



PRODUCT MANUAL

Numerical indicating device ZEPAX 04 type 504

APPLICATION

- For remote measurement of physical quantities. The input signal may be direct voltage or current or change of resistance.
- It enables signalling that two limits have been exceeded – either only on a display or by means of a relay with switch-over contact
- In design for measurement of current signals (504 xx2 xxx), the device is equipped with a source of voltage for supply of converter; the source has current limitation approx. 30 mA and its output is brought to terminal 1;
- In design for measurement of resistance signals (504 xx3 xxx), the output of the source of measuring current approx. 0.5 mA is brought out on terminal 1;
- In design with relay signalling, the device may also be used as proportional discontinuous regulator.

The devices are rated products pursuant to the Act No. 22/1997 Coll. and the Declaration of Conformity EC-504000 is issued for them.

DESCRIPTION

Electronic components of the indicating device are on three boards with printed circuits. On one board, there is the microcomputer part with input circuits of the device. The second board includes the source and outputs of the device. The third board is the indicator together with control circuits. The boards are mutually interconnected and the whole assembled module is slid into the cover plastic box. In the front of the device, there is a four-digit display, functional push-buttons and signalling diodes. Red LED indicates the switching limits have been exceeded. By the interconnecting piece, it is possible to choose negative logics, i.e. indication of exceeding the limit. The terminal board of the device is located in the rear part of the box and is directly interconnected with boards of the electronics.

In design for current signal, the device is equipped with a simple source of voltage 15V for connection of sensors.

The device is connected to the panel by means of installation yokes.

The device has no melting fuse. It is protected against overload by non-destructive thermally dependent limiter in the circuit of primary wiring of the transformer.

Input measured quantity is transferred to internal voltage signal entering the A/D converter.

After numerical indication, the conversion to value with dimension of the measurement-bearing quantity takes place (mV, mA, Ω, if the temperature sensing probe of the terminal board is filled, value of °C is also added to the said quantities). Constants entering this conversion are directly bound with a particular device and differ piece by piece.

Such values further enter the mathematic apparatus that enables the conversion to a physical quantity. The conversion characteristic is given by the multinomial of the 5th order. Constants entering this conversion are not dependent on any device any more. It enables to modify the conversion characteristic and also connect sensing probes or sensors with non-standard dependency of the output electric signal on the measured quantity.

Furthermore, two important parameters enter the calculation:

- Wiring resistance of two- and three-wire connection of resistors;
- Temperature of the terminal board in case of thermocouple ranges with internal compensation.

Then the result of these two conversions is displayed on the display and compared with set-up limits.

TECHNICAL DATA

The device is designed pursuant to ČSN EN 61010-1 as an electrical equipment of protection class II for the application in networks with category of overvoltage in installation III and pollution grade 2.

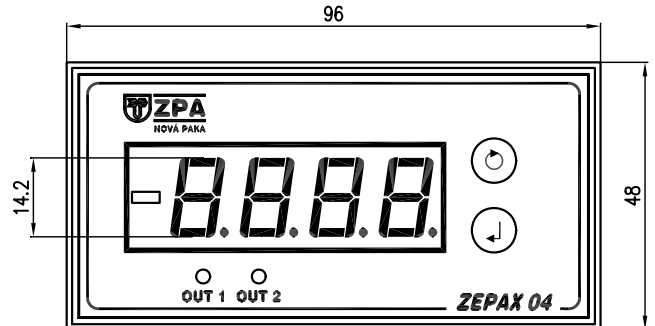
The device has internal protection by means of reversible thermal fuse in the primary circuit of the transformer and, therefore, it does not have to be secured with an external fuse.

Ingress protection pursuant to ČSN EN 60529: box IP 42 terminals IP 20

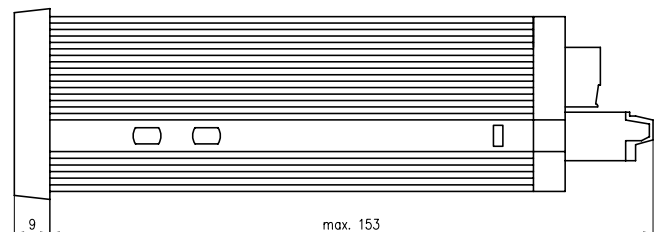
Weight: approx. 0.5 kg

Type of operation: continuous

Electric power input: max. 6 VA



- OUT1 – Signalling limit U1
- OUT2 – Signalling limit U2
- – Mode switching-over
- ⏵ – Selection confirmation



Electric isolation resistance

measured between groups of interconnected terminals: min. 20 MΩ

Interconnected terminals	U, N	S1, C1, O1	S2, C2, O2
U, N			
S1, C1, O1	500 V		
S2, C2, O2	500 V	500 V	
1, 2, 3, 4	500 V	500 V	500 V

Electric strength

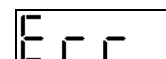
measured between groups of interconnected terminals: AC 50 Hz

Interconnected terminals	U, N	S1, C1, O1	S2, C2, O2
U, N			
S1, C1, O1	3700 V		
S2, C2, O2	3700 V	3700 V	
1, 2, 3, 4	3700 V	3700 V	3700 V

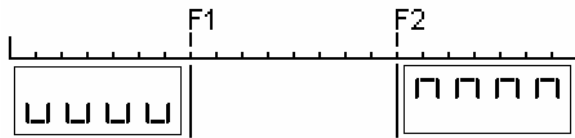
Device outputs

- Indication on display
Value displayed within the range –9999 to 9999, position of the decimal dot can be adjusted by the program.

In case the thermocouple is interrupted or the basic range is exceeded, the error message is displayed on the display (refer to figure).

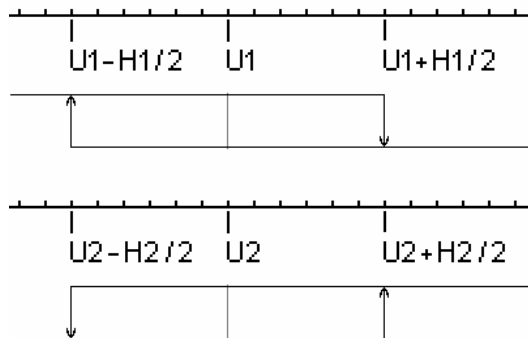


The operation range can be defined with constants F1, F2 (refer to Article *Commissioning* on page 5) as a part of the basic range. If the measured value is outside this range, the display responds with a message pursuant to the following figure.



- Indication of limits

Each device is equipped with indication of two independent limits U1 and U2. This indication is represented by two diodes LED on the front panel of the device. The limit value can be adjusted within the whole range of the device. Hysteresis of switching H1 and H2 can be adjusted independently for each limit. Hysteresis is in the same units and accuracy as the measured value and is distributed symmetrically with respect to the limit. The logic of switching can be changed by interconnecting pieces under the rear cover of the device (refer to figures 1 and 2). If an error is reported, both LEDs go out independently of the set-up switching logic. Factory set-up of logic of the limits is illustrated in the following figures.



- Signalling limits

If the device is equipped with relay signalling of limits, it concerns two relays, each with one switch-over contact. Relay is connected if the indication diode on the front panel is on. Relay contacts can be used either in circuits of mains voltage or in circuits of safe voltage. Values of surface paths correspond to ČSN EN 61010-1. Relay contacts are protected with varistors. Load of relay contacts
 Switching output: max. 2000 VA (cos Φ = 1)
 Alternating voltage: AC 12 to 250 V
 Permanent current: AC 8 A
 In case of an error message on the display, both relays (as well as the indication diodes) are brought to the conditions corresponding to the switched off device.
 Relay functions – refer to table 2.

Applied materials:

Box of the device	plastic material
Front panel	aluminium alloy
Front part	self-sealing plastic foil
Type of terminals	refer to figure 1

OPERATION CONDITIONS

The device is designed for the environment defined by the group of parameters and their severity grades IE 35 pursuant to ČSN EN 60721-3-3 and the following operation conditions.

Temperature of ambient surroundings: 0 to 50 °C

Relative ambient humidity:
 10 to 95 % with upper limit of water content 29g H₂O/kg of dry air without condensation

Atmospheric pressure: 86 to 106 kPa

Level of vibrations: up to amplitude 0.35 mm

Vibrations pursuant to ČSN EN 60068-2-6:

Frequency range	10 to 200 Hz
Drift amplitude	1.5 mm
Acceleration amplitude	5 ms ⁻²
Operation position:	discretionary, the device is designed to be built-in into the panel
Type of supply mains:	1/N AC230 V, 50 Hz
Tolerance of supply voltage:	±10 %
Tolerance of mains frequency:	48 to 62 Hz
Coefficient of upper harmonics:	max. 10 %
Settlement period after switching the feeding:	30 minutes
Electromagnetic compatibility EMC:	pursuant to ČSN EN 61000-6-4 ČSN EN 61000-6-2 ed. 2

METROLOGICAL DATA

Limits of permitted basic error at ambient temperature 20°C ± 2 °C.:

Voltage

- to ± 0 to 1 V ($R_{vst} \geq 1 \text{ M}\Omega$) 0.2 % of range
- from ± 0 to 2 V ($R_{vst} \geq 80 \text{ k}\Omega$) 0.2 % of range

Current

- to 0 to 200 µA ($R_{vst} \approx 240 \Omega$) 0.2 % of range
- from 0 to 500 µA ($R_{vst} \approx 100 \Omega$) 0.2 % of range
- from 0 to 5 mA ($R_{vst} \approx 5 \Omega$) 0.2 % of range
- from 0 to 200 mA ($R_{vst} \approx 2.5 \Omega$) 0.2 % of range

Natural signal from resistance thermometer

- Resistance transmitter 5 to 105 Ohm 0.2 % of range
- Resistance 0.1 % of range

Accuracy of measurement of resistance signals is defined without the impact of wiring resistance.

Thermocouples

Natural signal from thermocouple A

- 0 to 900 °C 0.4 % of range
- 0 to 1200 °C 0.6 % of range

Natural signal from thermocouple K

- 0 to 1200°C 0.4 % of range

Natural signal from thermocouple S

- 0 to 1600°C 0.4 % of range

Natural signal from thermocouple B

- 300 to 1800°C 0.8 % of range
- 600 to 1800°C 0.4 % of range

Accuracy of thermocouples is defined without the impact of temperature compensation.

Current for detection of interruption of thermocouples is approximately 500 nA.

Temperature of terminal board (comparison ends of thermocouple)

- 0 to 80 °C ± 0.5 °C ± 1°C / 10 °C of ambient temperature

Long-term drift for 240 hours: ± 0.2 % of basic range

Additional errors:

- 0.1 % at the change of ambient temperature per each 10 °C
- 0.1 % within the whole operation range of supply voltage
- ± 2 digits – error of indicator

Impact of other influencing quantities in the operation field has no metrological importance.

Response of indicator to input signal: typically 2 s

Source for voltage of two-wire converter:

- voltage 15 V ± 1 V
- ripple 30 mV

DESIGNATION

Data on the product

- Trade mark of the manufacturer
- Made in Czech Republic
- Product ordering number
- Type and size of supply mains
- Maximum protection
- Ingress protection
- Manufacturing number
- CE mark

RELIABILITY

Informative value of medium time between failures is 16 000 hours. Medium life is 5 years.

DELIVERY

Unless agreed otherwise with the customer, each delivery includes

- Delivery note
- Device pursuant to the purchase order
- 2 pcs of installation yokes for installation into the panel
- Accompanying technical documentation in Czech:
 - o Product quality and completeness certificate, which also serves as the Warranty Certificate;
 - o Product manual

If it is established in the purchase contract or agreed otherwise, the following documentation can be also delivered with the product:

- ES Declaration of Conformity

TABLE 1 - DESIGN OF INDICATING NUMERICAL DEVICES ZEPAX 04 - TYPE 504

Ordering number of the device has the following form: 504 abc def

SPECIFICATION		ORDERING NUMBER							
		504	a	b	c	de	f		
Limit reporting	LED		1						
	LED + relay		2						
Display colour	Red			1					
	Green			2					
Input signal	Voltage – standard ranges		504	a	b	c	de	f	
		0.00 to 10.00 mV				1	11	0	
		0.00 to 20.00 mV					12	0	
		0.00 to 50.00 mV					13	0	
		0.0 to 100.0 mV					14	0	
		0.0 to 200.0 mV					15	0	
		0.0 to 500.0 mV					16	0	
		0.000 to 1.000 V					21	0	
		0.000 to 2.000 V					22	0	
		0.000 to 5.000 V					23	0	
		0.00 to 10.00 V					24	0	
		-10.00 to 10.00 mV					31	0	
		-20.00 to 20.00 mV					32	0	
		-50.00 to 50.00 mV					33	0	
		-100.0 to 100.0 mV					34	0	
		-200.0 to 200.0 mV				35	0		
		-500.0 to 500.0 mV				36	0		
		-1.000 to 1.000 V				41	0		
		-2.000 to 2.000 V				42	0		
		-5.000 to 5.000 V				43	0		
		-10.00 to 10.00 V				44	0		
		Current – standard ranges		504	a	b	c	de	f
			0.00 to 50.00 µA				2	11	0
			0.00 to 100.0 µA					12	0
			0.00 to 200.0 µA					13	0
			0.0 to 500.0 µA					14	0

		0.000 to 1.000 mA					21	0
		0.000 to 2.000 mA					22	0
		0.000 to 5.000 mA					23	0
		0.00 to 10.00 mA					24	0
		0.00 to 20.00 mA					25	0
		0.00 to 50.00 mA					26	0
		0.0 to 100.0 mA					27	0
		0.0 to 200.0 mA					28	0
	Resistance – standard ranges		504	a	b	c	de	f
		0.00 to 50.00 Ω				3	11	0
		0.0 to 100.0 Ω					12	0
		0.0 to 200.0 Ω					13	0
		0.0 to 500.0 Ω					14	0
		0 to 1000 Ω					15	0
		0 to 2000 Ω					16	0
		0 to 5000 Ω					17	0
		0.0 to 10.00 kΩ				18	0	
	Temperature (resistance thermometer)		504	a	b	c	de	f
Pt100		-200.0 to 50.0 °C				3	21	1
		0.00 to 50.00 °C					22	2
		-200.0 to 400.0 °C					23	1
		0.0 to 400.0 °C					23	2
		-200.0 to 800.0 °C					24	3
Pt500		0.0 to 800.0 °C					24	4
		-200.0 to 150.0 °C					25	3
		0.00 to 150.00 °C					25	4
		-200.0 to 400.0 °C					26	3
		0.0 to 400.0 °C					26	4
Pt1000		-200.0 to 800.0 °C				27	5	
		0.0 to 800.0 °C				27	6	
		-200.0 to 60.0 °C				28	5	
		0.00 to 60.00 °C				28	6	
		-200.0 to 260.0 °C						
		0.0 to 260.0 °C						
		-200.0 to 400.0 °C						
	0.0 to 400.0 °C							
	-200.0 to 800.0 °C							
	0.0 to 800.0 °C							
	Position (resistance transmitter)		504	a	b	c	de	f
		0.0 to 100.0 %				3	21	7

TABLE 1 - DESIGN OF INDICATING NUMERICAL DEVICES ZEPAX 04 - TYPE 504 – continuation

Input signal	Temperature, signal from thermocouple (external compensation of temperature of comparison ends)		504	a	b	c	de	f
	J	0 to 340.0 °C				4	11	1
		0 to 900.0 °C					12	1
		0 to 1200 °C					13	1
	K	0 to 460 °C					14	1
		0 to 1200 °C					15	1
	S	0 to 1360 °C					16	1
		0 to 1600 °C					17	1
	B	300 to 1800 °C					18	1
		600 to 1800 °C					18	2
	Temperature, signal from thermocouple (internal compensation of temperature of comparison ends)		504	a	b		c	de
	J	0.0 to 340.0 °C				5	11	1
		0.0 to 900.0 °C					12	1
		0 to 1200 °C					13	1
	K	0.0 to 460 °C					14	1
		0 to 1200 °C					15	1
	S	0 to 1360 °C					16	1
		300 to 1360 °C					16	2
		0 to 1600 °C					17	1
	B	300 to 1600 °C					17	2
300 to 1800 °C					18		1	
	600 to 1800 °C				18	2		

Legend:

- Ranges, which shall be in the last position in the ordering number 0, represent **basic ranges**.
- Options can be derived from the basic ranges, where it is possible to identify another display on the display in the purchase order for a specific range of design (for what dimension and what range of measured quantity the device will be used). In such a case, the purchase order shall be accompanied with a filled-in questionnaire where digit 9 shall be specified in the last position of the ordering number.

- Name
- Product ordering number

ORDERING

The purchase order shall specify:

- In case of designs, which have 0 in the last position of the ordering number and a display of measured quantity on the display is required, a filled-in questionnaire shall be enclosed.
- Number of pieces

Standard design:

Numerical indicating device ZEPAX 04
 (with relay output, red colour of display, unified current input signal 4 to 20 mA)
 504 212 259
 5 pcs

PURCHASE ORDER EXAMPLE

The questionnaire specifies the range of connected pressure sensor 0 to 160.0 kPa and the table of the questionnaire is filled in:

Product ordering number:			504	a	b	c	de	9
				2	1	2	25	
Input signal			To be displayed on the display					
Start	End	Measurement-bearing quantity	Start	End	Measured quantity			
4	20	mA	0.0	160.0	kPa			

PACKING

The devices are delivered in a packing ensuring resistance to the impact of thermal effects and mechanical effects pursuant to controlled packing regulations.
 Dimensions of packed device: approx. 70 x 120 x 190
 Weight of packed device: approx. 0.6 kg

TRANSPORT

The devices may be transported on conditions corresponding to the set of combinations of classes IE 21 pursuant to ČSN EN 60721-3-2 (i.e. by airplanes and trucks, in premises that are ventilated and protected against atmospheric conditions).

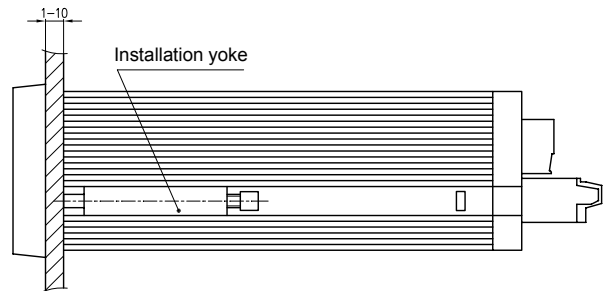
STORAGE

The devices may be stored on conditions corresponding to the set of combinations of classes IE 11 pursuant to ČSN EN 60721-3-1 (i.e. in places with continuous temperature control from 5 to 40 °C and humidity from 5 to 85%, without a special threat of an attack with biological agents, with vibrations of small significance and not situated close to sources of dust and sand).

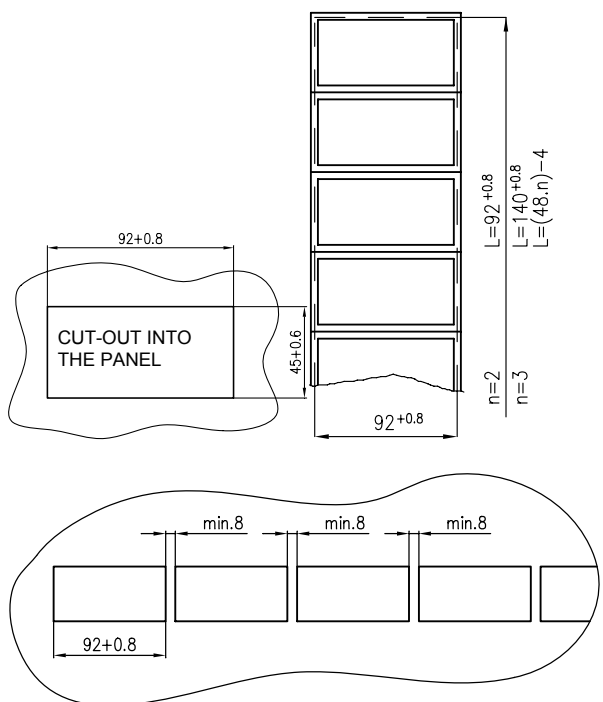
INSTALLATION AND CONNECTION

The device is installed into the panel by means of two installation yokes with the use of a cross screwdriver pursuant to figure. The installation into the panel only enables tight vertical installation of the device.

INSTALLATION OF THE DEVICE IN THE PANEL



CUT-OUT OF HOLES INTO THE PANEL



ELECTRICAL CONNECTION

The electrical connection may be only realized by qualified workers pursuant to § 5 of the Decree 50/1978 Coll. Drawing of connection of inputs and outputs is illustrated in figure 2.

Connection of input signals:

The sensors (input signal) are connected with a two-, three- or four-core cable with the total isolation resistance min. 6 MΩ and cross-section of cores up to 2.5 mm². Resistance value of circuit of voltage input signal:

- up to 1 V it may be max. 50 Ω
- over 1 V it may be max. 20 Ω

Resistance value of circuit of thermoelectric temperature sensor may be max. 20 Ω.

In case of two-wire connection of resistance temperature sensors, resistance of the whole wiring shall be set-up with the use of push-buttons of the device (variable "r1"). The device is set-up from the factory to 0 Ω.

In case of three-wire connection of resistance temperature sensors, resistance of parts of wiring to terminal (variable "r1") shall be set-up with the use of push-buttons of the device. The device is set-up from the factory to 0 Ω.

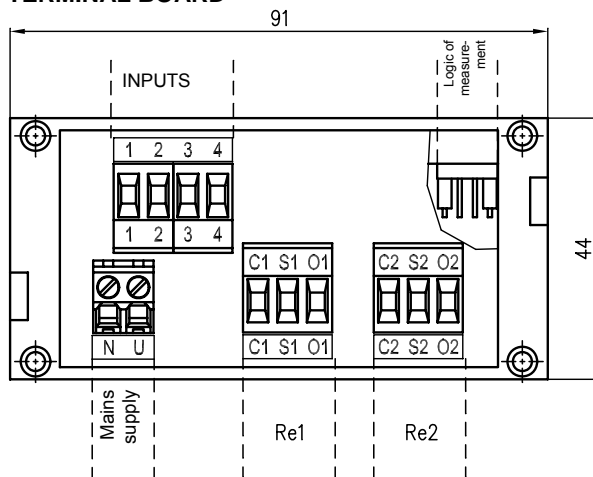
In case of four-wire connection of resistance temperature sensors, the wiring resistance is not applied and, therefore, the value 0 Ω shall be set-up as variable "r1". The device is set-up from the factory to 0 Ω.

When connecting the resistance transmitter, it is necessary to set-up resistance of parts of wiring to the terminal 1 (variable "r1") with the use of push-buttons on the face of the device. The device is set-up from the factory to 0 Ω.

For the connection of the device to the supply mains, isolated copper wires shall be used, which are dimensioned pursuant to ČSN 33 2000-4-43 with maximum cross-section of cores up to 1.5 mm².

The device installation shall include a switch that will enable to disconnect the device from the supply mains.

FIGURE 1 CONNECTION OF TERMINALS TO TERMINAL BOARD



Terminals: N Zero wire of mains supply
 U Phase wire of mains supply
 Type of terminals: screw type Weidmüller BLAT
 wire cross-section to 1.5 mm²
 S1,S2 Shared relay contact
 O1,O2 Switching relay contact
 C1,C2 Tripping relay contact
 Type of terminals: screw type ARK 2500
 wire cross-section to 2.5 mm²

COMMISSIONING



WARNING

THE EQUIPMENT MAY ONLY BE USED IN THE WAY FOR WHICH IT WAS DESIGNED BY THE MANUFACTURER.

After the connection of supply voltage and the settlement period, the device is prepared for operation.

The device has been set-up from the factory to the values identified in the purchase order.

On the face of the device it is possible, depending on design, to set-up the following parameters by means of push-buttons:

U1 – value of limit 1

H1 – hysteresis of limit 1

U2 – value of limit 2

H2 – hysteresis of limit 2

F1 – start of operation range (refer to Article *Outputs of the device* on page 1)

F2 – end of operation range

t1 – related temperature for thermocouple with external compensation

r1 – wiring resistance for resistance measurement in two- and three-wire connection

The values are set-up as follows:

Press the top push-button repeatedly; the display will display the name of variable that we want to edit. By pressing the bottom push-button, the display will display the value of variable. If we are not satisfied with it, press the bottom push-button again.

If the variable cannot be expressed in negative values, the digit of the highest adjustable order will start flashing.

You can change it cyclically from 0 to 9 with the top push-button. Confirm the choice with the bottom push-button.

When the last digit has been set-up, the whole display starts flashing. Now either confirm the value by pressing the bottom push-button or cancel the choice by pressing the top push-button.

If the variable can be expressed in negative values, indicators of limits will start flashing. With the top push-button you can change polarity of variable cyclically. (If minus is flashing, it is negative). Confirm with the bottom push-button. Then continue as in case of a positive variable.



WARNING

In case of the set-up mode (flashing on the face), measurement is interrupted (the status of limit signalling is not changed either); therefore, it is suitable to be well prepared for editing the constants.

The device is returned from other modes to the operation conditions after approx. 6 seconds.

Unless defined otherwise in the purchase order, the set-up of values from the manufacturer is as follows.

U1 approx. 30% of basic range

U2 approx. 60% of basic range

H1,H2 approx. 1% of basic range

F1 start of basic range

F2 end of basic range

t1 20°C

r1 0 Ω

OPERATION AND MAINTENANCE

The device does not require any operation and maintenance.

SPARE PARTS

The design of the device does not require any delivery of spare parts.

WARRANTY

Pursuant to § 429 of the Commercial Code and the provisions of § 620 (2) of the Civil Code, the manufacturer warrants for technical and operation parameters of the product specified in the manual. The warranty period is 24 months from the receiving of the product by the customer, unless established otherwise in the contract. Rejection of defects shall be enforced in writing at the manufacturer within the warranty period. The rejecting side shall identify the product name, ordering and manufacturing numbers, date of issue and number of the delivery note, clear description of the occurring defect and the subject of the claim. If the rejecting side is

invited to send the device for repair, it shall do so in the original package of the manufacturer and/or in another package ensuring safe transport.

The warranty shall not apply to defects caused by unauthorized intervention into the device, its forced mechanical damage or failure to comply with operation conditions of the product and the product manual.

REPAIRS

The devices shall be repaired by the manufacturer. They shall be sent for repair in the original or equal package without accessories.

The product and its package do not include any parts that could impact the environment.

Products that are withdrawn from operation, including their packages (with the exception of products marked as electrical equipment for the purposes of return withdrawal and separate salvage of electrical waste), may be disposed of to sorted or unsorted waste pursuant to the type of waste.

The manufacturer realizes free return withdrawal of marked electrical equipment (from 13.8.2005) from the consumer and points out the danger connected with their illegal disposal.

The package of the sensor can be recycled completely. Metal parts of the products are recycled, non-recyclable plastic materials and electrical waste shall be disposed of in compliance with the aforesaid Act.

DISABLING AND LIQUIDATION

They shall be realized in compliance with the Waste Act No. 106/2005 Coll.

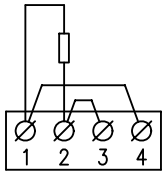
TABLE 2 – FUNCTION OF RELAY RE1 AND RE 2

Measured quantity	Re 1 C1 S1 O1	Re 2 C2 S2 O2	Logic of limits

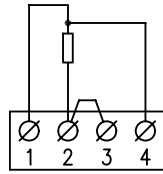
FIGURE 2 – CONNECTION OF INPUT SIGNALS

CONNECTION FOR MEASUREMENT WITH RESISTANCE SENSING PROBE (e.g. RESISTANCE TEMPERATURE SENSOR)

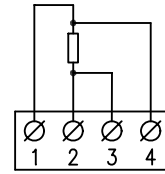
two-wire connection



three-wire connection

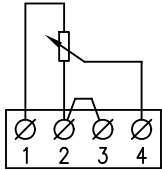


four-wire connection

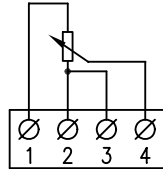


CONNECTION OF RESISTANCE TRANSMITTER connection

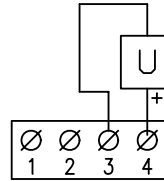
two-wire



three-wire

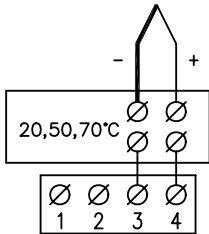


VOLTAGE SIGNAL

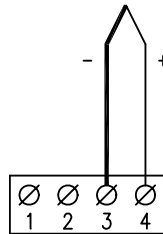


CONNECTION FOR MEASUREMENT WITH THERMOCOUPLES

with external compensation

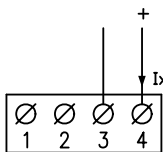


with internal compensation

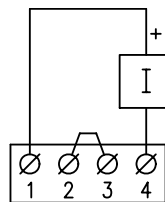


CONNECTION FOR CURRENT MEASUREMENT

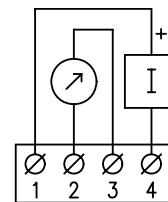
sensor with own power supply or measured current max. 200 mA



sensor with current output 4-20 mA powered from ZEPAX



powered from ZEPAX resistance MP < 100 Ω



NOVÁ PAKA

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**Numerical indicating device
ZEPAX 04
type 504**

QUESTIONNAIRE of ZPA Nová Paka, a.s. – page 1 / 1

Date of filling-in the questionnaire:

QUESTIONNAIRE FOR PROGRAMMING THE DEVICE

Product ordering number:			504	a	b	c	de	9
Input signal			To be displayed on the display					
Start	End	Measurement-bearing quantity	Start	End	Measured quantity			

Instructions for filling-in the questionnaire of the table:

The questionnaire shall only be enclosed to the purchase order if the last digit of the ordering number is 0 and the range identified in the table of design does not correspond to the required display directly. In the table of the questionnaire, digit 9 shall be specified instead of 0 in the last position of the ordering number.

Example of filling-in the questionnaire:

Temperature sensor 500 to 1500 °C with unified output 0 to 10 V shall be connected.
Select corresponding ordering number 504 111 240.
Change the ordering number to 504 111 249 and attach this questionnaire with the table filled-in as follows.

Product ordering number:			504	a	b	c	de	9
				1	1	1	24	
Input signal			To be displayed on the display					
Start	End	Measurement-bearing quantity	Start	End	Measured quantity			
0	10.00	V	500	1500	°C			

Additional information about ZEPAX 04: