Flamonitec
BFI AUTOMATION

Presentation

BFI Automation Mindermann GmbH

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Content

Flamonitec
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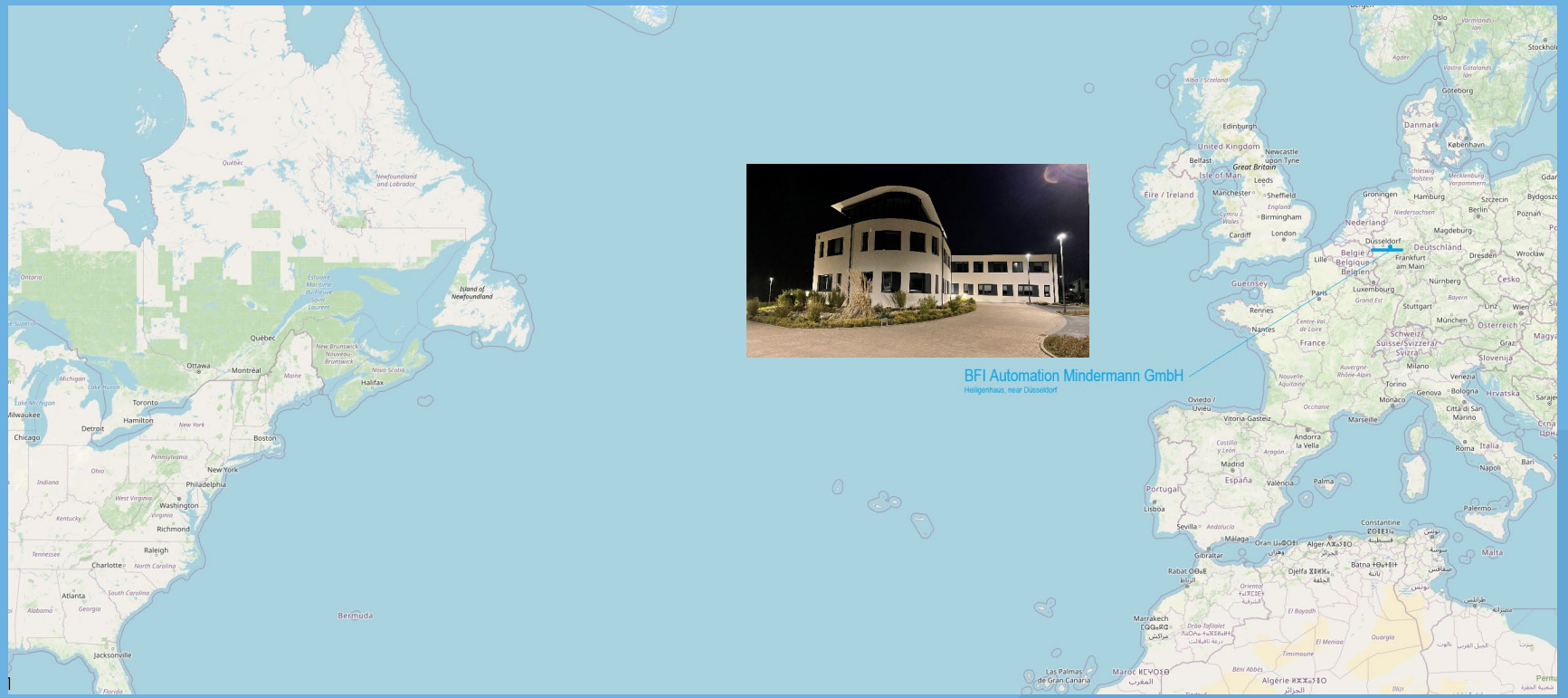
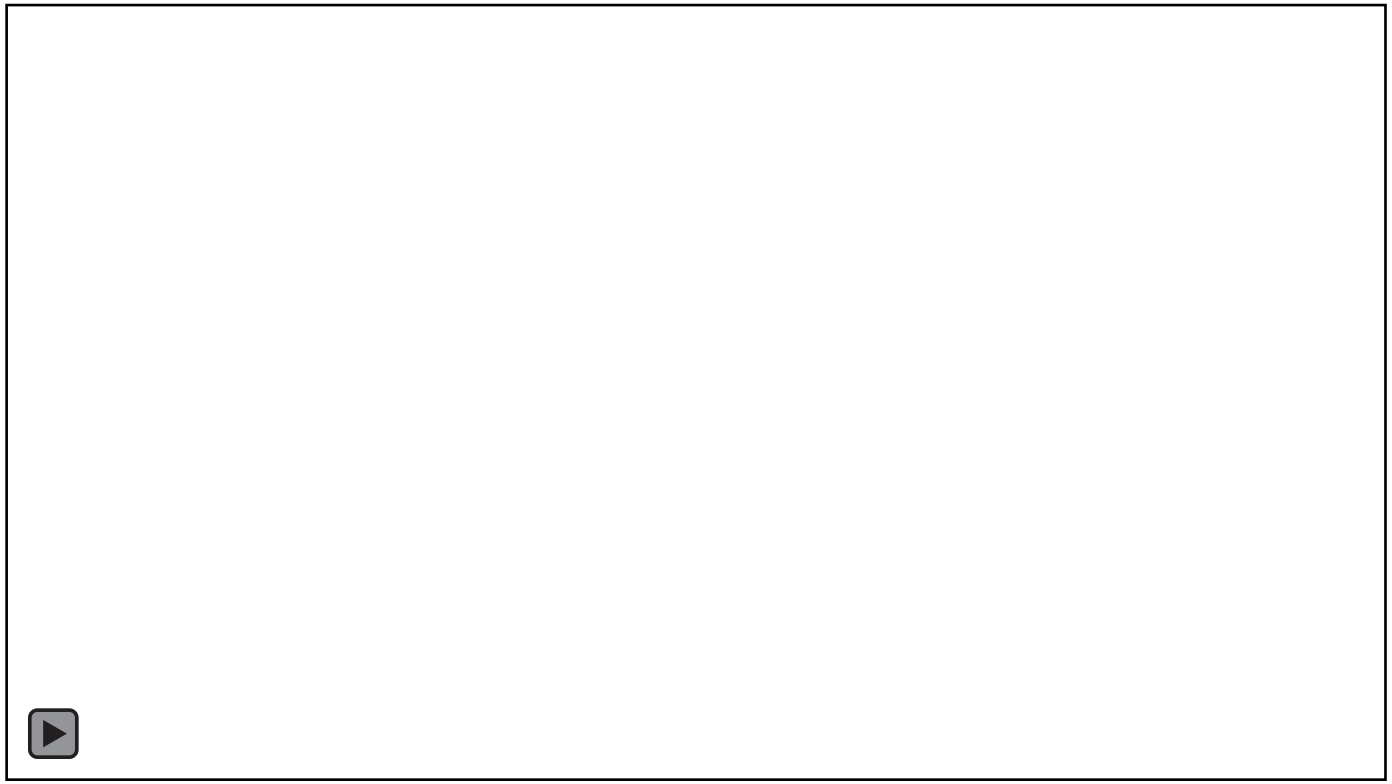
Location

Heiligenhaus, Northrhein-Westfalia, Germany



flamonitec.com

Flame **Moni**toring **Tec**hnologies



Flamonitec® is the brand name under which we offer the world's most comprehensive range of flame monitoring systems

Company history

1973	**Foundation of BFI Automation**
1990	Development of the first compact flame detector for continuous operation
1994	Development of the first compact flame detector for continuous operation
2013	First network solution in flame monitoring with TÜV-approved remote parameterization capability
2017	Move to the new company building
2021	Rebranding of the complete product range to Flamonitec®
2023	BFI Automation merges BST Solutions, whose business is the sale of flame monitoring systems for original equipment manufacturers of residential heating and industrial combustion equipment

Why Flamonitec

what the right choice of flame monitoring is important for

Many factors influence the selection of the suitable flame monitoring system

- **Fuel**
- **Burner design**
- **combustion chamber conditions**
- **Cost**
- **System integration**

Fields of Application

Power Stations

Gas Turbine Technology

Residential & Industrial Boiler

Pyro Technics / Fire Trainer

Refinery Applications

Waste Incineration

Food Industry

Synthetic Fuels

Product Range for residential and industrial Combustion series KLC/KHM/IF

UV-flame detectors KLC 1

Flicker flame detectors KLC 2

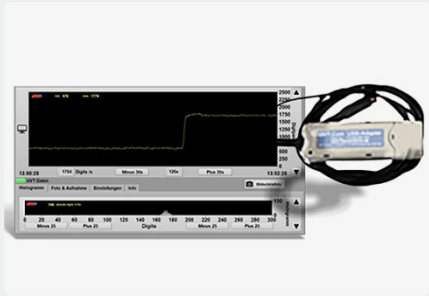
Industrieal flame detector KHM

Robust flame detectors IFC

Robust flame detectors IFR

Customised accessories

Other electronical devices



Service and development tools

Current Product Range intermittent Flame detectors

Type	Description	Application
KLC	KLC 10 KLC 11 KLC 20	Gas Burner, Dual Fuel Burner Gas Burner; Dual Fuel Burner Blue burning Burner (Oil + Gas)
IF...	IFC/IFR 10 IFC/IFR 11 IFC/IFR 50	Gas Burner; Dual Fuel Burner Gas Burner; Dual Fuel Burner Gas Burner; Dual Fuel Burner
KHM	KHM 20	Oil- + Gas Burner

UV - Flame Detector KLC 1x

The advantags of the KLC 1 at a glance

- compact UV-flame detector for oil and gas fired application with non continuous operation. Specially for combustion systems with low flicker contents in the flame
- no detection of hot refractories and mixing parts
- status indication via LED
- KLC 11 designed for control boxes without special UV-tube amplifier and includes an internal safety check. The flame detector can connected to ionization or LDR terminal.
- CE- and UL-approved

Flame Detector KLC 2x

The advantags of the KLC 2 at a glance

- compact flame detector for all kinds of oil- gasflames, specially for draft burners with blue burning combustion systems
- patent evaluation of the flame flicker frequency with microcontroller, no additional adjustments necessary
- The LED indiaction is used additionally as an optical Interface to read out all relevant parameters from the flame detector
- CE- and UL-approved

Flame Detector KHM 20

For industrial applications

- Compact flame monoring system for gas and dual fuel burner for non continuous operation
- for use with PLC controls or burner control boxes
- separated flange connection to the combustion chamber
- wide range of accessories
- metal housing protection IP 65

Industrial-Flame Monitoring Device IFC/IFR

- IFC/IFR 11 – including UV-cell check, open collector output
- IFC/IFR 50 – including UV-cell check and relais output for turnaround controls
- IFC/IFR 400- Semiconductor, continuous operation, relais or ionization output

UV-Flame Detector Series IFC11/50/400

designed for furnaces

- UV-compact flame monitoring device for gas fired application or dual fuel systems
- IFC11 for burner controls
- IFC50 for PLCs
- metal housing IP 65
- No detection of hot refractories and mixing parts
- Status Indication via LED
- Wide range of accessories

UV-Flame Detector IFR11/50/400

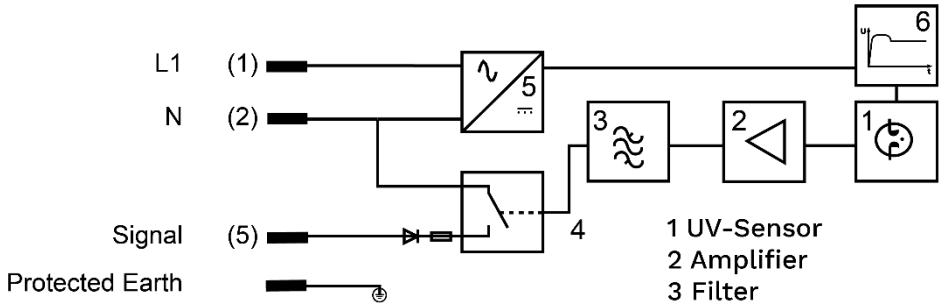
designed for draft burners

- UV-compact flame monitoring device for gas fired application or dual fuel systems
- radial view for draft burners
- metal housing IP 65
- No detection of hot refractories and mixing parts
- Status Indication via LED

Output signal KLC and IFx 11

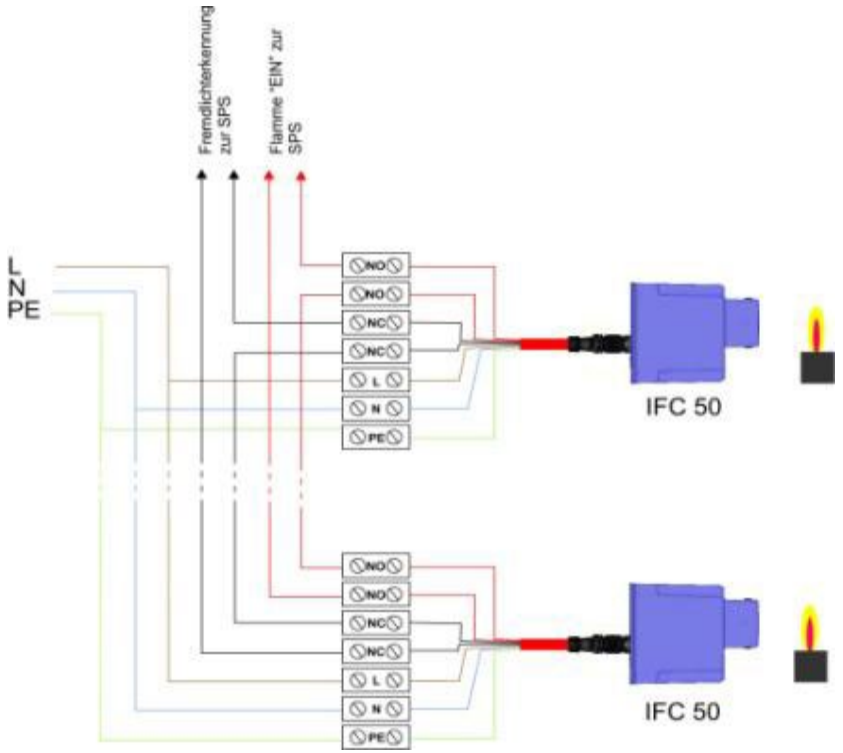
Open collector

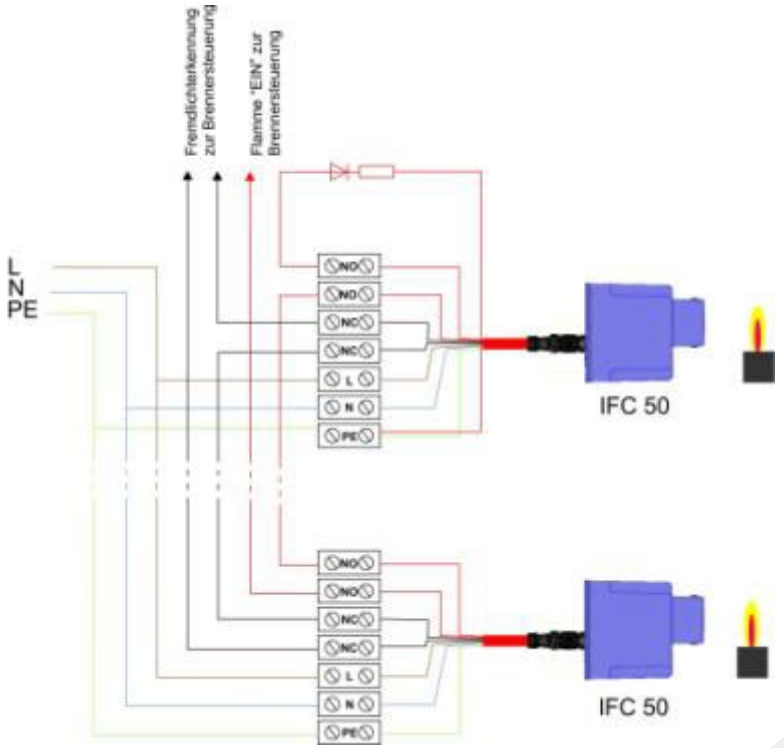
For example, in gas burner applications, if the flame rod is compromised by a bad ground or aggressive ambience, which can isolate the rod and generate a burner failure, a flame detector can easily replace the flame rod. The flame detector simulates an ionisation signal to the burner control. Adjustments at the flame detector are not necessary, reducing potential for error.



Industrial-Flame Monitoring Device IFC/IFR 50

Multiple flame detectors in one signal chain





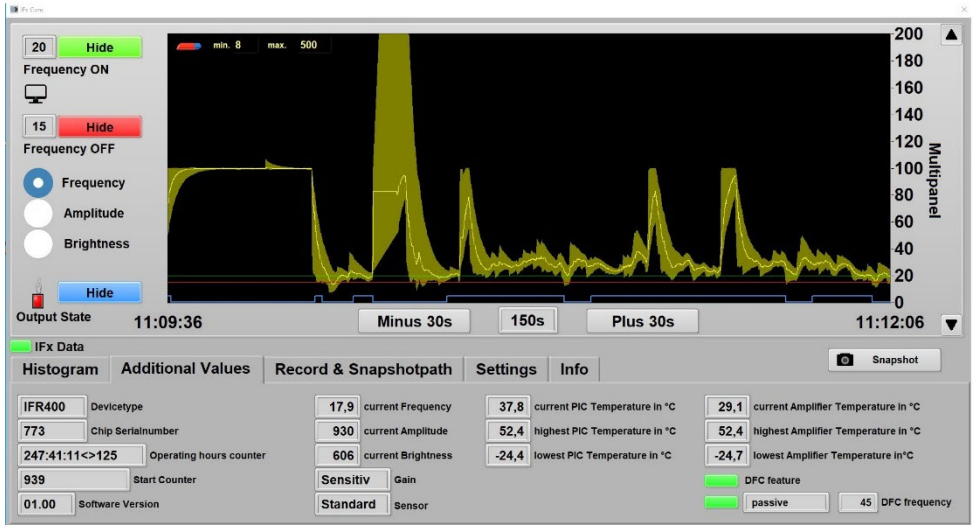
Industrial-Flame Detector IFC/IFR 400

- continuous operation
- cost-effective monitoring for standard applications
- output signal optionally potential-free relay contacts or ionization simulation
- Various designs for optimum alignment to the flame - IFC axial and IFR radial
- no adjustment necessary

Software BSTcom

One analytic software for all devices

- suitable for reading out the flame monitors KLC10, KLC20, KHM and Ifx, each with respective USB adapter
- visualization of the flame signals
- integrated data logger
- live note function
- snapshot function



New Projects for intermittent operation

Flame monitoring for hydrogen and synthetic fuels

Flame monitoring of hydrogen and biogases

Flame monitoring of climate-neutral liquid fuel

Product Range continuous operation series 3000/CFC and accessories

Series 3000

Amplifiers – System 3000

Compact Flame Controller CFC

Software for CFC x000

Network Solution for CFC x000

Fiber Optic Technologies

Ex proofed devices

Accessories

Flame Scanners – System 3000

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_2S-plants (Claus units)
- Duct burners
- Rotary kiln plants
- Fluidized bed firings
- Cracker
- High pressure combustions
- Waste incinerating plants/grid firings
- Residuals combustion
- Low NOx-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 seperate adjustable senstitivity ranges for UV and IR
Electrical connection	Zone 2 housings with dustproof plug-connector (optional with cable gland / conduit). 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.

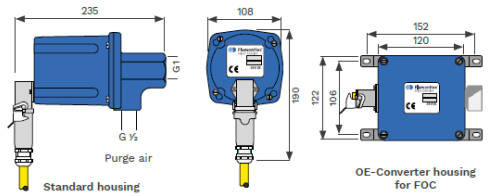
Applications

Flame Scanner	Spectral Range	Gas	Oil	Coal	H_2S
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*	■	■	■	■

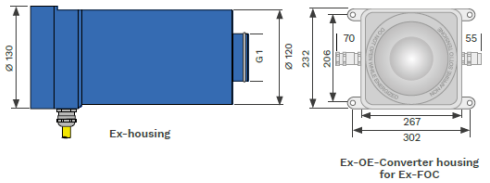
*up to 7000 nm with special glass available ■ = especially qualified ■ = qualified

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_2S
- H_2
- NH_3

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_2S-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_x-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 1 auxiliary change-over-contact (3001/3001D/3001S/ 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) 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) selectable 200 to 650 ms (3016) selectable 0,5 to 6 s (3017)
Certificates	TUEV, CSA, UL, EN298, SIL 2, SIL 3 for 3001, 3001S/ 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)

Back panel F | Back panel R

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

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_2S-plants (Claus units)
- Duct burners
- Rotary kiln plants
- Fluidized bed firings
- Cracker
- High pressure combustions
- Waste incinerating plants/grid firings
- Residuals combustion
- Low NO_x-applications
- Decarbonized combustions (e.g. H2/NH3)

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 Version UV / UV1	- 40 °C to + 85 °C (- 20 °C to + 70 °C with CSA & IECEx) - 55 °C to + 85 °C
High temperature application	up to 600 °C with fiber optic technology (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, adjustable via software
Electrical connection	Zone 2 housings with dustproof plug-connector (optional with cable gland/conduit). 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, UL, IECEx
Interface	infrared (for software CFC Com1) 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

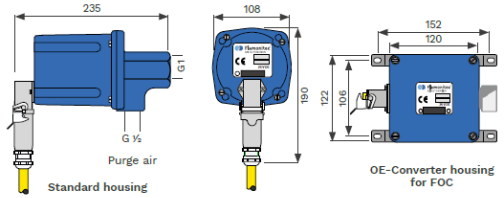
Applications

CFC Type	Spectral Range	Spectral Sensitivity	Gas	Oil	Coal	H_2S	Bio	H_2
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 (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	■	■	■			

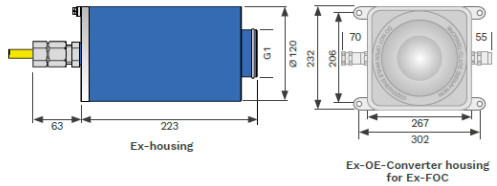
*not available for CFC 1000 ■ = especially qualified ■ = qualified

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_2S
- H_2
- NH_3

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

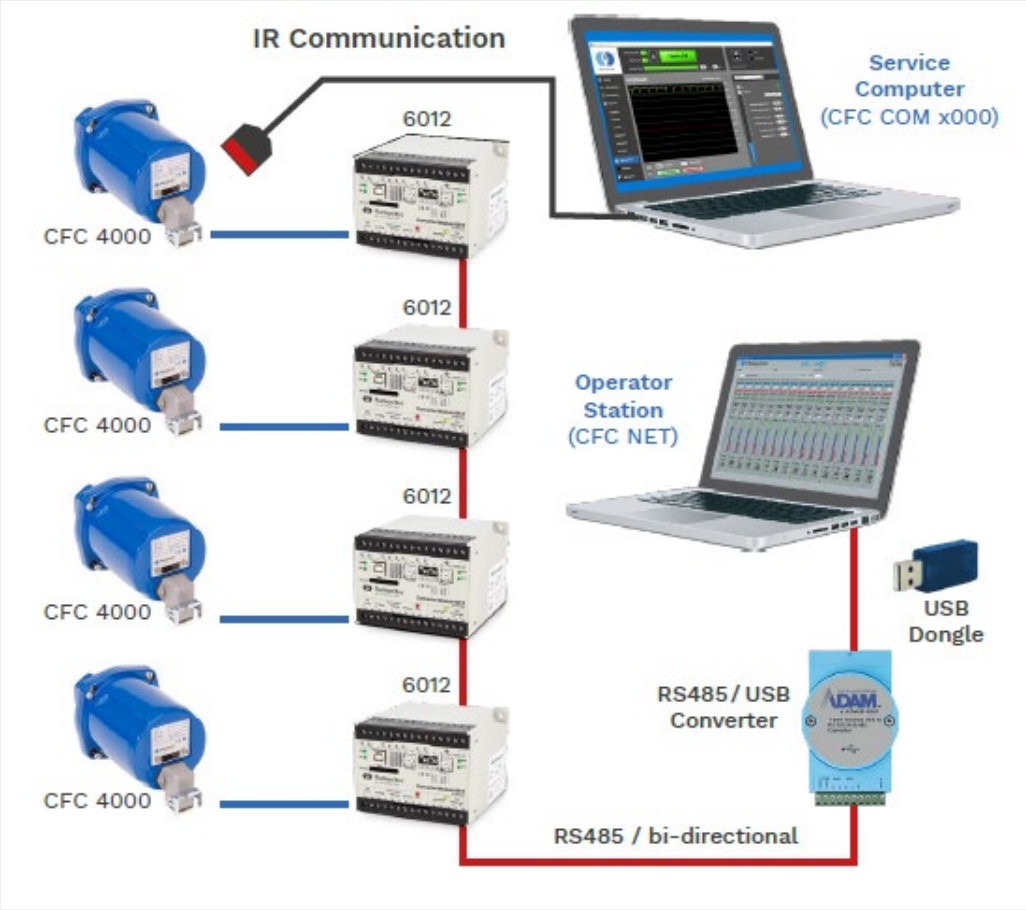
CFC 4000/6012 with bi-directional data communication:

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

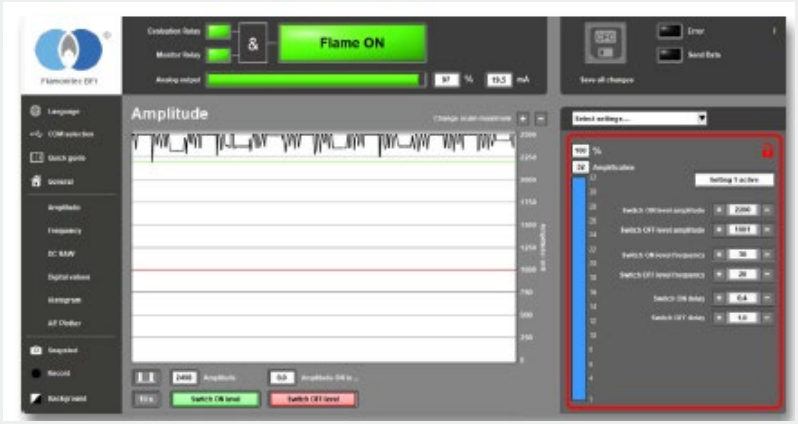
SERVICE ENGINEER, CFC NET & USB DONGLE
- Remote configuration of CFC via RS485 from control room
- Parameter management
- Flame analysis
- Signal recording



Software for CFC x000

Features

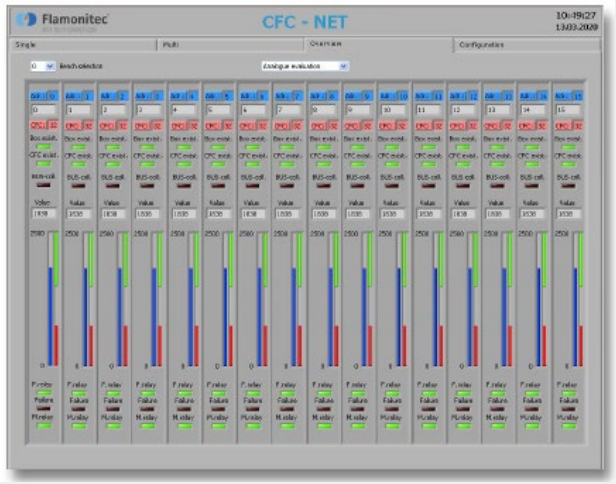
- Pure flame radiation signals in real-time and with analysing diagrams
- Visualization of output signals
- Switch ON/OFF thresholds
- Switch ON/OFF times
- Data logger
- Storage and uploading of CFC settings
- Multilingual
- Sensitivity setting
- Failure memory



Features

- 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

CFC - NET



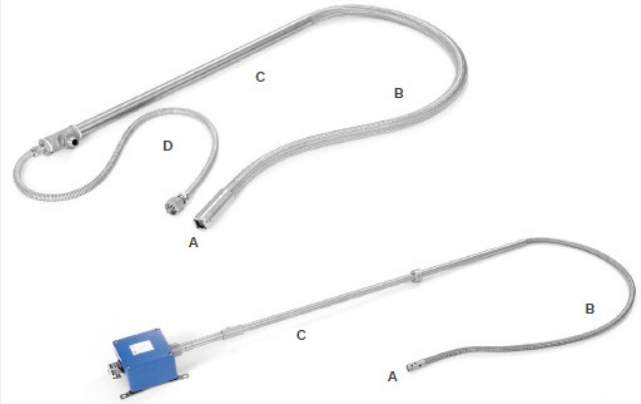
Fiber Optic Technologies

Fiber Optic System

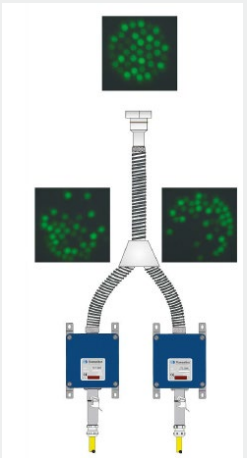
The system is consisting of a Sensor head SKL (lens unit) and a Fiber Optic Cable (FOC). This system enables the mounting of the flame monitoring system optics on locations which are not easy to reach or having high temperatures or strong vibrations. We differentiate our fiber optic systems by the spectral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

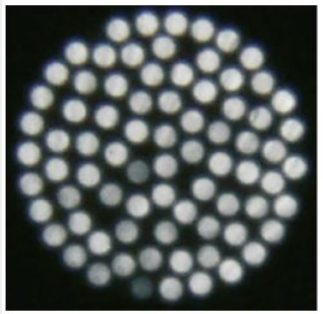
FOC & SKL

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

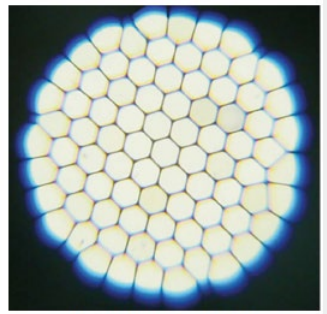


Customized configuration of single lengths A to D.





Fiber bundle Standard-FOC and HT-FOC

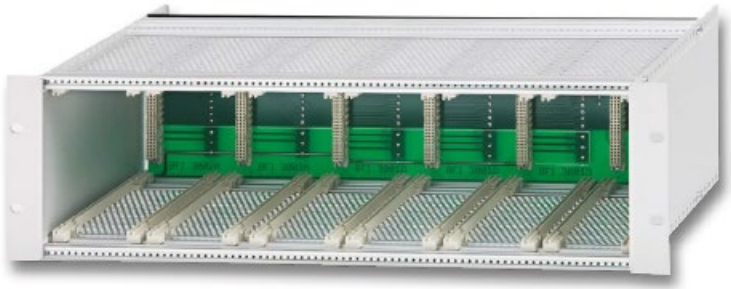


Fiber bundle Super-HT-FOC

Housings and Racks

19"- built-in rack

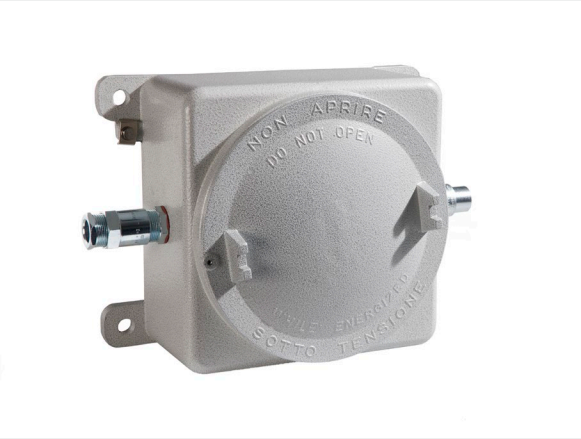
For the series 3000 we provide 19"-built-in-racks from one to six plug-in units (14HP). The connection can be easily done via screw terminals from the rearside. Alternative we provide standard connectors in accordance with international standards. Type of protection is IP20.



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

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.



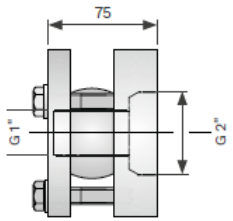
Accessories

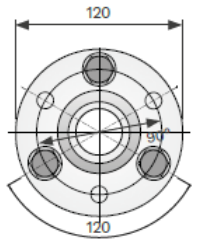
Pressure Barrier

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 ± 15° in all directions. The swivel mount is available with special materials (stainless steel, hastelloy, etc.) and NPT threads.



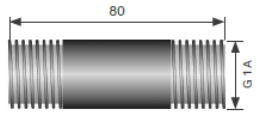


Technical Data

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

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

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 siginficant 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.

Customized cable

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)

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.

Thank you for your attention

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