

### Safety Precautions:

- The device may only be connected to supply power which complies with the specifications included in the technical data!
- The device must be disconnected from all sources of power during installation and maintenance work!
- The device may only be operated under the conditions specified in the operating instructions!

### Functions Description:

The TRUBOMAT turbidity measuring device determines the turbidity of liquids using the light absorption and scattered light measuring method.

The inline measuring cell at the sensor set makes use of two IR transmitters and one IR receiver in pulsating light mode (IR measuring method according ISO 7027).

The interconnected BAMOPHOX TUR measuring amplifier analyses the 4 to 20 mA signal generated by the sensor set.

### Technical Data:

**Measuring signal:** 4- 20mA, for connection to the BAMOPHOX TUR (436) measuring amplifier

**Observe:** If a different measuring amplifier is used, an external 10 to 30 V DC voltage source is required.  
→ The measuring signal output is a current sink (see wiring diagram at the end of these instructions).

**Auxiliary supply power:** 24V DC<sub>rated</sub> (10- 30V DC)

**Connected load:** 0.5 W

**Remark:** If the measuring circuit is also connected to the auxiliary power supply, the load will increase to additional 24V DCx 20mA= 0,48W

**Terminal housing:** PBT, IP65

**Ambient temperature:** +5...+45°C

**Medium temperature:** +5...+ 60°C

**Max. operating pressure:** 10bar max. 60°C

**Technical Data (continuation):**

<b>Measuring range:</b>	Version 20: 0,01- 20FNU Version 1000: 0,1- 1000FNU (5 selectable resolutions) FNU= "Formazine Nephelometric Units"
<b>Measuring accuracy:</b>	±5% of actual measuring value, ±1% of upper limit of effective range
<b>Colour- / Fouling compensation:</b>	only for GAB 20 available
<b>Control elements:</b>	6-fold DIP switch calibration potentiometer
<b>Indicators:</b>	Status LED (green) Fault LED (red)

**CE-Marks:**

In accordance with low-voltage directive (RL 2006/95/EWG) and EMC-directive (2004/108/EWG)

**Installing the Sensor Fixture:**

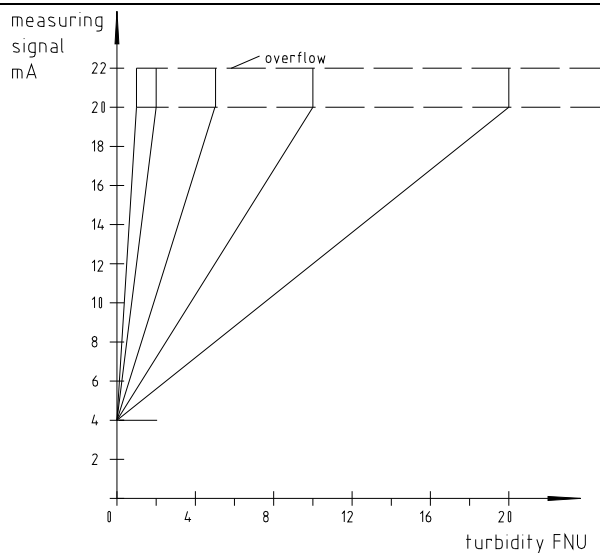
**Observe:**  
**The fixture must be installed vertically!**  
**Best installation is the mounting in a ascending tube with slow down section 600 mm in front and 400 mm behind the turbidity measuring device**

- The sensor fixture must be completely filled with liquid medium during the performance of measurements. Install to the vertical portion of a siphon trap if necessary.
- Air bubbles distort measurement results.
- Glasses must be clean – clean at regular intervals as required.

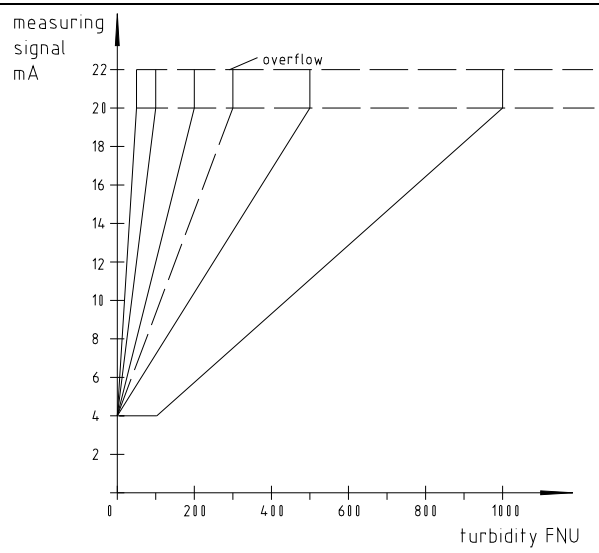
The sensor set consists of a receiver module with microprocessor-controlled analysis electronics and two transmitter modules.

The sensor set generates a 4 to 20 mA output signal in accordance with the following diagram. Measuring ranges are selected with the help of the DIP switches on the receiver module.

**TRUBOMAT GAB 20**



**TRUBOMAT GAB 1000**



**DIP Switch Settings**

Measuring Range [FNU]	DIP1	DIP2	DIP3	DIP4	DIP5	DIP6 *)
1 = 0,01 ... 1	ON	ON	OFF	OFF	OFF	OFF
2 = 0,01 ... 2	OFF	OFF	ON	OFF	OFF	OFF
3 = 0,01 ... 5	ON	OFF	ON	OFF	OFF	OFF
4 = 0,01 ... 10	OFF	ON	ON	OFF	OFF	OFF
5 = 0,01 ... 20	ON	ON	ON	OFF	OFF	OFF

\*) DIP 6= ON → Colour-/ Fouling compensation is switched on

**DIP Switch Settings**

Measuring Range [FNU]	DIP1	DIP2	DIP3	DIP4	DIP5*)	DIP6*)
1 = 0,1 ... 50	OFF	OFF	OFF	ON	OFF	OFF
2 = 0,1 ... 100	ON	OFF	OFF	ON	OFF	OFF
3 = 0,1 ... 200	OFF	ON	OFF	ON	OFF	OFF
4 = 0,1 ... 500 (**300)	ON	ON	OFF	ON	OFF	OFF
5 = 100 ... 1000	OFF	OFF	OFF	OFF	OFF	OFF

\*) DIP-switch 5 and 6 without function, Normal position= OFF  
 \*\*) armatures with nominal diameter > DN65 - DN100

**Troubleshooting:**

- Measuring current 22 mA = overflow
- Measuring current 0 mA = wrong DIP-switch setting (no valid measuring range selected)

**Indication**

green LED= 1Hz blinking	ready, measuring in operation
green LED= permanent ON	ready, measuring not in operation
green LED= OFF	no power supply or defective

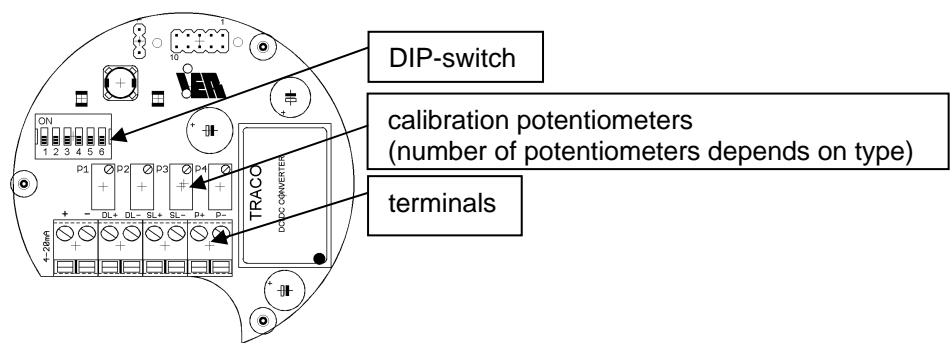
**Fault indication**

red LED= ON	= measuring circuit faulty, (short circuit or broken)
red LED= 1Hz blinking only TURBICUBE 20	= glasses dirty or liquids too much colored (damping factor > 20dB)

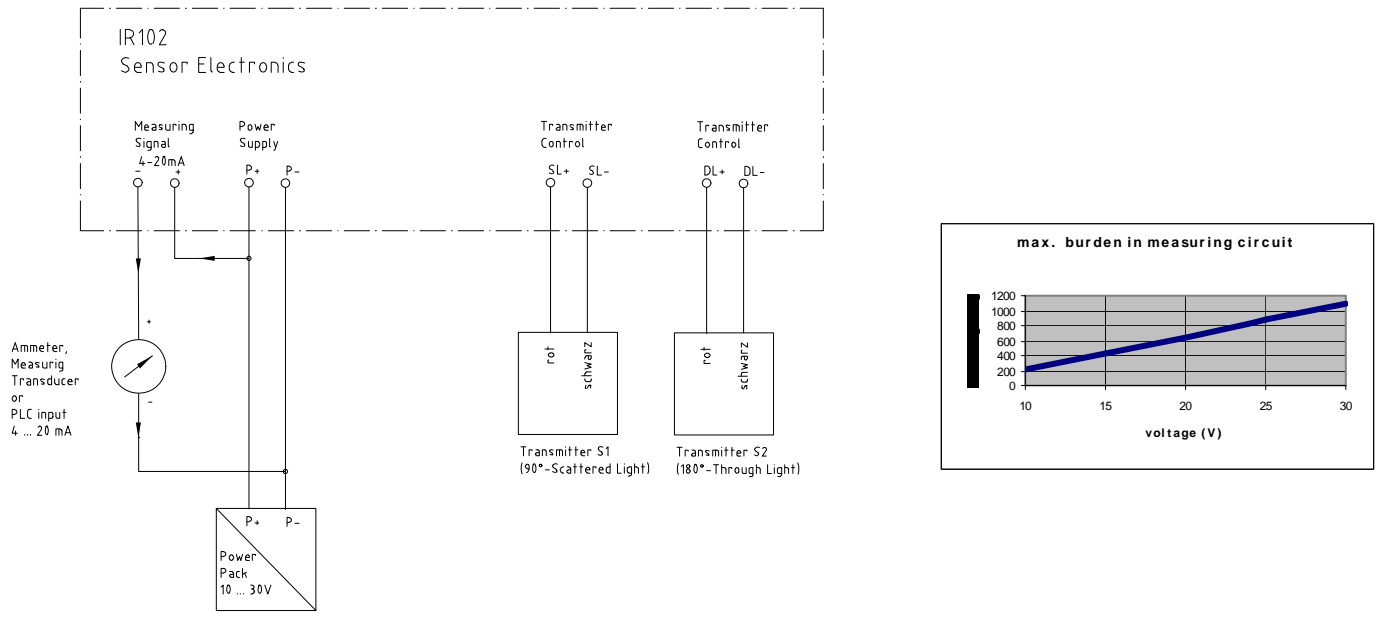
**Installing the Sensor Fixture (continuation):**

**Note:**  
The turbidity measuring instruments are calibrated with the internationally specified standard suspension **Formazin**.  
The indication takes place thus not in form of the measured light intensity, but as concentration of the **Formazin** calibration suspension. During the measurement of any liquid this means thus that the liquid concerned causes the same light scattering as the standard suspension of the indicated concentration. Measured values of other turbidity measuring instruments, which use other calibration suspensions and measuring angle, cannot be compared directly with those with Formazin calibrated measuring instruments!

Receiver Module PCB



**Electrical Connection:**



**Observe:**  
The measuring output "4- 20 mA" is a current drain, that means, the output channel has the same electrical behavior as a variable resistor.  
A active power supply for the measuring circuit is always needed.

**Connection to BAMOPHOX TUR (463)**  
see Operation instruction SU0325

**Maintenance:**

Cleaning intervals depend upon the type of liquid medium and must be determined by the user.

Cleaning the lenses:

- Disconnect the turbidity-measuring instrument from all sources of power.
- Depressurize pipes and empty liquid medium from the device.
- Remove the transmitters and the receiver from the fixture by unscrewing the sleeve nuts.



Unscrew the compression disc with the included tool and remove.



Remove the lens with the included suction cup and clean the lens – **do not use abrasive cleansers, which may cause scratching!!**

- Reassemble after cleaning by following the above instructions in reverse.

**Note: Inspect the O-ring before reassembly and replace if necessary.**

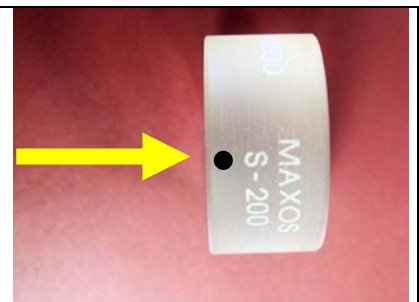
- tighten the compression disc with the included tool (use the rod of the suction cup as a lever).
- Before reinstalling the transmitters and the receiver, refill the fixture with liquid medium and inspect for possible leaks.

**Mounting**



Observe positioning of hole and pin!

This side has a dirt repellent coating. This side must face the medium after the lens has been mounted! Observe the point



Observe above note if coated lenses are used!

**Observe for cold fluids**

The fixture has to be installed to the pipelines **with mounted sensors** only

For cleaning the glasses **dismount the complete fixture**, after cleaning install as described above

**Testing and Readjustment:****Factory Calibration**

The sensor set is equipped with a calibration constant as a design feature.

As a rule, no recalibration is required.

Calibration point accuracy is better than 2%, and drift is less than 1% per year.

**Test Equipment Monitoring**

If device calibration testing is required as part of the respective quality assurance system for test equipment monitoring, calibration can be checked with the calibration rods, and the device can be readjusted if necessary.

A suitable calibration standard is delivered with each turbidity measuring instrument.

Each calibration standard is matched to the specific circumstances of the mating turbidity measuring instrument, and cannot be used for other measuring instruments of the same type!

**The calibration standard and the turbidity measuring instrument must have the same serial number!**



**Calibration box** with mounting tool and calibration rod for TURBICUBE 20  
(for TURBICUBE 1000 there are two rods in the box)

**Testing and Readjustment (continuation):**

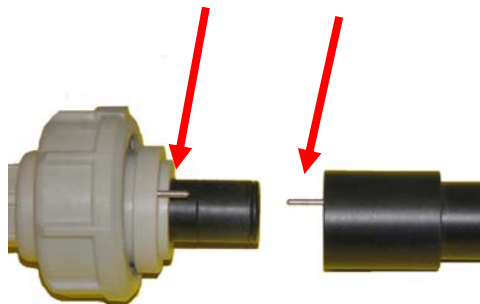
**Attention:**

It must be assured that all utilised control and switching devices are switched off during recalibration!

**Procedure for TRUBOMAT GAB 20:**

**The following adjustment sequence must be adhered to!!**

- Clean all lenses and wipe them dry (all visible water droplets and water film must be removed!).
- Then reinstall the lenses for the receiver and the S1 transmitter **only**.  
 → **Do not yet install** the lens and the compression disc for the S2 transmitter (180° scattered light)!!
- Reinstall the S1 transmitter and the receiver.
- **Remove the KN 20 calibration rod** from the box.
- Insert the calibration rod into the fixture
- Mount the S2 transmitter to the calibration rod (observe the locking pin)



- Insert the calibration rod with attached transmitter completely into the fixture (observe the locking pin), and tighten the sleeve nut.
- Set the DIP switches to the MB5 range = 0,01 to 20NTU (ON/ON/ON/OFF/OFF/OFF)
- Switch supply power back on again – the status LED blinks!
- Compare the setpoint value and the actual value.  
 Setpoint 1 (**SW1**) = setpoint on the plate in the box of the **KN20** calibration rod  
 Actual value = measured value
- Setpoint / actual value deviation:  
 Less than  $\pm 5\%$  → measuring instrument is OK  
 Greater than  $\pm 5\%$  → adjust actual value with potentiometer P4
- remove transmitter and calibration rod
- mount glass with sealing ring and compression disc and transmitter S2
- mount glass with sealing ring and compression disc and transmitter S2
- select the right DIP-switch setting for operation

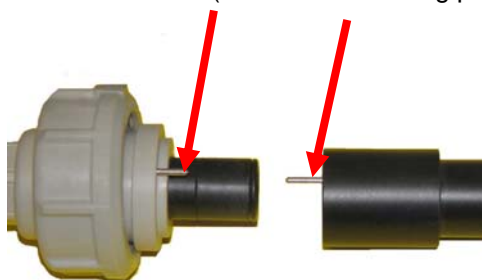
**Testing and Readjustment (continuation):**

**Procedure for TRUBOMAT GAB 1000:**

The following adjustment sequence must be adhered to!!

**Step 1**

- Clean all lenses and wipe them dry (all visible water droplets and water film must be removed!).
- Then reinstall the lenses for the receiver and the S1 transmitter **only**.  
 → **Do not yet install** the lens and the compression disc for the S2 transmitter (180° scattered light)!!
- Reinstall the S1 transmitter and the receiver.
- **Remove the KN-D calibration rod (through light)** from the box.
- Insert the calibration rod into the fixture
- Mount the S2 transmitter to the calibration rod (observe the locking pin)



- Insert the calibration rod with attached transmitter completely into the fixture (observe the locking pin), and tighten the sleeve nut.
- Set the DIP switches to the MB5 range = 100 to 1000 (all DIP-switches OFF).
- Switch supply power back on again – the status LED blinks!
- Compare the setpoint value and the actual value.  
 Setpoint 1 (**SW1**) = setpoint on the plate in the box of the **KN-D** calibration rod  
 Actual value = measured value
- Setpoint / actual value deviation:  
 Less than  $\pm 5\%$  → measuring instrument is OK  
 Greater than  $\pm 5\%$  → adjust actual value with potentiometer P3
- Remove the **KN-D calibration rod (through light)**.

**Step 2**

- **Remove the KN-S calibration rod (scattered light)** from the box.
- Mount the calibration rod to the S2 transmitter as described above.
- DIP switches stay on the MB5 range = 100 to 1000 (all switches off).
- Compare the setpoint value and the actual value.  
 Setpoint 2 (**SW2**) = setpoint on the plate in the box of the **KN-S** calibration rod  
 Actual value = measured value
- Setpoint / actual value deviation:  
 Less than  $\pm 5\%$  → measuring instrument is OK  
 Greater than  $\pm 5\%$  → adjust actual value with potentiometer P2

**Step 3**

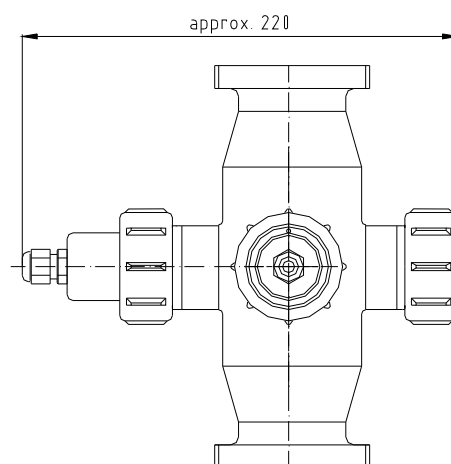
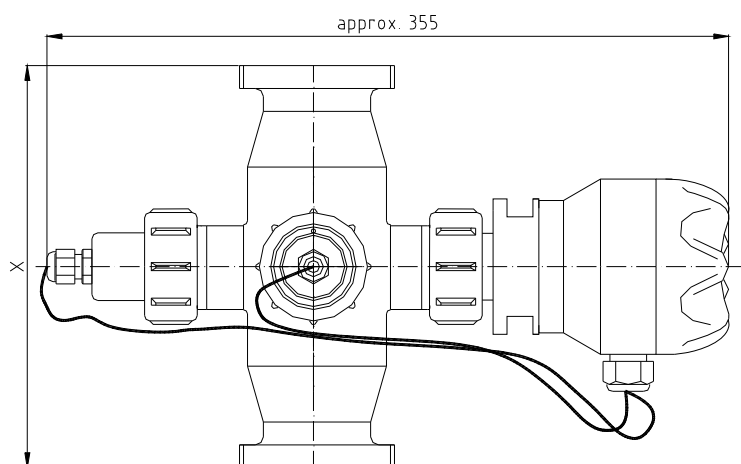
- Set the DIP switches to the MB4 range = 0,1 to 500 (DIP-switches ON/ON/OFF/ON/OFF/OFF).
- Compare the setpoint value and the actual value.  
 Setpoint 3 (**SW3**) = setpoint on the plate in the box of the **KN-D** calibration rod  
 Actual value = measured value
- Setpoint / actual value deviation:  
 Less than  $\pm 5\%$  → measuring instrument is OK  
 Greater than  $\pm 5\%$  → adjust actual value with potentiometer P4
- Remove the **KN-D calibration rod**.

**Step 4**

- mount glass with sealing ring and compression disc and transmitter S2
- select the right DIP-switch setting for operation



### Dimensions:



Dimension drawing GAB RG \_\_7 (DN 65 round thread)

Type	Nominal diameter	Process connection	Inner diameter meas. tube	mounting distance X (± 1 mm)
GAB FF __3	DN25	both sides flange DIN 2633 PN10	DN65	274
GAB FF __4	DN32	both sides flange DIN 2633 PN10	DN65	252
GAB FF __5	DN40	both sides flange DIN 2633 PN10	DN65	230
GAB FF __6	DN50	both sides flange DIN 2633 PN10	DN65	190
GAB FF __7	DN65	both sides flange DIN 2633 PN10	DN65	233
GAB FF __8	DN80	both sides flange DIN 2633 PN10	DN100	208
GAB FF __9	DN100	both sides flange DIN 2633 PN10	DN100	240
GAB RG __3	DN25	both sides round thread RG DIN 11851 SKC	DN65	288
GAB RG __4	DN32	both sides round thread RG DIN 11851 SKC	DN65	266
GAB RG __5	DN40	both sides round thread RG DIN 11851 SKC	DN65	244
GAB RG __6	DN50	both sides round thread RG DIN 11851 SKC	DN65	202
GAB RG __7	DN65	both sides round thread RG DIN 11851 SKC	DN65	249
GAB RG __8	DN80	both sides round thread RG DIN 11851 SKC	DN100	218
GAB RG __9	DN100	both sides round thread RG DIN 11851 SKC	DN100	260