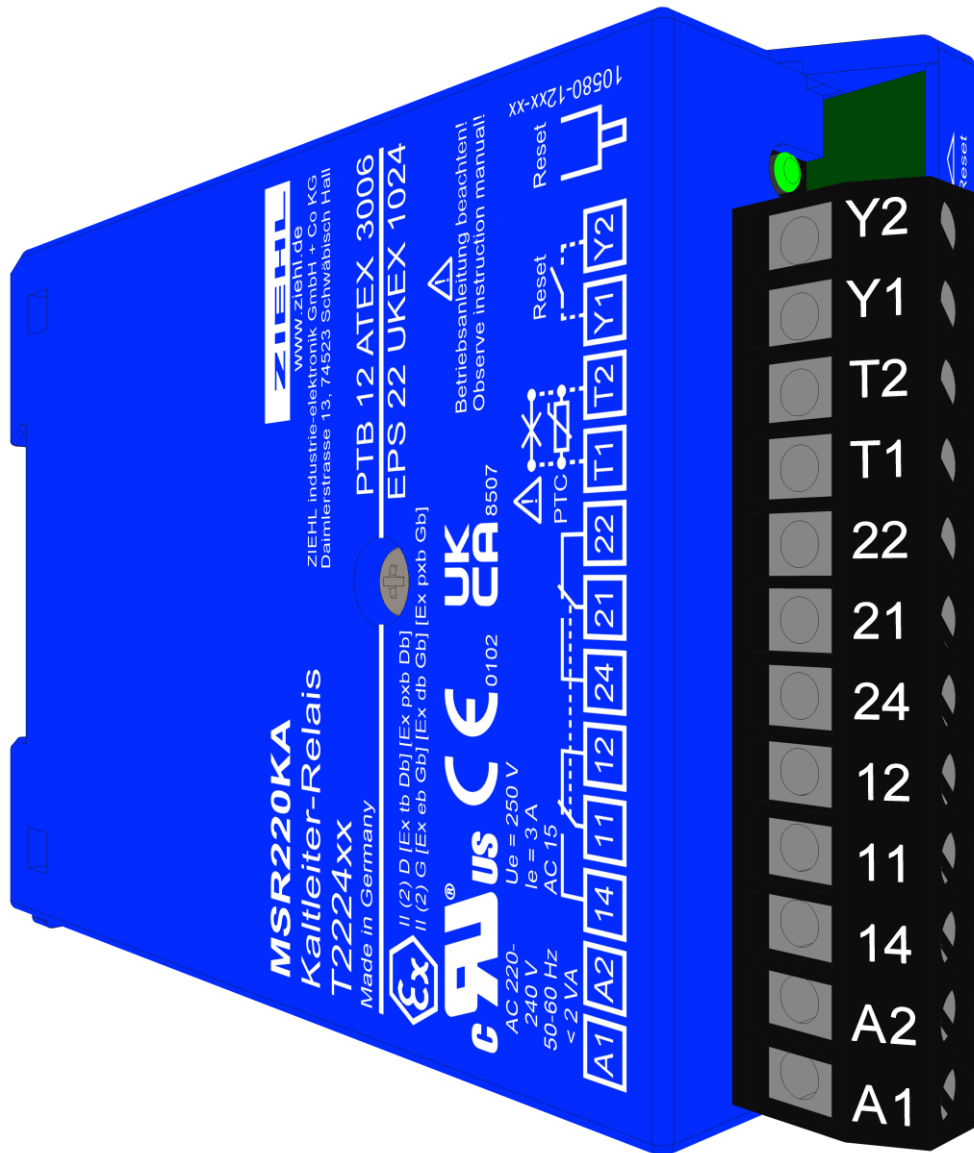


Operating Manual MS220KA and MSR220KA updated: 2022-12-12 / nm

PTC thermistor relay with short-circuit detection



Marking see type plate on the device

EU type examination certificate PTB 12 ATEX 3006 Issue 2
 UK type examination certificate EPS 22 UKEX 1024

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1 General Notes

Compliance with the following instructions is mandatory to ensure the functionality and safety of the product. If the following instructions given especially but not limited for general safety, transport, storage, mounting, operating conditions, start-up, maintenance, repair, cleaning and disposal / recycling are not observed, the product may not operate safely and may cause a hazard to the life and limb of users and third parties.

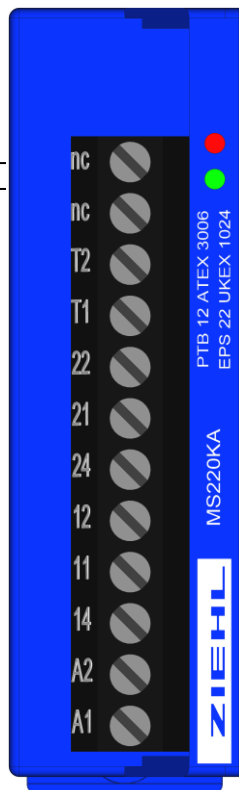
Deviations from the following requirements may therefore lead both to the loss of the statutory material defect liability rights and to the liability of the buyer for the product that has become unsafe due to the deviation from the specifications

2 Display- and control elements

MS220KA

Alarm (red)

ON (green)

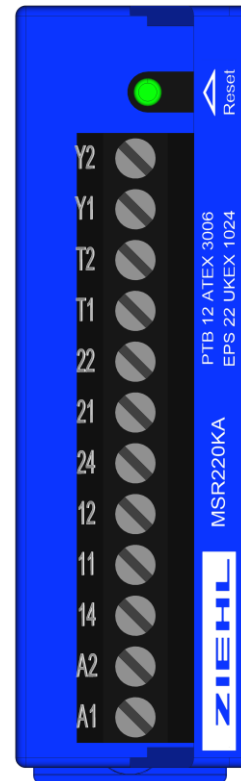


MSR220KA

Reset button

Alarm (red)

ON (green)



3 Pre-Adjustment

No settings have to be made. The tripping temperature is determined solely by the response temperature of the connected thermistors.

Depending on the number of thermistors the following tripping temperatures and reset temperatures arise related to TNF (detector operating temperature):



Attention!

Only 3 or 6 thermistors in series are allowed for usage in explosive atmospheres.

	Tripping temperature	Reset temperature
1 PTC thermistor	TNF + 15 K	TNF + 5 K
3 PTC thermistors in series	TNF + 5 K	TNF - 5 K
6 PTC thermistors in series	TNF	TNF - 20 K

4 Application and brief description

The device protects electrical equipment against excessive warming and thermal overload. Used in combination with respective thermistors tripping temperatures from 60 °C up to 180 °C can be realized.

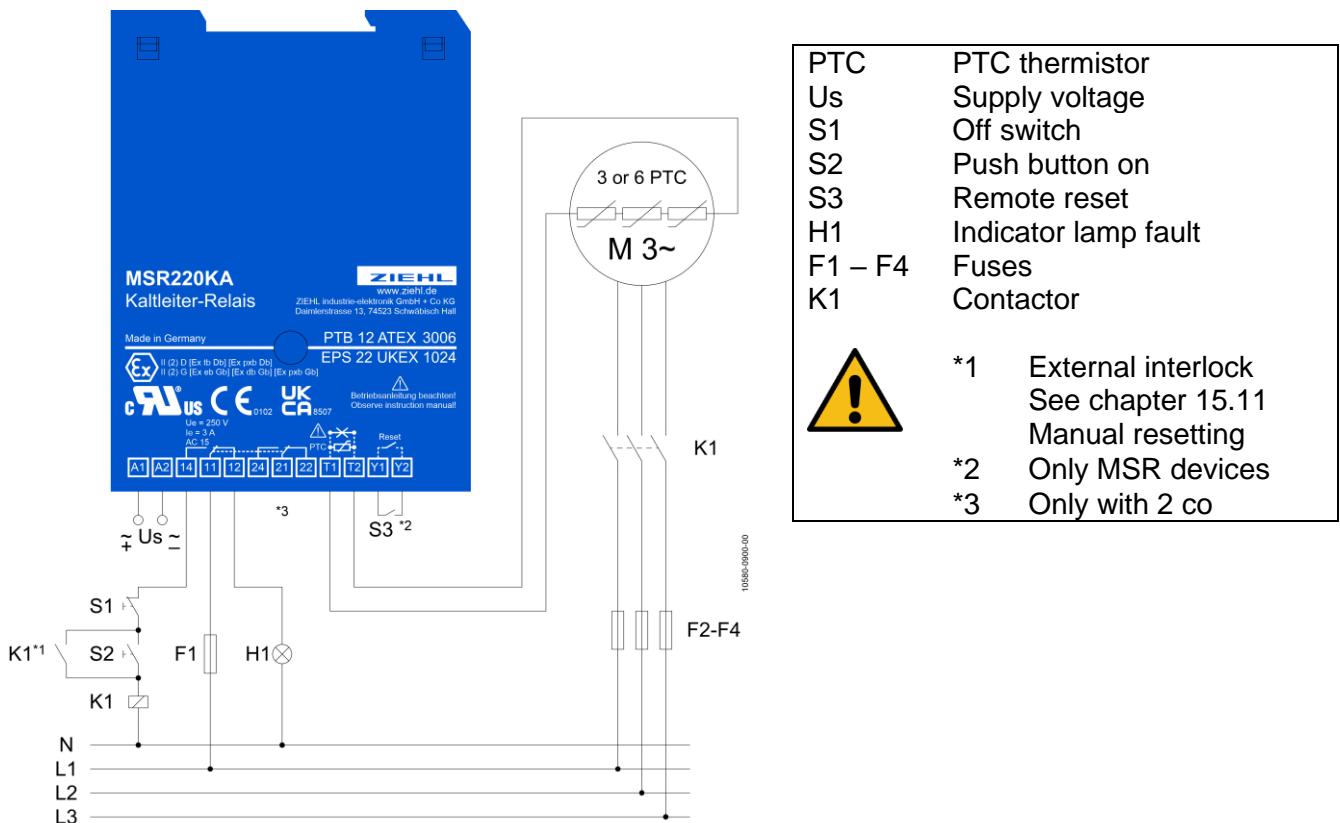
The device is conform to EN 60947-8. Thermistors according to DIN VDE V 0898-1-401 (ATEX) or equivalent detail specification (UKEX) shall be connected. The thermistors are suitable for installation into windings of electrical machines or transformers, bearings and heatsinks as well as to monitor the temperature of liquid media, airflow and gases. With ATEX approval, equipment in explosive gas atmospheres Zone 1 and 2 (marking G: gas) or in areas with combustible dust Zone 21 and 22 (marking D: dust) can be protected. All functions of the device serve to protect non-explosive-protected equipment and explosive-protected equipment in regular operation and in case of failure.

5 Summary of features

- 1 thermistor circuit for 1 (not allowed for explosive atmospheres) 3 or 6 PTC thermistors.
- Short-circuit detection within the thermistor circuit.
- Output relay with 1 or 2 change-over contact (co).
- Operating status display.

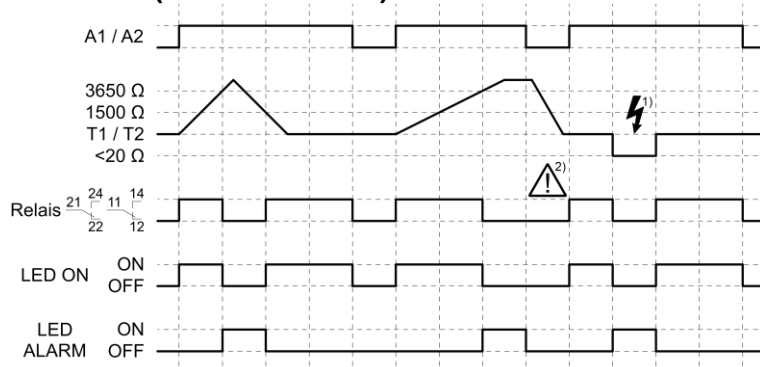
A current monitors continuously the resistance of the thermistor circuit. In cold state, the resistance is $\leq 250 \Omega$ per thermistor (thermistor circuit $\leq 1.5 \text{ k}\Omega$). The device is switched on and relay contacts 11, 14 and 21, 24 are closed. The resistance of the thermistor rises rapidly at detector operating temperature TNF. The device switches off at a resistance of 3...4 k Ω and the relay contacts 11, 14 and 21, 24 close. The device also switches off in the case of detector or line short-circuit ($< \text{approx. } 20\Omega$) or detector or line interruption. Device type MS switches on automatically when the temperature has cooled down. Device type MSR remains switched off until the build in or an external reset button is pushed. Power-on is recognized as reset. With bridged terminals Y1, Y2, the reclosing lock function is disabled and a device type MSR works like a device type MS.

6 Connecting diagram

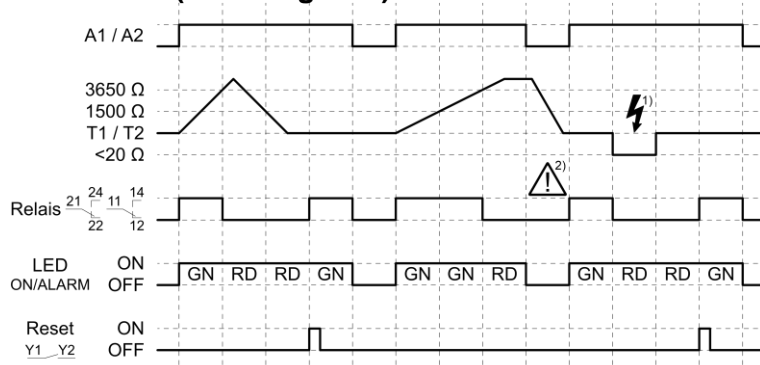


7 Function diagram

MS220KA (automatic reset)



MSR220KA (reclosing lock)



- 1) Detector or line short-circuit
- 2) Caution! The relay switches on automatically after a supply voltage dip.



With a bridge at the reset input (Y1/Y2) the reclosing lock is out of operation. The device switches back automatically, when the temperature of the thermistor circuit has fallen below the switchback value.

8 Important notes



Attention!
Observe safety rules and standards. Notice safety remarks!



Attention!
Hazardous voltage!
May cause electric shock and burns.
Before commencing work on the system, the power must be disconnected.

9 Installation

- The applicant must observe safety rules and standards.
- The device can be mounted on 35 mm rail according EN 60715 or with screws M4 (Option)
- K – Design; vertical terminal block, width 22.7 mm
- The device must be installed in an enclosure of international protection class IP 5X or better.
- Terminals maximum tightening torque 0.5 Nm.

When installing the device into the switchgear cabinet, please observe the max. permissible temperature. Care for both, sufficient clearance to other devices or sources of heat or enough forced draught. If cooling is made more difficult, e.g. close devices with increased surface temperature or by handicap of airflow cooling, the permissible ambient temperature reduces.

10 Commissioning



Attention!

Before switching on the mains voltage make sure that it matches the specification on the type plate.



Attention!

Observe chapter 15.8 Safe separation.

- After the supply voltage is switched on and when the thermistors are correctly connected the green LED „ON“ must light-up and the relay contacts 11, 14 and 21, 24 must close.
- The correct function of the device must be checked by resistance simulation at terminals T1, T2 according to chapter 16 Proof testing of the safety functions. This check must be repeated after changes to the installation.

11 Operating instructions

The device type MSR must be manually reset after a fault signal (red = alarm). For this purpose, the built-in illuminated reset button or an external button (remote reset terminals Y1, Y2) can be used.

12 Troubleshooting and remedies

Relay contacts 11, 14 or 21, 24 do not close:

- Check the supply voltage U_s at terminals A1, A2 (green LED lights-up).
- Check the thermistors at terminals T1, T2. In case of a fault the red LED lights-up.
- The resistance of the thermistor circuit must be $50 \Omega < R < 1500 \Omega$. The terminal voltage T1, T2 must be $< 2.5 \text{ VDC}$ with connected thermistors and temperature below TNF.
- For device type MSR push the button "Reset". A fault signal can be reset at $R < 1.65 \text{ k}\Omega$. The status LED changes from red to green. Alternatively, a reset can be done with closing an external contact at terminals Y1, Y2 or with voltage recovery.

Relay contacts 11, 14 or 21, 24 do not open:

- With no connection at terminals T1, T2 the device must indicate a fault and the relay contacts 11, 14 and 21, 24 must open. The terminal voltage T1, T2 must be approximately 8 VDC.

In case of any other malfunctions, replace the device. Please add a description of the occurred malfunction when sending back for repair.

13 Technical data

Power supply (A1, A2)

Power supply U_s (see type plate)	AC 110-120 V, AC 220-240 V, AC 380-415 V
Voltage tolerance	AC / DC 24 V (without galvanic isolation) AC 0.9 U_s ... 1.1 U_s DC 21 ... 30 V
Frequency	50 / 60 Hz
Frequency tolerance	45 Hz ... 65 Hz
Power consumption	$< 2 \text{ W}$
Voltage dip buffer time	max. 20 ms

PTC thermistor input (T1, T2)

Number	1 (not allowed for explosive atmospheres) 3 or 6 in series
Rated response temperature TFS	60 °C ... 180 °C
Response tolerance	$\pm 6 \text{ }^\circ\text{C}$
Collective resistance cold thermistor	$\leq 1.65 \text{ k}\Omega$
Terminal voltage (PTC thermistor)	$\leq 2.5 \text{ VDC}$ at $R \leq 3.65 \text{ k}\Omega$, $\leq 2 \text{ VDC}$ at $R \leq 1.65 \text{ k}\Omega$
Open-circuit voltage	$\leq 9 \text{ VDC}$ at $R = \infty$

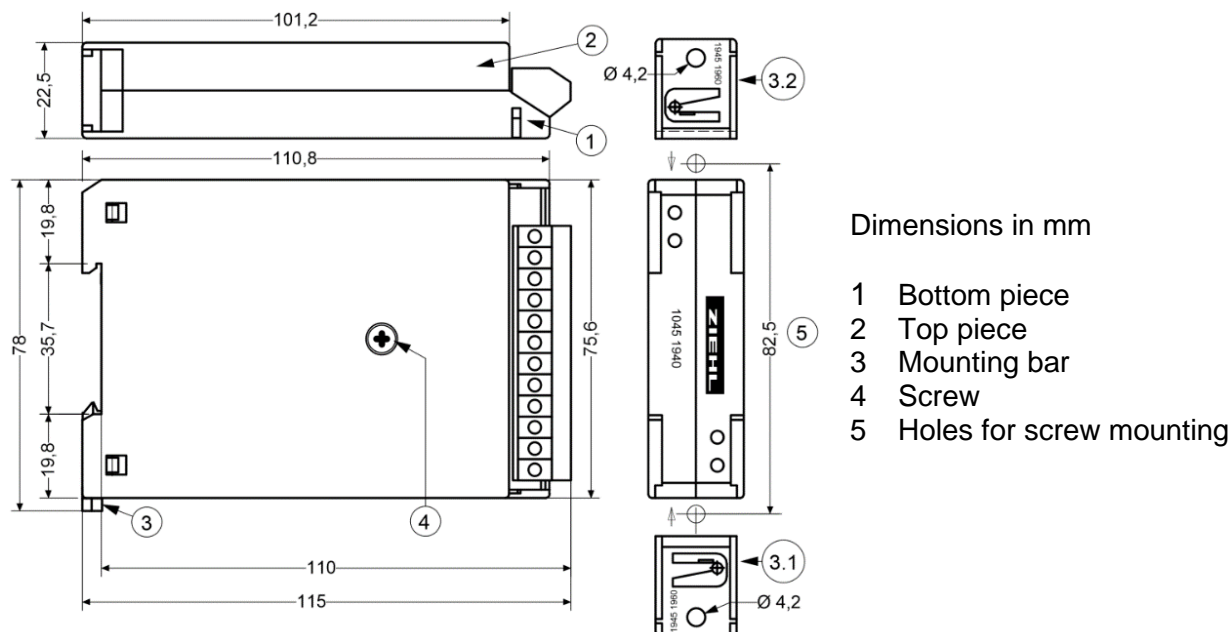
Terminal current (PTC thermistor)	≤ 1 mA
Power consumption	≤ 2 mW
Line capacity max.	0.2 μF
Temperature monitor cut-out-point	3.3 kΩ ...3.65 kΩ ...3.85 kΩ
Temperature monitor reclosing point	1.7 kΩ ...1.8 kΩ ...1.95 kΩ
Short circuit monitor cut-out-point	≤ 20 Ω
Short circuit monitor reclosing point	≤ 40 Ω
Reset input (Y1, Y2)	Potential free contact (no)
Current	1 mA
Voltage	< 30 VDC
Relay output (11,12,14 – 21,22,24)	EN 60947-5-1
Contacts	1 or 2 change-over contacts (co)
Switching voltage	max. AC 400 V
Switch-on current (NO)	AC 15 A 4s 10% ED
min. voltage / current	12 V 10 mA
Conventional thermal current I _{th}	max. 5 A
Switching power max. AC cos φ = 1	2000 VA
Switching power max. DC (ohm)	0.25 A 300 V; 0.35 A 150 V; 1 A 60 V; 8 A 30 V
Contact life electrical cos φ = 1	2 x 10 ⁵ operating cycles at 250 V / 2 A 1 x 10 ⁵ operating cycles at 250 V / 5 A
Contact life mechanical	3 x 10 ⁷ operating cycles
Recommended fuse (NO)	4 A time-lag or miniature circuit-breaker MCB B4
Recommended fuse (NC)	3,15 A time-lag
Utilization category	AC-15 I _e = 3 A U _e = 250 V
Rated operational current	DC-13 I _e = 2 A U _e = 24 V
Rated operational voltage	DC-13 I _e = 0.4 A U _e = 120 V DC-13 I _e = 0.2 A U _e = 250 V
UL electrical ratings	250 VAC, 3 A, general use C300
Test conditions	IEC/EN 60947-8
Rated impulse voltage	4000 V
Overtoltage category	III
Pollution degree	2
Rated insulation voltage U _i	320V
Transformer	EN 61558-2-6 (VDE 0570)
Proof Test Voltage	2500 VAC 50 Hz
EMC - Immunity	EN 61000-6-2
EMC - Emission	n.a., f _{mainosc} < 9kHz
On-period	100 %
Ambient conditions	
Fitting position	any
Rated ambient temperature	-20 °C ... +55 °C
Rated storage Temperature	-20 °C ...+70 °C (1K21 EN 60721-3-1)
Altitude	≤ 2000 m above sea level.
Climatic conditions	5-85 % rel. F., no condensation (3K22 EN60721-3-3)
Vibration DIN EN 60068-2-6	2...25 Hz ±1.6 mm 25 ... 150 Hz 5 g
Vibration DIN EN 60947-8	2 ... 13.2 Hz ± 1 mm 13.2 ... 100 Hz ± 0.7 g
Shock DIN EN 60947-8	half sine, 10 g, 11 ms
Housing	Design K
Dimensions (W x H x D) mm	22.5 x 75 x 115 mm
Width	1 M
Plastic material	PA66
Fire protection class	UL 94 V-2
Protection class housing EN 60529	IP 30
Mounting EN 60715	Snap mounting on 35 mm standard rail EN60715
Optional: Screw mounting	M4 screws (additional bar not included)
Weight	approx. 150 g
Terminal connection	Screw mounting M3

Protection class terminals EN 60529
 Line connection solid wire
 Stranded wire
 Stranded wire with insulated ferrules
 Insulation strip length min
 Tightening torque

IP 20
 1 x 0.34 mm² – 2.5 mm² / AWG 22 - 14
 1 x 0.34 mm² – 2.5 mm² / AWG 22 - 14
 1 x 0.14 mm² – 1.5 mm² / AWG 28 - 16
 8 mm
 0.5 Nm

Subject to technical modifications

14 Dimensions - Design K



15 Safety instructions and references for putting into operation



Attention!
Safety Instructions and references
please read carefully!

15.1 Explosive atmospheres

- The increased danger within explosive atmospheres (gas or dust) requires the careful attention of the safety instructions and references for putting into operation. Observe the national safety rules and regulations for prevention of accidents as well as the standard EN 60079-14 / VDE 0165-1. All work for the connection, for putting into operation and maintenance is to be implemented by qualified, responsible technical personnel. Inappropriate behaviour can cause heavy personal damage and damages to property.
- The response of device must directly switch off the motor, also when used together with inverters. This must be implemented with circuitry.

15.2 Special remarks for explosive gas atmospheres areas (Zone 0, 1 and 2)

- The device must be installed outside potentially explosive gas atmospheres unless the device is protected by a suitable ignition protection type (for example a flameproof enclosure).

15.3 Special remarks for use in the presence of combustible dust (Zone 20, 21, and 22)

- The device must be installed outside potentially explosive dust atmospheres unless the device is protected by a suitable enclosure for dust atmospheres.

15.4 Safety characteristics of the safety device (EN 50495 / VDE 0170-18)

Safety Integrity Level (EN 61508) and safety related parameters

Operating mode	Hardware architecture	HFT	Safety Integrity Level
low demand mode	1oo1	0	SIL 1

Type	MTBF	PFH	SFF	λ_{SD}	λ_{SU}	λ_{DD}	λ_{DU}
MS220KA	54 years	4.07E-07	55%	4.44E-07	5.55E-08	0	4.07E-07
MSR220KA	52 years	4.26E-07	55 %	4.52E-07	6.10E-08	0	4.26E-07

Type	Proof test interval T1	1year	3 years	5 years	10 years
MS220KA	PFDavg	1.78E-03	5.35E-03	8.91E-03	1.78E-02
MSR220KA	PFDavg	1.87E-03	5.60E-03	9.33E-03	1.87E-02

Observe proof test interval according EN 60079-17 for electrical equipment ≤ 3 years.

15.5 Category and Performance-Level (EN ISO 13849-1)

The device fulfils the requirements of category 1 and PL = c. $MTTF_d = 100$ years.

The data of the functional safety stated above are valid for an ambient temperature of 40 °C. Data for additional ambient temperatures can be obtained on request.

15.6 Application of the safety device used with equipment category (EN 50495 / VDE 0170-18)

This standard describes the minimum requirements of safety integrity level and fault tolerance of a safety device in the application together with the category of the Equipment Under Control (EUC).

EUC	Safety device		
	no safety device	SIL 1	SIL 2
Category 2 (2G, 2D) EPL = Gb, Db	Zone 1, Zone 21	Zone 0, Zone 20	Zone 0, Zone 20
Category 3 (3G, 3D) EPL = Gc, Dc	Zone 2, Zone 22	Zone 1, Zone 21	Zone 0, Zone 20

The device thus is suitable as safety device for Equipment Under Control (EUC) with HFT = 0 category 3 in Zone 1 and Zone 21. The combined equipment shall comply with the relevant standards EN 60079-0 according to the categories to match.

15.7 Wiring

- The lines of the thermistor circuit must be routed as separate control lines. Using lines of the supply cable or other mains voltage lines is not permissible. If extreme inductive or capacitive stray effects are to be expected by parallel cables of the power installation, shielded control lines should be used.
- The terminals Y1, Y2 may be attached parallel to a common resetting mechanism. Thermistor lines must not be connected.
- The line resistance within the thermistor circuit may not exceed a value of 20 Ω to ensure short circuit detection.
- Maximum of permissible length for thermistor circuit lines:

Wire length	2 x 1000 m	2 x 800 m	2 x 500 m	2 x 300 m	2 x 250 m
Wire cross section	2.5 mm ²	1.5 mm ²	1.0 mm ²	0.75 mm ²	0.5 mm ²

- With commissioning and after modification of the plant the thermistor resistance must be checked with a suitable measuring instrument. With a resistance < 50 Ω the sensor circuit is to be examined for short-circuit.



Attention!
Check PTC's only with measuring voltages of < 2.5 V.

15.8 Safe separation

- Line circuits (A1, A2), (11, 12, 14) and (21, 22, 24) have a safe separation to low-voltage electric circuits (T1, T2) and (Y1, Y2).
- Devices with a combined supply voltage DC/AC 24 V have no galvanic isolation and must be used with a power supply according to EN 61558-2-6 (safety isolating transformer or battery grid) and with protected wiring.

15.9 Stop function

- A stop function triggered by the device must transfer the machine as fast as possible into a safe state. The stop function must have top priority.
- In case of failure the device switches off the contactor / circuit breaker and prevents an overheating of the isolation system and / or the surface temperature. The protective function of the device is only guaranteed if wiring is done directly into the control circuit of the motor in accordance with the connection diagram. The contacts must be protected, to prevent welding.

15.10 Start and restart

- Only if no dangerous condition is present, a reset is allowed. Device type MS or device type MSR with bridged terminals Y1, Y2 (auto reset) switches back on after the thermistors cooled down. This function must not be used in applications where an automatic reset could cause personal injuries or damage to property.

15.11 Manual reset

- When the device triggers a stop instruction, it must be maintained until the manual reset mechanism is operated and safe conditions for a renewed start are given. The manual resetting may be only possible if all safety functions and protection devices are effective.
- Device type MSR have an electronic reclosing lock The stop instruction remains, until a reset is made by pressing the push-button „Reset“. A start-up is only possible, if no case of failure occurs and the motor is cooled down to a sufficient value of temperature.
- The device switches on automatically with return of supply voltage. The user must guarantee by external interlock (see connection diagram) that the supervised machine does not start again independently.



Attention!

Safety circuits according to EN 60204 / EN 62061. The devices must not be used alone for functions, where an automatic restart must be prevented.

16 Proof testing of the safety functions

- The safety function must be tested at regular intervals. It is recommended to carry out the proof-test once a year. Depending on the zone risk, tests should be conducted more frequently. A fault is recognized by the safety test. A fault between safety tests could cause loss of protection.

The following must be tested additionally to recurring examinations with maintenance services:

- The safety function must be tested by interrupt the thermistor circuit wire at terminals T1, T2.
- The short circuit monitoring function must be tested by bridging the thermistor circuit wires at terminals T1, T2.
- The safety function must be tested by changing the resistance from 50 - 1500 Ohm to 4000 Ohm at terminals T1, T2.
- For the device type MSR the function of the electronic interlock must be tested additionally.
- If an error is detected no restart must be induced until the error is cleared.

17 Maintenance and repair

- The device is maintenance free. Only the manufacturer may perform repairs. We recommend testing within the regular maintenance intervals of the plant, where the device is used. EN 60079-17 is to be observed.
- The guarantee presupposes the observance of these operating instructions (safety and start-up instructions).

18 Disposal



Disposal should be carried out properly and in an environmentally friendly manner in accordance with legal provisions.
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EU / UKCA-Konformitätserklärung

EU / UKCA-Declaration of Conformity

Hersteller:	ZIEHL industrie-elektronik GmbH + Co KG			
<i>Manufacturer:</i>				
Anschrift:	Daimlerstr. 13			
<i>Address:</i>	74523 Schwäbisch Hall			
	Germany			
Produktbezeichnung:	Kaltleiter-Relais			
<i>Product description:</i>	PTC Thermistor Relay			
Typ:	MS220KA	T222445	T222451	T222455
<i>Type:</i>	MSR220KA	T222471	T222473	T222475
		T222476		
Wir erklären in alleiniger Verantwortung, dass oben bezeichnetes Produkt den grundlegenden Anforderungen entspricht, die in den folgenden Europäischen Richtlinien und in den UK Rechtsverordnungen festgelegt sind.				
<i>We declare under our sole responsibility that the above designated product meets the basic requirements and complies with the following directives of the European Union and the UK Statutory Instruments:</i>				
Angewandte harmonisierte / designierte Normen und technischen Spezifikationen:	EN 50495:2010	EMV Richtlinie		
<i>Applied harmonised / designated standards and technical specifications:</i>	EN 60947-8:2003 + A1:2006 + A2:2012	SI/2016/1091 EMC Directive		
	EN IEC 61000-6-2:2019	2014/34/EU ATEX Richtlinie		
	EN 61000-6-3:2007 + A1:2011 + AC:2012	SI/2016/1107 ATEX Directive		
	EN IEC 63000:2018	2014/35/EU Niederspannungsrichtlinie		
		SI/2016/1101 Low Voltage Directive		
		2011/65/EU RoHS Richtlinie		
		2015/863/EU RoHS Directive		
		SI/2012/3032		
Benannte Stelle und Nummer der EU-Baumusterprüfbescheinigung:	PTB Physikalisch Technische Bundesanstalt 0102			
<i>Notified Body and number of the EU-type-examination certificate:</i>	PTB 12 ATEX 3006 A2			
Zugelassene Stelle und Nummer der UK-Baumusterprüfbescheinigung:	Bureau Veritas Consumer Products Services United Kingdom Limited, approved body No. 8507			
<i>Approved Body and number of the UK-type-examination certificate</i>	EPS 22 UKEX 1024			
CE-Kennzeichnung / UKCA-Kennzeichnung in:	2012 / 2022			
<i>CE marking / UKCA marking since:</i>				

Ort, Datum der Ausstellung:	Schwäbisch Hall, 25.10.2022
<i>Place, date of issue</i>	
Herbert Wahl Verkaufsleitung Sales manager	ppa. 