
Original Operating Instructions

Compact Flame Controller CFC4000IR with converter 6012 V5 and ready for operation relay

Type: CFC 4000UV1 + 6012 V5
with ready for operation
relay

Document-No.: BA 6014-4006-82 EN Rev2

Document-No.: Software settings
See
HB CFC Com1 EN



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1 General aspects

1.1 Introduction

These operating instructions are a helpful guide for ensuring the successful and safe operation of the compact flame controller. They contain important information on how to operate the controller 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 are not authoritative detailed designs.

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.

This work may involve, for example :

- 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 detector 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 compact flame controller!

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

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 compact flame controller 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 compact flame controller 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


 BFI Automation Mindermann GmbH
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EU Konformitätserklärung EC Declaration of Conformity

Produkt <i>Product</i>	Kompaktflammenwächter <i>Compact Flame Controller</i>
Typ <i>Type</i>	CFC1000, CFC2000, CFC3000, CFC4000, CFC4000 mit 6012 <i>CFC1000, CFC2000, CFC3000, CFC4000, CFC4000 with 6012</i>

Hiermit erklären wir, dass die bezeichneten Flammenwächter, in ihrer Konzipierung und Bauart sowie in der von uns in Verkehr gebrachten Ausführung, den grundlegenden Sicherheitsanforderungen folgender EU-Verordnungen und -Richtlinien entsprechen:

We hereby declare that the designated flame detectors, in their design and construction as well as in the version that we place on the market, comply with the essential safety requirements of the following EU regulations and directives:

Anwendungsbereich <i>Field of application</i>	EU/2016/426	EU-Gasgeräteverordnung <i>EU Gas Appliances Regulation</i>
Richtlinien <i>Directives</i>	2014/35/EU	Niederspannungsrichtlinie <i>Low voltage directive</i>
	2014/34/EU	Explosionsschutzrichtlinie <i>Explosion protection directive</i>
	2014/30/EU	EMV Richtlinie <i>EMC directive</i>
Benannte Stelle <i>Notified body</i>	Kiwa Nederland B.V. 0063	
CE-Zerifikat vom <i>CE certificate from</i>	01.12.2022	0063DN3204
Gültig bis <i>Valid until</i>	01.12.2032	Baumusterprüfbescheinigung <i>Type examination certificate</i>
Normen <i>Standards</i>	EN 298:2012 EN 60079-0:2018; EN 60079-7:2015/A1:2018 EN 60079-15:2010; EN 60079-31:2014	
Kennzeichnung ATEX <i>Identification ATEX</i>	ATEX Zone 1	Konformitätserklärung des Gehäuseherstellers <i>Declaration of conformity of housing manufacturer</i>
	ATEX Zone 2 TÜV 15 ATEX 7682 X	⊕ II 3G Ex ec nC IIC T4 Gc
	ATEX Zone 22	⊕ II 3D Ex tc IIIC T100°C Dc
Ausgestellt durch <i>Issued by</i>	BFI Automation Mindermann GmbH	
Rechtsverbindliche Unterschrift <i>Legally binding signature</i>	  Flamonitec BFI AUTOMATION BFI Automation Mindermann GmbH Ruegenstrasse 7 · 42579 Heiligenhaus · Germany T +49 2056 989 46-0 · info@flamonitec-bfi.com www.flamonitec.com	
	Name	Ort, Datum <i>Place, Date</i>
	Michael Thomas	Heiligenhaus, 13.02.2023
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	Prokurist <i>Authorized Officer</i>	

1.9 Address of the manufacturer

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2 Safety

2.1 Intended use

The Compact Flame Controller CFC 4000 UV1 + 6012 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 multiburner 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 compact flame controller.

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 that account 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

2.4.1 Fundamental aspects

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 compact flame controller 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.

2.4.2 Safety devices on the compact flame controller

The compact flame controller is equipped with the following safety devices:

- Housing (protection against accidental contact)
- Device earthing
- Explosion protection barrier (optional)
- Pressure barrier (optional)
- Purge air connection
- Heating insulator (optional)

2.5 Safety instructions in case of maintenance and troubleshooting

2.5.1 Fundamental aspects

- 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.

2.5.2 Electrical / electronic devices

⚠ DANGER

Danger to life caused by electrical current!

Contact with live wires or components presents a danger to life !

Before working on electrical components, disconnect the compact flame controller from the mains power supply!

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 machine until the defects have been corrected.
- 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 !

2.5.3 Testing in keeping with the German Workplace Safety Ordinance (BetrSichV)

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.

2.5.4 Safety test prior to initial operation

⚠ WARNING

Danger of injury and material damage if improperly used!

Improper use of the compact flame controller can lead to injury or even death and to material damage!

In order to ensure correct operation, the compact flame controller 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!

3 Technical data

3.1 General characteristic features

- Flame scanner with integrated amplifier and flame relay
- For continuous, intermittent and 72-hours operation
- Type UV1: for monitoring oil, coal and mixed-fuel burners
- Two-channel flame monitoring system
- Sensitivity adjustable separately for both channels by software
- Analog output flame intensity 0/4 to 20 mA
- Analog output frequency 0/4 to 20 mA
- Ready for Operation Relay contact
- Communication via RS485 BUS (read and write) and CFC-NET
- Flame analysis possibility by software
- LED status display for flame relay and flame intensity
- No additional wiring to external flame amplifiers
- Type of protection IP66

3.2 Electrical system, Optical and Mechanical Data

Spectral sensitivity	190 to 550 nm (UV)
Angle of view	2.7 degrees
Self-monitoring	Fully electronic, 1 x per 800 ms
Operating voltage	24 V DC
Current consumption	approx. 300 mA
Pre fuse	max. 1 A, slow
Design	In accordance with protec- tion class III SELV
Range of operating temper- ature	-20°C to +85°C
Current output flame intensity	0/4 to 20 mA ($R_a < 250 \text{ Ohm}$) Current window variable by software
Current output frequency	0/4 to 20 mA ($R_a < 250 \text{ Ohm}$)
Ready for Operation contact	potential free change-over contact max. 48 V switching voltage max. 1 A switching current max. 30 W switching power
Range changeover	External selection via 24 VDC signal
Flame relay	potential free change-over contact max. 48 V switching voltage max. 1 A switching current (fused with 0.5 A)

	max. 30 W switching power
Switching thresholds	programmable by software
Safety switch-off time	0.4 to 5 s, set to 1 s by factory
Electrical connection	Fixed cable connection
Housing dimension	183 x 108 x 108 mm
Type of protection	IP 66 ATEX Zone 2  II 3G Ex ec nC IIC T4 Gc
Approvals CE ATEX Zone 2	CE0085BN0347 TÜV 15 ATEX 7682 X
SIL 3	968/EL 566.03/16

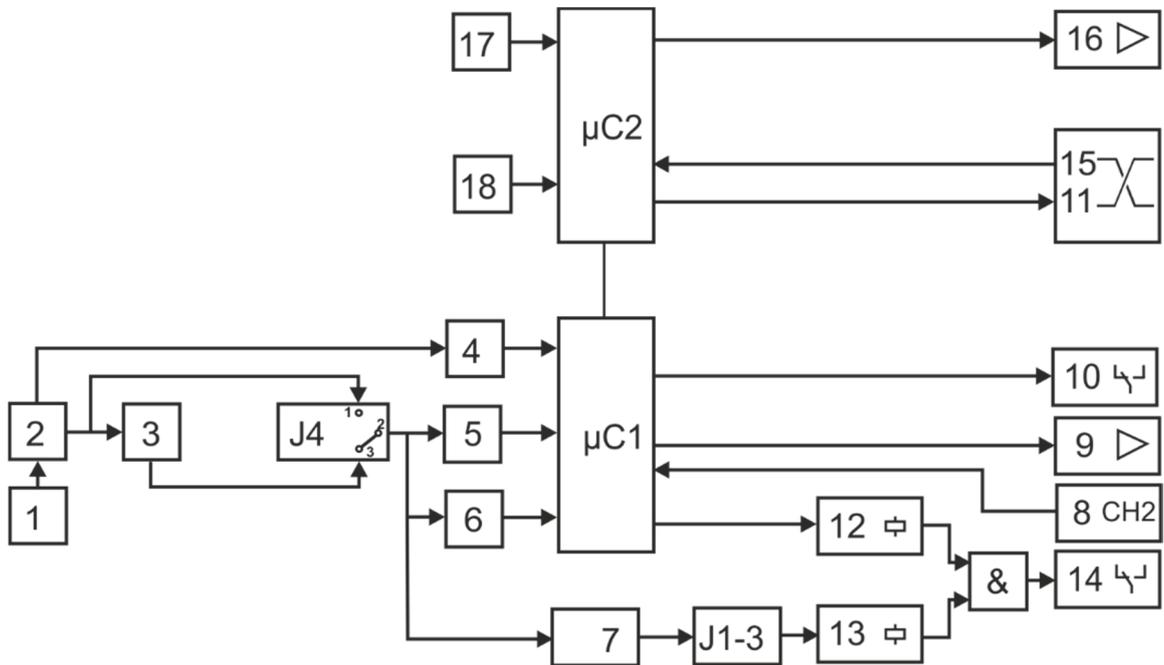
3.3 Weight

Standard housing	1.8	kg
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3.4 Dimensions

Length	183	mm
Width	108	mm
Height	108	mm

3.5 Block diagram



- | | | | |
|----|------------------------------------|------|---------------------------------|
| 1 | Sensor | 13 | Monitor relay |
| 2 | Pre-amplifier | 14 | Relay contact with fuse F3 |
| 3 | Band-pass filter | 15 | Data input RS485 |
| 4 | DC voltage part | 16 | Frequency output 0(4) to 20 mA |
| 5 | Frequency part | 17 | switch S3 |
| 6 | Modulation part | 18 | switch S1 + S2 |
| 7 | Monitor channel | J1-3 | Monitor channel switch-off time |
| 8 | Switchover to channel 2 (external) | J4 | Frequency tap selection |
| 9 | Analog output 0(4) to 20 mA | μC1 | Micro controller CFC |
| 10 | Operational readiness relay | μC2 | Micro controller ext. functions |
| 11 | Data output RS485 | & | AND logic |
| 12 | Flame relay | | |

4 Transport, Installation and Connection

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!*

4.1 Scope of delivery

- Compact Flame Controller CFC 4000UV1 + 6012
- Operating instruction BA 6014-4006-82_EN

4.2 Accessories (optional)

- Power supply unit 230/115 V AC
- 1" ball-flange with 2" flange disk
- 1" 3-way-ball-valve
- 1" heating insulator
- 1" pressure barrier
- Optical alignment device
- Fiber optic cable
- Double nipple
- Communication set with CFC-Com1 and CFC-NET
- USB/RS485 converter

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).

4.3 Packaging

The compact flame controller 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.

4.4 Forwarding instructions

NOTICE

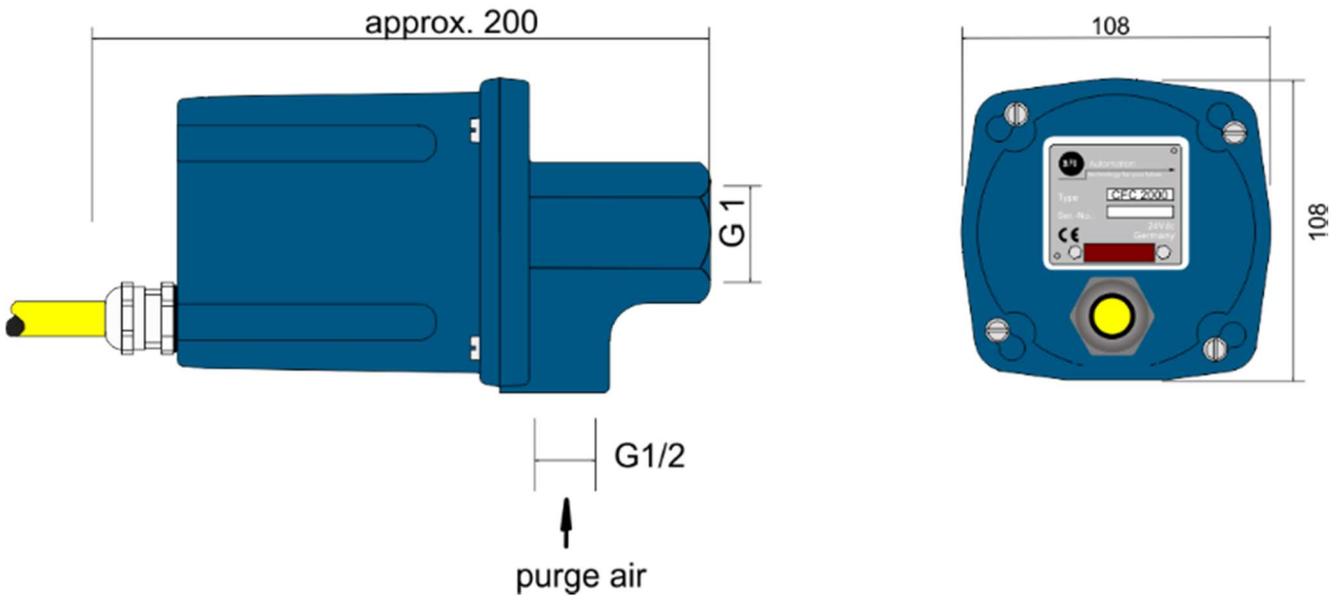
Do not drop the device during transport and do not subject to heavy impacts. Do not subject the device to any humidity.

4.5 Weight of Compact Flame Controller

See chapter 3.3 *Technical data*.

4.6 Space requirement

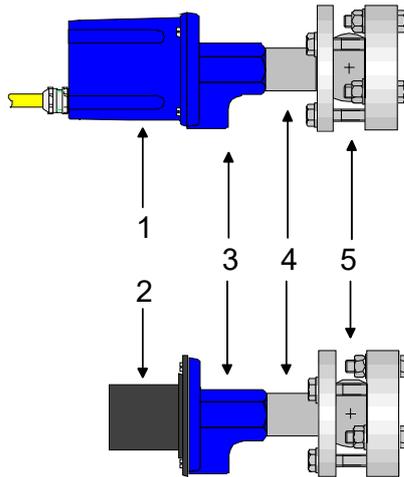
See following illustration.



4.7 Installation

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 | Compact Flame Controller | 4 | Heating insulator |
| 2 | Optical alignment device | 5 | Ball-flange |
| 3 | Purge air flange | | |

The mounting flange has slots for easy installation of the compact flame controller housing. Tighten all four M5 bolts.

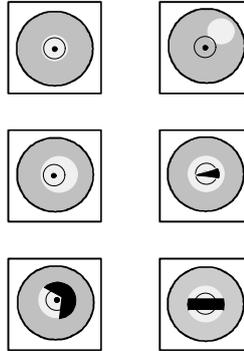
The sighting tube connection has a G1" internal pipe thread.

In order to ensure perfect flame monitoring, the correct and low-vibration position of the sighting tube relative to the flame is a significant pre-requisite. For selective burner monitoring, 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 compact flame controller. The sighting axis must, if possible, intersect the first third of the flame of the own burner. The extension of the sighting axis must not intersect the first third of the flame of other burners. Adjust the compact flame controller so that an optimum sighting is obtained.



Recommendation:

For adjustment, use the optical adjustment aid (available as an option) as shown in the figure below. The best setting is obtained when a large visual field is achieved.



correct incorrect

▲CAUTION

Risk of damage to the eyes from infrared and ultraviolet radiation and from escaping gases during visual flame monitoring!

Wear filtering protective goggles !

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 analysable 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

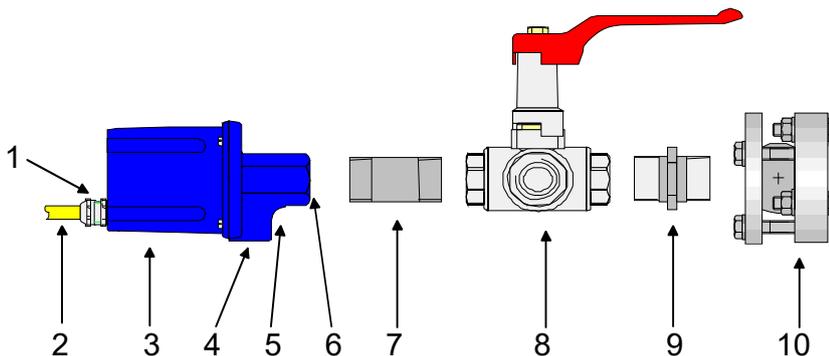
For this reason, the sighting tube should always be as short as possible. A diameter of 2" is recommended.

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" !

The use of a *ball flange* (optional, Part No.: 6590-9020-01) allows adjustments to be carried out easily in order to mechanically obtain the optimum observation point. The compact flame controller is supplied complete with a quick-installation flange. This guarantees quick and easy removal of the compact flame controller. It has a purge air connection whose special design prevents soiling of the lens without the possibly dust-laden purge air being able to damage the lens. If temperatures of over 50 °C occur at the compact flame controller caused by the heat dissipation of the sighting tube despite the inflow of cooling air, a *heat insulator* (optional, Part No.: 1598-0141-00) must be employed. At pressurised firing installations, an additional *3-port shut-off device* (optional, Part No.: 1594-8831-00) should be installed for the sake of safety. This prevents an escape of hot gases after the removal of the compact flame controller and provides additional cooling and purging of the installation.

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



- | | | | |
|---|---|----|--------------------------|
| 1 | Cable gland | 6 | Sighting tube connection |
| 2 | Special cable (14 x 0,5 mm ²) | 7 | Heating insulator |
| 3 | Compact Flame Controller | 8 | 3-way-ball-valve |
| 4 | Purge air connection | 9 | Double nipple |
| 5 | Purge air flange | 10 | Ball-flange |

4.7.1 Works setting of the compact flame controller

⚠ DANGER

Danger to life caused by combustion or explosion !

Incorrect installation or adjustment may result in uncontrolled combustion or explosions!

Observe the adjustment instructions of the plant operator!

Adjustment work may be carried out only by qualified and approved specialist staff!

Compact flame controllers with variable sensitivity settings are set to the highest value at the manufacturer's works.

Compact flame controllers with variable frequency filters have a high signal sensitivity on account of the pre-set low-frequency harmonisation. Compact flame controllers 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.

4.7.2 Adaption of the compact flame controller to the firing installation

⚠ DANGER

Danger to life caused by combustion or explosion !

Incorrect installation or adjustment may result in uncontrolled combustion or explosions!

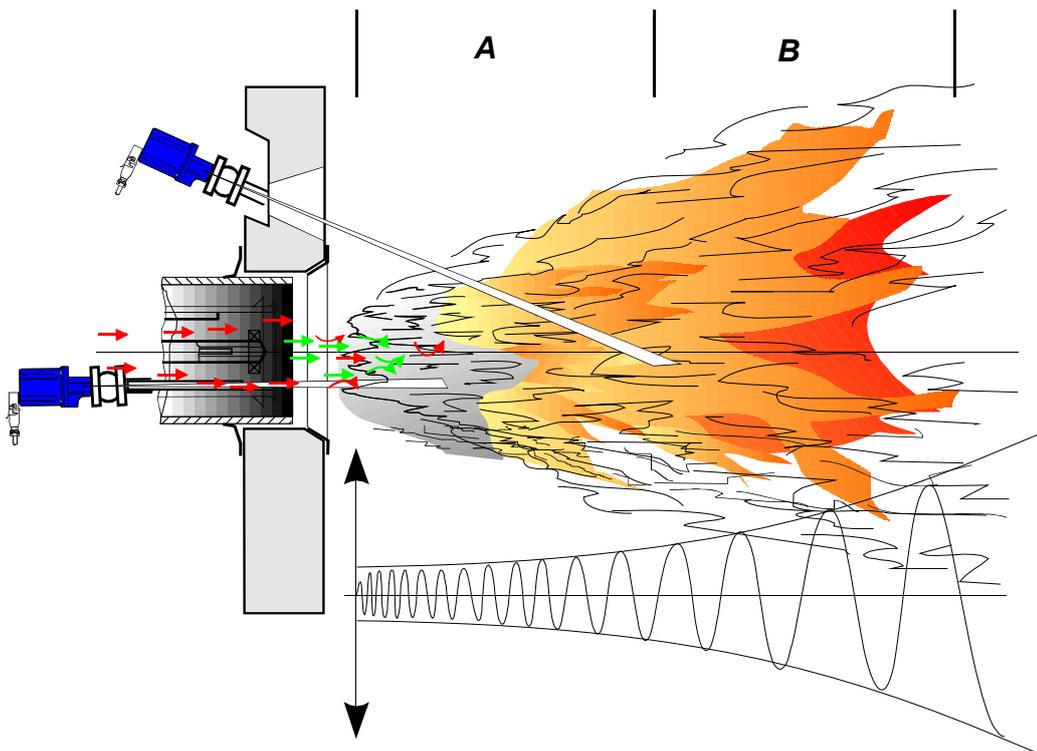
Observe the adjustment instructions of the plant operator!

Adjustment work may be carried out only by qualified and approved specialist staff!

NOTICE

All alignments and settings must be carried out, when new spare parts have been fitted, the compact flame controller has been moved or the flame image has been changed (e.g. due to additional fuels, new burners, changes in the burner/air registers) as well as during all initial installations!

For selective burner monitoring, the device must be installed in such a way that the primary combustion zone in all load ranges is within the visual angle of the compact flame controller. The sighting axis must, if possible, intersect the first third of the flame of the own burner. The extension of the sighting axis must not intersect the first third of the flame of other burners.



4.8 Connection

4.8.1 Electrical connection

⚠ DANGER

Danger to life caused by electrical current!

Electrical current may lead to injuries or to death!

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.

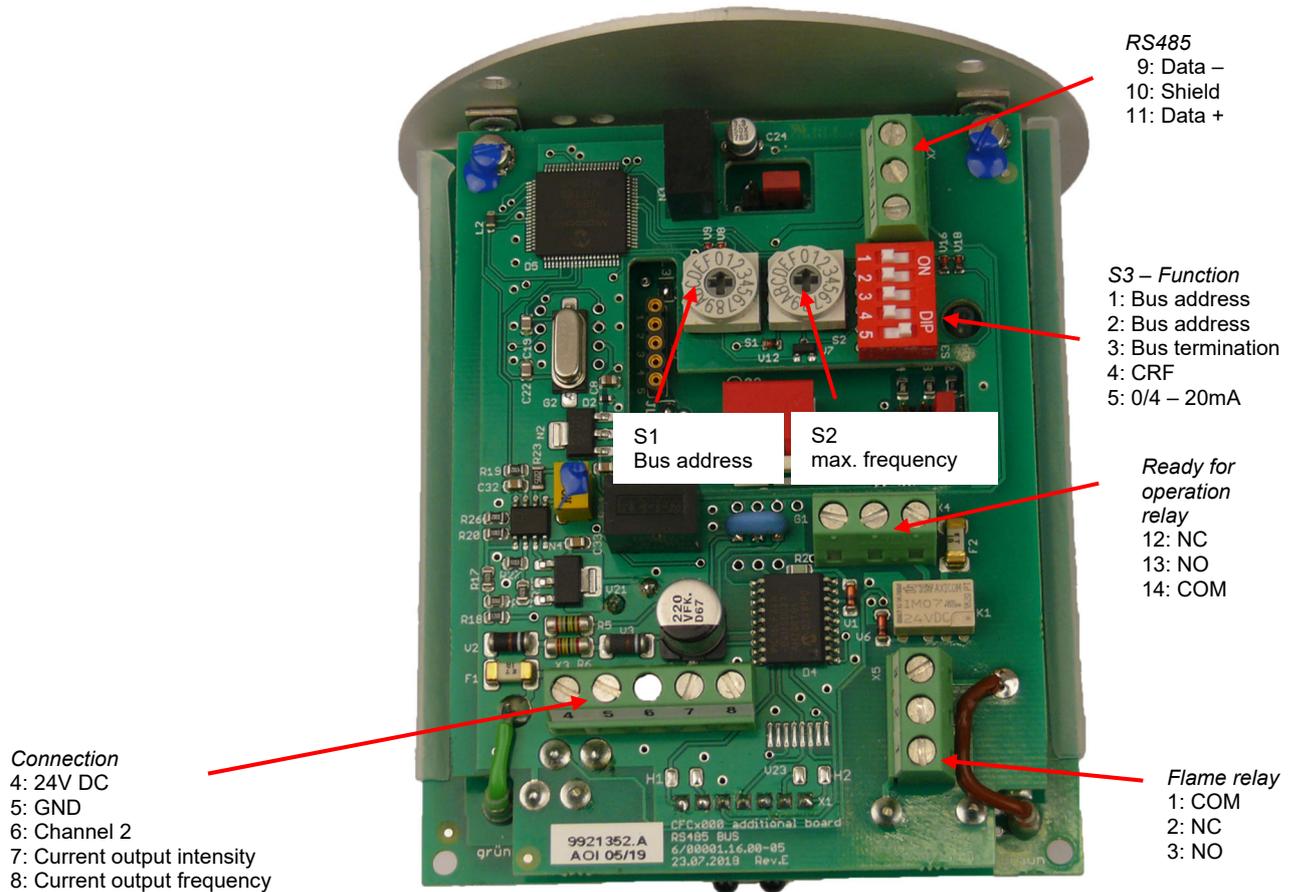
The output signal 0(4) to 20 mA for the flame intensity is not separate from the supply voltage so that the signal refers to the operating voltage ground. Should this result in problems, a corresponding isolating transformer can be supplied on request. The load of 250 ohm must not be exceeded.

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

4.8.2 Terminal list

Terminal number	Wire colour	Function
1		Flame Relay Root
2		NC Flame Relay OFF
3		NO Flame Relay ON
4		Power Supply +24V
5		Power Supply GND
6		Switch Over CH 2
7		mA Output Flame Intensity (Amplitude)
8		mA Output Frequency
9		Data – (RS485)
10		Data shield (RS485)
11		<i>Data + (RS485)</i>
12		<i>Ready for operation (NC –not ready)</i>
13		<i>Ready for operation (NO – ready)</i>
14		Ready for Operation (root)

4.8.3 Positions of terminals and switches



4.8.4 Connecting wires to the screw terminals

NOTICE

Use appropriate force to the screw terminals while connecting the wires and support screw terminals with fingers of second hand while tightening the terminal screws. Use proper tools.

4.9 Storage

Do not unpack the packed compact flame controller and accessories.

The following conditions apply to storage:

- Store in a dry place. Maximum relative humidity 60%. Ensure that the packages are not stored outdoors. In addition, It has to be assured that the floor in the storage area will remain dry throughout the storage period.
- Protect from direct sunlight. Storage temperature: 15 degrees to 25 degrees C (59 degrees to 77 degrees F).
- Store in a dust-free location.
- Avoid mechanical vibrations and damage.

5 Description

5.1 Type plate

The type plate is located on the device housing and contains the device type designation and the serial number.

5.2 Functional description

For flame radiation analysis the compact flame controller 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 permits an attenuation of the signal for adaptation 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 compact flame controller, 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.

5.3 Ready for Operation

The CFC 4000IR + 6012 is equipped with a ready for operation relay. The NO contact is closed after connecting the CFC 4000. If an internal fault is detected, the contact opens again.

5.4 Hardware settings

The safety concept of the compact flame controller is based on two-channel signal processing.

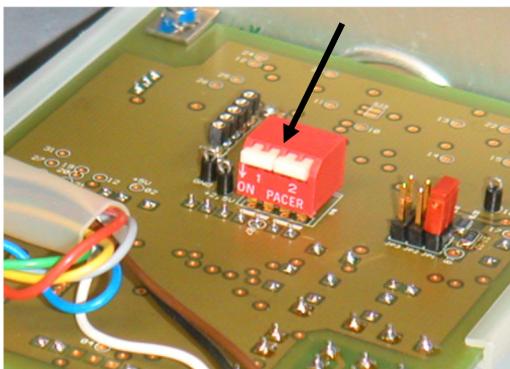
The *evaluation channel* processes the flame signal under processor control so that the settings can be changed by the BFI software.

The *safety channel* is configured with SMD technology. Settings can only be changed on the printed circuit board.

5.4.1 The frequency filter

The CFC 4000 has a four-step frequency filter in the signal input. The evaluation of the flame signal by the software takes place only downstream of the frequency filter. Part of the extraneous light can therefore be filtered out before the evaluation by the software. The limit frequencies of the high-pass filter can be set as follows:

Filter frequency (Hz)	Switch 1	Switch 2
30	off	off
60	on	off
90	off	on
120	on	on



NOTICE

The setting at the dip switches should only be changed when an adjustment of the compact flame controller is no longer possible by software.

5.4.2 Safety switch-OFF time of the safety channel

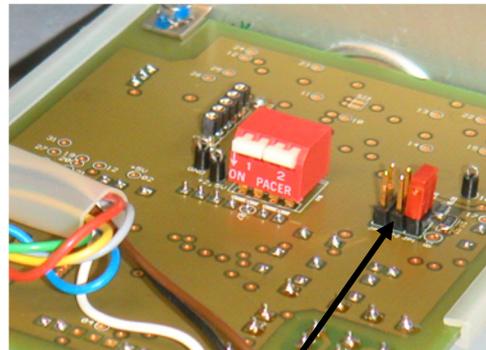
The safety switch-OFF time of the safety channel (hardware) is set by means of a jumper. The settings are as follows:

- Jumper 1 bridged: 1 second
- Jumper 2 bridged: 3 seconds
- Jumper 3 bridged: 5 seconds

If a switch-OFF time of 2 seconds is required, the jumper must be inserted in position 2 (3 seconds) and the switch-OFF time of the evaluation channel set by software to 2 seconds (see *Handbook HB CFC Com1 EN*). The shorter switch-OFF time of the two channels always takes priority.

NOTICE

*The safety switch-OFF time during operation (shut-off time) is also dependent on the software setting (see *Handbook HB CFC Com1 EN*)!*



Jumper 1-3

5.5 Current output frequency

With the rotary switch S2 the maximum frequency value can be defined, leading to a current of 20 mA at the frequency output (terminal 8). Choose one of the following maximum values:

<i>Switch position</i>	<i>Maximum frequency</i>
0	20
1	40
2	60
3	80
4	100
5	120
6	140
7	160
8	180
9	200
A	220
B	240
C	260
D	280
E	300
F	320

5.6 DIP switch S3

5.6.1 Current output range

DIP switch 5 selects whether the current output of the converter 6012 has a range of 0 ... 20 mA or 4 ... 20 mA.

NOTICE

Only when the span is set to 4 ... 20mA, a line break with the software CFC-NET can be detected!

5.6.2 Current-Relay-Function (CRF)

DIP switch 4 activates the Current-Relay-Function of converter module 6012. Here the generated current output is only active if the flame relay is switched on.

NOTICE

The switch affects the output current for the frequency only as this is generated by the converter 6012. The current relay function for the amplitude signal is set via the software CFC Com1 at compact flame controller CFC4000!

5.6.3 BUS termination

DIP switch 3 activates the internal BUS termination.

NOTICE

In a network the last device in a RS485 bus must be terminated only.

5.6.4 BUS addressing

Addressing the converter 6012 is made up of the setting of the DIP switches 1 and 2, and the address rotary switch S1. With the address rotary switch 16 addresses can be selected. The additional DIP switches 1 and 2, the address selection is extended to 4 banks. Thus, a total number of 64 gives addresses. The software CFC-NET provides each bank as a "Bank" is.

5.6.4.1 Adr. 1

DIP switch 2 sets the highest Bit of the address to "ON".

5.6.4.2 Adr. 2

DIP switch 1 sets the second highest Bit of the address to "ON".

5.6.4.3 Address rotary switch

The 6012 can be set to a bus address between 0 and 63. With the address rotary switches only addresses can be set between 0 and 15, are therefore in the DIP switch S3, two switches (DIP switches 1 and 2) that extends the addressable range from 0 to 63.

The address ranges are adjusted according to the following table:

DIP 3.2	DIP 3.1	Rotary Switch 1	BUS Address
0	0	0 – F	0 – 15
0	1	0 – F	16 – 31
1	0	0 – F	32 – 47
1	1	0 – F	48 – 63

5.7 CFC-NET

The software CFC NET is used to communicate between control room and CFC4000 with converter 6012.

5.7.1 Configuration

After starting the software CFC NET, select the computer interface and preferred language on the tab "Configuration". Now select address range and activate single bus addresses were 6012 boxes are connected.

The screenshot shows the CFC-Net 1.62 software interface. The main window is titled "CFC - NET" and displays a configuration screen. The interface is divided into several sections:

- Bank:** A dropdown menu set to "0".
- Table:** A table with columns "Kürzel", "Bezeichnung", and "Aktiv". The "Aktiv" column has a checked box for "Adr.0" and unchecked boxes for "Adr.1" through "Adr.15".
- Schnittstelle:** A dropdown menu set to "ASRL1:INSTR".
- Sprache:** A dropdown menu set to "Deutsch".
- Kunden Login:** Fields for "Dongle", "Fehler", "Kunde", "User", "Login Nr.", "Dongle Serial", and "Dongle ID".
- Zeiteinstellungen:** A section for "Datum/Zeit 6012" with a red LED indicator.
- Buttons:** "Lesen" and "Sync." buttons are circled in red.

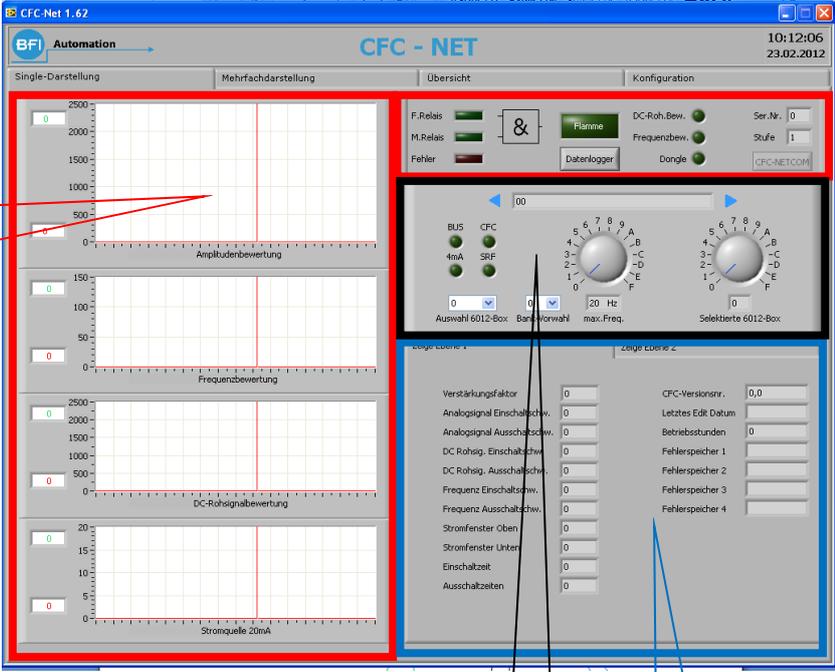
Red callout boxes with arrows point to the following elements:

- "Select address range" points to the "Bank" dropdown.
- "Activation of an address" points to the "Aktiv" checkbox for "Adr.0".
- "Choose language" points to the "Sprache" dropdown.
- "Select interface" points to the "Schnittstelle" dropdown.
- "Time synchronization" points to the "Lesen" and "Sync." buttons.

All connected network devices 6012 will get their time stamp from the network computer once per day. Time synch can be done immediately by activating "Read" button, followed by "Synch" button. The whole time synch process will take a few minutes. After successful synchronization, the LED is green next to the date/time window. This synchronization must be carried out again after taking off the converter from power supply.

5.7.2 Single Mode

In this mode the software CFC NET communicates with the selected converter 6012 only.



The screenshot shows the CFC-Net 1.62 software interface. On the left, four graphs are displayed: 'Amplitudenbewertung' (0-2500), 'Frequenzbewertung' (0-150), 'DC-Rohsignalebewertung' (0-2500), and 'Stromquelle 20mA' (0-20). A red box highlights these graphs and the top status area. A callout bubble points to these graphs with the text: "Amplitude, frequency, DC-rav signal and currentsourse, as well as the status of the relay". On the right, there are control panels for relays (F.Relais, M.Relais, Fehler), a 'Flamme' indicator, and a 'Datenlogger' button. Below this is a 'Auswahl 6012-Box' dropdown menu and a 'Bandvorwahl' dial. A blue box highlights the bottom right configuration area, with a callout bubble pointing to it: "Parameter of the CFC 4000". Another callout bubble points to the 'Auswahl 6012-Box' dropdown: "Settings at the converter".

Select the converter 6012 you wish to display here.

NOTICE

The selection is made via the drop down menus "Selection converter box" and "Unit Selection".

6 Operation of the Compact Flame Controller

⚠ WARNING

Danger of injury and material damage if improperly used!

Improper use of the compact flame controller can lead to injury or even death and to material damage!

Operation of the compact flame controller only by authorised and qualified special personnel!

Observe the operating instructions!

NOTICE

The response of the compact flame controller depends on the burner configuration as well as on the air flow and the spectral characteristic (wave length).

6.1 Test of the Compact Flame Controller

In order to ensure correct operation, the compact flame controller 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!

7 Care and Maintenance

The compact flame controller is maintenance-free.

For cleaning, use a moist cloth to wipe the housing from the outside only and clean the lens in regular intervals.

NOTICE

Take care not to scratch the lens!

8 Failures

Problem:	Display:	Cause:	Remedy:
No Flame ON signal after the burner was started	No mA output signal Yellow LED OFF Green LED OFF No data communication	Compact flame controller not functioning	Check voltage supply Replace compact flame controller Check electrical connection
	Flame signal (software) low Yellow LED OFF	Flame signal too low or below the starting threshold	Inspect compact flame controller Check flame, alignment, sighting tube and lens Check / set sensitivity and switching thresholds
	Flame signal (software) above the starting thresholds Yellow LED OFF Red LED ON (software)	Device or self-test fault	Check fault memory Possibly remove plug for 5 seconds then start the burner again Replace compact flame controller
	Flame signal (software) 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 (software) drops. Below the shut-off threshold, the flame relay switched off.	No flame, weak flame signal	Check flame Inspect compact flame controller Check alignment and lens Check sensitivity setting Check switching thresholds Replace compact flame controller Check electrical connection
	Flame signal above shut-off threshold Yellow LED OFF	Device or self-test fault	Check fault memory Possibly remove plug for 5 seconds then start the burner again Replace compact flame controller

9 Order data

The compact flame controller is available from BFI Automation Mindermann GmbH under the following order data:

Compact flame controller	
Typ	Part-No.
Compact Flame Controller CFC 4000 UV1, 6012, RS485, V5	6014-4006-82

10 Accessories

Communication and software	
Typ	Part-No.
Software CFC Com1 and data cable	6040-4901-00
Data cable without software, 1.5m	6040-4810-10
Data cable without software, 3m	6040-4810-13
Additional accessories	
Typ	Part-No.
Swivel mount 1" with a 2" flange plate	6590-9020-01
3-Way ballvalve 1"	1594-8831-00
Heating insulator 1"	1598-0141-00
Double nipple 2 x 1" outer thread	1591-0241-00
Optical alignment device BFI 235	6030-0235-00

More accessories you will find in our product catalog.

