Technical
Information
TI 117C/07/en

Turbidity sensor
CUS 4

Process and immersion sensor for turbidity and suspended solids based on multi-channel alternating technology

Areas of application
- Raw sludge drawoff in sewage treatment plants
- Activated sludge concentration
- Excess sludge concentration
- Coagulation sedimentation monitoring in waste water treatment
- Flocculation process monitoring in water treatment
- Scum registration
- Waste dump and seep water monitoring
- Sludge level monitoring
- Industrial waste water discharge monitoring
- Recycling of industrial service water
- Monitoring of phase separation processes
- Floatation process monitoring

Benefits at a glance
- Start-up either by means of numeric calibration with factory data or using sample media
- Automatic zero adjustment
- Measurement using multi-channel alternating technology for determination of concentration in highly turbid media making use of optimized LED scattered light detection angles
- Compact, shock-protected sensor design
- Inclined, flat sensor surface uses medium flow to promote self-cleaning effect and repels water bubbles
- Intelligent evaluation procedures eliminate reflection signals caused by moving coarse particles and air bubbles
- Measuring signals are interference-suppressed and transmitted to the evaluation unit so that maximum immunity to interference according to new IEC regulations is assured
- Self-monitoring and plausibility checking assure additional reliability
- The measuring range of up to 100 g/l (referred to SiO_2) is covered with an excellent resolution
- Integrated temperature measurement
- Integrated wiper cleaning in version CUS 4-W for mechanical cleaning
- Wiper movement is adjustable to obtain optimal cleaning effect

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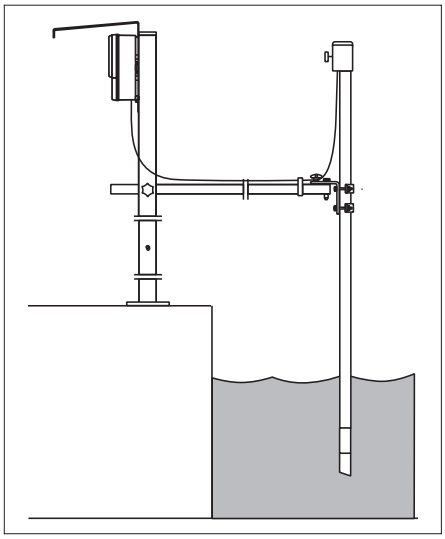
Measuring system

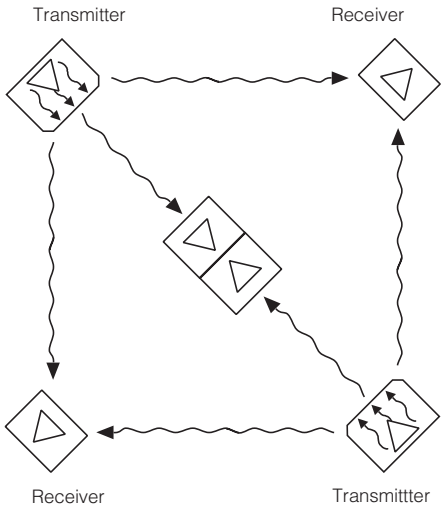


Possible installation of CUS 4 sensor

A functional measuring system consists of:

- Turbidity sensor CUS 4/CUS 4-W
- Mycom measuring transmitter CUM 121/151
- Assembly version according to application requirements, e.g. CYH 101
- Mounting accessories as required

Mode of operation



Explanation of operating principle
The excitation radiation is alternately emitted into the medium to be measured at a defined angle by 2 infrared transmitters.
The particles in the medium generate scattered light which is received by 3 scattered light receivers at different but defined angles. Different path lengths and measuring angles result in different scattered light signals.

The optimized arrangement of transmitters and receivers enables to determine the solids concentration.

This principle allows window soiling and changes in the intensity of the transmitting diodes to be effectively detected and taken into account when computing the result.

Notes on application

Water treatment
Turbidity measurement in water treatment processes serves as an indicator for the efficiency of the different process steps and their time sequence.

Industrial process monitoring
Turbidity measurement provides information on the concentration and mixing status of solid and liquid aggregates in numerous industrial processes that use water as a process medium.

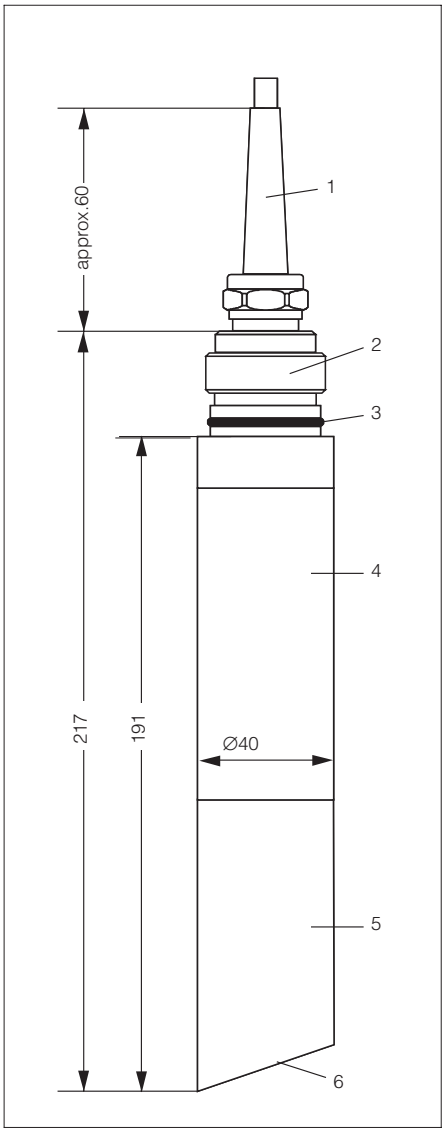
Waste water treatment
Turbidity and solids concentration measurement is indispensable for optimal process control in the various stages of a sewage treatment plant. Thus, for example, turbidity measurement provides immediate proof of activated sludge overaging or undesirable reductions in concentration due to increased inflow, allowing countermeasures to be initiated in time.

Noise-free transmission of measured values
The interference-suppressed measuring signals from the EMC-protected CUS-4 sensor are transmitted to the Mycom CUM 121/151 transmitter. Digital filtering
functions featuring outstanding interference suppression, sensor self-monitoring and plausibility checking during measured value acquisition assure superior accuracy and reliability: intelligent evaluation procedures detect and eliminate interference from reflection signals (e.g., caused by large air bubbles and coarse particles) .

Wiper cleaning
The sensor version CUS 4-W, available as an option, provides mechanical cleaning using a wiper. The wiper movement and timing are adjustable to achieve an optimal cleaning effect. The wiper can perform a circular motion in addition to the conventional back and forth movement.

Calibration
Every sensor is carefully calibrated at the factory; this calibration is based on the procedure following DIN 27027 / ISO 7027 standard.
The user enters the precalibrated sensor data to start up the measuring system, so there is no need to handle formazine suspension in the field. Turbidity, particularly in sludge applications, depends on the type of particles causing the diffusion. For this reason, a wet calibration with a sample is performed when monitoring concentration in sludge.
The zero point is automatically adjusted by a calibration routine. It can be performed as a wet calibration using a zero solution or in air.

Dimensions



1 Sensor connecting cable
2 Internal G1" thread
3 O-ring seal
4 Stainless steel body with pre-amplifier
5 Sensor sleeve, material PVC
6 Optics

Assemblies and Spray Cleaning
The CUS 4 or CUS 4-W sensor is used in conjunction with immersion assemblies which the sensor is securely attached to via a 1" thread. Different assemblies suitable for a wide variety of mounting types are available. Flow assemblies and welding adapters extend the application range for pressurised in-line measuring systems.

Spray cleaning can be performed using CUR 4 spray cleaning head directly on the sensor or CUR 3 in combination with flow assembly CUA 250. It is controlled directly by the Mycom CUM 121/151 using an appropriate injection device.

CUA 461 retractable assembly for pipe installation allows sensor cleaning without process interruption.

Technical data

Measuring principle	multi-channel alternating technology
Measuring ranges	0 ... 4000 NTU, 0 ... 100 g/l (SiO_2), 0 ... 200%
Wavelength	880 nm
Optical reference compensation	by means of reference photodiodes
Zero compensation	optionally calibratable or editable
Indication error of measurement	0.5% of upper range limit
Temperature/pressure	25 °C/ 6 bar, 50 °C/ 3 bar
– Specification	60 °C/ 1 bar
Connecting cable	measuring cable with 7-pin SXP connector
Auxiliary voltage supply	±8.5 V, +5 V
Cable lengths	1.5; 7; 15 m to 50 m on request
Temperature sensor	NTC
Temperature measuring range	-10 °C ... +70 °C
Nominal operating range	-10 °C ... +55 °C
Limit operating range	-10 °C ... +60 °C
Storage temperature range	-20 °C ... +65 °C
Materials	
Shaft	PVC / stainless steel 1.4571
Support plate, cable	PVC

Subject to modifications.

How to order

Turbidity sensor CUS 4

Cleaning

A	Standard version
W	Integrated wiper for cleaning

Cable length

0	Connecting cable 1.5 m
2	Connecting cable 7 m
4	Connecting cable 15 m
9	Connecting cable length of up to 50 m at extra charge

CUS 4- ☐☐ ⇐ **complete order code**

Accessories

- ☐ 3 spare wiper rubbers for CUS 4-W; designation CUY-1
- ☐ Spray cleaning head CUR 4
- ☐ DN 50 flange adapter CUA 120
- ☐ Flow assembly CUA 250
- ☐ Spray cleaning head CUR 3 for CUA 250
- ☐ Retractable assembly CUA 461
- ☐ Calibration vessel — Order no. 50057944
- ☐ Turbidity test solution CUY 21

Supplementary documentation

Technical Informations:

- ☐ CUA 120 / 250 — Order no. 50063827
- ☐ CYH 101 universal suspension assembly holders — Order no. 50061228
- ☐ CUA 461 retractable assembly — Order no. 50075623

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