BFI Automation

Operating instructions

FLAME SCANNER COMPACT VERSION 200

200 (UV/UV1/IR/IR3)(EX)

Content

1 | General aspects

1.1 Introduction

These operating instructions are a helpful guide for ensuring the successful and safe operation of the Flame Scanner. They contain important information on how to operate the system safely, correctly and efficiently. Observing the operating instructions will help to prevent hazards, reduce costs of repair and downtimes and increase the reliability and life of the device.

All illustrations and drawings in these operating instructions are shown for illustration purposes and do not contain details for design.

The operating instructions always have to be accessible at the device. They have to be read and applied by each person who is required to work with/on the device:

- operation
- troubleshooting during operation
- servicing
- maintenance (upkeep, inspection, repair) and/or
- transport

This should be confirmed by the operating company in writing.

1.2 Warning notes

The following warning notes are used in these operating instructions:

⚠ DANGER

This warning level indicates an imminent hazardous situation.
If the hazardous situation is not prevented, this will result in death or severe injury.
Follow the instructions that accompany this warning to prevent the risk of death and severe personal injury.

⚠ WARNING

This warning level indicates a potentially hazardous situation.
If the hazardous situation is not prevented, this may result in death or severe injury.
Follow the instructions that accompany this warning to prevent the potential risk of death and severe personal injury.

⚠ CAUTION

This warning level indicates a potentially hazardous situation.
If the hazardous situation is not prevented, this may result in slight or moderate injuries.
Follow the instructions that accompany this warning to prevent the injury of persons.

CAUTION

This warning level indicates potential damage to property.
If this situation is not prevented, it may result in damage to property.
Follow the instructions that accompany this warning to prevent damage to property.

NOTICE

A notice indicates additional information that will make the handling of the device easier.

1.3 Copyright protection

These operating instructions have to be treated as confidential. They may only be used by authorised staff. Access by third parties may only be granted upon written agreement of BFI Automation.

All documents are protected in keeping with the German copyright law.

The disclosure and reproduction of documentation, in whole or in part, as well as the exploitation and communication of its content shall not be permitted unless expressly stated otherwise. Offenders are liable for prosecution and the payment of damages.

We reserve all rights to exercise industrial property rights.

1.4 Disposal information

The Flame Scanner is equipped with electrical and electronic components and must be disposed separate from household waste. Follow the local and actual regulations for waste disposal.

1.5 Warranty

Read these operating instructions carefully and in full before operating the Flame Scanner!

The manufacturer is not liable for damage or operating malfunctions that result from the operating instructions not being observed.

The operating company has to supplement the operating instructions with operating instructions on the basis of national regulations on accident prevention and environmental protection, including information on supervision and notification requirements with respect to special operating circumstances, e.g. regarding organisation of work, working processes and staff deployed.

The recognised technical rules for safe and professional working also have to be observed in addition to the operating instructions and the regulations on accident prevention applicable to the country and place of use.

The warranty shall become void, for example, in the event of:

- inappropriate use
- use of impermissible equipment
- incorrect connection
- prior works that are not part of the supplied product or service
- non-use of original spares and accessories
- conversion, if this has not been harmonised with BFI Automation
- non-performance of specified maintenance work
- Repair work on the device that is not carried out by BFI employees

NOTICE

It is recommended that the operator of the device concludes a service contract with BFI Automation. This guarantees that the device is regularly checked by our service staff and ensures that any required wearing and spare parts are available without long delivery periods.

1.6 Obligation of the operating company

The Flame Scanner may cause hazards if it is operated inappropriately or in an improper condition.

The operating company is under the obligation to operate the machine in proper state only. The operating company has to secure hazardous areas that exist between BFI devices and the customer's own equipment.

The operating company has to appoint and instruct responsible staff:

- Only deploy trained or instructed staff.
- Clearly set out the responsibilities of the staff with regard to operation, set-up, maintenance and repair.
- Regularly check that staff are safety conscious and aware of hazards and are observing the operating instructions.
- Before starting work, staff who are assigned to work with/on the device have to have read and understood the operating instructions, in particular the chapter on "Safety", as well as the relevant regulations.
- The operating instructions and relevant regulations have to be stored in such a way that they are accessible to operating and maintenance staff.
- Set out who will have responsibility for device operation and ensure that this person has the authority to overrule any unsafe instructions of third parties.

NOTICE

Generally valid legal and other binding regulations on accident prevention and environmental protection have to be observed and instructed, in addition to the operating instructions.

1.7 Liability disclaimer

All technical information, data and guidance on device operation that are contained within these operating instructions are, to the best of our knowledge, correct at the time of printing, taking into account our present understanding and experience.

We reserve the right to make technical changes with respect to the further development of the flame amplifier outlined in these operating instructions. No claims can be made based on the specifications, illustrations and descriptions of these operating instructions.

We shall not be liable for damage or operating malfunctions that result from operating errors, inappropriate repairs or the non-observance of the operating instructions. We expressly state that only original spare parts and accessories approved by us may be used. This also applies to the components of other manufacturers that have been used.

The installation or use of non-approved spare and accessory parts and any unauthorized retrofits and modifications are not permitted for safety reasons and exclude any liability by BFI Automation for consequential damages.

BFI Automation is liable for possible errors or omissions with the exclusion of additional claims entered into in the framework of the warranty obligations conceded to in the contract. Claims for damages, on whatever legal basis they may be, shall be excluded.

Translations into foreign languages are carried out in good faith. We cannot accept any liability for translation errors; this also applies where the translation has been carried out or has been commissioned by us. The original text alone shall be binding.

Descriptions and illustrations do not necessarily depict the delivered product or a possible spare parts order. Drawings and graphics are not to scale.

1.8 Declaration of conformity

Flamonitec®
BFI AUTOMATION

EU Konformitätserklärung
EC Declaration of Conformity

Produkt *Product*	**Kompaktflammenwächter** *Compact Flame Controller*
Typ *Type*	**CFC200** *CFC200*

Hiermit erklären wir, dass der bezeichnete Flammenwächter, in seiner Konzipierung und Bauart sowie in der von uns in Verkehr gebrachten Ausführung, den grundlegenden Sicherheitsanforderungen folgender EU-Richtlinien entspricht:

This is to confirm that the described system in its design and type of construction complies with the provisions of the Directive of the Council of the European Communities on the approximation of the laws of the member states relating to:

Anwendungsbereich *Field of application*	EU/2016/426		EU-Gasgeräteverordnung *EU Gas Appliances Regulation*
Richtlinien *Directives*	2014/34/EU		Explosionsschutzrichtlinie *Explosion protection directive*
	2014/30/EU		EMV Richtlinie *EMV directive*
	2011/65/EU		RoHS Richtlinie *RoHS directive*
Benannte Stelle *Notified body*	Kiwa Nederland B.V.	0063	
CE-Zerifikat vom *CE certificate from*	19.02.2018	CE0085BT0013	Baumusterprüfbescheinigung *Type examination certificate*
Gültig bis *Valid until*	19.02.2028		
Normen *Standards*	EN 298:2012; EN 13611:2019 + AC:2021 EN 60730-1:2016 EN 60079-0:2018; EN 60079-7:2015/A1:2018 EN IEC 60079-15:2019; EN 60079-31:2014 EN IEC 63000:2018		
Kennzeichnung EX *Identification EX*	ATEX Zone 1		Konformitätserklärung des Gehäuseherstellers *Declaration of conformity of housing manufacturer* II 3G Ex ec nC IIC T4 Gc II 3D Ex tc IIIC T100°C Dc
	ATEX Zone 2 ATEX Zone 22	TÜV 15 ATEX 7682 X	

Ausgestellt durch / *Issued by*: BFI Automation Mindermann GmbH

Rechtsverbindliche Unterschrift / *Legally binding signature*

ppa. E. Röllecke

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Name	Funktion *Function*	Ort, Datum *Place, Date*
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1.9 Address of the manufacturer

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2 | Safety

2.1 Intended use

The Flame Scanner Compact Version is intended exclusively for the monitoring of flames. The fields of application of this Compact Flame Controller are flame detections for selective and continuous burner monitoring in industrial steam generators, single and multi-burner furnaces.

⚠ WARNING

Danger when improperly used !
The device may cause hazards if it is not used as intended and/or for any other purposes.
The device has to be used only for the purposes for which it is intended.
The procedures described in the operating instructions have to be observed.

The manufacturer/supplier shall not be liable for damage resulting from use for non-intended purposes. The user/operating company alone shall bear the risk.

2.2 Requirements on persons

NOTICE

Work on/with the device may only be performed by persons authorized to do so based on their training and qualification. Furthermore, such persons have to have been commissioned by the operating company.

Do not allow any persons who are being apprenticed, educated, instructed or on a general training programme to work on the device without the constant supervision of an experienced person.

Persons who are under the influence of drugs, alcohol or medication that affects reactivity shall not be permitted to carry out work on the device.

Connection, set-up, maintenance and repair work may only be carried out by qualified specialist staff.

This device may cause hazards if it is operated inappropriately by untrained staff or if it is not used for its intended purpose.

Generally valid legal and other binding regulations on accident prevention and environmental protection in addition to basic health and safety requirements have to be observed. The operating company has to instruct its staff accordingly.

2.3 Safety instructions

The following instructions on accident prevention have to be observed when operating the Flame Scanner Compact Version:

NOTICE

Only operate the device if it is in a proper state!

- Do not remove or disable safety devices.
- Check for externally noticeable damage and defects prior to using the device! Immediately notify the appropriate authority/ person of any changes that occur (including changes in operating performance). If necessary, stop and secure the device immediately.
- Allow only authorised specialist staff to carry out set-up and/ or maintenance work.
- Replace worn or defective parts.
- Use suitable maintenance tools only.
- After repair work, refit all safety devices and carry out electrical and mechanical checks.
- Check the operating instructions for details of displays as well as switch-on and switch-off procedures.
- Prior to switching on the device, make sure that no-one can be endangered by the device!
- The operating company is responsible for ensuring that the device is only operated in a proper state and thataccount is taken of all the appropriate safety requirements and provisions.
- The operating instructions always have to be kept close to the device and be readily at hand.
- Any non-compliance with the safety instructions outlined in these operating instructions may lead to damage to property, personal injury or even death.

2.4 Safety devices

Check the safety equipment and locking devices on the device for safe operational condition.

Only operate the device if all safety devices are present and enabled. The operating company or operator of the Flame Scanner Compact Version is responsible for the proper operation of the device.

NOTICE

The device has been fitted with warning and danger signs for the protection of operating staff. These signs have to be observed. Damaged or illegible signs have to be replaced immediately.

2.4.1 Safety devices

The Flame Scanner Compact Version has been fitted with the following safety devices:

- Housing (protection against accidental contact)
- Flame-proof housing (optional)
- Earth connection of device (optional)
- Explosion protection barriers (optional)
- Pressure barrier (optional)
- Locking device (optional)
- Purge air connection
- Heating insulator (optional)

2.5 Safety instructions in case of maintenance and troubleshooting

- Deadlines set or indicated in the operating instructions for repetitive checks / inspections shall have to be observed!
- Appropriate workshop equipment is essential for performing maintenance work.
- In conformity with the electrical regulations, work on the electrical equipment of the system may only be carried out by an electrical specialist or by trained staff under the direction and supervision of an electrical specialist.
- The adjustment, maintenance and inspection activities and deadlines stipulated by BFI Automation, including information on the replacement of parts / assemblies, have to be observed! These tasks may only be carried out by authorised specialist staff.
- Operating staff have to be informed before maintenance or other special work is carried out. A supervisor has to be appointed.
- When working on the plug, the cable must be disconnected from the power supply.
- Screw connections which have been loosened during maintenance and servicing work, have to be tightened.
- If maintenance and repairs require safety devices to be dismantled, these devices have to be remounted and checked as soon as the maintenance and repair work has been completed.
- Operating and auxiliary materials as well as exchanged parts have to be disposed of in a safe and eco-friendly way.
- Spare parts supplied by BFI Automation or approved of by BFI Automation only may be used.

2.5.1 Electrical / electronic devices

⚠ DANGER

Danger to life caused by electrical current!
Contact with live wires or components presents a danger to life!
Prior to any work on the electrical equipment, disconnect the flame amplifiering system from the power supply network!

NOTICE

In keeping with the electrical regulations, work on electrical / electronic parts / components may only be carried out by electrical specialists.

Important rules of conduct:

- Check the device in regular intervals. Any defects or faults ascertained have to be corrected immediately. Switch off the device until the defects have been corrected.
- Equipment parts undergoing inspection, maintenance or repair work have to be made de-energised, if required. First check that the disconnected parts are no longer live, then short to earth. Also isolate neighbouring live parts
- If work is required on live parts, a second person has to be assigned who can disconnect the power supply in case of an emergency. Only use insulated tools!
- Fuses must not be repaired or bridged. Only use original fuses with the specified current!

2.5.2 Testing in keeping with the German Workplace Safety Ordinance

In case of the coupling or installation of devices from various manufacturers or suppliers, the operating company has to carry out a precise test, prior to start-up, in keeping with the German Workplace Safety Ordinance (BetrSichV) in force and the applicable electrical regulations.

In case of queries, please get in touch with BFI Automation.

2.5.3 Safety test

⚠ WARNING

Danger of injury and material damage if improperly used!

Improper use of the Flame Scanner Compact Version can lead to injury or even death and to material damage!

In order to ensure correct operation, the Flame Scanner Compact Version must be tested several times for all applications by starting and stopping the burner several times. In all cases the flame relay must switch off reliably in case if the flame is not detected. Carry out these tests whilst several neighbouring burners are started and stopped and different boiler outputs are used. This is an indispensable prerequisite for a safe and correct operation of the device!

2.5.4 Specific conditions of use (IECEx)

⚠ WARNING

- The insulation of conductors must match with temperature requirements.
- The housing, especially the Harting plug and connector have to be installed impact-protected.
- The installation must be in accordance with IEC 60079-14.
- The equipment shall only be used in an area of at least pollution degree 2, as defined in IEC 60664-1.
- Transient protection shall be provided that is set at a level not exceeding 140 % of the peak rated voltage value at the supply terminals to the equipment.

3 | Technical data

3.1 General characteristic features

- Flame Scanner with integrated amplifier and flame relay
- Tested by Kiwa Nederland B.V.
- For continuous, intermittent and 72-hours operation
- Typ UV, UV1: For monitoring gas and oil-fired burners in the UV range
- Typ IR: For monitoring diffusion flames in the IR range
- Typ IR3: For gas surface burner and reheatings
- Adjustable sensitivity for analog output flame intensity 0(4) to 20 mA
- Analog output flame intensity 0(4) to 20 mA
- LED status display for flame relay (LED Yellow) and flame intensity (LED Green)
- No additional wiring to external Flame Amplifiers
- Type of protection IP 65 / IP 66

3.2 Electrical system, optical system, mechanical system

Spectral sensitivity UV1 UV IR IR3	 190 nm to 550 nm 280 nm to 420 nm 300 nm to 1050 nm 1050 nm to 2700 nm
Angle of view Standard/Ex-d-housing OE-Converter housing/ Ex-d-housing (GUB)	 1°, 2° or 2,7° 2,7° by sensor head
Self checking	fully electronic, once per 700 ms
Power supply	24 V DC SELV
Current consumption	max. 200 mA
Prefuse	max. 0,5 A, slow
Design	according to protection class III SELV
Current output	0/4...20 mA, Ra < 250 Ω current window variable by jumpers

3.2 Electrical system, optical system, mechanical system

Flame relay	1 changeover contact, potential-free max. 48 V switching voltage max. 1 A switching current (fused with 0,5 A) max. 30 W switching power
Safety switch-off time	1 ... 5 s, set at factory to 1 s (2 - 5 s available on request)
Ambient temperature OE-housing (IECEx) (IR, IR3) Ex-d-housing (GUB) (incl. heating, IECEx) Standard-housing (IR, IR3) Standard-housing (UV, UV1) OE-housing (EAC) (UV, UV1)	 -20 °C to +70 °C -40 °C to +85 °C -55 °C to +85 °C -55 °C to +70 °C
Electrical connection Standard/OE-Converter housing Ex-d-housing Ex-d-housing (GUB)	 dustproof plug-type connector permanently connected cable terminal blocks
Type of protection OE-Converter-/Ex-d-housing/ Ex-d-housing (GUB) Standard housing	 IP 66 IP 65
Sight port connection Standard/Ex-d-housing OE-Converter-/Ex-d-housing (GUB)	 1" female thread depending on SKL
Purge air Connection Volume Pressure	 ½" female thread 10 m³/h 0,02 bar over combustion chamber internal pressure
CE	CE0063
IECEx Zone 1 Ex-d-housing Ex-d-housing (GUB) Zone 2 Standard/OE-housing	 IECEx EPS 14.0042X IECEx INE 13.0069X IECEx TUR 15.0029X

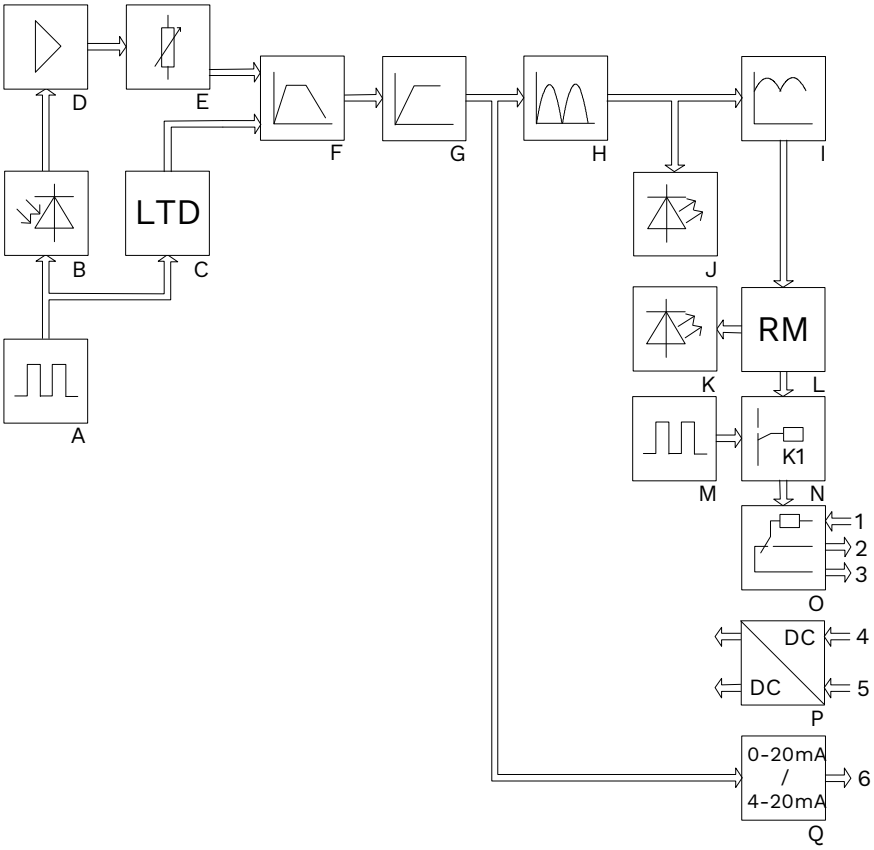
3.2 Electrical system, optical system, mechanical system

ATEX	
Zone 1	
Ex-d-housing	EPS 14 ATEX 1 696 X
Ex-d-housing (GUB)	INERIS 13ATEX0021X
Zone 2	
Standard/OE-housing	TÜV 15 ATEX 7682 X

3.3 Weight

Standard housing	approx. 1.5 kg
OE-Converter housing	approx. 1.5 kg
OE-Converter housing WH	approx. 2.1 kg
Ex-d-housing	approx. 3.5 kg
Ex-d-housing (GUB01)	approx. 5 kg
Ex-d-housing (GUB03 FEAM)	approx. 15 kg

3.4 Device design - block diagram



A	Electronical shutter	J	LED flame intensity (green)
B	Sensor	K	LED flame relay (yellow)
C	LTD (Long time delay)	L	Monitor channel
D	Preamplifier	M	Window generator
E	Sensitivity potentiometer	N	Relay / safety circuit
F	Band pass filter	O	Relay output
G	High pass filter	P	Galvanic isolation
H	Rectifier	Q	Current output
I	Smoothing	1-6	Pinning of the special cable

3.5 Setting elements - Sensitivity potentiometer

The gain of the Compact Flame Controller is adjusted with a potentiometer. The adjustment can be done during operating. The sensitivity potentiometer can be found on the back of the housing.

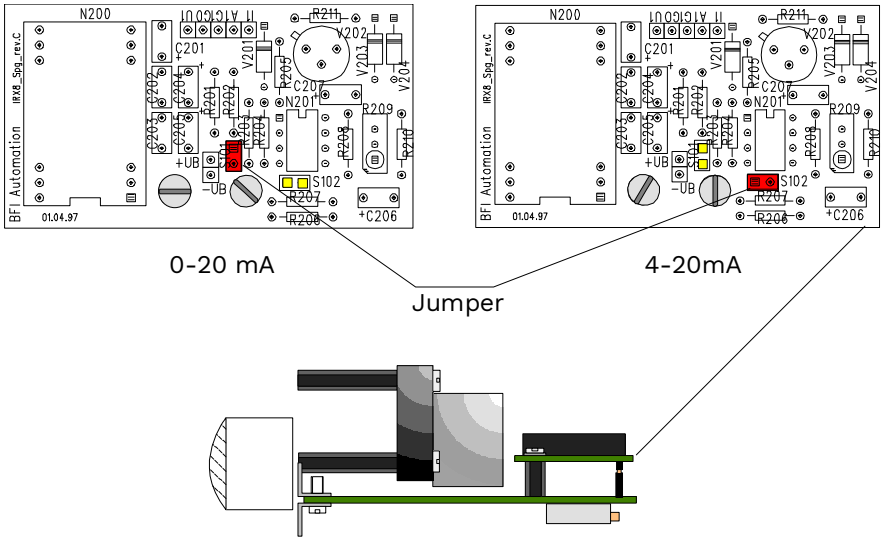
NOTICE

To the potentiometer applies: Increase sensitivity by turning clockwise!

The potentionmeter can be set in 24 full turns from 0 to 100 % for standard housings and 10 full turns for Ex-proof housings. It is not possible to over-tighten the potentiometers.

Factory setting: 100% by CFC200UV, UV1 and IR
50% by CFC200IR3

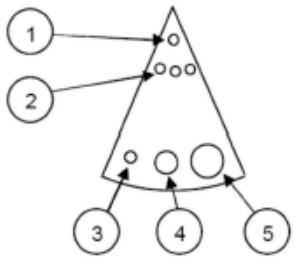
3.5.1 Setting elements - Select the current output



3.6 Optical aperture

With the CFC 2000 of the IR series, the radiation on the sensor element can be reduced with an optical diaphragm. The aperture permits a control of the radiation energy, which is picked up as flame signal by the semi-conductor sensor. It is used to fade out excessive radiation emitted by heavy oil flames, for example, by optical means. An overexcitation of the scanner electronics or a thermal overload of the scanners can be prevented.

Adjustment of the aperture
The unit has to be opened for the adjustment of the aperture. The aperture is located between the lens and the detector holding block. In order to be able to change the aperture setting, the rotational axis screw (1) has to be loosened first of all. Then loosen the set screw (2) until the aperture can be moved. Set the requested aperture (3-5) and lock the position with the set screw (2). Subsequently tighten the rotational axis screw (1) and close the device.



1 rotational axis
2 set screw
3 small aperture
4 medium aperture
5 big aperture

NOTICE

Flame Scanners Compact Version in OE-Converter housings and Ex-d-housings (GUB) are not equipped with an optical aperture.

4 | Installation and connection

4.1 Scope of delivery

- Flame Scanner Compact Version 200
- Operating instructions
- Connection cable (optional)
- Harting cable box (optional)
- Power supply unit (optional)
- Swivel Mount (optional)
- 3-way-ball-valve (optional)
- Heating insulator (optional)
- Pressure barrier (optional)
- Ex-housing (optional)
- Optical alignment device (optional)
- Fibre optic cable (optional)
- Sensor Head (optional)
- Double Nipple (optional)

Refer to the order papers for the exact scope of delivery and compare with the delivery note.

Checking for completeness

Check the entire delivery for completeness against the accompanying delivery note. Please refer to our terms of sale and delivery otherwise.

Report any damage

After arrival of the device and accessories, notify the shipping agent, the insurance company and BFI Automation immediately in case of any damage caused by transport or inadequate packaging. Take steps to minimise and prevent further damage.

Report the insurance case to the insurance company without delay and transmit the full claim documents at once in order to expedite the claims settlement (at the latest in sufficient time before the expiry of any periods of preclusion and/or limitation relating to the compensation claims against third parties).

NOTICE

All installation and connection work may be carried out by qualified and approved specialist staff only!

Observe the legal stipulations and adjustment instructions of the plant operator!

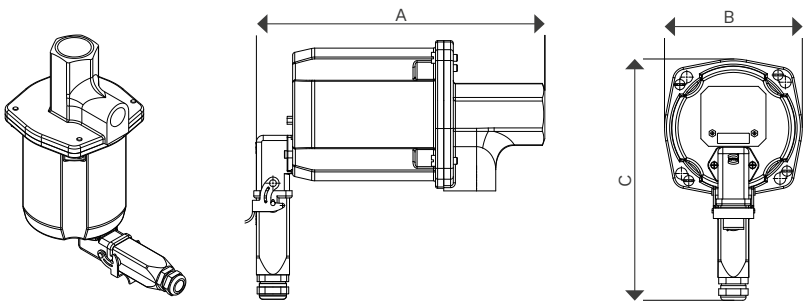
4.2 Packaging

The Flame Scanner Compact Version is shipped in different packaging materials.
The most frequently used packaging materials are cardboard and plastics (foils, foamed material).

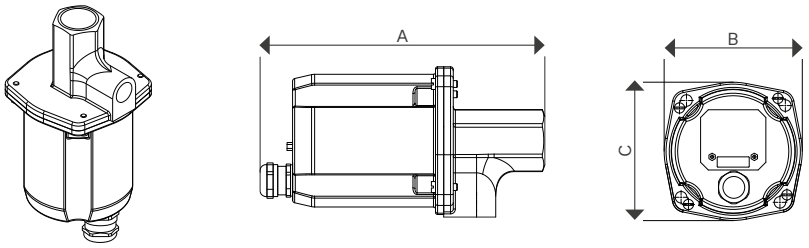
NOTICE

Packaging has to be disposed of in an environmentally friendly way and in accordance with the relevant provisions on disposal.

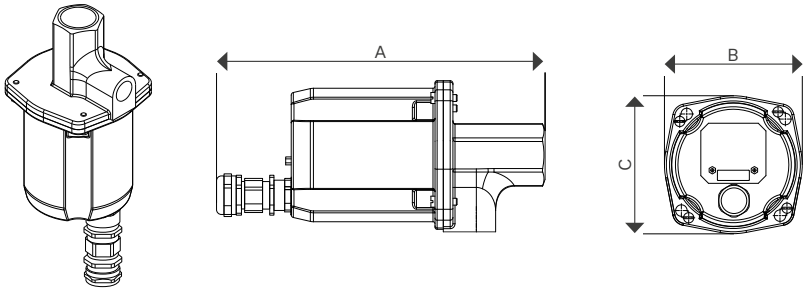
4.3 Space requirement - Housings



ATEX Zone 2	
Standard housing	
Length A:	235 mm
Width B:	108 mm
Height C:	190 mm
Weight:	1.5 kg
Type:	200

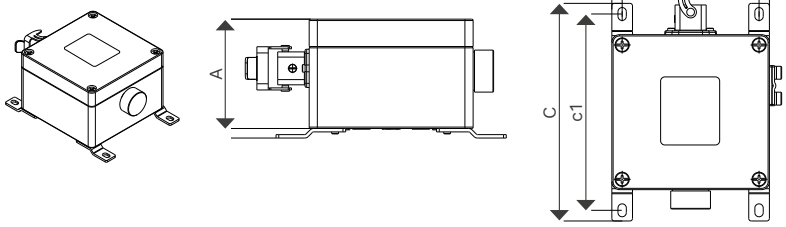


Standard housing with Cable gland	
Length A:	ca. 210 mm
Width B:	108 mm
Height C:	108 mm
Weight:	1.5 kg
Type:	200

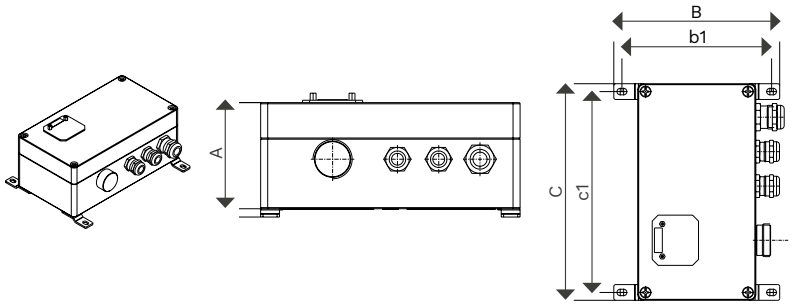


Standard housing with Conduit gland	
Length A:	247 mm
Width B:	108 mm
Height C:	108 mm
Weight:	1.5 kg
Type:	200

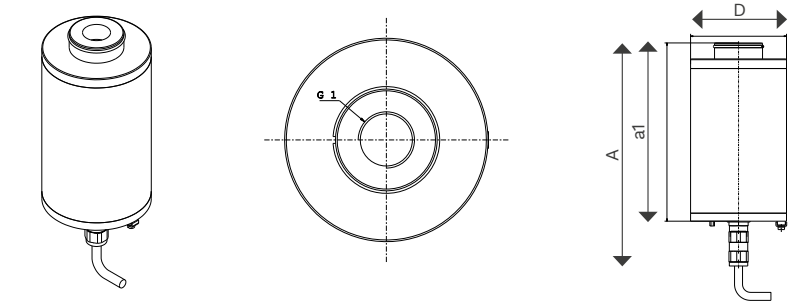
4.3 Space requirement - Housings



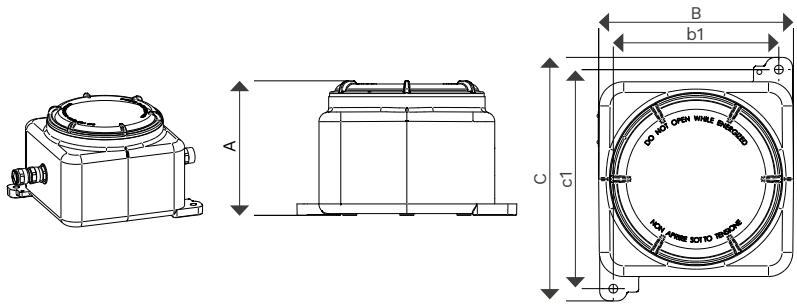
ATEX Zone 2	
OE-Converter housing	
Length A:	80 mm
Width B/b1:	122/106 mm
Height C/c1:	168.5/152mm
Weight:	1.5 kg
Type:	200



ATEX Zone 2	
OE-Converter housing WH	
Length A:	91 mm
Width B/b1:	168/125 mm
Height C/c1:	220/204 mm
Weight:	2.1 kg
Type:	200

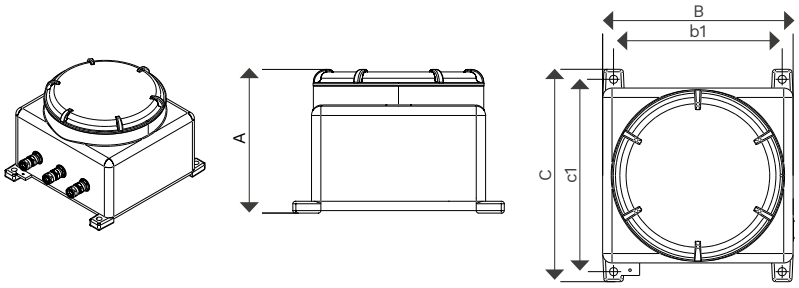


ATEX Zone 1	
Ex-d-housing	
Length A/a1:	286/223mm
Ø D:	120 mm
Weight:	3.5 kg
Type:	200 EX



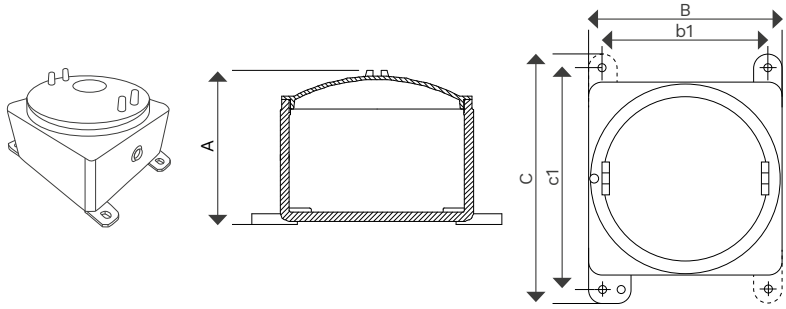
ATEX Zone 1	
Ex-d-housing (GUB01)	
Length A:	153 mm
Width B/b1:	200/170 mm
Height C/c1:	250/225 mm
Weight:	5 kg
Type:	200 EX

4.3 Space requirement - Housings

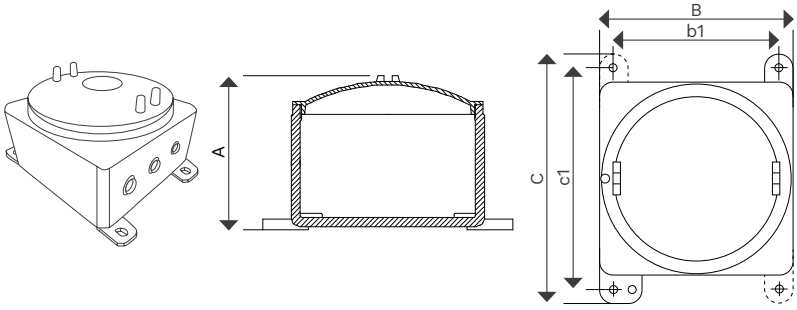


ATEX Zone 1	
Ex-d-housing (GUB03)	
Length A:	231 mm
Width B/b1:	305/270 mm
Height C/c1:	336/308 mm
Weight:	15 kg
Type:	200 EX

4.3.1 Space requirement - Discontinued housings



ATEX Zone 1	
Ex-d-housing (GUB02)	
Length A:	218 mm
Width B/b1:	232/196 mm
Height C/c1:	304/262 mm
Weight:	7.4 kg
Type:	200 EX



ATEX Zone 1	
Ex-d-housing (GUB03)	
Length A:	218 mm
Width B/b1:	276/236 mm
Height C/c1:	356/318 mm
Weight:	10.4 kg
Type:	200 EX

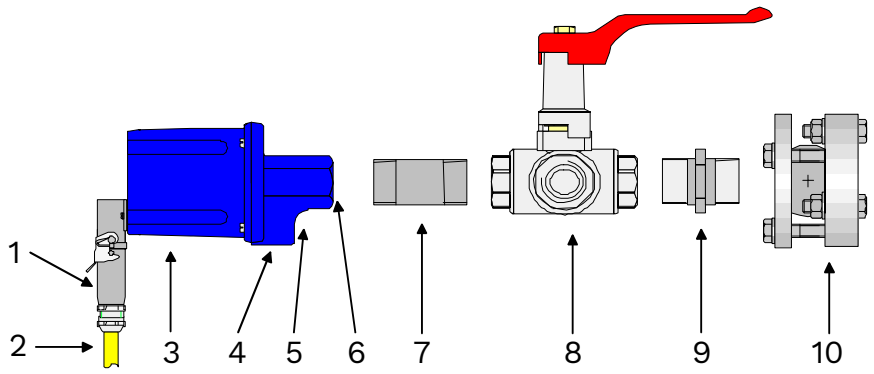
4.4.1 Installation - Standard housing

NOTICE

At a diameter of 1", the sighting tube should not be any longer than 50 cm. When doubling the length, double the diameter to 2"!

By using a ball-flange, the adjustment can be carried out easily ensuring that the ideal sighting point is set mechanically. The Flame Scanner Compact Version is supplied complete with a rapid-installation flange. This flange ensures the unproblematic disassembly of the flame scanner. It has a purge air connection, the construction of which prevents the soiling of the lens system without the dust-laden purge air damaging the lens. If temperatures of over 50 degrees Celsius occur at the flame scanner despite the inflow of cooling air caused by the heat dissipation of the sighting tube, heating insulator has to be used. In case of pressurised combustion, an additional 3-way-ball-valve has to be fitted for protection. The exit of hot gas after removal of the scanner is prevented, ensuring further cooling and purging of the arrangement.

The entire mechanical peripheral system can be supplied by BFI Automation.

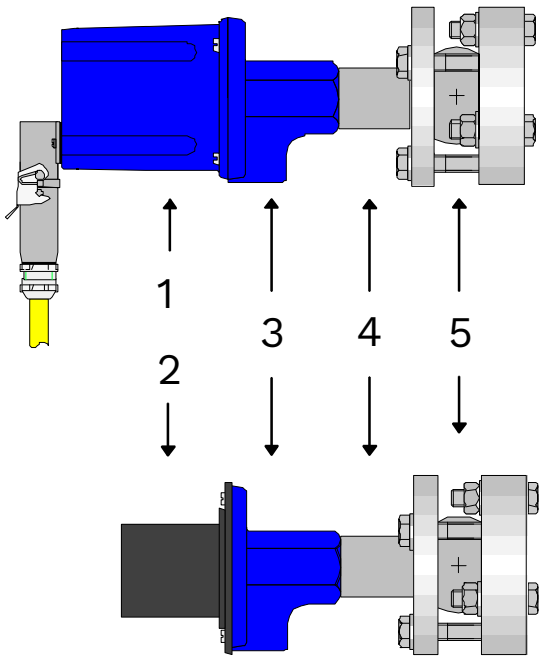


1. Harting plug
2. Special cable KW5
3. Flame Scanner Compact Version
4. Purge air connection
5. Purge air flange
6. Sighting tube connection
7. Heating insulator
8. 3-way-ball-valve
9. Double nipple
10. Swivel mount

4.4.1 Installation - Standard housing

NOTICE

All installation and connection work may be carried out by qualified and approved specialist staff only! The legal regulations as well as adjustment instructions of the plant operator have to be observed!



1 Flame Scanner Compact Version
2 Optical alignment device
3 Purge air flange
4 Heating insulator
5 Swivel mount

The Flame Scanner Compact Version has been provided with oblong holes for easy installation on the purge air flange. The sighting tube connection has been provided with a G1" internal thread.
In order to ensure perfect flame amplifiering, the correct and low-vibration position of the sighting tube relative to the flame is essential. The Flame Scanner Compact Version has to be aligned in such a way that a perfect visual image is set. For this purpose use the optical adjusting device (available as an accessory) as shown in chapter 4.4.5. The best setting results when a large visual field is achieved.

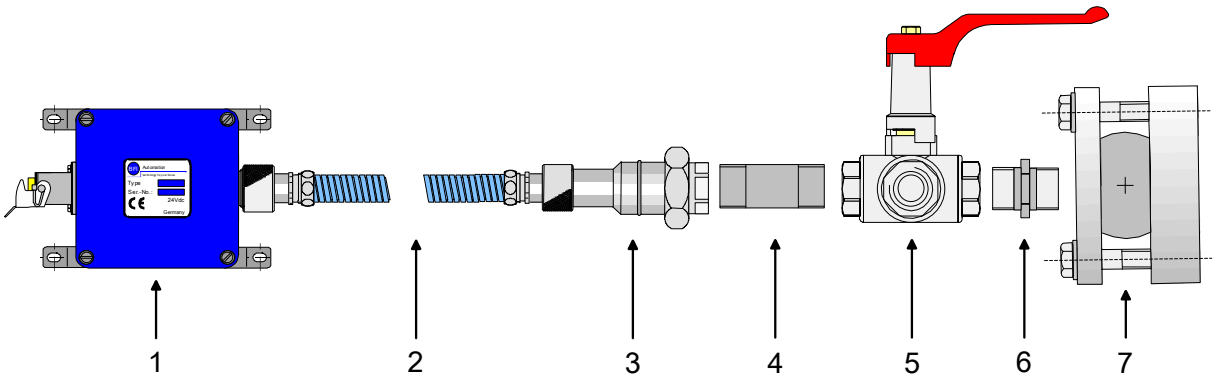
4.4.2 Installation - OE-Converter housing

NOTICE

At a diameter of 1", the sighting tube should not be any longer than 50 cm. When doubling the length, double the diameter to 2"!

By using a Swivel Mount, the adjustment can be carried out easily ensuring that the ideal sighting point is set mechanically. Connection of the fibre optic cable by using the swivel nuts at both ends. If temperature of over 200 degrees Celsius occur at the Flame Scanner Compact Version despite the inflow of cooling air caused by the heat dissipation of the sighting tube, heating insulator has to be used. In case of pressurised combustion, an additional 3-way-ball-valve has to be fitted for protection. The exit of hot gas after removal of the Sensor Head SKL is prevented, ensuring further cooling and purging of the arrangement.

The entire mechanical peripheral system can be supplied by BFI Automation.

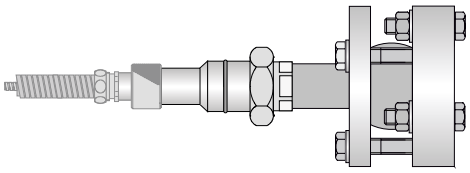


1. Flame Scanner Compact Version
2. Fibre Optic Cable
3. Sensor Head SKL
4. Heating Insulator
5. 3-way-ball-valve
6. Double Nipple
7. Swivel Mount

4.4.2 Installation - OE-converter housing

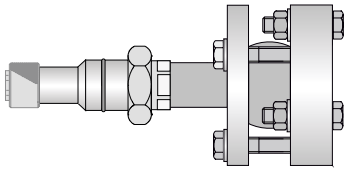
The sight port connection of the Sensor Head SKL is G 1" female thread.
In order to ensure perfect flame amplifiering, the correct and low-vibration position of the sighting tube relative to the flame is essential. The Sensor Head SKL has to be aligned in such a way that a perfect visual image is set. For this purpose use the Optical Alignment Device (available as an accessory) as shown in chapter 4.4.5.

Fibre Optic Cable



Remove the Fiber Optic Cable from the Scanner Head SKL, replace it with the optical alignment device and fix it with the hand nut.

Optical Alignment Device



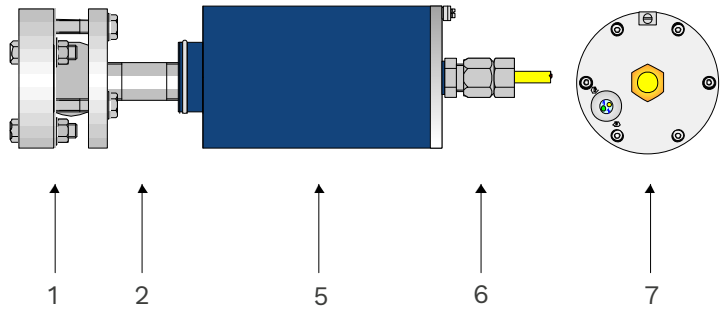
NOTICE

The enclosure may only be opened by a person authorised to do so when it is de-energised!

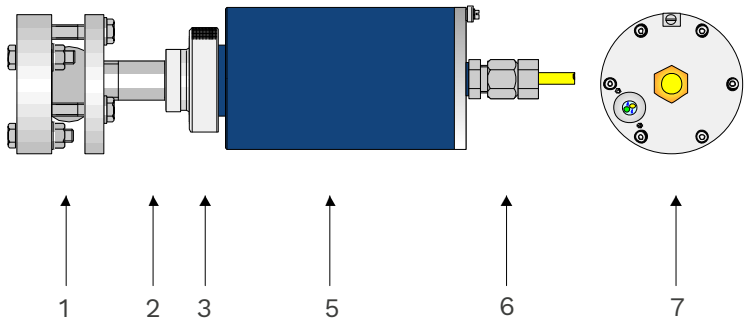
4.4.3 Installation - Ex-d-housing

The assembly of the Ex-proof housing can be performed in three different ways:

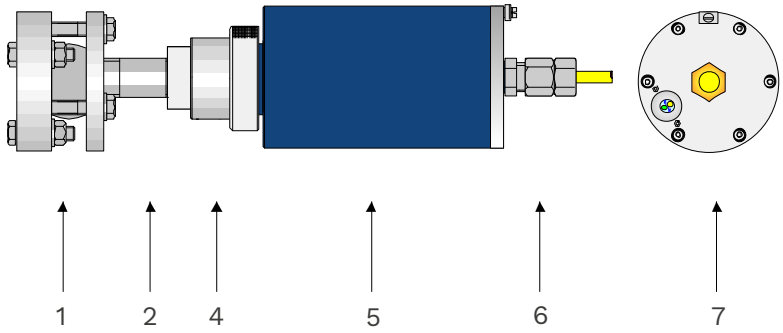
1. Standard



2. With quick release lock



3. With quick release lock and purge air connector



1. Swivel mount
2. Heating insulator
3. Quick release lock
4. Quick release lock with purge air connector
5. EX-proof housing
6. Cable coupling
7. Back view

4.4.3 Installation - Ex-d-housing

For alignment of the visual axis of the Flame Scanner Compact Version.

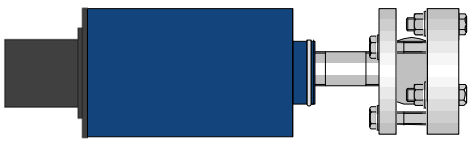
The circle insight the visor represents the detecting area of the sensor (see chapter 4.4.5).

With a swivel mount the visual axis can be aligned as shown below. The images in the upper line show a correct alignment. The images in the lower line show a misalignment of the visual axis of the Flame Scanner or a negative influence by burner internals.

Ex-housing

Remove the cover with electronics, replace it with the optical alignment device and fix it with the screws.

Optical Alignment Device



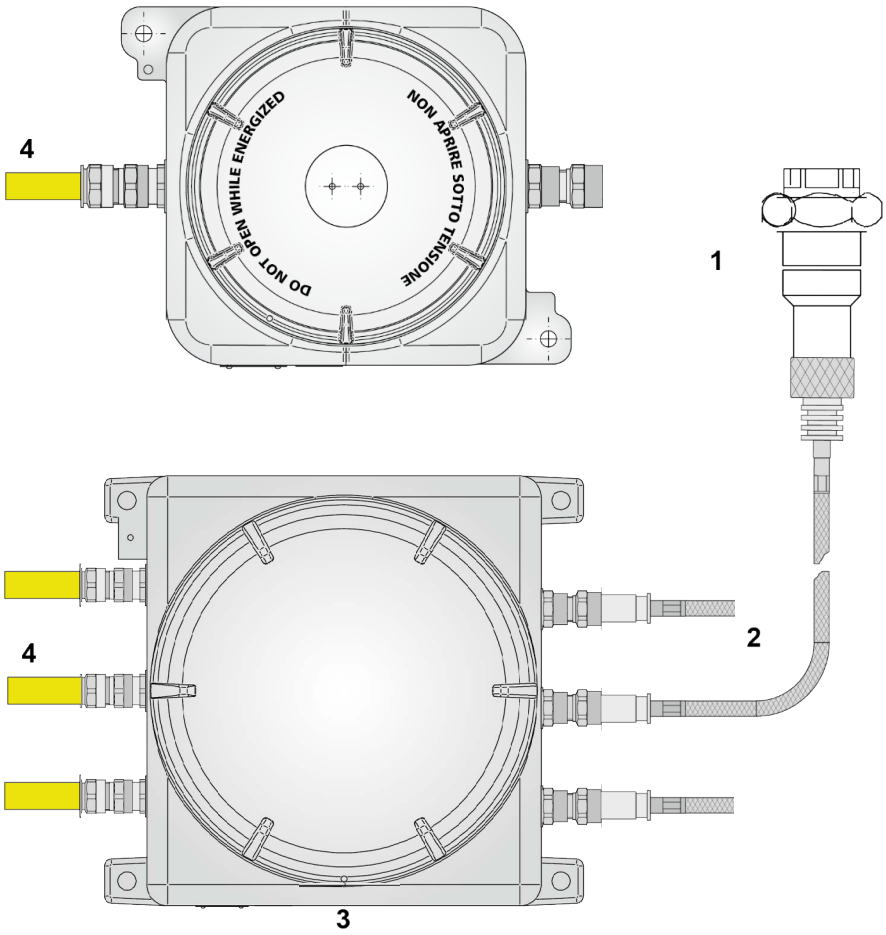
NOTICE

The enclosure may only be opened by a person authorised to do so when it is de-energised!

4.4.4 Installation - Ex-d-housing (GUB)

The sighting tube connection has been provided with a G1" internal thread. In order to ensure perfect flame amplifiering, the correct and low-vibration position of the sighting tube relative to the flame is essential.

The SKL-probe has to be aligned in such a way that a perfect visual image is set. For this purpose use the optical adjusting device as shown in chapter 4.4.5.



1. Sensor Head SKL
2. Fibre Optic Cable
3. Flame Scanner
4. Special Cable

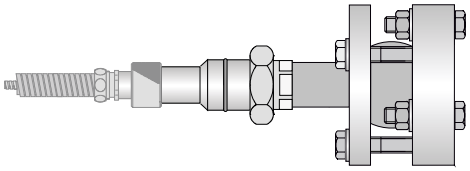
4.4.4 Installation - Ex-d-housing (GUB)

For alignment of the visual axis of the Flame Scanner Compact Version.

The circle insight the visor represents the detecting area of the sensor (see chapter 4.4.5).

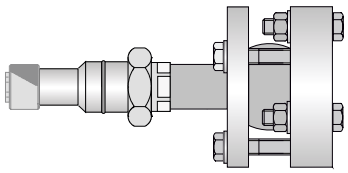
With a swivel mount the visual axis can be aligned as shown below. The images in the upper line show a correct alignment. The images in the lower line show a misalignment of the visual axis of the Flame Scanner Compact Version or a negative influence by burner internals.

Fibre Optic Cable



Remove the cover with electronics, replace it with the optical alignment device and fix it with the screws.

Optical Alignment Device



NOTICE

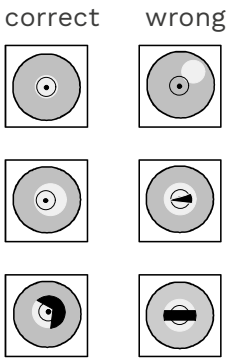
The enclosure may only be opened by a person authorised to do so when it is de-energised!

4.4.5 Vision images of the optical adjustment device

⚠ CAUTION

Danger of injuring the eyes by infrared and ultraviolet radiation and penetrating gases when checking the flame visually!
Wear filtering protective glasses!

Vision images of the optical adjustment device



NOTICE

The images appear mirror inverted in horizontal and vertical direction!

The length and the diameter of the sighting tube have a direct influence on the usable flame radiation as the visual angle of the lens system is defined. Without restriction of the visual range, the maximum length L of a sighting tube for conventional tube diameters D is as follows:

D:	1"	1.5"	2"
L:	0.5 m	0.8 m	1.1 m

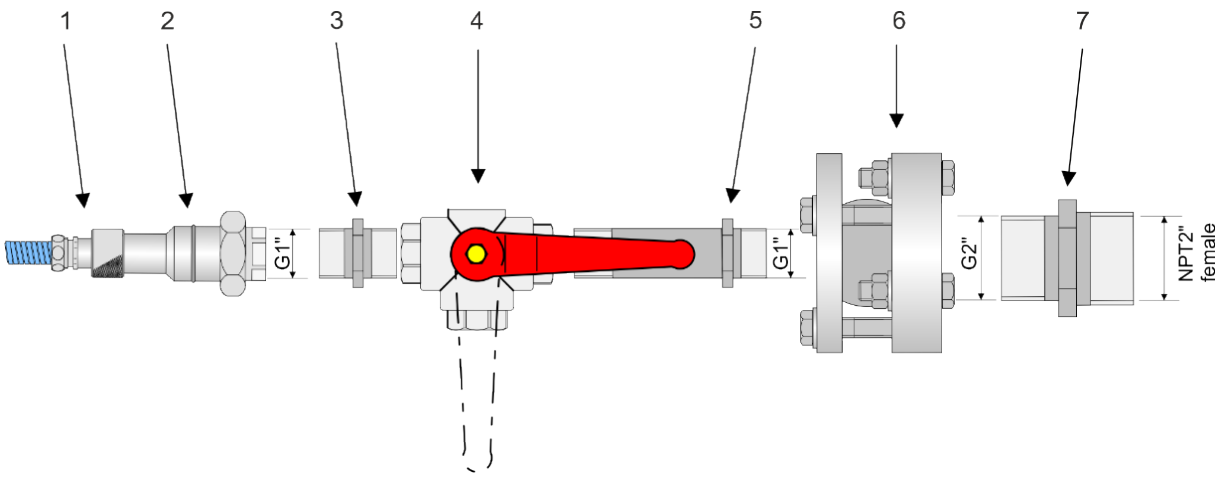
For this reason, the sighting tube should always be as short as possible. A diameter of 2" is recommended.

NOTICE

At a diameter of 1", the sighting tube should not be any longer than 50 cm. When doubling the length, double the diameter to 2"!

4.4.6 Mounting variant using accessories

By using a ball-flange, the adjustment can be carried out easily ensuring that the ideal sighting point is set mechanically. Connection of the fibre optic cable by using the swivel nuts at both ends. If temperature of over 100 degrees Celsius occur at the Flame Scanner despite the inflow of cooling air caused by the heat dissipation of the sighting tube, heating insulator has to be used. In case of pressurised combustion, an additional 3-way-ball-valve has to be fitted for protection. The exit of hot gas after removal of the SKL-probe is prevented, ensuring further cooling and purging of the arrangement. The entire mechanical peripheral system can be supplied by BFI Automation.



1. Fibre Optic Cable
2. Sensor Head SKL
3. Double Nipple
4. 3-way-ball-valve
5. Double Nipple
6. Swivel Mount
7. Double Nipple

4.4.7 Works setting of the Flame Scanner Compact Version

⚠ DANGER

Danger to life caused by combustion or explosion!
In case of incorrect installation or adjustment, uncontrolled combustion or explosions may be caused!
Observe the adjustment instructions of the plant operator!
Adjustment work may be carried out only by qualified and approved specialist staff!

Flame Scanner Compact Version with variable sensitivity settings are set to the highest value at the manufacturer's works.

Flame Scanner Compact Version with variable frequency filters have a high signal sensitivity on account of the preset low-frequency harmonisation. Flame Scanner Compact Version with a variable shutter are set at the manufacturer's works to Shutter open which ensures maximum radiation sensitivity.

Devices with an additional changeover system must be actively controlled by means of an external 24 V DC signal.

The switch-off time of the Flame Scanner Compact Version is set to 1 second at the factory. It is possible to set longer switch-off times.

4.4.8 Adaption of the Flame Scanner Compact Version to the firing

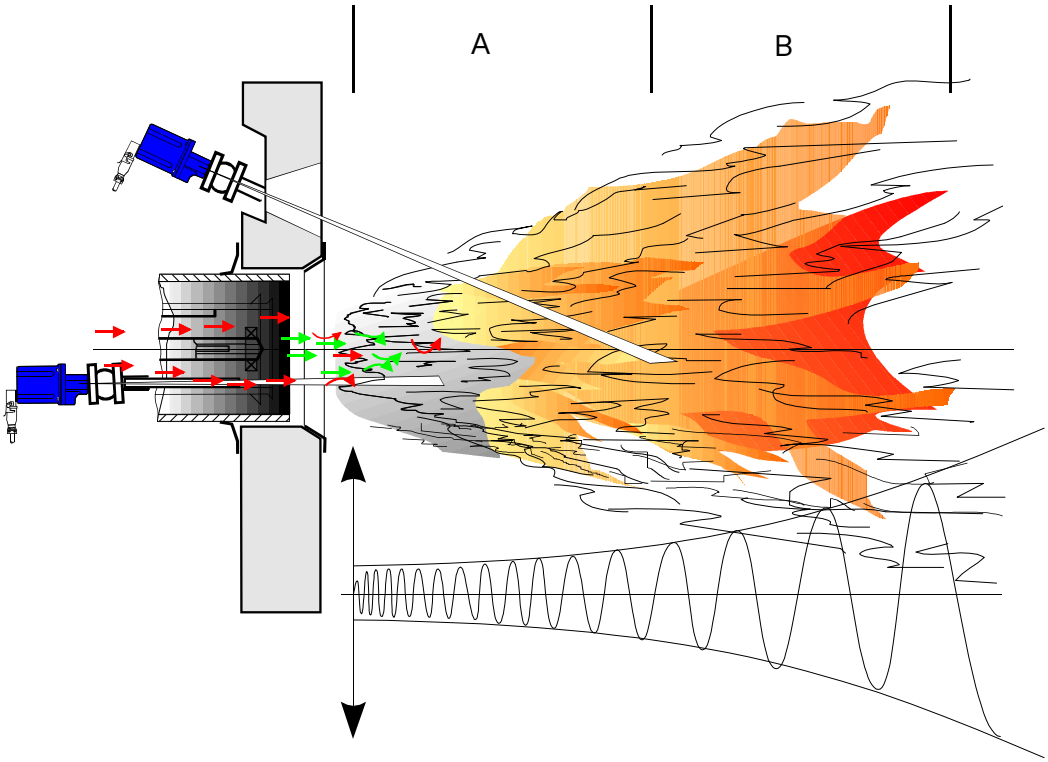
⚠ DANGER

Danger to life caused by combustion or explosion!
In case of incorrect installation or adjustment, uncontrolled combustion or explosions may be caused!
Observe the adjustment instructions of the plant operator!
Adjustment work may be carried out only by qualified and approved specialist staff!

NOTICE

All alignments and settings have to be carried out, when new spare parts have been fitted, the Flame Scanner Compact Version has been moved or the flame image has been changed (by additional fuel, new burner, change in the burner / air register, for example) as well as during all first installations!

For selective burner amplifiering, the device has to be installed in such a way that the primary combustion zone in all load ranges is inside the visual angle of the Flame Scanner Compact Version. The sight axle has to cut through the first third of the flame (A) of the own burner if possible. The extension of the sight axle must not cut through the first third of the flame of other burners.



4.5 Connection

⚠ DANGER

Danger to life caused by electrical current!
The safety instructions and local safety regulations have to be observed during connection!
The safety instructions and local safety regulations have to be observed during connection!
Have electrical connections made only by authorised specialist personnel!

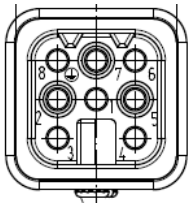
For connection data, please refer to the chapter Technical data and to the following terminal diagram.
Ensure that the available supply voltage complies with the voltage indicated on the type plate.
Prior to connection, check the device and the connecting cables for visible damage.
For the contact assignment of the plug connector, refer to the following terminal diagram.

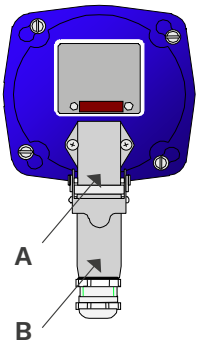
The output signal 0(4) to 20 mA for the flame intensity is not separate from the supply voltage so that the signal refers to the operating voltage ground. Should this result in problems, a corresponding isolating transformer can be supplied on request. The load of 250 ohm must on not account be exceeded.

After switching on the supply voltage, the device is immediately ready for operation.

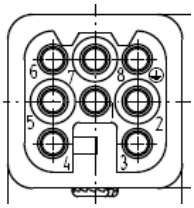
4.5.1 Electrical connection

A - Harting device plug (pin contacts)

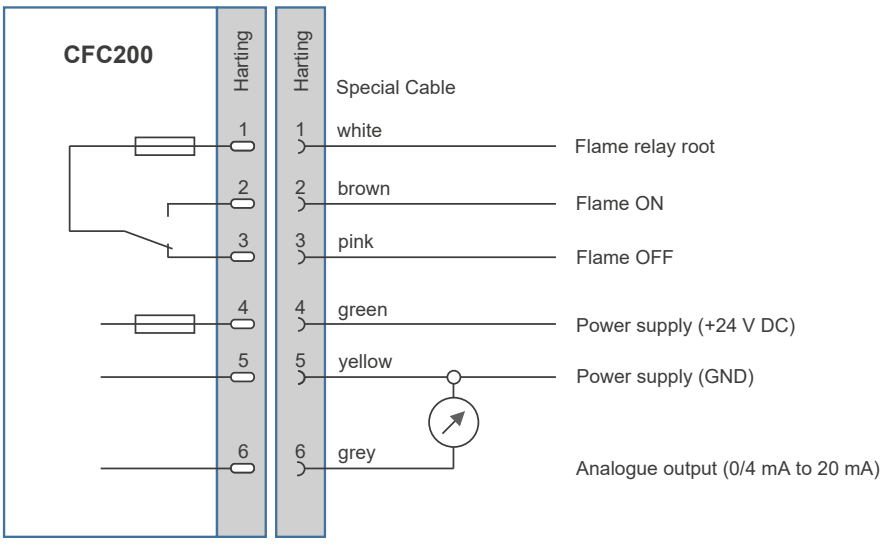




B - Harting cable connection box (socket contacts)



Connection of CFC without special configuration:



4.5.2 Laying the special cable

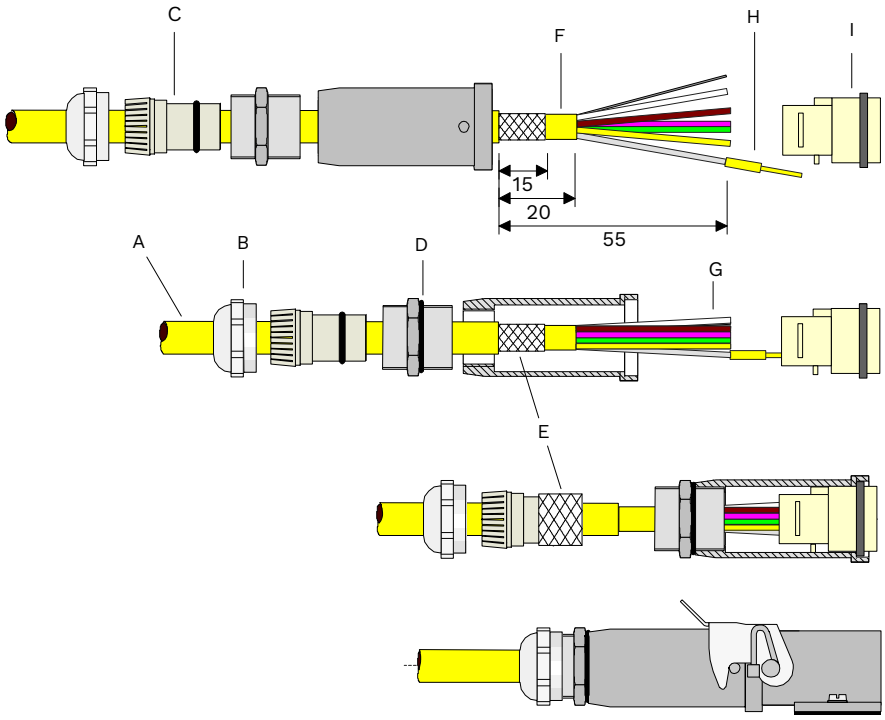
NOTICE

No contact chamber may remain bare!
All contact chambers in the contact insert have to be fitted with crimp contacts!
For this purpose use a suitable crimp tool!

HINWEIS

The union joint should be tightened with a tightening torque of 10 Nm.

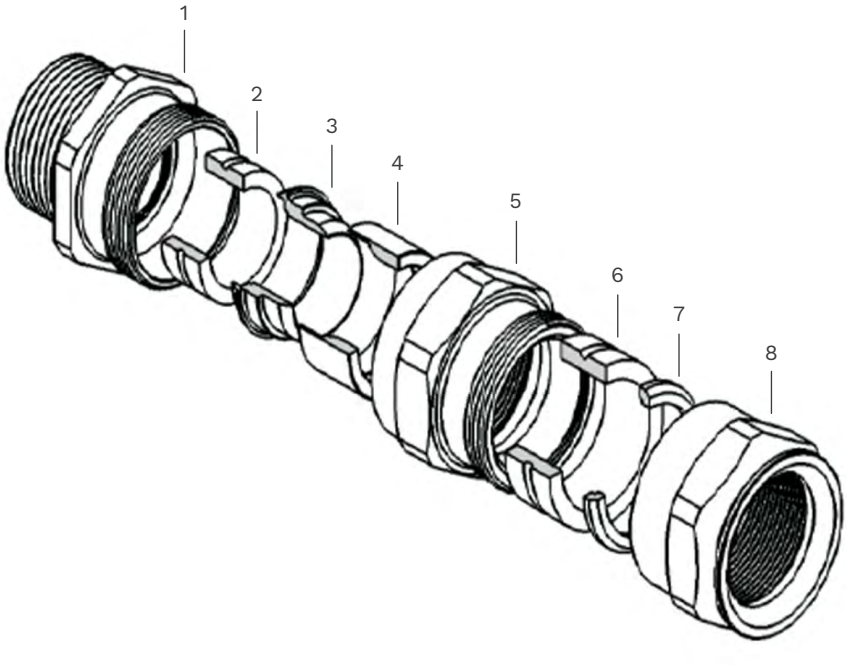
On the flame scanner side the external shielding is connected to the housing mass by means of a clamp connection located between the plastic insert the threaded part in the cable gland (not available in KW3 cable). The internal shielding is cut on the flame scanner side and is connected to the flame amplifier side along with the signal GND (see terminal diagram).



A	external PUR shielding	F	internal PUR shielding
B	union joint	G	individual wires
C	plastic insert	H	crimp contact
D	threaded part	I	female contact
E	external shield		

4.5.3 Mounting of the gland ADE4F (Type5) for Special Cable

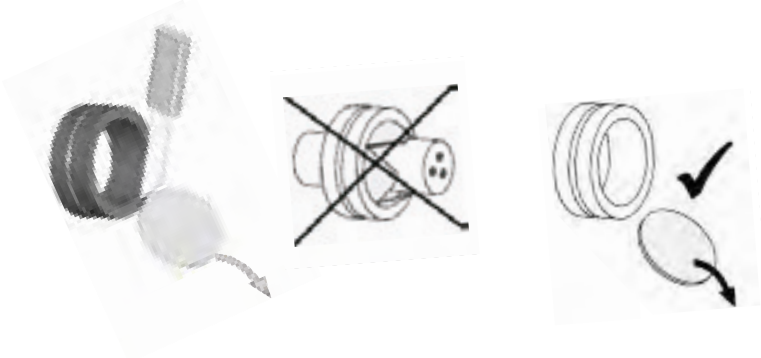
The base nut is already bonded and mounted to the Ex-d-housing (GUB).



1. Base nut
2. Sealing
3. Shielding clamp base
4. Shielding clamp
5. Middle nut
6. Sealing
7. Pressure distribution ring
8. Top nut

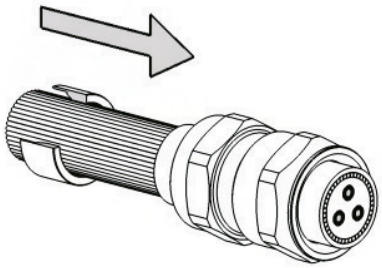
NOTICE

Both sealings (2 and 6) are closed and should be opened before mounting.

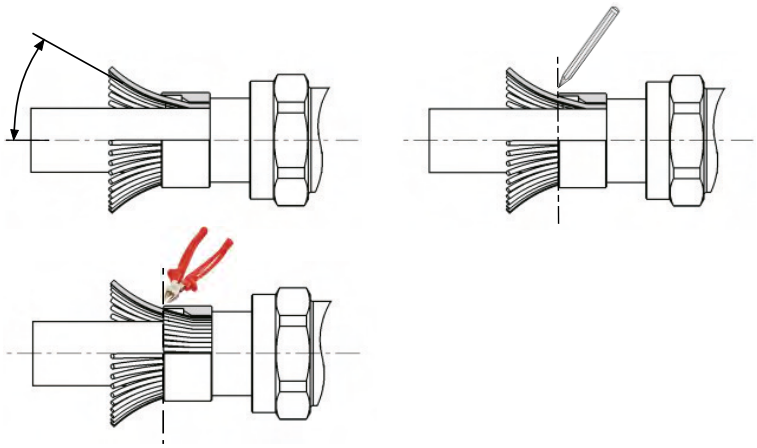


4.5.3 Mounting of the gland ADE4F (Type5) for Special Cable

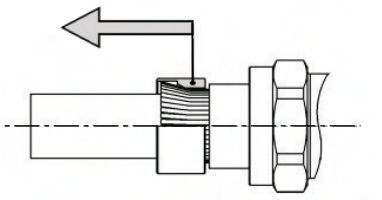
Put on part numbers 5 – 8 to the cable. Then shorten the cable to the needed length and cut off the outer sheath.
Now put on the shielding clamp (4) to the cable and shorten the shielding, but leave some 2 cm of the shielding.



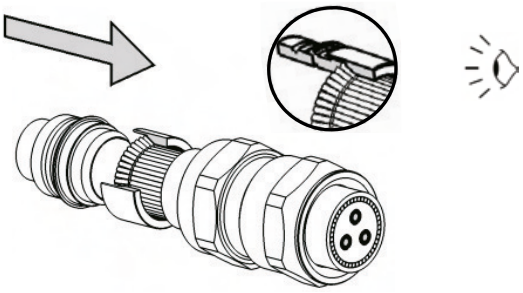
Fan out and cut the shielding in the shown way.



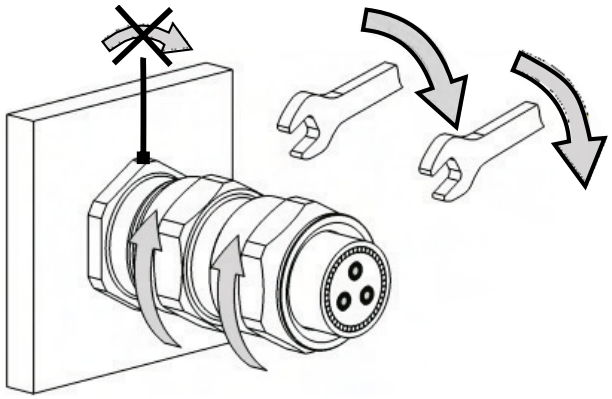
Put on the shielding clamp base and clamp the shielding.
Take care that shielding, shielding clamp base and shielding clamp are mounted like the following picture shows.



4.5.3 Mounting of the gland ADE4F (Type5) for Special Cable



Now push the sealing (2) to the cable and put it to the base nut (1). Hand-tighten the middle nut and top nut in first step. At last pull tight first the middle nut with 12.5 Nm and then the top nut with the same torque.



Last but not least you can connect the wires to their terminals.

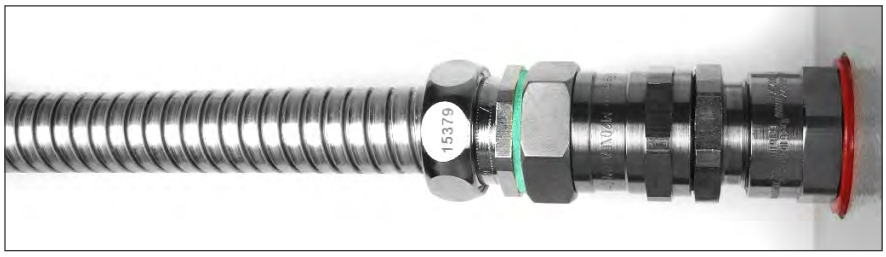
4.5.4 Mounting of the gland ADCS (Type6) for Fiber Optic Cable

NOTICE

The Fiber Optic Cable will turn around during the mounting to the Ex-housing. So it is highly recommended not to mount it to the Sensor Head SKL before this mounting has been done.

Firstly, the screw connection is screwed by hand with the base nut already fitted.
Not too tight because the small side of the Fiber Optic Cable (FOC) must still fit through.
Next step is to insert the small side of the FOC into the gland until the stop (Picture 1 und 2).

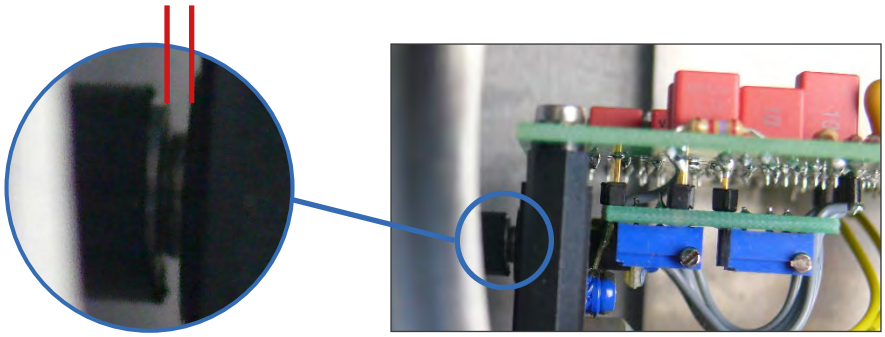
Picture 1



Picture 2

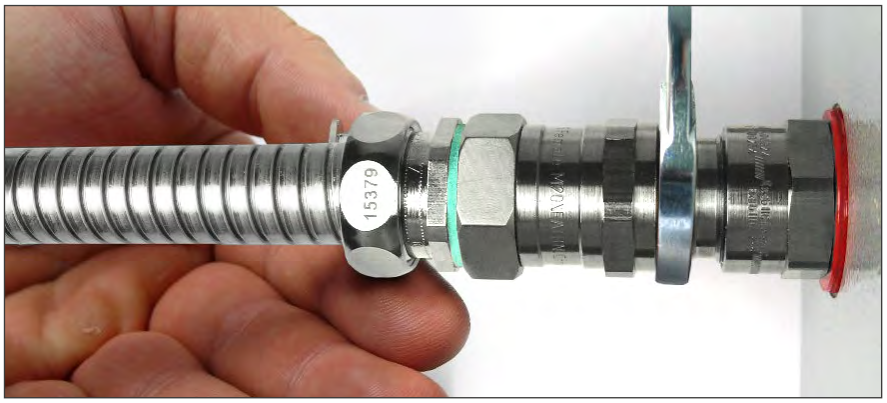
4.5.4 Mounting of the gland ADCS (Type6) for Fiber Optic Cable

Check the distance between the fibre optic cable and the sensor element (Picture 3). There should be a gap left of 2-3 mm.



Picture 3

Now the middle nut is to tightened with 20 Nm torque. Please hold the top nut and FOC during this mounting. The position of the FOC should not be changed.



Picture 4

The top nut can now be tightened also with 20 Nm torque.

4.6 Storage

Do not unpack any packed Flame Scanners Compact Version and accessories.

The following conditions apply to storage:

- Store in a dry place. Maximum relative humidity 60 %. In addition, It has to be assured that the floor in the storage area will remain dry through-out the storage period.
- Protect from direct sunlight. Storage temperature: 15 degrees to 25 degrees C (59 degrees to 77 degrees F).
- Store in a dustfree location.
- Avoid mechanical vibrations and damage.

5 | Description

5.1 Functional description

For flame radiation analysis the Flame Scanner Compact Version is using the integral method in the respective spectral range.

After pre-amplification, the undesirable unmodulated light portion is removed from the output signal of the wear-free detector. The subsequent sensitivity setting permist an attenuation of the signal for adaption to the firing conditions. The downstream bandpass ensures that only the typical flame radiation modulation of the primary combustion zone is evaluated. This allows extraneous light signals from neighbouring burners to be distinguished from the monitored flame. Further function groups include i.a. the signal processing for the dynamic monitor channel that continuously monitors the fault-free state of the device.

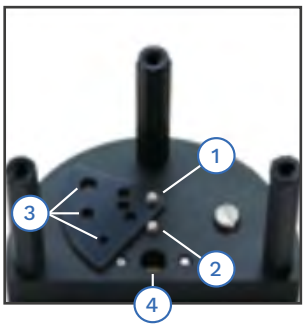
A part of component defect results in the immediate switch-OFF of the flame relay that represents a floating changeover contact for processing in the burner controller. The switching status is additionally indicated by a yellow LED on the rear side of the device behind the perspex panel.

For optimum adjustment of the Flame Scanner Compact Version, the flame intensity can be read off directly at the device by means of the pulsating green LED. A current output with 0(4) to 20 mA is available for visualisation or remote display.

The safety switch-OFF time that depends on the fuels to be monitored is set at the manufacturer's works to 1 second. Longer switch-OFF times can be set, if required.

5.2 Optical aperture

Available on CFC-IR-Series only.



An optical aperture reduces the flame radiation intake of the semiconductor-sensor ④ on optical way. The triangular aperture plate is located between lens and sensor and comes with three different hole sizes (small, medium and wide). Set as follows:

- open locking screw ①
- unfix axis screw ②
- set aperture ③
- fix axis screw ②
- close locking screw ①

The plate can be also turned away so that the semiconductorsensor ④ gets the full flame radiation (open).

6 | Operation of the Flame Scanner

⚠ WARNING

Danger of injury and material damage if improperly used!
Improper use of the Flame Scanner Compact Version can lead to injury or even death and to material damage!
Operation of the Flame Scanner Compact Version only by authorised and qualified special personnel! Observe the operating instructions!

NOTICE

The response of the Flame Scanner Compact Version depends on the burner configuration as well as on the air flow and the spectral characteristic (wave length).

6.1 Test of the Flame Scanner

In order to ensure correct operation, the Flame Scanner Compact Version must be tested several times for all applications by starting and stopping the burner several times (the flame relay must reliably shut-down in all cases when there is no flame). Carry out these tests whilst several neighbouring burners are started and stopped and different boiler outputs are used. This is an indispensable prerequisite for a safe and correct operation of the device!

6.2 Opening/closing the device

NOTICE

The Flame Scanner Compact Version may only be opened / closed by qualified personnel!

7 | Maintenance, care and transport

The Flame Scanner Compact Version requires no maintenance.
For cleaning, use a moist cloth to wipe the housing from the outside only and clean the lens in regular intervals.

NOTICE

Do not scratch the lens!

7.1 Forwarding instructions

NOTICE

Do not subject the appliance to heavy impacts during transport. Do not subject the appliance to any humidity!

8 | Failures

Problem	Display	Cause	Remedy
No flame-ON signal after the burner has been started	No mA output signal Yellow LED OFF Green LED OFF No data communication	Flame Scanner Compact Version does not work	Check voltage supply Replace Flame Scanner Compact Version Check electrical connection
	Flame signal (weak flashing of the green LED) low Yellow LED OFF	Flame signal too low or below the starting threshold	Inspect Flame Scanner Compact Version Check flame, alignment, sighting tube and lens Check / set sensitivity and switching thresholds
	Flame signal above the starting thresholds Yellow LED ON Green LED ON	Relay contact or wiring problem	Check fuse F3 in relay output circuit Check electrical connection
Burner fails	Flame signal drops. Below the shut-off threshold, the flame relay switched off.	No flame, weak flame signal	Check flame Check Flame Scanner Compact Version Check Flame Scanner Compact Version alignment, sight tube and lens Increase sensitivity setting Replace Flame Scanner Compact Version Check electrical connection
	Flame signal above shut-off threshold Yellow LED OFF	Device fault	Possibly remove plug for 5 seconds then start the burner again Replace Flame Scanner Compact Version

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