

Quick Reference for Endusers

## F200K Compact Flame Scanner





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# 1 General Information

## 1 General Information

### 1.1 Validity of these Instructions

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The devices correspond to the following directives and standards:

- DIN EN 230: 2005
- DIN EN 298: 2012
- DIN EN 60730-2-5: 2011
- DIN EN 746-2: 2011
- 2014/68/EU Pressure Equipment Directive
- 2009/142/EG Gas Appliance Directive
- 2014/30/EU Electromagnetic Compatibility Directive
- 2014/35/EU Low Voltage Directive
- DIN EN 61508: 2011, part 2 (requirements SIL 3) only Ex-II and Ex
- DIN EN ISO 9001:2008 Quality Management Systems
- ISO/IEC 80079-34:2011 Potentially explosive areas - Quality Management System (QAR)
- 2011/65/EU (RoHS2 Directive)

**Product-Identification-Number: CE-0085 BO 0005**

### 1.2 Purpose

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In single-burner and multiple-burner furnaces, the flame scanner performs a high-safety monitoring of the burner flame. When the flame goes out, the safe control state 'Flame ' is reached.

The flame scanner is mainly used in large-scale power plants, thermal power stations and chemical plants as well as for monitoring furnaces which are operated from.

- oil
- gas
- bio-mass
- dust coal
- chemicals and other waste products

## 2 Safety

### 2.1 For Your Safety

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The following symbols are used in this document to draw the user's attention to important safety information. They are located at points where the information is required. It is essential that the safety information is observed and followed, and that applies particularly to the warnings.

#### **DANGER!**

This draws the user's attention to imminent danger. If it is not avoided, it will result in death or very serious injury. The plant including its surroundings could be damaged.

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#### **WARNING!**

This draws the user's attention to the possibility of imminent danger. If it is not avoided, it may result in death or very serious injury. The plant including its surroundings could be damaged.

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#### **CAUTION!**

This draws the user's attention to the possibility of imminent danger. If it is not avoided, it may result in minor injuries. The plant including its surroundings could be damaged.

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#### **NOTICE**

This draws the user's attention to important additional information about the system or system components and offers further tips.

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The safety information described above is incorporated into the instructions.

Thus, the operator is requested to:

- 1 Comply with the accident prevention regulations whenever work is being carried out.
- 2 Do everything possible within his control to prevent personal injury and damage to property.

### 2.2 How to Use the Information

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The necessary data for correct mounting, wiring, installation, operation and maintenance of the flame scanner are to be taken from the relevant instructions for the burner or combustion in the official language of the country.

## **3 Product Description**

### **3 Product Description**

#### **3.1 Design**

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The compact flame scanner is composed of a cylindrical casing comprising an axial light incidence aperture, a processing status indicator at the rear of the unit and operational controls which can be accessed by removing the cover.

The device is connected through an integrated standard plug and using the a connection cable required for this with coupler.

## 4 Technical Data

### 4 Technical Data

#### 4.1 Characteristics

The compact flame scanner is available in 2 basic versions, as well as an ex-proof enclosure type with several spectral varieties (IR / UV).

Design type	F200K1	F200K2
Sensitivity range	1 sensitivity range 6 levels	2 sensitivity range increased sensitivity in range II, can externally be switched over, 6 levels each
Frequency range	10 ...190 Hz	10/20/30 ... 190 Hz can be adjusted on the device

#### NOTICE

Signals lying in the mains frequency range or its multiples are suppressed for 50 Hz mains generally. For 60 Hz application, please indicate separately in your order form. The related stop ranges are changed in factory.

LAMTEC offers a version without mains frequency suppression for special applications.

This design requires additional measures during installation.

Please contact LAMTEC Support for further information

The compact flame scanner is accordingly marked by a rating plate.

#### 4.2 Operating conditions

##### Input parameters

##### Auxiliary energy, input

- Supply voltage 24 V DC  $\pm$  20%, protection class III
- Power consumption  $\leq$  4 W,  $\leq$  380 mA (100 ms peak)
- inrush current 28,8 V  $\leq$  750 mA (100 ms peak)

##### spectral radiation range and sight angle

- F200K1 UV-1 and F200K2 UV-1(Ex) 260 ... 400 nm ca. 8°
- F200K1 UV-2 and F200K2 UV-2(Ex) 210 ... 380 nm ca. 8°
- F200K1 UV-3 and F200K2 UV-3(Ex) 210 ... 380 nm ca. 8°
- F200K1 IR-2 and F200K2 IR-2(Ex) 850 ... 1200 nm ca. 50°
- F200K1 IR-1 and F200K2 IR-1(Ex) 1200 ... 2800 nm ca. 60°

Response sensitivity 25 mV AC

Range remote switch-over (only F200K2) floating-contact, can be controlled by means of the supply voltage

- Control current ca. 10 mA

## 4 Technical Data

### Output parameters

Output contact	Change-over contact (floating)
- allowable switching voltage	max. 48 V DC, protection class II (250 V AC by main supply FN 20) min. 6 V AC/DC
- allowable switching current	max. 0,5 A bei < 60 °C 0,4 A bei < 75 °C min. 1 mA, at a limit load of 50 mA
- Switching capacity	min. 0,1 W max. 30 W
- Internal fuses	500 mA slow IEC and/or 750 mA slow UL
- Safety time 'Operation'	$t_{Voff} \leq 1$ s and/or. $\leq 2 \dots 5$ s, factory settings
- Start-up delay	$t_{Von} \approx$ FFDT

### NOTICE

The output contacts of the flame scanner have no radio interference suppression. The user is required to take the appropriate radio interference suppression measures on the basis of the overall installation design.

In order to ensure the required safety, carry out the installation circuitry in such a way as to avoid shorting-out of the contacts by defective components of the interference suppression unit.

### Measuring output for intensity

- Output continuous current	4 (0) ... 20 mA, there is no insulation of potential towards the supply voltage
- Maximum working resistance	220 $\Omega$
- Floating DC voltage	6,6 V
- Basic error	$\pm 2$ %

### Dynamic characteristics

Self-monitoring cycle	$t_{TAKT}$ ca. 3,0 s for safety time $t_{Voff} \leq 1$ s $t_{TAKT}$ ca. 7,0 s for safety time $t_{Voff} \leq 3$ s
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### Cable length LiYCY

Maximum extension above 3 m/3,28 yd connection cable for supply voltage 20.5V

cross-section 0,5 mm <sup>2</sup>	→ Extension to 50 m/54 yd
cross-section 1,0 mm <sup>2</sup>	→ Extension to 100 m/109 yd
cross-section 2,5 mm <sup>2</sup>	→ Extension to 250 m/273 yd

Different cable lengths e.g.

cross-section 0,5 mm <sup>2</sup>	→ lengths 150 m/164 yd
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When calculating wiring sizes for extended cable lead lengths factors such as volt drop must be taken into account such that the supply voltage does not fall below the device's lower operating threshold.

$19,2$  V +  $0,38$  A  $\times$  2  $\times$  150 m/164 yd  $\times$  0,035  $\Omega$ /mm = 23,3 V

The supply voltage must be > 23.2 V.



### Technische Belastbarkeit

Operating mode	DB - continuous operation Intermittent operation 72 h operating according TRD604
Creepage distances and clearances	IEC 60730-1:2010, ÜK III, VG 2
Interference susceptibility	IEC 60730-1:2010, EN 61000-4
Emitted interference	DIN EN 55011/A1, class B

## 5 Instructions for Maintenance

# 5 Instructions for Maintenance

## 5.1 Display and Operational Controls

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Represented in chapter 6.1 *Layout of the Operational Controls*.

### 5.1.1 Sensitivity Range - Indication

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This display type only exists in the F200K2 execution type. The display shows the sensitivity ranges I or II activated by external selection. The range I (normal sensitivity) is mainly used for high flame intensities, whilst range II (higher sensitivity) is used for weaker flame intensities.

### 5.1.2 Operating State - Indication

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The red LED shows the 'Flame OUT' operating state. Whilst indicating 'Flame IN' the green LED pulses in intensity to indicate the self-monitoring operation of the system. The pulse frequency is the same as the self-monitoring cycle time (1.5 or 3.0 seconds). If the green LED does not pulse then this could be symptomatic of electromagnetic interference (EMC) or a defect of the compact flame scanner. (refer to chapters from 5.2.4 *Fault on Flame Detection* to chapter 5.2.6 *Faults During Operation* and chapter 5.3 *Troubleshooting*).

## 5.2 Commissioning

### 5.2.1 General Information

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#### 5.2.1.1 'Flame Out' State

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After switching on the power supply, the flame scanner is ready for operation after approximately 5 seconds. The following display has to be shown:

- |                             |  |
|-----------------------------|--|
| - Display 'Flame out'       | 'Red' LED lights up  |
| - Sensitivity range I or II | 'Yellow' LED lights depending on external pre-selection f. range I or II (for F200K2 only) |

#### 5.2.1.2 'Flame In' State

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To check the monitoring parameters, install the compact flame scanner in the specified mounting place before starting the operation of the furnace. If the flame burns naturally, the display should change as follows:

- |             |   |
|-------------|---|
| 'Red' LED   | Goes out  |
| 'Green' LED | Lights up, changing its radiation intensity antivalently to the cycle rhythm of the self-monitoring system. Intensity indicator (lighting point) should reach 100%. |

## 5 Instructions for Maintenance

### 5.2.1.3 Operating mode switchover

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#### Two preselectable operating modes

The compact flame scanner F200K offers users two operating modes for selection. This makes it possible to select two different settings in the range of gain levels. The individual operating modes can be switched during operation.

### 5.2.2 Preparations

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#### 5.2.2.1 Checking the Compact Flame Scanner

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The flame scanner can be checked for proper functionality without a flame being present.

- 1 Carry out the complete electrical installation of the flame scanner and connect it to the supply voltage. A LAMTEC test emitter of the FFP30 type (IR + UV) can be used as an auxiliary means for flame simulation.
- 2 Simulation of flame radiation in front of the flame scanner's viewing port. This can be achieved using a lighter or any other type of a modulated-light source (do not use the mains frequency) having a sufficiently high intensity. For example the light from a lamp can be modulated by moving splayed fingers to and in front of the bulb.

The flame scanner will switch on its output contacts if the flame signal is simulated for a sufficient period of time. This is indicated by the extinction of the red LED and the pulsating light of the green LED. The 6-level intensity indicator illuminates.

If no flame signal is indicated despite apparent correct functionality then check the output contact (s. Kapitel 5.3 *Troubleshooting*)

#### 5.2.2.2 Optics

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There are no special requirements for locking discs or similar components when using **IR-flame scanners**. Small accumulations of dirt due to dust and similar materials are generally not critical for flame detection.

In **UV-flame scanners**, the requirements for locking discs are more critical. Ensure that materials, such as quartz, that allow UV light to pass through freely are used. These materials are used in the LAMTEC UV adjustable holding devices (FH30, FV30, FH40 and FV40) Small accumulations of dust, water and other contaminants are much more likely to affect the performance of flame detection than when using an IR scanner.



#### **WARNING!**

When using an F200K without mains frequency suppression, it must be ensured that it is protected against the detection of mains frequency light. The mounting of the sight opening on the burner must meet the requirements of a tool mounting. Unintentional loosening of the F200K must be prevented.

Advice on this is available from LAMTEC support.

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## 5 Instructions for Maintenance

### 5.2.3 Checking the Flame Shut-down on Fault

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Simulate a flame rupture or flame extinction by shunting off the fuel supply to the burner to be monitored by the flame scanner. Check that the signal for shutting-off the safety valve is triggered off within the period of  $T_S < 1$  s (on safety period 'Operation' at  $t_{vOff} = 1$  s) after extinction of the flame.

'Red' LED	lights
'Green' LED	dark

For the IR compact flame scanners of the F200K1(2) IR-1 and/or F200K1(2) IR-2 types, take into account the radiation effects characteristic of the combustion chamber. Consequently, switch-off tests should be carried out when the boiler has reached operating temperature. In particular, make sure that the sensitivity of the compact flame scanner is increased only to such a value required to safely and reliably monitor the flame throughout the operating range of the burner.

### 5.2.4 Fault on Flame Detection

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Check this function according to chapter 5.2.2 *Preparations* -5.2.2.1 *Checking the Compact Flame Scanner*.

#### 5.2.4.1 1. Interference

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Generally, interference becomes apparent by the fact that the intensity indicator of the device may indicate 100 %, but the green LED ('Flame in') does not light up. Or, the green LED lights up for a moment, but then it does not change its intensity according to the cycle rhythm and goes out again. This is a cycle synchronisation fault (signal in both evaluation channel present at the same time). This may chiefly be due to the interference emission of the ignition transformer during ignition.

- Check the shielding and FPE for proper connection to the F200K
- Carry out a proper grounding of the ignition transformer
- Check the cables for laying and if required untangle / separate them spatially

#### 5.2.4.2 2. Excessive Temperatures

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Make sure that the maximum allowable ambient temperature of 60 °C is not exceeded at the installation site. In case where the temperature is expected to exceed the limit, take appropriate cooling measures (e.g. cooling air enclosure FS 50, FS 51 or FS 56).

Make sure that the flame scanner casing does not heat up beyond this temperature value due to the impact of the heat radiated by the boiler. Overheating will result in a sensitivity loss in the first line, or will cause damage to the sensor elements and with it may result in a total failure of the system.

## 5 Instructions for Maintenance

### 5.2.5 Faults During Ignition

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Faults occurring during ignition may have several causes.

- 1 In case of additionally monitoring of pilot flame and main flame, the pilot flame may not sufficiently be detected.
  - Check the pilot flame for stable operation
- 2 Interference  
Refer to chapter 5.2.4 *Fault on Flame Detection*)
- 3 Defect in the device.

### 5.2.6 Faults During Operation

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Faults occurring during operation may have 3 causes.

- 1 The main flame may not sufficiently be detected.
  - Check the main flame for stable operation - provide for visibility throughout the operating range
- 2 Interference
- 3 Defect in the device.

## 5 Instructions for Maintenance

### 5.3 Troubleshooting

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#### on apparently immaculate functioning according to the indicator elements

- 1 Check the output contact fuse and the contact
  - Disconnect the flame scanner from the supply voltage
  - Check the normally closed output contact at the 1st clamping point behind the flame scanner between the brown (BR) and the white (WH) connection wire (avoid low resistance continuity check - fuse 500 mA)
  - Connect the flame scanner to the supply voltage
  - Check with simulated flame between the brown (BR) and the green (GN) connection wire
- 2 Check the supply voltage
  - Connect the flame scanner to the supply voltage
  - Check the supply voltage at the 1st clamping point behind the flame scanner between the red and the blue connection wire for compliance with the voltage limits (in particular the lower limit)
  - Repeat test with simulated flame

### 5.4 Maintenance

#### 5.4.1 General Information

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Provisions shall be made to ensure that the light entry port of the flame sensor and the viewing port on the furnace, where the sensor is fitted, are regularly cleaned, i.e. at regular intervals, which depend on the operating conditions of the furnace. The compact flame scanner needs no maintenance. The operation of the flame scanner by physically shutting off the flame should be incorporated into the maintenance cycle for the device.

#### 5.4.2 Instructions on Troubleshooting

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**DANGER!**

**The flame scanner is a safety device.**

**Any repair work or other changes to the device shall only be carried out by the manufacturer's specialist staff or by some other persons appointed by the manufacturer.**

**Any other person are not allowed to operate on parts inside the device.**

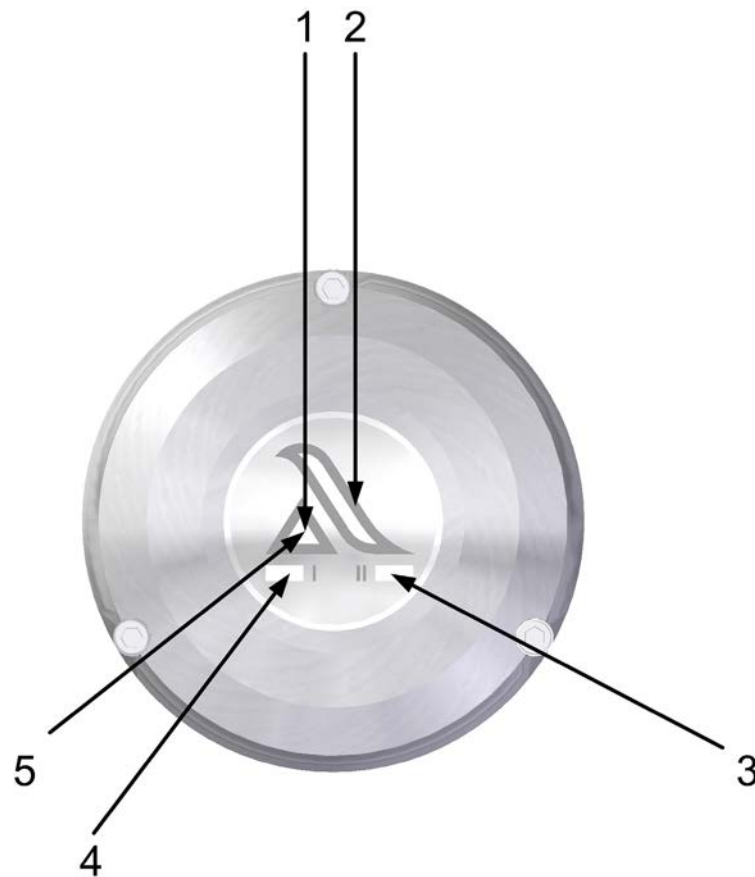
In particular, this concerns the unauthorized exchange of the flame contact fuse.

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## 6 Appendix

### 6.1 Layout of the Operational Controls

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*Fig. 6-1 Monitoring and control elements F200K2*

- 1 **LED (green)**: Indication, 'Flame in' state
- 2 **Intensity indicator** for flame signal in the range 0 ... 100 %
- 3/4 **LED (yellow)**, only for F200K2, lights for active range.
- 5 **LED (red)**: Indication, "Flame out state"

## 7 Accessories

### 7 Accessories

#### 7.1 Flame Scanner Testing Device



Fig. 7-1 Flame Scanner Testing Device FFP30

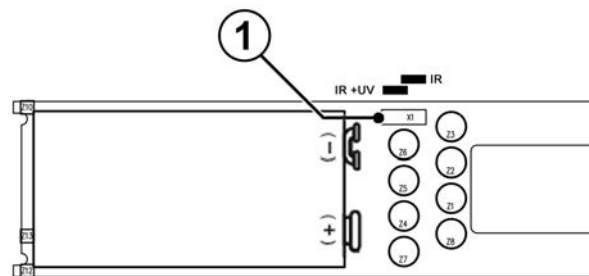


Fig. 7-2 1. (1) Positions of the internal jumper IR + UV

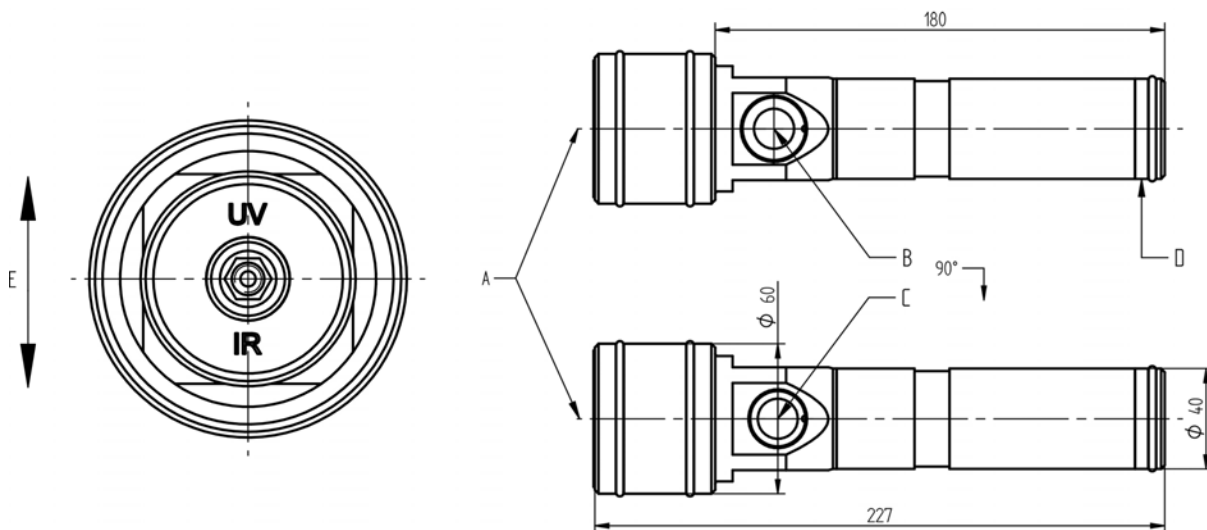


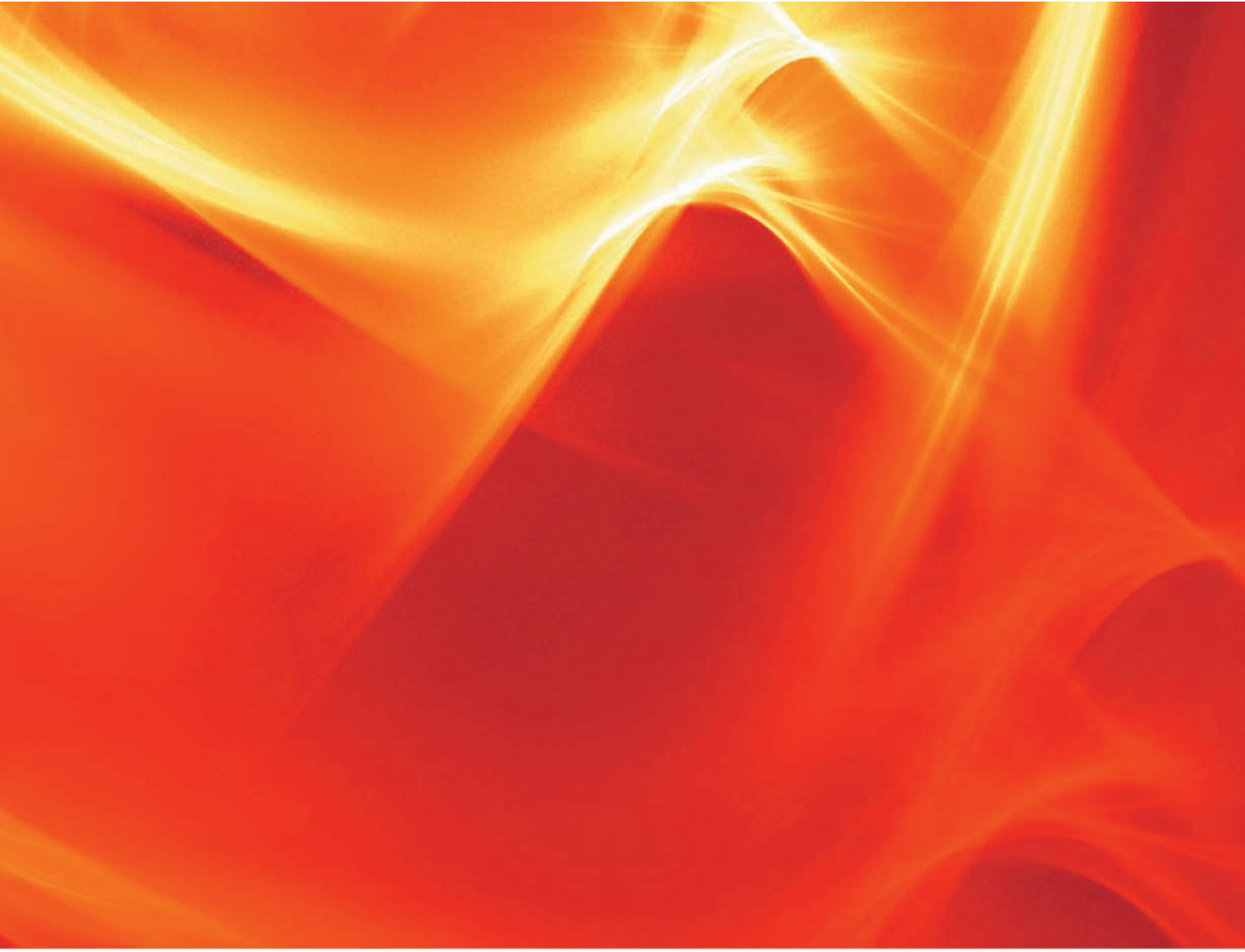
Fig. 7-3 Dimensional drawing FFP30

- A, B, C Threaded receptacle for F200K, F300K
- Plug-in receptacle for FFS05, FFS06, FFS07, FFS08, F200K
- D Changing battery (9 V, 500 mA - turn left to open housing)
- E Toggle switch



## 7 Accessories

<b>Design</b>	
Area of application:	IR- and UV flame sensor - Switching by means of toggle switch
Frequency range:	Flame simulation by 4 frequency ranges
Power supply:	Alkaline battery 9 V, 500 mAh - Automatic switch-off by approx 5 min - Battery life approx ca. 3 years
<b>Housing</b>	
Design:	Cylindrical aluminium housing
Montage:	Direct connection to: - Threaded receptacle for F200K, F300K - Plug-in receptacle for FFS05, FFS06, FFS07, FFS08, F200K
<b>Environmental conditions</b>	
Protection class:	IP54
Level of protection:	III
Weight:	0.52 kg/1.15 lb



The information in this publication is subject to technical changes.



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