

# **optek<sup>®</sup>**

## **inline control**

**MANUAL**  
**VERSION 1.0**  
**DATED AUGUST, 26<sup>TH</sup> 2002**

### **C4000 UVN EX-PROOF EN-D**

- **C4000 / AF16-EX / AF16-EX-HT**
- **C4000 / AF26-EX / AF26-EX-HT**
- **C4000 / TF16-EX / TF16-EX-HT**
- **C4000 / AF45-EX / AF45-EX-HT**
- **C4000 / AF46-EX / AF46-EX-HT**



# **ATEX**



# C4000 UVN EX EN-D 1.0



## Preface

This instruction manual is written in such a way that all necessary information is given to provide correct practice and trouble-free operation.

It is explicitly pointed out that no responsibility is accepted in case of loss or damage however caused on the use of this instruction manual and the included description of the products.

Due to reasons of printing technique, the following illustrations correspond only roughly to the true appearance of the products. This instruction manual is protected by copyright. However, the user may produce copies and translations as required for the correct operation of the products.

On request this instruction manual is available in different languages and also can be supplied on CD (Acrobat® Reader 4.0)

Our products are under constant development - technical data is subject to change without notice.

Essen, August 2002



# C4000 UVN EX EN-D 1.0



For further information please contact:

**optek-Danulat GmbH**

Emscherbruchallee 2 • 45356 Essen • Germany

Phone ++49 - (0)201 - 63 40 9-0

Fax ++49 - (0)201 - 63 40 9-999

E-mail [info@optek.de](mailto:info@optek.de)

**optek Geschäftsstelle Südwest**

Wilhelm-Maybach-Str. 11 • Mainz • Germany

Phone ++49 - (0)6131 - 58 20 15

Fax ++49 - (0)6131 - 50 40 26

E-mail [info@optek.de](mailto:info@optek.de)

**Optek-Danulat bv**

Staalweg 18 • 4104 AT Culemborg • Netherlands

Phone ++31 - (0)345 - 65 03 01

Fax ++31 - (0)345 - 65 03 61

E-mail [info@optek.nl](mailto:info@optek.nl)

**optek-Danulat, Inc.**

279 South 17th Avenue, Suite # 10

West Bend • WI 53095-3001 • USA

Phone ++1 - 262 - 335 - 42 88

Fax ++1 - 262 - 335 - 42 99

E-mail [info@optek.com](mailto:info@optek.com)

**INTERNET:** <http://www.optek.com>

or your local agent:

## Table of contents

page

|          |  |    |
|----------|--|----|
| <b>1</b> | <b>Safety description</b>                                      |    |
| 1.1      | Explosion protection concept                                   | 6  |
| 1.2      | Safety description converter C4000                             | 7  |
| 1.3      | Safety description sensors                                     | 8  |
| <b>2</b> | <b>Technical data</b>  |    |
|          | (Deviations from standard manual)                              |    |
| 2.1      | Converter C4000  | 11 |
| 2.2.1    | Sensors AF16-EX-HT, AF26-EX-HT, TF16-EX-HT                     | 12 |
| 2.2.2    | Sensors AF45-EX-HT, AF46-EX-HT                                 | 14 |
| 2.3.1    | Marking C4000 with AF16-EX-HT, AF26-EX-HT, TF16-EX-HT          | 16 |
| 2.3.2    | Marking C4000 with AF45-EX-HT, AF46-EX-HT                      | 17 |
| <b>3</b> | <b>Installation</b>  |    |
| 3.1      | General installation notes                                     | 18 |
| 3.2      | Space requirement and weight of sensors                        | 19 |
| 3.3      | Installation drawing C4000 / AF16-EX-HT, EN-D                  | 20 |
| 3.4      | Installation drawing C4000 / AF26-EX-HT, EN-D                  | 22 |
| 3.5      | Installation drawing C4000 / TF16-EX-HT, EN-D                  | 24 |
| 3.6      | Installation drawing C4000 / AF45-EX-HT, EN-D                  | 26 |
| 3.7      | Installation drawing C4000 / AF46-EX-HT, EN-D                  | 28 |
| 3.8      | Installation drawing C4000 / AF16-EX-HT / AF16-EX-HT, EN-D     | 30 |
| 3.9      | Installation drawing C4000 / AF26-EX-HT / AF26-EX-HT, EN-D     | 32 |
| 3.10     | Installation drawing C4000 / TF16-EX-HT / TF16-EX-HT, EN-D     | 34 |
| 3.11     | Installation drawing C4000 / AF45-EX-HT / AF45-EX-HT, EN-D     | 36 |
| 3.12     | Installation drawing C4000 / AF26-EX-HT / AF16-EX-HT, EN-D     | 38 |
| 3.13     | Installation drawing C4000 / TF16-EX-HT / AF16-EX-HT, EN-D     | 40 |
| 3.14     | Installation drawing C4000 / AF45-EX-HT / AF16-EX-HT, EN-D     | 42 |
| 3.15     | Installation drawing C4000 / AF26-EX-HT / TF16-EX-HT, EN-D     | 44 |
| <b>4</b> | <b>Maintenance</b>   |    |
| 4.1.1    | Lamp replacement AF45-EX-HT, AF46-EX-HT                        | 46 |
| 4.1.2    | Reference detector replacement AF45-EX-HT, AF46-EX-HT          | 48 |
| 4.2      | Lamp replacement AF16-EX-HT, AF26-EX-HT, TF16-EX-HT            | 49 |
| 4.3.1    | Detector module replacement AF16-EX-HT, AF45-EX-HT             | 50 |
| 4.3.2    | Detector module replacement AF26-EX-HT, TF16-EX-HT, AF46-EX-HT | 51 |
| 4.4      | Exploded view AF16-EX, AF16-EX-HT                              | 52 |
| 4.5      | Exploded view AF26-EX, AF26-EX-HT                              | 53 |
| 4.6      | Exploded view TF16-EX, TF16-EX-HT                              | 54 |
| 4.7      | Exploded view AF45-EX, AF45-EX-HT                              | 55 |
| 4.8      | Exploded view AF46-EX, AF46-EX-HT                              | 56 |
| 4.9      | Exchange converter C4000                                       | 57 |
| 4.10     | Spare parts  | 58 |




# C4000 UVN EX EN-D 1.0



| <b>Table of contents</b> |   | <b>page</b> |
|--------------------------|---|-------------|
| <b>5</b>                 | <b>Certificates</b>                               |             |
| 5.1                      | optek-Danulat GmbH „EC-Declaration of Conformity“ | 60          |
| 5.2                      | DIN ISO 9001 - 2000                               | 61          |
| 5.3                      | ATEX Manufacturer                                 | 62          |
| 5.4                      | RW-TÜV GmbH „GS-mark“                             | 63          |
| <b>6</b>                 | <b>EX-Certificates of Conformity</b>              |             |
| 6.1                      | DMT 02 ATEX E 176 (SYST)                          | 64          |
| 6.2                      | DMT 02 ATEX E 175 (lamp housings)                 | 65          |
| <b>7</b>                 | <b>Fax-reply</b>                                  | <b>66</b>   |

 **This manual covers exclusively explosion protection of the listed photometers and its intrinsically safe circuits !  
Explosion protection (EEx d or p) for the converter C4000 itself is covered in a separate manual !  
It is an addition to the hardware and software manuals !**

|                               |                              |
|-------------------------------|------------------------------|
| Hardware Converter C4000      | (see separate documentation) |
| Software Converter C4000      | (see separate documentation) |
| Software PC-TRANSFER C4000    | (see separate documentation) |
| Hardware Sensors              | (see separate documentation) |
| Hardware Armatures            | (see separate documentation) |
| <br>                          |                              |
| EX-Protection Converter C4000 | (see separate documentation) |

## 1 Safety description

### 1.1 Explosion protection concept

Generally, the explosion protected photometers C4000/AF16-EX-HT, C4000/AF26-EX-HT, C4000/TF16-EX-HT, C4000/AF45-EX-HT, C4000/AF46-EX-HT and all listed combinations

| converter configurations: CONTROL 4000         | C4101 | C4121 | C4221 | C4222 | C4322 | C4422 |
|--|-------|-------|-------|-------|-------|-------|
| inputs for optek sensors                       | 1     | 1     | 2     | 2     | 3     | 4     |
| mA-inputs                                      | -     | 2     | 2     | 2     | 2     | 2     |
| remote-inputs                                  | -     | 7     | 7     | 7     | 7     | 7     |
| FAIL-SAFE (active)                             | 1     | 1     | 1     | 1     | 1     | 1     |
| mA-outputs                                     | 2     | 2     | 2     | 4     | 4     | 4     |
| lamp-outputs for optek sensors                 | 1     | 1     | 1     | 2     | 2     | 2     |
| <b>permitted combinations converter-sensor</b> |       |       |       |       |       |       |
| 1 sensor AF16-EX-HT                            | x     | x     | x     | x     | x     | x     |
| 1 sensor AF26-EX-HT                            |       |       | x     | x     | x     | x     |
| 1 sensor TF16-EX-HT                            |       |       | x     | x     | x     | x     |
| 1 sensor AF45-EX-HT                            |       |       | x     | x     | x     | x     |
| 1 sensor AF46-EX-HT                            |       |       |       |       |       | x     |
| 2 sensors AF16-EX-HT + AF16-EX-HT              |       |       |       | x     | x     | x     |
| 2 sensors AF26-EX-HT + AF26-EX-HT              |       |       |       |       |       | x     |
| 2 sensors TF16-EX-HT + TF16-EX-HT              |       |       |       |       |       | x     |
| 2 sensors AF45-EX-HT + AF45-EX-HT              |       |       |       |       |       | x     |
| 2 sensors AF26-EX-HT + AF16-EX-HT              |       |       |       |       | x     | x     |
| 2 sensors TF16-EX-HT + AF16-EX-HT              |       |       |       |       | x     | x     |
| 2 sensors AF45-EX-HT + AF16-EX-HT              |       |       |       |       | x     | x     |
| 2 sensors AF26-EX-HT + TF16-EX-HT              |       |       |       |       |       | x     |

are applied in such a way that the sensor is installed within a hazardous location with

**Zone 1** hazardous explosive atmosphere can exist under normal operating conditions, or may exist frequently because of maintenance operations or leakage  
(The photometer has to be fulfill requirements of Category 2G)

or

**Zone 2** hazardous explosive atmosphere occurs not often and if at all only for short periods of time due to a fault or some unusual operating conditions  
(The photometer has to be fulfill requirements of Category 3G)

and the converter is mounted in a safe area (e.g. in a control room or a explosion protected housing).



**Combinations with AF26-EX-HT or TF16-EX-HT require all optek sensor inputs of C4000 to be I.S. !**

**Combinations with AF45-EX-HT or AF46-EX-HT require optek sensor inputs [C] and [D] of C4000 to be NON I.S. !**

**Combinations with AF26-EX-HT and AF45-EX-HT are not permitted !**

**Combinations with TF16-EX-HT and AF45-EX-HT are not permitted !**



# C4000 UVN EX EN-D 1.0



## 1 Safety description

### 1.2 Safety description converter C4000

**Manufacturer:** optek-Danulat GmbH, Essen, Germany

**Type:** C4000, EN-D

**Temperature:** -20°C < Tamb. < +55°C

**Description:**

Converter C4000 EN-D with up to four integrated single channel safety shunts IO-11.A with common ground, designed for the direct connection of explosion protected sensors AF16-EX, AF16-EX-HT, AF26-EX, AF26-EX-HT, TF16-EX, TF16-EX-HT, AF45-EX, AF45-EX-HT AF46-EX and AF46-EX-HT. The circuits into the detector arms are designed as intrinsically safe circuits. The energy in these circuits must be limited by safety shunts IO-11.A installed in the converter in such a way, that ignition is not possible. Circuits into the lamp arms of sensors AF45-EX-HT, AF46-EX-HT are designed as non intrinsically safe circuits. The energy in these circuits must not be limited by safety shunts.

**Converters are always associated apparatus with intrinsically safe inputs [A], [B].**

**Inputs [C], [D] are either**

**both intrinsically safe as well**

or

**both must be non intrinsically safe (with AF45-EX-HT, AF46-EX-HT)**

The intrinsically safe inputs are classified:

**[ EEx ia ] IIC**

**Output parameters per I.S. channel:**

|                                  |                         |
|----------------------------------|-------------------------|
| Maximal output voltage to earth: | U <sub>o</sub> = 7 V    |
| Maximal short circuit current:   | I <sub>o</sub> = 220 mA |
| Internal effective capacitance:  | C <sub>i</sub> = 170 nF |
| Internal effective inductance:   | L <sub>i</sub> = 90 µH  |

| Grouping                                   | IIC    | IIB     |
|--|--------|---------|
| Max. external capacitance C <sub>a</sub> : | 15 µF  | 300 µF  |
| Max. external inductance L <sub>a</sub> :  | 345 µH | 1650 µH |

**Explosion protection marking:**

The converters are labeled between the optek sensor input terminals [A], [B] and [C], [D]. Complete marking is shown in section 2.3.

Converters are built in two versions:

- **all optek sensor inputs are I.S. with shunt**  
(use with AF16-EX-HT, AF26-EX-HT, TF16-EX-HT)
- **optek sensor inputs [C] and [D] to be NON I.S.**  
(use with AF45-EX-HT, AF46-EX-HT)

## 1 Safety description

### 1.3 Safety description sensors

Due to the modular design of the sensors, the lamp arm and the detector arm represent two distinct electrical apparatus. Therefore, with respect to explosion protection one has to distinguish between circuits which lead into the lamp arm and those which lead into the detector arm. The sensors with its connection cables have a safety description as an intrinsically safe and flameproof apparatus. The intended use is together with converter C4000 as associated apparatus. The photometers as described have been approved by DMT as type C4000 UVN for the most demanding requirements.

**Manufacturer:** optek-Danulat GmbH, Essen, Germany

**Type:** AF16-EX, AF16-EX-HT, AF26-EX, AF26-EX-HT, TF16-EX, TF16-EX-HT

**Temperature:** see section 2.2

**Description:**

All detector circuits with current limiting resistors according to EN-D, designed for direct connection to converters C4000, EN-D with integrated safety shunt IO-11.A.

**Type:** AF45-EX, AF45-EX-HT, AF46-EX, AF46-EX-HT

**Temperature:** see section 2.2

**Description:**

Detector circuits [A] and [B] with current limiting resistors according to EN-D, designed for direct connection to converters C4000, EN-D with integrated safety shunt IO-11.A.

Detector circuits [C] and [D] are not intrinsically safe.

**Explosion protection marking:**

Sensors are labeled with respect to type of protection EEx i on the detector arm.

Sensors are labeled with respect to type of protection EEx d on the lamp arm.

Complete marking is shown in section 2.3





# C4000 UVN EX EN-D 1.0



## Lamp housing for AF16-EX-HT, AF26-EX-HT, TF16-EX-HT

**Manufacturer:** optek-Danulat GmbH, Essen, Germany

**Type:** 17L132-N05

**Description:** Flameproof housing made from stainless steel with front window. Cover with 2 m connecting cable with equipment grounding conductor, non-rewire able.

**Cable entry:** 1 Entry 1/2" NPT, factory fitted and sealed, not replaceable

**Temperature:** -30°C < Tamb. < +40 / 60°C

**Maximum temperature in the window area of the flameproof housing is 125°C under the following conditions:**

- Temperature class T6 is not required,
- Free air circulation at the flameproof housing is not hindered,
- Ambient temperature ( $T_{amb.}$ ) does not exceed 40°C,
- Optical axis of the flameproof housing is horizontal,
- Heat transfer to the flameproof housing is only related to the process temperature.

**The corresponding temperature class grouping is listed in section 2.2.**

**Explosion protection marking:**

EEx d IIC T6 / T5 according to DMT 02 ATEX E 175

## Lamp housing for AF45-EX-HT, AF46-EX-HT

**Manufacturer:** optek-Danulat GmbH, Essen, Germany

**Type:** 32L265-N05

**Description:** Flameproof housing made from stainless steel with front window. Cover with 2 m connecting cable with equipment grounding conductor, non-rewire able.

**Cable entry:** 2 Entries 1/2" NPT, factory fitted and sealed, not replaceable  
One used with AF45-EX-HT, both used with AF46-EX-HT

**Temperature:** -30°C < Tamb. < +40 / 60°C

**Maximum temperature in the window area of the flameproof housing is 125°C under the following conditions:**

- Temperature class T6 is not required,
- Free air circulation at the flameproof housing is not hindered,
- Ambient temperature ( $T_{amb.}$ ) does not exceed 40°C,
- Optical axis of the flameproof housing is horizontal,
- Heat transfer to the flameproof housing is only related to the process temperature.

**The corresponding temperature class grouping is listed in section 2.2.**

**Explosion protection marking:**

EEx d IIC T6 / T5 according to DMT 02 ATEX E 175

## Intrinsically safe circuits

The intrinsically safe circuits consist of the respective part in the detector arm and the associated cable to the safety shunt in the converter. The data are given separately for each intrinsically safe circuit, below listed as -1 for the measurement channels [A], [B] (terminals 1, 2, 5) and as -2 for the reference channels [C], [D] (terminals 3, 4, 5). Data are valid for sensor versions EX and EX-HT. Data for  $C_i$  and  $L_i$  refer to the circuits in the detector arms, the data for  $C_{cable}$  and  $L_{cable}$  cover cable lengths for the system of up to 400 m (1312 ft.) for Group IIC and of up to 1000 m (3280 ft.) for Group IIB.

| Detector circuit | Module $C_i$ | $C_{max}$<br>= $C_i$ + $C_{cable}$<br>incl. 400 m | $C_{max}$<br>= $C_i$ + $C_{cable}$<br>incl. 1000 m | Module $L_i$ | $L_{max}$<br>= $L_i$ + $L_{cable}$<br>incl. 400 m | $L_{max}$<br>= $L_i$ + $L_{cable}$<br>incl. 1000 m |
|------------------|--------------|---|--|--------------|---|--|
| AF16-EX [A]      | 140 nF       | 300 nF  | 540 nF   | 5 $\mu$ H    | 345 $\mu$ H                                       | 855 $\mu$ H  |
| AF26-EX-1 [A]    | 140 nF       | 300 nF  | 540 nF   | 5 $\mu$ H    | 345 $\mu$ H                                       | 855 $\mu$ H  |
| AF26-EX-2 [C]    | 140 nF       | 300 nF  | 540 nF   | 5 $\mu$ H    | 345 $\mu$ H                                       | 855 $\mu$ H  |
| TF16-EX-1 [A]    | 380 nF       | 540 nF  | 780 nF   | 5 $\mu$ H    | 345 $\mu$ H                                       | 855 $\mu$ H  |
| TF16-EX-2 [C]    | 140 nF       | 300 nF  | 540 nF   | 5 $\mu$ H    | 345 $\mu$ H                                       | 855 $\mu$ H  |
| AF45-EX [A]      | 140 nF       | 300 nF  | 540 nF   | 5 $\mu$ H    | 345 $\mu$ H                                       | 855 $\mu$ H  |
| AF46-EX-1 [A]    | 140 nF       | 300 nF  | 540 nF   | 5 $\mu$ H    | 345 $\mu$ H                                       | 855 $\mu$ H  |
| AF46-EX-2 [B]    | 140 nF       | 300 nF  | 540 nF   | 5 $\mu$ H    | 345 $\mu$ H                                       | 855 $\mu$ H  |

The resulting values for  $C_{max}$  and  $L_{max}$  are below the permitted values  $C_a$  and  $L_a$  for the converters.

| Cable length                   | EN - Approval           |
|--------------------------------|-------------------------|
| 0 – 400 m (0 – 1312 ft.)       | SYST EEx ia IIC T6 / T5 |
| 401 – 1000 m (1313 – 3280 ft.) | SYST EEx ia IIB T6 / T5 |



**Detector circuits [C] and [D] off the lamp arms AF45-EX-HT or AF46-EX-HT are not intrinsically safe circuits !**

## Cable

Only cable according to optek's specifications may be used. The safety relevant parameters  $C_{cable}$  and  $L_{cable}$  for the intrinsically safe circuits are listed in the installation drawings. Shielding and isolation resistance (> 2000 M $\Omega$ /km) of the cable are essential for the operation of the photometer.

## Electrical connection

Both, the flameproof housing for the lamp and the detector housing have fixed connection cables (2 m). The installation drawings H04510 A sheets 2/14 to 14/14 provide necessary additional information. Local regulations are not in the scope of these drawings, but may require additional attention.

## Armatures

All standard armatures - including those with measuring cells made from plastic material TFM4215 - are electrically conductive. The measuring cells made of TFM 4215 have a specific bulk resistance of 1000 Ohm x cm and a surface resistance of 1000 Ohm according to DIN 53 482 to realize protection against ignition by electrostatic discharge (ESD protection).

## Combination with option "HT" (high temperature):

The corresponding temperature class grouping is listed in section 2.2. Sensors-EX-HT may require an additional grounding of the detector housing to derive electrostatic charge (ESD protection).



# C4000 UVN EX EN-D 1.0



## 2 Technical data

### 2.1 Converter CONTROL 4000

#### Deviations from the hardware and software manuals:

- Converter must be installed in a safe location.
- Maximal line voltage is limited to 250 VAC.
- Power supply (fixed):  
115/230 V AC, selectable (93,5 - 132 / 187 - 250 V AC, 47 - 64 Hz).
- All other terminals are limited to maximal 250V AC as well.
- Over voltage category is II according to EN 61010.
- Contamination category is 2 according to EN 61010.
- Ambient temperature for the converters is:  
 $-20^{\circ}\text{C} (-4^{\circ}\text{F}) \leq T_{\text{amb}} \leq +55^{\circ}\text{C} (+131^{\circ}\text{F})$ .
- Converter is built with up to four safety shunts IO-11.A .
- Converter may have optek sensor inputs [C] and [D] NON I.S..
- Converter C4000 EN-D is marked in accordance with DMT 02 ATEX E 176.
- Connection of sensors-EX to converters without EX-marking is not permitted.
- Connection of standard sensors (not Ex) to converters with EX-marking is not permitted. However, use gets possible after removal of the EX-marking (label).
- Connection of the converter C4000 EN-D is done in accordance with the installation drawings H04510 A, sheets 2/14 to sheet 14/14.
- Exchange or replacement orders for converters with part numbers according to section 4.9.

## 2 Technical data

### 2.2.1 Sensors AF16-EX-HT, AF26-EX-HT, TF16-EX-HT

#### Deviations form hardware and software manuals

Please use part numbers in section 4.10 for exchange or replacement parts

The maximum allowed process temperature depends on the ambient temperature and on the temperature classes as follows:

#### Temperature class grouping AF16-EX, AF26-EX, TF16-EX:

| T-class            | Ambient temperature ( $T_{amb}$ ) | Process temperature             |
|--------------------|-----------------------------------|---------------------------------|
| T6 (85°C / 185°F)  | -30°C - +40°C (-22°F - +104°F)    | -30°C - + 40°C (-22°F - +104°F) |
| T5 (100°C / 212°F) | -30°C - +60°C (-22°F - +140°F)    | -30°C - + 60°C (-22°F - +140°F) |
| T4 (135°C / 275°F) | -30°C - +40°C (-22°F - +104°F)    | -30°C - +120°C (-22°F - +248°F) |
| T4 (135°C / 275°F) | -30°C - +50°C (-22°F - +122°F)    | -30°C - +110°C (-22°F - +230°F) |
| T4 (135°C / 275°F) | -30°C - +60°C (-22°F - +140°F)    | -30°C - +100°C (-22°F - +212°F) |

#### Temperature class grouping AF16-EX-HT, AF26-EX-HT, TF16-EX-HT:

| T-class            | Ambient temperature ( $T_{amb}$ ) | Process temperature             |
|--------------------|-----------------------------------|---------------------------------|
| T6 (85°C / 185°F)  | -30°C - +40°C (-22°F - +104°F)    | -30°C - + 70°C (-22°F - +158°F) |
| T5 (100°C / 212°F) | -30°C - +40°C (-22°F - +104°F)    | -30°C - +100°C (-22°F - +212°F) |
| T5 (100°C / 212°F) | -30°C - +50°C (-22°F - +122°F)    | -30°C - + 90°C (-22°F - +194°F) |
| T5 (100°C / 212°F) | -30°C - +60°C (-22°F - +140°F)    | -30°C - + 80°C (-22°F - +176°F) |
| T4 (135°C / 275°F) | -30°C - +40°C (-22°F - +104°F)    | -30°C - +120°C (-22°F - +248°F) |
| T4 (135°C / 275°F) | -30°C - +50°C (-22°F - +122°F)    | -30°C - +110°C (-22°F - +230°F) |
| T4 (135°C / 275°F) | -30°C - +60°C (-22°F - +140°F)    | -30°C - +100°C (-22°F - +212°F) |
| T3 (200°C / 392°F) | -30°C - +40°C (-22°F - +104°F)    | -30°C - +180°C (-22°F - +356°F) |
| T3 (200°C / 392°F) | -30°C - +50°C (-22°F - +122°F)    | -30°C - +160°C (-22°F - +320°F) |
| T3 (200°C / 392°F) | -30°C - +60°C (-22°F - +140°F)    | -30°C - +140°C (-22°F - +284°F) |
| T2 (300°C / 572°F) | -30°C - +40°C (-22°F - +104°F)    | -30°C - +240°C (-22°F - +464°F) |
| T2 (300°C / 572°F) | -30°C - +50°C (-22°F - +122°F)    | -30°C - +220°C (-22°F - +428°F) |
| T2 (300°C / 572°F) | -30°C - +60°C (-22°F - +140°F)    | -30°C - +200°C (-22°F - +392°F) |



All data listed above are valid only under the following conditions:

- Free air circulation is not hindered around lamp and detector arms !
- Sensor is installed in a vertical pipe !
- Lamp and detector arms are installed horizontally !
- Heat transfer to the sensor is due to the process temperature !
- There is no icing on the sensor !
- Appropriate material for the armature is use !



# C4000 UVN EX EN-D 1.0



Process temperatures below may occur short term in the absence of hazardous atmosphere.

**Short term: max. 15 min./day**

Possible process temperature AF16- , AF26- , TF16- :

| Ambient temperature ( $T_{amb}$ ) | EX                              | EX-HT                           |
|-----------------------------------|---------------------------------|---------------------------------|
| -30°C - +40°C ( -22°F - +104°F)   | -30°C - +150°C (-22°F - +302°F) | -30°C - +260°C (-22°F - +500°F) |
| -30°C - +50°C ( -22°F - +122°F)   | -30°C - +140°C (-22°F - +284°F) | -30°C - +240°C (-22°F - +464°F) |
| -30°C - +60°C ( -22°F - +140°F)   | -30°C - +130°C (-22°F - +266°F) | -30°C - +220°C (-22°F - +428°F) |

**Short term: max. 30 min./day**

Possible process temperature AF16- , AF26- , TF16- :

| Ambient temperature ( $T_{amb}$ ) | EX                              | EX-HT                           |
|-----------------------------------|---------------------------------|---------------------------------|
| -30°C - +40°C ( -22°F - +104°F)   | -30°C - +140°C (-22°F - +284°F) | -30°C - +250°C (-22°F - +482°F) |
| -30°C - +50°C ( -22°F - +122°F)   | -30°C - +130°C (-22°F - +266°F) | -30°C - +230°C (-22°F - +446°F) |
| -30°C - +60°C ( -22°F - +140°F)   | -30°C - +120°C (-22°F - +248°F) | -30°C - +210°C (-22°F - +410°F) |



All data listed above are valid only under the following conditions:

- Free air circulation is not hindered around lamp and detector arm !
- Sensor is installed in a vertical pipe !
- Lamp and detector arms are installed horizontally !
- Heat transfer to the sensor is due to the process temperature !
- There is no icing on the sensor !
- Appropriate material for the armature is use !

## 2 Technical data

### 2.2.2 Sensors AF45-EX-HT, AF46-EX-HT

#### Deviations form hardware and software manuals

Please use part numbers in section 4.10 for exchange or replacement parts

The maximum allowed process temperature depends on the ambient temperature and on the temperature classes as follows:

#### Temperature class grouping AF45-EX, AF46-EX:

| T-class            | Ambient temperature ( $T_{amb}$ ) | Process temperature             |
|--------------------|-----------------------------------|---------------------------------|
| T6 (85°C / 185°F)  | -30°C - +40°C (-22°F - +104°F)    | -30°C - + 40°C (-22°F - +104°F) |
| T5 (100°C / 212°F) | -30°C - +60°C (-22°F - +140°F)    | -30°C - + 60°C (-22°F - +140°F) |
| T4 (135°C / 275°F) | -30°C - +40°C (-22°F - +104°F)    | -30°C - + 70°C (-22°F - +158°F) |
| T4 (135°C / 275°F) | -30°C - +50°C (-22°F - +122°F)    | -30°C - + 70°C (-22°F - +158°F) |
| T4 (135°C / 275°F) | -30°C - +60°C (-22°F - +140°F)    | -30°C - + 70°C (-22°F - +158°F) |

#### Temperature class grouping AF45-EX-HT, AF46-EX-HT:

| T-class            | Ambient temperature ( $T_{amb}$ ) | Process temperature             |
|--------------------|-----------------------------------|---------------------------------|
| T6 (85°C / 185°F)  | -30°C - +40°C (-22°F - +104°F)    | -30°C - + 70°C (-22°F - +158°F) |
| T5 (100°C / 212°F) | -30°C - +40°C (-22°F - +104°F)    | -30°C - +100°C (-22°F - +212°F) |
| T5 (100°C / 212°F) | -30°C - +50°C (-22°F - +122°F)    | -30°C - + 90°C (-22°F - +194°F) |
| T5 (100°C / 212°F) | -30°C - +60°C (-22°F - +140°F)    | -30°C - + 80°C (-22°F - +176°F) |
| T4 (135°C / 275°F) | -30°C - +40°C (-22°F - +104°F)    | -30°C - +120°C (-22°F - +248°F) |
| T4 (135°C / 275°F) | -30°C - +50°C (-22°F - +122°F)    | -30°C - +110°C (-22°F - +230°F) |
| T4 (135°C / 275°F) | -30°C - +60°C (-22°F - +140°F)    | -30°C - +100°C (-22°F - +212°F) |



All data listed above are valid only under the following conditions:

- Free air circulation is not hindered around lamp and detector arm !
- Sensor is installed in a vertical pipe !
- Lamp and detector arms are installed horizontally !
- Heat transfer to the sensor is due to the process temperature !
- There is no icing on the sensor !
- Appropriate material for the armature is use !



# C4000 UVN EX EN-D 1.0



Process temperatures below may occur short term in the absence of hazardous atmosphere.

**Short term: max. 15 min./day**

Possible process temperature AF45- , AF46- :

| Ambient temperature ( $T_{amb}$ ) | EX                              | EX-HT                           |
|-----------------------------------|---------------------------------|---------------------------------|
| -30°C - +40°C ( -22°F - +104°F)   | -30°C - +135°C (-22°F - +275°F) | -30°C - +150°C (-22°F - +302°F) |
| -30°C - +50°C ( -22°F - +122°F)   | -30°C - +125°C (-22°F - +257°F) | -30°C - +140°C (-22°F - +284°F) |
| -30°C - +60°C ( -22°F - +140°F)   | -30°C - +115°C (-22°F - +239°F) | -30°C - +130°C (-22°F - +266°F) |

**Short term: max. 30 min./day**

Possible process temperature AF45- , AF46- :

| Ambient temperature ( $T_{amb}$ ) | EX                              | EX-HT                           |
|-----------------------------------|---------------------------------|---------------------------------|
| -30°C - +40°C ( -22°F - +104°F)   | -30°C - +120°C (-22°F - +248°F) | -30°C - +140°C (-22°F - +284°F) |
| -30°C - +50°C ( -22°F - +122°F)   | -30°C - +110°C (-22°F - +230°F) | -30°C - +130°C (-22°F - +266°F) |
| -30°C - +60°C ( -22°F - +140°F)   | -30°C - +100°C (-22°F - +212°F) | -30°C - +120°C (-22°F - +248°F) |



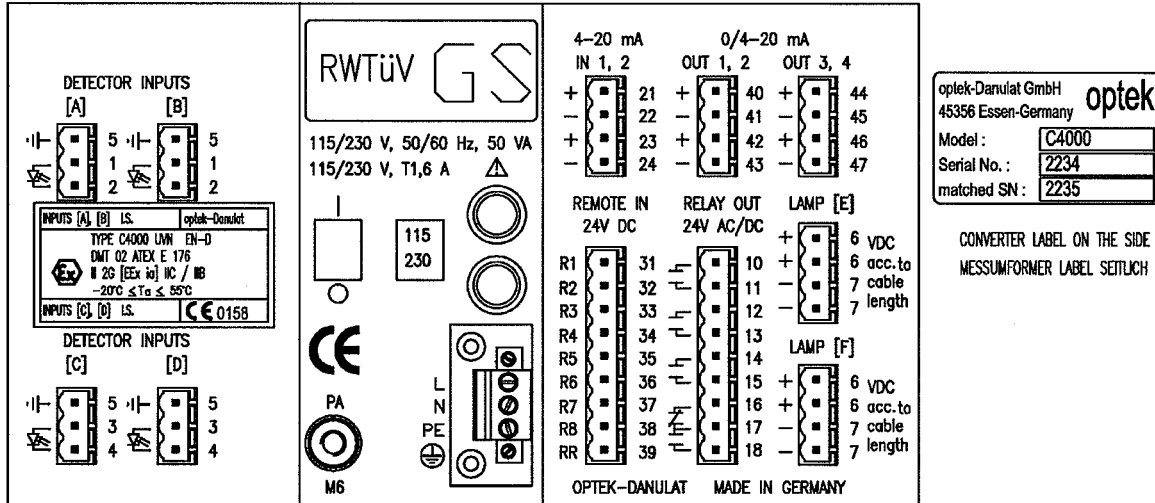
All data listed above are valid only under the following conditions:

- Free air circulation is not hindered around lamp and detector arm !
- Sensor is installed in a vertical pipe !
- Lamp and detector arms are installed horizontally !
- Heat transfer to the sensor is due to the process temperature !
- There is no icing on the sensor !
- Appropriate material for the armature is use !

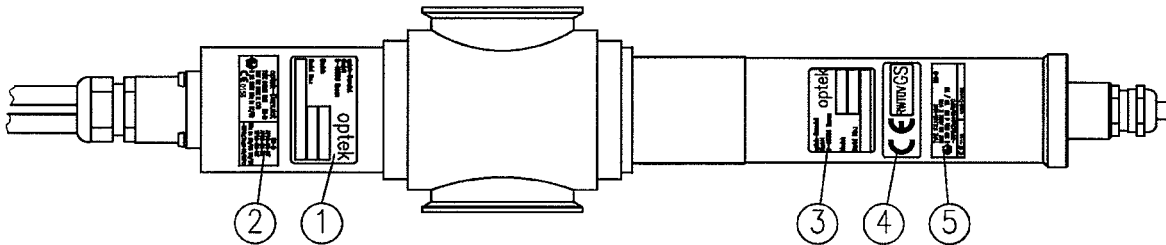
## 2 Technical data

### 2.3.1 Marking C4000 with AF16-EX-HT, AF26-EX-HT, TF16-EX-HT

Marking of the photometers is illustrated below with C4000/AF26-EX-HT as an example. The type plates for converter and sensor show in the last line the matching serial numbers. The label between detector inputs identifies them to be intrinsically safe.



115/230 VAC AND 24 V AC/DC CONVERTER VERSIONS ARE MARKED IDENTICALLY  
 115/230 VAC UND 24 V AC/DC VERSIONEN DER MESSUMFORMER SIND IDENTISCH GEKENNZEICHNET



- ① optek-Danulat GmbH 45356 Essen-Germany **optek**  
 Model: AF46-EX-HT  
 Serial No.: 2235  
 matched SN: 2234
- ② optek-Danulat EN-D  
 TYPE C4000 UVN AF16-EX-HT  
 DMT 02 ATEX E 176 AF26-EX-HT  
 II 2G SYST EEx ia IIC/IIB TF16-EX-HT  
 EEx ia IIC/IIB T6/T5  
 -30°C ≤ Ta ≤ +40/60°C  
 CE 0158
- ③ optek-Danulat GmbH 45356 Essen-Germany **optek**  
 Model: AF46-EX-HT  
 Serial No.: 2235  
 matched SN: 2234
- ④ **CE** RWTüV GS
- ⑤ TYPE 17L132-XXX EN-D  
 DMT 02 ATEX E 175  
 II 2G EEx d IIC T6 / T5  
 -30°C ≤ Ta ≤ +40/60°C  
 CE 0158 optek-Danulat





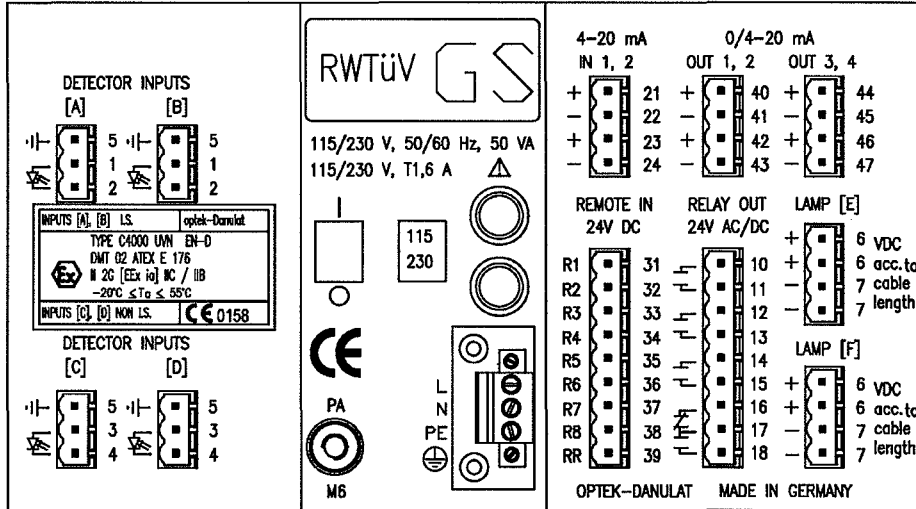
# C4000 UVN EX EN-D 1.0



## 2 Technical data

### 2.3.2 Marking C4000 with AF45-EX-HT, AF46-EX-HT

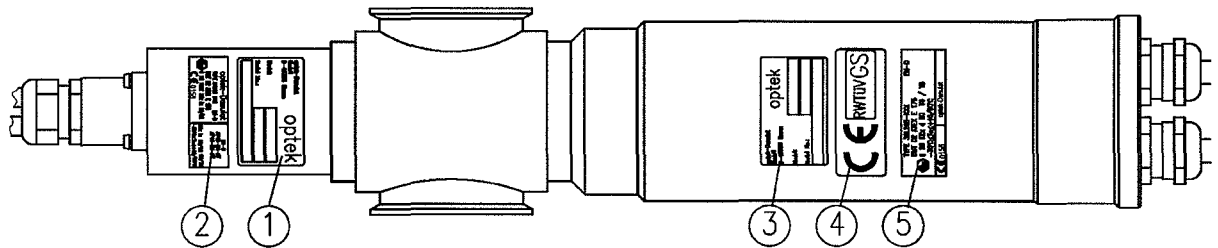
Marking of the photometers is illustrated below with C4000/AF46-EX-HT as an example. The type plates for converter and sensor show in the last line the matching serial numbers. The label between detector inputs identifies inputs [A] and [B] only as intrinsically safe. Inputs [C] and [D] must not be connected to intrinsically safe circuits.



|                          |       |
|--------------------------|-------|
| optek-Danulat GmbH optek |       |
| 45356 Essen-Germany      |       |
| Model :                  | C4000 |
| Serial No. :             | 2236  |
| matched SN :             | 2237  |

CONVERTER LABEL ON THE SIDE  
MESSUMFORMER LABEL SEITLICH

115/230 VAC AND 24 V AC/DC CONVERTER VERSIONS ARE MARKED IDENTICALLY  
115/230 VAC UND 24 V AC/DC VERSIONEN DER MESSUMFORMER SIND IDENTISCH GEKENNZEICHNET



①

|                          |            |
|--------------------------|------------|
| optek-Danulat GmbH optek |            |
| 45356 Essen-Germany      |            |
| Model :                  | AF46-EX-HT |
| Serial No. :             | 2237       |
| matched SN :             | 2236       |

③

|                          |            |
|--------------------------|------------|
| optek-Danulat GmbH optek |            |
| 45356 Essen-Germany      |            |
| Model :                  | AF46-EX-HT |
| Serial No. :             | 2237       |
| matched SN :             | 2236       |

②

|                                   |  |                      |
|-----------------------------------|--|----------------------|
| optek-Danulat                     |  | EN-D                 |
| TYPE C4000 UVN                    |  | AF45-EX-HT           |
| DMT 02 ATEX E 176                 |  | AF46-EX-HT           |
| II 2G SYST EEx ia IIC/IIB         |  | EEx ia IIC/IIB T6/T5 |
| -20°C ≤ T <sub>a</sub> ≤ +40/60°C |  |                      |
| CE 0158                           |  |                      |



⑤

|                                   |  |               |
|-----------------------------------|--|---------------|
| TYPE 32L265-XXX                   |  | EN-D          |
| DMT 02 ATEX E 175                 |  |               |
| II 2G EEx d IIC T6 / T5           |  |               |
| -30°C ≤ T <sub>a</sub> ≤ +40/60°C |  |               |
| CE 0158                           |  | optek-Danulat |

## 3 Installation

### 3.1 General installation notes

We explicitly point out that the instructions and conditions listed in the approval reports from DMT must be observed. All respective national and local installation and operation regulations must be observed as well.

Additionally, we give the following instructions:

- 1) The sensor has to be installed in such a way that the optical arms are oriented horizontally.
- 2) The temperature limits according to section 2.2 may not be exceeded
- 3) **All data regarding the temperature class grouping are only valid under the following conditions:**
  - Free air circulation is not hindered around lamp and detector arm.
  - Sensor has to be installed in a vertical pipe.
  - Lamp and detector arms are installed horizontally.
  - Heat transfer to the sensor is due to the process temperature.
  - There is no icing on the sensor.
  - Appropriate material for the armature is used.
- 4) Connection boxes and/ or conduit seals for the lamp cable have to be in accordance with the local regulations, they are not in the scope of delivery by optek.
- 5) Connection boxes for intrinsically safe circuits have to be in accordance with the local regulations, they are not in the scope of delivery by optek.
- 6) The clearance between separate intrinsically safe circuits in one connection box has to be more than 6 mm.
- 7) With the high temperature versions of sensors (-HT), the intermediate parts made of plastic which thermally isolate the lamp and detector arm from the armature, have to be provided with the warning:

**“Attention! Danger of electrostatic charge! Clean only with a wet cloth.”**

if their accessible surface is 100 cm<sup>2</sup> or more.

- 8) Sensors AF45-EX-HT and AF46-EX-HT have both intrinsically safe detector circuits [A], [B] and non intrinsically safe detector circuits [C], [D]. Separation of these circuits is required. Refer to installation drawings below for details.
- 9) Be sure marking is according to section 2.3 and corresponds to the installation drawing.

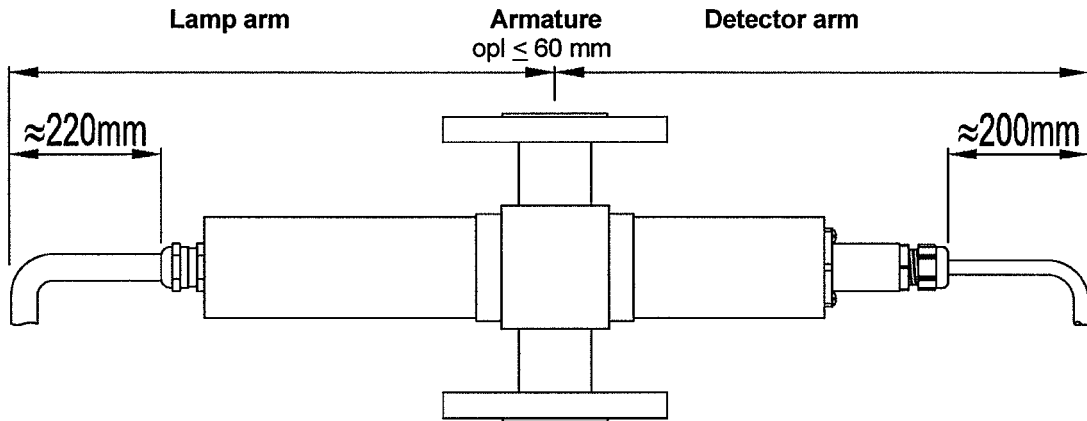


# C4000 UVN EX EN-D 1.0



## 3 Installation

### 3.2 Space requirement and weight of sensors



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The data include the space requirements for maintenance as well. The space requirement is the same for sensors-EX and sensors-EX-HT. The data include armatures with  $\text{opl}$ 's up to 60 mm. With larger  $\text{opl}$ 's it should be added half and half on both sides.

| Sensor     | Lamp arm (mm) |          | Detector arm (mm) |          |
|------------|---------------|----------|-------------------|----------|
|            | Length        | Diameter | Length            | Diameter |
| AF16-EX-HT | 550           | 100      | 350               | 100      |
| AF26-EX-HT | 550           | 100      | 350               | 120      |
| TF16-EX-HT | 550           | 100      | 350               | 120      |
| AF45-EX-HT | 550           | 150      | 350               | 100      |
| AF46-EX-HT | 550           | 150      | 350               | 120      |

#### Weight of sensors without armature:

| Sensor     | Weight (kg) | Sensor  | Weight (kg) |
|------------|-------------|---------|-------------|
| AF16-EX-HT | 3,0         | AF16-EX | 3,7         |
| AF26-EX-HT | 3,1         | AF26-EX | 3,8         |
| TF16-EX-HT | 3,1         | TF16-EX | 3,8         |
| AF45-EX-HT | 5,6         | AF45-EX | 6,1         |
| AF46-EX-HT | 5,7         | AF46-EX | 6,2         |

#### Weight of typical armatures with $\text{opl} \leq 60 \text{ mm}$ :

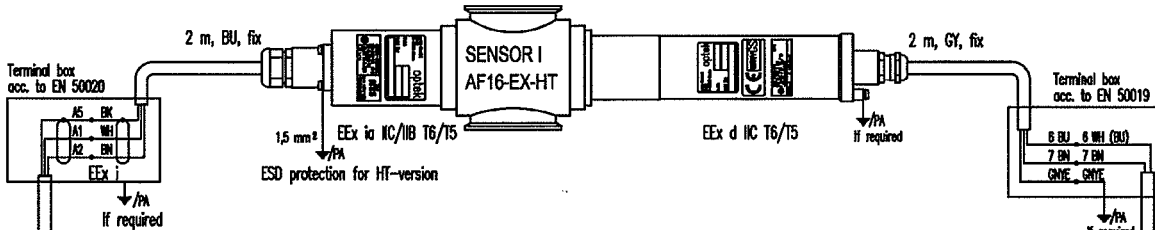
| Armature (kg) | DIN 2633 | DIN 11851 | ASME 150 lbs | Clamp TC |
|---------------|----------|-----------|--------------|----------|
| DN 25 / 1.0"  | 4,1      | 1,7       | 3,8          | 1,8      |
| DN 40 / 1.5"  | 5,4      | 2,6       | 5,1          | 1,8      |
| DN 50 / 2.0"  | 6,7      | 2,4       | 6,8          | 1,8      |
| DN 65 / 2.5"  | 7,4      | 2,4       | 9,5          | 2,0      |
| DN 80 / 3.0"  | 9,9      | 3,1       | 12,3         | 2,0      |
| DN100 / 4.0"  | 12,7     | 4,9       | 17,1         | ---      |



Check with armatures using measuring cells made from plastic whether or not additional support for the lamp arm is necessary (ex. with vibrations in the pipe) !

## 3 Installation

### 3.3 Installation drawing C4000/AF16-EX-HT, EN-D



| Normal version AF16-EX |           |               | High temp. version AF16-EX-HT |           |               |
|------------------------|-----------|---------------|-------------------------------|-----------|---------------|
| Normal version AF26-EX |           |               | High temp. version AF26-EX-HT |           |               |
| Normal version TF16-EX |           |               | High temp. version TF16-EX-HT |           |               |
| T CLASS                | Tamb (°C) | Tprocess (°C) | T CLASS                       | Tamb (°C) | Tprocess (°C) |
| T6                     | <40       | <40           | T6                            | <40       | <70           |
| T5                     | <60       | <60           | T5                            | <40       | <100          |
| T4                     | <40       | <120          | T4                            | <50       | <90           |
| T4                     | <50       | <110          | T4                            | <60       | <80           |
| T4                     | <60       | <100          | T3                            | <40       | <180          |
|                        |           |               | T3                            | <50       | <160          |
|                        |           |               | T3                            | <60       | <140          |
|                        |           |               | T2                            | <40       | <240          |
|                        |           |               | T2                            | <50       | <220          |
|                        |           |               | T2                            | <60       | <200          |

One circuit: 5 VDC, 0.775 A  
 optek lamp cable, LUY, GY  
 005-150 m: 2 x 1.5 mm<sup>2</sup>  
 151-250 m: 2 x 2.5 mm<sup>2</sup>  
 251-400 m: 2 x 4.0 mm<sup>2</sup>  
 401-600 m: 2 x 6.0 mm<sup>2</sup>  
 601-1000 m: 2 x 10 mm<sup>2</sup>

One separate intrinsically safe circuit  
 Circuit separation > 6 mm  
 One optek sensor cable 1, LUYCY 2x0.5, BU  
 Cc < 0.4 nF/m, Lc < 0.85 uH/m  
 Classification for 005-400 m:  
 IS circuits for EEx ia IIC T6/T5  
 Classification for 401-1000 m:  
 IS circuits for EEx ia IIB T6/T5

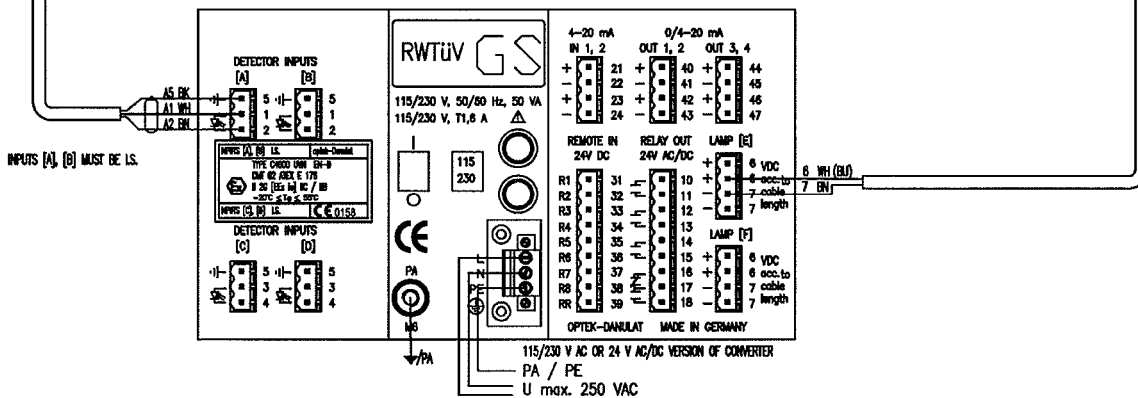
Hazardous location

-30°C < Tamb < +40/60°C

Safe location

-20°C < Tamb < +55°C

CONNECT SENSOR I TO TERMINALS [A], [E]



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See additional information regarding the installation drawing on next page.



# C4000 UVN EX EN-D 1.0



## Installation notes C4000/AF16-EX-HT, EN-D

The system consists of two components, the converter C4000 and the sensor AF16-EX or AF16-EX-HT, which are interconnected with two cables. The detector cable is not compatible with earlier delivered cables of the X12-series!!!

The connection is either to the 115/230 V AC or to the 24 V AC/DC version of the converter type C4000. It is not permitted to connect any apparatus with more than 250 V AC or 353,5 V DC to the converter.

The maximum cable length is 1000 m / 3280 ft.. Resistance, inductance and capacitance of the circuits change with the cable length. Consequently, the intrinsically safe circuit with cable length up to 400 m / 1312 ft. is permitted for all gases and vapors in group II (IIA, IIB, IIC according to EN 50014, 50018 and 50020). With longer cables the installation is permitted only in hazardous locations with groups IIB and IIA.

The voltage drop across the lamp cable requires a reduction of the cable resistance with cable length above 150 m / 492 ft.. The data for the cross sections in the installation drawing are for guidance only.

**The lamp voltage at the working sensor should be 4,80 V DC. It is absolutely necessary to adjust the lamp voltage with respect to the cable length (please refer to standard manual).**

It is recommended to connect the lamp cable (2 m / 6,5 ft.) preferably flexible, as the lamp housing must be unscrewed for lamp replacement (see section 4).

The cable connection of the intrinsically safe detector module may be removed directly at the sensor. The connector inside the cable connection allows easy and safe replacement of the detector module (see section 4).

Terminal boxes for intrinsically safe or non intrinsically safe circuits are not in the scope of delivery.

**Only sensor AF16-EX or sensor AF16-EX-HT should be connected to the associated converter type C4000 (see serial-no. on type plates), as both parts of the system are calibrated together.**



**Circuit [A] is intrinsically safe and connected to terminal [A] !**

### Terminal connections:

- [A] 1, 2, 5      **Detector cable to sensor I**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [E] 6, 7      **Lamp cable to sensor I**  
6 = white or blue (6)      7 = brown (7)
- L, N, PE      L, N, PE, power supply 115 / 230 V AC (OPTION: 24 V AC/DC)
- [C], [B], [D]      Detector inputs not in use
- [F]      Lamp output not in use

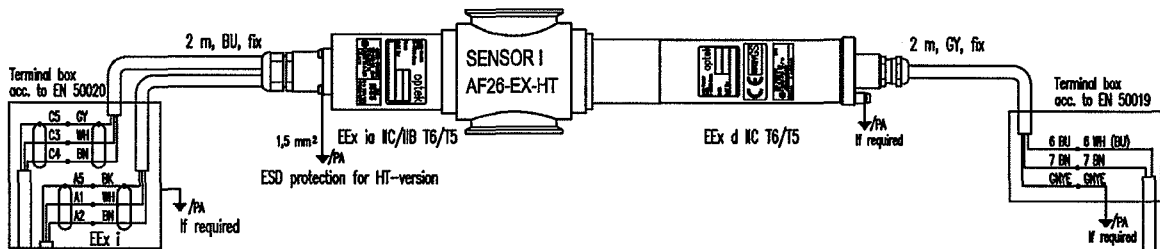
Fuses for 230 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 115 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 24 V AC/DC:      2 x SB 3,15 A (already installed at factory with option: 24 V AC/DC)

### 3 Mounting

#### 3.4 Installation drawing C4000/AF26-EX-HT, EN-D



| Normal version AF16-EX |                       |                           | High temp. version AF16-EX-HT |                       |                           |
|------------------------|-----------------------|---------------------------|-------------------------------|-----------------------|---------------------------|
| Normal version AF26-EX |                       |                           | High temp. version AF26-EX-HT |                       |                           |
| Normal version TF16-EX |                       |                           | High temp. version TF16-EX-HT |                       |                           |
| T CLASS                | T <sub>amb</sub> (°C) | T <sub>process</sub> (°C) | T CLASS                       | T <sub>amb</sub> (°C) | T <sub>process</sub> (°C) |
| T6                     | <40                   | <40                       | T6                            | <40                   | <70                       |
| T5                     | <60                   | <60                       | T5                            | <40                   | <100                      |
| T4                     | <40                   | <120                      | T5                            | <50                   | <90                       |
| T4                     | <50                   | <110                      | T5                            | <60                   | <80                       |
| T4                     | <60                   | <100                      | T4                            | <40                   | <120                      |
|                        |                       |                           | T4                            | <50                   | <110                      |
|                        |                       |                           | T4                            | <60                   | <100                      |
|                        |                       |                           | T3                            | <40                   | <180                      |
|                        |                       |                           | T3                            | <50                   | <160                      |
|                        |                       |                           | T3                            | <60                   | <140                      |
|                        |                       |                           | T2                            | <40                   | <240                      |
|                        |                       |                           | T2                            | <50                   | <220                      |
|                        |                       |                           | T2                            | <60                   | <200                      |

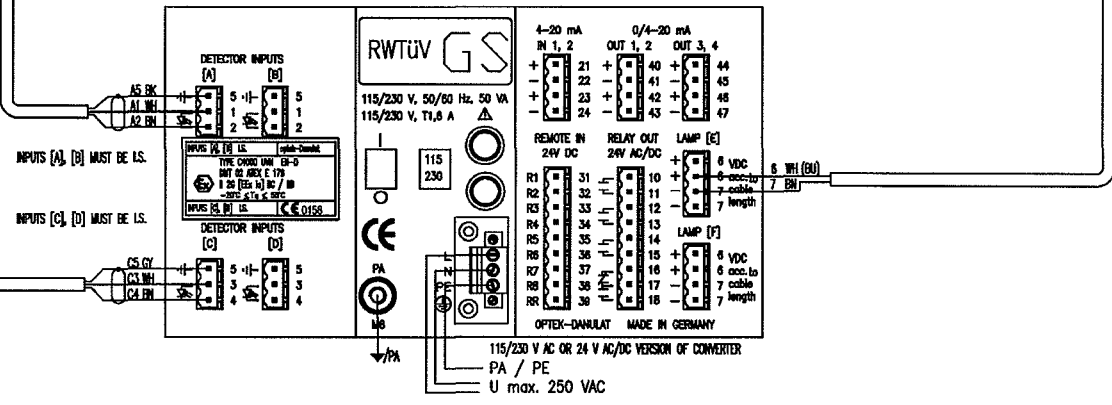
One circuit: 5 VDC, 0.775 A  
 optek lamp cable, UYY, GY  
 005- 150 m: 2 x 1.5 mm<sup>2</sup>  
 151- 250 m: 2 x 2.5 mm<sup>2</sup>  
 251- 400 m: 2 x 4.0 mm<sup>2</sup>  
 401- 600 m: 2 x 6.0 mm<sup>2</sup>  
 601-1000 m: 2 x 10 mm<sup>2</sup>

Two separate intrinsically safe circuits  
 Circuit separation > 6 mm  
 Two optek sensor cable 1, LZYCY 2x0.5, BU  
 Cc < 0.4 nF/m, Lc < 0.85 uH/m  
 Classification for 005- 400 m:  
 IS circuits for EEx ia IIC T6/T5  
 Classification for 401-1000 m:  
 IS circuits for EEx ia IIB T6/T5

**Hazardous location**  
 -30°C < T<sub>amb</sub> < +40/60°C

**Safe location**  
 -20°C < T<sub>amb</sub> < +55°C

CONNECT SENSOR 1 TO TERMINALS [A], [C], [E]



H04510-A1\_3-14\_EN-D.TIF

See additional information regarding the installation drawing on next page.



# C4000 UVN EX EN-D 1.0



## Installation notes C4000/AF26-EX-HT, EN-D

The system consists of two components, the converter C4000 and the sensor AF26-EX or AF26-EX-HT, which are interconnected with three cables. The detector cable is not compatible with earlier delivered cables of the X12-series!!!

The connection is either to the 115/230 V AC or to the 24 V AC/DC version of the converter C4000. It is not permitted to connect any apparatus with more than 250 V AC or 353,5 V DC to the converter.

The maximum cable length is 1000 m / 3280 ft.. Resistance, inductance and capacitance of the circuits change with the cable length. Consequently, the intrinsically safe circuit with cable length up to 400 m / 1312 ft. is permitted for all gases and vapors in group II (IIA, IIB, IIC according to EN 50014, 50018 and 50020). With longer cables the installation is permitted only in hazardous locations with groups IIB and IIA.

The voltage drop across the lamp cable requires a reduction of the cable resistance with cable length above 150 m / 492 ft.. The data for the cross sections in the installation drawing are for guidance only.

**The lamp voltage at the working sensor should be 4,80 V DC. It is absolutely necessary to adjust the lamp voltage with respect to the cable length (please refer to standard manual).**

It is recommended to connect the lamp cable (2 m / 6,5 ft.) preferably flexible, as the lamp housing must be unscrewed for lamp replacement (see section 4).

The cable connection of the intrinsically safe detector module may be removed directly at the sensor. The connector inside the cable connection allows easy and safe replacement of the detector module (see section 4).

Terminal boxes for intrinsically safe or non intrinsically safe circuits are not in the scope of delivery.

**Only sensor AF26-EX or sensor AF26-EX-HT should be connected to the associated converter type C4000 (see serial-no. on type plates), as both parts of the system are calibrated together.**



**Circuit [A] is intrinsically safe and connected to terminal [A] !**

**Circuit [C] is intrinsically safe and connected to terminal [C] !**

### Terminal connections:

- [A] 1, 2, 5      **Detector cable to measurement channel sensor I**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [C] 3, 4, 5      **Detector cable to reference channel sensor I**  
3 = white (C3)      4 = brown (C4)      5 = gray (C5)
- [E] 6, 7      **Lamp cable to sensor I**  
6 = white or blue (6)      7 = brown (7)
- L, N, PE      L, N, PE, power supply 115 / 230 V AC (OPTION: 24 V AC/DC)
- [B], [D],      Detector inputs not in use
- [F]      Lamp output not in use

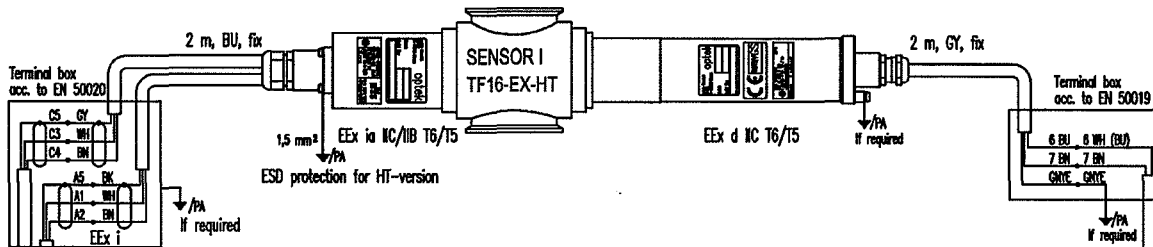
Fuses for 230 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 115 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 24 V AC/DC:      2 x SB 3,15 A (already installed at factory with option: 24 V AC/DC)

## 3 Mounting

### 3.5 Installation drawing C4000/TF16-EX-HT, EN-D



| Normal version AF16-EX |           |               | High temp. version AF16-EX-HT |           |               |
|------------------------|-----------|---------------|-------------------------------|-----------|---------------|
| Normal version AF26-EX |           |               | High temp. version AF26-EX-HT |           |               |
| Normal version TF16-EX |           |               | High temp. version TF16-EX-HT |           |               |
| T CLASS                | Tamb (°C) | Tprocess (°C) | T CLASS                       | Tamb (°C) | Tprocess (°C) |
| T6                     | <40       | <40           | T6                            | <40       | <70           |
| T5                     | <60       | <60           | T5                            | <40       | <100          |
| T4                     | <40       | <120          | T5                            | <50       | <90           |
| T4                     | <50       | <110          | T5                            | <60       | <80           |
| T4                     | <60       | <100          | T4                            | <40       | <120          |
|                        |           |               | T4                            | <50       | <110          |
|                        |           |               | T4                            | <60       | <100          |
|                        |           |               | T3                            | <40       | <180          |
|                        |           |               | T3                            | <50       | <160          |
|                        |           |               | T3                            | <60       | <140          |
|                        |           |               | T2                            | <40       | <240          |
|                        |           |               | T2                            | <50       | <220          |
|                        |           |               | T2                            | <60       | <200          |

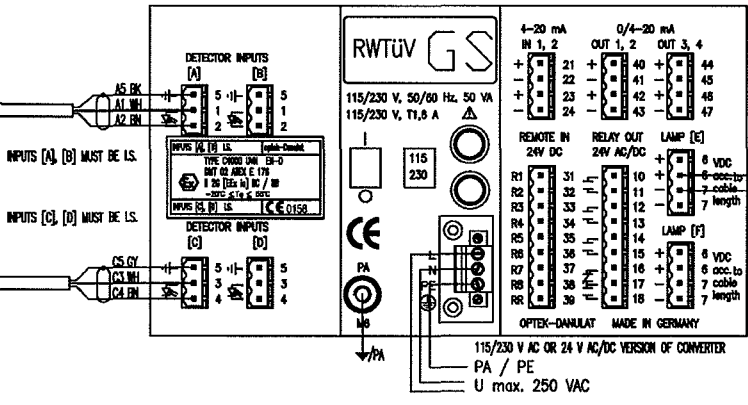
One circuit: 5 VDC, 0.775 A  
 optek lamp cable, LUYX, GY  
 005-150 m: 2 x 1.5 mm<sup>2</sup>  
 151-250 m: 2 x 2.5 mm<sup>2</sup>  
 251-400 m: 2 x 4.0 mm<sup>2</sup>  
 401-600 m: 2 x 6.0 mm<sup>2</sup>  
 601-1000 m: 2 x 10 mm<sup>2</sup>

Two separate intrinsically safe circuits  
 Circuit separation > 6 mm  
 Two optek sensor cable 1, LUYCY 2x0.5, BU  
 Cc < 0.4 nF/m, Lc < 0.85 uH/m  
 Classification for 005-400 m:  
 IS circuits for EEx ia IIC T6/T5  
 Classification for 401-1000 m:  
 IS circuits for EEx ia IIB T6/T5

**Hazardous location**  
 -30°C < Tamb < +40/60°C

**Safe location**  
 -20°C < Tamb < +55°C

CONNECT SENSOR 1 TO TERMINALS [A], [C], [E]







# C4000 UVN EX EN-D 1.0



## Installation notes C4000/TF16-EX-HT, EN-D

The system consists of two components, the converter C4000 and the sensor TF16-EX or TF16-EX-HT, which are interconnected with three cables. The detector cable is not compatible with earlier delivered cables of the X12-series!!!

The connection is either to the 115/230 V AC or to the 24 V AC/DC version of the converter type C4000. It is not permitted to connect any apparatus with more than 250 V AC or 353,5 V DC to the converter.

The maximum cable length is 1000 m / 3280 ft.. Resistance, inductance and capacitance of the circuits change with the cable length. Consequently, the intrinsically safe circuit with cable length up to 400 m / 1312 ft. is permitted for all gases and vapors in group II (IIA, IIB, IIC according to EN 50014, 50018 and 50020). With longer cables the installation is permitted only in hazardous locations with groups IIB and IIA.

The voltage drop across the lamp cable requires a reduction of the cable resistance with cable length above 150 m / 492 ft.. The data for the cross sections in the installation drawing are for guidance only.

**The lamp voltage at the working sensor should be 4,80 V DC. It is absolutely necessary to adjust the lamp voltage with respect to the cable length (please refer to standard manual).**

It is recommended to connect the lamp cable (2 m / 6,5 ft.) preferably flexible, as the lamp housing must be unscrewed for lamp replacement (see section 4).

The cable connection of the intrinsically safe detector module may be removed directly at the sensor. The connector inside the cable connection allows easy and safe replacement of the detector module (see section 4).

Terminal boxes for intrinsically safe or non intrinsically safe circuits are not in the scope of delivery.

**Only sensor TF16-EX or sensor TF16-EX-HT should be connected to the associated converter type C4000 (see serial-no. on type plates), as both parts of the system are calibrated together.**



**Circuit [A] is intrinsically safe and connected to terminal [A] !**

**Circuit [C] is intrinsically safe and connected to terminal [C] !**

### Terminal connections:

- [A] 1, 2, 5      **Detector cable to measurement channel sensor I**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [C] 3, 4, 5      **Detector cable to reference channel sensor I**  
3 = white (C3)      4 = brown (C4)      5 = gray (C5)
- [E] 6, 7      **Lamp cable to sensor I**  
6 = white or blue (6)      7 = brown (7)
- L, N, PE      L, N, PE, power supply 115 / 230 V AC (OPTION: 24 V AC/DC)
- [B], [D],      Detector inputs not in use
- [F]      Lamp output not in use

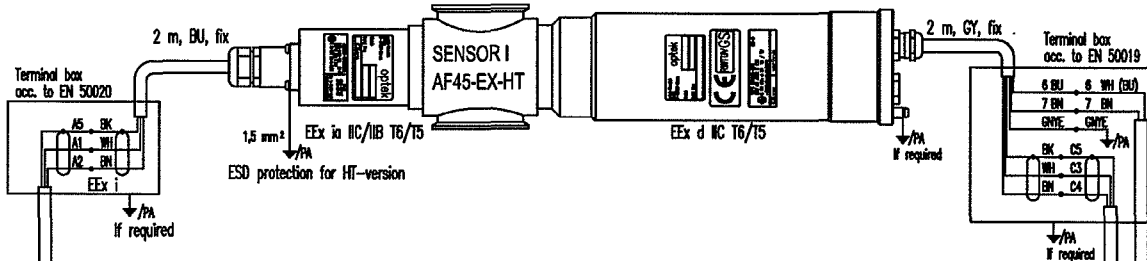
Fuses for 230 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 115 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 24 V AC/DC:      2 x SB 3,15 A (already installed at factory with option: 24 V AC/DC)

## 3 Mounting

### 3.6 Installation drawing C4000/AF45-EX-HT, EN-D



| Normal version AF45-EX |           |               | High temp. version AF45-EX-HT |           |               |
|------------------------|-----------|---------------|-------------------------------|-----------|---------------|
| T CLASS                | Tamb (°C) | Tprocess (°C) | T CLASS                       | Tamb (°C) | Tprocess (°C) |
| T6                     | <40       | <40           | T6                            | <40       | <70           |
| T5                     | <60       | <60           | T5                            | <40       | <100          |
| T4                     | <60       | <70           | T5                            | <50       | <90           |
|                        |           |               | T5                            | <60       | <80           |
|                        |           |               | T4                            | <40       | <120          |
|                        |           |               | T4                            | <50       | <110          |
|                        |           |               | T4                            | <60       | <100          |

One separate intrinsically safe circuit  
 Circuit separation > 6 mm  
 One optek sensor cable 1, L12YCY 2x0.5, BU  
 $C_c < 0.4 \text{ nF/m}$ ,  $L_c < 0.85 \text{ uH/m}$   
 Classification for 005-400 m:  
 IS circuits for EEx ia IIC T6/T5  
 Classification for 401-1000 m:  
 IS circuits for EEx ia IIB T6/T5

One circuit: 7 VDC, 1.143 A  
 optek lamp cable, L1Y, GY  
 005-150 m: 2 x 4.0 mm<sup>2</sup>

One circuit: <1 VDC, <0.01 A  
 optek sensor cable 1, L12YCY, GY  
 005-150 m: 2 x 0.5 mm<sup>2</sup>

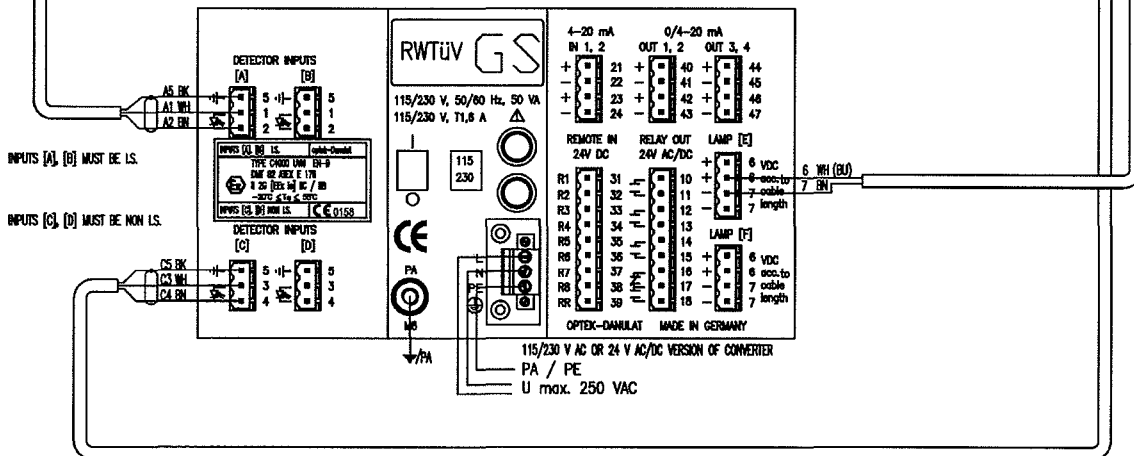
Hazardous location

-30°C < Tamb < +40/60°C

Safe location

-20°C < Tamb < +55°C

CONNECT SENSOR I TO TERMINALS [A], [C], [E]





# C4000 UVN EX EN-D 1.0



## Installation notes C4000/AF45-EX-HT, EN-D

The system consists of two components, the converter C4000 and the sensor AF45-EX or AF45-EX-HT, which are interconnected with three cables. The detector cable is not compatible with earlier delivered cables of the X12-series!!!

The connection is either to the 115/230 V AC or to the 24 V AC/DC version of the converter type C4000. It is not permitted to connect any apparatus with more than 250 V AC or 353,5 V DC to the converter.

The maximum cable length is 1000 m / 3280 ft.. Resistance, inductance and capacitance of the circuits change with the cable length. Consequently, the intrinsically safe circuit with cable length up to 400 m / 1312 ft. is permitted for all gases and vapors in group II (IIA, IIB, IIC according to EN 50014, 50018 and 50020). With longer cables the installation is permitted only in hazardous locations with groups IIB and IIA.

The voltage drop across the lamp cable requires a reduction of the cable resistance with cable length above 150 m / 492 ft.. The data for the cross sections in the installation drawing are for guidance only.

**The lamp voltage at the working sensor should be 7,00 V DC. It is absolutely necessary to adjust the lamp voltage with respect to the cable length (please refer to standard manual).**

It is recommended to connect the lamp cable (2 m / 6,5 ft.) preferably flexible, as the lamp housing must be unscrewed for lamp replacement (see section 4).

The cable connection of the intrinsically safe detector module may be removed directly at the sensor. The connector inside the cable connection allows easy and safe replacement of the detector module (see section 4).

Terminal boxes for intrinsically safe or non intrinsically safe circuits are not in the scope of delivery.

**Only sensor AF45-EX or AF45-EX-HT should be connected to the associated converter C4000 (see serial-no. on type plates), as both parts of the system are calibrated together.**



**Circuit [A] is intrinsically safe and connected to terminal [A] !  
Circuit [C] is not intrinsically safe and connected to terminal [C] !**

### Terminal connections:

- [A] 1, 2, 5      **Detector cable to sensor I, measurement channel, intrinsically safe**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [C] 3, 4, 5      **Detector cable to sensor I, reference channel, not intrinsically safe**  
3 = white (C3)      4 = brown (C4)      5 = black (C5)
- [E] 6, 7      **Lamp cable to sensor**  
6 = white or blue (6)      7 = brown (7)
- L, N, PE      L, N, PE, power supply 115 / 230 V AC (OPTION: 24 V AC/DC)
- [B], [D],      Detector inputs not in use
- [F]      Lamp output not in use

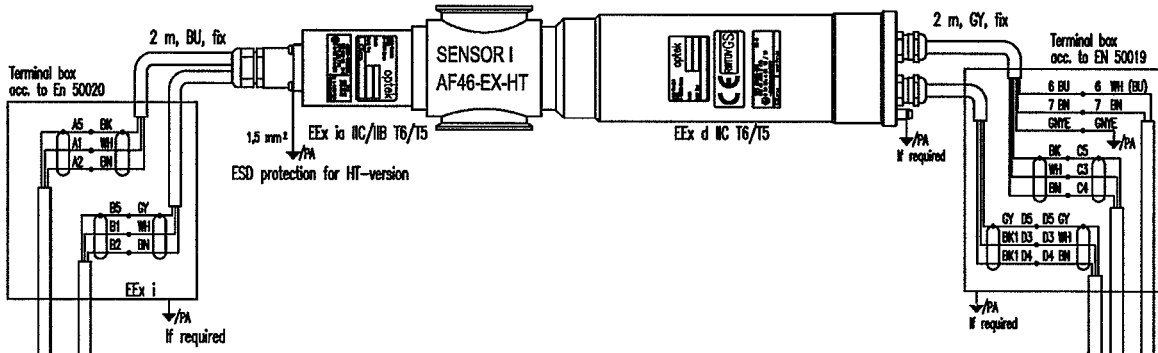
Fuses for 230 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 115 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 24 V AC/DC:      2 x SB 3,15 A (already installed at factory with option: 24 V AC/DC)

## 3 Mounting

### 3.7 Installation drawing C4000/AF46-EX-HT, EN-D



| Normal version AF46-EX |           |               | High temp. version AF46-EX-HT |           |               |
|------------------------|-----------|---------------|-------------------------------|-----------|---------------|
| T CLASS                | Tamb (°C) | Tprocess (°C) | T CLASS                       | Tamb (°C) | Tprocess (°C) |
| T6                     | <40       | <40           | T6                            | <40       | <70           |
| T5                     | <60       | <60           | T5                            | <40       | <100          |
| T4                     | <60       | <70           | T5                            | <50       | <90           |
|                        |           |               | T5                            | <60       | <80           |
|                        |           |               | T4                            | <40       | <120          |
|                        |           |               | T4                            | <50       | <110          |
|                        |           |               | T4                            | <60       | <100          |

Two separate intrinsically safe circuit  
 Circuit separation > 6 mm  
 Two optek sensor cable 1, LI2YCY 2x0.5, BU  
 $C_c < 0.4 \text{ nF/m}$ ,  $L_c < 0.85 \text{ uH/m}$   
 Classification for 005-400 m:  
 IS circuits for EEx i IIC T6/T5  
 Classification for 401-1000 m:  
 IS circuits for EEx i IB T6/T5

One circuit: 7 VDC, 1.143 A  
 optek lamp cable, LYV, GY  
 005-150 m: 2 x 4.0 mm<sup>2</sup>

Two circuits: <1 VDC, <0.01 A  
 optek sensor cable 1, LI2YCY, GY  
 005-150 m: 2 x 0.5 mm<sup>2</sup>

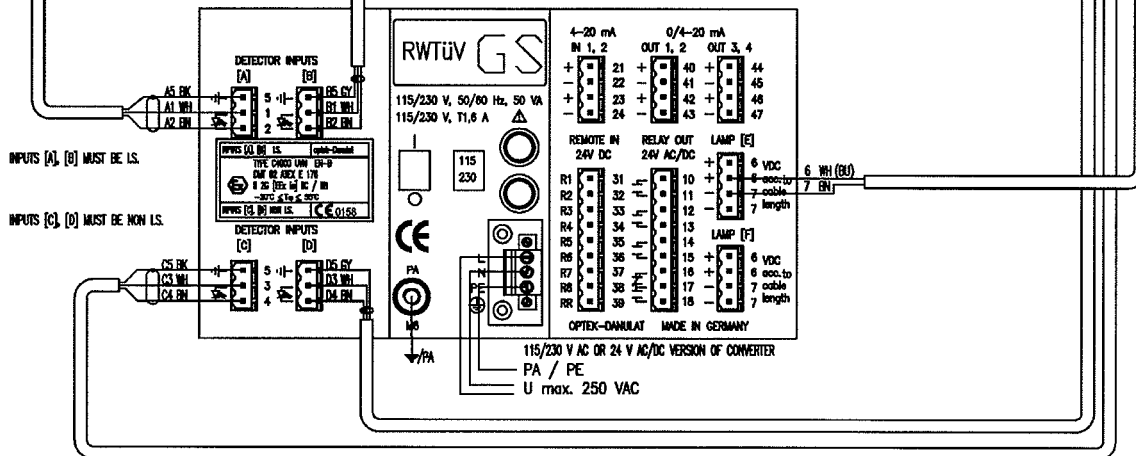
Hazardous location

-30°C < Tamb < +40/60°C

Safe location

-20°C < Tamb < +55°C

CONNECT DETECTOR ARM TO TERMINALS [A], [B]  
 CONNECT LAMP ARM TO TERMINALS [C], [D], [E]





# C4000 UVN EX EN-D 1.0



## Installation notes C4000/AF46-EX-HT, EN-D

The system consists of two components, the converter C4000 and the sensor AF46-EX or AF46-EX-HT, which are interconnected with five cables. The detector cable is not compatible with earlier delivered cables of the X12-series!!!

The connection is either to the 115/230 V AC or to the 24 V AC/DC version of the converter C4000. It is not permitted to connect any apparatus with more than 250 V AC or 353,5 V DC to the converter.

The maximum cable length is 1000 m / 3280 ft.. Resistance, inductance and capacitance of the circuits change with the cable length. Consequently, the intrinsically safe circuit with cable length up to 400 m / 1312 ft. is permitted for all gases and vapors in group II (IIA, IIB, IIC according to EN 50014, 50018 and 50020). With longer cables the installation is permitted only in hazardous locations with groups IIB and IIA.

The voltage drop across the lamp cable requires a reduction of the cable resistance with cable length above 150 m / 492 ft.. The data for the cross sections in the installation drawing are for guidance only.

**The lamp voltage at the working sensor should be 7,00 V DC. It is absolutely necessary to adjust the lamp voltage with respect to the cable length (please refer to the standard manual).**

It is recommended to connect the lamp cable (2 m / 6,5 ft.) preferably flexible, as the lamp housing must be unscrewed for lamp replacement (see section 4).

The cable connection of the intrinsically safe detector module may be removed directly at the sensor. The connector inside the cable connection allows easy and safe replacement of the detector module (see section 4).

Terminal boxes for intrinsically safe or non intrinsically safe circuits are not in the scope of delivery.

**Only sensor AF46-EX or AF46-EX-HT should be connected to the associated converter C4000 (see serial-no. on type plates), as both parts of the system are calibrated together.**



**Circuit [A] is intrinsically safe and connected to terminal [A] !  
Circuit [B] is intrinsically safe and connected to terminal [B] !**



**Circuit [C] is not intrinsically safe and connected to terminal [C] !  
Circuit [D] is not intrinsically safe and connected to terminal [D] !**

### Terminal connections:

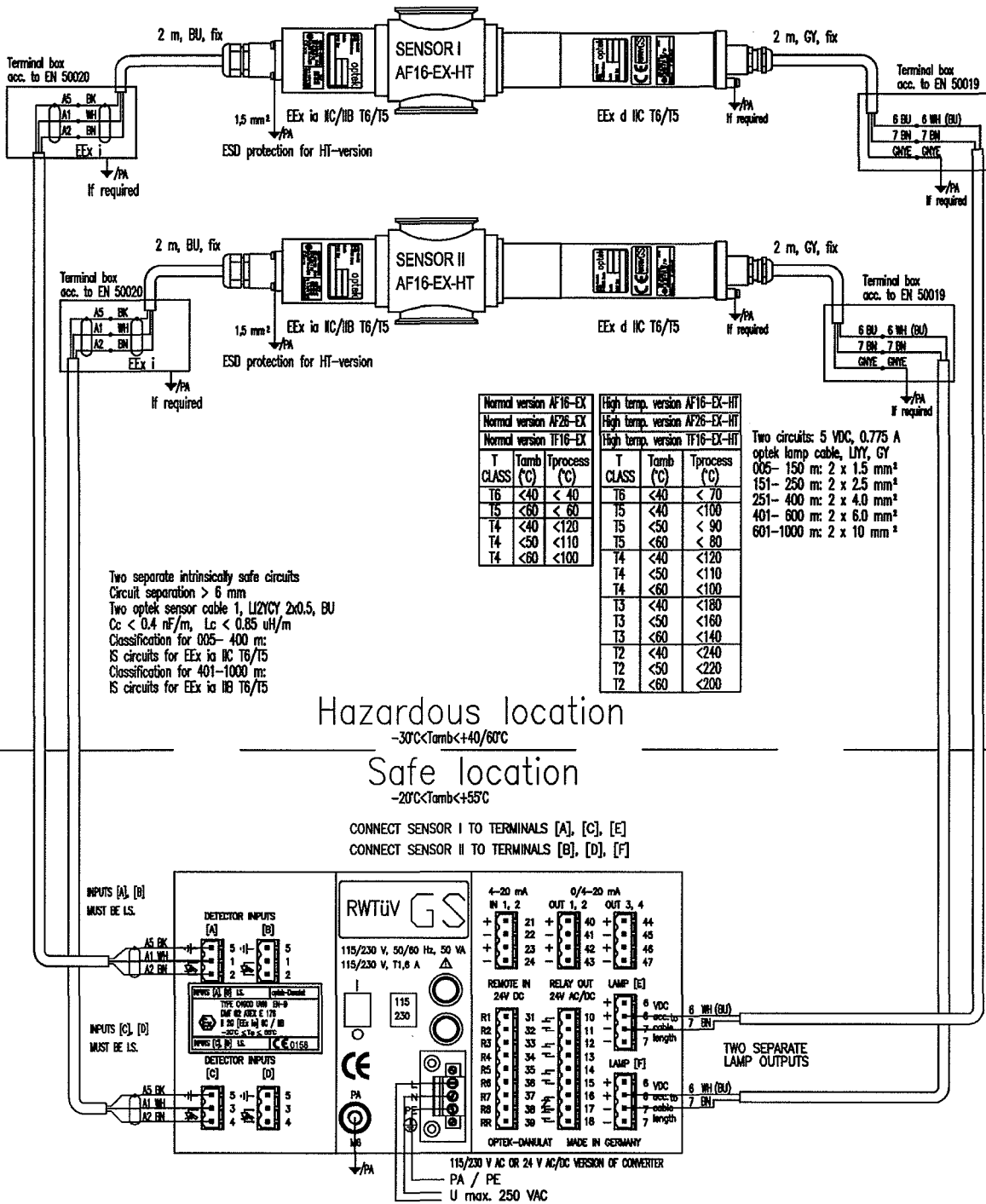
- [A] 1, 2, 5      **Detector cable to measurement channel I, intrinsically safe circuit**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [C] 3, 4, 5      **Detector cable to reference channel I, not intrinsically safe circuit**  
3 = white (C3)      4 = brown (C4)      5 = black (C5)
- [B] 1, 2, 5      **Detector cable to measurement channel II, intrinsically safe circuit**  
1 = white (B3)      2 = brown (B4)      5 = gray (B5)
- [D] 3, 4, 5      **Detector cable to reference channel II, not intrinsically safe circuit**  
3 = white (D3)      4 = brown (D4)      5 = gray (D5)
- [E] 6, 7      **Lamp cable to sensor I**  
6 = white or blue (6)      7 = brown (7)
- L, N, PE      L, N, PE, power supply 115 / 230 V AC (OPTION: 24 V AC/DC)
- [F]      Lamp output not in use

Fuses for 230 V AC:      2 x SB 1,60 A (already installed at factory)  
Fuses for 115 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 24 V AC/DC:      2 x SB 3,15 A (already installed at factory with option: 24 V AC/DC)

## 3 Mounting

### 3.8 Installation drawing C4000/AF16-EX-HT/AF16-EX-HT, EN-D



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See additional information regarding the installation drawing on next page.



# C4000 UVN EX EN-D 1.0



## Installation notes C4000/AF16-EX-HT/AF16-EX-HT, EN-D

The system consists of three components, the converter C4000 and the two sensor AF16-EX or AF16-EX-HT, which are interconnected with four cables. The detector cable is not compatible with earlier delivered cables of the X12-series!!!

The connection is either to the 115/230 V AC or to the 24 V AC/DC version of the converter C4000. It is not permitted to connect any apparatus with more than 250 V AC or 353,5 V DC to the converter.

The maximum cable length is 1000 m / 3280 ft.. Resistance, inductance and capacitance of the circuits change with the cable length. Consequently, the intrinsically safe circuit with cable length up to 400 m / 1312 ft. is permitted for all gases and vapors in group II (IIA, IIB, IIC according to EN 50014, 50018 and 50020). With longer cables the installation is permitted only in hazardous locations with groups IIB and IIA.

The voltage drop across the lamp cable requires a reduction of the cable resistance with cable length above 150 m / 492 ft.. The data for the cross sections in the installation drawing are for guidance only.

**The lamp voltage at the working sensor should be 4,80 V DC. It is absolutely necessary to adjust the lamp voltage with respect to the cable length (please refer to the standard manual).**

It is recommended to connect the lamp cable (2 m / 6,5 ft.) preferably flexible, as the lamp housing must be unscrewed for lamp replacement (see section 4).

The cable connection of the intrinsically safe detector module may be removed directly at the sensor. The connector inside the cable connection allows easy and safe replacement of the detector module (see section 4).

Terminal boxes for intrinsically safe or non intrinsically safe circuits are not in the scope of delivery.

**Only sensor AF16-EX or sensor AF16-EX-HT should be connected to the associated converter C4000 (see serial-no. on type plates), as both parts of the system are calibrated together.**



**Circuit [A] sensor I is intrinsically safe and connected to terminal [A] !  
Circuit [A] sensor II is intrinsically safe and connected to terminal [C] !**

### Terminal connections:

- |               |  |
|---------------|--|
| • [A] 1, 2, 5 | <b>Detector cable to sensor I</b><br>1 = white (A1)                      2 = brown (A2)                      5 = black (A5)  |
| • [E] 6, 7    | <b>Lamp cable to sensor I</b><br>6 = white or blue (6)                      7 = brown (7)                                    |
| • [C] 3, 4, 5 | <b>Detector cable to sensor II</b><br>3 = white (A1)                      4 = brown (A2)                      5 = black (A5) |
| • [F] 6, 7    | <b>Lamp cable to sensor II</b><br>6 = white or blue (6)                      7 = brown (7)                                   |
| • L, N, PE    | L, N, PE, power supply 115 / 230 V AC (OPTION: 24 V AC/DC)   |
| • [B], [D]    | Detector inputs not in use   |

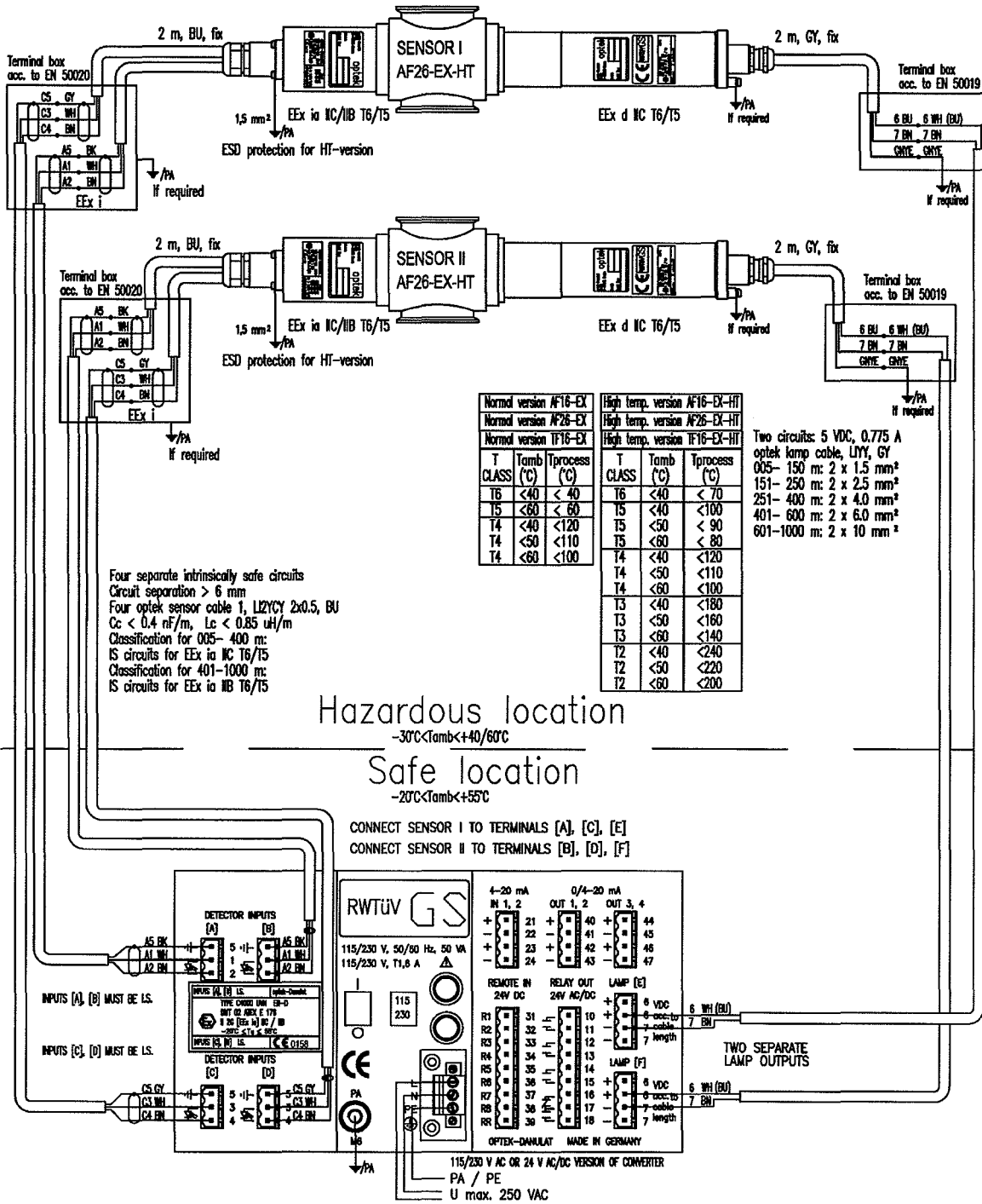
Fuses for 230 V AC:                      2 x SB 1,60 A (already installed at factory)

Fuses for 115 V AC:                      2 x SB 1,60 A (already installed at factory)

Fuses for 24 V AC/DC:                      2 x SB 3,15 A (already installed at factory with option: 24 V AC/DC)

## 3 Mounting

### 3.9 Installation drawing C4000/AF26-EX-HT/AF26-EX-HT, EN-D



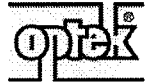
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See additional information regarding the installation drawing on next page.





# C4000 UVN EX EN-D 1.0



## Installation notes C4000/AF26-EX-HT/AF26-EX-HT, EN-D

The system consists of three components, the converter C4000 and the two sensor AF26-EX or type AF26-EX-HT, which are interconnected with six cables. The detector cable is not compatible with earlier delivered cables of the X12-series!!!

The connection is either to the 115/230 V AC or to the 24 V AC/DC version of the converter C4000. It is not permitted to connect any apparatus with more than 250 V AC or 353,5 V DC to the converter.

The maximum cable length is 1000 m / 3280 ft.. Resistance, inductance and capacitance of the circuits change with the cable length. Consequently, the intrinsically safe circuit with cable length up to 400 m / 1312 ft. is permitted for all gases and vapors in group II (IIA, IIB, IIC according to EN 50014, 50018 and 50020). With longer cables the installation is permitted only in hazardous locations with groups IIB and IIA.

The voltage drop across the lamp cable requires a reduction of the cable resistance with cable length above 150 m / 492 ft.. The data for the cross sections in the installation drawing are for guidance only.

**The lamp voltage at the working sensor should be 4,80 V DC. It is absolutely necessary to adjust the lamp voltage with respect to the cable length (please refer to the standard manual).**

It is recommended to connect the lamp cable (2 m / 6,5 ft.) preferably flexible, as the lamp housing must be unscrewed for lamp replacement (see section 4).

The cable connection of the intrinsically safe detector module may be removed directly at the sensor. The connector inside the cable connection allows easy and safe replacement of the detector module (see section 4).

Terminal boxes for intrinsically safe or non intrinsically safe circuits are not in the scope of delivery.

**Only sensor AF26-EX or sensor AF26-EX-HT should be connected to the associated converter C4000 (see serial-no. on type plates), as both parts of the system are calibrated together.**



**Circuit [A] sensor I is intrinsically safe and connected to terminal [A] !**

**Circuit [C] sensor I is intrinsically safe and connected to terminal [C] !**



**Circuit [A] sensor II is intrinsically safe and connected to terminal [B] !**

**Circuit [C] sensor II is intrinsically safe and connected to terminal [D] !**

### Terminal connections:

- [A] 1, 2, 5      **Detector cable to measurement channel sensor I**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [C] 3, 4, 5      **Detector cable to reference channel sensor I**  
3 = white (C3)      4 = brown (C4)      5 = gray (C5)
- [E] 6, 7      **Lamp cable to sensor I**  
6 = white or blue (6)      7 = brown (7)
- [B] 1, 2, 5      **Detector cable to measurement channel sensor II**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [D] 3, 4, 5      **Detector cable to reference channel sensor II**  
3 = white (C3)      4 = brown (C4)      5 = gray (C5)
- [F] 6, 7      **Lamp cable to sensor II**  
6 = white or blue (6)      7 = brown (7)
- L, N, PE      L, N, PE, power supply 115 / 230 V AC (OPTION: 24 V AC/DC)

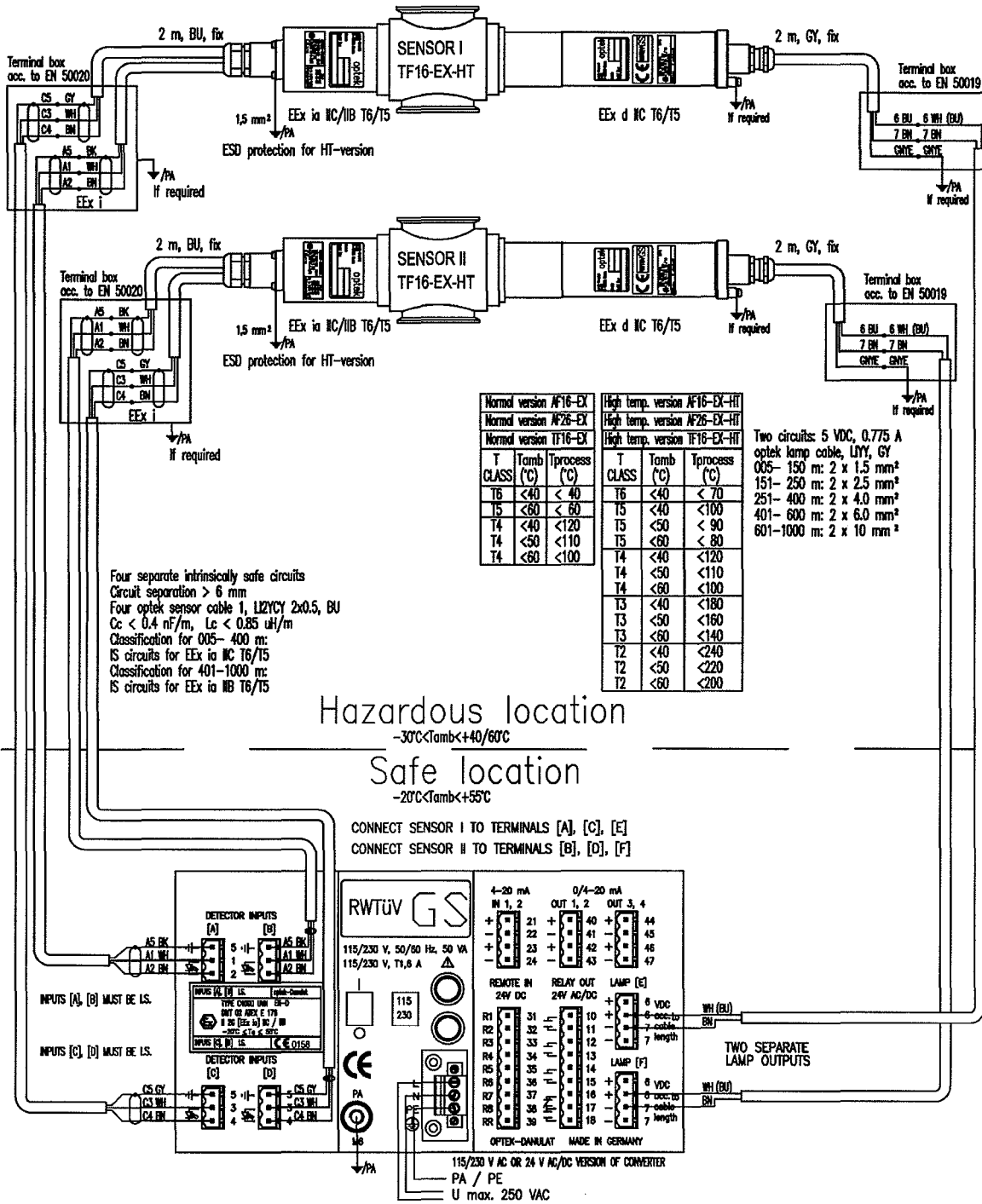
Fuses for 230 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 115 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 24 V AC/DC:      2 x SB 3,15 A (already installed at factory with option: 24 V AC/DC)

## 3 Mounting

### 3.10 Installation drawing C4000/TF16-EX-HT/TF16-EX-HT, EN-D



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See additional information regarding the installation drawing on next page.



# C4000 UVN EX EN-D 1.0



## Installation notes C4000/TF16-EX-HT/TF16-EX-HT, EN-D

The system consists of three components, the converter C4000 and the two sensor TF16-EX or TF16-EX-HT, which are interconnected with six cables. The detector cable is not compatible with earlier delivered cables of the X12-series!!!

The connection is either to the 115/230 V AC or to the 24 V AC/DC version of the converter C4000. It is not permitted to connect any apparatus with more than 250 V AC or 353,5 V DC to the converter.

The maximum cable length is 1000 m / 3280 ft.. Resistance, inductance and capacitance of the circuits change with the cable length. Consequently, the intrinsically safe circuit with cable length up to 400 m / 1312 ft. is permitted for all gases and vapors in group II (IIA, IIB, IIC according to EN 50014, 50018 and 50020). With longer cables the installation is permitted only in hazardous locations with groups IIB and IIA.

The voltage drop across the lamp cable requires a reduction of the cable resistance with cable length above 150 m / 492 ft.. The data for the cross sections in the installation drawing are for guidance only.

**The lamp voltage at the working sensor should be 4,80 V DC. It is absolutely necessary to adjust the lamp voltage with respect to the cable length (please refer to the standard manual).**

It is recommended to connect the lamp cable (2 m / 6,5 ft.) preferably flexible, as the lamp housing must be unscrewed for lamp replacement (see section 4).

The cable connection of the intrinsically safe detector module may be removed directly at the sensor. The connector inside the cable connection allows easy and safe replacement of the detector module (see section 4).

Terminal boxes for intrinsically safe or non intrinsically safe circuits are not in the scope of delivery.

**Only sensor TF16-EX or sensor TF16-EX-HT should be connected to the associated converter type C4000 (see serial-no. on type plates), as both parts of the system are calibrated together.**



**Circuit [A] sensor I is intrinsically safe and connected to terminal [A] !  
Circuit [C] sensor I is intrinsically safe and connected to terminal [C] !**



**Circuit [A] sensor II is intrinsically safe and connected to terminal [B] !  
Circuit [C] sensor II is intrinsically safe and connected to terminal [D] !**

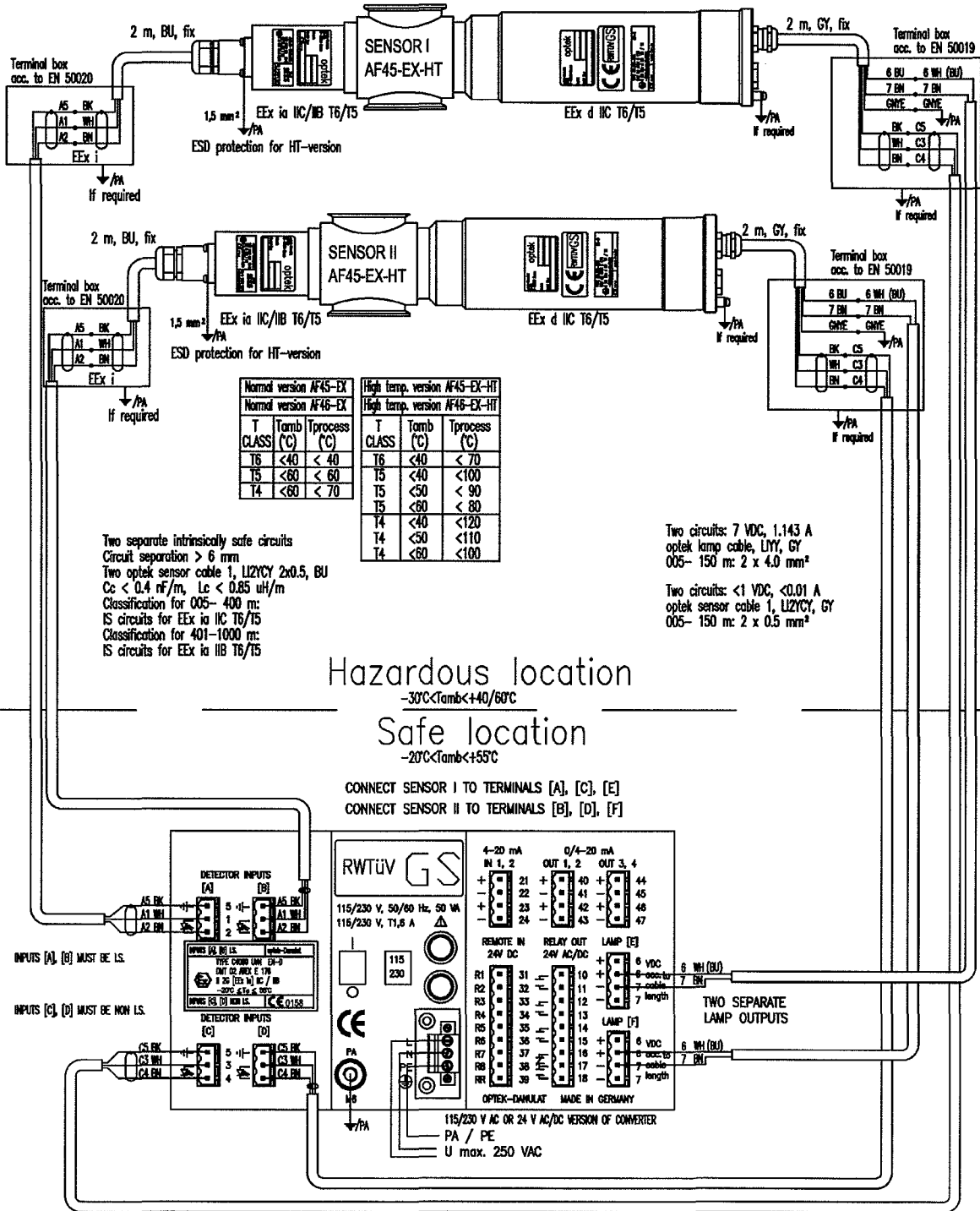
### Terminal connections:

- [A] 1, 2, 5      **Detector cable to measurement channel sensor I**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [C] 3, 4, 5      **Detector cable to reference channel sensor I**  
3 = white (C3)      4 = brown (C4)      5 = gray (C5)
- [E] 6, 7      **Lamp cable to sensor I**  
6 = white or blue (6)      7 = brown (7)
- [B] 1, 2, 5      **Detector cable to measurement channel sensor II**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [D] 3, 4, 5      **Detector cable to reference channel sensor II**  
3 = white (C3)      4 = brown (C4)      5 = gray (C5)
- [F] 6, 7      **Lamp cable to sensor II**  
6 = white or blue (6)      7 = brown (7)
- L, N, PE      L, N, PE, power supply 115 / 230 V AC (OPTION: 24 V AC/DC)

- Fuses for 230 V AC:      2 x SB 1,60 A (already installed at factory)
- Fuses for 115 V AC:      2 x SB 1,60 A (already installed at factory)
- Fuses for 24 V AC/DC:      2 x SB 3,15 A (already installed at factory with option: 24 V AC/DC)

## 3 Mounting

### 3.11 Installation drawing C4000/AF45-EX-HT/AF45-EX-HT, EN-D



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See additional information regarding the installation drawing on next page.



# C4000 UVN EX EN-D 1.0



## Installation notes C4000/AF45-EX-HT/AF45-EX-HT, EN-D

The system consists of three components, the converter C4000 and the two sensor AF45-EX or AF45-EX-HT, which are interconnected with six cables. The detector cable is not compatible with earlier delivered cables of the X12-series!!!

The connection is either to the 115/230 V AC or to the 24 V AC/DC version of the converter type C4000. It is not permitted to connect any apparatus with more than 250 V AC or 353,5 V DC to the converter.

The maximum cable length is 1000 m / 3280 ft.. Resistance, inductance and capacitance of the circuits change with the cable length. Consequently, the intrinsically safe circuit with cable length up to 400 m / 1312 ft. is permitted for all gases and vapors in group II (IIA, IIB, IIC according to EN 50014, 50018 and 50020). With longer cables the installation is permitted only in hazardous locations with groups IIB and IIA.

The voltage drop across the lamp cable requires a reduction of the cable resistance with cable length above 150 m / 492 ft.. The data for the cross sections in the installation drawing are for guidance only.

**The lamp voltage at the working sensor should be 7,00 V DC. It is absolutely necessary to adjust the lamp voltage with respect to the cable length (please refer to the standard manual).**

It is recommended to connect the lamp cable (2 m / 6,5 ft.) preferably flexible, as the lamp housing must be unscrewed for lamp replacement (see section 4).

The cable connection of the intrinsically safe detector module may be removed directly at the sensor. The connector inside the cable connection allows easy and safe replacement of the detector module (see section 4).

Terminal boxes for intrinsically safe or non intrinsically safe circuits are not in the scope of delivery.

**Only sensor AF45-EX or AF45-EX-HT should be connected to the associated converter type C4000 (see serial-no. on type plates), as both parts of the system are calibrated together.**



**Circuit [A] sensor I is intrinsically safe and connected to terminal [A] !**

**Circuit [C] sensor I is not intrinsically safe and connected to terminal [C] !**



**Circuit [A] sensor II is intrinsically safe and connected to terminal [B] !**

**Circuit [C] sensor II is not intrinsically safe and connected to terminal [D] !**

### Terminal connections:

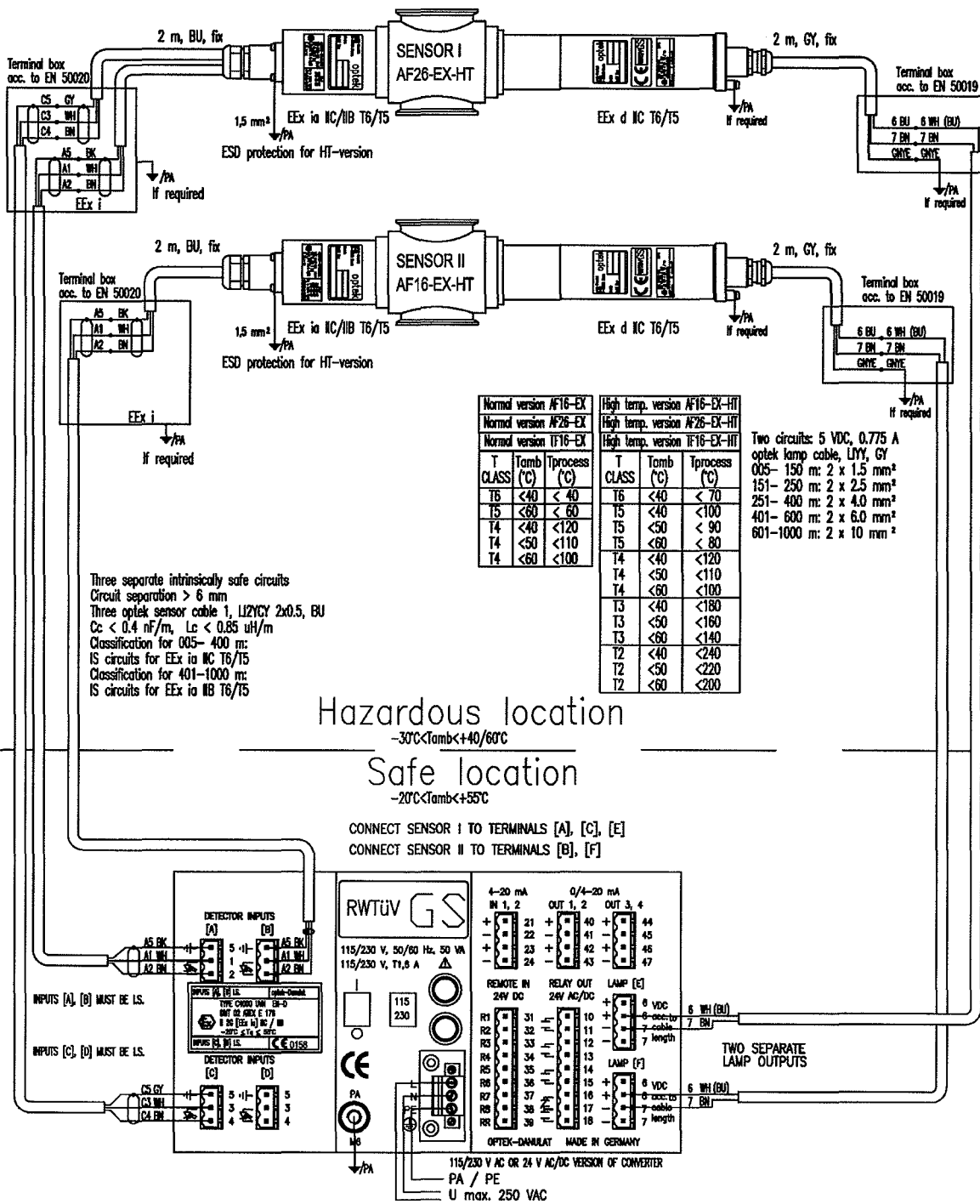
- [A] 1, 2, 5      **Detector cable to sensor I, measurement channel, intrinsically safe**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [C] 3, 4, 5      **Detector cable to sensor I, reference channel, not intrinsically safe**  
3 = white (C3)      4 = brown (C4)      5 = black (C5)
- [E] 6, 7      **Lamp cable to sensor I**  
6 = white or blue (6)      7 = brown (7)
- [B] 1, 2, 5      **Detector cable to sensor II, measurement channel, intrinsically safe**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [D] 3, 4, 5      **Detector cable to sensor II, reference channel, not intrinsically safe**  
3 = white (C3)      4 = brown (C4)      5 = black (C5)
- [F] 6, 7      **Lamp cable to sensor II**  
6 = white or blue (6)      7 = brown (7)
- L, N, PE      L, N, PE, power supply 115 / 230 V AC (OPTION: 24 V AC/DC)

Fuses for 230 V AC:      2 x SB 1,60 A (already installed at factory)  
Fuses for 115 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 24 V AC/DC:      2 x SB 3,15 A (already installed at factory with option: 24 V AC/DC)

## 3 Mounting

### 3.12 Installation drawing C4000/AF26-EX-HT/AF16-EX-HT, EN-D



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See additional information regarding the installation drawing on next page.



# C4000 UVN EX EN-D 1.0



## Installation notes C4000/AF26-EX-HT/AF16-EX-HT, EN-D

The system consists of three components, the converter C4000 and the two sensors AF26-EX or AF26-EX-HT and AF16-EX or AF16-EX-HT, which are interconnected with five cables. The detector cable is not compatible with earlier delivered cables of the X12-series!!!

The connection is either to the 115/230 V AC or to the 24 V AC/DC version of the converter C4000. It is not permitted to connect any apparatus with more than 250 V AC or 353,5 V DC to the converter.

The maximum cable length is 1000 m / 3280 ft.. Resistance, inductance and capacitance of the circuits change with the cable length. Consequently, the intrinsically safe circuit with cable length up to 400 m / 1312 ft. is permitted for all gases and vapors in group II (IIA, IIB, IIC according to EN 50014, 50018 and 50020). With longer cables the installation is permitted only in hazardous locations with groups IIB and IIA.

The voltage drop across the lamp cable requires a reduction of the cable resistance with cable length above 150 m / 492 ft.. The data for the cross sections in the installation drawing are for guidance only.

**The lamp voltage at the working sensors should be 4,80 V DC. It is absolutely necessary to adjust the lamp voltage with respect to the cable length (please refer to the standard manual).**

It is recommended to connect the lamp cable (2 m / 6,5 ft.) preferably flexible, as the lamp housing must be unscrewed for lamp replacement (see section 4).

The cable connection of the intrinsically safe detector module may be removed directly at the sensor. The connector inside the cable connection allows easy and safe replacement of the detector module (see section 4).

Terminal boxes for intrinsically safe or non intrinsically safe circuits are not in the scope of delivery.

**Only sensor AF26-EX, AF26-EX-HT or sensor AF16-EX, AF16-EX-HT should be connected to the associated converter C4000 (see serial-no. on type plates), as both parts of the system are calibrated together.**



**Circuit [A] sensor I is intrinsically safe and connected to terminal [A] !**

**Circuit [C] sensor I is intrinsically safe and connected to terminal [C] !**

**Circuit [A] sensor II is intrinsically safe and connected to terminal [B] !**

### Terminal connections:

- [A] 1, 2, 5      **Detector cable to measurement channel sensor I**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [C] 3, 4, 5      **Detector cable to reference channel sensor I**  
3 = white (C3)      4 = brown (C4)      5 = gray (C5)
- [E] 6, 7      **Lamp cable to sensor I**  
6 = white or blue (6)      7 = brown (7)
- [B] 1, 2, 5      **Detector cable to measurement channel sensor II**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [F] 6, 7      **Lamp cable to sensor II**  
6 = white or blue (6)      7 = brown (7)
- L, N, PE      L, N, PE, power supply 115 / 230 V AC (OPTION: 24 V AC/DC)
- [D]      Detector input not in use

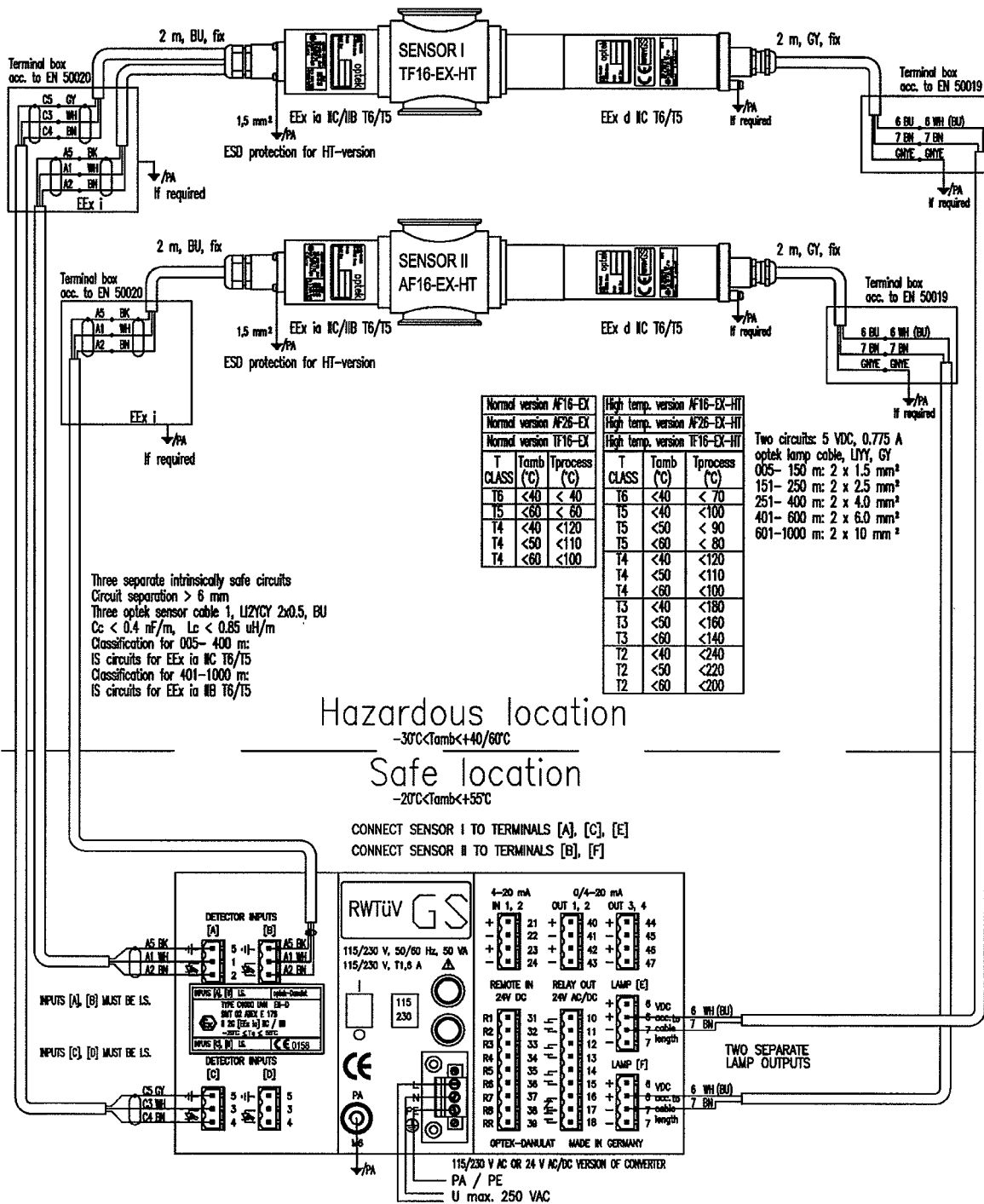
Fuses for 230 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 115 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 24 V AC/DC:      2 x SB 3,15 A (already installed at factory with option: 24 V AC/DC)

## 3 Mounting

### 3.13 Installation drawing C4000/TF16-EX-HT/AF16-EX-HT, EN-D



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See additional information regarding the installation drawing on next page.





# C4000 UVN EX EN-D 1.0



## Installation notes C4000/TF16-EX-HT/AF16-EX-HT, EN-D

The system consists of three components, the converter C4000 and the two sensors TF16-EX or TF16-EX-HT and AF16-EX or AF16-EX-HT, which are interconnected with five cables. The detector cable is not compatible with earlier delivered cables of the X12-series!!!

The connection is either to the 115/230 V AC or to the 24 V AC/DC version of the converter C4000. It is not permitted to connect any apparatus with more than 250 V AC or 353,5 V DC to the converter.

The maximum cable length is 1000 m / 3280 ft.. Resistance, inductance and capacitance of the circuits change with the cable length. Consequently, the intrinsically safe circuit with cable length up to 400 m / 1312 ft. is permitted for all gases and vapors in group II (IIA, IIB, IIC according to EN 50014, 50018 and 50020). With longer cables the installation is permitted only in hazardous locations with groups IIB and IIA.

The voltage drop across the lamp cable requires a reduction of the cable resistance with cable length above 150 m / 492 ft.. The data for the cross sections in the installation drawing are for guidance only.

**The lamp voltage at the working sensors should be 4,80 V DC. It is absolutely necessary to adjust the lamp voltage with respect to the cable length (please refer to the standard manual).**

It is recommended to connect the lamp cable (2 m / 6,5 ft.) preferably flexible, as the lamp housing must be unscrewed for lamp replacement (see section 4).

The cable connection of the intrinsically safe detector module may be removed directly at the sensor. The connector inside the cable connection allows easy and safe replacement of the detector module (see section 4).

Terminal boxes for intrinsically safe or non intrinsically safe circuits are not in the scope of delivery.

**Only sensor TF16-EX, TF16-EX-HT or sensor AF16-EX, AF16-EX-HT should be connected to the associated converter C4000 (see serial-no. on type plates), as both parts of the system are calibrated together.**



**Circuit [A] sensor I is intrinsically safe and connected to terminal [A] !  
Circuit [C] sensor I is intrinsically safe and connected to terminal [C] !**

**Circuit [A] sensor II is intrinsically safe and connected to terminal [B] !**

### Terminal connections:

- [A] 1, 2, 5      **Detector cable to measurement channel sensor I**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [C] 3, 4, 5      **Detector cable to reference channel sensor I**  
3 = white (C3)      4 = brown (C4)      5 = gray (C5)
- [E] 6, 7      **Lamp cable to sensor I**  
6 = white or blue (6)      7 = brown (7)
- [B] 1, 2, 5      **Detector cable to measurement channel sensor II**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [F] 6, 7      **Lamp cable to sensor II**  
6 = white or blue (6)      7 = brown (7)
- L, N, PE      L, N, PE, power supply 115 / 230 V AC (OPTION: 24 V AC/DC)
- [D] 3, 4, 5      Detector input not in use

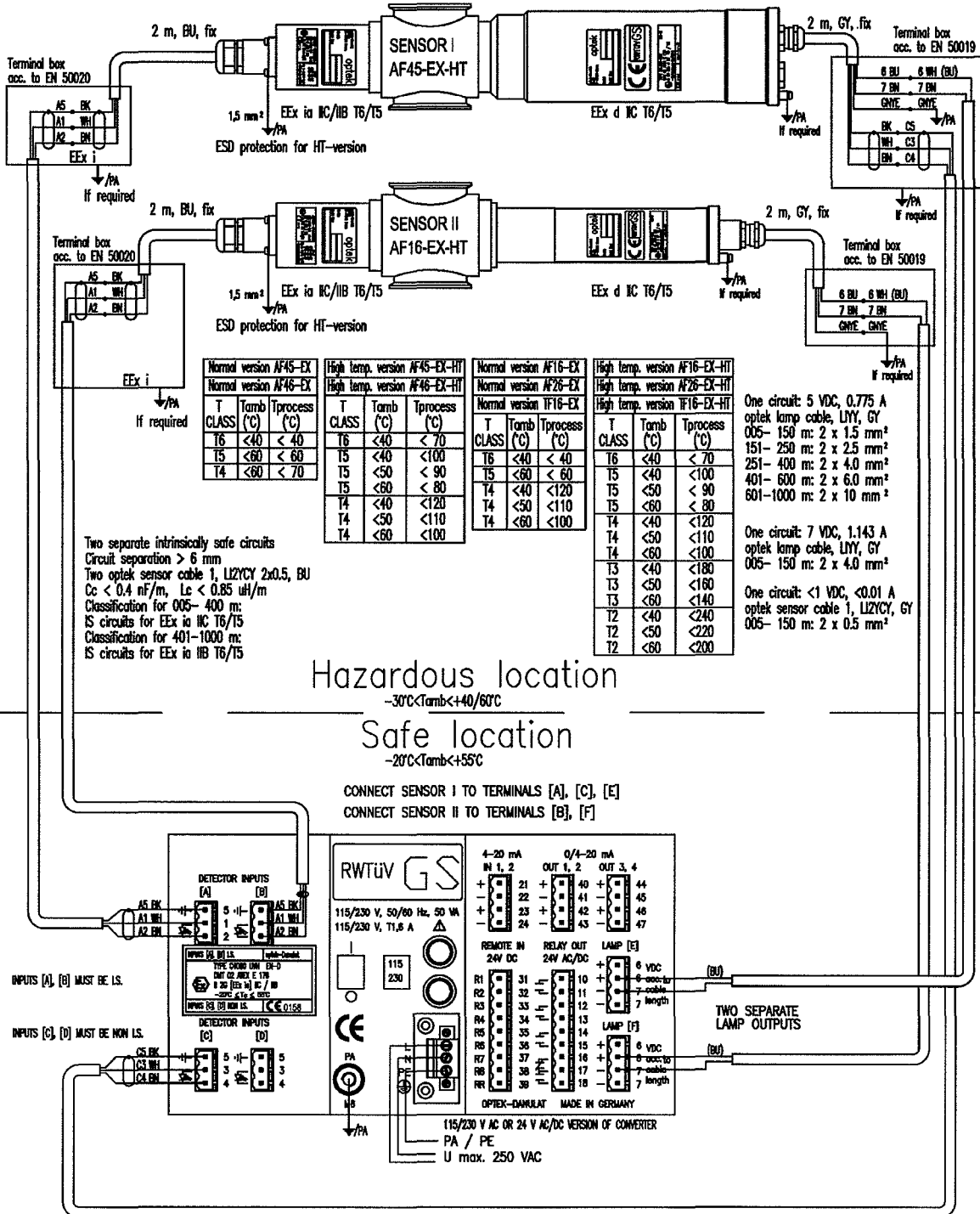
Fuses for 230 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 115 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 24 V AC/DC:      2 x SB 3,15 A (already installed at factory with option: 24 V AC/DC)

## 3 Mounting

### 3.14 Installation drawing C4000/AF45-EX-HT/AF16-EX-HT, EN-D



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See additional information regarding the installation drawing on next page.



# C4000 UVN EX EN-D 1.0



## Installation notes C4000/AF45-EX-HT/AF16-EX-HT, EN-D

The system consists of three components, the converter C4000 and the two sensors AF45-EX or AF45-EX-HT and AF16-EX or AF16-EX-HT, which are interconnected with five cables. The detector cable is not compatible with earlier delivered cables of the X12-series!!!

The connection is either to the 115/230 V AC or to the 24 V AC/DC version of the converter C4000. It is not permitted to connect any apparatus with more than 250 V AC or 353,5 V DC to the converter.

The maximum cable length is 1000 m / 3280 ft.. Resistance, inductance and capacitance of the circuits change with the cable length. Consequently, the intrinsically safe circuit with cable length up to 400 m / 1312 ft. is permitted for all gases and vapors in group II (IIA, IIB, IIC according to EN 50014, 50018 and 50020). With longer cables the installation is permitted only in hazardous locations with groups IIB and IIA.

The voltage drop across the lamp cable requires a reduction of the cable resistance with cable length above 150 m / 492 ft.. The data for the cross sections in the installation drawing are for guidance only.

**The lamp voltage at the working sensors should be 7,00 V DC for the AF45-EX-HT and 4,80 V DC for the AF16-EX-HT. It is absolutely necessary to adjust the lamp voltage with respect to the cable length (please refer to the standard manual).**

It is recommended to connect the lamp cable (2 m / 6,5 ft.) preferably flexible, as the lamp housing must be unscrewed for lamp replacement (see section 4).

The cable connection of the intrinsically safe detector module may be removed directly at the sensor. The connector inside the cable connection allows easy and safe replacement of the detector module (see section 4).

Terminal boxes for intrinsically safe or non intrinsically safe circuits are not in the scope of delivery.

**Only sensor AF45-EX, AF45-EX-HT or sensor AF16-EX, AF16-EX-HT should be connected to the associated converter C4000 (see serial-no. on type plates), as both parts of the system are calibrated together.**



**Circuit [A] sensor I is intrinsically safe and connected to terminal [A] !**

**Circuit [C] sensor I is not intrinsically safe and connected to terminal [C] !**

**Circuit [A] sensor II is intrinsically safe and connected to terminal [B] !**

### Terminal connections:

- [A] 1, 2, 5      **Detector cable to sensor I, measurement channel, intrinsically safe**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [C] 3, 4, 5      **Detector cable to sensor I, reference channel, not intrinsically safe**  
3 = white (C3)      4 = brown (C4)      5 = black (C5)
- [E] 6, 7      **Lamp cable to sensor I**  
6 = white or blue (6)      7 = brown (7)
- [B] 1, 2, 5      **Detector cable to sensor II, measurement channel, intrinsically safe**  
1 = white (A1)      2 = brown (A2)      5 = gray (A5)
- [F] 6, 7      **Lamp cable to sensor II**  
6 = white or blue (6)      7 = brown (7)
- L, N, PE      L, N, PE, power supply 115 / 230 V AC (OPTION: 24 V AC/DC)
- [D] 3, 4, 5      Detector input not in use

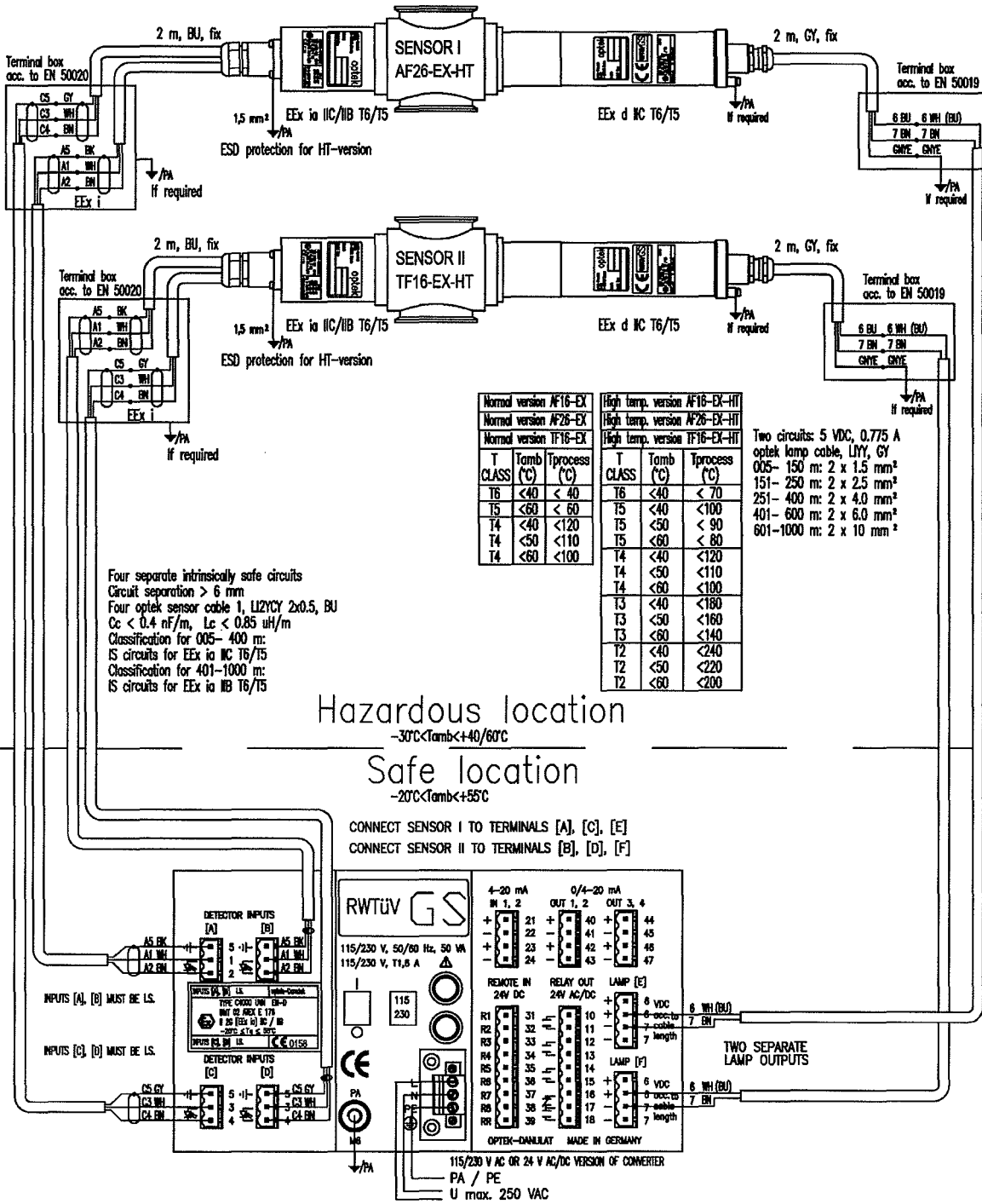
Fuses for 230 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 115 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 24 V AC/DC:      2 x SB 3,15 A (already installed at factory with option: 24 V AC/DC)

## 3 Mounting

### 3.15 Installation drawing C4000/AF26-EX-HT/TF16-EX-HT, EN-D



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See additional information regarding the installation drawing on next page.



# C4000 UVN EX EN-D 1.0



## Installation notes C4000/AF26-EX-HT/TF16-EX-HT, EN-D

The system consists of three components, the converter C4000 and the two sensors AF26-EX or AF26-EX-HT and TF16-EX or TF16-EX-HT, which are interconnected with six cables. The detector cable is not compatible with earlier delivered cables of the X12-series!!!

The connection is either to the 115/230 V AC or to the 24 V AC/DC version of the converter C4000. It is not permitted to connect any apparatus with more than 250 V AC or 353,5 V DC to the converter.

The maximum cable length is 1000 m / 3280 ft.. Resistance, inductance and capacitance of the circuits change with the cable length. Consequently, the intrinsically safe circuit with cable length up to 400 m / 1312 ft. is permitted for all gases and vapors in group II (IIA, IIB, IIC according to EN 50014, 50018 and 50020). With longer cables the installation is permitted only in hazardous locations with groups IIB and IIA.

The voltage drop across the lamp cable requires a reduction of the cable resistance with cable length above 150 m / 492 ft.. The data for the cross sections in the installation drawing are for guidance only.

**The lamp voltage at the working sensors should be 4,80 V DC. It is absolutely necessary to adjust the lamp voltage with respect to the cable length (please refer to the standard manual).**

It is recommended to connect the lamp cable (2 m / 6,5 ft.) preferably flexible, as the lamp housing must be unscrewed for lamp replacement (see section 4).

The cable connection of the intrinsically safe detector module may be removed directly at the sensor. The connector inside the cable connection allows easy and safe replacement of the detector module (see section 4).

Terminal boxes for intrinsically safe or non intrinsically safe circuits are not in the scope of delivery.

**Only sensor AF26-EX, AF26-EX-HT or sensor TF16-EX, TF16-EX-HT should be connected to the associated converter type C4000 (see serial-no. on type plates), as both parts of the system are calibrated together.**



**Circuit [A] sensor I is intrinsically safe and connected to terminal [A] !**

**Circuit [C] sensor I is intrinsically safe and connected to terminal [C] !**

**Circuit [A] sensor II is intrinsically safe and connected to terminal [B] !**

**Circuit [C] sensor II is intrinsically safe and connected to terminal [D] !**

### Terminal connections:

- [A] 1, 2, 5      **Detector cable to measurement channel sensor I**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [C] 3, 4, 5      **Detector cable to reference channel sensor I**  
3 = white (C3)      4 = brown (C4)      5 = gray (C5)
- [E] 6, 7      **Lamp cable to sensor I**  
6 = white or blue (6)      7 = brown (7)
- [B] 1, 2, 5      **Detector cable to measurement channel sensor II**  
1 = white (A1)      2 = brown (A2)      5 = black (A5)
- [D] 3, 4, 5      **Detector cable to reference channel sensor II**  
3 = white (C3)      4 = brown (C4)      5 = gray (C5)
- [F] 6, 7      **Lamp cable to sensor II**  
6 = white or blue (6)      7 = brown (7)
- L, N, PE      L, N, PE, power supply 115 / 230 V AC (OPTION: 24 V AC/DC)

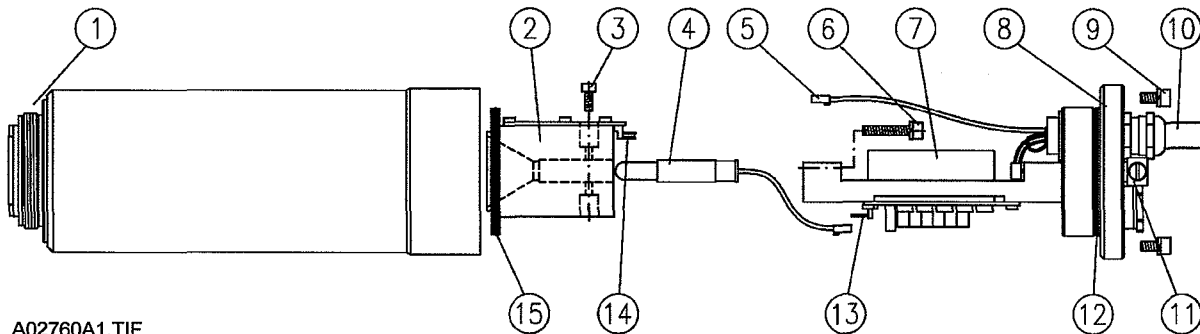
Fuses for 230 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 115 V AC:      2 x SB 1,60 A (already installed at factory)

Fuses for 24 V AC/DC:      2 x SB 3,15 A (already installed at factory with option: 24 V AC/DC)

## 4 Maintenance

### 4.1.1 Lamp replacement AF45-EX-HT / AF46-EX-HT



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#### Description:

- |   |  |
|---|--|
| 1 window side of housing 32L265-N05   | 8 cover housing 32L265-N05   |
| 2 lamp holder   | 9 4 screws for cover<br>M5 x 12, DIN 912 with washer, DIN 7980   |
| 3 fixing screw for lamp module:<br>M4 x 10 (DIN 912)  | 10 sensor cable 3 for lamp and detector [C] circuits   |
| 4 lamp module AF45-EX   | 11 external grounding terminal   |
| 5 cable for reference detector [C]<br>(AF46 has second cable for reference<br>detector [D] with different pinning ) | 12 O-ring (60.05 x 1.78 mm), EPDM  |
| 6 2 screws for lamp holder:<br>M5 x 25, DIN 912 with washer, DIN 7980   | 13 2 pole connector for lamp module  |
| 7 power converter HVPS  | 14 3 pole connector reference detector [C]<br>(AF46 has second connector for reference<br>detector [D] with different pinning) |
|   | 15 O-ring (50.52 x 1.78 mm), Viton®  |

#### Lamp module replacement:

- Loosen screws (9)
- pull out cover (8) with complete assembly
- disconnect lamp connector (13), 2-poles
- disconnect connector circuit [C] (14), 3-poles  
disconnect connector circuit [D] (AF46 only)
- Loosen screws (6) and separate lamp holder
- Loosen screws (3) and replace lamp module
- push lamp forward against stop and tighten screw (3)
- assemble lamp holder and tighten screws (6) with torque 4,5 Nm
- connect lamp circuit (13)
- connect detector circuits [C], [D] (14) (connectors have different pinning)
- insert complete assembly in housing and tighten screws (9) with torque 4,5 Nm
- check system zero prior to return to normal operation



**The lamp housing must not be opened in hazardous atmosphere while energized !  
Allow 10 minutes to cool down before you open the housing !  
Internal voltage is up to 900 V AC - Do not operate disassembled !**



# C4000 UVN EX EN-D 1.0

**Lamp voltage adjustment:**

The lamp voltage is adjusted at the converter. Its value depends on the type of sensor as well as on the cable length. It is listed in the sensor manual. Lamp voltage may not surpass the value given with respect to the installed cable length. The nominal voltage of 7.0 VDC at the sensor must not be exceeded during normal operation. In case of lamp failure, the voltage rises to a so-called open loop voltage. This is harmless under safety aspects because in this case a reduced power consumption occurs due to reduced current.

**Soil:**

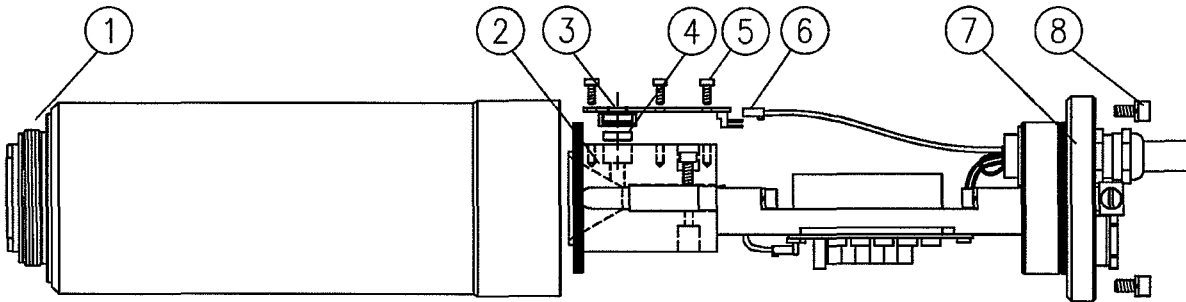
We recommend to remove soil with Isopropanole in the window area of the lamp housing as well as on all other optical elements.

Part numbers for replacement lamp module:

| Sensor EN-D            | AF45-EX      | AF45-EX-HT   | AF46-EX      | AF46-EX-HT   |
|------------------------|--------------|--------------|--------------|--------------|
| Lamp module 254 / P285 | 2100-1100-01 | 2100-1100-01 | 2100-1100-01 | 2100-1100-01 |

## 4 Maintenance

### 4.1.2 Reference detector / filter replacement 45-EX-HT / AF46-EX-HT



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#### Description:

- |   |   |
|---|---|
| 1 window side of housing 32L265-N05   | 6 3 pin connector reference detector [C]<br>(AF46 has second connector for reference detector [D] with different pinning) |
| 2 lamp holder   | 7 cover housing 32L265-N05  |
| 3 reference detector [C] pcb<br>(AF46 has second pcb reference detector [D] ) | 8 4 screws for cover<br>M5 x 12, DIN 912 with washer, DIN 7980  |
| 4 optical filter  |   |
| 5 3 screws M3 x 6, DIN 7985   |   |

#### Detector / filter replacement:

- loosen screws (8)
- pull out cover (7) with complete assembly
- disconnect connectors (6)
- Loosen screws (5) and separate detector pcb
- replace optical filter (4)
- assemble detector pcb with all parts
- tighten screws (5)
- connect circuits (6)
- insert lamp holder in housing and tighten screws (8) with torque 4,5 Nm
- check system zero prior to return to normal operation



**The lamp housing must not be opened in hazardous atmosphere while energized !  
Allow 10 minutes to cool down before you open the housing !  
Internal voltage is up to 900 V AC - Do not operate disassembled !**



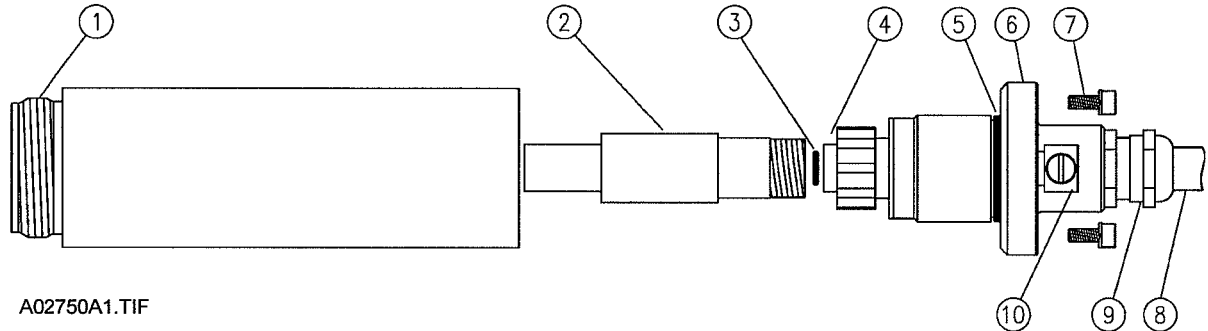


# C4000 UVN EX EN-D 1.0



## 4 Maintenance

### 4.2 Lamp replacement AF16-EX-HT / AF26-EX-HT / TF16-EX-HT



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#### Description:

- |                                  |  |
|----------------------------------|--|
| 1 window side housing 17L132-N05 | 6 cover housing 17L132-N05                       |
| 2 lamp module                    | 7 4 screws M4x10, DIN 912 with washers, DIN 7980 |
| 3 O-ring 10,10 x 1,60 mm, Viton® | 8 lamp cable                                     |
| 4 lamp connector AMP 11-4        | 9 approved cable gland, sealed in place          |
| 5 O-ring 28,30 x 1,78 mm, EPDM   | 10 external grounding terminal                   |

#### Lamp module replacement:

- loosen screws (7)
- pull out cover (6)
- turn ring of lamp connector (4) loose (counter clockwise)
- replace lamp module
- turn ring of lamp connector (4) tight (clockwise)
- Tighten screws (7) with torque 2,6 Nm.
- check system zero prior to return to normal operation



**The lamp housing must not be opened in hazardous atmosphere while energized !  
Allow 10 minutes to cool down before you open the housing !**

#### Lamp voltage adjustment:

The lamp voltage which is adjusted at the converter. Its value depends on the type of sensor as well as on the cable length. It is listed in the sensor manual. Lamp voltage may not surpass the value given with respect to the installed cable length. The nominal voltage of 5.0 VDC must not be exceeded during normal operation. In case of lamp failure, the voltage rises to a so-called open loop voltage. This is harmless under safety aspects because in this case a reduced power consumption occurs due to reduced current.

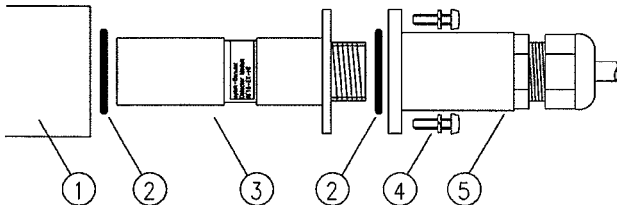
#### Part numbers for replacement lamp and optic modules:

| Sensor EN-D  | AF16-EX      | AF16-EX-HT   | AF26-EX      | AF26-EX-HT   | TF16-EX      | TF16-EX-HT   |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Lamp module  | 2100-0252-02 | 2100-0252-02 | 2100-0254-02 | 2100-0254-02 | 2100-0250-02 | 2100-0250-02 |
| Optic module | 2300-0350-00 | 2300-0370-00 | 2300-0352-00 | 2300-0372-00 | 2300-0356-00 | 2300-0376-00 |

The optic module is located in the adapter, not in the lamp housing.

## 4 Maintenance

### 4.3.1 Detector module replacement AF16-EX-HT, AF45-EX-HT



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**Description:**

- 1 detector arm, EN-D
- 2 O-ring 21.95 x 1.78 mm
- 3 detector module AF16-EX-HT, AF45-EX-HT
- 4 4 x screws M3 x 12, DIN 7985 with washer
- 5 intrinsically safe cable connection EXVAS1-1, (AMP 11-9 inside)

The intrinsically safe detector modules may be changed in the field during operation.

**Detector module replacement:**

- loosen screws (4)
- remove cable connection (5) from detector arm (1)
- remove outer O-ring (2)
- remove detector module (3)
- replace inner O-ring (2), make sure that the O-ring sits in the groove
- insert new detector module (3)
- replace outer O-ring (2), make sure that the O-ring sits in the groove
- connect (3) and (5), 9-pole connector with locking mate
- tighten all four screws (4)
- check system zero prior to return to normal operation

**Part numbers for replacement detector modules, EN-D:**

| Sensor EN-D     | AF16 V-EX    | AF16 V-EX-HT | AF16 N-EX    | AF16 N-EX-HT |
|-----------------|--------------|--------------|--------------|--------------|
| Detector module | 2500-0116-20 | 2500-0136-20 | 2500-0117-20 | 2500-0137-20 |

| Sensor EN-D     | AF16 F-EX    | AF16 F-EX-HT | AF45-EX      | AF45-EX-HT   |
|-----------------|--------------|--------------|--------------|--------------|
| Detector module | 2500-0118-20 | 2500-0136-20 | 2500-1116-20 | 2500-1136-20 |

Specify AF16-F and AF45 in addition with the wavelength or associated serial number.

**Replacement of the I.S. connecting cable**

The connecting cable EXVAS1-1, EN-D for the intrinsically safe detector module is sealed inside. Replace completely if necessary.

**Part numbers for replacement cable connection, 2m, I.S.:**

| Sensor EN-D      | AF16-EX      | AF16-EX-HT   | AF45-EX      | AF45-EX-HT   |
|------------------|--------------|--------------|--------------|--------------|
| Connecting cable | 6001-0002-04 | 6001-0002-04 | 6001-0002-36 | 6001-0002-36 |



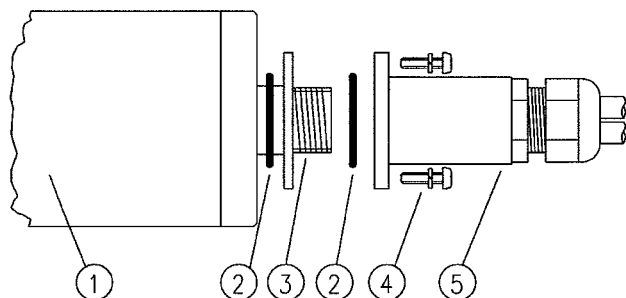
# C4000 UVN EX EN-D 1.0



## 4 Maintenance

### 4.3.2 Detector module replacement AF26-EX-HT, TF16-EX-HT, AF46-EX-HT

Description:



- 1 detector module AF26-EX-HT, TF16-EX-HT, AF46-EX-HT, EN-D
- 2 O-ring 21.95 x 1.78 mm
- 3 connector AMP 11-9
- 4 4 x screws M3 x 12, DIN 7985 with washer
- 5 intrinsically safe cable connection EXVAS1-2, EN-D (AMP 11-9 inside)

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The intrinsically safe detector modules may be changed in the field during operation.

#### Detector module replacement:

- loosen screws (4)
- remove cable connection (5) from detector module (1)
- remove outer O-ring (2)
- remove detector module (3)
- replace inner O-ring (2), make sure that the O-ring sits in the groove
- insert new detector module (3)
- replace outer O-ring (2), make sure that the O-ring sits in the groove
- connect (3) and (5), 9-pole connector with locking mate
- tighten all four screws (4)
- check system zero prior to return to normal operation

Part numbers for replacement detector modules, EN-D:

| Sensor EN-D     | AF26-EX      | AF26-EX-HT   | TF16-EX      | TF16-EX-HT   | AF46-EX      | AF46-EX-HT   |
|-----------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Detector module | 2500-0216-20 | 2500-0236-20 | 2500-0416-20 | 2500-0436-20 | 2500-1316-20 | 2500-1336-20 |

Specify AF26 and AF46 detector modules in addition with the wavelength combination or associated serial number.

#### Replacement of the I.S. connecting cable

The connecting cable EXVAS1-2, EN-D for the intrinsically safe detector module is sealed inside. Replace completely if necessary.

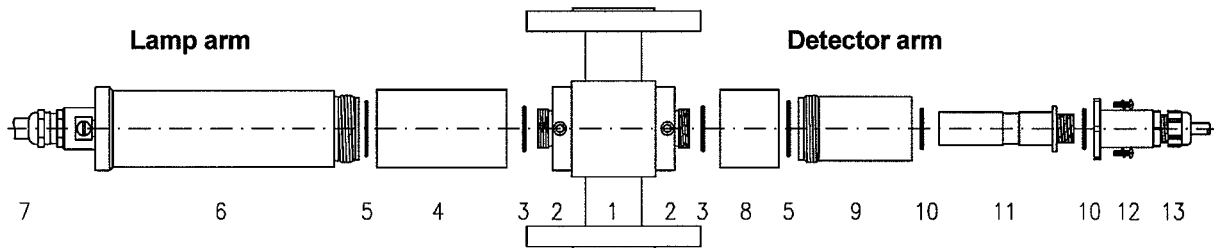
Part numbers for replacement cable connections, 2m, I.S.:

| Sensor EN-D      | AF26-EX      | AF26-EX-HT   | TF16-EX      | TF16-EX-HT   |
|------------------|--------------|--------------|--------------|--------------|
| Connecting cable | 6001-0002-14 | 6001-0002-14 | 6001-0002-14 | 6001-0002-14 |

| Sensor EN-D      | AF46-EX      | AF46-EX-HT   |
|------------------|--------------|--------------|
| Connecting cable | 6001-0002-46 | 6001-0002-46 |

## 4 Maintenance

### 4.4 Exploded view AF16-EX, AF16-EX-HT



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#### Description:

- 1 armature, for details see armature manual
- 2 window ring M24, part of armature
- 3 O-ring 25.12 x 1.78 mm, Viton®
- 4 lamp adapter AF16-EX, 1.4571 (316 Ti) with optic module AF16-EX
- 5 O-ring 31.47 x 1.78 mm, Viton®
- 6 lamp housing 17L132-N05, stainless steel, including lamp module AF16-EX
- 7 ATEX approved cable gland ½"NPT, EEx d IIC, stainless steel, sealed in place with fixed lamp cable , 2 m, grey
- 8 detector adapter AF16-EX, 1.4571 (316 Ti)
- 9 optical housing (OP06), 1.4571 (316 Ti)
- 10 O-ring 21.95 x 1.78 mm, Viton®
- 11 detector module AF16-EX ( -N, -V or -F depending on wavelength range), circuit [A]
- 12 4 screws M3 x 12, DIN 7985 with washer, DIN 7980, 1.4571 (316 Ti)
- 13 cable connection EXVAS1-1, stainless steel plug protector with one fixed detector cable, 2 m, blue, circuit [A]

#### Changes for sensor AF16-EX-HT:

- 4 lamp adapter AF16-EX-HT, PEEK, with optic module AF16-EX-HT
- 8 detector adapter AF16-HT, PEEK
- 11 detector module AF16-EX-HT

Lamp module AF16-EX is used with AF16-EX-HT as well.

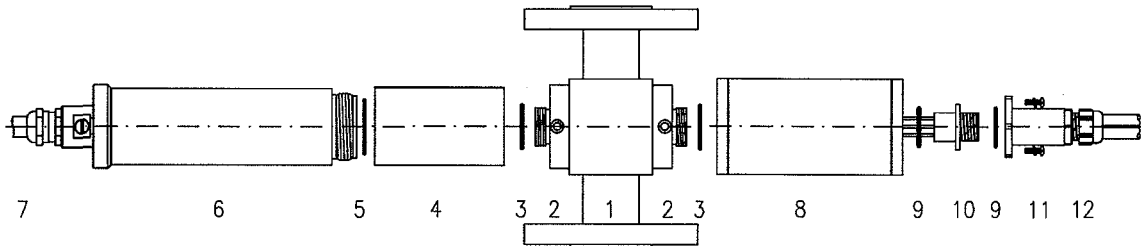


# C4000 UVN EX EN-D 1.0



## 4 Maintenance

### 4.5 Exploded view AF26-EX, AF26-EX-HT



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#### Description:

- 1 armature, for details see armature manual
- 2 window ring M24, part of armature
- 3 O-ring 25.12 x 1.78 mm, Viton®
- 4 lamp adapter AF26-EX, 1.4571 (316 Ti) with optic module AF26-EX
- 5 O-ring 31.47 x 1.78 mm, Viton®
- 6 lamp housing 17L132-N05, stainless steel, including lamp module AF26-EX
- 7 ATEX approved cable gland ½"NPT, EEx d IIC, stainless steel, sealed in place with fixed lamp cable , 2 m, grey
- 8 detector module AF26-EX, 1.4571 (316 Ti)
- 9 O-ring 21.95 x 1.78 mm, Viton®
- 10 connector AMP 11-9, two circuits [A], [C]
- 11 4 screws M3 x 12, DIN 7985 with washer, DIN 7980, 1.4571 (316 Ti)
- 12 cable connection EXVAS1-2, stainless steel plug protector with two fixed detector cables, 2 m, blue, circuits [A], [C]

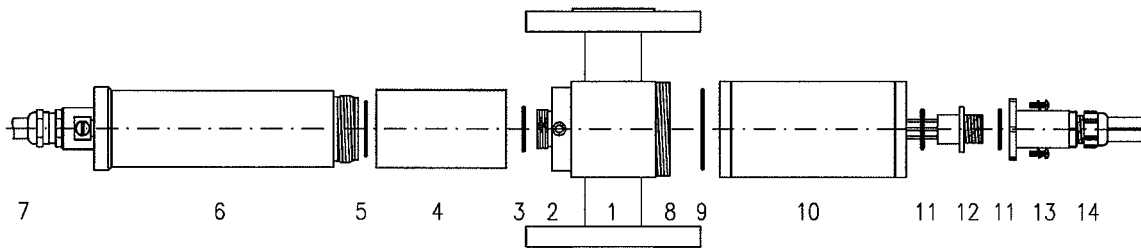
#### Changes for sensor AF26-EX-HT:

- 8 detector module AF26-EX-HT
- 4 lamp adapter AF26-EX-HT, PEEK, with optic module AF26-EX-HT

Lamp module AF26-EX is used with AF26-EX-HT as well.

## 4 Maintenance

### 4.6 Exploded view TF16-EX, TF16-EX-HT



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#### Description:

- 1 armature, for details see armature manual
- 2 window ring M24, part of armature
- 3 O-ring 25.12 x 1.78 mm, Viton®
- 4 lamp adapter TF16-EX, 1.4571 (316 Ti) with optic module TF16-EX
- 5 O-ring 31.47 x 1.78 mm, Viton®
- 6 lamp housing 17L132-N05, stainless steel, including lamp module TF16-EX
- 7 ATEX approved cable gland ½"NPT, EEx d IIC, stainless steel, sealed in place with fixed lamp cable , 2 m, grey
- 8 window ring M58, part of armature
- 9 O-ring 50.52 x 1.78 mm, Viton®
- 10 detector module TF16-EX, 1.4571 (316 Ti)
- 11 O-ring 21.95 x 1.78 mm, Viton®
- 12 connector AMP 11-9, two circuits [A], [C]
- 13 4 screws M3 x 12, DIN 7985 with washer, DIN 7980, 1.4571 (316 Ti)
- 14 cable connection EXVAS1-2, stainless steel plug protector with two fixed detector cables, 2 m, blue, circuits [A], [C]

#### Changes for sensor TF16-EX-HT:

- 10 detector module TF16-EX-HT
- 4 lamp adapter TF16-EX-HT, PEEK, with optic module TF16-EX-HT

Lamp module TF16-EX is used with AFT6-EX-HT as well.

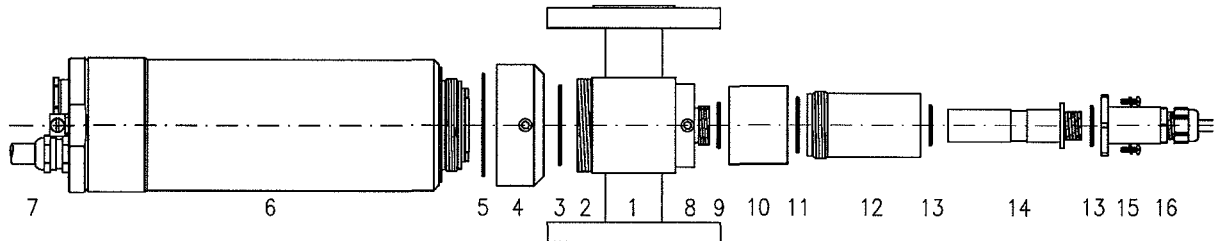


# C4000 UVN EX EN-D 1.0



## 4 Maintenance

### 4.7 Exploded view AF45-EX, AF45-EX-HT



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#### Description:

- 1 armature, for details see armature manual
- 2 window ring M58, part of armature
- 3 O-ring 50.52 x 1.78 mm, Viton®
- 4 lamp adapter AF45-EX, 1.4571 (316 Ti)  
with two connectors M5 for AirPurge, screw M5 x 6, DIN 84 with O-ring 4 x 1 mm, Viton®
- 5 O-ring 50.52 x 1.78 mm, Viton®
- 6 lamp housing 32L265-N05, stainless steel,  
including lamp module AF45-EX and lamp power converter
- 7 ATEX approved cable gland ½"NPT, EEx d IIC, stainless steel, sealed in place  
with fixed sensor cable 3 , 2 m, grey (includes lamp and detector [C] circuits)
- 8 window ring M24, part of armature
- 9 O-ring 25.12 x 1.78 mm, Viton®
- 10 detector adapter AF45-EX, 1.4571 (316 Ti)
- 11 O-ring 31.47 x 1.78 mm, Viton®
- 12 optical housing (OP06), 1.4571 (316 Ti)
- 13 O-ring 21.95 x 1.78 mm, Viton®
- 14 detector module AF45-EX, circuit [A]
- 15 4 screws M3 x 12, DIN 7985 with washer, DIN 7980, 1.4571 (316 Ti)
- 16 cable connection EXVAS1-1, stainless steel plug protector  
with one fixed detector cable, 2 m, blue, circuit [A]

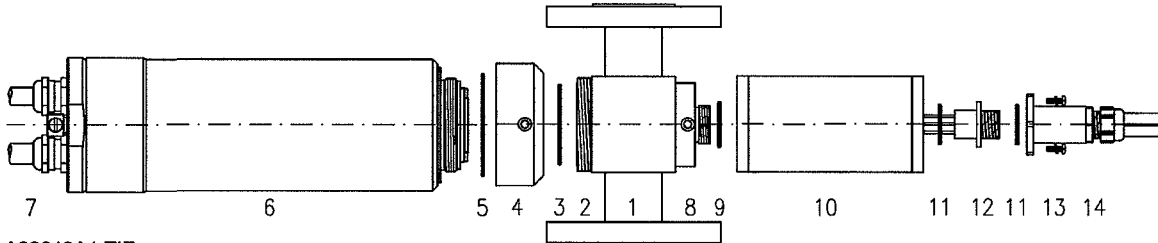
#### Changes for sensor AF45-EX-HT:

- 4 lamp adapter AF45-EX-HT, PEEK,
- 10 detector adapter AF45-EX-HT, PEEK
- 14 detector module AF45-EX-HT

Lamp module AF45-EX is used with AF45-EX-HT as well.

## 4 Maintenance

### 4.8 Exploded view AF46-EX, AF46-EX-HT



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#### Description:

- 1 armature, for details see armature manual
- 2 window ring M58, part of armature
- 3 O-ring 50.52 x 1.78 mm, Viton®
- 4 lamp adapter AF46-EX, 1.4571 (316 Ti)  
with two connectors M5 for AirPurge, screw M5 x 6, DIN 84 with O-ring 4 x 1 mm, Viton®
- 5 O-ring 50.52 x 1.78 mm, Viton®
- 6 lamp housing 32L265-N05, stainless steel,  
including lamp module AF46-EX and lamp power converter
- 7 two ATEX approved cable glands ½"NPT, EEx d IIC, stainless steel, sealed in place  
with fixed sensor cable 3, 2 m, grey (includes lamp and detector [C] circuits)  
with fixed sensor cable 4, 2 m, grey (detector [D] circuit)
- 8 window ring M24, part of armature
- 9 O-ring 25.12 x 1.78 mm, Viton®
- 10 detector module AF46-EX, 1.4571 (316 Ti)
- 11 O-ring 21.95 x 1.78 mm, Viton®
- 12 connector AMP 11-9, two circuits [A], [B]
- 13 4 screws M3 x 12, DIN 7985 with washer, DIN 7980, 1.4571 (316 Ti)
- 14 cable connection EXVAS1-2, stainless steel plug protector  
with two fixed detector cables, 2 m, blue, circuits [A], [B]

#### Changes for sensor AF46-EX-HT:

- 4 lamp adapter AF46-EX-HT, PEEK
- 10 detector module AF46-EX-HT

Lamp module AF46-EX is used with AF46-EX-HT as well.

Reference detector AF46-EX is used with AF46-EX-HT as well.





# C4000 UVN EX EN-D 1.0



## 4 Maintenance

### 4.9 Exchange converter C4000

The converters C4000 EN-D are built inside similar to the previous versions EN-C. The safety relevant parameters have not changed. However, marking is different due to the new approval. Please order replacement converters with the following part numbers:

| Installation drawing        | Basic configuration | Part number X <sup>1)</sup> | Notes                            |
|-----------------------------|---------------------|-----------------------------|----------------------------------|
| C4000/AF16-EX-HT            | 4121                | 503X – 4121 – 3300          | [A] I.S.                         |
|                             | 4101                | 530X – 4101 – 3300          | without IO-12                    |
| C4000/AF26-EX-HT            | 4221                | 503X – 4221 – 3500          | [A] I.S. , [C] I.S.              |
|                             | 4201                | 530X – 4201 – 3500          | without IO-12                    |
| C4000/TF16-EX-HT            | 4221                | 503X – 4221 – 3500          | [A] I.S. , [C] I.S.              |
|                             | 4201                | 530X – 4201 – 3500          | without IO-12                    |
| C4000/AF45-EX-HT            | 4221                | 503X – 4221 – 3400          | [A] I.S. , [C] NON I.S.          |
|                             | 4201                | 530X – 4201 – 3400          | without IO-12                    |
| C4000/AF46-EX-HT            | 4422                | 503X – 4422 – 3440          | [A], [B] I.S., [C], [D] NON I.S. |
|                             | 4402                | not available               | without IO-12                    |
| C4000/AF16-EX-HT/AF16-EX-HT | 4222                | 503X – 4222 – 3500          | [A] I.S. , [C] I.S.              |
|                             | 4202                | 530X – 4202 – 3500          | without IO-12                    |
| C4000/AF26-EX-HT/AF26-EX-HT | 4422                | 503X – 4422 – 3550          | [A], [B] I.S., [C], [D] I.S.     |
|                             | 4402                | not available               | without IO-12                    |
| C4000/TF16-EX-HT/TF16-EX-HT | 4422                | 503X – 4422 – 3550          | [A], [B] I.S., [C], [D] I.S.     |
|                             | 4402                | not available               | without IO-12                    |
| C4000/AF45-EX-HT/AF45-EX-HT | 4422                | 503X – 4422 – 3440          | [A], [B] I.S., [C], [D] NON I.S. |
|                             | 4402                | not available               | without IO-12                    |
| C4000/AF26-EX-HT/AF16-EX-HT | 4322                | 503X – 4322 – 3530          | [A], [C] I.S., [B] I.S.          |
|                             | 4302                | not available               | without IO-12                    |
| C4000/TF16-EX-HT/AF16-EX-HT | 4322                | 503X – 4322 – 3530          | [A], [C] I.S., [B] I.S.          |
|                             | 4302                | not available               | without IO-12                    |
| C4000/AF45-EX-HT/AF16-EX-HT | 4322                | 503X – 4322 – 3430          | [A], [B] I.S., [C] NON I.S.      |
|                             | 4302                | not available               | without IO-12                    |
| C4000/AF26-EX-HT/TF16-EX-HT | 4422                | 503X – 4422 – 3550          | [A], [B] I.S., [C], [D] I.S.     |
|                             | 4402                | not available               | without IO-12                    |

X<sup>1)</sup> Part number for C4000 with line voltage 115/230 VAC starts with 5030-

Part number for C4000 with line voltage 24 V DC/AC starts with 5031-

The C4000 can handle one and/or two input boards MA-11. Spare boards have the repair address #15 that will be automatically identified and overwritten with the correct address by the C4000 software. The same spare boards could be used for inputs [A], [C] and [B], [D], if identical hardware (intrinsically safe inputs) are usable. However, spare boards must be installed one at a time. The revision codes for hardware and software may be higher than the original ones.

It is not recommended to transform a standard converter into an ex-proof converter in the field. Marking and testing of the converter would require additional attention, consult factory for further information. An ex-proof converter may be used with standard sensors, but ex-marking must be removed permanently from the converter prior to use. It is not permitted to use such a converter with an ex-proof sensor later, as safety may have been affected adversely.

## 4 Maintenance

### 4.10 Spare parts

| Converter C4000 EN-D<br>115/230 VAC with REMOTE IN | Optek sensor inputs              | Part-number    | 2 - 3 years operation <sup>1)</sup> |
|--|----------------------------------|----------------|-------------------------------------|
| C4121 (AF16-EX)                                    | [A] I.S.                         | 5030-4121-3300 | One spare converter per 10 units    |
| C4221 (AF45-EX)                                    | [A] I.S. , [C] NON I.S.          | 5030-4221-3400 |                                     |
| C4221 (AF26-EX, TF16-EX)                           | [A] I.S. , [C] I.S.              | 5030-4221-3500 |                                     |
| C4222 (2xAF16-EX)                                  | [A] I.S. , [C] I.S.              | 5030-4222-3500 |                                     |
| C4322 (AF45-EX + AF16-EX)                          | [A], [B] I.S., [C], NON I.S.     | 5030-4322-3430 |                                     |
| C4322 (AF26-EX + AF16-EX, ....)                    | [A], [B] I.S., [C], I.S.         | 5030-4322-3530 |                                     |
| C4422 (AF46-EX, 2xAF45-EX)                         | [A], [B] I.S., [C], [D] NON I.S. | 5030-4422-3440 |                                     |
| C4422 (2xAF26-EX, 2xTF16, ....)                    | [A], [B] I.S., [C], [D] I.S      | 5030-4422-3550 |                                     |

| Converter C4000 EN-D<br>115/230 VAC without REMOTE IN | Optek sensor inputs     | Part-number    | 2 - 3 years operation <sup>1)</sup> |
|---|-------------------------|----------------|-------------------------------------|
| C4101 (AF16-EX)                                       | [A] I.S.                | 5030-4101-3300 | One spare converter per 10 units    |
| C4201 (AF45-EX)                                       | [A] I.S. , [C] NON I.S. | 5030-4201-3400 |                                     |
| C4201 (AF26-EX, TF16-EX)                              | [A] I.S. , [C] I.S.     | 5030-4201-3500 |                                     |
| C4202 (2xAF16-EX)                                     | [A] I.S. , [C] I.S.     | 5030-4202-3500 |                                     |

| Converter C4000 EN-D<br>24 V AC/DC with REMOTE IN | Optek sensor inputs              | Part-number    | 2 - 3 years operation <sup>1)</sup> |
|---|----------------------------------|----------------|-------------------------------------|
| C4121 (AF16-EX)                                   | [A] I.S.                         | 5031-4121-3300 | One spare converter per 10 units    |
| C4221 (AF45-EX)                                   | [A] I.S. , [C] NON I.S.          | 5031-4221-3400 |                                     |
| C4221 (AF26-EX, TF16-EX)                          | [A] I.S. , [C] I.S.              | 5031-4221-3500 |                                     |
| C4222 (2xAF16-EX)                                 | [A] I.S. , [C] I.S.              | 5031-4222-3500 |                                     |
| C4322 (AF45-EX + AF16-EX)                         | [A], [B] I.S., [C], NON I.S.     | 5031-4322-3430 |                                     |
| C4322 (AF26-EX + AF16-EX, ....)                   | [A], [B] I.S., [C], I.S.         | 5031-4322-3530 |                                     |
| C4422 (AF46-EX, 2xAF45-EX)                        | [A], [B] I.S., [C], [D] NON I.S. | 5031-4422-3440 |                                     |
| C4422 (2xAF26-EX, 2xTF16-EX, ....)                | [A], [B] I.S., [C], [D] I.S      | 5031-4422-3550 |                                     |

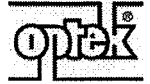
| Converter C4000 EN-D<br>24 V AC/DC without REMOTE IN | Optek sensor inputs     | Part-number    | 2 - 3 years operation <sup>1)</sup> |
|--|-------------------------|----------------|-------------------------------------|
| C4101 (AF16-EX)                                      | [A] I.S.                | 5031-4101-3300 | One spare converter per 10 units    |
| C4201 (AF45-EX)                                      | [A] I.S. , [C] NON I.S. | 5031-4201-3400 |                                     |
| C4201 (AF26-EX, TF16-EX)                             | [A] I.S. , [C] I.S.     | 5031-4201-3500 |                                     |
| C4202 (2xAF16-EX)                                    | [A] I.S. , [C] I.S.     | 5031-4202-3500 |                                     |

| Fuses C4000 (5 ea.) | Rating<br>(5 x 20 mm, SB) | Part-number  | 2 - 3 years operation <sup>1)</sup> |
|---------------------|---------------------------|--------------|-------------------------------------|
| 115 V AC            | 1,6 A                     | 0405-5033-00 | One set per 5 units                 |
| 230 V AC            | 1,6 A                     | 0405-5033-00 |                                     |
| 24 V DC/AC          | 3,15 A                    | 0405-5034-00 |                                     |

<sup>1)</sup> Recommended spare parts for typical operation over 2 –3 years.



# C4000 UVN EX EN-D 1.0



| Lamp module (1 ea.) | EX           | EX-HT        | 2 - 3 years operation <sup>1)</sup> |
|---------------------|--------------|--------------|-------------------------------------|
| AF16-V              | 2100-0252-02 | 2100-0252-02 | One per sensor                      |
| AF16-N              | 2100-0252-02 | 2100-0252-02 |                                     |
| AF16-F              | 2100-0252-02 | 2100-0252-02 |                                     |
| AF26                | 2100-0254-02 | 2100-0254-02 |                                     |
| TF16                | 2100-0250-02 | 2100-0250-02 |                                     |
| AF45 (254 / P285)   | 2100-1100-01 | 2100-1100-01 | One per sensor                      |
| AF46 (254 / P285)   | 2100-1100-01 | 2100-1100-01 |                                     |

| Optic module (1 ea.) | EX           | EX-HT        | 2 - 3 years operation <sup>1)</sup> |
|----------------------|--------------|--------------|-------------------------------------|
| AF16-V               | 2300-0350-00 | 2300-0370-00 | One per 10 sensors                  |
| AF16-N               | 2300-0350-00 | 2300-0370-00 |                                     |
| AF16-F               | 2300-0350-00 | 2300-0370-00 |                                     |
| AF26                 | 2300-0352-00 | 2300-0372-00 |                                     |
| TF16                 | 2300-0356-00 | 2300-0376-00 |                                     |

| Detector module (1 ea.) | EX EN-D      | EX-HT EN-D   | 2 - 3 years operation <sup>1)</sup> |
|-------------------------|--------------|--------------|-------------------------------------|
| AF16-V                  | 2500-0156-20 | 2500-0176-20 | One per 5 sensors                   |
| AF16-N                  | 2500-0157-20 | 2500-0177-20 |                                     |
| AF16-F*                 | 2500-0158-20 | 2500-0178-20 |                                     |
| AF26*                   | 2500-0256-20 | 2500-0276-20 |                                     |
| TF16                    | 2500-0456-20 | 2500-0476-20 |                                     |
| AF45*                   | 2500-1156-20 | 2500-1156-20 | One per 5 sensors                   |
| AF46*                   | 2500-1356-20 | 2500-1356-20 |                                     |
| AF45- / AF46-Ref [C]*   | 2500-1201-20 | 2500-1201-20 |                                     |
| AF46-Ref-[D]*           | 2500-1202-20 | 2500-1202-20 |                                     |

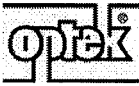
\*= Specify wavelength with the order !

| Gaskets <sup>2)</sup> (4 ea.) | Material           | Viton <sup>®</sup> | 2 - 3 years operation <sup>1) 2)</sup> |
|-------------------------------|--------------------|--------------------|--|
| O-ring Ø 4,00 x 1,00          | Viton <sup>®</sup> | 0208-4005-02       | One set                                |
| O-ring Ø 10,10 x 1,60         | Viton <sup>®</sup> | 0208-4004-02       |  |
| O-ring Ø 18,77 x 1,78         | Viton <sup>®</sup> | 0208-4007-02       |  |
| O-ring Ø 21,95 x 1,78         | Viton <sup>®</sup> | 0208-4001-02       |  |
| O-ring Ø 25,12 x 1,78         | Viton <sup>®</sup> | 0208-4002-02       |  |
| O-ring Ø 28,30 x 1,78         | EPDM               | 0208-4013-03       |  |
| O-ring Ø 31,47 x 1,78         | Viton <sup>®</sup> | 0208-4003-02       |  |
| O-ring Ø 50,52 x 1,78         | Viton <sup>®</sup> | 0208-4006-02       |  |
| O-ring Ø 60,05 x 1,78         | EPDM               | 0208-4010-03       |  |

| Screws (10 ea.)<br>(stainless steel A4-70)             | Part-number  | 2 - 3 years operation <sup>1)</sup> |
|--|--------------|-------------------------------------|
| M5 x 12, DIN 912, incl. washer M5, DIN7980             | 0101-1017-03 | One set                             |
| M5 x 6, DIN 84, incl. O-Ring 4 x 1, Viton <sup>®</sup> | 0101-1004-03 |                                     |
| M4 x 10, DIN 912, incl. washer M4, DIN7980             | 0101-1003-03 |                                     |
| M3 x 12, DIN7985, incl. washer M3, DIN7980             | 0101-1002-03 |                                     |

<sup>1)</sup> Recommended spare parts for typical operation over 2 –3 years.

<sup>2)</sup> Replace O-rings after disassembly !



# C4000 UVN EX EN-D 1.0



## 5 Certificates

### 5.1 optek-Danulat GmbH "EC-Declaration of Conformity"

| <b>EG-Konformitäts-Erklärung</b>  |   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
|---|---|---------------------------|-----------------------------------|------------------|-----------------------|-----------------|-------------------------------------|-----------------|------------------------------------|-----------------|---|---------|--|---------------|---------|--|-------------|---------|---------------------------|------------|---------|-----------|------------|---------|-----------|------------|---------|-----------|-----------------|---------|-----------|-----------------|---------|--|-----------------|---------|--|--------------------|---------|--|
| Wir   | optek-Danulat GmbH  |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| Anschrift   | Emscherbruchallee 2<br>D-45356 Essen<br>Deutschland   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| erklären in alleiniger Verantwortung, dass die Produkte                             |   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| Bezeichnung   | Photometer C4000 UVN, EN-D  |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| Modell, Artikel-Nr.   | Converter: C4101, C4121, C4221, C4222, C4322, C4422<br>Sensoren: AF16, AF26, AF45, AF46, TF16   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| mit den Anforderungen der Normen  | <table border="0"> <tr><td>EN 61 010-1</td><td>1993-04</td><td></td></tr> <tr><td>EN 50 081-1</td><td>1992-01</td><td></td></tr> <tr><td>EN 50 081-2</td><td>1993-08</td><td></td></tr> <tr><td>EN 50 082-1</td><td>1992-01</td><td></td></tr> <tr><td>prEN 50 082-1</td><td>1994-08</td><td></td></tr> <tr><td>EN 50 082-2</td><td>1995-03</td><td>AD 2000 Regelwerk 2000-03</td></tr> <tr><td>ENV 50 140</td><td>1993-08</td><td>EN 50 014</td></tr> <tr><td>ENV 50 141</td><td>1993-08</td><td>EN 50 018</td></tr> <tr><td>ENV 50 142</td><td>1993-08</td><td>EN 50 020</td></tr> <tr><td>prEN 61 000-4-2</td><td>1995-05</td><td>EN 50 039</td></tr> <tr><td>prEN 61 000-4-4</td><td>1995-05</td><td></td></tr> <tr><td>prEN 61 000-4-5</td><td>1995-03</td><td></td></tr> <tr><td>DIN EN 61 000-4-11</td><td>1995-04</td><td></td></tr> </table> | EN 61 010-1               | 1993-04                           |                  | EN 50 081-1           | 1992-01         |                                     | EN 50 081-2     | 1993-08                            |                 | EN 50 082-1                             | 1992-01 |  | prEN 50 082-1 | 1994-08 |  | EN 50 082-2 | 1995-03 | AD 2000 Regelwerk 2000-03 | ENV 50 140 | 1993-08 | EN 50 014 | ENV 50 141 | 1993-08 | EN 50 018 | ENV 50 142 | 1993-08 | EN 50 020 | prEN 61 000-4-2 | 1995-05 | EN 50 039 | prEN 61 000-4-4 | 1995-05 |  | prEN 61 000-4-5 | 1995-03 |  | DIN EN 61 000-4-11 | 1995-04 |  |
| EN 61 010-1   | 1993-04   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| EN 50 081-1   | 1992-01   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| EN 50 081-2   | 1993-08   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| EN 50 082-1   | 1992-01   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| prEN 50 082-1   | 1994-08   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| EN 50 082-2   | 1995-03   | AD 2000 Regelwerk 2000-03 |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| ENV 50 140  | 1993-08   | EN 50 014                 |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| ENV 50 141  | 1993-08   | EN 50 018                 |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| ENV 50 142  | 1993-08   | EN 50 020                 |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| prEN 61 000-4-2   | 1995-05   | EN 50 039                 |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| prEN 61 000-4-4   | 1995-05   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| prEN 61 000-4-5   | 1995-03   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| DIN EN 61 000-4-11  | 1995-04   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| übereinstimmen und damit den Bestimmungen der folgenden EG-Richtlinien entsprechen: |   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| EG-Richtlinien:   | <table border="0"> <tr><td><b>73/23/EG</b></td><td><b>Niederspannungs-Richtlinie</b></td></tr> <tr><td><b>89/336/EG</b></td><td><b>EMV-Richtlinie</b></td></tr> <tr><td><b>93/68/EG</b></td><td><b>CE-Kennzeichnungs-Richtlinie</b></td></tr> <tr><td><b>97/23/EG</b></td><td><b>Richtlinie über Druckgeräte</b></td></tr> <tr><td><b>94/09/EG</b></td><td><b>Richtlinie über Explosionsschutz</b></td></tr> </table>   | <b>73/23/EG</b>           | <b>Niederspannungs-Richtlinie</b> | <b>89/336/EG</b> | <b>EMV-Richtlinie</b> | <b>93/68/EG</b> | <b>CE-Kennzeichnungs-Richtlinie</b> | <b>97/23/EG</b> | <b>Richtlinie über Druckgeräte</b> | <b>94/09/EG</b> | <b>Richtlinie über Explosionsschutz</b> |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| <b>73/23/EG</b>   | <b>Niederspannungs-Richtlinie</b>   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| <b>89/336/EG</b>  | <b>EMV-Richtlinie</b>   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| <b>93/68/EG</b>   | <b>CE-Kennzeichnungs-Richtlinie</b>   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| <b>97/23/EG</b>   | <b>Richtlinie über Druckgeräte</b>  |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| <b>94/09/EG</b>   | <b>Richtlinie über Explosionsschutz</b>   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| Ort und Datum der Ausstellung:  | Essen, den 26. August 2002  |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| Unterschrift des Befugten:  | <i>S. Danulat</i><br><b>Stephan Danulat</b>   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |
| Diese Erklärung entspricht EN 45 014.   |   |                           |                                   |                  |                       |                 |                                     |                 |                                    |                 |   |         |  |               |         |  |             |         |                           |            |         |           |            |         |           |            |         |           |                 |         |           |                 |         |  |                 |         |  |                    |         |  |



# C4000 UVN EX EN-D 1.0



## 5 Certificates

### 5.2 DIN-ISO 9001-2000

**TÜV  
CERT**

# ZERTIFIKAT

Die TÜV CERT-Zertifizierungsstelle  
der RWTÜV Systems GmbH

bescheinigt gemäß  
TÜV CERT-Verfahren, dass das Unternehmen



**optek-Danulat GmbH**  
Emscherbruchallee 2  
45356 Essen

für den Geltungsbereich

**Inline- Prozessmesstechnik inklusive druckhaltender  
Ausrüstungsteile für die Bereiche Chemie, Pharma,  
Biotechnik, Lebensmittel und Getränke**

**ein Qualitätsmanagementsystem eingeführt hat  
und anwendet.**

Durch ein Audit, Bericht-Nr. **20546860**  
wurde der Nachweis erbracht, dass die Forderungen der  
**DIN EN ISO 9001 : 2000**  
erfüllt sind. Dieses Zertifikat ist gültig bis **September 2005**  
Zertifikat-Registrier-Nr. **04100 21397**



Essen, 02.09.2002





TÜV CERT-Zertifizierungsstelle  
der RWTÜV Systems GmbH

## 5 Certificates

### 5.3 Directive 94/09/EC



# CERTIFICATE

(1) **about acknowledgement of quality assurance  
production**

(2) - Directive 94/9/EC -  
Equipment and protective systems intended for use  
in potentially explosive atmospheres



(3) Certificate number: DMT 02 ATEX ZQS/E171

(4) Product category: Electrical equipment and devices, equipment-group II, category 2:  
Inline control devices



(5) Manufacturer: optek-Danulat GmbH

(6) Site of manufacture: Emscherbruchallee 2, 45356 Essen

(7) The certification body of Deutsche Montan Technologie GmbH, notified body N° 0158 in accordance with Article 9 of the Directive 94/9/EC of the European Parliament and the Council of 23 March 1994, certifies that the manufacturer has a production quality system, which complies with Annex IV of the Directive.

(8) This certificate is based on audit report ZQS/E171/02, issued 20.08.2002 and is valid until 1.08.2005.  
This certificate can be withdrawn if the manufacturer no longer satisfies the requirements of Annex IV.

Results of periodical re-assessments of the quality system are a part of this certificate.

(9) According to Article 10 (1) of the Directive 94/9/EC the CE marking shall be followed by the identification Number 0158 of Deutsche Montan Technologie GmbH as notified body involved in the production control stage.

**Deutsche Montan Technologie GmbH**

Essen, 28.08.2002

Certification body

Head of special services unit

Page 1 of 1  
This certificate may only be reproduced in its entirety and without any change.  
Am Technologiepark 1, 45307 Essen, Telefon (0201)172-1416, Telefax (0201)172-1716



# C4000 UVN EX EN-D 1.0



## 5 Certificates

### 5.4 RW-TÜV GmbH „GS-mark“

The regulations of the **European Directive for technical equipment** are met. The tests according to EN 61010-1 also cover the requirements of the **low voltage regulation** which is due since January 1st, 1997. After checking our systems RWTÜV Anlagentechnik GmbH attested the compliance with a **statement of authorization** (1064/96). Therefore our instruments are labeled with the **GS-mark**.

**RWTÜV**

**ZEICHENGENEHMIGUNGS-AUSWEIS** Nr. 2944/99  
Nur gültig mit umschriebenen Vertragsbedingungen

---

RWTÜV e.V. Postfach 10 32 61, D-45032 Essen

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**GENEHMIGUNGSINHABER:** Optek Danulat GmbH  
Haedenkampstr. 18, 45143 Essen

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**FERTIGUNGSSTÄTTE:** s. o.

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|                        |              |  |                                     |
|------------------------|--------------|--|-------------------------------------|
| G-Z des Antragstellers | Antragsdatum | Aktenzeichen                               | Ausstellungsdatum                   |
| Hr. Danulat            | 24.08.99     | 20359037/20<br>3.1.1-857/99 Mas/Spri / A27 | 24.01.2000<br>Gültig bis 01.12.2004 |

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**PRÜFZEICHEN:**

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**GERÄTEART:** Inline-Photometrie-Meßsystem

**Typbezeichnung:** Meßumformer: Control 4000  
Meßwertaufnehmer: AF4v-y-z; AFw6-y-z; TF16-y-z  
[v = 4 / 5 / 6]; [y = ( ) / EX]; [(z = ( ) / HT]

**Nennspannung:** 24 V DC und 24 V AC, 47-64 Hz  
oder 115 / 230 V AC, 47-64 Hz umschaltbar

**Nennleistung:** 50 VA maximal

**Schutzklasse:** I (Einbaugerät) bzw. III  
**Schutzart:** IP 20

**Netzanschluß:** Festanschluß über am Meßumformer verschraubten Steckverbinder

---

**GEPRÜFT NACH:** DIN EN 61010-1: 1994-03

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**WEITERE ANGABEN: VERGLEICHE ANLAGE 1 (AUFBAU-ÜBERSICHT)**

Die Zertifizierungsstelle für Gerätesicherheit des RWTÜV e.V., als vom Bundesminister für Arbeit und Sozialordnung benannte Zertifizierungsstelle für technische Arbeitsmittel mit den angeschlossenen Prüflaboratorien, bestätigt die im Gesetz über technische Arbeitsmittel - in der ab 26.08.1992 geltenden Fassung - gestellten Anforderungen werden von dem(n) oben aufgeführten Gerät(en) erfüllt.  
Die Genehmigung, das GS-Zeichen gem. den umseitig abgedruckten Vertragsbedingungen zu verwenden, wird hiermit erteilt.

Zertifizierungsstelle für Gerätesicherheit,  
Aufzüge und Medizintechnik

*[Handwritten Signature]*

RWTUEV2944-99\_C4000.TIF



# C4000 UVN EX EN-D 1.0



## 6 EX-Certificates of conformity

### 6.1 DMT 02 ATEX E 176 (SYST)

#### Certificate of compliance for photometer C4000 UVN, EN-D

The person in charge has confirmed the technical approval.  
The certificate is not yet available, however you will get it short term.





# C4000 UVN EX EN-D 1.0



## 5 EX-Certificates of Conformity

### 6.2 DMT 02 ATEX E 175,

**Certificate of compliance for housings 17L132-XXX and housings 32L265-XXX**

The person in charge has confirmed the technical approval.  
The certificate is not yet available, however you will get it short term.



# C4000 UVN EX EN-D 1.0



## 7 Fax Reply

**to: optek-Danulat GmbH**  
 Emscherbruchallee  
 45356 Essen(GERMANY)

**Phone:** (++49) 201 / 63 40 90  
**Fax:** (++49) 201 / 63 40 9999

**from: Company:** \_\_\_\_\_

**Name:** \_\_\_\_\_

**Department:** \_\_\_\_\_

**Street:** \_\_\_\_\_

**ZIP-Code / City:** \_\_\_\_\_

**Phone :** \_\_\_\_\_

**Fax:** \_\_\_\_\_

Dear Sirs,

Please forward the following information to the responsible manager.

- I am interested in Inline-Photometry - please keep me informed.
- The following colleague in our company may be interested in Inline-Photometry:

name: \_\_\_\_\_  
 department: \_\_\_\_\_  
 phone: \_\_\_\_\_

- I am interested in the following application:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

- We are already using your equipment - model: \_\_\_\_\_
- We are using another manufacturer: \_\_\_\_\_
- Please call me.

I found the instruction manual for model \_\_\_\_\_  
 good                        not good

I suggest following improvements: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Best regards

Date / Signature

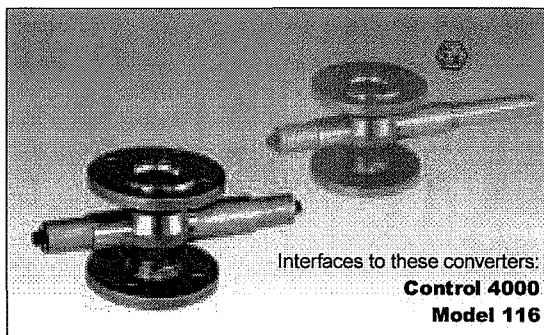


# Single-Beam NIR Absorption Sensor

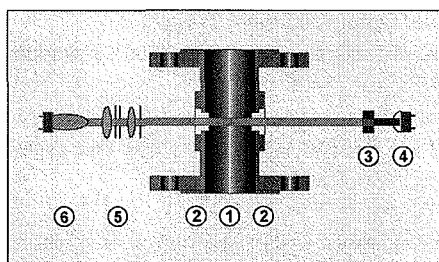
## AF16N

### Common Applications:

- |                           |                           |
|---------------------------|---------------------------|
| Total Suspended Solids    | Polymerization control    |
| Biomass concentration     | Product identification    |
| Filter aid dosing control | Pulp standardization      |
| Filter Performance        | Sedimentation             |
| Filter break detection    | Separator control         |
| Flocculation control      | Solids concentration      |
| Flotation optimization    | Starch concentration      |
| Flux concentration        | Titanium dioxide conc.    |
| Gas bubble detection      | Water in hydrocarbons     |
| Gypsum concentration      | Lauter Tun wort turbidity |
| Heat exchanger leaks      | Yeast concentration       |
| Lime milk concentration   | Yeast pitching            |
| Membrane filtration       | Interface Detection       |
| Milk in water             | CIP Return clarity        |
| Oil in water              | BOD reduction             |
| Crystallization control   | Evaporator feed control   |



Interfaces to these converters:  
**Control 4000**  
**Model 116**



(1) Sensor Body (2) Optical Windows (3) NIR Filter  
(4) Photo Diode (5) Focusing Optics (6) Light Source

### Features & Benefits:

- In-Line, Real Time Process Monitoring
- NIR measurement is not affected by process color and/or color changes
- Modular and easy to install, set-up and operate
- Extremely low maintenance, 3-5 year lamp life
- 24-Hour Technical Support
- Superior Product Warranty
- NIST-traceable validation accessories for absolute measurement confidence
- Broad variety of line sizes, process connections and wetted materials
- Options for all Hazardous Area Classifications
- Designed for High Temperatures and Pressures
- Sapphire Optics provide superior resilience to all abrasive and corrosive media

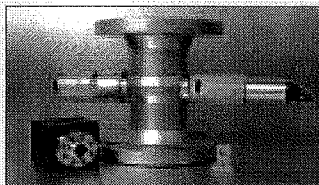
### Functional Description:

The **optek** AF16N Single-Beam NIR Absorption Sensor consists of three main assemblies: The in-line process sensor body (1), the lamp assembly including light source (6) and focusing optics (5), and the detector assembly including an NIR filter (3) and precision photo diode (4).

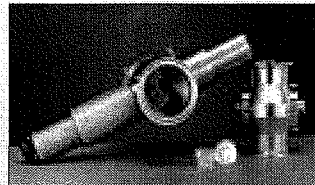
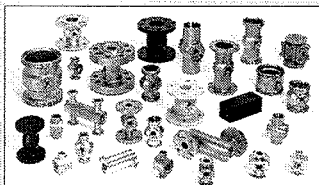
During operation, light from the tungsten lamp is partially absorbed while penetrating the process stream that is flowing through the in-line sensor body. The light exiting the process stream on the opposing side is received by the measuring photo diode after passing through a special NIR spectral filter which blocks all wavelengths except those within the NIR portion of the spectrum. A photo-current is induced which is directly proportional to the remaining light intensity. The photo-current is then transmitted to an **optek** converter via special cables where it is precisely amplified, converted, presented on the local display and transmitted as a 0/4-20 mA output to the plant's PLC/DCS-based control system or other process control devices such as chart recorders or PID loop controllers.

As this precision sensor is based on NIR spectral absorption, color and color variations of any magnitude will not affect the measurement. Typically installed to determine the content of suspended solids or immiscible liquids in the process stream, this sensor can be effectively implemented for a broad range of applications from low parts-per-million, barely detectable by the eye, to high percent level concentrations such as slurries or pastes providing a dynamic range of applications.

### A spectrum of sensors and configurations to meet virtually any process requirement

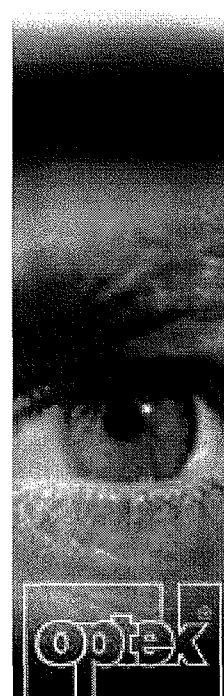


Flanged and NPT in a variety of materials

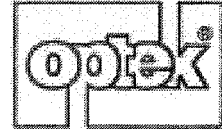


Solid Block 316L Ultra-Sanitary

real time  
precision  
**In-Line** photometric analysis  
process control



# Single-Beam NIR Absorption Sensor



## AF16N

### Specifications:

#### Headquarters

optek - Danulat GmbH  
Emscherbruchallee 2  
Essen 45356  
Germany  
Tel: (49) 201 634-090  
Fax: (49) 201 634-0911  
E-Mail: info@optek.de

#### North America

optek - Danulat, Inc.  
279 South 17th Avenue  
Suite # 10  
West Bend, WI 53095  
Toll Free: 800-371-4288  
Local: 262-335-4288  
Fax: 262-335-4299  
E-Mail: info@optek.com

#### The Netherlands

Technical Adviesbureau  
Staalweg 16  
Culemborg NL-4104 AT  
Netherlands  
Tel: (31) 0 345-650-301  
Fax: (31) 0 345-650-361  
E-Mail: info@optek.nl

#### Websites

[www.optek.com](http://www.optek.com)  
[www.daritek.com](http://www.daritek.com)

#### Sensor Body Materials

316 Ti Stainless Steel (1.4571) (standard), 316 L Stainless Steel (1.4435) TFMC (carbon-filled Teflon<sup>®</sup>), Kynar<sup>®</sup>, PEEK, CPVC, Nickel, Hastelloy C<sup>®</sup> Monel<sup>®</sup>, Inconel<sup>®</sup>, Tantalum, Titanium and others

#### Line Sizes

¼" to 12" OD and IPS (DN 6 to DN 300)

#### Process Connections

ANSI Flange, DIN Flange, Tri-Clamp, Female NPT, Straight Pipe Thread DIN ISO 228/1 G, SMS Thread, Sanitary Thread (DIN 11851), and others

#### Process Contact O-rings

Viton<sup>®</sup>, EPDM, Kalrez<sup>®</sup>, BUNA-N, Silicone, Fluoraz 797<sup>®</sup> and others

#### Optical Window Materials

Pyrex<sup>®</sup> (standard), Sapphire for superior abrasion and chemical resistance

#### Optical Path Length

1 mm to 500 mm, fixed optical bench, line size and application dependent

#### Operating Pressures

0.15 psi (10 mbar) to 7,250 psi (500 bar), line connection limited

#### Operating Temperatures

##### Standard Version (AF16N):

0°C (+32°F) to +120°C (+248°F) continuous, +150°C (+302°F) periodic

##### High Temperature Version (AF16N-HT):

-20°C (-4°F) to +240°C (+464°F) continuous, +260°C (+500°F) periodic

##### Explosion-proof Option (AF16N-Ex):\*

0°C (+32°F) to +120°C (+248°F) continuous, +150°C (+302°F) periodic

##### High Temperature & Ex-proof Option (AF16N-HT-Ex):\*

-20°C (-4°F) to +220°C (+428°F) continuous, +260°C (+500°F) periodic

#### Ambient Temperature

0°C (+32°F) to +40°C (+104°F) during operation\*\*

#### Air Purge

Standard on all sensors, provided to avoid condensation on optics

#### Light Source

Hybrid tungsten lamps: 5.0 V DC, 775 mA; 3 to 5 year continuous cycle

#### Detector

Precision silicon photo diodes, hermetically sealed

#### Wavelengths

Near-Infrared (NIR): 730 – 970 nm

#### Calibration

Factory calibration in CU (Concentration Units), user may specify others

#### Dynamic Measuring Range

Any required scale between 0 – 6 CU, 100 % to 0.0001 % T

#### Resolution

< ± 1% of respective measuring range

#### Repeatability

< ± 1% of respective measuring range

#### Linearity

Specific to application, typically < ± 1% of respective measuring range

#### Protection

316 Ti Stainless Steel optical housings, Rated NEMA Type 4X / IP 65

#### Cable Sets

Special ultra-shielded cable sets, pre-assembled and labeled. Provided with plastic quick-connect or optional rigid stainless steel connectors

#### Cable Lengths

Standard: 5, 10, 20, 35, 50 m (16, 33, 66, 115, 164 ft.)

Maximum: 250 m (800 ft.)

#### Validation Accessories

Validation / Calibration adapters, NIST-traceable validation filters and other calibration options to provide fast and precise sensor calibration

\* Ex-Proof Sensor Versions are available for all hazardous area classifications. Lamp assemblies are FM Class I, Div. 1, Groups A-D; Class II, Div. 1 & Div. 2, Groups E-G and PTB CENELEC EEx ia IIC T6. All detectors are wired intrinsically safe using approved shunt barriers integral to the converter.

\*\*Elevated or reduced ambient temperatures may require restrictions to the operating temperatures stated above.

### Options

#### Explosion Protection:

FM and PTB Cenelec ex-proof versions for proper safety and confidence in all hazardous area classifications.



#### Cable Sets:

Special ultra-shielded cable sets in five standard lengths. With quick-connect plastic or tough stainless steel protective ends.



#### NIST-traceable Validation:

Modular adapters and NIST-traceable validation filters for precision calibration with ease and total confidence.



#### Rapid-Cal Validation:

Compact and ingenious sensor fixtures & cuvettes to perform liquid calibrations fast and accurately.

