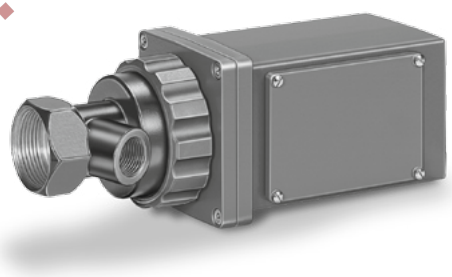
Honeywell | Industrial & Commercial Thermal

krom schroder

UV sensors for continuous operation UVD 1, UVD 2

Technical Information · GB
Edition 02.15l

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- Enhanced flexibility thanks to adjustable flame sensitivity
- Virtually immune to interference during operation due to its insensitivity to daylight, infrared radiation and incandescent bulbs
- Easy operation with LED displaying operational status
- Fail-safe software and hardware



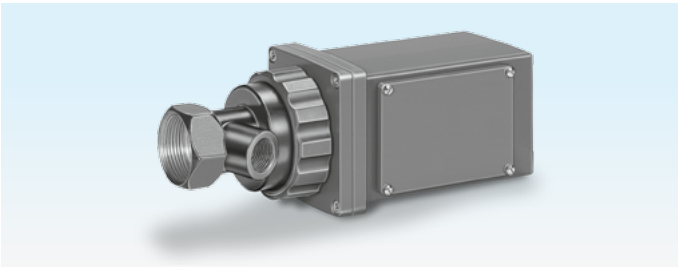
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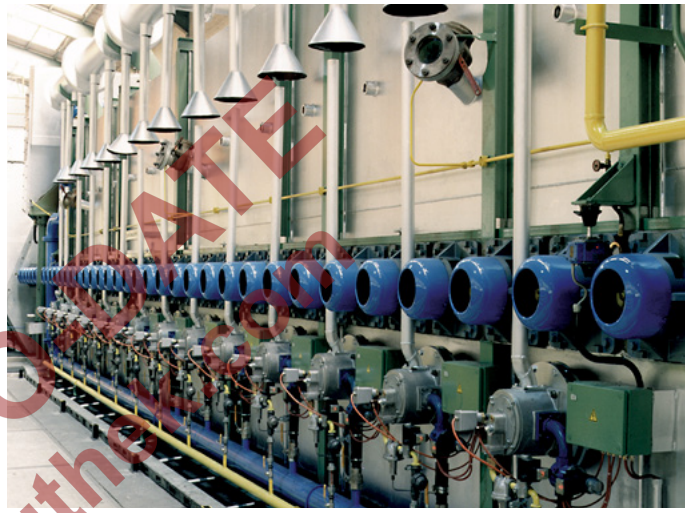
1 Application



UV sensors UVD 1 and UVD 2 are used to monitor gas burners of unlimited capacity with or without a fan in continuous operation. The UV sensors can be used on hot-air furnaces, gas-fired boilers, industrial furnaces and excess-gas flaring installations. The burners can either be ignited directly or operated as pilot and main burners.

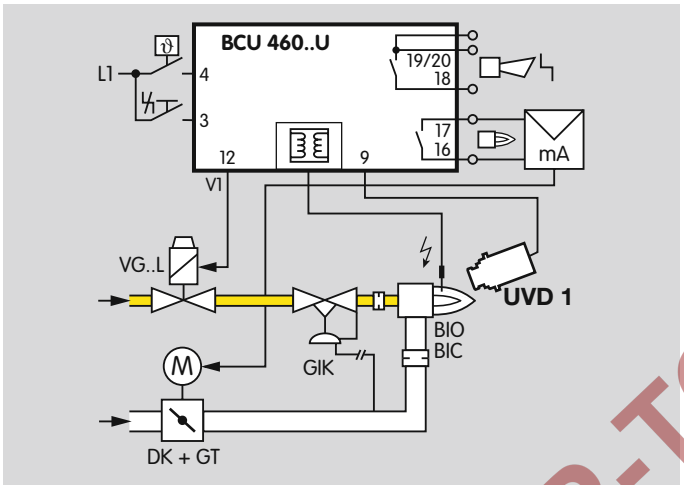
UVD 1 for flame control only in conjunction with Kromschröder burner control units BCU 370..U1, BCU 460..U, BCU 480..U, BCU 570..U0, PFU..U or automatic burner control units IFD 450, IFD 454 for continuous UV control.

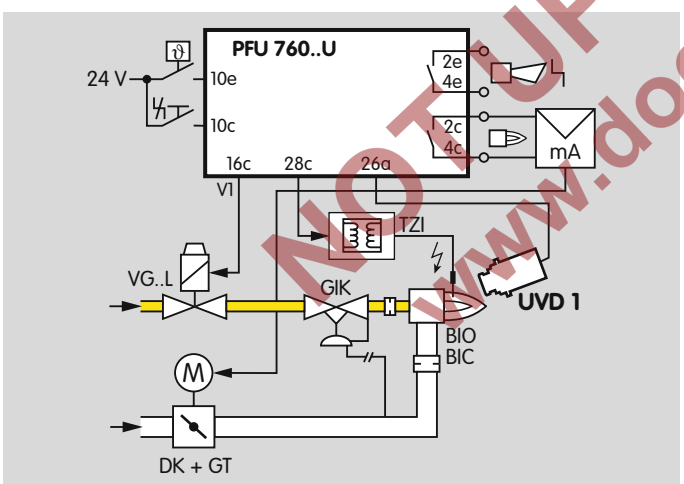
UVD 2 with isolated switching contact for flame control with fail-safe, programmable logic controller in continuous operation. Not suitable for use in conjunction with Kromschröder burner control units.



Roller hearth furnace

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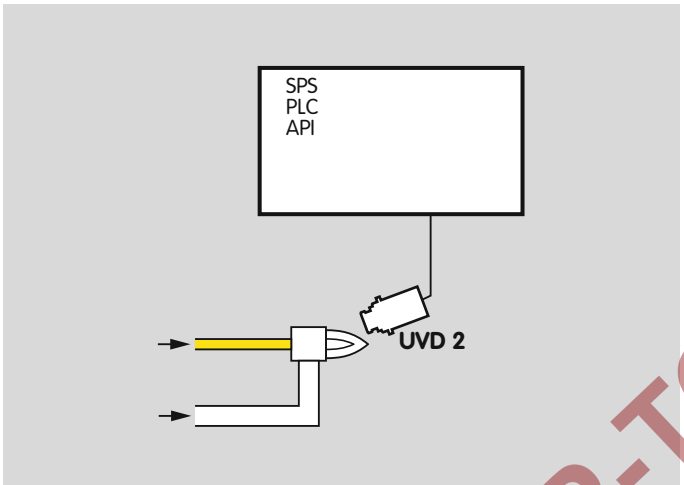


1.1 Examples of application

1.1.1 UVD 1

UVD 1 monitors gas burners in continuous operation in conjunction with burner control units BCU 370..U1, BCU 460..U, BCU 480..U, BCU 570..U0, PFU..U or automatic burner control units IFD 450, IFD 454.

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1.1.2 UVD 2

If the burner is controlled by a fail-safe PLC, UVD 2 can be used for flame control. It features a switching contact which closes as soon as the UV sensor detects a flame.

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2 Certification

2.1 UVD 1 certified to SIL and PL

For systems up to SIL 3 pursuant to EN 61508 and PL e pursuant to ISO 13849

2.2 EU certified

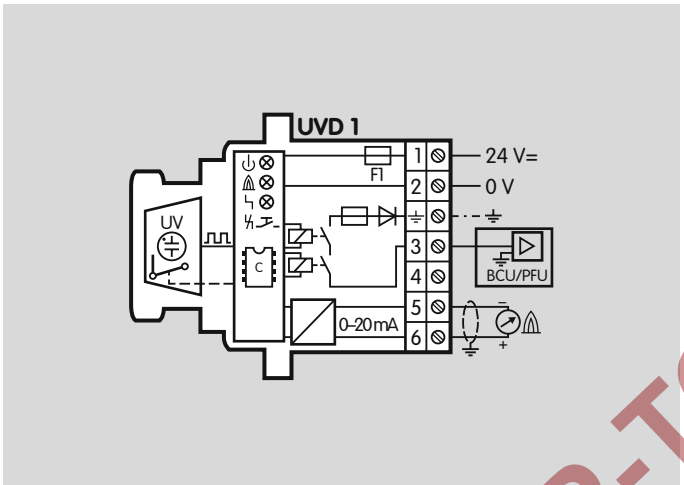
pursuant to

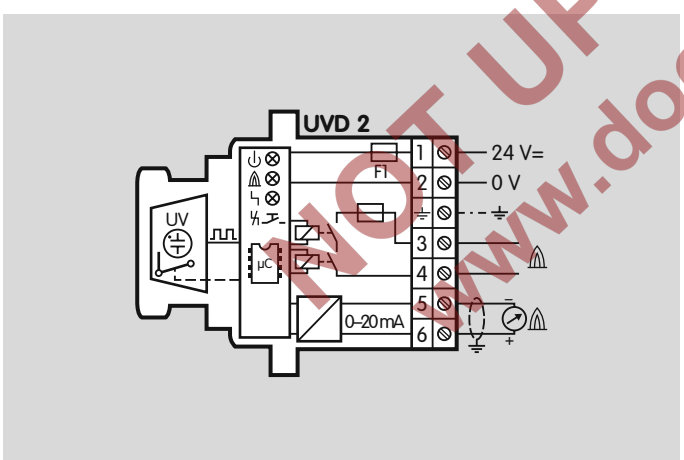
- Machinery Directive (2006/42/EC) in conjunction with EN 298:2003,
- Low Voltage Directive (2006/95/EC) in conjunction with EN 60730:2000,
- Electromagnetic Compatibility Directive (2004/108/EC) in conjunction with the relevant standards relating to radiation.

2.3 Approval for Russia

Certified by Gosstandart pursuant to GOST-R.
Approved by Rostekhnadzor (RTN).

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3 Function

After the 24 V voltage supply has been switched on, the UV sensor will conduct a self-test which will then be repeated constantly during continuous operation. The yellow LED indicates that it is ready for use.

The UV sensor detects UV radiation in the very short-wave UV-C range (185 – 260 nm).

The flame signal is sent by UVD 1 via terminal 3 to the connected burner control unit (BCU 370..U1, BCU 460..U, BCU 480..U, BCU 570..U0 or PFU..U) or automatic burner control unit (IFD 450 or IFD 454). On UVD 2, the switching contacts between terminals 3 and 4 close. If a flame is detected, the green LED will light up.

The sensitivity of the UV sensor can be adjusted to the radiation intensity of the flame in 10 settings.

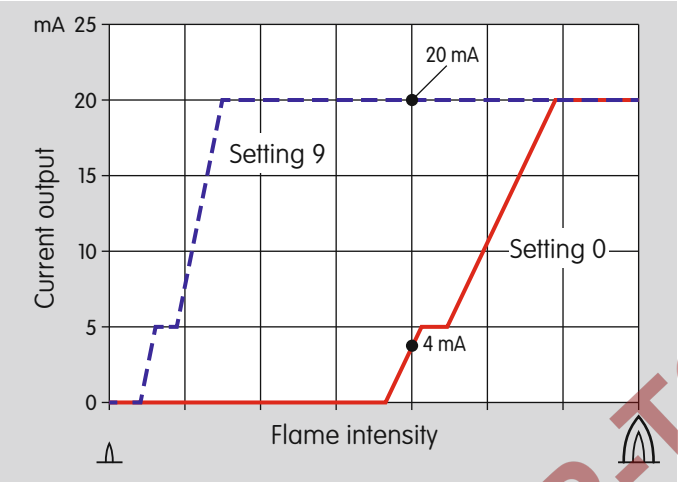
0 = lowest sensitivity
(high flame intensity)

9 = highest sensitivity
(low flame intensity)

The red LED will flash in the event of an internal device error or at the end of the service life of the UV tube.

In this case, the device will lock and the burner control unit will signal a flame failure. The UV sensor can be reset using the reset button or by interrupting the 24 V power supply.

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3.1 0 – 20 mA output

The 0 – 20 mA current output between terminals 5 and 6 reflects the flame intensity.

The switching point above which the UVD detects a flame is always 5 mA.

The sensitivity of the UV sensor can be adjusted to the flame intensity in 10 settings. At setting 0 for example (lowest sensitivity), a high flame intensity is required for the UVD to detect a flame. At setting 9 (highest sensitivity), the UVD will detect a flame at low flame intensity.

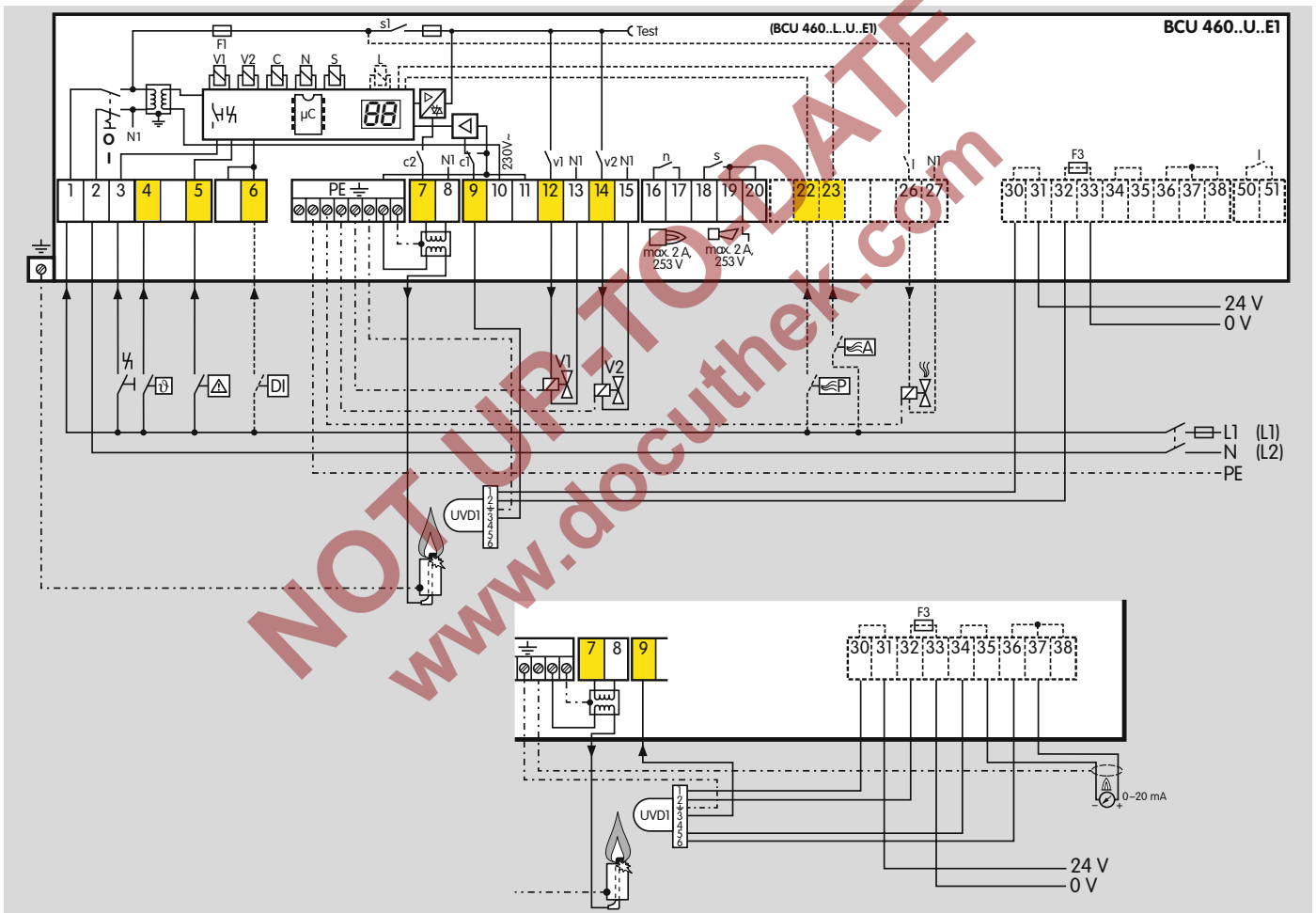
Depending on the setting, the current between terminals 5 and 6 may be lower or higher at a specific flame intensity, for example at medium flame intensity, the current at setting 0 is 4 mA while at setting 9 it is 20 mA.

Do not change the setting during operation.

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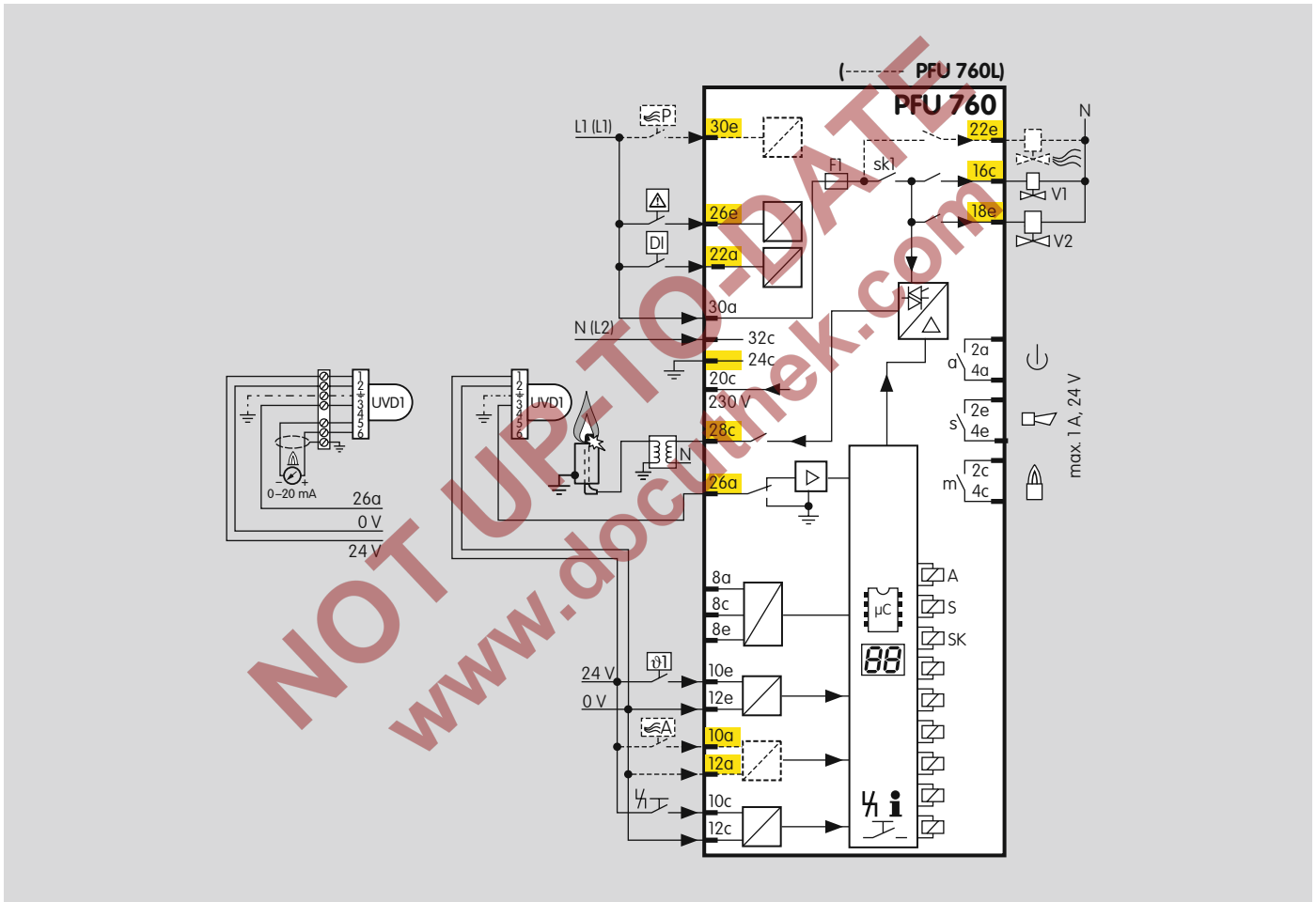
3.2 Connection diagram

3.2.1 UVD 1 on BCU 460..U..E1



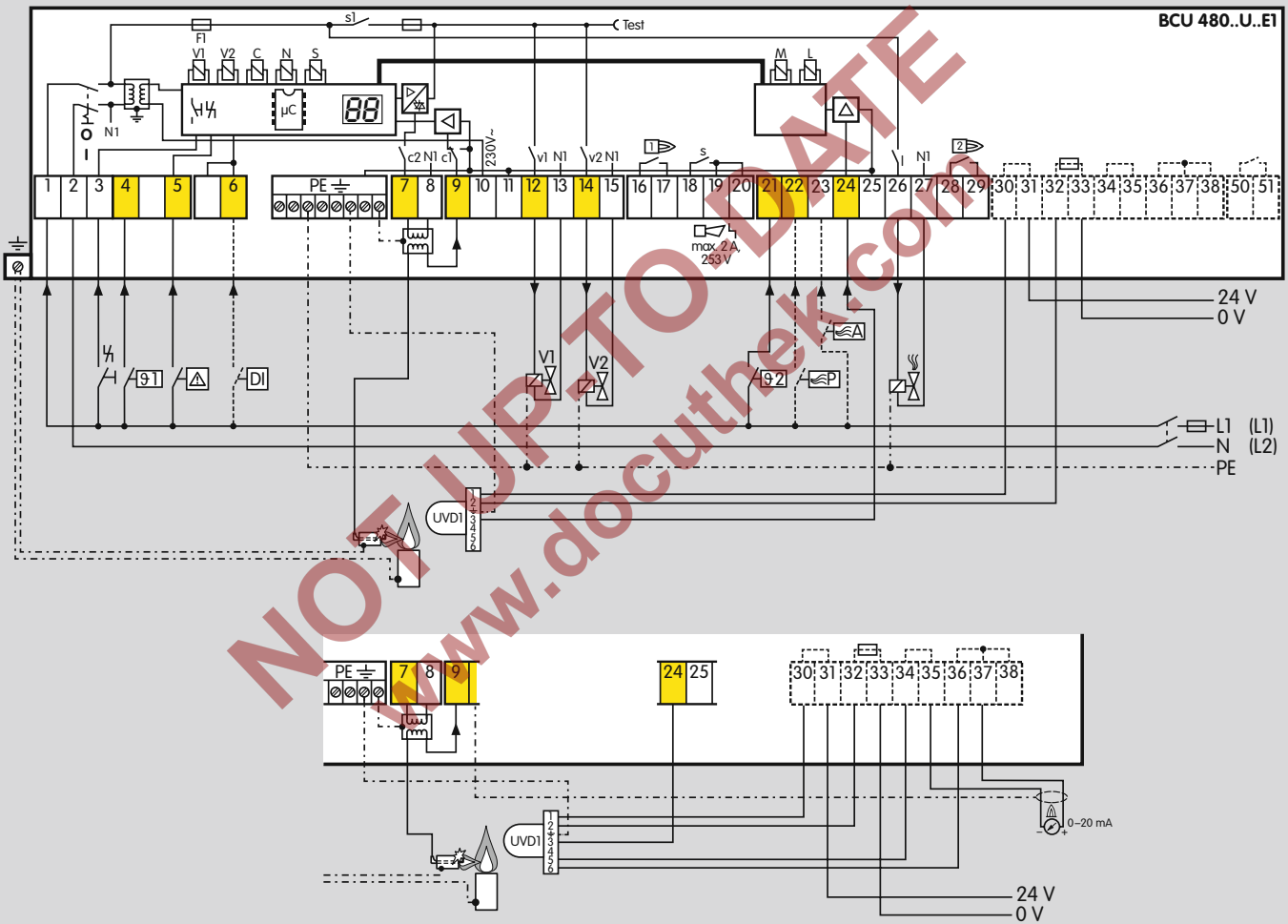
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3.2.2 UVD 1 on PFU 760



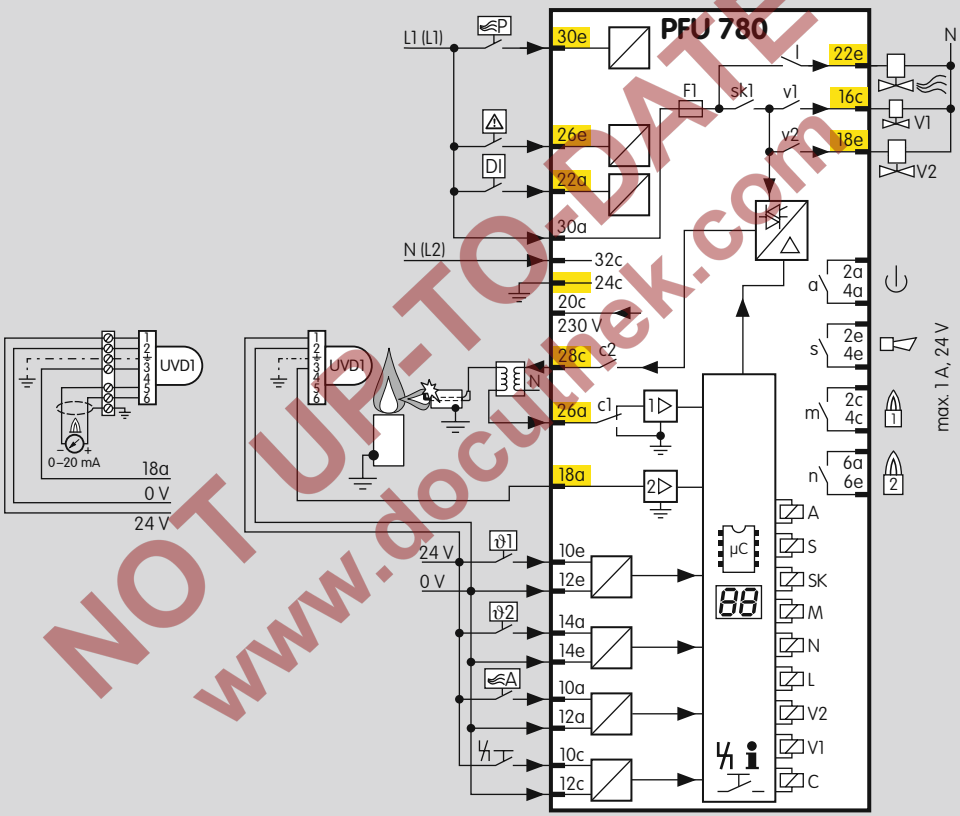
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3.2.3 UVD 1 on BCU 480..U..E1



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3.2.4 UVD 1 on PFU 780



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4 Selection

4.1 UVD 1

For flame control in continuous operation only in conjunction with Kromschröder burner control units BCU 370..U1, BCU 460..U, BCU 480..U, BCU 570..U0, PFU..U or automatic burner control units IFD 450, IFD 454.

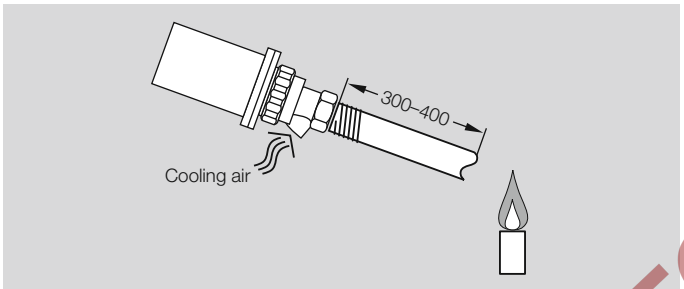
4.2 UVD 2

For flame control in continuous operation with signalling contact only in conjunction with a fail-safe PLC (not with Kromschröder burner control units).

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5 Project planning information

5.1 Installation



It can be fitted using a 1¼" viewing tube that should be aligned on the first flame third, as this is where the highest UV radiation is generally found. The inside of the steel tube should not be coated and the tube should be directed at the flame from above so that no dirt collects in front of the UV sensor.

The UVD may only “see” its own dedicated flame and must not be influenced by other flames. This must be observed when monitoring pilot and main burners in particular.

Supply cooling air to cool and protect the optical system from soiling and condensation.

Recommendation: use a heat guard – see page 16 (Accessories). It suppresses interference from compensating currents via the PE wire. Use a cooling air tube made of non-conductive material for this purpose.

5.2 Wiring

Use mains cable suitable for the type of operation and select cable material complying with local regulations; cable cross-section max. 1 mm^2.

The insulation of the cables must be designed for the maximum voltage occurring:
UVD 1: 230 V AC.
UVD 2: depending on the voltage used to activate the switching output.

Install connection cables well away from mains and ignition cables and interference from electro-magnetic sources.

Ground burner adequately.

Use an interference suppressed spark plug (1 kΩ) for the burner ignition cable.

The 0 – 20 mA current output is not required for normal operation. If it is used for the display in a control room for example, then the cable must be connected via a distributor box from which the 0 – 20 mA signal can be forwarded via a screened cable. Do not connect outputs, which are not in use. For use with a BCU 400..U, a distributor box is not required. This version of BCU is equipped with additional internal terminals, see pages 12 (UVD 1 on PFU 780) and 11 (UVD 1 on BCU 480..U..E1). Length of the unscreened cable from the UV sensor to the BCU 400..U or distributor box: max. 5 m.

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5.3 UVD 1

UVD 1 may only be used with versions of BCU 370, BCU 400, BCU 570 or PFU 700 prepared for continuous UV operation.

Only the main burner can be monitored with UVD 1 when connecting a UVD 1 to a BCU 480..U or PFU 780..U.

Flame control

Burner control unit/ Automatic burner control unit	Burner/ Pilot burner	Main burner
BCU 460..U	UVD 1	
BCU 480..U	Ionization or UVS	UVD 1
BCU 570 (parameter 4 = 2)	UVD 1	
PFU 760..U	UVD 1	
PFU 780..U	Ionization or UVS	UVD 1
IFD 450, IFD 454	UVD 1	

5.4 UVD 2

The switching output from UVD 2 (terminal 3) is protected by a non-replaceable fuse.

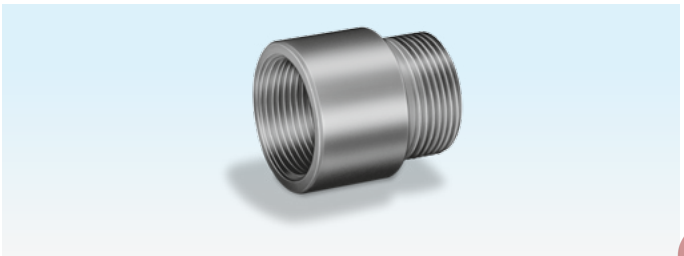
Connect an RC module parallel to the load to suppress sparks in a direct circuit with a direct current load (e.g. relay coil).

IMPORTANT! Do not connect the spark suppression circuit parallel to the flame signal output (terminal 3, terminal 4).

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6 Accessories

6.1 Heat guard with electrical isolation

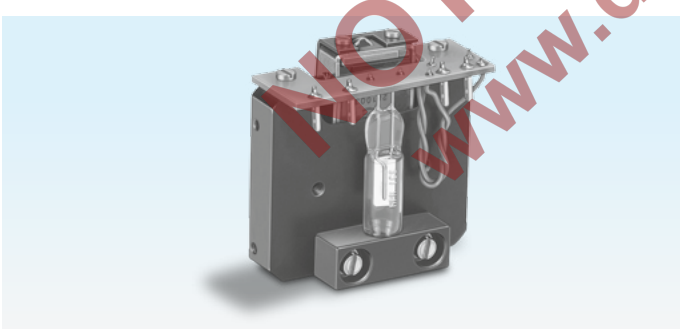


Prevents heat transmission via the viewing tube.

In addition, it suppresses interference from compensating currents via the PE wire. Use a pipe made of non-conductive material at the cooling air connection.

Order No.: 7 491 941 0.

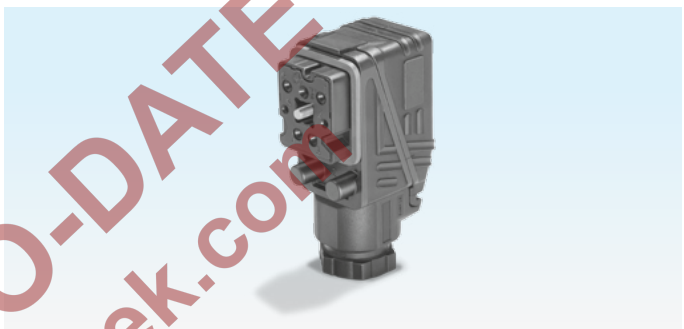
6.2 Shutter unit



As a replacement, when the service life of the UV tube has expired.

Order No.: 7 491 941 1.

6.3 Cable connection socket, 7-pin



Spare part if the supplied socket is lost.

Order No.: 7 492 099 5.

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7 Technical data

UVD 1, UVD 2

Spectral sensitivity: 185 – 260 nm.

Supply voltage:
24 V DC, ±20%, approx. 5 W.

Current output: 0 – 20 mA,
load impedance: max. 150 Ω.

Enclosure:
IP 65 (with mounted housing cover only).

Fuses in unit:
F1: 0.315 A, slow-acting, sub miniature fuse pursuant to IEC 60127-3/4;
fuse to protect the flame signal output:
0.5 A, slow-acting, not replaceable.
Electrical connection: 1 mm^2.

Viewing tube connection: Rp 1¼.

Purging air connection: Rp ½.

Integrated cooling air connection: Rp ½.

Ambient temperature: -20 to +60°C,
no condensation permitted.

Weight: approx. 1.8 kg.

Sensitivity: 10 adjustable settings.

Analogue output: 0 – 20 mA for external indication of flame intensity.
Socket (7-pin) supplied.

Maximum number of operating cycles: 250,000.

The UV sensor has a floating circuit between the power supply circuit (24 V DC) and the device-internal voltage circuit. The current output is electrically connected to the device-internal voltage.

UVD 1

Distance (cable length):
UVD 1 – BCU 570: max. 100 m,
UVD 1 – PFU 7xx, BCU 4xx or IFD 4xx: max. 50 m.

0 – 20 mA flame signal cable:
For cable lengths ≥ 5 m, use a distributor box from which the 0 – 20 mA signal is forwarded to the control room via a screened cable.

UVD 2

Switching capacity of flame signalling contact:
Max.: 24 V DC; 0.5 A with spark suppression or
250 V AC; 0.5 A; cos φ = 0.4 (inductive load),

Min.: 10 V DC or 10 V AC; 10 mA.

Safety time: 1 s.

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7.1 Safety-specific characteristic values of UVD 1

UV flame control of gas burners in continuous operation, suitable for Safety Integrity Level	SIL 3
Diagnostic coverage DC	97.9%
Type of subsystem	Type B to EN 61508-2, 7.4.3.1.4
Mode of operation	High demand mode pursuant to EN 61508-4, 3.5.12
Mean probability of dangerous failure PFH_D	3.97×10^{-8} 1/h
Mean time to dangerous failure $MTTF_d$	$MTTF_d = 1/PFH_D$
Safe failure fraction SFF	99.9%

Relationship between the Performance Level (PL) and the Safety Integrity Level (SIL)

PL	SIL
a	–
b	1
c	1
d	2
e	3

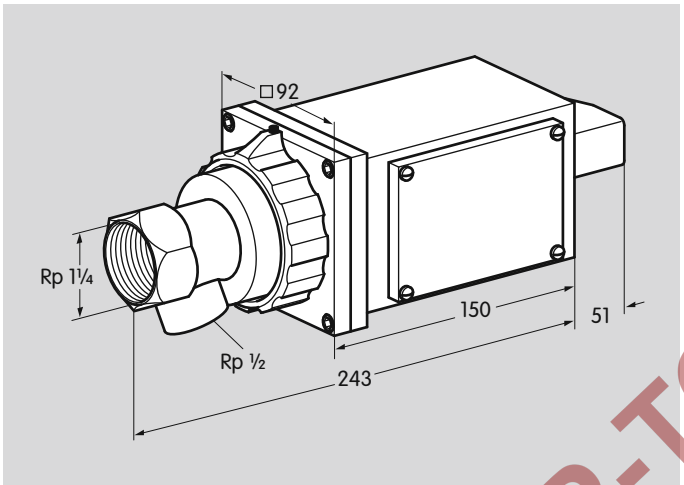
Pursuant to EN ISO 13849-1:2006, Table 4, UVD 1 can be used up to PL e.

Max. service life under operating conditions: 15 years after date of production.

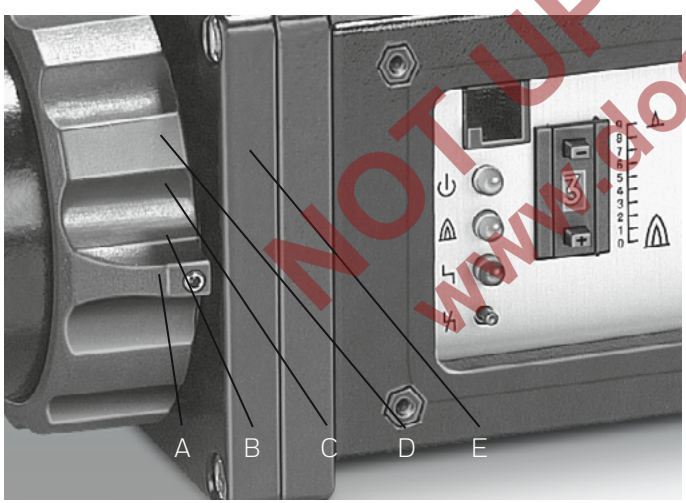
For a glossary of terms, see page 21 (Glossary).

For further information on SIL/PL, see www.k-sil.de.

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7.2 Dimensions



7.3 Operating controls

A: Reset button

B: Fault signal (red)

C: Flame signal (green)

D: Standby signal (yellow)

E: Adjustment of the sensitivity

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8 Maintenance cycles

Service life of the UV tube:
10,000 to 50,000 operating hours.
The UV tube with shutter unit must then be exchanged after this period.

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9 Glossary

9.1 Diagnostic coverage DC

Measure of the effectiveness of diagnostics, which may be determined as the ratio between the failure rate of detected dangerous failures and the failure rate of total dangerous failures

NOTE: Diagnostic coverage can exist for the whole or parts of a safety-related system. For example, diagnostic coverage could exist for sensors and/or logic system and/or final elements. Unit: %

see EN ISO 13849-1:2008

9.2 Safe failure fraction SFF

Fraction of safe failures related to all failures, which are assumed to appear

see EN 13611/A2:2011

9.3 Probability of dangerous failure PFH_D

Value describing the likelihood of dangerous failure per hour of a component for high demand mode or continuous mode. Unit: 1/h

see EN 13611/A2:2011

9.4 Mean time to dangerous failure $MTTF_d$

Expectation of the mean time to dangerous failure

see EN ISO 13849-1:2008

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Feedback

Finally, we are offering you the opportunity to assess this “Technical Information (TI)” and to give us your opinion, so that we can improve our documents further and suit them to your needs.

Clarity

- ○ Found information quickly
- ○ Searched for a long time
- ○ Didn’t find information

  What is missing?
- ○ No answer

Comprehension

- ○ Coherent
- ○ Too complicated
- ○ No answer

Scope

- ○ Too little
- ○ Sufficient
- ○ Too wide
- ○ No answer

Use

- ☐ To get to know the product
- ☐ To choose a product
- ☐ Planning
- ☐ To look for information

Navigation

- ○ I can find my way around
- ○ I got “lost”
- ○ No answer

My scope of functions

- ○ Technical department
- ○ Sales
- ○ No answer

Remarks



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