



**Flamონitec<sup>®</sup>**

BFI AUTOMATION

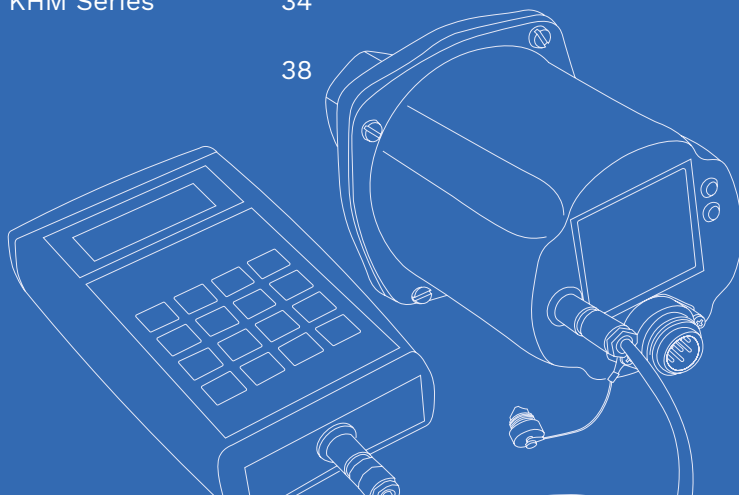
# Products Catalog Flame Monitoring & Evaluation Systems





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# The company – Who we are

**The name BFI Automation stands for innovative, trendsetting and future-oriented technology.**

The family-owned company, now in its second generation, was founded in Ratingen in 1973 and has set decisive milestones in optical flame monitoring in its now almost 50-year history.

BFI Automation Mindermann GmbH offers solutions for industrial flame monitoring. Through close cooperation and continuous exchange with our customers, we are always developing new systems and forward-looking technologies. This has made BFI Automation Mindermann GmbH a market leader in the field of flame monitoring with representatives in over 20 countries worldwide.

The former sister company BST Solutions GmbH has been active in the field of flame monitoring for original equipment manufacturers of heating technology and industrial firing equipment since 2004. In 2023, both companies merge to form BFI Automation Mindermann GmbH. By bundling the activities of both the companies under the brand name Flamоніtec<sup>®</sup>, we have created the world's largest supply portfolio for flame monitoring systems for our customers, from heating technology to industrial firing systems and large-scale power plants. Reliable, safe and technologically at the highest level – this is what the Flamоніtec<sup>®</sup> brand stands for – worldwide!

The growing demands for safety and the increasing importance of environmental protection present new challenges for industrial companies. The Flamоніtec<sup>®</sup> product range offers the right flame monitoring system with all relevant safety certificates for every combustion process.

Through their maximum quality and over-fulfillment of safety standards, Flamоніtec<sup>®</sup> products help to meet these challenges appropriately. A good example is that our Flamоніtec<sup>®</sup> System 3000 has already met today's safety requirements according to SIL3 for 30 years.

More than 20 patents in the field of flame monitoring show what the Mindermann Group understands by innovation. The entire spectrum of flame monitoring is covered, from basic research to processes and electronic circuits.

We preserve values and create sustainable innovations!

Since 2017, the BFI Automation Mindermann GmbH is operating from its new facility in Heiligenhaus, Germany.



# Flame Scanners – System 3000



Standard housing



Ex-housing



OE-Converter housing for FOC

## Features

- Fail safe design and self checking
- Qualified for single and multi burner applications
- Certified for continuous, intermittent and 72 h operation
- Available with different spectral sensitivity ranges from UV up to IR and also in combination
- Non-wearing due to fully electronic design
- Mounting and connecting compatible with all BFI flame scanners of series 3000
- SIL 2
- SIL 3 (depending on system)

## Applications

- Power plants
- Gas turbines
- H<sub>2</sub>S-plants (Claus units)
- Duct burners
- Rotary kiln plants
- Fluidized bed firings
- Cracker
- High pressure combustions
- Waste incinerating plants/grid firings
- Residuals combustion
- Low NO<sub>x</sub>-applications

**All flame scanners are building a complete flame monitoring system in combination with a flame amplifier of the series 3000 (pages 6/7).**

The flame monitoring and evaluation system 3000 was developed with due consideration of safety and optimal availability of customer plants. Our goal is the safe and reliable monitoring of fuel burning systems, provision of criteria to optimize the combustion process and to reduce emission of pollutants. The system is able to discriminate flames from different burners and to monitor these flames selectively.

## Technical Data

|                              |   |
|------------------------------|---|
| Self checking                | fully electronic, once per second   |
| Spectral sensitivity         | 190 to 7000 nm  |
| Sight opening angle          | 2.7 °   |
| Operating temperature        | - 40 °C to + 85 °C  |
| High temperature application | up to 600 °C with fiber optic technology (see page 24)  |
| Power supply                 | 24 V DC   |
| Current consumption          | approx. 100 mA  |
| Adjustment                   | multiple sensitivity channels, partially separate adjustable sensitivity ranges for UV and IR                             |
| Electrical connection        | Zone 2 housings with dustproof plug-connector (optional with cable gland / conduit).<br>Zone 1 housings with cable gland. |
| Type of protection           | IP65 (IP66 for Ex-housings)   |
| Cable length                 | 500 m, up to 1000 m with special specification  |
| Sight connection             | G 1" female thread ISO 228  |
| Purge air connection         | G ½" female thread ISO 228 with standard housing  |
| Required purge air quantity  | 10 m³/h   |
| Weight                       | approx. 1,5 kg (approx. 4 to 13 kg with Ex-housings)  |
| Certificates                 | TUEV, IECEx, ATEX, CSA/UL, EN298, SIL 2, SIL 3 for 2.0, 2.0GT, 2.0L or 2.0LA combined with 3001, 3001S or 3001D           |

**All flame scanners are also available with fiber optic technology and/or with Ex-proof housings.**

## Applications

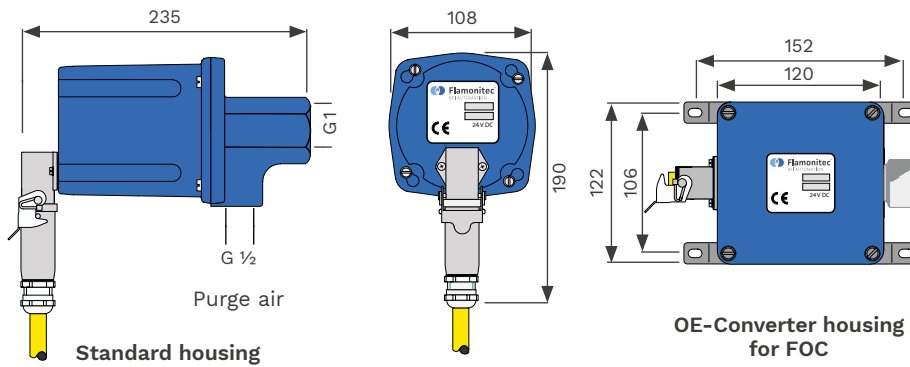
| Flame Scanner | Spectral Range   | Gas | Oil | Coal | H <sub>2</sub> S |
|---------------|------------------|-----|-----|------|------------------|
| Type 2.0      | 300 to 2700 nm   | ■   | ■   | ■    |                  |
| Type 2.0 GT   | 300 to 2700 nm   | ■   | ■   | ■    |                  |
| Type 3.32     | 280 to 420 nm    | ■   | ■   |      |                  |
| Type 4.0      | 300 to 1050 nm   |     | ■   | ■    |                  |
| Type 4.1      | 300 to 1050 nm   |     | ■   | ■    |                  |
| Type 4.2      | 300 to 1050 nm   |     | ■   | ■    |                  |
| Type 7.0      | 1050 to 2700 nm* | ■   | ■   | ■    | ■                |
| Type 7.0/2    | 1050 to 2700 nm* | ■   | ■   | ■    | ■                |
| Type 7.1      | 1050 to 2700 nm* | ■   | ■   | ■    | ■                |

\*up to 7000 nm with special glass available

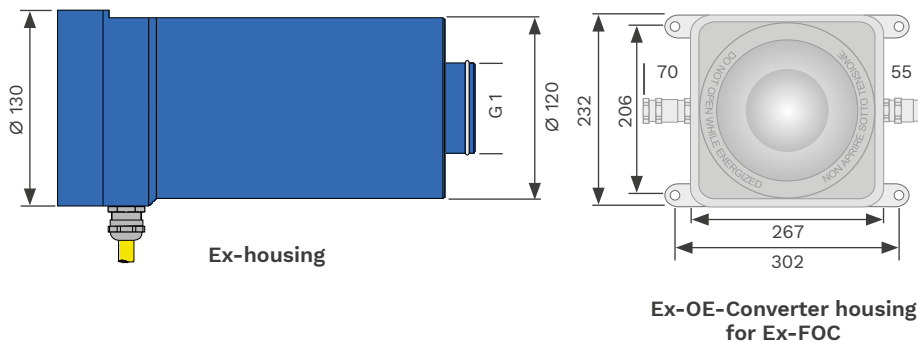
■ = especially qualified ■ = qualified

## Dimensions

IP65, ATEX Zone 2, similar to NEMA4/Class 1 Div 2



IP66, ATEX Zone 1, similar to NEMA4/Class 1 Div 1



## Fuels

- Oil (LDO & HFO)
- Natural gas, blast furnace gas and coke oven gas
- Biomass/biogas
- Powdered coal
- Sulfur
- Naphtha
- H<sub>2</sub>S
- H<sub>2</sub>
- NH<sub>3</sub>

## Accessories

- Swivel mount
- Ball valve
- Heating insulator
- Pressure barrier
- Measuring adapter
- Signal generator
- Special cable
- Alignment tool
- Heating
- Tropicalization



# Flame Amplifiers – System 3000



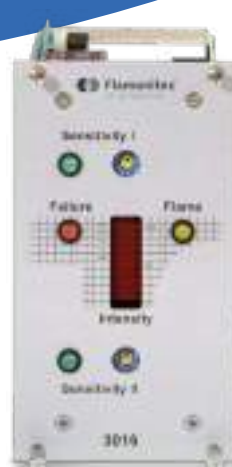
Type 3001



Type 3001D



Type 3001S



Type 3016



Type 3017

## Features

- Fail safe design and self checking
- Selective monitoring of different flames
- Certified for continuous, intermittent and 72 h operation
- Optimization of combustion process
- Multiple sensitivity ranges and switch-off times, selectable by remote signal
- Parallel connection of multiple flame scanners (scanner redundancy)
- 19-inch design in accordance with international standards
- SIL 2
- SIL 3 (depending on system)

## Applications

- Power plants
- Gas turbines
- H<sub>2</sub>S-plants (Claus units)
- Duct burners
- Rotary kiln plants
- Fluidized bed firings
- Cracker
- High pressure combustions
- Waste incinerating plants/grid firings
- Combustion of residuals
- Low NO<sub>x</sub>-applications

**All flame amplifiers are building a complete flame monitoring system in combination with a flame scanner of series 3000 (pages 4/5).**

The flame monitoring and evaluation system 3000 is based on different flame amplifier modules, manufactured as 19"-slide-in modules. They contain all control logics and provide the signals for external processing.

The flame monitoring and evaluation system 3000 was developed with due consideration of safety and optimal availability of customer plant. The goal is the safe and reliable monitoring of fuel burning systems, provision of criteria to optimize the combustion process and to reduce emission of pollutants. The system is able to discriminate flames from different burners and to monitor these flames selectively.

## Technical Data

|                        |  |
|------------------------|--|
| Self checking          | fully electronic, once per second  |
| Flame intensity output | 0/4 to 20 mA   |
| Relay output           | 1 safety change-over-contact, internally fused 1A<br>1 auxiliary change-over-contact (3001/3001D/3001S/<br>3016, 3017), 1 failure alarm (3016, 3017) |
| Power supply           | 24 V DC  |
| Current consumption    | approx. 300 mA (3001, 3001D, 3001S, 3016, 3017)  |
| Operating temperature  | - 20 °C to + 70 °C (3001, 3001D, 3001S)<br>0 °C to + 60 °C (3016, 3017)  |
| Cable lenght           | 500 m, up to 1000 m with special specification   |
| Safety                 | fail safe design, self checking  |
| Mode of operation      | continuous   |
| Weight                 | see 'Technical Features' on next page  |
| Type of protection     | IP00   |
| Safety switch OFF time | selectable 1 to 6 s (3001, 3001D, 3001S)<br>selectable 200 to 650 ms (3016)<br>selectable 0,5 to 6 s (3017)  |
| Certificates           | TUEV, CSA, UL, EN298, SIL 2, SIL 3 for 3001, 3001S/<br>3001D combined with 2.0, 2.0GT, 2.0L or 2.0LA   |

**All flame amplifiers are also available in Ex-housings. See chapter 'Housings' on pages 26/27.**

## Technical Features

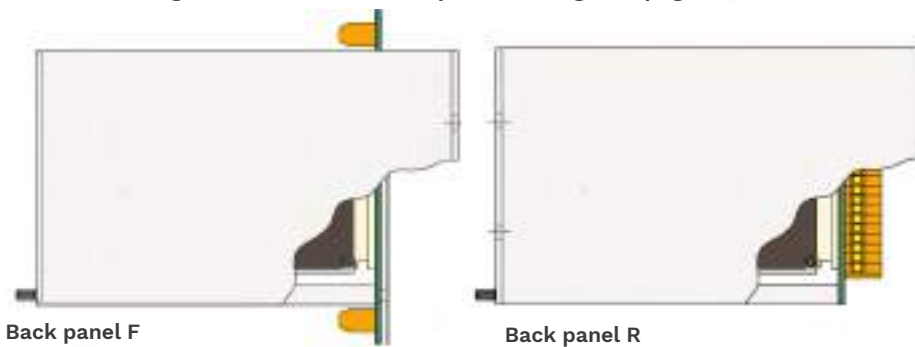
| Type                           | 3001       | 3001D         | 3001S      | 3016       | 3017       |
|--------------------------------|------------|---------------|------------|------------|------------|
| Amount of channels             | 2          | 2             | 2          | 2          | 2          |
| Amount of sensitivity channels | 2          | 2             | 2          | 2          | 2          |
| Switch OFF times               | 1-6 s      | 1-6 s         | 1-6 s      | 200-650 ms | 0,5-6 s    |
| Intensity bar graph            | ■          | ■             | ■          | ■          | ■          |
| Intensity indication, digital  | -          | ■             | -          | -          | -          |
| Impulse divider                | -          | 1:1, 1:2, 1:4 | -          | -          | -          |
| Pre-alarm                      | adjustable | 50% fix       | adjustable | adjustable | adjustable |
| Dimensions in 19"-units        | 14HP/3U    | 14HP/3U       | 10HP/3U    | 14HP/3U    | 14HP/3U    |
| Weight (approx.)               | 450 g      | 460 g         | 410 g      | 320 g      | 330 g      |
| SIL                            | SIL 3*     | SIL 3*        | SIL 3*     | SIL 2      | SIL 2      |

\*in combination with flame scanner 2.0 / 2.0GT / 2.0L / 2.0LA ■ = Yes - = No

## Overview Material Numbers

| Type                  | Material-No. |
|-----------------------|--------------|
| Flame amplifier 3001  | 6020-3001-00 |
| Flame amplifier 3001D | 6020-3001-20 |
| Flame amplifier 3001S | 6020-3001-40 |
| Flame amplifier 3016  | 6020-3016-00 |
| Flame amplifier 3017  | 6020-3017-00 |

Overview about available cable connections for 19" racks, built-on and built-in housings. (Dimensions see chapter 'Housings' on page 26)



## Housing Variants

- 19"-rack
- 19"-built-in housing
- 19"-built-on housing
- Wall mounting housing IP66
- Ex-wall mounting housing for ATEX Zone 1

## Accessories

- Multipoint connector
- Back panel R, F or RTA
- Signal generators
- Power supply modules
- Selector units
- Flame evaluation unit
- Signal evaluator unit
- Special cable
- Heating
- Tropicalization

## Back panels and Connectors

Our backpanels providing screw terminals for easy wiring, accessible from rear side (R) and front side (F). The back panel 3001RTA offers an additional failure output.

# Compact Flame Controller – CFC x000



Standard housing



Ex-housing



OE-Converter housing  
for FOC

## Features

- Fail safe design and self checking
- Qualified for single and multi burner applications
- Available with different spectral sensitivity ranges from UV up to IR and also in combination
- Certified for continuous, intermittent and 72 h operation
- Non-wearing due to fully electronic design
- Programmable via software
- Flame analysis via software
- Bus-ready in combination with converter 5012/5012SD/6012
- Robust housing
- SIL 3
- IECEx

## Applications

- Power plants
- Gas turbines
- H<sub>2</sub>S-plants (Claus units)
- Duct burners
- Rotary kiln plants
- Fluidized bed firings
- Cracker
- High pressure combustions
- Waste incinerating plants/grid firings
- Residuals combustion
- Low NO<sub>x</sub>-applications
- Decarbonized combustions (e.g. H<sub>2</sub>/NH<sub>3</sub>)

**The Compact Flame Controller CFC combines flame scanner and flame amplifier module built as an all-in-one system.**

The Compact Flame Controller CFC x000 series has been developed for applications on large steam generators and industrial boilers. The goal is safe and reliable monitoring of fuel burning systems, provision of data to optimize the combustion process and to reduce emission of pollutants. The system is able to discriminate flames from different burners and to monitor these flames selectively. All parameters can be optimized for any combustion via the corresponding software.

## Technical Data

|   |  |
|---|--|
| Self checking                             | fully electronic, once per 800 ms  |
| Spectral sensitivity                      | 190 to 7000 nm   |
| Sight opening angle                       | 2.7 °  |
| Operating temperature<br>Version UV / UV1 | - 40 °C to + 85 °C (- 20 °C to + 70 °C with CSA & IECEx)<br>- 55 °C to + 85 °C   |
| High temperature application              | up to 600 °C with fiber optic technology<br>(see page 24)  |
| Flame relay                               | 1 switch over contact (potential free)   |
| Safety switch OFF time                    | 1 to 5 s   |
| Flame intensity output                    | 0/4 to 20 mA   |
| Power supply                              | 24 V DC  |
| Current consumption                       | approx. 100 mA   |
| Adjustment                                | multiple parameter channels, remote selection,<br>adjustable via software  |
| Electrical connection                     | Zone 2 housings with dustproof plug-connector<br>(optional with cable gland / conduit).<br>Zone 1 housings with cable gland. |
| Type of protection                        | IP65 (IP66 with Ex-housings)   |
| Sight connection                          | G 1" female thread ISO 228   |
| Purge air connection                      | G ½" female thread ISO 228 with standard housing   |
| Required purge air quantity               | 10 m³/h  |
| Weight                                    | approx. 1,5 kg (approx. 4-13 kg with Ex-housings)  |
| Certificates                              | TUEV, IECEx, ATEX, CSA, AGA, EN298, SIL 3,<br>UL, IECEx  |
| Interface                                 | infrared (for software CFC Com1)<br>RS 232/485 (for software CFC NET)  |

**Our Compact Flame Controllers CFC x000 are also available with fiber optic technology and/or with Ex-proof housings.**



## Applications

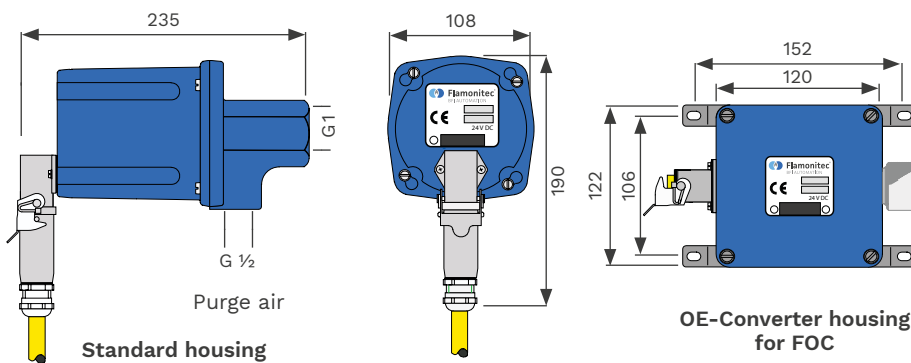
| CFC Type     | Spectral Range | Spectral Sensitivity         | Gas | Oil | Coal | H <sub>2</sub> S | Bio | H <sub>2</sub> |
|--------------|----------------|------------------------------|-----|-----|------|------------------|-----|----------------|
| CFC x000UV   | UV             | 280 to 420 nm                | ■   | ■   |      |                  | ■   | ■              |
| CFC x000UV1  | UV/VIS         | 190 to 550 nm                | ■   | ■   |      |                  | ■   | ■              |
| CFC x000IR   | UV/IR          | 300 to 1050 nm               |     | ■   | ■    |                  | ■   |                |
| CFC x000IR1* | IR             | 1050 to 2700 nm<br>(7000 nm) | ■   | ■   | ■    | ■                | ■   | ■              |
| CFC x000IR2  | UV/IR          | 300 to 2700 nm               | ■   | ■   | ■    |                  | ■   | ■              |
| CFC x000IR3  | IR             | 1050 to 2700 nm              |     |     |      | ■                | ■   | ■              |
| CFC x000IR4* | UV/IR          | 300 to 1050 nm               | ■   | ■   | ■    |                  |     |                |

\*not available for CFC 1000

■ = especially qualified ■ = qualified

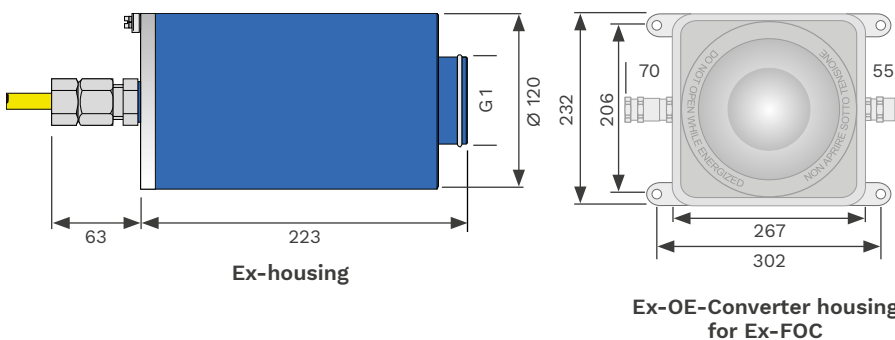
## Dimensions

IP65, ATEX Zone 2, similar to NEMA4/Class 1 Div 2



IP66, ATEX Zone 1, similar to NEMA4/Class 1 Div 1

\*The Ex-housing is also available in V4A stainless steel



## CFC-Configuration

| Function  | CFC 1000 | CFC 2000 | CFC 3000 | CFC 4000 |
|---|----------|----------|----------|----------|
| Multiple (2/4) parameter channel, remote selection                    |          | ■        | ■        | ■        |
| Frequency analysis via software                                       |          | ■        | ■        | ■        |
| DC-rough signal evaluation via software                               |          | ■        | ■        | ■        |
| RS 232 interface, network ready with converter 5012 (uni-directional) |          |          | ■        |          |
| RS 232 interface, network ready with converter 6012 (bi-directional)  |          |          |          | ■        |
| Failure output  | ■        | ■        |          |          |

■ = Function available

## Fuels

- Oil (LDO & HFO)
- Natural gas, blast furnace gas and coke oven gas
- Biomass/biogas
- Powdered coal
- Sulphur
- Naphtha
- H<sub>2</sub>S
- H<sub>2</sub>
- NH<sub>3</sub>

## Accessories

- Swivel mount
- Ball valve
- Heating insulator
- Pressure barrier
- Signal generator
- Special cable
- Alignment tool
- Heating
- Tropicalization
- Power supply
- Adapter unit
- Converter 5012/6012
- Software
- CFC COM x000 / NET / TAB

# Network Solution for CFC x000

## Network Solution

CFC 4000/6012 with bi-directional data communication:

### DCS / BMS

- 6012 provides signals for DCS / BMS:
- Flame Relay (SIL3)
- 3x mA output

### Service Computer (at the burner)

SERVICE ENGINEER & CFC COM x000

- Local configuration of CFC via IR communication cable
- Parameter management
- Flame analysis
- Signal recording

### Operator Station (control room)

OPERATOR & CFC NET

- Boiler overview for operator
- Flame analysis
- Signal recording

### SERVICE ENGINEER, CFC NET & USB DONGLE

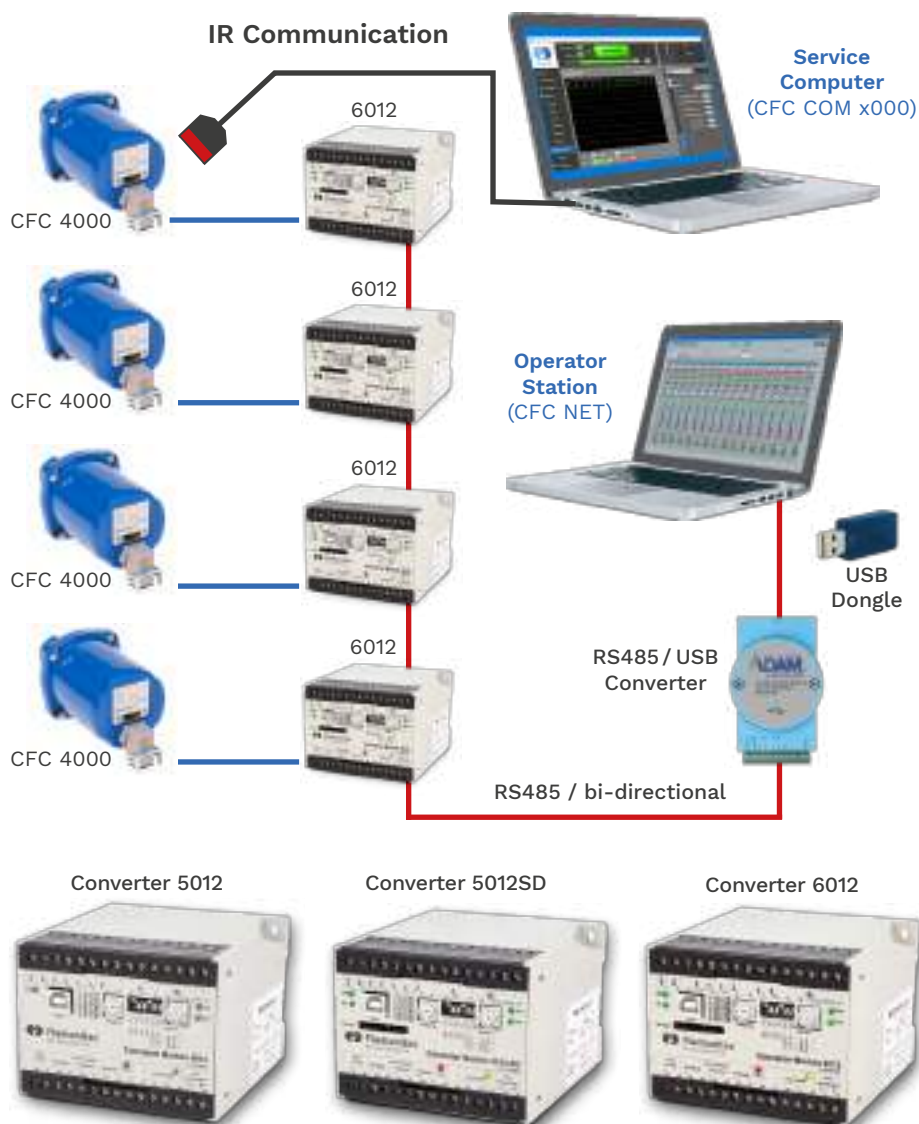
- Remote configuration of CFC via RS485 from control room
- Parameter management
- Flame analysis
- Signal recording

## Converter 5012/5012SD/6012

A wide range power supply unit and a relay for higher contact ratings are integrated. In combination with a CFC 3000/4000 it provides up to 3 analog output signals for different flame characteristic information, which supports your DCS to optimize the combustion process.

In addition to this, a network of up to 64 CFC 3000/4000 can be established by connecting the converters on a RS485 bus.

The converters 5012SD and 6012 are providing a SD-Card slot for data recording.



### Technical Data

|  | Converter 5012/5012SD                    | Converter 6012                           |
|--|--|--|
| In combination with                    | CFC 3000                                 | CFC 4000                                 |
| Power supply input                     | 24 V DC or 100 to 240 V AC               | 24 V DC or 100 to 240 V AC               |
| Current consumption                    | approx. 125 mA                           | approx. 125 mA                           |
| Flame relay                            | 1 change-over-contact<br>250 V/1 A       | 1 change-over-contact<br>250 V/1 A       |
| Analogue output                        | 0/4 to 20 mA                             | 0/4 to 20 mA                             |
| Datalogger on SD-Card<br>(up to 32 GB) | 5012 = No<br>5012SD = Yes                | 6012 = Yes                               |
| Data output                            | RS485                                    | RS485                                    |
| Operating temperature                  | - 20 °C to +60 °C                        | - 20 °C to +60 °C                        |
| Dimensions (W x H x D) mm              | 99,7 x 75 x 115                          | 99,7 x 75 x 115                          |
| Type of mounting                       | DIN rail mounting<br>(35 mm) or built-on | DIN rail mounting<br>(35 mm) or built-on |
| Type of protection                     | IP20                                     | IP20                                     |
| Weight                                 | approx. 450 g                            | approx. 450 g                            |

# Functional Upgrades of CFC x000

## Multi Output Board for GE Gas Turbines

For fail-safe (SIL3) output signals to all control systems:

- Relay output (e.g. Mark IV)
- Pulse output (e.g. Mark V)
- Current output (e.g. Mark VI)

All outputs available on board and selectable via jumper.  
 (available in OE-Converter wide housing)

## Fuel Discrimination Relay

The fuel discrimination relay provides a clear information in multi-fuel application via dry relay contact. The fuel discrimination bases on precise frequency information of two different fuels (1-Hz-Discrimination). (available in OE-Converter housing)

## Network via RS485 Interface

For long distances up to 1,200 meters. Remote analysis and configuration of up to 64 CFC 3000 or CFC 4000 with CFC NET software from control room. (available in all ATEX Zone 2 housings)

## SD-Card Recorder

For permanent data logging of detailed flame quality and status information on SD card. Data volume 100 MB/day with approx. 25 measurements per second for detailed analysis and reporting. (available in OE-Converter wide housing)

## Ready for Operation Relay

Output via potential-free relay contact. (available in all housings, optional)

## Wire Break Detection

For detection of wire break & shortcut in relay output circuit.  
 (available in all housings, optional)

## Screw Terminal Connection

(available in OE-Converter wide housing)

# CFC x000 in OE-Converter Wide Housing



## Upgrades for CFC x000

The Compact Flame Controllers CFC 3000 and CFC 4000 can be upgraded with new hardware features.

Depending on grade of functionality those upgraded CFCs are available in different housings.

## Applications

- Retrofit of gas turbines
- Flame detector of large steam generators with centralized management of signals and parameters (boiler overview, remote configuration, signal recorder, etc.)

# Software for CFC x000

## Features

- Pure flame radiation signals in real-time and with analysing diagrams
- Visualization of output signals
- Switch ON/OFF thresholds
- Switch ON/OFF times
- Data logger
- Storage and uploading of CFC settings
- Multilingual
- Sensitivity setting
- Failure memory

## Features

- Pure flame radiation signals in real-time and with analysing diagrams
- Visualization of output signals
- Switch ON/OFF thresholds
- Switch ON/OFF times
- Data logger
- Storage and uploading of CFC settings
- Sensitivity setting
- Failure memory

## CFC COM x000



Our software **CFC COM x000** enables flame analysis and programming of any Compact Flame Controller type CFC x000.

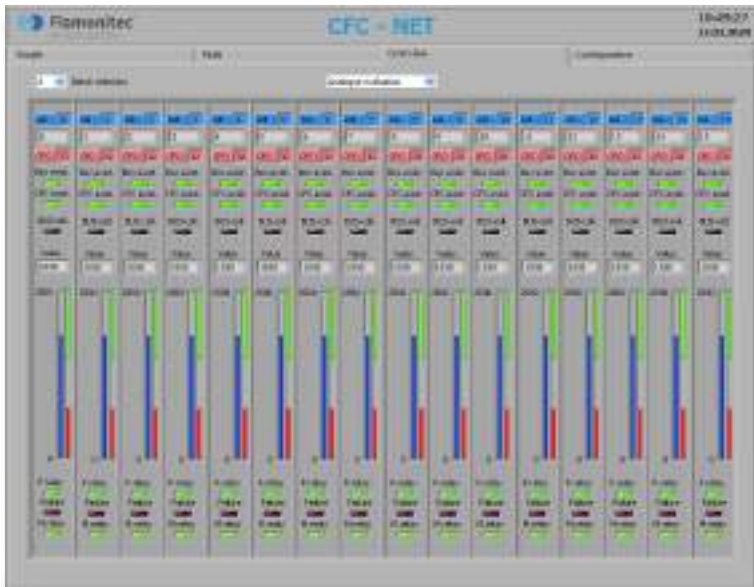
## CFC - COM 1 Tab



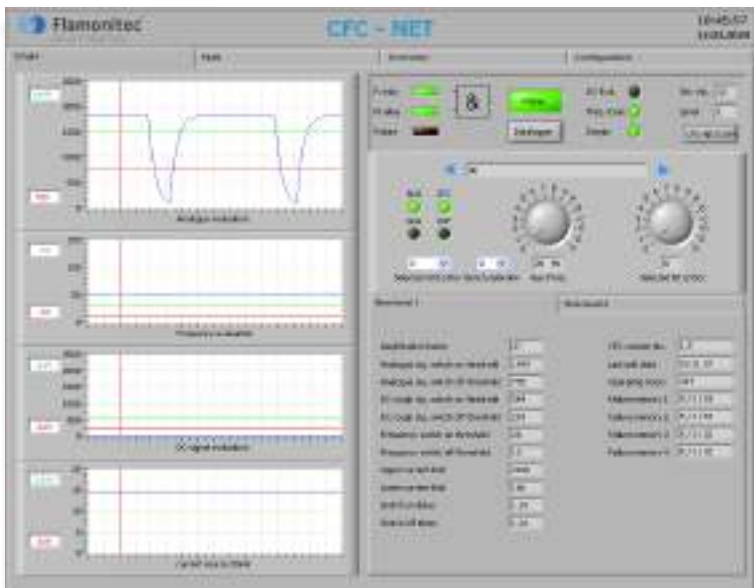
**CFC - COM 1 Tab** has been designed especially for the use with touch screen PC's (tablets).

| Communication Software and Accessories                       | Material-No. |
|--|--------------|
| Communication set for CFC x000 (Software and IR-Cable)       | 6040-4901-00 |
| USB/IR Data interface cable, 1.5 m                           | 6040-4810-10 |
| USB/IR Data interface cable, 3 m                             | 6040-4810-13 |
| USB/RS 485 - converter (STIXL), USB-Stick                    | 5040-0485-00 |
| USB/RS 485 - converter (ADAM), DIN rail mounting             | 5040-4561-00 |
| USB Dongle   | 5040-0420-00 |
| Converter 5012, DIN rail mounting                            | 6020-5012-00 |
| Converter 5012, integrated in a wall mounting housing IP66   | 6020-5012-01 |
| Converter 5012SD, DIN rail mounting                          | 6020-5012-02 |
| Converter 5012SD, integrated in a wall mounting housing IP66 | 6020-5012-03 |
| Converter 6012, DIN rail mounting                            | 6020-6012-00 |
| Converter 6012, integrated in a wall mounting housing IP66   | 6020-6012-01 |
| Programming device for CFC x000 with 8" Touch Screen         | 7040-2001-00 |

## CFC - NET



Our software **CFC - NET** enables the operator to get a clear overview about flame information of all connected CFC 3000/4000. The CFC bus capability can be achieved via the converter 5012/5012SD/6012.



## Features

- Analyzing on diagrams in real-time
- Switchover from boiler overview to burner view
- Visualization of output signals
- Switch ON/OFF thresholds
- Switch ON/OFF times
- Sensitivity settings
- SD-Card data logger with 5012SD or 6012
- Multilingual
- Configuration menu
- Failure memory
- Remote programming of CFC 4000 with converter 6012 from control room via USB Dongle



# Compact Flame Controller – CFC 200



Standard housing



Ex-housing



OE-Converter housing  
for FOC

## Features

- Fail safe design and self checking
- Particularly suitable for single burner applications
- Available with different spectral sensitivity ranges from UV up to IR and also in combination
- Non-wearing due to fully electronic design
- SIL 2
- Cost-efficient

## Applications

- Power plants
- Duct burner
- High pressure plants
- Claus plants
- Waste incineration plants/grid firings
- Rotary kiln plants
- Fluidized bed firings
- Cracker
- Residue incineration
- Low NO<sub>x</sub>-applications

**The Compact Flame Controller CFC 200 unites flame scanner and flame amplifier in one housing.**

The Compact Flame Controllers of the series CFC 200 are designed for the monitoring of gas- and oil flames on single burner applications.

## Technical Data

|                              |   |
|------------------------------|---|
| Self checking                | fully electronic, once per 700 ms   |
| Spectral sensitivity         | 190 to 2700 nm  |
| Angle of view                | 2.7 °   |
| Operating temperature        | - 20 °C to + 70 °C  |
| High temperature application | up to 600 °C via FOC (see page 24)  |
| Flame relay                  | 1 change-over contact (potential-free)  |
| Safety switch-off time       | 1 s, other times on request   |
| Flame intensity              | 0/4 to 20 mA  |
| Operating voltage            | 24 V DC   |
| Current consumption          | approx. 100 mA  |
| Adjustment                   | sensitivity potentiometer   |
| Electrical connection        | Zone 2 housings with dustproof plug-connector (optional with cable gland/conduit).<br>Zone 1 housings with cable gland. |
| Type of protection           | IP65 (IP66 with Ex-housings)  |
| Sight connection             | G 1" female thread ISO 228  |
| Purge air connection         | G 1/2" female thread ISO 228 with standard housing  |
| Required purge air quantity  | 10 m³/h   |
| Weight                       | approx. 1,5 kg (approx. 4 to 13 kg with Ex-housings)  |
| Certificates                 | TUEV, IECEx, ATEX, DVGW, CSA, EN298   |

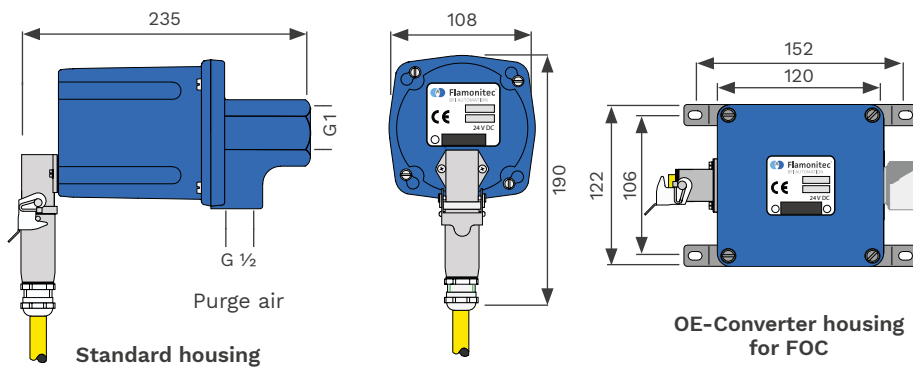
**All of our Compact Flame Controllers CFC 200 are available in FOC-technology and/or Ex-versions.**

## Applications

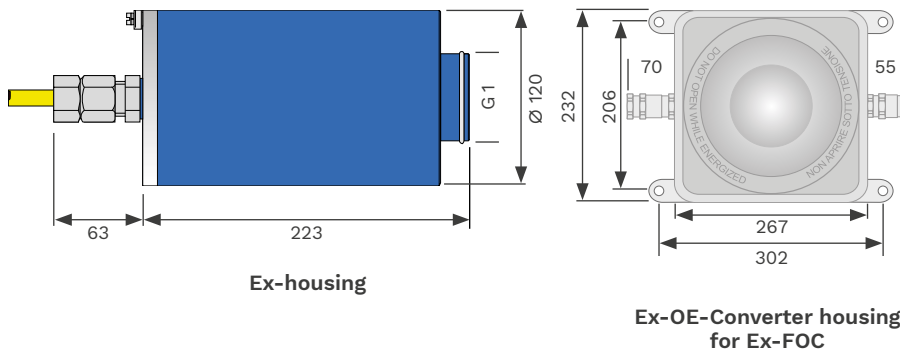
| CFC Type    | Spectral Range | Spectral Sensitivity | Gas | Oil |
|-------------|----------------|----------------------|-----|-----|
| CFC 200 UV1 | UV/VIS         | 190 to 550 nm        | ■   | ■   |
| CFC 200 UV  | UV             | 280 to 420 nm        | ■   | ■   |
| CFC 200 IR  | UV/IR          | 300 to 1050 nm       | -   | ■   |
| CFC 200 IR3 | IR             | 1050 to 2700 nm      | ■   | ■   |

## Dimensions

IP65, ATEX Zone 2, similar to NEMA4/Class 1 Div 2



IP66, ATEX Zone 1, similar to NEMA4/Class 1 Div 1



## Type of combustions

- Light- and heavy fuel oil
- Natural-, furnace- and coke oven gas
- Biomass
- H<sub>2</sub>S-gas

## Accessories

- Swivel mount
- Ball valve
- Heating insulator
- Pressure barrier
- Signal generator
- Special cable
- Alignment tool
- Heating
- Tropicalization

# Compact Flame – Controller CFC 100



**Compact Flame Controller  
type CFC 100 with hand  
programming device HT 100**

## Features

- Fail safe design and self checking
- Certified for continuous and intermittent operation
- Qualified for single and multi burner applications
- Dual channel flame monitoring system
- Intensity and relay status indication via LED
- 3 times increased lifetime of the UV-tube
- 20 times increased shutter lifetime

## Applications

- Power plants
- Duct burner
- Surface burner
- Rotary kiln plants
- Fluidized bed firings
- Cracking
- Mesh burner
- Quartz burner
- Waste incineration plants
- Low NO<sub>x</sub>-applications

## Type of combustions

- Natural gas
- Oil
- Mix firing

## Accessories

- Hand programming device
- Operating terminal
- Power supply
- Swivel mount
- Ball valve
- Heating insulator
- Pressure barriere
- Special cable
- Alignment tool
- Heating
- Tropicalization

**The Compact Flame Controller CFC 100 combines flame scanner and flame amplifier module built as all-in-one system.**

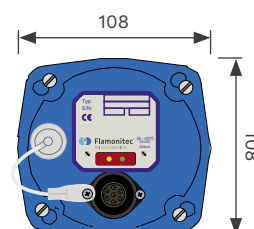
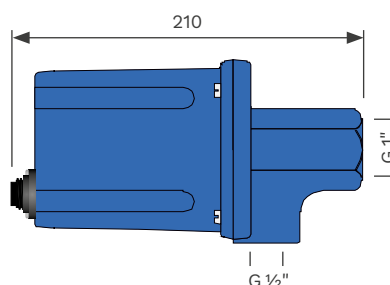
The Compact Flame Controller CFC 100 has been designed to monitor gas- and oil flames on single and multi burner applications. First time with UV tube sensors it is possible to set high-resolution thresholds for flame discrimination. Due to new shutter design with an electrical/mechanical combination the CFC 100 we increased the shutter lifetime by 20 times. Also the UV-tube lifetime was increased by 3 times due to the use of special high-temperature sensors.

## Technical Data

|                                  |   |
|----------------------------------|---|
| Self checking                    | 2 minutes electronically followed by 5 s electro-mechanically |
| Spectral sensitivity             | 185 to 260 nm   |
| Angle of view                    | 2.7 °   |
| Operating temperature            | - 20 °C to + 60 °C  |
| Flame relay                      | 1 change-over contact (potential-free)                        |
| Safety switch-off time           | 1 s   |
| Operating voltage                | 24 V DC   |
| Power consumption                | approx. 200 mA  |
| Electrical connection            | dust-proof connector  |
| Type of protection               | IP65  |
| Sight connector                  | G 1" female thread ISO 228                                    |
| Purge air connector              | G ½" female thread ISO 228                                    |
| Required purge air quantity      | 10 m³/h   |
| Weight                           | approx. 1.5 kg  |
| Certificates                     | EN298, UL   |
| Type                             | Material-No.  |
| Compact Flame Controller CFC 100 | 6012-1031-00  |
| Hand programming device HT 100   | 7040-2010-00  |

## Dimensions

**IP65, similar to NEMA4/Class 1 Div 2**



# Power Supply Units

| Technical Data        | 3002                                       | 3002A                                      |
|-----------------------|--|--|
| Input voltage         | 230 V AC or 115 V AC                       | 230 V AC or 115 V AC                       |
| Output voltage        | 24 V DC                                    | 24 V DC                                    |
| Output current        | 2 x 2.5 A                                  | 1 x 2.5 A                                  |
| Power                 | 2 x 60 VA                                  | 1 x 60 VA                                  |
| Status indication     | LED  | LED  |
| Status information    | -  | Relay output                               |
| Type of protection    | IP00                                       | IP00                                       |
| Operating temperature | - 20 °C to + 70 °C                         | - 20 °C to + 70 °C                         |
| Weight                | approx. 2.5 kg                             | approx. 2.5 kg                             |
| Front dimensions      | 70.78 mm (14HP) x 128.7 mm (3U) x 188.0 mm | 70.78 mm (14HP) x 128.7 mm (3U) x 188.0 mm |
| Type                  | Material-No.                               | Material-No.                               |
| 230 V AC              | 6020-3002-00                               | 6020-3002-10                               |
| 115 V AC              | 6020-3002-01                               | 6020-3002-11                               |



## Power Supply Unit 3002/3002A

Supplies all components of BFI Flame Monitoring System with the needed voltage of 24 V DC. The power supply is optionally available with status information with model 3002A.

| Technical Data        | 5002                         |
|-----------------------|------------------------------|
| Input voltage         | 230-240 V AC or 115-120 V AC |
| Power consumption     | approx. 100 mA               |
| Output voltage        | 24 V DC                      |
| Output current        | 200 mA                       |
| Type of mounting      | DIN rail, 35 mm              |
| Type of protection    | IP20                         |
| Operating temperature | - 20 °C to + 60 °C           |
| Weight                | approx. 0.5 kg               |
| Dimensions            | 45 x 73 x 120 mm             |
| Type                  | Material-No.                 |
| 230 V AC              | 6020-5002-00                 |
| 115 V AC              | 6020-5002-01                 |



## Power Supply Unit 5002

The power supply can be used for all BFI Compact Flame Controllers. It supplies enough power for one device and it is equipped with a relay for higher switching power. The device is designed for DIN rail mounting. Electrical connection by screw terminals.

## Converter 5012/5012SD/6012

The integrated wide range power supply serves the Compact Flame Controller CFC x000 with the needed 24 V DC. (Technical details see on page 10)



# Flame Evaluation, Selector Unit & Diode Decoupling Unit

## Flame Evaluation 3003

The flame evaluation 3003 operates in combination with one flame scanner and flame amplifier of the series 3000 and displays the digital scanner output signal. The 3003 provides additional relay outputs, controlled by adjustable thresholds and ON/OFF delay times.



### Technical Data

### 3003

|                       |  |
|-----------------------|--|
| Power supply          | 24 V DC  |
| Current consumption   | approx. 100mA                                    |
| Intensity indicator   | LED-7-segment 3-digit                            |
| Status indication     | relais output (RD)<br>fault diagnostic (FD)      |
| Threshold             | adjustable, 001 to 999                           |
| Switch-ON delay       | adjustable, 1s to 9s                             |
| Switch-OFF delay      | adjustable, 1s to 9s                             |
| Type of protection    | IP00   |
| Operating temperature | - 20 °C to + 70 °C                               |
| Weight                | approx. 0.5 kg                                   |
| Dimensions            | 70.78 mm (14HP)<br>x 128.7 mm (3U)<br>x 188.0 mm |
| Material-No.          | 6020-3003-00                                     |

## Flame Evaluator 3007

The flame evaluator 3007 converts up to four digital flame scanner output signals into linear analog signal outputs. The measurement range of each channel can be adjusted separately. The 3007 is a supplementary unit to our flame amplifiers.



### Technical Data

### 3007

|                       |  |
|-----------------------|--|
| Power supply          | 24 V DC  |
| Current consumption   | approx. 340 mA                                   |
| Channels              | 4  |
| Output per channel    | 0/4 to 20 mA,<br>max. load 500 Ohms              |
| Measurement ranges    | 5<br>selectable                                  |
| Type of protection    | IP00   |
| Operating temperature | - 20 °C to + 70 °C                               |
| Weight                | approx. 0.4 kg                                   |
| Dimensions            | 70.78 mm (14HP)<br>x 128.7 mm (3U)<br>x 188.0 mm |
| Material-No.          | 6020-3007-00                                     |



**Technical Data**
**3012**

|                       |  |
|-----------------------|--|
| Power supply          | 24 V DC  |
| Current consumption   | approx. 100mA                                    |
| Decoupling            | 4 x 2,5 A; 24 V DC                               |
| Voltage monitoring    | 24 V DC  |
| Low voltage           | - 20 %   |
| High voltage          | + 20 %   |
| Failure alarm output  | switch over relay contact, one per channel       |
| Failure alarm reset   | local or remote                                  |
| Status indication     | operation: LED green<br>alarm: LED red           |
| Type of protection    | IP00   |
| Operating temperature | - 20 °C to + 70 °C                               |
| Weight                | approx. 0.4 kg                                   |
| Dimensions            | 70.78 mm (14HP)<br>x 128.7 mm (3U)<br>x 188.0 mm |
| Material-No.          | 6020-3012-00                                     |


**Diode Decoupling Unit 3012**

The purpose of this diode decoupling and voltage monitoring unit 3012 is to decouple four separate DC power supplies (e.g. 2 x 3002) and to monitor over and under voltages. In combination with two power supply units the 3012 creates a redundant power supply with alarm output.

**Technical Data**
**3210**

|                       |   |
|-----------------------|---|
| Power supply          | 24 V DC   |
| Current consumption   | approx. 100 mA  |
| Signal output         | selected flame scanner signal, summarized flame signal, failure alarm contact |
| Status indication     | two-color-LED per Signal, failure alarm-LED                                   |
| Failure alarm relay   | 2 switch-over contacts, 250 V/1A / 300 VA                                     |
| Type of protection    | IP00  |
| Operating temperature | - 20 °C to + 70 °C  |
| Weight                | approx. 0.3 kg  |
| Dimensions            | 70.78 mm (14HP)<br>x 128.7 mm (3U)<br>x 188.0 mm                              |
| Material-No.          | 6020-3210-00  |

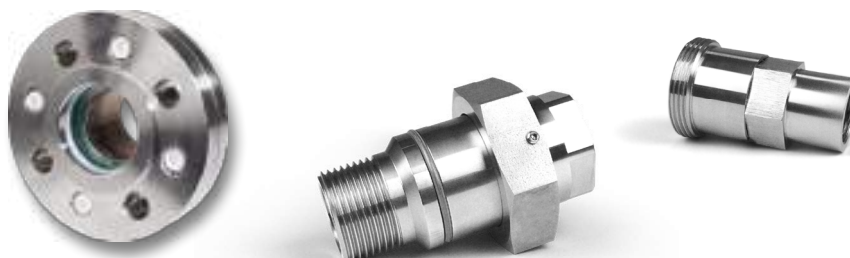

**Selector Unit 3210**

The selector unit 3210 provides up to three single flame intensity scanner signals on one output and in addition the summarized signal of the connected flame scanners. This selector unit is an ideal supplement for a redundant flame scanner operation in combination with our flame evaluation unit 3003. An on board failure alarm output can be used to identify a flame scanner without signal.

# Accessories

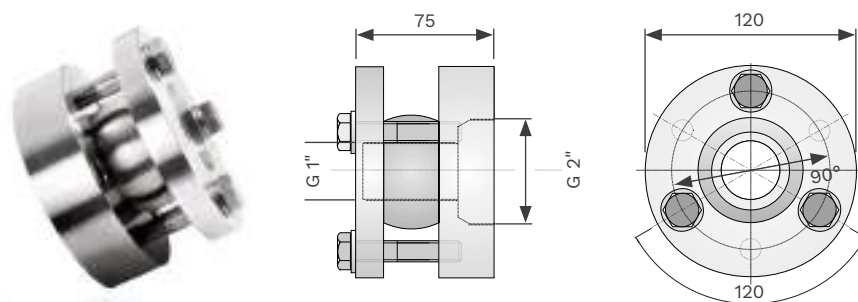
## Pressure Barrier

Prevents the pass out of hot and toxic combustion gases on overpressure furnaces and protects personnel and the flame scanner. Optional available with purge media inlet and for various pressures.



## Swivel Mount

Use this swivel mount for the alignment of flame scanners and Compact Flame Controllers to the primary combustion zone. The range of alignment is  $\pm 15^\circ$  in all directions. The swivel mount is available with special materials (stainless steel, hastelloy, etc.) and NPT threads.



### Technical Data

| Material                 | galvanized steel | stainless steel |
|--------------------------|------------------|-----------------|
| Process connection       | G 2"             | G 2"            |
| Flame scanner connection | 1"               | 1"              |
| Dimensions               | 115 x 120        | 115 x 120       |
| Weight                   | approx. 5 kg     | approx. 5 kg    |
| Material-No.             | 6590-9020-01     | 6590-9050-01    |

## Ball Valves

The ball valve isolates the sight tube from the combustion chamber. The three-way-valve provides a purge media inlet, which purges the sight tube arrangement also in closed position.



### Technical Data

|         | 2-Way-Valve  | 3-Way-Valve  |
|---------|--------------|--------------|
| G1"     | 1595-8821-00 | 1594-8831-00 |
| G1 1/2" | on request   | 1595-8831-00 |

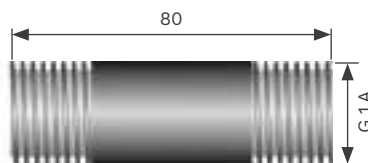
Additional variants available on request


**BFI 235**

**BFI 235 - EX**

**BFI 235 - LWL**
**Type**
**Material-No.**

|  |              |
|--|--------------|
| Optical alignment device BFI 235       | 6030-0235-00 |
| Optical alignment device BFI 235 - EX  | 6030-0235-02 |
| Optical alignment device BFI 235 - LWL | 6030-0235-03 |


**Technical Data**
**Thread Size**
**max. Temperature**
**Material-No.**

|                   |        |        |              |
|-------------------|--------|--------|--------------|
| Heating insulator | G 1"   | 260 °C | 1598-0141-00 |
| Heating insulator | NPT 1" | 260 °C | 1598-0143-00 |



**All cables can be delivered with mounted connectors.**

**Type**
**Material-No.**

|                       |                                    |
|-----------------------|------------------------------------|
| Special cable KW5     | 6060-0560-00                       |
| Special cable KW5-UL  | 6060-0570-00                       |
| Special cable KW6     | 6060-0680-00                       |
| Special cable KW6-UL  | 6060-0670-00                       |
| Mounting of connector | 9080-1201-00 (including connector) |
| Mounting of connector | 9080-1202-00 (excluding connector) |

## Optical Alignment Device

For the optimum alignment of BFI flame scanners and Compact Flame Controllers. The monitored zone and the surrounding area is shown on the special designed visor window.

## Heating Insulator

To be mounted between the swivel mount and the flame scanner/ Compact Flame Controller. It reduces the temperature transfer significant and protects so the flame scanner or Compact Flame Controller. Due to the special material this insulator can be used also for potential isolation between the burner and the electronic.

## Special Cable

For the connection between Flame Scanner and Flame Amplifier of the BFI System 3000. This cable provides a high efficiency protection against electrical, electrostatic and electromagnetic fields. The cable is halogen-free and resistant against microbes, oil, ozone and UV radiation. It is largely resistant to petrols, acids and alkaline solutions. For special application we provide cables like e.g. rodent proof version or UL listed cable.

# Measurement and Test Devices

## Measuring Adapter

The measuring adapters enable an interrupt-free connection of BFI measuring and test devices. The internal relay in types 236 and 237 can be used to select single scanners remotely in order to work in AND & OR operation with other BFI Flame Scanners.



BFI 234



BFI 236/237

| Type  | Material-No.<br>(standard) | Material-No.<br>(with state indicator) |
|---|----------------------------|--|
| Measuring adapter BFI 234<br>(with Harting connector) | 6040-2342-00               | -                                      |
| Measuring adapter BFI 236<br>(OR operation)           | 6040-2362-00               | 7040-2362-01                           |
| Measuring adapter BFI 237<br>(AND operation)          | 6040-2372-00               | 6040-2372-01                           |

## Signal Generator/Evaluator

This device provides all optical and electrical signals for the functional tests of BFI flame scanners and amplifiers series 3000. The device is available with up to two light sources (UV/IR) and will be delivered along with connection cables.

By handy design of the new compact signal generator 5101 and the integrated battery it is particularly suitable for short on-site tests in the system.

The new compact signal generator 5102 for CFC x000 is specifically designed for on-site testing of the CFC family.

The new compact signal generator 5107 is specifically designed for on-site testing of thermopile based BFI devices.



3101 IR/IR2/UV



| Type                            | Light Source    | Material-No. |
|---------------------------------|-----------------|--------------|
| Signal generator 3101 IR/IR2/UV | UVA + IRA + IRB | 6030-3101-22 |
| Signal generator 3101 NAGT      | IRA + IRB       | 6030-0015-03 |
| Flame signal evaluator 3103     | -               | 6030-3103-00 |
| Compact signal generator 5101   | UVA + IRA + IRB | 6030-5101-00 |
| Compact signal generator 5102   | UVA + IRA + IRB | 6030-5102-00 |
| Compact signal generator 5107   | IRB             | 6030-5107-00 |



Compact signal  
generator 5101



Compact signal  
generator 5102



Compact signal  
generator 5107

# Fiber Optic Technologies



FOC & SKL

| Type                             | Length     | X-IR         | UV           |
|----------------------------------|------------|--------------|--------------|
| Sensor head SKL with fiber optic | 2 m        | 6051-1020-00 | 6055-1020-62 |
| Sensor head SKL with fiber optic | 3 m        | 6051-1030-00 | 6055-1030-62 |
| Sensor head SKL with fiber optic | 5 m        | 6051-1050-00 | 6055-1050-62 |
| Sensor head SKL with fiber optic | 7 m        | 6051-1070-00 | 6055-1070-62 |
| Sensor head SKL with fiber optic | 10 m       | 6051-1100-00 | 6055-1100-62 |
| Other versions                   | on request | on request   | on request   |



SKL

| Type               | Material-No. |
|--------------------|--------------|
| Sensor head SKL IR | 6050-9010-00 |
| Sensor head SKL UV | 6050-9020-00 |

Additional variants (three-hole or four-hole flange disc) available.



FOC

| Standard Type | Transmission   | Material-No. |
|---------------|----------------|--------------|
| FOC X-IR      | 300 to 2450 nm | 5051-1xxx-00 |
| FOC UV        | 200 to 1200 nm | 5055-1xxx-62 |

The 'x' stands for the length in decimeter of the FOC.

## Fiber Optic System

The system is consisting of a Sensor head SKL (lens unit) and a Fiber Optic Cable (FOC). This system enables the mounting of the flame monitoring system optics on locations which are not easy to reach or having high temperatures or strong vibrations. We differentiate our fiber optic systems by the spectral range, length and mounting method. Customized lengths of FOC can be quoted on request.

The standard design temperature range is - 60 to + 200 °C. We also provide high temperature versions up to + 350 °C. The glass fibers are protected by a high-strength stainless steel hose. The type of protection is IP68.

## Sensor Head SKL (lens unit)

The SKL is a robust lens unit for the flame monitoring in the UV, VIS and IR range. It projects the flame radiation onto the Fiber Optic Cable (FOC). The SKL will be delivered with a 1" female thread for the mounting to the process. Various adapters/pressure barriers on request.

## Fiber Optic Cable (FOC)

The FOC is made up of a high quality glass fiber bundle, which is protected by a cover of glass silk braid and a stainless steel hose against mechanical damages. Optional we provide high temperature versions up to + 350 °C.



# Fiber Optic Technologies

## Fiber Optic Lance (FOL)

Wherever the optic of the flame monitoring system must be mounted inside the combustion chamber or burner (e.g. tilting burner), Fiber Optic Lances are essential. The lances are available in 4 different standard designs. Customized configuration of single lengths A to D.

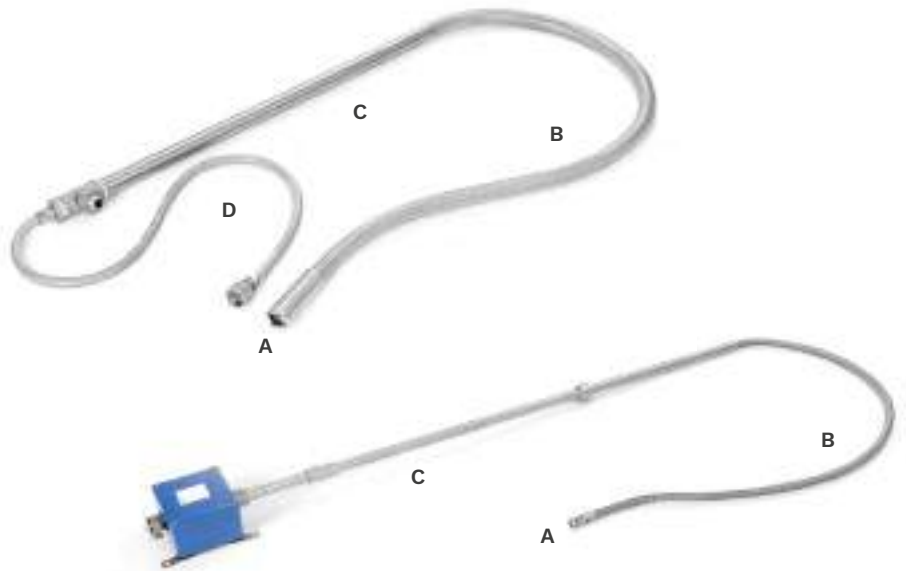
The air cooled Fiber Optic Lances are also in high temperature versions available. Beside our standard version with maximum temperatures up to + 200 °C we provide the following high temperature (HT) versions:

- + 350 °C
- + 600 °C

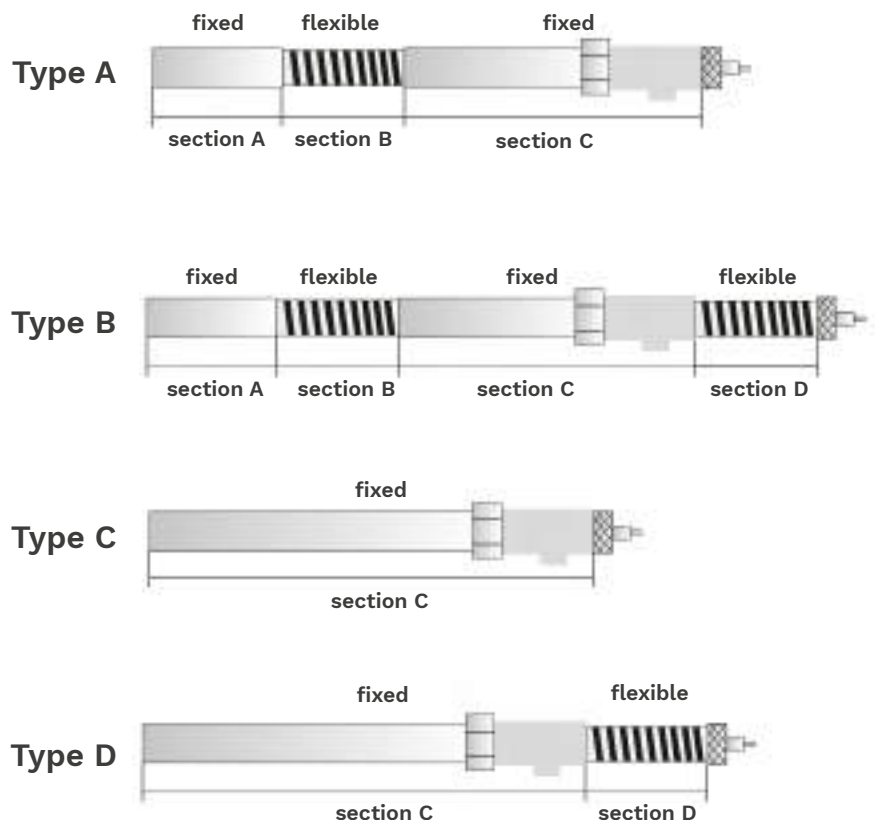
The total length should not exceed 20 m.

## Accessories

- Guiding tube, fixed
- Guiding tube, flexible
- Guide tube stopper

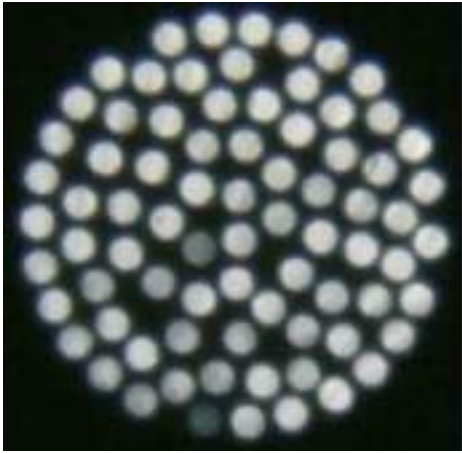


Customized configuration of single lengths A to D.



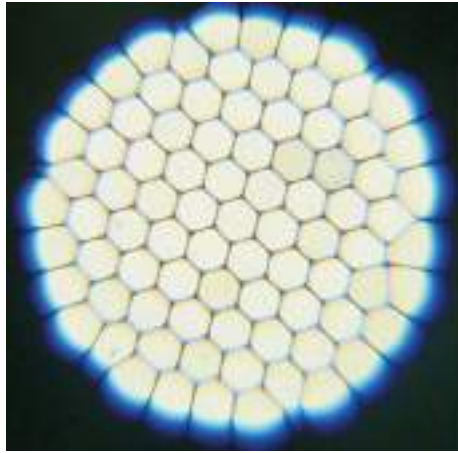
BFI Fibre Optic Lances can be designed as per customers request. Highly economical for replacement of existing FOL by using existing guide tubes (plug & play) during boiler operation.

# Special Fiber Optic Solutions



**Fiber bundle Standard-FOC and HT-FOC**

Due to the glue technology the space in between the single glass fibers can not be used for the light transport. The usable area for light transport typically amounts to approx. 50 % of the total fiber bundle area.



**Fiber bundle Super-HT-FOC**

The special treatment of the FOC ends does not require any glue. The space, which is normally used by the glue can be filled with additional fibers, so that the ratio between usable and loss area is much better. The usable area for light transport is typical higher than 95 % of the total fiber bundle area.

## FOC/FOL with high temperature tip

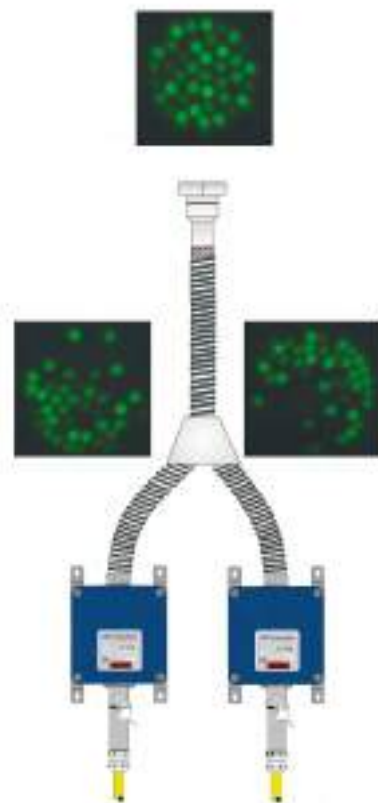
The temperature resistance can be increased up to + 350 °C by using a special glue technology. BFI Automation offers fiber optics, allowing us to special treatment of the fiber bundle having a temperature resistance of up to + 600 °C at a sufficient purge air. In addition to the very high temperature resistance this version provides also an increased transmission.

## Y-Type Fiber Optic Cable

The Y-type FOC uses all benefits of the BFI fiber optic standard series. Due to the splitting of the fiber bundle this Y-type FOC can be used to realize a redundant operation either on scanner side or on optic side.

## Application

- Scanner redundancy also on one sight port.
- Enhancement of the monitored area by using two of the optics.
- Separation of different spectral transmission ranges.



**Splitting of one flame signal to two Flame Scanners / CFC.**

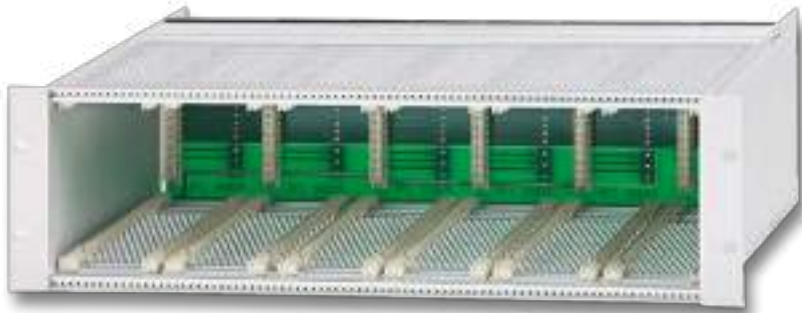


**Merging of two flame signals to one Flame Scanner / CFC.**

# Housings and Racks

## 19"- built-in rack

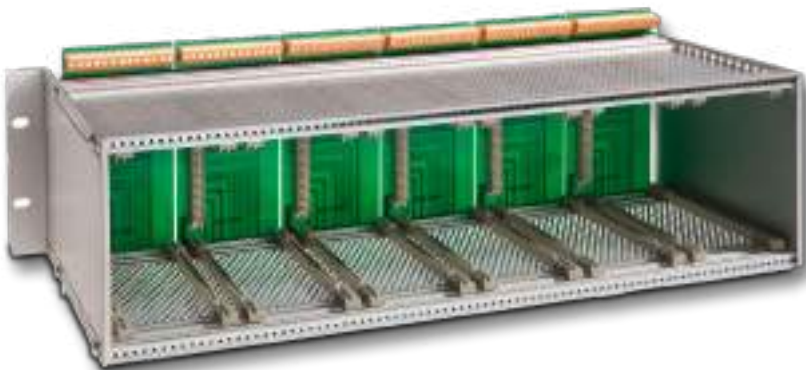
For the series 3000 we provide 19"-built-in-racks from one to six plug-in units (14HP). The connection can be easily done via screw terminals from the rearside. Alternative we provide standard connectors in accordance with international standards. Type of protection is IP20.



|                            | 14HP                                       | 28HP                                       | 42HP                                       | 56HP                                       | 84HP                                       |
|----------------------------|--|--|--|--|--|
| All dimensions<br>± 0.4 mm | for 1<br>plug-in<br>unit<br>series<br>3000 | for 2<br>plug-in<br>unit<br>series<br>3000 | for 3<br>plug-in<br>unit<br>series<br>3000 | for 4<br>plug-in<br>unit<br>series<br>3000 | for 6<br>plug-in<br>unit<br>series<br>3000 |
| Material-No.               | 6830-0701-01                               | 6830-0702-01                               | 6830-0703-01                               | 6830-0704-01                               | 6830-0706-01                               |

## 19"- built-on rack

For cabinet or wall mounting we provide 19"-built-on racks. The electrical connection can be done via frontside screw terminals. Type of protection is IP20.



|                            | 14HP                                       | 28HP                                       | 42HP                                       | 56HP                                       | 84HP                                       |
|----------------------------|--|--|--|--|--|
| All dimensions<br>± 0.4 mm | for 1<br>plug-in<br>unit<br>series<br>3000 | for 2<br>plug-in<br>unit<br>series<br>3000 | for 3<br>plug-in<br>unit<br>series<br>3000 | for 4<br>plug-in<br>unit<br>series<br>3000 | for 6<br>plug-in<br>unit<br>series<br>3000 |
| Material-No.               | 6830-0701-00                               | 6830-0702-00                               | 6830-0703-00                               | 6830-0704-00                               | 6830-0706-00                               |



Example

| Housing size | Material-No. |
|--------------|--------------|
| 20HP         | 6830-0601-00 |
| 30HP         | 6830-0602-00 |
| 49HP         | 6830-0603-00 |



Example

| Technical Data       |                     |                     |                     |
|----------------------|---------------------|---------------------|---------------------|
| Ex-classification    | II 2G Ex de II C T6 | II 2G Ex de II C T6 | II 2G Ex de II C T6 |
| Type of protection   | IP55                | IP55                | IP65                |
| Dimensions           | 860 x 594 x 410 mm  | 645 x 325 x 311 mm  | 755 x 435 x 311 mm  |
| Color of the housing | RAL 6034            | RAL 7032            | RAL 7032            |
| Weight               | approx. 150 kg      | approx. 37 kg       | approx. 58 kg       |
| Material-No.         | 1830-5313-01        | 1830-5314-00        | 1830-5314-01        |

## Wall Mounting Housings

For the field installation we provide wall mounting housings in three different sizes. The housings are made of impact resistance ABS with a clear and lockable front cover and a separate wiring chamber. The type of protection is IP66. All connections between BFI modules/ devices and screw terminals are pre-wired.

## Ex-Wall Mounting Housings

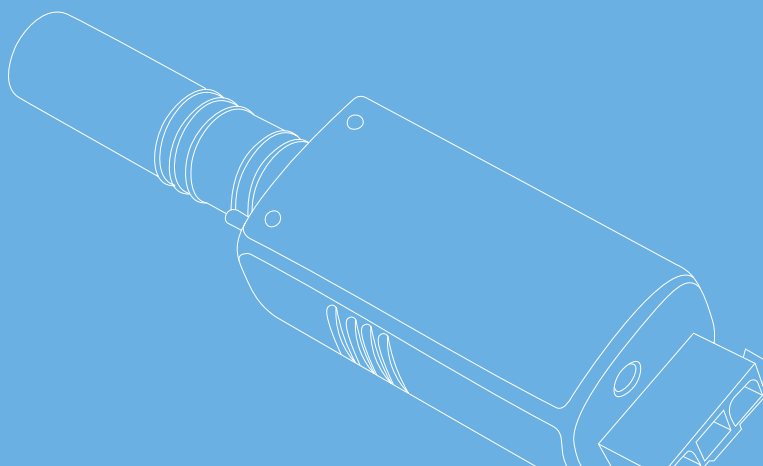
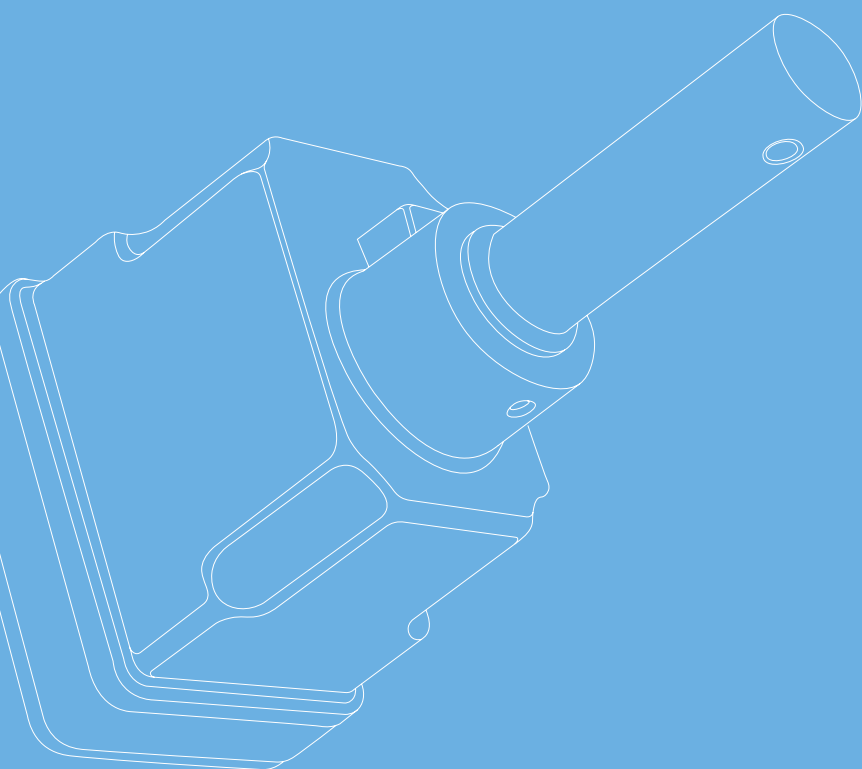
Explosion proof housing for hazardous areas with an Ex-proof window. This cabinet is designed to house for each up to 3 plug-in units in two 19" racks of the series 3000. The 19" racks are completely pre-wired and tested. The Ex-d housing is mechanically connected with the Ex-e wiring chamber. The window allows seeing the indication lamps of the flame amplifier modules.

## Accessories

- Drain-plug
- Heating
- MTL-Ex-barriers

# Heating technology and thermal process applications

|   |    |
|---|----|
| Flame Detector - KLC Series             | 30 |
| Compact Flame Detector - IFC Series     | 34 |
| Compact Flame Detector - IFR Series     | 35 |
| Compact Flame Detector - KHM 20         | 36 |
| Compact Flame Detector - IFx 400 Series | 37 |
| Accessories                             | 38 |





# Summary

| Device                                | KLC 10/11                    | KLC 20/21                    | IFC/IFR 10/11                | IFC/IFR 50                   | KHM 20                       | IFC/IFR 400                  |
|---------------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| Sensor UV-Tube                        | ■                            | —                            | ■                            | ■                            | —                            | —                            |
| Sensor Semiconductor                  | —                            | ■                            | —                            | —                            | ■                            | ■                            |
| UV Spectrum 185 to 260nm              | ■                            | —                            | ■                            | ■                            | —                            | —                            |
| VIS/IR Spectrum 380 to 1150 nm        | —                            | ■                            | —                            | —                            | ■                            | ■                            |
| Viewing direction                     | radial or radial and axial   | axial                        | axial/radial                 | axial/radial                 | axial                        | axial/radial                 |
| Mode                                  | intermittent                 | intermittent                 | intermittent                 | intermittent                 | intermittent                 | continuous                   |
| Self-monitoring                       | —                            | —                            | —                            | —                            | —                            | ■                            |
| Natural Gas                           | ■                            | ■                            | ■                            | ■                            | ■                            | ■                            |
| Hydrogen Gas                          | ■                            | —                            | ■                            | ■                            | —                            | —                            |
| Synthetic fuel                        | ■                            | ■                            | ■                            | ■                            | ■                            | ■                            |
| Light Oil                             | ■                            | ■                            | ■                            | ■                            | ■                            | ■                            |
| Heavy Oil                             | ■                            | ■                            | ■                            | ■                            | ■                            | ■                            |
| Flame signal                          | FET                          | FET                          | FET                          | Relay                        | Electronical Relay           | Relay                        |
| Potential free                        | no                           | no                           | no                           | yes                          | yes                          | yes                          |
| Suitable for switching input          | ■                            | ■                            | ■                            | ■                            | ■                            | ■                            |
| Suitable for ionization input         | ■                            | ■                            | ■                            | —                            | ■                            | ■                            |
| Operating temperature -20 °C to 60 °C | ■                            | ■                            | ■                            | ■                            | ■                            | ■                            |
| Fully electronic                      | —                            | ■                            | —                            | —                            | ■                            | ■                            |
| Maintenance free                      | —                            | ■                            | —                            | —                            | ■                            | ■                            |
| Small size                            | ■                            | ■                            | —                            | —                            | —                            | ■                            |
| Robust                                | —                            | —                            | ■                            | ■                            | ■                            | ■                            |
| Simple installation                   | ■                            | ■                            | ■                            | ■                            | ■                            | ■                            |
| Applications                          | Gas burner, dual fuel burner | Gas burner, dual fuel burner | Gas burner, dual fuel burner | Gas burner, dual fuel burner | Gas burner, dual fuel burner | Gas burner, dual fuel burner |
| Industrial Usage                      | —                            | —                            | ■                            | ■                            | ■                            | ■                            |
| Heating Technology                    | ■                            | ■                            | ■                            | ■                            | ■                            | ■                            |

# Flame Detector - KLC Series



Standard housing  
KLC 10



Ex-housing



Standard housing KLC 11

## KLC 10 / 11

Are compact UV-flame detector for heating and single burner applications, suitable for gas-, oil- and dual fuel burners. The flame detectors has been developed to meet the requirements of EN 298:2012 for burner management control units which make a 'no-flame' check after normal burner shut down when the flame amplifier is permanently energized. This Flame detector must be disconnected for started up once in a day.

## Features

- Intermittent operation
- Compact design
- Transistor output
- Quick change in the plant possible
- Insensitive to daylight
- Can be connected directly instead of ionization probes or LDR
- Alignment optional:
  - R - radial
  - RS - radial & sensitive
  - RA - radial & axial
  - RAS - radial & axial & sensitive

**UV-flame detector specially designed for single burner firing systems that produce almost no radiation in the visible light spectrum or operate with very low flame modulation.**

The flame signal intensity can be easily recognised via an LED as a visual indicator. The KLC 1x can be connected directly to the ionisation or LDR input of the automatic burner control system. It is compatible in its dimensions, connection dimensions and pin assignment with other devices from the KLC series. All accessories are therefore identical and reduce the variety of parts in production and service.

## Technical data

## KLC 10 / 11

|                                     |   |
|-------------------------------------|---|
| Sensor                              | UV tube   |
| Spectral range                      | 185 - 260 nm  |
| Lifetime UV tube                    | max. 10,000 h   |
| Supply voltage                      | 230 V AC<br>optionally 120 V AC   |
| Current consumption                 | max. 5.5 mA   |
| Operating temperature               | -20 °C to +60 °C<br>(> 50 °C reduces lifetime)  |
| Protection class                    | IP 21   |
| Switch-on delay<br>Switch-off delay | typically 0.5 s<br>< 0.5 s  |
| Switching output                    | open collector  |
| Weight                              | 0.029 kg  |
| Output                              | max. switched current 15 mA<br>max. switched power 0.3 W<br>max. switched voltage 280 V AC / 400 V DC |

**All KLC series are also available with Ex-proof housings for Zone 1.**

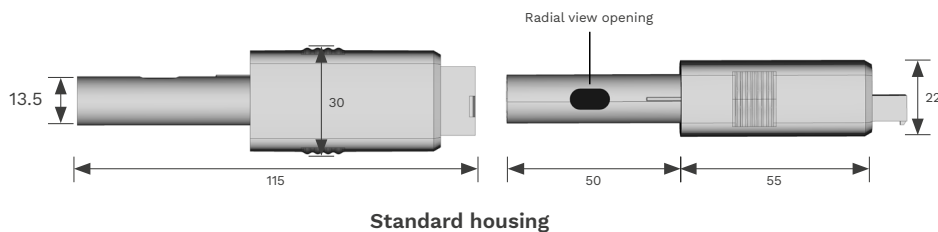
## Overview Material Numbers

| Type  | Material-No. |
|---|--------------|
| KLC 10/230 R, radial                        | 6011-1130-05 |
| KLC 10/230 RS, radial & sensitive           | 6011-1130-08 |
| KLC 10/230 RA, radial & axial*              | 6011-1130-06 |
| KLC 10/230 RAS, radial & axial & sensitive* | 6011-1130-07 |
| KLC 10/120 RAS, radial & axial & sensitive* | 6011-1323-00 |
| KLC 11/230 R, radial                        | 6011-1330-02 |
| KLC 11/230 RA, radial & axial*              | 6011-1330-03 |
| KLC 11/120 RA, radial & axial*              | 6011-1320-01 |

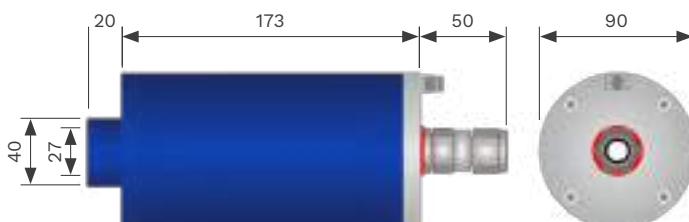
\*optional axial (reduced sensitivity at approx. 40%)

## Dimensions

### IP21



### IP66, ATEX Zone 1



All dimensions in mm

## Fuels

- Oil (LDO & HFO)
- Natural gas, Propan, Butan
- Biomass/biogas
- Synthetic fuels
- Methanol
- H<sub>2</sub>
- NH<sub>3</sub>

## Application

- Oil burner
- Gas burner

## Accessories

- Relay module RMF
- KLC cable
- KLC flange
- Angled mirror adapter for KLC
- Adapter ADP
- UVT-COM readout unit

# Flame Detector - KLC Series



Standard housing  
KLC 20



Ex-housing



Standard housing KLC 21

## KLC 20 / 21

The KLC 2x only evaluates the flickering of the flame to be monitored. A device version with interference frequency suppression is optionally available. Uniform light beams and any constant frequencies do not lead to a permanent flame detection. Disturbing sources of extraneous light, e.g. from fluorescent tubes or low-frequency background radiation from glowing brickwork, are suppressed. Unintentional influences on the flame detection can thus be avoided. Via the LED display as an optical interface, it is possible to read out various relevant operating parameters (e.g. monitoring of the flame signal, serial number).

## Features

- Intermittent operation
- Compact design
- Transistor output
- Quick change in the plant possible
- Insensitive to daylight
- Can be connected directly instead of ionization probes or LDR

**The KLC series broadband flame detector are compact flame detectors specially designed for blue-burning combustion systems in forced-air burner applications in the domestic sector.**

The patented evaluation of the signal takes place via the flicker frequency of the radiation of the upcoming flame. A processor enables the evaluation and conversion of the flame signal to a digital signal in the value required for the flame signal amplifier of the corresponding automatic burner control system.

## Technical Data

## KLC 20 / 21

|                              |   |
|------------------------------|---|
| Sensor                       | Semiconductor   |
| Spectral range               | 320 - 1150 nm   |
| Supply voltage               | 230 V AC<br>optionally 120 V AC<br>optionally 24 V AC / DC  |
| Current consumption          | max. 5.5 mA   |
| Operating temperature KLC 20 | -20 °C to +60 °C  |
| Operating temperature KLC 21 | -20 °C to +75 °C  |
| Protection class             | IP21  |
| Switch-on delay              | typically 0.5 s   |
| Switch-off delay             | < 0.6 s   |
| Switching output             | open collector  |
| Weight                       | 0.029 kg  |
| Output                       | max. switched current 15 mA<br>max. switched power 0.3 W<br>max. switched voltage 280 V AC / 400 V DC |

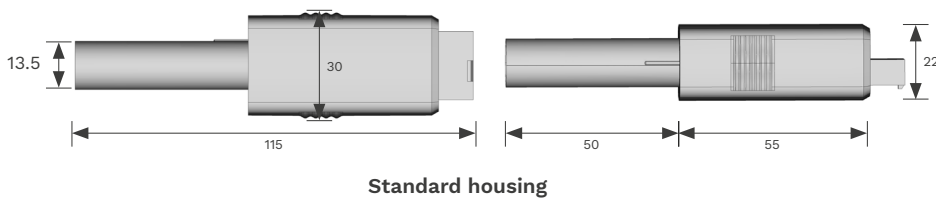
**All KLC series are also available with Ex-proof housings for Zone 1.**

## Overview Material Numbers

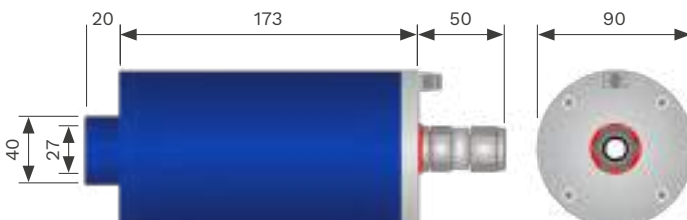
| Type                | Material-No. |
|---------------------|--------------|
| KLC 20/230, 25/15Hz | 6011-1433-02 |
| KLC 20/230, 52/15Hz | 6011-1436-00 |
| KLC 20/120, 25/15Hz | 6011-1423-03 |
| KLC 20/120, 52/15Hz | 6011-1426-00 |
| KLC 20/24, 25/15Hz  | 6011-1413-02 |
| KLC 20/24, 52/15Hz  | 6011-1416-00 |
| KLC 21/230, 25/15Hz | on request   |
| KLC 21/230, 52/15Hz | on request   |
| KLC 21/24, 25/15Hz  | 6011-1413-20 |
| KLC 21/24, 52/15Hz  | on request   |

## Dimensions

### IP21



### IP66, ATEX Zone 1



All dimensions in mm

## Fuels

- Oil (LDO & HFO)
- Natural gas, Propan, Butan
- Biomass/biogas
- Synthetic fuels
- Methanol
- NH<sub>3</sub>

## Application

- Oil burner
- Gas burner

## Accessories

- Relay module RMF
- KLC cable
- KLC flange
- Angled mirror adapter for KLC
- Flame simulator TG 10
- Adapter ADP
- KLC-COM readout unit



# Compact Flame Detector

## - IFC Series

### Industrial flame detectors

UV flame detector for harsh industrial environments with intermittent operation. The IFx series features a robust die-cast aluminum housing with IP65 protection. The housing design allows for quick replacement of the unit on site.

### Features

- Intermitted operation
- Output signal either potential-free relay contacts or ionization simulation
- Different designs for optimal alignment with the flame
- Metal housing with IP65 protection for industrial applications
- With various voltage versions
- CE-certified
- Stand-alone flame detector
- Easy implementation of the flame detector into existing systems
- Die-cast aluminium housing
- Relay output with 1 NC contact and 1 NO contact
- Quick exchange on site possible



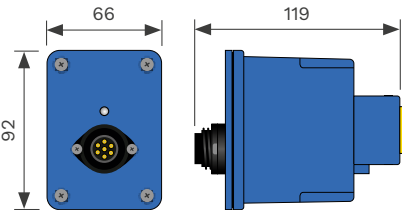
**Compact flame detectors combine sensor technology, flame evaluation and signal output conveniently in one housing.**

Flamonitec compact flame detectors are available in different housings for every application, whether for heating technology or for industrial requirements. Another advantage is the simple integration into the firing control system.

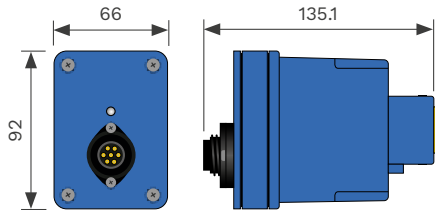
| Technical Data                      | IFC 10 / 11 / 50                 |
|-------------------------------------|----------------------------------|
| Sensor                              | UV tube                          |
| Alignment                           | axial                            |
| Spectral range                      | 185 - 260 nm                     |
| Lifetime UV tube                    | max. 10,000 h                    |
| Supply voltage                      | 230 V AC,<br>optionally 120 V AC |
| Current consumption                 | max. 5.5 / 18 mA                 |
| Operating temperature               | -20 °C to +60 °C                 |
| Protection class                    | IP65                             |
| Switch-on delay<br>Switch-off delay | typically 0.5 s<br>< 0.5 s       |
| Switching output                    | open collector / relay           |
| Weight                              | 0.52 / 0.59 kg                   |

All IFC series are also available with Ex-proof housings for Zone 1.

Dimensions IFC 10 / 11  
IP65



Dimensions IFC 50  
IP65



# Compact Flame Detector

## - IFR Series

### Technical Data

### IFR 10 / 11 / 50

|                       |                                  |
|-----------------------|----------------------------------|
| Sensor                | UV tube                          |
| Alignment             | radial                           |
| Spectral range        | 185 - 260 nm                     |
| Lifetime UV tube      | max. 10,000 h                    |
| Supply voltage        | 230 V AC,<br>optionally 120 V AC |
| Current consumption   | max. 5.5 / 18 mA                 |
| Operating temperature | -20 °C to +60 °C                 |
| Protection class      | IP65                             |
| Switch-on delay       | typically 0.5 s                  |
| Switch-off delay      | < 0.5 s                          |
| Switching output      | open collector / relay           |
| Weight                | 0.55 / 0.62 kg                   |



### Type

### IFC

### IFR

|        |              |              |
|--------|--------------|--------------|
| 10/230 | 6015-1104-00 | 6015-2104-00 |
| 11/230 | 6015-1114-00 | 6015-2114-00 |
| 50/230 | 6015-1204-00 | 6015-2204-00 |
| 10/120 | 6015-1103-00 | 6015-2103-00 |
| 11/120 | 6015-1113-00 | 6015-2113-00 |
| 50/120 | 6015-1203-00 | 6015-2203-00 |

### Applications

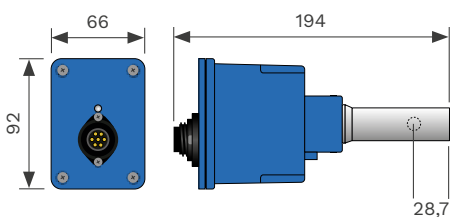
- Single gas burner
- Single oil burner

### Fuels

- Oil (LDO & HFO)
- Natural gas, Propan, Butan
- Biomass/biogas
- Synthetic fuels
- Methanol
- H<sub>2</sub>
- NH<sub>3</sub>

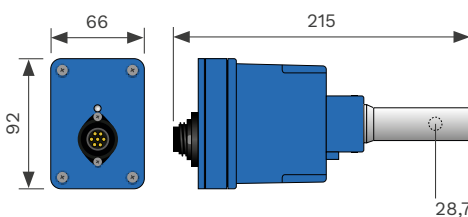
### Dimensions IFR 10 / 11

#### IP65

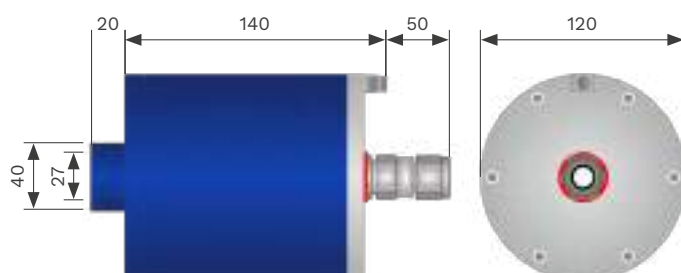


### Dimensions IFR 50

#### IP65



### IP66, ATEX Zone 1



Ex-housing

### Accessories

- Relay module RMF
- IFx cable
- Connection adapter 1/2"
- Connection adapter 1/2" with purge air connection
- UVT-COM readout unit

# Compact Flame Detector

## - KHM 20

### KHM 20

KHM 20 is available in 230 V AC, 120 V AC and 24 V DC with axial viewing. The KHM 20 is equipped with the function of the disturbance frequency cut off. On this occasion, detects the KHM 20 only real flames which mark themselves by an unstable changing frequency. DC light radiations and any steady frequency, e.g. from fluorescent lamps or other electric lights, are faded out and do not lead to a lasting flame recognition.

### Features

- Intermittent operation
- Robust IP65 housing
- Easy to install and connect
- Flame signal analyzable with KLC COM software

### Application

- Gas burner
- Oil burner

### Accessories

- Connection cable BK06 with female angle jack
- Connection adapter 1/2"
- Connection adapter 1/2" with purge air connection
- KLC COM readout unit

### Fuels

- Oil (LDO & HFO)
- Natural gas, Propan, Butan
- Biomass/biogas
- Synthetic fuels
- Naphtha
- NH<sub>3</sub>

Compact Flame Detector  
KHM 20



**The KHM 20 is a compact flame detector conceived especially for industrial single burner applications with programmable controls (i.e. PLC).**

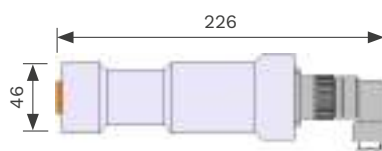
The flame signal output is a product of our patented flicker evaluation of any type flame. Field setting adjustment or commissioning are unnecessary. The KHM 20 values only the flickering of the flame being monitored. DC light radiation, any constant frequency, fluorescent lamps or background radiations from refractory are ignored. The diopter serves as mounting interface of the flame detector to the furnace chamber.

### Technical Data

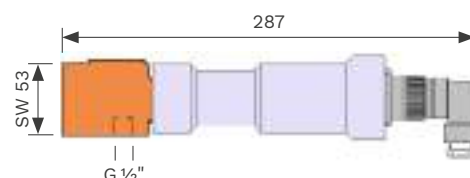
### KHM 20

|                                     |  |
|-------------------------------------|--|
| Sensor                              | Semiconductor  |
| Flame orientation                   | axial  |
| Spectral range                      | 380 - 1150 nm  |
| Supply voltage                      | 230 V AC,<br>optionally 120 V AC<br>optionally 24 V DC |
| Current consumption                 | max. 5 mA  |
| Operating temperature               | -20 °C to +60 °C                                       |
| Protection class                    | IP65   |
| Switch-on delay<br>Switch-off delay | typically 0.5 s<br>< 0.5 s                             |
| Weight                              | 0.440 kg   |
| Type                                | Material-No.   |
| KHM 20/230, Ionization              | 6011-0630-01   |
| KHM 20/120, Ionization              | 6011-0620-01   |
| KHM 20/24, Ionization               | 6011-0610-01   |
| KHM 20/230, PLC                     | 6011-0630-00   |
| KHM 20/120, PLC                     | 6011-0620-00   |
| KHM 20/24, PLC                      | 6011-0610-00   |

### Dimensions with angle plug IP65



### Dimensions with purge air inlet 1/2" (1/4") IP65



# Compact Flame Detector - IFx 400 Series

**Rugged compact flame detector for harsh industrial applications where continuous operation is required.**

The IFC/IFR 400 is a compact flame detector for continuous operation that was specially developed for industrial combustion furnaces. It offers either a galvanically isolated changeover contact as a safety-relevant criterion for a PLC control or a simulation for the ionisation output of a burner control unit, so that a wide variety of applications can be covered in a price-conscious manner.

Flame detection is realised by means of a 3-channel evaluation of the flame signal. Flame detection is signalled by an LED. The data within the flame detector can also be transmitted to the BSTcom software via this. In particular, the graphical and numerical representation of the flame signal is thus excellently possible and is later useable for analysis through the logger function.



**Continuous operation  
3-channel flame evaluation**

## Technical Data

## IFC 400 / IFR 400

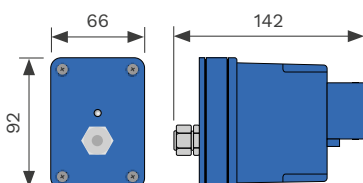
|                                     |  |
|-------------------------------------|--|
| Sensor                              | Semiconductor  |
| Flame orientation                   | axial / radial   |
| Spectral range                      | 350 - 1100 nm  |
| Supply voltage                      | 230 V AC,<br>optionally 120 V AC   |
| Power consumption                   | max. 50 mA / 5 mA  |
| Operating temperature               | -20 °C to +70 °C   |
| Protection class                    | IP65   |
| Switch-on delay<br>Switch-off delay | < 1 s<br>< 1 s   |
| Relay output                        | Floating, potential-free<br>change-over contact<br>max. switching current 0.5 A<br>max. switching power 125 W<br>max. switching voltage 250 V AC |
| Weight                              | 0.7 kg   |

## Overview Material Numbers

| Type   | Material-No. |
|--|--------------|
| IFC 400/230 with 1.5 m cable                 | 6015-0050-01 |
| IFC 400/230 for ionization, with 1.5 m cable | 6015-0050-04 |
| IFR 400/230 with 1.5 m cable                 | 6015-0060-01 |
| IFR 400/230 for ionization, with 1.5 m cable | 6015-0060-04 |

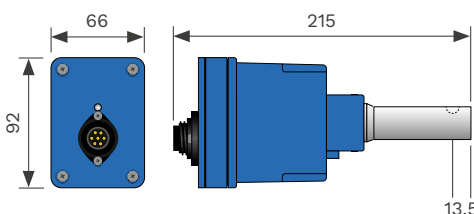
## Dimensions IFC 400

IP65



## Dimensions IFR 400

IP65



## Features

- Continuous operation
- Entry-level model
- Cost-optimised for OEMs
- 3-channel flame evaluation
- Various output signal
- Robust metal housing

## Fuels

- Oil (LDO & HFO)
- Natural gas, Propan, Butan
- Biomass/biogas
- Synthetic fuels
- Methanol
- H<sub>2</sub>
- NH<sub>3</sub>

## Accessories

- Relay module RMF
- Connection adapter 1/2"
- Connection adapter 1/2" with purge air connection
- IFx-COM readout unit

# Accessories



## KLC Flanges

Serves for the admission, connection and adjustment of the flame detectors KLC available in 7 mm and 13 mm.

| Type       | Lenght | Material-No. |
|------------|--------|--------------|
| KLC flange | 7 mm   | 1550-4220-07 |
| KLC flange | 13 mm  | 1550-4220-13 |

## Angle Adapter KLC

With the optionally available corner adaptor the radial adjustment of the KLC 20 is carried out by means of an optimally formed out reflecting surface to the flame axis. The corner adaptor substitutes at the same time for the connection flange KLC.



| Type              | Mirror          | Material-No. |
|-------------------|-----------------|--------------|
| Angle adapter KLC |                 | 1550-4225-10 |
| Angle adapter KLC | Stainless steel | 1550-4225-20 |

## Adapter ADP

The adaptor ADP enables to be able to mount the flame guards KLC 2x with additional axial adjustment directly to a fire space opening. A quartz glass prevents the escape of gases from the combustion chamber.



| Type                            | Material-No. |
|---------------------------------|--------------|
| Adapter ADP 10-UV, R 1/2"       | 6580-2030-00 |
| Adapter ADP 20-UV, NPSM 1/2"-14 | 6580-2031-00 |

## Purge air adapter for IFC / KHM

Adapter 1" with 1/2" or with 1/4" purge air connector.



| Type                                     | Material-No. |
|--|--------------|
| Adapter 1" with 1/2"-purge air connector | 1830-0161-12 |
| Adapter 1" with 1/4"-purge air connector | 1830-0161-14 |





**Cable IFx**



**Cable KLC**

**Type**

**Material-No.**

|                                     |            |
|-------------------------------------|------------|
| Connection cable KLC, length XX     | On request |
| Connection cable IFC/IFR, length XX | On request |

## Connection Cable

Consist of angle plug and a cable with stripped and crimped cable ends. The cable length is customized.



**Type**

**Material-No.**

|                         |              |
|-------------------------|--------------|
| Diagnostic tool KLC-COM | 6040-4830-00 |
| Diagnostic tool UVT-COM | 6040-4832-00 |
| Diagnostic tool IFX-COM | 6040-4833-00 |

## Diagnostic tool

USB diagnostic tools are available for the various flame detector series, especially for the development and service departments, in order to read out and log all relevant measurement data and information from the respective flame detector series via the BSTcom software. In particular, the graphical and numerical representation of the flame signal is thus excellently possible and is later useable for analysis through the logger function. The KLCcom is used for the KLC2x and KHM20 series; the UVTcom for the KLC1x, IFx1x and 5x and the IFxcom for the IFx400 series.



**Type**

**Material-No.**

|             |              |
|-------------|--------------|
| RMF 1/230   | 6040-0001-00 |
| RMF 1/120   | 6040-0001-01 |
| RMF 1/24 DC | 6040-0001-20 |

## RMF

The relay module flame detector serves for moving of the switching output signal of the series KLC, IFC 10/11 efficient relay contacts free of potential. With it these flame detectors can be used in PLC or round controls. It indicates his working condition and the status of the flame relay by means of LEDs on the front and secures the tension care of the flame detector electrically. Implementation with special functions can be also provided here.



# Flamონitec<sup>®</sup>

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Your sales partner



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**BFI Automation Mindermann GmbH**

Ruegenstr. 7

42579 Heiligenhaus . Germany

T +49 2056 98946-0

[info@flamონitec-bfi.com](mailto:info@flamონitec-bfi.com)

[www.flamონitec.com](http://www.flamონitec.com)