Quick Reference for Endusers

F300K Compact Flame Scanner

Sensors and Systems for Combustion Engineering

LAMTEC
www.lamtec.de

Table of Contents

1 Important Information about the Manual

1.1 Purpose/Applicability of the Document

This manual enables users to handle the F300K compact flame scanner system safely and efficiently.

The manual is valid for all F300K systems in any configuration.

The information in this document applies to software version F300K V1.3.0.0 and User Interface V1.4.0.0. If you have a different version of the software, you may find that some of the functions described are not available or that not all of the available functions are described.

The F300K system complies with the following standards and directives:

- DIN EN 298:2012
- DIN EN 60730-2-5:2015
- DIN EN 50156:2016, Section 10.5
- DIN EN 746-2:2011 (Industrial thermoprocessing equipment – Part 2: Safety requirements for combustion and fuel handling systems)
- 2014/68/EU (Pressure Equipment Directive)
- 2009/142/EC (Gas Appliances Directive)
- EU/2016/426 Gas Appliance Regulation (GAR)
- 2014/35/EU (Low Voltage Directive)
- 2014/30/EU (EMC Directive)
- DIN EN 61508:2011, parts 1-7 (SIL 3 requirements)
- ISO/IEC 80079-34:2011 Potentially explosive areas - Quality Management System (QAR)
- 2011/65/EU (RoHS2 Directive)
- UL372

1.2 Target Group

These instructions must have been read carefully and completely before commencing with any work. The basic prerequisite for working safely is compliance with all the specified safety instructions.

NOTICE

- ▶ All assembly, commissioning, troubleshooting and maintenance work may only be carried out by authorised and trained personnel.
- ▶ The device may be operated and maintained only by those who are capable of doing so in terms of their level of knowledge and training.
- ▶ For safety reasons, access to parameterisation must be restricted to authorised personnel.

1 Important Information about the Manual

1.3 Safekeeping of the Manual

Look after the manual and all the associated documents carefully.

The manual is part of the product and must be kept safe and be accessible to personnel at all times.

Moreover, it is important that the manual:

- Is available when required.
- Is kept for the entire service life of the device.
- Is available to its next operator.

2 General Safety Instructions

2.1 Classification of the Safety Instructions and Warnings

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.

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.

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.

NOTICE

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

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 General Safety Instructions

2.2 Product Safety

WARNING!

This product is state-of-the-art technology and complies with the generally accepted safety-related rules and regulations.
Every device is tested before delivery to ensure that it is working properly and safely.

- Only use this product when it is perfect condition and in accordance with the manual, the prevailing regulations and guidelines and the applicable safety and accident prevention regulations.

WARNING!

The risk of danger in the event of external fire, traffic and wind, flood waves and earthquakes depend on the installation situation and the installation site to be assessed separately where appropriate.

2.3 Product-specific Dangers

DANGER!

The F300K is not designed to switch off the fuel valves.

- The subsequent signal processing must be carried out in the control system, which is adapted to suit the combustion plant.

WARNING!

The F300K is a safety device. Only specialist staff of the manufacturer or people approved by the manufacturer may intervene. No interventions by anyone else are permissible. This applies, in particular, in the event of a defective fuse.

WARNING!

Radio interference suppression of the output contacts

In the interests of safety, ensure when installing the output contacts that:

- The user suppresses radio interference in such a way that the contacts of the safety relay contact output cannot be shorted by defective components of the suppressor circuitry.

WARNING!

The power supply of the flame scanner and the user interface with 24 VDC must be ensured by an external power supply unit, which supplies SELV or PELV.

3 Product Description

3.1 Structure of the F300K

1 Lens holder

2 F300K housing

3 Cover with operating unit UI (user interface) or LED display

4 Device connector

5 Connecting cable

Fig. 3-1 The components of the F300K

3.2 Basic variants

There are two basic variants of the F300K

NOTICE

The basic functions of the variants are identical. The differences lie merely in how they are operated and their displays.

F300K with LED display

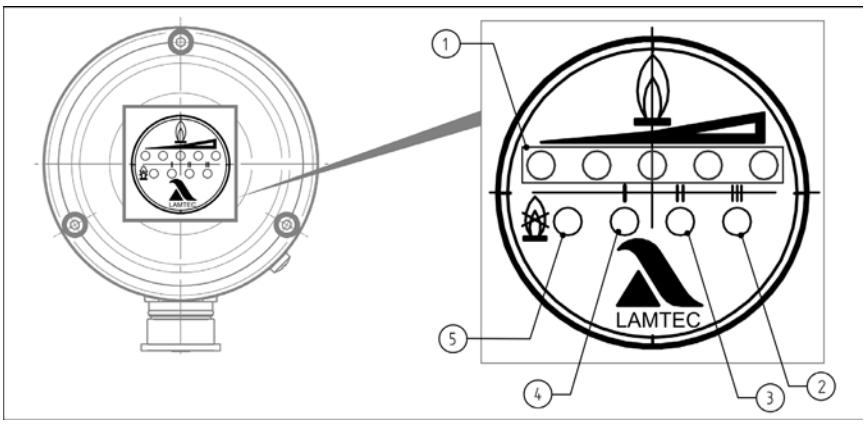


Fig. 3-2 F300K display unit with LED display

1 LEDs in the display strip show the intensity of the flame: a series of two yellow and three green LEDs; point display for intensity, flashing for a warning

2 Green LED: mode 3

3 Green LED: mode 2

4 Green LED: mode 1

5 Red LED: Flame OFF/stand-by – flashes in the event of a fault

NOTICE

For operation of F300K (with LED display) you need an external User Interface UI or the F300K Remote Software.

F300K with user interface

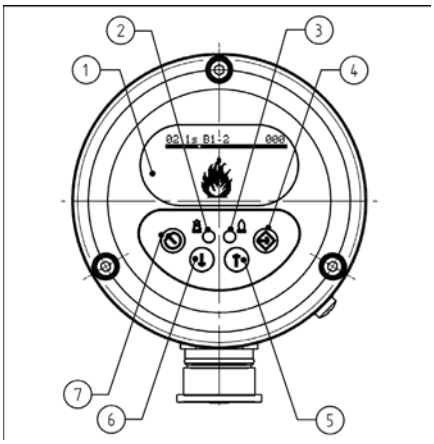


Fig. 3-3 F300K operating and display unit with UI

1 Display

2 LED shines red: Flame OFF/ready for operation

LED flashes red: fault

3 LED shines green: flame ON

LED flashes green: warning

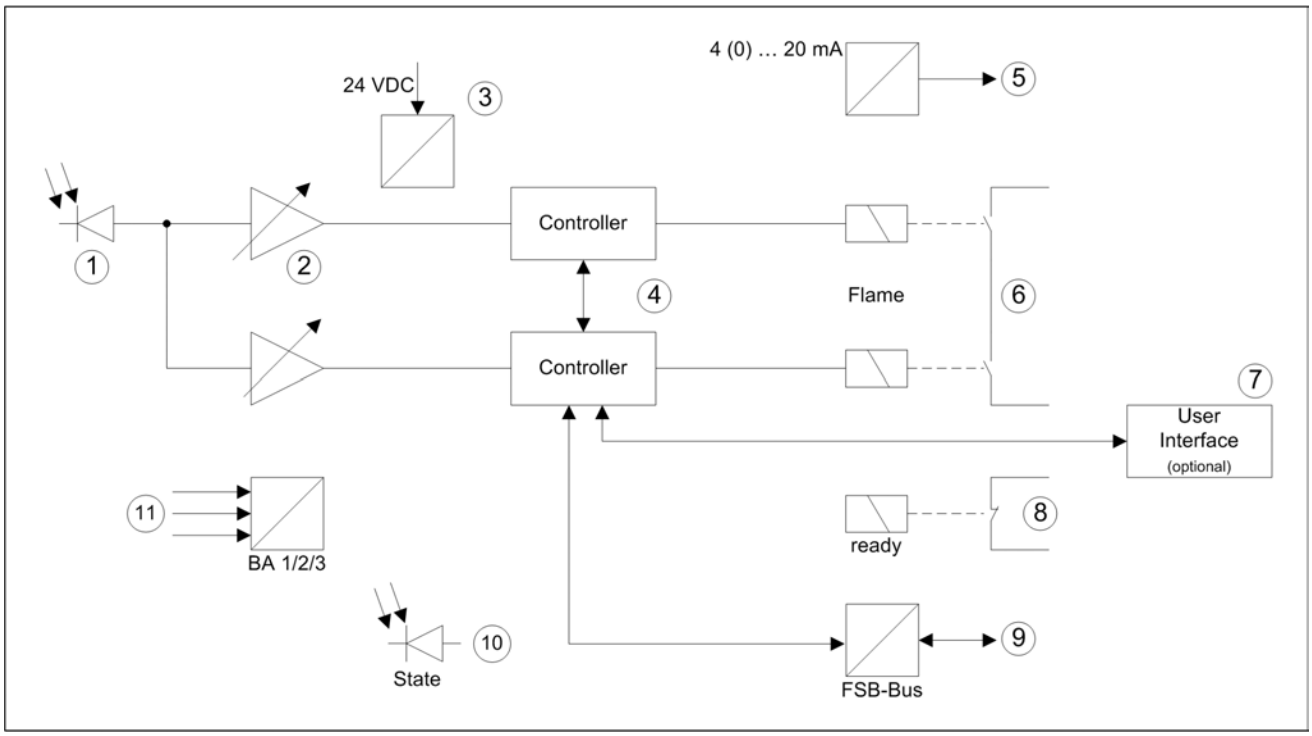
4 ENTER key

5 UP key

6 DOWN key

7 ESC/BACK key

4 Functional Description



1	Semiconductor sensor	**5**	Measuring output for intensity	**9**	FSB bus for parameterisation and messages
2	Amplifiers	**6**	Flame relay	**10**	LED status display
3	Power supply	**7**	Integrated operating unit (UI)	**11**	Mode selector
4	Microcontrollers	**8**	Ready		

The F300K analyses the flickering of the flame in the UV or IR range. For preparation for signal processing there is a **semiconductor sensor (1)** on a button strip. For each sensor signal, the level is adjusted by means of two adjustable **amplifiers (2)**. These two amplifiers are located on the main board, as are the **two microcontrollers (4)**. Due to the amplitude and the course taken by the signal to be evaluated over time, both microcontrollers detect the existence of the flame.

The safety of the device is monitored by means of both software and hardware diagnostics. The **ready contact (8)** indicates that the flame scanner is ready for operation.

The **mode selector (11)** allows you to choose between three different sets of parameters. These parameters are stored in the EEPROM and influence the analysis of the current sensor signal of the flame to be monitored.

There is a **FSB interface (9)** available for operation. The F300K is operated by means of an external or **internal user interface (7)** or the PC with F300K-Remote-Software. An **LED display (10)** makes the status of the flame scanner visible. The flame intensity is provided as non-failsafe information with a 4 (0) ... 20 mA **current loop (5).**

The circuit is supplied with **24 VDC (3)** by an external power supply unit with safe separation (e.g. FN20 or FN30).

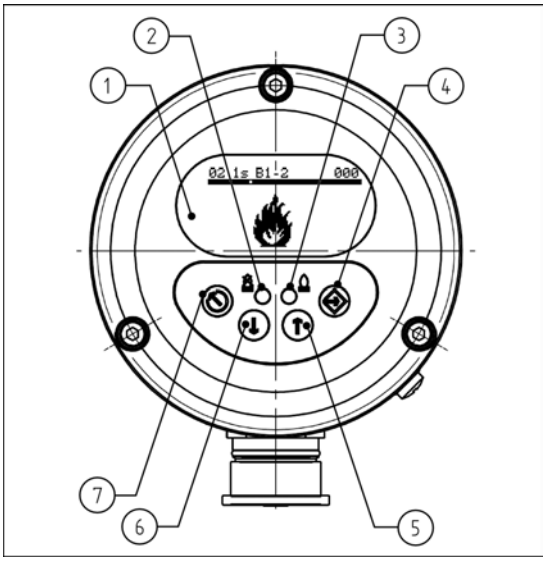
An internal temperature sensor monitors the temperature in the device.

5 User Interface

5.1 Operating and display elements

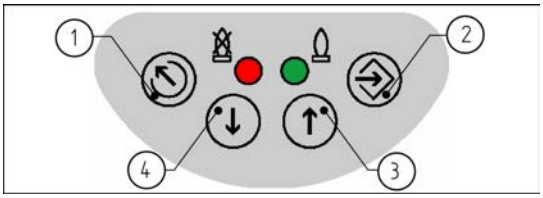
You can adjust and operate the F300K compact flame scanner by using either the user interface (integrated in the F300K or as an external device) or the F300K Remote Software.

You will find a description of the F300K Remote Software in a separate manual (publication no. DLT7652).



1 Display
2 LED shines red: Flame OFF/ready for operation
LED flashes red: fault
3 LED shines green: flame ON
LED flashes green: warning
4 ENTER key
5 UP key
6 DOWN key
7 ESC/BACK key

Fig. 5-1 F300K operating and display unit with UI



1 ESC/BACK key
2 ENTER key
3 UP key
4 DOWN key

Fig. 5-2 Keypad

NOTICE

To extend the service life of the display, it only remains switched on within a limited temperature range. If the temperature of the display rises to over 70 °C, it is deactivated. In this phase it is not possible to carry out parameterisation or read out information using the display. In order to get information about the reason (C0013) of the deactivated display, it is activated briefly after pressing a key. If the temperature of the display drops below 70 °C, it is activated again. Alternatively, the F300K Remote Software or an external user interface FB30 can be used to communicate with the F300K from a cooler place.

NOTICE

The accessibility and operation of the different displays depend on the current access level. See section *6.2 Enter Password*.

5 User Interface

5.2 Menu tree

For access level 0 (parameterisation during commissioning not possible)

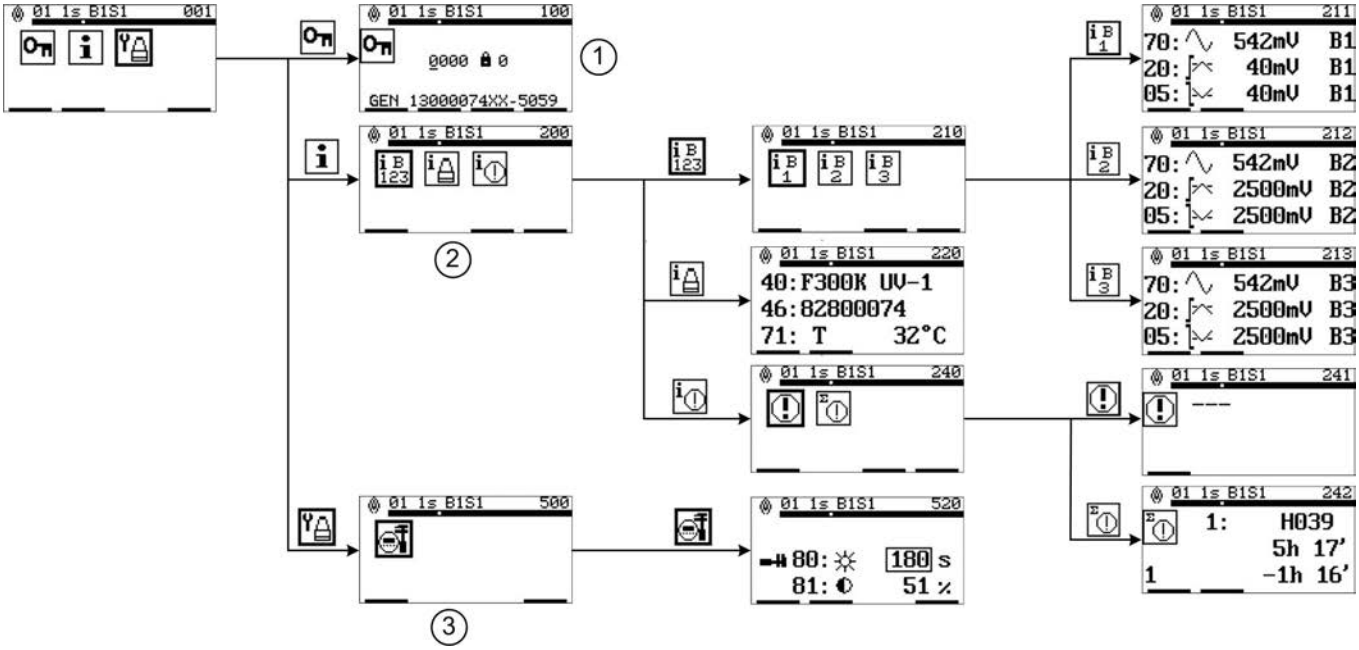


Fig. 5-3 Menu tree

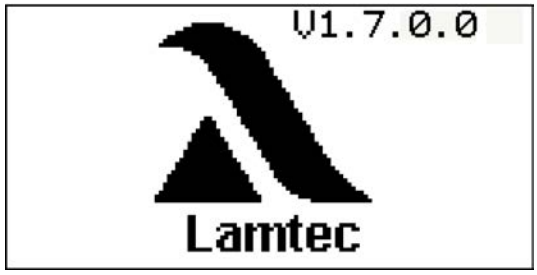
1 Menu password entry 2 Menu information 3 Menu device settings

6 Operation

6.1 Main Menu

This section gives you an overview of the displays and menus of the F300K.

Initial images



- Software version User Interface
- Manufacturer

Fig. 6-1 Initial image1

NOTICE

If the operating unit appears in the initial screen, you can adjust the contrast of the display by means of the key combination ESC/UP or ESC/DOWN.

NOTICE

The following view is only displayed with the external user interface if more than one device is connected to the BUS

	Selection symbol
01	Bus ID (device number)
F300K	Type
UV-4	Spectrum
03	Selection of other LAMTEC device
C0012	Display for an unknown device

Fig. 6-2 Initial image 2

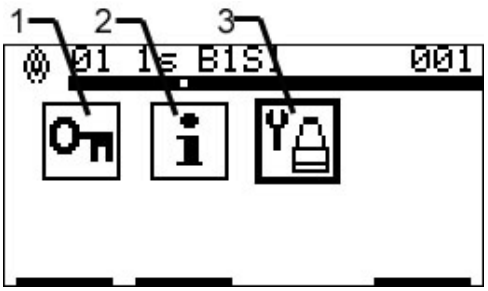
Main flame ON/OFF

Fig. 6-3 View with flame ON

Fig. 6-4 View with flame OFF

6 Operation

Main menu



1 Password entry
2 Information menu
3 Device setting

Fig. 6-5 Main menu without access via password (access level 0)

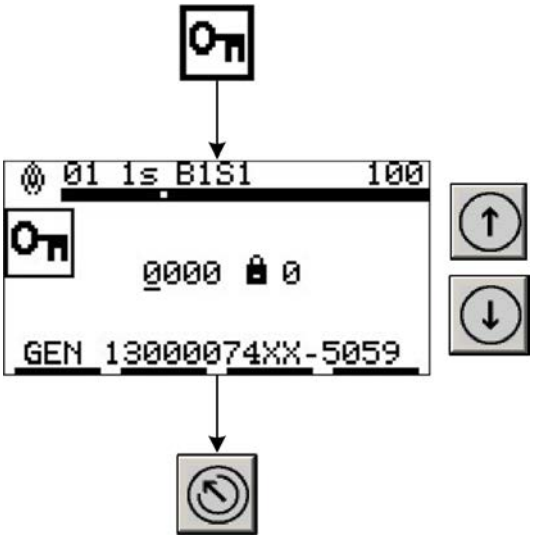
6.2 Enter Password

The operating menu is protected by passwords.
If you do not enter a password:

- You can only display information.
- You cannot change safety-related parameters.

When you enter a password, this gives you time-limited access to the associated password level. When you enter a valid password, you get access to additional information and parameters that you can change.

Enter password



Access is available to password level 0.

back

NOTICE

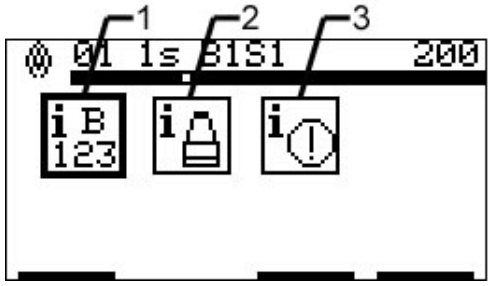
The following password levels are available:

- **Password level 1**: Standard level
  - limited manual parameterisation possible.
- **Password level 2**: Expert level
  - extensive manual parameterisation possible.
- **Password level 4**: entry via the LAMTEC hotline only (factory level)
  - full manual parameterisation possible.

6 Operation

6.3 Reading information

The following sections describe how to get to the various information menus.

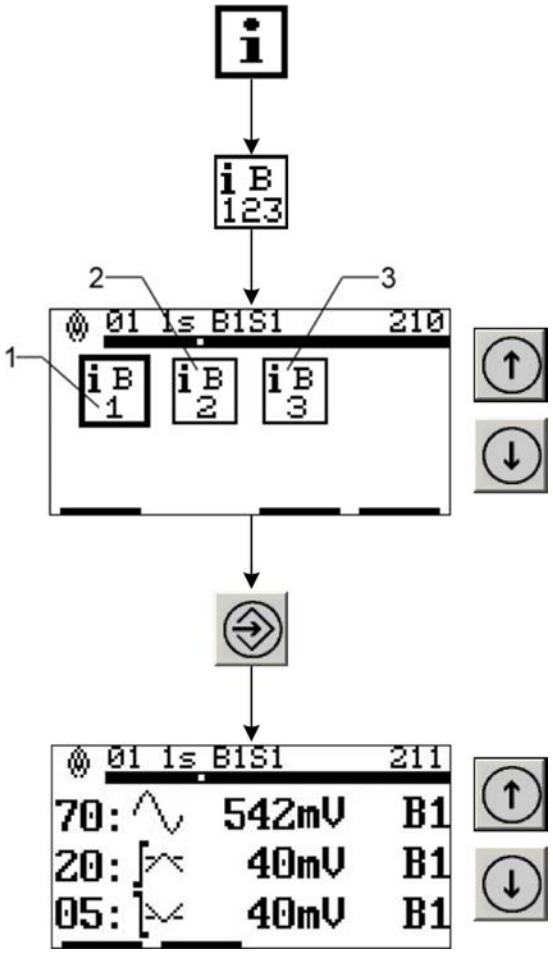


1 Mode 1-3 monitoring parameters
2 Device information
3 Fault

Fig. 6-6 Overview of the information menu

6.3.1 Read mode 1-3

Calling the information on the mode



1 Information on mode 1
2 Information on mode 2
3 Information on mode 3

Use the arrow keys to scroll up and down.

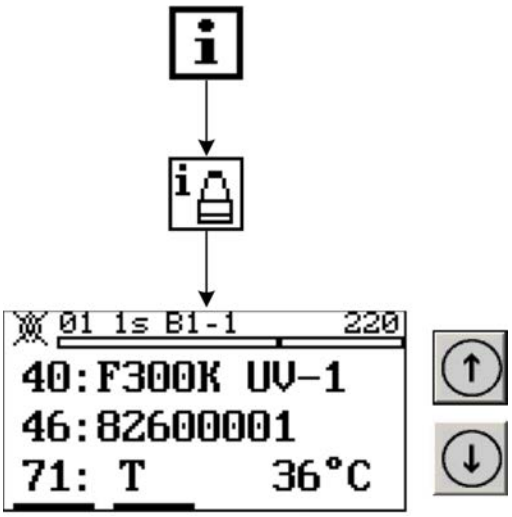
You will find more information on the values in the following table:

6 Operation

Icon		Name	Value	Explanation
70:		AC signal	0 ... 2,500 mV	Current effective value of amplified signal
20:		Switch-on level	0 ... 2,500 mV	Switching threshold for "flame ON"
05:		Switch-off level	0 ... 2,500 mV	Switching threshold for "flame OFF"
07:		Amplification Sensor 1	1 ... 13	Amplification level of the signal -Single sensor UV or IR -Double UV sensor
08:		Amplification Sensor 2	1 ... 13	Amplification level of the signal IR- Double sensor only
12:		Weighting	0 … 100%	Signal part of sensor 1 (UV) - Double sensor only
06:		Frequency	10 ... 110 Hz 5 ... 160 Hz	Lower limit frequency as of which the signal is analysed.
11:		Safety time	1 ... 5 sec	FFDT, maximum time before the flame relays are switched off after the non-appearance of the flame signal
10:		Switch-off time	0,3 ... 5 s	Time before the flame relays are switched off after the non-appearance of the flame signal
09:		Recovery time (integration time)	0,2 ... 5 sec	Time for the development of the full switch-off time of the flame relays if the flame signal is not emitted for a short period
24:		Switch-on time	0.2 ... 5.0 sec	Switch-on time of the flame relays after the appearance of a very high-quality flame signal – effective only in switch-on/startup
25:		Level of suppression	0.3 ... 5.0 sec	Level of suppression of portions of the signal that do not belong to the signal of the intended flame – effective only in switch-on/startup

6.3.2 Reading the device setting

Displaying the information on the device setting



Use the arrow keys to scroll up and down.

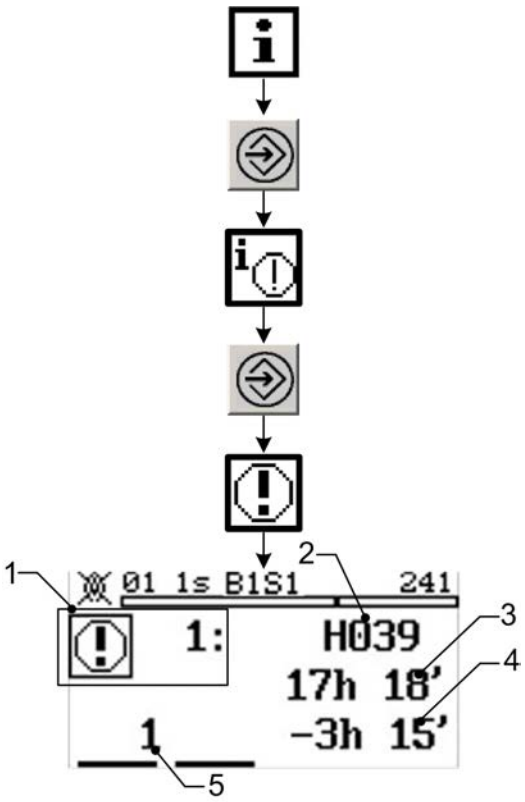
You will find more information on the values in the following table:

	Icon		Name	Value	Explanation
40:			Device type	-	Example: F300K UV-1
46:			Serial number	-	Consecutive number
71:	T		Current device temperature	°C	Temperature in flame sensor
74:			Operating hours without minutes	h	6 digits (e.g. 120003 h)
75:			Switching cycles	SC	Number of switching cycles (e.g. 100234)
76:			Software version of flame scanner	-	Example: SW-01-02-00-00
77:	CRC		CRC programme of flame scanner	-	Safety-related CRC
15:		B1	CRC switch-off parameters, mode 1	-	Safety-related CRC
15:		B2	CRC switch-off parameters, mode 2	-	Safety-related CRC
15:		B3	CRC switch-off parameters, mode 3	-	Safety-related CRC

6.3.3 Displaying faults

6.3.3.1 Reading the cause of a problem

Displaying the cause of a problem



1 Position in the fault list

2 Fault number

3 Fault time (operating hours, minutes)

4 Difference between the fault time and the current operating hours

5 Additional information on the fault

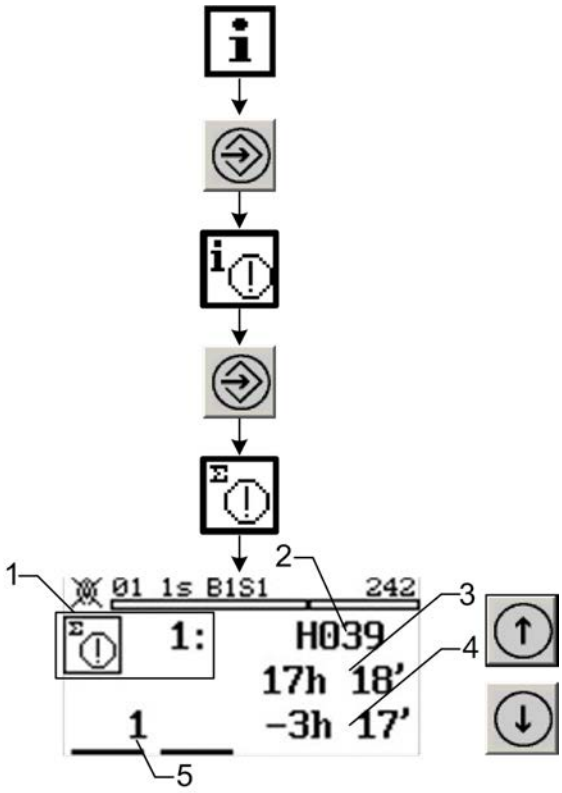
NOTICE

No fault displayed

If the user interface displays only the icon ---, the current cause of the switch-off is not a fault.

6.3.3.2 Reading the fault history

Displaying the fault history



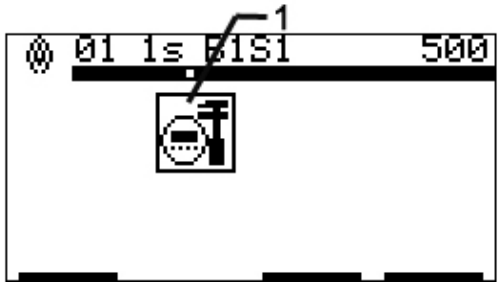
1 Position in the fault list
2 Fault number
3 Fault time (operating hours, minutes)
4 Difference between the fault time and operating hours
5 Additional information on the fault

In addition to the switch-off causes (see section *6.3.3.1 Reading the cause of a problem*), the display also shows any fault that has occurred.

6.4 Changing the device settings

The following sections explain the parameterisation of the device properties.

Only LAMTEC qualified personnel are allowed to change the device settings.

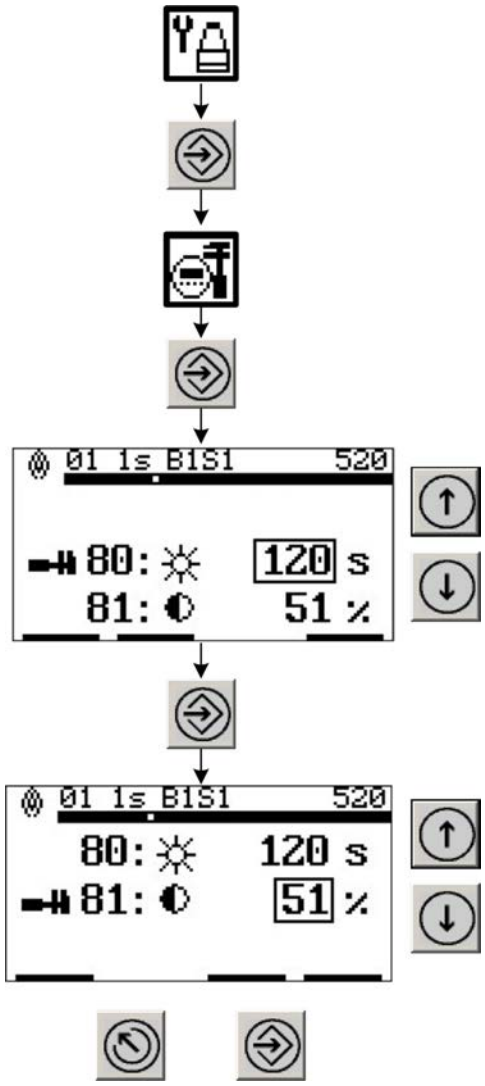


1 Parametrise User Interface

Fig. 6-7 Overview of the "Device settings" menu

6.4.1 Parameterising the User Interface

Setting the device parameters of the operating unit



Apply with or reject with .

You will find more information on the values in the following table:

Icon	Name	Value	Explanation
80:	Display 1, background lighting	seconds	Lighting duration, 180 seconds = default
81:	Display 2, graphical display	%	Contrast, 50 % = default

NOTICE

If the operating unit appears in the initial screen, you can adjust the contrast of the display by means of the key combination ESC/UP or ESC/DOWN.

NOTICE

Only the user interface is adapted here. In worst case, the contrast is so adjusted, that you can see nothing on the display.

7 Maintenance

7.1 Maintenance Tasks

NOTICE

The flame scanner requires no maintenance

However, you should at intervals – that depend on the operating conditions of the plant – clean the aperture of the compact flame scanner and the associated viewing opening on the furnace.

During **periodic maintenance** of the plant, you should do the following things:

- Check all the electrical plug-in connections.
- Put the burner into operation.

7.2 Customer Service Information

Please contact LAMTEC Service/Support if you have any questions.

LAMTEC GmbH & Co.KG
Sensors and Systems for Combustion Technology
Wiesenstraße 6
D-69190 Walldorf
Hotline: +49 (0) 6227 / 6052-33
email: support@lamtec.de

7.3 Warranty and Delivery Terms

The manufacturer's warranty conditions apply. Warranty claims are refused if changes have been made to the flame scanner or it has been interfered with in any way during the warranty period.

The device is shipped as specified in the purchase order information. LAMTEC's terms and conditions of delivery and service and the general terms and conditions of delivery and service of the electrical and electronic engineering industry apply.

8 Repairs

When the F300K is replaced, it is necessary to replace it with a device with the same identification information.
If possible, the parameterisation can be taken from the defective device, a backup file or the commissioning log. Any customisation of safety-related parameters that is necessary will be focused on the switching threshold.

NOTICE

Only qualified personnel may check the configuration.

NOTICE

Replacement and mounting may only be carried out by qualified service personnel.

9 Correcting Faults

9.1 Fault Finding and Troubleshooting

9.1.1 F300K Error Codes

NOTICE

H and U processor

The F300K reports errors of the H and U processors. The same error code contents are displayed with the same number. They are differentiated by means of a preceding H or U. The operating hours when the error occurred and additional information are displayed in the error menu.

No.	Description
017	Mode selection
	External error or internal hardware error – no or more than one BA activated
018	Periodic signal
	Signal frequency [Hz] – Sensor detects lamplight – strong resonance in burner chamber
027	Excess temperature
	Warning temperature's limit value exceeded – Ambient temperature is too high
035... 039	Communication with internal UI – Activate terminating resistor in UI or when accumulating change F300K or UI
035	Input buffer overflow internal bus
036	Communication with internal UI
037	Acknowledge error internal bus
038	BusOff Bus-A
039	Error-warning-level reaches internal bus
070	Power supply
	Voltage breakdown or voltage interuption – 24V DC disturbed from outside
071	Password generation
	No PW of level 4 produced – Repeat input
075... 079	Communication via external BUS – Disorder in the wiring – Termination resistor incorrect – when accumulating change F300K or UI on the bus
075	Input buffer overflow
076	Output buffer overflow
077	Acknowledge error
078	BusOff

No.	Description
079	Error-warning-level reached
093	EEPROM writing error
	Warning EEPROM writing error – Exchange device
100	Periodic signal <47 Hz- Warning strong resonance in burner chamber
other	internal error

9.1.2 Error codes at the level of the operating unit

Communication error			
No.	**Description**	**Graphic**	**W ***
C0001	Timeout	-	**X**
	At secure parameter transfer, the F300K did not respond within the safety time; in other words, the parameters were not accepted by the F300K.		
C0002	Communication		**X**
	The F300K is no longer responding. →F300K is no longer reachable Bus improperly terminated, line lengthtoo long, interference, defect or missing power supply		
C0003	Memory	-	-
	Error reading from/writing to flash memory → Repeat the operation or device defective		
C0004	Communication	-	-
	BUS error → If this error occurs repeatedly, change the user interface or have a repair carried out.		
C0005	Communication	-	-
	BUS error → If this error occurs repeatedly, change the user interface or have a repair carried out.		
C0006	No access level	-	**X**
	The access level has been reset. The time has expired. → Enter the password again.		
C0007	Communication	-	-
	→ If this error occurs repeatedly, change the user interface or have a repair carried out.		
C0008	Multiple devices are connected.	-	-
	An external user interface has been detected. It is no longer possible to operate the device using the internal user interface. → The external user interface has a connection to the F300K. Dual operation is prevented.		
C0009	Multiple devices are connected.	-	-
	It is not possible to operate the device with either the internal or the external user interface. → The F300K Remote Software has a connection to the F300K. Dual operation is prevented.		
C0010	Multiple devices are connected.	-	-

9 Correcting Faults

Communication error			
	Two external user interfaces have been detected on the bus. → Remove one of the external user interfaces from the bus.		
C0011	Multiple devices are connected.	-	-
	Two F300K Remote Software programmes have been detected on the bus. → Remove one of the F300K Remote Software programmes from the bus or close it.		
C0012	Unknown device	-	-
	Data is received from a device with an unknown device ID. → UI or F300K Remote Software is too old. Update the software.	 C0012	
C0013	Excess temperature display	-	-
	→Display switched off because of excess temperature. Communication is not affected.	-	-
Parameter transfer errors			
No.	**Description**	**Graphic**	**W ***
E200X	Communication	-	
	→ Repeat the operation. If this does not eliminate the error, the device is defective.		
E2012	Communication	-	
	→ PW error, PW Level 1 and 2 have been entered equal		
E300X	Communication	-	
	→ Repeat the operation. If this does not eliminate the error, the device is defective.		
E400X	Communication	-	-
	→ Repeat the operation. If this does not eliminate the error, the device is defective.		
E5001	Communication	-	-
	→ Parameters from other F300K.		
E5002	Communication	-	-
	→ No data transmission possible, since the stored data does not belong to the current F300K.		W

* W = warning is generated

* W = warning is generated

9 Correcting Faults

9.2 Information About the Repair Service

Please contact LAMTEC Service/Support if you have any questions.

LAMTEC GmbH & Co.KG
Sensors and Systems for Combustion Technology
Wiesenstraße 6
D-69190 Walldorf
Hotline: +49 (0) 6227 / 6052-33
email: support@lamtec.de

10 Appendix

10.1 Accessories

NOTICE

When installing electrical accessories you must ensure that the necessary protection class is reached.

10.1.1 FB30 External User Interface

Fig. 10-1 External User Interface FB30

10 Appendix

10.1.2 F300K Remote Software

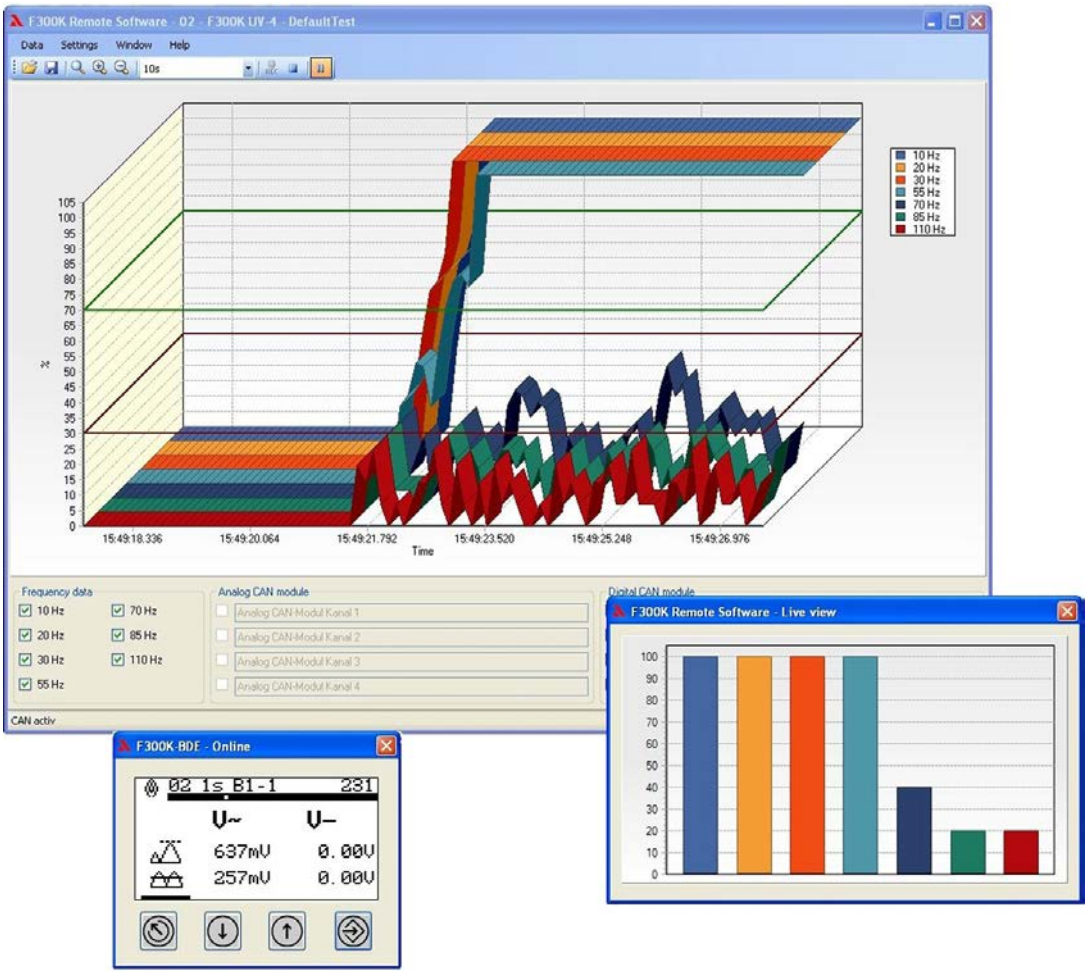


Fig. 10-2 F300K Remote software

10 Appendix

10.1.3 Power Supplies

Power pack FN20

Fig. 10-3 FN20 Top hat rail mounting

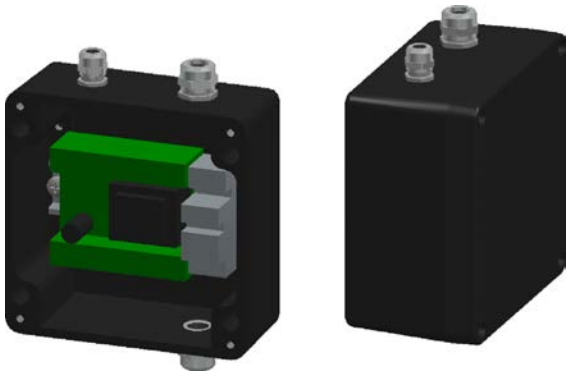


Fig. 10-4 FN20-10 as a built-in unit

Power pack FN30

Fig. 10-5 FN30-00 Top hat rail mounting

Fig. 10-6 FN30-10 as a built-in unit

10.1.4 FG30 connection housing

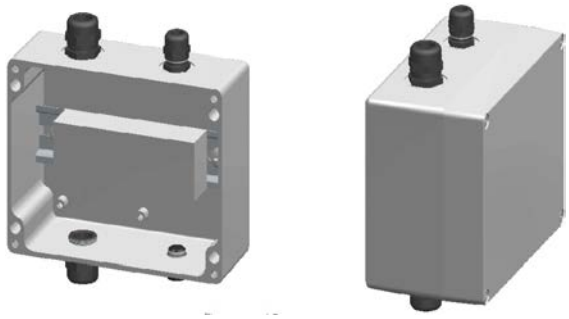


Fig. 10-7 Connection housing FG30-00

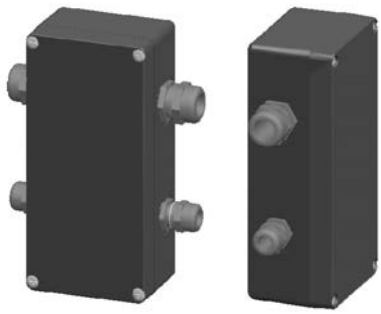


Fig. 10-8 Connection housing FG30-20 Ex-II

10 Appendix

10.1.5 Flame Scanner Testing Device

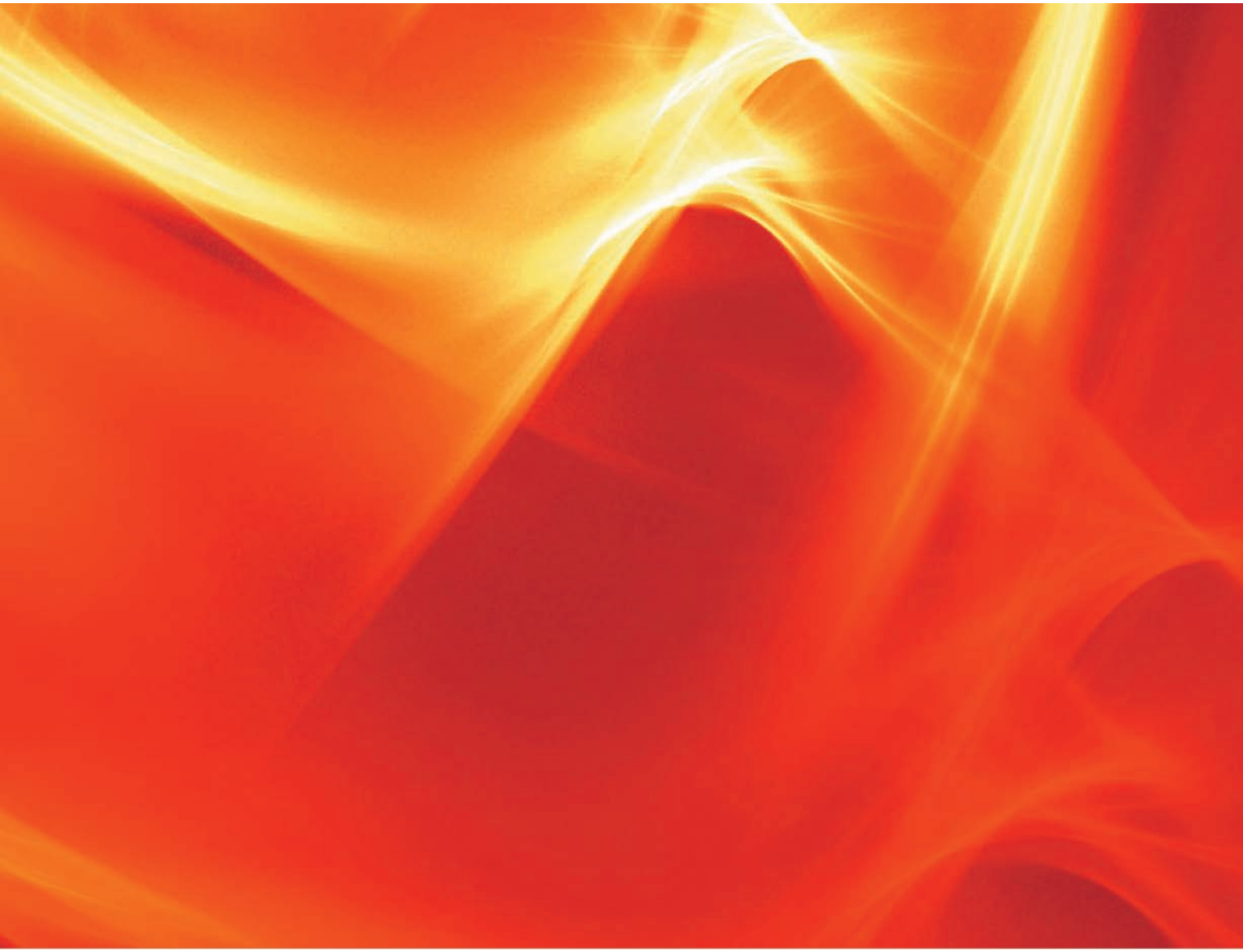
Fig. 10-9 FFP30 flame-scanner testing device

DANGER!

Explosion hazard!

▶ Flame sensors must **not** be tested in a potentially explosive atmosphere.

10 Appendix



The information in this publication is subject to technical changes.

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