Drägersafety

Operating and Installation Manual for the FD10 Draeger Flame Detector Range

Draeger Flame 1300
Draeger Flame 1700
Draeger Flame 2300

DRAEGER FLAME Manual Revision

1   Every effort has been made to ensure that the information contained in this manual is complete and accurate, however DRAEGER PLMS LTD. can assume no responsibility for any errors or omissions contained or their consequences.

2   Should you discover any errors or omissions in this manual, or have recommendations on how it may be improved DRAEGER PLMS LTD. would like to be informed. DRAEGER PLMS LTD. has included this page so that you can communicate any revisions you feel are necessary. Please photocopy, fill out and return to the address below.

To: Product Support DRAEGER PLMS LTD. Unit 3, Drakes Court Langage Business Park Plymouth Devon PL7 5JY Tel +44 (0) 1752 292700 Fax +44 (0) 1752 290061 Email support@sdsnet.com	From: Address Tel Fax Email
I suggest the following changes to section/page/para…	

1. IMPORTANT SAFETY NOTES

The purpose of the DRAEGER FLAME FD10 range is to detect a flame or fire. They may be installed in areas that contain potentially explosive atmospheres thus it is vital for your safety and that of others that its functions are understood and that every aspect of installation, commissioning and maintenance are carried out correctly.

This manual is intended to inform you of all aspects of the DRAEGER FLAME FD10 range. However, if you are in any doubt about any part of these instructions, any function of the equipment, or any operating procedure, please contact DRAEGER PLMS LTD. or your local distributor at the address below.

The DRAEGER FLAME FD10 range are certified and intended for use in potentially hazardous areas. Install and use the DRAEGER FLAME FD10 range in accordance with the latest regulations.

Do not drill holes in any housing, as this will invalidate the explosion protection.

Maintenance procedures must be carried out in accordance with the relevant work permit

1.1 Warning

This manual should be carefully read by any individuals who have or will have responsibility for using or maintaining this product.

Under no circumstances should a detector housing be opened in the Hazardous area. Detectors contain no user-serviceable parts and should, other than for access to the terminal compartment, never be opened. Under no circumstances should any components be substituted. Failure to comply with this may invalidate the hazardous area certification or disturb the critical parameters of the detector resulting in damage or failure to detect fires.

1.2 Caution

Check that the materials used in the construction of this detector are compatible with the environment in which they will operate, and that they are not affected by any anticipated contaminants.

The detector should not be used in an oxygen enriched atmosphere.

1.3 Attention

Information on power consumption and operating voltage of the detector can be found in the specifications section of this manual (see section 4). This should be read and taken into consideration when specifying cable core sizes to be used. In addition to this local authority regulations should also be considered before wiring the system and installation should be completed by a trained person.

During system tests or maintenance it is important that any control equipment is inhibited to avoid unwanted actuation or alarms.

2. DETECTOR DESCRIPTION

2.1 General description

The FD10 range of flame detectors consists of 3 different detectors:
Draeger Flame 1300 a single Infrared detector (IR).
Draeger Flame 1700 an Ultraviolet detector (UV)
Draeger Flame 2300 a combined Ultraviolet/Infrared detector (UVIR).

The detectors are Ex d (Explosionproof) certified devices suitable for both indoor and outdoor applications. Each detector is available in either LM 25 grade aluminium or 316 stainless steel housings.

2.2 Principle of operation

The Draeger flame 2300 detector is a dual spectrum optical detector, the 1300 and 1700 models are both single spectrum. All are designed to sense a flame or fire and subsequently trigger a warning system or activate some kind of extinguishing system.

Status of the detectors can be determined by a 0-20mA output (see section 4.16) and also by an LED situated on the faceplate of the detector (see section 6.1).

The detectors operate by monitoring an area for the presence of radiation. The Draeger Flame 2300 monitors in both ultra violet and infrared frequency spectrum, and the Draeger Flame 1300 and Draeger Flame 1700 monitor in the infrared and ultraviolet spectra respectively.

2.3 Detection level

The simultaneous detection of radiation in both UV and IR channels greater than the detector threshold level will trigger an alarm on the Draeger Flame 2300. Detection of radiation in the IR channel of the Draeger Flame 1300 will trigger an alarm and detection of radiation in the UV channel of the Draeger Flame 1700 will trigger an alarm.

2.31 Detection Wavelengths

The UV sensor uses wavelengths in the region of 0.185 to 0.26 microns. The sensor peak is at approximately 0.21 microns.

The IR detector uses wavelengths in the region of 4.2 to 4.7 microns. The sensor peak is at 4.4 microns.

3. GENERAL FEATURES

3.1 Optical Test

The detectors employ test facilities to check window cleanliness and functionality of the electronics. This check is automatic with the option for manual operation via a manual 24V input terminal.

The optical test is run every 60 minutes and takes up to approximately 10 seconds during in which time flame detection is not functional.

The Draeger Flame 2300 performs 2 sub tests: -

Test 1: testing the IR sensor
Test 2: testing the UV sensor

The Draeger Flame 1300 and 1700 each perform a single sub test:-

Draeger Flame 1300 testing the IR sensor
Draeger Flame 1700 testing the UV sensor

The IR section currently consists of a sub miniature incandescent bulb.
The UV section currently consists of a high voltage UV source.

The test sequence is as follows: -

The IR source is activated and modulated at 0.5Hz (this is done as the IR sensor detects rate of change of IR energy). This is active for up to 5 seconds. If the detector passes the IR test within this period the IR test is cancelled and the UV test started for the Draeger Flame 2300 detector. This is done to minimise the down time of the unit during the test. Note: Where the Draeger Flame 1300 is concerned, once the IR test is passed the detector returns to its detection mode.

The UV source is activated; it is not modulated, as the UV sensor does not respond to rate of change of incident UV energy but on the absolute amount present. If the detector passes the UV test within 5 seconds the test is considered a pass and the detector returns to its detection mode.

If the detector fails either of the tests (IR or UV), this will be indicated by a yellow LED (see section 6)

3.2 Field of View

The detectors have a 90° field of view in the horizontal axis.

Diagram 1The Horizontal field of view for the 3 detectors.
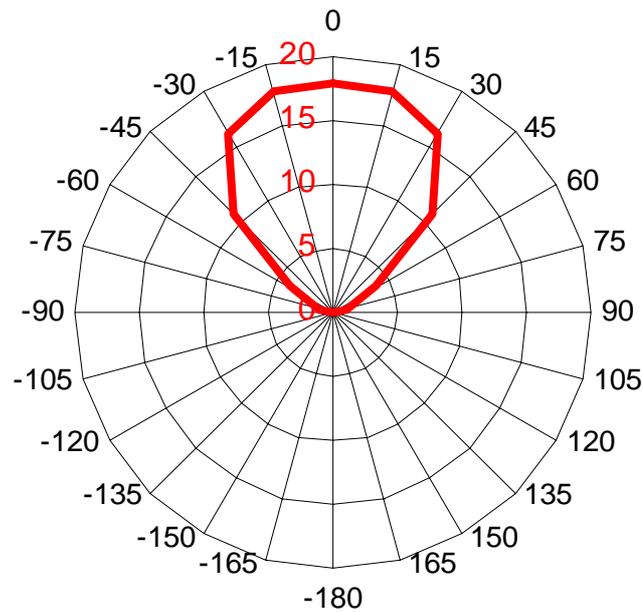
The detectors have a horizontal field of view of 90 degrees, with the greatest sensitivity lying along the central axis. This is indicated in diagram 1 which shows field of view in degrees plotted against distance in metres.

3.2 False alarm immunity

Extensive testing has shown that the detectors do not provide an alarm or a warning signal as a reaction to the radiation sources specified in table 1 below.

Notes:
IAD = Immune at any distance
All sources are chopped at 0.1 and 20 Hz
Tests carried out at various distances (indicated where appropriate)

Table 1: Immunity to false alarm faults

Radiation Source	Immunity distance (m)
Sunlight	IAD
Indirect or reflected sunlight	IAD
Vehicle headlights (low beam) conforming to MS553023-1	IAD
Incandescent frosted glass light, 100W	IAD
Incandescent clear glass light, rough service, 100W	IAD
Fluorescent light with white enamel reflector, standard office or shop, 40W (or two 20W)	IAD
Bright coloured clothing, including red and safety orange	IAD
Red dome light conforming to M251073-1	IAD
Blue-green dome light conforming to M251073-1	IAD
Radiation heater, 1500W	IAD
Radiation heater, 1000W with fan	IAD
Lit cigar or cigarette	$\geq$1.5m
Match, wood, stick including flare up	$\geq$1.5m
Welding	>4m
Angle grinding / metalwork	>4m

4. TECHNICAL SPECIFICATIONS

4.1 Electrical Specifications

4.11 Operating voltage

18 – 32 Volts DC (24 Volts nominal)

4.12 Current consumption

Draeger Flame 1300 150mA
Draeger Flame 1700 150mA
Draeger Flame 2300 300mA

4.13 Power on delay

The detector has a power delay of no more than 15 seconds. During in which system testing and system initialisation occurs.

4.14 Alarm reset

The detector relays are configurable for latching or non-latching. Where alarms are latching detector reset is done by temporary disconnection of the power supply.

NOTE: It is important to carry out a manual optical test approximately 30 seconds after resetting the detector.

4.15 Built in relays

The detectors have 3 built in relays

1. Alarm	DPDT/NO (reset according to latching option taken). This relay is not normally energised.
2. Fault	DPDT/NC (reset automatically when fault condition cancelled). This relay is energised without fault conditions.
3. Accessory	DPDT/NC. {Programmable in conjunction with RS485 option. (not yet available)}.

4.16 Current (source) isolated signal output

The detector has a 0-20mA current loop output providing the following signal levels:

- 0mA   Fault
- 1.9mA ± 0.15mA   Optical fault
- 3.8mA ± 0.23mA   Normal
- 15.6mA ± 0.40mA   Fire

4.17 Electrical Connections

Each detector has a built in terminal block of 37 terminals providing for a number of output connections;

- 4 terminals for 24v DC power
- 2 terminals for 4 – 20mA output
- 6 terminals for alarm relay
- 6 terminals for fault relay
- 6 terminals for spare programmable relay
- 6 terminals for RS485
- 2 terminals for manual test activation
- 2 terminals for internal linking of cable screens (shields)
- 2 terminals for passive components
- 1 terminal for connection to the enclosure (housing)

A 4-20mA current loop is provided along with an alarm relay and fault relay. A 2 input manual test input is provided which takes a 24V input (referenced to an external 0V, hence two inputs). This input allows the user to manually activate an optical test. There is also a pair of terminals into which is connected a user defined passive component to allow for interfacing to a number of vendors fire panels.

Each terminal is capable of accepting a suitably crimped/ferruled $2.5mm^2$ core wire. The detector also has an external earth (ground) connection capable of accepting $4mm^2$ wire.
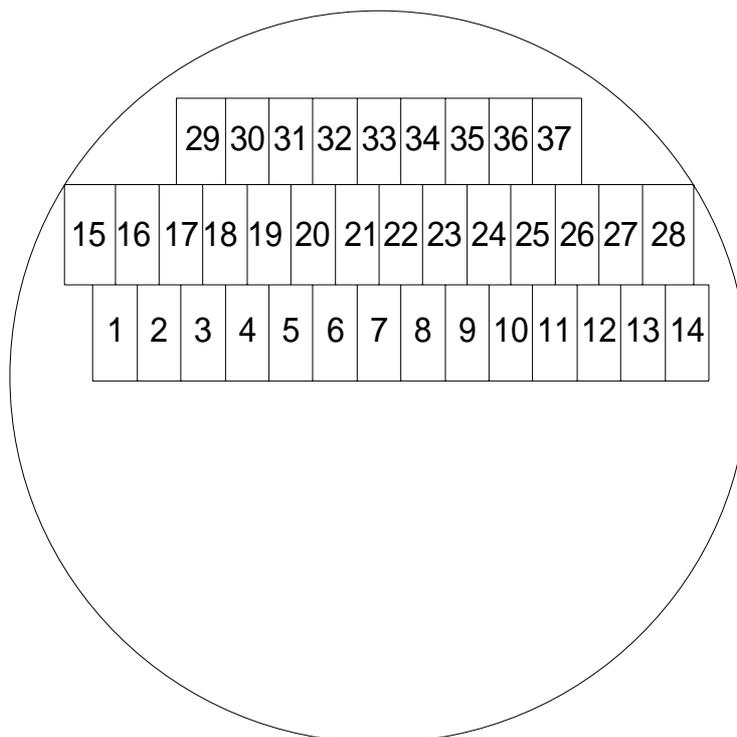
Diagram 2 Terminal block orientation

Table 2 Terminal connections

1	Cable Screen
2	Programmable Relay (normally open contact)
3	Programmable Relay (normally open contact)
4	Fault Relay (normally closed contact)
5	Fault Relay (normally closed contact)
6	Alarm Relay (normally open contact)
7	Alarm Relay (normally open contact)
8	" + 24 V
9	" + 24V
10	0 V
11	0 V
12	4-20mA (+)
13	4-20mA (-)
14	Cable Screen
15	Manual Test input (connect 24 V to activate)
16	Manual Test input (connect 24 V to activate)
17	Programmable Relay (common contact)
18	Programmable Relay (common contact)
19	Fault Relay (common contact)
20	Fault Relay (common contact)
21	Alarm Relay (common contact)
22	Alarm Relay (common contact)
23	*RS485 A +
24	*RS485 A -
25	*RS485 B +
26	*RS485 B -
27	*RS485 A GND
28	*RS485 B GND
29	Programmable Relay (normally closed contact)
30	Programmable Relay (normally closed contact)
31	Fault Relay (normally open contact)
32	Fault Relay (normally open contact)
33	Alarm Relay (normally closed contact)
34	Alarm Relay (normally closed contact)
35	Series Passive component
36	Connection to Enclosure
37	Series Passive component (to alarm relay common contact)

* Not available at present

4.18 Internal Built in Lighting Surge Protection

The detector has built in lightning surge protection as per
BS EN61000-4-5.

4.2 Mechanical specifications

4.21 Cable Entries

The detector is capable of having either 2 x M20, 2 x M25, 2 x ½" NPT or 2 x ¾" NPT cable entries in the housing (enclosure).

4.22 Materials

Enclosure		Aluminium Alloy grade LM25
	Or	Stainless Steel grade 316
Enclosure finish		Chromate prime and Polyester powder coat
Window		Sapphire
Window cement		Silicone Rubber
Seals		EPDM
Fasteners		Stainless Steel grade A4
Bracket		Stainless Steel grade 316
Labels		Aluminium Alloy
Cover		Polycarbonate/ABS

4.23 Weight

Aluminium Alloy housing   less than 3.5 kg (7.7 lbs)
Stainless Steel housing   less than 5 kg (11 lbs)

4.24 Ingress Protection

IP 67, NEMA 4X (with o-rings fitted)

4.25 Recommended Torque settings

Housing screws   M8, Hexagon head, recommended torque 15Nm
Back Cover locking screw M4, Socket Set Screw, recommended torque setting 0.8Nm
Front Cover locking screw M4, Socket Set Screw, recommended torque setting 0.8Nm

4.3 Environmental

4.31 Temperature and Humidity Range

The operating range of the detector is -50°C to +70°C.
0 – 99% relative humidity without condensation, valid between 91.5 - 105.5kPA.

4.4 Certification

4.41 Hazardous Area Certification

ATEX Certificate No. ITS04ATEX11807
II 2 G EEx d IIC
T6 Tamb -50°C to +60°C
T5 Tamb -50°C to +70°C

IECEx Certificate No. ITS 04.0003
II 2 G EEx d IIC
T6 Tamb -50°C to +60°C
T5 Tamb -50°C to +70°C

ETL C US Control No. 3057745
Class I, Groups A, B, C, D
Class I, Zone 1, Groups IIA, IIB & IIC
Ex d II C
T6 Tamb -50°C to +60°C
T5 Tamb -50°C to +70°C

FMRC Approval pending

4.42 Electromagnetic Compatibility

EN 61000-6-3:2001
EN 50130-4:   1995 + A1: 1998

4.43 Reliability

The detector is designed with a predicted Mean Time Between Failure (MTBF) rate in excess of 100,000 Hours.
The detector is designed so that all faults that could affect fire detection are revealed and indicated to the operator within an adequate time.

4.5 Response Time

The detector has a configurable response time of up to 30 seconds.
Optimal alarm times:
Draeger Flame 1300 3 seconds
Draeger Flame 1700 1 second
Draeger Flame 2300 3 seconds

4.6 Operating Distance

The detector will detect a 0.1 m^2 (1 sq. foot) N-heptane fire or Propane flame fire at 18m (60 feet) and respond to it within 30 seconds. It will detect a 5 inch (800 W) Propane flame at 1.44m (4 feet 9 inches) and respond within 30 seconds.

5. INSTALLATION

5.1 Positioning of detector

To enable optimum performance and minimise down time and false alarms care must be taken when positioning the detector. The following are points to be considered:

- A clear view of the area to be protected.
- Mounting of detectors on vibration free structures to provide best performance.
- Adequate number of detectors to cover the area to be protected.
- Detectors positioned so that they operate within their recommended operating distance.
- Type of fire hazard presented.
- Influences that could absorb wavelengths i.e. certain gases, heavy rain and dense fog.
- Angle at which detector is positioned – This should always be downwards and at a minimum of 10 to 20 degrees.

5.2 Detector mounting

The mounting bracket should be secured to a structure free from vibration, and capable of holding the detector and bracket. It is essential that the points covered in 5.1 above are considered when mounting the detector.

5.3 Detector wiring

Ensure that any power is switched off before connecting any cabling to the flame detector. The connections are made in the rear terminal compartment through suitably certified glands.
To access the terminal connections release the terminal cover locking screw using a 2 mm hexagon key and unscrew the terminal compartment cover.
The detector UV requires 24 Volts DC nominal supply voltage, also available are an isolated 4-20ma output and 3 relays.
Refer to section 4.17 for the correct terminal connections.

NOTE!
Wiring must be in accordance with local regulations. No more than one conductor should be used in each terminal. Duplicate terminals are supplied to allow "daisy chaining" of connections if required.
- Duplicate terminals are not supplied for 4-20mA connections, which cannot be "daisy chained"

When this equipment is installed within either:

NEC 500 Class 1 Div 1
NEC 505 Class 1 Zone 1

Certified areas then it must be installed using type MC-HL cable (Metal Clad for Hazardous Locations).

IMPORTANT
Before replacing the terminal compartment cover ensure the threads are lightly lubricated using suitable non-setting silicone grease. Hand-tighten the terminal cover and then tighten the locking screw with a 2 mm hexagon key (see section 4.25 for specified torque settings).

Finally the protective cover is fitted over the housing, to do this:

1. Briefly remove the detector from its mounting bracket by slackening the 2 M8 fixing screws.
2. Fit the two sides of the cover around the detector itself before aligning together and tightening with the 4 securing screws.
3. Finally return the detector to its mounting bracket and secure into position by tightening the 2 M8 screws to the specified torque (see section 4.25). ENSURING THAT THE DEVICE IS COVERING THE CORRECT AREA

Unused cable entries must be fitted with appropriate certified stopping plugs before commissioning the detector.
The detector is now ready for power on and set-up.

5.4 Detector Start up procedure

1. Switch on power
2. System performs internal test and system initialisation.
3. Power on test consists of a hardware check and optical test.
4. On successful completion of the power on test the green LED will light

See section 6.1 for information on the possible LED outputs from the detector regarding its status.

5.5 Detector Maintenance

Once installed there are no user serviceable parts within the detector. The only servicing requirements are to ensure that the detector is fully functional (see section 4.16 for possible 0-20mA outputs) and to ensure that the lenses are clean. A function test of the detectors using a suitable IR and/or UV test torch (dependent upon model) should be carried out regularly. Additionally a manual optical check of the detector may be carried out at anytime by connecting 24 Volts to pin 15 (manual test input) of the terminal block.

The terminal compartment cover and front cover threads must be lightly lubricated with non-setting grease prior to re-assembly.

The detector outer cover (weather shield) is moulded polycarbonate/abs and is not antistatic. CLEAN ONLY WITH A DAMP CLOTH.

Periodic maintenance checks may be performed in accordance with appropriate codes of practice or local regulations e.g. in Europe EN 60079-17 applies.

NOTE
When replacing the detector front cover assembly it is essential for the function of the detector that the calibration bar in front of the lens is horizontal when the cover is in place. To do this hand-tighten the front cover and then back it off a maximum of half a turn until the two locking screws are aligned with the slots in the front face of the detector housing. Tighten both locking screws to the specified torque (see section 4.25) using a 2 mm hexagon key.

6. OPERATION

6.1 Status indicators

Each detector provides the following status indications:

1. Healthy, green steady
2. Fire, red steady.
3. Optical fault, system fault, yellow steady

At power on the LED will glow yellow then green as the system performs internal tests and system initialisation. The power on test will involve first a hardware check and secondly an optical test to ensure the unit is available for fire detection immediately. Once the device has powered up correctly and providing there are no faults present the LED will remain green. This indicates that the hardware is working correctly and is available for fire detection.

After power up if there is hardware or optical failure within the device the yellow LED will be lit to indicate the problem. The yellow LED will stay lit until the problem has been addressed and remedied by the operator.

The 'Status LED' table describes the visual indications provided by the status LED.

Table 3 LED Status

System status	LED status	Visual indication
Power On / Running	Green steady LED indicates successfully running	🟢
System Fault/failed optical check	Steady Yellow LED indicates a system hardware fault or optical check failure	🟡
Radiation Detected	Steady red LED indicates a hazard has been detected	🔴

APPENDIX A

157

273

FD10 Flame Detector Housing

Cover to be fitted over FD10 Flame Detector

Cover Material polycarbonate/ABS blend

Draeger PLMS Ltd. **Dräger** © Plymouth, UK	Drawing related to certified product Refer to Authorised Person Prior to modification.	PRODUCT- FD10	DRAWING NO- FD1 12	ISSUE NO- 1.0 13/05/2004
		TITLE- Flame Detector Cover Dimensions		
All dimensions in millimetres	Projection	DRAWN BY- Keith Chitty	CHECKED BY-	DATE-
		REVISED BY-	CHECKED BY-	DATE-