

DURAG

D-LX 100 All-In-One Flame Scanner



European Standard	EN 230: 1991	Gas appliance directive 90/396/EWG	Pressure equipment directive 97/23/EG
Fuel	Oil	Gas	Oil + Gas
Register Number:	5F161/03	CE-0085AT0397	BAF MUC 03 04 072357 003

Tested by TÜV Süddeutschland
Approved for intermittent operation, continuous operation and 72-hour operation. Registered by DVGW and DIN CERTCO

American Standard:	UL 372	FM Class 7610
Registration Number:	MH25226	3000072 and 3010410

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Important Notice!

Flame monitors are safety relevant devices which shall ensure a safe operation of furnaces.

Please read this manual carefully before setting the flame monitor into operation.

The adjustment of flame monitors shall be carried out only by trained staff. Therefore, DURAG offers suitable courses.

Flame Monitors are certified devices. Any modifications will result in a loss of such certification. Repairs should be made only by the manufacturer or its representatives.

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1. General Information

The D-LX 100 All-In-One Flame Scanner consists of a control unit and an optical flame scanner. The flame scanner is suitable for monitoring flames from a variety of fuels and combustion techniques, particularly in single burner applications. Uses for this flame scanner include remote heating stations, chemical processes or thermal flue gas combustion systems.

The D-LX 100 All-In-One Flame Scanner offers an extremely high degree of safety and availability by using two microprocessors operating in parallel, with corresponding hardware and software. The hardware is designed to follow all EC guidelines and laws relevant to electromagnetic compatibility.

Thanks to the fail-safe design of the hardware, and the software's continuous checks of all safety-related functions, the D-LX 100 meets the European standards EN 230 (oil) and EN 298 (gas), as well as technical guidelines for steam boilers TRD 411 to 414 and TRD 604 for intermittent, continuous and 72-hour operation.

In order to accurately monitor various types of flames and combustion conditions, five different models are available, with spectral sensitivities in the UV and IR spectrums.

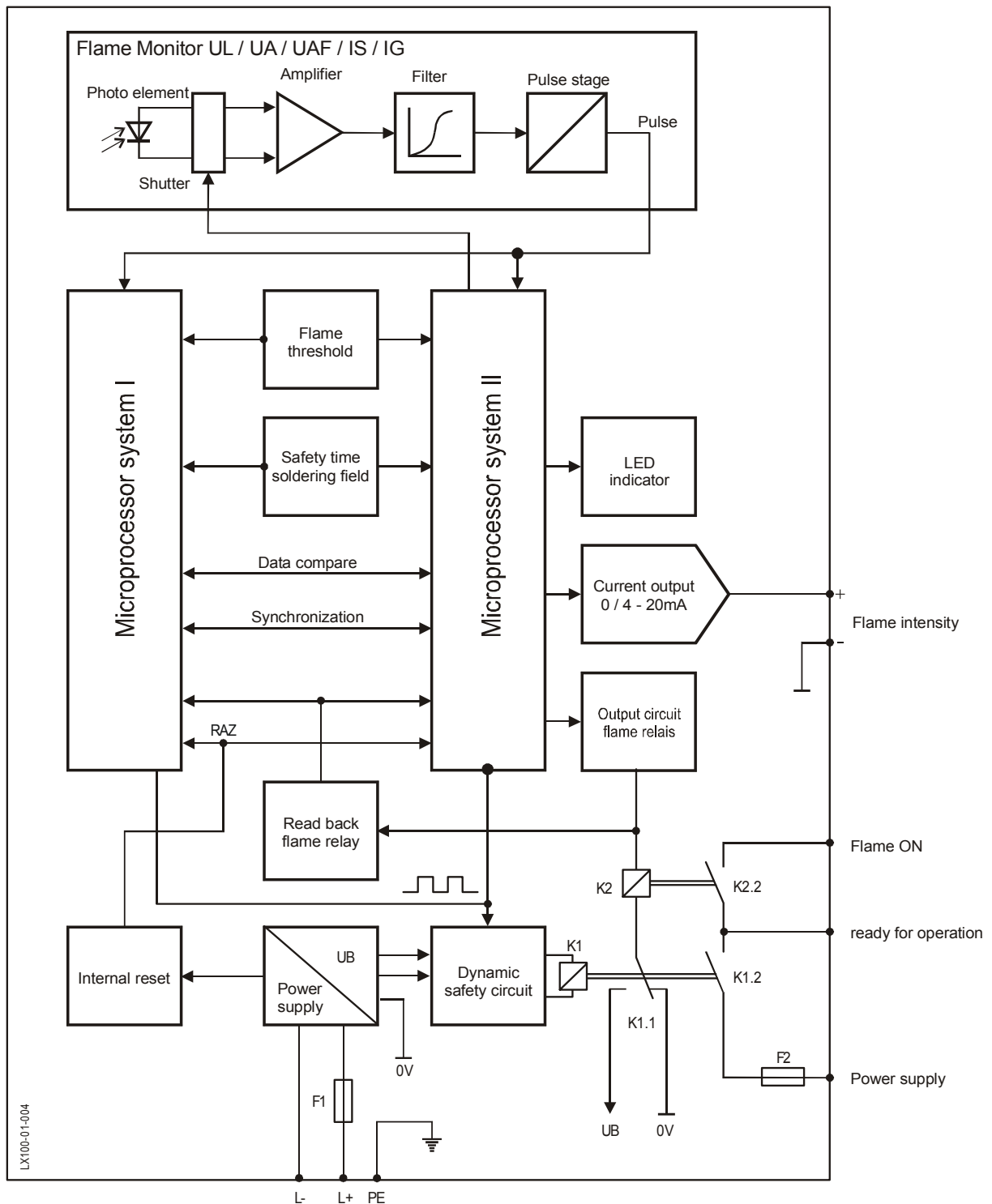
The flame recognition threshold for the flame scanner can be programmed to one of ten different settings using a push button switch on the front panel. The scanner's safety time, which refers to the number of seconds before the scanner will signal flame outage, is set at the factory to 1 s. Longer safety periods of 3 or 5 s may be programmed in upon request.

If one chooses the most suitable All-In-One flame scanner, positions it correctly on the sighting tube, and properly sets the threshold, one will always be able to selectively monitor single burners or even a furnace.

The essential operational groups of the control unit are depicted in the D-LX 100 block diagram (fig. 1):

- Dual-channel microprocessor systems for control and oversight of flame monitoring functions.
- Integrated flame scanner with shutter drive for performing self-checks.
- Dynamically driven fault relay, K1; internal operating voltages and all safety-related hardware functions are monitored.
- Guided flame relay, K2, with self-checking circuit.
- Programmable flame recognition threshold
- LED display for indicating operational readiness, flame signal or fault.
- 4-20 (or 0-20) mA analog output for external display of flame intensity.

2. Block Diagram



(Fig. 1) D-LX 100 block diagram

3. Functional Description

The photo elements used in the integrated optical flame scanner evaluate different spectral ranges of the flame. Those scanners with semiconductor photo elements cover ranges from short-wave UV-A to infrared. The signal from the photo element passes through an amplifier with suppression of any constant (non-dynamic) emitted energy. This amplifier can be set to one of two different levels. After the amplifier, the signal runs through a high-pass filter and a pulse generation stage.

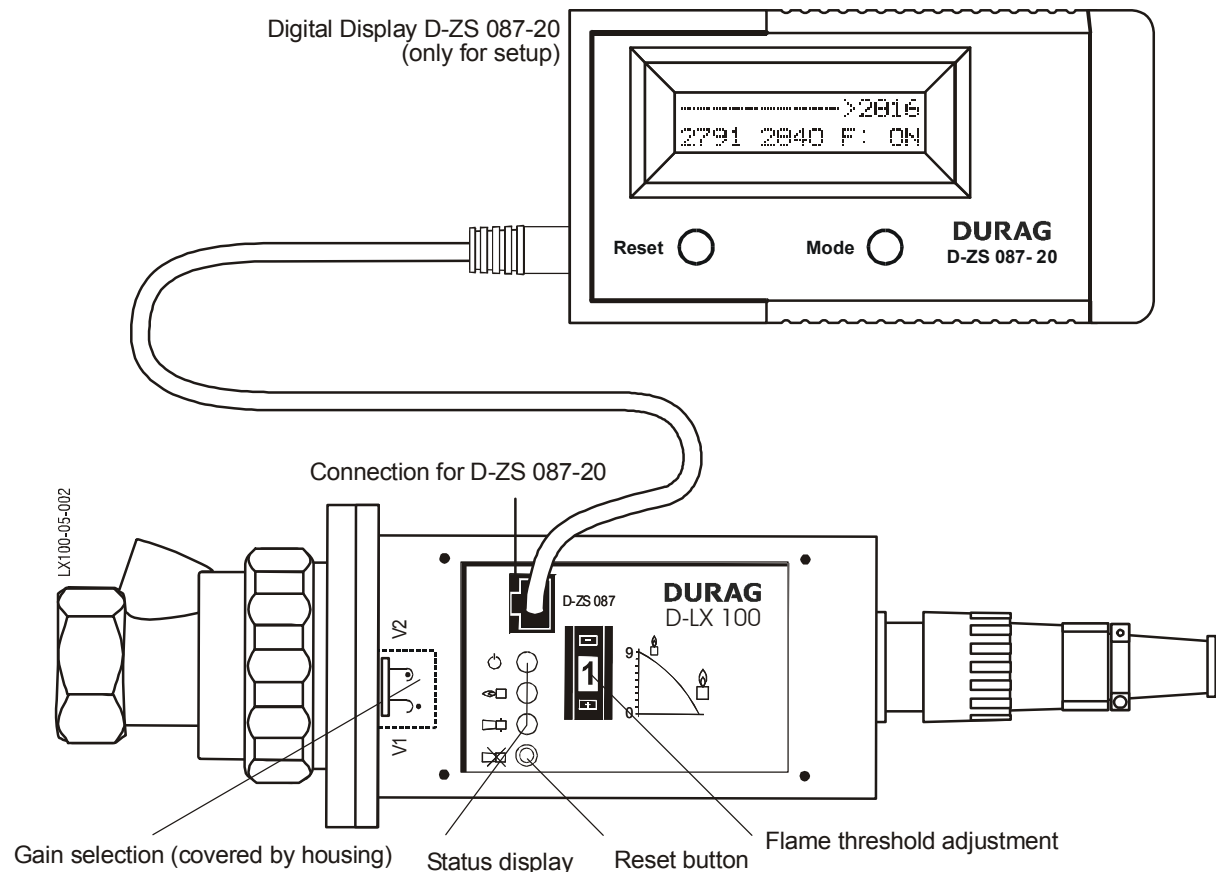
DURAG also offers a D-LX 100 flame scanner employing a UV photocell, which can monitor flames in the UV-C range, where wavelength is very short. In this range it is unnecessary to suppress any non-dynamic flame energy. This makes it possible to evaluate the often very high portion of constant energy generated by the flame. Due to the way the photocell operates, it is unnecessary to equipped this integrated flame scanner with an amplifier, high-pass filter or pulse generation stage. The cell itself generates pulses using the voltage supply via an RC reset circuit.

The pulses generated by the integrated flame scanners, which offer a measure of the flame intensity, are transmitted to the microprocessor system and will trigger a flame ON or OFF signal, depending on the flame recognition threshold programmed in.

Three features are available for the flame signal: 1) a fail-safe relay contact, K2, 2) a green LED on the front panel, and 3) a current output for display of the flame intensity. The current output is set at the factory to either 4-20 or 0-20 mA.

Both operational readiness and fault status are signaled via a contact in the K1 fault relay, and either a yellow (ready) or red (fault) LED on the front panel.

The DURAG D-ZS 087-20 Display Unit may be plugged into the jack on the front panel. This device displays the flame intensity as a pulse signal between 0 and 4095 pulses/sec. and further aides in setting the proper flame recognition threshold.



(Fig. 2) D-LX 100 with D-ZS 087

4. Self-Check

The D-LX 100 All-In-One Flame Scanner is fail-safe and self-checking, in accordance with European EN standards for flame scanning equipment. After power-up, the flame scanner performs a self-check, which is constantly performed during continuous operation.

If employed for continuous operation, any component failure that jeopardizes the safety-related functions of a scanner must trigger an error shutdown. The D-LX 100 is therefore equipped with a dual-channel microprocessor system. This system controls all functions and self-checks, and monitors all safety-related timing sequences. Input and output status is independently checked and compared by the microprocessors. Only if they agree is operation allowed to continue.

If the controller signals flame ON, the integrated flame scanner is automatically monitored. This occurs every second for 0.2 s via the activation of a shutter. The shutter is a transistor separating the photo element from the electronics. In the case of the D-LX 100 UL, a long-lasting mechanical shutter is used to interrupt the path from the photo element to the electronics. The interruption of the photocurrent simulates the outage of a flame and must result in a drop in the flame signal that was present during the 0.8 s that the scanner was monitoring the flame. If a hardware problem causes too little a decrease in the flame signal, an error shutdown will occur after eight such cycles, that is, after eight seconds.

If the flame ON signal is stopped, the integrated flame scanner is also no longer checked.

5. Fault

If the internal self-check recognizes an error in the safety-related software and hardware components, an error shutdown and internal lockout must be triggered. The relays for the flame, operational readiness and fault signals are released, and the red LED on the front panel will begin blinking. The contact from K1 signals the present fault.

The red LED blinks 5 times by itself. After that, the yellow LED will also begin blinking with the red. The number of times that the yellow LED blinks corresponds to the type of error, which allows the operator to precisely analyze the source of the fault. The following error sources can be signaled:

5.1. Error Codes of the 1st CPU:

Error Code	Yellow LED Blinks	Source of Error	Possible Cause of the Error
1.	1 x	Synchronization	defective / faulty microprocessor circuit
2.	2 x	2 nd CPU	2 nd CPU is indicating an error (no display of its own)
3.	3 x	FOS cycle	defective cycle generation / faulty acknowledgment
4.	4 x	Flame signal relay	defective drive / faulty acknowledgment
5.	5 x	Flame signal contact	defective / faulty acknowledgment of the contact position
6.	6 x	Status signal relay	defective drive / faulty acknowledgment
7.	7 x	Flame comparison	faulty transmission of flame data
8.	8 x	Flame recognition threshold	push button switch on front panel pressed by unauthorized personnel
9.	9 x	Safety time	unauthorized change in the soldering field
10.	10 x	PROM test	defective / faulty microprocessor circuit
11.	11 x	RAM test	defective / faulty microprocessor circuit
12.	12 x	Flag test	defective / faulty microprocessor circuit
13.	13 x	CPU test	defective / faulty microprocessor circuit

If the cause of the error is a defect in the integrated flame scanner, the red and green LED's will blink alternately.

Pressing the reset button on the front panel of the D-LX 100 acknowledges a fault in the unit and allows flame scanning functions to continue after restart. When the reset button is pressed, all LEDs will go off. It is also possible to reset the unit by open the plug connection or by interrupting the yellow 24 V supply wire for a short moment. In this case the cover of the flame scanner don't has to be opened in order to get access to the reset button.

If the power supply is interrupted or the reset button is pressed, the relays are released, regardless of the status of the unit (flame signal ON / OFF or fault). The flame scanning program is then restarted.

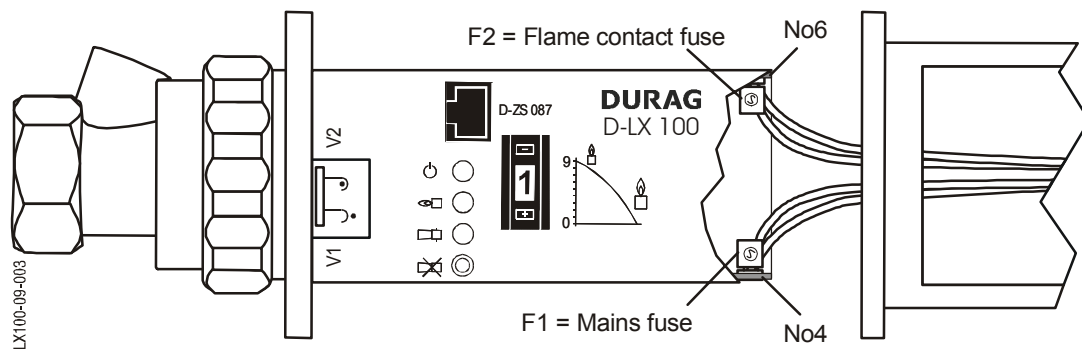
Note:

The D-LX 100 is an officially approved flame scanner. Any tampering or modifications will lead to a loss of its approved status. Repairs may only be performed by the manufacturer or its authorized service outlets.

6. Installation

Installation occurs according to the D-LX 100 dimensional drawings. The electrical installation must be performed in accordance with the wiring diagram in this manual, as well as any local guidelines. The location of fuses F1 and F2 can be found in the dimensional drawing.

The enclosure rating of the flame scanner is IP67 if it is a model with the plug connection, and IP65 if the scanner has a permanently threaded cable connection.



(Fig. 3) Location of fuses

Note: To change the amplification or to replace the fuses, the electronics must be pulled from the housing. Due to the D-LX 100's compact design, one must observe that no wires get pinched when putting the scanner back together. The housing should be closed without using excessive force.

To guarantee the best, most selective flame monitoring, one must determine the correct position of the scanner, since the flame must be visible to the flame scanner at all times, regardless of the load range of the burner. The 6° angle of view should always be oriented toward the root of the flame, that is, the bottom third of the flame. The D-LX 100 is mounted onto a sighting tube with a 1¼" pipe (male thread connection). A D-ZS 033-I adjustable ball joint flange is available to more easily align the scanner with the flame.

The flame scanner's purge air connection is responsible for keeping the sighting tube and optics free of particles from the combustion chamber. A current of air, strong enough to blow away heavier particles, must therefore be aimed toward the combustion chamber. In applications with low particle levels, like gas burners, a purge air velocity of $v = 3$ ft/s (1 m/s) in a 1¼" sighting tube will sufficiently purge the scanner (air consumption 100 ft³/h [3m³/h]). Those with higher levels, like coal-fired burners, require more purge air ($v = 10$ ft/s [3 m/s]). These velocities for the purge air in the sighting tube are only guidelines. Changes on a site-specific basis are certainly permissible. The scanner is equipped with ½" female pipe connection for the purge air.

The flame scanner should be routinely checked to ensure that the optics are clean and that the scanner is firmly mounted to the sighting tube.

For optimal alignment of the flame scanner, the D-LX 100 uses a 4-20 mA (or 0-20 mA, if desired) current output which displays the flame intensity. *Note:* the current output leads are not galvanically separated from the internal voltage supply. To avoid having faults attributed to the flame scanner, these leads may need to be shielded. As a rule, however, shielding is not required for cable lengths below 15 ft (5 m).

For high availability in the system, the power supply equipment and the flame scanner must be properly timed (power supply and maximum time for outages). In order to avoid possible interference in the grounded lead from any transient currents (e.g., current from an ignition device against ground potential), DURAG D-ZS 117-I insulators may be used between the sighting tube and the flame scanner. One must make certain, however, that the pipe or hose conduit for the scanner's purge air connection is also made of non-conducting material.



When connecting the flame scanner, all local regulations must be observed. The flame scanner is equipped with a safety screw to ensure that the scanner is firmly in place. Always be certain that the flame scanner has been mounted properly.

6.1. Start-Up

Once mounted and connected according to the drawings and diagrams in this manual, the D-LX 100 All-In-One Flame Scanner is immediately ready for operation once power is supplied.

7. Programming the Flame Scanner

The flame scanner is equipped with a push button switch for adjusting the flame recognition threshold of the flame relay. This threshold may be set to one of ten levels. The scanner is also equipped with a hook switch for adjusting the amplification of the photo current to one of two different levels. This amplification feature is unnecessary for the D-LX 100 UL, and is therefore not found on that scanner. The push button switch is accessible after removing the cover plate. The hook switch is still obscured by the housing even if the cover plate has been removed, since it is only intended to be switched under special circumstances for dampening very high flame signals.

7.1. Setting the Flame Recognition Threshold

By setting the flame recognition threshold on the flame scanner, the operator of the combustion system determines whether the flame signal (pulse frequency) of the integrated flame scanner should generate a flame ON or flame OFF signal. This threshold is set using the push button switch on the front panel, and may be programmed to one of ten settings. After start-up, the threshold setting must be protected from unauthorized changes.

Switch setting "0" is the highest threshold. The flame scanner must generate a strong flame signal in order to register flame ON. Position "9" is the lowest threshold. A weak flame signal is sufficient to trigger and maintain a flame ON signal.



The operator uses this threshold setting to determine when the flame scanner signals flame ON or OFF.

The green (flame ON) LED and the 4-20 mA (or 0-20 mA) analog output for flame intensity may be used to select the proper switch position. However, use of the D-ZS 087-20 Digital Display Unit is recommended. When setting the flame recognition threshold, one must always consider the possible influence of ambient light. This can play a role both in multi-burner and single burner applications.

Flame OFF Setting:

If the burner is shut down, the flame recognition threshold (switch-on threshold) must be set high enough that the flame scanner does not see any ambient light and reliably signals "Flame OFF":

- the green "Flame" LED is not illuminated,
- the current in the flame intensity measurement circuit is less than 8 (or 5) mA,
- the fail-safe relay output to the external flame ON signal is open.

Flame ON Setting:

If the burner is operating, the flame signal must reliably exceed the flame recognition (shut-off) threshold and signal "Flame ON":

- the green "Flame" LED is illuminated,
- the current in the flame intensity measurement circuit is greater than 12 (or 10) mA
- the fail-safe relay output to the external flame ON signal is closed.

Example:

The flame recognition threshold is set on site such that a flame ON signal is reliably present given sufficient flame intensity, under all load conditions. That is to say, the flame intensity current display fluctuates between 12 (or 10) and 20 mA. If the flame image deteriorates too much, the flame signal (pulse frequency) must dip below the shut-off threshold. The safety time programmed into the scanner will then begin to run. After the safety time expires, the flame OFF signal is given and the green LED goes out (flame intensity current is less than 8 (or 5) mA).



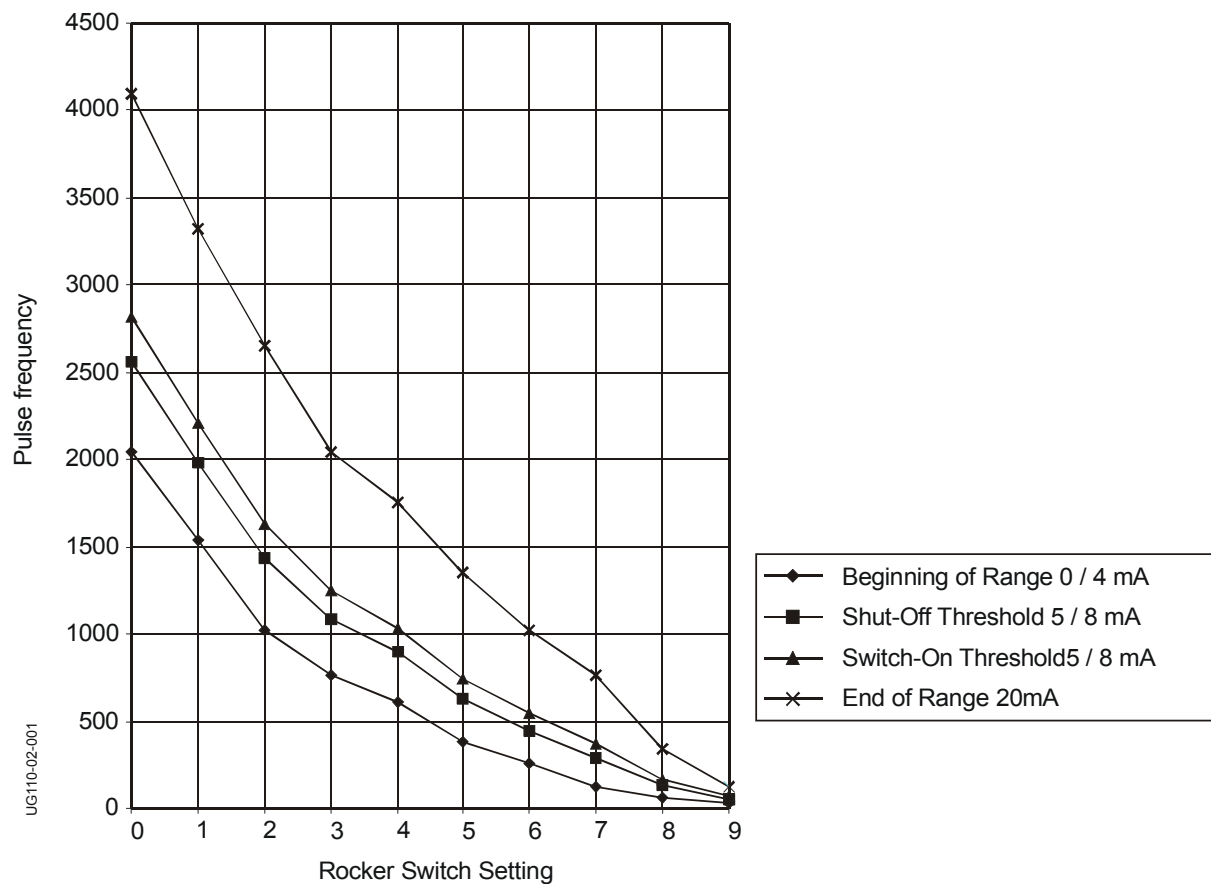
Once the scanner's alignment and flame recognition threshold have been properly determined, the D-LX 100 must reliably report if a burner is shut down or if an impermissible deterioration of the flame image occurs. Consideration must be given in order that ambient light sources do not generate faulty system status. The operator must see to it that the settings are never changed by unauthorized personnel.

If the flame recognition threshold is changed, one must be aware that if the push button is not pressed all the way, it is possible to have the scanner programmed to an intermediate setting, between settings 1 and 2, for example. If the switch is stuck in one of these undefined settings for more than 8 s, an error shutdown will occur.

7.2. Flame Recognition Thresholds as a Function of the Rocker Switch Setting

Rocker Switch Setting	Beginning of Range 0/4 mA	Shut-off Threshold 5/8 mA	Switch-On Threshold 5/8 mA	End of Range 20 mA
0	2048	2560	2816	4095
1	1536	1984	2208	3328
2	1024	1431	1634	2650
3	768	1088	1248	2048
4	608	894	1036	1750
5	384	626	746	1350
6	256	448	544	1024
7	128	288	368	768
8 *	64	132	166	336
9	32	56	68	128

- The flame recognition threshold is set to position 8 when delivered from the factory



(Fig. 4) Flame recognition thresholds as function of the rocker switch setting

7.3. Setting the Amplification

In most cases it is unnecessary to set the amplification of the photo element signal. However, if signal saturation should occur due to a very intense flame signal, the amplification hook switch can be moved from position V2 to position V1. As mentioned above, this is not a feature of the D-LX 100 UL. Switching to V1 reduces signal amplification by a factor of three.

The hook switch is mounted near the photo element. The housing must be removed in order to gain access to it. The four Allen screws must be loosened and the electronics insert pulled from the housing.

When putting the housing back together, the housing's o-ring must be in the correct position, and the cable bundle must lie inside the housing such that the electronics can be re-inserted without using excessive force and without pinching the cable bundle. Once the housing is back in place, the Allen screws must be screwed back in.

7.4. Adjusting the Flame Scanner D-LX 100...94Ex and D-LX 100.../95Ex

When operating a flame scanner in a hazardous location, an explosion-proof housing is required. Given the special design of this housing, different steps must be followed when programming the scanner.

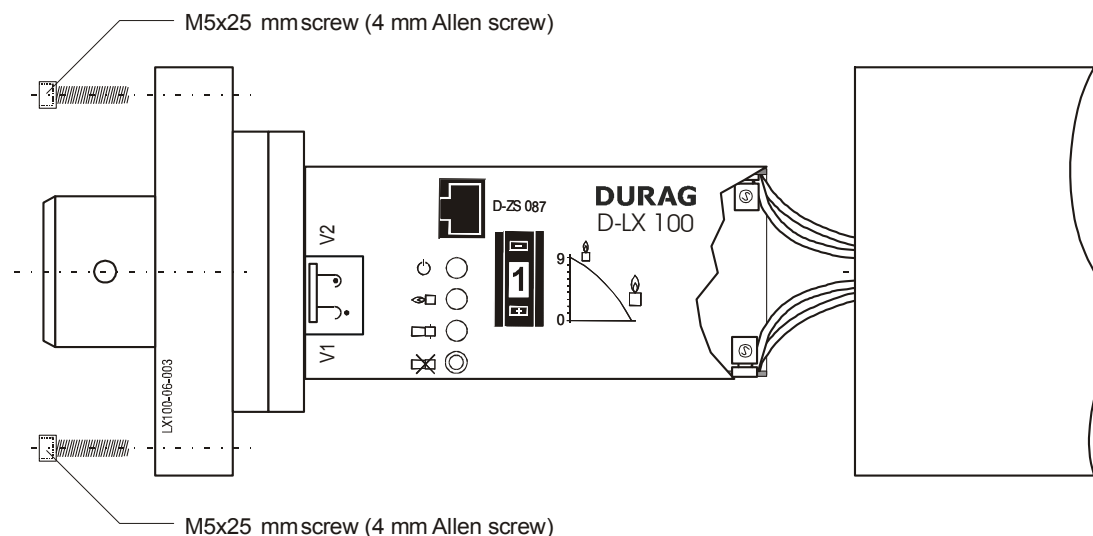


Before opening the housing in any hazardous location (e.g. explosive atmosphere), the flame scanner must be disconnected from its power source.

Explosion Hazard!

Unless asked by the customer to do otherwise, the flame recognition threshold is set to 8 and the amplification is set to V2 (high amplification; does not apply to the D-LX 100 UL). If changes are necessary, the procedure outlined below must be followed:

1. The flame scanner must be disconnected from the power source. All cable connections must therefore be disconnected.
2. The four M5x25 mm screws (4 mm Allen screws) must be unscrewed from the front part of the housing.
3. *Carefully* separate the housing. Because of the inner gasket and narrow gaps, greater force is required.
4. The flame scanner may now be programmed.
5. After the required settings have been made, the housing may be reassembled. One must be careful not to pinch or damage the connection cable.
6. Screw in the four M5x25 mm screws (4 mm Allen screws).
7. Reconnect the cable.



(Fig. 5) **Adjusting an explosion-proof flame scanner**

7.5. D-ZS 087-20 Digital Display Unit

By connecting the D-ZS 087 display unit, the flame intensity can be displayed as a pulse signal, from 0 - 4095 pulses. Furthermore, the minimum and maximum values are stored, and the thresholds for the flame ON and flame OFF ranges are calculated. This allows the operator to determine the optimal threshold between ambient light (relay must remain in the OFF position) and flame (relay must remain in the ON position, even if flame intensity is minimal).

8. Safety Time

The safety time is the response time of the flame scanner to the outage of the flame signal (pulse frequency of the integrated flame scanner) and the resulting shut-off of the relay contact for the flame ON signal.

The D-LX 100 has a standard safety time of 1 s. Safety times of 3 and 5 s are available upon request. Should the safety time need to be changed, the following steps must be followed:

9. Integrated Flame Scanner

In order that the flame scanner can be used in burner applications with the widest variety of fuels, 3 UV and 2 IR flame scanner models are available. All flame scanners with a semiconductor photo element have the same electronic shutter in common. The scanners use this shutter to perform a continuous check of the internal signal amplifier and filter. The signal amplifier can be set to one of two levels. Amplification level V2 is higher than V1 by a factor of three. The scanner comes from the factory having been set to V2.

DURAG also offers a UV flame scanner with a UV photocell. For performing self-checks, the scanner is equipped with a newly developed, long-lasting shutter which interrupts the path to the photocell. Because of the way the UV cell operates, it is not possible, or required, to switch from one amplification level to another since no saturation will occur.

9.1. Ultraviolet Flame Scanner

The UV zone of a flame is in general considerably smaller than the IR zone. Moreover, boiler walls and components do not radiate any dynamic UV energy. UV flame scanners are therefore very selective and not sensitive to ambient light.

The D-LX 100 UL uses a photocell with a spectral sensitivity of $\lambda = 185 \text{ nm}$ to 260 nm . Because this spectral range is so narrow and distant from that of daylight, it is permissible to evaluate both the dynamic and static energy of the flame. This important advantage makes the D-LX 100 UL a highly sensitive flame scanner, with excellent selectivity for all flames releasing energy in the UV-C range, e.g., gas and oil flames.

A semiconductor photo element with a spectral sensitivity of $\lambda = 190 \text{ nm}$ to 520 nm is employed in the D-LX 100 UA. The integrated flame scanner acquires the dynamic blue-to-transparent range of gas, oil and coal flames, without suffering signal collapse due to water vapor, recirculation gas or similar UV-absorbing gases.

In the D-LX 100 UAF, the photo element from the D-LX 100 UA is used with a filter. Because of this filtering, a reduced spectral range of $\lambda = 280 \text{ nm}$ to 410 nm results. This delivers better results in cases of very intense UV radiation or if higher selectivity is required. *Note:* in the visible spectral range the filter does not appear transparent—it appears black to the human eye. The photo element is, however, visible through the lens of the flame scanner.

9.2. Infrared Flame Scanner

The IR zone of a flame is in many cases large and, relative to UV radiation, very intense. The IR zone is easy to acquire under different angles of view, is strong in signal, and is not sensitive to absorption by gases. Compared to a UV flame scanner, however, it is more sensitive to ambient light.

A silicon photo element with a spectral sensitivity of $\lambda = 300 \text{ nm}$ to 1100 nm is used in the D-LX 100 IS. This flame scanner detects visible light. If the flame is red or gold in color, it is "visible" to the scanner, on the pre-condition, however, that there is movement in the flame, i.e., the flame is dynamic.

The D-LX 100 IG A employs a germanium photo element with a spectral sensitivity of $\lambda = 780 \text{ nm}$ to 1800 nm . The integrated flame scanner will therefore acquire the dynamic range of radiation generated by nearly all fuels. This type of flame scanner is strong in signal, but demonstrates lower selectivity due to the large IR zone.

Flames whose short-wave UV radiation is absorbed by dust, water vapor or other materials can be monitored in the IR range. Applications include waste incinerators and oil-fired combustion systems. In the case of the latter, IR monitoring in the spectral range of 300 to 1100 nm is typical.

IR flame scanners with a spectral sensitivity up to 1800 nm have proven themselves especially effective in applications employing measures for NO_x reduction, e.g., flue gas re-circulation or systems with combination burners for gas and oil.

Note:

It can occur in practice that static emitters, like glowing boiler components, become modulated by combustion air currents or flue gas clouds, and work like ambient light with dynamic portions of radiation. Should this radiation lie in the range received by the scanner, i.e., in the IR spectrum, and within the normal flicker frequency range (approx. 10 to 200 Hz), an output signal will be generated by the flame scanner in the form of a pulse frequency corresponding to the intensity and dynamics of the received radiation. The flame recognition threshold (pulse threshold) of the D-LX 100 may not in this case be exceeded by the pulse frequency of the integrated flame scanner and cannot be allowed to trigger a flame ON signal (see section 6: Setting the Flame Recognition Threshold on the Flame Scanner).

9.3. Selection Criteria for the D-LX 100 All-In-One Flame Scanner

Model	Spectral Range [nm]	Suitable for Following Fuels				Characteristics
		Gas	Oil	Coal	Wood	
D-LX 100 UL	185 – 260	++	+			Monitoring of gas and oil flames
D-LX 100 UA	190 - 520	++	++	○		Monitoring of gas and oil flames; also for low-NO _x combustion.
D-LX 100 UAF	280 - 410	+	++			Monitoring of very intense gas and oil flames; also for low-NO _x combustion.
D-LX 100 IS	300 - 1100		++	+	+	Monitoring of oil burners, even if additional fuels are also combusted.
D-LX 100 IG	780 - 1800	○	+	++	++	Monitoring of oil and wood flames, as well as coal flames.

Explanation of symbols:

++ Flame scanner is **ideally suited** for this fuel.

+ Flame scanner is **well suited** for this fuel.

○ Flame scanner is **conditionally suited** for this fuel. The monitoring characteristics depend for the most part on the combustion technique.

! Due to local regulations the flame sensor might not be approved for monitoring of gas flames.

This information is based on years of experience in a great proportion of combustion systems. Variations due to differing flame behaviour, caused by special combustion techniques cannot be taken into account or excluded. Therefore, deviations from table are possible.

9.4. Overview of D-LX 100 All-In-One Flame Scanner

Axial Plug Connection	Flameproof housing II 2G EEx de IIC T6	Flameproof housing Class I, Division 1 Group B, C&D	Version for Class I, Division 2 Group A, B, C&D	Version for II 3G EEx nC IIC T6
D-LX 100 UL-P	D-LX 100 UL/94Ex	D-LX 100 UL/95Ex	D-LX 100 UL/96Ex	D-LX 100 UL/97Ex
D-LX 100 UA-P	D-LX 100 UA/94Ex	D-LX 100 UA/95Ex	D-LX 100 UA/96Ex	D-LX 100 UA/97Ex
D-LX 100 UAF-P	D-LX 100 UAF/94Ex	D-LX 100 UAF/95Ex	D-LX 100 UAF/96Ex	D-LX 100 UAF/97Ex
D-LX 100 IG-P	D-LX 100 IG/94Ex	D-LX 100 IG/95Ex	D-LX 100 IG/96Ex	D-LX 100 IG/97Ex
D-LX 100 IS-P	D-LX 100 IS/94Ex	D-LX 100 IS/95Ex	D-LX 100 IS/96Ex	D-LX 100 IS/97Ex

9.5. Options

The D-LX 100 All-In-One Flame Scanner is normally delivered with the options listed in the table below. Should other options be required, please make them known when ordering.

"Flame intensity" current output	0 - 20 mA	4 - 20 mA	
Safety time	1 s	3 s	5 s

Note: the options shown in the shaded areas are standard; please indicate when placing an order whether any of the other options shown are desired instead.

10. Technical Data

- Permissible ambient temperatures: -20°C...+60°C (0°F...+140°F,
(other temperatures upon request)
- Safety time:..... 1 s (other times available upon request)
- Permissible operating modes:..... intermittent and continuous operation; 72-hour operation in
systems operating according to TRD 604
- Enclosure rating (EN 60529):..... IP67 (rating not associated with FM logo mark)
- Sighting tube connection:..... G1¼"
- Purge air connection: G½"
- Electrical connection: 1.5m (5 ft.) cable (8 conductor, 1 mm² / 18 gauge),
T = -60 to +180°C (-80°F to 360°F)
- Weight: approx. 1.8 kg (4 lb.)

10.1. Technical Data of the Integrated Flame Scanner

- Optical angle of view 6°; for the D-LX 100 UL: 6° horiz., 12° vert.
- Spectral sensitivity.....

185 nm – 260 nm	D-LX 100 UL
190 nm - 520 nm	D-LX 100 UA
280 nm - 410 nm	D-LX 100 UAF
300 nm - 1100 nm	D-LX 100 IS
780 nm - 1800 nm	D-LX 100 IG
- Flame scanner amplification: 2 levels: standard V2= V1x3, (not D-LX 100 UL)

10.2. Technical Data and Configuration of Inputs and Outputs

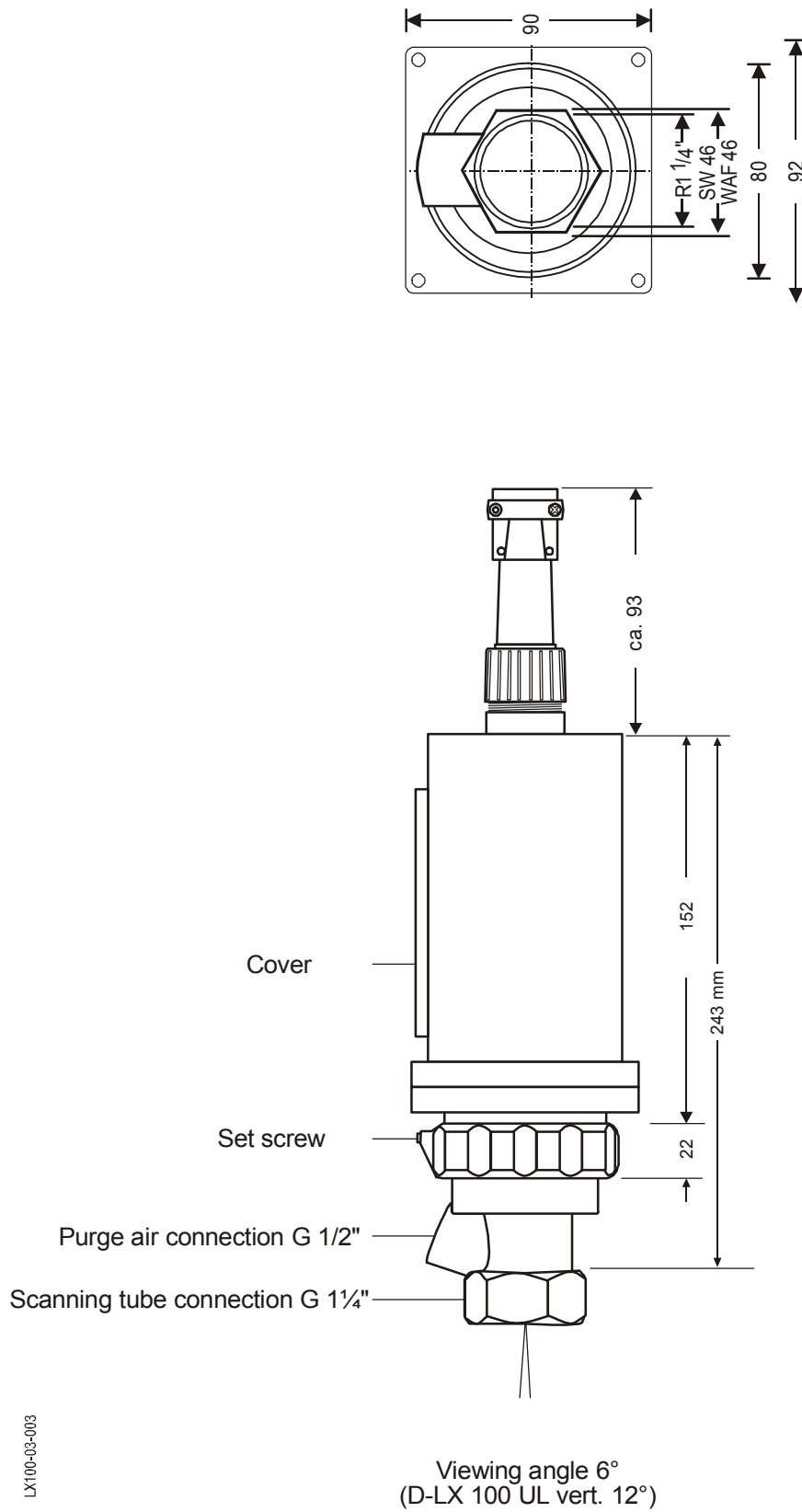
- Connection to power supply..... L+, L-, PE / grounded lead
- Power supply:..... 24 VDC ± 20%, approx. 5 W
- Fuse protection:..... F1= 0.315 A, semi-slow, MST 250
- Current output 0 / 4 - 20 mA Flame intensity / 150 Ohm maximum load
- Flame contact..... Closer; active if flame is present
- Fault contact..... Closer; active if no fault is present
Series connection with the flame contact as possible *second shut-off path*.
- Switching capacity of the relay contacts / fuse F2, slow, MST250:

min:.....	10 VAC/dc, 10 mA		
max:.....	250 VAC,	2.0 A / cosφ=1,0 (resistive load),	F2= 2A slow
		1.0 A / cosφ=0,4 (inductive load),	F2= 1A slow
		0.2 A / cosφ=0,2 (inductive load),	F2=0.2A slow
	24 VDC,	0.5 A with spark extinc.	F2=0.5A slow
	110 VDC,	0.2 A with spark extinc.	F2=0.2A slow
	220 VDC,	0.1 A with spark extinc.	F2=0.1A slow

The flame scanner is constructed such that there is potential separation between the power supply (24 VDC) and the unit's internal voltage (UB = 20 VDC / 5 VDC). The current output is galvanically connected to the internal voltage.

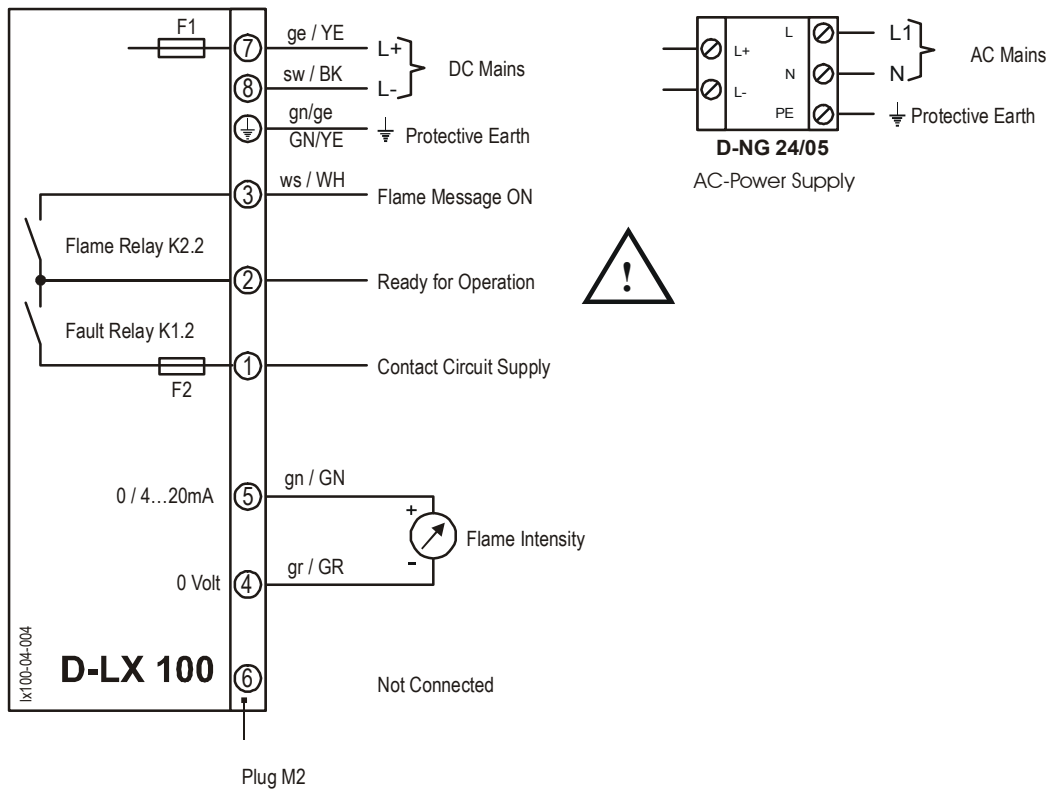
The relay contact for the flame ON signal is delivered with a fuse, F2 = 0.5 A, slow, MST250, for 24 VDC voltage switches. If connecting other switch voltages, this fuse must be exchanged accordingly.

10.3. D-LX 100 Dimensional Drawing




(Fig. 6) Dimensional drawing: D-LX 100

10.4. D-LX 100 Wiring Diagram



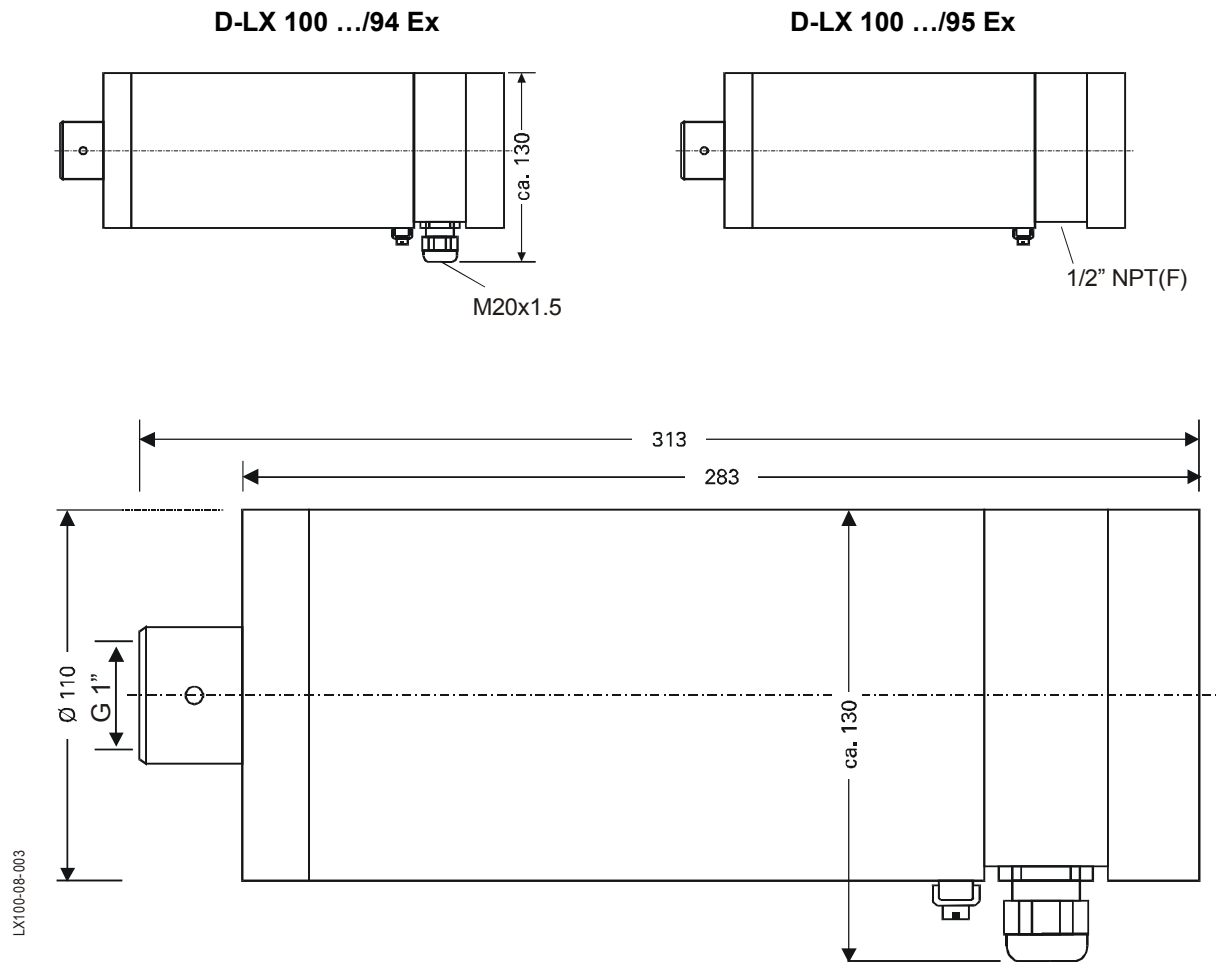
(Fig. 7) Wiring diagram: D-LX 100...-P, D-LX 100.../96Ex and D-LX 100.../97Ex

 **The Flame-On-Message has to be supplied via fuse F2 on the “Contact Circuit Supply” input. Only such components are allowed to be connected to the output “Read for Operation” which are non-interacting. These components can be for example the coil of a relay or a magnetic switch.**

Then the flame relays contact is protected against contact welding in accordance with EN 298.

Contacts K1.2 and K2.2 must be switched in series if the additional safety requirements for direct shut-off of the entire fuel supply are to be fulfilled. These are specified in VDE0116, paragraph 8.7.2 /10.98 or TRD 604, pages 1 and 2 for 72-hour operation (steam boiler without constant supervision).

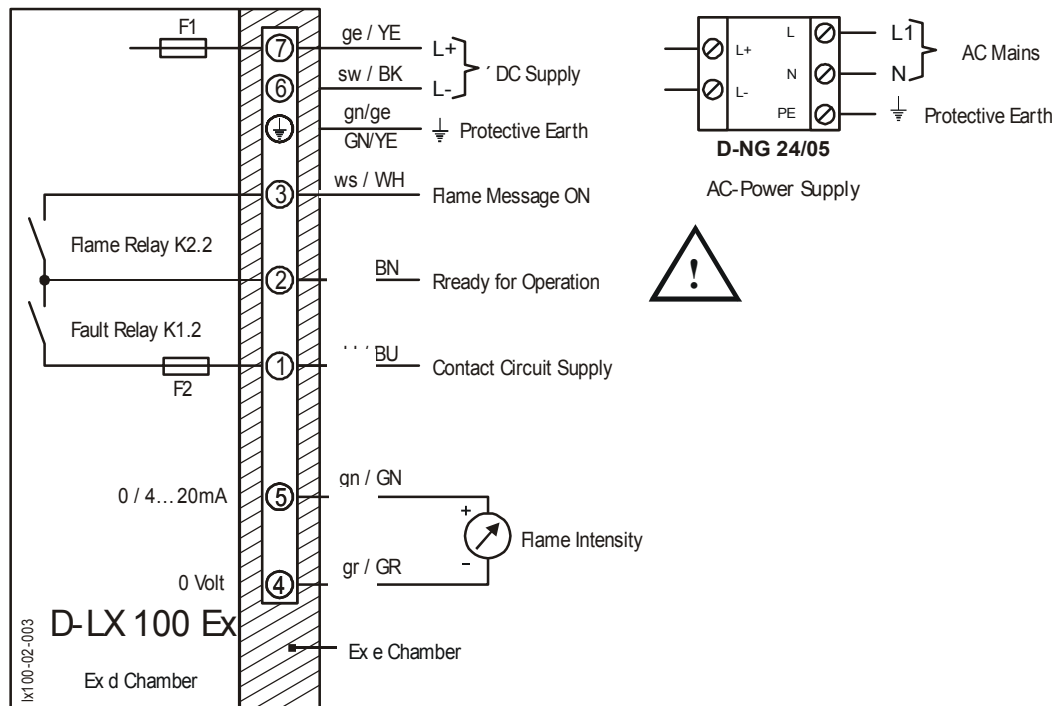
10.5. D-LX 100 ... /94 Ex and D-LX 100.../95Ex Housing for Hazardous Areas



(Fig. 8) Dimensional drawing: Ex-proof housing type K

Explosion protection:	D-LX 100.../94Ex: (PTB approved)	II 2G EEx de IIC T6/T5
	D-LX 100.../95Ex:	Class I, Div. 1, Group B, C & D (FM approved)
Max. ambient temperature:	at T5 : -20°C to +70°C (-4°F to 158°F) at T6 : -20°C to +60°C (-4°F to 140°F)	
Viewing pipe connection:	G 1" pipe thread	
Optical viewing angle:	6° (D-LX 100 UL: 6° horiz., 12° vert.)	
Weight:.....	3.8 kg (8.5 lb.)	
Enclosure rating:.....	IP 65 (rating not associated with FM logo mark)	
Cable entry:	D-LX 100.../94Ex:	Cable gland M20x1.5
	D-LX 100.../95Ex:	½" NPT (F) for conduit connection
Conformity certificate:.....	PTB 02 ATEX 1029 (D-LX 100.../94Ex only)	
Material:	AlCuMgPb	
Painting:.....	Blue, RAL 5017 and black RAL 9005	

10.6. Wiring Diagram for D-LX 100.../94Ex and D-LX 100.../95Ex



(Fig. 9) Wiring diagram: D-LX 100.../94Ex and D-LX 100.../95Ex

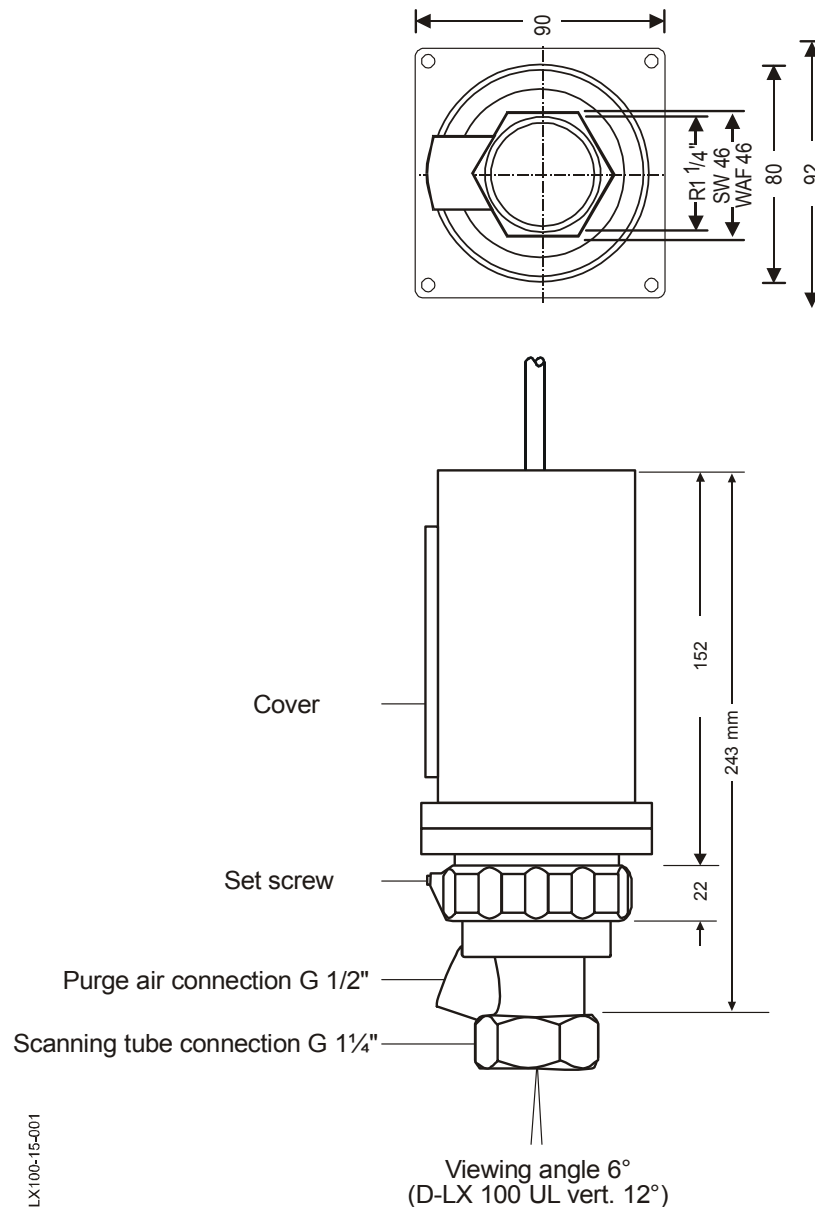


The Flame-On-Message has to be supplied via fuse F2 on the “Contact Circuit Supply” input. Only such components are allowed to be connected to the output “Read for Operation” which are non-interacting. These components can be for example the coil of a relay or a magnetic switch.


Then the flame relays contact is protected against contact welding in accordance with EN 298.

Contacts K1.2 and K2.2 must be switched in series if the additional safety requirements for direct shut-off of the entire fuel supply are to be fulfilled. These are specified in DIN-VDE0116, paragraph 8.7.2 /10.98 or TRD 604, pages 1 and 2 for 72-hour operation (steam boiler without constant supervision).

10.7. D-LX 100 ... /96 Ex for Hazardous Areas Class I, Div. 2, Group A,B,C&D



(Fig. 10) Dimensional drawing: D-LX 100.../96Ex



Explosion
Hazard!

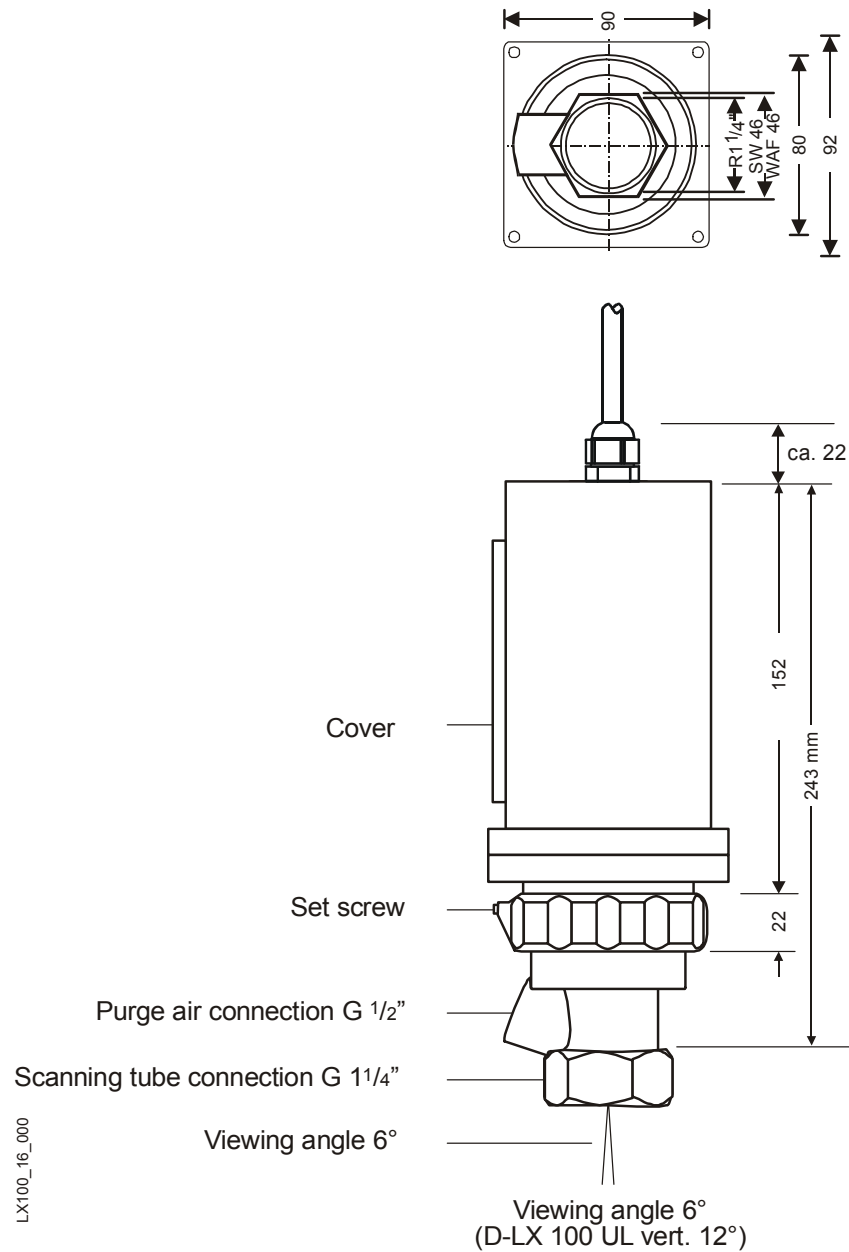
This flame scanner is suitable for use in Class I, Division 2, Groups A, B, C & D or non-hazardous areas only.

Exposures to some chemicals may degrade the sealing properties of used in the relays of the flame scanner. It is recommended that the sealing of the relays are checked periodically for any degradation of properties. In case of any degradation the flame scanner should be send to the manufacturer for service.


Before opening the housing in any hazardous location (e.g. explosive atmosphere), the flame scanner must be disconnected from its power source.

- Area classification:..... Class I, Division 2, Group A, B, C & D
- Viewing pipe connection: G 1 1/4" pipe thread
- Purge air connection: G 1/2" pipe thread
- Weight:..... 1.8 kg (3.96 lbs.)
- Cable entry: 1/2" NPT (F) for conduit connection
Wiring according to figure 7

10.8. D-LX 100 ... /97 Ex for Hazardous Areas Zone 2



(Fig. 11) Dimensional drawing: D-LX 100.../97Ex

	<p>This flame scanner is suitable for use in Zone 2, II 3G EEx nC IIC T5/T6 or non-hazardous areas only.</p> <p>Before opening the housing in any hazardous location (e.g. explosive atmosphere), the flame scanner must be disconnected from its power source.</p>
<p>Explosion Hazard!</p>	

- Area Classification:..... Zone 2, II 3G EEx nC IIC T5/T6
- IP-Rating:..... IP 65 (rating not associated with FM logo mark)
- Viewing pipe connection: G 1 1/4" pipe thread
- Purge air connection: G 1/2" pipe thread
- Weight:..... 1.8 kg (3.96 lbs.)
- Cable entry: Cable gland M20x1.5, wiring according to figure 7

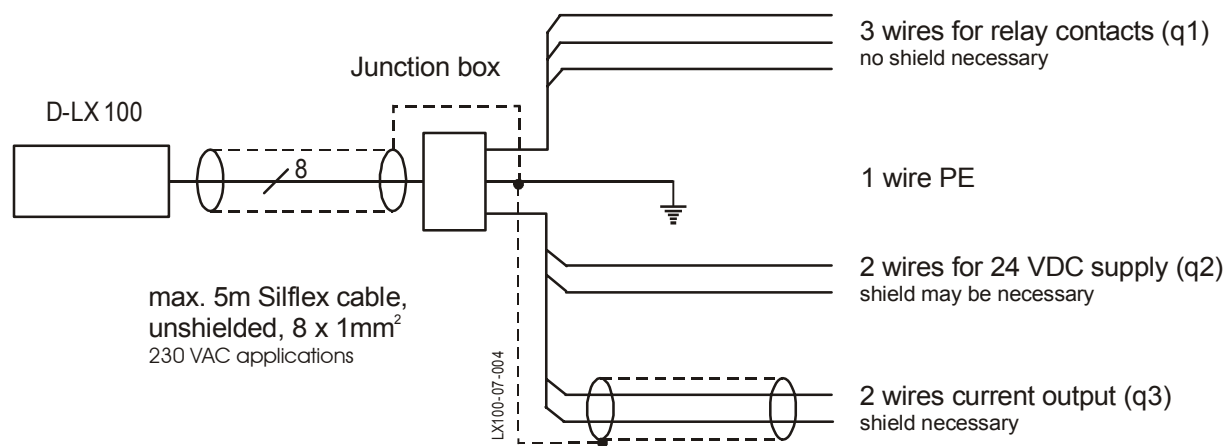
10.9. Cable and Shielding

The D-LX 100 is designed for the connection of 230 VAC via the fault contact and flame contact, while the system operates in the low-voltage 24 VDC range.

If the contacts are to be used in the "high-voltage" 230 VAC range, either an appropriately insulated cable must be used to cover the entire distance from the flame scanner, or a distributor panel needs to be installed, with separate cables used after it.

Shielding, if needed at all, is only required for the current output because the internal voltages of the flame scanner (0V and 5V) lead out from the flame scanner via this output.

Recommendation: Separate 3 high-voltage conductors and a protective ground as early as possible (up to 5m) from the low-voltage line and then lay 2 or 3 separate cables over greater distances:



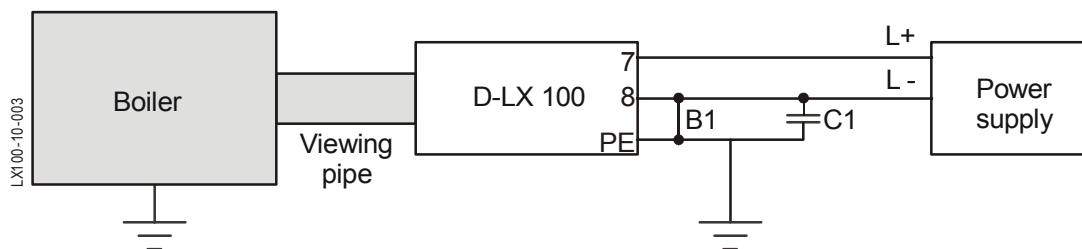
(Fig. 12) Cable and Shielding

Diameters q1 and q3 can be determined by conditions on site.

Diameter q2 must be great enough that resistance per conductor does not exceed $R = 10\Omega$. The D-LX 100 operates then at $24V - (200mA \times 2 \times 10\Omega) = 20V$ still permissible.

The D-LX 100 is constructed potential free. There is no connection between power supply and grounded housing. If the flame monitor stops operation because of a flame sensor-error (red and green LEDs flash) this potential separation may be responsible for that.

In that case a capacitive connection of $C1 =$ approx. 100nF or a direct connection B1 may help (but with B1 you loose the separation of potentials!)



(Fig. 13) Power supply and error suppression

11. Maintenance and Service

The optics of the Flame Scanner should be regularly checked for dust and debris and cleaned when necessary. If the outside of the lens regularly accumulates deposits, the purge air flow should be adjusted to alleviate this problem.

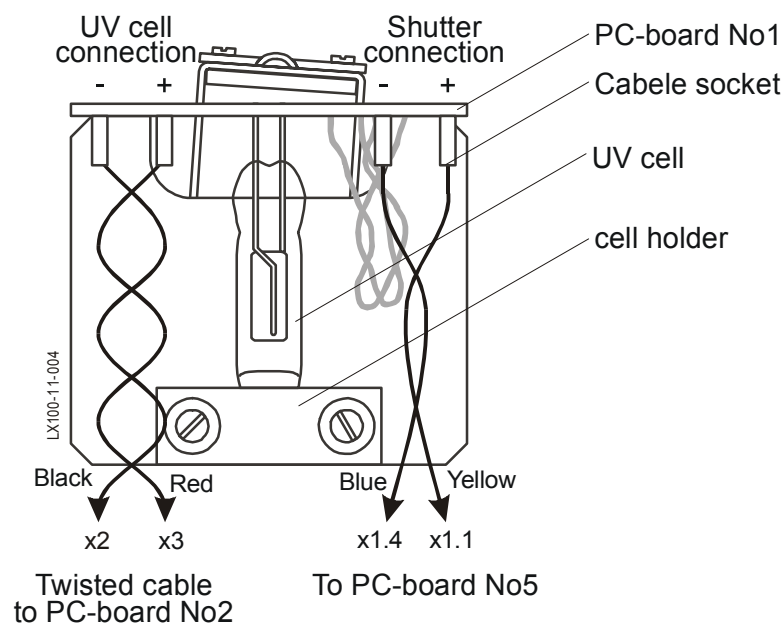
11.1 Replacement of the Shutter and the UV-Photocell on the D-LX 100 UL

The UV-photocell has a limited lifespan. A high pulse rate (> 1000 P/sec) and high ambient temperatures (60°C) contribute to the loss of filling gases (Gas Clean-up and Diffusion) and the darkening of the glass tube by sputtering. Both effects contribute to the reduction of sensitivity from 100% at the boundaries of the lifespan, which is defined by 50%.

Under extreme conditions, the lifespan is 10,000 hours, and in the most favorable conditions it is 50,000 hours or more.

The UV-Photocell is replaced in conjunction with the shutter. In order to remove this assembly, simply detach the four cable connectors.

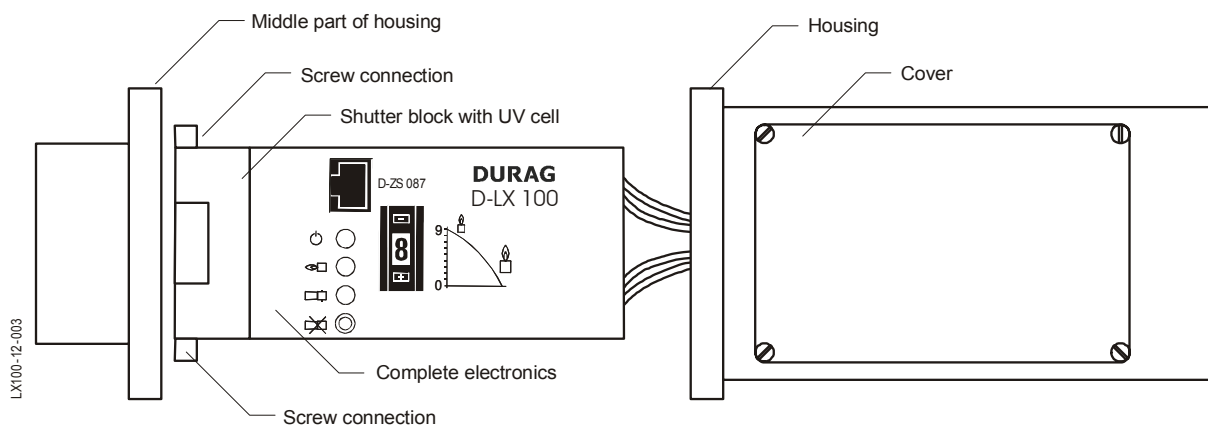
The layout of the device is displayed in the following illustration:



(Fig. 14) Shutter-Block with UV Cell

The replacement of the Shutter block and the UV Cell is to be done in the following manner:

1. Disconnect the scanner cable.
2. Remove the cover (4 x M3) and the housing (4 x M5 – Allen screws).
With Ex-type units there are special instructions for opening the housing, which are detailed in the chapter “Installation of Scanners with Explosion-proof housings.”
3. Remove the electronics assembly from the upper housing.
4. Remove the Shutter block.
5. Remove the cable connectors and reconnect them to the replacement unit. Please note the polarity.
6. Assemble the shutter block.
7. Screw the electronics assembly back onto the housing. Pay attention to the asymmetrical countersinking in the upper housing. The shutter block should lay open in the countersinking.
8. Assemble the electronics assembly and the housing, making sure not to crimp the wires.
9. Replace the cover.

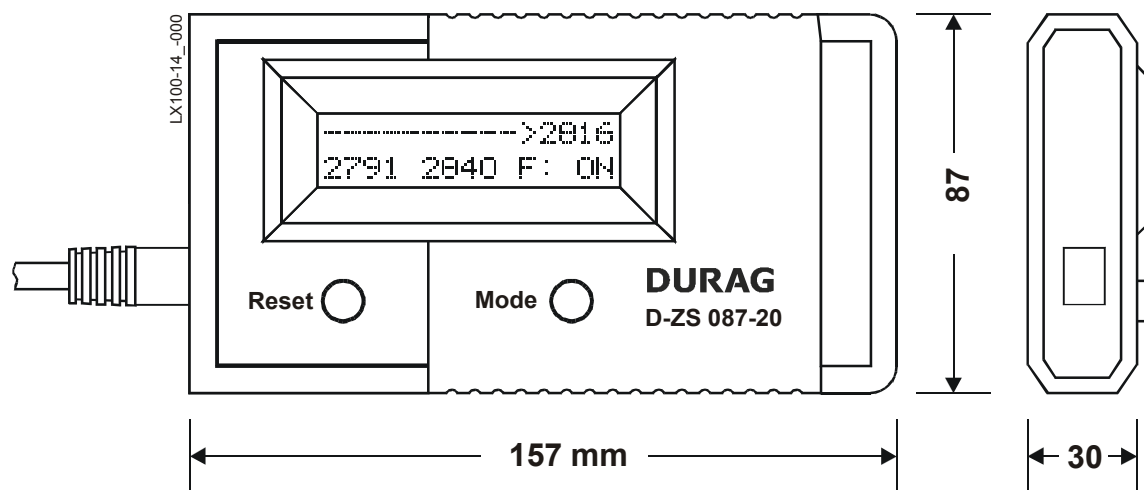


(Fig. 15) Layout of the Shutter block with the UV-Cell

12. Available Accessories

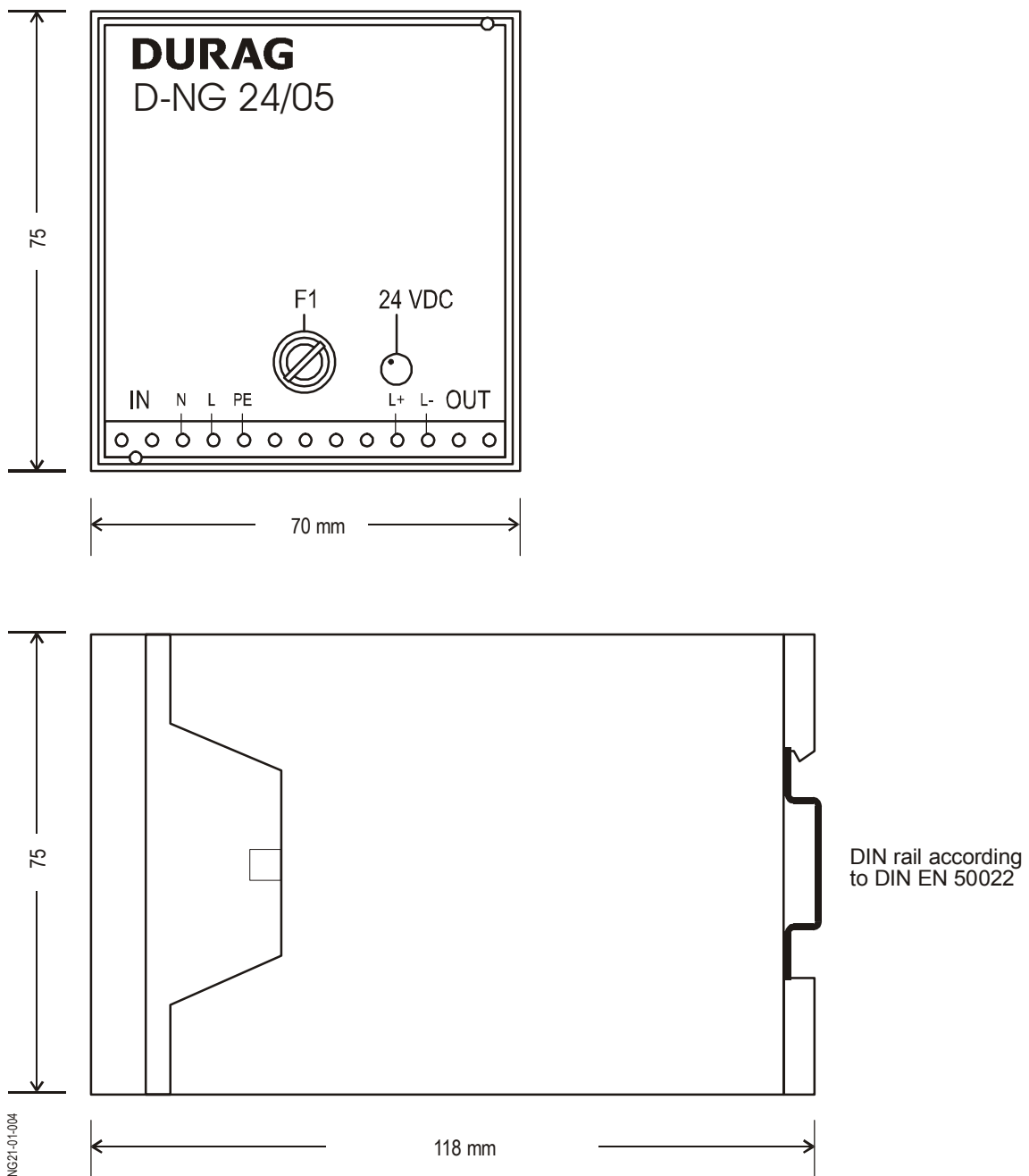
- D-ZS 033 - I** Ball joint flange with 1¼" threaded connection
- D-ZS 033 - III** Ball joint flange with 1" threaded connection
- D-ZS 087-20** Digital display unit for optimal orientation of the flame scanner; measures pulse rate, stores minimum and maximum pulse rate values, and calculates flame recognition thresholds for all DURAG flame scanners and burner management systems.
- D-ZS 077-10** UV-C-test light source 230V / 50Hz
- D-ZS 093** Combined test light source 230 V / 50 Hz ; covers UV-A, UV-B and IR ranges for functional testing of the D-LX 100
- D-ZS 117 - I** Heat insulator with potential separation and 1¼" threaded connection
- D-ZS 117 - III** Heat insulator with potential separation and 1" threaded connection for ex-housing
- D-ZS 118** Optical aid for aligning ball joint flange with sighting tube.
- D-ZS 129 - 10/11** LED bar graph display with switch unit for display of flame intensity and pre-alarm signaling.
- D-ZS 129 - 30/40** LED bar graph for display of flame intensity.
- kle8xAWG20SIHSI** unshielded silicone cable with DURAG color code, with UL approval, for flame sensors with wiring length up to 5m
- kle8xAWG18CY190** shielded PVC cable with DURAG color code, with UL approval, for flame sensors with wiring length up to 200m
- D-WSH 603** Weather protection hood for flame sensors

12.1. D-ZS 087-20 Digital Display



(Fig. 16) Dimensional drawing: D-ZS 087-20

12.2. D-NG 24/05 AC-Power Supply

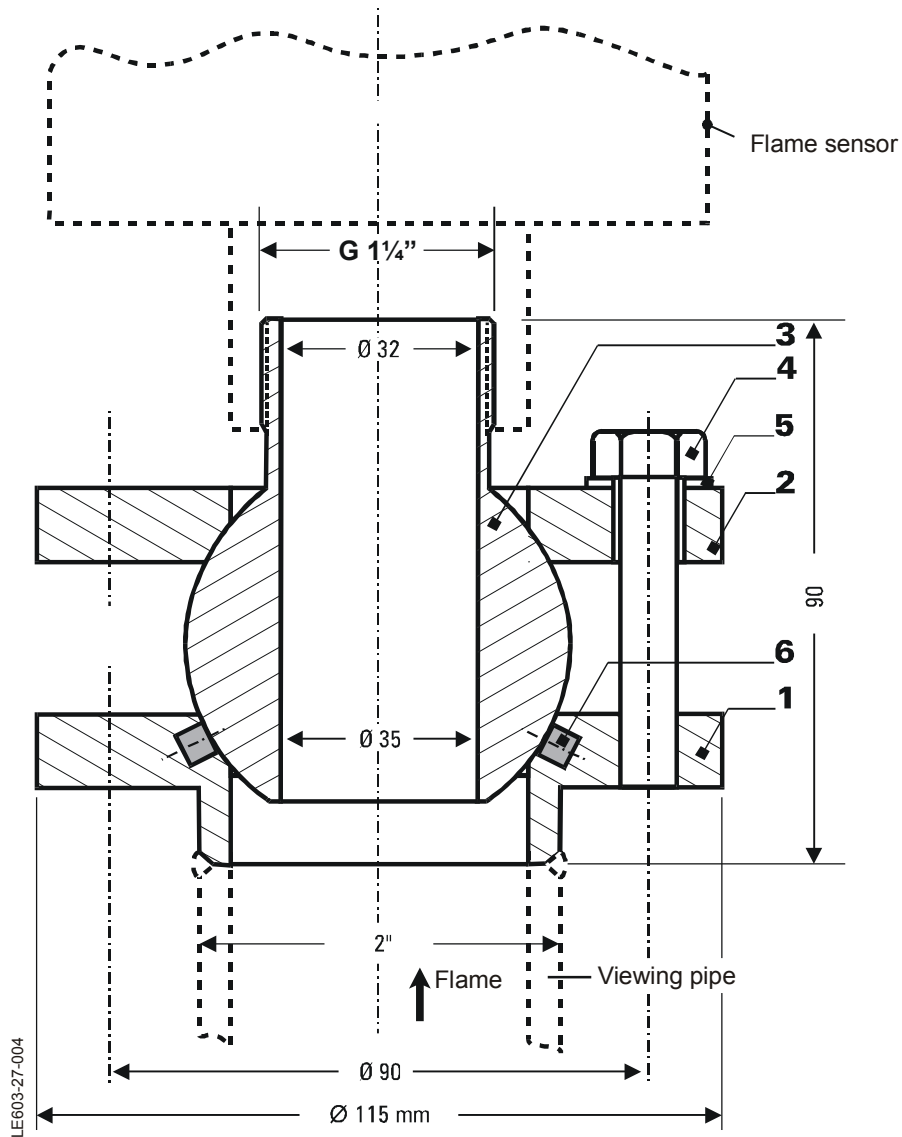


(Fig. 17) Dimensional drawing: D-NG 24/05

Technical Data on the D-NG 24/05 AC Power Supply:

- Power supply series connector: for operation of two D-LX 100 flame scanners
- Input: 115/230 VAC +10% -15% , 42-60 Hz , approx. 15 VA
- Fuse protection (F1): 0.1 A/slow / 5x20 mm (0.2x0.79 in.)
- Output: 24 VDC \pm 20% / 0.5 A
- Housing material (color) / dimensions: ABS (RAL 7035) and PC (transparent) / 75 x 70 x 118 mm (2.95x2.75x4.65 in.)
- Housing fastened: via TS35 DIN rail according to EN 50022

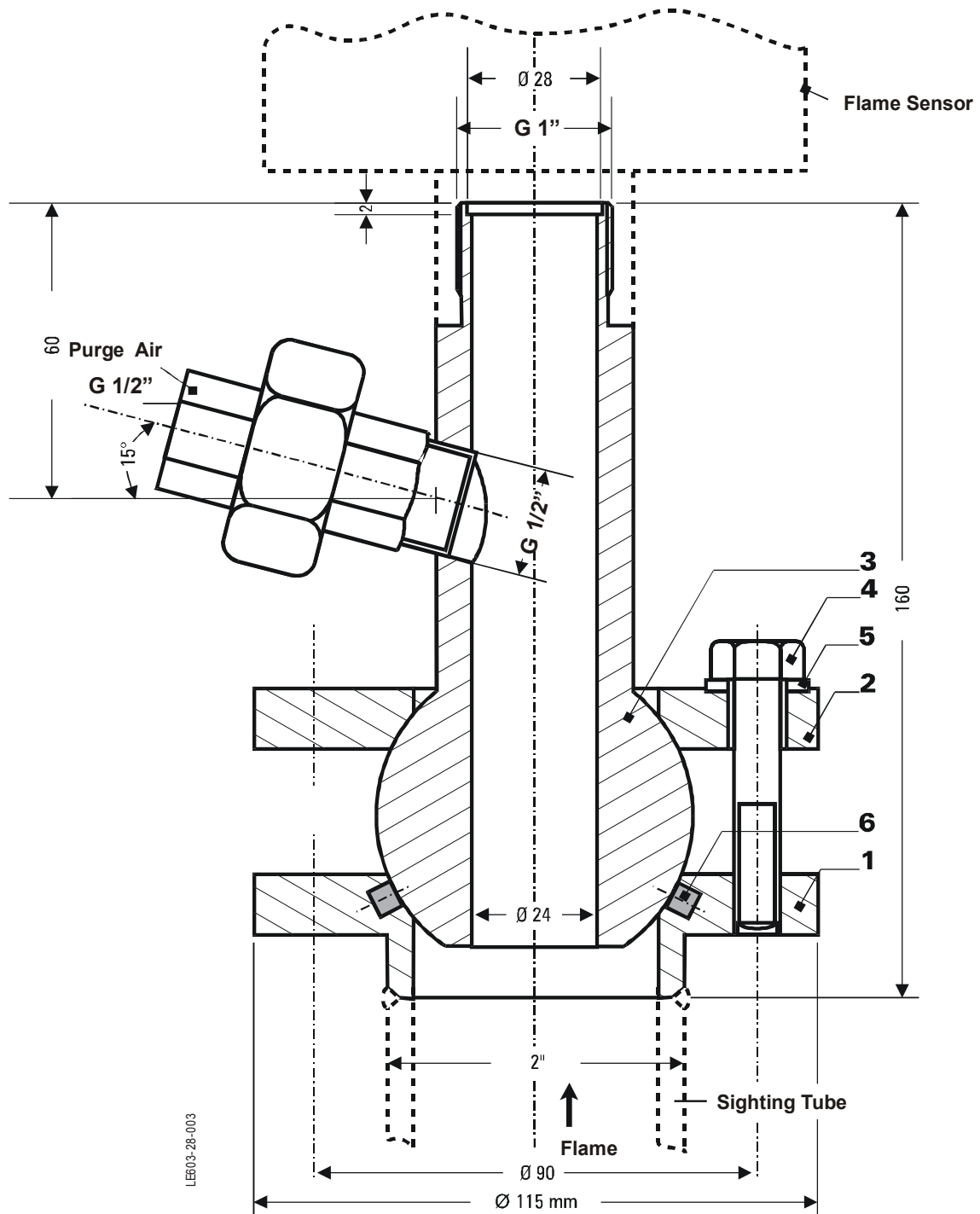
12.3. D-ZS 033-I Ball Type Adjustment Flange



Item	Qty.	Designation	Material
1	1	Welding flange	1.0718, galvanized
2	1	Flange	Al, Leg. 230
3	1	Ball joint	Al, Leg. 230
4	3	Hexagon head bolt	M10x50 DIN 558
5	3	Plain washer	10.5 DIN 125
6	1	Gasket	Asbestos-free graphite band,

(Fig. 18) Dimensional drawing: D-ZS 033-I ball type adjustment flange

12.4. D-ZS 033-III Ball Type Adjustment Flange

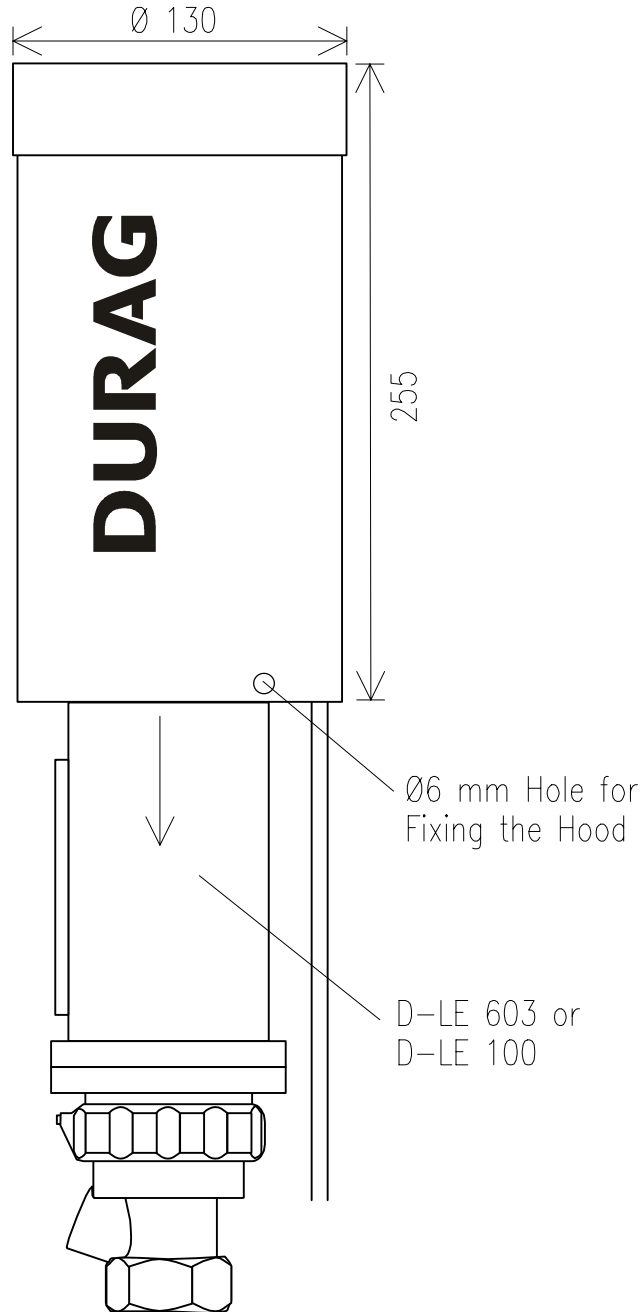


Pos.	Count	Description	Material
1	1	Welding flange	1.0718, galvanized surface
2	1	Flange	1.0718, galvanized surface
3	1	Ball	1.0718, galvanized surface
4	3	Hexagonal bolt	M10x50 DIN 558
5	3	Plain washer	10,5 DIN 125
6	1	Gasket	Graphite band, asbestos-free

(Fig. 19) Dimensional drawing: D-ZS 033-III ball type adjustment flange

12.5. Weather Protection Hood

On outdoor installations the D-WSH 603 Weather Protection Hood protects all D-LE 603 or D-LX 100 flame scanner against becoming rained when they are installed vertically, looking downwards. The plastic hood just has to be slipped over the flame scanner and so the flame scanner is protected ideally against rain and water.



(Fig. 20) Dimensional drawing: D-WSH 603

Technical Data



- Dimensions:..... Ø 130 x 225 mm
- Material:..... PVC
- Maximum Ambient Temperature -40°C +80°C
- Fastening:..... Mechanical Fixture through 6mm Hole
- Suitable for: D-LE 603...-P / -AP / -CG, D-LX 100...-P / -CG

13. Approvals

13.1. DIN-CERTCO

<div style="display: flex; justify-content: space-between; align-items: center;">   </div> <p style="text-align: center; font-weight: bold; font-size: 1.2em;">ZERTIFIKAT</p> <p style="text-align: center;">Der Firma DURAG Industrie Elektronik GmbH & Co KG Kollaustr. 105 22453 Hamburg</p> <p style="text-align: center;">wird für das Produkt Überwachungseinrichtungen und Steuergeräte für Ölzerstäubungsbrenner</p> <p style="text-align: center;">vom Typ D-LX 100...</p> <p style="text-align: center;">die Konformität mit DIN EN 230-1991-05</p> <p style="text-align: center;">bestätigt und das Nutzungsrecht für das Zeichen</p> <div style="text-align: center; margin: 10px 0;">  </div> <p style="text-align: center; font-size: 0.8em;">in Verbindung mit der unten genannten Registernummer erteilt Registernummer: 5F161/03 Dieses Zertifikat ist gültig bis 2008-10-31.</p> <div style="display: flex; justify-content: space-between; align-items: center; margin-top: 20px;"> <div style="font-size: 0.7em;"> <p>Weitere Angaben siehe Anhang DIN CERTCO Gesellschaft für Konformitätsbewertung mbH Burggrafenstraße 6, 10787 Berlin</p> </div> <div style="border: 1px solid black; border-radius: 50%; padding: 5px; text-align: center; font-size: 0.7em;"> <p>2004-06-09 Dr.-Ing. Michael Garner - Geschäftsführer/-Leiter der Zertifizierungsstelle -</p> </div> </div>	<p style="text-align: right; font-size: 0.8em;">Seite 1 von 1</p> <p>Anhang zum Zertifikat mit der Registernummer 5F161/03 vom 2004-06-08</p> <p>Technische Angaben Max. zul. Öldrucksatz: beliebig Betriebsweise: Dauerbetrieb geeignet zur: Überwachung von Brennern und Feuerungseinrichtungen für flüssige, gasförmige und feste Brennstoffe, auch in Verbindung an Wärmelieferzeugern.</p> <p>Typbeschreibung Mikrocontroller-gesteuerter Flammenwächter wahlweise mit integriertem Infrarot- oder UV-Flammenfühler</p> <p>Ausführungsvarianten: UL, UA, UAF, IS, IG / 97EX</p> <p>Prüflaboratorium / Überwachungsstelle TUV Süddeutschland Bau und Betrieb GmbH - Prüflabor. für Kälte-, Klima- u. Wärmetechnik Riederstraße 65 80339 München</p> <p>Prüfbericht FG 74 vom 1998-10-30 Ergänzungsschreiben A-Nr.: 109078 vom 2001-01-24 Ergänzungsschreiben vom 2002-01-22 C-F 1154-00/03 vom 2003-04-24 Ergänzungsschreiben C-F 1154-01/03 vom 2003-10-10 C-F 1154-02/04 vom 2004-05-06</p>
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13.2. EC Gas Appliance Directive 90/396/EC

<div style="display: flex; justify-content: space-between; align-items: center;">   </div> <p style="text-align: center; font-weight: bold; font-size: 1.1em;">EG-Baumusterprüfbescheinigung EC type examination certificate</p> <p style="text-align: right; font-size: 0.8em;">CE-0085AT0397 Produkt-Identifikationsnummer product identification no.</p> <table style="width: 100%; font-size: 0.8em;"> <tr> <td style="width: 20%;">Anwendungsbereich <i>field of application</i></td> <td>EG-Gasgeräte Richtlinie (90/396/EWG) EC Gas Appliances Directive (90/396/EEC)</td> </tr> <tr> <td>Zertifikatinhaber <i>owner of certificate</i></td> <td>DURAG Industrie Elektronik GmbH & Co. KG Kollaustraße 105, D-22453 Hamburg</td> </tr> <tr> <td>Vertreiber <i>distributor</i></td> <td>DURAG Industrie Elektronik GmbH & Co. KG Kollaustraße 105, D-22453 Hamburg</td> </tr> <tr> <td>Produktart <i>product category</i></td> <td>Ausrüstungsstelle für Gas- und Druckgeräte: Flammenwächter (4131)</td> </tr> <tr> <td>Produktbezeichnung <i>product description</i></td> <td>Mikroprozessor-gesteuerter Flammenwächter mit integriertem Infrarot- oder UV-Flammenfühler</td> </tr> <tr> <td>Modell <i>model</i></td> <td>D-LX 100 ...</td> </tr> <tr> <td>Bestimmungsänder <i>countries of destination</i></td> <td>AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IS, IT, LU, NL, NO, PT, SE</td> </tr> <tr> <td>Prüfberichte <i>test reports</i></td> <td>Baumusterprüfung: C-F 1154-02/04 vom 06.05.2004 (TSG) Baumusterprüfung: FGE 167 vom 30.10.1998 (TSG)</td> </tr> <tr> <td>Prüfgrundlagen <i>basis of type examination</i></td> <td>EU/90/396/EEG (29.06.1990) DIN EN 238 (01.02.1994)</td> </tr> <tr> <td>Aktenzeichen <i>file number</i></td> <td>04-0378-GEA</td> </tr> </table> <p style="font-size: 0.7em; margin-top: 20px;">24.08.2004 Rite A-1/2 DVGW-Zertifizierungsstelle - von der Deutschen Bundesregierung anerkannt und von der Europäischen Kommission als Zertifikationsstelle für die Konformitätsbewertung von Gasanlagen DVGW-Zertifizierungsbüro - anerkannt durch die Europäische Kommission für die Konformitätsbewertung von Gasanlagen</p>	Anwendungsbereich <i>field of application</i>	EG-Gasgeräte Richtlinie (90/396/EWG) EC Gas Appliances Directive (90/396/EEC)	Zertifikatinhaber <i>owner of certificate</i>	DURAG Industrie Elektronik GmbH & Co. KG Kollaustraße 105, D-22453 Hamburg	Vertreiber <i>distributor</i>	DURAG Industrie Elektronik GmbH & Co. KG Kollaustraße 105, D-22453 Hamburg	Produktart <i>product category</i>	Ausrüstungsstelle für Gas- und Druckgeräte: Flammenwächter (4131)	Produktbezeichnung <i>product description</i>	Mikroprozessor-gesteuerter Flammenwächter mit integriertem Infrarot- oder UV-Flammenfühler	Modell <i>model</i>	D-LX 100 ...	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13.3. EC Pressure Equipment Directive 97/23/EC

ZERTIFIKAT CERTIFICATE



**ZERTIFIKAT
Certificate**

EG-Baumusterprüfung (Modul B) nach Richtlinie 97/23/EG
EC Type-examination (Module B) according to Directive 97/23/EC

Zertifikat-Nr.: BAF-MUC 03 04 072357 003
Certificate No.: Revision 01

Name und Anschrift des Herstellers: Durag Industrie Elektronik GmbH & Co. KG
Kollastraße 105
D-22453 Hamburg

Hermit wird bescheinigt, daß das unten genannte EG-Baumuster die Anforderungen der Richtlinie 97/23/EG erfüllt.
We report hereby that the type mentioned below meets the requirements of the Directive 97/23/EC.

Produktart product category	Flammenwächter für Dauerbetrieb flame detector device for permanent operation
Typ, Ausführung type, model	D-LX 100 (Ausführungen siehe umseitig)
Prüfgrundlage basis of examination	DIN EN 298, DIN EN 230, DIN VDE 0116; Grundlegende Sicherheitsanforderungen gem. Anhang I
Prüfbericht Nr. test report no.	C-F 1154-00/03 vom 2003-04-24, Erg. C-F 1154-02/04 vom 2004-05-06
Fertigungsstätte manufacturing plant	Durag Industrie Elektronik GmbH & Co. KG D-22453 Hamburg

(Ort, Datum)
München, 2004-05-08

Ersatz für Ausgabe 2003-04-24
Bitte beachten Sie die untenstehende Hinweise.
Please note the remarks on the second page.

TUV Industrie Service GmbH
TUV SUD Gruppe
Fassungs- und Wärmetechnik
Reisenstraße 65
80339 München

Tel.: (089) 51 90 - 10 27
Fax: (089) 51 90 - 33 07
E-Mail: feuer@tuv-tsed.de
www.tuv-tsed.de

TUV Industrie Service GmbH
TUV SUD Gruppe
TUV-CERT-Zertifizierungsstelle
für Druckgeräte

Benannte Stelle, Kennnummer 0036
Number Body No. 0036

Mitglied der
CONFEDERATION EUROPEE
CEOC
D'ORGANISMES DE CONTRÔLE



Industrie Service

Seite 2 zum Zertifikat Nr.
page 2 of certificate no.
BAF-MUC 03 04 072357 003
Revision 01

Das Zertifikat erlaubt folgende Geräteausführungen / This certificate covers the following models:

Ausführung model	Spektralbereich spectral range	Anmerkung note
D-LX 100 UL D-LX 100 UL / 97Ex	UV 185...260 nm	
D-LX 100 UA D-LX 100 UA / 97Ex	UV 190...520 nm	Der Flammenwächter reagiert nicht auf natürliches Tageslicht The flame detector device does not react on natural day light
D-LX 100 UAF D-LX 100 UAF / 97Ex	UV 280...410 nm	Der Flammenwächter reagiert nicht auf natürliches Tageslicht The flame detector device does not react on natural day light
D-LX 100 IG D-LX 100 IG / 67Ex	IR 750...1850 nm	Der Flammenwächter reagiert nicht auf natürliches Tageslicht The flame detector device does not react on natural day light
D-LX 100 IS D-LX 100 IS / 97Ex	IR/VIS 300...1100 nm	Nicht für Gasbrenner / not for gas burners

Softwarestand V 1.2
Software version

Geeignet für Überwachung von Brennern und Feuerungsanlagen,
auch an Wärmelieferzeugen
Flame detection of burners and firing systems for liquid,
gaseous and solid fuels, also on hot air generators

Betriebsart / operation mode Dauerbetrieb / permanent operation

Sicherheitszeit / FRRT 1 s, wahlweise / optionally 3 s / 5 s

Der Flammenwächter erfüllt die Anforderungen der DIN VDE 016:1989-10, Abschnitt 8.7.2 für die Abschaltung der gesamten Brennstoffzufuhr. / Concerning safety shut-down of the entire fuel supply the flame detector device fulfills the requirements of DIN VDE 016:1989-10, clause 8.7.2.

Die nachstehenden Anforderungen sind zu beachten:
The conditions listed below have to be considered:

1. Beim Einbau des Flammenwächters sind die erforderlichen Maßnahmen hinsichtlich des Brandschutzes auszuführen. Dabei muß die Mindestschutzart IP 40 – bzw. IP 54 für den Gebrauch in Freiluft – gemäß EN 60529 sichergestellt sein.
After installation in the appliance the class of protection of the flame detector device shall be a minimum of IP 40 – or IP 54 for use in the open air – according to EN 60529.
2. Die Klemme 2 darf nur zur Signalisierung des internen Betriebszustandes des Flammenwächters, nicht aber zur Flammenmeldung herangezogen werden. An der Klemme 2 dürfen nur rückwirkungsfreie Geräte angeschlossen werden. Die Versorgung des Flammenwächterkontaktes (Klemme 3) darf nur über die Klemme 1 erfolgen und ist abhängig von der Versorgungsspannung entsprechend den Herstellerangaben abzusichern.
Output terminal 2 may only be used to indicate the status of the fault relay (ready for operation), but not for flame monitoring. Only devices without inductive interference shall be connected to terminal 2. The flame signal contact (output terminal 3) must be supplied over terminal 1 and must be fused according to the correct load voltage under consideration of the manufacturer's instructions.
3. Die notwendigen Daten zur korrekten Montage, Verschaltung, Inbetriebnahme, für den Betrieb und die Wartung des Flammenwächters sind in die entsprechenden Anweisungen des Brenners oder der Feuerungsanlage in der jeweiligen Amtssprache des Empfängerlandes aufzunehmen. Adequate information about proper location, mounting, installation, putting into service, operation and maintenance of the flame detector device shall be included into the installation and operating instructions of the burner or of the combustion system in an official language of the country in which the system is to be used.
4. Das Gefährdungsrisiko bei äußerem Brand sowie bei Belastungen durch Verkehr, Wind und Erdbeben ist abhängig von der Einbausituation und dem Aufstellungsort des Druckgerätes gegebenenfalls gesondert zu bewerten.
Hazardous risk from external fire as well as influences of traffic, wind and earthquake loading have to be evaluated particularly dependent on the situation of integration and installation of the pressure equipment.

13.4. UL-Listing

RE: Project Number(s) - 99NB4506

Your most recent listing is shown below. Please review this information and report any inaccuracies to the UL Engineering staff member who handled your project.

For information on placing an order for UL Listing Cards in a 3 x 5 inch format, please refer to the enclosed ordering information.

MCCZZ January 6, 2000
Controls, Primary Safety - Component

DURAG INDUSTRIE ELEKTRONIK GMBH & CO KG **MH25226**
KOLLAUSTRASSE 105, 22453 HAMBURG FED REP GERMANY

Models D-UG110, -UG120, -UG660 may be followed by a suffix number, flame monitors.
Model D-LE103, followed by UL, UAF, UA, IS, IG, followed by -P, -AP, -CG, combustion detectors.
Model D-LE603, followed by UH, US, UAF, UA, IS, IG, ISO, ISE, followed by -P, -AP, -CG, combustion detectors.
Subracks D-BT110, -BT660.
Model D-LX100 followed by IG, IS, UA, UAF or UL, followed by -AP, -CG, -P, flame monitor system.
Marking: Company name and model designation.

See General Information Preceding These Recognitions
For use only in equipment where the acceptability of the combination is determined by Underwriters Laboratories Inc.

13.5. CUL-Listing

RE: Project Number(s) - 99NB4506

Your most recent listing is shown below. Please review this information and report any inaccuracies to the UL Engineering staff member who handled your project.


For information on placing an order for UL Listing Cards in a 3 x 5 inch format, please refer to the enclosed ordering information.

MCCZ8 January 6, 2000
Controls, Primary Safety Certified For Canada

**DURAG INDUSTRIE ELEKTRONIK GMBH & CO KG
 KOLLAUSTRASSE 105, 22453 HAMBURG FED REP GERMANY**

MH25226

Models D-UG110, -UG120, -UG660 may be followed by a suffix number, flame monitors.
 Model D-LE103, followed by UL, UAF, UA, IS, IG, followed by -P, -AP, -CG, combustion detectors.
 Model D-LE603, followed by UH, US, UAF, UA, IS, IG, ISO, ISE, followed by -P, -AP, -CG, combustion detectors.
 Subracks D-BT110, -BT660.
 Model D-LX100 followed by IG, IS, UA, UAF or UL, followed by -AP, -CG, -P, flame monitor system.

Marking: Company name, model designation and Recognized Component Mark for Canada: 

See General Information Preceding These Recognitions

For use only in equipment where the acceptability of the combination is determined by Underwriters Laboratories Inc.

13.6. FM-Listing

DURAG INDUSTRIE ELEKTRONIK GmbH & Co KG, Kollaustrasse 105, D-22453 Hamburg, Germany

55 Series Flame Monitor Systems. Types D-UV 55-10/1 (or 3)/115 (or 230), D-IO 55-10 (or 11, 20, 21)/1 (or 3)/115 (or 230), D-IR 55-10/1(or 3)/115(or 230). Used with D-LE 55 UL-CG, D-LE 55 ISF-CG flame sensors or flame rods. Operate at 115 or 230 V ac.

DURAG Flame Monitor System, Type D-LX 100 series (D-LX 100 UL-P, D-LX 100 UL-CG, D-LX 100 UL/95Ex, D-LX 100 UL/96Ex, D-LX 100 UA-P, D-LX 100 UA-CG, D-LX 100 UA/95Ex, D-LX 100 UA/96Ex, D-LX 100 UAF-P, D-LX 100 UAF-CG, D-LX 100 UAF/95Ex, D-LX 100 UAF/96Ex, D-LX 100 IS-P, D-LX 100 IS-CG, D-LX 100 IS/95Ex, D-LX 100 IS/96Ex, D-LX 100 IG-P, D-LX 100 IG-CG, D-LX 100 IG/95Ex, D-LX 100 IG/96Ex), (operating voltage: 24Vdc, flame failure response time can be adjusted by DURAG between 1 sec and 3 sec, flame intensity output current 0-20mA or 4-20mA).

DURAG Flame Monitor System, Type D-UG110 control unit (operating voltage: 24/48/110/115/220/230 V ac, 50/60 Hz or 24/48 V dc, flame failure response time can be adjusted by DURAG between 1 and 4 sec, flame intensity output current 0-20 mA or 4-20 mA).

DURAG Flame Monitor System, Type D-UG 660 control unit (operating voltage: 24/48/110/115/220/230 V ac, 50/60 Hz or 24/48 V dc, flame failure response time can be adjusted by the customer between 1 and 4 sec, flame intensity output current 0-20 mA or 4-20 mA). DURAG Flame Monitor System, Type D-UG120 control unit (operating voltage: 24 V dc or 115/230 V ac, 50/60 Hz when using a DURAG power supply D-NG 24/05, flame failure response time 1 sec, flame intensity output current 0-20 mA or 4-20 mA).

Flame scanner Type D-LE 103 series or D-LE 603 series for oil, gas, coal or wood flames (D-LE 103 UL-P, D-LE 103 UL-AP, D-LE 103 UL-CG, D-LE 103 UL-MP, D-LE 103 UAF-P, D-LE 103 UAF-AP, D-LE 103 UAF-CG, D-LE 103 UAF-MP, D-LE 103 UA-P, D-LE 103 UA-AP, D-LE 103 UA-CG, D-LE 103 UA-MP, D-LE 103 IS-P, D-LE 103 IS-AP, D-LE 103 IS-CG, D-LE 103 IS-MP, D-LE 103 IG-P, D-LE 103 IG-AP, D-LE 103 IG-CG, D-LE 103 IG-MP, D-LE 603 UH-P, D-LE 603 UH-AP, D-LE 603 UH-CG, D-LE 603 UH-MP, D-LE 603 UH/95 Ex, D-LE 603 UH/96Ex, D-LE 603 US-P, D-LE 603 US-AP, D-LE 603 US-CG, D-LE 603 US-MP, D-LE 603 US/95 Ex, D-LE 603 US/96Ex, D-LE 603 UAF-P, D-LE 603 UAF-AP, D-LE 603 UAF-CG, D-LE 603 UAF-MP, D-LE 603 UAF/95Ex, D-LE 603 UAF/96Ex, D-LE 603 UA-P, D-LE 603 UA-AP, D-LE 603 UA-CG, D-LE 603 UA-MP, D-LE 603 UA/95Ex, D-LE 603 UA/96Ex, D-LE 603 UI-P, D-LE 603 UI-AP, D-LE 603 UI-CG, D-LE 603 UI-MP, D-LE 603 UI/95Ex, D-LE 603 UI/96Ex, D-LE 603 IS-P, D-LE 603 IS-AP, D-LE 603 IS-CG, D-LE 603 IS-MP, D-LE 603 IS/95 Ex, D-LE 603 IS/96Ex, D-LE 603 IG-P, D-LE 603 IG-AP, D-LE 603 IG-CG, D-LE 603 IG-MP, D-LE 603 IG/95 Ex, D-LE 603 IG/96Ex, D-LE 603 ISE-P, D-LE 603 ISE AP, D-LE 603 ISE-CG, D-LE 603 ISE-MP, D-LE 603 ISE/95 Ex, D-LE 603 ISE/96Ex, D-LE 603 ISO-P, D-LE 603 ISO-AP, D-LE 603 ISO-CG, D-LE 603 ISO-MP, D-LE 603 ISO/95 Ex, D-LE 603 ISO/96Ex.)

Flame scanner Type D-LE 603.../95Ex and compact flame monitor system D-LX 100.../95Ex are certified for use in hazardous areas classified as Class I, Div. 1, Group B, C & D

Flame scanner Type D-LE 603.../96Ex and compact flame monitor system D-LX 100.../96Ex are certified for use in hazardous areas classified as Class I, Div. 2, Group A, B, C & D

13.7. ATEX Certificate

Physikalisch-Technische Bundesanstalt 
 Braunschweig und Berlin



(1) **EC-TYPE-EXAMINATION CERTIFICATE**
 (Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 94/9/EC**

(3) EC-type-examination Certificate Number:
PTB 02 ATEX 1029

(4) Equipment: Flame detector, type D-L*** / 9° Ex

(5) Manufacturer: DURAG Industrie Elektronik GmbH & Co. KG

(6) Address: Kollastr. 105, 22453 Hamburg, Germany

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential report PTB Ex 02-11302

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
EN 50014:1997 + A1 + A2 EN 50018:2000 EN 50019:2000

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-type-examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment shall include the following:


Zertifizierungsstelle Explosionsschutz
 By order:


 Dr.-Ing. U. Klausmeyer
 Regierungsdirektor

Braunschweig, May 13, 2002

sheet 1/3

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • D-38116 Braunschweig

Physikalisch-Technische Bundesanstalt 
 Braunschweig und Berlin

SCHEDULE

(13)

(14) **EC-TYPE-EXAMINATION CERTIFICATE PTB 02 ATEX 1029**

(15) Description of equipment
 The flame detector D-L*** / 9° Ex is used for combustion process supervision to meet safety requirements in furnaces. Should the flame be extinguished, the flame detector will safeguard immediate interruption of fuel supply. It consists of a flameproof enclosure provided with a glass inspection window. Electrical connection is by means of a connector designed to type of protection Increased Safety.

Technical data

Rated voltage:	max. 275 V
Rated current:	max. 2 A
Rated cross section:	max. 2.5 mm ²
Protection:	IP 65

(16) Test report PTB Ex 02-11302

(17) Special conditions for safe use
 None
Additional information for safe use
 Connection


- Only such components (terminal compartments, bushings, explosion-proof cable entries, connectors) may be installed in or attached to the flame detector, which as a minimum comply with the technical standards as referenced on the cover sheet and for which a separate examination certificate has been issued. The conditions of use specified in the certificates for these components shall duly be complied with.
- Cable entries (conduit threads) and sealing plugs of simple designs must not be used.
- For connection of cable entries, the clearance and creepage distances specified in EN 50019, section 4.3 (table 1) and section 4.4 (table 2) shall duly be considered.
- The connecting cable of flame detector D-L*** / 9° Ex shall be installed to provide for permanent wiring and adequate protection against damage.
- If the temperature at entry elements should exceed 70 °C, heat-resistant connecting cables shall be used.

The above instructions shall be made known to the system operator in a suitable form.

sheet 2/3

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • D-38116 Braunschweig

Physikalisch-Technische Bundesanstalt 
 Braunschweig und Berlin

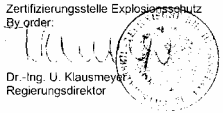
SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE PTB 02 ATEX 1029

Maximum ambient temperature and power dissipation in relation to temperature class

Temperature class	Max. ambient temperature	Max. power dissipation
T5	70 °C	55 W
T6	60 °C	40 W

Screwed cable gland
 The permissible continuous service temperature of the screwed cable gland as certified by a separate examination certificate shall be 90 °C as a minimum.

(18) Essential health and safety requirements
 Complied with by compliance with the standards referenced above.

Zertifizierungsstelle Explosionsschutz
 By order:

 Dr.-Ing. U. Klausmeyer
 Regierungsdirektor

Braunschweig, May 13, 2002

sheet 3/3

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • D-38116 Braunschweig

13.8. EC Declaration of Conformity

EC Declaration of Conformity

Manufacturer **DURAG** GmbH
Address Kollaustraße 105, 22453 Hamburg, Germany
Product Description Compact Flame Monitor **D-LX 100** ...

The described product complies with the following provisions of Council Directive, provided that it is installed, maintained and used in applications for which it was made, in accordance with relevant installation standards and manufacturer's instructions.

Council Directive 89/336/EC (EMC Directive)
Council Directive 90/396/EC (Low Voltage Directive)
Council Directive 73/23/EC (Gas Appliance Directive)
Council Directive 97/23/EC (Pressure Equipment Directive)
Council Directive 94/9/EC (Ex-Protection-Directive) *) **)

We confirm the conformity of the above mentioned product according to the standards:

EN 61 000-6-4 (2002)
EN 61 000-6-2 (2002)
EN 230 (1991)
EN 298 (1994)
EN 60 730-1 (2002)
EN 50014 (1997) *)
EN 50018 (2000) *)
EN 50019 (2000) *)
EN 50021 (2000) **)

Remark regarding to the ex-protection directive 94/9/EC

The D-LX 100.../94 Ex fulfils the requirements for II 2 G EEx de IIC T5/T6.
The D-LX 100.../97 Ex fulfils the requirements for II 3 G EEx nC IIC T5/T6.

Remark regarding to the pressure device directive 97/23/EC

As an equipment part having a safety function, the described product falls into category IV under the terms of the Pressure Equipment Directive 97 / 23 / EC. The assessment of conformity takes place in accordance with modules B and D.

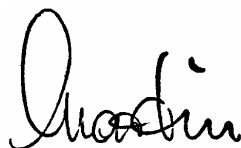
The monitoring of the QA system in accordance with 97 / 23 / EC, module D, is effected by TÜV-Cert, Zertifizierungsstelle für Druckgeräte, TÜV NORD GRUPPE, Große Bahnstraße 31, D-22525 Hamburg, Germany (reference number CE-0045).

The type examination in accordance with 97 / 23 / EC, module B, was performed by TÜV-Süddeutschland, Abteilung Feuerungs- u. Wärmetechnik, Ridler Straße 65, D-80339 München, Germany. A type test certification with the number (BAF MUC 03 04 072357 003) is available.

*) Only applicable for D-LX 100.../94Ex

***) Only applicable for D-LX 100.../97Ex

Issuer DURAG GmbH
Place, date Hamburg, 31.08.2004
Legally binding Signature



(Prof. Dr.-Ing. Martin)