Product Description

Providing users with easy installation in mechanical fan and pump systems, the Allen-Bradley PowerFlex® 400 AC drive offers a wide range of built-in features allowing for seamless building system integration. Available in power ratings of 3.0-350HP @ 480VAC and 3.0-50HP @ 240V AC, the PowerFlex 400 is designed to meet global OEM, contractor and end-user demands for flexibility, space savings and ease-of-use. The PowerFlex 400 is a cost-effective solution for speed control in variable torque fan and pump applications.

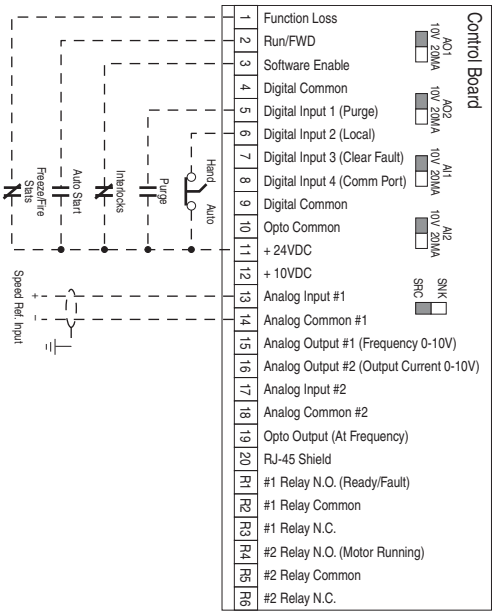
Table of Contents

Packaging

- **IP20, NEMA/UL Type 1** - For conventional mounting inside or outside a control cabinet in a 45°C (113°F) ambient.
- **Flange Type** - Frame C ratings through 15 kW (20 HP) @ 380-480V AC and 7.5 kW (10 HP) @ 200-240V AC allow for mounting heatsink through back of an enclosure, thus removing a large portion of the heat inside a cabinet. The backside is rated IP66, NEMA/UL Type 4X/12 for both indoor and outdoor use.
- Installation flexibility is enhanced by the UL Plenum rating allowing for direct mounting in an air handling system.

I/O

- Three (3) semi-programmable and four (4) fully programmable digital inputs provide application versatility.
- Two (2) programmable form C relay outputs and one (1) opto output can be used to indicate various drive or motor conditions.
- Two (2) analog outputs are DIP Switch selectable for either voltage (0-10V) or current (0-20 mA). These scalable, 10-bit outputs are suitable for metering or as a speed reference for another drive.
- Two (2) analog inputs (one unipolar and one bipolar) are DIP switch selectable for either voltage or current. One input is isolated from the rest of the drive I/O.
- Six (6) programmable form A relay outputs are available via user installed Auxiliary Relay Board (Frames D through H only).

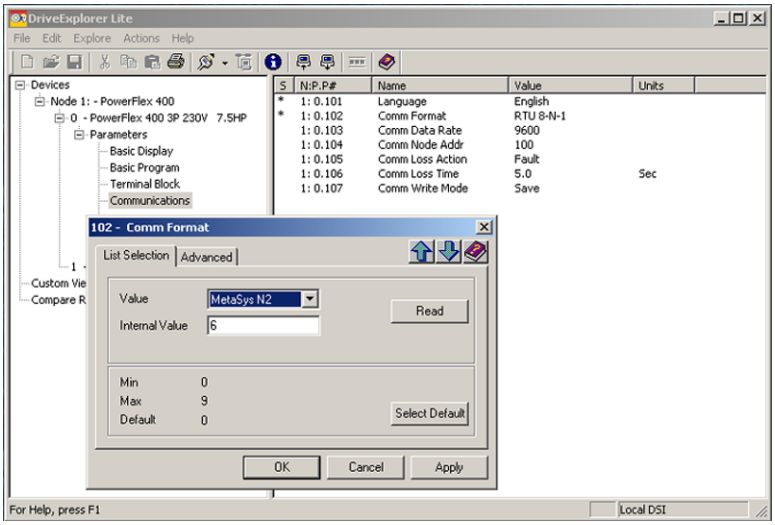


Operator Keypad and Programming

- Integral keypad features 2 line, 16 character LCD display.
- LED indicators provide system configuration and fault status.
- Configurable Hand/Off/Auto function buttons.
- Digital increase/decrease speed control.
- Parameter names are displayed as text.
- Parameters are grouped into files based upon function, making programming fast and easy.

Communications

- Supports **Drive Serial Interface** (DSI) communication modules (**DeviceNet**™, **EtherNet/IP**™, **PROFIBUS**™ **DP, LonWorks**®, **BACnet**®) and accessories.
- Embedded **Modbus RTU**, **P1-FLN** and **Metasys N2** protocols are parameter selectable and require no additional hardware or software.
- **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.



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.

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.

Connected Components Workbench Software (CCW)

- Online and offline programming capability.
- 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.
- Edit, upload, and download parameters.
- Immediate visual indication of drive and communication status when viewing online drive.

Application Features

Configurable Keypad Hand-Off-Auto Functions

Parameter P042 [Auto Mode] defines the operating configuration of the control keys.

Hand-Off-Auto Configuration

Hand Mode: Start command and speed reference come from the integral keypad. Auto key switches control from Hand mode to Auto mode in a bumpless transfer as long as there is an active run command.

Auto Mode: Start command is defined by P036 [Start Source] (keypad, terminal block, comm port) and speed reference is defined by P038 [Speed Reference] (analog inputs, preset frequency, comm port). Start/Hand key switches control and speed reference to the integral keypad in a bumpless transfer.

Local/Remote Configuration

Local Mode: Start command and speed reference come from the integral keypad. Auto key stops the drive and the drive switches to Remote mode.

Remote Mode: Start command is defined by P036 [Start Source] and speed reference is defined by P038 [Speed Reference]. Auto key stops the drive and the drive switches to Local mode.

Auto/Manual Configuration

Manual Mode: Start command is defined by P036 [Start Source] and the speed reference comes from the integral keypad. Auto key toggles frequency control to Auto mode in a bumpless transfer.

Auto Mode: Start command is defined by P036 [Start Source] and speed reference is defined by P038 [Speed Reference]. Auto key switches frequency control to the integral keypad in a bumpless transfer.

Connectivity to Building Fire and Life Safety Systems

Purge

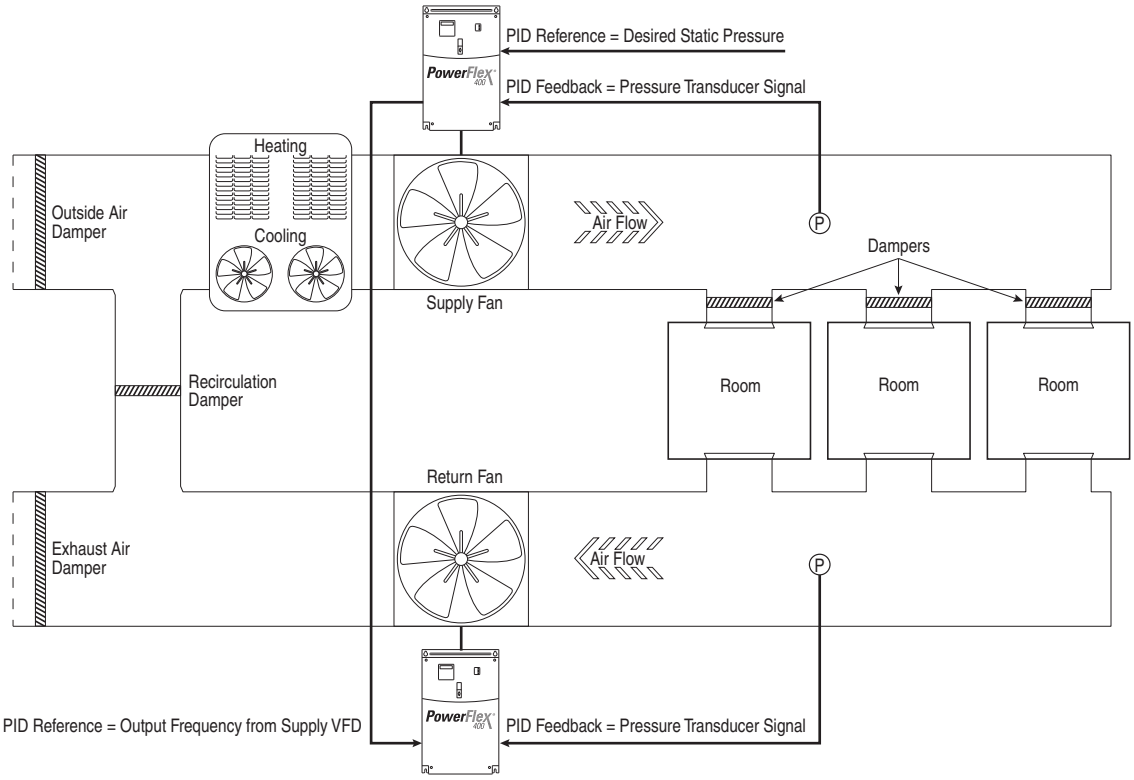
The PowerFlex 400 drive has an input which can be wired to a fire control panel or other fire/life safety systems allowing control of the drive to be overridden. A purge input will start the drive at a programmable purge speed regardless of the selected start source. Purge can occur and is operational at any time whether the drive is running or stopped. A purge command will take precedence over a stop command from the comm port/network and over a “SW Enable” command from the terminal block.

Fire/Freeze Status

The PowerFlex 400 drive can be tied into fire alarm systems or interlocked with cooling coils via a “Function Loss” input on the drive. Upon opening of the input, the drive will immediately coast to a stop if running and issue a fault. The drive will only be allowed to restart once the alarm state is cleared and the drive fault is reset.

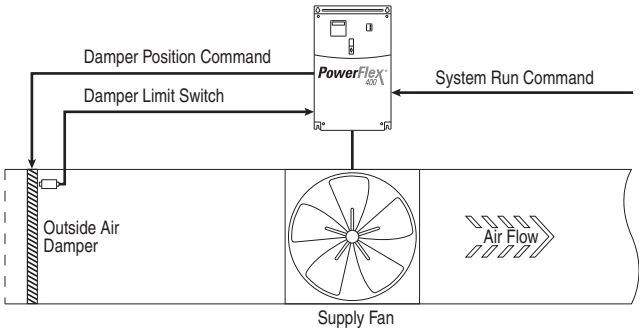
Proportional, Integral, Differential Control Loop

The PowerFlex 400 has a built-in PID (Proportional, Integral, Differential) control loop. The PID loop is used to maintain a process variable, such as pressure or flow, at a desired set point. The PID loop works by subtracting the PID feedback from a reference and generating an error value. The PID loop reacts to the error, based on the PID gains, and outputs a frequency to try to reduce the error value to zero.



Damper Control

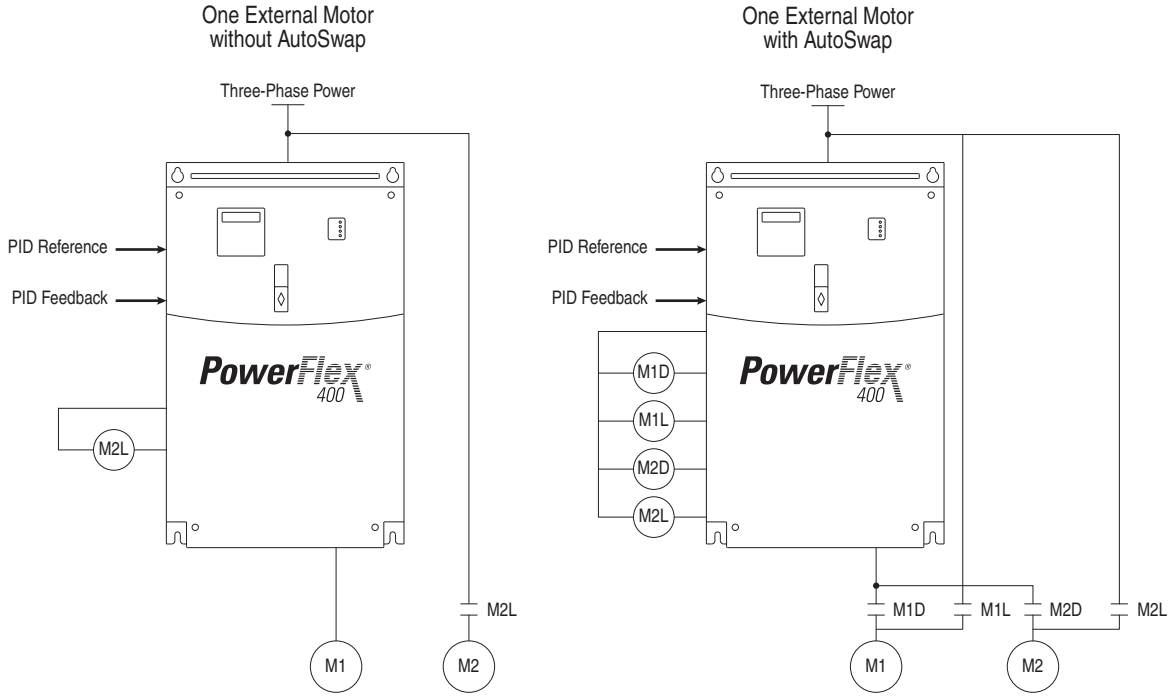
The PowerFlex 400 allows damper control logic to be imbedded within the drive reducing cost associated with external control hardware and software. A system Run command can be wired directly into one of the drive inputs. Relay outputs can be used to energize the damper to either open or close. A damper limit switch can be wired back to the drive providing indication that the damper is in the proper position and that it is safe for the drive to run at commanded speed.



Auxiliary Motor Control

The PowerFlex 400 has a built in Auxiliary Motor Control feature. This feature allows operation of up to three (3) line-started motors in addition to the motor controlled directly by the PowerFlex 400 drive. System output can vary from 0% (auxiliary motors off and drive-controlled motor at zero speed) to 400% (3 auxiliary motors and drive-controlled motor at full speed). When Auxiliary Motor Control is enabled, the internal PID controller in the PowerFlex 400 uses a reference and feedback signal to adjust the speed of the drive controlled motor such that the feedback signal follows the reference signal. When demand exceeds the first motors capacity, the PowerFlex 400 Auxiliary Motor Control automatically starts an auxiliary motor. The speed of the drive controlled motor is reduced to account for the auxiliary motors additional output to the system. If demand continues to increase, the PowerFlex Auxiliary Motor Control starts additional motors using the same process. When demand decreases, an auxiliary motor is stopped and the PowerFlex Auxiliary Motor Control increases the speed of the drive controlled motor to account for lost system output. A Motor Interlock input identifies motors that are out of service and causes them to skipped over to the next available motor.

An AutoSwap function also can be used which allows equal wear to be placed on each motor by periodically swapping the drive controlled and auxiliary motors. Each motor in the system will over time be connected to the PowerFlex 400 drive and also directly to the AC line. During an AutoSwap, the motor directly connected to the PowerFlex 400 drive is stopped and the contactor is opened. The contactor of the next motor that will be controlled by the PowerFlex 400 drive is opened if running across the AC line. A contactor is closed connecting this motor directly to the PowerFlex 400 drive and is started. An additional motor is line started if required.



Catalog Number Explanation

Position Number

1-3	4	5	6-8	9	10	11	12
22C	–	D	038	A	1	0	3
a		b	c	d	e	f	g

a

Drive	
Code	Type
22C	PowerFlex 400

b

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

c1

Rating			
200…240V Input			
Code	Amps	kW (Hp)	Frame
012	12	2.2 (3.0)	C
017	17.5	3.7 (5.0)	C
024	24	5.5 (7.5)	C
033	33	7.5 (10)	C
049	49	11 (15)	D
065	65	15 (20)	D
075	75	18.5 (25)	D
090	90	22 (30)	D
120	120	30 (40)	E
145	145	37 (50)	E

c2

Rating			
380…480V Input			
Code	Amps	kW (Hp)	Frame
6P0	6.0	2.2 (3.0)	C
010	10.5	4.0 (5.0)	C
012	12	5.5 (7.5)	C
017	17	7.5 (10)	C
022	22	11 (15)	C
030	30	15 (20)	C
038	38	18.5 (25)	D
045	45.5	22 (30)	D
060	60	30 (40)	D
072	72	37 (50)	E
088	88	45 (60)	E
105	105	55 (75)	E
142	142	75 (100)	E
170	170	90 (125)	F
208	208	110 (150)	F
260	260	132 (200)	G
310	310	160 (250)	G
370	370	200 (300)	H
460	460	250 (350)	H

d

Enclosure	
Code	Enclosure
N	Panel Mount - IP20, NEMA/UL Type Open ∗
A	Panel Mount - IP30, NEMA/UL Type 1 ❄
F	Flange Mount - IP20, NEMA/UL Type Open ‡

∗ Frame C drives only available with IP20, NEMA/UL Type Open enclosure. Field installed conversion kit available to achieve IP30, NEMA/UL Type 1 rating.

❄ Frame D, E and F drives only available with IP30, NEMA/UL Type 1 enclosure.

‡ Frame C drives only.

e

HIM	
Code	Interface Module
1	Fixed Keypad

f

Emission Class	
Code	Rating
0	Not Filtered

g

Version	
Code	Version
3	RS485

PowerFlex 400 Standard Drives

200-240V AC, Three Phase Drives

Drive Ratings					Catalog Number	
kW	HP	Output Current ❷	Frame Size	Rating	Panel Mount	Flange Mount
2.2	3.0	12A	C	IP20, NEMA/UL Open Type ❶	22C-B012N103	22C-B012F103
3.7	5.0	17.5A	C	IP20, NEMA/UL Open Type ❶	22C-B017N103	22C-B017F103
5.5	7.5	24A	C	IP20, NEMA/UL Open Type ❶	22C-B024N103	22C-B024F103
7.5	10	33A	C	IP20, NEMA/UL Open Type ❶	22C-B033N103	22C-B033F103
11	15	49A	D	IP30, NEMA/UL Type 1	22C-B049A103	–
15	20	65A	D	IP30, NEMA/UL Type 1	22C-B065A103	–
18.5	25	75A	D	IP30, NEMA/UL Type 1	22C-B075A103	–
22	30	90A	D	IP30, NEMA/UL Type 1	22C-B090A103	–
30	40	120A	E	IP30, NEMA/UL Type 1	22C-B120A103	–
37	50	145A	E	IP30, NEMA/UL Type 1	22C-B145A103	–

380-480V AC, Three Phase Drives

Drive Ratings					Catalog Number	
kW	HP	Output Current ❷	Frame Size	Rating	Panel Mount	Flange Mount
2.2	3.0	6.0A	C	IP20, NEMA/UL Open Type ❶	22C-D6P0N103	22C-D6P0F103
4.0	5.0	10.5A	C	IP20, NEMA/UL Open Type ❶	22C-D010N103	22C-D010F103
5.5	7.5	12A	C	IP20, NEMA/UL Open Type ❶	22C-D012N103	22C-D012F103
7.5	10	17A	C	IP20, NEMA/UL Open Type ❶	22C-D017N103	22C-D017F103
11	15	22A	C	IP20, NEMA/UL Open Type ❶	22C-D022N103	22C-D022F103 ❸
15	20	30A	C	IP20, NEMA/UL Open Type ❶	22C-D030N103	22C-D030F103 ❸
18.5	25	38A	D	IP30, NEMA/UL Type 1	22C-D038A103	–
22	30	45.5A	D	IP30, NEMA/UL Type 1	22C-D045A103	–
30	40	60A	D	IP30, NEMA/UL Type 1	22C-D060A103	–
37	50	72A	E	IP30, NEMA/UL Type 1	22C-D072A103	–
45	60	88A	E	IP30, NEMA/UL Type 1	22C-D088A103	–
55	75	105A	E	IP30, NEMA/UL Type 1	22C-D105A103	–
75	100	142A	E	IP30, NEMA/UL Type 1	22C-D142A103	–
90	125	170A	F	IP30, NEMA/UL Type 1	22C-D170A103	–
110	150	208A	F	IP30, NEMA/UL Type 1	22C-D208A103	–
132	200	260A	G	IP30, NEMA/UL Type 1	22C-D260A103	–
160	250	310A	G	IP30, NEMA/UL Type 1	22C-D310A103	–
200	300	370A	H	IP30, NEMA/UL Type 1	22C-D370A103	–
250	350	460A	H	IP30, NEMA/UL Type 1	22C-D460A103	–

❶ IP30, NEMA/UL Type 1 can be achieved for panel mount drives with top cover and optional conduit box kit installed. Field installed conversion kit specified under User Installed Options.

❷ Drive terminals are sized according to UL. Depending on operating ambient and wire used, some local or national codes may require a larger wire size than what the power terminals can accept. Multiple conductors, 90°C wire, and/or lugs may be required. Refer to the PowerFlex 400 User Manual for details on terminal block wire ranges.

❸ 11 and 15 kW (15 and 20 HP) Frame C flange mount drives require external DC series bus inductor.

User Installed Options

IP30, NEMA/UL Type 1 Conversion Kit

Description	Drive Frame	Catalog Number
IP30, NEMA/UL Type 1 Kit *Description:* Field installed kit. Converts drive to IP30, NEMA/UL Type 1 enclosure. Includes conduit box with mounting screws and plastic top panel.	C	22-JBAC
IP30, NEMA/UL Type 1 Kit with Communication Option *Description:* Field installed kit. Converts drive to IP30, NEMA/UL Type 1 enclosure. Includes communication option conduit box with mounting screws and plastic top panel.	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/UL Type 4X/12) indoor use only, Includes 2.0 meter cable. *Note:* Remote HIM display and keypad are different than PowerFlex 400 integral keypad. See the PowerFlex 400 *User Manual* for details.	22-HIM-C2S
Remote Human Interface Module (HIM) – Handheld *Description:* LCD Display, Remote Handheld, Digital Speed Control, Full Numeric Keypad, CopyCat capable, IP30, NEMA/UL Type 1), Includes 1.0 meter cable, Panel Mount with optional Bezel Kit. *Note:* Remote HIM display and keypad are different than PowerFlex 400 integral keypad. See the PowerFlex 400 *User Manual* for details.	22-HIM-A3
Bezel Kit *Description:* Panel Mount for LCD Display, Remote Handheld unit, IP30, NEMA/UL Type 1).	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
DriveTools SP 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.	9303-4DTE01ENE
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. ❶	9306-4EXP01ENE
Connected Components Workbench Software	"Windows" based software package for programming and configuring Allen-Bradley drives and other Rockwell Automation products. Compatibility: Windows XP, Windows Vista, and Windows 7.	http://ab.rockwellautomation.com/programmable-controllers/connected-components-workbench-software

❶ See www.ab.com/drive/ for support devices.

Spare Parts

Description	Catalog Number
PowerFlex 400 Fan Replacement Kit *Description:* (1) Fan, 3-10 HP @ 200-240V AC and 3-10 HP @ 380-480V AC	SK-U1-FAN1-C1
PowerFlex 400 Fan Replacement Kit *Description:* (1) Fan, 15-20 HP @ 380-480V AC	SK-U1-FAN1-C2

Other Options

Description	Catalog Number
Auxiliary Relay Board *Description:* Field installed kit. Expands drive output capabilities.	AK-U9-RLB1

Communication Option Kits

Description	Catalog No.
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:* RJ45 120 Ohm resistors (2 pieces)	AK-U0-RJ45-TR1
Terminal Block *Description:* RJ45 two position terminal block (5 pieces)	AK-U0-RJ45-TB2P
BACnet® MS/TP RS-485 Communication Adapter *Note:* Requires a Communication Adapter Cover when used with Frame C PowerFlex 400 drives (Ordered Separately).	22-COMM-B
ControlNet™ Communication Adapter *Note:* Requires a Communication Adapter Cover when used with Frame C PowerFlex 400 drives (Ordered Separately).	22-COMM-C
DeviceNet Communication Adapter *Note:* Requires a Communication Adapter Cover when used with Frame C PowerFlex 400 drives (Ordered Separately).	22-COMM-D
EtherNet/IP™ Communication Adapter *Note:* Requires a Communication Adapter Cover when used with Frame C PowerFlex 400 drives (Ordered Separately).	22-COMM-E
LonWorks™ Communication Adapter *Note:* Requires a Communication Adapter Cover when used with Frame C PowerFlex 400 drives (Ordered Separately).	22-COMM-L
PROFIBUS™ DP Communication Adapter *Note:* Requires a Communication Adapter Cover when used with Frame C PowerFlex 400 drives (Ordered Separately).	22-COMM-P
External DSI Communications Kit *Description:* External mounting kit for 22-COMM communication options	22-XCOMM-DC-BASE
External Comms Power Supply *Description:* Optional 100-240V ac Power Supply for External DSI Communications Kit	20-XCOMM-AC-PS1
Communication Adapter Cover *Description:* Houses the Communication Adapter for Frame C drives. *Note:* This cover adds 25 mm (0.98 in.) to the overall depth of the drive and is only required for Frame C PowerFlex 400 drives.	22C-CCC ❶
Serial Flash Firmware Kit *Description:* Use a PC to update drive firmware.	AK-U9-FLSH1

❶ If IP30, MENA/UL Type 1 is required, must also order 22-JBCC (Frame C drives only).

Input and Output Line Reactors (Loose)

208V, 60 Hz, Three-Phase

PowerFlex 400 Ratings			Catalog Number	
kW	HP	Amps	IP00 (NEMA/UL Type Open)	IP11 (NEMA/UL Type 1)
3% Impedance				
2.2	3.0	12	1321-3R12-A	1321-3RA12-A
3.7	5.0	18	1321-3R18-A	1321-3RA18-A
5.5	7.5	25	1321-3R25-A	1321-3RA25-A
7.5	10	35	1321-3R35-A	1321-3RA35-A
11	15	45	1321-3R45-A	1321-3RA45-A
15	20	55	1321-3R55-A	1321-3RA55-A
18.5	25	80	1321-3R80-A	1321-3RA80-A
22	30	80	1321-3R80-A	1321-3RA80-A
30	40	100	1321-3R100-A	1321-3RA100-A
37	50	130	1321-3R130-A	1321-3RA130-A
5% Impedance				
2.2	3.0	12	1321-3R12-B	1321-3RA12-B
3.7	5.0	18	1321-3R18-B	1321-3RA18-B
5.5	7.5	25	1321-3R25-B	1321-3RA25-B
7.5	10	35	1321-3R35-B	1321-3RA35-B
11	15	45	1321-3R45-B	1321-3RA45-B
15	20	55	1321-3R55-B	1321-3RA55-B
18.5	25	80	1321-3R80-B	1321-3RA80-B
22	30	80	1321-3R80-B	1321-3RA80-B
30	40	100	1321-3R100-B	1321-3RA100-B
37	50	130	1321-3R130-B	1321-3RA130-B

240V, 60 Hz, Three-Phase

PowerFlex 400 Ratings			Catalog Number	
kW	HP	Amps	IP00 (NEMA/UL Type Open)	IP11 (NEMA/UL Type 1)
3% Impedance				
2.2	3.0	12	1321-3R12-A	1321-3RA12-A
3.7	5.0	18	1321-3R18-A	1321-3RA18-A
5.5	7.5	25	1321-3R25-A	1321-3RA25-A
7.5	10	35	1321-3R35-A	1321-3RA35-A
11	15	45	1321-3R45-A	1321-3RA45-A
15	20	55	1321-3R55-A	1321-3RA55-A
18.5	25	80	1321-3R80-A	1321-3RA80-A
22	30	80	1321-3R80-A	1321-3RA80-A
30	40	100	1321-3R100-A	1321-3RA100-A
37	50	130	1321-3R130-A	1321-3RA130-A
5% Impedance				
2.2	3.0	12	1321-3R12-B	1321-3RA12-B
3.7	5.0	18	1321-3R18-B	1321-3RA18-B
5.5	7.5	25	1321-3R25-B	1321-3RA25-B
7.5	10	35	1321-3R35-B	1321-3RA35-B
11	15	45	1321-3R45-B	1321-3RA45-B
15	20	55	1321-3R55-B	1321-3RA55-B
18.5	25	80	1321-3R80-B	1321-3RA80-B
22	30	80	1321-3R80-B	1321-3RA80-B
30	40	100	1321-3R100-B	1321-3RA100-B
37	50	130	1321-3R130-B	1321-3RA130-B

Input and Output Line Reactors (Loose)

480V, 60 Hz, Three-Phase

PowerFlex 400 Ratings			Catalog Number	
kW	HP	Amps	IP00 (NEMA/UL Type Open)	IP11 (NEMA/UL Type 1)
3% Impedance				
2.2	3.0	8.0	1321-3R8-C	1321-3RA8-C
4.0	5.0	12	1321-3R12-B	1321-3RA12-B
5.5	7.5	12	1321-3R12-B	1321-3RA12-B
7.5	10	18	1321-3R18-B	1321-3RA18-B
11	15	25	1321-3R25-B	1321-3RA25-B
15	20	35	1321-3R35-B	1321-3RA35-B
18.5	25	35	1321-3R35-B	1321-3RA35-B
22	30	45	1321-3R45-B	1321-3RA45-B
30	40	55	1321-3R55-B	1321-3RA55-B
37	50	80	1321-3R80-B	1321-3RA80-B
45	60	80	1321-3R80-B	1321-3RA80-B
55	75	100	1321-3R100-B	1321-3RA100-B
75	100	130	1321-3R130-B	1321-3RA130-B
90	125	160	1321-3R160-B	1321-3RA160-B
110	150	200	1321-3R200-B	1321-3RA200-B
132	200	250	1321-3RB250-B	1321-3RAB250-B
160	250	320	1321-3RB320-B	1321-3RAB320-B
200	300	400	1321-3RB400-B	1321-3RAB400-B
250	350	500	1321-3R500-B	1321-3RA500-B
5% Impedance				
2.2	3.0	8.0	1321-3R8-D	1321-3RA8-D
4.0	5.0	12	1321-3R12-C	1321-3RA12-B
5.5	7.5	12	1321-3R12-C	1321-3RA12-C
7.5	10	18	1321-3R18-C	1321-3RA18-C
11	15	25	1321-3R25-C	1321-3RA25-C
15	20	35	1321-3R35-C	1321-3RA35-C
18.5	25	35	1321-3R35-C	1321-3RA35-C
22	30	45	1321-3R45-C	1321-3RA45-C
30	40	55	1321-3R55-C	1321-3RA55-C
37	50	80	1321-3R80-C	1321-3RA80-C
45	60	80	1321-3R80-C	1321-3RA80-C
55	75	100	1321-3R100-C	1321-3RA100-C
75	100	130	1321-3R130-C	1321-3RA130-C
90	125	160	1321-3R160-C	1321-3RA160-C
110	150	200	1321-3R200-C	1321-3RA200-C
132	200	250	1321-3RB250-C	1321-3RAB250-C
160	250	320	1321-3RB320-C	1321-3RAB320-C
200	300	400	1321-3RB400-C	1321-3RAB400-C
250	350	500	1321-3R500-C	1321-3RA500-C

DC Series Bus Inductors (Loose)

200-240V, 60 Hz, Three-Phase

PowerFlex 400 Ratings				Catalog Number
kW	HP	Amps	Inductance (mH)	IP00 (NEMA/UL Type Open)
2.2	3.0	12	0.92	1321-DC12-1
3.7	5.0	17.5	0.63	1321-DC18-1
5.5	7.5	24	0.85	1321-DC32-1
7.5	10	33	0.75	1321-DC40-1

380-480V, 60 Hz, Three-Phase

PowerFlex 400 Ratings				Catalog Number
kW	HP	Amps	Inductance (mH)	IP00 (NEMA/UL Type Open)
2.2	3.0	6.0	3.68	1321-DC9-2
4.0	5.0	10.5	2.1	1321-DC12-2
5.5	7.5	12	3.75	1321-DC18-4
7.5	10	17	1.75	1321-DC25-4
11	15	22	2.68	1321-DC32-2
15	20	30	2.00	1321-DC40-4

EMC Filters (Loose)

200-240V, 50/60 Hz, Three-Phase

PowerFlex 400 Ratings			Catalog Number
kW	HP	Amps	
2.2	3.0	12	22-RF034-CS
3.7	5.0	17.5	22-RF034-CS
5.5	7.5	24	22-RF034-CS
7.5	10	33	22-RF034-CS
11	15	49	22-RFD070
15	20	65	22-RFD100
18.5	25	75	22-RFD100
22	30	90	22-RFD150
30	40	120	22-RFD150
37	50	145	22-RFD180

380-480V, 50/60 Hz, Three-Phase

PowerFlex 400 Ratings			Catalog Number
kW	HP	Amps	
2.2	3.0	6.0	22-RF018-CS
4.0	5.0	10.5	22-RF018-CS
5.5	7.5	12	22-RF018-CS
7.5	10	17	22-RF018-CS
11	15	22	22-RF026-CS
15	20	30	22-RFD036
18.5	25	38	22-RFD050
22	30	45.5	22-RFD050
30	40	60	22-RFD070
37	50	72	22-RFD100
45	60	88	22-RFD100
55	75	105	22-RFD150
75	100	142	22-RFD180
90	125	170	22-RFD208
110	150	208	22-RFD208
132	200	260	22-RFD323
160	250	310	22-RFD480
200	300	370	22-RFD480
250	350	460	22-RFD480

Isolation Transformers (Loose)

208V AC, 3 Phase, 60 Hz Secondary

PowerFlex 400 Ratings			IP32 (NEMA/UL Type 3R) Isolation Transformer	
				Catalog Number
kW	HP	Amps	kVA	208 Volt Primary
2.2	3.0	12	5.0	1321-3TW005-XX
4.0	5.0	17.5	7.5	1321-3TW007-XX
5.5	7.5	24	11	1321-3TW011-XX
7.5	10	33	14	1321-3TW014-XX
11	15	49	20	1321-3TW020-XX
15	20	65	27	1321-3TW027-XX
18.5	25	75	34	1321-3TW034-XX

230V AC, 3 Phase, 60 Hz Secondary

PowerFlex 400 Ratings			IP32 (NEMA/UL Type 3R) Isolation Transformer			
				Catalog Number		
kW	HP	Amps	kVA	230 Volt Primary	460 Volt Primary	575 Volt Primary
2.2	3.0	12	5.0	1321-3TW005-AA	1321-3TW005-BA	1321-3TW005-CA
3.7	5.0	17.5	7.5	1321-3TW007-AA	1321-3TW007-BA	1321-3TW007-CA
5.5	7.5	24	11	1321-3TW011-AA	1321-3TW011-BA	1321-3TW011-CA
7.5	10	33	14	1321-3TW014-AA	1321-3TW014-BA	1321-3TW014-CA
11	15	49	20	1321-3TW020-AA	1321-3TW020-BA	1321-3TW020-CA
15	20	65	27	1321-3TW027-AA	1321-3TW027-BA	1321-3TW027-CA
18.5	25	75	34	1321-3TW034-AA	1321-3TW034-BA	1321-3TW034-CA
22	30	90	40	1321-3TW040-AA	1321-3TW040-BA	1321-3TW040-CA
30	40	120	51	1321-3TW051-AA	1321-3TW051-BA	1321-3TW051-CA
37	50	145	63	1321-3TH063-AA	1321-3TH063-BA	–

460V AC, 3 Phase, 60 Hz Secondary

PowerFlex 400 Drive Ratings			IP32 (NEMA/UL Type 3R) Isolation Transformer			
				Catalog Number		
kW	HP	Amps	kVA	230 Volt Primary	460 Volt Primary	575 Volt Primary
2.2	3.0	6.0	5.0	1321-3TW005-AB	1321-3TW005-BB	1321-3TW005-CB
4.0	5.0	8.7	7.5	1321-3TW007-AB	1321-3TW007-BB	1321-3TW007-CB
5.5	7.5	12	11	1321-3TW011-AB	1321-3TW011-BB	1321-3TW011-CB
7.5	10	17	14	1321-3TW014-AB	1321-3TW014-BB	1321-3TW014-CB
11	15	22	20	1321-3TW020-AB	1321-3TW020-BB	1321-3TW020-CB
15	20	30	27	1321-3TW027-AB	1321-3TW027-BB	1321-3TW027-CB
18.5	25	38	34	1321-3TW034-AB	1321-3TW034-BB	1321-3TW034-CB
22	30	45.5	40	1321-3TW040-AB	1321-3TW040-BB	1321-3TW040-CB
30	40	60	51	1321-3TW051-AB	1321-3TW051-BB	1321-3TW051-CB
37	50	72	63	1321-3TH063-AB	1321-3TH063-BB	–
45	60	88	75	1321-3TH075-AB	1321-3TH075-BB	–
55	75	105	93	1321-3TH093-AB	1321-3TH093-BB	–
75	100	142	118	1321-3TH118-AB	1321-3TH118-BB	–
90	125	170	145	1321-3TH145-AB	1321-3TH145-BB	–
110	150	208	175	1321-3TH175-AB	1321-3TH175-BB	–
132	200	260	200	1321-3TH220-AB	1321-3TH220-BB	–
160	250	310	245	1321-3TH275-AB	1321-3TH275-BB	–
200	300	370	305	1321-3TH330-AB	1321-3TH330-BB	–
250	350	460	390	1321-3TH440-AB	1321-3TH440-BB	–

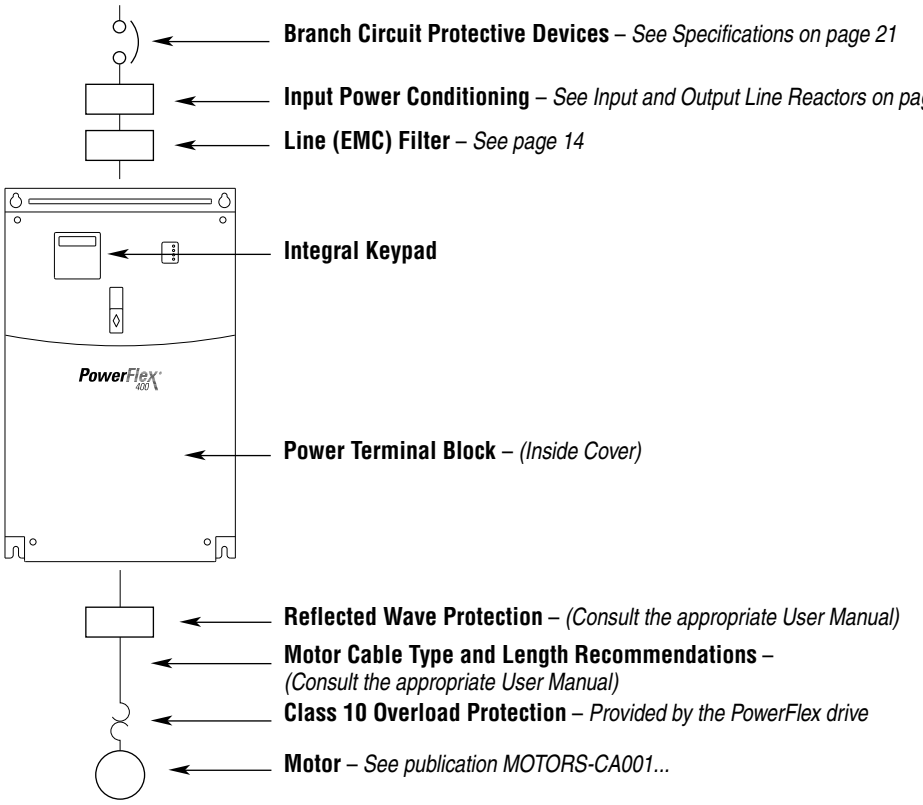
Power Wiring

PowerFlex 400 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 400 *User Manual*, Publication 22C-UM001**…** available online at **www.ab.com/manuals/dr**, 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



Drive Specifications

Drive Ratings											
Catalog Number	Output Ratings			Input Ratings			Branch Circuit Protection				Power Dissipation
	kW (HP)	Amps		Voltage Range	kVA	Amps	Fuses	*140M Motor Protectors* ❶ ❷	Contactors	Min. Enclosure Volume❸ (in.³)	IP20 Open Watts
		45°C	50°C								
200 - 240V AC – 3-Phase Input, 0 - 230V 3-Phase Output											
22C-B012N103	2.2 (3.0)	12	12	180-265	6.5	15.5	20	140M-F8E-C16	100-C23	5098	146
22C-B017N103	3.7 (5.0)	17.5	17.5	180-265	8.8	21	30	140M-F8E-C25	100-C37	5098	207
22C-B024N103	5.5 (7.5)	24	24	180-265	10.9	26.1	35	140M-F8E-C32	100-C37	5098	266
22C-B033N103	7.5 (10)	33	33	180-265	14.4	34.6	45	140M-F8E-C45	100-C45	5098	359
22C-B049A103	11 (15)	49	49	180-265	21.3	51	70	–	100-C60	–	488
22C-B065A103	15 (20)	65	65	180-265	28.3	68	90	–	100-C85	–	650
22C-B075A103	18.5 (25)	75	75	180-265	32.5	78	100	–	100-D95	–	734
22C-B090A103	22 (30)	90	81	180-265	38.3	92	125	–	100-D110	–	778
22C-B120A103	30 (40)	120	120	180-265	51.6	124	175	–	100-D180	–	1055
22C-B145A103	37 (50)	145	130	180-265	62.4	150	200	–	100-D180	–	1200
380 - 480V AC – 3-Phase Input, 0 - 460V 3-Phase Output											
22C-D6P0N103	2.2 (3.0)	6	6	340-528	6.3	7.5	10	140M-D8E-C10	100-C09	5098	105
22C-D010N103	4.0 (5.0)	10.5	10.5	340-528	10.9	13	20	140M-D8E-C16	100-C16	5098	171
22C-D012N103	5.5 (7.5)	12	12	340-528	11.9	14.2	20	140M-D8E-C16	100-C23	5098	200
22C-D017N103	7.5 (10)	17	17	340-528	15.3	18.4	25	140M-D8E-C20	100-C23	5098	267
22C-D022N103	11 (15)	22	22	340-528	19.2	23	30	140M-F8E-C32	100-C30	5098	329
22C-D030N103	15 (20)	30	27	340-528	25.8	31	40	140M-F8E-C32	100-C37	5098	435
22C-D038A103	18.5 (25)	38	38	340-528	33.3	40	50	140M-F8E-C45	100-C60	9086	606
22C-D045A103	22 (30)	45.5	45.5	340-528	39.1	47	60	–	100-C60	–	738
22C-D060A103	30 (40)	60	54	340-528	53.3	64	80	–	100-C85	–	764
22C-D072A103	37 (50)	72	72	340-528	60.7	73	100	–	100-C85	–	1019
22C-D088A103	45 (60)	88	88	340-528	74.9	90	125	–	100-D110	–	1245
22C-D105A103	55 (75)	105	105	340-528	89	107	150	–	100-D140	–	1487
22C-D142A103	75 (100)	142	128	340-528	124.8	150	200	–	100-D180	–	2043
22C-D170A103	90 (125)	170	170	340-528	142	170	250	–	100-D250	–	2617
22C-D208A103	110 (150)	208	208	340-528	167	200	250	–	100-D250	–	3601
22C-D260A103	132 (200)	260	260	340-528	196	235	300	–	100-D300	–	3711
22C-D310A103	160 (250)	310	290	340-528	242	290	400	–	100-D420	–	4208
22C-D370A103	200 (300)	370	370	340-528	304	365	500	–	100-D420	–	4916
22C-D460A103	250 (350)	460	410	340-528	387	465	600	–	100-D630	–	6167

❶ The AIC ratings of the Bulletin 140M Motor Protector Circuit Breakers may vary. See Bulletin 140M Motor Protection Circuit Breakers Application Ratings.

❷ 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.

❸ 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.

Specifications

Category	Specification	
Agency Certification	c UL us	Listed to UL508C and CAN/CSA-22.2 Listed to UL508C for plenums
		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
	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: 405V DC bus voltage (equivalent to 290V AC incoming line) 380-460V AC Input: 810V DC bus voltage (equivalent to 575V AC incoming line)
	Bus Undervoltage Trip:	200-240V AC Input: 210V DC bus voltage (equivalent to 150V AC incoming line) 380-480V AC Input: 390V DC bus voltage (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, NEMA/UL Type Open: IP30, NEMA/UL Type 1:	 –10 to 50 degrees C (14 to 122 degrees F) –10 to 45 degrees C (14 to 113 degrees F)
	Cooling Method:	Fan: All 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
	Seismic Rating	Meets the seismic requirements of the 2003 International Building Code as specified by AC156.
Electrical	Voltage Tolerance:	200-240V ±10% 380-480V ±10%
	Frequency Tolerance:	48-63 Hz
	Input Phases:	Three-phase input provides full rating. Single-phase operation provides 35% rated current.
	Displacement Power Factor:	0.98 across entire speed range
	Efficiency:	97.5% at rated amps, nominal line voltage
	Transistor Type:	Isolated Gate Bipolar (IGBT)
	Internal DC Bus Choke: 200-240V AC Input: 380-480V AC Input:	 11-37 kW (15-50 HP) Panel Mount Drives 18.5-160 kW (25-150 HP) Panel Mount Drives
	Internal AC Line Reactor 380-480V AC Input:	 200-250 kW (300-350 HP) Panel Mount Drives
Control	Method:	Sinusoidal PWM, Volts/Hertz
	Carrier Frequency Frames C and D: Frames E and F:	 2-10 kHz, Drive rating based on 4 kHz 2-8 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:	±1% of base speed across a 60:1 speed range
	Output Frequency:	0-320 Hz (programmable)
	Stop Modes:	Multiple programmable stop modes including - Ramp, Coast, DC-Brake, Ramp-to-Hold and S Curve.
	Accel/Decel:	Two independently programmable accel and decel times. Each time may be programmed from 0 - 600 seconds in 0.1 second increments.
	Drive Overload:	110% Overload capability for up to 1 minute
	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.

Specifications

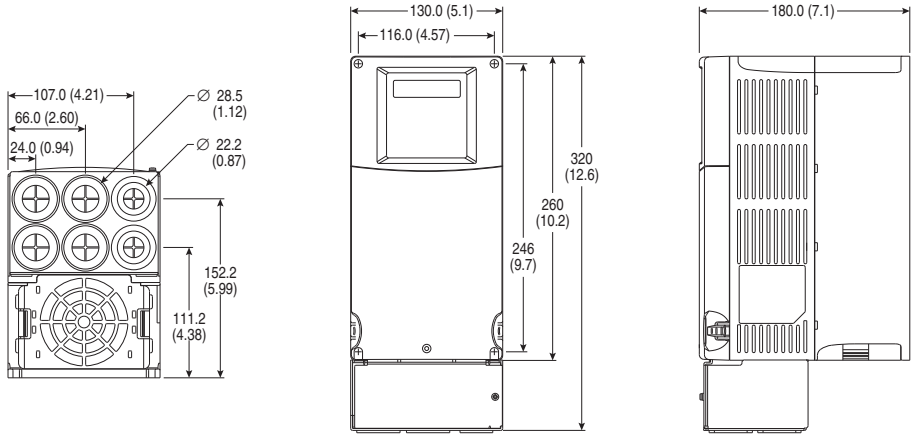
Category	Specification		
Control Inputs	Digital:	Quantity:	(3) Semi-programmable (4) Programmable
		Type Source Mode (SRC): Sink Mode (SNK):	 18-24V = ON, 0-6V = OFF 0-6V = ON, 18-24V = OFF
	Analog:	Quantity:	(1) Isolated, –10 to 10V or 4-20mA (1) Non-isolated, 0 to 10V or 4-20mA
		Specification Resolution: 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
Control Outputs	Relay:	Quantity:	(2) Programmable Form C (6) Optional Programmable Form A (Drive Frames D through H Only)
		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:	(1) Programmable
		Specification:	30V DC, 50mA Non-inductive
	Analog:	Quantity:	(2) 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
Keypad	Display:	Integral 2 line by 16 character LCD with (5) LED Indicators	
	Languages:	English, Français, Español, Italiano, Deutsch, Português, Nederlands	
Communication	Type:	Serial (RS485)	
	Supported Protocols (Standard):	Drive Serial Interface (DSI) Modbus RTU Metasys N2 P1-Floor Level Network (FLN)	
	Supported Protocols (Optional):	BACnet DeviceNet EtherNet/IP PROFIBUS DP ControlNet LonWorks	
	Software (Optional):	Windows Based Pocket PC/Windows Mobile 2003	

Approximate Dimensions

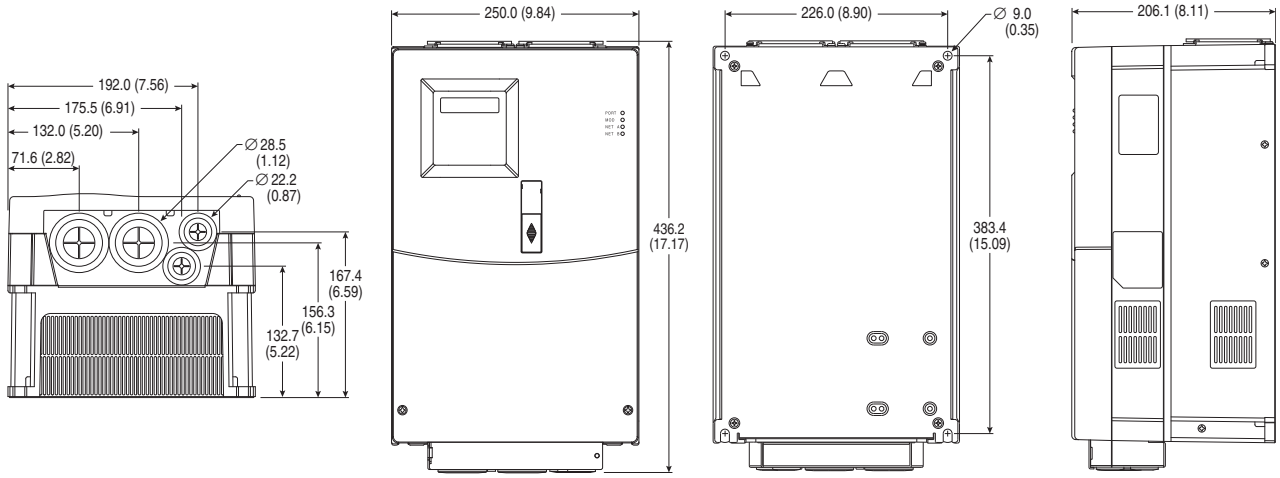
Ratings are in kW and (HP).

Frame	240V AC – 3-Phase		480V AC – 3-Phase	
C	2.2 (3.0)	5.5 (7.5)	2.2 (3.0)	7.5 (10)
	3.7 (5.0)	7.5 (10)	4.0 (5.0)	11 (15)
			5.5 (7.5)	15 (20)
D	11 (15)	18.5 (25)	18.5 (25.0)	30 (40)
	15 (20)	22 (30)	22.0 (30.0)	
E	30 (40)		37.0 (50.0)	55 (75)
	37 (50)		45.0 (60.0)	75 (100)
F	–		90 (125)	110 (150)
G	–		132 (200)	160 (250)
H	–		200 (300)	250 (350)

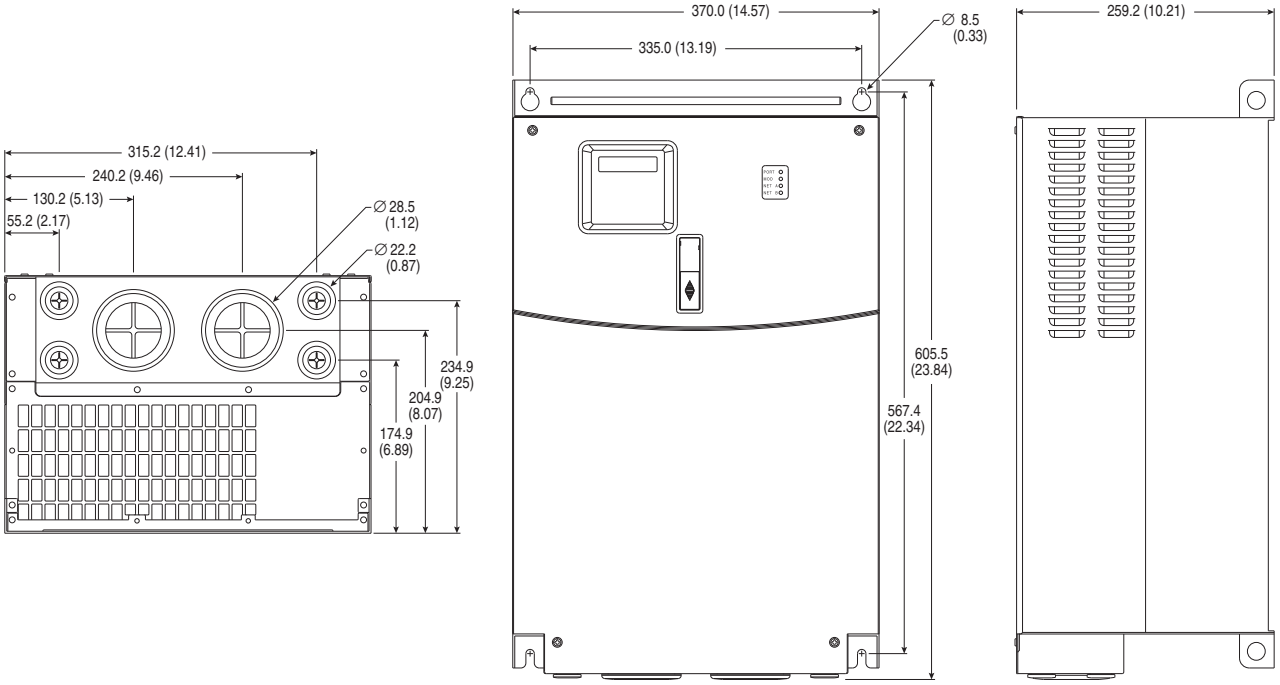
Panel Mount Drive



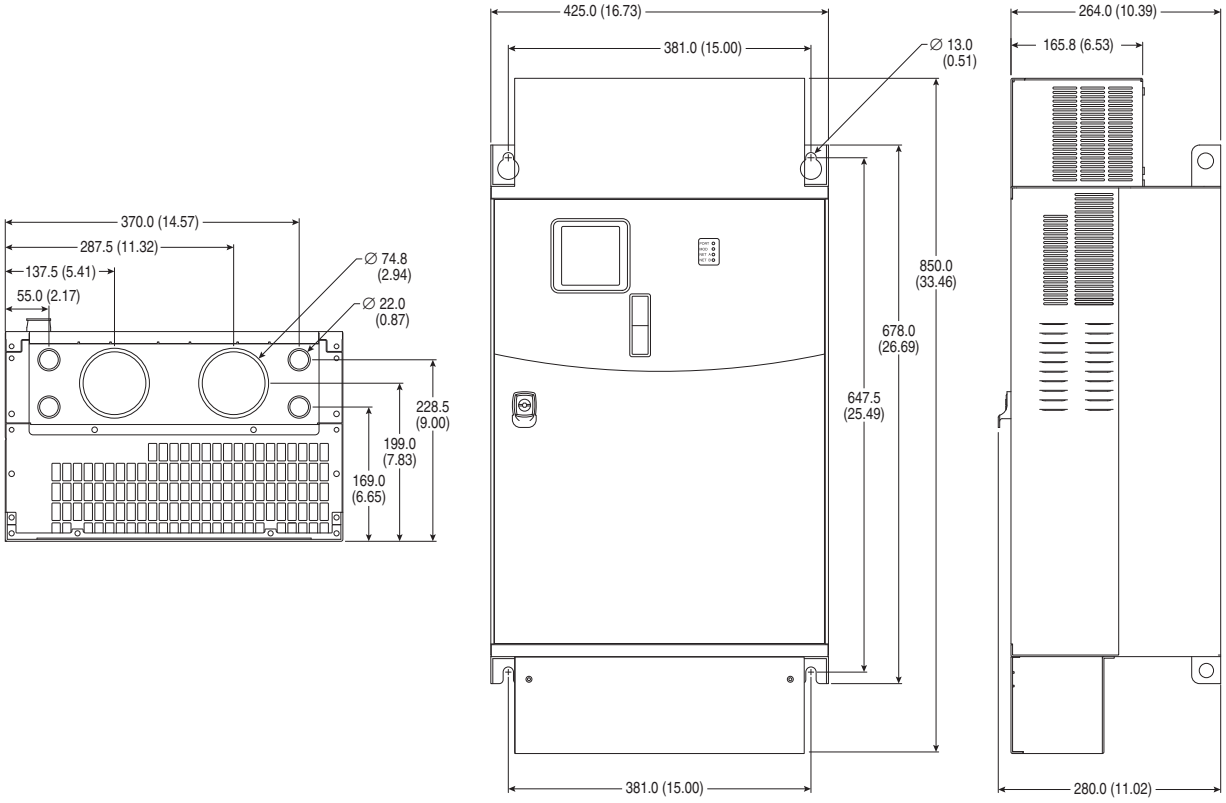
Frame C
(Shown with IP30, NEMA/UL Type 1 conversion kit.)



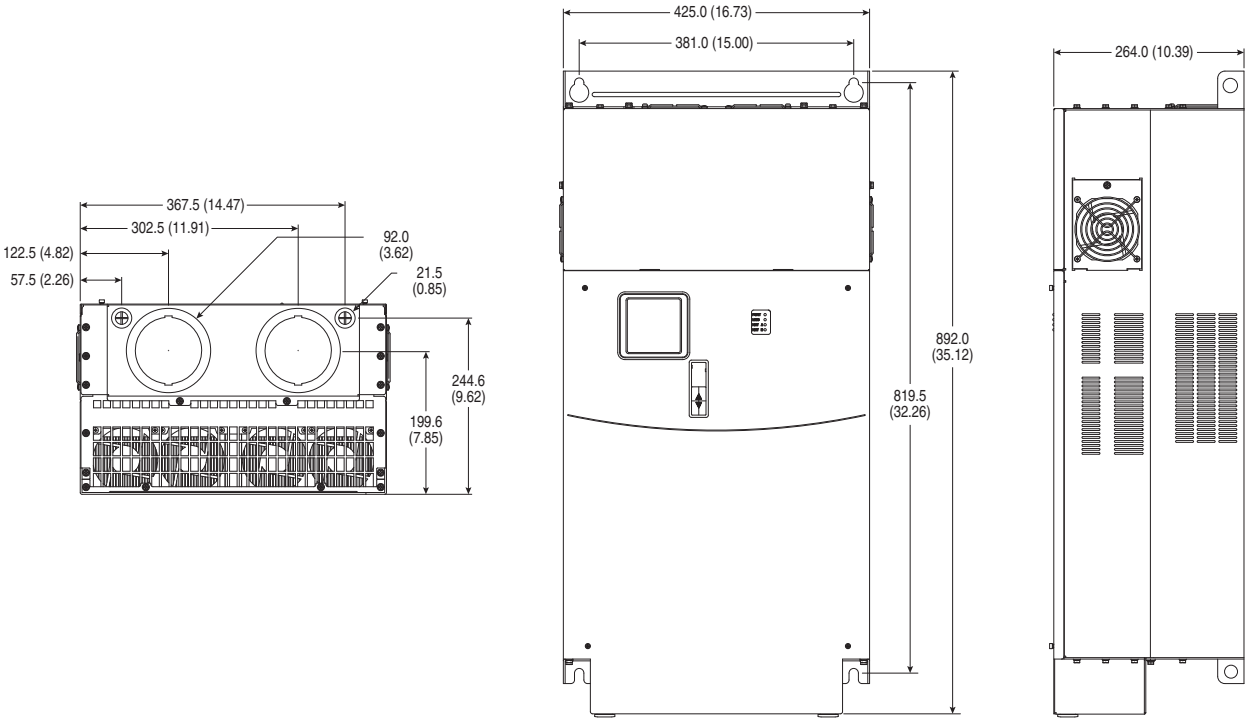
Frame D



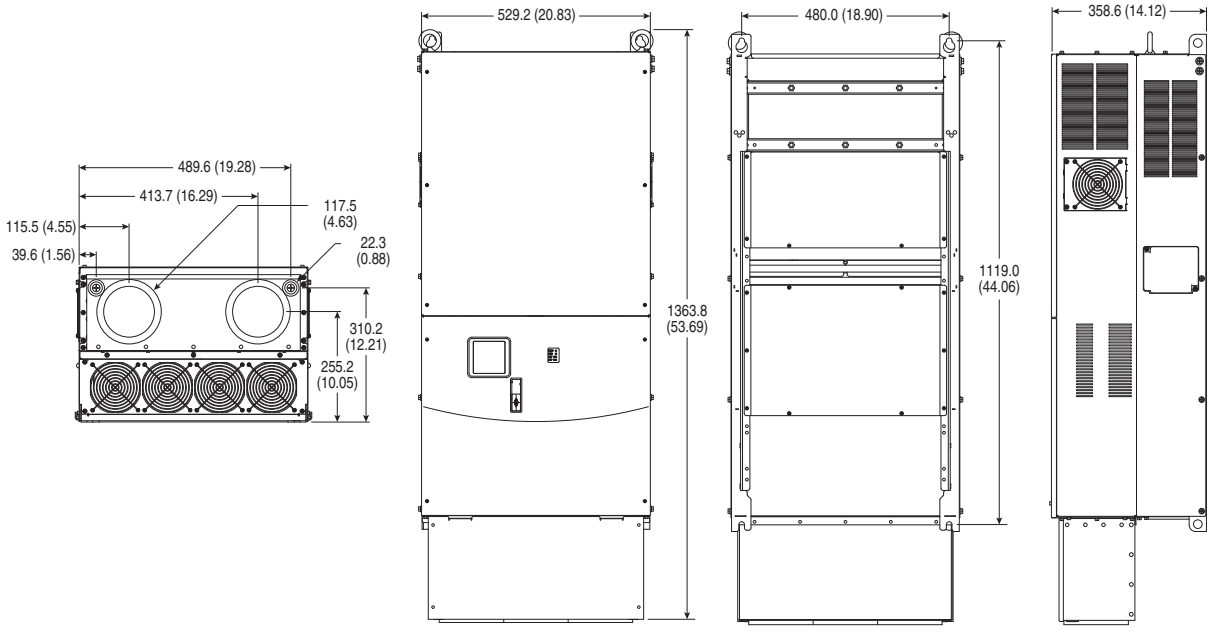
Frame E



Frame F

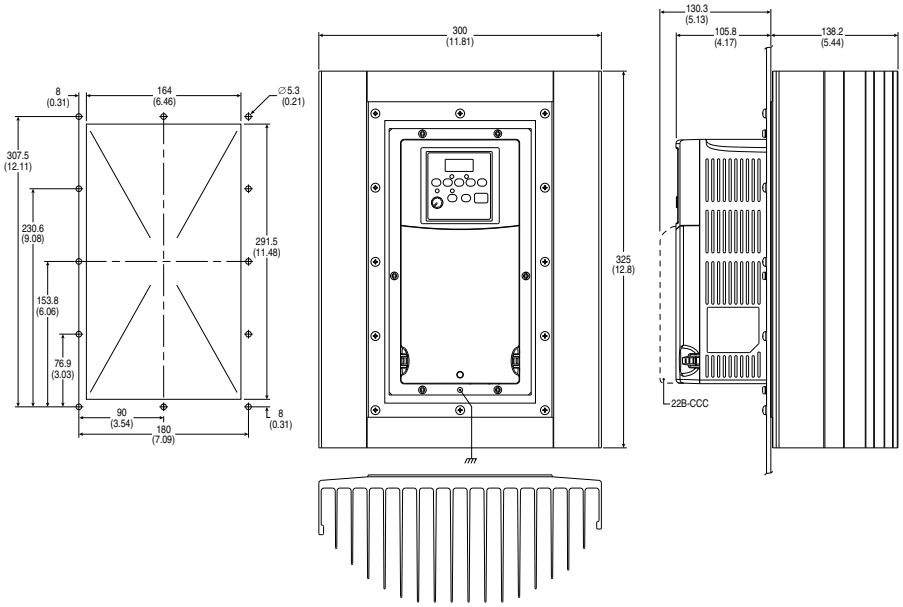


Frame G



Frame H

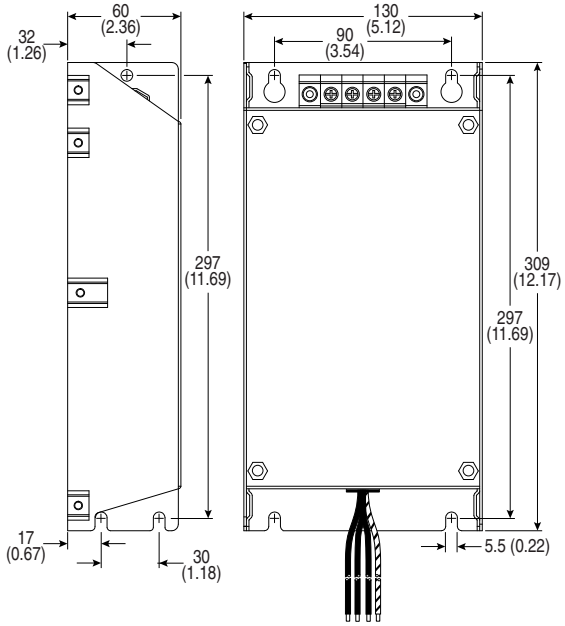
Flange Mount Drive



Frame C — Flange Mount

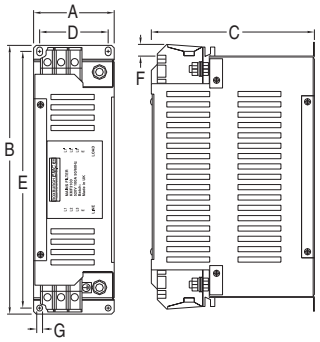
EMC Line Filters

Dimensions are in millimeters and (inches)
Catalog Numbers: 22-RF018-CS, 22-RF026-CS, 22-RF034-CS



Specifications

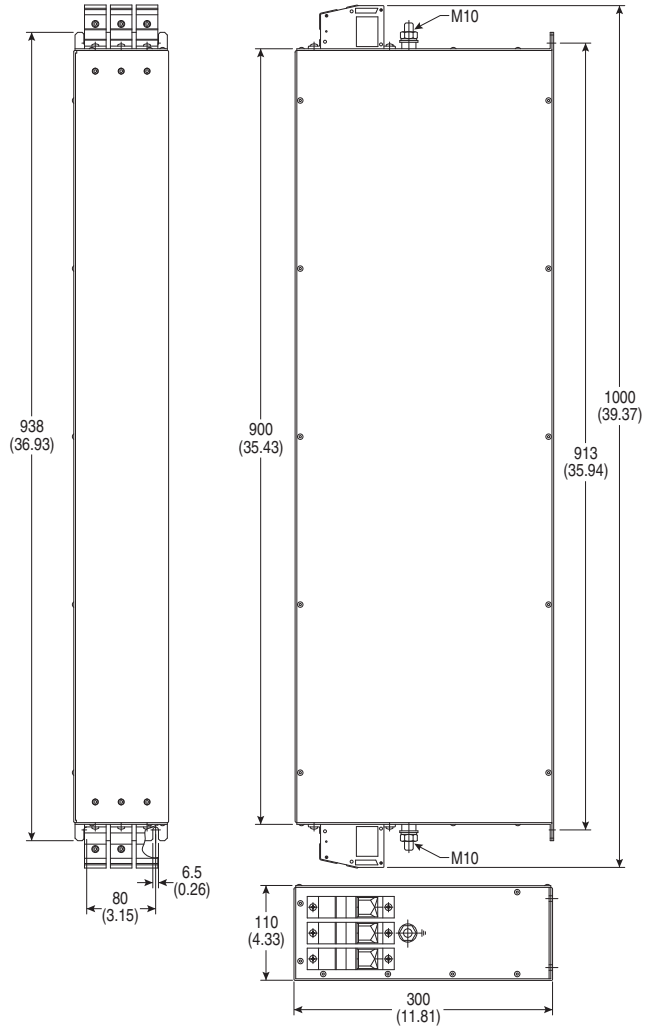
Catalog Numbers: 22-RFD036, 22-RFD050, 22-RFD070, 22-RFD100, 22-RFD150, 22-RFD180



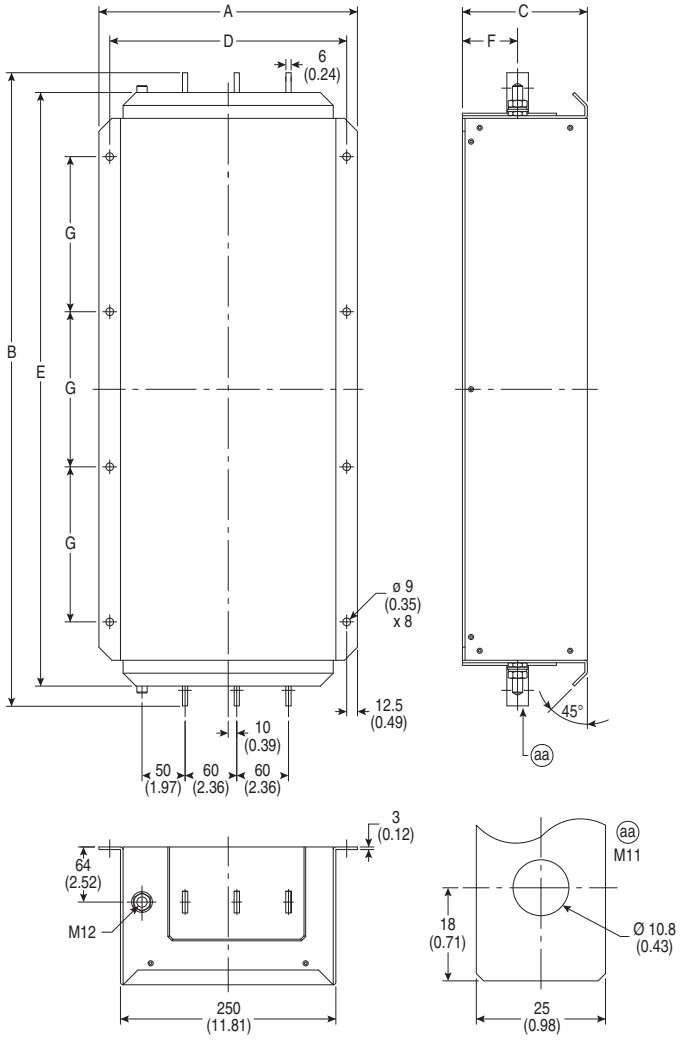
Catalog Number	A	B	C	D	E	F	G
22-RFD036	74 (2.91)	272 (10.71)	161 (6.34)	60 (2.36)	258 (10.16)	7.5 (0.30)	7 (0.28)
22-RFD050	93 (3.66)	312 (12.28)	190 (7.48)	79 (3.11)	298 (11.73)	13.5 (0.53)	7 (0.28)
22-RFD070	93 (3.66)	312 (12.28)	190 (7.48)	79 (3.11)	298 (11.73)	13.5 (0.53)	7 (0.28)
22-RFD100	93 (3.66)	312 (12.28)	190 (7.48)	79 (3.11)	298 (11.73)	13.5 (0.53)	7 (0.28)
22-RFD150	126 (4.96)	312 (12.28)	224 (8.82)	112 (4.41)	298 (11.73)	19.5 (0.77)	7 (0.28)
22-RFD180	126 (4.96)	312 (12.28)	224 (8.82)	112 (4.41)	298 (11.73)	27 (1.06)	7 (0.28)

Specifications

Catalog Number: 22-RFD208



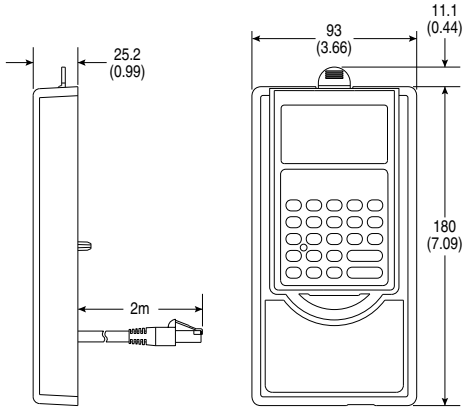
Catalog Numbers: 22-RFD323 and 22-RFD480

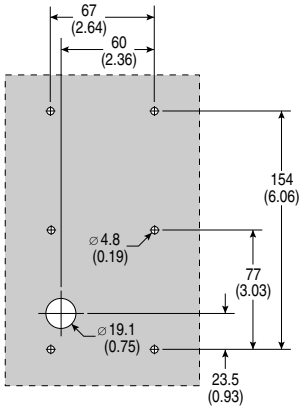


Catalog Number	A	B	C	D	E	F	G
22-RFD323	300 (11.81)	735 (28.94)	145 (5.71)	275 (10.83)	689 (27.13)	64 (2.52)	180 (7.09)
22-RFD480	300 (11.81)	882 (34.72)	145 (5.71)	275 (10.83)	836 (32.91)	64 (2.52)	240 (9.45)

Human Interface Module (HIM) Dimensions

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





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