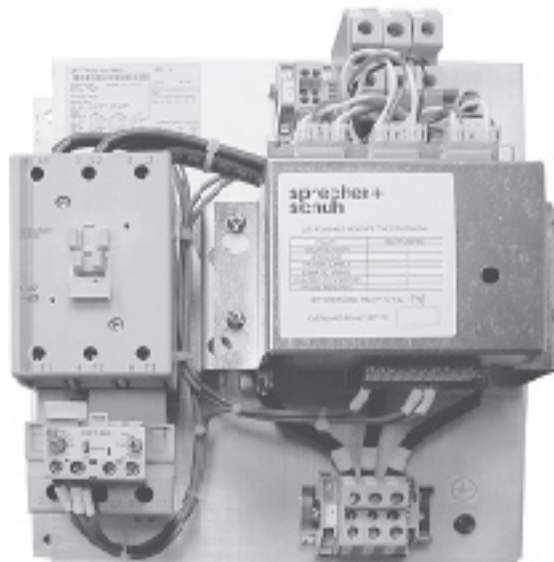


Hydraulic Elevator Softstarter Series PES User Manual



Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards. The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Sprecher + Schuh does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication. There are important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication. Reproduction of the contents of this copyrighted publication, in whole or part, Without written permission of Sprecher + Schuh is prohibited.

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Manual Conventions

Throughout this manual we use notes to make you aware of safety considerations:

ATTENTION

Identifies information about practices or circumstances that can lead to personal injury or death, property damage or economic loss.

Attention statements help you to:

- identify a hazard
 - avoid a hazard
 - recognize the consequences
-

IMPORTANT

Identifies information that is critical for successful application and understanding of the product.

Approvals & Standards

UL/cUL

The Series PES Softstarters are UL Listed and cUL Listed (Canadian Standards per UL 508 and CSA C22.2 No. 14-95 as solid state motor controllers in File E96956. They are also UL Listed and cUL Listed per UL 508 and CAN/CSA B44.1-96 as elevator controllers in File E3125.

EU/IEC

European Communities (EC) Directive Compliance

If this product has the CE mark it is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives

EMC Directive

This product is tested to meet the Council Directive 89/336/EC Electromagnetic Compatibility (EMC) by applying the following standards, in whole or in part, documented in a technical construction file:

- EN 60947-4-2 EMC — Product Standard

This product is intended for use in an industrial environment.

Low Voltage Directive

This product is tested to meet the Council Directive 73/23/EEC Low Voltage.

This equipment is classified as open equipment and must be mounted in an enclosure during operation to provide safety protection.

Product Overview

The PES Hydraulic Elevator Softstarter is designed to operate a 3 phase Wye-Delta motor with motor connections made on an inside-the-delta configuration. The PES is a current limiting starter that reduces

- high current surges of weak electrical systems,
- the starting torque and the systems mechanical stress,
- the voltage and current spikes caused by conventional Wye-Delta starters,
- the mechanical and electrical strain on the motor, and
- the system maintenance and downtime.

Installation Information

Inspection

Before installing the controller, make a complete visual check of the controller for damage in shipment or handling. Claims for damage or missing parts must be made to the carrier as soon as possible after receipt of shipment.

Mounting

The Series PES controller is shipped as an open device. No special mounting plate or cooling requirement restrictions are necessary. The operating temperature of the controller is 0°C...50°C (32° F...122° F) (open) or 0°C...40°C (32° F...104° F) (enclosed).

Electrical Ratings

Motor Voltage	Current Rating	S+S Catalog Number
200-240VAC, 50/60 Hz	52 Amp	PESC-52-240V
	64 Amp	PESC-64-240V
	78 Amp	PESC-78-240V
	104 Amp	PESC-104-240V
	146 Amp	PESC-146-240V
	168 Amp	PESC-168-240V
380-480V VAC, 50/60Hz	52 Amp	PESC-52-480V
	64 Amp	PESC-64-480V
	78 Amp	PESC-78-480V
	104 Amp	PESC-104-480V
	146 Amp	PESC-146-480V
	168 Amp	PESC-168-480V
500-600 VAC, 50/60Hz	52 Amp	PESC-52-600V
	64 Amp	PESC-64-600V
	78 Amp	PESC-78-600V
	104 Amp	PESC-104-600V
	146 Amp	PESC-146-600V

Wiring

The PES Softstarter receives its control power from a separate 100..120VAC 50/60 Hz or (special order) 200...240V VAC 50/60 Hz source. The line and load connections and starter control wiring terminations are described in connection drawings.

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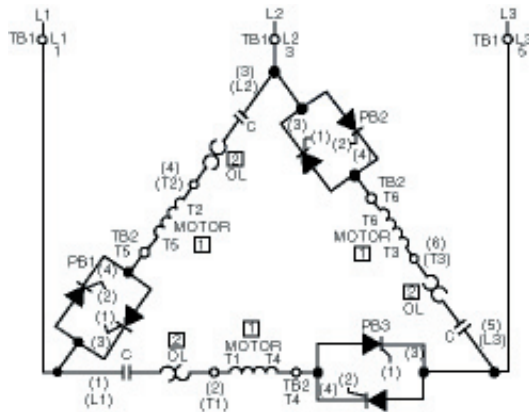
The PES Softstarter must only be connected only to a Wye-Delta motor with either six (6) or twelve (12) leads.

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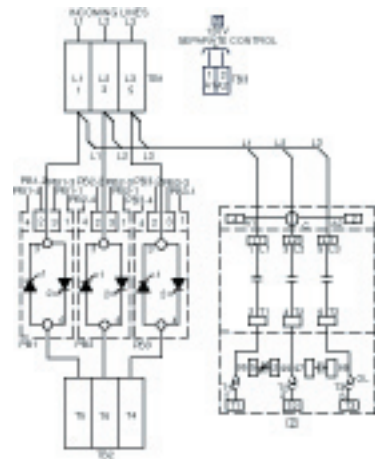


Hazardous voltages are present at the load terminals of the controller when it is turned off. Warning labels must be attached to the motor terminal box, the controller enclosure, and the control station. Additional equipment and circuitry must be included to provide automatic isolation.

Power Wiring

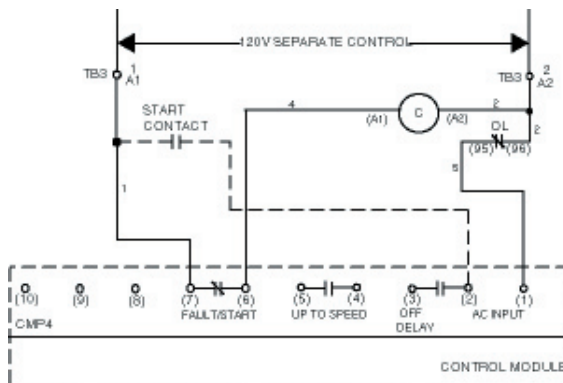


Schematic



Wiring Diagram

Control Wiring



Control Wiring Schematic



Control Connection Block

Adjustments - Dip Switch and Overload Settings

ATTENTION



Disconnect power before servicing dip switch settings.

IMPORTANT

Dip Switch and overload relay settings should be set properly prior to energizing the unit.

Dip Switch Settings

There are four (4) dip switch adjustments that will change the motor starting characteristics. Use a small screwdriver to adjust the dip switch to the preferred settings. The dip switch is located on the right side of the control board housing. Switches are numbered left to right when facing the switch, beginning with switch #1. Switch #8 is unused.



Dip Switches

Start Time

The amount of time in seconds the starter will restrict the inrush to a specified current limit to accelerate the motor. If the motor is not up to speed within the time setting, the soft starter goes to full voltage at that time.

Start Time (Seconds)		
Setting In Seconds	Dip Switch 1	Dip Switch 2
0 (Full Voltage Immediately)	Off	Off
1	On	Off
2	Off	On
3	On	On

Current Limit

This setting restricts by percentage the amount of inrush current the motor received during the specified start time.

Current Limit			
Setting in %	Dip Switch 3	Dip Switch 4	Dip Switch 5
150%	Off	Off	Off
200%	On	Off	Off
250%	Off	On	Off
300%	On	On	Off
325%	Off	Off	On
350%	On	Off	On
400%	Off	On	On
450%	On	On	On

Adjustments - Dip Switch and Overload Settings *(continued)*

Half Second "Hold-In" (Off) Delay

When enabled, if the power is removed the starter will continue to operate normally for 1/2 second. After the 1/2 second, the starter will shut down normally.

Half Second "Hold-In" Delay	
Setting	Dip Switch 6
Disabled	Off
Enabled	On

Phase Reversal "CBA" Checking

When enabled, three phase input power will be verified before starting. If input power phasing is detected to be incorrect, the start will be aborted and the Fault LED indicator will flash seven (7) times.

Phase Reversal "CBA" Checking	
Setting	Dip Switch 7
Disabled	Off
Enabled	On

Overload Settings

Wye-Delta (Y Δ) applications (relay carrying motor phase current): Follow the application service factor instructions, except divide the motor nameplate full load current amperes by 1.73. Below is a table showing Overload Relay (OLR) settings for various Motor Full Load Ampere ratings (Motor).

21	12	47	27	73	42	98	57	124	72	150	87
23	13	49	28	75	43	100	58	126	73	152	88
25	14	51	29	77	45	102	59	128	74	154	89
27	16	53	31	79	46	104	60	130	75	156	90
29	17	55	32	81	47	106	61	132	76	158	91
31	18	57	33	83	48	108	62	134	77	160	92
33	19	59	34	85	49	110	64	136	79	162	94
35	20	61	35	87	50	112	65	138	80	164	95
37	21	63	36	89	51	114	66	140	81	166	96
39	23	65	38	91	53	116	67	142	82		
41	24	67	39	93	54	118	68	144	83		

Troubleshooting

ATTENTION



Disconnect the controller from the motor before measuring insulation resistance (IR) of the motor windings. Voltages used for insulation resistance testing can cause SCR failure. Do not make any measurements on the controller with an IR tester (megger).

ATTENTION



Hazardous voltage is present in the motor circuit even when the controller is off. To avoid shock hazard, disconnect main power before working on the controller, motor, or control devices such as Start-Stop push buttons. Properly qualified personnel, using appropriate local safety work practices and precautionary measures, must perform procedures that require parts of the equipment to be energized during troubleshooting, testing, etc.

Fault Indication

The PES Softstarter will monitor a number of operating conditions. Some conditions must be verified before SCR firing and others while starting and operating the motor. If a fault occurs, the LED will flash to indicate which type of fault that occurred. The LED will cycle between flashing and a two second delay until control power is removed. All faults will prevent the unit from starting the motor.

LED Functionality	
LED Flashes	Fault Type
2	Shorted SCR/Open Load
3	Line/Phase Loss
4	Power Supply Loss
5	Erratic Firing
6	Swapped SCR Connectors
7	Phase Reversal

Fault Explanations

Shorted SCR/Open Load

Prior to every start, the unit will check all SCRs for shorts and unit load connections to the motor. If there is a shorted SCR and/or open load, the start will be aborted and a shorted SCR/Open Load fault will be indicated. This prevents damage from phase imbalance.

Line/Phase Loss

The unit will not attempt a start if there is a single phase condition on the line. This protects from motor burnout during single phase starting.

Power Supply Loss

The unit will monitor control power from start to stop. If power is lost abnormally, a power supply loss fault indication will be given.

Erratic Firing

While starting, the stability of the start will be monitored. If the controller detects instability in the firing sequence, the start will be aborted and an erratic firing fault will be indicated.

Swapped SCR Connectors

The unit will verify the three gate load connections before initiating motor start. If it is determined that any connectors have been switched, the start will be aborted and a swapped connector fault indicated.

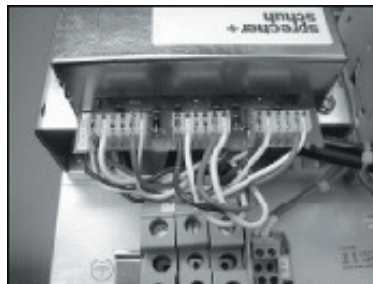
Phase Reversal

When phase reversal “CBA” protection is enabled, the unit will not start if line side connections are wired incorrectly. This feature can be selected on or off via a dipswitch adjustment.

Troubleshooting Chart

Below is a comprehensive troubleshooting guide for the Series PES Softstarter. For additional help in resolving problems, contact your nearest Sprecher + Schuh sales office.

Series PES Troubleshooting Guide			
Problem	LED Flashes	Possible Cause	Remedy
Motor fails to start and	3 Flashes	Phase Loss (Open Line)	Check power connections to unit and, confirm that proper three phase voltage is present in panel.
	2 Flashes	Shorted SCR	Perform continuity check across the power poles with CMP1, CMP2, and CMP3 connections removed. Measurements should exceed 10K for good power pole.
	2 Flashes	Lost or loose motor connection	Check motor connections for tightness and continuity.
	4 Flashes	Loss of main 3-phase power	Check for 3-phase power at incoming terminals restore if necessary.
	6 Flashes	Swapped SCR connections	Check CMP1, CMP2 and CMP3 that they are in proper order on the control module.
	7 Flashes	Phase reversal	Check phase rotation on line.
	No Flashing	If none of above	Replace control module.
If Fault contactor fails to close terminals module.	No Flashing	Failed fault contactor	Apply control voltage to PES Softstarter then check for voltage across contactor coil terminals A1-A2. appropriate voltage is across coil replace
	No Flashing	Failed relay on control board	Remove control voltage to PES Softstarter, and measure continuity between control board 6 and 7 (fault/start). If open, replace control
Motor attempts to	5 Flashes	Erratic firing of SCR's	Check CMP1, CMP2, and CMP3 connections for



Connectors CMP1, CMP2, and CMP3

Product Specifications and Ratings

Voltage Ratings (Power)

Line Voltage Rating (+10%, -15%) 50/60 Hz (Also Rated Insulation Voltage)	200-240V VAC 380-480V VAC 500-600 VAC
Dielectric Withstand Ratings	2200V (UL/cUL), 2500V IEC
Repetitive Peak Voltage Ratings	1200V for 240V Units 1400V for 480V Units 1600V for 600V Units
Operating Frequency	50/60 Hz
Rated Impulse Voltage	3.4 kV

Basic Ratings

	PESC-52-...	PESC-64-...	PESC-78-...	PESC-104-...	PESC-146-...	PESC-168-...	
Max. Operating Current (Line Current) (Also Max. FLA of Motor)	52	64	78	104	146	168	
Maximum Delta Amps	30	37	45	60	84	97	
Minimum Line Amps	1	1	2	2	2	2	
Max. Class J Fuse Amps	175	200	225	450	450	600	
Maximum Unit Heat Dissipation (Watts)	100	120	145	190	266	305	
Overload Setting Range (Amps)	12-30	12-37	14-45	26-85	26 - 85	66 - 110	
Available Fault Current	10,000A	10,000A	10,000A	10,000A	10,000A	10,000A	
Tightening Torque	Line Side	19 lb.-in.	22 lb.-in.	22 lb.-in.	22 lb.-in.	133 lb.-in.	275 lb.-in.
	Load Side	12.8 lb.-in.	19 lb.-in.	19 lb.-in.	19 lb.-in.	22 lb.-in.	22 lb.-in.
	Overload	16 lb.-in.	14 lb.-in.	14 lb.-in.	35 lb.-in.	35 lb.-in.	150 lb.-in.
Wire Range (AWG)	Line Side	#14...#4	#14...1/0	#14...1/0	#14...1/0	#4...3/0	#6...400 mcm
	Load Side	#14...#8	#14...#8	#14...#6	#14...#4	#14...1/0	#14...1/0
	Overload	#14...#8	#14...#8	#14...#6	#14...#4	#14...#2	#1...1/0

Control Circuit Ratings

Control Voltage Range (+10%, -15%) 50/60 Hz	100-120 VAC 200-240V VAC (Special Order)
Rated Insulation Voltage	300V
Rated Impulse Voltage	3000V
Dielectric Withstand Ratings	1600V (UL/cUL), 2000V IEC
Operating Frequency	50/60 Hz
Control Power Requirements	120 ma @ 120VAC
Control Terminals Tightening Torque	5.3 lb.-in.
Wire Size Range (AWG)	#20...#12
Output Contacts Type	Electromagnetic Relay
Up to Speed Contact Ratings	3A 120V Operational 5A 120V Thermal (3600/360 VA Make/Break) Utilization Category AC15
Fault Contact Ratings	2A 120V Operational 2.5A 120V Thermal (2500/250 VA Make/Break) Utilization Category AC15

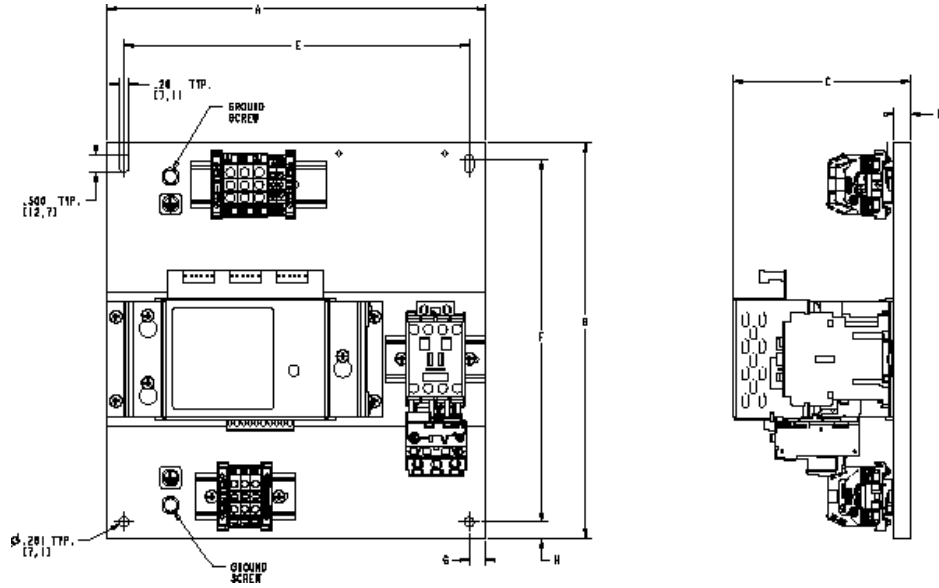
Control Module Auxiliaries

Rated Operational Voltage	250V AC
Rated Insulation Voltage	300V AC
Dielectric Withstand	1600V AC (UL/cUL), 2000V AC IEC
Operating Frequency	50/60 Hz
-4, -5 (K1, Up to Speed)	
Type of Control Circuit	Electromagnetic Relay
Number of Contacts	1
Type of Contacts	Normally Open (N.O.)
Type of Current	AC
Rated Operational Current	3 A @ 120V AC
Conventional Thermal Current I_{th}	5 A
Make VA/Break VA	3600/360
Utilization Category	AC15
-6, -7 (K2, Fault/Start)	
Type of Control Circuit	Electromagnetic Relay
Number of Contacts	1
Type of Contacts	Normally Closed (N.C.)
Type of Current	AC
Rated Operational Current	2 A @ 125V AC
Conventional Thermal Current I_{th}	2.5 A
Make VA/Break VA	2500/250
Utilization Category	AC15

Environmental Ratings

Operating Temperature:	0°C...50°C (32° F...122° F (open) 0°C...40°C (32° F...104° F (enclosed)
Altitude	2000 Meters (6560 Feet)
Humidity	5% to 95% (non-condensing)
Pollution Degree	2
Resistance to Vibration	
Operational	1.0 G Peak, 0.006" Displacement
Non-Operational	2.5 G Peak, 0.015" Displacement
Resistance to Shock	
Operational	15 G
Non-Operational	30 G
EMC Emission Levels	
Conducted Radio Frequency and Radiated Emissions	IEC Class A
EMC Immunity Levels	
Electrostatic Discharge	5 kV Contact and 15KV Air Discharge
Radio Frequency Electromagnetic Field	Per IEC 60947-4-2
Fast Transient	Per IEC 60947-4-2
Surge Transient	Per IEC 60947-4-2
Installation for EMC Compliance	Grounded metal backplate and enclosure. Maintain separation between power and control wiring.

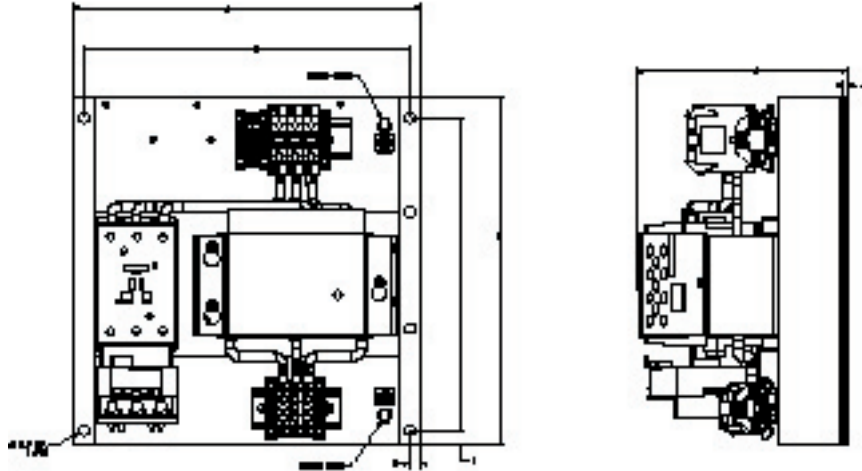
52...78A Controllers



Dimensions and Approximate Shipping Weight

Controller	Unit of Measure	A Width	B Height	C Depth	D	E	F	G	H	Approx. Ship. Wt.
52 Amp	Millimeter	285.8	298.5	134.5	12.7	260.4	273.0	12.7	12.7	6.4 kg
	Inch	11-1/4	11-3/4	5-9/32	1/2	10-1/4	10-3/4	1/2	.1/2	14 lbs.
64 Amp	Millimeter	285.8	298.5	134.5	12.7	260.4	273.0	12.7	12.7	6.6 kg
	Inch	11-1/4	11-3/4	5-9/32	1/2	10-1/4	10-3/4	1/2	.1/2	14.5 lbs.
78 Amp	Millimeter	285.8	298.5	134.5	12.7	260.4	273.0	12.7	12.7	6.8 kg
	Inch	11-1/4	11-3/4	5-9/32	1/2	10-1/4	10-3/4	1/2	.1/2	15 lbs.

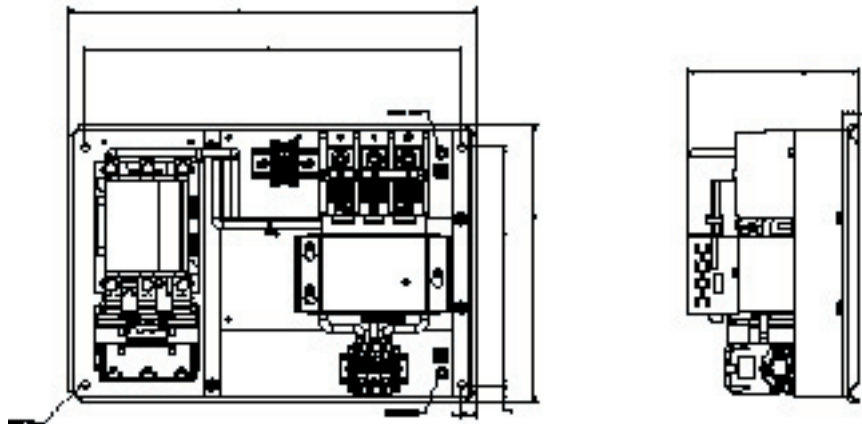
104...146A Controllers



Dimensions and Approximate Shipping Weight

Controller	Unit of Measure	A Width	B Height	C Depth	D	E	F	G	H	Approx. Ship. Wt.
104 Amp	Millimeter	304.8	304.8	185.7	6.4	285.8	273.1	9.5	12.7	9.5 kg
	Inch	12	12	7-5/16	1/4	11-1/4	10-3/4	3/8	1/2	21 lbs.
146 Amp	Millimeter	304.8	304.8	185.7	6.4	285.8	273.1	9.5	12.7	10.7 kg
	Inch	12	12	7-5/16	1/4	11-1/4	10-3/4	3/8	1/2	23.5 lbs.

168A Controllers



Dimensions and Approximate Shipping Weight

Contr
168 A

1	Approx. Ship. Wt.
9	17.9 kg
/4	39.5 lbs.

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