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PowerFlex® 40P



TECHNICAL DATA

ADJUSTABLE FREQUENCY AC DRIVES

ALLEN-BRADLEY • ROCKWELL SOFTWARE

Rockwell Automation

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Product Description

As part of the industry leading PowerFlex® family of AC drives, the PowerFlex 40P addresses your needs for closed loop control and category 3 Safe-off in a compact and cost effective design. The PowerFlex 40P AC drive is based on the popular PowerFlex® 40 AC drive platform and shares common options and accessories. Available in power ratings from 0.4 to 11 kW (0.5 to 15 HP) and in voltage classes of 240, 480 and 600 volts, PowerFlex 40P AC drives are designed to meet global OEM and end-user demands for flexibility, space savings and ease of use. PowerFlex 40P AC drives are cost-effective solutions for speed control of applications such as diverters, smart conveyors, packaging machines, palletizers, drafting machines, ring spinning machines and synthetic fiber spinning machines.



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PowerFlex 40P AC Drive Features

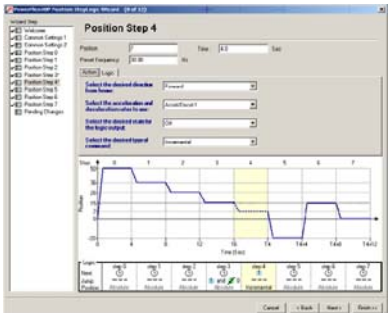
Flexible Packaging and Mounting Options

- Versatile packaging options allow for **panel mount NEMA 1/IP30** as well as **NEMA 4/IP66** (with like enclosure) using the plate/flange drives.
- **Plate drives** also allow for a reduction in overall enclosure size based on a 75% reduction in enclosed Watts.
- Installation can be a virtual snap using the **DIN rail mounting** feature on B frame drives. Panel mounting is also available, providing added flexibility.
- An optional **IP30 (NEMA 1) conduit box** is easily adapted to the standard IP20 (NEMA Type Open) product, providing increased environmental ratings.
- **Zero Stacking**™ is allowable for ambient temperatures up to 40°C, saving valuable panel space. 50°C ambient temperatures are permitted with minimal spacing between drives.
- **External filters** are available for all PowerFlex 40P drive ratings to meet EN55011, Class A and B EMC requirements.



Start Up, Programming and Operation

- PowerFlex 40P drive programming is achieved by the use of an **external HIM** or via the resident DSI connection and the **PC programming tool**.
  - DriveTools™ SP
  - DriveExplorer™
  - Pocket DriveExplorer™
- **StepLogic™ wizards** available for DriveTools SP and DriveExplorer (Lite or Full) assist in setup of position or velocity StepLogic programming
- An **integral display and reset button** allows user to change display parameters and reset the drive if a fault occurs.
- **4 digit display** with 10 additional LED indicators provides an intuitive display of drive status and information.
- Integral **RS485 communications** can be used for programming from a PC. It can also be used in a multi-drop network configuration. A serial converter module provides connectivity to any controller with a DF1 port.
- The 10 most common application parameters are contained in the **Basic Program Group**. Common parameters shared with PowerFlex 40 are in the **Advanced Program Group**, and additional position control and fibers parameters located in **Enhanced Program Group**.
- A **NEMA Type 4X** remote and **NEMA Type 1 hand-held LCD keypad** provide additional programming and control flexibility, both featuring the popular CopyCat function.



StepLogic wizards available for ease of position or velocity StepLogic programming using drive software tools.



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PowerFlex 40P PC Programming Software

Through the use of a Serial Converter Module and **DriveExplorer**™ or **DriveTools**™ **SP** software, programming can be greatly simplified.

DriveExplorer Software



- View and modify drive and adapter parameters in a method similar to the file management capability of Microsoft Windows Explorer.
- Operate the drive via an on-screen Control Bar, which is a tool that allows you to start, stop, and change the speed reference of the drive.
- Save, restore and print parameter information.
- Compare current parameters with factory defaults or previously saved parameter values.
- Edit, upload and download parameters.
- StepLogic setup wizards available for ease of programming.



- DriveTools SP Software
- Online and offline programming capability.
- In-grid and dialog-based parameter editing.
- Immediate visual indication of drive and communication status when viewing online drive.
- Integrated HTML Help architecture.
- StepLogic setup wizards available for ease of programming.

Optimized Performance

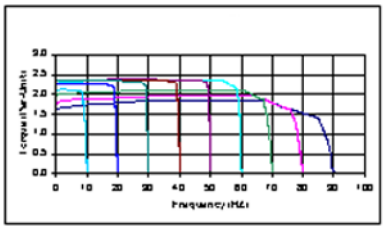


- **Removable MOV** to ground provides trouble-free operation when used on ungrounded distribution systems.
- A **relay pre-charge** limits inrush current.
- **Integral brake transistor**, available on all ratings, provides dynamic braking capability with simple low cost brake resistors.
- DIP switch settable **24V DC sink or source control** for control wiring flexibility.
- 150% overload for 60 seconds or 200% overload for 3 seconds provides **robust overload protection**.
- **Adjustable PWM frequency up to 16 kHz** ensures quiet operation.

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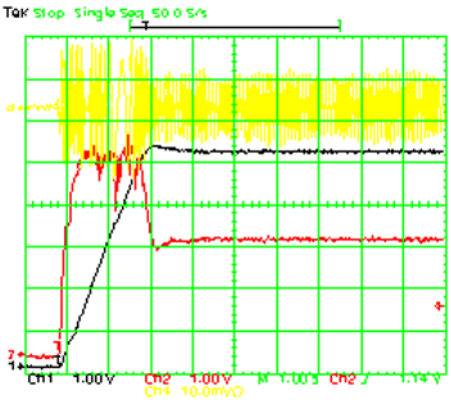
Sensorless Vector Control

- **Sensorless Vector Control** provides exceptional speed regulation and very high levels of torque across the entire speed range of the drive.
- The **Autotune feature** allows the PowerFlex 40P AC drive to adapt to individual motor characteristics.
- **Closed loop** with encoder feedback replaces slip compensation with trim for improved speed range and regulation.



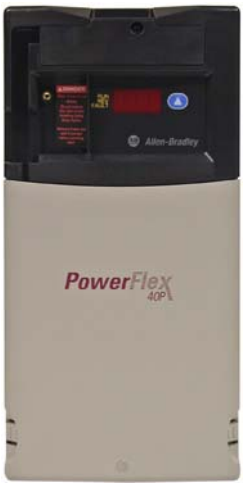
Performance (Open Loop)

- This graph depicts the ability of a PowerFlex 40P drive to accelerate into at least 150% load.
- At 100% motor load, the drive will run the motor at synchronous speed.
- Excellent current regulation.
- Linear acceleration.
- Best in class digital input response time and repeatability.



Control Performance

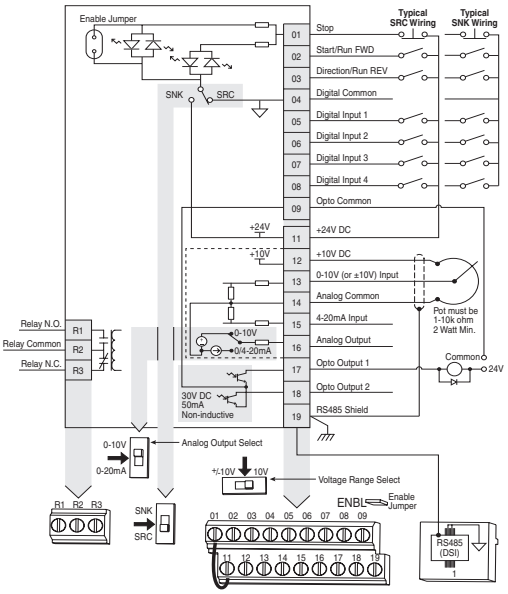
- **V/Hz Motor Control**
- **Sensorless Vector Control** with Autotune feature develops high torque over a wide speed range and adapts to individual motor characteristics.
  - Slip compensation or encoder trim
- Integral **PID** functionality enhances application flexibility.
- **Position control** regulator mode.
- **Timer, Counter, Basic Logic and StepLogic™ functions** can reduce hardware design costs and simplify control schemes.
  - **Timer function:** Relay or opto outputs controlled by drive performing timer function. Timer is initiated by activating a digital input programmed as “Timer Start.”
  - **Counter function:** Relay or opto outputs controlled by drive performing counter function. Counter function is activated by a digital input programmed as “Counter Input.”
  - **Basic Logic:** Relay or opto outputs controlled by status of digital inputs programmed as “Logic Inputs.” Performs basic Boolean logic.
  - **Velocity and Position StepLogic™** function available providing repeatable speed or position changes based on StepLogic application profile.



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I/O

- Two (2) semi-programmable digital inputs.
  - Dedicated for start and stop
  - Simplifies wiring and troubleshooting
- Five (5) fully programmable digital inputs provide application versatility.
  - Standard 27 different settings, same as PowerFlex 40 AC drive providing application versatility
  - Additional 9 settings for Fibers and basic positioning enhancements
  - Reverse DI is now fully programmable via E202 [Digital Term 3]
- One (1) programmable form C relay output and two (2) opto output can be used to indicate various drive or motor conditions.
- One (1) analog output is DIP Switch selectable for either voltage (0-10V) or current (0-20 mA). This scalable, 10-bit output is suitable for metering or as a speed reference for another drive.
- One (1) analog input is DIP switch selectable for either voltage or current. Input is isolated from the rest of the drive I/O. Bipolar mode offers improved zero-cross performance.



Communications

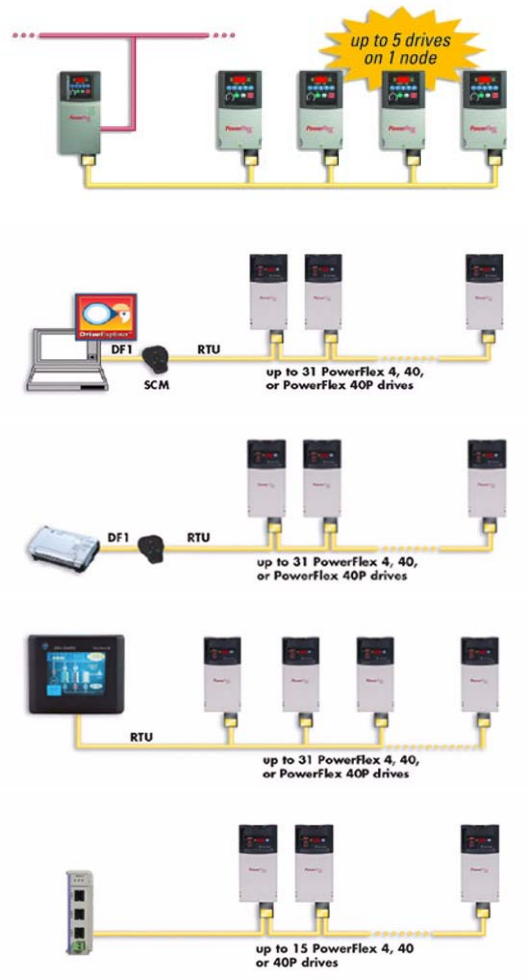
- Integral communication cards such as **DeviceNet**™, **EtherNet/IP**™, **PROFIBUS**™ **DP**, **LonWorks**® and **ControlNet**™ can improve machine performance.
- The DSI **Wireless Interface Module** (WIM) provides a wireless communication interface between a Pocket PC, laptop computer or desktop computer equipped with ***Bluetooth***® wireless technology, and any Allen-Bradley® product supporting the DSI™ protocol.
- **Field installed option** allows for future addition of stand-alone drives to a network.
- **Online EDS file creation** with RSNetWorx™ providing ease of set-up on a network.



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Communication Options

- PowerFlex 40P AC drives are compatible with any device that acts as a **RTU Master** and supports standard 03, 06 and 16 RTU commands.
- A network can be configured using PowerFlex 40P AC drives with **optional communication cards** for high performance and flexible configuration capabilities.
  - DeviceNet
  - EtherNet/IP
  - PROFIBUS DP
  - LonWorks
  - ControlNet
- A **multi-drive solution** can be reached using a single PowerFlex 40P AC drive DeviceNet option, with the ability for up to five (5) drives to reside on one (1) node.
- **Integral RS485** communications enable the drives to be used in a multi-drop network configuration. A serial converter module (SCM) provides connectivity to any controller with a DF1 port. The SCM can be eliminated if the controller acts as a RTU Master.



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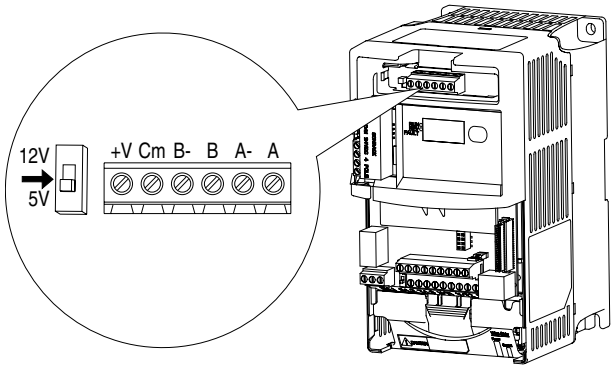
PowerFlex 40P AC Drive Advanced Features

Closed Loop

Encoder/Pulse Train Input Standard

The PowerFlex 40P AC drive allows for configurable closed loop control for either speed or position feedback for **improved speed regulation, basic position control**, or other **pulse inputs** for motor control.

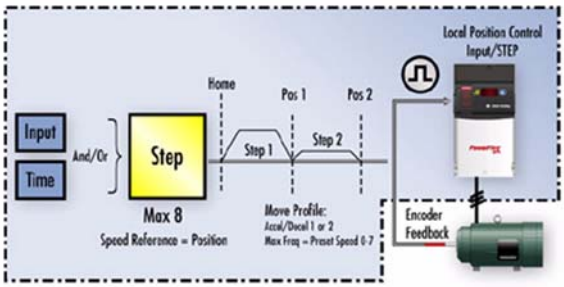
- Improved speed regulation
- Basic position control



Basic Position Control

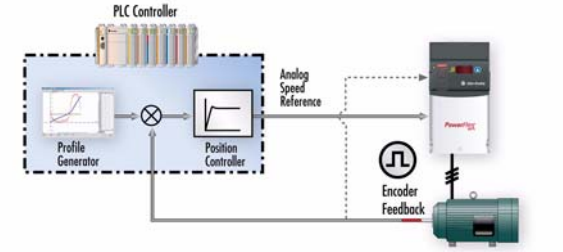
Local Position Control

- **Position regulator with Step Logics**
  - 8 positions (local logic)
  - Infinite if write to single step over multiple field bus networks (external logic)



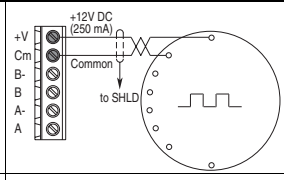
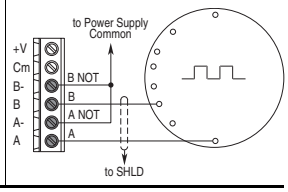
Outer Position Control Loop

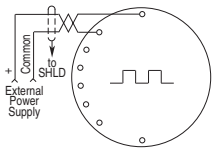
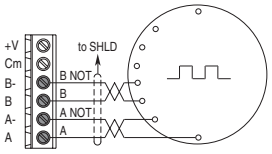
- **Analog input bipolar mode** offers improved zero-cross performance.
- **Simple motion control** applications with more complex position profiles.
- **Speed reference** supplied to Drive via Analog Input or over multiple field bus network options.
- **Speed ratio** available for simple draw applications.



Feedback Details

- Line Driver Type Incremental Encoder Quadrature (dual channel) or Single Channel.
  - 5/12V DC supply, 10mA min per channel
  - Single Ended or Differential (A,B Channel)
  - Duty Cycle of 50%, +10%
- Pulse Train Input.
  - Configurable Input Voltage 5V/12V/ 24V DC autodetect
  - Frequency controlled PWM
- Allowable Pulse Frequency DC to 250 kHz.

I/O	Connection Example
Encoder Power – Internal Drive Power Internal (drive) 12V DC, 250mA	
Encoder Signal – Single-Ended, Dual Channel	

I/O	Connection Example
Encoder Power – External Power Source	
Encoder Signal – Differential, Dual Channel	

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Improved Ride Through

Operation Down to 1/2 Line Voltage



The PowerFlex 40P AC drive allows for the selection of **1/2 DC Bus operation**, for use in critical applications where continued drive output is desired even in the event of brown out or low voltage conditions. The PowerFlex 40P AC drive also supports **enhanced inertia ride through** for additional low voltage mitigation.

- Selectable 1/2 line voltage operation.
- Increased power loss ride through.

Optimized for Common DC Bus Installations

Enhanced Control of Internal Pre-charge

Common DC Bus offers additional inherent breaking capabilities by utilizing all the drives/loads on the bus for energy absorption offering higher efficiency and cost savings. The PowerFlex 40P AC drive has been optimized for use in **Common DC Bus or Shared DC bus** installations.

- Configurable pre-charge control using digital inputs.
- Direct DC Bus connection to power terminal blocks.

Safety Inside using DriveGuard® Safe-off Option

With the **DriveGuard option**, category 3 Safe-off combines safety and productivity with zone control and cost savings through the reduction of components. The PowerFlex 40P AC drive with the Allen-Bradley DriveGuard relay board option is a certified safety solution for AC drive control per EN954-1.



DriveGuard®
Series B, 20-DG01

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Application-Specific Features

Beverage and Brewing Industry

- Embedded Encoder in a compact and cost effective design
  - Reduction in dedicated sensors to track product position during production cycle
  - More process reliability and control, allowing for different process control “recipes” to be changed on the fly
  - Local logic capability with position/speed based on StepLogic
- Safety inside (Category 3 Safe-off functionality).
  - Zone control
  - Reduction in components/cost using DriveGuard® Safety Relay Option
- Applications:
  - Smart Conveyors
  - Simple Indexing (Mixers, etc.)
  - Palletizers

Fibers and Textiles Industry

- Fibers Firmware Features
  - Output frequency up to 500Hz
  - Synchronized input ramps
  - Speed ratio over comms
  - Traverse and P-Jump
  - 4 acc./decs.
- ½ DC bus operation and improved ride through.
  - Continuous output under brown out conditions
  - Inherent breaking and ride through with the use of drives/loads in application
- Encoder/Pulse train input.
- Plate drive – 75% reduction in enclosed Watts.
  - Mount to external heat sink
- Applications:
  - Drafting Machines
  - Ring Spinning Machines
  - Roving Machines
  - Carding Machines
  - Draw/Twist Machines
  - Fiber Winder Control
  - Synthetic Fiber Spinning Machines



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Automotive Industry

- Embedded Encoder in a compact and cost effective design.
  - Sensorless Vector with encoder feedback provide increased reliability
  - Position Regulator: reduction in sensors required to control process
  - Local logic (StepLogic) for time or digital input based positioning
- Safety inside (Category 3 Safe-off functionality).
  - Zone control
  - Reduced component count to achieve Cat 3 EN 954-1 Solution
- Applications
  - Smart Conveyors
  - Simple Indexing Applications
  - Variable frequency drive applications requiring Category 3 Safe-off per EN 954-1

Material Handling

- Embedded Encoder in a compact and cost effective design.
  - Sensorless Vector with encoder feedback provide increased reliability
  - Position regulator: reduction in sensors required to control process
  - Local logic (StepLogic) for time or digital input based positioning
- Safety inside (Category 3 Safe-off functionality).
  - Zone Control
  - Reduced component count to achieve Cat 3 EN 954-1 solution
- Applications:
  - Palletizers
  - Packaging Equipment
  - Smart Conveyors



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Catalog Number Explanation

Position	1-3	4	5	6-8	9	10	11	12	13-14
	22D	–	B	2P3	N	1	0	4	AA
	a		b	c	d	e	f	g	h

a

Drive	
Code	Type
22D	PowerFlex 40P

b

Voltage Rating		
Code	Voltage	Ph.
B	240V ac	3
D	480V ac	3
E	600V ac	3

c1

Rating		
200-240V Three-Phase Input		
Code	Amps	kW (Hp)
2P3	2.3	0.4 (0.5)
5P0	5.0	0.75 (1.0)
8P0	8.0	1.5 (2.0)
012	12	2.2 (3.0)
017	17.5	3.7 (5.0)
024	24	5.5 (7.5)
033	33	7.5 (10)

c2

Rating		
380-480V Three-Phase Input		
Code	Amps	kW (Hp)
1P4	1.4	0.4 (0.5)
2P3	2.3	0.75 (1.0)
4P0	4.0	1.5 (2.0)
6P0	6.0	2.2 (3.0)
010	10.5	4.0 (5.0)
012	12	5.5 (7.5)
017	17	7.5 (10)
024	24	11 (15)

c3

Rating		
460-600V Three-Phase Input		
Code	Amps	kW (Hp)
1P7	1.7	0.75 (1.0)
3P0	3.0	1.5 (2.0)
4P2	4.2	2.2 (3.0)
6P6	6.6	4.0 (5.0)
9P9	9.9	5.5 (7.5)
012	12	7.5 (10)
019	19	11 (15)

d

Enclosure	
Code	Enclosure
N	Panel Mount - IP 20 (NEMA Type Open)
F	Flange Mount - IP 20 (NEMA Type Open)
H	Plate Drive - IP 20 (NEMA Type Open)

e

HIM	
Code	HIM Version
1	Display/Fault Reset Only
2	Display/Fault Reset Only (Plate Drive)

f

Emission Class	
Code	EMC Filter
0	No Filter

g

Version	
Code	Version
4	Standard

h

Optional	
Code	Purpose
AA through ZZ	Reserved for custom firmware

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PowerFlex 40P Standard Drives

240V ac, Three-Phase Drives (50/60 Hz, No Filter)

Drive Ratings				Cat. No.		
kW	HP	Output Current (A)	Frame Size	IP20/NEMA Type Open	IP20 Plate Drive	IP20 Flange Mount ❶
0.4	0.5	2.3	B	22D-B2P3N104	22D-B2P3H204	22D-B2P3F104
0.75	1.0	5.0	B	22D-B5P0N104	22D-B5P0H204	22D-B5P0F104
1.5	2.0	9.0	B	22D-B8P0N104	22D-B8P0H204	22D-B8P0F104
2.2	3.0	12	B	22D-B012N104	22D-B012H204	22D-B012F104
3.7	5.0	17.5	B	22D-B017N104	22D-B017H204	22D-B017F104
5.5	7.5	24	C	22D-B024N104	22D-B024H204	22D-B024F104
7.5	10	33	C	22D-B033N104	22D-B033H204	22D-B033F104

480V ac, Three-Phase Drives (50/60 Hz, No Filter)

Drive Ratings				Cat. No.		
kW	HP	Output Current (A)	Frame Size	IP20/NEMA Type Open	IP20 Plate Drive	IP20 Flange Mount ❶
0.4	0.5	1.4	B	22D-D1P4N104	22D-D1P4H204	22D-D1P4F104
0.75	1.0	2.3	B	22D-D2P3N104	22D-D2P3H204	22D-D2P3F104
1.5	2.0	4.0	B	22D-D4P0N104	22D-D4P0H204	22D-D4P0F104
2.2	3.0	6.0	B	22D-D6P0N104	22D-D6P0H204	22D-D6P0F104
4.0	5.0	10.5	B	22D-D010N104	22D-D010H204	22D-D010F104
5.5	7.5	12	C	22D-D012N104	22D-D012H204	22D-D012F104
7.5	10	17	C	22D-D017N104	22D-D017H204	22D-D017F104
11	15	24	C	22D-D024N104	22D-D024H204	22D-D024F104

600V ac, Three-Phase Drives (50/60 Hz, No Filter)

Drive Ratings				Cat. No.		
kW	HP	Output Current (A)	Frame Size	IP20/NEMA Type Open	IP20 Plate Drive	IP20 Flange Mount ❶
0.75	1.0	1.7	B	22D-E1P7N104	22D-E1P7H204	22D-E1P7F104
1.5	2.0	3.0	B	22D-E3P0N104	22D-E3P0H204	22D-E3P0F104
2.2	3.0	4.2	B	22D-E4P2N104	22D-E4P2H204	22D-E4P2F104
4.0	5.0	6.6	B	22D-E6P6N104	22D-E6P6H204	22D-E6P6F104
5.5	7.5	9.9	c	22D-E9P9N104	22D-E9P9H204	22D-E9P9F104
7.5	10	12	C	22D-E012N104	22D-E012H204	22D-E012F104
11	15	19	C	22D-E019N104	22D-E019H204	22D-E019F104

❶ Meets IP 40/54/65 (NEMA 1/12/4/4X) when installed in an enclosure of like rating.

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User Installed Options

IP30/NEMA 1/UL Type 1 Conversion Kit

Description	Drive Frame	Catalog Number
IP30/NEMA 1/UL Type 1 Kit *Description:* Field installed kit. Converts drive to IP30/NEMA 1/UL Type 1 enclosure. Includes conduit box with mounting screws and plastic top panel.	B	22-JBAB
	C	22-JBAC
IP30/NEMA 1/UL Type 1 Kit with Communication Option *Description:* Field installed kit. Converts drive to IP30/NEMA 1/UL Type 1 enclosure. Includes communication option conduit box with mounting screws and plastic top panel.	B	22-JBCB
	C	22-JBCC

Human Interface Module Option Kits and Accessories

Description	Catalog Number
Remote Human Interface Module (HIM) – Panel Mount *Description:* LCD Display, Remote Panel Mount, Digital Speed Control, CopyCat capable, IP66 (NEMA Type 4X/12) indoor use only, Includes 2.0 meter cable. *Note:* The 22-HIM-C2S is smaller than the 22-HIM-C2 and cannot be used as a direct replacement.	22-HIM-C2S
Remote Human Interface Module (HIM) – Handheld *Description:* LCD Display, Remote Handheld, Digital Speed Control, Full Numeric Keypad, CopyCat capable, IP30 (NEMA Type 1), Includes 1.0 meter cable, Panel Mount with optional Bezel Kit.	22-HIM-A3
Remote Human Interface Module (HIM) – Wireless Handheld *Description:* Remote Handheld, Wireless Interface Module with *Bluetooth®* technology, IP30 (NEMA Type1), Panel Mount with optional bezel kit.	22-WIM-N1
Remote Human Interface Module (HIM) – Wireless Handheld *Description:* Remote Handheld, Wireless Interface Module with *Bluetooth* technology, IP66 (NEMA Type 4X/12) indoor use only.	22-WIM-N4S
Bezel Kit *Description:* Panel Mount for LCD Display, Remote Handheld unit, IP30 (NEMA Type 1). Includes a 22-RJ45CBL-C20 cable.	22-HIM-B1
DSI HIM Cable *Description:* DSI HIM to RJ45 cable. 1.0 Meter (3.3 Feet) 2.9 Meter (9.51 Feet)	 22-HIM-H10 22-HIM-H30

PC Programming Software

Item	Description	Catalog Number
DriveExecutive	"Windows" based software package that provides an intuitive means for monitoring or configuring Allen-Bradley drives and communications adapters online and offline. Compatibility: Windows 98, ME, NT, 4.0 (Service Pack 3 or later), 2000 and XP. ❶	9303-4DTE01ENE
DriveTools™ SP Suite - includes DriveExecutive, DriveObserver		9303-4DTS01ENE
DriveTools™ SP Suite Upgrade from DriveExecutive - includes DriveExecutive, DriveObserver		9303-4DTE2S01ENE
DriveExplorer™ Software	"Windows" based software package that provides an intuitive means for monitoring or configuring Allen-Bradley drives and communications adapters online and offline. Compatibility: Windows 98, ME, NT, 4.0 (Service Pack 3 or later), 2000 and XP. ❶❷❸	9306-4EXP02ENE
Pocket DriveExplorer™ Software	"Windows" based software package for monitoring and configuring Allen-Bradley drive and communication adapters.	9306-4PXP01ENE

❶ Setup Wizards are available for use with DriveTools SP and DriveExplorer (Lite/Full) only.
❷ See www.ab.com/drive/ for support devices.
❸ DriveExplorer Lite available for free, download at: http://www.ab.com/drives/driveexplorer/free_download.html.

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Spare Parts

Description		Catalog Number
Fan Replacement Kits	Frame B, (1) Fan	SK-U1-FAN1-B1
	Frame B, (2) Fans	SK-U1-FAN2-B1
	Frame C, (1) Fan	SK-U1-FAN1-C1
	Frame C, (1) Fan, 15 Hp	SK-U1-FAN1-C2
Cover Replacement Kits	Frame B with Power Terminal Guard	SK-U1-DCVR3-B1
	Frame C with Power Terminal Guard	SK-U1-DCVR3-C1
	Frame B and C Encoder Terminal Cover	SK-U1-DCVR4-EN

Other Options

Description	Catalog Number
DriveGuard® Safe-Off Option (Series B) *Description:* Field installed kit. Used with suitable safety components to help provide protection against restart.	20A-DG01

Communication Option Kits

Description	Catalog No.
Universal Serial Bus™ (USB) Converter Module *Description:* Provides serial communication via DF1 protocol for use with DriveExplorer and DriveTools SP software. *Includes:* 2m USB cable, 20-HIM-H10 cable, and 22-HIM-H10 cable.	1203-USB
Serial Converter Module (RS485 to RS232) *Description:* Provides serial communication via DF1 protocol for use with DriveExplorer and DriveExecutive™ software. *Includes:* DSI to RS232 serial converter, 1203-SFC serial cable, 22-RJ45CBL-C20 cable, and DriveExplorer Lite CD.	22-SCM-232
Serial Cable *Description:* 2.0 meter serial cable with a locking low profile connector to connect to the serial converter and a 9-pin sub-miniature D female connector to connect a computer.	1203-SFC
Null Cable Converter *Description:* For use when connecting the serial converter to DriveExplorer on a handheld PC.	1203-SNM
DSI Cable *Description:* 2.0 meter RJ45 to RJ45 cable, male to male connectors.	22-RJ45CBL-C20
Splitter Cable *Description:* RJ45 one to two port splitter cable.	AK-U0-RJ45-SC1
Terminating Resistors *Description:* 120 Ohm resistor embedded in an RJ45 connector (2 pieces)	AK-U0-RJ45-TR1
Terminal Block *Description:* RJ45 two position terminal block (5 pieces) with two 120 Ohm terminating resistors (loose).	AK-U0-RJ45-TB2P
ControlNet™ Communication Adapter *Note:* Requires a Communication Adapter Cover when used with Frame B and C PowerFlex 40P drives (Ordered Separately).	22-COMM-C
DeviceNet™ Communication Adapter *Note:* Requires a Communication Adapter Cover when used with Frame B and C PowerFlex 40P drives (Ordered Separately).	22-COMM-D
EtherNet/IP™ Communication Adapter *Note:* Requires a Communication Adapter Cover when used with Frame B and C PowerFlex 40P drives (Ordered Separately).	22-COMM-E
LonWorks™ Communication Adapter *Note:* Requires a Communication Adapter Cover when used with Frame B and C PowerFlex 40P drives (Ordered Separately).	22-COMM-L
PROFIBUS™ DP Communication Adapter *Note:* Requires a Communication Adapter Cover when used with Frame B and C PowerFlex 40P drives (Ordered Separately).	22-COMM-P
External DSI Communications Kit *Description:* External mounting kit for 22-COMM Adapters.	20-XCOMM-DC-BASE
External Comms Power Supply *Description:* Optional 100-240V ac Power Supply for External DSI Communications Kit	20-XCOMM-AC-PS1
Compact I/O Module (3 Channel)	1769-SM2
Communication Adapter Cover *Description:* Houses the Communication Adapter for Frame B and C drives. *Note:* This cover adds 25 mm (0.98 in.) to the overall depth of the drive. Frame B Frame C	 22D-CCB ❶ 22D-CCC ❶

❶ If NEMA 1/IP30 is required, must also order 22-JBCB (Frame B drives) or 22-JBCC (Frame C drives).

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Dynamic Brake Resistors

Drive Ratings			Minimum Resistance	
Input Voltage	kW	Hp	Ohms	Catalog Number ❶
240V 50/60 Hz 3-Phase	0.4	0.5	48	AK-R2-091P500
	0.75	1.0	48	AK-R2-091P500
	1.5	2.0	48	AK-R2-091P500
	2.2	3.0	32	AK-R2-047P500
	3.7	5.0	19	AK-R2-047P500
	5.5	7.5	13	AK-R2-030P1K2
	7.5	10	10	AK-R2-030P1K2
480V 50/60 Hz 3-Phase	0.4	0.5	97	AK-R2-360P500
	0.75	1.0	97	AK-R2-360P500
	1.5	2.0	97	AK-R2-360P500
	2.2	3.0	97	AK-R2-120P1K2
	4.0	5.0	77	AK-R2-120P1K2
	5.5	7.5	55	AK-R2-120P1K2
	7.5	10	39	AK-R2-120P1K2
	11	15	24	AK-R2-120P1K2 ❷
600V 50/60 Hz 3-Phase	0.75	1.0	120	AK-R2-360P500
	1.5	2.0	120	AK-R2-360P500
	2.2	3.0	82	AK-R2-120P1K2
	4.0	5.0	82	AK-R2-120P1K2
	5.5	7.5	51	AK-R2-120P1K2
	7.5	10	51	AK-R2-120P1K2
	11	15	51	AK-R2-120P1K2 ❷

❶ Resistors listed in this table are rated 5% duty cycle.
❷ Requires two resistors wired in parallel.

Input Line Reactors

240V, 50/60 Hz, Three-Phase, 3% Impedance

kW	HP	Fundamental Amps	Maximum Continuous Amps	Inductance (mh)	Watts Loss (W)	Catalog Number
0.4	0.5	4.0	6.0	12	21	1321-3R4-B
0.75	1.0	8.0	12	3.0	29	1321-3R4-B
1.5	2.0	8.0	12	1.5	19.5	1321-3R8-B
2.2	3.0	12	18	1.25	26	1321-3R12-A
3.7	5.0	18	27	0.8	36	1321-3R18-A
5.5	7.5	25	37.5	0.5	48	1321-3R25-A
7.5	10	35	52.5	0.4	49	1321-3R35-A

480V, 50/60 Hz, Three-Phase, 3% Impedance

kW	HP	Fundamental Amps	Maximum Continuous Amps	Inductance (mh)	Watts Loss (W)	Catalog Number
0.4	0.5	2.0	3.0	20	11.3	1321-3R2-B
0.75	1.0	4.0	6.0	9.0	20	1321-3R4-C
1.5	2.0	4.0	6.0	6.5	20	1321-3R4-B
2.2	3.0	8.0	12	5.0	25.3	1321-3R8-C
4.0	5.0	12	18	2.5	31	1321-3R8-B
5.5	7.5	12	18	2.5	31	1321-3R12-B
7.5	10	18	27	1.5	43	1321-3R18-B
11	15	25	37.5	1.2	52	1321-3R25-B

600V, 50/60 Hz, Three-Phase, 3% Impedance

kW	HP	Fundamental Amps	Maximum Continuous Amps	Inductance (mh)	Watts Loss (W)	Catalog Number
0.75	1.0	2.0	3.0	20	11.3	1321-3R2-B
1.5	2.0	4.0	6.0	6.5	20	1321-3R4-C
2.2	3.0	4.0	6.0	6.5	20	1321-3R4-B
4.0	5.0	8.0	12	5.0	25.3	1321-3R8-C
5.5	7.5	12	18	2.5	31	1321-3R12-B
7.5	10	12	18	2.5	31	1321-3R12-B
11	15	18	27	1.5	43	1321-3R18-B

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EMC Filters

Drive Ratings			Catalog Number	
Input Voltage	**kW**	**HP**	***S Type Filter*** ❶	**L Type Filter** ❸
240V 50/60 Hz 3-Phase	0.4	0.5	22-RF021-BS ❷	22-RF021-BL ❷
	0.75	1.0	22-RF021-BS ❷	22-RF021-BL ❷
	1.5	2.0	22-RF021-BS ❷	22-RF021-BL ❷
	2.2	3.0	22-RF021-BS ❷	22-RF021-BL ❷
	3.7	5.0	22-RF021-BS ❷	22-RF021-BL ❷
	5.5	7.5	22-RF034-CS	22-RF034-CL
	7.5	10	22-RF034-CS	22-RF034-CL
480V 50/60 Hz 3-Phase	0.4	0.5	22-RF012-BS	22-RF012-BL
	0.75	1.0	22-RF012-BS	22-RF012-BL
	1.5	2.0	22-RF012-BS	22-RF012-BL
	2.2	3.0	22-RF012-BS	22-RF012-BL
	4.0	5.0	22-RF012-BS	22-RF012-BL
	5.5	7.5	22-RF018-CS ❷	22-RF018-CL
	7.5	10	22-RF018-CS ❷	22-RF018-CL
	11	15	22-RF026-CS ❷	22-RF026-CL
600V 50/60 Hz 3-Phase	0.75	1.0	–	22-RF8P0-BL
	1.5	2.0	–	22-RF8P0-BL
	2.2	3.0	–	22-RF8P0-BL
	4.0	5.0	–	22-RF8P0-BL
	5.5	7.5	–	22-RF015-CL
	7.5	10	–	22-RF015-CL
	11	15	–	22-RF024-CL

❶ This filter is suitable for use with a cable length of up to 10 meters for Class A and 1 meter for Class B environments.
❷ Filter must be Series C or later.
❸ This filter is suitable for use with a cable length of up to 100 meters for Class A and 5 meters for Class B environments.

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Installation Considerations

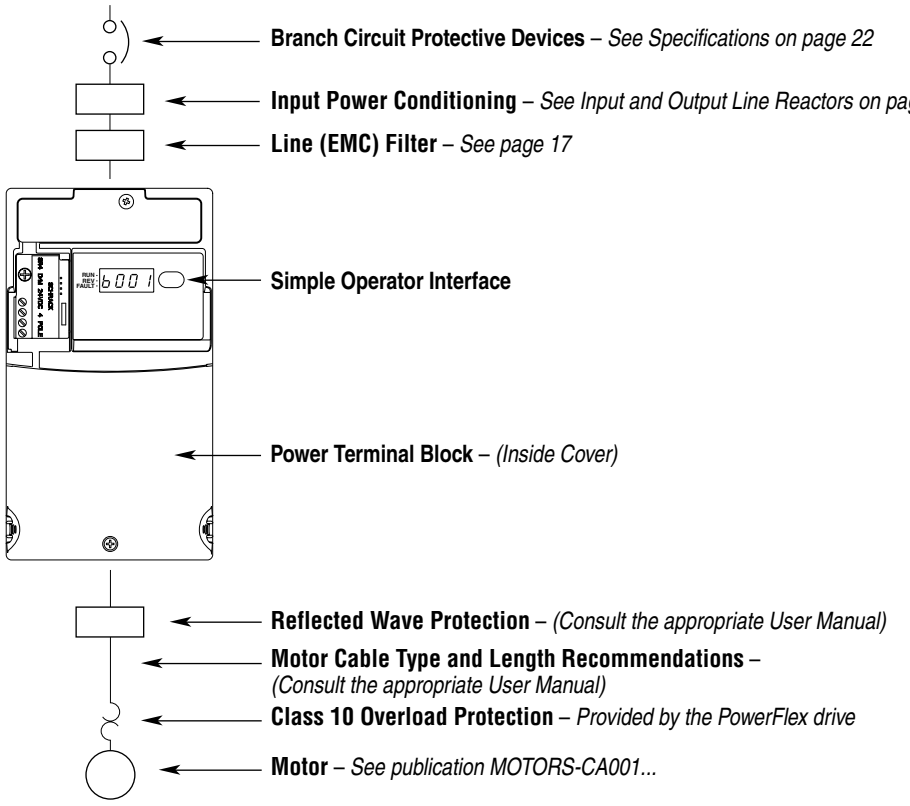
Power Wiring

PowerFlex 40P drives have the following built in protective features to help simplify installation.

- Ground fault protection while starting and running ensures reliable operation
- Electronic motor overload protection increases motor life
- 6kV transient protection provides increased robustness for 380-480V system voltages

There are many other factors that must be considered for optimal performance in any given application. The block diagram below highlights the primary installation considerations. Consult the PowerFlex 40P *User Manual*, Publication 22D-UM001… available online at **http://www.rockwellautomation.com/literature**, for detailed recommendations on input power conditioning, CE conformance (EMC filtering), FCC Compliance, reflected wave protection, motor cable types and motor cable distances.

Block Diagram



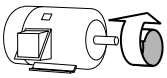
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Power Terminal Block

Terminal Block Specifications

Name	Frame	Description	Wire Size Range ❶		Recommended Torque
			Maximum	Minimum	
Power Terminal Block	B	All power terminals	5.3 mm² (10 AWG)	1.3 mm² (16 AWG)	1.7-2.2 N-m (16-19 lb.-in.)
	C	All power terminals	8.4 mm² (8 AWG)	1.3 mm² (16 AWG)	2.9-3.7 N-m (26-33 lb.-in.)

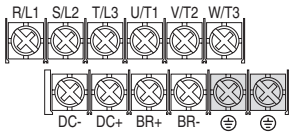
❶ Maximum/minimum sizes that the terminal block will accept - these are not recommendations.

Terminal ❷	Description
R/L1, S/L2	1-Phase Input ❸
R/L1, S/L2, T/L3	3-Phase Input
U/T1	To Motor U/T1
V/T2	To Motor V/T2 =  Switch any two motor leads to change forward direction.
W/T3	To Motor W/T3
P2, P1	DC Bus Inductor Connection (C Frame drives only.) The C Frame drive is shipped with a jumper between Terminals P2 and P1. Remove this jumper only when a DC Bus Inductor will be connected. Drive will not power up without a jumper or inductor connected. 
DC+, DC–	DC Bus Connection (Frame C Drives)
BR+, BR–	Dynamic Brake Resistor Connection
⏚	Safety Ground - PE

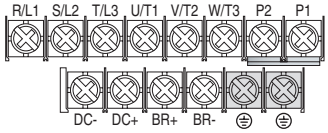
❷ **Important:** Terminal screws may become loose during shipment. Ensure that all terminal screws are tightened to the recommended torque before applying power to the drive.

❸ Single-phase operation requires a 65% derate of drive rated current.

B Frame



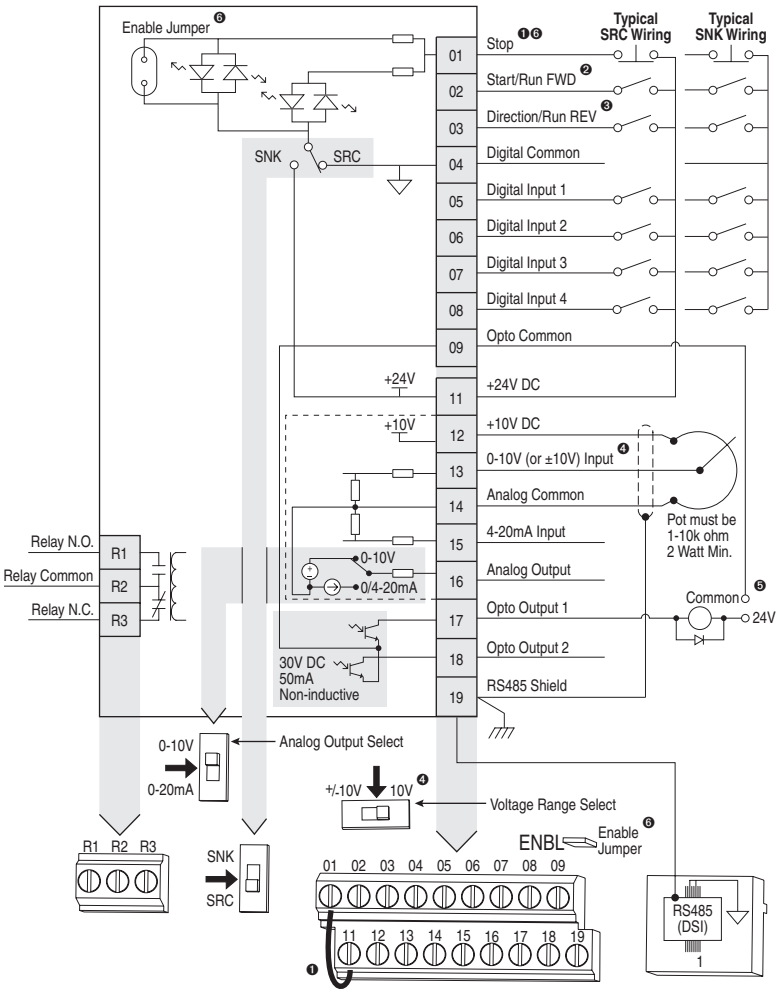
C Frame



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Control Wiring

- The control logic is 24V DC and can be set for either Sink or Source control via a DIP switch setting.
- Control terminal screws are sized for a conventional blade screw driver.
- I/O Terminals 1 and 2 are semi-programmable and dedicated for Stop, Start and SW Enable inputs. These I/O Terminals can be programmed for 2- or 3-Wire operation to meet application requirements.
- I/O Terminals 5, 6, 7 and 8 are fully programmable and provide added flexibility. Programmable functions include Local Control, Second Accel/Decel, Clear Fault, Preset Frequencies, RS485 Control, Auxiliary Fault, and Purge.
- Speed can be controlled via (2) analog inputs. Both inputs can be configured for either voltage or current and can be used for applications such as PID. Voltage input can be programmed for bipolar operation.
- The drive is shipped with a jumper installed between I/O Terminals 01 and 11. This jumper can be removed when using I/O Terminal 01 as a Stop or Enable input.



❶ **Important:** I/O Terminal 01 is always a coast to stop input except when P036 [Start Source] is set to "3-Wire", "2-W Lvl Sens" or "Momt FWD/REV" control. In three wire control, I/O Terminal 01 is controlled by P037 [Stop Mode]. All other stop sources are controlled by P037 [Stop Mode].

P036 [Start Source]	Stop	I/O Terminal 01 Stop
3-Wire	Per P037	Per P037(5)
2-Wire	Per P037	Coast
2-W Lvl Sens	Per P037	Per P037(5)
2-W Hi Speed	Per P037	Coast
RS485 Port	Per P037	Coast
Momt FWD/REV	Per P037	Per P037(5)

Important: The drive is shipped with a jumper installed between I/O Terminals 01 and 11. Remove this jumper when using I/O Terminal 01 as a stop or enable input.

❷ Two wire control shown. For three wire control use a momentary input on I/O Terminal 02 to command a start. Use a maintained input for I/O Terminal 03 to change direction.
❸ The function of I/O Terminal 03 is fully programmable. Program with E202 [Digital Term 3].
❹ Match the Voltage Range Select DIP switch setting with the control scheme for proper Uni-Polar or Bipolar analog input operation.
❺ When using an opto output with an inductive load such as a relay, install a recovery diode parallel to the relay as shown, to prevent damage to the output.
❻ When the ENBL enable jumper is removed, I/O Terminal 01 will always act as a hardware enable, causing a coast to stop without software interpretation.

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Control I/O Terminal Designations

No.	Signal	Default	Description
R1	Relay N.O.	Fault	Normally open contact for output relay.
R2	Relay Common	–	Common for output relay.
R3	Relay N.C.	Fault	Normally closed contact for output relay.

Analog Output Select DIP Switch	0-10V	Sets analog output to either voltage or current. Setting must match A065 [Analog Out Sel].
Sink/Source DIP Switch	Source (SRC)	Inputs can be wired as Sink (SNK) or Source (SRC) via DIP Switch setting.

01	Stop ❶	Coast	The factory installed jumper or a normally closed input must be present for the drive to start.
02	Start/Run FWD	Not Active	I/O Terminal 03 is fully programmable. Program with E202 [Digital Term 3]. To disable reverse operation, see A095 [Reverse Disable].
03	Digital Term 3	Not Active	
04	Digital Common	–	For digital inputs. Electronically isolated with digital inputs from analog I/O and opto outputs.
05	Digital Input 1	Preset Freq	Program with A051 [Digital In1 Sel].
06	Digital Input 2	Preset Freq	Program with A052 [Digital In2 Sel].
07	Digital Input 3	Local	Program with A053 [Digital In3 Sel].
08	Digital Input 4	Jog Forward	Program with A054 [Digital In4 Sel].
09	Opto Common	–	For opto-coupled outputs. Electronically isolated with opto outputs from analog I/O and digital inputs.
11	+24V DC	–	Referenced to Digital Common. Drive supplied power for digital inputs. Maximum output current is 100mA.
12	+10V DC	–	Referenced to Analog Common. Drive supplied power for 0-10V external potentiometer. Maximum output current is 15mA.
13	±10V In ❷	Not Active	For external 0-10V (unipolar) or ±10V (bipolar) input supply (input impedance = 100k ohm) or potentiometer wiper.
14	Analog Common	–	For 0-10V In or 4-20mA In. Electronically isolated with analog inputs and outputs from digital I/O and opto outputs.
15	4-20mA In ❷	Not Active	For external 4-20mA input supply (input impedance = 250 ohm).
16	Analog Output	OutFreq 0-10	The default analog output is 0-10V. To covert to a current value, change the Analog Output Select DIP Switch to 0-20mA. Program with A065 [Analog Out Sel]. Max analog value can be scaled with A066 [Analog Out High]. Maximum Load:4-20mA = 525 ohm (10.5V) 0-10V = 1k ohm (10mA)
17	Opto Output 1	MotorRunning	Program with A058 [Opto Out1 Sel]
18	Opto Output 2	At Frequency	Program with A061 [Opto Out2 Sel]
19	RS485 (DSI) Shield	–	Terminal should be connected to safety ground - PE when using the RS485 (DSI) communications port.

❶ See Footnotes ❶ and ❻ on page 20.

❷ 0-10V In and 4-20mA In are distinct input channels and may be connected simultaneously. Inputs may be used independently for speed control or jointly in PID mode.

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Specifications

Drive Ratings

	Output Ratings		Input Ratings			Branch Circuit Protection			Estimated Power Dissipation
Catalog Number❶	kW (HP)	Amps	Voltage Range	kVA	Amps	Fuses	*140M Motor Protectors* ❷	Contactors	IP20 Open Watts
200 - 240V AC – 3-Phase Input, 0 - 230V 3-Phase Output									
22D-B2P3	0.4 (0.5)	2.3	180-264	1.15	2.5	6	140M-C2E-B40	100-C07	40
22D-B5P0	0.75 (1.0)	5.0	180-264	2.45	5.7	10	140M-C2E-C10	100-C09	60
22D-B8P0	1.5 (2.0)	8.0	180-264	4.0	9.5	15	140M-C2E-C16	100-C12	85
22D-B012	2.2 (3.0)	12.0	180-264	5.5	15.5	25	140M-C2E-C16	100-C23	125
22D-B017	3.7 (5.0)	17.5	180-264	8.6	21.0	30	140M-F8E-C25	100-C23	180
22D-B024	5.5 (7.5)	24.0	180-264	11.8	26.1	40	140M-F8E-C32	100-C37	235
22D-B033	7.5 (10)	33.0	180-264	16.3	34.6	60	140M-G8E-C45	100-C60	305
380 - 480V AC – 3-Phase Input, 0 - 460V 3-Phase Output									
22D-D1P4	0.4 (0.5)	1.4	342-528	1.4	1.8	3	140M-C2E-B25	100-C07	35
22D-D2P3	0.75 (1.0)	2.3	342-528	2.3	3.2	6	140M-C2E-B40	100-C07	50
22D-D4P0	1.5 (2.0)	4.0	342-528	4.0	5.7	10	140M-C2E-B63	100-C09	70
22D-D6P0	2.2 (3.0)	6.0	342-528	5.9	7.5	15	140M-C2E-C10	100-C09	100
22D-D010	4.0 (5.0)	10.5	342-528	10.3	13.0	20	140M-C2E-C16	100-C23	160
22D-D012	5.5 (7.5)	12.0	342-528	11.8	14.2	25	140M-D8E-C20	100-C23	175
22D-D017	7.5 (10)	17.0	342-528	16.8	18.4	30	140M-D8E-C20	100-C23	210
22D-D024	11 (15)	24.0	342-528	23.4	26.0	50	140M-F8E-C32	100-C43	300
460 - 600V AC – 3-Phase Input, 0 - 575V 3-Phase Output									
22D-E1P7	0.75 (1.0)	1.7	414-660	2.1	2.3	6	140M-C2E-B25	100-C09	50
22D-E3P0	1.5 (2.0)	3.0	414-660	3.65	3.8	6	140M-C2E-B40	100-C09	70
22D-E4P2	2.2 (3.0)	4.2	414-660	5.2	5.3	10	140M-C2E-B63	100-C09	100
22D-E6P6	4.0 (5.0)	6.6	414-660	8.1	8.3	15	140M-C2E-C10	100-C09	160
22D-E9P9	5.5 (7.5)	9.9	414-660	12.1	11.2	20	140M-C2E-C16	100-C16	175
22D-E012	7.5 (10)	12.2	414-660	14.9	13.7	25	140M-C2E-C16	100-C23	210
22D-E019	11 (15)	19.0	414-660	23.1	24.1	40	140M-D8E-C25	100-C30	300

❶ Ratings apply to all drive types; Panel Mount (N104), Flange Mount (F104), and Plate Drive (H204).

❷ Refer to the Bulletin 140M Motor Protectors Selection Guide, publication 140M-SG001… to determine the frame and breaking capacity required for your application.

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Category	Specification	
Agency Certification	c UL us	Listed to UL508C and CAN/CSA-22.2
		Certified to AS/NZS, 1997 Group 1, Class A
	CE	Marked for all applicable European Directives EMC Directive (89/336) EN 61800-3, EN 50081-1, EN 50082-2 Low Voltage Directive (73/23/EEC) EN 50178, EN 60204
	TÜV EMC; TÜV EN 50178; TÜV Rheinland FS	Certified to EN 954-1, Category 3. Meets Functional Safety (FS) when used with the DriveGuard Safe-Off Option (Series B).
	The drive is also designed to meet the appropriate portions of the following specifications: NFPA 70 - US National Electrical Code NEMA ICS 3.1 - Safety standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems. IEC 146 - International Electrical Code.	
Protection	Bus Overvoltage Trip 200-240V AC Input: 380-460V AC Input: 460-600V AC Input:	 405V DC bus (equivalent to 290V AC incoming line) 810V DC bus (equivalent to 575V AC incoming line) 1005V DC bus (equivalent to 711V AC incoming line)
	Bus Undervoltage Trip 200-240V AC Input: 380-480V AC Input: 460-600V AC Input P042 = 3 “High Voltage”: P042 = 2 “Low Voltage”:	 210V DC bus (equivalent to 150V AC incoming line) 390V DC bus (equivalent to 275V AC incoming line) 487V DC bus (equivalent to 344V AC incoming line) 390V DC bus (equivalent to 275V AC incoming line)
	Power Ride-Thru:	100 milliseconds
	Logic Control Ride-Thru:	0.5 seconds minimum, 2 seconds typical
	Electronic Motor Overload Protection:	I^2t protection - 150% for 60 seconds, 200% for 3 seconds (Provides Class 10 protection)
	Overcurrent:	200% hardware limit, 300% instantaneous fault
	Ground Fault Trip:	Phase-to-ground on drive output
	Short Circuit Trip:	Phase-to-phase on drive output
Environment	Altitude:	1000 m (3300 ft) max. without derating. Above 1000 m (3300 ft) derate 3% for every 305 m (1000 ft).
	Maximum Surrounding Air Temperature without derating: IP20, Open Type: IP30, NEMA Type 1, UL Type 1: Flange and Plate Mount:	 –10 to 50° C (14 to 122° F) –10 to 40° C (14 to 104° F) Heatsink:–10 to 40° C (14 to 104° F) Drive:–10 to 50° C (14 to 122° F)
	Cooling Method Convection: Fan:	 0.4 kW (0.5 HP) drives and all Flange and Plate drives All other drive ratings
	Storage Temperature:	–40 to 85 degrees C (–40 to 185 degrees F)
	Atmosphere:	**Important:** Drive **must not** be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the drive is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.
	Relative Humidity:	0 to 95% non-condensing
	Shock (operating):	15G peak for 11ms duration (±1.0 ms)
	Vibration (operating):	1G peak, 5 to 2000 Hz
Electrical	Voltage Tolerance:	200-240V ±10% 380-480V ±10% 460-600V ±10%
	Frequency Tolerance:	48-63 Hz
	Displacement Power Factor:	0.98 across entire speed range
	Maximum Short Circuit Rating:	100,000 Amps Symmetrical
	Actual Short Circuit Rating:	Determined by AIC Rating of installed fuse/circuit breaker
	Transistor Type:	Isolated Gate Bipolar (IGBT)

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Category	Specification		
Control	Method:		Sinusoidal PWM, Volts/Hertz, and Sensorless Vector
	Carrier Frequency		2-16 kHz, Drive rating based on 4 kHz.
	Frequency Accuracy Digital Input: Analog Input: Analog Output:		 Within ±0.05% of set output frequency Within 0.5% of maximum output frequency, 10-Bit resolution ±2% of full scale, 10-Bit resolution
	Speed Regulation Open Loop with Slip Compensation: With Encoder:		 ±1% of base speed across a 80:1 speed range ±0.3% of base speed across a 80:1 speed range ±0.05% of base speed across a 20:1 speed range
	Output Frequency:		0-500 Hz (programmable)
	Efficiency:		97.5% (typical)
	Stop Modes:		Multiple programmable stop modes including - Ramp, Coast, DC-Brake, and Ramp-to-Stop
	Accel/Decel:		Four independently programmable accel and decel times. Each time may be programmed from 0 - 600 seconds in 0.1 second increments.
	Intermittent Overload:		150% Overload capability for up to 1 minute 200% Overload capability for up to 3 seconds
	Electronic Motor Overload Protection		Class 10 protection with selectable speed sensitive response and power-down overload retention function when enabled.
Control Inputs	Digital:	Bandwidth:	10 Rad/Secs for open and closed loop
		Quantity:	(2) Dedicated for start and stop (5) Programmable for functions such as preset speeds, jog, etc.
		Current:	6 mA
		Type Source Mode (SRC): Sink Mode (SNK):	 18-24V = ON, 0-6V = OFF 0-6V = ON, 18-24V = OFF
	Analog:	Quantity:	(2) Isolated, –10 to 10V and 4-20mA
		Specification Resolution: 0 to 10V DC Analog: 4-20mA Analog: External Pot:	 10-bit 100k ohm input impedance 250 ohm input impedance 1-10k ohm, 2 Watt minimum
Encoder	Type:		'Incremental, dual channel
	Supply:		12V, 250 mA. 12V, 10 mA minimum inputs isolated with differential transmitter, 250 kHz maximum.
	Quadrature:		90°, ±27 degrees at 25 degrees C.
	Duty Cycle:		50%, +10%
	Requirements:		Encoders must be line driver type, quadrature (dual channel) or pulse (single channel), 3.5 - 26V DC output, single-ended or differential and capable of supplying a minimum of 10 mA per channel. Maximum input frequency is 250 kHz. The encoder I/O automatically scales to allow 5V, 12V and 24V DC nominal voltages.
Control Outputs	Relay:	Quantity:	(1) Programmable Form C
		Specification Resistive Rating: Inductive Rating:	 3.0A at 30V DC, 3.0A at 125V, 3.0A at 240V AC 0.5A at 30V DC, 0.5A at 125V, 0.5A at 240V AC
	Opto:	Quantity:	(2) Programmable
		Specification:	30V DC, 50mA Non-inductive
	Analog:	Quantity:	(1) Non-Isolated 0-10V or 4-20mA
		Specification Resolution: 0 to 10V DC Analog: 4-20mA Analog:	 10-bit 1k ohm minimum 525 ohm maximum

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Parameter List

Parameter Number	Parameter Name	Description	Factory Default
Basic Display Group			
b001	Output Freq	Output frequency present at T1, T2 & T3 (U, V & W).	Read Only
b002	Commanded Freq	Value of the active frequency command.	Read Only
b003	Output Current	Output current present at T1, T2 & T3 (U, V & W).	Read Only
b004	Output Voltage	Output voltage present at T1, T2 & T3 (U, V & W).	Read Only
b005	DC Bus Voltage	Present DC bus voltage level.	Read Only
b006	Drive Status	Present operating condition of the drive.	Read Only
b007	Fault 1 Code	A code that represents a drive fault.	Read Only
b008	Fault 2 Code		
b009	Fault 3 Code		
b010	Process Display	Output frequency scaled by A099 [Process Factor].	Read Only
b012	Control Source	Displays the active source of the Start Command and Speed Command.	Read Only
b013	Contrl In Status	Status of the control terminal block control inputs.	Read Only
b014	Dig In Status	Status of the control terminal block digital inputs.	Read Only
b015	Comm Status	Status of the communication ports.	Read Only
b016	Control SW Ver	Main Control Board software version.	Read Only
b017	Drive Type	Used by Rockwell Automation field service personnel.	Read Only
b018	Elapsed Run Time	Accumulated time drive is outputting power.	Read Only
b019	Testpoint Data	Present value of the function selected in A102 [Testpoint Sel].	Read Only
b020	Analog In 0-10V	Present value of the voltage at I/O Terminal 13.	Read Only
b021	Analog In 4-20mA	Present value of the current at I/O Terminal 15.	Read Only
b022	Output Power	Output power present at T1, T2 & T3 (U, V & W).	Read Only
b023	Output Powr Fctr	The angle in electrical degrees between motor voltage and motor current.	Read Only
b024	Drive Temp	Present operating temperature of the drive power section.	Read Only
b025	Counter Status	The current value of the counter when counter is enabled.	Read Only
b026	Timer Status	The current value of the timer when timer is enabled.	Read Only
b028	Stp Logic Status	The current step of the StepLogic profile.	Read Only
b029	Torque Current	The current value of the motor torque current.	Read Only
Basic Program Group			
P031	Motor NP Volts	20 to Drive Rated Volts	Based on Drive Rating
P032	Motor NP Hertz	15 to 500 Hz	60 Hz
P033	Motor OL Current	0.0 to (Drive Rated Amps x 2)	Based on Drive Rating
P034	Minimum Freq	0.00 to 500.0 Hz	0.00 Hz
P035	Maximum Freq	0.00 to 500.0 Hz	60.00 Hz
P036	Start Source	6 settings; 3-Wire, 2-Wire, 2-W Lvl Sens, 2-W Hi Speed, Comm Port, Momt FWD/REV	Comm Port
P037	Stop Mode	10 settings: Ramp, CF; Coast, CF; DC Brake, CF; DCBrkAuto,CF; Ramp; Coast; DC Brake; DC BrakeAuto; Ramp+EM B,CF; Ramp+EM Brk	Ramp, CF (Clear Fault)
P038	Speed Reference	9 settings; InternalFreq, 0-10V Input, 4-20mA Input, Preset Freq, Comm Port, Stp Logic, Anlg In Mult, Encoder, Positioning	Comm Port
P039	Accel Time 1	0.0 to 600.0 seconds	10.0 Secs
P040	Decel Time 1	0.0 to 600.0 seconds	10.0 Secs
P041	Reset To Defalts	Used to reset drive to factory default settings.	Ready/Idle
P042	Voltage Class	Sets the voltage class of 600V drives.	High Voltage
P043	Motor OL Ret	Enables/disables the Motor Overload Retention function.	Disabled
Advanced Program Group			
A051	Digital In1 Sel	36 settings: Not Used; Acc/Dec Sel1; Jog; Aux Fault; Preset Freq; Comm Port; Clear Fault; RampStop,CF; CoastStop,CF; DCInjStop,CF; Jog Forward; Jog Reverse; 10V In Ctrl; 20mA In Ctrl; PID Disable; MOP Up; MOP Down; Timer Start; Counter In; Reset Timer; Reset Countr; Rset Tim&Cnt; Logic In1; Logic In2; Current Lmt2; Anlg Invert; EM Brk Rlse; Acc/Dec Sel2; Precharge En; Inertia Dcel; Sync Enable; Traverse Dis; Home Limit; Find Home; Hold Step; Pos Redefine	Preset Freq
A052	Digital In2 Sel		Preset Freq
A053	Digital In3 Sel		Local
A054	Digital In4 Sel		Jog Forward
A055	Relay Out Sel	26 settings; Ready/Fault, At Frequency, MotorRunning, Reverse, Motor Overld, Ramp Reg, Above Freq, Above Cur, Above DCVolt, Retries Exst, Above Anlg V, Logic In 1, Logic In 2, Logic 1 & 2, Logic 1 or 2, StpLogic Out, Timer Out, Counter Out, Above PF Ang, Anlg In Loss, ParamControl, NonRec Fault, EM Brk Cntrl, At Position, At Home, Safe-Off	Ready/Fault
A056	Relay Out Level	0.0 to 9999	0.0
A058	Opto Out1 Sel	26 settings; Ready/Fault, At Frequency, MotorRunning, Reverse, Motor Overld, Ramp Reg, Above Freq, Above Cur, Above DCVolt, Retries Exst, Above Anlg V, Logic In 1, Logic In 2, Logic 1 & 2, Logic 1 or 2, StpLogic Out, Timer Out, Counter Out, Above PF Ang, Anlg In Loss, ParamControl, NonRec Fault, EM Brk Cntrl, At Position, At Home, Safe-Off	MotorRunning
A059	Opto Out1 Level	0.0 to 9999	0.0
A061	Opto Out2 Sel	26 settings; Ready/Fault, At Frequency, MotorRunning, Reverse, Motor Overld, Ramp Reg, Above Freq, Above Cur, Above DCVolt, Retries Exst, Above Anlg V, Logic In 1, Logic In 2, Logic 1 & 2, Logic 1 or 2, StpLogic Out, Timer Out, Counter Out, Above PF Ang, Anlg In Loss, ParamControl, NonRec Fault, EM Brk Cntrl, At Position, At Home, Safe-Off	At Frequency

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Parameter Number	Parameter Name	Description	Factory Default
A062	Opto Out2 Level	0.0 to 9999	0.0
A064	Opto Out Logic	0 to 3	0
A065	Analog Out Sel	21 settings; OutFreq 0-10, OutCurr 0-10, OutVolt 0-10, OutPowr 0-10, TstData 0-10, OutFreq 0-20, OutCurr 0-20, OutVolt 0-20, OutPowr 0-20, TstData 0-20, OutFreq 4-20, OutCurr 4-20, OutVolt 4-20, OutPowr 4-20, TstData 4-20, OutTorq 0-10, OutTorq 0-20, OutTorq 4-20, Setpnt 0-10, Setpnt 0-20, Setpnt 4-20	OutFreq 0-10
A066	Analog Out High	0 to 800%	100%
A067	Accel Time 2	0.0 to 600.0 Secs	20.0 Secs
A068	Decel Time 2	0.0 to 600.0 Secs	20.0 Secs
A069	Internal Freq	0.00 to 600.0 Hz	60.00 Hz
A070	Preset Freq 0	0.00 to 500.0 Hz	0.00 Hz
A071	Preset Freq 1		5.00 Hz
A072	Preset Freq 2		10.00 Hz
A073	Preset Freq 3		20.00 Hz
A074	Preset Freq 4		30.00 Hz
A075	Preset Freq 5		40.00 Hz
A076	Preset Freq 6		50.00 Hz
A077	Preset Freq 7		60.00 Hz
A078	Jog Frequency	0.00 to [Maximum Freq]	10.00 Hz
A079	Jog Accel/Decel	0.1 to 600.0 Secs	10.0 Secs
A080	DC Brake Time	0.0 to 99.9 Secs	0.0 Secs
A081	DC Brake Level	0.0 to (Drive Rated Amps x 1.8)	Drive Rated Amps x 0.05
A082	DB Resistor Sel	0 to 99	0
A083	S Curve %	0 to 100%	0%
A084	Boost Select	15 settings: Custom V/Hz; 30.0, VT (Variable Torque); 35.0, VT; 40.0, VT; 45.0, VT; 0.0 no IR; 0.0; 2.5, CT (Constant Torque); 5.0, CT; 7.5, CT; 10.0, CT; 12.5, CT; 15.0, CT;17.5, CT; 20.0, CT	5.0, CT 2.5, CT: 5, 7.5, 10 & 15 Hp
A085	Start Boost	0.0 to 25.0%	2.5%
A086	Break Voltage	0.0 to 100.0%	25.0%
A087	Break Frequency	0.0 to 500.0 Hz	15.0 Hz
A088	Maximum Voltage	20 to Drive Rated Volts	Drive Rated Volts
A089	Current Limit 1	0.1 to (Drive Rated Amps x 1.8)	Drive Rated Amps x 1.5
A090	Motor OL Select	3 settings; No Derate, Min Derate, Max Derate	No Derate
A091	PWM Frequency	2.0 to 16.0 kHz	4.0 kHz
A092	Auto Rstrt Tries	0 to 9	0
A093	Auto Rstrt Delay	0.0 to 120.0 Secs	1.0 Secs
A094	Start At PowerUp	2 settings; Disabled, Enabled	Disabled
A095	Reverse Disable	2 settings; Rev Enabled, Rev Disabled	Rev Enabled
A096	Flying Start En	2 settings; Disabled, Enabled	Disabled
A097	Compensation	4 settings; Disabled, Electrical, Mechanical, Both	Electrical
A098	SW Current Trip	0.0 to (Drive Rated Amps x 2)	0.0 (Disabled)
A099	Process Factor	0.1 to 999.9	30.0
A100	Fault Clear	3 settings; Ready/Idle, Reset Fault, Clear Buffer	Ready/Idle
A101	Program Lock	2 settings; Unlocked, Locked	Unlocked
A102	Testpoint Sel	400 to FFFF Hex	400
A103	Comm Data Rate	6 settings; 1200, 2400, 4800, 9600, 19.2K, 38.4K	9600
A104	Comm Node Addr	1 to 247	100
A105	Comm Loss Action	4 settings; Fault, Coast Stop, Stop, Continu Last	Fault
A106	Comm Loss Time	0.1 to 60.0 Secs	5.0 Secs
A107	Comm Format	6 settings; RTU 8-N-1, RTU 8-E-1, RTU 8-O-1, RTU 8-N-2, RTU 8-E-2, RTU 8-O-2	RTU 8-N-1
A108	Language	7 settings; English, Francais, Espanol, Italiano, Deutsch, Portugues, Nederlands	English
A109	Anlg Out Setpt	0.0 to 100.0%	0.0%
A110	Anlg In 0-10V Lo	0.0 to 100.0%	0.0%
A111	Anlg In 0-10V Hi	0.0 to 100.0%	100.0%
A112	Anlg In4-20mA Lo	0.0 to 100.0%	0.0%
A113	Anlg In4-20mA Hi	0.0 to 100.0%	100.0%
A114	Slip Hertz @ FLA	0.0 to 10.0 Hz	2.0 Hz
A115	Process Time Lo	0.00 to 99.99	0.00
A116	Process Time Hi	0.00 to 99.99	0.00
A117	Bus Reg Mode	2 settings; Disabled, Enabled	Enabled
A118	Current Limit 2	0.1 to (Drive Rated Amps x 1.8)	Drive Rated Amps x 1.5
A119	Skip Frequency	0 to 500 Hz	0 Hz
A120	Skip Freq Band	0.0 to 30.0 Hz	0.0 Hz
A121	Stall Fault Time	6 settings; 60 Seconds, 120 Seconds, 240 Seconds, 360 Seconds, 480 Seconds, Flt Disabled	60 Seconds
A122	Analog In Loss	7 settings; Disabled, Fault, Stop, Zero Ref, Min Freq Ref, Max Freq Ref, Int Freq Ref	Disabled

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Parameter Number	Parameter Name	Description	Factory Default
A123	10V Bipolar Enbl	2 settings; Uni-Polar In, Bi-Polar In	Uni-Polar In
A124	Var PWM Disable	2 settings; Enable, Disable	Enable
A125	Torque Perf Mode	2 settings; V/Hz, Sensrls Vect	Sensrls Vect
A126	Motor NP FLA	0.1 to (Drive Rated Amps x 2)	Drive Rated Amps
A127	Autotune	3 settings; Ready/Idle, Static Tune, Rotate Tune	Ready/Idle
A128	IR Voltage Drop	0.0 to 230.0 VAC	Based on Drive Rating
A129	Flux Current Ref	0.00 to [Motor NP FLA]	Based on Drive Rating
A130	PID Trim Hi	0.0 to 500.0 Hz	60.0 Hz
A131	PID Trim Lo	0.0 to 500.0 Hz	0.0 Hz
A132	PID Ref Sel	11 settings: PID Disabled; PID Setpoint; 0-10V Input; 4-20mA Input; Comm Port; Encoder; Setpnt, Trim; 0-10V, Trim; 4-20mA, Trim; Comm, Trim; Encoder,Trim	PID Disabled
A133	PID Feedback Sel	4 settings; 0-10V Input, 4-20mA Input, Comm Port, Encoder	0-10V Input
A134	PID Prop Gain	0.00 to 99.99	0.01
A135	PID Integ Time	0.0 to 999.9 Secs	2.0 Secs
A136	PID Diff Rate	0.00 to 99.99 (1/Secs)	0.01 (1/Secs)
A137	PID Setpoint	0.0 to 100.0%	0.0%
A138	PID Deadband	0.0 to 10.0%	0.0%
A139	PID Preload	0.0 to 500.0 Hz	0.0 Hz
A140	Stp Logic 0	0001 to FAFF	00F1
A141	Stp Logic 1		
A142	Stp Logic 2		
A143	Stp Logic 3		
A144	Stp Logic 4		
A145	Stp Logic 5		
A146	Stp Logic 6		
A147	Stp Logic 7		
A150	Stp Logic Time 0	0.0 to 999.9 Secs	30.0 Secs
A151	Stp Logic Time 1		
A152	Stp Logic Time 2		
A153	Stp Logic Time 3		
A154	Stp Logic Time 4		
A155	Stp Logic Time 5		
A156	Stp Logic Time 6		
A157	Stp Logic Time 7		
A160	EM Brk Off Delay	0.01 to 10.00 Secs	2.00 Secs
A161	EM Brk On Delay	0.01 to 10.00 Secs	2.00 Secs
A162	MOP Reset Sel	2 settings; Zero MOP Ref, Save MOP Ref	Save MOP Ref
A163	DB Threshold	0.0 to 110.0%	100.0%
Enhanced Program Group			
E201	LED Display Opt	0 to 3	2
E202	Digital Term 3	36 settings: Start Source; Acc/Dec Sel1; Jog; Aux Fault; Preset Freq; Comm Port; Clear Fault; RampStop,CF; CoastStop,CF; DCInjStop,CF; Jog Forward; Jog Reverse; 10V In Ctrl; 20mA In Ctrl; PID Disable; MOP Up; MOP Down; Timer Start; Counter In; Reset Timer; Reset Countr; Rset Tim&Cnt; Logic In1; Logic In2; Current Lmt2; Anlg Invert; EM Brk Rlse; Acc/Dec Sel2; Precharge En; Inertia Dcel; Sync Enable; Traverse Dis; Home Limit; Find Home; Hold Step; Pos Redefine	Term Block
E203	Accel Time 3	0.0 to 600.0 Secs	5.0 Secs
E204	Decel Time 3	0.0 to 600.0 Secs	5.0 Secs
E205	Accel Time 4	0.0 to 600.0 Secs	30.0 Secs
E206	Decel Time 4	0.0 to 600.0 Secs	30.0 Secs
E207	Comm Write Mode	2 settings; EEPROM, RAM only	EEPROM
E208	Power Loss Mode	2 settings; Coast, Decel	Coast
E209	Half Bus Enable	2 settings; Disabled, Enabled	Disabled
E210	Max Traverse	0.00 to 300.0 Hz	0.00 Hz (Disabled)
E211	Traverse Inc	0.00 to 30.00 Secs	0.00 Secs
E212	Traverse Dec	0.00 to 30.00 Secs	0.00 Secs
E213	P Jump	0.00 to 300.0 Hz	0.00 Hz
E214	Sync Time	0.0 to 3200.0 Secs	0.0 Secs (Disabled)
E215	Speed Ratio	0.01 to 99.99	1.00
E216	Motor Fdbk Type	6 settings; None, Pulse Train, Single Chan, Single Check, Quadrature, Quad Check	None
E217	Motor NP Poles	2 to 40	4
E218	Encoder PPR	1 to 20000	1024
E219	Pulse In Scale	1 to 20000	64
E220	Ki Speed Loop	0.0 to 400.0	2.0
E221	Kp Speed Loop	0.0 to 200.0	0.5

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Parameter Number	Parameter Name	Description	Factory Default
E222	Positioning Mode	0 to 4	0
E223	Find Home Freq	0.1 to 500.0 Hz	10.0 Hz
E224	Find Home Dir	2 settings; Forward, Reverse	Forward
E225	Encoder Pos Tol	1 to 50000	100
E226	Counts Per Unit	1 to 32000	4096
E230	Step Units 0	0 to 64000	0
E232	Step Units 1		
E234	Step Units 2		
E236	Step Units 3		
E238	Step Units 4		
E240	Step Units 5		
E242	Step Units 6		
E244	Step Units 7		
E231	Step Units F 0	0.00 to 0.99	0.00
E233	Step Units F 1		
E235	Step Units F 2		
E237	Step Units F 3		
E239	Step Units F 4		
E241	Step Units F 5		
E243	Step Units F 6		
E245	Step Units F 7		
E246	Pos Reg Filter	0 to 15	8
E247	Pos Reg Gain	0.0 to 200.0	3.0
E248	Enh Control Word	0 to 1	0
E249	Cmd Stat Select	0 to 1	0
Advanced Display Group			
d301	Drive Status 2	0 to 1	Read Only
d302	Fibers Status	0 to 1	Read Only
d303	Slip Hz Meter	0.0 to 25.0 Hz	Read Only
d304	Speed Feedback	0 to 64000 RPM	Read Only
d305	Speed Feedback F	0.0 to 0.9	Read Only
d306	Encoder Speed	0 to 64000	Read Only
d307	Encoder Speed F	0.0 to 0.9	Read Only
d308	Units Traveled H	0 to 64000	Read Only
d309	Units Traveled L	0.00 to 0.99	Read Only

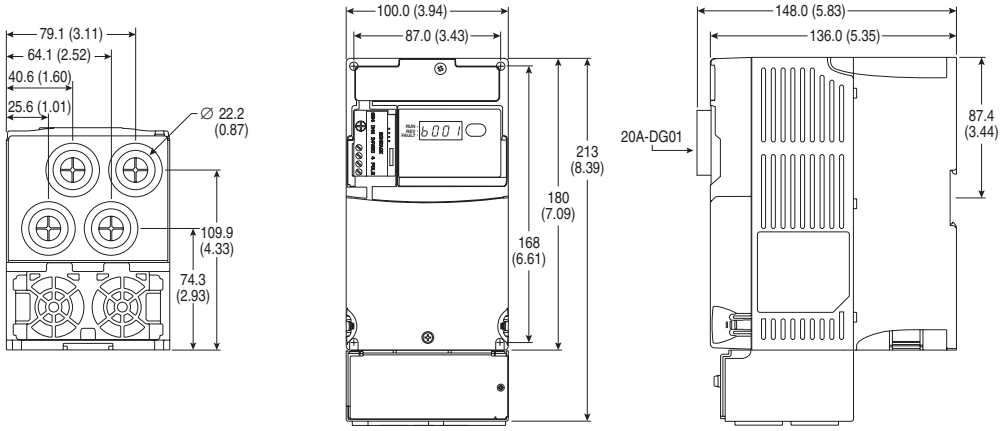
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Approximate Dimensions

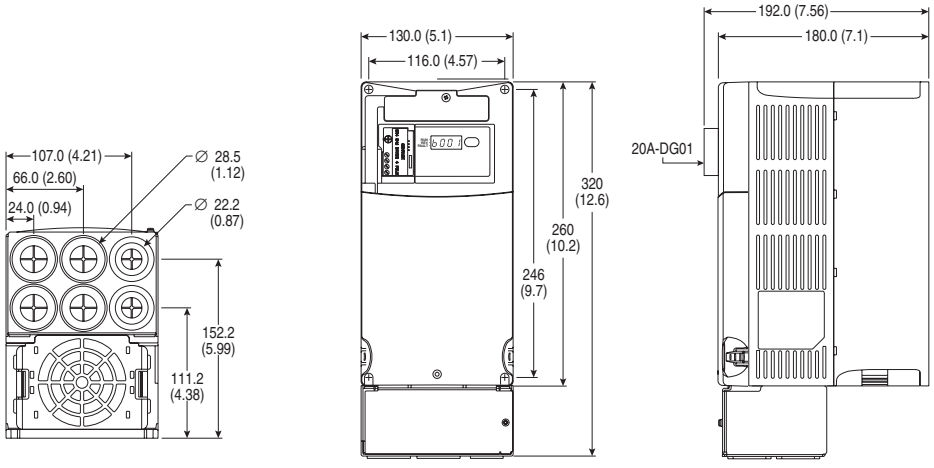
Ratings are in kW and (HP).

Frame	240V AC – 3-Phase		480V AC – 3-Phase		600V AC – 3-Phase	
B	0.4 (0.5) 0.75 (1.0) 1.5 (2.0)	2.2 (3.0) 3.7 (5.0)	0.4 (0.5) 0.75 (1.0) 1.5 (2.0)	2.2 (3.0) 4.0 (5.0)	0.75 (1.0) 1.5 (2.0)	2.2 (3.0) 4.0 (5.0)
C	11.0 (15.0) 15.0 (20.0)	18.5 (25.0) 22.0 (30.0)	5.5 (7.5) 7.5 (10.0)	11.0 (15.0)	5.5 (7.5) 7.5 (10.0)	11.0 (15.0)

IP 30/NEMA 1/ UL Type 1 Option Kit without Communication Option



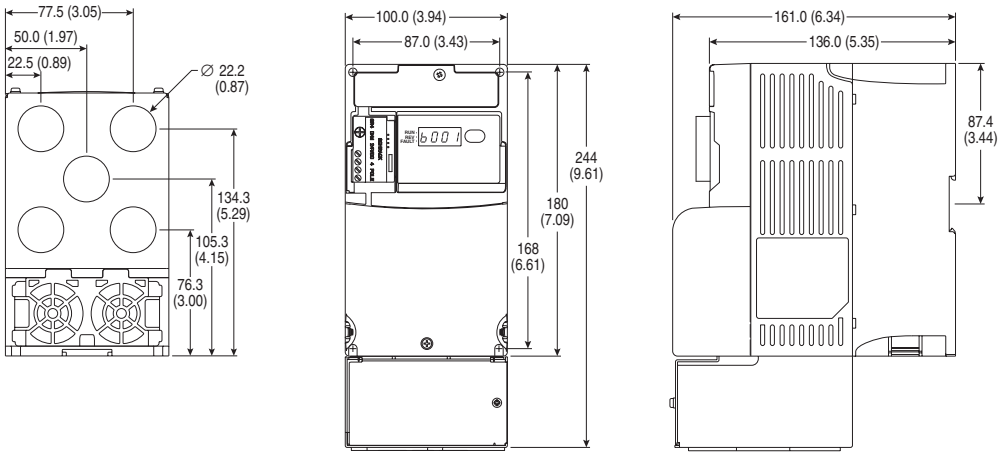
Frame B
(Shown with IP30/NEMA 1/UL Type 1 conversion kit.)



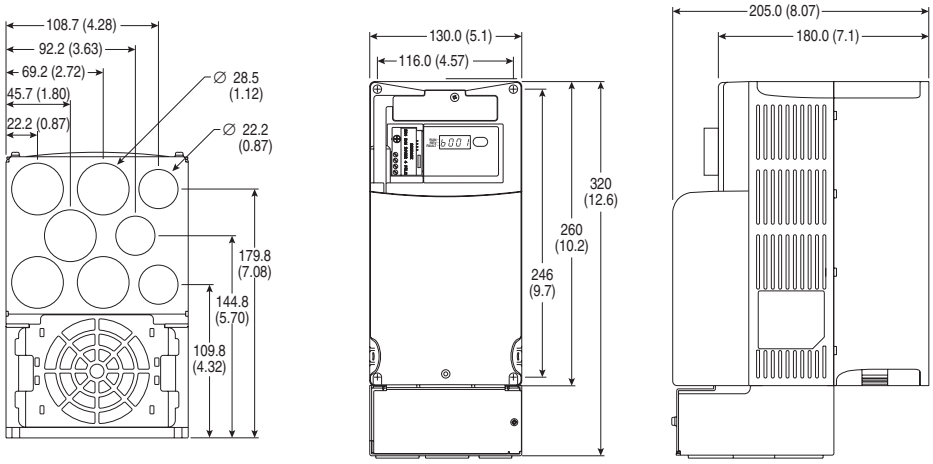
Frame C
(Shown with IP30/NEMA 1/UL Type 1 conversion kit.)

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IP 30/NEMA 1/UL Type 1 Option Kit with Communication Option



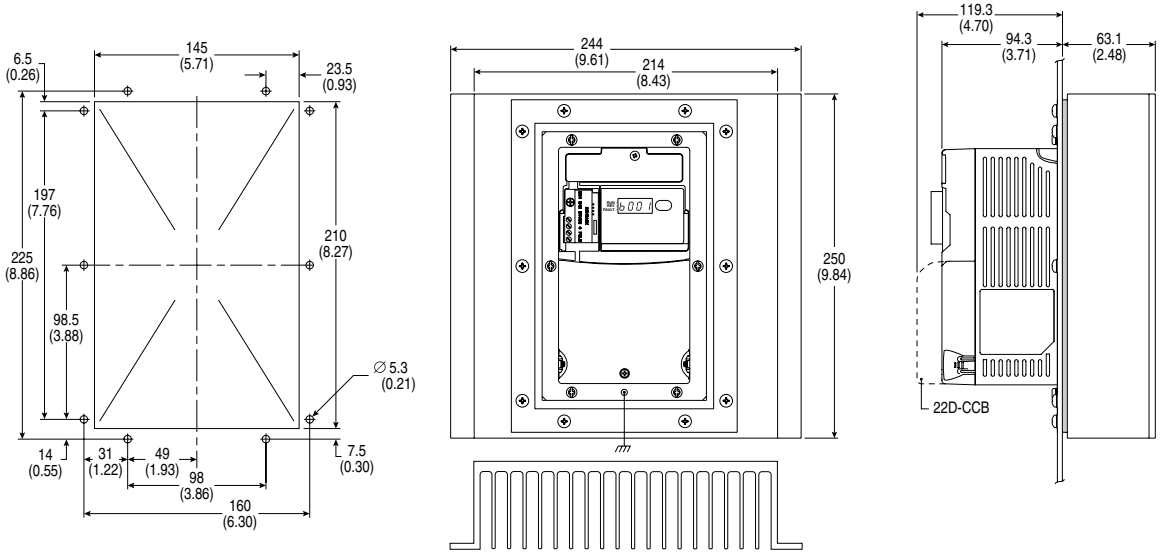
Frame B - 22-JBCB



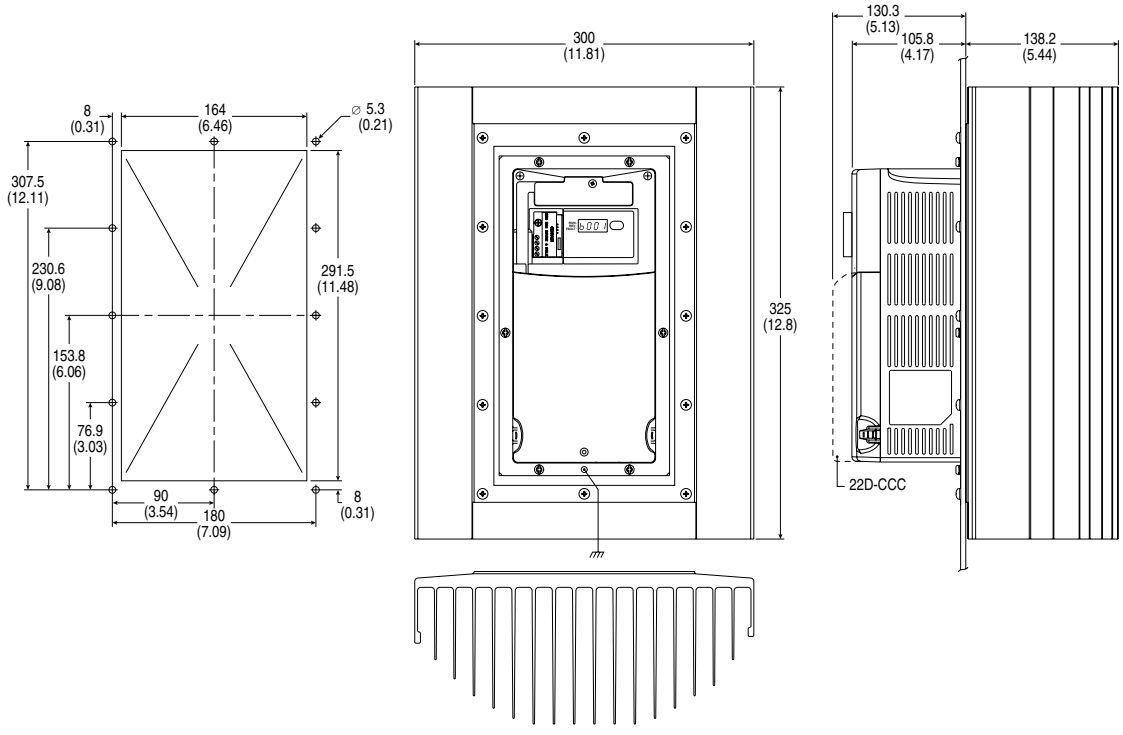
Frame C - 22-JBCC

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Flange Mount Drive



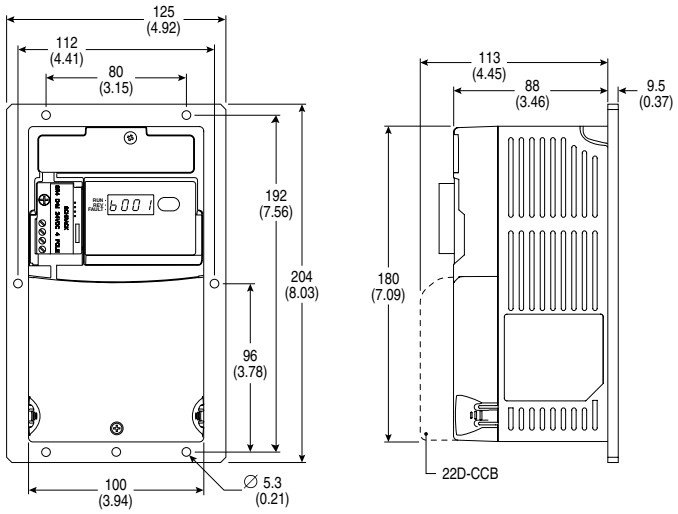
Frame B — Flange Mount



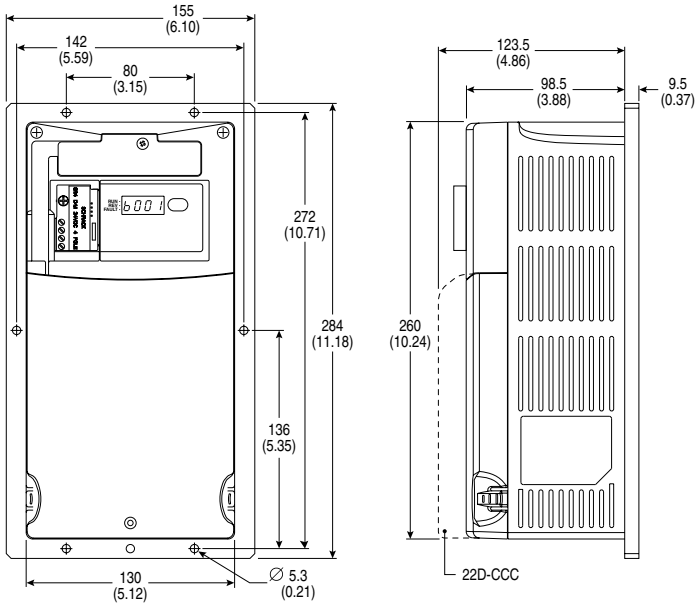
Frame C — Flange Mount

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Plate Drive



Frame B — Plate Drive

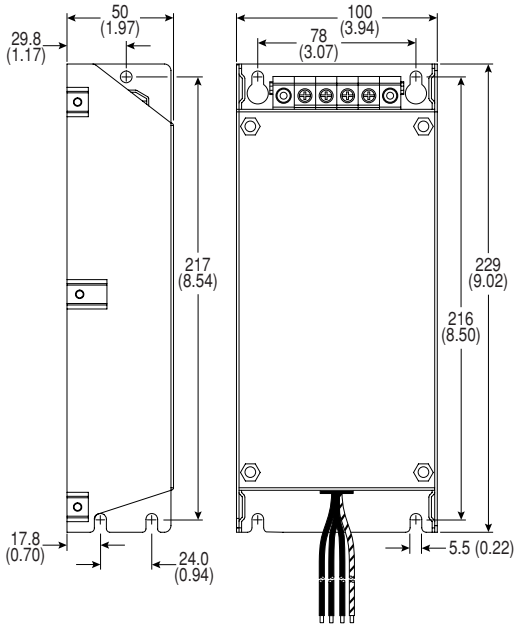


Frame C — Plate Drive

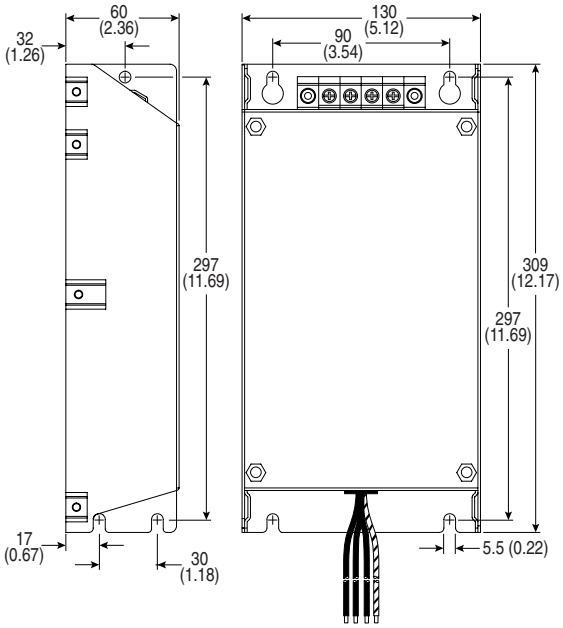
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EMC Line Filters

Dimensions are in millimeters and (inches)
Catalog Numbers: 22-RF0P8-BL; 22-RF012-BS, -BL (Series B); 22-RF021-BS, -BL



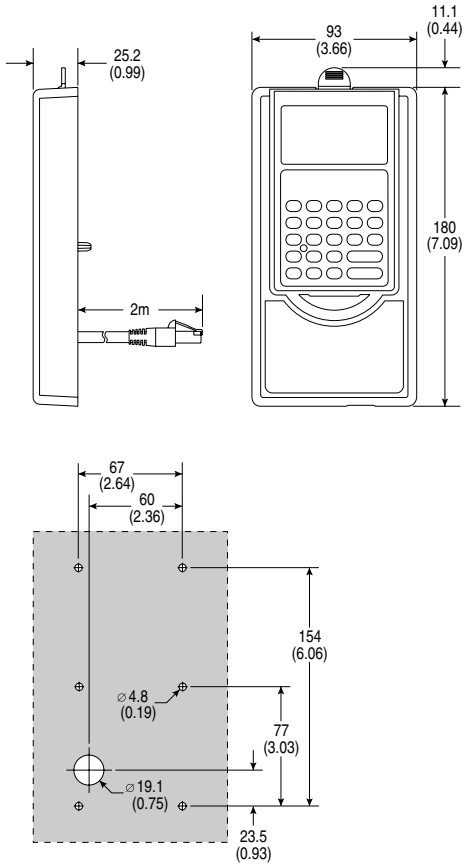
Catalog Numbers: 22-RF018-CS, -CL; 22-RF025-CL; 22-RF026-CS, -CL; 22-RF034-CS, -CL



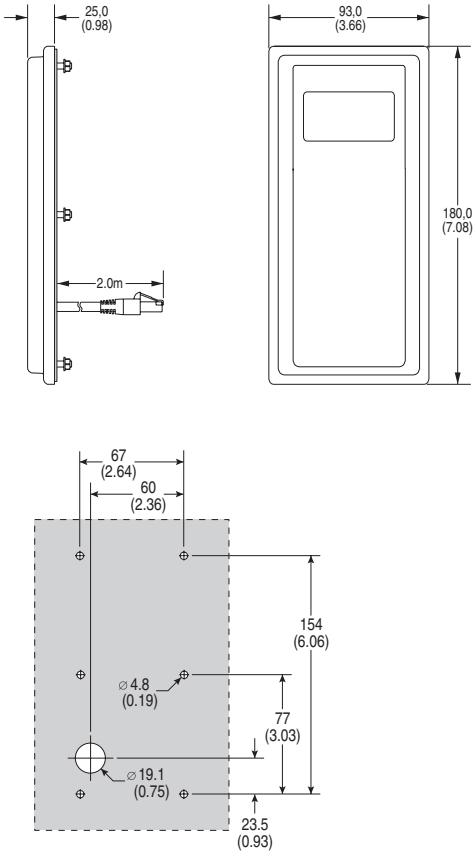
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Human Interface Module (HIM) Dimensions

NEMA Type 1 Bezel – Dimensions are in millimeters and (inches)
Catalog Number: 22-HIM-B1



NEMA Type 4X/12 Remote (Panel Mount) Small HIM
– Dimensions are in millimeters and (inches)
Catalog Number: 22-HIM-C2S



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Notes

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