



*Allen-Bradley*

## SMC-DP Elevator

Bulletin 150



User Manual

**Rockwell  
Automation**

## 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, Allen-Bradley does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1, *Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control* (available from your local Allen-Bradley office), describes some 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.

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

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**ATTENTION**

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

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Attention statements help you to:

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

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**IMPORTANT**

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

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## 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 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.

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## Product Overview

### Description

The SMC-DP (Definite Purpose) Motor Controller is designed to operate a 3-phase Wye-Delta motor with motor connections made on an inside-the-delta configuration. The SMC-DP is a current limiting starter that reduces:

- high current surges of electrical systems
- starting torque and the system's mechanical stress
- voltage and current spikes caused by conventional Wye-Delta starters
- mechanical and electrical strain on the motor
- system maintenance and down-time

The SMC-DP comes with a motor overload device and an optional fault contactor mounted on a compact footprint.

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

Minimum enclosure sizes can be found in the product specifications.

## Approximate Dimensions and Shipping Weights

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

Figure 1.1 Dimensions — 52...78 A

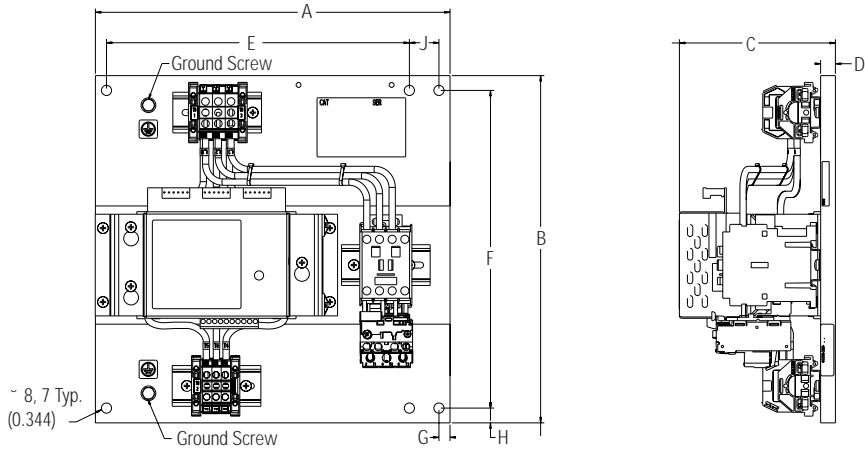


Table 1.A Approximate Dimensions and Shipping Weights — 52...78 A

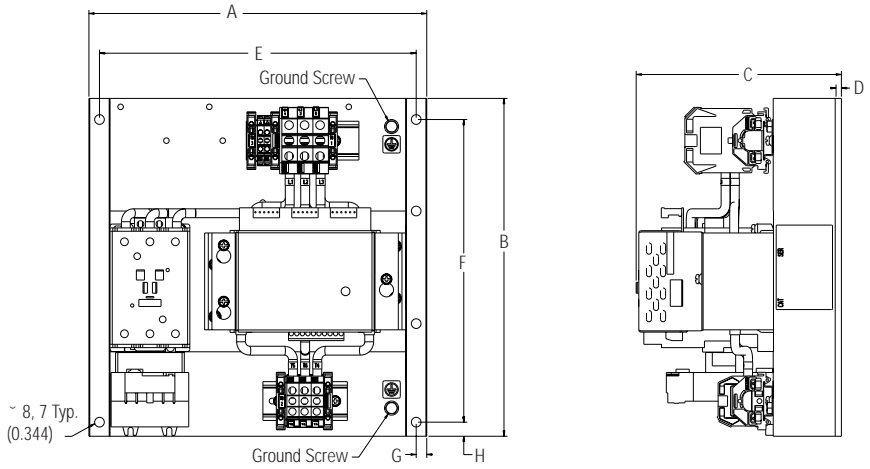
Controller	A Width	B Height	C Depth	D	E	F	G	H	J	Approx. Ship. Wt.
52 A	285.8 (11-1/4)	298.5 (11-3/4)	134.5 (5-9/32)	12.7 (1/2)	260.4 (10-1/4)	273.1 (10-3/4)	12.7 (1/2)	12.7 (1/2)	25.4 (1)	6.4 kg (14 lbs)
64 A	285.8 (11-1/4)	298.5 (11-3/4)	134.5 (5-9/32)	12.7 (1/2)	260.4 (10-1/4)	273.1 (10-3/4)	12.7 (1/2)	12.7 (1/2)	25.4 (1)	6.6 kg (14.5 lbs)
78 A	285.8 (11-1/4)	298.5 (11-3/4)	134.5 (5-9/32)	12.7 (1/2)	260.4 (10-1/4)	273.1 (10-3/4)	12.7 (1/2)	12.7 (1/2)	25.4 (1)	6.8 kg (15 lbs)



## Approximate Dimensions and Shipping Weights

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

**Figure 1.2 Dimensions — 104...146 A**



**Table 1.B Approximate Dimensions and Shipping Weights — 104...146 A**

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

## Approximate Dimensions and Shipping Weights

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

Figure 1.3 Dimensions — 168 A

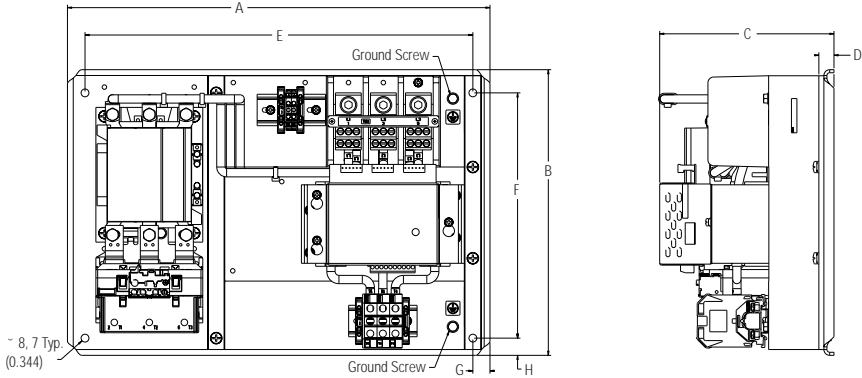


Table 1.C Approximate Dimensions and Shipping Weights — 168 A

Controller	A Width	B Height	C Depth	D	E	F	G	H	Approx. Ship. Wt.
168 A	469.9 (18-1/2)	317.5 (12-1/2)	193.7 (7-5/8)	17.5 (11/16)	431.8 (17)	273.1 (10-3/4)	19 (3/4)	19 (3/4)	17.9 kg (39.5 lbs)

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## Wiring and Installation Diagrams

The SMC-DP receives its control power from a separate 100...120V AC 50/60 Hz source. Proper line and load connections are shown in Figure 2.1 and Figure 2.2. The starter control wiring terminations are described in Figure 2.3 and Figure 2.4.

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**ATTENTION**

**The SMC-DP must be connected to a Wye-Delta motor with either six (6) or twelve (12) leads.**

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**ATTENTION**

When not using an isolation contactor, hazardous voltages are present at the load terminals of the controller when the controller 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.

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## Typical Connection Diagrams

Figure 2.1 Power Wiring Schematic

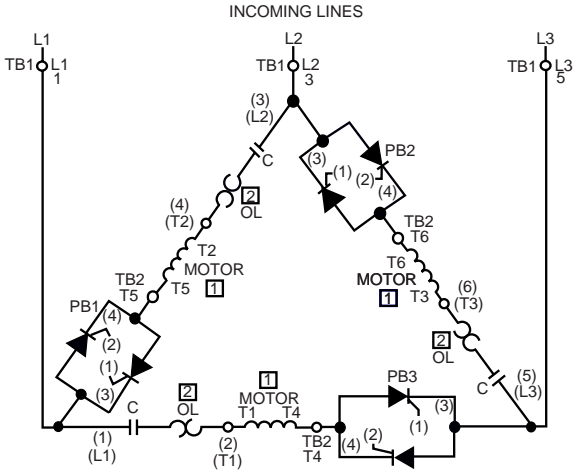


Figure 2.2 Power Wiring Connections

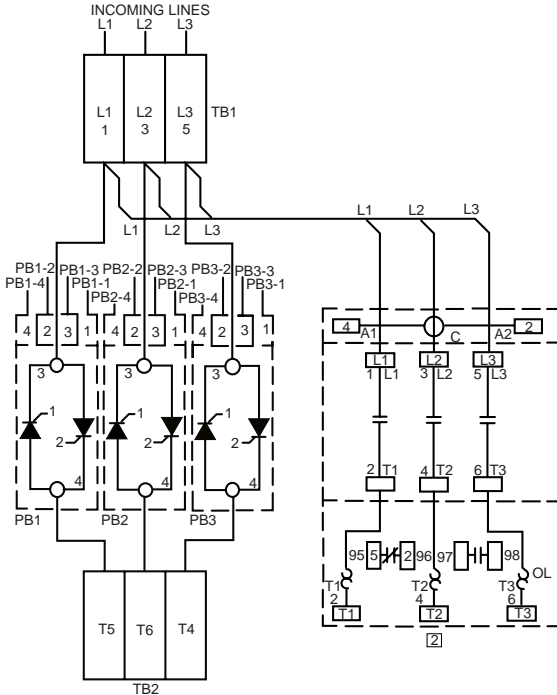


Figure 2.3 Control Wiring — MiProm I (with VTS)

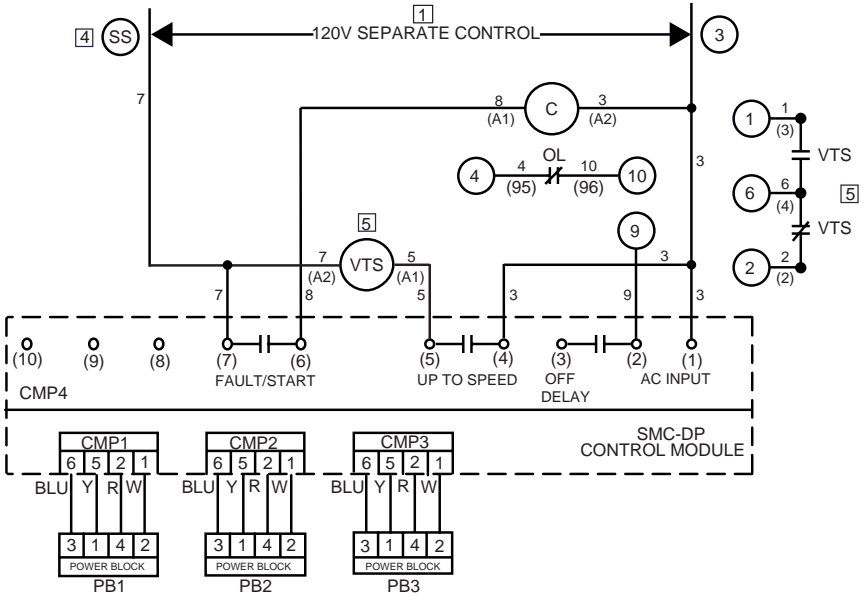
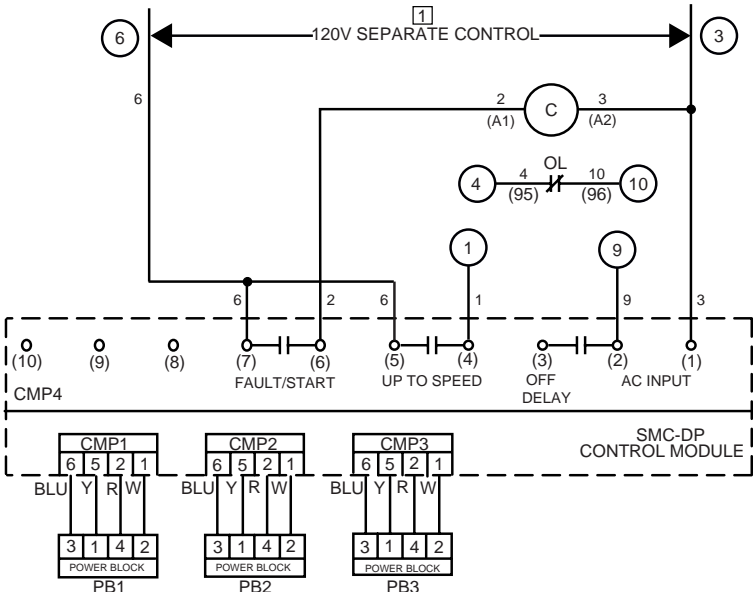


Figure 2.4 Control Wiring — MiProm HS (without VTS)



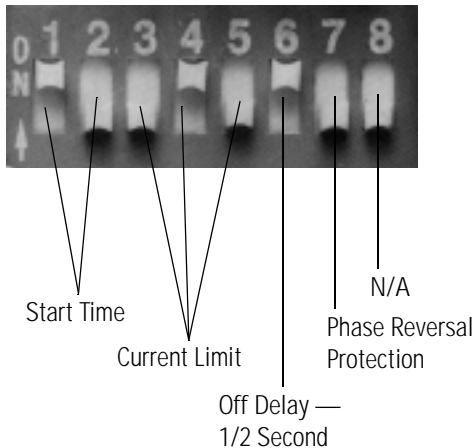
## Adjustments

**ATTENTION**

Disconnect power before servicing dip switch settings.

### 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 switches to the preferred settings.



Example — 1 second start, 250% current limit with a 1/2 second delay, no phase reversal protection.

## Start Time

Start time refers to the amount of time in seconds the starter will restrict the in-rush to accelerate the motor. If the motor is not up to speed within the time setting, the soft starter supplies full voltage and allows the in-rush to get the motor to full speed.

**Table 3.A Start Time**

Setting (in Seconds)	Dip Switch 1	Dip Switch 2
0 (Max. Voltage Applied Immediately)	Off	Off
1	On	Off
2	Off	On
3	On	On

## Current Limit

The current limit setting restricts, by percentage, the amount of in-rush current the motor receives during the specified start time.

**Table 3.B Current Limit**

Setting	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

## Off Delay — 1/2 Second

When enabled, if the start contact signal is removed, the starter will continue to operate normally for an additional ½ second to allow a hydraulic valve to close before the motor shuts down. After the ½ second, the starter will shut down normally. Additional wiring is required from TB3-1 to 3 to provide power for this option.

**Table 3.C Off Delay — 1/2 Second**

Setting	Dip Switch 6
Disabled	Off
Enabled	On

## Phase Reversal “CBA” Protection

When enabled, 3-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.

**Table 3.D Phase Reversal “CBA” Protection**

Setting	Dip Switch 7
Disabled	Off
Enabled	On



## Overload Settings

Wye-Delta ( $Y\Delta$ ) applications (relay carrying motor phase current): Follow the application service factor instruction, dividing the motor nameplate full load current amperes by 1.73.

**Table 3.E Line Amperes (A) (Motor FLA) and Overload (OL) Setting**

Line A	OL	Line A	OL	Line A	OL	Line A	OL	Line A	OL	Line A	OL
21	12	47	27	73	42	98	57	124	72	150	87
23	13	49	28	75	44	100	58	126	73	152	88
25	15	51	30	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	77	158	92
31	18	57	33	83	48	108	63	134	78	160	93
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	37	89	52	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	84		
43	25	69	40	94	55	120	70	146	85		
45	26	71	41	96	56	122	71	148	86		

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## Trouble Shooting Guide

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**ATTENTION**

Hazardous voltage is present in the motor circuit even when the SMC-DP 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.

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**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).

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## Fault Indication

The SMC-DP will monitor a number of operating conditions. Some conditions must be verified before SCR firing; other conditions must be verified while starting and operating the motor. If a fault occurs, the LED will flash to indicate the type of fault that occurred.

## Fault Indication Descriptions

### *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 in the SMC-DP 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 due to 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.

*Switched SCR Connectors*

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

**Table 4.A LED Functionality**

<b>Fault</b>	<b>LED Flashes</b>
Shorted SCR/Open Load	2
Line/Phase Loss	3
Power Supply Loss	4
Erratic Firing	5
Switched SCR Connectors	6
Phase Reversal	7

Note: The LED will cycle between flashing and a two second delay until control power is removed.

**Table 4.B SMC-DP Troubleshooting Guide**

<b>Problem</b>	<b>Possible Cause</b>	<b>Solution</b>
Prestart — Motor Fails to Start	Line/Phase Loss	Check power connections to SMC-DP and contactors, confirm that 3-phase is present in panel.
	Open Load	Check motor connections for looseness.
	Switched SCR Connectors	Check CMP1, CMP2, and CMP3 to ensure they are in proper order on the control module.
	Shorted SCR	Perform continuity check across the power poles with CMP1, CMP2, and CMP3 connections removed. Measurements should exceed 10K for good power pole.
	Phase Reversal	Check phasing of line.
	If None of the Above	Replace control module.
Fault Contactor Fails to Close	Failed Fault Contactor	Apply appropriate control voltage, measure control voltage across contactor coil. If appropriate voltage is across coil, replace contactor.
	Failed Relay on Control Board	Remove appropriate control voltage, and measure continuity between terminals 6 and 7 (fault/start). If closed, replace control module.
Motor Attempts to Start, but Aborts Before Up to Speed	Erratic Firing of SCRs	Check CMP1, CMP2, and CMP3 connections for looseness.
Motor Stops Inadvertently and Fails to Start	Overload	Check overload and reset, if necessary.

Note: Troubleshooting guide assumes presence of appropriate control and line voltages.

## Product Specifications

**Table A.1 Electrical Ratings — MiProm I (with VTS)**

Motor Voltage	Control Voltage	Current Rating	Cat. No.
200...240V AC 50/60 Hz	100...120V AC 50/60 Hz	52 A	150DP-A52NAD-K1-FC-7FA❶
		64 A	150DP-A64NAD-K1-FC-7FA❶
		78 A	150DP-A78NAD-K1-FC-7FA❶
		104 A	150DP-A104NAD-K1-FC-7FA❶
		146 A	150DP-A146NAD-K1-FC-7FA❶
		168 A	150DP-A168NAD-K1-FC-7FA❶
380...480V AC 50/60 Hz	100...120V AC 50/60 Hz	52 A	150DP-A52NBD-K1-FC-7FA❶
		64 A	150DP-A64NBD-K1-FC-7FA❶
		78 A	150DP-A78NBD-K1-FC-7FA❶
		104 A	150DP-A104NBD-K1-FC-7FA❶
		146 A	150DP-A146NBD-K1-FC-7FA❶
		168 A	150DP-A168NBD-K1-FC-7FA❶
500...600V AC 50/60 Hz	100...120V AC 50/60 Hz	52 A	150DP-A52NCD-K1-FC-7FA❶
		64 A	150DP-A64NCD-K1-FC-7FA❶
		78 A	150DP-A78NCD-K1-FC-7FA❶
		104 A	150DP-A104NCD-K1-FC-7FA❶
		146 A	150DP-A146NCD-K1-FC-7FA❶
		168 A	150DP-A168NCD-K1-FC-7FA❶

❶ Insert the Overload Class required on the product: Class 10 (1) or Class 20 (2).

**Table A.2 Electrical Ratings — MiProm HS (without VTS)**

Motor Voltage	Control Voltage	Current Rating	Cat. No.
200...240V AC 50/60 Hz	100...120V AC 50/60 Hz	52 A	<b>150DP-A52NAD-K2-FC-7FA</b> ❶
		64 A	<b>150DP-A64NAD-K2-FC-7FA</b> ❶
		78 A	<b>150DP-A78NAD-K2-FC-7FA</b> ❶
		104 A	<b>150DP-A104NAD-K2-FC-7FA</b> ❶
		146 A	<b>150DP-A146NAD-K2-FC-7FA</b> ❶
		168 A	<b>150DP-A168NAD-K2-FC-7FA</b> ❶
380...480V AC 50/60 Hz	100...120V AC 50/60 Hz	52 A	<b>150DP-A52NBD-K2-FC-7FA</b> ❶
		64 A	<b>150DP-A64NBD-K2-FC-7FA</b> ❶
		78 A	<b>150DP-A78NBD-K2-FC-7FA</b> ❶
		104 A	<b>150DP-A104NBD-K2-FC-7FA</b> ❶
		146 A	<b>150DP-A146NBD-K2-FC-7FA</b> ❶
		168 A	<b>150DP-A168NBD-K2-FC-7FA</b> ❶
500...600V AC 50/60 Hz	100...120V AC 50/60 Hz	52 A	<b>150DP-A52NCD-K2-FC-7FA</b> ❶
		64 A	<b>150DP-A64NCD-K2-FC-7FA</b> ❶
		78 A	<b>150DP-A78NCD-K2-FC-7FA</b> ❶
		104 A	<b>150DP-A104NCD-K2-FC-7FA</b> ❶
		146 A	<b>150DP-A146NCD-K2-FC-7FA</b> ❶
		168 A	<b>150DP-A168NCD-K2-FC-7FA</b> ❶

❶ Insert the Overload Class required on the product: Class 10 (1) or Class 20 (2).

**Table A.3 Power Circuit**

	UL/cUL	IEC
Rated Operational Voltage	200...240V AC 380...480V AC 500...600V AC	200...240V- 380...480V- 500V-
Rated Insulation Voltage	200...240V AC — NA 380...480V AC — NA 500...600V AC — NA	200...240V- — 500V- 380...480V- — 500V- 500V- — 500V-
Dielectric Withstand	200...240V AC — 2200V AC 380...480V AC — 2200V AC 500...600V AC — 2200V AC	200...240V- — 2500V- 380...480V- — 2500V- 500V- — 2500V-
Repetitive Peak	200...240V AC — 1200V 380...480V AC — 1400V 500...600V AC — 1600V	200...240V- — 1200V 380...480V- — 1400V 500V- — 1600V
Operating Frequency	50/60 Hz	50/60 Hz
Utilization Category	Intermittent Duty	AC-53a

**Table A.3 Power Circuit (Continued)**

	UL/cUL	IEC
Power Connections Tightening Torque		
52 A Panel — Line Side (L1...L3) Overload (T1...T3) Load Side (T4...T6)	19 lb-in. 16 lb-in. 12.8 lb-in.	2.1 Nm 1.8 Nm 1.4 Nm
64 A Panel — Line Side (L1...L3) Overload (T1...T3) Load Side (T4...T6)	22 lb-in. 14 lb-in. 19 lb-in.	2.5 Nm 1.6 Nm 2.1 Nm
78 A Panel — Line Side (L1...L3) Overload (T1...T3) Load Side (T4...T6)	22 lb-in. 14 lb-in. 19 lb-in.	2.5 Nm 1.6 Nm 2.1 Nm
104 A Panel — Line Side (L1...L3) Overload (T1...T3) Load Side (T4...T6)	22 lb-in. 35 lb-in. 19 lb-in.	2.5 Nm 4 Nm 2.1 Nm
146 A Panel — Line Side (L1...L3) Overload (T1...T3) Load Side (T4...T6)	133 lb-in. 35 lb-in. 22 lb-in.	15 Nm 4 Nm 2.5 Nm
168 A Panel — Line Side (L1...L3) Overload (T1...T3) Load Side (T4...T6)	275 lb-in. 150 lb-in. 22 lb-in.	31.1 Nm 16.9 Nm 2.5 Nm
Wire Range	AWG	mm <sup>2</sup>
52 A Panel — Line Side (L1...L3) Overload (T1...T3) Load Side (T4...T6)	14...4 14...8 14...8	2.5...16 2.5...10 2.5...10
64 A Panel — Line Side (L1...L3) Overload (T1...T3) Load Side (T4...T6)	14...1/0 14...8 14...8	2.5...35 2.5...10 2.5...10
78 A Panel — Line Side (L1...L3) Overload (T1...T3) Load Side (T4...T6)	14...1/0 14...6 14...6	2.5...35 2.5...16 2.5...16
104 A Panel — Line Side (L1...L3) Overload (T1...T3) Load Side (T4...T6)	14...1/0 14...4 14...4	2.5...35 2.5...16 2.5...16
146 A Panel — Line Side (L1...L3) Overload (T1...T3) Load Side (T4...T6)	4...3/0 14...2 14...1/0	4...70 2.5...35 2.5...35
168 A Panel — Line Side (L1...L3) Overload (T1...T3) Load Side (T4...T6)	6...400 mcm 1...1/0 14...1/0	16...185 10...50 2.5...35
Number of Poles	Equipment designed for 3-phase only	
Method of Connecting	Motor in Delta, SCR in series with a winding	
Rated Impulse Voltage	3.4 kV	

**Table A.4 Control Circuit**

	UL/cUL	IEC
Rated Operational Voltage	100...120V AC	120V~
Rated Insulation Voltage	NA	300V~
Rated Impulse Voltage	NA	3000V
Dielectric Withstand	1600V AC	2000V~
Operating Frequency	50/60 Hz	50/60 Hz
Control Power		
52 A...78 A	120 mA @ 120V AC and 60 mA @ 240V AC	
104 A...146 A	200 mA @ 120V AC and 100 mA @ 240V AC	
168 A	650 mA @ 120V AC and 325 mA @ 240V AC	
Control Terminals (W4) Tightening Torque	5.3 lb-in.	0.6 Nm
Wire Range	20...12 AWG	0.5...2.5 mm <sup>2</sup>

**Table A.5 Panel-Specific Information**

	52 A	64 A	78 A	104 A	146 A	168 A
Rated Operational Current	AC-53a 3.5 — 3: 30 — 80					
Maximum Continuous Current	52 A	64 A	78 A	104 A	146 A	168 A
Minimum/Maximum Line Amps	1/52	1/64	2/78	2/104	2/146	2/168
Maximum Delta Amps	30	37	45	60	84	97
Overload Current Range Amps	12...32	12...37	14...45	26...85	26...85	66...110
Maximum Class J Fuse Amps	175	200	225	450	450	600
Control Voltage Range (+10%, -15%) V AC, 50/60 Hz	100...120 200...240					
Line Voltage Range (+10%, -15%) V AC, 50/60 Hz	200...240 380...480 500...600					
Minimum Enclosure Size — mm (in.)	610 H x 406 W x 229 D (24" H x 16" W x 9" D) 100CFM internal circulating fan			915 H x 762 W x 318 D (36" H x 30" W x 12.5" D) 100CFM internal circulating fan		
SCPD Performance	Type 1					
Available Fault Current	10,000 A					
Weight — kg (lbs)	5.6 (12)	5.8 (12.5)	6.2 (13)	9.5 (21)	10.7 (23.5)	17.9 (39.5)
Maximum Unit Dissipation Heat (Watts)	100	120	145	190	266	305



**Table A.6 Control Module Auxiliaries**

	<b>UL/cUL</b>	<b>IEC</b>
Rated Operational Voltage	250V AC	250V~
Rated Insulation Voltage	NA	300V~
Dielectric Withstand	1600V AC	2000V~
Operating Frequency	50/60 Hz	50/60 Hz
<b>-4, -5 (K1, Up to Speed)</b>		
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~ and 1.5 A @ 240 V~	
Conventional Thermal Current $I_{th}$	5 A	
Make VA/Break VA	3600/360	
Utilization Category	AC15	
<b>-6, -7 (K2, Fault/Start)</b>		
Type of Control Circuit	Electromagnetic Relay	
Number of Contacts	1	
Type of Contacts	Normally Open (N.O.)	
Type of Current	AC	
Rated Operational Current	2 A @ 125V~ and 1 A @ 250V~	
Conventional Thermal Current $I_{th}$	2.5 A	
Make VA/Break VA	2500/250	
Utilization Category	AC15	

**Table A.7 Environmental Ratings**

<b>Mechanical Design Specifications/Test Requirements</b>		
Resistance to Vibration		
Operational	1.0 G Peak, 0.006 Inch Displacement	
Non-Operational	2.5 G Peak, 0.015 Inch Displacement	
Resistance to Shock		
Operational	15 G	
Non-Operational	30 G	
<b>Environmental</b>		
Operating Temperature	0...50°C (32...122°F) (open), 0...40°C (32...104°F) (enclosed)	
Altitude	2000 m (6560 ft)	
Humidity	5...95% (non-condensing)	
Pollution Degree	2	
<b>Others</b>	<b>UL/cUL</b>	<b>IEC</b>
EMC Emission Levels		
Conducted Radio Frequency Emissions	NA	Class A
Radiated Emissions	NA	Class A
EMC Immunity Levels		
Electrostatic Discharge	8 kV Contact and 15 kV Air Discharge	
Radio Frequency Electromagnetic Field	NA	Per IEC 60947-4-2
Fast Transient	NA	Per IEC 60947-4-2
Surge Transient	NA	Per IEC 60947-4-2
Ground Provision	Included on back panel	
Installation for EMC Compliance	Grounded metal backplate, optional grounded metal enclosure. Maintain separation between power and control wiring.	



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