Operating Instructions

for

Turbidity Measurement

Systems

Model: ATS-K / ATT-KS...

ATA-K / ATT-KA...

1. Contents

Manufactured and sold by:

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2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The instruction manuals on our website www.kobold.com are always for currently manufactured version of our products. Due to technical changes, the instruction manuals available online may not always correspond to the product version you have purchased. If you need an instruction manual that corresponds to the purchased product version, you can request it from us free of charge by email (info.de@kobold.com) in PDF format, specifying the relevant invoice number and serial number. If you wish, the operating instructions can also be sent to you by post in paper form against an applicable postage fee.

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EC-machine guidelines.

PED 2014/68/EU
In acc. with Article 4, Paragraph (3), "Sound Engineering Practice", of the PED 2014/68/EU no CE mark.
Table 9, Pipe, Group 2 no dangerous fluids

3. Regulated Use

Any use of the Turbidity Measurement Systems, model: ATS-K / ATT-KS and ATA-K / ATT-KA, which exceeds the manufacturers specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

4. Instrument Inspection

Instruments are inspected prior to shipping and sent out in perfect condition. Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

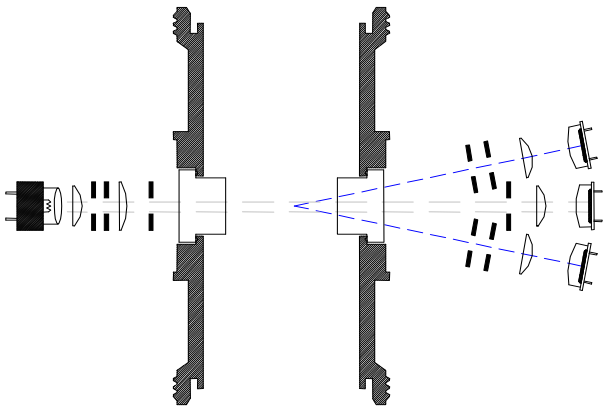
Scope of delivery:
The standard delivery includes:

- Turbidity Measurment Systems Model: ATS-K / ATT-KS or ATA-K / ATT-KA

5. Operating Principle

5.1 Turbidity Sensor ATS-K (scattered light principle)

The model KOBOLD ATS-K is a high precision 2-beam scattered light sensor. It uses the light scattered in the forward direction (11°) and the transmitted light to measure the particles. The sensor is manufactured from stainless steel and has been designed to fit in process piping. The process medium is penetrated by a focussed beam of light. The light scattered by the particles in the medium is sensed by the receiver optics at an angle of 11° by four silicon photodiodes. Simultaneously, unscattered light is absorbed as transmitted light by another photodiode.
Unwanted light can thus be compensated for. Due to the small scattering angle, transmitted light and scattered light practically follow the same path in the medium, which means that product-specific noise variables such as colour or changes in colour of the carrier medium, as well as window soiling can also be compensated for. The sensor uses visible (VIS) and near infrared (NIR) light from 400 to 1100 nm.



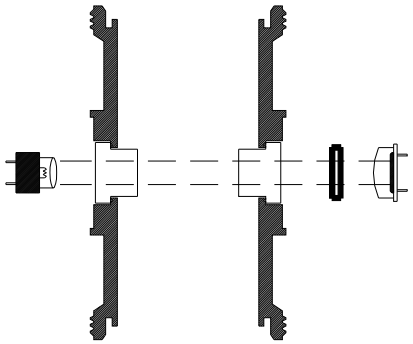
Lamp / Optics Medium Detectors

5.2 Transmitter ATT-KS

The transmitted light and scattered light signals generated in the sensor are amplified in the KOBOLD transmitter ATT-K to produce a weighted ratio. The measured variable thus created is proportional to the total volume of particles in the carrier medium.
Two independently adjustable switch points as well as an analogue output are available for alarm signalling, or control and regulating. An additional relay output (FAIL-SAFE) signals lamp or system failures. Basic system calibration is carried out, as standard, in ppm DE (mg Diatomaceous Earth/ L water). The device may also be calibrated to FTU (Formazene Turbidity Standard) or to EBC (European Brewery Convention) if required.

5.3 Turbidity Sensor ATA-K

The high precision KOBOLD single-beam turbidity sensor ATA-K measures the degradation of light (in the near infrared range, NIR) passing through the process medium. The sensor has been manufactured from stainless steel and designed to fit into process piping. The process medium is penetrated by a suitably focussed, constant beam of light. The intensity of the incoming light is measured by a silicon photodiode and routed to the transmitter as a photoelectric current. The changes of intensity in this light, caused by absorption and/or scattering by substances (dissolved and undissolved) in the medium, is measured and an output signal is generated by the transmitter. Concentration can thus be measured in ppm as well as in percentage. The sensor works in the infrared range from 730 to 970 nm.



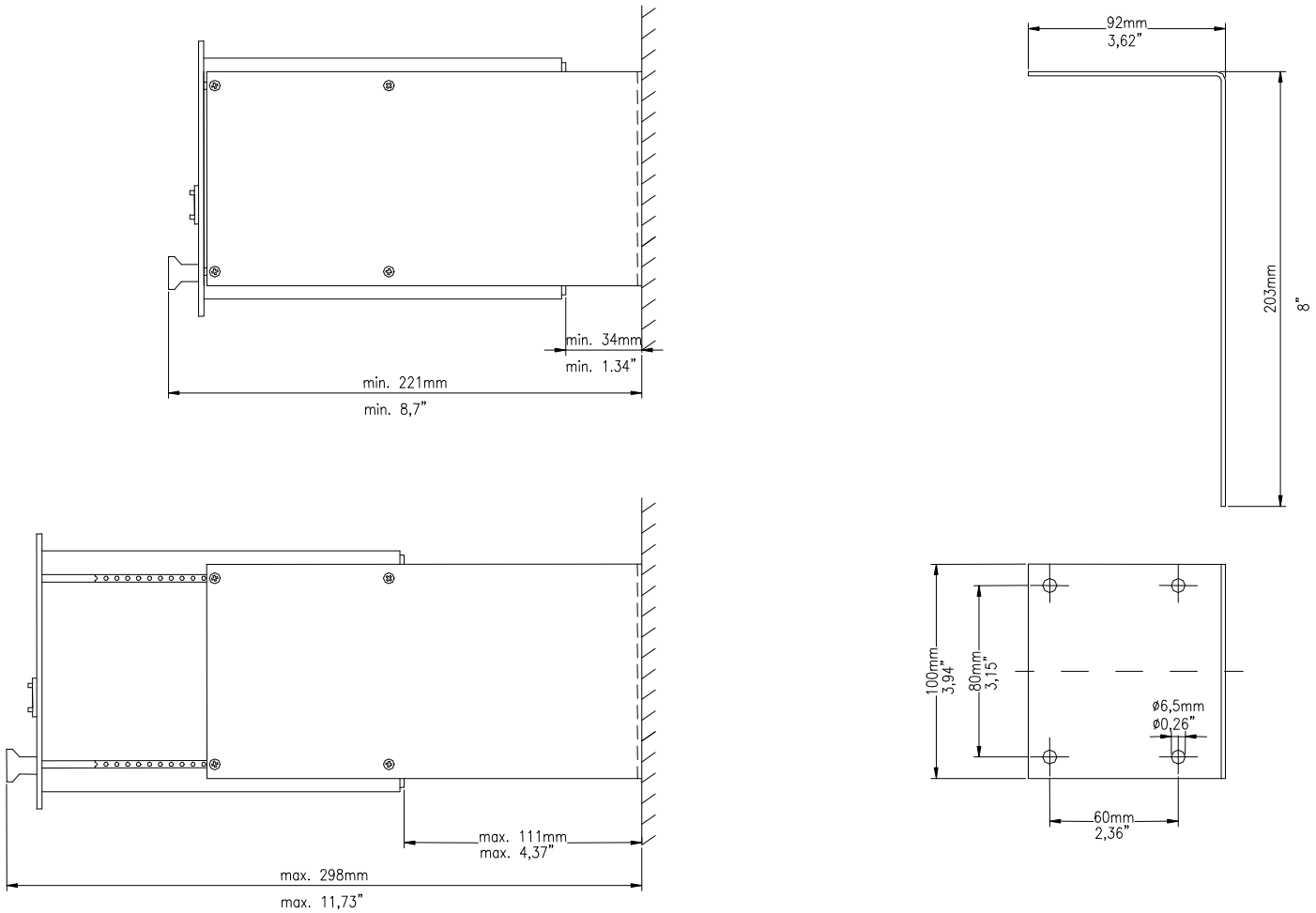
5.4 Transmitter ATT-KA

The change in light intensity is determined in the KOBOLD transmitter ATT-KA from the photoelectric current and a measuring signal proportional to the concentration in the process medium is obtained. Two independently adjustable switch points as well as an analogue output are available for alarm signalling, or control and regulating. An additional relay output (FAIL-SAFE) signals lamp/system failure.
Basic system calibration is carried out in concentration units (CU). The unit CU is defined as the negative decadic logarithm of the change in light intensity. This means: an increase in measured value of 1 CU corresponds to a 90 % degradation of the light beam.

6. Mechanical Connection

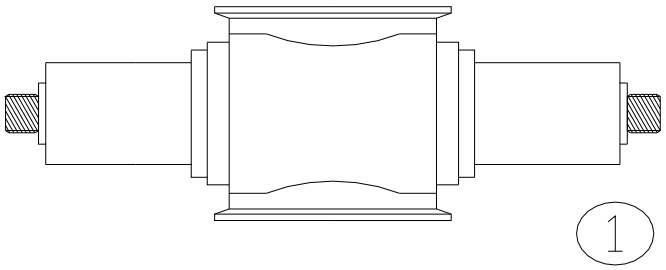
6.1 Transmitter ATT-K

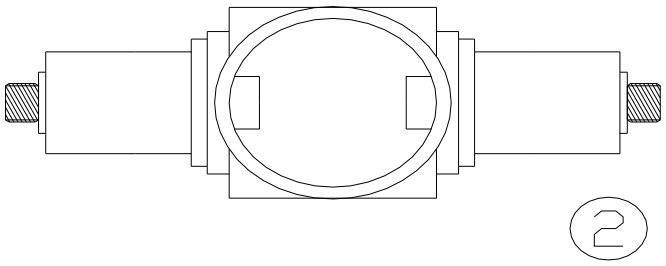
The housing of the transmitter is designed for 19“ rack mounting (3 HE / 21 TE) as well as for front panel mounting (cut-out: 106 x 116 mm / 4.17" x 4.57"). The mounting of the converter is accomplished by using the attached mounting parts. For the specific dimensions of the additional housing for wall mounting please refer to the drawings in Section **Fehler! Verweisquelle konnte nicht gefunden werden.**, Dimensions.

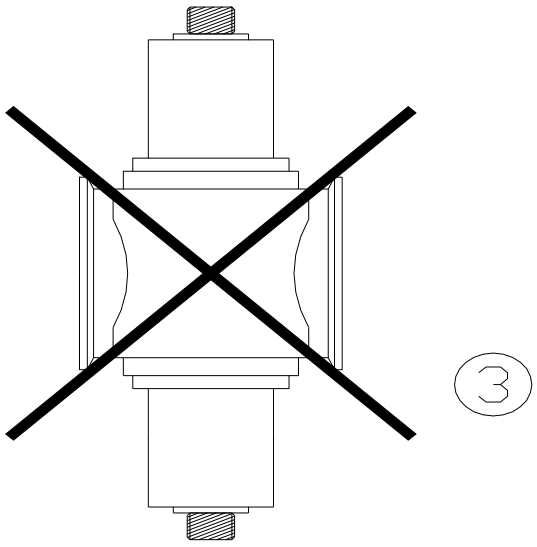


6.2 Sensors ATS-K / ATA-K

The sensor must be installed in the process pipeline in such a way that the optical arms are in the horizontal position (diagrams 1 and 2). An installation in the vertical plane (diagram 3) has to be avoided because of sedimentation on the lower window which may cause error in the measurement. The second reason is that an installation according to diagram 3 may cause thermal problems depending on process and ambient temperatures. During operation the sensor should always be completely full in order to eliminate possible measurement errors (caused by air or gas bubbles).





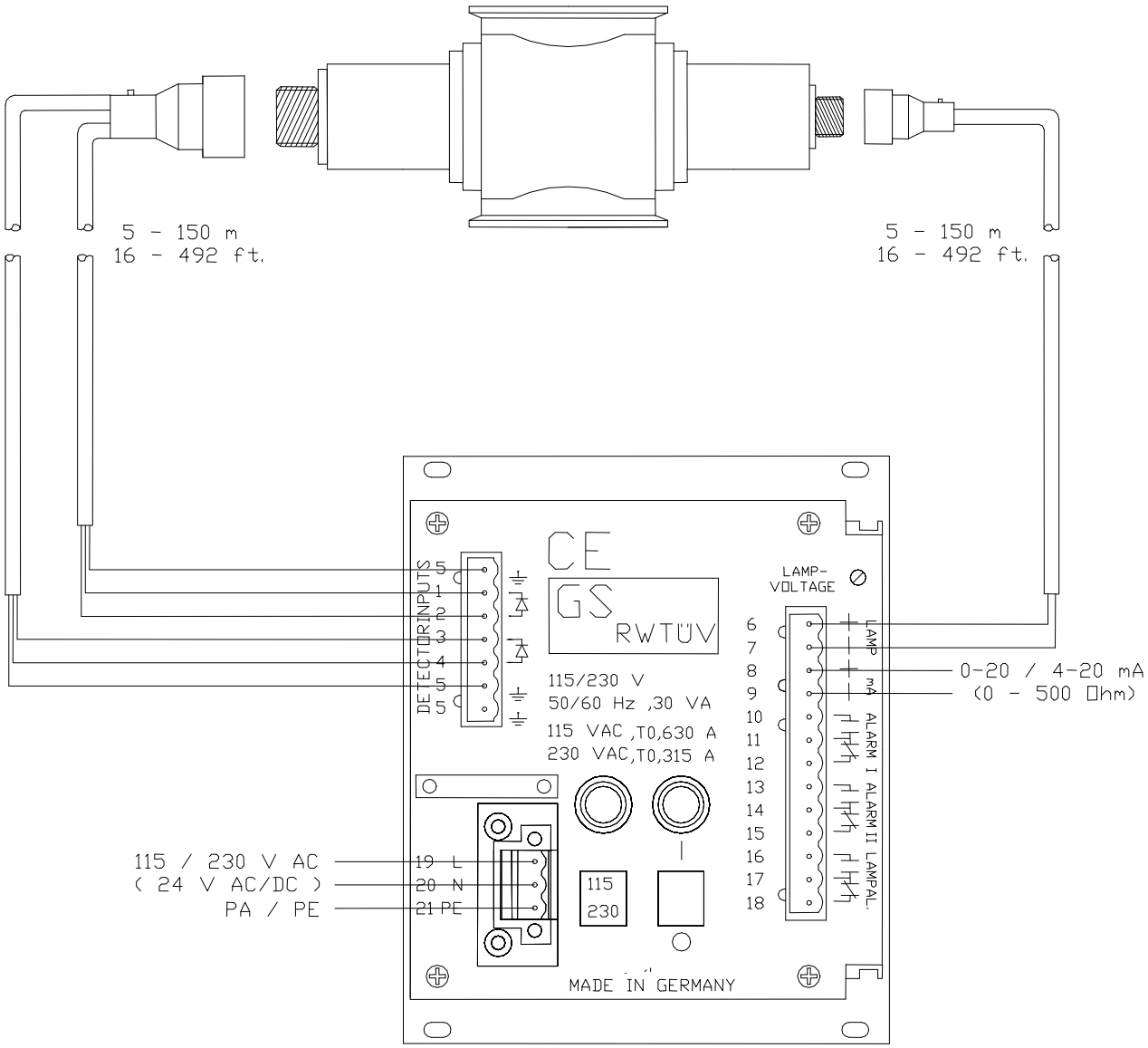


7. Electrical Connection

Attention! Make sure that the voltage values of your system correspond with the voltage values of the measuring unit.

Attention! Incorrect wiring will lead to damage of the unit's electronics.

7.1 Field Wiring Schematic Model ATS-K / ATT-KS - 115/230 V_{AC} (24 $V_{AC/DC}$)



The system consists of two components, the converter ATT-KS and the sensor ATS-K which are interconnected with three cables (max. 150 m / 492 ft). Concerning the sensor, it is impossible to cross connect the cables, as different plugs are used. (9-pole on the detector side, 4-pole on the lamp side). The detector cable is not compatible with former version cables with an 8-pole connector!

It is absolutely necessary to adjust the lamp voltage to correspond with the cable length (please refer to paragraph 8.4.).

Because the system of sensor and converter is calibrated together it is necessary to connect the converter ATT-KS only with the appropriate sensor type ATS-K (see serial-no.-label):

Model:	**ATT-KS**
Serial No.:	**XXXXX**
matched	YYYYY

⟷

Model:	**ATS-K**
Serial No.:	YYYYY
matched	**XXXXX**

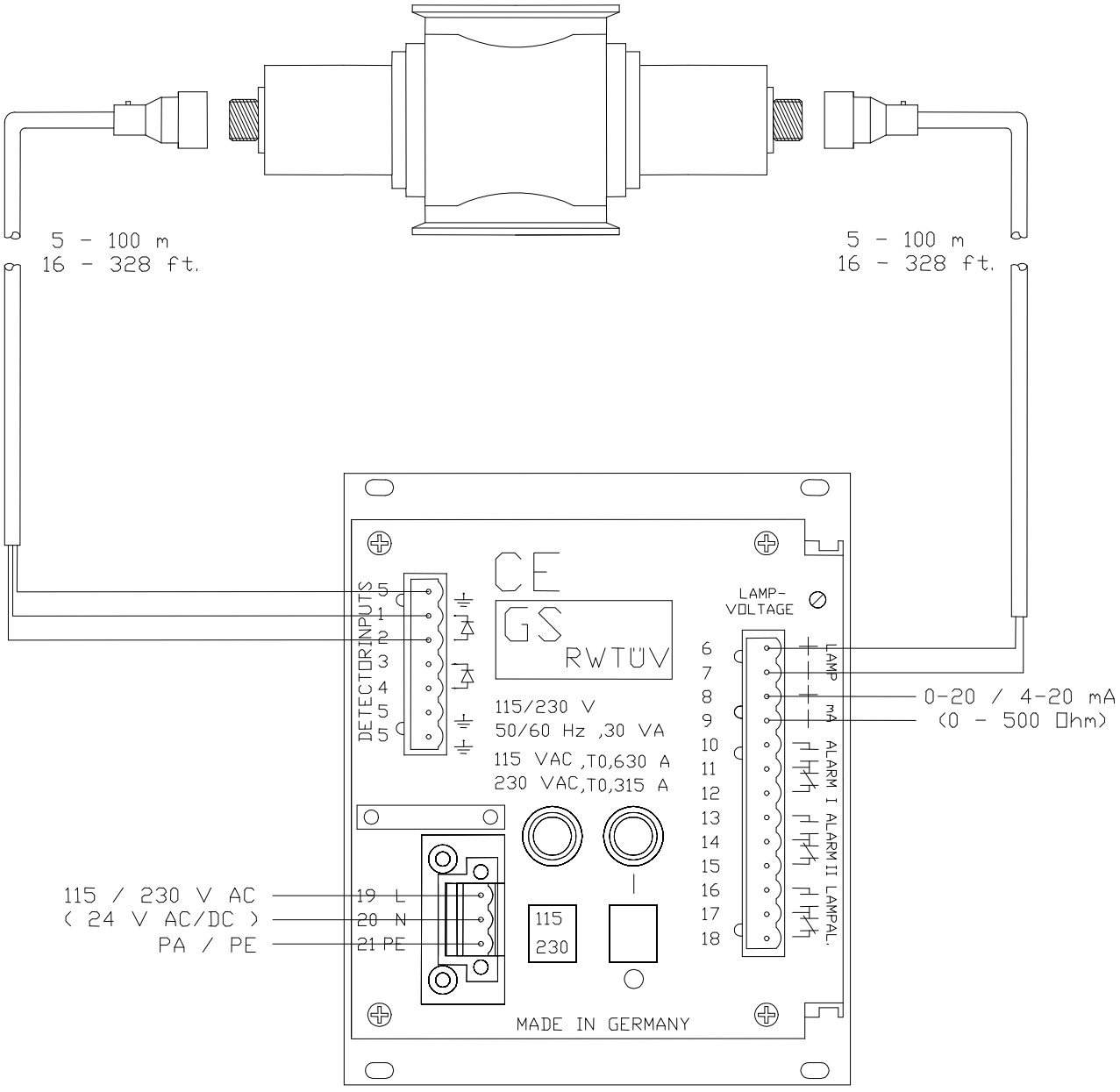
Terminal connections:

- 1, 2, 5 **detector cable to sensor (measurement)**
  1 = white (A1) 2 = brown (A2) 5 = black (A5)
- 3, 4, 5 **detector cable to sensor (reference)**
  3 = white (C3) 4 = brown (C4) 5 = grey (C5)
- 6, 7 **lamp cable to sensor**
  6 = white or blue (6) 7 = brown (7)
- 8, 9 mA-output (8 + / 9 –)
- 10, 11, 12, alarm 1
- 13, 14, 15, alarm 2
- 16, 17, 18 lamp failure alarm, active
- 19, 20, 21 power supply 115 / 230 V_{AC} (OPTION: 24 $V_{AC/DC}$)
- (1 x 5) not in use

Fuses 230 V_{AC}: 2 x SB 0.315 A (already installed from factory)
Fuses 115 V_{AC}: 2 x SB 0.630 A have to be installed (fuses are included) because the system has been set by the factory to 230 V_{AC}

Fuses 24 $V_{AC/DC}$: 2 x SB 1.25 A (already installed from factory with option: 24 $V_{AC/DC}$)

7.2 Field Wiring Schematic Model ATA-K / ATT-KA - 115/230 V_{AC} (24 $V_{AC/DC}$)



The system consists of two components, the converter type ATT-KA and the sensor type ATA-K which are interconnected with two cables (max. 100 m / 328 ft). Concerning the sensor, it is impossible to cross connect the cables, as different plugs are used. (9-pole on the detector side, 4-pole on the lamp side). The detector cable is not compatible with former version cables with an 8-pole connector!!!

It is absolutely necessary to adjust the lamp voltage to correspond with the cable length (please refer to paragraph 8.4.).

Because the system of sensor and converter are calibrated together, it is necessary to connect the converter type ATT-KA only with the appropriate sensor type ATA-K (see serial-no.-label) :

Model:	ATA-K
Serial No.:	XXXXX
Matched	YYYYY

Model:	ATT-KA
Serial No.:	YYYYY
matched	XXXXX

Terminal connections:

- 1, 2, 5 **detector cable to sensor (measurement)**
  1 = white (A1) 2 = brown (A2) 5 = black (A5)
- 6, 7 **lamp cable to sensor**
  6 = white or blue (6) 7 = brown (7)
- 8, 9 mA-output (8 + / 9 –)
- 10, 11, 12, alarm 1
- 13, 14, 15, alarm 2
- 16, 17, 18 lamp failure alarm, active
- 19, 20, 21 power supply 115 / 230 V_{AC} (OPTION: 24 $V_{AC/DC}$)

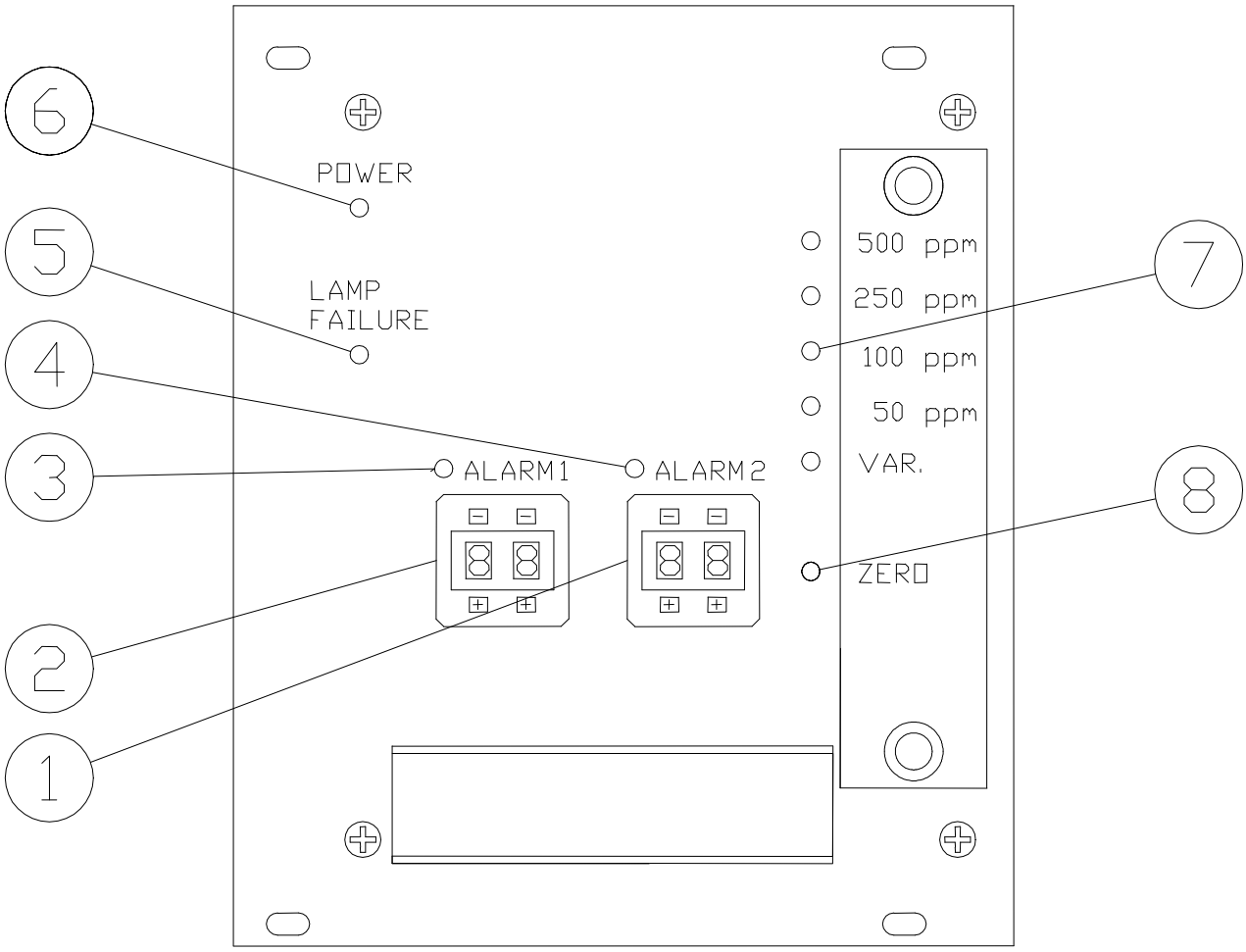
- 3, 4 (2 x 5) not in use

Fuses 230 V_{AC}: 2 x SB 0.315 A (already installed from factory)
Fuses 115 V_{AC}: 2 x SB 0.630 A have to be installed (fuses are included) because the system has been set by the factory to 230 V_{AC}

Fuses 24 $V_{AC/DC}$: 2 x SB 1.25 A (already installed from factory with option: 24 $V_{AC/DC}$)

8. Operation

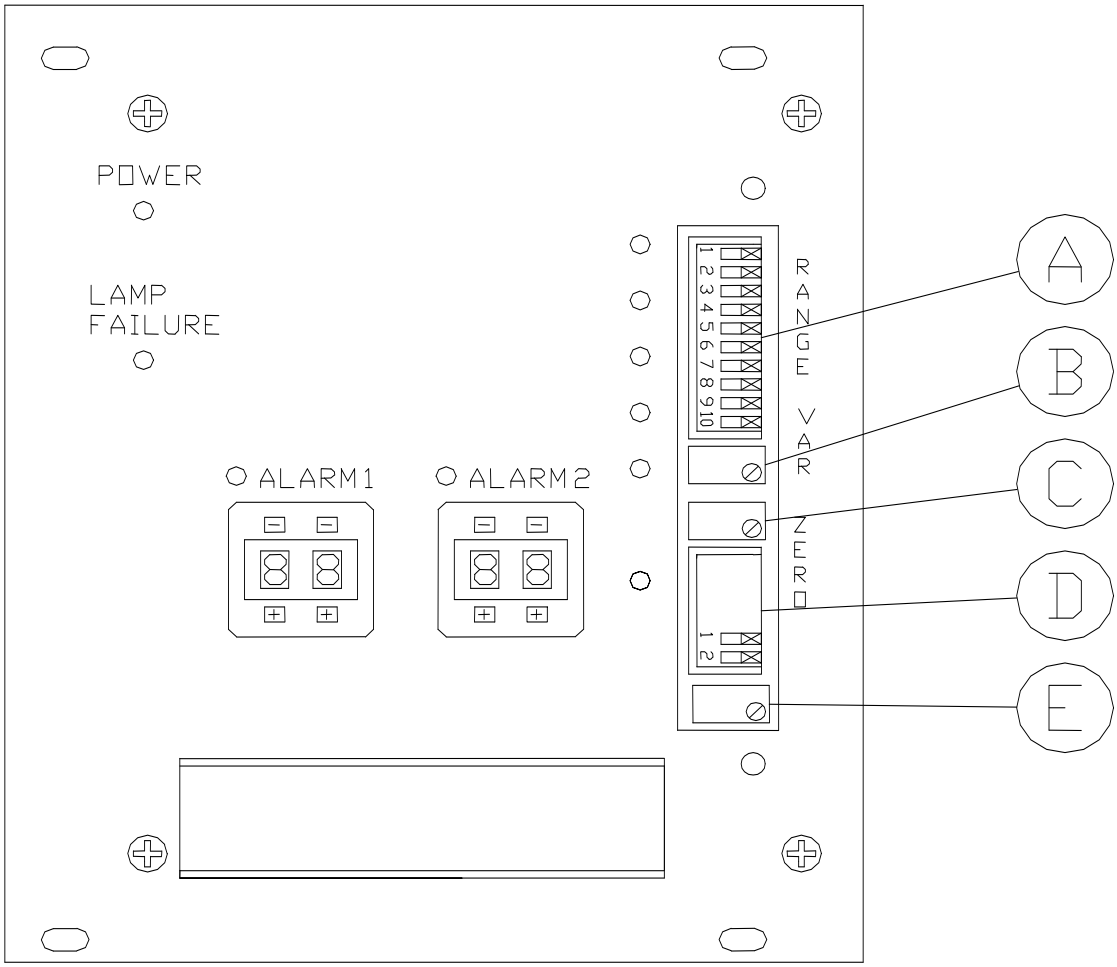
8.1 Front Panel ATT-KS



Description:

1 code setter for alarm 2 in steps of 1 % of respective measuring range
2 code setter for alarm 1 in steps of 1 % of respective measuring range
3 LED (red), alarm 1 indicator
4 LED (red), alarm 2 indicator
5 LED (red), lamp failure indicator
6 LED (red), power on
7 5 LEDs (yellow), indicator for range setting
8 LED (green), zero

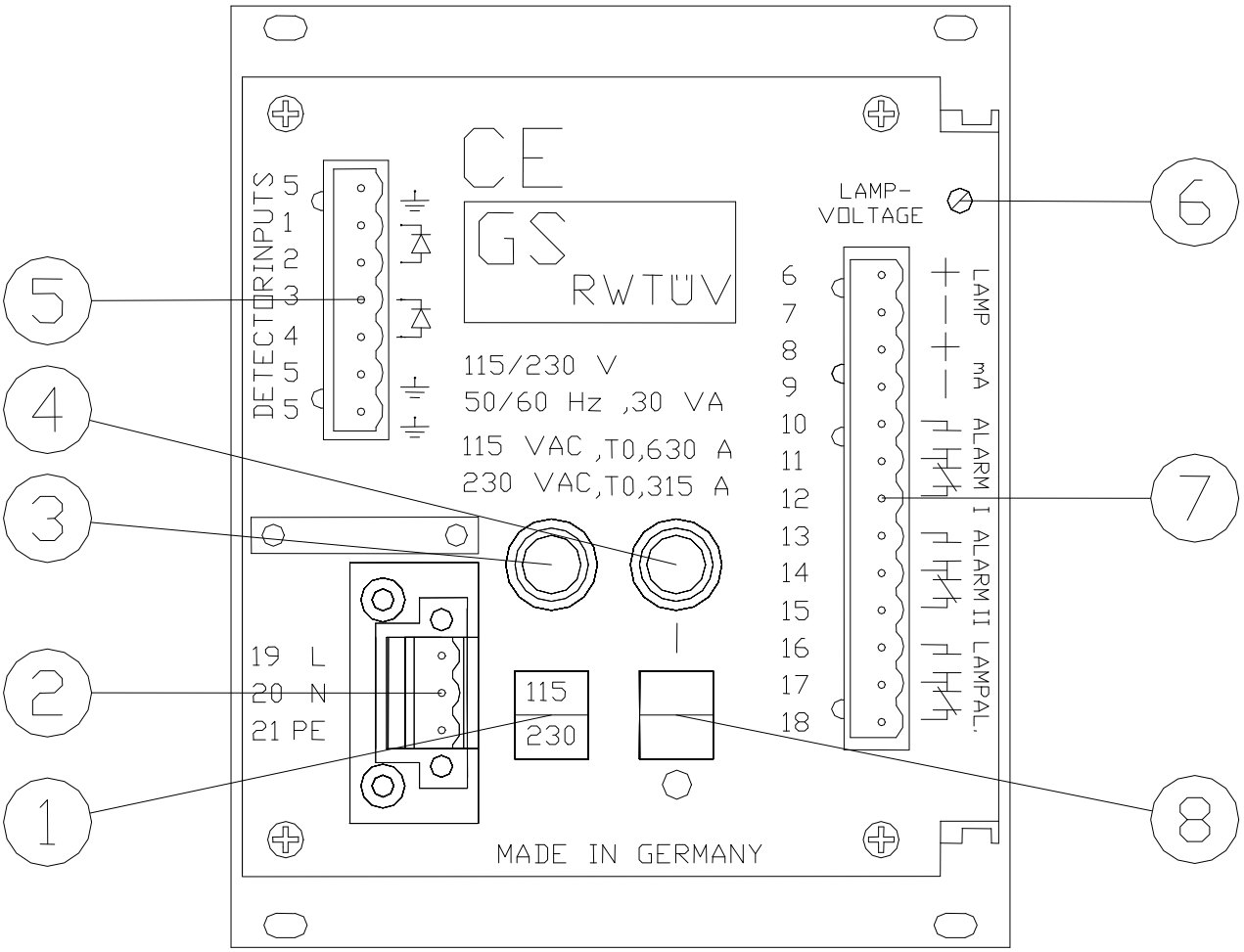
Description of the DIP-switches below the covering plate



Description:

A DIP-switch for range setting
B potentiometer for variable range adjustment
C potentiometer for zero adjustment
D DIP-switch for adjustment of digital read-out A3 (Option)
E potentiometer for adjustment of digital read-out A3 (Option)

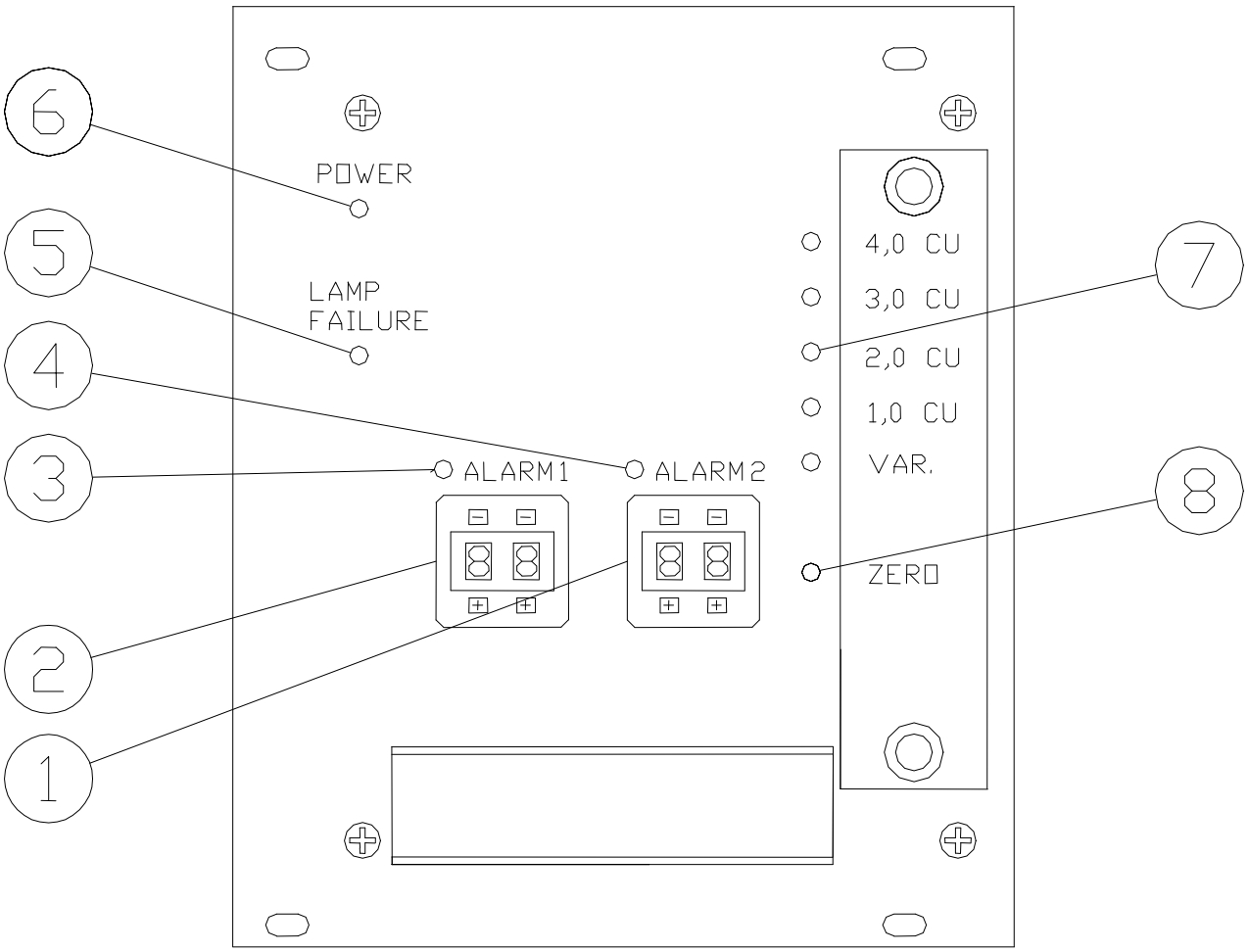
8.2 Back Panel ATT-KS



Description:

1 voltage selector (factory setting: 230 V_{AC}) - (not with 24 $V_{AC/DC}$ - Version)
2 terminal III for power supply (fixed)
3 fuse I SB 0.315 A for 230 V_{AC} - SB 0.630 A for 115 V_{AC} - SB 1.250 A for 24 $V_{AC/DC}$
4 fuse II SB 0.315 A for 230 V_{AC} - SB 0.630 A for 115 V_{AC} - SB 1.250 A for 24 $V_{AC/DC}$
5 terminal I for detector cable
6 potentiometer for lamp voltage adjustment
7 terminal II for lamp cable, mA-output, relay-outputs
8 main power switch ON/OFF

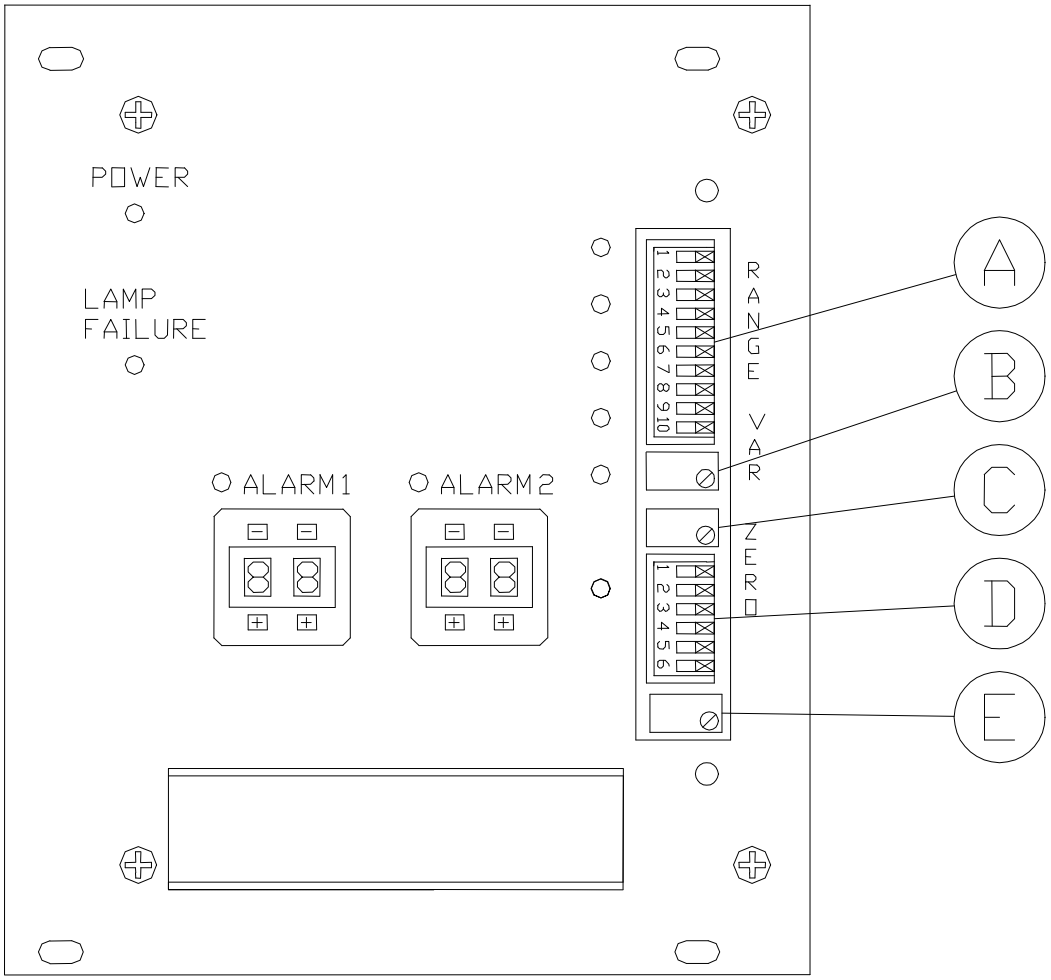
8.3 Front Panel ATT-KA



Description:

1 code setter for alarm 2 in steps of 1 % of respective measuring range
2 code setter for alarm 2 in steps of 1 % of respective measuring range
3 LED (red), alarm 1 indicator
4 LED (red), alarm 2 indicator
5 LED (red), lamp failure indicator
6 LED (red), power on
7 5 LEDs (yellow), indicator for range setting
8 LED (green), zero

Description of the DIP-switches below the covering plate



Description:

ADIP-switch for range setting
Bpotentiometer for variable range adjustment
C potentiometer for zero adjustment
D DIP-switch for adjustment of digital read-out A3 (Option)
Epotentiometer for adjustment of digital read-out A3 (Option)

8.4 Lamp Voltage Adjustment (ATT-K)

Normally, it is not necessary to change the lamp voltage, because the instrument has already been factory adjusted to the sensor and cable set delivered with the converter. In case the cable length was not specified in time for shipment of the instrument, the lamp voltage is always factory set to the shortest possible cable length (5 m). An adjustment of the lamp voltage to the cable length is necessary to compensate for voltage drop within the cables. If the lamp voltage is too low, incorrect measured values may occur. If the lamp voltage is too high, the lifetime of the lamp module may be reduced considerably.

To realise longer cable lengths beside the standard cable (1.5 mm²) a heavier cable (2.5 mm²) is delivered with a cable length from 100 m. If the cable length is adjusted on site this has to be observed when adjusting the lamp voltage.

cable lengths		**lamp voltage V_{DC}**	
m	**ft.**	**1.5 mm²**	**2.5 mm²**
0	0	**4.80**	
5	16	**4.90**	
10	33	**4.99**	
15	49	**5.09**	
20	66	**5.18**	
25	82	**5.28**	
30	98	**5.38**	
35	115	**5.47**	
40	131	**5.57**	
45	148	**5.66**	
50	164	**5.76**	
60	197	**5.95**	
70	230	**6.14**	
80	262	**6.34**	
90	295	**6.53**	
100	328	**6.72**	
110	361		5,99
120	394		6,10
130	427		6,20
140	459		6,31
150	492		6,42
lamp voltage =		**4,80 + 0,0192 / m**	**4,80 + 0,0108 / m**
resistance =		**12,8 Ohm / 1000 m**	**7,2 Ohm / 1000 m**

The lamp voltage can be measured at terminals 6 and 7 on the back panel of the converter. The following lamp voltages should be adjusted with potentiometer (6) on the back panel with respect to the installed cable lengths (**values are only correct for original cable sets!!!**). Cable and lamp module have to be connected for a minimum of 3 minutes before measuring the lamp voltage, because the instrument adjusts the voltage depending on the load.

8.5 Zero Adjustment

During initial system start-up and preventive maintenance, the system's zero should always be set. Prior to adjusting the zero, the following points must be checked:

a) the sensor and the windows must be clean.

b) the sensor must be filled with clean, particle-free water - or chosen zero solution.

c) no gas bubbles are present in the liquid.

d) no gas bubbles are present on the windows.

e) there is no direct light entering the sensor (in case there is, cover the cell).

f) wait at least 15 min. for the system to warm up.

Once the above conditions are met, the system's zero can be precisely adjusted by means of the potentiometer (C, chapter 8.1) “zero“ under the cover at the front panel as follows:

For zero adjustment first loosen the two screws on the front panel to remove the cover. Turn the potentiometer (C) with a screwdriver to the far right and then **slowly** to the left until the green LED (8, chapter 8.1) “zero“ flashes. As long as this LED flashes, zero is adjusted to $\pm$ 1 % of the actual measuring range.

ATS-K: When performing the zero adjustment with normal tap water, sometimes even with distilled water, turbidities between 0.2 and 2 ppm are very common.

If it is not possible to adjust to zero, first check the sensor's contents, the windows, lamp, wiring and the serial-no. of sensor and converter, then repeat the procedure.

ATA-K: After changing the detector module and/or the optical pathlength, it may happen in very rare cases that the zero point can only be adjusted after an adjustment of the internal operating range.

8.6 Alarm Adjustment

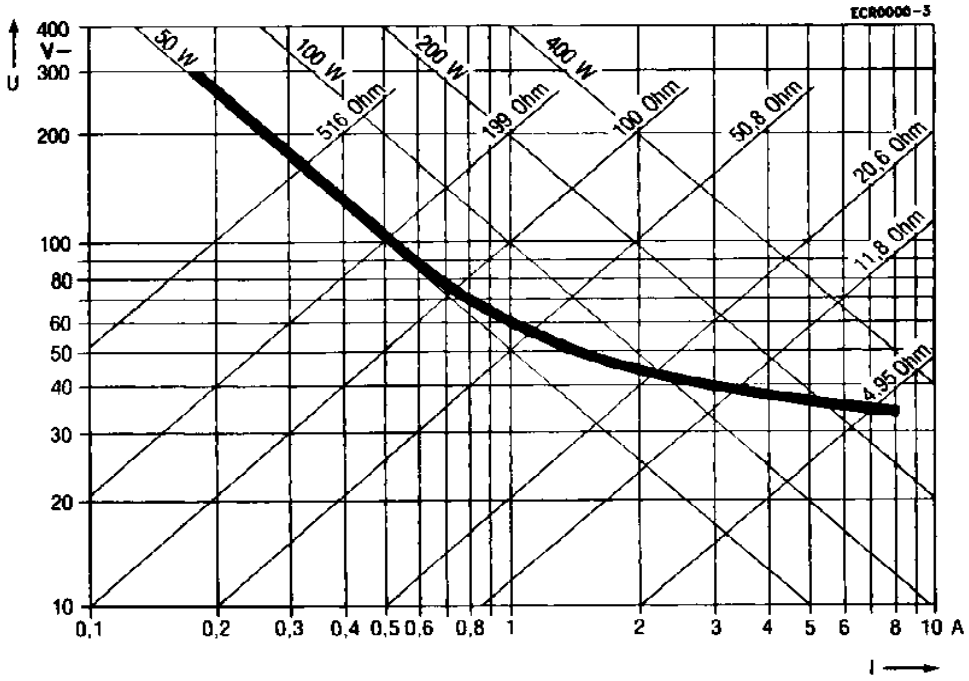
8.6.1 Setpoint adjustment

There are two independent adjustable alarms available. The activation of the alarms is indicated by two red LED's (3 and 4, chapter 8.1). The respective relay-outputs are available on terminals 10, 11, 12 for alarm 1 and on terminals 13, 14, 15 for alarm 2. The adjustment of the setpoints is carried out by code setter (2) for alarm 1 and code setter (1) for alarm 2. With these code setters, you are able to set the alarms in 1 % steps of the respective measuring range within 0-99 %. Since these alarms are activated by integrators, their function is related to the process dynamics. A small (slow) increase above setpoint will cause a delayed alarm. Respectively a large (fast) increase will cause an immediate alarm.

8.6.2 Lamp failure alarm

Lamp failure or a similar system failure is indicated through pick-up of the lamp failure relay on terminals 16, 17, 18 and flashing of the lamp failure LED (5, chapter 8.1). The resulting loss of the minimum signals of the sensor will activate the two alarms and associated LED's (3 and 4). The lamp failure relay is “ON” during active operation, this means that under normal conditions, the lamp failure relay is activated. In case of low lamp current (approx. < 310 mA) the lamp failure relay is deactivated in a fail-safe configuration. This allows indication of lamp and power or system failure

8.6.3 voltage-current contact ratings



8.6.4 mA-output

To transmit the measuring signal, a mA-output is provided as a standard (galvanically isolated > 500 V_{DC}). This mA-output is always set to 4 - 20 mA.

8.7 Range Adjustment

A change of the measuring range can be carried out by using the DIP-switch (A, chapter 8.1 and 8.3) under the cover on the front panel. As a standard the following measuring ranges are available:

8.7.1 ATS-K / ATT-KS (Scattered light principle)

0 - 50 ppm	0 - 20 FTU	0 - 5 EBC
0 - 100 ppm	0 - 40 FTU	0 - 10 EBC
0 - 250 ppm	0 - 100 FTU	0 - 25 EBC
0 - 500 ppm	0 - 200 FTU	0 - 50 EBC

VARIABLE: 0 - 25 to 0 - 500 ppm (factory setting 0 - 25 ppm)
VARIABLE: 0 - 10 to 0 - 200 FTU (factory setting 0 - 10 FTU)
VARIABLE: 0 - 2.5 to 0 - 50 EBC (factory setting 0 - 2.5 EBC)

After removing the 2 screws on the front panel the cover can be removed. The setting of the measuring range is according to the following table:

Range: DIP-switch:	**0 - 500 ppm 0 - 200 FTU 0 - 50 EBC**	**0 - 250 ppm 0 - 100 FTU 0 - 25 EBC**	**0 - 100 ppm 0 - 40 FTU 0 - 10 EBC**	**0 - 50 ppm 0 - 20 FTU 0 - 5 EBC**	**Variable**
1	**ON**	OFF	OFF	OFF	OFF
2	**ON**	OFF	OFF	OFF	OFF
3	OFF	**ON**	OFF	OFF	OFF
4	OFF	**ON**	OFF	OFF	OFF
5	OFF	OFF	**ON**	OFF	OFF
6	OFF	OFF	**ON**	OFF	OFF
7	OFF	OFF	OFF	**ON**	OFF
8	OFF	OFF	OFF	**ON**	OFF
9	OFF	OFF	OFF	OFF	**ON**
10	OFF	OFF	OFF	OFF	**ON**

To adjust the appropriate measuring range, first set the instrument to the largest range (500 ppm resp. 200 FTU / 50 EBC) to get information about the occuring measurement peaks. Now use the DIP-switch to adjust to the smallest possible range where still all peaks are not leading to an overrange (i.e.: peak at 180 ppm = range selector to 200 ppm). This can be easily controlled by increasing the alarm setting until the alarm LED stops flashing.

For special applications, the **variable range** can be set to a customer specified range. For this any range between 25 ppm and 500 ppm (10 FTU and 200 FTU resp. 2.5 EBC and 50 EBC) can be used. The delivered factory presetting for this range is 0 - 25 ppm (resp. 0 - 10 FTU / 0 - 2.5 EBC). The adjustment of the variable range is carried out with the potentiometer (B) under the cover on the front panel.

Adjustment of the variable range:

1) First fill the pipe, or the sensor body if it is not installed yet, with a slightly turbid liquid and make sure no outside light is getting into the sensor. Wait until the reading of the mA-output stabilizes. Select the first fixed measuring range which is a bit higher than the desired variable range.

2) A multimeter connected to the mA-output at terminals 8 and 9 on the back panel will provide the actual reading.

3) Adjust the variable range by using the potentiometer (B) according to the following example:

a) fixed range: 0 - 500 ppm
mA-output (4-20): 12 mA corresponding measurement: 250 ppm

b) switch to variable range

c) variable range: 0 - 350 ppm (desired)
Turn the potentiometers (B) to the right (resp. to the left) till the multimeter delivers the following reading:

mA-output (4-20) 15.4 mA corresponding measurement: 250 ppm

$$\text{Calculation adjustment} = \frac{\text{measurement (250 ppm)}}{\text{desired range (350 ppm)}} \times 16\text{ mA} + 4\text{ mA} = 15.4\text{ mA}$$

d) Recheck zero according to paragraph 8.5

8.7.2 ATA-K / ATT-KA (Absorption principle)

A change of the measuring range can be carried out by using the DIP-switch (A, chapter 8.1) under the cover on the front panel. As a standard the following measuring ranges are available:

0 - 2 CU
0 - 2 CU
0 - 3 CU
0 - 4 CU
VARIABLE: 0 - 0.5 to 0 - 4 CU (factory setting 0 - 0.5 CU)

One CU is defined as the negative decade logarithm of the light intensity. Or in other words, an increase of 1 CU corresponds to an attenuation of the light source by 90 %. This gives the following table:

Measuring value (CU)	**remaining light (%)**
0,00	100,0
0,05	89,1
0,10	79,4
0,20	63,1
0,50	31,6
1,00	10,0
2,00	1,0
3,00	0,1
4,00	0,01
5,00	0,001
6,00	0,0001

After removing the 2 screws on the front panel the cover can be removed. The setting of the measuring range is according to the following table:

Range: DIP-switch:	**0 - 4 CU**	**0 - 3 CU**	**0 - 2 CU**	**0 - 1 CU**	**variable**
1	**ON**	OFF	OFF	OFF	OFF
2	**ON**	OFF	OFF	OFF	OFF
3	OFF	**ON**	OFF	OFF	OFF
4	OFF	**ON**	OFF	OFF	OFF
5	OFF	OFF	**ON**	OFF	OFF
6	OFF	OFF	**ON**	OFF	OFF
7	OFF	OFF	OFF	**ON**	OFF
8	OFF	OFF	OFF	**ON**	OFF
9	OFF	OFF	OFF	OFF	**ON**
10	OFF	OFF	OFF	OFF	**ON**

To adjust the appropriate measuring range, first set the instrument to the largest range (4 CU) to get information about the occurring measurement peaks. Now use the DIP-switch to adjust to the smallest possible range where all peaks are still not leading to an over-range ((i.e.: peak at 1,8 CU = range selector to 2 CU). This can be easily adjusted by increasing the alarm setting until the alarm LED stops flashing.

Adjustment of the variable range:

1. First fill the pipe, resp. the sensor body if it is not installed yet, with a slightly turbid liquid and make sure that no outside light is getting into the sensor. Wait until the reading of the mA-output stabilizes. Select the first fixed measuring range, which is a bit higher than the desired variable range.

2. A multimeter connected to the mA-output at terminals 8 and 9 on the back panel will provide the actual reading.

3. Adjust the variable range by using the potentiometer (B) according to the following example:

a) fixed range: 0 - 3.0 CU
mA-output (4-20): 12 mA corresponding measurement: 1.5 CU

b) switch to variable range

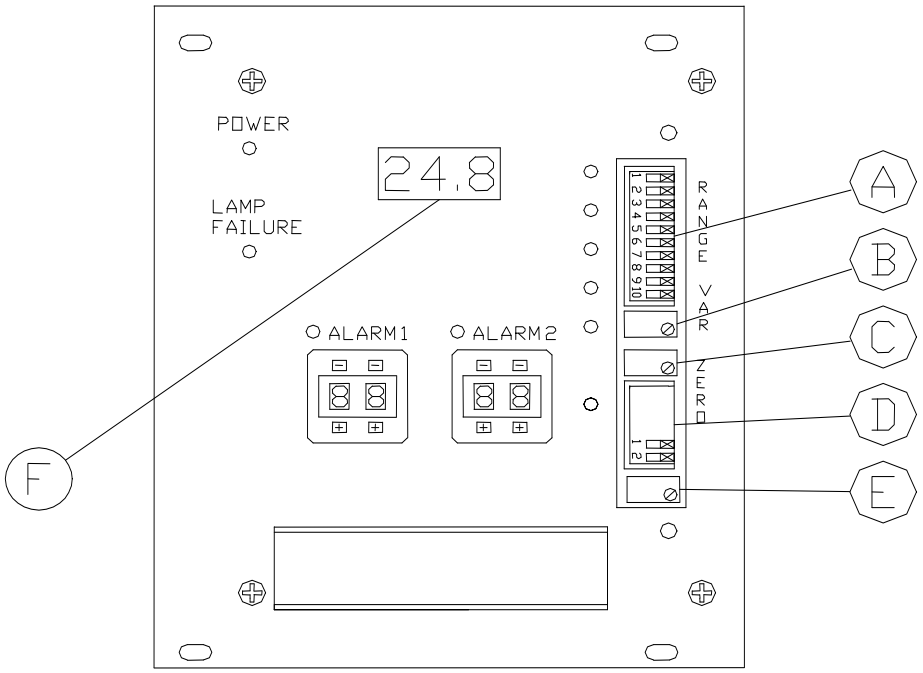
c) variable range: 0 - 2.3 CU (desired)
Turn the potentiometers (B) to the right (resp. to the left) till the multimeter delivers the following reading:

mA-output (4-20) 14.4 mA corresponding measurement: 1.5 CU

$$\text{Calculation adjustment} = \frac{\text{measurement (1.5 CU)}}{\text{desired range (2.3 CU)}} \times 16\text{ mA} + 4\text{ mA} = 14.4\text{ mA}$$

d) Recheck zero according to paragraph 8.5

8.8 Adjustment of Digital Read-Out



Description:

A DIP-switch for range setting
B potentiometer for variable range adjustment
C potentiometer for zero adjustment
zero pre-calibration (factory set)
D DIP-switch 1,2,3,4: zero pre-calibration (factory set)
DIP-switch 5, 6: decimal point setting of the digital read-out:

5 = OFF	6 = OFF	no decimal point	(XXX)
5 = ON	6 = OFF	1 digit	(XX.X)
5 = OFF	6 = ON	2 digits	(X.XX)

E Potentiometer to adjust the span of the digital read-out:

By using the potentiometer, the span of the digital read-out (4 mA = 0 % / 20 mA = 100%) can be adjusted to any value between 100 and 999 as follows:
First fill the pipe, resp. the sensor body if it is not installed yet, with a slightly turbid liquid and make sure that no outside light is getting into the sensor. Wait until the reading of the mA-output stabilizes. A multimeter connected to the mA-output at terminals 8 and 9 on the back panel will provide the actual reading. Adjust the span by adjusting the potentiometer (E) according to the following example:

mA-output = 14,4 mA	reading is 65 %
set LED read-out to 065	reading is 0 - 100
set LED read-out to 325	reading is 0 - 500

F 3-digits, LED read-out (7 mm)

9. Commissioning

Basic rules:

1. Read the instruction manual before installation!!!
2. Only trained personnel should be allowed to install!!!
3. If something is not clear - check before installation!!!

procedure (referring to paragraphs in this instruction manual)	**initial start-up**	**start-up after stop**	**start-up after lamp replacement**
Read instruction manual !!!	**XXX**	**XXX**	**XXX**
Check shipment to be complete as ordered	**XXX**		
Inspect parts for damage	**XXX**		
Install measuring cell (0,)	**XXX**		
Check piping and connections for leakage	**XXX**		
Check windows for cleanliness	**XXX**	**XXX**	
Install converter (6.1)	**XXX**		
Install cables (7.1, 7.2)	**XXX**		
Connect cables (7.1, 7.2)	**XXX**		
Connect power (7.1, 7.2, 8.2)	**XXX**		
Power up converter (8.2)	**XXX**	**XXX**	**XXX**
Allow 15 min. to warm-up	**XXX**	**XXX**	**XXX**
Adjust lamp voltage / cable length (8.4)	**XXX**		
Adjust instrument zero (8.1, 8.5)	**XXX**	(XXX)	**XXX**
Set measuring range (8.1, 8.7)	**XXX**		
Set alarms (8.6)	**XXX**		
Note all settings (5.1/16.5)	**XXX**	(XXX)	**XXX**
Check readings for correctness	**XXX**	**XXX**	**XXX**
Allow measurement for control purpose	**XXX**	**XXX**	**XXX**

10. Fault Finding

In case of a system failure, the following should be checked:

10.1 Connection Failure

It is impossible to cross connect the plugs on the sensor, as the lamp plug has four-poles and the detector plug has nine-poles. Therefore, the fault will only be found at the connection wiring to the converter. Please check according to paragraph 7.

10.2 Cable Failure

If a continuity check of the cables is performed and a failure of the cable or a broken connector is found, replace only with new factory cable to ensure best possible results. It is highly recommended not to repair cables or connectors!!!

• lamp cable:	6	(white or blue)	<->	connector POLE 1
	7	(brown)	<->	connector POLE 4
• detector cable:	A1	(white)	<->	connector POLE 2 (measurem.)
	A2	(brown)	<->	connector POLE 4 (measurem.)
	A5	(black)	<->	connector POLE 7 (inner shield)
ATS-K only:				
• detector cable:	C3	(white)	<->	connector POLE 3 (reference)
	C4	(brown)	<->	connector POLE 6 (reference)
	C5	(grey)	<->	connector POLE 8 (inner shield)

10.3 Lamp Failure

In case the lamp circuit is broken (i.e. Lamp failure = lamp current < approx. 310 mA) it is indicated through pick-up of the lamp failure relay and flashing of the lamp failure LED (5). The procedure then is to loosen the four screws on the optical arm and to install a replacement lamp module. This can be done on-line. (refer to paragraph 16.1, 16.2).

- lamp module ATS-K (PN: 2100-0206-00)
- lamp module ATA-K (PN: 2100-0205-00)

10.4 Detector failure

Both alarms are activated and zero adjustment (refer to paragraph 8.5) is no longer possible if one or both detector circuits have failed. The procedure then is to loosen the optical arm by hand and to install a replacement detector module. This can be carried out while on-line. (refer to paragraph 16.1, 16.2).

- detector module ATS-K (PN: 2500-0506-00)
- detector module ATA-K (PN: 2500-0307-00)

10.5 Window fouling

Depending on the process conditions, fouling of the window surfaces may cause an erroneous reading. In this case adequate cleaning is required. In most processes the use of sapphire windows may increase the cleaning interval.

10.6 Window corrosion

Depending on the process conditions and the selected window material (i.e. Pyrex®), corrosion on the optical surfaces of the windows may occur which will cause an erroneous reading. In such cases the existing windows should be replaced by sapphire windows.

10.7 Condensation

Due to low temperatures of the process medium, the temperature in the sensor housing drops below the dew point of the air, thus resulting in a condensate deposit on the windows. In this case the sensor should be equipped with the corresponding window rings with purge connections (refer to paragraph 16.4). For start-up the two optical housings, lightly unscrewed, should be purged for about 10 min. with dry air (oil and dust free). Then tighten the optical housings again and leave the purge connection in order to maintain a light pressure (max. 0.1 bar) above atmospheric. The air consumption is minimum under this condition.

10.8 Overranging

10.8.1 ATS-K / ATT-KS

If the measuring range has been exceeded due to process conditions, the next higher range should be adjusted (refer to paragraph 8.7). If the system is already in the highest range, it is not possible to get a working measurement by shortening the optical pathlength. In most cases the use of a single-beam absorption detector model ATA-K / ATT-KA will solve the problem.

10.8.2 ATA-K / ATT-KA

If the measuring range has been exceeded due to process conditions, the next higher range should be adjusted (refer to paragraph 8.7). If the system is already in the highest range, it is possible to get a working measurement by shortening the optical pathlength. This might be carried out by simply replacing the windows.

10.8.3 mA-output

If the mA-output is low at high readings, most probably the load of the analogue loop is higher than 500 Ω.

Results of the mA-output under certain conditions:

- no power supply 0 mA
- lamp breakdown 22 - 26 mA
- detector breakdown 22 - 26 mA
- reading < 0 % 3,5 - 4,0 mA
- reading = 0 % 4,0 mA
- reading = 80 % 16,8 mA
- reading = 100 % 20,0 mA
- reading > 100 % 20 - 26 mA

10.8.4 Converter failure

If none of the above-mentioned failures can be traced, the complete system, converter and sensor, should be returned for checking. If possible, leave the sightglass in-line and only send the optical arms.

11. Preventative Maintenance

The Turbidity Measurement Systems have been designed for operation virtually free of maintenance. Extensive quality procedures in production such as checking every single part when received or a 7-day burn-in for electronic components (including lamp modules) guarantees the very best reliability.

11.1 Parts in Contact with the Process Medium

If the materials are well chosen for parts, which are in contact with the process medium, a periodic check is normally not necessary. In most cases a check for leakage during the complete plant survey is sufficient

11.2 Detector Module

The detectors utilized do not have any relevant aging, which can be measured. Therefore replacements / adjustments are not necessary.

11.3 Lamp Module

The lamps are designed for a long service cycle. To further increase the lamp´s life it is operated below its specifications (4.8 V_{DC} instead of 5.0 V_{DC}). Based on the experience of several thousand installations, life cycles of more than 5 years are quite common. From statistics the expected life time is approx. 3 years. (I.e.: heavy vibrations, high temperatures or frequent on/off-switching of the system may reduce this timeframe). Depending on the individual importance of the measurement, a preventive replacement of the lamp module is recommended after 1 to 2 years of operation.

11.4 Cable

The cables in use do not have any relevant aging, which can be measured, if they are properly installed and handled. Therefore replacements / adjustments are not necessary. In very few cases there may occur a problem with isolation of the contacts due to humidity, oil or chemicals. Therefore, the contacts should be visually inspected for any coating (corrosion).

11.5 Converter

The converter including all parts do not have any relevant ageing and are also fully functional with varying ambient temperatures due to the built-in stabilisation.

12. Technical Information

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

13. Order Codes

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

14. Dimensions

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

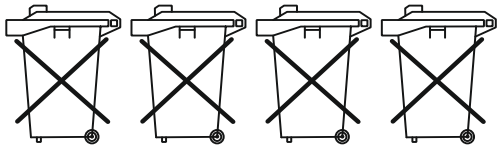
15. Disposal

Note!

- Avoid environmental damage caused by media-contaminated parts
- Dispose of the device and packaging in an environmentally friendly manner
- Comply with applicable national and international disposal regulations and environmental regulations.

Batteries

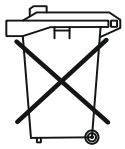
Batteries containing pollutants are marked with a sign consisting of a crossed-out garbage can and the chemical symbol (Cd, Hg, Li or Pb) of the heavy metal that is decisive for the classification as containing pollutants:



Cd[1] Hg[2] Pb[3] Li[4]

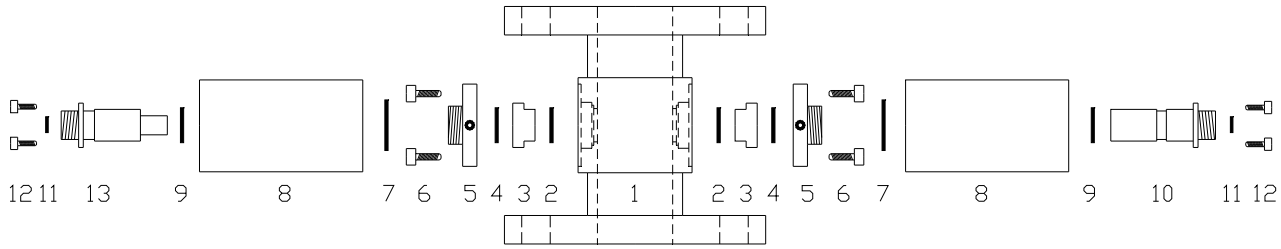
1. „Cd" stands for cadmium
2. „Hg" stands for mercury
3. „Pb" stands for lead
4. „Li" stands for lithium

Electrical and electronic equipment



16. Appendix

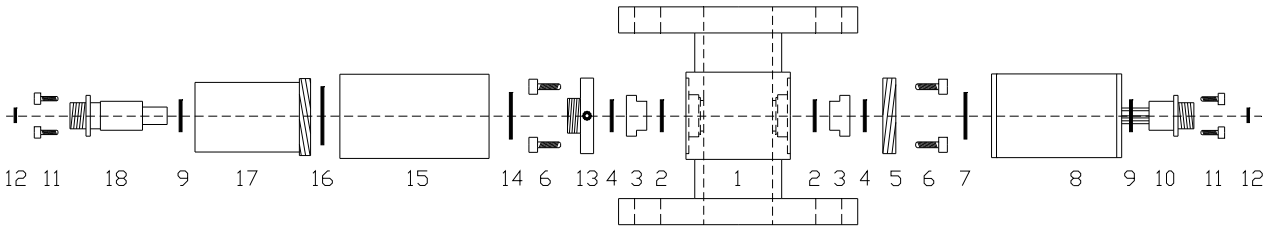
16.1 Exploded View of Sensor ATS-K



Description:

1 measuring cell
2 “O“-ring (21.95 x 1.78 mm), Silicone (optional EPDM, Viton®, Kalrez®)
3 windows, Pyrex® (optional Sapphire)
4 “O“-ring (21.95 x 1.78 mm), Silicone (optional EPDM, Viton®, Kalrez®)
5 window ring M58 x 1.5, 1.4571 (316 Ti)
6 4 screws M4 x 10 (DIN 912) with washer (DIN 7980), 1.4571 (316 Ti)
7 “O“-ring (50.52 x 1.78 mm), Viton®
8 detector module, 1.4571 (316 Ti)
9 “O“-ring (21.95 x 1.78 mm), Viton®
10 detector plug, 9-pole
11 4 screws M3 x 6 (DIN 7985), 1.4571 (316 Ti)
12 “O“-ring (10.1 x 1.6 mm), Viton®
13 window ring M24 x 1,5 AP, 1.4571 (316 Ti)
connector (M5) for AirPurge (screw M5 x 6 (DIN 84) with “O“-ring, Viton® 4 x 1 mm)
14 “O“-ring (25.12 x 1.78 mm), Viton®
15 lamp adapter, 1.4571 (316 Ti) with optic module
16 “O“-ring (31.47 x 1.78 mm), Viton®
17 optical housing (OP06), 1.4571 (316 Ti)
18 lamp module

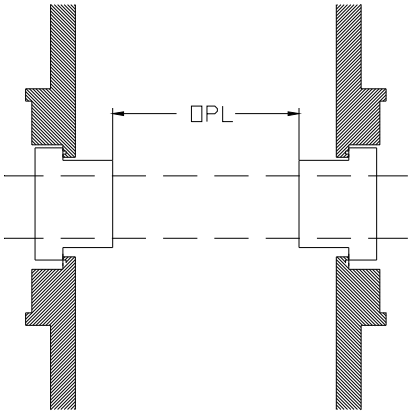
16.2 Exploded View of Sensor ATA-K



Description:

1 measuring cell
2 “O“-ring (21.95 x 1.78 mm), Silicone (optional, EPDM, Viton®, Kalrez®)
3 windows, Pyrex® (optional Sapphire)
4 “O“-ring (21.95 x 1.78 mm), Silicone (optional, EPDM, Viton®, Kalrez®)
5 window ring M24 x 1,5 AP, 1.4571 (316 Ti)
connector (M5) for AirPurge (screw M5 x 6 (DIN 84) with “O“-ring, Viton® 4 x 1 mm)
6 4 screws M4 x 10 (DIN 912) with washer (DIN 7980), 1.4571 (316 Ti)
7 “O“-ring (25.12 x 1.78 mm), Viton®
8 optical housing (OP03-Purge), 1.4571 (316 Ti)
9 “O“-ring (25.12 x 1.78 mm), Viton®
10 detector module
11 “O“-ring (10.1 x 1.6 mm), Viton®
12 4 screws M3 x 6 (DIN 7985), 1.4571 (316 Ti)
13 lamp module

16.3 Optical Pathlengths



Due to the modular concept of the sensors, it is easy to change the optical pathlength (OPL) by changing the windows used:

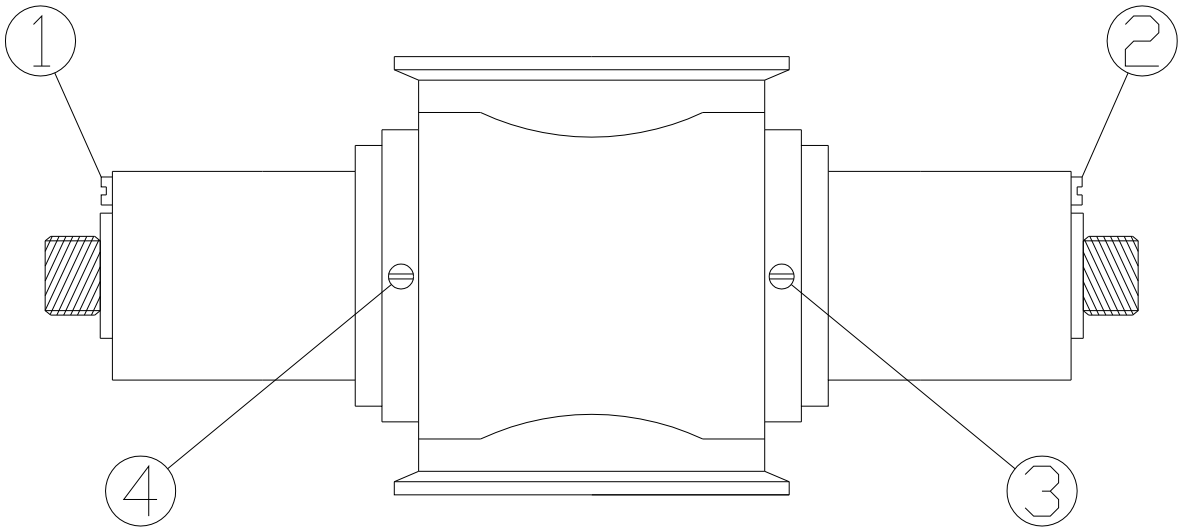
- be sure that the pipe is empty and pressure is released
- loosen the cable connectors (by hand)
- unscrew the optical arms (by hand)
- loosen the 4 screws (No. 6 in paragraph 16.1, 16.2) using an allen wrench (SW3)
- replace the window(s) (No. 3 in paragraph 16.1, 16.2)
- when assembling, make absolutely sure that the „O“rings (No. 2 and No. 4 in paragraph 16.1, 16.2) are exactly positioned in the groove to prevent breaking of the window.
- fasten the 4 screws crosswise (No. 6 in paragraph 16.1, 16.2) using an allen wrench (SW3)

With different window combinations the following optical pathlengths can be achieved:

Window combination	OPL (A/A) = X	OPL (A/A) = 20 mm
A - A	X	20.0 mm
A - B	X - 5.0 mm	15.0 mm
A - C	X - 10.0 mm	10.0 mm
B - B	X - 10.0 mm	10.0 mm
B - C	X - 15.0 mm	5.0 mm
C - C	X - 20.0 mm	not possible
K - K	X - 17.5 mm	2.5 mm

With the ATS sensor the measuring cell and the window combination have to be chosen in such way that there is always a window type “A“on the detector side and that the optical pathlengths is 40 mm minimum.

16.4 AirPurge



Due to low temperature of the process medium, which could cause condensate water to settle the dewpoint of the air inside the optical housing may be reached, condensate settle on the windows. For this case, the sensor is equipped with special window rings with AirPurge connectors. During start-up, the two optical housings have to be slightly unscrewed and dry air (no oil or dust) has to flow for approx. 10 minutes at max. 1 bar through the sensor. Afterwards, the optical arms have to be tightened again and the AirPurge stays connected to achieve a small pressure (0,1 bar). In this case the air consumption is minimized.

AirPurge ATS-K:
On the ATS-K sensor, please use connections 2 (detector side) and 4 (lamp side). The connections 1 and 3 are not available with this model.

AirPurge ATA-K:
On the ATA-K sensor, please use connections 3 and 4. The connections 1 and 2 are not available with this model.

Upon delivery the AirPurge ports are sealed with a M5 x 6 (DIN 84) screw and sealed with an “O“-ring (4 x 1 mm). For installation of AirPurge, the AirPurge connectors (for use with 4 mm ID tubing) must be used.

16.5 Documentation of Installation

Applications:	
Place of installation:	TAG-No.:
Operator:	Phone:
Model:	Delivered:
Serial No. Converter:	Serial No. Sensor:
Process connection:	Line size:
Material:	Gaskets:
Windows:	Optical Pathlength (OPL):
Meas. Wavelength:	
Standard Set-up:	
Range:	
Alarm I:	
Alarm II:	
Notes:	

17. EU Declaration of Conformance

We, KOBOLD Messring GmbH, Nordring 22-24, 65719 Hofheim, Germany, declare under our sole responsibility that the product:

Turbidity Measurement Systems **Model:** **ATS-K / ATT-KS...**
ATA-K / ATT-KA...

to which this declaration relates is in conformity with the following EU directives stated below:

2014/30/EU	EMC Directive
2014/35/EU	Low Voltage Directive
2011/65/EU	**RoHS** (category 9)
2015/863/EU	Delegated Directive (RoHS III)

Also, the following standards are fulfilled:

EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

EN 61326-2-3:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-3: Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements

EN 61326-2-5:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-5: Particular requirements - Test configurations, operational conditions and performance criteria for field devices with field bus interfaces according to IEC 61784-1

EN IEC 63000:2018 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Hofheim, 26 Sept 2023

H. Volz
General Manager

J. Burke
Compliance Manager