

Temperatuur

# Sensoren



## ATAL Temperatuursensoren

Wij presenteren u hierbij de catalogus met een actueel compleet overzicht van ons pakket temperatuursensoren.

Waar waardes moeten worden gemeten en geregeld, komt ATAL in beeld. ATAL is sinds 1994 specialist in meet- en registratiesystemen. ATAL past in haar oplossingen de nieuwste beschikbare technologie toe.

Ook de temperatuursensoren die in deze catalogus worden gespecificeerd staan synoniem voor kwaliteit in optima forma, met - dankzij ervaren medewerkers - daaraan verbonden een hoge graad van service en advies.

De temperatuursensoren worden gefabriceerd en geassembleerd door onze partner SENSIT. Deze toonaangevende fabrikant is gecertificeerd volgens ISO 9001, EN ISO 14001 en OHSAS 18001.

Deze certificering, gecombineerd met een uitvoerige sensorkalibratie en -inspectie vormen een waarborg voor sensorleveranties van een hoogwaardige en constante productkwaliteit.

Door onze intensieve samenwerking zijn wij ook in staat 'custom' sensoruitvoeringen te leveren. De assemblage van kleine series of zelfs losse sensoren behoort eveneens tot de mogelijkheden. Diverse sensoren zijn bovendien compatible met de meet- en regelsystemen van o.a. Siemens, Landis en Johnson Controls.

### De temperatuursensoren in ons pakket worden onder meer toegepast in:

- HVAC-applicaties
- energie monitoring systemen
- warmtemeters
- machinebouw
- industrie  
(o.a. proces-, chemische- & voedingsmiddelenindustrie)
- laboratoria
- transport- en logistieke applicaties

Een volledig overzicht van ons productaanbod en onze kalibratiediensten vindt u op [www.atal.nl](http://www.atal.nl)

## ATAL Temperature sensors

We proudly present to you this new catalog with a comprehensive overview of our range of temperature sensors.

Where values are to be measured and controlled, ATAL comes into view. Since 1994 ATAL is a specialist supplier for measuring and recording systems.

With a strong customer focus and dedication to quality, ATAL is committed to providing 'state of the art' technology to solve monitoring needs. Also the range of temperature sensors specified in this catalog is an example of quality at its best, with – thanks to our dedicated staff – a related high level of service and expertise.

The temperature sensors are manufactured and assembled at our partner SENSIT. This leading manufacturer complies to the requirements imposed by ISO 9001, EN ISO 14001 and OHSAS 18001.

Meeting the international quality standards, combined with a comprehensive sensor calibration and output inspection constitute a guarantee for sensor supplies at the cutting edge of today's temperature monitoring applications.

The ability of producing small-series and 'single-part' sensors, as well as our eye for customers with a special temperature monitoring need, is of great value.

Various sensors are also compatible with the building automation and control systems of Siemens, Landis and Johnson Controls.

### Typical applications for the temperature sensors presented in this catalog are:

- HVAC applications,
- energy monitoring systems
- heat Meters
- mechanical engineering
- industry  
(including process, chemical & food industry)
- laboratories
- transportation and logistics

A complete overview of our product range and our calibration services can be found at [www.atal.nl](http://www.atal.nl)

# **ATAL** al 20 jaar uiterst precies in meettechniek

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Sinds 1994 is ATAL B.V. de specialistisch leverancier voor meet- en registratiesystemen. Onze klanten hebben ATAL-apparatuur toegepast in een grote diversiteit aan applicaties.

Zo worden onze meetinstrumenten en sensoren ingezet voor metingen in bijvoorbeeld treinen, kassen, ziekenhuizen, kantoren, scholen, vrachtwagens, kinderdagverblijven, grootkeukens, koelcellen, containers, serverruimtes, vliegtuigen en laboratoria.

Wij mogen inmiddels vele gerenommeerde bedrijven en instellingen tot onze klantenkring rekenen; zowel multi-nationals, overheids-instellingen als lokale MKB-bedrijven vertrouwen hun meet- en registratie applicaties graag aan ons toe!

Ons productpakket omvat:

- temperatuursensoren,
- CO2-sensoren & -regelaars,
- data loggers/data recorders,
- monitoring systemen,
- portable meetinstrumenten,
- ethernet gebaseerde meetsystemen,
- warmtebeeld camera's en
- kalibratieservice.

De ATAL-producten kenmerken zich door een uitstekende kwaliteit en een concurrerende prijsstelling. Veel apparatuur kan direct uit voorraad worden geleverd.

Het ATAL Sales & Service-team is u graag behulpzaam bij het vinden van een passende oplossing voor uw applicatie!

U kunt ons telefonisch bereiken via nummer (+31) (0)299-630610 of email [info@atal.nl](mailto:info@atal.nl)

## **ATAL** solving monitoring needs for over 20 years

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Since 1994 ATAL B.V. acts as a specialist supplier for measurement instrumentation, sensors and data logging systems. Our customers have used ATAL equipment in a remarkable and wide variety of applications in various market segments.

Our instruments and sensors have been used for monitoring purposes in e.g. trains, green houses, hospitals, offices, schools, trucks, nurseries, kitchens, cold storage rooms, containers, server rooms, airplanes and laboratories.

We take pride in having many well-known companies and governmental agencies among our customers; both multinationals as well as local small businesses trust their critical monitoring needs to us!

The ATAL product range does include:

- temperature sensors,
- CO2-sensors & -transmitters,
- data loggers/data recorders,
- monitoring systems,
- portable measurement instruments,
- ethernet based monitoring systems,
- thermal imaging camera's and
- (re)calibration services.

ATAL's instrumentation and sensors are characterized by excellent quality and high reliability at competitive pricing. Many devices can be delivered directly from stock for your convenience.

The ATAL Sales & Service Team looks forward to the opportunity to support your monitoring needs!

For enquiries or information please contact us at telephone number (+31) (0)299-630610 or email [info@atal.nl](mailto:info@atal.nl)

## CONTENTS

### GLOSSARY

### GUARANTEE PERIODS, PRINCIPAL CLASSIFICATION OF THE TEMPERATURE SENSORS, WASTE DISPOSAL, REPAIRS, CONTACTS

#### ● TEMPERATURE SENSORS WITH A CONNECTION HEAD

07.13a	Indoor temperature sensors	6
102.6a	Indoor temperature sensors in ABB design	8
08.14a	Temperature sensors for outdoor purposes with a plastic enclosure	11
99.5a	Temperature sensors for outdoor purposes with a metal connection head	14
38.13a	Temperature sensors with a stem and plastic enclosure	16
117.4a	Temperature sensors with a stem, MINI series	19
43.13a	Temperature sensors with a stem and metal connection head	22
42.12a	Fast response temperature sensors with a plastic enclosure	24
101.5a	Fast response temperature sensors with a metal connection head	27
51.11a	Temperature sensors with a stem and stainless steel connection head	29
11.15a	Contact temperature sensors with a plastic enclosure	32
12.6a	Contact temperature sensors with a cable	35
04.2a	Temperature sensors with magnetic fixing	37
28.13a	Temperature sensors up to 400 °C	39
115.4a	Temperature sensors up to 400 °C with programmable converter 4–20 mA	41
29.3a	Temperature Sensors (IP 68) up to 400 °C	43
116.2a	Temperature Sensors (IP 68) up to 400 °C with programmable converter 4–20 mA	45
30.2a	Temperature Sensors (IP 68) up to 600 °C	47
122.2a	Temperature Sensors (IP 68) up to 600 °C with programmable converter 4–20 mA	49
208.1a	Digital thermometers with display	51

#### ● TEMPERATURE SENSORS WITH A CABLE

06.14a	Temperature Sensors with cable and metal tip	52
	● Temperature sensors with a smooth case with diameter ≤ 5 mm	53
	● Temperature sensors with a smooth case with diameter > 5 mm	54
	● Temperature sensors with a thread	57
	● Contact temperature sensors	59
	● Temperature sensors for cryogenic temperatures	61
09.5a	Temperature Sensors with cable and plastic tip	63
14.4a	Temperature sensors for explosive environments with a cable	66

#### ● TEMPERATURE SENSORS WITH DIGITAL OUTPUT

97.7a	SD 11x series sensor – intelligent temperature sensors for outdoor purposes	68
100.6a	SD 12x series sensors – intelligent temperature sensors with a stem and plastic enclosure	70

#### ● TEMPERATURE SENSORS WITH CORRECTION

67.8a	Temperature sensors with correction of the requested value SAU 1000 and SAU 1500	72
82.6a	Temperature sensors with correction of the requested value SAU 2000	74

#### ● TEMPERATURE SENSORS FOR HEAT CONSUMPTION METERS

37.18a	Paired temperature sensors TP 11E	76
80.6a	Paired temperature sensors TP 13, TP 13A	78
79.7a	Paired temperature sensors TP 15, TP 15A, TP 15B	80
118.4a	Paired temperature sensors TP 16, TP 16A	82
02.5a	Resistance temperature sensors T 13	84
119.4a	Resistance temperature sensors T 16	86



## ● ACCESSORIES FOR SENSORS

40.7a	Thermowells, welded-on pieces, pipe reducers	88
-------	--	----

## ● TEMPERATURE PROBES

03.18a	Temperature probes	90
200.1a	Thermocouple probes	93

## ● CONVERTERS

20.14a	Temperature to current converters STI and STID (4–20 mA)	94
21.10a	Temperature to voltage converters STU (0–10 V)	96
22.1a	Temperature converters – RS 485	98
201.1a	Programmable converters	100
	● INOR converters	100
	● Programmable converters for lines RS 485	101
	● Intelligent programmable converters for heads	102
	● Universal programmable converters for DIN rail mounting	102
	● Universal multi-input programmable converter with Ethernet output	103
	● AC2NI/SXX double temperature to power converter	103
	● Programmable converters for cables	103

## ● TEMPERATURE SWITCHES

107.1a	Temperature switches TSDD	104
104.5a	Temperature switches TSZ2H	106
106.2a	Temperature switches TSZ2H-RS485	108
15.14a	Temperature switches TSA	110
39.11a	Temperature switches TFA	113

## ● TEMPERATURE AND HUMIDITY SENSORS

124.2a	Temperature and humidity sensors for indoor and outdoor purposes, with 4–20 mA output	116
125.2a	Duct mounted Temperature and Humidity sensors, for air distribution systems, with 4–20 mA output	118
126.2a	Temperature and Humidity sensors for indoor and outdoor purposes, with external probe, outputs 4–20 mA	120

## ● FLOW SENSORS, FLOW SWITCHES

54.3a	Flow Sensors for air and gaseous media (non-aggressive), SNP	122
55.2a	Flow Switches, for air and gaseous media (non-aggressive), SPP	125

## ● DISPLAY UNITS

90.7a	Portable temperature meters SENSITEST 204C and 2004C	128
-------	--	-----

## CUSTOM PRODUCTION OF TEMPERATURE SENSORS

130
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# GLOSSARY

Product type	sheet Nr	page	Product type	sheet Nr	page	Product type	sheet Nr	page	Product type	sheet Nr	page	Product type	sheet Nr	page
100-60/x	03.18a	91	NK 320	43.13a	22	NS 301	07.13a	6	PTS 120	38.13a	16	SD 122	100.6a	70
200-80/x	03.18a	91	NK 321	43.13a	22	NS 310x	08.14a	11	PTS 120K	38.13a	16	SENSITEST 2004C	90.7a	128
6xS PoETH	201.1a	103	NK 510	99.5a	14	NS 310xK	08.14a	11	PTS 140	11.15a	32	SENSITEST 204C	90.7a	128
<b>A</b>			NK 520	43.13a	22	NS 311x	08.14a	11	PTS 140K	11.15a	32	SH 1	201.1a	102
AC2Ni/Sxx	201.1a	103	NK 560	101.5a	27	NS 311xK	08.14a	11	PTS 150A	12.6a	35	SNP	54.3a	122
APAQ-H	201.1a	100	NS 100 ALPHA	102.6a	8	NS 320	38.13a	16	PTS 160	42.12a	24	SPP	55.2a	125
<b>C</b>			NS 100 ELEMENT	102.6a	8	NS 320K	38.13a	16	PTS 160K	42.12a	24	ST 485A	22.1a	98
CP 500	200.1a	93	NS 100 IMPULS	102.6a	8	NS 321	38.13a	16	PTS 180K	51.11a	29	ST 485B	22.1a	98
CZ 550	200.1a	93	NS 100 SOLO	102.6a	8	NS 321K	38.13a	16	PTS 180P	51.11a	29	ST 485C	22.1a	98
CZ 900	200.1a	93	NS 100 TANGO	102.6a	8	NS 340	11.15a	32	PTS 190	04.2a	37	STD 485A	22.1a	98
<b>E</b>			NS 100 TIME	102.6a	8	NS 340K	11.15a	32	PTS 190K	04.2a	37	STD 485B	22.1a	98
EVOMINI	201.1a	103	NS 100	07.13a	6	NS 341	11.15a	32	PTS 200 ALPHA	102.6a	8	STD 485C	22.1a	98
EX SERIE TG 8	14.4a	66	NS 101 ALPHA	102.6a	8	NS 341K	11.15a	32	PTS 200 ELEMENT	102.6a	8	STI Ni	20.14a	94
EX SERIE TR 011	14.4a	66	NS 101 ELEMENT	102.6a	8	NS 350A	12.6a	35	PTS 200 IMPULS	102.6a	8	STI Pt 100	20.14a	94
<b>G</b>			NS 101 IMPULS	102.6a	8	NS 351A	12.6a	35	PTS 200 SOLO	102.6a	8	STI Pt 1000	20.14a	94
GD 260	200.1a	93	NS 101 SOLO	102.6a	8	NS 380K	51.11a	29	PTS 200 TANGO	102.6a	8	STID Ni	20.14a	94
GD 700	200.1a	93	NS 101 TANGO	102.6a	8	NS 380P	51.11a	29	PTS 200 TIME	102.6a	8	STID Pt 100	20.14a	94
GD 1250	200.1a	93	NS 101 TIME	102.6a	8	NS 381K	51.11a	29	PTS 200	07.13a	6	STID Pt 1000	20.14a	94
GT 1150	200.1a	93	NS 101	07.13a	6	NS 381P	51.11a	29	PTS 210x	08.14a	11	STU Ni	21.10a	96
<b>H</b>			NS 102 ALPHA	102.6a	8	NS 390	04.2a	37	PTS 210xK	08.14a	11	STU Pt 100	21.10a	96
HK 110	99.5a	14	NS 102 ELEMENT	102.6a	8	NS 390K	04.2a	37	PTS 220	38.13a	16	STU Pt 1000	21.10a	96
HK 120	43.13a	22	NS 102 IMPULS	102.6a	8	NS 391	04.2a	37	PTS 220K	38.13a	16	SUG2	201.1a	102
HK 160	101.5a	27	NS 102 SOLO	102.6a	8	NS 391K	04.2a	37	PTS 240	11.15a	32	<b>T</b>		
HS 100 ALPHA	102.6a	8	NS 102 TANGO	102.6a	8	NS 500 TANGO	102.6a	8	PTS 240K	11.15a	32	T 13	02.5a	84
HS 100 ELEMENT	102.6a	8	NS 102 TIME	102.6a	8	NS 500	07.13a	6	PTS 250A	12.6a	35	T 16	119.4a	86
HS 100 IMPULS	102.6a	8	NS 102	07.13a	6	NS 510x	08.14a	11	PTS 260	42.12a	24	TDx	208.1a	51
HS 100 SOLO	102.6a	8	NS 103 ALPHA	102.6a	8	NS 510xK	08.14a	11	PTS 260K	42.12a	24	TFA 220 A	39.11a	113
HS 100 TANGO	102.6a	8	NS 103 ELEMENT	102.6a	8	NS 520	38.13a	16	PTS 280K	51.11a	29	TFA 220 C	39.11a	113
HS 100 TIME	102.6a	8	NS 103 IMPULS	102.6a	8	NS 520K	38.13a	16	PTS 280P	51.11a	29	TFA 220 K	39.11a	113
HS 100	07.13a	6	NS 103 SOLO	102.6a	8	NS 540	11.15a	32	PTS 290	04.2a	37	TFA 220 P	39.11a	113
HS 110x	08.14a	11	NS 103 TANGO	102.6a	8	NS 540K	11.15a	32	PTS 290K	04.2a	37	TG 1	06.14a	57
HS 110xK	08.14a	11	NS 103 TIME	102.6a	8	NS 560	42.12a	24	PTS 300 ALPHA	102.6a	8	TG 2	06.14a	57
HS 120	38.13a	16	NS 103	07.13a	6	NS 560K	42.12a	24	PTS 300ELEMENT	102.6a	8	TG 3	06.14a	53
HS 120K	38.13a	16	NS 110x	08.14a	11	NS 590	04.2a	37	PTS 300 IMPULS	102.6a	8	TG 3A	06.14a	53
HS 140	11.15a	32	NS 110xK	08.14a	11	NS 590K	04.2a	37	PTS 300 SOLO	102.6a	8	TG 4	06.14a	53
HS 140K	11.15a	32	NS 111x	08.14a	11	NS 700 ALPHA	102.6a	8	PTS 300 TANGO	102.6a	8	TG 6	06.14a	59
HS 150A	12.6a	35	NS 111xK	08.14a	11	NS 700 ELEMENT	102.6a	8	PTS 300 TIME	102.6a	8	TG 7	06.14a	59
HS 160	42.12a	24	NS 112x	08.14a	11	NS 700 IMPULS	102.6a	8	PTS 300	07.13a	6	TG 8	06.14a	55
HS 160K	42.12a	24	NS 112xK	08.14a	11	NS 700 SOLO	102.6a	8	PTS 310x	08.14a	11	TG 8J	06.14a	55
HS 180K	51.11a	29	NS 113x	08.14a	11	NS 700 TANGO	102.6a	8	PTS 310xK	08.14a	11	TG 9	06.14a	54
HS 180P	51.11a	29	NS 113xK	08.14a	11	NS 700 TIME	102.6a	8	PTS 320	38.13a	16	TG 68	06.14a	55
HS 190	04.2a	37	NS 120	38.13a	16	NS 700	07.13a	6	PTS 320K	38.13a	16	TGL	06.14a	54
HS 190K	04.2a	37	NS 120K	38.13a	16	NS 710x	08.14a	11	PTS 340	11.15a	32	TGLJ	06.14a	54
<b>I</b>			NS 121	38.13a	16	NS 710xK	08.14a	11	PTS 340K	11.15a	32	TP 11E	37.18a	76
IPAQ C520	201.1a	101	NS 121K	38.13a	16	NS 720	38.13a	16	PTS 350A	12.6a	35	TP 13	80.6a	78
IPAQ-H PLUS	201.1a	101	NS 122	38.13a	16	NS 720K	38.13a	16	PTS 360	42.12a	24	TP 13A	80.6a	78
IPAQ-H	201.1a	100	NS 122K	38.13a	16	NS 740	11.15a	32	PTS 360K	42.12a	24	TP 15	79.7a	80
<b>J</b>			NS 123	38.13a	16	NS 740K	11.15a	32	PTS 380K	51.11a	29	TP 15A	79.7a	80
J 001	40.7a	89	NS 123K	38.13a	16	NS 760	42.12a	24	PTS 380P	51.11a	29	TP 15B	79.7a	80
J 010	40.7a	89	NS 140	11.15a	32	NS 760K	42.12a	24	PTS 390	04.2a	37	TP 16	118.4a	82
JPTS 41	40.7a	88	NS 140K	11.15a	32	NS 790	04.2a	37	PTS 390K	04.2a	37	TP 16A	118.4a	82
JPTS 641	40.7a	89	NS 141	11.15a	32	NS 790K	04.2a	37	PTS 441	29.3a	43	TR 011	06.14a	57
JS 130	40.7a	88	NS 141K	11.15a	32	NS 810A	08.14a	11	PTS 443	29.3a	43	TR 024	06.14a	53
JS 130B	40.7a	88	NS 142	11.15a	32	NS 810AK	08.14a	11	PTS 445	29.3a	43	TR 024A	06.14a	53
JTG 8	40.7a	89	NS 142K	11.15a	32	NS 820	38.13a	16	PTS 451	29.3a	43	TR 024K	06.14a	61
JTP 11	40.7a	89	NS 143	11.15a	32	NS 820K	38.13a	16	PTS 461	29.3a	43	TR 030	06.14a	58
JTP 15	40.7a	89	NS 143K	11.15a	32	NS 840	11.15a	32	PTS 463	29.3a	43	TR 046	06.14a	55
JTP 16	40.7a	89	NS 150A	12.6a	35	NS 840K	11.15a	32	PTS 465	29.3a	43	TR 046S	06.14a	61
<b>M</b>			NS 151A	12.6a	35	NS 860	42.12a	24	PTS 471	29.3a	43	TR 050A	06.14a	56
MESO-H	201.1a	100	NS 152A	12.6a	35	NS 860K	42.12a	24	PTS 481	116.2a	45	TR 050H	06.14a	56
MINI H 120	117.4a	19	NS 153A	12.6a	35	<b>P</b>			PTS 491	116.2a	45	TR 068C	06.14a	58
MINI H 120K	117.4a	19	NS 160	42.12a	24	PMA 300	201.1a	102	PTS 580K	51.11a	29	TR 080A	06.14a	57
MINI N 120	117.4a	19	NS 160K	42.12a	24	PP 200	201.1a	102	PTS 580P	51.11a	29	TR 081	06.14a	56
MINI N 120K	117.4a	19	NS 161	42.12a	24	PP 210	201.1a	102	PTS 641	30.2a	47	TR 093	06.14a	54
MINI N 121	117.4a	19	NS 161K	42.12a	24	PP 300	201.1a	102	PTS 645	30.2a	47	TR 093A	06.14a	54
MINI N 121K	117.4a	19	NS 162	42.12a	24	PPL100	201.1a	101	PTS 651	30.2a	47	TR 099	06.14a	61
MINI N 122	117.4a	19	NS 162K	42.12a	24	PROFIPAQ-H	201.1a	101	PTS 661	30.2a	47	TR 125	06.14a	53
MINI N 122K	117.4a	19	NS 180K	51.11a	29	PSTID	201.1a	102	PTS 665	30.2a	47	TR 125B	06.14a	62
MINI N 123	117.4a	19	NS 180P	51.11a	29	PTK 110	99.5a	14	PTS 671	30.2a	47	TR 129	06.14a	58
MINI N 123K	117.4a	19	NS 181K	51.11a	29	PTK 120	43.13a	22	PTS 681	122.2a	49	TR 141	06.14a	59
MINI N 320	117.4a	19	NS 181P	51.11a	29	PTK 160	101.5a	27	PTS 691	122.2a	49	TR 141A	06.14a	60
MINI N 320K	117.4a	19	NS 182K	51.11a	29	PTK 210	99.5a	14	PTSV 110	124.2a	116	TR 141B	06.14a	59
MINI N 321	117.4a	19	NS 182P	51.11a	29	PTK 220	43.13a	22	PTSV 120	125.2a	118	TR 141E	06.14a	60
MINI N 321K	117.4a	19	NS 183K	51.11a	29	PTK 260	101.5a	27	PTSV 130	126.2a	120	TR 151	09.5a	63
MINI N 520	117.4a	19	NS 183P	51.11a	29	PTK 310	99.5a	14	<b>S</b>			TR 152	09.5a	63
MINI P 120	117.4a	19												

## ■ GUARANTEE PERIODS FOR THE PRODUCTS

Resistance-based temp. sensors provided with a conn. head	48 months	Platinum-based sensors for temp. measurements up to 600 °C	24 months
Resistance-based temp. sensors provided with a cable	30 months	Portable thermometers	24 months
Paired temperature sensors	60 months	Temperature probes	24 months
Temperature sensors with current and voltage output	30 months	Switches, thermostats	24 months
Temperature sensors with frequency output	30 months	Humidity sensors	24 months
Converters Temperature/Current and Temperature/Voltage	30 months	Flow sensors, Flow switches	24 months
Digital output temperature sensors	24 months	Custom-made products	individual guarantee period

Guarantee period for the particular product is listed in the instruction manual.

## ■ PRINCIPAL CLASSIFICATION OF THE TEMPERATURE SENSORS

### According to the application

- Control of heating systems
- HVAC equipment
- Energy systems
- Heat meters
- Laboratories
- Machinery and equipment
- Custom made temperature sensors
- Process industry
- Automotive technology
- Home appliances
- Food processing industry
- Health service
- Chemical industry, etc.

### According to the sensing element type

#### Nickel types

- Ni 1000 / 5000 (e.g. LANDIS)
- Ni 1000 / 6180 (e.g. SAUTER, SAIA, AMIT, TECO)
- Ni 891 (e.g. JOHNSON CONTROLS)
- T1 (e.g. STAEFA CONTROLS) = Ni 2226
- Ni 10000 / 5000
- Ni 10000 / 6180

#### Platinum types

- Pt 100 / 3850
- Pt 100 / 3911
- Pt 500 / 3850
- Pt 1000 / 3850

#### Thermistor types

- NTC 20 kΩ (e.g. HONEYWELL)
- NTC 10 kΩ, etc.

#### Semiconductor types

- DALLAS 18B20
- KTY 81-X
- KTY 83-X
- SMT 160-30
- ADT 7301
- TSic 20X / 30X

#### Thermocouple types

- type K
- type J
- type T

### According to the output signal

#### Resistive

- Pt, Ni
- NTC
- PTC
- KTY

#### Current output

- Output signal 4–20 mA

#### Voltage output

- Output signal 0–10 V
- According to the type of Thermocouple
- Special (TSic, LM35)

#### Digital output

- ADAM 4000 Protocol
- AMIT Protocol
- MODBUS Protocol
- ADT 7301
- DS 18B20
- TSic

#### Frequency output

- 1–5 kHz
- 2–10 kHz
- 3–15 kHz
- SMT 160-30

## ■ KALIBRATIE EN REPARATIE

Na de productie zal aan de sensor of het meetinstrument een initiële kalibratie worden uitgevoerd, e.e.a. in het kader van het productieproces van de fabrikant en de lokaal geldende wettelijke bepalingen. Er wordt gewaarborgd dat het meetmiddel voldoet aan de door de fabrikant gestelde specificaties, e.e.a. conform wettelijke bepalingen. De sensoren en meetinstrumenten zoals in deze catalogus staan gespecificeerd voldoen aan lokale wettelijke voorschriften, waarin de Richtlijnen 2002/95/EEC en 2002/96/EG werden geïmplementeerd.

In het geval van een defect van een sensor of meetinstrument kan dit bij ATAL ter reparatie worden aangeboden, compleet met een heldere omschrijving van het defect of klacht en een ingevuld "Reparatie Retour Formulier" (te downloaden van onze website [www.atal.nl](http://www.atal.nl)). Reparaties kunnen gedurende en na de garantieperiode worden verricht. Klachten, garantie aanspraken, reparaties en/of verwijdering van sensoren zullen overeenkomstig de Algemene Voorwaarden van ATAL B.V. worden uitgevoerd. De Algemene Voorwaarden worden op uw verzoek gratis verstrekt of deze zijn in te zien op onze website [www.atal.nl](http://www.atal.nl)

## ■ CALIBRATION, REPAIRS AND DISPOSAL

After production the sensor or measuring instrument will be subject to an initial calibration, within the framework of the manufacturing processes, to comply with common local regulations. It is ensured that the instrument or sensor meets the specifications set by the manufacturer, all this in accordance with legal provisions. The sensors and instruments as are specified in this catalog comply with legal requirements in which the Council Directives 2002/95/EEC and 2002/96/EC have been implemented.

In the case of a defect/failure of a sensor or instrument, the faulty product may be submitted for repair at ATAL, complete with a clear description of the defect or complaint and a completed "Repair Return Form" (to be downloaded from our website [www.atal.nl](http://www.atal.nl)). Repairs may be submitted to ATAL during and after the warranty term. Complaints, warranty claims, repairs and/or disposal of sensors/measuring instruments will be in accordance with the terms as laid out in the General Conditions of ATAL B.V. These General Conditions are provided free of charge at customers request, or can be viewed and downloaded from our website [www.atal.nl](http://www.atal.nl)

## ■ CONTACTS

ATAL B.V., Ampèrestraat 35-37, NL-1446 TR PURMEREND | Correspondence: P.O. Box 783, NL-1440 AT PURMEREND  
Tel: (+31) (0)299 630 610 | Fax: (+31) (0)299 630 611 | Email: [info@atal.nl](mailto:info@atal.nl) | Web: [www.atal.nl](http://www.atal.nl) |

## INDOOR TEMPERATURE SENSORS



### DESCRIPTION AND APPLICATION

These resistance-type sensors are intended for temperature measurement of gaseous substances in water-protected rooms. The standard temperature range in which the sensors are allowed to be utilised is -30 to 100 °C. The plastic enclosure is made of LEXAN 503RS (grey, ivory) or ABS (white) material.

The sensors can be utilised for control systems that are compatible with sensing element output signals or output signals quoted in the table of sensing element types.

The sensors are designed to be operated in a chemically non-aggressive environment.



### DECLARATION, CERTIFICATES, CALIBRATION

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA and 0 to 10 V.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.

### SPECIFICATIONS

#### BASIC DATA

Sensor type	NS 100	NS 101	NS 102	NS 300	NS 301
Type of sensing element	Ni 1000/5000	Ni 1000/6180	Ni 891	Ni 10000/5000	Ni 10000/6180
Measuring range	-30 to 100 °C LEXAN 503RS 5 to 55 °C (for short period -20 to 75 °C) ABS				
Maximum measuring DC current	1 mA	1 mA	1 mA	0.3 mA	0.3 mA

Sensor type	NS 103	PTS 100	PTS 200	PTS 300	HS 100
Type of sensing element	T1 = Ni 2226	PT 100/3850	PT 500/3850	PT 1000/3850	termistor NTC 20 kΩ
Measuring range	-30 to 100 °C LEXAN 503RS 5 to 55 °C (for short period -20 to 75 °C) ABS				
Maximum measuring DC current	0.7 mA	3 mA	1.5 mA	1 mA	1 mW *)

\*) maximum power consumption

Sensor type	NS 500	NS 700	Note
Type of sensing element	Pt 1000/3850	Pt 1000/3850	
Output	4 to 20 mA	0 to 10 V	
Measuring ranges	-30 to 60 °C	-30 to 60 °C	Enclosure ambient temperature
	0 to 35 °C	0 to 35 °C	
	0 to 100 °C	0 to 100 °C	
	0 to 150 °C	0 to 150 °C	
Voltage supply ( $V_{CC}$ )	11 to 30 V DC	15 to 30 V DC	Recommended value
Maximum ripple $V_{CC}$	0.5 %	0.5 %	NS 500: 12 V DC NS 700: 24 V DC
Load resistance	$50(V_{CC}-10) \Omega$	$> 50 \text{ k}\Omega$	
Sensing element break	$> 24 \text{ mA}$	$> 10.5 \text{ V}$	
Sensing element short	$< 3.5 \text{ mA}$	$\sim 0 \text{ V}$	

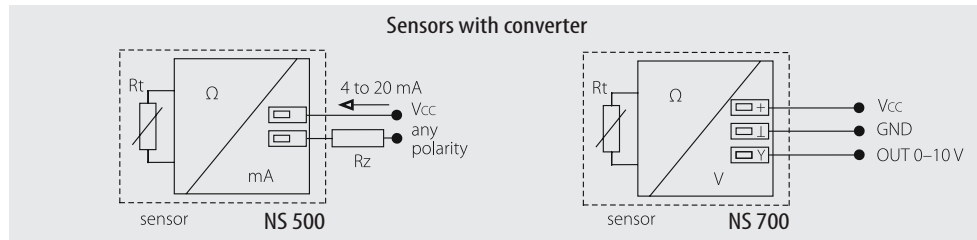
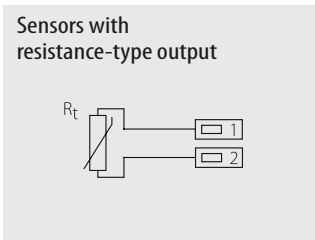
#### OTHER PARAMETERS

Accuracy class	Ni sensing elements: B class, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: B class according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C NTC 20 kΩ: $\pm 1$ °C for the range 0 to 70 °C
Measuring error for NS 500	$\pm 1.5$ °C
Measuring error for NS 700	$< 0.6$ % of the measuring range, minimum 0.5 °C
Sensor connection	according to the wiring diagram
Response time	$\tau_{0.5} < 8 \text{ s}$ (in air streaming at the velocity 1 m.s <sup>-1</sup> )
Recommended wire cross section	0.35 to 1.5 mm <sup>2</sup>
Ingress protection	IP 30 according to EN 60 529

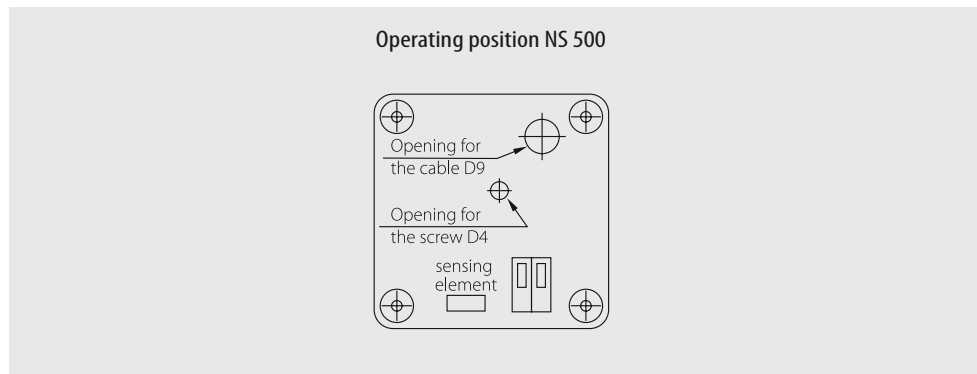
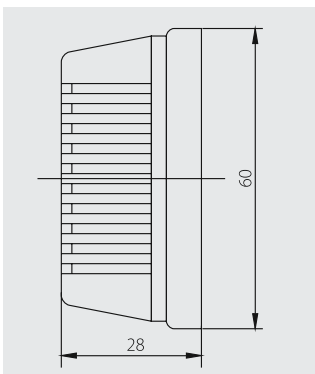
## INDOOR TEMPERATURE SENSORS

<b>Material of the enclosure</b>	LEXAN 503RS (grey, ivory), ABS (white colour)
<b>Operating conditions</b>	ambient temperature: -30 to 100 °C LEXAN
	-30 to 80 °C LEXAN with a converter
	5 to 55 °C (for a short period -20 to 75 °C) ABS
<b>Weight</b>	relative humidity: max 85 % (at the ambient temperature 25 °C)
	atmospheric pressure: 87 to 107 kPa
<b>Weight</b>	approximately 0.1 kg

### WIRING DIAGRAM



### DIMENSIONAL DRAFT



### SENSOR INSTALLATION AND SERVICING

Prior to connecting the supply lead-in cable, separate the perforated lid from the plastic box base. While doing this, proceed carefully not to mechanically damage the sensing element or the converter components. The lead-in cable is connected according to the wiring diagram by pushing it through the 9 mm opening and fastening it in the WAGO terminals. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>.

In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used.

After connecting the lead-in cable the box base is to be fastened to a plane surface by using a screw with a diameter of maximum 4 mm. In the last installation step the perforated lid is put into the corresponding base openings and snapped in.

After installing and connecting the sensor to the sequential evaluating electrical equipment the sensor is ready to use. The sensor does not require any special service or maintenance. Except for the NS 500 type it can be situated in any operating position. The NS 500 operation position is illustrated in the paragraph 4.

### CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- option enclosing two sensors
- option enclosing non-standard temperature sensors (DALLAS, TSic, KTY, SMT, etc.)
- class A precision type of temperature element (with the exception of sensors Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, thermistor NTC 20 kΩ)
- option of three- or four-wire connection
- sensor head colour – ivory white, white, etc.



## INDOOR TEMPERATURE SENSORS IN ABB DESIGN

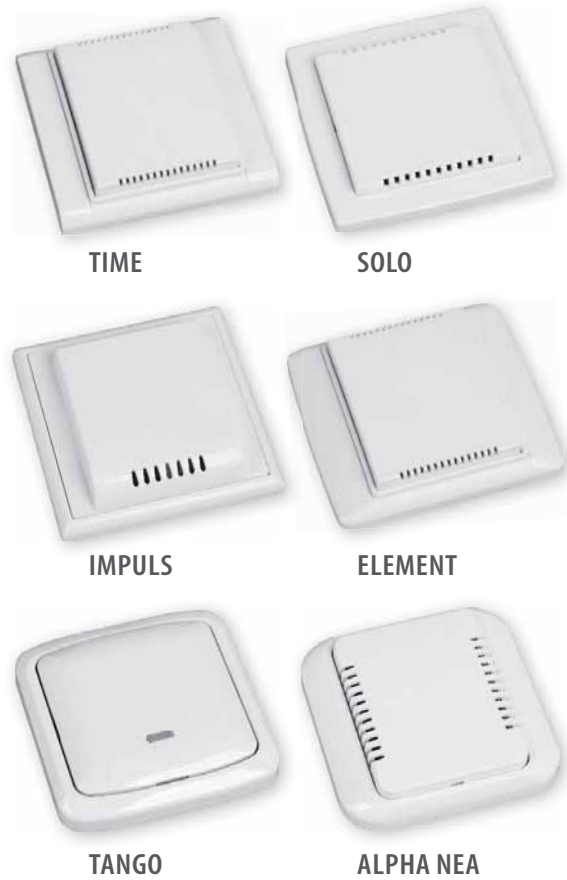
### DESCRIPTION AND APPLICATION

These resistance-type sensors are intended for temperature measurements in interiors and that is why they meet high aesthetic demands. Standard temperature operating range is between 5 and 55 °C (-20 to 75 °C for a short time).

The sensor design is based on the standard design of household wiring material of ABB - Alpha nea, Impuls, Solo, Tango, Time and Element. The standard colour for the Alpha nea line is white matte. For Solo, Tango, Element and Time – white, and alpine white for the Impuls line.

The sensors can be utilised for control systems that are compatible with sensing element output signals or output signals quoted in the table of sensing element types.

The sensors are designed to be operated in a chemically non-aggressive environment.



### DECLARATION, CERTIFICATES, CALIBRATION

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA and 0 to 10 V.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.



Upon the wishes of the customer, sensors can be supplied in the designs of the following companies: SCHNEIDER, LEGRAND, UNICA.

### SPECIFICATIONS

#### BASIC DATA

Sensor type	NS 100 xxxx	NS 101 xxxx	NS 102 xxxx	NS 300 xxxx	NS 301 xxxx
Type of sensing element	Ni 1000/5000	Ni 1000/6180	Ni 891	Ni 10000/5000	Ni 10000/6180
Measuring range	5 to 55 °C (for short period -20 to 75 °C)				
Maximum measuring DC current	1 mA	1 mA	1 mA	0.3 mA	0.3 mA

Sensor type	NS 103 xxxx	PTS 100 xxxx	PTS 200 xxxx	PTS 300 xxxx	HS 100 xxxx
Type of sensing element	T1 = Ni 2226	PT 100/3850	PT 500/3850	PT 1000/3850	thermistor NTC 20 kΩ
Measuring range	5 to 55 °C (for short period -20 to 75 °C)				
Maximum measuring DC current	0.7 mA	3 mA	1.5 mA	1 mA	1 mW *)

\*) maximum power consumption

Sensor type	NS 500 TANGO	NS 700 xxxx	Note
Type of sensing element	Pt 1000/3850	Pt 1000/3850	
Output	4 to 20 mA	0 to 10 V	
Measuring ranges	-30 to 60 °C	-30 to 60 °C	Enclosure ambient temperature 5 to 55 °C (for short period -20 to 75 °C)
	0 to 35 °C	0 to 35 °C	
	0 to 100 °C	0 to 100 °C	
	0 to 150 °C	0 to 150 °C	
Voltage supply (V <sub>CC</sub> )	11 to 30 V DC	15 to 30 V DC	Recommended value NS 500: 12 V DC NS 700: 24 V DC
Maximum ripple V <sub>CC</sub>	0.5 %	0.5 %	
Load resistance	50(V <sub>CC</sub> -10) Ω	> 50 kΩ	
Sensing element break	> 24 mA	> 10.5 V	
Sensing element short	< 3 mA	~ 0 V	

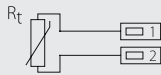
## INDOOR TEMPERATURE SENSORS IN ABB DESIGN

### OTHER PARAMETERS

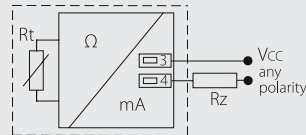
Accuracy class	Ni sensing elements: B class, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: B class according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C; NTC 20 k $\Omega$ : $\pm 1$ °C for the range 0 to 70 °C
Measuring error for NS 500 xxxx	$\pm 0.5$ °C (with correction), $-0.5$ to $2.2$ °C (without correction)
Measuring error for NS 700 TANGO	$< 0.6$ % of the measuring range, minimum $0.5$ °C
Sensor connection	according to the wiring diagram
Recommended wire cross section	0.35 to 1.5 mm <sup>2</sup>
Ingress protection	IMPULS – IP20; ALPHA NEA, SOLO, ELEMENT, TIME – IP 30; TANGO – IP50 according to EN 60 529
Material of the enclosure	ABS
Operating conditions	ambient temperature: $5$ to $55$ °C (for a short period $-20$ to $75$ °C)
	relative humidity: max $85$ % (at the ambient temperature $25$ °C)
	atmospheric pressure: $87$ to $107$ kPa
Weight	approximately $0.1$ kg

### WIRING DIAGRAM

#### Sensors with resistance-type output

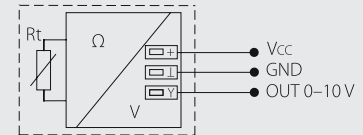


#### With the converter 4 to 20 mA



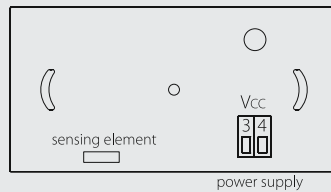
NS 500 ABB

#### With the converter 0 to 10 V



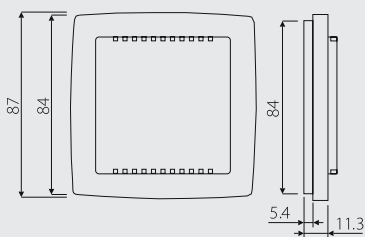
NS 700 ABB

#### Operating position of the sensor DPS NS 500 ABB

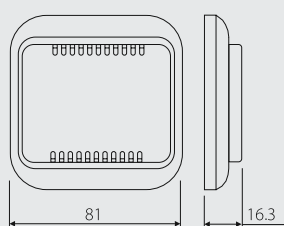


### DIMENSIONAL DRAFT

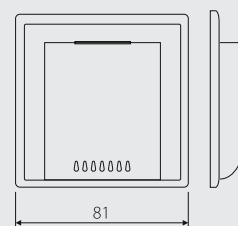
Design: **SOLO**  
Sensor series: NS x0x SOLO  
PTS x00 SOLO  
HS 100 SOLO



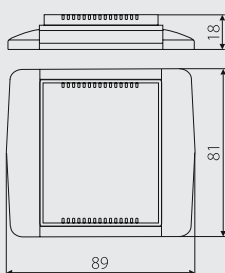
Design: **ALPHA NEA**  
Sensor series: NS x0x ALPHA  
PTS x00 ALPHA  
HS 100 ALPHA



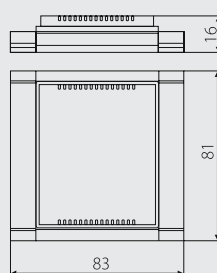
Design: **IMPULS**  
Sensor series: NS x0x IMPULS  
PTS x00 IMPULS  
HS 100 IMPULS



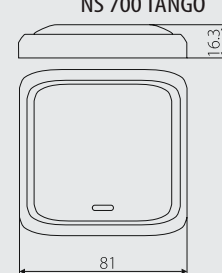
Design: **ELEMENT**  
Sensor series: NS x0x ELEMENT  
PTS x00 ELEMENT  
HS 100 ELEMENT  
NS 700 ELEMENT



Design: **TIME**  
Sensor series: NS x0x TIME  
PTS x00 TIME  
HS 100 TIME  
NS 700 TIME



Design: **TANGO**  
Sensor series: NS x0x TANGO  
PTS x00 TANGO  
HS 100 TANGO  
NS 500 TANGO  
NS 700 TANGO



## INDOOR TEMPERATURE SENSORS IN ABB DESIGN

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### ■ SENSOR INSTALLATION AND SERVICING

#### ALPHA NEA, TANGO:

The lead-in cable is connected to the terminal boards according to the wiring diagram by pushing it through the 9 mm opening in the printed board. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>. The printed board should be inserted in the frame and screwed to the wiring box by means of screws M3 x 14. The openings in the board enable to proper turning of the printed board and the frame on the wall. Finally, the cover is inserted in the frame by slight pressure.

#### IMPULS, SOLO, ELEMENT, TIME:

The lead-in cable is connected to the terminal boards according to the wiring diagram by pushing it through the 9 mm opening in the printed board. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>. The printed board should be screwed to the wiring box by means of screws M3 x 10. The openings in the board enable to proper turning of the printed board and the frame on the wall. Finally, the frame is put on the printed board and the cover is inserted in the frame by slight pressure. By disassembly the reverse order is used. The cover is unfastened by slight leverage by means of flat screwdriver. In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. After installing and connecting the sensor to the sequential evaluating electrical equipment the sensor is ready to use. The sensor does not require any special servicing or maintenance. The operating position is presented in the WIRING DIAGRAM section.

### ■ CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- option enclosing two sensors
- option enclosing non-standard temperature sensors (DALLAS, TSic, KTY, SMT, etc.)
- class A precision type of temperature element (with the exception of sensors Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, thermistor NTC 20 kΩ)
- option of three- or four-wire connection
- the colour of plastic sensor parts – according to the manufacturer's swatch



## DESCRIPTION AND APPLICATION

These resistance-type sensors are intended for contact temperature measurement of gaseous substances. The plastic enclosure is provided with a cable outlet bushing (terminal board is located in the head) or a connector. The standard temperature range in which the sensors are allowed to be utilised is -30 to +100 °C. The sensors can be utilised for control systems that are compatible with sensing element output signals or output signals quoted in the table of sensing element types. Easy mounting of the temperature sensor is ensured by the unique “S head” design. The sensors are designed to be operated in a chemically non-aggressive environment.

## ACCESSORIES

- For the version with connector:
  - led-in connector ELKA 4012 or RKCS 4/9
  - connection cable with the straight-type RKT connector
  - connection cable with the rectangular-type RKWT connector.

## DECLARATION, CERTIFICATES, CALIBRATION

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA, 0 to 10 V and frequency.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.

**Caution:** The temperature sensors with the output 4–20 mA and frequency output can be delivered with the new enclosure only in the version A.



## SPECIFICATIONS



We also offer these sensors in the design for explosive environments – see catalogue data sheet no. 13.4.

### BASIC DATA

Sensor type (K – with connector)	NS 110x NS 110xK	NS 111x NS 111xK	NS 112x NS 112xK	NS 310x NS 310xK	NS 311x NS 311xK
Type of sensing element	Ni 1000/5000	Ni 1000/6180	Ni 891	Ni 10000/5000	Ni 10000/6180
Measuring range	-30 to 100 °C				
Maximum measuring DC current	1 mA	1 mA	1 mA	0.3 mA	0.3 mA

Sensor type (K – with connector)	NS 113x NS 113xK	PTS 110x PTS 110xK	PTS 210x PTS 210xK	PTS 310x PTS 310xK	HS 110x HS 110xK
Type of sensing element	T1 = Ni 2226	PT 100/3850	PT 500/3850	PT 1000/3850	thermistor NTC 20 kΩ
Measuring range	-30 to 100 °C				
Maximum measuring DC current	0.7 mA	3 mA	1.5 mA	1 mA	1 mW *)

\*) maximum power consumption

Sensor type (K – with connector)	NS 510A NS 510AK	NS 710x NS 710xK	NS 810A NS 810AK	Note
Type of sensing element	Pt 1000/3850	Pt 1000/3850	Pt 1000/3850	
Output	4 to 20 mA	0 to 10 V	1 to 5 kHz 2 to 10 kHz 3 to 15kHz	
Measuring ranges	-30 to 60 °C 0 to 35 °C 0 to 100 °C 0 to 150 °C	-30 to 60 °C 0 to 35 °C 0 to 100 °C 0 to 150 °C	Any measuring range, minimum span 50 °C	Enclosure ambient temperature -30 to 80 °C; for NS 810AK -30 to 70 °C
Voltage supply (V <sub>cc</sub> )	11 to 30 V DC	15 to 30 V DC	8 to 30 V <sub>ss</sub>	Recommended value 24 V DC; Recommended power supply for NS 820(K) 12 V DC Axima AXSP3P02012
Maximum ripple V <sub>cc</sub>	0.5 %	0.5 %	0.5 %	
Load resistance R <sub>z</sub>	50(V <sub>cc</sub> -10) Ω	> 50 kΩ	> 1 kΩ	
Output signal - sensing element break	> 24 mA	> 10.5 V	Adjustable (< low range or high range>)	
Output signal - sensing element short	< 3.5 mA	~ 0 V		

Note: x = version A or version B

# TEMPERATURE SENSORS FOR OUTDOOR PURPOSES WITH A PLASTIC ENCLOSURE

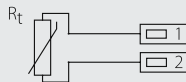
## OTHER PARAMETERS

Accuracy class	Ni sensing elements: B class, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: B class according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C NTC 20 k $\Omega$ : $\pm 1$ °C for the range 0 to 70 °C
Measuring error	< 0.6 % of the measuring range, minimum 0.5 °C NS 820(K) 0.5 °C for range with a span < 100 °C, < 0.6% of the range with a span > 100 °C
Sensor connection	according to the wiring diagram
Standard length of the stem (version A)	for resistance output and for output 0 to 10 V - 25 mm for output 4 to 20 mA - 50 mm
Response time	$T_{0.5} < 9$ s (in streaming air at $1 \text{ m s}^{-1}$ ) – version A $T_{0.5} \leq 30$ s (in streaming air at $1 \text{ m s}^{-1}$ ) – version B
Recommended wire cross section – sensors with grommet	0.35 to 1.5 mm <sup>2</sup>
Type of connector in the head – sensors with connector	RSFM4 - Lumberg
Insulation resistance	> 200 M $\Omega$ at 500 V DC, $25^\circ \pm 3$ °C; humidity < 85 %
Ingress protection	IP 65 according to EN 60 529
Material of the sensor stem	stainless steel 1.4301 – version A
Material of the enclosure	POLYAMID
Operating conditions	ambient temperature: -30 to 100 °C; -30 to 80 °C with a converter; -30 to 70 °C with frequency output relative humidity: max. 85 % ((at the ambient temperature 25 °C) atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.15 kg

## WIRING DIAGRAM

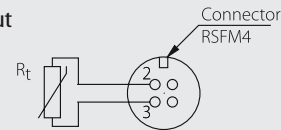
### SENSOR WITH THE GROMMET:

With a resistance output



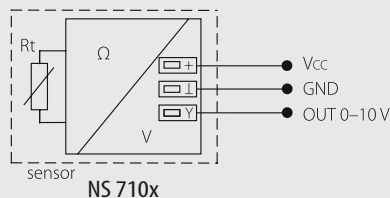
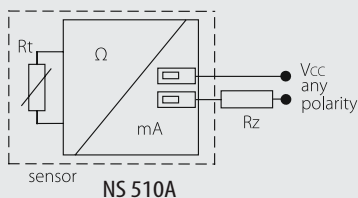
### SENSOR WITH CONNECTOR:

With a resistance output

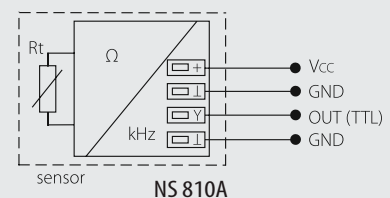


### SENSOR WITH THE GROMMET:

With a converter

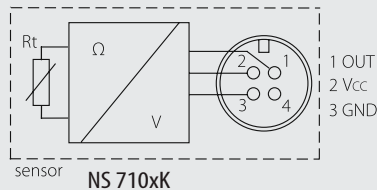
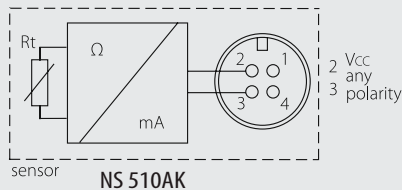


With frequency output

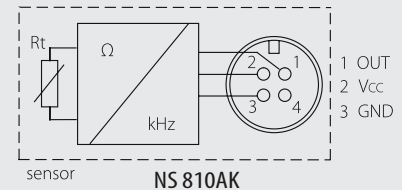


### SENSOR WITH CONNECTOR:

With a converter

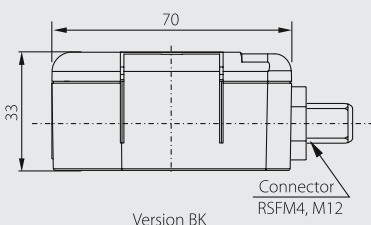


With frequency output

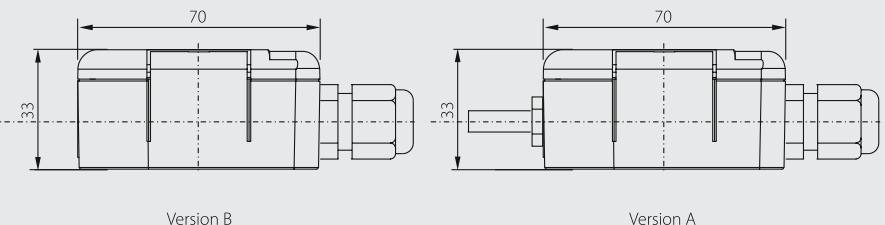


## DIMENSIONAL DRAFT

Sensors with connector



Sensors with the grommet:





## ■ SENSOR INSTALLATION AND SERVICING

### SENSORS WITH GROMMET:

Before connecting the supply lead-in cable, lift off the lid of the plastic enclosure by means of a flat screwdriver. The lead-in cable is connected to the terminals according to the wiring diagram through the loosened grommet. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm. To ensure the ingress protection value of IP 65, the grommet has to be tightened and the lid has to be put on after connecting the lead-in cable.

### SENSORS WITH CONNECTOR:

The lead-in cable with connector is connected to the connector RSFM4, which is the part of the sensor head. Optionally the stand-alone connector ELKA 4012, or a lead-in cable of the length of 5 m equipped with a straight-type RKT connector, or with a rectangular-type RKWT connector may be delivered. To ensure the ingress protection value of IP 65 the connectors and the lid of sensor have to be tightened and checked. In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. The openings for the plastic clip installation have to be drilled according to the dimensioned sketch on which the opening diameters and the distances of their centres are illustrated. After installing and connecting the sensor to the sequential evaluating electrical equipment the sensor is ready to use. The sensor does not require any special servicing or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards. Sensors are mounted by means of two methods: a) directly on flat surface by means of two screws  $\varnothing$  4.5 mm in the openings placed in head corners. The 13 mm (distance to the barrier in the enclosure) must be added to the necessary length for fastening to a basis; b) by means of the side holder which should be fastened for example on a wall by means of two screws  $\varnothing$  4.5 mm. To ensure the tightness it is necessary to tighten the grommet carefully. During closing of the head by means of the lid the clips should be snapped in original position.

## ■ CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- option enclosing two sensors
- option enclosing non-standard temperature sensors (DALLAS, TSic, KTY, SMT, etc.)
- class A precision type of temperature element (with the exception of sensors Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, thermistor NTC 20 k $\Omega$ )
- option of three- or four-wire connection



## DESCRIPTION AND APPLICATION

These resistance-type sensors are intended for contact temperature measurement of gaseous substances outdoors or in industrial areas. The standard operating temperature range is -30 to 100 °C. The sensors can be utilised for control systems that are compatible with sensing element output signals or output signals quoted in the table of sensing element types.

The sensors are designed to be operated in a chemically non-aggressive environment.

## ACCESSORIES

- The metal central holder K110.

## DECLARATION, CERTIFICATES, CALIBRATION

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.



## SPECIFICATIONS

### BASIC DATA

Sensor type	NK 110	NK 111	NK 112	NK 310	NK 311
Type of sensing element	Ni 1000/5000	Ni 1000/6180	Ni 891	Ni 10000/5000	Ni 10000/6180
Measuring range	-30 to 100 °C				
Maximum measuring DC current	1 mA	1 mA	1 mA	0.3 mA	0.3 mA

Sensor type	NK 113	PTK 110	PTK 210	PTK 310	HK 110
Type of sensing element	T1 = Ni 2226	PT 100/3850	PT 500/3850	PT 1000/3850	thermistor NTC 20 kΩ
Measuring range	-30 to 100 °C				
Maximum measuring DC current	0.7 mA	3 mA	1.5 mA	1 mA	1 mW *)

\*) maximum power consumption

Sensor type	NK 510	Note
Type of sensing element	Pt 1000/3850	
Output signal	4 to 20 mA	
Measuring ranges	-30 to 60 °C	Connection head ambient temperature -30 to 80 °C
	0 to 35 °C	
	0 to 100 °C	
	0 to 150 °C	
Measuring error	< 0,6 % of the range	0.5 °C at least
Power supply (V <sub>CC</sub> )	10 to 30 V DC	Recommended value 24 V DC
Maximum voltage ripple V <sub>CC</sub>	0.5 %	
Load resistance	50(V <sub>CC</sub> -9) Ω	
Output signal	> 24 mA	
- sensing element break		
Output signal	< 3.5 mA	
- sensing element short		

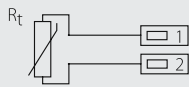
### OTHER PARAMETERS

Accuracy class	Ni sensing elements: B class, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: B class according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C NTC 20 kΩ: $\pm 1$ °C for the range 0 to 70 °C
Sensing element connection	according to the wiring diagram
Standard length of the stem	for resistance output - 25 mm for output 4 to 20 mA - 50 mm
Response time	$\tau_{0.5} < 9$ s (in air streaming at 1 m s <sup>-1</sup> )

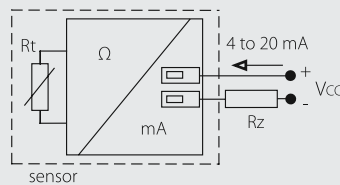
Recommended wire cross section	0.35 to 1.5 mm <sup>2</sup>
Insulation resistance	> 200 MΩ at 500 V DC, 25° ±3 °C; humidity < 85 %
Ingress protection	IP 54 according to EN 60 529
Material of the stem	stainless steel 1.4301
Type of connection head	LIMATHERM MA
Material of the connection head	aluminium alloy
Operating conditions	ambient temperature: -30 to 100 °C; -30 to 80 °C with a converter
	relative humidity: max. 85 % (at the ambient temperature 25 °C)
	atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.2 kg

## WIRING DIAGRAM

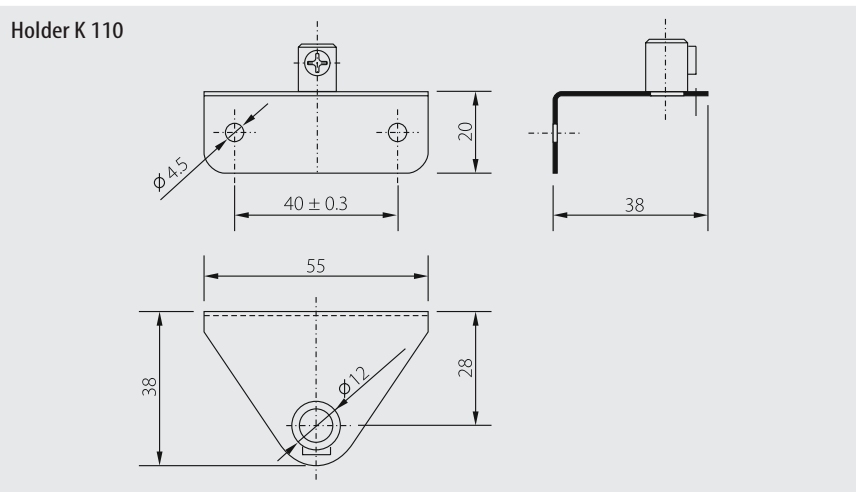
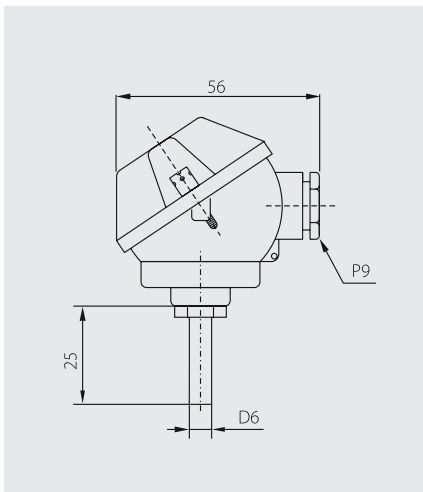
With a resistance-type output



With a converter 4 to 20 mA



## DIMENSIONAL DRAFT



## SENSOR INSTALLATION AND SERVICING

Prior to connecting the lead-in cable unscrew the lid of the metal connection head. The lead-in cable is then connected to the corresponding terminals through the loosend grommet according to the wiring diagram. Recommended wire cross-section is 0.35 to 1.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm. In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. To ensure the ingress protection value of IP 54 the grommet has to be tightened and the lid has to be screwed on after connecting the lead-in cable. The openings for installation of stainless steel holder are drilled according to the dimensional draft, where hole diameters and distances between hole centers can be found. After installing and connecting the sensor to the appropriate electrical equipment, the sensor is ready to use. The sensor does not require any special servicing or maintenance. The sensors can be placed in any operating position but the grommet must not be directed upwards.

## CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- option enclosing two sensors
- option enclosing non-standard temperature sensors (DALLAS, TSic, KTY, SMT, etc.)
- class A precision type of temperature element (with the exception of sensors Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, thermistor NTC 20 kΩ)
- option of three- or four-wire connection



## DESCRIPTION AND APPLICATION

These resistance-type sensors are intended for contact temperature measurements of liquid or gaseous substances. The plastic enclosure is provided with a cable outlet ending (the terminal board is placed in the enclosure) or a connector. The sensor-central holder combination is suitable for temperature measurements in air condition ducts. The sensor-thermowell combination is suitable for temperature measurements in tubing. The sensor variant with welded thread is ideal for direct measuring of various media in ducts. The standard operating temperature range is -30 to 150 °C. By using a sensor with a longer stem the upper limit of allowable temperature can be extended up to 250 °C. The sensors can be utilised for control systems that are compatible with sensing element output signals or output signals quoted in the table of sensing element types. Easy mounting of the temperature sensor is ensured by the unique "S head" design. The sensors are designed for operation in chemically non-aggressive environment.



## ACCESSORIES

- The central plastic holder – it is part of the sensor
- The thermowell JS 130
- The metal central holder K120
- For the version with connector:
  - led-in connector ELKA 4012 or RKCS 4/9
  - connection cable with the straight-type RKT connector
  - connection cable with the rectangular-type RKWT connector.

## DECLARATION, CERTIFICATES, CALIBRATION

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA, 0 to 10 V and frequency.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.

## SPECIFICATIONS



We also offer these sensors in the design for explosive environments – see catalogue data sheet no. 13.4.

### BASIC DATA

Sensor type (K – with connector)	NS 120 NS 120K	NS 121 NS 121K	NS 122 NS 122K	NS 320 NS 320K	NS 321 NS 321K
Type of sensing element	Ni 1000/5000	Ni 1000/6180	Ni 891	Ni 10000/5000	Ni 10000/6180
Measuring range	-30 to 150 °C				
Maximum measuring DC current	1 mA	1 mA	1 mA	0.3 mA	0.3 mA

Sensor type (K – with connector)	NS 123 NS 123K	PTS 120 PTS 120K	PTS 220 PTS 220K	PTS 320 PTS 320K	HS 120 HS 120K
Type of sensing element	T1 = Ni 2226	PT 100/3850	PT 500/3850	PT 1000/3850	thermistor NTC 20 kΩ
Measuring range	-30 to 150 °C	-50 to 150 °C (enclosure ambient temperature -30 to 100 °C)			-30 to 150 °C
Maximum measuring DC current	0.7 mA	3 mA	1.5 mA	1 mA	10 mW *)

\*) maximum power consumption

Sensor type (K – with connector)	NS 520 NS 520K	NS 720 NS 720K	NS 820 NS 820K	Note
Type of sensing element	Pt 1000/3850	Pt 1000/3850	Pt 1000/3850	
Output signal	4 to 20 mA	0 to 10 V	1 to 5 kHz 2 to 10 kHz 3 to 15 kHz	
Measuring ranges	-50 to 50 °C -30 to 60 °C 0 to 35 °C 0 to 100 °C 0 to 150 °C 0 to 200 °C 0 to 250 °C	-30 to 60 °C 0 to 35 °C 0 to 100 °C 0 to 150 °C 0 to 200 °C 0 to 250 °C	Any measuring range, minimum span 50 °C	Enclosure ambient temperature -30 to 80 °C; for NS 820(K) -30 to 70 °C
Power supply (V <sub>CC</sub> )	11 to 30 V DC	15 to 30 V DC	8 to 30 V DC	Recommended value 24 V DC; Recommended power supply for NS 820(K) 12 V DC Axima AXSP3P02012
Maximum voltage ripple V <sub>CC</sub>	0.5 %	0.5 %	0.5 %	
Load resistance	50(V <sub>CC</sub> -10) Ω	> 50 kΩ	> 1 kΩ	
Output signal - sensing element break	> 24 mA	> 10.5 V	Adjustable (< low range or high range>)	
Output signal - sensing element short	< 3.5 mA	~ 0 V		

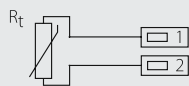
## OTHER PARAMETERS

Accuracy class	Ni sensing elements: class B, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in $^{\circ}\text{C}$ ; Pt sensing elements: class B according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in $^{\circ}\text{C}$ NTC 20 k $\Omega$ : $\pm 1^{\circ}\text{C}$ for the range 0 to 70 $^{\circ}\text{C}$
Measuring error for NS 520(K), NS 720(K) and NS 820(K)	< 0.6 % of the measuring range, minimum 0.5 $^{\circ}\text{C}$ NS 820(K) 0.5 $^{\circ}\text{C}$ for range with a span < 100 $^{\circ}\text{C}$ , < 0.6 % of the range with a span > 100 $^{\circ}\text{C}$
Sensor connection	according to the wiring diagram
Standard length of stem L1	70, 120, 180, 240, 300, 360, 420 mm
Response time	$t_{0.5} < 9$ s (in streaming water at 0.4 $\text{m}\cdot\text{s}^{-1}$ )
Recommended wire cross section - sensors with the grommet	0.35 to 1.5 $\text{mm}^2$
Type of connector in the head - sensors with connector	RSFM4 - Lumberg
Insulation resistance	> 200 M $\Omega$ at 500 V DC, 25 $^{\circ} \pm 3^{\circ}\text{C}$ ; humidity < 85 %
Ingress protection	IP 65 according to EN 60 529
Material of the sensor stem	stainless steel 1.4301
Material of the enclosure	POLYAMID
Operating conditions	ambient temperature: -30 to 100 $^{\circ}\text{C}$ ; -30 to 80 $^{\circ}\text{C}$ with a converter; -30 to 70 $^{\circ}\text{C}$ with frequency output relative humidity: max. 85 % (at the ambient temperature 25 $^{\circ}\text{C}$ ) atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.15 kg

## WIRING DIAGRAM

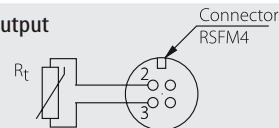
### SENSOR WITH THE GROMMET:

With resistance-type output



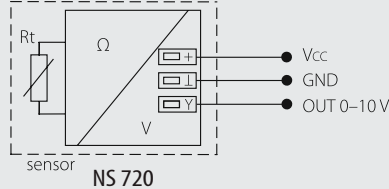
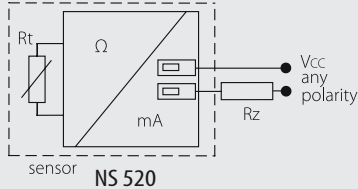
### SENSOR WITH THE CONNECTOR:

With resistance-type output

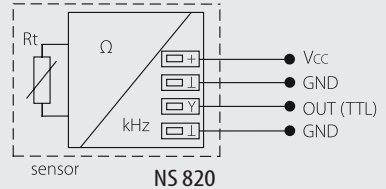


### SENSOR WITH THE GROMMET:

With the converter

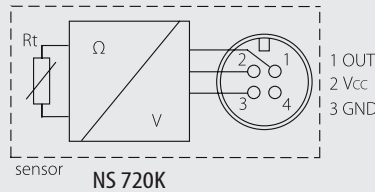
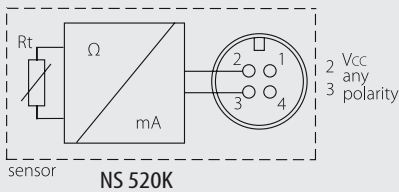


With frequency output

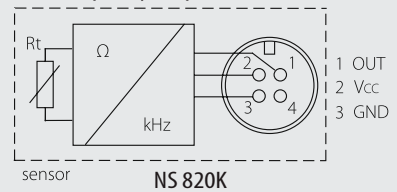


### SENSOR WITH THE CONNECTOR:

With the converter

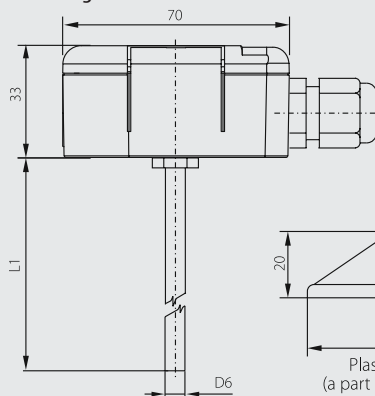


With frequency output

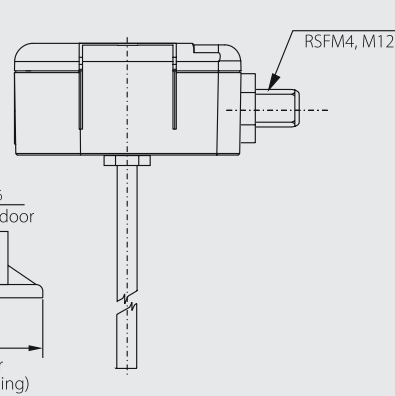


## DIMENSIONAL DRAFT

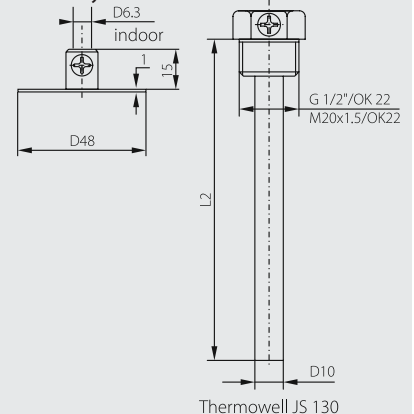
With the grommet



With the connector



Accessory





## ■ SENSOR INSTALLATION AND SERVICING

### SENSORS WITH GROMMET:

Before connecting the supply lead-in cable, lift off the lid of the plastic enclosure by means of a flat screwdriver. The lead-in cable is connected to the terminals according to the wiring diagram through the loosened grommet. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm. To ensure the ingress protection value of IP 65, the grommet has to be tightened and the lid has to be put on after connecting the lead-in cable.

### SENSORS WITH CONNECTOR:

The lead-in cable with connector is connected to the connector RSFM4, which is the part of the sensor head. Optionally the stand-alone connector ELKA 4012, or a lead-in cable of the length of 5 m equipped with a straight-type RKT connector, or with a rectangular-type RKWT connector may be delivered. To ensure the ingress protection value of IP 65 the connectors and the lid of sensor have to be tightened and checked.

In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. In case of using a stainless steel thermowell or a stainless steel holder these accessories should be placed first in the location where the temperature will be measured. Then the sensor is inserted into the holder, or pushed as far as the thermowell bottom, and tightened with a screw. The openings for the plastic clip installation have to be drilled according to the dimensioned sketch on which the opening diameters and the distances of their centres are illustrated.

After installing and connecting the sensor to the sequential evaluating electrical equipment the sensor is ready to use. The sensor does not require any special servicing or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.

## ■ CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- option enclosing two sensors
- option enclosing non-standard temperature sensors (DALLAS, TSic, KTY, SMT, etc.)
- class A precision type of temperature element (with the exception of sensors Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, thermistor NTC 20 kΩ)
- option of three- or four-wire connection
- variable stem design – L1 length, materials, diameters, option of thread design
- thermowell thread type options

## TEMPERATURE SENSORS WITH A STEM, MINI SERIES



### DESCRIPTION AND APPLICATION

These resistance-type temperature sensors of serie MINI are designed for temperature measurements of liquid or gaseous substances in the temperature range -30 °C to 150 °C. The plastic enclosure is provided with a cable outlet ending (the terminal board is placed in the connection head) or a connector. The sensor-central holder combination is suitable for temperature measurements in air condition ducts. The sensor-thermowell combination is suitable for temperature measurements in tubing. The sensor variant with welded thread is ideal for direct measuring of various media in ducts. By using a sensor with a longer stem the upper limit of allowable temperature can be extended up to 250 °C. The sensors can be utilised for control systems that are compatible with sensing element output signals or output signals quoted in the table of sensing element types. The sensors are designed to be operated in a chemically non-aggressive environment.

### ACCESSORIES

- The central plastic holder – it is part of the sensor
- The thermowell JS 130
- The metal central holder K120
- For the version with connector:
  - led-in connector ELKA 4012 or RKCS 4/9
  - connection cable with the straight-type RKT connector
  - connection cable with the rectangular-type RKWT connector

### DECLARATION, CERTIFICATES, CALIBRATION

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.



### SPECIFICATIONS

#### BASIC DATA

Sensor type (K – with connector)	MINI N 120 MINI N 120K	MINI N 121 MINI N 121K	MINI N 122 MINI N 122K	MINI N 320 MINI N 320K	MINI N 321 MINI N 321K
Type of sensing element	Ni 1000/5000	Ni 1000/6180	Ni 891	Ni 10000/5000	Ni 10000/6180
Measuring range	-30 to 150 °C (connection head ambient temperature -30 to 100 °C)				
Maximum measuring DC current	1 mA	1 mA	1 mA	0.3 mA	0.3 mA

Sensor type (K – with connector)	MINI N 123 MINI N 123K	MINI P 120 MINI P 120K	MINI P 220 MINI P 220K	MINI P 320 MINI P 320K	MINI H 120 MINI H 120K
Type of sensing element	T1 = Ni 2226	PT 100/3850	PT 500/3850	PT 1000/3850	thermistor NTC 20 kΩ
Measuring range	-30 to 150 °C	-50 to 150 °C (connection head ambient temperature -30 to 100 °C)			-30 to 150 °C
Maximum measuring DC current	0.7 mA	3 mA	1.5 mA	1 mA	10 mW *)

\*) maximum power consumption

Sensor type	MINI N 520	Note
Type of sensing element	Pt 1000/3850	
Output signal	4 to 20 mA	
Measuring ranges	-50 to 50 °C	Connection head ambient temperature -30 to 80 °C
	-30 to 60 °C	
	0 to 35 °C	
	0 to 100 °C	
Power supply (V <sub>CC</sub> )	10 to 30 V DC	Recommended value 24 V DC
Maximum voltage ripple V <sub>CC</sub>	0.5 %	
Load resistance R <sub>Z</sub>	50(V <sub>CC</sub> -9) Ω	
Output signal - sensing element break	> 24 mA	
Output signal - sensing element short	< 3 mA	

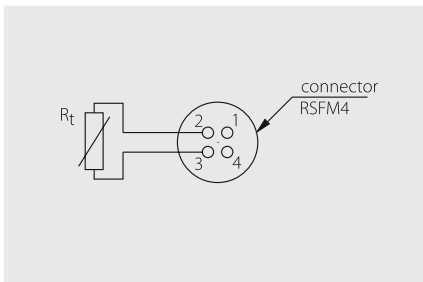
TEMPERATURE SENSORS WITH A STEM, MINI SERIES

OTHER PARAMETERS

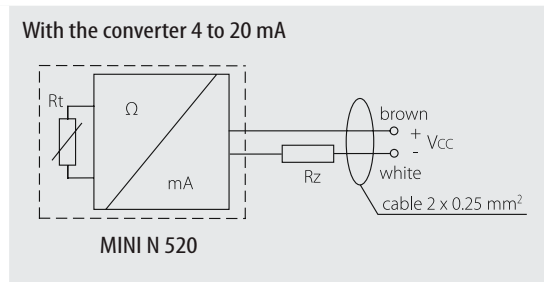
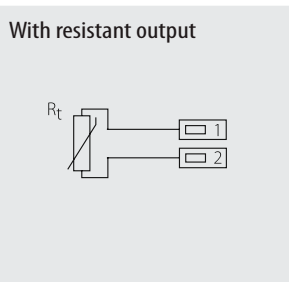
Accuracy class	Ni sensing elements: B class, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: B class according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C NTC 20 kΩ: $\pm 1$ °C for the range 0 to 70 °C
Measuring error (MINI N 520)	< 0.6 % of the range, minimum 0.5 °C
Sensor connection	according to the wiring diagram
Standard length of the stem L1	70, 120, 180, 240, 300, 360, 420 mm
Response time	$\tau_{0.5} < 9$ s (in streaming water at 0.4 m.s <sup>-1</sup> )
Type of terminal board - sensors with grommet	Weco 951-A-LFDS, maximum wire cross section 1.5 mm <sup>2</sup>
Type of connector - sensors with connector	RSFM4 – Lumberg, M12
Type of lead-in cable - sensors with the output 4 to 20 mA	2 x 0.25 mm <sup>2</sup> , PVC shielded, up to 80 °C
Insulation resistance	> 200 MΩ at 500 V DC, 25° ± 3 °C; humidity < 85 %
Ingress protection	IP 65 according to EN 60 529
Material of the stem	stainless steel 1.4301
Material of the connection head	POLYAMID
Operating conditions	ambient temperature: -30 to 100 °C; -30 to 80 °C with a converter or PVC cable
	relative humidity: max. 85 % (at the ambient temperature 25 °C)
	atmospheric pressure: 87 to 107 kPa
Weight	MINI approximately 60 g, MINI K 35 g

WIRING DIAGRAM

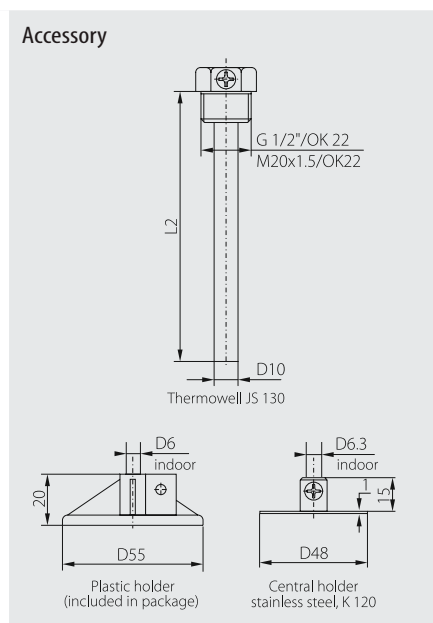
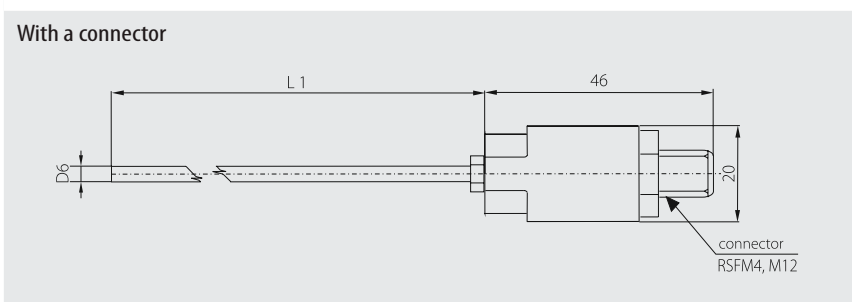
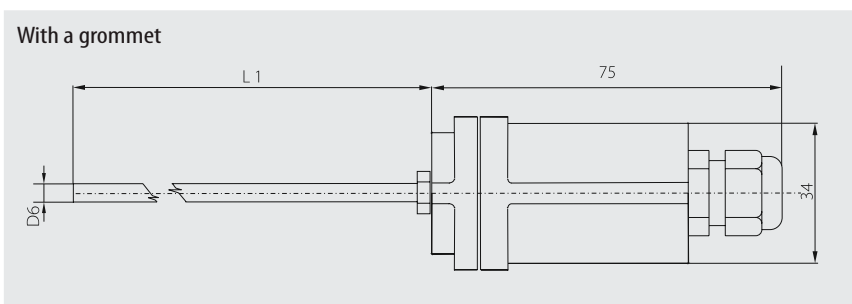
SENSORS WITH A CONNECTOR:



SENSORS WITH A GROMMET:



DIMENSIONAL DRAFT



## TEMPERATURE SENSORS WITH A STEM, MINI SERIES

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### ■ SENSOR INSTALLATION AND SERVICING

#### SENSORS WITH GROMMET:

Before connecting the supply lead-in cable the lid of plastic head has to be screwed off. The lead-in cable is connected according to the wiring diagram by pushing it through the loosened grommet. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup> and outside diameter of circular-section-cable can be 4 to 8 mm. To ensure the ingress protection value of IP 65 the grommet has to be tightened and the lid has to be screwed on after connecting the lead-in cable.

#### SENSORS WITH CONNECTOR:

According to the wiring diagram the lead-in cable is connected to the connector RSFM4 which is part of the head of sensor. If required, separate lead-in connector ELKA 4012 or lead-in cable of the length of 5 m with direct connector RKT or lead-in cable with rectangular connector RKWT can be delivered. To ensure the ingress protection value of IP 65 is necessary to check the right fastening of connectors and sensor-lid.

In case the lead-in cable is laid close the high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment) a shielded cable should be used.

In case of using a stainless steel thermowell or a stainless steel holder these accessories should be placed first in the location where the temperature will be measured. Then the sensor is inserted into the holder, or pushed as far as the thermowell bottom and tightened with a screw. The openings for the plastic clip installation or for stainless steel holder installation have to be drilled according to the enclosed pattern, on which the opening diameters are marked.

After installing and connecting the sensor to the appropriate evaluating electrical equipment, the sensor is ready to use. The sensor does not require any special service or maintenance. The device can be operated in any working position but the grommet must not be directed upwards.

### ■ CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- option enclosing two sensors
- option enclosing non-standard temperature sensors (DALLAS, TSic, KTY, SMT, etc.)
- class A precision type of temperature element (with the exception of sensors Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, thermistor NTC 20 kΩ)
- option of three- or four-wire connection
- variable stem design – L1 length, materials, diameters, option of thread design
- thermowell thread type options

## DESCRIPTION AND APPLICATION

These resistance-type sensors are intended for contact temperature measurements of liquid or gaseous substances. The sensor-central holder combination is suitable for temperature measurements in air condition ducts. The sensor-thermowell combination is suitable for temperature measurements in tubing. The sensor variant with welded thread is ideal for direct measuring of various media in ducts. The standard operating temperature range is -30 to 200 °C. By using a sensor with a longer stem the upper limit of allowable temperature can be extended up to 250 °C. The sensors can be utilised for control systems that are compatible with sensing element output signals or output signals quoted in the table of sensing element types. The sensors are designed to be operated in a chemically non-aggressive environment.

## ACCESSORIES

- The metal central holder K120
- The thermowell JS 130

## DECLARATION, CERTIFICATES, CALIBRATION

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.



## SPECIFICATIONS

### BASIC DATA

Sensor type	NK 120	NK 121	NK 122	NK 320	NK 321
Type of sensing element	Ni 1000/5000	Ni 1000/6180	Ni 891	Ni 10000/5000	Ni 10000/6180
Measuring range	-30 to 200 °C (connection head ambient temperature -30 to 100 °C)				
Maximum measuring DC current	1 mA	1 mA	1 mA	0.3 mA	0.3 mA

Sensor type	NK 123	PTK 120	PTK 220	PTK 320	HK 120
Type of sensing element	T1 = Ni 2226	PT 100/3850	PT 500/3850	PT 1000/3850	thermistor NTC 20 kΩ
Measuring range	-30 to 150 °C	-50 to 200 °C (connection head ambient temperature -30 to 100 °C)			-30 to 150 °C
Maximum measuring DC current	0.7 mA	3 mA	1.5 mA	1 mA	10 mW *)

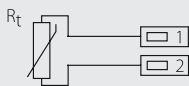
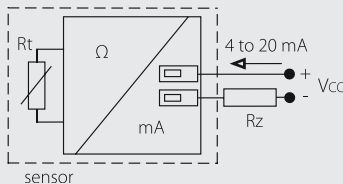
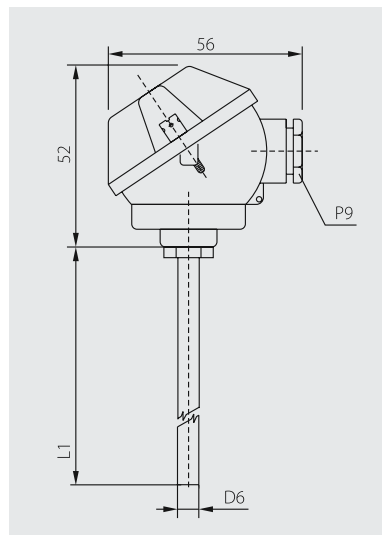
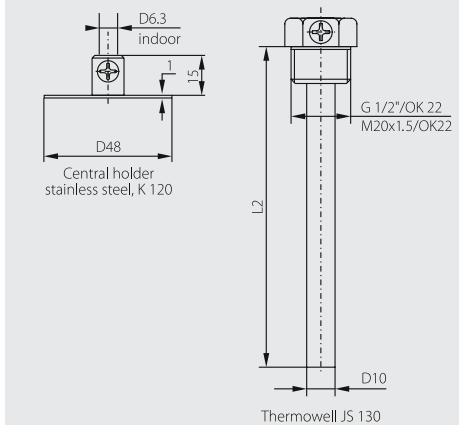
\*) maximum power consumption

Sensor type	NK 520	Note
Type of sensing element	Pt 1000/3850	
Output signal	4 to 20 mA	
Measuring ranges	-50 to 50 °C	connection head ambient temperature -30 to 80 °C
	-30 to 60 °C	
	0 to 35 °C	
	0 to 100 °C	
	0 to 150 °C	
	0 to 200 °C	
0 to 250 °C		
Error of the measurement	< 0.6 % of the range	no less than 0.5 °C
Power supply (V <sub>CC</sub> )	10 to 30 V DC	recommended value 24 V DC
Maximum voltage ripple V <sub>CC</sub>	0.5 %	
Load resistance R <sub>Z</sub>	50(V <sub>CC</sub> -9) Ω	
Output signal	> 24 mA	
- sensor element break		
Output signal	< 3.5 mA	
- sensor element short		



**OTHER PARAMETERS**

Accuracy class	Ni sensing elements: B class, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: B class according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C NTC 20 kΩ: $\pm 1$ °C for the range 0 to 70 °C
Sensor connection	according to the wiring diagram
Standard length of the st	70, 120, 180, 240, 300, 360, 420 mm
Response time	$\tau_{0.5} < 9$ s (in streaming water at 0.4 m.s <sup>-1</sup> )
Recommended wire cross section	0.35 to 1.5 mm <sup>2</sup>
Insulation resistance	> 200 MΩ at 500 V DC, 25° ± 3 °C; humidity < 85 %
Ingress protection	IP 54 according to EN 60 529
Material of the stem	stainless steel 1.4301
Type of connection head	LIMATHERM MA
Material of connection head	aluminium alloy
Operating conditions	ambient temperature: -30 to 100 °C; -30 to 80 °C with a converter relative humidity: max. 85 % (at the ambient temperature 25 °C) atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.15 kg

**WIRING DIAGRAM**
**With the resistance output**

**With a converter 4 to 20 mA**

**DIMENSIONAL DRAFT**

**Accessory**

**SENSOR INSTALLATION AND SERVICING**

Before connecting the supply lead-in cable screw off the lid of the metal connection head. The lead-in cable is connected to the terminals according to the wiring diagram through the loosened grommet. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm. To ensure the ingress protection value of IP 54 the grommet has to be tightened and the lid has to be screwed on after connecting the lead-in cable.

In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. In case of using a stainless steel thermowell or a stainless steel holder these accessories should be placed first in the location where the temperature will be measured. Then the sensor is inserted into the holder, or pushed as far as the thermowell bottom, and tightened with a screw. The openings for the stainless steel holder installation have to be drilled according to the attached template, on which the opening diameters are depicted, too. After installing and connecting the sensor to the appropriate evaluating electrical equipment the sensor is ready to use. The sensor does not require any special service or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.

**CUSTOMER SPECIFIC MODIFICATIONS**

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- option enclosing two sensors
- option enclosing non-standard temperature sensors (DALLAS, TSic, KTY, SMT, etc.)
- class A precision type of temperature element (with the exception of sensors Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, thermistor NTC 20 kΩ)
- option of three- or four-wire connection
- variable stem design – L1 length, materials, diameters, option of thread design
- thermowell thread type options



## DESCRIPTION AND APPLICATION

These resistance-type sensors are intended for contact temperature measurements of liquid or gaseous substances. The plastic enclosure is provided with a cable outlet ending (the terminal board is placed in the enclosure) or a connector. The structure of the sensor's stem enables the sensor to be used for direct measuring of the temperature in ducts and also ensures quick response of the sensor to changes in temperature. The standard operating temperature range is -30 to 130 °C. The sensors can be utilised for control systems that are compatible with sensing element output signals or output signals quoted in the table of sensing element types. Easy mounting of the temperature sensor is ensured by the unique "S head" design. The sensors are designed to be operated in a chemically non-aggressive environment.

## ACCESSORIES

For the version with connector:

- led-in connector ELKA 4012 or RKCS 4/9
- connection cable with the straight-type RKT connector
- connection cable with the rectangular-type RKWT connector

## DECLARATION, CERTIFICATES, CALIBRATION

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA, 0 to 10 V and frequency.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.



We also offer these sensors in the design for explosive environments – see catalogue data sheet no. 13.4.

### MAXIMUM STREAM VELOCITY OF THE MEASURED MEDIUM - AIR AND WATER VAPOUR / WATER [m.s<sup>-1</sup>]

Length of the stem	up to 60 mm	> 60 to 100 mm	> 100 to 160 mm	> 160 to 220 mm
Values for diameter of the stem 4 mm	8 / 0.8	6 / 0.6	3.2 / 0.4	1.0 / 0.25

## SPECIFICATIONS

### BASIC DATA

Sensor type (K – with connector)	NS 160 NS 160K	NS 161 NS 161K	NS 162 NS 162K
Type of sensing element	Ni 1000/5000	Ni 1000/6180	Ni 891
Measuring range	-30 to 130 °C (Enclosure ambient temperature -30 to 100 °C)		
Maximum measuring DC current	1 mA	1 mA	1 mA

Sensor type (K – with connector)	PTS 160 PTS 160K	PTS 260 PTS 260K	PTS 360 PTS 360K	HS 160 HS 160K
Type of sensing element	PT 100/3850	PT 500/3850	PT 1000/3850	thermistor NTC 20 kΩ
Measuring range	-50 to 130 °C (Enclosure ambient temperature -30 to 100 °C)			-30 to 130 °C
Maximum measuring DC current	3 mA	1,5 mA	1 mA	10 mW *)

\*) maximum power consumption

Sensor type (K – with connector)	NS 560 NS 560K	NS 760 NS 760K	NS 860 NS 860K	Note
Type of sensing element	Pt 1000/3850	Pt 1000/3850	Pt 1000/3850	
Output signal	4 to 20 mA	0 to 10 V	1 to 5 kHz 2 to 10 kHz 3 to 15 kHz	
Measuring ranges	-50 to 50 °C -30 to 60 °C 0 to 35 °C 0 to 100 °C 0 to 150 °C	-30 to 60 °C 0 to 35 °C 0 to 100 °C 0 to 150 °C	Any measuring range, minimum span 50 °C	Enclosure ambient temperature -30 to 80 °C; for NS 820(K) -30 to 70 °C
Power supply (V <sub>cc</sub> )	11 to 30 V DC	15 to 30 V DC	8 to 30 V DC	Recommended value 24 V DC; Recommended power supply for NS 820(K) 12 V DC Axima AXSP3P02012
Maximum voltage ripple V <sub>cc</sub>	0,5 %	0,5 %	0,5 %	
Load resistance	50(V <sub>cc</sub> -10) Ω	> 50 kΩ	> 1 kΩ	
Output signal - sensing element break	> 24 mA	> 10,5 V	Adjustable (< low range or high range>)	
Output signal - sensing element short	< 3,5 mA	~ 0 V		

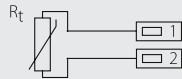
## OTHER PARAMETERS

Accuracy class	Ni sensing elements: class B, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: class B according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C NTC 20 k $\Omega$ : $\pm 1$ °C for the range 0 to 70 °C
Measuring error for NS 560 and NS 760	< 0.6 % of the measuring range, minimum 0.5 °C
Sensor connection	according to the wiring diagram
Standard length of stem L1	50, 100, 160, 220 mm
Diameter of the stem	4 $\pm$ 0.1 mm
Standard thread	G 1/2"
Nominal pressure of the stem	PN 25
Response time	$t_{0.5} < 4$ s (in streaming water at 0.4 m.s <sup>-1</sup> )
Recommended wire cross section - sensors with the grommet	0.35 to 1.5 mm <sup>2</sup>
Type of connector in the head - sensors with connector	RSFM4 – Lumberg, M12
Insulation resistance	> 200 M $\Omega$ at 500 V DC, 25° $\pm$ 3 °C; humidity < 85 %
Ingress protection	IP 65 according to EN 60 529
Material of the sensor stem	stainless steel 1.4301
Material of the enclosure	POLYAMID
Operating conditions	ambient temperature: -30 to 100 °C; -30 to 80 °C with a converter relative humidity: max. 85 % (at the ambient temperature 25 °C) atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.15 kg

## WIRING DIAGRAM

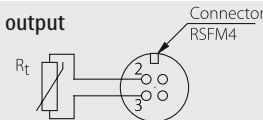
### SENSOR WITH THE GROMMET:

With resistance-type output



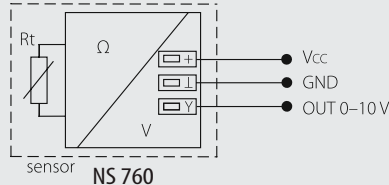
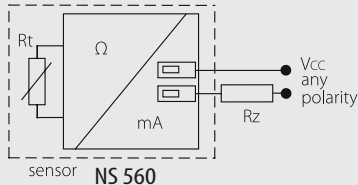
### SENSOR WITH THE CONNECTOR:

With resistance-type output

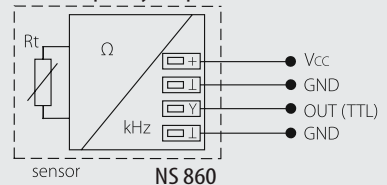


### SENSOR WITH THE GROMMET:

With the converter

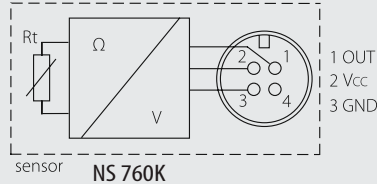
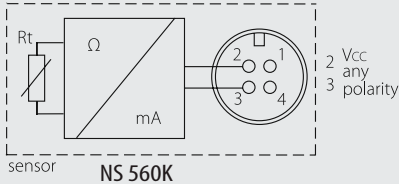


With frequency output

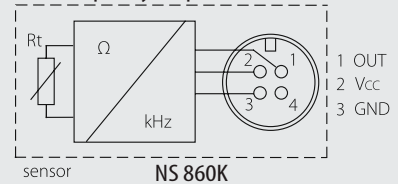


### SENSOR WITH THE CONNECTOR:

With the converter

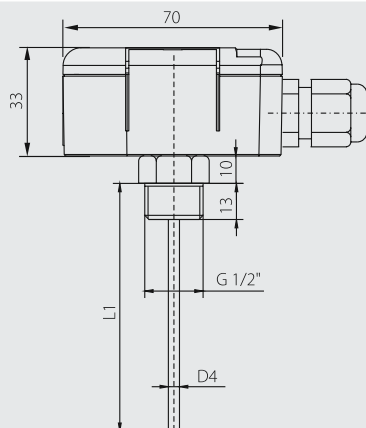


With frequency output

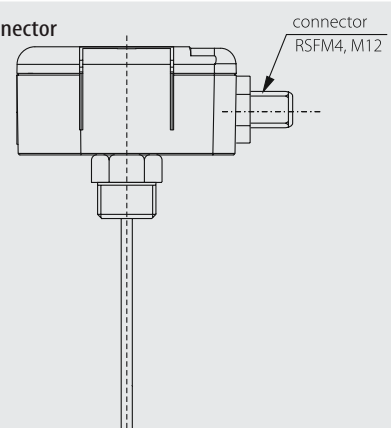


## DIMENSIONAL DRAFT

Sensors with the grommet



Sensors with the connector



## ■ SENSOR INSTALLATION AND SERVICING

Before connecting the supply lead-in cable, position the sensor in the location of temperature measurement.

### SENSORS WITH GROMMET:

Before connecting the supply lead-in cable, lift off the lid of the plastic enclosure by means of a flat screwdriver. The lead-in cable is connected to the terminals according to the wiring diagram through the loosened grommet. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm. To ensure the ingress protection value of IP 65, the grommet has to be tightened and the lid has to be put on after connecting the lead-in cable.

### SENSORS WITH CONNECTOR:

According to the wiring diagram, the lead-in cable with connector is connected to the connector RSFM4, which is part of the sensor head. Optionally the stand-alone connector ELKA 4012, or a lead-in cable of the length of 5 m equipped with a straight connector of RKT type, or with a rectangular connector of RKWT type may be delivered. To ensure the ingress protection value of IP 65 the connectors and the lid of sensor have to be tightened and checked. In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. After installing and connecting the sensor to the appropriate evaluating electrical equipment the sensor is ready to use. The sensor does not require any special service or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.

## ■ CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- class A precision (with the exception of sensor termistor NTC 20 kΩ)
- option of three- or four-wire connection
- variable stem design – L1 length, materials, diameters, option of thread design



## DESCRIPTION AND APPLICATION

These resistance-type sensors are intended for contact temperature measurements of liquid or gaseous substances. The structure of the sensor's stem enables the sensor to be used for direct measuring of the temperature in ducts and also ensures quick response of the sensor to changes in temperature. The standard operating temperature range is -30 to 130 °C. The sensors can be utilised for control systems that are compatible with sensing element output signals or output signals quoted in the table of sensing element types.

The sensors are designed to be operated in a chemically non-aggressive environment.

## DECLARATION, CERTIFICATES, CALIBRATION

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.



### MAXIMUM STREAM VELOCITY OF THE MEASURED MEDIUM - AIR AND WATER VAPOUR / WATER [m.s<sup>-1</sup>]

Length of the stem	up to 60 mm	> 60 to 100 mm	> 100 to 160 mm	> 160 to 220 mm
Values for diameter of the stem 4 mm	8 / 0.8	6 / 0.6	3.2 / 0.4	1.0 / 0.25

## SPECIFICATIONS

### BASIC DATA

Sensor type	NK 160	NK 161	NK 162
Type of sensing element	Ni 1000/5000	Ni 1000/6180	Ni 891
Measuring range	-30 to 130 °C (Connection head ambient temperature -30 to 100 °C)		
Maximum measuring DC current	1 mA	1 mA	1 mA

Sensor type	PTK 160	PTK 260	PTK 360	HK 160
Type of sensing element	PT 100/3850	PT 500/3850	PT 1000/3850	thermistor NTC 20 kΩ
Measuring range	-50 to 130 °C (Connection head ambient temperature -30 to 100 °C)			-30 to 130 °C
Maximum measuring DC current	3 mA	1.5 mA	1 mA	10 mW *)

\*) maximum power consumption

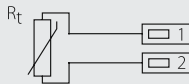
Sensor type	NK 560	Note
Type of sensing element	Pt 1000/3850	
Output signal	4 to 20 mA	
Measuring ranges	-50 to 50 °C	Connection head ambient temperature -30 to 70 °C
	-30 to 60 °C	
	0 to 35 °C	
	0 to 100 °C	
	0 to 150 °C	
Power supply (V <sub>CC</sub> )	10 to 30 V DC	Recommended value 24 V DC
Maximum voltage ripple V <sub>CC</sub>	0.5 %	
Load resistance	50(V <sub>CC</sub> -9) Ω	
Output signal	> 24 mA	
- sensing element break		
Output signal	< 3.5 mA	
- sensing element shorg		

**OTHER PARAMETERS**

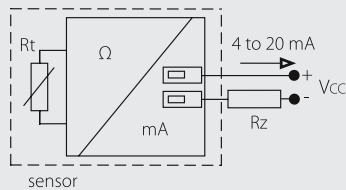
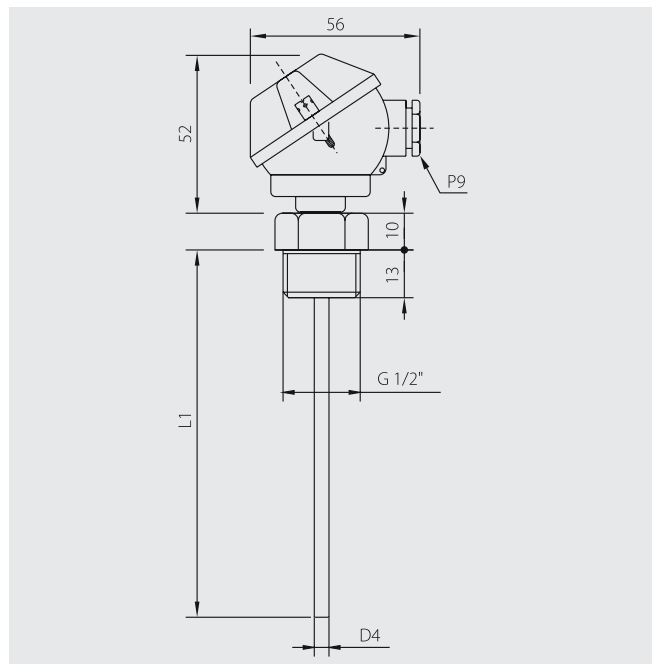
Accuracy class	Ni sensing elements: B class, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: B class according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C NTC 20 k $\Omega$ : $\pm 1$ °C for the range 0 to 70 °C
Measuring error for NK 560	< 0.6 % of the measuring range, minimum 0.5 °C
Sensor connection	according to the wiring diagram
Standard length of the stem L1	50, 100, 160, 220 mm
Diameter of the stem	$4 \pm 0.1$ mm
Standard thread	G 1/2"
Nominal pressure of the stem	PN 25
Response time	$\tau_{0.5} < 4$ s (in streaming water at 0.4 m.s <sup>-1</sup> )
Recommended wire cross section	0.35 to 1.5 mm <sup>2</sup>
Insulation resistance	> 200 M $\Omega$ at 500 V DC, 25° $\pm$ 3 °C; humidity < 85 %
Ingress protection	IP 54 according to EN 60 529
Material of the stem	stainless steel 1.4301
Material and type of connection head	aluminium alloy, LIMATHERM MA
Operating conditions	ambient temperature: -30 to 100 °C; -30 to 80 °C with a converter relative humidity: max. 85 % (at the ambient temperature 25 °C) atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.2 kg

**WIRING DIAGRAM**

With a resistance output



With a converter 4 to 20 mA


**DIMENSIONAL DRAFT**

**SENSOR INSTALLATION AND SERVICING**

Before connecting the supply lead-in cable, position the sensor in the location of temperature measurement, and screw off the lid of the metal connection head. The lead-in cable is connected to the terminals according to the wiring diagram through the loosened grommet. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm.

In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used.

To ensure the ingress protection value of IP 54 the grommet has to be tightened and the lid has to be screwed on after connecting the lead-in cable. After installing and connecting the sensor to the appropriate evaluating electrical equipment the sensor is ready to use. The sensor does not require any special service or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.

**CUSTOMER SPECIFIC MODIFICATIONS**

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- Class A precision (with the exception of sensor termistor NTC 20 k $\Omega$ )
- option of three- or four-wire connection
- variable stem design – L1 length, materials, diameters, option of thread design





## DESCRIPTION AND APPLICATION

These resistance-type sensors are intended for contact measurements of temperatures of liquid and gaseous substances. These sensors are produced in two versions: the small connection head with the resistance-type output and the big connection head with the output 4–20 mA. The sensors are designed to be used in the food-processing industry mainly. The sensor - central holder combination is suitable for temperature measurement in air condition ducts. The sensor - thermowell combination is suitable for temperature measurement in tubing. The sensor variant with welded thread is ideal for direct measuring of various media in ducts. The standard temperature range in which the active sensors are allowed to be utilised is -30 to +150 °C, for the passive sensors the range is -30 to +200 °C. The sensors can be utilised for control systems that are compatible with sensing element output signals or output signals quoted in the table of sensing element types. The sensors are designed to be operated in a chemically non-aggressive environment.



## ACCESSORIES

- The metal central holder K120
- the thermowell JS 130
- for the version with connector:
  - led-in connector ELKA 4012 or RKCS 4/9
  - connection cable with the straight-type RKT connector
  - connection cable with the rectangular-type RKWT connector

## DECLARATION, CERTIFICATES, CALIBRATION

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.

## SPECIFICATIONS

### BASIC DATA

Sensor type (K – with connector)	NS 180P NS 180K	NS 181P NS 181K	NS 182P NS 182K	NS 380P NS 380K	NS 381P NS 381K
Type of sensing element	Ni 1000/5000	Ni 1000/6180	Ni 891	Ni 10000/5000	Ni 10000/6180
Measuring range	-30 to 200 °C (connection head ambient temperature -30 to 100 °C)				
Maximum measuring DC current	1 mA	1 mA	1 mA	0.3 mA	0.3 mA

Sensor type (K – with connector)	NS 183P NS 183K	PTS 180P PTS 180K	PTS 280P PTS 280K	PTS 380P PTS 380K	HS 180P HS 180K
Type of sensing element	T1 = Ni 2226	PT 100/3850	PT 500/3850	PT 1000/3850	thermistor NTC 20 kΩ
Measuring range	-30 to 150 °C	-50 to 200 °C (connection head ambient temperature -30 to 100 °C)			-30 to 150 °C
Maximum measuring DC current	0.7 mA	3 mA	1.5 mA	1 mA	1 mW *)

\*) maximum power consumption

Sensor type (K – with connector)	PTS 580P PTS 580K	Note
Type of sensing element	Pt 1000/3850	
Output signal	4 to 20 mA	
Measuring ranges	-50 to 50 °C	Connection head ambient temperature -30 to 80 °C
	-30 to 60 °C	
	0 to 35 °C	
	0 to 100 °C	
0 to 150 °C		
Power supply (V <sub>CC</sub> )	12 to 30 V DC	Recommended value 24 V DC
Maximum voltage ripple V <sub>CC</sub>	0.5 %	
Load resistance	50(V <sub>CC</sub> -11) Ω	
Output signal - sensing element break	> 24 mA	
Output signal - sensing element short	< 3.5 mA	

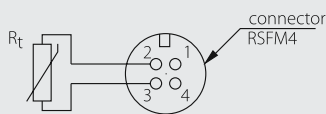
## OTHER PARAMETERS

Accuracy class	Ni sensing elements: B class, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: B class according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C NTC 20 k $\Omega$ : $\pm 1$ °C for the range 0 to 70 °C
Measuring error	< 0.6 % of the measuring range, minimum 0.5 °C
Sensor connection	according to the wiring diagram
Standard length of the stem L1	70, 120, 180, 240 mm
Response time	$\tau_{0.5} < 9$ s (in streaming water at 0.4 m.s <sup>-1</sup> )
Lead-in cable – version with cable	PVC shielded 2 x 0.25 mm <sup>2</sup>
Type of connector in the head – sensors with connector	Lumberg RSFM4, M 12
Standard lengths of the cable	1, 2, 5, 10 m
Insulation resistance	> 200 M $\Omega$ at 500 V DC, 25° $\pm$ 3 °C; humidity < 85 %
Ingress protection	IP 67 according to EN 60 529
Material of the stem	stainless steel 1.4301
Material of the connection head	stainless steel 1.4301
Operating conditions	ambient temperature: -30 to 100 °C; -30 to 80 °C with a converter
	relative humidity: max. 85 % (at the ambient temperature 25 °C)
	atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.25 kg

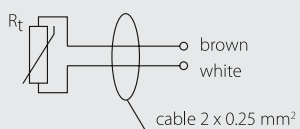
## WIRING DIAGRAM

### SENSORS WITH A RESISTANCE OUTPUT:

#### Sensors with connector

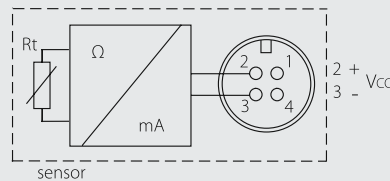


#### Sensors with cable

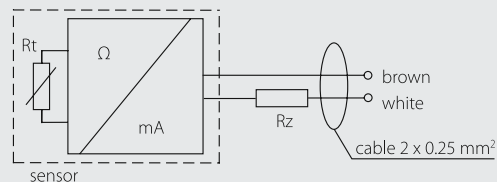


### SENSORS WITH CURRENT OUTPUT:

#### Sensors with connector



#### Sensors with cable



## SENSOR INSTALLATION AND SERVICING

### SENSORS WITH THE GROMMET:

The temperature sensor is positioned in the location of temperature measurement by means of a thermowell or a stainless steel holder, and the lead-in cable is connected to the terminals of the sensing device according to the wiring diagram. To secure the ingress protection value of IP 67 the tightness of the grommet must be checked. This grommet is a component part of the sensor's connection head.

### SENSORS WITH CONNECTOR:

The temperature sensor is positioned in the location of temperature measurement by means of the thermowell or the stainless steel holder. To the RSFM 4 connector, which is a component part of the connection head, the lead-in cable provided with a connector is connected according to the wiring diagram. Optionally the stand-alone connector ELKA, or a lead-in cable of the length of 5 m equipped with a straight connector of RKT type, or with a rectangular connector of RKWT type may be delivered. To secure the ingress protection value of IP 67 the proper tightness of the connectors must be checked. In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. The openings for the stainless steel holder installation have to be drilled according to the attached template, on which the opening diameters are depicted, too. In case of using the stainless steel thermowell or the holder these accessories must first be positioned in the temperature measurement location, then then the sensor shall be inserted into the holder, or, as the case may be, as far as to the thermowell bottom, and then secured with a screw. After installing and connecting the sensor to the appropriate evaluating electrical equipment the sensor is ready to use. The sensor does not require any special service or maintenance. The device can be operated in any working position, but the grommet or the connector must not be directed upwards.

# TEMPERATURE SENSORS WITH A STEM AND STAINLESS STEEL CONNECTION HEAD

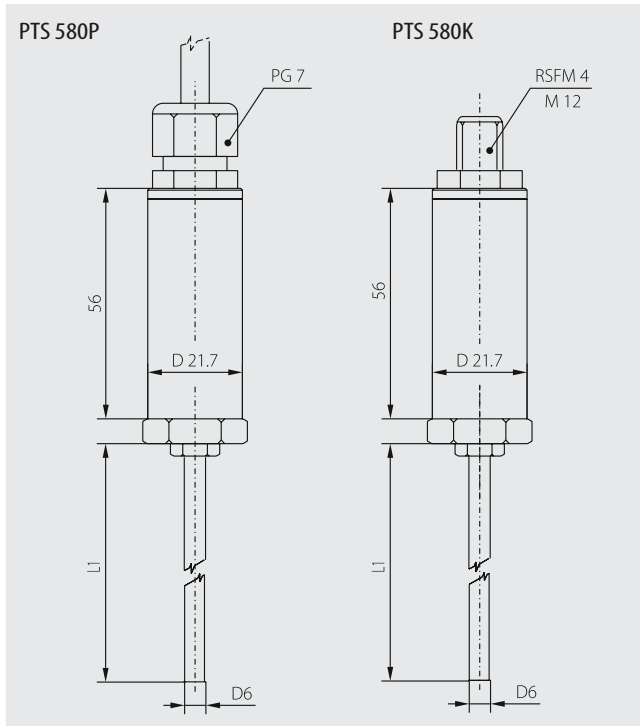
## CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

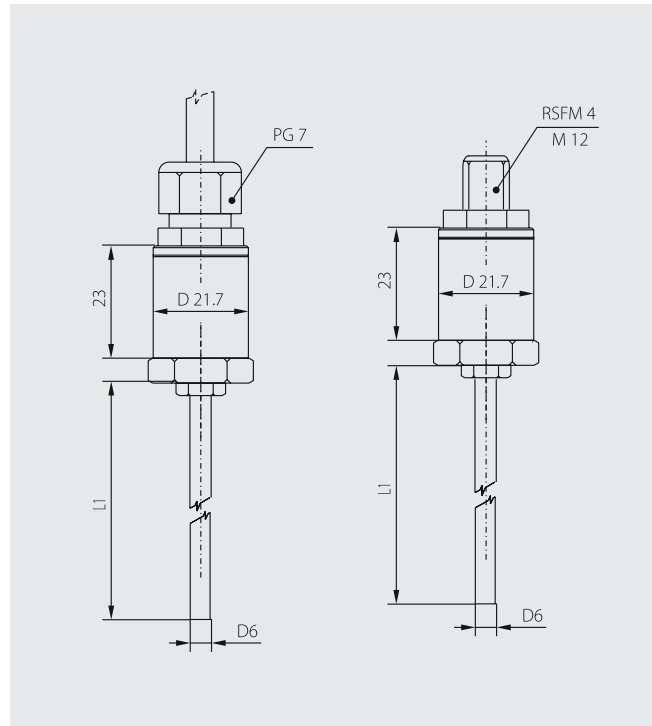
- option enclosing two sensors
- option enclosing non-standard temperature sensors (DALLAS, TSic, KTY, SMT, etc.)
- class A precision type of temperature element (with the exception of sensors Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, thermistor NTC 20 kΩ)
- option of three- or four-wire connection
- variable stem design – L1 length, materials, diameters, option of thread design
- changing the sensor cable length – version with grommet
- thermowell thread type options

## DIMENSIONAL DRAFT

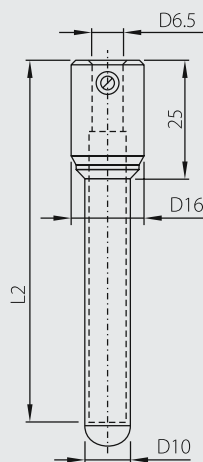
SENSORS WITH CURRENT OUTPUT:



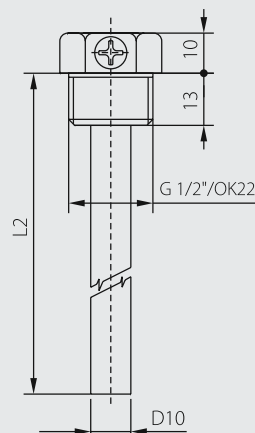
SENSORS WITH RESISTANCE OUTPUT:



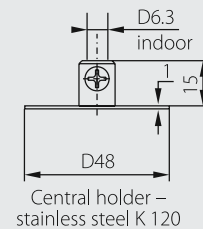
Accessory



Cylindrical thermowell welded in J 010



Thermowell JS 130



## CONTACT TEMPERATURE SENSORS WITH A PLASTIC ENCLOSURE



### DESCRIPTION AND APPLICATION

These resistance-type sensors are intended for contact surface temperature measurement. The sensors, which are available including the fastening strap and a closing device are suitable for temperature surface measurements on piping. The enclosure is provided with a cable gland (the terminal board is placed in the enclosure) or a connector. The standard operating temperature range is -30 to 130 °C. The proper sensing element is isolated so the ambient temperature does not affect the sensor readings. The sensors can be utilised for control systems that are compatible with sensing element output signals or output signals quoted in the table of sensing element types. Easy mounting of the temperature sensor is ensured by the unique "S head" design. The sensors are designed to be operated in a chemically non-aggressive environment.

### ACCESSORIES

- For the version with connector:
  - led-in connector ELKA 4012 or RKCS 4/9
  - connection cable with the straight-type RKT connector
  - connection cable with the rectangular-type RKWT connector
- The thermal conductive paste up to 200 °C, 5g



### DECLARATION, CERTIFICATES, CALIBRATION

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA, 0 to 10 V and frequency.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.



We also offer these sensors in the design for explosive environments – see catalogue data sheet no. 13.4.

### SPECIFICATIONS

#### BASIC DATA

Sensor type (K – with connector)	NS 140 NS 140K	NS 141 NS 141K	NS 142 NS 142K	NS 340 NS 340K	NS 341 NS 341K
Type of sensing element	Ni 1000/5000	Ni 1000/6180	Ni 891	Ni 10000/5000	Ni 10000/6180
Measuring range	-30 to 130 °C (enclosure ambient temperature -30 to 100 °C)				
Maximum measuring DC current	1 mA	1 mA	1 mA	0.3 mA	0.3 mA

Sensor type (K – with connector)	NS 143 NS 143K	PTS 140 PTS 140K	PTS 240 PTS 240K	PTS 340 PTS 340K	HS 140 HS 140K
Type of sensing element	T1 = Ni 2226	PT 100/3850	PT 500/3850	PT 1000/3850	thermistor NTC 20 kΩ
Measuring range	-30 to 130 °C (enclosure ambient temperature -30 to 100 °C)				
Maximum measuring DC current	0.7 mA	3 mA	1.5 mA	1 mA	1 mW *)

\*) maximum power consumption

Sensor type (K – with connector)	NS 540 NS 540K	NS 740 NS 740K	NS 840 NS 840K	Note
Type of sensing element	Pt 1000/3850	Pt 1000/3850	Pt 1000/3850	
Output signal	4 to 20 mA	0 to 10 V	1 to 5 kHz 2 to 10 kHz 3 to 15 kHz	
Measuring ranges	-50 to 50 °C -30 to 60 °C 0 to 35 °C 0 to 100 °C 0 to 150 °C	-30 to 60 °C 0 to 35 °C 0 to 100 °C 0 to 150 °C	Any measuring range, minimum span 50 °C	Enclosure ambient temperature -30 to 80 °C; for NS 840(K) -30 to 70 °C
Power supply (V <sub>CC</sub> )	11 to 30 V DC	15 to 30 V DC	8 to 30 V DC	Recommended value 24 V DC; Recommended power supply for NS 820(K) 12 V DC Axima AXSP3P02012
Maximum voltage ripple V <sub>CC</sub>	0.5 %	0.5 %	0.5 %	
Load resistance	50(V <sub>CC</sub> -10) Ω	> 50 kΩ	> 1 kΩ	
Output signal - sensing element break	> 24 mA	> 10.5 V	Adjustable (< low range or high range>)	
Output signal - sensing element short	< 3.5 mA	~ 0 V		

## CONTACT TEMPERATURE SENSORS WITH A PLASTIC ENCLOSURE

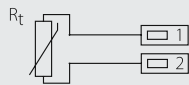
### OTHER PARAMETERS

Accuracy class	Ni sensing elements: class B, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: class B according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C NTC 20 k $\Omega$ : $\pm 1$ °C for the range 0 to 70 °C
Measuring error for NS 540 and NS 740	< 0.6 % of the measuring range, minimum 0.5 °C NS 820(K) 0.5 °C for range with a span < 100 °C, < 0.6 % of the range with a span > 100 °C
Sensor connection	according to the wiring diagram
Response time	$\tau_{0.5} < 3$ s (in streaming water at 0.4 m.s <sup>-1</sup> )
Recommended wire cross section - sensors with the grommet	0.35 to 1.5 mm <sup>2</sup>
Type of connector in the head - sensors with connector	RSFM4 - Lumberg
Insulation resistance	> 200 M $\Omega$ at 500 V DC, 25° ± 3 °C; humidity < 85 %
Ingress protection	IP 65 according to EN 60 529
Material of the case	brass
Material of the enclosure	POLYAMID
Standard strap length	40 cm
Minimum pipe diameter	20 mm
Operating conditions	ambient temperature: -30 to 100 °C; -30 to 80 °C with a converter; -30 to 70 °C with frequency output relative humidity: max. 85 % (at the ambient temperature 25 °C) atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.15 kg

### WIRING DIAGRAM

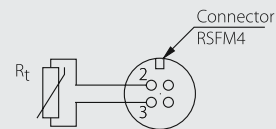
#### SENSORS WITH THE GROMMET:

With resistance output



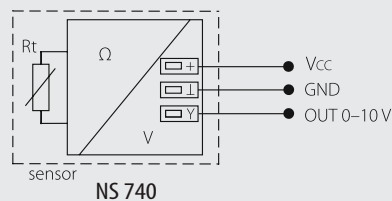
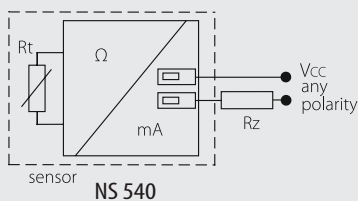
#### SENSORS WITH THE CONNECTOR:

With resistance output

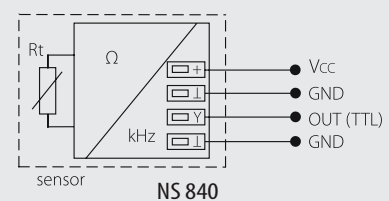


#### SENSORS WITH THE GROMMET:

With the converter

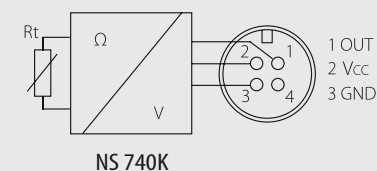
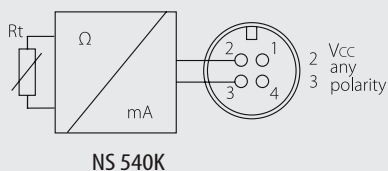


With frequency output

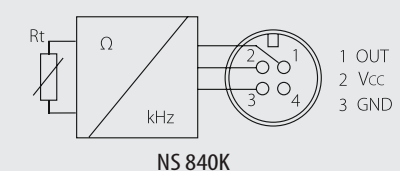


#### SENSORS WITH THE CONNECTOR:

With the converter

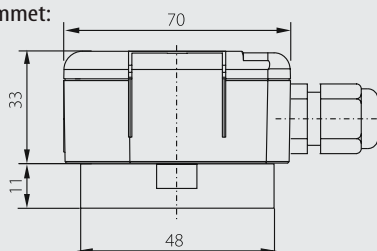


With frequency output

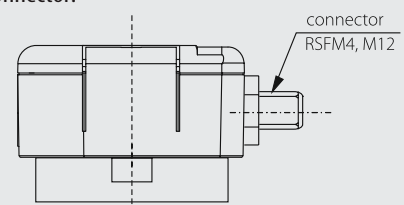


### DIMENSIONAL DRAFT

Sensors with the grommet:



Sensors with the connector:



## CONTACT TEMPERATURE SENSORS WITH A PLASTIC ENCLOSURE

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### ■ SENSOR INSTALLATION AND SERVICING

Before connecting the supply lead-in cable, it is recommended to mount the sensor to the pipe by means of fastening atrapa.

#### SENSORS WITH GROMMET:

Before connecting the supply lead-in cable, lift off the lid of the plastic enclosure by means of a flat screwdriver. The lead-in cable is connected to the terminals according to the wiring diagram through the loosened grommet. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm. To ensure the ingress protection value of IP 65, the grommet has to be tightened and the lid has to be put on after connecting the lead-in cable.

#### SENSORS WITH CONNECTOR:

The lead-in cable with connector is connected to the connector RSFM4, which is part of the sensor head according to the wiring diagram. Optionally the stand-alone connector ELKA 4012, or a lead-in cable equipped with a straight connector of RKT type, or with a rectangular connector of RKWT type may be delivered. To ensure the ingress protection value of IP 65 the connectors and the lid have to be tightened and checked. In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. After installing and connecting the sensor to the appropriate evaluating electrical equipment the sensor is ready to use. The sensor does not require any special service or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.

### ■ CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- option enclosing two sensors
- option enclosing non-standard temperature sensors (DALLAS, TSic, KTY, SMT, etc.)
- class A precision type of temperature element (with the exception of sensors Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, thermistor NTC 20 kΩ)
- option of three- or four-wire connection
- various length of the fastening strap



## CONTACT TEMPERATURE SENSORS WITH A CABLE



### DESCRIPTION AND APPLICATION

These resistance-type sensors are intended for contact surface temperature measurement. The sensors, which are available including the fastening strap, are suitable for temperature measurements on piping. The sensor dimension make it possible to mount the sensor even under the pipe insulation. The standard operating temperature range is -30 to 130 °C. The proper sensing element is isolated so the ambient temperature does not affect the sensor readings. The sensors can be utilised for control systems that are compatible with sensing element output signals or output signals quoted in the table of sensing element types. The sensors are designed to be operated in a chemically non-aggressive environment.



### ACCESSORIES

- The thermal conductive paste up to 200 °C, 5g

### DECLARATION, CERTIFICATES, CALIBRATION

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.

### SPECIFICATIONS

#### BASIC DATA

Sensor type	NS 150A	NS 151A	NS 152A	NS 350A	NS 351A
Type of sensing element	Ni 1000/5000	Ni 1000/6180	Ni 891	Ni 10000/5000	Ni 10000/6180
Measuring range	-30 to 130 °C				
Maximum measuring DC current	1 mA	1 mA	1 mA	0.3 mA	0.3 mA

Sensor type	NS 153A	PTS 150A	PTS 250A	PTS 350A	HS 150A
Type of sensing element	T1 = Ni 2226	PT 100/3850	PT 500/3850	PT 1000/3850	thermistor NTC 20 kΩ
Measuring range	-30 to 130 °C				
Maximum measuring DC current	0.7 mA	3 mA	1.5 mA	1 mA	10 mW *)

\*) maximum power consumption

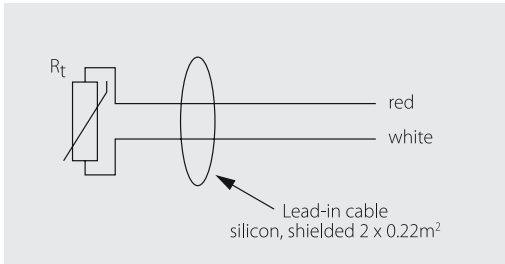
#### OTHER PARAMETERS

Accuracy class **)	Ni sensing elements: B class, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: B class according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C NTC 20 kΩ: $\pm 1$ °C for the range 0 to 70 °C
Sensor connection	according to the wiring diagram
Response time	Sensor type S 150A $\tau_{0.5} < 10$ sec, $\tau_{0.5} < 45$ sec (on smooth surface without paste)
Insulation resistance	$> 200$ MΩ at 500 V DC, $25^\circ \pm 3$ °C; humidity $< 85$ %
Ingress protection	IP 65 according to EN 60 529
Material of the case	brass
Lead-in cable	shielded silicone $2 \times 0.22$ mm <sup>2</sup>
Standard length of the cable	2, 5, 10 m
Material of the protection case	POLYAMID type S150A
Standard length of the strap	40 cm
Minimum diameter of a pipe	20 mm
Operating conditions	ambient temperature: -30 to 130 °C relative humidity: max. 85 % (at the ambient temperature 25 °C) atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.15 kg

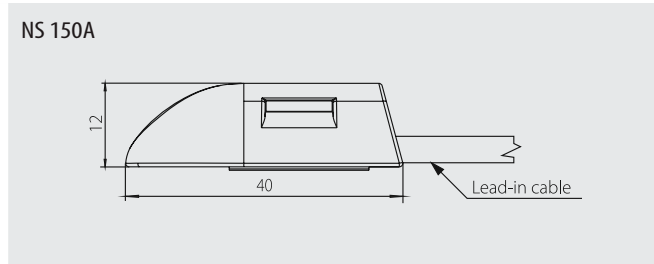
\*\*) Regulated by immersing the sensor in a liquid, an error in method is not considered – the influence of the ambient temperature and environment, uneven surface, etc. In terms of two-wire connections, the impact of the resistance of the lead wire must be added. In a temperature of 20 °C, the impact of the lead resistance is 0.4 °C/1 m.

## CONTACT TEMPERATURE SENSORS WITH A CABLE

### ■ WIRING DIAGRAM



### ■ DIMENSIONAL DRAFT



### ■ SENSOR INSTALLATION AND SERVICING

By means of the straps the sensor is mounted to the piping at the desired location. The lead-in cable is connected to the terminals according to the wiring diagram. After installing to the piping and connecting to the corresponding electrical measuring equipment the sensor is ready to use. The sensor does not require any special servicing and maintenance.

Recommendation: To ensure accuracy of measurement and fast response is recommended to use a thermal conductive paste or silicone vaseline on a surface.

### ■ CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- option enclosing two sensors
- option enclosing non-standard temperature sensors (DALLAS, TSic, KTY, SMT, etc.)
- class A precision type of temperature element (with the exception of sensors Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, thermistor NTC 20 kΩ)
- option of three- or four-wire connection
- various length of the fastening strap

## TEMPERATURE SENSORS WITH MAGNETIC FIXING



### DESCRIPTION AND APPLICATION

The sensors are intended for contact temperature measurements of ferromagnetic materials. The sensor's contact element does contain a springing mechanism, which ensure a reliable contact to the surface to be measured. The plastic enclosure is provided with a cable outlet ending (the terminal board is placed in the enclosure) or a connector. The standard operating temperature range is -30 to 130 °C. The sensors can be utilised for control systems that are compatible with sensing element output signals or output signals quoted in the table of sensing element types. The sensors are designed to be operated in a chemically non-aggressive environment.

### ACCESSORIES

- For the version with connector:
  - led-in connector ELKA 4012 or RKCS 4/9
  - connection cable with the straight-type RKT connector
  - connection cable with the rectangular-type RKWT connector




### DECLARATION, CERTIFICATES, CALIBRATION

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA, 0 to 10 V.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.

Cable sensors with magnetic fixing are a possible alternative to the S 190 line of sensors, see catalogue data sheet no. 06.14.



### SPECIFICATIONS

#### BASIC DATA

Sensor type (K – with connector)	NS 190 NS 190K	NS 191 NS 191K	NS 192 NS 192K	NS 390 NS 390K	NS 391 NS 391K
Type of sensing element	Ni 1000/5000	Ni 1000/6180	Ni 891	Ni 10000/5000	Ni 10000/6180
Measuring range	-30 to 100 °C				
Maximum measuring DC current	1 mA	1 mA	1 mA	0.3 mA	0.3 mA

Sensor type (K – with connector)	NS 193 NS 193K	PTS 190 PTS 190K	PTS 290 PTS 290K	PTS 390 PTS 390K	HS 190 HS 190K
Type of sensing element	T1 = Ni 2226	PT 100/3850	PT 500/3850	PT 1000/3850	thermistor NTC 20 kΩ
Measuring range	-30 to 100 °C				
Maximum measuring DC current	0.7 mA	3 mA	1.5 mA	1 mA	1 mW *)

\*) maximum power consumption

Sensor type (K – with connector)	NS 590 NS 590K	NS 790 NS 790K	Note
Type of sensing element	Pt 1000/3850	Pt 1000/3850	
Output signal	4 to 20 mA	0 to 10 V	
Measuring ranges	-30 to 60 °C	-30 to 60 °C	Enclosure ambient temperature -30 to 80 °C
	0 to 35 °C	0 to 35 °C	
	0 to 100 °C	0 to 100 °C	
	0 to 150 °C	0 to 150 °C	
Power supply (V <sub>CC</sub> )	11 to 30 V DC	15 to 30 V DC	Recommended value 24 V DC
Maximum voltage ripple V <sub>CC</sub>	0.5 %	0.5 %	
Load resistance	50(V <sub>CC</sub> -10) Ω	> 50 kΩ	
Output signal - sensing element break	> 24 mA	> 10.5 V	
Output signal - sensing element short	< 3.5 mA	~ 0 V	

#### OTHER PARAMETERS

Accuracy class	Ni sensing elements B class, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements B class according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C; NTC 20 kΩ: $\pm 1$ °C for the range 0 to 70 °C
Measuring error for NS 590 and NS 790	< 0.6 % of the measuring range, minimum 0.5 °C
Sensor connection	according to the wiring diagram
Measuring surface diameter	19 mm
Measuring surface pressure	5 N
Adhesive power of the sensor	60 N

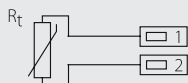
## TEMPERATURE SENSORS WITH MAGNETIC FIXING

Recommended wire cross section - sensors with the grommet	0.35 to 1.5 mm <sup>2</sup>
Type of connector in the head - sensors with connector	RSFM4 - Lumberg
Insulation resistance	> 200 MΩ at 500 V DC, 25° ± 3 °C; humidity < 85 %
Ingress protection	IP 52 according to EN 60 529
Material of the head	LEXAN 503RS
Operating conditions	ambient temperature: -30 to 100 °C; -30 to 80 °C with a converter
	relative humidity: max. 85 % (at the ambient temperature 25 °C)
	atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.1 kg (NS 590, NS 790); 0.08 kg (passive)

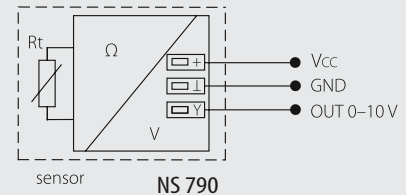
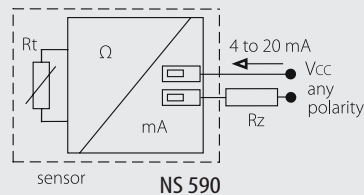
### WIRING DIAGRAM

#### SENSORS WITH THE GROMMET:

##### With resistance output

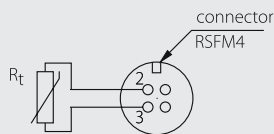


##### With a converter

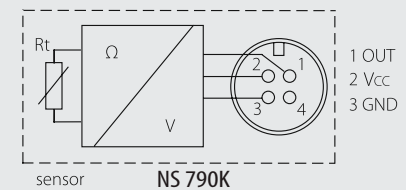
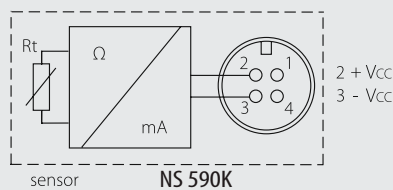


#### SENSORS WITH THE GROMMET:

##### With resistance output

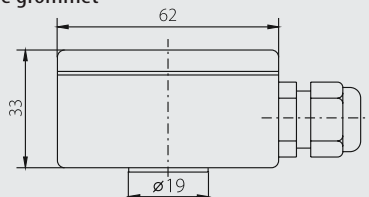


##### With a converter

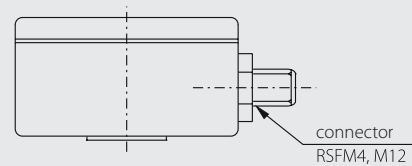


### DIMENSIONAL DRAFT

#### Sensors with the grommet



#### Sensors with the connector



### SENSOR INSTALLATION AND SERVICING

**SENSORS WITH GROMMET:** Before connecting the supply lead-in cable, lift off the lid of the plastic enclosure by means of a flat screwdriver. The lead-in cable is connected to the terminals according to the wiring diagram through the loosened grommet. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm.

**SENSORS WITH CONNECTOR:** The lead-in cable with corresponding connector is connected to the connector RSFM4, which is part of the sensor head. Optionally the stand-alone connector ELKA 4012, or a lead-in cable equipped with a straight connector of RKT type, or with a rectangular connector of RKWT type may be delivered. In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. After installing and connecting the sensor to the appropriate evaluating electrical equipment the sensor is ready to use. The sensor does not require any special service or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.

### CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- option enclosing two sensors
- option enclosing non-standard temperature sensors (DALLAS, TSic, KTY, SMT, etc.)
- class A precision type of temperature element (with the exception of sensors Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, thermistor NTC 20 kΩ)
- option of three- or four-wire connection

## TEMPERATURE SENSORS UP TO 400 °C

### DESCRIPTION AND APPLICATION

These resistance-type sensors are intended for contact measurements of temperatures up to 400 °C. Temperature sensors, in combination with a central holder or thermowell, can be used to measure the temperature in various applications of an industrial environment. The sensor variant with welded thread is ideal for direct measuring of various media in ducts. The standard operating temperature range is -50 to 400 °C. The sensors can be utilised for control systems that are compatible with sensing element output signals or output signals quoted in the table of sensing element types. The sensors are designed to be operated in a chemically non-aggressive environment.

### ACCESSORIES

- The metal central holder K 120
- The thermowell JPTS 41

### DECLARATION, CERTIFICATES, CALIBRATION

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.



#### MAXIMUM STREAM VELOCITY OF THE MEASURED MEDIUM - AIR AND WATER VAPOUR / WATER [m.s<sup>-1</sup>]

Length of the thermowell/stem	> 60 to 100 mm	> 100 to 160 mm	> 160 to 220 mm	> 220 to 400 mm
Values for the versions with screw joint	15 / 1.5	8.0 / 1.0	2.5 / 0.6	0.6 / 0.3

### SPECIFICATIONS

#### BASIC DATA

Sensor type with smooth stem	PTS 41	PTS 43	PTS 45
Sensor type with welded-on screwed joint	PTS 61	PTS 63	PTS 65
Type of sensing element	Pt 100	Pt 500	Pt 1000
Measuring range B class	-50 to 400 °C		
Measuring range A class	-50 to 250 °C		
Maximum measuring DC current	3 mA	1.5 mA	1 mA

Sensor type with smooth stem	PTS 51	Note
Sensor type with welded-on screwed joint	PTS 71	
Type of sensing element	Pt 1000/3850	
Output signal	4 to 20 mA	
Measuring ranges	-50 to 50 °C	
	0 to 100 °C	
	0 to 150 °C	
	0 to 200 °C	
	0 to 400 °C	
Power supply (V <sub>cc</sub> )	11 to 30 V DC	Recommended value 24 V DC
Maximum voltage ripple V <sub>cc</sub>	0.5 %	
Load resistance	50(V <sub>cc</sub> -10) Ω	
Output signal - sensing element break	> 25 mA	
Output signal - sensing element short	< 3.5 mA	

#### OTHER PARAMETERS

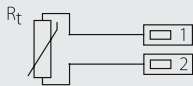
Accuracy class	B class according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C A class according to IEC 751, $\Delta t = \pm (0.15 + 0.002 t )$ in °C
Measuring error	< 0.6 % of the measuring range, minimum 0.5 °C
Sensor connection	according to the wiring diagram
Standard length of the stem L1	50, 100, 160, 220, 280, 400 mm
Nominal pressure of the stem	PN 63 (with a screw joint)
Response time	$\tau_{0.5} < 9$ s (in streaming water at 0.4 m.s <sup>-1</sup> )
Recommended wire cross section	0.35 to 1.5 mm <sup>2</sup>

## TEMPERATURE SENSORS UP TO 400 °C

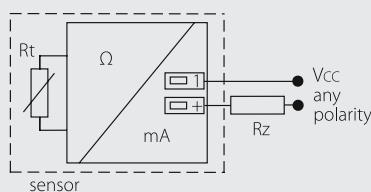
Thead types for PTS 61, PTS 63, PTS 65, PTS 71	G 1/2"; M 20 x 1.5; M 27 x 2
Insulation resistance	> 200 MΩ at 500 V DC, 25° ± 3 °C; humidity < 85 %
Ingress protection	IP 54 according to EN 60 529
Material of the stem	stainless steel 1.4301
Material of the connection head	aluminium LIMATHERM B
Operating conditions	ambient temperature: -30 to 100 °C; -30 to 80 °C with a converter
	relative humidity: max. 85 % (at the ambient temperature 25 °C)
	atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.25 kg

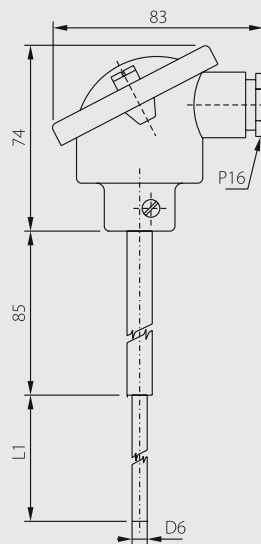
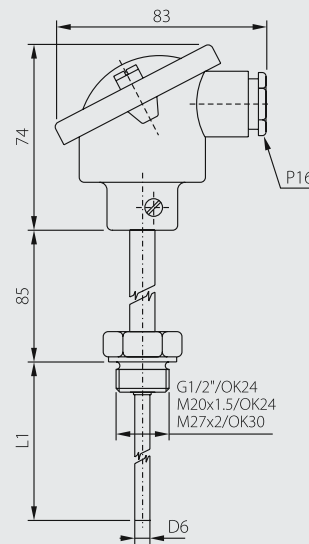
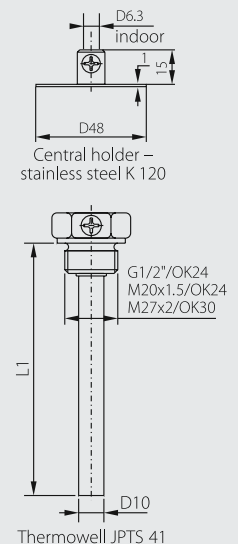
**WIRING DIAGRAM**

With a resistance output



With a converter 4 to 20 mA


**DIMENSIONAL DRAFT**

 PTS 41, PTS 43,  
PTS 45, PTS 51

 PTS 61, PTS 63,  
PTS 65, PTS 71

 Accessory (by the sensors  
PTS 41, PTS 43, PTS 45,  
PTS 51 only)

**SENSOR INSTALLATION AND SERVICING**

Before connecting the supply lead-in cable, position the sensor in the location of temperature measurement, and screw off the lid of the metal connection head. The lead-in cable is connected to the terminals according to the wiring diagram after pushing it in through the loosened grommet. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm. In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. To ensure the ingress protection value of IP 54 the grommet has to be tightened and the lid has to be screwed on after connecting the lead-in cable. In case of using a stainless steel thermowell or a holder these accessories have first to be installed in the temperature measurement location, then then the sensor shall be pushed into the holder or eventually to the thermowell bottom, after which the sensor is secured with a screw. (This applies for the PTS 41, PTS 43, PTS 45 and PTS 51 sensors only). The openings for the stainless steel holder installation have to be drilled according to the attached template, on which the opening diameters are illustrated, too. (This applies for the PTS 41, PTS 43, PTS 45 and PTS 51 sensors only). After installing and connecting to the appropriate evaluating electrical equipment the sensor is ready to use. The sensor does not require any special service or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.

**CUSTOMER SPECIFIC MODIFICATIONS**

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- option enclosing two sensors
- Class A of accuracy for the range -50 to 200 °C
- option of three- or four-wire connection
- variable stem design – L1 length, materials, diameters, option of thread design
- thermowell thread type options



## DESCRIPTION AND APPLICATION

These resistance-type sensors are intended for contact measurements of temperatures up to 400 °C. Temperature sensors, in combination with a central holder or thermowell, can be used to measure the temperature in various applications of an industrial environment. The sensor variant with welded thread is ideal for direct measuring of various media in ducts. The standard operating temperature range is -50 to 400 °C. The sensors can be utilised for any control systems that are compatible with output signal 4–20 mA. The sensors are designed to be operated in a chemically non-aggressive environment.

## ACCESSORIES

- The metal central holder K 120
- The thermowell JPTS 41

## DECLARATION, CERTIFICATES, CALIBRATION

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.



### MAXIMUM STREAM VELOCITY OF THE MEASURED MEDIUM - AIR AND WATER VAPOUR / WATER [m.s<sup>-1</sup>]

Length of the thermowell/stem	> 60 to 100 mm	> 100 to 160 mm	> 160 to 220 mm	> 220 to 400 mm
Values for the versions with screw joint	15 / 1.5	8.0 / 1.0	2.5 / 0.6	0.6 / 0.3

## SPECIFICATIONS

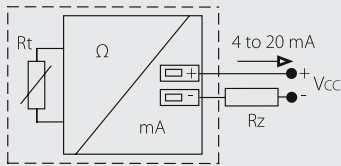
Sensor type with smooth stem	PTS 81
Sensor type with welded-on screwing	PTS 91
Type of sensing element	Pt 100
Output signal	4 to 20 mA
Maximum measurement range	-50 to 400 °C
Adjustable measurement range	optional, minimum interval 10 °C
Accuracy of sensing element	class B according to IEC 751 temperature error < 0.05 °C
Accuracy of converter	error of setting < 0.12 °C error of linearity < 0.05 % from the set range, minimum 0.16 °C influence of supply voltage < 0.005 %/V from the range
Current limitation	sensing element short < 3.2 mA sensing element break > 22.7 mA
Lead-in connection	recommended wire 1.5 to 2.5 mm <sup>2</sup>
Ingress protection	IP 54 according to EN 60 529
Material of sensor stem	stainless steel 1.4301
Standard length of the stem L1	50, 100, 160, 220, 280, 400 mm
Nominal pressure of the stem	PN 63 (with a screw point)
Way of programming	PK – USB adapter *
Thread types by PTS 91	G ½"; M 20 x 1.5; M 27 x 2
Insulation resistance	> 200 MΩ at 500 V DC, 25 °C ± 3 °C; humidity < 85 %
Material of connection head	aluminium, LIMATHERM B
Operating conditions	ambient temperature: -25 to 80 °C relative humidity: max. 85 % (at the ambient temperature 25 °C) atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.25 kg

\*programming software is free

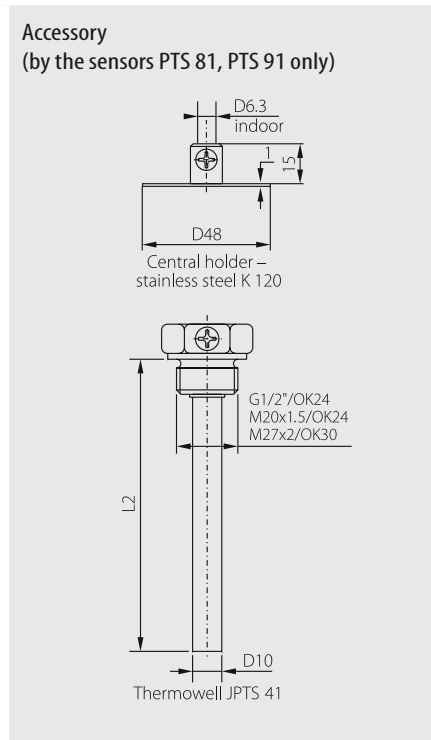
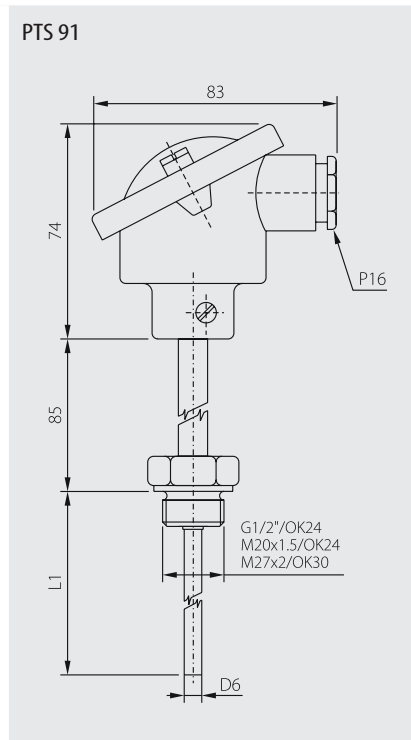
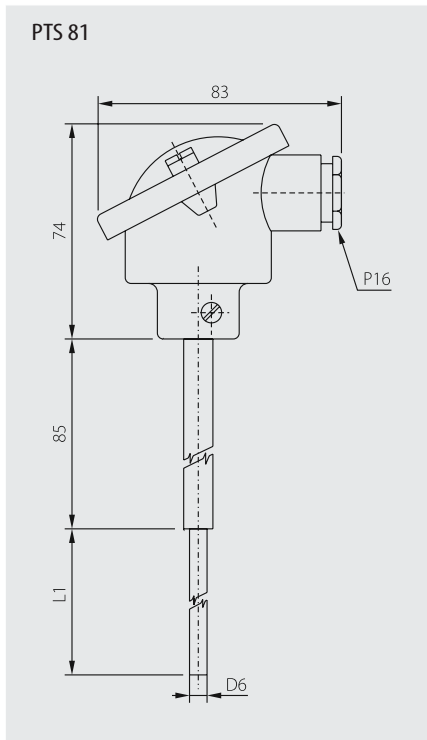


**WIRING DIAGRAM**

With a converter 4 to 20 mA



**DIMENSIONAL DRAFT**



**SENSOR INSTALLATION AND SERVICING**

Before connecting the supply lead-in cable, position the sensor in the location of temperature measurement, and screw off the lid of the metal connection head. The lead-in cable is connected to the terminals according to the wiring diagram after pushing it through the loosened grommet. The recommended wire cross section is 1.5 to 2.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm. In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. To ensure the ingress protection value of IP 54 the grommet has to be tightened and the lid has to be screwed on after connecting the lead-in cable. In case of using a stainless steel thermowell or a holder these accessories have first to be installed at the temperature measurement location, then the sensor shall be pushed into the holder (or eventually to the thermowell bottom), finally the sensor is secured with a screw. The openings for the stainless steel holder installation have to be drilled according to the attached template, on which the opening diameters are marked, too. (This applies for the PTS 81 sensor only).

After installing and connecting the sensor to the appropriate evaluating electrical equipment the sensor is ready to use. The sensor does not require any special servicing or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.

We can offer two options for programming the required temperature range:

- a) when placing the order, the desired temperature range is clearly communicated. During production this temperature range will be programmed. The end-user will not have the possibility to change this setting afterwards, or
- b) by purchasing the optional USB-adaptor cable & software (item PK-USB), the end-user does have the opportunity to (re)program the temperature sensor at the desired range.

**CUSTOMER SPECIFIC MODIFICATIONS**

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- variable stem design – L1 length, materials, diameters, option of thread design
- thermowell thread type options

TEMPERATURE SENSORS (IP 68) UP TO 400 °C

**DESCRIPTION AND APPLICATION**

These resistance-type sensors are intended for contact measurements of temperatures up to 400 °C. Temperature sensors, in combination with a central holder or thermowell, can be used to measure the temperature in various applications of an industrial environment. The sensor variant with welded thread is ideal for direct measuring of various media in ducts. **These sensors meet the IP 68 rating** in accordance with EN 60 529. The standard operating temperature range is -50 to 400 °C. The sensors can be utilised for control systems that are compatible with sensing element output signals or output signals quoted in the table of sensing element types. The sensors are designed to be operated in a chemically non-aggressive environment.

**ACCESSORIES**

- The metal central holder K 120
- The thermowell JPTS 41

**DECLARATION, CERTIFICATES, CALIBRATION**

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.



**MAXIMUM STREAM VELOCITY OF THE MEASURED MEDIUM - AIR AND WATER VAPOUR / WATER [m.s<sup>-1</sup>]**

Length of the thermowell/stem	> 60 to 100 mm	> 100 to 160 mm	> 160 to 220 mm	> 220 to 400 mm
Values for the versions with screw joint	15 / 1.5	8.0 / 1.0	2.5 / 0.6	0.6 / 0.3

**SPECIFICATIONS**

**BASIC DATA**

Sensor type with smooth stem	PTS 441	PTS 443	PTS 445
Sensor type with welded-on screwed joint	PTS 461	PTS 463	PTS 465
Type of sensing element	Pt 100	Pt 500	Pt 1000
Measuring range B class	-50 to 400 °C		
Measuring range A class	-50 to 250 °C		
Maximum measuring DC current	3 mA	1.5 mA	1 mA

Sensor type with smooth stem	PTS 451	Note
Sensor type with welded-on screwed joint	PTS 471	
Type of sensing element	Pt 1000/3850	Connection head ambient temperature -30 to 80 °C
Output signal	4 to 20 mA	
Measuring ranges	-50 to 50 °C	
	0 to 100 °C	
	0 to 150 °C	
	0 to 200 °C	
	0 to 400 °C	
Power supply (V <sub>cc</sub> )	11 to 30 V DC	Recommended value 24 V DC
Maximum voltage ripple V <sub>cc</sub>	0.5 %	
Load resistance	50(V <sub>cc</sub> -10) Ω	
Output signal - sensing element break	> 25 mA	
Output signal - sensing element short	< 3.5 mA	

**OTHER PARAMETERS**

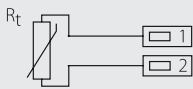
Accuracy class	B class according to IEC 751, Δt = ± (0.3 + 0.005 t ) in °C
Measuring error (PTS 451, PTS 471),	< 0.6 % of the measuring range, minimum 0.5 °C
Sensor connection	according to the wiring diagram
Standard length of the stem L1	50, 100, 160, 220, 280, 400 mm
Nominal pressure of the stem	PN 63 (with a screw joint)
Response time	t <sub>0.5</sub> < 9 s (in streaming water at 0.4 m.s <sup>-1</sup> )
Recommended wire cross section	0.35 to 1.5 mm <sup>2</sup>

## TEMPERATURE SENSORS (IP 68) UP TO 400 °C

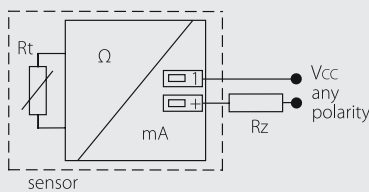
Thead types for PTS 461, PTS 463, PTS 465, PTS 471	G 1/2"; M 20 x 1.5; M 27 x 2
Insulation resistance	> 200 MΩ at 500 V DC, 25° ± 3 °C; humidity < 85 %
Ingress protection	IP 68 according to EN 60 529, 5 bar/30 min.
Material of the stem	stainless steel 1.4301
Material of the connection head	aluminium LIMATHERM B
Operating conditions	ambient temperature: -30 to 100 °C; -30 to 80 °C with a converter
	relative humidity: max. 85 % (at the ambient temperature 25 °C)
	atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.25 kg

**WIRING DIAGRAM**

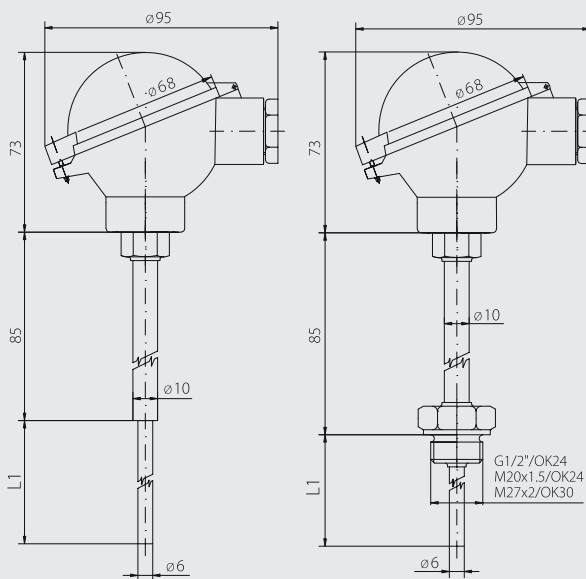
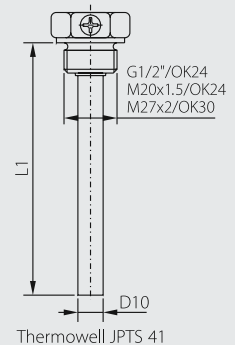
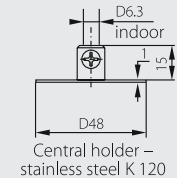
With a resistance output



With a converter 4 to 20 mA


**DIMENSIONAL DRAFT**

 PTS 441, PTS 443,  
PTS 445, PTS 451

 PTS 461, PTS 463,  
PTS 465, PTS 471

 Accessory (by the sensors  
PTS 441, PTS 443, PTS 445,  
PTS 451 only)

**SENSOR INSTALLATION AND SERVICING**

Before connecting the supply lead-in cable, position the sensor in the location of temperature measurement, and screw off the lid of the metal connection head. The lead-in cable is connected to the terminals according to the wiring diagram after pushing it in through the loosened grommet. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm. In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. To ensure the ingress protection value of IP 68 the grommet has to be tightened and the lid has to be screwed on after connecting the lead-in cable.

In case of using a stainless steel thermowell or a holder these accessories have first to be installed at the temperature measurement location, then the sensor shall be pushed into the holder (or eventually to the thermowell bottom), finally the sensor is secured with a screw. (This applies for the PTS 441, PTS 443, PTS 445 and PTS 451 sensors only). The openings for the stainless steel holder installation have to be drilled according to the attached template, on which the opening diameters are illustrated, too. (This applies for the PTS 441, PTS 443, PTS 445 and PTS 451 sensors only). After installing and connecting to the appropriate evaluating electrical equipment the sensor is ready to use. The sensor does not require any special service or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.

**CUSTOMER SPECIFIC MODIFICATIONS**

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- option enclosing two sensors
- A class of accuracy for the range -50 to 250 °C
- option of three- or four-wire connection
- variable stem design – L1 length, materials, diameters, option of thread design
- thermowell thread type options



## DESCRIPTION AND APPLICATION

These resistance-type sensors are intended for contact measurements of temperatures up to 400 °C. Temperature sensors, in combination with a central holder or thermowell, can be used to measure the temperature in various applications of an industrial environment. The sensor variant with welded thread is ideal for direct measuring of various media in ducts. **These sensors meet the IP 68 rating** in accordance with EN 60 529. The standard operating temperature range is -50 to 400 °C. The sensors can be utilised for any control systems that are compatible with output signal 4–20 mA. The sensors are designed to be operated in a chemically non-aggressive environment.

## ACCESSORIES

- The metal central holder K 120
- The thermowell JPTS 41

## DECLARATION, CERTIFICATES, CALIBRATION

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.



### MAXIMUM STREAM VELOCITY OF THE MEASURED MEDIUM - AIR AND WATER VAPOUR / WATER [m.s<sup>-1</sup>]

Length of the thermowell/stem	> 60 to 100 mm	> 100 to 160 mm	> 160 to 220 mm	> 220 to 400 mm
Values for the versions with screw joint	15 / 1.5	8.0 / 1.0	2.5 / 0.6	0.6 / 0.3

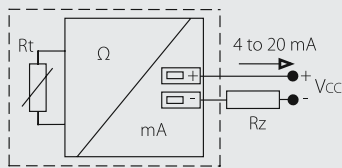
## SPECIFICATIONS

Sensor type with smooth stem	PTS 481
Sensor type with welded-on screwing	PTS 491
Type of sensing element	Pt 100
Output signal	4 to 20 mA
Maximum measurement range	-50 to 400 °C
Adjustable measurement range	optional, minimum interval 10 °C
Accuracy of sensing element	class B according to IEC 751 temperature error < 0.05 °C
Accuracy of converter	error of setting < 0.12 °C error of linearity < 0.05 % from the set range, minimum 0.16 °C influence of supply voltage < 0.005 %/V from the range
Current limitation	sensing element short < 3.2 mA sensing element break > 22.7 mA
Lead-in connection	recommended wire 1.5 to 2.5 mm <sup>2</sup>
Ingress protection	IP 68 according to EN 60 529
Material of sensor stem	stainless steel 1.4301
Standard length of the stem L1	50, 100, 160, 220, 280, 400 mm
Way of programming	PK – USB adapter *
Thread types by PTS 491	G 1/2"; M 20 x 1.5; M 27 x 2
Insulation resistance	> 200 MΩ at 500 V DC, 25 °C ± 3 °C; humidity < 85 %
Material of connection head	aluminium, LIMATHERM B ambient temperature: -25 to 80 °C
Operating conditions	relative humidity: max. 85 % (at the ambient temperature 25 °C) atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.25 kg

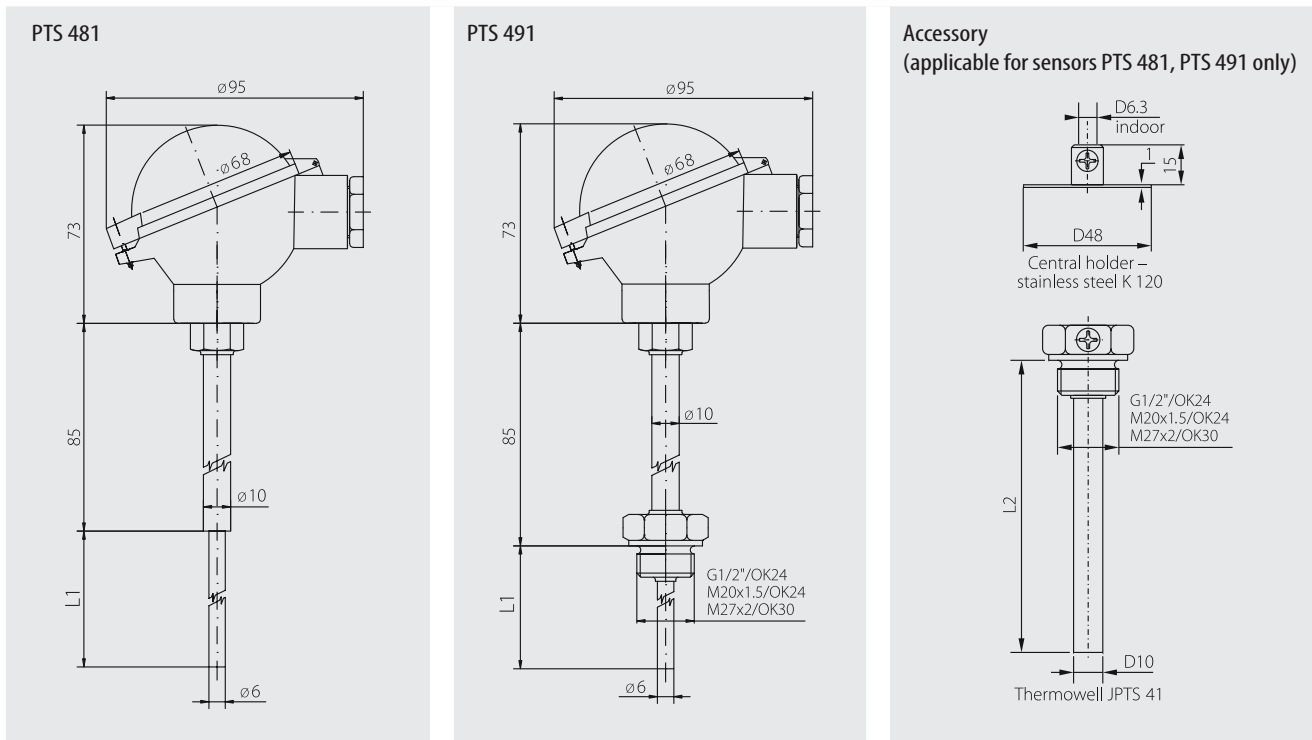
\*programming software is free

## WIRING DIAGRAM

With a converter 4 to 20 mA



## DIMENSIONAL DRAFT



## SENSOR INSTALLATION AND SERVICING

Before connecting the supply lead-in cable, position the sensor in the location of temperature measurement, and screw off the lid of the metal connection head. The lead-in cable is connected to the terminals according to the wiring diagram after pushing it through the loosened grommet. The recommended wire cross section is 1.5 to 2.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm. In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. To ensure the ingress protection value of IP 68 the grommet has to be tightened and the lid has to be screwed on after connecting the lead-in cable. In case of using a stainless steel thermowell or a holder these accessories have first to be installed in the temperature measurement location, then then the sensor shall be pushed into the holder or eventually to the thermowell bottom, after which the sensor is secured with a screw. The openings for the stainless steel holder installation have to be drilled according to the attached template, on which the opening diameters are marked, too. (This applies for the PTS 481 sensor only). After installing and connecting the sensor to the appropriate evaluating electrical equipment the sensor is ready to use. The sensor does not require any special servicing or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.

Programming of required range is possible by two ways. The range can be defined directly in the order and afterward it is programmed and user has no possibility to change it. The second way is purchasing the programming adapter PK-USB including software and in this case the range can be programmed user-own.

## CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- variable stem design – L1 length, materials, diameters, option of thread design
- thermowell thread type options

## TEMPERATURE SENSORS (IP 68) UP TO 600 °C

### DESCRIPTION AND APPLICATION

These resistance-type sensors are intended for contact measurements of temperatures up to 600 °C. Temperature sensors, in combination with a central holder or thermowell, can be used to measure the temperature in various applications of an industrial environment. The sensor variant with welded thread is ideal for direct measuring of various media in ducts. **These sensors meet the IP 68 rating** in accordance with EN 60 529. The standard operating temperature range is -50 to 600 °C. The sensors can be utilised for control systems that are compatible with sensing element output signals or output signals quoted in the table of sensing element types. The sensors are designed to be operated in a chemically non-aggressive environment.

### ACCESSORIES

- The metal central holder K 120
- The thermowell JPTS 41

### DECLARATION, CERTIFICATES, CALIBRATION

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.



#### MAXIMUM STREAM VELOCITY OF THE MEASURED MEDIUM - AIR AND WATER VAPOUR / WATER [m.s<sup>-1</sup>]

Length of the thermowell/stem	> 60 to 100 mm	> 100 to 160 mm	> 160 to 220 mm	> 220 to 400 mm
Values for the versions with screw joint	15 / 1.5	8.0 / 1.0	2.5 / 0.6	0.6 / 0.3

### SPECIFICATIONS

#### BASIC DATA

Sensor type with smooth stem	PTS 641	PTS 645
Sensor type with welded-on screwed joint	PTS 661	PTS 665
Type of sensing element	Pt 100	Pt 1000
Measuring range B class	-50 to 600 °C, on a short term to 650 °C	
Maximum measuring DC current	3 mA	1 mA

Sensor type with smooth stem	PTS 651	Note
Sensor type with welded-on screwed joint	PTS 671	
Type of sensing element	Pt 1000/3850	Connection head ambient temperature -30 to 80 °C
Output signal	4 to 20 mA	
Measuring ranges	-50 to 50 °C	
	0 to 100 °C	
	0 to 150 °C	
	0 to 200 °C	
	0 to 400 °C	
Power supply (V <sub>CC</sub> )	11 to 30 V DC	Recommended value 24 V DC
Maximum voltage ripple V <sub>CC</sub>	0.5 %	
Load resistance	50(V <sub>CC</sub> -10) Ω	
Output signal - sensing element break	> 25 mA	
Output signal - sensing element short	< 3.5 mA	

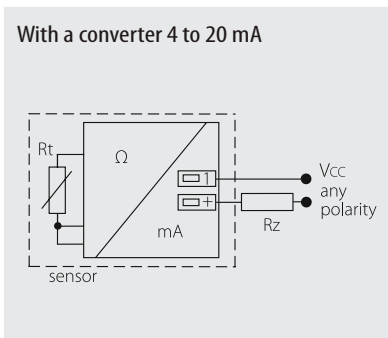
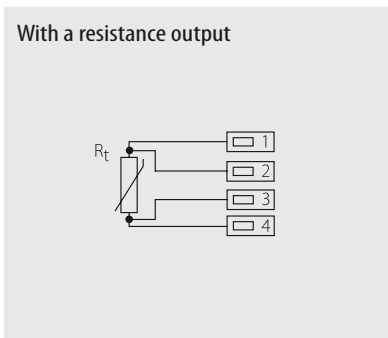
#### OTHER PARAMETERS

Accuracy class	B class according to IEC 751, Δt = ± (0.3 + 0.005 t ) in °C
Measuring error (PTS 651, PTS 671)	< 0.6 % of the measuring range, minimum 0.5 °C
Sensor connection	4-wire
Standard length of the stem L1	50, 100, 160, 220, 280, 400 mm
Nominal pressure of the stem	PN 63 (with a screw joint)
Response time	τ <sub>0.5</sub> < 9 s (in streaming water at 0.4 m.s <sup>-1</sup> )

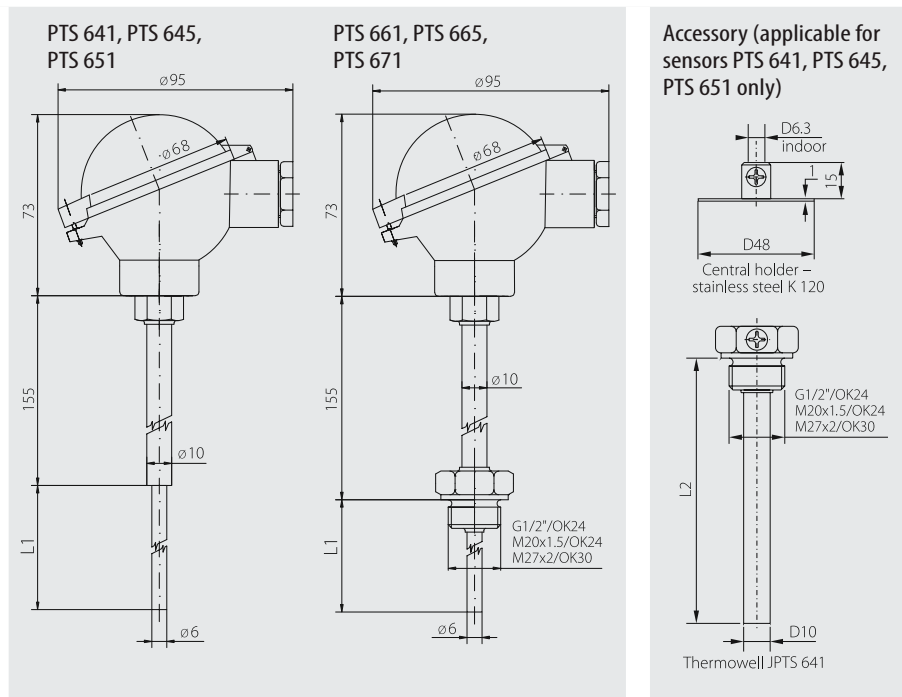
TEMPERATURE SENSORS (IP 68) UP TO 600 °C

Recommended wire cross section	0.35 to 1.5 mm <sup>2</sup>
Thead types for PTS 661, PTS 665, PTS 671	G 1/2"; M 20 x 1.5; M 27 x 2
Insulation resistance	> 200 MΩ at 500 V DC, 25° ± 3 °C; humidity < 85 %
Ingress protection	IP 68 according to EN 60 529, 5 bar/30 min.
Material of the stem	stainless steel EN X6CrNiTi 18-10 (DIN 1.4541)
Material of the connection head	aluminium LIMATHERM B
Grommet type	M 20 x 1.5
Operating conditions	ambient temperature: -30 to 100 °C; -30 to 80 °C with a converter
	relative humidity: max. 85 % (at the ambient temperature 25 °C)
	atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.25 kg

**WIRING DIAGRAM**



**DIMENSIONAL DRAFT**



**SENSOR INSTALLATION AND SERVICING**

Before connecting the supply lead-in cable, position the sensor in the location of temperature measurement, and screw off the lid of the metal connection head. The lead-in cable is connected to the terminals according to the wiring diagram after pushing it in through the loosened grommet. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm. In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. To ensure the ingress protection value of IP 68 the grommet has to be tightened and the lid has to be screwed on after connecting the lead-in cable.

In case of using a stainless steel thermowell or a holder these accessories have first to be installed in the temperature measurement location, then then the sensor shall be pushed into the holder or eventually to the thermowell bottom, after which the sensor is secured with a screw. (This applies for the PTS 641, PTS 645 and PTS 651 sensors only). The openings for the stainless steel holder installation have to be drilled according to the attached template, on which the opening diameters are illustrated, too. (This applies for the PTS 641, PTS 645 and PTS 651 sensors only). After installing and connecting to the appropriate evaluating electrical equipment the sensor is ready to use. The sensor does not require any special service or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.

**CUSTOMER SPECIFIC MODIFICATIONS**

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- option enclosing two sensors
- A class of accuracy for the range -50 to 200 °C
- option of three- or four-wire connection
- variable stem design – L1 length, materials, diameters, option of thread design
- thermowell thread type options





## DESCRIPTION AND APPLICATION

These resistance-type sensors are intended for contact measurements of temperatures up to 600 °C. Temperature sensors, in combination with a central holder or thermowell, can be used to measure the temperature in various applications of an industrial environment. The sensor variant with welded thread is ideal for direct measuring of various media in ducts. **These sensors meet the IP 68 rating** in accordance with EN 60 529. The standard operating temperature range is -50 to 600 °C. The sensors can be utilised for any control systems that are compatible with output signal 4–20 mA. The sensors are designed to be operated in a chemically non-aggressive environment.

## ACCESSORIES

- The metal central holder K 120
- The thermowell JPTS 41

## DECLARATION, CERTIFICATES, CALIBRATION

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.



### MAXIMUM STREAM VELOCITY OF THE MEASURED MEDIUM - AIR AND WATER VAPOUR / WATER [m.s<sup>-1</sup>]

Length of the thermowell/stem	> 60 to 100 mm	> 100 to 160 mm	> 160 to 220 mm	> 220 to 400 mm
Values for the versions with screw joint	15 / 1.5	8.0 / 1.0	2.5 / 0.6	0.6 / 0.3

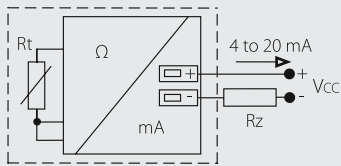
## SPECIFICATIONS

Sensor type with smooth stem	PTS 681
Sensor type with welded-on screwing	PTS 691
Type of sensing element	Pt 100
Output signal	4 to 20 mA
Maximum measurement range	-50 to 600 °C, on a short term to 650 °C
Adjustable measurement range	optional, minimum interval 10 °C
Accuracy of sensing element	class B according to IEC 751 temperature error < 0.05 °C
Accuracy of converter	error of setting < 0.12 °C error of linearity < 0.05 % from the set range, minimum 0.16 °C influence of supply voltage < 0.005 %/V from the range
Current limitation	sensing element short < 3.2 mA sensing element break > 22.7 mA
Lead-in connection	recommended wire 1.5 to 2.5 mm <sup>2</sup>
Ingress protection	IP 68 according to EN 60 529
Material of sensor stem	stainless steel EN X6CrNiTi 18-10 (DIN 1.4541),
Standard length of the stem L1	50, 100, 160, 220, 280, 400 mm
Way of programming	PK – USB adapter *
Thread types by PTS 691	G ½"; M 20 x 1.5; M 27 x 2
Insulation resistance	> 200 MΩ at 500 V DC, 25 °C ± 3 °C; humidity < 85 %
Material of connection head	aluminium, LIMATHERM B ambient temperature: -25 to 80 °C
Operating conditions	relative humidity: max. 85 % (at the ambient temperature 25 °C) atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.25 kg

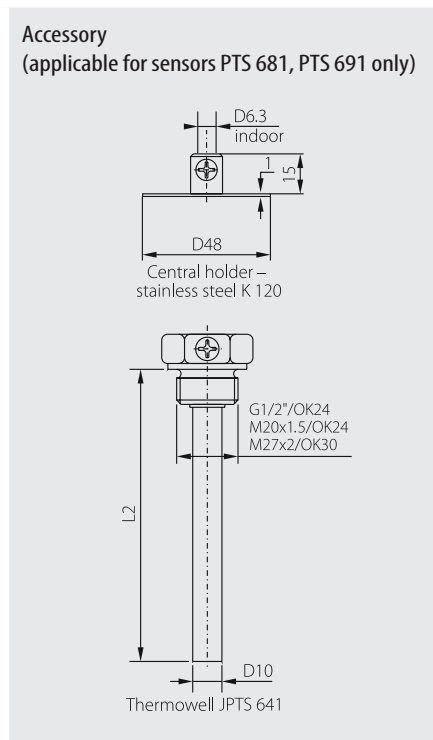
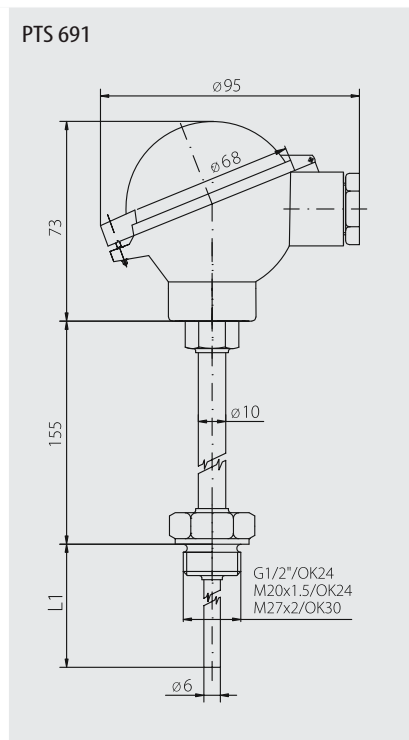
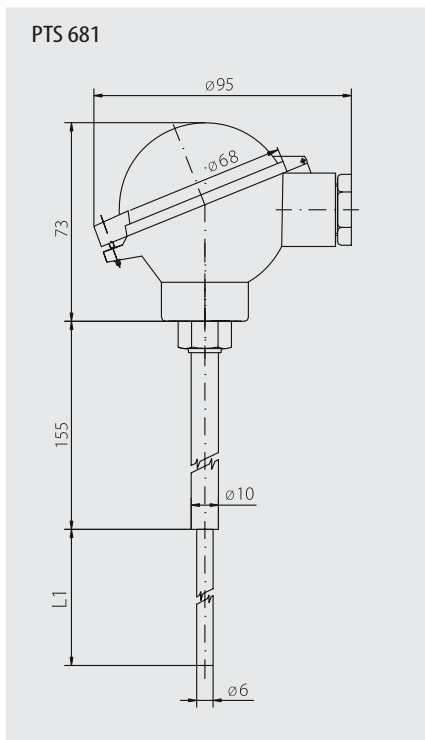
\*programming software is free

## WIRING DIAGRAM

With a converter 4 to 20 mA



## DIMENSIONAL DRAFT



## SENSOR INSTALLATION AND SERVICING

Before connecting the supply lead-in cable, position the sensor in the location of temperature measurement, and screw off the lid of the metal connection head. The lead-in cable is connected to the terminals according to the wiring diagram after pushing it through the loosened grommet. The recommended wire cross section is 1.5 to 2.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm. In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. To ensure the ingress protection value of IP 68 the grommet has to be tightened and the lid has to be screwed on after connecting the lead-in cable. In case of using a stainless steel thermowell or a holder these accessories have first to be installed in the temperature measurement location, then the sensor shall be pushed into the holder (or eventually to the thermowell bottom), finally the sensor is secured with a screw. The openings for the stainless steel holder installation have to be drilled according to the attached template, on which the opening diameters are marked, too. (This applies for the PTS 681 sensor only). After installing and connecting the sensor to the appropriate evaluating electrical equipment the sensor is ready to use. The sensor does not require any special servicing or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.

We can offer two options for programming the required temperature range:

- when placing the order, the desired temperature range is clearly communicated. During production this temperature range will be programmed. The end-user will not have the possibility to change this setting afterwards, or
- by purchasing the optional USB-adaptor cable & software (item PK-USB), the end-user does have the opportunity to (re)program the temperature sensor at the desired range.

## CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- variable stem design – L1 length, materials, diameters, option of thread design
- thermowell thread type options

## DIGITAL THERMOMETERS WITH DISPLAY

### TDx THERMOMETERS WITH DIGITAL DISPLAY

These thermometers are made in 5 versions:

The **TDi** version is fitted with a programmable converter for a 4–20 mA current loop. Buttons enable the setting of certain parameters of the current loop on display (e.g. temperature unit).

The **TDu** version with a voltage output of 0–10 V or 0–5 V (three-wire connection). With the help of the buttons you can set the parameters for the voltage output or units on the display. On request, it is possible to add two switching semiconductor switches.

The **TDs** version with only a switching contactless 30 V/500 mA switch. By using the buttons you can set the parameters of switching and the units on the display.

The **TDb** battery-powered version. It does not have analogue or switching output. The thermometer is generally in sleep mode and data appears on the display for approx. 10 sec. Moreover, in this version you can select certain parameters of display, such as the temperature unit or minimum or maximum temperature value.

The **TDd** version with RS232 or RS485 (three-wire) serial digital output. This version enables the use of 1 switch. The communication protocol is ASCII or MODBUS RTU.

### ■ SPECIFICATIONS

Power supply	(Vs): 9 to 30 V DC for 2-wire connection (TDi), 15 to 30 V DC for 3-wire connection (TDu, TDs, TDd)
Maximum operating temperature range	-50 to +150 °C, -50 to 400 °C
Load resistance	< (Vs-9V)/0.02 for 2-wire connection > 10 k for 3-wire connection
Display range	4 ½ digits, bar graph, power supply effect (IEC 770): < 0.005 %/1V
Sensor accuracy	See Pt100 A or Pt100 B standard
Converter errors (in accordance with IEC 770)	basic 0.15 %, repeatability 0.05 %, hysteresis 0.03 %, linearity 0.25 %
Temperature dependence (IEC 770)	zero error 0.15 %/10 °K (range 0 to 70 °C) error margin 0.15 %/10 °K (range 0 to 70 °C)
Range of analogue outputs	adjustable using buttons and display – min. margin 20 % of the standard range
Response time	standard (flowing water, 0.4 ms–1.50=) < 7 s fast (flowing water, 0.4 ms–1.50=) < 4 s Fast (flowing water, 0.4 ms-1.90-=) < 10 s
Damping constant	programmable 0 to 100 s
Ambient temperature of heads	-20 to 70 °C
Relative humidity	< 95 % (without condensation)
Ingress protection	IP 65 according to EN 60 529
Material of the sensor stem	stainless steel 17240
Head material	PA 6.6, polycarbonate
EMC (electromagnetic compatibility)	EN 50081-2 (emissions) EN 50082-2 (resistance)



TEMPERATURE SENSORS WITH CABLE AND METAL TIP



**DESCRIPTION AND USE**

Temperature sensors with a cable are designed for contact temperature measuring of solid, liquid or gaseous substances in various sectors of industry, e.g. in the food industry, chemical industry, refrigeration etc.

Temperature sensors consist of a metal case, which conceals the temperature sensor and lead-in cable. All types of resistance sensors can be used as resistance sensors, i.e. – Pt 100, Pt 500, Pt 1000, Ni 1000, Ni 10000, Ni 891, T1 = Ni 2226, NTC, PTC etc, as well as other types of sensors, such as elements KTY, SMT 160, DALLAS, TSic, etc. The following tables state the basic combinations of these types of cases, sensors and cables. Other combinations based on the wishes of the customer are possible through custom manufacturing.

Based on design, sensor connections can be two-wire, or custom three-wire and four-wire.

The basic materials for sensor cases are class 1.4301 stainless steel, Aluminium alloy or brass. Temperature sensors can be used for measuring temperatures ranging from -190 to 450 °C, the specific range is stipulated for each type separately.

Sensors are designed for use in chemically non-aggressive environments.



**SPECIFICATIONS**

Type of sensing element	Resistance temperature sensing element – Pt 100/3850, Pt 500/3850, Pt 1000/3850, Ni 1000/5000, Ni 1000/6180, Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, Ni 891, NTC Thermocouple temperature sensing element – TCK, TCJ, TCT Special temperature sensing elements – KTY, SMT 160, DALLAS, TSic, etc.
Accuracy class of individual sensors	Ni sensing elements: class B, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: class B in accordance with IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C NTC 20 k $\Omega$ : $\pm 1$ °C at a range of 0 to 70 °C KTY: $\pm 1$ % at 25 °C NTC: $\pm 1$ %, 3 %, 5 % at 25 °C (according to type) TC: class 2 in accordance with IEC 584-2 DS18B20: $\pm 0.5$ °C for -10 up to 80 °C SMT 160-30: $\pm 0.7$ °C TSic: according to type
Sensor connection	2-wire, 3-wire or 4-wire
Insulation resistance	> 200 M $\Omega$ at 500 V DC, 25 °C $\pm 3$ °C; humidity < 85 %
Insulation variant of lead-in cables	Silicone -50 up to 200 °C
	PVC -30 up to 80 °C
	PVC* -40 up to 105 °C
	Teflon -190 to 250 °C (short-term 300 °C) Fibreglass insulation 0 up to 400 °C

\* With increased temperature resistance.

**MAXIMUM FLOW SPEED OF THE MEASURED MEDIUM – AIR AND WATER STEAM/WATER [m.s<sup>-1</sup>] \*\***

Length of case L (mm)	up to 60	> 60 to 100	> 100 to 160	> 160 to 220	> 220 to 400
Case diameter (mm)					
Ø 6	20 / 2.0	15 / 1.5	8.0 / 1.0	2.5 / 0.6	0.6 / 0.3
Ø 4	8.0 / 0.8	6 / 0.6	3.2 / 0.4	1.0 / 0.25	0.25 / 0.12

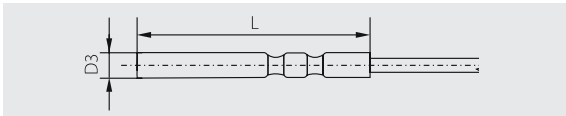
\*\* For sensors with a thread for direct mounting.

TEMPERATURE SENSORS WITH CABLE AND METAL TIP

■ Temperature sensors with a smooth probe and diameter ≤ 5 mm

**TG 3 and TG 3A sensors – stainless steel 3 mm diameter**

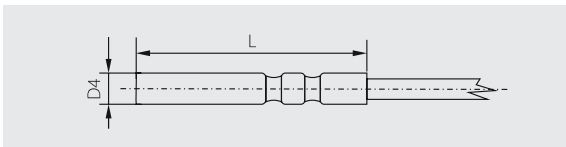
These resistance sensors are designed for contact measuring of the temperature of gaseous, liquid or solid substances. The temperature range of use for TG 3 sensors is -50 °C to 200 °C and -50 °C to 260 °C for model TG 3A. The case diameter ensures a quick response to changes in temperature. Lead-in cables with Teflon insulation without shielding are used. The sensors are designed for universal use. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.



Sensor	TG 3	TG 3A
Temperature range of use	-50 to 200 °C	-50 to 260 °C (short-term 300 °C)
Type of sensing element	Pt, Ni, NTC, Thermocouple K, J	
Ingress protection	IP 67 in accordance with EN 60529	IP 64 in accordance with EN 60529
Case material	Stainless steel 1.4301	
Case diameter	3 mm	
Case length L	40 mm (minimum length of 25 mm)	
Lead-in cable	Teflon unshielded 2 x 0.205 mm <sup>2</sup>	
Circuit resistance	0.16 Ω for 1 m of cable for 2-wire connection	
Response time	τ <sub>0.5</sub> = up to 3 s, τ <sub>0.9</sub> = up to 9 s	

**TR 024 and TR 024A sensors – stainless steel 4 mm diameter**

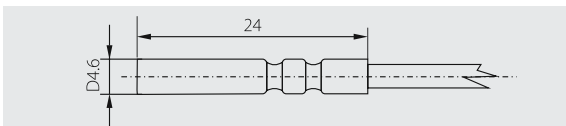
These resistance sensors are designed for contact measuring of the temperature of gaseous, liquid or solid substances. The temperature range of use for TR 024 sensors with a Teflon cable is -50 °C to 260 °C and -50 °C to 200 °C for model TR 024A with a silicone cable. The case diameter ensures a quick response to changes in temperature. The sensors are designed for universal use. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.



Sensor	TR 024	TR 024A
Temperature range of use	-50 to 250 °C	-50 to 200 °C
Type of sensing element	Pt, Ni	
Ingress protection	IP 64 in accordance with EN 60529	IP 67 in accordance with EN 60529
Case material	Stainless steel 1.4301	
Case diameter	4 mm	
Case length L	35 to 60 mm (in 10 mm)	
Lead-in cable	Teflon shield. 2 x 0.14 mm <sup>2</sup>	Silicone shielded Teflon shield. 2 x 0.22 mm <sup>2</sup>
Circuit resistance	0.254 Ω for 1 m of cable for 2-wire connection	0.16 Ω for 1 m of cable for 2-wire connection
Response time	τ <sub>0.5</sub> < 5 s in water flowing at a rate of 0.4 m.s <sup>-1</sup>	

**TG 4 sensors – brass case 4.6 mm diameter**

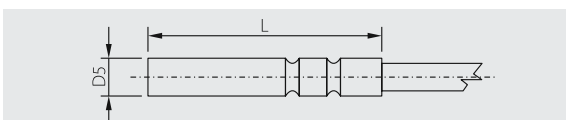
These resistance sensors are designed for contact measuring of the temperature of gaseous, liquid or solid substances. The maximum temperature range of use for the sensors is -50 °C to 200 °C. The applied materials and the case diameter ensure a quick response to changes in temperature. Lead-in cables with silicone insulation and shielding are used. The sensors are designed for use in a chemically non-aggressive environment. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.



Maximum temperature range of use	-50 to 200 °C (can be restricted depending on the type of sensor, specified in the instructions for use)	
Type of sensing element	Pt, Ni, NTC, Thermocouple K, J	
Ingress protection	IP 67 in accordance with EN 60529	
Case material	Brass	
Case diameter	4.6 mm	
Case length	24 mm	
Lead-in cable	Silicone shielded 2 x 0.22 mm <sup>2</sup>	
Circuit resistance	0.16 Ω for 1 m of cable for 2-wire connection	
Response time	τ <sub>0.5</sub> < 7 s in water flowing at a rate of 0.4 m.s <sup>-1</sup>	

**TR 125 sensors – stainless steel 5 mm diameter**

These resistance sensors are designed for contact measuring of the temperature of gaseous and liquid substances. The maximum temperature range of use for the sensors is -50 °C to 200 °C. The applied materials and the case diameter ensure a quick response to changes in temperature. Lead-in cables with silicone insulation and shielding are used. The sensors are designed for universal use. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.

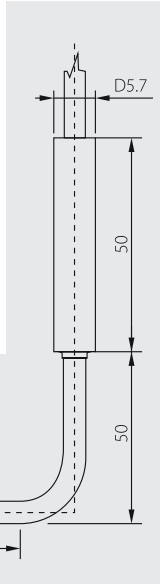


Maximum temperature range of use	-50 to 200 °C (can be restricted depending on the type of sensor, specified in the instructions for use)	
Type of sensing element	Pt, Ni, NTC, TCx	
Ingress protection	IP 67 in accordance with EN 60529	
Case material	Stainless steel 1.4301	
Case length L	30 to 200 mm	
Lead-in cable	Silicone shielded 2 x 0.22 mm <sup>2</sup> Silicone shielded 4 x 0.15 mm <sup>2</sup>	
Circuit resistance	0.16 Ω for 1 m of cable for 2-wire connection	
Response time	τ <sub>0.5</sub> < 7 s in water flowing at a rate of 0.4 m.s <sup>-1</sup>	

TEMPERATURE SENSORS WITH CABLE AND METAL TIP

**TR 093 and TR 093A sensors – stainless steel 3 mm diameter**

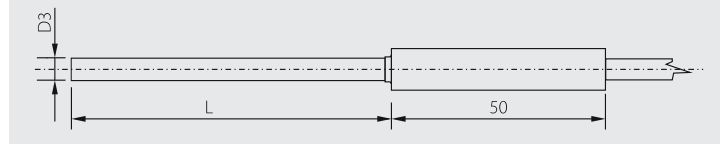
These resistance sensors are designed for measuring the temperature of gaseous and liquid substances. The maximum temperature range of use for the sensors is -50 °C to 200 °C. The case diameter ensures a quick response to changes in temperature. Lead-in cables with PVC or silicone insulation and shielding are used. The sensors are designed for universal use. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.



TR 093

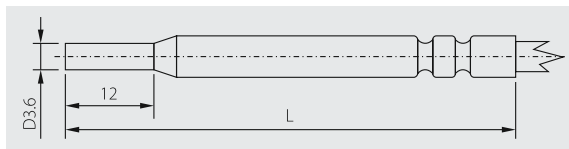
Maximum temperature range of use	-50 to 200 °C (can be restricted depending on the type of sensor and cable, specified in the instructions for use)
Type of sensing element	Pt 100, Pt 500, Pt 100, Ni 1000, NTC, Thermocouple K, J
Ingress protection	IP 67 in accordance with EN 60529
Case material	Stainless steel 1.4301
Case diameter	3 mm
Case length L	100 to 300 mm
Lead-in cable	PVC shielded 2 x 0.25 mm <sup>2</sup> or 4 x 0.25 mm <sup>2</sup> Silicone shielded 2 x 0.22 mm <sup>2</sup> or 4 x 0.22 mm <sup>2</sup>
Circuit resistance	0.16 Ω for 1 m of cable for 2-wire connection – silicone 0.14 Ω for 1 m of cable for 2-wire connection – PVC
Response time	τ <sub>0.5</sub> < 4 s in water flowing at a rate of 0.4 m.s <sup>-1</sup>

TR 093A



**TG9 sensors – stainless steel 5/3.6 mm diameter**

These resistance sensors are designed for measuring the temperature of gaseous and liquid substances. The maximum temperature range of use for the sensors is -50 °C to 200 °C. The shape of the case tapering to 3.6 mm in diameter ensures a quick response to changes in temperature. Lead-in cables with silicone insulation and shielding are used. The sensors are designed for universal use. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.

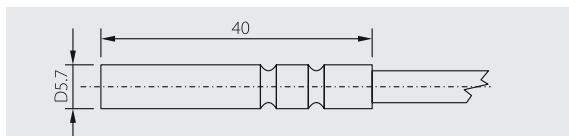


Maximum temperature range of use	-50 to 200 °C (can be restricted depending on the type of sensor and cable, specified in the instructions for use)
Type of sensing element	Pt, Ni (except for T1 = Ni 2226 and Ni 10000), NTC, TCx
Ingress protection	IP 67 in accordance with EN 60529
Case material	Stainless steel 1.4301
Case diameter	5 mm
Case tip diameter	3.6 mm
Case length L	60 to 200 mm
Lead-in cable	Silicone shielded 2 x 0.22 mm <sup>2</sup> Silicone shielded 4 x 0.22 mm <sup>2</sup>
Circuit resistance	0.16 Ω for 1 m of cable for 2-wire connection
Response time	τ <sub>0.5</sub> < 4 s

**Temperature sensors with a smooth probe and diameter > 5 mm**

**TGL and TGLJ sensors – stainless steel 5.7 mm diameter**

These resistance sensors are designed for measuring the temperature of gaseous and liquid substances. The maximum temperature range of use for the sensors is -40 °C to 105 °C. Lead-in cables with PVC insulation for up to 80 °C with shielding or up to 105 °C without shielding are used. The diameter of the case enables even special temperature sensors to be encased – KTY, SMT 160, DS 18B20, TSIC etc. In combination with a TG8 thermowell these sensors can be used for measuring the temperature in pipes as well as a pressure device pursuant to Government Regulation No. 26/2003 Coll., as amended. The sensors are designed for universal use. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.



Sensor	TGL	TGLJ
Use	General	For JTG8 thermowell
Temperature range of use	-40 to 105 °C (it may be restricted by the cable type)	
Type of sensing element	All types	
Ingress protection	IP 67 in accordance with EN 60529	
Case material	Stainless steel 1.4301	
Case diameter	5.7 mm	
Case length	40 to 200 mm (in 20 mm)	
Lead-in cable	PVC shielded 2 x 0.34 mm <sup>2</sup> or 4 x 0.25 mm <sup>2</sup> (-40 to 80 °C) PVC unshielded 2 x 0.35 mm <sup>2</sup> or 4 x 0.35 mm <sup>2</sup> (-40 to 105 °C)	
Circuit resistance	0.11 Ω for 1 m of cable for 2-wire connection	
Response time	τ <sub>0.5</sub> < 7 s in water flowing at a rate of 0.4 m.s <sup>-1</sup>	τ <sub>0.5</sub> < 45 s in water flowing at a rate of 0.4 m.s <sup>-1</sup>



TEMPERATURE SENSORS WITH CABLE AND METAL TIP

**TG8 and TG8J sensors – stainless steel 5.7 mm diameter**

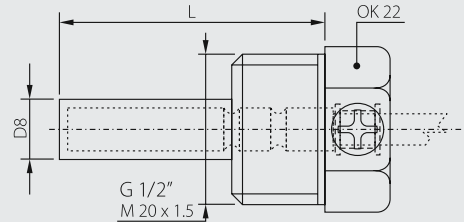
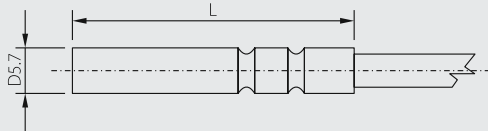
These resistance sensors are designed for measuring the temperature of gaseous and liquid substances. The maximum temperature range of use for the sensors is -50 °C to 105 °C. Lead-in cables with silicone insulation and shielding are used. The diameter of the case enables even special temperature sensors to be encased – KTY, SMT 160, DS 18B20, TSiC etc. In combination with a TG8 thermowell these sensors can be used for measuring the temperature in pipes as well as a pressure device pursuant to Government Regulation No. 26/2003 Coll., as amended. The sensors are designed for universal use. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.



TG8 sensors are also supplied in the design for explosive environments. More information available in the catalogue in data sheet 14.4.

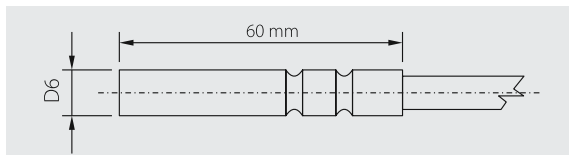
Sensor	TG 8	TG 8J
Use	General	For JTG8 thermowell
Maximum temperature range of use	-50 to 200 °C (it may be restricted by the sensor type, specified in the instructions for use)	
Type of sensing element	All types	
Ingress protection	IP 67 in accordance with EN 60529	
Case material	Stainless steel 1.4301	
Case diameter	5.7 mm	
Case length L	40 to 200 mm (in 20 mm)	
Lead-in cable	Silicone shielded 2 x 0.34 mm <sup>2</sup> Silicone shielded 4 x 0.22 mm <sup>2</sup>	
Circuit resistance	0.11 Ω for 1 m of cable for 2-wire connection	
Response time	$\tau_{0.5} < 7$ s in water flowing at a rate of 0.4 m.s <sup>-1</sup>	$\tau_{0.5} < 45$ s in water flowing at a rate of 0.4 m.s <sup>-1</sup>

TG8J sensor + JTG 8 thermowell



**TG 68 sensors – stainless steel 6 mm diameter, IP 68 d5**

These resistance sensors are designed for measuring the temperature of gaseous and liquid substances. The maximum temperature range of use for the sensors is -40 °C to 200 °C for the model with a silicone cable and -40 °C to 105 °C for PVC cable models. The diameter of the case enables even special temperature sensors to be encased – KTY, SMT 160, DS 18B20, TSiC etc. In combination with a thermowell these sensors meet the IP 68 (d = 5 m) degree of ingress protection in accordance with EN 60529 and are designed for measuring temperatures below the surface for permanent immersion in a depth of up to 5 m. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.



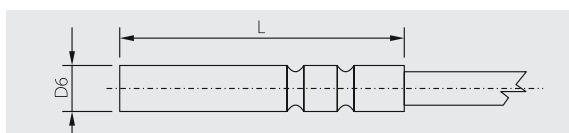
Maximum temperature range of use	-40 to 105 °C PVC cable, -40 to 200 °C silicone cable
Type of sensing element	All types
Ingress protection	IP 68 (d = 5 m) in accordance with EN 60529
Case material	Stainless steel 1.4301
Case diameter	6 mm
Case length L	60 mm
Lead-in cable	Silicone shielded 2 x 0.34 mm <sup>2</sup> or 4 x 0.22 mm <sup>2</sup> PVC unshielded 2 x 0.35 mm <sup>2</sup> nebo 4 x 0.35 mm <sup>2</sup>
Circuit resistance	0.11 Ω for 1 m of cable for 2-wire connection
Response time	$\tau_{0.5} = 12$ s, $\tau_{0.9} = 35$ s in water flowing at a rate of 0.4 m.s <sup>-1</sup>

The sensors meet the ingress protection level of IP 68 in accordance with EN 60529 and can be permanently immersed in a depth of up to 5 m.



**TR 046 sensors – stainless steel 6 mm diameter**

These resistance sensors are designed for measuring the temperature of gaseous and liquid substances. The maximum temperature range of use for the sensors is -50 °C to 200 °C. The case can be made from stainless steel class 17240, 17349 or 17348. Lead-in cables with silicone insulation and shielding are used. The diameter of the case enables even special temperature sensors to be encased – KTY, SMT 160, DS 18B20, TSiC etc. The sensors are designed for universal use. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.



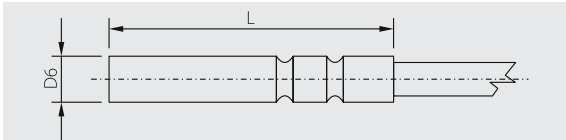
Maximum temperature range of use	-50 to 200 °C (it may be restricted by the sensor type, specified in the instructions for use)
Type of sensing element	All types
Ingress protection	IP 67 in accordance with EN 60529
Case material	Stainless steel 1.4301
Case diameter	6 + 0.1 mm
Case length L	40 to 200 mm (in 20 mm)
Lead-in cable	Silicone shielded 2 x 0.34 mm <sup>2</sup> Silicone shielded 4 x 0.22 mm <sup>2</sup>
Circuit resistance	0.11 Ω for 1 m of cable for 2-wire connection
Response time	$\tau_{0.5} < 7$ s in water flowing at a rate of 0.4 m.s <sup>-1</sup>



TEMPERATURE SENSORS WITH CABLE AND METAL TIP

**TR 050A sensors – stainless steel 6 mm diameter, up to 400 °C**

These resistance sensors are designed for measuring the temperature of gaseous or solid substances. **The maximum temperature range of use for the sensors is 0 °C to 350 °C, 400 °C short-term.** Considering the type of lead-in cable used with fiberglass insulation and metal braiding, the sensors are not resistant against the penetration of humidity into the case and are designed for application in a dry environment. The sensors are designed for use in a chemically non-aggressive environment. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.

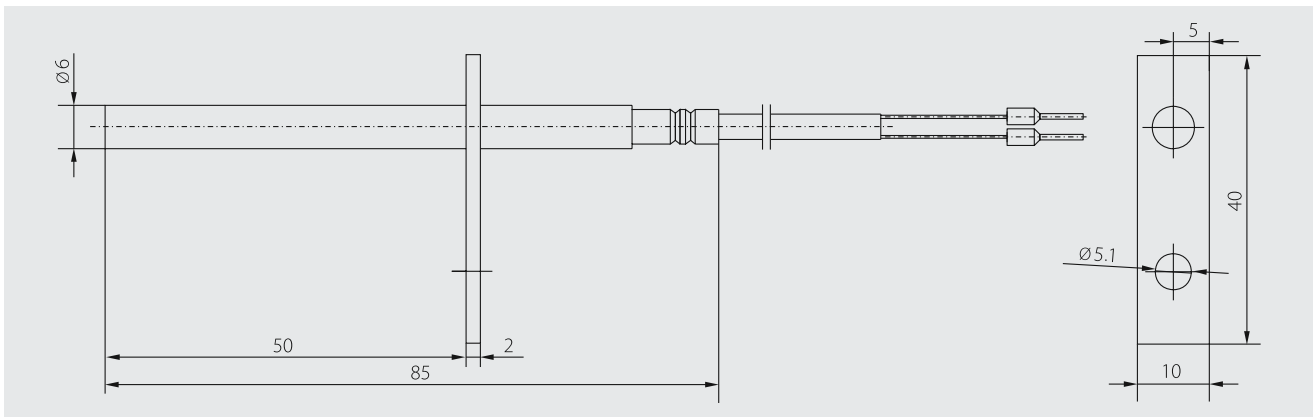


Temperature range of use	0 to 350 °C (400 °C short-term)
Type of sensing element	Pt 100, Pt 500, Pt 1000
Ingress protection	IP 50 in accordance with EN 60529
Case material	Stainless steel 1.4301
Case diameter	6 + 0,1 mm
Case length L	40, 60, 100 and 200 mm
Lead-in cable	with fiberglass and metal braiding 2 x 0.35 mm <sup>2</sup> with fiberglass and metal braiding 4 x 0.35 mm <sup>2</sup>
Circuit resistance	0.11 Ω for 1 m of cable for 2-wire connection

**TR 050H sensors – stainless steel 6 mm diameter, up to 400 °C**

These resistance sensors are designed for measuring the temperature of gaseous or solid substances. **The maximum temperature range of use for the sensors is 0 °C to 350 °C, 450 °C short-term for the active part of the sensor case.** Lead-in cables with silicone insulation and shielding are used, thus the ambient temperature of the cables must not exceed 200 °C. The sensors are primarily designed for measuring the temperature of flue gases and combustion gases in fireplace vents, fireplace stoves and boilers. The sensors are designed for a chemically non-aggressive environment. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.

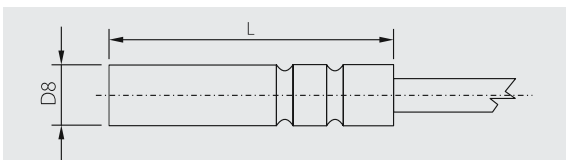
Temperature range of use	0 to 350 °C (450 °C short-term) – measuring part of the case up to 250°C in the surroundings of the cables
Type of sensing element	Pt 100, Pt 500, Pt 1000
Ingress protection	IP 65 in accordance with EN 60529
Case material	Stainless steel 1.4301
Case diameter	6 + 0.1 mm 50 / 85 mm
Case length L	50 / 85 mm
Lead-in cable	Silicone shielded 2 x 0.22 mm <sup>2</sup>
Circuit resistance	0.16 Ω for 1 m of cable for 2-wire connection



**TR 081 sensors – stainless steel 8 mm diameter**

These resistance sensors are designed for measuring the temperature of gaseous and liquid substances. **The maximum temperature range of use for the sensors is -50 °C to 200 °C.** The case can be made from stainless steel class 17240 or 17348. Lead-in cables with silicone insulation and shielding are used. The diameter of the case enables even special temperature sensors to be encased – KTY, SMT 160, DS 18B20, TSiC etc. The sensors are designed for universal use. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.

Maximum temperature range of use	-50 to 200 °C (it may be restricted by the sensor type, specified in the instructions for use)
Type of sensing element	All types
Ingress protection	IP 67 in accordance with EN 60529
Case material	Stainless steel 1.4301
Case diameter	8 ± 0.1 mm
Case length L	60 to 200 mm (in 20 mm)
Lead-in cable	Silicone shielded 2 x 0.34 mm <sup>2</sup> Silicone shielded 4 x 0.22 mm <sup>2</sup>
Circuit resistance	0.11 Ω for 1 m of cable for 2-wire connection
Response time	t <sub>0.5</sub> < 7 s in water flowing at a rate of 0.4 m.s <sup>-1</sup>

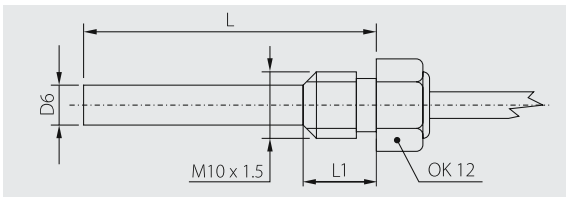


TEMPERATURE SENSORS WITH CABLE AND METAL TIP

**Temperature sensors with a thread**

**TG1 and TG2 sensors – brass 6 mm diameter**

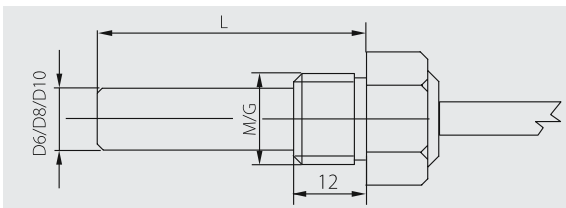
These resistance sensors are designed for measuring the temperature of gaseous and liquid substances. The maximum temperature range of use for the sensors is -50 °C to 200 °C. Lead-in cables with silicone insulation and shielding are used. The sensors are primarily designed for measuring the temperature in pipes. Their design facilitates a faster response to changes and allows them to be used as a pressure device pursuant to Government Regulation No. 26/2003 Coll., as amended. The sensors are designed for use in a chemically non-aggressive environment. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.



Sensor	TG 1	TG 2
Maximum temperature range of use	-50 to 200 °C (it may be restricted by the sensor type, specified in the instructions for use)	
Type of sensing element	Pt, Ni, NTC	All types
Ingress protection	IP 67 in accordance with EN 60529	
Thread / OK	M 10 x 1.5 / OK 12	
Case material	Brass	Stainless steel 1.4301
Case diameter	6 mm	
Thread length L1X	8 mm	10 mm
Case length L	10 to 60 mm (in 10 mm)	10 to 100 mm (in 10 mm)
Lead-in cable	Silicone shielded 2 x 0.22 mm <sup>2</sup> Silicone shielded 4 x 0.15 mm <sup>2</sup>	
Circuit resistance	0.16 Ω for 1 m of cable for 2-wire connection	
Response time	$\tau_{0.5} < 7$ s in water flowing at a rate of 0,4 m.s <sup>-1</sup>	$\tau_{0.5} < 9$ s in water flowing at a rate of 0,4 m.s <sup>-1</sup>

**TR 011 sensors – stainless steel 6-10 mm diameter**

These resistance sensors are designed for measuring the temperature of gaseous, liquid and solid substances. The maximum temperature range of use for the sensors is -50 °C to 200 °C. Lead-in cables with silicone or PVC insulation with shielding or without shielding are used. The sensors are primarily designed for measuring the temperature in pipes. Their design facilitates a faster response to changes and allows them to be used as a pressure device pursuant to Government Regulation No. 26/2003 Coll., as amended. The sensors are designed for use in a chemically non-aggressive environment. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.



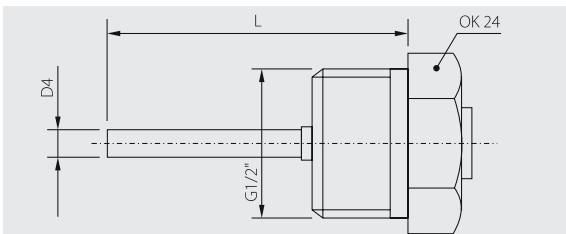
Maximum temperature range of use	-50 to 200 °C (it may be restricted by the sensor type, specified in the instructions for use)	
Type of sensing element	All types	
Ingress protection	IP 67 in accordance with EN 60529	
Thread / OK	According to the customer	
Case material	Stainless steel 1.4301	
Case diameter	6 to 10 mm	
Case length L	40 to 500 mm	
Lead-in cable	According to the customer	
Response time	$\tau_{0.5} < 9$ s in water flowing at a rate of 0.4 m.s <sup>-1</sup>	



**TR 011 sensors are also supplied in the design for explosive environments. Please refer to data sheet section 14.4a in this catalog for more information.**

**TR 080A sensors – stainless steel 4 mm diameter**

These resistance sensors are designed for measuring the temperature of gaseous, liquid and solid substances. The maximum temperature range of use for the sensors is -30 °C to 180 °C. Lead-in cables with silicone insulation with shielding are used. The sensors are primarily designed for measuring the temperature in air-conditioning ducts. The case diameter ensures a quick response to changes in temperature. The sensors are designed for use in a chemically non-aggressive environment. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.

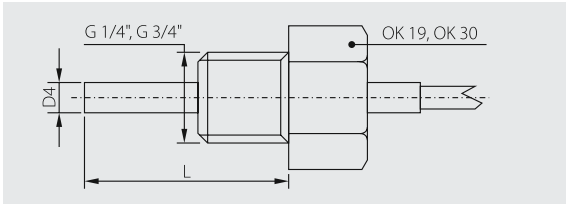


Maximum temperature range of use	-30 to 180 °C (it may be restricted by the sensor type, specified in the instructions for use)	
Type of sensing element	Ni 1000, Pt 100, Pt 500, Pt 1000, NTC	
Ingress protection	IP 65 in accordance with EN 60529	
Thread / OK	According to the customer	
Case material	Stainless steel 1.4301	
Case diameter	4 mm	
Case length L	40 to 200 mm	
Lead-in cable	Silicone shielded 2 x 0.22 mm <sup>2</sup> Silicone shielded 4 x 0.15 mm <sup>2</sup>	
Circuit resistance	0.16 Ω for 1 m of cable for 2-wire connection	
Response time	$\tau_{0.5} < 5$ s in water flowing at a rate of 0.4 m.s <sup>-1</sup>	

TEMPERATURE SENSORS WITH CABLE AND METAL TIP

**TR 129 sensors – stainless steel 4 mm diameter, 250 °C**

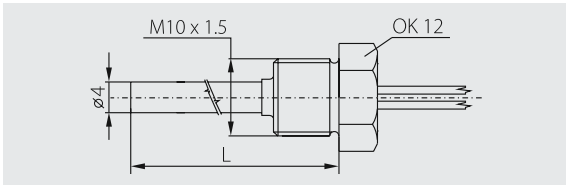
These resistance sensors are designed for measuring the temperature of gaseous and liquid substances. The maximum temperature range of use for the sensors is -50°C to 250°C. Lead-in cables with silicone insulation with shielding are used. The production technology and case diameter ensure a quick response to changes in temperature even up to 250 °C. The sensors are designed for use in a chemically non-aggressive environment. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.



Maximum temperature range of use	-50 to 250 °C (it may be restricted by the sensor type, specified in the instructions for use)
Type of sensing element	Pt, Ni, NTC, TCx
Ingress protection	IP 67 in accordance with EN 60529
Thread / OK	According to the customer
Case material	Stainless steel 1.4301
Case diameter	4 mm
Case length L	100 to 300 mm
Lead-in cable	Silicone shielded 2 x 0.22 mm <sup>2</sup> Silicone shielded 4 x 0.22 mm <sup>2</sup>
Circuit resistance	0.16 Ω for 1 m of cable for 2-wire connection
Response time	$t_{0.5} < 5$ s

**TR 030 sensors – stainless steel 4 mm diameter**

These resistance sensors are designed for measuring the temperature of gaseous, liquid and solid substances. The maximum temperature range of use for the sensors is -50 °C to 200 °C. The resistance signal of the temperature sensor is conducted by a pair of lead wires with Teflon insulation, whereby ensuring the minimization of heat transfer and thus achieving higher measuring accuracy even at shallow immersion depths. The case diameter ensures a quick response to changes in temperature. The sensors are designed for use in a chemically non-aggressive environment. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.

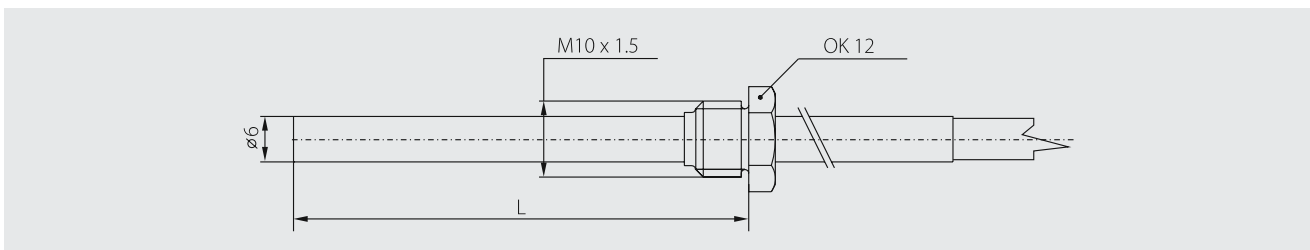


Maximum temperature range of use	-50 to 200 °C (it may be restricted by the sensor type, specified in the instructions for use)
Type of sensing element	Pt, Ni, NTC, TCx
Ingress protection	IP 52 in accordance with EN 60529
Thread / OK	M 10 x 1.5 / OK 12
Case material	Stainless steel 1.4301
Case diameter	4 mm
Case length L	20 to 60 mm
Lead-in cable	2 x LT 0.07 mm <sup>2</sup> with Teflon insulation
Circuit resistance	0.51 Ω for 1 m of lead wire
Response time	$t_{0.5} < 5$ s

**TR 068C sensors – stainless steel 6 mm diameter, 400 °C**

These resistance sensors are designed for measuring the temperature of gaseous and liquid substances. **The temperature range of use for the sensors is 0 °C to 400 °C, 500 °C short-term for the active part of the sensor case after the thread.** Lead-in cables with Teflon insulation with shielding are used, thus the ambient temperature of the cables must not exceed 250 °C. The production technology and case diameter ensure a quick response to changes in temperature even up to 250 °C. The sensors are primarily designed for measuring the temperature of flue gases and combustion gases in fireplace vents, fireplace stoves and boilers. The sensors are designed for a chemically non-aggressive environment. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.

Maximum temperature range of use	0 to 400 °C (500 °C short-term)
Type of sensing element	Pt 100, Pt 500, Pt 1000
Ingress protection	IP 64 in accordance with EN 60529
Thread / OK	M 10 x 1.5/OK12
Case material	Stainless steel 1.4301
Case diameter	6,0 ± 0,1 mm
Case length L	60 mm
Lead-in cable	Teflon shielded 2 x 0.14 mm <sup>2</sup>
Circuit resistance	0.3 Ω for 1 m of cable for 2-wire connection

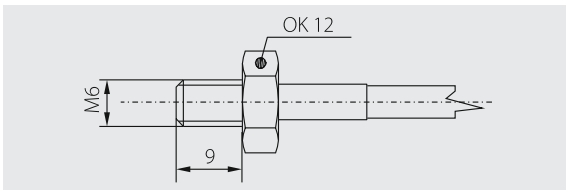


TEMPERATURE SENSORS WITH CABLE AND METAL TIP

**Contact temperature sensors**

**TG 6 sensors – brass, M 6 thread**

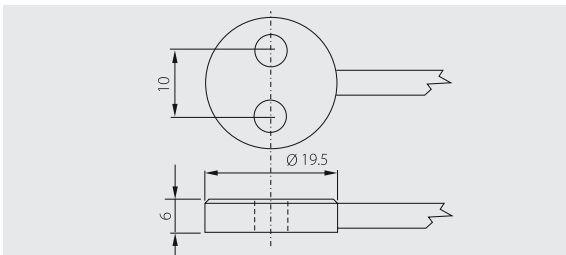
These resistance sensors are designed for measuring the surface temperature of solid substances. The maximum temperature range of use for the sensors is -30 °C to 200 °C and must not be exceeded even short-term. The structure of the sensors, which includes an M6 thread, enables measuring the temperature of solids below the surface. The sensors are designed for use in a chemically non-aggressive environment. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.



Maximum temperature range of use	-30 to 200 °C (it may be restricted by the sensor type, specified in the instructions for use)
Type of sensing element	Pt, Ni, NTC, TCx
Ingress protection	IP 67 in accordance with EN 60529
Thread / OK	M 6 / OK 12
Case material	Brass
Thread length	9 mm
Lead-in cable	Silicone shielded 2 x 0.22 mm <sup>2</sup> Silicone shielded 4 x 0.15 mm <sup>2</sup>
Circuit resistance	0.16 Ω for 1 m of cable for 2-wire connection
Response time	$\tau_{0.5} < 4$ s
Maximum permissible cable tension	1 kg

**TG 7 sensors – brass**

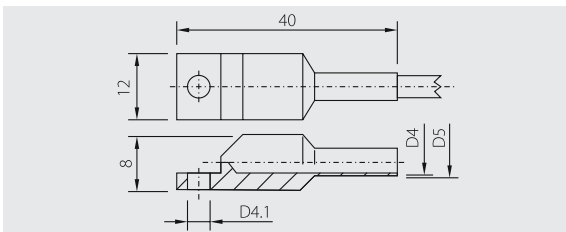
These resistance sensors are designed for measuring surface temperatures. The maximum temperature range of use for the sensors is -50 °C to 200 °C and must not be exceeded even short-term. The structure of the sensors ensures fast response to temperature changes and high accuracy using the contact method of measuring, especially when silicone Vaseline or contact paste is applied between the measured surface and the sensor. Mounting the sensor to the surface is carried out using one or two M4 screws. The sensors are designed for use in a chemically non-aggressive environment. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.



Maximum temperature range of use	-50 to 200 °C (it may be restricted by the sensor type, specified in the instructions for use)
Type of sensing element	Pt, Ni, NTC, TCx
Ingress protection	IP 65 in accordance with EN 60529
Case material	Brass
Case dimensions	∅ 19.5 mm, height 6 mm
Lead-in cable	Silicone shielded 2 x 0.22 mm <sup>2</sup> Silicone shielded 4 x 0.15 mm <sup>2</sup>
Circuit resistance	0.16 Ω for 1 m of cable for 2-wire connection
Response time	$\tau_{0.5} < 7$ s (on a flat surface of an Al prism without paste)
Maximum permissible cable tension	2 kg
Recommendation	Use contact paste for mounting

**TR 141 and TR 141 B sensors – dural or stainless steel, 350 °C**

These resistance sensors are designed for measuring the surface temperature of solid substances with flat and smooth surfaces. The maximum temperature range of use for the sensors is 0 °C to 350 °C, 400 °C short-term. Considering the type of lead-in cable used with fibreglass insulation and metal braiding, the sensors are not resistant against the penetration of humidity into the case and are designed for application in a dry environment. The sensors are designed for use in a chemically non-aggressive environment. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.

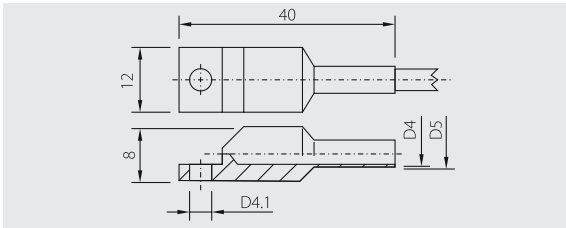


Sensor	TR 141	TR 141B
Maximum temperature range of use	0 to 350 °C	
Type of sensing element	Pt 100, Pt 500, Pt 1000, Thermocouple K, J	
Ingress protection	IP 50 in accordance with EN 60529	
Case material	Aluminium alloy	Stainless steel 1.4301
Case length	40 mm	
End sleeves	H 0.25 / 10 mm	
Lead-in cable	With fibreglass insulat. and metal braiding 2 x 0.35 mm <sup>2</sup> With fibreglass insulat. and metal braiding 4 x 0.35 mm <sup>2</sup>	
Circuit resistance	0.11 Ω for 1 m of cable for 2-wire connection	
Maximum permissible cable tension	1 kg	
Recommendation	Use contact paste for mounting	

TEMPERATURE SENSORS WITH CABLE AND METAL TIP

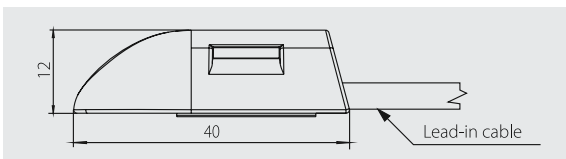
**TR 141A and TR 141E sensors – Al-alloy or stainless steel, 200 °C**

These resistance sensors are designed for measuring the surface temperatures. The maximum temperature range of use for the sensors is -50 °C to 200 °C. When mounting using an M4 screw, it is recommended to apply contact paste or silicone Vaseline to the measured surface, which ensure faster response time and minimizes the error rate of the measuring method. **The structure of the sensors ensures increased resistance against vibrations. The sensors meet the requirements of EN 61373 category 1, class B standard.** The sensors are designed for use in a chemically non-aggressive environment. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.



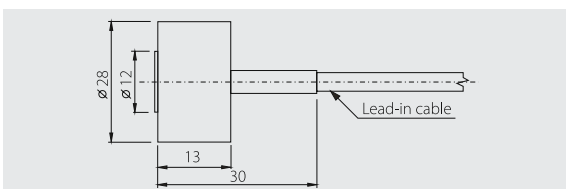
**S 150A sensors – brass, 130 °C**

These resistance sensors are designed for measuring surface temperatures. The maximum temperature range of use for the sensors is -50 °C to 130 °C and must not be exceeded even short-term. The sensor, which is provided with mounting tape and lids, can be used for measuring the temperature of pipes. The structure of the sensors ensures fast response to temperature changes and high accuracy using the contact method of measuring, especially when silicone Vaseline or contact paste is applied between the measured surface and the sensor. Mounting the sensor to the surface is carried out using one or two M4 screws. The sensors are designed for use in a chemically non-aggressive environment. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.



**TR 158 sensors – with magnetic mount, 150 °C**

These resistance sensors are designed for measuring the surface temperature of ferromagnetic objects. The temperature range of use for the sensors is -30 °C to 150 °C. The minimum surface for placement on the measured surface must be 28 mm in diameter. The structure of the sensors ensures fast response to temperature changes and high accuracy using the contact method of measuring, especially when silicone Vaseline or contact paste is applied between the measured surface and the sensor. Mounting the sensor to the surface is carried out using one or two M4 screws. The sensors are designed for use in a chemically non-aggressive environment. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.



Sensor	TR 141A	TR 141E
Maximum temperature range of use	-50 to 200 °C (it may be restricted by the sensor type, specified in the instructions for use)	
Type of sensing element	Pt, Ni, NTC, Thermocouple K, J	
Ingress protection	IP 67 in accordance with EN 60529	
Case material	Stainless steel 1.4301	Aluminium alloy
Case length	40 mm	
Lead-in cable	Silicone shielded 2 x 0.22 mm <sup>2</sup> Silicone shielded 4 x 0.12 mm <sup>2</sup>	
Circuit resistance	0.16 Ω for 1 m of cable for 2-wire connection	
Response time	τ <sub>0.5</sub> < 10 s (on a flat surface of an Al prism without paste)	
Maximum permissible cable tension	1 kg	
Recommendation	Use contact paste for mounting	

Maximum temperature range of use	-50 to 130 °C
Type of sensing element	All types
Ingress protection	IP 65 in accordance with EN 60529
Case material	Brass
Protective case material	POLYAMIDE
Minimum pipe diameter	20 mm
Lead-in cable	Silicone shielded 2 x 0.22 mm <sup>2</sup> Silicone shielded 4 x 0.15 mm <sup>2</sup>
Circuit resistance	0.16 Ω for 1 m of cable for 2-wire connection
Response time	τ <sub>0.5</sub> ≤ 10 s (on a flat surface of an Al prism without paste)
Recommendation	Use contact paste for mounting



Please refer to data sheet section 12.6a in this catalog for more information on the S 150A sensors.

Maximum temperature range of use	-30 to 150 °C
Type of sensing element	Pt, Ni, NTC
Ingress protection	IP 67 in accordance with EN 60529
Holding force of the sensor	20 N
Pressure of the measuring surface	3 N
Case material	Nickel steel / dural
Case dimensions	∅ 26 x 13 mm
Lead-in cable	Silicone shielded 2 x 0.34 mm <sup>2</sup> Silicone shielded 2 x 0.22 mm <sup>2</sup>
Standard cable length	2, 5, 10 m
Circuit resistance	0.11 Ω for 1 m of cable for 2-wire connection

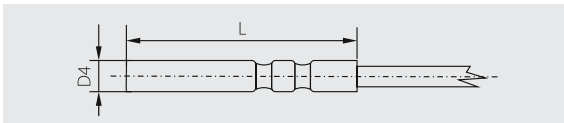
TEMPERATURE SENSORS WITH CABLE AND METAL TIP

■ Temperature sensors for cryogenic temperatures



**TR 024K sensors – 4 mm diameter, -100 to 150 °C**

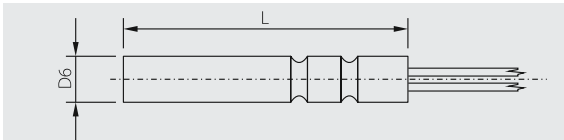
These resistance sensors are designed for measuring the temperature of gaseous, liquid and solid substances. Considering the applied materials and production technology, the sensors can also be used in ultra low temperatures. The temperature range of use for the sensors is -100 °C to 150 °C and this temperature should not be exceeded, not even for a short term. The diameter of the case ensures a quick response to changes in temperature. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.



Maximum temperature range of use	-100 to 150 °C (must not be exceeded even short-term)
Type of sensing element	Pt 100, Pt 1000
Ingress protection	IP 67 in accordance with EN 60529
Case material	Stainless steel 1.4301
Case diameter	4 mm
Case length L	50 to 100 mm (in 10 mm)
Lead-in cable	Teflon shielded 2 x 0.14 mm <sup>2</sup> Teflon shielded 4 x 0.14 mm <sup>2</sup>
Circuit resistance	0.3 Ω for 1 m of cable for 2-wire connection
Response time	τ <sub>0.5</sub> < 6 s in water flowing at a rate of 0.4 m.s <sup>-1</sup>

**TR 046S sensors – 6 mm diameter, -100 to 150 °C**

These resistance sensors are designed for measuring the temperature of gaseous and solid substances. Considering the applied materials and production technology, the sensors can also be used in ultra low temperatures. The temperature range of use for the sensors is -100 °C to 150 °C and this temperature should not be exceeded, not even for a short term. The sensors are primarily designed for measuring in freezers, refrigerators etc. The resistance signal of the temperature sensor is conducted by a pair of lead wires with Teflon insulation, whereby ensuring their small volume, enabling them to be placed between door sealing. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.

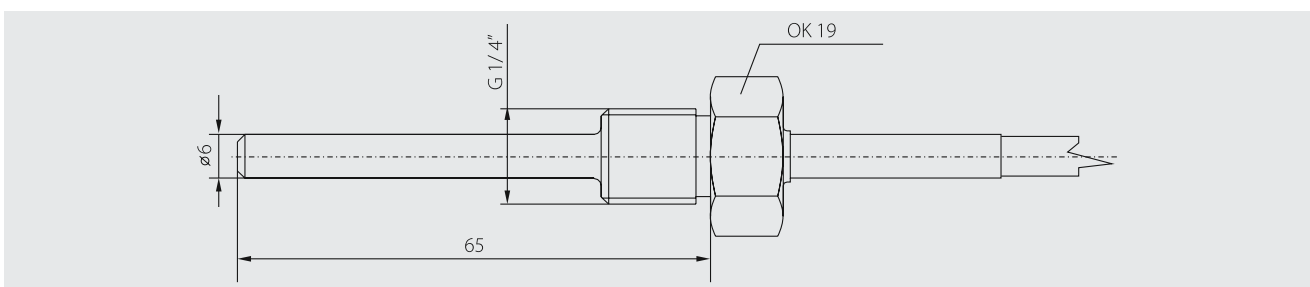


Maximum temperature range of use	-100 to 150 °C (must not be exceeded even short-term)
Type of sensing element	Pt 100, Pt 1000
Ingress protection	IP 67 in accordance with EN 60529
Case material	Stainless steel 1.4301
Case diameter	6.0 ± 0,1 mm
Case length L	40 to 200 mm (in 20 mm)
Lead-in cable	Teflon APFA 0.22 mm <sup>2</sup>
Circuit resistance	0.16 Ω for 1 m of cable for 2-wire connection
Response time	τ <sub>0.5</sub> < 7 s in water flowing at a rate of 0.4 m.s <sup>-1</sup>

**TR 099 sensors – with a thread, -190 to 100 °C**

These resistance sensors are designed for measuring the temperature of gaseous, liquid and solid substances. Considering the applied materials and production technology, the sensors can also be used in ultra low temperatures. The temperature range of use for the sensors is -190 °C to 150 °C, whereby class B accuracy in accordance with EN 60751 is guaranteed within the scope from -100 to 150 °C. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.

Maximum temperature range of use	-190 to 100 °C
Type of sensing element	Pt 100, Pt 1000
Ingress protection	IP 67 in accordance with EN 60529
Thread	M 10, M 12, G 1/4"
Case material	Stainless steel 1.4301
Case diameter	6 ± 0,1 mm
Case length	40 to 80 (in 10 mm); or other lengths customized
Lead-in cable	Teflon shielded 2 x 0.14 mm <sup>2</sup> Teflon shielded 4 x 0.14 mm <sup>2</sup>
Circuit resistance	0.16 Ω for 1 m of cable for 2-wire connection



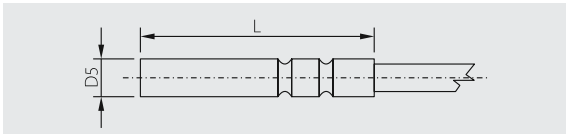


TEMPERATURE SENSORS WITH CABLE AND METAL TIP

TR 125B sensors – 5 mm diameter, -190 to 100 °C

These resistance sensors are designed for measuring the temperature of gaseous, liquid and solid substances. Considering the applied materials and production technology, the sensors can also be used in ultra low temperatures. The temperature range of use for the sensors is -190 °C to 150 °C whereby class B accuracy in accordance with EN 60751 is guaranteed within the scope from -100 to 150 °C. The sensor case includes screw connections that enable it to be used for measuring temperatures in pipes, fittings etc. The structure facilitates a faster response to temperature changes in comparison to sensors with a protective thermowell. The method of use must be selected with consideration to the temperature and chemical resistance of the case and lead-in cable.

Maximum temperature range of use	-190 to 150 °C
Type of sensing element	Pt 100, Pt 1000
Ingress protection	IP 67 in accordance with EN 60529
Case material	Stainless steel 1.4301
Case diameter	5 ± 0,1 mm
Case length L	50 to 80 mm (in 10 mm)
Lead-in cable	Teflon shielded 4 x 0.14 mm <sup>2</sup>
Circuit resistance	0.3 Ω for 1 m of cable for 2-wire connection



A variety of sensor types is available, such as:

- 2 x sensing element
- material of the case: stainless steel 1.4401, 1.4404, 1.4571, etc.
- special cable (under soil, FM 4910 cable, etc.)
- various design of the case
- NPT thread, etc.

The most common application of our sensors:

- Control of heating systems
- HVAC equipment
- Energy systems
- Heat meters
- Laboratories
- Machinery and equipment
- Custom made temperature sensors
- Process industry
- Automotive technology
- Home appliances
- Food processing industry
- Health service
- Chemical industry, etc.



TEMPERATURE SENSORS WITH CABLE AND PLASTIC TIP



TR 151 and TR 152

DESCRIPTION AND APPLICATION

Temperature sensors with a plastic tip are intended for temperature measurements of gaseous, eventually liquid materials. For long-lasting temperature measurements (especially at the temperatures over 90 °C) we recommend to use the sensor in combination with a thermowell. All sensors come with a plastic polyamid tip, in which the temperature sensing element is located.

The diameter of the case TR 151 is 6 mm, the case diameter for TR 152 is 8 mm. All types of thin layer resistance-type sensing elements (Ni 1000, Ni 891, T1 = Ni 2226, Pt 100, Pt 500, Pt 1000, NTC 20 kΩ) and also others can be used. **The wiring of the sensors is always 2-wire.**

Material of the case has medium resistivity to atmospheric aging, it resists oils, fuels, hydraulic liquids, alifatic and aromatic hydrocarbons, esters, ketons and slight alcalis. Material is not resistant to acids, strong alcalis and chlorinated hydrocarbons.

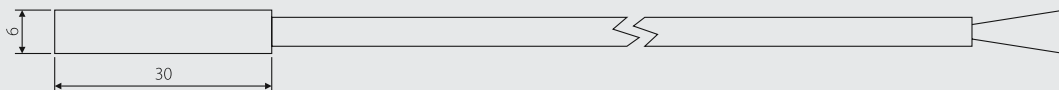


**SPECIFICATIONS**

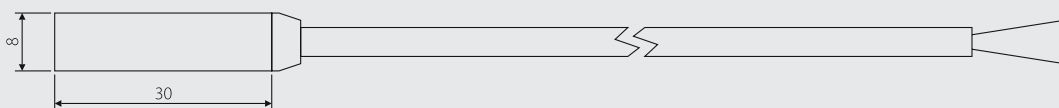
Type of sensing element	Resistance temperature sensing element – Pt 100/3850, Pt 500/3850, Pt 1000/3850, Ni 1000/5000, Ni 1000/6180, Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, Ni 891, NTC Thermocouple temperature sensing element – TCK, TCJ, TCT Special temperature sensing elements – KTY
Accuracy class of individual sensors	Ni sensing elements: class B, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: class B in accordance with IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C NTC 20 kΩ: $\pm 1$ °C at a range of 0 to 70 °C KTY: $\pm 1$ % at 25 °C NTC: $\pm 1$ %, 3 %, 5 % at 25 °C (according to type) TC: class 2 in accordance with IEC 584-2
Measuring range	-20 to 105 °C (according to the sensing element and lead-in cable)
Ingress protection	IP 67 according to EN 60 529
Response time	TR 151: $\tau_{0.9} < 45$ s (in streaming water at 0.4 m.s <sup>-1</sup> ) TR 152: $\tau_{0.9} < 75$ s (in streaming water at 0.4 m.s <sup>-1</sup> )
Sensor connection	2-wire
Material of the case	polyamid
Case length/diameter	TR 151: 30 mm / 6 mm TR 152: 30 mm / 8 mm
Lead-in cable	FLRYWYW 2 x 0.35 mm <sup>2</sup> PVC non shielded up to 105 °C; Rv = 0.105 Ω/m LiYY 2 x 0.25 mm <sup>2</sup> PVC non shielded up to 80 °C; Rv = 0.254 Ω/m LiYCY 2 x 0.14 mm <sup>2</sup> PVC non shielded up to 80 °C; Rv = 0.14 Ω/m

**DIMENSIONAL DRAFT**

TR 151



TR 152



TEMPERATURE SENSORS WITH CABLE AND PLASTIC TIP



TR 160, TR 161 and TR 162

DESCRIPTION AND APPLICATION

Temperature sensors TR 160, TR 161 and TR 162 are intended for temperature measurements of solid, loose ground, gaseous and liquid materials. The sensors meet the IP 67 rating according to EN 60 529 standard. The sensors have a polyamid tip with diameter 6, 8 or 10 mm in which the a sensing element is hermetically encapsulated.

All types of thin layer resistance-type sensing elements (Ni 1000, Ni 891, T1 = Ni 2226, Pt 100, Pt 500, Pt 1000, NTC 20 kΩ) and also others (NTC and PTC thermistors, KTY, DALLAS 18B20 and others) can be used. The sensors do come with a 2-wire connection as a standard.

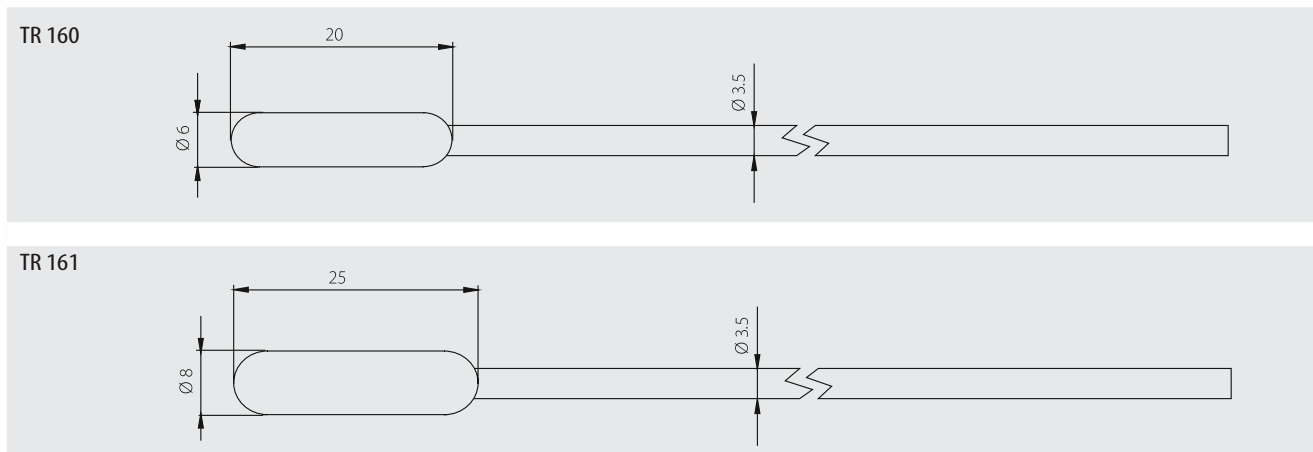
Material of the tip is highly resistive against motor-car oils.



**SPECIFICATIONS**

Type of sensing element	Resistance temperature sensing element – Pt 100/3850, Pt 500/3850, Pt 1000/3850, Ni 1000/5000, Ni 1000/6180, Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, Ni 891, NTC Thermocouple temperature sensing element – TCK, TCJ, TCT Special temperature sensing elements – KTY, SMT 160, DALLAS, TSic, etc.
Accuracy class of individual sensors	Ni sensing elements: class B, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: class B in accordance with IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C NTC 20 kΩ: $\pm 1$ °C at a range of 0 to 70 °C KTY: $\pm 1$ % at 25 °C NTC: $\pm 1$ %, 3 %, 5 % at 25 °C (according to type) TC: class 2 in accordance with IEC 584-2 DS18B20: $\pm 0.5$ °C for -10 up to 80 °C SMT 160-30: $\pm 0.7$ °C TSic: according to type
Measuring range	-40 to 105 °C (according to the sensing element)
Ingress protection	IP 67 according to EN 60 529
Response time	$\tau_{0.5} \leq 12$ s, $\tau_{0.9} \leq 32$ s (in streaming water at 0.4 m.s <sup>-1</sup> )
Sensor connection	standardly 2-wire
Material of the case	on the base of polyamid
Length/diameter of the case	20 mm / 6 mm; 25 mm / 8 mm; 25 mm / 10 mm
Lead-in cable	FLRYWYW 2 x 0.35 mm <sup>2</sup> PVC non shielded up to 105 °C; Rv = 0.105 Ω/m LiYY 2 x 0.25 mm <sup>2</sup> PVC non shielded up to 80 °C; Rv = 0.254 Ω/m LiYCY 2 x 0.14 mm <sup>2</sup> PVC non shielded up to 80 °C; Rv = 0.14 Ω/m

**DIMENSIONAL DRAFT**



TEMPERATURE SENSORS WITH CABLE AND PLASTIC TIP



**CUSTOMER SPECIFIC MODIFICATIONS**

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- option enclosing non-standard temperature sensors (DALLAS, TSic, KTY, SMT, etc.)
- class A precision type of temperature element (with the exception of sensors Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, thermistor NTC 20 kΩ)
- option of three- or four-wire connection



**DESCRIPTION AND APPLICATION**

The temperature sensors are designed to meet the requirements of EN 60 079-0 and EN 60 079-15 as amended by a valid certificate. The operation of the sensor is based on a pre-defined ratio between the resistance value of the temperature sensing element and the temperature. They are not able to form sparks, electric arcs or high surface temperatures. The sensors that are identified on the type label by II 3G ex nA II ty code can be applied in explosion endangered rooms, device group II, zone 2. The operating temperature range for using them in zone 2 is identified by the lead-in cable type. These limits must not be exceeded even for a short time - see Y in the specifications. According to the design of the sensors there are the following variants:

**Serie TG 8** – The sensing element is located in the stainless steel case with diameter 5.7 mm as a standard, the length of the case can be selected in the range 40 to 500 mm optionally. The stainless steel thermowell JTG8 can be delivered as an accessory.  
Certificate FTZU 07 ATEX 0142X

**Serie TR 011** – The sensing element is located in the stainless steel case, the part of which is the screwing enabling the direct assembly in tubing etc. Diameter of the case and the type of thread is taken up by customer, the length of the case can be selected in the range 40 to 500 mm optionally.  
Certificate FTZU 07 ATEX 0143X



The sensors meet the IP 67 ingress protection requirements according to EN 60 529 standard. The sensors are designed to be operated in chemically non-aggressive environment. **They can be used only for fix installations of group II and the user must provide fixed clamping of the cable in the distance max. 100 to 300 mm from the sensor enclosure according EN 60 079-0 as amended by a valid certificate.**

**SPECIFICATIONS**

**BASIC DATA**

Standard types of sensing elements	Ni 1000/5000, Ni 1000/6180, Ni 891, Pt 100/3850, Pt 500/3850, Pt 1000/3850, NTC 20 kΩ
Measuring range	Y -- T6: -20 ≤ Ta ≤ 70 °C cable PVC T5: -20 ≤ Ta ≤ 95 °C cable PVC up to 105 °C T3: -30 ≤ Ta ≤ 180 °C cable SILICONE
Recommended/maximum DC measuring current	1 mA/3 mA for the sensors with the sensing element Pt 100 0.5 mA/1.5 mA for the sensors with the sensing element Pt 500 0.3 mA/1 mA for other sensors
Recommended/maximum DC power consumption of sensing element	0.05 mW/1 mW for the sensors with the sensing element NTC 20 kΩ
Accuracy class	Ni sensing elements: class B, Δt = ± (0.4 + 0.007t), for t ≥ 0; Δt = ± (0.4 + 0.028 t ), for t ≤ 0 in °C; Pt sensing elements: class B according to IEC 751, Δt = ± (0.3 + 0.005 t ) in °C NTC 20 kΩ: ± 1 °C for the range 0 to 70 °C
Sensor connection	2-wire, 3-wire, 4-wire
Insulation resistance	min. 200 MΩ at 500 V DC, at the temperature 15 to 35 °C, maximum rel. humidity 80 %
Dielectric strength (ATEX)	1 000 V DC during the period 1 s, at the temperature 15 to 35 °C, maximum rel. humidity 80 % according to the article 6.8.1. of the EN 60 079-15 ed. 2 standard
Ingress protection	IP 67 according to EN 60 529
Types of lead-in cables and their thermal resistivity	-30 to 200 °C MCBE-AFEP, 2 x 0.34 a 4 x 0.22 mm <sup>2</sup> , silicone insulation -25 to 105 °C FLRYWYW, 2 x 0.35 a 4 x 0.35 mm <sup>2</sup> , PVC insulation up to 105 °C -30 to 80 °C LiYCY 2 x 0.34 mm <sup>2</sup> , PVC insulation
Resistance of lead-in cables / conductor cross section	0,11 Ω/m / 0,35 mm <sup>2</sup> ; 0,16 Ω/m / 0,22 mm <sup>2</sup> (2-wire connection)
Weight	according to the length of the cable, minimum 0.15 kg

**SUPPLEMENTARY DATA TO THE INDIVIDUAL TYPES**

**Serie TG 8**

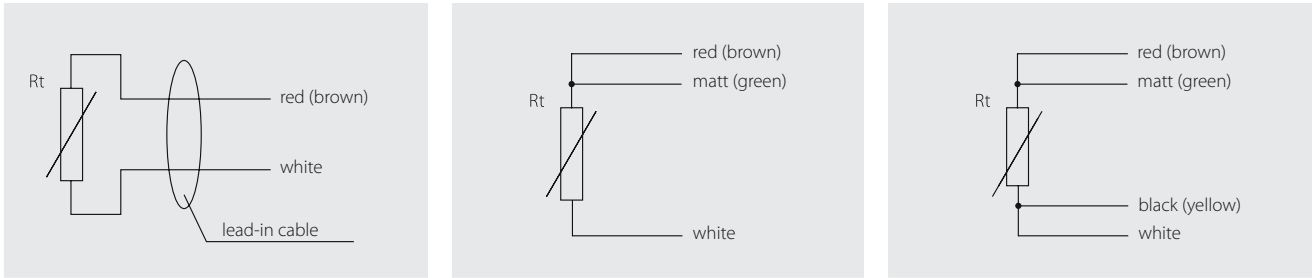
Stem length	40 to 500 mm
Stem diameter	5.7 to 10 mm
Material of the stem	stainless steel 1.4301
Response time	τ <sub>0.5</sub> < 6 s (in streaming air at 1 m.s <sup>-1</sup> ) for the diameter 5.7 mm

**Serie TR 011**

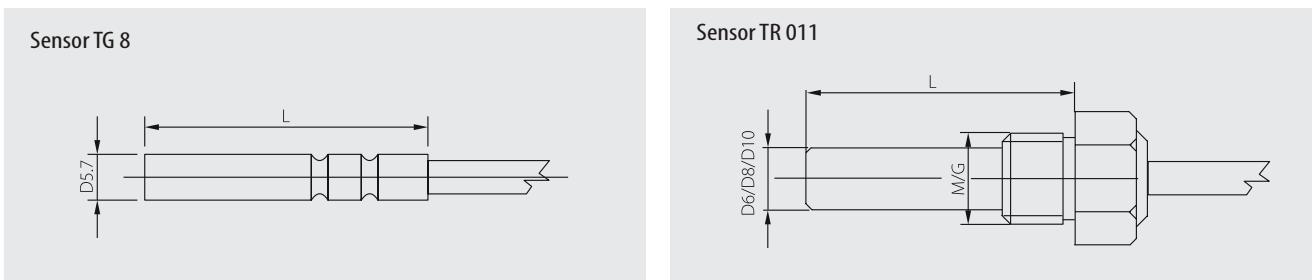
Stem length	40 to 500 mm
Stem diameter	6 to 10 mm
Material of the stem	stainless steel 1.4301
Response time	τ <sub>0.5</sub> < 7 s (in streaming air at 1 m.s <sup>-1</sup> ) for the diameter 6 mm

## TEMPERATURE SENSORS FOR EXPLOSIVE ENVIRONMENTS WITH A CABLE

### ■ WIRING DIAGRAM



### ■ DIMENSIONAL DRAFT



### ■ SENSOR INSTALLATION AND SERVICING

1. Assemble the sensor in the location in which the temperature to be measured. **They can be used only for fix installations of group II and user must provide fixed clamping of the cable in the distance max. 100 to 300 mm from the sensor case according EN 60 079-0 as amended by a valid certificate.**
2. Connect the wires of the lead-in cable according to the wiring diagram. **The shielding of the lead-in cable is not electrically connected to the external sensor case not even sensing element. For the temperature range  $-30 \leq T_a \leq 180 \text{ }^\circ\text{C}$  the end of the cable of the length 150 mm including of the type label should not be placed in the zone 2.**

After installing and connecting the sensor to the sequential evaluating electrical equipment the sensor is ready to use. The sensor does not require any special servicing or maintenance. The sensor can be operated in any working position.

### ■ CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- length of the sensor
- possibility of encapsulation of two sensing elements
- A class of accuracy (except for the NTC 20k $\Omega$  sensing elements)
- encapsulation of other types of sensing elements KTY, DALLAS, SMT 160 etc.
- type of the thread and the case

### ■ HOW TO ORDER

WHEN ORDERING GOODS, THE FOLLOWING DATA ARE REQUIRED:

Type name of sensor serie	TG 8 or TR 011
Type of sensing element	
Connection	2, 3 or 4-wire
Temperature operating range	-20 to 70 °C; -20 to 95 °C; -30 to 80 °C
Length of the case	
Type of the thread	only for TR 011
Optionally diameter of the case	



## DESCRIPTION AND APPLICATION

The sensors of the serie SD 11x are intelligent microprocessor-controlled temperature sensors. SD 11x outdoor sensors are intended for temperature measurement in industrial areas or outdoors. The standard temperature range in which the sensors are allowed to be utilised is -30 to +70 °C. The sensors communicate by means of RS 485 bus and only the bus can control the sensors. Communication inputs are protected to overvoltage. In case the module is placed as terminal on the line, a terminating resistor can be attached to the wiring by shorting the contacts (the switch SW placed next to terminals for communication lines connection). All settings are stored in EEPROM memory. The electronic module is equipped with the WATCHDOG circuit, which safeguards proper program functioning in the microprocessor. Easy mounting of the temperature sensor is ensured by the unique “S head” design.

The sensors are designed to be operated in a chemically non-aggressive environment. The sensors are made in three basic variants:

- SD 110** – with a simple ASCII communication protocol corresponds with ADAM 4000 modules by ADVANTECH company. Thus, standard drivers for ADAM modules can be used in various control programmes. For easier operation, the green LED indicates if power supply is on and the red LED indicates that the module is communicating. The SD 1x0 module is provided by the INIT shorting jumper on its printed circuit board. If it is shorted when power is switched on, the module communicates on 00 address with 9600 Bd transfer speed without checksum.
- SD 111** – the command structure corresponds with the ARION communication protocol, which is used among control systems by Amit company.
- SD 112** – the command structure corresponds with the ModBus communication protocol.



## DECLARATION, CERTIFICATES, CALIBRATION

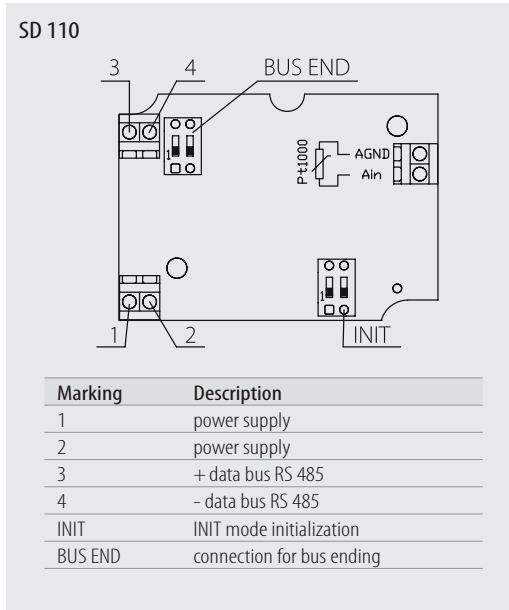
**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an digital output.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.

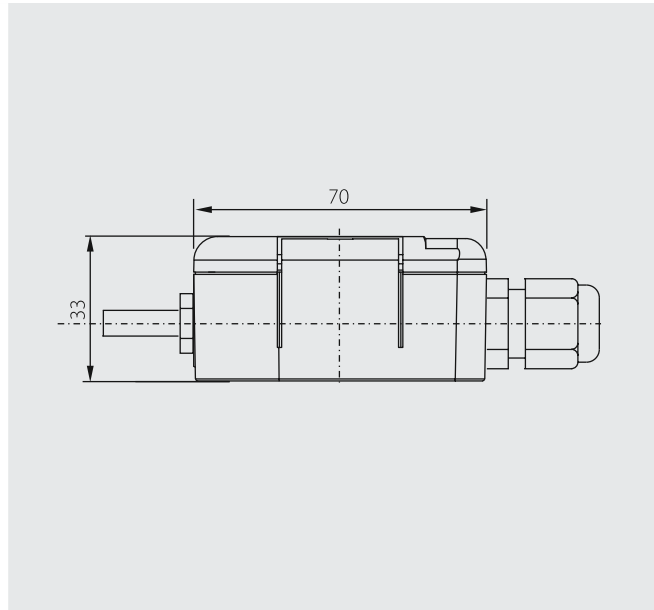
## SPECIFICATIONS

Sensor type	SD 110	SD 111	SD 112
Power supply	10 to 35 V DC (unstabilized) 14 to 24 V AC		
Power consumption	max. 1000 mW		
Measuring range	-30 to 70 °C		
Standard stem length	25 mm		
Communication properties	communication via RS 485, maximum segment length is 1200 m, asynchronous transfer		
	transfer speeds 1200, 2400, 4800, 9600, 19200 Bd	transfer speeds 9600, 19200, 38400, 57600 Bd – DIP switch	preset transfer speed 9600 Bd optional transfer speeds 1200, 2400, 4800, 19200, 57600, 115200 Bd – DIP switch
	256 modules / 1 serial port	63 modules / 1 serial port	247 modules / 1 serial port
	protocol consistent with ADAM modules	protocol ARION	protocol ModBus 1 stop bit, without parity
Accuracy of electronics	0.05 %		
Accuracy of sensing element	± 0.5 °C		
Resolution	0.01 °C		
Ingress protection	IP 65 according to EN 60 529		
Material of the sensor stem	stainless steel 1.4301		
Material of the enclosure	POLYAMID		
Working conditions	ambient temperature: -30 to 70 °C		
	relative humidity: max. 85 % (at the ambient temperature 25 °C)		
	atmospheric pressure: 87 to 107 kPa		
Weight	0.2 kg		

**WIRING DIAGRAM**



**DIMENSIONAL DRAFT**



**SENSOR INSTALLATION AND MAINTENANCE**

Before connecting the supply lead-in cable, lift off the lid of the plastic enclosure by means of a flat screwdriver. The lead-in cable is connected to the terminals according to the wiring diagram through the loosened grommet. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm. To ensure the ingress protection value of IP 65, the grommet has to be tightened and the lid has to be put on after connecting the lead-in cable.

In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. After installing and connecting the sensor to the sequential evaluating electrical equipment the sensor is ready to use. The sensor does not require any special servicing or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.



# SD 12x SERIES SENSORS – INTELLIGENT TEMPERATURE SENSORS WITH A STEM AND PLASTIC ENCLOSURE



## DESCRIPTION AND APPLICATION

The sensors of the serie SD 12x are intelligent microprocessor-controlled temperature sensors. These sensors are intended for contact temperature measurements of liquid or gaseous substances. The sensor-central holder combination is suitable for temperature measurements in air condition ducts. The sensor-thermowell combination is suitable for temperature measurements in tubing. The standard temperature range in which the sensors are allowed to be utilised is -40 to 150 °C. The sensors communicate by means of RS 485 bus and only the bus can control the sensors. Communication inputs are protected to overvoltage. In case the module is placed as terminal on the line, a terminating resistor can be attached to the wiring by shorting the contacts (the switch SW placed next to terminals for communication lines connection). All settings are stored in EEPROM memory. The electronic module is equipped with the WATCHDOG circuit, which safeguards proper program functioning in the microprocessor. Easy mounting of the temperature sensor is ensured by the unique "S head" design.

The sensors are designed to be operated in a chemically non-aggressive environment. The sensors are made in three basic variants:

- SD 120** – with a simple ASCII communication protocol corresponds with ADAM 4000 modules by ADVANTECH company. Thus, standard drivers for ADAM modules can be used in various control programmes. For easier operation, the green LED indicates if power supply is on and the red LED indicates that the module is communicating. the SD 1x0 module is provided by the INIT shorting jumper on its printed circuit board. If it is shorted when power is switched on, the module communicates on 00 address with 9600 Bd transfer speed without checksum.
- SD 121** – the command structure corresponds with the ARION communication protocol, which is used among control systems by Amit company.
- SD 122** – the command structure corresponds with the ModBus communication protocol.

## ACCESSORIES

- The central plastic holder
- The thermowell JS 130
- The metal central holder

## DECLARATION, CERTIFICATES, CALIBRATION

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an digital output.

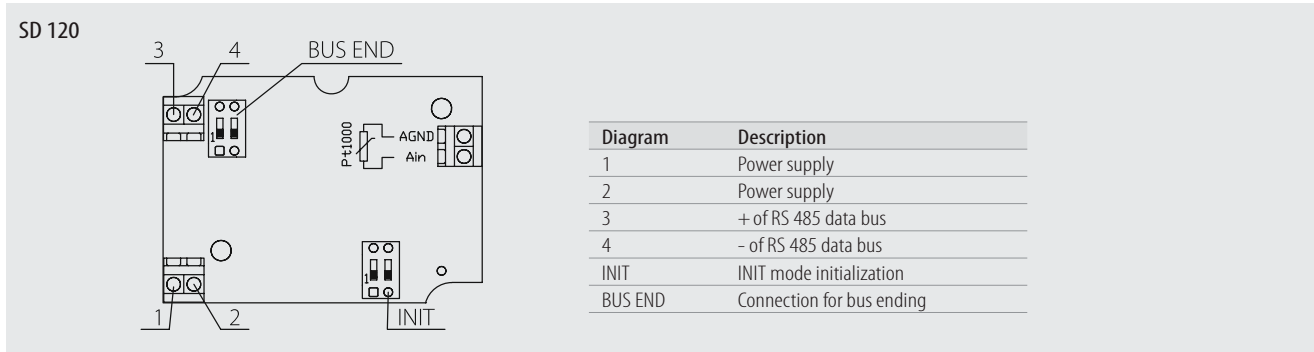
**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.

## SPECIFICATIONS

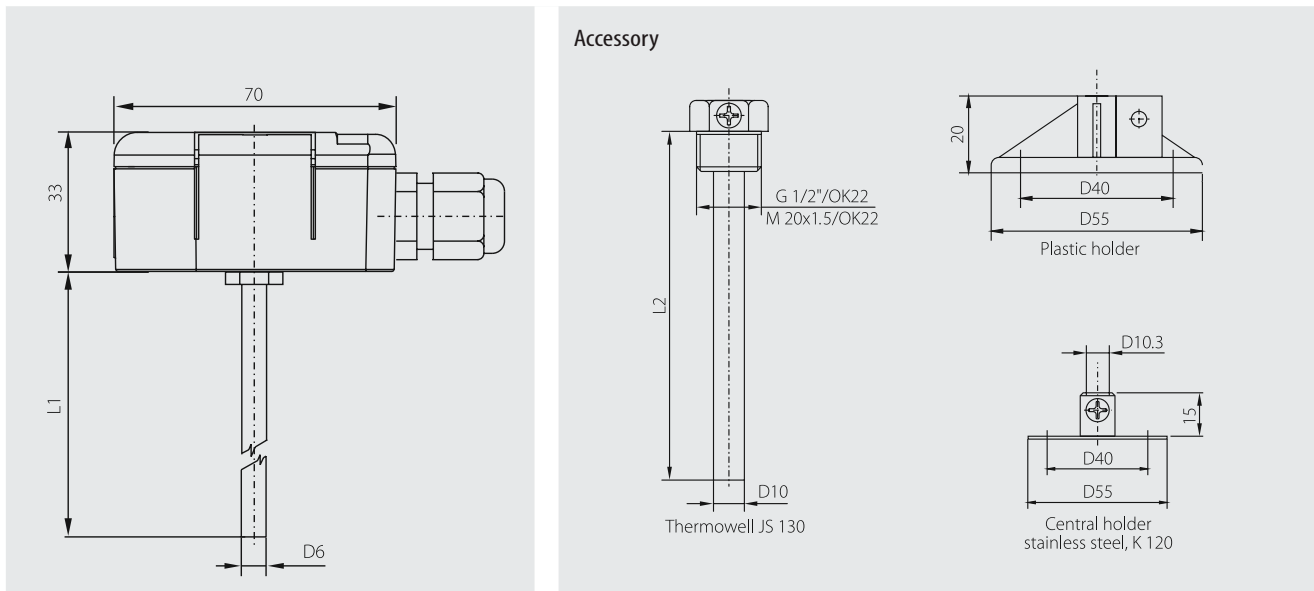
Sensor type	SD 120	SD 121	SD 122
Power supply	10 to 35 V DC (unstabilized) 14 to 24 V AC		
Power consumption	max. 1000 mW		
Measuring range	-40 to 150 °C		
Standard stem lengths	70, 120, 180, 240 mm		
Communication properties	communication via RS 485, maximum segment length is 1200 m, asynchronous transfer		
	transfer speeds 1200, 2400, 4800, 9600, 19200 Bd	transfer speeds 9600, 19200, 38400, 57600 Bd – DIP switch	preset transfer speed 9600 Bd optional transfer speeds 1200, 2400, 4800, 19200, 57600, 115200 Bd – DIP switch
	256 modules / 1 serial port	63 modules / 1 serial port	247 modules / 1 serial port
	protocol consistent with ADAM modules	protocol ARION	protocol ModBus 1 stop bit, without parity
Accuracy of electronics	0.05 %		
Accuracy of sensing element	± 0.5 °C		
Resolution	0.01 °C		
Ingress protection	IP 65 according to EN 60 529		
Material of the sensor stem	stainless steel 1.4301		
Material of the enclosure	POLYAMID		
Working conditions	ambient temperature: -30 to 70 °C		
	relative humidity: max. 85 % (at the ambient temperature 25 °C) atmospheric pressure: 87 to 107 kPa		
Weight	0.2 kg		



**WIRING DIAGRAM**



**DIMENSIONAL DRAFT**



**SENSOR INSTALLATION AND MAINTENANCE**

Before connecting the supply lead-in cable, lift off the lid of the plastic enclosure by means of a flat screwdriver. The lead-in cable is connected to the terminals according to the wiring diagram through the loosened grommet. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm. To ensure the ingress protection value of IP 65, the grommet has to be tightened and the lid has to be put on after connecting the lead-in cable.

In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. In case of using a stainless steel thermowell or a stainless steel holder these accessories should be placed first in the location where the temperature will be measured. Then the sensor is inserted into the holder, or pushed as far as the thermowell bottom, and tightened with a screw. The openings for the plastic clip installation have to be drilled according to the dimensioned sketch on which the opening diameters and the distances of their centres are illustrated. After installing and connecting the sensor to the sequential evaluating electrical equipment the sensor is ready to use. The sensor does not require any special servicing or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.

**CUSTOMER SPECIFIC MODIFICATIONS**

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- variable stem design – L1 length, materials, diameters, option of thread design
- thermowell thread type options



## DESCRIPTION AND APPLICATION

The SAU 1000, SAU 1500 control modules are intended to measure air temperature in water protected rooms. In addition to measuring temperature they enable to correct the requested value. These sensors are encapsulated in a plastic case, in which the temperature sensing element and a potentiometer are situated. Based on the measured temperature information an adjustment in the control system can be done, resulting in temperature increase or decrease.

Both control module types are enclosed in TANGO boxes made by ABB elektro, and as such they are a suitable supplement to wall switches, sockets, sensors and further elements of this series.

The sensors are designed to be operated in a chemically non-aggressive environment.

## DECLARATION, CERTIFICATES, CALIBRATION

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.



## SPECIFICATIONS

### SAU 1000

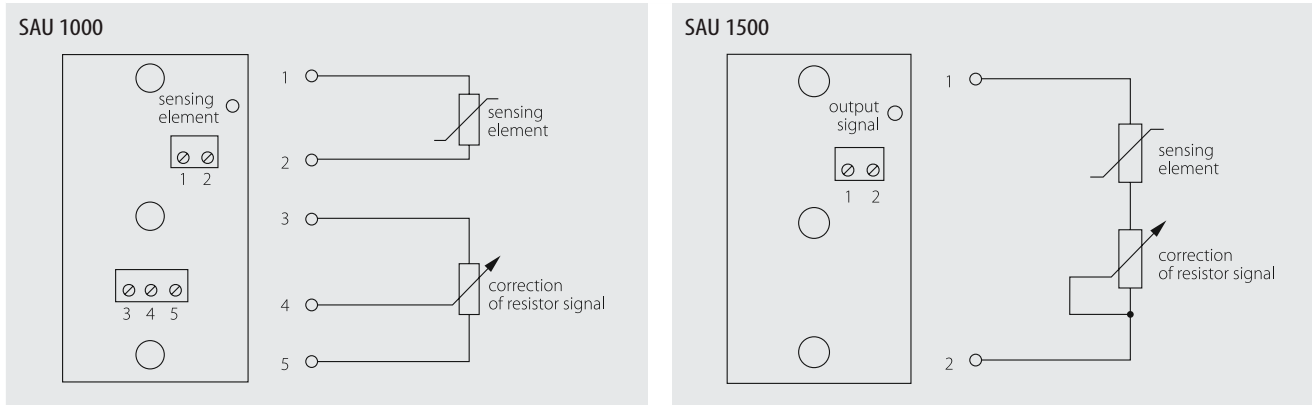
Type of sensing element	Ni 1000/5000, Ni 1000/6180, Ni 891, Ni 10000/5000, Ni 10000/6180, Pt 100, Pt 500, Pt 1000, NTC 20 kΩ etc.
Accuracy class	Ni sensing elements: B class, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: B class according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C NTC 20 kΩ: $\pm 1$ °C for the range 0 to 70 °C
Maximum measuring DC current	Pt 100 – 3 mA; Pt 500 – 1.5 mA; Pt 1000, Ni 1000, Ni 891 – 1 mA; T1 = Ni 2226 – 0.7 mA; Ni 10000 – 0.3 mA; NTC 20 kΩ – maximum power dissipation 1 mW
Correction range	Basic version: 0 to 250 Ω
	Possible options: 0 to 10 Ω
	0 to 100 Ω
	0 to 22 kΩ/G 0 to 2.5 kΩ
Sensor connection	according to the wiring diagram
Response time	$t_{0.5} < 15$ s (in streaming air at $1 \text{ m.s}^{-1}$ )
Type of terminal board	MEB 02001, ARK 500/3 – wire cross section 0.35 to 1.5 mm <sup>2</sup>
Ingress protection	IP 30 according to EN 60 529
Temperature range	–30 to 70 °C
Dimensions of the box	81 x 81 x 28 mm
Material of the box	ABS
Working conditions	ambient temperature: –30 to 70 °C
	relative humidity: max. 85 % (at the ambient temperature 25 °C)
	atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.15 kg

### SAU 1500

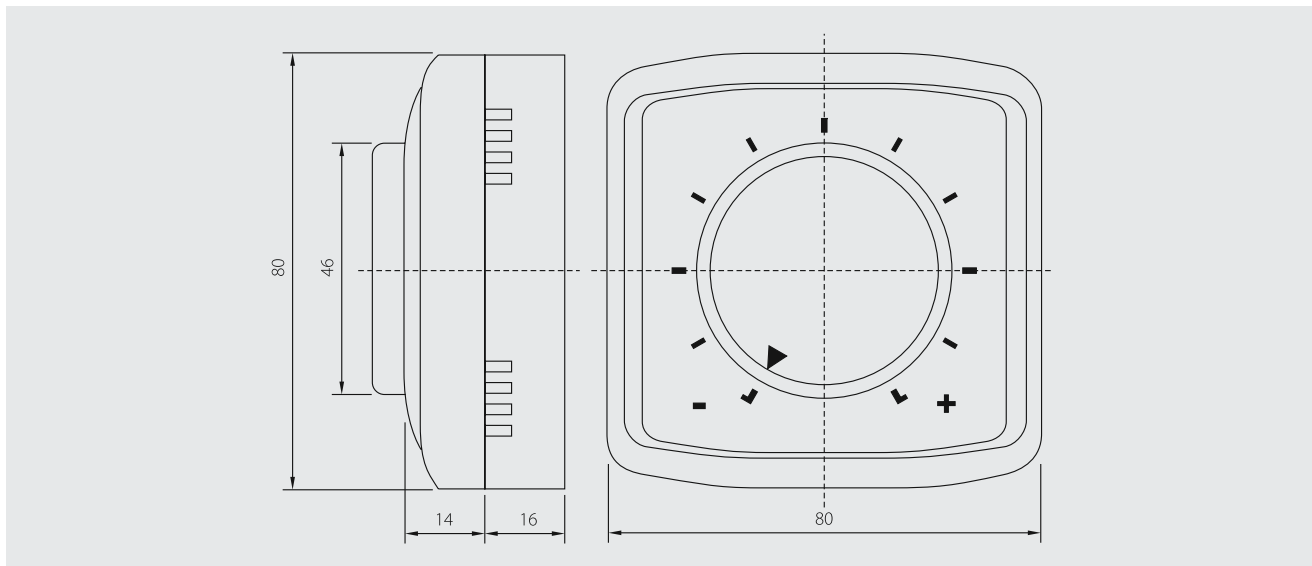
Type of sensing element	Ni 1000/5000, Ni 1000/6180, Pt 1000			
Accuracy class	Ni sensing elements: B class, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: B class according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C			
Maximum measuring DC current	Pt 1000, Ni 1000 – 1 mA			
Correction potentiometer	0 to 10 Ω	0 to 25 Ω	0 to 50 Ω	
Correction range	Ni 1000/5000	0 to 2.2 °C	0 to 5.5 °C	0 to 11 °C
	Ni 1000/6180	0 to 1.8 °C	0 to 4.5 °C	0 to 10 °C
	Pt 1000/3850	0 to 2.6 °C	0 to 6.5 °C	0 to 13 °C
Sensor connection	according to the wiring diagram			
Response time	$t_{0.5} < 15$ s (in streaming air at $1 \text{ m.s}^{-1}$ )			
Type of terminal board	MEB 02001 – wire cross section 0.35 to 1.5 mm <sup>2</sup>			
Ingress protection	IP 30 according to EN 60 529			
Temperature range	–30 to 70 °C			
Dimensions of the box	81 x 81 x 28 mm			
Material of the box	ABS			
Working conditions	ambient temperature: –30 to 70 °C			
	relative humidity: max. 85 % (at the ambient temperature 25 °C)			
	atmospheric pressure: 87 to 107 kPa			
Weight	approximately 0.15 kg			

TEMPERATURE SENSORS WITH CORRECTION  
OF THE REQUESTED VALUE SAU 1000 AND SAU 1500

■ WIRING DIAGRAM



■ DIMENSIONAL DRAFT



■ SENSOR INSTALLATION AND SERVICING

Before connecting the lead-in cable the control wheel with an arrow and the case lid carrying a dial have to be removed. **Be careful when opening the lid to avoid mechanical damage to these parts.** The control module is fixed to the wall by means of two screws, for which two openings are provided in the case bottom. The case construction makes it possible to screw the case by means of an accumulator driven screwdriver to the wall without the necessity of taking off the peripheral frame carrying vent holes.

Another two openings are intended for the lead-in cable. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>. In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used.

After installation and connection to the cooperating electric measuring device the sensors is ready for operation. The sensor does not require any special service or maintenance.

■ CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- class A precision type of temperature element (with the exception of sensors Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, thermistor NTC 20 kΩ)
- other resistance type elements for temperature measurement, like the KTY or the NTC thermistors etc. can be encapsulated
- another correction (temperature set point) value can be implemented



## DESCRIPTION AND APPLICATION

The SAU 2000 control modules are intended to measure air temperature in water protected rooms. In addition to measuring temperature they enable to adjust (correct) the temperature set point, as well as to utilise the indicating LED and the pulse push button. These sensors are encapsulated in a plastic case, in which two terminal boards are installed: a terminal board with a resistance-type temperature sensing element, and another one to which the potentiometer, the push button and the LED are connected. Based on the measured temperature information an adjustment in the control system can be done, resulting in temperature increase or decrease.

Both control module types are enclosed in TANGO boxes made by ABB elektro, and as such they are a suitable supplement to wall switches, sockets, sensors and further elements of this series.

The sensors are designed to be operated in a chemically non-aggressive environment.



## DECLARATION, CERTIFICATES, CALIBRATION

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.

## SPECIFICATIONS

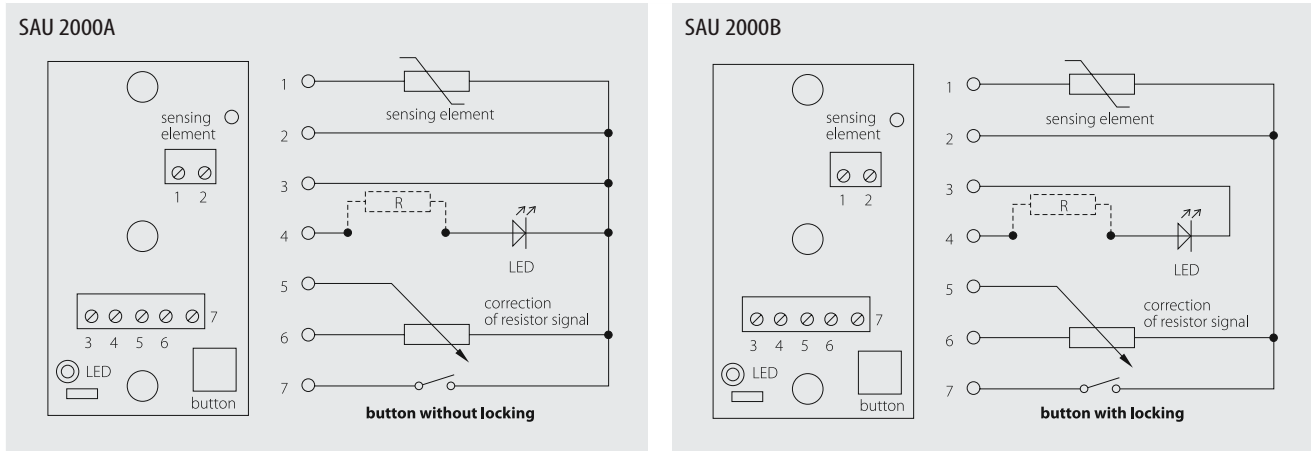
Type of sensing element	Ni 1000/5000, Ni 1000/6180, Ni 891, Ni 10000/5000, Ni 10000/6180, Pt 100, Pt 500, Pt 1000, NTC 20 kΩ etc.
Accuracy class	Ni sensing elements: B class, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: B class according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C NTC 20 kΩ: $\pm 1$ °C for the range 0 to 70 °C
Maximum measuring DC current	Pt 100 – 3 mA; Pt 500 – 1.5 mA; Pt 1000, Ni 1000, Ni 891 – 1 mA; T1 = Ni 2226 – 0.7 mA; Ni 10000 – 0.3 mA; NTC 20 kΩ – maximum power dissipation 1 mW
Correction range	Basic version: 0 to 250 Ω
	Possible option: 0 to 10 Ω
	0 to 100 Ω
	0 to 22 kΩ/G 0 to 2.5 kΩ
Sensor connection	according to the wiring diagram
Standard value of the resistor R for the signal diode *	1.5 kΩ for the power supply 12 V**
Button version	SAU 2000A without locking SAU 2000B with locking
Response time	$\tau_{0.5} < 15$ s (in streaming air at 1 m.s <sup>-1</sup> )
Type of terminal board	MEB 02001, ARK 500/3 – wire cross section 0.35 to 1.5 mm <sup>2</sup>
Ingress protection	IP 30 according to EN 60 529
Temperature range	–30 to 70 °C
Dimensions of the box	81 x 81 x 28 mm
Material of the box	ABS
Working conditons	ambient temperature: –30 to 70 °C
	relative humidity: max. 85 % (at the ambient temperature 25 °C)
	atmospheric pressure: 87 to 107 kPa
Weight	approximately 0.15 kg

\* Power dissipation of the signal diode and resistor must no be more than 150 mW.

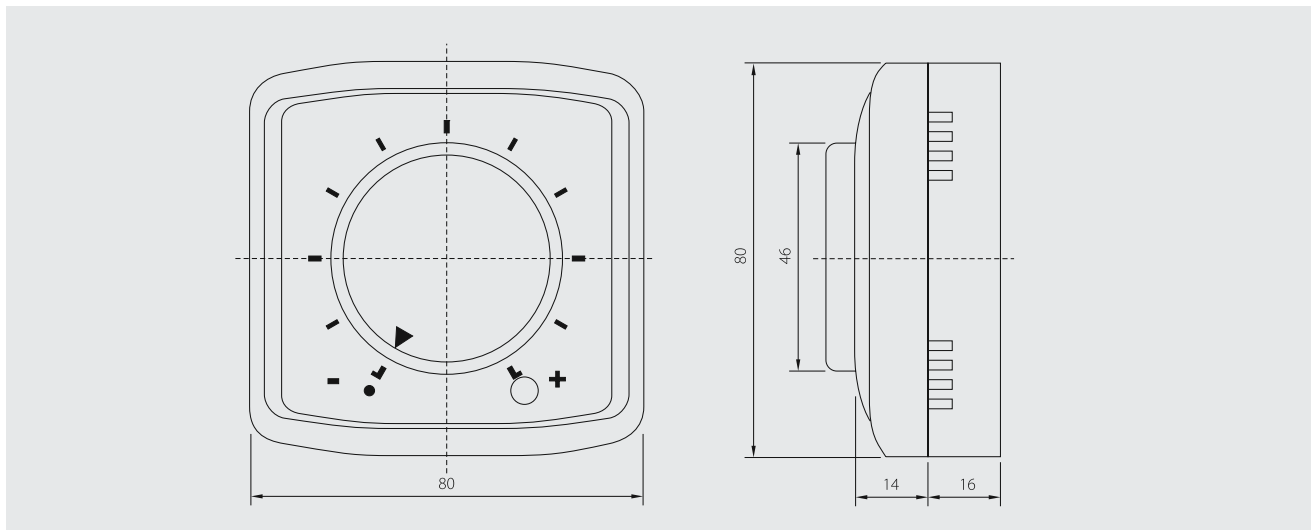
\*\* 3.9 kΩ for the power supply 24 V.

TEMPERATURE SENSORS  
WITH CORRECTION OF THE REQUESTED VALUE SAU 2000

**WIRING DIAGRAM**



**DIMENSIONAL DRAFT**



**SENSOR INSTALLATION AND SERVICING**

Before connecting the lead-in cable the control wheel with an arrow and the case lid carrying a dial have to be removed. **Be careful when opening the lid to avoid mechanical damage to these parts.** The control module is fixed to the wall by means of two screws, for which two openings are provided in the case bottom. The case construction makes it possible to screw the case by means of an accumulator driven screwdriver to the wall without the necessity of taking off the peripheral frame carrying vent holes.

Another two openings in the base of the case are intended for the lead-in cable. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>. In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used.

After installation and connection to the cooperating electric measuring device the sensors are ready for operation. The sensor does not require any special service or maintenance.

**CUSTOMER SPECIFIC MODIFICATIONS**

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- class A precision type of temperature element (with the exception of sensors Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, thermistor NTC 20 kΩ)
- other resistance type elements for temperature measurement, like the KTY or the NTC thermistors etc. can be encapsulated
- another correction (temperature set point) value can be implemented

## PAIRED TEMPERATURE SENSORS TP 11E



### DESCRIPTION AND APPLICATION

These paired temperature sensors are used as component parts of the electrical heat-quantity meters. They are produced with the Pt 100, Pt 500 and Pt 1000 temperature sensing elements. The sensors are compatible with heat-quantity meters manufactured by SIEMENS, LANDIS+GYR, KAMSTRUP, ITRON, CODEA, COMAC CAL, SENSUS METERING and others. The sensors are intended for installation in thermowells. The standard operating temperature range is 0 to 180 °C or 0 to 150 °C.

The sensors are designed to operate in a chemically non-aggressive environment.

### ACCESSORIES

- The thermowell JTP 11

### DECLARATION, CERTIFICATES

The sensors are compliant with the requirements of the EN 60 751 and EN 1434 standards and have an EC-Type Examination Certificate No. TCM 321/07-4530.

**EC Declaration of Conformity** – the sensors are manufactured in conformity with the Directive of the European Parliament and of the Council 2004/22/EC on Measuring Instruments (so-called MID).



The variable location of the plug allows the use of these short sensor tips even in longer existing thermowells.

### SPECIFICATIONS

#### BASIC DATA

Type of sensing element	Pt 100, Pt 500, Pt 1000
Maximum measuring DC current	3 mA (Pt 100); 1.5 mA (Pt 500); 1 mA (Pt 1000)
Recommended measuring DC current	1 mA (Pt 100); 0.5 mA (Pt 500); 0.3 mA (Pt 1000)
Measuring range	0 to 180 °C or 0 to 150 °C
$\Delta\Theta_{\min}$	2 °C or 3 °C
$\Delta\Theta_{\max}$	180 °C or 150 °C
Accuracy class of individual sensors	B according to IEC 751
Sensor connection	according to the wiring diagram

#### OTHER PARAMETERS

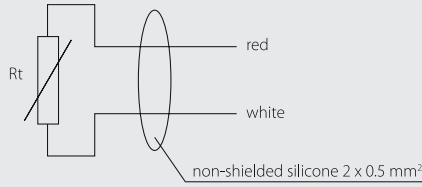
Length of the case	40 ± 5 mm (37 mm as a standard)
Diameter of the case	5.5 ± 0,5 mm
Material of the case and the thermowell	stainless steel 1.4301
Lead-in cable	2-wire non-shielded silicone 2 x 0.5 mm <sup>2</sup> 4-wire non-shielded silicone 4 x 0.25 mm <sup>2</sup>
Lengths of the cable	according to the standard EN 1434-2, art. 3.3.4, chart 2
Wire resistance	0.07 Ω for 1 m of 2-wire cable
Temperature stability of the cable	-25 to 180 °C
Ingress protection	IP 67 according to EN 60 529
Insulation resistance	> 100 MΩ at 100 V DC, 15 to 35 °C, humidity < 80 %
Response time	$t_{0.5} < 6$ s (in streaming water at 0.4 m.s <sup>-1</sup> )
Recommended minimum immersion	75 mm
Lengths of thermowells	36, 86, 136, 176 mm
Thermowell thread	G ½", M 20 x 1.5
Maximum overpressure for a thermowell	6.3 MPa



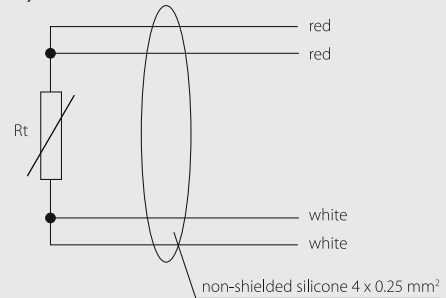
PAIRED TEMPERATURE SENSORS TP 11E

**WIRING DIAGRAM**

2-wire connection

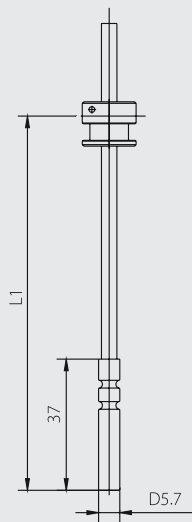


4-wire connection )\*

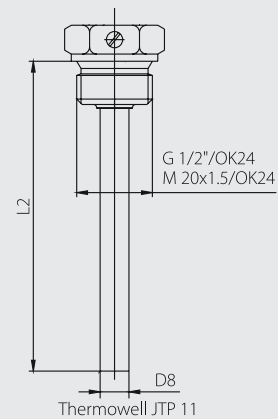


**DIMENSIONAL DRAFT**

TP 11E



Accessories



L1 Distance of the fixing plug for TP 11E)**	L2 thermowell length for JTP 11
47	36
97	86
147	136
187	176

)\* In the 4-wire connection the wire colour design can be red, blue / black, white

)\*\* By means of the length L1 the distance of the fixing plug is defined and the length of a spacer is defined by the length of the thermowell

**SENSOR INSTALLATION AND SERVICING**

As a rule, the sensors are fitted with thermowells and installed in tubing in perpendicular or in a skew position in an angle of 45° counter to the streaming of the media the temperature to be measured. Before installing these paired temperature sensors first place the thermowells in locations where the temperature is to be measured, after that push the sensors in to the thermowell bottom, together with the spacer tube and the plug, which are placed on the cable between the sensor's case and name plate. Secure the plug, and thereby the whole sensor, by a screw located in the thermowell. The screw must be tightened to secure the sensor reliably.

The sensor marked with the red identification label, the red plug and the red insulation is intended for wiring in supply circuit. The second sensor with blue identification label, plug and insulation is intended for assembly in reverse branch.

To prevent unauthorized manipulation the sensors are provided with sealing openings. The installation sealing wire has to be pushed through the screw opening first, and then through the plumb opening. Then it has to be sealed not to allow to turn the screw more than one turn!

Finally the individual sensors are connected to the heat quantity meter according to the wiring diagram.

**Caution:** Before installation check the identity of the paired sensors by means of the code specified on the sensor's name plate. The numbers within one pair must be identical. Also, check the attestation date. Consult the producer in case the serial numbers in the name plate are not identical.

**Caution:** The lead-in cable resistance in the two-wire connection depends on the cable length. That is why the conductors must not be changed (shortened). The superfluous cable has to be rolled up and fastened.

## PAIRED TEMPERATURE SENSORS TP 13, TP 13A



### DESCRIPTION AND APPLICATION

These paired temperature sensors are used as component parts of the electrical heat-quantity meters. They are produced with the Pt 100, Pt 500 and Pt 1000 temperature sensing elements. The structure of the case allows for direct installation of sensors into pipes without the need for a thermowell, thus ensuring a quick response to changes in temperature. The sensors are compatible with heat-quantity meters manufactured by SIEMENS, LANDIS+GYR, KAMSTRUP, ITRON, CODEA, COMAC CAL, SENSUS METERING and others. The standard operating temperature range is 0 to 180 °C or 0 to 150 °C.

The sensors are designed to operate in a chemically non-aggressive environment.

### ACCESSORIES

- The sealing from TEMASIL material
- The VEXVE valve

### DECLARATION, CERTIFICATES

The sensors are compliant with the requirements of the EN 60 751 and EN 1434 standards and have an EC-Type Examination Certificate No. TCM 321/07-4530.

**EC Declaration of Conformity** – the sensors are manufactured in conformity with the Directive of the European Parliament and of the Council 2004/22/EC on Measuring Instruments (so-called MID).



Quick response to changes in temperature.



VEXVE valve

### SPECIFICATIONS

#### BASIC DATA

Type of sensing element	Pt 100, Pt 500, Pt 1000
Maximum measuring DC current	3 mA (Pt 100); 1.5 mA (Pt 500); 1 mA (Pt 1000)
Recommended measuring DC current	1 mA (Pt 100); 0.5 mA (Pt 500); 0.3 mA (Pt 1000)
Measuring range	0 to 180 °C or 0 to 150 °C
$\Delta\Theta_{\min}$	2 °C or 3 °C
$\Delta\Theta_{\max}$	180 °C or 150 °C
Accuracy class of individual sensors	B according to IEC 751
Sensor connection	according to the wiring diagram

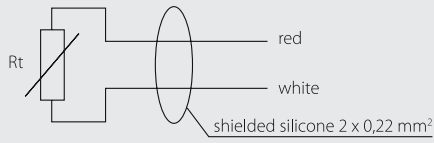
#### OTHER PARAMETERS

Length of the case	27,5 mm
Diameter of the case	3.6 mm (TP 13); 5 mm (TP 13A)
Material of the case	stainless steel 1.4301
Material of the fastening nut	brass
Lead-in cable	2-wire shielded silicone 2 x 0.22 mm <sup>2</sup> 4-wire shielded silicone 4 x 0.12 mm <sup>2</sup>
Lengths of the cable	According to EN 1434-2, art. 3.3.4, chart 2
Wire resistance	0.16 Ω per 1 m of the 2-wire cable
Temperature stability of the cable	-25 to 180 °C
Ingress protection	IP 67 according to EN 60 529
Insulation resistance	> 100 MΩ at 100 V DC, 15 to 35 °C, humidity < 80 %
Response time	TP 13: $\tau_{0.5} < 3$ s (in streaming water at 0.4 m.s <sup>-1</sup> ) TP 13A: $\tau_{0.5} < 8$ s (in streaming water at 0.4 m.s <sup>-1</sup> )

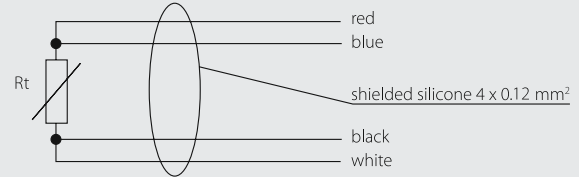
PAIRED TEMPERATURE SENSORS TP 13, TP 13A

**WIRING DIAGRAM**

2-wire connection

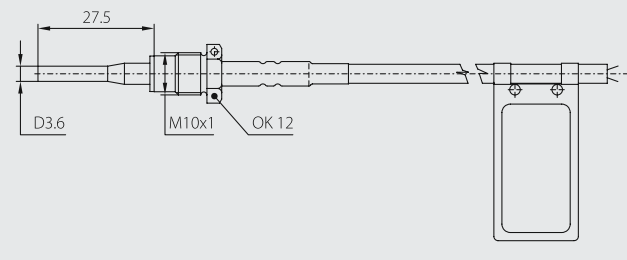


4-wire connection

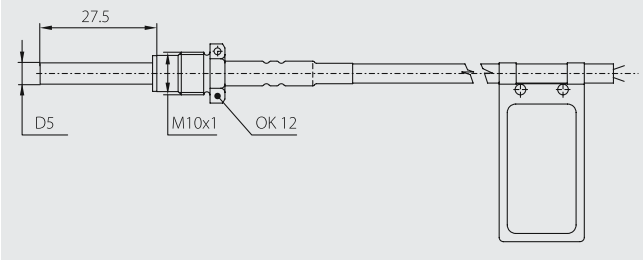


**DIMENSIONAL DRAFT**

TP 13



TP 13A



**SENSOR INSTALLATION AND SERVICING**

These sensors are intended for a direct installation in a tubing. As a rule, the sensors are fitted in a skew position at an angle of 45° counter to the streaming of the media the temperature of which is to be measured. Before connecting the temperature sensor to the heat consumption meter insert the sensor in the opening designed for the sensor installation, screw in the fixing nut, which is the sensor's component part, and tighten it to secure the sensor reliably.

The sensor marked with the red identification label, the red plug and the red insulation is intended for wiring in supply circuit. The second sensor with blue identification label, plug and insulation is intended for assembly in reverse branch.

To prevent unauthorised manipulation, the sensors are provided with sealing openings. The installation seal wire has to be pushed through the fixing nut opening first, then through the installation opening in the flow meter (or the weld-on piece) body, after which it has to be sealed in such a way that the fixing nut cannot be turned! Finally the individual sensors are connected to the heat consumption meter according to wiring diagram.

**Caution:** Before installation check the identity of the paired sensors by means of the code specified on the sensor's name plate. The numbers within one pair must be identical. Also, check the attestation date. Consult the producer in case the serial numbers in the name plate are not identical.

**Caution:** The lead-in cable resistance in the two-wire connection depends on the cable length. That is why the conductors must not be changed (shortened). The superfluous cable has to be rolled up and fastened.

PAIRED TEMPERATURE SENSORS TP 15, TP 15A, TP 15B



**DESCRIPTION AND APPLICATION**

These paired temperature sensors are used as component parts of the electrical heat-quantity meters. They are produced with the Pt 100, Pt 500 and Pt 1000 temperature sensing elements. The sensors are compatible with heat-quantity meters manufactured by SIEMENS, LANDIS+GYR, KAMSTRUP, ITRON, CODEA, COMAC CAL, SENSUS METERING and others. The sensors are intended for installation in thermowells. The standard operating temperature range is 0 to 180 °C or 0 to 150 °C.

The sensors are designed to operate in a chemically non-aggressive environment.

**ACCESSORIES**

- The thermowell JTP 15

**DECLARATION, CERTIFICATES**

The sensors are compliant with the requirements of the EN 60 751 and EN 1434 standards and have an EC-Type Examination Certificate No. TCM 321/07-4530.

**EC Declaration of Conformity** – the sensors are manufactured in conformity with the Directive of the European Parliament and of the Council 2004/22/EC on Measuring Instruments (so-called MID).



Variable design of temperature sensors allows for precise installation and helps to achieve fast time responses even for sensors installed in thermowells.

**SPECIFICATIONS**

**BASIC DATA**

Type of sensing element	Pt 100, Pt 500, Pt 1000
Maximum measuring DC current	3 mA (Pt 100); 1.5 mA (Pt 500); 1 mA (Pt 1000)
Recommended measuring DC current	1 mA (Pt 100); 0.5 mA (Pt 500); 0.3 mA (Pt 1000)
Measuring range	0 to 180 °C or 0 to 150 °C
$\Delta\Theta_{min}$	2 °C or 3 °C
$\Delta\Theta_{max}$	180 °C or 150 °C
Accuracy class of individual sensors	B according to IEC 751
Sensor connection	according to the wiring diagram

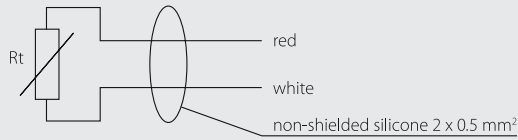
**OTHER PARAMETERS**

The standard length of the case	TP 15: 65, 105, 140, 230 mm TP 15A: 120/91; 175/146 mm TP 15B: 120/91; 175/146 mm
Diameter of the case	6 mm (with tolerance d10 in the length 50 mm)
Material of the case and of the thermowell	stainless steel 1.4301
Lead-in cable	2-wire non-shielded silicone 2 x 0.5 mm <sup>2</sup> 4-wire non-shielded silicone 4 x 0.25 mm <sup>2</sup>
Cable lengths	according to EN 1434-2, art. 3.3.4, chart 2
Wire resistance	0.07 Ω per 1 m of the 2-wire cable
Temperature stability of the cable	-25 to 180 °C
Ingress protection	IP 67 according to EN 60 529
Insulation resistance	> 100 MΩ at 100 V DC, 15 to 35 °C, humidity < 80 %
Response time	$\tau_{0.5}$ < 6 s (in streaming water at 0.4 m.s <sup>-1</sup> )
Lengths of the thermowells	65, 105, 140, 230 mm (TP 15); 91, 146 mm (TP 15 A)
Thermowell thread	G1/2", M 20 x 1.5
Maximum overpressure of the thermowell	6.3 MPa

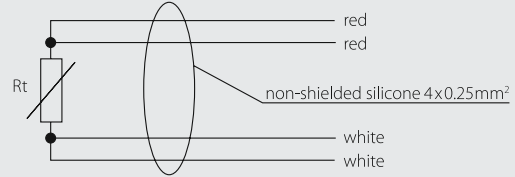
PAIRED TEMPERATURE SENSORS TP 15, TP 15A, TP 15B

**WIRING DIAGRAM**

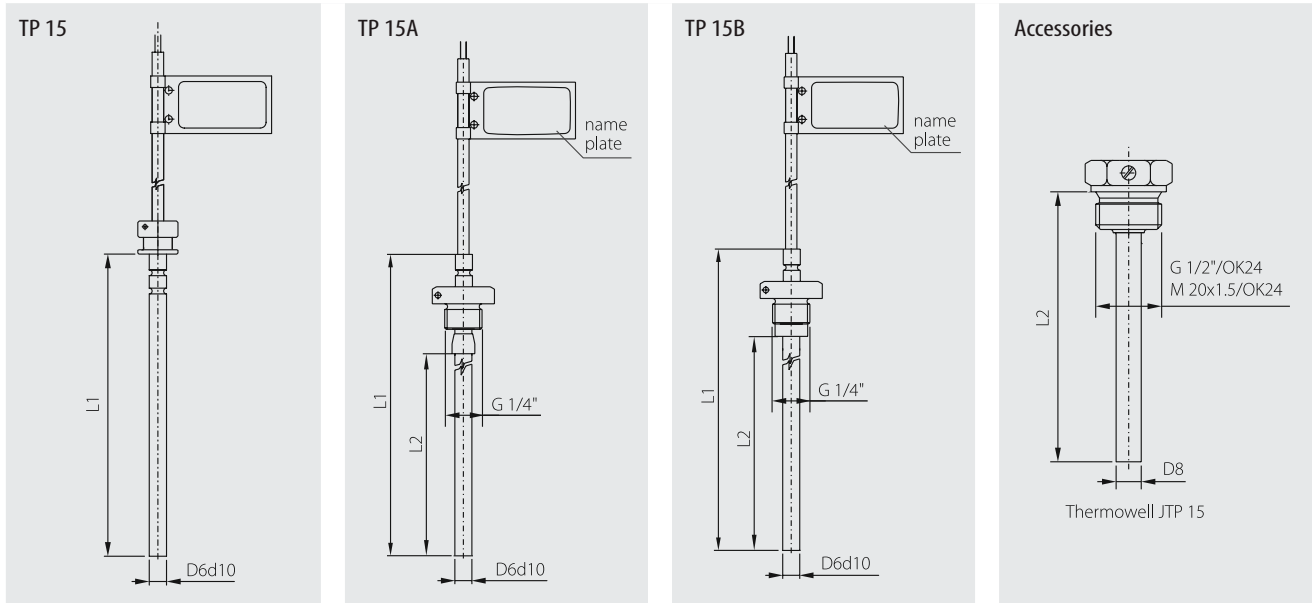
2-wire connection



4-wire connection



**DIMENSIONAL DRAFT**



L1 Case length for TP 15	Thermowell length L2 – JTP 15
65	65
105	105
140	140
230	230

L1 Case length for TP 15A, TP 15B	Thermowell length L2 – JTP 15A, JTP 15B
120	91
175	146

**SENSOR INSTALLATION AND SERVICING**

As a rule, the sensors are assembled with thermowells and they are fitted into tubings in a skew position at an angle of 45° counter to the streaming of the media the temperature of which is to be measured. Before installing the temperature sensor fix the thermowell in the location where the temperature should be measured, then insert the sensor into the thermowell up to the thermowell bottom together with a plug, which is put on the cable between the case and the name plate. Then secure the plug and thereby the whole sensor by a screw placed in the thermowell. Tighten the screw to secure the sensor reliably.

The sensor marked with the red identification label, the red plug and the red insulation is intended for wiring in supply circuit. The second sensor with blue identification label, plug and insulation is intended for assembly in reverse branch.

To prevent unauthorised manipulation, the sensors are provided with sealing openings. The installation seal wire has to be pushed through the fixing nut opening first, then through the installation opening in the flow meter (or the weld-on piece) body, after which it has to be sealed in such a way that the fixing nut cannot be turned! Finally the individual sensors are connected to the heat consumption meter according to wiring diagram.

**Caution:** Before installation check the identity of the paired sensors by means of the code specified on the sensor's name plate. The numbers within one pair must be identical. Also, check the attestation date. Consult the producer in case the serial numbers in the name plate are not identical.

**Caution:** The lead-in cable resistance in the two-wire connection depends on the cable length. That is why the conductors must not be changed (shortened). The superfluous cable has to be rolled up and fastened.

## PAIRED TEMPERATURE SENSORS TP 16, TP 16A

### DESCRIPTION AND APPLICATION

These paired temperature sensors are used as component parts of the electrical heat-quantity meters. They are produced with the Pt 100, Pt 500 and Pt 1000 temperature sensing elements. Two-wire or four-wire circuits can be connected to the sensors (the inner circuit is always two-wire). The sensors are compatible with heat-quantity meters manufactured by SIEMENS, LANDIS+GYR, KAMSTRUP, ITRON, CODEA, COMAC CAL, SENSUS METERING and others. The sensors are designed for installation in thermowells. The standard operating temperature range is 0 to 180 °C or 0 to 150 °C.

The sensors are designed to operate in a chemically non-aggressive environment.

### ACCESSORIES

- The thermowell JPT 16 or JPT 16A

### DECLARATION, CERTIFICATES

The sensors are compliant with the requirements of the EN 60 751 and EN 1434 standards and have an EC-Type Examination Certificate No. TCM 321/07-4530.

**EC Declaration of Conformity** – the sensors are manufactured in conformity with the Directive of the European Parliament and of the Council 2004/22/EC on Measuring Instruments (so-called MID).



Type TP 16A ensures a fast response time to changes in temperature.

### SPECIFICATIONS

#### BASIC DATA

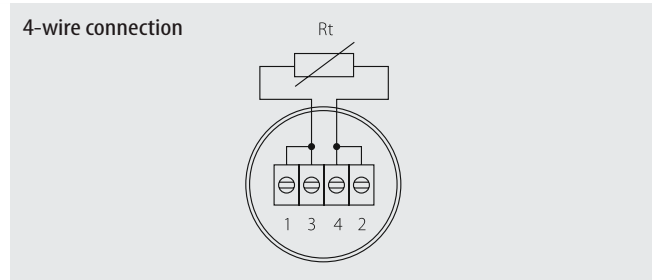
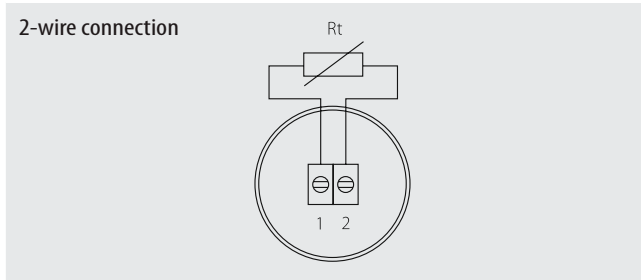
Type of sensing element	Pt 100, Pt 500, Pt 1000
Maximum measuring DC current	3 mA (Pt 100); 1.5 mA (Pt 500); 1 mA (Pt 1000)
Recommended measuring DC current	1 mA (Pt 100); 0.5 mA (Pt 500); 0.3 mA (Pt 1000)
Measuring range	0 to 180 °C or 0 to 150 °C
$\Delta\Theta_{\min}$	2 °C or 3 °C
$\Delta\Theta_{\max}$	180 °C or 150 °C
Accuracy class of individual sensors	B according to IEC 751
Sensor connection	according to the wiring diagram
Maximum overpressure of the thermowell	6.3 MPa

#### OTHER PARAMETERS

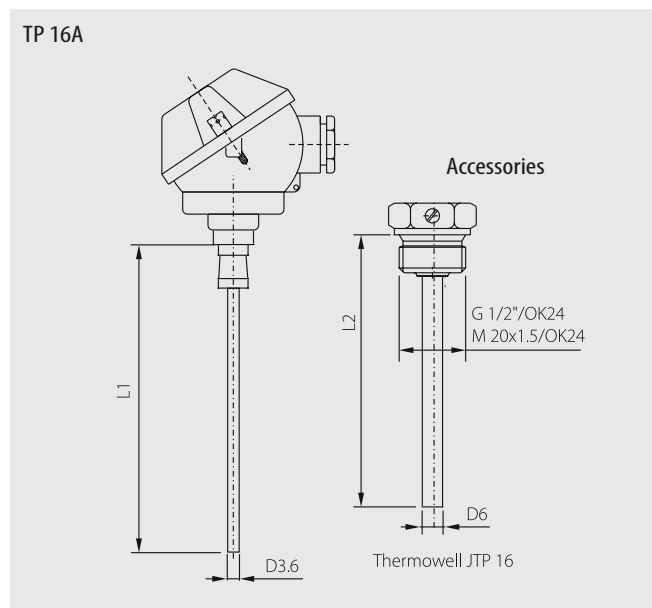
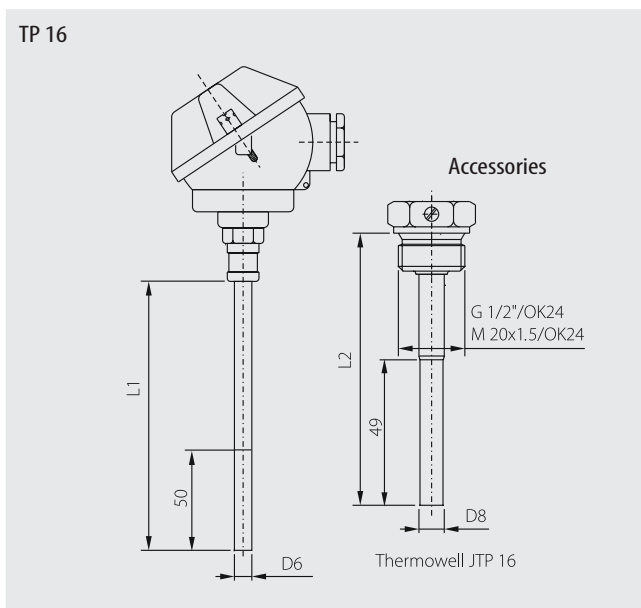
Length of the case	TP 16: 105, 140, 230 mm; TP 16A: 97, 133 mm
Diameter of the case	TP 16: 6 mm ± 0.1 mm; TP 16A: 3.6 mm ± 0.005 mm
Material of the case and of the thermowell	stainless steel 1.4301
Type of the connection head	LIMATHERM MA
Material of the connection head	aluminium alloy
Temperature stability of the connection head	-25 to 100 °C
Internal wiring resistance	TP 16: 0.013 Ω / 105 mm 0.017 Ω / 140 mm 0.027 Ω / 230 mm TP 16A: 0.03 Ω / 97 mm 0.04 Ω / 133 mm
Recommended wire cross section	0.35 to 1.5 mm <sup>2</sup>
Ingress protection	IP 54 according to EN 60 529
Insulation resistance	> 100 MΩ at 100 V DC, 15 to 35 °C, humidity < 85 %
Response time	TP 16: $\tau_{0.5} < 5$ s (in streaming water at 0.4 m.s <sup>-1</sup> ) TP 16A: $\tau_{0.5} < 3$ s (in streaming water at 0.4 m.s <sup>-1</sup> )
Lengths of thermowells	105, 140, 230 mm (TP 16); 88, 124 mm (TP 16A)
Thermowell thread	G ½", M 20 x 1.5

PAIRED TEMPERATURE SENSORS TP 16, TP 16A

**WIRING DIAGRAM**



**DIMENSIONAL DRAFT**



L1 Case length for TP 16	L2 thermowell length for JTP 16
105	105
140	140
230	230

L1 Case length for TP 16A	L2 thermowell length for JTP 16A
97	88
133	124

**SENSOR INSTALLATION AND SERVICING**

As a rule, the sensors are fitted with thermowells and installed in tubing in a skew position in an angle of 45° counter to the streaming of the media the temperature of which is to be measured. Before installing these paired temperature sensors place first the thermowells in locations where the temperature will be measured, and after that push in the sensors as far as the thermowell bottom. Secure the sensor by a screw located in the thermowell. The screw must be tightened to the endstop.

Before connecting the lead-in cable screw off the lid of the metal connection head. To secure the IP 54 ingress protection the cable grommet has to be tightened and the lid has to be screwed on after connecting the lead-in cable.

To prevent unauthorized manipulation the sensors are provided with sealing openings. The installation sealing wire has first to be pushed through the opening in the connection head, and then through the plumb opening in the thermowell. Then it has to be sealed not to allow to pull out the sensor out of the thermowell.

Finally the individual sensors are connected to the heat quantity meter.

**Caution:** Before installation check the identity of the paired sensors by means of the code quoted in the sensor's name plate (the numbers within one pair must be identical). Consult the producer in case the serial numbers are not identical.



## RESISTANCE TEMPERATURE SENSORS T 13



### DESCRIPTION AND APPLICATION

The sensors were designed as a part of meters that measure a heat quantity supplied by vapour according to TPM 3723-03 and TPM 3724-03. They are produced with the Pt 100, Pt 500 and Pt 1000 temperature sensing elements. The structure of the sleeve allows for direct installation of sensors type DS into pipes without the need for a thermowell, which ensures a fast response to changes in temperature. The standard operating temperature range is 0 to 150 °C.

The sensors are designed to operate in a chemically non-aggressive environment and they are supplied with a calibration certificate, issued by the metrological centre of our manufacturing facility.

### DECLARATION, CERTIFICATES

The sensors are compliant with the requirements of the EN 60 751 standard and TPM 3342-94, which is declared by official certification. The approval mark of the sensor type is TCM 321/01-3608.

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.



Quick response time to changes in temperature.

### SPECIFICATIONS

#### BASIC DATA

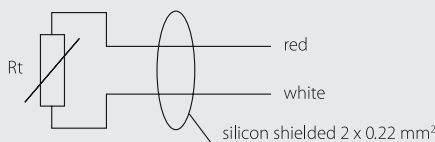
Type of sensing element	Pt 100, Pt 500
Maximum measuring DC current	3 mA (Pt 100); 1,5 mA (Pt 500)
Recommended measuring DC current	1 mA (Pt 100); 0,5 mA (Pt 500); 0,3 mA (Pt 1000)
Measuring range	0 to 150 °C
Accuracy class of individual sensors	B according to IEC 751
Sensor connection	according to the wiring diagram

#### OTHER PARAMETERS

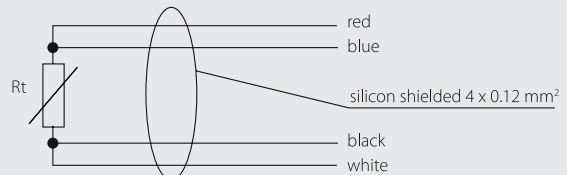
Case length	27,5 mm
Case diameter	3,6 mm
Material of the case	stainless steel 1.4301
Lead-in cable	2-wire silicone shielded 2 x 0,22 mm <sup>2</sup> 4-wire silicone shielded 4 x 0,12 mm <sup>2</sup>
Cable lengths	Pt 100 (2-wire) – max. 3 m; Pt 500 (2-wire) – max. 15 m
Wire resistance	2-wire cable 0,16 Ω for 1 m cable
Temperature resistivity of the cable	-25 to 180 °C
Ingress protection	IP 67 according to EN 60 529
Insulation resistance	> 100 MΩ at 100 V DC, 15 to 35 °C, humidity < 80 %
Response time	$\tau_{0,5} < 3$ s (in streaming water at 0,4 m·s <sup>-1</sup> )
Maximum overpressure of the thermowell	2,5 MPa

### WIRING DIAGRAM

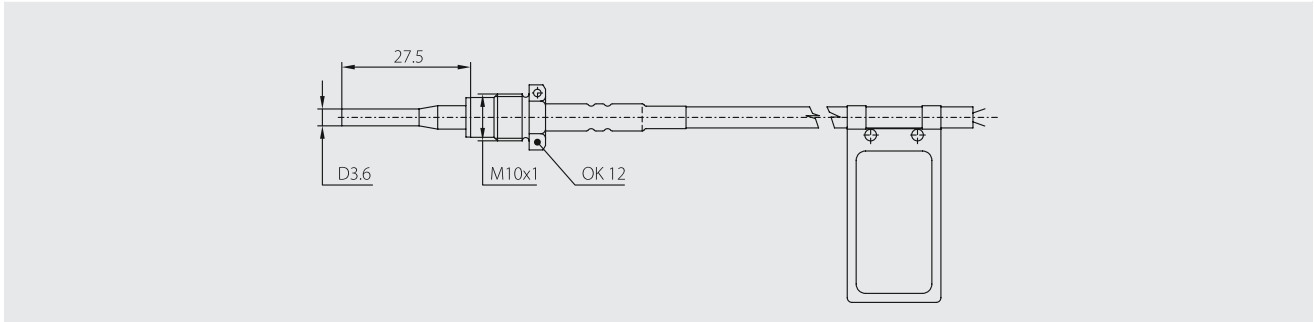
#### 2-wire connection



#### 4-wire connection



## RESISTANCE TEMPERATURE SENSORS T 13

**■ DIMENSIONAL DRAFT**

**■ SENSOR INSTALLATION AND SERVICING**

The sensors are intended directly for a directly installation in tubing. As a rule, the sensors are installed in tubing in the skew position in the angle of 45° counter to the streaming of measured medium. Before connection of individual sensors to a heat-meter the sensors have to be inserted in corresponded openings for sensors-installation. After that the nut which is the part of a sensor has to be screwed and tightened to the endstop.

To prevent an unauthorized manipulation, the sensors are provided by sealing openings. The installation sealing wire has to be pushed through the nut opening and then through the assembly opening in the body of a flowmeter (or in welded-on piece). Then it has to be sealed not to allow to turn the nut! Finally the individual sensors are connected to the heat quantity meter according to the wiring diagram.

**Caution:** The lead-in cable resistance in the two-wire connection depends on the cable length. That is why the conductors must not be changed (shortened). The superfluous cable has to be rolled up and fastened.

## RESISTANCE TEMPERATURE SENSORS T 16



### DESCRIPTION AND APPLICATION

The sensors were designed as a part of meters that measure a heat quantity supplied by vapour according to TPM 3723-03 and TPM 3724-03. They are produced with the Pt 100, Pt 500 and Pt 1000 temperature sensing elements. Two-wire or four-wire circuits can be connected to the sensors (the inner circuit is always two-wire). The standard operating temperature range is 0 to 150 °C.

The sensors are designed to operate in a chemically non-aggressive environment and they are supplied with a calibration certificate, issued by the metrological centre of our manufacturing facility.

### ACCESSORIES

- The thermowell JPT 16

### DECLARATION, CERTIFICATES

The sensors are compliant with the requirements of the EN 60 751 standard and TPM 3342-94, which is declared by official certification. The approval mark of the sensor type is TCM 321/01-3608.

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.



### SPECIFICATIONS

#### BASIC DATA

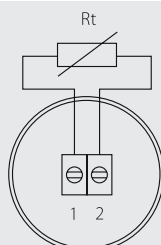
Type of sensing element	Pt 100, Pt 500, Pt 1000
Maximum measuring DC current	3 mA (Pt 100); 1.5 mA (Pt 500); 1 mA (Pt 1000)
Recommended measuring DC current	1 mA (Pt 100); 0.5 mA (Pt 500); 0.3 mA (Pt 1000)
Measuring range	0 to 150 °C
Accuracy class of individual sensors	B according to IEC 751
Sensor connection	according to the wiring diagram

#### OTHER PARAMETERS

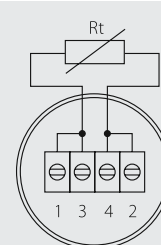
Length of the case	105, 140, 230 mm
Diameter of the case	6 mm
Material of the case and of the thermowell	stainless steel 1.4301
Connection head type	LIMATHERM MA
Material of the connection head	aluminium alloy
Temperature stability of the connection head	-25 to 100 °C
Internal wiring resistance	0.013 Ω / 105 mm
	0.017 Ω / 140 mm
	0.027 Ω / 230 mm
Recommended wire cross section	0.35 to 1.5 mm <sup>2</sup>
Ingress protection	IP 54 according to EN 60 529
Insulation resistance	> 100 MΩ at 100 V DC, 15 to 35 °C, humidity < 80 %
Response time	$\tau_{0.5} < 6$ s (in streaming water at 0.4 m.s <sup>-1</sup> )
Lengths of thermowells	105, 140, 230 mm
Thermowell thread	G 1/2", M 20 x 1.5

### WIRING DIAGRAM

#### 2-wire connection

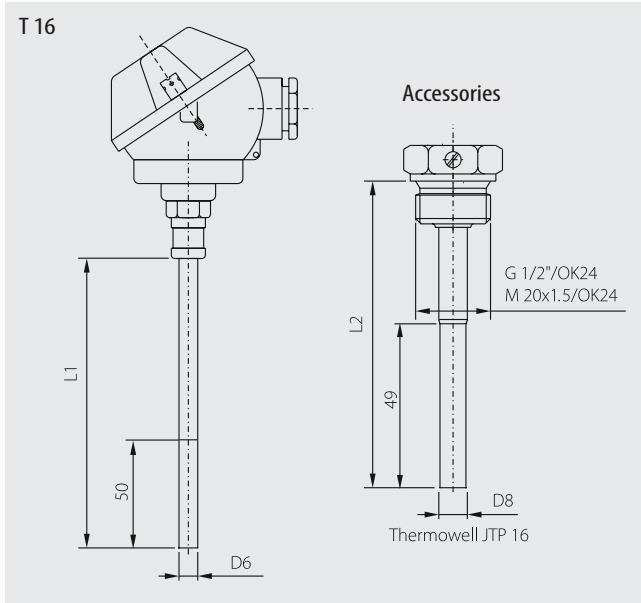


#### 4-wire connection



RESISTANCE TEMPERATURE SENSORS T 16

**DIMENSIONAL DRAFT**



L1 Case length – T 16	L2 thermowell length – JTP 16
105	105
140	140
230	230

**SENSOR INSTALLATION AND SERVICING**

As a rule, the sensors are fitted with thermowells and installed in tubing in the skew position in the angle of 45° counter to the streaming of the media of which the temperature is to be measured. Before installing these temperature sensors first place the thermowells in locations where the temperature is to be measured, after that push in the sensors as far as the thermowell bottom. Secure the sensor by a screw located in the thermowell. The screw must be tightened to the endstop. Before connecting the lead-in cable screw off the lid of the metal connection head. To secure the IP 54 ingress protection the grommet has to be tightened and the lid has to be securely screwed after connecting the lead-in cable.

To prevent unauthorized manipulation the sensors are provided with sealing openings. The installation sealing wire has to be pushed through the opening in the connection head first, and then through the plumb opening in the thermowell. Then it has to be sealed not to allow to pull out the sensor out of the thermowell. Finally the individual sensors are connected to the heat quantity meter.

**THERMOWELLS, WELDED-ON PIECES, PIPE REDUCERS**



**DESCRIPTION AND APPLICATION**

Thermowells are component parts that are usually screwed in or welded in a pipe line. They protect the measuring part of the sensors against the influence of the liquid being measured. Thermowells enable the replacement of the sensors while the technological equipment is in operation.

All of the thermowell types are made of high-quality stainless steel 1.4301. They are standardly provided with the G 1/2" thread, but it is also possible to deliver them with the G 3/8", M 20 x 1.5, M 27 x 2 threads or even others if necessary.

In addition to the standard lengths listed in the catalogues, thermowells can also be manufactured in non-standard lengths.

Temperature sensors are locked in the thermowell with a M4 x 10 screw.

**Thermowells are manufactured for the nominal pressure PN 63.**

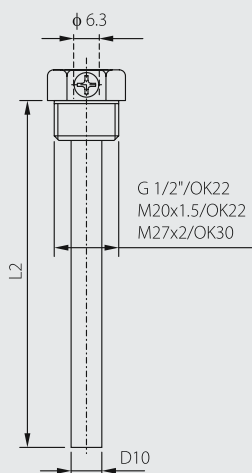


MAXIMUM STREAM VELOCITY OF THE MEASURED MEDIUM - AIR AND WATER VAPOUR / WATER [m.s<sup>-1</sup>]

Thermowell length (mm)	up to 60	> 60 to 100	> 100 to 160	> 160 to 220	> 220 to 400
Thermowell diameter (mm)					
Ø 6 a Ø 8	20 / 2.0	15 / 1.5	8.0 / 1.0	2.5 / 0.6	0.6 / 0.3
Ø 10 a Ø 12	35 / 3.5	30 / 3.0	15 / 2.0	5.0 / 1.2	1.6 / 0.8

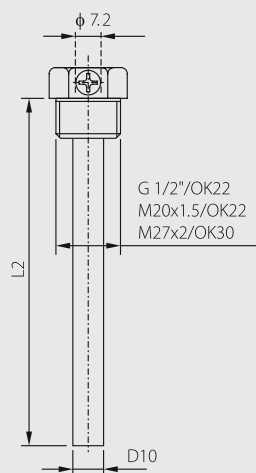
**DIMENSIONAL DRAFTS OF THE THERMOWELLS**

JS 130 thermowell



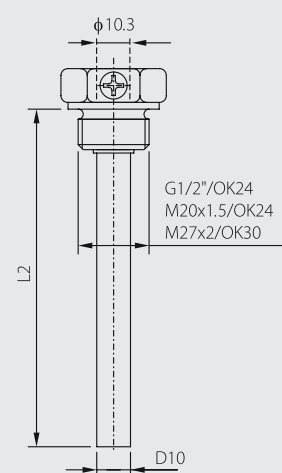
**Application:** Stem temperature sensors, temperature sensors with a metal head, PTS 580P, PTS 580K  
**L2 standard lengths:** 50, 100, 160, 220, 280, 340, 400 mm  
**Maximum diameter of the stem:** 6.2 mm

JS 130B thermowell



**Application:** Stem temperature sensors, temperature sensors with a metal head, PTS 580P, PTS 580K  
**L2 standard lengths:** 50, 100, 160, 220 mm  
**Maximum diameter of the stem:** 7.0 mm

JPTS 41 thermowell



**Application:** Platinum temperature sensors for temperatures up to 400 °C: PTS 41, PTS 43, PTS 45, PTS 51, PTS 81  
**L2 standard lengths:** 50, 100, 160, 220, 280, 400 mm  
**Maximum diameter of the stem:** 7.0 mm

THERMOWELLS, WELDED-ON PIECES, PIPE REDUCERS

**JTP 11 thermowell**

**Application:** TP 11 paired temperature sensors  
**L2 standard lengths:** 36, 86, 136, 176 mm  
**Maximum diameter of the stem:** 5.8 mm

**JTP 16 thermowell**

**Application:** TP 16 paired temperature sensors  
**L2 standard lengths:** 105, 140, 230 mm  
**Maximum diameter of the stem:** 6.0 mm

**JTG 8 thermowell**

**Application:** Temperature sensing elements mounted in case TG 8  
**L2 standard lengths:** 40, 60, 80, 100 mm  
**Maximum diameter of the stem:** 5.8 mm

**JTP 15 thermowell**

**Application:** TP 15 paired temp. sensors  
**L2 standard lengths:** 65, 105, 140, 230 mm  
**Inside diameter:** 6.000–6.048 mm  
 (tolerances according to EN 1434)

**J001 thermowell**

**Application:** 8 mm diameter temperature sensors  
**L2 standard lengths:** 65, 105, 165 mm  
**Maximum diameter of the stem:** 9 mm

**J010 thermowell**

**Application:** for food-industry, for ex. for the sensors PTS 580P, PTS 580K  
**L2 standard lengths:** 110, 170, 250 mm  
**Maximum diameter of the stem:** 6.3 mm

**Thermowell for resistance temperature sensors up to 600 °C from material stainless steel 1.4541**

**JPTS 641 thermowell**

**Application:** Platinum temperature sensors for temperatures up to 600 °C with IP 68: PTS 641, PTS 645, PTS 651  
**Material:** stainless steel 1.4541  
**L2 standard lengths:** 50, 100, 160, 220, 280, 400 mm  
**Maximum diameter of the stem:** 7 mm

**DIMENSIONAL DRAFTS OF THE WELDED-ON PIECES AND PIPE REDUCERS**

direct welded-on piece  
 – stainless steel 1.4301  
 – iron 11353

skew welded-on piece  
 – stainless steel 1.4301  
 – iron 11353

reducer – iron 11120

TEMPERATURE PROBES



**DESCRIPTION AND APPLICATION**

The temperature probes are designed to be used for contact temperature measurements of solid, liquid or gaseous substances in various branches of industry, e. g. in the food-processing industry, chemical industry, cooling technology etc.

By construction and features, these temperature probes can be classified as follows:

1. Contact probes – S x031/150, S x033/250
2. Air temperature probes – 200-80/x, 100-60/x, S x042/150
3. Stick-in probes – S x051/150, S x061/200, Sx061/250, S x301/220, S x091/200, S x091/260
4. Special probes – S x071, S x081



In the standard version these probes are fitted with the sensing elements as specified in the table of the common specifications. The temperature probes use the two-wire connection. All probes using the Ni 1000/6180 resistance-type sensing element (accuracy class A) can be used in combination with the SENSITEST 204C or SENSITEST 2004C digital thermometers.

The probes are meant for operation in a chemically non-aggressive environment. They cannot be used for temperature measurements on equipment under electric voltage (alive).

**DECLARATION, CERTIFICATES, CALIBRATION**

**Declaration of Conformity** – in accordance with EN ISO/IEC 17050-1 standard as amended for sensors with resistance output.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.

**SPECIFICATIONS**

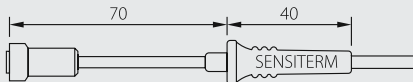
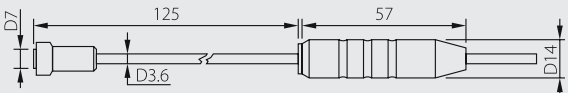
**COMMON SPECIFICATIONS**

Type of sensing element	Ni 1000/5000, Ni 1000/6180, Ni 891, Pt 100, Pt 500, Pt 1000, NTC 20 kΩ (specified for individual probes)
Accuracy class	Ni sensing elements: B class, $\Delta t = \pm (0.4 + 0.007t)$ , for $t \geq 0$ ; $\Delta t = \pm (0.4 + 0.028 t )$ , for $t \leq 0$ in °C; Pt sensing elements: B class according to IEC 751, $\Delta t = \pm (0.3 + 0.005 t )$ in °C; NTC 20 kΩ: $\pm 1$ °C for the range 0 to 70 °C
Maximum measuring DC current	Pt 100 – 3 mA; Pt 500 – 1.5 mA; Pt 1000, Ni 1000, Ni 891 – 1 mA; T1 = Ni 2226 – 0.7 mA; Ni 10000 – 0.3 mA; NTC 20 kΩ – kW - maximum power dissipation 1 mW
Connection of probes	2-wire
Cable lengths	1, 2, 5, 10 m

**Contact probes S x031, S x033**

These temperature probes are intended to measure the contact temperature of solid substances having a plane and smooth surface. The probes consist of a metal case terminated by a special bowl to contact the surface to be measured, further of a grip with the lead-in cable of a standard length of 1 m. The resistance-type sensing element is located in brass bowl, which is firmly inserted in a special rubber case, reducing the influence of the ambient on the measurement results. The design of the individual probes is illustrated in the following drawings.

Type of sensing element	Ni 1000/5000, Ni 1000/6180, Pt 100, Pt 1000
Material of the contact brass	Aluminium alloy
Material of the pipe	S x031, S x033 stainless steel 1.4301
Material of the grip	S x031 polypropylene S x033 teflon
Lead-in cable	S x031 shielded, silicone insulation 2 x 0.07 mm <sup>2</sup> S x033 shielded, silicone insulation 2 x 0.22 mm <sup>2</sup>

Probe	Dimensional draft of contact probes	Temperature range of usage/ Temperature resistance of the grip
S x031/150		-30 to 150 °C / -15 to 120 °C
S x033/250		-30 to 250 °C / -30 to 250 °C



TEMPERATURE PROBES

**Air temperature probes 200-80/x, 100-60/x, S x042/150**

These temperature probes are intended for temperature measurement of air and gaseous media. The S x042 probe is characterised by a metal perforated probe tip (for fast response), a grip and a lead-in cable of a standard length of 1 m. Constructed of stainless steel and high quality components, the S x042 probe is suitable for temperature monitoring purposes in the **food-processing industry** as well.

The resistance-type sensing element is placed in the perforated probe tip, whereby a direct contact to the gaseous substance to be measured, and a fast response to temperature changes are secured. The design of the individual probes is illustrated in the following drawings.

Type of sensing element	Ni 1000/5000, Ni 1000/6180, Pt 100, Pt 1000
Material of the cavity	Nickel plated copper
Material of the metal case	S x042 stainless steel 1.4301
Material of the grip	S x042 teflon
Type of connector	200-80/E ELKA K1321 200-80/C CINCH
Lead-in cable	shielded silicone 2 x 0.22 mm <sup>2</sup>

Probe	Dimensional draft of air temperature probes	Temperature operating range
200-80/x 100-60/x		-30 to 80 °C
S x042/150		-30 to 150 °C

**Stick-in probes for temperature measurement in the food-processing industry**

**S x051, S x061/200, S x061/250, S x091/200, S x091/260 and universal S x301/220**

These temperature probes are intended to measure the contact temperature of solid substances. They can be used also for temperature measurement of liquid and gaseous substances. These probes consist of a metal case terminated by a tip, further of a grip with the lead-in cable of a standard length of 1 m. Constructed of stainless steel and high quality components, the S x051, S x061 and the S x091 probes are suitable for temperature monitoring purposes in the **food-processing industry** as well.

The resistance-type sensing element is placed in the tip of the metal probe. The design of the individual probes is illustrated in the following drawings.

Type of sensing element	All types of resistance sensing elements
Ingress protection	S x061, S x051, S x091 - IP 68 h 1 m, S x301 - IP 65
Material of the metal case	stainless steel 1.4301
Material of the grip	S x051 silicone S x061 teflon S x301 polypropylene S x091/260 PEEK
Lead-in cable	S x061/250, S x091/260 – shielded teflon 2 x 0.14 mm <sup>2</sup> others – shielded silicone 2 x 0.22 mm <sup>2</sup>

Probe	Dimensional draft of stick-in probes	Temperature operating range
S x051/150		-30 to 150 °C
S x061/200		-30 to 200 °C
S x061/250		-30 to 250 °C (for a short period to 300°C)
S x301/220		-30 to 220 °C Temperature resistance of the grip -15 to 120 °C

TEMPERATURE PROBES

Probe	Dimensional draft of stick-in probes	Temperature operating range
S x091/200		-30 to 200 °C
S x091/260		-30 to 260 °C (for a short period to 300°C)

Special temperature probes: S x071, S x081

The temperature probe **S x071** is intended to measure temperature of solids. Constructed with a special probe tip and the use of stainless steel material, make this a perfect sensor for temperature measurements of deep frozen food products, even down to -30 °C.

The temperature probe **S x081** is intended to measure temperature of solids. Thanks to the smart probe design and the stainless steel construction, the probe is suitable for food-processing industrial applications, such as measure temperature in blast chillers or in deep freezing equipment. The operating temperature range is -20 to 80 °C.

Type of sensing element	S x071, S x081 all types S x071A, S x081A all types
Ingress protection	IP 67
Material of the metal case	stainless steel 1.4301
Material of the grip	S x071, S x081 stainless steel 1.4301
Lead-in cable	S x071A, S x081A shielded silicone 2 x 0.22 mm <sup>2</sup>
Type of connection	S x071, S x081 CINCH S x071A, S x081A grommet for cable

Probe	Dimensional draft of room probes	Temperature range of usage
S x071 S x071A		-30 to 50 °C
S x081 S x081A		-20 to 80 °C

DEFINING THE SENSING ELEMENT TYPE IN THE PROBE DESIGNATION

x (in the probe designation)	1	P	2	3	6	7	0	9	TCK
Sensing element type	Pt 100	Pt 500	Pt 1000	2 x Pt 100	NTC 20 kΩ	Ni 1000/5000	Ni 1000/6180	Ni 891	TCK J

**THERMOCOUPLE PROBES**

**FAST WIRE PROBE**

**Use:** measurement of gases, liquids and solid surfaces.  
Lengths of 1 m, 2 m, 3 m, 4 m.

**Type GD 260**

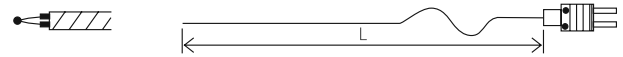
**Operating temperature range:** -65 to 260 °C  
**Full diameter:** approx. 0.8 mm  
**Insulation:** teflon

**Type GD 700**

**Operating temperature range:** -65 to 700 °C  
**Full diameter:** approx. 2 mm  
**Insulation:** duplex, high temperature glass

**Type GD 1250**

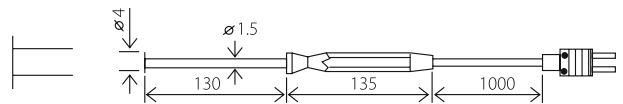
**Operating temperature range:** -65 to 980 °C  
**Full diameter:** approx. 4 mm  
**Insulation:** duplex, Silica (silicon based)



**PROBE SURFACE CP 500**

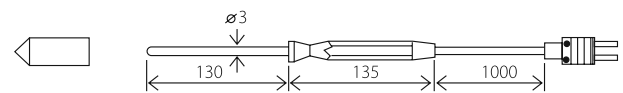
The temperature probes are intended to measure the contact temperature of solid substances having a plane and smooth surface. The contact pad is electrically connected to the thermocouple.

**Operating temperature range:** -65 to 500 °C – only end of the stem!  
**Plastic handle operating temperature range:** -20 to 80 °C  
**Response time:**  $t_{90}$  = approx. 5 s  
**Material of the contact pad:** copper  
**Lead – in cable:** silicone insulation



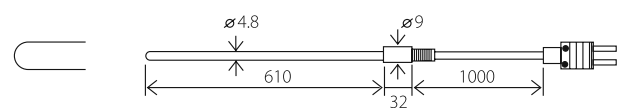
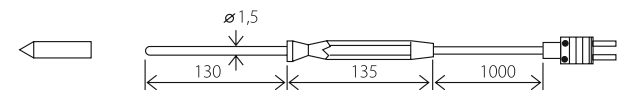
**INSERTION PROBE FOR SOFT MATERIAL CZ 900**

**Operating temperature range:** -65 to 1000 °C – only end of the stem!  
**Plastic handle operating temperature range:** -20 to 80 °C  
**Response time:**  $t_{90}$  = approx. 5 s  
**Material of the needle:** stainless steel V4A  
**Lead – in cable:** silicone insulation  
The needle of the probe is electrically connected to the thermocouple.



**FAST INSERTION PROBE FOR SOFT PLASTIC MATERIAL CZ 550**

**Operating temperature range:** -65 to 550 °C – only end of the stem!  
**Plastic handle operating temperature range:** -20 to 80 °C  
**Response time:**  $t_{90}$  = approx. 3 s  
**Material of the needle:** stainless steel V4A  
**Lead – in cable:** silicone insulation  
The needle of the probe is electrically connected to the thermocouple.



**PROBE GT 1150 – thermocouple probe with handle**

**Operating temperature range:** -65 to 1150 °C – only end of the stem!  
**Handle operating temperature range:** 220 °C max.  
**Material of the metal case:** Inconel

**Extension cable thermocouple K with female connector, 1meter length**

-65 to +200 °C, duplex insulated



## TEMPERATURE TO CURRENT CONVERTERS STI AND STID (4–20 mA)



### DESCRIPTION AND APPLICATION

STI and STID converters are intended for converting the signal of Ni 1000/6180, Pt 100/3850 or Pt 1000/3850 resistance-type temperature sensing elements to the unified current signal 4–20 mA. These converters can be applied in any control system compatible with 4–20 mA current output. Standard measuring ranges of the converter are listed in the specifications table. Operating temperature range is -30 to 80 °C. These limits must not be exceeded even for a short time.

The sensors are designed to be operated in a chemically non-aggressive environment. Two variants exist regarding to the design of the converter case:

- 1. STI Pt and STI Ni converters:** the plastic enclosure is made of POLYAMID material, and is identical to, for example, the enclosure of S 120 sensors. It is provided with a wall bracket or with a clip for attaching to a DIN console. The terminal board casing meets the IP 65 ingress protection requirements according to the EN 60 529 standard.
- 2. STID Pt and STID Ni converters:** the plastic enclosure is made of NORYL SE1 material and is provided by a self-extinguishing retarder. It is intended for installation directly to a switchboard on a DIN console. The terminal board casing meets the IP 20 ingress protection requirements according to the EN 60 529 standard.



### DECLARATION, CERTIFICATES, CALIBRATION

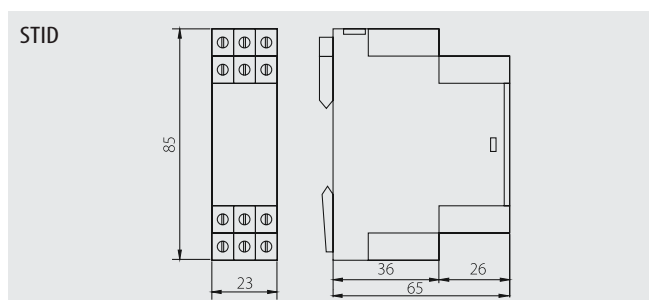
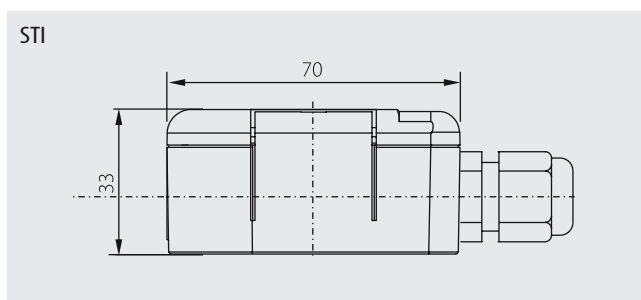
**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for converters with an output of 4 to 20 mA.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.

### SPECIFICATIONS

Converter type	STI Ni STID Ni	STI Pt 100 STID Pt 100	STI Pt 1000 STID Pt 1000
Input signal	Ni 1000/6180	Pt 100/3850	Pt 1000/3850
Output signal	4 to 20 mA		
Power supply (Vcc)	11 to 30 V DC for STI; 10 to 30 V DC for STID (Recommended value 24 V DC)		
Maximum voltage ripple Vcc	0.5 %		
Standard measuring ranges	-30 to 60 °C	-30 to 60 °C	-30 to 60 °C
	0 to 35 °C	0 to 35 °C	0 to 35 °C
	0 to 100 °C	0 to 100 °C	0 to 100 °C
	0 to 150 °C	0 to 150 °C	0 to 150 °C
	0 to 250 °C	0 to 200 °C	0 to 200 °C
		0 to 400 °C	0 to 400 °C
Terminal board ingress protection	IP 65 (for STI), IP 20 (for STID) according to EN 60 529		
Ambient temperature	-30 to 80 °C		
Measurement error	< 0.6 % of the measuring range, minimum 0.5 °C		
Load resistance	50(Vcc - 10) Ω for STI; 50(Vcc - 9) Ω for STID		
Output current for sensing element break	> 24 mA		
Output current for sensing element short	< 3.5 mA		
Sensor connection	according to the wiring diagram		
Recommended wire cross section	STI: 0.35 to 1.5 mm <sup>2</sup> STID: 0.35 to 4 mm <sup>2</sup>		
Material of the case	STI: POLYAMID STID: NORYL SE1		
Working conditions	ambient temperature: -30 to 80 °C		
	relative humidity: max. 85 % (at the ambient temperature 25 °C)		
	atmospheric pressure: 87 to 107 kPa		
Weight	0.15 kg		

### DIMENSIONAL DRAFT



TEMPERATURE TO CURRENT CONVERTERS STI AND STID (4–20 mA)

**WIRING DIAGRAM**

**STI Ni**

Vcc – supply voltage, any polarity  
1 sensing element terminal no. 1  
2 sensing element terminal no. 2 + shielding

**STI Pt 100, STI Pt 1000**

Vcc – supply voltage, any polarity  
1, 2 terminals for Pt 100, Pt 1000 sensing element conn.  
3, 4 terminals for conn. of compensation wiring

**STID Pt 100, STID Pt 1000, STID Ni**

**2-wire connection**

Ni 1000

**2-wire connection**

Pt 100, Pt 1000

**3-wire connection**

Pt 100, Pt 1000

**expansion loop connection**

Pt 100, Pt 1000

**SENSOR INSTALLATION AND SERVICING**

Prior to connecting the lead-in cables of the resistance-type sensing element and supply voltage it is necessary to attach the converter to a wall or a DIN console and, if dealing with the STI Pt or STI Ni variant, to unscrew the enclosure lid. The lead-in cables of a resistance-type sensing element are then connected to the corresponding terminals according to the wiring diagram. Recommended wire cross-section is determined by terminal board type and can be found in the specifications table. In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. To ensure the ingress protection value of IP 65 of STI Pt or STI Ni variants the grommet has to be tightened and the lid has to be screwed on after connecting the lead-in cable. After installing and connecting the sensor to the appropriate evaluating electrical equipment, it is ready to use. The sensor does not require any special servicing or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.

TEMPERATURE TO VOLTAGE CONVERTERS STU (0–10 V)



**DESCRIPTION AND APPLICATION**

The converters of the type STU are intended for converting the signal of the Ni 1000/6180, Pt 100/3850 or Pt 1000/3850 resistance-type temperature sensing elements to a unified signal 0 to 10 V. These converters can be applied in any control system compatible with 0–10 V voltage output. The case is provided by the console for wall-mounting or a bracket for DIN rail mounting. The standard measuring ranges are listed in the specifications table. The operating temperature range is -30 to 80 °C. These limits must not be exceeded even for a short time.

The sensors are designed to be operated in a chemically non-aggressive environment.



**DECLARATION, CERTIFICATES, CALIBRATION**

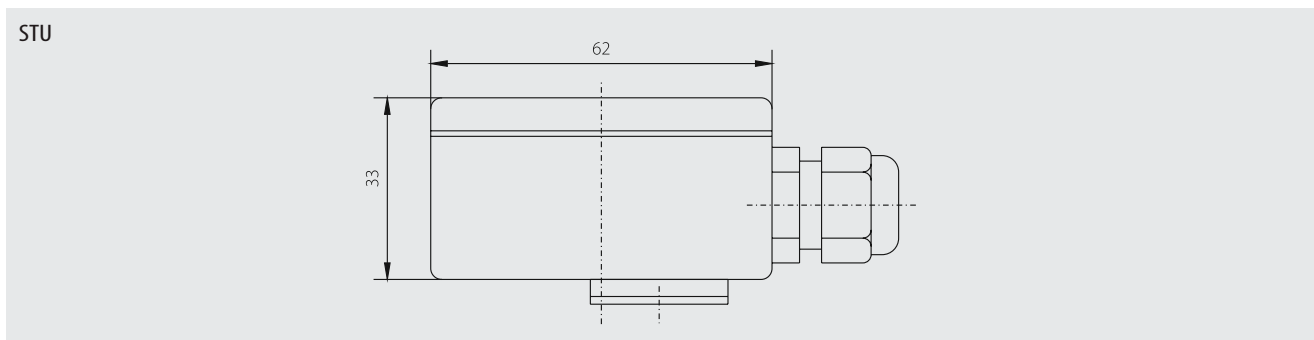
**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for converters with an output of 0 to 10 V.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.

**SPECIFICATIONS**

Converter type	STU Ni	STU Pt 100	STU Pt 1000
Input signal	Ni 1000/6180	Pt 100/3850	Pt 1000/3850
Output signal	0 to 10 V		
Power supply (Vcc)	15 to 30 V DC (Recommended value 24 V DC)		
Measuring ranges	-30 to 60 °C	-30 to 60 °C	-30 to 60 °C
	0 to 35 °C	0 to 35 °C	0 to 35 °C
	0 to 100 °C	0 to 100 °C	0 to 100 °C
	0 to 150 °C	0 to 150 °C	0 to 150 °C
	0 to 200 °C	0 to 200 °C	0 to 200 °C
	0 to 250 °C	0 to 250 °C	0 to 250 °C
Terminal board ingress protection	IP 65 according to EN 60 529		
Ambient temperature	-30 to 80 °C		
Measurement error	< 0.6 % of the measuring range, minimum 0.5 °C		
Load resistance	50 kΩ		
Current consumption	< 8 mA		
Sensing element break	> 14 V		
Sensing element short	~ 0 V		
Sensor connection	according to the wiring diagram		
Recommended wire cross section	0.35 to 1.5 mm <sup>2</sup>		
Material of the case	LEXAN 503RS		
Weight	0.15 kg		

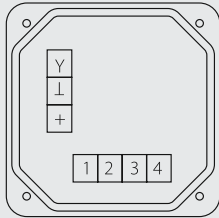
**DIMENSIONAL DRAFT**



TEMPERATURE TO VOLTAGE CONVERTERS STU (0–10 V)

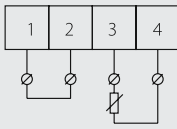
**WIRING DIAGRAM**

STU Ni, STU Pt



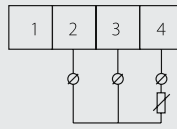
- Y output
- ⊥ minus pole of power supply
- + plus pole of power supply
- 1, 2 terminals for compensation wiring connection (only for Pt 100)
- 3, 4 terminals for sensor connection

2-wire connection



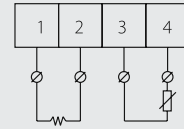
Ni 1000, Pt 100, Pt 1000

3-wire connection



Pt 100, Pt 1000

Wiring with compensation loop



Pt 100, Pt 1000

**SENSOR INSTALLATION AND SERVICING**

Prior to connecting the lead-in cables of the resistance-type sensing element it is necessary to attach the converter to a wall or a DIN bar and to unscrew the enclosure lid. The lead-in cables of a resistance-type sensing element are then connected to the corresponding terminals according to the wiring diagram. Recommended wire cross-section is determined by terminal board type and can be found in the specifications table. In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. To ensure the ingress protection value of IP 65 the grommet has to be tightened and the lid has to be screwed on. After installing and connecting the sensor to the appropriate evaluating electrical equipment the converter is ready to use. The sensor does not require any special servicing or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.



## TEMPERATURE CONVERTERS – RS 485


**DESCRIPTION AND APPLICATION**

ST 485x and STD 485x converters are intended for converting the signal of Pt 1000/3850 resistance-type temperature sensing elements to the digital signal of RS485 serial bus. The standard temperature range is -50 to 150°C. Communication inputs are protected to overvoltage. In case the module is placed as terminal on the line, a terminating resistor can be attached to the wiring by shorting the contacts (the switch SW placed next to terminals for communication lines connection). All settings are stored in EEPROM memory. The electronic module is equipped with the WATCHDOG circuit, which safeguards proper program functioning in the microprocessor. These converters can be utilised in any control system compatible with communication protocol ADAM 4000, ADVANTECH and MODBUS RTU. Easy mounting of the converters is ensured by the unique “S head” design. The converters are designed to operate in a chemically non-aggressive environment. The converters are made in three basic versions:

1. **ST 485A** – with a simple ASCII communication protocol corresponds with ADAM 4000 modules by ADVANTECH company. Thus, standard drivers for ADAM modules can be used in various control programmes. For easier operation, the green LED indicates if power supply is on and the red LED indicates that the module is communicating. the SD 1x0 module is provided by the INIT shorting jumper on its printed circuit board. If it is shorted when power is switched on, the module communicates on 00 address with 9600 Bd transfer speed without checksum.
2. **ST 485B** – the command structure corresponds with the ARION communication protocol, which is used among control systems by Amit company.
3. **ST 485C** – the command structure corresponds with the ModBus communication protocol.


**DECLARATION, CERTIFICATES, CALIBRATION**

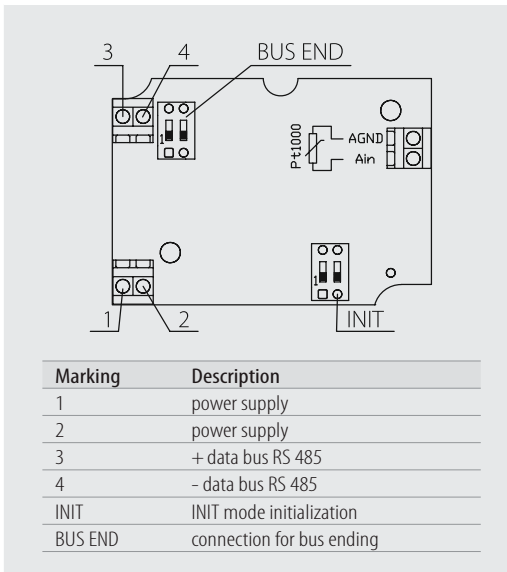
**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an RS 485 output.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.

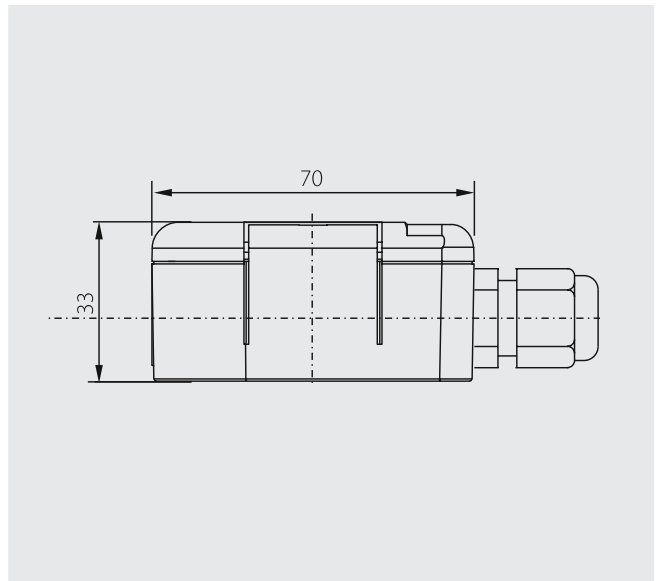
**SPECIFICATIONS**

Converter type	ST 485A STD 485A	ST 485B STD 485B	ST 485C STD 485C
Input signal	Pt 1000/3850		
Power supply	10 to 35 V DC (unstabilized) 14 to 24 V AC		
Power consumption	max. 1000 mW		
Measuring range	-50 až 150 °C		
Communication properties	communication via RS 485, maximum segment length is 1200 m, asynchronous transfer		
	transfer speeds 1200, 2400, 4800, 9600, 19200 Bd	transfer speeds 9600, 19200, 38400, 57600 Bd – DIP switch	preset transfer speed 9600 Bd optional transfer speeds 1200, 2400, 4800, 19200, 57600, 115200 Bd – DIP switch
	256 modules / 1 serial port	63 modules / 1 serial port	247 modules / 1 serial port
	protocol consistent with ADAM modules	protocol ARION	protocol ModBus 1 stop bit, without parity
Accuracy of electronics	0.05 %		
Accuracy of sensing element	± 0.5 °C		
Resolution	0.01 °C		
Ingress protection	IP 65 according to EN 60 529		
Recommended wire cross section	0.14 to 1.5 mm <sup>2</sup>		
Material of the sensor stem	stainless steel 1.4301		
Material of the enclosure	POLYAMID		
Working conditions	ambient temperature: -10 až 70 °C		
	relative humidity: max. 85 % (at the ambient temperature 25 °C)		
	atmospheric pressure: 87 to 107 kPa		
Weight	0.2 kg		

**WIRING DIAGRAM**



**DIMENSIONAL DRAFT**



**CONVERTER INSTALLATION AND SERVICING**

Before connecting the supply lead-in cable, lift off the lid of the plastic enclosure by means of a flat screwdriver. The lead-in cable is connected to the terminals according to the wiring diagram through the loosened grommet. The recommended wire cross section is determined by the type of terminals and is quoted in the table. To ensure the ingress protection value of IP 65, the grommet has to be tightened and the lid has to be put on after connecting the lead-in cable.

In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. After installing and connecting the converter to the sequential evaluating electrical equipment the sensor is ready to use. The converter does not require any special servicing or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.

PROGRAMMABLE CONVERTERS

**INOR CONVERTERS**

**APAQ-H ANALOGUE PROGRAMMABLE CONVERTER**

Use	APAQ-H is a series of multi-range two-wire temperature converters for thermometer heads
Input	Pt100 (-HRF, -HRFX), thermocouple J, L, T, K, N (-HCF, -HCFX)
Output	4 to 20 mA
Measuring range	Adjustable; -HRF, -HRFX: 50/100/150/200/300/400/500 °C -HCF, -HCFX: 10 to 50 mV continuously
Accuracy	-HRF, -HRFX: ±0.15 % of the temperature range -HCF, -HCFX: ±0.5 % to ±1.0 % of the temperature range
Maximum operating temperature range	-40 to 85 °C
Power supply	6.5 to 32 VDC (-HRF, -HCF), 8.5 to 30 VDC (-HRFX, -HCFX)

-HRFX, -HCFX: designed for explosive environments



**MINIPAQ-H BASIC PROGRAMMABLE CONVERTER**

Use	Basic, programmable, uninsulated, two-wire converter for thermometer heads
Input	Pt100, Pt1000, thermocouple B, E, J, L, T, K, N, R, S, U
Output	4 to 20 mA
Measuring range	Programmable
Accuracy	±0.15 %
Maximum operating temperature range	-40 to 85 °C
Power supply	8 to 36 VDC

-HX: designed for explosive environments



**IPAQ-H UNIVERSAL PROGRAMMABLE CONVERTER**

Use	IPAQ-H/-HX are universal insulated, two-wire, programmable converters for thermometer heads
Input	Pt100, Pt1000, potentiometer, thermocouple B, E, J, L, T, K, N, R, S, U
Output	4 to 20 mA
Measuring range	Programmable
Accuracy	±0.1 % of the temperature range
Maximum operating temperature range	-40 to 85 °C
Power supply	6.5 to 36 VDC (-H), 8.0 to 30 VDC (-HX)

-HX: designed for explosive environments



**UNIVERSAL**

**MESO-H UNIVERSAL HART COMPATIBLE PROGRAMMABLE CONVERTER**

Use	MESO-H/-HX are intelligent, universal, fully linearized and insulated two-wire converters for thermometer heads
Input	Pt100, Pt1000, thermocouple B, E, J, L, T, K, N, R, S, U
Output	4 to 20 mA
Measuring range	Programmable
Accuracy	±0.1 % of the temperature range
Maximum operating temperature range	-40 to 85 °C
Power supply	MESO-H: 10 to 42 VDC, MESO-HX: 12 to 30 VDC

MESO-HX: designed for explosive environments



**HART**

PROGRAMMABLE CONVERTERS

**IPAQ-C520 UNIVERSAL PROGRAMMABLE CONVERTER**

Use	IPAQ-C520/-C520X are insulated programmable converters for heads with HART 6 protocol and double input
Input	Pt100, Pt1000, potentiometer, thermocouple B, C, D, J, K, L, N, R, S, T, U
Output	HART
Measuring range	Programmable
Accuracy	±0.05 % of the temperature range, max. ±0.1 °C
Maximum operating temperature range	-40 to 85 °C
Power supply	10 to 36 V

-C520X: designed for explosive environments



**HART**

**IPAQ-H<sup>PLUS</sup> UNIVERSAL PROGRAMMABLE CONVERTER**

Use	IPAQ-HPLUS/HXPLUS are efficient insulated, two-wire programmable converters for thermometer heads
Input	Pt100, potentiometer, thermocouple B, E, J, L, T, K, N, R, S, U
Output	4 to 20 mA
Measuring range	Programmable
Accuracy	±0.05 % of the temperature range
Maximum operating temperature range	-40 to 85 °C
Power supply	-HPLUS: 6.5 to 36 VDC, -HXPLUS: 8.0 to 30 VDC

-HXPLUS: designed for explosive environments



**EXTREMELY FAST AND ACCURATE**

**PROFIPAQ-H UNIVERSAL PROFIBUS-PA CONVERTER**

Use	PROFIPAQ-H/-HX are highly efficient and very resistant converters for thermometer heads
Input	Pt100, Pt1000, Ni100, Ni1000, potentiometer, thermocouple B, E, J, L, T, K, N, R, S, U
Output	Digital Profibus – up to 125 converters in one network
Measuring range	Programmable
Accuracy	Pt100: ±0.1 °C
Maximum operating temperature range	-40 to 85 °C
Power supply	PROFIPAQ-H: 9 to 32 VDC, PROFIPAQ-HX: 9 to 17.5 VDC

PROFIPAQ-HX: designed for explosive environments



**PROFIBUS**

**PROGRAMMABLE CONVERTERS FOR LINES RS485**

**DESCRIPTION**

The PPL100 converter is designed for converting signals from a resistant temperature sensor within the range from -55 °C to 640 °C to a figure in ASCII format.

Converter type	PPL100
Input	PT 100/3850, PT 1000/3850, Ni 100/5000 and 6180, Ni 1000/5000 and 6180 (others as well upon agreement, e.g. NTC 20K)
Output	RS485 (-55...+640 °C)
Linearization	Yes
Power supply	8 to 20 V
Accuracy	0.2 °C
Maximum operating temperature range	-25 to 85 °C



PROGRAMMABLE CONVERTERS

**INTELLIGENT PROGRAMMABLE CONVERTERS FOR HEADS**

**DESCRIPTION**

PP and SH1 heads are programmable converters for heads and they are designed for converting industrial signals from resistant temperature sensors (SH1, SLM) or thermocouples into a unified industrial signal of 4 to 20 mA.



Converter type	SH1	PP200	PMA300	PP300
Input	Pt 100/3850 Pt 1000/3850 Ni 100/6180 Ni 1000/6180	PT 100/3850 PT 1000/3850 Ni 100/5000 and 6180, Ni 1000/5000 and 6180	PT 100/3850 PT 1000/3850 Ni 100/5000 and 6180 Ni 1000/5000 and 6180	PT 100/3850 PT 1000/3850 Ni 100/5000 and 6180 Ni 1000/5000 and 6180 Thermocouple J, L, K, T, S, B, E...
Input connection	2 or 3-wire	2 or 3-wire	2-wire	
Output	4 to 20 mA, programmable range			
Measuring range	Random, min. 25 °C margin	Random, min. 10 °C margin	Random, min. 10 °C margin	According to the thermocouple type
Linearization	Program-controlled	Yes	Yes	Yes
Power supply	9 to 30 V	8 to 28 V on output loop	8 to 28 V on output loop	8 to 30 V on output loop
Accuracy	Max. $\pm(0.1\% + 0.1\text{ }^\circ\text{C})$ – four-wire sensor connection *)	0.15 %	0.15 %	0.15 %
Maximum operating temperature range	-20 to 80 °C	-25 to 80 °C	-25 to 80 °C	-25 to 80 °C

\*) Errors in percentage are related to the range.

**UNIVERSAL PROGRAMMABLE CONVERTERS FOR DIN RAIL MOUNTING**

**DESCRIPTION**

Programmable measuring converters are designed for converting industrial signals from resistant temperature sensors (PP210, PSTID, SUG2) or thermocouples (PSTID, SUG2) into a unified industrial signal of 4 to 20 mA.



Converter type	PP210	PSTID	SUG <sub>2</sub>
Input	PT 100/3850 PT 1000/3850 Ni 100/5000 and 6180 Ni 1000/5000 and 6180	PT 100/3850 PT 1000/3850 Ni 100/5000 and 6180 Ni 1000/5000 and 6180 Thermocouple J, L, K, T, S, B, E...	PT 100/3850 PT 1000/3850 Ni 100/ 6180 Ni 1000/ 6180 Thermocouple J, L, K, T, S, B, E...
Input connection	2 or 3-wire	2 or 3-wire	2 or 3-wire
Output	4 to 20 mA	4 to 20 mA	4 to 20 mA
Galvanically isolated output	No	No	Yes
Measuring range	Random, min. 10 °C margin	Random, min. range in °C according to the sensor type	Random, min. range in °C according to the sensor type
Linearization	Yes	Program-controlled	Program-controlled
Power supply	8 to 28 V	9 to 30 V	9 to 30 V
Maximum operating temperature range	-20 to 80 °C	-30 to 80 °C	-20 to 80 °C

## PROGRAMMABLE CONVERTERS

**UNIVERSAL MULTI-INPUT PROGRAMMABLE CONVERTERS WITH ETHERNET OUTPUT**
**DESCRIPTION**

The converter is designed for converting six analogue signals into data signals, Modbus TCP protocol, a physical layer of the Ethernet.

Converter type	6xS PoETH
Input	6 inputs: SS voltage, SS power, Pt 100/3850, Pt 1000/3850, Ni 100/6180, Ni 1000/6180, thermocouple J, K, T, L, E, S... (others are possible upon agreement)
Design with display	Various display regimes for measured data on the display
Output	Ethernet
Linearization	Program-controlled
Power supply	24 V or via PoE
Accuracy	According to the output signal type
Maximum operating temperature range	-20 to 60 °C


**AC2Ni/Sxx DOUBLE TEMPERATURE TO POWER CONVERTER**
**DESCRIPTION**

The two-channel converter is designed for converting signals of resistance temperature sensors with Ni 1000/6180 ppm elements into the unified signal of 4–20 mA.

Converter type	AC2Ni/Sxx
Input	Up to 2 x Ni 1000/6180
Number of channels	2
Output	4 to 20 mA
	S1 -30 to +60 °C
	SE* 0 to +35 °C
	S2 0 to +100 °C
	S3 0 to +150 °C
	SZ* 0 to +xxx °C
Power supply	12 to 35 VDC
Accuracy	0.5 %
Size h x w x d	100 x 23 x 75 mm


**PROGRAMMABLE CONVERTERS FOR CABLES**
**DESCRIPTION**

The programmable converter is designed for converting industrial signals from resistance temperature sensors Pt 100/3850 into the unified signal of 4–20 mA. Its structure makes it suitable for connecting to cable sensors.

Input	Pt 100/3850
Input connection	3-wire
Connector	M12 4-pin
Output	4 to 20 mA
Measuring range	Programmable, max. -50 to 800 °C, min. 50 °C margin
Power supply	8.5 to 32 V
Accuracy	0.2 %
Size	Diameter 14 mm, length 55 mm
Maximum operating temperature range	-40 to 80 °C (for plastic body)





## TEMPERATURE SWITCHES TSDD



### DESCRIPTION AND APPLICATION

TSDD switches are built as two-state regulators (ON/OFF regulation), which compare the pre-set and actual temperature reading. The TSDD-unit enables switching galvanically isolated relay contacts when the pre-set temperature value is reached. The sensors consists of a plastic enclosure with the transparent lid. In the enclosure electronic equipment is located with LED display. The switches meet the IP 65 ingress protection requirements according to the EN 60 529 standard. Easy mounting of the switches is ensured by the unique „S head“ design.

With a choice of locations of the sensing element and typical switch applications the following TSDD-versions are available:

- TSDD A** – Temperature switch for sensing temperature in the switch ambient. The sensing element is placed in the metal stem.
- TSDD P** – Contact version switch (for pipe mounting) for surface temperature measurements. The sensing element is fitted in a metal measuring case. It is delivered with fastening strap of the length 40 cm and with clamp.
- TSDD K** – The sensing element is placed in the metal stem for use in air condition equipment or in ducts. This temperature switch version is available with a plastic mounting clip. Stainless steel thermowell or metal holder can be delivered as an accessory.
- TSDD C** – The sensing element is protected by the TG 8 case length 40 mm and provided with a cable 1 m length. Another type of enclosure or another cable length should be specified in the order.



Standard temperature ranges, in which the temperature set point can be adjusted, are given in the specifications table. For the TSDD A the maximum operating temperature is 70 °C, for the TSDD P this maximum temperature is 110 °C. For applications above 140 °C the TSDD K switch can be applied. However, in this case the switch version with the stem elongated by 60 mm and the metal centric fixing clip shall be applied. These switches are designed to be applied in a chemically non-aggressive environment.

### ACCESSORIES

- The thermowell JS 130
- The metal central holder K 120
- The thermal conductive paste up to 200 °C, 5 g for TSDD P type

### DECLARATION, CERTIFICATES, CALIBRATION

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for temperature switches.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.

### SPECIFICATIONS

#### BASIC DATA

Power supply	12 or 24 V DC
Maximum switched voltage / current	30 V DC / 5 A
Maximum temperature range	-50 to 300 °C
Hysteresis	1 to 15 °C
Electronics equipment error	± (0.2 % of values + 1 dig.)
Accuracy class of Pt sensor	class B according to IEC 751, $\Delta t = \pm (0,3 + 0,005 t )$ in °C
Enclosure dimension	70 x 63 x 34 mm
Material of the enclosure	POLYAMID
Ingress protection	IP 65 according to EN 60 529
Enclosure ambient temperature	-30 to 70 °C
Recommended wire cross section	0.2 to 1 mm <sup>2</sup>
Insulation resistance	> 200 MΩ at 500 V DC, 25°C ± 3 °C

#### ADDITIONAL DATA FOR INDIVIDUAL SENSOR TYPES

##### TSDD A

Standard length of the stem L1	50 mm
Diameter of the stem	6 + 0.2 mm
Material of the stem	stainless steel 1.4301
Maximum range of measured temperature	-25 to 70 °C

##### TSDD K

Standard length of the stem L1	70, 120, 180, 240 mm
Diameter of the stem	6 + 0.2 mm
Material of the stem	stainless steel 1.4301
Switch installation	by means of a plastic or stainless steel holder or a stainless steel thermowell
Maximum range of measured temperature	-25 to 200 °C (using an elongated stem above 140 °C)



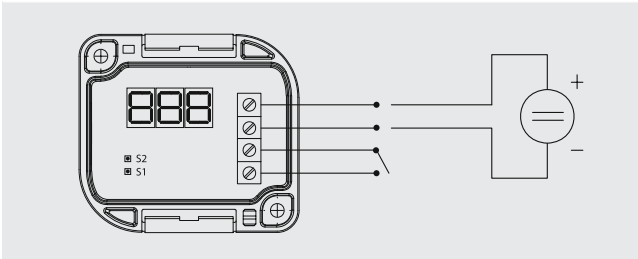
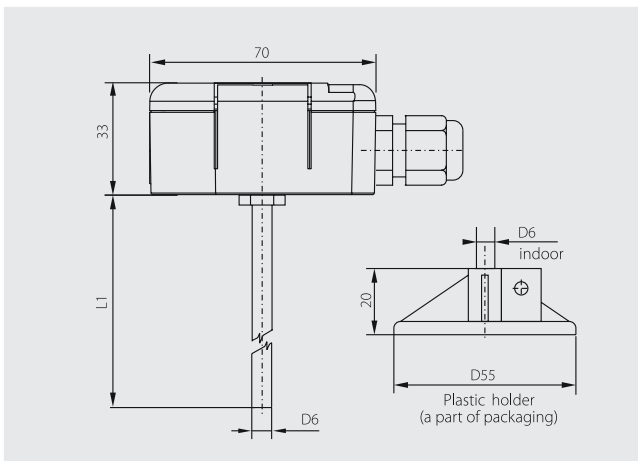
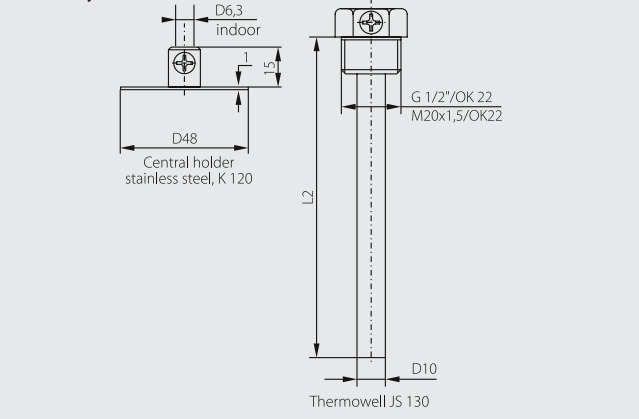
## TEMPERATURE SWITCHES TSDD

**TSDD P**

Material of the measuring case	brass
Switch installation	by means of fastening band with closure
Standard length of the band	40 cm
Minimum diameter of tubing	-20 mm

**TSDD C**

Standard type of sensor	TG 8 – 40, cable 1 m
Diameter of the case	$5,7 \pm 0,1$ mm
Material of the case	stainless steel 1.4301
Lead-in cable	shielded silicone $2 \times 0,34$ mm <sup>2</sup>
Sensor ingress protection	IP 67 according to EN 60 529
Maximum range of measured temperature	-30 to 200 °C

**WIRING DIAGRAM**

**DIMENSIONAL DRAFT**

**Accessory**

**SWITCHES INSTALLATION AND SERVICING**

Before connecting the supply lead-in cable, lift off the lid of the plastic enclosure by means of a flat screwdriver. The lead-in cable is connected to the terminals according to the wiring diagram through the loosened grommet. The recommended wire cross section is 0.2 to 1 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can vary between 4 and 6 mm. In case the lead-in cable is situated near the vicinity of high voltage conductors or equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. To ensure the ingress protection value of IP 65, the grommet has to be tightened and the lid has to be securely closed after connecting the lead-in cable. In case of using a stainless steel thermowell or a stainless steel holder these accessories should be placed first in the location where the temperature switch. Then the temperature switch is inserted into the holder, or pushed as far as the thermowell bottom, and tightened with a screw. The openings for the plastic clip installation have to be drilled according to the dimensioned sketch on which the opening diameters and the distances of their centres are illustrated.

After installing and connecting the sensor to the sequential evaluating electrical equipment the sensor is ready to use. The temperature switch type TSDD P is mounted by means of fastening band and a clamp. The temperature switch does not require any special servicing or maintenance. The device can be operated in any working position, but the grommet must not be directed upwards.

**CUSTOMER SPECIFIC MODIFICATIONS**

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- adding a clip for fixing the device on the DIN bar instead of the metal holder for fixing the device on the wall
- variable stem design of TSDD K type of temperature switch – L1 length, materials, diameters, option of thread design
- type and length of the case by TSDD C type of temperature switches

## TEMPERATURE SWITCHES TSZ2H



### DESCRIPTION AND APPLICATION

These temperature switches with display are designed to be used as two-state controllers (ON/OFF type control). They compare the temperature set-point with the actual temperature value and enable switching the galvanically separated (electrically insulated) contacts of a connected relay when the pre-set temperature limit is reached. Supply voltage of the switches is 7 to 36 V DC or 230 V AC (by the type). Two temperature sensing elements on the base of Pt (Pt 1000/3850) or on the base of Ni (Ni 1000/6180) can be connected to the switches. The display indicates the present value of the measuring temperature during measure process. Setting of individual parameters is executed by two control buttons.

The switch can be used in 5 different modes:

- Mode no. 1: The switch operates as a single controller which switches the first relay by the pre-set temperature interval and the second relay is activated when exceeding the pre-set critical temperature (only one sensing element is used).
- Mode no. 2: The switch operates as a single controller which switches each relay by the pre-set temperature interval (only one sensing element is used).
- Mode no. 3: The switch operates as a double controller, it means that each relay is controlled by the temperature of one sensing element.
- Mode no. 4: The switch operates as a differential controller which switches on the base of temperature difference of two sensing elements (similar to mode no. 1).
- Mode no. 5: The switch operates as a differential controller which switches on the base of temperature difference of two sensing elements (similar to mode no. 2).

The time delay of switching-off for the relay 1 within the limits 0–300 s can be set in each mode.

The switches are developed for DIN-rail mounting. The temperature range of the switch applications depends on the applied type of temperature sensing element (for example for the sensor in the TG8 case the range is -50 to 200 °C). Maximum operating temperature range of the switch is -50 to 250 °C.

The switches are intended to operate in a chemically non-aggressive environment.



### DECLARATION, CERTIFICATES, CALIBRATION

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for temperature switches.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 in the temperature range -70 to 600 °C.

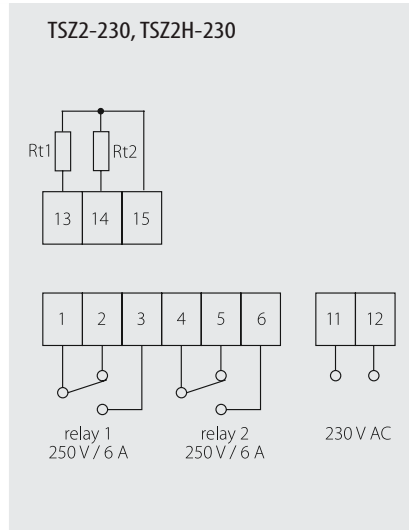
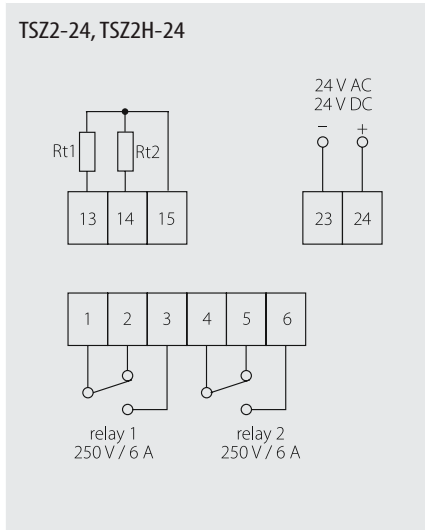
### SPECIFICATIONS

Switch type	TSZ2H-24	TSZ2H-230
Output	2 relays	
Type of sensing element	Pt 1000/3850 or Ni 1000/6180	
Maximum temperature operating range	-50 to 250 °C	
Power supply	7 – 36 V DC, V AC	230 V AC
Maximum switched voltage	250 V AC / 6 A	
Maximum error of the switch*	± (0.2 % from the value + 2 dig)	
Resolution	0.1 °C	
Setting range	-50 to 250 °C, step 0.1 °C	
Display	4 digits – red LED, high of the digits 10 mm	
Brightness of the display setting	4 levels	
Updating of the display	< 0.2 s	
Type of terminal board	terminal board ARK 210, wire cross section 0.35 to 1.5 mm <sup>2</sup>	
Material of the case	ABS, self-extinguishing, meeting the UL94-V0 standard	
Case dimensions	86 x 67 x 65 mm	
Ingress protection	IP 20 according to EN 60 529	
Working conditions	ambient temperature: -5 to 60 °C	
	relative humidity: max 85 % (at the ambient temperature 25 °C)	
	atmospheric pressure: 87 to 107 kPa	
Weight	0.15 kg (without sens. el.)	0.25 kg (without sens. el.)

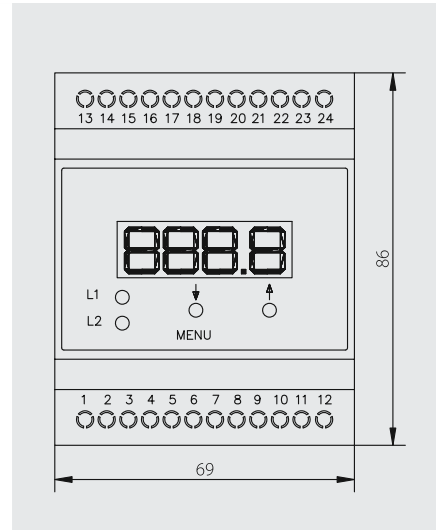
\*error of the sensing element is not incorporated

TEMPERATURE SWITCHES TSZ2H

**WIRING DIAGRAM**



**DIMENSIONAL DRAFT**



**SWITCH INSTALLATION AND SERVICING**

An integral part of the switch is a clamp enabling to mount the switch on a DIN-RAIL. After mounting the unit the relevant supply lead-in cables (terminals 23, 24 – 24 V AC/DC, terminals 11, 12 – 230 V AC), the temperature sensors (terminals 13, 15 – sensing element 1; terminals 14, 15 – sensing element 2) and the cable for the relay output signal (1, 2, 3 – relay 1; 4, 5, 6 – relay 2) are connected to the terminals according to the wiring diagram. The recommended wire cross-section is 0.35 to 1.5 mm<sup>2</sup>.

In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. The shielding of the lead-in cable of the temperature sensor is connected to the terminal no. 3.

## TEMPERATURE SWITCHES TSZ2H – RS485



### DESCRIPTION AND APPLICATION

These temperature switches with display are designed to be used as two-state controllers (ON/OFF type control). They compare the temperature set-point with the actual temperature value and enable switching the galvanically separated (electrically insulated) contacts of a connected relay when the pre-set temperature limit is reached. Supply voltage of the switches is 7 to 36 V DC or 230 V AC (by the type). Two temperature sensing elements on the base of Pt (Pt 1000/3850) or on the base of Ni (Ni 1000/6180) can be connected to the switches. The display indicates the present value of the measuring temperature during measure process. Setting of individual parameters is executed by two control buttons.

The switch can be used in 5 different modes:

- Mode no. 1: The switch operates as a single controller which switches the first relay by the pre-set temperature interval and the second relay is activated when exceeding the pre-set critical temperature (only one sensing element is used).
- Mode no. 2: The switch operates as a single controller which switches each relay by the pre-set temperature interval (only one sensing element is used).
- Mode no. 3: The switch operates as a double controller, it means that each relay is controlled by the temperature of one sensing element.
- Mode no. 4: The switch operates as a differential controller which switches on the base of temperature difference of two sensing elements (similar to mode no. 1).
- Mode no. 5: The switch operates as a differential controller which switches on the base of temperature difference of two sensing elements (similar to mode no. 2).

The time delay of switching-off for the relay 1 within the limits 0–300 s can be set in each mode.

Measurements and setting all parameters can be done by means of the industrial bus RS485 with the protocols Modbus RTU (standardly), Adam and Arion that must be specified in an order. With a simple converter RS485/RS232 the switch can be connected to the PC-serial port to make various settings. Please contact ATAL for further details on this software. The switches are developed for DIN-rail mounting. The temperature range of the switch applications depends on the type of temperature sensing element applied (for example for the sensor in the TG8 case the range is -50 to 200 °C). Maximum operating temperature range of the switch is -50 to 250 °C.

The switches are intended to operate in a chemically non-aggressive environment.



### DECLARATION, CERTIFICATES, CALIBRATION

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for temperature switches.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 in the temperature range -70 to 600 °C.

### SPECIFICATIONS

Switch type	TSZ2H-24 – RS485	TSZ2H-230 – RS485
Output	2 relays	
Type of sensing element	Pt 1000/3850 or Ni 1000/6180	
Maximum temperature operating range	-50 to 250 °C	
Power supply	7–36 V DC, V AC	230 V AC
Maximum switched voltage	250 V AC / 6 A	
Maximum error of the switch*	± (0.2 % from the value + 2 dig)	
Resolution	0.1 °C	
Setting range	-50 to 250 °C, step 0.1 °C	
Display	4 digits – red LED, high of the digits 10 mm	
Brightness of the display setting	4 levels	
Updating of the display	< 0.2 s	
Type of terminal board	terminal board ARK210, wire cross section 0.35 to 1.5 mm <sup>2</sup>	
Material of the case	ABS, self-extinguishing, meeting the UL94-V0 standard	
Dimensions of the case	86 x 67 x 65 mm	
Ingress protection	IP 20 according to EN 60 529	
Operating conditions	ambient temperature: -5 to 60 °C	
	relative humidity: max 85 % (at the ambient temperature 25 °C)	
	atmospheric pressure: 87 to 107 kPa	
Weight	0.15 kg (without sensing element)	0.25 kg without sensing element

\*error of the sensing element is not incorporated

## TEMPERATURE SWITCHES TSZ2H – RS485

## COMMUNICATION PROPERTIES

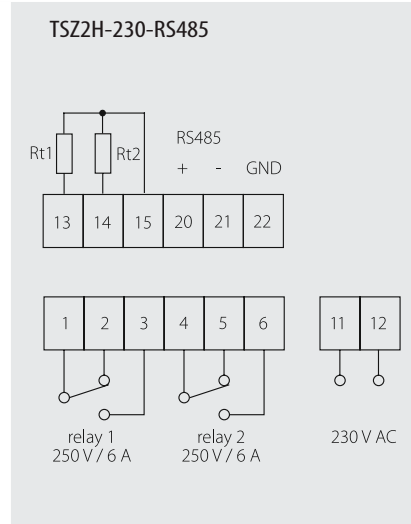
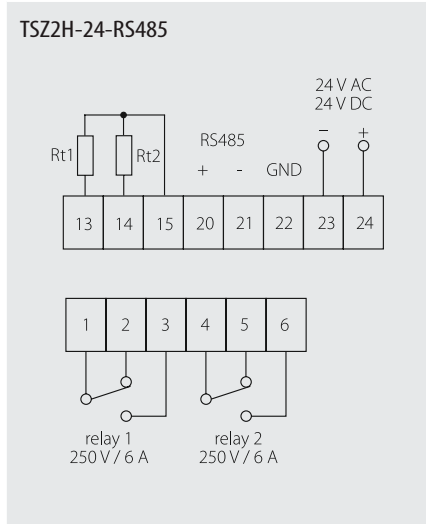
communication via RS 485, maximum segment length is 1200 m, asynchronous transfer

 transfer speeds 1200, 2400, 4800 Bd  
 32 modules / 1 serial port  
 protocol consistent with ADAM modules

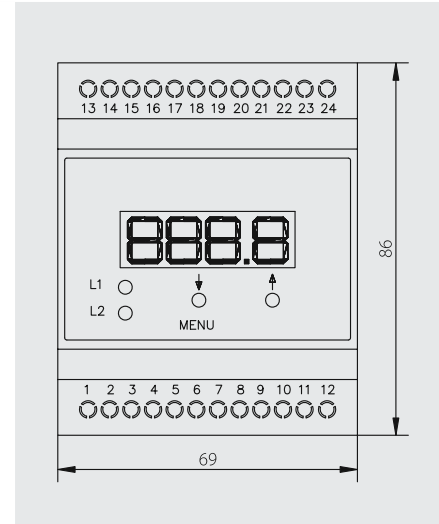
 transfer speeds 1200, 2400, 4800 Bd  
 32 modules / 1 serial port  
 protocol ARION

 transfer speeds 1200, 2400, 4800 Bd  
 32 modules / 1 serial port  
 protocol ModBus 1 stop bit, without parity

## WIRING DIAGRAM



## DIMENSIONAL DRAFT



## SWITCH INSTALLATION AND SERVICING

An integral part of the switch is a clamp enabling to mount the switch on a DIN-rail. After mounting the unit the relevant supply lead-in cables (terminals 23, 24 – 24 V AC/DC, terminals 11, 12 – 230 V AC), the temperature sensors (terminals 13, 15 – sensing element 1; terminals 14, 15 – sensing element 2), the cable for the relay output signal (1, 2, 3 – relay 1; 4, 5, 6 - relay 2) and RS 485 bus (terminals 20, 21, 22) are connected to the terminals according to the wiring diagram. The recommended wire cross-section is 0.35 to 1.5 mm<sup>2</sup>.

In case the lead-in cable is laid in the vicinity of high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. The shielding of the lead-in cable of the temperature sensor is connected to the terminal no. 3.

## CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- change of the communications protocol - Adam, Arion

## TEMPERATURE SWITCHES TSA



### DESCRIPTION AND APPLICATION

These temperature switches are designed to be used as two-state controllers (ON/OFF type control). They compare the temperature set-point to the actual temperature value. They cause the galvanically separated (electrically insulated) contacts of a connected relay to switch, when the pre-set limit temperature is reached. The temperature set point is adjustable by a potentiometer.

**With the choice of location of the sensing element and typical switch applications, the following TSA-220-version are available:**

- TSA 220 A** – Temperature switch for sensing temperature in the switch ambient. The sensing element is placed in the metal stem (60 mm length).
- TSA 220 K** – The sensing element is placed in the metal stem for use in air condition equipment or in ducts. This temperature switch version is available with a plastic holder. A stainless steel thermowell or metal holder can be delivered as an accessory.
- TSA 220 C** – The sensing element is protected by the TG 8 case (40 mm length) and provided with a cable (1 m length). Another type of enclosure or another cable length should be specified in the order.
- TSA 220 P** – Contact version switch for fixing on pipeline surfaces for surface temperature measurements. The sensing element is fitted in a metallic measuring case, which is covered by a protective enclosure made of POLYAMID. It is delivered with the fastening strap of the length 40 cm and with closure device.

Standard temperature ranges, in which the temperature set point can be adjusted, are given in the specifications table. For the TSA 220 A the maximum allowable operation temperature is 70 °C, for the TSA 220 P this temperature limit is 110 °C. For applications above 140 °C the TSA 220 K may be used. However, in this case the switch version with the stem elongated by 60 mm and the metal centric fixing holder must be used.

These switches are designed to be used in a chemically non-aggressive environment.



### ACCESSORIES

- The thermowell JS 130
- The metal central holder K 120
- The thermal conductive paste up to 200 °C, 5 g for TSA 220 P type

### DECLARATION, CERTIFICATES, CALIBRATION

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for temperature switches.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.

### SPECIFICATIONS

#### BASIC DATA

Type of sensing element	Ni 1000/5000			
Operating temperature ranges (°C)	-25 to 15 °C	0 to 40 °C	0 to 80 °C	60 to 140 °C
	10 to 34 °C	20 to 60 °C	40 to 80 °C	120 to 160 °C
Power supply	230 V / 50 Hz			
Maximum switched voltage	250 V AC / 6 A			
Set point adjustment failure	± 0.5 °C			
Standard hysteresis	2 °C			
Connection of the switch	according to the wiring diagram			
Recommended wire cross section	0.35 to 1.5 mm <sup>2</sup>			
Material of the connection head	LEXAN 503RS			
Connection head dimensions	62 x 62 x 95 mm (including the control button)			
Connection head ambient temperature	-25 to 70 °C			
Ingress protection	IP 54 according to EN 60 529			
Grommet type	M 16 x 1.5			
Weight	depending on design, min. 0.2 kg			

TEMPERATURE SWITCHES TSA

ADDITIONAL DATA FOR INDIVIDUAL SENSOR TYPES

**TSA 220 A**

Standard length of the stem L1	60 mm
Diameter of the stem	6 + 0.2 mm
Material of the stem	stainless steel 1.4301
Switch installation	on the wall, by means of a metal holder
Maximum range of measured temperature	-25 to 70 °C

**TSA 220 K**

Standard length of the stem L1	70, 120, 180, 240 mm
Diameter of the stem	6 + 0.2 mm
Material of the stem	stainless steel 1.4301
Switch installation	by means of a plastic or stainless steel holder or a stainless steel thermowell
Maximum range of measured temperature	-25 to 200 °C (using an elongated stem above 120 °C)

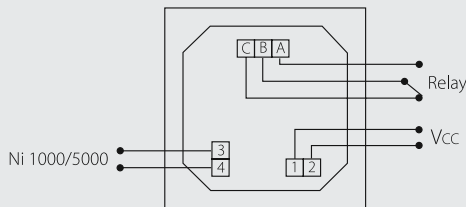
**TSA 220 C**

Standard type of sensor	TG 8 – 40, cable 1 m
Diameter of the case	5.7 ± 0.1 mm
Material of the case	stainless steel 1.4301
Lead-in cable	shielded silicone 2 x 0.34 mm <sup>2</sup>
Sensor ingress protection	IP 67 according to EN 60 529
Switch installation	on the wall, by means of a metal holder
Maximum range of measured temperature	-30 to 200 °C

**TSA 220 P**

Material of the measuring case	brass
Switch installation	by means of fastening band with closure
Standard length of the band	40 cm
Minimum diameter of tubing	20 mm

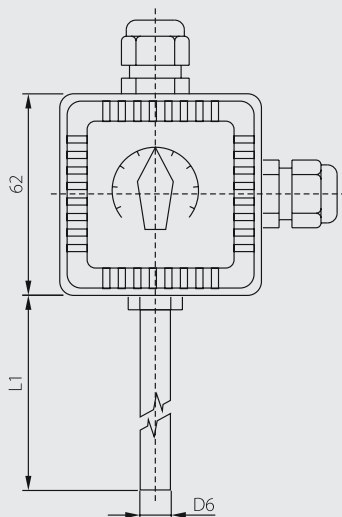
**WIRING DIAGRAM**



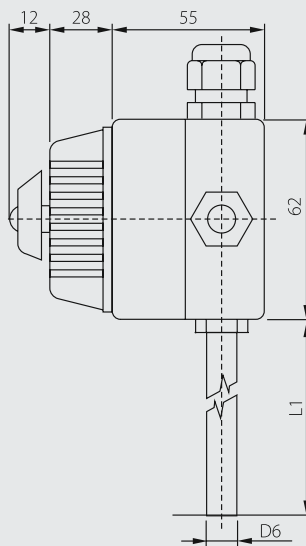
The terminal board for sensing element connection is installed for the TSA 220 C version only. The version is delivered without any sensing element or with an other type than the TG 8 - 40.

**DIMENSIONAL DRAFT**

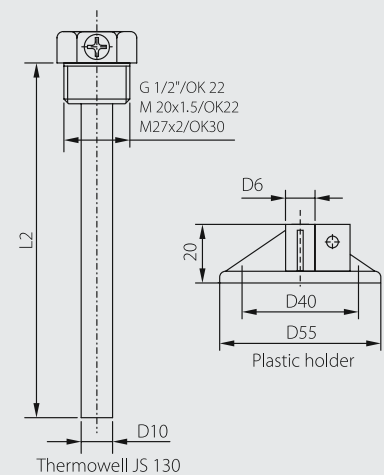
TSA 220 K – front view



TSA 220 K – lateral view



Accessory





## TEMPERATURE SWITCHES TSA

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### ■ OPERATION DESCRIPTION

Suppose the switching temperature set point is 20 °C. When the measured temperature value is above the set point, then the output relay's A and B terminals are closed. When the measured temperature value goes down below 18 °C, then the output relay's A and C terminals are closed. The difference of 2 °C is determined by the switch hysteresis.

### ■ SWITCH INSTALLATION AND SERVICING

Before connecting the supply lead-in cable and the cable for the relay output signal, screw off the switch's lower segment to lift it off slightly. When doing this use caution not to break the internal connecting wires. The relevant lead-in cables are pushed through the loosened grommets and connected according to the wiring diagram. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>. A shielded cable has to be used when laying the lead-in cable in the vicinity of high voltage conductors or those supplying equipment generating interfering electromagnetic field (e.g. inductance type equipment). To secure a hermetic condition, the grommets has to be tightened and the switch's lower segment has to be replaced.

A component part of the TSA 220 A and the TSA 220 C switches is a metal clip making it possible to fasten the switch on plane surfaces by means of two screws. In case a stainless steel thermowell, or a centric holder are used in the TSA 220 K version, these accessories are first to be placed in locations where the temperature should be measured, then the switch has to be inserted into the holder, or at the bottom of the thermowell and then secured with the screw. The openings designed to install a plastic or a stainless steel holder are to be drilled according to the attached template, on which the opening diameters are marked, too.

The TSA 220 P switch version is intended to be mounted on tubings by means of the fastening band and a clamp. After installing and connecting the sensor to the appropriate evaluating electrical equipment the switch is ready to use. The switch does not require any special service or maintenance.

### ■ CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- supply voltage 24 V AC or 24 V DC
- changing the range of temperatures to be compared
- adding a clip for fixing the device on the DIN bar instead of the metal holder for fixing the device on the wall
- removing the control button and shortening the potentiometer shaft
- in the TSA 220 A and the TSA 220 K versions changing the stem length; in the TSA 220 C changing the case and cable lengths
- customer specified stem or case design, e. g. in the fast-response TSA 220 R version
- hysteresis value modification
- the function of a differential switch

## TEMPERATURE SWITCHES TFA



### DESCRIPTION AND APPLICATION

TFA temperature switches are designed as two-state controllers (ON/OFF control) that compare the pre-set temperature to actual temperature reading and switch galvanically separated relay contacts when the set temperature is reached. Based on the order information, the required temperature settings are pre-set by the factory. These settings cannot be adjusted afterwards.

With the choice of location of the sensing element and typical switch applications, the following TFA-220-version are available:

- TFA 220 A** – Temperature switch for sensing temperature in the switch ambient. The sensing element is placed in the metal stem of the 60 mm length.
- TFA 220 K** – The sensing element is placed in the metal stem for use in air condition equipment or in tubings. This temperature switch version is available with a plastic holder. Stainless steel thermowell or metal holder can be delivered as an accessory.
- TFA 220 C** – The sensing element is protected by the TG 8 case, 40 mm long, and provided with a cable 1 m long. Another case type or another cable length should be specified in the order.
- TFA 220 P** – Contact version switch for fixing on pipeline surfaces for surface temperature measurements. The sensing element is housed in a measuring case made of metal, which is protected by a protection case made of SILIKON and SILAMID. It is delivered with the fastening strap of the length 40 cm and with closure device.

Maximal operating temperature of TFA 220 A switches is 70 °C, for TFA 220 P it is 110 °C. For operating TFA 220 K in temperature higher than 140 °C, a variant with an extended measuring stem (60 mm) and a metal centric holder is provided. The switches are designed for operating in a chemically non-aggressive environment.



### ACCESSORIES

- The thermowell JS 130
- The metal central holder K 120
- The thermal conductive paste up to 200 °C, 5 g for TFA 220 P type

### DECLARATION, CERTIFICATES, CALIBRATION

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for temperature switches.

**Calibration** – we perform standard calibration of resistance temperature sensors in accordance with EN ISO/IEC 17025 standard in the temperature range of the stated type of sensor.

### SPECIFICATIONS

#### BASIC DATA

Type of sensing element	Ni 1000/5000
Power supply	230 V / 50 Hz
Maximum switched voltage	250 V AC / 6 A
Set point adjustment failure	± 0.5 °C
Standard hysteresis	2 °C
Connection of the switch	according to the wiring diagram
Recommended wire cross section	0.35 to 1.5 mm <sup>2</sup>
Material of the enclosure	LEXAN 503RS
Enclosure dimensions	62 x 62 x 55 mm
Enclosure ambient temperature	-25 to 70 °C
Ingress protection	IP 65 according to EN 60 529
Grommet type	M 16 x 1.5
Weight	depending on design, min. 0.2 kg

#### SUPPLEMENTARY DATA TO PARTICULAR TYPES

##### TFA 220 A

Standard length of the stem L1	60 mm
Diameter of the stem	6 + 0.2 mm
Material of the stem	stainless steel 1.4301
Switch installation	on the wall, by means of a metal holder
Maximum range of measured temperature	-25 to 70 °C

TEMPERATURE SWITCHES TFA

**TFA 220 K**

Standard length of the stem L1	70, 120, 180, 240 mm
Diameter of the stem	6 + 0.2 mm
Material of the stem	stainless steel 1.4301
Switch installation	by means of a plastic or stainless steel holder or a stainless steel thermowell
Maximum range of measured temperature	-25 to 200 °C (using an elongated stem above 120 °C)

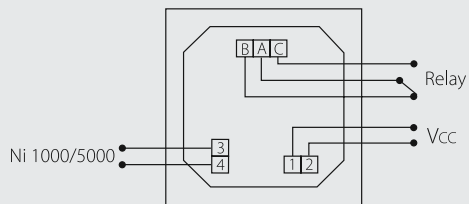
**TFA 220 C**

Standard type of sensor	TG8 – 40, kabel 1 m
Diameter of the case	5.7 ± 0.1 mm
Material of the case	stainless steel 1.4301
Lead-in cable	shielded silicone 2 x 0.34 mm <sup>2</sup>
Sensor ingress protection	IP 67 according to EN 60 529
Switch installation	on the wall, by means of a metal holder
Maximum range of measured temperature	-30 to 200 °C

**TFA 220 P**

Material of the measuring case	brass
Switch installation	by means of fastening band
Standard length of the band	40 cm
Minimum diameter of tubing	20 mm

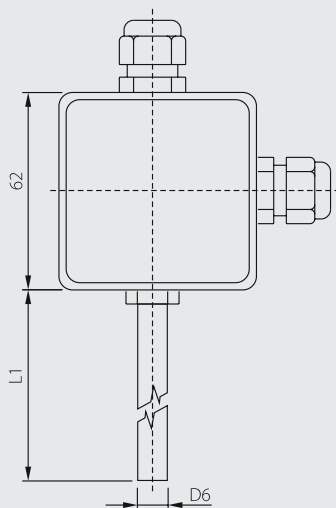
**WIRING DIAGRAM**



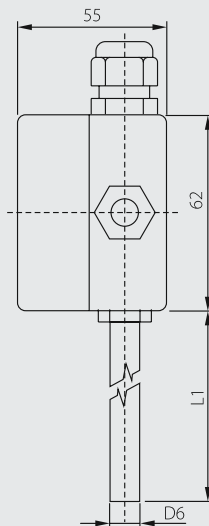
The terminal board for sensing element connection is installed for the TFA 220 C version only. The version is delivered without any sensing element or with an other type than the TG8 - 40.

**DIMENSIONAL DRAFT**

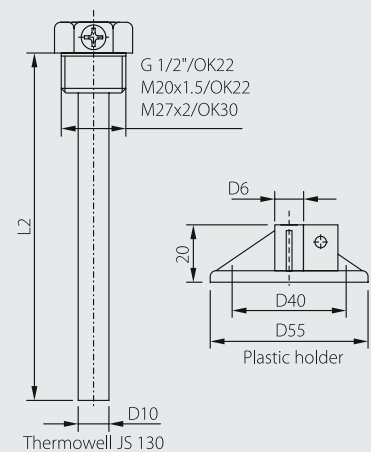
TFA 220 K – front view



TFA 220 K – lateral view



Accessories



## TEMPERATURE SWITCHES TFA

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### ■ OPERATION DESCRIPTION

Suppose the switching temperature set point is 20 °C. When the measured temperature value is above the set point, then the output relay's A and B terminals are closed. When the measured temperature value goes down below 18 °C, then the output relay's A and C terminals are closed. The difference of 2 °C is determined by the switch hysteresis.

### ■ SENSOR INSTALLATION AND SERVICING

Before connecting the power lead-in cable and the cable for the relay output signal, screw off the switch's lower segment to lift it off slightly. The relevant lead-in cables are pushed through the loosened grommets and connected to the terminals in accordance with the wiring diagram. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>. A shielded cable has to be used when laying the lead-in cable in the vicinity of high voltage conductors or those supplying equipment generating interfering electromagnetic field (e.g. inductance type equipment). To secure a hermetic condition, the grommets have to be tightened and the switch's lower segment has to be replaced. A component part of the TFA 220 A and the TFA 220 C switches is a metal clip making it possible to fasten the switch on plane surfaces by means of two screws.

In case a stainless steel thermowell or a centric holder are used in the TFA 220 K version, these accessories are first to be placed in locations where the temperature should be measured, then the switch has to be inserted into the holder, or, as the case may be, as far as to the thermowell's bottom, and then secured with the screw. The openings designed to install a plastic or a stainless steel holder are to be drilled according to the attached template, on which the opening diameters are depicted, too.

The TFA 220 P switch version is intended to be fixed on tubings by means of the fastening band and a special closing device. After installing and connecting the sensor to the appropriate evaluating electrical equipment the switch is ready to use. The switch does not require any special service or maintenance.

### ■ CUSTOMER SPECIFIC MODIFICATIONS

REGARDING TO SENSORS MANUFACTURED IN A STANDARD VERSION THE FOLLOWING PARAMETERS CAN BE MODIFIED:

- supply voltage 24 V AC or 24 V DC
- changing the range of temperatures to be switched
- adding a clip for fixing the device on a DIN console instead of the metal holder for fixing the device on the wall
- for the TFA 220 A and TFA 220 K versions changing the stem length; for the TFA 220 C changing the case and cable lengths
- customer specified stem or case design
- functioning of the differential switch can be modified



## DESCRIPTION AND APPLICATION

The programmable sensor is intended for temperature measurement and measurement of relative humidity of air. The sensors are designed to measure temperature and humidity in food-processing areas, storage of pharmaceutical products and stores for raw material. Moreover these sensors are perfectly suitable for monitoring of temperature and humidity conditions in museums, archives, galleries, meteorological stations etc. Easy mounting of the temperature sensor is ensured by the unique "S head" design.

The unique design and high quality components ensure a long-term sensor stability. The humidity sensing element is temperature compensated and the sensor provides a signal in the event of a failure. The most up to date polymeric sensing element for humidity guarantees stability of indication and resistance to condensation water.

Two galvanically separated current signals 4 to 20 mA are available as output signals of the measured variables; the outputs are factory set:

**the value on the output I1:** relative humidity, range 4 to 20 mA is related to 0 to 100 % RH

**the value on the output I2:** temperature, range 4 to 20 mA is related to -30 to 80 °C

A calibration sheet and program TSensor for sensor configuration by means of USB cable SP003 are included in the sensor price. (A spare PC-cable for sensor configuration must be ordered separately).

The sensors are designed to be operated in a chemically non-aggressive environment.



## DECLARATION, CERTIFICATES, CALIBRATION

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA.

**Calibration** – the sensors are delivery with a calibration sheet from from producer. Based on customer requirements the sensor can be delivered with a calibration sheet from an accredited laboratory.

## SPECIFICATIONS

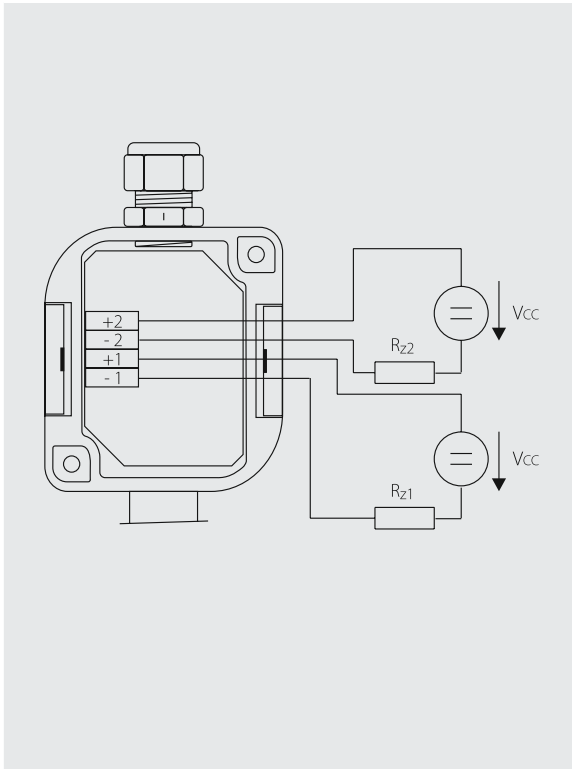
### BASIC DATA

Type of sensor	PTSV 110
Type of sensing element	Pt 1000/3850
Analog outputs	two galvanically separated signals 4 to 20 mA
Current output in the case of error	< 3.8 mA or > 24 mA
Power supply (Vcc)	9 to 30 V DC, maximum ripple 0.5 %
Range of temperature measurement*	-30 to 80 °C
Accuracy	± 0.4 °C in the range 0 to 100 °C, otherwise 0.4 % of the measuring value
Range of relative humidity measurement **	0 to 100 % RH (the reading is temperature compensated in all temperature range)
Accuracy	± 2.5 % RH in the range 5 to 95 % RH at 23 °C
Ingress protection	electronics IP65 according to EN 60 529 sensors are placed behind the cover with ingress protection IP40 according to EN 60 529
Dust filter of the sensors	filtration efficiency 0.025 mm
Operating temperature range of the device	-30 to 80 °C
Operating humidity range of the device	0 to 100 % RH
Working position	the measure stem should be mounted downwards
Electromagnetic compatibility	in accordance with EN 61326-1
Storage conditions	temperature -30 to 80 °C, humidity 0 to 100 % RH without condensation
Weight	approximately 150 g
Material of the enclosure	polyamid

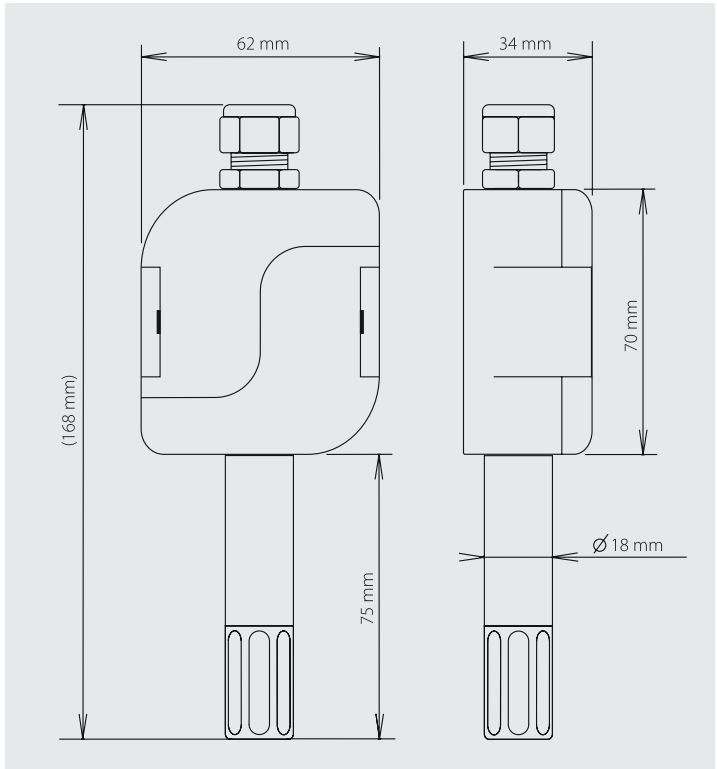
\* The maximum temperature as specified above is only valid for the end of the probe, containing the sensing elements. At temperature above +85 °C in continuous operation, the relative humidity conditions should not exceed the limitation of the range, as specified in the diagram on page 120 of this catalog.

\*\* Any kind of value – temperature, relative humidity, temperature of a condensation point, absolute humidity, specific humidity, proportion of mixture or specific enthalpy can be assigned to the each output of the 2-output-sensor. The same value can be assigned to both outputs, as well. The outputs are set factory for the maximum range. The range of the outputs can be adjusted by user by means of PC using the cable SP003 which is delivered as optional accessory at extra cost. Other setting of outputs (RH, T, Trb, ..) and ranges is possible – this should be specified in the order.

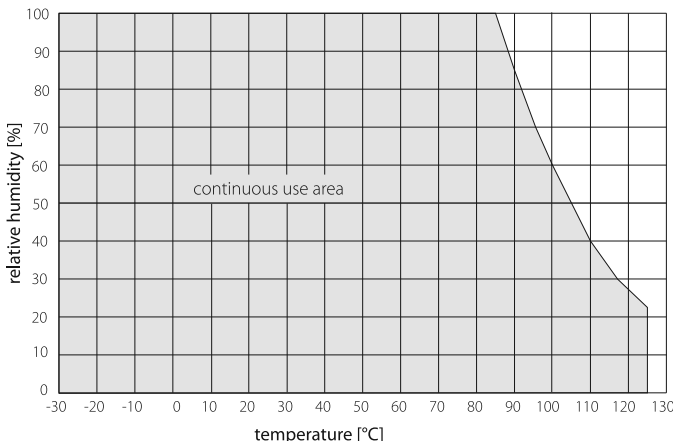
**WIRING DIAGRAM**



**DIMENSIONAL DRAFT**



**Limitation of the measuring range for temperature and humidity**



**SENSOR INSTALLATION AND SERVICING**

Before connecting the supply lead-in cable, lift off the lid of the plastic enclosure by means of a flat screwdriver. The lead-in cable is connected to the terminals according to the wiring diagram through the loosened grommet. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm. To ensure the ingress protection value of IP 65, the grommet has to be tightened and the lid has to be securely closed after connecting the lead-in cable.

In case the lead-in cable is located near high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. In case of using a holder this accessory should be mounted first in the location where the temperature will be measured, prior to mounting the actual sensors.

After installing and connecting the sensor to the appropriate evaluating electrical equipment the sensor is ready to use. The sensor does not require any special attendance or maintenance. The device can be operated in any working position, but the grommet should not be directed upwards.

Sensors are mounted in any working position directly on flat surface by means of two screws of diameter 4.0 mm in the openings placed in head corners. The dimension 13 mm (distance to the barrier in the enclosure) must be added to the necessary length for fastening to a basis. To ensure the tightness it is necessary to tighten the grommet carefully after connecting the cable. During closing of the head by means of the lid the clips should be snapped in the proper position.



**DESCRIPTION AND APPLICATION**

The programmable sensors are designed for measurements of temperature relative humidity in air conditioning ducts. The plastic enclosure is provided with a cable gland. Easy mounting of the sensor is ensured by the unique “S head” design.

The unique design and high quality components ensure a long-term sensor stability. The humidity sensing element is temperature compensated and the sensor provides a signal in the event of a failure. The most up to date polymeric sensing element for humidity guarantees stability of indication and resistance to condensation water.

Two galvanically separated current signals 4 to 20 mA are available as output signals of the measured variables; the outputs are factory set:

**the value on the output I1:** relative humidity, range 4 to 20 mA is related to 0 to 100 % RH

**the value on the output I2:** temperature, range 4 to 20 mA is related to -30 to 120 °C

A calibration sheet and program TSensor for sensor configuration by means of USB cable SP003 are included in the sensor price.

The sensors are designed to be operated in a chemically non-aggressive environment.



**ACCESSORIES**

- The plastic central holder

**DECLARATION, CERTIFICATES, CALIBRATION**

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA.

**Calibration** – the sensors are delivery with a calibration sheet from producer. Based on customer requirements the sensor can be delivered with a calibration sheet from an accredited laboratory.

**SPECIFICATIONS**

**BASIC DATA**

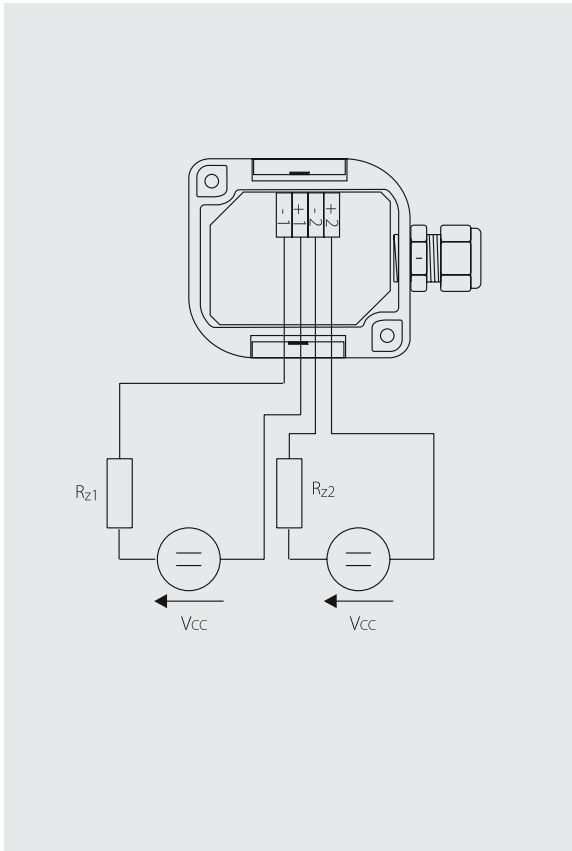
Type of sensor	PTSV 120
Type of sensing element	Pt 1000/3850
Analog outputs	two galvanically separated signals 4 to 20 mA
Current output in the case of error	< 3.8 mA or > 24 mA
Power supply (Vcc)	9 to 30 V DC, maximum ripple 0.5 %
Standard length of the stem	150 mm
Range of temperature measurement*	-30 to 125 °C
Accuracy	± 0.4 °C in the range 0 to 100 °C, otherwise 0.4 % of the measuring value
Range of relative humidity measurement **	0 to 100 % RH (the reading is temperature compensated in all temperature range)
Accuracy	± 2.5 % RH in the range 5 to 95 % RH at 23 °C
Ingress protection	electronics IP65 according to EN 60 529 sensors are placed behind the cover with ingress protection IP 40 according to EN 60 529
Dust filter of the sensors	filtration efficiency 0.025 mm
Operating temperature range of the device	-30 to 80 °C
Operating humidity range of the device	0 to 100 % RH
Working position	the measure stem should be mounted downwards
Electromagnetic compatibility	in accordance with EN 61326-1
Storage conditions	temperature -30 to 80 °C, humidity 0 to 100 % RH without condensation
Material of the stem	stainless steel 1.4301
Weight	approximately 225 g
Material of the enclosure	polyamid

\* The maximum temperature as specified above is only valid for the end of the probe, containing the sensing elements. At temperature above +85 °C in continuous operation, the relative humidity conditions should not exceed the limitation of the range, as specified in the diagram on page 122 of this catalog.

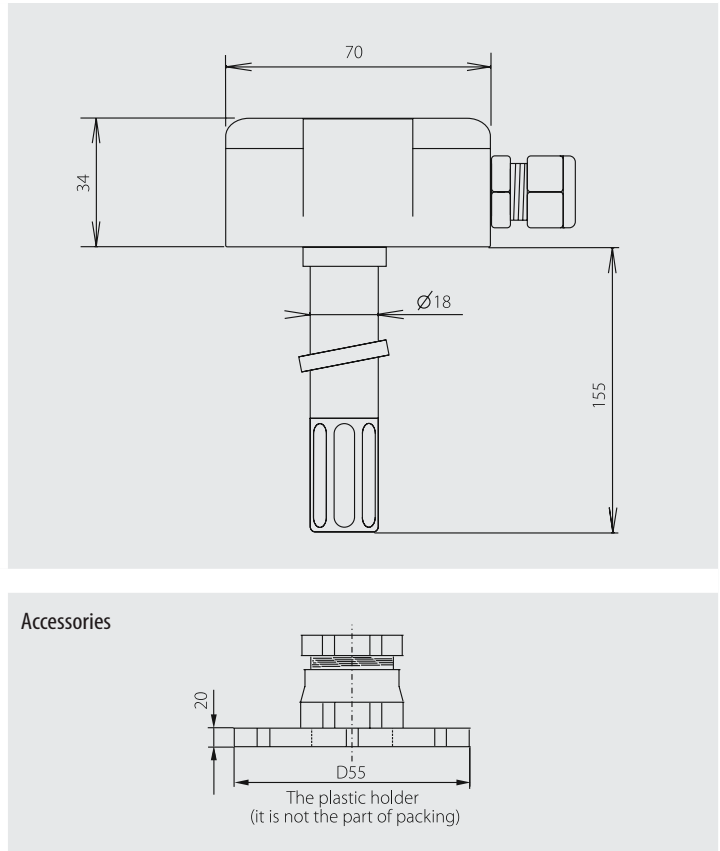
\*\* Any kind of value – temperature, relative humidity, temperature of a condensation point, absolute humidity, specific humidity, proportion of mixture or specific enthalpy can be assigned to the each output of the 2-output-sensor. The same value can be assigned to both outputs, as well. The outputs are set factory for the maximum range. The range of the outputs can be adjusted by user by means of PC using the cable SP003 which is delivered as optional accessory at extra cost. Other setting of outputs (RH, T, Trb, ..) and ranges is possible – this should be specified in the order.



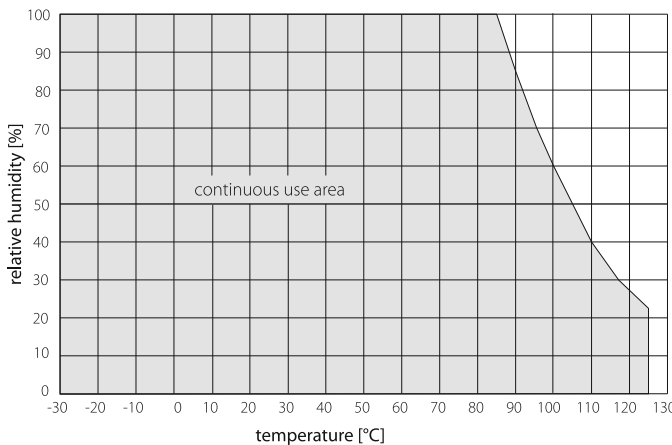
**WIRING DIAGRAM**



**DIMENSIONAL DRAFT**



**Limitation of the measuring range for temperature and humidity**



**SENSOR INSTALLATION AND SERVICING**

Before connecting the supply lead-in cable, lift off the lid of the plastic enclosure by means of a flat screwdriver. The lead-in cable is connected to the terminals according to the wiring diagram through the loosened grommet. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm. To ensure the ingress protection value of IP 65, the grommet has to be tightened and the lid has to be securely closed after connecting the lead-in cable.

In case the lead-in cable is located near high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. In case of using a holder this accessory should be mounted first in the location where the temperature will be measured, prior to mounting the actual sensor.

After installing and connecting the sensor to the appropriate evaluating electrical equipment the sensor is ready to use. The sensor does not require any special attendance or maintenance. The device can be operated in any working position, but the grommet should not be directed upwards.



**DESCRIPTION AND APPLICATION**

The programmable sensors are designed to measure of temperature and humidity in food-processing areas, storage rooms of pharmaceutical products and stores for raw materials. Moreover these sensors are perfectly suitable for monitoring temperature and humidity conditions in museum, archives, galleries, meteorological stations etc. The measuring sensors are located in an external remote probe with cable that is connected to an enclosure containing the electronic. The probe of the sensor can not be disconnected from the enclosure with electronic circuits. The enclosure with the sensor electronic is designed for wall mounting. Easy mounting of the temperature sensor is ensured by the unique “S head” design.

The unique design and high quality components ensure a long-term sensor stability. The humidity sensing element is temperature compensated and the sensor provides a signal in the event of a failure. The most up to date polymeric sensing element for humidity guarantees stability of indication and resistance to condensation water.

Two galvanically separated current signals 4 to 20 mA are available as output signals of the measured variables; the outputs are factory set:

**the value on the output I1:** relative humidity, range 4 to 20 mA is related to 0 to 100 % RH

**the value on the output I2:** temperature, range 4 to 20 mA is related to -30 to +105 °C

A calibration sheet and program TSensor for sensor configuration by means of USB cable SP003 are included in the sensor price.

The sensors are designed to be operated in a chemically non-aggressive environment.



**DECLARATION, CERTIFICATES, CALIBRATION**

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 4 to 20 mA.

**Calibration** – the sensors are delivery with a calibration sheet from from producer. Based on customer requirements the sensor can be delivered with a calibration sheet from an accredited laboratory.

**SPECIFICATIONS**

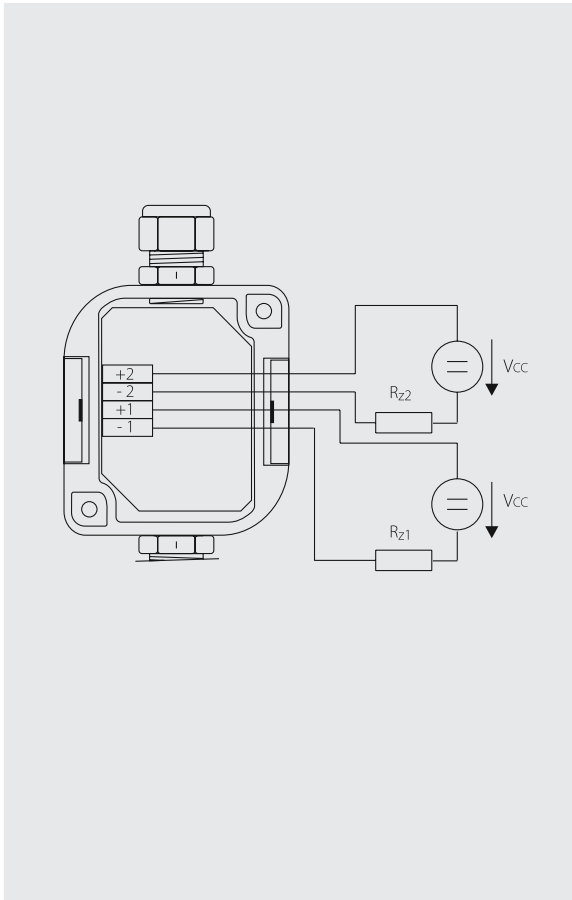
**BASIC DATA**

Type of sensor	PTSV 130
Type of sensing element	Pt 1000/3850
Analog outputs	two galvanically separated signals 4 to 20 mA
Current output in the case of error	< 3.8 mA or > 24 mA
Power supply (Vcc)	9 to 30 V DC, maximum ripple 0.5 %
Lengths of cross-connecting cables	2 m a 4 m
Range of temperature measurement*	-30 to 105 °C
Accuracy	± 0.4 °C in the range 0 to 100 °C, otherwise 0.4 % of the measuring value
Range of relative humidity measurement **	0 to 100 % RH (the reading is temperature compensated in all temperature range)
Accuracy	± 2.5 % RH in the range 5 to 95 % RH at 23 °C
Ingress protection	electronics IP65 according to EN 60 529 sensors are placed behind the cover with ingress protection IP 40 according to EN 60 529
Dust filter of the sensors	filtration efficiency 0,025 mm
Operating temperature range of the device	-30 to 80 °C
Operating humidity range of the device	0 to 100 % RH
Working position	the measure stem should be mounted downwards
Electromagnetic compatibility	in accordance with EN 61326-1
Storage conditions	temperature -30 to 80 °C, humidity 0 to 100 % RH without condensation
Weight	approximately 200 g a 300 g
Material of the enclosure	polyamid

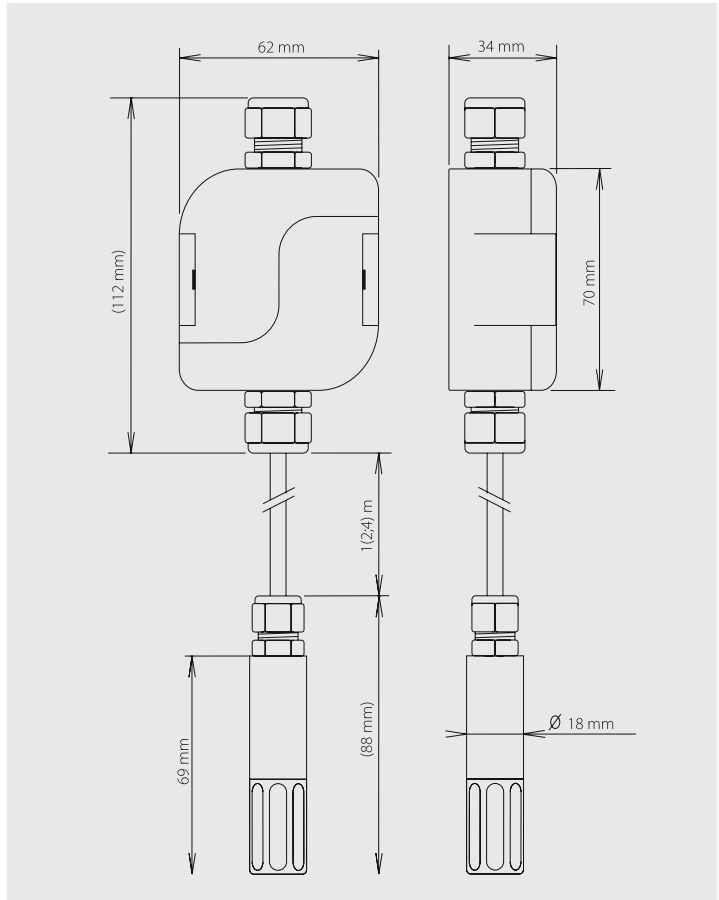
\* The maximum temperature as specified above is only valid for the end of the probe, containing the sensing elements. At temperature above +85 °C in continuous operation, the relative humidity conditions should not exceed the limitation of the range, as specified in the diagram on page 124 of this catalog.

\*\* Any kind of value – temperature, relative humidity, temperature of a condensation point, absolute humidity, specific humidity, proportion of mixture or specific enthalpy can be assigned to the each output of the 2-output-sensor. The same value can be assigned to both outputs, as well. The outputs are set factory for the maximum range. The range of the outputs can be adjusted by user by means of PC using the cable SP003 which is delivered as optional accessory at extra cost. Other setting of outputs (RH, T, Trb, ..) and ranges is possible – this should be specified in the order.

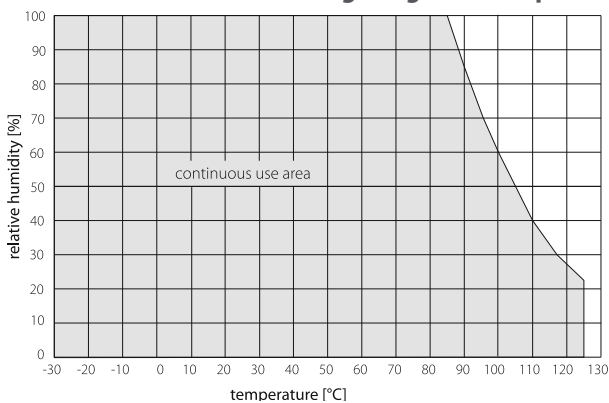
**WIRING DIAGRAM**



**DIMENSIONAL DRAFT**



**Limitation of the measuring range for temperature and humidity**



**SENSOR INSTALLATION AND SERVICING**

Before connecting the supply lead-in cable, lift off the lid of the plastic enclosure by means of a flat screwdriver. The lead-in cable is connected to the terminals according to the wiring diagram through the loosened grommet. The recommended wire cross section is 0.35 to 1.5 mm<sup>2</sup>, the outer diameter of the circular cross-section cable can range between 4 and 8 mm. To ensure the ingress protection value of IP 65, the grommet has to be tightened and the lid has to be securely closed after connecting the lead-in cable. In case the lead-in cable is located near high voltage conductors or those supplying equipment creating disturbing electromagnetic field (e.g. inductive load equipment), a shielded cable should be used. In case of using a holder this accessory should be mounted first in the location where the temperature will be measured, prior to mounting the actual sensors. After installing and connecting the sensor to the appropriate evaluating electrical equipment the sensor is ready to use. The sensor does not require any special attendance or maintenance. The device can be operated in any working position, but the grommet should not be directed upwards. Sensors are mounted in any working position directly on flat surface by means of two screws of diameter 4.0 mm in the openings placed in head corners. The dimension 13 mm (distance to the barrier in the enclosure) must be added to the necessary length for fastening to a basis. To ensure the tightness it is necessary to tighten the grommet carefully after connecting the cable. During closing of the head by means of the lid the clips should be snapped in the proper position.



## DESCRIPTION AND APPLICATION

The flow sensors are designed for reliable measurement of air flow and other gaseous media. Combined with the central mounting holder, it is possible to use the sensor for measurements of flow in air conditioning ducts or piping. The temperature resistance of the sensor head is -30 to 70 °C. This critical temperature should not be exceeded, not even for a short time. The sensors can be used for all control systems that are compatible with the 0 to 10 V voltage output. Easy mounting of the temperature sensor is ensured by the unique "S head" design. The output voltage signal is not linear.

The sensors are designed for operation in chemically non-aggressive environments.

## ACCESSORIES

- The plastic central holder

## DECLARATION, CERTIFICATES, CALIBRATION

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 0 to 10 V.

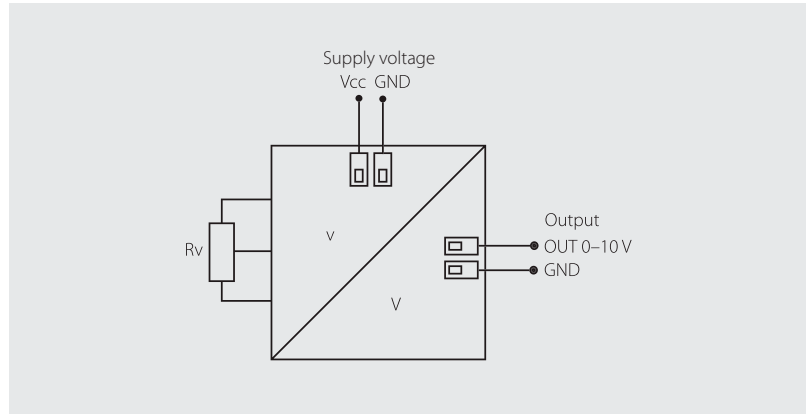
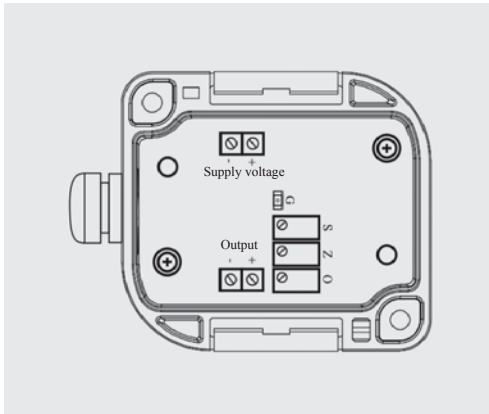
**Calibration** – at the customer's request the calibration can be provided in an accredited laboratory.



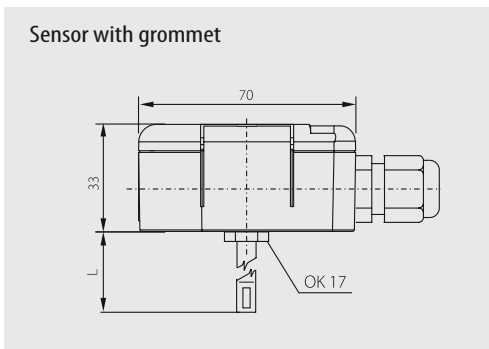
## SPECIFICATION

Sensor type	SNP	
Sensing element type	FS5	
Standard measuring range / Recommended measuring range	0–5 m/s / 2–5 m/s	
	0–10 m/s / 2–10 m/s	
	0–20 m/s / 2–20 m/s	
	user selectable 0–100 m/s	
Supply voltage	15 to 30 VDC (recommended 24 VDC)	
Power consumption	1 W	
Output signal	0–10 V	
Measuring sensitivity	0.01 m/s	
Measuring principle	Thermoelectric and anemometric principle	
Time to stabilize after power-up	15 minutes	
Measurement error	< ±3 % of the range or ±0.3 m/s	(Applied to air, temperature 25±5 °C, humidity 40±5 % RH, atmospheric pressure 1000±10 hPa in recommended measuring range. Error after power-up is approx. +2V, after 5 min. < +0.3V, after 10 min. < +0.1V.)
Response time	< 2 s	
Sensor wiring	according to the wiring diagram	
Recommended wire cross-section	0.35 to 1.5 mm <sup>2</sup>	
Material of enclosure	Polyamide	
Dimensions enclosure	70 x 63 x 34 mm	
Operating temperature enclosure	-30 to 70 °C	
Operating temp. probe with sensing element	-20 to 150 °C	
Degree of protection of enclosure	IP 65 according to EN 60 529	
Degree of protection of measuring probe	IP 20 according to EN 60 529	
EMC compatibility - criterion A for:	EMC emission	EN 61 000-6-3
	EMC immunity	EN 61 000-6-2
	Electrostatic discharge	IEC 61 000-4-2
	Electromagnetic field	IEC 61 000-4-3
	Fast transient phenomena	IEC 61 000-4-4
	Shock pulse	IEC 61 000-4-5
	Electromagnetic interference	IEC 61 000-4-6
	Short-time interruption	IEC 61 000-4-11
Type of grommet	M 16 x 1.5	
Measuring probe diameter	10 mm	
Measuring probe standard lengths	100 mm a 200 mm	
Weight	0.15 kg	

## WIRING DIAGRAM



## DIMENSIONAL DRAWING



## SENSOR INSTALLATION AND OPERATION

It is necessary to open the plastic head before the supply cable is connected. To open the head, use a standard flat-tip screwdriver and insert the tip subsequently into both of the slots in the cap and release it by tilting the tool up. Put the supply cable through the loose grommet and connect it to the terminals according to the wiring diagram. The recommended wire cross-section is 0.35 up to 1.5 mm<sup>2</sup> and the external diameter of the circular section of the cable is 4 to 8 mm.

If the supply cable is located near high voltage cables or those supplying the units generating interfering electromagnetic fields, a shielded cable should be used.

The sensors are installed on a horizontal surface using the plastic holder with grommet or the internal holes in the sensor head. The holes are accessible after removing the cap from the head. The plastic holder is not included in the delivery.

The recommended operating position is with the grommet not facing up. In order to ensure impermeability, the grommet should be tightened after connection of the supply cable. When closing the head, the clips must click into the proper seats.

The sensor may only be installed by the person with electrical qualification according to § 5 Regulation No. 50/1978 Coll. and who has been well familiarized with the "Operating Instructions".

SNP-type of flow sensors should not be used for measuring in the following locations:

- Where the flow sensors may be subject to vibrations or mechanical effects.
- With explosion hazard or with substantial electrical interference.
- In chemically aggressive environments.
- Where sensors could be exposed to direct thermal radiation (lighting, radiators, etc.) or to solar radiation.

## FLOW SENSOR SETTING

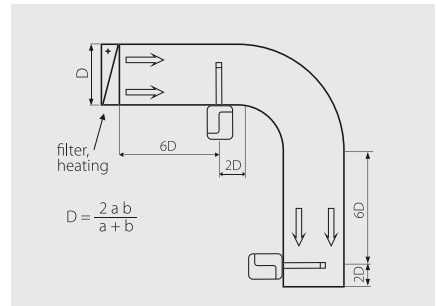
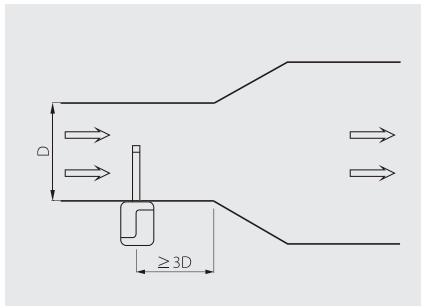
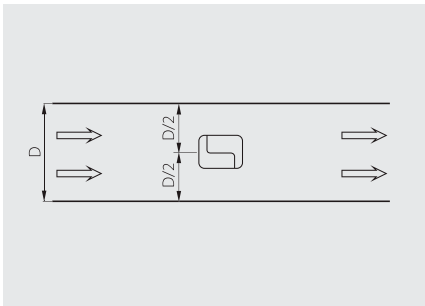
Once the supply voltage is connected to terminals + and -, the G control LED (green) is on. The sensor has three trimmers for setting up. The S and O trimmers are set factory and it is not allowed to adjust them. The Z trimmer is set up in such a way so that the output voltage is 10 V at the nominal flow speed. You can use the Z trimmer to adjust the 10 V output voltage for a different flow speed. The change of setting may be necessary in the cases when the air flow speed is not measured.

**RECOMMENDED MOUNTING OF THE SNP-SERIES FLOW SENSORS:**

For the sensor to operate correctly, it is essential it is properly mounted. The positioning and mounting of the sensing head in the air flow has a relevant impact on the measurement accuracy. Please find below the basic guidelines on correct positioning of the flow sensor in the duct system:

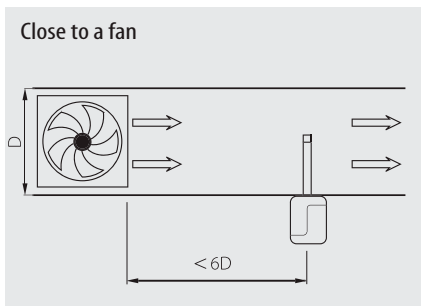
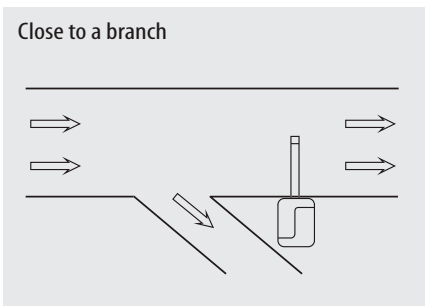
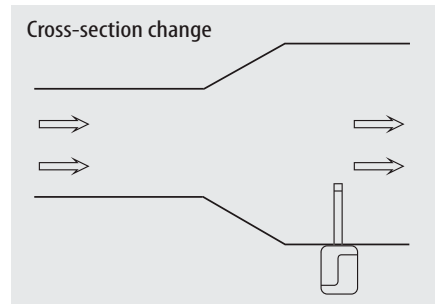
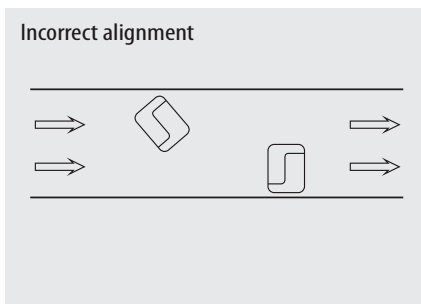
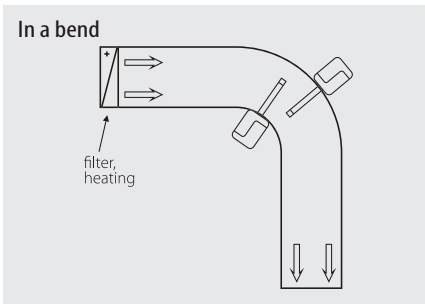
**Correct:**

The axis of the cable grommet should be horizontally in line with the air flow direction.



For rectangular ducts, the diameter **D** is calculated from the rectangle sides **a, b**.

**Incorrect:**





## DESCRIPTION AND APPLICATION

The flow switches are designed for switching loads after reaching the air flow preset value. Combined with the central mounting holder, it is possible to use the switch for measurements of flow in air conditioning ducts or piping. The temperature resistance of the switch head is -30 to 70 °C. This critical temperature should not be exceeded, not even for a short time. The switches can be used for all types of load. Easy mounting of the temperature sensor is ensured by the unique "S head" design.

The switches are designed for operation in chemically non-aggressive environment.

## ACCESSORIES

- The plastic central holder

## DECLARATION, CERTIFICATES, CALIBRATION

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for sensors with an output of 0 to 10 V.

**Calibration** – at the customer's request the calibration can be provided in an accredited laboratory.

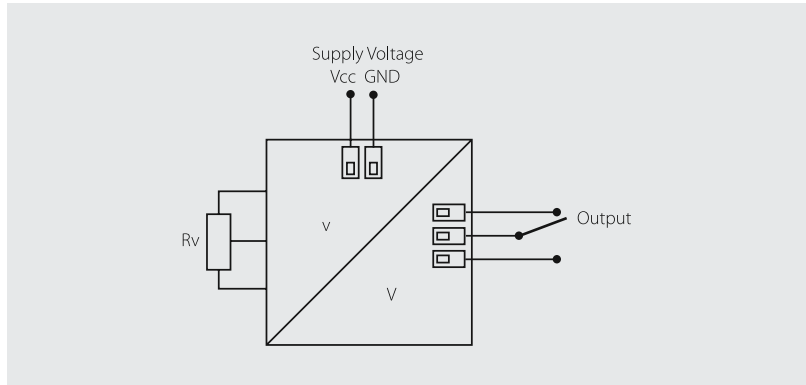
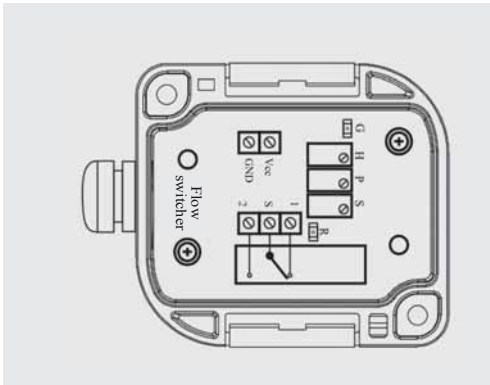


## SPECIFICATION

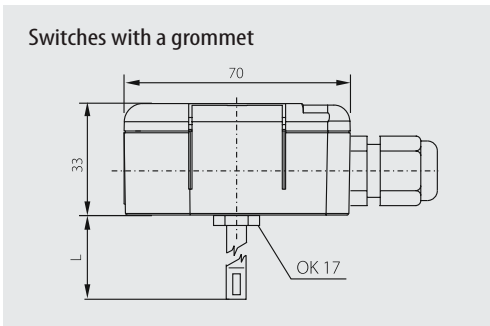
Sensor type	SPP	
Sensing element type	FS5	
Standard measuring range / Recommended measuring range	0–5 m/s / 2–5 m/s	
	0–10 m/s / 2–10 m/s	
	0–20 m/s / 2–20 m/s	
	user selectable 0–100 m/s	
Supply voltage	15 to 30 VDC (recommended 24 VDC)	
Power consumption	1 W	
Switched load	8 A / 250 VAC	
Measurement sensitivity	0.01 m/s	
Measuring principle	Thermoelectric and anemometric principle	
Settling time after power-up	15 minutes	
Measurement error	< ±3 % of the range or ±0.3 m/s (Applicable to air, temperature 25±5 °C, humidity 40±5 % RH, Atmospheric pressure 1000±10 hPa in recommended measuring range. Error after power-up is approx. +2V, after 5 min. < +0.3 V, after 10 min. < +0.1V.)	
Speed of response	< 2 s	
Switch wiring	according to wiring diagram	
Recommended wire cross-section	0.35 to 1.5 mm <sup>2</sup>	
Material enclosure	Polyamide	
Dimensions enclosure	70 x 63 x 34 mm	
Operating temperature enclosure	-30 to 70 °C	
Operating temp. probe with sensing element	-20 to 150 °C	
Degree of protection of enclosure	IP 65 according to EN 60 529	
Degree of protection of measuring probe	IP 20 according to EN 60 529	
EMC compatibility - criterion A for:	EMC emission	EN 61 000-6-3
	EMC immunity	EN 61 000-6-2
	Electrostatic discharge	IEC 61 000-4-2
	Electromagnetic field	IEC 61 000-4-3
	Fast transient phenomena	IEC 61 000-4-4
	Shock pulse	IEC 61 000-4-5
	Electromagnetic interference	IEC 61 000-4-6
	Short-time interruption	IEC 61 000-4-11
Type of grommet	M 16 x 1.5	
Measuring probe diameter	10 mm	
Measuring probe standard lengths	100 mm a 200 mm	
Weight	0.15 kg	



**WIRING DIAGRAM**



**DIMENSIONAL DRAWING**



**SWITCH INSTALLATION AND OPERATION**

It is necessary to open the plastic head before the supply cable is connected. To open the head, use a standard flat-tip screwdriver and insert the tip subsequently into both of the slots in the cap and release it by tilting the tool up. Put the supply cable through the loose grommet and connect it to the terminals according to the wiring diagram. The recommended wire cross-section is 0.35 up to 1.5 mm<sup>2</sup> and the external diameter of the circular section of the cable is 4 to 8 mm.

If the supply cable is laid in the proximity to high voltage cables or those supplying the units generating interfering electromagnetic fields, a shielded cable should be used. The switches are installed on a horizontal surface using the plastic holder with grommet or the internal holes in the switch head. The holes are accessible after removing the cap from the head. The plastic holder is not included in the delivery.

The recommended operating position is with the grommet not facing up. In order to ensure impermeability, the grommet should be tightened after connection of the supply cable. When closing the head, the clips must click into their original seats.

The switch may only be installed by the person with electrical qualification according to § 5 Regulation No. 50/1978 Coll. and who has been well familiarized with the "Operating Instructions".

Switches must not be used for measuring in the following locations:

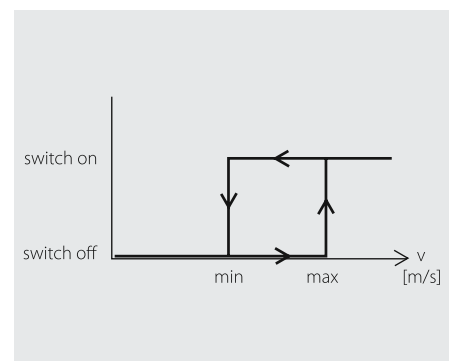
- Where the switch may be subject to vibrations or mechanical effects,
- With explosion hazard or with substantial electrical interference,
- In chemically aggressive environments,
- Where they could be exposed to direct thermal radiation (lamps, radiators, etc.) or to solar radiation.

**FLOW SWITCH SETTING**

Once the supply voltage is connected to Vcc and GND terminals, the G LED (green) is on, the relay is tested; it is powered and de-powered for 1 second. The energised relay is indicated by the R (red) LED. Once the output relay is de-powered, terminals S and 1 are connected. Once the required air flow speed is reached, the relay is powered and terminals S are 2 connected.

The relay load current may be 8 A at 250 V. The flow switch is factory set during its initial calibration to 10 m/s at which the relay gets energised.

The unit contains three adjustable trimmers to adjust the sensitivity of the sensing element, switching threshold and hysteresis. The sensitivity of the element is adjusted with trimmer S, the hysteresis with trimmer H. The switching threshold of the switch is adjusted with trimmer P, which can be adjusted to the full extent. The width between the minimum and maximum flow values to activate the switch is adjusted with trimmer H. The trimmer S is adjusted by the manufacturer and it is not allowed to re-adjust it.

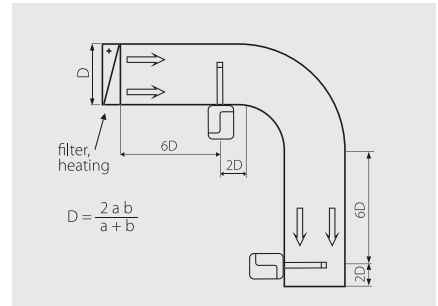
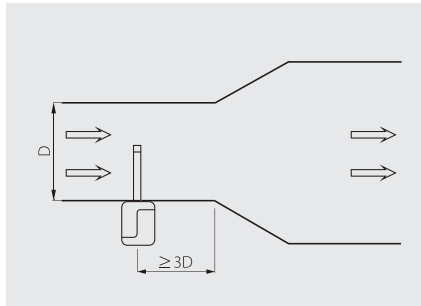
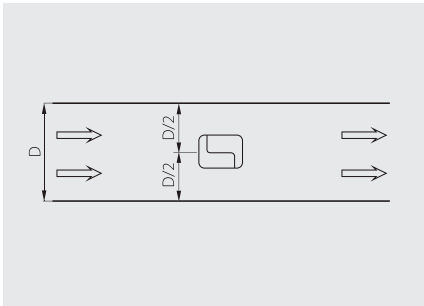


**RECOMMENDED MOUNTING OF THE SPP-SERIES FLOW SWITCHES:**

For the switch to operate correctly, it is essential it is properly mounted. The positioning and mounting of the sensing head in the air flow has a relevant impact on the measurement accuracy. Please find below the basic guidelines on correct positioning of the switch in the duct system:

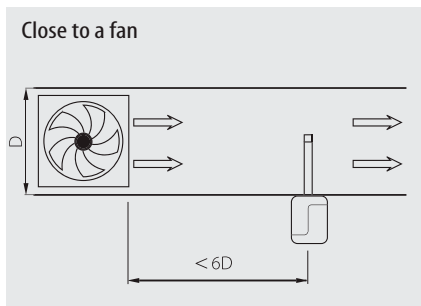
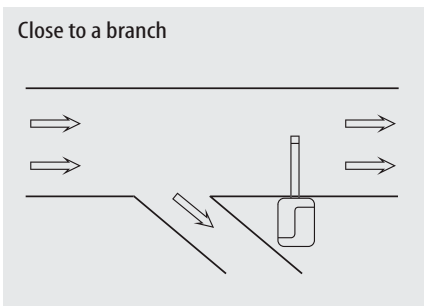
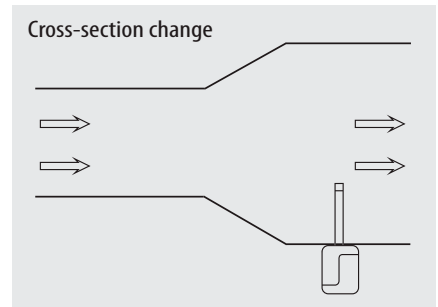
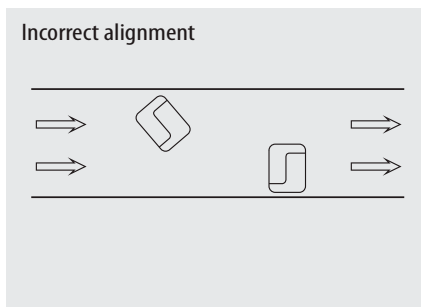
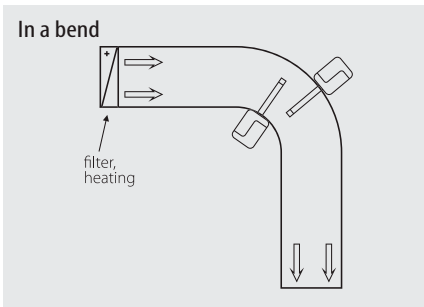
**Correct:**

The axis of the cable grommet should be horizontally in line with the air flow direction.



For rectangular ducts, the diameter **D** is calculated from the rectangle sides **a, b**.

**Incorrect:**





**DESCRIPTION AND APPLICATION**

The SENSITEST 204C and 2004C digital thermometers are developed to measure temperature of solid liquid and gaseous media using external temperature probes. The corresponding temperature probes are connected to the device by means of a CINCH type connector. The probes using the Ni 1000/6180 sensing element of accuracy class A can be connected to the one device. The SENSITEST 204C version is able to measure temperature with the resolution of 0,1 °C, whereas the sensitest 2004C is able to perform this function with the resolution of 1 °C.

Possible battery voltage drop is indicated by the warning notification "LO BAT". Under reduced visibility conditions the brightness of the display can be enhanced by pushing the "Light" button. The standard operating temperature range is determined by the type of the temperature probe connected, the maximum operating temperature range is -30 to 250 °C. Using the SENSITES 204C the maximum temperature of 199,9 °C can be displayed.

These digital thermometers are designed for operation in a chemically non-aggressive environment.

**ACCESSORIES**

- The wall clamping

**DECLARATION, CERTIFICATES, CALIBRATION**

**EC Declaration of Conformity** – in accordance with Act No. 22/1997 Coll. as amended for digital sensors SENSITEST.

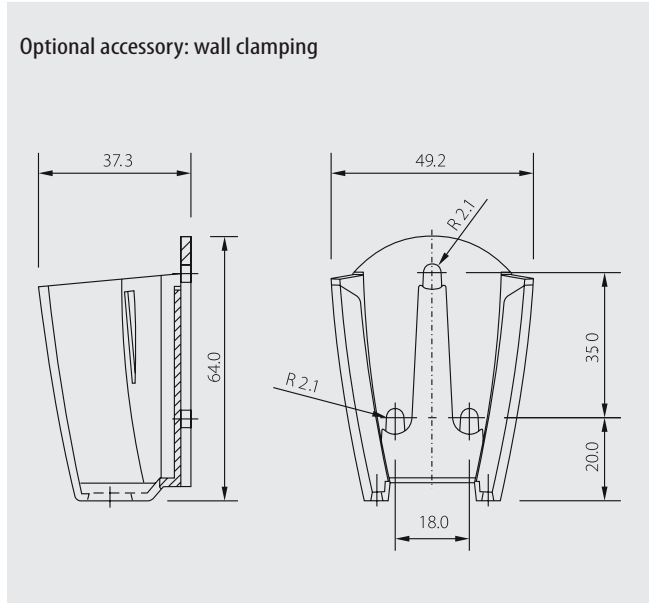
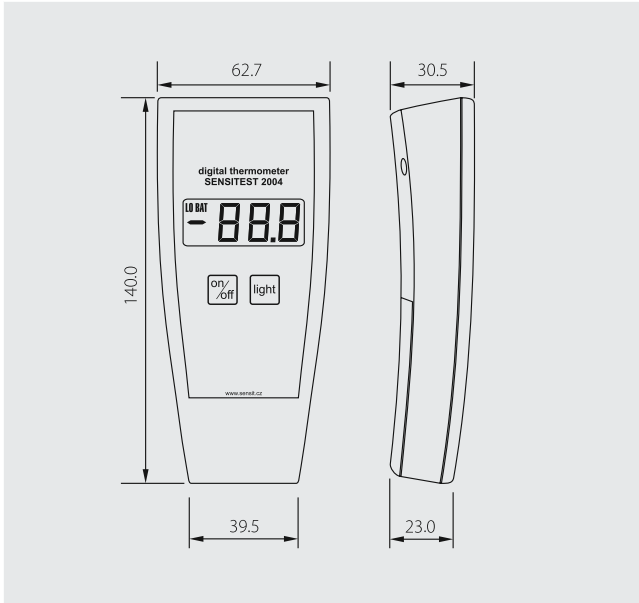
**Calibration** – at the customer's request the calibration can be provided in an accredited laboratory.



**SPECIFICATIONS**

Type of device	SENSITEST 204C	SENSITEST 2004C
Resolution	0.1 °C	1 °C
Type of sensing element	Ni 1000/6180	
Measurement speed	3 measurements per second	
Maximum operating temperature range	-30 to 199,9 °C	-30 to 250 °C
Power supply	9 V battery 6F22 or NiCd cell	
Battery operation service hours	100 hours	
Measurement accuracy of the thermometer including a probe	0 to 100 °C ± (0.3 % of measure temperature + 1 digit)	-30 to 250 °C ± (0.4 % of measure temperature + 1 digit)
Display	3 and 1/2 digits – LCD, character height 13 mm	
Operating temperature	0 to 50 °C	
Connector	CINCH	
Material of the enclosure	ABS (UL94HB)	
Colour of the enclosure	black or white	
Dimensions enclosure	62.7 x 140 x 30.5 mm	
Ingress protection	IP 41 according to EN 60 529	
Weight	0.11 kg (without battery)	

**DIMENSIONAL DRAFT**



**USER INSTRUCTIONS FOR SENSITEST THERMOMETERS**

Switch on the device by the ON/OFF push button, which is located below the display unit. Once activated, the digital thermometer starts to measure temperature immediately. When no temperature probe is connected, "0" is shown on the display.

The battery is located under the removable cover at backside of the instrument.

Possible battery voltage drop is indicated by displaying the warning notice "LO BAT". In this case the battery 9V should be replaced.

## CUSTOM PRODUCTION OF TEMPERATURE SENSORS

We are able to design and produce single quantity units of temperature sensors. Also we are prepared to meet special requirements for specific customer temperature monitoring needs.



### WE CAN OFFER:

1/ Cooperation, our experience and expertise to offer the best sensor solution for your application. Our technicians are available to discuss your monitoring need in person.

2/ Ensure the required certification, statement by rules.

3/ Design and production of temperature sensors „in customs case“

- Production of sensors according to samples or drawings.
- Modification of the standard cases or enclosures.
- Production of sensor with difficult and unusual case design.
- Production of sensor with a small case diameter 2–3 mm.
- Proposing of assembly according to application.

4/ Encapsulation of special sensing element

- KTY ● NTC ● TSic ● SMT 160 ● wo and more elements to case (same & different).

5/ Sensors compliant with special requirement for:

- Resistant to vibration and shock.
- High resistance to abrasive action.
- Use in cryogenic temperatures.
- Frequent repeatability and stability.
- The required high accuracy.
- Execution and compliance to standards (test) el. strenght and puncture.
- Very fast response temperature changes.

6/ Standard used special materials can be replaced according to your requirements..

In areas such as housing material:

- Tin bronze CuSn9 ● Plastics – makromelt ● Aluminium (alloy)
- Stainless steel 1.4571 ● Brass

For cable, shrinking tubes:

- PFA ● Viton ● Kynar ● Flame retardant cable – FM 4910
- Specific cables for application in soil and so on



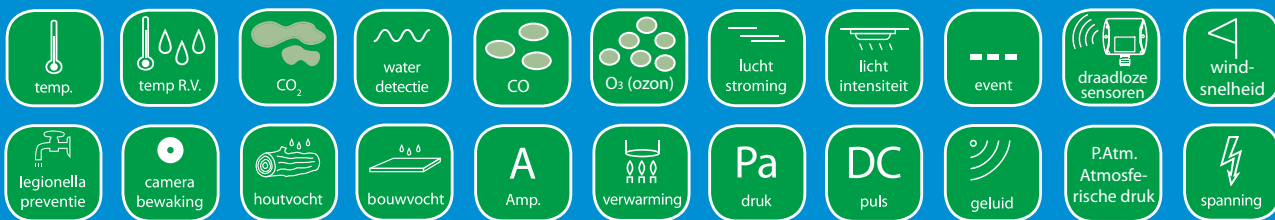
### OUR „ALL-IN“ SERVICE INCLUDES:

- Consequent analysis of application.
- Technical support and consultation to design the best sensor for your needs, personal approach.
- The production and delivery of samples.
- Our price quotes are fully targeting on meeting your needs in terms of specification, quantity, delivery time and of course the best possible pricing.
- The production of sensors includes a quality check of every sensor, for every piece.
- The delivery date between 10–21 days (specific sensor types are available directly from stock).
- Also an express manufacturing and express delivery service is available (acceptance of express orders is subject to our technological and manufacturing schedule. Please contact us for further information).





Meet- en registratie oplossingen voor:



- **Sensoren**
- **Dataloggers/Datarecorders**
- **Monitoring Systemen**
- **Portable meetinstrumenten**
- **Warmtebeeld camera's**
- **Ethernet meetsystemen**
- **Kalibratieservice**

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