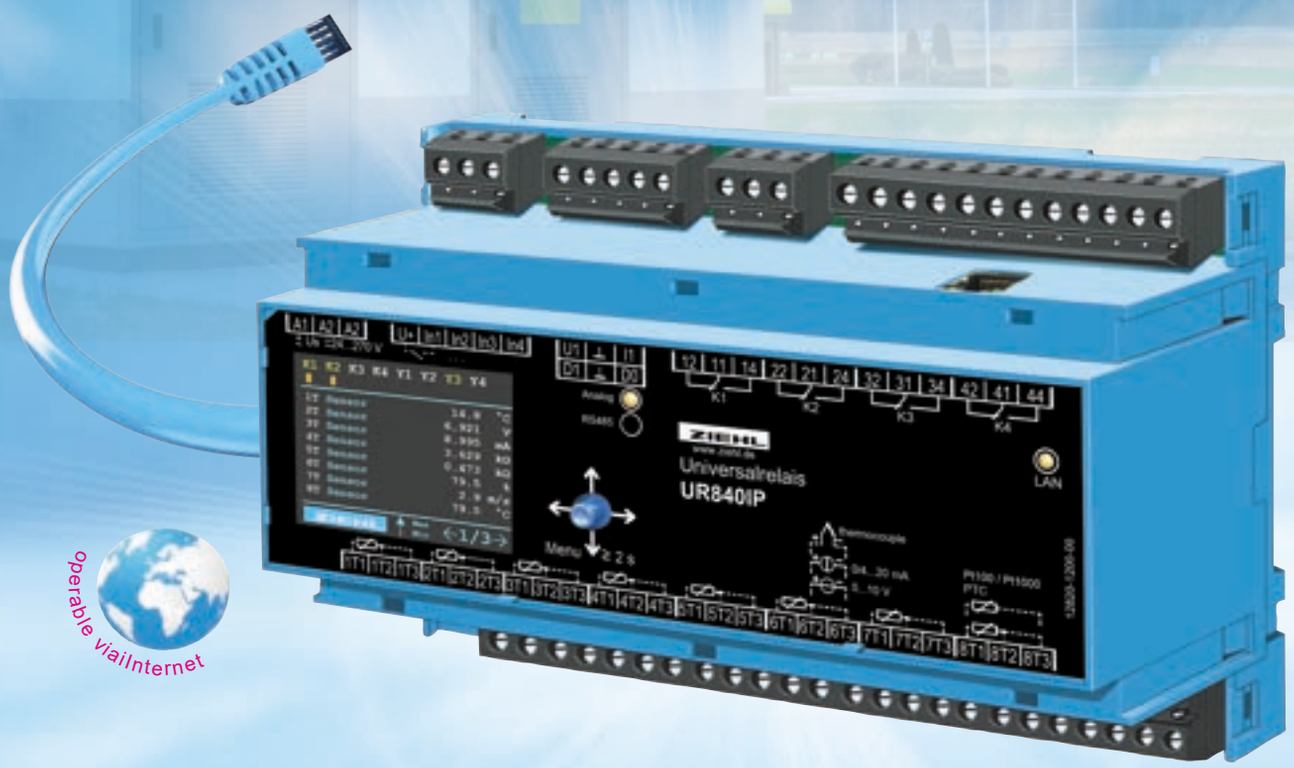
Product Catalogue

2026



Universal Relay Type UR840IP

Web-IO universal limit value relay with Ethernet interface, built-in web server and 8 inputs for temperature sensors or other analog signals

Monitor up to 8 different analogue measured values and transfer them to the Internet

Measured value query and remote maintenance via intranet/internet

NEW: Data visualization in the web interface.

URB40

Expand your UR840IP up to four additional relay outputs with the Universal Relay Box Type URB40!

MEASURING AND MONITORING ON HIGHEST LEVEL

ZIEHL

Editorial

Competent, innovative, and always one step ahead. Since 1967, we have been developing and manufacturing electronic devices for industrial applications.

Our company is certified according to ISO 9001:2015 and the ATEX Directive 2014/34/EU, and our UL-approved devices are regularly inspected. We manufacture using state-of-the-art equipment and the latest technology. Values such as sustainability, energy efficiency, and maximum cost-effectiveness can be optimally achieved with the use of our products.

Our particular strengths include the close collaboration between development, production, and sales at a single location, proximity to our customers, and, of course, our own high standards for the best quality in all products—genuinely “Made in Schwäbisch Hall.”

For easier engineering of our products, you will find product macros and master data for more than 100 items in the EPLAN Data Portal.

Temperature monitoring: Protection of motors and transformers against overheating, with PTC thermistor sensors, Pt100, and Pt1000 sensors. **Mains monitoring**: current relays, voltage relays, phase sequence relays, frequency relays, and grid protection relays (grid and plant protection). **Digital measuring devices MINIPAN®**: universal measuring instruments with LED display. **Switching relays and Controls**: speed monitors, level relays, controllers for extraction systems. **Measuring Transducers**: temperature, current, voltage, resistance. **Development and production of customized devices according to customer requirements.**

Contents

Your customer number

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*Latest Information and Operating manuals see www.ziehl.com

Temperature Relays

1

PTC-Resistor Relays

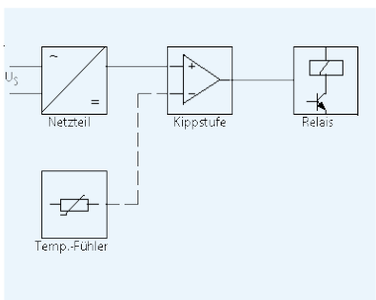
General

ZIEHL PTC resistor relays and ZIEHL PTC resistors according to DIN 44 081 and DIN 44 082 are a reliable protection from thermal overloading. Together they result in a fast and effective protective system for i.e. engines and transformers.
ZIEHL PTC relays offer the following advantages:

- Sensors and relays can be used in many combination
- fixed response temperatures of the sensors of 60... 180 °C
- reliable monitoring of sensor line sensors
- 1 - 6 PTC resistor connectable
- monitoring of normally closed contacts possible
- housings for the fast assembly standard rail or with screws M4
- protection against accidental contact according to VBG 4, VDE 106 part of 100

ZIEHL PTC resistor relays are routine tested and meet the following standards for PTC resistor relays: VDE 0660, VDE 0160, IEC 337-1, CENELEC hp 420 i

Function



The electronics monitors the sensor circuit with a continous current. In the cold state the resistance is <250 Ω per sensor and the relay signals o.k. The resistance of the sensors rise rapidly when reaching nominal response temperature (NRT).
The relay switches at values between 1650 Ω... 4000 Ω. The relay switches backat values ≤1650 Ω.

PTC relays type MS switch back automatically.
PTC relays type MSR store the switching until a RESET (integrated reset-button, external reset with contact at terminal or switch-off of power-supply).
PTC-relays type MSM have a power-fail proof reclosing lock.

Application

PTC relays in combination with PTC resistors also effectively monitor the temperatures of

- bearings in equipment and machinery
- coolants, i.e. in transformers
- airflows and gases
- oil and other liquid media

PTC resistor sensors are suitable for the installation into windings of electrical machines. They protect against to high temperatures in case of: blocking rotors, hard start, countercurrent operation, undervoltage and phase failure, with increased ambient temperature and hindered cooling.

Comparison PTC-Resistor Relays

Type	Art.-No.	Number of sensor inputs	Outputs	Alarm type	Alarm locked	Short circuit monitoring PTC	Line break monitoring PTC	Display	Supply voltage	Other functions	Approvals	Design
MS220C	T221830	1xPTC	1x change-over contact	Limit value; Fixed	-	-	-	-	24V AC/DC	-	CE, cuRUs, UKCA	C
	T221821	1xPTC	1x change-over contact	Limit value; Fixed	-	-	-	-	24-240V AC/DC	-	CE, cuRUs, UKCA	C
	T221804	1xPTC	1x change-over contact	Limit value; Fixed	-	-	-	-	220 - 240V AC	-	CE, cuRUs, UKCA	C
	T221805	1xPTC	1x change-over contact	Limit value; Fixed	-	-	-	-	400V AC/DC	-	CE, UKCA	C
MS220K	T228102	1xPTC	1x change-over contact	Limit value; Fixed	-	-	-	1x Power LED, 1x Alarm LED	24-240V AC/DC	-	CE, cuRUs, UKCA	K
MS220KA	T228114	1xPTC	1x2 change-over contact	Limit value; Fixed	-	✓	-	1x Power LED, 1x Alarm LED	24V AC/DC	-	CE, cuRUs, UKCA, Atex, SIL 1	K
	T228115	1xPTC	1x2 change-over contact	Limit value; Fixed	-	✓	-	1x Power LED, 1x Alarm LED	220-240V AC	-	CE, cuRUs, UKCA, Atex, SIL 1	K
	T228116	1xPTC	1x change-over contact	Limit value; Fixed	-	✓	-	1x Power LED, 1x Alarm LED	220-240V AC	-	CE, cuRUs, UKCA, Atex, SIL 1	K
MS220VA	T222415	1xPTC	1x change-over contact	Limit value; Fixed	-	✓	-	1x Power LED, 1x Alarm LED	220-240V	-	CE, cuRUs, UKCA, Atex, SIL 1	V2
MSF220K	T228144	2xPTC	1x co* / 1x no*	Limit value; Fixed	-	✓	✓	1x Power LED, 2x Alarm LED	220-240V AC	-	CE, cuRUs, UKCA	K
	T228143	2xPTC	1x co* / 1x no*	Limit value; Fixed	-	✓	✓	1x Power LED, 2x Alarm LED	24 - 240V AC/DC	-	CE, cuRUs, UKCA	K
MSF220V	T221738	3xPTC	2x co* / 1x no*	Limit value; Fixed	-	✓	✓	1x Power LED, 2x Alarm LED, 1x Fan LED, 1x Error LED	220-240V AC	-	CE, cuRUs	V6
MSF220VL	T221674	4xPTC	4x change-over contact	Limit value; Fixed	-	✓	✓	1x Power LED, LEDs per channel: 1x Error, 1xAlarm, 1xRelays	24 - 240V AC/DC	4 Pro-grammes	CE, cuRUs	V6
MSF220VU	T221675	3xPTC	2x co* / 1x no*	Limit value; Fixed	-	✓	✓	1x Power LED, 2x Alarm LED, 1x Fan LED, 1x Error LED	24-240V AC/DC	-	CE, cuRUs, UKCA	V6
MSR220K	T228111	1xPTC	1x2 change-over contact	Limit value; Fixed	✓	-	-	1xAlarm, 1xPower	24-240V AC/DC	-	CE, cuRUs, UKCA	K

Type	Art.-No.	Number of sensor inputs	Outputs	Alarm type	Alarm locked	Short circuit monitoring PTC	Line break monitoring PTC	Display	Supply voltage	Other functions	Approvals	Design
MSR220K2	T221945	2xPTC	2x changer with split root	Limit value; Fixed	✓	-	-	1x Power LED, 2x Alarm LED	230V AC	-	CE, cuRUs	K
	T221943	2xPTC	2x changer with split root	Limit value; Fixed	✓	-	-	1x Power LED, 2x Alarm LED	24V AC/ DC	-	CE, cuRUs	K
	T228126	2xPTC	2x changer with split root	Limit value; Fixed	✓	-	-	1x Power LED, 2x Alarm LED	24-240V AC/DC	-	CE, cuRUs	K
MSR220KA	T222473	1xPTC	2x change-over contact	Limit value; Fixed	✓	✓	-	1xDual Led Power, Alarm, Error	110-120V AC	-	CE, cuRUs, UKCA, Atex, SIL 1	K
	T228134	1xPTC	2x change-over contact	Limit value; Fixed	✓	✓	-	1xDual Led Power, Alarm, Error	220-240V AC	-	CE, cuRUs, UKCA, Atex, SIL 1	K
	T228138	1xPTC	2x change-over contact	Limit value; Fixed	✓	✓	-	1xDual Led Power, Alarm, Error	380-415V AC	-	CE, cuRUs, UKCA, Atex, SIL 1	K
	T228130	1xPTC	2x change-over contact	Limit value; Fixed	✓	✓	-	1xDual Led Power, Alarm, Error	24V AC/ DC	-	CE, cuRUs, UKCA, Atex, SIL 1	K
MSR220VA	T222435	1xPTC	1x change-over contact	Limit value; Fixed	✓	✓	-	1xDual Led Power, Alarm, Error	220-240V AC	-	CE, cuRUs, UKCA, Atex, SIL 1	V2
	T222431	1xPTC	1x change-over contact	Limit value; Fixed	✓	✓	-	1xDual Led Power, Alarm, Error	24V AC/ DC	-	CE, cuRUs, UKCA, Atex, SIL 1	V2
MSR220K6	T228128	6xPTC	1x change-over contact	Limit value; Fixed	✓	✓	-	1x Power LED, 1x short circuit LED, 6x Alarm LED	24-240V AC/DC	-	CE, cuRUs, UKCA	K
MSR820V	T221709	8xPTC	2x change-over contact	Limit value; Fixed	✓	✓	-	1x Power, 2x Relays, 8x Sensor Status	24-240V AC/DC	Sensors can be activated/ deactivated individually	CE	V6
MSF220SE	T221696	2xPTC	2x co*, 1x co* time	Limit value; Fixed	-	✓	✓	1x Power LED, 2x Alarm LED	24-240V AC/DC	-	CE	S12
	T221697	2xPTC	2x co* temperature, 1x co* time	Limit value; Fixed	-	✓	✓	1x Power LED, 2x Alarm LED	90 - 240V AC/DC	-	CE	S12
MS40ZT	T221120	1xPTC	2x change-over contact	Limit value; Fixed	-	-	-	1x Impulse LED, 1x Temperature LED	220-240V	Pulse monitoring elevator	CE	S12

Key

co = change-over contact
no = normally open contact

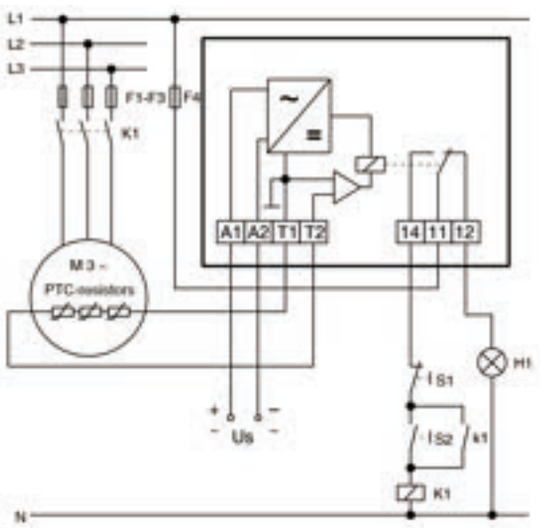
PTC-Resistor Relay Type MS220C

Single PTC-Circuit

MS220C

This compact device is the smallest version of all our PTC-resistor relays:

- terminals outside
- protection terminals IP 20
- Relays 1 change-over contact (co)
- AC 220 - 240 V



Us = supply voltage
S1 = pushbutton OFF
S2 = pushbutton ON
H1 = trip alarm
F1-F4 = fuse
K1 = contactor

Part numbers:

T221804	AC 220-240 V
T221830	AC/DC 24 V
T221805	AC 400 V (without cURus)

Technical Data

Rated supply voltage Us	AC 220-240 V, AC 400 V, ± 10 %, 50/60 Hz, 2 VA AC/DC 24 V, AC +10/-15 %, DC +25/-20 %, < 1 W, < 2 VA, without potential separation
connectable PTC resistors	1... 6 PTC according to DIN 44 081 or 44 082 or bimetal contacts (Klixon)
switching point	<4000 Ω
output relay type of contact	1 change-over contact (co) type 2 see "general technical information"
test conditions rated ambient temperature range	see "general technical information" -20 °C ... +55 °C
dimensions (h x w x d) attachment	design C: 72 x 33 x 60 [mm] on 35 mm of DIN rail according to EN 60 715 or with screws M4
protection housing / terminals	IP 30 / IP 20
weight	approx. 120 g

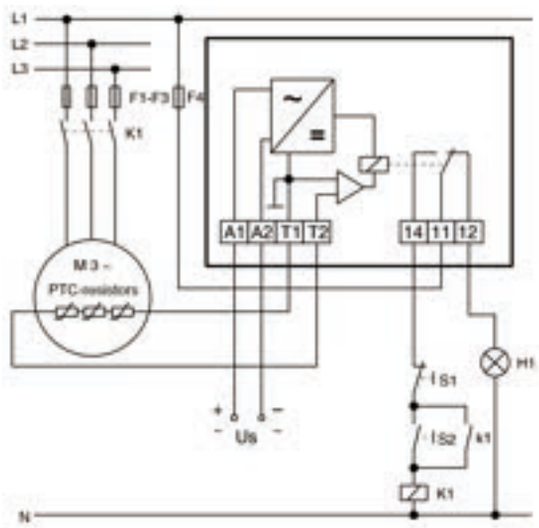
PTC-Resistor Relay Type MS220C

Single PTC-Circuit, Supply Voltage AC/DC 24 - 240 V

MS220C

This compact device is the smallest version of all our PTC-resistor relays:

- terminals outside
- protection terminals IP 20
- Relays 1 change-over contact (co)



Us = Anschlussspannung
S1 = Aus-Taster
S2 = Ein-Taster
H1 = Meldelampe Störung
F1-F4 = Sicherungen
K1 = Motorschütz

Us = supply voltage
S1 = pushbutton OFF
S2 = pushbutton ON
H1 = trip alarm
F1-F4 = fuse
K1 = contactor

Part number:
T221821 AC/DC 24-240 V

Technical Data

Rated supply voltage Us	AC/DC 24-240 V, AC 20-264 V, DC 20-297 V, < 1 W, < 4 VA
connectable PTC resistors	1... 6 PTC according to DIN 44 081 or 44 082 or bimetal contacts (Klixon)
switching point	<4000 Ω
output relay type of contact	1 change-over contact (co) type 2 see "general technical information"
test conditions rated ambient temperature range	see "general technical information" -20 °C ... +70 °C
dimensions (h x w x d) attachment	design C: 72 x 33 x 60 [mm] on 35 mm of DIN rail according to EN 60 715 or with screws M4
protection housing / terminals	IP 30 / IP 20
weight	approx. 120 g

PTC-Resistor Relay Type MS220K

Single PTC-Circuit

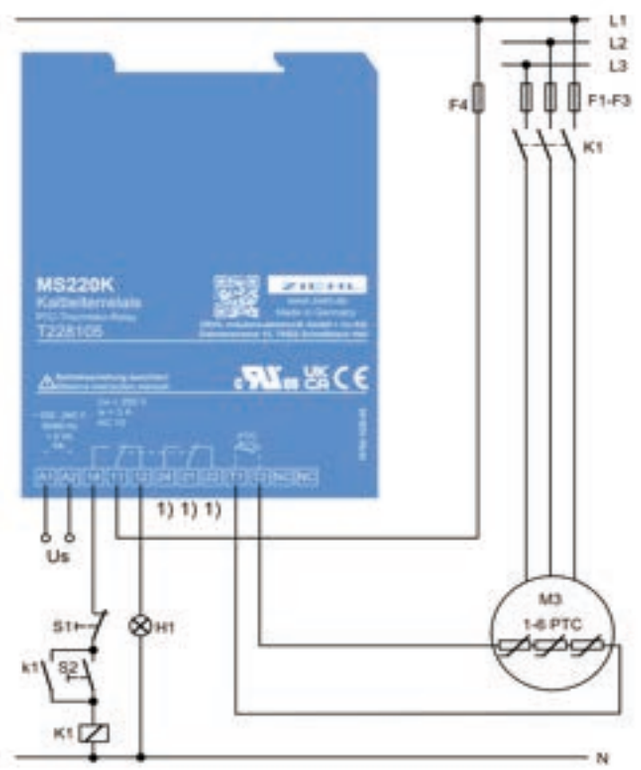
MS220K

The MS220K is a particularly economical standard design in a 22,5 mm wide housing with vertically arranged terminals.
Each terminal remains accessible even if all others are already occupied.

- 1 PTC resistor set 1... 6 PTC resistors, or bimetal contacts
- output relay with 1 or 2 change-over (co) contacts
- 2 LEDs for ON and ALARM
- K-type housing, vertically arranged terminals, 22,5 mm wide assembly on 35 mm
- DIN rail or with 2 screws M4 (option)
- UL Recognized Component

Part number:

T228102 AC 220-240V 1U



Technical data

Rated supply voltage U_S	**AC 220 - 240 V 50/60 Hz**
Tolerance (voltage)	AC 0,9 Us -1,1 Us
Tolerance (frequency)	45-62 Hz
Power consumption	< 2 VA

PTC-resistor connection	**PTC-sensor according to DIN 44081/82**
Number	set with 1 ... 6 PTC's in series
Cut-out-point	3,3 kΩ ... 3,65 kΩ ... 3,85kΩ
Reclosing point	1,7 kΩ ... 1,8 kΩ ... 1,95 kΩ
Response tolerance of system	±6 °C
Collective resistance cold sensors	≤1,65 kΩ
Terminal voltage (sensors)	≤ 2,5 V at R ≤3,65 kΩ , ≤ 9 V at R= ∞
Terminal current (sensors)	≤ 1 mA
Power consumption	≤ 2 mW

Test conditions	EN 60 947
Rated impulse voltage	4000 V
Overvoltage category	III
Contamination level	3
Rated insulation voltage Ui	250 V 415 V
Transformer	EN 61558-2-6 (VDE 0551)
On-period	100 %
Rated ambient temperature range	-20 °C ... +55 °C EN 60068-2 Dry Heat
EMV - Immunity	EN 61000-6-2
EMV - Emission	EN 61000-6-3
Vibration resistance EN 60068-2-6	2 ... 25 Hz ± 1,6 mm, 25 ... 150 Hz 5g

Relay output	EN 60947-5 / IEC 947-5
Contacts	1 or 2 change-over contacts (co)
Switching voltage	max. AC 415 V
Switching current	max. 6 A
Switching power AC cos = 1	max. 2000 VA max. 120 W at DC 24 V
Rated operational current Ie	3 A AC15 250 V; 2 A DC13 24 V
Recommended fuse	3,15 A slow (gL)
Mechanical contact life	3 x 10^7 operations 1 x 10^5 operations at 240 V / 6 A 1 x 10^6 operations ati 240 V / 2 A
Electrical contact life	0,5
Factor of reduction at cos φ = 0,3	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
UL electrical ratings	C 300

Reliability - failure rate	EN 61709 / SN29500		
Ambient conditions	Local operation in dry rooms		
Operation time 24/7/365	8760 h/y		
Failure rate (FIT)	Tu = 40 °C	Tu = 60 °C	Tu = 80 °C
Tu = Tref (component not in operation)	310 FIT	622 FIT	1558 FIT
	100 (368) years	100 (184) years	73 years

Contact termination	Push-in spring-type terminal
Protection class terminal	IP20
Actuation type	Push-Button
Number of levels	1
Solid conductor	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 28 ... 16
Fine-stranded conductor	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 26 ... 14
Fine-stranded with insulated ferrule	1 x 0,25 mm^2 ... 0,75 mm^2
Fine-stranded with uninsulated ferrule	1 x 0,25 mm^2 ... 1,5 mm^2
Strip length	8 ... 9 mm

Housing	Type K
Dimensions (W x H x D)	22,5 x 75 x 115 mm
Width	1 M
Protection class housing	IP40
IK-Code	IK06 (1 J impact energy)
Mounting	Snap mounting on 35 mm standard rail EN60715 or M4 screws (additional bar not included)
Mounting position	any
Weight	app. 150 g

Subject to technical changes

PTC-Resistor Relay Type MS220KA

Single PTC-Circuit, ATEX-Approval according to Directive 2014/34/EU

MS220KA

Part numbers:

1 cange-over

T228116	AC 220-240 V

2 change-over

T228115	AC 220-240 V
T228114	AC/DC 24 V

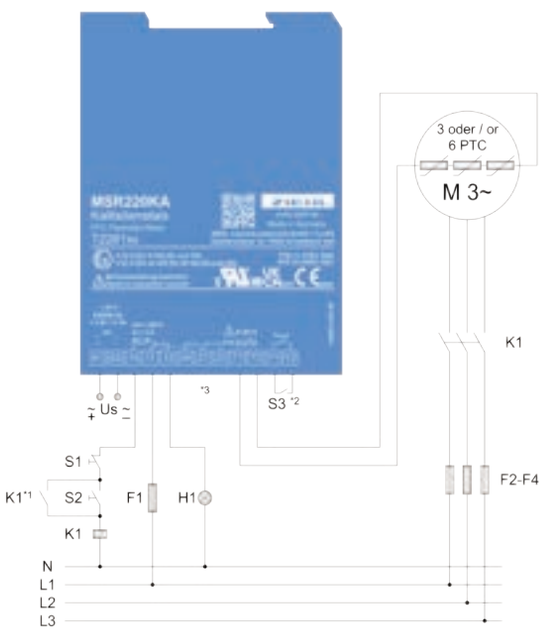
Replaces the following items:

T222445	AC 220-240 V, 1CO
T222455	AC 220-240 V, 2CO
T222451	AC/DC 24 V, 2CO

PTC-relay for the application as a protection device against inadmissible heating up at electrical equipment in areas with explosive gases (zones 1 and 2) and areas with combustible dust (21 and 22), e.g. for direct temperature-monitoring of explosion-proof motors EEx e and EEx d.

- ATEX-approval according to directive 2014/34/EU
- SIL 1 according to IEC 61508
- PL c according to ISO 13849
- 1 PTC-resistor (thermistor) set, each 3 or 6 PTC-sensors
- short-circuit monitoring of sensor-circuit
- output-relay with 1 or 2 change-over contacts (co)
- 2 LEDs for ON and ALARM
- assembly on DIN-rail or with 2 screws M4 (option)
- UL Recognized Component
- Option:
  - other suppy-voltages

II (2) D [Ex tb Db] [Ex pxb Db]
II (2) G [Ex eb Gb] [Ex db Gb]
[Ex pxb Gb]



When using one temperature sensor in explosive atmospheres, the systems tripping temperature (TNF + 15 K) must be independently assessed by the user. When three or more temperature sensors are connected in series, the system complies with the normatively required tolerance of ±6 K.

Technical Data

Power supply (A1, A2)	
Power supply Us	AC 110V…120V, AC 220V…240V, AC 380V…415V
(see type plate)	AC / DC 24 V (without galvanic isolation)
Voltage tolerance	AC 0.9 Us …1.1 Us
	DC 21V... 30V
Frequency	50 / 60 Hz
Frequency tolerance	45 Hz … 65 Hz
Power consumption	< 2 W
Voltage dip buffer time	max. 20 ms
PTC thermistor input (T1, T2)	according to DIN VDE V 0898-1-401 or equivalent
Number	1, 3 or 6 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 VDC at R ≤ 3.65 kΩ, ≤ 2 VDC at R ≤ 1.65 kΩ
Open-circuit voltage	≤ 9 VDC 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 (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 Ith	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 Ie = 3 A Ue = 250 V
Rated operational current	DC-13 Ie = 2 A Ue = 24 V
Rated operational voltage	DC-13 Ie = 0.4 A Ue = 120 V
UL electrical ratings	DC-13 Ie = 0.2 A Ue = 250 V 250 VAC, 3 A, general use C300

Test conditions	IEC / EN 60947-8
Rated impulse voltage	4000 V
Overvoltage category	III
Pollution degree	2
Rated insulation voltage Ui	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 %

Reliability – failure rate	EN 61709 / SN29500		
Ambient conditions	Local operation in dry rooms		
Operation time 24/7/365	8760 h/y		
	Tu = 40 °C	Tu = 60°C T	u = 80°C
Failure rate (FIT)	198 FIT	363 FIT	798 FIT
Tu = Tref (component not in operation)	100 (577) years	100 (314) years	100 (143) years

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

Contact termination	Push-In spring-type terminal
Protection class terminals	IP20
Actuation type	Push-Button
Number of levels	1
Solid conductor	1 x 0,14 mm² … 1,5 mm² / AWG 28 … 16
Fine-stranded conductor	1 x 0,14 mm² … 1,5 mm² / AWG 26 … 14
Fine-stranded with insulated ferrule	1 x 0,25 mm² … 0,75 mm²
Fine-stranded with uninsulated ferrule	1 x 0,25 mm² … 1,5 mm²
Strip length	8 … 9 mm / 0.31 … 0.35 inches

Housing	Type K
Dimensions (B x H x T)	22,5 x 75 x 115 mm
Width	1 M
Protection class housing	IP40
IK-Code	IK06 (1 J impact energy)
Mounting	Snap mounting on 35 mm standard rail EN60715 or M4 screws (additional bar not included)
Mounting position	any
Weight	app. 150 g

Subject to technical changes

PTC-Resistor Relay Type MS(R)220VA

Single PTC-Circuit, Atex-Approval according to Directive 2014/34/EU

MS220VA

PTC-relay for the application as a protection device against inadmissible heating up at electrical equipment in areas with explosive gases (zones 1 and 2) and areas with combustible dust (21 an 22), e.g. for direct temperature-monitoring of explosion-proof motors EEx e and EEx d.
This compact version is especially suitable for mounting in fuse-boxes or power-distribution panels.

- ATEX-approval according to directice 2014/34/EU
- SIL 1 nach IEC 61508
- PL c nach ISO 13849
- 1 PTC-resistor (thermistor) set, each 3 or 6 PTC-sensors
- short-circuit monitoring of sensor-circuit
- output-relay with 1 change-over contact (co)
- 2 LEDs for ON and ALARM
- housing for mounting in fuse-boxes
- mounting height 55 mm, 35 mm wide
- assembly on DIN-rail or with 2 screws M4
- UL Recognized Component

II (2) D [Ex tb Db] [Ex pxb Db]
II (2) G [Ex eb Gb] [Ex db Gb]
[Ex pxb Gb]

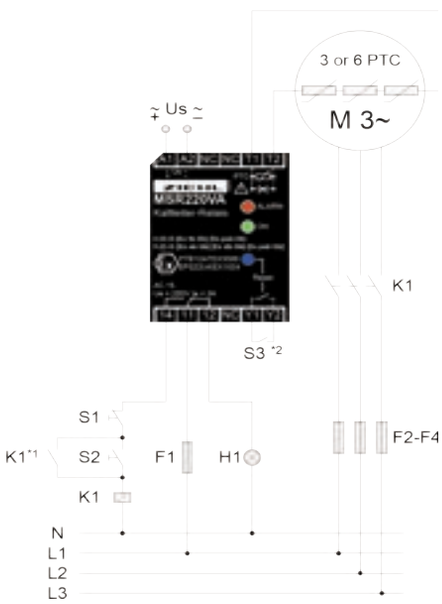
SIL IEC 61508

Part number:
T222415 AC 220-240 V

MSR220VA

Same execution as MS220VA, additionally with electronic reclosing lock. An alarm is stored until a reset is made.

- ATEX-approval according to directive 2014/34/EU
- SIL 1 nach IEC 61508
- PL c nach ISO 13849
- electronic reclosing lock (disconnectable)
- integrated RESET-button
- link for external reset
- automatic reset at voltage recovery
- UL Recognized Component



PTC = PTC termistor
Us = supply voltage
S1 = push button OFF
S2 = push button ON
S3 = remote reset
H1 = indicator lamp fault
F1 - F4 = fuses
K1 = contactor
1) external interlock
2) only MSR devices

II (2) D [Ex tb Db] [Ex pxb Db]
II (2) G [Ex eb Gb] [Ex db Gb]
[Ex pxb Gb]

SIL IEC 61508

Part numbers:
T222435 AC 220-240 V
T222431 AC/DC 24 V

When using one temperature sensor in explosive atmospheres, the systems tripping temperature (TNF + 15 K) must be independently assessed by the user. When three or more temperature sensors are connected in series, the system complies with the normatively required tolerance of ±6 K.

Technical Data

Power supply (A1, A2)	
Power supply Us: (see type plate)	AC 220-240 V AC / DC 24 V (without galvanic isolation)

PTC thermistor input (T1, T2)	**according to DIN VDE V 0898-1-401 or equivalent**
Number	1, 3 or 6 thermistors
Rated response temperature TFS	60 °C … 180 °C
Response toerance	± 6 °C
Collective resistance cold thermistor	≤ 1,65 kΩ
Terminal voltage (PTC thermistor)	≤ 2,5 VDC at R ≤ 3,65 kΩ, ≤ 2 VDC at R ≤ 1,65 kΩ
Open-circuit voltage	≤ 9 VDC at R = ∞
Terminal current (PTC thermistor)	≤ 1 mA
Power consumption	≤ 2 mW
Line capacity max	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)	**EN 60947-5-1**
Contacts	1 change-over contact (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 Ith	max. 5 A
Switching power max. AC cos φ = 1	2000 VA
Switching powermax. 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 curcuit-breaker MCB B4
Recommended fuse (NC)	3,15 A time-lag
Utilization category	AC-15 Ie = 3 A Ue = 250 V DC-13 Ie = 0,4 A Ue = 120 V
Rated operational current	DC-13 Ie = 0,2 A Ue = 250 V
Rated operational voltage	DC-13 Ie = 2 A Ue = 24 V
UL electrical ratings	250 VAC, 3 A, general use C300
Test conditions	**EN IEC 60947-8**
Reliability - failure rate	**EN 61709 / SN29500**
Ambient conditions	Local operation in dry rooms
Operation time 24/7/365	8760 h/y

	Tu = 40 °C	Tu = 60 °C	Tu = 80 °C
Failure rate (FIT)	210 FIT	408 FIT	989 FIT
Tu = Tref (component not in operation)	100 (544) years	100 (280) years	100 (115=) years

Ambient conditions	
Rated ambient temperature	-20 °C ... +55 °C
Housing	**Design V2**
Dimensions (W x H x D)	35 x 90 x 58 mm
Width	2 M
Mounting EN 60715	Snap mounting on 35 mm standard rail EN60715
Optional: Screw mounting	M4 screws (additional bar not included)
Weight	approx. 117 g
Terminal connection	**Screw mounting M3**
Protection class terminals EN 60529	IP 20

The technical data listed on this data sheet is only an excerpt; please refer to the operating manual for the complete technical data, which we strongly recommend you observe.

Subject to technical changes

PTC Relay Type MSF220K

for Dry-Transformers, 2 PTC-Circuits

MSF220K

PTC-relay for the monitoring of dry transformers.
Alarm 1 with relay in closed-circuit current mode for preliminary warning, releases at over-temperature at PTC-set 1 and serves at the same time as functional monitoring.
Alarm 2 in operating current mode. Thus no wiping signal occurs when switching on the supply voltage on.
Additional terminals enable comfortable wiring from supply voltage to relays K1 and/or K2.

- 2-PTC resistor sets
- 2 output relays 1 change-over contact (co) / 1 normally open contact (no)
- monitoring of sensors for short-circuit and break activatable
- Test-button (delayed)
- LEDs for ON, alarm 1 and 2
- K-type housing, vertically arranged terminals, 22,5 mm wide
- for attachment on DIN rail 35 mm or with 2 screws M4

Part numbers:

T228144	AC 220-240 V
T228143	AC/DC 24-240 V

Technical Data

Power supply (A1, A2)		
Rated supply voltage		Us see type plate on device
Model	Us = AC/DC 24...240 V	DC 20,4 … 297 V / AC 20 … 264 V
Frequency		AC 40…500 Hz, from AC 80 V: 10…500 Hz
Power consumption		< 1 W < 3 VA
Model	Us = AC 220...240 V	AC 0,9 Us -1,1 Us 40 ... 62 Hz
Power consumption		< 2 W < 2 VA
Relay output		**EN 60947-5-1**
Contacts		1 change-over contact , 1 NO contact
Switching voltage		max. AC 300 V; DC 300 V
Minimum voltage / current		12 V / 10 mA
Switching current Ith		max. 5 A
Current per terminal		max. 5 A
Switching power (ohm resistive load)		max. 1250 VA
		max. 120 W at DC 24 V
rated operating current Ie		AC-15 Ie = 3 A Ue = 250 V
rated operational voltage Ue		DC-13 Ie = 2 A Ue = 24 V
		DC-13 Ie = 0,2 A Ue = 240 V
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

PTC thermistor input (T0-T1, T0-T2)	acc. DIN 44081 / DIN 44082
Number	2 x 1…6 PTC thermistor in series
Rated response temperature TFS	60 °C … 180 °C
Response tolerance	±6 °C
Temperature monitor cut-out-point	3,3 kΩ…3,65 kΩ…3,85 kΩ
Temperature monitor reclosing point	1,5 kΩ…1,6 kΩ …1,65 kΩ
Collective resistance cold thermistor	≤ 1,5 kΩ
Terminal voltage (PTC thermistor)	≤ 2,2 V at R ≤ 3,65 kΩ ≤ 5 V at R = ∞
Terminal current (PTC thermistor)	≤ 1 mA
Power consumption	≤ 1,5 mW
Short circuit monitor	On: approx. 20 Ω Off: approx. 40 Ω
Interruption monitor	On: approx. 20 kΩ, only if temperature monitor cutout-point has not previously exceeded, Off: approx. 1,6 kΩ

Test conditions	EN 60947-8
Rated impulse voltage	4000 V
Overvoltage category	III
Pollution degree	2
Rated insulation voltage Ui	300 V
Transformer	EN 61558-2-6 (VDE 0551)
On-period	100 %
EMC immunity (industry)	EN 61000-6-2
EMC emission	EN 61000-6-3

Reliability - failure rate	EN 61709 / SN29500		
Ambient conditions	Local operation in dry rooms		
Operation time 24/7/365	8760 h/a		
Tu = Tref (component not in operation)	Tu = 40 °C	Tu = 60 °C	Tu = 80 °C
Failure rate (FIT)	601 FIT	1214 FIT	2789 FIT
	100 (190) years	94 years	41 years

Installation conditions	
Fitting position	any
Rated ambient temperature range	-20 °C ... +55 °C
Storage temperature	-20 °C ... +70 °C
Temperature for wiring (admissible)	-5 °C … +70 °C
Altitude	up to 2000 m
Climatic conditions	5-85% rel. F., no condensation
Vibration resistance EN 60068-2-6	2…13,2 Hz ±1 mm 13,2...100 Hz 0,7g

Contact termination	Push-In spring-type terminal
Protection class terminals	IP20
Actuation type	Push-Button
Number of levels	1
Solid conductor	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 28 ... 16
Fine-stranded conductor	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 26 ... 14
Fine-stranded with insulated ferrule	1 x 0,25 mm^2 ... 0,75 mm^2
Fine-stranded with uninsulated ferrule	1 x 0,25 mm^2 ... 1,5 mm^2
Strip length	8 ... 9 mm / 0.31 ... 0.35 inches

Housing	Type K
Dimensions (W x H x D)	22,5 x 75 x 115 mm
Width	1 M
Protection class housing	IP40
IK-Code	IK06 (1 J impact energy)
Mounting	Snap mounting on 35 mm standard rail EN60715 or M4 screws (additional bar not included)
Mounting position	any
Weight Model AC 220...240 V	approx. 140 g
AC/DC 24...240 V	approx. 110 g

Subject to technical changes

PTC-Resistor Relay Type MSF220V

for Dry-Transformers, 3 PTC-Circuits

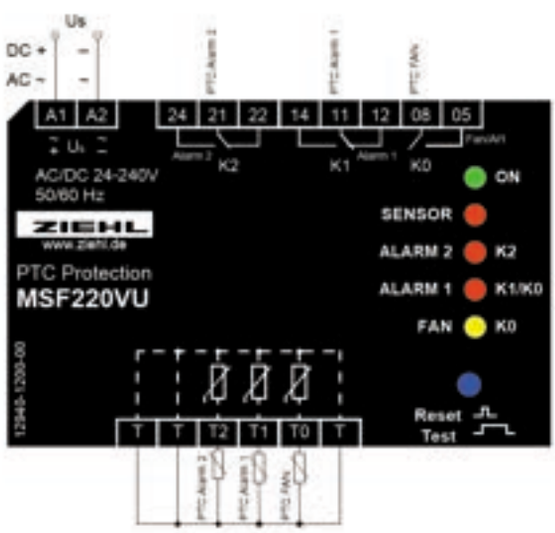
MSF220V

Part number:
MSF220V
T221738 AC 230/240 V

ER4
T224384

The MSF220V is particularly suitable for the temperature monitoring at dry transformers.
3 PTC-circuits with different nominal response temperatures (NRT) can be connected to this unit, one for controlling an fan (forced cooling) and two for alarms.
Each PTC-circuit is monitored for break and short circuit. This reduces the probability of false alarms.

- 3 PTC-circuits
- intelligent control of fan (relay K0, 1 normally-open contact)
- ALARM 1 in closed-circuit current mode (relay K1, 1 change-over contact) for pre-alarm. Signals also error in any sensor and interruption of supply voltage.
- ALARM 2 in operation current mode (relay K2, 1 change-over contact). No signal when switching on ond off the supply voltage.
- all output relays potentially monitoring of sensor lines
- TEST-button (stop possible before ALARM 2)
- open-circuit and short-circuit monitoring can be disabled (for 10 minutes) for easier system tests
- LEDs for ON, sensor error, Fan, ALARM 1 and ALARM 2
- plug-in terminals
- UL Recognized Component
- housing for mounting on DIN-rail or wall-mount
- mounting height 55 mm
- Accessory: Installation frame ER4 for panel mount



Technical Data

Rated supply voltage US	AC 220 - 240 V ± 10 %, 50/60 Hz, ≤3 VA
Connectable PTC resistors	3 x 1... 6 PTC according to DIN 44 081 or 44 082
Switching point	< 4000 Ω
Output relays	2 x 1 change-over contacts, 1 normally-open contact
Type of contact	Type 2 see "general technical information"
Test conditions	see "general technical information"
Rated ambient temperature range	-20° C ... +55° C
Housing / Installation Frame	Design V4 / Front mounting kit type ER4
Dimensions (h x w x d)	90 x 70 x 58 [mm]
Attachment	on 35 mm DIN rail according to DIN EN 50 022 or with screws M4
Protection housing / terminals	IP 30 / IP 20
Weight	approx. 250 g

PTC-Resistor Relay Type MSF220VL

for Dry-Transformers, Fan, Warning, Trip Winding and Trip Core

MSF220VL

Part numbers:

T221674 AC/DC24-240 V

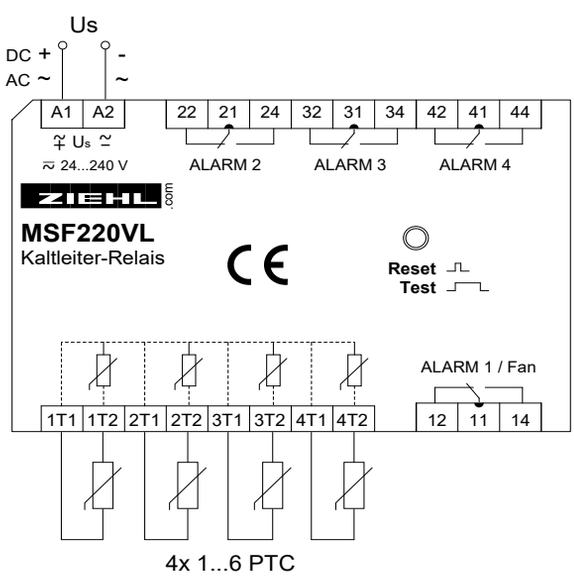
T224384 ER4 

The MSF220VL is particularly suitable for monitoring of temperatures at dry transformers, when also the temperature of the core shall be measured. Monitoring of core temperature is especially required in rectifier transformers because of harmonics causing heat in the core. An intelligent control prolongs automatically the runtime of a cooling-fan, depending on the load of the transformer. Each PTC-circuit is monitored for break and short circuit. This reduces probability of false alarms. Relays in operating-current mode prevent from a trip-signal when switching on supply voltage.

The device can be adapted to different applications with 4 programs:

1.) Fan-control - alarm - trip (winding) - trip (core)
2.) Alarm - trip (winding) - trip (core) - alarm (fault)
3.) Fan-control - alarm - trip (winding) - alarm (fault)
4.) Fan-control with hysteresis T1/T2 - alarm - trip (winding) - time relay

- 4 inputs for PTCIntelligent control of fan
- Automatic fan-test 1x / week
- electronic reclosing lock for alarms (trip) connectable
- Monitoring of sensors
- Test-button
- Simple testing with disconnectable monitoring of break and short circuit (for 10 minutes)
- LEDs for alarms, states of relays and sensors
- Housing for mounting on DIN-Rail or wall-mount (option)
- Mounting height 55 mm
- Universal supply voltage AC/DC 24-240 V
- DEWA-standard for Dubai
- Accessory: Installation frame ER4 for panel mount



Technical Data

Rated supply voltage Us	AC/DC 24 - 240 V ± 15 %, < 5 VA
Connectable PTC resistors	4 x 1... 6 PTC according to DIN 44 081 or 44 082
Switching point	< 4000 Ω
Output relays	4 x 1 change-over contacts
Type of contact	Type 2 see "general technical information"
Test conditions	see "general technical information"
Rated ambient temperature range	-20 °C ... +60 °C
Housing / Installation Frame	Design V4 / Front mounting kit type ER4
Dimensions (h x w x d)	90 x 70 x 58 [mm]
Attachment	on 35 mm DIN rail according to DIN EN 50 022 or with screws M4
Protection housing / terminals	IP 30 / IP 20
Weight	approx. 185 g

PTC-Resistor Relay Type MSF220VU

for Dry-Transformers, 3 PTC-Circuits

MSF220VU

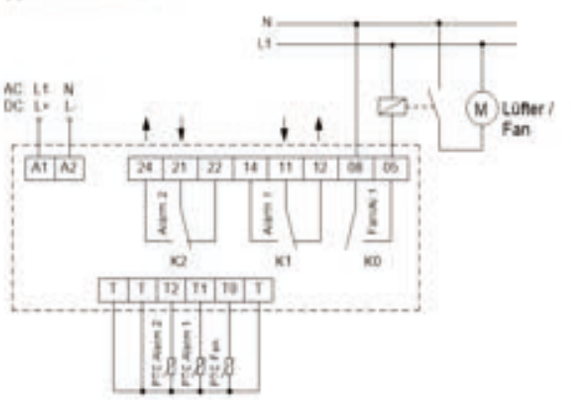
Part number:
MSF220VU
T221675 AC/DC 24-240 V

ER4
T224384

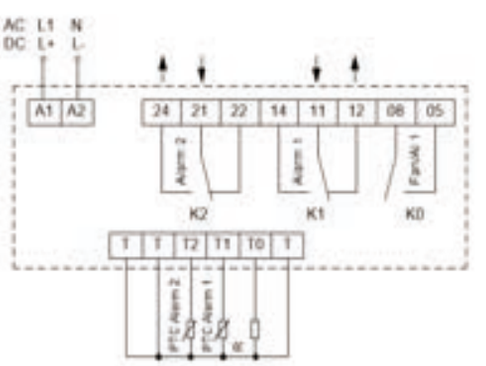
The MSF220VU is particularly suitable for the temperature monitoring at dry transformers.
3 PTC-circuits with different nominal response temperatures (NRT) can be connected to this unit, one for controlling an fan (forced cooling) and two for alarms.
Each PTC-circuit is monitored for break and short circuit. This reduces the probability of false alarms.

- 3 PTC-circuits
- MSF220VU for universal supply voltage AC/DC 24-240 V
- intelligent control of fan (relay K0, 1 normally-open contact)
- ALARM 1 in closed-circuit current mode (relay K1, 1 change-over contact) for pre-alarm. Signals also error in any sensor and interruption of supply voltage.
- ALARM 2 in operation current mode (relay K2, 1 change-over contact). No signal when switching on ond off the supply voltage.
- all output relays potentially separated from each other.
- monitoring of sensor lines
- TEST-button (stop possible before ALARM 2)
- open-circuit and short-circuit monitoring can be disabled (for 10 minutes) for easier system tests
- LEDs for ON, sensor error, Fan, ALARM 1 and ALARM 2
- plug-in terminals
- UL Recognized Component
- housing for mounting on DIN-rail or wall-mount
- mounting height 55 mm
- Accessory: Installation frame ER4 for panel mount

Application with fan



Application without fan



Technical Data

Type:	MSF220VU	
Supply voltage Us	AC/ DC 24…240 V	0/50/60 Hz
Power consumption	P < 7 VA < 2 W	
Tolerance voltage Us	AC/ DC 20,4…297 V	
Tolerance frequency Us	0/40…70 Hz	

PTC-resistor connection:	**3 x 1...6 PTC in series DIN 44081 / DIN 44082**
Cut-out point	3,3 kΩ…4,0 kΩ, typ. 3,65kΩ
Reclosing point	1,5 kΩ…1,65 kΩ, typ. 1,60kΩ
Collective resistance of cold sensors	≤ 1,5 kΩ
Short-circuit monitoring	Rmin>40 Ω, Rk = 20…40 Ω
Terminal voltage (sensors)	≤ 2,5 V at R ≤ 250 Ω, ≤ 5 V at R ≥ 4000 Ω
Terminal current (sensor)	max. 2 mA
Time for measurement	1s
Relay output:	**K1 and K2 = 1 co potential free** **K0 = 1 no potential free**
Switching voltage	max. AC 415 V
Switching current	max. 6 A
Switching power max.	max. 2000 VA max.120 W at DC 24 V
Rated operational current Ie	AC-15: I_e= 3A, U_e= 250 V AC-14: I_e= 5A, U_e= 400 V DC-13: I_e= 2A, U_e= 24 V
Mechanical contact life	3 x 10^7 operations
Electrical contact life	1 x 10^5 operations at 230 V / 6 A
Factor of reduction at cos φ 0,3	0.5 x max. switching capacity
Fuse for device and contacts	4 A, time-lag (gL)
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
Test conditions	**EN 60947-8**
Rated insulation voltage	AC 300 V
Pollution degree	2
Overvoltage category	III
Rated impulse voltage	4000 V
EMC immunity (industry)	EN 61000-6-2
EMC emission	EN 61000-6-3
On period	100 %
Installation conditions	
Fitting position	any
Rated ambient temperature range	-20 °C ... +60 °C
Storage temperature	-20 °C ... +70 °C
Temperature for wiring (admissible)	-5 °C …+70 °C
Altitude	up to 2000 m
Climatic conditions	5-85% rel. F., no condensation
Vibration resistance EN 60068-2-6	2…13,2 Hz ±1 mm 13,2...100 Hz 0,7g

Reliability – failure rate:	**EN 61709 / SN29500**		
Environmental conditions	Stationary operation in dry rooms		
Continuous operation 24/365	8760 h/a		
Tu = Tref (component part not operated)	Tu = 40 °C	Tu = 60°C	Tu = 80°C
Failure In Time (FIT)	589 FIT	1187 FIT	2647 FIT
MTTF	193,81 years	96,17 years	43,13 years

Housing	**design V4**
Material	Polyamid PA 66, UL 94 V-2
Mounting height / width	55 mm / 4 TE
Dimensions (w x h x d)	70 x 90 x 58 mm
Mounting	snap able on 35 mm standard rail according to EN 60715 or assembly with screws M 4
Protection housing/contacts	IP 30 / IP 20
Tightening torque	0,5 Nm
Line connection solid wire	1 x 0,13 - 2,5 mm² / AWG 26 - 12
Stranded wire with insulated ferrules	1 x 0,14 – 1,5 mm² / AWG 26 - 16
Weight	app. 160 g

Subject to technical changes

PTC-Resistor Relay Type MSR220K

Single PTC-Circuit

MSR220K

Part number:

2 CO
T228111 AC/DC 24-240V

Replaces the following items:

MS220K

T221741	AC/DC 24V 1CO
T221743	AC 110-120V 1CO
T221749	AC/DC 24-240 V
T221761	AC/DC 24V 2CO
T221765	AC 220-240V, 2CO

MSR220K

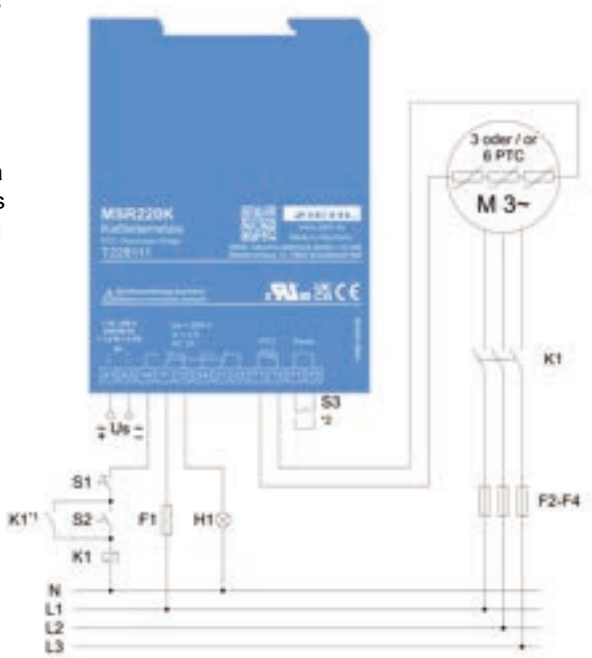
T221771	AC/DC 24V 2CO
T221775	AC 220-240V 2CO

The MSR220K is a specialized device for monitoring and protecting equipment such as power transformers and drive motors. It is a protective relay that responds to the increase in resistance of cold conductors (PTC resistors) and is specifically designed to prevent overheating.

Example of use:
In industrial processes, the MSR220K is commonly used as part of a motor protection system. Cold conductors are temperature-dependent resistors that change their resistance value drastically when a certain temperature is reached. The relay monitors these resistors and triggers when a defined threshold is exceeded, shutting down the motor to protect it from overheating. This is particularly important in applications where motors operate under heavy load, and the risk of overheating is high.
Due to its ability to automatically shut down the motor and require a manual reset, the MSR220K offers an effective protection mechanism that minimizes downtime and prevents costly repairs.

Features:

- Versatile power supply:
  Flexibility in integration into various systems with control voltage AC/DC 24-240V
- Connection options:
  Supports the connection of 1 to 6 cold conductors or bimetallic contacts (normally open, Klixon) to ensure temperature monitoring.
- Electronic restart lockout (can be disabled):
  Prevents automatic restarting after a trip until a manual or external reset is performed. Automatic reset when voltage returns.
- LED operational display on reset button
- Compact design



Technical data

Rated supply voltage U_S	**AC/DC 24 - 240 V 0/50/60 Hz**
Tolerance (voltage)	AC/DC 20,4 ... 297 V
Tolerance (frequency)	0/410 ... 70 Hz
Power consumption	< 1,5 W / < 4 VA

PTC-resistor connection:	**PTC-sensor according to DIN 44081/82**
Number	set with 1 ... 6 PTC´s in series
Cut-out-point	3,3 kΩ…3,65 kΩ…3,85 kΩ
Reclosing point	1,7 kΩ…1,8 kΩ …1,95 kΩ
response tolerance of system	±6 °C
Collective resistance cold sensors	≤ 1,65 kΩ
Terminal voltage (sensors)	≤ 2,5 V at R ≤ 3,65 kΩ, ≤ 9 V at R = ∞
Terminal current (sensors)	≤ 1 mA
Power consumption	≤ 2 mW

Reset input (Y1, Y2)	Potential free contact (no)
Current	1 mA
Voltage	< 30 VDC

Test conditions	IEC / EN 60947-8
Rated impulse voltage	4000 V
Overvoltage category	III
Contamination level	2
Rated insulation voltage Ui	320 V
Transformer	EN 61558-2-6 (VDE 0551)
On-period	100 %
Rated ambient temperature range	-20 °C ... +55 °C EN 60068-2 Dry Heat
EMC - Immunity	EN 61000-6-2
EMV - Emission	EN 61000-6-3
Vibration resistance EN 60068-2-6	2…25 Hz ±1,6 mm, 25 ... 150 Hz 5g

Relay output	EN 60947 / IEC- 947-5
Contacts	2x 1 change-over contact (co)
Switching voltage	max. AC 300 V; DC 300 V
Switch-on current (NO)	AC 15 A 4s 10% ED
min. voltage / current	12 V 10 mA
conventional thermal current Ith	max. 5 A
Switching power max. AC cos φ = 1	1500 VA 300 V * 5 A
Switching power max. DC (ohm)	0.3 A 300 V; 0.4 A 120 V; 0.8 A 60 V; 8 A 30 V
Contact life electrical	cos φ = 1 -> 5 x 105 operating cycles 250 V / 2 A
Contact life mechanical	3 x 107 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 Rated operational current	AC-15 Ie = 3 A Ue = 250 V
Rated operational current	DC-13 Ie = 2 A Ue = 24 V
Rated operational voltage	DC-13 Ie = 0.4 A Ue = 120 V; DC-13 Ie = 0.2 A Ue = 240 V
UL electrical ratings	250 Vac, 3 A, general use C300

Reliability – failure rate	EN 61709 / SN29500		
Ambient conditions	Local operation in dry rooms		
Operation time 24/7/365	8760 h/y		
Failure rate (FIT)	Tu = 40 °C	Tu = 60°C	Tu = 80°C
Tu = Tref (component not in operation)	431 FIT	865 FIT	1901 FIT
	100 (264) years	100 (133) years	60 years

Contact termination	Push-In spring-type terminal
Protection class terminals	IP20
Actuation type	Push-Button
Number of levels	1
Solid conductor	1 x 0,14 mm² … 1,5 mm² / AWG 28 … 16
Fine-stranded conductor	1 x 0,14 mm² … 1,5 mm² / AWG 26 … 14
Fine-stranded with insulated ferrule	1 x 0,25 mm² … 0,75 mm²
Fine-stranded with uninsulated ferrule	1 x 0,25 mm² … 1,5 mm²
Strip length	8 … 9 mm / 0.31 … 0.35 inches

Housing	Type K
Dimensions (B x H x T)	22,5 x 75 x 115 mm
Width	1 M
Protection class housing	IP40
IK-Code	IK06 (1 J impact energy)
Mounting	Snap mounting on 35 mm standard rail EN60715 or M4 screws (additional bar not included)
Mounting position	any
Weight	app. 95 g

Subject to technical changes

PTC-Resistor Relay Type MSR220K2

2 PTC-Circuits

MSR220K2

Part numbers:

T228126	AC/DC 24-240V

Replaces the following articles:

MS220K2

T221923	AC/DC 24V
T221925	AC 230V

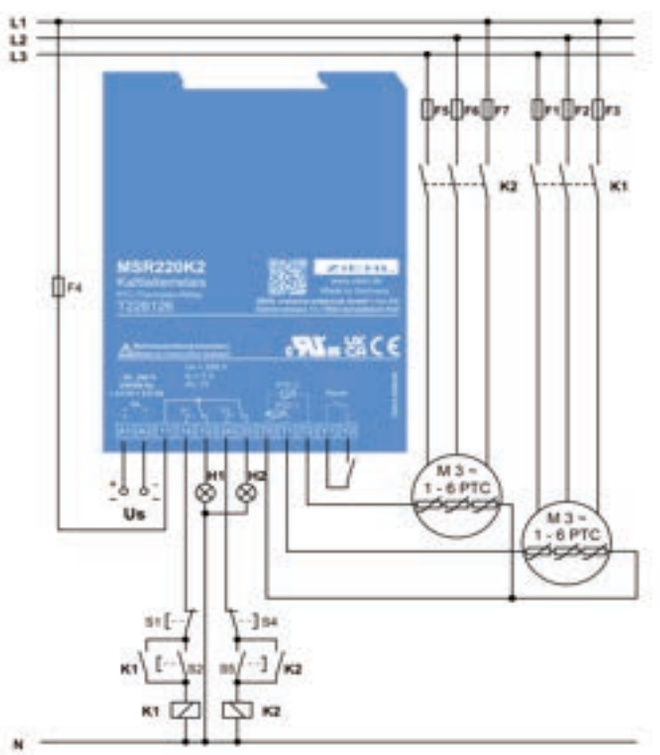
MSR220K2

T221943	AC/DC 24V
T221945	AC 230V

The MSR220K2 allows for the simultaneous and independent monitoring of two PTC circuits in a compact 22.5 mm enclosure.
If an overtemperature occurs in one of the circuits, the corresponding output relay is de-energized. The device is suitable for PTC sensors and bimetal contacts (NC, e.g. Klixon).
The MSR220K2 offers a reliable and flexible solution for temperature monitoring in a compact design – ideal for applications with high demands on safety and functionality.

Features:

- Monitoring of 2 independent PTC circuits (each with 1…6 sensors)
- Suitable for PTC sensors and bimetal contacts (NC, Klixon)
- 2 output relays (each 1 changeover contact)
- LED indicators for operation and tripping, including short-circuit indication
- Electronic reset lockout (can be disabled)
- Built-in reset button
- Connection for external remote reset
- Automatic reset after power supply returns
- Sensor circuit monitoring for interruption and short-circuit detection, for maximum operational safety.



Technical Data

Rated supply voltage Us:	AC/DC 24 – 240 V	0/50/60 Hz
Tolerance	AC 20 - 297 V	DC 20,4 - 297 V
Power consumption	< 5,5 VA	< 2,5 W

PTC-Thermistor connection	2 sensor circuits
Number	2 sets with 1 … 6 PTC`s in series according to DIN 44081/44082
Cut-out-point	≤ 4000 Ω
Response tolerance of system	±6 °C
Collective resistance cold sensors	≤ 1650 Ω
Terminal voltage (sensors)	≤ 2,5 V bei R ≤ 1650 Ω ≤ 7,5 V bei R ≥ 4000 Ω
Terminal current (sensors)	≤ 1,25 mA

Relay output	EN 60947-5-1
Contacts	2 x 1 changeover contact (co)
Switching voltage	max. AC 415 V
Switching current	max. 6 A
Switching power AC cos = 1	max. 2000 VA max. 120 W at DC 24 V
Rated operational current Ie	3 A AC15 250 V 2 A DC13 24 V
Recommended fuse	3,15 A slow (gL)
Mechanical contact life	3 x 10^7 operations
Electrical contact life	1 x 10^5 operations at 240 V / 6 A 1 x 10^6 operations at 240 V / 2 A
Factor of reduction at cos φ = 0,3	0,5

Reliability - failure rate	EN 61709 / SN29500		
Ambient conditions	Local operation in dry rooms		
Operation time 24/7/365	8760 h/a		
	Tu = 40 °C	Tu = 60 °C	Tu = 80 °C
Failure rate (FIT)	552 FIT	1093 FIT	2419 FIT
Tu = Tref (component not in operation)	100 (206) years	100 (104) years	47 years

Test conditions	EN 60947
Rated impulse voltage	4000 V
Overvoltage category	III
Contamination level	2
Ratd insulation voltage Ui	250 V
Transformer	EN 61558-2-6 (VDE 0551)
On-period	100 %
Rated ambient temperature range	-20 °C ... +55 °C
Interference resistance	EN 50 082-2
Interference transmission	EN 50 081-1
Vibration resistance	EN 60068-2-6 2…25 Hz ±1,6 mm, 25 ... 150 Hz 5g

Contact termination	Push-in spring-type terminal
Protection class terminals	IP20
Actuation type	Push-Button
Number of levels	1
Solid conductor	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 28 ... 16
Fine-stranded conductor	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 26 ... 14
Fine-stranded with insulated ferrule	1 x 0,25 mm^2 ... 0,75 mm^2
Fine-stranded with uninsulated ferrule	1 x 0,25 mm^2 ... 1,5 mm^2
Strip length	8 ... 9 mm

Housing	Design type K
Dimensions (W x H x D)	22,5 x 75 x 115 mm
Width	1 TE
Protection class housing	IP40
IK-Code	IK06 (1 J impact energy)
Mounting	on 35 mm standard rail according to EN 60715 M4, only with extra bar (not enclosed)
Mounting position	any
Weight	approx. 100 g

Subject to technical changes

PTC-Resistor Relay Type MSR220KA

Single PTC-Circuit, ATEX-Approval according to Directive 2014/34/EU

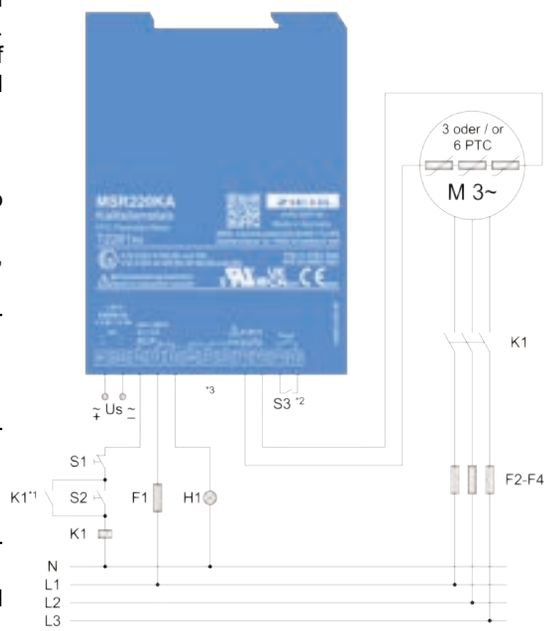
MSR220KA

SIL IEC 61508

II (2) D [Ex tb Db] [Ex pxb Db]
II (2) G [Ex eb Gb] [Ex db Gb]
[Ex pxb Gb]

PTC-relay for the application as a protection device against inadmissible heating up at electrical equipment in areas with explosive gases (zones 1 and 2) and areas with combustible dust (21 and 22), e.g. for direct temperature-monitoring of explosion-proof motors EEx e and EEx d. An alarm is stored until a reset is made.

- ATEX-approval according to directive 2014/34/EU
- 1 PTC-resistor (thermistor) set, each 3 or 6 PTCsensors
- output-relay with 1 or 2 change-over contacts (co)
- SIL 1 according to IEC 61508
- PL c according to ISO 13849
- electronic reclosing lock (disconnectable)
- integrated RESET-button
- link for external reset
- automatic reset at voltage recovery
- LEDs for power-on (green) and alarm (red) in reset-button
- UL Recognized Component
- Option:
  - other suppy-voltages



Part numbers:
2 change-over

T228134	AC 220-240 V
T228130	AC/DC 24 V
T228133	AC 110-120 V
T228138	AC 380-415 V (without cURus)

When using one temperature sensor in explosive atmospheres, the systems tripping temperature (TNF + 15 K) must be independently assessed by the user. When three or more temperature sensors are connected in series, the system complies with the normatively required tolerance of ±6 K.

Technical Data

Power supply (A1, A2)	
Power supply Us	AC 110V…120V, AC 220V…240V, AC 380V…415V
(see type plate)	AC / DC 24 V (without galvanic isolation)
Voltage tolerance	AC 0.9 Us …1.1 Us
	DC 21V... 30V
Frequency	50 / 60 Hz
Frequency tolerance	45 Hz … 65 Hz
Power consumption	< 2 W
Voltage dip buffer time	max. 20 ms
PTC thermistor input (T1, T2)	according to DIN VDE V 0898-1-401 or equivalent
Number	1, 3 or 6 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 VDC at R ≤ 3.65 kΩ, ≤ 2 VDC at R ≤ 1.65 kΩ
Open-circuit voltage	≤ 9 VDC 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 (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 Ith	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 Ie = 3 A Ue = 250 V
Rated operational current	DC-13 Ie = 2 A Ue = 24 V
Rated operational voltage	DC-13 Ie = 0.4 A Ue = 120 V
UL electrical ratings	DC-13 Ie = 0.2 A Ue = 250 V 250 VAC, 3 A, general use C300

Test conditions	IEC / EN 60947-8
Rated impulse voltage	4000 V
Overvoltage category	III
Pollution degree	2
Rated insulation voltage Ui	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 %

Reliability – failure rate	EN 61709 / SN29500		
Ambient conditions	Local operation in dry rooms		
Operation time 24/7/365	8760 h/y		
	Tu = 40 °C	Tu = 60°C T	u = 80°C
Failure rate (FIT)	198 FIT	363 FIT	798 FIT
Tu = Tref (component not in operation)	100 (577) years	100 (314) years	100 (143) years

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

Contact termination	Push-In spring-type terminal
Protection class terminals	IP20
Actuation type	Push-Button
Number of levels	1
Solid conductor	1 x 0,14 mm² … 1,5 mm2 / AWG 28 … 16
Fine-stranded conductor	1 x 0,14 mm² … 1,5 mm2 / AWG 26 … 14
Fine-stranded with insulated ferrule	1 x 0,25 mm² … 0,75 mm²
Fine-stranded with uninsulated ferrule	1 x 0,25 mm² … 1,5 mm²
Strip length	8 … 9 mm / 0.31 … 0.35 inches

Housing	Type K
Dimensions (B x H x T)	22,5 x 75 x 115 mm
Width	1 M
Protection class housing	IP40
IK-Code	IK06 (1 J impact energy)
Mounting	Snap mounting on 35 mm standard rail EN60715 or M4 screws (additional bar not included)
Mounting position	any
Weight	app. 150 g

Subject to technical changes

PTC-Resistor Relay Type MSR220K6

6 PTC-Circuits

MSR220K6

Part number:
T228128 AC/DC 24-240 V

The MSR220K6 monitors up to 6 PTC-reseitor sets with up to 6 PTCs each at the same time. If a temperature rise occurs in one set, the output relay releases and LEDs show the overheated sensor.
Switching-off is stored until a Reset. Thus enables to find the overheated sensor even when it has cooled down.

With the MSR220K6 only 4 mm space is needed per monitored PTC-circuit.
It is especially suitable for monitoring drives with multiple motors, like cranes or robots.
Instead of the PTC-sensors also contacts (normally closed) can be connected.

- 6 PTC-resistor sets, each 1...6 PTC
- Monitoring of short-circuit of sensor
- Output relay 1 x change-over contact
- Electronic reclosing lock (disconnectible with bridge)
- Input for external RESET
- Automatic RESET at voltage recovery
- LED for power on (green)
- 6 LEDs for display of overheated sensor
- Universal supply voltage AC/DC 24-240 V
- UL Recognized Component

Technical Data

Rated supply voltage Us:	AC/DC 24-240 V	0/50/60 Hz
Tolerance	AC 20 - 264 V	DC 20,4 - 264 V
Power consumption	< 5 VA	< 3 W
Output relay K1, K2 (Alarm 1, 2)	1 change over contact	
Switching voltage	max. AC 415 V	
Switching current	max. 5 A	
Switching power	max. 1250 VA (resistive Load) max.48 W bei DC 24 V	
Reduction factor at cos φ 0,7	0,5	
Rated operational current Ie	AC15 Ie = 1 A Ue = 400 V AC15 Ie = 2 A Ue = 250 V DC13 Ie = 2 A Ue = 24 V DC13 Ie = 0,2 A Ue = 125 V DC13 Ie = 0,1 A Ue = 250 V	
Recommended fuse	T 3,15 A (gL)	

Contact life mechanical	1 x 10^7 operating cycles
Contact life electrical	1 x 10^5 operating cycles at AC 250 V / 5 A 2 x 10^5 operating cycles at AC 250 V / 3 A 6 x 10^5 operating cycles at AC 250 V / 1 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

Test conditions	EN 60947-8
Rated impulse voltage	4000 V
Overvoltage category	III
Pollution degree	3
Rated insulation voltage Ui	250 V
On-period	100 %

EMC-tests	
Emission	EN 61000-6-3
Immunity	EN 61000-6-2
SElectrical fast transient/Burst	EN 61000-4-4 ±4 kV Pulse 5/50 ns, f = 5 kHz, t = 15 ms, T = 300 ms
SURGE immunity	IEC 61000-4-5 ±2 kV IEC 61000-4-2 ± 6 kV contact discharge, ± 8 kV
Electrostatic discarge	over air EN 60068-2-2 dry warmth
Vibration resistance	10 g 30 ... 150 Hz
Shock resistance	10 g 11 ms

Reliability - failure rate	EN 61709 / SN29500		
Ambient conditions	Local operation in dry rooms		
Operation time 24/7/365	8760 h/a		
Tu = Tref (component not in operation)	Tu = 40 °C	Tu = 60 °C	Tu = 80 °C
Failure rate (FIT)	519 FIT	1052 FIT	2371 FIT
	100 (219) years	100 (108) years	48 years

Installation conditions	
Permissible ambient temperature	-20 °C ... +55 °C
Permissible storage temperature	-20 °C ... +70 °C
Installation height	≤ 2000 m over N.N.
Climatic conditions	5-85% rel. F, no condensation
Permissible wiring temperature	-5 °C ... +60 °C

Contact termination	Push-In spring-type terminal
Protection class terminals	IP20
Actuation type	Push-Button
Number of levels	1
Solid conductor	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 28 ... 16
Fine-stranded conductor	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 26 ... 14
Fine-stranded with insulated ferrule	1 x 0,25 mm^2 ... 0,75 mm^2
Fine-stranded with uninsulated ferrule	1 x 0,25 mm^2 ... 1,5 mm^2
Strip length	8 ... 9 mm / 0.31 ... 0.35 inches

Housing	Type K
Dimensions (W x H x D)	22,5 x 75 x 115 mm
Width	1 M
Protection class housing	IP40
IK-Code	IK06 (1 J impact energy)
Mounting	Snap mounting on 35 mm standard rail EN60715 or M4 screws (additional bar not included)
Mounting position	any
Weight	app. 87 g

Subject to technical changes

PTC-Resistor Relay Type MSR820V

8 PTC-Circuits

MSR820V

Part numbers:

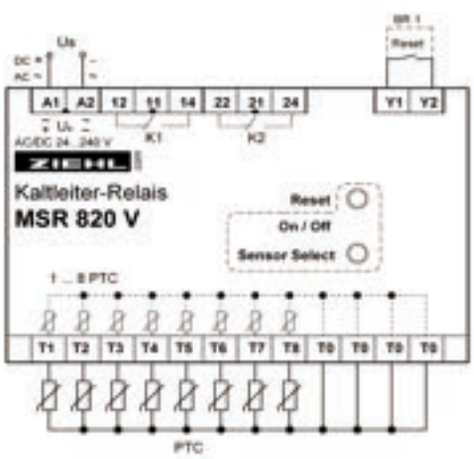
T221709 AC/DC 24-240 V

T224384 ER4 

The MSR820V monitors up to 8 PTC-resistor-circuits at the same time. A common relay signals an alarm or an error in a sensor-circuit.
The inputs can be enabled or disabled during operation.
The MSR820V can also be used as a fault annuciator for collective reports

- 1-8 PTC-circuits, each 1…6 PTC in series (max. cold-resistance 1500Ω/circuit)
- Easy activating/deactivating of PTC-circuits (display with LEDs)
- 2 potential-free relay-outputs, display of switching state with LEDs
- Display of state of PTC-circuits with 2 LEDs per circuit
- Electronic reclosing-lock (disconnectible with bridge Y1-Y2)
- monitoring of contacts for collective fault-reports

- Programmable functions:
  - Monitoring of short-circuit of PTCs (off / on)
  - External Reset as normally closed (nc) or open (no) contact (Y1, Y2)
  - Power-fail-safe reclosing lock (off / on)
  - Function of relay
    - K1 and K2 closed-current mode
    - K1 and K2 operating-current mode
    - K1 closed- and K2 operating-current-mode
- Universal supply-voltage AC/DC 24 – 240 V
- Mounting on DIN-rail 35mm EN 60715 or wall-mount (Option)
- Mounting height 55 mm
- Accessory: Installation frame ER4 for panel mount



BR 1: reclosing lock off

Technical Data

Rated supply-voltage U_s	AC/DC 24-240 V 0/50/60 Hz + 25/-20 %, <1W,<3VA DC 20,4 - 297 V AC 20 - 264 V
Connectable PTC-resistors	8 x 1...6 pieces according to DIN 44081/82
Switching Point	3,3 kΩ...4 kΩ typical 3,65 kΩ
Output Relay	2 x 1 change-over contact (CO)
Type of contact	$AgSnO_2$
Testing Conditions	see "general technical informations"
Rated ambient Temperature range	-20 °C ... +55 °C
Housing / Installation Frame	Design V4 / Front mounting kit type ER4
Dimensions H x W x D	90 x 70 x 58 [mm] mounting height 55 mm
Attachment	on rail NS 35 mm according to EN 60 715 or with screws M4 (option)
Protection Housing / Terminals	IP 30 / IP 20
Weight	app. 180 g

PTC-Resistor Relay Type MSF220SE

for Dry-Transformers, 2 PTC-Circuits

MSF220SE

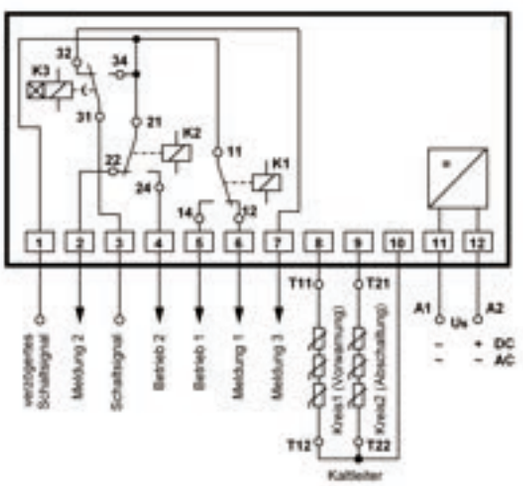
Part numbers:

T221697	AC/DC 90-240 V
T221696	AC/DC 24-240 V

The MSF220SE is a 2-channel PTC resistorrelay. It is used favourably wherever an alarm has to be supressed for a short period when applying the supply voltage.

- 2 PTC resistor sets
- 2 output-relays with change-over contacts (co)
- integrated timing-relay K3 to suppress an alarm-impulse when switching on supply voltage
- ALARM 1, i.e. for preliminary alarm
- ALARM 2, i.e. for switching off power on green LED
- ALARM 1 yellow LED
- ALARM 2 red LED
- Test-button for testing of re-
- lays K1/K2
  time-delayed signal (2-4s) of
- K3 available at terminal 1 for extarnal use

Thanks to the delayed switching-on of relay K3, the MSF 220 SE is especially suitable in applicatiions, where an auxiliary voltage is not available and the secondary voltage of the monitored transformer is being used as supply voltage.
As a consequence of this feature, there will be no alarm case of failure of supply voltage. We recommend therefore the monitoring of the function of K3 at terminals 1 or 7.



Technical Data

Rated supply voltage Us	AC/DC 90-240 V, AC 80-264 V, DC 80-297 V, < 2 VA AC/DC 24-240 V, AC 20-264 V, DC 21-297 V, < 2 VA
connectable PTC resistors	2 x 1... 6 PTC according to DIN 44 081 or 44 082
switching point	< 4000 Ω
output relays	2 x 1 change-over contacts (co)
type of contact	type 2 see "general technical information"
test conditions	see "general technical information"
rated ambient temperature range	-20 °C ... +55 °C
dimensions (h x w x d) attachment	design S 12: 82 x 42 x 121 [mm] on 35 mm DIN rail according to DIN EN 50 022 or with screws M4
protection housing / terminals	IP 40 / IP 20
weight	approx. 290 g

PTC-Resistor Relay Type MS40ZT
for Elevators

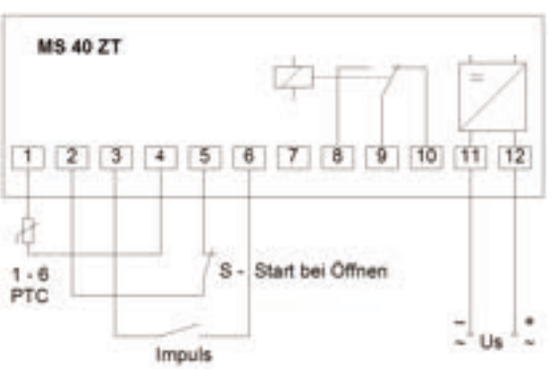
MS40ZT

Part number:
T221120 AC 220-240 V

The PTC-resistor relay MS40ZT monitors particularly engines at elevator cars and lifts.
A pulse input monitors the movement of the elevator car as long as the motor is switched on.

- watchdog timing adjustable 5 - 50 s.
- temperature monitoring with PTC-resistor
- integrated RESET-button
- LED for temperatur alarm
- LED for watchdog alarm

At elevator systems the temperature of the motor and the travelling motion have to be monitored. With the car at rest and contact between terminals 2 and 5 closed, the integrated relay picks up (terminals 8, 9 connected). The time monitoring starts with the opening of the contact between terminals 2 and 5. Then the pulse input between terminals 3 and 6 must continously open and close during travelling motion. When the pulse stops or



Technical Data

Rated supply voltage Us	AC 220 - 240 V ±10 %, 50/60 Hz, 3VA
connectable PTC resistors	1... 6 PTC according to DIN 44 081 or 44 082
switching point	< 4000 Ω
output relay	1 change-over contact (co)
type of contact	type 2 (see "general technical informations")
test conditions	see "general technical informations"
rated ambient temperature range	-20 °C ... +55 °C
dimensions (h x w x d) attachment	design S 12: 82 x 42 x 121 [mm] on 35 mm DIN rail according to DIN EN 50 022 or with screws M4
protection housing / terminals	IP 30 / IP 20
weight	approx. 280 g

Transformer-Protection Type TS1000
with integrated monitoring of Fans

Trafosafe TS1000

Part number:
T221660 AC/DC24-240 V

The Trafosafe TS1000 is applied at transformers with forced cooling.
It monitors the temperature of the transformer with 3 sensor-circuits (PTC-thermistors), controls the forced cooling depending on the load of the transformer, reports exceeding of alarm-temperature and switches off the transformer (trip) when increasing of the temperature continues.

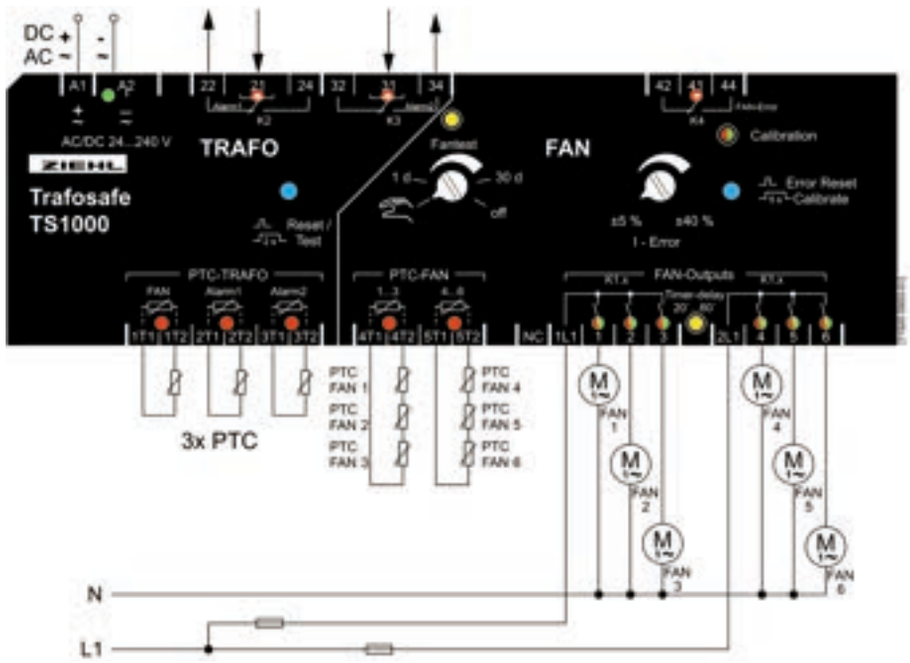
Up to 6 fans can be controlled and monitored directly with the TS1000. Contactors and motor protection switches are not necessary any more.

At Pt 100-monitored transformers the TS1000 can be used to control only the fans.

Temperature-Monitoring:
- 1 PTC-circuit for controlling the cooling (1T1/1T2) = input for starting fan when using as fan-control only.
- 2 x 1 PTC-circuit for alarm 1 (2T1/2T2) and alarm 2/ trip (3T1/3T2), monitored for
- short-circuit and interruption Alarm 1 (K2) in closed-circuit current mode = monitoring of function
- Alarm 2/trip (K3) in open-circuit current mode = no signal/tripping when switching on the device
- Test-/Reset-button for testing the function

Fan-Control and Monitoring of Fan:
- direct connection of up to 6 fans 0,07...4,0 A
- automatic exceeding of the on-time of the fans at high load of the transformer
- Monitoring of failure fan (over-/undercurrent)
- Self-calibration of the monitored values of the currents to the fans
- Switching-point for current-failure adjustable ± 5-40 %
- automatic test of fans 1-30 days, disconnectable
- Relay for reporting fan-failure
- Clear displays with LEDs

General:
- Universal-power-supply AC/DC 24-240 V
- compact hausing for cabinet-mount, 140 mm wide, mounting height 55 mm
- Attachment on 35 mm rail or with 3 screws M4



Technical Data

Supply voltage U_s	AC/DC 24 - 240 V, 0/45-120 Hz, < 2 W, < 4 VA
Tolerance	DC 20,4 - 297 V, AC 20 - 264 V
Connectable PTC-circuits	5 x 1...6 pcs according to DIN 44081 or 44082
Switching point	< 4000 Ω
Output relays K2, K3, K4	3 x 1 change-over contact (co)
Type of contact	type 3 (see "general technical informations")
Output relays 1-6	6 x 1 normally-open contact (no)
Rated current of fans	0,07...4,0 A
Test conditions	see "general technical informations"
Rated ambient temp. range	-20 °C ... +55 °C
Dimensions (h x w x d)	housing V8: 90x140x8 [mm], mounting height 55 mm
Attachment	on DIN-rail 35 mm or 3 screws M4
Protection housing / terminals	IP 30 / IP 20
Weight	app. 400 g

PTC-Resistor Temperature-Sensors MINIKA®

to DIN VDE V 0898-1-401 (ehem. DIN 44081/82)

General

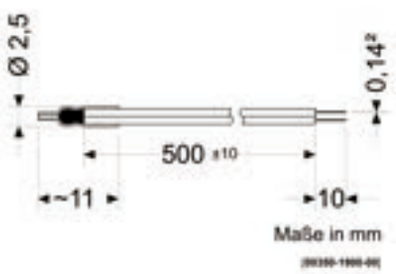
PTC-resistor temperature sensors (also called PTC-resistors or thermistors) are temperatur dependent semiconductor resistors whose main function is to alter their electrical resistance drastically when their body temperature reaches the nominal trip temperature NAT (TNF)

PTC-resistors are used principally to protect windings in electromotors or transformers against excess temperature. They also find application in machines, tooling machines especially machine bearings and controlling the temperature of power semiconductors.

PTC-resistor temperature sensors are particularly suited to this purpose due to their precise response range combined with small dimensions and minimal thermal inertia at low cost.

Single PTC-resistor type MINIKA® K

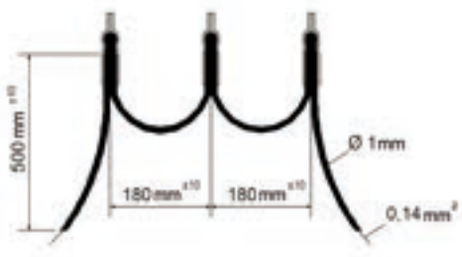
PTFE-insulated strand
Cu, silver-plated
Lead length: 500 ±10 mm
Stripping of lead-ends 10 mm
standard cross-section:
0,14 mm² (AWG 26)
weight: approx. 2,6 g



Type	NAT°C	Standard ID colour (DIN 44 081)	**Part numbers:** MINIKA®
K60	60 ± 5	white - grey	**K401000**
K70	70 ± 5	white - brown	**K401010**
K 80	80 ± 5	white - white	**K401005**
K 90	90 ± 5	green - green	**K401015**
K100	100 ± 5	red - red	**K401025**
K110	110 ± 5	brown - brown	**K401035**
K120	120 ± 5	grey - grey	**K401045**
K130	130 ± 5	blue - blue	**K401055**
K140	140 ± 5	white - blue	**K401065**
K150	150 ± 5	black - black	**K401075**
K160	160 ± 5	blue - red	**K401085**
K170	170 ± 5	white - green	**K401095**
K 180	180 ± 5	white - red	**K401090**

Triple PTC-resistor type MINIKA® KD

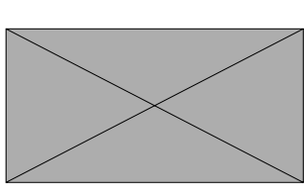
PTFE-insulated strand
Cu, silver-plated
Lead length:
500-180-180-500 ± 10 mm
Stripping of lead ends 10 mm
standard cross-section:
0.14 mm² (AWG 26)
weight: approx. 3,6 g



Type	NAT°C	Standard ID colour (DIN 44 082)	**Part numbers** MINIKA®
KD60	60 ± 5	white - yellow - yellow - grey	**K401300**
KD70	70 ± 5	white - yellow - yellow - brown	**K401310**
KD80	80 ± 5	white - yellow - yellow - white	**K401305**
KD90	90 ± 5	green - yellow - yellow - green	**K401315**
KD100	100 ± 5	red - yellow - yellow - red	**K401325**
KD110	110 ± 5	brown - yellow - yellow - brown	**K401335**
KD120	120 ± 5	grey - yellow - yellow - grey	**K401345**
KD130	130 ± 5	blue - yellow - yellow - blue	**K401355**
KD140	140 ± 5	white - yellow - yellow - blue	**K401365**
KD150	150 ± 5	black - yellow - yellow - black	**K401375**
KD160	160 ± 5	blue - yellow - yellow - red	**K401385**
KD170	170 ± 5	white - yellow - yellow - green	**K401395**
KD180	180 ± 5	white - yellow - yellow - red	**K401390**

Screw-in sensors in housing G2 (M4) and G3 (M6) MINIKA® KS

PTFE-insulated strand
Cu, silver-platedd
Lead length:
500 mm ± 10 mm
Stripping of lead ends 10 mm
standard cross-section:
0.14 mm² (AWG 26)
weight: G2: approx. 5 g
G3: approx. 14 g



Type	NAT°C	Standard ID colour DIN (44 081)	**Part numbers** G2 (M4)	G3 (M6)
KS80	80 ± 5	white - white	**K302005**	**K302109**
KS90	90 ± 5	green - green	**K302015**	**K302119**
KS100	100 ± 5	red - red	**K302025**	**K302129**
KS110	110 ± 5	brown - brown	**K302035**	**K302139**
KS120	120 ± 5	grey - grey	**K302045**	**K302149**

Technichal Data

Design	**K**	**KD**	**KS**
Max. operational voltage	25 V DC	25 V DC	25 V DC
Measuring voltage at NAT+15K -20...NAT+5K	 ≤ 7,5 V DC ≤ 2,5 V DC	 ≤ 7,5 V DC ≤ 2,5 V DC	 ≤ 7,5 V DC ≤ 2,5 V DC
Nominal response temperature NAT (TNF)	60...180°C	60...180°C	80...120°C
Tolerance NAT	± 5 K	± 5 K	± 5 K
Nominal resistance R at -20...NAT-20K VPTC ≤ 2,5 V	≤ 250 Ω	≤ 750 Ω	≤ 250 Ω
Rated ambient temperature range	-20°C...NAT+20°C		
Thermal response-time ta	≤ 5 s	≤ 5 s	-
Storage temperature	-25°C...+65°C		
Rated insulation voltage Ueff	690 V	690 V	690 V
Test voltage Ueff	2500 V AC	2500 V AC	2500 V AC

Resistors

The resistance of each individual sensor (according to standard) must, for temperatures related to the Nominal Response Temperature (NAT), have the following values:

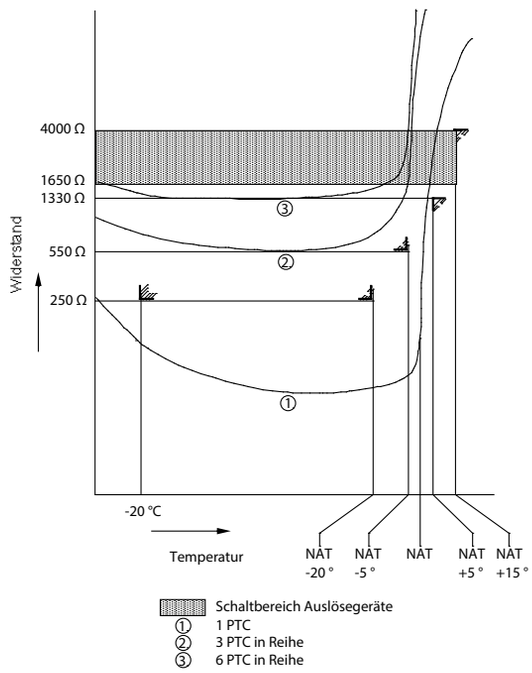
- ≤ 250 Ohms at temperatures of -20°C to NAT -20 degrees. Measurement voltage up to max. 2.5 V
- ≤ 550 Ohms at a temperature of NAT -5 degrees. Measurement voltage max. 2.5 V
- ≥ 1330 Ohms at a temperature of NAT +5 degrees. Measurement voltage max. 2.5 V
- ≥ 4000 Ohms at a temperature of NAT +15 degrees. Measurement voltage max. 7.5 V

The exact values of the resistance values in the temperature ranges are not relevant. Flawless sensors should have a cold resistance of between 20 and at most 250 Ohms. Typical values (ambient temperature) lie between 50 - 150 Ohms.

When the cold resistance is within these limits, short-circuit and interruption can be excluded. For checking the nominal response temperature, the sensors have to be heated up to this temperature.

In accordance with standards, trip devices switch between 1650 Ohms and 4000 Ohms.
If a varying number of temperature sensors connected in series to a trip device are subjected to uniform heat, this results in the following cut-off point:

- 1 PTC switches at latest at NAT +15 degrees, at earliest at NAT +5 degrees.
- 3 PTC (typical instance) switch at latest at NAT +5 degrees, at earliest at NAT -5 degrees.
- 6 PTC switch at latest at NAT, at earliest at NAT -20 degrees. (Absolutely uniform heating of all sensors virtually never occurs in this instance).



Insulation classes

For built-in PTC-resistors, we recommend the following nominal cut-off temperature values for machines which are used to full capacity within permissible heating limits in keeping with their insulation class (VDE 0530).

These values can then be correspondingly reduced for machines at less than full capacity. In some instances it might prove necessary to work out nominal response temperature values which deviate somewhat from the values recommended in the table, on the basis of trial and error. When it is intended as a preliminary warning, the value recommended as nominal response temperature is 20°C below the break temperature.

Insulation material class			
120 (E)	130 (B)	155 (F)	180 (H)
120 °C	130 °C	150 °C	

Fitting PTC-resistor temperature sensors

PTC-resistors can only be fitted before a winding has been impregnated by the motor manufacturer. It is not possible to insert them at a later stage.

Each winding has a sensor of its own. This means fitting 3 in single-speed motors and 6 in pole changing motors, with these sensors arranged in series and taken to separate terminals in the terminal box.

Measuring circuit must be provided with a separate power supply. The use of motor supply lines or other main current lines is unacceptable. Shielded supply lines must be used in case inductive or capacitive interference is produced by nearby high-voltage lines.

The maximum line lenght for a cable diameter of 0.5 mm^2 is approx. 500 m. For greater diameter cable, correspondingly more.

Fitting should, where possible, be carried out at the warmest winding head in the exhausted-air-side of the electrical machine. Care should be taken to ensure good heat contact between the sensors and the winding when being fitted. The more intimate the connection between a PTC-resistor and its winding, the better the winding temperature is registered, especially when temperatures rise sharply. For this reason, Temperature sensors should be implanted in the middle of the end winding-heads so as to be surrounded on all sides by the winding copper.

To fit the temperature sensors, the ready-shaped winding heads are spread apart in the centre using a piece of winding wood. The temperature sensors should be inserted parallel to the winding wires, care being taken that the winding wires are actually touching the temperature sensors. Cavities and air-occlusions impair heat contact and can be minimized by exerting pressure by hand to close the gap between winding wires and sensors. At the spot where the sensors are to be fitted, the winding wires on the end winding should be tightly bandaged. If the wire is more than 1 mm^2 thick, intervening spaces should be filled in with resin thickened with quartz powder.

If the motor manufacturer uses special saturants or impregnating resins whose chemical behaviour is anything but neutral, or if he uses some special working method, he will have to test the temperature sensors' resistivity himself in the operating conditions he will use.

To prevent peaks in interference voltage due to the formation of loops, we recommed that the connecting strand be fed back on the same side as the lead.

Assembly Tip: Do not shorten leads which are too long, roll them up and fasten them in position.

Testing fitted PTC-resistors

A maximum DC-voltage of 2.5 V can be passed through PTC-resistor temperature sensors when testing. Buzzers (voltage peaks) and similar testers should, therefore, not be used, but only meters or bridges.

For all measurement voltage values up to DC 2.5 V, resistance values ranging from -20°C to NAT -20 degrees should not exceeded 250 Ohms. Exact resistance values within this temperature range are unimportant. For flawless sensors, the lowest resistance value is generally above 20 Ohms.
When measurement values are being determined, care must be taken that the measurement results are not influenced by the selfwarming of the sensors. In the course of the manufacturing process, we test all sensors for NAT and disruptive strength.

Pt 100 Temperature Relays Type TR

General

Temperature relays type TR monitor temperatures in connection with temperature sensors Pt 100 according to
DIN 43 760 / IEC 751. They signal or switch, if a preset limit is exceeded.

They operate according to standard with relays in closed-circuit current mode. Break of sensor is recognized. In some models also short-circuit of sensor line is monitored.

The temperature relays type TR have the following features:

Application

Temperature relays type TR and temperature sensors Pt 100 are a reliable monitoring system. Possible damage by excess temperature in machines and plants are positively avoided.

Typical for all devices is exact recording of temperatures and constant switching points.

For the monitoring of engines or transformers devices with 3 to 6 inputs are especially suitable. They can monitor a sensor in the coil of each phase.

If the measuring temperature is to be displayed additionally or be evaluated by a superior computer system, devices with analogue output or interface RS 485 are recommended.

We supply temperature sensors Pt 100 in many various executions, according to customer´s request and with isolation for high voltages.

Comparison Pt 100 Temperature Relays Type TR

Type	Art.-No.	Sensors	Number of sensor inputs	Outputs	Alarm type	Display	Parameterization	Network / Communication	Other functions	Design	Main areas of application
TR111V	**T224107** (10...+200° C) **T224108** (0...400° C)	PT100	1	1x alarm relay, 1x analog	Threshold value	LEDs	Potentiometer	-	Switch-on or switch-off delay	V2	For simple monitoring tasks where only moderate measurement accuracy is required.
TR122D(A)	**T224126** TR122DA with analog output **T224127** TR122D	PT100, resistance 0...850 ohms	1	2x alarm relay, 1x analog (TR122DA only)	Threshold value	7-segment display, LEDs	Button	-	Switch-on or switch-off delay	S12	For simple monitoring tasks with two switching points
TR210	**T224071**	PT100, PT1000, KTY83, KTY84, thermo-couples, 0-10V, 0/4-20mA	2	2x alarm relay, 1x analog	Threshold value, differential monitoring	7-segment display, LEDs	Button	-	Switch-on and switch-off delay, separate limits for day & night, min/max, simulation	V4	Temperature monitoring to prevent condensation, for example, temperature control depending on the time of day, e.g., in greenhouses
TR250	**T224190**	PT100, PT1000, PTC, KTY83, KTY84	3	3x alarm relay	Threshold value, differential monitoring	7-segment display, LEDs	Button	-	Switch-on and switch-off delay, fan test, simulation	V4	Overload protection for motors/generators, transformers, temperature control
TR400	**T224380**	PT100	4	4x alarm relay, 1x fault relay, 2x analog	Threshold value, differential monitoring	7-segment display, LEDs	Button	-	Switch-on and switch-off delay, simulation	V8	Overload protection for motors/generators, transformers, temperature control
TR440	**T228102**	PT100	4	4x alarm relay	Threshold value	7-segment display, LEDs	Button	RS485 (only T224185)	Switch-on and switch-off delay, fan test, simulation	SE2 (Panel mounting)	Overload protection for motors/generators, transformers, temperature control
TR600	**T224360** (Analog output) **T224361** (Interface RS485)	PT100	6	6x alarm relay, 1x fault relay, 2x analog (only T224360)	Threshold value	7-segment display, LEDs	Button	RS485 (only T224361)	Switch-on and switch-off delay, simulation	V8	Temperature measurement with switching thresholds and signal conversion or further processing of signals
TR800Web	**T224164**	PT100, PT1000, KTY83, KTY84, thermo-couples	8	4x alarm relay	Threshold value	7-segment display, LEDs	Button, web interface	RS485	Switch-on and switch-off delay, simulation, time-dependent limit values, warning by email	V8	Temperature measurement, monitoring, and recording, e.g., cold storage facilities
TR640IP	**T224390**	PTC, PT100, PT1000	6	4x alarm relay	Threshold value, difference, rate of change	Display, LED	Joystick, web interface	Ethernet	Switch-on and switch-off delay, simulation, cyclic relay test, 2 digital inputs	V6	Extended monitoring for motors, transformers, differential monitoring
TR660IP	**T224370** (Analog output) **T224371** (Modbus RTU)	PTC, PT100, PT1000	6	6x alarm relay, 2x analog (only T224370)	Threshold value, difference, rate of change	Display, LED	Joystick, web interface	RS485, Ethernet	Switch-on and switch-off delay, simulation, cyclic relay test, 2 digital inputs	V8	Extended monitoring for motors, transformers, differential monitoring
TR1200	**T224095**	PT100	12	1x fault relay	-	7-segment display, LEDs	Button	RS485	-	V8	Remote temperature measurement
TR1200IP	**T224078**	PT100	12	1x fault relay	-	7-segment display, LEDs	Button, web interface	Ethernet	GOOSE protocol	V8	Remote temperature measurement

- All devices marked with RS485 can be read out using the Modbus RTU protocol.
- All devices marked with Ethernet can be read out using the Modbus TCP protocol.
  In addition, these devices have a web interface through which all settings can be made.

Pt 100-Temperature Relay Type TR111V

1 Sensor

TR111V
3-Leiter

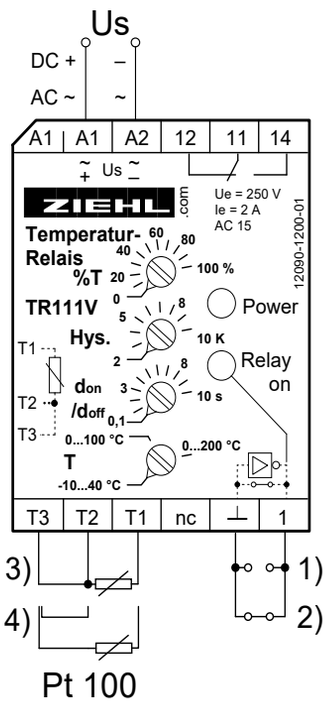
Part numbers:

T224107	-10...+200 °C
T224108	0...+400 °C

Temperature-Relays TR111V can be used as limit-switches or 2-point controllers with high repeat accuracy.
3 measuring-ranges, adjustable hysteresis and switching delay and the choice between operating- and closed-current principle of the relay make it a very universal device.

- Measuring input 1x Pt 100 (RTD) / 3-wire
- measuring-ranges selectable:
  - -10...+40/0...100/0...200 °C
  - 0...100/100...200/200...300/300...400 °C
- 1 limit adjustable 0...100 % switching delay adjustable 0,1...10 s
- Output-relay 1 changeover-contact (co)
- Operating- or closed-surrent-mode selectable with bridge
- Switching off at sensor-short-circuit or break
- LEDs for display state of operation
- Universal supply-voltage AC/DC 24-240 V
- Housing for mounting in switchgear cabinets or fuse-boxes, 35 mm wide
  Mounting heigt 55 mm

Application:
Protection from over-temperature in processes, plants and machines. Monitoring of temperatures in bearings. Controlling of temperatures in processes and plants.



1) Ruhestrom / closed current mode
2) Arbeitsstrom / operating current mode
3) 3-Leiter / 3-wire
4) 2-Leiter / 2-wire
Brücke zwischen T2-T3 / Bridge from T2-T3

Technical Data

Supply voltageUs	AC/DC 24-240 V, 0/50/60 Hz, < 2W, < 3VA (DC 20,4 - 297, AC 20-264 V)
Pt 100 -Sensor (RTD)	EN 60751 / IEC 60751
Measuring ranges	ranges selectable
Error of setting	± 5 K
Repeat error	app. 0,5 K
Temperature-dependence	≤0,05 %/K
Hysteresis	adjustable 2...10 K
Switching delay don/doff	adjustable 0,1...10 s
Relay output	1 change-over contact (co)
Type of contact	**type 3 see** "general technical informations"
Test conditions	siehe "general technical informations"
Rated ambient temperature range	-20 °C … +55 °C
Dimensions (H x W x D)	design V4: 90x70x58 [mm], mounting height 55 mm
Attachment	on 35 mm DIN-rail according to EN 60 715 or with screws M4
Protection housing/terminals	IP 30 / IP 20
Weight	app. 100 g

Pt 100-Temperature Relay Type TR122D(A)

1 Sensor, 2 Limits, Digital display, Analog-output

TR122D(A)

Part numbers:
TR122DA
T224126 with analog output
TR122D
T224127 no analog output

Switching-Relays Typs TR 122 D(A) monitor the input-signal for 2 limits. The TR 122 DA transduces the measured temperature/ resistance to a proportional DC-current.

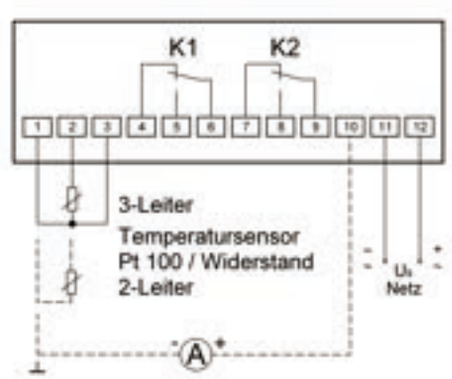
- 1 sensor Pt 100 (RTD) 2- or 3-wire-connection
- Range -199...+850 °C
- Resistance 0...850 Ω
- 2 alarms/relays (co- contacts)
  Digital display, 3 digits
- Monitoring of sensor (break/
- short-circuit)
  Display of MIN- and MAX-
- values
  scalable analog output
- 0/4...20 mA (TR 122 DA only)
  Universal supply voltage AC/
- DC 24-240 V
  Plug-in housing for easy
- mounting and service

Applications:

- Monitoring of temperature with pre-alarm and alarm
- Monitoring of under- and over-temperature
- 2-point-controller, e.g. for heating (the second switching point can be used for monitoring the function and release an alarm at over- or undertemperature)
- 3-point-controller for heating/keeping temperature
- Monitoring of resistance 0...850 Ohm
- Transducer for Resistance

The following parameters can be programmed:

- Switching points (alarms)
- Hysteresis (+ or - = MIN or MAX-function)
- Relay in closed- or operating current mode
- automatic reset or electronic reclosing lock
- switching- and switch-back-delay
- Analog output
- ***EasyLimit*** for simplyfied setting of alarms
- Code-lock against manipulation of settings



Technical Data

rated supply voltage Us	AC/DC 24-240 V, <3W, <5VA (AC 20-264 V, DC 20,4-297 V)
sensor Pt 100 (RTD) connection	Pt 100 according to EN 60 751/IEC 60 751, Resistance 0...850 Ohm line-resistance max. 3 x 22 Ω / 2 x 10 Ω
measuring accuracy	< 0,3 % of value ± 0,5 K (Ω)
measuring current	≤ 0,8 mA
connection of sensor	2-/3-wire, line-resistance max. 2 x 50 Ω/ 3 x 50 Ω
analog output	0/4-20 mA, max. 500 Ω, error <0,3% of fullscale
measuring range	-199 ... +850 °C / 0 ... 850 Ω
resolution	1 K (Ω), -19,9 ... 99,9: 0,1 K (Ω)
hysteresis	±200 K
switching delays	0...999 s
relay-contact	**type 2** (see "general technical informations")
test conditions	see "general technical informations"
rated ambient temp. range	-20 °C ... +55 °C
dimensions (h x w x d)	design S12: 82 x 42 x 121 [mm]
attachment	on 35 mm DIN rail according to DIN EN 50 022 or with screws M4
protection housing / terminals	P 30 / IP 20
weight	app. 300 g

Universal Temperature Relay/ Limit Value Switch Type TR210

for 2 Temperature-Sensors or 0/4-20 mA, 0-10 V, 2 Limits, Analog-output

TR210

Part numbers:

T224071 AC/DC 24-240 V

Accessory: Installation frame ER4 for panel mount

T224384 ER4

The control unit TR210 monitors up to 2 measuring inputs for Pt100 (RTD), Pt1000, thermocouples, or standard-signals 0/4-20 mA, 0-10 V.
The signals are monitored for up to 4 limits. The value of one or of both inputs can be read out at an analog output.

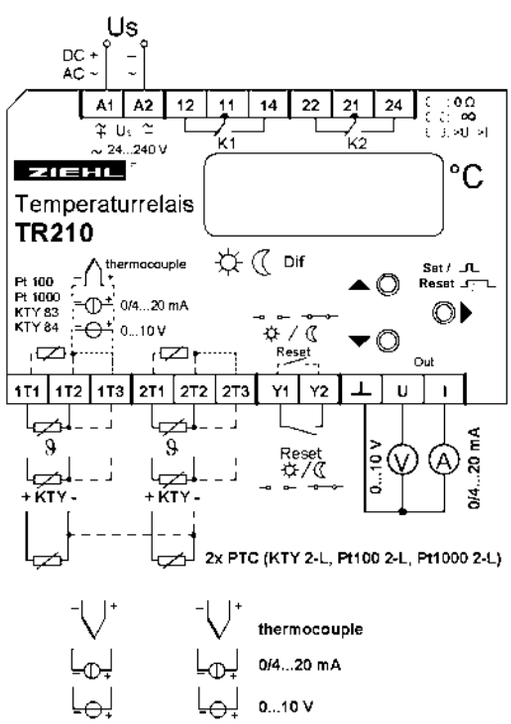
Application:
The TR210 is very versatile and can thus be used in many applications. Nevertheless multiple preset programs allow an easy setting.
It can be used as a limit switch or as a controller for 2 limits (with day/night shift up to 4 limits).
As a measuring transducer it can convert signals from the temperature-sensors to standard-signals or change the scaling of standard-signals. The user can also select, if minimum or maximum of 2 signals or the difference of 2 signals is connected to the analog output.
For more applications see basic programs.

- Measuring and monitoring range -270...+1820 °C
- resolution 0,1°C (to 999.9 °C)
- Analog output (scaleable) for 1 input, min./max. of 2 inputs or difference of 2 sensors (no isolation between inputs and output)
- 2 relay outputs
- Shifting of day/night (selectable with contact at terminals Y1/Y2)
- Universal power supply AC/DC 24-240 V
- Easy setting with 3 buttons and preset programs
- Storing of min- and max-values of inputs
- Code-lock against manipulation of settings
- Terminals pluggable

2 Measuring-Inputs:
- Resistance-sensors Pt100 (RTD), Pt1000, KTY83/84 in 2- or 3-wire-connection
- Thermocouples types B, E, J, K, L, N, R, S or T
- different sensors at both inputs possible
- Standard-signals 0/4-20 mA, 0-10 V (scaleable)

Displays:
- 4-digit for measuring value
- 2 LEDs for state of relays
- 3 LEDs sensor/difference
  2 LEDs day/night

Switching-Functions:
- 2 relays (co-contacts)
- 2-4 limits
- Warmest/coldest sensor switches relay
- Programmable for every relay:
  - hysteresis (+ or - = MIN- or MAX-function) -199.9...999.9 s
  - autoreset or electronic reclosing lock
  - delay-time for switching and switching back 0...9999 s
  - operating- or closed current-mode
  - cyclic check of function
- Monitoring of difference in temperature
- Preset basic programs



Basic Programs

Program 1:
1 Temperature-sensor,
2 Limits
Application: Monitoring of a temperature for 2 limits, e.g. over-temperature with warning and switchjing off or monitoring of a temperature-range (min/max).

Program 2:
2 Temperature-Sensors,
1 Limit for each Sensor
Application: Monitoring of 2 temperatures for 1 limit each, e.g. over.temperature or as double electronic controller.

Program 3:
1 Temperature-Sensor,
2 Limits each day/night
Application: Controlling of a temperature with first limit, different for day and night.
Monitoring of the same temperature with second limit, different for day and night.

Program 4:
2 Temperature-Sensors,
each 1 Limit for day/night
Application: Monitoring or controlling of 2 temperatures for 2 limits, depending on operation mode, e.g. controlling of 2 circulation pumps (day/night) or of processes (active/stand-by).

Program 5:
2 Temperature-Sensores for monitoring of differences in temperature, 2 Limits
Application: Regulation or monitoring of the difference of 2 measuring-points for 2 limits, e.g. circulation pumps in solar systems.

Program 6:
1 Standard-Signal 0/4-20 mA or 0-10 V, 2 Limits
Display can be scaled, e.g. measuring input 4-20 mA = display 0...1200 l/h.
Application: Monitoring of signals from a measuring transducer for 2 limits, e.g. over- or under- exceeding of limits with pre-alarm and alarm or monitoring of a signal-range (min/max) and/or as measuring-transducer. In combination with any measuring-transducers, signals like pressure, volume-flow, pH-value, ... can be monitored.

Program 7:
2 Standard-Signals 0/4-20 mA or 0-10 V,
1 Limit each
Display can be scaled, e.g. measuring input 4-20 mA = display 0...1200 l/h.
Application: Monitoring of signals from 2 measuring transducers, each for 1 limit, e.g. over- or under- exceeding of a limit as double electronic controller.

Program 8:
2 Standard-Signals 0/4-20 mA or 0-10 V for monitoring of differences of signals
Application: Regulation or monitoring of the difference of 2 analog signals for 2 limits, e.g. levels of liquids.

Program 9:
2 Temperature-Sensors, 2 shared Limits
Application: Coldest (MIN) or warmest (MAX) sensor switches relay. Monitoring of 2 bearings for pre-alarm and alarm.

Application as Measuring-Transducer:
At programs **with 1measuring-input** the output can be scaled for this input, e.g. 0...200.0 = 4-20 mA.
At programs **with 2 measuring-inputs** the output can be scaled for 1 input or min- or max- value of both inputs.
At programs **for measuring of differences** output can be scaled for 1 signal or for the difference input 2 minus input or for min- or max- value of both inputs.
Thus the TR 210 can be used as limit value switch and/or measuring-transducer simultaneously. The measured values ca be forwarded to e.g. a remote display or a superior control.

Technical Data

Rated supply voltageUs	AC/DC 24-240V, <3W, <7VA (AC 20-264 V, DC 20,4-297 V)
2 Measuring inputs	Pt 100, Pt 1000 according to EN 60 751 Thermocouples types B, E, J, K, L, N, R, S, according to EN 60 584, DIN 43 710 0/4-20 mA (22Ω), 0-10 V (13 kΩ)
Measuring-time	<2,5 s to 5 s, depending on speed of change of signal
Analog output	0/4-20 mA, max. 500 Ω. 0-10 V, max. 10 mA (without isolation to inputs)
Relay output	type 3, see "general technical informations" 2 x 1 co- (change-over) contact
Test conditions	see "general technical informations"
Rated ambient temp.range	-20 °C … +65 °C
Housing / Installation Frame	Design V4 / Front mounting kit Type ER4
Dimensions h x w x d	90x70x58 [mm], mounting height 55 mm
Protection housing / terminals	IP 30 / IP 20 (terminals pluggable)
Weight	app. 200 g
Attachment	on 35 mm DIN-rail or with screws M 4

Temperature-Measuring with Thermocouples

A thermocouple consists of two spot welded wires of different metals or metal alloys. When the joint (measuring point) is heated, a voltage is produced at the free ends (connection or reference junction). This effect, which is essential for the action of the thermocouple, results from the fact that a contact voltage is produced at the contact of two different metals, the value of which depends on the temperature (thermo-voltage).

The value of the contact voltage at metal junctions can be taken from the thermoelectric voltage series.

The contact value of the measuring point cannot be measured easily. When the metallic line ends form a circuit, by connecting to a measuring instrument, there are additional contact voltages at each metal junction. The total voltage in the closed circuit will equal zero as long as all junctions are on the same temperature level.

This calls for three essential requirements:

1. The open ends of the thermocouples must be led to the measuring instrument on special compensating leads in order to avoid additional contact voltages.

2. To avoid distorting contact voltages at themeasuring instrument, both connecting terminals must have the same temperature (isothermal block).

3. As with the thermocouples, only the temperature difference between the measuring point and the reference junction can be measured. The temperature at the reference junction must be kept constant (by measuring with 2 thermocouples) or the measuring instrument must automatically compensate for the error incurred by the change of the ambient temperature at the reference junction (in this case at the terminal) in some electronic way.

Thermocouples cover a vast temperature range, from -270°C to +2800°C. Their accuracy is guaranteed to DIN 43 710 and IEC 584-1 standards which facilitates their interchangeability. Their performance curves show mainly non-linear characteristics so that a linearisation becomes necessary. Thermocouples are very small, have short response times and a stability of just a few ° Kelvin variation year by year. Their range of applications depends on the materials used for the thermocouple and the medium to be measured. Thermocouple suppliers give exact information with regard to the service life and the admissible maximum short-time temperatures.

Which Thermocouple for which application?

Pt 30 Rh-Pt 6 Rh Typ B
DIN EN 60 584-1

in mV temperatures in steps of 10 °C
reference junction 0 °C

°C	0	10	20	30	40	50	60	70	80	90
0	0	-0,002	-0,003	-0,002	-0	0,002	0,006	0,011	0,017	0,025
100	0,033	0,043	0,053	0,065	0,078	0,092	0,107	0,123	0,140	0,159
200	0,178	0,199	0,220	0,243	0,266	0,291	0,317	0,344	0,372	0,401
300	0,431	0,462	0,494	0,527	0,561	0,596	0,632	0,669	0,707	0,746
400	0,786	0,827	0,870	0,913	0,957	1,002	1,048	1,095	1,143	1,192
500	1,241	1,292	1,344	1,397	1,450	1,505	1,560	1,617	1,674	1,732
600	1,791	1,851	1,912	1,974	2,036	2,100	2,164	2,230	2,296	2,363
700	2,430	2,499	2,569	2,639	2,710	2,782	2,855	2,928	3,003	3,078
800	3,154	3,231	3,308	3,387	3,466	3,546	3,626	3,708	3,790	3,873
900	3,957	4,041	4,126	4,212	4,298	4,386	4,474	4,562	4,652	4,742
1000	4,833	4,924	5,016	5,109	5,202	5,297	5,391	5,487	5,583	5,680
1100	5,777	5,875	5,973	6,073	6,172	6,273	6,374	6,475	6,577	6,680
1200	6,783	6,887	6,991	7,096	7,202	7,308	7,414	7,521	7,628	7,736
1300	7,845	7,953	8,063	8,172	8,283	8,393	8,504	8,616	8,727	8,839
1400	8,953	9,065	9,178	9,291	9,405	9,519	9,634	9,748	9,863	9,979
1500	10,094	10,210	10,325	10,441	10,558	10,674	10,790	10,907	11,024	11,141
1600	11,257	11,374	11,491	11,608	11,725	11,842	11,959	12,076	12,193	12,310
1700	12,426	12,543	12,659	12,776	12,892	13,008	13,124	13,239	13,354	13,470

Pt 15 Rh-Pt Typ R
DIN EN 60 584-1

in mV temperatures in steps of 10 °C
reference junction 0 °C

°C	0	10	20	30	40	50	60	70	80	90
0	0	0,054	0,111	0,171	0,232	0,296	0,363	0,431	0,501	0,573
100	0,647	0,723	0,800	0,879	0,959	1,041	1,124	1,208	1,294	1,380
200	1,468	1,557	1,647	1,738	1,830	1,923	2,017	2,111	2,207	2,303
300	2,400	2,498	2,596	2,695	2,795	2,896	2,997	3,099	3,201	3,304
400	3,407	3,511	3,616	3,721	3,826	3,933	4,039	4,146	4,254	4,362
500	4,471	4,580	4,689	4,799	4,910	5,021	5,132	5,244	5,356	5,469
600	5,582	5,696	5,810	5,925	6,040	6,155	6,272	6,388	6,505	6,623
700	6,741	6,860	6,979	7,098	7,218	7,339	7,460	7,582	7,703	7,826
800	7,949	8,072	8,196	8,320	8,445	8,570	8,696	8,822	8,949	9,076
900	9,203	9,331	9,460	9,589	9,718	9,848	9,978	10,109	10,240	10,371
1000	10,503	10,636	10,768	10,902	11,035	11,170	11,304	11,439	11,574	11,710
1100	11,846	11,983	12,119	12,257	12,394	12,532	2,669	12,808	12,946	13,085
1200	13,224	13,363	13,502	13,642	13,782	13,922	14,062	14,202	14,343	14,483
1300	14,624	14,765	14,906	15,047	15,188	15,329	15,470	15,611	15,752	15,893
1400	16,035	16,176	16,317	16,458	16,599	16,741	16,882	17,022	17,163	17,304
1500	17,445	17,585	17,726	17,866	18,006	18,146	18,286	18,425	18,564	18,703
1600	18,842	18,981	19,119	19,257	19,395	19,533	19,670	19,807	19,944	

Pt 10 Rh-Pt Typ S
DIN EN 60 584-1

in mV temperatures in steps of 10 °C
reference junction 0 °C

°C	0	10	20	30	40	50	60	70	80	90
0	0	0,055	0,113	0,173	1,234	0,299	0,365	0,432	0,502	0,573
100	0,645	0,719	0,795	0,872	0,950	1,029	1,109	1,190	1,273	1,356
200	1,440	1,525	1,611	1,698	1,785	1,873	1,962	2,051	2,141	2,232
300	2,323	2,414	2,506	2,599	2,692	2,786	2,880	2,974	3,069	3,164
400	3,260	3,356	3,452	3,549	3,645	3,743	3,840	3,938	4,036	4,135
500	4,234	4,333	4,432	4,532	4,632	4,732	4,832	4,933	5,034	5,136
600	5,237	5,339	5,442	5,544	5,648	5,751	5,855	5,960	6,064	6,169
700	6,274	3,380	6,486	6,592	6,699	6,805	6,913	7,020	7,128	7,236
800	7,345	7,454	7,563	7,672	7,782	7,892	8,003	8,114	8,225	8,336
900	8,448	8,560	8,673	8,786	8,899	9,012	9,126	9,240	9,355	9,470
1000	9,585	9,700	9,816	9,932	10,048	10,165	10,282	10,400	10,517	10,635
1100	10,754	10,872	10,991	11,110	11,229	11,348	11,467	11,587	11,707	11,827
1200	11,947	12,067	12,188	12,308	12,429	12,550	12,671	12,792	12,913	13,034
1300	13,155	13,276	13,397	13,519	13,640	13,761	13,883	14,004	14,125	14,247
1400	14,368	14,489	14,610	14,731	14,852	14,973	15,094	15,215	15,336	15,456
1500	15,576	15,697	15,817	15,937	16,057	16,176	16,296	16,415	16,534	16,653
1600	16,771	16,890	17,008	17,125	17,243	17,360	17,477	17,594	17,711	

Cu-CuNi, Typ T
DIN EN 60 584-1

in mV temperatures in steps of 10 °C
reference junction 0 °C

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90
-200	-5,603	-	-	-	-	-	-	-	-	-
-100	-3,378	-3,656	-3,923	-4,177	-4,419	-4,648	-4,865	-5,069	-5,261	-5,439
0	0	-0,383	-0,757	-1,121	-1,1475	-1,819	-2,152	-2,475	-2,788	-3,089

°C	0	10	20	30	40	50	60	70	80	90
0	0	0,391	0,789	1,196	1,611	2,035	2,467	2,908	3,357	3,813
100	4,277	4,749	5,227	5,712	6,204	6,702	7,207	7,718	8,235	8,757
200	9,286	9,5820	10,360	10,905	11,456	12,011	12,572	13,137	13,707	14,281
300	14,860	15,443	16,030	16,621	17,217	17,816	18,420	19,027	19,638	20,252

Fe-CuNi, Typ J
DIN EN 60 584-1

in mV temperatures in steps of 10 °C
reference junction 0 °C

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90
-200	-7,890	-	-	-	-	-	-	-	-	-
-100	-4,632	-5,036	-5,426	-5,801	-6,159	-6,499	-6,821	-7,122	-7,402	-7,659
0	0	-0,501	-0,995	-1,481	-1,960	-2,431	-2,892	-3,344	-3,785	-4,215

°C	0	10	20	30	40	50	60	70	80	90
0	0	0,507	1,019	1,536	2,058	2,585	3,115	3,649	4,186	4,725
100	5,268	5,812	6,359	6,907	7,457	8,008	8,560	9,113	9,667	10,222
200	10,777	11,332	11,887	12,442	12,998	13,553	14,108	14,663	15,217	15,771
300	16,325	16,879	17,432	17,984	18,537	19,089	19,640	20,192	20,743	21,295
400	21,846	22,397	22,949	23,501	24,054	24,607	25,161	25,716	26,272	26,829
500	27,388	27,949	28,511	29,075	29,642	30,210	30,782	31,356	31,933	32,513
600	33,096	33,683	34,273	34,867	35,464	36,066	36,671	37,280	37,893	38,510
700	39,130	39,754	40,382	41,013	41,647	42,283	42,922	43,563	44,207	44,852

Fe-CuNi, Typ L

in mV temperatures in steps of 10 °C
reference junction 0 °C

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90
-200	-8,15	-	-	-	-	-	-	-	-	-
-100	-4,75	-5,15	-5,53	-5,90	-6,26	-6,60	-6,93	-7,25	-7,56	-7,86
0	0	-0,51	-1,02	-1,53	-2,03	-2,51	-2,98	-3,44	-3,89	-4,33

°C	0	10	20	30	40	50	60	70	80	90
0	0	0,52	1,05	1,58	2,11	2,65	3,19	3,73	4,27	4,82
100	5,37	5,92	6,47	7,03	7,59	8,15	8,71	9,27	9,83	10,39
200	10,95	11,51	12,07	12,63	13,19	13,75	14,31	14,88	15,44	16,00
300	16,56	17,12	17,68	18,24	18,80	19,36	19,92	20,48	21,04	21,60
400	22,16	22,72	23,29	23,86	24,43	25,00	25,57	26,14	26,71	27,28
500	27,85	28,43	29,01	29,59	30,17	30,75	31,33	31,91	32,49	33,08
600	33,67	34,26	34,85	35,44	36,04	36,64	37,25	37,85	38,47	39,09
700	39,72	40,35	40,98	41,62	42,27	42,92	43,57	44,23	44,89	45,55
800	46,22	46,89	47,57	48,25	48,94	49,63	50,32	51,02	51,72	52,43

NiCr-CuNi, Typ E
DIN EN 60 584-1

in mV temperatures in steps of 10 °C
reference junction 0 °C

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90
-200	-8,824	-9,063	-9,274	-9,455	-9,604	-9,719	-9,797	-9,835		
-100	-5,237	-5,680	-6,107	-6,516	-6,907	-7,279	-7,631	-7,963	-8,273	-8,561
0	0	-0,581	-1,151	-1,709	-2,254	-2,787	-3,306	-3,811	-4,301	-4,771

°C	0	10	20	30	40	50	60	70	80	90
0	0	0,591	1,192	1,801	2,419	3,047	3,683	4,329	4,983	5,646
100	6,317	6,996	7,683	8,377	9,078	9,787	10,501	11,222	11,949	12,681
200	13,419	14,161	14,909	15,661	16,417	17,178	17,942	18,710	19,481	20,256
300	21,033	21,814	22,597	23,383	24,171	24,961	25,754	26,549	27,345	28,143
400	28,943	29,744	30,546	31,350	32,155	32,960	33,767	34,574	35,382	36,190
500	36,999	37,808	38,617	,9,426	40,236	41,045	41,853	42,662	43,470	44,278
600	45,085	45,891	46,697	47,502	48,306	49,109	49,911	50,713	51,513	52,312
700	53,110	53,907	54,703	55,498	56,291	57,083	57,873	58,663	59,451	60,237
800	61,022	61,806	62,588	63,368	64,147	64,924	65,700	66,473	67,245	68,015
900	68,783	69,549	70,313	71,075	71,835	72,593	73,350	74,104	74,857	
75,608										

NiCr-Ni, Typ K
DIN EN 60 584-1

in mV temperatures in steps of 10 °C
reference junction 0 °C

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90
-200	-5,891	-	-	-	-	-	-	-	-	-
-100	-3,554	-3,852	-4,138	-4,411	-4,669	-4,913	-5,141	-5,354	-5,550	-5,730
0	0	-0,392	-0,778	-1,156	-1,527	-1,889	-2,243	-2,587	-2,920	-3,243

°C	0	10	20	30	40	50	60	70	80	90
0	0	0,397	0,798	1,203	1,612	2,023	2,436	2,851	3,267	3,682
100	4,096	4,509	4,920	5,328	5,735	6,138	6,540	6,941	7,340	7,739
200	8,138	8,539	8,940	9,343	9,747	10,153	10,561	10,971	11,382	11,795
300	12,209	12,624	13,040	13,457	13,874	14,293	14,713	15,133	15,554	15,975
400	16,397	16,820	17,243	17,667	18,091	18,516	18,941	19,366	19,792	20,218
500	20,644	21,071	21,497	21,924	22,350	22,776	23,203	23,629	24,055	24,480
600	24,905	25,330	25,755	26,179	26,602	27,025	27,447	27,869	28,289	28,710
700	29,129	29,548	29,965	30,382	30,798	31,213	31,628	32,041	32,453	32,865
800	33,075	33,685	34,093	34,501	34,908	35,313	35,718	36,121	36,524	36,925
900	37,326	37,725	38,124	38,522	38,918	39,314	39,708	40,101	40,494	40,885
1000	41,276	41,665	42,053	42,440	42,826	43,211	43,595	43,978	44,359	44,740
1100	45,119	45,497	45,873	46,249	46,623	46,995	47,367	47,737	48,105	48,473
1200	48,838	49,202	49,565	49,926	50,286	50,644	51,000	51,355	51,708	52,060
1300	52,410	52,759	53,106	53,451	53,795	54,138	54,479	54,819	-	-

Pt100-Temperature Relay Type TR250

3 Sensors Pt 100 (RTD), Pt 1000, PTC or KTY, 3 Limits, Alarm counter and preset programs for use with PTC thermistors only

TR250

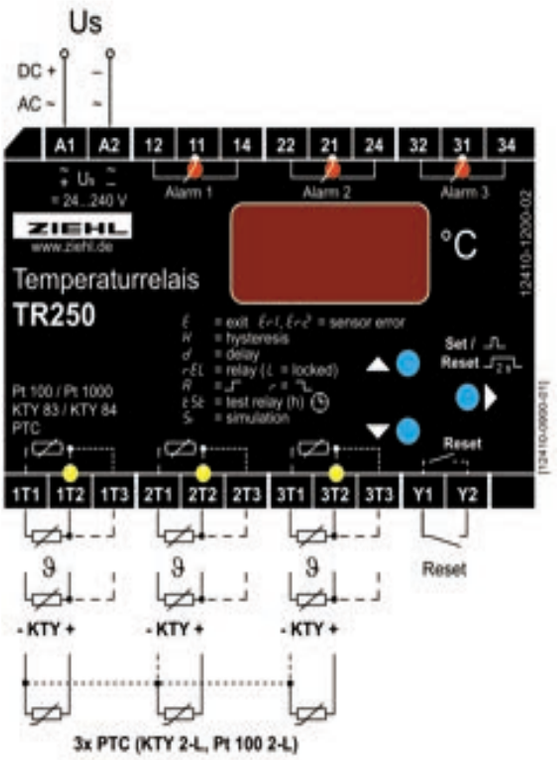
Part number:
T224190 AC/DC 24-240 V

Accessory: Installation frame ER4 for panel mount

T224384 ER4

The Pt100 thermostat TR250 monitors up to 3 sensors Pt100 (RTD), Pt1000, KTY83 KTY84 or thermistors (PTC) at the same time. Different types of sensors, e.g. Pt 100 and PTC can be monitored simultaneously.
The unit is especially suitable for monitoring motors, generators and transformers.

An other application is the use as a 2- or 3-step-controller with additional monitoring of over- or under-temperature. monitoring of differences in temperatures of 2 sensors or temperature controller for heat pumps.



- Measuring and monitoring range - 199...+850°C
- resolution 0.1 °C selectable within range -19.9...99.9 °C
- 3 relay outputs K1 to K3 with change-over contacts
- Universal power supply AC/DC 24-240 V
- Easy setting
- Storing of values of MIN- and MAX- temperature
- Alarm counter for 3x99 alarms with display of sensor and elapsed time.
- Code-lock against manipulation of settings

3 Sensor-Inputs:
- Pt100/1000, 2- or 3-wire
- connection, KTY83, KTY84
- Thermistors (PTC) each 1...6
- in series
- Monitoring of short-circuit
- and break

Displays:
- 3 digit 7-segment-display for
- temperature and program-
- ming
- 3 LEDs for sensors, for alarms/
- relays
- display °C or °F selectable,
- resolution 0.1 °C

Switching-Functions
- 3 relays
- warmest/coldest sensor switches relay
- prgrammable for every relay:
- - hysteresis
  - autoreset or electronic reclosing lock
  - delay-time for switching and switching back
  - operating- or closed current-mode
  - cyclic check of function
  - monitoring of difference in temperature
-

6 preset programs:
- motor / generator with 3x Pt 100
- transformer with 3x Pt 100
- transformer with 2x PTC / 3x PTC
- transformer with 2x PTC and 1x Pt 100
- 3 x 1 alarm per sensor
-

Technical Data

Rated supply voltage Us	AC/DC 24-240 V (AC 20-264 V, DC 20-297 V)
Sensor connection	3 x Pt100 (DIN 43 760/IEC 751) (RTD) 3 x Pt1000, KTY83, KTY84 3 x 1...6 PTC (DIN 44080/44081)
Measuring accuracy	< 0,5 % of value ±1 K
Sensor-current	< 1 mA
Connection	3-wire, 2-wire, line-resistance max. 2 x 50 Ω
Measuring range	-199 °C ... +850 °C
Hysteresis	-99 °C ... +99 °C
Switching delay on/off	0...99 s / 0...999 s
Type of contact	**type 2** (see "general technical information") 3 x change-over / alarm
Test conditions	see "general technical information"
Rated ambient temp. range	-20 °C ... +65 °C
Housing / Installation Frame	Design V4 / Front mounting kit type ER4
Dimensions (h x w x d)	90 x 70 x 58 [mm], mounting height 55 mm
Protection housing / terminals	P 30 / IP 20
Weight	app. 200 g
Attachment	on 35 mm DIN rail or with screws M4

Pt100-Temperature Relay Type TR400

Digital, 4 Sensors, 4 Limits

TR400

Part numbers:

TR400 **T224380**

ER8 **T224388**

4-fold temperature relay for Pt 100 sensors

The Pt100 thermostat TR400 is a temperature controller and monitors up to four Pt100 (RTD) sensors at the same time. Four switching points and four relays permit almost any combination of switching action. It also can select the highest temperatur of a group of three or four sensors. The temperatures of two sensors or groups of sensors can be issued to 2 analog outputs i.e. for remote displays or further evaluation. Programming is very variable and simple.

Due to the fact that 4 type Pt100 sensors can be connected, the unit is especially suitable for temperature monitoring wherever up to 4 different measuring points must be monitored simultaneously:

- machines, bearings, plants
- motors and generators with simultaneous monitoring of bearing orcoolant
- transformers with additional monitoring of the core temperature also

Function overview

- Measuring and monitoring range -199 ... +800 °C
- 4 sensor inputs with 2- or 3-wire connection
- 4 relay outputs K1 to K4 with change-over contact.
- 2 analog outputs, 0/4...20 mA and 0/2...10 V, with individual scaling. Outputs can be assigned individually to different sensors
- or sensor groups (warmest of 2, 3 or 4 sensors is selected)
- Universal power supply. 2 ranges AC/DC 24-240 V
- Plug-in connection terminals

Displays

- built-in 3 digit temperature display and 1 digit programm-mode display
- LED Alarm showing state of the alarm relays
- LED Sensor Error blinking at sensor short circuit or sensor interruption.
- Stored Values of MIN- and MAX-temperature can be displayed „Sensor select“ showing tempe-

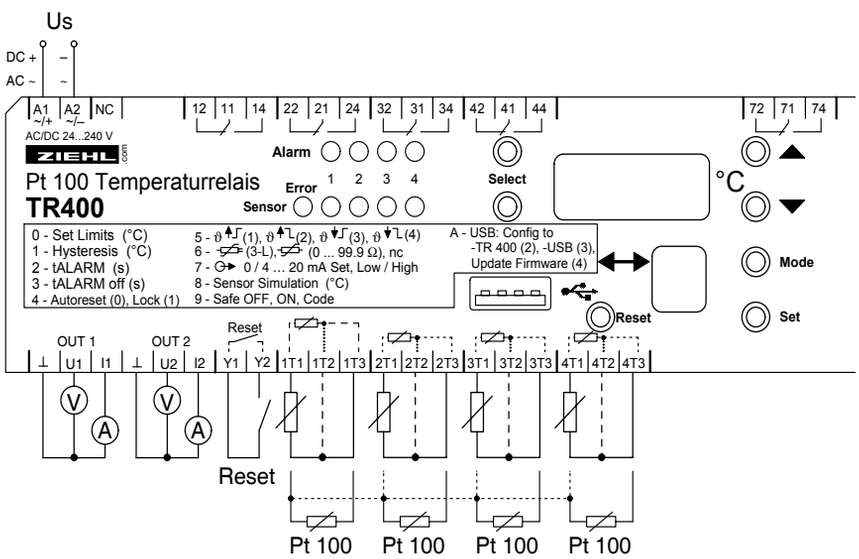
Switching functions:

- 4 output relays (1 changeover contact each) for limit values. If several poten-
- tial-separated output contacts (e.g. 2 changeover contacts) are required at a switching point, the same limit value is simply programmed to a second relay.
- Limit values for individual sensor or warmest value from sensor group (3 or 4 sensors) Individually programmable for each relay:
  - Hysteresis
  - Autoreset or locked (reset button on the device and connection for remote reset)
  - Response and switch-back delay
  - MIN-/MAX switching function
  - Working/quiescent current
- Fault signal relay for sensor break or short circuit

Operation:

- Clear and easy to operate. Operator guidance with LEDs and 7-segment displays, basic functions (e.g. 3 sensors can be directly selected for 1 limit value)
- Connection for a USB stick for downloading and uploading/saving a configuration file and for firmware updates
- Test function: temperatures of each sensor can be simulated with UP/DOWN buttons
- Code lock to prevent unintentional/unauthorized changes to the parameters

Accessory: Installation frame ER8 for panel mount



Technical Data TR400

Rated supply voltage Us

	AC/DC 24 – 240 V
tolerance DC-supply	DC 20,4...297 V
tolerance AC-supply	AC 20...264 V
power consumption	< 4 W, < 13 VA
frequency	0 / 50 / 60 Hz

Relay outputs

	5 change-over contacts (co)
switching voltage	max. AC 415 V
switching current	max. 5 A
switching power	max. 1250 VA (ohmic load) max. 120 W at DC 30 V
Nominal operational current I_e AC15	I_e = 3 A U_e = 250 V
DC13	I_e = 0,1 A U_e = 250 V I_e = 2 A U_e = 24 V
recommended fuse NO	4 A time-lag or miniature circuit-breaker MCB B4
recommended fuse NC	3.15 A time-lag
expected life mechanical	3 x 10^7 operations
expected life electrical	1 x 10^5 operations with AC 250 V / 5 A, cos φ = 1

Testing conditions

	EN 60 010-1
ambient temperature range	- 20 °C... + 65 °C
galvanic separation	Us-Relay, Sensors, USB, Analog output Restet input -> DC 3820 V Relay - Sensors, USB, Analog output Reset input -> DC 3820 V
No galvanic separation	Sensors, USB, Analog output, Reset input

Sensor connection

	4 x Pt 100 acc. to EN 60751 / IEC 60751, 2-/3-wire
measuring accuracy	±0,5 % of value ±1 Digit
sensor current	≤ 0,7 mA
measuring delay time t_M	<1,5 s

Temperature alarm

switch points	-199 ... +800 °C
hysteresis	1 ... 99 K
delay time tALARM	0,1 ... 99,9 s
delay time tALARM off	0 ... 999 s

Analog output OUT 1/2

voltage outputs	DC 0/2 V – 10 V , max. DC 10 mA
current outputs	DC 0/4 mA – 20 mA
output resistance current	max. 500 Ω
no-load voltage	max. DC 16 V
accuracy	1% of span ±1 K

Housing

design / Installation Frame	V8 / Front mounting kit ER8, 8 TE
dimensions (h x w x d)	90 x 140 x 58 [mm] mounting height 55 mm
line connection solid wire	1 x 1,5 mm^2(1,0 mm^2 with end sleeves for strands)
protection housing / terminals	IP 30 / IP 20
attachment	on 35 mm DIN rail according to DIN EN 60 715 or M4 screw
weight	app. 360 g

Pt100-Temperature Relay Type TR440

4 Sensors Pt100 (RTD), Monitoring of Core, Panel-Mount

TR440

Part numbers:
T224184
T224185 RS485

Temperature-Relay for the protection of transformers from over-temperature and for controlling a fan.
Monitoring of the temperatures in the windings is made with 3 sensors. The input for the 4th sensor can be used for monitoring the temperature in the core or for a sensor for ambient temperature. The 4 alarms/relay-outputs control the fan and release signals for alarm and trip if limits are exceeded. Different programs allow to adapt the required alarms to the application. Depending on the program e.g. extra alarms for sensor-error or for tripping because of over-temperature in the core are available.

Other applications:
The forth sensor can be used to monitor the room, in which the transformer is set up and the alarm can control a forced cooling of the room.
The TR440 can also be used for the monitoring of temperatures e.g. at motors.

Function:

Features:
- 4 sensor-inputs Pt 100 (RTD) and Pt 1000
- Sensor-connection in 2- or 3-wire
- Monitoring range -199…+850°C /-199...+999°F
- 4 alarms / relays
- Supply-voltage AC/DC 24-240 V
- Clearly arranged displays and easy programming
- Storing of values of MIN- and MAX-temperature
- Code-lock against unintended / unauthorized manipulations of settings

Displays:
- 3 digit 7-segment-display
- 4 LEDs for sensor-inputs, LED for sensor-error
- 4 LEDs for alarms
- 4 LEDs for state of relays
- Display in °C or °F

Switching functions:
- 4 relay-outputs, change-over (co) contacts
- Relay for Fan max. 10 A
- Adjustable (depending of function)
  - Hysteresis 1…99 K
  - Switch- and switch-back-delay 0…999 s
  - Operating- or closed-current mode
  - Autoreset or electronic re-closing lock
  - Cyclic start of fan (K1 only)
  -

Option:
- Interface RS485 (Modbus RTU)

Monitoring Programs:
3 sensors in windings:
Alarms/outputs for:
- Fan (with cyclic test)
- Alarm
- Trip
- Sensor-Error

3 sensors in windings and 1 sensor in core:
Alarms/outputs for:
- Fan (with cyclic test)
- Alarm (winding and core)
- Trip (winding and core)
- Sensor-Error

For core and winding different limits can be programmed.

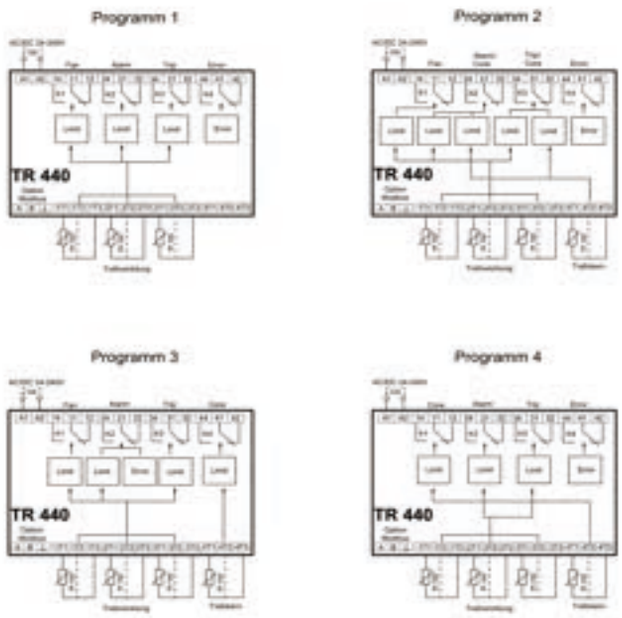
3 sensors in windings and 1 sensor in core:
Alarms/outputs for:
- Fan (with cyclic test)
- Alarm (winding) / sensor-error (combined)
- Trip (winding)
- Trip (core)

Alarm 2 reports sensor-error and alarm

3 sensors in windings and 1 sensor in core:
Alarms/outputs for:
- Trip (core)
- Alarm (winding)
- Trip (winding)
- Sensor-Error

The relay for error (short-circuit or break of sensor-lines) is preset in closed-current mode (alarm also at loss of supply-voltage or failure in the device = monitoring of function of the device). All other relays are in operating-current mode (pick up at an alarm = no alarm when switching on and off supply-voltage). The mode of the relays can be changed by the user.

Connection plan:



Technical Data

Rated supply voltage Us	AC/DC 24-240V, AC 20-264 V, DC 20-297 V,
Power consumption	< 3 W, < 5 VA
Sonsor-connection	4 x Pt100 (RTD) acc. to EN 60 751/ IEC 60 751
Measuring accuracy	< 1% of value ± 1 digit
Sensor-current	≤ 1 mA
Connection	2- wire or 3-wire, with line-resistance max. 2 x 50 Ω
Measuring range	-199 °C ... 850 °C (-199...+999 °F)
Hysteresis	1 °C ... 99 °C (°F)
Switching-delay on/off	0...999 s
Relay-output	Alarm 1 (Fan): 10 A Alarms 2-4: type 3, see "general technical informations"
Test conditions	see "general technical informations"
Rated ambient temperature range	-40 °C ... +65 °C
Housing	panel-mount 96 x 96 mm
Dimensions (H x B x T)	96 x 96 x 85 mm
Terminals	2 x 13-pole
Line connection solid wire	1 x 0,5 mm^2
Stranded with insulated ferrules	1 x 0,14...1,5 mm^2
Attachment	Panel-mount, cutout $92^{+0,8}$x$92^{+0,8}$ mm
Protection housing	IP 20
Protection front	IP 54
Protection terminals	IP 20
Weight	app. 290 g

Pt100-Temperature Relay Type TR600

Digital, 6 Sensors, 6 Limits, 2 analog outputs

TR600
with analog output

Part numbers:

TR600 analog	**T224360**
ER8 	**T224388**

Temperature Relay for 6 Sensors Pt100
The Pt100-temperature relay TR600 monitors up to six sensors Pt100 (RTD) at the same time. Six switching points and six relays permit almost any combination of switching action. It also can select the highest temperature of groups of sensors. The temperatures of two sensors or groups of sensors can be issued to 2 analog outputs i.e. for remote displays or further evaluation. Programming is very variable and simple.

Due to the fact that 6 type Pt100 sensors can be connected, the unit is especially suitable for temperature monitoring wherever up to 6 different measuring points must be monitored simultaneously:

- machines, bearings, plants
- motors and generators with simultaneous monitoring of bearings and coolant.
- transformers with additional monitoring of the core temperature also

Accessory: Installation frame ER8 for panel mount

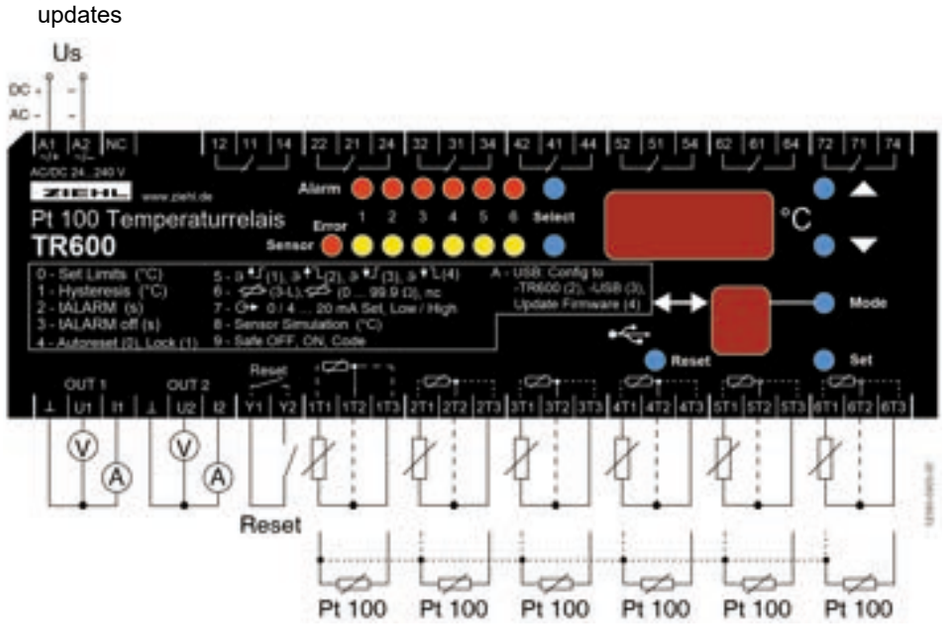
- measuring and monitoring range -199 ... +800 °C
- 6 sensor inputs with 2- or 3-wire connection
- 6 relay outputs K1 to K6 with change-over contacts
- switching points for single sensor or group of 2, 3 or 6 sensors
- sensor error relay K7 monitors sensor break or
- sensor short circuit as well as an interruption of the power-supply.
- 2 analog outputs, 0/4...20 mA and 0/2...10 V, with individual scaling.
- universal power supply in 2 ranges AC/DC 24 - 240 V
- USB-Stick-Terminal for up- and download of sets of parameters and for firmware-updates

Displays

- built-in 3 digit temperature display and 1 digit program-mode display
- LED Alarm showing state of the alarm relays
- LED Sensor Error blinking at sensor short circuit or sensor interruption.
- Stored Values of MIN- and MAX- temperature can be displayed
- „Sensor select“ showing temperatures of the different sensors
- „Alarm select“ showing switching points .

Programmable for each relay extra:

- hysteresis
- electronic reclosing lock or autoreset
- switch-on delay and switch-off delay
- MIN or MAX- function of relay
- relay releases or picks up when exceeding the setpoint



Technical Data TR600

Rated supply voltage Us		AC/DC 24 – 240 V
	tolerance DC-supply	DC 20,4...297 V
	tolerance AC-supply	AC 20...264 V
	power consumption	< 4 W, < 13 VA
	frequency	0 / 50 / 60 Hz
Relay outputs		7 change-over contacts (co)
	switching voltage	max. AC 415 V
	switching current	max. 5 A
	switching power	max. 1250 VA (ohmic load) max. 120 W at DC 30 V
	Nominal operational current I_e	
	AC 15	I_e = 3 A U_e = 250 V
	DC 13	I_e = 2 A U_e = 24 V I_e = 0,1 A U_e = 250 V
	recommended fuse NO	4 A time-lag or miniature circuit-breaker MCB B4
	recommended fuse NC	3.15 A time-lag
	expected life mechanical	3 x 10^7 operations
	expected life electrical	1 x 10^5 operations with AC 250 V / 5 A, cos φ = 1
Testing conditions		EN 60 010-1
	ambient temperature range	-20 °C ... + 65 °C
	galvanic separation	Us-Relay, Sensors, USB, Analog output Reset input -> DC 3820 V Relay - Sensors, USB, Analog output Reset input -> DC 3820 V
	No galvanic separation	Sensors, USB, Analog output, Reset input
Sensor connection		6 x Pt 100 acc. to EN 60751 / IEC 60751, 2- / 3-wire
	measuring accuracy	±0,5 % of value ±1 Digit
	sensor current	≤ 0,7 mA
	measuring delay time t_M	<1,5 s
Temperature alarm	switch points	-199 °C ... +800 °C
	hysteresis	1 ... 99 K
	delay time tALARM	0,1 ... 99,9 s
	delay time tALARM off	0 ... 999 s
Analog output OUT 1/2	voltage outputs	DC 0/2 V – 10 V , max. DC 10 mA
	current outputs	DC 0/4 mA – 20 mA
	output resistance current	max. 500 Ω
	no-load voltage	max. DC 16 V
	accuracy	1% of span ±1 K
Housing	Design / Installation Frame	V8 / Front mounting kit ER8, 8 TE
	Simensions (h x w x d)	90 x 140 x 58 [mm] mounting height 55 mm
	Line connection solid wire	1 x 1,5 mm^2(1,0 mm^2 with end sleeves for strands)
	Protection housing / terminals	IP 30 / IP 20
	Attachment	on 35 mm DIN rail according to EN 60715 or M4 screw
	Weight	app. 360 g

Pt100-Temperature Relay Type TR600

Digital, 6 Sensors, 6 Limits, RS485

TR600
Interface RS485

Part numbers:
TR600 RS485 **T224361**
(no analog output)
ER8 **T224388**

Temperature Relay for 6 Sensors Pt100
The Pt100-temperature relay TR600 monitors up to six sensors Pt100 (RTD) at the same time. 6 switching points and 6 relays permit almost any combination of switching action. It also can select the highest temperature of groups of sensors.
Programming is very variable and simple.

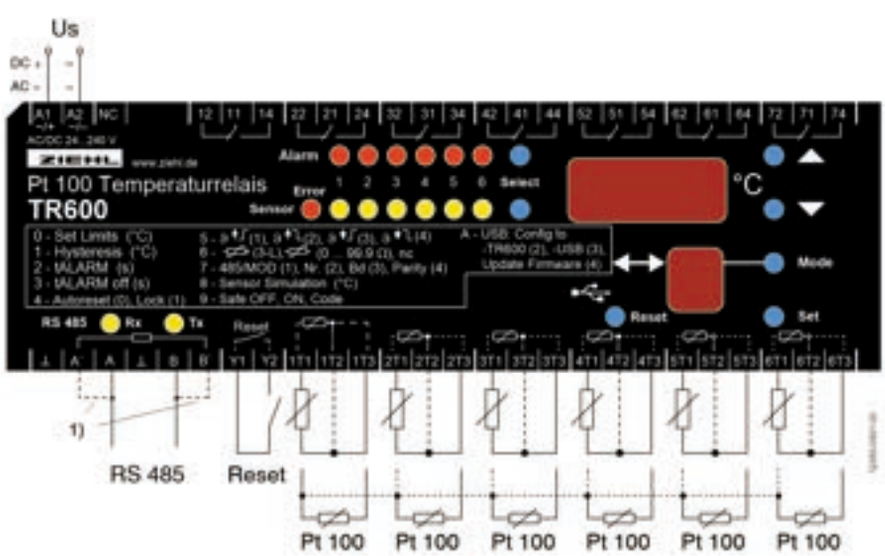
Due to the fact that 6 type Pt100 sensors can be connected, the unit is especially suitable for temperature monitoring wherever up to 6 different measuring points must be monitored simultaneously:
- machines, bearings, plants
- motors and generators with simultaneous monitoring of bearings and coolant.
- transformers with additional monitoring of the core temperature also

Accessory: Installation frame ER8 for panel mount

- measuring and monitoring range -199 ... +800 °C
- 6 sensor inputs with 2- or 3-wire connection
- 6 relay outputs K1 to K6 with change-over contacts
- switching points for single sensor or group of 2, 3 or 6 sensors
- sensor error relay K7 monitors sensor break or sensor short circuit as well as an interruption of the power-supply.
- interface RS485 protocols ZIEHL and modbus RTU
- universal power supply in 2 ranges AC/DC 24 - 240 V
- USB-Stick-Terminal for up- and download of sets of parameters and for firmware-updates

Displays
- built-in 3 digit temperature display and 1 digit program-mode display
- LED Alarm showing state of the alarm relays
- LED Sensor Error blinking at sensor short circuit or sensor interruption.
- Stored Values of MIN- and MAX- temperature can be displayed
- „Sensor select“ showing temperatures of the different sensors
- „Alarm select“ showing switching points .

Programmable for each relay extra:
- hysteresis
- electronic reclosing lock or autoreset
- switch-on delay and switch-off delay
- MIN or MAX- function of relay
- relay releases or picks up when exceeding the setpoint



Technical Data TR600

Rated supply voltage Us		AC/DC 24 – 240 V
	tolerance DC-supply	DC 20,4...297 V
	tolerance AC-supply	AC 20...264 V
	power consumption	< 4 W, < 13 VA
	frequency	0 / 50 / 60 Hz
Relay outputs		7 change-over contacts (co)
	switching voltage	max. AC 415 V
	switching current	max. 5 A
	switching power	max. 1250 VA (ohmic load) max. 120 W at DC 30 V
	Nominal operational current I_e	
	AC 15	I_e = 3 A U_e = 250 V
	DC 13	I_e = 2 A U_e = 24 V I_e = 0,1 A U_e = 250 V
	recommended fuse NO	4 A time-lag or miniature circuit-breaker MCB B4
	recommended fuse NC	3.15 A time-lag
	expected life mechanical	3 x 10^7 operations
	expected life electrical	1 x 10^5 operations with AC 250 V / 5 A, cos φ = 1
Testing conditions		EN 60 010-1
	ambient temperature range	-20 °C ... +65 °C
	galvanic separation	Us-Relay, Sensors, USB, Analog output Reset input -> DC 3820 V Relay - Sensors, USB, Analog output Reset input -> DC 3820 V
	No galvanic separation	Sensors, USB, Analog output, Reset input
Sensor connection		6 x Pt 100 acc. to EN 60751 / IEC 60751, 2- / 3-wire
	measuring accuracy	±0,5 % of value ±1 Digit
	sensor current	≤ 0,7 mA
	measuring delay time t_M	<1,5 s
Temperature alarm	switch points	-199 °C ... +800 °C
	hysteresis	1 ... 99 K
	delay time tALARM	0,1 ... 99,9 s
	delay time tALARM off	0 ... 999 s
Interface RS485		Modbus RTU/ZIEHL RS485 protocol
	address/busnumber	1-247 (Modbus)/0-99 (ZIEHL RS485 protocol)
	baudrate	4800/9600/19200/57600
	parity bit	no, odd, even
	stoppbit	1 (at modbus and pority no, stoppit = 2)
	Response time ZIEHL RS485 protocol	7-9 ms after reception of last sign
Housing	Design / Installation Frame	V8 / Front mounting kit ER8, 8 TE
	Simensions (h x w x d)	90 x 140 x 58 [mm] mounting height 55 mm
	Line connection solid wire	1 x 1,5 mm^2(1,0 mm^2 with end sleeves for strands)
	Protection housing / terminals	IP 30 / IP 20
	Attachment	on 35 mm DIN rail according to EN 60715 or M4 screw
	Weight	app. 360 g

Universal Relay Type TR800Web

8 Inputs, Operation with Browser via TCP/IP

TR800Web

Part numbers:

TR800Web	**T224164**
ER8 	**T224388**

Web-IO Universal Relay with 8 Inputs for Temperature-Sensors and other analog Signals.

The TR800Web can be connected to the internet or an intranet and operated via TCP/IP from a normal PC with a suitable browser. No special software and no special instruction is necessary.

The Universal-Relay TR800Web monitors and logs signals from up to 8 inputs. Up to 8 limits (one per input) can be programmed for each of the 4 output-relays. Thus e.g. alarm 1 can be activated when the temperature at a sensor (e.g. Pt100) at input 1 exceeds a limit or when the signal of a transmitter for pressure (e.g. 4-20 mA) at input 5 falls below a limit.
It can also send an email when a limit is exceeded and/or when the signals falls short of the limit again. A day/night switchover allows to vary limits depending on daytime.
In addition the device has an interface RS485 with the protocols Modbus and ZIEHL-standard.

Applications:
The TR800Web is used where one or more of the following features a required:

- measuring of up to 8 analog signals and transmit the data via TCP/IP
- reading of measured values and teleservice via internet/intranet
- signalling of alarms via email when limits are exceeded
- monitoring of filling levels (water, oil) with ZIEHL filling level probe NS6123-6
- logging of measured values and remote inquiry
  e.g. for monitoring temperatures at engines and in plants

Features

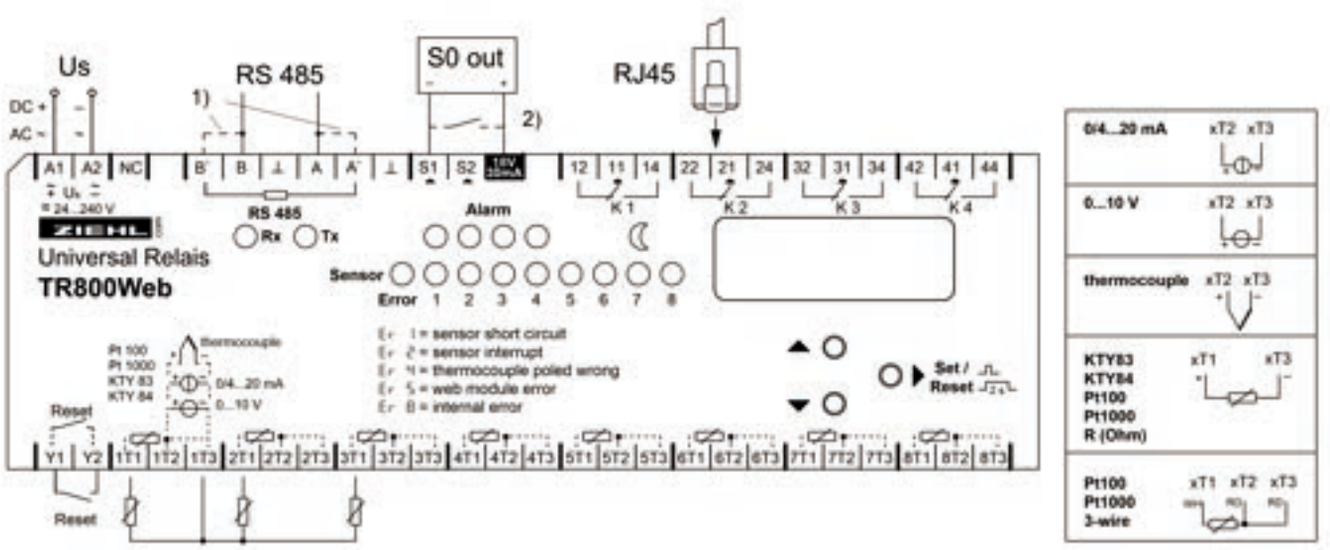
8 Measuring Inputs (each programmable):

- Pt100 (RTD), Pt1000 in 2- or 3-wire
- KTY83 or KTY84
- thermocouples types B, E, J, K, L, N, R, S, T
- DC 0-10 V, DC 0/4-20 mA, display can be scaled
- resistance 0-500 Ohm, 0-30 kOhm
- Difference of 2 signals

4 Alarms

- 4 relays, potential-free change-over contacts
- Remote switching of relays via Ethernet
- for every alarm separately programmable
  - one limit per input (limit and switching-back-value)
  - second set of values switchable day/night
  - switching-delay and switching-back delay
  - remote operation of relays (on/off) with browser
  - interlocked switching
  - email at alarm

Accessory: Installation frame ER8 for panel mount



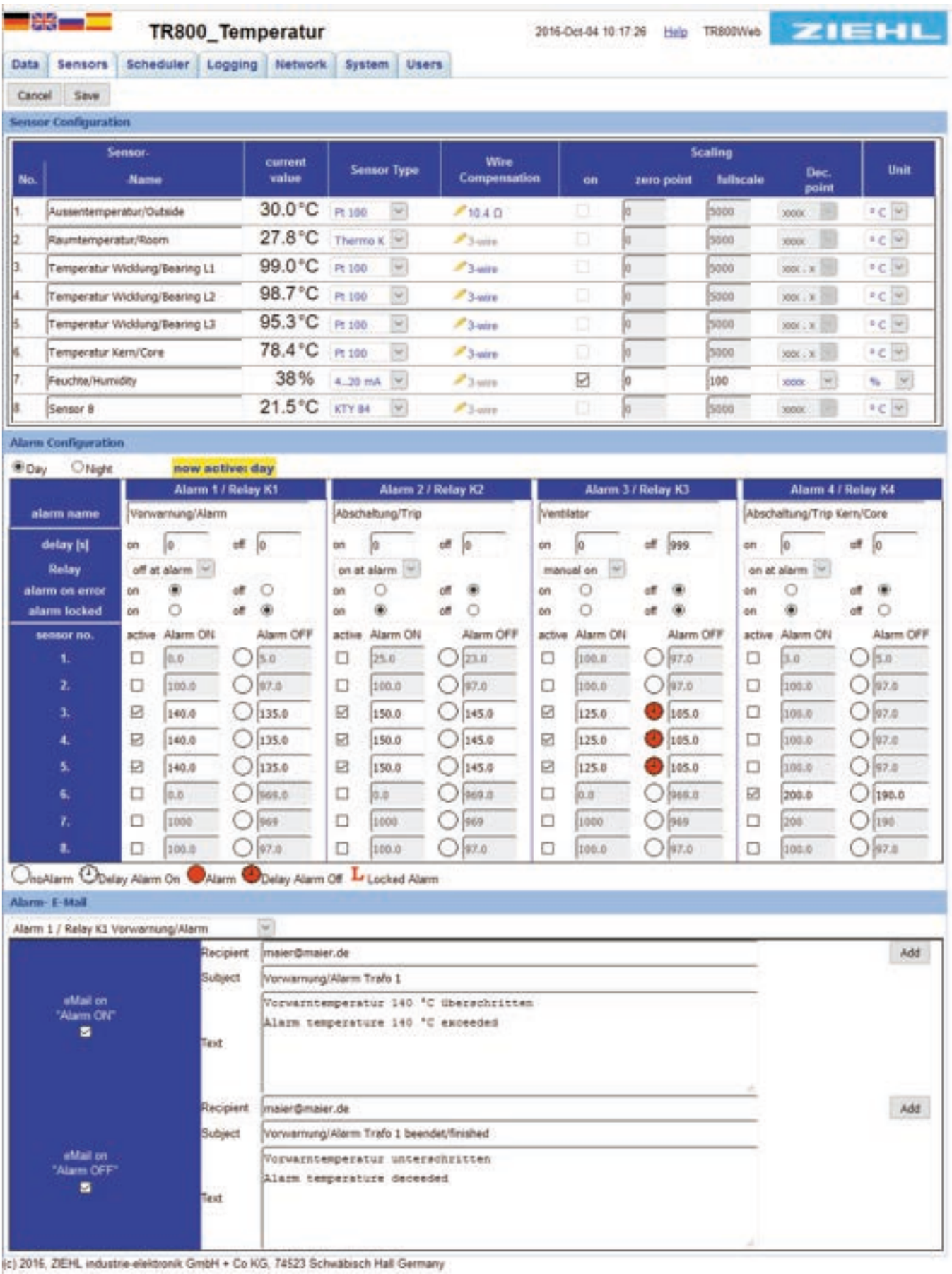
Programmable via internet in web-browser
- display of measured values, min- and max-values with date/time-stamp
- simulation of measured values state of alarms
- configuration of inputs (name, compensation, scaling and measuring-unit)
- configuration of alarms (limits, function of relays, ...)
- time-depending day/night changing of limits
- logging of up to 150.000 values per input, alarms with date/time-stamp
- logging-interval adjustable 2 seconds to 24 hours
- configuration of network
- settings of system
- administration of users and code-protection
- real-time clock with synchronizing with time-server, reserve 7 days

Interfaces:
Ethernet interface (http, https, UDP and Modbus)
- http (port can be selected and switched off) and https
- ftp-upload for automatic (interval adjustable)
- storage of logged data on ftp-server
- UDP- and Modbus protocol to read data (port can be selected)
- AJAX for data-readout in html
- SNMP

RS485 interface to readout data with modbus (RTU) and ZIEHL-protocol

Displays and Operating elements:
- 8 LEDs for inputs
- 4 LEDs for alarms, 4 LEDs for state of relays
- 4 digit display for measuring values
- 3 buttons for reading measured values at the device and for setting of IP-adress
- switch IP 10.10.10.10 / user
- reset-button
- LEDs for activity of interfaces

Operating and Programming with Web-Browser:



Technical Data TR800Web

Rated supply voltage Us

Tolerance: AC/DC 24-240 V, 0/50/60 Hz < 4 W < 13 VA
DC 20,4...297 V, AC 20...264 V

Relay output

Type of contact: 4 x 1 change-over contact (CO)Typ 2
type 2 (see "general technical informations")

Testing conditions

see "general technical informations"

Network-connection

10/100 MBit Auto-MDIX

Inputs

Measuring cycle/measuring time: < 3 s

Pt100, Pt1000 according to EN 60 751

	Measuring range °C		Short-circuit Ohm	Interruption Ohm	Resistance sensor + resistance line Ohm
Sensor	min	max	<	>	max
Pt100	-199	860	15	400	500
Pt1000	-199	860	150	4000	4100
KTY83	-55	175	150	4000	4100
KTY84	-40	150	150	4000	4100

Accuracy: < ± 0,5 % of measured value ± 0,5 K (KTY ±5K)
Sensor-current: ≤ ± 0,6 mA
Thermal drift: < 0,04 °C/K

Thermocouples according to EN 60 584, DIN 43710

Typ	Measuring range °C Min	Max	Accuracy
B	0	1820	≤ ± 2 °C T > 300 °C
E	-270	1000	≤ ± 1 °C
J	-210	1200	≤ ± 1 °C
K	-200	1372	≤ ± 2 °C
L	-200	900	≤ ± 1 °C
N	-270	1300	≤ ± 2 °C
R	-50	1770	≤ ± 2 °C
S	-50	1770	≤ ± 2 °C
T	-270	400	≤ ± 1 °C

Thermal drift: < 0,01 % /K
Measuring-error of sensor-line: + 0,25 µV / Ω
Accuracy of summing point: < ± 5 °C

Inputs for voltage and current

	Resistance of input	max. Inputsignal	Accuracy from Full Scale
0 - 10 V	12 k Ω	27 V	< 0,1 %
0/4...20 mA	18 Ω	100 mA	< 0,5 %

Thermal drift: < 0,02 %/ K

Measuring of resistance:

Accuracy 0,0...500,0 Ω: < 0,2 % of measured value ± 0,5 Ω
Accuracy 0...30,00 kΩ: < 0,5 % measured value ± 2 Ω
Measuring current: ≤ 0,6 mA

Housing

Dimensions (w x h x d): Design V8 / Front mounting kit ER8, 8 TE
Protection housing/terminals: 140 x 90 x 58 mm, mounting height 55 mm
Attachment: IP 30/ IP 20
DIN-rail 35 mm according to EN 60715 oder screws M4
Weight: (with 2 extra bars)
app. 370 g

Temperature Relay Type TR640IP

Sensors 6 x Pt 100, Pt 1000 or PTC, 4 limits, IP interface, operation with browser via TCP/IP

TR640IP

Part numbers:

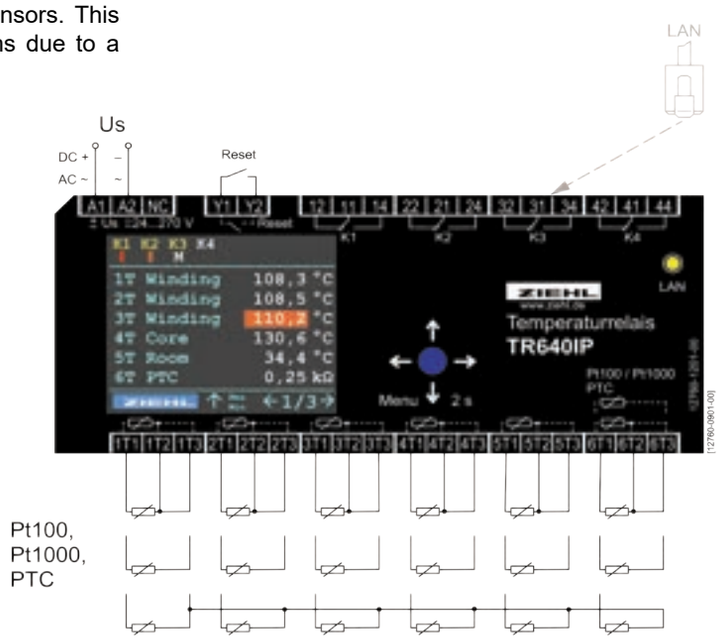
TR640IP	**T224390**
ER6 	**T224386**

Temperature Relays TR640IP monitor up to 6 sensors for up to 4 limits. Different sensors can be connected at the same time, e.g. Pt 100 (RTD) and PTC-thermistors. Typical applications are monitoring of motors, generators or transformers. An other application is the use as a 2- or more step-controller with additional monitoring of over- or undertemperature or monitoring of differences in temperatures of 2 sensors.
Preset programs allow easy setting e.g. monitoring of transformers with/without monitoring of temperature of core or with/without controlling a ventilator.If the evaluation "2 out of x" is activated with several connected sensors, an alarm is only triggered when the limit value is exceeded in 2 sensors. This prevents false alarms due to a fault in one sensor.

Operation can be made at the device or with a standard browser via ethernet.

- 6 inputs for sensors Pt 100, Pt 1000 and PTC, mixed sensors possible
- 4 alarms / output relays
- alarm 2 of x = alarm only when limit is exceeded in min. 2 sensors
- monitoring of difference of temperatures
- monitoring of rate of change of temperature
- logging of temperatures and history
- preset programs for protection of motors, transformers and more
- interface ethernet TCP/IP, values available via modbus TCP
- programming with browser via TCP/IP or with joystick at device
- coloured LCD display for clear display of temperatures and states of alarms
- universal power supply AC/DC 24-270 V

Accessory: Installation frame ER6 for panel mount



Technical data

Supply voltage Us:	DC/AC 24 … 270 V, 0/50/60 Hz	
Tolerance	DC 20,4 … 297 V	AC 20 … 297 V
Power consumption	< 3 W	< 9 VA

Relay outputs K2, K3, K4 (Alarm 2,3,4)	Change over
Switching voltage	max. AC 300 V; DC 300 V
Inrush current normally open (NO)	AC 15 A 4s 10% ED
Min. voltage / current	12 V 10 mA
Conventional thermal current Ith	max. 5 A
Switching power max. AC cos φ = 1	2000 VA
Switching power max. DC (ohm)	0,3 A 300 V; 0,4 A 120 V; 0,8 A 60 V; 8 A 30 V
Contact service life, electrical cos φ = 1	cos φ = 1 -> 5 x 10^5 operations at 250 V / 2 A

Contact service life, mechanical	3 x 10^7 operations
Short circuit strength (NO)	4 A sluggish or circuit breaker B4
Short circuit strength (NC)	3,15 A sluggish
Rated operational current	AC-15 Ie = 3 A Ue = 250 V DC-13 Ie = 2 A Ue = 24 V DC-13 Ie = 0,4 A Ue = 120 V DC-13 Ie = 0,2 A Ue = 240 V
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 C300

Relay outputs K1 (Alarm 1)	Change over
Switching voltage	max. AC 300 V; DC 300 V
Inrush current normally open (NO)	25 A max. 4 s / 50 A max. 1 s 10% ED
Min. voltage / current	12 V 10 mA
Conventional thermal current Ith	max. 9 A
Switching power max. AC cos φ = 1	2000 VA
Switching power max. DC (ohm)	0,3 A 300 V; 0,4 A 120 V; 0,8 A 60 V; 16 A 28 V
Contact service life, electrical	1 x 10^6 operations at 250 V / 6 A cos φ = 1 2 x 10^5 operations at AC 250 V / 10 A cos φ = 0,6
Contact service life, mechanical	3 x 10^7 operations
Short circuit strength (NO, NC)	10 A gL/gG Neozed or circuit breaker B10
Rated short-circuit current	1000 A, Cos phi 0,5 bis 0,7
Switching capacity usage category	AC-15 Ie = 6 A Ue = 250 V DC-13 Ie = 2 A Ue = 24 V
Rated operating current	DC-13 Ie = 0,4 A Ue = 120 V
Rated operating voltage	DC-13 Ie = 0,2 A Ue = 240 V

Sensor inputs	Pt100, Pt1000 according to EN60751

	Measuring range °C		Short circuit Ohm	Sensor break Ohm	Sensor resistance + line resistance Ohm
Sensor	min	max	<	>	max
Pt 100	-199,9	800,0	15	400	500
Pt 1000	-199,9	800,0	150	4000	4100
PTC			20	20000*	

*if no value between 3800 and 20000 ohms was measured before

Tolerance Pt100, Pt1000	±0,5% from measuring value ±1K
Tolerance PTC	±0,5% from measuring value ±5Ω
Sensor current	≤ 1 mA
Measuring cycle / Measuring time t_M	<1 s (depending on the number and type of connected sensors)

Test conditions	EN 61010-1; EN 61326-1

Installation conditions	
Operating temperature	-20 °C ... +65 °C

Housing	Construction type V6, distribution board
Mounting depth	55 mm
Width	8 TE
Dimensions (W x H x D)	105 x 90 x 58 mm
Protection class housing / terminals	IP 30 / IP20
Mounting	Snap-on fastening on 35 mm mounting rail acc. EN 60 715 or with M4 screwed attachment (additional bar not included in the scope of delivery)
Weight	app. 250 g

The technical data listed on this data sheet is only an excerpt; please refer to the operating manual for the complete technical data, which we strongly recommend you observe.

Subject to technical changes

Temperature Relay Type TR660IP

Sensors 6 x Pt 100, Pt 1000 or PTC, 7 limits, analog outputs or interface RS485, IP interface, operation with browser via TCP/IP

TR660IP

Part numbers:

TR660IP analog	**T224370**
TR660IP RS485	**T224371**
ER8 	**T224388**

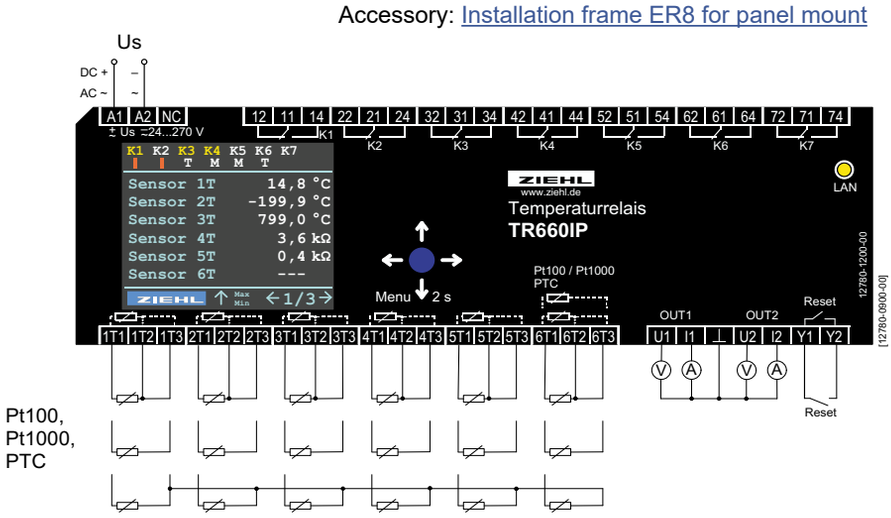
Temperature Relays TR660IP monitor up to 6 sensors for up to 7 limits. Different sensors can be connected at the same time, e.g. Pt 100 (RTD) and PTC-thermistors. Typical applications are monitoring of motors, generators or transformers. An other application is the use as a 2- or more step-controller with additional monitoring of over- or undertemperature or monitoring of differences in temperatures of 2 sensors.
Preset programs allow easy setting e.g. monitoring of transformers with/without monitoring of temperature of core or with/without controlling a ventilator.If evaluation "2 out of x" is activated with several connected sensors, an alarm is only triggered when the limit value is exceeded in 2 sensors. This prevents false alarms due to a fault in one sensor.

Operation can be made at the device or with a standard browser via ethernet.

- 6 inputs for sensors Pt 100, Pt 1000 and PTC, mixed sensors possible
- 7 alarms / output relays
- alarm 2 of x = alarm only when limit is exceeded in min. 2 sensors
- monitoring of difference of temperatures
- monitoring of rate of change of temperature
- logging of temperatures and history
- preset programs for protection of motors, transformers and more
- interface ethernet TCP/IP, values available via modbus TCP
- programming with browser via TCP/IP or with joystick at device
- coloured LCD display for clear display of temperatures and states of alarms
- universal power supply AC/DC 24-270 V

TR660IP RS485:
Interface RS 485 (modbus RTU)
TR660IP analog:
4 analog outputs 2x 0/4-20 mA and 2x 0/2-10V, isolated from sensor inputs, individually programmable

Accessory: Installation frame ER8 for panel mount



Technical data

Supply voltage Us:	DC/AC 24 … 270 V, 0/50/60 Hz	
Tolerance	DC 20,4 … 297 V	AC 20 … 297 V
Power consumption	< 3 W	< 9 VA

Relay outputs K1 … K7 (Alarm 1 …7)	Change over
Switching voltage	max. AC 300 V; DC 300 V
Inrush current normally open (NO)	AC 15 A 4s 10% ED
Min. voltage / current	12 V 10 mA
Conventional thermal current Ith	max. 5 A
Switching power max. AC cos φ = 1	2000 VA
Switching power max. DC (ohm)	0,3 A 300 V; 0,4 A 120 V; 0,8 A 60 V; 8 A 30 V
Contact service life, electrical cos φ = 1	cos φ = 1 -> 5 x 10^5 operations at 250 V / 2 A

Contact service life, mechanical	3 x 10^7 operations
Short circuit strength (NO)	4 A sluggish or circuit breaker B4
Short circuit strength (NC)	3,15 A sluggish
Switching capacity usage category	AC-15 Ie = 3 A Ue = 250 V DC-13 Ie = 2 A Ue = 24 V
Rated operational current	DC-13 Ie = 0,4 A Ue = 120 V
Rated operational voltage	DC-13 Ie = 0,2 A Ue = 240 V
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 C300

Sensor inputs

Pt100, Pt1000 according to EN60751

	Measuring range °C		Short circuit Ohm	Sensor break Ohm	Sensor resistance + line resistance Ohm
Sensor	min	max	<	>	max
Pt 100	-199,9	800,0	15	400	500
Pt 1000	-199,9	800,0	150	4000	4100
PTC			20	20000*	

*if no value between 3800 and 20000 ohms was measured before

Tolerance Pt100, Pt1000	±0,5% from measuring value ±1K
Tolerance PTC	±0,5% from measuring value ±5Ω
Sensor current	≤ 1 mA
Measuring cycle / Measuring time t_M	<1 s (depending on the number and type of connected sensors)

Analog output (TR660IP Analog only)

U1, U2, I1, I2

Voltage output	DC 0/2 … 10V
Accuracy	0,3% of full scale (from 0,1V)
Temperature drift	< 0,01% / K
Resolution	11,6 Bit <3,1mV
Burden	≥ 1 kΩ
Current output	DC 0/4 … 20mA
Accuracy	0,3% of full scale (from 0,1mA)
Temperature drift	< 0,015% / K
Resolution	11,6 Bit <6,1mV
Load	≤ 500 Ω
Error load	(250 Ω – load) / 250 Ω * 0,3% of current

RS485 interface

(TR660IP RS485 only)

Protocol	Modbus RTU
Adress / bus number	1 … 247
Baud rate	4800, 9600, 19200, 57600
Parity	No, odd, even
Stop bit	1 … 2

Test conditions

EN 61010-1; EN 61326-1

Installation conditions

Operating temperature	-20 °C ... +65 °C

Housing

Construction type V8, distribution board

Mounting depth	55 mm
Width	8 TE
Dimensions (W x H x D)	140 x 90 x 58 mm
Protection class housing / terminals	IP 30 / IP20
Mounting	Snap-on fastening on 35 mm mounting rail acc. EN 60 715 or with M4 screwed attachment (additional bar not included in the scope of delivery)
Weight	app. 370 g

The technical data listed on this data sheet is only an excerpt; please refer to the operating manual for the complete technical data, which we strongly recommend you observe.

Subject to technical changes

Pt100-Temperature Relay Type TR1200

12 Sensors, Interface RS485

TR1200

Part number:
T224095 AC/DC 24-240 V

12-channel Temperature-Relay for Sensors Pt100 (RTD)
Temperature-relays TR1200 measure the temperature of up to 12 sensors within 199…+850 °C and provide the data at an interface RS485 for external evaluation. With its universal power-supply AC/DC 24-240 V it can be connected to all common supply-voltages.
The TR1200 provides the data as Modbus-RTU-protocol or according to the ZIEHL-standard.

With protocol ZIEHL-standard it can replace two ZIEHL TR600.

The TR1200 is used where temperatures of many sensors Pt100 shall be evaluated by a device with input RS485. TR1200 itself does not monitor temperatures for limits. For direct monitoring of temperatures our devices with alarms and output relays are recommended.

Applications are e.g. monitoring of
- motors and generators (windings, bearings, coolant, ambient temperature)
- transformers (windings, core, ambient temperature)
- machines, plants and equipment

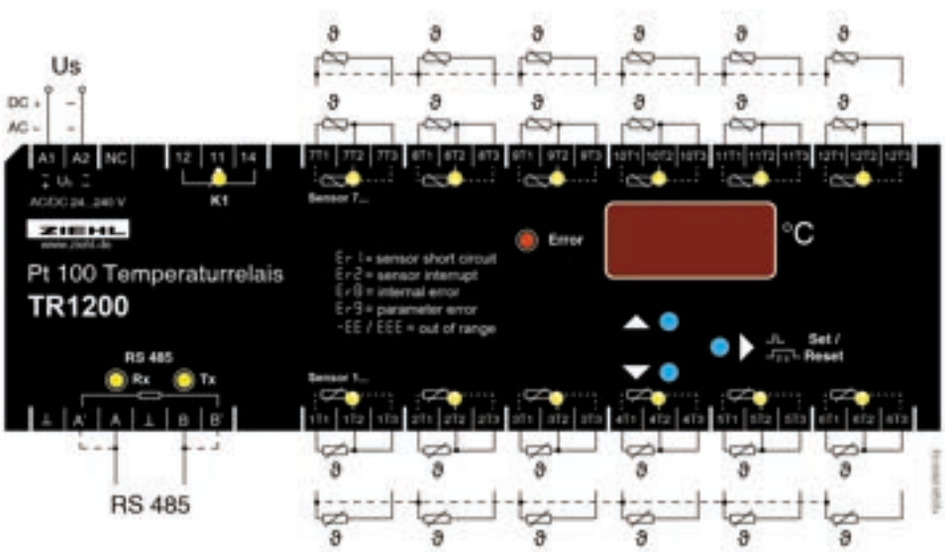
Features

Sensors and Displays:
- 12 inputs for sensors Pt100 (RTD)
- Connection 2- or 3-wire
- unneeded inputs can be switched off
- Monitoring of sensors for short-circuit and interrupt
- 3-digit-display for temperature
- LEDs for assigning the measured value, error, state of relay and interface

Interface:
- Interface RS485 (protocols ZIEHL-standard and Modbus-RTU)
- Baud rate (4800/9600/19200) and Parity-Bit
- selectable Protocols see operating-manual at www.ziehl.de
- Relay for Error (1 co-contact) for sensor-error and operational failure

More Features:
- easy operation and selection of temperatures at the device
- Sensor-simulation
- Code-protection against manipulation of settings
- Universal supply-voltage AC/DC 24…240 V
- Housing for switchgear-mount, 140 mm wide, mounting-height 55 mm
- Mounting on DIN-rail 35mm or with screws M4 (option)

Software for operation (download from www.ziehl.de)
- Software (Modbus) for programming the inputs
- Logging-function (with connected PC only)
- Hardware for every TR1200: PC with USB or RS232 interface + RS485-RS232 converter (depending on the interface)
- Software: Win7/Win10 and Excel 2010-2016



Technical Data TR1200

Rated Supply Voltage Us	AC/DC 24-240 V, 0/50/60 Hz, < 3 W, <10 VA DC: 20,4...297 V, AC: 20,4...264 V
Relay output	1 change-over contact (CO) type 2, see "general technical informations"
Measuring inputs	12 x Pt100 (RTD) acc. to EN 60 751 / IEC 60 751
Measuring time sensor	0,25...3s (depending on number of sensors)
Measuring range	-199 °C ... 850 °C
Resolution	1 °C
Tolerance	± 0,5 % of value ± 1 K
Sensor-current	≤ 0,8 mA
RS485 interface	
Adress of device	0...96
Baud rate	4800, 9600, 19200 baud
Parity	N, O, E (non, odd, even)
cable-length	max. 1000 m at 19200 baud
Testing conditions	see "general technical informations"
Rated ambient temperature range	-20 °C ... +65 °C
Housing	Design V8
Dimensions (W x H x D)	140 x 90 x 58 mm, mounting height 55 mm
Protection housing/terminals	IP 30 / IP 20
Attachment	DIN-rail 35 mm acc. to EN 60715 or screws M4 (option)
Weight	app. 350 g

Pt100-Temperature Relay Type TR1200IP

12 Sensors, Interface TCP/IP, IEC 61850 (GOOSE)

TR1200IP

Part number:
T224078 AC/DC 24-240 V

12-channel Temperature-Relay for Sensors Pt 100 (RTD)
Temperature-relays TR1200IP measure the temperature of up to 12 sensors within 199…+850 °C and provide the data at an ethernet interface for external evaluation. With its universal power-supply AC/DC 24-240 V it can be connected to all common supply-voltages.
Actual measured values and stored min- and max-values can be displayed in a normal browser.

At the ethernet interface the following protocols are available:
- Modbus TCP
- ZIEHL RTD
- IEC 61850 (GOOSE)

The TR1200IP is used where temperatures of many sensors Pt100 shall be measured and transmitted via Ethernet. TR1200IP itself does not monitor temperatures for limits. For direct monitoring of temperatures our devices with alarms and output relays are recommended.

Applications are e.g. monitoring of
- motors and generators (windings, bearings, coolant, ambient temperature)
- transformers (windings, core, ambient temperature)
- machines, plants and equipment

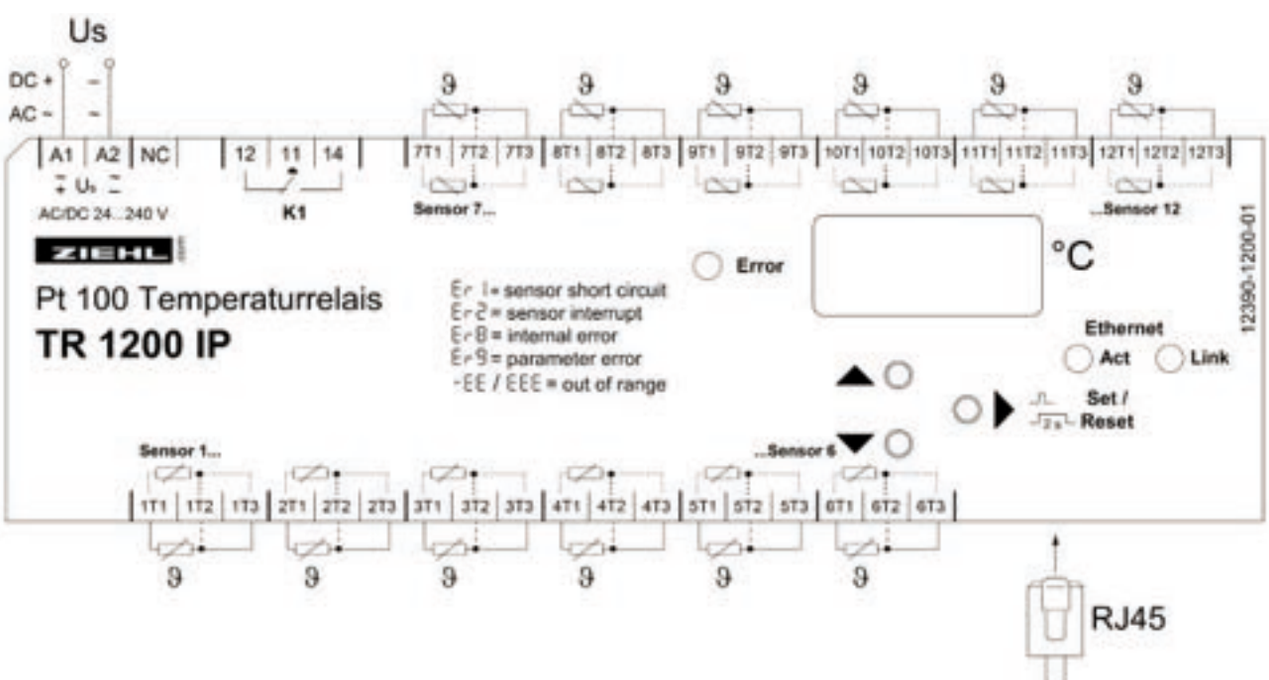
Features

Sensors and Displays:
- 12 inputs for sensors Pt100 (RTD)
- Connection 2- or 3-wire unneeded inputs can be switched off
- Monitoring of sensors for short-circuit and interrupt
- 3-digit-display for temperature LEDs for assigning the measured value, error, state of relay and interface

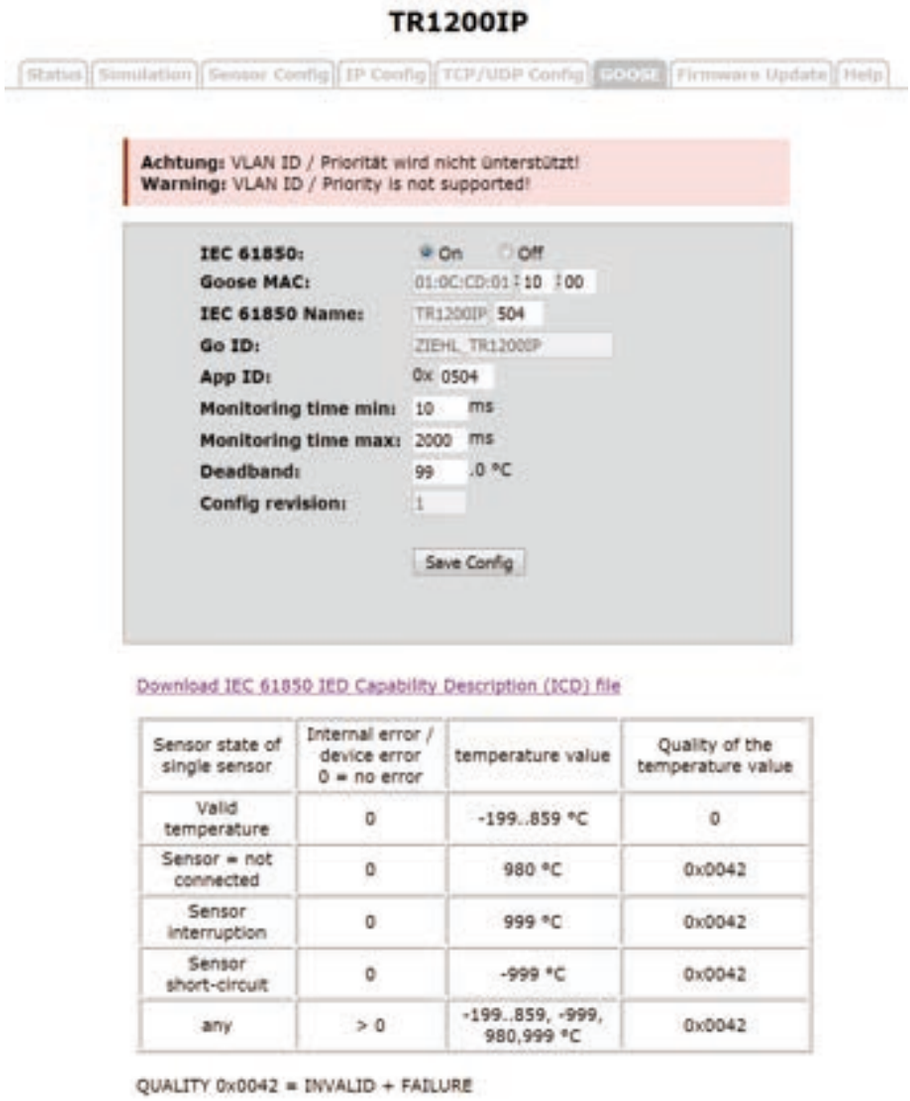
Interface:
Interface TCP/IP
- 10 MBit/s Ethernet
- supports IEC 61850 GOOSE
- Protocol details see www.ziehl.de - operating manuals

More Features:
- easy operation and selection of temperatures at the device
- Sensor-simulation
- Code-protection against manipulation of settings
- Relay for Error (1 co-contact) for sensor-error and operational failure
- Universal supply-voltage AC/DC 24…240 V
- Housing for switchgear-mount, 140 mm wide, mounting-height 55 mm
- Mounting on DIN-rail 35mm or with screws M4 (option)

Software
- The TR1200IP can be operated with a normal web-browser. There is no special software required.



GOOSE settings and configuration:



Sensor state of single sensor	Internal error / device error 0 = no error	temperature value	Quality of the temperature value
Valid temperature	0	-199..859 °C	0
Sensor = not connected	0	980 °C	0x0042
Sensor interruption	0	999 °C	0x0042
Sensor short-circuit	0	-999 °C	0x0042
any	> 0	-199..859, -999, 980,999 °C	0x0042

QUALITY 0x0042 = INVALID + FAILURE

Technical Data TR1200IP

Rated Supply Voltage Us	AC/DC 24-240 V, 0/45...65 Hz, < 5 VA DC: 20,4...297 V, AC: 20,4...264 V
Relay output	1 change-over contact (CO) type 2, see "general technical informations"
Measuring inputs	12 x Pt 100 (RTD) acc. to EN 60 751 / IEC 60 751
Measuring time sensor	0,25...3s (depending on number of sensors)
Measuring range	-199 °C ... 850 °C
Resolution	1 °C
Tolerance	± 0,5 % of value ± 1 K
Sensor-current	≤ 0,8 mA
Ethernet interface	
IP-adress	selectable
Subnet mask	selectable
UDP Port	selectable 0...65535
Max. cable-length	max. 20 m with CAT 5 patch-cable
Max. response time	200 ms
Testing conditions	see "general technical informations"
Rated ambient temperature range	-20 °C ... +65 °C
Housing	Design V8
Dimensions (W x H x D)	140 x 90 x 58 mm, mounting height 55 mm
Protection housing/terminals	IP 30 / IP 20
Attachment	DIN-rail 35 mm acc. to EN 60715 or screws M4 (option)
Weight	app. 350 g

Comparison Universal Relay Type UR

Type	UR220IP	UR420IP	UR840IP
Art.-No.	T224355	T224354	T224353
Sensors	PT100, PT1000, KTY83, KTY84, thermocouples, 0-10V, 0/4-20mA	PT100, PT1000, KTY83, KTY84, thermocouples, 0-10V, 0/4-20mA	2
Number sensor inputs	2	4	8
Digital inputs	1	2	4
Outputs	2x alarm relay, 1x analog	2x alarm relay	4x alarm relay, 4x analog
Alarm type	Sensor-specific thresholds, difference, rate of change Temperature, 2 out of X	Sensor-specific thresholds, difference, rate of change Temperature, 2 out of X	Sensor-specific thresholds, difference, rate of change Temperature, 2 out of X
Virtual sensors	2	4	8
Display	-	Display, LED	Display, LED
Parameterization	Joystick, web interface	Joystick, web interface	Joystick, web interface
Network / Communication	NFC, Ethernet	RS485, Ethernet	RS485, Ethernet
Other functions	Switch-on and switch-off delay, simulation	Switch-on and switch-off delay, simulation, extension with URB or STWA4MH	Switch-on and switch-off delay, simulation, extension with URB or STWA4MH
Housing	V4	V6	V8
Main areas of application	Measured value monitoring and control	Measured value monitoring and control	Measured value monitoring and control

Universal Relay Type UR420IP

Monitoring Relay for Temperatures and Analog Signals
2 limits, IP-interface, built-in webserver

UR420IP

Part numbers:

UR420IP	**T224354**
ER6 	**T224386**

Web-IO universal limit value relay with Ethernet interface, built-in web server and 4 inputs for temperature sensors or other analog signals.
The UR420IP can be connected to the internet or an intranet and operated via TCP/IP from a normal PC with a suitable browser.
The device can simultaneously evaluate and monitor up to 4 different input signals. Each of the 2 output relays can be assigned up to 4 limit values, one per input.

If a limit value is reached, an alarm is triggered and a relay switches. Example: Alarm 1 is activated when a temperature is exceeded at sensor input 3 (e.g. Pt 100) or the signal from a pressure transmitter (e.g. 4-20 mA) at input 5 falls below a limit value. The device also has an RS485 interface (Modbus RTU).

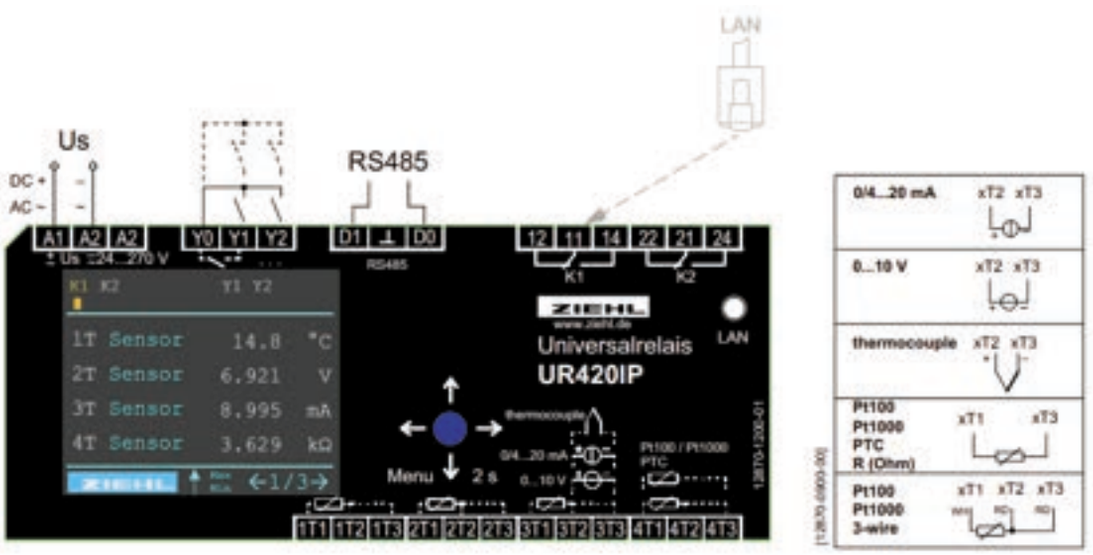
Applications:
The UR420IP supports you in process monitoring and control and can simultaneously evaluate and monitor up to 4 different input signals.

4 Measuring inputs (every input individually programmable):
- Pt 100 (RTD), Pt 1000 in 2- or 3-wire connection
- PTC-sensors (thermistors)
- Thermocouples type B, E, J, K, L, N, R, S, T
- DC 0-10 V, DC 0/4-20 mA
- Resistance 500 Ohm, resistance 30 kOhm
- Virtual sensors: linking of measured values (difference, MIN/MAX)
- 2 digital inputs with programmable functions

2 Alarms/Output Relays
- 2 relays (potential-free changeover contacts)
- individually programmable for each alarm:
  - one limit value per measurement input/virtual sensor (switching and reset value)
  - switching and switch-back delay
  - Remote control of the relays (on/off) via browser
  - 2 out of x, alarm only if limit value is reached in 2 sensors

Interfaces:
- Ethernet interface (http and modbus)
  - Modbus TCP protocol (port adjustable)
- RS485 interface (Modbus RTU)

Connected to internet via web browser
- Measured values, min/max values with date/time stamp
- Simulation of measured values
- status of the alarms
- Configuration of the inputs (name, type, compensation, scaling and unit)
- Configuration of alarms (limit values, relay function, ...)
- Data logging of measured values for each input, with time stamp
- Logging interval adjustable from 10 seconds to 30 minutes.
- alarm logging
- network configuration and system settings
- User management and password protection
- Real-time clock with time server synchronization, power reserve 7 days
- New firmware feature:
  - Current measurement with the Modbus sensor STWA4MH for the finest resolution up to 60 A AC.



Technical Data

Rated supply voltage Us:	**AC/DC 24 … 270 V, 0/50/60 Hz**
Tolerance	AC 20 … 297 V DC 20,4 … 297 V
Relay outputs K1 … K2 (Alarm 1 …2)	**Changeover contact**
Switching voltage	max. AC 300 V; DC 300 V
Conventional thermal current I_{th}	max. 5 A
Digital inputs	**approx. DC 18 V / 3,5 mA**

Sensor inputs

Pt100, Pt1000 according to EN60751

	Measuring range °C		short-circuit Ohm	Interruption Ohm	Resistance sensor + resistance line Ohm
Sensor	min	max	<	>	max
Pt 100	-199,9	800,0	15	400	500
Pt 1000	-199,9	800,0	150	4000	4100
PTC			20	20,000*	

*if no value between 3,800 and 20,000 ohms was previously measured

Tolerance	±0,5% of measured value ±1K
Sensor current	≤ 1 mA

Thermocouples according to EN60584

Type Sensor	Measuring range °C Min	Max	Accuracy
B	0,0	1820,0	≤ ± 2 °C T > 300 °C
E	-270,0	1000,0	≤ ± 1 °C
J	-210,0	1200,0	≤ ± 1 °C
K	-200,0	1372,0	≤ ± 2 °C
L	-200,0	900,0	≤ ± 1 °C
N	-270,0	1300,0	≤ ± 2 °C
R	-50,0	1770,0	≤ ± 2 °C
S	-50,0	1770,0	≤ ± 2 °C
T	-270,0	400,0	≤ ± 1 °C

Temperature drift	< 0,01 % / K
Mesurement error of the sensor cable	+ 0,25 µV / Ω
Temperature error of the reference junction	<± 5 °C

Voltage / current input

	Input resistance	Max. permissible signal	Measurement error input signal
0/2 ... 10 V	12 k Ω	27 V	< 0,1 %
0/4...20 mA	18 Ω	100 mA	< 0,5 %

Temperature drift	< 0,02 % / K

Resistance measurement(PTC, 500Ω, 30kΩ)

Resistance measurement (PTC, 500Ω, 30kΩ)	< 0.2 % of the measured value ± 0.5 Ω
Measuring error 0.000 ... 30,000 kΩ	< 0.5 % of the measured value ± 2 Ω
Sensor current	≤ 1 mA

Housing	**V6 design, distributor installation**
Installation depth	55 mm
Width	6 TE
Dimensions (W x H x D)	105 x 90 x 58 mm
Protection class housing / terminals	IP 30 / IP20
Fastening	Snap-on mounting on mounting rail 35 mm according to EN 60 715 or screw mounting M 4 (additional bolt not included)
Weight	approx. 250 g

The technical data listed on this data sheet is only an excerpt; please refer to the operating manual for the complete technical data, which we strongly recommend you observe.

Subject to technical changes

Universal Relay Type UR840IP

Monitoring Relay for Temperatures and Analog Signals
4 limits, IP-interface, built-in webserver

UR840IP

Part numbers:

UR840IP	**T224353**
ER8 	**T224388**

Web-IO universal limit value relay with Ethernet interface, built-in web server and 8 inputs for temperature sensors or other analog signals.
The UR840IP can be connected to the internet or an intranet and operated via TCP/IP from a normal PC with a suitable browser.
The device can simultaneously evaluate and monitor up to 8 different input signals. Each of the 4 output relays can be assigned up to 8 limit values, one per input. If a limit value is reached, an alarm is triggered and a relay switches. Example: Alarm 1 is activated when a temperature is exceeded at sensor input 3 (e.g. Pt 100) or the signal from a pressure transmitter (e.g. 4-20 mA) at input 5 falls below a limit value. The device also has an RS485 interface (Modbus RTU), or analogue outputs 0/2-10 V or 0/4-20 mA.

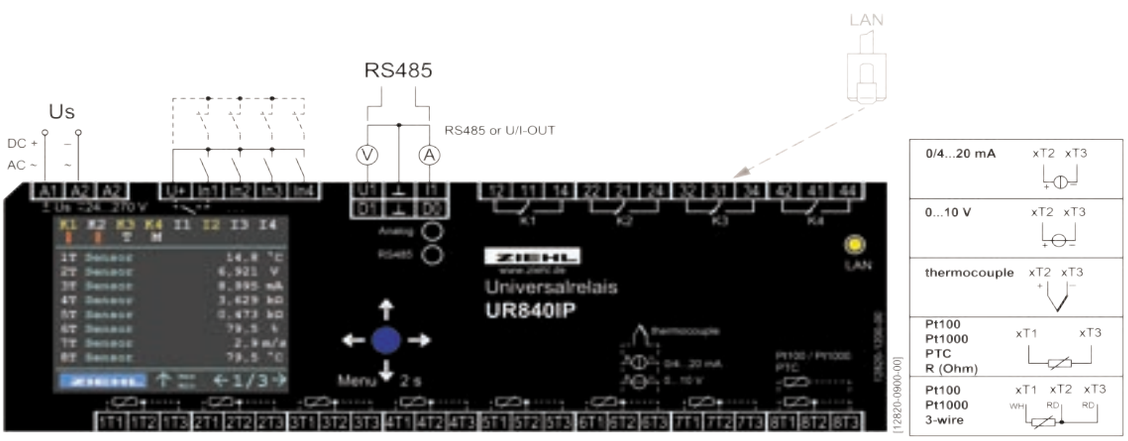
Applications:
The UR840IP is used to advantage wherever the following features are required
- monitor up to 8 different analogue measured values and transfer them to the Internet
- Measured value query and remote maintenance via intranet/internet

8 Measuring inputs (every input individually programmable):
- Pt 100 (RTD), Pt 1000 in 2- or 3-wire connection
- PTC-sensors (thermistors)
- Thermocouples type B, E, J, K, L, N, R, S, T
- DC 0/2-10 V, DC 0/4-20 mA, display scalable
- Resistance 0-500 Ohm, resistance 0-30 kOhm
- Virtual sensors: linking of measured values (difference, MIN/MAX)
- 4 digital inputs with programmable functions

4 Alarms/Output Relays
- 4 relays (potential-free changeover contacts)
- individually programmable for each alarm:
  - one limit value per measurement input/virtual sensor (switching and reset value)
  - switching and switch-back delay
  - Remote control of the relays (on/off) via browser
  - 2 out of x, alarm only if limit value is reached in 2 sensors

Interfaces:
- Ethernet interface (http and modbus)
  - Modbus TCP protocol for reading data (port adjustable)
- RS485 interface for reading data with Modbus (RTU)
- 2 analogue outputs 0/2-10 V / 0/4-20 mA, configurable (optionally instead of RS485)

Connected to internet via web browser
- Measured values, min/max values with date/time stamp
- Simulation of measured values
- status of the alarms
- Configuration of the inputs (name, type, compensation, scaling and unit)
- Configuration of alarms (limit values, relay function, ...)
- Data logging of measured values for each input, with time stamp
- Logging interval adjustable from 10 seconds to 30 minutes.
- alarm logging
- network configuration and system settings
- User management and password protection
- Real-time clock with time server synchronization, power reserve 7 days
- New firmware features:
  - Data visualization in the web interface
  - Current measurement with the modbus sensor STWA4MH for finest resolution up to 60 A AC.



Technical Data

Rated supply voltage Us:	**AC/DC 24 … 270 V, 0/50/60 Hz**
Tolerance	AC 20 … 297 V DC 20,4 … 297 V
Relay outputs K1 … K2 (Alarm 1 …2)	**Changeover contact**
Switching voltage	max. AC 300 V; DC 300 V
Conventional thermal current I_{th}	max. 5 A
Digital inputs	**ca. DC 18 V / 3,5 mA**

Sensor inputs

Pt100, Pt1000 according to EN60751

	Measuring range °C		short-circuit Ohm	Interruption Ohm	Resistance sensor + resistance line Ohm
Sensor	min	max	<	>	max
Pt 100	-199,9	800,0	15	400	500
Pt 1000	-199,9	800,0	150	4000	4100
PTC			20	20,000*	

*if no value between 3,800 and 20,000 ohms was previously measured

Tolerance	±0,5% of measured value ±1K
Sensor current	≤ 1 mA

Thermocouples according to EN60584

Type Sensor	Measuring range °C Min	Max	Accuracy
B	0,0	1820,0	≤ ± 2 °C T > 300 °C
E	-270,0	1000,0	≤ ± 1 °C
J	-210,0	1200,0	≤ ± 1 °C
K	-200,0	1372,0	≤ ± 2 °C
L	-200,0	900,0	≤ ± 1 °C
N	-270,0	1300,0	≤ ± 2 °C
R	-50,0	1770,0	≤ ± 2 °C
S	-50,0	1770,0	≤ ± 2 °C
T	-270,0	400,0	≤ ± 1 °C

Temperature drift	< 0,01 % / K
Mesurement error of the sensor cable	+ 0,25 µV / Ω
Temperature error of the reference junction	<± 5 °C

Voltage / current input

	Input resistance	Max. permissible signal	Measurement error input signal
0/2 ... 10 V	12 k Ω	27 V	< 0,1 %
0/4...20 mA	18 Ω	100 mA	< 0,5 %

Temperature drift	< 0,02 % / K

Resistance measurement(PTC, 500Ω, 30kΩ)

Resistance measurement (PTC, 500Ω, 30kΩ)	< 0.2 % of the measured value ± 0.5 Ω
Measuring error 0.000 ... 30,000 kΩ	< 0.5 % of the measured value ± 2 Ω
Sensor current	≤ 1 mA

Housing	**V8 design, distributor installation**
Installation depth	55 mm
Width	8 TE
Dimensions (W x H x D)	140 x 90 x 58 mm
Protection class housing / terminals	IP 30 / IP20
Fastening	Snap-on mounting on mounting rail 35 mm according to EN 60 715 or screw mounting M 4 (additional bolt not included)
Weight	approx. 370 g

The technical data listed on this data sheet is only an excerpt; please refer to the operating manual for the complete technical data, which we strongly recommend you observe.

Subject to technical changes

Universal Relay Box Type URB40

Extension for universal relay (UR) with additional relay outputs, communication via Modbus RTU

URB40

Part number:

URB40 **T224356**

Relay extension box type URB40, for universal relay box type UR

The URB40 universal relay box is an extension box for UR devices that can be used to control up to four additional relay outputs via Modbus RTU. The URB40 monitors the communication between the devices and can transfer each relay output to a predefined state in the event of a timeout. The device has no operating elements and is controlled and configured exclusively via the RS-485 interface.

Application:
With the URB40, an additional four alarms and relays are available, and the device can also be easily operated on other control systems via the integrated RS 485 interface.

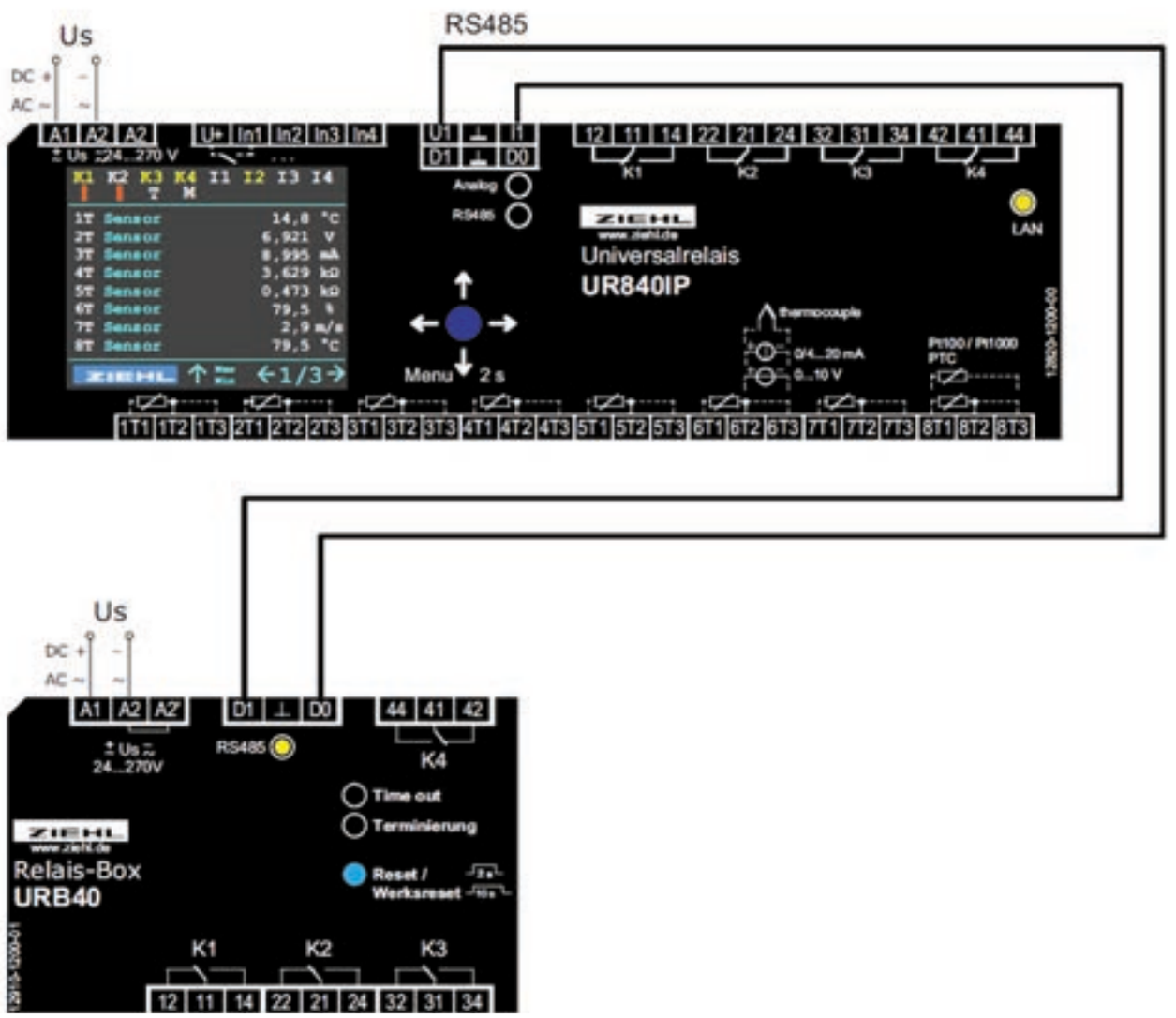
- 4 additional alarms
- No additional control system required
- Easy extension of existing control systems of the UR series
- Space-saving installation

Control voltage:
DC/AC 24-270 V 0/50/60 Hz

Output relay:
4 x 1 changer max. AC 300 V; DC 300 V

Interfaces:
RS485 (Modbus RTU)

Connection diagram:



Technical Data URB40

Rated supply voltage Us

	DC/AC 24-270 V	0/50/60 Hz
Tolerance	DC 20.4-297 V	AC 20-297 V

Relay outputs K1, K2, K3, K4

	4 x 1 changeover contact
Switching voltage	max. AC 300 V, DC 300 V
Inrush current N/O contact	AC 15 A 4s 10% ED
Minimum values voltage/current	12 V 10 mA
Conventional thermal current Ith	max. 5 A
Switching capacity max. AC cos φ = 1	1500 VA
Switching capacity max. DC (ohmic)	0.3 A 300 V; 0.4 A 120 V; 0.8 A 60 V; 8 A 30 V
Rated operating current Rated operating voltage	DC-13 Ie = 2.0 A Ue = 24 V DC-13 Ie = 0.4 A Ue = 120 V DC-13 Ie = 0.2 A Ue = 240 V

RS485 - Interface

Speed	4800, 9600, 19200, 57600, 115200 Baud
Addressing	1-247
Data bits	8 bits
Stop bits	1, 2 bits
Parity	even, odd, no
Terminating resistor	120 ohms (can be switched on & off)

Test conditions

	EN 61010-1
Rated impulse withstand voltage	4000 V
Overvoltage category	III
Pollution degree	2
Rated insulation voltage Ui	300 V
Duty cycle insulation	100 %
Test voltage	3.5 kV, Ueff, 50 Hz, 1 min.

Installation conditions

Permissible ambient temperature	-4 °F (-20 °C) ... +149 °F (+65 °C)
Permissible storage temperature	-4 °F (-20 °C)...+158 °F (+70 °C)
Installation height	< 2000 m above sea level
Climate resistance	5-85% relative humidity, no condensation
Permissible wiring temperature	23 °F ...+158 °F (-5 °C …+70 °C)
Oscillation	IEC 60255-21-1 / class 1
Shock	IEC 60255-21-2 / class 1
Seismic stress	IEC 60255-21-3 / class 1

Housing

	Type V4, distributor installation
Dimensions (W x H x D)	2.76 x 3.54 x 2.28 in. (70 x 90 x 58 mm)
Width	4 TE
Protection class housing	IP30
Fastening	Snap-on fastening on 1.38 in. (35 mm) mounting rail in accordance with EN 60715 or M4 screw fastening (additional latch not included in scope of delivery)
Installation position	as required
Weight	0.44 lbs (200 g)

Safety Temperature Limiter Type STR100
for Pt100

STR100

Part numbers:

T224148	0...200 °C	AC 230 V
T224142	100...300 °C	AC 230 V
T224144	200...500 °C	AC 230 V
T224058	0...200 °C	DC 24 V
T224059	100...300 °C	DC 24 V
T224062	200...500 °C	DC 24 V

Other measuring ranges upon request

The electrical safety temperature limiting device type STR100, in connection with Pt100 sensors, monitors temperatures in applications for which monitoring with increased safety is required. Functioning corresponds to type 2BDK as per VDE 0631.
The limit temperature T can be set at the front by means of a scaled potentiometer. An unauthorized or unintended manipulation of the limit is prevented by a transparent plastic-plate which can be sealed.A potential free relay contact is switched off when exceeding the limit value.

Safety temperature limiting devices are used in plants when temperature monitoring has to meet high requirements:

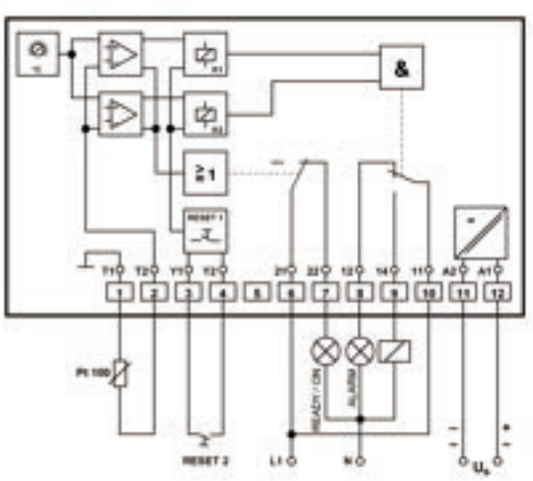
- Industrial furnace plants
- Dyeing machines
- Thermal oil plants

The device ca be used in combination with sensors Pt100 (RTD). The suitability must be proved in combination with the used sensors. Regular checks are stipulated for enhanced safety requirements.
The safe STR100 can be used in applications, in which an increased safety level up to SIL 2, PL c is required. It meets the requirements of safety category 3 (Safety of machines according to DIN EN 954-1, for models with supply-voltage DC 24 V and AC 230 V tested and approved by TÜV Rheinland with reports T24/00, 19.6.2000, T103/2007, 25.1.2007 and Z103/2007 E2, 12.9.07. Reports see homepage www.ziehl.de).

Description

The safety temperature limiting device STR100 detects the resistance of a Pt100-sensor connected to the input. This is linearized and evaluated in 2 separated channels. If the measured temperature is smaller than the limit value adjusted, both output relays are picked up. To do this, a reset has to be made after switching on the supply voltage (close contact between terminals 3+4). The relays are wired in such a way to have the function of a change-over switch to the outside. The load circuit is only closed when both relays are picked up. If a malfunction occurs or if the limit value is exceeded, both relays are released and the load circuit is separated. The released relays K1 and K2 are indicated by the lighting up of the red LEDs. When the limit value is exceeded, a third relay picks up which is used for error indication. Interruption of the sensor or short-circuit are signaled by a red LED each and also lead to disconnection of both channels.
Only when the temperature has fallen below the response value by the switching hysteresis of about 10°C and no malfunction occurs, it is possible for the STR 100 to close the load circuit after actuating the reset key.
Readiness for switching on is displayed by the third relay and a LED. An incorporated safety fuse avoids welding of the relay contacts.

- Safety temperature limiting device meets safety category 3 (SK 3) as per DIN EN 954-1
- SIL2 according to IEC61508
- Connection for Pt 100 sensors as per EN 60751/IEC 60751 can be delivered with
- measuring-range between -200 and +700 °C
- 2-channel evaluation
- Sensor monitoring for interruption and short-circuit
- LED-displays for relay position, error messages and readyness for switching on
- Relay for message readiness for switching on
- Setting of limit value to be sealed
- Incorporated reset key
- Connection for external reset key
- Assembly-friendly plug-in base housing S 12



Technical Data STR100

Power supply	Rated supply-voltage U_s	AC 230 V	DC 24 V
	Adm. tolerance U_s	-10...+10%	-15...+25%
	Power consumption	< 2 VA	< 3W
	Frequency	50/60 Hz	
Sensor-Input		2-wire Pt 100 acc. to EN 60751/IEC 751, α = 0,00385	
	Max. current	< 3,15 mA (< 10 mA bei -200...+0°C)	
	Max. voltage	< 2 V, open terminals < 15 V	
	Line resistance	Standard = 0,5 Ω, Option: max. 30 Ω	
Switching points	Switching off	Over-temperature, sensor break, sensor short circuit and malfunction	
	Limit value T	adjustable	
	Switching hysteresis	10°C (±25%)	
	Reset	with reset key at the front or an external key	
Relay outputs		1 change-over contact (CO)	
	Switching voltage	max. AC 400 V	max. DC 300 V
	Switching current	max. 6 A	
	Switching power	max. 2000 VA (ohmic load)	
		max. 48 W at DC 24 V	
	nominal continous current I_{th}	6 A	
	nominal operating current I_e	2 A AC 15 400V	2 A DC 13 24 V
		4 A AC 11/AC 15 230V	
	recommended fuse for contacts	3,15 A slow blow, 4 A flink	
	expected life mechanical	3 x 10^7 operations	
	expected life electrical	1 x 10^5 operations with 240 V/6 A	
	derating factor cos φ 0,3	0,5	
Testing conditions		EN 50178, EN 61010-1, EN 60947-5	
	Rated insulation voltage	AC 250 V	
	Contamination level	2 (normal)	
	Rated impulse withstand voltage	4000 V	
	Overvolatage category		
	Transformer	III	
	Interference resistance industry	EN 61558-2-6 (VDE 0551)	
	Interference transmission	EN 61000-6-2, EN 61326-1	
	"on"-period	Class B EN 50081-1	
	Rated ambient temperature range	100 %	
		0...50°C EN 60068-2-1 dry heat	
Housing	Dimensions H x B x T		
	wire-connection		
	Protection housing	Design S 12 (plugable): 82 x 42 x 121 [mm]	
	Protection terminals	12-pole, each 2 x 1,5 mm^2	
	Fitting position	IP 40	
	Fastening	IP 20	
		any	
	Vibration resistance	Snap mounting on 35 mm standard rail conforms to DIN EN 50 022 or M4 screws	
	Shock resistance	1 mm deflection 25 Hz/ 10 g 25-100 Hz	
		10 g 20 ms	
	Weight	20 g 4 ms	
		approx. 300 g	

Pt100 Temperature Sensors Type TF101

General

TF101 temperature sensors use EN 60751/IEC 60751 platinum resistance temperature detectors (RTD). For precise temperature measurement the Platinum Resistance Thermometer offers the best overall advantages in repeatability and stability over a long period. High accuracy allows replacement of a sensor without any need for re-adjust of the connected measuring devices or thermostats.

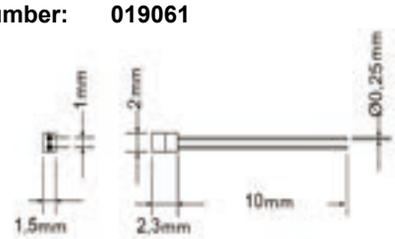
Types / Description

TF101N
-70°C...+500°C

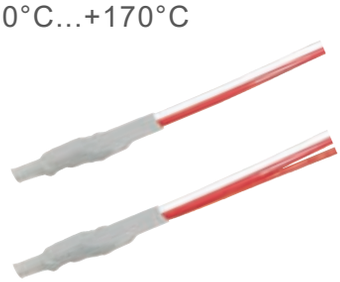
Platinum resistance temperature sensor on ceramic substrate intended for installation into any housing depending to user's requirements. Very small and quick sensor, only suitable for further treatment. Notice: do not cut the sensor leads. Thermal response time refer to manufacturer data:

$T_{0,9}$ in the air 10 s, in water <1 s.

Part number: **019061**



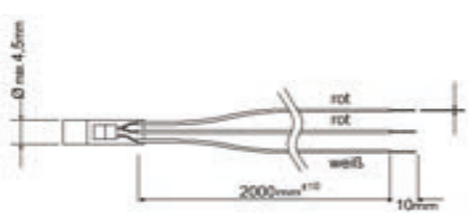
TF101K
-50°C...+170°C



Platinum resistance temperature sensor on ceramic substrate protected by a heat-shrinkable sleeve and with PTFE isolated stranded wire. The TF101K version can be installed in motor or transformer windings. When build-in into windings do not pressure the sensor element. Precautions should be taken to protect sensor and extension leads against push and pull forces. Thermal response time $T_{0,9}$ in the air 100 s, in water 19 s.

With 2-wire connection and cable-length of 2 m there is a temperature-failure of approx. 0.51 Ω = 1.32 K caused by the line resistance.
Cable length: 2000 mm
Weight: 10 g

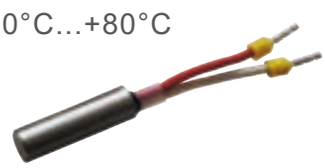
Part numbers: **T223154** 2-wire
T223134 3-wire



TF101U2
-30°C...+105°C

-50°C...+170°C

-30°C...+80°C

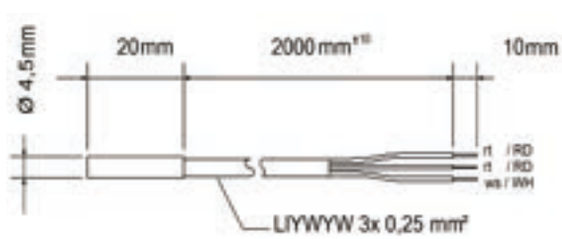


Sensors TF101U2 are encapsulated in a stainless-steel-shell V4A. They are suitable for measuring temperatures in fluids, at surfaces or for inside or outside applications. The protection class is IP 66. The version with PVC-insulated cable (3 x 0,25 mm² in one cable) can be easily wired. The maximum ambient temperature is 105 °C.
The sensor with cable 30mm (PVC) can be mounted in terminals in switchgear cabinets to measure temperature in enclosure.
The version with PTFE-insulation (3 x 0,14 mm² single wires) withstands peak-temperatures up to 200 °C

Weights: PVC: 2 m = 50 g, 10 m = 250 g, 30 mm = 15 g
PTFE: 2 m = 20 g

Part numbers:

T223051	3-wire	2 m	PVC	-30...+105 °C
T223058	3-wire	10 m	PVC	-30...+105 °C
T223052	3-wire	2 m	PTFE	-50...+170 °C
T223047	2-wire	30 mm	PVC	-30... +80 °C



TF101G3
-50°C...+170°C
mit Gewinde

Platinum resistance temperature sensor on ceramic substrate built into a M6 brass threaded bush, especially suitable for being screwed into metal, e.g. for monitoring temperature of heat sinks or heating plates.
Please note that there will be a measuring error due to the design, as the sensor can loose heat via the connection strand.
Cable length: 2000 mm
Weight: 21 g.
(Dimensions see Dimension illustrations)

Part number: **T223143** 3-wire

TF101ZG2
-50°C...+170°C

Platinum resistance temperature sensor built into steel tube V4A, 1/2 inch, suitable for installation in pipes. Thermal response time T0,9 in the air 255 s, in water 45 s. Connection flat plug 2,8 mm, Gasket IP55, clamping diameter 8-12 mm, cable connection max 100 °C
Suitable for transmission in 2- or 3-wire technique

Weight 120 g
(Dimensions see Dimension illustrations)

Part number: **T223137**
110 mm depth of immersion

TF101R
-20...+70°C

Sensor for measuring ambient temperatures inside or outside.
Protection class IP 54. Cabling can be connected in 2- or 3- wire technique.
Housing W x H x D = 65 x 50 x 38 mm
Weight: app. 70 g

Part number: **T223060**

Technical Data

Nominal resistance	100 Ω at 0 °C
Temperature coefficient	3,85 x 10^{-3}/K (see table)
Class B, DIN EN 60751	$\Delta\vartheta = \pm (0{,}3 + 0{,}005\ \vartheta)$ [°C]
Test voltage	2,5 kV AC (not 019061 and T223047)
Extension leads	PTFE; silver-plated stranded copper wire 0,14 mm^2 or PVC isolated copper wire
Shrink sleeve	Kynar
max. temperature at sensors with max. 170°C	200 °C (max. 170 h)

Cabling

ZIEHL thermostats of TR series are generally insensitive to interference in the sensor line. Occasionally, however, undesirable switching is unavoidable, especially when temperature is near the switching point. For this reason it is highly recommended that cables are not laid parallel to power current lines over long distances. When appropriate, cables should be screened or twisted together.

Line-resistance

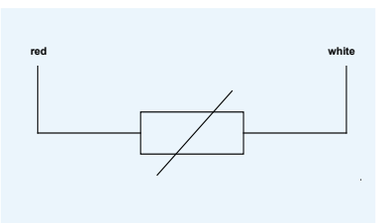
With RTD sensors the resistance of the connecting cable should be considered, otherwise there is an measuring error. The resistance must be compensated. The resistance of a connecting cable can be calculated as follows:

R [Ω] = l/(k x A),

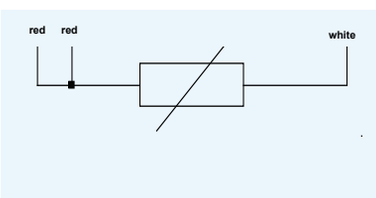
l = cable length [m],
k = conductivity [S x m/mm²] e.g. Cu = 56,
A = wire cross-section [mm²]

Example sensor with cable 50 m: (l = 2 x 50 m = 100 m), with wire cross-section 1 mm²:
R = 100/(56 x 1) = 1,79 Ω, Resulting error = 1,79 Ω/0,385 Ω x K = 4,6 K.

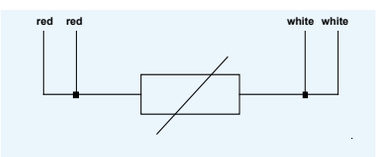
Linecompensation



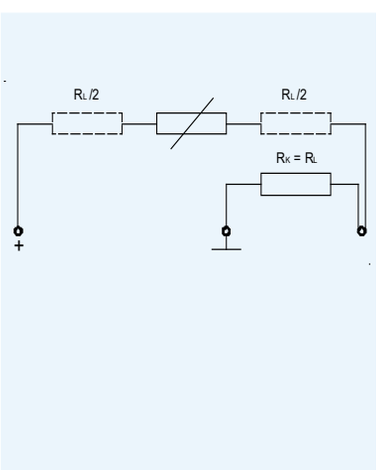
2-wire technique
With 2-wire connection the line resistance is compensated for by a potentiometer in the thermostat, by programming (e.g. TR122D, TR600) or via wiring an external resistor. The advantage of the possibly simpler and more economical running of just two wires is counteracted by the disadvantage of the manual compensation required in the case of longer wiring. Differences in resistance caused by temperature changes cannot be compensated.



3-wire technique
With 3-wire connection, a third wire (sense) connected to the sensor registers the drop in voltage in one line. For compensation of line resistance it is assumed that the voltage drop in the second line is identical (i.e. the same wire and same wire temperature). Compensation is then performed automatically. Possible changes of resistance in the line due to temperature changes are also compensated for.



4-wire technique
With 4-wire connection, impressed current flows via two wires to the sensor. Via a two sensor line the drop in voltage is measured directly at the sensor. Possible differences in the sensor connection wiring can be disregarded. A disadvantage is the higher costs involved in running 4 wires.



Kombination of 2- and 3-wire technique
When connecting 2-wire-sensors to units with 3-wire input, the line resistance can be compensated by connecting a compensation resistor (Rk) between ground and sense-input. Rk must have the same value as the resistance of the line. The sensor then has to be connected to the + and the sense- input. Rk must be lower than the permitted resistance for 1 line of the 3-wire-input.

Units requiring 3-wire configurations can also be operated by 2-wire sensors. The sensor input is simply shortened. The line resistance need not be compensated.

3-wire sensors can be used as 2-wire sensors, simply by omitting one wire.
2-wire sensors can be branched at any desired position in a 3 or 4-wire connection system. In this case though, the line resistance of the two wires from the branching point to the sensor is not compensated.

ZIEHL thermostats, series TR are designed for use with 2 or 3-wire connection.

Pt100 resistance table

Basic values in Ω for measuring resistors Pt 100 according to DIN/ IEC 751

°C	Ω	°C	Ω	°C	Ω	°C	Ω	°C	Ω	°C	Ω
-200	18,49	0	100,00	200	175,84	400	247,04	600	313,59	800	375,51
-190	22,80	10	103,90	210	179,51	410	250,48	610	316,80	810	378,48
-180	27,08	20	107,79	220	183,17	420	253,90	620	319,99	820	381,45
-170	31,32	30	111,67	230	186,82	430	257,32	630	323,18	830	384,40
-160	35,53	40	115,54	240	190,45	440	260,72	640	326,35	840	387,34
-150	39,71	50	119,40	250	194,07	450	264,11	650	329,51	850	390,26
-140	43,87	60	123,24	260	197,69	460	267,49	660	332,66		
-130	48,00	70	127,07	270	201,29	470	270,86	670	335,79		
-120	52,11	80	130,89	280	204,88	480	274,22	680	338,92		
-110	56,19	90	134,70	290	208,45	490	277,56	690	342,03		
-100	60,25	100	138,50	300	212,02	500	280,90	700	345,13		
- 90	64,30	110	142,29	310	215,57	510	284,22	710	348,22		
- 80	68,33	120	146,06	320	219,12	520	287,53	720	351,30		
- 70	72,33	130	149,82	330	222,65	530	290,83	730	354,37		
- 60	76,33	140	153,58	340	226,17	540	294,11	740	357,42		
- 50	80,31	150	157,31	350	229,67	550	297,39	750	360,47		
- 40	84,27	160	161,04	360	233,17	560	300,65	760	363,50		
- 30	88,22	170	164,76	370	236,65	570	303,91	770	366,52		
- 20	92,16	180	168,46	380	240,13	580	307,15	780	369,53		
- 10	96,09	190	172,16	390	243,59	590	310,38	790	372,52		

Pt1000 Temperature Sensor

The Pt1000 sensor is the "big brother" of the Pt100 sensor. Its nominal resistance at 0°C is 1000 Ω. Resistance values of the whole series are higher by a factor of 10. The sensor is used in the same way as the Pt100 sensor. Its dimensions are slightly larger (4 x 5 un-insulated). Thermostats and sensors for Pt1000 on request.

Pt1000 resistance table

values see Pt100, multiplicated by the factor of 10.

Mains Monitoring

Phase Monitoring Type PS - Phase asymmetry - Phase sequence

General

The PS-type phase protector safeguards electromotors against 2-phase operation even in the case of feedback via the motor. Depending on the model, the device has the following functions or connections.

Nowadays, more and more modern electrical switching plants for power generation and distribution, tooling and finishing machinery and a number of other drives are equipped with metering and control devices. However the use of such instruments also requires that the mains voltage feed varies only slightly from the rated value, as otherwise the necessary accuracy of the measuring results or control commands will not be achieved. In case of deviations in the rated voltage either exceeding or falling below a pre-defined value, the plant must be switched off, or at least warn the operator via an optical or acoustic signal.

Special applications where these PS devices can be put into operation are building machinery, hoisting plants, escalators and travelling staircases, cranes, tooling machinery of all kinds, and all switching frequency motors with high starting and braking times.

	PS2DK	PSSW1	DRR10	DRR20	COSFI100V
Phase asymmetry / failure	X	X		X	
Phase sequence	X	X	X	X	
Undervoltage		X		X	
Overvoltage		X			
Connection for PTC-sensor			X		
automatic change of wrong phase-sequence			X	X	
Monitoring of COSFI/ true current					X
Monitoring of current-direction					X
Housing	K	K	V4	K	V4

Phase asymmetry Relay Type PS2DK

Monitoring of Phase-Asymmetry and Phase Sequence

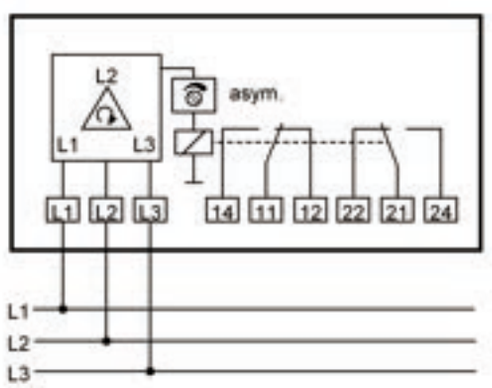
Phasenasymmetrierelais
PS2DK

Part number: **P227105**

Phase asymmetry relays PS2DK are used for the protection of electric motors against asymmetries in the 3-phase mains without neutral and for monitoring the phase-sequence.
The switching-point is adjustable and can be adapted to the situation in the mains.
If a motor, running with 2 phases, creates the 3rd phase, the sensitivity can be increased.
With mains with high harmonics it can be necessary to reduce the sensitivity.
When the sensitivity is reduced to minimum (25% = potentiometer turned fully right) , the device works as a phase-sequence relay. It trips only at wrong phase-sequence or missing phase.

If there is a wrong phase-sequence when switching on the device, the relay does not pick up.Monitoring of phase-asymmetry

Functions:
- Monitoring of phase-sequence
- Adjustable sensitivity 5…25 %
- Output-relay with 2 change-over contacts
- Switching delay adjustable 0,1 … 5 s
- LED for display state of operation
-



Technical Data

Rated supply voltage Us:	**3 AC 400V 50/60Hz**
Tolerance	0,85 Us … 1,1 Us
Power consumption	< 3 VA
Switching point:	
Adjustable asymmetry	from approx. 5 … 25%, set ex works approx. 15%
Response delay	0.1 ... 5 s
Actuation time	Approx. 0.2 s after phase return
Hysteresis	Approx. 5%
Output relay K1, K2	**2 x 1 changeover contact:**
Switching voltage	max. AC 400V
Switching current	max. 6A
Switching capacity max. AC cos φ = 1	2000 VA (ohmic load)
Switching capacity max. DC (ohmic)	120W at DC 24V
Nominal operating current i e for changers	3A AC-15, 250V; 2A DC-13, 24V
Mechanical contact lifespan	$3x10^7$ switching cycles
Electrical contact lifespan	$1x10^5$ switching cycles at 240V / 6A $1x10^6$ switching cycles at 240V / 2A
Reduction factor at cos φ = 0.3	0.5

EMC-tests	
Emission	EN 61000-6-3 Class B
Immunity	EN 61000-6-2 industrial environment
Electrical fast transient/Burst	EN 61000-4-4 ±4 kV Pulse 5/50 ns, f = 5 kHz, t = 15 ms, T = 300 ms
SURGE immunity	IEC 61000-4-5 ±2 kV
Electrostatic discarge	IEC 61000-4-2 ± 6 kV contact discharge, ± 8 kV air

Reliability - failure rate	EN 61709 / SN29500		
Ambient conditions	Local operation in dry rooms		
Operation time 24/7/365	8760 h/a		
Tu = Tref (component not in operation)	Tu = 40 °C	Tu = 60 °C	Tu = 80 °C
Failure rate (FIT)	781 FIT	1499 FIT	3060 FIT
	100 (146) years	76 years	37 years

Installation conditions	
Permissible ambient temperature	-20 °C ... +60 °C
Permissible storage temperature	-20 °C ... +70 °C
Installation height	≤ 2000 m over N.N.
Climatic conditions	5-85 % rel. F, no condensation
Permissible wiring temperature	-5 °C ... +70 °C
Vibration resistance EN 60068-2-6	2 ... 25 Hz ±1,6 mm 25 ... 150 Hz 5 g

Contact termination	Push-In spring-type terminal
Protection class terminals	IP20
Actuation type	Push-Button
Number of levels	1
Solid conductor	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 28 ... 16
Fine-stranded conductor	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 26 ... 14
Fine-stranded with insulated ferrule	1 x 0,25 mm^2 ... 0,75 mm^2
Fine-stranded with uninsulated ferrule	1 x 0,25 mm^2 ... 1,5 mm^2
Strip length	8 ... 9 mm / 0.31 ... 0.35 inches

Housing	Type K
Dimensions (W x H x D)	22,5 x 75 x 115 mm
Width	1 M
Protection class housing	IP40
IK-Code	IK06 (1 J impact energy)
Mounting	Snap mounting on 35 mm standard rail EN60715 or M4 screws (additional bar not included)
Mounting position	any
Weight	app. 150 g

Subject to technical changes

Monitor for 3-phase Type PSSW1

Phase asymmetry, Phase sequence, over- and undervoltage

PSSW1

Part numbers:

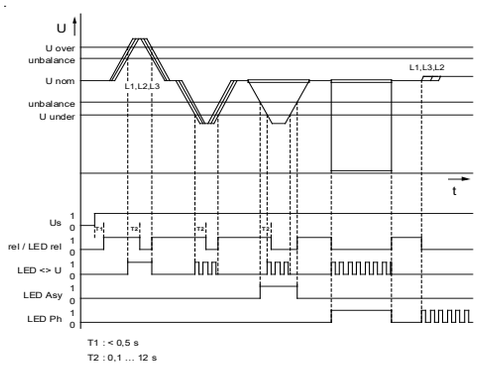
P222525	AC 230 V
P222526	AC/DC 400 V

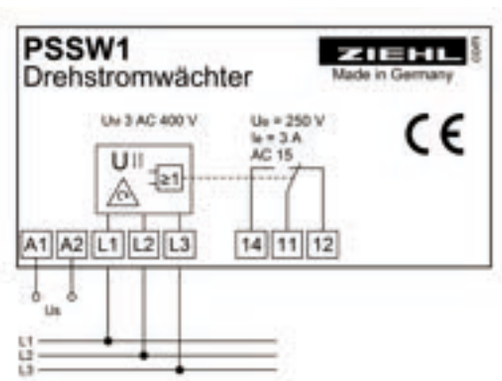
Relays for 3-phase networks type PSSW1 monitor 3-phase networks for phase-sequence, asymmetry and over- and undervoltage.
Applications: Monitoring of 3-phase-networks at heat pumps, compressors or at machines at building sites.

Functions:
- Over- and undervoltage, adjustable ± 2-20 % (common)
- Asymmetry adjustable 5-15%
- Phase loss
- Phase sequence
- Switching delay adjustable 0,1-12 s (for voltage and asymmetry)
- Bifrequential measuring input 50/60 Hz

Displays:
4 LEDs for:
- Over-/undervoltage
- Asymmetry
- Phase-sequence/loss
- State of relay

Order-numbers:





Technical Data

Rated supply voltage Us	AC 230 V, alt. AC 400 V, 50/60 Hz, < 3 VA
Admissible tolerance Us	±20 %
Output relay	1 change-over contact (co)
Type of contact	**type 2** see "general technical informations"
Test conditions	see"general technical informations"
Rated ambient temperature range	-20 °C ... +55 °C
Monitoring asymmetry	switching point adjustable 5...15 %
Hysteresis	app. 2 %
Switching delay	adjustable 0,1...12 s
Loss of voltage	switching point app. 50 %
Hysteresis	app. 5 %
Switching delay	0,1 s
Under-/overvoltage	measuring voltage 3 AC 400 V
Switching point	adjustable ±2...20 % (common, symmetric)
Hysteresis	app.1 %
Switching delay	adjustable 0,1-12 s
Dimensions (h x w x d)	housing K: 75 x 22,5 x 110 mm
Attachment	on 35 mm DIN-rail or with 2 screws M4 (option)
Protection housing / terminals	IP 40 / IP 20
Weight	160 g

Phase Sequence Relay Type DRR10

Automatic change of wrong Phase sequence

DRR10

Part numbers:
P222546 3x AC 400 V

Phase sequence relays DRR10 measure the sequence of the phases when being switched on and switch - if necessary - the rotation of the field by changing 2 phases.
The integrated PTC-monitor protects the motor from over-heating.

Applications are especially machines and equipment, that is operated at variable locations e.g. at building sites. Pumps, compressors and vacuum cleaners always run correctly. No more search for faults or change of wiring necessary.

- automatic change of wrong phase-sequence when connected falsely
- running backward of motors is avoided
- integrated PTC-protection for motor
- enable-input for direct switching on/off of the motor with DRR10
- max. 3 x 12 A
- switch-on currents 30 A / max. 4 s / 60 A / max. 1 s
- higher currents with external contactors
- integrated protection for relay contacts
- integrated protection from over-temperature
- housing for mounting in fuse-boxes or switchgear-cabinets, mounting height 55 mm

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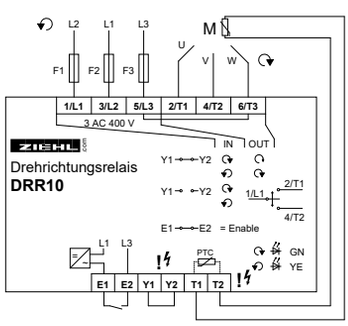
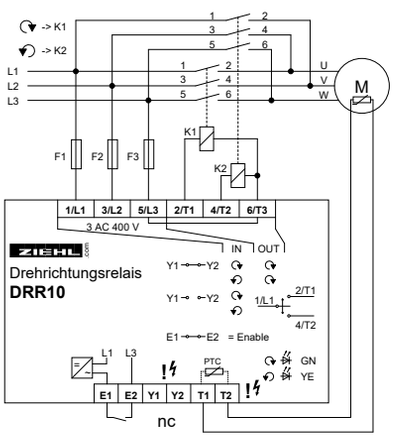
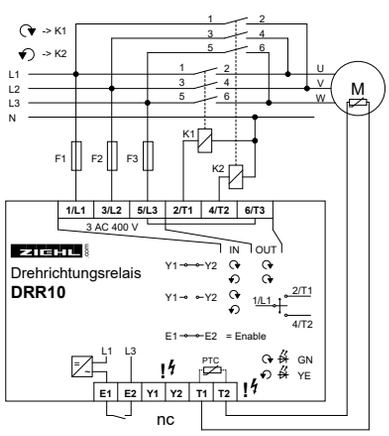






Technical Data

rated supply voltage Us	3 AC 400 V, 50/60 Hz, < 3 VA
admissible tolerance Us	+10 % ... -20 %
relay output	2 x 2 normally opened contacts (no)
switching voltage	max. AC 440 V
conventional thermal current Ith	12 A
switch-on current (10% on)	30 A / max. 4 s, 60 A / max. 1 s
recommended fuse	gG/gL 16 A
expected contact life mech.	30 x 10^6 operations
expected contact life electr.	1 x 10^6 operations at AC 400 V / 3 A 2 x 10^5 operations at AC 400 V / 6 A cosfi 0,5
inputs	without separation of potential from supply-voltage
T1 - T2	PTC-thermistors according to DIN 44081/44082
E1 - E2	potential-free contact for AC 400 V
rated ambient temp. range	-20 °C ... +55 °C
housing (H x W x D) mm	design V4: 90 x 70 x 58 mm
fitting position	any
attachment	on 35 mm DIN rail according to EN 60715 or 2 screws M 4
protection housing/terminals	IP 30 / IP 20
weight	app. 230 g

Phase Sequence Change Relay Type DRR20

With integrated monitoring of undervoltage and asymmetry

Phase-Sequence-Change Relay
DRR20

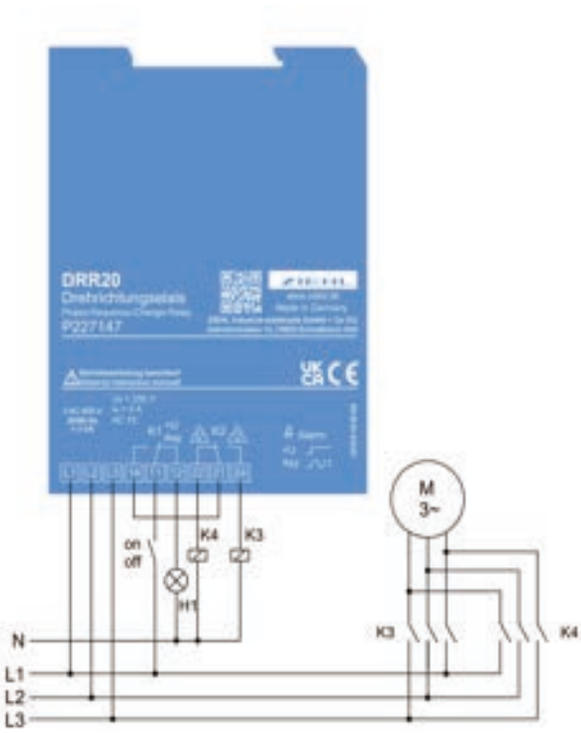
Part number: **P227147**

Phase sequence change relays DRR20 measure the sequence of the phases and switch – if necessary the rotation of the field. At the output (connect relays K1 and K2 in series in this application) two contactors are connected. The contactor at the normally-open contact of K2 switches the phases 1:1without changing them, the second (at normally-closed contact) changes 2 phases.

When switching on with phase-sequence ok, relay K2 picks up. With wrong phase-sequence it remains released. After K2 has switched, K1 picks up. K1 also releases first. This makes sure, that no wrong contactor can be picked up under any condition.
Additionally the DRR20 monitors the three phases for asymmetry and undervoltage. If the limits are exceeded, the K1 switches off (respectively doesn't pick up) and protects the connected motor from damage.
The device can also be used as a monitor for undervoltage, asymmetry or phase-sequence.

Applications are machines and equipment that is operated at variable locations, e.g. at building sites. Pumps, compressors and vacuum-cleaners always run correctly and they are protected from damage by undervoltage or asymmetry.

- automatic change of wrong phase-sequence when connected falsely (2 contactors afforded)
- running backward of motors is avoided
- no switching on at asymmetry or undervoltage
- relay K2 picks up when phase-sequence is correct
- relay K1 picks up (after K2) when symmetry and voltage is correct
- 3 LEDs for state of relays and errors
- measuring-voltage 3 AC 400 V
- limit asymmetry adjustable 5…25 %
- limit undervoltage adjustable 70…95 %
- alarm-delay adjustable 0,1…10 s (undervoltage and asymmetry)
- no supply-voltage required



Technical Data

Rated supply voltage Us:	**3 AC 400V 50/60Hz**
Tolerance	0,7 Us … 1,2 Us
Power consumption	< 3 VA
Switching point:	
Undervoltage adjustable	from approx. 70 … 95 %, factory setting from approx. 85 %
Adjustable asymmetry	from approx. 5 … 25 %, set ex works approx. 15 %
Trigger delay adjustable	0.1 ... 10 s, factory setting at approx. 2 s
Actuation time	Approx. 0.2 s after phase return
Hysteresis	Approx. 2 %

Output relay K1, K2	**2 x 1 changeover contact:**
Switching voltage	max. AC 400V
Switching current	max. 6A
Switching capacity max. AC cos φ = 1	2000 VA (ohmic load)
Switching capacity max. DC (ohmic)	120W at DC 24V
Nominal operating current i e for changers	3A AC-15, 250V; 2A DC-13, 24V
Mechanical contact lifespan	$3x10^7$ switching cycles
Electrical contact lifespan	$1x10^5$ switching cycles at 240V / 6A $1x10^6$ switching cycles at 240V / 2A
Reduction factor at cos φ = 0.3	0.5

EMC-tests	
Emission	EN 61000-6-3 Class B
Immunity	EN 61000-6-2 industrial environment
Electrical fast transient/Burst	EN 61000-4-4 ±4 kV Pulse 5/50 ns, f = 5 kHz, t = 15 ms, T = 300 ms
SURGE immunity	IEC 61000-4-5 ±2 kV
Electrostatic discarge	IEC 61000-4-2 ± 6 kV contact discharge, ± 8 kV over air

Reliability - failure rate	**EN 61709 / SN29500**		
Ambient conditions	Local operation in dry rooms		
Operation time 24/7/365	8760 h/a		
Tu = Tref (component not in operation)	Tu = 40 °C	Tu = 60 °C	Tu = 80 °C
Failure rate (FIT)	815 FIT	1557 FIT	3160 FIT
	100 (140) years	73 years	36 years

Installation conditions	
Permissible ambient temperature	-20 °C ... +60 °C
Permissible storage temperature	-20 °C ... +70 °C
Installation height	≤ 2000 m over N.N.
Climatic conditions	5-85% rel. F, no condensation
Permissible wiring temperature	-5 °C ... +60 °C
Vibration resistance EN 60068-2-6	2 ... 25 Hz ±1,6 mm 25 ... 150 Hz 5 g

Contact termination	**Push-In spring-type terminal**
Protection class terminals	IP20
Actuation type	Push-Button
Number of levels	1
Solid conductor	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 28 ... 16
Fine-stranded conductor	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 26 ... 14
Fine-stranded with insulated ferrule	1 x 0,25 mm^2 ... 0,75 mm^2
Fine-stranded with uninsulated ferrule	1 x 0,25 mm^2 ... 1,5 mm^2
Strip length	8 ... 9 mm / 0.31 ... 0.35 inches

Housing	**Type K**
Dimensions (W x H x D)	22,5 x 75 x 115 mm
Width	1 M
Protection class housing	IP40
IK-Code	IK06 (1 J impact energy)
Mounting	Snap mounting on 35 mm standard rail EN60715 or M4 screws (additional bar not included)
Mounting position	any
Weight	app. 150 g

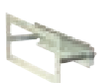
Subject to technical changes

Motor Load Relay Type COSFI100V

Active current with direction, over- and underload and cosφ

COSFI 100V

Part numbers: **P222534**

ER4  **T224384**

Load monitors protect motors in 1- or 3-phase mains from over- or underload. They are simply switched into the supply-line of the motor and monitor the phase angle between voltage and current and/or the true current.

The power factor cos fi has its greatest alteration at small loads at the motor. Therefore monitoring this parameter is suitable to recognize underload.
The current of the motor increases most at high loads. Provided that the motor is not oversized, the current is more suitable for monitoring overload.

The COSFI100V can monitor both values. It is even possible to monitor the power factor with alarm 1 for underload and protect the drive from overload by monitoring the current with alarm 2.
This allows detection of a breaking V-belt or clogging of a filter or a valve. A local sensor near the motor is not necessary.

As **monitor for current direction**, value and direction of active current in one phase is measured. Thus it can be used for the direction dependent monitoring of AC-current.

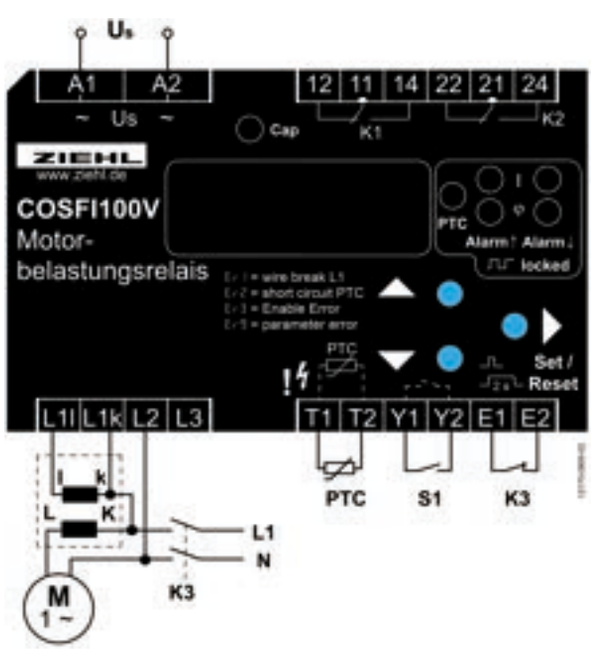
With its digital display and many setting options, it can be individually adapted to the application.
The resolution of the measuring input is 0.1 A. When using a current transformer, multiply this by the transformer facotor.

Application cos φ / active current:
- Monitoring of V-belt (slip and destruction)
- Fan-monitoring
- Pump-monitoring
- Conveyor systems
- Agitators
- excessive wear
- wear-out of tools
- Protection of motors, drives and plants from overload

Application current direction:
- Optimizing of own consumption of energy in photovoltaik plants.
  Consumers can be switched on or off depending on power available. By measuring current at the feed point it can be detected, wheather there is enough power available to start heat pumps, cooling units or other consumers.
- Warning or shut-down when a generator is consuming energy instead of producing.

Function and features:
At an AC-motor (inductive load) the phase of the current is retarded to the voltage by the phase angle φ. With decreasing load, this angle increases and the cos φ decreases. Thus the load at the shaft of the motor can be measured.
The load monitor COSFI100V can measure sinusoidal signals.

- for networks AC and 3 AC
- Digital display for cos φ and true current
- 2 limits / alarms
- min, max or min/max for each alarm
- Monitoring of 2 x cos φ, 2 x true current or 1 x cos φ and 1 x true current
- Scaling of display (factor of current-transformer)
- Hysteresis and switching-delay programmable
- Auto-reset or interlocked switching
- Programmable attempts (1…10) for restart
- Auto-enable (current) or external signal
- Start-up delay programmable 0…99 s
- Current input max. 10 A, more with transformers
- Detection of breaks
- Input for PTC-thermistors
- Housing for mounting in fuse-boxes or switchboards
- Accessory: Installation frame ER4 for panel mount



As a **current direction relay**, the device measures the magnitude and direction of the active current in one phase and can thus be used for direction-dependent monitoring of AC current.

- Increase of self-consumption in photovoltaic systems: Consumers can be switched on or off depending on the available feed-in power. By measuring the current at the feed-in point, it is possible to determine whether there is sufficient surplus power from the photovoltaic system for heat pumps, air conditioning units, refrigeration systems, or other large consumers.
- Warning or shutdown if a generator is drawing current instead of supplying it.

Current direction relay COSFI 100V monitors AC currents for magnitude and direction.
The active current in one phase is measured. This makes it possible to control self-consumption in power generation systems. It is more economical to use the electricity yourself, for example to heat domestic water, rather than selling it to the grid operator at a low price.
If power from wind turbines, CHP units or batteries must not be fed into the public grid, the COSFI 100V can be used as an energy flow direction sensor (EnFluRi sensor).
The resolution of the measuring input is 0.1 A

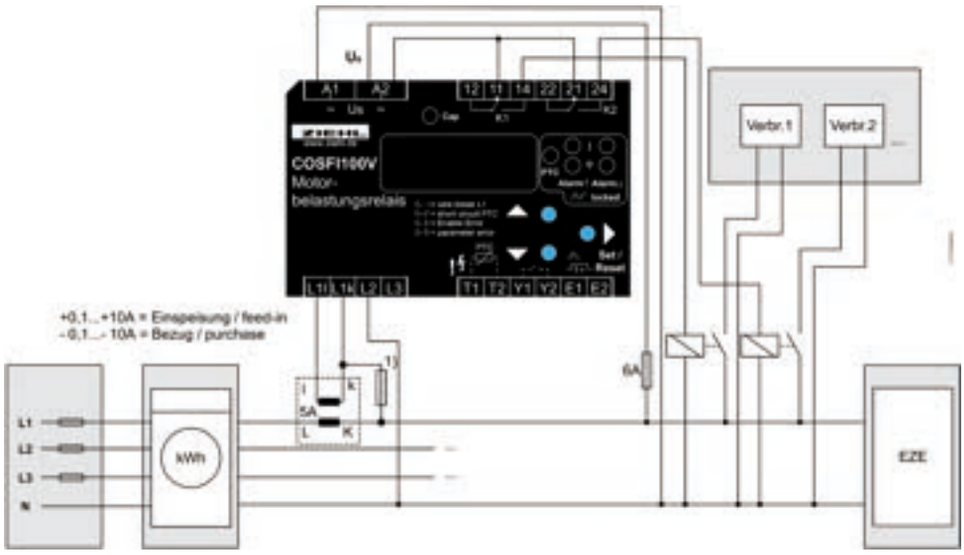
Increase of self-consumption (Program 4):
The COSFI 100V can increase self-consumption by switching consumers on in up to 2 stages when a set current value is exceeded. If the current drops by the set hysteresis, the consumer is switched off again. Generous adjustment ranges for response and release delay allow the user to influence the switching frequency and thus prevent excessive switching, e.g. of heat pumps.
The current is measured directionally. This ensures that consumers are not switched on during power import (at night).

Energy flow direction sensor, prevention of feed-in (Program 4):
When operating various power generation units in parallel, such as small CHP units, wind turbines, or photovoltaic systems, the grid operator may require that individual units be disconnected. This may be the case, for example, if the PV system receives a higher feed-in tariff than other units. A practical example is company systems that consume little power at weekends and want to feed surplus energy into the grid. Here, as soon as feed-in occurs, e.g. the wind turbine must be disconnected. Battery power must also not be fed into the grid under certain conditions.
The COSFI 100V current direction relay can thus prevent non-subsidized or excessively subsidized power from being fed into the public grid.

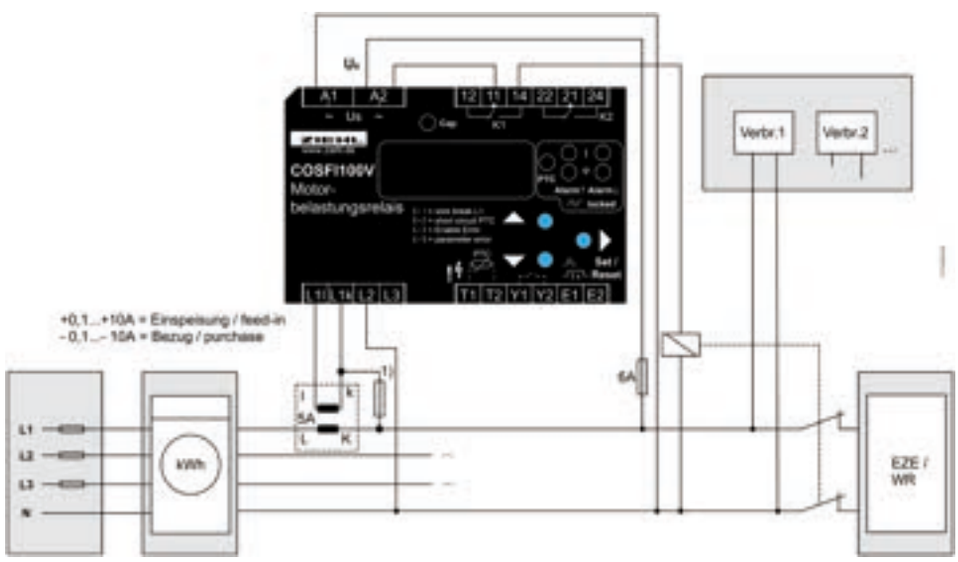
Motor load monitor (Programs 1-3):
To protect motors against overload or underload (e.g. dry running or belt breakage), motor current and/or phase angle between voltage and current can be monitored for two limit values.

Functions (Program 4):
- Monitoring of AC current in one phase
- Digital display for measured values and programming
- 2 limit values / output relays
- each configurable as minimum, maximum, or window monitoring
- Scalable current display (transformer ratio)
- Hysteresis adjustable 0.1...9.5 A x transformer ratio
- Response and release delay adjustable 0...1999 s
- Auto-reset or latched shutdown
- Current input up to 10 A direct (higher currents via transformer)
- Distribution board housing 4 TE, installation depth 55 mm
- Control voltage AC 230 V

Increase self-consumption (with current transformer)



Prevent / limit feed-in (with current transformer)



Technical Data COSFI100V

Rated supply voltage U_S	AC 230 V, +10%/-15%, 3VA, 50 Hz
Power factor (cosφ)	-0,99...+0,99
Hysteresis (cosφ)	0,05...0,20
Nominal current of motor	0,2...10 A (higher currents with current-transfomers)
Overload capacity	10 A continuously, 15 A max. 3 s
Resolution active current	Current factor x 0.1 A
Input Voltage L1-L2-L3	AC 100...400 V, 48...62 Hz
Relay	2 change-over contacts (co)
Type of contact	**Type 2** (see "general technical informations")
Test conditions	see "general technical informations"
Rated ambient Temp. Range	-20 °C ... +55 °C
Housing / Installation Frame	Design V4/ Front mounting kit Type ER4
Dimensions (H x W x D) mm	90 x 70 x 58 mm, mounting height 55 mm
Attachment	on rail 35 mm according to EN 60 715 or with screws M4 (option)
Protection Housing/Terminals	IP 30/IP 20
Weight	app. 300 g

Voltage Monitoring Relays

Modern electrical switching plants for power generation and distribution, for tooling and finishing machinery and a number of other drives, are generally equipped with control devices. The use of such instruments, however, also requires that the mains voltage differs only slightly from its nominal value, as otherwise the required accuracy of the measuring results or control commands will not be achieved, or downstream devices may be destroyed by overvoltage.

ZIEHL SW-type voltage monitors are used to monitor the mains voltage in DC, AC and 3-phase networks for under- and/or overvoltage. In the case of deviation of the rated voltage the plant must be switched off or the operator should be warned by an optical or acoustic signal.

Special applications where the SW device can be used are in building machinery, hoisting plant, escalators and travelling staircases, cranes , tooling machinery of all kinds, switching frequency motors and motors with high starting and braking times, as well as emergency plant and electronic devices.

The following table provides a summary of the different models of the ZIEHL-voltage monitors.

Summary

Voltage	AC/DC / 3AC	AC / 3AC	3AC				
Type	**SW32V**	**SW31V**	**UFR1001E**	**SPI1021**	**UFR1002IP**	**SW31K**	
Function	↑↓	↓	↑↓	↑↓	↑↓	↓	
Monitoring of - Undervoltage	X	X	X	X	X	X	
- Overvoltage	X	-	X	X	X	-	
Switching point adjustable	digital	-	digital	digital	digital	-	
Relay output	2 U	2 U	2 U	2 U	2 U	1 U	
Housing	V 4	V 2	V 6	V 6	V 6	K	

Other devices for monitoring of voltage AC/DC you can find at chapter MINIPAN Digital Panelmeters. The Limit-Value-Switch TR210 monitors voltages of DC 0 - 10 V.

Function and Features

When the mains voltage turns on, the integrated relay closes if the voltage values in the mains to be monitored do not fall short or are exceeded. The relay releases if the set limit value falls short. The instruments with overvoltage monitoring switch off if their upper limit is exceeded. According to the switching hysteresis, the switchback points are closer to the rated voltage than to switch off points (see electr. Data).

Single-phase instruments measure phase against N (the single-phase measuring principle). 3-phase current instruments monitor the voltage phase against phase.

Upon request the instruments can also be equipped with measurement phase against N.

These instruments operate with high reliability - even in mains with high interference voltage superimposition - by using integrated overvoltage protection against voltage peaks.

Voltage Relay for three-phase current Type SW31V

also for alternating current networks

SW31V

Part number:
S222281 AC 230 V

Modern electrical switchgear for energy generation and distribution, for treatment and processing machines and for a variety of other drives are usually equipped with measuring and control-engineering devices.
However, the use of such devices demands that the supplied mains voltage deviates only slightly from the nominal value as otherwise the required accuracy of the measurements or the actuating signal is not attained, or downstream units are destroyed by overvoltage.

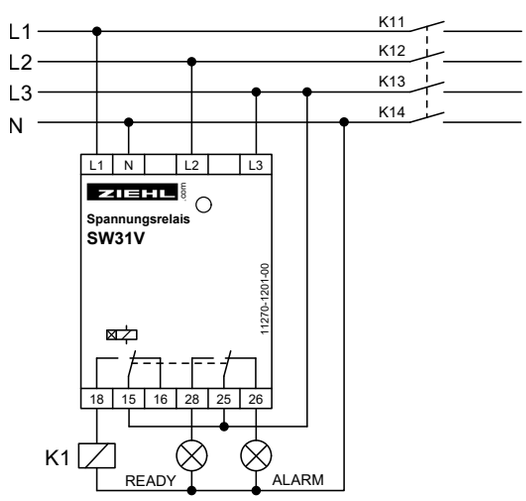
SW series voltage monitors from ZIEHL are used to monitor the mains voltage in direct, alternating and three-phase current networks for undervoltage and/or overvoltage. If the nominal voltage deviates by various values which, depending on the consumer, are not allowed to be undercut, the involved system needs to be disconnected, or at least the operator needs to be optically or acoustically warned.

2

When the mains voltage is applied, the integrated relay picks up if the voltage value preset for the network to be monitored is not undercut. If the set limit is undercut, the relay releases.
Type SW voltage monitors comply with Class III acc. VDE 0435 Part 303, Para. 4.8.2, for static measuring relays (SMR).

Undervoltage monitors (↓) for three-phase current networks with N and alternating voltage networks. The switching point lies at approx. 80% UNom. Hysteresis is approx. 5%. The voltages of the 3 phases are measured against the neutral conductor.
A green LED indicates the unit is ready for service. During undervoltage (<80%), the relay (2 change-over contacts) releases and the green LED goes out.
The housing can be snapped onto 35 mm mounting rails and is perfectly suited for installation in distribution cabinets.

Features:
- Monitoring three-phase current networks 3 AC 400 V with neutral conductor
- Monitoring alternating current networks AC 230 V (connect inputs L1/2/3)
- Monitoring own power supply
- Switching point fixed 80 %
- Output relay 2 change-over contacts
- Panel mounted housing, 35 mm wide



Technical Data

Rated Supply Voltage Us	AC 230 V, +10...-30%, < 5 VA
Frequency	50/60 Hz
Output Relay	2change-over contacts
Type of contact	**Type 2** see "general technical informations"
Test conditions	see "general technical informations"
Rated ambient temperature range	-20 °C ... +55 °C
Hysteresis	approx. 5% U_{Nom}
Delay relay, undervoltage at voltage breakdown	L1/N: ca. 400 ms, L2/L3: ca. 1 s
Dimensions H x W x D	Design V2: 90x35x58 [mm], mounting height 55 mm
Protection housing/terminals	IP 30 / IP 20

Universal voltage monitor SW32V

Over- and undervoltage for DC-, AC- and 3AC voltages

SW32V

Part numbers: **S222276**

ER4  **T224384**

The voltage relay SW32V is a high-grade voltage monitor with a wide measuring-range for monitoring DC-, AC- and 3-phase voltages for over- and/or undervoltage.
In 3-phase power networks phase-symmetry and phase-sequence can also be monitored. The limits are set in Volts. Thus the device can be used at different nominal voltages.

The digital display shows the measured value as well as it helps setting the limits, switching-delays and switching functions.

Application:
As voltage monitor in equipment for generation or ditribution of electric energy, especially in photovoltaic plants and block heating stations,
Monitoring of voltage in machines and plants to protect them from damage caused by failure or deviation of voltage.

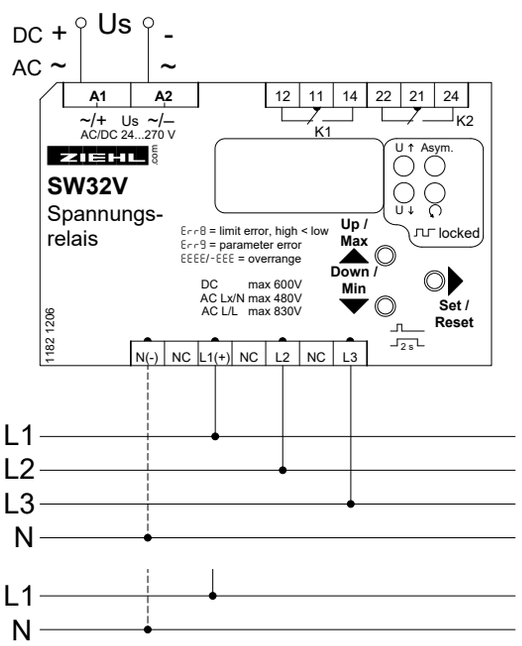
Description

General:
- monitoring of voltage in DC networks DC 10…600 V
- monitoring of voltage in AC networks AC 15…480 V
- monitoring of voltage in 3-phase networks with/without neutral 3AC 26…830 V
- preset values for grid- and plant protection acc. to VDE-AR-N 4110:2018-11
- Asymmetry (5…50%) and phase-sequence-monitoring selectable
- measuring of True RMS
- 2 alarms / relays, each with 1 changeover-contact
- setting of limits and hysteresis in VOLT
- simulation-function to test settings
- codelock against manipulation of settings
- universal power supply AC/DC 24-270 V
- housing for DIN-rail-mount, 70 mm wide, height 55 mm

Display:
- 3 digit display for measured values and settings
- MIN/MAX-values of measured voltages
- 4 LEDs for alarm
- 4 LEDs for displayed inputs
- 2 LEDs for states or relays
- resolution <100V: 0,1V

Switching functions:
- overvoltage with hysteresis, switching- and switch-back time
- undervoltage with hysteresis, switching- and switch-back time
- asymmetry / phase-sequence
- relay-function normally opened mode/normally closed mode, reclosing lock

Accessory: Front Mounting Kit type ER4



Technical Data SW32V

Power Supply	Rated supply voltage Us	AC/DC 24-270 V, 0/45...100 Hz, <5VA DC: 20,4...297 V, AC: 20,4...297 V
Relay-Output		2 change-over contacts **type 2** see "general technical informations"
Measuring Input	Measuring voltage DC	DC 10...600 V
	Measuring voltage phase/phase	AC 26...830 V
	Measuring voltage phase/neutral	AC 15...480 V
	Frequency	40...100 Hz
	Measuring time DC	DC average over 50 ms
	Measuring time AC	< 50 ms
	Measuring accuracy DC	>100V: 0,5% of value ± 1 Digit <100V: 0,5% of value ± 5 Digit (res. 0,1V)
	Measuring accuracy AC with N	>100V: 0,8% of value ± 1Digit <100V: 0,8% of value ± 5Digit (res. 0,1V)
	without N	>100V: 1,0% of value ± 1Digit <100V: 1,0% of value ± 5Digit (res. 0,1V)
	Hysteresis	adjustable 0,1...130 V
	Range asymmetry	5...50%
	Hysteresis asymmetry	fest 1%
	Error asymmetry	± 15% of set value
	Switching delay	0,05...99,9 s
	Switch-back delay	0...999 s
	Time until ready after applying Us	≤ 300 ms (+ switch-back delay)
Test Conditions	Rated impulse voltage	EN 60255
	Overvoltage catagory	6000 V
	Pollution degree	III
	Rated Insulation voltage	2
	Operation time	AC 690 V
	Permissible ambient tempera-ture	100 %
	EMC - immunity	-20 °C ... +55 °C
	EMC - emission	EN 60 068-2-2 dry heat EN 61 000-6-2 EN 61 000-6-4
Housing	Design	V4
	Dimensions (h x w x d)	90 x 70 x 58 mm, mounting height 55 mm
	Protection housing	IP 30
	Protection terminals	IP20
	Attachment	DIN-rail 35 mm or screws M4
	Weight	app. 200 g

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Voltage and Frequency Relay Type UFR1001E

Grid- and Plant Protection VDE-AR-N 4105 and 4110, G98 + G99, DIN V VDE 0126-1-1, VFR2013/2014, NRS 0972-1:2017 Ed 2, Synergrid C10/C11, EN50438:2013, RD1699:2011/RD413:2014 and more

UFR1001E

Part numbers:

UFR1001E	**S222296**
ER6 	**T224386**

The grid- and plant protection device UFR1001E monitors voltage and frequency in plants for own generation of electricity. It complies with the requirements of VDE-AR-N 4105:2018-11, VDE-AR-N 4110:2018-11, G98, G99, ÖVE/ÖNORM E 8001-4-712:2009 and other standards for generators connected to the public grid.

The UFR1001E is a dual-channel device and thus one-fault-proof. The function of the output-relays and of the connected switches can be monitored with feed-back contacts. When a connected switch does not switch off, the UFR does not switch on again. When a switch does not switch on it makes 2 restarts and thus improves availability of monitored plant.

The limits are pre-set according to VDE-AR-N 4105-2018-11, VDE-AR-N 4105:2018-11 and other standards. They can be changed if required and be protected with a code and/or a seal.
With a 2-step test both channels can be tested individually and the triggering time of connected switches is measured.
The standby input allows a remote shutoff e.g. with a RCR.

Monitoring of:
- Under- and overvoltage 15…520 V (with voltage transformers up to 1000V)
- Under- and overfrequency 45…65 Hz
- Quality of voltage (10-minutes-average)
- Vector shift 2…65°, *zuschaltbar*
- Measuring phase-neutral or phase-phase
- ROCOF rate of change of frequency df/dt 0,100...5,000 Hz/s
- Zero voltage U_0 (ANSI 59v0)

Functions:
- One-fault-proof with monitoring of connected switches (defeatable when using the integrated switch of pv and battery inverter acc. to DIN EN 62109 (VDE 0126-4))
- 2 automatic restarts at switch-on error
- Passive anti-islanding protection acc. to ch. 6.5.3 and app. D2
- Switching delay adjustable 0.05 … 300 s
- Switching back delay adjustable 0 … 6.000 s
- Alarm counter for 100 alarms (trip value, cause and rel. time stamp)
- Record of added times of alarms
- Input for standby with counter and recording of time
- Test button and simulation with measuring of switching-times
- Sealing. All values can be read-out when sealed
- Easy installation and programming with pre-set programs
- Housing for DIN-rail-mount, 105 mm wide, mounting

Preset values:
- VDE-AR-N 4105:2018-11 (Pr2), VDE-AR-N 4105-2011-08 (Pr1)
- VDE-AR-N 4110:2018-11 (PR11-14) and BDEW (Pr 3-6)
- G98 (G83/2) and G99 (G59/3) for Great Britain TOR producers type A, B, C, D for Austria
- Synergrid C10/C11 for Belgium
- NA/EEA-NE7 CH 2020 for Switzerland

Accessory: Installation frame ER6 for panel mount

Certificates:

Certificate of conformity Grid and Plant protection acc. to VDE-AR-N 4105 2011-08 and 2018-11 "Plants for generation of own energy in low voltage grid"
Certificate for component VDE-AR-N 4110 and 4120
Cerfitificate of conformity Grid and Plant protection acc. to BDEW requirement "Plants for generation of own energy in medium voltage grid""

Certificate of compliance DIN V VDE 0126-1-1

gelistet bei Energex RED STD00233

TOR Erzeuger A,B,C,D
Certificate ÖVE/ÖNORM E 8001-4-712:2009-12, Enclosure A

approved Synergrid C10/C11

Certificate de conformité
DIN V VDE 0126-1-1, VFR2013/VFR 2014

Certificate of compliance G59/3:2013, G83/2:2012, G99/1-1+2+3:2018 und G98/1-1+2:2018

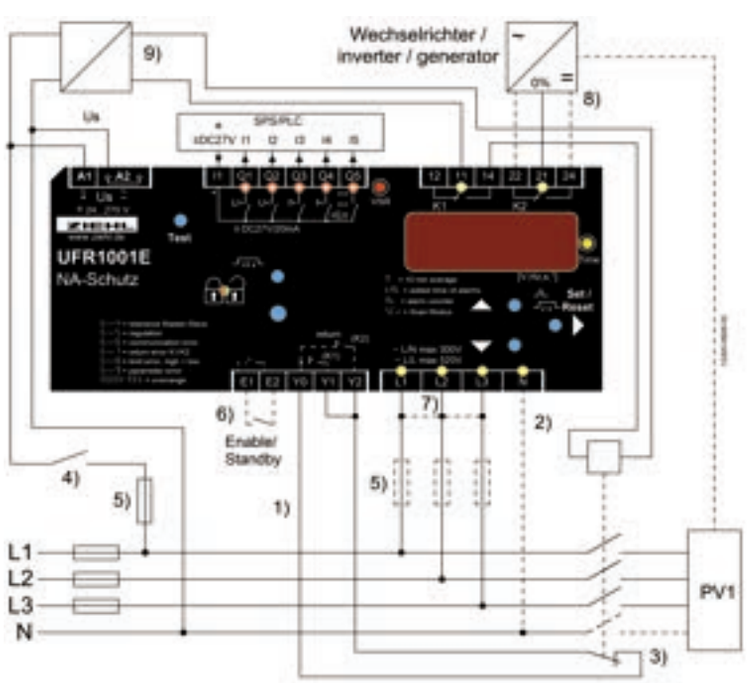
Certificate of compliance EN 50549-1:2019, EN 50438:2013

accepted by Tepco

Netherlands EN50549-1

RD1699:2011 / RD413:2014

Certificate of compliance NRS 097-2-1:2017 2.0 South Africa



Technical Data UFR1001E

Power supply	Rated supply voltage Us	AC/DC 24-270 V, 0/45...65 Hz, <5VA DC: 20,4...297 V, AC: 20,4...297 V
Relay output		2 change-over contacts see operating manual
Voltage	Measurement phase-phase	AC 15...530 V (< 5 V display: 0)
	Setting range phase-phase	AC 15...520 V
	Measuring voltage phase-neutral	AC 10...310 V (< 5 V display: 0)
	Setting range phase-neutral	AC 15...300 V
	Measurement method	true RMS
	Hysteresis	adjustable 1,0...180 V
	Measurement accuracy	with neutral: ±0,6% of measured value without neutral: ±0,8% of measured value
	Accuracy of display	>100V: -1 digit (resolution 1 V) <100V: -1 digit (resolution 0,1 V)
	Measurement functions	3-phase with / without neutral
	Switching-delay (dAL)	adjustable 0,05 (± 15ms)...300,0 s
	Switching-back-delay (doF)	adjustable 0 (approx. 200 ms)...6.000 s
Frequency	Measurement range	40...70 Hz
	Setting range	45,00...65,00 Hz
	Hysteresis	0,05...10,00 Hz
	Measurement accuracy	± 0,04 Hz ± 1 digit
	Switching delay (dAL)	adjustable 0,05 (± 15ms)...300,0 s
	Switching-back-delay (doF)	adjustable 0 (>200 ms)...6.000 s
Vector-Shift	Measurement range	0...90,0°
	Setting range	2,0...65,0°
	Switching-delay (dAL)	< 50 ms
	Switching-back-delay (doF)	adjustable 3...240 s
	Delay at Us on	adjustable 2...20 s
ROCOF (df/dt)	Setting range	0,100...5,000 Hz/s, 4...50 cycles
Digital outputs insulated	Voltage I1	DC 4,5...27 V
	Current Q1...Q5	max. 20 mA / output
Input Feed-back-contacts	Voltage Y0...Y1/2	DC 15...35 V
	Switching time connected switches	adjustable 0,5...99,0 s
Test Conditions		EN 60255
	Rated impulse voltage	4000 V
	Overvoltage category	III
	Pollution degree	2
	Rated Insulation voltage Ui	300 V
	Operating time	100 %
	Operating temperature	-20 °C ... +55 °C
	Storage temperature	-25 °C ... +70 °C
	Climatic conditions (IEC/EN 60721-3-3)	3K5 (except condesation and formation of ice)
	EMC - immunity	EN 61 000-6-2
	EMC - emission	EN 61 000-6-3
Housing	Design / Installation Frame	V6 / Front mounting kit type ER6, 6 TE
	Dimensions (h x w x d)	90 x 105 x 69 mm, mounting height 66 mm
	Protection housing	IP30
	Protection terminals	IP20
	Attachment	DIN-rail 35 mm according to EN 60 715 or screws M4
	Weight	ca. 250 g

Voltage- and Frequency-Relay Type SPI1021

Grid- and Plant Protection according to CEI 0-21 (Italy) and DEWA-standard (Dubai), with integrated Vector-Shift-Relay

SPI1021

Part numbers:

SPI1021	**S222300**
ER6	**T224386**

Declaration of confrmity with requirements of **CEI 0-21 Italy**. *Dichiarazione die confomità alle prescrizioni alla Norma CEI 0-21 Italia..*

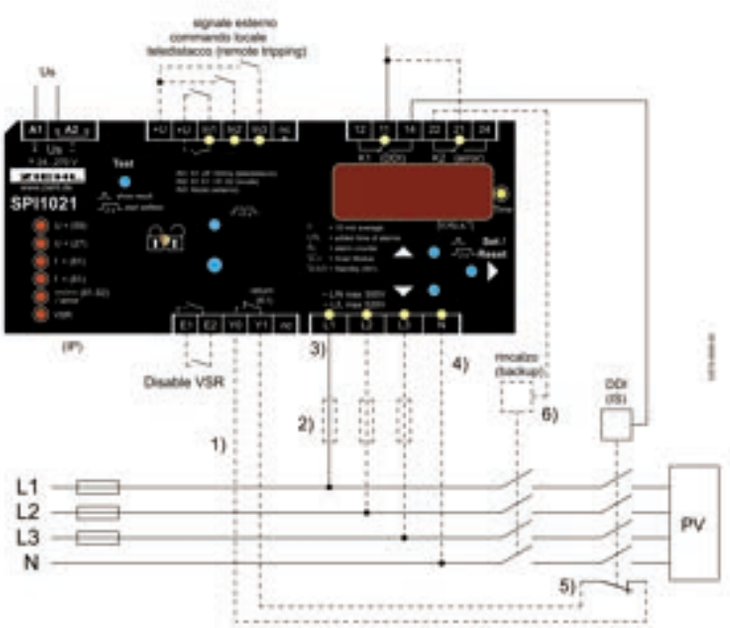
Declaration of conformity with requirements of **DEWA 2016 Dubai (DRRG).**

The SPI1021 monitors voltage and frequency in plants for own generation of electricity. It fulfills the requirements of CEI 0-21 (Italy) and DEWA-standard (Dubai) Interface Protection (IP) according to DEWA Distributed Renewable Resources Generation programme (DRRG19, September 01, 2016).
6 selectable programs allow measuring 3 phases to neutral (4-wire mode), 3 phases phase-phase (3-wire mode) and single phase to neutral (2-wire).
The SPI1021 can monitor all decentralized power, photovoltaic, wind or thermal plants, that feed in the low voltage and medium voltage grid. In applications with possible asymmetry >6 kVA, power balance has to be monitored extra.

With the integrated certified self test, the device can be used in plants < 6kVA.
In programs 1-3 (3= default), the limits are preset according to CEI 0-21. In programs 4-6 they are preset according to DEWA-standard. They can be changed if required and be protected with a code and/or a seal.

A counter for alarms and standbys stores the last 100 events with reason and elapsed time. In addition the time the SPI1021 has interrupted the plant is recorded. All values can be displayed at the device and give the operator valuable information about the availability of the plant.
When the device has been installed, a self-test starts automatically. The self-test can be repeated when required. All values of the test are stored and can be read out at the display.

- Monitoring of under- and overvoltage 15-520 V
- Measuring of 3 phase with or without neutral or single phase
- Monitoring of over- and underfrequency 45-65 Hz
- Monitoring of quality of voltage (10-minutes-average) RocoF "Rate of Change of Frequency" connectable
- Monitoring of vector-shift (connectible)
- Input IN2 for selection of frequency window
- Input In3 for selection of mode transitory or definitive
- Input Y0/Y1 for monitoring function of connected switch (automatic detection of nc/no)
- Relay K2 picks up (on time <500 ms) only at failure at switch connected to K1
- 2 restarts at switch-on error of connected switch Selftest with storing of values
- Switching delays adjustable 0,05…130 s
- Switching-back-delays adjustable 0…999 s
- Different switching time according to type of alarm
- and selected mode
- Switch-on delay 300 s (adjustable) All parameters preset according to CEI 0-21
- Alarm counter for 100 alarms with value. Reason
- and elapsed time
- Recording of added time of alarms Input for standby (off time <50ms) with counter and
- recording of time
- Simulation for testing Sealing, all parameters can be read out while sealed
- Easy installation and programming with 6 preset
- programs Supply-voltage AC/DC 24-270 V
- Housing for DIN-rail-mount, 105 mm wide, mounting height 70 mm
-
-



Accessory: Installation frame ER6 for panel mount

Technical Data SPI1021

Power supply	Rated supply voltage Us	AC/DC 24-270 V, 0/40...70 Hz, <5VA DC: 20,4...297 V, AC: 20,4...297 V
Relay output		2 change-over contacts
Measuring voltage	Voltage phase-phase	AC 15...530 V (< 5 V display 0)
	Setting range phase-phase	AC 15...520 V
	Voltage phase-neutral	AC 10...310 V (< 5 V display 0)
	Setting range phase-neutral	AC 15...300 V
	Measurement method	true RMS
	Hysteresis	adjustable1,0...99,9 V
	Measurement accuracy (with neutral)	±0,6% of measured value
	Measurement accuracy (without neutral)	±0,8% of measured value
	Accuracy of display	>100V: ±1 digit (resolution 1 V) <100V: ±1 digit (resolution 0,1 V)
	Measurement functions	3-phase with / without neutral, single phase
	Switching-delay (dAL)	adjustable 0,05 (± 15ms)...130,0 s
	Switching-back-delay (doF)	adjustable 0 (= 40ms)...999 s
Measuring frequency	Measurement range	40...70 Hz
	Setting range	45,00...65,00 Hz
	Hysteresis	0,05...10,00 Hz
	Measurement accuracy	± 0,01 Hz ± 1 digit
	Switching delay (dAL)	adjustable 0,05 (± 15ms)...130,0 s
	Switching-back-delay (doF)	adjustable 0 (= 40ms)...999 s
Vector-Shift	Measurement range	0...45,0°
	Measurement range	2,0...20,0°
	Switching-delay (dAL)	< 50 ms
	Switching-back-delay (doF)	adjustable 3...240 s
	Delay at Us on	adjustable 2...20 s
Digital inputs (INx)	Switching voltage + U	DC 15...37 V
	Current INx	> 3 mA
Input Feedback contact	Switching voltage Y0...Y1	DC 15...35 V
	Current Y1	> 3 mA
	Switching time connected switches	adjustable 0,5...99,0 s
Housing	Design / Installation Frame	V6 / Front mounting kit type ER6, 6 TE
	Dimensions (h x w x d)	90 x 105 x 69 mm, mounting height 70 mm
	Wiring connection single strand	1 x 4 mm2
	Finely stranded with wire end ferule	1 x 2,5 mm2
	Protection housing	IP30
	Protection terminals	IP20
	Attachment	DIN-rail 35 mm according to EN 60 715 or screws M4
	Weight	ca. 250 g

Voltage and Frequency Relay Type UFR1002IP

Grid- and Plant Protection VDE-AR-N 4105, 4110, 4120, IP interface and LCD-Display

UFR1002IP

Part numbers:

UFR1002IP	**S222301**
ER6 	**T224386**
VG1200	**S222312**

The grid decoupling relay UFR1002IP is the "big brother" of the UFR1001E and monitors voltage and frequency in three-phase and AC grids.

With a color LCD display (German/English) and joystick, it is even easier to operate than the UFR1001E. Measured values and settings are clearly displayed. The device can be programmed, updates installed and the alarm memory read out via the integrated IP interface. The real-time clock (with power reserve) simplifies the traceability of the alarms. Up to 1,200 V can be monitored in conjunction with the VG1200 coupling device.

The device has a two-channel, single-fault-safe design and thus meets the requirements of VDE-AR-N 4105:2018-11. The function of the connected switch is monitored. If monitoring is activated, the device does not switch on again if a switch-off error is detected.

Limit values for different applications are preset. Where permitted, they can easily be changed. If the nominal voltage is changed, the device automatically adjusts the limit values that have already been set.
With the standby input, a remote shutdown can be implemented, e.g. with a ripple control receiver.

Monitoring of:
- Under/over voltage 15-520V (with ZIEHL VG1200 coupling device up to 1,200 V)
- Under/over frequency 45-65 Hz
- Voltage quality (10-minute average)
- Vector shift 2-65°
- ROCOF, rate of change of frequency df/dt 0.100...5.000 Hz/s
- Zero voltage U0 (ANSI 59v0)
- passive anti islanding protection

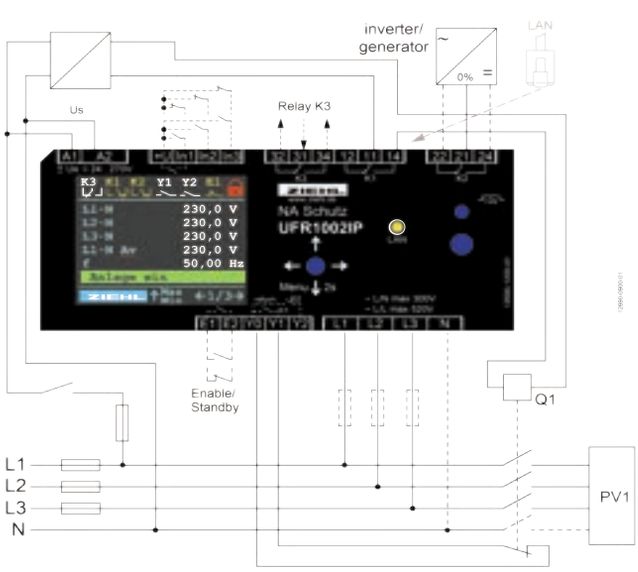
Approvals/certificates:
Germany:
- Certificate of conformity Grid- and Plant protection acc. to VDE-AR-N 4105 2018-11 "Plants for generation of own energy in low voltage grid"
- Certificate for component VDE-AR-N4110 and 4120

Great Britain:
- Certificate of compliance G98/1-7:2022 and G99/1-9:2022

Austria:
- Clearance Certificate TOR Producer Type A and TOR Producer Type B

Sweden nät och systemskydd:
- Certificate of compliance EN 50549-1:2019. EN 50549- 2:2019

Features:
- single-fault-proof, with monitoring of connected switch (can be switched off when using the integrated switch of PV and battery converters
- Programmable restart attempts in the event of a switch-on error in the connected switch
- Relay K3 with programmable functions, including life contact, delayed switch-on signal for switches or error messages
- Response time adjustable 0.05 … 300,0 s
- Switch-back time adjustable 0 … 6,000 s
- Preset according to VDE-AR-N 4105-2018-11 (Pr1.02, Pr. 1.08 + 1.09) and VDE-AR-N 4105-2011-
- 08 (Pr 1.01)
  Preset according to VDE-AR-N 4110-2018-11
- (Pr 1.11-1.14) and bdew guideline (Pr 1.03-1.06)
  automatic adjustment of the switching points when
- the nominal voltage is changed
  Alarm counter for 100 alarms (with trigger value,
- cause and date/time, time of restart)
- 3 programmable digital inputs
  Standby counter and timer with standby on/off date/
- time
  Test and simulation function with measurement of
- switch-off times
- Sealing option and code protection for settings
  Interface ethernet TCP/IP, values available via
- modbus TCP
  Simple commissioning and programming thanks to preset basic programs and transmission via IP
- interface
- Supply voltage AC/DC 24-270 V
  Housing for DIN-rail mount, 105 mm wide, installation depth 66 mm



Accessory: Installation frame ER6 for panel mount
ZIEHL Coupling device VG1200

Technical Data UFR1002IP

Power supply	Rated supply voltage Us	AC/DC 24-270 V, 0/50/60 Hz, <4,5 W, < 12,5 VA DC: 20,4...297 V, AC: 20,4...297 V
	bridging at dropping Us	230 V -> 0 V: 1,2 s
Relay output		3 change over contacts, see operating manual
Voltage	Measurement phase-phase	AC 15...530 V (< 5 V display 0)
	Measuring voltage phase-neutral	AC 10...310 V (< 5 V display 0)
	Setting range	AC 15...520 V
	Measurement method	true RMS
	Measurement accuracy	≤0,8 % of nominal voltage
	Measurement functions	3-phase with / without neutral
	Switching-delay (dAL)	adjustable 0,05 (± 15 ms)...300,0 s
	Switching-back-delay (doF)	adjustable 0 (> 200 ms)...6.000 s
	Input resistance phase - phase and phase - N	993 kΩ
Frequency	Measurement range	40...70 Hz
	Setting range	45,00...65,00 Hz
	Measurement accuracy	± 0,05 Hz
	Switching delay (dAL)	adjustable 0,05 (± 15 ms)...300,0 s
	Switching-back-delay (doF)	adjustable 0 (> 200 ms)...6.000 s
ROCOF (df/dt)	Setting range	0,100...5,000 Hz/s, 4...50 cycles
Digital outputs insulated	E1/E2, Y0...Y2, In1...In3	DC 15...35 V
Test Conditions		IEC/EN 60255
	Rated impulse voltage	4000 V
	Overvoltage category	III
	Pollution degree	2
	Rated Insulation voltage Ui	300 V
	Operating time	100 %
	Operating temperature	-20 °C ... +55 °C
	Storage temperature	-25 °C ... +70 °C
	Climatic conditions (IEC/EN 60721-3-3)	3K5 (except condensation and formation of ice)
	EMC - immunity	EN 61 000-6-2
	EMC - emission	EN 61 000-6-3
Housing	Design / Installation Frame	V6 / Front mounting kit type ER6
	Dimensions (h x w x d)	90 x 105 x 69 mm, mounting height 55 mm
	Protection housing/terminals	IP30/20
	Attachment	DIN rail 35 mm according to EN 60 715 or screws M4
	Weight	approx. 290 g

Coupling Device for Voltage Type VG1200

Measuring of voltages up to 1.200V with NA-Box UFR1200IP

VG1200

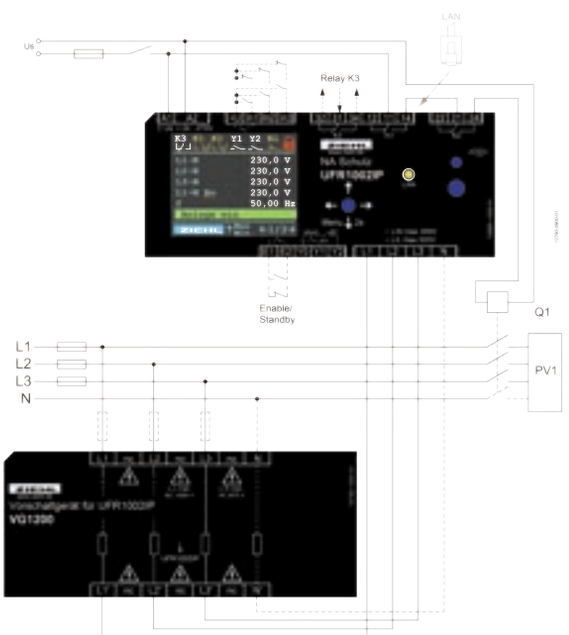
Part numbers:

VG1200	**S222312**
UFR1002IP	**S222301**

In order to achieve higher efficiencies and to reduce line losses, inverters with a higher output voltage than the usual 3AC 400 V are often used in large on-site generation systems.
So that the grid and system protection can monitor this high voltage, it must be reduced. This is usually done with voltage converters.
With the VG1200IP coupling device, an ohmic voltage divider is available that takes on this task. In conjunction with the VG1200 coupling device, the UFR1002IP can measure voltages of up to 1200 V. The display in the UFR1002IP is scalable. This means that the voltages at the input of the VG1200 are displayed and the limits for protection against over- and undervoltage are set accordingly.
Both devices together meet the requirements of VDE-AR-N 4110 (feeding into the medium-voltage grid).

- Measuring of voltage up to 1200 V
- Measuring tolerance ≤ 1,2% of nominal voltage (of UFR1002IP)
- No voltage converters required
- Display of the correct voltage on the UFR1002IP (scalable)
- No supply voltage required
- Housing V6, 105 mm wide

Accessory:
ZIEHL NA-Box UFR1002IP



Technical Data

Measurement	3AC + N
Nominal voltage Un L-N	250...690 V
Nominal voltage Un L-L	440...1200 V
Measuring range	0...1,25 Un (continously)
Measurement tolerance UFR1002IP + VG1200	≤ 1,2% of nominal voltage (of UFR1002IP)
Frequency range	AC 45...65 Hz
Overvoltage category	III
Pollution degree	2
Protection category	II (with UFR1002IP)
Rated impulse voltage	10,5 kV
Basic isolation	L1, L2, L3, N
Reinforced isolation	Electronics - Housing
Internal resistance Ri	1,8 MOhm / measuring channel
Residual current (single error)	<0,9 mA @1500 V_{L-L}
Protection class	Housing = IP30 / Terminals = IP20
Perm. ambient temperature	-20 °C ... 55 °C
Housing	Design V6
Dimensions (H x B x T)	V6: 90x 105 x 58 [mm], Fitting height 55 mm
Attachment	35 mm standard rail according EN 60 715

Voltage Monitor for 3-Phase Networks Type SW31K

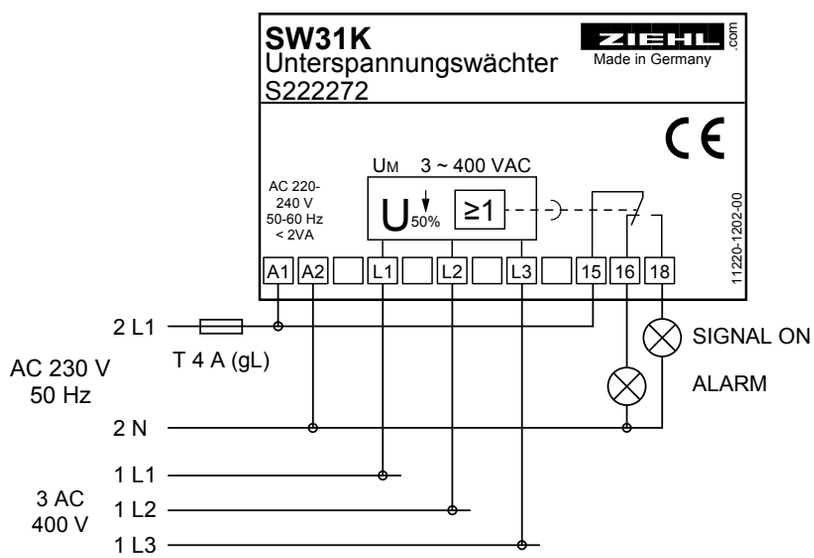
Undervoltage

SW31K

Part numbers:
S222272 AC 400 V
S222271 AC 690 V
Special Versions upon request

Undervoltage monitor for three-phase networks without N for monitoring on voltage failure. The voltage is being measured between phases and an artificial neutral point. At symmetrical decrease of the voltage to approx. 50% of the nominal value or in case of failure of a phase the integrated relay (1 change-over contact) releases with a delay of approx. 1s. With engines running-on on 2 phases, so much back voltage can be produced that the failure of a phase may be not detected. The SW31K is available for measuring voltages AC 400 V and AC 690 V. As supply voltage in the standard version AC 230 V is needed.

Application:
- Monitoring of three-phase networks on loss of a phase
- monitoring of fuses



Technical Data

Rated supply voltage U_s	AC 230 V, +10...-15%, < 3 V
other Voltages	upon request
Frequency	50/60 Hz
Relay-Output	1 change-over contact (co)
Type of Contact	**Type 2** see "general technical information"
Testing Conditions	see "general technical information"
Rated ambient Temp. Range	-20 °C ... +55 °C
Hysteresis	app. 10% U_{Nenn}
Switching delay	app. 1 s
Dimensions (H x W x D) mm	Design K: 75 x 22 x 115 mm
Protection Housing/Terminals	IP 30 / IP 20
Weight	app.135 g

Current Recognition Relays for Alternating Current Type STW

General

ZIEHL current monitors for current recognition are electronic measuring relays for current monitoring in up to 8 measuring circuits. The current is captured by STWA1 type current transducers. Current monitors in OR-evaluation (STW1K, STW12V and STW12), in AND-circuits (STW20K, STW20V) or for individual monitoring STW12 are available for different monitoring tasks. OR-circuit current monitors signal if at least one of several monitored lines is connected.
AND-circuit current monitors signal if not all lines are connected.

Summary

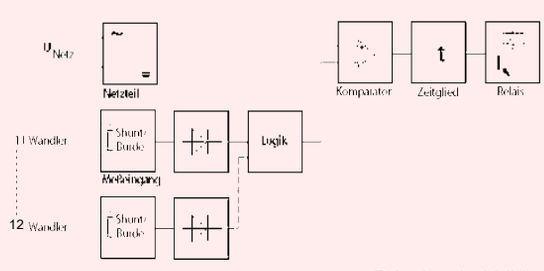
Type	**STW20K**	**STW20V**			
Number of circuits	3	3			
Connection via change-over STWA 1 or Current-Sensor S1	X	X			
Response value	1 A	1A 2 x 1 - 5 A			
Relay output	2 U	2 U			
Transistor outoput	-	-			
Operating mode	cl.-circuit current	cl.-circuit current			
Evaluation principle	AND	AND			
Current/voltage comparison	-	-			

Function and Features

In case of current flow through a connected STWA1 type transformer, a voltage is induced at the current monitor input. This voltage is captured, evaluated, and releases corresponding switching functions.
Due to the simple yes/no evaluation of current recognition and the permission of relatively high tolerances (±20%) in the transformer and evaluation device, a wide variety of functions can be created with a good performance at moderate prices. The operating state of consumers outside the switch cabinet can be captured without a direct feedback of the consumer (costly and work-intensive wiring being unnecessary).

If the switching threshold is not reached due to low currents of less than 1 A, the monitored wire should be led multiple times through the transformer.

Current relays of type STW conform to VDE 0435 part 303, 4.8.2



Prinzipschaltbild

Current-Relay Type STW20K

AC-Detection, AND-Evaluation, 3 Transformers

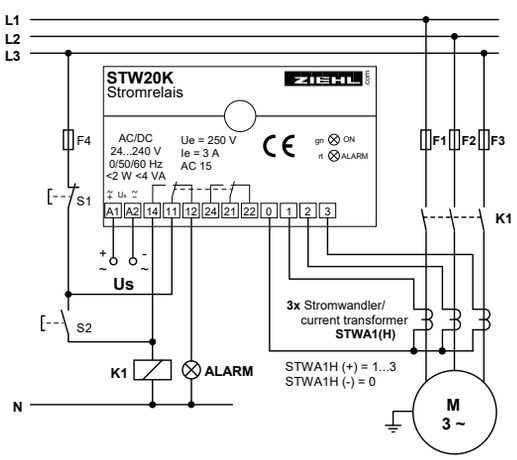
STW20K

Part number:
S225121 AC/DC 24-240 V

The current relay STW20K monitors the current in up to 3 lines with current transformers STWA1 (AND circuit). If there is a current in all 3 monitored lines, the relay (2 change-over contacts) picks up. If there is no current in at least one of the lines, the relay releases. The relay works in closed circuit current. When voltage is applied to the STW, the relay signals an alarm until the it has picked up.

Applications:
Identifies power failure with 1- or 3-phase electrical consumers, e.g. with monitoring of heating elements or heating installations where a constant heating has to be guaranteed.
A further application is the identification of phase failure, monitoring of fuses, or triggering of operating hours counters.
If the switching threshold is not reached due to low currents of less than 1 A, the monitored wire should be led multiple times through the transformer. Not required inputs have to be connected to a occupied input.

Features
- 3 current transformers STWA1
- AND-evaluation
- relay output 2 CO
- Switching point approx. AC 1 A
- LED-display for power on and alarm
- housing design K



Technical Data

Power supply Us	AC/DC 24 - 240 V, 0/50/60 Hz, < 1 W, < 4 VA (DC 20 - 297 V, AC 20 - 264 V)
Output relay	2 CO
Type of contact	**type 2** see "general technical informations**"**
Function	3 channel/AND
Transformer input	1 to 3, type STWA 1
Overload cap.continous/max 10s	100 A / 300 A
Switching point on	≤ AC 1 A
Switching point off	≥ AC 0,3 A
Tolerance	± 20%
Switch-off delay	approx. 0,3 s
Switch-on delay	approx. 0,3 ms
Testing conditions	see "general technical informations**"**
rated ambient temperature range	-20 °C … +55 °C
Dimensions H x B x T	design K: 75 x 22,5 x 110 [mm], 12-pol
Protection housing / terminals	IP 30 / IP 20
Weight	approx. 120 g

Current-Relay Type STW20V

AC-Detection, AND-Evaluation, 3 Transformers

STW20V

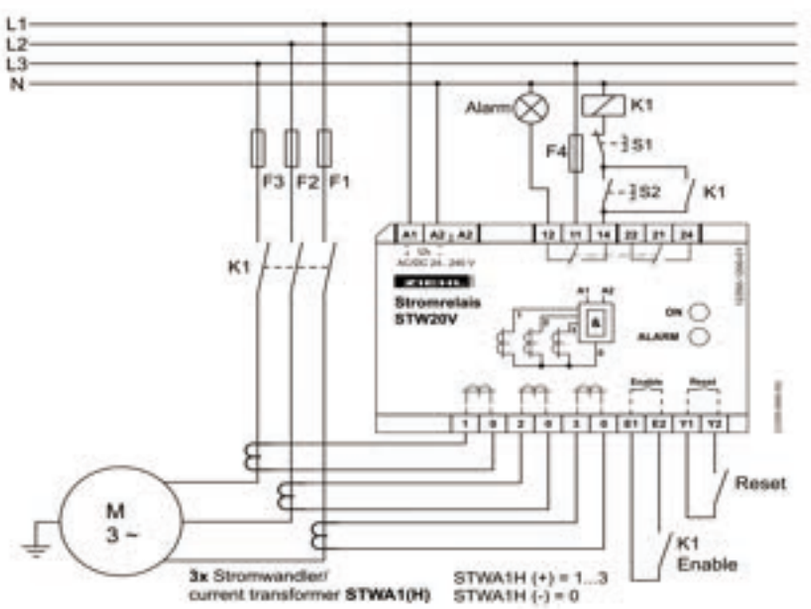
Part number:
S225124 AC/DC 24-240 V

The current relay STW20V monitors the current in up to 3 lines with current transformers STWA 1 (AND circuit). If there is a current in all 3 monitored lines, the relay (2 change-over contacts) picks up. If there is no current in at least one of the lines, the relay releases.
The relay works in closed circuit current. When voltage is applied to the STW, the relay signals an alarm until the it has picked up. This can be avoided if the device is constantly alive and monitoring is started by closing a contact at the Enable input. With a bridge at the Enable input, monitoring is automatically started when voltage is applied.

- 3 inputs (transformer STWA1)
- 3 x current-sensor S1 (power-supply required)
- AND-evaluation
- output relay 2 CO
- switching point app. AC 1 A
- Enable-input
- storage of alarms or Auto-Reset
- LEDs power on and alarm
- housing V4 for mounting on DIN-rail or wall-mount

Applications:
Identifies power failure with 1- or 3-phase electrical consumers, e.g. with monitoring of heating elements or heating installations where a constant heating has to be guaranteed.
A further application is the identification of phase failure, monitoring of fuses, or triggering of operating hours counters.

2



Technical Data

Power supply Us	AC/DC 24 - 240 V, < 3 W, < 5 VA, (AC 20 - 264 V, DC 20,4 - 297 V) AND-evaluation
Function	AND-evaluation
Transformer input	1 or 3, type STWA 1
Overload cap. continious/max.10s	100A / 300 A
Switching point on	≤ AC 1 A
Switching point off	≥ AC 0,3 A
Switch-off delay	approx. 0,3 s.
Switch-on delay	approx. 0,3 s.
Overload capacity cont./max.10s	100 A / 300 A
Output relay	2 CO
Type of contact	**type 2** see "general technical informations"
Testing conditions	see "general technical informations"
rated ambient temperature range	-20 °C … +55 °C
Dimensions H x B x T	design V 4: 90 x 70 x 58 [mm]
Protection housing / terminals	IP 30 / IP 20
Weight	approx. 240 g

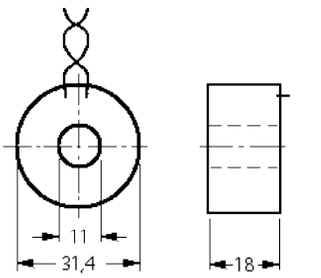
Current Transformer Type STWA1/STWA1H

for recognition of AC-currents

Current Transformer STWA1

for monitoring current yes/no

Part number: **S225201**



Dimensions in mm

The STWA1 current transformer is made to match the STW current monitor. One current transformer is required for each line being monitored. The STWA1 consists of a climate-proven sealed-in coil with toroidal tape core. The connection cables are permanently fixed to the transformer and are 1 m in length. The level of the current to be monitored is limited to 100 A continously, 300 A for max. 10s.

In case of current of more than approx. 5 A, an LED can be triggered directly via the STWA 1 current transformer. Thus it's easy for users to visually monitor the current conduction in a line. The LED is protected by an anti-parallel diode or by its connection in series. A protective resistor is necessary depending on the LED used or the level of current being monitored.

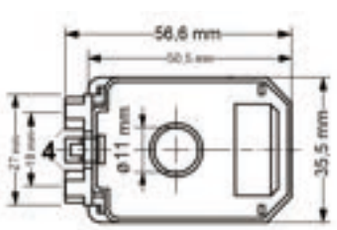
Current Transformer STWA1H

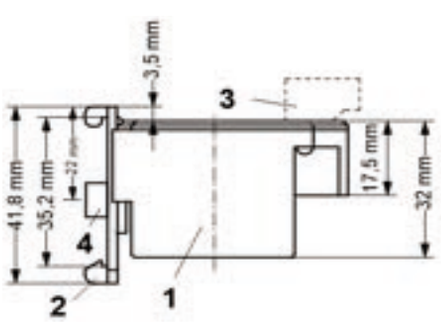
for DIN-rail-mount or screw-mount

Part number: **S225506**

Current-transformers STWA1H can be fixed on a 35 mm DIN-rail or with 2 screws.
The electrical connection is made via pluggable terminals.
The cables are led vertical through the transformer (right angle to 35 mm-rail). The available diameter is 11 mm.

A built-in LED lights up at currents > app. 2 A. Even short current pulses are visible.
ZIEHL current monitor type STW or an external LED can be conntected to the terminals. The built-in resistor protects the LED from overload.
The STWA 1 H can also be used to visualize current-flow in stand-alone mode, without connecting it to a current monitor.





1 Housing
2 Clip for DIN-rail
3 Terminal (pluggable)
4 Wall-mounting (M4)

Electronic Current Transformers

Current-Detection and Measuring-Transducers

General

Electronic current-transformers are compact and good-valued devices for the detection of a current in a wire.
Electronic current-transformers and current-sensors give a signal, when there is a current in a wire. At STWA1SEH and at current-sensors S1 the response-value is adjustable. The evaluation of the signals usually is made with digital inputs of PLCs. STWA1LH can directly switch AC-signals up to 230 V / 0,5 A.
Electronic current-transformers as measuring-transducers supply a signal 0-20 mA or 4-20 mA at the output that is proportional to the measured current. The output-signal of the STWA1FH is a frequency, which can be evaluated with digital inputs of PLCs.

Overview

Function	Current-detection yes/no				Measuring-Transducer for AC-current			Current-detection
Type	**Current-sensor S1**	**STWA1S**	**STWA1SH**	**STWA1SEH**	**STWA1AH**	**STWA2AH**	**STWA1FH**	**STWA1LH**
Measuring-input	AC/DC	AC	AC	AC	AC	AC 0-20/ 0-100 A	AC 0-20 A	AC
Response-value	5-30 A	2 A	2 A	2-10 A	-	-	-	2-20 A
Output	Transistor PNP/NPN	Transistor	Transistor	Transistor	DC 0-20 mA	DC 4-20 mA	Transistor 0,5-20 Hz	Triac 0,5 A
Housing	S 1	Ø 34,5 mm	H	H	H	H	H	H

Comparison Current Sensors S1

Type		**Current Sensor S1**	**Current Sensor S1 - Version 2 with Switch on/Switch off delay**
Part number		S225694	S225697
Current		5 - 30A AC/DC	5 - 30A AC/DC
Switch on/Switch off delay		-	0 - 10 min
Output		1x PNP, 1x NPN	1x PNP or NPN, 1x +24V
Output load capacity		20 mA	20 mA
Display	LED yellow	Switching state output	Switching state output
	LED green	-	Output type
Setting		Potentiometer	Button + Potentiometer
Connection type		Connecting cable	M12 - connector
Supply voltage		DC 24 V	DC 24 V

Functions and Properties

The current-sensors S1 are attached at the outside of the monitored wire, e.g. with a cable-tie or velcro tape. With help of a hall-sensor they detect AC- and DC-currents in the wire. The response-value depends on the orientation of the sensor to the current (distance, angle). Neighboured wires can have an impact.

At Electronic current-transformers the monitored wire is pushed through the hole (11 mm) in the transformer. A built-in coil transforms the current into a measuring-signal. This signal is evaluated by the built-in electronics and transduced into the required output-signal. A supply-voltage is not necessary (except STWA1FH and current-sensor S1). The STWA2AH is loop-powered (4-20 mA). Electronic current-transformers in housing type H can be fixed on an 35 mm DIN-rail or with 2 screws M4. The terminals are pluggable.

Current Sensor S1 for AC and DC currents

Put-on sensor with transistor-output, adjustable

Current sensor S1
for AC and DC currents

Part number: **S225694**

The current sensor S1 records the current in a cable with a hall-sensor. At currents of adjustable 5-30 A the transistor-outputs switch and report a current in the monitored cable.
The current sensor can be fixed with a cable fastener (apply to only 1 cable). Thus it can be mounted subsequently without disconnecting the cable.
As supply-voltage DC 24 V are required.

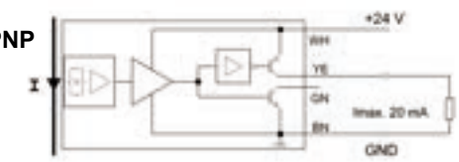
The current sensor can be connected to ZIEHL current-relays for current detection yes/ no and to ZIEHL controls for extraction systems. The connection to a digital input of a PLC also is possible.

Application:
Recording of welding currents (mounting at ground wire) for controlling dedusting plants in combination with ZIEHL-controls type STW.
Recording of the state of a consumer of electricity (on or off or defective).
In general the current sensor S1 is used where the current flow is to be detected, with the exact value of the current either known from the power consumption of the connected consumer or does not matter for the evaluation.
For evaluation of measuring data in more than 1 cable, the outputs of several current sensors can be connected in parallel (or-evaluation).

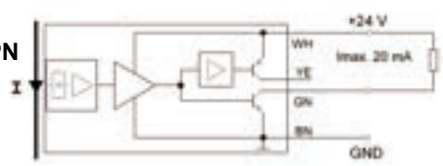
- switching point adjustable 5-30 A
- LED for current flow
- monitoring of AC and DC currents
- mounting without disconnection of cable possible
- 2 transistor-outputs, switching + and -
- direct connection to a PLC possible
- connection to current-relays ZIEHL type STW
- sturdy, sealed execution
- overload capacity: unlimited
- test-voltage 2,5 kV

2

PNP



NPN



Technical Data

Supply voltage Us	DC 24 V ±20%, 12 mA
Switching point at Tu = 25°C	adjustable AC/DC 5-30 A
Tolerance	± 20%
Repeat accuracy	± 2%
Temperature coefficient	typical < ± 0,2 A/K, max. ± 0,45 A/K
Frequency of measured current	0 / 10 ... 400 Hz
Overload cap. continious/< 1min	500 A / 1000 A
Output 1	DC 24 V, + switching, max. 10 mA
Output 2	DC 24 V, - switching, max. 10 mA
On- / off-delay	app. 300 ms
Rated ambient temperature range	0 °C ... 55 °C
Dimensions (l x w x h)	75 x 16,5 x 10 mm
Cable for connection	app. 2 m, 4 x 0,34 mm2
Attachmant	e.g. with cable fastener (not included)
Weight	app. 150 g (cable included)

Current Sensor S1(V2) for AC and DC currents

Put-on sensor with switch on/switch off delay, with transistor-output, adjustable

Current sensor S1
Version 2 with switch on/switch off delay
for AC and DC currents

Part number: **S225697**

The current sensor S1 records the current in a cable with a hall-sensor. At currents of adjustable 5-30 A the transistor-outputs switch and report a current in the monitored cable.
The current sensor can be fixed with a cable tie or velcro tape (apply to only 1 cable). Thus it can be mounted subsequently without disconnecting the cable. As supply-voltage DC 24 V are required.

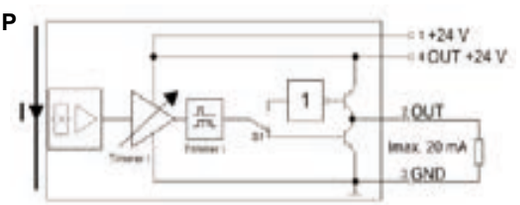
The current sensor can be connected to ZIEHL current-relays for current detection yes/ no and to ZIEHL controls for extraction systems. The connection to a digital input of a PLC also is possible.

Application:
Recording of welding currents (mounting at ground wire) for controlling dedusting plants in combination with ZIEHL-controls type STW.
Recording of the state of a consumer of electricity (on or off or defective).

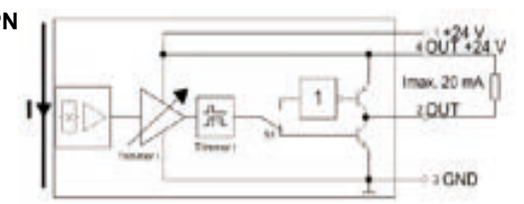
In general the current sensor S1 is used where the current flow is to be detected, with the exact value of the current either known from the power consumption of the connected consumer or does not matter for the evaluation.
For evaluation of measuring data in more than 1 cable, the outputs of several current sensors can be connected in parallel (or-evaluation).

- switching point adjustable 5-30 A
- LED for current flow
- monitoring of AC and DC currents
- mounting without disconnection of cable possible
- 2 transistor-outputs, switching + and -
- direct connection to a PLC possible
- connection to current-relays ZIEHL type STW
- sturdy, sealed execution
- test-voltage 2,5 kV

PNP



NPN



Technical Data

Rated supply voltage Us:	**DC 24 V**
Tolerance	10 … 28 V DC
Current consumption	max. 12 mA + max. 20 mA NPN / PNP
Power consumption	< 0,7 W
Monitoring function :	**Current monitoring**
Switching threshold at Tu = 25°C	AC/DC > 5…30 A
Tolerance	± 20 %
Repeatability	± 2 %
Temperature dependence	Typical < ±0,2 A / K
Frequency of the measuring current	DC, AC 10 ... 2,5 kHz
Continuous overload capacity	500 A
Overload capacity max. 1 minute	1000 A
Response time	ca. 300 ms
Display of the switching function	LED yellow
Output PNP (Switching Plus):	**Open Collector**
Output current	≤ 20 mA
Short circuit	≤ 3 s
Output NPN (Switching Minus)	**Open Collector**
Output current	≤ 20 mA
Short circuit	≤ 3 s

Test conditions	IEC/EN 61010-1	
Rated insulation voltage Ui	300 V	
Rated impulse voltage	4000 V	
Overvoltage category	III	
Insulation material group I	CTI = 600	
Pollution degree	3	
Safe separation	Enclosure - input/output	
Test voltage	AC 3510 V / 50 Hz	60 s

EMC-tests :	EN 61326
Interference emission:	
HF radiated - EN 55011	Class B
HF conducted - EN 55011	Class B
Interference immunity:	
ESD IEC/EN 61000-4-2	±8 kV Air discharge
HF- radiated IEC/EN 61000-4-3	10V/m
Burst IEC/EN 61000-4-4	2 kV
Surge IEC/EN 61000-4-5	±1 kV
HF-conducted IEC/EN 61000-4-6	3V/m
Oscillators	
- Operation (IEC 60255-21-1) IEC 60068-2-6	Class 2
- Transport (IEC 60255-21-1) IEC 60068-2-6	Class 1
- Earthquake IEC 60255-21-3)	Class 1
Shock	
- Operation (IEC 60255-21-2)	Class 2
- Transport (IEC 60255-21-2)	Class 1

Distances to live conductors		
Current	**Distance DC**	**Distance AC 50Hz**
10 A	> 5 mm	> 25 mm
20 A	> 5 mm	> 50 mm
40 A	> 40 mm	> 80 mm

Reliability	EN 61709/ SN29500		
Ambient conditions	Local operation in dry rooms		
Operation time 24/7/365	8760 h/y		
Failure rate (FIT)	Tu = 40 °C	Tu = 60°C	Tu = 80°C
Tu = Tref (Component not in operation)	368 FIT	689 FIT	1377 FIT
	100 (310) years	100 (165) years	82 years

Installation conditions	
Temperature range	
- Operation	0 °C … +50 °C
- Transport	-25 °C … +55 °C
- Storage	-25 °C … +55 °C (70 °C max. 24 h)
Height position	
- Maximum installation height	2000 m NN
Climate resistance	
- Enviroonmental class EN60721-3-3	3K3
Air humidity	
- Humid heat (IEC60068-2-30)	55 °C and 93% r.F.

Connection	M12-Connector
Protection	IP68
PIN 1	DC 24 V ±20%
PIN 2	OUT max. 20 mA
PIN 3	GND
PIN 4	Out-24 V

Housing	Type S1
Dimensions (W x H x D)	30 x 27,5 x 116,1 mm
Enclosure material	PA66
Fire protection class	UL 94 V-0
Protection	IP64
Mounting	with cable tie or velcro tape
Mounting position	According to current direction
Weight	app. 65g

Subject to technical changes

AC-Electronic Current Transformer Type STWA1S

with transistor-output

STWA1S
Electronic current transformer
with fixed switching-point

Part number: **S225195**

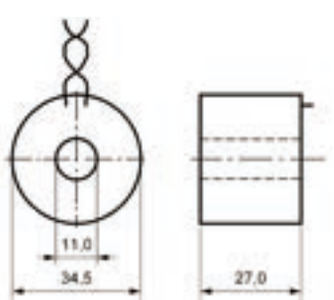
The STWA1S has an integrated electronic with transistor-output. The switching point is 2 A. Above app. 2 A the output transistor is switched on (LOW), below app. 1.5 A it is off (HIGH).
The conductor is simply pushed through the transformer.Multiple loops reduce the switching point correspondingly, for instance to 0.5 A with four loops. A supply voltage is not required.

Application: The STWA1S is used where current flow is to be detected, with the exact value of the current either known from the power consumption of the connected consumer or does not matter for the evaluation.
For simultaneous evaluation of the current flow in several conductors the STWA1S device can be connected in series (AND circuit, pay attention to the voltage drop) or in parallel (OR circuit, pay attention to the leak current).

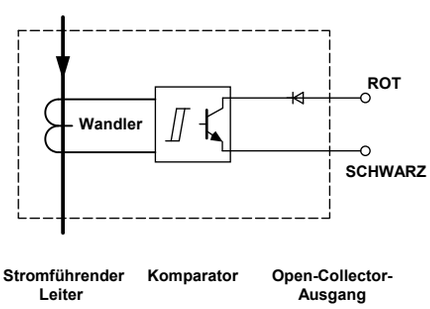
- isolated transistor-output max. DC 40 V/40 mA
- output can be directly connected to the digital input
- of a PLC
- integrated diode for reverse voltage protection
- 2-wire-connection, 1 m
- no supply voltage required
- transformer and electronic unit enapsulated in a
- climate-proof housing
- plug-in current transformer (Ø 11 mm)
- max. overload 100 A continously, 300 A / 10 s
-

Switching point at Tu = 25°C	AC 2 A +20/-40%
Hysteresis	approx. 6%
Repeat accuracy	±5 %
Temperature dependence	0 °C ... 55 °C: <0,5%/K (-20...0°C: <2,5%/K)
Overload cap. continous / 10s	100 A / 300 A
Output voltage/current max.	DC 40 V / 40 mA
Voltage drop (ON)	max. 3 V
Leak current (OFF)	max. 0,6 mA
Switch-on /switch-off delay	app. 50 / 200 ms
nominal frequency/ operating range	50 Hz/ 30...70 Hz
error	≤ 1%/Hz
rated ambient temperature range	-20 °C ... +55 °C
Housing	
Dimensions (Ø x H)	Design S
Diameter for conductor	34,5 x 27 mm
Weight	11 mm
	app. 60 g

Dimension illustrations



Dimensions in mm



Electronic current transformer STWA1S

AC-Electronic Current Transformer Type STWA1SH

2 A, with transistor-output

STWA1SH
Electronic Current Transformer with
fixed switching point

Part number: **S225550**

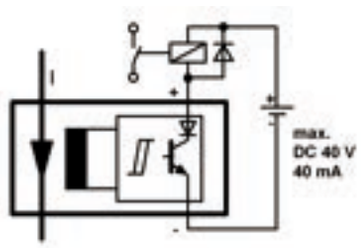
The STWA1SH has an integrated electronic with transistor-output. The switching point is 2 A. Above app. 2 A the output transistor is switched on below app. 1.5 A it is off.
The conductor is simply pushed through the transformer.Multiple loops reduce the switching point correspondingly, for instance to 0.5 A with four loops. A supply voltage is not required.

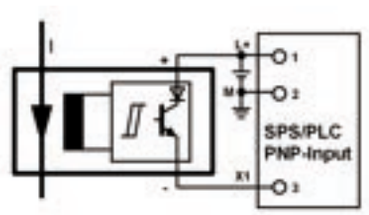
Application: The STWA1SH is used where current flow is to be detected, with the exact value of the current either known from the power consumption of the connected consumer or does not matter for the evaluation.
For simultaneous evaluation of the current flow in several conductors the STWA 1 S device can be connected in series (AND circuit, pay attention to the voltage drop) or in parallel (OR circuit, pay attention to the leak current).

- isolated transistor-output max. DC 40 V/40 mA
- output can be directly connected to the digital input of a PLC
- integrated diode for reverse voltage protection
- electrical connection via screwless pluggable terminals
- no supply voltage required
- DIN-rail-mount or with screws
- plug-in current transformer (Ø 11 mm)
- max. overload 100 A continously, 300 A / 10 s

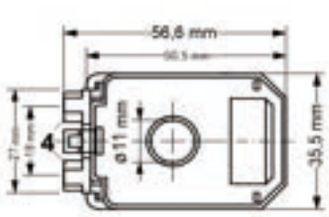
2

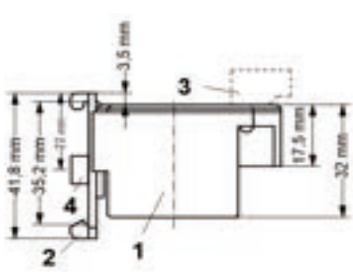
Switching point at Tu = 25°C	AC 2 A +20/-40%
Hysteresis	approx. 6%
Repeat accuracy	± 5%
Temperature dependence	0...55°C: <0,5%/K (-20...0°C: <2,5%/K)
Overload cap. continous / 10s	100 A / 300 A
Output voltage/current max.	DC 40 V / 40 mA
Voltage drop (ON)	max. 3 V
Leak current (OFF)	max. 0,6 mA
Switch-on /switch-off delay	app. 50 / 200 ms
Nominal frequency	50 Hz
operating range	30...70 Hz
error	≤ 1%/Hz
Rated ambient temperature range	-20 °C ... +55 °C
Housing	Design H
Dimensions (h x w x d)	50 x 36 x 56 mm
Diameter for conductor	11 mm
Weight	app. 90 g





Dimension illustrations





1 Housing
2 Clip for DIN-rail
3 Terminal (pluggable)
4 Wall-mounting (M4)

AC-Electronic Current Transformer Type STWA1SEH

adjustable 2...10 A, with transistor-output

STWA1SEH

Electronic current transformer with fixed switching-point 2...10 A

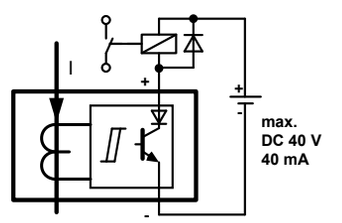
Part number: **S225549**

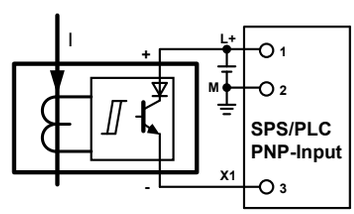
The STWA1SEH has an integrated electronic with transistor-output.
The switching point is adjustable 2-10 A. Above switching-point the output transistor is switched on, below it is off.
The conductor is simply pushed through the transformer. Multiple loops reduce the switching point correspondingly, for instance to 0.5-2,5 A with four loops. A supply voltage is not required.
For monitoring of higher currents, the STWA1SEH is simply looped into the secondary current of big current transformers.

Application: The STWA1SE is used where AC current flow is to be detected in a conductor, e.g. to give a warning if a defined current value is exceeded or not reached, or to switch off a machine or to simply report the current flow.

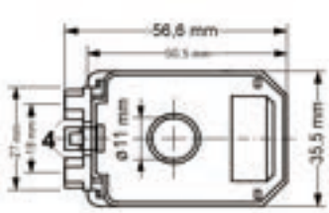
- adjustable switching limit 2...10 A
- isolated transistor-output max. DC 40 V/40 mA
- output can be directly connected to the digital input of a PLC
- LED for display state of output
- integrated diode for reverse voltage protection
- electrical connection via screwless pluggable terminals
- no supply voltage required
- plug-in current transformer (Ø 11 mm)
- max. overload 100 A continously, 300 A / 10 s

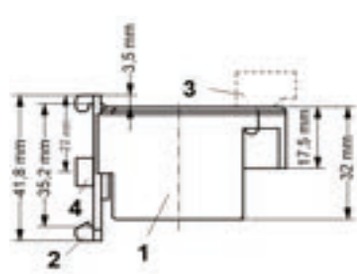
Switching point at Tu = 25°C	AC 2...10 A ±25 %
Hyseteresis	5...30 %
Repeat accuracy	± 2 %
Temperature dependence	< 0,06%/K
Overload cap. continous / 10s	100 A / 300 A
Output voltage/current max.	DC 40 V / 40 mA
Voltage drop (ON)	max. 1,5 V
Leak current (OFF)	max. 0,6 mA
Switch-on /switch-off delay	0,2...2s / ≤0,3 s
nominal frequency	50 Hz
operating range	30...70 Hz
error	≤ 3%/Hz
rated ambient temperature range	-20 °C ... +50 °C
Housing	
Dimensions (h x w x d)	Design H
Diameter for conductor	50 x 36 x 56 mm
Weight	11 mm
	app. 90 g





Dimension illustrations





1 Housing
2 Clip for DIN-rail
3 Terminal (pluggable)
4 Wall-mounting (M4)

AC-Electronic Current Transducer Type STWA1AH

with analog output

STWA1AH
Electronic current transformer
AC 0...15 A - DC 0...20 mA

Part number: **S225579**

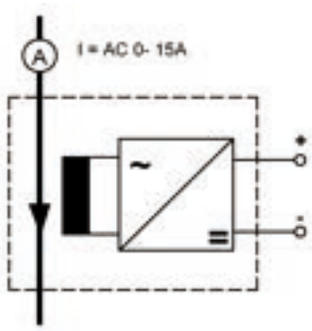
The STWA1AH is a measuring transducer for AC currents 0...15 A. Multiple loops of the conductor through the transformer reduces the measuring range correspondingly (for instance to 0...5 A with three loops).
For the monitoring of currents of any level, the STWA1AH is simply looped into the secondary circuit of a large transformer with secondary 5 A (cable three times through the STWA1AH). Consequently, the output is proportional to the primary current of the transformer, e.g. 0...100 A for a transformer with 100/5 A.
The analog output is isolated. The load should be 50...300 Ω.

Application: The STWA1AH makes it possible to monitor the value of an AC current. The output signal can be evaluated or displayed with components with analog inputs, e.g. ZIEHL TR210, STW1000/V2 or MINIPAN®.

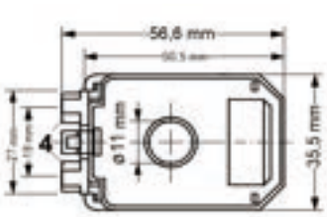
- current-proportional analog output DC 0...20 mA = AC 0...15 A (isolated)
- electrical connection via screwless pluggable terminals
- no supply voltage required
- DIN-rail-mount or with screws
- plug-in current transformer (Ø 11 mm)
- max. overload 100 A continously, 300 A / 10 s
- plug-in current transformer, easy assembly

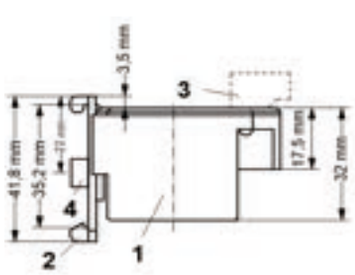
2

Monitoring range	AC 0 - 15 A
Analog output	DC 0 - 20 mA
Adjustment time	< 0,5 s.
Error (from 10% / I_{nom})	<5% from FS (at 100 Ω), <7% 50...200Ω <9% ..300Ω
Error with other load	+5%/100 Ω, max. 500 Ω
Temperature coefficient	< 0,06%/K
Ripple at 50 Hz	<2,5 % at 300Ω, <4,5 % at 100Ω, <7,5 % at 50Ω
Nominal frequency	50 Hz
Operating range	30...400 Hz
Error	≤ 0,2%/Hz
Overload cap. continous / 10s	100 A / 300 A
Rated ambient temperature range	0 °C ... 55 °C
Housing	
Dimensions (h x w x d)	Design H
Diameter for conductor	50 x 36 x 56 mm
Weight	11 mm
	app. 90 g



Dimension illustrations





1 Housing
2 Clip for DIN-rail
3 Terminal (pluggable)
4 Wall-mounting (M4)

AC-Electronic Current Transducer Type STWA2AH

with analog output

STWA2AH

Electronic current transformer
AC 0...20 A / 0...100 A - DC 4...20 mA

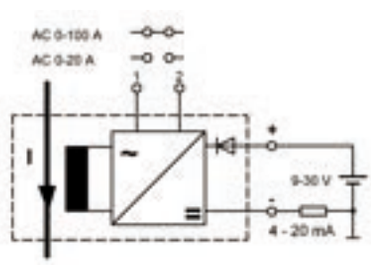
Part number: **S225580**

The STWA2AH is a measuring transducer for AC currents 0...100 A, divided in 2 ranges 0...20 A and 0...100 A. Multiple loops of the conductor through the transformer reduces the measuring range correspondingly (for instance to 0...5 A with four loops).
For the monitoring of currents of any level, the STWA2AH is simply looped into the secondary circuit of a large transformer with secondary 5 A (cable four times through the STWA2AH). Consequently, the output is proportional to the primary current of the transformer, e.g. 0...100 A for a transformer with 100/5 A.
The analog output is isolated. The STWA 2 AH is in 2-wire execution and needs a supply-voltage DC 9...30 V.

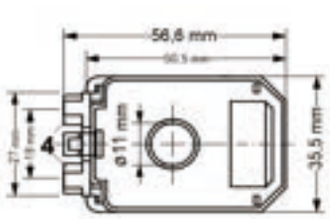
Application: The STWA2AH makes it possible to monitor the value of an AC current. The output signal can be evaluated or displayed with components with analog inputs, e.g. ZIEHL TR210, STW1000V2 or MINIPAN®.

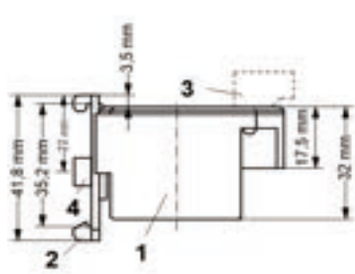
- current-proportional analog output DC 4...20 mA = AC 0...20 / 0...100 A (isolated)
- electrical connection via screwless pluggable terminals
- supply voltage DC 9...30 V (2-wire)
- DIN-rail-mount or with screws
- plug-in current transformer (Ø 11 mm

Supply voltage	DC 9...30 V (2-wire), depending on load
Monitoring ranges	AC 0 - 20 / 0...100 A
Analog output	DC 4 - 20 mA (max. 32 mA)
Adjustment time	< 0,5 s.
Error (of scale, above 10%/I_{rated})	<5%
Temperature coefficient	0...55°C: <0,06%/K (-20...0°C: <0,5%/K)
Nominal frequency	50/60 Hz
Operating range	30...400 Hz
Error	≤ 0,1%/Hz (30 - 50 Hz) ≤ 0,05%/Hz (60 - 400 Hz)
Overload cap. 20/100 A	63 A / 360 A continously
Rated ambient temperature range	-20 °C ... +55 °C
Housing	Design H
Dimensions (h x w x d)	50 x 36 x 56 mm
Diameter for conductor	11 mm
Weight	app. 90 g



Dimension illustrations





1 Housing
2 Clip for DIN-rail
3 Terminal (pluggable)
4 Wall-mounting (M4)

AC-Electronic Current Tranducer Type STWA1FH

with frequency output

STWA1FH

Electronic Current Transformer with current proportional frequency output 0...20 A - 0,5...20 Hz

Part number: **S225560**

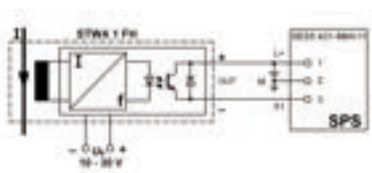
The STWA1FH provides a frequency output with 0.5...20 Hz which corresponds to a current flow of AC 0 - 20 A through the transformer. Multiple loops of the conductor through the transformer reduce the current range correspondingly (e.g. with fourfold looping-through 0 - 5 A correspond to 0.5...20 Hz).
For the monitoring of high currents, the STWA1FH is simply looped in the secondary circuit of a large current transformer. Consequently, the frequency output is proportional to the primary current of the transformer, e.g. 0 - 100 A for a transformer with 100/5 A (cable four times through the STWA1F).
The offset of 0.5 Hz at the beginning of the transducing range is for technical reasons. During evaluation, it can be taken into account.

Application: The STWA1FH enables moderately priced detection of the value of an AC-current with a DIGITAL INPUT of a PLC. Costly analogue inputs are no longer necessary.
The STWA1FH is particularly suitable to evaluate the current in electric motors in machines of i.e. saws. The feed can be regulated dependent from the load of the motor of the saw.

- current-proportional frequency output 0.5 - 20 Hz = AC 0 - 20 A
- output isolated, max DC 30 V/30 mA
- output frequency limited to 30 Hz
- output can be connected to the digital input of a PLC
- incorporated reverse voltage protection diode
- electrical connection via screwless pluggable terminals
- supply voltage DC 10...30 V
- DIN-rail-mount or with screws
- plug-in current transformer (Ø 11 mm)

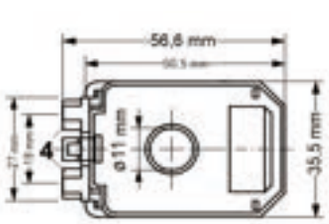
- Options: - currents up to 60 A
  - other frequencies

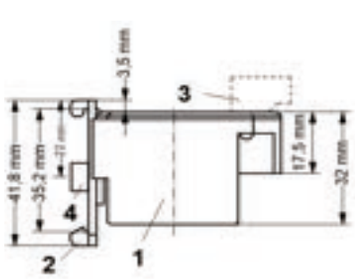
Power supply Us	DC 10 - 30 V
Monitoring range	AC 0...20 A
Output	0,5...20 Hz
Switching voltage	max. DC 30 V
Switching current min/max	DC 1 / 30 mA
Adjustment time	< 0,5 s.
Error (of scale, above 10%/I_{rated})	≤ 3%
Temperature coefficient	< 0,06%/K
Nominal frequency/operating range	50 Hz/50...400 Hz
Error	≤ 0,2%/Hz
Overload capacity cont./10 s	In + 5% / 200 A
Testing voltage to supply voltage	500 V
max. ambient temperature	0 °C ... 55 °C
Housing	Design H
Dimensions (h x w x d)	50 x 36 x 56 mm
Diameter for conductor	11 mm
Weight	app. 90 g



Dimension illustrations

Dimensions in mm





1 Housing
2 Clip for DIN-rail
3 Terminal (pluggable)
4 Wall-mounting (M4)

AC-Electronic Current Tranducer Type STWA4MH

AC 0 - 60 A, with interface RS485

STWA4MH

Electronic Current Transformer 0 - 60 A, with interface RS485

Part number: **S225570**

STWA4MH is a measuring transducer. It measures AC up to 60A and has an RS485 interface (Modbus RTU). The measured analog current value is made available as a digital signal and can be read by a PLC, an IPC or a master computer.

The conductor to be measured is passed through an opening (Ø 11 mm). In case of small currents, the sensitivity of the current transducer can be increased by looping through the current-carrying conductor several times, e.g. double looping doubles the sensitivity. The measuring range of the STWA4MH is reduced by multiple looping. To measure currents of any size, the STWA4MH is simply looped into the secondary circuit of a large current transformer with a secondary output of 5A (lead the cable through STWA4MH several times).

Application:

The STWA4MH enables the space-saving an cost-effective measurement of the actual value of an alternating current. Compared to transducers with analog output, the bus technology significantly reduces the effort for the hardware (inputs) and the wiring. Applications are e.g. the recording of the current consumption of electrical motors in processing machines. Here the feed can be regulated depending on the load on the motor. Another example is the monitoring of consumers, e.g. heating elements, for failure.

- Current measurement AC 0…60 A (RMS - Root Mean Square), resolution 1mA
  - Actual value
  - Average over 200 ms
  - Average over 1 s
  - Measured values from the last 50 periods
- Frequency measurement 40…70 Hz (sinus-shaped signals)
- RS485 interface (Modbus RTU)
- Addressable up to 246 participants
- Baud rates 4800, 9600, 19200, 57600, 115200
- Wiring effort minimized through bus technology
- Supply voltage DC 24 V (10…30V)
- Connection via plug in spring type terminals
- Lockable housing on mounting rail or screw fastening
- Plug in current transformer (Ø 11 mm)

Now compatible with UR420IP/UR840IP via Modbus RTU thanks to new UR series firmware feature:

- Data visualization in web interface (UR840IP only)
- Precise current and frequency measurement with STWA4MH via Modbus

Technical Data

Rated supply voltage Us:	
Nominal voltage	DC 24 V
Tolerance	DC 10,0 … 30,0 V
Power consumption	< 0,25 W
Measuring input: current	
Nominal current (I_{nom})	AC 60 A, sine
Measuring range	AC 0 … 60 A
Measuring principle	RMS
Tolerance (from 1%/ I_{nom})	± 0,1 % ± 200 mA
Temperature coefficient	≤ 0,1 % / K
Resolution	1 mA
Measurement time	1 period (40 ... 70 Hz)
Overloard contstantly	I_{nom} + 20 %
Overload 10s	AC 200 A
Measuring input: frequency	
Nominal frequency	50 Hz
Measuring range	40 … 70 Hz
Tolerance (ab 1%/ I_{Nom})	≤ 0,1 Hz
Temperature coefficient	≤ 0,001 Hz / K
Resolution	0,01 Hz

Measuring output: RS485 - Interface	
Baud rate	4800, 9600, 19200, 57600, 115200 Baud
Address	1 - 247
Data bits	8 bits
Stop bits	1, 2 bits
Parity	Even, odd, no
Terminating resistor	120 Ohm (included)

Test conditions	EN 61010-1
Rated impulse voltage	4000 V
Overvoltage category	III
Pollution degree	2
Rated insulation voltage Ui	300 V
On-period	100 %
Insulation test voltage	3 kV, U_{eff}, 50 Hz, 1 min

EMC-tests	EN 61326-1 - industrial environment
Emission	EN 61326-1; CISPR 11 class B
Immunity	EN 61326-1 - industrial environment
Fast transient disturbances (Burst)	EN 61000-4-4 ±4 kV Pulse 5/50 ns, f = 5 kHz, t = 15 ms, T = 300 ms
Surge immunity test	IEC 61000-4-5 ±2 kV
Electrostatic discharge immunity test	IEC 61000-4-2 ± 4 kV contact discharge, ± 8 kV air discharge
Measuring transducer EMC	IEC 61326-2-3:2013

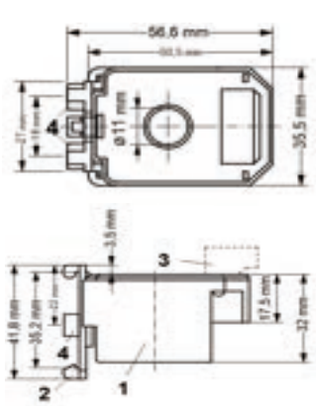
Installation conditions	
Permissible ambient temperature	-20 °C ... +55 °C
Permissible storage temperature	-20 °C …+70 °C
Installation height	< 2000 m above N.N.
Climatic conditions	5-85% rel. h., no condensation
Permissible wiring temperature	-5 °C …+70 °C
Vibration resistance EN 60068-2-6	2 … 13,2 Hz ±1,0 mm 13,2 ... 100 Hz 1 g 2 … 25 Hz ±1,6 mm 25,0 ... 150 Hz 5 g
Impact resistance	5 g, 11 ms

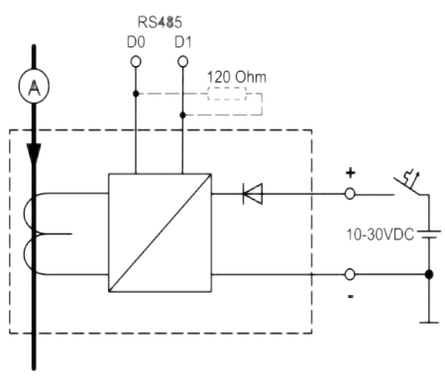
Gehäuse	Bauform H, (Verteilereinbau oder Schraubmontage)
Abmessungen (H x B x T)	53 x 36 x 56 mm
Max. Ø Conductor	11 mm
Terminals	Spring-type terminal, pluggable
Line connection solid wire	1 x 0,2 – 2,5 mm² / AWG 24 – 14
Stranded wire with insulated ferrules	1 x 0,2 – 2,5 mm² / AWG 24 – 12
Stripping length	9 mm
Protection class housing / terminals	IP 54 / IP20
Mounting	Snap mounting on 35 mm standard rail EN60715 or M4 screws
Mounting position	any
Weight	approx. 90 g

Subject to technical changes

Dimension illustrations/ wiring sheme

Dimensions in mm





1 Housing
2 Clip for DIN-rail
3 Terminal (pluggable)
4 Wall-mounting (M4)

AC-Electronic Current Transformer Type STWA1LH

with output AC 230 V / 0,35 A

STWA1LH

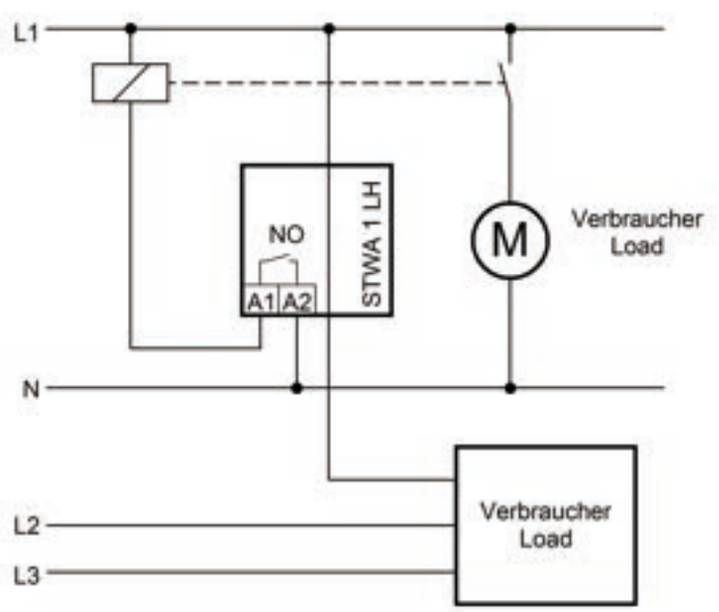
Part number: **S225591**

The electronic current transformer STWA1LH monitors alternating currents 2 ... 20 A. For lower currents, the monitored wire can be led multiple times through the transformer. Used in the secondary circuit of transformers (e.g. 100/5 A), it is possible to monitor higher currents.
The STWA1LH directly switches alternating voltage up to AC 230 V / 0,35 A.

- Control of ventilations or suction plants
- Control of valves at suction plants in the wood-working industry

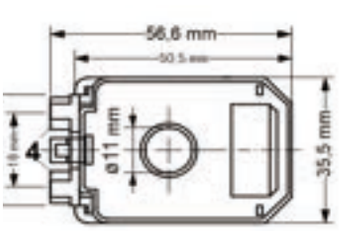
Features
- Monitoring of alternating current up to 20 A
- Response value adjustable 2 ... 20 A
- Two-wire contact (voltage supply through output)
- Operating voltage AC 24 ... 240 V
- Transformer, ø 11 mm
- Space-saving, easy mounting
- Potential separation between monitored current circuit and switch output

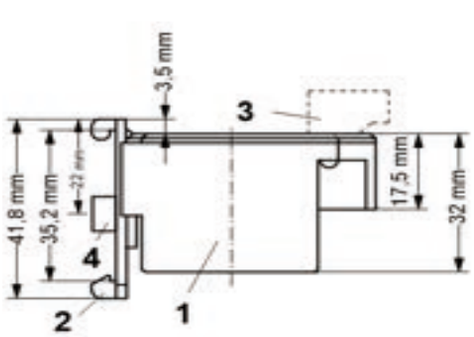
Automatic switching-on of additional consumers



Technical Data STWA1LH

Operating voltage		
	Operating voltage tolerance	AC 24...240 V ± 10 %
	Frequency	50/60 Hz
	Overvoltage category	III (EC 60 664)
Current measuring range		
		AC 2...20 A For lower currents, the monitored wire can be led multiple times through the transformer
	Maximum permanent current	AC 40 A
	Maximum excess current	AC 100 A for 60 s
Output		
	Maximum output current	AC 350 mA
	Minimum output current	ca. 10 mA
	Voltage drop	≤ AC 8 V
	Leakage current	≤ AC 2 mA at 230 V
	Switch	solid state
	Electomagnetic compatibility	EN 61000-6-2 and EN 61 000-6-4
	Adjustment accuracy	± 15 %
	Repeat accuray	± 5 %
	Hysteresis	ca. 10 % of value
	Release time	On = <100 ms...800 ms Off = app. 1,5 s
	Design	housing H
	dimensions (H x W x D)	50 x 36 x 56 mm
	Fitting position	any
	max. ambient temperature range	0 °C ... 55 °C
	storage temperature	-20 °C ... +70 °C
	Attachment	35 mm standard rails conform to EN 50 022 or M 4 screws
	Protection	IP 20
	Weight	approx. 90 g





1 Housing
2 Clip for DIN-rail
3 Terminal (pluggable)
4 Wall-mounting (M4)

Current Monitors Type STW
adjustable

General

The STW is an electronic current monitoring relay. Depending on the model, one or more consumers can be monitored using only one instrument.

Specific applications, where current monitors can be used are:

- obstacle lights
- stone- and woodworking machines
- chemical plants
- machine tools of all kinds

and wherever it is necessary to monitor currents for over- or undercurrent.

Function and Features

According to the application, the current-relays are connected into the current-line to the load directly or via a current-transformer. The built-in relay picks up after supply-voltage is switched on. It releases, when the limit is exceeded and the switching delay has run down.

Summary

Current Monitor	DC	DC	AC/DC	AC	AC	AC
Type	**STW1000V2**	**TR210**	**STW1000**	**STW200**	**RCM1000V**	**COSFI100V**
Connection current direct	X	X	X	X	-	x
External shunt	-	-	X	-	-	-
External transformer	-	-	X	-	STWA3D	x
Number of circuits	1	1	1	1	1	1
Response values adjustable	0 / 4 - 20 mA 0 / 2 - 10 V	0 - 20 mA 4 - 20 mA 0 - 10 V	0,1 - 1 A 0,5 - 5A 1 - 10 A 6 - 60 mV	12 - 120 mA 0,1 - 1 A	0,01 - 9,99 A	-10,0 - +10,0 A
Analog output	-	X	-	-	-	-
Housing	V2	V4	V4	V4	V4	V4

DC-Limit Value Switch Type STW1000V2

DC 0/4 - 20 mA, 0/2 - 10 V

STW1000V2

Part number:
S225677 AC/DC 24-240 V

ZIEHL current-relays STW1000V2 monitor standard-signals from measuring transducers if a limit is exceeded. For monitoring of more than 1 signal, multiple relays can be connected in series (current) or in parallel (voltage).
Measuring inputs for 0/4-20 mA and 0-10 V, adjustable hysteresis and switching delay and the choice between operating- and closed-current mode of the relay make it a very universal limit switch.

- Measuring inputs 0-20 mA / 0-10 V, switchable to 4-20 mA / 2-10 V
- Limit adjustable 0-100 %
- Hysteresis adjustable 5-30 %
- Start-up delay adjustable 0,1 ... 10 s
- Switching delay adjustable 0,1 ... 10 s
- Output-relay 1 changeover-contact (co)
- Operating- or closed-circuit-mode for relay selectable with bridge
- LEDs for display state of operation
- Universal supply-voltage AC/DC 24-240 V
- Housing for mounting in switchgear cabinets or fuse-boxes, 35 mm wide

Applications:
Monitoring of different values in combination with measuring transducers, e.g. in machines and controls.

1) 0...20 mA, 0...10 V
2) 4...20 mA, 2...10 V
3) Ruhestrom / closed current
4) Arbeitsstrom / operating current

Technical Data

Supply voltage Us	AC/DC 24 - 240 V, 0/50/60 Hz, < 2W, < 3VA (DC 20,4 - 297 V, AC 20 - 264 V)
Relay output	1 change-over contact (co)
Type of contact	**type 3 see** "general technical informations**"**
Test conditions	see "general technical informations**"**
Function	Maximum limit switch
Measuring signals	DC 0/4 ... 20 mA, 20 Ω DC 0...10 V, 63 kΩ
Switching point	adjustable 0...100%
Hysteresis	adjustable 5...30% of set limit
Error of setting	< 10% of fullscale
Repeat error	< 0,2%
Temperature-dependence	≤0,05 %/K
Start-up-delay d_{Enable}	adjustable 0,1...10 sec.
Switching delay d_{AL}	adjustable 0,1...10 sec.
Rated ambient temp.range	-20 °C … +55 °C
Dimensions (H x W x D)	design V2: 90x35x58 [mm], mounting height 55 mm
Attachment	on 35 mm DIN-rail according to EN 60 715 or with screws M4
Protection housing/terminals	IP 30 / IP 20
Weight	approx. 130 g

Current Relay for DC- and AC-currents Type STW1000

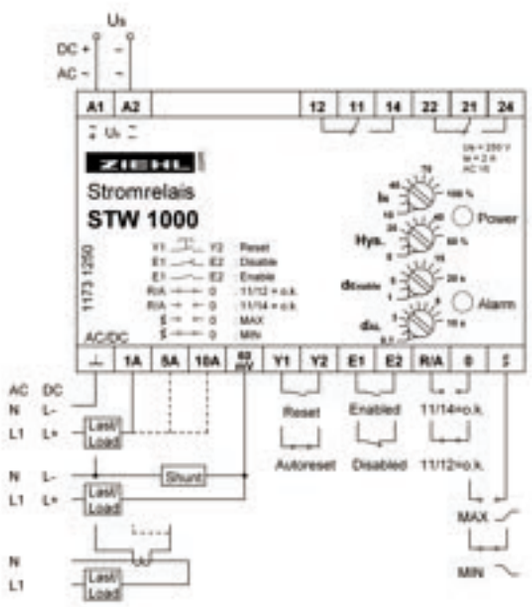
AC/DC 0,1 - 10 A, 60 mV with external shunt

STW1000

Part number:
S225684 AC/DC 24-240 V

ZIEHL current-relays STW1000 have 4 measuring-ranges. They monitor most of the common AC- and DC-currents for over- or undercurrent.
Currents up to 10 A can be connected directly to the STW. For higher currents external transformers (to inputs 1/5 A) or Shunts (input 60 mV) can be connected.

- Measuring inputs 1 A, 5 A, 10 A, direct or via transformer
- Measuring input 60 mV for ext. Shunt
- Automatic detection of AC/DC
- Monitoring of over- or under-current
  Adjustable range 10...100% I_N
- Hysteresis adjustable 5...50%
- Start-up delay 1...20s (input enable)
  Switching delay 0,1...10s for
- fading of short peaks
  Output-relay 2 changeover-
- contacts (co)
  Operating- or closed-circuit-
- mode for relays selectable with bridge
- Universal supply-voltage AC/DC 24-240 V
- Interlocked switching selectable with bridge
- LEDs for display state of relay
- Housing for mounting in switchgear cabinets or fuse
- boxes, 70 mm wide, mounting height 55 mm
  option: other supply voltages
-



2

Technical Data

supply voltageUs	AC/DC 24-240 V, <3W, <5VA (AC 20-264 V, DC 20,4...297 V)
relay output	2 change-over contacts
type of contact	**type 2 see** "general technical informations"
test conditions	siehe "general technical informations"
function	Over- or undercurrent, DC orAC (1-phase)
frequency of measured current	0 / 40 ... 400 Hz
internal resistance	60 mV: 40 kΩ, 1A: 0,1 Ω, 5A: 20 mΩ, 10 A: 10 mΩ
overload capacity/continously	60 mV: 10 V, 1A: 2 A, 5A: 7,5 A, 10 A: 11 A
max. 10s	60 mV: 10 V, 1A: 5 A, 5A: 15 A, 10 A: 20 A
switching point	adjustable 10...100% I_N
hysteresis	adjustable 5...50% of switching point
error of setting	< 10%
repeat error	± 0,2%
temperature-dependence	≤0,05 %/K
start-up-delay d_{enable}	adjustable1...20 sec.
switching delay d_{al}	adjustable 0,1...10 sec.
rated ambient temp. range	-20 °C … +55 °C
dimensions (h x w x d)	design V4: 90 x 70 x 58 [mm]
attachment	on 35 mm DIN-rail according to EN 60 715 or with screws M4
protection housing/terminals	IP 30 / IP 20
weight	approx. 180 g

Current-Relay for Obstacle Lights Type STW200

AC 12 - 120 mA for LED-Lamps, 0,1...1 A for light bulbs

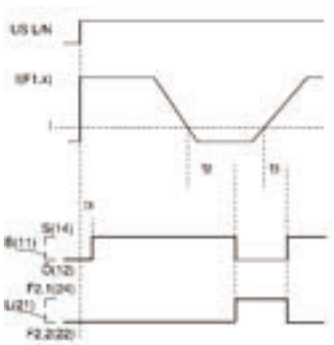
STW200

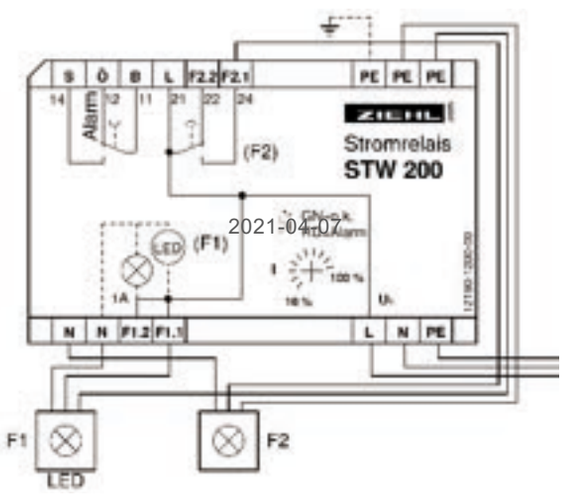
Current-relays STW200 monitor AC-currents for falling below an adjusted limit. The ranges 12 ... 120 mA and 0,1 ... 1 A allow the monitoring of LED-Lamps as well as incandescent lamps in obstruction lights.
In case of main lamp failure a relay switches on the reserve lamp. An alarm contact is available for signaling a lamp failure.
If an alarm is required in case of failure of reserve lamp, a second STW200 is used.

Application:
Monitoring of LED-Lamps or light-bulbs in twin obstacle lights with alarm (lamp failure) and switching on a reserve lamp.
Monitoring of the function of single obstacle lights.
At conventional solutions with a change-over contact, there is a short on-pulse at the reserve lamp everytime when the system is switched on. The STW200 switches it on only in case of a failure of the main lamp.
LED-lamps can also be monitored with long cables between relay and lamp.
When monitoring LED-lamps a total failure is detected. Failures of single LEDs are not detected.

Part number:
S225530 AC 230 V

- Measuring input 12...120 mA for LED-lamps
- Measuring input 0,1...1 A for incandescent lamps (bulbs)
- withstands current-peaks when switching on lamp
- Adjustment range 10...100 %
  Relay for switching on reserve light in operating-current mode
  Relay for alarm in closed-current mode
- Cable-length from relay to lamp up to 500 m
- Display green = o.k., red = low current alarm
- Housing 70 mm wide, mounting height 55 mm
-





2021-04-07

Technical Data

Supply voltage U_s	AC 230 V 50/60 Hz, < 3 VA
Tolerance	0,85 ... 1,1 Us
Relay output	2 x 1 change-over contact
Type of contact	**type 2** see "General Technical Informations"
Measuring ranges	AC 12...120 mA / AC 0,1...1 A
Tolerance / repeating error	±15 % / <1 %
Hysteresis	app. 5%
Delay alarm	app. 2 s
rated ambient temp. range	-40 °C ... +55 °C
Dimensions H x B x T	V 4: 90 x 70 x 58 mm, mounting height 55 mm
Line connection	one wire: 4 mm², stranded with sleeves: 2,5 mm²
Attachment	35 mm DIN-rail or 2 screws M4 (option)
Protection housing/terminals	IP 30/ IP 20
Weight	app. 210 g

Residual Current Monitor Type RCM1000V

Monitoring of AC-currents in grounded power supply systems

RCM1000V

Part numbers:

S225710 AC/DC 24-240 V

T224384 ER4 

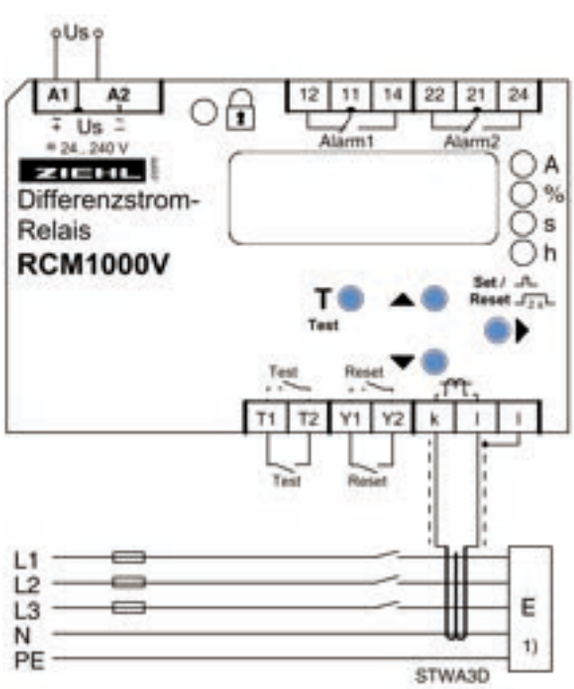
RCM100V monitors residual currents in grounded power supply systems. Used as a current relay it monitors AC- or pulsing DC-currents for exceeding upper or lower limits.
Insulation faults can be caused by damages (mechanical, thermic or chemical) of insulations or also by humidity or pollution. At currents > app. 250 mA (at 230 V) at a location, the fault can lead to danger of fire.

Applied as current relays RCM1000V can among others monitor current in the neutral conductor. Nonlinear loads, e.g. switching power supplies in PC, printers or lights with EGC, cause harmonics in the neutral conductor: Even when the load is symmetric, the harmonics can lead to an overload in the neutral conductor. RCM1000V detect and report this overload.
Residual current monitors detect these faults in widely branched power supply systems and make a signal before additional damage develops.

By displaying the residual current also stealthy changes can easily be detected and localized by switching on and off parts of the power supply system.

Particularly useful in monitoring in systems in which no fault current circuit breaker can or shall be used, because an immediate switching would have wide-ranging consequences, such as breakdown of computer systems or interruption of processes of sensitive goods. RCM1000V do NOT replace fault current circuit breakers for protection from electric shock but they can complement it by detection an fault in the insulation before the systems has to be shut off.

- Monitoring of residual currents
- 2 limits for alarm and trip
- Monitoring of current, 2 x under- or overcurrent or windows
- Measuring range 0,003 … 9,999 A
- Setting range 0,010...9,999 A
- Display can be scaled
- Test-button and automatic test every 24 hours
- Input for current transformer STWA3D with monitoring of transformer
- Start-up delay to suppress alarms when switching on
- 4 digits bright LED-display for measured values and programming
- LEDs for alarms, state of relays and units
- Limit, hysteresis, switching delay and switch off delay individually programmable
- Function of relays (nc-, or no-mode) and interlocked switching or autoreset programmable
- Universal supply voltage AC/DC 24-240 V
- Housing for DIN-rail mount, 70 mm wide, mounting height 55 mm
- Accessory: Installation frame ER4 for panel mount



Technical Data

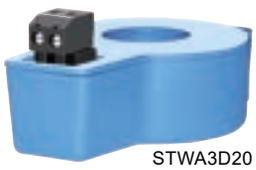
Rated supply voltage	AC/ DC 24V - 240V, < 1,5W, < 5 VA DC 20,4 - 297 V, AC 20-264 V 50 ...500 Hz
Relays K1, K2 (alarm 1, 2)	2 x 1 co-contacts, type 2, see "general technical informations"
Monitoring of current (program 1 and 2)	Type STWA3D... (20, 35, 70, 125) ≤ 10 m, single wire, ≥ 0,75 mm² 0,003 A ... 9,999 A 10 % ... 25 % 50 ...500 Hz adjustable 0 ... 10 s adjustable 0,03 ... 10,0 s (Prog. 2 = 0,03 ... 500,0 s) adjustable 0 ... 999 s
Residual current relay (program 1 only)	EN 62020 Alarm 2 -> adjustable 0,010 A ... 9,999 A Alarm 1 -> adjustable 50% ... 100% of alarm 2 0 ... -20% depending of configuration of relays: closed current -> relays release = alarm operating current -> relays remain released (= no alarm) type A 
Current relay (program 2 only)	EN 50178 / EN 60947-5-1 0,010 A ... 9,999 A 10%...25% ± 2%, ± 3 digit ± 10%, ± 3 digit
Insulation	EN 60664-1 4000 V AC 300 V III 2
EMC tests	EN 62020 EN 61000-6-3 EN 61000-4-4 ± 4 kV pulse 5/50 ns, f = 5 kHz, t = 15 ms, T = 300 ms IEC 61000-4-5 ± 2 kV IEC 61000-4-2 ± 3,8 kV discharge contact, ± 6 kV discharge air
	-20 °C ... +65 °C -20 °C ... +70 °C
Housing	Design V4 / Front mounting kit type ER4 70 x 90 x 58 mm mounting height 55 mm IP30/20 Snap mount on standard rail 35 mm acc. to EN 60715 or screws M4 app. 170 g

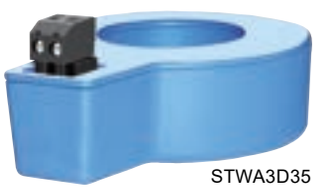
Current Transformer Types STWA3D
for use with RCM1000V

STWA3D

The current transformers STWA3D for use with residual current monitor RCM1000V are available with 4 different inside diameters.

STWA3D20-70 can be snapped on a DIN-rail, vertically or horizontally or be fixed with screws. The Bracket for mounting is included.
STWA3D125 can only be mounted with screws.

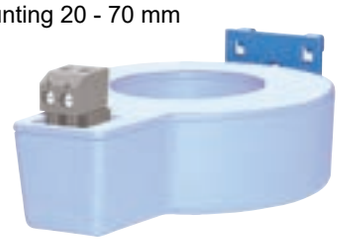

STWA3D20


STWA3D35


STWA3D70


STWA3D125

Bracket for mounting 20 - 70 mm



2

Part numbers:

S225725	STWA3D20	20 mm	ø Inside
S225726	STWA3D35	35 mm	ø inside
S225727	STWA3D70	70 mm	ø inside
S225728	STWA3D125	125 mm	ø inside

Option:
Split core current transformer upon request.

Technical Data

Rated current Kn primary/secondary	10 A / 0,0167 A
Rated power	50 mVA (180 Ohm)
Frequency range	42 Hz … 3 kHz
Rated ambient temperature range	-5 °C … +70 °C
Temperature storage	-25 °C … +70 °C
Rated short-time thermal current I_{th}	2,4 kA / 1 s
Rated continuous residual current	40 A
Nominal current I_{DYN}	6 kA / 40 ms
Nominal voltage	0,8 kV
Rated impulse voltage	8 kV
Contamination level	III

Dimensions	STWA3D20	STWA3D35	STWA3D70	STWA3D125
Inside diameter	20 mm	35 mm	70 mm	125 mm
X * Y * Z (mm)	53 * 49 * 87	68 * 49 * 103	103 * 49 * 137	173 * 63 * 200
Weight	120 g	160 g	290 g	910 g

Current Transformers for AC-Current

WS and **AS**

Current-Transformer Type WS

Current-Transformer Type AS

For currents >5A current monitors require a current transformer with secondary 1 or 5 A and a rated capacity of min. 2.5 VA. The primary rated current must be appropriate to the max. expected current (fuse). Plug-in or winding current transformers can be used. We recommend the use of WS winding current transformers for primary rated currents of 5 to 30 A. For primary rated currents of 60 to 500 A we recommend using AS plug-in current transformers, suitable for the Cu-rail of 30 x 10 mm or 2 x 20 x 10 mm or round conductor of 28 mm. Both transformers have a Class 1 accuracy and a voltage resistance of up to 800 V. When ordering, please indicate desired type (WS or AS) primary and secondary rated current.

Terminal designation
primary: K/L
secondary: k/l

Part numbers:

WS winding current transformers are available:

	Class 1, 2.5 A
S225178	WS5/1 A
S225179	WS10/1 A
S225180	WS20/1 A
S225688	WS30/1 A
S225182	WS5/5 A
S225183	WS10/5 A
S225184	WS20/5 A
S225689	WS30/5 A

AS plug-in current transformers are available:

	Class 1, 2,5 VA
S225170	AS60/1 A (1,5 VA)
S225171	AS100/1 A
S225172	AS200/1 A
S225173	AS500/1 A
S225174	AS60/5 A (1,5 VA)
S225175	AS100/5 A
S225176	AS200/5 A
S225177	AS500/5 A

Weight approx. 300 g

Frequency and Speed Relay Type FRMU1000

with integrated Measuring-Transducer

FRMU1000

Part numbers:
FR1000 no analog output
U226135

FRMU1000 with analog output
U226134
Input 20-200 / 80-440 V
U226138
Input 110-300 / 210-830 V

The FRMU1000 is a speed-monitor, a frequency-monitor and a measuring-transducer in one device.
2 limits with 1 relay each can be programmed for under- or over-speed, under- or overfrequency or each monitoring of a range (min/max).
The input for monitoring of speed can evaluate signals from proximity-sensors 2- or 3-wire, npn- or pnp. The display can be scaled. Thus the real speed of a shaft can be displayed, even though there are several pulses per revolution, e.g. from a cogwheel.

Application as Frequency-Relay:
Monitoring of frequencies in mains 16 2/3 to 400 Hz on maintaining a range (min/max).

Application as Speed-Relay:
Monitoring of overspeed or underspeed, each with pre-alarm and alarm, monitoring of maintaining a range (min/max) or monitoring of stop at machines and equipment, e.g. at conveyors, escalators or lifts or for monitoring of drive-belts.

Application as Measuring-Transducer:
In addition, the FRMU can be used as measuring-transducer to convert the input-signal into a standard-signal 0/4-20 mA or 0-10 V.

2

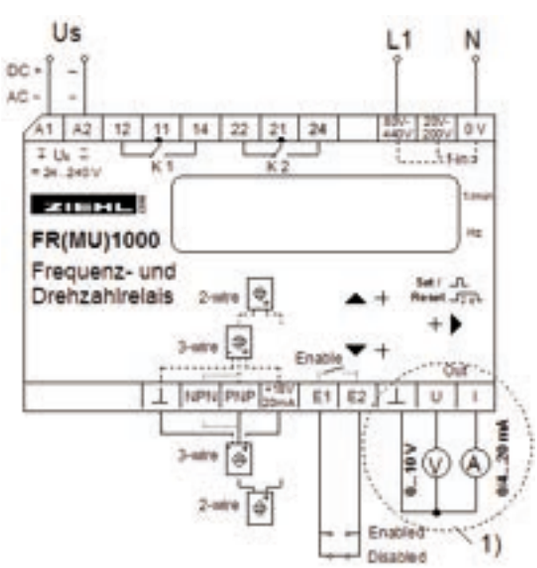
Function

Frequency:
- Measuring-inputs voltage AC 20-200 V/ 80-440 V oder AC 110-300 V/ 210-830 V (option)
- Monitoring of frequency of own supply-voltage
- Monitoring range 10-500 Hz
- Resolution of display 0,01 Hz

Speed:
Monitoring range
- 5...99999 min^{-1}
Display can be scaled
- Measuring-input for capacit-
- ance-switches 2- or 3-wire, npn or pnp
Start-up-delay programmable
- Start-input (activates device with switching on the monito-
- red drive)

General:
Setting in Hz or min^{-1}
5-digit display
- Analog output DC 0/4-20 mA,
- or DC 0-10 V, freely scaleable
- (with isolation to frequency-input U1/U2)
2 limits/ 2 relays
Programmable for each relay:
- - Monitoring of min, max or
- range
  - Hysteresis
  - Autoreset reclosing lock
  - Delay-time for switching and switching back down to 50 ms
  - Operating- or closed-current mode

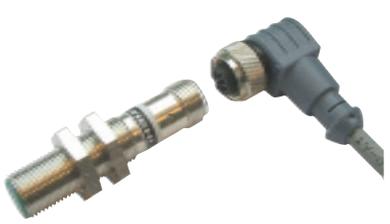
  LEDs for state of relays and unit (Hz oder min^{-1})
- Storage of min- and max- values of the inputs
- Easy setting with 3 buttons
- Code lock against manipulation of settings
- Universal power supply AC/DC 24-240 V
- Terminals pluggable
-



Technical Data FRMU1000

Rated supply voltage Us	AC/DC 24-240 V, <3W, <10VA (AC 20-264 V, DC 20,4-297 V)
Frequency	0, 40...500 Hz, > AC 80 V: 10...500 Hz
Measuring input Frequency	10.00-500.00 Hz
Admissible voltage	AC 20-200 V/ 80-440 V AC 110-300 V/ 210-830 V (option)
Measuring input Speed	5-99999 min $^{-1}$ PNP or NPN, 3-wire or 2-wire
Analog output	0/4-20 mA, max. 500 Ω, 0-10 V, max. 10 mA
max. error	< 0,15 % from FullScale + 0,015 %/K
Relay output	Type 3, see "general technical information" 2 x 1 (change-over) contact
Test conditions	see "general technical information"
Rated ambient temperature range	-20 °C ... +60 °C
Dimensions(h x w x d)	Design V4: 90 x 70 x 58 mm, mounting height 55 mm
Protection housing / terminals	IP 30/IP 20 (terminals pluggable)
Weight	app. 180 g
Attachment	on 35 mm DIN rail or with screws M 4

Inductive Proximity Sensor IG2



Part numbers:

U226003	IG2
U226004	cable

Proximity-Sensor for Speed Relay FRMU 1000.

- 3-wire-connection PNP brown =**+**, blue = **-**, black = A
- nickel-plated brass
- flush-mounting possible
- max. 48.000 IPM (800 Hz)
- max. switching distance 4 mm (recommended ≤ 3 mm)
- Connection cable pluggable
- integrated protection against reverse polartity
- LED for state of output

Connection Cable

- Plug M 12, angled
- Length 5 m, 3 x 0,34 sqmm
- PUR cable sheath

Technical Data

Rated supply voltage Us	DC 10-30 V
Max. switching frequency	800 Hz = 48000 Imp/min
Max. switching distance	4 mm (recomm. ≤3 mm)
Factor of reduction	Ms: 0,45, Al: 0,4, Cu: 0,3
Rated amb. temp. range	-25 °C ... +70 °C
Housing	Threaded pipe M12x1
Material	nickel-plated brass
Weight	app. 26 g
Dimensions	M 12x1 / length 50 mm
Torque	max. 10 Nm
Connection	threaded plug M 12
Shock resistance	≤30 g, ≤11 ms
Vibration resistance	≤55 Hz, ≤1 mm
protection	IP 67

Measuring Relays for Self-Generation Systems

General

Zero Export Devices / Energy flow relays of the EFR type are designed for monitoring and controlling the direction and flow of electrical energy at the grid connection point between consumers and the public power grid. These devices help ensure compliance with grid regulations, support the integration of distributed generation, and provide reliable measurement and switching functions for various applications in energy management systems

Function and Features

- Certified monitoring of active power flow direction
- Fast response for grid protection and control
- Flexible measurement options for different transformer types
- Multiple output and communication interfaces for integration
- Suitable for expanding generation capacity under regulatory frameworks

Summary

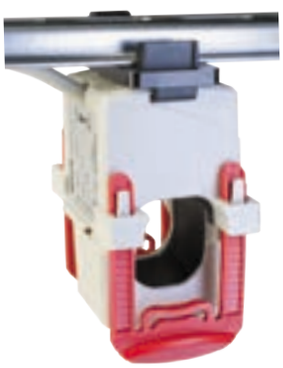
Type	EFR4002IP	EFR4002IPR
For grounded medium voltage transformers	X	
For Rogowski coils (333mV input)		X
Certified according to VDE-AR-N 4105	X	X
Pav,e monitoring (<200 ms)	X	X
Analog outputs	X	X
Digital outputs	X	X
Relay ouputs	X	X
Modbus TCP / Web server	X	X
Supply voltage 24-270 V AC/DC	X	X
Ambient temperature -20°C to +55°C	X	X
Housing	V8	V8

Current Transformers for Relay for Energy Flow Type EFR

Split core current transformer KBR18S, 60/1 A, class 3, 0,4 VA

Compact current transformer CTM7, 64/1 A, class 1, 0,5 VA

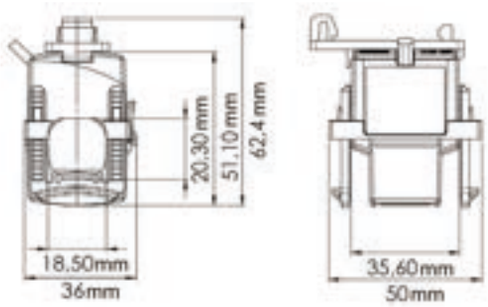
KBR18S



Part number: **S225770**

The split core current transformer KBR18S is especially suitable for being subsequently mounted in existing facilities. With its primary 60 A it matches perfectly the 63 A with which domestic connections are usually fused.
The secondary 1 A are connected to EFR. The inputs of the EFR are preset for this value.
A clip for mounting on DIN-rail is included.

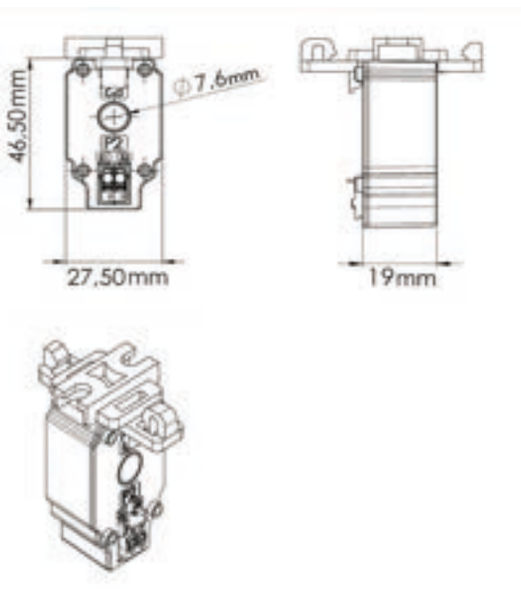
For EFR three current transformers are required.



CTM7

Part number: **S225780**

The compact current transformer is especially suitable for use in tight space conditions. With its primary 64 A it matches perfectly the 63 A with which domestic connections are usually fused.
The secondary 1 A are connected to EFR. The inputs of the EFR are preset for primary currents 60 A, changing is simple.
A clip for mounting on DIN-rail is included. The transformers can be clicked together for saving space.
For EFR three current transformers are required.



Technical Data

	KBR18S	CTM7
Applied standards	EN 61869-1, EN 61869-2 und IEC 61010-1	EN 61869-1, EN 61869-2 und IEC 61010-1
Primary nominal current	60 A	64 A
Secondary nominal current	1 A	1 A
Accuracy class	3	1
Rated power	0,4 VA	0,5 VA
Operating temperature	-5 °C ... +40 °C	-5 °C ... +50 °C
Dimensions (w x h x d)	36,0 x 50 x 51,1 mm	27,5 x 19 x 46,5 mm
Diameter of cable	max. 18,5 mm (isolated wire only)	max. 7,5 mm (isolated wire only)
Connection	cable 2,5 m 0,5 mm^2	Terminals 0,2...1,5 mm
Attachment	on 35 mm DIN rail or with screws	on 35 mm DIN rail or with screws
Weight	ca. 180 g	ca. 47 g

Zero Export Device Type EFR4002IP

Certified monitoring of Pav,e with standard VDE-AR-N 4105:2018-11
Optimization of self-consumption of self-generated energy
Energy Flow Relay

EFR4002IP

Part numbers:

EFR4002IP	**S227260**
ER8 	**T224388**

Relays for energy flow EFR4002IP monitor the current flow between public power grid and generating plant / consumer. Operation is made comfortably via integrated webserver or directly at the device. Measured values are displayed neatly arranged at device on monitor.
When the own power plant generates more power than actually is consumed it often is more economical to consume the excess energy self. This is especially reasonable when the difference is high between the price you pay to the grid provider and the price the provider pays for fed in energy.

Many areas suitable for photovoltaics could not be used so far, since only a limited amount of power can be fed in at the grid connection point.

In Germany new standards VDE-AR-N 4105:2018-11 allow exceeding this value by up to 66.6% or more installed capacity. The prerequisite for this is that the overbuilt power is consumed and not fed into the grid. In order to still ensure the stability of the system, this can be monitored with EFR4002IP.
The same applies to zero export, when no energy at all may be fed into the grid. In this case, the device can be used as an energy flow direction sensor (EnFluRi). The EFR4002IP has been optimized for these functions. Data exchange with PPS (Power Plant Controller) possible.

Zero-Export-Device or limiter:
- Switching off the power generation system or parts of it if the permissible feed-in power is exceeded with relay K3
- Switching on consumers or reducing generators before it comes to that by means of regulating with an analogue output or switching loads with relays K1 and K2
- Energy flow direction sensor (EnFluRi sensor) and feed-in limitation < 0.1s

Functions
- Switching of up to 3 consumers: the largest consumer, ranked 1-2-3 or combination of 3 consumers (7 levels))
- Switch on and off points. At which energy flow consumers are switched on and off again
- Switch on and off delay of consumers, minimum on time.
- Control of heat pumps (SG-ready), battery chargers, inverters

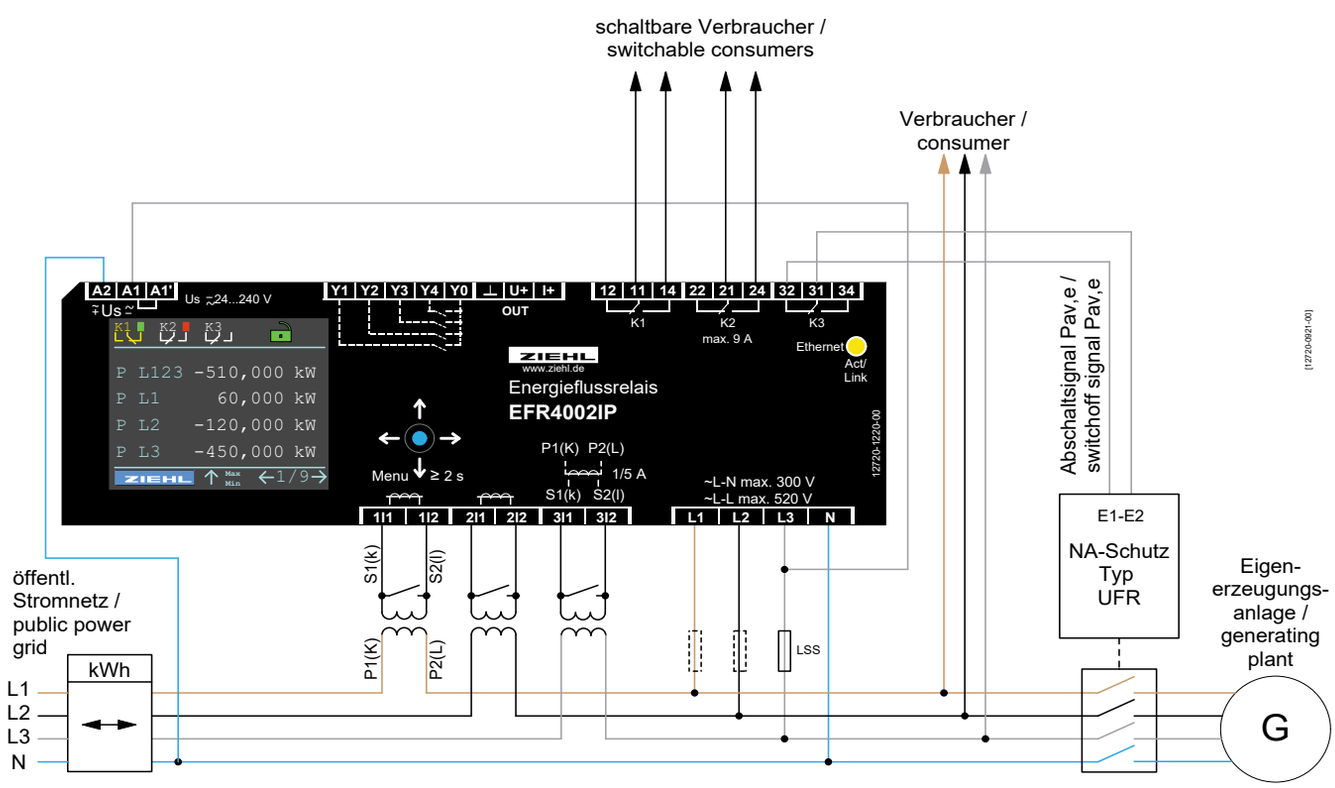
Features:
- Can be used for medium-voltage applications Connection of earthed medium-voltage transformers and series connected measuring devices
- Measuring of active power 1- or 3-phase ± 99,99 MW
- Pav,e monitoring predefined and with any values
- Pav,e monitoring in compliance with the entire limit curve
- 3 inputs for customary current transformers with secondary 1 or 5 A.
- Current transformer connectable, proportion adjustable
- Counters for power (feed in and consumption)
- 3 relay outputs
- 4 digital inputs Y1-Y4 for control signals, e.g. relay on or off
- IP-connection, integrated webserver
- Values available via Modbus TCP, SunSpec (Energy Meter)
- Analog outputs as measuring transducer and for stepless regulation of a consumer

Accessory:
- Installation frame ER8 for panel mount
- Current transormers scaleable up to 2.400 A, secondary 1 A or 5 A (for Pav,e min. class 1) for example ZIEHL Type AS oder WS
- Type CTM7 61/1A, class 1 0,5 VA

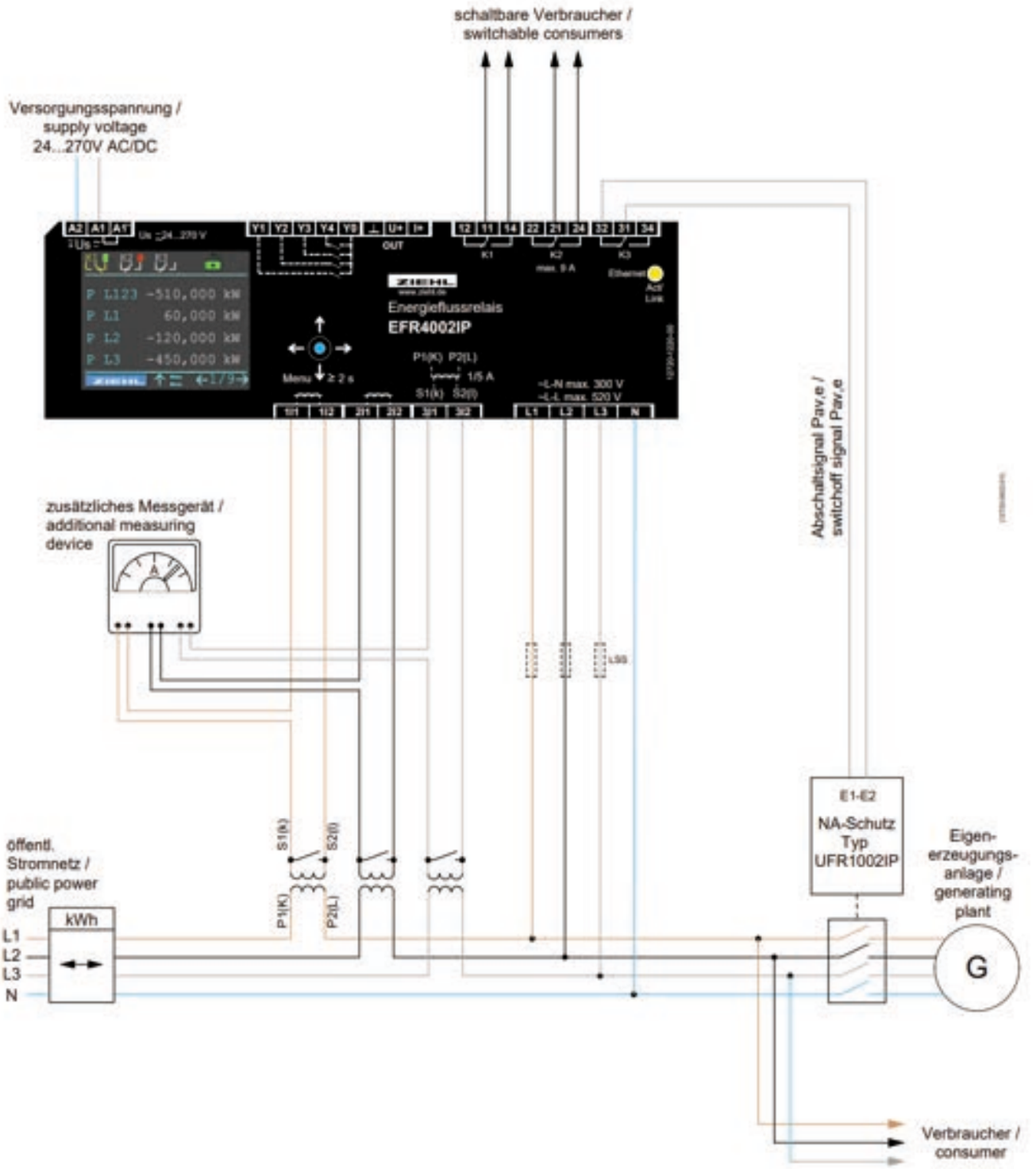
Technical Data

Rated supply voltage	DC/AC 24 – 270 V 0/40...70 Hz, <3.5 W, <9 VA
Tolerance	DC 20,4 - 297 V AC 20 - 297 V
Relay outputs K1, K2, K3	3 x 1 change-over contact
Switching voltage	max. AC 300 V, DC 300 V
Conventionel thermal current Ith	max. 9 A
Switching power max cos φ=1	2000 VA
Contact service life, electr. cos φ=1	10^5 operations at 300 V / 9 A
Rated operational current	AC-15 Ie = 6 A Ue = 250 V
Measurement of voltage (RMS)	L1 / L2 / L3 towards N
Current transformer	adjustable 1:1 ... 1:250
Voltage phase-N	AC 10,0 … 330,0 V / 50 Hz
Resolution	0,1 V
Max. error of measurement	± 0,5% of fullscale, ±1 digit
Measurement of current	with transformers (scaleable up to 2.400 A)
Nominal currents / resolution	AC 1/5 A / 1 mA
Max. error of measurement	± 0,5% of fullscale ±1 digit
Overload capacity	6 A continously, 12,5 A max. 1 s
Resistance of input	30 mΩ
Measurement of active power	with voltage transformers from - 99,99 up to 99,99 MW
Max. error of measurement	± 1 % of fullscale ±1 digit
Analog outputs	DC 0/4/1-10...20 mA, DC 0/2/0-5...10 V
Load	≤ 500 Ω
Test conditions	see "general technical information"
Operating temperature	-20 °C ... +55 °C
Housing / Installation Frame	Design V8 / Front mounting kit ER8, 8 TE
Dimensions (B x H x T)	140 x 90 x 58 mm, mounting height 55 mm
Protection housing/terminals	IP 30 / IP20
Attachment	on 35 mm DIN rail or with screws M4
Weight	app. 300 g

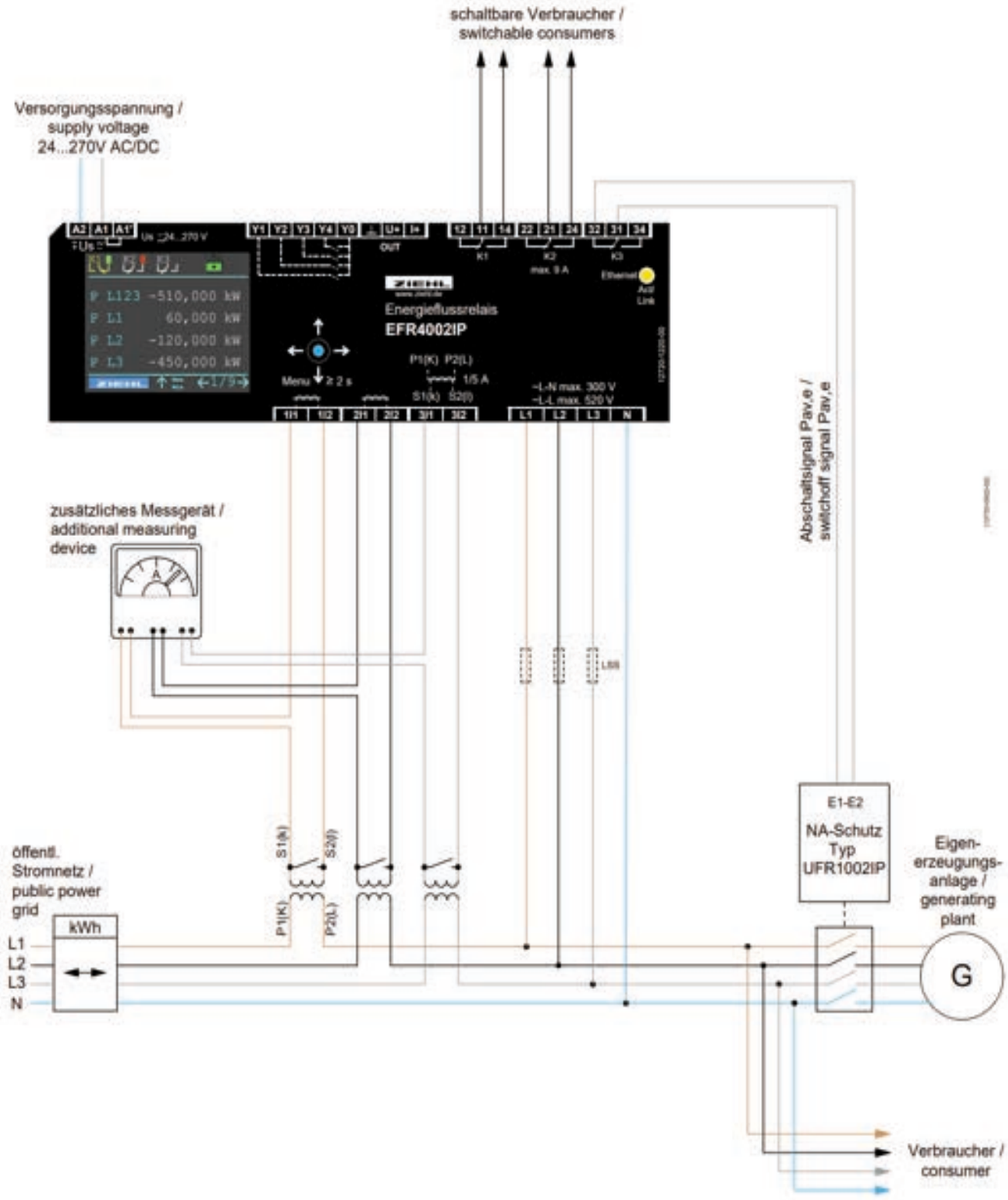
Connection Example:



Connection Example: Low-voltage network + measuring device in series



Connection Example: Earthed current transformers



Our sample connection diagrams are for illustrative purposes only. We accept no liability for any operating errors.

We would like to point out that work on this product may only be carried out by individuals who are familiar with the installation, commissioning and operation, and have the appropriate qualifications for their work.

Safety instructions in the operating manual must be strictly followed.

Zero Export Device Type EFR4002IPR

Certified monitoring of Pav,e with standard VDE-AR-N 4105:2018-11
Optimization of self-consumption of self-generated energy
Energy Flow Relay

EFR4002IPR

Part numbers:

EFR4002IPR	**S225763**
ER8	**T224388**
NRCM Rogowski Coil	**S227900**

Relays for energy flow EFR4002IPR monitor the current flow between public power grid and generating plant / consumer. Operation is made comfortably via integrated webserver or directly at the device. Measured values are displayed neatly arranged at device on monitor.
When the own power plant generates more power than is actually consumed, it often is more economical to consume the excess energy yourself. This is especially reasonable when the difference is high between the price you pay to the grid provider and the price the provider pays for fed in energy.

Many areas suitable for photovoltaics could not be used so far, since only a limited amount of power can be fed in at the grid connection point.

In Germany new standards VDE-AR-N 4105:2018-11 allow exceeding this value by up to 66.6% or more installed capacity. The prerequisite for this is that the overbuilt power is consumed and not fed into the grid. In order to still ensure the stability of the system, this can be monitored with EFR4002IPR.
The same applies to zero export, when no energy at all may be fed into the grid. In this case, the device can be used as an energy flow direction sensor (EnFluRi). The EFR4002IPR has been optimized for these functions.
Data exchange with PPS (Power Plant Controller) possible.

Zero-Export-Device or limiter:
- Switching off the power generation system or parts of it if the permissible feed-in power is exceeded with relay K3
- Switching on consumers or reducing generators before it comes to that by means of regulating with an analogue output or switching loads with relays K1 and K2
- Energy flow direction sensor (EnFluRi sensor) and feed-in limitation < 0.1s

Functions
- Switching of up to 3 consumers: the largest consumer, ranked 1-2-3 or combination of 3 consumers (7 levels))
- Switch on and off points. At which energy flow consumers are switched on and off again
- Switch on and off delay of consumers, minimum on time.
- Control of heat pumps (SG-ready), battery chargers, inverters

Features:
- Can be used for medium-voltage applications Connection of Rogwoski Coil possible
- Measuring of active power 1- or 3-phase ± 99,99 MW
- Pav,e monitoring predefined and with any values
- Pav,e monitoring in compliance with the entire limit curve
- 3 inputs for Rogowski Coil with 333mV
- Counters for power (feed in and consumption)
- 3 relay outputs
- 4 digital inputs Y1-Y4 for control signals, e.g. relay on or off
- Analog outputs as measuring transducer and for stepless regulation of a consumer
- Universal control voltage AC/DC 24-240 V
- IP-connection, integrated webserver
- Values available via Modbus TCP, SunSpec (Energy Meter)

Accessory:
- Installation frame ER8 for panel mount
- Standard Rogowski Coil with 333mV, for example ZIEHL Rogowksi Coil Type NRCM 100A

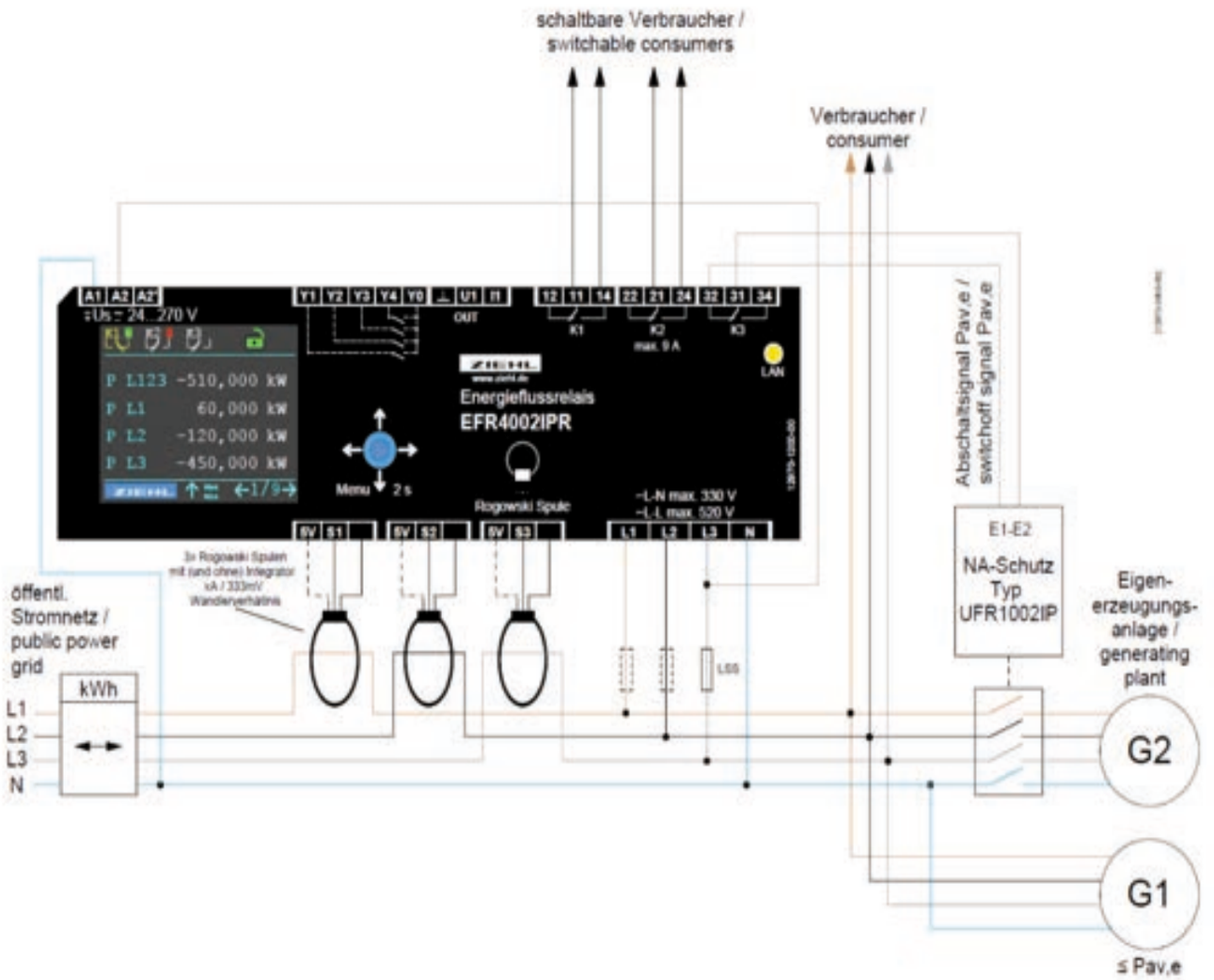
Technical Data

Rated Supply Voltage U_s (A1, A2)	**AC/DC 24 - 240 V**	**0/40 ... 70 Hz**
Tolerance	AC 20 ... 297 V	DC 20,4 ... 297 V
Power consumption	< 3,5 W < 10,5 VA	
Relay outputs K1, K2, K3	**3 x 1 change-over contact**	
Switching voltage	max. AC 300 V;	DC 300 V
Conventional thermal current Ith	max. 9 A	
Switching power max. AC cos φ = 1	2000 VA	
Contact service life electrical cos φ = 1	10^5 operations at 300 V / 9 A	
Rated operational current	AC-15 Ie = 6 A	Ue = 250 V
	DC-13 Ie = 2 A	Ue = 24 V
	DC-13 Ie = 0,2 A	Ue = 240 V
Measurement: Voltage U (L1 / L2 / L3 towards N)		
Resolution	0,1 V	
Max. error of measurement	±0,5% of fullscale ± 1 Digit	
Measurement: Signal input I/U (S1 / S2 / S3)		
Resolution	100 µV	
Max. error of measurement	±0,5% of fullscale	
Measurement: Active power P	**Multiply the values by factors of current and voltage transformers**	
Measuring range per phase / total	-60 … 60 MW / -99,99 … 99,99 MW	
Max. error of measurement	±0,5% of fullscale ± 1 Digit	
Measurement: Line frequency f		
Measuring rage	40,000 … 70,000 Hz	
Max. error of measurement	±0,01% ± 1 Digit	
Analog output (GND (⊥), I+)	**DC 0/4/0-10…20 mA for active power ±999 kW, scalable**	
Load	≤ 500 Ω	
Analog output (GND (⊥), U+)	**DC 0/2/0-5…10 V for active power ±999 kW, scalable**	
Load	≥ 1 Ω	
Ethernet	**Parameterization, measured values, firmware update, Modbus TCP, logging**	
Speed	10 / 100 Mbit/s	
IP adress	Adjustable / DHCP, default: DHCP on	
Subnet mask	Adjustable, default: 255.255.255.0	
Conditions		
Test conditions	EN 61010-1	
Installation conditions (allowed operating temperature)	-20 °C ... +55 °C	
Housing	**Design V8, Mount in circuit breaker box**	
Dimensions (W x H x D)	140 x 90 x 58 mm	
Protection housing / terminals	IP 30 / IP20	
Attachment	Snap-on fastening on 35 mm mounting rail acc. EN 60 715 or with M4 screwed attachment (additional bar not included in scope of delivery)	
Weight	approx. 300 g	

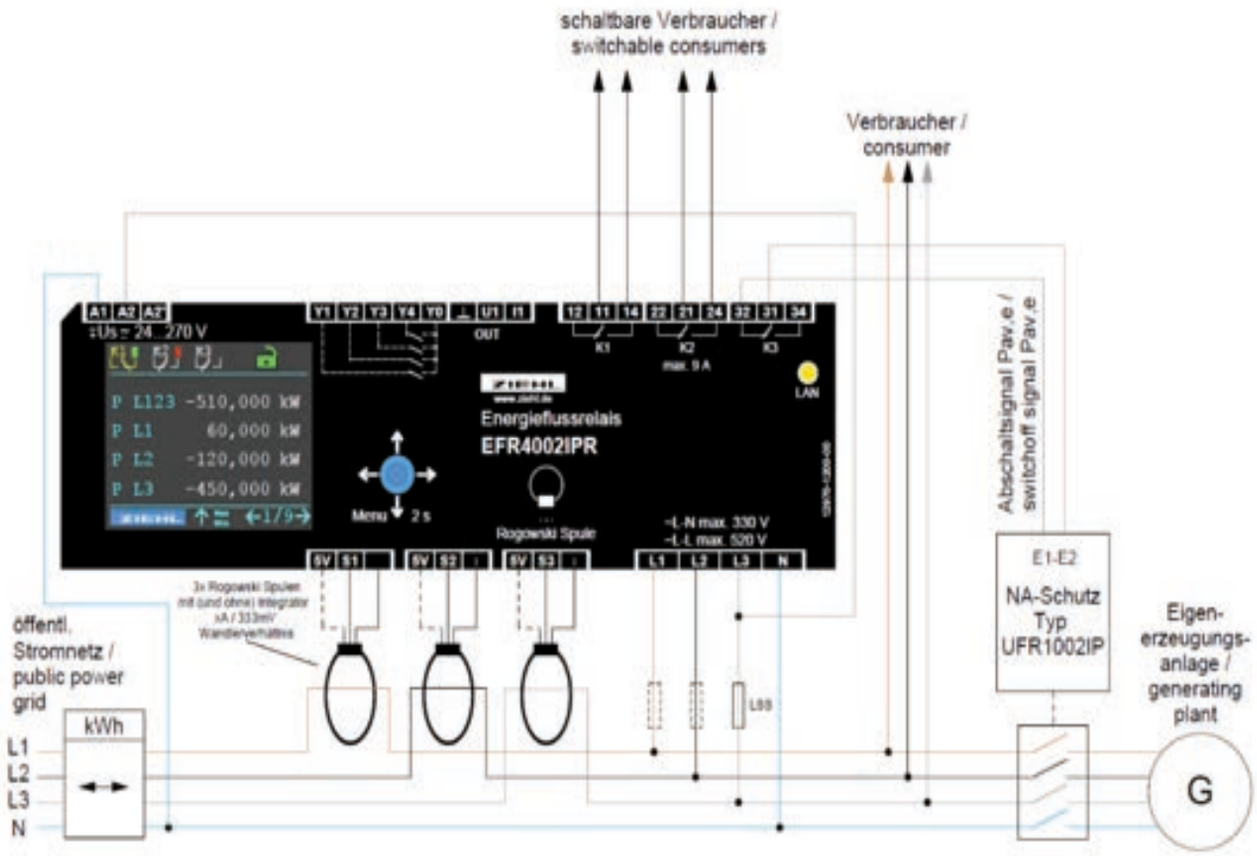
The technical data listed on this data sheet is only an excerpt; please refer to the operating manual for the complete technical data, which we strongly recommend you observe.

Subject to technical changes

Connection example: Pav,e monitoring, separate shutdown of system components



Connection example: Pav,e monitoring complete shutdown via grid and plant protection



Our sample connection diagrams are for illustrative purposes only. We accept no liability for any operating errors.

We would like to point out that work on this product may only be carried out by individuals who are familiar with the installation, commissioning and operation, and have the appropriate qualifications for their work.

Safety instructions in the operating manual must be strictly followed.

Current Relay SolarYes

Monitoring of Function at Photovoltaic Systems, Detection of Failure at Inverters, 8 inputs

SolarYes AC

Part number: **S225535**

ER4  **T224384**

The SolarYes monitors outputs of inverters in PV-systems. Its output-relays (2 potential-free contacts) switch, when there has been no current during the last 24 hours in one of up to 8 monitored lines. Thus the failure of an inverter or a fuse is detected and reported. The operator can initiate repair immediately and saves downtime.
The SolarYes is a simple, easily understandable and economical solution, that protects PV-systems from downtimes.

The device is mounted in a switch cabinet or a distribution box. The current is measured contactless with simple and solid current transformers, that are mounted over the line at any position, e.g. near the fuses. A subsequent installation in an existent system is possible.
Over the course of 24 hours occurring minimal currents (at night there can be wattles currents, caused by interference suppression capacitors in the inverter) are automatically measured and faded out in the evaluation.
The minimum response limit of 0,3 A allows measuring of low current-levels. The limit can de reduced by leading the monitored line multiple times through the transformer (Ø 11 mm).
In case of false alarms, e.g. with snow on the solar modules, the monitoring interval can be extended to up to 8 days or the alarm can be suppressed with a switch.
The 2 output-relays can switch alarm-lamps or electroacoustic transducers. The connection of an alarm system or another monitoring unit also is possible.

Function

Inputs:
- 8 inputs for current transformers STWA1 or STWA1H (max. 100 A)
- Not connected inputs disconnectible
- Sensitivity adjustable AC 0,3…2,4 A (lower values by leading the monitored line multiple times through the transformer)
- Autocalibration of inputs
- Enable-input

Displays and Controls:
- 8 LEDs for inputs
- 8 LEDs for alarms
- 4 LEDs for display of state and programming
- 2 LEDs for relays
- 1 LED enable-input
- 3 pushbuttons

Other features:
- 2 change-over contacts, nc and no individually programmable
- Autocalibration for easy startup
- Power-saving (Eco-Mode), disconnectible
- Power consumption <0,5 W, <1,2 VA
- Universal supply-voltage AC/DC 24-240 V
- Housing for DIN-rail mount, 70 mm, mounting height 55 mm
- Accessory: Installation frame ER4 for panel mount

Current transformers STWA1 and STWA1H

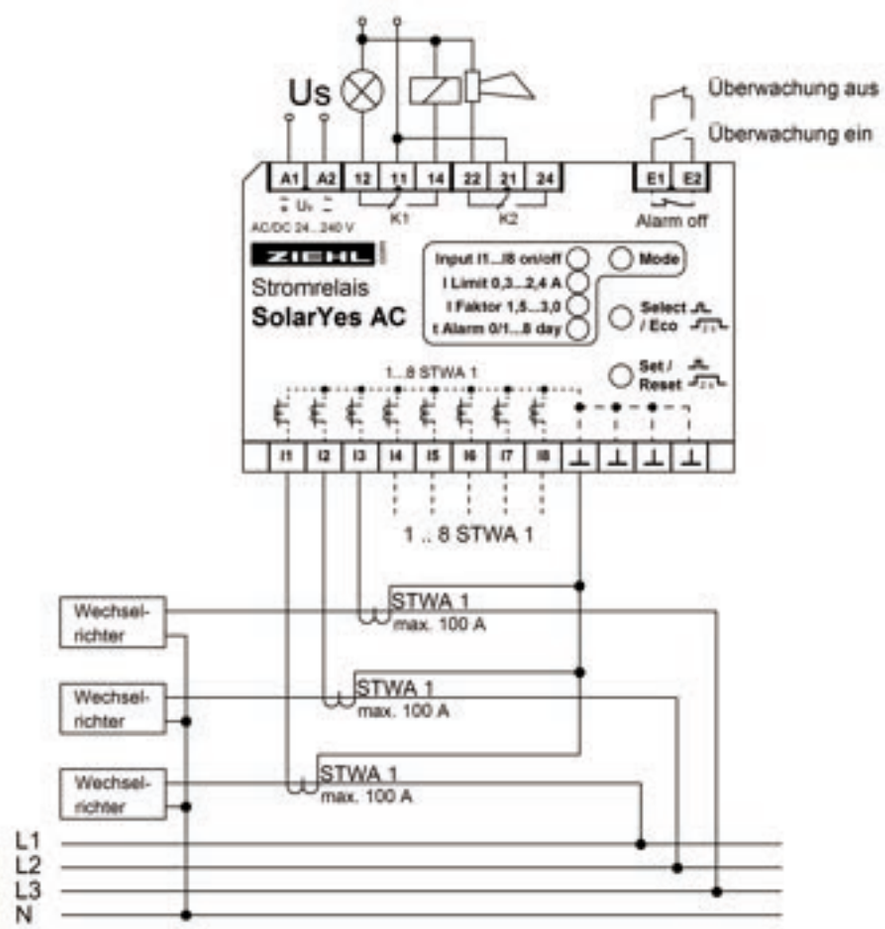
Part numbers:
S225201 STWA1
S225506 STWA1H

For measuring the current, current transformers STWA1 and STWA1H are used, one for every monitored line.
The STWA1 consist of a climate-proven sealed-in coil with 2 x 1 m cable.

The STWA1H can be fixed on a DIN-rail or mounted with 2 screws. The electrical connection is made via pluggable terminals. A built-in LED lights up at currents > app. 2 A.
The inner diameter of both current transformers is 11 mm, the maximum current is 100 A.

Technical Data SolarYes

Rated Supply Voltage	AC/DC 24-240 V, 0/45...65 Hz DC: 20,4...297 V, AC: 20,4...264 V
Power Consumption	< 0,5 W, < 1,2 VA
Relay-Output	2 Change-over contact (CO) type 2, see general technical hints
Measuring Inputs	1-8 Current transformers STWA 1 or STWA 1 H Sensitivity adjustable AC 0,3 - 2,4 A ± 30% max. 100 A continously, 300 A / 10 s
Function	Monitoring interval adjustable 1-8 days
Test Conditions	see general technical hints
Rated ambient temperature range	-20 °C ... +65 °C
Housing / Installation Frame	Design V4 / Front mounting kit type ER4
Dimensions (w x h x d)	70 x 90 x 58 mm, mounting height 55 mm
Protection housing/terminals	IP 30 / IP 20
Attachment	DIN-rail 35 mm or screw-mount M4
Weight	approx. 180 g



Digital Measuring Instruments MINIPAN®

Universal Digital Panelmeter MINIPAN® 300

in Housing for Panel-Mount 36 x 72 mm

MINIPAN 300

Part numbers:

D440300	MINIPAN 300 DC
D440320	MINIPAN 300 AC
D440340	MINIPAN 300 Pt100

With its 4 digit, 14 mm high display, Digital Panelmeters of MINIPAN 300- series allow the accurate display of different values in the range -1999 ... +9999. Only 3 designs cover the measuring of DC voltage and current, AC voltage and current and temperature with Pt 100-sensors (RTD). The display can be easily programmed by the customer (e.g. input 0-10 V --> display 0-350.0 ms or AC 0-1 A ---> 0-400.0 A With the built-in universal power-supply AC/DC 24-240 V it is especiall versatile.

Inputs DC-Meter:

- Measuring of current with external shunt max. 300 mV
- 1 A for direct measuring of current
- 0/4-20 mA for standard-signals
- 0-10 V for standard-signals
- 100/500 V switchable

Inputs AC-Meter:

- 500 V
- 50 V
- 10 V
- Measuring of current with external shunt max.150 mV
- 1 A for direct measuring of current or with external
- transformers

Measuring of Temperature Pt100 (RTD):

Pt100 in 2- or 3-wire connection

- Measuring Range -199,9 ... +850,0 °C
- Resolution 0,1 °C
- Display in °C or °F

Easy programming with 3 buttons

Display (skaling, decimal-point)

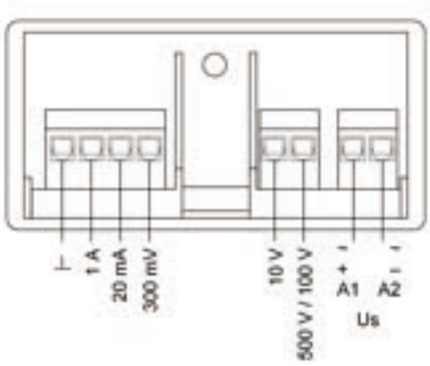
- Display of MIN- and MAX-values
- Delay at unstable signals
- Code-lock against manipulation of settings

Additional Features:

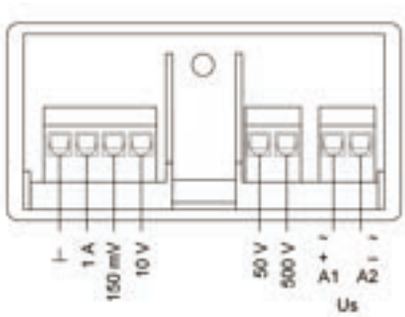
Sticker with different measuring units included

- Terminals pluggable
- Face-Plate 36 x 72 mm

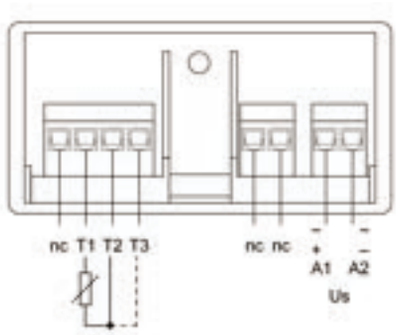
DC



AC



Pt 100



Technical Data MINIPAN 300

Power supply	rated supply-voltage Us	AC/DC 24-240 V
	tolerance DC	DC 20 - 297 V (0,85 x 24 V...1,35 x 220 V)
	tolerance AC	AC 20 - 264 V (0,85 x 24 V...1,1 x 240 V)
	power consumption	< 3 VA
	frequency	48...62 Hz
Measuring inputs	(always connect 1 input only)	potentially separated from supply-voltage
	DC-Meter measuring-range / resistance of input / overload capacity	**± 300 mV** / 120 kΩ / max. ±2,5 V **± 10.00 V** / 1 MΩ / max. ±50 V **+ 500.0 V** / **-199.9 V** / 3 MΩ / max. ±600 V **+ 100.0 V** / **-100.0 V** / 3 MΩ / max. ±600 V **+ 20.00 mA** / -19.99 mA/ Shunt 15 Ω/ max. ±100 mA **± 1.00 A** / Shunt 150 mΩ / max. ±2 A
	AC-Meter measuring-range / resistance of input / overload capacity	**150 mV** / 900 Ω / max. 2,5 V **10.00 V** / 100 kΩ / max. 50 V **50.0 V** / 1 MΩ / max. 60 V **500.0 V** / 3 MΩ / max. 600 V **1.00 A** / Shunt 150 mΩ / max. 2 A
	Temperature Pt 100 (RTD) sensor-input resistance 3-wire measuring time AC/DC measuring time Pt 100	**- 199,9 °C ... + 850,0 °C** (= -328 ... +1563 °F) Pt 100, 2- or 3-wire connection max. 3 x 50 Ω <400 ms <400 ms
Accuracy	resolution	+9999 / -1999
	error (of full measuring range) DC-voltage, DC-current AC-voltage, AC current temperature factor total error at temperature-measuring temperature factor	 ± 0,1 % ± 1 Digit ± 0,5 % ± 1 Digit ± 0,02 % / K ± 0,3 % of value ± 0,5 K ± 0,03 °C / K
Housing	Design 300 dimensions (h x w x d) mm Attachment Single wire Fine wired with end sleeves Rated ambient temperature range protection housing/terminals weight	panel-mount housing 36 x 72 x 79 mm panel-mount, panel cutout 33 $^{+0,6}$ x 68 $^{+0,6}$ mm max. thickness of panel 8 mm 1 x 0,5…1,5 mm^2 1 x 0,14…1 mm^2 -20 °C ... +60 °C IP 30/IP 20 ca. 120 g

3

Universal Display MINIPAN® 350V
in Housing for DIN-Rail-Mount

MINIPAN 350V

Part numbers:

D890110	MINIPAN 350 DC
D890210	MINIPAN 350 AC
D890310	MINIPAN 350 Pt100

With its 4 digit, 7 mm high display, Digital measuring-instruments of MINIPAN 350V- series allow the accurate display of different values in the range -1999 ... +9999. Only 3 designs cover the measuring of DC voltage and current, AC voltage and current and temperature with Pt 100-sensors (RTD). The display can be easily programmed by the customer (e.g. input 0-10 V --> display 0-350.0 ms or AC 0-1 A ---> 0-400.0 A). With the built-in universal power-supply AC/DC 24-240 V it is especiall versatile.

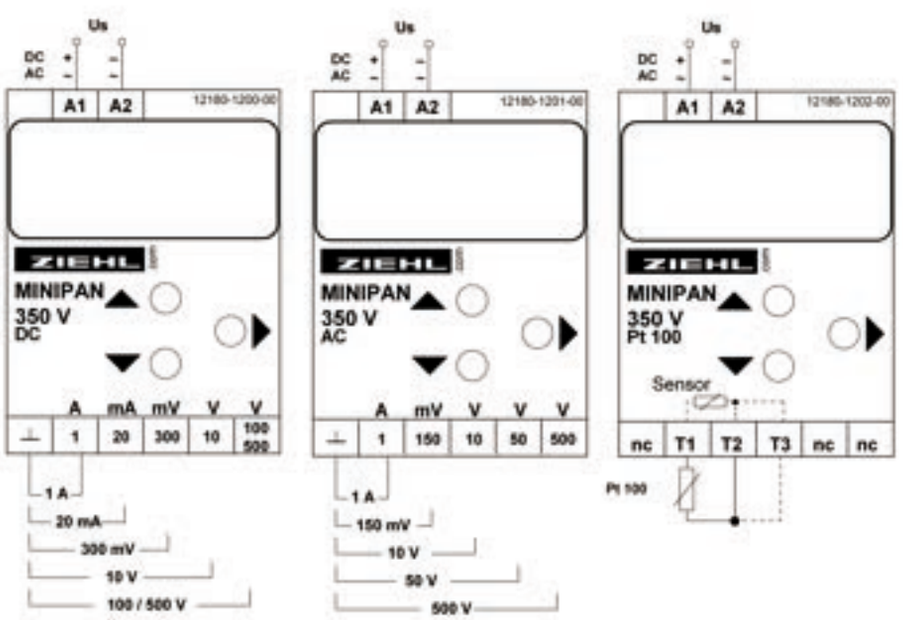
Inputs DC-Meter:
- Measuring of current with external shunt max. 300 mV
- 1 A for direct measuring of current
- 0/4-20 mA for standard-signals
- 0-10 V for standard-signals
- 100/500 V switchable

Inputs AC-Meter:
- 500 V
- 50 V
- 10 V
- Measuring of current with external shunt max.150 mV
- 1 A for direct measuring of current or with external transformers

Measuring of Temperature Pt 100 (RTD):
- Pt100 in 2- or 3-wire connection
- Measuring Range -199,9 ... +850,0 °C
- Resolution 0,1 °C
- Display in °C or °F

Easy programming with 3 buttons
- Display (skaling, decimal-point)
- Display of MIN- and MAX-values
- Delay at unstable signals
- Code-lock against manipulation of settings

Additional Features:
- Sticker with different measuring units included
- Terminals pluggable
- Mounting-height 55 mm, 70 mm wide



Technical Data MINPAN 350V

Power supply	rated supply-voltage Us	AC/DC 24-240 V
	tolerance DC	DC 20 - 297 V (0,85 x 24 V...1,35 x 220 V)
	tolerance AC	AC 20 - 264 V (0,85 x 24 V...1,1 x 240 V)
	power consumption	< 3 VA
	frequency	48...62 Hz
Measuring inputs	(always connect 1 input only)	potentially separated from supply-voltage
	DC-Meter measuring-range / resistance of input / overload capacity	**± 300 mV** / 120 kΩ / max. ±2,5 V **± 10.00 V** / 1 MΩ / max. ±50 V **+ 500.0 V** / **-199.9 V** / 3 MΩ / max. ±600 V **+ 100.0 V** / **-100.0 V** / 3 MΩ / max. ±600 V **+ 20.00 mA** / -19.99 mA/ Shunt 15 Ω/ max. ±100 mA **± 1.00 A** / Shunt 150 mΩ / max. ±2 A
	AC-Meter measuring-range / resistance of input / overload capacity	**150 mV** / 900 Ω / max. 2,5 V **10.00 V** / 100 kΩ / max. 50 V **50.0 V** / 1 MΩ / max. 60 V **500.0 V** / 3 MΩ / max. 600 V **1.00 A** / Shunt 150 mΩ / max. 2 A
	Temperature Pt 100 (RTD) sensor-input resistance 3-wire	**- 199,9 °C ... + 850,0 °C** (= -328 ... +1563 °F) Pt 100, 2- or 3-wire connection max. 3 x 50 Ω
	measuring time AC/DC measuring time Pt 100	<400 ms <400 ms
Accuracy	resolution error (of full measuring range) DC-voltage, DC-current AC-voltage, AC current temperature factor total error at temperature-measuring temperature factor	+9999 / -1999 ± 0,1 % ± 1 Digit ± 0,5 % ± 1 Digit ± 0,02 % / Kelvin ± 0,3 % of value ± 0,5 K ± 0,03 °C / K
Housing	housing dimensions (h x w x d) mm terminals Attachment	design V2 90 x 35 x 58 mm, mounting height 55 mm 8-pole on 35 mm DIN-rail or with screws M4
	ambient temperature range protection housing/ protection terminals weight	-20 °C ... +60 °C IP 30 IP 20 app. 100 g

Universal Instrument MINIPAN® 352V

for DIN-rail-mounting

MINIPAN 352V

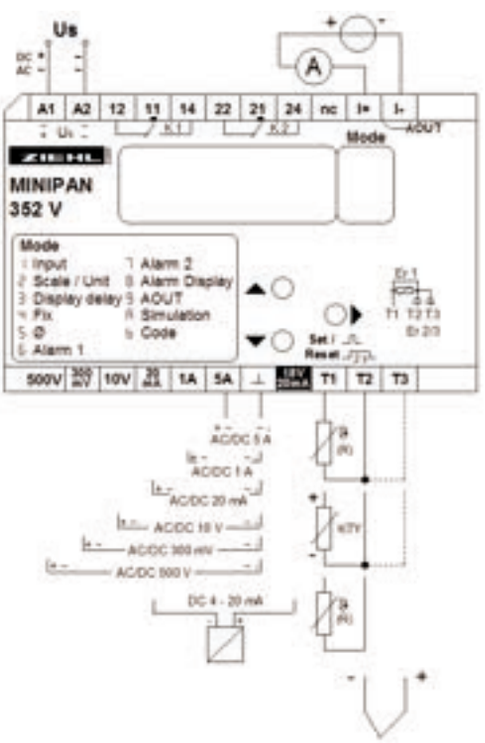
Part numbers:
D340101
D340110 with analog output

With its 4 digit, 14 mm high display, Digital Panelmeters of MINIPAN 352V- series allow the accurate display of different values in the range -1999 ... +9999. Measuring inputs AC (True RMS), DC current and voltage and measuring of restistance and of temperatures with various sensors are combined in one instrument.
Two programmable switching points allow applications as limit-switch or 2- or 3-point controller. With ***EasyLimit*** the switching points can be set easily. Other parameters are blocked and thus protected from unindended manipulation.
With its analog output (option) it is in addition a measuring-transducer.
The display can be easily programmed by the user (e.g. input DC 4-20 mA / display 0-350.0 m/s or 0...200 Ω / 0...3000 mm or AC 0-5 A / 0-400.0 A).
In addition the built-in universal power-supply AC/DC 24-240 V makes it even more versatile.

- Temperature:
  - Pt 100 (RTD) , Pt 1000, KTY 83 and KTY 84 in 2- or 3-wire connection
  - Thermocouples type B, E, J, K, L, N, R, S, T Measuring range –170 ... +1820 °C
  - Resolution 0.1 °C (up to 999.9 C)
  - Display in °C or °F
  -
- AC/DC-measuring inputs:
  - 300 mV for measuring current with external shunt
  - 1 and 5 A for direct measuring of current (or AC with external transformer)
  - 500 V
  - 10 V for standard signals
  - 20 mA for standard signals
  - AC-measuring TrueRMS

- Measuring of resistance:
  - Range 0...500 Ω
  - Range 0...30 kΩ

- Easy programming with 3 buttons and supporting display:
  - Display (zero, fullscale, decimal point)
  - 2 switching points with hysteresis and delays
  - ***EasyLimit*** for easy setting of alarms
  - Switching with automatic reset or interlocked
  - MIN/MAX-contacts or operating-/closed current mode of relays
  - Storage of MIN- and MAX-values
  - Average of multiple measurings
  - Simulation of operation
  - Code-lock against manipulation of settings
- Outputs 2 potential-free change-over contacts (co)
- Supply-voltage for external measuring transducer 4-20 mA
- Sticker with different measuring units included
- Terminals pluggable
- Mounting dimensions 72x72 mm
- Supply-voltage AC/DC 24-240 V
- Option: analog output 4...20 mA (insulated when externally supplied)



Technical Data MINIPAN 352V

Power supply	Rated supply-voltage Us	AC/DC 24-240 V
	Tolerance DC	DC 20 - 297 V (0,85 x 24 V...1,35 x 220 V)
	Tolerance AC	AC 20 - 264 V (0,85 x 24 V...1,1 x 240 V)
	Power consumption	< 5 VA
	Frequency	48...62 Hz
Measuring inputs		potentially separated from supply-voltage (always connect 1 input only at the same time)
	DC-measuring Measuring-range / input- Resistance / overload capacity	**± 300 mV** / 29 kΩ / max. ±2,5 V **± 10.00 V** / 1 MΩ / max. ±50 V **± 500.0 V** / 3 MΩ / max. ±600 V **± 20.00 mA** / Shunt 8 Ω/ max. ±100 mA **± 1.00 A** / Shunt 150 mΩ / max. ±2 A **± 5.00 A** / Shunt 30 mΩ / max. ±7,5 A for 10 s
	AC-measuring Measuring-range / input- Resistance / overload capacity	**300 mV** / 20 kΩ / max. 2,5 V **10.00 V** / 1 MΩ / max. 50 V **500.0 V** / 3 MΩ / max. 600 V **20.00 mA** / Shunt 8 Ω / max. 100 mA **1.00 A** / Shunt 150 mΩ / max. 2 A **5.00 A** / Shunt 30 mΩ / max. 7,5 A for 10 s
	Messuring of resistance	0...500 Ω 0... 30 kΩ
	Temperature-measuring Sensor-input Thermocouples	**- 199,9 °C... + 850,0 °C** (= -328 ... +1563 °F) Pt 100, Pt 1000, KTY 83, KTY 84, 2- or 3-wire connection, line-resistance max. 3x 50 Ω B, E, J, K, L, N, R, S, T
	Measuring time DC Measuring time AC Measuring time temperature + Resistance	< 300 ms x Ø < 700 ms + 300 ms x Ø < 600 ms (3-wire + thermocouple) < 300 ms (2-wire)
Output	Relay output Analog output Supply-voltage for loop-powered measuring transducer and analog output	Typ 2, see "general technical informations" 2x1 change-over) contanct 4-20 mA (insulated when externally supplied) DC 15-20 V / max. 45 mA
Accuracy	Resolution Error DC (of FullScale) Error AC (of FullScale) Error resistance (of value) Error Pt 100 (of value)	-1999 / +9999 ± 0,1 % ± 1 Digit ± 0,02 % K ± 0,5 % ± 1 Digit ± 0,05 % K 500 Ω: 0,2 % ± 0,5 Ω 30 kΩ: 0,5 % ±2 Ω ± 0,2 % ± 0,5 K ± 0,04 °C/K
Housing	Housing Dimensions (h x w x d) mm Attachment	V4 90 x 70 x 58 mm on 35 mm DIN rail according to EN 60 715 or with 2 screws M4 (option)
	Ambient temperature range Protection housing Protection terminals Weight	-20 °C ... +60 °C IP 30 IP 20 approx. 190 g

Universal Instrument MINIPAN® 352P

in Housing for Panel-Mount 72 x 72 mm

MINIPAN 352P

Part number:
D440210 with analog output

With its 4 digit, 14 mm high display, Digital Panelmeters of MINIPAN 352P- series allow the accurate display of different values in the range -1999 ... +9999. Measuring inputs AC (True RMS), DC current and voltage and measuring of restistance and of temperatures with various sensors are combined in one instrument.
Two programmable switching points allow applications as limit-switch or 2- or 3-point controller. With ***EasyLimit*** the switching points can be set easily. Other parameters are blocked and thus protected from unindended manipulation.
With its analog output it is in addition a measuring-transducer. The display can be easily programmed by the user (e.g. input DC 4-20 mA / display 0-350.0 m/s or 0...200 Ω / 0...3000 mm or AC 0-5 A / 0-400.0 A).
In addition the built-in universal power-supply AC/DC 24-240 V makes it even more versatile.

Temperature:

- Pt 100 (RTD) , Pt 1000, KTY 83 and KTY 84 in 2- or
  - 3-wire connection
    Thermocouples type B, E, J, K, L, N, R, S, T
  - Measuring range –170 ... +1820 °C
  - Resolution 0.1 °C (up to 999.9 C)
  - Display in °C or °F

AC/DC-measuring inputs:

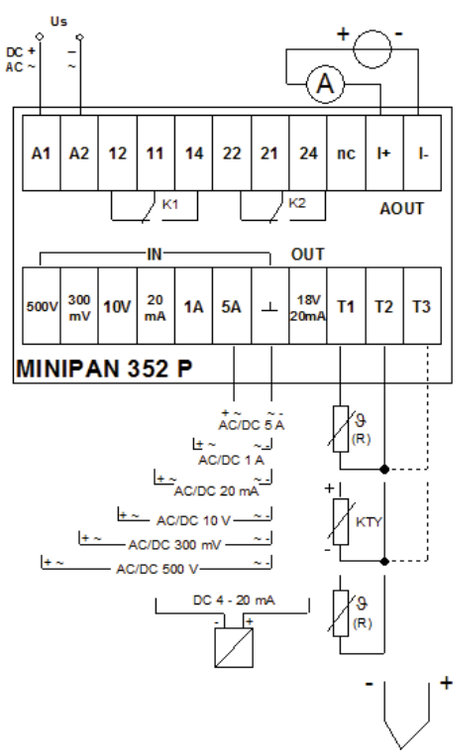
- 300 mV for measuring current with external
  - shunt
    1 and 5 A for direct measuring of current (or AC with
  - external transformer)
    500 V
    10 V for standard signals
  - 20 mA for standard signals
  - AC-measuring TrueRMS

Measuring of resistance:

- Range 0...500 Ω
  - Range 0...30 kΩ
  -

Easy programming with 3 buttons and supporting

- display:
  Display (zero, fullscale, decimal point)
  - 2 switching points with hysteresis and delays
  - ***EasyLimit*** for easy setting of alarms
  - Switching with automatic reset or interlocked
  - MIN/MAX-contacts or operating-/closed cur-
  - rent mode of relays
    Storage of MIN- and MAX-values
  - Average of multiple measurings
  - Simulation of operation
  - Code-lock against manipulation of settings
    Outputs 2 potential-free change-over contacts (co)
- Supply-voltage for external measuring transducer
- 4-20 mA
  Sticker with different measuring units included
- Terminals pluggable
- Mounting dimensions 72x72 mm
- Supply-voltage AC/DC 24-240 V
- Analog output 4...20 mA (insulated when external-
- ly supplied)



Technical Data MINIPAN 352P

Power supply	Rated supply-voltage Us	AC/DC 24-240 V
	Tolerance DC	DC 20 - 297 V (0,85 x 24 V...1,35 x 220 V)
	Tolerance AC	AC 20 - 264 V (0,85 x 24 V...1,1 x 240 V)
	Power consumption	< 3 W, < 10 VA
	Frequency	48...62 Hz
Measuring inputs		potentially separated from supply-voltage (always connect 1 input only at the same time)
	DC-measuring Measuring-range / input- Resistance / overload capacity	**± 300 mV** / 29 kΩ / max. ±2,5 V **± 10.00 V** / 1 MΩ / max. ±50 V **± 500.0 V** / 3 MΩ / max. ±600 V **± 20.00 mA** / Shunt 8 Ω/ max. ±100 mA **± 1.00 A** / Shunt 150 mΩ / max. ±2 A **± 5.00 A** / Shunt 30 mΩ / max. ±7,5 A for 10 s
	AC-measuring Measuring-range / input- Resistance / overload capacity	**300 mV** / 20 kΩ / max. 2,5 V **10.00 V** / 1 MΩ / max. 50 V **500.0 V** / 3 MΩ / max. 600 V **20.00 mA** / Shunt 8 Ω / max. 100 mA **1.00 A** / Shunt 150 mΩ / max. 2 A **5.00 A** / Shunt 30 mΩ / max. 7,5 A for 10 s
	Messuring of resistance	0...500 Ω 0... 30 kΩ
	Temperature-measuring Sensor-input Thermocouples	**- 199,9 °C... + 850,0 °C** (= -328 ... +1563 °F) Pt 100, Pt 1000, KTY 83, KTY 84, 2- or 3-wire connection, line-resistance max. 3x 50 Ω B, E, J, K, L, N, R, S, T
	Measuring time DC Measuring time AC Measuring time temperature + Resistance	< 300 ms x Ø < 700 ms + 300 ms x Ø < 600 ms (3-wire + thermocouple) < 300 ms (2-wire)
Output	Relay output Analog output Supply-voltage for loop-powered measuring transducer and analog output	Typ 2, see "general technical informations" 2x1 change-over) contanct 4-20 mA (insulated when externally supplied) DC 15-20 V / max. 45 mA
Accuracy	Resolution Error DC (of FullScale) Error AC (of FullScale) Error resistance (of value) Error Pt 100 (of value)	-1999 / +9999 ± 0,1 % ± 1 Digit ± 0,02 % K ± 0,5 % ± 1 Digit ± 0,05 % K 500 Ω: 0,2 % ± 0,5 Ω 30 kΩ: 0,5 % ±2 Ω ± 0,2 % ± 0,5 K ± 0,04 °C/K
Housing	 Dimensions (h x w x d) mm Attachment Rated ambient temperature-range Protection housing Protection terminals Weight	panel-mount housing 72 x 72 mm 72 x 72 x 103 mm panel-mount, panel cutout 68 $^{+0,7}$ x 68 $^{+0,7}$ mm max. thickness of panel: 8 mm -20 °C ... +60 °C front-side IP 50, back-side IP 20 IP 20 approx. 240 g

3

Universal Instrument MINIPAN® SE352

in Housing for Panel-Mount 48 x 96 mm

MINIPAN SE352

Part number:
D440110 with analog output

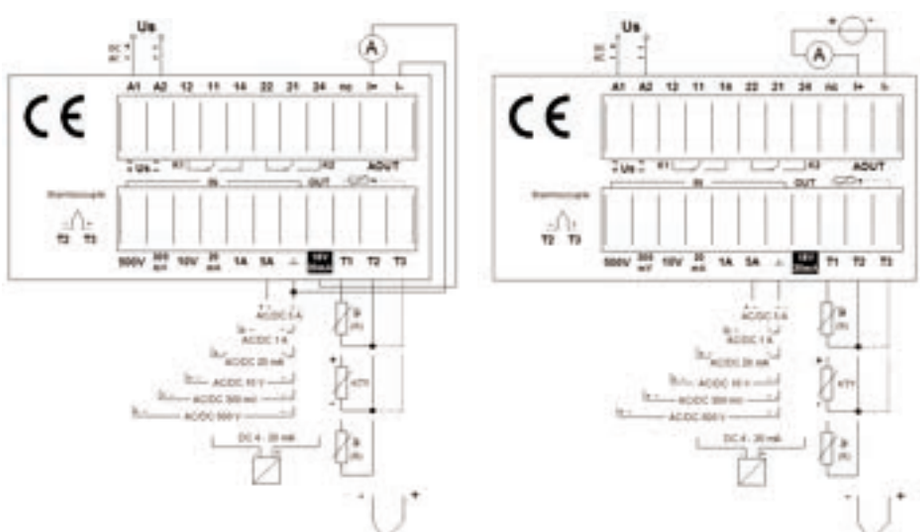
With its 4 digit, 14 mm high display, Digital Panelmeters of MINIPAN SE 352-series allow the accurate display of different values in the range -1999 ... +9999. Measuring inputs AC (True RMS), DC current and voltage and measuring of restistance and of temperatures with various sensors are combined in one instrument.
Two programmable switching points allow applications as limit-switch or 2- or 3-point controller. With ***EasyLimit*** the switching points can be set easily. Other parameters are blocked and thus protected from unindended manipulation.
With its analog output it is in addition a measuring-transducer. The display can be easily programmed by the user (e.g. input DC 4-20 mA / display 0-350.0 m/s or 0...200 Ω / 0...3000 mm or AC 0-5 A / 0-400.0 A).
In addition the built-in universal power-supply AC/DC 24-240 V makes it even more versatile.

- Temperature:
  - Pt 100 (RTD) , Pt 1000, KTY 83 and KTY 84 in 2- or 3-wire connection
  - Thermocouples type B, E, J, K, L, N, R, S, T
  - Measuring range –170 ... +1820 °C
  - Resolution 0.1 °C (up to 999.9 C)
  - Display in °C or °F

- AC/DC-measuring inputs:
  - 300 mV for measuring current with external shunt
  - 1 and 5 A for direct measuring of current (or AC with external transformer)
  - 500 V
  - 10 V for standard signals
  - 20 mA for standard signals
  - AC-measuring TrueRMS

- Measuring of resistance:
  - Ranges 0...500 Ω, 0...30 kΩ

- Easy programming with 3 buttons and supporting display:
  - Display (zero, fullscale, decimal point)
  - 2 switching points with hysteresis and delays
  - ***EasyLimit*** for easy setting of alarms
  - Switching with automatic reset or interlocked
  - MIN/MAX-contacts or operating-/closed current mode of relays
  - Storage of MIN- and MAX-values
  - Average of multiple measurings
  - Simulation of operation
  - Code-lock against manipulation of settings
- Outputs 2 potential-free change-over contacts (co)
- Supply-voltage for external measuring transducer 4-20 mA
- Sticker with different measuring units included
- Terminals pluggable
- Mounting dimensions 48 x 96 mm
- Splash-proof frontside IP54
- Supply-voltage AC/DC 24-240 V
- Analog output 4...20 mA (insulated when externally supplied)



Technical Data MINIPAN SE352

Power supply	Rated supply-voltage Us	AC/DC 24-240 V
	Tolerance DC	DC 20 - 297 V (0,85 x 24 V...1,35 x 220 V)
	Tolerance AC	AC 20 - 264 V (0,85 x 24 V...1,1 x 240 V)
	Power consumption	< 3 W, < 10 VA
	Frequency	48...62 Hz
Measuring inputs		potentially separated from supply-voltage (always connect 1 input only at the same time)
	DC-measuring Measuring-range / input- Resistance / overload capacity	**± 300 mV** / 29 kΩ / max. ±2,5 V **± 10.00 V** / 1 MΩ / max. ±50 V **± 500.0 V** / 3 MΩ / max. ±600 V **± 20.00 mA** / Shunt 8 Ω/ max. ±100 mA **± 1.00 A** / Shunt 150 mΩ / max. ±2 A **± 5.00 A** / Shunt 30 mΩ / max. ±7,5 A for 10 s
	AC-measuring Measuring-range / input- Resistance / overload capacity	**300 mV** / 20 kΩ / max. 2,5 V **10.00 V** / 1 MΩ / max. 50 V **500.0 V** / 3 MΩ / max. 600 V **20.00 mA** / Shunt 8 Ω / max. 100 mA **1.00 A** / Shunt 150 mΩ / max. 2 A **5.00 A** / Shunt 30 mΩ / max. 7,5 A for 10 s
	Messuring of resistance	0...500 Ω, 0... 30 kΩ
	Temperature-measuring Sensor-input Thermocouples	**- 199,9 °C... + 850,0 °C** (= -328 ... +1563 °F) Pt 100, Pt 1000, KTY 83, KTY 84, 2- or 3-wire connection, line-resistance max. 3x 50 Ω B, E, J, K, L, N, R, S, T
	Measuring time DC Measuring time AC Measuring time temperature + Resistance	< 300 ms x Ø < 700 ms + 300 ms x Ø < 600 ms (3-wire + thermocouple) < 300 ms (2-wire)
Output	Relay output Analog output Supply-voltage for loop-powered measuring transducer and analog output	Typ 2, see "general technical informations" 2x1 change-over) contanct 4-20 mA (insulated when externally supplied) DC 15-20 V / 25 mA
Accuracy	Resolution Error DC (of FullScale) Error AC (of FullScale) Error resistance (of value) Error Pt 100 (of value)	-1999 / +9999 ± 0,1 % ± 1 Digit ± 0,02 % K ± 0,5 % ± 1 Digit ± 0,05 % K 500 Ω: 0,2 % ± 0,5 Ω 30 kΩ: 0,5 % ±2 Ω ± 0,2 % ± 0,5 K ± 0,04 °C/K
Housing		panel-mount housing
	Dimensions (h x w x d) mm Attachment	48 x 96 x 100 mm panel-mount, panel cutout 45 $^{+0,6}$ x 92 $^{+0,8}$ mm max. thickness of panel: 8 mm
	Rated ambient temperature-range	-20 °C ... +60 °C
	Protection housing Protection terminals Weight	front-side IP 54, back-side IP 20 IP 20 approx. 240 g

Switching Relays and Controls

Controls for Suction Plants Type STW

for Dust, Sawdust, Shaving and Smoke

General

ZIEHL controls STW are designed to control suction plants especially in carpentry and wood-processing industry.
They are mounted centrally in the switchgear-cabinet. They monitor the current to the machines with help of transformers STWA1 or STWA1H and thus detect, when a machine is switched on. When used in systems with welding-fume, the DC-currents are detected with current-sensors S1.
Simple switch-on automats (STW1K, STW12V) start dedusting when at least one of the monitored machines is switched on and stop dedusting with a delay after the last machine has been switched off.
Devices with integrated control of slide-valves (STW81V, STW84V) make sure that full advantage is taken from the available dedusting-capacity.
Multiple STW84V can be combined for controlling greater plants.
In addition STW84V can control a frequency-converter at the motor of the fan and thus optimize dedusting and save energy.
When PLCs are used for controlling the dedusting plant, electronic current-transmitters STWA 1 S can detect, if a machine is switched on. They can be directly connected to digital inputs of PLCs.

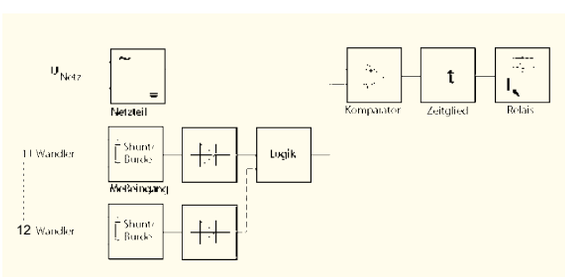
Overview

Typ	**STW1K**	**STW12V**	**STW81V**	**STW84V**	**STW164IP/ STW168M/ STW161M**	
Number of monitored machines	8	12	8	8	32	
Imputs for Transformers STWA 1 Current Sensor S1 Potential-free contact	STWA1 S1 -	STWA1 S1 Contact	STWA1 S1 Contact	STWA1 S1 Contact	- - -	
Operating value	≤ 1 A	0,5 - 5 A	0,5 - 5 A	0,5 - 5 A	0,5 - 9,9 A	
Control of valves	-	-	X	X	-	
Relay outputs	1 U	1 U	8 + 1 U	8 + 3 U	4 + 32 U	
Control of minimum volume-flow	-	-	-	X	-	
Control of filter-cleaning	-	-	-	-	X	
Control of discharge	-	-	-	X	X	
Monitoring of max. volume flow	-	-	-	X	X	

Function and Characteristics

When there is a current through a current-transformer STWA 1, the input of the control can measure a voltage at the output of the STWA 1. This voltage is evaluated and according actions are performed by the device.
This simple principle to detect current yes/no allows to realize various functions at a reasonable price.
The state (on/off) of a consumer outside the switchgear-cabinet can be detected without needing a signal from the consumer. This saves cabling.

At currents <1 A, the necessary current for reaching the operating-value of the input of the control can be reduced by leading the monitored wire multiple times through the transformer STWA 1.



Current Relay Type STW1K

AC-Detection, OR-Evaluation of 1-8 Transformers

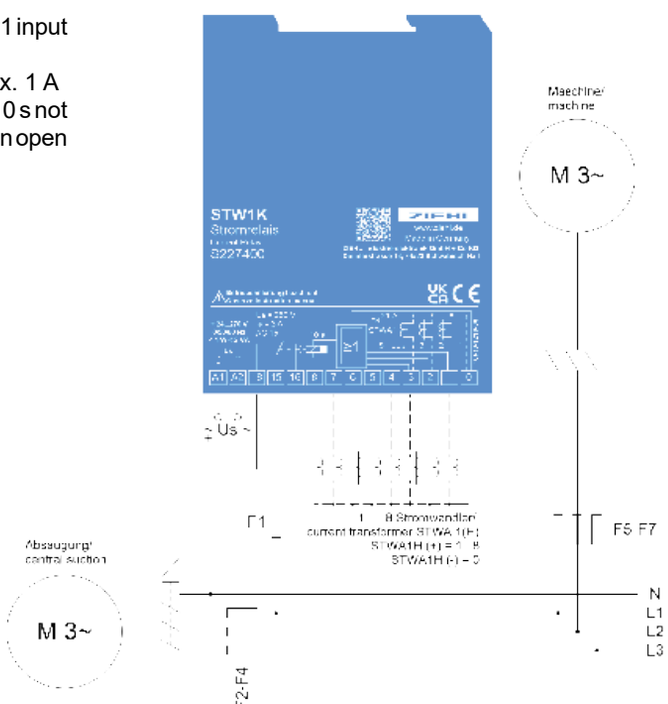
STW1K

Part number: **S227400**

Current relay in OR evaluation with 8 inputs, designed e.g. for controlling of suction plants in the timber and plastics processing industry.
When there is an AC-current >1 A through one of up to 8 connected transformers STWA1, the integrated relay (15/18) picks up. When all currents are 0, the relay releases with a delay of approx. 10s (15/16). This enables a run-after of the central suction.

- 8 inputs
- OR-evaluation
- relay picks up if at least 1 input is activated
- operating value approx. 1 A
- turn-off delay approx. 10 s not
- necessary inputs remain open

The basic function of the device is to detect whether a current is flowing in the supply line of one of several woodworking machines. If a current flow is detected, the device switches on a suction system. When the last machine is switched off, the device stops the extraction system after a delay.



Technical Data

Rated supply voltage U_S	**AC/DC 24 - 240 V 0/50/60 Hz**
Tolerance	AC 20 - 297 V / DC 20,4 - 297 V
Power consumption	< 2 VA, < 1 W
Output relay K1	**1 change over contact**
Switching voltage	max. AC 415 V
Conventional thermal current Ith	max. 6 A
Switching capacity max. AC cos φ = 1	2000 VA (resistive load) 120W at DC 24 V
Electrical contact life cos φ = 1	1 x 10^5 switching cycles at 240 V / 6 A
Mechanical contact life	3 x 10^7 switching cycle
Short circuit resistance (NO)	4 A slow action or LS switch B4
Short circuit resistance (NC)	3,15 A slow action
Shutdown capability category	AC-15 Ie = 3 A Ue = 250 V
Rated operational current	DC-13 Ie = 2 A Ue = 24 V
Rated operational voltage	
Reduction factor for cosφ = 0,3	0,5

Transformer connection	
Connection transformers	1 … 8 pcs. type STWA1 or. STWA1H
Alternating current - internal resistance	approx. 7kΩ
Transformer overload capacity	max. 100A continuous, max. 300A for 10 s

Switching points	
Switching value	approx. AC 1 A
Activation delay	< 200 ms
Switch-off delay	See nameplate (without < 200 ms)

Test conditions	EN 61010-1
Rated impulse voltage	4000 V
Overvoltage category	III
Pollution degree	2
Rated insulation voltage Ui	250 V
On-period	100 %

EMC-tests	EN 61326-1 industrial environment
Emission	EN 61326-1; CISPR 11 class B
Immunity	EN 61326-1 industrial environment
Electrical fast transient / Burst	EN 61000-4-4 ±4 kV Pulse 5/50 ns, f = 5 kHz, t = 15 ms, T = 300 ms
SURGE immunity	IEC 61000-4-5 ±4 kV (Us), ±2 kV (Inputs)
Electrostatic discarge	IEC 61000-4-2 ± 8 kV contact discarge, ± 8 kV over air

Reliability – failure rate	EN 61709/ SN29500		
Ambient conditions	Local operation in dry rooms		
Operation time 24/365	8760 h/y		
Failure rate (FIT)	Tu = 40 °C	Tu = 60°C	Tu = 80°C
Tu = Tref (component not in operation)	555 FIT	1147 FIT	2596 FIT
	100 (205) years	99 years	43 years

Installation conditions		
Permissible ambient temperature	-20 °C ... +55 °C	
Permissible storage temperature	-20 °C …+70 °C	
Installation height	< 2000 m over N.N.	
Climatic conditions	5-85% rel. F., no condensation	
Permissible wiring temperature	-5 °C …+70 °C	
Vibration resistance EN 60068-2-6	2 … 13,2 Hz ±1 mm	13,2 ... 100 Hz 1 g
	2…25 Hz ±1,6 mm	25 ... 150 Hz 5 g

Contact termination	Push-in spring-type terminal
Protection class terminals	IP20
Actuation type	Push-Button
Number of levels	1
Solid conductor	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 28 ... 16
Fine-stranded conductor	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 26 ... 14
Fine-stranded with insulated ferrule	1 x 0,25 mm^2 ... 0,75 mm^2
Fine-stranded with uninsulated ferrule	1 x 0,25 mm^2 ... 1,5 mm^2
Strip lenth	8 ... 9 mm

Housing	Type K
Dimensions (W x H x D)	22,5 x 75 x 115 mm
Width	1 M
Protection class housing	IP40
IK-Code	IK06 (1 J impact energy)
Mounting	Snap mounting on 35 mm standard rail EN 60715 or M4 screws (additional bar not included)
Mounting position	any
Weight	approx. 95 g

Subject to technical changes

Current-Relay Type STW12V

Current-Detection, OR-Evaluation, 12 Inputs, adjustable

STW12V

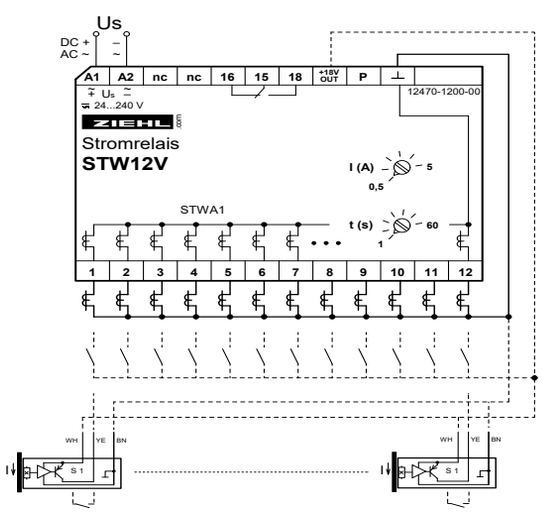
Part number:
T225519 AC/DC 24-240 V

The basic function of the device is to detect whether a current is flowing in the supply line of one of several woodworking machines. If a current flow is detected, the device switches on a suction system. When the last machine is switched off, the device stops the extraction system after a delay.

Current relays in OR evaluation with 12 inputs, designed e.g. for controlling of suction plants in the timber and plastics processing industry.
Recording of current is made with current transformers type STWA 1, current-sensors S 1 (DC also) or potential-free contacts.
When there is an AC-current higher than the set response value (setting range 0.5 - 5A) through at least one of the connected transformers , the integrated relay (1 NO) picks up. If all monitored circuits are switched off or the current falls below the set response value by approx. 0.3 A, the output relay releases after the set time delay (1 - 60).
Due to the adjustable response value, the user can permit lower currents without releasing switchings. Thus, for example, a machine can be switched on in order to adjust its electronic settings (low current via transformers). The STW will only switch on when the main motor has been put into operation (high current). Due to the adjustable switch off delay an easy adjustment of the follow-on is possible.

- Current monitoring of up to 12 currents
- Inputs for current transformers STWA 1, current-sensors S 1 or potential-free contacts
- Adjustable switching point 0.5 - 5 A
- Adjustable switch off delay (1 - 60 s)
- Plug-in terminals
- Universal supply-voltage AC/DC 24-240 V
- Housing for mounting in switchgear cabinets or fuse-boxes, 70 mm wide, mounting height 55 mm

Application:
ZIEHL current monitors in OR-circuits can be used particularly where dust, fumes and gases are generated by various electrical devices, and where these must be extracted by a central suction system. Due to the integrated delaytime the follow-on of the suction is controlled.



Technical Data

Supply voltageUs	AC/DC 24 - 240 V, < 3 W, < 5 VA,50/ 60 Hz AC 20 - 264 V, DC 20,4 - 297 V
Relay output	1 change-over contact (co)
Type of contact	**type 2 see** "general technical informations**"**
Test conditions	siehe "general technical informations**"**
Rated amb. temperature range	-20 °C … +55 °C
Function	OR-evaluation
Measuring inputs	12 x for current transmitters STWA 1, current-sensors S 1 or potential-free contacts
Overload cap./continous max 10s	100 A / 300 A
Switching point	with STWA 1 adjustable, AC 0,5 - 5 A
Tolerance	± 20%
Switch-off delay	adjustable 1- 60 s
Switch-on delay	app. 0,5 s
Dimensions (H x W x D)	design V4: 90x70x58 [mm], mounting height 55 mm
Attachment	on 35 mm DIN-rail according to EN 60 715 or with screws M4
Protection housing/terminals	IP 30 / IP 20
Weight	app. 200 g

Current Relay Type STW81V

8-channel, single evaluation + OR-circuit
Adjustable switching point 0,5 - 5 A

STW81V

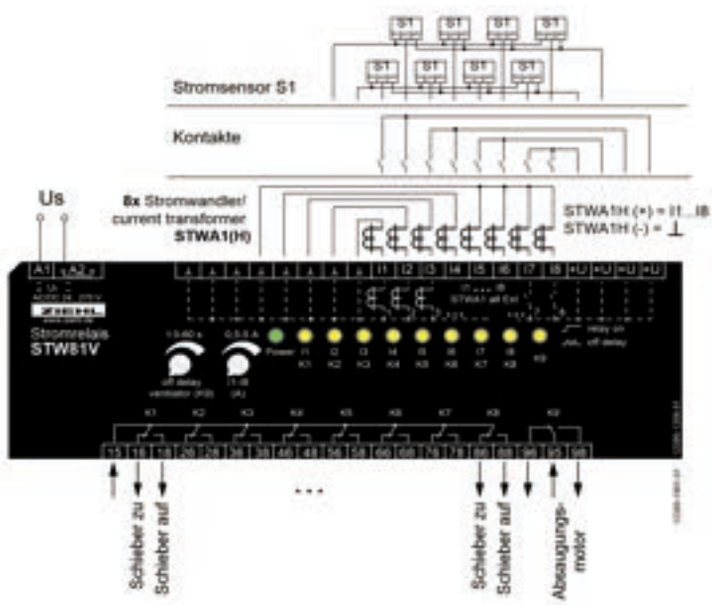
Part number:
S225516.1 AC/DC 90-270 V

The basic function of the device is to detect whether a current is flowing in the supply line of one of several woodworking machines. If a current flow is detected, the device opens a valve on the machine's suction channel. At the same time, the extraction system is switched on. When a machine is switched off, the device closes the associated valve with a delay. If the last machine is switched off, the extraction system also stops after a delay.

The current relay STW81V is an 8-channel AC current relay, designed for controlling of suction plants e.g. in the timber and plastics processing industry.
When there is an AC-current >1A through one of up to 8 connected transformers type STWA1, the appropriate relay K1...K8 (1 x co) picks up and opens the slide valve of the machine. At the same time the relay K9 starts the central suction.
Relays K1...K8 switch off 10s after the current flow through the appropriate transformer is 0. K9 switches off 0...60s (adjustable) after the current in all transformers is 0.

Application:
The current relay STW81V is particularly suitable for the central control of slide valves in suction plants, which are to be operated dependent on operating condition of individual machines. It can control a central suction at the same time.

- single evaluation of 8 inputs with STWA1
- single evaluation of 8 inputs with current-sensor S1
- inputs for 8 potential-free contacts
- OR-evaluation of all circuits (K9)
- 9 output relays
- LED display for relays / inputs
- Switching point adjustable 0,5 ...5 A
- switch-off delay of K9 adjustable 0 - 60 seconds
- switch-off delay single relays 10 s
  last relay: K9 + 20 s
- Power consumption < 1W (in standard-operation with STWA1)



4

Technical Data

Rated supply voltage Us	AC/DC 24 - 270 V, 0/50/60 Hz, < 2 W, < 6 VA DC: 20,4... 297 V, AC: 20 ... 264 V
Output relay	8 + 1 change-over contacts (co)
Type of contact	**type 2** see "general technical informations"
Test conditions	see "general technical informations"
Rated ambient temperature range	-20 °C … +55 °C
Transformer input	1...8 type STWA1, or STWA1H
Function	single/OR-circuit
Overload cap. continuous max. 10 s	100 A / 300 A
Switching point on	adjustable 0,5...5 A
Switch-on delay	approx. 0,5s
Switch-off delay	10 s / 0 - 60 s
Dimensions (h x w x d)	design V 8 / 90 x 140 x 58 [mm]
Attachment	on 35 mm DIN rail according to DIN EN 50 022 or with screws M4 (option)
Protection housing / terminals	IP 30 / IP 20
Weight	approx. 330 g

Control for Suction Plants Type STW84V

with integrated control for dedusting of filters and volume flow

STW84V

Part numbers:

STW84V **S225522**

ER8  **T224388**

The basic function of the device is to detect whether a current is flowing in the supply line of one of several woodworking machines. If a current flow is detected, the device opens a valve on the machine's suction channel. At the same time, the extraction system is switched on. When a machine is switched off, the device closes the associated valve with a delay. If the last machine is switched off, the extraction system also stops after a delay.

The current relay STW84V monitors up to 8 alternating current sets on current flow yes/no. The inputs can analyse signals of current transformers type STWA1 or of potential-free contacts.
For controlling of great dedusting plants several relays can be combined.

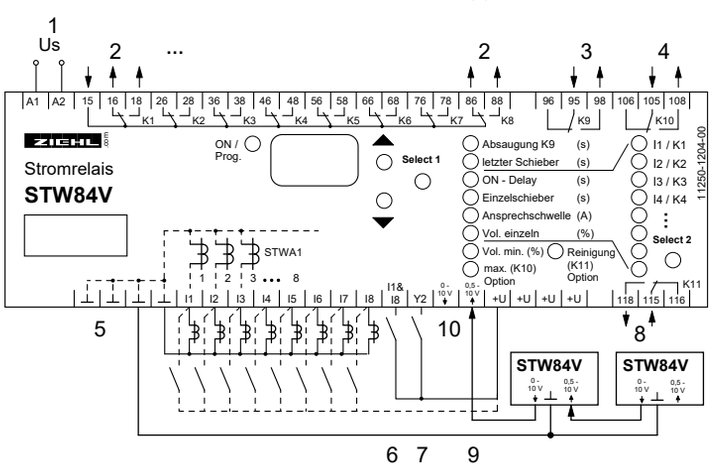
Applications: Controlling of dedusting plants in the timber and plastic processing industry according to the technical rules for dangerous materials TRGS 553. The central suction is switched on, as soon as any machine is put into operation. According slide valves in the suction ducts of the individual machines are opened. In addition, cleaning of a filter (vibration) and a cellular wheel/discharge can be controlled, an external cleaning (with compressed air) can be startet or exceeding of max. volume flow can be reported.

The analog output 0...10 V can control a frequency-converter at the motor of the ventilator and thus optimize performance and save energy.

Description:
- Monitoring of 8 machines (STWA1 or contact)
- input for "open all slide valves"
- 8 relays (with change-over contacts) for slide valves
- 1 relay for control ventilator
- 1 relay for filter-cleaning
- 1 relay for control of cellular wheel/ discharge or report exceeding max.. volume flow
- analog output for control of frequency-converter and combination of more STW
- terminals plugable
- Universal supply voltage AC/DC 24-270 V

Functions/adjustments:
- run-after last slide valve 0... 99 s
- turn-off delay ventilator 0...99 s
- minimum volume flow 1... 100%, (if necessary automatic opening of additional slide valves, beginning with K8)
- maximum volume flow 5... 100%

Individually adjustable per channel:
- turn-on delay I1... I8: 0... 20 s
- turn-off delay relay K1...K8: 0... 99 s
- operating value I1...I8: app. 0.5... 5A
- volume flow of slide valves 1...100%



1 power supply
2 8 outputs for slide-valves (16, 26...86=close, 18, 28...88=open
3 suction ON
4 max. volume-flow exceeded/option
5 inputs for current transformers STWA 1
6 open all slide valves
7 external dedusting command
8 dedusting/option
9 analog input
10 control of suction power

Combination of more STW:
Master-relay considers volume-flow of other relays for:
- control of ventilator (relay K9 and analog output 0-10 V)
- opening of additional slide valves
- adding time for filter-cleaning
- report of exceeding max. volume flow

Control of cleaning of filters:
The run time of the ventilator is added with consideration of the volume flow. The dedusting of the filters is started after achieving the programmed run time (only with switched off ventilation).

- time for addition: 0... 99 min.
- added time stored permanently even at loss of power (power failure or upon completion of work)
- delay before start of cleaning: 0... 990 s
- number of dedusting impulses: 0... 20
- impulse on-time: 1... 30 s
- impulse off-time: 1... 990 s
- time of continous dedusting: 0... 990 s
- alternatively impulse shaking 0.1... 9.9 s (square)
- alternatively dedusting request (with running suction)
- input for external dedusting command
- controlling a cellular wheel / discharge during dedusting

Displays and operation:
- 7-segment-display for settings during programming, in operation display of the volume flow
- 8 LEDs for input/output selection and display of the active inputs/outputs
- 9 LEDS for function selection
- easy programming

Accessory: Installation frame ER8 for panel mount

Technical Data STW84V

Power Supply	rated supply voltage Us	AC/DC 24-270 V
	Voltage tolerance	+10...-15%
	Power consumption	< 12 VA
	Frequency	50/ 60 Hz
Relay output	Contact elements	11 change-over contacts (co)
	Type of contact	**type 3**
	(see with " general information " under relays)	max. 5 A/ 1250 VA
Test conditions		EN 61010
	rated insulation voltage U_i	Ui 250 V
	Pollution degree	2
	rated impulse voltageelement	4000 V
	EMC - interference transmission	EN 61326-1 CISPR 11 class B
	EMC - interference resistance	EN 61326-1 (industrial surrounding)
	rated ambient temperature range	-20 °C … +45 °C
Voltage output +U		DC 17-21 V max. 120 m A at Us = 230 V (max. 8 Current sensors S1) max. 10 mA at Us = 24 V (0 sensors S1)
Inputs		1...8 STWA 1, floating contact or AC/DC 24 V, STWA 1 H or current-sensor S1
	Overload cap. continuous/max.10s	100 A/300 A
	Current overload capacity	ca.15 kΩ
	Operating value	adjustable 0.5... 5 A
	Tolerance	±20%
Command inputs	Y2, external dedusting command	+ DC 24 V
	I1&I8, command all valves open	+ DC 24 V
	internal resistance of inputs	approx.15 kΩ
Housing	Design / Installation Frame	V8 / Front mounting kit ER8, 8 TE
	Dimensions (h x w x d) mm	90 x 140 x 58 mm, mounting height 55 mm
	Wire connections	1 x 1.5 mm^2 for each pole
	Installation position	any
	Attachment	on 35 mm DIN rail or M4 screws
	Housing protection	IP 30
	Terminal protection	IP 20
	Vibration resistance	1 mm 25 cycles per second / 10 g 25 - 100 cycles per second of
	Shock resistance	10 g 20 ms 20 g 4 ms
	Weight	approx. 350g

Control for Extraction Systems with Bus Type STW164IP

Control of up to 32 Sliders via bus line

STW164IP

Part numbers:

STW164IP	**S225542**
ER8 	**T224388**

The basic function of the device is to detect whether a current is flowing in the supply line of one of several woodworking machines. If a current flow is detected, the device opens a slider on the extraction channel of the machine. The extraction system is switched on at the same time. When a machine is switched off, the device closes the associated slider with a delay. If the last machine is switched off, the extraction system also stops after a delay time.
Controllers STW164IP in conjunction with slider controls STW168M and bus modules STW161M allow the control of extraction systems with up to 32 machines.

The control STW164IP serves as the central control unit. It records the operating state of the machines by measuring their current consumption in the supply lines (current transformer STWA1 (H)) or via potential-free contacts.
It switches on the central extraction and opens the sliders on the channels to the individual machines. 8-fold slider modules are used to control the sliders. These can be mounted next to the STW164IP or distributed in the system. The latter reduces the wiring effort.
Additional sliders can be opened to optimize the air flow. Assignment to different lines and prioritization is possible. It is also possible to control cleaning and discharge.
The parameters are conveniently configured via the network (Ethernet). If the control is connected to the Internet, it can also be parameterized remotely.
The recording of operating hours of the machines and the switching frequency of the valves provide valuable services for preventive maintenance. In this way, components can be replaced as part of a service operation before they age and fail.

Description:

- Individual evaluation of 16 machines on the device (STWA 1, current sensor S1 or contact) Another 16 machines via slider controls/bus modules
- Input for "all sliders open" with timer for automatic shutdown
- 1 relay for extraction motor
- 1 relay for filter cleaning
- 1 relay for discharge (staggered start possible)
- 1 relay for message max. volume flow exceeded or fault messages
- Control of up to four 8-fold slider modules for controlling sliders via potential-free contacts
- Control of up to 32 1-fold bus modules for controlling sliders DC 24V
- Analog output 0-10V for frequency converter control on the extraction motor
- Plug-in connection terminals
- Supply voltage DC 24V
- Accessories: Installation frame ER8 for panel mount

Function/setting options:

- Switch-on delay extraction 0...1200s
- Overrun extraction 0...1200s
- Overrun last slider 0...1200s Minimum volume flow, 1...
- 100% (if necessary, automatic opening of additional sliders, sequence can be set via priority of sliders)
- Maximum volume flow 5... 100%
- Logging of the operating processes
- Operating hours counter for extraction system and extracted machines
- Counter for switching frequency of the sliders

Individually adjustable per channel (I0...I31):

- Response thresholds approx. 0.5...9.9A
- Switch-on delay 0...20s
- Volumetric flow slider 1...100%
- Overrun slider 0...120s

Control of filter cleaning:

The runtime of the extraction is added taking into account the volume flow. Cleaning is started after the programmed runtime has expired. Vibrating processes are only carried out when the extraction is switched off.

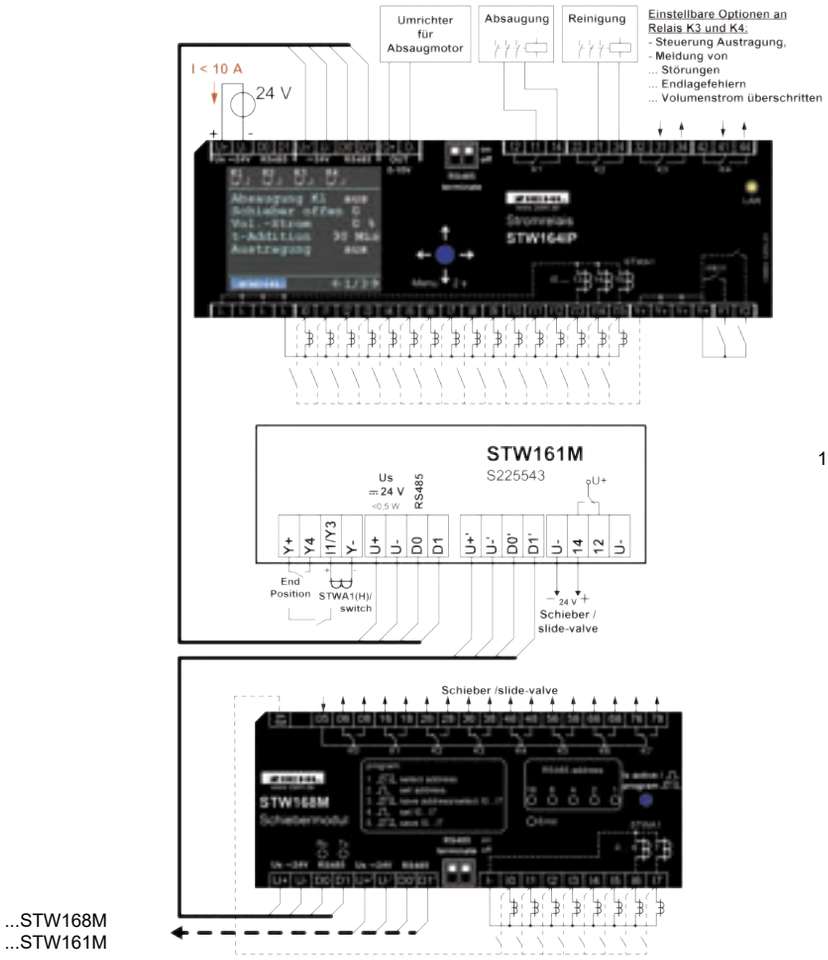
- Addition time: 0...1200min
- Storage of the added time even in the event of a power failure (power failure, closing time)
- Rundown time: 0...1200s
- Number of vibration intervals: 0...20
- Interval vibration time: 1...30s
- Interval break time: 1...120s
- Continuous vibration time: 0...1200s
- Optional pulse vibration 0.1...10s (rectangle)
- Optional cleaning request (while the extraction is running) for cleaning with compressed air
- Input for external vibration command
- Control of the overrun of the chip removal depending on the cleaning.

Ethernet interface:

- Integrated web server
- Modbus TCP (read)

Display and operation:

- Color LCD display for displaying operating states and programming
- Intuitive operation with joystick
- Via web browser
  - Display of the operating states
  - Convenient programming
  - Saving and transferring configurations
  - No additional software required



Technical Data STW164IP

Control voltage Us	DC 24V
Tolerance/ power consumption	DC 20 - 30V/ < 3W
Relay outputs K1, K2, K3, K4	4 x 1 changeover contact
Switching voltage	max AC 300V, DC 300V
Inrush current NO contact (no)	AC 15A, 4s, 10% ED
Minimum values voltage/current	12V 10mA
Conventional therm.current Ith	max. 5A
Switching capacity max AC cosfi=1	2000 VA
Inputs I0...I15	STWA1(H), potential-free contact, current sensor
Connectable converters	S1
Overload capability with STWA1(H)	max. 100 A continuous, max. 300A for 10s
Inputs Y1, Y2	
Internal resistance	approx. 38kQ
Switching threshold	ON > 17V, OFF < 8V
EMC tests	EN 61326-1
Interference emission/resistance	CISPR 11 Class B/ industrial environment
Permissible ambient temperature	-20 °C ... +55 °C
Vibration resistance EN 60068-2-6	2...13.2Hz ± 1mm 13.2...100Hz 1g 2...25Hz ± 1.6mm 25...150Hz 5g
Housing / installation frame	Type V8 distributor installation / ER8
Dimensions (W x H x D)	140 x 90 x 58mm (8 TE), installation depth 56mm
Cable connection single-wire	1 x 0.34 - 1.5mm² / AWG 22 - 14
Fine-wire with ferrule	1 x 0.1 - 1.0mm² / awg 27 - 16
Stripping length / tightening torque	8mm / 0.5Nm
Protection class	IP 30 / IP 20
housing/terminals fastening	Snap-on fastening on 35mm mounting rail to EN 60 715 or M4 screw fastening (additional latches not included)
Weight	approx. 310g

Bus Module for Sliders Type STW161M

Control of sliders in extraction systems

STW161M

Part number: **S225543**

STW161M bus modules control sliders in extraction systems in conjunction with STW164IP control units.
The wiring effort is drastically reduced by the bus technology.

Application
Control of extraction systems in the wood and plastics processing industry in accordance with the-Technical Rules for Hazardous Substances TRGS 553.
The central automatic start-up switches the extraction system on as soon as a machine is put into operation. The sliders in the extraction ducts of the individual machines are controlled via STW161M bus modules. DC 24 V is available as a signal. If required, the bus modules can also monitor the function of the sliders (input for end position reached) and record the operating status of the extracted machine (on/off) via STWA1 current transformers or potential-free contacts, and report this to the central control system.

Description

- Module for connecting a slider
- Control via STW164IP
- Control voltage DC 24 V (via 4-pole bus cable)
- LEDs for input and output statuses and for BUS communication
- Connections via spring terminals
- Cable feed via cable glands (included in scope of delivery)
- Dimensions W x H x D: (without screw connections) 94 x 130 x 57 mm

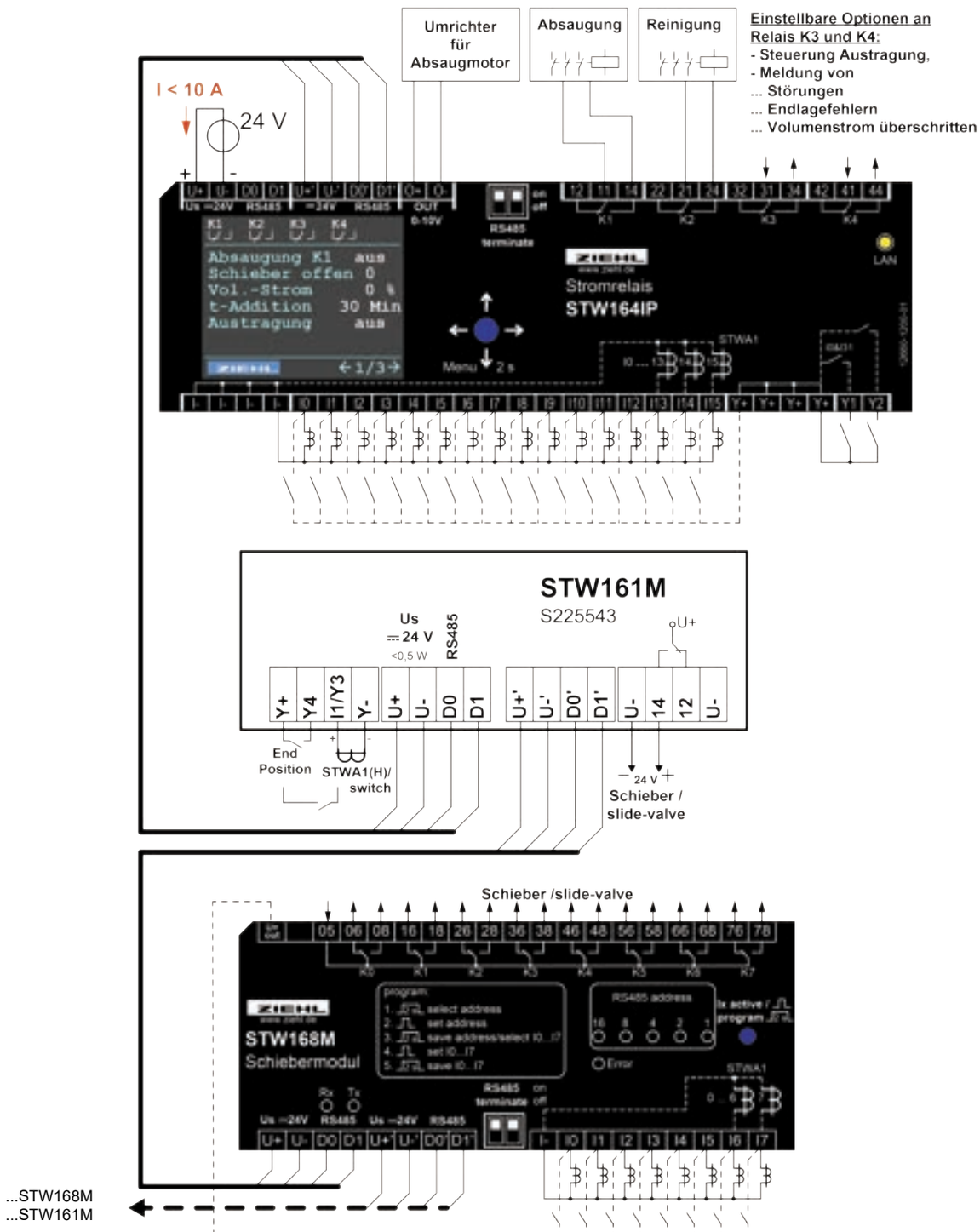
Functions/ setting options:

- Machine detection Response threshold approx. 0.5...10 A (on STWA164IP)
- Slider end position monitoring (on STW164IP)
- Bus address 0...31 with coding switch

Technical data STW161M

Control voltage Us	DC 24 V
Tolerance	DC 20 - 30 V
Power consumption	< 0.5 W
Relay output (12, 14)	
Switching voltage	DC 24 V
Switching current Rated operating current	max. 0.5 A DC-13 Ie = 0.5 A Ue = 24 V
Inputs I1, Y3	
Connectable transformers	STWA1(H), potential-free contact, current sensor S1
Overload capacity with STWA1(H)	max. 100 A continuous, max. 300 A for 10 s
Input Y3 Internal resistance	approx. 38 kΩ
Switching threshold	ON > 17 V, OFF < 8 V
Permissible ambient temperature Vibration resistance EN 60068-2-6	-20 °C … +55 °C 2...13,2 Hz ± 1 mm 13,2...100 Hz 1g 2...25 Hz ± 1.6 mm 25...150 Hz 5g
Housing Dimensions (W x H x D)	94 x 130 x 57 mm
Cable connection Solid wire	1 x 0.34 - 1.5 mm² / AWG 22 - 16
Flexible wire	1 x 0.1 - 1.0 mm² / AWG 27 - 18
Stripping length	8.5 mm
Protection class	IP 54 / IP 20
Housing/terminals	Screw fastening
Weight	approx. 310 g

Connection diagram



4

8-fold Damper Module with Bus Control Type STW168M

Control of up to 8 sliders in extraction systems

STW168M

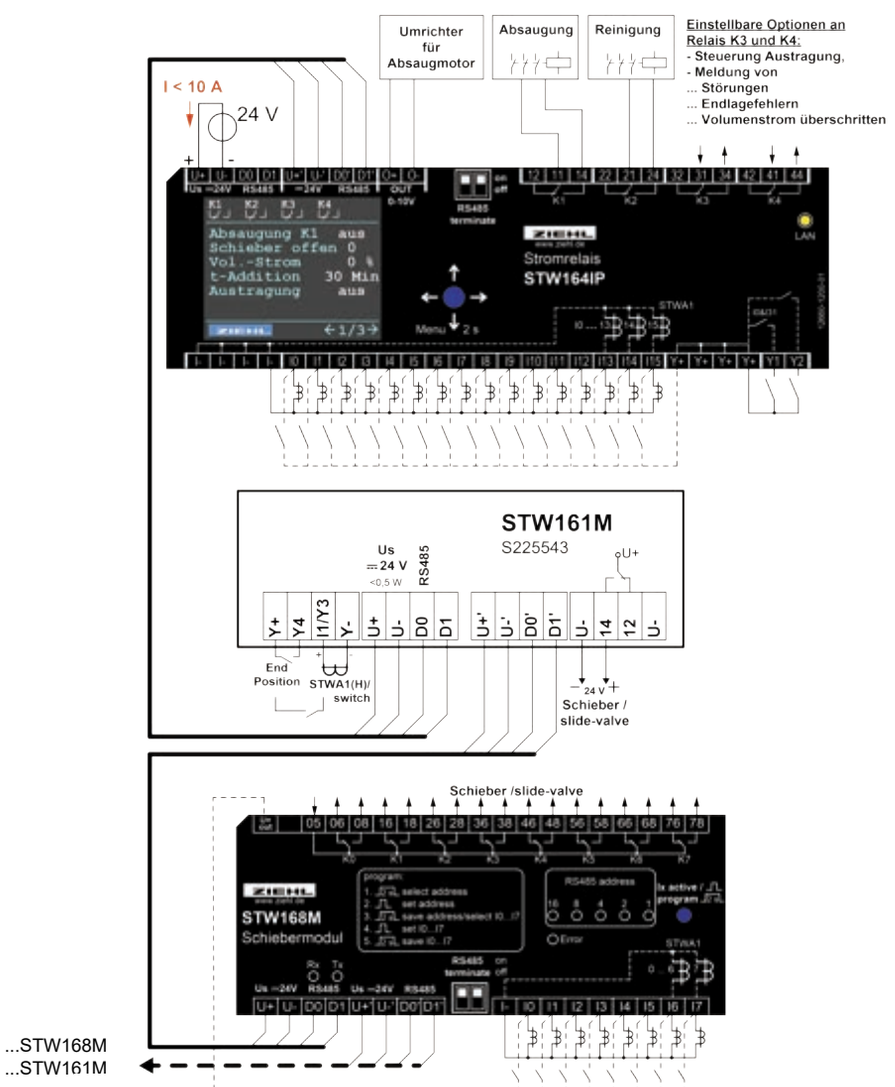
Part numbers:

STW168M	**S225544**
ER6 	**T224386**

STW168M shutter modules control up to 8 shutters in extraction systems in conjunction with an STW164IP control unit.
Up to 4 STW168M units can be combined with one STW164IP control unit. They are simply mounted next to the STW164IP in the control cabinet.
Alternatively, they can be placed near the slide valves. In this case, only the module needs to be connected with a bus line. The long supply lines from the control cabinet to each individual gate valve are no longer necessary
Simultaneous use of single modules STW161M in the same system is possible (switch on STW161M only DC 24 V).

- Module for connecting up to 8 sliders
- Outputs potential-free changeover contacts for 24 or 230 V
- Inputs for recognising the operating status of the machines (on/off), response threshold 0.5...9.9 A adjustable on the STW164IP
- Connections via screw terminals
- Control via STW164IP (max. 4 x STW168M can be connected)
- Bus address 0...31 adjustable
- Control voltage DC 24 V (via 4-pole bus cable)
- LEDs for displaying the status of the inputs and outputs
- Mounting Distribution board installation on top-hat rail EN 60715
- Dimensions W x H x D: 105 x 90 x 58 mm

Accessory: Front Mounting Kit type ER



Technical data STW168M

Control voltage Us	DC 24 V, SELV, PELV
Tolerance	DC 20 - 30 V
Power consumption	< 3.5 W
Imax on bus line	< 10 A
Duty cycle	100 %
Relay outputs K0...K7	
Switching voltage Inrush current NO contact (no)	8 x 1 changeover contact, common root max AC 300 V, DC 300 V
Minimum values	AC 15A, 4s, 10% ED
Voltage/current	12 V, 10 mA
Conventional thermal current Ith	max. 5 A
Total current via terminal 05	max. 5 A
Switching capacity max AC cosfi=1	1500 VA
Inputs I0...I7 Internal resistance Overload capacity with STWA1(H)	STWA1(H), potential-free contacts, current sensor S1 approx. 15 kΩ max. 100 A continuous, max. 300 A for 10 s
Perm. ambient temperature Perm. storage temperature Installation height Climatic resistance Vibration resistance EN 60068-2-6	-20 °C … +55 °C -20 °C … +70 °C < 2000 m above sea level. 5-85% rel. humidity, no condensation 2...13,2 Hz ± 1 mm 25...150 Hz 5g
Housing / mounting frame	Type V6 distribution board installation / ER6
Dimensions (W x H x D)	105 x 90 x 58 mm (6 HP), installation depth 58 mm
Cable connection single-wire	1 x 0.34 - 2.5 mm² / AWG 22 - 12
fine-wire with wire end ferrule	1 x 0.34 - 2.5 mm² / AWG 22 - 12
Stripping length / tightening torque	8 mm / 0,5 Nm
Protection class Housing/terminals	IP 30 / IP 20
	Snap-on mounting on 35 mm mounting rail in accordance with EN 60 715 or M4 screw fastening (additional bolts not included in the scope of delivery)
Weight	approx. 250 g

Vibrator Controls Typ RS

General

Vibrator controls type RS are specifically designed for controlling shakers in extraction systems. They ensure automated shaking of filter elements to maintain continuous functioning of the extraction system and extend filter service life. Both controls prevent shaking during the extraction phase or the fan's after-running time and offer flexible adjustment options to optimally tailor shaking cycles to the process. Thus, they provide a reliable component for the safe and efficient operation of extraction systems.

Comparison RS1K and RS2K

Type		**RS1K**	**RS2K**
Rapping time point		T_n after switching on the first machine	After Σ(machine runtime) ≥ T_n
T_n		1 - 30 min	5 - 30 min
Run-down time		-	60s
Rapping interval	K1	for 18s in 3s or continuous vibrating for 20s	for 18s in 3s or continuous vibrating for 20s
	K2	every 0,5s or 0,8s	every 0,5s or 1s
Display	Device power on	-	LED green
	Waiting for vibration time	LED red	LED yellow
	Cleaning active	LED green	LED green flashing
	Run-down time	-	LED yellow flashing
Control voltage		AC/DC 24 - 240 V	AC/DC 24 - 270 V

Function and characteristics

The RS1K and RS2K vibrator controls impress with simple and safe operation combined with flexible adjustment options. The delay time is triggered on both models either via a contactor control signal or by monitoring the extraction fan motor current with a current sensor. The RS1K offers a continuously adjustable delay time from 1 to 30 minutes, while the RS2K allows a delay between 5 and 30 minutes and additionally includes a 60-second after-run time to account for the fan’s spool-down phase.

Several control modes enable comfortable selection of shaking programs: Both controls provide relay K1 with options for continuous shaking lasting 20 seconds or pulse shaking for 18 seconds in 3-second intervals. For relay K2, the RS1K supports pulse intervals of 0.5 or 0.8 seconds, whereas the RS2K offers 0.5 or 1.0 second intervals. The device status is visually indicated by LEDs: the RS1K uses a red LED to signal the delay time and a green LED for active shaking; the RS2K displays the delay time with a yellow LED, the active shaking with a green blinking LED, and the after-run with a yellow blinking LED. Additionally, the RS2K shows a green LED when the device is powered on.

Both models are compactly designed for control cabinet installation. The RS1K operates at a supply voltage of AC/DC 24 to 240 V, while the RS2K is slightly more flexible with 24 to 270 V. Their reliable control and practical indication and adjustment features optimally support the trouble-free operation of extraction systems and comply with all relevant safety requirements with CE certification.

Vibrator Control Type RS1K

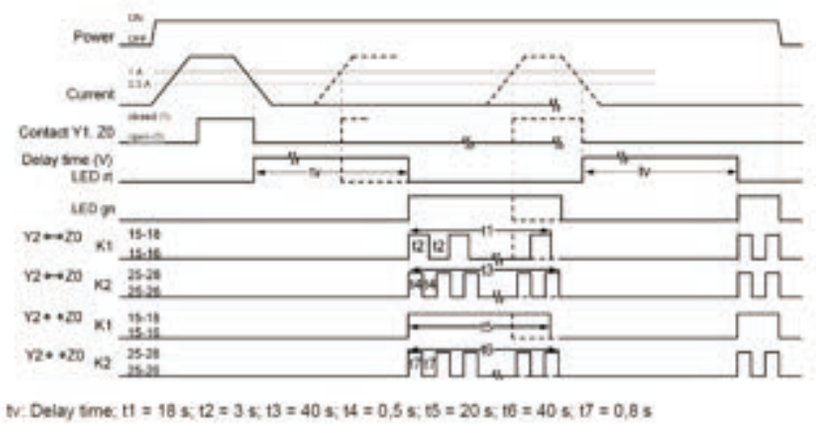
RS1K

Part number: **Z227800**

The vibrator control RS1K is a compact multiple time relay for triggering of vibrators in suction plants. In order to be able to operate suction plants at an optimum, the filters which get clogged by sawdust, chips or dust, have to be dedusted by vibration from time to time. The vibration action is by no means to be carried out the suction running or while slowing down the ventilator. If suctioning is started during vibration, the process is immediately to be interrupted. Prior to starting the vibration action, an adjustable deceleration time is running to delay the ventilator before start of vibration. This means that short stoppages can be by-passed without being obliged to carry out a vibration every time.

- Start of deceleration time by break contact at Y1/Z0 (e.g. from contactor suction motor)
- Starting of deceleration time through current transformer STWA 1 / STWA1H at Z0/Z1 (e.g. L1 from suction motor)
- adjustable deceleration time 1...30 min.
- Relay K1: continous vibration 20 s or impulse-vibration 18 s with 3 s clock
- Relay K2: impulse-vibration 40 s with clock 0.5 s or 0.8 s (for magnet valves)
- LED (red) signals deceleration time
- LED (green) signals vibration action
- automatic interruption of the vibration action when starting the suction process.

Function Chart:



tv: Delay time; t1 = 18 s; t2 = 3 s; t3 = 40 s; t4 = 0,5 s; t5 = 20 s; t6 = 40 s; t7 = 0,8 s

*1: Absaugung EIN
*2: Auswahl Rüttelfunktion

Technical Data

Control voltage U_S	AC/DC 24 - 270 V	0/50/60 Hz
Tolerance	AC 20 - 264 V; 45 - 62 Hz;	DC 20,4 - 297 V
Power consumption	< 4 VA	< 2 W
Inputs Z1-Z0		
Transformer connection	1x STWA1 or STWA1H	
Overload capacity	Max. 100A continuous, max. 300A for 10s	
Switch-on threshold	Ion ≥ AC 1 A	
Switch-off threshold	Ion ≤ AC 0,4 A	
Tolerance	± 20 %	
Inputs Y1-Z0, Y2-Z0		
Terminal voltage, -current	18 V; 3 mA	
Addition time	1 … 30 min (± 20%) adjustable	

Relay outputs, K1, K2	2x 1 changeover		
Switching voltage	max. AC 300V; DC 300V		
Minimum voltage/current	12 V 10 mA		
Conventional thermal current Ith	max. 5 A		
Current per terminal	max. 5 A		
Switching capacity (resistive load)	max. 1250 VA		
	max. 120 W at DC 24 V		
Operating category switching capacity	AC-15	Ie = 3 A	Ue = 250 V
	DC-13	Ie = 2 A	Ue = 24 V
	DC-13	Ie = 0,2 A	Ue = 240 V

Test condtions	EN 61010-1
Rated impulse withstand voltage	4000 V
Overvoltage category	III
Degree of pollution	2
Rated insulation voltage Ui	300 V
Duty cycle	100 %

EMC test	EN 61326-1 industrial environment
Interference emission	EN 61326-1; CISPR 11 Class B
Interference immunity	EN 61326-1
Fast transient interference variables (burst)	EN 61000-4-4 ±4,5 kV
	Pulse 5/50 ns, f = 5 kHz, t = 15 ms, T = 300 ms
High-energy surge voltages (surge)	IEC 61000-4-5 ±1 kV

Installation conditions	
Permissible ambient temperature	-20 °C ... +60 °C
Permissible storage temperature	-20 °C …+70 °C
Installation height	< 2000 m above sea level
Climate resistance	5 - 85% rel. humidity, no condensation
Permissible wiring temperature	-5 °C …+70 °C
Vibration resistance EN 60068-2-6	10…57 Hz ± 0,75 mm
	57…150 Hz 1g

Reliability - failure rate	EN 61709 / SN29500		
Ambient conditions	Local operation in dry rooms		
OPeration time 24/7/365	8760 h/a		
Failure rate (FIT)	Tu = 40 °C	Tu = 60 °C	Tu = 80 °C
Tu = Tref (component not in operation)	1181 FIT	2287 FIT	4681 FIT
	96 years	49 years	24 years

Connection type	Push-in spring-cage terminal
IP protection class terminals	IP20
Operation type	Push button
Number of levels	1
Conductor cross-section solid	1 x 0,14 mm² ... 1,5 mm² / AWG 28 ... 16
Conductor cross-section finely stranded	1 x 0,14 mm² ... 1,5 mm² / AWG 26 ... 14
Conductor cross-section ferrule with collar	1 x 0,25 mm² ... 0,75 mm²
Conductor cross-section ferrule without collar	1 x 0,25 mm² ... 1,5 mm²
Stripping length	8 ... 9 mm

Housing	Type K
Dimensions (W x H x D)	22.5 x 75 x 115 mm
Width	1 TE
IP protection class housing	IP40
IK protection class housing	IK06 (1 J impact energy)
Fastening	Snap-on mounting on mounting rail 35 mm to EN 60715 or screw fixing M 4
Installation position	any
Weight	approx. 120 g

Subject to technical changes

Vibrator Control Type RS2K

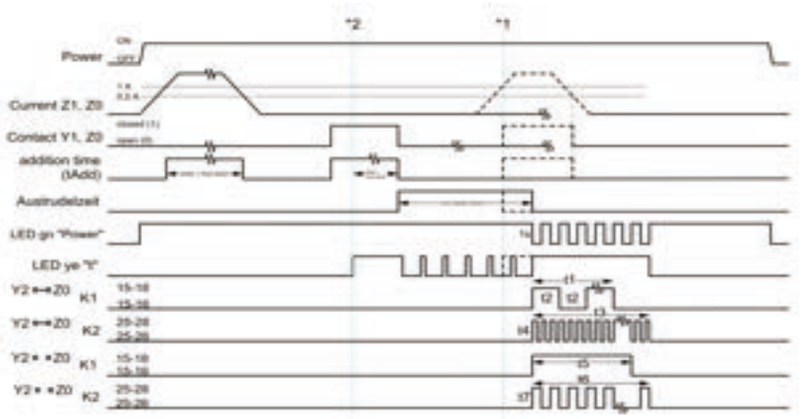
RS2K

Part number: **Z227802**

The vibrator control RS2K is a compact multiple time relay for triggering of vibrators in suction plants. In order to be able to operate suction plants at an optimum, the filters which get clogged by sawdust, chips or dust, have to be dedusted by vibration from time to time. The vibration action is by no means to be carried out the suction running or while slowing down the ventilator. If suctioning is started during vibration, the process is immediately to be interrupted. Prior to starting the vibration action, an adjustable deceleration time is running to delay the ventilator before start of vibration. This means that short stoppages can be by-passed without being obliged to carry out a vibration every time.

- Start of deceleration time by break contact at Y1/Z0 (e.g. from contactor suction motor)
- Starting of deceleration time through current transformer STWA 1 / STWA1H at Z0/Z1 (e.g. L1 from suction motor)
- adjustable deceleration time 5...30 min.
- Relay K1: continous vibration 20 s or impulse-vibration 18 s with 3 s clock Relay K2: impulse-vibration 40 s with clock 0.5 s or 1.0 s (for magnet valves)
- LED (yellow) signals deceleration time
- LED (green) signals vibration action
- automatic interruption of the vibration action when starting the suction process.

Function Chart:



*1: Absaugung EIN
*2: Auswahl Rüttelfunktion

Technical Data

Control voltage U_S	AC/DC 24 - 270 V	0/50/60 Hz
Tolerance	AC 20 - 297 V; 45 - 62 Hz;	DC 20,4 - 297 V
Powr consumption	< 4 VA	< 2 W
Inputs Z1-Z0		
Transformer connection	1x STWA1 or STWA1H	
Overload capacity	STWA1 Max. 100A continuous, max. 300A for 10s	
Switch-on threshold	Ion ≥ AC 1 A	
Switch-off threshold	Ion ≤ AC 0,4 A	
Tolerance	± 20 %	
Inputs Y1-Z0, Y2-Z0		
Terminal voltage, -current	18 V; 3 mA	
Addition time	5 … 30 min (± 20%) adjustable	

Relay outputs, K1, K2	**2x 1 changeover**
Switching voltage	max. AC 300V; DC 300V
Minimum voltage/current	12 V 10 mA
Conventional thermal current Ith	max. 5 A
Current per terminal	max. 5 A
Switching capacity (resistive load)	max. 1250 VA max. 120 W at DC 24 V
Operating category switching capacity	AC-15 Ie = 3 A Ue = 250 V DC-13 Ie = 2 A Ue = 24 V DC-13 Ie = 0,2 A Ue = 240 V

Test condtions	**EN 61010-1**
Rated impulse withstand voltage	4000 V
Overvoltage category	III
Degree of pollution	3
Rated insulation voltage Ui	250 V
Duty cycle	100 %

EMC test	**EN 61326-1 industrial environment**
Interference emission	EN 61326-1; CISPR 11 Class B
Interference immunity	EN 61326-1
Fast transient interference variables (burst)	EN 61000-4-4 ±4,5 kV Pulse 5/50 ns, f = 5 kHz, t = 15 ms, T = 300 ms
High-energy surge voltages (surge)	IEC 61000-4-5 ±1 kV

Installation conditions	
Permissible ambient temperature	-20 °C ... +60 °C
Permissible storage temperature	-20 °C …+70 °C
Installation height	< 2000 m above sea level
Climate resistance	5 - 85% rel. humidity, no condensation
Permissible wiring temperature	- 5 °C …+70 °C
Vibration resistance EN 60068-2-6	10…57 Hz ± 0,75 mm 57…150 Hz 1g

Reliability - failure rate	**EN 61709 / SN29500**		
Ambient conditions	Local operation in dry rooms		
OPeration time 24/7/365	8760 h/a		
Failure rate (FIT)	Tu = 40 °C	Tu = 60 °C	Tu = 80 °C
Tu = Tref (component not in operation)	1181 FIT	2287 FIT	4681 FIT
	96 years	49 years	24 years
On/Off cycles	$1*10^6$		

Connection type	**Push-in spring-cage terminal**
IP protection class terminals	IP20
Operation type	Push button
Number of levels	1
Conductor cross-section solid	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 28 ... 16
Conductor cross-section finely stranded	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 26 ... 14
Conductor cross-section ferrule with collar	1 x 0,25 mm^2 ... 0,75 mm^2
Conductor cross-section ferrule without collar	1 x 0,25 mm^2 ... 1,5 mm^2
Stripping length	8 ... 9 mm

Housing	**Type K**
Dimensions (W x H x D)	22.5 x 75 x 115 mm
Width	1 TE
IP protection class housing	IP40
IK protection class housing	IK06 (1 J impact energy)
Fastening	Snap-on mounting on mounting rail 35 mm to EN 60715 or screw fixing M 4
Installation position	any
Weight	approx. 120 g

Subject to technical changes

Level Monitors Type NS

General

The NS level monitor is an electronical device for monitoring liquid levels. They can be used as limit monitor or minimal-maximal control.
The monitoring of liquid levels is effected via electrodes.

Application:
The NS units protect aggregates and plants against dry running, overflow, leakage damages and unnecessary lost of liquids. Characteristical applications are swimming pools, groundwater endangered buildings, oilfilled under-water-pumps as well as whereever a certain level should be maintained resp. dosed.

Function

The level capture is effected through resistance measurement via an AC voltage measuring path, operating completely DC voltage-free. Hereby, the resistance between two (resp. three) electrodes is measured.
When the level increases, the electrodes are bridged and an integrated relay switches.

The level monitor operates as conductivity measuring device and guarantees a perfect level capture at a resistance of up to 250 kΩ, measured between the electrodes. ZIEHL level monitors are also available with adjustable time delay in order to avoid a too high relay switching frequency in case of a moving water surface. As electrodes any conductors, that jut into the tank down to the required level, can be used. At metal tanks the wall of the tank can be used as basic electrode.

Niveauelectrodes

Electrode NE1

Part number: **V223430**

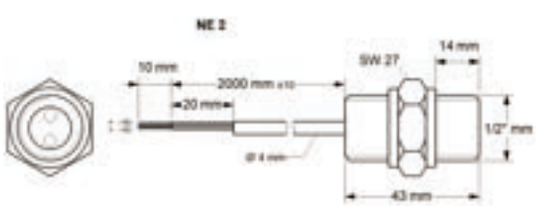
Insulated screw-in electrodes for mounting in walls of tanks. The electrodes are made of stainless steel (V2A), the material of the insulation is Teflon.

Electrode NE2

Part number: **V223429**

The electrode NE2 with its ½" thread can directly be screwed into the wall of a tank. The two electrodes (stainless steel V4A) are flush cast in a plastic housing (Polypropylen, PP) with cast resin. The electrode can be used in a temperature-range -5…+60 °C and is pressure-resistant up to 6 bar. The ingrained cable with 2 strands, each 0,25 mm2, is 2000 mm long, Ø 4 mm.

For one level only one NE2 is sufficient. For use with a level-monitor for more levels, normally one NE2 per level is required.



Filling Level Probe Type NS6123-6

for measuring filling level of water and gasoil
0 - 250 mbar, integrated measuring transducer

NS6123-6

Part number: **V223470**

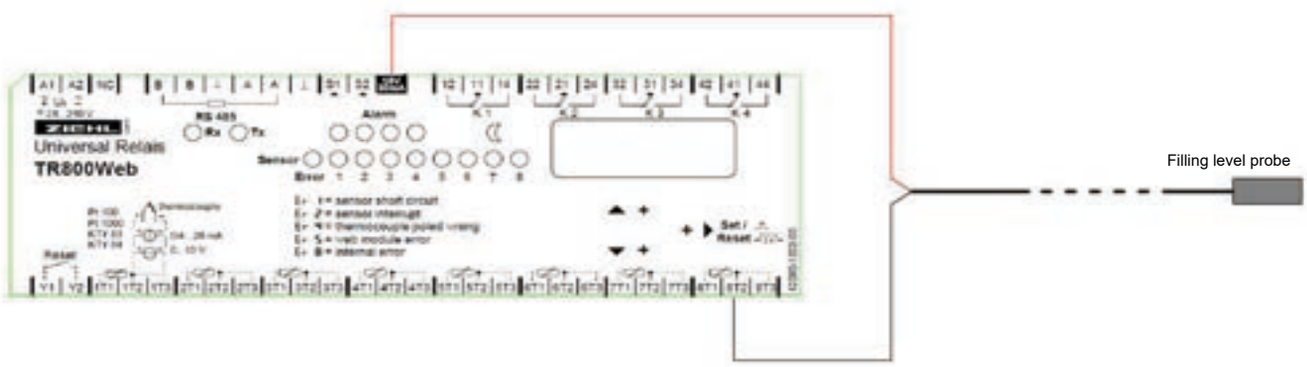
Economy-priced probe with integrated measuring transducer fr measuring filling level e.g. in tanks, cisterns or water.
Connection to ZIEHL Web-Relay TR800Web for monitoring and logging of filling levels are reached, e.g. before tank is empty.
Monitoring and display of levels with Digital Panelmeters MINIPAN 352 or orther devices with input 4-20 mA.
The probe for relatice pressure is submersible. It is placed at the bottom of the tank and deermines the level by measuring the hydrostatic pressure. The result is transmitted via signal 4-20 mA (2 wire).

The cable (PUR) includes a pressure compensation capillary that compensates fluctuation of atmospheric pressure.

Applications:
- Gasoil, diesel, used oil
- Engine oil and lube oil (fresh)
- Rainwater in cisterns, basins and water levels in general

Standard probe NS6123-6
0-250 mbar, cable 6 m

Connection to Universal Web-Relay Type TR800Web



Scaling of TR800Web for water:

Sensor-Einstellungen

Nr.	Sensor-Name	aktueller Messwert	Sensortyp	Leitungs-Kompensation	Skalierung ein	Nullpunkt	Fullscale	Dez. Punkt	Einheit
1.	Pegelsonde	25.3cm	4..20 mA	3-Leiter	☑	0	2500	xxx . x	cm

Water (density 1,0): 1 mbar = 1 cm
0...250 mbar correspond to level 250.0 cm

Scaling of TR800Web for oil:

Sensor-Einstellungen

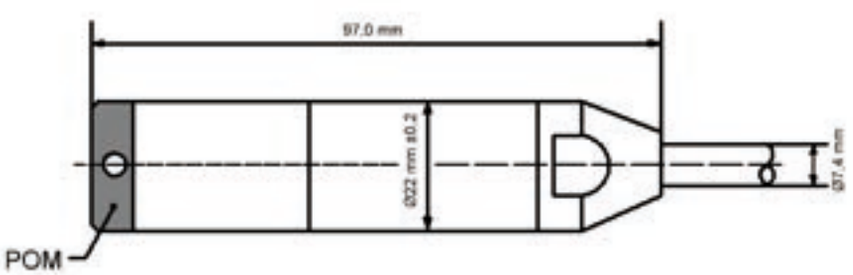
Nr.	Sensor-Name	aktueller Messwert	Sensortyp	Leitungs-Kompensation	Skalierung ein	Nullpunkt	Fullscale	Dez. Punkt	Einheit
1.	Pegelsonde	25.3cm	4..20 mA	3-Leiter	☑	0	2900	xxx . x	cm

Oil (density 0,82...0,95): 1 mbar = 1/density cm
Example density 0,862: 1 mbar = 1,160 cm
0...250 mbar correspond to level 0,0...290 cm
Density of liquid can be calculated by using signal of probe and measuring depth of immersion with a meter stick.

Technical Data

Input	0...250 mbar (0...250 cm water; 0...~290 cm oil)
Output	4...20 mA, 2-wire
Supply voltage	10...30 V DC direct connection to TR800Web
Measuring cell	ceramic Al_2O_3, DMS bridge
Response time	50 ms
Error	< 1% of FullScale
Thermal drift	< 0,05% /K of span
Ambient temperature	-10 °C ... +40 °C
Housing	stainless steel 1.4404 (316 L, V4A)
Weight of probe	ca. 0,2 kg, without cable
Cable	PUR black, oil proofen with pressure compensation capillary
Applications	Gasoil, diesel, water not for petrol, kerosine not for use in zone EEx

Drawing



Level Monitors Type NS1

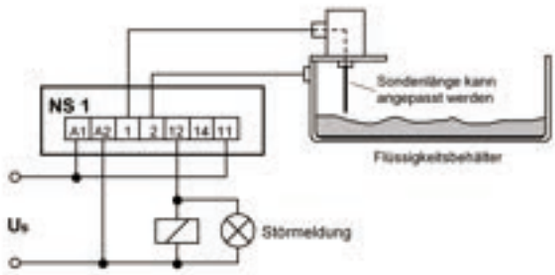
1 Niveau, Wall-mount

NS1

Part number: **V223202**

This level monitor for two electrodes preferrably serves to the limit control, e.g. as overflow or running dry protection of a conducting liquid. The device is integrated in a shock-resistant plastic housing of the type 94 and can also be used for outside- resp. waterproof mounting according to its protection system IP 54.

The function of the relay is reversible (standard: releases, when E2 is reached) by changing of jumpers in the device. The sensitivity can be changed between 25…250 kOhm and the switching delay between 0,5…10 s.



Technical Data

Supply Voltage U_s		AC 230 V
Adm. Tolerance U_s		+10%…-15%
Power Consumption		≤ 3 VA
Frequency		50…60 Hz
Relays		1 CO
Contact type		Type 2 (see "General technical Informations")
Pick up delay approx.		0,5 s
Release delay approx.		0,5...10s adjustable
Text conditions		see "General technical Informations"
max. ambient temperature		-20 °C ... +55 °C
Quantity Electrodes		2
Voltage at the Electrodes		< AC 6 V_{eff}
Line capacity	at 25 kΩ	max. 100 nF = approx. 500 m
	at 150 kΩ	max. 20 nF = approx. 100 m
	at 250 kΩ	max. 10 nF = approx. 50 m
Dimensions (H x B x T)		Design I 94: 94 x 94 x 57 mm
Fitting position		with screws
Protection housing/ terminals		IP 54/ IP 20
Weight		approx. 310 g

Level Monitor Type NS20

1 Level and MIN / MAX-Control

NS20

Part number: **V223440**

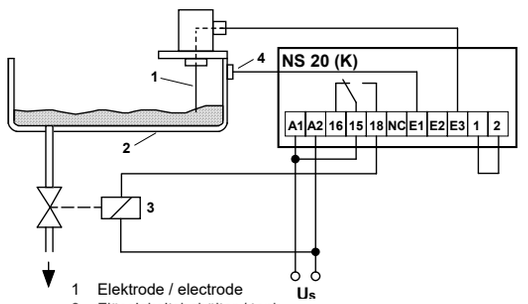
Lever-Relays NS20 for conductive liquids can be used as monitors for 1 Level and for controlling a level between 2 electrodes.

- 3 elektrodes for MIN/MAX-control
- 2 elektrodes (E2 open) as level-monitor
- Sensitivity adjustable 5 kΩ...250 kΩ
- LED for state of relay
- Function of relay reversible (picks up or releases at top electrode)
- Switching-delay adjustable 0,1 ... 10 s
- Universal supply-voltage AC/DC 24-240 V

Applications as level-monitor:
Protection from running dry or overflow, seal-monitoring of submersible pumps for leaks, detection of leaks.

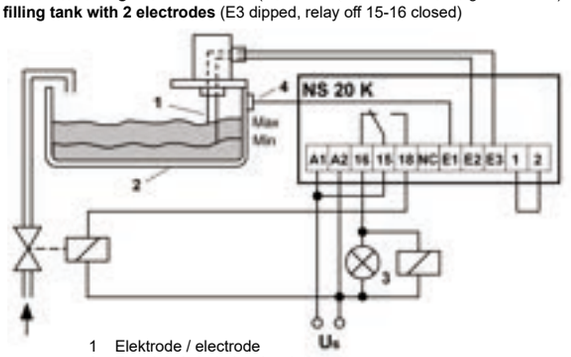
Applications Min/Max:
Controlling a level between minimum (elektrode E2) and maximum (E3). As long as E3 is dry, a magnetic valve is opened (or a pump is running) and liquid is influenting. As soon as maximum (E3) is reached, the NS 20 closes the valve. When the level falls below E2, the cycle starts new. In reverse also discharging of a container can be controlled.

Überwachung Flüssigkeitsstand mit 1 Elektrode (E3 benetzt, Relais an 15-18 geschlossen)
monitoring of liquid with 1 electrode (E3 dipped, relay on 15-18 closed)



1 Elektrode / electrode
2 Flüssigkeitsbehälter / tank
3 Magnetventil / magnetic valve
4 Bezugselektrode / basic electrode

Zulaufsteuerung mit 2 Elektroden (E3 benetzt, Relais aus 15-16 geschlossen)
filling tank with 2 electrodes (E3 dipped, relay off 15-16 closed)



1 Elektrode / electrode
2 Flüssigkeitsbehälter / tank
3 Magnetventil / magnetic valve
4 Bezugselektrode / basic electrode

Technical Data

Supply voltage U_s		AC/DC 24-240 V, 0/50/60 Hz, <2W, <3VA (DC 20,4-297 V, AC 20-264 V)
Relay		1 change-over-contact (co)
Contact		**type 2** see "general technical information"
Switching delay		adjustable 0,1...10 s
Test conditions		see "general technical information"
Rated ambient temperature range		-20 °C ... +55 °C
Number of electrodes		2 or 3 (with 2 electrodes: E2 not connected)
Voltage at electrodes		< AC 6 V_{eff}
Line capacity	at 5 kΩ	max. 500 nF = app. 2500 m
	at 150 kΩ	max. 20 nF = app. 100 m
	at 250 kΩ	max. 10 nF = app. 50 m
Dimensions (h x w x d) mm		design V2: 90 x 35 x 58 mm, mounting height 55 mm
Attachment		on 35 mm DIN-rail or with screws M4
Protection housing/terminals		IP 30/ IP 20
Weight		app. 100 g

Level Monitor Type NS20K

1 Level and MIN / MAX-Control

NS20K

Part number: **V229001**

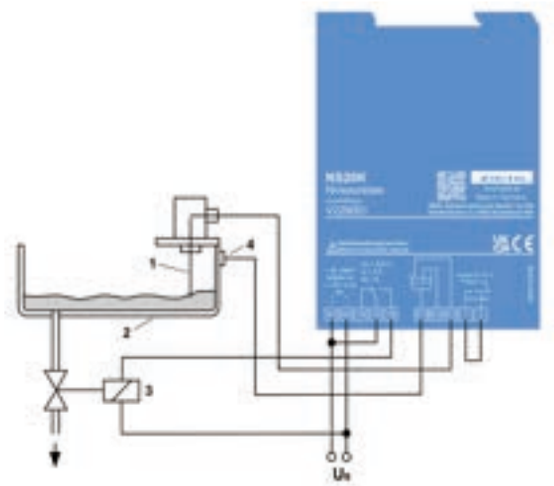
Level-Relays NS20 can be used for monitoring 1 level and as MIN/MAX-Control.

- 3 elektrodes for MIN/MAX-control
- 2 elektrodes (E2 open) as level-monitor
- Sensitivity adjustable 5 kΩ...250 kΩ
- LED for state of relay Function of relay reversible
- (picks up or releases at top electrode)
- Switching-delay adjustable 0,1 ... 10 s

Application as level-monitor:
Protection from running dry or overflow, seal-monitoring of submersible pumps for leaks, detection of leaks.

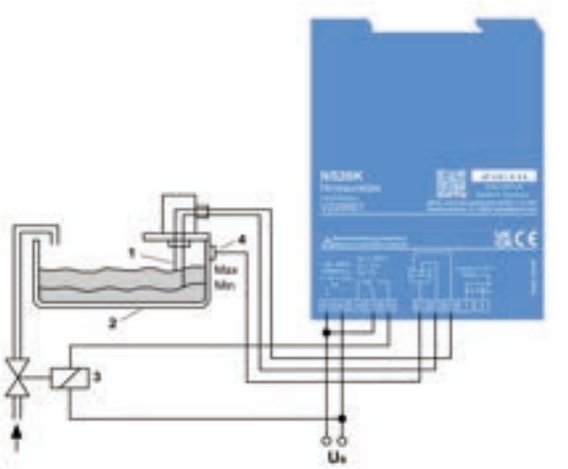
Application Min/Max:
Controlling a level between minimum (elektrode E2) and maximum (E3). As long as E3 is dry, a magnetic valve is opened (or a pump is running) and liquid is influenting. As soon as maximum (E3) is reached, the NS 20 closes the valve. When the level falls below E2, the cycle starts new. In reverse also discharging of a container can be controlled.

Überwachung Flüssigkeitsstand mit 1 Elektrode (E3 benetzt, Relais an 15-18 geschlossen)
monitoring of liquid with 1 electrode (E3 dipped, relay on 15-18 closed)



1 Elektrode / electrode
2 Flüssigkeitsbehälter / tank
3 Magnetventil / magnetic valve
4 Bezugselektrode / basic electrode

Zulaufsteuerung mit 2 Elektroden (E3 benetzt, Relais aus 15-16 geschlossen)
filling tank with 2 electrodes (E3 dipped, relay off 15-16 closed)



1 Elektrode / electrode
2 Flüssigkeitsbehälter / tank
3 Magnetventil / magnetic valve
4 Bezugselektrode / basic electrode

Technical Data

Rated supply voltage U_S	**AC/DC 24 - 240 V**	**0/50/60 Hz**
Tolerance	AC 20 - 264 V	DC 20,4 - 297 V
Power consumption	< 3 VA	< 1 W

Level-electrodes (E1, E2, E3)		
max. voltage	< 6 Veff	
max. current	< 250 µA	
Switching point	adjustable app.. 5 kΩ … 250 kΩ	
Switching point	max. cable length	max. capacity of cable
5 kΩ	2500 m	500 nF
250 kΩ	50 m	10 nF
Switch on/off delay	0,1...10 s adjustable	
Tolerance	25 %	

Data of relay:	EN 62947-5
Type of contact	1 change-over.contact (CO)
Switching voltage	max. AC 415 V
Switching current	max. 6 A
Switching power	max. 2000 VA (ohmic load) max. 120 W at DC 24 V
Rated nominal current Ie for co	3 A AC15 250 V; 2 A DC13 24 V
Recommended fuse	3,15 A slow (gL)
Contact life mechanical	3 x 10^7 operations
Contact life electrical	1 x 10^5 operations at 240 V / 6 A 1 x 10^6 operations at 240 V / 2 A
Reduction factor at cos φ = 0,3	0,5

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

Test conditions	EN 61010-1
Rated impulse voltage	4000 V
Overvoltage category	III
Pollution degree	3
Rated insulation voltage Ui	250 V
On-period	100 %

Reliability - failure rate	EN 61709 / SN29500		
Ambient conditions	Local operation in dry rooms		
Operation time 24/365	8760 h/y		
Failure rate (FIT)	Tu = 40 °C	Tu = 60 °C	Tu = 80 °C
Tu = Tref (component not in operation)	549 FIT	1104 FIT	2485 FIT
	100 (207) years	100 (103) years	45 years

Installation conditions		
Permissible ambient temperature	-20 °C ... +60 °C EN 60068-2-2 dry heat	
EMV - immunity	EN 61000-6-2	
EMV - emission	EN 61000-6-3	
Vibration resistance EN 60068-2-6	2…25 Hz ±1,6 mm	25 ... 150 Hz 5 g

Contact termination	Push-In spring-type terminal
Protection class terminals	IP20
Actuation type	Push-button
Number of levels	1
Solid conductor	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 28 ... 16
Fine-stranded conductor	1 x 0,14 mm^2 ... 1,5 mm^2 / AWG 26 ... 14
Fine-stranded with insulated ferrule	1 x 0,25 mm^2 ... 0,75 mm^2
Fine-stranded with uninsulated ferrule	1 x 0,25 mm^2 ... 1,5 mm^2
Strip length	8 ... 9 mm
Twin-stranded with insulated ferrule	1 x 0,25 mm^2 … 0,75 mm^2
Strip length	10 mm

Housing	Type K
Dimensions (W x H x D)	22,5 x 75 x 115 mm
Width	1 M
Protection class housing	IP40
IK-Code	IK06 (1 J impact energy)
Mounting	Snap mounting on 35 mm standard rail EN60715 or M4 screws (additional bar not included)
Mounting position	any
Weight	app. 100 g

Subject to technical changes

Level Monitors Type NS43

MIN/MAX-Regulation, protection from overflow and unlubricated operation

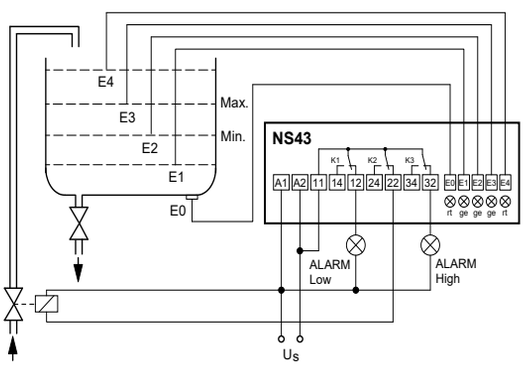
NS43

Part number: **V223267**

The level monitor NS43 regulates the level of liquid in a container between 2 electrodes. In the normal operation the level of the liquid is situated between the electrodes E2 and E3. The relay K2 tightens, if the level E3 is achieved and drops, if E2 is fallen below. Over the output contacts (1 change-over switch) a pump or a valve can be controlled depending upon case of application and so the level be regulated. If the level continues to rise in an incident and if the electrode achieves E4, then a message takes place via relay K3 (drops). In the reverse case (level under E1) the relay K1 drops and protects e.g. a pump against running dry.
LEDS signal, which electrodes are moistened.

- Level monitoring of leading liquids
- MIN/MAX level regulation
- protection from overflow
- protection from running dry
- sensitivity adjustable 5... 250 k?
- LED for level display / alarm

Application:
In the galvanotechnics and everywhere, where the level of a leading liquid must be held on a certain level and at the same time a monitoring on overflow and/or no-load operation is necessary.



Elektrodes		LED	Relay	Contact	
E1	not dipped	E0-red	K1 off	11-12 closed	ALARM Low (running dry)
E1	dipped	E1-ye	K1 on	11-14 closed	
E2	dipped	E2-ye	K2 off	11-22 closed	
E3	dipped	E3-ye	K2 on	11-24 closed	
			(K2 on until E2 not dipped)		
E4	dipped	E4-red	K3 off	11-32 closed	ALARM High (overflow)

Technical Data

Supply voltage U_s		AC/DC 24-240 V
Admissible tolerance U_s		AC 20-264 V, DC 20-297 V
Power consumption		≤ 5 VA, < 3 W
Frequency		0,45 - 62 Hz
Relay		3 CO
Contact		Type 2 see "general technical information"
Pick up delay		approx. 1 s
Release delay		approx. 1 s
Test conditions		see "general technical information"
Rated ambient temperature range		-20 °C ... +60 °C
Number of electrodes		5
Voltage at electrodes		< AC 3 V_{eff} (≤ 0,1 mA)
Line capacity	at 5 kΩ	max. 500 nF = approx. 2500 m
	at 25 kΩ	max. 100 nF = approx. 500 m
	at 250 kΩ	max. 10 nF = approx. 50 m
Dimensions (h x w x d) mm		Design K: 75 x 22,5 x 115 mm
Attachment		Snap mounting on 35 mm standard rail
Protection housing/terminals		IP 30/ IP 20
Weight		approx. 130 g

Level Monitor Type NS43V

Switchgear-mount Housing

NS43V

Part numbers:

NS43V **V223313**

ER6 **T224386**

The NS level monitor is an electronic device for monitoring levels of conductive liquids.
The monitoring of the levels is effected vis electrodes, which are dipped or set free according to liquid level.
All conductive liquids can be monitored, preferrably, however, water, also of different degree of hardness.

To adapt the relay to the conductivity of the liquid and to the capacitance of (long) cables, the switching limit can be adjusted app. 5 kΩ ... 250 kΩ. Thus it also is possible to tell between the liquid and foam over the liquid.

The NS unit protects aggregates and plants against dry running, overflow, leakage damages and unnecessary loss of liquids.
It controls and monitors levels of liquids in waste-water, pools, fish farms and whereever a certain level should be maintained or dosed.
Depending on the application and the set program, it controls the level between 2 or 3 electrodes by means of opening or closing dose or drain of a container.
The top and the lowest electrode protect from overflow or running dry.

An electrolytic corrosion of the electrodes as well as detonating gas production is excluded due to a AC current measuring path.
The universal supply voltage AC/DC 24-240 V allows to connect the relay to any common mains.The isolation between electronics (= electrodes) and supply voltage avoids malfunctions caused by potential spreading, also at DC-supplys.

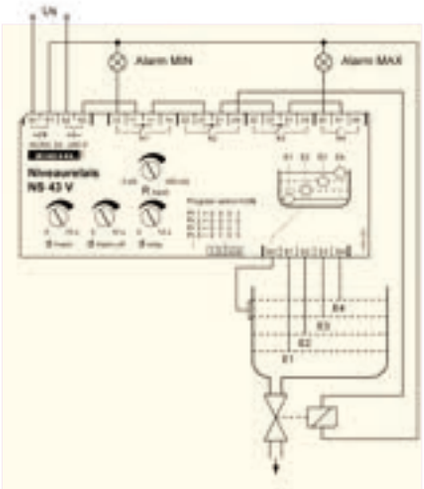
- Monitoring of up to 4 levels
- 4 relays with change-over contacts (co)
- Sensitivity adjustable 5...250 kΩ
- Switching delay of relays adjustable 0...10 s
- Switching-delay of alarms (on/off) adjustable 0...10 s
- Basic programs (selectable with DIP-switches) for various applications
- Universal supply voltage AC/DC 24-240 V
- Terminals pluggable
- Housing for DIN-rail or wall-mount, mounting height 55 mm, 70 mm wide

Accessory: Installation frame ER6 for panel mount

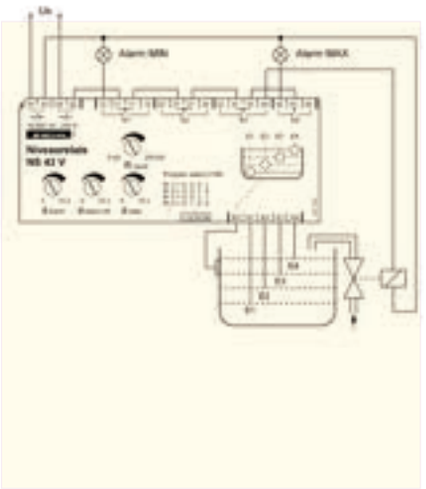
4

Technical Data

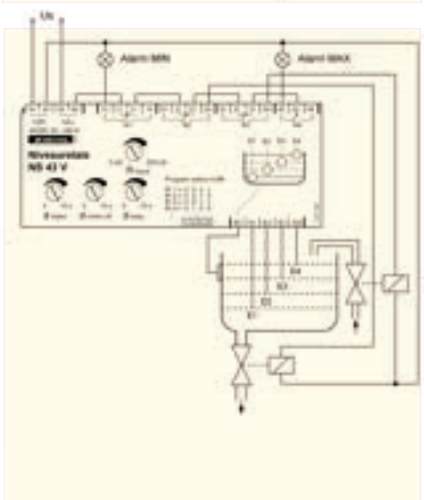
Supply voltage Us	AC/DC 24-240V, <3W, <6VA AC 20-264 V, DC 20,4-297 V,
Electrode connection	Level electrodes E1, E2, E3, E4, reference E0
max. voltage/current	<3Veff / <100 µA
Sensitivity	adjustable 5 kΩ...250 kΩ ± 25%
max. cable-length/capacity	5 kΩ/approx. 500m/100 nF, 250 kΩ/approx. 50m/10nF
Hysteresis	approx. 15% + 5 kΩ
Switching delay	adjustable 0,1...10 s
Relay output	Type 2 see "general technical informations" 4 x 1 changeover-contact
Test conditions	see "general technical informations"
Rated ambient temperature	- 20 °C … +55 °C
Housing / Installation Frame	Design V6 / Front mounting kit type ER6, 6 TE
Dimensions h x b x d	90 x 105 x 58 [mm], mounting height 55 mm
Attachment	On 35 mm DIN-rail or screws M4
Protection housing / terminals	IP 30 / IP 20 (terminals pluggable)
Weight	approx. 250 g



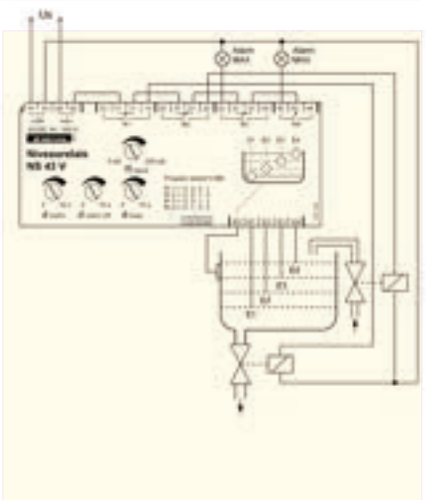
Program 1
Control of dose or drain with 2 elektrodes with 2 more electrodes to protect from overflow and running dry.
The level swings between the 2 middle electrodes.
Standard-program for levelling a liquid in a container.



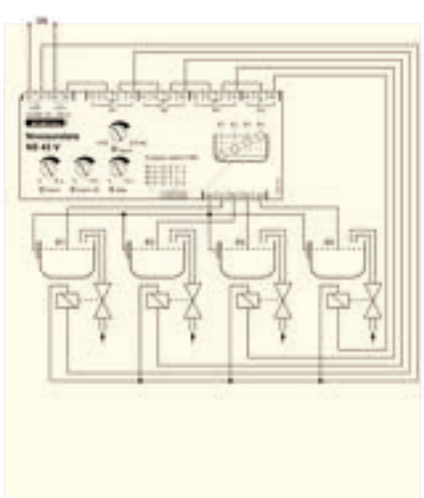
Example for dose-control



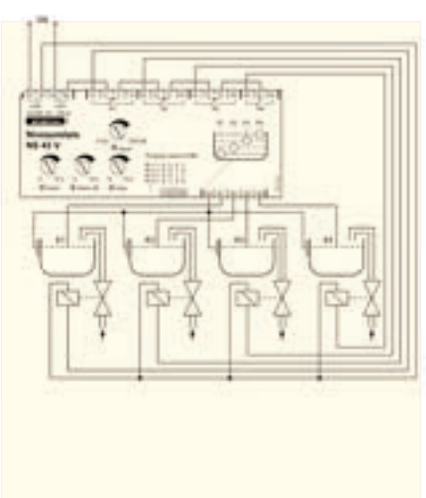
Program 2
Control of dose and drain between 2 electrodes with 2 more electrodes to protect from overflow and running dry.
Depending on if speed of dose or drain is higher, the level swings around the upper or the lower of the 2 middle electrodes.



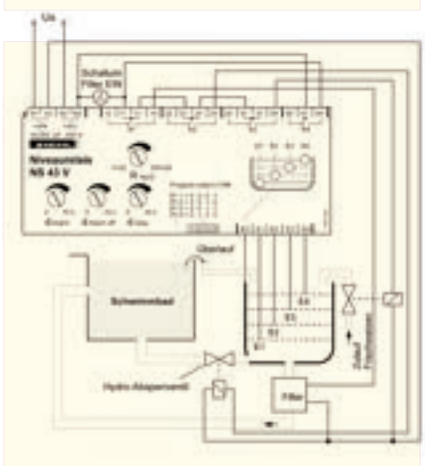
Program 3
Control of dose and drain between 3 electrodes with 2 more electrodes to protect from overflow.
The level swings between electrodes E1 and E3. Dose and drain are switched on at E2 and off at E3 respectively E1.
Application e.g. in fish-farming.



Program 4
Monitoring of 4 single levels with 4 electrodes. Relay OFF when relevant electrode is dipped.
Program for controlling or monitoring of levels in 4 containers or for monitoring of up to 4 levels in 1 container.



Program 5
Monitoring of 4 single levels with 4 electrodes. Relay ON when relevant electrode is dipped.
Program for controlling or monitoring of levels in 4 containers or for monitoring of up to 4 levels in 1 container.
E.G. monitoring of break of a pipe at 4 different points.



Program 6
Pool control for overflow bassin with switching of hydro-lock valve, dosing of fresh water, emergency filter-on and protection from running dry.

Order-number:
AC/DC 24-240 V
V223313

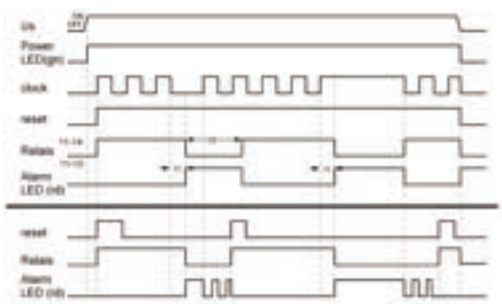
Watchdog Time-Relay Type WD100V

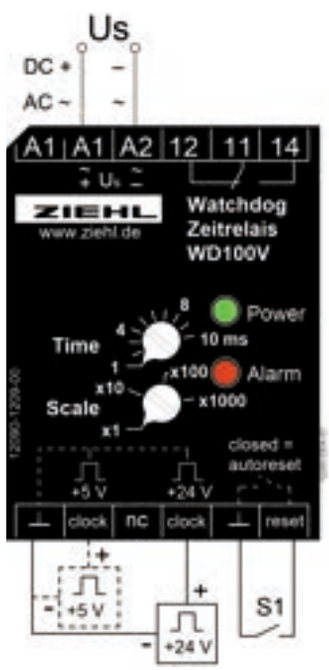
WD100V

Part number: **Z224319**

In the control technology of today, the number of industrial PCs (IPC) partly with decentralized intelligence constantly increases. Individual processes are controlled independent of each other. In case of failure or malfunction of one component, it can therefore be necessary to switch off the hardware of a complete machine or plant.
Time-Relay WD100V is used to make sure that because of malfunctions in the program flow, caused by short-term voltage interruptions for instance, no undefined status are created. The output signal can be evaluated by a superordinate control or directly switched into the emergency-stop circuit of the machine.

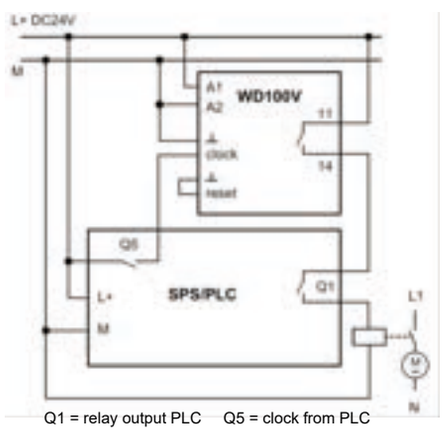
Application:
Monitoring of controls/IPC in packing machines.
Monitoring of application software





Example for application: Release motor

The software of the mmonitored control (PLC, IPC) makes a clock signal at the output Q5 (DC24V, transistor). The relay of the WD100V picks up only when the input recognizes a clock signal. The time between two slopes has to be shorter than the time set at the WD100V (time x scale). When the clock is missing completely or at a missing slope, the output relay of the WD100V opens contacts 11-14 and the motor is switched off respectively switching on is inhibited. When the square signals recovers and the reset-input is closed or supply-voltage is switched on, the relay picks up again (not earlier than 500 ms after switching off).



Q1 = relay output PLC Q5 = clock from PLC

4

Technical Data

Rated supply voltage U_s	AC/DC 24-240 V, 0/50/60 Hz, <2W, < 3 VA DC 20,4-297 V, AC 20-264 V
Contact elements	1 change-over contact (co)
Contact type	**Type 3** see "General technical Informations"
Measuring input clock	app. DC 5/24 V square wave Relay picked up when square wave voltage is fed Relay is released 1-10.000 ms after last slope
Pulse lenth	0,5 ... 10.000 ms
Input Reset	Button for Reset / bridge = autoreset
Rated ambient temp. range	-32 °C ... +70 °C
Dimensions h x w x d	Design V2: 90 x 35 x 58 [mm]
Weight	approx. 100 g
Attachment	on 35 mm DIN-rail or with screws M4.
Protection housing / terminals	IP 30/ IP 20

Measuring Transducers

Overview Measuring Transducers

General

Measuring transducers supply a linear output signal which is proportional to the measured value. ZIEHL delivers measuring-transducers for input signals DC voltage and AC/DC current, Pt100, Pt1000, KTY83/84, thermocouples and resistance (potentiometer). Output signals are: DC 0/4-20 mA, 0-10 V or frequencies. Frequency signals can be easily evaluated by digital inputs of PLC's.
Various measuring- and switching-devices are also available with analog output. Thus also measuring-transducers for AC voltage, frequency and speed are available.
To display the measured values digital panelmeters type MINIPAN are recommended.
For the evaluation of limits we recommend our limit-relays STW1000V2 and TR210.
In combination with our measuring point change-over switch MUM8 and MUM16 up to 16 signals can be connected to one input (i.e. display or PLC).

Measuring Transducers for Temperature

Type	Input	Output	Potential separation	Housing-Design	Remarks
TMU300	3 x Pt100	4-20 mA	no	420	Transducer for motor-protection Loop-supplied
TR210	2 x Pt100/ 1000 2/3-wire KTY83/84	0/4-20 mA 0-10 V	no	V4	Digital display, programmable 1 or 2 sensors, difference 2 alarms/relays
TMU100V	Pt100 3-wire	0/4-20 mA 0-10 V	no	V2	zero and full scale adjustable
TMU104V	Pt100, Pt1000, KTY83/84, Ther- mocouples, B, E, J, K, L, N, R, S, T	4 x Pt100	yes	V4	Measuring Point Multiplicator
MU1000K	Pt100 3-wire	0/4-20 mA und 0-10 V	yes	K	various zero and spans programmable

More devices with integrated measuring transducer (see according product-group in catalog):

TR122DA	Pt100 2-/3-wire	0/4-20 mA	no	S12	2 alarms/relays
TR400	4 x Pt100 2-/3-wire	2 x 0/4 mA or 0/2-10 V	no	V8	Max. values out of 3/4 sensors, programmable
TR600	6 x Pt100 2/ 3-wire	2 x 0/4-20 mA or 0/2-10 V	no	V8	Max. values out of 2/3/4/6 sensors, programmable
MINIPAN352P MINIPAN SE352 MINIPAN 352V	Pt100 2-/3-wire	4-20 mA	yes	350	potential-free output 4-20 mA, Loop-supplied

Measuring Transducers for Thermocouples

Type	Input	Output	Potential-separation	Housing-Design	Remarks
TR210	B, E, J, K, L, N, R, S, T	0/4-20 mA 0-10 V	no	V4	Digital display, programmable, 1 or 2 Sensors, difference, 2 alarms/relays

More devices with integrated measuring transducer (see according product-group in catalog):

MINIPAN 352P, 352V and SE352	B, E, J, K, L, N, R, S, T	4-20 mA	yes	350	potential free output 4-20 mA, Loop-supplied

Measuring-Transducers for AC Current (see Electronic Current-Transformers)

Type	Input	Output	Potential-separation	Housing-Design	Remarks
STWA1FH	AC 0-20 A	0,5-20 Hz	yes	H	Electronic current-transmitter, Transistor-output
STWA1AH	AC 0-15 A	0-20 mA	yes	H	Electronic current-transmitter, No suply required
STWA2AH	AC 0-20 / 100 A	4-20 mA	yes	H	Electronic current-transmitter, Loop-powered 4-20 mA
More devices with integrated measuring transducer (see according product-group in catalog):					
MINIPAN 352P MINIPAN 352V MINIPAN SE352	AC/DC current and voltage	4-20 mA	yes	350	Passiv analog output mit Loop-powered

Measuring-Transducers for DC current/voltage

Type	Input	Output	Potential-separation	Housing-Design	Remarks
MU1000K	DC 0/4-20 mA und 0-10 V	0/4-20 mA 0-10 V	yes	K	Universal-supply-voltage all inputs and outputs in one device
MU1001K	DC 0/4...20 mA DC 0...300 mV DC 0...300 V	0/4-20 mA 0-10 V	yes	K	Universal-supply-voltage all inputs and outputs in one device Scaleable inputs
MU100U	DC 0/4-20 mA	0/4-20 mA und 0-10 V	yes 0-10 V	K	Universal-supply-voltage all inputs and outputs in one device
TR210	DC 0/4-20 mA 0-10 V	0/4-20 mA 0-10 V	no	V4	Digital display, programmable, 1 or 2 Sensors, difference, 2 alarms/relays

Measuring Transducers for Potentiometers

Type	Input	Output	Potential-separation	Housing-Design	Remarks
MU100W	Potentiometer 0-500 Ω/ 10 kΩ	0/4-20 mA and 0-10 V	no	V2	For remote potentiometers
More devices with integrated measuring transducer (see according product-group in catalog):					
TR122DA	0 - 850 Ω	0/4 - 20 mA	no	S12	2 alarms/relays

Measuring Transducers for Speed/Frequency

FRMU1000	AC-voltage 10-500 Hz	0/4-20 mA 0-10 V	yes	V4	Measuring voltage 80-440 V
FRMU1000	5-99999 IMP/min	0/4-20 mA 0-10 V	yes	V4	Input for proximity-sensor 2- or 3-wire, PNP oder NPN

Measuring Transducer for Motor Protection Type TMU300

for 3 x Pt100

TMU300

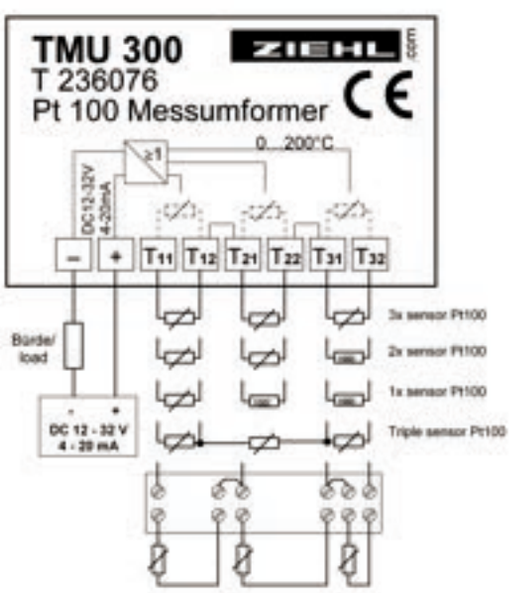
Part number: **T236076**

Transducers for motor protection TMU300 are transducers for 1-3 sensors Pt100 (RTD).
A new, current-saving measuring-system makes it possible to evaluate 3 sensors with a transducer that is supplied by a loop 4-20 mA.

This design is protected.
The sensors Pt100 are connected in 2-wire-technique. The output signal is a current 4-20 mA. The value of the output current corresponds with the temperature of the hottest sensor.

Application:
Recording of temperatures at e.g. motors, generators, transformers or compressors and forward them to relais or controls for evaluation. In difference to PTC with sensors Pt100 a adjustable switching temperature can be realized. The temperature protection can be adapted to the requirements at any time.
Optimal operation and longer life by intelligent management possible. E.g. no start at high motor temperatures.
The cast-resign sealed electronics can be used at temperatures up to 85 °C and thus be placed near the sensors, e.g. in the terminal box of a motor. This reduces influence of EMC and line resistance. The signal 4-20 mA can be transmitted over long distances

Characteristics:
- connection of 1-3 sensors Pt 100 in 2-wire-technique
- measuring range 0...200 °C
- automatic selection of warmest sensor
- I < 3,5 mA at short circuit in any sensor
- I > 25 mA at interruption in any sensor
- analog output 4-20 mA
- rated ambient temperature up to 85 °C
- no supply voltage required (supplied by 4-20 mA-loop)
- with sealed-in electronics



Technical Data

Input	1 - 3 x Pt 100 DIN 43 760/IEC 751 without compensation of line resistance
Output	
Current output	DC 4...20 mA
Voltage loop	DC 12...32 V
Error	class 2,5
Temperature coefficient	0,025 %/°K
Reference conditions	IEC 770, Tu = 23 °C ± 5 °C, Us = DC 24 V ± 1 V
adm. operating temperature	-20 °C ... +85 °C
	TMU300
Dimensions (W x H x D)	Design 420 with terminals 60 x 55 x 32 mm
Attachment	Screw mounting 2 x M4
Protection housing / terminals	IP 40 / IP 20
Weight	approx. 70 g

Measuring Transducer for Temperature Type TMU100V

for Pt 100 (RTD)

TMU100V

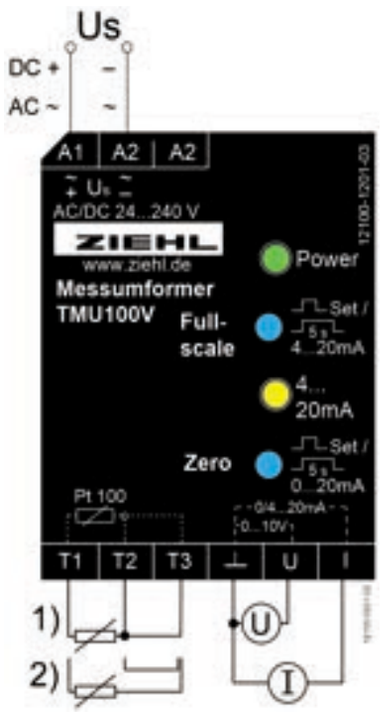
Part number: **T236090**

Model TMU100 Pt100 measuring transducers are suitable for measuring temperatures with sensors Pt100 (RTD).
Zero and FullScale can be freely set within the whole range -199 ... +850 °C. To do this only resistors with the according value or a Pt 100-decade is connected. The adjustment is done by pressing a button.

The built-in universal power-supply AC/DC 24-240 V allows the connection to all common supply-voltages.
The Pt100- sensor can be connected in 2- or 3-wire connection.
The output delivers 0/4 ... 20 mA and 0 ... 10 V simultaneously.

- Pt100-input 2- or 3-wire automatic compensation of
- line up to 500 Ω total resistance (sensor + line)
- Detection of sensor-break
- Easy adjustment of Zero and FullScale by pressing a button
- Wide measuring-range -200... +850 °C

- Analog output 0 ... 20 mA / 4 ... 20 mA
- Analog output 0 ... 10 V
- LEDs for display of operative state
- Universal supply AC/DC 24-240 V
- Housing for DIN-rail or wall-mount, 35 mm wide, mounting height 55 mm



1) 3-Leiter/3-wire
2) 2-Leiter/2-wire
Brücke zwischen T2-T3/
Bridge from T2-T3

5

Technical Data

Rated supply volatge Us	AC/DC 24V…240 V, 0/50/60 Hz, < 3 W, <5 VA
Adm. tolerance DC	DC 20…297 V
Adm. tolerance AC	AC 19…264 V
Measuring input	Pt 100 EN 60751, 2-/3--wire, ≤0,8 mA
Temperature-range	-200 ... +850 °C
Resolution	0,1 K
Tolerance	± 0,5 % of measured value ±0,5 K
Temperature factor	<0,03 %/K
Analog output	DC 0…10 V, min. 1 kΩ DC 0/4…20 mA, max. 500 Ω
Error	< 0,3% of FullScale
Test conditons	EN 61010
Rated impulse withstand voltage	4000 V
Contamination level	2
Rated insulation voltage	250 V
Rated ambient temp. range	-20 °C … +60 °C
Dimensions (h x w x d)	design V2: 90x35x58 mm, mounting height 55 mm
Weight	app. 130 g
Attachment	on 35 mm DIN-rail EN 60 715 or with screws M4
Protection housing / terminals	IP 20 / IP 30

Measuring Point Multiplicator Type TMU104V

1 Input for Temperature Sensors, 4 Outputs Pt100 (RTD)

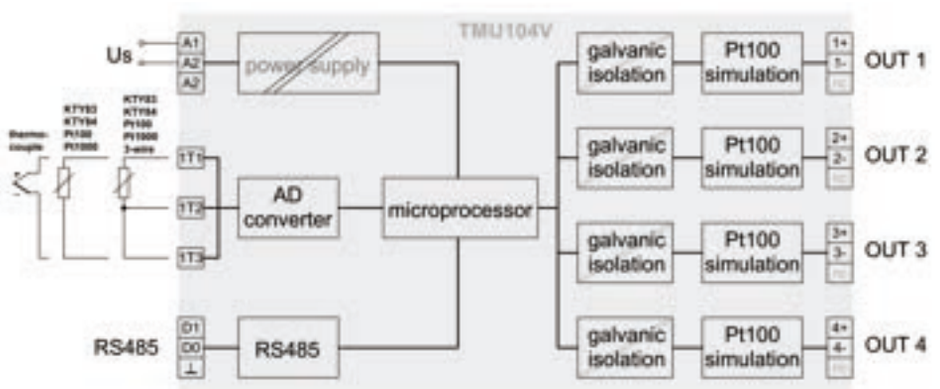
TMU104V

Part number: **T236061**

The measuring point multiplicator TMU104V measures the temperature at a connected sensor and transduces it into 4 insulated signals Pt 100 (RTD).
Via interface RS 485 it can be used as a simulator for up to 4 signals Pt 100.

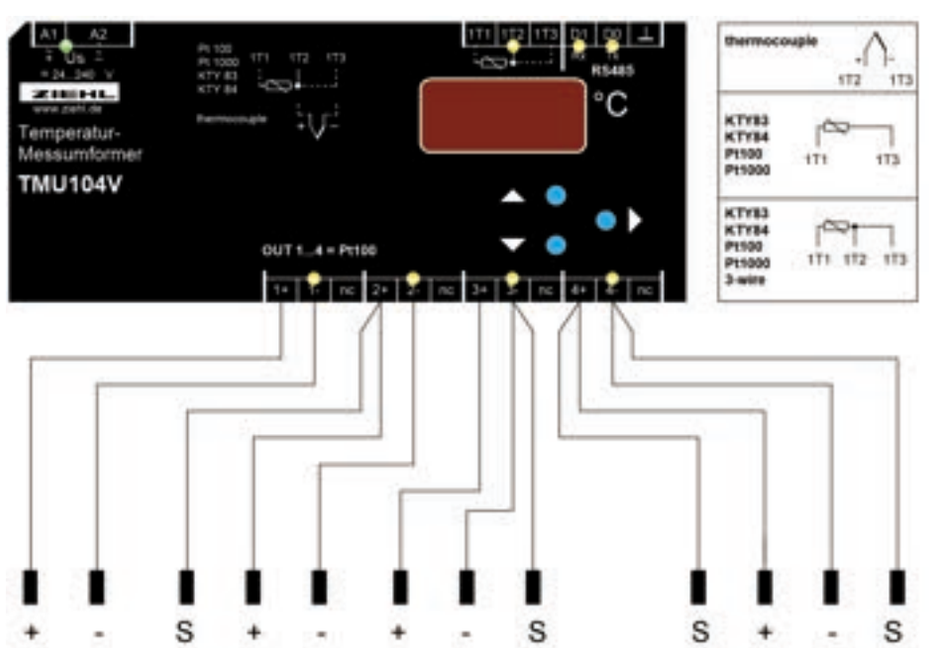
- Measuring input Pt 100 (RTD), Pt 1000, KTY 83 / 84 in 2- or 3-wire
- connection
- Measuring input thermocouple (types B, E, J, K, L, N, R, S, T)
- Measuring range -199…+850 °C
- 4 insulated outputs signal Pt 100 (resistance- signal), connection in 2-, 3- or 4-wire
- 3-way isolator
- Digital display, 3 digits, resolution 1 °C (-19.9 … 99.9 °C: resolution 0,1 °C)
- Storing of MIN- and MAX- values
- Universal supply voltage AC/DC 24-240 V
- Interface RS 485 (protocols ZIEHL and Modbus RTU)
- Housing for DIN-rail or wall-mount, 105 mm wide, mounting height 55 mm

Block diagram



Measuring Point Multiplicator and Transducer:
The temperature of the sensor (resistance or thermocouple), connected to the input, is available as signal Pt 100 (RTD) at 4 insulated outputs. Thus allows the connection of other sensors than Pt 100 to inputs for Pt 100 at other devices.
Normally only one input can be connected to a temperature sensor. With help of TMU104 up to 4 devices (controls, displays, monitoring devices) with inputs Pt 100 can be connected to one sensor at the same time.

Simulator für Pt 100:
Controlled via interface RS 485 (protocol Modbus RTU) the TMU1004V can simulate up to 4 sensors Pt 100 (RTD). This allows the application in equipment, that makes automatic tests and calibrations at devices and installations with several inputs Pt 100.



Technical Data

Rated supply voltage U_s	AC/ DC 24V - 240V < 2,5 V
Tolerance	DC 20,4 - 297 V, AC 20-264 V, 50/60 Hz

Sensor input 1T/2T/3T

Pt100 (RTD), Pt1000 nach EN 60751:

Sensor	Measuring range [°C] from	to	Short Circuit [Ω]	Break [Ω]	Resistance of sensor + line[Ω]
Pt100	-199	860	15	400	500
Pt1000	-199	860	150	4000	4100
KTY83	-55	175	150	4000	4100
KTY84	40	150	150	4000	4100

Tolerance	± 0,2 % of measured value ±0,5 K (KTY ±5 K)
Sensor current	≤ 0,6 mA
Temperature factor	< 0,04°C/K
Measuring time 2-wire/3-wire	≤ 330 ms/ ≤ 440 ms

Thermocouples according to EN 60584, DIN 43710:

Type	Measuring range [°C] from	to	Tolerance [°C]
B	0	1820	T > 300 ± 2
E	-270	1000	± 1
J	-210	1200	± 1
K	-200	1372	± 2
L	-200	900	± 1
N	-270	1300	± 2
R	-50	1770	± 2
S	-50	1770	± 2
T	-270	400	± 1

Temperature factor	± 0,01 % /K
Measuring error of sensor line	+ 0,25 µV / Ω
Reference junction	± 5 °C
Measuring time	≤ 440 ms

Sensor output OUT1...OUT4

	Pt100 according to EN60751
Reaction time	< 10 ms
Current range	200 µA … 5 mA
Type of connection	2-, 3-, 4-wire
Tolerance	±0,2 % of simulated value

Test conditions

	EN 61010-1
Rated impulse voltage	4000 V
Overvoltage category	III
Contamination level	2
Rated insulation voltage	Ui 300 V
ON period	100%
Insulation / Test voltage	Us - OUT1...4, Input, RS 485: DC 3820 V OUT1...4 -Input, RS 485: DC 1000 V OUT1 - OUT2 - OUT3 - OUT4: DC 1000 V
no insulation	Input - RS 485
EMC-Tests	EN 61326-1
Rated ambient temperature range	-20 °C ...+65 °C

Housing

Dimensions (w x h x d)	Design V6, 105 x 90 x 58 mm
Torque	0,5 Nm (3,6 lb.in)
Protection Housing/Terminals	IP30/IP20
Installation	Snap mount on rail 35 mm or screws M4
Weight	app. 200g

5

Measuring Transducers Type MU

General

The measuring transducers type MU capture various electrical measured variables – from standard signals 0/4–20 mA and 0–10 V to voltage and current signals as well as, depending on the type, temperature signals. They precisely convert these into standardized analog signals and are therefore ideal for signal conditioning for PLCs, control systems, and display instruments.

Due to the galvanic isolation between input, output, and power supply, the devices also serve as isolation amplifiers and protect downstream electronics from interference. The universal power supply and adjustable measurement ranges enable flexible use in new and existing systems and reduce the variety of variants in the control cabinet.

Comparison MU series

Type	MU100U	MU1000K	MU1001K	MU2000K
Measuring varlues	0/4…20mA, 0-10V	0/4…20mA, 0-10V, Pt 100	0… ± 60/150/300mV DC, 0… ±10/300V DC	0…30/150/300/600V AC/DC, 0…1/5 A AC/DC
Output signals	0/4…20mA, 0-10V	0/4…20mA, 0/2-10V	0/4…20mA, 0/2-10V	0/4…20mA, 0/2-10V
Scaling adjustment	2 potentiometer	2 buttons: Programs or signal adjustment	2 buttons: Programs signal adjustment	2 buttons: Programs signal adjustment
Display LEDs	1x power	1x power, 3x settings	1x power, 3x settings	1x power, 3x settings
Test voltage between potentials	2500 V	3510 V	3540 V	3540 V
Input resolution	n.a.	14 Bit	14 Bit	14 Bit
Output resolution	n.a.	11,6 Bit: < 3,1 mV; < 6,1 uA	11,6 Bit: < 3,1 mV; < 6,1 uA	11,6 Bit: < 3,1 mV; < 6,1 uA
Housing design	K	K	K	K
Measuring time	~50 ms	Voltage/Current: < 20 ms; Temperature: <350 ms	< 20 ms	Adjustable measurement time
Main areas of application	Signal isolation	Signal isolation	Signal conversion, voltage measurement	Voltage/current measurement

Function and Characteristics

The integrated 3-way isolator ensures safe galvanic isolation of input, output, and power supply, enabling the use of MU transducers as powerful isolation amplifiers in measurement, control, and monitoring circuits. This effectively protects expensive evaluation units: The transducer serves as an intermediate link and handles signal conversion and isolation of interference variables such as overvoltages or ground loops – for example in demanding applications like lehr ovens in the glass industry. Depending on the type, various measurement ranges, signal types, and scaling options are available, which can be conveniently adjusted via potentiometers or pushbuttons.

Short response times and high resolution ensure accurate and dynamic capture of process signals. Status LEDs support quick commissioning and diagnostics, while the compact design facilitates DIN rail mounting even in tight spaces. For direct measured value acquisition, the MU converts the signals before display via our recommended MINIPAN devices – for seamless integration into the system. The transducers are used, among other things, in industrial and building technology, in ventilation, air conditioning, and pump systems, as well as in energy and infrastructure projects, ensuring reliable signal acquisition and transmission.

Universal Measuring Transducer/ Isolating Amplifier Type MU100U

MU100U

The universal measuring transducer MU100U can be connected to any supply voltage AC or DC between 24 and 240 V.
Input signals and output signals are electrically isolated from each other (3-way isolator).
Signals DC 0/4-20 mA or 0-10 V can be connected to the inputs. The input signals are transduced to standard-signal 0-10 V, 0/4-20 mA at the outputs. It can be used as an isolating amplifier for 0-10 V signals.

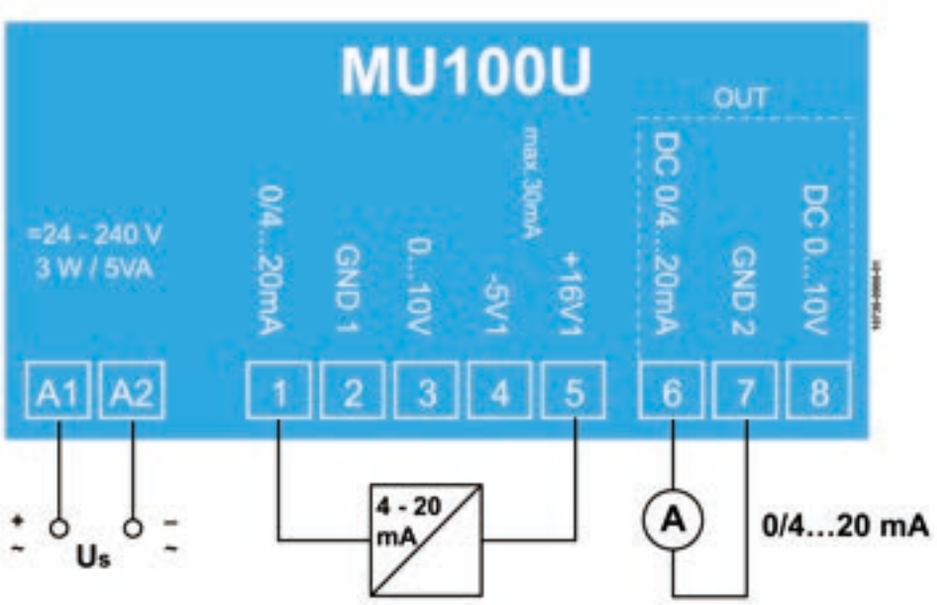
The measuring signal applied to one of the inputs is converted into a normalized voltage signal and changed into a frequency. The frequency signal is transferred by means of an optocoupler for electrical isolation. It is then converted again into a voltage and amplified. Signals 0/4-20 mA and 0-10 V are now available at the outputs. The electronics before and after the optocoupler are supplied from the power supply unit with potential separated voltages each.

Part number: **T236010**

It is often necessary to separate the potentials of signals by means of isolation amplifiers as otherwise this would lead to adulteration of measuring values because of compensating currents.
Furthermore, the low-voltage side is effectively protected against damage caused by malfunctions at the primary side.
Because of the variety of the current standard signals (0-20 mA, 4-20 mA, 0-10 V), it often happens that the output of a measuring transducer is not compatible with the input of the evaluation unit.

MU 100 U eliminates these problems. Stockkeeping is largely facilitated by the universal supply voltage and different input and output signals in one device.
These measuring transducers almost always fit.

- Input signals DC 0 - 20 mA, 0 - 10 V
- Output signals DC 0 - 20 mA, 0 - 10 V
- Offset with signals 4 - 20 mA can be compensated by the user
- Universal supply voltage AC/DC 24 - 240 V
- electrical isolation between inputs and outputs
- supply voltage for external measuring transducers -5/+18 V/ max. 30 mA
- Isolation voltage 2.5 kV



Technical Data

Power Supply	Rated supply voltage U_S	AC/ DC 24V - 240V
	adm. tolerance DCV	DC 20 - 297 V
	adm. tolerance ACV	AC 19 - 264 V, Frequency 20 - 120 Hz
	Power consumption	< 3 W
	recommended fuse	2 A slow (gL)
Inputs	**Input voltage**	DC 0 - 10 V
	Nominal input resistance	> 500 kΩ
	Input current	DC 0/ 4 - 20 mA
	max. current	DC 50 mA
	Nominal input resistance	50 Ω
Voltage supply for ext. Measuring Transducer	voltage	DC -5 V/ ground GND1 -16 - 20 V
	current	max. 30 mA
Outputs		2 outputs with common ground
	Output voltage	DC 0 - 10 V
	max. no load voltage	DC 12 V
	Load	> 1 kΩ
	Output current	DC 0/4 - 20 mA
	max. short-circuit current	DC 30 mA (short-circuit-proof)
	max. load	500 Ω
	Accuracy	class 0,2 at Tu = 23°C
	Temperature effect	0,025%*K^{-1}
	Nominal rise time $T_{0,9}$	50 ms
Operation Conditions	rated ambient temperature range	0 °C … 50 °C
	ambient storage temperature	-20 °C … +70 °C
Test Conditions	Isolation	Input/Output/Supply voltage 2500 VAC
	EMV	EN 61000-6-4 / EN 61000-6-2
	Operating time	100%
Housing	Dimensions H x W x D	Design K: 75 x 22,5 x 110 [mm]
	Line connection one-wire	1 x 0,5 - 2,5 mm^2
	fine-wire with multicore cable ends	1 x 0,14 - 1,5 mm^2
	Fitting position	any
	Fastening	Snap mounting on 35 mm standard rail conforms to DIN EN 60 715 or M4 screws
	Protection housing / terminals	IP 40 / IP 20
	Burning behaviour	UL 94 V-2
	Stripping length	8 mm
	Connection torque of screw	max. 0,5 Nm
	Weight	approx. 200 g

Universal Measuring Transducer MU1000K

Temperature Pt 100 (RTD), DC Current and Voltage, Isolating Amplifier

MU1000K

Part number: **T236004**

Universal-measuring-transducers MU1000K can measure signals Pt100 and analog input signals. Several measuring-ranges are pre-programmed. More can be easily scaled. The output-signals are potentially separated from inputs and supply-voltage.
With its universal power-supply AC/DC 24-240 V the measuring-transducer can be connected to all common supply-voltages. It can be used as an isolating amplifier for 0-10 V signals.

Inputs:
- DC 0/2-10 V, DC 0/4-20 mA
- Supply-voltage for external measuring transducer DC 18V/25 mA
- Input Pt 100, 3-wire, -200 … +800 °C
  - automatic compensation of line-resistance
  - pre-programmed zeros and spans
  - individually programmable zeros and spans

Outputs:
- DC 0/4-20 mA, DC 0/2-10 V
- Galvanic isolation between inputs, outputs and supply-voltage (3-way isolation)

Displays and control elements:
- 2 buttons for scaling
- 4 LEDs for display of state and scaling

Technical Data

Rated supply voltage U_S	**AC/DC 24 - 240 V**	**0/50/60 Hz**
Tolerance	AC 20 - 264 V	DC 20,4 - 297 V
Power consumption	< 5 VA	< 3 W

Inputs	**Input-resistance**	**Maximum input signal**	**Error of full scale**
Voltage input	12 kΩ	DC 27 V	0,1 %
Current input	18 Ω	DC 100 mA	0,5 %
Resolution	14 Bit		

	Measuring range	Max. resistance of sensor + wire
Pt100 sensor input	- 200°C … 800 °C	500 Ω
Tolerance	± 0,5 % of measured value ± 0,5 K	
Resolution	0,1 °C	
Sensor current	≤ 0,6 mA	
Temperature factor	< 0,04 °C / K	

Outputs	**2 outputs with common ground**	
Voltage output	DC 0/2 – 10 V	
Tolerance	0,3 % of full scale (from 0,1 V)	
Temperature factor	< 0,01 % / K	
Resolution	11,6 Bit	< 3,1 mV
Load	≥ 1 k Ω	
Current output	DC 0/4 – 20 mA	

Tolerance	0,3 % of full scale (from 0,1 mA)
Temperature factor	< 0,015 % / K
Resolution	11,6 Bit < 6,1 µA
Load	≤ 500 Ω
Error from Load	(250 Ω – resistance) / 250 Ω * 0,3 % of final value

Response-time T09	
Pt100 sensor input	< 350ms
Voltage / current input	< 20ms

Galvanic insulation	Us – input - output	
Test voltage	Us – output	DC 3540V
	Us – input	DC 3540V
	Input – output	DC 3540V

Test conditions	EN 61010-1
Rated impulse voltage	4000 V
Overvoltage category	III
Pollution degree	2
Rated insulation voltage Ui	300 V
On-period	100 %

EMC-tests	EN 61326-1 (Equipment intended for use in industrial locations)
Emission	EN 61326-1, CISPR 11 class B
Immunity	EN 61326-1 industrial environment
Electrical fast transient (Burst)	EN 61000-4-4 ±4,5 kV Pulse 5/50 ns, f = 5 kHz, t = 15 ms, T = 300 ms
Surge immunity test	IEC 61000-4-5 ±2 kV

Environmental conditions	
Permissible ambient temperature	-20 °C ... +65 °C
Permissible storage temperature	-20 °C ... +70 °C
Permissible wiring temperature	-5 °C ... +70 °C
Climatic conditions	5 – 85 % rel. humidity, no condensation
Installation height	< 2000 m
Vibration resistance	EN 60068-2-6 2…25 Hz ±1,6 mm 25 ... 150 Hz 5 g

Reliability – failure rate	EN 61709/ SN29500		
Ambient conditions	Local operation in dry rooms		
Operation time 24/7/365	8760 h/y		
Failure rate (FIT)	Tu = 40 °C	Tu = 60°C	Tu = 80°C
Tu = Tref (component not in operation)	602 FIT	1149 FIT	2370 FIT
	100 (190) years	99 years	48 years

Contact termination	Push-In spring-type terminal
Protection class terminals	IP20
Actuation type	Push-Button
Number of levels	1
Solid conductor	1 x 0,14 mm² … 1,5 mm² / AWG 28 … 16
Fine-stranded conductor	1 x 0,14 mm² … 1,5 mm² / AWG 26 … 14
Fine-stranded with insulated ferrule	1 x 0,25 mm² … 0,75 mm²
Fine-stranded with uninsulated ferrule	1 x 0,25 mm² … 1,5 mm²
Strip length	8 … 9 mm / 0.31 … 0.35 inches

Housing	Type K
Dimensions (W x H x D)	22,5 x 75 x 115 mm
Width	1 M
Protection class housing	IP40
IK-Code	IK06 (1 J Impact energy)
Mounting	Snap mounting on 35 mm standard rail EN60715 or M4 screws (additional bar not included)
Mounting position	any
Weight	app. 100 g

Subject to technical changes

Universal Measuring Transducer MU1001K

DC voltage and DC current, Isolating Amplifier, scaleable

MU1001K

Part number: **T236007**

Universal Measuring-Transducers MU1001K can measure DC-signals up to 300 V. Inputs 60/150/300 mV measure direct current.
Pre-set measuring-ranges can be selected by the user. More measuring-ranges (zero and full scale) can be easily scaled.
The output-signals are insulated from measuring-input and supply-voltage.
With its universal power-supply AC/DC 24-240 V the measuring-transducer can be connected to all common supply-voltages.
It can be used as an isolating amplifier for 0-10 V signals.

Inputs:
- ± DC 0 - 300 mV (pre-set: 60/150/300 mV, ± 60/150/300 mV)
- DC 0 - 10 V, ± 10 V
- DC 0 - 300 V (pre-set: 20/50/100/200/300 V)

Outputs:
- DC 0/4-20 mA
- DC 0/2-10 V
- Galvanic isolation between inputs, outputs and supply-voltage(3-way isolation)

Displays and control elements:
- 2 buttons for scaling
- 4 LEDs for display of state and scaling

Technical Data

Rated supply voltage Us	AC/DC 24 - 240 V	0/50/60 Hz
Tolerance	AC 20 - 264 V	DC 20,4 - 297 V
Power consumption	< 5 VA	< 3 W

Input	Input-resistance	Maximum input signal	Error of fl full scale
DC 300 V	500 kΩ	DC ± 300 V	0,1 %
DC 10 V	500 kΩ	DC ± 300 V	0,1 %
DC 60mV	10 MΩ	DC ± 2 V	0,1 %
DC 150mV	10 MΩ	DC ± 2 V	0,1 %
DC 300mV	10 MΩ	DC ± 2 V	0,1 %
Resolution	14 Bit		
Measuring time	< 20 ms		

max. 300 V

Outputs	2 outputs with common ground	
Response-time T09	< 40 ms	
Voltage output	DC 0/2 – 10 V	
Tolerance	0,3 % of full scale (from 0,1 V)	
Temperature factor	< 0,01 % / K	
Resolution	11,6 Bit	< 3,1 mV
Load	≥ 1 k Ω	
Current output	DC 0/4 – 20 mA	
Tolerance	0,3 % of full scale (from 0,1 mA)	

Temperature factor	< 0,015 % / K
Resolution	11,6 Bit < 6,1 µA
Load	≤ 500 Ω
Error from load	(250 Ω – resistance) / 250 Ω * 0,3 % of final value

Galvanic isolation	Us – input - output
Test voltage	Us – output DC 3540V Us – input DC 3540V Input – output DC 3540V

Test conditions	EN 61010-1
Rated supply voltage Us (terminals A1,A2)	
Pollution degree	2
Overvoltage category	III reinforced insulation
Rated insulation voltage Ui	300 V
Input (terminals 5,6,7)	
Pollution degree	2
Overvoltage category	II reinforced insulation
Rated insulation voltage Ui	300 V

EMC-tests	EN 61326-1 (Equipment intended for use in industrial locations)
Emission	EN 61326-1, CISPR 11 class B
Immunity	EN 61326-1 industrial environment
Electrical fast transient (Burst)	EN 61000-4-4 ±4,5 kV Pulse 5/50 ns, f = 5 kHz, t = 15 ms, T = 300 ms
Surge immunity test	IEC 61000-4-5 ±2 kV

Environmental conditions	
Permissible ambient temperature	-20 °C ... +65 °C
Permissible storage temperature	-20 °C ... +70 °C
Permissible wiring temperature	-5 °C ... +70 °C
Climatic conditions	5 – 85 % rel. humidity, no condensation
Installation height	< 2000 m
Vibration resistance	EN 60068-2-6 2…25 Hz ±1,6 mm 25 ... 150 Hz 5 g

Reliability – failure rate	EN 61709/ SN29500		
Ambient conditions	Local operation in dry rooms		
Operation time 24/7/365	8760 h/y		
Failure rate (FIT)	Tu = 40 °C	Tu = 60°C	Tu = 80°C
Tu = Tref (component not in operation)	602 FIT	1149 FIT	2370 FIT
	100 (190) years	99 years	48 years

Contact termination	Push-In spring-type terminal
Protection class terminals	IP20
Actuation type	Push-Button
Number of levels	1
Solid conductor	1 x 0,14 mm² … 1,5 mm² / AWG 28 … 16
Fine-stranded conductor	1 x 0,14 mm² … 1,5 mm² / AWG 26 … 14
Fine-stranded with insulated ferrule	1 x 0,25 mm² … 0,75 mm²
Fine-stranded with uninsulated ferrule	1 x 0,25 mm² … 1,5 mm²
Strip length	8 … 9 mm / 0.31 … 0.35 inches

Housing	Type K
Dimensions (W x H x D)	22,5 x 75 x 115 mm
Width	1 M
Protection class housing	IP40
IK-Code	IK06 (1 J Impact energy)
Mounting	Snap mounting on 35 mm standard rail EN60715 or M4 screws (additional bar not included)
Mounting position	any
Weight	app. 100 g

5

Subject to technical changes

Universal-Measuring-Transducer MU2000K

AC and DC, Voltage and Current

MU2000K

Part number: **T236056**

Measuring transducers MU200K can measure DC- and AC- voltages up to 600 V and AC- and DC- currents 0-1/5 A.
Preset measuring ranges can be selected. More measuring ranges (zero and full scale) can be easily scaled.
The output signals DC 0/2-10 V and 0/4-20 mA are insulated from measuring input and supply voltage.
With its universal supply voltage AC/DC 24-240 V the measuring transducer can be connected to all common supply voltages.
The MU2000K e.g. is suitable for measuring DC voltages and charging currents at batteries or for measuring AC voltages and currents in plants for own generation of energy.

Inputs:
- Voltage AC/DC 600 V (preset 0-30/150/300/600 V, 80-120V)
- Current AC/DC 5 A (preset 1/5 A)
- AC and DC measuring without switching over

Outputs:
- DC 0/4-20 mA
- DC 0/2-10 V
- Galvanic isolation between input, output and supply voltage (3-way isolator).

Displays and control elements:
- 2 buttons for scaling
- 4 LEDs for display of state and scaling

Technical Data

Rated supply voltage U_S	AC/DC 24 - 240 V	0/50 ... 400 Hz
Tolerance	AC 20 - 264 V	DC 20,4 - 297 V
Power consumption	< 8 VA	< 3 W

Input / Ranges	Input-resistance	Maximum input signal	Error of full scale
AC 30 V, 150 V, 300 V, 600 V	> 500 kΩ	600 V	0,5 %
DC 30 V, 150 V, 300 V, 600 V			0,2 %
AC 1 A, 5 A	30 mΩ	25 A / 1s,	0,5 %
DC 1 A, 5 A		4,5 A / 4s	0,1 %

AC und DC- measuring possible without switching over (AC ranges only, see Operating Manual item 8.8)

Frequency at AC- measurements	45 … 420 Hz
measurement deviation at > 100 Hz	1% of full scale
measurement deviation at > 300 Hz	2% of full scale
Temperature factor	< 0,02 % / K
Resolution	14 Bit

CAT II 300 V
max. 300 V

Output	2 outputs with common ground
Voltage output	DC 0 – 10 V (0 - 10,25 V, 11 V at device error) DC 2 – 10 V (1,9 - 10,25 V, 11 V at device error)
Tolerance / Temperatur factor	0,3 % of full scale (from 0,1 V) / < 0,01 % / K
Resolution	11,6 Bit < 3,1 mV
Load	≥ 1 k Ω

Current output	DC 0 – 20 mA (0 - 20,5 mA, 22mA at device error) DC 4 – 20 mA (3,8 - 20,5 mA, 22mA at device error)
Tolerance / Temperature factor	0,3 of full scale (from 0,1 mA) / < 0,015 % / K
Resolution	11,6 Bit < 6,1 µA
Load	≤ 500 Ω
Error from load	(250 Ω – load) / 250 Ω * 0,3 % of current

Measuring principle	**RMS (AC), mean (DC)**
Measuring time	20 ms (17 ms at 60 Hz)
Averaging	adjustable 1, 2, 4, 8, 16, 32 measurements
System measuring time	Measuring time * Averaging
Reaction time of the outputs	< 45ms + system measuring time

Test conditions	**EN 61010-1**
Rated supply voltage Us (terminals A1, A2)	
Pollution degree	2
Overvoltage category	III reinforced insulation
Rated insulation voltage Ui	300V
Input (terminals 4,5,6,7)	
Pollution degree	2
Overvoltage category	II reinforced insulation
Rated insulation voltage Ui	300 V
Galvanic insulation / Test-voltage	
Input – output	DC 3540 V
Us – output	DC 3540 V
Us – input	DC 3540 V

EMV immunity	**EN 61326-1 Industrial electromagnetic environment**
EMC emission	EN 61000-6-3

Reliability - failure rate	**EN 61709 / SN29500**		
Ambient conditions	Local operation in dry rooms		
Operation time 24/7/365	8760 h/a		
Failure rate (FIT)	Tu = 40 °C	Tu = 60 °C	Tu = 80 °C
Tu = Tref (component not in operation)	615 FIT	1205 FIT	2565 FIT
	100 (186) years	95 years	45 years

Environmental conditions	
Rated ambient temperature range	-20 °C ... +50 °C
Storage temperature	-20 °C ... +70 °C
Admissible temperature for wiring	-5 °C ... +70 °C
Altitude	< 2000 m above sea level (MSL)
Climatic conditions	5 - 85% rel. humidity, no Condensation
Vibration resistance	EN 60068-2-6 2…13,2 Hz ±1 mm 13,2 ... 100 Hz 1 g

Contact termination	**Push-In spring-type terminal**
Protection class terminals	IP20
Actuation type	Push-Button
Number of levels	1
Solid conductor	1 x 0,14 mm² … 1,5 mm² / AWG 28 … 16
Fine-stranded conductor	1 x 0,14 mm² … 1,5 mm² / AWG 26 … 14
Fine-stranded with insulated ferrule	1 x 0,25 mm² … 0,75 mm²
Fine-stranded with uninsulated ferrule	1 x 0,25 mm² … 1,5 mm²
Strip length	8 … 9 mm / 0.31 … 0.35 inches

Housing	**Type K**
Dimensions (W x H x D)	22,5 x 75 x 115 mm
Width	1 M
Protection class housing	IP40
IK-Code	IK06 (1 J Impact energy)
Mounting	Snap mounting on 35 mm standard rail EN60715 or M4 screws (additional bar not included)
Mounting position	any
Weight	app. 100 g

Subject to technical changes

Measuring-Transducer for Potentiometers Type MU100W

for 0-500 Ω ... 0-10 kΩ

MU100W

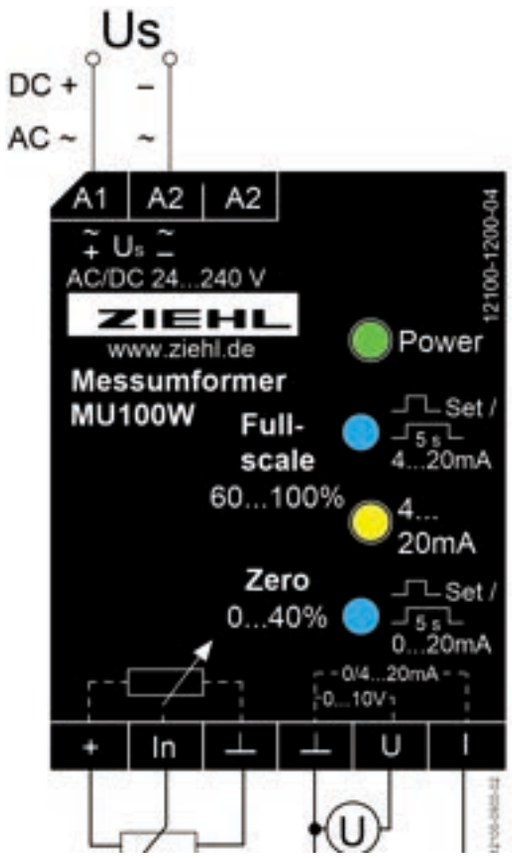
Part number: **T236041**

The MU100W measuring transducer converts the position of a potentiometer into a linear signal 0/4-20 mA respectively 0-10 V. Zero can be easily scaled 0...40 %, FullScale 60 ... 100 % of the range of thepotentiometers by pressing a button.

The built-in universal power-supply AC/DC 24-240 V allows the connection to all common supply-voltages.
The output delivers 0/4 ... 20 mA and 0 ... 10 V simultaneously.

Applications are the creation of adjusting commands or the detection of mechanical elements, e.g. flaps.

- Connection of a potentiometer 0...500 Ω to 0...10 kΩ
- Zero adjustable 0 ... 40 % of Scale
- FullScale adjustable 60 ... 100 % of Scale
- Easy adjusting of zero and FullScale by pressing a button
- Analog output 0 ... 20 mA / 4 ... 20 mA
- Analog output 0 ... 10 V
- LEDs for display of operative
- state
- Universal supply AC/DC 24-240 V
- Housing for DIN-rail or wall-mount, 70 mm wide,
- mounting height 55 mm



Technical Data

Rated supply volatge Us	AC/DC 24V…240 V, 0/50/60 Hz, < 3 W, <5 VA
Tolerance DC	DC 20…297 V
Tolerance AC	AC 19…264 V
Measuring input	Resistance-potentiometer 0...500 Ω to 0...10 kΩ
Measuring current/ -voltage	6,6 mA ... 330 µ/3,3 VA
Analog output	DC 0…10 V, min. 1 kΩ DC 0/4…20 mA, max. 500 Ω
Error	< ±1%
Temperature factor	0-10 V: < 0,01 %/K, 0/4-20 mA: < 0,015 %/K
Test conditons	EN 61010
Rated impulse withstand voltage	4000 V
Contamination level	2
Rated insulation voltage	250 V
Rated ambient temp. range	-20 °C … +60 °C
Dimensions (h x w x d)	design V2: 90x35x58 mm, mounting height 55 mm
Weight	app. 130 g
Attachment	on DIN-rail 35 mm or with screws M4
Protection housing / terminals	IP 20 / IP 30

Measuring Point Change-over Switch Type MUM

for 8 or 16 Measuring points

General

Measuring point change-over switches allow the connection of up to 16 measuring points to 1 measuring device, e.g. an analog input of a PLC.
The inputs can be selected with a BCD-Code.
Manual selection can be made with a code-switch.

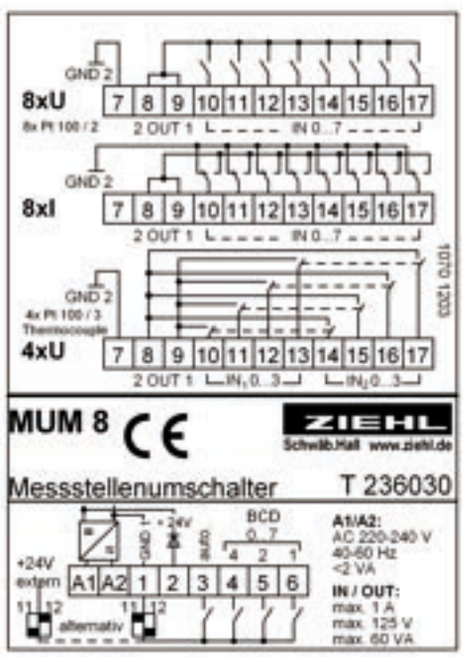
In automatic mode, the inputs are polled (tact-time adjustabe) and thus be displayed in succession.
When using a measuring point change-over switch, only 1 measuring input is needed to collect multiple values. Especially with slowly changing signals like temperatures, measuring every other second is enough. Expensive inputs for Pt100 or 0-10 V/0-20 mA at PLCs can be saved.

MUM8

Part number: **T236030**

With the MUM8, alternatively 8 measuring points with common ground or 4 measuring points with separated ground can be switched.

- PLC-compatibel. Channel-selection over 3 bit parallel (24 V), e.g. PLC or by a code switch
- Optional switching + or -
- 8 channels (0/4 ... 20 mA, 0 ... 10V, Pt 100) with common ground
- 4 double-channels (= Pt 100/3-wire and thermocouples)
- Supply-voltage AC 230 V or DC 24 V
- LED-display for selected channel
- Clock time in automatic mode adjustable 0,5 ... 10 s
- plug-in terminals



MUM16

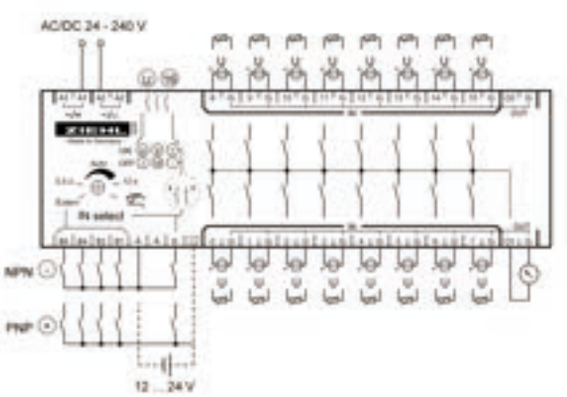
Part numbers:
MUM16 **T236035**

ER8  **T224388**

With the MUM16, alternatively 16 measuring points with common ground or 8 measuring points with separated ground can be switched.

- PLC-compatibel. Channel-selection over 4 bit parallel (24 V), e.g. PLC or by a code-switch
- Optional switching + or -
- Enable-input for using multiple MUM in parallel
- Monitoring of up to 16 signals for one limit with only 1 limit switch
- 16 channels (0/4 ... 20 mA, 0 ... 10V, Pt 100) with common ground
- 8 double-channels (= Pt 100/ 3-wire and thermocouples)
- Simple configuration with 3 DIP-switches
- Supply voltage AC/DC 24-240 V
- LED-display for selected channel
- Tact-time in automatic mode adjustable 0,5 ... 10 s
- plug-in terminals
- Housing for mounting in switchgear cabinets or fuse boxes, 140 mm wide, mounting height 55 mm

Accessory: Installation frame ER8 for panel mount



Technical Data		MUM8	MUM16
Supply voltage	Rated supply-Voltage U_s	AC 220 - 240 V/ DC 24 V	AC/DC 24 - 240 V
	Frequency	50/ 60 Hz	0/ 50/ 60 Hz
	Power consumption	< 2 VA	< 6,5 VA, 4 W
	Admissible tolerance	AC -10…+10%	-10...+10%
Inputs	Number of input channels	8 channels with common ground or 4 x 2 channels potentially separated	16 channels with common ground or 8 x 2 channels potentially separated
	display	1 LED / channel	
	switching voltage	max. AC/ DC 24 V	
	switching current	max. 100 mA	
	switching capacity	max. 2,4 W or 2,4 VA (ohmic Load)	
	relays	8 x 1 co	16 x 1 co
	expected contact life mech.	approx. 10^8 operations	
	expected contact life elec.	5 x 10^7 operations at 12 V/ 10 mA 3 x 10^6 operations at 24 V/ 0,1 A	
	control inputs	manual / automatic channel select 3 bit BCD	enable channel select 4 bit BCD
	control signal	potentially separated from analog part for all control inputs 0/24 V (PLC-compatible) aktive high or low selectable with DIP-switches	
	clock-time	adjustable (potentiometer) 0,5…10 s	
	switching time	break between 2 channels app. 1-2 ms	
Outputs	outputs	max. 2	
	at single channel:	In 0 - 7 to Out 1 + Out 2	In 0 - 15 to Out 1
	at double channel:	In 0 - 3 to Out 1 In 4 - 7 to Out 2	In 0 - 7 to Out 1 In 8 - 15 to Out 2
Test Conditions		EN 50 178	
	rated insulation voltage U_i	AC 250 V/ DC 300 V	
	insulation	EN 60664	
	pollution grade	4 kV	
	EMC	2	
	transformer	EN 61 000-6-2, EN 61 000-6-3 EN 61 558	
Normal conditions of use	rated ambient temperature	0 °C ... +50 °C	-20 °C ... +55 °C
	storage temperature	-40 °C ... +75 °C	
	environmental conditions	EN 60 068-1	
	on-period	100%	
Housing	Design / Installation Frame	K / -	V8 / ER8, 8 TE
	Dimensions (h x w x d) mm	75 x 22,5 x 118	90 x 140 x 58 mounting height 55 mm
	Protection housing	IP 20, EN 60 529	
	Protection terminals	IP 20, EN 60 529	
	Fitting position	any	
	Weight	app. 150 g	app. 350 g
	Attachment	on 35 mm DIN-rail according to EN 60 715 option: screw-mount M 4 with additional bar (not included)	

5

Accessories

Front Mounting Kit type ER4, ER6, ER8

For housings for cabinet mount V4, V6, V8
Installation frame for mounting in control panels or doors.

ER4 / ER6 / ER8

You found a device in that meets your requirements and you want to install it in a control panel or in the door of a control cabinet?

With the installation frame of the ER series, this is possible for all ZIEHL devices in housings V4, V6 and V8 (width 70/105/140 mm).

Enclosed by a high-quality frame made of anodized aluminum, all displays can be read outside the control cabinet. Switches, buttons and joystick can be operated

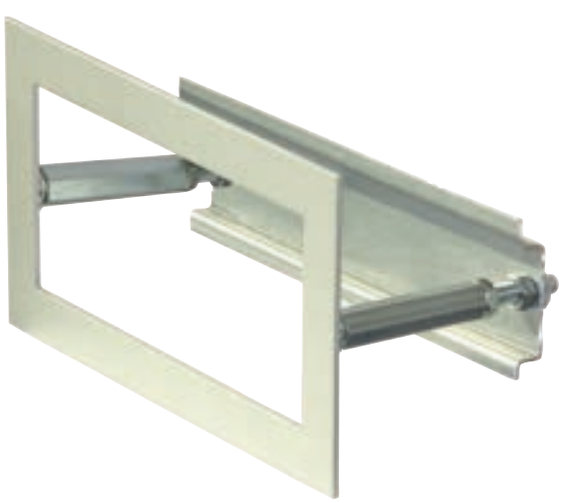
Part numbers:

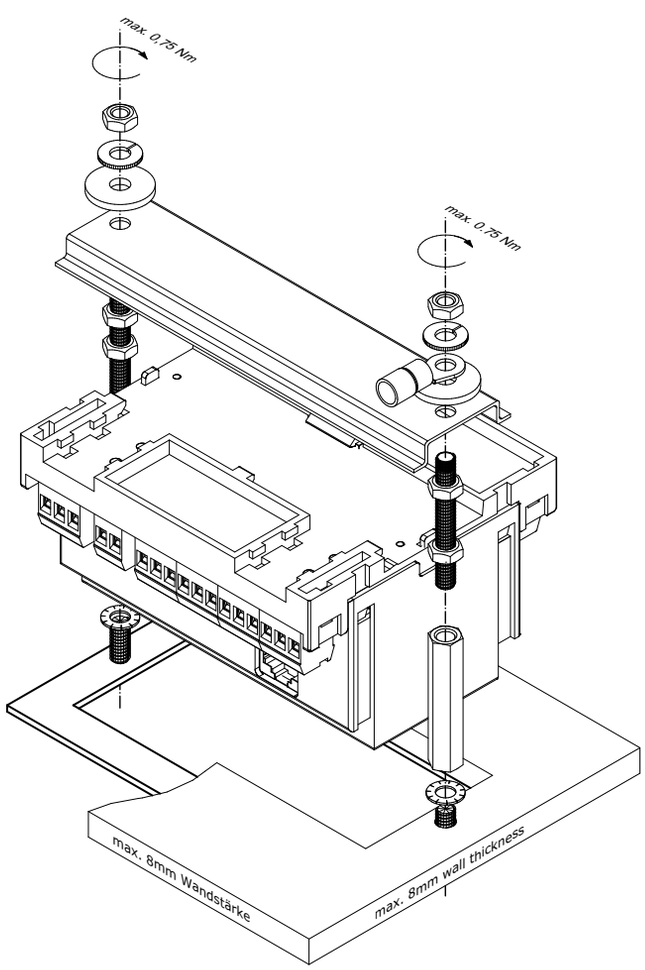
T224384 ER4, housing V4, 4 TE
T224386 ER6, housing V6, 6 TE
T224388 ER8, housing V8, 8 TE

Technical Data

		Width	Height	Cutout
ER4	4 TE	95 mm	70 mm	71 x 46 mm
ER6	6 TE	130 mm	70 mm	106 x 46 mm
ER8	8 TE	165 mm	70 mm	141 x 46 mm

Maximum wall thickness 8 mm
Frame anodized aluminum
Mounting material steel





Z

Ferrules for simple chain bridges

DIN 46228-4, UL 486F-F, cross sections: 0,5 mm², 0,75 mm², 1,0 mm²

Ferrules

Part number: T228950 0,50 mm²

Ferrules are used for the secure and durable connection of stranded wires in electrical installations. They prevent the strands from splicing and ensure an even contact surface in screw or spring clamp connections. Their tinned copper surface improves conductivity and corrosion resistance.

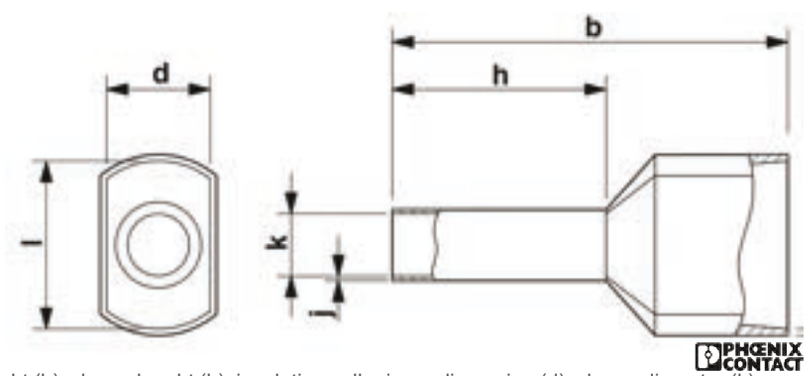
Available in various sizes, they enable optimum adaptation to the conductor cross-section and ensure reliable, standard-compliant wiring in a wide range of applications.

Your advantages:

- By using these special ferrules, chain bridges can be set up with ease
- The TWIN ferrules provide a practical way to crimp two conductors easily and efficiently in one ferrule

Part number: T228951 0,75 mm²

Part number: T228952 1,00 mm²



Lenght (b), sleeve lenght (h), insulating collar inner dimension (d), sleeve diameter (k), insulating collar thickness (i), sleeve wall thickness (j)

Technical Data

	0,50 mm²	0,75 mm²	1,00 mm²
According to standard	DIN 46228-4 and UL 486F-F	DIN 46228-4 and UL 486F-F	DIN 46228-4 and UL 486F-F
Conductor category	stranded conductors, class 2, 5, 6 / B, C, K, M	stranded conductors, class 2, 5, 6 / B, C, K, M	stranded conductors, class 2, 5, 6 / B, C, K, M
Conductor cross section flexible max.	0,5 mm²	0,75 mm²	1,0 mm²
Conductor cross section AWG max.	20	18	18
Stripping length	13 mm	14 mm	14 mm
Sleeve length	17 mm	17 mm	17 mm
Length contact range	10 mm	10 mm	10 mm
Maximum stripping length	13 mm	14 mm	14 mm
Ferrule diameter	1,5 mm	1,7 mm	2,05 mm
Sleeve wall thickness	0,15 mm	0,15 mm	0,15 mm
Insulating collar thickness	0,25 mm	0,25 mm	0,3 mm
Inner dimensions of the insulating collar	2,5 mm	2,8 mm	3,4 mm
Permanent temperature	105 °C (-40 °C no load / 0 °C dynamic load)	105 °C (-40 °C no load / 0 °C dynamic load)	105 °C (-40 °C no load / 0 °C dynamic load)
Short-term temperature	120 °C	120 °C	120 °C
Customs tariff number	85369010	85369010	85369010
Weight per piece	0,123 g	0,149 g	0,168 g
Weight per unit (100 pcs)	12,30 g	14,90 g	16,80 g

Rogowski Coil NRCM for EFR4002IPR

Ø8 screw type flexible Rogowski Coil, IEC 61010-1

Rogowski Coil NRCM

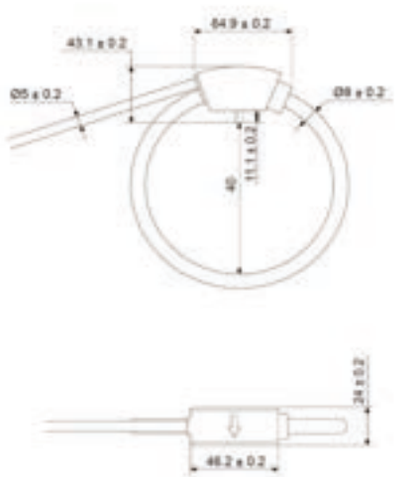
The NRCM Rogowski coils enable precise measurement of AC currents over a wide measuring range. The coil detects alternating currents non-invasively via the magnetic field around the conductor and converts this into a corresponding output voltage. Thanks to the bayonet lock, the coils can be easily retrofitted into existing installations.

Your advantages:
- High linearity
- Wide dynamic range
- Simple and fast installation
- Low weight
- IP68 protection class
- Integrator included

Applications:
- Smart meters
- Power quality analyzers
- Motor protection

Part no.:

S227900	100A	Ø40
S227910	1000A	Ø115
S227911	3000A	Ø115
S227912	6000A	Ø115



Technical Data

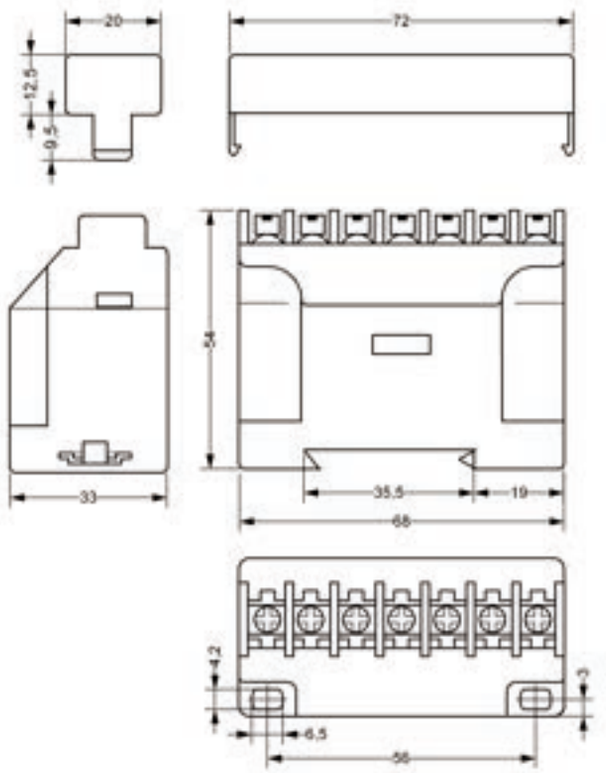
Rated supply voltage Us:	**DC 5 V**
Tolerance	± 5 %
Power consumption	< 0,75 W
Input (Primary)	
Rated current	100 A, 1000 A, 3000 A, 6000 A (AC)
Phase error	< 1°for 45 – 65 Hz
Maximum measurement deviation	< 1% of full scale
Linearity	± 0,1 % over the entiry measruing range
Position error (Conductor)	± 1 % max.
Influence of external fields	± 1,5 % max.
Output (Secondary)	
Output voltage	0,333 V (AC)
Max. output voltage	1,3 V (AC)
Test conditions	
Applied standards	EN 61010-1:2010+A1:2019 EN 61010-2-032:2012
Ratd impulse withstand voltage	4000 V (DC)
Max. output voltage	1,3 V (AC)
Installation conditions	
Connection cable	2 m
Permissible ambient temperature	-40 °C ... +85 °C
Protection class terminals	IP68

Subject to technical changes

Dimension Illustrations

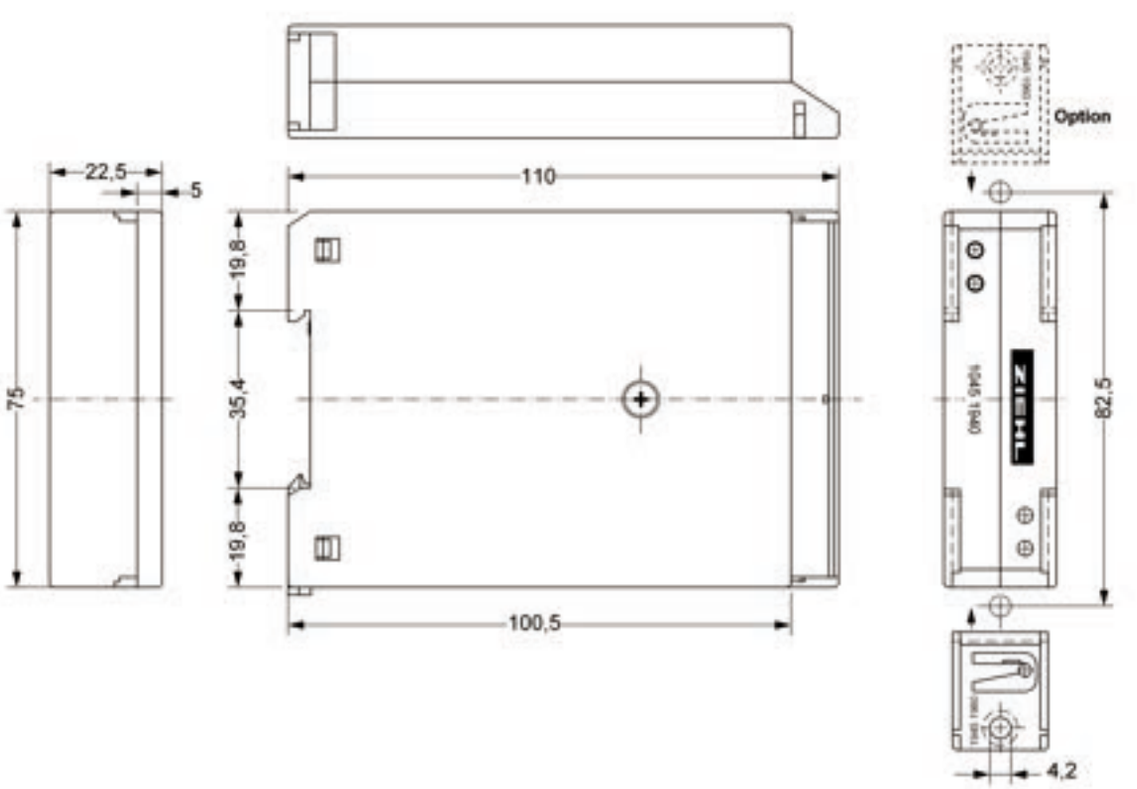
Housing Design C

Material:
Polyamid PA66



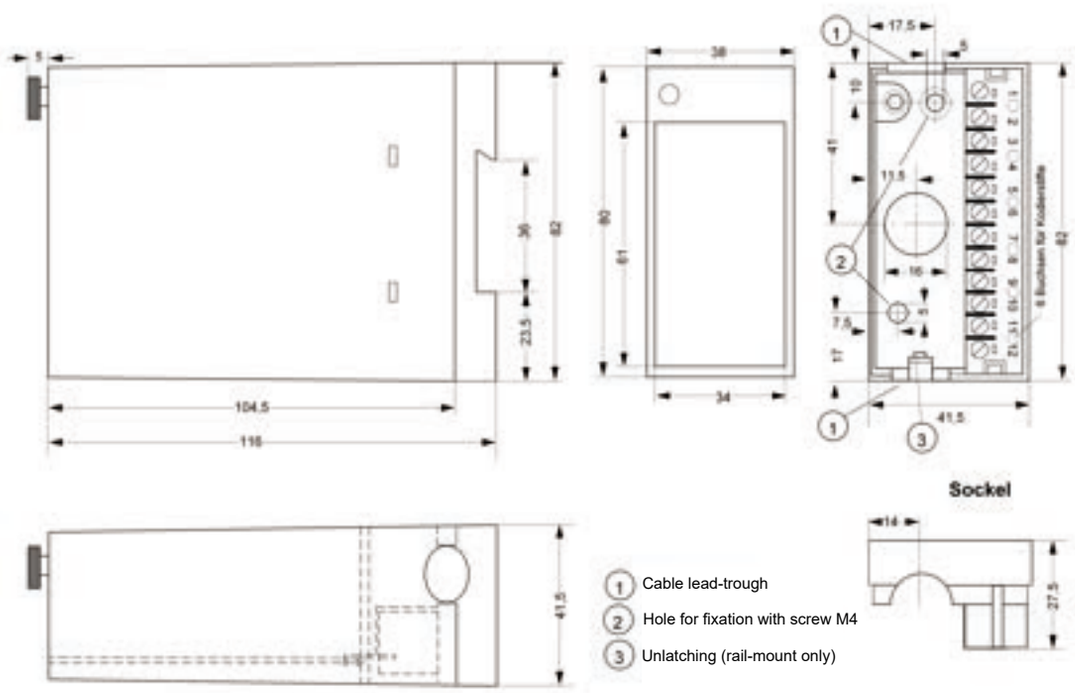
Housing Design K

Material:
Polyamid PA 66



Housing
Design S12

Material:
Polyamid PA 6

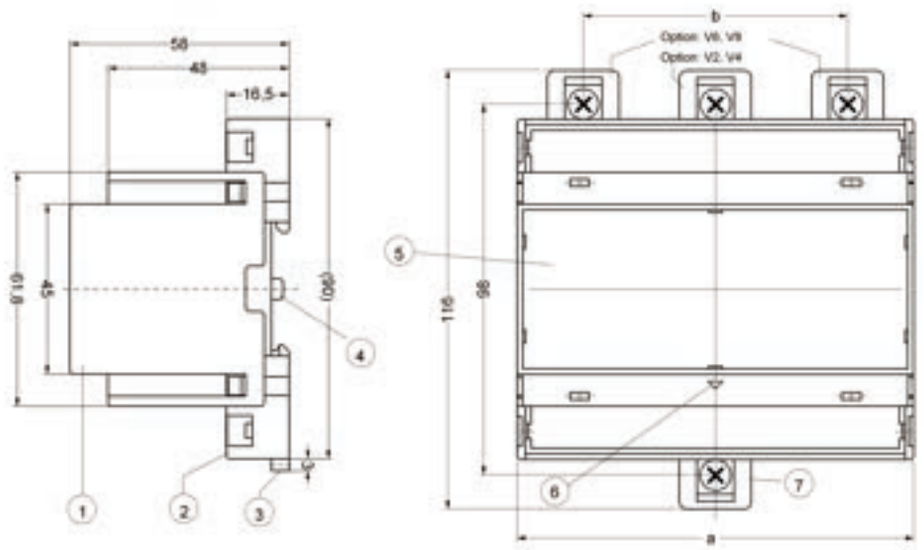


M

Housing
Design V

Material:
Polyamid PA 66
Front plate Polycarbonat

Switchboard mount
V2, V4, V6, V8:
Mounting height 55 mm



Maß a:
V2: 35 mm = 2 TE
V4: 70 mm = 4 TE
V6:105 mm = 6 TE
V8:140 mm = 8 TE

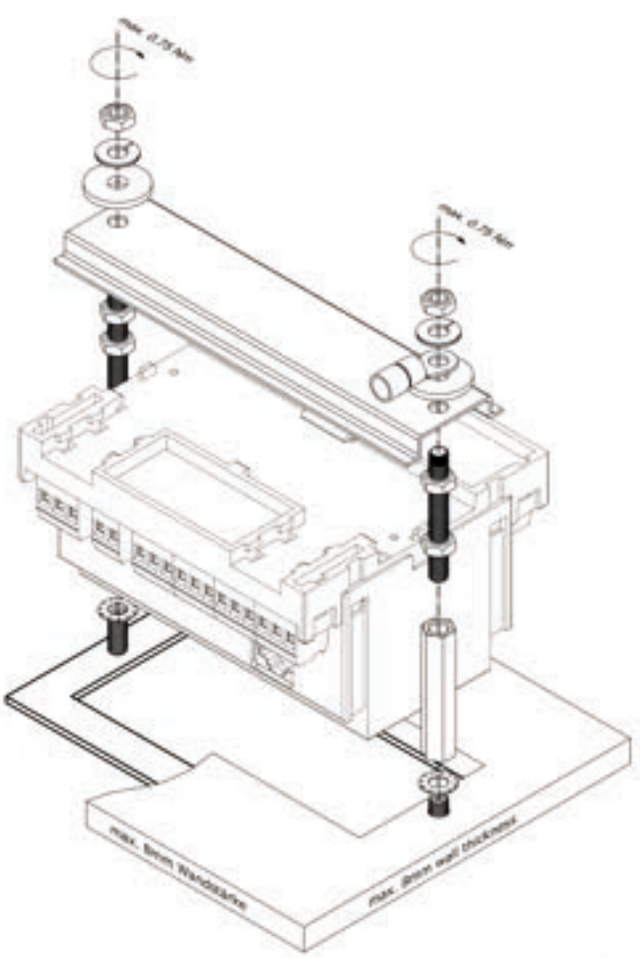
Maß b:
V6: 70 mm
V8: 105 mm

Installation frame
ER4, ER6, ER8

Material:
Frontplate: anodized aluminum
Mounting material: steel

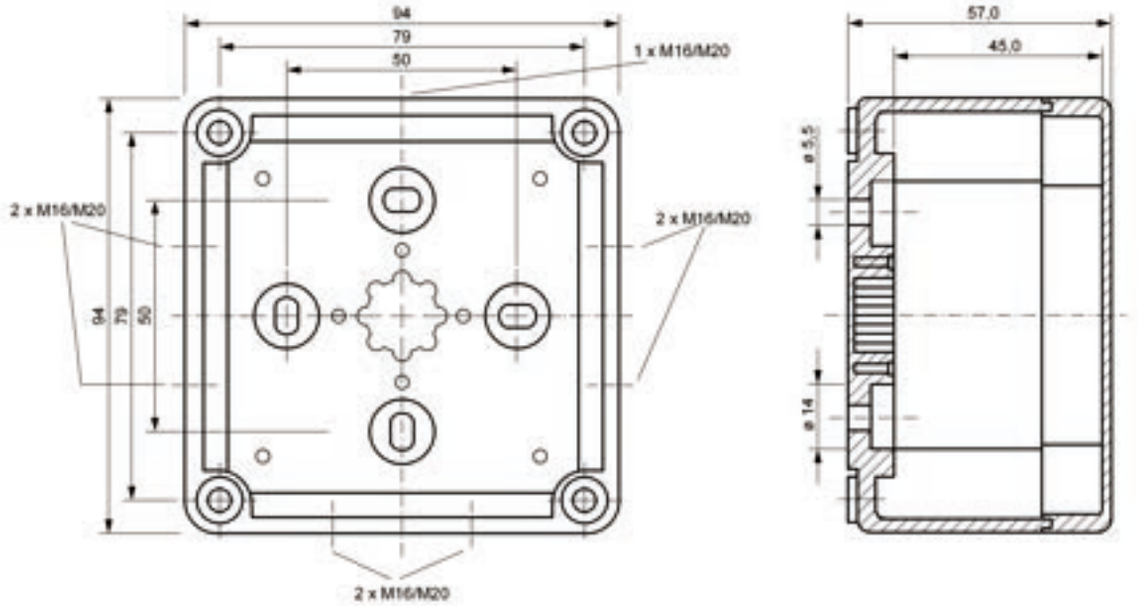
For mounting in control panels or in the door of a control cabinet for housings for cabinet mount 4 TE, 6 TE, 8 TE

Maximum wall thickness 8 mm



Housing
Design I94

Material:
Polystyrol = Standard
Polycarbonat = Option



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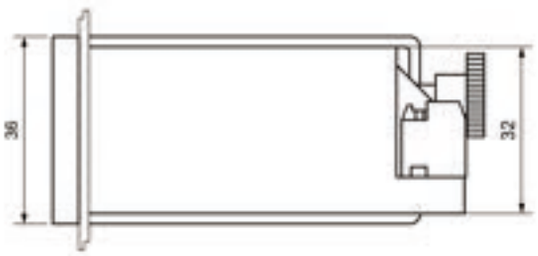
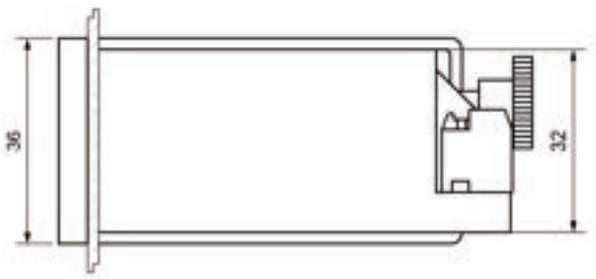
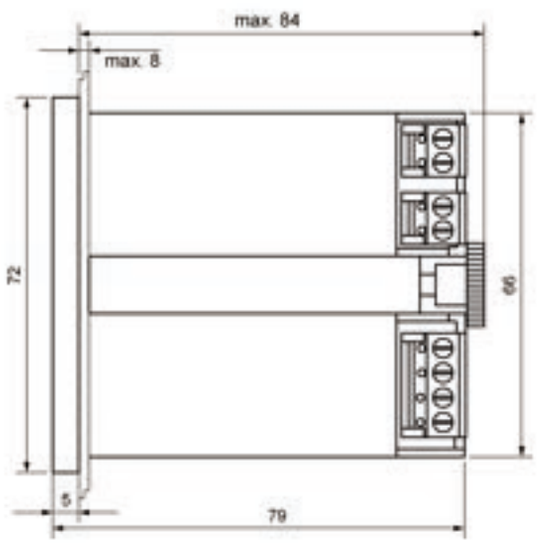
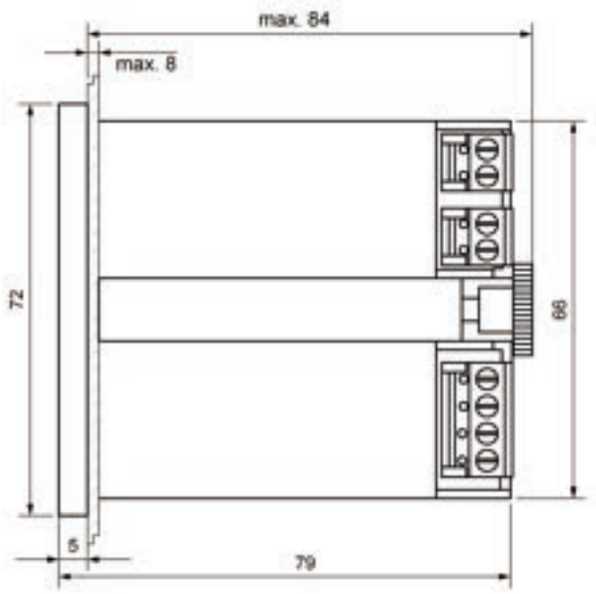
Housing Design 300
MINIPAN 300

Material:
Housing: Polyamid PA 6
Front plate: Polycarbonat



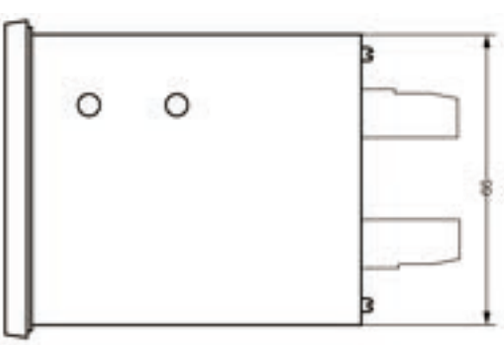


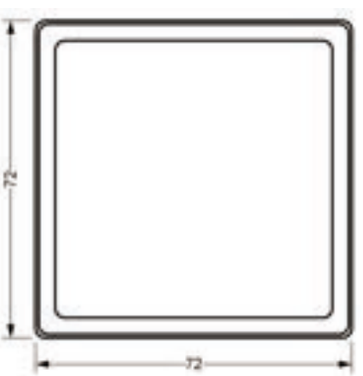


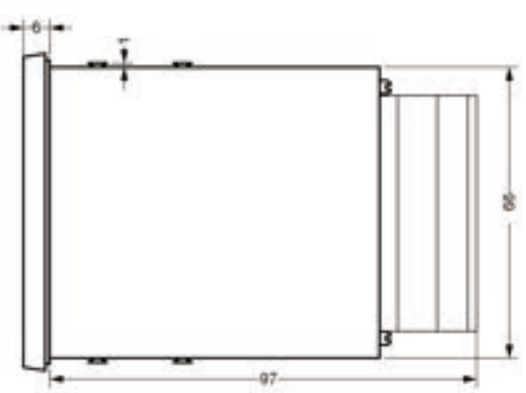


Housing Design 350
MINIPAN 352P

Material:
Housing: Ultramid U-B3WG5
Front plate: Polycarbonat

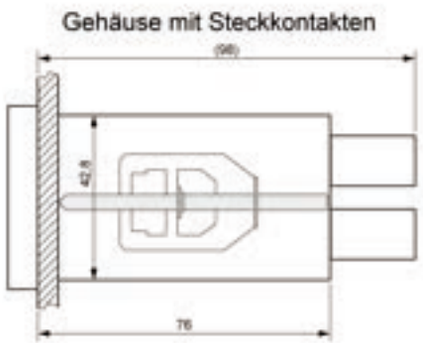




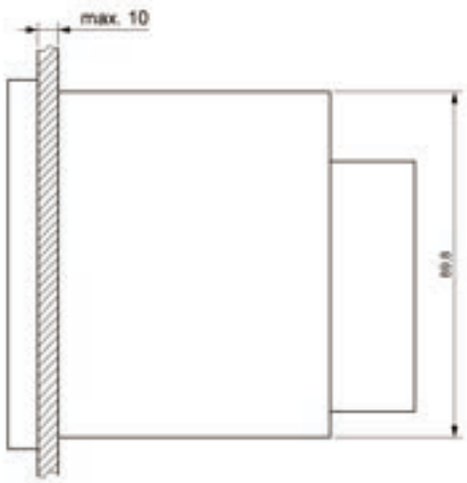


Housing Design SE
MINIPAN SE352

Material:
Housing: Noryl GFN2 SE1
Backplane: FR4
Front frame: Noryl GFN2 SE1



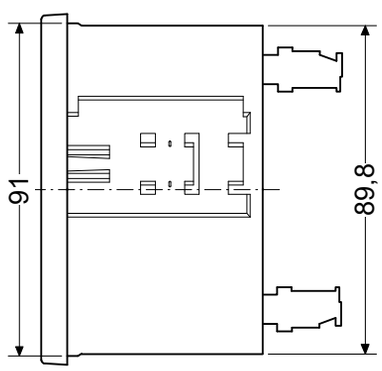
Panel cut-out 92x45

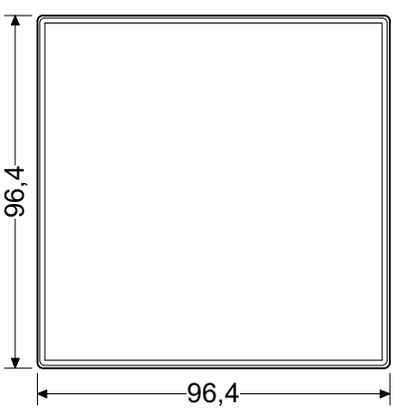


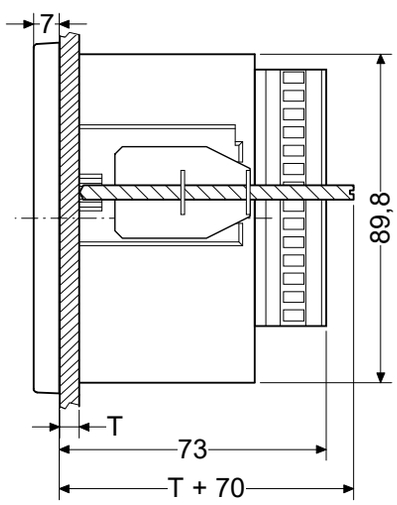
Housing Design SE2
TR440

Material:
Housing: Noryl SE1 GFN1
Backplane: FR4

Front frame: Noryl SE1 GFN1
Front plate: Polyesterfolie







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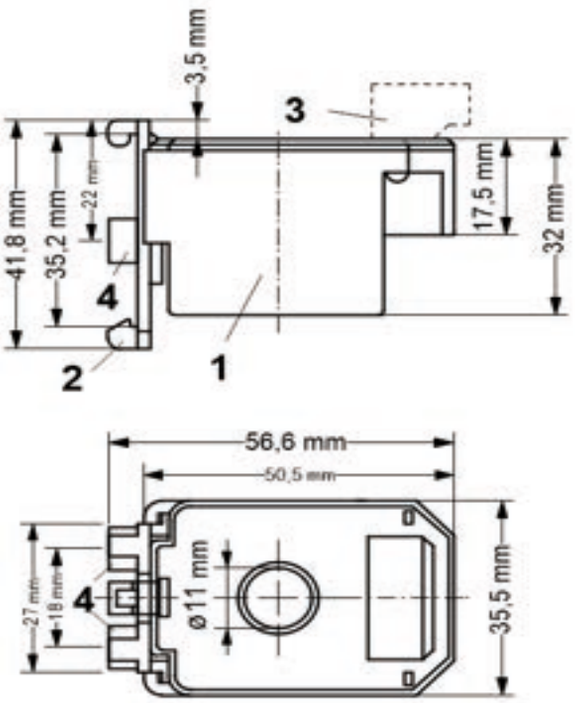
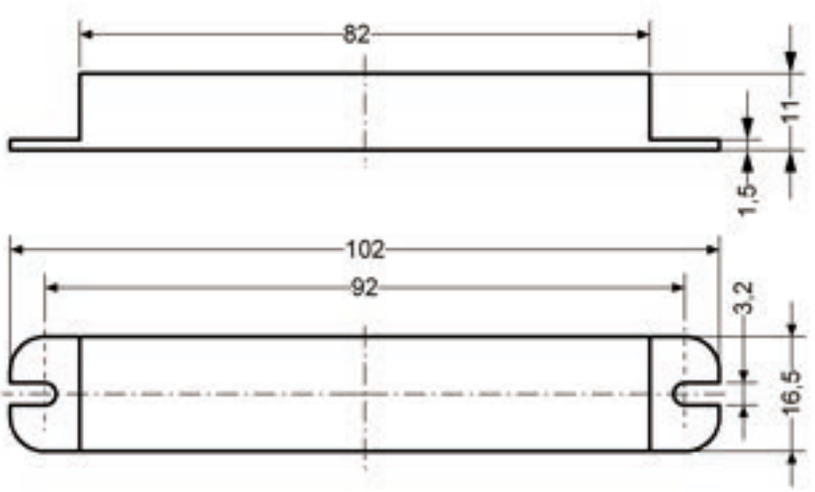
Housing Design H for Current-Transfomers

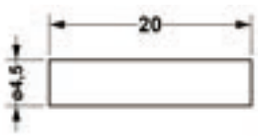
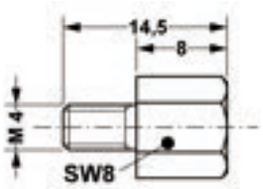
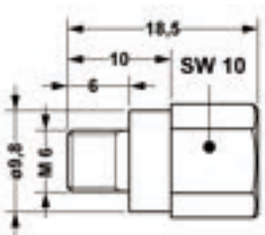
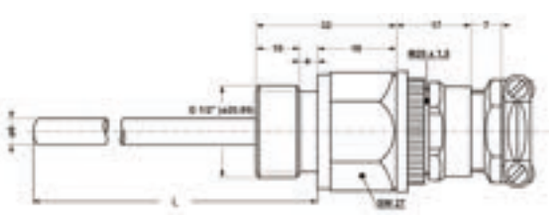


1 Base
2 Clip for DIN-rail
3 Terminal (pluggable)
4 Surface-mount (M4)

Housing Design S1 for Current-Sensor S1



Designs of Temperature-Sensors

Type of Housing	Material	
U2	High-grade steel WSt-Nr. 1.4571	
G2	Aluminum	
G3	Brass	
ZG2	High-grade steel WSt.-Nr. 1.4571	

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Appendix

A

General Technical Information

Important note: The terms and definitions laid out here do not lay claim to accuracy, completeness or legal validity. These terms and definitions should help the user to understand our catalogue, and provide some useful hints and advice. In case of any doubt, the user should refer to the relevant VDE regulations, IEC publications and DIN standards.

Standards + regulations: The devices described in this catalogue are manufactured taking into account the provisions of EN60664 / VDE0110, EN50178 / VDE0160, EN60947 / VDE0660, EN 61010 /VDE 0411, EN60255 / VDE0435 and a number of other relevant standards and regulations.

Quality assurance: Our quality management system according DIN EN ISO 9001 is evaluated regularly by an independent body. In addition we have a quality assurance system for the production in accordance with Directive 2014/34/EU (ATEX) and parts of the production are monitored by UL.

AC/DC 24 V: Such a device can be operated from either an AC or DC 24 V supply voltage. It is not equipped with a mains transformer (the supply voltage input goes directly to the rectifier) and there is no insulation between supply voltage and electronic parts.

AC voltage, AC current: technically AC voltage has a sinusoidal form. Preferred frequencies are 50 and 60 Hz. AC voltages and AC currents are measured as RMS value. The peak value is √2 times the RMS value.

Altitude: The device is designed for use at a height of up to 2000 m above sea level (MSL).

Ambient temperature, permissible: typically -20 °C to +55 °C measured in a distance of 10 mm to the bottom surface of the housing. Depending on self-heating and the material used also other values can be realized. With some devices the specified accuracy applies only within a narrow temperature range.

ATEX approval: -> Explosion protection
Motor protection devices with ATEX approval protect non-explosion-protected motors and explosion-protected motors with ignition rating according EN 60079 in normal operation an in case of failure.

Accident prevention regulation DGUV Vorschrift 3: All devices featured in the catalogue comply with the accident prevention regulations issued by the Professional Association for precision mechanics and electrical engineering (BG ETEM). This provision clarifies that for "Occasional managing" components such as pushbuttons, tilting levers or knobs,a protection against direct contact has to be made. All dangerous voltage parts are "finger-proof" run and may therefore be not touchable with the test finger acc. EN 60529. The standard equipment of our house meet these conditions, unless the customer has removed no parts.

Climatic conditions, humidity, condensation: Electrical equipment must be suitable for the application. The ambient conditions of the electronic device determine the protection afforded against the environmental influences (e.g. cooling, water splash, oil saturated air) or the equipment has its own protection system (protection provided by enclosures, e.g. IP 65). Ziehl devices are for installation complying with EN50178/VDE 0160. All devices are usually suitable for environmental class 3K3.

CE mark: We declare as manufacturer, that our products comply with the requirements of the appropriate directives. These products carry the CE mark.

Closed current principle: The relay is energized in the OK state (when the actual value is within the permissible range) and releases with the alarm signal. Disadvantage: malfunction may produce a switching signal, e.g. in case of voltage breakdown in the supply voltage. Advantage: A monitoring breakdown will normally be recognized. → Open circuit current.

Current output: Measuring transducers have current outputs with DC 0 - 20 mA or 4 - 20 mA. The loading capacity of current outputs is limited. The permissible maximum load (burden) is determined by the maximum voltage in the device, e.g. 500 Ω at 20 mA and 10 V. Current inputs of multiple devices may be connected to a current output up to the maximum permissible load. → Input resistance.

Creepage distance: shortest distance along the surface of an insulation material between two conducting parts.

DC voltage: A DC voltage is indicated as an average value. Accumulators supply a smooth DC voltage. RMS value and average value are taken to be equal. Rectifiers supply a pulsating DC voltage. If nothing else is stated, a sufficiently smooth DC voltage is expected, produced with the help of capacitors, when using devices with DC supply voltage; the upper and lower peak values of the DC voltage should not exceed the permissible tolerance of the supply voltage.

Duty cycle: ZIEHL devices are usually designed for a 100% duty cycle.

Declaration of Conformity: The devices comply with the regulations and directives 2014/35/EU (electrical equipement designed for use within certain voltage limits) and 2014/30/EU (electromagnetic compatibility - EMC)

1. EN 50178: Electronic equipment for use in power installations
2. EN 61000-6-4: Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
3. EN 61000-6-2:
Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
4. EN 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements
5. EN 60255-27: Measuring relays and protection equipment - Part 27: Product safety requirements
6. EN 60947-8: Low-voltage switchgear and controlgear - Part

Climatic Conditions (normal conditions, minimum ambient conditions)

Typical places	Temperature	Relative Humidity	Barometric Pressure
weather-protected places, e.g. not air-conditioned	+5°C...+40°C	5%...85%	760 hPa...1060 hPa
control rooms and operating areas	outside of cabinet	no condensation	
during storage	-20°C...+70°C	5%...95%	760 hPa...1060 hPa
during transport	-20°C...+70°C	5%...95%	700 hPa...1060 hPa

5-8: Control circuit devices and switching elements - Three-position enabling switches.

Emitted interference: If not otherwise specified devices with AC supply voltage (built-in transformer) meet the requirements of the EN 61000-6-3: Emission for residential, commercial and light-industrial environments . If not otherwise specified devices with DC control voltage or AC/DC 24-240 V-all voltage power supplies meet the requirements of EN 61000-6-4: Emission standard for industrial environments.

EN 61558/ VDE 0551: Specification of the technical construction of a transformer with safe separation between mains and electrical low voltage. Performed absolutely short-circuit proof or conditional short-circuit proof with integrated →Fuse.

Explosion proof: Devices carry an explicit warning with regard to applications in potentially explosive atmospheres . They are not equipped with intrinsically safe terminals. Connection to sensors in potentially explosive atmospheres must be effected via suitable zener-barriers (exception MS(R)220Vi). In doing so, it must be observed that line resistance should not be adversely affected. Devices with ATEX approval are to be installed outside potentially explosive atmospheres.

Galvanic isolation (of mains): In many applications a galvanic separation is necessary between the voltage supply and the electronics, and thus e.g. measuring input/sensor. The separation is achieved typically by transformer or DC/DC converters →proof voltage.

Galvanic isolation (between input and output): → Measuring transducer with galvanic isolation

Hysteresis: Hysteresis is the difference between two switching points. For example, the hysteresis is -5°C if a temperature monitor relay switches off at 80°C as the temperature rises and switches back again at 75°C as the temperature falls. A certain minimum hysteresis is necessary to avoid any "flutter effect" in the relay when switching.

Important Notes! Read carefully! Faultless and reliable functioning of devices requires appropriate transport and storage, expert installation and setup, as well as operation in accordance with the regulations. These devices may be operated only by persons who are well acquainted with their installation, setup and operation and who are qualified in accordance with their occupation. They should strictly observe all operating instructions, the directions fixed to the device and the relevant safety regulations for installation and operation of electronic plant. These devices are constructed and tested to DIN VDE specifications, and leave our factory in perfect condition and conforming with safety regulations. To maintain this condition, the safety regulations which are explicitly highlighted under the headline "Attention" in the operating instructions must be strictly observed. Death, bodily harm, or damage to the device itself and to other devices or installations may result from non-observance of the safety regulations. Should the information in the operating instructions be in any way inadequate, please do not hesitate to contact us directly or one of our agents or representatives. Relevant regulations in the user's country must be observed with regard to the application area of the device, over and above the valid industry standards and regulations mentioned in these operating instructions which are valid in Europ

Input impedance: A current input has usually a low input impedance. Especially for the upstream transducer it is important that inputs DC 0/4-20 mA cause loads as little as possible. And high current inputs to keep low power loss on the shunt. Vice versa, a voltage output requires a high load resistance so as to reduce the power losses. → current output → voltage output

Installation hints: All devices are to be installed by appropriately trained skilled labour taking into account all the relevant regulations.

Insulation: In order to protect against dangerous body currents (electric shock), protective arrangements must be taken conforming with EN 61140. Shock-proof protection → Protection system. A frequently used protection measure consists of insulation. →Insulation coordination →creepage distances.

Insulation coordination: due to the application expectable impulse and over-voltages during lifecycle (e.g. lightning strike), subsequent contamination and the insulation features of the materials are used as a basis for the definition of minimum values fo→ creepage distances. The same applies for the → Proof voltage, which is used for testing the insulation features of the products.

Insulation voltage: The rated insulation voltage Ui is specified according EN60664. It provides information of the maximum voltages that can be connected to the equipment.

Insulation voltage, temperature sensor: In the case of temperature sensors a higher insulation voltage will usually lead to a higher heat transmission resistance of the sensor and thus to a higher response time.

Maintenance: Usually not necessary for our devices. Depending upon the application, though, we recommend periodical inspection, especially where otherwise a breakdown would not be noticed.

MAX-contact: The switching condition for a relay will be achieved at signal increase on the set switching point. Switchback after signal falls below particular setting: → Hysteresis. Hysteresis is negativ.

MIN-contact: The switching condition for a relay will be achieved at signal drop on the set switching point. Switchback after signal exceeds a particular point: → Hysteresis. Hysteresis is positive.

MINIKA®: ZIEHL registered trade name.

MINIPAN®: ZIEHL registered trade name.

Modifications: We reserve the right to make technical modifications within the scope of further development of our products.

Pollution degree: according to EN 60664-1 the levels of pollution are defined as follows:

Pollution degree 1: no pollution or only dry, non-conductive pollution occurs, which has no influence
Pollution degree 2: only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is expected
Pollution degree 3: conductive pollution occurs, or dry, non-conductive pollution occurs which becomes conductive due to condensation which is expected
Pollution degree 4: continuous conductivity occurs due to conductive dust, rain or other wet conditions.

Power consumption: Indicated in VA (AC) or W (DC). We are constantly trying to minimize the capacity consumption in our devices by the application of current-saving components.

Power supply: If the voltage range is specified for the supply voltage, e.g. AC 220 - 240 V +10/-15%, the operating range will be from AC 187 V up to AC 264 V. In case of DC supply only smoothed voltages with an upper ripple of max. 5% are admissible.

Proof voltage: voltage for testing the → Insulation of an equipment. The insulation strenght between supply voltage, output contacts, housing and the electrical low voltage circuits (ELV) is tested. As a rule of thumb: withstand voltage = 2 x rated insulation voltage + 1000 V. → Protection provided by enclosure, → Safe separation.

Protection system: ZIEHL devices comply with DGUV part 3 (formerly BGV A3). They are equipped with protection against indirect contact (finger guard, protection against electric shock).

Protection proviced by enclosure (IP-Code): Defined according to EN60529. The first figure thereof states the protection against contact and the penetration of foreign bodies, the second one represents water-proofing, as follows:

1st figure:
0: no protection
1: Protection against large foreign bodies Ø 50 mm
2: Protection against medium-sized foreign bodies Ø 12 mm
3: Protection against small foreign bodies Ø 2.5 mm
4: Protection against granular-structured bodies Ø 1 mm
5: Protection against dust deposit. Complete protection against contact of voltage-carrying parts
6: protection against dust penetration

2nd figure:
0: No protection
1: Protection against vertically falling dripping water
2: Protection against angular (≤15°) falling dripping water
3: Protection against spray water (<60° to vertical)
4: Protection against splash water from all directions
5: Protection against jet water
6: Protection against water penetration while dipping under fixed conditions
7: Protection against water penetration while dipping under fixed conditions
8: Protection against submersion

To achieve the type of required protection in the relevant application, the devices must be installed into housings or cabinets if necessary. In places with expected radiated EMI, the installation should be appropriately shielded.

Rated frequency: ZIEHL devices with AC voltage supply usually operate with 50 and 60 Hz. Deviations are indicated explicitly.

Rated voltage: The component or device is designed for this voltage and the operating and performance features refer to it. → Us, rated operating voltage

Relay, connection designation according to EN 60947-1: Change-over = 11 (15), normally closed contact = 12 (16), normally opened contact = 14 (18) (figures in brackets for time-delayed contacts). NO: 13/14 (17/18), NC: 11/12 (15/16). The first number is the number of the relay, e.g. 32 = normally closed contact of relay K3.

Relay, contact material: The material used for the relay contacts is crucial for the switching capacity. No contact material is optimally suited for all applications. Thus contact materials which are suitable for switching higher voltages and currents will show poor features with regard to the transmission of low signals. ZIEHL devices usually use relays with silver-nickel alloy (AgNi).

Silver-nickel alloy AgNi10
Advantage: high resistance to arc-erosion, low welding tendency, especially suitable for inductive loads, 6 - 400 V and 10 mA up to 100 A. Disadvantage: higher contact resistance than other Ag contacts.

Silver nickel alloy AgNi0,15 (fine grain silver)
Advantages: relatively small contact resistance, low welding tendency, suitable for the switching of medium and high loads.

Relay, contact life cycle: This will be determined by the number of switches under load. Modern relays have mechanical life cycle of more than 1 million switching operations. The electrical life cycle will be determined by the switching capacity of the contacts. See also contact material.

Relay, contact protection: Switching inductive loads it is advised to connect the load with a protection element to eliminate errors. For alternating current with a RC-element or a VDR (voltage-depending resistance) at DC with a RC-element or a free-wheeling diode. The switch-off time then must be observed. Generally the interference effect will be significantly reduced and the life-time of the contacts improved.

Relay contacts: see Table next page

Relay, fuse protection of contacts: In order to avoid welding of the relay contacts, we generally recommend the use of a fuse. For typical application with relays type 2 and make-contact (NO) we recommend a fuse slow-blow 4 A or miniatur circuit breaker 4 A (MCB) characteristic B..

Relay, rated operating current Ie: This is the current which can reliably be switched by the relay contact at an indicated rated operating voltage -> Switching capacity.

Relay, switching capacity according to EN 60 947-5-1: to AC 15 / DC 13, auxiliary current circuits, electromagnetic load

Relay, switching capacity is the load (ohmic), which can switched by a relay contact. Maximum specified values, therefore, shouldn't be exceeded. In case of AC current loads the maximum switching capacity must be reduced because of the phase displacement between current and voltage (cos φ = 0.7).

Service life: is mainly limited by the relay (number of operations, contact load) and electrolytic capacitors (which may dry out within a certain period in the case of high ambient temperature). We generally equip our devices with relays and capacitors with a high life expectancy.

Shock resistance: Specifies the acceptable mechanical shock (in a multiple of the acceleration due to gravity "g" with half sine wave form and 11 ms duration) where no malfunctions occur. All instruments featured in the catalogue are resilient with 5 g

Storage temperature, permissible: usually -20 up to +70°C.

Switch-on behaviour: When applying the supply voltage it takes some time until all outputs and displays change into the steady state. Output relay with → closed current principle are designed to signal an error message during this switch-on period.

Technical changes: We reserve the right to make technical changes in the course of further product development.

Test conditions: These are the test conditions of our devices, as far as not mentioned otherwise in the data sheet
Rated insulation voltage Ui acc. EN 60664-1:
AC 250 V pollution degree 3
AC 415 V pollution degree 2
Overvoltage category III
Rated impulse withstand voltage 4000 V

Proof voltage between control supply voltage Us, sensor circuits and relay outputs AC 2500 V
Proof voltage open contact (normal open, no) AC 1000 V
Emitted interference/immunity for industrial environments: EN 61000-6-4; EN 61000-6-2
Vibration resistance: ±0,075 mm 10...57Hz; 1g 57...150Hz
Shock resistance: 5g 11 ms
Climatic conditions 3K3 acc. EN 60721-3

Us, Control voltage, rated operating voltage: is the rated value of the voltage to be connected for operating the device. Voltage variations are allowed within the stated tolerances

Vibration resistance: Specifies at which amplitude and ac-

Relay contacts:		
	Type 3	**Type 2**
Contact material	AgNi 9/10	AgNi 0,15
Rated voltage	AC 250 V 50 Hz	AC 250 V 50 Hz
Switching voltage	max. AC 400 V max. DC 300 V	max. AC 400 V max. DC 300 V
Thermal current AC/DC	3 A	5 A
Minimum current/voltage	12 V 10 mA	12 V 10 mA
Switching power max. AC cos φ = 1	5 A 250 V	8 A 250 V
Switching power max. DC (ohmic load)	0,3 A DC 240 V 5 A DC 30 V	0,3 A DC 300 V 8 A DC 30 V
Switching capacity normally opened (no)	Application category	Application category
Rated nominal current	- AC-15 Ie = 2 A Ue = 250 V DC-13 Ie = 2 A Ue = 24 V DC-13 Ie = 0,8 A Ue = 60 V DC-13 Ie = 0,4 A Ue = 120 V DC-13 Ie = 0,2 A Ue = 240 V	AC-15 Ie = 2 A Ue = 400 V AC-15 Ie = 3 A Ue = 250 V DC-13 Ie = 2 A Ue = 24 V DC-13 Ie = 0,8 A Ue = 60 V DC-13 Ie = 0,4 A Ue = 120 V DC-13 Ie = 0,2 A Ue = 240 V
Contact life cycle		
Life cycle electrical	cos φ = 1	cos φ = 1
2 x 10^5 switching operations	3 A - 250 VAC	5 A - 250 VAC
5 x 10^5 switching operations	2 A - 250 VAC	3 A - 250 VAC

Application category	Typical conditions
AC-12	Switching of ohmic load and load of semiconductors in inputcircuits of optocoupler
AC-13	Switching of load of semiconductors with de-coupling by a transformer
AC-14	Switching of low electromagnetic load (max. 72 VA)
AC-15	Switching of lelctromagnetic load (> 72 VA)
DC-12	Switching of ohmic load and load of semiconductors in inputcircuits of optocoupler
DC-13	Switching of electromagnetic loads
DC-14	Switching of electromagnetic loads with economy resistance in circuit

Application category	Normal conditions					
	Switch-on			Switch-off		
	I/I_e	U/U_e		I/I_e	U/U_e	
AC-12	1	1	cos φ = 0,9	1	1	cos φ = 0,9
AC-15	10	1	cos φ = 0,3	1	1	cos φ = 0,3
DC-13	1	1	T < 300 ms	1	1	T < 300 ms

celeration in a defined frequency range no malfunctions or damages occur. All our devices featured in the catalog are sufficient resilient and comply with EN 60068-2-6 for device, where no increased demands appear due to their installation location. Vibration Test Fc with 10-57 Hz ± 0.075 mm and 57-150 Hz 1 g

Voltage output: Measuring transducer are available with voltage outputs with DC 0 - 10 V. Other values are available upon request. The Loading capacity of voltage outputs is limited. Voltage inputs of several devices may be connected in parallel to one voltage output until the minimum permissible load is reached. → Input resistance

A

Terms of Payment and Delivery

1.) General Provisions

(1) These General Conditions of Sale and Delivery shall apply to any and all purchase contracts and deliveries, provided or rendered by ZIEHL industrie-elektronik GmbH + Co KG, Daimlerstraße 13, 74523 Schwäbisch Hall (hereinafter, "ZIEHL") vis-à-vis its clients (hereinafter, "Clients"). They also apply to such contracts concluded via the online store at https://shop.ziehl.com/de/ (hereinafter: "Online Shop"). These General Conditions of Sale and Delivery shall also apply as a general agreement as amended to future contracts for the sale and/or delivery of movable items that are concluded with the same Client, without ZIEHL being obliged to make express reference to these General Conditions of Sale and Delivery in each individual case; in any such case, ZIEHL shall inform the Client promptly of any amendments to the Conditions of Sale.
(2) These General Conditions of Sale and Delivery do not apply to contracts with consumers.
(3) Any deviating provisions of the Clients do not apply, unless ZIEHL has consented to these in writing. This requirement to grant consent shall apply in any case, for instance also when ZIEHL, being aware of the General Terms and Conditions of the Client, carries out the delivery to the Client without reservations. Agreements concluded with the Client on a case-by-case basis (including subsidiary arrangements, supplements and amendments) in any case take precedence over these Conditions of Sale. For the contents of such agreements, a written contract or the written confirmation by ZIEHL shall be authoritative. Legally relevant declarations and notifications that have to be made by the Client vis-à-vis ZIEHL after the conclusion of the contract (e.g. setting of time limits, reminders, cancellation), must be made in writing be to legally valid.
(4) Vicarious agents and representatives of ZIEHL are not entitled to make any oral subsidiary arrangements. If and to the extent that they nevertheless make oral subsidiary arrangements or warranties, which go beyond the scope of the written purchase contract, these always require written confirmation by ZIEHL to be legally valid.
(5) Business relations between ZIEHL and the Client are subject to the laws of the Federal Republic of Germany. The application of international uniform law, in particular of the UN Sales Convention (United Nations Convention on Contracts for the International Sale of Goods) is excluded. The prerequisites for and the effects of retention of title in accordance with section 6 are subject to the law in force at the relevant location of the goods if, in accordance with the provisions of that law, the choice of law in favour of German law is inadmissible or invalid.
(6) With regard to the place of performance and the place of jurisdiction for any and all deliveries and payments as well as for any disputes arising between the parties from the contracts concluded between them, the place of business of ZIEHL in Schwäbisch Hall shall be relevant. ZIEHL shall also be entitled to sue the Client at the Client's place of business.

2.) Conclusion of Contracts

(1) The Client may order via the Online Shop as well as enquire about specific items by e-mail or via the contact form provided on ZIEHL's website. Upon receipt of such an inquiry, ZIEHL shall submit a separate offer to the Client by e-mail or letter.
(2) Any offer made by ZIEHL is always subject to change without notice and non-binding. The same applies if ZIEHL has provided the Client with catalogues, documentation (e.g. drawings, plans, calculations, and cost estimations), other product descriptions or documents – including in electronic form – to which ZIEHL retains title and copyrights. Price information provided in the Online Shop also does not constitute an offer in the legal sense.
(3) The order of goods by the Client via the Online Shop or in any other way shall be deemed a binding contractual offer. ZIEHL shall be entitled to accept this contractual offer within 5 working days of its receipt by sending an order confirmation.
(4) Acceptance may be declared either in writing (e.g. by confirmation of the order) or by delivery of the goods to the Client. The documents belonging to the offer, e.g. illustrations, drawings, indications of weight and measures are, unless otherwise expressly agreed upon, only approximately authoritative.
(5) After confirmation of the order by ZIEHL, the Client is bound to the order and can only withdraw from the respective purchase contract in accordance with the statutory provisions.
(6) Employees, or other sales intermediaries of ZIEHL are not entitled to make any commitments which deviate in terms of content, or to give any guarantees.

3.) Prices, VAT and Payment

(1) Unless prices are agreed upon on an individual contract basis, the prices of ZIEHL in force and effect at the time of conclusion of the contract apply. Prices are subject to VAT at the respective statutory rate, if VAT has to be charged.
(2) Forwarding costs, costs of transport and packaging as well as customs duties, taxes or other public taxes shall be borne by the Client. ZIEHL does not take back transport packaging and all other packaging; it becomes the property of the Client. ZIEHL shall charge a minimum quantity surcharge of EUR 15.00 for an order value of less than EUR 100.00.
(3) Unless otherwise agreed, ZIEHL's invoices are due and payable net without deductions within 10 (ten) days of the date of the invoice. However, ZIEHL is entitled at any time, also within the framework of an ongoing business relationship, to make a delivery in whole or in part only against advance payment. ZIEHL will declare a corresponding reservation at the latest with the order confirmation.
(4) Payments shall be made in the currency agreed upon at the time of the order. In the case of transfers from abroad, the Client shall always bear the bank charges incurred. If ZIEHL exceptionally accepts bills of exchange and checks as means of payment, these shall only be accepted on account of performance.
(5) Should the Client fail to pay on the due date/default in payment, ZIEHL is entitled to charge default interest in an amount of 9 percentage points over the base interest rate. Pursuant to sec. 288 para. 2 of the German Civil Code (BGB), the Client shall be obliged to reimburse ZIEHL for reminder charges in the amount of a lump sum of EUR 40.00; these shall be offset against any costs of legal action. ZIEHL reserves the right to claim further damage caused by default. With respect to merchants, ZIEHL's claim to the commercial due date interest rate (sec. 353 HGB) shall remain unaffected.
(6) If, after conclusion of the contract, it becomes apparent that ZIEHL's claim to the purchase price is jeopardized by the Client's inability to perform, ZIEHL shall be entitled to refuse performance in accordance with the statutory provisions and, if necessary, to

withdraw from the contract after setting a deadline.
(7) ZIEHL shall always issue an invoice to the Client, which shall be handed over to the Client upon delivery of the goods or otherwise received in text form.

4.) Period of Delivery and Delay in Delivery, Call-Off Orders

(1) The period of delivery is individually agreed upon or specified by ZIEHL upon the acceptance of the order. If this is not the case, the delivery period is 1 week from the conclusion of the contract. Compliance with the period of delivery by ZIEHL in this connection requires the performance of the contractual obligations by the Client.
(2) The periods of delivery indicated by ZIEHL, even if notified in writing, only constitute non-binding information. The expiry of certain periods of delivery does not relieve the Client from its obligation to define an appropriate grace period for the performance of the service and the declaration that it will refuse the performance after the expiry of the deadline. This does not apply, if and to the extent that ZIEHL has expressly and in writing designated a period of delivery or a deadline as a “binding delivery date”.
(3) If ZIEHL is not able to comply with binding periods of delivery for reasons beyond its control (non-availability of performance), ZIEHL will inform the Client accordingly and at the same time inform it of the expected new period of delivery. If performance is also not possible during the new period of delivery, ZIEHL shall be entitled to withdraw from the contract in full or in part; any consideration by the Client will be reimbursed promptly by ZIEHL. The rights of cancellation and termination of the Client in accordance with section 7 of these Conditions of Sale shall remain unaffected.
(4) ZIEHL shall be entitled to make reasonable partial deliveries.
(5) The occurrence of delay in delivery by ZIEHL is determined in accordance with the statutory provisions. In any case, however, the Client is required to send a reminder. If ZIEHL is in default of delivery, the Client may demand lump-sum compensation for its damage caused by the delay. The lump-sum compensation shall amount to 0.5% of the net price (delivery value) for each full calendar week of the delay, but in total not more than 5% of the delivery value of the goods delivered late. ZIEHL reserves the right to prove that the Client has incurred no damage at all or only significantly less damage than the aforementioned lump-sum.
(6) By concluding call-off orders or blanket orders, the Client shall be obligated to purchase the total quantity underlying the call-off order or blanket order. If no specific call dates result from the call-off or blanket order, the entire quantity shall be called within 12 months. If call-off dates are not met by the Client, ZIEHL shall be entitled, after giving written notice and pointing out the consequences of the failure to call-off, at its discretion to invoice the full total quantity and to store the goods at the Client’s expense until payment is made or to withdraw from the contract and claim damages.

5.) Passing of the Risk, Dispatch

(1) The risk of accidental loss and accidental deterioration shall pass to the Client at the latest upon handover. However, in the case of sale by delivery to a place other than the place of performance, the risk of accidental loss and accidental deterioration of the goods as well as the risk of delay shall pass to the Client upon delivery of the goods to the forwarding agent, the carrier or any other person or institution designated to carry out the shipment.
(2) If delivery is delayed due to circumstances within the control of the Client, the risk passes to the Client from the date of readiness for dispatch; however, ZIEHL shall be obliged, at the request and cost of the Client, to effect the insurance required by the Client.
(3) If the Client does not require a specific mode of dispatch, ZIEHL shall be entitled to choose the mode of dispatch and the dispatch route at its own discretion, without being obliged to choose the most inexpensive mode of dispatch.

6.) Counterclaims, Retention of Title

(1) The Client shall be entitled to exercise rights of set-off or rights of retention only to the extent that its counterclaim has become res judicata or is undisputed. In the event of defective delivery, any counterclaims of the Client shall remain unaffected, in particular its right to withhold a share of the purchase price that is commensurate with such a defect.
(2) ZIEHL retains title to the goods until payment in full of the purchase price. The Client must not pledge the delivery item or transfer title to the item as security. In the event of seizure and attachment or any other orders or dispositions by third parties, it shall promptly inform ZIEHL accordingly.
(3) In the event that the Client behaves in a way which is not in conformity with the contract, in particular in the case of non-payment of the purchase price that is due and payable, ZIEHL shall be entitled to revoke the contract in accordance with the statutory provisions and to demand the return of the goods on the basis of the retention of title and the revocation. If the Client does not pay the purchase price that is due and payable, ZIEHL may exercise these rights only if ZIEHL has previously granted the Client an appropriate deadline for payment which has not been complied with, or if the setting of such deadline is unnecessary in accordance with the statutory provisions.
(4) The Client is entitled to sell on the goods that are subject to the reservation of title in the ordinary course of business, subject to the proviso that the claims resulting from such resale are transferred to ZIEHL as follows:

a) The Client with immediate effect assigns to ZIEHL any and all claims together with any and all ancillary rights up to the amount of the purchase price claim, which accrue to it vis-à-vis the purchaser or vis-à-vis third parties from such resale.
b) The Client shall be entitled to collect such receivable even after assignment. The right of ZIEHL to collect the receivables itself shall remain unaffected thereby; however, ZIEHL undertakes not to collect the receivables as long as the Client duly and properly performs its payment obligations.
c) ZIEHL may demand that the Client informs ZIEHL of the assigned receivables and of their debtor(s), provides any and all information required for the collection of the receivables, hands over the relevant documentation and informs the debtor of the assignment.
d) In any case, the above-mentioned collateral shall automatically lapse as soon as their value exceeds the receivables to be secured by more than 10 %.

7.) Liability, Defects and Warranty

(1) As regards the rights of the Client in the event of any material defects and defects of title (including incorrect and short delivery) the statutory provisions apply, unless otherwise provided for in the following. The special statutory provisions applying in the case

of final delivery of the goods to a consumer shall remain unaffected (recourse against supplier in accordance with sec. 445a, 478 BGB) in any of these cases.
(2) The liability of ZIEHL for defects is primarily based on the agreement relating to the condition of the goods.
The product descriptions designated as such, which have been handed to the Client prior to the placement of its order or which have been included in the agreement in the same way as these Conditions of Sale, are regarded as the agreement relating to the condition of the goods.
(3) The claims of the Client for defects require that it has complied with its statutory obligations to examine the goods and to make a complaint (sec. 377, 381 HGB). Should any defect be detected upon examination or at a later time, this fact has to be notified promptly in writing to ZIEHL. Such notification is deemed to have been made promptly, if it is made within 1 week, with the timely dispatch of the notification being sufficient to observe the time limit. Irrespective of this obligation to examine the goods and to make a complaint, the Client must notify obvious defects (including incorrect delivery and short deliveries) within 1 week after delivery in writing, with the timely dispatch of the notification also in this case being sufficient to observe the time limit. Should the Client fail to perform a due and proper examination and/or fail to make a complaint, ZIEHL's liability for any defect that has not been notified is excluded.
(4) In the event of justified notification of defects given within the specified deadline, ZIEHL will remedy the defects by means of subsequent performance in accordance with sec. 439 BGB by subsequent delivery or removal of defects. ZIEHL is not obliged to make subsequent performance if any actions have been taken or changes made to the goods without the consent of ZIEHL, unless the Client proves that the defect has not been caused by such actions and changes. In the event that subsequent performance is refused, fails or is unreasonable for the Client, the Client shall be entitled to rescind the purchase contract or to reduce the purchase price. No right of rescission applies in the case of an insignificant defect. Claims of the Client for damages or reimbursement of expenses incurred to no avail exist only in accordance with the provisions of sec. 8 and are excluded in all other respects.
(5) In the event of fraudulent concealment of a defect or of assumption of a warranty for the characteristics of the object of purchase at the time the risk has passed in accordance with sec. 444 BGB (declaration by ZIEHL to the effect that the object of the purchase has certain characteristics at the time at which the risk passes and that ZIEHL intends to assume liability, regardless of negligence or fault, for any and all consequences of the absence) the rights of the Client are exclusively determined by the statutory provisions.
(6) If defects are found, written notifications of defects must be submitted immediately upon receipt of goods. Failure to do so shall result in the goods being deemed to have been accepted at the latest five working days from receipt of delivery. In the event of a notification of defects being justified, the defect shall be rectified once the reported goods have been returned. We shall furthermore rectify potential defects, including those only uncovered at a later date, within two years from delivery, regardless of operating hours. To do so, we may choose to repair the goods or deliver replacements. This warranty includes materials and contract work carried out on the goods but excludes transport costs. All further claims, particularly claims for damages, shall be excluded. We shall not assume any liability for damages caused by improper use. The buyer is responsible for using our products in a proper and professional manner. The warranty period stated in blanket orders also starts upon delivery of the goods, but ends no later than three years from issuing the blanket order. We give six months guarantee on parts replaced during repairs or devices modified upon the customer's request. In the event of the goods being sold on, the buyer shall undertake not to enter into any agreements with its customers which exceed the warranty claims agreed in this document.

8.) Exclusion of Liability

(1) Over and above the liability for material defects and defects of title, ZIEHL shall be liable without limitation, if the damage has been caused intentionally or by gross negligence. ZIEHL shall also be liable for negligent violation of material contractual obligations (obligations whose violation jeopardizes the attainment of the purpose of the contract) as well as for the violation of essential obligations ("Kardinalpflichten") (obligations, whose performance will enable the due and proper performance of the contract in the first place and on whose performance the Client as a rule relies), in each case, however, only for the foreseeable damage that is typical for this type of contract. ZIEHL shall not be liable for the negligent violation of obligations other than those mentioned above.
(2) The limitations of liability specified in the preceding paragraphs do not apply in the case of death, bodily injury or damage to health, any deficiency occurring after the assumption of warranty for the characteristics of the product and in the case of defects that have been fraudulently concealed. Liability in accordance with the German Product Liability Act ("Produkthaftungsgesetz") shall remain unaffected.
(3) If the liability of ZIEHL is excluded or limited, this shall also apply to the personal liability of the employees, representatives and vicarious agents of ZIEHL.
(4) Any and all claims for damages asserted vis-à-vis ZIEHL, irrespective of their legal ground, shall be barred by the statute of limitations at the latest one year after delivery of the goods to the Client, in the event of liability in tort from the time of becoming aware of or grossly negligent ignorance of the circumstances giving rise to the claim and of the person liable for damages. The regulations of this paragraph do not apply and, in that event, the statutory provisions shall apply, in the case of liability for intent and in the cases mentioned in para.2. Any shorter statutory periods of limitation take precedence.
(5) If the ultimate buyer of the goods is a consumer, the statutory provisions apply to the period of limitation of any right of recourse of the Client vis-à-vis ZIEHL.

9.) Intellectual Property Rights

(1) ZIEHL reserves the intellectual property rights and copyrights to any and all products, packaging, images and other documents provided by it. The Client may utilize any such documents only with ZIEHL's prior express written consent, without any independent rights to any such advertising materials accruing to it.
(2) The Client undertakes that it will not violate any intellectual property rights of third parties (patents, licenses, trademarks, etc.) when selling on the goods purchased from ZIEHL.

10.) Data Privacy

For the purpose of handling orders, enquiries and offers which are submitted by the Clients or third parties mandated by them on their behalf, ZIEHL shall be entitled to store the data electronically and process such data further. ZIEHL shall also be entitled to pass on data to third parties, in particular to credit institutions and contract parties, which are needed for the processing of orders. The provisions of the German Federal Data Protection
Act (Bundesdatenschutzgesetz - BDSG) and the General Data Protection Regulation (GDPR) are complied with.

Index

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Quality MADE IN GERMANY - Certified in accordance to DIN ISO 9001 and ATEX directive 2014/34/EU

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