

3-Phase Voltage Monitors

All SymCom voltage monitors are microcontroller based and are factory calibrated for highly accurate and precise voltage measurements to provide high sensitivity while minimizing nuisance tripping. The high accuracy and precision of these devices allows them to detect a single-phase condition or voltage unbalance even with regenerated voltages present. Uncalibrated devices require low sensitivity to voltage faults to prevent nuisance trips, thus may not trip in the presence of regenerated voltages.

SymCom voltage monitors are built with transformer power supplies which makes them highly resistant to damage caused by small voltage transients on the power system. Other types of power supplies such as switching, resistor limited and capacitor limited, are typically more easily damaged by transients.

Product Selection Matrix

MODEL	Low Voltage	Phase-Reversal	Voltage Unbalance	Single-Phasing	Frequency Shift	High Voltage	Contact Failure	Rapid Cycling	Diagnostic LEDs	Variable Trip Point	Variable Restart Delay	Variable Trip Delay	Variable Voltage Unbalance	Manual Reset	DPDT Relay	10 Amp	15 Amp General Purpose	470VA @ 600VAC	480VA @ 600VAC	8 Amp General Purpose Pilot Duty	8 Amp General Purpose Pilot Duty	Dual Range 190-480VAC	100V Range 95-120VAC	200V Range 190-240VAC	400V Range 380-480VAC	600V Range 475-600VAC	Voltage Band Monitor
80	•	•	•	•																							
102A	•	•	•	•																							
102A-2	•	•	•	•			•																				
102A-3	•	•	•	•						•																	
102A-9	•	•	•	•		•																					
102-600	•	•	•	•																							
201A	•	•	•	•																							
201A-9	•	•	•	•		•																					
201A-AU	•	•	•	•																							
201-575-AU	•	•	•	•		•																					
201-100-DPDT	•	•	•	•											•	•							•				
201-200-DPDT	•	•	•	•											•	•							•				
201-100-DPDT-60mS	•	•	•	•											•	•							•				
201-200-DPDT-60mS	•	•	•	•											•	•							•				
202	•	•	•	•		•				•																	
202-RP	•	•	•	•																							
202-575-RP	•	•	•	•																							
250A	•	•	•	•		•																					
250-600	•	•	•	•		•																					
350-200	•	•	•	•																							
350-200-2	•	•	•	•																							
350-200-2-6	•	•	•	•																							
350-200-2-8*	•	•	•	•																							
350-200-2-9	•	•	•	•		•																					
350-400	•	•	•	•																							
350-400-2	•	•	•	•																							
350-400-2-5	•	•	•	•																							
350-400-2-6	•	•	•	•																							
350-400-2-8*	•	•	•	•																							
350-400-2-9	•	•	•	•		•																					
350-600	•	•	•	•																							
350-600-2	•	•	•	•																							
350-600-2-6	•	•	•	•																							
350-600-2-8*	•	•	•	•																							
350-600-2-9	•	•	•	•		•																					
355-200	•	•	•	•																							
355-400	•	•	•	•																							
355-400-5	•	•	•	•																							
355-600	•	•	•	•																							
455	•	•	•	•																							
455-575	•	•	•	•																							
455-480R	•	•	•	•		•																					
460	•	•	•	•																							
460-OEM	•	•	•	•																							
460-L	•	•	•	•																							
460L-OEM	•	•	•	•																							
460-14	•	•	•	•																							
460-575-14	•	•	•	•																							
460-15	•	•	•	•																							
460-MR	•	•	•	•																							
460-575	•	•	•	•																							
460-VBM	•	•	•	•																							
460-400Hz	•	•	•	•																							
601**	•	•	•	•																							
601-575**	•	•	•	•		•																					

* These units are not equipped with manual reset as indicated on the label.
 ** Indicates units have RS-485 Modbus communication capability and digital display
 •• Indicates two relays



The Model 80

is designed to continuously monitor phase rotation of 3-phase systems. Critical applications include fan motors, scroll compressors, grinders, conveyor systems, elevators and escalators. A solid-state phase-sensing circuit drives an internal electro-mechanical relay which is energized when proper phase rotation is applied. An LED indicator illuminates when phase rotation is correct. Reset is automatic.

For more information see:

See Appendix A, page 68, Figure 6 for dimensional drawing.

See Appendix B, page 73, Figures 8 & 9 for typical wiring diagrams.

Features:

- Protects 3-phase motors from reverse phase
- Run light to indicate ABC sequence
- Universal input voltage
- CSA & CSA-NRTL/C approved

Approvals:

Available Models:

80

Specifications

Input Characteristics	
3-phase line voltage .....	.171-264VAC (200V Input) 342-528VAC (400V Input)
Frequency .....	.50/60 Hz
Functional Characteristic	
Response Time .....	.05 second
Output Characteristics	
Output Contact Rating (SPDT - 1 Form C)	
Pilot Duty .....	.480VA @ 240VAC
General Purpose .....	.10A @ 240VAC
General Characteristics	
Temperature Range	-.20° to 50°C (-4° to 122°F)
Maximum Input Power .....	.5 W
Relative Humidity .....	.10-95%, non-condensing per IEC 68-2-3
Standards Passed	
Fast Transient Burst .....	.IEC 61000-4-4, Level 2, 2kV
Surge Immunity	
IEC .....	.IEC 61000-4-5, Level 4, Level 3, 4kV line-to-line and line-to-ground
Safety Marks	
CSA .....	.C22.2 41-95 (File #LR46510)
Dimensions	
	.2"H x 2"W x 1.25"D (50.8 x 50.8 x 31.75mm)
Weight .....	.015 lbs (2.4 oz., 68.04 g)
Mounting Method .....	.#8 screw

3-Phase Voltage Monitor

3-phase voltage/phase monitor, high voltage option, panel mount, adjustable or manual restart delay

Model 102A



The Model 102A

is a 3-phase, auto-ranging, dual-range voltage monitor that protects 190-480VAC, 50*/60Hz motors regardless of size. The product provides a user selectable nominal voltage setpoint and the voltage monitor automatically selects between the 200V and 400V range.

A unique microcontroller-based voltage and phase-sensing circuit constantly monitors the 3-phase voltages to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to acceptable levels. The Model 102A includes advanced single LED diagnostics. Five different light patterns distinguish between faults and normal conditions.

For more information see:

See Appendix A, page 68, Figure 7 for dimensional drawing.

See Appendix B, page 73, Figures 10 & 11 for typical wiring diagrams.

Options




2 - Variable Restart Delay (Manual, 2-300 seconds)

3 - Variable Trip Delay (2-30 seconds)

9 - High Voltage Detection

Features:

- Low voltage trip
- Single-phase trip
- Reverse-phase trip
- Fixed 6% voltage unbalance trip
- Single LED diagnostics
- Optional high voltage trip
- Optional variable restart delay
- Optional variable trip delay
- Separate indicators for:
 - Power-up restart delay
 - Reverse-phase trip
 - Good voltage/relay energized
 - Unbalance/single-phase trip
 - High/low voltage trip

Approvals:   

Available Models:

102A
102A-2
102A-3
102A-9
102-600

Specifications

Input Characteristics

Line Voltage	
102A	190-480VAC
102-600	475-600VAC
Frequency	50*/60Hz

Functional Characteristics

Low Voltage (% of setpoint)	
Trip	90%
Reset	93%
Voltage Unbalance (NEMA)	
Trip	6%
Reset	4.5%
Trip Delay Time	
Low/High Voltage	4 seconds (standard)
Unbalance & Phasing Faults	2 seconds
Restart Delay Time	
After a Fault	2 seconds (standard)
After a Complete Power Loss	2 seconds (standard)

Output Characteristics

Output Contact Rating (SPDT - 1 Form C)	
Pilot Duty	480VA @ 240VAC
General Purpose	10A @ 240VAC

General Characteristics

Temperature Range	-40° to 70°C (-40° to 158°F)
Maximum Input Power	.5 W

Terminal

Torque	7 in.-lbs.
Wire Size	12-18AWG
Standards Passed	
Electrostatic Discharge (ESD)	IEC 61000-4-2, Level 3, 6kV contact, 8kV air
Fast Transient Burst	IEC 61000-4-4, Level 3, 4kV input, 2kV input/output

Transient Protection (Internal) IEC 61000-4-5; 1995 ±6kV

Safety Marks

UL	UL508 (File #E68520)
CSA	22.2 No. 14 (File #46510)
CE	IEC 60947-6-2
Dimensions	2.93" H X 5.27" W X 2.95" D (74.4 x 133.9 x 74.9mm)

Weight	1.05 lbs. (16.8 oz., 476.27 g)
Mounting Method	#8 screws

Available Options

(2) Adjustable Restart Delay	Manual, 2-300 seconds
(3) Adjustable Trip Delay	2-30 seconds (Phasing and unbalance trip delay remains at 2 seconds)

(9) High Voltage Operating Points

Trip (% of Setpoint)	110%
Reset (% of Setpoint)	107%

*Note: 50Hz will increase all delay timers by 20%.



Must use Model OT08 socket for UL Rating!

The Model 201A

is a 3-phase, auto-ranging, dual-range voltage monitor that protects 190-480VAC, 50/60Hz motors regardless of size. The product provides a user selectable nominal voltage setpoint and the voltage monitor automatically selects between the 200V and 400V range. The Model 201A includes advanced single LED diagnostics, where five different light patterns distinguish between faults and normal conditions.

This unique microcontroller-based voltage and phase-sensing device constantly monitors the 3-phase voltages to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to acceptable levels.

For more information see:

See Appendix A, page 68, Figure 8 for dimensional drawing.



See Appendix B, pages 73 & 74, Figures 12 & 13 for typical wiring diagrams.

Option

9 - High Voltage Detection

Features:

- Low voltage trip
- Single-phase trip
- Reverse-phase trip
- Fixed 6% voltage unbalance trip
- Single LED diagnostics
- Optional high voltage trip
- 8-pin plug-in; DIN rail or surface mount
- Separate indicators for:
 - Power-up restart delay
 - Reverse-phase trip
 - Good voltage/relay energized
 - Unbalance/single-phase trip
 - High/low voltage trip

Approvals:  

Auxiliary Products:

- 8-pin octal socket (P/N: CT0T08-PC)

Available Models:

201A
201A-9

Specifications

Input Characteristics		
Line Voltage	190-480VAC	Wire Gauge
Frequency	50/60Hz	Transient Protection (Internal)
Functional Characteristics		Standards Passed
Low Voltage (% of setpoint)		Electrostatic Discharge (ESD)
Trip	90%	Radio Frequency Immunity (RFI), Radiated
Reset	93%	Fast Transient Burst
Voltage Unbalance (NEMA)		Surge Immunity
Trip	6%	IEC
Reset	4.5%	ANSI/IEEE
Optional High Voltage (% of setpoint)		Hi-potential Test
Trip	110%	Safety Marks
Reset	107%	UL (OT08 octal socket required)
Trip Delay Time		CE
High/Low Voltage Fault	4 seconds	Dimensions
Unbalance & Phasing Faults	2 seconds	Weight
Restart Delay Time		Mounting Method
After a Fault	2 seconds	Socket Available
After a Complete Power Loss	2 seconds	
Output Characteristics		
Output Contact Rating (SPDT)		
Pilot Duty	480VA @ 240VAC	
General Purpose	10A @ 240VAC	
General Characteristics		
Temperature Range	-40° to 70°C (-40° to 158°F)	
Maximum Input Power	5 W	
Relative Humidity	10-95%, non-condensing per IEC 68-2-3	
Terminal Torque	12 in.-lbs.	

The 600V socket can be surface mounted or installed on DIN Rail.

3-Phase Voltage Monitor

3-phase voltage/phase monitor, 8-pin socket mount, adjustable trip/restart delays & voltage unbalance percentage

Model 201A-AU



Must use Model OT08 socket for UL Rating!

The Model 201A-AU

is a 3-phase, auto-ranging, dual-range voltage monitor that protects 190-480VAC, 50/60Hz motors regardless of size. The product provides a user selectable nominal voltage setpoint and the voltage monitor automatically selects between the 200V and 400V range. The Model 201A-AU includes advanced single LED diagnostics, where five different light patterns distinguish between faults and normal conditions. Adjustment knobs allow the user to set a 1-30 second trip delay, a manual restart or 1-500 second restart delay and a 2-8% voltage unbalance trip point.

This unique microcontroller-based voltage and phase-sensing device constantly monitors the 3-phase voltages to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to acceptable levels.

For more information see:

See Appendix A, page 68, Figure 8 for dimensional drawing.

See Appendix B, page 74, Figures 14 & 15 for typical wiring diagrams.

Features:

- Protects 3-phase motors from:
 - Loss of any phase (single phasing)
 - Low voltage
 - High voltage
 - Voltage unbalance
 - Phase reversal
 - Rapid cycling
- 8-pin plug-in; DIN rail or surface mountable
- Manual reset option provides last fault detection
- Auto-ranging voltage
- Advanced LED diagnostics
- Adjustable voltage unbalance trip setting
- Adjustable trip & restart delay settings

Approvals:  

Auxiliary Products:

- 8-pin octal socket (P/N: CT0T08-PC)

Available Models:

201A-AU
201-575-AU
201A-AU-OT (sold with OT08 socket)
201-575-AU-OT (sold with OT08 socket)

Specifications

Input Characteristics

Line Voltage	
201A-AU	190-480VAC
201-575-AU	475-600VAC
Frequency	50/60Hz

Functional Characteristics

Low Voltage (% of setpoint)	
Trip	90% ±1%
Reset	93% ±1%
High Voltage (% of setpoint)	
Trip	110% ±1%
Reset	107% ±1%
Voltage Unbalance (NEMA)	
Trip	2-8% adjustable
Reset	Trip Setting Minus 1% (5-8%) Trip Setting Minus 0.5% (2-4%)

Trip Delay Time

High, Low and Unbalanced Voltage	1-30 seconds adjustable
Single-Phasing Faults	1 second fixed
Restart Delay Time	
After a Fault	Manual, 1-500 seconds adj.
After a Complete Power Loss	Manual, 1-500 seconds adj.

Output Characteristics

Output Contact Rating (1-Form C)	
Pilot Duty	480VA @ 240VAC, B300
General Purpose	10A @ 240VAC

General Characteristics

Ambient Temperature Range	
Operating	-40° to 70°C (-40° to 158°F)
Storage	-40° to 80°C (-40° to 176°F)
Maximum Input Power	.5 W
Relative Humidity	10-95%, non-condensing per IEC 68-2-3
Standards Passed	
Electrostatic Discharge (ESD)	IEC 61000-4-2, Level 3, 6kV contact, 8kV air
Radio Frequency Immunity, Radiated	150 MHz, 10V/m
Fast Transient Burst	IEC 61000-4-4, Level 3, 3.5kV input power & controls
Surge	
IEC	IEC 61000-4-5, Level 3, 4kV line-to-line; Level 4, 4kV line-to-ground
ANSI/IEEE	C62.41 Surge and Ring Wave Compliance to a level of 6kV line-to-line
Hi-potential Test	Meets UL508 (2 x rated V +1000V for 1 min.)
Safety Marks	
UL (OT08 octal socket required)	UL508 (File #E68520)
CE	IEC 60947-6-2
Enclosure	Polycarbonate
Dimensions	1.750" H x 2.375" W x 4.125" D (with socket) (44.45 x 60.325 x 104.775mm)
Weight	0.7 lb. (11.2 oz., 317.51 g)
Mounting Method	DIN rail or surface mount (plug in to OT08 socket)
Socket Available	Model OT08 (UL Rating 600V)

The 600V socket can be surface mounted or installed on DIN Rail.

3-Phase Voltage Monitor

3-phase voltage/phase monitor, 11-pin socket mount, two isolated Form C relays

Model 201-xxx-DPDT



Must use Model OT11 socket for UL Rating!

The Model 201-xxx-DPDT

is an 11-pin octal base plug-in voltage monitor designed to protect 3-phase motors regardless of size. The 201-100-DPDT is used on 95-120VAC, 50/60Hz motors and the 201-200-DPDT is used on 190-240VAC, 50/60Hz motors to prevent damage caused by incoming voltage problems. The units feature two isolated sets of contacts that are ideal for use with two control circuits with different voltages.

The unique microcontroller-based voltage and phase-sensing circuit constantly monitors the voltages to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relays are deactivated after a specified trip delay. The output relays reactivate after power line conditions return to an acceptable level and a specified amount of time has elapsed (restart delay). The trip delay prevents nuisance tripping due to rapidly fluctuating power line conditions.

This unit is also available with a shorter trip delay and faster restart delay. The 201-xxx-DPDT-60mS has a trip delay of 0.5 seconds and a restart delay of 60 milliseconds.



For more information see:

See Appendix A, page 68, Figure 8 for dimensional drawing.

See Appendix B, page 74, Figure 16 for typical wiring diagrams.

Features:

- Low voltage protection
- Single-phase protection
- Reverse-phase protection
- Voltage unbalance protection
- Two isolated Form C relays (DPDT)
- Diagnostic LED
- 11-pin plug-in; DIN rail or surface mount

Approvals:  

Auxiliary Products:

- 11-pin octal socket (P/N: OT11-PC)

Available Models:

201-100-DPDT
201-200-DPDT
201-100-DPDT-60mS
201-200-DPDT-60mS

Specifications

Input Characteristics

Line Voltage	
201-100-DPDT, 201-100-DPDT-60mS	.95-120VAC
201-200-DPDT, 201-200-DPDT-60mS	.190-240VAC
Frequency	.50/60Hz

Functional Characteristics

Low Voltage (% of setpoint)	
Trip	.90% \pm 1%
Reset	.93% \pm 1%
Voltage Unbalance	
Trip	.6%
Reset	.4.5%

Trip Delay Times

Low Voltage	.4 seconds
Unbalance, Phasing Faults	.2 seconds
Models with -60ms option	.0.5 second

Restart Delay Times

After a Fault or Complete Power Loss	.2 seconds
Models with -60mS option	.60 milliseconds

Output Characteristics

Output Contact Rating (DPDT)	
Pilot Duty	.480VA @ 240VAC
General Purpose	.10A @ 240VAC

General Characteristics

Temperature Range	.-40° to 70°C (-40° to 158°F)
Maximum Input Power	.5 W
Standards Passed	
Electrostatic Discharge (ESD)	.IEC 61000-4-2, Level 3, 6kV contact, 8kV air
Radio Frequency Immunity, Radiated	.150MHz, 10V/m
Fast Transient Burst	.IEC 61000-4-4, Level 3, 2.5kV input power and controls

Safety Marks

UL (OT11 octal socket required)	.UL508 (File #E68520)
CE	.IEC 60947-6-2
Dimensions	.1.750" H x 2.375" W x 4.125" D (with socket) (44.45 x 60.325 x 104.775mm)
Weight	.0.65 lb. (10.4 oz., 294.84 g)
Mounting Method	.DIN rail or surface mount (plug in to OT11 socket)
Socket Available	.Model OT11 (UL Rated 300V)

The 300V socket can be surface mounted or installed on DIN Rail.

3-Phase Voltage Monitor

3-phase voltage/phase monitor, panel mount, adjustable or manual restart delay
(-RP reverse-phase protection only)

Model 202 / 202-RP



The Model 202

is a 3-phase, auto-ranging, dual-range voltage monitor that protects 190-480VAC, 50*/60Hz motors regardless of size. The product provides a user selectable nominal voltage setpoint and the voltage monitor automatically selects between the 200V and 400V range.

This unique microcontroller-based voltage and phase-sensing device constantly monitors the 3-phase voltages to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to acceptable levels. The Model 202 includes advanced single LED diagnostics. Five different light patterns distinguish between faults and normal conditions.

The Model 202-RP

monitors the phase rotation of 3-phase systems and trips on reverse phase only. Critical applications include fan motors, scroll compressors, grinders, conveyor systems, elevators and escalators. The status light turns green and the relay is activated when rotation is correct.

For more information see:

See Appendix A, page 68, Figure 9 for dimensional drawing.

See Appendix B, page 74, Figures 17 & 18 for typical wiring diagrams.

Features:

- Quick mounting with single screw
- Small package, ideal for assembly into panels
- Standard 1/4" quick connects
- Adjustable restart delay

Approvals: 

Available Models:

202
202-RP
202-575-RP

Specifications

Input Characteristics

Line Voltage	
202, 202-RP	190-480VAC
202-575-RP	475-600VAC
Frequency	50*/60Hz

Functional Characteristics

Phase Sequence	ABC
Low Voltage (% of setpoint)	
Trip	90%
Reset	93%
High Voltage (% of setpoint)	
Trip	110%
Reset	107%
Voltage Unbalance (NEMA)	
Trip	6%
Reset	4.5%
Trip Delay Time	
High and Low Voltage	4 seconds
Unbalance & Phasing Faults	2 seconds
Restart Delay Time	
After a Fault	Manual, 2-300 seconds adj.
After a Complete Power Loss	Manual, 2-300 seconds adj.

Output Characteristics

Output Contact Rating (SPDT)	
Pilot Duty	480VA @ 240VAC
General Purpose	10A @ 240VAC

General Characteristics

Temperature Range	-40° to 70°C (-40° to 158°F)
Trip & Reset Accuracy	±1%
Repeatability	±0.5%
Maximum Input Power	5 W
Relative Humidity	95%, non-condensing
Transient Protection	IEC 61000-4-5, ±4kV
Input to Output Dielectric	1960 Vrms min.
Termination	0.25" male quick connect
Safety Marks	
UL	UL508 (File #E68520)
Dimensions	2.5" H x 2.5" W x 1.4" D (63.5 x 63.5 x 35.56mm)
Weight	0.5 lb. (8 oz., 226.8 g)
Mounting Method	1/4" socket head cap screw (customer supplied)

*Note: 50Hz will increase all delay timers by 20%.
CE Pending

3-Phase Voltage Monitor

3-phase voltage/phase monitor, panel mount, adjustable or manual restart delay,
2 Form C relay contacts

Model 250A



The Model 250A

is a 3-phase, auto-ranging, dual-range voltage monitor that protects 190-480VAC, 50*/60Hz motors regardless of size. The product provides a user selectable nominal voltage setpoint and the voltage monitor automatically selects between the 200V and 400V range.

This unique microcontroller-based voltage and phase-sensing device constantly monitors the 3-phase voltages to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to acceptable levels. The Model 250A includes advanced single LED diagnostics. Five different light patterns distinguish between faults and normal conditions.



For more information see:

See Appendix A, page 68, Figure 7 for dimensional drawing.

See Appendix B, page 75, Figure 19 for typical wiring diagrams.

Features:

- Low voltage trip
- High voltage trip
- Single-phase trip
- Reverse-phase trip
- Fixed 6% voltage unbalance trip
- Single LED diagnostics
- Adjustable restart delay
- Manual reset selection
- DPDT relay output
- Separate indicators for:
 - Power-up restart delay
 - Reverse-phase trip
 - Good voltage/relay energized
 - Unbalance/single-phase trip
 - High/low voltage trip

Approvals:   

Available Models:

250A
250-600

Specifications

Input Characteristics

Line Voltage	
250A	190-480VAC
250-600	475-600VAC
Frequency	50*/60Hz

Functional Characteristics

Low Voltage (% of setpoint)	
Trip	90%
Reset	93%
High Voltage (% of setpoint)	
Trip	110%
Reset	107%
Voltage Unbalance (NEMA)	
Trip	6%
Reset	4.5%
Trip Delay Time	
Low Voltage, High Voltage	4 seconds
Unbalance, Phasing Faults	2 seconds
Restart Delay Time	
After a Fault or Complete Power Loss	Manual, 2-300 seconds adj.

Output Characteristics

Output Contact Rating (DPDT - 2 Form C)	
Pilot Duty	480VA @ 240VAC
General Purpose	10A @ 240VAC
General Characteristics	
Temperature Range	-40° to 70°C (-40° to 158°F)
Maximum Input Power	5 W
Relative Humidity	Up to 95% non-condensing per IEC 68-2-3
Terminal	
Torque	7 in.-lbs.
Wire Size	12-18AWG
Transient Protection (Internal)	IEC 61000-4-5;1995 ±6kV
Safety Marks	
UL	UL508 (File #E68520)
CSA	22.2 No. 14 (File #46510)
CE	IEC 60947-6-2

Dimensions	2.93"H x 5.27"W x 2.95"D (74.4 x 133.9 x 74.9mm)
Weight	1.02 lb. (16.32 oz., 462.66 g)
Mounting Method	#8 screws

*Note: 50Hz will increase all delay timers by 20%.

3-Phase Voltage Monitor

3-phase voltage/phase monitor, panel mount, optional 1 or 2 15A rated relay contacts

Model 350



The Model 350

is a heavy-duty voltage monitor. This product should be used when high current relays or dual contacts are required, or 480V controls are used. Since the Model 350 uses heavy-duty relays, it comes in fixed voltage range models rather than a dual auto-ranging version like the Model 250.

The Model 350-200 has a 15A general purpose contact. The Model 350-400 provides a SPDT (Form C) relay rated to switch up to 600V, allowing the use of 480V controls, eliminating the need for a control power transformer to step the voltage down to 120-240V. Several DPDT (two Form C contacts) relay models are also available.

The Model 350 microcontroller-based family of products are low cost yet highly advanced solutions to heavy-duty problems. The Model 350 includes advanced single LED diagnostics. Five different light patterns distinguish faults and normal operating conditions. Other options such as high voltage trip, adjustable trip delay and adjustable restart delay are available.

For more information see:

See Appendix A, page 68, Figure 7 for dimensional drawing.




See Appendix B, page 75, Figure 20 for typical wiring diagrams.

Options

- 2 - Variable Restart Delay (Manual, 2-300 seconds)
- 5 - DPDT Relay
- 6 - 2 Relays (1) 10A, (1) 15A
- 8 - 2 Relays (2) 15A
- 9 - High Voltage Detection

Features:

- Low voltage trip
- Optional high voltage trip
- Single-phase trip
- Reverse-phase trip
- Fixed 6% voltage unbalance trip
- Single LED diagnostics
- Separate indications for:
 - Power-up restart delay
 - Reverse-phase trip
 - Good voltage/relay energized
 - Unbalance/single-phase trip
 - High/low voltage trip

Approvals:   

Available Models:

- 350-200
- 350-200-2
- 350-200-2-6
- 350-200-2-8**
- 350-200-2-9
- 350-400
- 350-400-2
- 350-400-2-5
- 350-400-2-6
- 350-400-2-8**
- 350-400-2-9
- 350-600
- 350-600-2
- 350-600-2-6
- 350-600-2-8**
- 350-600-2-9

Specifications

Input Characteristics

Line Voltage	
350-200	190-240VAC
350-400	380-480VAC
350-600	475-600VAC
Frequency	50*/60Hz

Functional Characteristics

Low Voltage (% of setpoint)

Trip	90%
Reset	93%

Voltage Unbalance (NEMA)

Trip	6%
Reset	4.5%

Trip Delay Time

Low Voltage	4 seconds
Unbalance & Phasing Faults	2 seconds

Restart Delay Time

After a Fault	2 seconds
After a Complete Power Loss	2 seconds

Output Characteristics

Output Contact Rating

SPDT (350-200)	
Pilot Duty	480VA @ 240VAC
General Purpose	15A
SPDT (350-400, 350-600)	470VA @ 600VAC
DPDT (-6 Option)	1-10A General Purpose
	480VA @ 240VAC Pilot Duty
	1-15A General Purpose
	480VA @ 240VAC Pilot Duty
	1hp @ 240VAC

DPDT (-8 Option)	2-15A General Purpose
	480VA @ 240VAC Pilot Duty
	1hp @ 240VAC

General Characteristics

Ambient Temperature Range	
Operating	-40° to 70°C (-40° to 158°F)
Storage	-40° to 80°C (-40° to 176°F)
Maximum Input Power	5 W
Terminal	
Torque	7 in.-lbs.
Wire Size	12-18AWG
Transient Protection (Internal)	IEC 61000-4-5;1995 ±6kV
Safety Marks	
UL	UL508 (File #E68520)
CSA	22.2 No. 14 (File #46510)
CE	IEC 60947-6-2
Dimensions	2.93"H x 5.27"W x 2.95"D
	(74.4 x 133.9 x 74.9mm)
Weight	1.05 lbs. (16.8 oz., 476.27 g)
Mounting Method	#8 screws

Special Options

Option 2 - Variable Restart Delay	Manual, 2-300 seconds adj.
Option 5 - DPDT Relay	
Option 6 - 2 Relays (1) 10A, (1) 15A	
Option 8 - 2 Relays (2) 15A	
Option 9 - High Voltage (% of setpoint)	
Trip	110%
Reset	107%

*Note: 50Hz will increase all delay timers by 20%.

** These units are not equipped with Manual Reset.

3-Phase Voltage Monitor

3-phase voltage/phase monitor, panel mount, adjustable trip/restart delays & voltage unbalance percentage, optional 2 each 480V-rated relays

Model 355



The Model 355

is a 3-phase voltage monitor with adjustable trip and restart delay, adjustable voltage unbalance and multiple diagnostic lights. It is perfect for heavy-duty applications that need both protection and simple user-friendly diagnostics. Applications include pump panels, commercial HVAC, oil rigs and others.

The Model 355 uses microcontroller technology to monitor incoming voltage and de-energize its output relay if power problems exist. The Model 355 can protect motors from damage caused by single-phasing, high and low voltage, phase reversal and voltage unbalance. It has four diagnostic LEDs that clearly show overvoltage, undervoltage, voltage unbalance, reverse-phase and normal conditions.

The Model 355-200 is equipped with a heavy-duty 10A general purpose SPDT relay. The Model 355-400 and 355-600 are equipped with a 470VA @ 600VAC pilot duty SPDT relay. A high voltage (600V) DPDT relay output option is available with the 400V model.

For more information see:

See Appendix A, page 68, Figure 7 for dimensional drawing.


See Appendix B, page 75, Figures 21 & 22 for typical wiring diagrams.

Option

5 - DPDT Relay

Features:

- Standard high voltage relay for 400V and 600V ranges
- Multiple LEDs provide diagnostics
- Adjustable trip and restart delays

Approvals: 

Available Models:

355-200
355-400
355-400-5
355-600

Specifications

Input Characteristics

Line Voltage	
355-200	.190-240VAC
355-400	.380-480VAC
355-600	.475-600VAC
(Specify voltage range)	
Frequency	.50*/60Hz

Functional Characteristics

Low Voltage (% of setpoint)	
Trip	.90% ±1%
Reset	.93% ±1%
High Voltage (% of setpoint)	
Trip	.110% ±1%
Reset	.107% ±1%
Voltage Unbalance (NEMA)	
Trip	.2-8% adjustable
Reset	.Trip setting minus 1%
Trip Delay Time	
Low & High Voltage and Unbalance	.2-30 seconds adjustable
Single-phasing Faults (>25% UB)	.2 seconds
Restart Delay Time	
After a Fault or Power Loss	.Manual, 2-300 seconds adj.

Output Characteristics

Output Contact Rating	
SPDT (355-200)	
Pilot Duty	.480VA at 240VAC
General Purpose	.10A

SPDT (355-400, 355-600)

Pilot Duty	.470VA @ 600VAC
DPDT (-5 Option)	
Pilot Duty	.470VA @ 600VAC

General Characteristics

Temperature Range	
Operating	-.40° to 70°C (-40° to 158°F)
Storage	-.40° to 80°C (-40° to 176°F)
Repeat Accuracy	
Fixed Conditions	±0.1%
Maximum Input Power	.6 W
Terminal	
Torque	.7 in.-lbs.
Wire Size	.12-18AWG
Transient Protection (Internal)	.2500V for 10 ms
Safety Marks	
UL	.UL508 (File #E68520)
Dimensions	.2.93"H x 5.27"W x 2.95"D (74.4 x 133.9 x 74.9mm)
Weight	.0.94 lb. (15.04 oz., 426.38 g)
Mounting Method	.#8 screws

Special Options

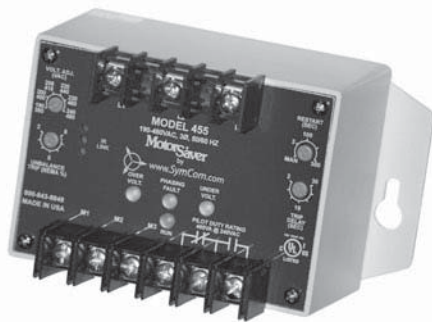
Option 5 - DPDT Relay

*Note: 50Hz will increase all delay times by 20%.

3-Phase Voltage Monitor

Model 455

3-phase voltage/phase monitor, panel mount, has add'l voltage inputs for monitoring load side of contactor for contactor failure & works with Informer-MS diagnostic tool



The Model 455

3-phase voltage monitor combines load and line side monitoring to alert the user of contactor failure or impending contactor failure. The line side monitoring will protect the motor from damaging line side conditions prior to the motor starting. With other line-load side voltage monitors, the motor must be started before a voltage problem is detected. With the Model 455, the motor is fully protected at all times. The motor will not start when a power problem is present.

The Model 455 is a 3-phase, auto-ranging, dual-range voltage monitor that protects 190-480VAC, 50*/60Hz motors regardless of size. The product provides a user selectable nominal voltage setpoint and the voltage monitor automatically selects between the 200V and 400V range. Other

adjustments include a 2-30 second trip delay, a 2-300 second restart delay (and manual restart) and a voltage unbalance trip point adjustment from 2-8%.

Four LEDs indicate the status of the Model 455: run light, undervoltage, overvoltage and phasing fault. The Model 455 is a load and line side monitor that does not require a separate power source for its electronics, making it much easier to install.

The Model 455 now has an infrared LED to communicate with the new Informer-MS. Just aim the handheld diagnostic tool at the 455 to get valuable information such as real-time voltage and voltage unbalance on both line and load sides, motor run hours, last 20 faults, last 32 motor starts, high and low voltage trip points, voltage unbalance trip point, restart and trip delay settings, MotorSaver® status and more!

For more information see:

See Appendix A, page 68, Figure 7 for dimensional drawing.

See Appendix B, page 75, Figures 23 & 24 for typical wiring diagrams.

Features:

- Load side monitoring of contactor
- Multiple LEDs for diagnostics, special indicators for overvoltage, undervoltage and phasing faults
- Prevents rapid cycling by monitoring contactor or starter
- Infrared LED to communicate with Informer-MS

Approvals:   

Auxiliary Products:

- Informer-MS
- IR Kit-36 (36" infrared adapter cable)

Available Models:

455
455-480R
455-575

Specifications

Input Characteristics

Line Voltage	
455	190-480VAC
455-575	475-600VAC
455-480R	380-480VAC
Frequency	50*/60Hz

Functional Characteristics

Low Voltage (% of setpoint)	
Trip	90% ±1%
Reset	93% ±1%
High Voltage (% of setpoint)	
Trip	110% ±1%
Reset	107% ±1%
Voltage Unbalance (NEMA)	
Trip	2-8% adjustable
Reset	Trip setting minus 1%
Trip Delay Time	
Low & High Voltage and Unbalance	2-30 seconds adjustable
Single-phasing Faults (>25% UB)	2 seconds fixed
Restart Delay Time	
After a Fault	Manual, 2-300 seconds adj.
After a Complete Power Loss	Manual, 2-300 seconds adj.
After a Motor Shut-down	Manual, 2-300 seconds adj.

Output Characteristics

Output Contact Rating (SPDT)	
Pilot Duty	480VA @ 240VAC
General Purpose	10A
High Voltage Relay (-480R)	
Pilot Duty	470VA @ 600VAC
General Characteristics	
Ambient Temperature Range	
Operating	-40° to 70°C (-40° to 158°F)
Storage	-40° to 80°C (-40° to 176°F)
Repeat Accuracy	
Fixed Conditions	±0.1%
Maximum Input Power	6 W
Terminal	
Torque	7 in.-lbs.
Wire Size	12-18AWG
Transient Protection (Internal)	IEC 61000-4-5;1995 ±6kV
Safety Marks	
UL	UL508 (File #E68520)
CSA	C22.2 No. 14 (File #46510)
CE	IEC 60947-6-2
Dimensions	2.93"H x 5.27"W x 2.95"D (74.4 x 133.9 x 74.9mm)
Weight	1.1 lbs. (17.6 oz., 498.95 g)
Mounting Method	#8 screws

*Note: 50Hz will increase all delay times by 20%.

3-Phase Voltage Monitor

wireless hand-held diagnostic tool reads Model 455 to display last 20 fault causes, real-time voltage/phase & much more

Model Informer-MS



The Informer-MS

is a handheld diagnostic tool designed for use with MotorSaver® Model 455* equipped with an infrared LED transmitter.

The Informer-MS uses an infrared receiver to read valuable information transmitted from the Model 455*, which can be helpful for troubleshooting the system. A green communication status light indicates the Informer-MS is receiving data from the MotorSaver®. If communication is lost, the Informer-MS will display the last values it received.

*Model 455s manufactured after 03/01/06 are equipped with the infrared LED transmitter. Models manufactured prior to this date are not compatible with the Informer-MS.

An infrared adapter can be purchased to allow communication with the Model 455 without opening the panel door.

For more information see:
See Appendix A, page 69, Figure 10 for dimensional drawing.

Features:

The Informer-MS displays:

- Real-time, line and load side voltage
- Real-time, line and load side voltage unbalance
- Motor run hours
- Last 20 faults
- Last 32 motor starts
- High and low voltage trip points
- Voltage unbalance trip point
- Restart and trip delay settings
- Voltage at last fault

Auxiliary Products:

- Model 455 Series
- IR Kit-36 (36" infrared adapter cable)

Available Models:

Informer-MS

Specifications

Functional Characteristics	
Power	
Input	9 Volts DC (requires one 9-volt alkaline battery)
Auto Shut-off	2 minutes
Communication	
Signal	Infrared
Range	1-8 ft.
Data Update	4 seconds
General Characteristics	
Temperature Range	0 to 60°C (32° to 140°F)
Accuracy	
Voltage	±2%
Maximum Input	0.25 W
Resolution	
Voltage	1.0VAC
Display (Liquid crystal)	
Size	2 rows x 16 characters
Keypad	Three 0.5" buttons
Mechanical Life	500,000 actuations
Overlay Material	Lexan
Enclosure	
Dimensions	5.50" H x 3.6" W x 1.125" D (139.7 x 91.44 x 28.58mm)
Weight	0.5 lb. (8 oz., 226.8 g) (w/out battery)
Material	Black ABS

3-Phase Voltage Monitor

3-phase voltage monitor, *din rail mount, adj trip/restart delays & V unbalance %, and options for 2 individual contacts, adj high/low voltage trip pts & much more*

Model 460 Product Line



The Model 460

is a 3-phase, auto-ranging, dual-range voltage monitor that protects 190-480VAC, 50/60Hz motors regardless of size. The product provides a user selectable nominal voltage setpoint and the voltage monitor automatically selects between the 200V and 400V range. The 460's wide operating range, combined with UL and CE compliance, enables quick access to domestic and global markets.

This unique microcontroller-based voltage and phase-sensing device constantly monitors the 3-phase voltages to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to an acceptable

level for a specified amount of time (restart delay). The trip and restart delays prevent nuisance tripping due to rapidly fluctuating power line conditions.

The Model 460 automatically senses whether it is connected to a 190-240V, 60Hz system, a 440-480V, 60Hz system or a 380-416V, 50Hz system. An adjustment is provided to set the nominal line voltage from 190-240 or 380-480VAC. Other adjustments include a 1-30 second trip delay, a 1-500 second restart delay and a 2-8% voltage unbalance trip point.

-L The 460-L is similar to a 460, but without the adjustable voltage unbalance and variable trip delay. These are fixed at 6% for unbalance and 4 seconds for high, low and unbalanced voltage and 1 second for single phase.

-575 The 460-575 is intended for incoming power sources between 470VAC and 600VAC. Most commonly used in Eastern Canada and on generation units that generate 600VAC power.

-MR The 460-MR is used for any application that needs to have an external manual reset button. It is equipped with a two-prong connection to hook to a normally open pushbutton, which can be mounted outside a panel, therefore eliminating the need to open the panel to reset the unit.

-14 The 460-14 has two sets of contacts, 1 form A and 1 form B, for differing applications where two different voltages may be required, such as 5VDC for an input to a PLC and 115VAC for an alarm.

-15 The 460-15 has two sets of contacts, 2 form A, for applications where two different units are to be controlled at once, such as a unit that has separate contacts for a compressor and a fan.

-VBM The 460-VBM is designed so the user can set specific low and high voltage trip points. They also have a 1-30 second trip delay and 1-500 second restart delay. The voltage unbalance is fixed at 6%.

-400HZ The 460-400HZ is intended for applications that have a 400Hz power supply rather than 50-60Hz, such as aircraft and marine applications. It has all the features of the regular 460, such as the variable restart delay, voltage unbalance (2-8%) and restart delay. Auto ranging from 190-480VAC.

See Appendix A, page 69, Figure 11 for dimensional drawing.

See Appendix B, page 76, Figure 25 for typical wiring diagram; Figure 26 for a typical wiring diagram for the 460-14 & 460-15.

Specifications

Input Characteristics		Form A & Form B	
Line Voltage		Pilot Duty	360VA @ 240VAC, B300
460, 460-L, 460-MR, 460-14, 460-15	190-480VAC	General Purpose	8A @ 240VAC
460-VBM, 460-400HZ	190-480VAC	General Characteristics	
460-575, 460-575-14	475-600VAC	Ambient Temperature Range	
Frequency	50/60Hz	Operating	-40° to 70°C (-40° to 158°F)
Functional Characteristics		Storage	-40° to 80°C (-40° to 176°F)
Low Voltage (% of setpoint)		Maximum Input Power	6 W
Trip	90% ±1%	Class of Protection	IP20, NEMA 1 (finger safe)
Reset	93% ±1%	Relative Humidity	10-95%, non-condensing per IEC 68-2-3
High Voltage (% of setpoint)		Terminal Torque	6 in.-lbs.
Trip	110% ±1%	Wire Type	Stranded or solid 12-20 AWG, one per terminal
Reset	107% ±1%	Standards Passed	
Voltage Unbalance (NEMA)		Electrostatic Discharge (ESD)	IEC 61000-4-2, Level 3, 6kV contact, 8kV air
Trip	2-8% adjustable	RFI, Radiated	150 MHz, 10V/m
Reset	Trip setting minus 1% (5-8%) Trip setting minus 0.5% (2-4%)	Fast Transient Burst	IEC 61000-4-4, Level 3, 3.5kV input power & controls
460L	6% UB fixed (4.5% reset)	Surge	IEC 61000-4-5, Level 3, 4kV line-to-line; Level 4, 4kV line-to-ground
Trip Delay Time		ANSI/IEEE	C62.41 Surge and Ring Wave Compliance to a level of 6kV line-to-line
Low, High and Unbalanced Voltage	1-30 seconds adjustable	Hi-potential Test	Meets UL508 (2 x rated V +1000V for 1 minute)
460L	4 seconds fixed	Safety Marks	
Single-Phase Faults (>25% UB)	1 second fixed	UL	UL508 (File #E68520)
Restart Delay Time		CE	IEC 60947-6-2
After a Fault	1-500 seconds adjustable	Enclosure	Polycarbonate
After a Complete Power Loss	1-500 seconds adjustable	Dimensions	3.5" H X 2.084" W X 2.350" D (88.9 x 52.93 x 59.69mm)
Output Characteristics		Weight	0.7 lb. (11.2 oz., 317.51 g)
Output Contact Rating		Mounting Method	35mm DIN rail or Surface Mount (#6 or #8 screws)
Form C		460-MR (manual reset)	External NO pushbutton required.
Pilot Duty	480VA @ 240VAC, B300		
General Purpose	10A @ 240VAC		

3-Phase Voltage Monitor

Model 601

3-phase voltage & frequency monitor, on-board display, adjustable trip delay, optional communications to PLC/SCADA/monitoring systems



The Model 601

is a fully-programmable voltage monitor designed to protect 3-phase motors. It can be used as a stand-alone product or networked with an RM-1000, RM-2000, PLC, computer or SCADA system.

When a harmful condition is detected, the MotorSaver's output relay is deactivated after the specified trip delay. The output relay reactivates after power line conditions return to an acceptable level for the programmed restart delay (RD2).




The following 11 setpoints can be viewed from the 3-digit LED display or from a networked device: low voltage, high voltage, voltage unbalance, low frequency, high frequency, trip delay for voltage/frequency faults, trip delay for single-phase faults, rapid-cycle timer (RD1), restart delay after all faults (RD2), type of restart after all faults (manual or automatic), and RS-485 address. Six parameters can be viewed as the motor is running: L1-L2 voltage, L2-L3 voltage, L1-L3 voltage, average voltage, percent voltage unbalance and frequency.

When used with the RS485MS-2W communications module, the Model 601 can communicate with most modbus RTU master devices. Voltage conditions can be monitored and setpoints can be changed remotely using SymCom's Solutions software, an RM-1000, RM-2000 or other device.

For more information see:
See Appendix A, page 66, Figure 1 for dimensional drawing.
See Appendix B, page 76, Figure 27 for typical wiring diagrams.

Features:

- Protects 3-phase motors from:
 - Loss of any phase (single phasing)
 - Phase reversal
 - Low voltage
 - High voltage
 - Voltage unbalance
 - Low frequency
 - High frequency
 - Rapid cycling
- Built-in 3-digit display for programming, real-time information and diagnostics
- Programmable voltage and frequency settings/parameters
- Programmable restart control (adjustable automatic restart or manual restart)
- Reset pushbutton (and optional remote reset pushbutton)
- 2 each separate programmable trip delay timers and restart delay timers
- Last four faults (with characteristics) available via 3-digit display, network or remote displays
- RS-485 Modbus network communications
- Optional remote displays aid in complying with arc-flash safety regulations

Approvals:   

Auxiliary Products:

- RS485MS-2W (communication module)
- RM-1000/RM-2000 (remote displays)
- 777-MRSW (manual remote reset kit)

Available Models:

601
601-575

Specifications

Input Characteristics

Line Voltage	
601.....	190-480VAC
601-575.....	500-600VAC
Frequency.....	.50/60Hz

Functional Characteristics

Programmable Operating Points

LV - Low Voltage Threshold.....	.170V (450V**) - HV Setting
HV - High Voltage Threshold.....	LV Setting - 528V (660V**)
VUB - Voltage Unbalance Threshold.....	.2-15% or off
LF - Low Frequency Threshold.....	.35Hz - HF Setting
HF - High Frequency Threshold.....	LF Setting - 75Hz
TD1 - Trip Delay for Voltage/ Unbalance/Frequency Faults.....	1-50 seconds
TD2 - Trip Delay for Single-Phase Faults.....	1-50 seconds
RD1 - Rapid-Cycle Timer.....	.0, 2-500 seconds
RD2 - Restart Delay After All Faults.....	2-500 seconds
#RF - Type of Restart.....	Manual or Automatic
ADDR - RS-485 Address.....	A01-A99
Fixed Reset Points	
Overvoltage Reset.....	.97% of HV Setting
Low Voltage Reset.....	.103% of LV Setting
Voltage Unbalance Reset.....	.UB Setting -1%
Low Frequency Reset.....	.LF Setting +0.6Hz
High Frequency Reset.....	.HF Setting -0.6Hz

Output Characteristics

Output Contact Rating	
Pilot Duty.....	.480VA @ 240VAC

General Characteristics

Temperature Range.....	-20° to 70°C (-4° to 158°F)
Accuracy	
Voltage.....	±1%
Timing.....	.5% ±1 second
Repeatability	
Voltage.....	±0.5%
Maximum Input Power.....	.5 W
Transient Protection (Internal).....	.2500 V for 10 ms
Safety Marks	
UL.....	UL508 (File #E68520)
CSA.....	C22.2 No. 14 (File #46510)
CE.....	IEC 60947-6-2
Dimensions.....	3.05 H x 3.85 W x 5.05 D in. (77.47 x 97.79 x 128.27 mm)
Weight.....	1.2 lbs. (19.2 oz., 544.31 g)
Mounting Method.....	Surface mount (4 - #8 screws) or DIN rail mount

SymCom's Model 601 can be preprogrammed prior to installation by applying at least 120V to the L1 and L2 terminals.

**575V Model