Allen-Bradley

Technical Data

PowerFlex® 700H High Power Adjustable Frequency AC Drives

Allen-Bradley
RELIANCE ELECTRIC
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PowerFlex 700H Adjustable Frequency AC Drive Technical Data

The PowerFlex 700H AC drive offers a cost-effective, compact package for general purpose, variable speed applications. It is designed to meet the demands for space, flexibility and performance. The many features allow the user to easily configure the drive for most application needs. Ratings currently available include 200 to 450 HP output at 480V AC input.

An LCD Human Interface Module (also used with the PowerFlex® 70, 700 and 700S) provides multilingual text for startup, metering, programming, and troubleshooting.

PowerFlex 700H AC drives are configurable for Volts-per-Hertz or Sensorless Vector control modes to meet a wide variety of application needs. This control is housed in a module which is separately removable from the power structure. The control module is the same for all drive ratings, simplifying installation and maintenance for the entire product line. Optional I/O is available as 24V DC or 115V AC.

Optional internal communication modules are available as user-installed kits. These provide fast and efficient control and/or data exchange with host controllers over popular interfaces. These interfaces include; DeviceNet™, ControlNet™, Ethernet/IP, Profibus, Interbus, Remote I/O, Serial Communications and other open control and communication networks. PC tools such as DriveExplorer™ and DriveTools™ SP assist with programming, monitoring and troubleshooting the PowerFlex 700H.

Table of Contents

Flexible Packaging and Mounting

Flexible Programming, Hardware, and Communication Interfaces.

- Advanced features and parameter set modeled after the PowerFlex® 700 AC drive.
- Standard I/O includes either 24V or 115V digital I/O plus analog I/O.
- NetLinx™ communication options, including DeviceNet™, ControlNet™, and EtherNet/IP networks.

Easy to Use

- Full-featured LCD Human Interface Module (HIM) with multi-line and multi-lingual display simplifies programming.
  - Large and easy to read 7 line x 21 character backlit display
  - Variety of languages (English, French, German, Italian, Spanish, Portuguese, Dutch)
  - Alternate function keys for shortcuts to common tasks
  - "Calculator-like" number pad for fast and easy data entry (Full Numeric version only)
  - Control keys for local start, stop, speed, and direction
  - Remote versions for panel mount application
- S.M.A.R.T. Start and assisted startup routines in the LCD HIM allow for easy configuring and tuning of the drive.
- Pull-apart control terminal blocks allow for easy wiring and quick disconnect of I/O wiring.
- Easy-to-remove control module is common among all PowerFlex 700H power ratings.
- Optimized global voltage settings designed to worldwide standards allow quick set-up anywhere in the world.
- PC-based configuration tools include:
  - DriveExplorer™ and DriveExplorer Lite
    A simple and flexible "On-line" tool for monitoring and configuration while connected to a drive.
  - DriveTools™ SP
    A suite of software tools which provide an intuitive means for programming, troubleshooting and maintaining Allen-Bradley AC & DC drives.

Industry-Standard Packaging

- Modular design and high degree of power structure commonality with equivalent PowerFlex® 700S AC drive ratings for reduced spare parts stocking.
- Standard floor-standing cabinet designs (frame 10 and larger) for compact stand-alone drive applications or multi-drive lineups.

Catalog Number Explanation

Position

1-3	4	5-7	8	9	10	11	12	13	14	15	16
20C	**D**	**261**	**A**	**3**	**A**	**Y**	**N**	**B**	**N**	**N**	**0**
Drive	Voltage Rating	ND Rating	Enclosure	HIM	Documentation	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

Code	Type
20C	PowerFlex 700H

Code	Enclosure
A	IP 21, NEMA Type 1

Code	Type
A	User Manual

Code	w/Resistor
N	No

Code	Version
N	None

Code	Type
0	None

Code	Voltage	Ph.
D	480V AC	3

Code	Operator Interface
0	Blank Cover
3	Full Numeric LCD HIM, Drive Mounted
C	Full Numeric LCD HIM, Door Mount ❶

Code	w/Brake IGBT❷
Y	Yes
N	No

Code	CE Filter	CM Choke
B	Yes	No
N❸	No	No

Code	I/O Volts
A	24V DC
B	115V AC
N	None

480V, 60Hz Input

Code	Amps	HP - ND (HD)
261	261	200 (150)
300	300	250 (200)
385	385	300 (250)
460	460	350 (300)
500	500	450 (350)

400V, 60Hz Input

Code	Amps	kW - ND (HD)
261	261	132 (110)
300	300	160 (132)
385	385	200 (160)
460	460	250 (200)
500	500	250 (200)

❶ Frame 10 & up only.
❷ Brake IGBT available on Frame 9 drives only.
❸ For use on ungrounded distribution systems (Frame 9 drives only).

PowerFlex 700H Drives

380-500V AC, Three-Phase Drives

480V AC Input					380-500V AC Input					IP21, NEMA Type 1	
Output Amps			Normal Duty HP	Heavy Duty HP	Output Amps			Normal Duty kW	Heavy Duty kW	Catalog Number *20C . . .*	Frame Size
Cont.	1 Min.	2 Sec.❷			Cont.	1 Min.	2 Sec.❷				
261 (205)❶	287 (308)	410 (410)	200	150	261 (205)	287 (308)	410 (410)	132	110	D261A0ANNBNN0	9
300 (245)❶	330 (368)	450 (490)	250	200	300 (245)	330 (368)	450 (490)	160	132	D300A0ANNBNN0	9
385 (300)❶	424 (450)	600 (600)	300	250	385 (300)	424 (450)	600 (600)	200	160	D385A0ANNBNN0	10
460 (385)❶	506 (578)	770 (770)	350	300	460 (385)	506 (578)	770 (770)	250	200	D460A0ANNBNN0	10
500 (420)❶	550 (630)	750 (840)	450	350	500 (420)	550 (630)	750 (840)	250	200	D500A0ANNBNN0	10

❶ These drives have dual current ratings; one for normal duty applications, and one for heavy duty applications (in parenthesis). The drive may be operated at either rating.
❷ The 2 sec. output current is only available at initial start or drive operating at light load.

Option Selection

Position 9 — Human Interface Modules (HIM)

Position 9 of the catalog string specifies the Human Interface Module (HIM). Four LCD styles are available as well as a blank plate. These HIMs can be factory or user installed.

20C	D	261	A	0	A	Y	N	B	N	N	O
Drive	Voltage Rating	ND Rating	Enclosure	HIM	Documentation	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

Default Value "0" — HIM Not Used (Blank Cover Included)

Choose User Installed Kit — Leave Default Value "0"

User Installed Kit ❶

Description	Handheld/Local (Drive Mount) Catalog Number
Blank Plate	20-HIM-A0
LCD Display, Digital Speed	20-HIM-A2
LCD Display, Full Numeric Keypad	20-HIM-A3
LCD Display, Analog Speed Potentiometer	20-HIM-A4
LCD Display, Programmer Only	20-HIM-A5

❶ Separately-Mounted HIMs can be found on page 8, Accessories.
❷ For indoor use only.
❸ Includes a 1202-C30 cable (30 meters).

Choose Catalog Code— Factory Installed Option

Factory Installed Options

Catalog Code: 0
No HIM (Blank Cover)

Catalog Code: 3
LCD Full Numeric

Catalog Code: C
Door Mounted LCD Full Numeric
Frame 10 Only

Position 10 — Documentation

Position 10 specifies documentation. Documentation set includes Programming & Installation Manuals.

20C	D	261	A	0	A	Y	N	B	N	N	O
Drive	Voltage Rating	ND Rating	Enclosure	HIM	Documentation	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

Default Value "A" — English Manual

Choose Catalog Code — Factory Installed Option

Description	Catalog Code
English Documentation Set	A

Option Selection *(continued)*

Position 11 — Internal Brake IGBT

Position 11 specifies the Internal Dynamic Brake IGBT.

20C	D	261	A	0	A	N	N	B	N	N	O
Drive	Voltage Rating	ND Rating	Enclosure	HIM	Documentation	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

Default Value "N" — Dynamic Braking Not Used

No User Kit Available — Leave Default Value "N"

Frame 9 Only

Choose Catalog Code — Factory Installed Option

Factory Installed Option

Drive Input Voltage	Brake IGBT	Frame	Catalog Code
380-500V AC	Optional	9	Y

Position 12 — Dynamic Brake Resistors

Position 12 specifies the Internal Dynamic Brake resistor which is not available at this time.

20C	D	261	A	0	A	N	N	B	N	N	O
Drive	Voltage Rating	ND Rating	Enclosure	HIM	Documentation	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

Default Value "N" — No Dynamic Brake Resistor Included

Position 13 — EMC Filter

Position 13 identifies the presence of the internal EMC filter (meets second environment CE standards).

20C	D	261	A	0	A	Y	N	B	N	N	O
Drive	Voltage Rating	ND Rating	Enclosure	HIM	Documentation	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

Frame 9 Only

Default Value "B" — EMC Filter Included

380-500V AC

No User Installed Kit Available — Leave Default Value "B"

Catalog Code Option – Factory Installed Option

Factory Installed Option

Drive Input Voltage	CE Filter	Frame	Common Mode Core	Catalog Code
380-500V AC	Yes	9-10	No	B
380-500V AC	No	9	No	N❶

❶ **Important:** For use on ungrounded distribution systems (Frame 9 drives only).

Option Selection *(continued)*

Position 14 — Communication Adapter

Position 14 selects a communications adapter for the drive. Adapters are available for most industrial networks and can be supplied factory installed or as field kits.

20C	D	261	A	0	A	Y	N	B	N	N	O
Drive	Voltage Rating	ND Rating	Enclosure	HIM	Documentation	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

Default Value "N" — Communication Adapters Not Used

Choose User Installed Kit — Leave Default Value "N"

User Installed Kit

Description	Catalog Number
ControlNet Communication Adapter	20-COMM-C
DeviceNet Communication Adapter	20-COMM-D
Ethernet/IP Communication Adapter	20-COMM-E
HVAC Communication Adapter	20-COMM-H
Interbus Communication Adapter	20-COMM-I
LonWorks Communication Adapter	20-COMM-L
Profibus Communication Adapter	20-COMM-P
Remote I/O Communication Adapter	20-COMM-R
RS-485 DF1 Communication Adapter	20-COMM-S
Serial Null Modem Adapter	1203-SNM
Smart Self-powered Serial Converter (RS-232) - includes 1203-SFC and 1202-C10 Cables	1203-SSS

No Factory Installed Options Available

Position 15 — I/O Option Card

Position 15 specifies I/O voltage.

20C	D	261	A	0	A	Y	N	B	N	N	O
Drive	Voltage Rating	ND Rating	Enclosure	HIM	Documentation	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

Choose User Installed Kit — Leave Default Value "N"

Description	Catalog No.
24V DC Digital Input w/Analog I/O	20C-DA1-A
115V AC Digital Input w/Analog I/O	20C-DA1-B
115V AC Digital Outputs	20C-DO1

Choose Catalog Code — Factory Installed Option

Description	Catalog Code
24V DC Digital Input w/Analog I/O and 115V AC Digital Output	A❶
115V AC Digital Input w/Analog I/O and 115V AC Digital Output	B❶
None	N

❶ Includes the digital/analog I/O card and digital output card.

Option Selection *(continued)*

Position 16 — Input Cards for Feedback Devices

Position 16 specifies the input card for the desired feedback device.

20C	D	261	A	0	A	Y	N	B	N	N	0
Drive	Voltage Rating	ND Rating	Enclosure	HIM	Documentation	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

Default Value "0" — Encoder Feedback Not Available

Accessories

Accessory kits are available to supplement the drive installation or tailor the drive to the particular requirements. These may include installation issues, communications structure or others.

Separately-Mounted Human Interface Module (HIM)

Description	Remote (Panel Mount) IP 66, UL Type 4x12 ❶ Catalog Number
LCD Display, Full Numeric Keypad	20-HIM-C3 ❷
LCD Display, Programmer Only	20-HIM-C5 ❷

❶ For indoor use only.
❷ Includes a PowerFlex HIM Interface Cable (20-HIM-H10).

Human Interface Module Interface Cables

Description	Catalog Number
Bezel Kit for LCD HIMs, NEMA 1 ❶	20-HIM-B1
PowerFlex HIM Interface Cable, 1 m (39 in.) ❷	20-HIM-H10
Cable Kit (Male-Female) ❸	
0.33 Meters (1.1 Feet)	1202-H03
1 Meter (3.3 Feet)	1202-H10
3 Meter (9.8 Feet)	1202-H30
9 Meter (29.5 Feet)	1202-H90
DPI/SCANport™ One to Two Port Splitter Cable	1203-S03

❶ Includes an interface cable (1202-C30) for connection to drive.
❷ Required only when HIM is used as handheld or remote.
❸ Required in addition to 20-HIM-H10 for distances to a total maximum of 10 Meter (32.8 Feet).

Reflected Wave Reduction

Terminator

Description ❶	Used with	Catalog Number (Loose Kit)
IP65 (NEMA Type4x) Connection Cable Included	0.37-1.5 kW (0.5-2 HP) 460V Drives 0.75-597 kW (1-800 HP) 575V Drives	1204-TFA1
	1.5-597 kW (2-800 HP) 460V Drives 0.75-597 kW (1-800 HP) 575 Drives	1204-TFB2

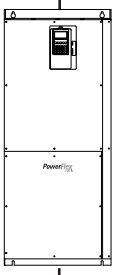
❶ Correct terminator selection is dependent on motor characteristics, cable type and cable length. Refer to publication 1204-1.0 for application details before ordering.

Power Wiring

The PowerFlex 700H has the following built in protective features to help simplify installation:

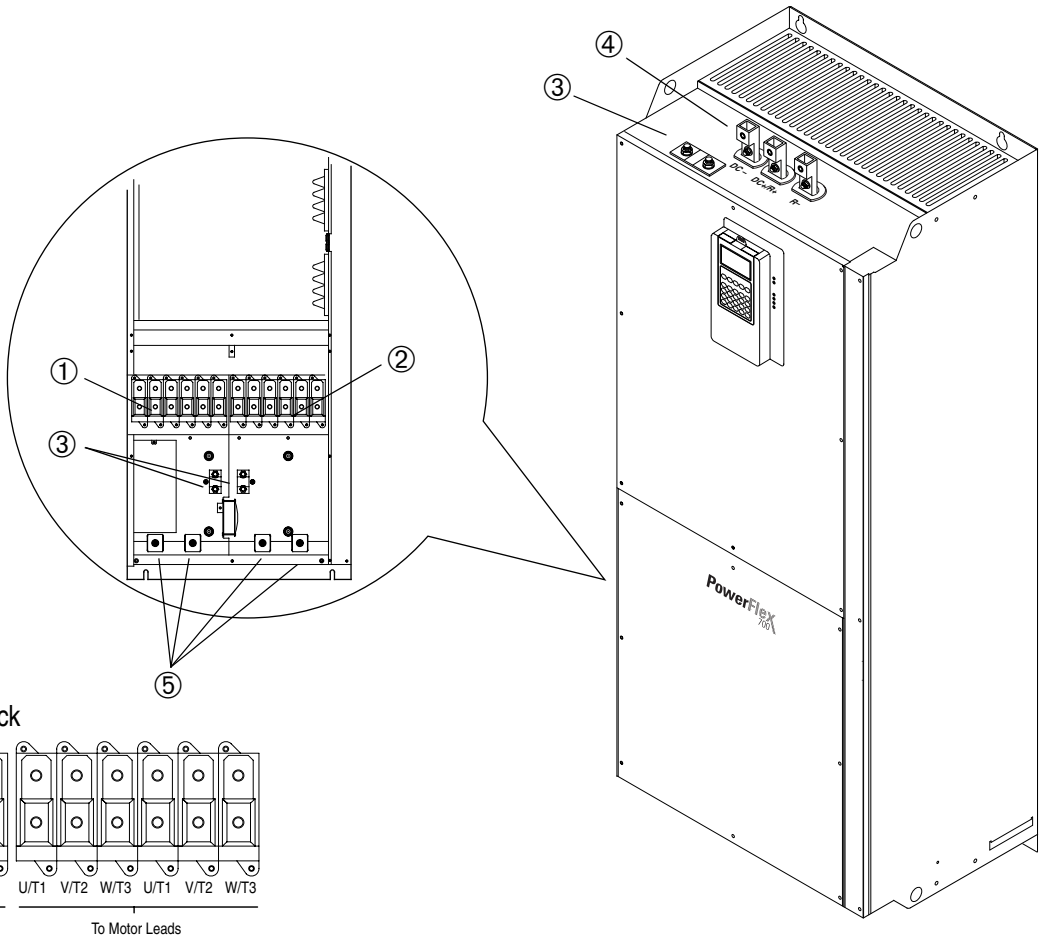
- Ground fault protection during start up and running ensures reliable operation
- Electronic motor overload protection increases motor life
- To ensure compatibility with ungrounded systems, Frame 10 drives incorporate removable MOV to ground and common mode capacitors to ground. Frame 9 drives can be specially ordered to allow compatibility with ungrounded systems.
- 6 kV 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.

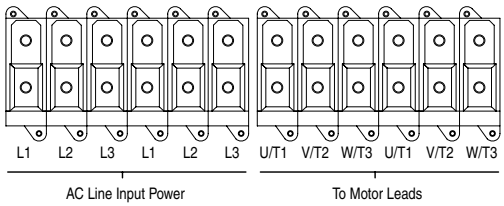
DC Input		AC Input
Input Fuses – page 24		Branch Circuit Protective Devices
Input Cable Length (limited)		Input Power Conditioning
Not Used		EMC Requirements
		LCD Human Interface Module – page 8 Power Terminal Block – page 10
		Reflected Wave Reduction – page 8
Same as AC		Cable Requirements – page 18 Class 10 Motor Overload Motor Recommendations See Publication MOTORS-CA001

Terminals

Terminal Locations – Frame 9



Power Terminal Block



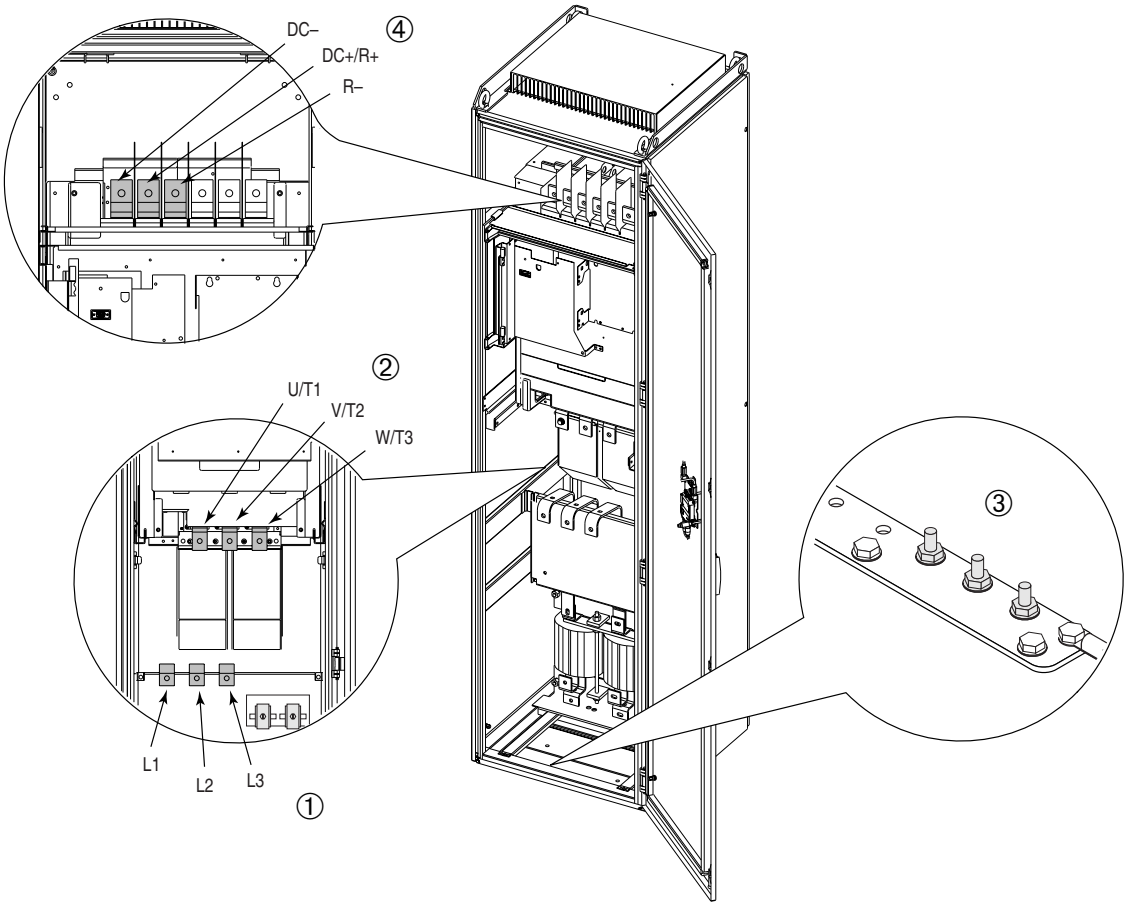
Power Terminal Specifications – Frame 9

No.	Name	Description	Wire Size Range ❶❸ Maximum	Wire Size Range ❶❸ Minimum	Torque Recommended
①	Input Power Terminal Block L1, L2, L3	Input power	185.0 mm2 (350 MCM)	95.0 mm2 (4/0 AWG)	40 N-m (354 lb.-in.)
②	Output Power Terminal Block U/T1, V/T2, W/T3	Motor connections	185.0 mm2 (350 MCM)	95.0 mm2 (4/0 AWG)	40 N-m (354 lb.-in.)
③	SHLD Terminal, PE, Motor Ground	Terminating point for wiring shields	95.0 mm2 (4/0 AWG)	5.0 mm2 (10 AWG)	22 N-m (195 lb.-in.)
④	DC Bus ❷ (2 Terminals; DC–, DC+)	DC input or external brake *(Internal Brake option not ordered)*	185.0 mm2 (350 MCM)	95.0 mm2 (4/0 AWG)	40 N-m (354 lb.-in.)
	DC Bus w/Brake ❷ (3 Terminals; DC–, DC+/R+, R–)	DC input/internal brake *(Internal Brake option is ordered)*	185.0 mm2 (350 MCM)	95.0 mm2 (4/0 AWG)	40 N-m (354 lb.-in.)
⑤	Cable Clamp for Strain Relief				

❶ Do Not exceed maximum wire size. Parallel connections may be required.
❷ DC terminal and brake lugs can be removed.
❸ Maximum/minimum sizes that the terminal block will accept - these are not recommendations.

Terminals *(continued)*

Terminal Locations – Frame 10



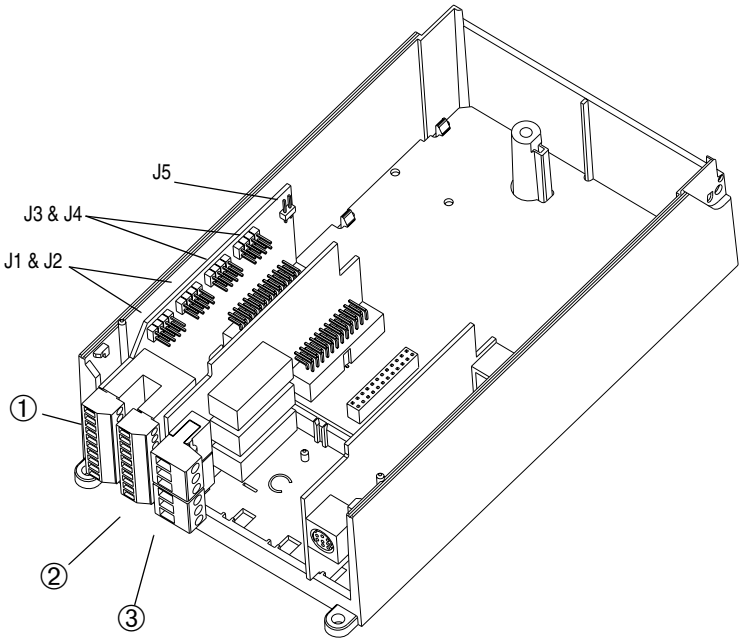
Power Terminal Specifications – Frame 10

No.	Name	Description	Wire Size Range❶❷ Maximum	Wire Size Range❶❷ Minimum	Torque Recommended	Terminal Bolt Size❸❹
①	Input Power Terminal Block❸ L1, L2, L3	Input power	300 mm2 (600 MCM)	2.1 mm2 (14 AWG)	40 N-m (354 lb.-in.)	M12
②	Output Power Terminal Block❸ U/T1, V/T2, W/T3	Motor connections	300 mm2 (600 MCM)	2.1 mm2 (14 AWG)	40 N-m (354 lb.-in.)	M12
③	SHLD Terminal, PE, Motor Ground❸	Terminating point for wiring shields	300 mm2 (600 MCM)	2.1 mm2 (14 AWG)	40 N-m (354 lb.-in.)	M10
④	DC Bus❸ (2 Terminals; DC–, DC+)	DC input or external brake *(Internal Brake option not ordered)*	300 mm2 (600 MCM)	2.1 mm2 (14 AWG)	40 N-m (354 lb.-in.)	M12
	DC Bus w/Brake❸ (3 Terminals; DC–, DC+/R+, R–)	DC input/internal brake *(Internal Brake option is ordered)*	300 mm2 (600 MCM)	2.1 mm2 (14 AWG)	40 N-m (354 lb.-in.)	M12
⑤	Cable Clamp for Strain Relief					

❶ Maximum/minimum sizes that the terminal block will accept - these are not recommendations.
❷ Do Not exceed maximum wire size. Parallel connections may be required.
❸ These connections are bus bar type terminations and require the use of lug type connectors.
❹ Apply counter torque to the nut on the other side of terminations when tightening or loosening the terminal bolt in order to avoid damage to the terminal.

Control Terminals

I/O Terminal Blocks & Jumpers



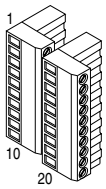
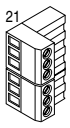
I/O Terminal Block Specifications

No.	Name	Description	Wire Size Range❶		Torque	
			Maximum	Minimum	Maximum	Recommended
①	Analog I/O	Analog I/O Signals	2.5 mm^2 (14 AWG)	0.5 mm^2 (22 AWG)	0.2 N-m 1.8 lb.-in.	0.2 N-m 1.8 lb.-in.
②	Digital Inputs	Digital Input Signals	2.5 mm^2 (14 AWG)	0.5 mm^2 (22 AWG)	0.2 N-m 1.8 lb.-in.	0.2 N-m 1.8 lb.-in.
③	Digital Outputs	Digital Out Relays	2.5 mm^2 (14 AWG)	0.5 mm^2 (22 AWG)	0.5 N-m 4.5 lb.-in.	0.5 N-m 4.5 lb.-in.

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

Control Terminals *(continued)*

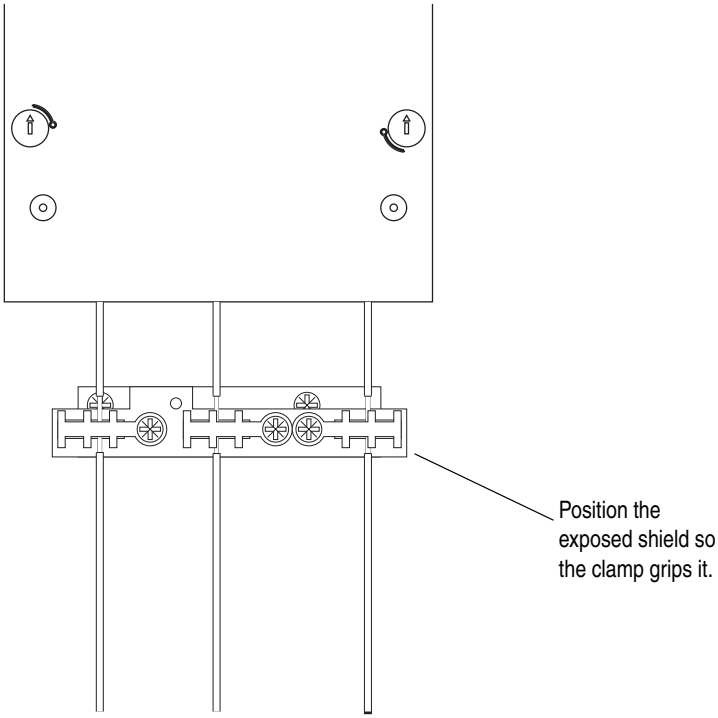
I/O Terminal Designations

	No.	Signal	Factory Default	Description	Related Parameter(s)
	1	Analog In 1 (–) ❶	❹	Isolated❺, bipolar, differential, 9 bit & sign, 88k ohm input impedance. A jumper (page 14) selects: 0-10V, ±10V, 4-20mA. Default: 0-10V (Ri =200k), 4-20mA (Ri=100 ohm).	320 - 327
	2	Analog In 1 (+) ❶			
	3	Analog In 2 (–) ❶			
	4	Analog In 2 (+) ❶			
	5	–10V Pot Reference	–	2k ohm minimum, 10 mA maximum load, 1% accuracy.	
	6	Pot Common (GND)		For (+) and (–) 10V pot references.	
	7	+10V Pot Reference	–	2k ohm minimum, 10mA maximum load, 1% accuracy.	
	8	Analog Out 1 (+)	❹	Bipolar (current out is not bipolar), 9 bit & sign, 2k ohm minimum load. A jumper (see page 14) selects: 0-10V, ±10V, 4-20mA.	340 - 347
	9	Analog Out Common			
	10	Analog Out 2 (+)			
	11	Digital In 1	Stop - CF	115V AC, 50/60 Hz - Opto isolated Low State: less than 30V AC High State: greater than 40V AC 24V DC - Opto isolated (250V) Low State: less than 5V DC High State: greater than 20V DC 11.2 mA DC Enable: Digital Input 6 is jumper selectable for HW Enable. On-Time: < 16.7ms, Off-Time < 1ms	361 - 366
	12	Digital In 2	Start		
	13	Digital In 3	Jog		
	14	Digital In 4	Speed Sel 1		
	15	Digital In 5	Speed Sel 2		
	16	Digital In 6/Hardware Enable, see pg. 15	Speed Sel 3		
	17 18	Digital In Common		Allows source or sink operation. Terminals 17/18 & 19 can also be used to provide backup power to DPI and control devices.	
	19	+24VDC ❶	–	Drive supplied logic input power.	
	20	24V Common❷	–	Common for internal power supply.	
	21	Digital Out 1 – N.C.❶	Fault	Max. Resistive Load: 240V AC/30V DC – 1200VA, 150W Max. Current: 5A, Min. Load: 10mA Max. Inductive Load: 240V AC/30V DC – 840VA, 105W Max. Current: 3.5A, Min. Load: 10mA	380 - 391
	22	Digital Out 1 Common			
	23	Digital Out 1 – N.O.❸	NOT Fault		
	24	Digital Out 2 – N.C.❸	NOT Run		
	25	Digital Out 2/3 Com.			
	26	Digital Out 3 – N.O.❸	Run		

❶ **Important:** Input must be configured with a jumper. Drive damage may occur if jumper is not installed properly. Refer to page 14.
❷ 150mA maximum Load. Not present on 115V versions. Can be used to provide control power from an external 24V source when main power is not applied. Refer to page 15.
❸ Contacts in unpowered state. Any relay programmed as Fault or Alarm will energize (pick up) when power is applied to drive and deenergize (drop out) when a fault or alarm exists. Relays selected for other functions will energize only when that condition exists and will deenergize when condition is removed.
❹ These inputs/outputs are dependant on a number of parameters (see “Related Parameters”).
❺ Differential Isolation - External source must be maintained at less than 160V with respect to PE. Input provides high common mode immunity.

I/O Cable Grounding

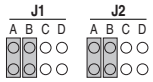
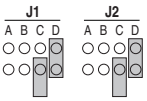
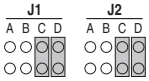
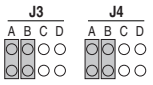
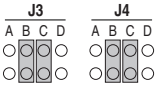
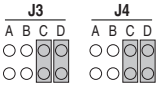
When installing/stripping shielded multi-conductor cable for analog and digital I/O, allow sufficient distance from the terminal plug to permit attachment to the cable clamp for grounding and strain relief.



Analog I/O Configuration

Important: Analog I/O must be configured through programming, as well as the jumpers shown below.

I/O Configuration

Signal	Jumper	Setting		
Analog Inputs	J1 (Analog In 1) J2 (Analog In 2)	0-20 mA	0-10V	±10V
				
Analog Outputs	J3 (Analog Out 1) J4 (Analog Out 2)	0-20 mA	0-10V	±10V
				

Hardware Enable Circuitry

By default, the user can program a digital input as an Enable input. The status of this input is *interpreted by drive software*. If the application requires the drive to be disabled *without* software interpretation, a “dedicated” hardware enable configuration can be utilized. This is done by removing jumper J5 and wiring the enable input to “Digital In 6” (see below). Verify that [Digital In6 Sel], parameter 366 is set to “1, Enable.”

Hardware Enable Configuration

Signal	Jumper	Setting	
Hardware Enable	J5	Hardware Enable	Input Programmable (No Hardware Enable)
		J5 A B	J5 A B

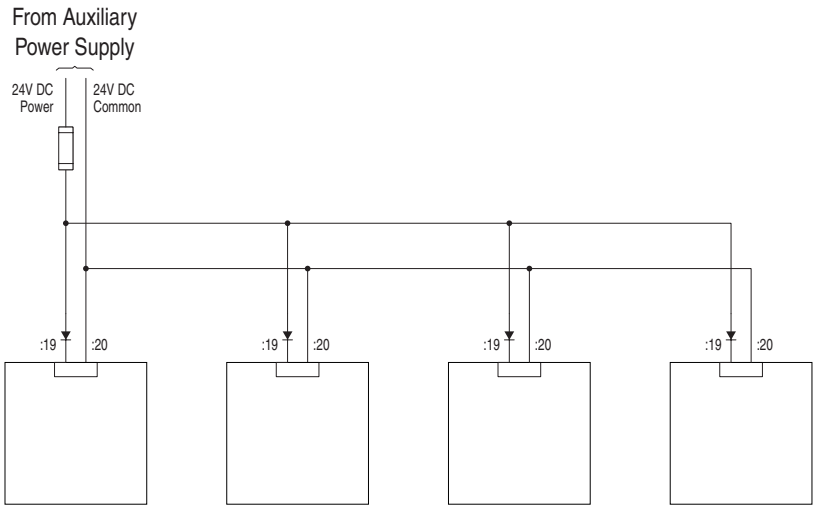
Auxiliary Power Supply

You may use an auxiliary power supply to keep the PowerFlex 700H Control Unit energized, when input power is deenergized. This provides back-up power for the Control Unit and is sufficient for setting parameters. Connect 24V DC power to pin 19 and 24V DC common to pin 20 of the 24V DC version of the I/O card.

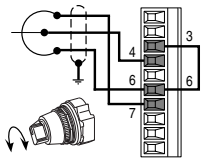
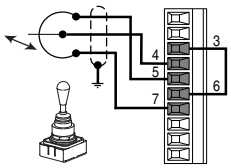
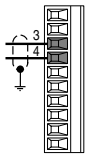
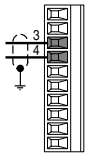
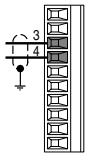
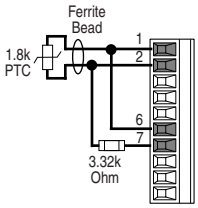
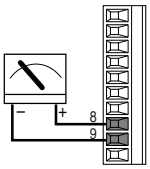
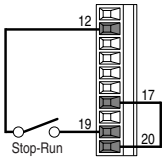
Auxiliary Power Supply Specifications

Voltage	Current (Min)	Current (Max)
24V DC ± 15%	150 mA	250 mA

If 24V terminals of several drives are connected in parallel, we recommend using a diode circuit to block current flow in the opposite direction. Reverse current flow could damage the Control Board.

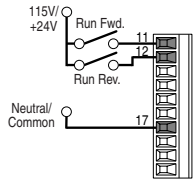
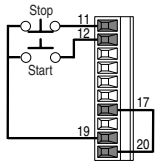
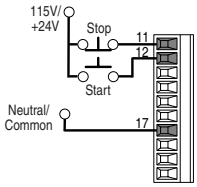
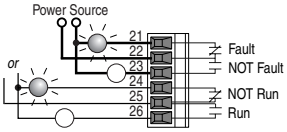
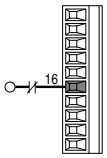


I/O Wiring Examples

Input/Output	Connection Example	Required Parameter Changes
Potentiometer Unipolar Speed Reference❶ 10k Ohm Pot. Recommended (2k Ohm Minimum)		• Adjust Scaling: Parameters 91/92 and 325/326 • View Results: Parameter 002
Joystick Bipolar Speed Reference ❶ ±10V Input		• Set Direction Mode: Parameter 190 = “1, Bipolar” • Adjust Scaling: Parameters 91/92 and 325/326 • View Results: Parameter 002
Analog Input Bipolar Speed Reference ±10V Input		• Set Direction Mode: Parameter 190 = “1, Bipolar” • Adjust Scaling: Parameters 91/92 and 325/326 • View Results: Parameter 002
Analog Voltage Input Unipolar Speed Reference 0 to +10V Input		• Configure Input with parameter 320 • Adjust Scaling: Parameters 91/92 and 325/326 • View results: Parameter 002
Analog Current Input Unipolar Speed Reference 4-20 mA Input		• Configure Input for Current: Parameter 320 and add jumper at appropriate terminals • Adjust Scaling: Parameters 91/92 and 325/326 • View results: Parameter 002
Analog Input, PTC PTC OT set > 5V PTC OT cleared < 4V PTC Short < 0.2V		• Set Drive Alarm 1: Parameter 211, bit 11 = “True” • Set Fault Config 1: Parameter 238, bit 7 = “Enabled” • Set Alarm Config 1: Parameter 259, bit 11 = “Enabled”
Analog Output ±10V, 4-20 mA Bipolar +10V Unipolar *(shown)*		• Configure with Parameter 340 • Select Source Value: Parameter 384, [Digital Out1 Sel] • Adjust Scaling: Parameters 343/344
2-Wire Control Non-Reversing❷ 24V DC internal supply		• Disable Digital Input:#1: Parameter 361 = “0, Unused” • Set Digital Input #2: Parameter 362 = “7, Run” • Set Direction Mode: Parameter 190 = “0, Unipolar”

❶ Refer to the Installation Manual for important bipolar wiring information.
❷ **Important:** Programming inputs for 2 wire control deactivates all HIM Start buttons.

I/O Wiring Examples *(continued)*

Input/Output	Connection Example	Required Parameter Changes
2-Wire Control Reversing❶ External supply (I/O Board dependent)		• Set Digital Input:#1: Parameter 361 = “8, Run Forward” • Set Digital Input #2: Parameter 362 = “9, Run Reverse”
3-Wire Control Internal supply		• No Changes Required
3-Wire Control External supply (I/O Board dependent). Requires 3-wire functions only ([Digital In1 Sel]). Using 2-wire selections will cause a type 2 alarm.		• No Changes Required
Digital Output Relays shown in powered state with drive faulted. 2 relays at terminals 24-26.		• Select Source to Activate: Parameters 380/384
Enable Input		• Configure with parameter 366 For dedicated hardware Enable: Remove Jumper J5 (see page 15)

❶ **Important:** Programming inputs for 2 wire control deactivates all HIM Start buttons.

Cable Recommendations

Important points to remember about I/O wiring:
- Always use copper wire.
- Wire with an insulation rating of 600V or greater is recommended.
- Control and signal wires should be separated from power wires by at least 0.3 meters (1 foot).

Important: I/O terminals labeled "(–)" or "Common" are not referenced to earth ground and are designed to greatly reduce common mode interference. Grounding these terminals can cause signal noise.

Signal and Control Wire Types

Recommended Signal Wire

Signal Type	Wire Type(s)	Description	Minimum Insulation Rating
Analog I/O	Belden 8760/9460 (or equiv.)	0.750 mm^2 (18 AWG), twisted pair, 100% shield with drain. ❶	300V, 75-90 degrees C (167-194 degrees F)
	Belden 8770 (or equiv.)	0.750 mm^2 (18 AWG), 3 cond., shielded for remote pot only.	
EMC Compliance	Refer to Installation Manual for details.		

❶ If the wires are short and contained within a cabinet which has no sensitive circuits, the use of shielded wire may not be necessary, but is always recommended.

Recommended Control Wire for Digital I/O

Type	Wire Type(s)	Description	Minimum Insulation Rating
Unshielded	Per US NEC or applicable national or local code	–	300V, 60 degrees C (140 degrees F)
Shielded	Multi-conductor shielded cable such as Belden 8770 (or equiv.)	0.750 mm^2 (18 AWG), 3 conductor, shielded.	

Cable Types Acceptable for 200-600 Volt Installations

A variety of cable types are acceptable for drive installations. For many installations, unshielded cable is adequate, provided it can be separated from sensitive circuits. As an approximate guide, allow a spacing of 0.3 meters (1 foot) for every 10 meters (32.8 feet) of length. In all cases, long parallel runs must be avoided. Do not use cable with an insulation thickness less than or equal to 15 mils (0.4 mm/0.015 in.). Use Copper wire only. Wire gauge requirements and recommendations are based on 75 degrees C. Do not reduce wire gauge when using higher temperature wire.

Unshielded Cable

THHN, THWN or similar wire is acceptable for drive installation in dry environments provided adequate free air space and/or conduit fill rates limits are provided. **Do not use THHN or similarly coated wire in wet areas**. Any wire chosen must have a minimum insulation thickness of 15 mils (0.4 mm/0.015 in.) and should not have large variations in insulation concentricity.

Shielded Cable

Shielded cable contains all of the general benefits of multi-conductor cable with the added benefit of a copper braided shield that can contain much of the noise generated by a typical AC drive. Strong consideration for shielded cable should be given in installations with sensitive equipment such as weigh scales, capacitive proximity switches and other devices that may be affected by electrical noise in the distribution system. Applications with large numbers of drives in a similar location, imposed EMC regulations or a high degree of communications/ networking are also good candidates for shielded cable.

Cable Recommendations *(continued)*

Shielded cable may also help reduce shaft voltage and induced bearing currents for some applications. In addition, the increased impedance of shielded cable may help extend the distance that the motor can be located from the drive without the addition of motor protective devices such as terminator networks. Refer to *Reflected Wave* in "Wiring and Grounding Guidelines for PWM AC Drives," publication DRIVES-IN001A-EN-P.

Consideration should be given to all of the general specifications dictated by the environment of the installation, including temperature, flexibility, moisture characteristics and chemical resistance. In addition, a braided shield should be included and be specified by the cable manufacturer as having coverage of at least 75%. An additional foil shield can greatly improve noise containment.

A good example of recommended cable is Belden® 295xx (xx determines gauge). This cable has four (4) XLPE insulated conductors with a 100% coverage foil and an 85% coverage copper braided shield (with drain wire) surrounded by a PVC jacket.

Other types of shielded cable are available, but the selection of these types may limit the allowable cable length. Particularly, some of the newer cables twist 4 conductors of THHN wire and wrap them tightly with a foil shield. This construction can greatly increase the cable charging current required and reduce the overall drive performance. Unless specified in the individual distance tables as tested with the drive, these cables are not recommended and their performance against the lead length limits supplied is not known.

Armored Cable

Cable with continuous aluminum armor is often recommended in drive system applications or specific industries. It offers most of the advantages of standard shielded cable and also combines considerable mechanical strength and resistance to moisture. It can be installed in concealed and exposed manners and removes the requirement for conduit (EMT) in the installation. It can also be directly buried or embedded in concrete.

Because noise containment can be affected by incidental grounding of the armor to building steel when the cable is mounted, it is recommended the armored cable have an overall PVC jacket. Refer to "Wire Types," in publication DRIVES-IN001, *Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives*.

Interlocked armor is acceptable for shorter cable runs, but continuous welded armor is preferred.

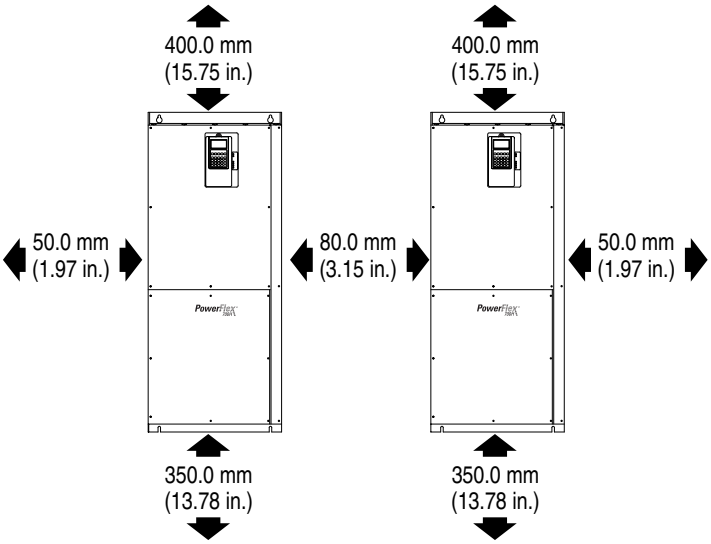
Best performance is achieved with 3 spaced ground conductors, but acceptable performance below 200 HP is provided via a single ground conductor.

Recommended Shielded / Armored Cable

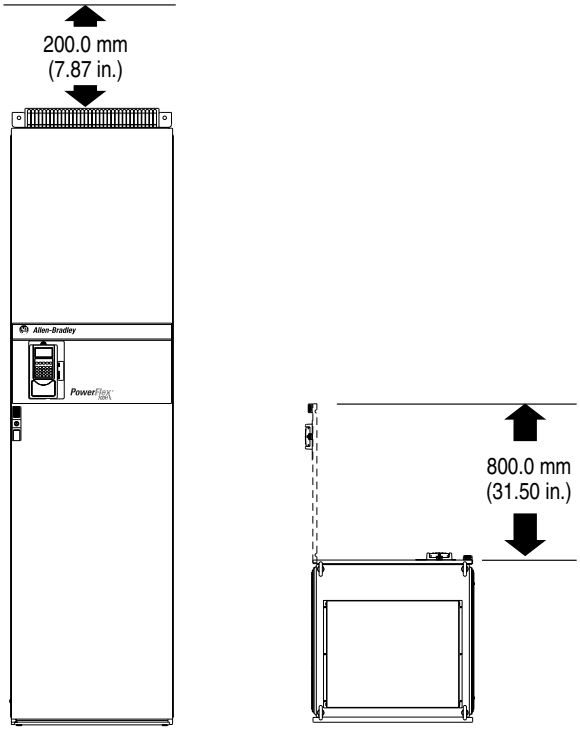
Location	Rating/Type	Description
Standard (Option 1)	600V, 90° C (194° F) XHHW2/RHW-2 Anixter B209500-B209507, Belden 29501-29507, or equivalent	• Four tinned copper conductors with XLPE insulation. • Copper braid/aluminum foil combination shield and tinned copper drain wire. • PVC jacket.
Standard (Option 2)	Tray rated 600V, 90° C (194° F) RHH/RHW-2 Anixter OLF-7xxxxx or equivalent	• Three tinned copper conductors with XLPE insulation. • 5 mil single helical copper tape (25% overlap min.) with three bare copper grounds in contact with shield. • PVC jacket.
Class I & II; Division I & II	Tray rated 600V, 90° C (194° F) RHH/RHW-2 Anixter 7V-7xxxx-3G or equivalent	• Three bare copper conductors with XLPE insulation and impervious corrugated continuously welded aluminum armor. • Black sunlight resistant PVC jacket overall. • Three copper grounds on #10 AWG and smaller.

Mounting

Frame 9



Frame 10



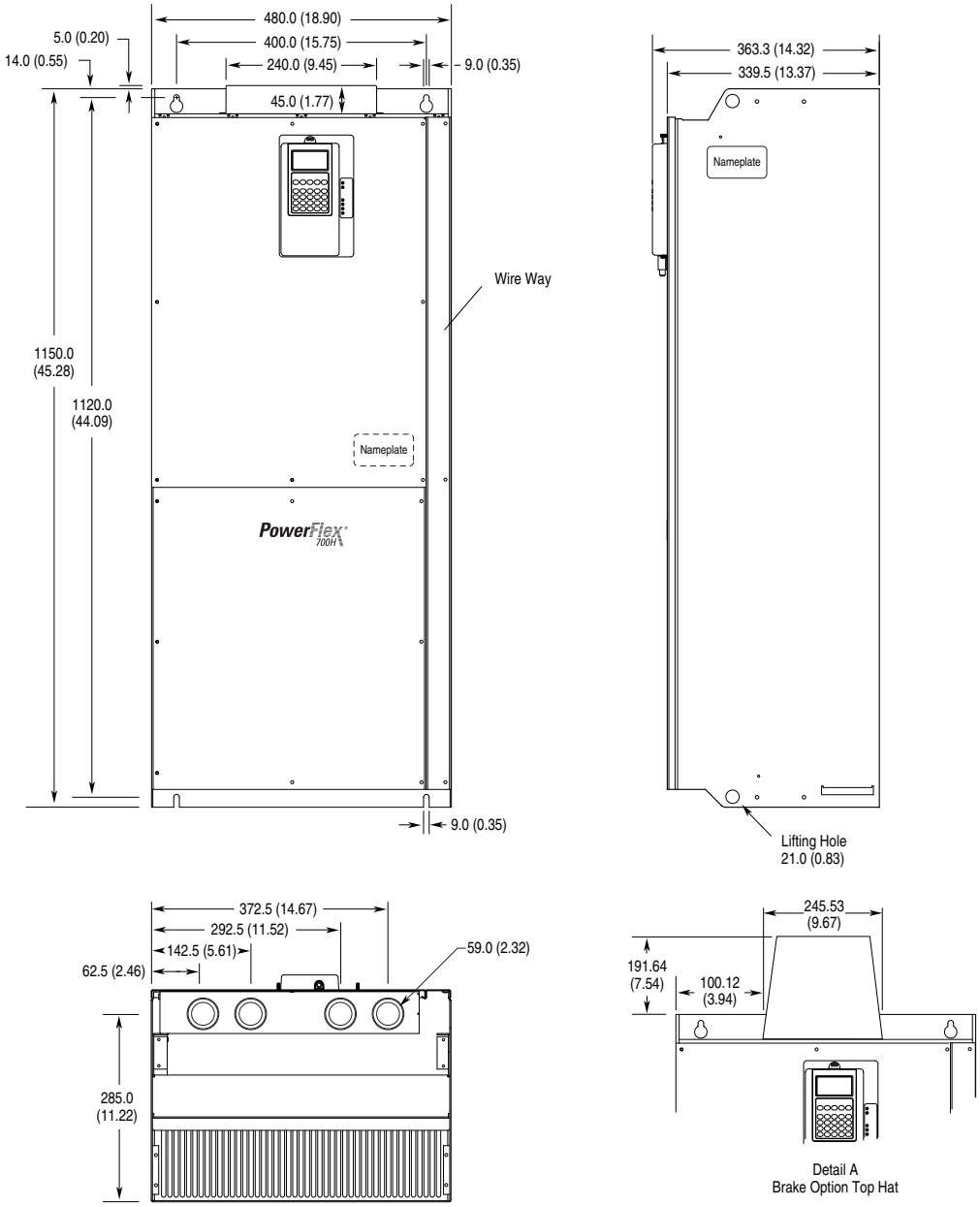
Operating Temperatures

Drive requires a minimum of 1300 m^3/h (765 cfm) of cooling air.

Maximum Surrounding Air Temperature	
Normal Duty	**Heavy Duty**
0 to 40 degrees C (32 to 104 degrees F)	0 to 50 degrees C (32 to 122 degrees F)

Approximate Dimensions

Frame 9 Dimensions

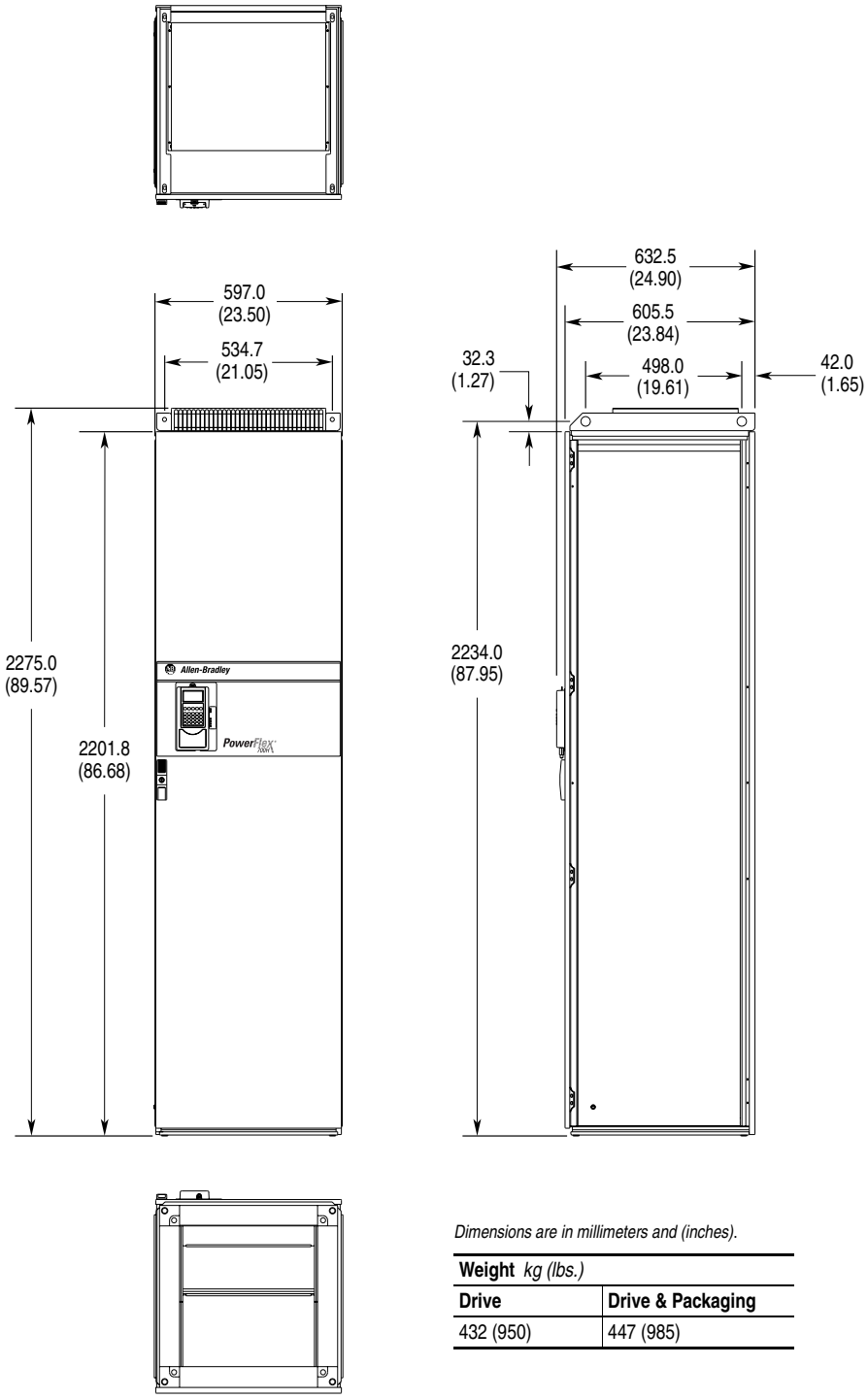


Dimensions are in millimeters and (inches).

Weight *kg (lbs.)*	
Drive	**Drive & Packaging**
142.9 (315)	176.9 (390)

Approximate Dimensions *(continued)*

Frame 10 Dimensions



Dimensions are in millimeters and (inches).

Weight *kg (lbs.)*	
Drive	**Drive & Packaging**
432 (950)	447 (985)

Control and Performance

Category		PowerFlex 700H
Agency Certification	c UL us	Listed to UL508C and CAN/CSA-C2.2 No. 14-M91.
	CE	Marked for all applicable European Directives❶ EMC Directive (89/336/EEC) EN 61800-3 Adjustable Speed electrical power drive systems Low Voltage Directive (73/23/EEC) EN 50178 Electronic Equipment for use in Power Installations
		The drive is also designed to meet 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.

❶ Applied noise impulses may be counted in addition to the standard pulse train causing erroneously high [Pulse Freq] readings.

Category	Specification	PowerFlex 700H				
Protection	**Drive**	**380/400**	**480V**	**500V**	**600V**	**690V**
	AC Input Overvoltage Trip:	611V AC	611V AC	611V AC	806V AC	806V AC
	AC Input Undervoltage Trip:	235V AC	235V AC	235V AC	326V AC	326V AC
	Bus Overvoltage Trip:	911V DC	911V DC	911V DC	1200V DC	1200V DC
	Bus Undervoltage Shutoff/Fault:	333V DC	333V DC	333V DC	461V DC	461V DC
	Nominal Bus Voltage (Full Load):	517V DC	621V DC	645V DC	776V DC	890V DC
	Heat Sink Thermistor:	Monitored by microprocessor overtemp trip				
	Drive Overcurrent Trip Software Overcurrent Trip:	 —				
	Hardware Overcurrent Trip: Instantaneous Current Limit:	360% of rated heavy duty current (typical) —				
	Line transients:	up to 6000 volts peak per IEEE C62.41-1991				
	Control Logic Noise Immunity:	Showering arc transients up to 1500V peak				
	Power Ride-Thru:	15 milliseconds at full load				
	Logic Control Ride-Thru:	0.5 seconds minimum, 2 seconds typical				
	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				
	Maximum Surrounding Air Temperature without Derating:	Based on drive rating				
	Storage Temperature (all const.):	–40 to 60 degrees C (–40 to 140 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:	5 to 95% non-condensing				
	Shock:	15G peak for 11ms duration (±1.0 ms)				
	Vibration:	2.0 mm (0.0787 in.) displacement, 1G peak EN50178/EN60068-2-6				
Electrical	Voltage Tolerance:	–				
	Frequency Tolerance:	47-63 Hz.				
	Input Phases:	Three-phase input provides full rating for all drives. Single-phase operation provides 50% of rated current.				
	Displacement Power Factor:	0.98 across entire speed range.				
	Efficiency:	97.5% at rated amps, nominal line volts.				
	Maximum Short Circuit Rating:	200,000 Amps symmetrical.				
	Actual Short Circuit Rating:	Determined by AIC rating of installed fuse/circuit breaker.				
	Maximum Drive to Motor Power Ratio	Recommended not greater than 2:1 ratio.				

Category	Specification	PowerFlex 700H
Control	Method:	Sine coded PWM with programmable carrier frequency. Ratings apply to all drives (refer to the *Derating Guidelines* in the PowerFlex Reference Manual). The drive can be supplied as 6 pulse or 12 pulse in a configured package.
	Carrier Frequency:	Minimum: 1 kHz, Maximum: Dependent on drive rating
	Output Voltage Range:	0 to rated motor voltage
	Output Frequency Range:	0 to 320 Hz
	Frequency Accuracy Digital Input: Analog Input:	 Within ±0.01% of set output frequency. Within ±0.4% of maximum output frequency.
	Frequency Control:	Speed regulation - with Slip Compensation 0.5% of base speed across 40:1 speed range 40:1 operating range
	Selectable Motor Control:	Sensorless Vector with full tuning. Standard V/Hz with full custom capability.
	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 to 3276.7 seconds in 0.1 second increments.
	S-Curve Time	0-100% of accel/decel time.
	Intermittent Overload:	110% Overload capability for up to 1 minute 150% Overload capability for up to 2 seconds
	Current Limit Capability:	Proactive Current Limit programmable from 20 to 160% of rated output current. Programmable proportional gain.
	Electronic Motor Overload Protection:	Class 10 protection with speed sensitive response. Investigated by U.L. to comply with N.E.C. Article 430. U.L. File E59272, volume 12.

Drive, Fuse & Circuit Breaker Ratings

The tables on page 25 provide drive ratings (including continuous, 1 minute & 2 second) and recommended AC line input fuse and circuit breaker information. Both types of short circuit protection are acceptable for UL and IEC requirements. Sizes listed are the recommended sizes based on 40 degree C and the U.S. N.E.C. Other country, state or local codes may require different ratings.

Fusing

If fuses are chosen as the desired protection method, refer to the recommended types listed below. If available amp ratings do not match the tables provided, the closest fuse rating that exceeds the drive rating should be chosen.

- IEC – BS88 (British Standard) Parts 1 & 2*, EN60269-1, Parts 1 & 2, type gG or equivalent should be used.
- UL – UL Class T, J or L must be used.

* Typical designations include, but may not be limited to the following; Parts 1 & 2: AC, AD, BC, BD, CD, DD, ED, EFS, EF, FF, FG, GF, GG, GH.

Circuit Breakers

The “non-fuse” listings in the following tables include both circuit breakers (inverse time or instantaneous trip). **If one of these is chosen as the desired protection method**, the following requirements apply.

- IEC and UL – Both types of devices are acceptable for IEC and UL installations.

400/480 Volt AC Input Protection Devices

Drive Catalog Number	Frame	HP Rating		Input Ratings		Output Amps			Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker ❶	Motor Circuit Protector ❷
		ND	*HD*	*Amps*	*kVA*	*Cont.*	*1 Min.*	*2 Sec.*	*Min.* ❸	*Max.* ❹	*Min.* ❸	*Max.* ❹	*Max.* ❺	*Max.* ❺
400 Volt AC Input														
20xC261	9	132	-	256	171	261	287	410	325	575	325	700	700	400
		-	110	201	139	205	308	410	250	450	250	550	600	400
20xC300	9	160	-	294	204	300	330	450	375	800	375	800	800	400
		-	132	240	166	245	368	490	325	650	325	650	700	400
20xC385	10	200	-	377	261	385	424	600	500	850	500	1000	800	600
		-	160	294	204	300	450	600	375	675	375	800	800	400
20xC460	10	250	-	451	312	460	506	770	575	1000	575	1200	1200	600
		-	200	377	261	385	578	770	500	850	500	1000	800	600
20xC500	10	250	-	490	339	500	550	750	625	1100	625	1400	1200	800
		-	200	411	285	420	630	840	525	900	525	1000	1200	600
480 Volt AC Input														
20xD261	9	200	-	245	204	261	287	410	325	575	325	700	700	400
		-	150	193	160	205	308	410	250	450	250	550	600	400
20xD300	9	250	-	282	234	300	330	450	375	800	375	800	800	400
		-	200	230	191	245	368	490	325	650	325	650	700	400
20xD385	10	300	-	362	301	385	424	600	500	850	500	1000	800	600
		-	250	282	234	300	450	600	375	675	375	800	800	400
20xD460	10	350	-	432	359	460	506	770	575	1000	575	1200	1200	600
		-	300	362	301	385	578	770	500	850	500	1000	800	600
20xD500	10	450	-	469	390	500	550	750	625	1100	625	1400	1200	800
		-	350	394	328	420	630	840	525	900	525	1000	1200	600

❶ Circuit Breaker - inverse time breaker. For US NEC, minimum size is 125% of motor FLA. Ratings shown are maximum.
❷ Motor Circuit Protector - instantaneous trip circuit breaker. For US NEC minimum size is 125% of motor FLA. Ratings shown are maximum.
❸ Minimum protection device size is the lowest rated device that supplies maximum protection without nuisance tripping.
❹ Maximum protection device size is the highest rated device that supplies drive protection. For US NEC, minimum size is 125% of motor FLA. Ratings shown are maximum.
❺ Maximum allowable rating by US NEC. Exact size must be chosen for each installation.

540/650 Volt DC Input Protection Devices

Drive Catalog Number	Frame	kW Rating		DC Input Ratings		Output Amps			Fuse	Bussmann Style Fuse
		ND	*HD*	*Amps*	*kW*	*Cont.*	*1 Min.*	*2 Sec.*		
540 Volt DC Input										
20xH261	9	132	-	312	161	261	287	410	500	170M6608
		-	110	245	127	205	308	410	500	170M6608
20xH300	9	160	-	359	186	300	330	500	630	170M6610
		-	132	293	152	245	368	490	630	170M6610
20xH385	10	200	-	460	238	385	424	600	700	170M6611
		-	160	359	186	300	450	600	700	170M6611
20xH460	10	250	-	550	284	460	506	770	900	170M6613
		-	200	460	238	385	578	770	900	170M6613
20xH500	10	250	-	598	309	500	550	750	1000	170M6614
		-	200	502	260	420	630	840	1000	170M6614
650 Volt DC Input										
20xJ261	9	200	-	299	186	261	287	410	500	170M6608
		-	150	235	146	205	308	410	500	170M6608
20xJ300	9	250	-	343	213	300	330	500	630	170M6610
		-	200	281	174	245	368	490	630	170M6610
20xJ385	10	300	-	441	274	385	424	600	700	170M6611
		-	250	343	213	300	450	600	700	170M6611
20xJ460	10	350	-	527	327	460	506	770	900	170M6613
		-	300	441	274	385	578	770	900	170M6613
20xJ500	10	450	-	572	356	500	550	750	1000	170M6614
		-	350	481	299	420	630	840	1000	170M6614

Parameter List

Parameter Name	Number	Group
Accel Mask	281	Masks/Owners
Accel Owner	293	Masks/Owners
Accel Time X	140, 141	Ramp Rates
Alarm Clear	261	Alarms
Alarm Config 1	259	Alarms
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Alarm X Code	262-269	Alarms
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Analog In X Lo	323, 326	Analog Inputs
Analog In X Loss	324, 327	Analog Inputs
Analog In1 Value	016	Metering
Analog In2 Value	017	Metering
Analog OutX Hi	343, 346	Analog Outputs
Analog OutX Lo	344, 347	Analog Outputs
Analog OutX Sel	342, 345	Analog Outputs
Anlg In Config	320	Analog Inputs
Anlg In Sqr Root	321	Analog Inputs
Anlg Out Absolut	341	Analog Outputs
Anlg Out Config	340	Analog Outputs
Anlg OutX Scale	354, 355	Analog Outputs
Anlg OutX Setpt	377, 378	Analog Outputs
Auto Rstrt Delay	175	Restart Modes
Auto Rstrt Tries	174	Restart Modes
Autotune	061	Torq Attributes
Break Frequency	072	Volts per Hertz
Break Voltage	071	Volts per Hertz
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Bus Reg Ki	160	Stop/Brake Modes
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Bus Reg Mode X	161, 162	Stop/Brake Modes
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Current Lmt Sel	147	Load Limits
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Data Out XX	310-317	Datalinks
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DC Bus Memory	013	Metering
DC Bus Voltage	012	Metering
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Decel Owner	294	Masks/Owners
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Dig Out Status	217	Diagnostics
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Drive Logic Rslt	271	Comm Control
Drive Ramp Rslt	273	Comm Control
Drive Ref Rslt	272	Comm Control
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Parameter Name	Number	Group
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Fault 3 Code	247	Faults
Fault 3 Time	248	Faults
Fault 4 Code	249	Faults
Fault 4 Time	250	Faults
Fault 5 Code	251	Faults
Fault 5 Time	252	Faults
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Jog Speed 1	100	Discrete Speeds
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Maximum Speed	082	Spd Mode/Limits
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MOP Rate	195	MOP Config
MOP Reference	011	Metering
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Motor OL Factor	048	Motor Data
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Output Freq	001	Metering
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PI Control	125	Process PI
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PI Fdback Meter	136	Process PI
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Parameter Name	Number	Group
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PI Feedback Sel	128	Process PI
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PI Output Meter	138	Process PI
PI Preload	133	Process PI
PI Prop Gain	130	Process PI
PI Ref Meter	135	Process PI
PI Reference Hi	460	Process PI
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Support

Rockwell Automation is committed to maintaining and supporting Allen-Bradley drives and installations. Included in this commitment is start-up support and consultation for drive applications.

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With ProtectionPlus Drives Start-Up Services from Rockwell Automation, users can leverage the extensive product and industry experience of Rockwell Automation technicians to quickly commission drives and reduce the time between integration and actual start-up.

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