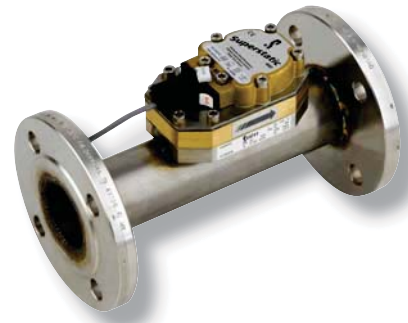


Sontex Energy Meter

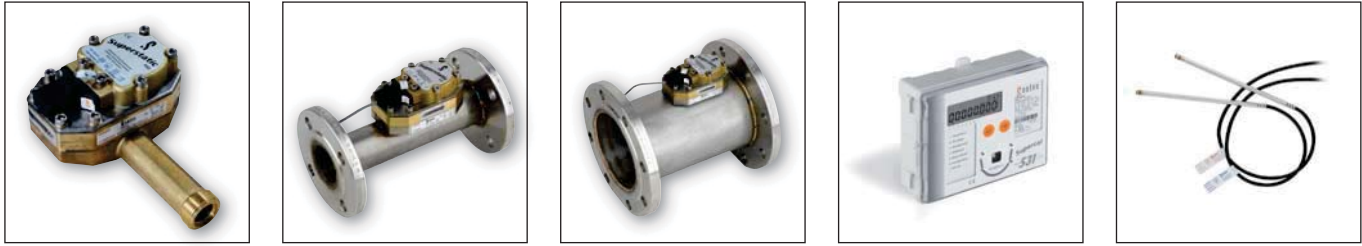


Technical Databook

Version 3.11



Thermal energy meter Superstatic 440+Supercal 531+Temperature sensor



Belimo Trade Item

Nominal pressure PN16
AC 24V power supply
Built-in M-Bus module
Pt500 sensor
EN 1434 Class 2

Temp. sensor cable 3m
Sensor head cable 3m

Threaded connection - Brass pipe (EXT-..)

Model No.	Nominal flow	Mounting length	Connection	Energy unit	Volume unit	Sensor	Pockets
440M0600	1.5m ³ /h	110mm	G 3/4"	0.1kWh	0.001m ³	0460R030	0460A206
440M1000	2.5m ³ /h	190mm	G 1"	0.1kWh	0.001m ³	0460R030	0460A206
440M1600	6.0m ³ /h	260mm	G 1-1/4"	1kWh	0.01m ³	0460R531	0460A207
440M2000	10m ³ /h	300mm	G 2"	1kWh	0.01m ³	0460R531	0460A207

Flange connection - Brass pipe (EXT-..)

Model No.	Nominal flow	Mounting length	Connection	Energy unit	Volume unit	Sensor	Pockets
440M2200	10m ³ /h	300mm	DN40	1kWh	0.01m ³	0460R531	0460A207

Flange connection - Stainless Steel pipe (EXT-..)

Model No.	Nominal flow	Mounting length	Connection	Energy unit	Volume unit	Sensor	Pockets
440X2400	15m ³ /h	270mm	DN50	1kWh	0.01m ³	0460R531	0460A207
440X2600	25m ³ /h	300mm	DN65	1kWh	0.01m ³	0460R532	0460A208
440X3000	40m ³ /h	300mm	DN80	0.01MWh	0.1m ³	0460R532	0460A208
440X3400	60m ³ /h	360mm	DN100	0.01MWh	0.1m ³	0460R532	0460A208
440X3600	100m ³ /h	250mm	DN125	0.01MWh	0.1m ³	0460R532	0460A208
440X3800	150m ³ /h	300mm	DN150	0.01MWh	0.1m ³	0460R532	0460A208
440X4200	250m ³ /h	350mm	DN200	0.1MWh	1m ³	0460R533	0460A209
440X4400	400m ³ /h	450mm	DN250	0.1MWh	1m ³	0460R533	0460A209

Flange connection - Coated Steel pipe (EXT-..)

Model No.	Nominal flow	Mounting length	Connection	Energy unit	Volume unit	Sensor	Pockets
440X4600	800m ³ /h	500mm	DN350	0.1MWh	1m ³	*0460R852	0460A209
440X5000	1500m ³ /h	500mm	DN500	0.1MWh	1m ³	*0460R852	0460A209

*Connection cable is not included for sensor 0460R852, cable400 can be ordered separately.

The tried and tested oscillating jet principle of Superstatic flow sensors in combination with Supercal 531 integrators guarantees reliable, long-term metering of thermal energy and flow.

Thread, EN ISO 228-1

Flange, DIN-EN 1092-1/DIN 2501/ISO 7005-1

Thermal energy meter Superstatic 440+Supercal 531+Temperature sensor

Design The energy meter consists of a Superstatic 440 flow sensor, a Supercal 531 (AC 24V) integrator and a pair of temperature sensors. Consumption values can be read easily on display.

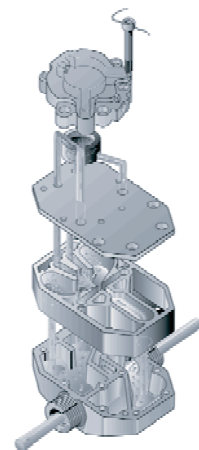
Temperature sensor pair Supercal 531 integrators in combination with Superstatic flow sensors are supplied as standard in Pt500 version. The temperature sensors are matched to one another. They are always supplied in pairs and must not be separated, extended or shortened. In the case of a temperature sensor paired with a cable longer than 3m, we recommend the exclusive use of screened temperature sensor pairs. In this case, the screening must be fitted correctly.

Measurement technique The Supercal 531 with AC 24V power supply records the supply and the return temperature every 3 seconds. The recording flow rate is dependent on the pulse value of the flow sensor unit and is constantly updated. From the mean flow rate, the temperature difference and the heat coefficient will calculate the energy of the captured medium and display on the 8-digit LCD.

Functional description The top level of Superstatic flow sensors is always the sensor level with feedback loops. The sensor frequency/pulses are directly proportional to the flow/volume.

The oscillating jet level has an acceleration section with interactive action. The oscillate frequency of the oscillating jet and the electrical signals generated do not need any external energy source.

The water inlet and outlet have a fluid input optimised for flow and an integrated straight section, which makes an external straight section up to DN40 redundantly.



Main features

Superstatic flow sensors are optimised for the measurement and calculation of energy consumption in cooling and heating systems. They are also extremely well suited to use purely as volumetric flow meters for various media.

- Interchangeable measuring head
- Comprehensive range 1...1500m³/h
- Purchase and maintenance costs are reasonable compared with other static flow sensors.
- Corrosion resistant materials
- Threaded and flange connection
- No straight sections necessary up to DN40
- No moving parts, therefore no wear
- Not sensitive to dirt
- Durable
- Can be installed anywhere
- Common spare parts 1...1500m³/h
- Dynamic range
 - 1:25 for qp 800...1500m³/h
 - 1:50 for qp 40...400m³/h
 - 1:100 for qp 1...40m³/h
- Direct pick-up of voltage pulses
- Measurement irrespective of medium
- Long-term, stable, accurate and reliable measurement, even if water quality is poor.

Ordering

When placing an order for energy meters you must indicate the normal flow used for heating or cooling and mounting place (supply or return).

Integrator

The Supercal 531 integrator is suitable for connection with Pt500 temperature sensor pairs with 2- or 4-conducting wires techniques. Volume inputs can be combined with mechanical, magnetic-inductive, ultrasonic or fluidic oscillators flow sensors with a maximum nominal flow rate of 10,000m³/h. The factor of the pulse value is defined in the flow meter unit. The volume input value is defined when the unit is produced. The additional pulse inputs allow the connection of hot water, cold water, gas, oil and electricity meters. Consumption values can be read easily on the LCD display or via the M-bus.

Power supply module

The power supply of the Supercal 531
- AC 24V 50/60Hz

Communication module

Built-in M-bus module.

Data storage

In case of power failure, the Supercal 531 has two non-volatile EEPROM for extensive data safety storage. In both EEPROM the data is updated every hour. The first non-volatile memory is located inside on the printed circuit board of the relevant calibration and measurement part of the integrator and stores the following data:

- Parameters of the integrator and configuration parameter
- Cumulated energy
- Cumulated volume
- Customer's specific tariff
- 15 monthly values
- 32 maximum values
- 32 average values
- Two set day
- Cumulated energy or volume on the set day
- Operating hours
- Date and time
- MET serial number (integrator upper part, calibration and measurement part)
- Pulse value of the flow meter

The second non-volatile EEPROM is located on the printed circuit board in the integrator base part and stores the following parameters:

- MIO serial number (integrator base part, printed circuit board)
- Identification number and customer number
- Pulse value of additional meters 1 and 2
- Cumulated values of additional meters 1 and 2
- Unit of additional meters 1 and 2
- M-bus address
- Baud rate (M-bus)
- Pulse value of the pulse output
- Parameter setting of the analogue outputs
- Alarm and threshold value

This EEPROM ensures a smooth exchange of the calibration and measurement relevant part, without a new entering of the configuration of the communication.

Main features (continued)

Cumulated energy	For energy unit displayed in kWh/MWh. The maximum energy that can be displayed is 99,999,999; the number of decimals can be set at the factory or by an authorised calibration laboratory.
Backup	For examination and safety storage of the measurement results the Supercal stores all data in a non-volatile memory once per hour. With power supply failure all values are automatically updated and stored.
Test segment	Shown on the LCD display.
Cumulated volume	Displayed in m ³ . The maximum displayable energy is 9,999,999.9, the number of decimals can be set at the factory or by an authorised calibration laboratory.
Operating hour	Displayed in hours.
Error time	The cumulated time, while some error was present, is indicated in minutes.
Flow rate	The current flow rate is displayed in m ³ /h, the number of decimals can be set at the factory or by an authorised calibration laboratory.
Supply and return temperature	The temperature is displayed with one decimal. Temperatures under 0°C are shown with a " - " (minus) sign. The display range is -20...200°C.
Temperature difference	The temperature difference is displayed with two decimals. If the return temperature is higher than the supply temperature, a " - " (minus) sign will be placed in front.
Power	The standard unit displayed in kWh/MWh.
Set day values	The Supercal 531 has two set days. On set day the cumulated energy, volume, tariff values and auxiliary pulse inputs are stored by date.
Monthly values	The storage date for the 15 months' values can be set. The cumulated energy, volume, auxiliary pulse inputs and tariff values are stored. The storage date of the monthly values can be set, if the parameter settings mode is activated.
Average values	For the period of the 32 average values an integration time from 1 minute to 45 days can be chosen. The average value for the actual power, flow, supply and return temperature, temperature difference, impulse input A1 and A2 are displayed on the LCD.
Maximum value	The precise monitoring and recording of power drops can be parameterised in 1-hour cycles and cycles up to 1 year. The maximum values for the actual power, flow, supply and return temperature, temperature difference, impulse input A1 and A2 are displayed on the LCD.
Pulse parameters	The pulse values for the flow meter, for the additional meters A1 and A2 and the pulse values are displayed in the configuration menu. Values can be changed by the program 531.
Identification number	The identification/customer number is displayed with 8 digits. The identification/customer number can be changed via the push buttons, if the parameter setting mode is activated.
Date and time	The date and time are displayed in the different menus. The date with the index DA and the time with Hr are displayed. There is no differentiation between summer and winter time. Thanks to the backup function and in case of power supply loss, the date and time update themselves for several months. The date and the time can be changed via the push buttons, if the parameter setting mode is activated.
Pt500 resistance values	The resistance value is 500 ohm at 0°C.
Primary address	The primary address is displayed on the LCD. The primary address can be changed via the push buttons, if the parameter setting mode is activated.

Main features (continued)

Communication

Communication is displayed by means of an indicator. The indicator enables one to recognise whether the integrator calculates or communicates from the inside or the outside.

Status message transistor outputs

The Supercal 531 allows a locking of status messages on the transistor outputs. The conditions of the status can be defined with the threshold values. An alarm output for fast and exact external monitoring of the operating conditions can be generated.

Solar and cooling installations

The integrator units calibrated for water also ensure a precise measurement with glycol mixtures, as the average mixing ratio can be customised over the optical interface. The Supercal 531 also processes and computes negative temperatures. The dust and splash proof water-protected housings, IP65, are especially suitable for cooling installations. For these customised mixing ratios no official approvals are possible.

Cooling energy

The cooling energy is cumulated, if at the same time the two following conditions are fulfilled:

- (Δt) temperature difference > -0.2K
- as well as the supply temperature < 18°C

The threshold value of the temperature is set at the factory at 18°C. The threshold value can be changed in steps of 1K via the optical interface. The cooling energy has the same physical unit as the heat energy. If the integrator unit is used for the combined heating and cooling measurement, then cooling energy, cooling power and the temperature difference with a minus (-) displayed and the appropriate values are assigned to the tariff 1.

Tariffs

Besides the cooling/heating tariff, the Supercal 531 disposes over the most different customer specific - customised tariffs (e.g. power tariffs), which can be defined with the help of the threshold values. The tariffs can be reloaded without compromising the verification over the M-bus.

Example of tariff types:

- Tariff control by means of the current flow rate
- Tariff control by means of the current power
- Tariff control by means of the temperature difference
- Combined cooling/heating meter
- Tariff control by means of the inner tariff time switch
- Tariff control by means of the M-bus

Open system

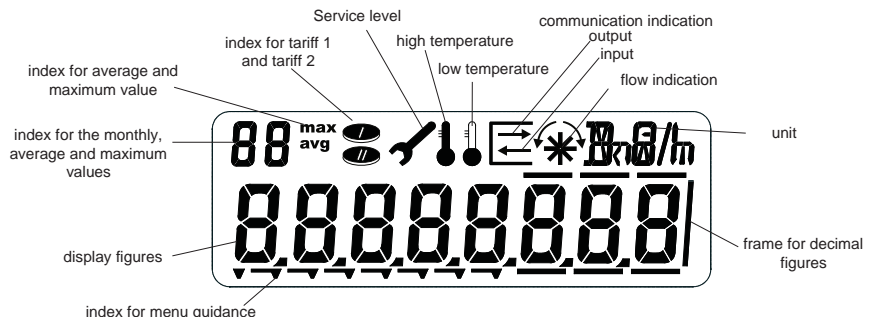
In open system installations a flow meter is mounted in the supply pipe and another one in the return pipe. The integrator unit calculates the used energy by the difference of the temperature and the two flows.

Volume measurement

The integrator Supercal 531 can also be used for volume measurement. In order to ensure an accurate measurement, the average water temperature is parameterised.

Display

In consideration of the person reading the LCD display of the Supercal 531, the display is arranged clearly and is particularly large.



The display sequences are divided into the following menus:

- Main menu
- Set days
- 15 monthly values
- 32 average values
- 32 maximum values
- Configuration
- Service information
- Test and parameter setting level

The display sequence can be customised. The two push buttons enable simple and customer friendly usage and readout of measurement data.

Main features (continued)

Control concept



With the command push button the different display levels or the display within the display level can be selected.



By pressing the enter push button a display level or one of the submenus can be selected. Afterwards the individual displays within the display level or within the submenu can be selected with the command push button. If the command push button and the enter push button are pressed at the same time, then the display switches back again to the selection level of the different display levels.

Operating mode

The integrator Supercal 531 works in principle in normal mode. The following additional operating modes are integrated in the integrator's software:

- Test mode (without damaging the seal)
- Parameterisation mode (user seal to be removed)
- Verification mode (verification seal to be removed)

The integrator Supercal 531 is fully parameterised at the factory and according to the country specific parameter settings. Authorised laboratories offices may modify the factory parameters.

Error messages

The Supercal 531 displays the Err-sign on the LCD, together with a number code of the occurring errors. When several errors occur at the same time the numbers of the error code are summed up; e.g Err3=Err1+Err2.

Err1	Supply sensor is short circuited or disconnected
Err2	Return sensor is short circuited or disconnected
Err4	Flow rate too high
Err8	Storage error EEPROM in the integrator unit - lower part (only after the second time active)
Err16	Storage error EEPROM in measuring and calibration relevant part (only after the second time active)
Err32	Configuration error EEPROM in measuring and calibration relevant part
Err64	Configuration error EEPROM in the integrator unit - lower part
Err128	Error of internal electronic, return to the manufacturer
Err256	Voltage failure
Err512	Defect of communication module, module location 1
Err1024	Defect of communication module, module location 2
Err2048	Error impulse input auxiliary meter A1
Err4096	Error impulse input auxiliary meter A2
Err8192	Error of internal electronic, return to the manufacturer

If an error displays for more than one hour, it is stored in the error memory with the date it occurred, the time error commenced and the duration (in minutes). If an error stays less than 60 minutes, it is deleted automatically and without storage. The two temperature sensor indicators are displayed as a message with the cumulated energy display on the main menu, indicating if:

- The temperature sensors are interchanged >> this condition arises with most installations during the summer time.
- The temperature in the colder line is higher than in the warmer line.

All error messages are deleted automatically on the LCD, 30 seconds after the error correction.

Optical interfaces

The integrator Supercal 531 has an optical interface according to EN 61107. The M-Bus protocol according to EN 1434. The optical interface corresponds electrically and mechanically to the ZVEI IEC 1107 standard. Following start-up and service work, it allows:

- Readout of all values
- Parameterisation
- Tests

Communication options

The Supercal 531 differentiates between standard option possibilities equipped at the factory and optional plug-in communication modules. The Supercal 531 has two plug-in spaces for all kinds of optional communication modules foreseen. The integrator unit recognises the optional modules approximately 10 seconds after plug-in. The functions are freely available.

Open collector outputs

The Supercal 531 has as a standard two Open Collector outputs for energy, volume, tariff 1, tariff 2, alarm and threshold values. These outputs are not galvanically separated. Optionally, two galvanically separated Open Collector output modules for standard or high-speed impulse outputs are available. The high-speed impulse can be used, for example, for the control of a valve. The impulse type and pulse duration can be set over the optical interface or with the help of the control push button.

Resolution of the impulse input and output

The set resolution as well as the unit of the impulse input and output are seen on the display menu - configuration.

Technical data

Flow sensor 1.5...10m³/h (3/4" ...2")

Model No. (EXT-..)	440M0600	440M1000	440M1600	440M2000	
Threaded connector	3/4"	1"	1-1/4"	2"	G
Nominal flow qp	1.5	2.5	6.0	10	m ³ /h
Maximum flow qs	3.0	5.0	12	20	m ³ /h
Minimum flow qi	0.015	0.025	0.06	0.1	m ³ /h
Mounting length	110	190	260	300	mm
Weight	1.8	2.3	1.96	6.1	kg
Standard	EN 1434 Class 2 (+/- 2% at qp)				
Nominal pressure PN	16				bar
Pressure loss at qp	0.09	0.25	0.16	0.25	bar

Flow sensor 10...25m³/h (DN40...65)

Model No. (EXT-..)	440M2200	440X2400	440X2600	
DN	40	50	65	DN
Nominal flow qp	10	15	25	m ³ /h
Maximum flow qs	20	30	50	m ³ /h
Minimum flow qi	0.1	0.15	0.25	m ³ /h
Mounting length	300	270	300	mm
Weight	7.0	12.2	12.8	kg
Standard	EN 1434 Class 2 (+/- 2% at qp)			
Nominal pressure PN	16			bar
Pressure loss at qp	0.25	0.25	0.25	bar

Flow sensor 40...100m³/h (DN80...125)

Model No. (EXT-..)	440X3000	440X3400	440X3600	
DN	80	100	125	DN
Nominal flow qp	40	60	100	m ³ /h
Maximum flow qs	80	120	200	m ³ /h
Minimum flow qi	0.8	1.2	2	m ³ /h
Mounting length	300	260	250	mm
Weight	12.2	14.6	16.0	kg
Standard	EN 1434 Class 2 (+/- 2% at qp)			
Nominal pressure PN	16			bar
Pressure loss at qp	0.09	0.10	0.10	bar

Flow sensor 150...1500m³/h (DN150...500)

Model No. (EXT-..)	440X3800	440X4200	440X4400	*440X4600	*440X5000	
DN	150	200	250	350	500	DN
Nominal flow qp	150	250	400	800	1500	m ³ /h
Maximum flow qs	300	500	800	1600	3000	m ³ /h
Minimum flow qi	3	5	8	32	60	m ³ /h
Mounting length	300	350	450	500	500	mm
Weight	26.0	30.0	57.0	90.0	130.0	kg
Standard	EN 1434 Class 2 (+/- 2% at qp)					
Nominal pressure PN	16					bar
Pressure loss at qp	0.10	0.10	0.10	0.10	0.10	bar

*440X4600 and 440X5000 coated steel pipe

Integrator

STANDARD VERSION

Temperature measurement

Pt500
2 wires
Absolute temperature range -20...180°C
Homologation range 2...150K
Temperature resolution Δt 0.1K
Temperature resolution Δt 0.01K
Measuring precision better than EN 1434-1 request

Measuring cycle

Temperature measurement:
3 seconds when mains operated
Volume measurement:
- Pulse volume is constantly updated

Ambient temperature

Operation +5...+55°C
Storing and transport -25...+70°C

Display

8 digit LCD

Display unit

Energy kWh/MWh
Volume m³
Additional pulse inputs volume or energy
Temperature °C

Input voltage

Voltage AC 24V 50/60Hz

Rated current

AC 24V supply 800mA

Data security

Verification and measurement relevant part EEPROM
Integrator base EEPROM
EEPROM size 8Kb, 10⁶ writing cycle

Housing protection

Integrator IP65
Superstatic 440 IP68

Pulse input

Input frequency
Normal mode max. 5kHz
Fast mode max. 12kHz
Battery operation max. 5kHz
Mains operation max. 12kHz
Input voltage 0...30V
Volume pulse inputs 1-10-100-1000/pulse
or 2.5-25-250-2500/pulse

M-Bus

Fixed or variable data structure
Potential free, reverse battery proof
Baud rate 300...9600 baud

2 pulse outputs

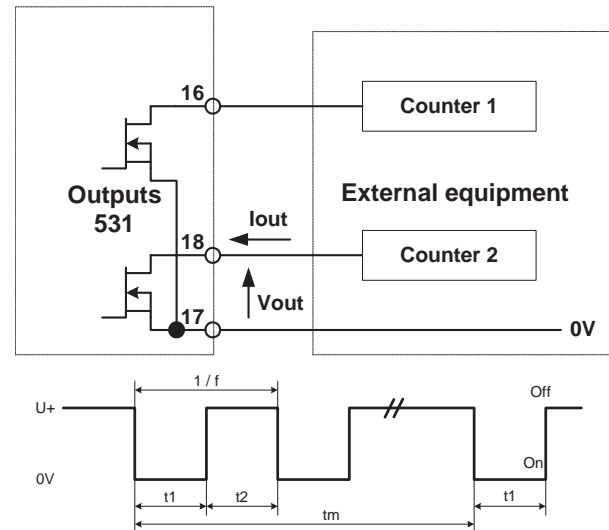
Open collector outputs are polarised and not separated from the ground. They have to be connected to external 'pull-up' resistor. The outputs provide to an external system the possibility to totalise the energy and volume calculated in the integrator or other values related to the configuration settings.

OC class :

allows connection to IB class(EN1434-2:1997prA1) inputs f max=5Hz (+60%/-20%)

OD+ class:

allows connection to fast inputs
f max=10kHz (+60%/-20%)



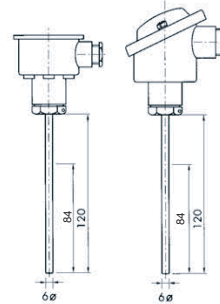
Electric specifications EN1434-2 :1997prA1

	Contact Off	Contact On
Vout max	<30V	0.3V
Vout min	2.0V	0V
Iout max	<5uA @ 30V	<100uA
Iout min0	0uA	1.65uA @ 3.6V
t1 (slow) typ.	---	100mS
t1 (fast) typ.	---	0.05mS
t2 (contact) typ.	100mS	---
t2 (fast) typ.	0.05mS	---

Technical data - temperature sensor 4-wire (optional)

Temperature sensor 84...174mm, diameter 6mm, 4-wire Standard versions temperature sensors

Sensor (EXT-..)	Element	Shielding	Head
0460R850 0460R851 0460R852	Pt500	DIN 43765	Aluminium
0460R853 0460R854 0460R855	Pt500	DIN plastic	Plastic



Measuring element: Pt500 platinum resistor according to DIN IEC 751
Mating: Computer-paired in accordance with CEN 1434
Measuring range: Standard version 0°C...150°C (0°C...180°C with connection head)
Connection: 2-wire cable or 4-wire cable
Connection head Plastic, cable entry PG9 with sealable cover, IP53, or Aluminium DIN 43765 form B, cable entry PG16, IP54
Circuit: Standard version in 4-wire technology
Material: Sensor pipe, stainless high-grade steel 1.4571
Nominal pressure: Sensor PN16, protection pocket PN25
Pocket: Stainless high-grade steel 1.4571 with high pressure-safe squeezing ring connection

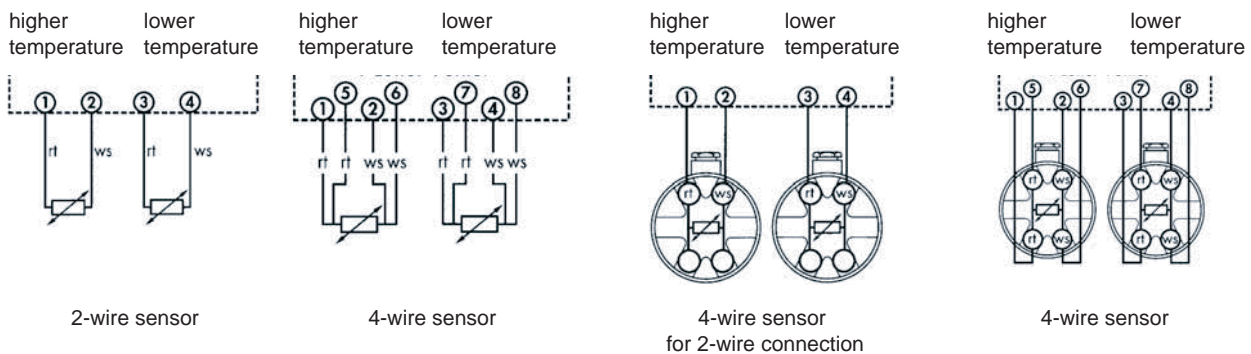
2-wire connection without connection head

For this connection, the resistance of the cable is to be added to the sensor resistance. For the differential temperature measurement, both sensor cables must be identical in length and type. The sensors are computer-matched at the factory and must not be separated. Also the supplied sensor cables are not allowed to be cut.

4-wire connection with connection head

Wire 1 and 2 (3 and 4) are used for constant current flow values whilst 5 and 6 (7 and 8) are for voltage changes from the Pt sensor being measured. In this connection, different cable types or lengths can be used since the cable resistances have no influence on the measurement.

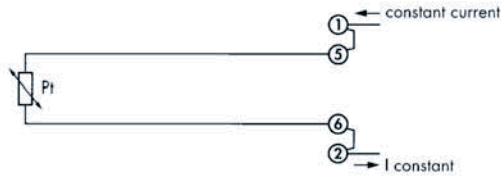
Diagram for connections of temperature sensors



Technical data - temperature sensor 4-wire (optional)

2-wire connection

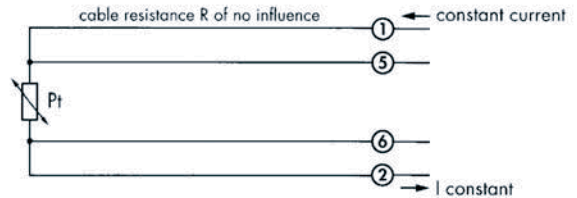
Measuring result=Resistance Pt500+cable resistance



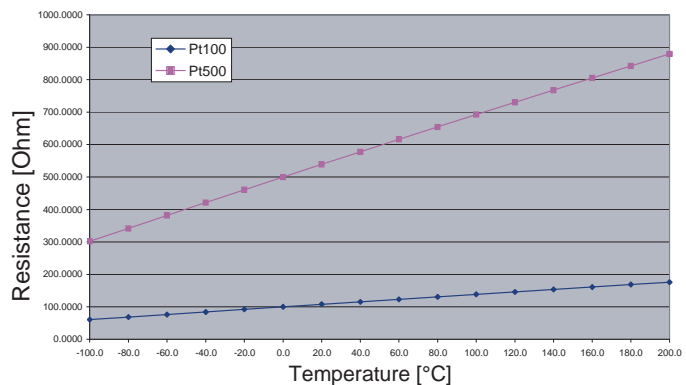
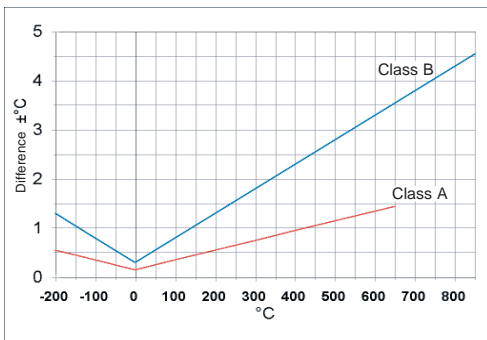
4-wire connection

Measuring result=Resistance Pt500+cable resistance

The cable resistance is not to be considered with 4-wire technology



Characteristics of the temperature sensors according to DIN IEC751



Insulation in accordance with SIA

Temperature sensor overall lengths in dependence of the pipe diameters and thickness of the thermal insulation in accordance with SIA (Schweizerischer Ingenieur-und Architektenverein-Swiss engineer and architect association).

Pipe		Insulation thickness D with temperature difference K			Welding sleeve		Sensor and protection pocket nominal length	
Nominal size		K<40°C	40<K<80°C	K>80°C	d	l		
mm	inch	mm	D mm	D mm	D mm	inch	mm	
15	1/2	21.3	30	40	50	3/8 1/2	20	31 33
20	3/4	26.9	40	40	50	3/8 1/2	20	31 33
25	1	33.7	40	50	-	3/8 1/2	20	31 33
25	1	33.7	-	-	60	1/2	60	84
32	1 1/4	42.4	40	50	60	1/2	60	84
40	1 1/2	48.3	40	50	60	1/2	60	84
50	2	60.3	50	60	60	1/2	60	84
65	2 1/2	76.1	50	60	-	1/2	60	84
65	2 1/2	76.1	-	-	80	1/2	80	134
80	3	88.9	50	60	80	1/2	80	134
100	4	114.8	60	80	80	1/2	80	134
125	5	139.7	80	80	80	1/2	80	134
150	6	165.1	80	80	100	1/2	80	174
200	8	219.1	80	80	100	1/2	80	174

Technical data - temperature sensor 4 wire (optional)

Thermal insulation

For more accurate temperature measurement, thermal insulation should be installed.

Permissible insulation



The insulation should never cover the temperature sensor cable.

Installation recommendations according to EN1434

TYPE OF PROBE INSTALLATION	PIPE SIZE	INSTALLATION RECOMMENDATIONS
A IN THREADED PIPE FITTING	DN15 DN20 DN25	<p>FOR PROBE TYPE DS ONLY</p>
B IN BEND	≤ DN50	
C ANGLED PROBE	≤ DN50	
D PERPENDICULAR PROBE	DN65 TO DN250	