

UV flame detector UVC 1

TECHNICAL INFORMATION

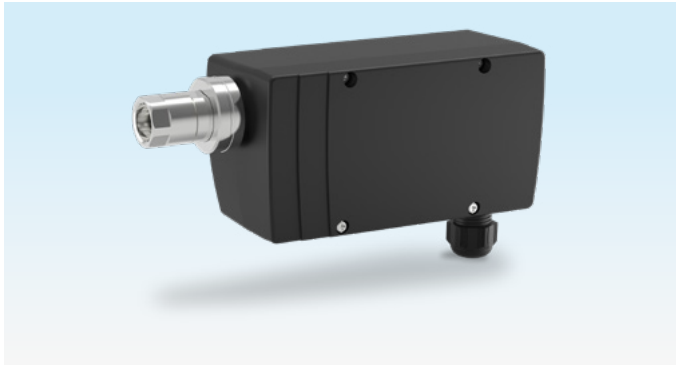
- Enhanced flexibility thanks to adjustable switch-off threshold
- Virtually immune to interference during operation due to its insensitivity to daylight, infrared radiation and incandescent bulbs
- High operational safety thanks to self-test
- For systems up to SIL 3 pursuant to EN 61508 and continuous operation to EN 298



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1 Application



UV flame detector UVC 1 is used to monitor gas burners of unlimited capacity with or without a fan. It can be used on hot-air furnaces, gas-fired boilers, industrial furnaces and excess-gas flaring installations. The gas burners can either be ignited directly or operated as pilot and main burners.

The UV flame detector is suitable for intermittent or continuous operation in conjunction with Kromschröder burner control units BCU 370..U, BCU 4xx, PFU 7xx..U or BCU 5xx..U0.

Using the BCSofT program, the switch-off threshold can be parameterized and the analysis and diagnostic information can be read from the flame detector via the optionally available opto-adapter PCO 200 or 300.



Roller hearth furnace

2 Certification

Certificates – see www.docuthek.com

2.1 EU certified



- 2014/35/EU (LVD), Low Voltage Directive
- 2014/30/EU (EMC), Electromagnetic Compatibility Directive
- (EU) 2016/426 (GAR), Gas Appliances Regulation
- 2011/65/EU – RoHS II
- 2015/663/EU – RoHS III
- EN 298:2012
- EN 60730-2-5:2015
- EN 61508:2010, suitable for SIL 3

2.2 SIL and PL



For systems up to SIL 3 pursuant to IEC 61508.

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

2.3 UKCA certified



Gas Appliances (Product Safety and Metrology etc. (Amendment etc.) (EU Exit) Regulations 2019)

BS EN 298:2012

2.4 FM approved



Factory Mutual (FM) Research Class: 7610 “Combustion Safeguards and Flame Sensing Systems”.

www.approvalguide.com

2.5 UL listed



Underwriters Laboratories UL 60730 – Automatic Electrical Controls

2.6 AGA approved



Australian Gas Association, Approval No.: 8586

www.aga.asn.au

2.7 Eurasian Customs Union



The products UVC 1 meet the technical specifications of the Eurasian Customs Union.

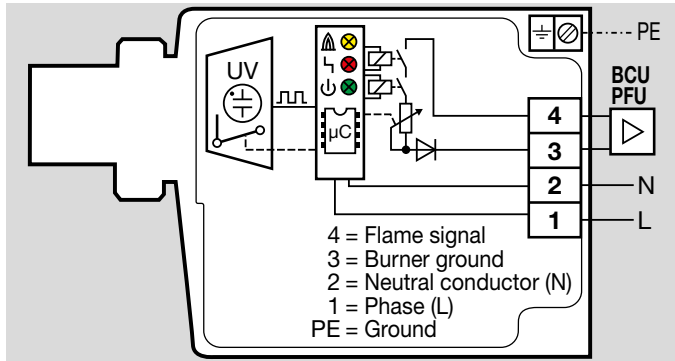
2.8 REACH Regulation

The device contains substances of very high concern which are listed in the Candidate List of the European REACH Regulation No. 1907/2006. See Reach list HTS at www.docuthek.com.

2.9 China RoHS

Directive on the restriction of the use of hazardous substances (RoHS) in China. Scan of the Disclosure Table China RoHS2, see certificates at www.docuthek.com.

3 Function



After the voltage supply has been switched on, the flame detector will conduct a self-test (initialization). The three LEDs (yellow, red and green) will be lit. Once the self-test has been successfully completed, the UVC 1 is ready for operation. The green LED will be lit.

As soon as a flame with sufficient intensity has been detected, the yellow LED will be lit. A self-test is carried out every minute using the integrated shutter. The flame detector detects UV radiation in the shortwave UV-C range (190–270 nm).

The flame signal is sent via terminals 3 and 4 to the connected burner control unit (BCU 370..U, BCU 4xx, PFU 7xx..U or BCU 5xx..U0).

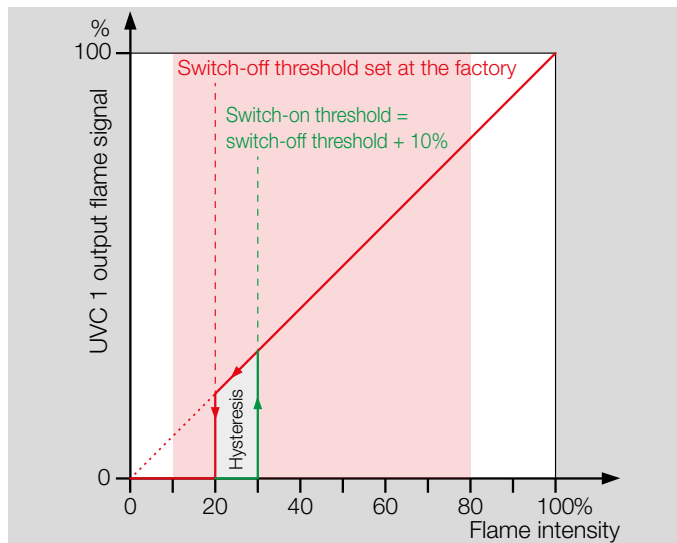
The red LED will flash in the event of an internal device error or a defect in the UV tube. In this case, the device will lock. Once the error has been remedied, the flame detector can be reset using the reset button.

3.1 Switch-off threshold/flame intensity

The sensitivity of the UV flame detector can be adjusted to the radiation intensity of the flame to ensure that flame simulation can be reacted to in a flexible manner. The switch-off threshold can be set using parameter 01. This threshold determines the flame intensity at which the UVC 1 detects a flame. The switch-off threshold can be set in 10% steps from 20 to 80%. It is set to 20% at the factory.

Above the switch-on threshold (flame intensity = switch-off threshold + 10%), the UVC 1 transfers a flame signal to the burner control unit via the outputs at terminals 3 and 4. A μA signal is transferred, depending on the flame intensity. As soon as the flame intensity falls below the switch-off threshold, the UVC 1 switches off the flame signal.

The opto-adaptor PCO 200 and the BCSof software are required to adapt parameter 01 and to read the flame intensity.



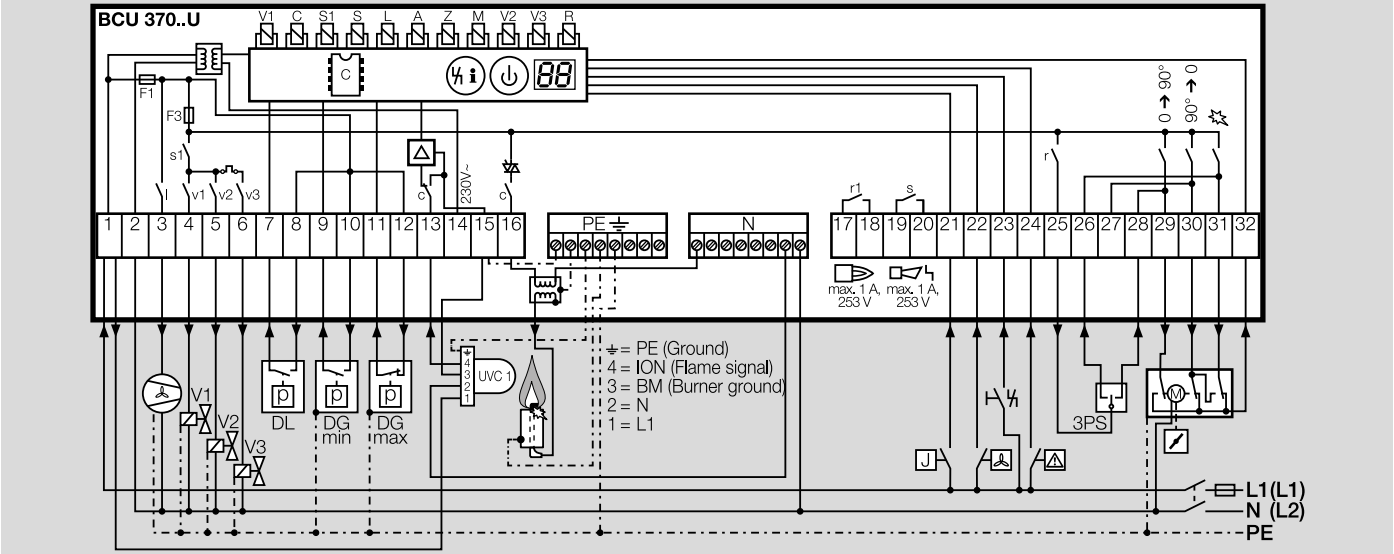
Example:

If the switch-off threshold has been set to 20% at the factory, the flame intensity must be at least 30% (switch-on threshold) in order for a flame signal to be generated.

A flame signal at the outputs at terminals 3 and 4 of 100% corresponds to a current of approximately 25 μA .

3.2 Connection diagrams

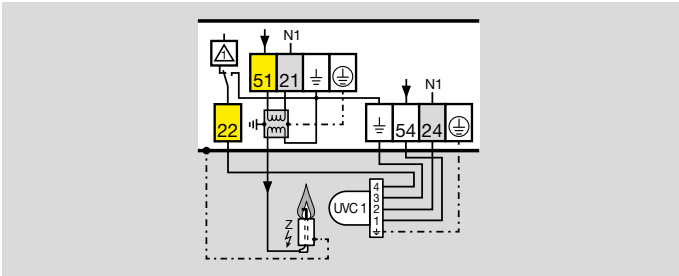
3.2.1 UVC 1 on BCU 370..U



Electrical connection, see page 16 (7 Project planning information)

Explanation of symbols, see page 25 (12 Legend)

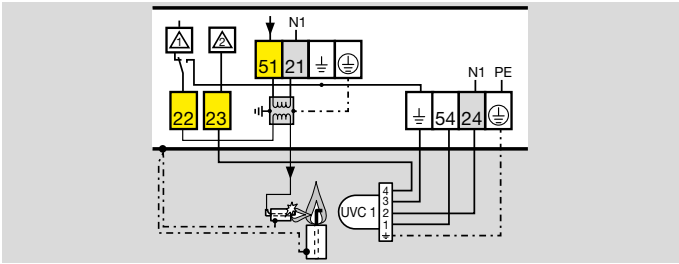
3.2.2 UVC 1 on BCU 460/BCU 465



Electrical connection, see page 16 (7 Project planning information)

Explanation of symbols, see page 25 (12 Legend)

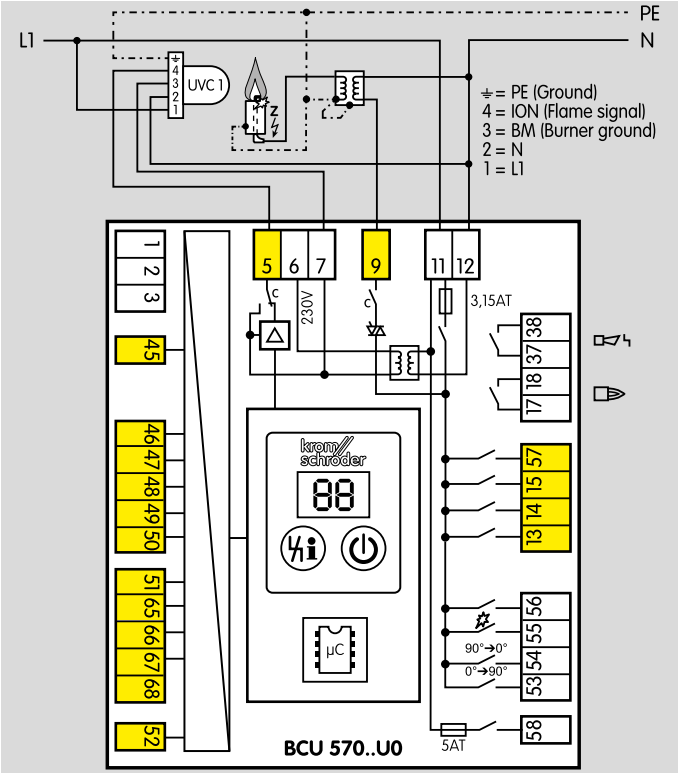
3.2.3 UVC 1 on BCU 480



Electrical connection, see page 16 (7 Project planning information)

Explanation of symbols, see page 25 (12 Legend)

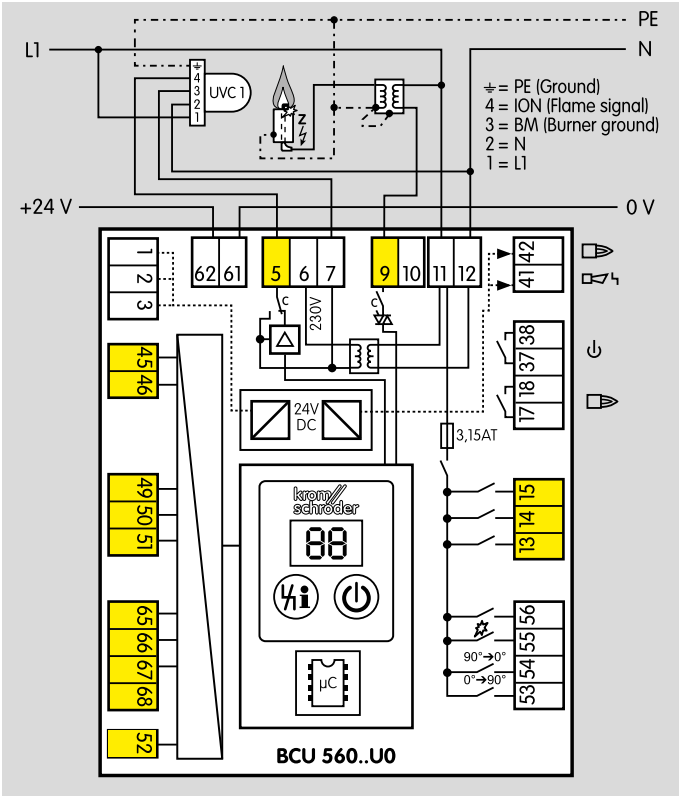
3.2.4 UVC 1 on BCU 570..U0



Electrical connection, see page 16 (7 Project planning information)

Explanation of symbols, see page 25 (12 Legend)

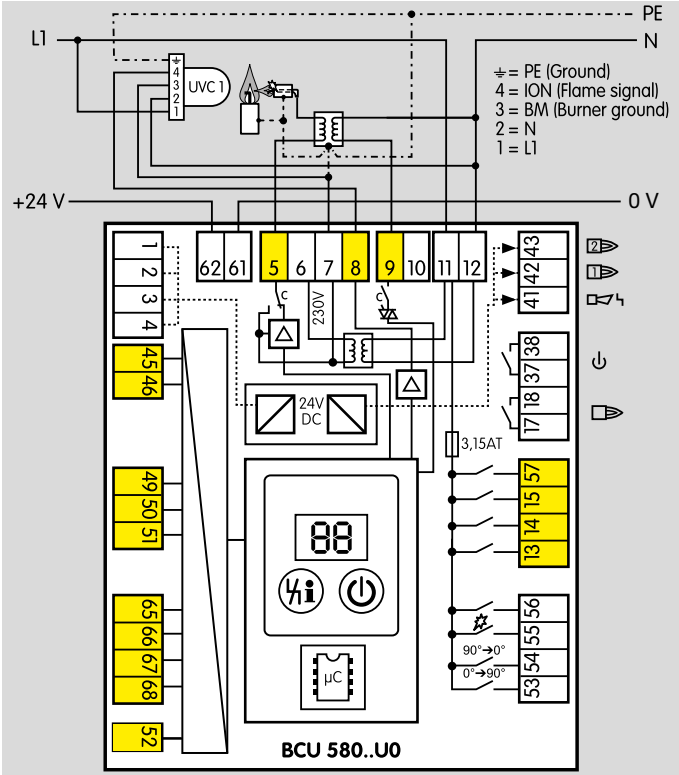
3.2.5 UVC 1 on BCU 560..U0



Electrical connection, see page 16 (7 Project planning information)

Explanation of symbols, see page 25 (12 Legend)

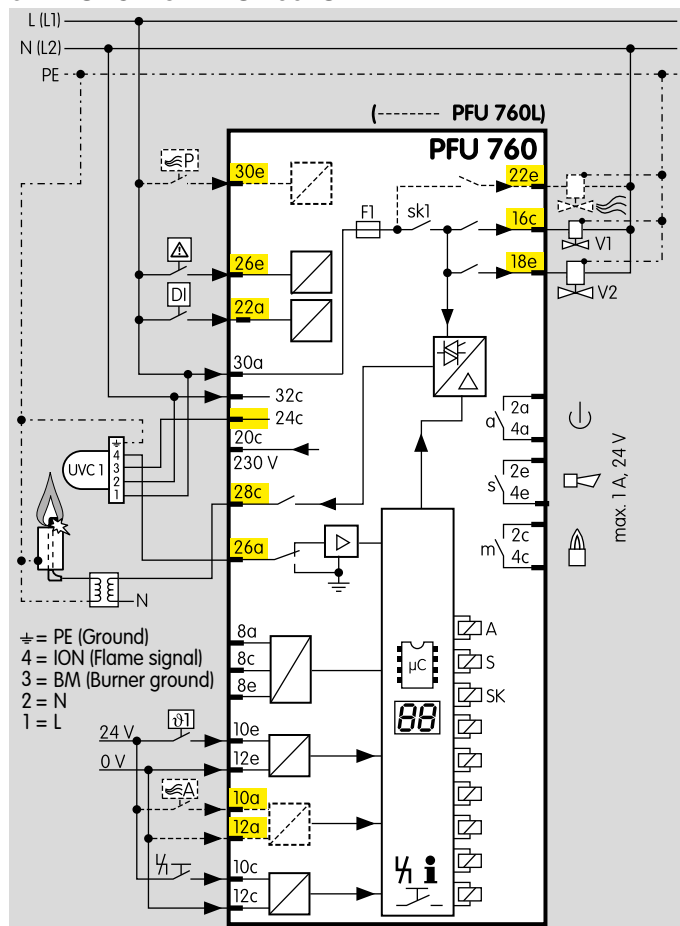
3.2.6 UVC 1 on BCU 580..U0



Electrical connection, see page 16 (7 Project planning information)

Explanation of symbols, see page 25 (12 Legend)

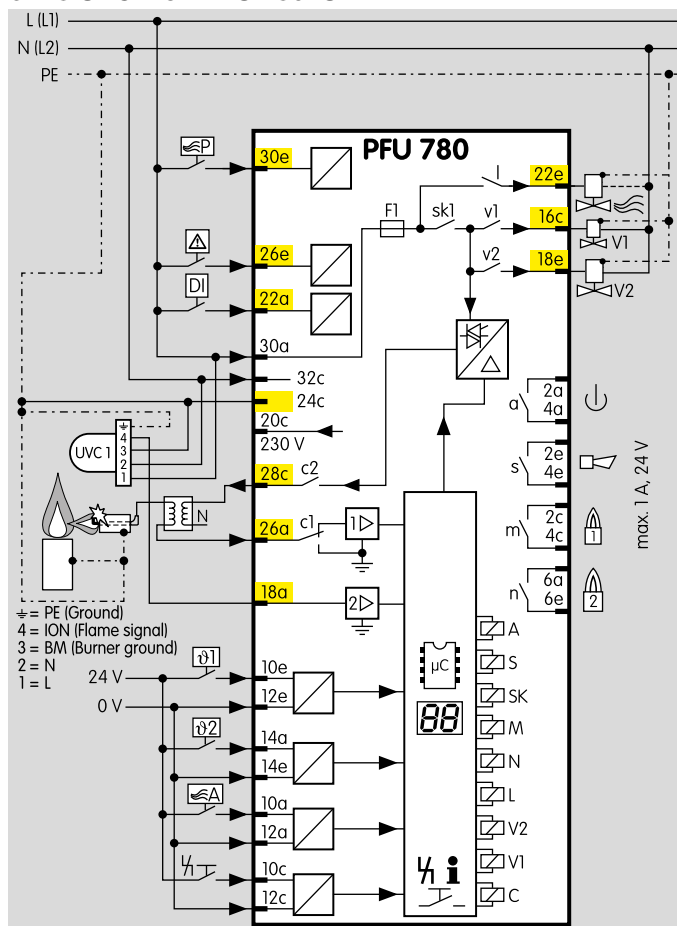
3.2.7 UVC 1 on PFU 760..U



Electrical connection, see page 16 (7 Project planning information)

Explanation of symbols, see page 25 (12 Legend)

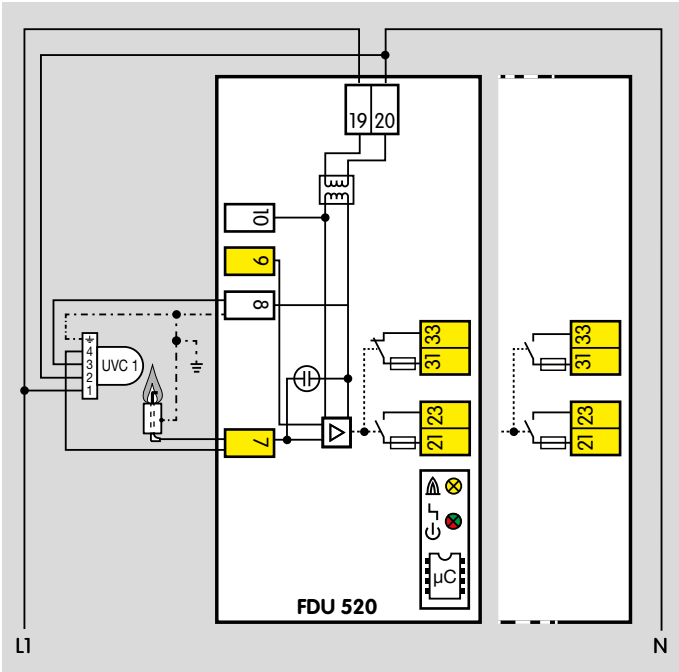
3.2.8 UVC 1 on PFU 780..U



Electrical connection, see page 16 (7 Project planning information)

Explanation of symbols, see page 25 (12 Legend)

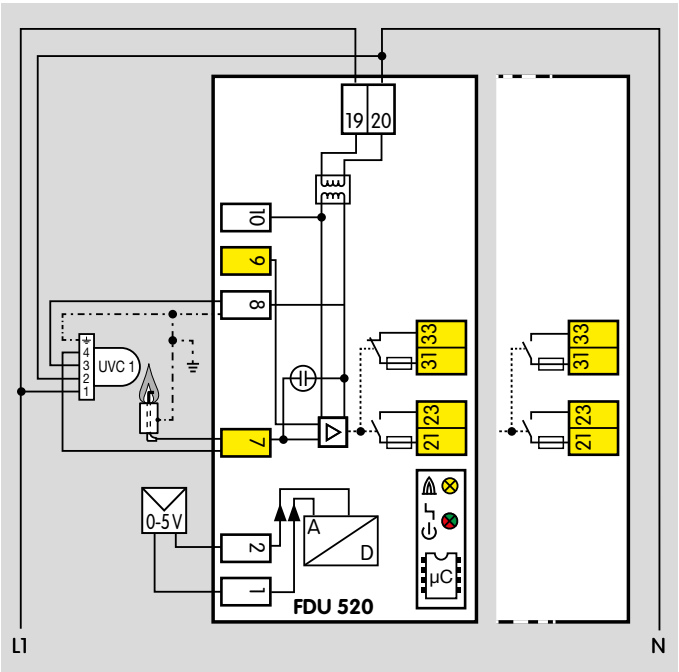
3.2.9 UVC connected to FDU 520



Electrical connection, see page 16 (7 Project planning information)

Explanation of symbols, see page 25 (12 Legend)

3.2.10 UVC connected to FDU 520 with 0 to 5 V output

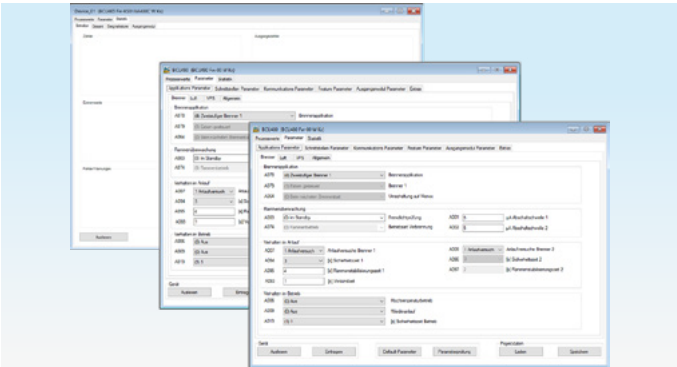


Electrical connection, see page 16 (7 Project planning information)

Explanation of symbols, see page 25 (12 Legend)

4 BCSOft

BCSoft is an engineering tool for PCs with a Windows operating system. BCSoft (from version 4.x.x) makes it possible to set the device parameter 01 (Switch-off threshold) in order to adjust it to the specific application, see page 7 (3.1 Switch-off threshold/flame intensity). Device data can be logged and archived using BCSoft. The process values overview provides commissioning support. In the event of faults or service interventions, details on troubleshooting can be derived from the device statistics and the fault history.



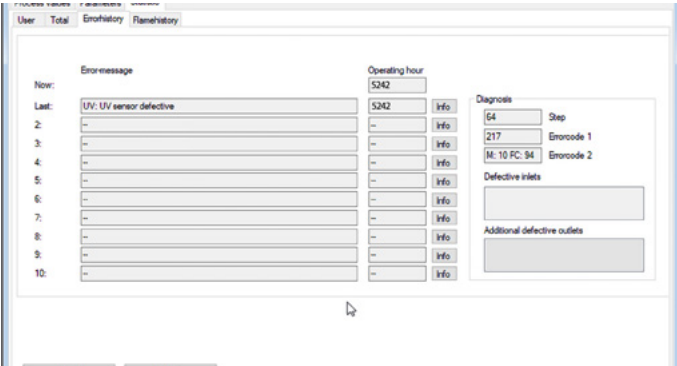
The current version of the engineering tool BCSoft4 is available at www.docuthek.com.

In addition to the engineering tool BCSoft, an opto-adapter with USB connection is required for data transfer between the PC and UVC 1.

BCSoft4 and opto-adapter PCO 200, see page 18 (8 Accessories).

5 Fault messages

Fault messages can be read from the UVC 1 using the op-to-adapter PCO 200, which is an additional extra, and the BCSof program, see page 18 (8 Accessories) and the BCSof V4.x operating instructions at www.docuthek.com.



Display in BCSof for fault message “UV tube dark test error” (BCSof Errorcode 1 = 217)

Fault message	BCSoft Errorcode 1	Description
Internal error	97	Internal error
Internal error	98	Internal error
Internal error	99	Internal error
UV tube dark test error	217	UV tube defective

Fault message	BCSoft Errorcode 1	Description
Non-fail-safe parameters (NFS) inconsistent	30	NFS parameter range is inconsistent
Fail-safe parameters (FS) inconsistent	31	FS parameter range is inconsistent
Mains voltage	32	Operating voltage too high/low or not sinusoidal
Faulty parameterization	33	Parameter set contains illegal settings
Internal error	89	Error in processing internal data
Internal error due to UV pulse	94	Flame detected when the shutter is closed
Internal error	95	Internal error
Internal error	96	Internal error

6 Selection

Option	UVC
Series	1
Heat guard	D, L
Viewing tube connection	0, 1, 2, 3
M20 cable gland	G1
Mains voltage	A

Order example

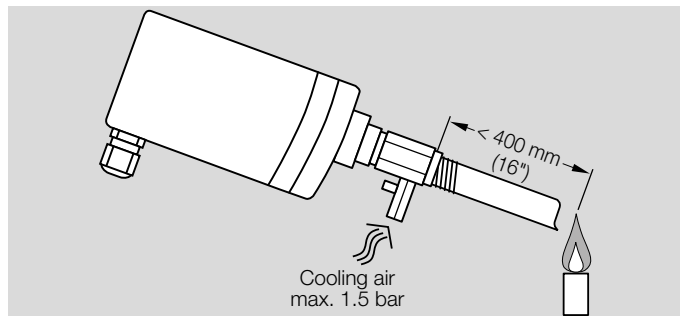
UVC 1L0G1A

6.1 Type code

UVC	UV flame detectors
1	Series 1
D	Quartz glass heat guard
L	Quartz glass heat guard lens
0	Rp 1/2 internal thread
1	Rp 1/2 internal thread and cooling air connection
G1	M20 cable gland
A	Mains voltage: 100–230 V AC, 50/60 Hz

7 Project planning information

7.1 Installation



The device can be fitted using a 1/2" viewing tube that should be directed at the first flame third as this is where the highest UV radiation is found. In order to improve the signal transfer, the inside of the steel tube should not be coated. Direct the steel tube at the flame from above so that no dirt collects in front of the UV flame detector.

The UVC 1 may only "see" its own dedicated flame and must not be influenced by other sources of light (e.g. neighbouring flames when monitoring pilot and main burners, ignition sparks, arcs from welding devices or lamps emitting ultraviolet light). Avoid exposing the UVC 1 viewing opening to direct sunlight.

Supply cooling air to cool and protect the optical system from soiling and condensation. Use a flame detector with cooling air connection (UVC 1..1 or UVC 1..3) in high temperatures, see page 15 (6.1 Type code).

The installation surface for the UVC 1 may be max. 20°C above the maximum allowable ambient temperature.

7.2 Wiring

Use 5-core connection cable including a PE wire and complying with local regulations.

The M20 cable gland of the UVC 1 is designed for cable diameters of 7 to 13 mm. The screw terminals are suitable for wire cross-sections of 0.5 mm² to ≤ 1.5 mm² (AWG 26 to AWG 16).

Lay the connection cable

- individually,
- and if possible, not in a metal conduit.
- Do not lay together with ignition cable but lay them as far apart as possible.

Note the maximum cable length as specified for burner control units BCU or PFU.

The UVC 1 is grounded using a PE wire connection which is galvanically connected to the housing.

7.3 Burner control unit

The UVC 1 may only be operated with Kromschöder burner control units BCU 370..U, BCU 4xx, BCU 5xx..U0, PFU 760..U or PFU 780..U (prepared for UV continuous operation), see also page 15 (6 Selection).

BCU 5xx

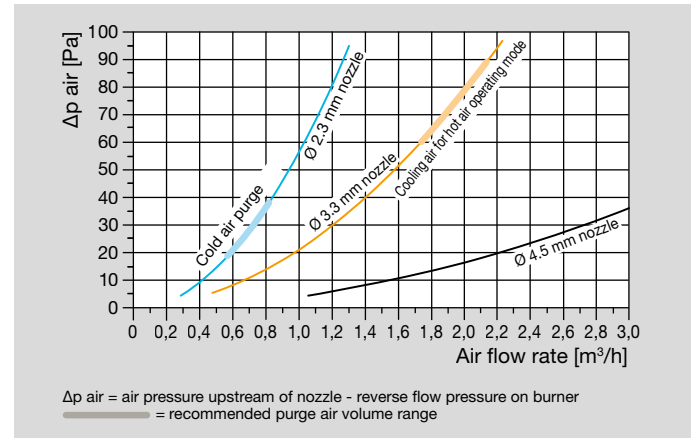
For flame control in conjunction with the UVC 1, parameter P 04 = 2 must be set.

BCU 4xx

For flame control in conjunction with the UVC 1, parameter I 004 = 2 must be set.

7.4 Purge air/Cooling air

The UVC 1 can be supplied with cooling or purge air through a cooling air adapter for cooling purposes and to protect the lens from soiling and condensation. Various nozzles for the cooling air adapter can be supplied for adjusting the air volume and the O₂ content perfectly to the site conditions, see page 19 (8.3 Nozzle for cooling air adapter).



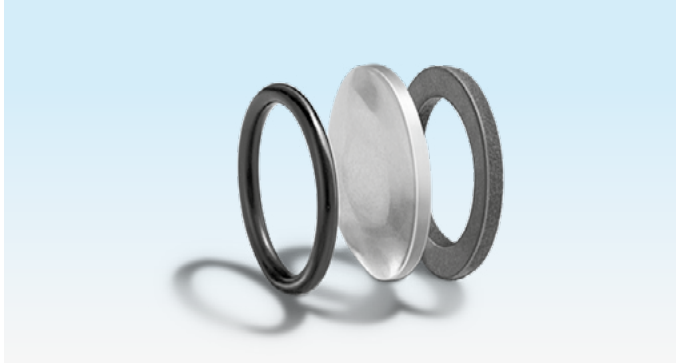
A nozzle with a diameter of 4.5 mm can be used for processes which are not O₂ critical.

See burner documentation for details of air pressure and reverse flow pressure at the burner.

Max. cooling air pressure: 1.5 bar.

8 Accessories

8.1 Quartz glass disc

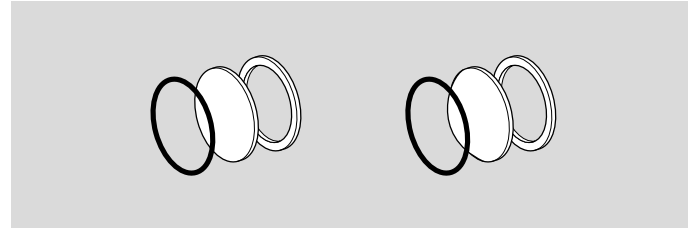


To protect the UV tube

To convert a UV sensor with lens (UVC 1L) to a quartz glass disc. The quartz glass disc is installed in the UV sensor adapter after removing the lens from the adapter.

Quartz glass disc with seal,
Order No.: 7 496 061 2

8.2 Quartz glass disc for UVS 10/UVC 1



To protect the UV tube.

Quartz glass disc with seal,
Order No.: 7 496 061 2.

Quartz glass lens with seal,
Order No.: 7 496 061 1;

when installing, ensure that the lens curvature points towards the flame. Precisely align the UV sensor. The gap between the UV sensor and the flame can be increased to approximately 600 to 1200 mm (23" to 47").

8.3 Nozzle for cooling air adapter



Rp 1/4, d = 2.3 mm, Order No.: 74960637

Rp 1/4, d = 3.3 mm, Order No.: 74960638

Rp 1/4, d = 4.5 mm, Order No.: 74960616

8.4 BCSOft

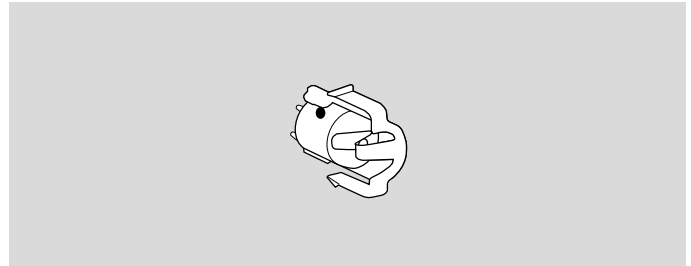
The current software can be downloaded from our Internet site at www.docuthek.com. To do so, you need to register in the DOCUTHEK.

8.4.1 Opto-adapter PCO 200



Including BCSOft CD-ROM,
Order No.: 74960625.

8.5 Spare UV tube



With bracket,
Order No.: 74960684.

9 Technical data

Ambient conditions

Condensation and dew in and on the unit are not permitted.

Avoid direct sunlight or radiation from red-hot surfaces on the unit.

Avoid corrosive influences, e.g. salty ambient air or SO₂.

Permitted relative humidity: min. 5%, max. 95%.

This unit is not suitable for cleaning with a high-pressure cleaner and/or cleaning products.

The unit may only be stored/installed in enclosed rooms/buildings.

Ambient temperature: -20 to +80°C (-4 to +176°F), no condensation/icing permitted.

Transport temperature = ambient temperature.

Storage temperature: -20 to +60°C (-4 to +140°F).

Enclosure: IP 65.

Safety class: 1.

Pollution degree: internal environment: 2, external environment: 4.

Permitted operating altitude: < 2000 m AMSL.

Mechanical data

Housing: aluminium.

Cable gland for cable diameters of 7 to 13 mm.

Clamping range of the connection terminals:
0.5 to 1.5 mm² (AWG 26 to AWG 16).

Weight: 1 kg.

Max. cooling air pressure: 1.5 bar.

Electrical data

Supply voltage:

100 to 230 V AC, -15/+10%, 50/60 Hz
(terminals L and N).

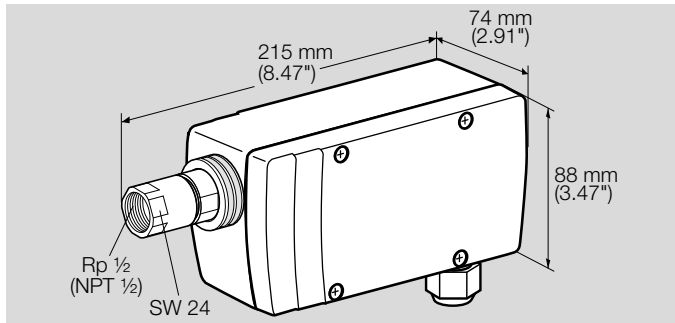
Length of cable between UV flame detector and automatic burner control unit: min. 2 m, max. 100 m (note the specifications for the connected burner control unit).

Distance between UV flame detector and flame:
300 to 400 mm.

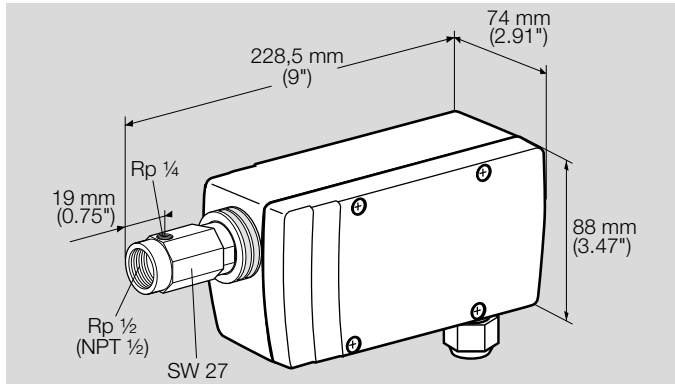
UV tube: R16388,
spectral range: 185 to 280 nm,
max. sensitivity: 210 nm ± 10 nm.

Min. DC signal: 1 µA.

Dimensions

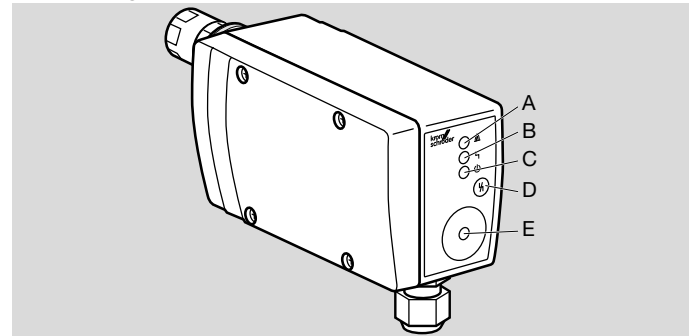


UVC 1..0, UVC 1..2



UVC 1..1, UVC 1..3

Operating controls



A: Yellow LED (flame signal)

B: Red LED (fault signal)

C: Green LED (ready for operation)

D: Reset button

E: Connection for opto-adaptor PCO 200/300

9.1 Safety-specific characteristic values

Suitable for Safety Integrity Level	Up to SIL 3
Diagnostic coverage DC	94.7%
Type of subsystem	Type B to EN 61508-2:2010
Mode of operation	High demand mode pursuant to EN 61508-4:2010 Continuous operation (to EN 298)
Mean probability of dangerous failure PFH _D	10.2 × 10 ⁻⁹ 1/h
Mean time to dangerous failure MT-TF _d	MTTF _d = 1/PFH _D
Safe failure fraction SFF	98.9%

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, Table 4, the UVC 1 can be used up to PL e.

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

For a glossary of terms, see page 26 (13 Glossary).

For further information on SIL/PL, see under “System Technology” at www.kromschroeder.com

10 Safety instructions

Scope of application: as set out in "Industrial thermoprocessing equipment – Part 2: Safety requirements for combustion and fuel handling systems" (DIN EN 746-2:2010) when used with fuels and oxidants which emit UV radiation during oxidation.

Action: Type 2 pursuant to DIN EN 60730-1.

Behaviour under fault conditions:

Pursuant to Type 2.AD2.Y. During a fault, the UVC 1 switches off and uses a trip-free mechanism which cannot be reclosed.

Fault detection time: ≤ 10 min. during operation depending on the number of testing cycles for the UV tube by the integrated shutter.

Safety time during operation (in the event of a flame failure): < 0.5 s.

Intermittent operation:

Possible pursuant to EN 298:2012, Section 7.101.2.9. As a result of the fault detection time, depending on the process time it may happen that a defective tube is not detected during the self-check using the shutter. A flame simulation check must be conducted before starting the burner control unit.

Software class: corresponds to software class C which operates in a similar double-channel architecture with comparison.

Short-circuit fault exclusion:

No. Internal voltages are neither SELV nor PELV.

Interfaces

Type of wiring:

Attachment type X to EN 60730-1.

Connection terminals:

Supply voltage: 100 to 230 V AC, 50/60 Hz, between terminals L and N.

Ionization signal: 230 V AC between terminals ION (ionization output) and BM (burner ground). The voltage is provided by the burner control unit/automatic burner control unit.

DC signal:

No flame: $< 1 \mu\text{A}$.

Active flame: 5 to 25 μA , depending on flame quality.

Grounding:

Using PE wire connection, galvanically connected to the housing.

11 Maintenance

Designed lifetime of the UV tube: 10,000 operating hours.
The UV tube must be replaced after this period, see page 19 (8.5 Spare UV tube). When replacing the UV tube, clean the quartz glass disc/lens.

12 Legend

Symbol	Description
	Ready for operation
	Safety interlocks (limits)
	Control element position check
LDS	Safety limits (limits during start-up)
	Gas valve
	Air valve
	Air/gas ratio control valve
	Pilot burner (burner 1)
	Main burner (burner 2)
	Purge
	External air valve control
 1	Flame signal, pilot burner (burner 1)
 2	Flame signal, main burner (burner 2)
	Burner operating signal
	Fault signal
	Start-up signal (1 = pilot burner, 2 = main burner)
HT	Input for high temperature operation
	Pressure switch for tightness control (TC)
	Pressure switch for maximum pressure
	Pressure switch for minimum pressure
	Differential pressure switch

Symbol	Description
Pxx	Input signal depending on parameter xx
	Actuator with butterfly valve
	Valve with proof of closure switch
	Fan
	Three-point step switch
	Input/Output, safety circuit

13 Glossary

since otherwise the flame signal amplifier cannot detect if its own flame is extinguished.

13.1 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

13.2 Safe failure fraction SFF

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

see EN 13611/A2

13.3 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

13.4 Flame simulation

Light (e.g. from neighbouring burners, welding devices, ignition sparks, solar UV radiation) which is present in addition to that of the desired light from a flame. As of a certain intensity, it can adversely affect UV control and in this case must be covered up/filtered out or reduced by other means,

For more information

The Honeywell Thermal Solutions family of products includes Honeywell Combustion Safety, Eclipse, Exothermics, Hauck, Kromschroder and Maxon. To learn more about our products, visit ThermalSolutions.honeywell.com or contact your Honeywell Sales Engineer.

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