

**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

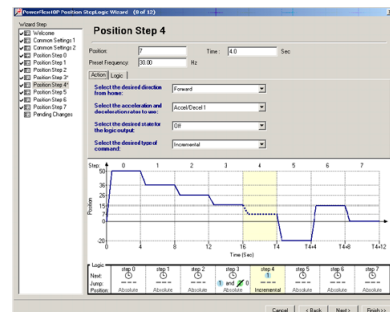
### Flexible Packaging and Mounting Options

- 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.*



### 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.



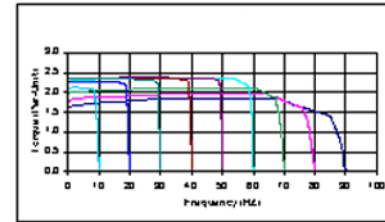
#### Optimized Performance

- **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.



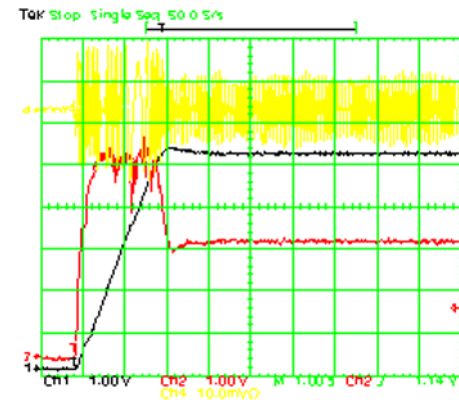
### Sensorless Vector Control

- **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.



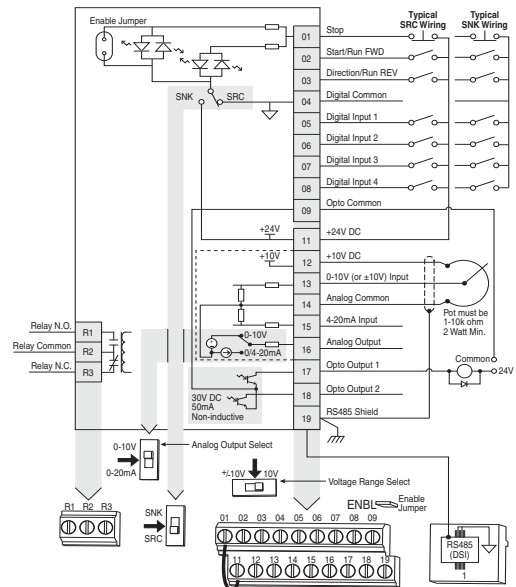
### Control Performance

- **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.



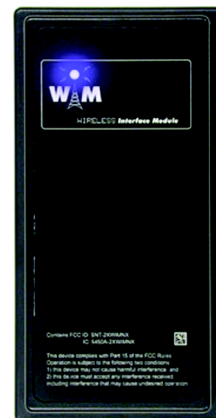
## I/O

- 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.



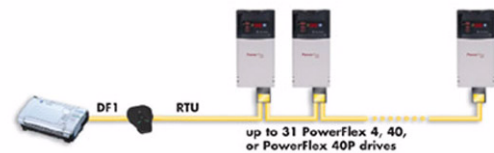
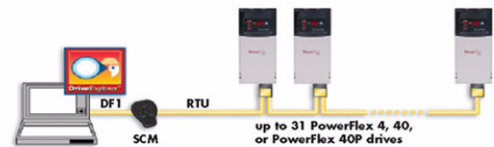
## Communications

- 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.



### 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.





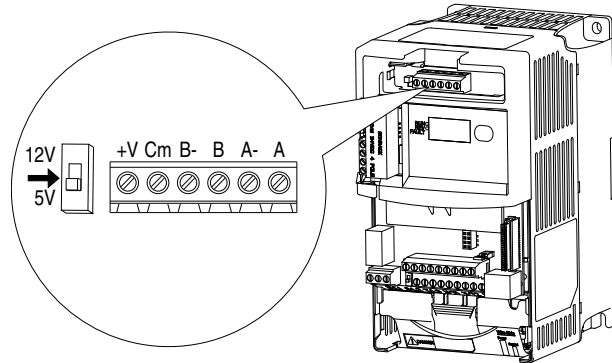
## PowerFlex 40P AC Drive Advanced Features

### 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.

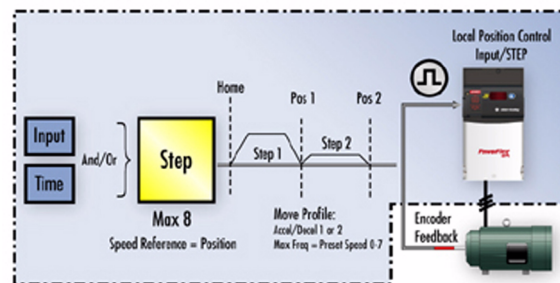
- Improved speed regulation
- Basic position control



### Basic Position Control

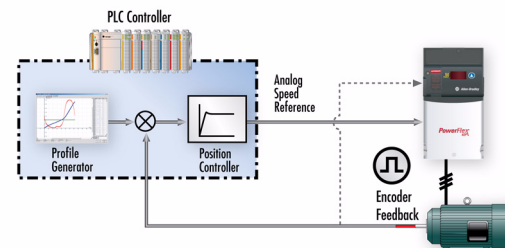
#### Local Position Control

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

### 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



## ***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



### 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



## Catalog Number Explanation

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

<i>a</i>		
Drive		
Code	Type	
22D	PowerFlex 40P	

<i>b</i>		
Voltage Rating		
Code	Voltage	Ph.
B	240V ac	3
D	480V ac	3
E	600V ac	3

<i>c1</i>		
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)

<i>c2</i>		
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)

<i>c3</i>		
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)

<i>d</i>	
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)

<i>e</i>	
HIM	
Code	HIM Version
1	Display/Fault Reset Only
2	Display/Fault Reset Only (Plate Drive)

<i>f</i>	
Emission Class	
Code	EMC Filter
0	No Filter

<i>g</i>	
Version	
Code	Version
4	Standard

<i>h</i>	
Optional	
Code	Purpose
AA through ZZ	Reserved for custom firmware

**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 ①
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 ①
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 ①
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

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

## User Installed Options

### IP30/NEMA 1/UL Type 1 Conversion Kit

Description	Drive Frame	Catalog Number
IP30/NEMA 1/UL Type 1 Kit <i>Description:</i> 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 <i>Description:</i> 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 <i>Description:</i> LCD Display, Remote Panel Mount, Digital Speed Control, CopyCat capable, IP66 (NEMA Type 4X/12) indoor use only, Includes 2.0 meter cable. <i>Note:</i> 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 <i>Description:</i> 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 <i>Description:</i> Remote Handheld, Wireless Interface Module with <i>Bluetooth</i> ® technology, IP30 (NEMA Type1), Panel Mount with optional bezel kit.	22-WIM-N1
Remote Human Interface Module (HIM) – Wireless Handheld <i>Description:</i> Remote Handheld, Wireless Interface Module with <i>Bluetooth</i> technology, IP66 (NEMA Type 4X/12) indoor use only.	22-WIM-N4S
Bezel Kit <i>Description:</i> Panel Mount for LCD Display, Remote Handheld unit, IP30 (NEMA Type 1). Includes a 22-RJ45CBL-C20 cable.	22-HIM-B1
DSI HIM Cable <i>Description:</i> 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.	9306-4XP01ENE

❶ Setup Wizards are available for use with DriveTools SP and DriveExplorer (Lite/Full) only.

❷ See [www.ab.com/drive/](http://www.ab.com/drive/) for support devices.

❸ DriveExplorer Lite available for free, download at: [http://www.ab.com/drives/driveexplorer/free\\_download.html](http://www.ab.com/drives/driveexplorer/free_download.html).

## Spare Parts

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

## Other Options

Description	Catalog Number
DriveGuard® Safe-Off Option (Series B) <i>Description:</i> 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 <i>Description:</i> Provides serial communication via DF1 protocol for use with DriveExplorer and DriveTools SP software. <i>Includes:</i> 2m USB cable, 20-HIM-H10 cable, and 22-HIM-H10 cable.	1203-USB
Serial Converter Module (RS485 to RS232) <i>Description:</i> Provides serial communication via DF1 protocol for use with DriveExplorer and DriveExecutive™ software. <i>Includes:</i> DSI to RS232 serial converter, 1203-SFC serial cable, 22-RJ45CBL-C20 cable, and DriveExplorer Lite CD.	22-SCM-232
Serial Cable <i>Description:</i> 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 <i>Description:</i> For use when connecting the serial converter to DriveExplorer on a handheld PC.	1203-SNM
DSI Cable <i>Description:</i> 2.0 meter RJ45 to RJ45 cable, male to male connectors.	22-RJ45CBL-C20
Splitter Cable <i>Description:</i> RJ45 one to two port splitter cable.	AK-U0-RJ45-SC1
Terminating Resistors <i>Description:</i> 120 Ohm resistor embedded in an RJ45 connector (2 pieces)	AK-U0-RJ45-TR1
Terminal Block <i>Description:</i> RJ45 two position terminal block (5 pieces) with two 120 Ohm terminating resistors (loose).	AK-U0-RJ45-TB2P
ControlNet™ Communication Adapter <i>Note:</i> Requires a Communication Adapter Cover when used with Frame B and C PowerFlex 40P drives (Ordered Separately).	22-COMM-C
DeviceNet™ Communication Adapter <i>Note:</i> Requires a Communication Adapter Cover when used with Frame B and C PowerFlex 40P drives (Ordered Separately).	22-COMM-D
EtherNet/IP™ Communication Adapter <i>Note:</i> Requires a Communication Adapter Cover when used with Frame B and C PowerFlex 40P drives (Ordered Separately).	22-COMM-E
LonWorks™ Communication Adapter <i>Note:</i> Requires a Communication Adapter Cover when used with Frame B and C PowerFlex 40P drives (Ordered Separately).	22-COMM-L
PROFIBUS™ DP Communication Adapter <i>Note:</i> Requires a Communication Adapter Cover when used with Frame B and C PowerFlex 40P drives (Ordered Separately).	22-COMM-P
External DSI Communications Kit <i>Description:</i> External mounting kit for 22-COMM Adapters.	20-XCOMM-DC-BASE
External Comms Power Supply <i>Description:</i> 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 <i>Description:</i> Houses the Communication Adapter for Frame B and C drives. <i>Note:</i> 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).



## Dynamic Brake Resistors

Drive Ratings			Minimum Resistance	Catalog Number ❶
Input Voltage	kW	Hp	Ohms	
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
600V 50/60 Hz 3-Phase	11	15	24	AK-R2-120P1K2 ❷
	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

**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
600V 50/60 Hz 3-Phase	11	15	22-RF026-CS ❷	22-RF026-CL
	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.

## Installation Considerations

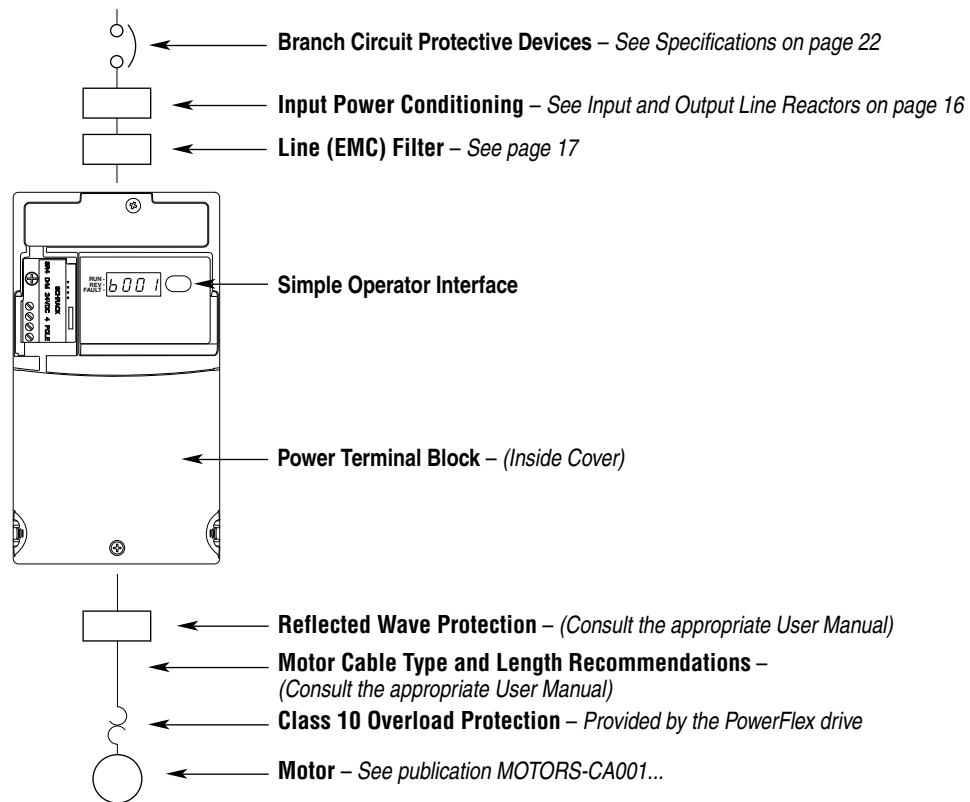
### Power Wiring

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



## Specifications

### Drive Ratings





Catalog Number <sup>❶</sup>	Output Ratings		Input Ratings			Branch Circuit Protection				Estimated Power Dissipation
	kW (HP)	Amps	Voltage Range	kVA	Amps	Fuses	140M Motor Protectors <sup>❷</sup> ❸	Contactors	Min. Enclosure Volume <sup>❹</sup> (in. <sup>3</sup> )	IP20 Open Watts
<b>200 - 240V AC – 3-Phase Input, 0 - 230V 3-Phase Output</b>										
22D-B2P3	0.4 (0.5)	2.3	180-264	1.15	2.5	6	140M-C2E-B40	100-C07	1655	40
22D-B5P0	0.75 (1.0)	5.0	180-264	2.45	5.7	10	140M-C2E-C10	100-C09	1655	60
22D-B8P0	1.5 (2.0)	8.0	180-264	4.0	9.5	15	140M-C2E-C16	100-C12	1655	85
22D-B012	2.2 (3.0)	12.0	180-264	5.5	15.5	25	140M-C2E-C16	100-C23	1655	125
22D-B017	3.7 (5.0)	17.5	180-264	8.6	21.0	30	140M-F8E-C25	100-C23	1655	180
22D-B024	5.5 (7.5)	24.0	180-264	11.8	26.1	40	140M-F8E-C32	100-C37	2069	235
22D-B033	7.5 (10)	33.0	180-264	16.3	34.6	60	140M-G8E-C45	100-C60	2069	305
<b>380 - 480V AC – 3-Phase Input, 0 - 460V 3-Phase Output</b>										
22D-D1P4	0.4 (0.5)	1.4	342-528	1.4	1.8	3	140M-C2E-B25	100-C07	1655	35
22D-D2P3	0.75 (1.0)	2.3	342-528	2.3	3.2	6	140M-C2E-B40	100-C07	1655	50
22D-D4P0	1.5 (2.0)	4.0	342-528	4.0	5.7	10	140M-C2E-B63	100-C09	1655	70
22D-D6P0	2.2 (3.0)	6.0	342-528	5.9	7.5	15	140M-C2E-C10	100-C09	1655	100
22D-D010	4.0 (5.0)	10.5	342-528	10.3	13.0	20	140M-C2E-C16	100-C23	1655	160
22D-D012	5.5 (7.5)	12.0	342-528	11.8	14.2	25	140M-D8E-C20	100-C23	2069	175
22D-D017	7.5 (10)	17.0	342-528	16.8	18.4	30	140M-D8E-C20	100-C23	2069	210
22D-D024	11 (15)	24.0	342-528	23.4	26.0	50	140M-F8E-C32	100-C43	2069	300
<b>460 - 600V AC – 3-Phase Input, 0 - 575V 3-Phase Output</b>										
22D-E1P7	0.75 (1.0)	1.7	414-660	2.1	2.3	6	140M-C2E-B25	100-C09	1655	50
22D-E3P0	1.5 (2.0)	3.0	414-660	3.65	3.8	6	140M-C2E-B40	100-C09	1655	70
22D-E4P2	2.2 (3.0)	4.2	414-660	5.2	5.3	10	140M-D8E-B63	100-C09	1655	100
22D-E6P6	4.0 (5.0)	6.6	414-660	8.1	8.3	15	140M-D8E-C10	100-C09	1655	160
22D-E9P9	5.5 (7.5)	9.9	414-660	12.1	11.2	20	140M-D8E-C16	100-C16	2069	175
22D-E012	7.5 (10)	12.2	414-660	14.9	13.7	25	140M-D8E-C16	100-C23	2069	210
22D-E019	11 (15)	19.0	414-660	23.1	24.1	40	140M-F8E-C25	100-C30	2069	300

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

❷ The AIC ratings of the Bulletin 140M Motor Protector Circuit Breakers may vary. See [Bulletin 140M Motor Protection Circuit Breakers Application Ratings](#).

❸ Manual Self-Protected (Type E) Combination Motor Controller, UL listed for 208 Wye or Delta, 240 Wye or Delta, 480Y/277 or 600Y/347. Not UL listed for use on 480V or 600V Delta/Delta, corner ground, or high-resistance ground systems.

❹ When using a Manual Self-Protected (Type E) Combination Motor Controller, the drive must be installed in a ventilated or non-ventilated enclosure with the minimum volume specified in this column. Application specific thermal considerations may require a larger enclosure.

Category	Specification	
Agency Certification		Listed to UL508C and CAN/CSA-22.2
		Certified to AS/NZS, 1997 Group 1, Class A
		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
		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: 380-480V 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:	Provides class 10 motor overload protection according to NEC article 430 and motor over-temperature protection according to NEC article 430.126 (A) (2). UL 508C File 29572.
	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:	<b>Important:</b> Drive <b>must not</b> 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
	Voltage Tolerance:	200-240V ±10% 380-480V ±10% 460-600V ±10%
	Frequency Tolerance:	48-63 Hz
Electrical	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)

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:	Within $\pm 0.05\%$ of set output frequency
	Analog Input:	Within 0.5% of maximum output frequency, 10-Bit resolution
	Analog Output:	$\pm 2\%$ of full scale, 10-Bit resolution
	Speed Regulation	
	Open Loop with Slip Compensation:	$\pm 1\%$ of base speed across a 80:1 speed range
	With Encoder:	$\pm 0.3\%$ of base speed across a 80:1 speed range $\pm 0.05\%$ of base speed across a 20:1 speed range
	Output Frequency:	0-500 Hz (programmable)
Control Inputs	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	Provides class 10 motor overload protection according to NEC article 430 and motor over-temperature protection according to NEC article 430.126 (A) (2). UL 508C File 29572.
	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	
Encoder	Source Mode (SRC):	18-24V = ON, 0-6V = OFF
	Sink Mode (SNK):	0-6V = ON, 18-24V = OFF
	Analog:	
	Quantity:	(2) Isolated, -10 to 10V and 4-20mA
	Specification	
	Resolution:	10-bit
	0 to 10V DC Analog:	100k ohm input impedance
	4-20mA Analog:	250 ohm input impedance
	External Pot:	1-10k ohm, 2 Watt minimum
	Type:	'Incremental, dual channel
Control Outputs	Supply:	12V, 250 mA. 12V, 10 mA minimum inputs isolated with differential transmitter, 250 kHz maximum.
	Quadrature:	90°, $\pm 27$ degrees at 25 degrees C.
	Duty Cycle:	50%, $\pm 10\%$
	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.
	Relay:	
	Quantity:	(1) Programmable Form C
	Specification	
	Resistive Rating:	3.0A at 30V DC, 3.0A at 125V, 3.0A at 240V AC
	Inductive Rating:	0.5A at 30V DC, 0.5A at 125V, 0.5A at 240V AC
	Opto:	
Control Outputs	Quantity:	(2) Programmable
	Specification:	30V DC, 50mA Non-inductive
	Analog:	
	Quantity:	(1) Non-Isolated 0-10V or 4-20mA
	Specification	
	Resolution:	10-bit
	0 to 10V DC Analog:	1k ohm minimum
	4-20mA Analog:	525 ohm maximum

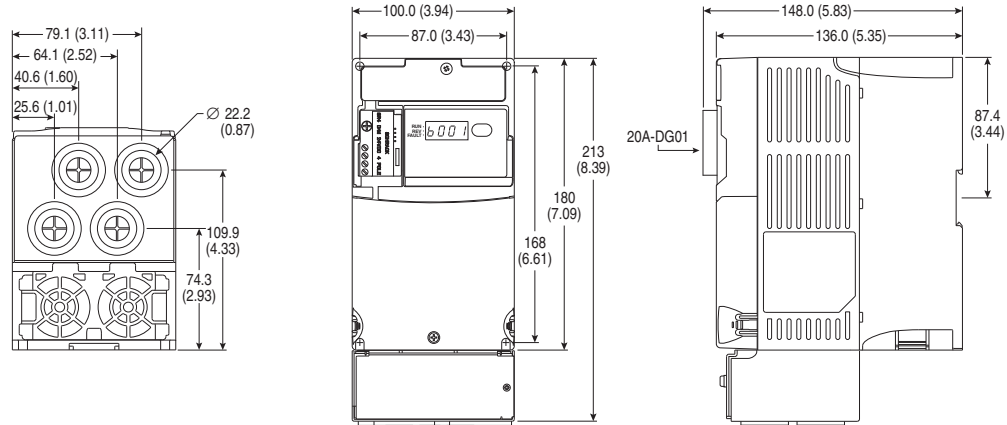


## Approximate Dimensions

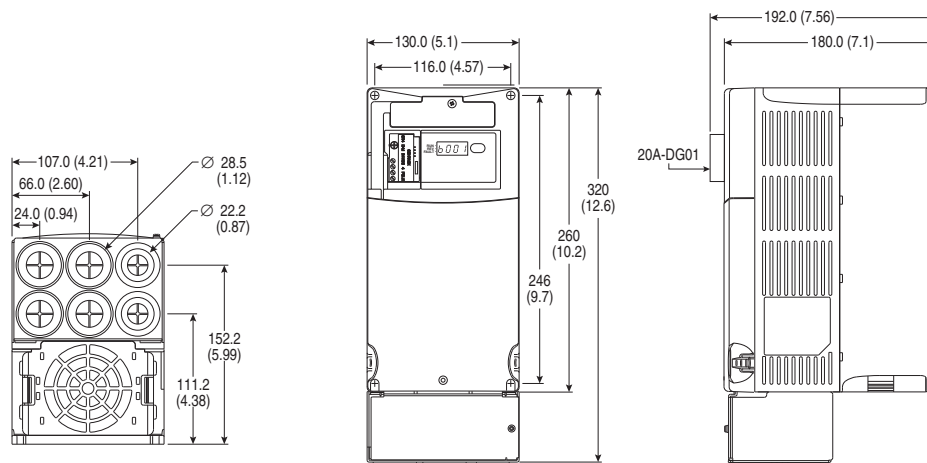
Ratings are in kW and (HP).

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

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

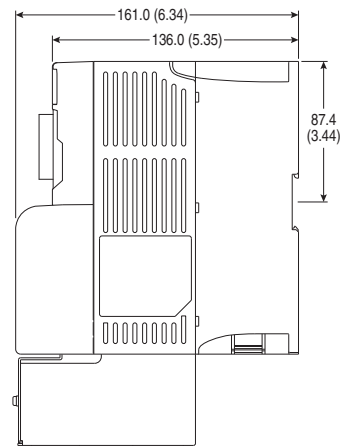
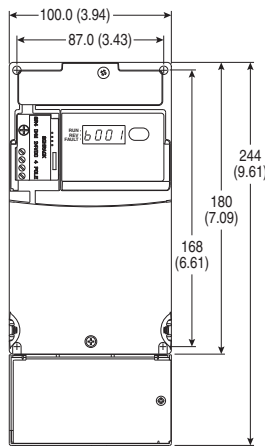
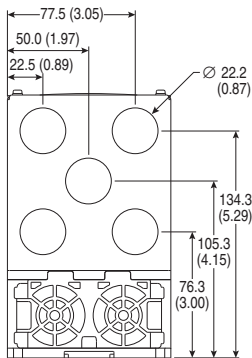


Frame B  
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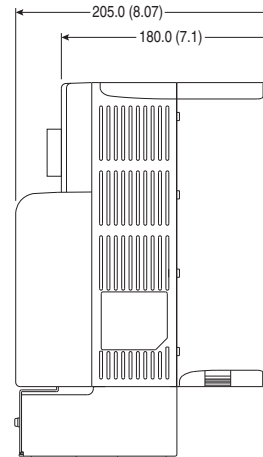
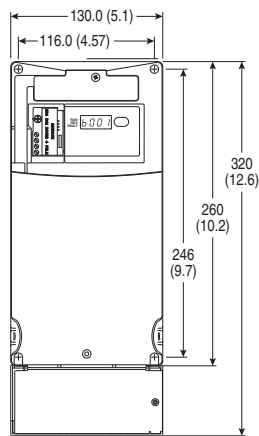
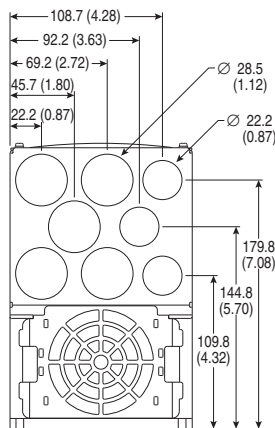


Frame C  
(Shown with IP30/NEMA 1/UL Type 1 conversion kit.)

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

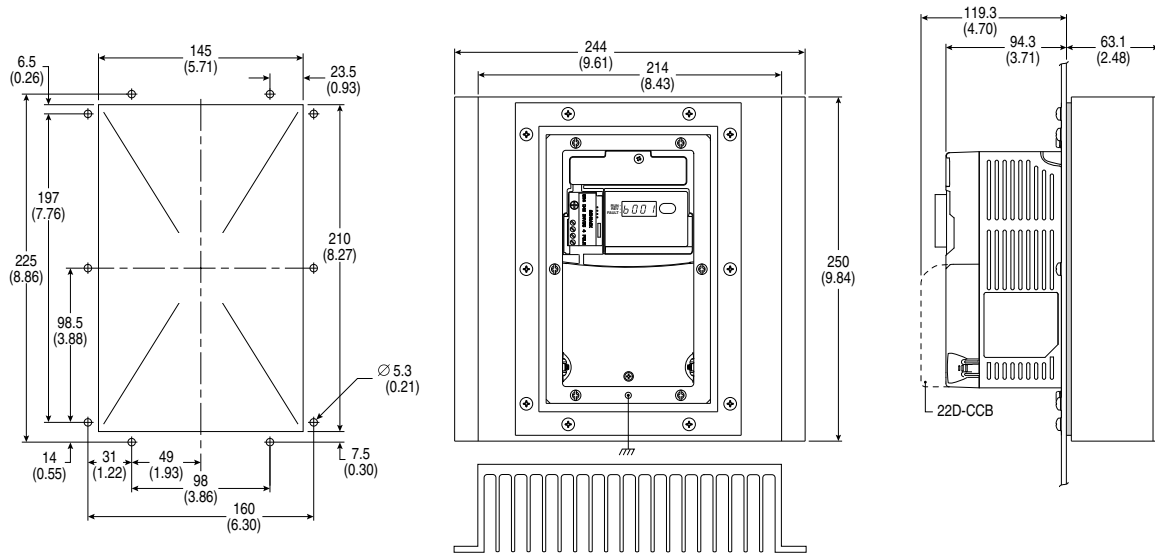


Frame B - 22-JBCB

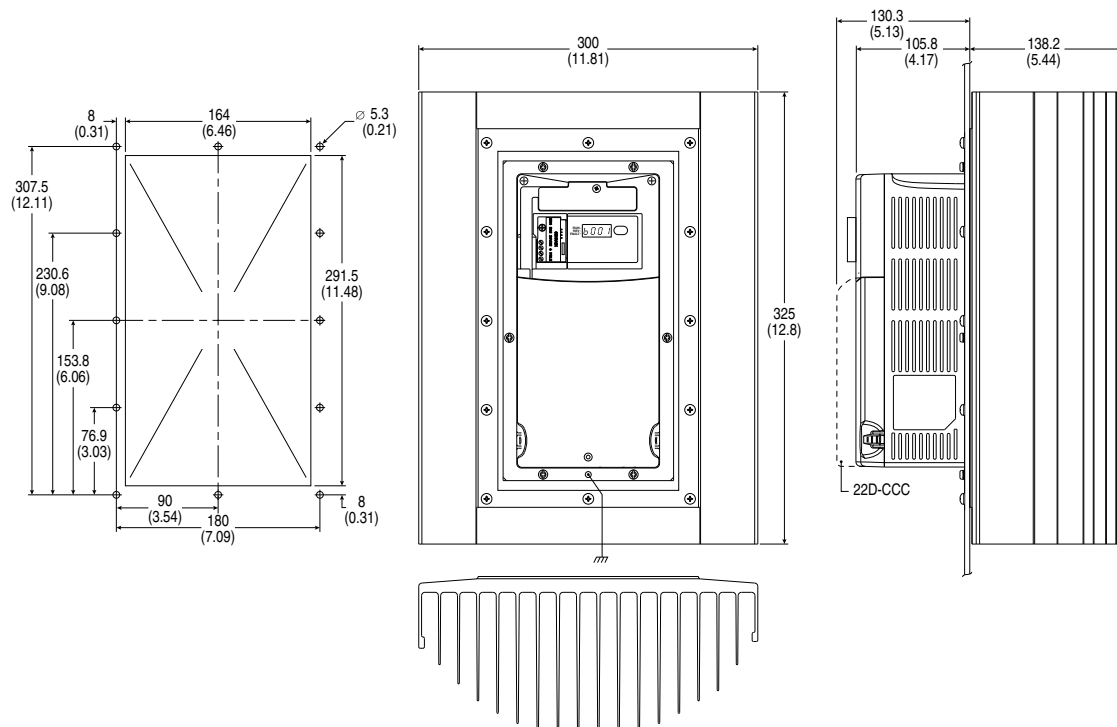


Frame C - 22-JBCC

## Flange Mount Drive

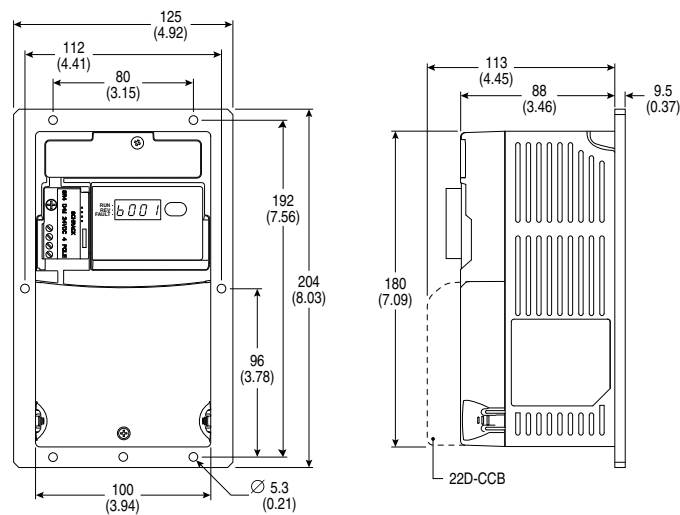


Frame B — Flange Mount

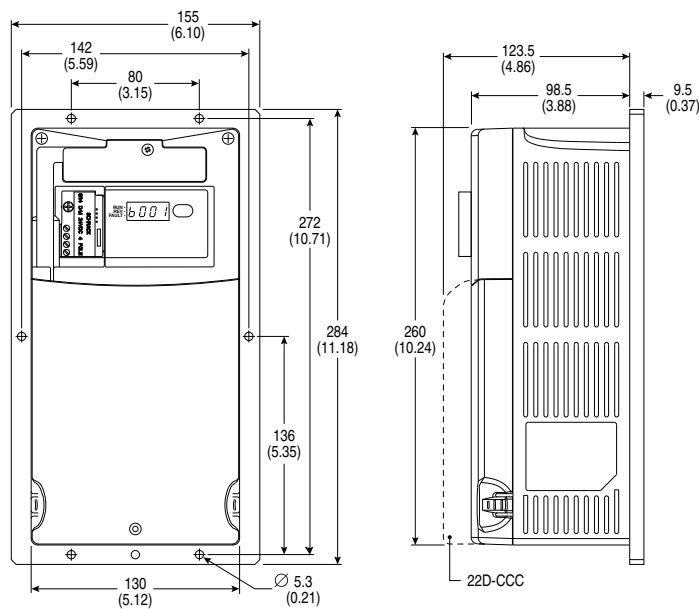


Frame C — Flange Mount

Plate Drive



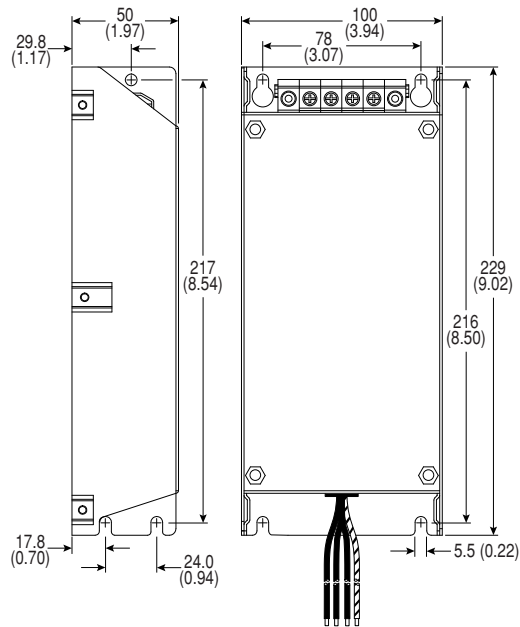
Frame B — Plate Drive



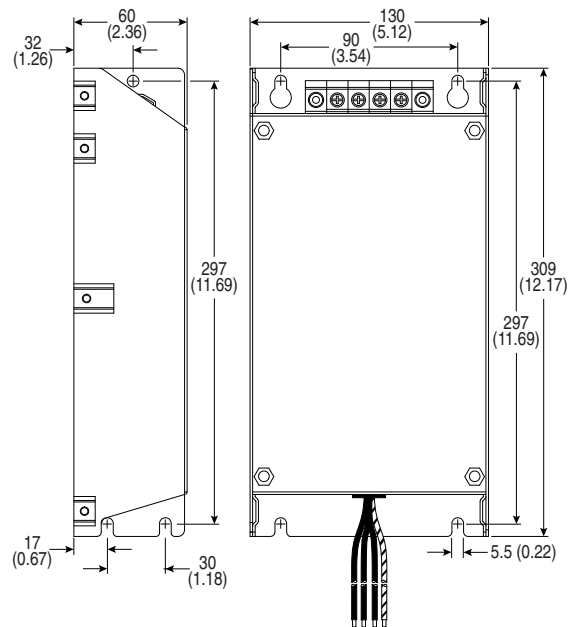
Frame C — Plate Drive

EMC Line Filters

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

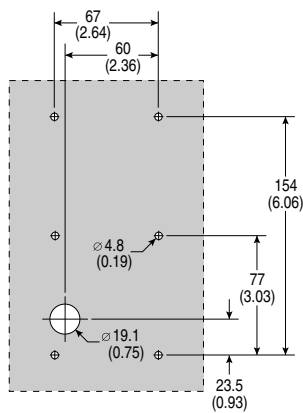
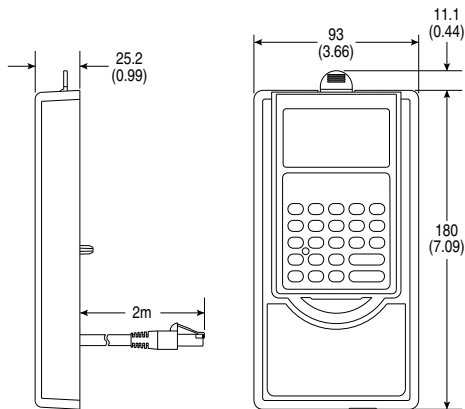


Catalog Numbers: 22-RF018-CS, -CL; 22-RF025-CL; 22-RF026-CS, -CL; 22-RF034-CS, -CL



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

