



PowerFlex 4 Adjustable Frequency AC Drive

Catalog Number 22A

ATTENTION:

- Before installing, configuring, operating or maintaining this product, read this document and the documents listed in the Additional Resources section for installing, configuring, or operating equipment. Users should familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.
- Installation, adjustments, putting into service, use, assembly, disassembly, and maintenance shall be carried out by suitably trained personnel in accordance with applicable code of practice.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls, publication SGI-1.1, available from your local Rockwell Automation sales office or online at <http://www.rockwellautomation.com/literature> describes some important differences between solid state equipment and hard-wired electromechanical devices.

ATTENTION: Do not install, configure, operate or maintain this product until you have read the product documentation and the documents in the Additional Resources section for installing, configuring, operating or maintaining equipment. To get the product documentation go to <http://www.rockwellautomation.com/literature> or contact your local sales office or Rockwell Automation representative.

ATTENTION: Ne pas installer, configurer, exploiter ou maintenir ce produit tant que vous n'avez pas lu sa documentation et les documents de la rubrique Documents connexes pour l'installation, la configuration, l'exploitation et la maintenance de l'équipement. Pour obtenir de la documentation, rendez-vous sur le site <http://www.rockwellautomation.com/literature> ou contactez votre agence commerciale Rockwell Automation locale ou son représentant.

ACHTUNG: Für die Installation, Konfiguration, den Betrieb und die Wartung dieses Produkt lesen Sie sich bitte zunächst die Produktdokumentation sowie die Dokumente im Abschnitt "Weitere Informationen" durch. Die entsprechende Produktdokumentation finden Sie unter <http://www.rockwellautomation.com/literature> oder kontaktieren Sie Ihr lokales Vertriebsbüro bzw. einen Rockwell Automation-Mitarbeiter.

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Additional Resources

These documents contain additional information concerning the installation, programming, and application of the AC drive.

English	This instruction sheet is available in multiple languages at http://www.rockwellautomation.com/literature . Select publication language and type “22A-QS001” in the search field.
Deutsch	Diese Anleitung steht in mehreren Sprachen unter http://www.rockwellautomation.com/literature zur Verfügung. Wählen Sie Ihre Sprache aus, und geben Sie „22A-QS001” in das Suchfeld ein.
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한국의	이 명령 부 http://www.rockwellautomation.com/literature 에서 여러 언어로 사용할 수 있습니다. 출판 언어와 유형을 선택하십시오 “22A-QS001” 검색 필드에있다
中文 (简体)	从以下网页可以获得本说明书的多种语言的版本: http://www.rockwellautomation.com/literature 。请选择出版物的语言,并在搜索栏输入 “22A-QS001” 印。
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Polski	Niniejsza instrukcja dostępna jest w wielu językach na stronie http://www.rockwellautomation.com/literature . Wybrać język publikacji, w polu wyszukiwania wpisać “22A-QS001”.

PowerFlex 4 User Manual **22A-UM001**: Detailed information on the parameters and specifications of the PowerFlex 4 adjustable frequency drive.

AC Drive Installation Considerations **DRIVES-IN003**: Provides additional information needed to properly install PowerFlex AC drives.

Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives, publication **DRIVES-IN001**: Provides basic information needed to properly wire and ground PWM AC drives.

Industrial Automation Wiring and Grounding Guidelines **1770-4.1**: Provides general guidelines for installing a Rockwell Automation industrial system.

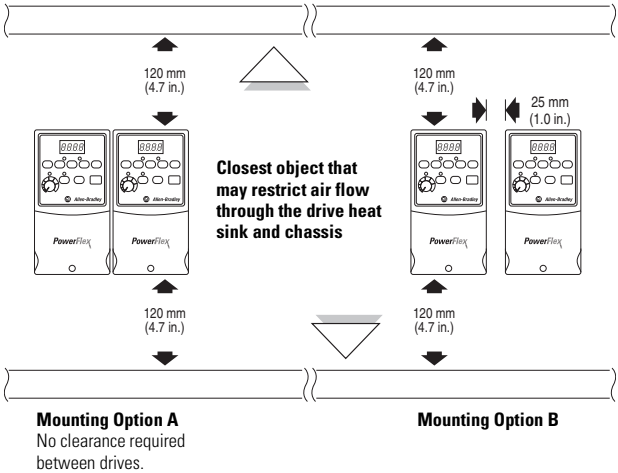
Mounting Considerations

- Mount the drive upright on a flat, vertical and level surface.

Min. Panel Thickness	Screw Size	Screw Torque	DIN Rail
1.9 mm (0.0747 in.)	M4 (#8...32)	1.56...1.96 Nm (14...17 lb-in.)	35 mm

- Protect the cooling fan by avoiding dust or metallic particles.
- Do not expose to a corrosive atmosphere.
- Protect from moisture and direct sunlight.

Minimum Mounting Clearances



Ambient Operating Temperatures

Ambient Temperature		Enclosure Rating	Minimum Mounting Clearances
Minimum	Maximum		
-10 °C (14 °F)	40 °C (104 °F)	IP20/Open Type	Use Mounting Option A
		IP30/NEMA 1/UL Type 1 ⁽¹⁾	Use Mounting Option B
	50 °C (122 °F)	IP20/Open Type	Use Mounting Option B

⁽¹⁾ Rating requires installation of the PowerFlex 4 IP30/NEMA 1/UL Type 1 option kit.

Drive Dimensions

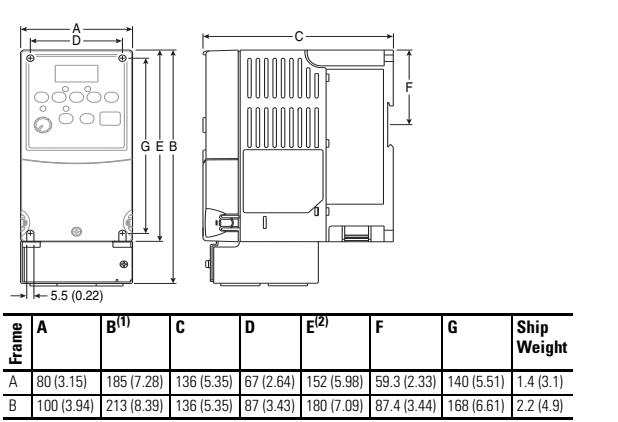
PowerFlex 4 Panel Mount Drives

Flange Mount drives are also available. Refer to the PowerFlex 4 User Manual for more information.

Ratings are in kW and (HP).

Frame	120V AC – 1-Phase	240V AC – 1-Phase No Brake	240V AC – 1-Phase	240V AC – 3-Phase	480V AC – 3-Phase
A	0.2 (0.25) 0.37 (0.5)	0.2 (0.25) 0.37 (0.5) 0.75 (1.0)	0.2 (0.25) 0.37 (0.5) 0.75 (1.0)	0.2 (0.25) 0.37 (0.5) 0.75 (1.0) 1.5 (2.0)	0.37 (0.5) 0.75 (1.0) 1.5 (2.0)
B	0.75 (1.0) 1.1 (1.5)	1.5 (2.0) 2.2 (3.0)	1.5 (2.0)	2.2 (3.0) 3.7 (5.0)	2.2 (3.0) 3.7 (5.0)

Dimensions are in mm and (in.). Weights are in kg and (lb).

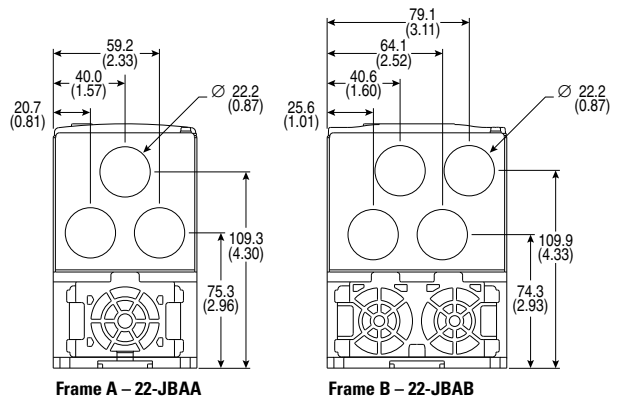


Frame	A	B ⁽¹⁾	C	D	E ⁽²⁾	F	G	Ship Weight
A	80 (3.15)	185 (7.28)	136 (5.35)	67 (2.64)	152 (5.98)	59.3 (2.33)	140 (5.51)	1.4 (3.1)
B	100 (3.94)	213 (8.39)	136 (5.35)	87 (3.43)	180 (7.09)	87.4 (3.44)	168 (6.61)	2.2 (4.9)

⁽¹⁾ Overall height of drive with IP30/NEMA 1/UL Type 1 option kit installed.

⁽²⁾ Overall height of standard IP20/Open Type drive.

IP30/NEMA 1/UL Type 1 Option Kit



Specifications, Fuses and Circuit Breakers

Drive Ratings									
Catalog No.	Output Rating		Input Rating			Branch Circuit Protection		Power Dissipation	
	kW (HP)	Amps	Voltage Range	kVA	Amps	Fuses	140M Motor Protectors (2) (3)	Min. Enclosure Volume ⁽⁴⁾ (in. ³)	IP20 Open Watts
100...120V AC (±10%) – 1-Phase Input, 0...230V 3-Phase Output									
22A-V1P5N104	0.2 (0.25)	1.5	90...126	0.75	6.0	10	140M-C2E-C10	1655	32
22A-V2P3N104	0.4 (0.5)	2.3	90...126	1.15	9.0	15	140M-C2E-C16	1655	40
22A-V4P5N104	0.75 (1.0)	4.5	90...126	2.25	18.0	30	140M-D8E-C20	1655	55
22A-V6P0N104	1.1 (1.5)	6.0	90...126	3.0	24.0	40	140M-F8E-C32	1655	80
200...240V AC (±10%) – 1-Phase⁽¹⁾ Input, 0...230V 3-Phase Output, NO BRAKE									
22A-A1P4N103	0.2 (0.25)	1.4	180...265	0.7	3.2	6	140M-C2E-B40	1655	32
22A-A2P1N103	0.4 (0.5)	2.1	180...265	1.05	5.3	10	140M-C2E-B63	1655	40
22A-A3P6N103	0.75 (1.0)	3.6	180...265	1.8	9.2	15	140M-C2E-C16	1655	55
22A-A6P8N103	1.5 (2.0)	6.8	180...265	3.4	14.2	25	140M-C2E-C16	1655	85
22A-A9P6N103	2.2 (3.0)	9.6	180...265	4.8	19.6	30	140M-D8E-C25	1655	125
200...240V AC (±10%) – 1-Phase Input⁽¹⁾, 0...230V 3-Phase Output									
22A-A1P5N104	0.2 (0.25)	1.5	180...265	0.75	5.0	10	140M-C2E-B63	1655	32
22A-A2P3N104	0.4 (0.5)	2.3	180...265	1.15	6.0	10	140M-C2E-B63	1655	40
22A-A4P5N104	0.75 (1.0)	4.5	180...265	2.25	10.0	15	140M-C2E-C16	1655	55
22A-A8P0N104	1.5 (2.0)	8.0	180...265	4.0	18.0	30	140M-D8E-C20	1655	85
200...240V AC (±10%) – 3-Phase Input, 0...230V 3-Phase Output									
22A-B1P5N104	0.2 (0.25)	1.5	180...265	0.75	1.8	3	140M-C2E-B25	1655	32
22A-B2P3N104	0.4 (0.5)	2.3	180...265	1.15	2.5	6	140M-C2E-B40	1655	40
22A-B4P5N104	0.75 (1.0)	4.5	180...265	2.25	5.2	10	140M-C2E-C10	1655	55
22A-B8P0N104	1.5 (2.0)	8.0	180...265	4.0	9.5	15	140M-C2E-C16	1655	85
22A-B012N104	2.2 (3.0)	12.0	180...265	5.5	15.5	25	140M-C2E-C16	1655	125
22A-B017N104	3.7 (5.0)	17.5	180...265	8.6	21.0	30	140M-F8E-C25	1655	180
380...480V AC (±10%) – 3-Phase Input, 0...460V 3-Phase Output									
22A-D1P4N104	0.4 (0.5)	1.4	340...528	1.4	1.8	3	140M-C2E-B25	1655	35
22A-D2P3N104	0.75 (1.0)	2.3	340...528	2.3	3.2	6	140M-C2E-B40	1655	50
22A-D4P0N104	1.5 (2.0)	4.0	340...528	4.0	5.7	10	140M-C2E-B63	1655	70
22A-D6P0N104	2.2 (3.0)	6.0	340...528	5.9	7.5	15	140M-C2E-C10	1655	100
22A-D8P7N104	3.7 (5.0)	8.7	340...528	8.6	9.0	15	140M-C2E-C16	1655	150

⁽¹⁾ 200...240V AC – 1-Phase drives are also available with an integral EMC filter. Catalog suffix changes from N103 to N113 and N104 to N114.

⁽²⁾ The AIC ratings of the Bulletin 140M Motor Protector Circuit Breakers may vary. See [Bulletin 140M Motor Protection Circuit Breakers Application Ratings](#).

⁽³⁾ 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.

⁽⁴⁾ 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.

Input/Output Ratings		Approvals	
Output Frequency: 0...240 Hz (Programmable) Efficiency: 97.5% (Typical)		 UL508C CSA 22.2 No. 14  N223  EMC Directive 2004/108/EC: EN 61800-3 LV Directive 2006/95/EC: EN 50718	
Digital Control Inputs (Input Current = 6 mA)		Analog Control Inputs	
SRC (Source) Mode: 18...24V = ON 0...6V = OFF	SNK (Sink) Mode: 0...6V = ON 18...24V = OFF	4...20 mA Analog: 250 Ω input impedance 0...10V DC Analog: 100 kΩ input impedance External Pot: 1...10 kΩ, 2 W min	
Control Output (Programmable Output, form C relay)			
Resistive Rating: 3.0 A @ 30V DC, 125V AC and 240V AC Inductive Rating: 0.5 A @ 30V DC, 125V AC and 240V AC			
Fuses and Circuit Breakers			
Recommended Fuse Type: UL Class J, CC, T or Type BS88; 600V (550V) or equivalent. Recommended Circuit Breakers: HMCP or Bulletin 140U or equivalent.			
Protective Features			
Motor Protection: I ² t overload protection – 150% for 60 s, 200% for 3 s (Provides Class 10 protection)			
Overcurrent: 200% hardware limit, 300% instantaneous fault			
Over Voltage: 100...120V AC Input – Trip occurs @ 405V DC bus voltage (equivalent to 150V AC incoming line) 200...240V AC Input – Trip occurs @ 405V DC bus voltage (equivalent to 290V AC incoming line) 380...460V AC Input – Trip occurs @ 810V DC bus voltage (equivalent to 575V AC incoming line)			
Under Voltage: 100...120V AC Input – Trip occurs @ 210V DC bus voltage (equivalent to 75V AC incoming line) 200...240V AC Input – Trip occurs @ 210V DC bus voltage (equivalent to 150V AC incoming line) 380...480V AC Input – Trip occurs @ 390V DC bus voltage (equivalent to 275V AC incoming line)			
Control Ride Through: Minimum ride through is 0.5 s – typical value 2 s			
Faultless Power Ride Through: 100 ms			
Dynamic Braking			
Internal brake IGBT included with all ratings except No Brake versions. Refer to Appendix B of the PowerFlex 4 User Manual for DB resistor ordering information.			

Power Wiring

Power Wire Rating	Recommended Copper Wire
Unshielded 600V, 75 °C (167 °F) THHN/THWN	15 Mils insulated, dry location
Shielded 600V, 75 °C or 90 °C (167 °F or 194 °F) RHH/RHW-2	Belden 29501-29507 or equivalent
Shielded Tray rated 600V, 75 °C or 90 °C (167 °F or 194 °F) RHH/RHW-2	Shawflex 2ACD/3ACD or equivalent

Power Terminal Block

Frame A

Terminal	Description
R/L1, S/L2	1-Phase Input
R/L1, S/L2, T/L3	3-Phase Input
U/T1	To Motor U/T1
V/T2	To Motor V/T2
W/T3	To Motor W/T3
BR+, BR-	Dynamic Brake Resistor Connection [0.75 kW (1 HP) ratings and higher]
⊕	Safety Ground - PE

Power Terminal Block Specifications

Frame	Maximum Wire Size ⁽¹⁾	Minimum Wire Size ⁽¹⁾	Torque
A	3.3 mm ² (12 AWG)	0.8 mm ² (18 AWG)	1.7...2.2 Nm (16...19 lb-in.)
B	5.3 mm ² (10 AWG)	1.3 mm ² (16 AWG)	

⁽¹⁾ Maximum/minimum sizes that the terminal block will accept – these are not recommendations.

Control Terminal Block

Control Wiring Block Diagram

	30V DC	125V AC	240V AC	P036 [Start Source]	Stop	I/O Terminal 01 Stop
Resistive	3.0 A	3.0 A	3.0 A	Keypad	Per P037	Coast
Inductive	0.5 A	0.5 A	0.5 A	3-Wire	Per P037	Per P037
				2-Wire	Per P037	Coast
				RS485 Port	Per P037	Coast

- (1) **Important:** I/O Terminal 01 is always a coast to stop input except when P036 [Start Source] is set to "3-Wire" control. In three wire control, I/O Terminal 01 is controlled by P037 [Stop Mode]. All other stop sources are controlled by P037 [Stop Mode].
Important: The drive is shipped with a jumper installed between I/O Terminals 01 and 11. Remove this jumper when using I/O Terminal 01 as a stop or enable input.
- (2) Two wire control show. For three wire control use a momentary input on I/O Terminal 02 to command a start. Use a maintained input for I/O Terminal 03 to change direction.
- (3) Only one analog frequency source may be connected at a time. If more than one reference is connected at the same time, an undetermined frequency reference will result.

General Grounding Requirements

IMPORTANT The MOV to ground jumper must be removed if the drive is installed on an ungrounded or resistive grounded distribution system. Tighten screw after jumper removal.

Prepare For Drive Start-Up

ATTENTION: Power must be applied to the drive to perform the following start-up procedures. Some of the voltages present are at incoming line potential. To avoid electric shock hazard or damage to equipment, only qualified service personnel should perform the following procedure. Thoroughly read and understand the procedure before beginning. If an event does not occur while performing this procedure, **Do Not Proceed. Remove All Power** including user supplied control voltages. User supplied voltages may exist even when main AC power is not applied to the drive. Correct the malfunction before continuing.

Integral Keypad

Menu	Description
	Display Group (View Only) Consists of commonly viewed drive operating conditions.
	Basic Program Group Consists of most commonly used programmable functions.
	Advanced Program Group Consists of remaining programmable functions.
	Fault Designator Consists of list of codes for specific fault conditions. Displayed only when fault is present.

No.	LED (Color)		No.	LED (Color)	
1	Run/Direction Status (Red) Note: A flashing LED indicates that the drive has been commanded to change direction. Indicates actual motor direction while decelerating to zero.		4	Program Status (Red)	
2	Alphanumeric Display (Red)		5	Fault Status (Red)	
3	Displayed Units (Red)		6	Pot Status (Green)	
			7	Start Key Status (Green)	
No.	Key	Name	No.	Key	Name
8		Escape	9		Potentiometer
		Select			Start
	 	Up Arrow Down Arrow			Reverse
		Enter			Stop

Smart Start-Up with Basic Program Group Parameters

The PowerFlex 4 is designed so that start up is simple and efficient. The Program Group contains the most commonly used parameters.

= Stop drive before changing this parameter.

No.	Parameter	Min/Max	Display/Options	Default
P031	[Motor NP Volts] Set to the motor nameplate rated volts.	20/Drive Rated Volts	1V AC	Based on Drive Rating
P032	[Motor NP Hertz] Set to the motor nameplate rated frequency.	10/240 Hz	1 Hz	60 Hz
P033	[Motor OL Current] Set to the maximum allowable motor current.	0.0/(Drive Rated Amps× 2)	0.1 A	Based on Drive Rating
P034	[Minimum Freq] Sets the lowest frequency the drive will output continuously.	0.0/240.0 Hz	0.1 Hz	0.0 Hz
P035	[Maximum Freq] Sets the highest frequency the drive will output.	0/240 Hz	1 Hz	60 Hz
P036	[Start Source] Sets the control scheme used to start the drive. ⁽¹⁾ When active, the Reverse key is also active unless disabled by A095 [Reverse Disable].	0/5	0 = "Keypad" ⁽¹⁾ 1 = "3-Wire" 2 = "2-Wire" 3 = "2-W Lvl Sens" 4 = "2-W Hi Speed" 5 = "Comm Port"	0
P037	[Stop Mode] Active stop mode for all stop sources [e.g. keypad, run forward (I/O Terminal 02), run reverse (I/O Terminal 03), RS485 port] except as noted below. Important: I/O Terminal 01 is always a coast to stop input except when P036 [Start Source] is set for "3-Wire" control. When in three wire control, I/O Terminal 01 is controlled by P037 [Stop Mode].	0/7	0 = "Ramp, CF" ⁽¹⁾ 1 = "Coast, CF" ⁽¹⁾ 2 = "DC Brake, CF" ⁽¹⁾ 3 = "DCBrkAuto, CF" ⁽¹⁾ 4 = "Ramp" 5 = "Coast" 6 = "DC Brake" 7 = "DC BrakeAuto" ⁽¹⁾ Stop input also clears active fault.	0
P038	[Speed Reference] Sets the source of the speed reference to the drive. Important: When A051 or A052 [Digital Inx Sel] is set to option 2, 4, 5, 6, 13 or 14 and the digital input is active, A051, A052, A053 or A054 will override the speed reference commanded by this parameter. Refer to Chapter 1 of the PowerFlex 4 User Manual for details.	0/5	0 = "Drive Pot" 1 = "InternalFreq" 2 = "0-10V Input" 3 = "4-20mA Input" 4 = "Preset Freq" 5 = "Comm Port"	0 1 (IP66, Type 4X)
P039	[Accel Time 1] Sets the rate of accel for all speed increases.	0.0/600.0 s	0.1 s	10.0 s
P040	[Decel Time 1] Sets the rate of decel for all speed decreases.	0.1/600.0 Secs	0.1 s	10.0 s
P041	[Reset To Defaults] Resets all parameter values to factory defaults.	0/1	0 = "Idle State" 1 = "Reset Defaults"	0
P043	[Motor OL Ret] Enables/disables the Motor Overload Retention function.	0/1	0 = "Disabled" 1 = "Enabled"	0

Fault Codes

To clear a fault, press the Stop key, cycle power or set A100 [Fault Clear] to 1 or 2.

No.	Fault	Description
F2	Auxiliary Input ⁽¹⁾	Check remote wiring.
F3	Power Loss	Monitor the incoming AC line for low voltage or line power interruption.
F4	UnderVoltage ⁽¹⁾	Monitor the incoming AC line for low voltage or line power interruption.
F5	OverVoltage ⁽¹⁾	Monitor the AC line for high line voltage or transient conditions. Bus overvoltage can also be caused by motor regeneration. Extend the decel time or install dynamic brake option.
F6	Motor Stalled ⁽¹⁾	Increase [Accel Time x] or reduce load so drive output current does not exceed the current set by parameter A089 [Current Limit].
F7	Motor Overload ⁽¹⁾	An excessive motor load exists. Reduce load so drive output current does not exceed the current set by parameter P033 [Motor OL Current].
F8	Heatsink OvrTmp ⁽¹⁾	Check for blocked or dirty heat sink fins. Verify that ambient temperature has not exceeded 40 °C (104 °F) for IP 30/NEMA 1/UL Type 1 installations or 50 °C (122 °F) for Open type installations. Check fan.
F12	HW OverCurrent	Check programming. Check for excess load, improper DC boost setting, DC brake volts set too high or other causes of excess current.
F13	Ground Fault	Check the motor and external wiring to the drive output terminals for a grounded condition.
F33	Auto Rstrt Tries	Correct the cause of the fault and manually clear.
F38	Phase U to Gnd	Check the wiring between the drive and motor. Check motor for grounded phase.
F39	Phase V to Gnd	Replace drive if fault cannot be cleared.
F40	Phase W to Gnd	
F41	Phase UV Short	Check the motor and drive output terminal wiring for a shorted condition.
F42	Phase UW Short	Replace drive if fault cannot be cleared.
F43	Phase VW Short	
F48	Params Defaulted	The drive was commanded to write default values to EEPROM. Clear the fault or cycle power to the drive. Program the drive parameters as needed.
F63	SW OverCurrent ⁽¹⁾	Check load requirements and A098 [SW Current Trip] setting.
F64	Drive Overload	Reduce load or extend Accel Time.
F70	Power Unit	Cycle power. Replace drive if fault cannot be cleared.
F71	Net Loss	The communication network has faulted.
F81	Comm Loss	If adapter was not intentionally disconnected, check wiring to the port. Replace wiring, port expander, adapters or complete drive as required. Check connection. An adapter was intentionally disconnected. Turn off using A105 [Comm Loss Action].
F100	Parameter Checksum	Restore factory defaults.
F122	I/O Board Fail	Cycle power. Replace drive if fault cannot be cleared.

⁽¹⁾ Auto-Reset/Run type fault. Configure with parameters A092 and A093.

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At <http://www.rockwellautomation.com/support/>, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://www.rockwellautomation.com/support/>.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual.

You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/support/americas/phone_en.html , or contact your local Rockwell Automation representative.

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Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

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