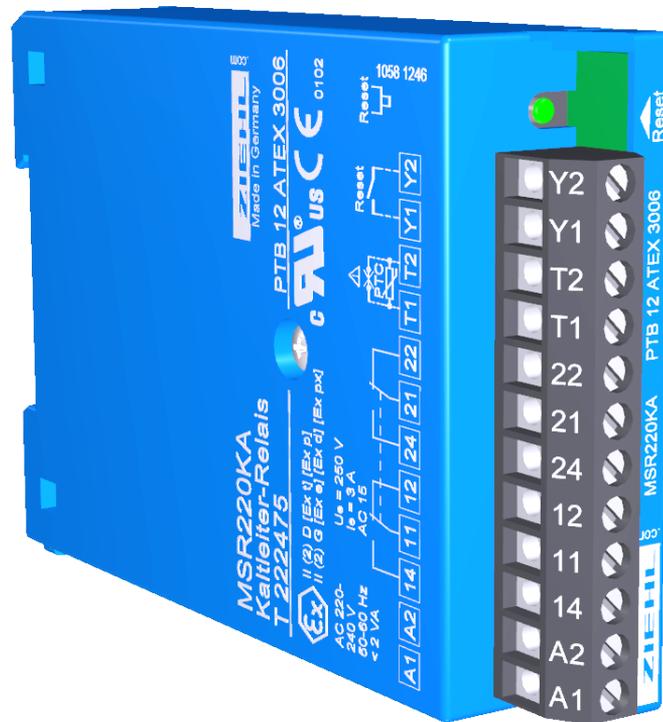


Operating Manual MS220KA and MSR220KA

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PTC thermistor relay with short-circuit detection



Marking see type plate on the device - type examination certificate PTB 12 ATEX 3006 Issue 1

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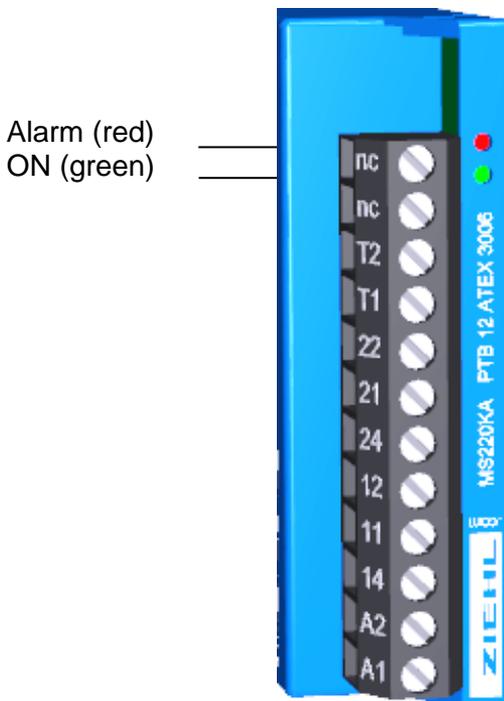
1 General Notes

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 key-button
Alarm (red)
ON (green)
DIN VDE V 0898-1-401



3 Pre-Adjustment

No settings are necessary on the devices. The tripping temperature is determined solely by the response temperature of the connected PTC thermistors.

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

	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

Ziehl PTC thermistor relays protect motors, transformers, machines and equipment against thermal overload. Used in conjunction with respective PTC thermistors they provide a reliable temperature protection in the temperature range 60 °C up to 180 °C.

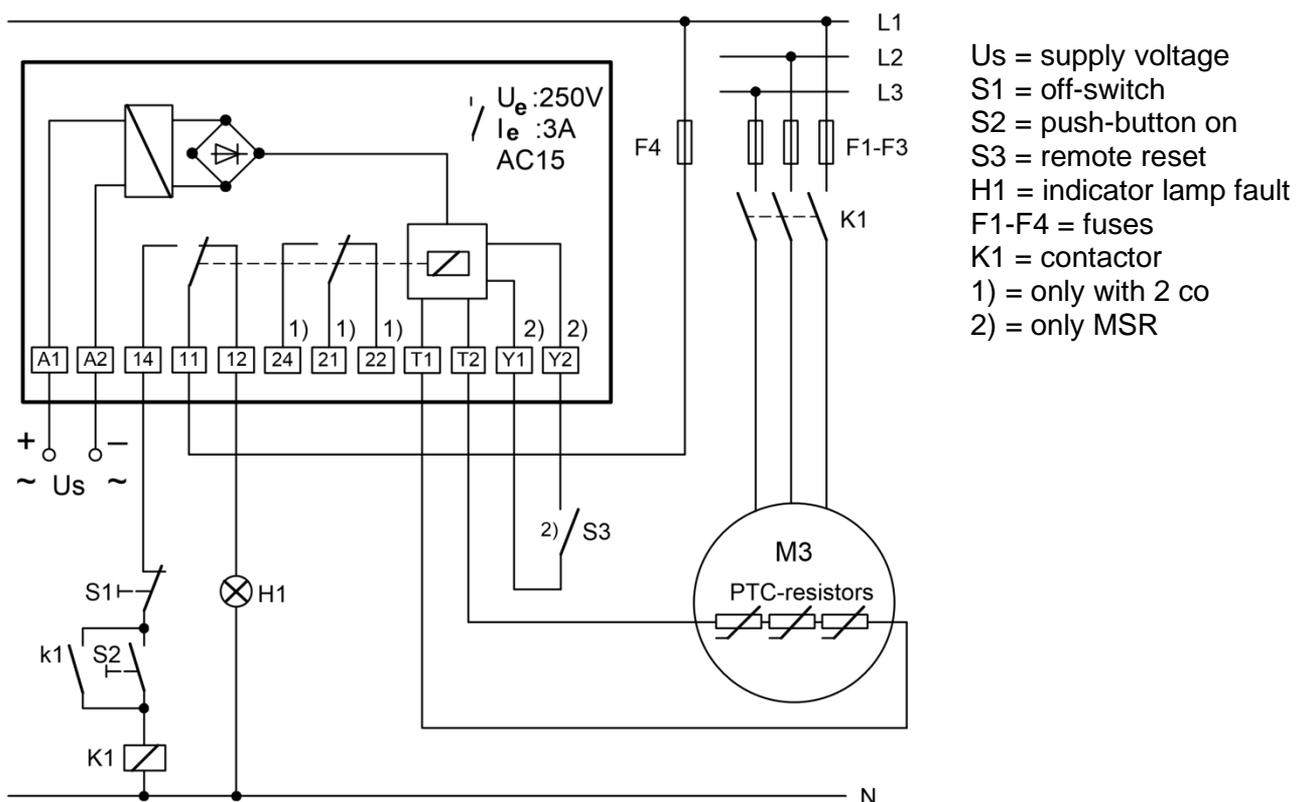
ZIEHL PTC thermistor relays are conform to EN 60947-8 and are thus exchangeable. PTC-thermistors according DIN VDE V 0898-1-401 (replacement for DIN 44081 and DIN 44082) shall be connected. PTC thermistors are suitable for the installation into windings of electrical machines, bearings and transformers as well as to monitor the temperature of liquid media, airflow and gases. With ATEX approval, explosion-protected equipment in explosive gas atmospheres (marking G: gas) or in areas with combustible dust (marking D: dust) can be protected.

5 Summary of functions

- 1 thermistor circuit for 1...6 PTC thermistors
- Short-circuit detection within the thermistor circuit
- Output relay with 1 or 2 change-over contact (co)
- Operating status display with LED

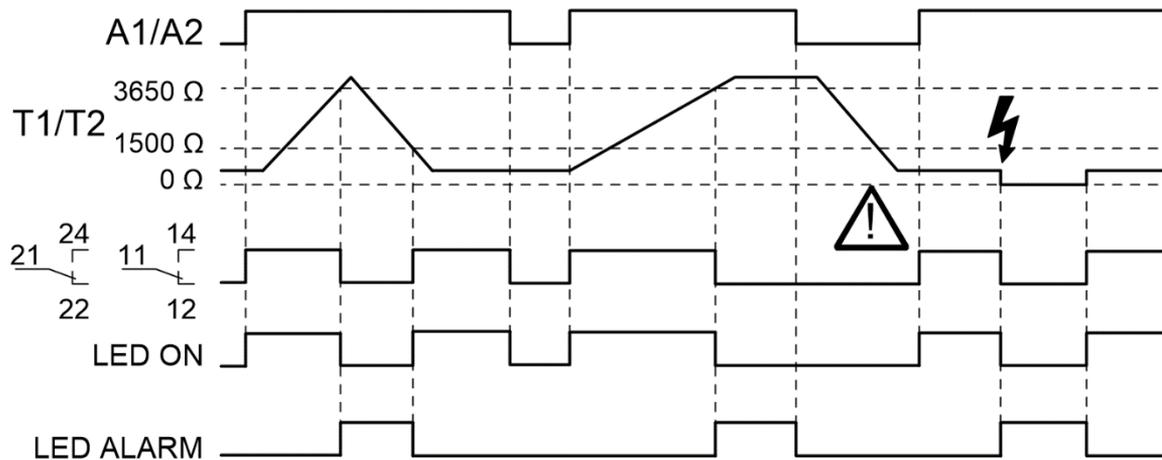
A current monitors continuously the resistance of the sensors. In cold state, the resistance is $<250 \Omega$ per sensor (sensor circuit $< 1.5 \text{ k}\Omega$). The relay has picked up and contacts 11/14 (21/24) are closed. The resistance of the thermistor rises rapidly at detector operating temperature TNF. The relay release at a resistance of 3...4 k Ω and contacts 11/12 (21/22) close. The devices also switch off in the case of detector or line short-circuit ($< \text{approx. } 20\Omega$) or detector or line interruption. MS types switch on automatically when the temperature has decreased approx. 5 °C. MSR types store the switch-off and must be reset (to be acknowledged) manually with the built-in key button or an external push-button. Power-on is recognized as an automatic reset. With bridged terminals Y1 and Y2, the function reclosing-lock is disabled. Then the device works like type MS.

6 Connecting diagram

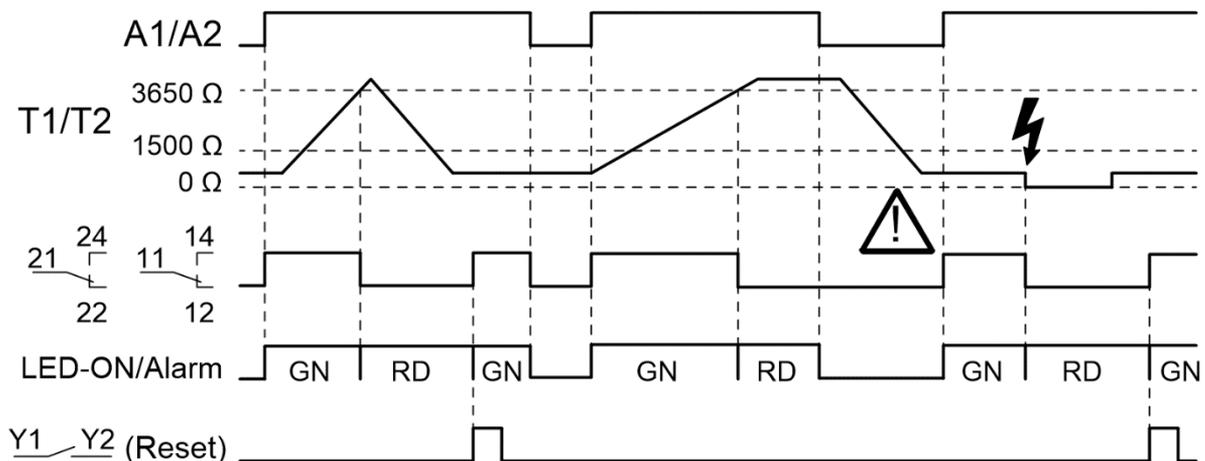


7 Function diagram

MS220KA (automatic reset)



MSR220KA (reclosing lock)



Caution! The released relay switches on automatically after a voltage dip.

8 Important Notes



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



DANGER!
Hazardous voltage!
Will cause death or serious injury. Turn off and lock out all power supplying this device before working on this device!

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 devices must be installed in an enclosure of international protection class IP 5x or better.
- Terminals with screw mounting M3 maximum tightening torque 0,5 Nm

When installing the device into the switchgear cabinet, please observe the max. admissible 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 has to be reduced.

10 Commissioning



Attention!

Before switching on make sure that the operational voltage U_s of the Type plate and the mains voltage are the same!

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 close.

The correct function of the tripping device must be checked by resistance simulation at terminals T1 and T2. This check is also performed after changes to the installation.

11 Operating instructions

MSR220KA devices have an illuminated built-in reset button and can be manually reseted after a fault signal (Red = alarm). For this purpose, also an external button (remote reset terminal Y1, Y2) can be used. Terminals Y1 and Y2 may be bridged so the function reclosing-lock is disabled.

12 Trouble – shooting and remedies

Relay does not pick up. Please check:

- The supply voltage U_s at terminals A1-A2 (green LED lights-up).
- The PTC's at terminals T1-T2. In the case of disturbance the red LED lights-up.
- The resistance of a PTC circuit must be at $50 \Omega < R < 1500 \Omega$. The terminal voltage T1-T2 is to be measured $< 2.5 \text{ Vdc}$ with connected PTC.
- MSR types please push the key button "Reset". The relay can pick up at resistance $R < 1.65 \text{ k}\Omega$ and the key button light changes from red to green. Alternatively reset can be done with closing an external contact at terminals Y1-Y2 or with voltage recovery.

Relay does not release. Please check:

- With no PTC sensor connected the relay must release. The voltage at terminals T1-T2 must be approx. 8 V.

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

13 Technical data

Power supply (A1, A2)

Rated supply voltage U_s (see type plate)	AC 110-120 V	AC 220-240	AC 380-415 V
Tolerance of voltage	AC / DC 24 V	(without potentially separation)	
Frequency (AC)	AC 0,9 U_s	-1,1 U_s	DC 21 ... 30 V
Tolerance of frequency	50 / 60 Hz		
Power consumption	45 Hz ... 65 Hz		
On-period	< 2 W		
Voltage dip buffer time	100 %		
	Max. 20 ms		

PTC thermistor input (T1, T2)		acc. DIN VDE V 0898-1-401	
Number	1 ... 6 PTC thermistor in series		
Rated response temperature TFS	60 °C ... 180 °C		
Response tolerance	+/- 6° C		
Collective resistance cold thermistor	≤1.65 kΩ		
Terminal voltage (PTC thermistor)	≤ 2.5 V at R ≤ 3.65 kΩ, ≤ 2 V at R ≤1.65 kΩ		
	≤ 9 V at R = ∞		
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		
Rated operational voltage Ue	250 V		
Switching voltage max.	Max AC 415 V Min 12 V		
Switching current.	Max 5 A Min 10 mA		
Switching power max. (ohm resistive load)	120 W at DC 24 V		1250 VA
Rated operational current (Ie)	AC15 Ie = 3 A		Ue = 250 V
	DC13 Ie = 2 A		Ue = 24 V
Recommended fuse	4 A (gG)		
Mechanical contact life	3 x 10 ⁷ operations		
Electrical contact life	1 x 10 ⁵ operations at 240 V/ 6 A		
UL electrical ratings	250 V ac, 3 A, general use		
	240 V ac, 1/4 hp, 2.9 FLA		
	120 V ac, 1/10 hp, 3.0 FLA		
	C 300		
Electrical Safety - Testing conditions		IEC/EN 60947	
Rated insulation voltage Ui	300 V		
Rated impulse voltage	4000 V		
Overvoltage category	III		
Contamination level	3		
Transformer	EN 61558-2-6		
Proof Test Voltage	2500 VAC 50 Hz		
Ambient conditions			
Fitting position	any		
Rated ambient temperature range	-20 ... +55° C		
Storage Temperature range	-10 ...+70 °C (1K3 EN60721-3-1)		
Alltitude	≤ 2000 m above sea level		
Climatic conditions	5-85% rel. F., no condensation		
	(3K3 EN60721-3-3)		
Vibration resistance EN 60068-2-6	2...13.2 Hz ± 1 mm		
	13.2 ... 100 Hz ± 0,7g		
EMC - Immunity	EN 61000-6-2		
EMC - Emission	EN 61000-6-3		

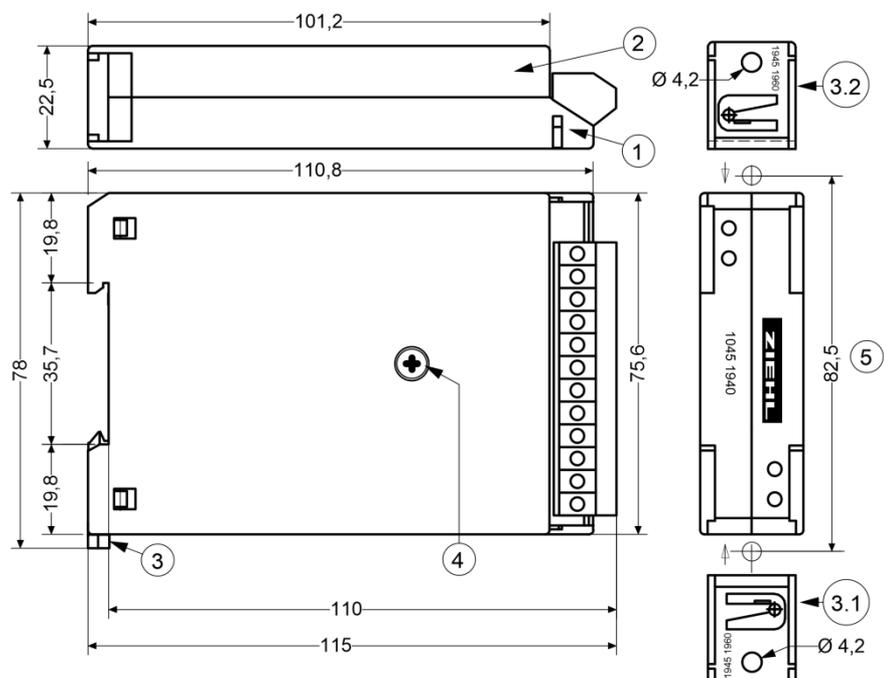
Housing	Design K
Dimensions (H x W x D) mm	75 x 22.5 x 115
Plastic Material	PA 66
Fire protection class	UL 94V-2
Protection class housing EN 60529	IP 30
Mounting EN 60715	standard rail 35 mm
Optional: Screw mounting	M4, only with additional bolt (not part of delivery)
Weight	approx. 150 g
Connection terminals	Screw mounting M3
Protection class terminals EN 60529	IP 20
Tightening torque	0.5 Nm
Line connection solid wire	1 x 0.5 ... 2.5 mm ² (AWG 22 – 14)
Stranded wire with insulated ferrules	1 x 0.14 mm ² ... 1.5 mm ²
Insulation strip length min.	8 mm

Subject to technical modifications

14 Dimensions - Design K

Dimensions in mm

- 1 Bottom
- 2 Top
- 3. Bolt
- 4 Screw
- 5 Holes for screw mounting



15 Safety Instructions and references for putting into operation



– please read carefully!

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

- The increased danger within hazardous areas 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 European Standard EN 60079-14. All work for the connection, for putting into operation and maintenance is to be implemented by qualified, responsible technical personnel. Inappropriate behavior can cause heavy personal damage and damages to property.

- The response of the thermal motor protection must directly switch off the motor, also when used together with converters. This must be realized in the logic section or configuration in the converter.
- The tripping device may be installed only outside potentially explosive atmospheres for the protection of explosive-protected motors. When used in potentially explosive atmospheres, the device must comply with the required type of protection.

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

- The increased danger within hazardous areas of combustible 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 European Standard EN 60079-14. Installation, electrical connection and commissioning to be carried out by trained service personnel only. Inappropriate behaviour can cause heavy personal damage and damages to property.
- The tripping device may be installed only outside potentially explosive atmospheres for the protection of explosive-protected motors. When used in potentially explosive atmospheres, the device is to be provided with a dust proofed enclosure according EN 60529.

15.3 Safety characteristics of the safety device

Safety Integrity Level (EN 61508) and safety related parameters

Operating mode	Hardware architecture	HFT	Safety Integrity Level
low demand mode	1001	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	1 year	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.

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

The devices fulfil 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.

15.5 Application of the safety device used with equipment category (EN 50495/VDE 0171-18)

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 tripping relay thus is suitable as safety device for Equipment Under Control (EUC) Category 3 ($HFT = 0$) in Zone 1 and Zone 21 and for Equipment Under Control (EUC) Category 2 ($HFT = 1$) in Zone 0 and Zone 20. The combined equipment shall comply with the relevant standards EN 60079-0 respectively EN 61241 according to the categories to match.

15.6 Wiring

- The lines of the thermistor circuit are to be routed as separate control lines as far as to the motor line. The use of lines of the supply cable or other mainstream 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.
- Used with electronic speed regulation the thermistor lines must be routed separately from the power lines as far as to the motor line, in order to avoid EMC distortion and thus false signal release.
- With devices type MSR the terminals Y1, Y2 may be attached parallel to a common resetting mechanism. Sensor lines may not be connected together.
- The line resistance within the sensor circuit may not exceed a value of 20 Ω .
- Maximum of permissible length for sensor circuit lines:

Wire cross section	Wire length
2,5 mm ²	2 x 1000 m
1,5 mm ²	2 x 800 m
1,0 mm ²	2 x 500 m
0,75 mm ²	2 x 300 m
0,5 mm ²	2 x 250 m

- With commissioning and after modification of the plant the sensor 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.

15.7 Safe separation

- Line circuits (A1, A2, 11, 12, 14) have a safe separation to low-voltage electric circuits (T1, T2, Y1, Y2).
- Trip relays with supply voltage DC/AC 24 V are permissible only at power supplies according EN 61558-2-6 where protected wiring is used.

15.8 Stop function

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

15.9 Start and Restart

- A restart may take place automatically only if no dangerous condition can be present. The tripping devices of types MS220KA are equipped with an automatic reset function. For this device design, suitable wiring of the control units must be ensured to prevent automatic restarting of the explosive-protected motor of the type of protection Increased Safety „e“ in case of failure.

15.10 Manual resetting

- After introducing a stop instruction by the protection device this must be maintained, until the manual resetting 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.
- Trip devices type MSR 220KA have an electronic reclosing lock. The stop instruction remains, until by pressing the push-button „Reset“ a reset is made. A start-up is only possible, if no case of failure occurs and the motor is cooled down to a sufficient value of temperature. Trip devices type MSR220KA switch on automatically with return of supply voltage. The user must guarantee by external interlock (see connection diagram) so the supervised motor/machine does not start again independently.



Attention!
Safety circuits according to EN 60204/EN 62061.
The tripping 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 shall 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 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 1500 Ohm to 4000 Ohm at terminals T1, T2.
- 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 devices are maintenance-free. Only the manufacturer may accomplish repairs. We recommend testing within the regular maintenance intervals of the plant, where the device is used. EN 60079-17 is to be observed.

You'll find this and other user manuals in the internet under www.ziehl.com

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18 EU-Declaration of Conformity

EU-Declaration of Conformity

Erklärung/Declaration No. 10585-1300-04

Hersteller: <i>Manufacturer:</i>	Ziehl industrie-elektronik GmbH + Co KG			
Anschrift: <i>Address:</i>	Daimlerstr. 13 74523 Schwäbisch Hall Germany			
Produktbezeichnung: <i>Product specification:</i>	Kaltleiter-Relais PTC Thermistor Relay			
Typ: <i>Type:</i>	MS220KA	T222445	T222451	T222455
	MSR220KA	T222471	T222473	T222475
		T222476		
Wir erklären in alleiniger Verantwortung, dass oben bezeichnetes Produkt den grundlegenden Anforderungen entspricht, die in den folgenden Europäischen Richtlinien festgelegt sind: <i>We declare under our sole responsibility that above designated product meets the basic requirements and complies with the following directives of the European Union:</i>	2014/35/EU	Niederspannungsrichtlinie Low Voltage Directive		
	2014/30/EU	EMV Richtlinie EMC Directive		
	2014/34/EU	ATEX Richtlinie ATEX Directive		
	2011/65/EU	RoHS Richtlinie		
	2015/863/EU	RoHS Directive		
Angewandte harmonisierte Normen und technischen Spezifikationen: <i>Applied harmonised standards and technical specifications:</i>	EN 60947-8:2003 + A1:2006 + A2:2012 EN IEC 61000-6-2:2019 EN 61000-6-4:2007 + A1:2011 + A2:2012 EN 50495:2010 EN IEC 63000:2018			
Benannte Stelle und Nummer der EU-Baumusterprüfbescheinigung: <i>Notified Body and number of the EU-type-examination certificate:</i>	PTB Physikalisch Technische Bundesanstalt 0102 PTB 12 ATEX 3006 Issue 1			
Schwäbisch Hall, 10.08.2020 Ort, Datum der Ausstellung <i>Place, date of issue</i>	CE-Kennzeichnung: 2012 <i>CE marking in:</i>			
ppa. 	i.V. 			
Herbert Wahl Verkaufsleitung	Bernhard Scheu Qualitätsmanagement			