KLIXON® | PHENOLIC MOTOR PROTECTORS

WHY PROTECT MOTORS?

Overheating of motor insulation causes reduction in dielectric strength which can result in motor insulation damage or failure. The following are causes of motor overheating for which Klixon motor protectors can be applied to achieve protection:

- Prolonged running overload
- Locked rotor: mechanical / electrical failure to start
- Low line voltage
- High ambient temperature and lack of ventilation

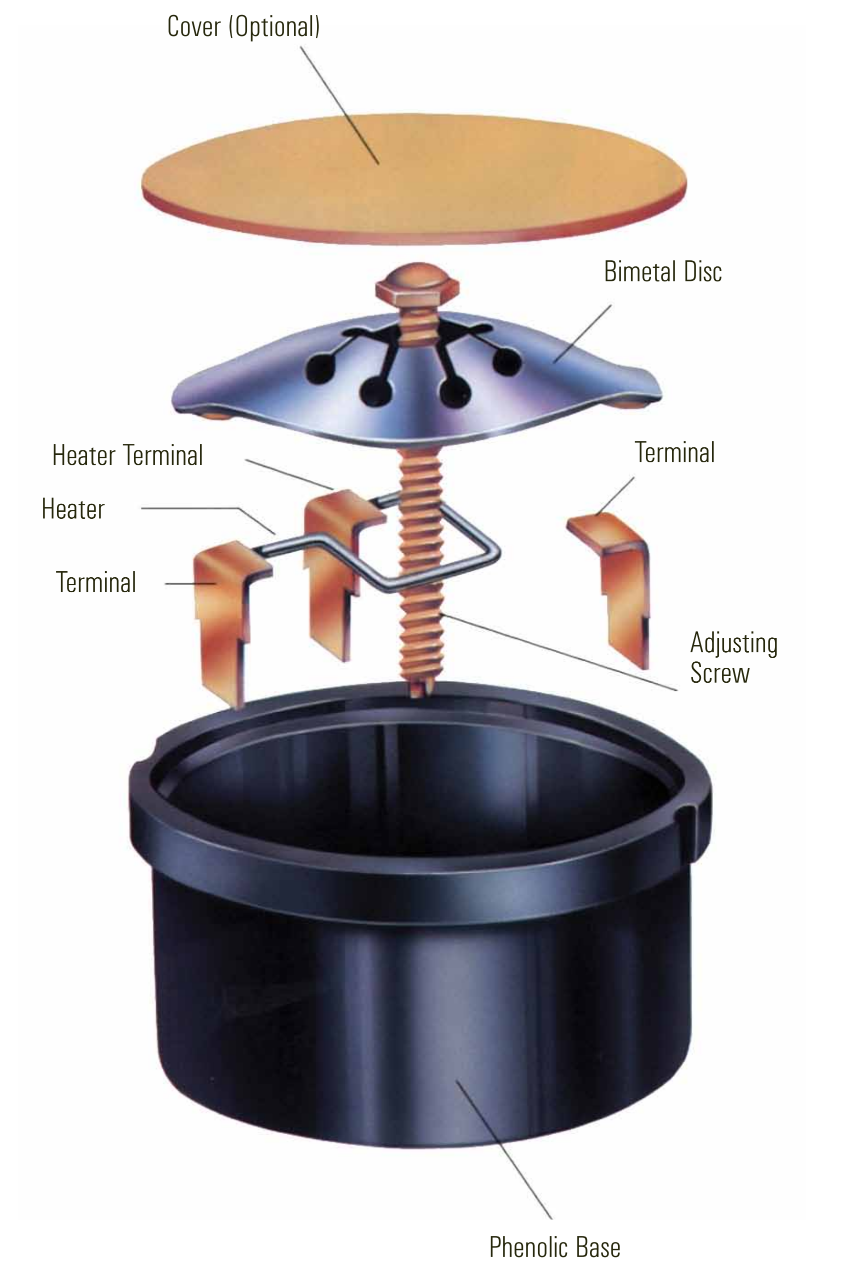
Features

- Normally closed "make or break" Klixon® contact system, which is operated by a snap action disc, is sensitive to both temperature and current.
- Precision calibration – temperature calibrated and inspected under controlled conditions for dependable performance.
- Automatic or manual reset series available
- Easy to install
- UL recognized E15962
- CSA certified LR11372
- VDE certificate with production surveillance, overheating protector. 37 amperes maximum locked rotor 230 VAC, File 4464.4-4510-1013, License No. 3938 UG for 3/4" M.P. only.
- Inherent protection devices for approximately 1/2 to 5 h.p. motors used in applications such as industrial motors, agricultural equipment, well and sump pumps, fans, air conditioners, refrigerators, home appliances, etc.
- When properly applied, protector shuts off motor when temperature exceeds maximum safe level due to an overload or stalled (locked rotor) condition.

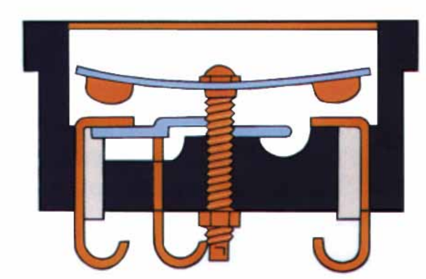
Klixon Phenolic Motor Protectors are equipped with a bimetallic snap acting disc, on which the contacts are mounted, and through which the current flows. If overheating conditions occur, the heating effect of the current flow through the Klixon disc and the influence of motor heat will cause the disc temperature to rise.

When the disc reaches the calibrated setpoint, the Klixon protector automatically opens and shuts down the motor, limiting the winding and shell temperature. When the motor has cooled to an acceptable operating level, allowing the protector to cool to its reset temperature, the Klixon protector resets automatically to a closed contact position allowing the motor to restart.
Manual reset versions are also available for applications where automatic restarting may be hazardous to equipment or operations.

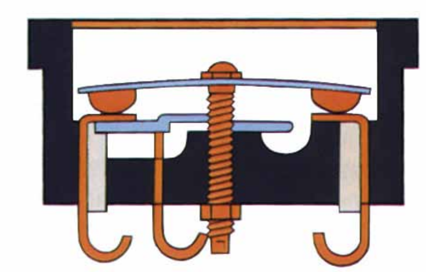
Automatic Reset Exploded View



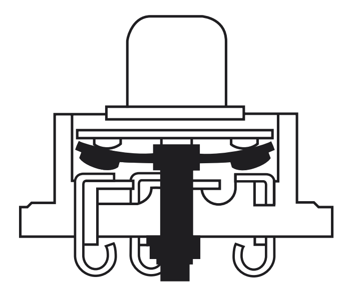
Contacts Open



Contacts Closed

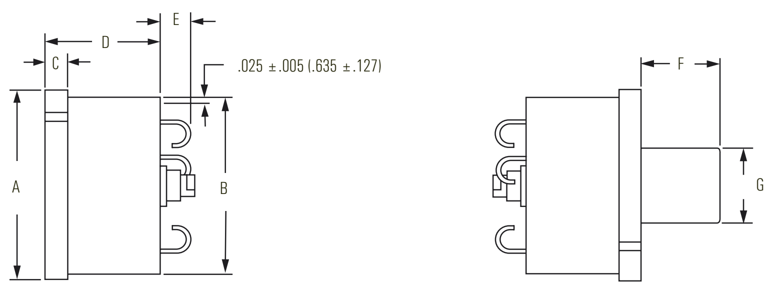


Manual Reset



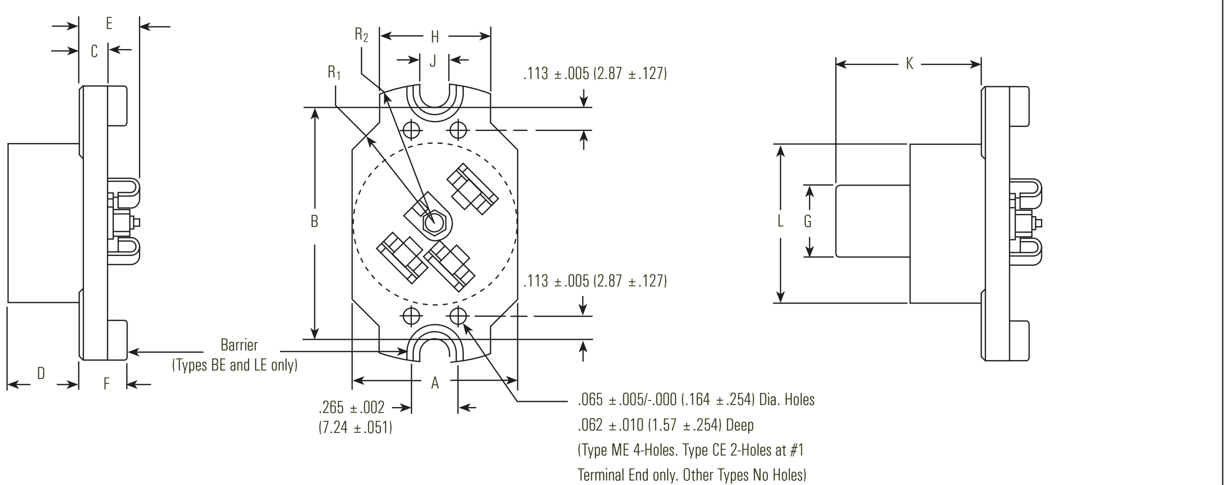
Dimensional Drawings
(Single Phase Types)

Round Base



Type	Size	A	B	C	D	E Max.	F	G
MR	1/8"	1.031 ± .010	.970 ± .006	.125 ± .005	.625 ± .010	.171	23/64 ± 1/32	.375 ± .006
CR	1"	1.312 ± .010	1.218 ± .010	.125 ± .005	.640 ± .010	.218	31/64 ± 1/32	.442 ± .006
BR	1 1/4"	1.640 ± .010	1.555 ± .010	.156 ± .010	.930 ± .015	.313	27/64 ± 1/32	.442 ± .006
LR	1 1/2"	1.983 ± .010	1.881 ± .010	.154 ± .010	.830 ± .015	.375	15/32 ± 3/64	.781 ± .006

Eared Base



Type	Size	A	B	C	D	E	F	G	H	J	K	L	R_1	R_2
ME	1/8"	.970 ± .010	1.390 ± .015	.175 ± .010	.450 ± .015	.354	–	.436 ± .007	.625 ± .010	.176 ± .010	.953	.970 ± .006	.656 ± .010	.845 ± .010
CE	1"	1.187 ± .010	1.390 ± .015	.175 ± .010	.464 ± .015	.406	–	.440 ± .008	.625 ± .010	.176 ± .010	1.000	1.187 ± .010	.656 ± .010	.845 ± .010
BE	1 1/4"	1.594 ± .010	2.125 ± .010	.223 ± .010	.715 ± .010	.552	.332 ±010	.440 ± .008	1.000 ± .010	.218 ± .010	1.180	1.552 ± .010	.844 ± .010	1.344 ± .010
LE	1 1/2"	1.875 ± .010	2.125 ± .020	.267 ± .010	.890 ± .010	.683	.517 ± .010	.781 ± .006	1.250 ± .010	.218 ± .010	1.370	1.875 ± .010	1.000 ± .010	1.344 ± .010

Type Code Structure for Single Phase Phenolic Motor Protectors

The following is an explanation of the type code which appears on each standard Klixon phenolic motor protector. By using this code, it is possible to determine the following size, type of base, terminals, heater, disc and contacts type and operating temperature.

M R P 36 A X – 63

Terminations

Size

M = 1/4"
C = 1"
B = 1 1/4"
L = 1 1/2"

Base

E = Eared commercial
R = Round commercial
C† = Round comm. cut down and cover
G* = Eared comm. and cover
S* = Round commercial and cover

* Except 13/4" size which always has cover. E&R designate this.
* Only 11/2" applications.

Terminals

F = 2 solder low cap
H = 2 solder high cap
K = 2 std screw low cap
M = 2 std screw high cap
P = 2 stub low cap
T = 2 stub high cap
G = 3 solder low cap
J = 3 solder high cap
L = 3 std screw low cap
O = 3 std screw high cap
P = 3 stub low cap
T = 3 stub high cap

Heater

Selected to satisfy application requirements

Disc & Contact

3/4"		1"	
High cap		Low cap	High cap
A	AB	F	C
B	AD	G	D
C	AE	J	E
D	AF	P	H
E	AG	L	I
	AH	S	K
	AI	O	
	AJ	T	
	AK	AB	
J	AL	AE	X
	AM	AF	
L	AP	AG	
		AH	
		AI	
R		AJ	
		AK	
		AL	
		AM	
		AN	

Operating Temperature

Automatic Reset	
Open ± 5ºC	Close ± 9ºC
J = 90	57**
K = 105	61
L = 105	69
V = 105	78
Z = 120	61
N = 120	69
X = 120	78
Y = 120	92
W = 135	61
U = 135	69
M = 135	78
R = 135	92
S = 135	102
H** = 150**	78**
P** = 150**	115**
O** = 150**	102**

Manual Reset	
Open ± 5ºC	Close ± 12ºC
G = 90	54**
F = 105	63***
A = 105	74*
B = 120	74
D = 135	96
E** = 150**	96**

* 1-Phase Protectors only.
** Special temperatures. Consult net additions.
*** 3-Phase Protectors only.

Maximum Recommended Protector Contact Ratings

This chart is used to determine protector size needed when making an application.

Size	Disc Contacts	Terminals	Max. Current V = 120	Max. Current V = 240
3/4"	HC	LC	32	25
3/4"	HC	HC	50	37
1"	LC	LC	40	30
1"	HC	LC	40	30
1"	LC	HC	40	30
1"	HC	HC	80	60
1 1/4"	STD	STD	135	100
1 1/2"	STD	STD	175	130

HC = High Capacity **LC** = Low Capacity **STD** = Standard Capacity
For reference only. Plese contact Sensata for application asistance.

Application Worksheet

A sample worksheet provides the information needed for a proper application. It is not possible to apply a Klixon protector based on horsepower, amperage, or name plate data only.

Motor Data

A. Locked Rotor Requirements

1. Locked Rotor Current Cold: the current which exists the instant the motor is turned on.
2. Locked Rotor Current Hot: The current level that exists at end of 1st cycle test. Typically 10 to 30 seconds after motor is first turned on.
3. Time elapsed during above test to raise motor winding temperature from room temperature to around maximum allowed temperature for the UL class of motor insulation. An example would be, for a class A motor, 25°C to 175°C in 12.5 seconds.
4. Ambient Temperature During test: Room temperature (usually 25°C).

B. Running Overload Requirements

1. Load Current: With the motor running, the load on the motor is to be increased in small increments until the motor winding has completely stabilized at approximately 10°C below the maximum allowed by the UL class of the motor. An example would be, for a class A motor, the maximum allowed is 140°C. The motor winding temperature was completely stabilized at 130°C and the current draw at that time would be recorded.

2&3. Protector Location Temperatures: These temperatures are taken at the conclusion of the above load current test while the motor is running under the above load.

4. Ambient Temperature: Room temperature (usually 25°C).

C. Abnormal Conditions for Protection.

1. Max/min Ambient Temperatures: temperature in the surroundings of protector.
2. Max/min Line Volts: The highest and lowest voltages for which protection should be effective.
3. Other environmental considerations: i.e., exposed to agricultural weather conditions.

Name Plate Data

A. Horsepower ________ H.P.
B. Voltage ________ Volts
C. Single or three phase ________ Phase
D. FLA (full load amps) ________ Amps
E. LRA (locked rotor amps) ________ Amps
F. Insulation class (UL/CSA) (indicate one) ________ ABFH

Protector Requirements

A. Automatic or manual reset ________
B. Round or eared base ________
C. Termination type ________

Motor Data Required

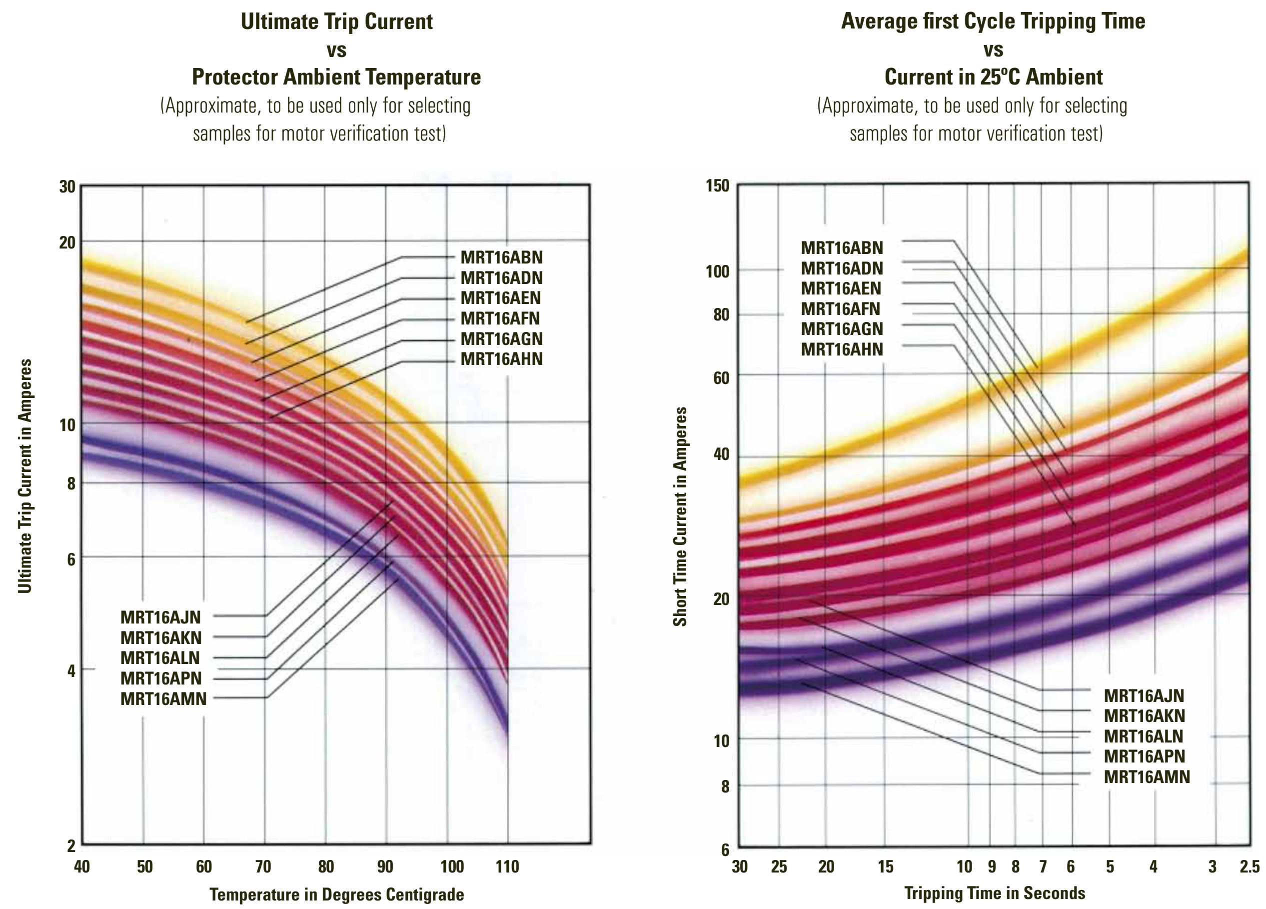
A. Locked rotor requirements
  1. Locked rotor current cold ________ Amps
  2. Locked rotor current hot ________ Amps
  3. Time required to raise motor winding to max. temperature ________ Sec
  4. Ambient temperature during test ________ Deg

B. Running overload requirements
  1. Load current required to stabilize main winding temp. at 10°C below maximum allowed ________ Amps
  2. Protector location temperature below protector surface ________ Deg
  3. Protector location temperature above protector (air temp) ________ Deg
  4. Ambient temp during test ________ Deg

C. Abnormal conditions for protection
  1. Max/min ambient temperatures ________ Deg
  2. Max/min line volts ________ Volts
  3. Other environmental considerations ________

Note: Application assistance available from Sensata.

Example of Motor Protector Performance Curves



Note: Other ratings available for single and three phase applications.
Computer software is available to assist in application.