

**Safety Precautions:**

- Installation, initial start-up and maintenance may only be performed by trained personnel! All applicable European and national regulations regarding installation of electrical equipment must be adhered to.
- The device may only be connected to supply power which complies with the specifications included in the technical data and on the serial plate!
- 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 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.

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.

Technical Data:

Measuring signal	4 ... 20 mA, for connection to the BAMOPHOX TUR 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 _{rated} (10 ... 30V DC)
Connected load	0.5 W Remark: if the measuring circuit is also connected to the auxiliary power supply of the load will increase to additional 24 VDC x 20mA = 0,48W
Terminal housing:	PBT, IP 65
Ambient temperature	+5 ... +45° C
Medium temperature	PVC-type: +5 ... + 60° C PP-Type: +5 ... + 80° C
Max. allowable operating pressure	6 bar max. 20°C / 1 bar max. 60°C
Measuring range	Version 20: 0,01 ... 20 FNU Version 1000: 0,1 ... 1000 FNU (5 selectable resolutions) FNU - "Formazine Nephelometric Units"
Measuring accuracy	±5 % of actual measuring value, ±1 % of upper limit of effective range
Colour- / Fouling compensation:	only for TURBICUBE 20 available
Control elements	6-fold DIP switch , calibration potentiometer
Indicators	Status LED (green)

CE Mark:

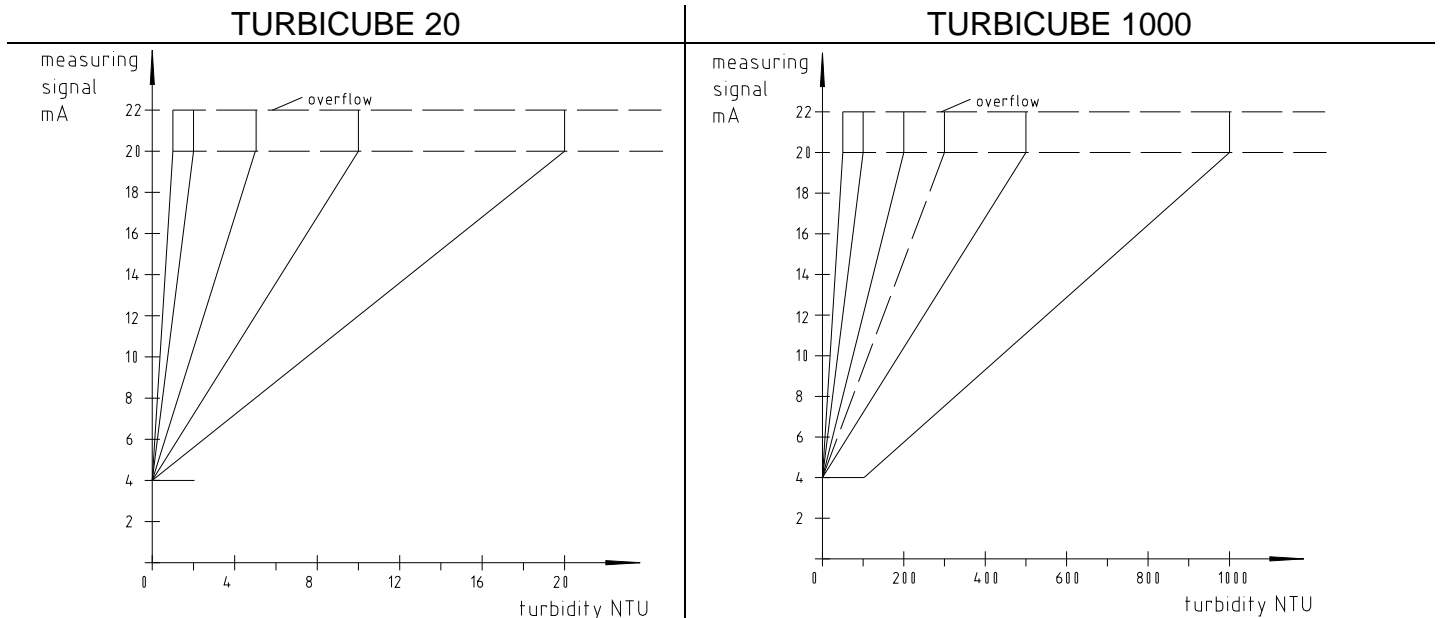
In accordance with low-voltage directive RL 2006/95/EC and EMC directive 2004/108/EC

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.

Settings:



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

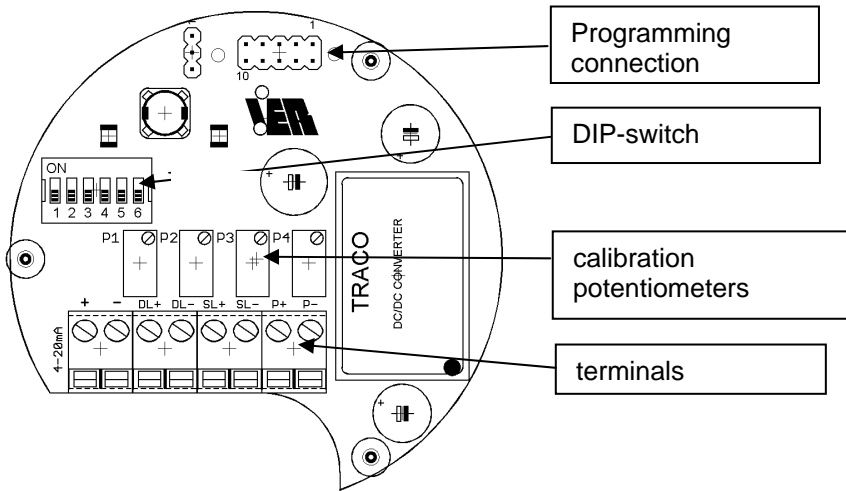
Fault indication

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

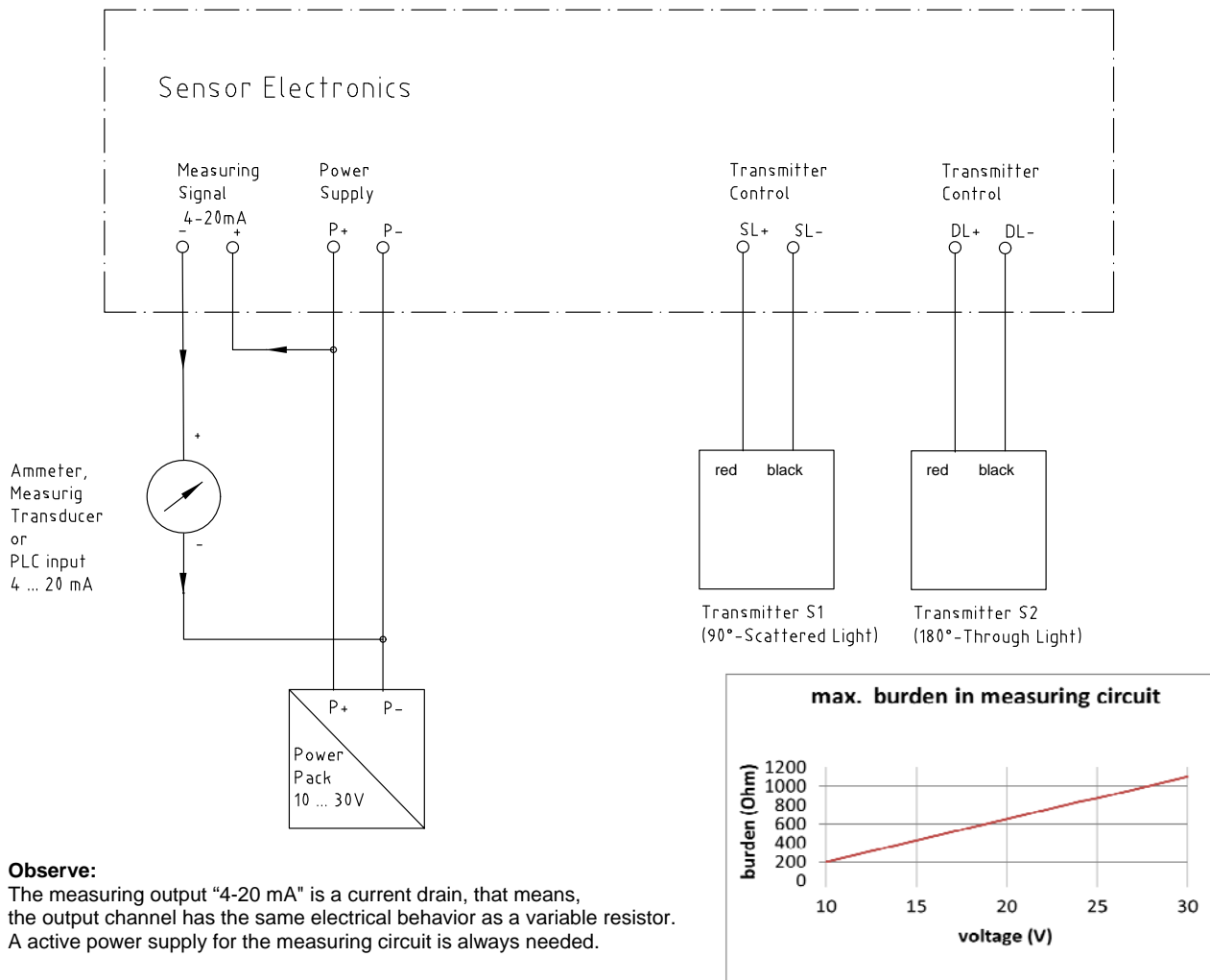
Note:

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.

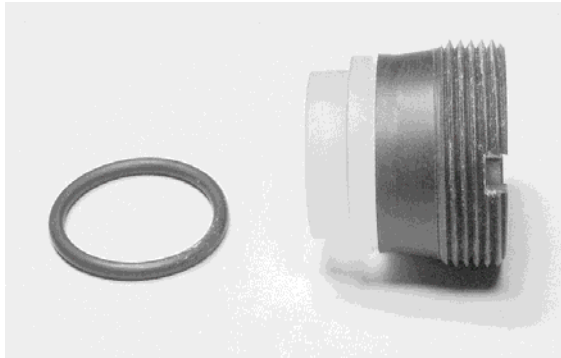
Connection to BAMOPHOX TUR (436)
see Operation instruction SU0325

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.



screw the ETR-glasses with the included tool and remove.

clean the lens – **do not use abrasive cleansers, which may cause scratching!!**



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

mount the o-ring approximately as shown in the picture

- tighten the ETR-glasses with the included tool .
- Before reinstalling the transmitters and the receiver, refill the fixture with liquid medium and inspect for possible leaks.



Observe positioning of hole and pin!

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)

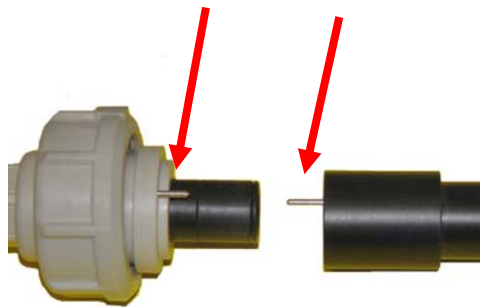
Attention:

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

Procedure for TURBICUBE 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)



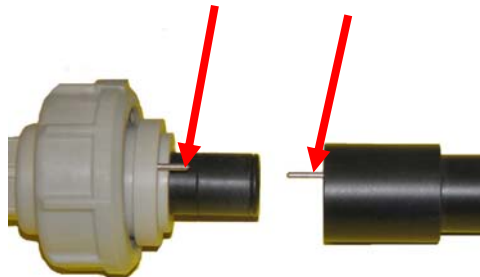
- Insert the calibration rod with attached transmitter completely into the fixture (observe the locking pin), and tighten the sleeve nut.
- Set the DIP switches to the MB5 range = 0,01 to 20FNU (ON/ON/ON/OFF/OFF/OFF)
- Switch supply power back on again – the status LED blinks!
- Compare the setpoint 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

Procedure for TURBICUBE 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

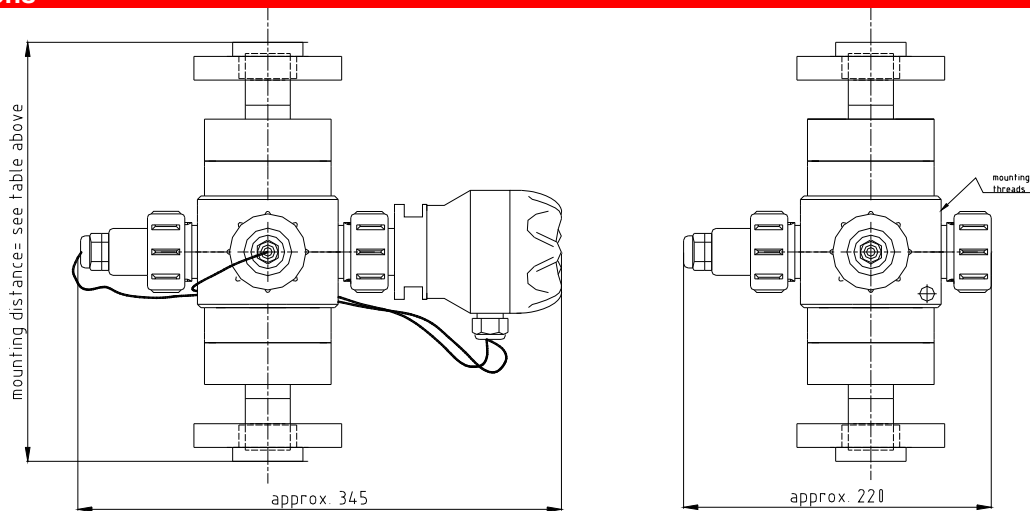
Mounting distance:

nominal dia (DN) process conn.	d	PVC (tolerance: -0/+2 mm-)		PP-type (tolerance: ±2 mm)	
		both side thread connection	both side flange DIN 2501	both side thread connection	both side flange DIN 2501
DN20	d25	240	240	300	300
DN25	d32	240	240	300	300
DN32	d40	240	240	300	300
DN40	d50	240	240	300	300
DN50	d63	262	262	342	300
DN65	d75	314	314	342	300
DN80	d90	347	347	394	400
DN100	d110	347	347	394	400

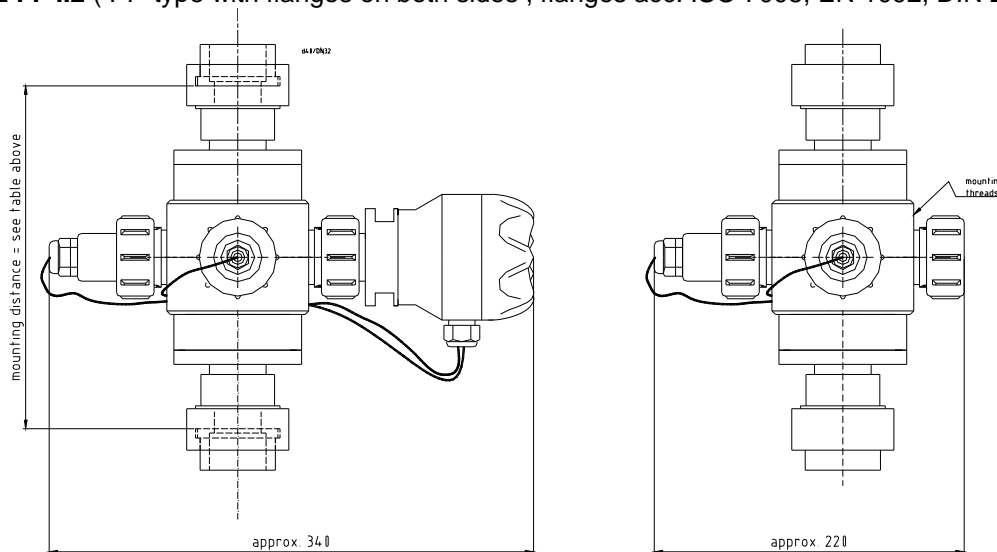


Observe! Only for vertical ascending tubes!
Mounting in a ascending tube with slow down section in front and behind the TURBICUBE is optimal.

Dimensions



Example:
TURBICUBE FF ..2 (PP-type with flanges on both sides , flanges acc. ISO 7005, EN 1092, DIN 2501 PN10



Example:
TURBICUBE VV .. 1 (PVC-type with DN-threading on both sides)