

Operating instructions



Temperature Sensors

for potentially explosive atmospheres in the European Union according to Directive 2014/34/EU (ATEX) / IECEx, protection class Ex d

In the following explosion proof execution:

- Sxx ### Thermocouple / Resistance Temperature Detector



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1 General

The thermosensors described in these operating instructions have been designed using the latest standards, guidelines and findings. During the manufacturing process, all components are subject to our high quality and environmental criteria. For this purpose we maintain certified management systems according to ISO 9001 and ISO 14001. For the special requirements of devices for intended use in potentially explosive atmospheres we maintain a management system according to ISO 80079-34.

1.1 Purpose of this manual

These operating instructions contain basic instructions for the installation, operation and maintenance of the device. It must be read by the installer, the operator and the specialist personnel responsible for the device before installation and commissioning of the device. These operating instructions must always be available at the place of use.

The following sections on general safety instructions 2 as well as the following special instructions on intended use 2.2 to disposal 11 contain important safety instructions, the non-observance of which may cause health and safety hazards to people, in particular to workers, and possibly to domestic and farm animals, as well as property.

1.2 Symbols



Warning.

...indicates a potentially hazardous situation, the non-observance of which may cause hazards to the health and safety of people, especially workers, and possibly to domestic and farm animals, as well as property.



Information.

... highlights important information for efficient and trouble-free operation.

1.3 Limitation of liability

Improper use of the devices, disregarding the operating instructions, the use of unqualified personnel for installation and maintenance work as well as unauthorized modifications to these devices will inevitably result in the loss of liability claims against the device manufacturer.

1.4 Copyright

These operating instructions may only be reproduced and passed on as a complete document without the special consent of the publisher.

Subject to technical changes.

1.5 Warranty

For the product described here we grant warranty according to § 6 warranty for defects, in our General Terms and conditions of delivery and payment.

1.6 Manufacturer address, customer service

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2 Security

2.1 General sources of danger

Temperature sensors are usually components of a control and measurement system. These devices have pressure- or temperature-loaded parts, the failure of which can lead to dangerous situations. The temperature sensors should be selected in accordance with the applicable standards and regulations and the rules of technology.

2.2 Intended use

Temperature sensors type Sxx and Sxx are used to convert the temperature at the measuring point into electrical signal or in digital data.

Further technical data for the intended use are summarized in the product data sheets (chapter 12.1).

2.3 Responsibility of the operator

The safety instructions for proper operation of the device must be observed. They are to be provided by the operator to the respective qualified personnel for installation, maintenance, inspection and operation. Hazards due to electrical energy and released energy of the medium, due to escaping media and due to improper connection of the device must be excluded. For details, refer to the relevant applicable regulations such as DIN EN, UVV (accident prevention regulations) and, in the case of industry-specific applications (DVWG, Ex- GL, etc.), the VDE guidelines and the regulations of the local utility companies.

The device must be taken out of operation and secured against unintentional operation if it must be assumed that safe operation is no longer possible (chapter 10 Malfunctions).



The device may only be opened in a non-explosive atmosphere.

The operational safety of the device and the manufacturer's warranty are only guaranteed if the device is used as intended. The device design must be adapted to the medium and potentially explosive atmosphere used in the plant. The limit values specified in the technical data must not be exceeded. When planning systems in potentially explosive atmospheres, IEC 60079-14 Project Planning, Selection and Installation of Electrical Systems must be applied.

The safety instructions listed in this operating manual, existing national regulations for accident prevention and internal work, operating and safety regulations must be observed by the operator. Furthermore, he is responsible for ensuring that all prescribed maintenance, inspection and installation work is carried out by authorized and qualified personnel.

The operator of this plant is obliged to carry out an ignition hazard analysis and a zone classification.

2.4 Personnel qualification (target group assessment)

The device may only be installed and commissioned by trained specialist personnel.

Qualified personnel are persons who are able to perform the work assigned to them due to their specialized training, experience and knowledge of the country-specific regulations, applicable standards and directives. For explosion-protected devices, the personnel must be trained or instructed or authorized to work on explosion-protected devices in hazardous areas.

2.5 Signage/safety marking

The temperature sensor is provided with labels. The type designation, measuring principle and accuracy class, serial number, Ex marking (including X for special conditions of use), electrical parameters and the manufacturer can be seen on the type plate.

The legibility of the nameplate, which is important for use in potentially explosive atmospheres, must be checked by the operator at regular intervals.

The outer carton is labelled with the type designation, order number, item number, measuring range and manufacturer's details.

2.6 Environmental protection

This device contains electrical components. The requirements listed in the WEEE Directive of the European Union (2012/19/EU) on "Waste Electrical and Electronic Equipment" and by the Electrical and Electronic Equipment Act (ElektroG) have been taken into account and are applicable.

The European Directives (RoHS) 2011/65/EU "On the restriction of the use of certain hazardous substances in electrical and electronic equipment" and the Delegated Directive 2015/863/EU on the extension of the list of hazardous substances in Annex II of Directive 2011/65/EU were taken into account in the manufacture of the products. Compliance with the requirements of these directives is confirmed in the declaration of conformity in the appendix.

Depending on the configuration of our products, the requirements of the directive (REACH) 2006/1907/EC "Registration, Evaluation, Authorisation and Restriction of Chemicals" must be taken into account; the corresponding safety data sheets of the chemical manufacturers can be downloaded from our website. At the end of the product life cycle we recommend to recycle the devices, as they are mainly made of aluminium or stainless steel. Information on disassembly, material separation and disposal can be found in chapter 11.

3 Use in potentially explosive atmospheres according to Directive 2014/34/EU (ATEX)

Our Ex temperature sensors Sxx are used as temperature equipment in liquid and gaseous media for intrinsic safety Ex d (EN IEC 60079-1).

3.1 Range of use:

Explosive atmosphere	Potentially explosive atmospheres		Equipment category 2014/34/EU	Subdivision of gases or dusts	EPL EN 60079-0
Gases & Vapours	Zone 1	Occasionally occurs during normal operation	2G	IIC	Gb
	Zone 2	occurs in normal operation usually don't show up, or only for a short time			

Maximum allowable ambient temperature		
Models	Temperature for classification	Ambient temperature
<i>With and Without transmitter</i>	T6 T5	-20 °C ... +60°C ⁽¹⁾

(1) Extended ambient temperature range are available with special head, in any case refer to label or certificate.

Maximum medium temperature		
Models	Type	Medium temperature
Thermocouple	K, N, E	-200°C ... 500°C
	J	-40°C ... 500°C
RTD	Pt100	-200°C ... 500°C
	Pt1000	-40°C ... 400°C

Permissible ambient media Air with normal oxygen content (21 %), ambient pressure 80 kPa (0.8 bar) to 110 kPa (1.1 bar)



Warning! With gaseous media, the device temperature can increase due to compression heat. In such cases, the rate of pressure change must be throttled or the permissible medium temperature reduced.



The devices must not be operated in hazardous areas of a plant in which an explosive hybrid mixture of gases and dusts is present in the atmosphere.



To avoid additional heating, the devices must not be exposed to direct sunlight during operation!

EU type-examination certificate:

LCIE 02 ATEX 6138X

LCIE, Notified Body number 0081 in accordance with article 17 of the Directive 2014/34/EU of the European Parliament and the Council of 26 February 2014 certifies that product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

Thermocouple (TC) & RTD Temperature Sensors in type of protection explosion proof "d" designed to measure process temperature in liquid or gaseous media.


The temperature sensor consists of:

- The equipment consists of a sensor cable jacketed, with a connection head enclosure certified Ex db IIC Gb.
- Connection head enclosure is made of aluminium alloy or stainless steel and certified. Temperature classification in this report is considered only for connection head enclosure.

Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

Standards applied for the evaluation of ignition protection	
IECEX	ATEX
IEC 60079-0:2017 IEC 60079-1:2014	EN IEC 60079-0 :2018 EN 60079-1:2014

3.2 Marking

ATEX	ATEX	IECEX
Explosion proof (Zone 1 and 2)	CE 2813  II 2 G Ex db IIC T6...T5 Gb	Ex db IIC T6 or T5 Gb

3.3 Specific conditions of use in potentially explosive atmospheres

- Maintenance work to be carried out, from chapter 9 by non-authorized personnel, may result in damage and lead to loss of approval. The electrical connection may only be carried out by trained and authorized personnel.
- When temperature probes are integrated in an ATEX safety apparatus in charge of limitation of explosion hazards, the safety apparatus must be assessed according to EN 50495 requirements.
- Temperature probes must be replaced after 10 years of use.
- Use of product in low vibration environment.
- In function of the operating ambient temperature, the apparatus can be only equipped with the following connecting heads:

Connection head	Certification	Operating ambient temperature
FPL: TTE1xx	CESI 00 ATEX 008U IECEX CES 14.0005U, Issue No:1	-55°C to +75°C
FPL: TTE2xx, TTE3xx, TTE6xx, TTE7xx	CESI 08 ATEX 029U IECEX CES 14.0006U, Issue No:1	-55°C to +60°C
LIMATHERM: XD-A**	FTZU 03 ATEX 0074U IECEX FTZU 14.0003U, Issue No:3	-50°C to +60°C

- The calorific transfer of sensor shall not transmit, in any case a heating above 80°C including ambient temperature, to all sensor part directly in contact with explosive atmosphere.
- It is the responsibility of the manufacturer or end user to ensure that external source of heating or cooling (if present) does not impact the temperature classification of the equipment.
- For higher max ambient temperatures see table below (only for the version with head TTE1XX / IECEX CES 14.0005U:

Surface temperature class / Process temperature	T6 400°C	T6 700°C	T5 700°C
Ambient temperature	-55°C to +75°C	-55°C to +65°C	-55°C to +75°C

- The equipment must be associated to a certified Ex d cable gland.

4 Technical data

For detailed technical data please refer to the documents in the appendix chapter 12.

5 Marking of the device

The nameplate is located on the housing perimeter and includes:

- Manufacturer
- Marking of the device for potentially explosive atmospheres (ATEX)
- Type designation
- Measuring principle
- Electrical ratings
- Serial number
- Accuracy class
- Warning "DO NOT OPEN WHEN AN EXPLOSIVE GAS / DUST ATMOSPHERE PRESENTS".

Example nameplate:

	ATEX	IECEX
Type: S## RUEGER Made in Germany Input: 1 x PT 100 cl. A IEC 60751 SN: ##### Date: 20## 52477 Alsdorf, Germany	CE 2813 LCIE 02 ATEX 6138 X II 2 G Ex db IIC T6...T5 Gb -50°C ≤ Tamb ≤ +60°C * *Ref. to certificate for extended temp. WARNING: DO NOT OPEN WHEN ENERGIZED	IECEx LCIE 13.0050 X Ex db IIC T6...T5 Gb - 50°C ≤ Tamb ≤ +60°C * *Ref. to certificate for extended temp. WARNING: DO NOT OPEN WHEN ENERGIZED

6 Structure and function

6.1 Functional description

A thermocouple produces a temperature-dependent voltage. This design of sensor consists of two dissimilar metal wires, which are joined together at one end, connected to an instrument that is capable of accepting a thermocouple input and measure the reading.

An RTD (Resistance Temperature Detector) is a sensor whose resistance changes as its temperature changes. The resistance increases as the temperature of the sensor increases. The resistance vs temperature relationship is well known and is repeatable over time

6.2 Description of the components

The measuring insert is designed with one or two measuring circuits and is equipped with thermocouple or RTD (Resistance Temperature Detector) sensors. These sensors are embedded in a densely compacted powder made of magnesium oxide (MgO), which provides excellent electrical insulation and thermal conductivity. The entire assembly is enclosed within a metallic sheath, which is made of stainless steel for additional mechanical protection and durability. The measuring element is connected either to a terminal block or one of the transmitters from the associated transmitters. Connection head enclosure are made of aluminum alloy or stainless steel.

7 Transport

The temperature sensors must be protected from rough impact. The device must only be transported in the packaging provided for this purpose. The transport may only be carried out in a cleaned condition (free of residual medium). Plastic blind plugs serve to protect the device during transport and must be replaced by suitable cable entries.

7.1 Transport inspection

The delivery must be checked for completeness and transport damage. In the event of transport damage, the delivery is not to be accepted or only with reservations, the extent of the damage is to be noted and, if necessary, the complaint is to be initiated. In such cases, please contact our service department.

7.2 Storage

The storage of the devices should exclude external influences as far as possible in order to avoid damage to the devices. Vibrations or impact effects must be avoided, the limit values of the storage temperatures must be taken into account.

8 Mounting



In addition to the measures described here for the installation of Ex devices, IEC 60079-14 must be taken into account.

8.1 Preparation

To ensure safe working during installation and maintenance, suitable shut-off valves must be installed in the system by means of which the unit:

- can be subjected to a functional check on site.

During the work of mounting/installing the switch, the system must be secured against being switched on again.

It is recommended to carry out the assembly / installation without an existing explosive atmosphere (e.g. ventilated room).

8.2 Requirements for the installation site

- Check the suitability of the device for the medium to be measured,
- Design of the measuring range to the requirements of the measurement,
- A measuring device holder must be installed if the measuring line does not have sufficient load-bearing capacity.
- Please refer to the corresponding data sheets for the materials used and technical data.
- To minimize the risk of injury, the temperature sensor must be installed in accordance with the required safety and electrical codes.
- The temperature sensor must be protected from moisture, shock and/or extreme vibration.
- Mounting position: The temperature sensor can be mounted in any position.
- In potentially explosive atmospheres, check that the atmosphere is not explosive and that the power supply is disconnected before removing the cover.
- Damage to the immersion tube and the sensor must be prevented. Flexible and MgO cables must not be kinked or laid in too tight a radius.
- To avoid measurement errors due to heat conduction and radiation, the following minimum immersion lengths are recommended

Type	Inset	In liquid (water)	In gas/vapour
RTD	Ø3mm	60 mm	75 mm
	Ø6mm	30 mm	50 mm
TC	Ø3mm	45 mm	55 mm
	Ø6mm	15 mm	25 mm

8.3 Process connection

- Connection only by authorized and qualified personnel.
- If the process medium is also subject to pressure or flow during temperature measurement, a thermowell has to be used.
- Use only with mechanical process connection provided - for version, see ordering code on the nameplate of the device with matching thread seal.

8.3.1 Electrical connection



When installing and operating electrical systems in potentially explosive atmospheres, the electrical data in the EU type examination certificate and the locally applicable regulations and directives must be observed (e.g. EN 60079-14 etc.).

- Connection only by authorized and qualified personnel.

- The electrical connection of the device must be carried out in accordance with the relevant regulations of the VDE directive and the regulations of the local utility company.
- Before wiring the electrical connections, the system must be disconnected from the power supply.
- Before putting the temperature sensor into operation, close all cable openings and/or terminal boxes in accordance with the required safety and electrical regulations.
- Always follow safety and electrical regulations when connecting these devices.
- Connect the device according to the electrical connection standards or identification of measurement circuits on terminal block and/or marking plate:
RTD: color coding, according to IEC 60751.
TC: type of thermocouple is identified by color code for thermocouples according to IEC 60584-3 or ANSI/ASTM E230/E230M depending on the order.
- The device must be earthed on cable shield or within the junction box
- Internal resistances of conductors inside inset are approx. 0.28 Ω /m for insets \varnothing 3 mm and approx. 0.07 Ω /m for insets \varnothing 6 mm (indicative values for temperatures +15 to +35°C).

8.4 Changes to the installation site



Do not dismantle the temperature sensor from one measuring point and mount it at another. There is a risk of mixing media with unpredictable chemical reactions.

9 Maintenance



All maintenance or inspection work must be carried out in accordance with IEC 60079-17.

All ASHCROFT temperature sensors are virtually or completely maintenance free.

- Ensure that the enclosure remains closed at all times to ensure IP and ignition protection.
- If the temperature sensor is exposed to process media that may harden and/or accumulate in the process connection, the device may need to be removed and cleaned.

However, in order to ensure reliable operation and a long service life of the device, we recommend that the device be checked regularly.

During maintenance work, no potentially explosive atmospheres may be present in the vicinity of the Ex device, the process lines must be depressurized, the temperature sensors must cool down to ambient temperature, the electrical connections must be disconnected from the power supply and the system must be secured against being switched on again.

9.1 Functional check and recalibration

The function check and recalibration is carried out at regular intervals depending on the application. The exact test cycles are to be adapted to the operating and ambient conditions. When various device components interact, the operating instructions of all other devices must also be observed.

- Verification of the function in conjunction with other components in the process.
- Checking the electrical connections.
- Remove any dust deposits
- Checking the legibility of the nameplate
- Possible damage to the cable, housing or the earths

9.2 Cleaning and maintenance

Cleaning is carried out with a non-aggressive cleaning agent and a damp, soft cloth to avoid electrostatic charging. In the same work process, care can be taken to detect possible damage to the device at an early stage. If damage is detected, the device should be handed over to the manufacturer's service department immediately.

10 Malfunctions



All defective or deficient equipment shall be taken out of service in accordance with IEC 60079-19.

Defective or defective temperature sensors endanger the operational and process safety of the plant and can lead to danger or damage to persons, the environment or the plant.

10.1 Fault table

Malfunctions	Possible causes	Possible measures
Random measuring results	Damage in transit or external rough impact	Replacement of the device, Repair is usually no longer possible.
Corrosion at the process connection	Incompatible medium	Check installation location and replace device
Leakage of process media	Seal not perfect	Errors during assembly
Damage to housing or cables		Repair by the manufacturer, Replace device

10.2 Behavior after rectification of the fault

- See chapter 8.3 Assembly/installation

11 Dismantling & disposal

11.1 Disassembly

- During maintenance work on the device, the lines must be depressurized, the electrical connections disconnected from the power supply and the system secured against being switched on again.
- Remove temperature sensor with a suitable tool.



Residual media in and on removed temperature sensors can endanger people, the environment and equipment. Sufficient precautionary measures must be taken. If necessary, clean the devices thoroughly (see instructions in the safety data sheets).

11.2 Disposal



At the end of the product life cycle, do not dispose of this product with your normal household waste. Take this product to a collection point or waste management facility for recycling of the components.

With the help of the product coding and our data sheets (see appendix 12.1 available on our website) you will receive the necessary information about the materials to be able to carry out a material separation yourself.

Please help to protect our environment!



Some of the product materials can be reused if you take the product to a collection point or a waste management company. By reusing some parts or raw materials from used products, you are making an important contribution to protecting the environment.

Our products are delivered in optimized packaging. This essentially means that materials are used that can be recycled as secondary raw materials at the local disposal service. For more information on the disposal of packaging, please contact your local authority.

12 Appendix

12.1 Data sheet for thermocouple and RTD Sxx

Detailed data sheets are available directly from the manufacturer (see chapter 1.6 Manufacturer's address, customer service).

The following table contains an overview of the individual documents.

Model	Description	Document
S10	Temperatur sensor for thermocouples and RTD	DS S10
S50	Temperatur sensor for thermocouples and RTD	DS S50
S70	Temperatur sensor for thermocouples and RTD	DS S70

12.2 EU Declaration of Conformity



EU-Konformitätserklärung EU-Declaration of Conformity EN ISO / IEC 17050-1:2010



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erklärt in alleiniger Verantwortung, dass die mit CE gekennzeichneten Produkte
declares in sole responsibility that the products marked with CE

Gerät: **Temperatursensor Sxx** (gilt auch für Sensoren mit verbauten Transmittern)
Equipment: **Temperatur Sensor Sxx.** (also applicable for Sensors with Transmitter)
Sxx = 10, 50, 70

Kennzeichnung: **LCIE 02 ATEX 6138 X // IECEx LCIE 13.0050 X**
Marking:

CE 2813 **Ex** II 2G
Ex db IIC T6...T5 Gb
Ta= siehe Betriebsanleitung / see instruction manual

Herstellungsdatum: **ab 08.12.2025**
Date of manufacture: *from 8th of December 2025*

die grundlegenden Sicherheits- und Schutzanforderungen erfüllen, in Übereinstimmung mit den unten genannten Richtlinien und Normen. Die Konformitätsaussage bezieht sich auf die Konzeption und Fertigung der oben genannten Produkte.

Meet the essential safety and protection requirements in accordance with the directives and standards listed below. This declaration of conformity refers to the design and manufacture of the above-mentioned products.

Richtlinie <i>Directive</i>	2014/34/EU „Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen“ <i>“equipment and protective systems intended for use in potentially explosive atmospheres”</i>
Harmonisierte Normen <i>Used harmonized Standards</i>	EN 1127-1:2019, EN IEC 60079-0:2018, EN 60079-1:2014
Benannte Stelle 2813 <i>Notification Body 2813</i>	CSA Group Netherlands B.V. Utrechtseweg 310 (B42) 6812AR Arnhem, Netherlands
Bericht zur Bewertung <i>Assessment Report</i>	19892504-792987 v00
Richtlinie <i>Directive</i>	2014/35/EU „Niederspannungsrichtlinie“ <i>“Electrical equipment designed for use within certain voltage limits”</i>
Harmonisierte Normen <i>Used harmonized Standards</i>	IEC 61010-1:2010 + COR:2011 EN 60947-7-1 to 3:2010
Richtlinie <i>Directive</i>	2014/30/EU Richtlinie „Elektromagnetische Verträglichkeit“ <i>„Electrical equipment for measurement, control and laboratory use”</i>
Harmonisierte Normen <i>Used harmonized Standards</i>	EN 61000-6-2:2005/AC:2005, EN 61000-6-4:2007/A1:2011, EN 61326-1:2013
Richtlinie <i>Directive</i>	2011/65/EU „Richtlinie zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten“ <i>“Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment”</i> 2015/863/EU „Änderung von Anhang II der Richtlinie 2011/65/EU“ <i>“Amending Annex II to Directive 2011/65/EU”</i>
Bewertung <i>Evaluation</i>	Das oben benannte Produkt erfüllt die Anforderungen der derzeit gültigen EU Richtlinien. <i>The above-mentioned product comply with the currently valid provisions of EU Directive.</i>

Alsdorf, den 08.12.2025
Ort und Datum
Place and date

ATEX Verantwortlicher
ATEX Manager

Digitale Ausführungen nur mit validierter Unterschrift gültig. Die gültige Validierung ist in einem unveränderten Dokument enthalten.
Digital executions valid only with validated signature. The valid validation is included in an unmodified document.

12.3 Technical information for execution SIL2 sensor type S** and temperature transmitters

Convert the temperature at the measuring point into electrical signal or in digital data			
Summary of IEC 61508-2 Clauses 7.4.2 & 7.4.4		Sxx Temperatur sensor	
		RTD	Thermocouple
Random hardware failures: [h ⁻¹]	λ _{DD}	3.81E-07	9.0E-07
	λ _{DU}	9.50E-08	1.0E-07
Random hardware failures: [h ⁻¹]	λ _{SD}	0.00E-00	0.00E-00
	λ _{SU}	0.00E-00	0.00E-00
Diagnostic coverage (DC)		80%	90%
PFD @ PTI = 8760 Hrs. MTTR = 8 Hrs.		4.16E-04	4.39E-04
Probability of Dangerous failure (High Demand - PFH) [h ⁻¹]		9.5E-08	1.00E-07
Hardware safety integrity compliance		Route 1 _H	Route 1 _H
Systematic safety integrity compliance		Not assessed	Not assessed
Systematic Capability (SC1, SC2, SC3, SC4)		Not assessed	Not assessed
Hardware safety integrity achieved		SIL2	SIL2