



# MOTOR STARTER-PROTECTOR COMBO (MSC) REFRIGERATION PACKAGE

COMPACT, RELIABLE, LOW POWER CONSUMPTION

## Introduction

The Klixon® MSC refrigeration pack-age is a compact motor starter and motor protector package that dissipates less than 2 watts under typical operating conditions.



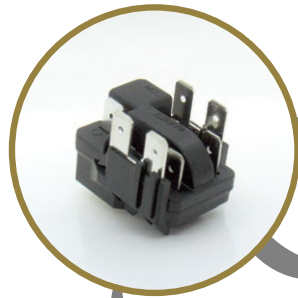
**Standard**



**1-Piece (RSCR)**



**2-Piece (RSCR)**



**Terminal Board**

## Overview

The MSC by Sensata Technologies serves as a combination control that:

- Uses compact metal can motor protector and solid state PTC motor starter
- Includes Internal Back-up Protection System for the PTC motor starter
- Available for RSCR applications (Contact Sensata for alternate configurations)
- Plugs directly onto compressor terminal pins
- Dissipates less than 2 watts under typical operating conditions

## Features

- Applicable to fractional horsepower compressors used in residential refrigerators and freezers, and similar refrigeration applications
- Utilizes ceramic PTC (Positive Temperature Coefficient) thermistor element to energize / de-energize motor start windings
- Available for 120 and 220 volt applications
- Configurations available to suit most residential applications
- Less costly to install than discrete motor starter and protector components

## SPECIFICATIONS

### General

<b>Temperature Limits</b>	Ambient Air: 0°C to 70°C
<b>Electrical Requirements</b>	120 or 240 VAC nominal voltage (50 or 60 Hz)

### Motor Starter

<b>Room Temperature Resistance</b>	3.9Ω to 47Ω ratings available ±25% resistance tolerance
<b>Switch Time</b>	0.1 – 1.4s at 120 or 240 VAC
<b>Reliability</b>	500,000 cycles at maximum rated conditions of voltage and current

## Motor Protector

<b>Device Actuation Temperatures</b>	Open Temperature: 100°C to 160°C ± 5°C Close Temperature: 55°C to 70°C ± 9°C Temperature Differential: 60°C typical
<b>Rated Hot Locked Rotor Current</b>	120 VAC: 18.0 A maximum 240 VAC: 10.0 A maximum 60% power factor
<b>Ultimate Trip Current</b>	0.5 – 5.5 A @ 71°C
<b>Endurance<sup>1</sup></b>	Minimum of 15,000 cycles at maximum rated current at 120 and 240 volts, as predicted by Weibull analysis of the test data. This protection must be verified in the end application.

<sup>1</sup> A failure is defined as an open circuit or permanently closed circuit, rapid cycle (>3X normal rate), or by a change in the open or close temperature of more than 10% from the original values.

## CONFIGURATIONS

### MSC Standard

Multiple quick connect (QC) terminal configurations available; designed to be used with secondary compressor relay cover

### MSC One-Piece Connector

3.2 mm x 0.5 mm terminals for use with standard insulated connector

### MSC Two-Piece Connector

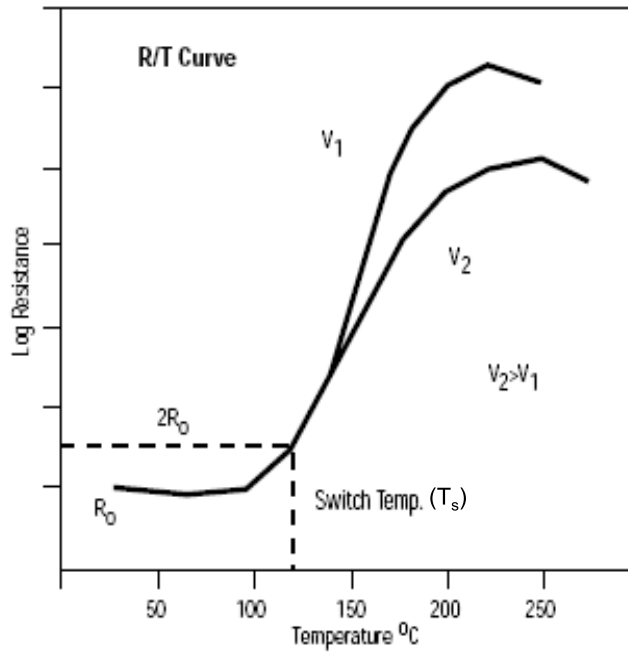
1/4" and/or 3/16" QC terminal configurations for use with standard insulated connectors

### MSC Terminal Board

Multiple QC and screw terminal configurations available; designed to be used with secondary compressor relay cover

## APPLICATION NOTES

1. The surface and terminals of the MSC device can reach high temperatures under typical running conditions. Any material in contact with the MSC and its terminals, including wire and quick-connect receptacle plastic insulation, should have a minimum temperature rating (UL RTI) of 105°C. Adequate spacing should be provided to insulate lower-rated materials from this heat source.
2. The MSC device should be protected from potential sources of liquid, such as the evaporator tray and water connections.
3. Certain materials, such as chlorine (Cl) containing gases, can degrade the characteristics of the MSC device. The MSC device should not be exposed to sulphur (S) or chlorine (Cl) containing gases, and must be kept away from materials that can generate them. In particular, avoid the use of polyvinyl chloride (PVC) insulation in contact with the MSC terminals.
4. The MSC device should not be exposed to hydrocarbon based materials, as they can cause a degradation in the PTC characteristics.
5. The final device configuration selection will determine the necessity for a secondary compressor relay cover and or supplemental retention requirements.
6. The installation force applied to the MSC device must be in parallel with the compressor feedthrough pins and must not exceed 20 kgf (44 lbs).

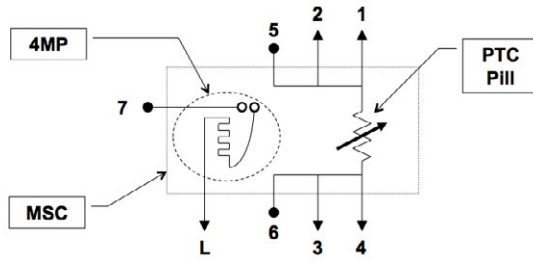


### Glossary

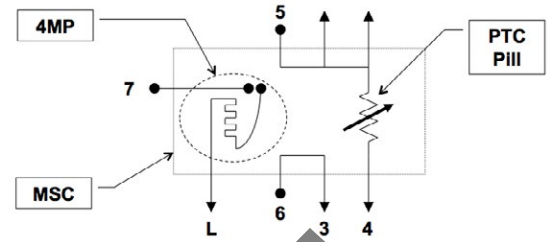
<b><math>R_0</math></b>	Measured resistance value at 25°C at maximum of 2.0 volts
<b>Switch Time (<math>t_s</math>)</b>	Time required for the inrush current to decrease to 1/2 of its initial value
<b>Switch (Curie) Temp. (<math>T_s</math>)</b>	Temperature at which the PTC resistance value is 2X the 25°C value ( $R_0$ )
<b>Reset Time</b>	Time required for the PTC resistance to return to 2X the initial value ( $2R_0$ )
<b><math>V_{max}</math></b>	Maximum operating voltage that may be applied across the PTC
<b><math>V_r</math></b>	Nominal rated supplied voltage: 120 or 240 VAC ( $\sim V_{max}$ )
<b><math>I_{ss}</math></b>	Steady state current remaining at maximum operating voltage
<b><math>I_{max}</math></b>	Maximum operating (inrush) current



MSC STD

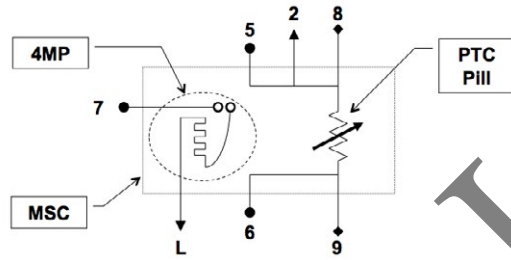


RS\*R

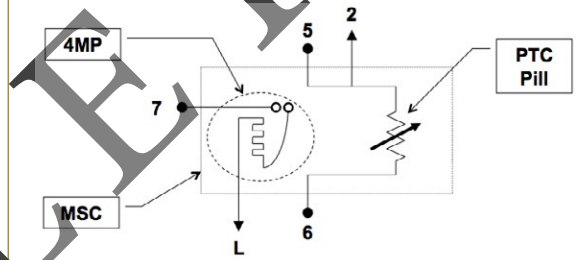


CS\*R

MSC 1-PC  
MSC 2-PC



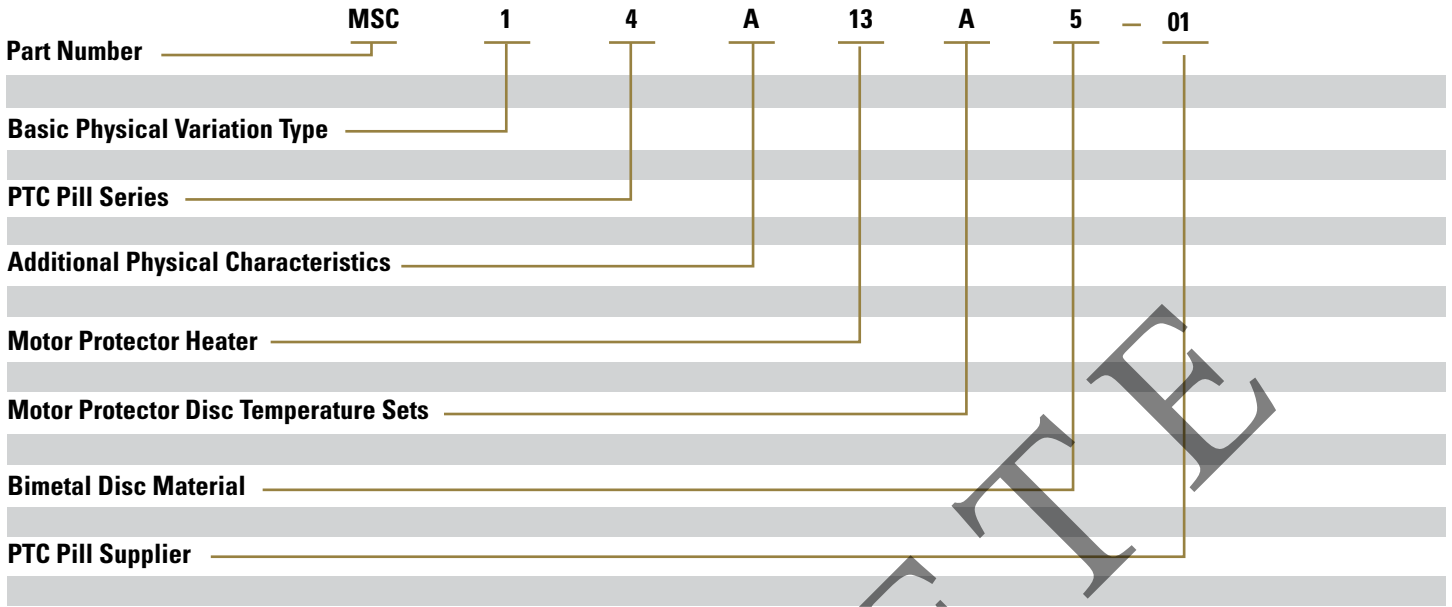
RSCR



RSIR

- ↑ Quick-connect terminal
- ↑ Pin connector
- ↑ Run Capacitor connector (outputs)

OBSOLETE



AGENCY APPROVALS & CERTIFICATIONS



<b>UL / C-UL</b>	File# SA3745
<b>KEMA / ENEC</b>	Certification # 2014531.01 IEC/EN 60730-2-4: 2007 IEC/EN 60730-2-10: 2007 IEC/EN 60079-15: 2005 IEC/EN 60335-1: 2001, clause 30.2.3
<b>CQC</b>	Certification 08002025660
	RoHS Compliant

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