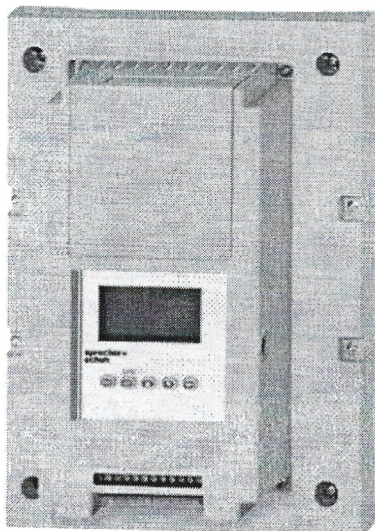


PF Controllers

The Intelligent Controller with extensive starting and stopping configurations up to 400HP (3-wire), 700HP (6-wire) @460V



PF Control module with standard built in keypad and backlit LCD display

The PF Softstarter Controller provides intelligence, unmatched performance, flexibility, and diagnostics in a modular compact design for controlling either a standard squirrel-cage induction motor or a star-delta motor. Seven standard, and two optional modes of operation are available within a single controller.

Standard Modes of Operation

- Soft Start with selectable kick start
- Current Limit Starting
- Dual ramp start
- Full voltage starting
- Linear speed acceleration
- Preset slow speed
- Soft stop

Optional Modes of Operation

- Pump Control
- Brake Control - Smart Motor Brake, Accu-stop and Slow Speed with Braking

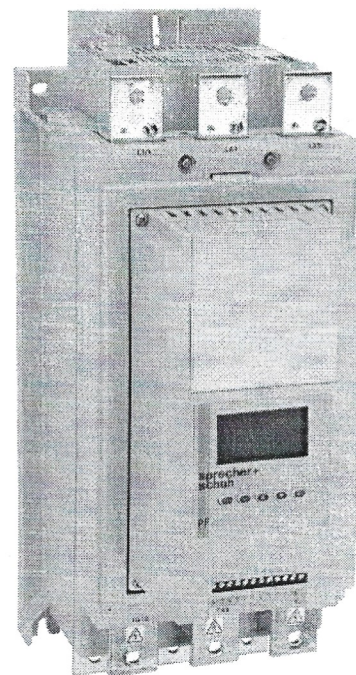
Product Features

- Built-in SCR Bypass/Run Contactor
- Built in Electronic Motor Overload Protection
- CT on each phase
- LCD Display
- Keypad programming
- Four programming Auxiliary Contacts

The PF Softstarter is available for motors rated 1...480A, 200...600V AC, 50 and 60Hz. In addition to motors, the PF Softstarter can be used to control resistive loads.

Modular and Compact Softstarter

The PF Softstarter reduces both product size and the total cost to the customer. As standard, the PF Softstarter includes electronic overload, integral bypass and motor starting capabilities for both star-delta and standard squirrel-cage induction motors, advanced protection and diagnostics in a compact maintainable modular, cost-effective package.



Large or small HP and options for any application

The basic PF Controller combines large horsepower capacity with the most popular starting modules (up to 400HP @ 460V, 3-wire). Even in middle and low horsepower applications, PF Softstarters can be configured to provide exactly the right starting and stopping profile (see descriptions on following pages).

Precise programming set-up with built-in keypad & LCD display

The PF Controller comes equipped with a built-in keypad and LCD display for programming the controller parameter settings for the specific industrial application. The three-line 16-character backlit LCD display provides parameter identification using clear informative text. Parameters are arranged in an organized four-level menu structure for ease of programming and fast access to parameters which allows the PF Softstarters set-up to be performed quickly and easily.

Product Overview

Modular Design

The PF Softstarter provides intelligence, unmatched performance, flexibility and diagnostics in a modular compact design for controlling either a standard squirrel-cage induction motor or a star-delta motor.

Compact Size

The PF Softstarter integrates a bypass to minimize heat generation during run time. The bypass automatically closes when the motor reaches its nominal speed, resulting in a cooler-running component and reduction in enclosure size.

Current Range - 12 Models

Product Rating	Line Current	Delta Current
5	5	9
25	25	43
43	43	74
60	60	104
85	85	147
108	108	187
135	135	234
201	201	348
251	251	435
317	317	549
361	361	625
480	480	831

Voltage Range

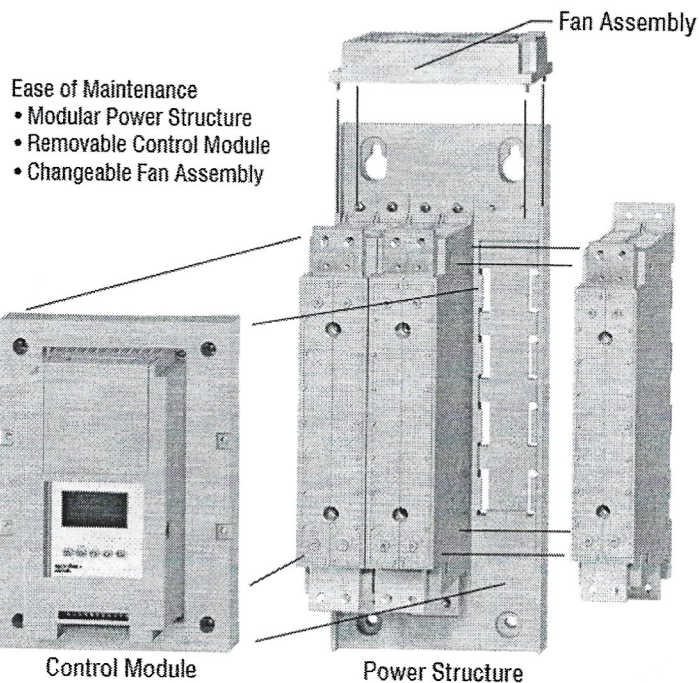
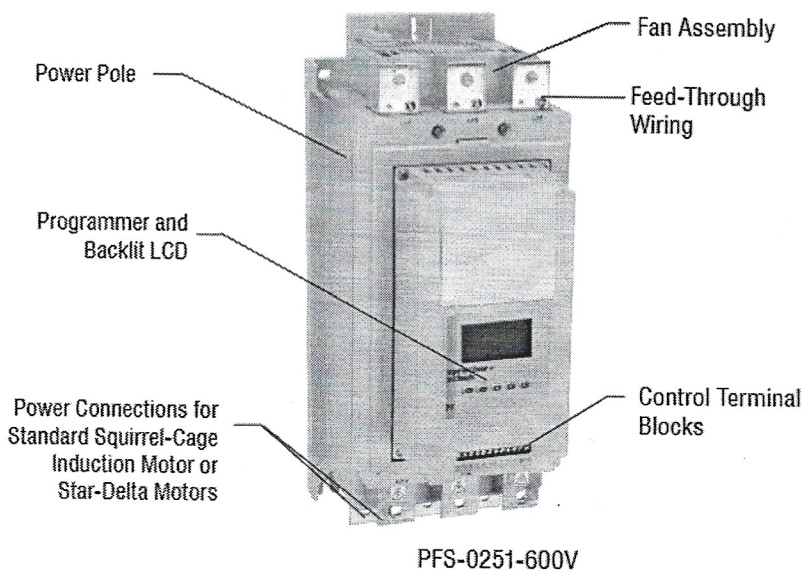
200...600V AC, 50/60 Hz

Control Range

100...240V AC or 24V AC/DC

Starting Modes

	PFS Standard	PFB Pump Control	PFD Braking Control
Soft Start	X	X	X
Soft Stop	X		
Current Limit	X	X	X
Full Voltage	X	X	X
Kick Start	X	X	X
Preset Slow Speed	X		X
Linear Speed Start and Stop	X		
Dual Ramp	X		
Pump Start and Stop		X	
Smart Motor Brake			X
Accu-Stop			X
Slow Speed with Braking			X



Product Features

Overload

- Flexibility in Trip Class (10,15, 20, 30, Off)
- Reset Operation (Manual or Automatic)

Diagnostics

- PTC
- Line Fault
- Voltage Imbalance
- Undervoltage
- Overtemperature
- Overload
- Ground Fault
- Power Loss
- Phase Reversal
- Overvoltage
- Open Gate
- Excessive Starts per Hour

Configurable Auxiliary Contacts - 4

- Normal, Up-to-speed, External bypass, Fault, Alarm
- N.O. or N.C.

Motor Control

- Standard Squirrel-Cage Induction Motor
- Start-Delta Motor

Metering

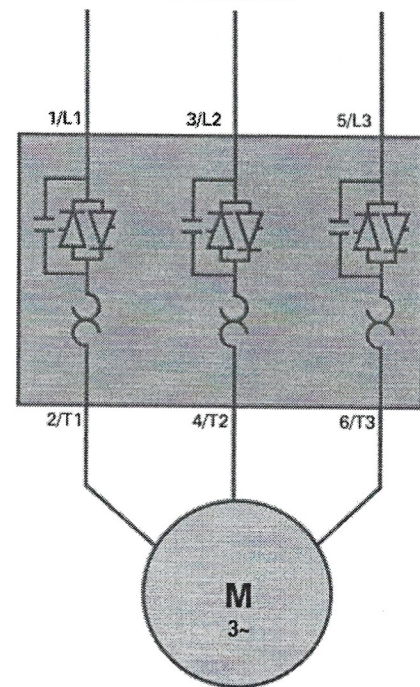
- Three-phase Currents
- Three-phase voltages
- Power in kW
- Power Usage in kWh
- Motor Thermal
- Power Factor of the Running Motor
- Capacity Usage
- Elapsed Time of Motor

Operation

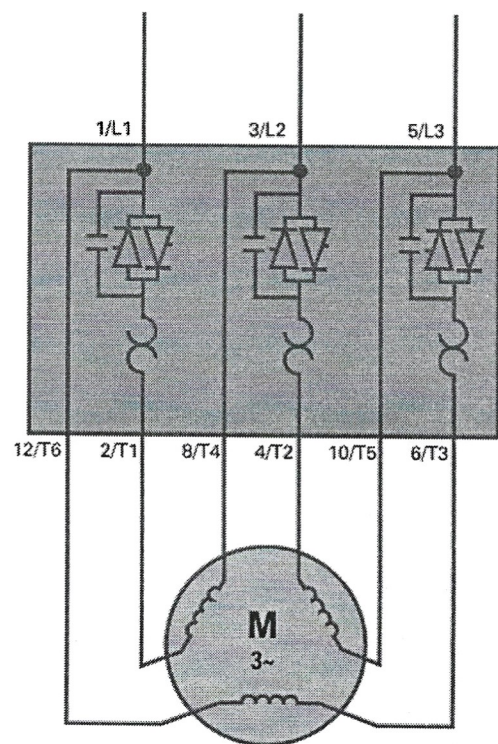
I/O

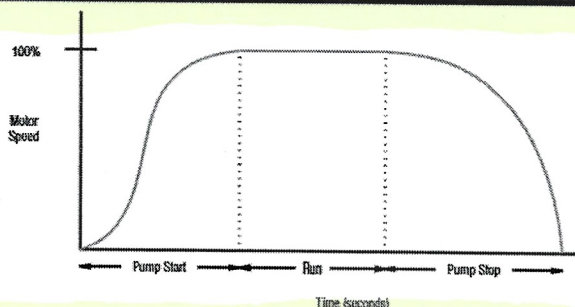
- 2 Inputs
- 4 Configurable Auxiliary Contacts

Line Connection

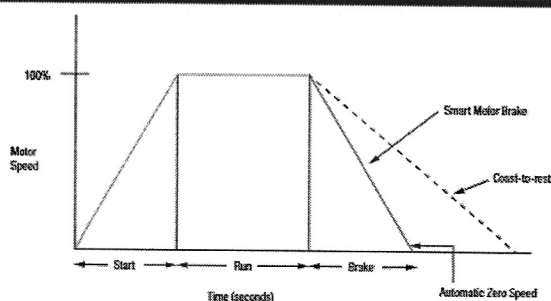


Delta Connection

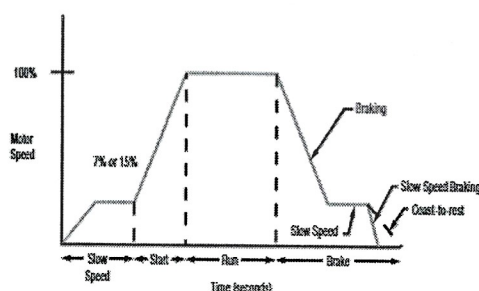


Optional Modes of Operation
Pump Control - Start and Stop (Option "PFB") ①


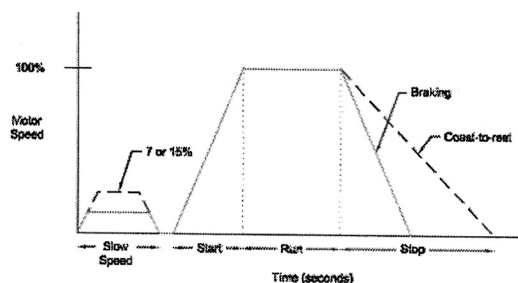
This option is used to reduce surges during the starting and stopping of a centrifugal pump by smoothly accelerating and decelerating the motor. The microprocessor analyzes the motor variables and generates commands which control the motor and reduce the possibility of surges occurring in the system. The pump control module also provides a built-in anti-backspin timer.

Smart Motor Brake (Option "PFD") ①


This option provides motor braking for applications that require the motor to stop faster than a coast to rest. Braking control, with automatic zero speed shut off, is fully integrated into the compact design of the PF controller. This design facilitates a clean, straight forward installation and eliminates the requirement for additional hardware such as braking contactors, resistors, timers, and speed sensors. The microprocessor based braking system applies braking current to a standard squirrel-cage induction motor. The strength of the braking current is programmable from 150...400% of full-load current.

Accu-Stop (Option "PFD") ①


This option is used in applications requiring controlled position stopping. During stopping, braking torque is applied to the motor until it reaches preset slow speed (7% or 15% of rated speed) and holds the motor at this speed until a stop command is given. Braking torque is then applied until the motor reaches zero speed. Braking current is programmable from 0...400% of full-load current. Slow Speed Current is programmable from 0...450% of full-load current. Slow speed can be programmed for either 7% (low) or 15% (high).

Slow Speed with Braking (Option "PFD") ①


Slow Speed with Braking is used on applications that require slow speed (in the forward direction) for positioning or alignment and also require braking control to stop. Slow speed adjustments are 7% (low) or 15% (high) of rated speed. Slow speed acceleration current is adjustable from 0...450%. Slow speed running current is adjustable from 0...450% of full-load current. Braking current is adjustable from 0...400%.

① Not intended to be used as an emergency stop. Refer to the applicable standards for emergency stop requirements.

Description of Features

Electronic Motor Overload Protection

The PF Softstarter controller incorporates, as standard, electronic motor overload protection. This overload protection is accomplished electronically with an I²t algorithm. When coordinated with the proper short circuit protection, overload protection is intended to protect the motor, motor controller, and power wiring against overheating caused by excessive overcurrent. The PF Softstarter controller meets applicable requirements as a motor overload protective device. The controller's overload protection is programmable, providing the user with flexibility. The overload trip class consists of either OFF, 10, 15, 20 or 30 protection. The trip current is programmed by entering the motor full-load current rating, service factor, and selecting the trip class. Thermal memory is included to accurately model motor operating temperature. Ambient insensitivity is inherent in the electronic design of the overload.

Stall Protection and Jam Detection

Motors can experience locked-rotor currents and develop high torque levels in the event of a stall or a jam. These conditions can result in winding insulation breakdown or mechanical damage to the connected load. The PF Softstarter controller provides both stall protection and jam detection for enhanced motor and system protection. Stall protection allows the user to program a maximum stall protection delay time from 0...10 seconds. The stall protection delay time is in addition to the programmed start time and begins only after the start time has timed out. If the controller senses that the motor is stalled, it will shut down after the delay period has expired. Jam detection allows the user to determine the motor jam detection level as a percentage of the motor's full-load current rating. To prevent nuisance tripping, a jam detection delay time, from 0.0...99.0 seconds, can be programmed. This allows the user to select the time delay required before the PF Softstarter controller will trip on a motor jam condition. The motor current must remain above the jam detection level during the delay time. Jam detection is active only after the motor has reached full speed.

Underload Protection

Utilizing the underload protection of the PF Softstarter controller, motor operation can be halted if a drop in current is sensed. The PF Softstarter controller provides an adjustable underload trip setting from 0...99% of the programmed motor full-load current rating with an adjustable trip delay time of 0...99 seconds.

Undervoltage Protection

The PF Softstarter controller's undervoltage protection will halt motor operation if a drop in the incoming line voltage is detected. The undervoltage trip level is adjustable as a percentage of the programmed line voltage, from 0...99%. To eliminate nuisance trips, a programmable undervoltage trip delay time of 0...99 seconds can also be programmed. The line voltage must remain below the undervoltage trip level during the programmed delay time.

Overvoltage Protection

If a rise in the incoming line voltage is detected, the PF Softstarter controller's overvoltage protection will halt motor operation. The overvoltage trip level is adjustable as a percentage of the programmed line voltage, from 0...199%. To eliminate nuisance trips, a programmable overvoltage trip delay time of 0...99 seconds can also be programmed. The line voltage must remain above the overvoltage trip level during the programmed delay time.

Voltage Unbalance Protection

Voltage unbalance is detected by monitoring the 3-phase supply voltage

magnitudes in conjunction with the rotational relationship of the three phases. The controller will halt motor operation when the calculated voltage unbalance reaches the user-programmed trip level. The voltage unbalance trip level is programmable from 0...25% unbalance.

Excessive Starts Per Hour

The PF Softstarter controller allows the user to program the allowed number of starts per hour (up to 99). This helps eliminate motor stress caused by repeated starting during a short time period.

Metering

Power monitoring parameters include:

- 3-phase current
- 3-phase voltage
- Power in kW
- Power factor
- Motor thermal capacity usage
- Elapsed time
- Power usage in kWh

Note: The motor thermal capacity usage allows the user to monitor the amount of overload thermal capacity usage before the PF Softstarter controller's built-in electronic overload trips.

LCD Display

The PF Softstarter controller's three-line 16-character backlit LCD display provides parameter identification using clear, informative text. Controller set up can be performed quickly and easily without the use of a reference manual. Parameters are arranged in an organized four-level menu structure for ease of programming and fast access to parameters.

Keypad Programming

Programming of parameters is accomplished through a five-button keypad on the front of the PF Softstarter controller. The five buttons include up and down arrows, an Enter button, a Select button, and an Escape button. The user needs only to enter the correct sequence of keystrokes for programming the PF Softstarter controller.

Auxiliary Contacts

Four fully programmable hard contacts are furnished as standard with the PF Softstarter controller:

Aux #1, Aux #2, Aux #3, Aux #4:

- N.O./N.C.
- Normal/Up-to-Speed/External Bypass/Fault/Alarm

Ground Fault Input

The PF Softstarter can monitor for ground fault conditions. An external core balance current transformer is required for this function.

Tach Input

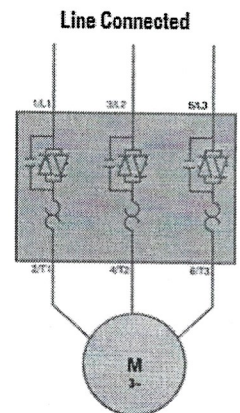
A motor tachometer is required for the Linear Speed Start mode. Please see the Specifications section page D49 for tachometer characteristics.

PTC Input

A motor PTC input can be monitored by the PF Softstarter. In the event of a fault, the PF Softstarter will shut down and indicate a motor PTC fault.

Open Type Controller - Line Connected ①⑤


Rated Voltage [V AC]	Motor Current (Amps) ②	Max. kW 50 Hz	Max. Hp 60 Hz ③	100...240V AC 50/60Hz Control Voltage ④	24V AC/DC Control Voltage ④
				Catalog Number	Catalog Number
400/415/460	1...5	2.2	3	PFS-0005-600V	PFS-0005-600V-024
	5...25	11	15	PFS-0025-600V	PFS-0025-600V-024
	8.6...43	22	30	PFS-0043-600V	PFS-0043-600V-024
	12...60	30	40	PFS-0060-600V	PFS-0060-600V-024
	17...85	45	60	PFS-0085-600V	PFS-0085-600V-024
	27...108	55	75	PFS-0108-600V	PFS-0108-600V-024
	34...135	75	100	PFS-0135-600V	PFS-0135-600V-024
	67...201	110	150	PFS-0201-600V	PFS-0201-600V-024
	84...251	132	200	PFS-0251-600V	PFS-0251-600V-024
	106...317	160	250	PFS-0317-600V	PFS-0317-600V-024
500/575	120...361	200	300	PFS-0361-600V	PFS-0361-600V-024
	160...480	250	400	PFS-0480-600V	PFS-0480-600V-024
	1...5	2.2	3	PFS-0005-600V	PFS-0005-600V-024
	5...25	15	20	PFS-0025-600V	PFS-0025-600V-024
	8.6...43	22	40	PFS-0043-600V	PFS-0043-600V-024
	12...60	37	50	PFS-0060-600V	PFS-0060-600V-024
	17...85	55	75	PFS-0085-600V	PFS-0085-600V-024
	27...108	75	100	PFS-0108-600V	PFS-0108-600V-024
	34...135	90	125	PFS-0135-600V	PFS-0135-600V-024
	67...201	132	200	PFS-0201-600V	PFS-0201-600V-024
	84...251	160	250	PFS-0251-600V	PFS-0251-600V-024
	160...317	200	300	PFS-0317-600V	PFS-0317-600V-024
	120...361	250	350	PFS-0361-600V	PFS-0361-600V-024
	160...480	315	500	PFS-0480-600V	PFS-0480-600V-024



- ① Controllers rated 108 A and greater are not equipped with line and load terminal lugs. See page D49 for terminal lug kits.
- ② Motor FLA rating must fall within specified current range for unit to operate properly. Special consideration should be given when using a motor with a potentially high starting current (greater than ten times motor FLA) with the PF in the "Full Voltage" starting mode. Contact Sprecher+Schuh technical support for further guidance.

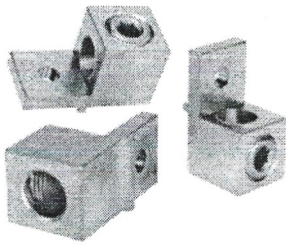
- ③ Hp ratings at motor terminal voltages for 200, 230, 460, and 575 line volts, respectively.
- ④ Separate 120V or 240V single phase is required for PF fan operation.
- ⑤ See page D48 if ordering factory installed PFB Pump Control or PFD Smart Motor Bake Control Modules, or other options.
- ⑥ 110/120V control power only. For 230V control power only, change catalog number suffix "-120" to "-230". Price remains the same.

Options - Field Modifications
Protective Modules ❶


 PFP-0085-600V	Current Rating	Description	Catalog Number
	5...85	600V Protective Module • PF (3 Lead) Line Connected Applications: Protective modules may be installed on the line and/or load side • PF (6 Lead) Delta Connected Applications: Protective modules must be installed on the line side only. • Clamping voltage range 705V...1750V, energy rating 290 joules	PFP-0085-600V
	108...480		PFP-0480-600V

EQUAL TO EATON EM539

Terminal Lug Kits (108...1250 A) ❷

	Current Rating (A)	Conductor Size	Total No. of Line Controller Terminal Lugs Possible Each Side		Pkg. Qty.	Catalog Number
			Line Side	Load Side		
	108...135	#6...250 MCM AWG	3	3	3	PNX-1120
	201...251	16 mm ² ...120mm ²	6	6		
	317...480	#4...500 MCM AWG 25 mm ² ...240MM ²	6	6		PNX-1240

IEC Terminal Covers ❸❹

	Description	Pkg. Qty.	Catalog Number
	IEC line or load terminal covers for 108...135A devices. Dead front protection	1	PFT-0135
	IEC line or load terminal covers for 201...251A devices. Dead front protection		PFT-0251
	IEC line or load terminal covers for 317...480A devices. Dead front protection.		PFT-0480

- ❶ The same protective module mounts on the line or load side of the PF Softstarter. For applications requiring both line and load side protection, two protective modules must be ordered.
- ❷ Line and Load terminals are provided as standard on enclosed PF Softstarters.
- ❸ PF 5...85A units have box lugs as standard. No additional lugs are required. The 1250 A device requires (1) CA6-L630 and (1) CA6-L860 per connection. When a multi-conductor lug is required, refer to the PF User Manual for appropriate lug catalog number.
- ❹ PFx-108...480 units include one terminal guard as standard.

Standard Features

Installation	Power Wiring	Standard squirrel-cage induction motor or a Wye-Delta, six-lead motor.
	Control Wiring	2- and 3-wire control for a wide variety of applications.
Setup	Keypad	Front keypad and backlit LCD display.
Starting and Stopping Modes		<ul style="list-style-type: none"> • Soft Start • Current Limit Start • Dual Ramp • Full Voltage • Linear Speed Acceleration • Preset Slow Speed • Soft Stop
Protection and Diagnostics		Power loss, line fault, voltage unbalance, excessive start/hour, phase reversal, undervoltage, overvoltage, controller temp, stall, jam, open gate, overload, underload.
Metering		Amps, Volts, kW, kWh, elapsed time, power factor, motor thermal capacity usage.
Alarm Contact		Overload, underload, undervoltage, overvoltage, unbalance, jam, stall, and ground fault
Status Indication		Stopped, starting, stopping, at speed, alarm, and fault.
Auxiliary Contacts		Four fully programmable contacts as normal/up-to-speed/external bypass/fault/alarm, (N.O./N.C.). On external bypass (N.O. only).

Optional Features

Pump Control		Helps reduce fluid surges in centrifugal pumping systems during starting and stopping period. Starting time is adjustable from 0...30 seconds. Stopping time is adjustable from 0...120 seconds.
Braking Control	Smart Motor Brake	Provides motor braking without additional equipment for applications that require the motor to stop quickly. Braking current is adjustable from 0...400% of the motor's full load current rating.
	Accu-Stop	Provides controlled position stopping. During stopping, braking torque is applied to the motor until it reaches preset slow speed (7% or 15% of rated speed) and holds the motor at this speed until a stop command is given. Braking torque is then applied until the motor reaches zero speed. Braking current is programmable from 0...450% of full load current.
	Slow Speed with Braking	Used on applications that require slow speed (in the forward direction) for positioning or alignment and also require braking control to stop.

Technical Information

Electrical Ratings				
Power Circuit	UL/CSA/NEMA		IEC	
	Rated Operation Voltage		200...600V AC (-15%, +10%)	200...500V
	Rated Insulation Voltage		N/A	500V
	Rated Impulse Voltage		N/A	6000V
	Dielectric Withstand		2200V AC	2500V
	Repetitive Peak Inverse Voltage Rating		1600V	1600V
	Operating Frequency		50/60 Hz	
	Utilization Category	5...480 A	MG 1	AC-53B:3.0-50:1750
		625...1250 A	MG 1	AC-53B:3.0-50:3550
	Protection Against Electrical Shock	5...85 A	NA	IP20
		108...480 A		IP2X (with terminal covers)
625...1250 A		IP00 (open device)		
DVT/DT Protection		RC Snubber Network		
Transient Protection		Metal Oxide Varistors: 220 Joules		
Control Circuit	UL/CSA/NEMA		IEC	
	Rated Operational Voltage	5...480 A	100...240V AC or 24V AC/DC (-15%, +10%)	
		625...1250 A	110/120V AC and 230/240V AC	
	Rated Insulation Voltage		N/A	240V
	Rated Impulse Voltage		N/A	3000V
	Dielectric Withstand		1600V AC	2000V
	Operating Frequency		50/60 Hz	
	Input on state voltage minimum (terminals 15-18)		85V AC, 19.2V DC / 20.4V AC	
	Input on state current (terminals 15-18)		20 mA @ 120V AC/40 mA @ 240V AC, 7.6 mA @24V AC/DC	
	Input off state voltage maximum (terminals 15-18)		50V AC, 10V DC / 12V AC	
	Input off state current @ Input off state voltage (terminals 15-18)		<10 mA AC, <3 mA DC	

Electrical Ratings

SCDP Performance 200...600V

Type 1 ④

SCPD List ①	Device Rating	Max. Standard Available Fault	Max. Standard Fuse (A) ②	Max. Standard Available Fault	Max. Circuit Breaker (A)	Max. High Fault	Max. Fuse (A) ③
	5	5 kA	20	5 kA	20	70 kA	10
	25	5 kA	100	5 kA	100	70 kA	50
	43	10 kA	150	10 kA	150	70 kA	90
	60	10 kA	225	10 kA	225	70 kA	125
	85	10 kA	300	10 kA	300	70 kA	175
	108	10 kA	400	10 kA	300	70 kA	200
	135	10 kA	500	10 kA	400	70 kA	225
	201	18 kA	600	18 kA	600	70 kA	350
	251	18 kA	700	18 kA	700	70 kA	400
	317	30 kA	800	30 kA	800	69 kA	500
	361	30 kA	1000	30 kA	1000	69 kA	600
	480	42 kA	1200	42 kA	1200	69 kA	800
	625	42 kA	1600	42 kA	1600	74 kA	1600
	780	42 kA	1600	42 kA	2000	74 kA	1600
	970	85 kA	2500	85 kA	2500	85 kA	2500
	1250	85 kA	3000	85 kA	3200	85 kA	3000
	8.7	5 kA	35	5 kA	35	70 kA	17.5
	43	5 kA	150	5 kA	150	70 kA	90
	74	10 kA	300	10 kA	300	70 kA	150
	104	10 kA	400	10 kA	400	70 kA	200
	147	10 kA	400	10 kA	400	70 kA	200
	187	10 kA	600	10 kA	500	70 kA	300
	234	10 kA	700	10 kA	700	70 kA	400
	348	18 kA	1000	18 kA	1000	70 kA	600
	435	18 kA	1200	18 kA	1200	70 kA	800
	549	30 kA	1600	30 kA	1600	69 kA	1000
	625	30 kA	1600	30 kA	1600	69 kA	1200
	831	42 kA	1600	30 kA	1600	69 kA	1600
	850	42 kA	1600	42 kA	2000	74 kA	1600
	900	42 kA	1600	42 kA	2000	74 kA	1600
	1200	85 kA	3000	85 kA	3200	85 kA	3000
	1600	85 kA	3000	85 kA	3200	85 kA	3000

Line Device Operational Current Rating (A)

Delta Device Operational Current Rating (A)

Short Circuit Protection

Semi-Conductor Fusing

SCCR ④

Maximum FLC

Device Rating	Max. Standard Available Fault	Max. Ampere tested - North American Style	Max. Ampere Tested - European Style
108	70 kA	A070URD33xxx500	6.9 gRB 73xxx400 6.6URD33xxx500
135	70 kA	A070URD33xxx500	6.9 gRB 73xxx400 6.6URD33xxx500
201	70 kA	A070URD33xxx700	6.9 gRB 73xxx630 6.6URD33xxx700
251	70 kA	A070URD33xxx700	6.9 gRB 73xxx630 6.6URD33xxx700
317	70 kA	A070URD33xxx900	6.9 gRB 73xxx800 6.6URD33xxx900
361	70 kA	A070URD33xxx900	6.9 gRB 73xxx800 6.6URD33xxx900
480	70 kA	A070URD33xxx1250 A100URD73xxx1250	9 URD 73xxx1250 6.6URD33xxx1250
625	70 kA	A070URD33xxx1400	6.6URD33xxx1400
780	70 kA	A070URD33xxx1400	6.6URD33xxx1400
970	85 kA	Two fuses in parallel A070URD33xxx1250	Two fuses in parallel 6.6URD33xxx1250
1250	85 kA	Two fuses in parallel A070URD33xxx1250	Two fuses in parallel 6.6URD33xxx1250

① Consult local codes for proper sizing of short circuit protection.

② Non-time delay fuses (K5 – 5 ...480V (8.7...831 A) devices; Class L – 625...1250V (850...1600 A) devices).

③ High capacity fault rating when used with time delay class CC, J, or L fuses.

④ Type 1 performance/protection indicates that, under a short-circuit condition, the fused or circuit breaker-protected starter shall cause no danger to persons or installation but may not be suitable for further service without repair or replacement.

Electrical Ratings

Power Requirements	Control Module	1...480 A	120...240V AC	Transformer	75 VA	
			24V AC	Transformer	130 VA	
			24V DC	Inrush Current	5 A	
				Inrush Time	250 ms	
				Transient Watts	60 W	
				Transient Time	500 ms	
				Steady State Watts	24 W	
				Minimum Power Supply	FLEX6024A	
			625...1250 A	751 VA (recommended 800 VA)		
			Heatsink Fan(s) (A) ❶	5...135 A, 20 VA		
201...251 A, 40 VA						
317...480 A, 60 VA						
625...1250 A, 150 VA						
Steady State Heat Dissipation with Control and Fan Power (Watts)	Controller Rating (A)	5	70			
		23	70			
		43	81			
		60	97			
		85	129			
		108	91			
		135	104			
		201	180			
		251	198			
		317	225			
		361	245			
		480	290			
		625	446			
		780	590			
		970	812			
		1250	1222			
		Auxiliary Contacts 19/20 (Aux #1) 29/30 (Aux #2) 31/32 (Aux #3) 33/34 (Aux #4)	Type of Control Circuit	Electromagnetic relay		
Number of Contacts	1					
Type of Contacts	programmable N.O./N.C.					
Type of Current	AC					
Rated Optional Current	3 A @ 120V AC, 1.5 A @ 240V AC					
Conventional Thermal Current I_{th}	5 A					
Make/Break VA	3600/360					
Utilization Category	AC-15					
PTC Input Ratings	Response Resistance	3400 $\Omega \pm 150 \Omega$				
	Reset Resistance	1600 $\Omega \pm 100 \Omega$				
	Short-Circuit Trip Resistance	25 $\Omega \pm 10 \Omega$				
	Max. Voltage at PTC Terminals ($R_{PTC} = 4k$)	< 7.5V				
	Max. Voltage at PTC Terminals ($R_{PTC} = \text{open}$)	30V				
	Max. No. of Sensors	6				
	Max. Cold Resistance of PTC Sensor Chain	1500 Ω				
Tach input	Response Time	800 ms				
	0...5V DC, 4.5V DC = 100% Speed					

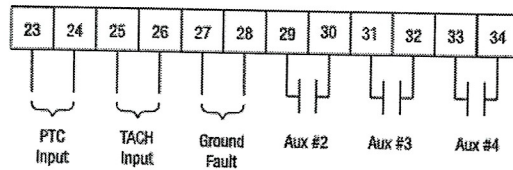
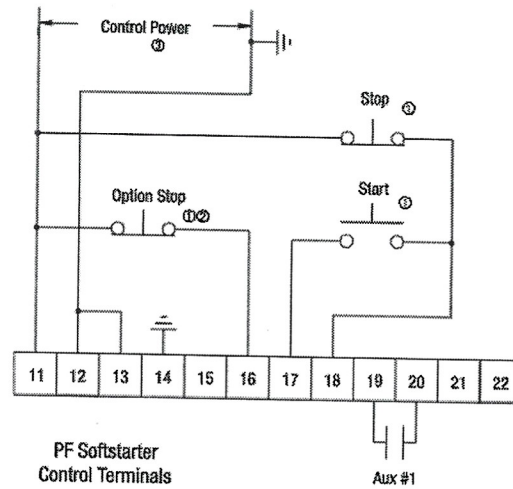
Environmental

Operating Temperature Range	-5...50 °C (23...122 °F) (open)
Storage and Transportation Temperature Range	-5...40 °C (23...104 °F) (enclosed)
Altitude	-20...+75 °C (-4...167 °F)
Humidity	2000 m (6560 ft)
Pollution Degree	5...95% (non-condensing)
	2

❶ For devices rated 5...480 A, heatsink fans can be powered by either 110/120V AC or 220/240V AC.
For devices rated 625...1250 A, heatsink fans can only be powered by 110/120V AC.

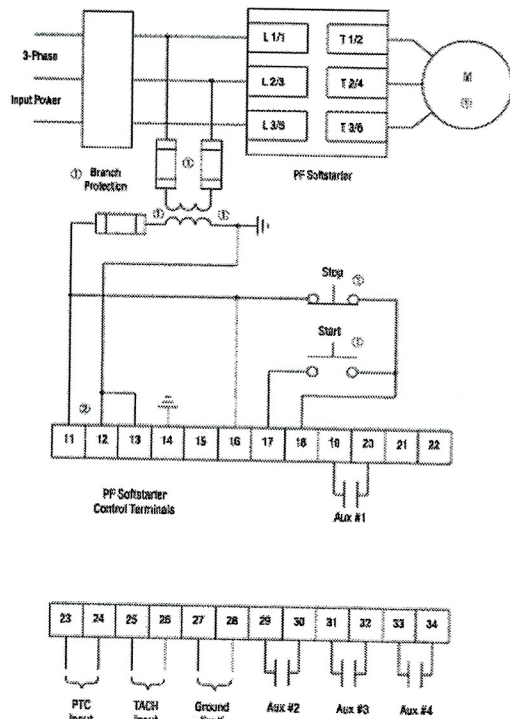
Mechanical			
Resistance to Vibration	Operational	All	1.0 G Peak, 0.15 mm (0.006 in.) displacement
	Non-Operational	5...480 A	2.5 G Peak, 0.38 mm (0.015 in.) displacement
		625...1250 A	1.0 G Peak, 0.15 mm (0.006 in.) displacement
Resistance to Shock	Operational	5...85 A	15 G
		108...480 A	5.5 G
		625...1250 A	4 G
	Non-Operational	5...85 A	30 G
		108...480 A	25 G
		625...1250 A	12 G
Construction	Power Poles	5...85 A	Heatsink thyristor modular design
	Power Poles	108...1250 A	Heatsink hockey puck thyristor modular design
	Control Modules		Thermoset and Thermoplastic Moldings
	Metal Parts		Plated Brass, Copper or Painted Steel
Terminals	Power Terminals	5...85 A	Cable size – Line Upper – 2.5...95 mm ² (14...3/0 AWG) Line Lower – 0.8...2.5 mm ² (18...14 AWG) Load Upper – 2.5...50 mm ² (14...1 AWG) Load Lower – 0.8...2.5 mm ² (18...14 AWG) Tightening torque – 14.7 N·m (130 lb.-in.) Wire strip length – 18...20 mm (0.22...0.34 in.)
		108...135 A	One M10 x 1.5 diameter hole per power pole
		201...251 A	Two M10 x 1.5 diameter holes per power pole
		317...480 A	Two M12 x 1.75 diameter holes per power pole
		625...1250 A	Two 13.5 mm (0.53 in.) diameter holes per power pole
	Power Terminal Markings		NEMA, CENELEC EN50 012
	Control Terminals	M3 screw clamp	Clamping yoke connection
Other			
EMC Emission Levels	Conducted Radio Frequency Emissions		Class A
	Radiated emissions		Class A
EMC Immunity Levels	Electrostatic Discharge		B kV Air Discharge
	Radio Frequency Electromagnetic Field		Per EN/IEC 60947-4-2
	Fast Transient		Per EN/IEC 60947-4-2
	Surge Transient		Per EN/IEC 60947-4-2
Overload Characteristics	Current Range		Line
		5	1...5
		25	5...25
		43	8.6...43
		60	12...60
		85	17...85
		108	27...108
		135	34...135
		201	67...201
		251	84...251
		317	106...317
		361	120...361
		480	160...480
		625	208...625
		780	260...780
		970	323...970
		1250	416...1250
			Delta
			1.7...9
			8.6...43
			14.8...75
			20.8...104
			29.4...147
			47...187
			59...234
			116...348
			145...435
			183...549
			208...625
			277...831
			283...850
			300...900
			400...1200
			533...1600
Certifications	Trip Classes		10, 15, 20, and 30
	Trip Current Rating		117% of Motor FLC
	Number of Poles		3
Certifications	Open Type Controllers		CE Marked Per Low Voltage Directive 73/23/EEC, 93/68/EEC
			UL Listed (File No. E195687)

Soft Stop, Pump Control and Braking Wiring Diagram



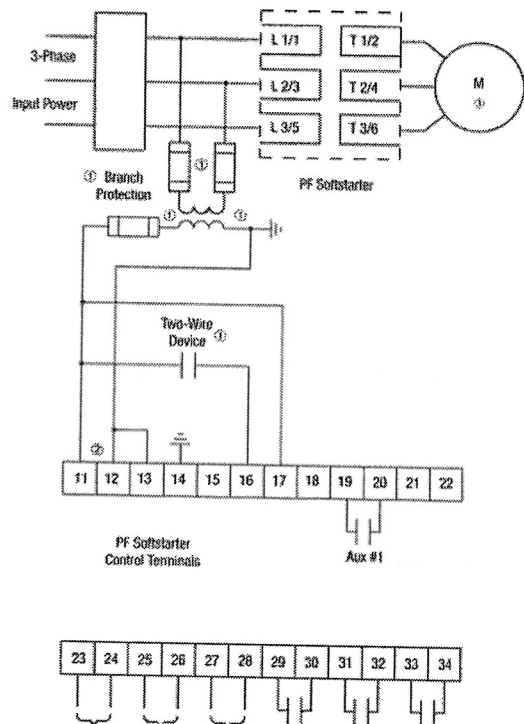
① Customer supplied.

3-Wire Control



① Customer supplied.

2-Wire Control



Approximate Dimensions and Shipping Weights

Open Type Controllers

Dimensions are in millimeters (inches). Dimensions not intended for manufacturing purposes.

Rating (A)	Height	Width	Depth	Weight
5...85	321 (12.6)	150 (5.9)	203 (8.0)	5.7 kg (12.6 lbs)
108...135	443.7 (17.47)	196.4 (7.74)	205.2 (8.08)	15.0 kg (33 lbs)
201...251	560 (22.05)	225 (8.86)	253.8 (9.99)	304 kg (67 lbs)
317...480	600 (23.62)	290 (11.42)	276.5 (10.89)	45.8 kg (101 lbs)
625...780	1041.1 (41.0)	596.9 (23.5)	346.2 (13.63)	179 kg (395 lbs)
970...1250	1041.1 (41.0)	596.9 (23.5)	346.2 (13.63)	224 kg (495 lbs)

PFS Softstarters

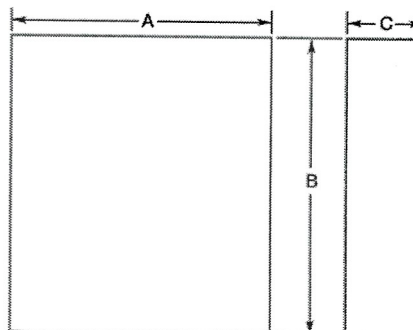
Enclosed Type Line-Connected Controllers

IMPORTANT NOTE:

Factory-installed options may affect enclosure size requirements.

Exact dimensions can be obtained after order entry.

Please consult your local Sprecher + Schuh representative.



Controller Rating (A)	Disconnect Rating (A)	IP65 (Type 4/12)		
		Height B	Width A	Depth C
Non-Combination Controller				
5	—	610 (24)	508 (20)	254 (10)
25	—	610 (24)	508 (20)	254 (10)
43	—	610 (24)	508 (20)	254 (10)
60	—	610 (24)	508 (20)	254 (10)
85	—	610 (24)	508 (20)	254 (10)
108	—	762 (30)	610 (24)	305 (12)
135	—	762 (30)	610 (24)	305 (12)
201	—	914 (36)	762 (30)	406 (16)
251	—	914 (36)	762 (30)	406 (16)
317	—	1524 (60)	914 (36)	406 (16)
361	—	1524 (60)	914 (36)	406 (16)
480	—	1524 (60)	914 (36)	406 (16)
625	—	2286 (90)	1829 (72)	508 (20)
780	—	2286 (90)	1829 (72)	508 (20)
970 ①	—	2286 (90)	1829 (72)	508 (20)
1250 ①	—	2286 (90)	1829 (72)	508 (20)

① 970...1250 rated devices are only available as Type 1 and require a door-mounted fan, capable of delivering 204 cfm.

Flexible Switching Mode Power Supplies

Input Voltage AC	Input Voltage Selection	Watts	Output VDC	Output Amps @40°C @60°C		Power Good Contact ⑤	Catalog Number ④
Single Phase							
115...230	Automatic	36...72	24	2 ①	1.5 ②	~	FLEX6024A
115/230	Selectable ③	96/120		5	4	Yes	FLEX9024A
115/230	Selectable ③	120/180		7.5	5	Yes	FLEX17024A
115/230	Selectable ③	240/336		14	10	Yes	FLEX28024A
115/230	Bridge only ③	480/600		25	20	Yes	FLEX50024A
Two Phase							
230/400...500	Selectable ③	96/120	24	5	4	Yes	FLEX9024B
230/400...500	Selectable ③	120/180		7.5	5	Yes	FLEX17024B
230/400...500	Selectable ③	240/336		14	10	Yes	FLEX28024B
Three Phase							
400...500	Automatic	480...600	24	25	20	Yes	FLEX50024B

EQUAL TO EATON
P56240F



Norms and certifications

The CE mark in According to EMC 2004/108/EC and the Low voltage directive 2006/95/EC

EMC Immunity

EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-6-2

Electrical Safety

According to UL508, UL file E308682, IEC/EN 60950 (VDE 0805) e EN 50178 (VDE 0160) for assembling device. The unit must be installed according to IEC/EN 60950. Input / Output separation: SELV EN60950-1 and PELV EN 60204-1. Double or reinforced insulation.

EMC Emission:

EN 61000-6-4, EN61000-3-2

Standards Conformity

EN 60204-1 Safety of Electrical Equipment Machines

- ① 115V Amp Rating shown; 3A @ 230V (72 W)
- ② 115V Amp Rating shown; 2.5@ 230V @ 50°C (60 W)
- ③ Input voltage selectable via slide switch located below input terminals inside metal casing.

- ④ With the exception of Flex6024A, all models are capable of being set to hiccup mode, manual reset or Continuous mode via factory supplied jumper.
- ⑤ The NO Power Good signal contact Closes when the output power is OK and Opens when the output voltage falls below 20V DC.
- ⑥ For 115V Input voltage jumper is required between "bridge only" terminals.