

ZIRKOR200 Ex-D

Oxygen Analyzer

SICK
Sensor Intelligence.



Described product

Product name: ZIRKOR200 Ex-D

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Original document

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1 About this document

1.1 Function of this document

These Operating Instructions describe:

- Device components
- Installation
- Operation
- Maintenance work required for reliable operation
- Decommissioning

1.2 Scope of application

These Operating Instructions are only applicable for the measuring device described in the product identification.

They are not applicable for other SICK measuring devices.

The standards referred to in these Operating Instructions are to be observed in the respective valid version.

1.3 User qualification

These Operating Instructions are intended for persons installing, operating and maintaining the device.

Table 1: Qualification requirements

Work	User groups	Qualification
Installation	Operator / system integrator	<ul style="list-style-type: none"> • E.g. plant operator, untrained in measurement technology • Qualification for explosion protection
Electrical installation	Qualified personnel	<ul style="list-style-type: none"> • Authorized electrician (authorized skilled electrician or person with similar training) • Qualification for explosion protection
Initial commissioning	Authorized operator ☹	<ul style="list-style-type: none"> • General knowledge of measurement technology, device expertise (customer training at SICK if necessary) • Qualification for explosion protection
Recommissioning		
Decommissioning	<ul style="list-style-type: none"> • Operator / system integrator • Authorized operator ☹ 	<ul style="list-style-type: none"> • E.g. plant operator, untrained in measurement technology • Authorized electrician (authorized skilled electrician or person with similar training) • Qualification for explosion protection
Operation		
Maintenance		
Troubleshooting		

1.4 Further information










Observe the supplied documents.

- Final inspection record ZIRKOR200 Ex-D
- USB stick with technical information and certificates

1.5 Symbols and document conventions

1.5.1 Warning symbols

Table 2: Warning symbols

Symbol	Significance
	Hazard (general)
	Hazard by electrical voltage
	Hazard in potentially explosive atmospheres
	Hazard by explosive substances/mixtures
	Hazard by oxidizing substances
	Hazard by toxic substances
	Hazard by unhealthy substances
	Hazard by high temperature or hot surfaces
	Hazard for environment/nature/organisms

1.5.2 Warning levels and signal words

DANGER:

Risk or hazardous situation which *will* result in severe personal injury or death.

WARNING:

Risk or hazardous situation which *could* result in severe personal injury or death.

CAUTION:

Hazard or unsafe practice which *could* result in less severe or minor injuries.




NOTICE:

Hazard which *could* result in property damage.

Note:

Hints

1.5.3 Information symbols

Symbol	Significance
	Information on the nature of the product in relation to Directive 2014/34/EU for devices and protective systems intended for use in potentially explosive atmospheres
	Important technical information for this product
	Important information for electrical or electronic functions

1.6 Data integrity

SICK AG uses standardized data interfaces, such as standard IP technology, in its products. The focus here is on product availability and features.

SICK AG always assumes that the customer is responsible for the integrity and confidentiality of data and rights involved in connection with using the products.

In all cases, the customer is responsible for the implementation of safety measures suitable for the respective situation, e.g., network separation, firewalls, virus protection and patch management.

2 For your safety

2.1 Basic safety information

Work on the device



DANGER: Danger of explosion

Danger of explosion when working on the device.

- ▶ Ensure no explosive atmosphere is present when working on the device.
 - ▶ Make sure the stack is switched off.
-



DANGER: Danger of explosion through explosive mixture in the components

Close filter and analyzer electronics cover completely after working on the device, otherwise ignitable sparks can escape and lead to explosions.

- ▶ Close filter and analyzer electronics cover completely after working on the device.
-



DANGER:

Risk for system safety through work on the device not described in these Operating Instructions

Work on the device not described in these Operating Instructions or associated documents can lead to unsafe operation of the measuring system and therefore endanger plant safety.

- ▶ Only carry out the work on the device described in these Operating Instructions and associated documents.
-



DANGER:

Danger of explosion through incorrect performance of work described in these Operating Instructions

Incorrect performance of work in potentially explosive atmospheres can cause serious injuries to people and damage during operation.

- ▶ Maintenance and commissioning tasks as well as checks should only be carried out by experienced/trained personnel with knowledge of the rules and regulations for potentially explosive atmospheres, especially:
 - Ignition protection types
 - Installation rules
 - Zone classification
-

Escaping gases



DANGER:

Risk of burns and poisoning from escaping hot and toxic gas in systems with overpressure conditions

In systems with overpressure, hot and toxic gas can escape from the process connection. This can lead to burns or damage to health.

- ▶ Always keep the process connection tightly closed.
 - ▶ Pay attention to hot surfaces.
 - ▶ Wear appropriate protective equipment.
-

Potential equalization



CAUTION:

Danger of explosion through incorrect or missing grounding

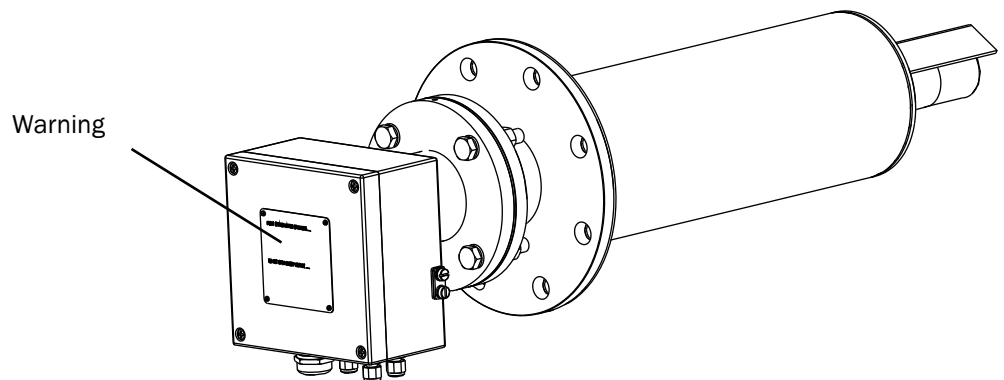
Incorrectly connected potential equalization can lead to potential differences which can create sparks due to transient phenomena (discharges) and lead to explosions in Ex-atmospheres.

- ▶ Connect a potential equalization on all planned points on the device components.
- ▶ Ensure the potential equalization is connected during all work on the device described in these Operating Instructions.
- ▶ Ensure there is a ground connection via the voltage supply.
- ▶ Perform regular checks of the grounding connections for intactness.

2.2 Warning information on device

On the analyzer electronics enclosure:

Fig. 1: Warning information on the analyzer electronics enclosure



- Do not open under voltage and when the incinerator is in operation. Wait for at least 1 hour after switching the stack off to allow the analyzer unit components to cool down below the temperature critical to touch.
- Follow the instructions in the Manual.

2.3 Intended use

2.3.1 Purpose of the device

The device is a stationary oxygen measuring device and serves continuous measurement of oxygen as emission and process monitoring in the industrial sector. The device measures continuously directly in the gas duct (in-situ).

This device has been especially designed for use in explosive dust atmospheres and certified according to the Ex-identifications stated in the following Section.

2.3.2 Operation in potentially explosive atmospheres

- The ZIRKOR200 Ex-D analyzer unit corresponds to the ATEX category (according to ATEX 2014/34/EU):
⚠ II 2D Ex tb IIIC T133 °C/T141 °C Db
- The ZIRKOR200 Ex-D analyzer unit meets the IECEx qualification:
Ex tb IIIC T133 °C/T141 °C Db
- Location of Ex-relevant assemblies, see [“System overview”, page 19](#).
- Do not remove, add or modify any components to or on the device unless described and specified in the official manufacturer information. Otherwise the approval for the device for use in potentially explosive atmospheres becomes void.
- Adhere to the prescribed maintenance intervals, see [“Maintenance plan”, page 56](#).

Special conditions:

The specification of the surface temperature of T133 °C/T141 °C applies to an ambient temperature range of -20 °C to +40 °C/70 °C.

- The heater voltage of the measuring probe must be switched off by a monitoring device independent of the control and certified for this use when a limit temperature of 810 °C is reached. This task is performed by the heating monitoring system (see [“Heating shut-down in case of malfunction”, page 69](#)).
- Only use the analyzer unit with associated protective pipe in flue gases, when the composition is not critical concerning the corrosion effect on the materials used. If this cannot be ensured, regular recurring checks must be carried out at sufficiently short intervals (see [“Maintenance plan”, page 56](#)).
- The flue gas temperature must not exceed 600 °C on the measuring probe.

2.4 Responsibility of user

2.4.1 Designated users

see “User qualification”, page 7

The ZIRKOR200 Ex-D should only be installed and operated by skilled technicians who, based on their technical training and knowledge as well as knowledge of the relevant regulations, can assess the tasks given and recognize the hazards involved.

2.4.2 Correct project planning

This Manual presumes that the device has been delivered as specified during project planning (i.e., based on the SICK application questionnaire) and the relevant delivery state of the device (delivered System Documentation).

- ▶ If you are not sure whether the device complies with the planned configuration or the delivered system documentation:
Contact SICK Customer Service.

2.4.3 Correct use

- ▶ Only use the ZIRKOR200 Ex-D as described in these Operating Instructions (see “Intended use”, page 11). The manufacturer bears no responsibility for any other use.
- ▶ Carry out the prescribed maintenance work (see “Maintenance plan”, page 56).
- ▶ Do not carry out any work on the ZIRKOR200 Ex-D not described in these Operating Instructions.
Do not remove, add or modify any components to or on the ZIRKOR200 Ex-D unless described and specified in the official manufacturer information.
Otherwise:
 - Any warranty by the manufacturer becomes void.
 - The ZIRKOR200 Ex-D can become dangerous.
 - The approval for use in potentially explosive atmospheres is no longer valid.

2.4.4 Special local conditions

- ▶ Follow all local laws, regulations and company-internal operating directives applicable at the installation location.

2.4.5 Read the Operating Instructions

- ▶ Only put the ZIRKOR200 Ex-D into operation after reading and understanding the Operating Instructions.
- ▶ Observe all safety information.
- ▶ If anything is not clear: Contact SICK Customer Service.

These Operating Instructions must be:

- ▶ Available for reference.
- ▶ Passed on to new owners.

3 Product description

3.1 Product identification

Product name	ZIRKOR200 Ex-D DustEx Oxygen analyzer with analyzer unit and control unit
Manufacturer	SICK AG Erwin-Sick-Str. 1 · D-79183 Waldkirch · Germany
Type designation	Z200EXD-70***** for control unit and analyzer unit* Z200EXD-71***** for control unit Z200EXD-72***** for analyzer unit

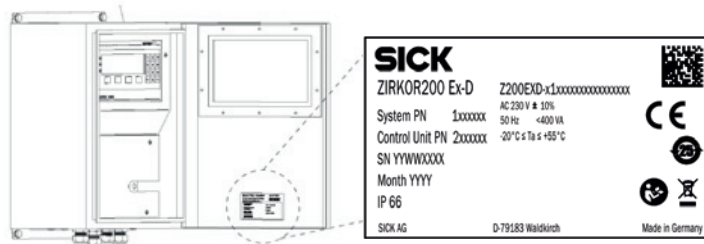
*The system code of the complete system serves as additional information but has no reference for the approval.

3.2 Type plates

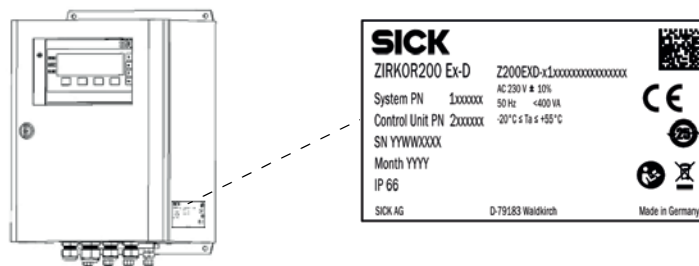
The type plate is located on the unit components as shown in the Figures below.

Fig. 2: Type plates (1)

Type plate of the control unit - safe area inside



Type plate of the control unit - safe area outside



Type plate of the 19" rack mount electronics

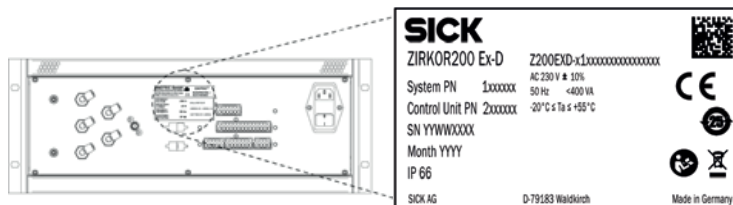
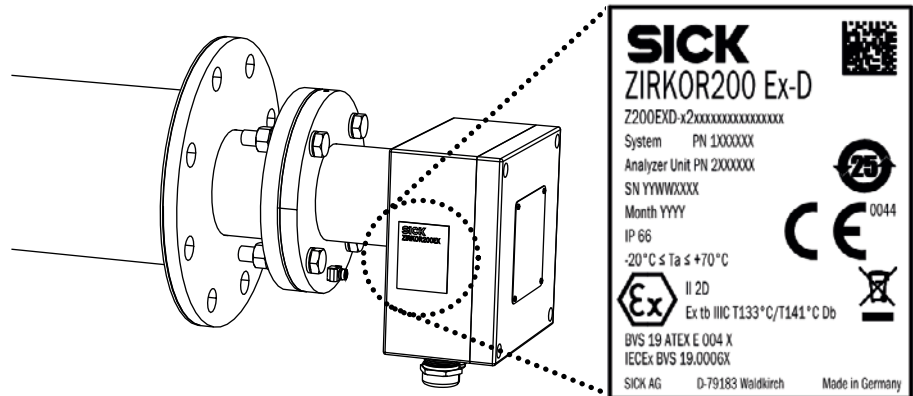
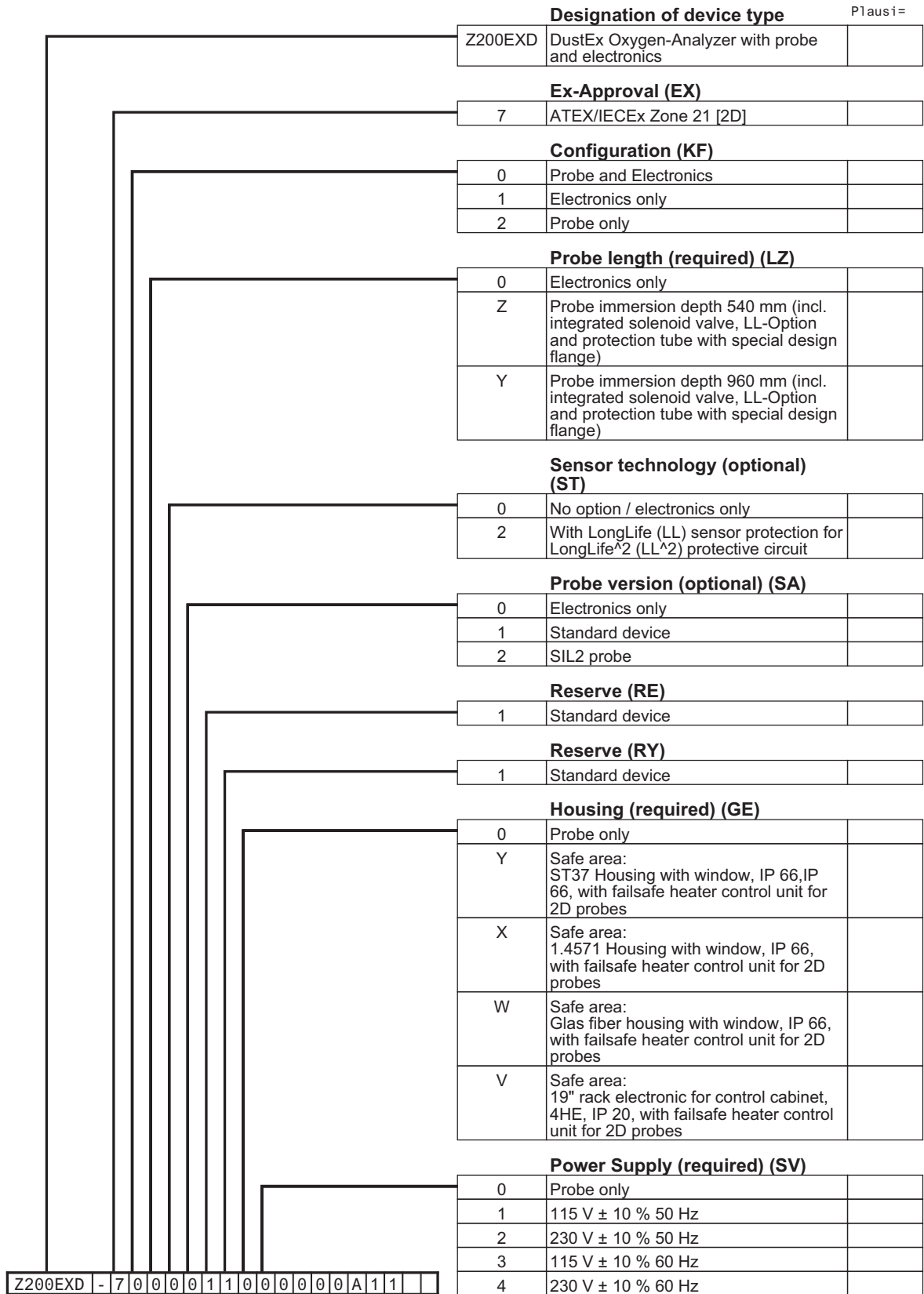


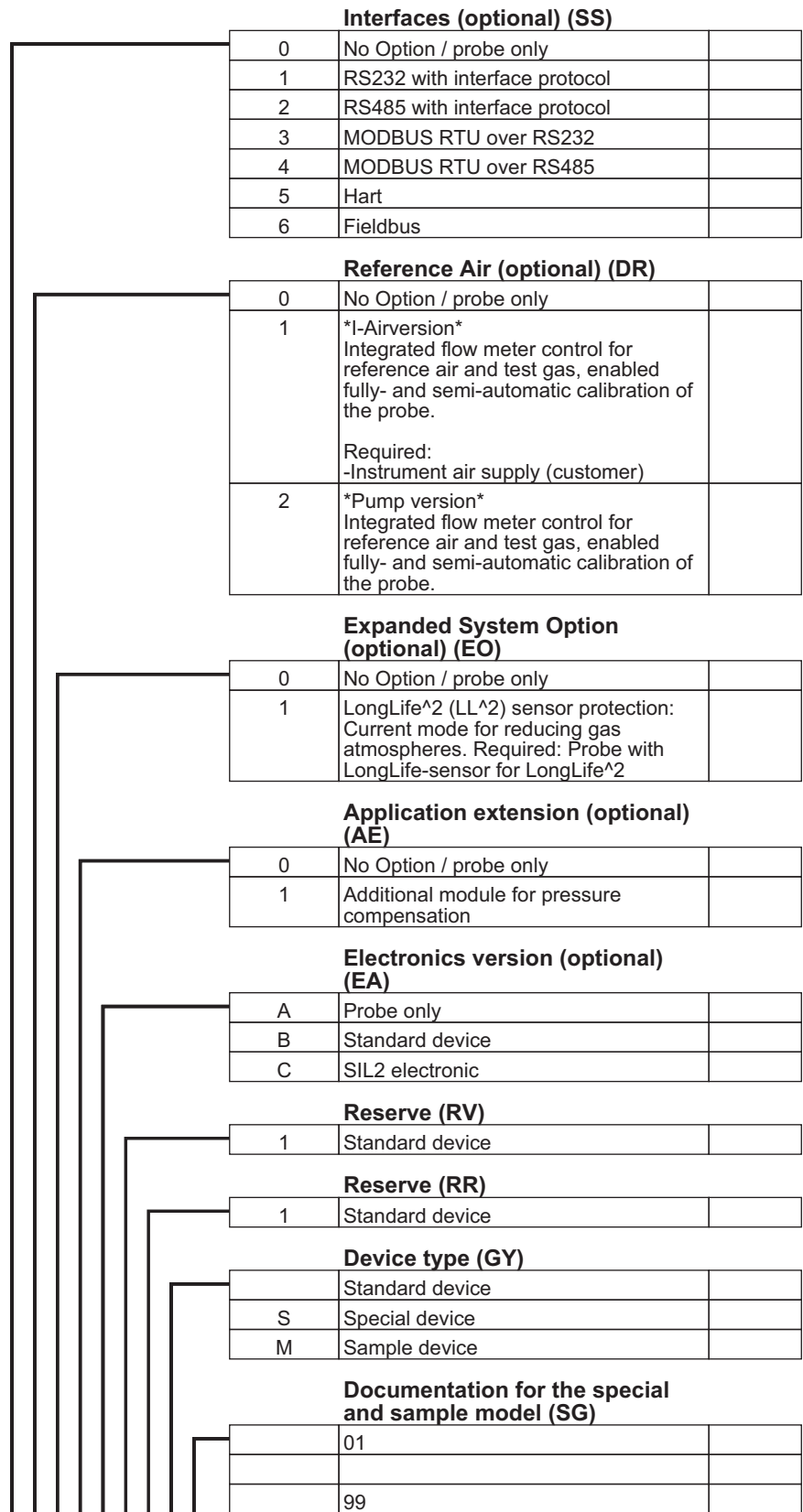
Fig. 3: Type plates (2)
 Type plate of the Ex-D analyzer unit



3.3 Device versions

Fig. 4: Type code for Ex-device versions





Interfaces (optional) (SS)

0	No Option / probe only	
1	RS232 with interface protocol	
2	RS485 with interface protocol	
3	MODBUS RTU over RS232	
4	MODBUS RTU over RS485	
5	Hart	
6	Fieldbus	

Reference Air (optional) (DR)

0	No Option / probe only	
1	*I-Airversion* Integrated flow meter control for reference air and test gas, enabled fully- and semi-automatic calibration of the probe. Required: -Instrument air supply (customer)	
2	*Pump version* Integrated flow meter control for reference air and test gas, enabled fully- and semi-automatic calibration of the probe.	

Expanded System Option (optional) (EO)

0	No Option / probe only	
1	LongLife^2 (LL^2) sensor protection: Current mode for reducing gas atmospheres. Required: Probe with LongLife-sensor for LongLife^2	

Application extension (optional) (AE)

0	No Option / probe only	
1	Additional module for pressure compensation	

Electronics version (optional) (EA)

A	Probe only	
B	Standard device	
C	SIL2 electronic	

Reserve (RV)

1	Standard device	
---	-----------------	--

Reserve (RR)

1	Standard device	
---	-----------------	--

Device type (GY)

	Standard device	
S	Special device	
M	Sample device	

Documentation for the special and sample model (SG)

	01	
	99	

Z200EXD - 7 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 A 1 1

3.4 Device variants

- Analyzer unit, standard

3.5 Options

- Analyzer unit: Solenoid valve for test gas feeding
- Counter flange
- Various interfaces (RS-232, RS485, HART, Fieldbus)

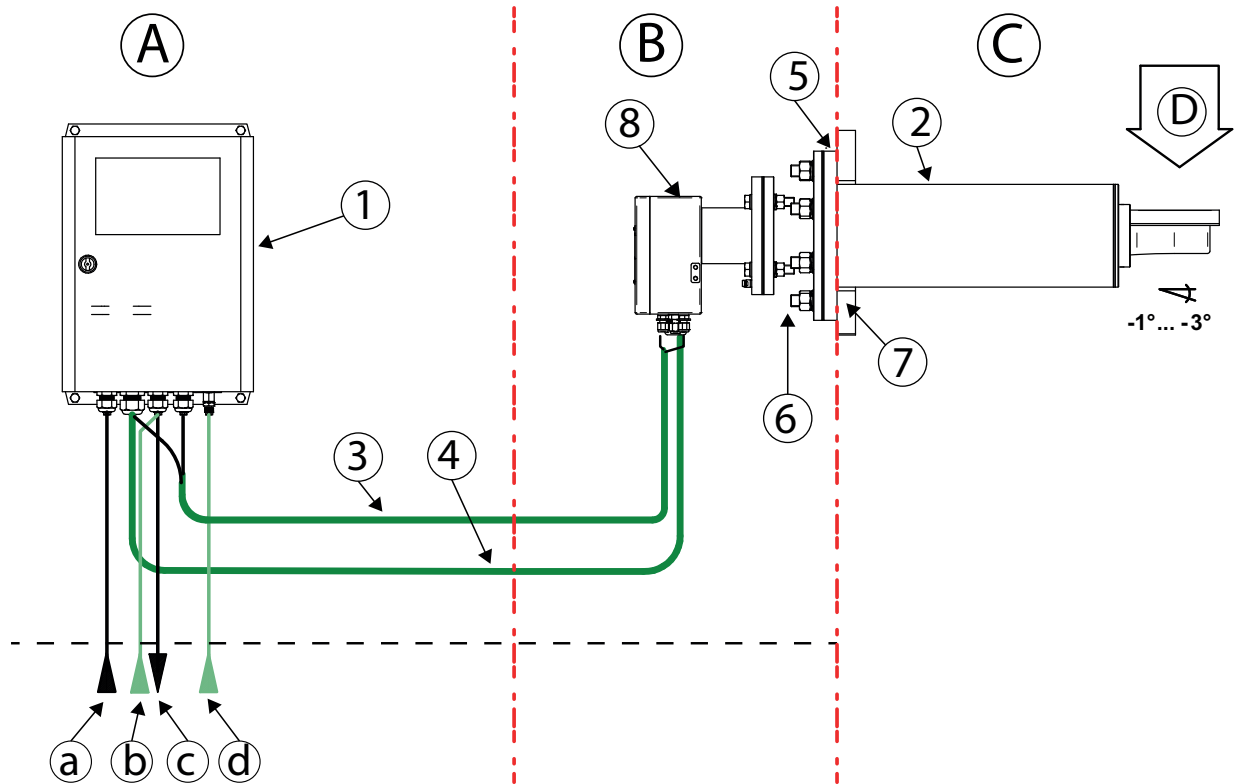
3.6 Expansion modules

The electronics are also available optionally with different interfaces (RS-232, RS485, HART, Fieldbus). If you have ordered one of these options, a separate Manual/Specification for this interface is included with the delivery.

4 Layout and function

4.1 System overview

Fig. 5: System overview



1 Control unit / IP66

2 In-situ measuring probe / IP6X

3 Pneumatic line

4 O₂ connection cable analyzer electronics - control unit

5 Counter flange (optional)

6 Insulation: Customer*

7 Duct wall

8 Analyzer electronics

A Safe zone

Max. ambient temperature: -20 °C to +55 °C (+50 °C for pump version)
(-4 °F to +131 °F (+122 °F for pump version))

B Potentially explosive atmospheres (dust Ex) Zone 21 IIIC T133°C/T141°C

Max. ambient temperature: -20 °C to +70 °C (-4 °F to +158 °F)

C Potentially explosive atmosphere (dust Ex) Zone 21 IIIC T133°C/T141°C flue gas duct / combustion chamber

D Flue gas direction - max. flue gas temperature: 600 °C (1112 °F)

a Power supply, power voltage 230 V/115 V ±10% 50 to 60 Hz, max. 400 VA

b Test gas inlet

c Output signals (analog and digital)

d Instrument air inlet

* Note: Risk of corrosion due to lack of insulation

4.2 Measuring principle

The ZIRKOR200 Ex-D oxygen measuring system consists of an in-situ analyzer unit, which is installed on the duct with the gas to be analyzed, and a control unit for voltage and gas supply as well as for signal processing. An oxygen sensor regulated to 800 °C which functions according to the zirconium oxide principle is fitted on the probe tip. An mV signal is measured between the reference gas side of the sensor (inside, instrument air 20.95% O₂) and the measuring gas side, which depends logarithmically on the relation of the oxygen partial pressures of both sides. The mV signal is converted to the oxygen partial pressure in the sample gas using the Nernst equation, which determines the O₂ concentration in the sample gas.

4.3 Scope of application

The ZIRKOR200 Ex-D DustEx oxygen measuring system is suitable for measuring oxygen (O₂) in flue gases.



NOTICE:

The system must not be used to determine the oxygen content of combustible gases because the measuring accuracy cannot be guaranteed when combustible gases occur.



NOTICE:

Device damage with regular O₂ concentrations below 0.5%. Under normal process conditions, the minimum concentration of O₂ in the flue gas should not be less than 0.5%.

- ▶ The cell protection circuit option is recommended when the O₂ concentration regularly falls below 0.5%. Called LL² (LongLife²), so that the O₂ sensor is permanently protected.
-

4.4 Potential hazards



WARNING: Danger of burns on hot components which are in the process gas

The temperature of the probe filter head and all parts in the process gas is 150 °C to 800 °C (302 °F to 1472 °F) during operation. Directly touching the parts for disassembly or maintenance causes serious burns.

- ▶ Use heat protection gloves when removing the measuring probe.
 - ▶ Switch the electronics supply voltage off before removing the measuring probe.
 - ▶ Place the analyzer unit in a safe, protected area after removal and wait until the measuring probe temperature has cooled down to the ambient temperature.
-

4.5 Process interruption

The oxygen measuring system must remain in operation even when the process is interrupted or the system is temporarily switched off (e.g. at night or on weekends). Frequent cooling and heating of the analyzer unit leads to a thermal load on hot analyzer unit components (heater, thermoelement and O₂ sensor) and shortens their service life. SICK shall not be liable for any resulting damage.

4.6 ATEX / IECEx certification

The control unit of the ZIRKOR200 Ex-D oxygen measuring system is not Ex-certified and must be installed in the safe area. The analyzer unit may be installed in Zone 21 environments (certified II 2D Ex tb IIIC T133 °C/T141 °C Db).



Note:

To ensure the maximum permissible surface temperature, the analyzer unit is switched off at 810 °C when the operating temperature is overflowed and can only be heated up by a restart. The recording of the operating temperature is done redundantly with 2 thermocouples in a sheathed thermoelement.

Switching off is performed by a protective device independent of the controller and SIL certified for this purpose. **Operating temperature of the analyzer unit is 800 °C.**



WARNING:

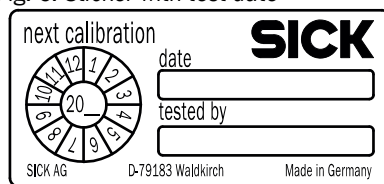
Do not open the analyzer electronics covers during operation. Prior to opening, ensure that all analyzer unit components meet the requirements of surface temperature T133 °C / T141 °C after switching off the system. The minimum waiting time after switching off is 1 hour.

If the ambient conditions can be determined as not explosive, work on the analyzer unit can also be performed under voltage.

4.6.1 Ignition source monitoring of the analyzer unit by means of temperature monitoring

The temperature of the analyzer unit is monitored by an additional electronic system (Part No. 2105158) with two thermoelements. The electronics are designed to be fail-safe (redundant). These automatically switch off the analyzer unit heating when the operating temperature of the analyzer unit is exceeded. The switch-off temperature is 810 °C. In addition, the heating is switched off in the event of a fault in one of the thermoelements. The electronics go into self-holding mode, which means that if a fault occurs, the electronics must be reset. The printed circuit board must be checked every three years by the manufacturer for safe operation. The next test date is on the sticker on the printed circuit board. (see “Heating shutdown in case of malfunction”, page 69)

Fig. 6: Sticker with test date



5 Installation

5.1 Determination of the requirements for explosion protection

Check with the marking of the device and its components whether all requirements regarding zone classification, temperature class, gas group, safety level, ambient temperatures and pressure conditions are met.

5.2 Information on installation in potentially explosive atmospheres

Correct installation



DANGER: Danger of explosion during installation work

There is a danger of explosion due to sparking during installation, for example when cables are connected or components are dropped.

- ▶ Perform installation work only in the Ex-free area.
-



DANGER: Danger of explosion through incorrect installation work

Incorrect assessment of the installation location as well as all further installation work in potentially explosive atmospheres can cause serious injuries to people and damage during operation.

- ▶ Installation, commissioning, maintenance and testing may be performed only by experienced persons who have knowledge of the rules and regulations for potentially explosive atmospheres, particularly:
 - Ignition protection types
 - Installation rules
 - Zone classification
 - ▶ Standards to be applied
 - ▶ Local work safety regulations
-



DANGER: Danger of explosion due to damaged probe tube

A cold analyzer unit can be damaged by condensed, corrosive flue gas, as a result of which the analyzer unit is no longer encapsulated in a flameproof enclosure and can lead to explosions.

- ▶ The analyzer unit must be in operation while in the process.
-



CAUTION: Risk of injury when the device drops down

The device is heavy and may cause injury if dropped.

- ▶ Carry out assembly work on the device in pairs.
-

5.3 Tools required

Tools required	Required for
Allen key set	Terminal release
Cross-head screwdriver set	Opening the analyzer electronics cover Removing covers in the electronics housing
Ferrule pliers	Cable preparation
Wire stripper	Cable preparation

5.4 Material required

Material required	Required for
Ferrules	Cable preparation

5.5 Preparing the measuring point



NOTICE:

Basis for determining the measuring point:

- Preceding project planning (e.g., based on the SICK application questionnaire)
 - Regulations of local authorities
- Responsibility of the plant operator
- Determining the measuring point
 - Preparing the measuring point

5.6 Transport



DANGER: Danger of explosion through electrostatic charges

There is a danger of explosion due to sparks caused by electrostatic charge, for example during transport or when unpacking the analyzer unit and control unit.

- ▶ Only transport and unpack in an Ex-free area.



NOTICE:

The device may only be transported and installed by skilled persons who, based on their training and knowledge as well as knowledge of the relevant regulations, can assess the tasks given and recognize the dangers involved.

The device must be lifted and transported by at least two persons.

5.7 Storage information

SICK devices and spare parts must be stored in a dry place with sufficient ventilation. Paint fumes, silicone sprays etc. must be avoided in the storage environment.



DANGER: Health hazard due to contaminated measuring probe

Depending on the composition of the gas in the measuring channel, the analyzer unit, after use in the process, may be contaminated with substances that can cause serious damage to health.

- ▶ Decontaminate the analyzer unit before storage.
 - ▶ Wear the specified protective clothing for all work with a contaminated analyzer unit.
 - ▶ Clean all components of the measuring system with slightly moistened cleaning cloths. Use a mild cleaning agent here.
 - ▶ Pack all components for storage or transport. Preferably use the original packing.
 - ▶ Store all components of the measuring system in a dry, clean room.
- Storage temperature for all components -40 °C to +80 °C.

5.8 Scope of delivery

Check the scope of delivery according to the order confirmation/delivery note.

Checking the delivery state

Check all components have no exterior damage.

Make sure the supply voltages indicated on the type plates correspond to the system conditions.

5.9 Installation

Installation steps overview

Step	Procedure	Reference
1	Fit the counter flange on the duct.	see "Fitting the counter flange on the duct", page 25
2	Fit the control unit.	see "If necessary, attach duct insulation to protect the device from heat.", page 25
3	Install the control unit.	see "Installing the control unit", page 25
4	Fit the analyzer unit.	see "Fitting the analyzer unit", page 26
5	Install the analyzer unit.	see "Installing the analyzer unit", page 27
6	Fit the counter flange.	see "Fitting the counter flange", page 28
7	Align the V-shield.	see "Aligning the V-shield", page 29
8	Lay connection cable and hoses.	see "Lay connection cable and hoses", page 29
9	Install connection cable.	see "Installing connection cables", page 30

5.9.1 Fitting the counter flange on the duct



DANGER: Hazard through hot, explosive or toxic flue gases

Hot and/or noxious gases can escape during assembly work on the gas duct depending on plant conditions.

- ▶ Work on the gas duct may only be performed by skilled persons who, based on their technical training and knowledge as well as knowledge of the relevant regulations, can assess the tasks given and recognize the hazards involved.
- ▶ Switch the plant off when working on the gas duct.

- ▶ On the basis of a risk assessment, the operator determines the required safety measures that must be observed when working with the system switched on.



NOTICE: Device damage due to faulty/missing insulation when the measuring duct is hot

- ▶ When the measuring duct is hot, design the insulation of the duct and the flanges so that the radiant heat of the duct is not higher than the permissible maximum temperature of the analyzer specification (see Technical Data).



Note:

The analyzer unit must not collide with other devices or installations.

- 1 Tilt the flange with pipe slightly downwards ($1^\circ - 3^\circ$) and allow it to protrude approx. 30 mm into the duct so that any condensate can drain off.
- 2 Now fix the flange with tube properly to the gas duct. Make sure the flange alignment does not change.
- 3 If necessary, attach duct insulation to protect the device from heat.

5.9.2 Installing the control unit

The lengths of the cables to the analyzer unit match the project planning.

- ▶ Fit the control unit on the 4 fixing points according to the project planning.

<p>min 200 mm 50 mm 50 mm 330 mm</p>	<p>Install at eye level.</p>
<p>Maintain minimum distances to adjacent objects.</p>	

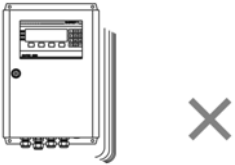
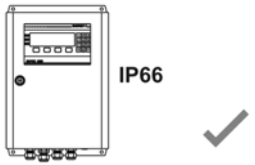
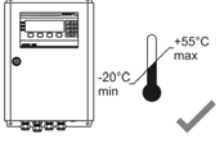

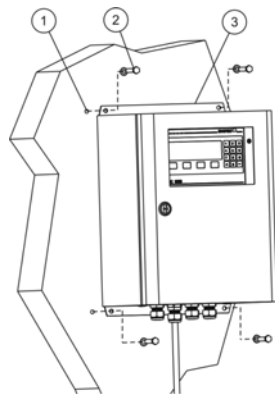
 <p>Avoid vibrations greater than 2 g.</p>	 <p>Observe enclosure protection class.</p>
 <p>Ambient temperatures Min.: -20 °C / Max.: +55 °C Min.: -4 °F / Max.: +131 °F (Pump version -20 °C to +50 °C)</p>	 <p>Heavy device, ensure correct lifting and carrying.</p>

Fig. 7: Fitting the control unit



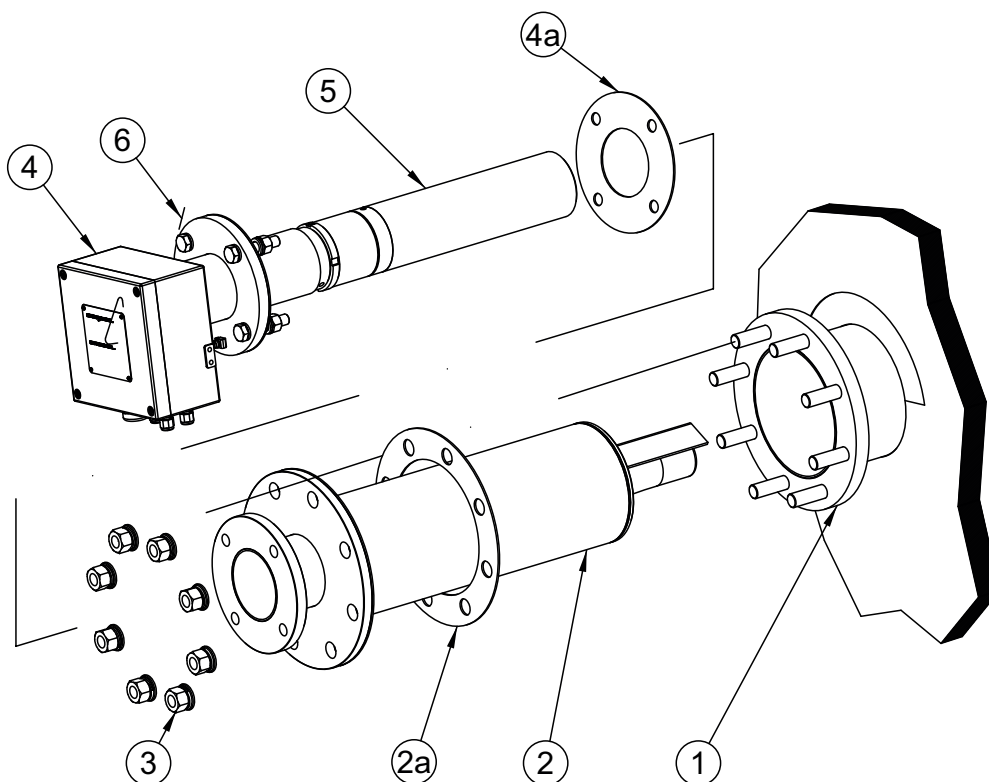
Secure the enclosure on a structure that can safely carry the weight of the enclosure. Use expansion anchors when fitting the enclosure on concrete. Use vibration resistant fitting material when fitting the enclosure in a steel frame. Protect the device from long or strong mechanical vibrations.

- 1 Drill holes according to the mounting method for safe installation.
- 2 Use screws suitable for the substrate and fastening method.
- 3 Control unit

5.9.3 Fitting the analyzer unit

- ▶ Push the analyzer unit into the duct.
- ▶ Align V-shield to flow.
- ▶ Fix the analyzer unit to the duct.

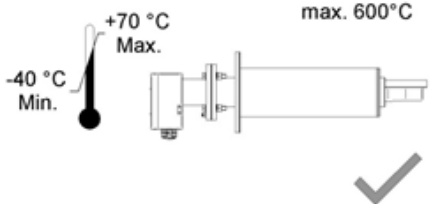
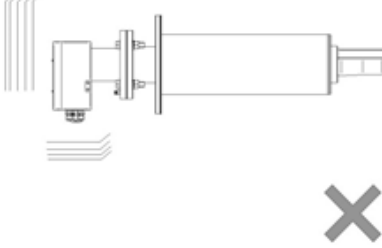
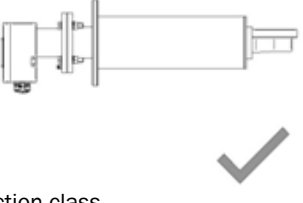

Fig. 8: Installing and insulating the analyzer unit



- 1 Gas-tight welded adapter plate
- 2 Measuring probe protective pipe
- 2a Protective pipe seal
- 3 Nuts, washers and lock washers
- 4 Analyzer electronics
- 4a Analyzer unit flange seal
- 5 Filter head
- 6 Analyzer unit flange

5.9.4 Installing the analyzer unit

Flue gas temperature, pressure and all other process conditions must be within the specification limits of the ZIRKOR200 Ex-D. Ensure sufficient clearance for fitting the measuring probe and protective pipe. Ensure access to the analyzer unit and the connection unit. Before breaking through the flue gas duct wall, make sure there is enough space inside and outside the duct for installation, that there are no fixtures in the vicinity and no other obstacles in the way.

 <p>Observe ambient temperature on the connection unit and process temperature.</p>	 <p>Avoid vibrations greater than 2 g.</p>
<p>IP 6X</p>  <p>Observe protection class.</p>	 <p>Heavy device, ensure correct lifting and carrying.</p>

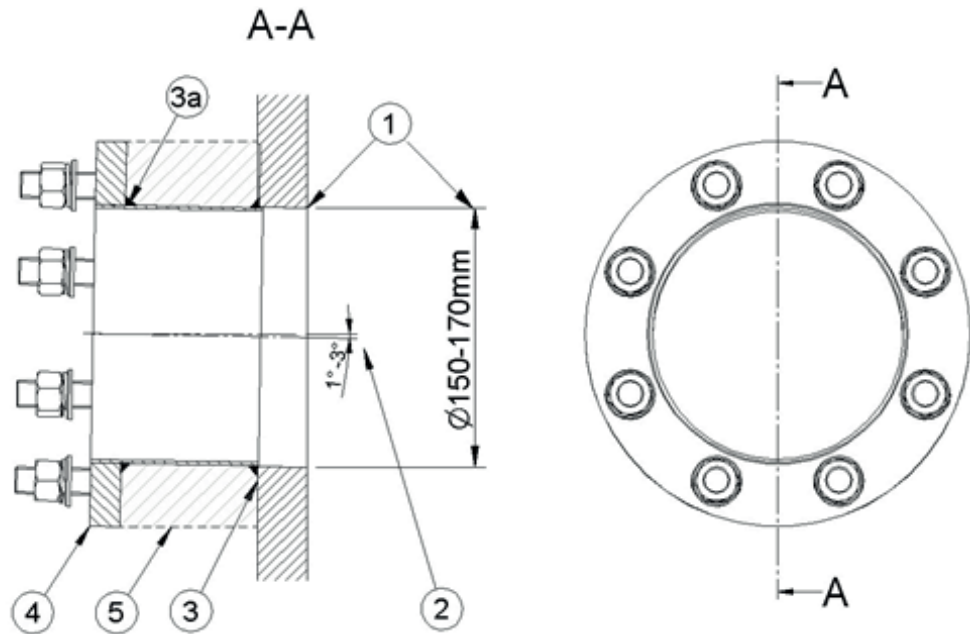
5.9.5 Fitting the counter flange

The counter flange is welded gas-tight to the duct wall (3) or to the connection piece (3a) by the customer at the angle shown.

The insulation (5) is also provided by the customer.

The flange must be mounted at an angle of 1-3° (2) so that condensed flue gas elements can flow back into the duct.

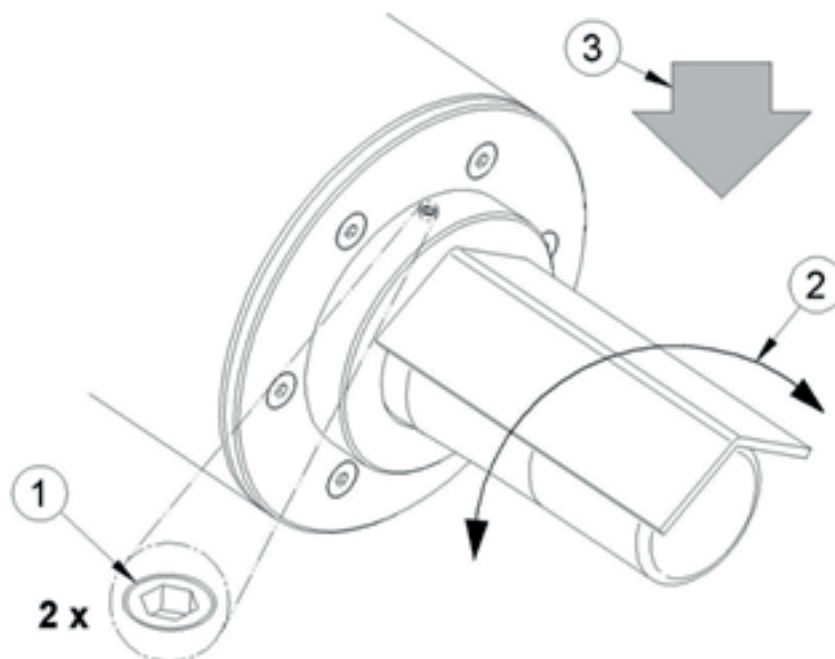
Fig. 9: Fitting the counter flange



5.9.6 Aligning the V-shield

Before fitting the analyzer unit, determine flow direction (3) of the flue gas and turn V-shield (2) of the filter against the exhaust gas flow. The V-shield can be freely rotated through 360°. To do this, loosen locking screws (1) on the retaining ring, align V-shield (2) and retighten the locking screws.

Fig. 10: Aligning the V-shield



5.9.7 Lay connection cable and hoses

- ▶ Lay cables and hoses – ensure no electrostatic charge is generated.



WARNING: Danger of explosion through electrostatic charges

Static charges on the cables can cause an explosion.

- ▶ Protect cables against electrostatic charges.
- ▶ Lay cables in the Ex-area firmly, for example by using cable trays.

- ▶ Connect to analyzer electronics.
- ▶ Connect control unit.



NOTICE:

- The system is not equipped with a power switch. A disconnecting device (e.g. a circuit breaker) must be installed in the power supply cable. The disconnecting device must comply with local safety standards, be easily accessible, located in the immediate vicinity of the system and clearly marked as the disconnecting device of the system (on/off switch).
- The connection cable is suitable for an ambient temperature of -40 °C to +90 °C. All other cables must be suitable for the ambient temperature onsite and must have the relevant cross-section.
- The connection terminals of the control unit are suitable for conductor cross-sections from 0.08 mm² (AWG 28) to 2.5 mm² (AWG 12). Reduce the suitable cross-sections by one size unit when using ferrules.



WARNING: Danger of explosion

- Disconnect the power voltage from the system before removing the terminal cover. First connect the power voltage supply to the system again after attaching the terminal cover.

5.9.8 Installing connection cables

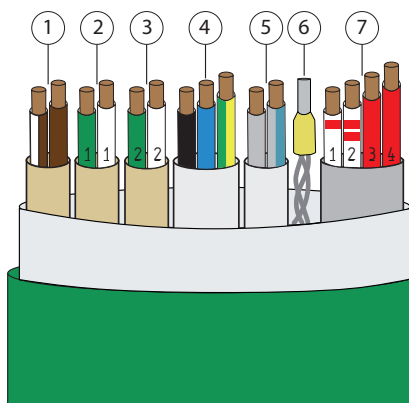


Note:

Connect the connection cable shielding to one side of the protective conductor (PE terminal) in the control unit. Do not connect the connection cable shielding to the analyzer unit as this will falsify the measured value. The connection cable is suitable for an ambient temperature of -40 °C to + 90 °C. Only lay the connection cable in a temperature range of -5 °C to +50 °C.

<p>Observe maximum possible cable length (max. cable length of pump version - 50 m).</p>	
<p>Observe minimum bending radius. $R_{min} = 330 \text{ mm}$</p>	<p>Lay connection cable (1) only crosswise to cables (2) carrying the load current.</p>
<p>Ambient temperature limits - Installation</p>	<p>Ambient temperature limits - Operation</p>

Fig. 11: Connection cable



Probe cable				
No.	Function	Diameter	Colors	Additional information
1	Measuring cell	2 x 0.75 mm ²	White-brown / brown	With shielding
2	Thermoelement	2 x 0.75 mm ²	Green / white	With shielding
3	Thermoelement	2 x 0.75 mm ²	Green / white	With shielding
4	Measuring probe heater	3 x 1.5 mm ²	Black / blue / yellow-green	
5	Solenoid valve of the analyzer unit	2 x 0.75 mm ²	Grey / grey-blue	
6	Shielding			
7	Not used			

5.10 Electrical installation

Electrical safety



WARNING:

Endangerment of electrical safety during installation and maintenance work when the voltage supply is not switched off

- ▶ Before starting work on the device, ensure the voltage supply can be switched off according to the valid standards using a power isolating switch/circuit breaker.
- ▶ Make sure the isolating switch is easily accessible, located near the system and clearly marked (on/off switch).
- ▶ An additional disconnecting device is mandatory when the power isolating switch cannot be accessed or only with difficulty after installation of the device connection.
- ▶ After completion of the work or for test purposes, the voltage supply may only be activated again by authorized personnel complying with the safety regulations.



WARNING:

Endangerment of electrical safety through power cable with incorrect rating
Electrical accidents can occur when the power cable specifications have not been adequately observed.

- ▶ Always observe the exact specifications in the Operating Instructions (Technical data Section) when replacing a removable power cable.

**WARNING:****Danger of electrical accidents**

Incorrect performance of electrical work could result in serious electrical accidents.

- ▶ Electrical work on the device may only be carried out by electricians familiar with the possible dangers.

**NOTICE:****Device damage through short-circuit on the device**

The internal electronics can be damaged when signal connections are established and the voltage supply is switched on.

- ▶ Only carry out work on the device when the voltage supply is switched off.

Special safety instructions**DANGER:****Danger of explosion and expiration of the Ex-approval for the device when using cable inlets and closures on the analyzer electronics not approved for operation in explosive environments.**

The cable inlets and closures are part of the explosion protection and must meet the requirements of the relevant standards for explosion protection.

- ▶ Do not replace cable inlets and closures with other types not approved for use in explosive atmospheres.
- ▶ Observe the dimensions of the cable inlets.

**DANGER:****Danger of explosion through unsuitable screw fittings and cables on the analyzer electronics**

- ▶ Only use cables (according to valid standard) with suitable outer diameters.
- ▶ Protect cables against electrostatic charges.
- ▶ Lay cables in the Ex-area firmly, for example by using cable trays.
- ▶ Only open cable inlets used for cable installation. Keep the plugs. Refit the original plug when a cable inlet must be closed again afterwards.

- SICK AG recommends a tightening torque of 0.5 Nm for the screws of the screw terminals(see [“Control unit electrical connections”, page 35](#)).
- The supplied control unit is completely wired. Do not change or manipulate this control unit. Observe the wiring diagram when connecting the control unit.
- Make sure the external grounding connections are present, in good condition, and not damaged or corroded.
- Observe the maximum possible conductor lengths in order to minimize power dissipation.

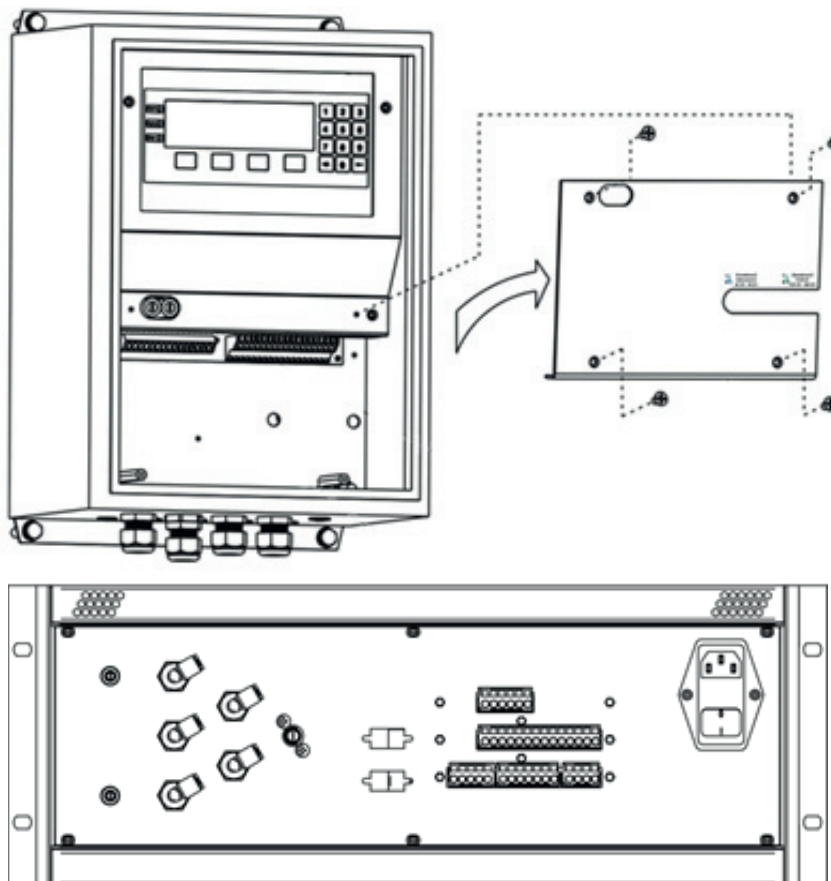
5.10.1 Accessing the connection terminals



WARNING:

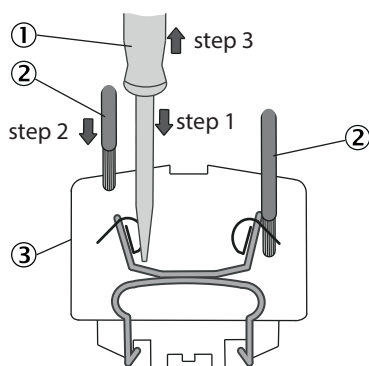
Disconnect the power voltage from the system before removing the terminal cover. Do not restore the power supply to the system until all enclosure covers have been closed. Live parts may not be accessible after installation.

Fig. 12: Accessing the connection terminals



5.10.2 Instructions for the function of the spring-loaded terminal

Fig. 13: Connecting conductors, schematic diagram



- ▶ Follow steps 1 to 3 to connect the wires.
- ▶ For the spring-loaded terminal position, see [“Control unit electrical connections”, page 35](#) and see [“Electrical connections on the analyzer electronics”, page 37](#).

- 1 Screwdriver
- 2 Conductor
- 3 Terminal strip

5.10.3 Potential equalization, (PE, ground)

- ▶ Connect the external grounding connection on the enclosure parts of the control unit and supply unit, analyzer electronics enclosure and the optionally installed solenoid valves directly to the main potential (ground). The required conductor cross-section is 4 mm².

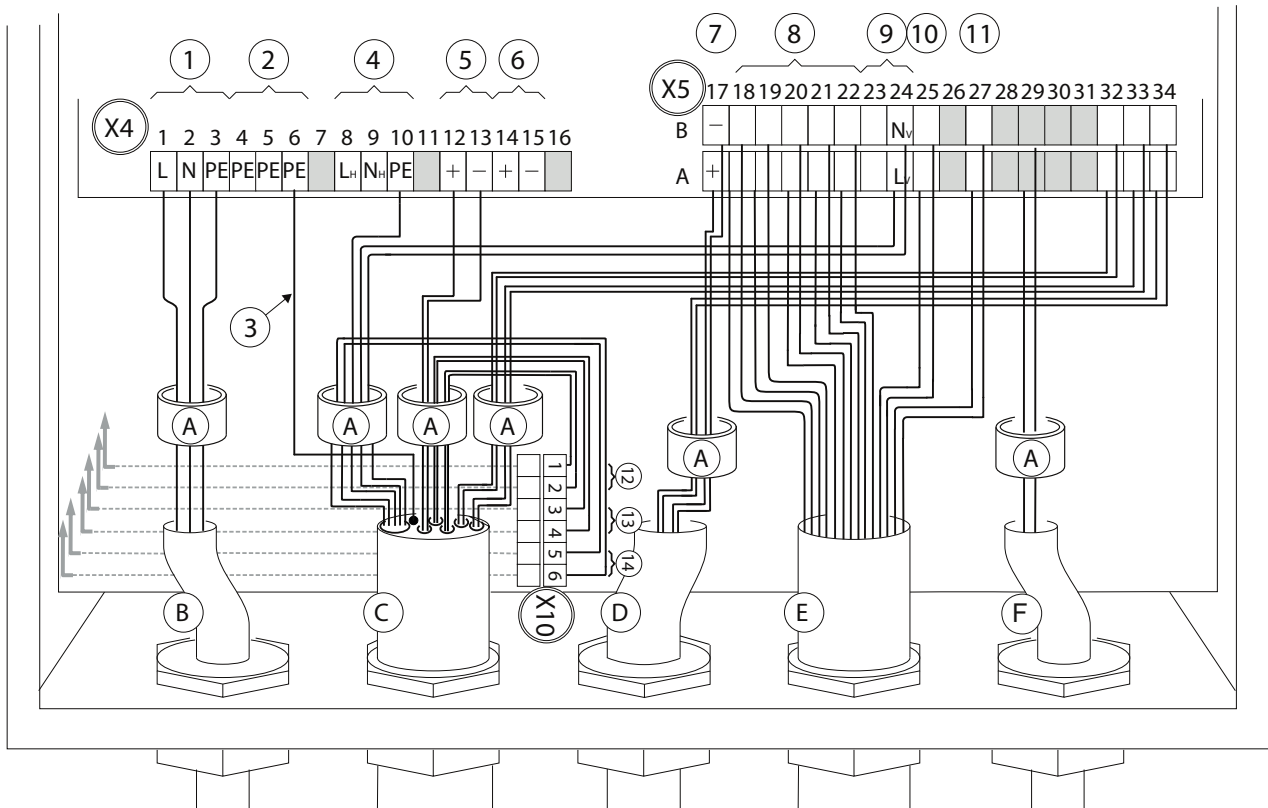
5.10.4 Fitting the ferrite sleeves (EMC)

Mount the ferrite sleeves supplied as follows to avoid line-bound interference influencing the control unit.

EU conformity is void when these ferrite sleeves are not installed!

5.10.5 Control unit electrical connections

Fig. 14: Control unit electrical connections



- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>A Ferrite sleeves (included)</p> <p>B Power voltage cable (not included)</p> <p>C Connection cable (included)</p> <p>1 Voltage supply (115/230 V AC, 50/60 Hz)</p> <p>1 L 1</p> <p>2 N Neutral conductor</p> <p>3 PE Protective conductor</p> <p>2 Functional grounding.</p> <p>4 PE Protective conductor</p> <p>5 PE Protective conductor</p> <p>6 PE Protective conductor</p> <p>3 Shielding</p> <p>4 Voltage supply, measuring probe heater, 115 V AC</p> <p>8 LH Black, phase</p> <p>9 NH Blue, neutral conductor</p> <p>10 PE Green/yellow, protective conductor</p> <p>5 O₂ sensor signal</p> <p>12 + Brown</p> <p>13 - Brown/white</p> <p>6 Thermoelement (O₂ sensor)</p> <p>14 + Green</p> <p>15 - White</p> | <p>D Analog output cable (not included)</p> <p>E Status signal cable (not included)</p> <p>F Optional pressure transmitter, analog input cable (ZIRKOR Ex-D only) (option, customer-side)</p> <p>7 Analog outputs (active, 4-20 mA)</p> <p>17A + O₂</p> <p>17B - O₂</p> <p>8 Relay contacts for status signals, potential-free</p> <p>18 A/B Maintenance</p> <p>19 A/B System fault</p> <p>20 A/B Output O₂ measuring range</p> <p>21A/B O₂ limit value alarm 1</p> <p>22A/B O₂ limit value alarm 2</p> <p>9 Probe solenoid valve</p> <p>23 A Internal voltage supply for</p> <p>23 B Solenoid valve of analyzer unit (115 VAC)</p> <p>24A LV Grey</p> <p>24B NV Grey/blue</p> <p>10 Measuring range switch O₂ (12..24V DC - external supply)</p> <p>25A +</p> <p>25B -</p> <p>11 Adjustment release (12..24V DC - external supply)</p> <p>27A +</p> <p>27B -</p> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

5.10.6 Outputs/functions and relay assignment

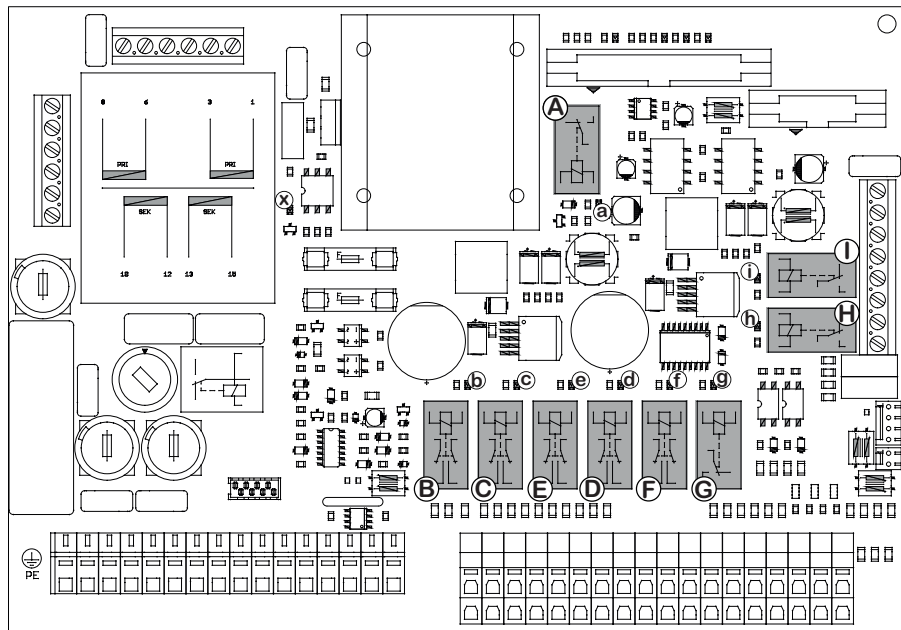
All relay contacts are designed for 24 V and 1 A ~, 1 A = (exception: Probe valve).

Connection terminal	Relay output	Contact	Function
X5:19A/B	System error*	NC contact	Signals operation-critical errors
X5:18A/B	Maintenance	NO contact	System code was entered, system in Maintenance mode.
X5:20A/B	Measuring range	NO contact	Closed: Measuring range 1 active Open: Measuring range 2 active
X5:24A/B	Analyzer unit valve**	NO contact	Control of the analyzer unit valve
X5:21A/B	Limit value 1	NC contact	Signal an O ₂ limit value exceeds 1 st limit value
X5:22A/B	Limit value 2	NC contact	Signal an O ₂ limit value exceeds 2 nd limit value

* The system error relay is also active during the heating phase.

** The relay contact of the analyzer unit valve is designed for 230 V and 1 A ≅ .

Fig. 15: Relay board with relays and LEDs marked



Relay marking	LED marking	Function
A	a	Main measuring probe heater relay
B	b	Maintenance
C	c	System error
D	d	Limit value O ₂ 1
E	e	Measuring range
F	f	Limit value O ₂ 2
G	g	Analyzer unit valve
H	h	Solenoid valve test gas 1
I	i	Solenoid valve test gas 2
	x	Measuring probe heater control

5.10.7 Digital inputs

The digital inputs are designed for a DC voltage of 12 to 30 V for logical “high”. Logical “low” corresponds to a voltage less than 1 V.

Digital input	Function
Adjustment release	External release to start adjustment at ACAL
Measuring range switchover	Activate the 2nd O2 measuring range

5.10.8 Electrical connections on the analyzer electronics



Note:

The connection cable is to be treated as measuring cable. **Under no circumstances** should the shielding of the connection cable be laid to the **probe side**, as this will lead to measurement inaccuracies.

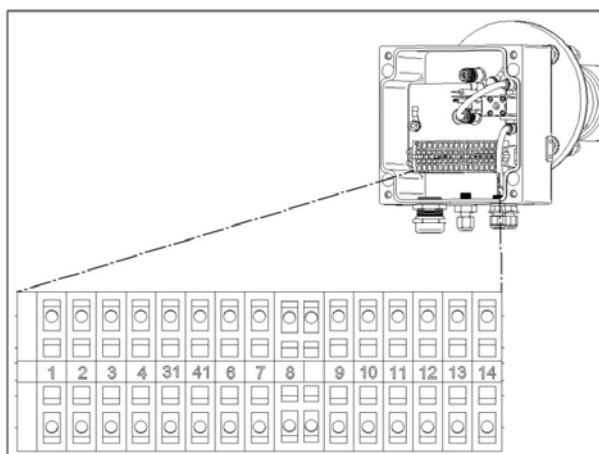


DANGER: Danger of explosion through damaged seals

Damaged seals on the enclosure cover can allow explosive air to enter the enclosure and cause an explosion.

► Check seals for damage and replace if necessary.

Fig. 16: Electrical connections on the analyzer electronics



- 1 - mV O₂ measuring cell (white-brown)
- 2 + mV O₂ measuring cell (brown)
- 3 + mV thermocouple 1 (green)
- 4 - mV thermocouple 1 (white)
- 31 + mV thermocouple 2 (green)
- 41 - mV thermocouple 2 (white)
- 6 L 115 VAC (max) measuring probe heater (black)
- 7 N 115 VAC measuring probe heater (blue)
- 8 PE protective conductor (green-yellow)
- 9 L 115 V solenoid valve (grey)
- 10 N 115 V solenoid valve (grey-blue)

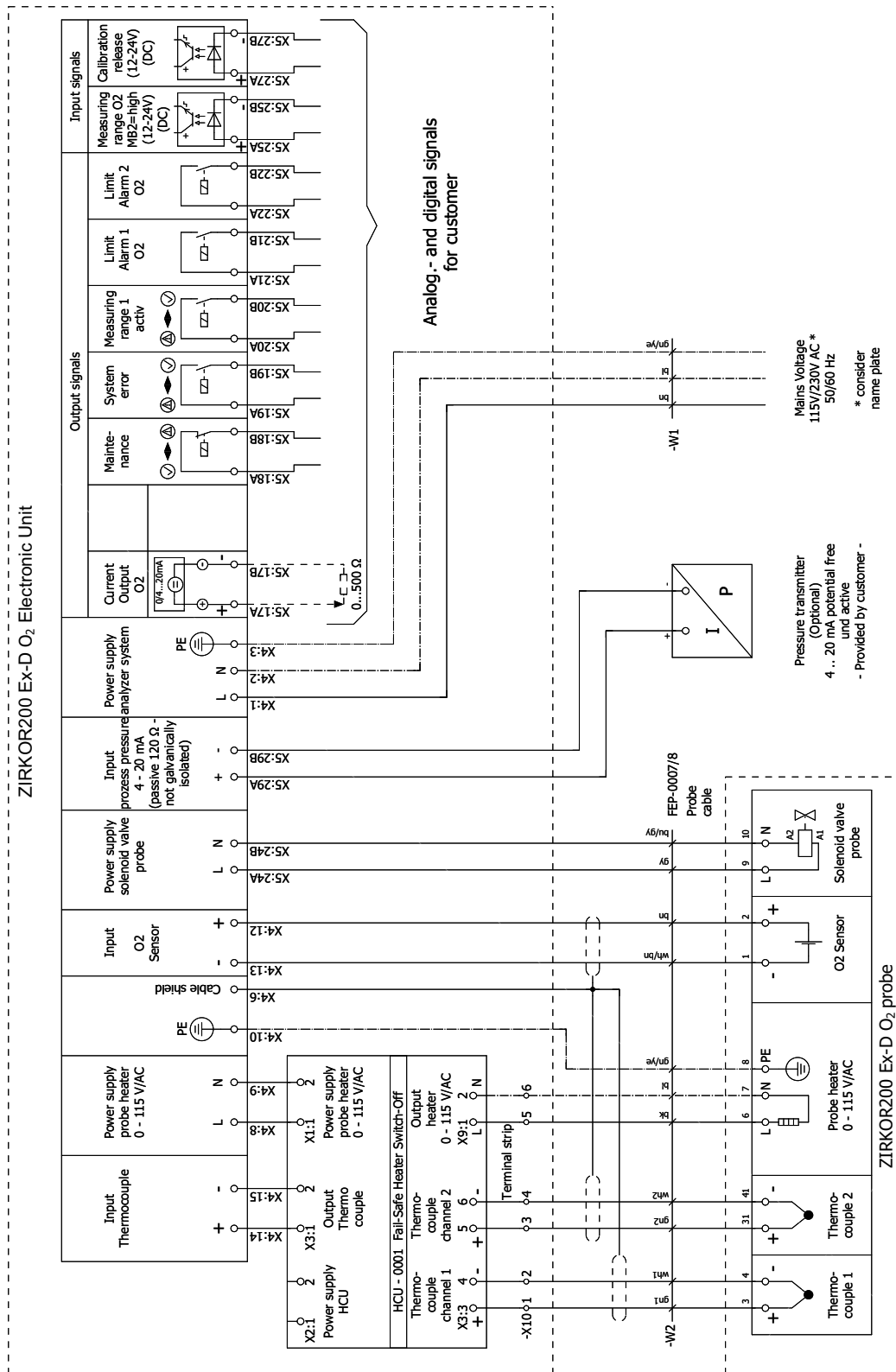


Note:

The voltage supply (115 V AC) of the solenoid valve on the analyzer unit is realized by the control unit.

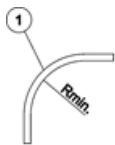
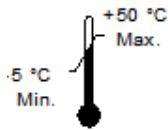
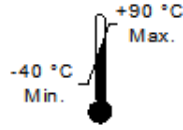
5.10.9 Electrical connection plan – ZIRKOR Ex-D

Fig. 17: Electrical connection plan ZIRKOR200 Ex-D O₂ analyzer



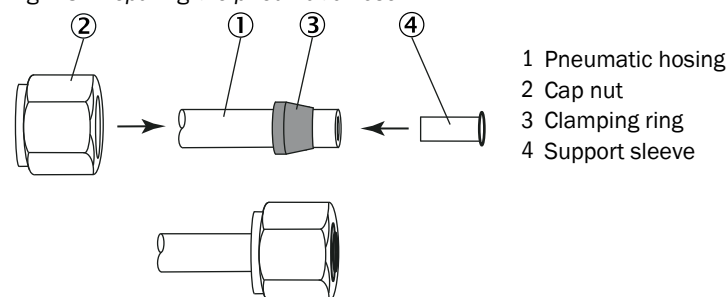
5.11 Pneumatic connections and settings

5.11.1 Pneumatic hose requirements

	<p>Observe minimum bending radius. Hose → $R_{min} = 138 \text{ mm}$</p>
 <p>Temperature range - installation</p>	 <p>Temperature range - operation</p>

5.11.2 Preparing the pneumatic hose

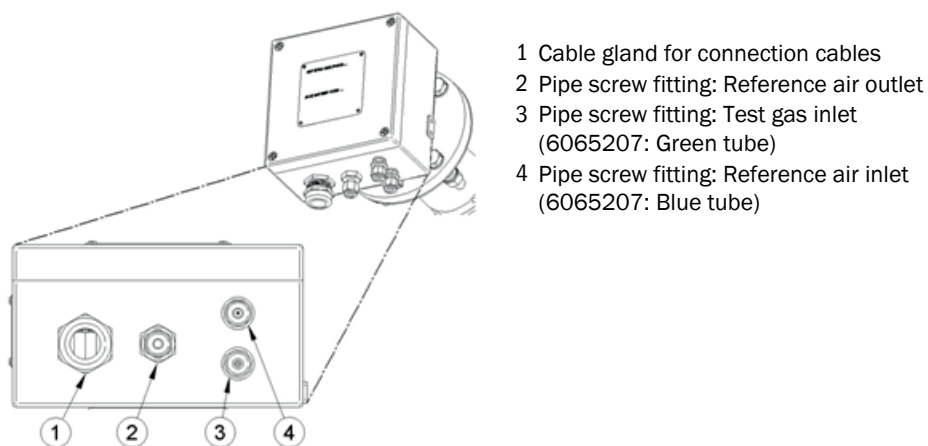
Fig. 18: Preparing the pneumatic hose



- ▶ Both pneumatic hoses (1) for reference air (blue) and test gas (green) must be prepared with support sleeves (4), clamping rings (3) and cap nuts (2).
- ▶ Tighten the nuts hand-tight and turn a further 1 ¼ turns tight with a wrench.

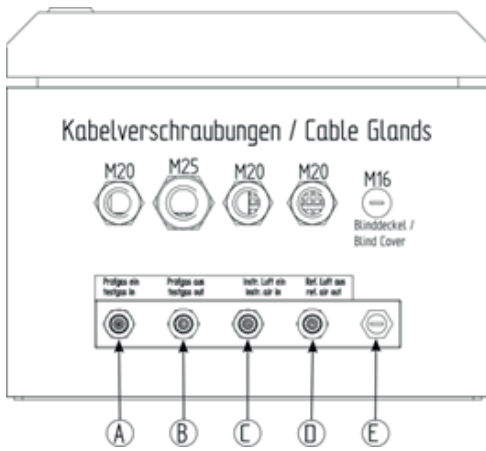
5.11.3 Pneumatic connections on the analyzer unit

Fig. 19: Pneumatic connections on the analyzer electronics



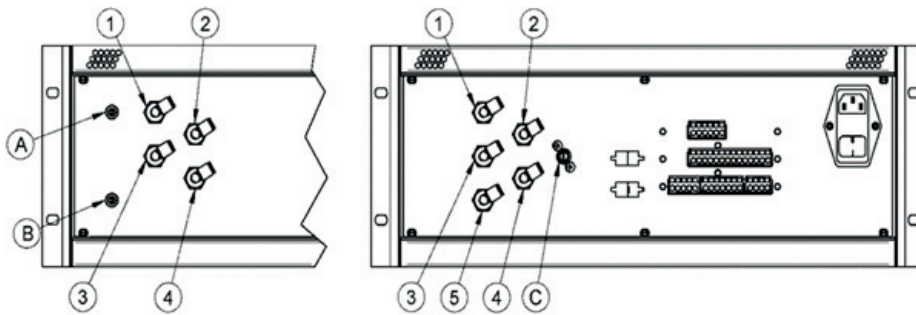
5.11.4 Pneumatic connections of the electronics

Fig. 20: Bottom view of control unit, safe area with pneumatic unit



No.	Tube	Pump version	Instrument air version
A	1/4"	Test gas inlet	Test gas inlet
B	1/4"	Test gas outlet	Test gas outlet
C	1/4"	Reference air inlet	Instrument air inlet
D	1/4"	Reference air outlet	Reference air outlet
E	1/4"	Test air inlet	

Fig. 21: Pneumatic connections, 19" rack, rear



No.	Tube	Pump version	Instrument air version
A	1/4"	Test gas inlet	Test gas inlet
B	1/4"	Test gas outlet	Test gas outlet
C	1/4"	Reference air inlet	Instrument air inlet
D	1/4"	Reference air outlet	Reference air outlet
E	1/4"	Test air inlet	

- A Reference air throttle
- B Test air throttle
- C Test air throttle

6 Commissioning

- ▶ Observe the regulations according to IEC 60079-17 during commissioning, maintenance and testing.
- ▶ The device must be completely voltage-free during installation and maintenance. Voltage may only be applied after complete assembly and connection of all circuits required for operation. This also applies to all signal and digital interfaces that are led to/from the device.
- ▶ Does the serial number of the analyzer unit match the serial number of the control unit? Assign when not correct. (see “1-point adjustment (manual)”, page 52 and see “2-point adjustment (manual)”, page 53)
- ▶ Does the power voltage correspond to the data on the type plate? (see “Type plates”, page 14) If not, contact SICK.
- ▶ Are the electrical connections made correctly? (see “Electrical installation”, page 31 and see “Electrical connection plan – ZIRKOR Ex-D”, page 38)
- ▶ Is the allocation of the pneumatic connections correct and are the connections gas-tight? (See Sections 5.15 and see “Pneumatic connections and settings”, page 39)
- ▶ Make sure there are no leaks on the analyzer unit - is the counter flange welded gas-tight to the flue gas duct, are the flange bolts sufficiently tightened? Were flange gaskets used? (See Section 5.8 - Installing the measuring probe)
- ▶ Do the conditions on site correspond to the specifications in the Data Sheets? (see “Technical data”, page 84)

6.1 Safety information on commissioning

Safety information concerning gas



DANGER:

Risk of burns and poisoning from escaping hot and toxic gas in systems with overpressure conditions

When working on the gas duct, hot gas can escape from the process connection. This can lead to burns or damage to health.

- ▶ Always keep the process connection tightly closed and perform leakage test.
- ▶ Pay attention to hot surfaces.
- ▶ Wear appropriate protective equipment.

Grounding



CAUTION:

Device damage through incorrect or missing grounding

During installation and maintenance work, it must be ensured that the protective grounding to the devices and/or lines involved is effective in accordance with the applicable standards.

6.2 Initial commissioning

Switch on the supply voltage. After switching the device on, the startup screen which also contains the software version is displayed briefly. Afterwards, you will be prompted to select the language, set the system date and time, assign a TAG number and select a SICK REMOTE code (only if SICK REMOTE is activated at the factory).

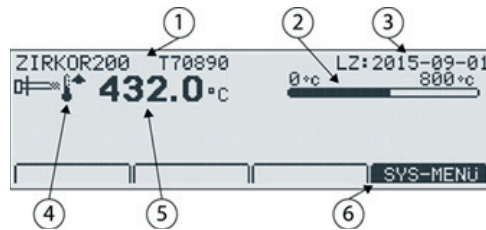
The measuring probe heater phase begins and then the measuring mode starts.

Fig. 22: Initial commissioning. The software version is displayed in the lower right corner.



6.3 Display - heating process

Fig. 23: Display - heating process

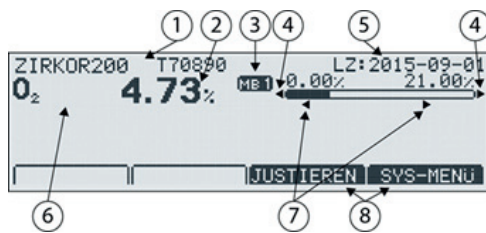


The heating process starts with heating up the O₂ sensor.

- 1 TAG No.
- 2 Temperature, analog display
- 3 Last access, with date
- 4 Rising measuring probe temperature
- 5 (or) shows waiting time
- 6 (or) heating fault
- 5 Current temperature
- 6 Softkey: System menu

6.4 Display - Measuring mode

Fig. 24: Display - Measuring mode

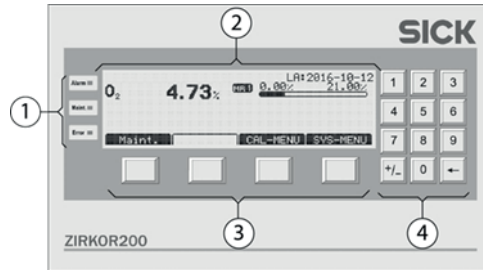


- 1 TAG No.
- 2 Measured value
- 3 Measuring range specification
- 4 Flashing arrow - indicators show measuring range underflow or overflow
- 5 Last access, with date
- 6 Measuring component
- 7 Analog display shows measured value and range indicator - min-alarm / max-alarm *
- 8 Softkey name

* Only when O₂ limit value alarms are switched on and the defined limit values are within the measuring range.

6.5 Operating elements and display

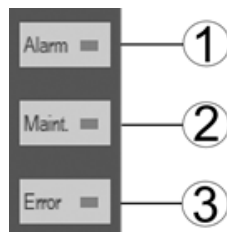
Fig. 25: Operating elements and display



The controls and display of the ZIRKOR200 are located in the control unit and comprise:

- 1 Three LED indicators for active status messages
- 2 Graphics-capable, backlit display
- 3 Four function keys with changing assignment (softkeys)
- 4 Numeric keypad for numerical input

6.6 Status LEDs



- 1 Alarm, orange - lights when an alarm is present (e.g. O₂ limit value alarm).
- 2 Maintenance, orange - lights when a system function is called up that may influence the O₂ measured value.
- 3 Error, red - lights when a system error occurs.

6.7 Softkey symbols

	Moves a selection up one position
	Moves a selection down one position
	Exit selection
	Cancel function or entry
	Select or confirm a function / value

6.8 System code



Note:

The system code is 0000 on delivery. In this state, system changes are possible without code entry. The system code protects the configuration data of the system against unauthorized users. Functions that can influence the O₂ measurement are also secured in this way.

Caution: After commissioning, change the system code to secure the system configuration data against unauthorized users. Keep the changed system code in a safe place.

7 Menu overview and explanations

7.1 SYS-MENU

SYS-MENU		
System information		
<input checked="" type="checkbox"/>	Current measured value	
	O ₂ measured value (% O ₂) (optionally ppm)	
	O ₂ -mA output 17A/B (mA)	
	O ₂ sensor input (mV)	
	Reference air flow volume	
	O ₂ probe temperature (°C / °F)	
	O ₂ probe heating capacity (%)	
	Thermovoltage input (mV)	
	Terminal temperature (°C / °F)	
	Internal temperature (°C / °F)	
	Process pressure (rel.) (mbar/psi)	
	O ₂ -Sensor life expectancy (%)	
	Lambda	
Adjustment results		
	e.g. 2012-05-11 (select data/time)	
	Performed on	
	Adjustment method	
	O ₂ sensor adjustment	
	~~ Adjustment results ~~	
	O ₂ value with test air (% O ₂)	
	◆ adjusted to	
	O ₂ value with test gas (% O ₂)	} Only visible when performed
	◆ adjusted to	
	~~ Adjustment data ~~	
	O ₂ -Sensor offset (mV)	
	O ₂ -Sensor slope (mV / dec)	} 2-point adjustment only
	~~ Test gas data ~~	
	Test air (% O ₂)	
	Test gas (e.g. 2.1% O ₂)	
	~~ Sensor raw data~~	
	O ₂ voltage with test air (mV)	
	◆ At pressure (mbar/psi)	
	O ₂ voltage with test gas (mV)	} Only visible when performed
	◆ At pressure (mbar/psi)	

SYS-MENU		
		O ₂ reaction to test gas (s) } Only visible when performed
	↑ ↓	O ₂ reaction to process (s) } Only visible when performed
	↑ ↓	O ₂ -Sensor life expectancy (s)
	← →	
↑ ↓	↑ ↓	Device operating data
		Switch-on cycles
		Operating hours
↑ ↓	↑ ↓	Min. internal temperature
		Max. internal temperature:
	← →	
	← →	Software version and option
	✓	
↑ ↓	↑ ↓	Software ZIRKOR200
	↑ ↓	~~ Options ~~
	◆
← →	← →	
		System configuration
		O₂ measuring range
	✓	
		Measuring range 1, from (% O ₂ , ppm O ₂)
		Measuring range 1, to (% O ₂ , ppm O ₂)
		Measuring range 2, from (% O ₂ , ppm O ₂)
		Measuring range 2, to (% O ₂ , ppm O ₂)
↑ ↓	↑ ↓	Measuring range selection with (Dig. input / key)
		Measured value average over (s)
		Conversion wet → dry (% H ₂ O)
		mA output type (0-20 mA / 4-20 mA)
		mA output for system fault (mA)
↑ ↓	← →	
↑ ↓	↑ ↓	O₂ limit value alarms
		O ₂ limit value alarm 1 (ON / OFF)
	◆	at } Only visible when "ON"
	◆	Hysteresis
↑ ↓	↑ ↓	O ₂ limit value alarm 2 (ON / OFF)
	◆	at } Only visible when "ON"
	◆	Hysteresis
	← →	
		O₂ sensor adjustment values
↑ ↓	↑ ↓	O ₂ adj value - offset (mV)
		O ₂ adj value - slope (mV/Dek)
	← →	

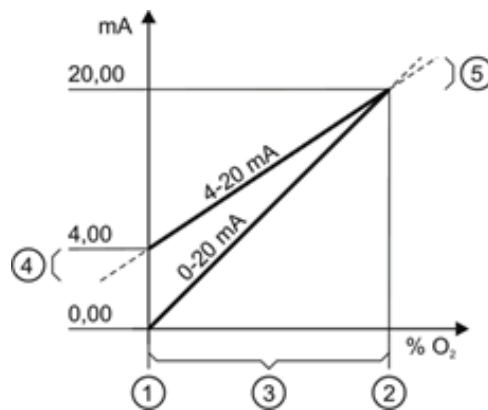
SYS-MENU		
Adjustment setting		
	Time per test gas feed (min.)	
	Stopping time to process (min.)	
	Hold measured value at Just. (ON/OFF)	ON: The last valid measured value from the process is held for adjustment duration.
	Auto. Adjustment (ON/OFF)	
↑	↓	◆ Adjustment method (1-point / 2-point) } Only visible when "ON"
↑	↓	◆ Test gas (cylinder value) {only for 2-point adjustment} } Only visible when "ON"
	◆ Start by (time, digital input, both)	} Only visible when "ON"
	◆ Interval (days)	} Only on "time" and "both"
	◆ Next AJUST (date)	Adjustable
←	←	←
Process pressure input range		
	Pressure range from (mbar)	
↑	Pressure range to (mbar)	
↓	Site altitude above sea level (m)	
←		
System clock/TAG No.		
✓		
↑	System data [yyyy.mm.dd]	
↑	System time [hh:mm:ss]	
↓	TAG	
←		
REMOTE - settings (optional)		} Visible when REMOTE interface is activated.
✓		
	REMOTE (ON/OFF)	
↑	REMOTE code (8-digit code)	} Visible when REMOTE is on.
↓	Range (short / medium / maximum)	
←		
Units of measure		
✓		
↑	Temperature (°C / °F)	
↓	◆ Pressure (mbar/psi)	
←		
Language		
✓		
↑	Select language (German / English / Spanish / Polish / French)	
←		
Change system code		
✓		
←		

SYS-MENU	
	Load default set.
⬆	☑
⬇	⬅
	Service
⬅	⬅

7.2 Menu explanations

7.2.1 O₂ measuring ranges (scaling)

Fig. 26: O₂ measuring ranges



O₂ measuring range (3) specifies the linear scaling of the O₂ measured value as analog output value (mA).

“O₂ measuring range from” (1) defines the O₂ value at which the analog output signal should be 4.00 mA (4-20 mA) or 0.00 mA (0-20 mA). “O₂ measuring range to” (2) defines the O₂ value at which the analog output signal should be 20.00 mA.

Only 4-20 mA: A measuring range underflow (4) exists when the O₂ measured value falls below the value defined in “O₂ measuring range from”. The analog output signal is limited to a minimum of 3.60 mA for the O₂ measured value output.

A measuring range overflow (5) exists when the O₂ measured value rises above the value specified in “O₂ measuring range to”. The analog output signal is limited to a maximum of 20.40 mA for the O₂ measured value output. Measuring range underflows and overflows are shown on the display (measuring mode).

7.2.2 Measured value average over [s]

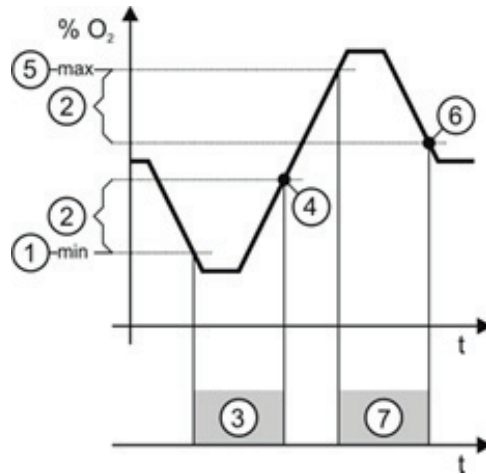
This entry defines the time span up to 60 seconds for continuous averaging (rolling average). During an adjustment as well as a sensor check, averaging for the O₂ measurement display is switched off, the signal at the analog output is still averaged.

7.2.3 mA output for system error

Sets the mA output value in the range 0 to 3.55 or 20.41 to 20.80 mA in the event of a system error. The mA output value in case of a system error cannot be within the mA measuring range.

7.2.4 O₂ limit value alarms

Fig. 27: O₂ limit value alarm settings



The entry “at” defines the O₂ value from which the O₂ limit value alarm is to be signaled.

With the O₂ limit value alarm function “min” (1), limit value alarm (3) is triggered when the O₂ measured value falls below the defined O₂ limit value “min”.

If a hysteresis unequal to 0.00% O₂ is defined (2), the limit value alarm is reset when the O₂ measured value rises above the O₂ limit value *plus* hysteresis value (4).

With the O₂ limit value alarm function “max” (5), limit value alarm (7) is triggered when the O₂ measured value rises above the defined O₂ limit value “max”.

If a hysteresis unequal to 0.00% O₂ is defined (2), the limit value alarm is reset when the O₂ measured value drops below the O₂ limit value *minus* hysteresis value (6). If the hysteresis is set to 0.00% O₂, the O₂ limit value alarm must be reset manually on the device.

7.2.5 O₂ sensor adjustment values

A 1-point adjustment should be carried out every 4-6 weeks and a 2-point adjustment every 6 months.

With EMI, a 1-point adjustment should be carried out every 3 days and a 2-point adjustment every 6 months.



Note:

The O₂ sensor adjustment values can be changed by a 1- or 2-point adjustment. Manual entry is only necessary after replacing the O₂ probe.

7.2.6 Time per test gas feed

Defines the time per test gas feed (test air feed) during a sensor adjustment. If the sensor stability is not reached within the preset maximum time, the adjustment is aborted with the error message:

“O₂ sensor adjustment failed - O₂ sensor signal unstable”. Extend the time when this error message appears.

The maximum time set at the factory is 10 minutes. If necessary, the time can be set between 5 and 30 minutes.

7.2.7 Stopping time until process (O₂)

The entry determines, on the one hand, the stopping time of the measured value memory (when switched on) after the test gas feed (test air feed) has been completed, and, on the other hand, the time for which the O₂ trend display should still be shown on the display after the test gas feed (test air feed) has been completed during sensor adjustment.

7.2.8 Auto. Adjustment (ACAL)

The automatic adjustment enables a cyclic, time-controlled or remote-controlled adjustment of the sensors via the digital input provided for this purpose. The automatic adjustment can be globally switched on or off. It only starts from the main measured value display.

When an ACAL 2-point is set, a test gas cylinder must be permanently connected and turned on.



Note:

Make sure the test air and test gas flow volumes required for adjustment are set correctly.

For systems *with flow monitoring*: The flow volumes can be checked via System check --> Sensor check and adjusted if necessary.

For systems *without flow monitoring*: Check the flow volumes using an external flow meter and, if necessary, set to 150 - 180 l/h using an external throttle valve.

7.2.9 Settings for auto. adjustment

The settings for automatic adjustment are only visible when automatic adjustment is switched on globally. The adjustment method determines whether the automatic adjustment should be carried out as a 1-point adjustment with test air only or as a 2-point adjustment with two test gases (test air / test gas). The required concentrations of the test gases can be entered depending on the adjustment method. Test air (ambient air) is preset with a fixed O₂ concentration of 20.95%; this value is therefore neither displayed nor can it be changed.

The automatic adjustment starts via:

- **Time:** Time-controlled start with fixed intervals. The interval time (in days) as well as the time of the next execution (next ACAL) can be defined here. The entry for the next execution also allows a date/time before the system time, but this is then automatically corrected to the system time + interval.
- **Time + digital input:** Same as "Time", additionally a control voltage of 12...24 V DC must be applied to the digital input "Adjustment release" to start the automatic adjustment.
- **Digital input:** Automatic adjustment is started as soon as a control voltage of 12...24 V DC is applied to the digital input "Adjustment release". A new automatic adjustment is started immediately when the control voltage on the digital input is maintained after adjustment.

7.2.10 REMOTE



Note:

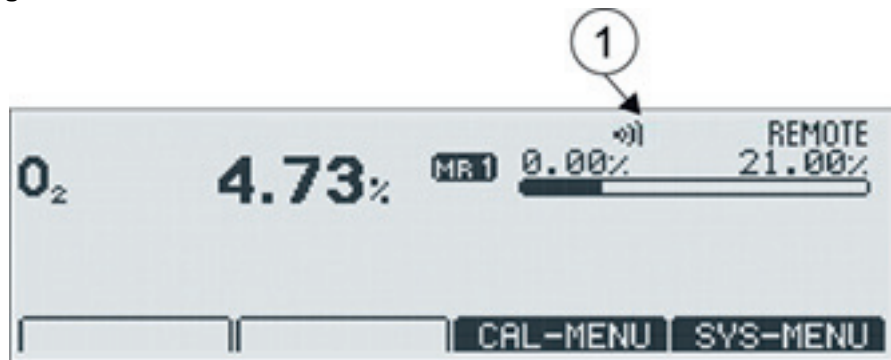
REMOTE is disabled by default, so the password and range are not shown. After activation (only possible from system level), the 8-digit password which is prompted during the remote connection setup must be assigned.

The password is used:

- For authentication and pairing with a smartphone/tablet/notebook/PC.
- For authentication/login after each connection establishment. Without authentication/login, neither device data can be read out nor the device configuration changed.

The **range** limits the transmission power of the REMOTE module. **Maximum** = approx. 100 m, **medium** = approx. 10 m, **short** = approx. 1 m. The actual possible range can vary greatly due to local conditions and the reception performance of the smartphone used.

Fig. 28: REMOTE connection active



If a SICK-REMOTE connection to the analyzer is active, the connection is shown in the upper right corner of the display (1).



HINTS:

A maximum of 16 users (smartphones / tablets) can be connected to the REMOTE module of a SICK analyzer. The connection fails when additional users try to connect. In this case, REMOTE must be switched off and on again via the front panel, all mobile devices that have already been connected to the device once must be registered to it again.

7.2.11 Units of measure

Sets the units of measurement for temperature (°C / °F) and pressure (psi / mbar).

7.2.12 Language

Sets the language for all display texts. The languages German, English, Spanish, Polish and French are available.

7.2.13 Change system code

The system code protects the system configuration against unauthorized use. Settings that may influence the measurements are also protected.



Note:

The system code is 0000 on delivery.

Note the new system code and keep the information in a place accessible only to those authorized to make changes to the system. If the system code is lost, it can only be restored by a trained service technician.

7.2.14 Loading the factory settings

Restores the delivery status of the system. All values changed in the meantime as well as the O₂ sensor adjustment values and adjustment results are lost. Write down all O₂ sensor adjustment values beforehand and enter them again afterwards. A new adjustment must be carried out when this is not done.

7.2.15 Service (factory service settings)

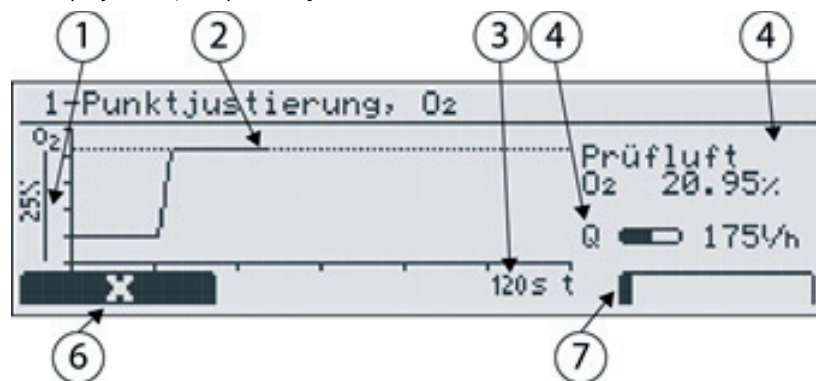
The service functions may only be called up by trained service technicians. They are protected by their own service code, which is independent of the system code.

7.2.16 Adjustment menu

Adjusting		
<input checked="" type="checkbox"/>		
<input type="checkbox"/>	1-point adjustment, O ₂	
<input type="checkbox"/>	2-point adjustment, O ₂	
<input type="checkbox"/>		

7.2.17 Display - Adjustment

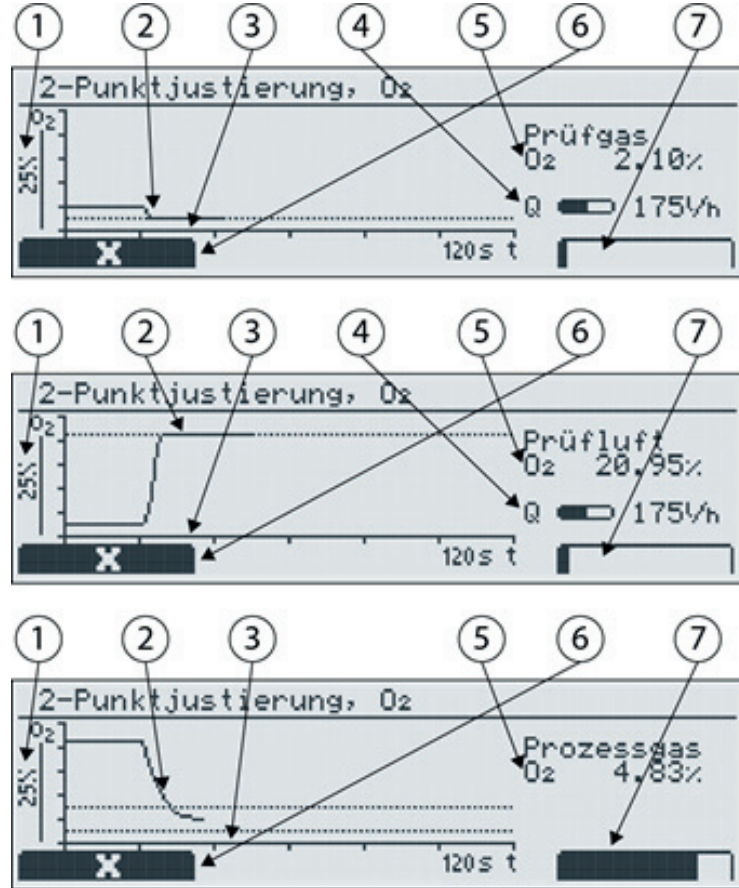
Fig. 29: Display - here, a 1-point adjustment



1	Measured value scale - shows the scale value (corresponds to the maximum adjustable measuring range).
2	Trend display O ₂ measured value _____ and O ₂ target value The target value is given by the O ₂ concentration of the test gas/test air.
3	Time scale of the respective test gas feed in seconds. The time specification refers to the end of the time scale
4	Current flow volume (only with flow monitoring option)

5	Current O ₂ measured value
6	Cancel adjustment
7	Progress bar

Fig. 30: The 3 phases of a 2-point adjustment; Test gas feed, test air feed and return to process.



Note:

The test gas concentration for test air is not entered because it is known (20.95% O₂). The test gas concentration(s) is (are) only entered after the test gas/process gas feed processes.

7.2.18 1-point adjustment (manual)

The adjustment value **Offset** is determined during 1-point adjustment of the sensor. For this purpose, test air (test gas 1) is fed to the sensor. For systems without integrated pneumatics, the test air feed (test gas 1 feed) must be performed manually, i.e. by the user, and the test gas flows must be checked and, if necessary, readjusted.

Sequence

- 1 System code entry
- 2 Maintenance signal is set
- 3 Prompt for test air feed (*only appears for systems without flow monitoring*)
- 4 Adjustment with test air
- 5 Prompt to terminate test air feed (*only appears for systems without flow monitoring*)
- 6 Display of the process return when the difference between the previously measured O₂ concentration in the process and the O₂ concentration with test air is more than 3.00%
- 7 Entry O₂ concentration test gas 1 (*not applicable for test air*)

- 8 Display of adjustment results (*max. 1 minute*)
- 9 Maintenance signal reset (*delayed after last test gas monitoring by the "Stopping time until process" when "Hold measured value during adjustment" is switched on*)
- 10 Return to main measured value display











7.2.19 2-point adjustment (manual)

During 2-point adjustment of the sensor, adjustment values **Offset** (constant) and **Slope** (steepness) are determined. For this purpose, two test gases are fed to the sensor. For systems without integrated pneumatics, test air/test gas feed must be performed manually, i.e. by the user, and the test gas flows must be checked and, if necessary, readjusted.

Sequence

- 1 System code entry
- 2 Maintenance signal is set
- 3 Prompt for test gas feed (*only appears for systems without flow monitoring*)
- 4 Adjustment with test gas (*test gas 1*)
- 5 Prompt for test air feed (*only appears for systems without flow monitoring*)
- 6 Adjustment with test air
- 7 Prompt to terminate test gas feed (*only systems without internal flow monitoring*)
- 8 Display of the process return when the difference between the previously measured O₂ concentration in the process and the O₂ concentration with test air is more than 3.00%
- 9 Prompt for test gas concentration(s)
- 10 Display of adjustment results (*max. 1 minute*)
- 11 Maintenance signal reset (*delayed after last test gas monitoring by the "Stopping time until process" when "Hold measured value during adjustment" is switched on*)
- 12 Return to main measured value display

7.3 System check

O₂ sensor check		
	Source: Test air O ₂ sensor .. mV = ... % Flow.. l/h	
	Source: Test gas O ₂ sensor .. mV = ... % Flow (3 bar max) .. l/h	
	Source: Process O ₂ sensor .. mV = ... %	
		
Check mA outputs		
	Set mA output 17A/B (mA)	
		
Check relay outputs		
	Relay contact on 18A/B (open / closed)	
	Relay contact on 19A/B (open / closed)	
	Relay contact on 20A/B (open / closed)	
	Relay contact on 21A/B (open / closed)	
	Relay contact on 22A/B (open / closed)	
		
Check digital inputs		
	Input status on 25A/B	
	Input status on 27A/B	
		
Check mA inputs		
	Check mA input on 29A/B	
		

8 Maintenance

8.1 Technical knowledge necessary for maintenance work



Note: Malfunction hazard

Only technicians with special ZIRKOR200 Ex-D training are allowed to perform maintenance tasks on the ZIRKOR200 Ex-D.

8.2 Safety instructions for maintenance work



DANGER: Danger of explosion due to damaged measuring probe

A cold measuring probe can be damaged by condensed, corrosive flue gas, as a result of which the analyzer unit is no longer encapsulated in a flameproof enclosure and can lead to explosions.

- ▶ The analyzer unit must be in operation while in the process.



DANGER: Danger of explosions through hot surfaces

The measuring probe can be heated by the process. When withdrawn from the process, the temperature of the measuring probe may be higher than the surface temperature certified for the environment (see Ex-marking) and can lead to an explosion.

- ▶ Only remove hot measuring probe from the duct in an Ex-free environment.



WARNING: Hot surface

The measuring probe is heated by the process and may cause burns during and after removal from the duct.

- ▶ Wear suitable protective clothing.
- ▶ Perform work on the analyzer unit after it has cooled down.



DANGER: Hazard by voltage

There is a risk of electric shock when working on the device with the voltage supply switched on.

- ▶ Only carry out maintenance work when the device is disconnected from the power supply.
- ▶ The voltage supply may only be switched on again after work completion or for test purposes by the persons carrying out the work under consideration of the valid safety regulations.



WARNING: Risk of chemical burns/poisoning through caustic/toxic residues on components with sample gas contact

After the device has been decommissioned or removed from the measuring channel, process gas residues can exist as deposits on components with sample gas contact (e.g., gas filter, gas-carrying lines etc.). These residues can be odorless or invisible depending on the gas mixture in the duct. Without protective clothing, contact with such contaminated components can lead to severe burns or poisoning.

- ▶ Take appropriate protective measures for work (e.g., by wearing a safety mask, protective gloves and acid resistant clothes).
- ▶ In case of contact with the skin or eyes, rinse the affected parts immediately with clear water and consult a doctor
- ▶ Decontaminate all contaminated components according to regulations after disassembly.

8.3 Information on use in Ex-areas



DANGER:
Danger of explosion when using spare or expendable parts not approved for the Ex-area

All spare and expendable parts for the in-situ gas measuring device are tested by SICK for use in Ex-areas. The use of other spare and expendable parts will invalidate the claim against SICK because the ignition protection cannot be guaranteed.

- ▶ Use only original spare parts and expendable parts from SICK.



DANGER:
Danger of explosion through residual voltages and hot surfaces in the device

Danger of explosion during installation and maintenance work on the device.

- ▶ Ensure the work area is Ex-free when working on the device.
- ▶ Protect the device from high dust load by cleaning it with a damp cloth.

8.4 Maintenance plan

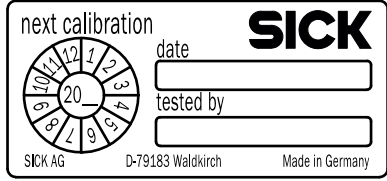
In general, the maintenance work to be carried out and the necessary maintenance interval depend on the flue and/or process gas conditions in which the analyzer unit is installed. Therefore, the appropriate maintenance interval can vary from a few months up to several years.

The main influencing factors are the presence of corrosive components such as SO₂ or HCl, a continuous reducing atmosphere (reduced oxygen concentration, increased concentration of combustible gases) and the nature of the solid components in the sample gas. These may have the following effects: chemical or mechanic damage to the measuring probe, clogging of the filter element or accelerated aging of the sensor. This can lead to both a falsification of the measured values and an increase in the response time, which can subsequently lead to an incorrect process operation.

For this reason, a sensor check is recommended with test gas and test air every six months. A 2-point calibration should be carried out after a serious deviation between the values obtained and those presently anticipated. A visual inspection of the analyzer unit, which includes cleaning the filter element if necessary, should be conducted at least once a year.

Deviating from these recommendations, the operator must define a suitable maintenance interval for his process and measuring location that is appropriate to the safety relevance of the measurement and the conditions of the process.

Maintenance interval ^[1]			Maintenance work
1M	6M	1Y	
x	x	x	Measured value plausibility check
	x	x	Check with test air and gas: <ul style="list-style-type: none"> - Check sensor adjustment values - Check the solenoid valve (optional) - Check the flow volumes
	x	x	(As required) Adjustment of the sensor
	x	x	Visual check of the analyzer unit and the dust protection pipe: <ul style="list-style-type: none"> - Check the measuring probe and the filter and clean as necessary - Check for corrosion - General check of the dust protection pipe

Maintenance interval ^[1]			Maintenance work
1M	6M	1Y	
	x	x	Check the calibration date of the heating monitoring 
		x	Visual check of cables and hoses for external damage
		x	Exchange the reference and test air filter (optional)

[1] M = month(s), Y = year(s)

+i Deviating from these recommendations, the operator must define a suitable maintenance interval for his process and measuring location that is appropriate to the safety relevance of the measurement and the conditions of the process.

8.5 Tools required

Tools
3 mm Allen key
4 mm Allen key
Cross-head screwdrivers in different sizes

8.6 Maintenance work

8.6.1 Replace fuses

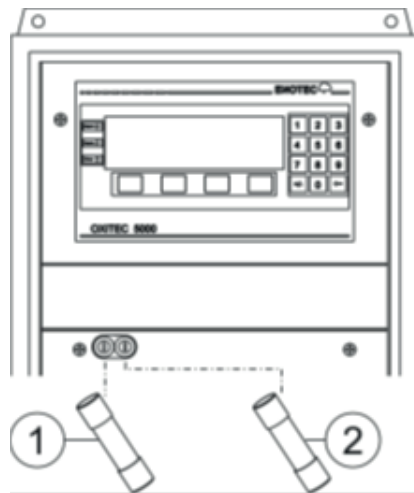
- ▶ Open the enclosure.
- ▶ Replace the corresponding fuses, see “Control unit main fuses”, page 58.
- ▶ Close the enclosure.

Fuses F1 and F2 are directly accessible on the front panel of the control unit.

	Fuse	Rated current	SICK Part No.	Type	Task
1	F3	0.5 A	2116785	Slow 5x20 mm glass tube fuse	To protect the electronics
2	F4	0.5 A		Slow 5x20 mm glass tube fuse	To protect the electronics
3	F5	1 A		Medium slow 5x20 mm glass tube fuse	To protect the 115 V AC solenoid valves as well as the test and reference air pump
5	F1	2.0 A (230 V AC) 4.0 A (115 V AC)		Slow 5x20 mm ceramic tube fuse	To protect the entire system
6	F2	4 A		Medium slow 5x20 mm ceramic tube fuse	To protect the measuring probe heater

All fuses listed in the Table are available as a spare parts set under the SICK Part No. 2089370 E-SET FUSES.

Fig. 31: Control unit main fuses



8.6.2 Test air and reference air volumes

The systems are always preset at the factory to the correct test air or reference air volumes. The instrument air versions are designed for a primary pressure of 1...10 bar, it might be necessary to adjust the reference air and/or test air volumes for a primary pressure higher than 6 bar.

The air volume should be within the following ranges:

Test air: 150 l/h - 180 l/h

Reference air: 30 l/h - 40 l/h

8.6.3 Setting the flow volume (Safe Area control unit)

On systems with integrated pneumatics, it is possible to set the reference or test air volume on the electronics. A distinction is made here between the pump and instrument air version:

- The **pump version** uses ambient air. Only the test air volume can be set for the pump version.
- The **instrument air version** requires an external supply of clean, dry and oil-free air (instrument air) directly at the installation site. Here both the reference and test air volumes must be set.

Fig. 32: Controller positions for test air (1) (pump version)

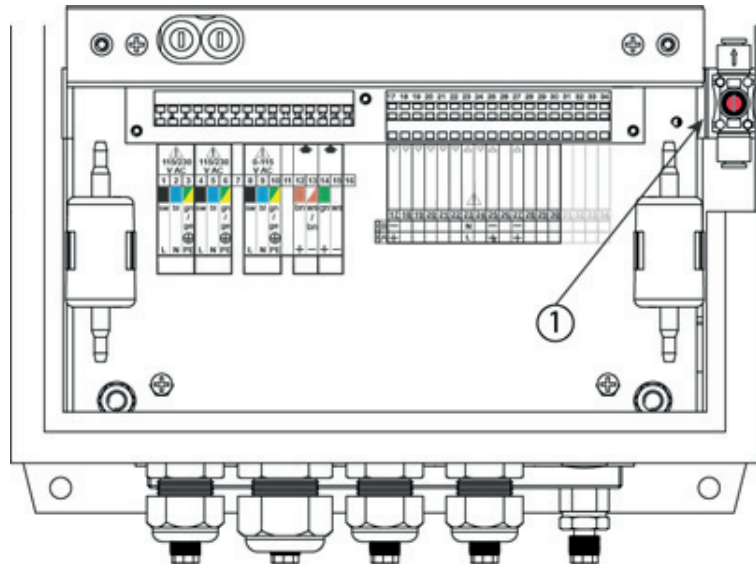
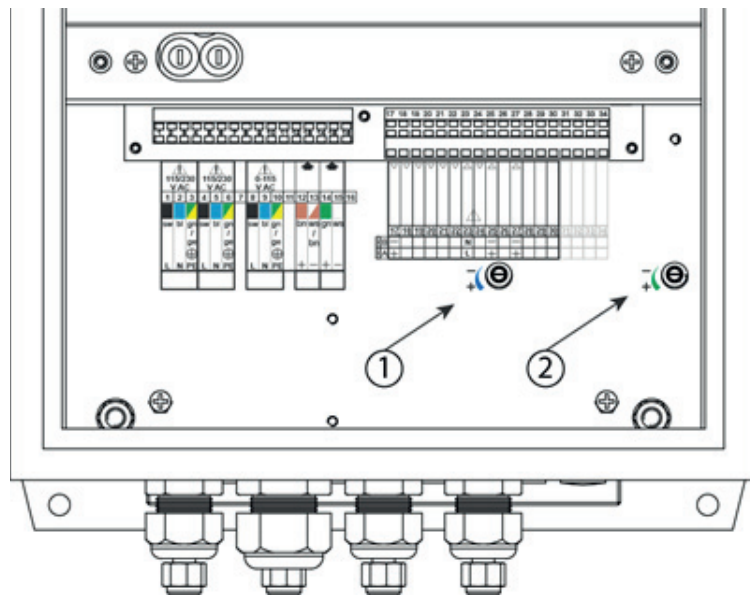
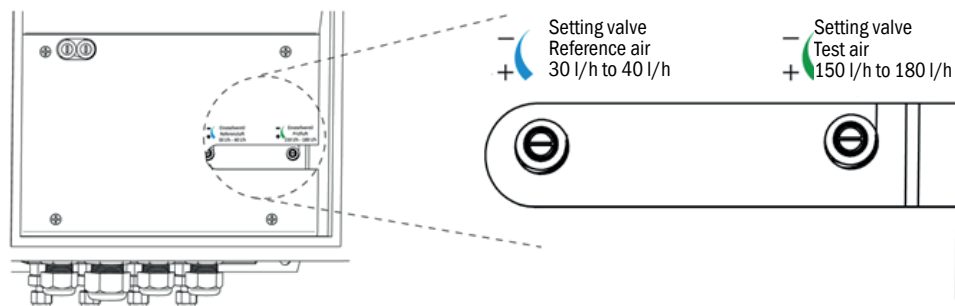


Fig. 33: Controller positions for reference air (1) and test air (2) (instrument air version)



8.6.4 Setting valves position

Fig. 34: Terminal cover of the Safe Area control unit



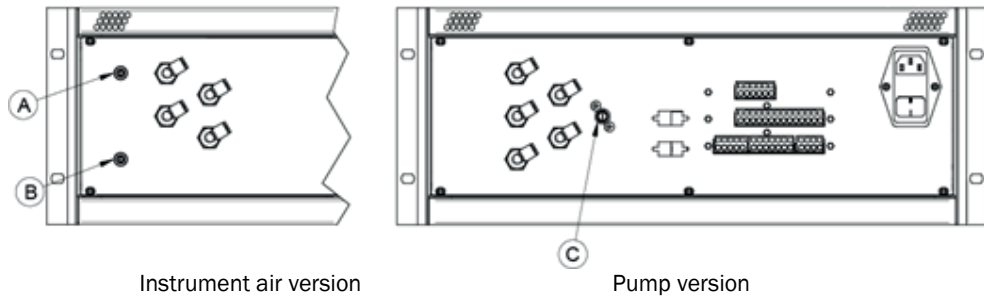
Arrows show the position of the setting valves for reference air and test air

8.6.5 Setting the flow volume (19" rack)

In the 19" slot with integrated pneumatics, it is possible to set the reference or test air volume on the rear of the control unit. A distinction is made here between the pump and instrument air version:

- Only the test air volume can be set for the pump version.
- With an instrument air version, it is possible to set both the reference and test air volume.

Fig. 35: 19" rack - setting the flow volumes



- A Controller, test air
- B Controller, reference air
- C Controller, test air

8.6.6 Replacing the filter head



WARNING: Danger of explosion through breaching the flameproof enclosure

An Allen screw, damaged due to incomplete loosening during filter replacement or a loose Allen screw can damage the flameproof enclosure by damaging the flameproof joint and thus lead to an explosion.

- ▶ Loosen and tighten the hexagon socket screw completely.
- ▶ Replace damaged hexagon socket screws.

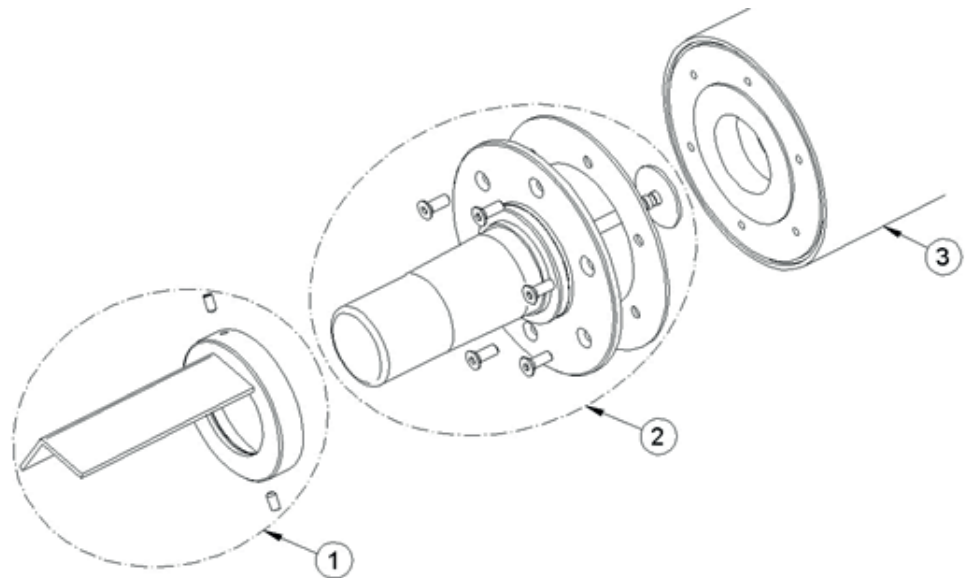


WARNING: Danger of burns on hot components which are in the process gas

The temperature of the filter head and all parts in the process gas is 150 °C to 800 °C (302 °F to 1472 °F) during operation. Directly touching the parts for disassembly or maintenance causes serious burns.

- ▶ Use heat protection gloves when removing the measuring probe.
- ▶ Switch the electronics supply voltage off before removing the measuring probe.
- ▶ Place the analyzer unit in a safe, protected area after removal and wait until the measuring probe temperature has cooled down to the ambient temperature.

Fig. 36: Replacing the filter



- ▶ Loosen the locking screws on V-shield (1) and pull the V-shield off the protective pipe.
- ▶ Loosen the 6 screws of filter flange (2) and remove the filter with filter flange and seal from protective pipe (3).
- ▶ Fit the new filter with filter flange and gasket, aligning the V-shade towards the flue gas flow.



Note:

Measuring probes in the Ex-D protective pipe contain a filter made of sintered metal, which is welded to the filter flange.

8.6.7 Replacing an analyzer unit



WARNING: Risk of burns

The temperature of the filter head and all parts in the process gas is 150 °C to 800 °C (302 °F to 1472 °F) during operation. Directly touching the parts for disassembly or maintenance causes serious burns.

- ▶ Use heat protection gloves when removing the measuring probe.
 - ▶ Switch the electronics supply voltage off before removing the measuring probe.
 - ▶ Place the analyzer unit in a safe, protected area after removal and wait until the measuring probe temperature has cooled down to the ambient temperature.
-

- 1 Disconnect the connection cable analyzer electronics - control unit in the control unit.
- 2 Loosen the counter flange bolts and remove the analyzer unit.
- 3 Install the new analyzer unit with a new seal. Determine the flow direction of the flue gas and align the V shield ([see "Aligning the V-shield", page 29](#)).
- 4 Fasten the counter flange bolts and connect the connection cable in the control unit.
- 5 Switch on the supply voltage and wait until the measuring probe has reached the setpoint temperature.
- 6 Perform a 2-point adjustment under process conditions.

8.6.8 Replacing the O₂ measuring cell



Note:

It is only necessary to replace the measuring cell if it leaks (jumping or incorrect measured values) and a two-point adjustment was faulty.

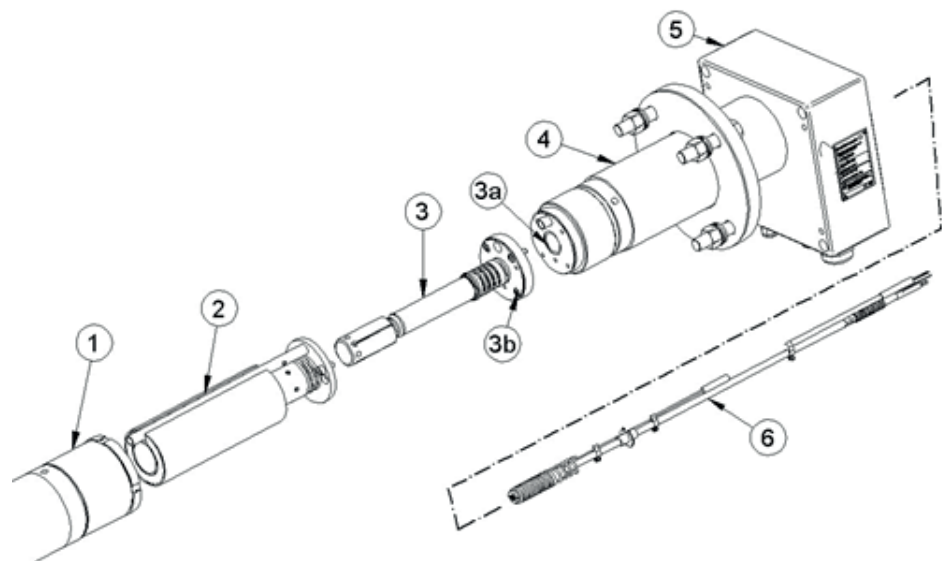


WARNING: Risk of burns

The temperature of the filter head and all parts in the process gas is 150 °C to 800 °C (302 °F to 1472 °F) during operation. Directly touching the parts for disassembly or maintenance causes serious burns.

- ▶ Use heat protection gloves when removing the measuring probe.
- ▶ Switch the electronics supply voltage off before removing the measuring probe.
- ▶ Place the analyzer unit in a safe, protected area after removal and wait until the measuring probe temperature has cooled down to the ambient temperature.

Fig. 37: Replacing the O₂ measuring cell



- | | |
|-------------------------------|------------------------------|
| 1 Filter head | 3b Measuring cell flange |
| 2 Test gas distributor | 4 Measuring probe |
| 3 Measuring cell | 5 Analyzer electronics |
| 3a Measuring cell flange seal | 6 Measuring probe inner part |

- ▶ Switch off the electronics, remove the measuring probe from the protective pipe and let the analyzer unit cool down.
- ▶ To replace the O₂ measuring cell, first remove the inner part of measuring probe (6) (see [“Replacing the O₂ measuring cell”, page 63](#)).
- ▶ Then unscrew filter head (1) and remove test gas distributor (2) by loosening the two hexagon socket screws.
- ▶ Now loosen the 4 hexagon socket screws on measuring cell flange (3b) and remove measuring cell (3) from measuring probe (4). Also carefully remove the old measuring cell flange seal (3a).
- ▶ Clean the flange on the measuring probe with fine sandpaper.
- ▶ Install the test gas distributor.
- ▶ Screw the new measuring cell with new seal and 4 new screws to the measuring cell flange of the measuring probe.
- ▶ Tighten the 4 hexagon socket screws with a hexagon socket wrench crosswise.
- ▶ Now fit the inner part of the measuring probe again and install test gas distributor and filter head.
- ▶ Install the analyzer unit and let the system heat up to operating temperature. Perform a two-point calibration after two hours of operation.

8.6.9 Replacing the inner part of the analyzer unit

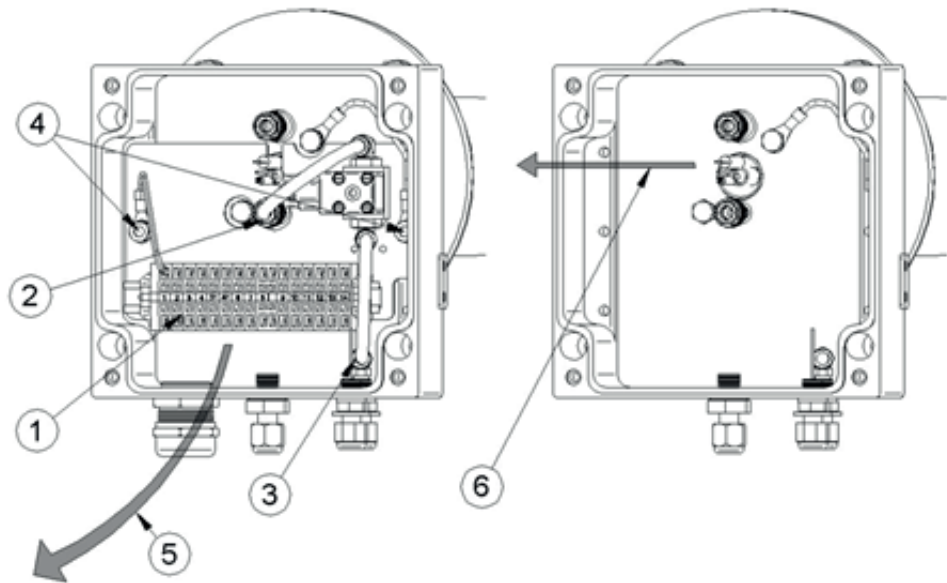


WARNING: Risk of burns

The temperature of the filter head and all parts in the process gas is 150 °C to 800 °C (302 °F to 1472 °F) during operation. Directly touching the parts for disassembly or maintenance causes serious burns.

- ▶ Use heat protection gloves when removing the measuring probe.
- ▶ Switch the electronics supply voltage off before removing the measuring probe.
- ▶ Place the analyzer unit in a safe, protected area after removal and wait until the measuring probe temperature has cooled down to the ambient temperature.

Fig. 38: Analyzer electronics when removing the inner part of the measuring probe



- ▶ Switch off the electronics, remove the measuring probe from the protective pipe and let the analyzer unit cool down.
- ▶ Disconnect the conductors of the inner part of analyzer electronics (1), loosen two hoses (2) and (3), loosen two screws (4) and remove retaining plate (5).
- ▶ Remove the thin, transparent reference air hose from the feed-through fitting on the analyzer electronics.
- ▶ Now carefully pull out the inner part of the measuring probe (4-hole ceramics rod with measuring signal wire, thermoelement and heating).
- ▶ Now carefully push the new inner part into the measuring probe and screw the retaining plate on (make sure the inner part remains movable). The inner part is now pressed against the measuring cell by the retaining plate with spring force.
- ▶ Then re-establish all electrical and pneumatic connections. Connect the cables as shown:

Connection terminal	Color	Description	Polarity	Unit
1	White/brown	Signal cable, measuring cell	-	mV
2	Brown	Signal cable, measuring cell	+	mV
3	Green	Thermocouple 1	+	mV
4	White	Thermocouple 1	-	mV
31	Green	Thermocouple 2	+	mV
41	White	Thermocouple 2	-	mV
6	Black	Measuring probe heater		

Connection terminal	Color	Description	Polarity	Unit
7	Blue	Measuring probe heater		
8	Green/yellow	Protective conductor heater		
9	Grey	Solenoid valve (remains connected)		
10	(Grey-blue)	Solenoid valve (remains connected)		

- ▶ Install the analyzer unit and let the system heat up to operating temperature.
- ▶ Perform a two-point adjustment after 24 hours of operation.

8.6.10 Stability criteria during adjustment

During adjustment, the cell voltage is checked for stability. This check works according to the following criteria:

The last measured value is stored temporarily. If the next value is out of tolerance, the internal timer is reset and the new value is stored temporarily. This means that if the timer has not been reset, the value is stable. This means that the last measured value after the timer (2 minutes) is used to calculate the constants or slope.

9 Status messages

9.1 Error messages

Error message	Relay contact	Analog signal output	Description
Hardware error 1-7	System error, open	2.00 mA, if not set otherwise	The error can occur at any time and signals a fault in one of the electronic components. The O ₂ measuring probe heater is switched off. Contact one of the Sick Service points if the fault cannot be rectified by switching the system off and on again.
Open circuit Thermoelement	System error, open	2.00 mA, if not set otherwise	The error can occur at any time and signals an interruption in the thermoelement circuit. The O ₂ sensor heating is switched off. It can be reset by the user when the error cause has been eliminated. Possible causes: Contact problems of the thermoelement cable on the terminal points of the control unit and/or analyzer unit, connection cable damaged or thermoelement defective.
O ₂ measuring probe temperature not reached	System error, open	2.00 mA, if not set otherwise	The error can occur during the heating process (max. 90 minutes) of the O ₂ sensor. The O ₂ sensor heating is switched off. It can be reset by the user to start a new heating attempt. Possible causes: Fuse F2 defective, contact problems of O ₂ sensor heating cable on the terminal points of the control unit and/or analyzer unit, connection cable damaged, short circuit thermoelement, reference air flow volume greater than 60 l/h, power voltage too low, flow volume too high and/or temperature in process too low, electronics error.
O ₂ measuring probe temperature too low	System error, open	2.00 mA, if not set otherwise	The error can occur during measurement operation and indicates that the O ₂ sensor temperature has dropped 20 °C (68 °F) below the setpoint temperature. The O ₂ sensor heating is switched off. It can be reset by the user to start a new heating attempt. Possible causes: Fuse F2 defective, contact problems of O ₂ sensor heating cable on the terminal points of the control unit and/or analyzer unit, connection cable damaged, short circuit thermoelement, reference air flow volume greater than 60 l/h, power voltage too low, flow volume too high and/or temperature in process too low, electronics error.
O ₂ measuring probe temperature too high	System error, open	2.00 mA, if not set otherwise	The error can occur during measurement operation and indicates that the O ₂ sensor temperature has risen 20 °C (68 °F) above the setpoint temperature. The O ₂ sensor heating is switched off. It can be reset by the user to start a new heating attempt. Possible causes: Process temperature too high, O ₂ measuring probe heater cable incorrectly connected to the control unit, electronics error.
Open circuit O ₂ sensor	System error, open	2.00 mA, if not set otherwise	The error can occur at any time and signals an interruption in the circuit of the O ₂ sensor. It can be reset by the user when the error cause has been eliminated. Possible causes: Contact problem of the O ₂ connection cable on the terminal points of the control unit and/or analyzer unit, connection cable defective, contact problem of the inner part of the measuring probe to the O ₂ sensor.
O ₂ sensor calibration failed	System error, open		O ₂ sensor adjustment failed for one of the following reasons. It can be reset by the user; all entries subordinate to this error are then also reset.
Test gas flow rate too low	System error, open		The error can only occur during an O ₂ sensor adjustment and signals an insufficient test gas flow during the adjustment. It can be reset by the user. A new successful adjustment also resets the error. Possible causes: Test gas cylinder empty, test gas flow volume incorrectly set, test air flow volume incorrectly set, instrument air supply to the system not available.

Error message	Relay contact	Analog signal output	Description
Test gas flow rate too high	System error, open		The error can only occur during an O ₂ sensor adjustment and signals an insufficient test gas flow during the adjustment. It can be reset by the user. A new successful adjustment also resets the error. Possible causes: Test gas pressure too high, test gas flow volume incorrectly set, test air flow volume incorrectly set
O ₂ sensor offset too low	System error, open		The error can only occur during an O ₂ sensor adjustment. It can be reset by the user. A new successful adjustment also resets the error. Possible causes: Reference air supply insufficient, process pressure too high, wrong test gas (not with test air), O ₂ sensor defective.
O ₂ sensor offset too high	System error, open		The error can only occur during an O ₂ sensor adjustment. It can be reset by the user. A new successful adjustment also resets the error. Possible causes: Wrong test gas (not with test air), test gas flow volume too low, O ₂ sensor defective
O ₂ sensor slope too low	System error, open		The error can only occur during an O ₂ sensor adjustment. It can be reset by the user. A new successful adjustment also resets the error. Possible causes: Wrong test gas, test gas flow volume too low, filter damager, filter head not fitted, O ₂ sensor defective.
O ₂ sensor slope too high	System error, open		The error can only occur during an O ₂ sensor adjustment. It can be reset by the user. A new successful adjustment also resets the error. Possible causes: Wrong test gas, O ₂ sensor defective.
O ₂ sensor signal instable	System error, open		The error can only occur during an O ₂ sensor adjustment. It can be reset by the user. A new successful adjustment also resets the error. Possible causes: Test gas flow volume too low, filter damaged, process pressure fluctuations too high.
mA input for process pressure	System error, open		Circuit open or pressure transmitter signal Lower than 3.6 mA / higher than 20.4 mA
Error REMOTE module	System error, open		Signals a hardware error of the REMOTE module. Possible cause: The REMOTE module is defective.

Error messages not listed: The fault cannot be rectified by the customer. Contact one of the SICK service points.

9.2 Alarm messages

Error message	Relay contact	Description
Reference air flow too low		Possible causes: Reference air flow rate incorrectly set, instrument air supply to the system insufficient, reference air pump defective.
Reference air flow too high		Possible cause: Reference air flow rate incorrectly set.
Limit alarm 1	O ₂ limit value alarm 1, open	Possible cause: The O ₂ measured value underflows/overflows the specified O ₂ alarm limit.
Limit alarm 2	O ₂ limit value alarm 2, open	Possible cause: The O ₂ measured value underflows/overflows the specified O ₂ alarm limit.
Electronic temp. too low		Possible cause: The ambient temperature of the control unit falls below the specified lower limit. The measured value tolerances specified for the system are no longer guaranteed.
Electronic temp. too high		Possible cause: The ambient temperature of the control unit falls below the specified lower limit. The measured value tolerances specified for the system are no longer guaranteed.
Clock battery low		This cannot be reset by the user; it is only reset automatically after the watch battery (lithium cell 2032) has been replaced. The alarm has no effect as long as the system is supplied with power voltage. The set time/date can be incorrect after switching the system off and on again. Any timer-controlled automatic adjustment that may have been set can then no longer be carried out correctly.

Alarm messages not listed: Contact one of the SICK service points.

9.3 Maintenance messages

Maintenance message:	Relay contact	Description
Measured value(s) held	Maintenance, closed	When the measured value memory is switched on, the O ₂ measured value determined before an adjustment is held at the mA output for the duration of the status message.

10 Heating shutdown in case of malfunction

10.1 General information

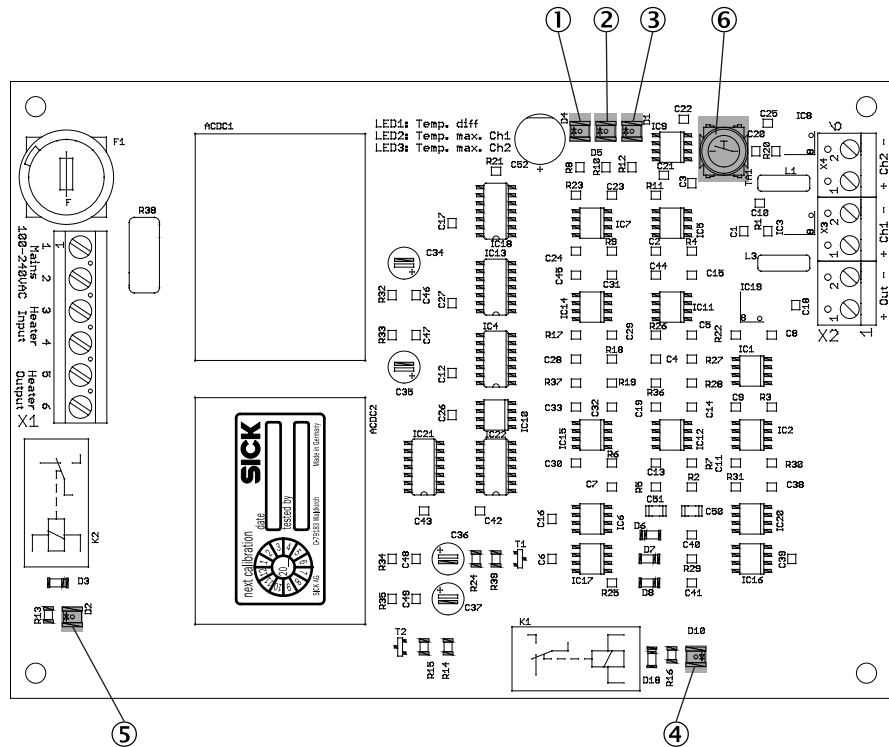
The temperature of the measuring probe is monitored by an additional electronic system (Part No. 2105158) with two thermoelements. The electronics are designed to be fail-safe (redundant). They automatically switch off the measuring probe heater when the operating temperature of the measuring probe is exceeded. The switch-off temperature is 810 °C. In addition, the heating is switched off in the event of a fault in one of the thermoelements. The electronics go into self-holding mode, which means that if a fault occurs, the electronics must be reset.

The error-free operating status is indicated by two green LEDs (see “Display and operating elements”, page 69). The error case is indicated by three red LEDs.

In case of an error, the device must be reset manually. The position of the Reset button is shown in the Figure, see “Display and operating elements”, page 69.

The reset can also be initiated by switching the power supply off and on again for at least 5 seconds.

Fig. 39: Display and operating elements



No.	Designation	Color	Description
1	LED 1	Red	Fault, temperature difference
2	LED 2	Red	Fault, temperature maximum channel 1
3	LED 3	Red	Fault, temperature maximum channel 2
4	LED 4	Green	Operation, channel 1
5	LED 5	Green	Operation, channel 2
6	Reset		

Fig. 40: Control unit Safe Area



There is an opening in the front panel marked “HCU LED”. The error LEDs can be seen through this opening. The electronics must be reset when a fault occurs. This is done by switching the system off and on again.

Fig. 41: HCU LED opening



19" rack

10.2 Functional description

The fail-safe heating shutdown can be used to switch the heating off when the limit temperature of heaters is exceeded, especially for ATEX-certified O₂ analyzer units.

The heating shutdown is permanently set to the temperature specified in the order code (standard is 810 °C).

The temperature is measured by means of two type K thermocouples housed in a sheathed thermoelement. The device has two independent channels. Each of these channels switches a relay when the specified maximum temperature is reached.

The contacts of both relays are connected in series so that the heating is switched off when the temperature in one channel is exceeded. The heating is also switched off when the supply voltage is lost. Furthermore, the difference between the two channels is monitored; the heating is switched off when the difference is more than 32 °C.

10.3 Maintenance

The heating monitoring is checked by the manufacturer before delivery.

The heating monitoring device must be returned to SICK for inspection at the latest by the date noted on the calibration label (see “Display and operating elements”, page 69).

11 Troubleshooting

11.1 Strongly fluctuating O₂ measured value

Possible cause	Notes
Loose contact due to wire breakage of the measuring signal wire	Remove loose contact.
Loose contact in the analyzer electronics (internal mV tap)	
Broken filter element	Visual inspection by removing the analyzer unit.
Incorrectly installed V-shield	
Analyzer unit was installed without filter head	

11.2 O₂ display remains at end of measuring range or is higher than expected

Possible cause	Notes
Leakage on the measuring cell or measuring cell flange seal.	Check all flanges and screw fittings for leaks. Replace the measuring cell or renew the measuring cell flange seal. If there is a leak in the area of the O ₂ measuring cell, it must be replaced.
Analyzer unit flange leaking.	Tighten the flange screws to the required torque.

11.3 Indications on the display are OK, mA output signal is not correct

Possible cause	Notes
Control unit is defective - mA value not available	Check measuring range. Check whether the current value is outside the measuring range.
	Measure the mA output on the terminal strip.

11.4 O₂ display on 0%, although the operating mode indicates a higher O₂ value

Possible cause	Notes
Measuring probe heater defective (resistance must be approx. 37.5...47.5 Ohm; disconnect on the analyzer unit and check) Attention: Disconnect the analyzer unit from the power supply beforehand	Query the measuring cell temperature (setpoint 800 °C or 840 °C depending on the setting). A cell temperature lower than 800 °C or 840 °C can cause a display of 0%.
Thermoelement defective (check resistance, approx. 2...80 Ohm)	Replace the inner part of the measuring probe.
Fuse of the heating voltage defective	Replace the fuse.
Transformer (230/115 V) defective	Check voltages.
Line short-circuit Electronics inlet defective Wire break	<ul style="list-style-type: none"> - Check wiring. - Measure the connection cable
mV-tap in the analyzer unit (measuring signal wire) is not available or interrupted	Check the inner part of the measuring probe for good contact.
Combustible components in flue gas	Check that the analyzer unit reacts to test gas. When the analyzer unit reacts to test gas, there may be a higher percentage of combustible gases in the flue gas. In this case, reducing conditions prevail on the O ₂ measuring cell, which reduce the O ₂ content on the cell surface.
Measuring cell defective	Replace the measuring cell.

12 Decommissioning

12.1 Safety information on decommissioning

Technical knowledge needed / requirements for decommissioning



Note:

- You are basically familiar with the ZIRKOR200 Ex-D.
- You are basically familiar with the ATEX Directive.
- You are familiar with the local situation, especially the potential hazards caused by gases in the gas duct (hot/noxious). You are capable of recognizing and preventing danger by possibly escaping gases.

If one of these requirements is not met:

- ▶ Please contact SICK Customer Service or your local representative.

Danger of explosion



DANGER:

Danger of explosion through residual voltages and hot surfaces in the device

After switching off the device, there is a danger of explosion due to the residual voltage and hot surfaces.

- ▶ Only perform work on the device in an Ex-free environment.

Gas



DANGER:

Danger to health through contaminated measuring probe

Depending on the composition of the gas in the measuring channel, the measuring probe could be contaminated with substances which could result in serious health damage.

- ▶ Wear the specified protective clothing for all work with a contaminated measuring probe.
- ▶ Decontaminate the measuring probe before storage.



WARNING:

Danger to health from contact with hot and/or aggressive measuring gases

There is a risk of contact with noxious sample gases when working on an open measuring duct.

- ▶ Observe the valid regulations concerning protective equipment during operation during all work on the device.
- ▶ Never remove the measuring probe from the duct when overpressure exists in the duct without taking appropriate safety measures.

Electricity

Observe all safety information in the Commissioning and Electrical Installation Sections:

see “[Electrical installation](#)”, page 31 and see “[Commissioning](#)”, page 41

12.2 Shutdown procedure

Carry out shutdown preparations

- ▶ Ensure the environment is Ex-free.
- ▶ Disconnect enclosure from power voltage (e.g. switch off the main switch of the host system).

After shutdown

- ▶ In potentially explosive atmospheres: Wait at least 60 minutes after disconnecting from the power voltage before opening the enclosure.
- ▶ Observe the safety information on the enclosure.

12.3 Removing the device

Material required	Part number	Required for
Flange cover	-	Covering the flange.
Personal protective equipment	-	Protection when working on the stack or hot or aggressive sample gases.

Removing the measuring system

- 1 Disconnect all cables to the power supply.
- 2 Disconnect all connecting cables between analyzer unit and control unit.
- 3 Disconnect all connecting cables between pneumatic unit and control unit.
- 4 Disconnect all cables of the customer wiring at the control unit.
- 5 Loosen the connection screws between the analyzer unit and gas channel and remove the measuring probe.
- 6 Close the flanges on the gas duct with a cover.
- 7 Loosen the connecting screws of the pneumatic unit and remove the pneumatic unit.
- 8 Loosen the connecting screws of the control unit and remove the control unit.
- 9 Pack components in containers suitable for transport.

Information on storage, see [“Storage information”](#), page 24.

12.4 Environmentally compatible disposal

The device should be disposed as industrial waste.



Note:

Observe relevant local conditions for disposal of industrial waste.



Note:

Disposal of subassemblies containing residual substances which are harmful to the environment

The following subassemblies could contain substances that have to be disposed of separately:

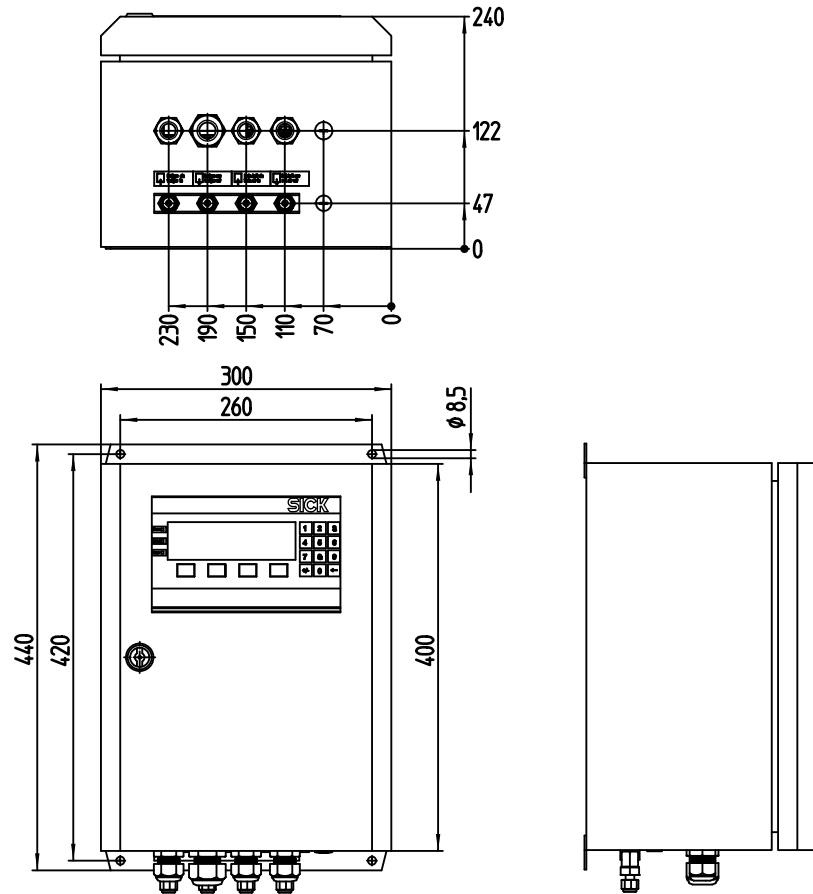
- ▶ Electronics: Capacitors, rechargeable batteries, batteries
- ▶ Display: Liquid of LC display

13 Technical data

13.1 Dimension drawings

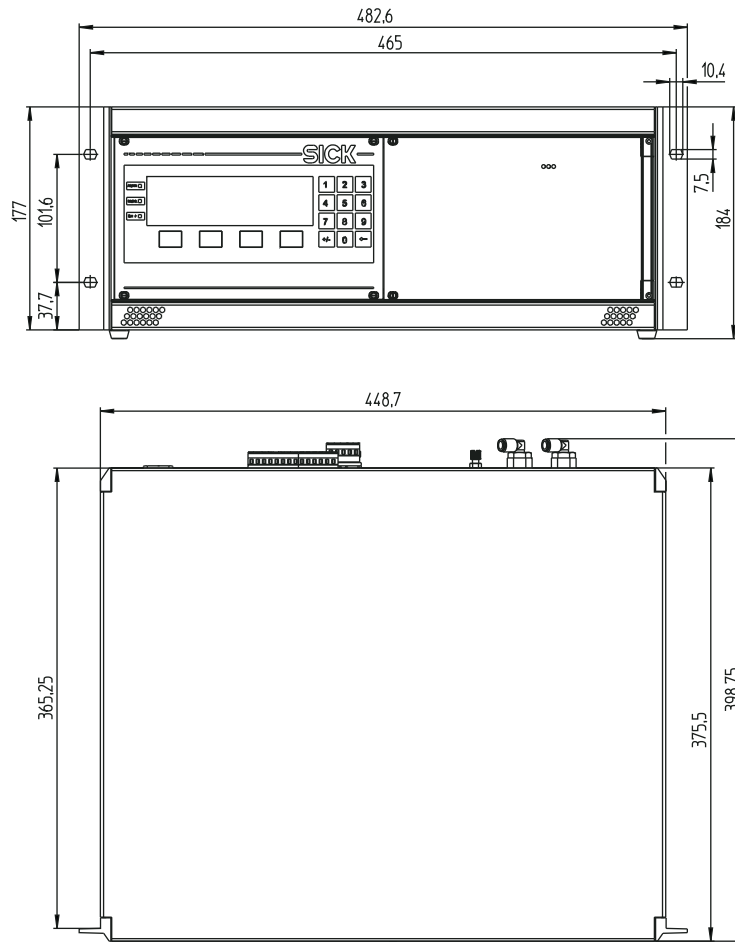
13.1.1 Dimension sheets of the control unit

Fig. 42: Dimensions of the control unit Safe Area in mm



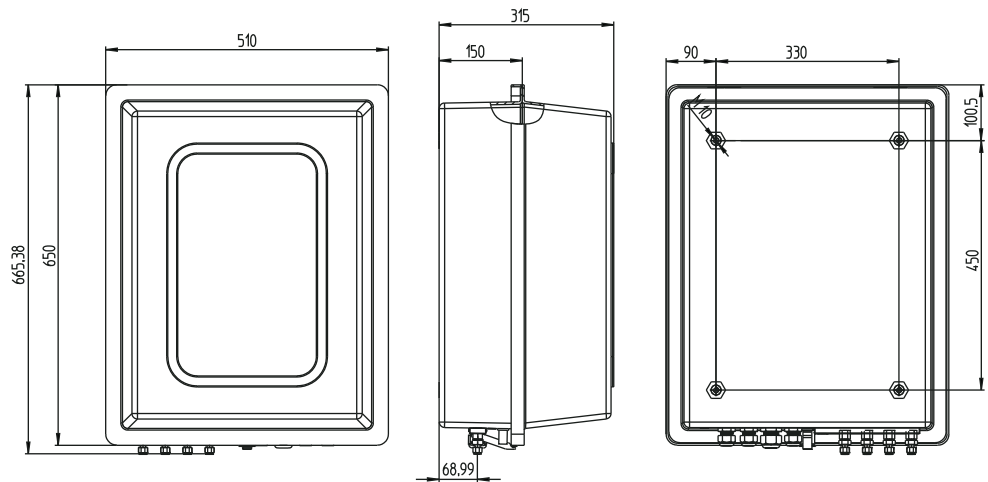
All dimensions in mm

Fig. 43: 19" rack dimensions in mm



All dimensions in mm

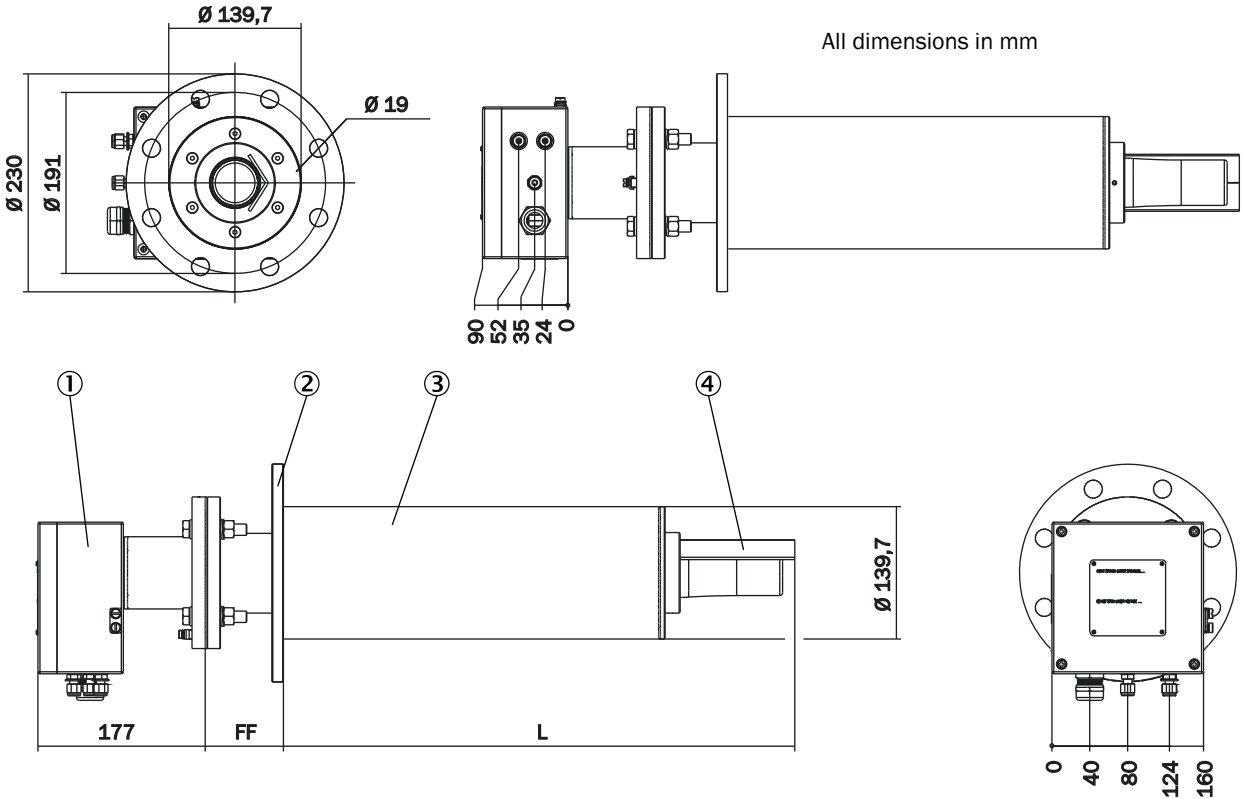
Fig. 44: GRP enclosure (option)



All dimensions in mm

13.1.2 Dimension sheets of the analyzer unit

Fig. 45: Dimensions of analyzer unit for ZIRKOR200 Ex-D



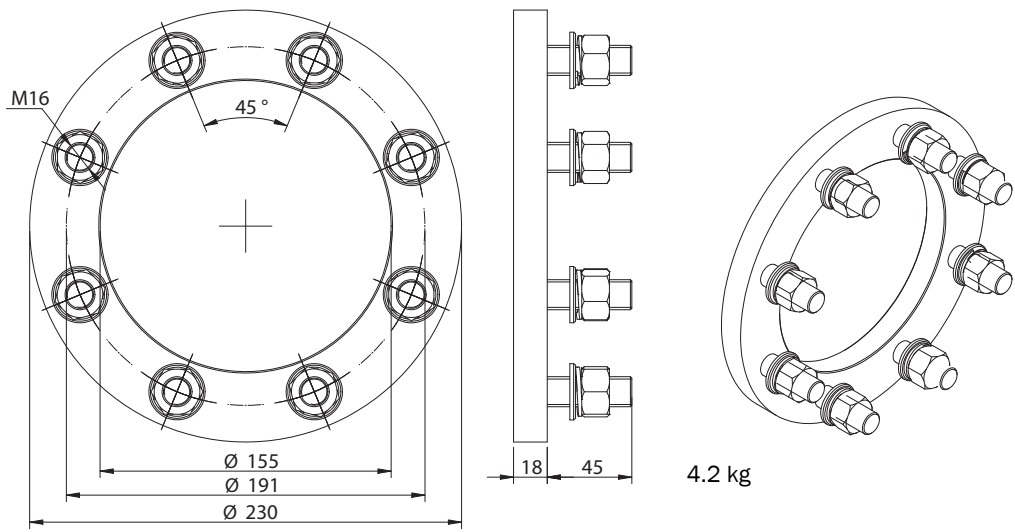
- 1 Analyzer electronics
- 2 Protective pipe flange
- 3 Protective tube
- 4 V-shield

FF	L	kg*
80 mm	540 mm	24,4
120 mm	960 mm	32,8

* with counter flange

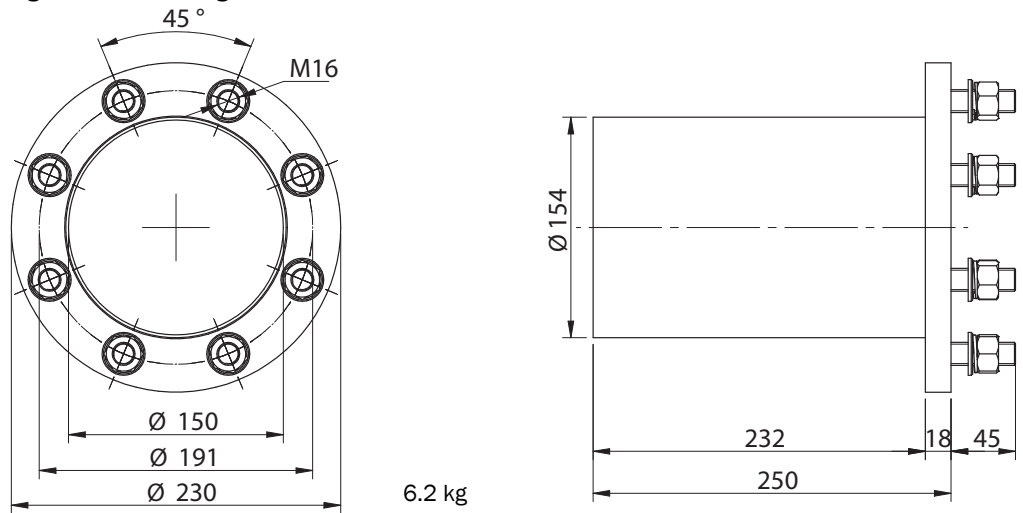
13.1.3 Counter flange dimensions

Fig. 46: Counter flange dimensions 5340177



All dimensions in mm

Fig. 47: Counter flange dimensions 5342052



All dimensions in mm

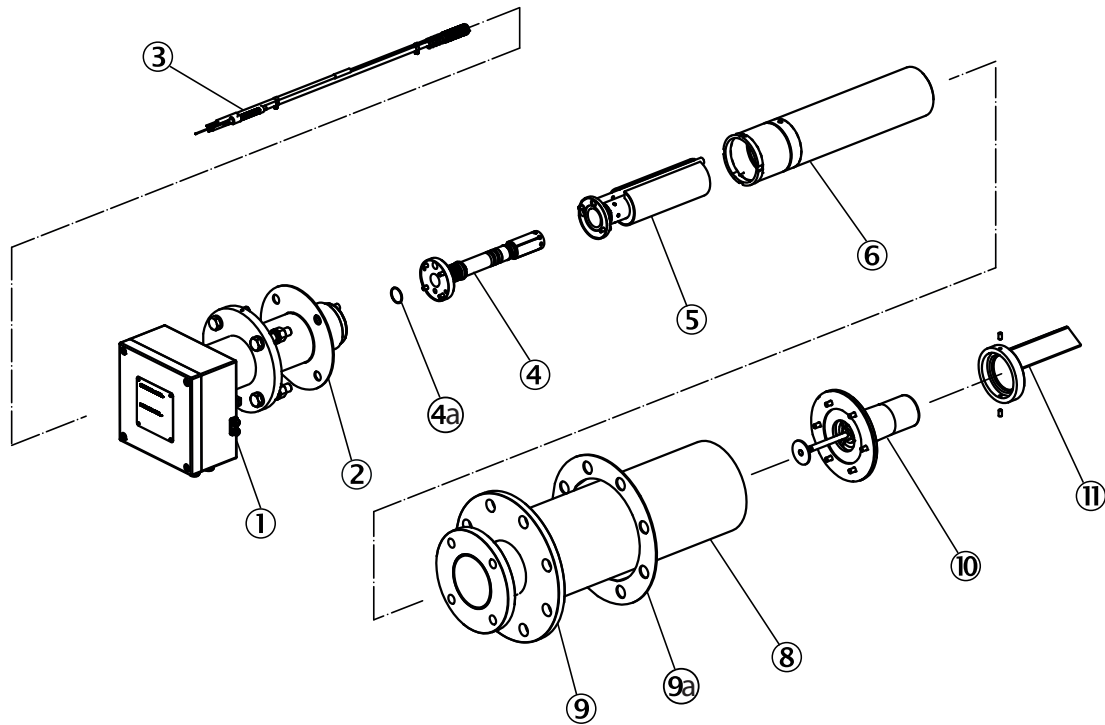
Flange type	Part No.	Ø D	b	Ø k	Ø d2	Drill holes
ANSI 4" 150 lbs	A	228.6 (9.00)	12.5 (0.50)	190.5 (7.5)	19.0 (0.75)	8
ANSI 2" 150 lbs (only with cooling protection pipe)	B	153.0 (6.0)	12.5 (0.50)	121.0 (4.75)	20.0 (0.78)	4
ANSI 3" 150 lbs	C	190.5 (7.5)	23.9 (0.94)	152.4 (6.00)	19.1 (0.75)	4

Flange type	Part No.	Ø D	b	Ø k	Ø d2	Drill holes
ANSI 3" 300 lbs	D	209.5 (8.25)	28.6 (1.13)	168.3 (6.63)	22.2 (0.87)	8
ANSI 4" 150 lbs	E	228.6 (9.0)	23.9 (0.94)	190.5 (7.50)	19.1 (0.75)	8
ANSI 4" 300 lbs	F	254.0 (10)	31.7 (1.25)	200.1 (7.88)	22.2 (0.87)	8
DN50/ PN16DIN2527 (only with cooling protec- tion pipe)	G	165.0 (6.47)	18.0 (0.71)	125.0 (4.90)	18.0 (0.71)	4
DN65/ DIN2527 (only with cooling protec- tion pipe)	H	160.0 (6.27)	14.0 (0.55)	130.0 (5.12)	14.0 (0.55)	4
DN65/ DIN2527 (only with cooling protec- tion pipe)	I	185.0 (7.28)	18.0 (0.71)	145.0 (5.71)	18.0 (0.71)	4
DN80 PN6	K	190.0 (7.48)	18.0 (0.71)	150.0 (5.91)	18.0 (0.71)	4
DN80/PN16 DIN2527	L	200.0 (7.87)	20.0 (0.79)	160.0 (6.29)	18.0 (0.71)	8
DN100/ PN16	M	220.0 (8.66)	20.0 (0.79)	180.0 (7.09)	18.0 (0.71)	8
Electronics only	Z					

All dimensions in mm (inch)

13.1.4 Analyzer unit components

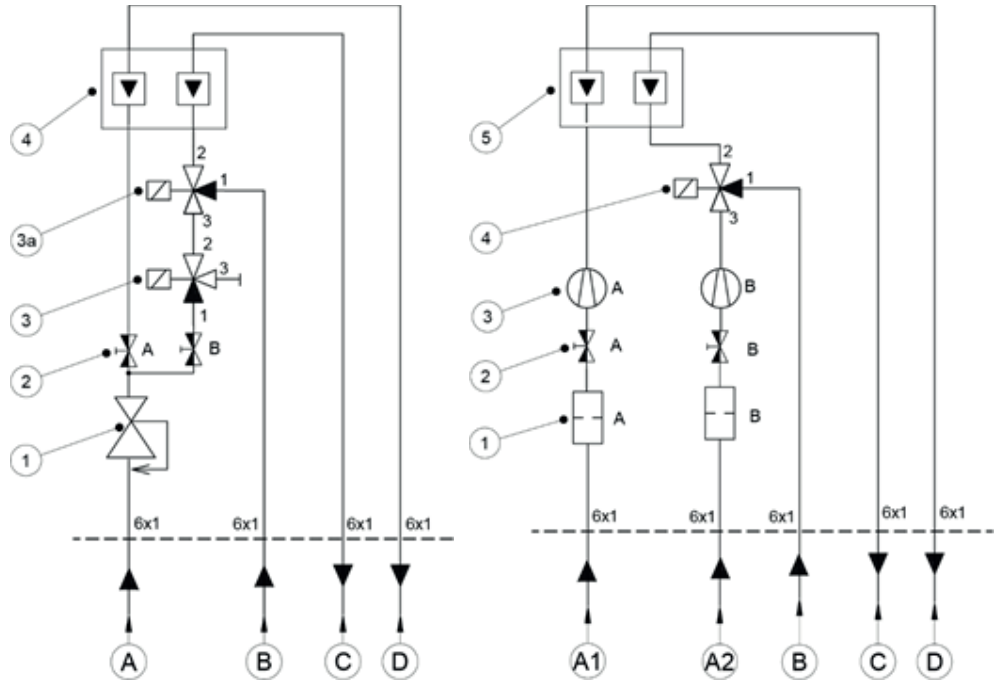
Fig. 48: Analyzer unit components



No.	Part No.	Description
1	2112939...540 mm 2112944...960 mm	Measuring probe tube with analyzer electronics
2	2089293	Analyzer unit - flange seal
3	2105138...540 mm 2105139...960 mm	Inner part of measuring probe
4	2105147	O ₂ measuring cell
4a	2105148	Metal O-ring
5	2105161	Test gas distributor with insulating tube
6	2105150	Filter head
8	2105164...540 mm 2105165...960 mm	Protective pipe
9	Included in (8)	Protective pipe flange
9a	2105166	Protective pipe flange seal
10	2105149	Sintered metal filter and flange
11	2105167	Mounting ring with V-shield

13.1.5 Gas plans

Fig. 49: Gas plans



Pneumatic version for instrument air

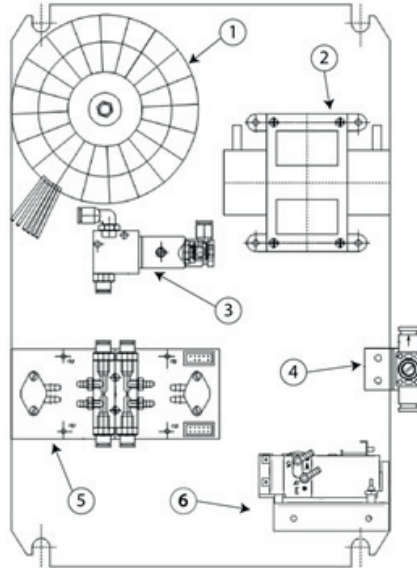
Pneumatic version with pumps

- 1 Pressure regulating valve
- 2 Throttle check valve
- 3 3/2-way solenoid valve
- 3a 3/2-way solenoid valve
- 4 Flow meter
- A Instrument air inlet
- B Test gas inlet
- C Test gas outlet
- D Reference air outlet

- 1 Filter
- 2 Throttle valve
- 3 Reference / test air pump
- 4 3/2-way solenoid valve
- 5 Flow meter
- A1 Reference air inlet
- A2 Test gas inlet
- B Test gas inlet
- C Test gas outlet
- D Reference air outlet

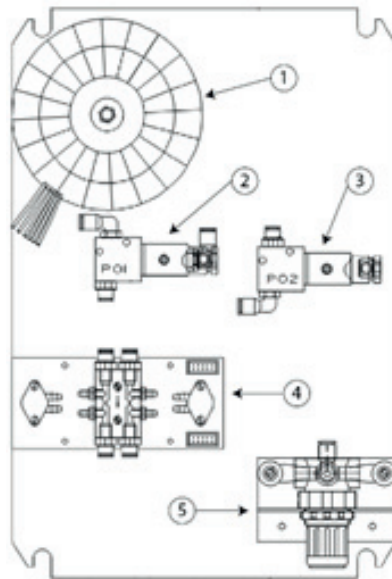
13.1.6 Installation overview of the electronics

Fig. 50: Installation plate 1 (pump version)



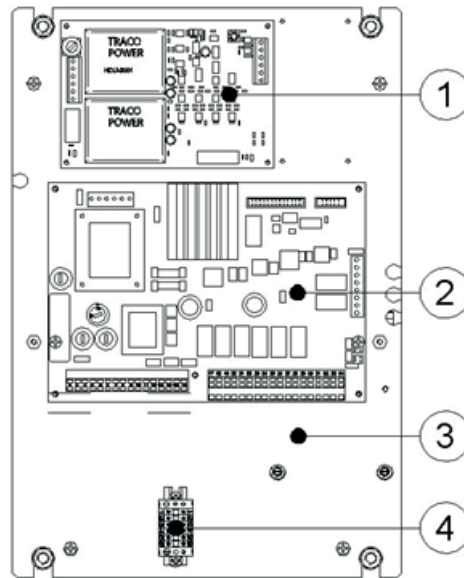
Material list: Test gas and reference air unit with internal pumps		
No.	Part No.	Designation
1	2089317	Toroidal core transformer 2x115 V; Secondary 115 V / 330 VA
2	2089330	Test air pump 720 l/h
3	2089324	Test gas solenoid valve P01 m. Pneumatic version with screw fitting.
4		Throttle screw fitting
5	2089327	Internal flow meter for test and reference gas
6	2089329	Reference air pump 30 l/h

Fig. 51: Installation plate 1 (instrument air version)



Material list: Test gas and reference air unit for instrument air		
No.	Part No.	Designation
1	2089317	Toroidal core transformer 2x115 V; Secondary 115 V / 330 VA
2	2089324	Test gas solenoid valve P01 m. Pneumatic version with screw fitting.
3	2089325	Test gas solenoid valve P02 m. Pneumatic version with screw fitting.
4	2089327	Internal flow meter for test and reference gas
5	2089336	Pressure regulating valve

Fig. 52: Installation plate 2 with fail-safe heating shutdown



Material list: Installation plate 2		
No.	Part No.	Designation
1	2105158	Heating shutdown
2	2116780	Power board
3		Installation plate
4		X10 terminal strip

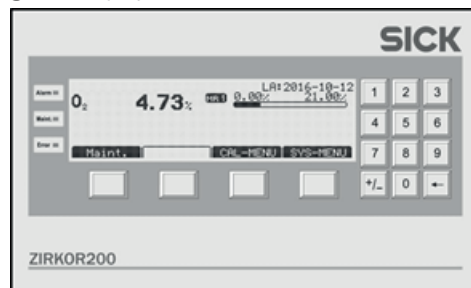


Note:

The 19 inch group carrier spare parts are identical with the spare parts shown above.

13.1.7 Display board

Fig. 53: Display board



Material list: Display and control unit	
Part No.	Designation
2089320	Display board with software for systems without pneumatics
2089321	Display board with software for systems with pneumatics


13.2 Technical data

13.2.1 Technical data of the control unit

Housing:	Sheet steel ST37, RAL6029 (19" rack, optional) (GRP, optional)
Protection class:	Sheet steel: IP66 GRP enclosure: IP66 19" rack: IP20
Display:	LC Dot Matrix 240 x 64 LED backlit
Keypad:	Foil keyboard with pressure point
Signal LED:	Alarm, maintenance, error
O₂ measuring ranges:	2 measuring ranges: 0 - 2% O ₂ to 0 - 25% O ₂
O₂ accuracy:	<0.5% of the measured value or 0.02 Vol% O ₂ (higher value valid)
Manual or automatic adjustment:	1-point or 2-point (automatic adjustment)
Power voltage:	Instrument air version 230 V ±10% 50 to 60 Hz 115 V ±10% 50 to 60 Hz
Power input:	400 VA (heating up phase) 200 VA (typ., measuring mode)
Recommended back-up fuse:	10 A
Output signal O₂:	Active, 0/4 to 20 mA, max. load resistance 500 Ω Galvanically isolated
Relay contacts:	24 V AC/DC, 1 A
Relay contact Probe solenoid valve:	230 V AC/DC, 1 A
Dimensions:	300 x 440 x 240 mm (W x H x D)
Weight:	Approx. 20 kg
Temperature range, storage*:	-40 °C to +80 °C
Temperature range, operation*:	-20 °C to +55 °C (50 °C for pump version)

* Others temperature ranges on request

13.2.2 Technical data of the analyzer unit

Flue gas temperature:	Max. 600 °C	
Immersion depth:	540 mm 960 mm	
Property of the probe heating:	Rated voltage: Up to 115 V AC +/- 10% Rated current: Up to 5 A	
Measuring principle:	Zirconium oxide	
Process gas pressure:	-50 to +50 mbar (others on request)	
Flow velocity:	0 to 10 m/s, others on request	
Ambient temperature:	-20 °C to +70 °C	
Maximum surface temperature depending on the ambient temperature:	Ambient temperature [°C]	Max. surface temperature [°C]
	40	133
	50	136
	60	138
	70	141
	The specification of the maximum surface temperature T133 °C.....T141 °C applies to the above-mentioned ambient temperature range.	
Reaction time (stopping time):	< 1 s (test gas)	
T90:	< 5 s (test gas)	
Probe material:	Stainless steel (SS316)	
Protection class:	ATEX:  II 2D Ex tb IIIC T133 °C/T141 °C Db IECEX: Ex tb IIIC T133 °C/T141 °C Db	
Protection class:	IP 66	
Certificate number:	BVS 19 ATEX E 004 X IECEX FTZU 19.0006X	
Voltage supply:	Via control unit	

13.2.3 Technical specification for the gas supply

The oxygen measuring system uses the connected instrument air during the entire operating time to supply reference air and to supply test air (test gas 1) during adjustment or system test.

Instrument air as reference air supply / test air supply	
Specification:	According to ISO 8573-1 Class 2 (Particle size max. 1 µm, particle density max. 1 mg/m ³ , oil content max. 0.1 mg/m ³ , pressure dew point max. -40 °C) Constant 20.95 Vol. % O ₂
Inlet pressure	2...10 bar
Flow volume:	Continuous maximum 40 l/h (for reference air supply) 180 l/h during adjustment

Test gases (cylinder gas) for adjustment / system test	
Inlet pressure	Max. 3 bar
Specification Test gas 1 (optional):	21% O ₂ in N ₂ (synthetic air – when instrument air not available)
Specification Span gas 2:	The adjustment gas must have the same composition as specified in the test protocol. The test protocol is located on the analyzer unit/sensor on delivery.
Flow volume:	Max. 180 l/h at 1.1 bar (+/- 0,1)



Note:

The flow volume of the test gases must be adjusted on the test gas cylinders themselves.



WARNING:

Disposal of subassemblies containing residual substances which are harmful to the environment

The following subassemblies could contain substances that have to be disposed of separately:

- ▶ Electronics: Capacitors, rechargeable batteries, batteries
- ▶ Display: Liquid of LC display

13.3 Tightening torques for Ex-relevant screw fittings

Connection unit	Reference air	+3/4 turn after hand-tight
Connection unit	Test gas	+3/4 turn after hand-tight

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Phone +61 (3) 9457 0600
1800 33 48 02 – tollfree
E-Mail sales@sick.com.au

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Phone +43 (0) 2236 62288-0
E-Mail office@sick.at

Belgium/Luxembourg

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E-Mail info@sick.be

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