Protection components

Thermistor protection units
for use with PTC thermistor probes (positive temperature coefficient)

Application

LT3-S● thermistor protection units continuously monitor the temperature of the machines to be protected (motors, generators, etc.) by means of PTC thermistor probes embedded in the machine windings.

If the nominal operating temperature of the probes is reached, they convert the rapid increase in resistance into a switching function which can be used to switch off the machine or signal a fault (see paragraph relating to thermistor probes below).

Accidental breaks in the supply circuits of the thermistors are also detected.

Electromagnetic compatibility

Electromagnetic compatibility to EN 50082-2	
Resistance to electrostatic discharge (conforming to IEC/EN 61000-4-2)	**Level 3**
Resistance to fast transients (conforming to IEC/EN 61000-4-4)	**Level 3**
Susceptibility to electromagnetic fields (conforming to IEC/EN 61000-4-3)	**Level 3**
Surge resistance 1.2/50 - 8/20 (conforming to IEC/EN 61000-4-5)	**Level 4**
Immunity to microbreaks and voltage drops (IEC/EN 61000-4-11)	

Suitable for use with variable speed controllers

Thermistor probes

Range of most commonly used PTC thermistor probes: from 90 to 160 °C, in steps of 10 °C.
Curve R = f (θ), characteristic of a PTC thermistor probe is defined by standard IEC/EN 60034-11.

The choice of PTC thermistor probe to be incorporated in the motor winding depends on the insulation class, the type of motor and the most suitable location for the probe. This choice is usually made by the motor manufacturer or the motor rewinder, who have all the necessary information

Application example

Insulation class of rotating machines conforming to IEC/EN 60034-11-2 (S1 duty)	NOT Nominal operating temperature	Temperature at which rapid increase in resistance occurs Probes used for	
		Alarm	Fault
	°C	°C	°C
A	100	100	110
B	110	110	120
E	120	120	130
F	140	140	150
H	160	160	170

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Protection components

Thermistor protection units
for use with PTC thermistor probes (positive temperature coefficient)

Type			**LT3-SE**	**LT3-SA**	**LT3-SM**
Reset method			Automatic	Automatic	Manual/Automatic
Fault indication			–	On front face of unit and remote	On front face of unit and remote
Fault test			–	–	By pushbutton on front face of unit
Interchangeability			Label “Mark A” to IEC 60034-11-2	Label “Mark A” to IEC 60034-11-2	Label “Mark A” to IEC 60034-11-2
Environment					
Conforming to standards			IEC 60034-11-2 VDE 0660	IEC 60034-11-2 VDE 0660	IEC 60034-11-2 VDE 0660
Approvals			CSA, UL (pending)	CSA, UL, PTB, RINA, BV, GL, DNV, LROS (pending)	
Degree of protection			IP 20 conforming to IEC/EN 60529, VDE 0106		
CE marking			LT3-S● protection units have been designed to comply with the essential recommendations of European directives relating to low voltage and EMC. Therefore, LT3-S● products bear the European Community CE mark.		
Ambient air temperature around the device	Storage To IEC/EN 60068-2-1 and 60068-2-2	°C	- 40…+ 85		
	Operation	°C	- 25…+ 60		
Maximum operating altitude	Without derating	m	1500		
	With derating		Up to 3000 m, the maximum permissible ambient air temperature for operation (60 °C) must be reduced by 5 °C per additional 500 m above 1500 m		
Vibration resistance	Conforming to IEC/EN 60068-2-6		2.5 gn (2…25 Hz) 1 gn (25…150 Hz)		
Shock resistance	Conforming to IEC/EN 60068-2-27		5 gn (11 ms)		
Operating positions without derating	In relation to normal vertical mounting position		Any		
Power supply circuit characteristics					
Rated control circuit voltage (Uc)	∿ 50/60 Hz 0.85…1.1 Uc	Single voltage Dual voltage	V	115 or 230 –	– 115/230	400 115/230, 24/48
	∿ 50/60 Hz 0.85…1.1 Uc	Multi-voltage	V	–	24…230	24…230
	⎓ 0.8...1.25 Uc	Single voltage Dual voltage	V	24 –	– 24/48	– 24/48
	0.8...1.25 Uc	Multi-voltage	V	–	24...230	24...230
Average consumption	Sealed	∿	VA	< 2.5	< 2.5	< 2.5 (except 400V: 2.7)
		⎓	W	< 1	< 1	< 1

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Protection components

Thermistor protection units
for use with PTC thermistor probes (positive temperature coefficient)

Control circuit characteristics

Type			LT3-SE	LT3-SA	LT3-SM
Resistance	Tripping	Ω	2700…3100	2700…3100	2700…3100
	Reset	Ω	1500…1650	1500…1650	1500…1650
Maximum number of probes fitted in series (1)	Probes ≤ 250 Ω to 25°		6	6	6
Voltage at terminals in the thermistor circuit	Normal operation (R=1500Ω)	V	< 2.5	< 2.5	< 2.5
	Conforming to IEC/EN 60034-11-2 (R=4000Ω)	V	< 7.5	< 7.5	< 7.5
Short-circuit detection	Operating threshold	Ω	–	< 20	< 20
Connection of probes to the LT3	Distance	m	300	400	500	1000 (2)
	Minimum c.s.a. of conductors	mm²	0.75	1	1.5	2.5

Electrical characteristics of the output relay contacts

Contact type	Single voltage or dual voltage		1 N/C	1 N/C + 1 N/O	1 N/C + 1 N/O
	Multi-voltage		–	2 C/O	2 C/O
Rated insulation voltage		V	∼ 500		
Maximum operational voltage		V	∼ 250 (∼ 400 V for **LT3-SM00V**)		
Rated impulse withstand voltage	U imp	kV	2.5		
Conventional thermal current		A	5		
Operational power	At 220 V	VA	100 for 0.5 million operating cycles		
Breaking capacity in AC-16	120 V	A	6		
	250 V	A	3		
in DC-13	24 V	A	2		
Cabling (cage type connector) for flexible or solid cable	Without cable end	mm²	2 x 1...1 x 2.5		
	With cable end	mm²	1 x 0.75...2 x 2.2		
Tightening torque		N.m	0.8		

Thermistor probe characteristics

Type			DA1-TT●●●	DA1-TS●●●
Conforming to standards			IEC/EN 60034-11-2 Mark A	
Resistance	At 25 °C	Ω	3 x 250 in series	250
Rated operational voltage (Ue)	Per probe	V	⎓ 2.5 V max	⎓ 2.5 V max
Rated insulation voltage (Ui)		kV	2.5	1
Insulation			Reinforced	Reinforced
Length of connecting cables	Between probes	mm	250	–
	Between probes and motor terminal plate	m	1	1

(1) Provided that the total resistance of the probe circuit is less than 1500 Ω at 20 °C.
(2) For distances greater than 500 m take cabling precautions (twisted shielded pairs).

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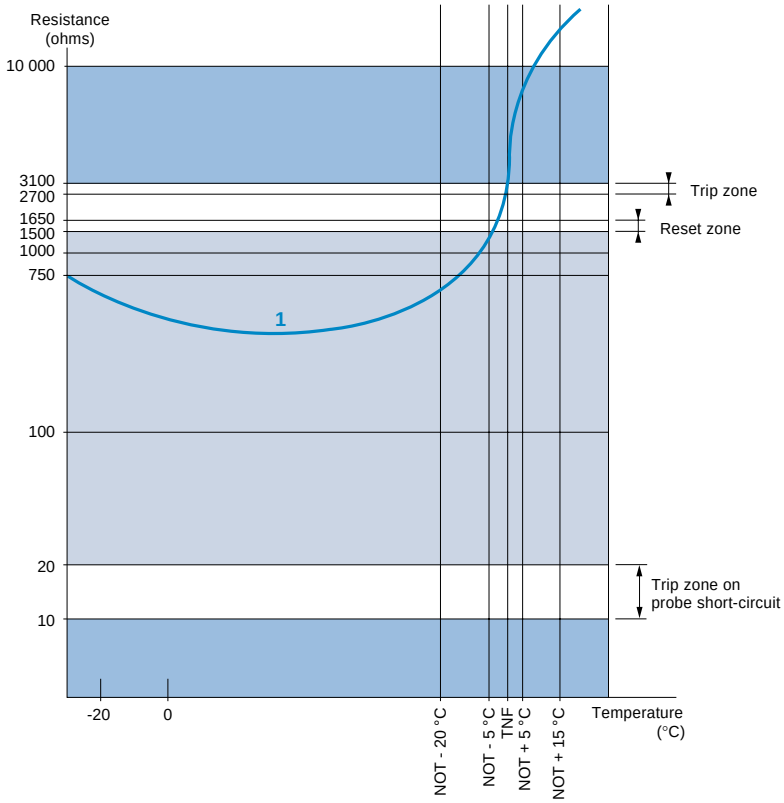
Protection components

Thermistor protection units
for use with PTC thermistor probes (positive temperature coefficient)

LT3-S protection unit/thermistor probe combination

Guaranteed operating zones: examples with 3 probes type DA1-TT●●● (250 Ω to 25 °C) in series, conforming to IEC/EN 60034-11-2, mark A.

LT3-SE, LT3-SA, LT3-SM protection units



1 3 probes type DA1-TT●●● (250 Ω at 25 °C) in series

NOT: Nominal operating temperature

Protection unit tripped

Protection unit set

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Protection components

Thermistor protection units
for use with PTC thermistor probes (positive temperature coefficient)

LT3-SE00M

Protection units (without fault memory)

Units with automatic reset with thermistor short-circuit detection

Connection	Voltage		Output contact	Reference	Weight kg
Cage connectors	∼ 50/60 Hz	115 V	N/C	**LT3-SE00F**	0.220
		230 V	N/C	**LT3-SE00M**	0.220
	⎓	24 V	N/C	**LT3-SE00BD**	0.220

LT3-SA00M

Units with automatic reset with thermistor short-circuit detection
On front face: fault and voltage signalling indicator.

Connection	Voltage		Output contact	Reference	Weight kg
Cage connectors	∼ 50/60 Hz	115/230 V	N/C + N/O	**LT3-SA00M**	0.220
	⎓	24/48 V	N/C + N/O	**LT3-SA00ED**	0.220
	∼ 50/60 Hz or ⎓	24…230 V	2 C/O	**LT3-SA00MW**	0.220

LT3-SM00M

Protection units (with fault memory)

Units with manual reset with thermistor short-circuit detection.
On front face:
- fault and voltage signalling LED,
- Test and Reset button.

Connection	Voltage		Output contact	Reference	Weight kg
Cage connectors	∼ 50/60 Hz	400 V	N/C + N/O	**LT3-SM00V**	0.220
		24/48 V	N/C + N/O	**LT3-SM00E**	0.220
		115/230 V	N/C + N/O	**LT3-SM00M**	0.220
	⎓	24/48 V	N/C + N/O	**LT3-SM00ED**	0.220
	∼ 50/60 Hz or ⎓	24…230 V	2 C/O	**LT3-SM00MW**	0.220

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Protection components

Thermistor protection units
for use with PTC thermistor probes (positive temperature coefficient)

DA1-TT●●●

PTC thermistor probes

Description	Nominal operating temperature (NOT)	Sold in lots of	Unit reference	Weight
	°C			kg
Integrated triple probes	90	10	**DA1-TT090**	0.010
	110	10	**DA1-TT110**	0.010
	120	10	**DA1-TT120**	0.010
	130	10	**DA1-TT130**	0.010
	140	10	**DA1-TT140**	0.010
	150	10	**DA1-TT150**	0.010
	160	10	**DA1-TT160**	0.010
	170	10	**DA1-TT170**	0.010
Surface probes	60	10	**DA1-TS060**	0.005
	70	10	**DA1-TS070**	0.005
	80	10	**DA1-TS080**	0.005
	90	10	**DA1-TS090**	0.005
	100	10	**DA1-TS100**	0.005

DA1-TS●●●

Accessories (to be ordered separately)

Mounting accessories

Description	Application	Sold in lots of	Unit reference	Weight kg
Adaptor	For fixing on ⊏⊐ rail DZ5-MB	10	**RHZ-66**	0.005

Marking accessories

Clip-in markers (maximum of 5 per device)	Strips of 10 identical numbers (0 to 9)	25	**AB1-R●** (1)	0.002
	Strips of 10 identical capital letters (A to Z)	25	**AB1-G●** (1)	0.002

(1) Replace the ● in the reference with the required number or letter.

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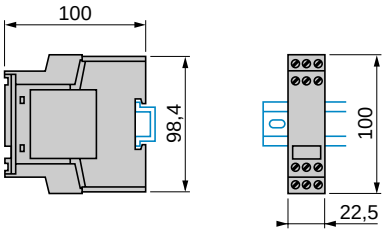
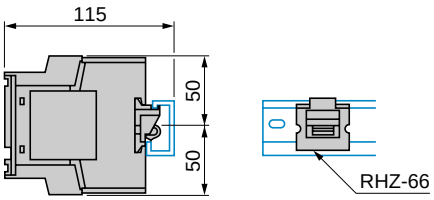
Protection components

Thermistor protection units
for use with PTC thermistor probes (positive temperature coefficient)

Dimensions
LT3-SE, SA, SM
Mounting on rail AM1-DP200

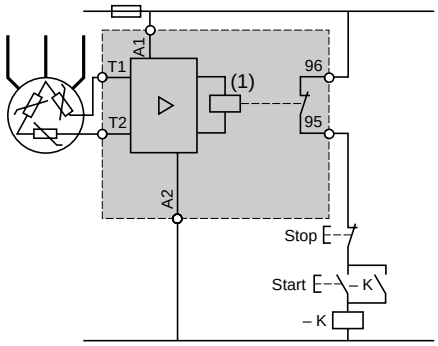


Mounting on one ⊔ rail
(with mounting plate RHZ-66)

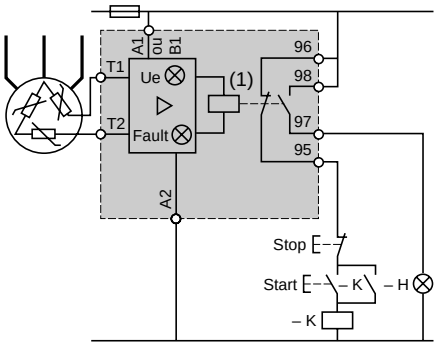


Schemes for "no fault" operation

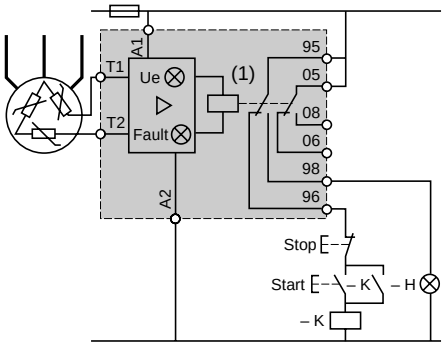
LT3-SE
Without fault memory



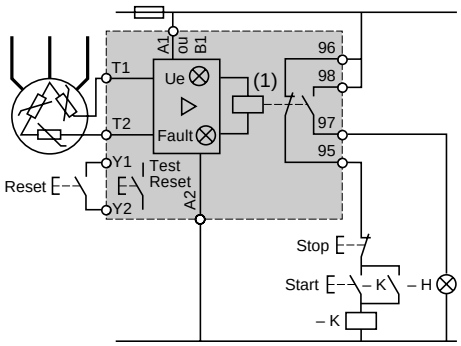
LT3-SA dual voltage



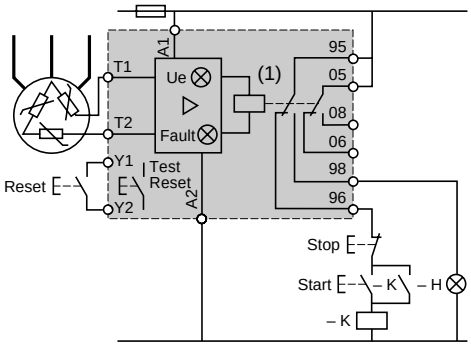
LT3-SA multi-voltage



LT3-SM dual voltage
and 400 V (without B1)



LT3-SM multi-voltage



LT3-S● dual voltage

Note:
Dual voltage units
Supply must be connected as follows:
Lower of the two specified voltages
-B1 + A2
Higher of the two specified voltages
-A1 + A2

1) Contacts shown with relay energised

Setting-up
Cabling

It is inadvisable to use the same multi-core cable for the thermistor probe circuit and the power circuit. This is especially important for long cable runs.
If it is impossible to comply with the above recommendation, a pair of twisted conductors must be used for the thermistor probe circuit.

Testing the insulation of the line connecting the thermistors to the LT3-S unit

Before carrying out this test, short-circuit all the terminals of the LT3-S protection unit.
Measure the insulation value between these terminals and earth using a megger or a flash tester, progressively increasing the voltage to the value defined by the standards.

Checking the PTC thermistor probes for correct operation

With the machine stopped, in the cold state and after having taken all the necessary safety precautions:
- disconnect the line linking the thermistors to the LT3-S protection unit, at the terminals of the machine being protected: motor, etc.,
- using an ohmmeter with a voltage rating less than or equal to 2.5 V, measure the resistance of the probe circuit at the machine terminals,
- depending on the number and type of thermistors connected in series, check that their resistance value at 25 °C is correct.

Example: motor fitted with 3 PTC thermistor probes with a resistance ≤ 250 Ω at 25 °C.
Any value higher than 250 x 3 = 750 Ω indicates a problem.

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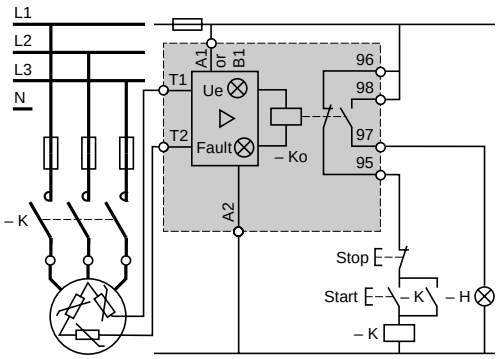
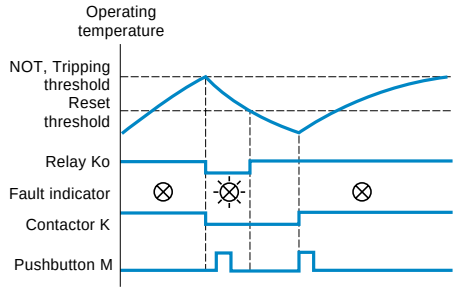
Protection components

Thermistor protection units
for use with PTC thermistor probes (positive temperature coefficient)

LT3-SA protection units



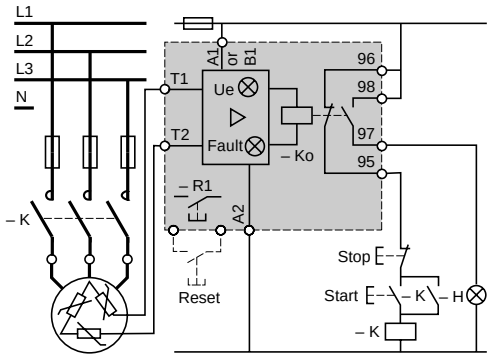


Starting
The LT3-SA is normally energised and its internal relay is in the pre-energised position.
The motor is started by operating pushbutton “Start” automatically held in by K (3-wire control circuit).

Thermal fault
The strong increase in resistance of the PTC probes at the moment their temperature reaches the nominal operating temperature (NOT) is detected by the LT3-SA unit and causes the relay to drop out; indicator H comes on, as does the built-in indicator on unit LT3-SA.
Contactor K drops out and pressing button “Start” has no effect.

Reset
As the motor cools, it reaches the reset threshold , 2 to 3 °C below the nominal operating temperature. The relay resets and the motor can be started by pressing button “Start”

LT3-SM protection units

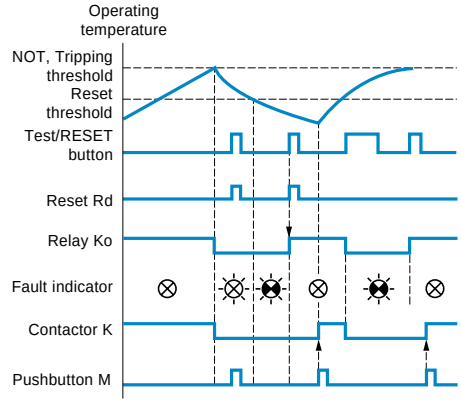


Operation is very similar to that described above, except for the following:

Reset
After tripping on thermal fault and cooling to the reset threshold, the Test/RESET button on the unit (R1) or a remote reset button (Reset) must be pressed to energise the relay.

The fault is therefore memorised, even though the temperature of the probes has dropped to well below the reset threshold.

Signalling circuit
As the relay is fitted with 2 separate contacts, the signalling voltage may be different from the contactor control voltage.



Test
Pressing the Test/RESET button simulates a fault and causes the relay to drop out: the FAULT indicator comes on, as does the remote signalling indicator. The unit is reset by pressing the Test/RESET button again.

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