SITRANS TO500, multipoint temperature transmitter

Overview

SITRANS TO500 is a multipoint temperature transmitter for measuring temperatures and temperature profiles with fiber-optic multipoint measuring lances.

Benefits

- Evaluation of a large number of sensors (Fiber Bragg Grating (FBG)) in one temperature transmitter
- Low space requirements of the multipoint measuring lance
- 4 multipoint measuring lance channels per temperature transmitter
- Easy to install
- PROFIBUS DP - Simple integration into control system
- Fast response to temperature changes
- Exact, no recalibration required due to internal reference
- Also suitable for high process temperatures

Application

SITRANS TO500 is used for evaluating a high number of sensors that are arranged on a fiber-optic multipoint measuring lance.

Up to 4 multipoint measuring lances, each with as many as 48 sensors (Fiber Bragg Grating (FBG)), can be simultaneously processed by one SITRANS TO500.

Accurate and fast determination of temperature profiles enables process optimization in terms of service life, quality and output.

Locations of excessive temperature rise are quickly and accurately detected, thereby preventing damage to the process, equipment and environment.

Wherever temperature profiles must be determined and installation space is limited, the SITRANS TO500 with fiber-optic temperature measurement is the right choice.

Design

The SITRANS TO500 multipoint temperature transmitter is located in the control cabinet in a compact aluminum enclosure for mounting onto DIN rails.

The connectors are easy to access on the front:

- 4 x connector for multipoint measuring lances
- 1 x connector for power supply
- 1 x connector PROFIBUS DP
- 1 x connector Ethernet

The status displays are also located on the front.

Mode of operation

In the SITRANS TO500 multipoint temperature transmitter, light with a wavelength from 1 500 to 1 600 nm is generated with a continuously adjustable laser and decoupled to the multipoint measuring lance. Fiber Bragg Gratings (FBG) are mounted at freely defined points on the multipoint measuring lances. Each FBG reflects light of a defined wavelength. The wavelength reflected by the FBG varies depending on the temperature. The reflection at the FBGs is thus a measurement of the temperature at the corresponding measuring point. A maximum of 48 FBGs per channel can be evaluated, depending on the temperature range.

A gas cell with fixed absorption line serves as a reference in the SITRANS TO500 and the wavelength determination is continuously adjusted by it.

Function

The SITRANS TO500 has 4 channels which are evaluated simultaneously. The wavelength reflected at each sensor in the multipoint measuring lance depends on the temperature, and this wavelength is output in the multipoint temperature transmitter. All 4 channels are read at the same time and updated once per second. The temperature can be determined and displayed accurately at up to 48 sensors per channel. The positions of the sensors can be specified by the customer. This leads to a flexible and application-specific solution for the customer.

The measured temperatures are transferred to the control system by PROFIBUS DP. The parameters of the SITRANS TO500 are set via the integrated Ethernet interface.

Technical specifications

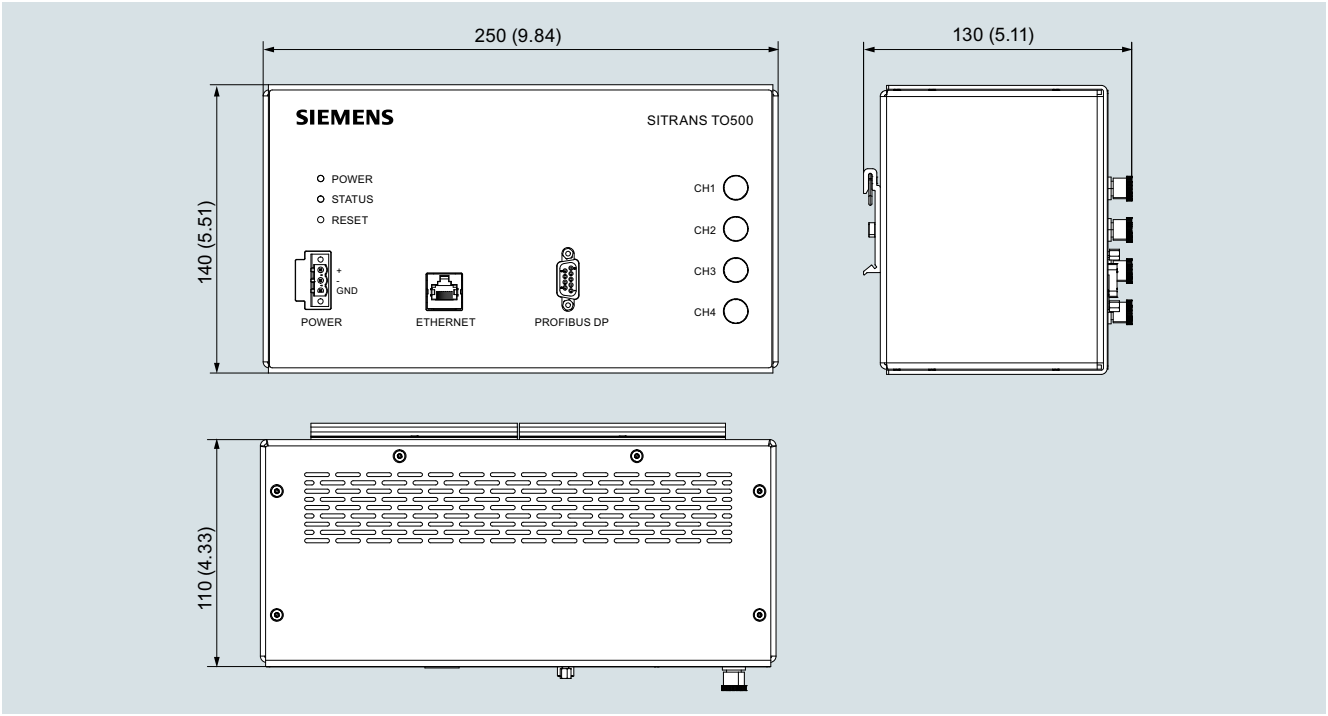
Input	
Channels	4
Measured variable	Temperature
Input type	max. 48 sensors (FBGs) per channel
Characteristics	Temperature-linear
Resolution	0.1 K
Measuring accuracy	< 0.5 K
Repeatability	< 0.5 K
Measuring cycle	1 s
Measuring range	-180 ... +800 °C (-292 ... +1472 °F) depending on the multipoint measuring lance
Unit	°C
Power supply	24 V DC + 20%
Power consumption	Max. 15 W
Protection	Against reverse polarity
Measuring velocity	
• Measurement rate	1 Hz independent of the number of APCBs
Output	
Output signal	PROFIBUS DP
Optical power	≤ 1 mW per channel
Laser protection class	Class 1
Rated conditions	
Ambient conditions	
• Ambient temperature	0 ... 50 °C (32 ... 122 °F)
• Storage temperature	-40 ... +85 °C (-40 ... +185 °F)
• Relative humidity	< 80%, non condensing at 50 °C (122 °F)
• Electromagnetic compatibility	According to EN 61326 and NAMUR NE21
Degree of protection to EN 60529	
• Enclosure	IP20
Design	
Weight	2.4 kg (5.3 lb)
Dimensions	See "Dimensional drawings"
DIN rail adapter	Rear-mounted
Material	Aluminum
Displays and control elements	
LEDs	• "Power-on" (continuous light) • "Status" (flashing during startup; otherwise continuous light)
Pushbutton	"Reset" (system restart or address reset)

Selection and Ordering data

	Article No.
SITRANS TO500 **multipoint temperature transmitter** Communication: PROFIBUS DP Channels: 4 Power supply: 24 V DC Optical connection: FC/APC plug Enclosure: Aluminum, IP20	**7NG9551-4AA00-0AA0**

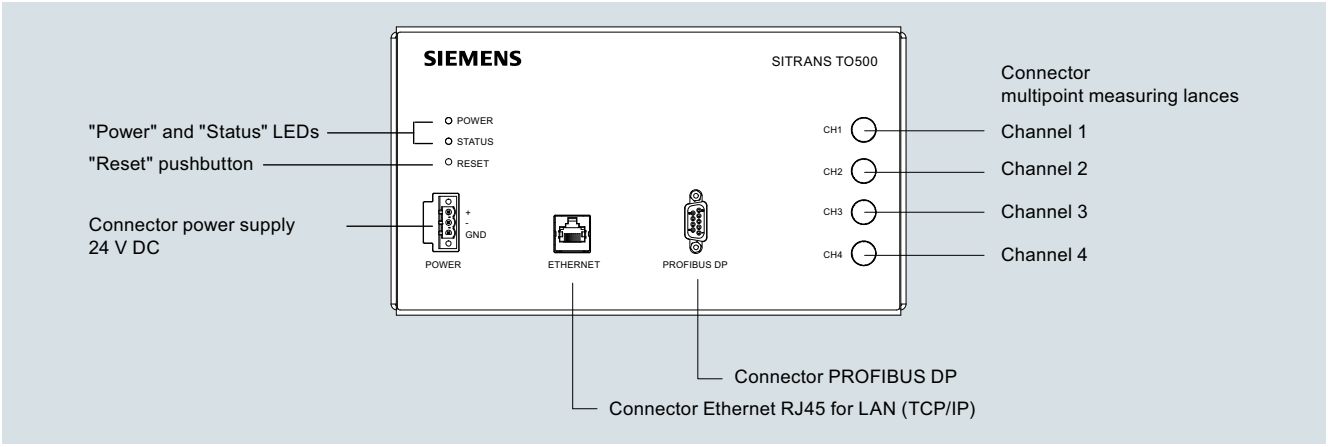
SITRANS TO500, multipoint temperature transmitter

Dimensional drawings



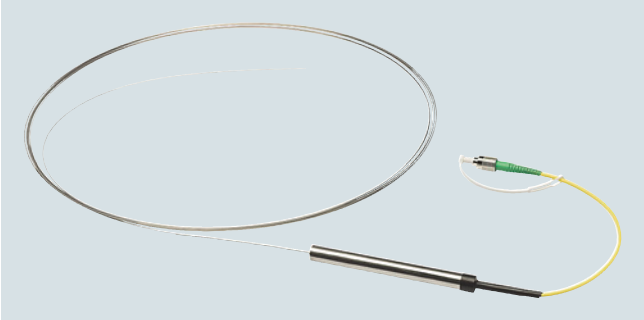
SITRANS TO500, front, rear and side view; dimensions in mm (inch)

Circuit diagrams



SITRANS TO500, connector assignment

Overview



The SITRANS TO multipoint measuring lance for measuring temperatures and temperature profiles using fiber-optic Fiber Bragg Grating (FBG).

Benefits

- Fast response to temperature changes
- Easy to install
- Low space requirements
- Freely selectable sensor arrangement (≤ 20 sensors per multipoint measuring lance)
- Freely selectable measuring lance length (≤ 20 m/787 inch)
- Also suitable for high process temperatures (≤ 450 °C/842 °F)

Application

The SITRANS TO multipoint measuring lance is used for measuring temperatures determined using fiber-optic Fiber Bragg Gratings.

Up to 20 temperature sensors can be arranged on a multipoint measuring lance simultaneously. Depending on the process, the position of the sensor points can be freely selected; minimum distance is 50 mm (2 inch).

Design

The SITRANS TO multipoint measuring lance consists of an optical fiber to which the Fiber Bragg Grating has been applied with a laser.

The fiber is surrounded by a stainless steel capillary.

The multipoint measuring lance is inserted into the measurement environment in a thermowell on the process side, e.g. reactor, vessel.

Mode of operation

From the supplied light with a wavelength range of 1500 to 1600 nm, each grid in the fiber reflects a value that is specific for the position and the temperature. This specific value is evaluated in the SITRANS TO500 multi-point temperature transmitter.

Function

Accurate and fast determination of temperature profiles enables process optimization in terms of service life, quality and output.

Local overheating is detected quickly and precisely located, thereby preventing damage to the process, equipment and environment.

Wherever temperature profiles must be determined and installation space is limited, the SITRANS TO500 and fiber-optic temperature measurement are the right choice.

Integration

Connection to SITRANS TO500 is made via single-mode patch cable.

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Technical specifications

Input	
Measured variable	Temperature
Measuring system	FBG sensors
Working area	1 500 ... 1 600 nm
Resolution	0.1 K
Measuring accuracy	< 1 K or 1% of measuring span; the larger value applies
Repeatability	< 0.5 K
Measuring range	-40 ... +450 °C (-40 ... +842 °F), other ranges on request
Number of sensors	1 ... 20; maximum number depending on the measuring range, numbers > 20 on request
Response time (T0.9)	
• Multipoint measuring lance without thermowell	< 2 s
• Multipoint measuring lance with thermowell, stainless steel, wall thickness 1 mm; example:	
- Outer diameter 3 mm	18 s
- Outer diameter 6 mm	43 s
Rated conditions	
Ambient conditions	
• Ambient temperature	-20 ... +80 °C (-4 ... +176 °F)
• Storage temperature	-40 ... +85 °C (-40 ... +185 °F)
• Operation	Vertically extended or horizontally (+1 K measuring error)
• Relative humidity	5 ... 95 %
• Condensing moisture	Not permitted
Bending radius of the multipoint measuring lance during transportation and installation	> 500 mm (19.7 inch); briefly 250 mm (9.8 inch)
Other conditions	Avoid direct contact of the sensor with aggressive and corroding chemicals such as halogens, NO_X and SO_X
IP degree of protection (handpiece and multipoint measuring lance without connectors)	IP67
Pigtail	
• Bending radius	> 60 mm (2.4 inch)
• Tensile force	< 5 N
Design	
Weight	60 g (0.13 lb) + 2 g/m + 0.0044 lb/m)
Connectors	FC/APC Clean with a suitable cleaning agent before connecting. Close with cap if not in use.
Capillary material	AISI 316L
Dimensions	See "Dimensional drawings"
• Length	0.1 … 20 m (3.9 … 787 inch)
• Diameter	0.8 mm (0.031 inch)
Thermowell inside diameter (recommended)	
• Measuring lance < 2 m (79 inch)	≥ 2 mm (0.0787 inch)
• Measuring lance < 5 m (197 inch)	≥ 3 mm (0.118 inch)
• Measuring lance < 10 m (394 inch)	≥ 4 mm (0.157 inch)
• Measuring lance > 10 m (394 inch)	≥ 6 mm (0.236 inch)
Distance from last sensor to tip of multipoint measuring lance	10 mm (0.39 inch)
Length of sensor point	6 mm (0.236 inch)
Positioning accuracy of sensor	±3 mm (0.118 inch)
Distance between 2 sensors	> 50 mm (2 inch); smaller on request
Length FOC connection to the transmitter	10 000 m (39 3701 inch)

Displays and control elements	
Displays and buttons	
• Without	
Installation instructions	
Mechanical shock	Avoid mechanical shocks to the multipoint measuring lance, such as: Falls from heights > 0.5 m (19.7 inch) or whipping and/or snapping of the capillaries.
Concentrated pressure	Avoid concentrated pressure on the capillaries. For example, do not hold with pliers or other similar tools. After several hours at an ambient temperature > 250 °C (482 °F), the steel loses its elasticity.
Removal and reinstallation	Extreme caution must be exercised during transport, storage and installation if removing or reinstalling. The multipoint measuring lance is irreversibly damaged at temperatures > 550 °C (1 022 °F).

Selection and ordering data

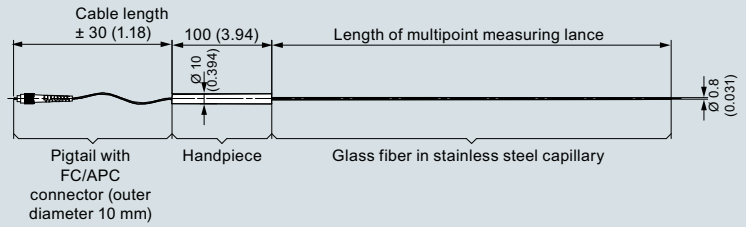
	Article No.	Order code
SITRANS TO multipoint measuring lance (coating: stainless steel) ↗	**7MC7700-**	
↗ Click on the Article no. for the online configuration in the PIA Life Cycle Portal.		
Number of sensors		
1	**0 A**	
2	**0 B**	
3	**0 C**	
4	**0 D**	
5	**0 E**	
6	**0 F**	
7	**0 G**	
8	**0 H**	
9	**0 J**	
10	**0 K**	
11	**0 L**	
12	**0 M**	
13	**0 N**	
14	**0 P**	
15	**0 Q**	
16	**0 R**	
17	**0 S**	
18	**0 T**	
19	**0 U**	
20	**0 V**	
Customer-specific design: Add order code; enter number of sensors and high temperature limit in plain text.	**9 X**	**H 1 Y**
Installation length U; customer-specific		
0.1 m < U ≤ 2 m (4 inch < U ≤ 79 inch)	**A**	
2 m < U ≤ 4 m (79 inch < U ≤ 157.5 inch)	**B**	
4 m < U ≤ 6 m (157.5 inch < U ≤ 236 inch)	**C**	
6 m < U ≤ 8 m (236 inch < U ≤ 315 inch)	**D**	
8 m < U ≤ 10 m (315 inch < U ≤ 394 inch)	**E**	
10 m < U ≤ 12 m (394 inch < U ≤ 472 inch)	**F**	
12 m < U ≤ 14 m (472 inch < U ≤ 551 inch)	**G**	
14 m < U ≤ 16 m (551 inch < U ≤ 630 inch)	**H**	
16 m < U ≤ 18 m (630 inch < U ≤ 709 inch)	**J**	
18 m < U ≤ 20 m (709 inch < U ≤ 787 inch)	**K**	
Customer-specific design: Add order code and specify required length in plain text.	**X**	**Y 4 4**
High temperature limit		
100 °C (212 °F)	**1 0**	
150 °C (302 °F)	**1 1**	
200 °C (392 °F)	**1 2**	
250 °C (482 °F)	**1 3**	
300 °C (572 °F)	**1 4**	
350 °C (662 °F)	**1 5**	
400 °C (752 °F)	**1 6**	
450 °C (842 °F)	**1 7**	
Customer-specific design	**8 8**	

	Article No.	Order code
SITRANS TO multipoint measuring lance (coating: stainless steel)	**7MC7700-**	
Optical connector		
FC/APC connector	**0**	
Mechanically reinforced connector	**1**	
Connecting cable length LC		
LC = 200 mm for standard connection	**B**	
0.2 m < LC ≤ 2 m (define precise length in option Y45)	**C**	
Customer-specific design (LC > 2 m): Add order code and specify required length in plain text.	**Z**	**P 1 Y**
Temperature measurement range		
100 K	**A**	
150 K	**B**	
200 K	**C**	
250 K	**D**	
300 K	**E**	
350 K	**F**	
400 K	**G**	
500 K	**H**	
Customer-specific design: Add order code and specify required temperature measuring range in plain text.	**Z**	**Q 1 Y**
Wavelength bandwidth distribution		
Without (no color code; 1 multipoint measuring lance per channel)	**0**	
Dual split (2 multipoint measuring lances per channel) • 1 500 ... 1 550 nm (white color code; multipoint measuring lance 1 of 2)	**1**	
• 1 551 ... 1 600 nm (black color code; multipoint measuring lance 2 of 2)	**2**	
Quad split (4 multipoint measuring lances per channel) • 1 500 ... 1 525 nm (blue color code; multipoint measuring lance 1 of 4)	**3**	
• 1 526 ... 1 550 nm (red color code; multipoint measuring lance 2 of 4)	**4**	
• 1 551 ... 1 575 nm (green color code; multipoint measuring lance 3 of 4)	**5**	
• 1 576 ... 1 600 nm (yellow color code; multipoint measuring lance 4 of 4)	**6**	
Customer-specific design: Add order code and specify required number of multipoint measuring lances per channel in plain text.	**9**	**R 1 Y**

SITRANS TO, multipoint measuring lance

Options	Order code
Append suffix "**-Z**" to article no., add order code and plain text, if applicable.	
Sensors	
Working temperature of high temperature limit < 100 °C (212 °F)	**Y02**
Tag plate	
Tag plate	**Y15**
Lengths	
Customer-specific installation length (in m)	**Y44**
Customer-specific length of the connecting cable (in m)	**Y45**
Special versions	
Description of the special version	**Y98**
Reference/offer no. - application data sheet with sensor positioning	**Y99**

Dimensional drawings



SITRANS TO multipoint measuring lance with FC/APC connector, pigtail and handpiece; dimensions in mm (inch)