Phase Failure Relays
Type MPS and MPD

Class 8430

Catalog

04

CONTENTS

a brand of Schneider Electric

SQUARE D

Three-Phase Monitoring

If, for any reason, the motor windings draw more current than they are rated for, excess heat is generated, causing deterioration of the motor insulation. This deterioration is irreversible and cumulative. Eventually, the windings will short to the motor housing, causing motor failure. The reaction time of thermal overload units may be too slow to provide effective protection from the excess heat generated by high current. A phase failure relay, by limiting the overcurrent will help to:

- Increase motor life
- Reduce the very costly repair or replacement of motors
- Minimize downtime due to motor problems
- Reduce the risk of electric shock or fire due to the shorting out of motor windings

Types of Protective Relays

There are two major types of protective relays for three-phase systems: current sensing and voltage sensing. The advantages of current sensing protective relays over voltage sensing relays are that they are not fooled by back EMF (Electromotive Force) which accompanies a phase failure on motor loads and they also can detect an abnormal condition on either the line side or load side in a branch circuit in which the relay is used. Voltage sensing devices can only detect abnormal conditions on the line side of where the relay is connected.

However, a voltage sensing relay has an important advantage in that it can detect an abnormal condition independent of the motor's running status. A current sensing device requires the motor to be running before an abnormal condition can be detected. Therefore, a voltage sensing device will provide pre-start protection while a current sensing device will not. Other advantages of voltage sensing devices are that they are easy to install, are generally less expensive because they do not need current transformers, and require only voltage connections so that they may be applied independent of the system load.

Phase Failure Detection

A phase failure may occur because of a blown fuse in some part of the power distribution system, a mechanical failure within the switching equipment, or if one of the power lines open. A three-phase motor running on single phase draws all of its current from the remaining two lines. Attempting to start a three-phase motor on single phase will cause the motor to draw locked-rotor current and the motor will not start. The reaction time of thermal overload units may be too slow to provide effective protection from the excessive heat generated in the motor windings when a phase failure occurs.

Protecting a three-phase motor against phase failure is difficult because a lightly loaded three-phase motor operating only on single phase will generate a voltage, often called regenerated voltage or back EMF, in its open winding almost equal to the lost voltage. Therefore, voltage sensing devices which monitor only the voltage magnitude may not provide complete protection from a phase failure which occurs when the motor is running. A greater degree of protection can be obtained from a device which can detect the phase angle displacement accompanying a phase failure. Under normal conditions, the three-phase voltages are 120 degrees out of phase with respect to one another. A phase failure will cause a phase angle displacement away from the normal 120 degrees.

Phase Reversal Detection

Phase reversal can occur when maintenance is performed on motor-driven machinery, when modifications are made to the power distribution system, or when power restoration results in a different phase sequence than before the power outage. Phase reversal detection is important if a motor running in reverse may damage the driven machinery or injure personnel. The National Electric Code (NEC) requires phase reversal protection on all equipment transporting people, such as escalators or elevators.

Voltage Unbalance Detection

Voltage unbalance can occur when incoming line voltages delivered by the power company are of different levels, or when single-phase loads such as lighting, electrical outlets and single-phase motors are connected on individual phases and not distributed in a balanced way. In either case, a current unbalance will result on the system which shortens motor life and diminishes motor efficiency. An unbalanced voltage applied to a three-phase motor can result in a current unbalance in the motor windings equal to several times the voltage unbalance. This will increase the heat generated, a major cause of rapid deterioration of motor insulation.

Undervoltage

Undervoltage may occur if the power supplied by the local power company is overloaded, causing the voltage to drop, which is known as a brown out. An undervoltage condition can also occur in remote areas at the end of long power lines. As the voltage available to the motor is decreased, the current drawn by the motor increases, resulting in generated heat which deteriorates the motor insulation.

8430MPS

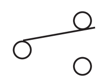
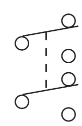
- Socket mounted
- Undervoltage adjustment from 75 to 100%
- Detects phase unbalances over 10%
- Hard output contacts with 240 Vac rating

8430MPD

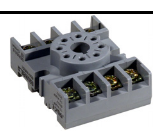
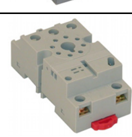
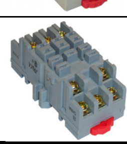
- Offers the same protection as the 8430MPS
- Surface mounted
- LED indication when relay is energized
- Locking potentiometer undervoltage adjustment
- Hard output contacts with 600 Vac rating

Both relays protect motors against:

- Phase failure
- Voltage unbalance
- Phase reversal
- Undervoltage

Product	Description	Contact Arrangement	Monitored Voltage	Catalog Number	Recommended Socket
	A socket-mounted voltage sensing phase failure relay	 SPDT	240 V–60 Hz	8430MPSV24	8501NR51 or 8501NR52
			480 V–60 Hz	8430MPSV29	8501NR82
	A surface-mounted voltage sensing phase failure relay	 DPDT	120 V–60 Hz	8430MPDV20	Not required
			240 V–60 Hz	8430MPDV24	
			480 V–60 Hz	8430MPDV29	
			600 V–60 Hz	8430MPDV32	

Sockets for 8430MPS Relays
35mm DIN 3 Track Mount or Direct Panel Mount

Product	Description	Socket Rating		Catalog Number	Package Quantity
		UL	CSA		
	8 pin tubular single tier screw terminal	10 A, 600 V 15 A, 300 V	10 A, 300 V	8501NR51	1
				8501NR51B	10
	8 pin tubular double tier screw terminal	5 A, 600 V 16 A, 300 V	10 A, 300 V	8501NR52	1
				8501NR52B	10
	11 pin spade double tier screw terminal	15 A, 300 V ▲	15 A, 300 V ▲	8501NR82	1
				8501NR82B	10

Depending on the application, the RM4 relay should be considered.

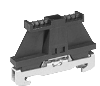
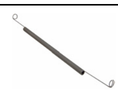
▲ Rated 10 A, 480 V when used with an 8430MPSV29 phase failure relay.

35 mm DIN 3 Mounting Track

Height	Length	Catalog Number	Package Quantity
7.5 mm (0.30 in.)	0.5 m (19.68 in.)	9080MH220	10
		9080MH320	10
	1.0 m (39.37 in.)	9080MH239	10
		9080MH339	10
	2.0 m (78.74 in.)	9080MH279	10
		9080MH379	10
		AM1DP200	10
15.0 mm (0.60 in.)	2.0 m (78.74 in.)	AM1ED200	10
		AM1DE200	10

For additional track lengths or technical data, refer to the IEC Type Terminal Block Catalog, 9080CT9602.

Accessories

Product	Description	Catalog Number	Package Quantity
	Screw-on end clamp	9080MHA10	50
	Screw-on end clamp	AB1AB8M35	50
	Hold down for 8430MPS relays	8501NH7	1

Conformity to Standards:

8430MPS

File **E78351** CCN **NLDX** with proper socket
8430MPSV24 – With 8501NR51 or NR52 socket
8430MPSV29 – With 8501NR82 socket

File **E42240** CCN **NLDX** without sockets

File **060905** Class **3211 03**

8430MPD

File **E78351** CCN **NLDX**

File **060905** Class **3211 03**

8501NR

File **E66924** CCN **SW1V2**

File **LR84913** Class **3211 07**

Output Contact Rating:

Type	Contacts	Maximum Control Circuit Voltage	AC Ratings			
			Inductive		Resistive	
			Make VA	Break VA	Make & Break Amperes	Thermal Contin-uous Current
MPS	SPDT	120 240	1800 1800	180 180	5 5	5 5
MPD	DPDT	120 240 480 600	3400 3600 3600 3600	340 360 360 360	5 5 2.5 2.5	5 5 5 5

Undervoltage Adjustment:
75 to 100% of nominal voltage

Phase Unbalance Detection:
Greater than 10%

Maximum Power Consumption:
8430MPS–5.0 VA (240 V), 5.5 VA (480 V)
8430MPD–5.0 VA (120 V), 5.5 VA (240 V), 6.5 VA (480 V), 7 VA (600 V)

Transient Spike Protection:
5000 volts for 50 microseconds

Temperature Rating:
Operating: -5 to 50 °C (23 to 122 °F)
Storage: -20 to 70 °C (-4 to 158 °F)

Screw Tightening Torque:
8430MPD Relay: 7–9 lb-in (0.8–1.0 N•m)
8501NR51, 52 or 82 sockets: 7–9 lb-in (0.8–1.0 N•m)

Wire Range:
8430MPD Relay: One or two #18 to #14 AWG Copper wire (75 °C insulation or higher)
8501NR Sockets: One or two #12 to #22 AWG Copper wire (75 °C insulation or higher)

Pick-up Time:
Typically 0.1 seconds when correct three-phase voltage is applied

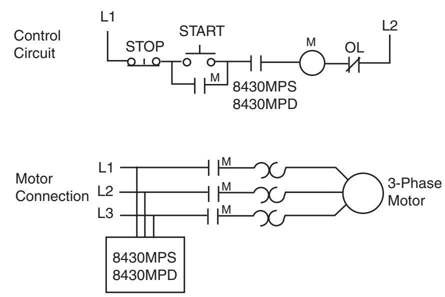
Drop Out Time:
Typically 3 seconds for any incorrect voltage condition.

8430 MPS and MPD relays will reset automatically when the phase abnormality is corrected. Therefore, 3-wire control should be used to accomplish safe operation of equipment.

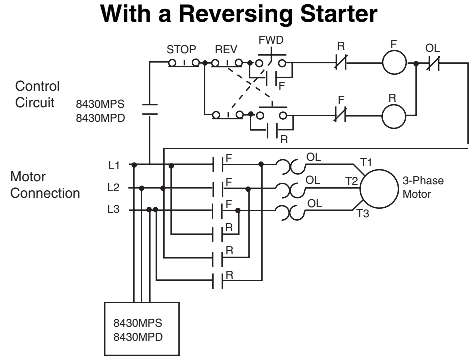
Line Side Monitoring

With the relay connected before the starter, the motor can be started in the reverse direction. However the motor is unprotected against phase failures between the relay and the motor.

With a Nonreversing Starter



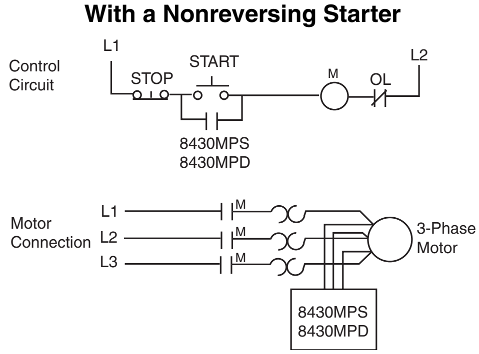
With a Reversing Starter



Load Side Monitoring

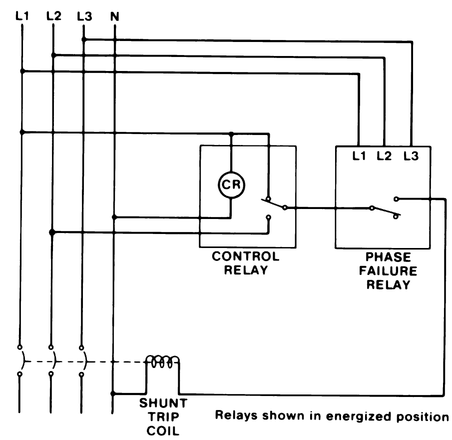
With the relay connected directly to the motor, the total feed lines are monitored. This connection should not be used with reversing motors.

With a Nonreversing Starter



Interfacing Phase Failure Relays With Shunt Trip Circuit Breakers

Phase failure relays are often used to control a shunt trip circuit breaker. When this is done, care must be taken to insure that the shunt trip circuit always has an adequate source available. This can be accomplished by using the diagram below.

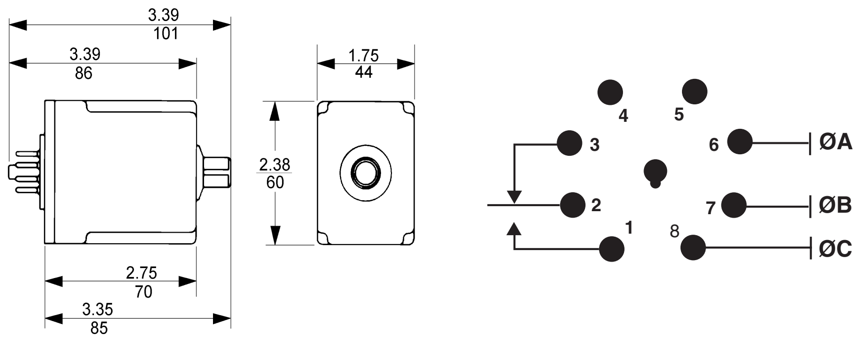


If a phase failure occurs on L2 or L3, the shunt trip coil will draw power from L1 through the control relay (CR) contacts and phase failure relay contacts (which will change state upon detecting a phase failure). If a phase failure occurs on L1, the control relay (CR) contacts change state. The shunt trip coil will now draw power from L2 through the CR contacts and phase failure relay contacts.

If the control relay coil or contacts, the phase failure relay contacts, or the shunt trip coil does not have the same voltage rating as the motor, control transformers may be interposed where needed.

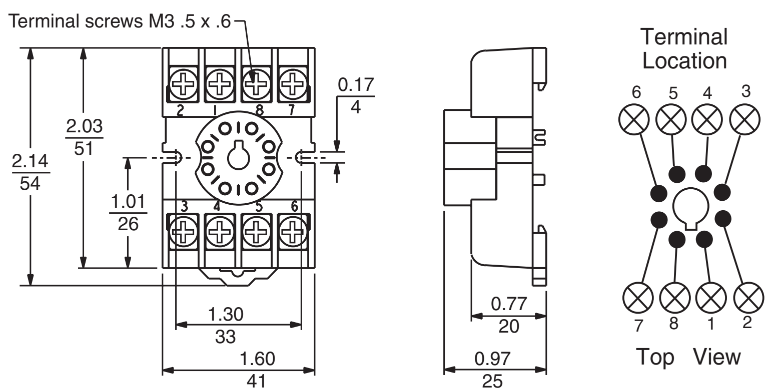
SQUARE D

Phase Failure Relays Type MPS and MPD
Approximate Dimensions and Weights – Class 8430

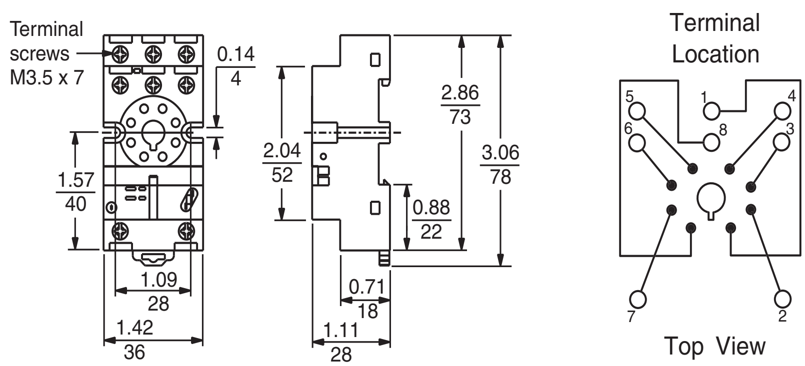


Type MPS 240V

8430MPSV24
Weight: 7.1 oz (0.20 kg)

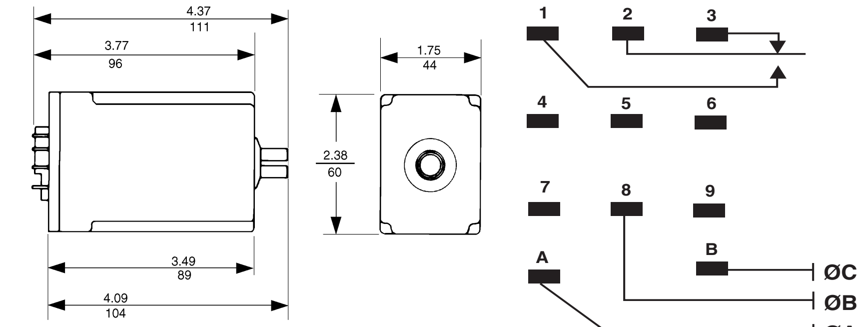


8501NR51
Weight: 1.6 oz (0.05 kg)



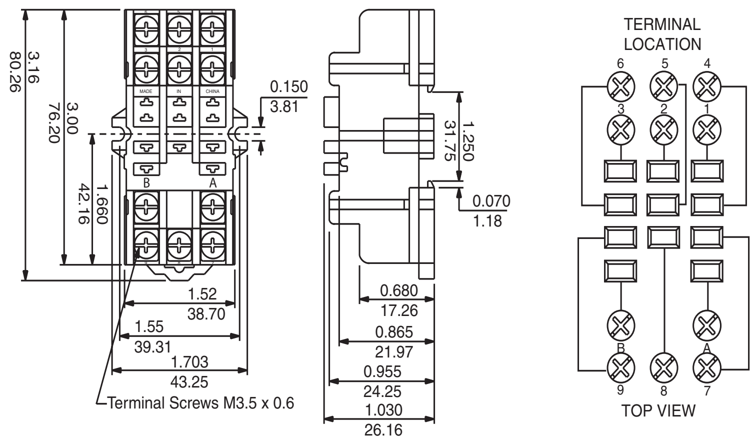
8501NR52
Weight: 1.6 oz (0.05 kg)

Dimensions = $\frac{\text{in.}}{\text{mm}}$

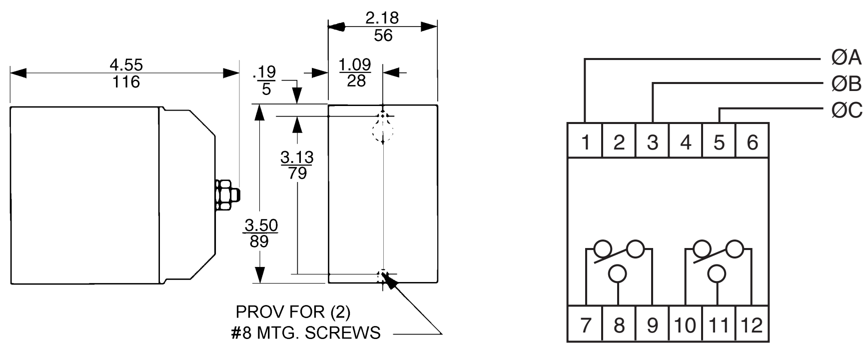


Type MPS 480V

8430 MPSV29
Weight: 7.9 oz (0.23 kg)



8501NR82
Weight: 2.3 oz (0.07 kg)



Type MPD

8430MPD
Weight: 15.9 oz (0.45 kg)

Dimensions= in. / mm

Schneider Electric USA
8001 Highway 64 East
Knightdale, NC 27545
1-888-SquareD
(1-888-778-2733)
www.us.SquareD.com

Schneider Electric Canada
19 Waterman Avenue,
M4B 1 Y2
Toronto, Ontario
1-800-565-6699
www.schneider-electric.ca

Catalog No. 8430CT9701R6/04 June 2004
Replaces 8430CT9701 dated 01/1998.