

Turbidity and Solids Content Sensor *TurbiMax P CUS 63 / CUS 63H*

Turbidity and Solids Content Sensor for Low Concentrations in High-Temperature and Hazardous Areas Using the 90 Scattered Light Method



The TurbiMax P CUS 63 / CUS 63H sensor is used for optical solid matter content measurement in pure and process water for up to 1000 FNU in high-temperature and hazardous applications.

Applications

- Filtrate monitoring
- Purity control of boiler feed water
- Condensate monitoring
- In-process monitoring of industrial water
- Industrial quality control

Features and benefits

- Reliable concentration measurement using optical measuring process
- Four-beam pulsed light method for compensation of sensor soiling and ageing of optical components
- Stainless steel sensor body
- No mechanically moving parts
- Measured value preprocessing in sensor resulting in low signal transmission sensitivity

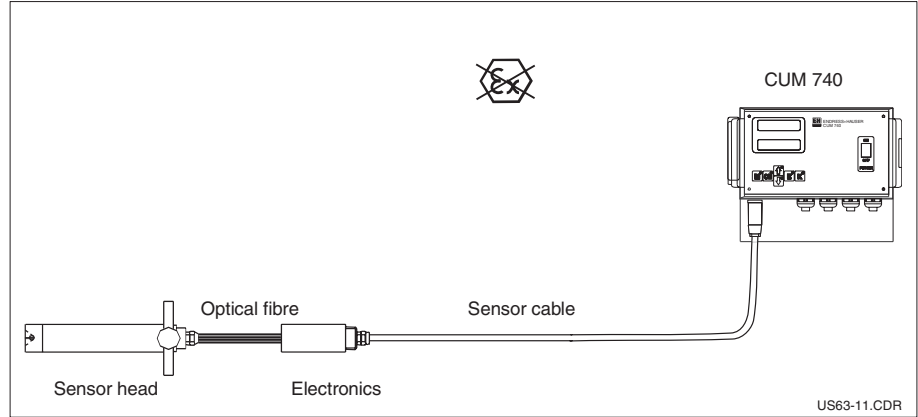


Measuring system

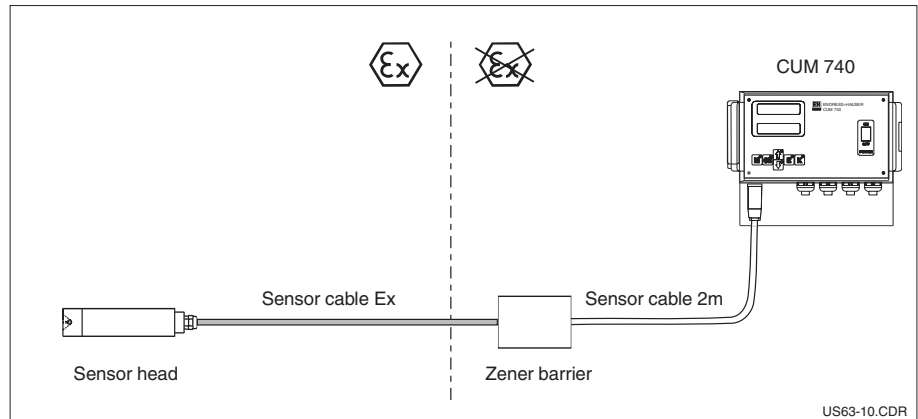
The complete measuring system consists of:

- Turbidity transmitter CUM 740
- Turbidity sensor TurbiMax P CUS 63 / 63H with the components:
 - Sensor head
 - Zener barrier 7900 ZB (for hazardous applications)
 - Optical fibre and sensor electronics (for high temperature applications)
- Assembly for installation or immersion

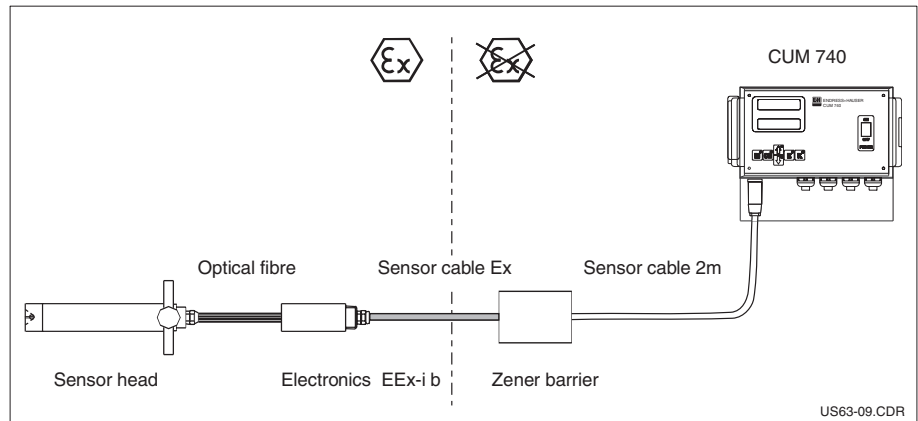
Measuring system
CUM 740
with CUS 63H-A2



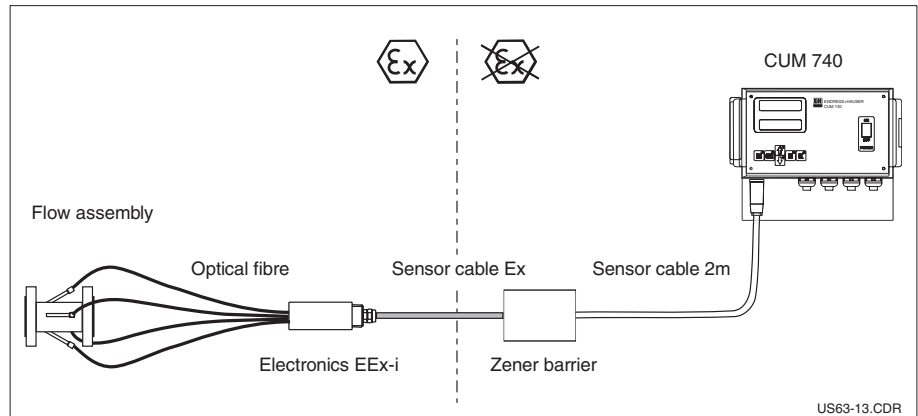
Measuring system
CUM 740
with CUS 63-G1



Measuring system
CUM 740
with CUS 63H-G2



Measuring system
CUM 740
with CUS 63H-G3



Measuring principle

Turbidity measurement

By turbidity we mean the scattered component of a light beam which is diverted away from its original course by optically denser particles in the medium e.g. solid matter particles.

Four-beam pulsed light method

This method is based on two light sources and two photoreceivers. Long-life LEDs (at least 20,000 operating hours) are used as monochromatic light sources.

To eliminate interference from extraneous light sources, the LEDs are pulsed at a rate of several kHz.

Two measuring signals are detected at the two photoreceivers with every light pulse. The four measuring signals are compared logarithmically with each other and converted into a ratio. This compensates for detector soiling and the ageing of optical modules.

90 scattered light method

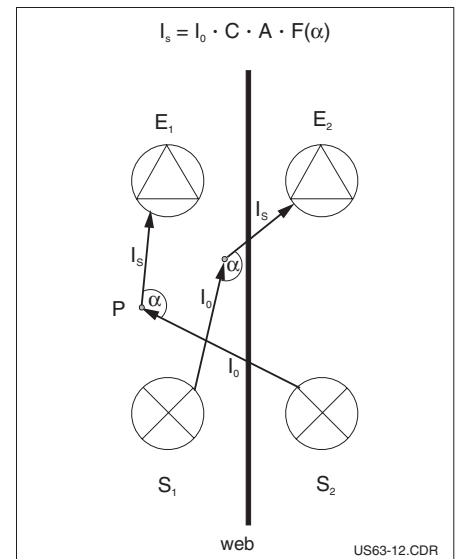
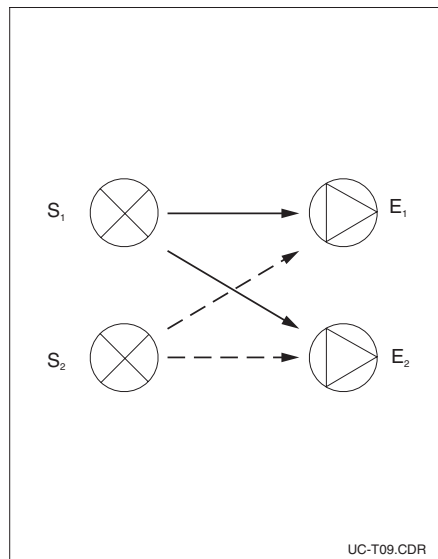
Measurements are made using the standardised 90 scattered light method in accordance with ISO 7027 / EN 27027. The measuring method is based on the Tyndall effect.

The turbidity of the medium is determined from the amount of scattered light. The transmitted infra-red light beam is scattered by the particles in the medium. The scattered beams are measured by scattered light receivers which are fixed at an angle of 90 to the transmitted light. The measured scattered light signals are converted to frequency signals. The frequency signals are assigned to corresponding turbidity units and solid matter concentrations, and appear in the display.

left:
Principle of measured light transmission
S = Transmitter
E = Receiver

right:
Principle of 90 scattered beam measurement

I_0 = Intensity of transmitted light
 I_s = Intensity of scattered light
A = Geometrical factor
C = Concentration
 $f(\alpha)$ = Angle correlation
P = Particle



Calibration

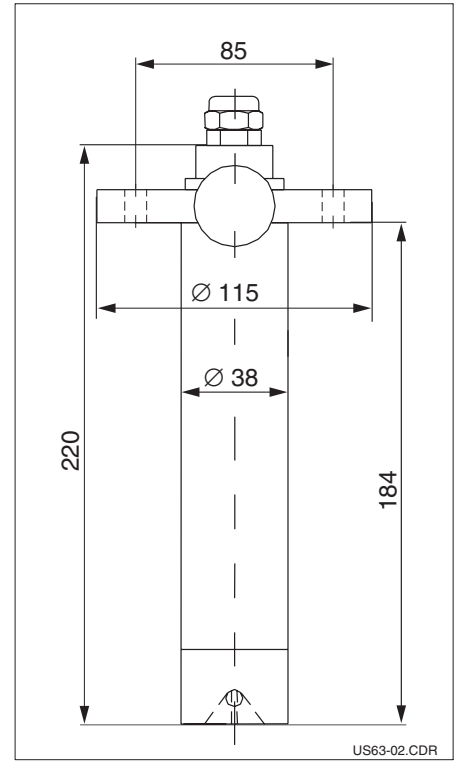
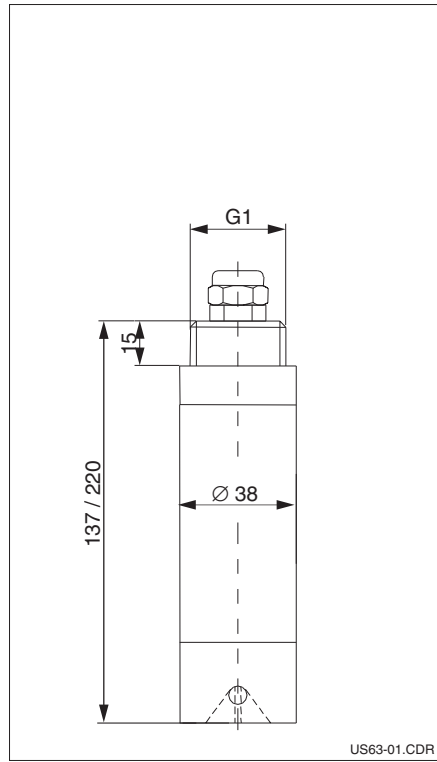
Each sensor is subjected to careful calibration at the factory. One customer calibration can also be saved.

Dimensions

Dimensions CUS 63

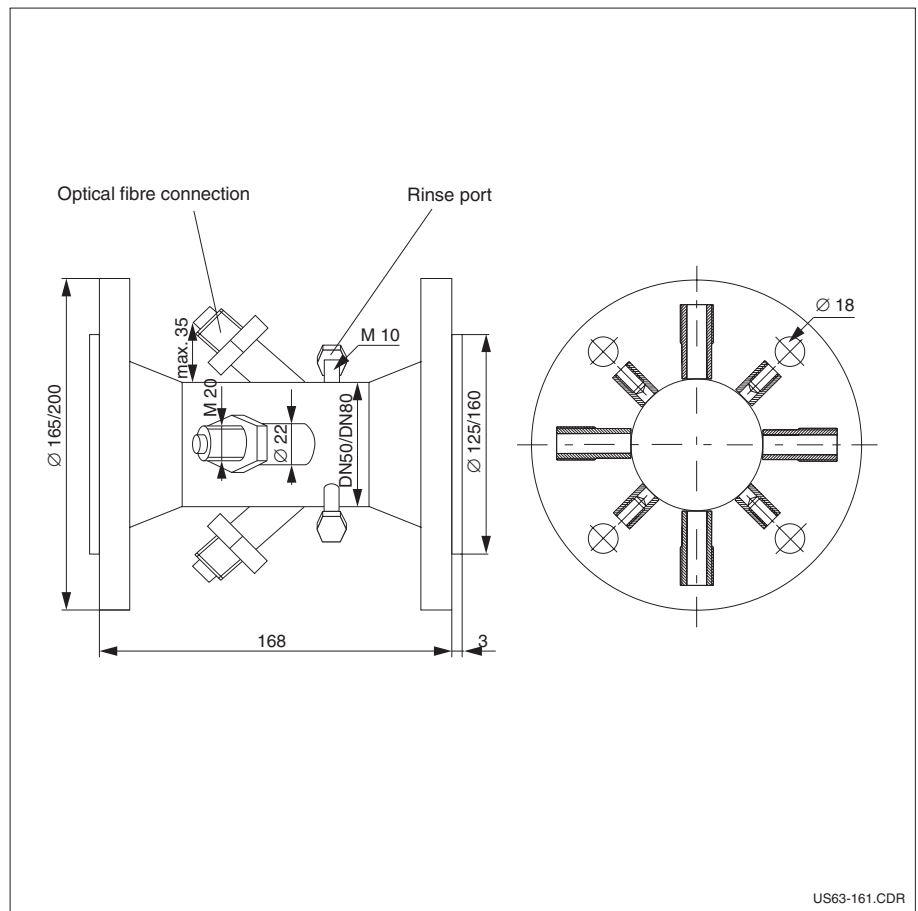
left:
Immersion type
CUS 63 (length 137 mm)
CUS 63H (length 220 mm)

right:
Installation type
CUS 63 / CUS 63H

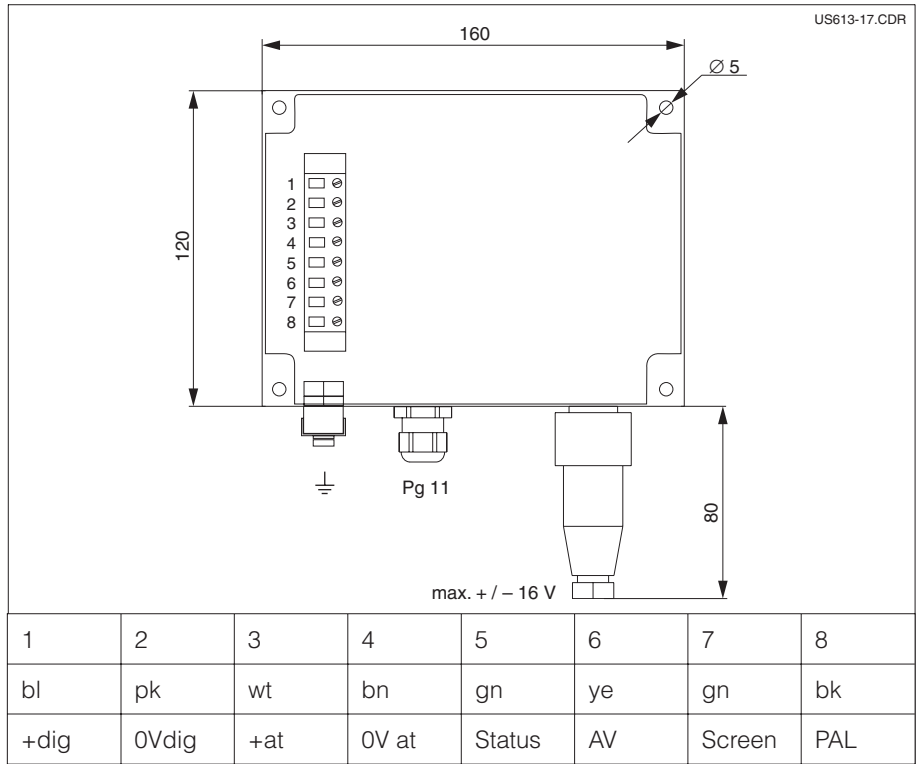


Dimensions

Flow assembly for
CUS 63H (DN 50/DN 80)

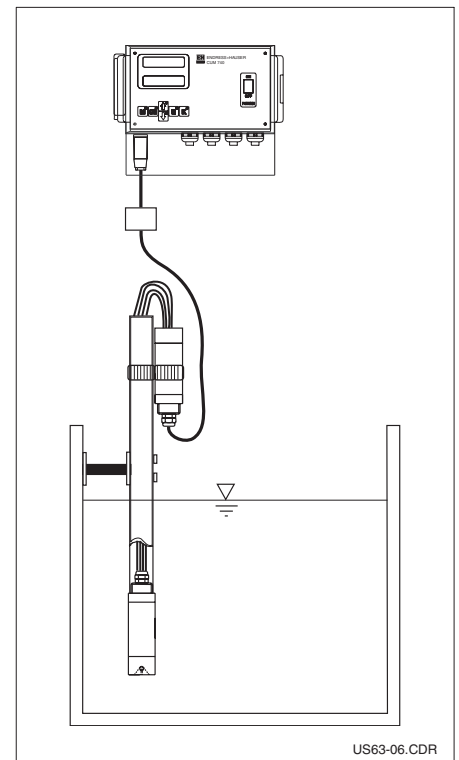
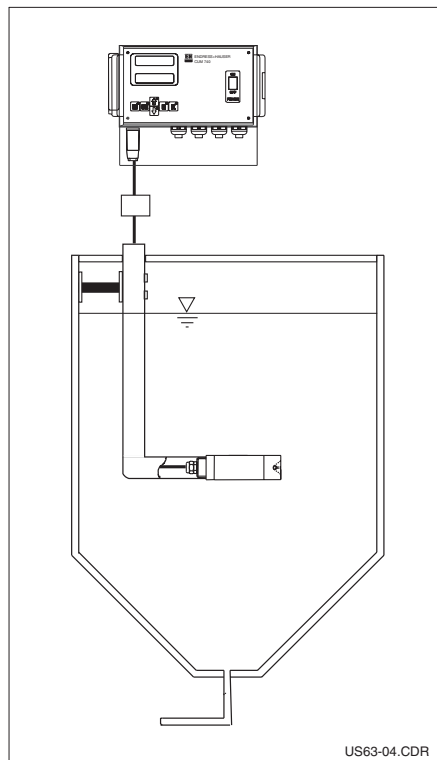


Dimensions



Dimensions and connections of the Zener barrier 7900 ZB

Installation



Installation examples for the sensor, immersion type

left:
Tank installation
CUS 63 with immersion tube

right:
Channel installation
CUS 63H
with basin mounting
and straight immersion tube



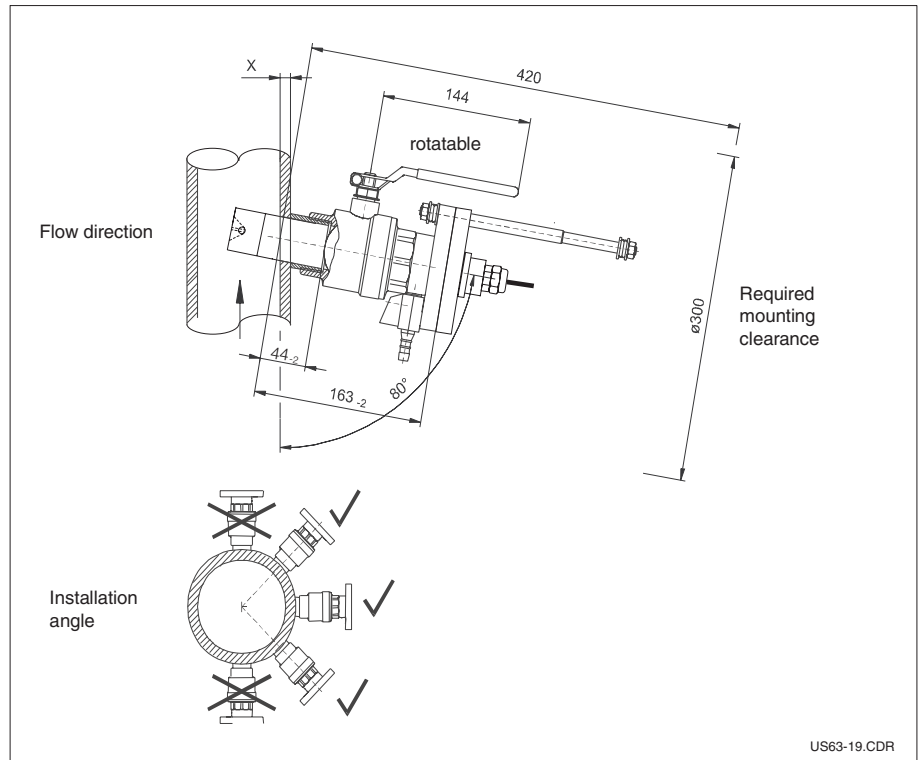
Note:

- We recommend the use of an immersion tube (with 90° angle) for the CUS 63 immersion type.
- The immersed version of the CUS 63H may only be fitted with a straight immersion tube to prevent the optical fibre from breaking (immersion tube contained in scope of supply).
- Do not immerse the separate sensor electronics! Attach the sensor electronics with the mounting kit included in the scope of supply.
- Installing the sensor in pipelines or close to a wall can lead to back-scattering and therefore to signal increase.

Installation

Installation example of
CUS 63 sensor
Installation version

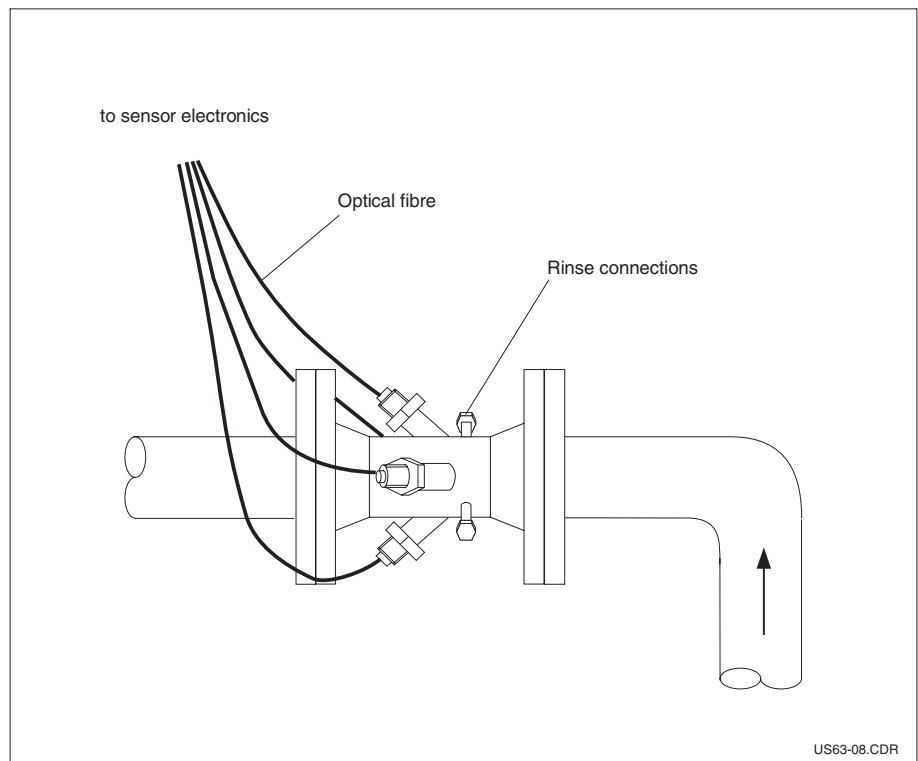
Pipe installation with ball
valve built-in assembly
(accessories)



US63-19.CDR

Installation examples for
CUS 63H sensor
Flow version

Pipe installation



US63-08.CDR

Accessories

- ❑ Ball valve built-in assembly for sensor extension under process conditions
DN 40 with safety lock
Material: stainless steel SS 316 Ti, O-rings made of Viton®
Order No.: 51503588
- ❑ Immersion tube 1m
Material: stainless steel SS 316 Ti
Order No. 51506000
- ❑ Immersion tube 2m
Material: stainless steel SS 316 Ti
Order No. 51505994
- ❑ Sensor fixing bracket for basin mounting
Material: stainless steel SS 316 Ti,
Order No.: 51503626
- ❑ Immersion tube 2m, 90°
Material: stainless steel SS 316 Ti
Order No. 51505996

Technical data

Sensor CUS 63

General data

Manufacturer	Endress+Hauser
Product designation	TurbiMax P CUS 63

Mechanical data

Dimensions (L x Ø)	Installation type Immersion type	220 x Ø 38mm 137 x Ø 38mm
Weight	Installation type Immersion type	approx. 3kg approx. 1kg

Materials

Sensor body	Stainless steel SS 316 Ti
Sight glass	Polyoxymethylene (POM), Araldit® adhesive
O-rings	Viton®

Turbidity measurement

Measuring principle	90° scattered light method
Optical components	Light source: 2 LEDs, Detector: 2 photodiodes
Measuring light	Infrared light at 880nm (absorption maximum)
Measuring range	2.0 ... 1000 FNU
Accuracy	< 1% of measuring range end value
Reference	Using four-beam pulsed light method
Factory calibration	Formazine standard
Cable lengths	13m, 25m, 25 ... 100m

Operating conditions

Operating temperature	0 ... +50°C
Operating pressure	max. 6 bar
Ingress protection	IP 68
Explosion protection CUS 63-G	EEx ib IIC T4

Supplementary documentation

Technical Information CUM 740	Order No.: 51504297
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Sensor CUS 63H

General specifications

Manufacturer	Endress+Hauser
Instrument designation	TurbiMax P CUS 63H

Mechanical data

Dimensions (L x Ø)	Installation type Immersion type Flow assembly	220 x Ø 38mm 220 x Ø 38mm 174 x Ø 165mm
Weight	Installation type Immersion type Flow assembly	approx. 3kg approx. 1kg approx. 8kg

Materials

Sensor body	Stainless steel SS 316 Ti
Sight glass	Silica glass
O-rings	Viton®, Simeritz®
Optical fibre	Optical fibre
Optical fibre sheath	Silicon (up to 160°C), stainless steel (up to 230°C)

Turbidity measurement

Measuring principle	90° scattered light method
Optical components	Light source: 2 LEDs, Detector: 2 photodiodes
Measuring light	Infrared light at 880nm (absorption maximum)
Measuring range	2.0 ... 1000 FNU
Accuracy	< 1% of measuring range end value
Reference	Using four-beam pulsed light method
Factory calibration	Formazine standard
Cable lengths	13m, 25m, 25 ... 100m
Connecting cable length of Zener barrier to transmitter	2m

Operating conditions

Operating temperature	sensor head sensor electronics	0 ... 120°C, 0 ... 230°C 0 ... 50 °C
Operating pressure		max. 6 bar
Ingress protection	sensor head sensor electronics	IP 68 IP 65
Explosion protection CUS 63H-G		EEx ib IIC T4

Supplementary documentation

Technical Information CUM 740	Order No.: 51504297
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Product structure

Turbidity sensor TurbiMax P CUS 63						
Certificate						
G	ATEX II 2G EEx ib IIC T4					
Y	Special version					
Version						
1	Immersion type					
2	Installation type					
9	Special version					
Cable length						
D	Connecting cable 13m					
F	Connecting cable 25m					
H	Connecting cable 25 ... 100m (price per metre)					
Z	Special version					
Additional equipment						
A	Standard version					
Y	Special version					
CUS 63-						Complete order code

Turbidity sensor TurbiMax P CUS 63H						
Certificate						
A	Version for hazard-free zones					
G	ATEX II 2G EEx ib IIC T4					
Y	Special version					
Version						
1	Immersed version					
2	Mounting version					
3	With flow assembly DN 50					
4	With flow assembly DN 80					
9	Special version					
Cable length						
D	Connecting cable 13m					
F	Connecting cable 25m					
H	Connecting cable 25 ... 100m (price per metre)					
Y	Special version					
Optical fibre length						
1	Optical fibre length 600mm (for version 2, 3, 4)					
2	Optical fibre length 1200mm (for version 2, 3, 4)					
3	Optical fibre length 1200mm, immersion tube 1m (only version 1)					
9	Special version					
Temperature range						
1	Temperature range to 120°C					
2	Temperature range to 230°C (only versions 3, 4)					
9	Special version					
Additional equipment						
A	Standard version					
Y	Special version					
CUS 63H-						Complete order code

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