



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Operating Instructions

Turbimax W CUS65

Turbidity sensor

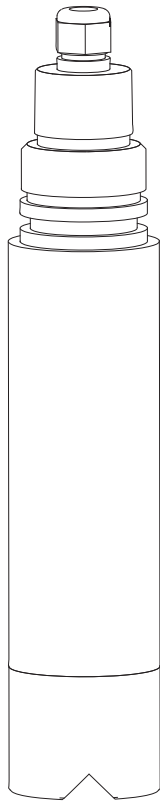


Table of contents

1	Safety instructions	4
1.1	Designated use	4
1.2	Installation, commissioning and operation	4
1.3	Operational safety	4
1.4	Return	5
1.5	Notes on safety icons and symbols	5
1.6	Notes on document symbols	5
2	Identification	6
2.1	Product structure	6
2.2	Scope of delivery	6
3	Installation	7
3.1	Incoming acceptance, transport, storage	7
3.2	Installation conditions	7
3.3	Installation instructions	10
3.4	Post-installation check	11
4	Wiring	11
4.1	Connection to the transmitter	11
4.2	Post-connection check	11
5	Commissioning	12
5.1	Function check	12
5.2	Calibration	12
6	Maintenance	12
7	Accessories	13
7.1	Assemblies	13
7.2	Wall mounting	13
7.3	Transmitter	13
7.4	Connection accessories	14
8	Troubleshooting	15
8.1	Troubleshooting instructions	15
8.2	Return	15
8.3	Disposal	15
9	Technical data	16
9.1	Input	16
9.2	Performance characteristics	16
9.3	Environment	16
9.4	Process	17
9.5	Mechanical construction	17
	Index	18

1 Safety instructions

1.1 Designated use

The Turbimax W CUS65 sensor is used for optical turbidity and solids content measurement. Due to various sensor heads the sensor is suitable for use from low to high concentration ranges.

- Wastewater clarification / sludge treatment
- Boiler feedwater monitoring
- Condensate monitoring
- Service water monitoring

Any other use than the one described here compromises the safety of persons and the entire measuring system and is, therefore, not permitted.

The manufacturer is not liable for damage caused by improper or non-designated use.

1.2 Installation, commissioning and operation

Please note the following items:

- Installation, commissioning, operation and maintenance of the measuring system must only be carried out by trained technical personnel.
The technical personnel must be authorized for the specified activities by the system operator.
- Electrical connection must only be carried out by a certified electrician.
- Technical personnel must have read and understood these Operating Instructions and must adhere to them.
- Before commissioning the entire measuring point, check all the connections for correctness. Ensure that electrical cables and hose connections are not damaged.
- Do not operate damaged products and secure them against unintentional commissioning. Mark the damaged product as being defective.
- Measuring point faults may only be rectified by authorized and specially trained personnel.
- If faults can not be rectified, the products must be taken out of service and secured against unintentional commissioning.
- Repairs not described in these Operating Instructions may only be carried out at the manufacturer's or by the service organization.

1.3 Operational safety

The sensor has been designed and tested according to the state of the art and left the factory in perfect functioning order.

Relevant regulations and European standards have been met.

As the user, you are responsible for complying with the following safety conditions:

- Installation instructions
- Local prevailing standards and regulations.

1.4 Return

If the sensor has to be repaired, please return it *cleaned* to the sales center responsible. Please use the original packaging, if possible.

Please enclose the completed "Declaration of Hazardous Material and De-Contamination" (copy the second last page of these Operating Instructions) with the packaging and the transportation documents.

No repair without completed declaration!

1.5 Notes on safety icons and symbols



Warning!

This symbol alerts you to hazards. They can cause serious damage to the instrument or to persons if ignored.



Caution!

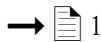
This symbol alerts you to possible faults which could arise from incorrect operation. They could cause damage to the instrument if ignored.



Note!

This symbol indicates important items of information.

1.6 Notes on document symbols



This symbol indicates a cross reference to a defined page (e.g. p. 1).



This symbol indicates a cross reference to a defined figure (e.g. fig. 2).

2 Identification

2.1 Product structure

Measuring range, application					
A	0 to 12 g/l, activated sludge, centrate				
B	0 to 40 g/l, return sludge				
C	0 to 50 g/l, primary sludge, digested sludge				
D	1 to 1000 FNU, wastewater effluent, service water, condensate, boiler feedwater				
E	10 to 150 g/l, centrifuge inlet, press inlet				
Certificates					
1	Factory calibration certificate				
Process connection					
A	G1 + NPT 3/4 thread				
Y	Special version acc. to customer specification				
Connecting cable					
1	7 m (23 ft), SXP plug				
2	15 m (49 ft), SXP plug				
3	1 m (3.3 ft) + extension cable 10 m (32 ft), both with SXP plug				
Seal					
A	Viton				
Y	Special version acc. to customer specification				
CUS65- <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td><td> </td><td> </td><td> </td></tr></table> complete order code					

2.2 Scope of delivery

The scope of delivery comprises:

- 1 CUS65 sensor, cable length depending on version
- 1 extension cable (only version CUS65-xxx3)
- 1 Quality certificate
- 1 Operating Instructions BA370C/07/en

If you have any questions, please contact your supplier or your sales center responsible.

3 Installation

3.1 Incoming acceptance, transport, storage

- Make sure the packaging is undamaged!
Inform the supplier about damage to the packaging. Keep the damaged packaging until the matter has been settled.
- Make sure the contents are undamaged!
Inform the supplier about damage to the delivery contents. Keep the damaged products until the matter has been settled.
- Check that the scope of delivery is complete and agrees with your order and the shipping documents.
- The packaging material used to store or to transport the product must provide shock protection and humidity protection. The original packaging offers the best protection. Also, keep to the approved ambient conditions (see "Technical data").
- If you have any questions, please contact your supplier or your sales center responsible.

3.2 Installation conditions

3.2.1 Dimensions

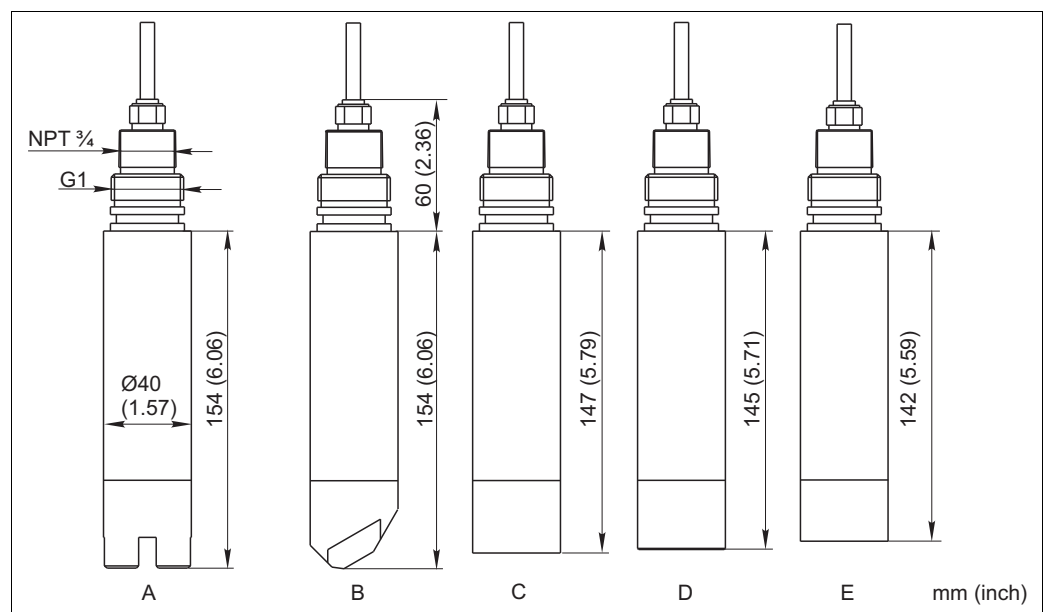


Fig. 1: Dimensions depend on the sensor version (see ordering information)

3.2.2 Wall distance

Installing the sensor in pipework or very close to the wall can cause backscatter which results in a higher sensor signal.
The effective wall or bottom distance can be optimized by aligning the flat sensor side.

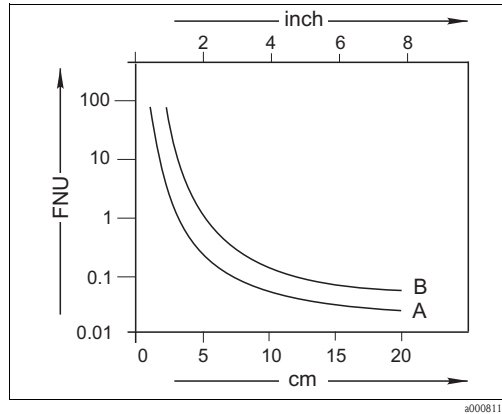


Fig. 2: Effect of the distance from the wall or bottom

- A Dark wall or bottom (non-reflective)
- B Bright wall or bottom (reflective)



Note!

The following generally applies: The lower the turbidity to be measured, the darker the vessel walls should be and the greater the wall distance should also be.

3.2.3 Pipe installation

The following figure illustrates various installation positions in pipes and indicates whether they are permitted or not.

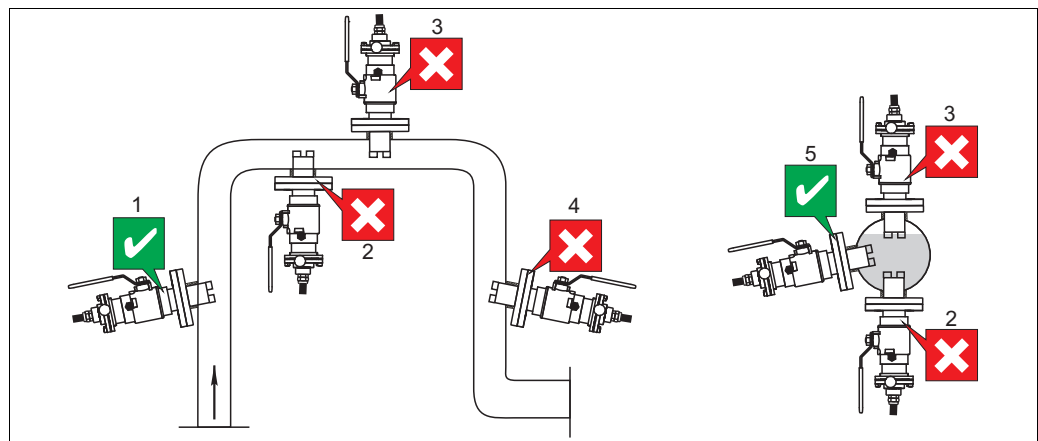
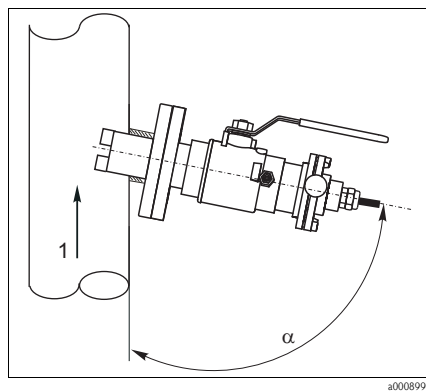


Fig. 3: Orientation and installation positions (with retractable assembly CUA451)

- The pipeline diameter must be at least 100 mm (4") if reflective materials (e.g. stainless steel) are used.
- Install the sensor in places with uniform flow conditions.
- The best installation location is in the ascending pipe (it. 1). Installation is also possible in the horizontal pipe (it. 5).
- Do not install the sensor in places where air may collect or foam bubbles form (it. 3) or where suspended particles may settle (it. 2).
- Avoid installation in the down pipe (it. 4).
- Pay attention to the correct installation angle α (s. below).



Installation angle α dependent on sensor version:

- CUS65-A: 80°
- CUS65-B: 90°
- CUS65-C, E: 100°
- CUS65-D: 110°

Fig. 4: Installation with retractable assembly
Arrow = flow direction of the medium

3.2.4 Immersion operation



Note!

- Observe the required mounting clearance for the installation mode selected. Installing the sensor in pipes or close to a wall can lead to backscattering resulting in signal increase, mainly with measurements in low turbidity ranges (<100 FNU).
- Make sure the sensor is completely immersed at changing water levels.

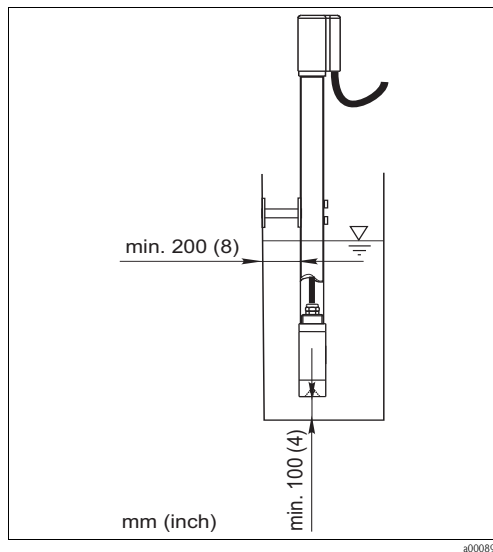


Fig. 5: Wall distance with immersion pipe

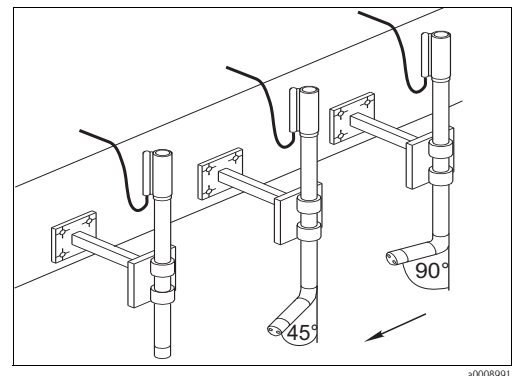


Fig. 6: Immersion pipe angles
Arrow = flow direction of the medium

- CUS65-A: 45 °
- CUS65-D: 90 °
- CUS65-B, -C, -E: 180 ° (straight)

3.3 Installation instructions

3.3.1 Measuring system

A complete measuring system comprises:

- Turbidity transmitter CUM740
- Turbidity sensor Turbimax W CUS65
- Immersion pipe CYY105 or
- Retractable assembly Cleanfit CUA451
- Extension cable (optional)
- Junction box (optional)

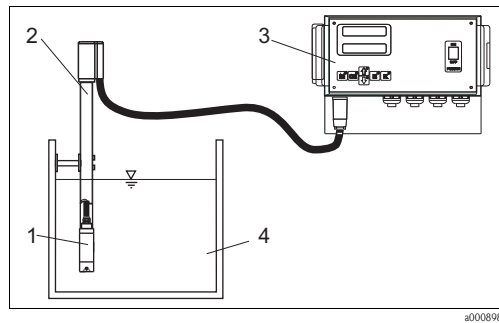


Abb. 7: Measuring system with immersion pipe

- 1 Turbidity sensor Turbimax W CUS65-C
- 2 Immersion pipe CYY105
- 3 Turbidity transmitter CUM740
- 4 Basin or channel

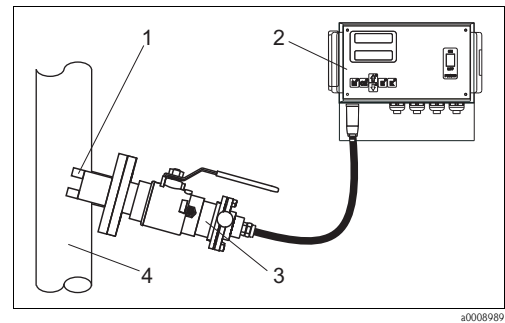


Abb. 8: Measuring system with retractable assembly

- 1 Turbidity sensor Turbimax W CUS65-A
- 2 Turbidity transmitter CUM740
- 3 Retractable assembly Cleanfit CUA451
- 4 Pipe

3.3.2 Notes on installation

Proceed as follows for complete installation of a measuring point:

1. Install the retractable (if used) into the process.
2. Connect the water to the rinsing nozzles (if using assembly with cleaning).
3. Install and connect the turbidity sensor.
4. Install the immersion assembly (if used) into the process.



Caution!

- Please follow national grounding regulations when using metal assemblies and installation devices.
- The sensor must be installed in an immersion assembly for immersion operation. Do not use the sensor suspended freely from the cable.
- Screw the sensor into the assembly in such a way that the cable does not become twisted.
- Avoid large traction (e.g. by tugging) on the cable.



Note!

- Select a mounting location which can be easily accessed for later calibrations.
- When installing without an assembly, the sensor optics must be immersed **at least 4 cm (1.5")** into the medium.
- Please pay special attention to the installation instructions in the Operating Instructions of the assembly used.

3.4 Post-installation check

Checks	Info
In general: Optical windows free of film? Permissible orientation observed? Medium present?	If no: cleaning (→ "Maintenance") → "Installation conditions" Is the assembly or piping completely filled with medium?
Immersion assembly: Sensor installed in immersion assembly? Protection cap on immersion assembly?	Do not use the sensor suspended freely from the cable. Prevent moisture penetrating the assembly!
Retractable assembly: Sensor installed in flow or retractable assembly?	Ensure the sensor is aligned correctly to the flow direction!

4 Wiring



Warning!

- The electrical connection must only be carried out by a certified electrician.
- Technical personnel must have read and understood the instructions in this manual and must adhere to them.
- Ensure that there is no voltage at the power cable before beginning the connection work.

4.1 Connection to the transmitter

Connect the sensor directly to the transmitter by using the special measuring cable with SXP plug.

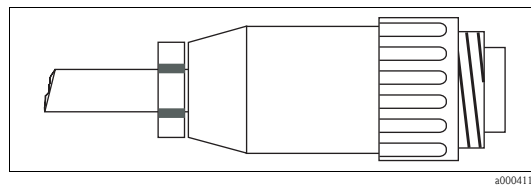


Fig. 9: SXP plug

4.2 Post-connection check

Instrument status and specifications	Remarks
Are the sensor, assembly, junction box or cable damaged?	Visual inspection
Electrical connection	Remarks
Does the supply voltage of the transmitter match the specifications on the nameplate?	110/230 V AC 24 V AC/DC
Are the installed cables strain-relieved and not twisted?	
Is the cable type route completely isolated?	Power cable/signal cable
Are the power supply and signal cable correctly connected to the transmitter?	Use the connection diagram of the transmitter.
Are all the screws terminals properly tightened?	
Are all the cable entries installed, tightened and sealed?	For lateral cable entries : cable loops downwards for water to be able to drip off.
Are all the cable entries installed downwards or lateral?	

5 Commissioning

5.1 Function check

Before first commissioning, check if:

- the sensor is correctly installed
- the electrical connection is correct.



Warning!

Danger of medium leaking off

Before applying compressed air to an assembly with cleaning facility, make sure the connections are correctly fitted. Otherwise, the assembly may not be inserted into the process.

5.2 Calibration

The sensor CUS65-D is calibrated in the factory acc. to standard procedures (ISO 7027/EN 27027). The sensor zero point adjustment relates to almost particle-free water (particles < 0.2 µm).

The versions CUS65-A/B/C/E are factory-calibrated to SiO₂ as function test.

When commissioning these sensors, you must calibrate them using the medium for your application, e.g. activated sludge.

Calibration modes:

- Two-point-calibration (normal case)
- Multi-point-calibration (recommended for CUS65-A)



Note!

- CUS65-E is designated for thickened sludge. To achieve representative measuring results, you must use a sludge concentration of at least 1% for the first calibration point.
- To obtain reliable calibration results, record the raw signal of the sensor (process measurement) over a defined period (e.g. a week) and relate the signals to corresponding laboratory measurements.
- Follow the calibration instructions in the Operating Instructions of the transmitter.

6 Maintenance

Contamination of the sensor can impact the measurement up to the point that measurement no longer functions.

The sensor must be cleaned regularly to ensure reliable measurement. The frequency and intensity of the cleaning depend on the medium.

The sensor must be cleaned:

- prior to every calibration
- if necessary, regularly during the operation
- prior to returning the sensor for repair.

Type of contamination	Cleaning measures
Lime deposits	Immerse the sensor in 1-5 % hydrochloric acid (a few minutes).
Dirt particles on the optics	Mechanically clean the sensor head with water and a suitable brush or sponge.



Caution!

After cleaning, rinse the sensor with water.

7 Accessories

7.1 Assemblies

Retractable assembly Cleanfit CUA451

- retractable assembly with ball valve; for turbidity sensors; material: stainless steel
- ordering acc. to product structure (Technical Information TI369C/07/en)

Immersion assembly CYY105

- For sensor immersion in basins
- Materials:
 - pipe: SS 1.4404 (AISI 316L)
 - fitting: SS 1.4571 (AISI 316Ti)
- Ordering acc. to product structure (Technical Information TI092C/07/en)

7.2 Wall mounting

Wall attachment for immersion pipes

- Material: stainless steel 1.4301 (AISI 304)
- order no. 51503581

Counter plate

- Material: stainless steel 1.4301 (AISI 304)
- order no. 51512992

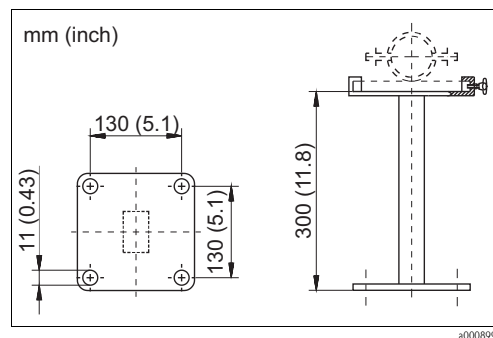


Fig. 10: Wall mounting

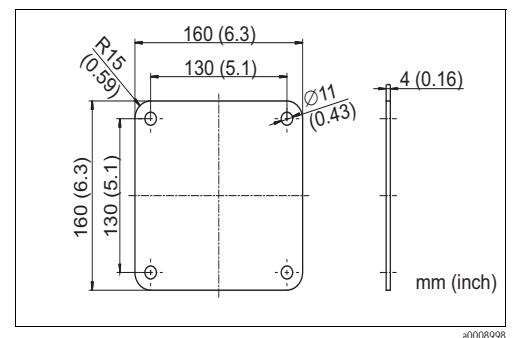


Fig. 11: Counter plate

7.3 Transmitter

CUM740

- Transmitter for turbidity and solids content measurement
- see Technical Information (TI232C/07/en)

7.4 Connection accessories

Extension cable

- Extension cable length 10m (32 ft)
- Shielded, with SXP plug and SXX coupling
- Ingress protection IP 67
- Order No.: 51503633

Plugs

- SXP plug
 - 7-pole
 - Order No.: 51504027
- SXX coupling
 - 7-pole
 - Order No.: 51504025

Junction box

- Junction box for extension of cable connection between sensor and instrument
- Sensor cable input SXB socket, cable output Pg 11 cable gland
- Material: Makrolon®
- Ingress protection IP 67
- Order No.: 51503632

8 Troubleshooting

8.1 Troubleshooting instructions

Troubleshooting must take account of the whole measuring system:

- Transmitter
- Electrical leads and connectors
- Assembly
- Sensor

The possible causes of failure listed in the following table primarily refer to the sensor.

Problem	Check	Remedy
No display, no sensor reaction	Mains voltage at transmitter? Sensor connected correctly? Film formation on optical windows?	Connect mains voltage. Set up correct connection. Clean the sensor.
Reading too high or too low	Film formation on optical windows? Sensor calibrated?	Clean the sensor. Calibrate.
Reading greatly fluctuating	Check mounting location.	Select other mounting location.



Note!

Please pay special attention to the instructions on handling errors in the Operating Instructions of the transmitter. Check the transmitter, if necessary.

8.2 Return

If the sensor has to be repaired, please return it *cleaned* to the sales center responsible. Please use the original packaging, if possible.

Please enclose the completed "Declaration of Hazardous Material and De-Contamination" (copy the second last page of these Operating Instructions) with the packaging and the transportation documents.

No repair without completed declaration!

8.3 Disposal

The device contains electronic components and must therefore be disposed of in accordance with regulations on the disposal of electronic waste.

Please observe local regulations.

9 Technical data

9.1 Input

Measured variable Turbidity

Measuring range

Version	Measuring range	Application
CUS65-A	0 to 12 g/l	Activated sludge, centrate
CUS65-B	0 to 40 g/l	Return sludge
CUS65-C	0 to 50 g/l	Primary sludge, digested sludge
CUS65-D	1 to 1000 FNU	Wastewater outlet, service water, condensate, boiler feedwater
CUS65-E	10 to 150 g/l	Centrifuge inlet, press inlet

9.2 Performance characteristics

Maximum measured error < 1% of measuring range end
(system measured error related to the primary formazine standard / tracing according to ISO 5725 and ISO 7027 / EN 27027)

Wavelength 880 nm

Reference measurement by four-beam pulsed light method

Factory calibration CUS65-A, -B, -C, -E: SiO₂
CUS65-D: Formazine acc. to ISO 7027 / EN 27027

9.3 Environment

Ambient temperature -20 to 60 °C (0 to 140 °F)

Storage temperature -20 to 60 °C (0 to 140 °F)

Humidity 5 to 95 %

Ingress protection IP 68

9.4 Process

Process temperature range 0 to 50 °C (32 to 120 °F)

Process pressure 1 to 6 bar (15 to 87 psi)

Temperature pressure diagram

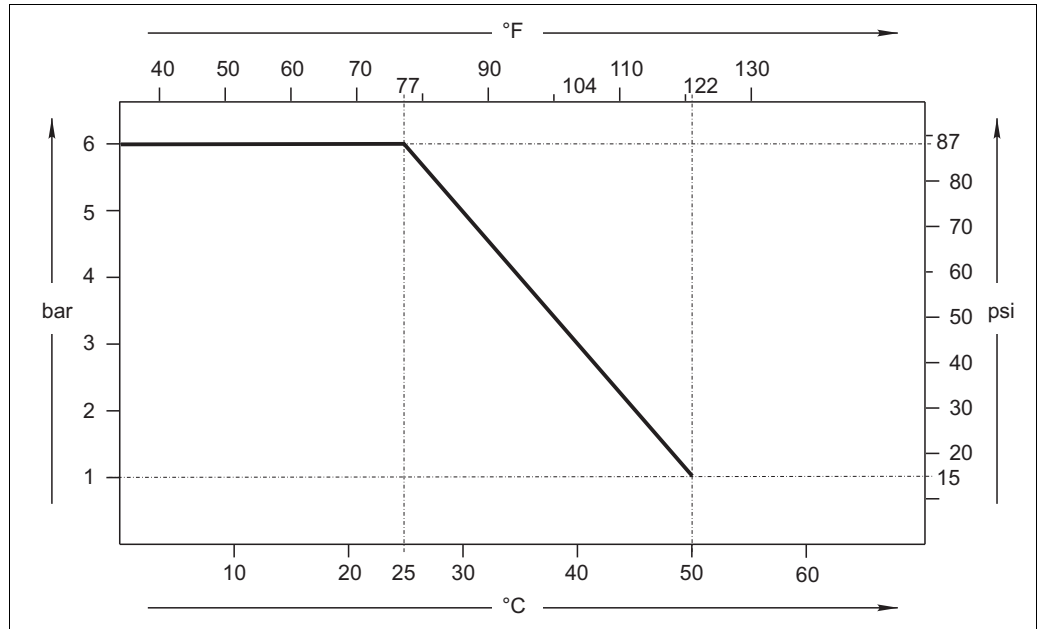


Fig. 12: Temperature pressure diagram

Flow No minimum flow required.
Make sure that there is a sufficient turbulence for solids with a tendency to sedimentation.

9.5 Mechanical construction

Design, dimensions see "Installation conditions"

Weight approx. 1 kg (2.2 lbs)

Materials	Sensor	Stainless steel 1.4404 (AISI 316L)
	Optical windows	CUS65-A, -C, -E: Epoxy resin CUS65-B, -D: Polyoxymethylene (POM)
	O-rings	Viton®

Index

A

Accessories	
Transmitter	13
Ambient temperature	16
Assemblies	13

C

Cable length	17
Calibration	12
Checking	
Connection	11
Function	12
Commissioning	4, 12
Connection	11
Checking	11

D

Design, dimensions	17
Designated use	4
Dimensions	7
Disposal	15
Document symbols	5

E

Electrical connection	11
Environment	16

F

Factory calibration	16
Flow	17
Flow mode	10

H

Humidity	16
----------	----

I

Immersion operation	9
Incoming acceptance	7
Ingress protection	16
Installation	4, 7
Measuring system	10
Installation instructions	10

M

Maintenance	12
Materials	17
Maximum measured error	16
Measured value	16
Measured variable	16
Measuring range	16
Measuring system	10

O

Operation	4
Operational safety	4

P

Performance characteristics	16
Pipework	8
Process	17
Process pressure	17
Process temperature range	17
Product structure	6

R

Reference measurement	16
Return	5, 15

S

Safety icons	5
Scope of delivery	6
Storage	7
Storage temperature	16
Symbols	5

T

Technical data	16
Temperature compensation	17
Temperature pressure diagram	17
Transport	7
Troubleshooting instructions	15

U

Use	4
-----	---

W

Wall distance	8
Wall mounting	13
Wavelength	16
Weight	17
Wiring	11

Declaration of Hazardous Material and De-Contamination *Erklärung zur Kontamination und Reinigung*

RA No.

Please reference the Return Authorization Number (RA#), obtained from Endress+Hauser, on all paperwork and mark the RA# clearly on the outside of the box. If this procedure is not followed, it may result in the refusal of the package at our facility.
Bitte geben Sie die von E+H mitgeteilte Rücklieferungsnummer (RA#) auf allen Lieferpapieren an und vermerken Sie diese auch außen auf der Verpackung. Nichtbeachtung dieser Anweisung führt zur Ablehnung ihrer Lieferung.

Because of legal regulations and for the safety of our employees and operating equipment, we need the "Declaration of Hazardous Material and De-Contamination", with your signature, before your order can be handled. Please make absolutely sure to attach it to the outside of the packaging.

Aufgrund der gesetzlichen Vorschriften und zum Schutz unserer Mitarbeiter und Betriebseinrichtungen, benötigen wir die unterschriebene "Erklärung zur Kontamination und Reinigung", bevor Ihr Auftrag bearbeitet werden kann. Bringen Sie diese unbedingt außen an der Verpackung an.

Type of instrument / sensor

Geräte-/Sensortyp _____

Serial number

Seriennummer _____

Used as SIL device in a Safety Instrumented System / Einsatz als SIL Gerät in Schutzeinrichtungen

Process data / Prozessdaten

Temperature / Temperatur _____ [°F] _____ [°C]

Pressure / Druck _____ [psi] _____ [Pa]

Conductivity / Leitfähigkeit _____ [µS/cm]

Viscosity / Viskosität _____ [cp] _____ [mm²/s]

Medium and warnings

Warnhinweise zum Medium



	Medium /concentration <i>Medium /Konzentration</i>	Identification CAS No.	flammable <i>entzündlich</i>	toxic <i>giftig</i>	corrosive <i>ätzend</i>	harmful/ irritant <i>gesundheitsschädlich/ reizend</i>	other * <i>sonstiges*</i>	harmless <i>unbedenklich</i>
Process medium <i>Medium im Prozess</i>								
Medium for process cleaning <i>Medium zur Prozessreinigung</i>								
Returned part cleaned with <i>Medium zur Endreinigung</i>								

* explosive; oxidising; dangerous for the environment; biological risk; radioactive

* *explosiv; brandfördernd; umweltgefährlich; biogefährlich; radioaktiv*

Please tick should one of the above be applicable, include safety data sheet and, if necessary, special handling instructions.

Zutreffendes ankreuzen; trifft einer der Warnhinweise zu, Sicherheitsdatenblatt und ggf. spezielle Handhabungsvorschriften beilegen.

Description of failure / Fehlerbeschreibung _____

Company data / Angaben zum Absender

Company / Firma _____	Phone number of contact person / Telefon-Nr. Ansprechpartner: _____
Address / Adresse _____	Fax / E-Mail _____
_____	Your order No. / Ihre Auftragsnr. _____

"We hereby certify that this declaration is filled out truthfully and completely to the best of our knowledge. We further certify that the returned parts have been carefully cleaned. To the best of our knowledge they are free of any residues in dangerous quantities."

"Wir bestätigen, die vorliegende Erklärung nach unserem besten Wissen wahrheitsgetreu und vollständig ausgefüllt zu haben. Wir bestätigen weiter, dass die zurückgesandten Teile sorgfältig gereinigt wurden und nach unserem besten Wissen frei von Rückständen in gefahrbringender Menge sind."

(place, date / Ort, Datum)

Name, dept./Abt. (please print / bitte Druckschrift)

Signature / Unterschrift

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