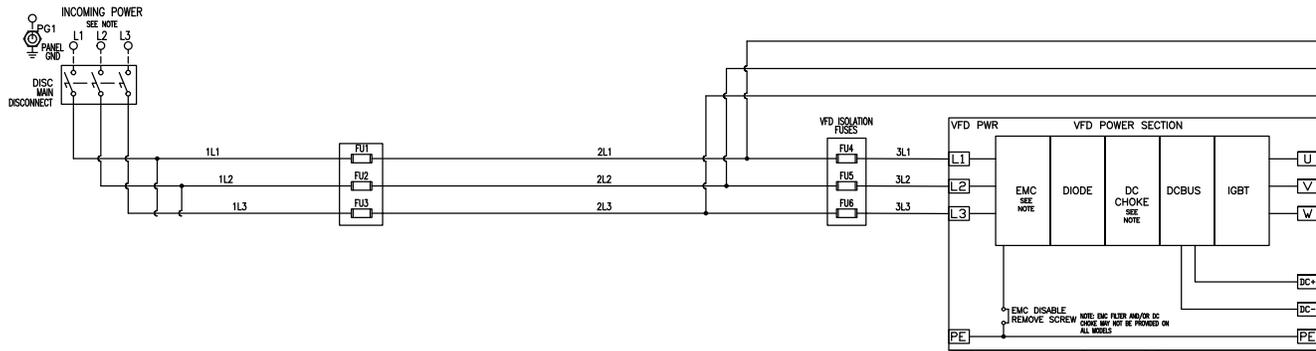
In some designs, VFD isolation fuse options are provided in addition to line fuses (FU1, 2 and 3) which protect both the VFD and Bypass paths for short circuit.

Figure 15. Isolation fuse option 1



Options

Figure 16. Isolation fuse option 2



Fuse values and replacement information are indicated on a label near the fuse. An example is shown below.

Figure 17. Fuse values



Light options

There are two pilot light options available as defined by the catalog number nomenclature.

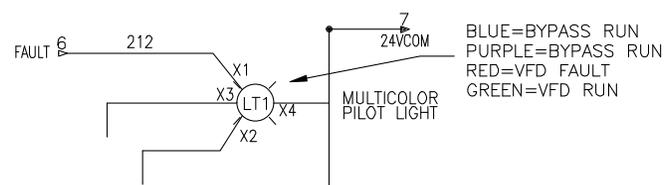
- Multicolored Pilot Light—EHD models only
- Multicolored Pilot Light—EHB bypass models only

If provided, it is a single multicolored LED pilot light, door or cover mounted. The wiring is shown on the main schematic shown on the rating plate.

Note: EHC models will never have a pilot light.

In the bypass design, the light can indicate the following states: VFD RUN, VFD FAULT, BYP RUN, BYP RUN and VFD FAULTED, VFD RUN/VFD FAULTED.

Figure 18. Bypass design



In a Non-bypass design, the light can indicate only 2 states: VFD RUN and VFD FAULT.

Figure 19. Non-bypass design

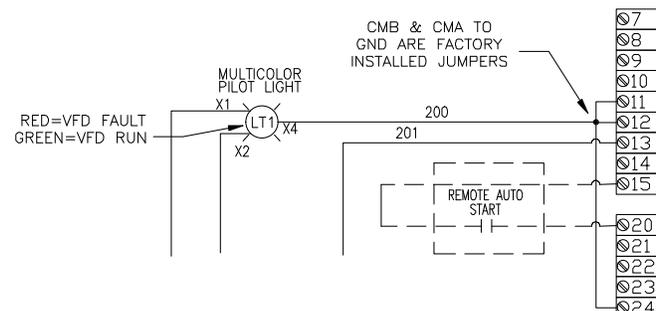


Table 1. Lights

Color and definition	Description
Green—VFD Run	VFD output contactor is closed and the motor is connected to the VFD. The motor speed is set by the VFD between 0 and 100%.
Blue—Bypass Run	Bypass contactor is closed and the motor is connected across the line. The motor speed is 100%.
Red—VFD Faulted	Output contactor has opened and the VFD is Faulted. The motor is disconnected from the system motor may be coasting.
Purple—Bypass Run and VFD is Faulted	Bypass contactor is closed and the motor is connected across the line. The motor speed is 100%. The VFD has a fault.
Yellow—VFD Faulted and VFD RUN	The VFD has determined a fault and is slowing the motor to zero speed. Output contactor remains closed. This is usually a temporary condition and once the motor reaches zero speed, the output contactor will open and the light color will change to red. Note: Yellow is not shown on the legend plate.

Floor stands

These options are only available for the larger oversized enclosures.

See Dimensions and Mounting section for floor stand details.

Options

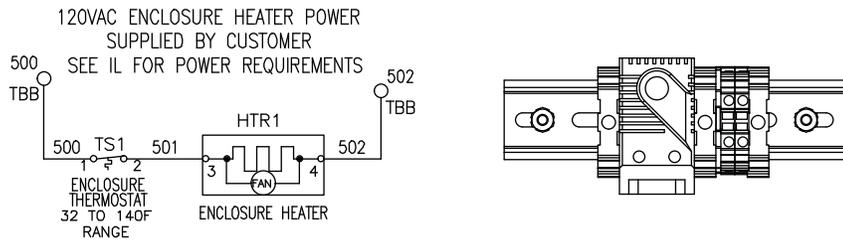
Enclosure heater option

An optional enclosure heater and thermostat can be provided. This option is only available with the 3R type enclosure option.

The heater is designed to reduce internal condensation when the temperature falls below the set point. The heater is powered from external source and is not interlocked with VFD system or operation. Branch circuit protection and any interlock required is provided by others.

The power requirements depends on the size of the heater, either 120 VA 150 Watt or 120 Vac 250 Watt. The thermostat is set to min (32 °F) and can be adjusted as needed.

Figure 20. Enclosure heater option



CAUTION

EXTERNAL POWER FOR HEATER IS NOT CONTROLLED OR REMOVED BY THE MAIN DISCONNECT AND MAY BE PRESENT WITH THE DOOR OPEN OR THE COVER REMOVED.

CAUTION

VOLTAGE MAY BE PRESENT FROM MORE THAN ONE SOURCE AND SHOULD BE DISCONNECTED FOR SERVICING.

ATTENTION

LA TENSION PEUT PROVENIR DE PLUS D'UNE SOURCE D'ALIMENTATION ÉLECTRIQUE. COUPER TOUTES LES SOURCES D'ALIMENTATION AVANT L'ENTRETIEN.

Communication and non-power options

There are a number of plug-in options cards available as defined by the catalog number nomenclature. If this option is provided, a separate option drawing is shown on the rating nameplate and a printed copy is provided in the documentation packet supplied with the unit.

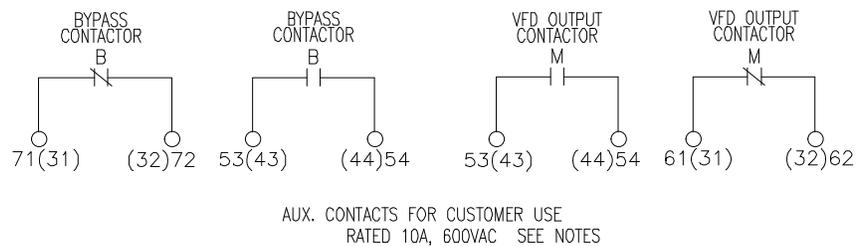
Also see the Option manual for more information on the option cards.

Auxiliary contact option

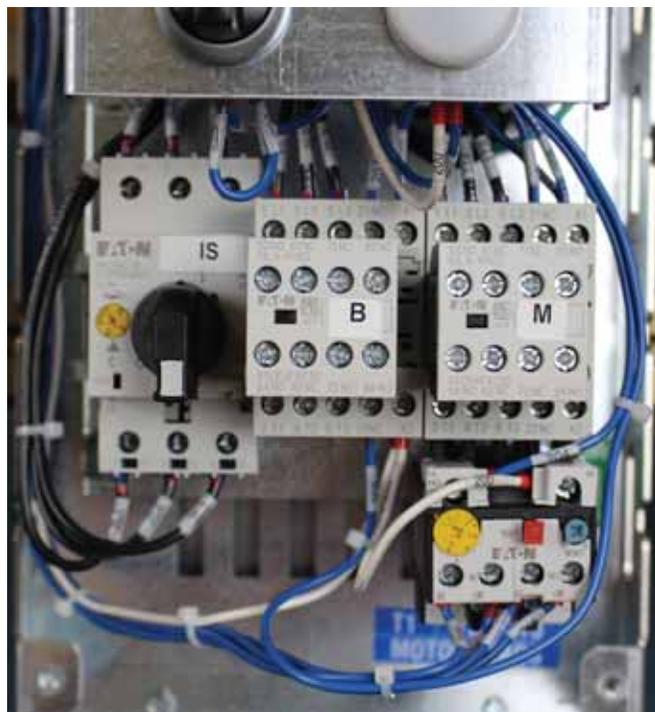
This option is only available on bypass units.

Bypass designs have an option for Auxiliary contacts on both the VFD output M and the Bypass B contactors. These are provided for customer use and not wired to any component or terminal. If supplied, they are shown on the main schematic.

Figure 21. Auxiliary option



Auxiliary example



General setup, disconnection and basic operation

General setup

Included in the documentation packet supplied with the unit is the VFD quick start guide. The guide will provide information for setting and customizing the VFD operations using the keypad and display.

Real time clock

The Quick setup guide will provide information for activation and setting of the real time clock.

Disconnection

Disconnect setup/operation

This section describes the basic operation of start/stop and speed control of the motor. Refer to the Installation Manual to become familiar with the VFD Keypad operation and VFD Menu Structures. A copy of the manual is supplied in the Documentation packet supplied with the unit.

Disconnect VFD parameter settings

All disconnect designs are shipped from the factory at the VFD default values as shown in VFD documentation. No changes are needed for STD operation.

All EHD and EHC designs are set up from the factory to control Motor Start and Stopping and Motor speed set point from the keypad.

Basic operation

Apply power and close disconnect.

The keypad should power and display Startup Wizard.

Follow the startup wizard prompts to set the basic parameter for your system except, set Bypass to Disable, Once set to Bypass disable the Keypad display should "FORWARD" above the left keypad soft button.

For Disconnect Designs, the Bypass mode should be disabled. The left soft key will show Forward or Reverse. Pressing the soft Key will ask if OK to change motor direction.

The VFD can now be started/stopped from the keypad by pressing the appropriate keys. Motor speed can be set from the keypad or as set from the Startup Wizard.

Figure 22. Basic operation

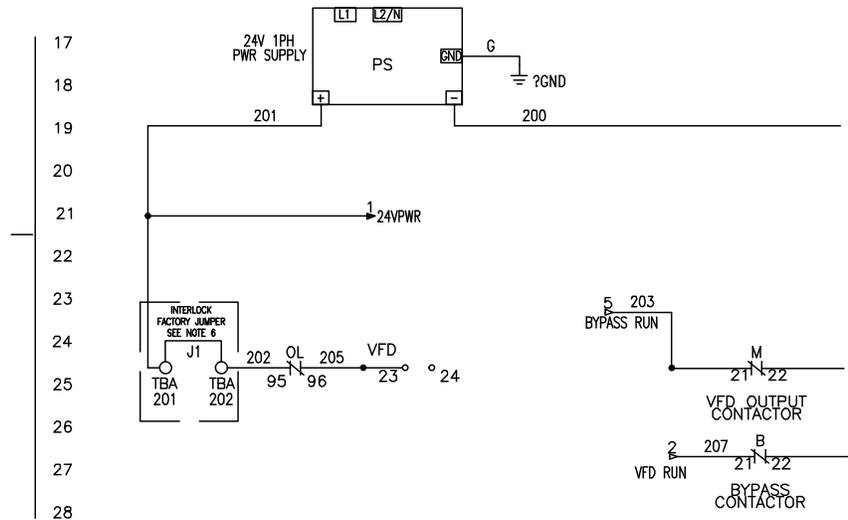


Control interlock

All bypass units have a 24 V control circuit interlock that will remove 24 V control power from the contactors. The interlock also removes the RUN ENABLE input to the VFD (DigiIn2).

This can be used by the customer as needed. The interlock connections on terminal block TBA terminals 201 and 202 and has a factory jumper installed.

Figure 23. Control interlock



Bypass setup/operation

This section describes the basic operation allowing the unit to start/stop the motor in bypass and under VFD control.

IMPORTANT

Refer to the Application Manual to become familiar with the VFD Keypad operation and VFD Menu Structures. A copy of the manual is supplied in the documentation packet supplied with the unit.

Bypass options

There are several bypass power and control options that are defined by the catalog number nomenclature: 2 Contactor Bypass, VFD Isolation Contactor and VFD Isolation Switch and Manual Bypass Switch. See options sections for description/operation.

VFD parameter settings

Bypass Designs have several parameters that were reset to operate the bypass controls correctly. If these parameters are changed either Manually or Automatically (using the "Load Parameter Set" function P13.1.3), the bypass control circuit may not operate properly!

The key bypass design parameters are:

- P2.2.3 IO terminal 1 Start Signal 2 must be set to DigIN:NormallyOpen
- P2.2.6 IO terminal 2 Start Signal 2 must be set to DigIN:NormallyOpen
- P2.2.9 Ext Fault 1 NO must be set to DigIN 3
- P2.2.19 Run Enable must be set to DigIN 2
- P2.2.34 Bypass Start must be set to DigIN 7
- P3.1.2 RO1 Function must be set to BYPASS Run
- P3.1.5 RO2 Function must be set to RUN
- P3.1.8 RO3 Function must be set to FAULT
- P10.1.1 Bypass Enable is set to ENABLE
- P10.1.2 Bypass Start Delay is set to 1 sec
- P10.1.3 Auto Bypass Start is set to DISABLE

Bypass modes of operation

Bypass designs have three modes of operation: VFD, OFF or BYPASS.

VFD mode, the motor is powered by the VFD and motor speed is adjustable. The motor may or may not be running depending on the controls.

BYPASS mode, the motor connected across the line and motor speed is fixed at base speed. The motor may or may not be running depending on the controls.

OFF mode, the motor is not powered and is not running.

Mode selection is dependent on the options provided. As standard, the three modes can always be selected from the VFD keypad. The BYPASS or VFD mode is selected by using the Left Soft key and the OFF mode by pressing the OFF/ Stop key.

IMPORTANT

Under some circumstances there may be a delay in the actual start of the motor when in the bypass mode. Refer to application manual and parameters P10.1.2 Bypass delay start and P10.1.4 Auto Bypass Delay Start for more information about these delays.

An optional door or cover 3-position selector switch can be provided to override the VFD keypad mode selection and set the system to OFF or BYPASS.

- If unit has SW1 option on cover or door, place in OFF position
- Apply power and close disconnect
- Keypad should power and display Startup Wizard
- The Keypad display should show "BYPASS" above the left keypad soft button. Pressing the button should give you the message "Switch to Bypass- Press OK"

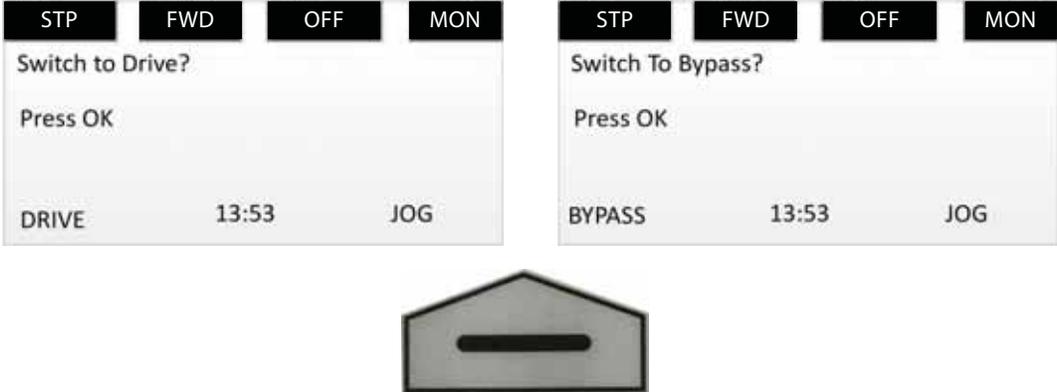
Note: The BYPASS/VFD mode selection using the Soft Key on the keypad will only appear if the BYPASS mode has been enabled in software by using the startup wizard or direct entry using parameter P10.1.1

Using the keypad to select the mode

Mode selection is made from the VFD keypad using the Left soft key. The selection is shown above the key and the display will indicate the next mode to be selected by pressing the key and not the active mode.

Some bypass designs have an optional VFD-OFF-BYP switch located on the cover or door of the unit. The switch must be in the VFD position in order for the keypad to select the desired mode as described above.

Figure 24. Press key (not active mode)



Using the switch to select the mode

Some bypass designs have an optional VFD-OFF-BYP switch located on the cover or door of the unit. The switch selects where the mode is determined.

In the OFF position, the VFD Keypad control is disabled and the motor cannot be started from any means. This position also removes the RUN ENABLE input to the VFD (DigIn2).

Figure 25. Using switch



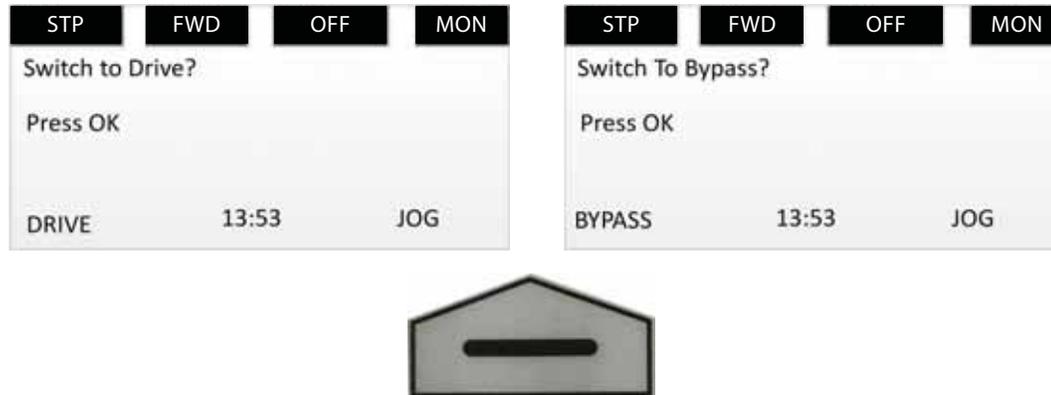
In the Bypass position, the VFD Keypad control is disabled and the motor started immediately in Bypass. This position also removes the RUN ENABLE input to the VFD (DigIn2).

In the VFD position, the VFD control is enabled and the motor can be started from keypad in either the Hand or Auto methods. This position applies the RUN ENABLE input to the VFD (DigIn2).

Bypass setup/operation

The mode is indicated by the switch position and the VFD Keypad display text.

Figure 26. Mode indication



Operation in the VFD mode

Once the VFD mode is selected as default, the keypad is used to start and stop the motor and set the speed.

VFD relay outputs and bypass

As default, R1 relay is set up as Bypass Run and closes whenever the VFD is in bypass mode and has an active start command. The relay remains programmed as Bypass Run even if the bypass mode is disabled (via the Startup Wizard or the parameter.

Auto transfer bypass sequence

The feature will transfer the mode from VFD to Bypass automatically after a specific fault has occurred. The feature is disabled from the factory, but can be enabled by the user using Auto Bypass parameter P10.1.3.

P10.1.3 Auto Bypass

P10.1.3 Auto Bypass Delay—10 sec the delay before the motor is actually started in bypass

⚠ WARNING

THIS FEATURE AUTOMATICALLY STARTS THE MOTOR WITHOUT WARNING AND WITHOUT REQUIRING OPERATING PERSONNEL TO RE-INITIATE THE START SEQUENCE.

This modification must be applied only to machinery with all moving parts completely inaccessible to personnel. If unit has optional VFD-OFF-BYP mode, the feature will operate when the switch is in the VFD mode, It is disabled when the switch is in the OFF mode.

Once enabled, Auto Bypass can only be activated when 3 conditions are met:

1. The active control place is I/O (typically this means the unit is in Auto).
2. At least one of the bypass faults (Parameters 10.1.5 to 10.1.18) has occurred. See table 45 in the application manual. By default, all the faults that trigger the auto bypass sequence are disabled. In order for the auto bypass feature to work, at least one of the bypass faults must be set to enable.
3. The VFD was in a run mode when it faulted and an active run command is present after the fault.

Note: If the auto restart after a fault feature executes, the auto bypass sequence will occur **ONLY** after the auto restart sequence fails to restart the VFD.

Once Auto Bypass sequence is activated:

- Keypad display flashes “Auto Bypass Activated Switching to Bypass” for 10 seconds. The 10 second time is fixed.
- At the end of 10 seconds, the Drive Status display changes to BYP_STP indicating bypass mode is active and the motor not connected.
- When a run command is received (or is already present), the Bypass Start Delay timer P10.1.2 starts, while the timer is timing the Drive status display flashes NRD indicating the bypass and motor is about to start.
- After time out, the Drive Status display BPR (bypass run) stops flashing and bypass run relay closes and motor starts.
- When the I/O run command is removed, Bypass relay drops out immediately and the Drive status display changes back to BYS indicating the unit is still in Bypass mode but not running. If the run command is reapplied, the bypass restarts.

If the VFD fault is cleared after the unit has been switched to the bypass mode, the unit remains in the bypass mode until the mode is manually changed back to VFD by pressing the soft key or by changing to the OFF mode by pressing the OFF key.

Keypad Fault LED is on and remains on in bypass and bypass running states until the VFD fault is cleared.

Pressing the OFF key or the soft key VFD/BYP at any time will cancel the sequence and put the unit into OFF mode.

Other notes

If the control place is OFF by the keypad or the optional door VFD-OFF-BYP switch and any fault occurs, the unit displays the fault, the Auto Bypass or Auto Restart sequence is not activated and there is no change to the mode because unit is in OFF mode.

If the control place is KYP and Hand button is pressed with a fault present, the unit remains faulted, the Auto bypass or Auto Reset sequence is not activated and there is no change to the mode because Hand (run) command is given from keypad.

If the control place is I/O with active fault is present, and the run command is present or applied, and the auto restart function is enabled (and set for the active fault) then the unit will first begin the Auto Restart sequences. If fault continues after auto restart sequence is complete, then begin Auto Bypass sequence will begin.

Auto restart feature—If the auto restart function is not enabled (or not set for the active fault), then Auto Bypass sequence begins immediately after the fault. See Basic manual for Auto restart feature.

Motor overload

Motor overload function—disconnect designs

For EHC/EHD designs, the VFD logic provides the overload protection when the motor is running on the VFD. Refer to “Motor Overtemp” fault and setup section in the Application Manual to set the overload function and understand the faults displayed.

Note: For Type E Disconnect designs, CMC overload protection is also active when running on the VFD mode, but the VFD OL logic is more accurate and is the primary method of protection due to the nature of VFD output waveform. The Type E device trip value should set at the max value.

Motor overload protection types—bypass designs

For EHB bypass designs, the motor overload protection is provided by different methods depending on the input disconnect type provided. It could be a Circuit Breaker/ Disconnect or Type E CMC.

Setting the Motor overload level and the OL trip/function is dependent on the type of overload protection that senses the overload.

Circuit breaker or disconnect

Motor protection is provide by the following depending on the mode:

A bimetallic overload relay provides the overload protection when in running in the bypass mode and the VFD logic provides the overload protection when the motor is running on the VFD.

Type E (CMC)

Motor protection is provided by the following depending on the mode:

The CMC input device provides the motor overload protection when in running in the bypass mode and the VFD logic provides the overload protection when the motor is running on the VFD.

Note: The VFD logic provides the overload protection when the motor is running on the VFD. Refer to “Motor Overtemp” fault and setup section in the installation manual.

Note: For Type E Disconnect designs, CMC overload protection is also active when running on the VFD mode, but the VFD OL logic is more accurate and is the primary method of protection due to the nature of VFD output waveform.

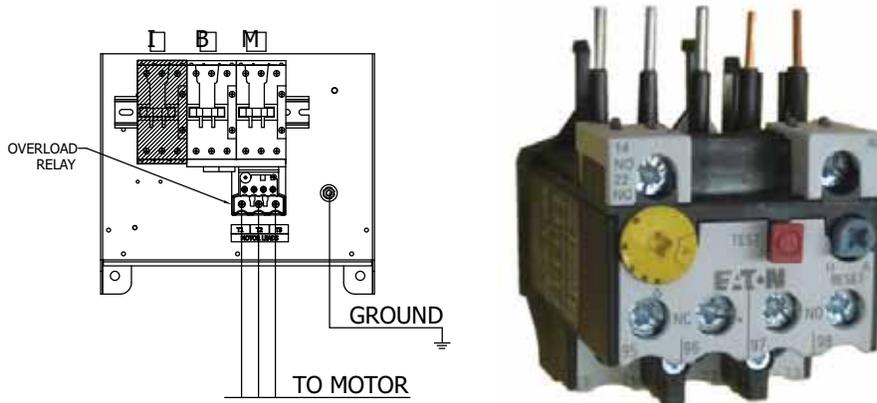
Motor overload operation

Depending the design and BCP, there are serval different ways a motor overload can be sensed.

Sensed by the bimetallic overload relay

The OL trip level is set by the overload relay using the dial set to the motor FLA. The OL relay is designed to protect the motor at Class 10 protection. Some larger hp units may use CT base overloads, which provide Class 30.

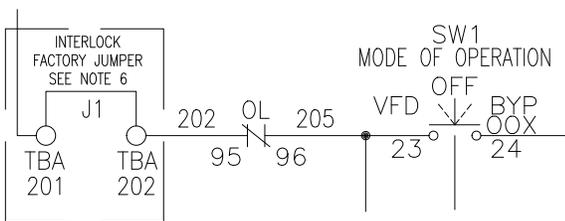
Figure 27. OL trip level



When an overload occurs, the 24 V control circuit power is removed via the NC overload relay contact (95-96) (see schematic). Both the VFD (M) and Bypass (B) contactors are disabled.

The overload can only be reset by removing main power and opening the enclosure door or removing the cover and then pressing the reset button on the OL relay. The overload relay is set for manual reset operation; Auto reset is not used or recommended.

Figure 28. VFD (M) and bypass (B) disabled

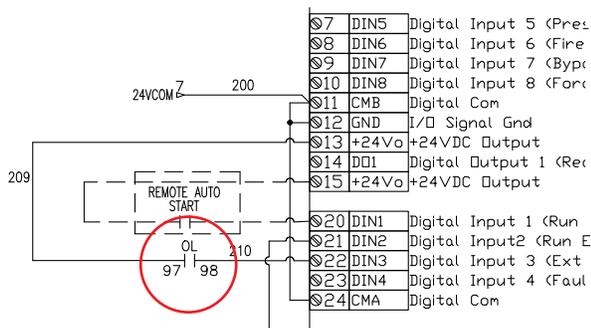


The VFD keypad display will also indicate an "External Fault". VFD input 3 is closed via the NO overload relay contact (97-98) (see schematic). The VFD keypad fault LED will be on.

Figure 30. Overload reset



Figure 29. VFD keypad display



⚠ CAUTION

ON BYPASS DESIGNS HAVE AN OPTIONAL VFD-OFF-BYP SWITCH LOCATED ON THE COVER OR DOOR OF THE UNIT. IF THE SWITCH IS LEFT IN THE BYPASS POSITION, THE MOTOR WILL AUTOMATICALLY RESTART IN BYPASS AS SOON AS POWER IS REAPPLIED AFTER THE OVERLOAD RELAY HAS BEEN RESET. IT IS RECOMMENDED THAT THE SWITCH BE MOVED TO THE OFF POSITION BEFORE REAPPLYING POWER.

Motor overload operation

Sensed by the VFD logic overload algorithm

The OL protection level provided/calculated by the VFD is set up based on parameters entered by the user. See Application Manual for setup and defaults and specifications.

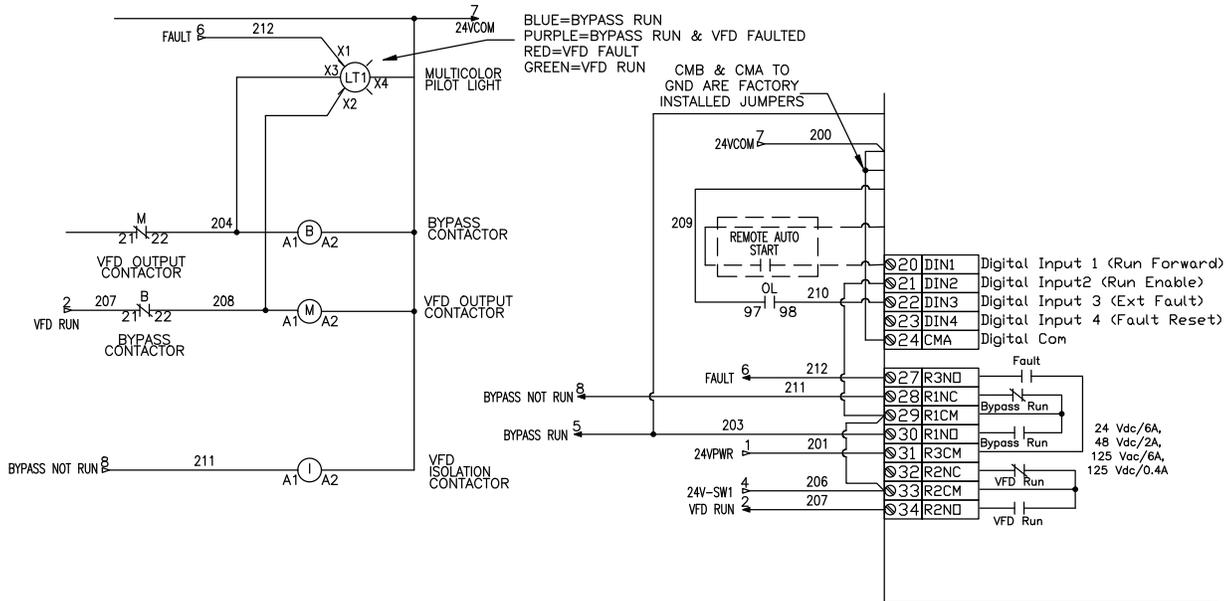
When a fault occurs, the VFD contactor is disabled by removing the VFD RUN signal to the M contactor.

The VFD keypad will indicate a MOTOR OVERTEMP Fault code 16 and the keypad Fault LED will be on.

The overload can be reset by using the Fault reset feature of the VFD. Once the fault is reset, the VFD can be restarted.

Note: Other VFD faults may provide the same contactor action, only the keypad display will be different.

Figure 31. VFD contactor disabled



Sensed by the input disconnect (CMC)

The MMP unit provides Overload and fixed magnetic short-circuit trip capability in one compact unit. The unit also provides the disconnect function with the ON/OFF rotary handle with lockout provision.

The OL trip amp level is set on the device using the dial set to the motor FLA. The OL relay is designed to protect the motor at Class 10 overload protection and phase loss sensitivity.

Figure 32. MMP unit



When the unit trips, all 3-phase input power is removed from the control. Both the VFD and bypass contactors are disabled. The disconnect handle will move and indicate a trip.

Figure 33. Disconnect handle trip indication



The VFD Logic and Keypad will have no power. The keypad will be dark.

The overload can only be reset by using handle to reset the overload. Once reset, power may be reapplied by turning the disconnect handle back to ON position.

⚠ CAUTION
ON BYPASS DESIGNS HAVE AN OPTIONAL VFD-OFF-BYP SWITCH LOCATED ON THE COVER OR DOOR OF THE UNIT. IF THE SWITCH IS LEFT IN THE BYPASS POSITION, THE MOTOR WILL AUTOMATICALLY RESTART IN BYPASS AS SOON AS POWER IS REAPPLIED. IT IS RECOMMENDED THAT THE SWITCH BE MOVED TO THE OFF POSITION BEFORE REAPPLYING POWER.

Figure 34. Switch moved to OFF position



Fuses

Disconnect, VFD Isolation or CPT fuses are based on design type and ratings.

All fuses will have a label indicating the fuse replacement requirements. Refer to actual label on unit for replacements. Example of the label is below.

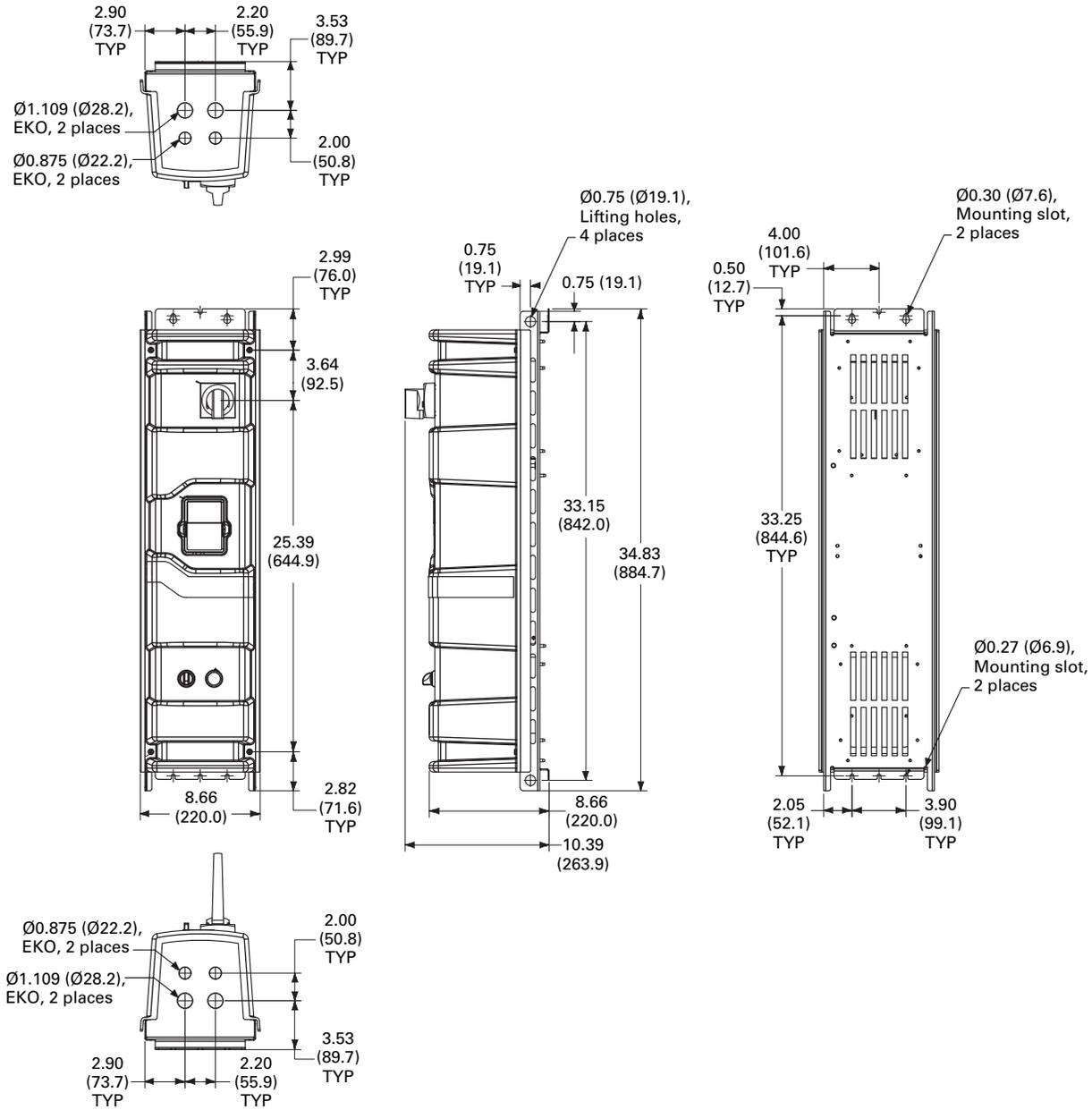
Figure 35. Fuses



Dimension drawings

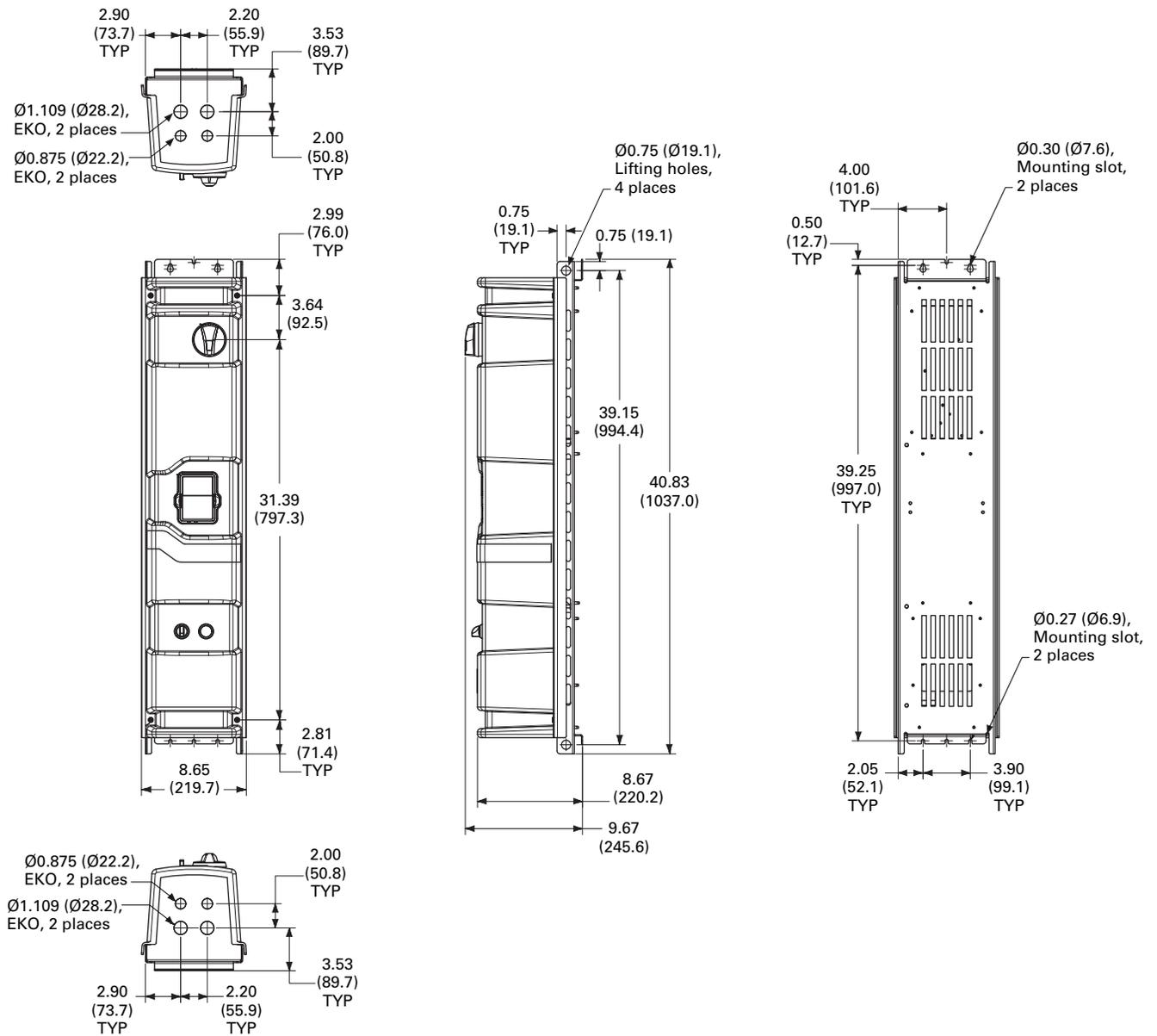
Approximate dimensions in inches (mm).

Figure 36. H1S



Approximate dimensions in inches (mm).

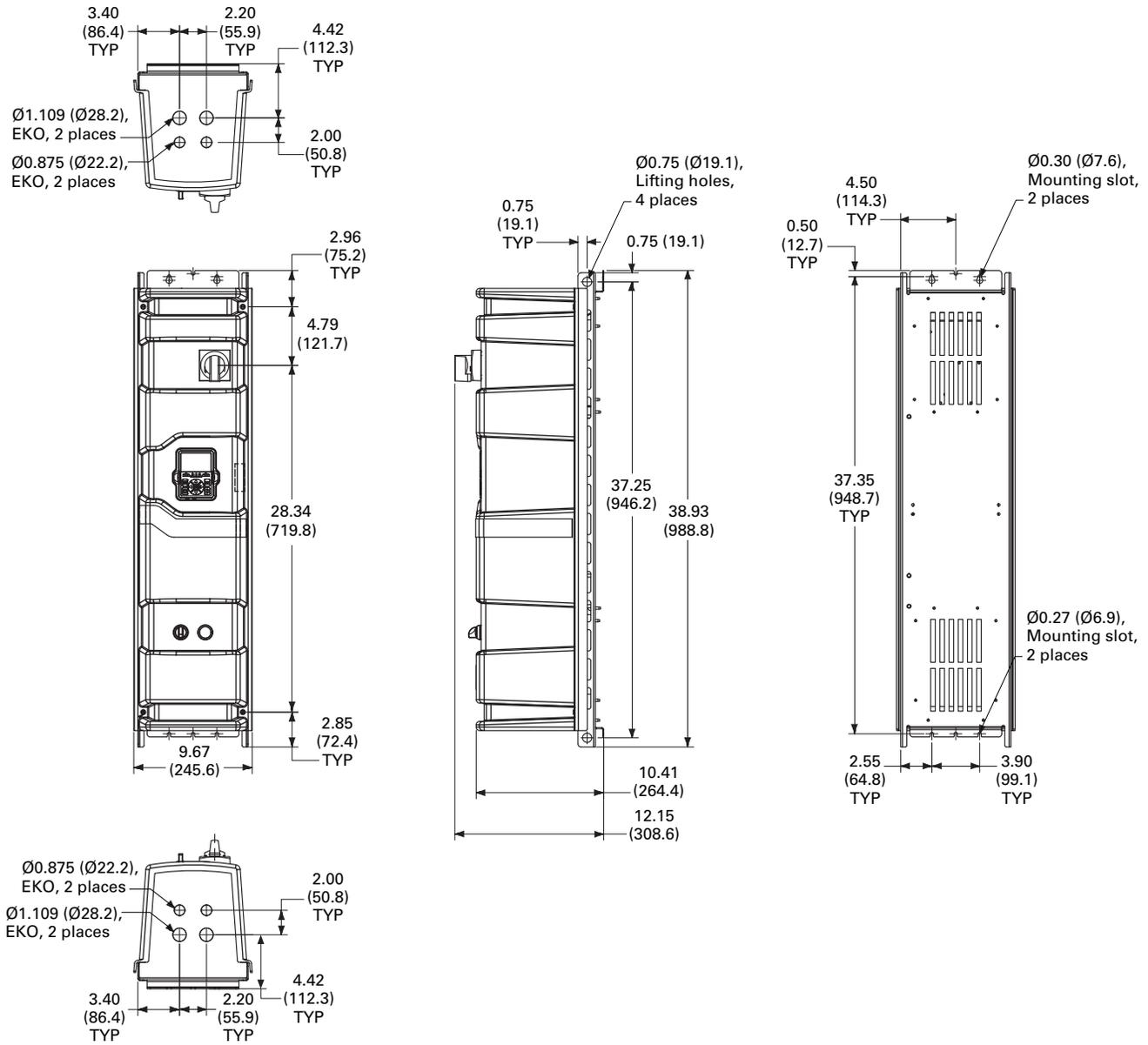
Figure 37. H1



Dimension drawings

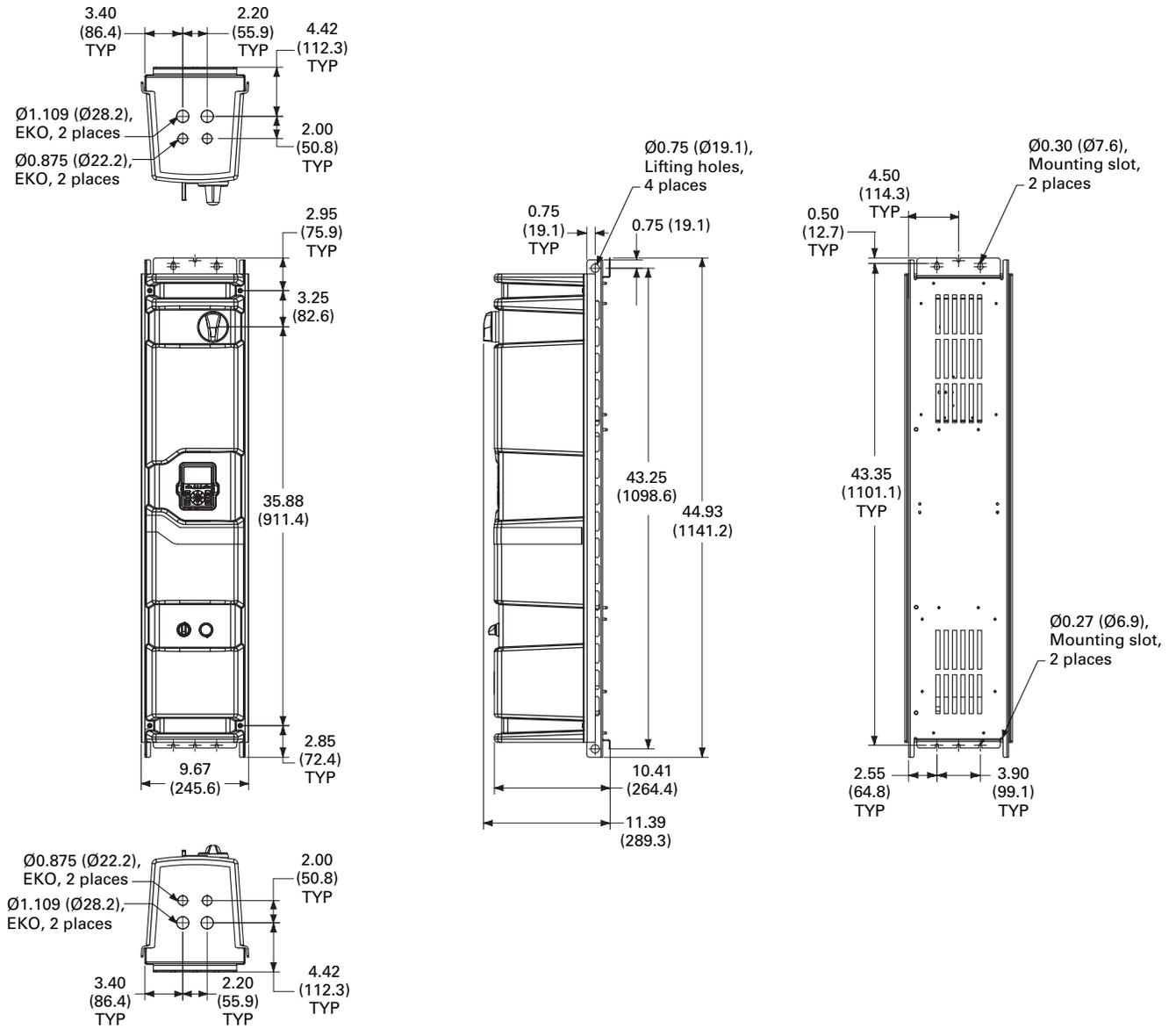
Approximate dimensions in inches (mm).

Figure 38. H2S



Approximate dimensions in inches (mm).

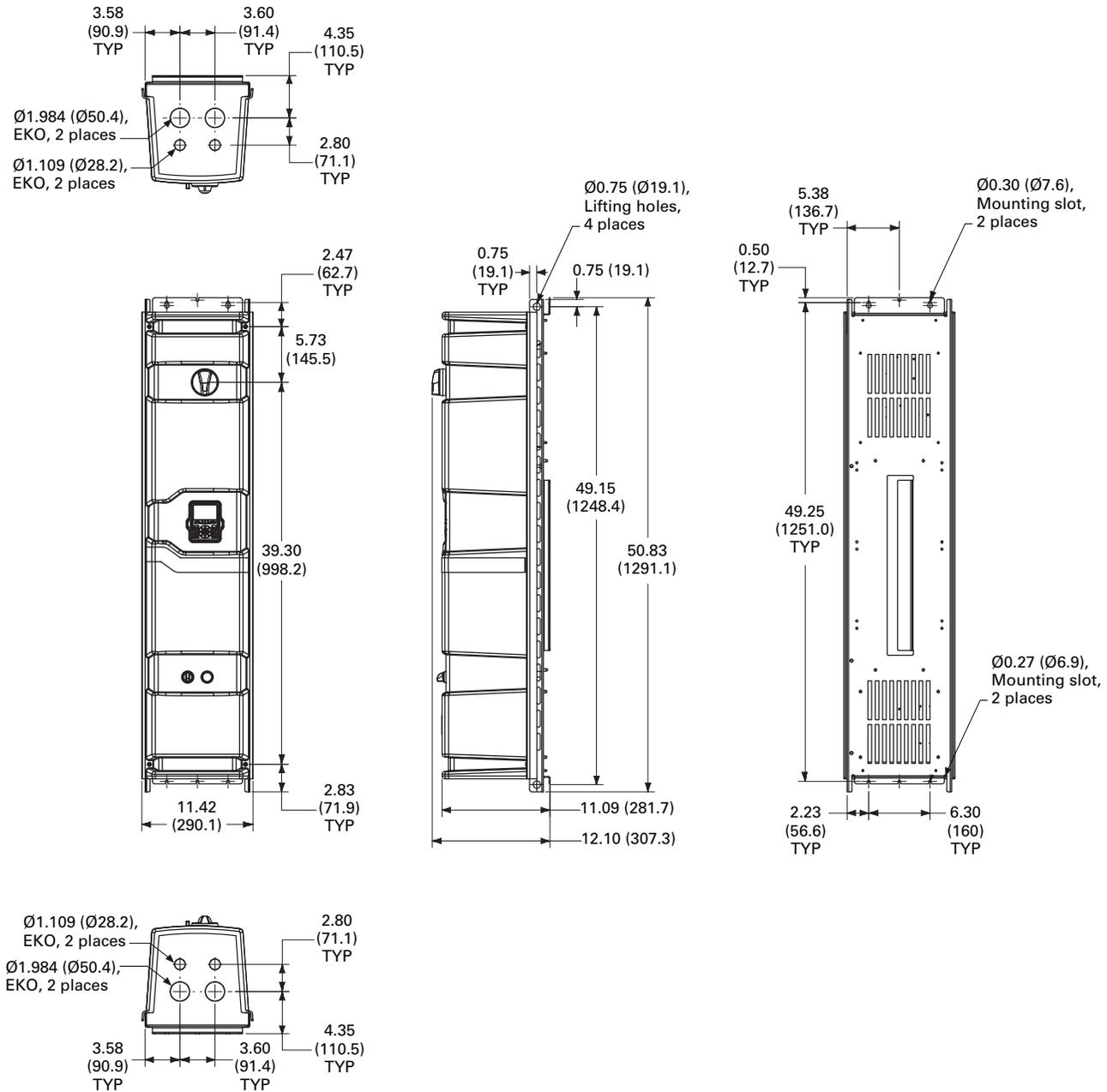
Figure 39. H2



Dimension drawings

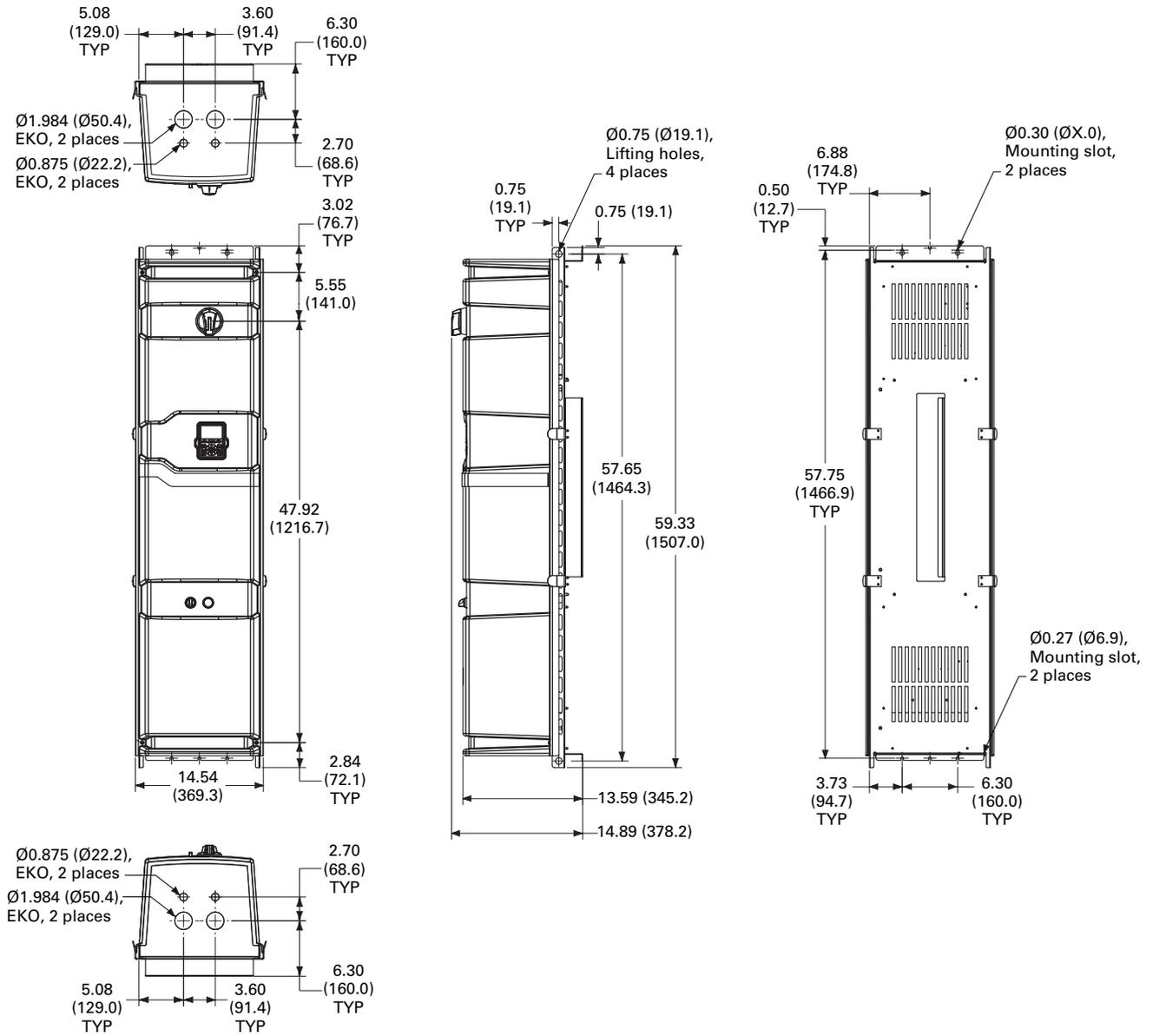
Approximate dimensions in inches (mm).

Figure 40. H3



Approximate dimensions in inches (mm).

Figure 41. H4



Dimension drawings

Approximate dimensions in inches (mm).

Figure 42. H1D

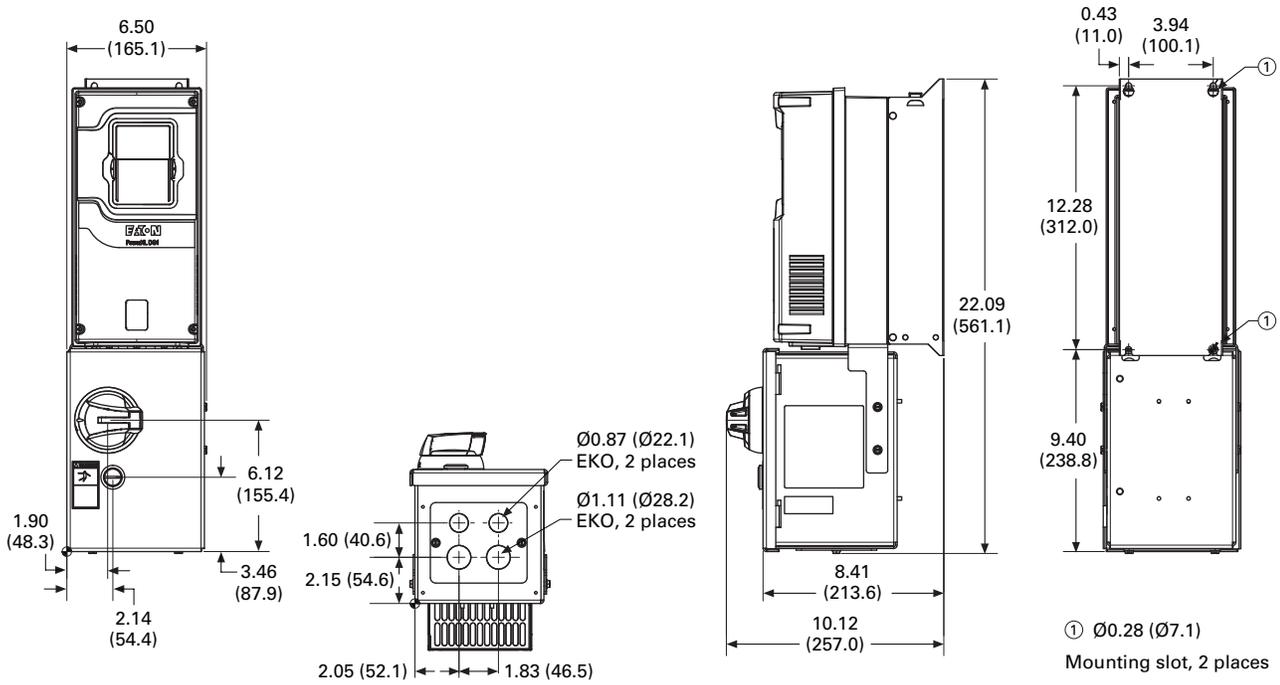
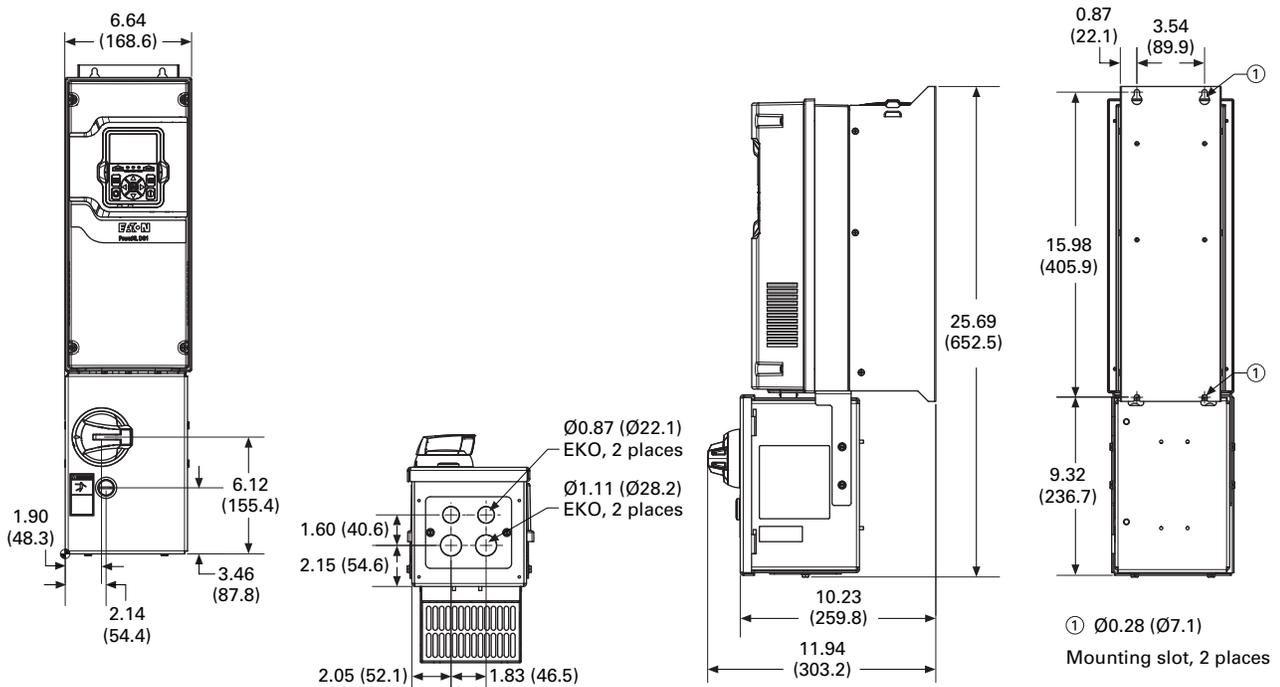


Figure 43. H2D



Approximate dimensions in inches (mm).

Figure 44. H3D

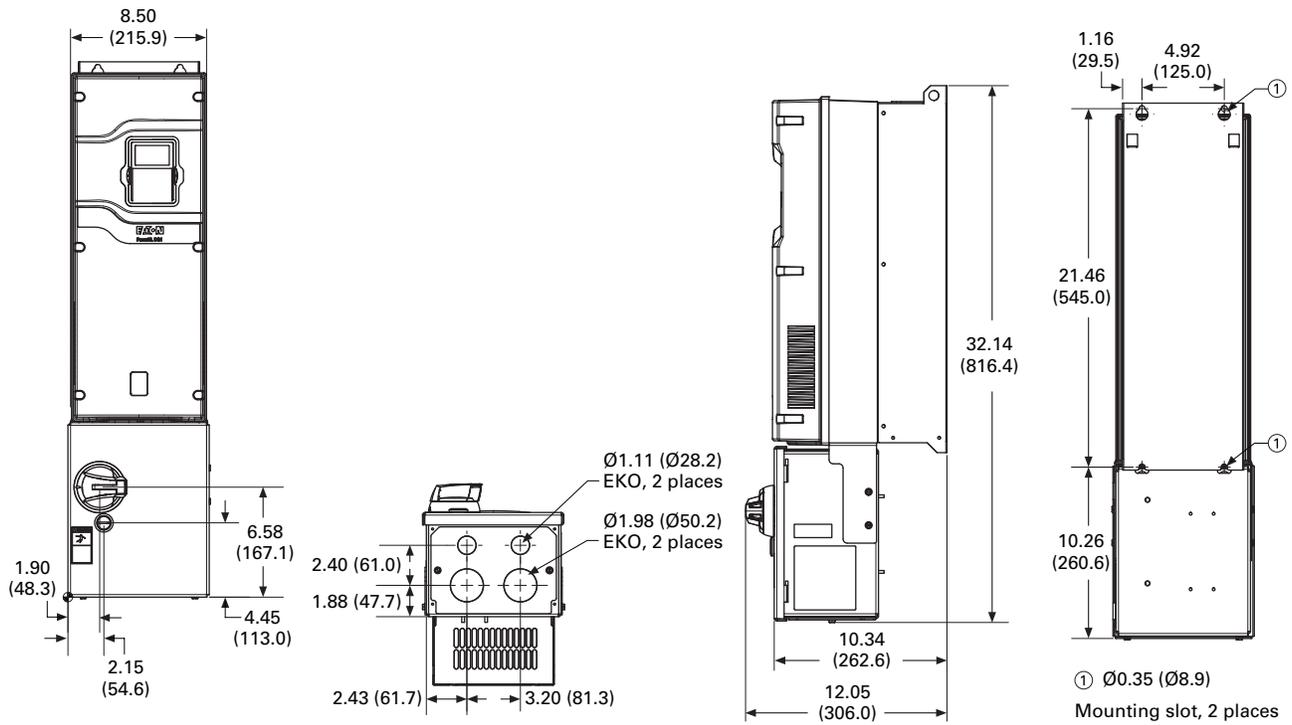
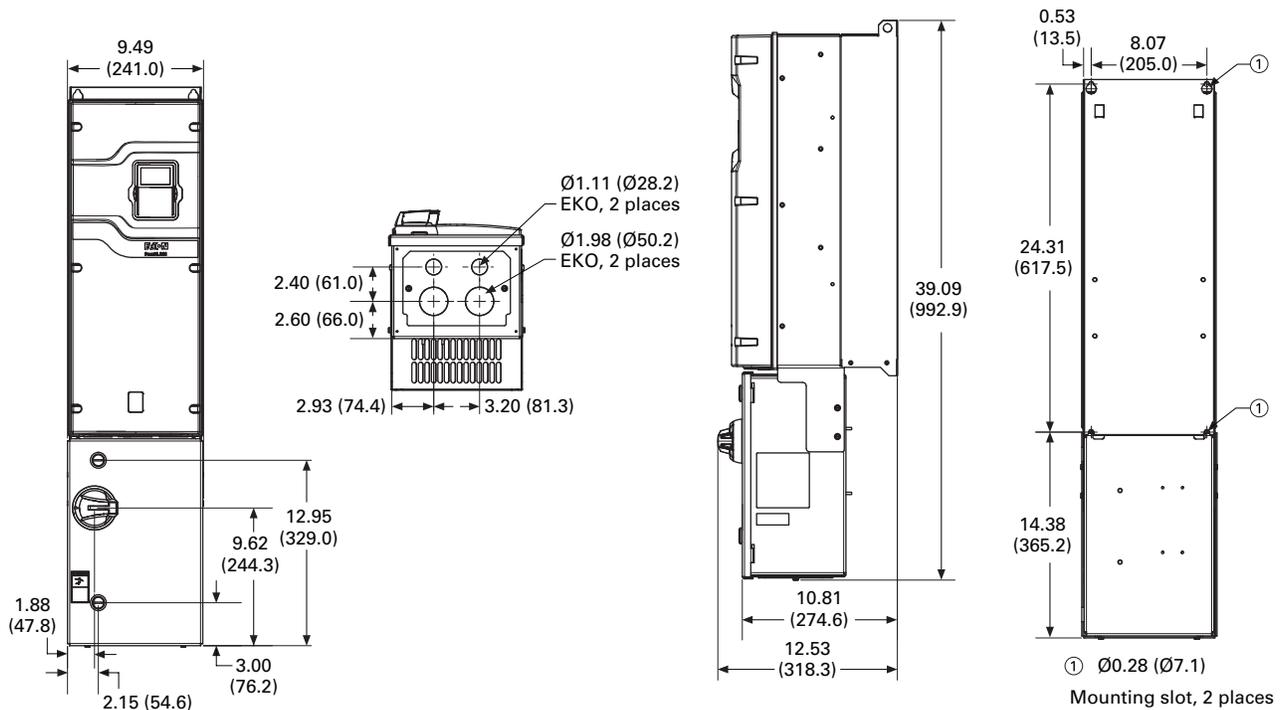


Figure 45. H4D



Dimension drawings

Approximate dimensions in inches (mm).

Figure 46. H3X—Type 12

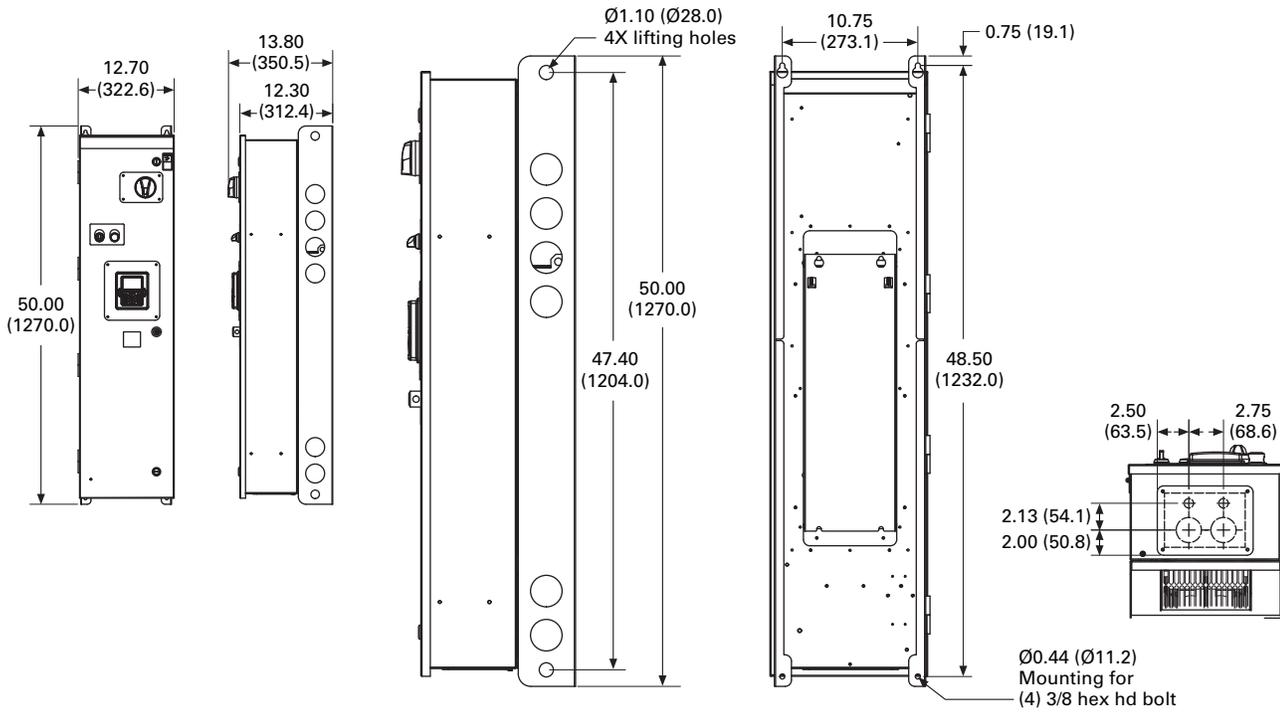
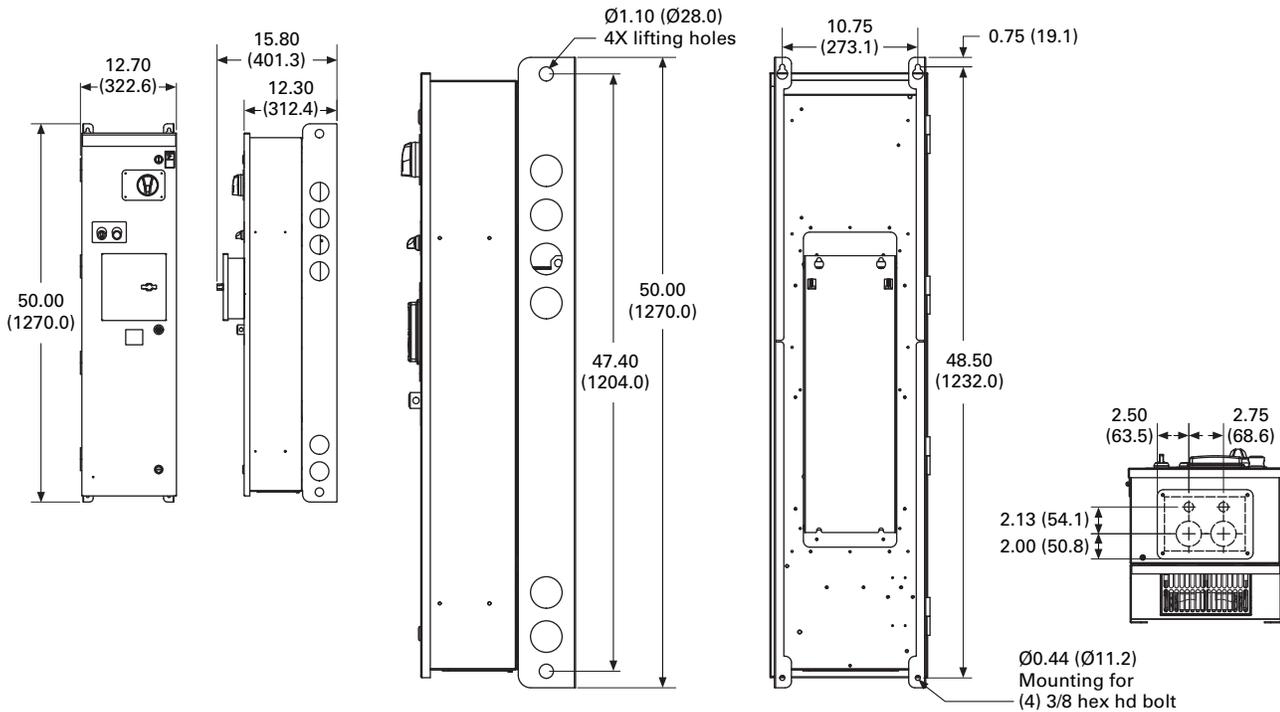


Figure 47. H3X—Type 3R



Approximate dimensions in inches (mm).

Figure 48. BX—Type 12

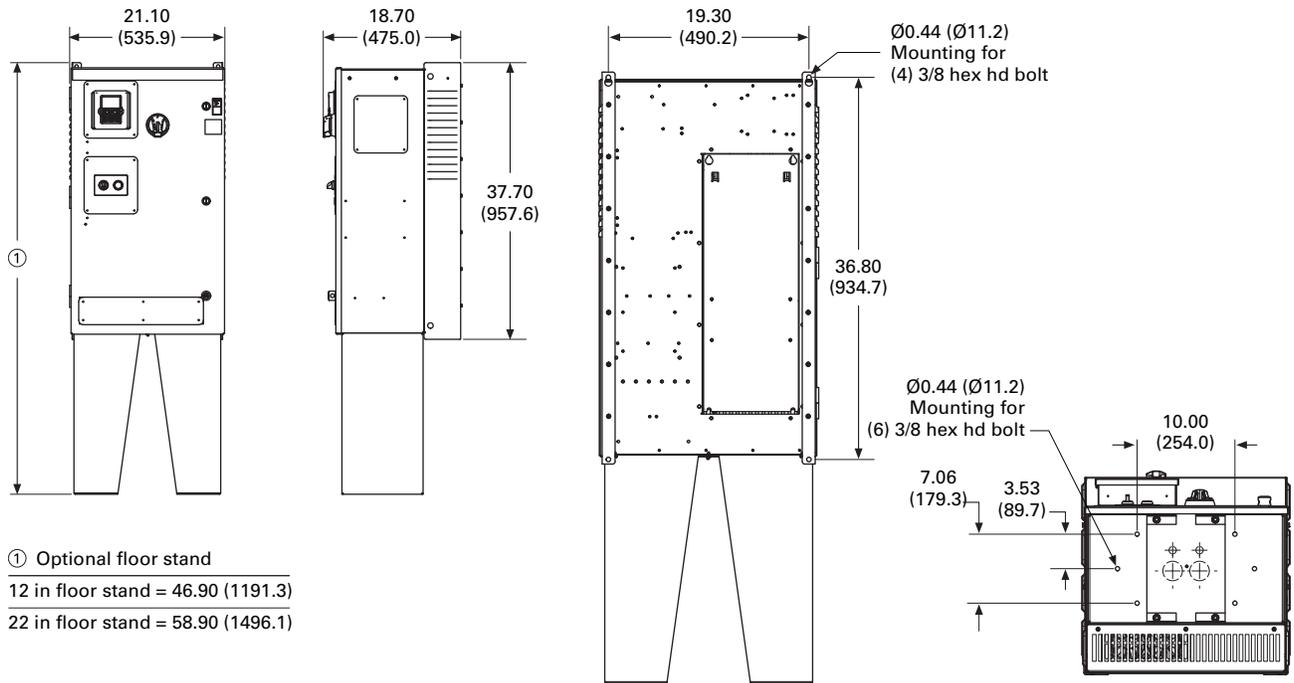
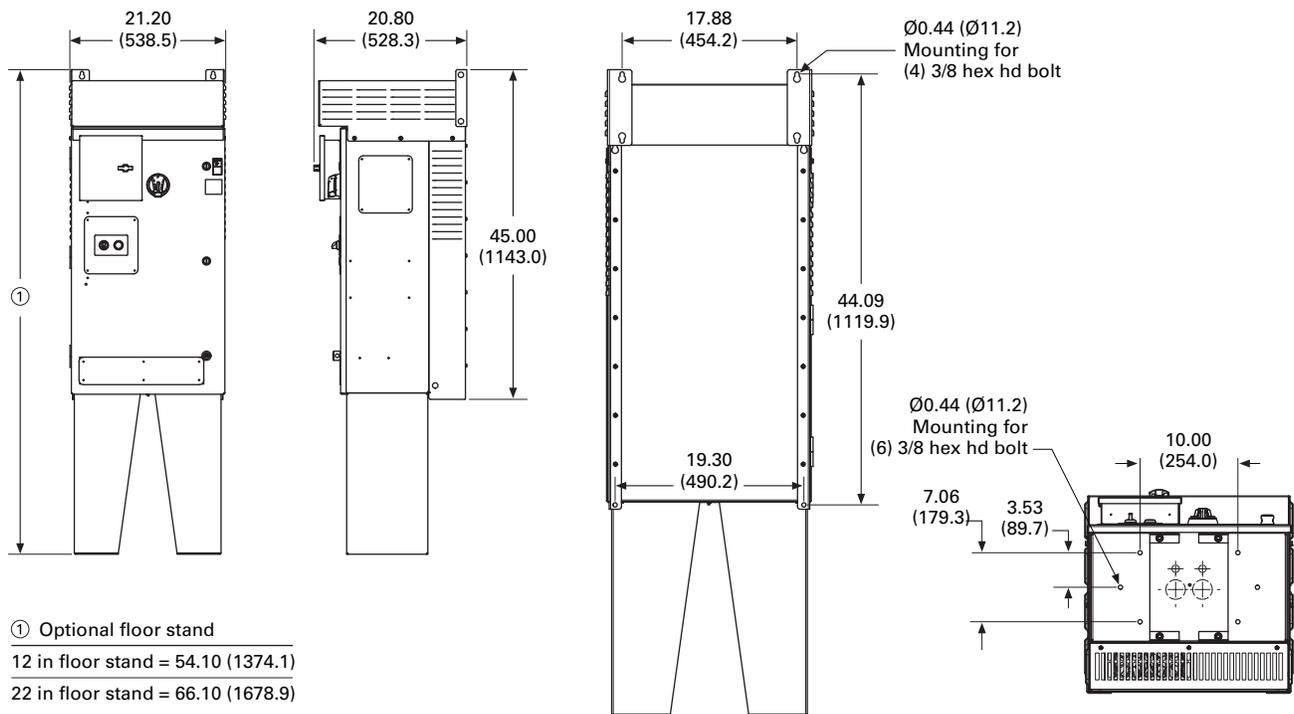


Figure 49. BX—Type 3R



Dimension drawings

Approximate dimensions in inches (mm).

Figure 50. CX—Type 1 and 12

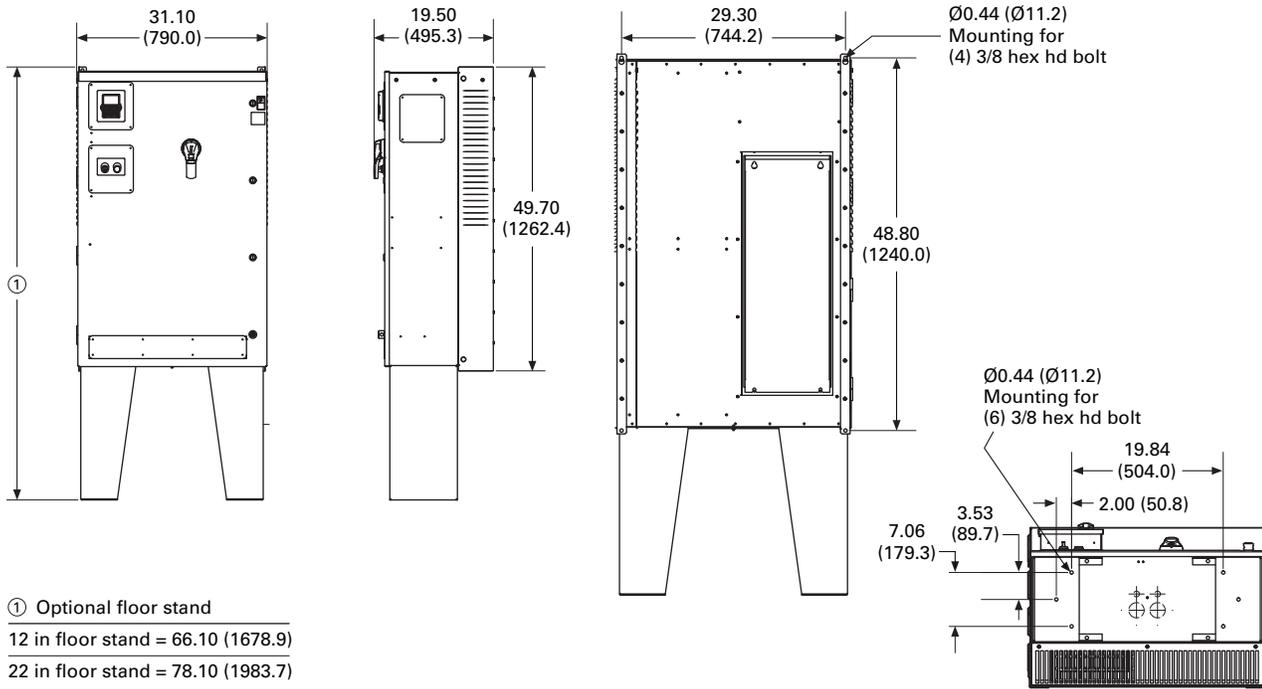
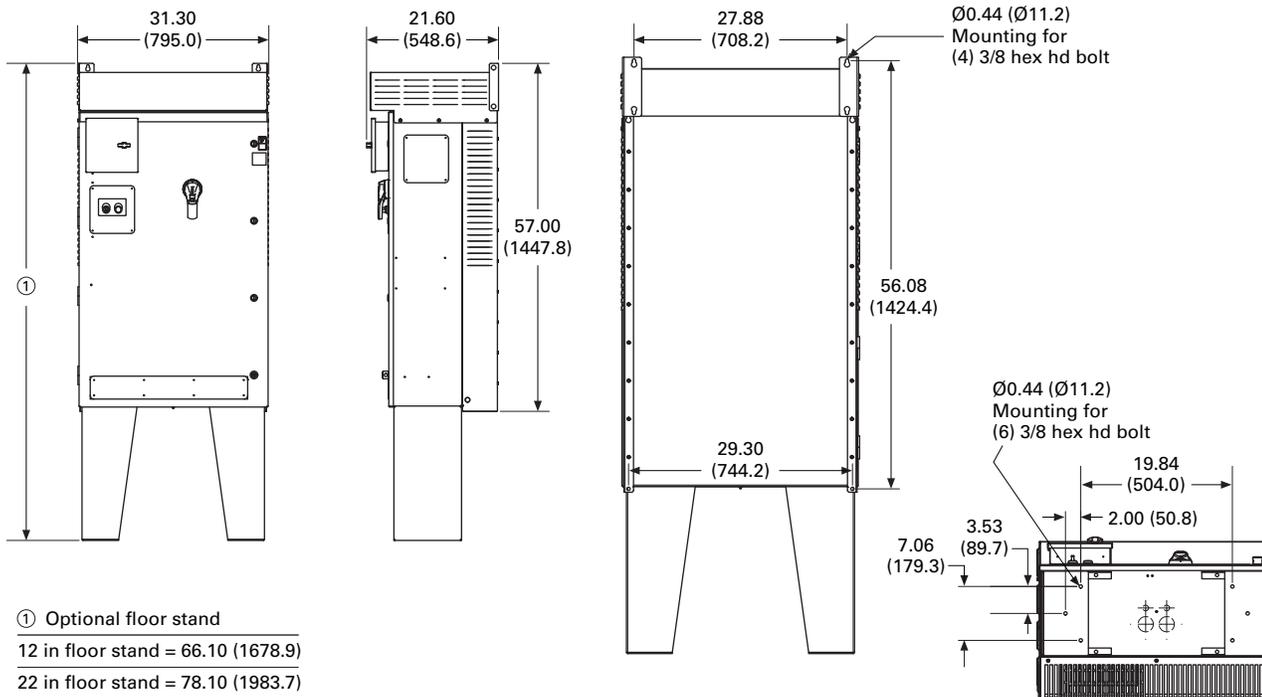


Figure 51. CX—Type 3R



Approximate dimensions in inches (mm).

Figure 52. CX-XL—Type 1 and 12

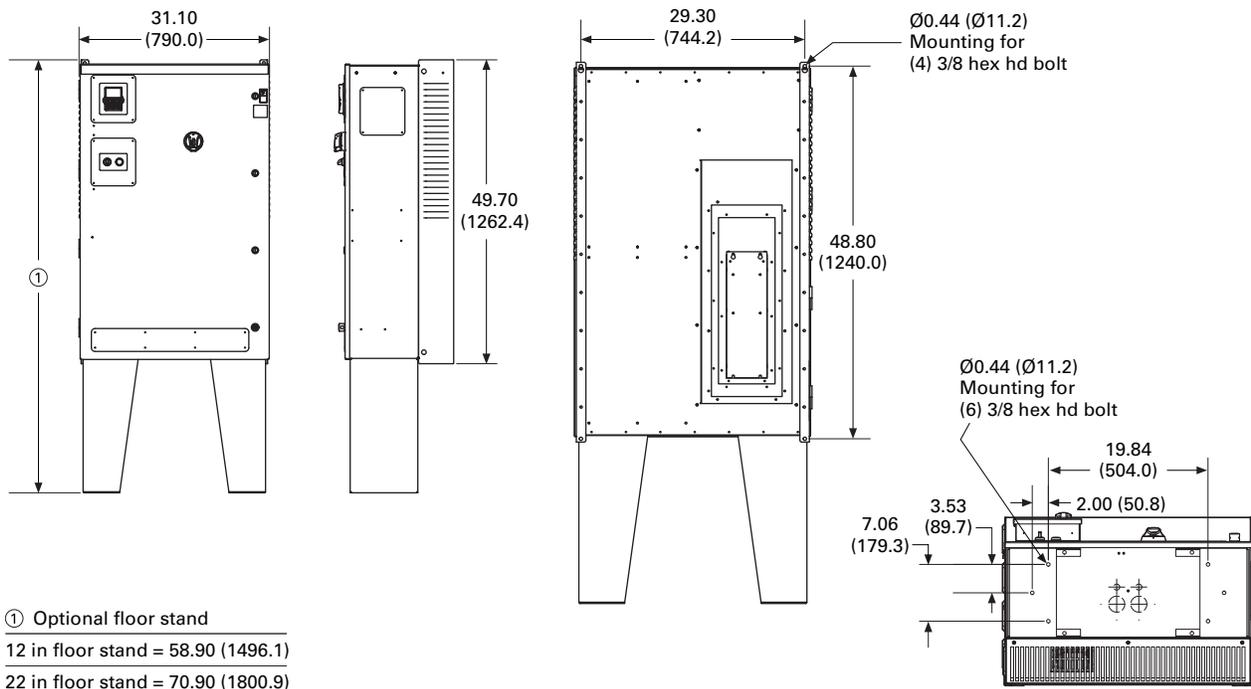
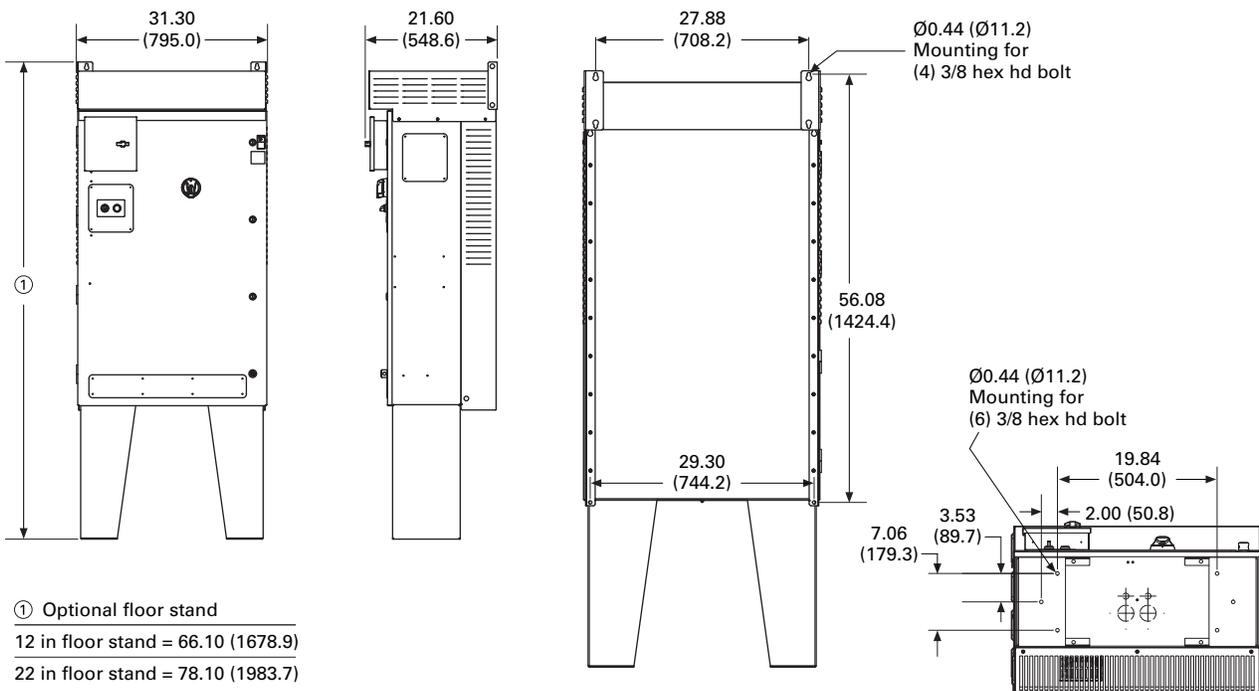


Figure 53. CX-XL—Type 3R



Dimension drawings

Approximate dimensions in inches (mm).

Figure 54. DX—Type 1 and Type 12 (FR5 and FR6)

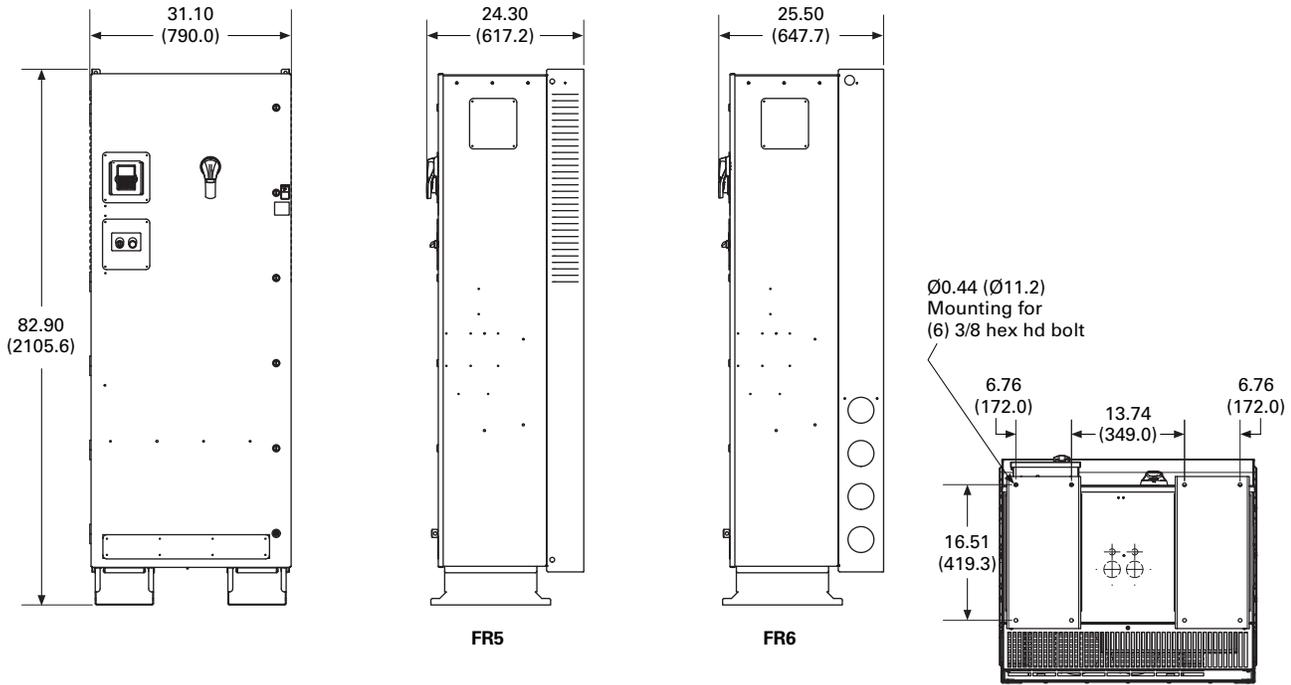
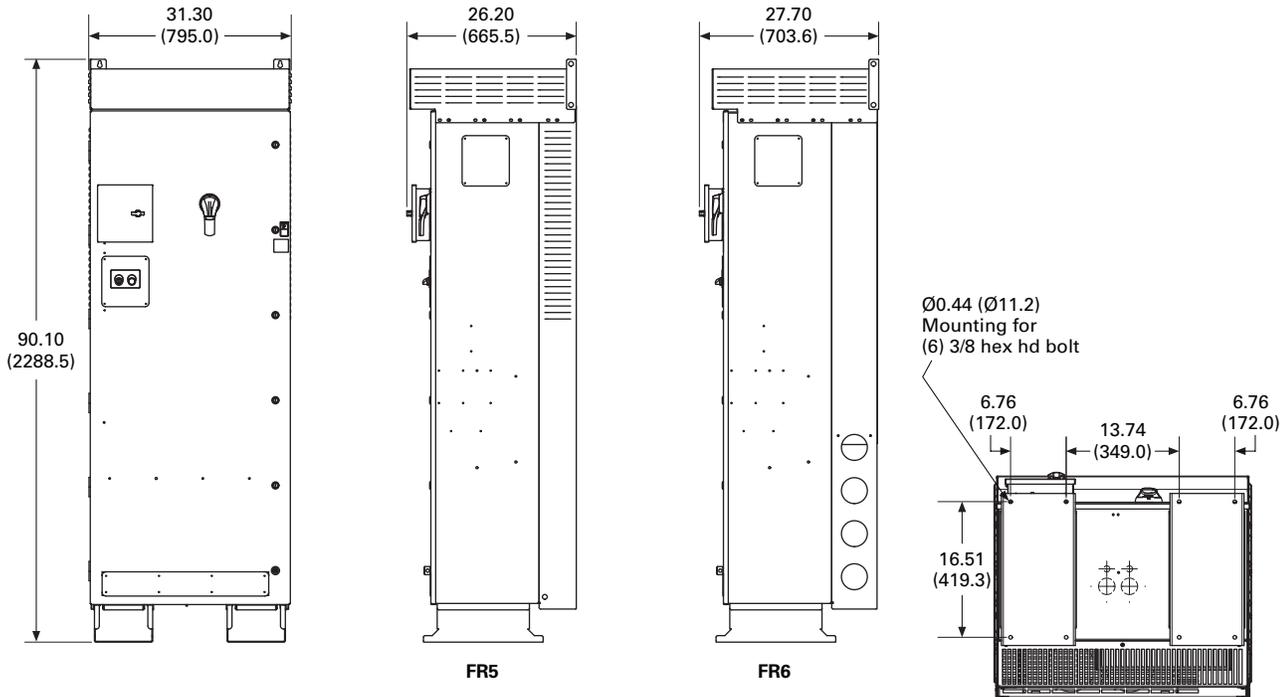


Figure 55. DX—Type 3R (FR5 and FR6)



Approximate dimensions in inches (mm).

Figure 56. DX-XL—Type 1 and Type 12

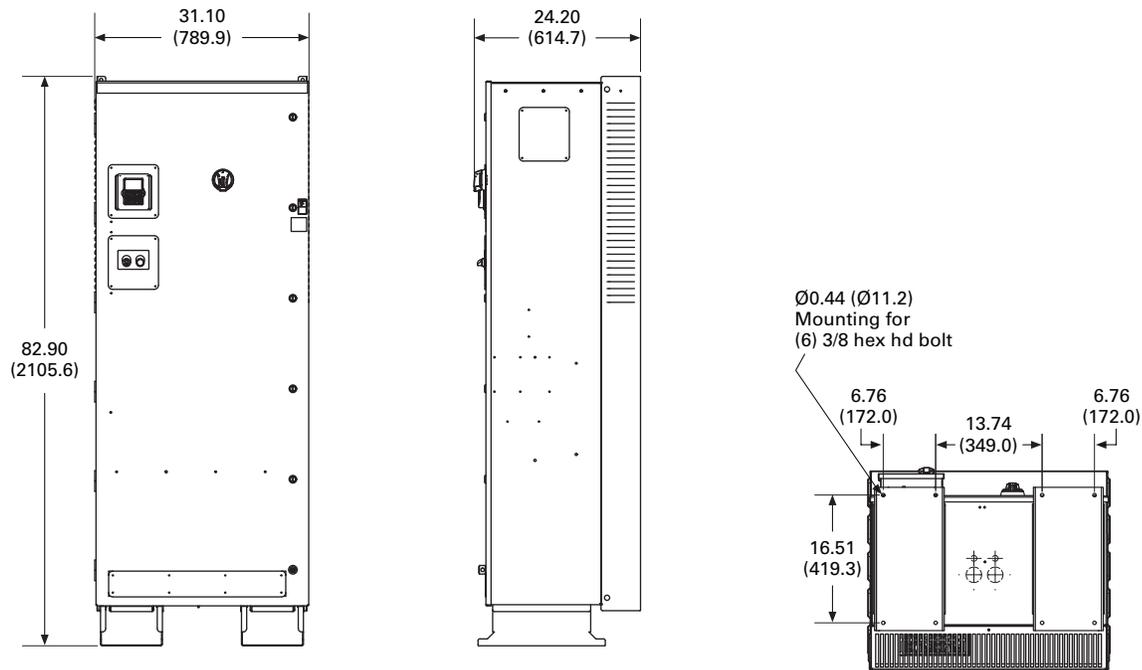
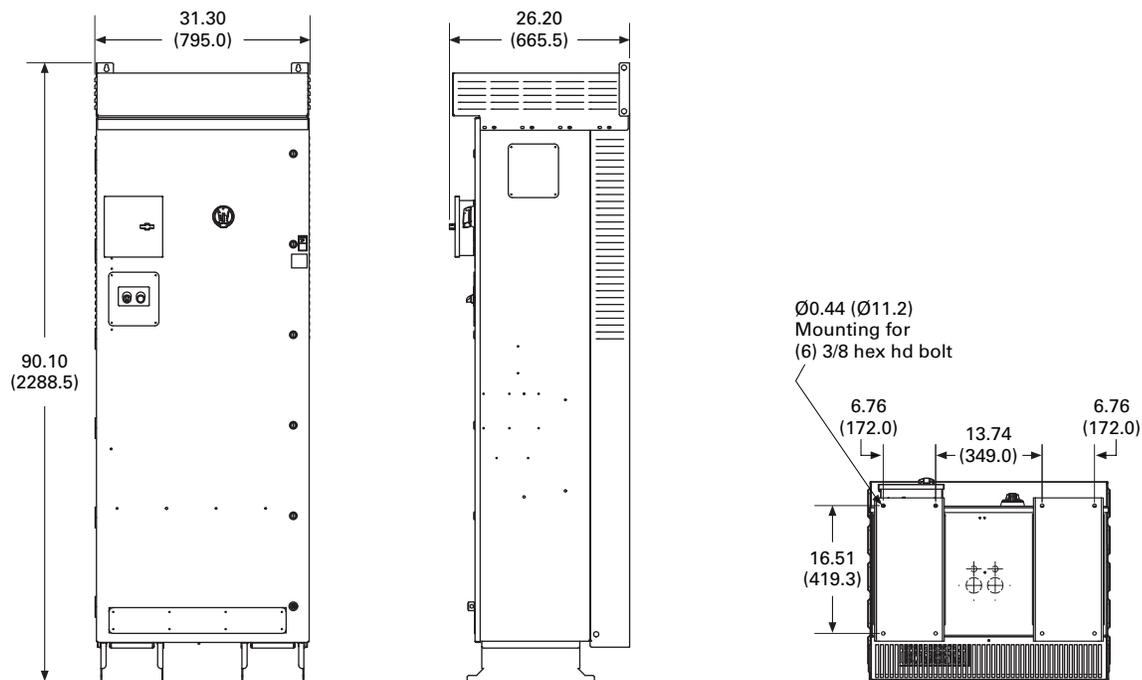


Figure 57. DX-XL—Type 3R



Dimension drawings

Approximate dimensions in inches (mm).

Figure 58. EX-XL—Type 1 and Type 12

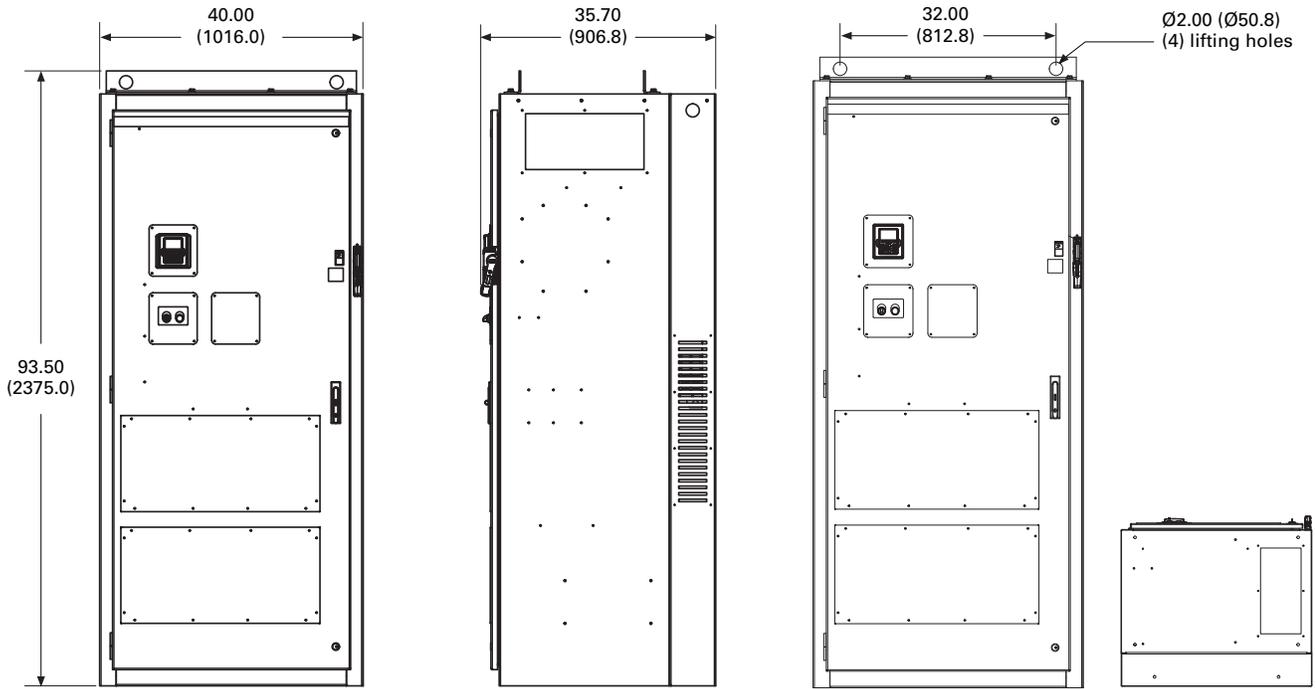
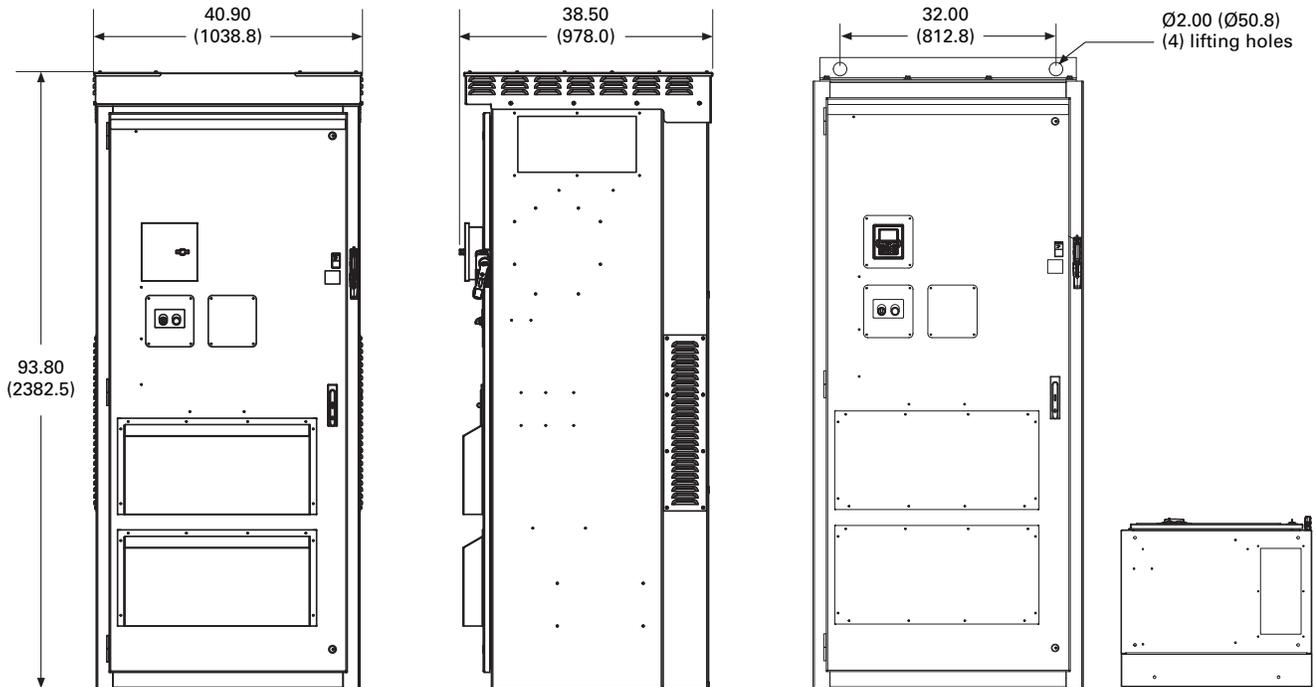


Figure 59. EX-XL—Type 3R



Approximate dimensions in inches (mm).

Figure 60. FX-XL—Type 1 and Type 12

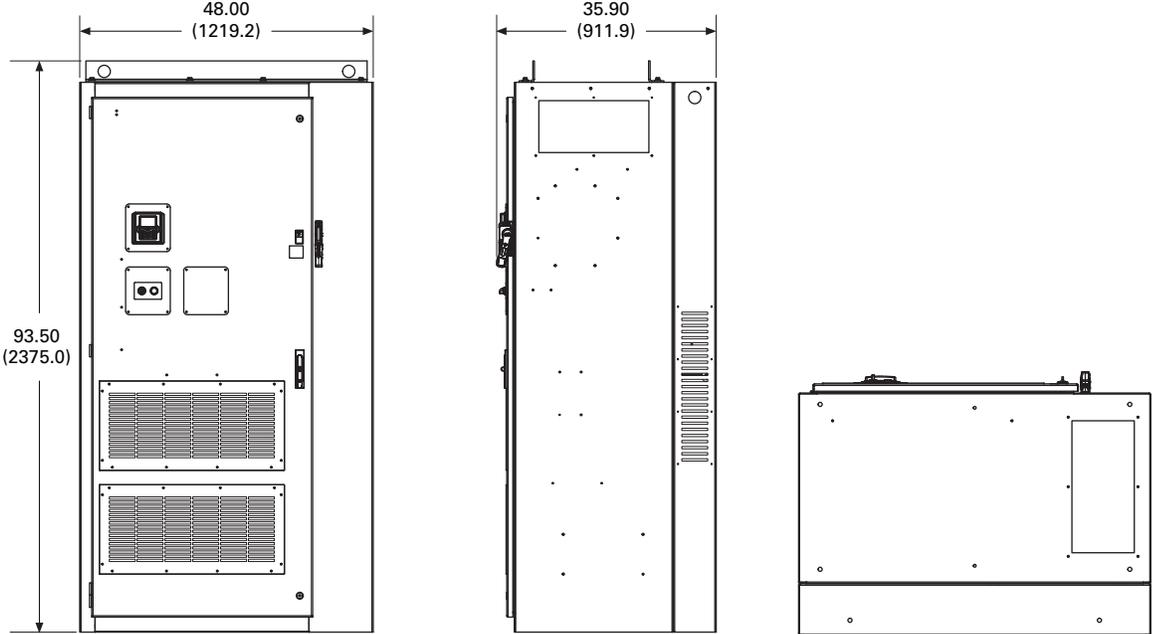


Figure 61. FX-XL—Type 3R

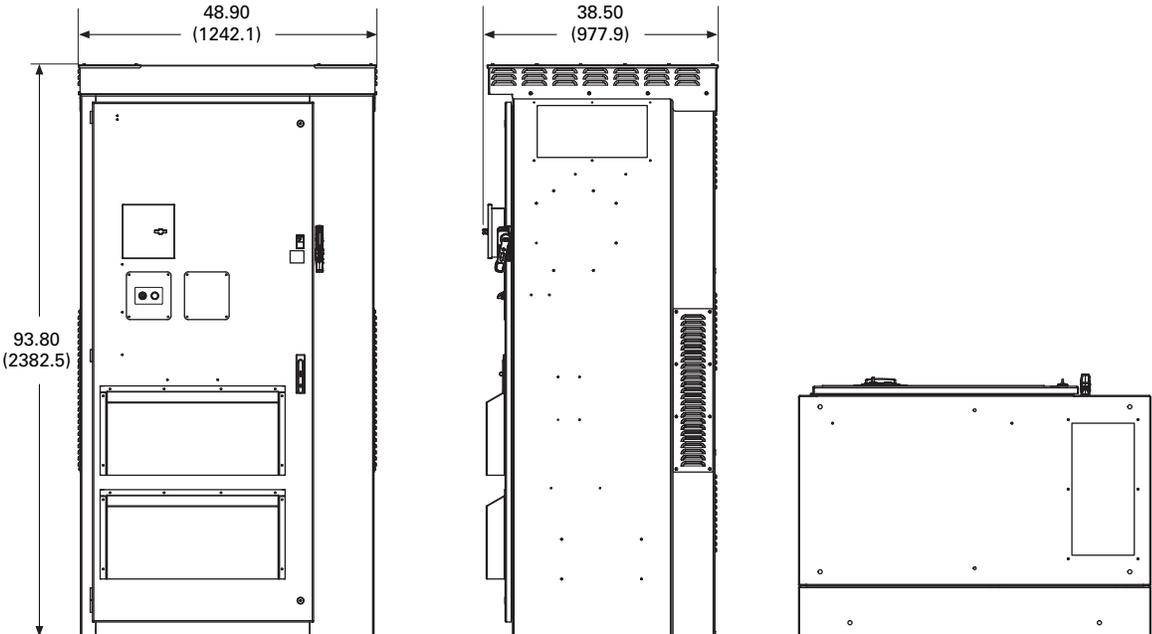
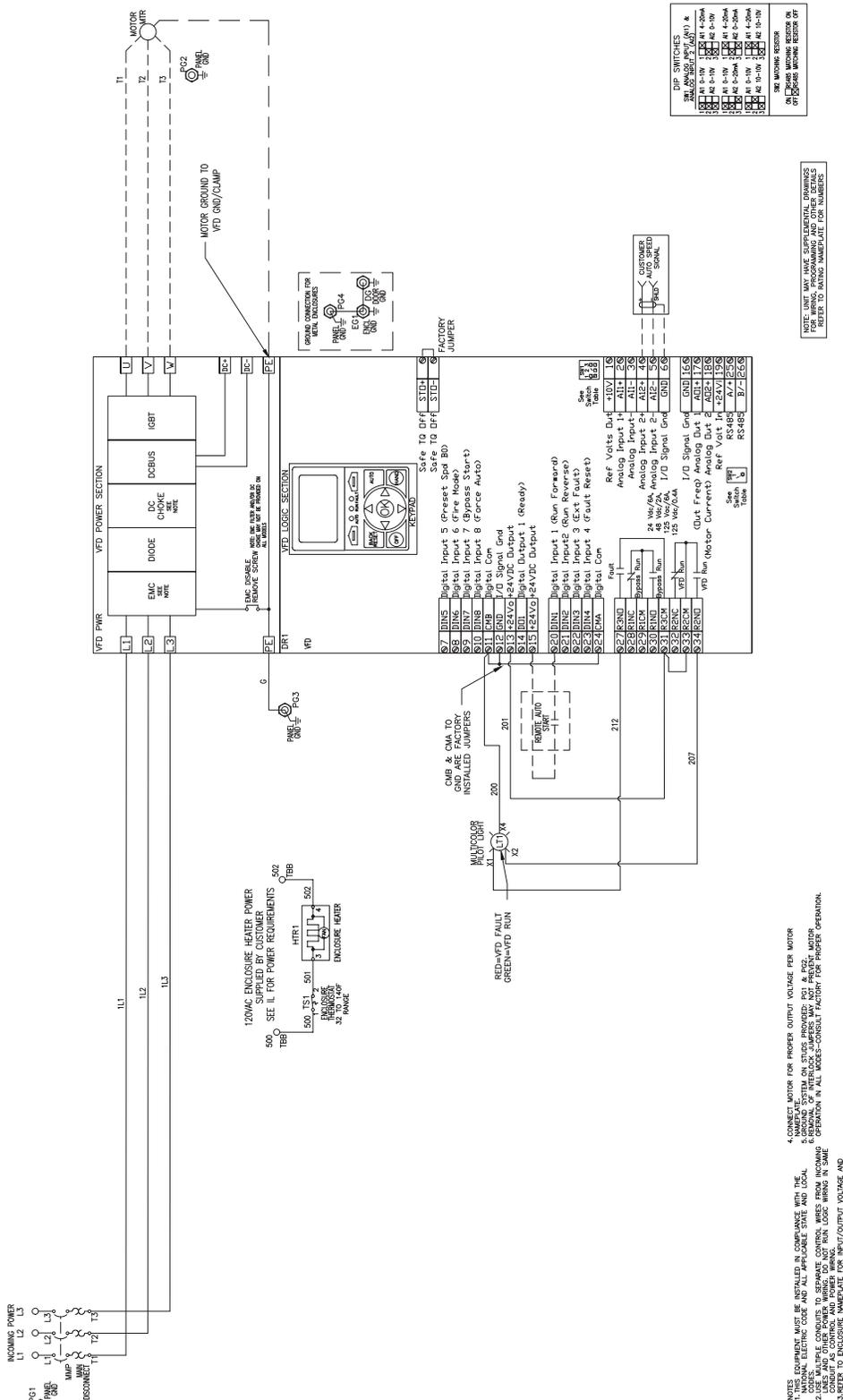
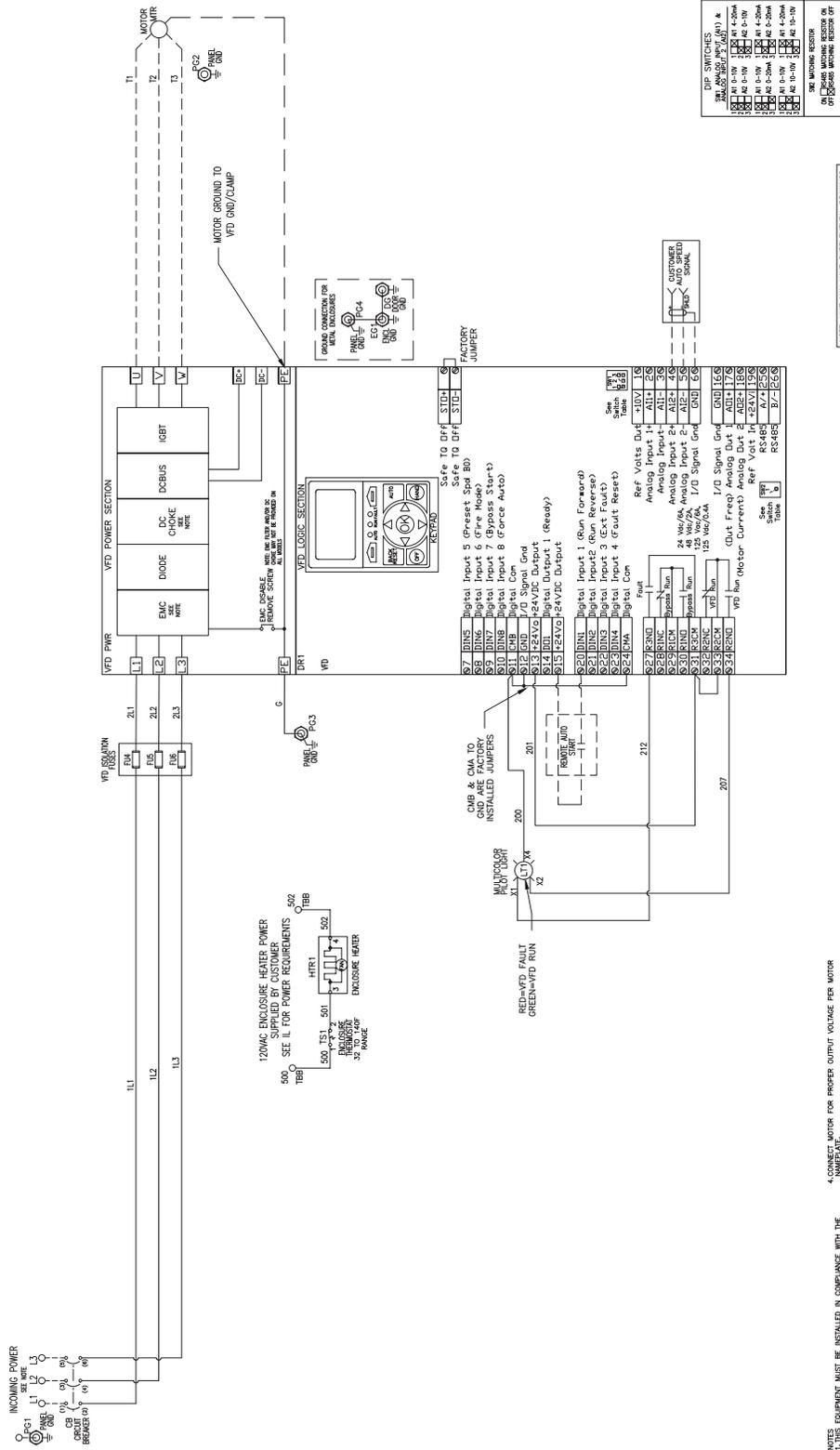


Figure 66. EHD electrical schematic (1 of 2)



288785-10000

Figure 67. EHD electrical schematic (2 of 2)



288785-300000

Wiring technical information

Input wiring

Connection will be made to one of the following components:

- Circuit Breaker
- Manual Motor protector
- Disconnect (fused or non-fused)

See appropriate table for wire range, torque and tool needed based on component supplied.

Output wiring

Connection will be made to one of the following components:

- VFD
- Contactor
- Motor Overload
- Power Terminal Block

See appropriate table for wire range, torque and tool needed based on component supplied.

Table 2. CMC input connection point

Connection ID	Type	Part number	Frame	Rating	Pole	OL range (Amps)	Lug	Wire type	AWG wire range	Torque (in-lb)	Metric wire size mm ²	Torque Nm	Screw/head type/tool	ILL#1	ILL#2
L1,L2,L3	CMC	XTPR2P5BC1	B	2.5	3	1.6–2.5	Integral	CU	18–10 ①	15	1–6 ①	1.7	0.6 x 3.5 straight	IL03402003Z	IL03407011Z
L1,L2,L3	CMC	XTPR6P3BC1	B	6.3	3	4–6.3	Integral	CU	18–10 ①	15	1–6 ①	1.7	0.6 x 3.5 straight	IL03402003Z	IL03407011Z
L1,L2,L3	CMC	XTPR004BC1	B	4	3	2.5–4	Integral	CU	18–10 ①	15	1–6 ①	1.7	0.6 x 3.5 straight	IL03402003Z	IL03407011Z
L1,L2,L3	CMC	XTPR010BC1	B	10	3	6.3–10	Integral	CU	18–10 ①	15	1–6 ①	1.7	0.6 x 3.5 straight	IL03402003Z	IL03407011Z
L1,L2,L3	CMC	XTPR012BC1	B	12	3	8–12	Integral	CU	18–10 ①	15	1–6 ①	1.7	0.6 x 3.5 straight	IL03402003Z	IL03407011Z
L1,L2,L3	CMC	XTPR016DC1	D	16	3	10–16	Integral	CU	14–2 ①	29.2	1–35 ①	1.7	Pozidrive #2	IL03402002Z	IL03407001Z
L1,L2,L3	CMC	XTPR020BC1	B	20	3	16–20	Integral	CU	18–10 ①	15	1–6 ①	1.7	0.6 x 3.5 straight	IL03402003Z	IL03407011Z
L1,L2,L3	CMC	XTPR025DC1	D	25	3	16–25	Integral	CU	14–2 ①	29.2	1–35 ①	1.7	Pozidrive #2	IL03402002Z	IL03407001Z
L1,L2,L3	CMC	XTPR032DC1	D	32	3	24–32	Integral	CU	14–2 ①	29.2	1–35 ①	1.7	Pozidrive #2	IL03402002Z	IL03407001Z
L1,L2,L3	CMC	XTPR040DC1	D	40	3	32–40	Integral	CU	14–2 ①	29.2	1–35 ①	1.7	Pozidrive #2	IL03402002Z	IL03407001Z
L1,L2,L3	CMC	XTPR050DC1	D	50	3	40–50	Integral	CU	14–2 ①	29.2	1–35 ①	1.7	Pozidrive #2	IL03402002Z	IL03407001Z
L1,L2,L3	CMC	XTPR058DC1	D	58	3	50–58	Integral	CU	14–2 ①	29.2	1–35 ①	1.7	Pozidrive #2	IL03402002Z	IL03407001Z

① Quantity = 2.

Table 3. CB input connection point

Connection ID	Type	Part number	Frame	Lug part number	Wire type	AWG wire range	Torque (in-lb)	Metric wire size mm ²	Torque Nm	Screw/head type/tool	ILL#1	ILL#2
L1,L2,L3	CB	FDC3015L	F	3T100FB	CU	①	①	①	①	Slotted	ILL29C101I	—
L1,L2,L3	CB	FDC3020L	F	3T100FB	CU	①	①	①	①	Slotted	ILL29C101I	—
L1,L2,L3	CB	FDC3025L	F	3T100FB	CU	①	①	①	①	Slotted	ILL29C101I	—
L1,L2,L3	CB	FDC3030L	F	3T100FB	CU	①	①	①	①	Slotted	ILL29C101I	—
L1,L2,L3	CB	FDC3035L	F	3T100FB	CU	①	①	①	①	Slotted	ILL29C101I	—
L1,L2,L3	CB	FDC3040L	F	3T100FB	CU	①	①	①	①	Slotted	ILL29C101I	—
L1,L2,L3	CB	FDC3045L	F	3T100FB	CU	①	①	①	①	Slotted	ILL29C101I	—
L1,L2,L3	CB	FDC3050L	F	3T100FB	CU	①	①	①	①	Slotted	ILL29C101I	—
L1,L2,L3	CB	FDC3060L	F	3T100FB	CU	①	①	①	①	Slotted	ILL29C101I	—
L1,L2,L3	CB	FDC3070L	F	3T100FB	CU	①	①	①	①	Slotted	ILL29C101I	—
L1,L2,L3	CB	FDC3080L	F	3T100FB	CU	①	①	①	①	Slotted	ILL29C101I	—
L1,L2,L3	CB	FDC3090L	F	3T100FB	CU	①	①	①	①	Slotted	ILL29C101I	—
L1,L2,L3	CB	FDC3100L	F	3T100FB	CU	①	①	①	①	Slotted	ILL29C101I	—
L1,L2,L3	CB	FDC3110L	F	3TA225FD	CU	①	①	①	①	3/16 hex	ILL29C101I	—
L1,L2,L3	CB	FDC3125L	F	3TA225FD	CU	①	①	①	①	3/16 hex	ILL29C101I	—
L1,L2,L3	CB	FDC3150L	F	3TA225FD	CU	①	①	①	①	3/16 hex	ILL29C101I	—
L1,L2,L3	CB	FDC3175L	F	3TA225FD	CU	①	①	①	①	3/16 hex	ILL29C101I	—
L1,L2,L3	CB	FDC3200L	F	3TA225FD	CU	①	①	①	①	3/16 hex	ILL29C101I	—
L1,L2,L3	CB	FDC3225L	F	3TA225FD	CU	①	①	①	①	3/16 hex	ILL29C101I	—
L1,L2,L3	CB	JDC3250	J	TA250KB	CU	①	①	①	①	5/16 hex	IL29C103G	6632C43H08
L1,L2,L3	CB	KDC3300	K	TA350K	CU	①	①	①	①	—	IL29C104E	—
L1,L2,L3	CB	KDC3350	K	TA350K	CU	①	①	①	①	—	IL29C104E	—
L1,L2,L3	CB	KDC3400	K	TA350K	CU	①	①	①	①	—	IL29C104E	—
L1,L2,L3	CB	NGC3080	N	TA1000NB1	CU	①	①	①	①	—	IL29C106F	—
L1,L2,L3	CB	NGC3120	N	TA1200NB1	CU	①	①	①	①	—	IL29C106F	—
L1,L2,L3	CB	RDC316T	R	TA1600RD	CU	①	①	①	①	—	IL29C107L	—
L1,L2,L3	CB	RDC320T	R	TA2000RD	CU	①	①	①	①	—	IL29C107L	—

① See table based on wire size used.

Wiring technical information

Table 4. Disc input connection point

Connection ID	Type	Part number	Frame	Rating	Pole	Terminal/catalog number	Wire type	AWG wire range	Torque (in-lb)	Metric wire size mm ²	Torque Nm	Screw/head type/tool	ILL#1	ILL#2
L1,L2,L3	Disc	R9C3030U	R9C	30	3	Integral	—	①	①	①	①	—	537678a	—
L1,L2,L3	Disc	R9C3060U	R9C	60	3	Integral	—	①	①	①	①	—	537678a	—
L1,L2,L3	Disc	R9C3100U	R9C	100	3	Integral	—	①	①	①	①	—	537678a	—
L1,L2,L3	Disc	R9D3100U	R9D	100	3	LK3R9DL	—	①	①	①	①	—	538264a	—
L1,L2,L3	Disc	R9D3200U	R9D	200	3	LK3R9DL	—	①	①	①	①	—	538264a	—
L1,L2,L3	Disc	R9E3400U	R9E	400	3	LK3R9EM	—	①	①	①	①	—	538265a	—
L1,L2,L3	Disc	R9F3600U	R9F	600	3	LK3R9FN	—	①	①	①	①	—	528414d	—
L1,L2,L3	Disc	R9F3800U	R9F	800	3	LK6R96	—	①	①	①	①	—	528414d	—
L1,L2,L3	Disc	R9J2030FJ	R9J	30	2	Integral	—	①	①	①	①	—	538037a	—
L1,L2,L3	Disc	R9J2030FJ	R9J	30	2	Integral	—	①	①	①	①	—	538037a	—
L1,L2,L3	Disc	R9J2060FJ	R9J	60	2	Integral	—	①	①	①	①	—	538037a	—
L1,L2,L3	Disc	R9J2060FJ	R9J	60	2	Integral	—	①	①	①	①	—	538037a	—
L1,L2,L3	Disc	R9K2100FJ	R9K	100	2	Integral	—	①	①	①	①	—	538037a	—
L1,L2,L3	Disc	R9K2100FJ	R9K	100	2	Integral	—	①	①	①	①	—	538037a	—
L1,L2,L3	Disc	R9L2200FJ	R9L	200	2	LK2R9DL	—	①	①	①	①	—	538038a	—
L1,L2,L3	Disc	R9L2200FJ	R9L	200	2	LK2R9DL	—	①	①	①	①	—	538038a	—
L1,L2,L3	Disc	R9N2600FJ	R9N	600	2	LK2R9FN	—	①	①	①	①	—	538040a	538043a
L1,L2,L3	Disc	R9N2600FJ	R9N	600	2	LK2R9FN	—	①	①	①	①	—	538040a	538043a
L1,L2,L3	Disc	R9N2800FL	R9N	800	2	LK2R9FN	—	①	①	①	①	—	538040a	538043a
L1,L2,L3	Disc	R9N2800FL	R9N	800	2	LK2R9FN	—	①	①	①	①	—	538040a	538043a
L1,L2,L3	Disc	R4H3030FCC	R4H	30	3	Integral	—	①	①	①	①	—	538040a	538043a
L1,L2,L3	Disc	R4H3030FJ	R4H	30	3	Integral	—	①	①	①	①	—	538040a	538043a
L1,L2,L3	Disc	R9I3030FCC	R9I	30	3	Integral	—	①	①	①	①	—	538049a	—
L1,L2,L3	Disc	R9J3030FJ	R9J	30	3	Integral	—	①	①	①	①	—	538037a	—
L1,L2,L3	Disc	R9J3030FJ	R9J	30	3	Integral	—	①	①	①	①	—	538037a	—
L1,L2,L3	Disc	R9J3060FJ	R9J	60	3	Integral	—	①	①	①	①	—	538037a	—
L1,L2,L3	Disc	R9J3060FJ	R9J	60	3	Integral	—	①	①	①	①	—	538037a	—
L1,L2,L3	Disc	R9K3060FJ	R9K	60	3	Integral	—	①	①	①	①	—	538037a	—
L1,L2,L3	Disc	R9K3060FJ	R9K	60	3	Integral	—	①	①	①	①	—	538037a	—
L1,L2,L3	Disc	R9K3100FJ	R9K	100	3	Integral	—	①	①	①	①	—	538037a	—
L1,L2,L3	Disc	R9K3100FJ	R9K	100	3	Integral	—	①	①	①	①	—	538037a	—
L1,L2,L3	Disc	R9L3200FJ	R9L	200	3	LK3R9DL	—	①	①	①	①	—	538038a	—
L1,L2,L3	Disc	R9L3200FJ	R9L	200	3	LK3R9DL	—	①	①	①	①	—	538038a	—
L1,L2,L3	Disc	R9M3400FJN	R9M	400	3	LK3R9FN	—	①	①	①	①	—	538039a	—
L1,L2,L3	Disc	R9M3400FJN	R9M	400	3	LK3R9FN	—	①	①	①	①	—	538039a	—
L1,L2,L3	Disc	R9M3600FJN	R9M	600	3	LK3R9FN	—	①	①	①	①	—	538039a	—
L1,L2,L3	Disc	R9M3600FJN	R9M	600	3	LK3R9FN	—	①	①	①	①	—	538039a	—
L1,L2,L3	Disc	R9N3600FJ	R9N	600	3	LK3R9FN	—	①	①	①	①	—	538040a	538043a
L1,L2,L3	Disc	R9N3800FL	R9N	800	3	LK3R9FN	—	①	①	①	①	—	538040a	538043a
L1,L2,L3	Disc	R9N3600FJ	R9N	600	3	LK3R9FN	—	①	①	①	①	—	538040a	538043a
L1,L2,L3	Disc	R9N3800FL	R9N	800	3	LK3R9FN	—	①	①	①	①	—	538040a	538043a

① See disc terminal table based on wire size.

Table 5. Contactor motor connection point

Connection ID	Type	Output contactor part number	Frame reference	Wire type	AWG wire range	Torque (in.-lb)	Metric wire size mm ²	Torque Nm	Screw/head type/tool	ILL #1
T1,T2,T3	Contact	XTCE007B01**	B	CU	8-14	11	—	1.2	Pozidriv #2	IL03407013Z
T1,T2,T3	Contact	XTCE009B01**	B	CU	8-14	11	—	1.2	Pozidriv #2	IL03407013Z
T1,T2,T3	Contact	XTCE012B01**	B	CU	8-14	11	—	1.2	Pozidriv #2	IL03407013Z
T1,T2,T3	Contact	XTCE015B01**	B	CU	8-14	11	—	1.2	Pozidriv #3	IL03407013Z
T1,T2,T3	Contact	XTCE018C01**	C	CU	8-14	27	—	3	M5 screw/bolt	IL03407013Z
T1,T2,T3	Contact	XTCE025C01**	C	CU	8-14	27	—	3	M5 screw/bolt	IL03407013Z
T1,T2,T3	Contact	XTCE032C01**	C	CU	14-1	27	—	3	M5 screw/bolt	IL03407013Z
T1,T2,T3	Contact	XTCE040D00**	D	CU	14-1	29	—	3.3	M6 screw/bolt	IL03407033Z
T1,T2,T3	Contact	XTCE050D00**	D	CU	14-1	29	—	3.3	M6 screw/bolt	IL03407033Z
T1,T2,T3	Contact	XTCE065D00**	D	CU	14-1	29	—	3.3	M6 screw/bolt	IL03407033Z
T1,T2,T3	Contact	XTCE072D00**	D	CU	14-1	29	—	3.3	M6 screw/bolt	IL03407033Z
T1,T2,T3	Contact	XTCE080F00**	F	CU	8-3/0	124	—	14	M10 screw/bolt	IL03407039Z
T1,T2,T3	Contact	XTCE095F00**	F	CU	8-3/0	124	—	14	M10 screw/bolt	IL03407039Z
T1,T2,T3	Contact	XTCE115G00**	G	CU	8-3/0	124	—	14	M10 screw/bolt	IL03407039Z
T1,T2,T3	Contact	XTCE150G00**	G	CU	8-3/0	124	—	14	M10 screw/bolt	IL03407039Z
T1,T2,T3	Contact	XTCE170G00**	G	CU	8-3/0	124	—	14	M10 screw/bolt	IL03407039Z
T1,T2,T3	Contact	XTCE185H22**	H	CU	—	214	—	24	M10 screw/bolt	IL03406001Z
T1,T2,T3	Contact	XTCE225H22**	H	CU	—	214	—	24	M10 screw/bolt	IL03406001Z
T1,T2,T3	Contact	XTCE185L22**	L	CU	—	—	—	0	M10 screw/bolt	IL03406001Z
T1,T2,T3	Contact	XTCE225L22**	L	CU	—	—	—	0	M10 screw/bolt	IL03406001Z
T1,T2,T3	Contact	XTCE250L22**	L	CU	—	212	—	24	M10 screw/bolt	IL03406002Z
T1,T2,T3	Contact	XTCE300M22**	M	CU	—	212	—	24	M10 screw/bolt	IL03406002Z
T1,T2,T3	Contact	XTCE400M22**	M	CU	—	212	—	24	M10 screw/bolt	IL03406002Z
T1,T2,T3	Contact	XTCE500M22**	M	CU	—	212	—	24	M10 screw/bolt	IL03406002Z
T1,T2,T3	Contact	XTCE580N22**	N	CU	—	221/310	—	24/35	M10/12 screw/bolt	IL03407023Z
T1,T2,T3	Contact	XTCE650N22**	N	CU	—	221/310	—	24/35	M10/12 screw/bolt	IL03407023Z
T1,T2,T3	Contact	XTCE750N22**	N	CU	—	310	—	35	M12 screw/bolt	IL03407023Z
T1,T2,T3	Contact	XTCE820N22**	N	CU	—	310	—	35	M12 screw/bolt	IL03407023Z
T1,T2,T3	Contact	XTCEC10N22**	N	CU	—	310	—	35	M12 screw/bolt	IL03407023Z
T1,T2,T3	Contact	XTCEC14P22**	N	CU	—	310	—	35	M12 screw/bolt	IL03407023Z
T1,T2,T3	Contact	XTCEC16R22**	N	CU	—	310	—	35	M12 screw/bolt	IL03407023Z

Wiring technical information

Table 6. Overload motor connection point

Connection ID	Type	Voltage	hp	Overload part number	Overload type	OL range (Amps)	Frame reference	Wire type	AWG wire range	Torque (in-lb)	Metric wire size mm ²	Torque Nm	Screw/head type/tool	ILL#1	ILL#2
T1,T2,T3	OL relay	208V	0.75	XTOB004BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	208V	1	XTOB006BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	208V	1.5	XTOB010BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	208V	2	XTOB010BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	208V	3	XTOB012BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	208V	5	XTOB024CC1	BM	C	BM	CU	14-8	16	—	1.8	Pozidrive #3	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	208V	7.5	XTOB032CC1	BM	C	BM	CU	14-8	16	—	1.8	Pozidrive #3	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	208V	10	XTOB032CC1	BM	C	BM	CU	14-8	16	—	1.8	Pozidrive #3	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	208V	15	XTOB057DC1	BM	D	BM	CU	14-2	31	—	3.5	Pozidrive #2	IL03407008Z	MN03407005Z
T1,T2,T3	OL relay	208V	20	XTOB065DC1	BM	D	BM	CU	14-2	31	—	3.5	Pozidrive #2	IL03407008Z	MN03407005Z
T1,T2,T3	OL relay	208V	25	XTOB100GC1	BM	G	BM	CU	3/0	89	—	10	5 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	208V	30	XTOB100GC1	BM	G	BM	CU	3/0	89	—	10	5 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	208V	40	XTOB125GC1	BM	G	BM	CU	3/0	89	—	10	5 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	208V	50	XTOB150GC1	BM	G	BM	CU	3/0	89	—	10	5 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	208V	60	XTOB220HC1	BM	H	BM	CU	250	160	—	18	16 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	230V	0.75	XTOB004BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	230V	1	XTOB006BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	230V	1.5	XTOB006BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	230V	2	XTOB010BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	230V	3	XTOB010BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	230V	5	XTOB016CC1	BM	C	BM	CU	14-8	16	—	1.8	Pozidrive #3	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	230V	7.5	XTOB024CC1	BM	C	BM	CU	14-8	16	—	1.8	Pozidrive #3	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	230V	10	XTOB032CC1	BM	C	BM	CU	14-8	16	—	1.8	Pozidrive #3	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	230V	15	XTOB057DC1	BM	D	BM	CU	14-2	31	—	3.5	Pozidrive #2	IL03407008Z	MN03407005Z
T1,T2,T3	OL relay	230V	20	XTOB057DC1	BM	D	BM	CU	14-2	31	—	3.5	Pozidrive #2	IL03407008Z	MN03407005Z
T1,T2,T3	OL relay	230V	25	XTOB075DC1	BM	D	BM	CU	14-2	31	—	3.5	Pozidrive #2	IL03407008Z	MN03407005Z
T1,T2,T3	OL relay	230V	30	XTOB100GC1	BM	G	BM	CU	3/0	89	—	10	5 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	230V	40	XTOB125GC1	BM	G	BM	CU	3/0	89	—	10	5 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	230V	50	XTOB150GC1	BM	G	BM	CU	3/0	89	—	10	5 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	230V	60	XTOB175GC1	BM	G	BM	CU	3/0	89	—	10	5 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	230V	75	XTOB220HC1	BM	H	BM	CU	250	160	—	18	16 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	480V	0.75	XTOB1P6BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	480V	1	XTOB2P4BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	480V	1.5	XTOB004BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	480V	2	XTOB004BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	480V	3	XTOB006BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	480V	5	XTOB010BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	480V	7.5	XTOB012BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	480V	10	XTOB016BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	480V	15	XTOB024CC1	BM	C	BM	CU	14-8	16	—	1.8	Pozidrive #3	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	480V	20	XTOB032CC1	BM	C	BM	CU	14-8	16	—	1.8	Pozidrive #3	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	480V	25	XTOB040DC1	BM	D	BM	CU	14-2	31	—	3.5	Pozidrive #2	IL03407008Z	MN03407005Z
T1,T2,T3	OL relay	480V	30	XTOB040DC1	BM	D	BM	CU	14-2	31	—	3.5	Pozidrive #2	IL03407008Z	MN03407005Z

CT = Current transformer.

BM = Bimetallic.

C= Included in the Type E disconnect—BCP table.

Table 6. Overload motor connection point, continued

Connection ID	Type	Voltage	hp	Overload part number	Overload type	OL range (Amps)	Frame reference	Wire type	AWG wire range	Torque (in-lb)	Metric wire size mm ²	Torque Nm	Screw/head type/tool	ILL#1	ILL#2
T1,T2,T3	OL relay	480V	40	XTOB057DC1	BM	D	BM	CU	14-2	31	—	3.5	Pozidrive #2	IL03407008Z	MN03407005Z
T1,T2,T3	OL relay	480V	50	XTOB065DC1	BM	D	BM	CU	14-2	31	—	3.5	Pozidrive #2	IL03407008Z	MN03407005Z
T1,T2,T3	OL relay	480V	60	XTOB100GC1	BM	G	BM	CU	3/0	89	—	10	5 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	480V	75	XTOB100GC1	BM	G	BM	CU	3/0	89	—	10	5 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	480V	100	XTOB125GC1	BM	G	BM	CU	3/0	89	—	10	5 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	480V	125	XTOB175GC1S	BM	G	BM	CU	3/0	89	—	10	5 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	480V	150	XTOB220HC1	BM	H	BM	CU	250	160	—	18	16 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	575V	0.75	XTOB1P6BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	575V	1	XTOB2P4BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	575V	1.5	XTOB2P4BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	575V	2	XTOB004BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	575V	3	XTOB004BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	575V	5	XTOB010BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	575V	7.5	XTOB010BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	575V	10	XTOB012BC1	BM	B	BM	CU	14-8	16	—	1.8	Pozidrive #2	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	575V	15	XTOB024CC1	BM	C	BM	CU	14-8	16	—	1.8	Pozidrive #3	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	575V	20	XTOB024CC1	BM	C	BM	CU	14-8	16	—	1.8	Pozidrive #3	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	575V	25	XTOB032CC1	BM	C	BM	CU	14-8	16	—	1.8	Pozidrive #3	IL03407015Z	MN03407004Z
T1,T2,T3	OL relay	575V	30	XTOB040DC1	BM	D	BM	CU	14-2	31	—	3.5	Pozidrive #2	IL03407008Z	MN03407005Z
T1,T2,T3	OL relay	575V	40	XTOB057DC1	BM	D	BM	CU	14-2	31	—	3.5	Pozidrive #2	IL03407008Z	MN03407005Z
T1,T2,T3	OL relay	575V	50	XTOB057DC1	BM	D	BM	CU	14-2	31	—	3.5	Pozidrive #2	IL03407008Z	MN03407005Z
T1,T2,T3	OL relay	575V	60	XTOB065DC1	BM	D	BM	CU	14-2	31	—	3.5	Pozidrive #2	IL03407008Z	MN03407005Z
T1,T2,T3	OL relay	575V	75	XTOB100GC1	BM	G	BM	CU	3/0	89	—	10	5 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	575V	100	XTOB100GC1	BM	G	BM	CU	3/0	89	—	10	5 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	575V	125	XTOB125GC1	BM	G	BM	CU	3/0	89	—	10	5 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	575V	150	XTOB160HC1	BM	H	BM	CU	250	160	—	18	16 mm hex	IL03407006Z	MN03407005Z
T1,T2,T3	OL relay	575V	200	XTOB220HC1	BM	H	BM	CU	250	160	—	18	16 mm hex	IL03407006Z	MN03407005Z

CT = Current transformer.
 BM = Bimetallic.
 C= Included in the Type E disconnect—BCP table.

Wiring technical information

Table 7. PTB motor connection point

Connection ID	Type	PTB	Amps rating	Wire type	AWG wire range	Torque (in-lb)	Metric wire size mm ²	Torque Nm	Screw/head type/tool	ILL#1	ILL#2
T1,T2,T3	PTB	NDN1	90	CU	18–2	32	1–35	3.6	Slotted	—	—
T1,T2,T3	PTB	NDN111	90	CU	18–2	32	1–35	3.6	Slotted	—	—
T1,T2,T3	PTB	PDBFS204	175	CU	8–2/0	110	10–70	12.4	3/16 hex	SB09689	SB09689
T1,T2,T3	PTB	PDBFS303	310	CU	6–350	275	16–185	31.1	5/16 hex	SB09690	SB09690
T1,T2,T3	PTB	PDBFS500	620	CU	4–350 ①	275	12–185	31.1	5/16 hex	SB09691	SB09691
T1,T2,T3	PTB	PDBFS504	760–600V	CU	6–500 ①	500	16–240	56.5	3/8 hex	SB09692	SB09692

① Quantity = 2.

Table 8. VFD motor connection point

Connection ID	Type	Voltage	hp	Part number	Frame size	Wire type	AWG wire range	Torque (in-lb)	Metric wire size mm ²	Torque Nm	Screw/head type/tool	ILL#1	ILL#2
L1,L2,L3/T1,T2,T3	VFD	208V	0.75	DH1-324D8DN-C21C	1	CU	26–10 ①	5.3	0.2–6	0.6	Flat blade	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	208V	1	DH1-324D8DN-C21C	1	CU	26–10 ①	5.3	0.2–6	0.6	Flat blade	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	208V	1.5	DH1-326D6DN-C21C	1	CU	26–10 ①	5.3	0.2–6	0.6	Flat blade	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	208V	2	DH1-327D8DN-C21C	1	CU	26–10 ①	5.3	0.2–6	0.6	Flat blade	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	208V	3	DH1-32011DN-C21C	1	CU	26–10 ①	5.3	0.2–6	0.6	Flat blade	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	208V	5	DH1-32017DN-C21C	2	CU	20–6 ①	15.6	0.5–16	1.8	Flat blade	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	208V	7.5	DH1-32025DN-C21C	2	CU	20–6 ①	15.6	0.5–16	1.8	Flat blade	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	208V	10	DH1-32031DN-C21C	2	CU	20–6 ①	15.6	0.5–16	1.8	Flat blade	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	208V	15	DH1-32048DN-C21C	3	CU	6–2 ①	40	16–35	4.5	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	208V	20	DH1-32061DN-C21C	3	CU	6–2 ①	40	16–35	4.5	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	208V	25	DH1-32075DN-C21C	4	CU	6–1/0 ①	95	16–50	10.7	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	208V	30	DH1-32088DN-C21C	4	CU	6–1/0 ①	95	16–50	10.7	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	208V	40	DH1-32114DN-C21C	4	CU	6–1/0 ①	95	16–50	10.7	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	208V	50	DH1-32143DN-C21C	5	CU	1/0–350 ①	354	50–185	40	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	208V	60	DH1-32170DN-C21C	5	CU	1/0–350 ①	354	50–185	40	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	208V	75	DH1-32211DN-C21C	5	CU	1/0–350 ①	354	50–185	40	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	208V	100	DH1-32261FN-C21C	6	CU	1/0–300 ②	480	50–150 ②	54.2	1/2 hex	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	230V	0.75	DH1-324D8DN-C21C	1	CU	26–10 ①	5.3	0.2–6	0.6	Flat blade	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	230V	1	DH1-324D8DN-C21C	1	CU	26–10 ①	5.3	0.2–6	0.6	Flat blade	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	230V	1.5	DH1-326D6DN-C21C	1	CU	26–10 ①	5.3	0.2–6	0.6	Flat blade	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	230V	2	DH1-327D8DN-C21C	1	CU	26–10 ①	5.3	0.2–6	0.6	Flat blade	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	230V	3	DH1-32011DN-C21C	1	CU	26–10 ①	5.3	0.2–6	0.6	Flat blade	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	230V	5	DH1-32017DN-C21C	2	CU	20–6 ①	15.6	0.5–16	1.8	Flat blade	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	230V	7.5	DH1-32025DN-C21C	2	CU	20–6 ①	15.6	0.5–16	1.8	Flat blade	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	230V	10	DH1-32031DN-C21C	2	CU	20–6 ①	15.6	0.5–16	1.8	Flat blade	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	230V	15	DH1-32048DN-C21C	3	CU	6–2 ①	40	16–35	4.5	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	230V	20	DH1-32061DN-C21C	3	CU	6–2 ①	40	16–35	4.5	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	230V	25	DH1-32075DN-C21C	4	CU	6–1/0 ①	95	16–50	10.7	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	230V	30	DH1-32088DN-C21C	4	CU	6–1/0 ①	95	16–50	10.7	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	230V	40	DH1-32114DN-C21C	4	CU	6–1/0 ①	95	16–50	10.7	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	230V	50	DH1-32143DN-C21C	5	CU	1/0–350 ①	354	50–185	40	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	230V	60	DH1-32170DN-C21C	5	CU	1/0–350 ①	354	50–185	40	—	MN040002EN	MN040039EN

① Quantity = 1.

② Quantity = 2.

Table 8. VFD motor connection point, continued

Connection ID	Type	Voltage	hp	Part number	Frame size	Wire type	AWG wire range	Torque (in-lb)	Metric wire size mm ²	Torque Nm	Screw/head type/tool	ILL#1	ILL#2
L1,L2,L3/T1,T2,T3	VFD	230V	75	DH1-32211DN-C21C	5	CU	1/0-350 ①	354	50-185	40	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	230V	100	DH1-32261FN-C21C	6	CU	1/0-300 ②	480	50-150 ②	54.2	1/2 hex	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	230V	125	DH1-32312FN-C21C	6	CU	1/0-300 ②	480	50-150 ②	54.2	1/2 hex	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	0.75	DH1-343D3DN-C21C	1	CU	26-10 ①	5.3	0.2-6	0.6	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	1	DH1-343D3DN-C21C	1	CU	26-10 ①	5.3	0.2-6	0.6	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	1.5	DH1-343D3DN-C21C	1	CU	26-10 ①	5.3	0.2-6	0.6	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	2	DH1-344D3DN-C21C	1	CU	26-10 ①	5.3	0.2-6	0.6	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	3	DH1-345D6DN-C21C	1	CU	26-10 ①	5.3	0.2-6	0.6	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	5	DH1-347D6DN-C21C	1	CU	26-10 ①	5.3	0.2-6	0.6	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	7.5	DH1-34012DN-C21C	1	CU	26-10 ①	5.3	0.2-6	0.6	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	10	DH1-34016DN-C21C	2	CU	20-6 ①	15.6	0.5-16	1.8	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	15	DH1-34023DN-C21C	2	CU	20-6 ①	15.6	0.5-16	1.8	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	20	DH1-34031DN-C21C	2	CU	20-6 ①	15.6	0.5-16	1.8	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	25	DH1-34038DN-C21C	3	CU	6-2 ①	40	16-35	4.5	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	30	DH1-34046DN-C21C	3	CU	6-2 ①	40	16-35	4.5	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	40	DH1-34061DN-C21C	3	CU	6-2 ①	40	16-35	4.5	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	50	DH1-34072DN-C21C	4	CU	6-1/0 ①	95	16-50	10.7	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	60	DH1-34087DN-C21C	4	CU	6-1/0 ①	95	16-50	10.7	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	75	DH1-34105DN-C21C	4	CU	6-1/0 ①	95	16-50	10.7	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	100	DH1-34140DN-C21C	5	CU	1/0-350 ①	354	50-185	40	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	125	DH1-34170DN-C21C	5	CU	1/0-350 ①	354	50-185	40	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	150	DH1-34205DN-C21C	5	CU	1/0-350 ①	354	50-185	40	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	200	DH1-34261FN-C21C	6	CU	1/0-300 ②	480	50-150 ②	54.2	1/2 hex	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	480V	250	DH1-34310FN-C21C	6	CU	1/0-300 ②	480	50-150 ②	54.2	1/2 hex	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	0.75	DH1-354D5FB-C21C	1	CU	26-10 ①	5.3	0.2-6	0.6	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	1	DH1-354D5FB-C21C	1	CU	26-10 ①	5.3	0.2-6	0.6	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	1.5	DH1-354D5FB-C21C	1	CU	26-10 ①	5.3	0.2-6	0.6	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	2	DH1-354D5FB-C21C	1	CU	26-10 ①	5.3	0.2-6	0.6	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	3	DH1-354D5FB-C21C	1	CU	26-10 ①	5.3	0.2-6	0.6	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	5	DH1-357D5FB-C21C	1	CU	26-10 ①	5.3	0.2-6	0.6	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	7.5	DH1-35010FB-C21C	1	CU	26-10 ①	5.3	0.2-6	0.6	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	10	DH1-35013FB-C21C	2	CU	20-6 ①	15.6	0.5-16	1.8	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	15	DH1-35018FB-C21C	2	CU	20-6 ①	15.6	0.5-16	1.8	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	20	DH1-35022FB-C21C	2	CU	20-6 ①	15.6	0.5-16	1.8	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	25	DH1-35027FB-C21C	3	CU	6-2 ①	40	16-35	4.5	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	30	DH1-35034FB-C21C	3	CU	6-2 ①	40	16-35	4.5	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	40	DH1-35041FB-C21C	3	CU	6-2 ①	40	16-35	4.5	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	50	DH1-35052FN-C21C	4	CU	6-1/0 ①	95	16-50	10.7	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	60	DH1-35062FN-C21C	4	CU	6-1/0 ①	95	16-50	10.7	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	75	DH1-35080FN-C21C	4	CU	6-1/0 ①	95	16-50	10.7	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	100	DH1-35100FN-C21C	5	CU	1/0-350 ①	354	50-185	40	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	125	DH1-35125FN-C21C	5	CU	1/0-350 ①	354	50-185	40	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	150	DH1-35144FN-C21C	5	CU	1/0-350 ①	354	50-185	40	—	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	200	DH1-35208FN-C21C	6	CU	1/0-300 ②	480	50-150 ②	54.2	1/2 hex	MN040002EN	MN040039EN
L1,L2,L3/T1,T2,T3	VFD	575V	250	DH1-35250FN-C21C	6	CU	1/0-300 ②	480	50-150 ②	54.2	1/2 hex	MN040002EN	MN040039EN

① Quantity = 1.

② Quantity = 2.

Wiring technical information

Table 9. Disconnect terminal data

Type	Frame/ID	Terminal/ catalog number	Max. rated amps	Wire type	AWG wire range	Torque (in-lb)	Metric wire size mm ²	Torque Nm	Screw/head type/tool
Disc	R4H	Integral	30–60	CU	14–10 ①	—	2–5.26 ①	—	—
Disc	R9C	Integral	30–60–100	CU solid	12–10	35.4	10–70	4	4 mm hex
Disc	R9C	Integral	30–60–100	CU stranded	10–1	35.4	4–50	4	4 mm hex
Disc	R9C	Integral	30–60–100	CU stranded	1/0	39.8	54	4.5	4 mm hex
Disc	R9C	Integral	30–60–100	CU stranded	2/0	44.3	67	5	4 mm hex
Disc	R9C	Integral	30–60–100	CU compact stranded	2/0	48.7	67	5.5	4 mm hex
Disc	R9D	LK3R9DL	100–200	CU	6–300 ①	200	13–152 ①	22.5	—
Disc	R9E	LK3R9EM	400	CU	4–600 ①	310	21–304 ①	35	—
Disc	R9E	LK3R9EM	400	CU	1/0–250 ②	310	54–127 ②	35	—
Disc	R9F	LK3R9FN	600	CU	2–600 ②	500	34–304 ②	56.5	—
Disc	R9F	LK6R9G	800	CU	2–600 ③	500	34–304 ③	56.5	—
Disc	R9I	Integral	30	CU	14–10 ①	—	2–5.26 ①	—	—
Disc	R9J	Integral	30–60	CU solid	14–10	31	2.5–6	3.5	Posidriv 2
Disc	R9J	Integral	30–60	CU stranded	14–6	31	2.5–16	3.5	Posidriv 2
Disc	R9K	Integral	60–100	CU solid	10	35.5	6	4	4 mm hex
Disc	R9K	Integral	60–100	CU stranded	10–6	35.5	6–16	4	4 mm hex
Disc	R9K	Integral	60–100	CU stranded	4–1	44.2	25–42	5	4 mm hex
Disc	R9L	LK3R9DL	200	CU	6–300 ①	200	13–152 ①	22.5	—
Disc	R9M	LK3R9FN	400	CU	2–600 ②	500	34–304 ②	56.5	—
Disc	R9N	LK3R9FN	600–800	CU	2–600 ②	500	34–304 ②	56.5	—

① Quantity = 1.

② Quantity = 2.

③ Quantity = 4.

Table 10. Circuit breaker terminal data

Type	Frame/ID	Series	Terminal/ catalog number	Terminal material	max. rated amps	Wire type	AWG wire range	Torque (in.-lb)	Metric wire size mm ²	Torque Nm	Screw/head type/tool
CB	EHD	C	3T20FB	Steel	20	CU	14–10 ①	35	2.5–6	3.96	Slotted
CB	F	C	3TA50FB	Aluminum	50	CU	14–10 ①	35	2.5–6 ①	3.96	Slotted
CB	F	C	3TA50FB	Aluminum	50	CU	8 ①	40	10 ①	4.52	Slotted
CB	F	C	3TA50FB	Aluminum	50	CU	6–4 ①	45	16–25 ①	5.09	Slotted
CB	F	C	3T100FB	Steel	100	CU	14–10 ①	35	2.5–6 ①	3.96	Slotted
CB	F	C	3T100FB	Steel	100	CU	8 ①	40	10 ①	4.52	Slotted
CB	F	C	3T100FB	Steel	100	CU	6–4 ①	45	16–25 ①	5.09	Slotted
CB	F	C	3T100FB	Steel	100	CU	3–1/0 ①	50	27–53 ①	5.65	Slotted
CB	F	C	3TA100FD	Aluminum	100	CU	14–10 ①	35	2.5–6 ①	3.96	Slotted
CB	F	C	3TA100FD	Aluminum	100	CU	8 ①	40	10 ①	4.52	Slotted
CB	F	C	3TA100FD	Aluminum	100	CU	6–4 ①	45	16–25 ①	5.09	Slotted
CB	F	C	3TA100FD	Aluminum	100	CU	3–1/0 ①	50	27–53 ①	5.65	Slotted
CB	F	C	3TA150F3K	Aluminum	150	CU	14–2 ①	70	2.5–25	7.9	5/32 hex
CB	F	C	3TA150F6K	Aluminum	150	CU	14–6 ①	25	2.5–10	2.8	3/32 hex
CB	F	C	3TA150FB	Stainless-steel	150	CU	4 ①	45	25 ①	5.09	Slotted
CB	F	C	3TA150FB	Stainless-steel	150	CU	3–4/0 ①	50	35–95 ①	5.65	Slotted
CB	F	C	3TA225FD	Aluminum	225	CU	4–4/0 ①	120	25–95	13.6	3/16 hex
CB	F	C	3TA225FDK	Aluminum	225	CU	6–300 ①	275	16–150	31	5/16 hex
CB	F	C	3TA225FDM	Aluminum	225	CU	4–4/0 ①	120	25–95	13.6	5 mm hex
CB	J	C	T250KB	Stainless-steel	250	CU	4–350 ①	275	25–185 ①	31	5/16 hex
CB	J	C	TA250KB	Aluminum	250	CU	4–350 ①	275	25–185 ①	31	5/16 hex
CB	K	C	T300K	Copper	300	CU	3–350 ①	275	35–185 ①	31	—
CB	K	C	TA300K	Aluminum	300	CU	3–350 ①	275	35–185 ①	31	—
CB	K	C	T350K	Copper	350	CU	250–500 ①	375	120–240 ①	42	—
CB	K	C	TA350K	Aluminum	350	CU	250–500 ①	375	120–240 ①	42	—
CB	K	C	T400K	Copper	400	CU	3/0–250 ②	275	95–120 ②	31	—
CB	K	C	TA400K	Aluminum	400	CU	3/0–250 ②	275	95–120 ②	31	—
CB	K	C	TA401K	Aluminum	400	CU	250 ②/500 ①	275/375	120 ②/240 ①	31/42	—
CB	K	C	TA402K	Aluminum	400	CU	500–750 ①	550	240–300 ①	62	—
CB	N	C	TA700NB1	Aluminum	700	CU	1–500 ①	—	50–240 ①	—	—
CB	N	C	TA1000NB1	Aluminum	1000	CU	3/0–400 ③	—	95–185 ③	—	—
CB	N	C	TA1200NB1	Aluminum	1200	CU	4/0–500 ④	—	120–240 ④	—	—
CB	N	C	TA1201NB1	Aluminum	1200	CU	500–750 ③	—	300–400 ③	—	—
CB	R	C	T1600RD	Copper	1600	CU	1–600 ④	375	50–300 ④	42	—
CB	R	C	TA1600RD	Aluminum	1600	CU	500–1000 ④	550	300–500 ④	62	—
CB	R	C	TA2000RD	Aluminum	1600	CU	2–600 ⑤	—	35–300 ⑤	—	—

① Quantity = 1.

② Quantity = 2.

③ Quantity = 3.

④ Quantity = 4.

⑤ Quantity = 6.

NOTES

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