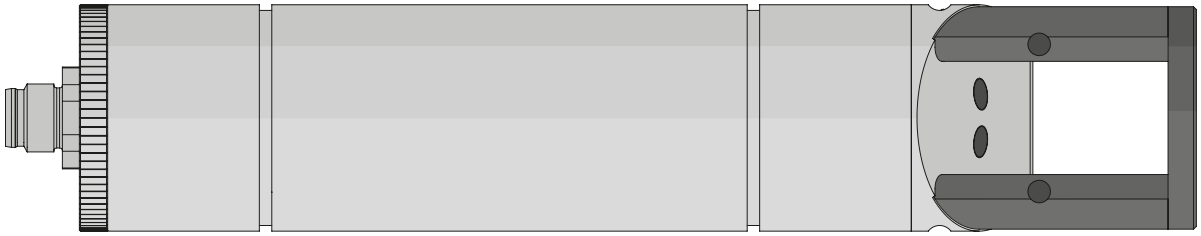
Type 4170
Turbidity Sensor

Operating Instructions



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MA_00197 / 01 (08.2025)

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www.gfps.com

Original instruction manual

Disclaimer

The technical data are not binding. They neither constitute expressly warranted characteristics nor guaranteed properties nor a guaranteed durability. It is subject to modification. Our General Terms of Sale apply.

Contents

1 About this document

Other applicable documents

Document
GF Planning Fundamentals Industry
Datasheet

These documents are available at www.gfps.com or from the representative of GF Piping Systems.

Symbols

Symbol	Meaning
•	Listed in no particular order
►	Call for action: here, something has to be done
1.	Call for action in a certain order: here, something has to be done in the specified order

2 Safety Information

The safety instructions apply to use as described under „Intended use“.

The safety instructions do not cover the following cases:

- Incidental events occurring during installation, operation and service.
- The operator is responsible for the local and site-related safety regulations.

2.1 Meaning of the signal words

In this instruction manual, warnings are used, which shall warn the user of death, injuries or material damage. Always read and observe these warnings!

⚠ DANGER!

Imminent danger!

Non-observance may result in major injuries or death.

► Measures to avoid the danger.

⚠ WARNING!

Possible danger!

Non-observance may result in serious injuries.

► Measures to avoid the danger.

⚠ CAUTION!

Dangerous situation!

Non-observance may result in minor injuries.

► Measures to avoid the danger.

NOTICE!

Avoid the situation!

Non-observance may result in property damage.

2.2 Safety and responsibility

- ► Only use the product as intended, see „Intended use“.
- ► Do not use a damaged or defective product. Have any damages and defects immediately corrected by the GF Piping Systems Service Department.
- ► Make sure that the piping system has been installed professionally and that it is inspected regularly.

2.3 General safety information

Observe instruction manual

The instruction manual is part of the product and an important element within the safety concept.

- ► Read and observe instruction manual.
- ► The instruction manual must always be accessible on the product.
- ► Give instruction manual to all subsequent users of the product.
- ► Commissioning, use and disassembly by qualified personnel only!
- ► Product and accessories shall only be put into operation by persons who have the required training, knowledge or experience.
- ► Regularly instruct personnel on all questions regarding the local regulations applying to occupational safety and environmental protection, especially for pressurized pipes.

Storage and transport

The product must be handled, transported and stored with care. Please note the following points:

- ► Transport and store the product in its unopened original packing.
- ► Protect the product from harmful physical influences such as dust, heat, humidity and UV radiation.
- ► The product and its components must not be damaged either by mechanical or thermal influences.
- ► Check the product for general damage prior to installation.

⚠ CAUTION!

No product modifications!

Material damage and/or risk of injury due to modifications to the product or incompatible spare parts.

- ► Do not make any internal or external modifications.
- ► Only use original spare parts from GF Piping Systems with the specifications according to the type plate.

⚠ WARNING!

Do not use damaged products!

Danger of injury or material damage through the use of defective or damaged products.

- ► Do not use a damaged or defective product.
- ► Replace any damaged or defective products immediately.

⚠ WARNING!

Protection from hazardous media!

Caution should be exercised when using chemicals or solvents and appropriate eye, face, hand, body and/or respiratory protection should be used.

- ► Wear safety goggles or a face shield during installation/maintenance.

⚠ CAUTION!

Risk of Electric Shock!

Internal components may carry hazardous voltages that can cause serious injury or death if touched.

- ► Before working on wiring or terminals, always ensure the power supply is completely disconnected (zero potential).
- ► Installation, handling, and servicing must be performed only by qualified personnel trained in electrical safety and authorized to work on industrial instrumentation.

NOTICE!

Properly disposal!

Before disposal, separate the individual materials into recyclable materials, normal waste and hazardous waste.

- ► Observe local regulations, standards and guidelines.
- ► Products with electrical components must be disposed of separately.
- ► Consult safety data sheet.
- ► A product marked with this symbol must be taken to separate collection of electrical and electronic equipment.
- ► For questions concerning the disposal of the product, please contact your national representative of GF Piping Systems.

2.4 Warnings regarding Turbidity Sensors

⚠ WARNING!

Incompatible materials!

Incompatible materials can be attacked by aggressive media, which can cause damage to property or injuries.

- ► Confirm chemical compatibility before use.

⚠ WARNING!

High pressures!

Excessive pressure can pose a risk of damage to the product, property damage or personal injury.

- ► Do not exceed maximum temperature/pressure specifications.

⚠ DANGER!

Manipulations on pressurized pipes.

Improper manipulations on a pressurized pipe can lead to the medium escaping under pressure, resulting in injuries, damage to the transmitter and material damage on site.

- ► Always consult the Instruction Manual before making any manipulations to pipes.
- ► It is absolutely essential that manipulations to a extractable assembly are made according to the Instruction Manual.
- ► On all other installation versions, the medium line must be emptied before removing the transmitter.

⚠ CAUTION!

Leaking water connections!

Escaping water can lead to flooding of the room and material damage to the building and fittings.

- ► Check that there are no leaks.

⚠ DANGER!

Damaged cabling!

Touching damaged cables may lead to electrical shocks or death.

- ► The product may only be operated if the cables are undamaged and it has been correctly installed.

⚠ DANGER!

Damage to incorrect service voltage.

If connected to an incorrect service voltage, the product can be damaged.

- ► Only connect to voltage sources as specified on the product label.

⚠ CAUTION!

Avoid moisture!

If moisture or condensation penetrates the inside of the device, electronic components can be damaged.

- ► Regularly check gaskets.
- ► Work inside may only be carried out in a dry room and at room temperature. The device should be at operating or room temperature (avoid condensation on optical and electrical surfaces).

⚠ CAUTION!

Leaking gaskets!

Danger of injury by leaking medium due to damaged or aged gaskets.

- ► Store gaskets if possible in a cool, dry and dark place.
- ► Before installing them, the gaskets have to be checked on possible aging damages, such as fissures and hardenings.
- ► Regularly check the gaskets and replace, where necessary.

⚠ CAUTION!

Wrong cleaning agents!

Use of aggressive cleaning chemicals can cause damage to transmitter components.

- ► Do not use aggressive chemicals or cleaning agents when cleaning.
- ► If the device comes into contact with harsh chemicals, clean it thoroughly with a neutral detergent.

3 Product description

3.1 Intended use

The type 4170 Turbidity Sensor is an optical sensor designed for the continuous measurement of turbidity in water applications, including industrial and municipal water treatment, such as drinking water, process water, and wastewater monitoring. The sensor provides Modbus RTU outputs for direct integration into PLC systems and 4–20 mA (connector version M12 only). For local display, diagnostics, and operations such as calibration and verification, a compatible transmitter (Type 8640) is available.

3.1.1 Non-intended use

Any use other than that described for the intended use is not in accordance with the intended use and is therefore not permitted. If unsuitable products are installed or used in safety-relevant applications, unintended operating states may occur in the application which may cause personal injury and/or damage to property.

Only use the product in safety-relevant applications if this use is expressly specified and permitted in the product documentation. GF Piping Systems AG accepts no liability for damage resulting from improper use. The risks associated with improper use are the sole responsibility of the user.

3.2 EC declaration of conformity

Georg Fischer Piping Systems Ltd., Ebnatstrasse 111, 8201 Schaffhausen, Switzerland, hereby declares that the products listed below conform to the applicable EU directives and comply with the relevant harmonised standards specified.
The CE marking on the product confirms this conformity.
Any modifications which affect the specified technical data and the intended use will invalidate this manufacturer's declaration.

Product group	Type designation	EU-Directive	Applied Standards
Turbidity Sensor	4170	EMC 2014/30/EU WEEE 2019/19/EU RoHS 2011/65/EU	EN 61326-1:2013

CE

Schaffhausen, 14.08.2025

Ed DeGrood 

Director of Quality and Compliance
Georg Fischer Piping Systems Ltd.
CH-8201 Schaffhausen (Switzerland)

3.3 Hazardous substances declaration

产品中有害物质的名称及含量 Toxic and hazardous substance name and containment in product										
	有毒有害物质 Toxic and hazardous substances									
部分名称 Part Name	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent chromium (Cr6+)	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)	邻苯二甲酸二（2-乙基己基）酯 Bis(2-ethylhexyl) phthalate (DEHP)	邻苯二甲酸丁苄酯 Butyl benzyl phthalate (BBP)	邻苯二甲酸二丁酯 Dibutyl phthalate (DBP)	邻苯二甲酸二异丁酯 Diisobutyl phthalate (DIBP)
Type 4170 Turbidity Sensor	0	0	0	0	0	0	0	0	0	0

本表格根据SJ/T 11364（CN）编制。本产品标有以下符号：
Table composed in accordance with SJ/T 11364 (CN).
This product is bearing the following symbol:

O：表示该部件所有同质材料中危险物质的含量均低于GB/T 26572规定的限值。
O : Indicates that the content of the hazardous substance in all homogenous materials of the part is below the limit specified in GB/T 26572

X：表示该部件中至少一种同质材料中的有毒物质含量超过了GB/T 26572规定的限值。
X : Indicates that the content of the toxic substance in at least one of the homogeneous materials of the part exceeds the limits specified in GB/T 26572

3.4 Design and function

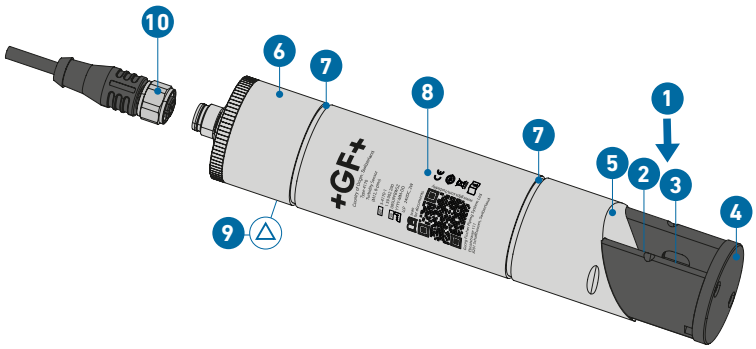
3.4.1 Function

The Type 4170 Turbidity Sensor is a high-performance optical sensor, designed for inline turbidity measurement in drinking water, desalination, and industrial water applications. Based on the 90° scattered light principle (ISO 7027 / EN 27027), it provides precise measurements from 0.001 to 4000 FNU with minimal maintenance.

Made from durable materials like SS316Ti, sapphire glass, and PPSU, the sensor features a slanted optical head. This allows continuous flushing by the flowing medium, reducing fouling and minimizing maintenance. An integrated light absorber increases measurement stability, supports self-flushinand enables reliable operation. This ensures reliable measurement even in challenging pipe conditions, such as tight bends, reducers, or reflective surfaces (e.g., stainless steel) down to DN50 (2"). The sensor enables precise measurement, calibration, and verification even under standard laboratory lighting, without interference from external light sources.

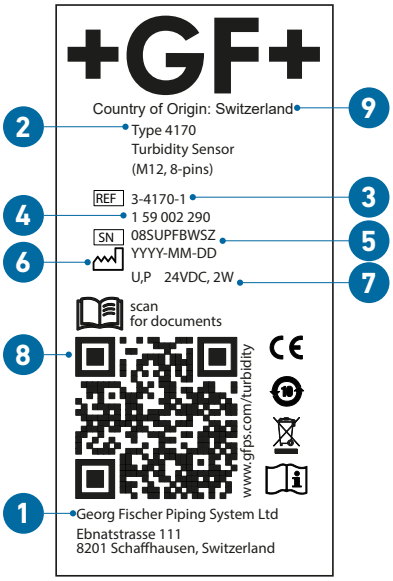
The Type 4170 turbidity sensor can be directly integrated into PLC or SCADA systems via Modbus RTU; the M12-Connector version also includes an analog 4 ... 20 mA output. In combination with the compatible Type 8640 turbidity transmitter, it forms a complete monitoring system with display, configuration options, and graphical analysis.

3.4.2 Design



Pos.	Designation
1	Flow direction
2	Near-Infrared LED
3	Photo detector
4	Light absorber
5	Slanted sensor head
6	Stainless steel sensor body
7	Mounting grooves
8	Laser-engraved label
9	Flow direction marking, outlet side
10	M12, 8-pin connector (female) or fixed cable, 10m

3.4.3 Label



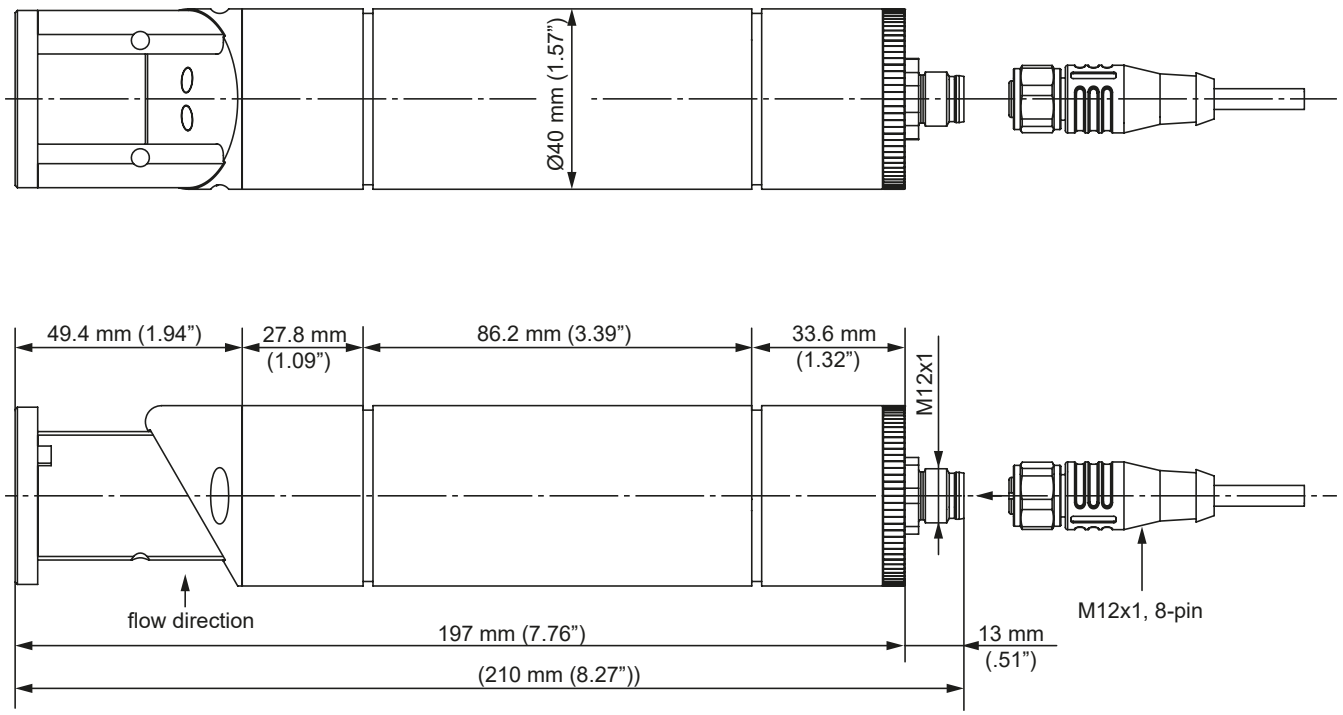
Pos.	Designation
1	Manufacturer
2	Product name
3	Order reference
4	Order code
5	Serial number
6	Date of manufacture
7	Service voltage and power
8	QR-code to documentation
9	Country of origin

3.5 Technical Data

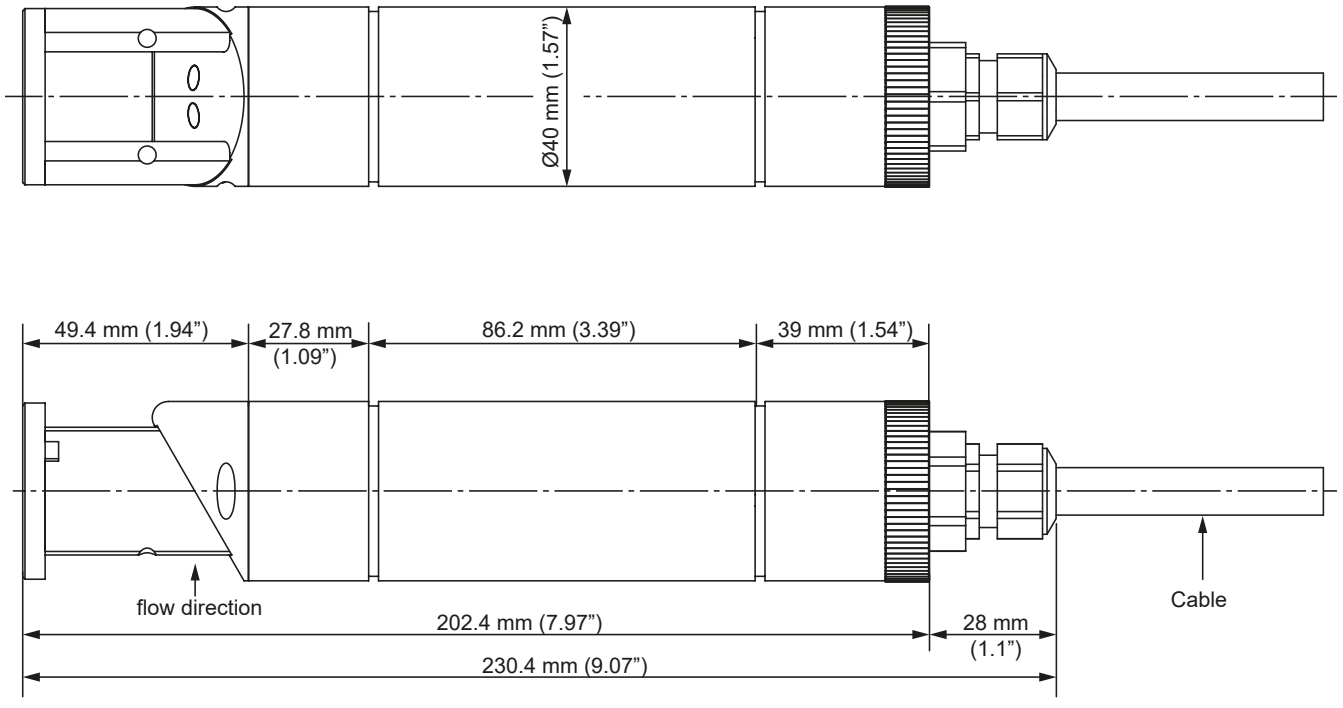
Technical Data		
General	Measuring principle	90° Scattered light measurement according to ISO 7027/EN27027
	Light source	Long life low drift 860nm near-infrared LED
	Measurement span	0 ... 4000 FNU (or NTU), unit changeable
	Medium	Water
	Wavelength	860 nm near-infrared, compliant with ISO 7027/ EN 27027
Accuracy	Measurement accuracy	± 0.2 % of measurement value (range 0 ... 0.5 FNU) ± 0.1 % of measurement value (range >0.5 FNU)
	Resolution	0.001 FNU
	Reproducibility	0 ... 10 FNU: ± 0.002 FNU, or ± 1 %
		10 ... 4000 FNU: ± 2 %
	Repeatability	0.001 FNU, or ± 0.1%
	Resolution temp. measurement	0.1 °C
Outputs	Analog	1 x current output 0/4 .. 20 mA, maximum load 600 Ohm – Minus pole to ground on service voltage (connector version M12 only)
	Digital	- 2 x digital outputs; 24V, high side, max. 25mA (connector version only) - Modbus RTU (all versions)
Application	Pressure max.	1 MPa (10 bar) @ 20 °C
	Flow speed max.	3 m/sec.
	Medium temperature	0 ... +60 °C / 32 ... 140 °F
	Ambient temperature	0 ... +60 °C / 32 ... 140 °F
	Temperature measurement	0 ... +60 °C / 32 ... 140 °F (immersion vers.)
	Ambient humidity	0 ... 100 % rel.
	Protection class	IP67: M12-Connector version IP68: Fixed cable version
Power	Voltage supply	24 VDC ± 10 % isolated from sensor housing
	Power consumption max.	2 W
Materials	Housing body	Stainless steel 316Ti (1.4571)
	Optical windows	Sapphire
	Light absorber	PPSU
Connection	Connector version	M12x1, 8-pin, 10 m
	Cable version	Fixed cable, 10 m
Dimensions	Weight	0.5 kg
	Dimensions	Ø 40 mm x 197 mm (length with connector 300 mm)
Approvals and Standards	CE, China RoHS, certificates from SVGW; ACS, DWI, DVGW safe for use for drinking water applications	

3.5.1 Dimensions

M12-Connector version



Fixed cable version



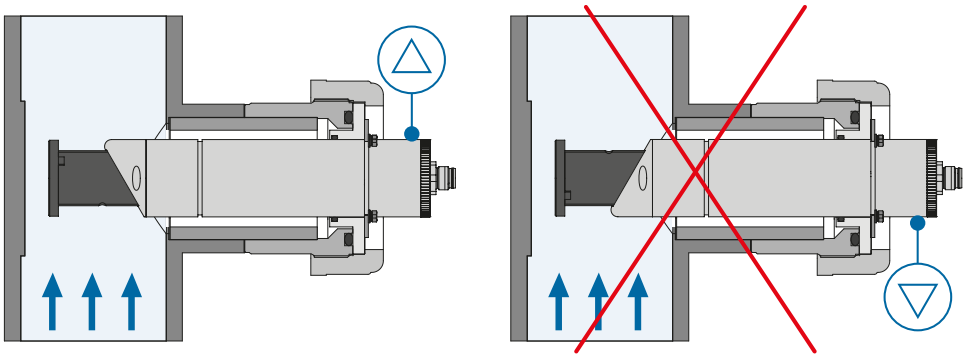
4 Installation

4.1 General mounting information

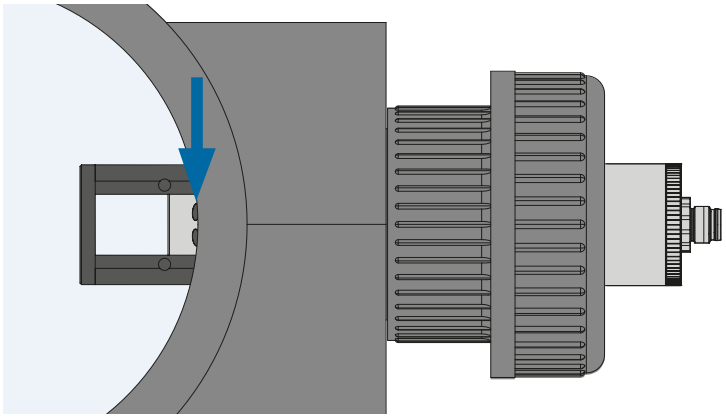
The Type 4170 Turbidity Sensor should be mounted in positions where there is a uniform flow. This is usually the case in the standpipe. To ensure that measurements are performed properly, it is important to avoid any interference of the measuring signal.

4.1.1 Flow direction

The slanted sensor head must always face against the flow direction. Refer to the flow direction marking on the sensor body.



4.1.2 Sensor positioning



Notice: For optimum passive sensor sefl-cleaning, the optical part must be located within the flow.

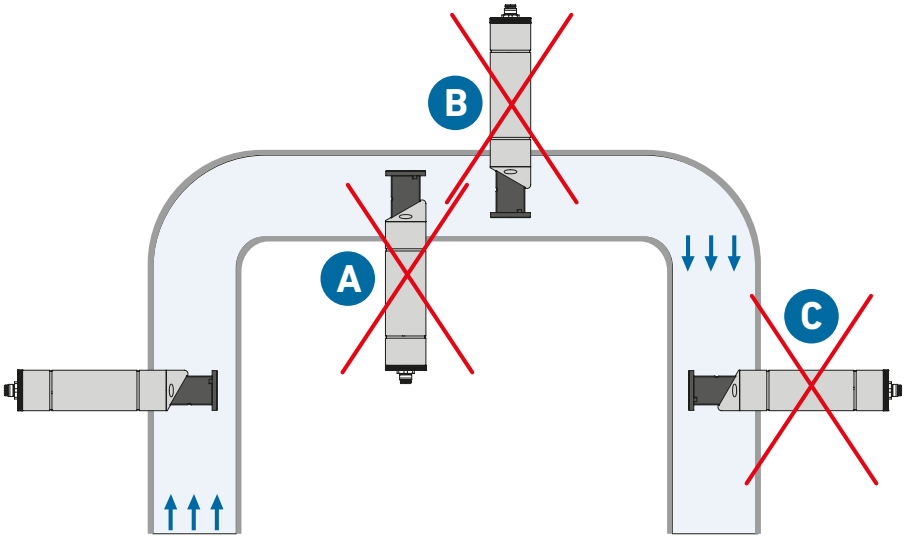
4.1.3 Mounting orientation and location

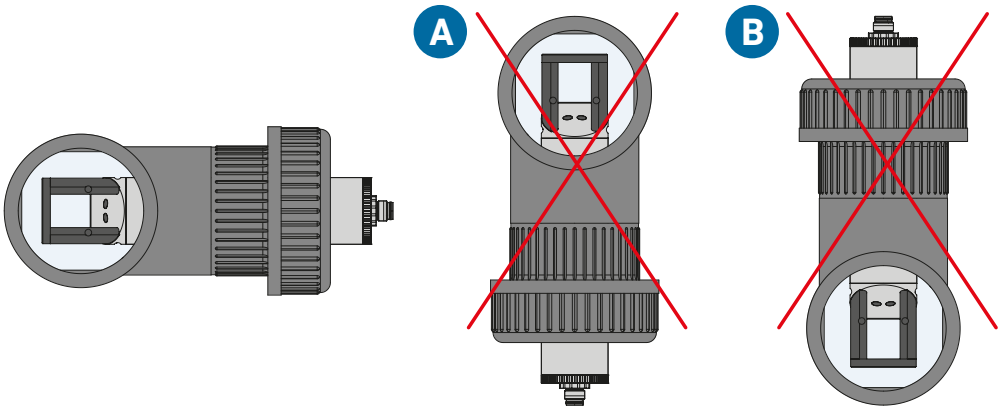
The Type 4170 Turbidity Sensor can be installed in horizontal pipelines when mounted sideways.

A) Do not install the sensor in areas where dirt or particles may settle or accumulate.

B) Do not install the sensor in areas where bubbles can accumulate.

C) Do not mount the Type 4170 Turbidity Sensor in a downpipe.

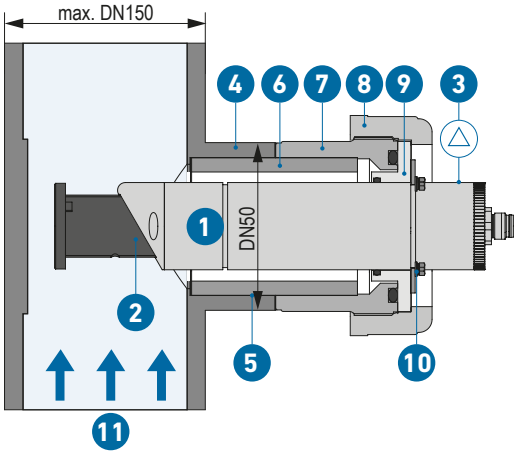




4.2 In-Line installation

4.2.1 Union installation

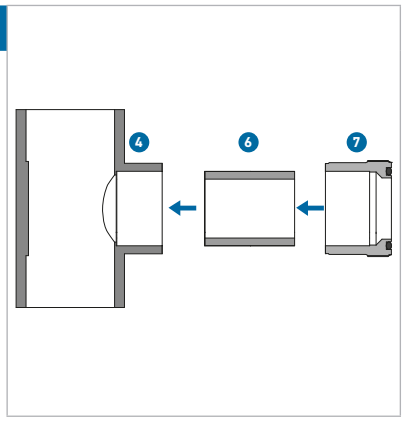
Overview



Pos.	Designation
1	Type 4170 Turbidity Sensor
2	Slanted sensor head
3	Flow direction marking, outlet side
4	Tee DN50 / 2"
5	DN50 Reduction (optional)
6	Pipe/Nipple DN50 / 2"
7	Union Bush DN50 / 2"
8	Union Nut DN50 / 2"
9	Turbidity Union End Adapter
10	Installation brackets
11	Medium flow direction

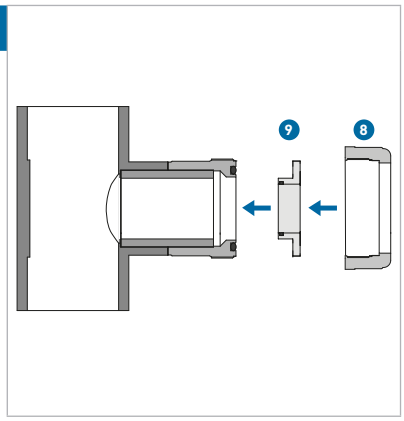
Installation procedure

1



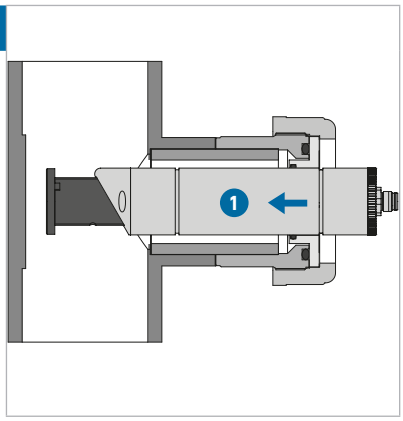
Step 1
Cement the pipe/nipple (6) and union bush (7) into the tee (4). Optional: DN50 reduction.

2



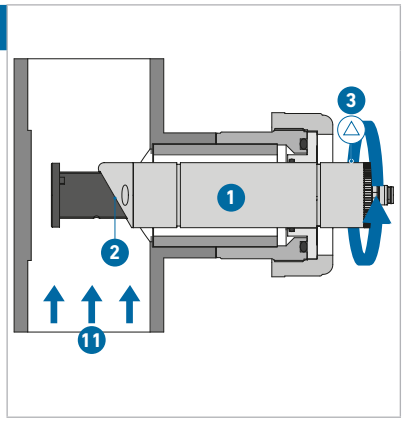
Step 2
Fix Turbidity Union End Adapter (9) with Union Nut (8).

3



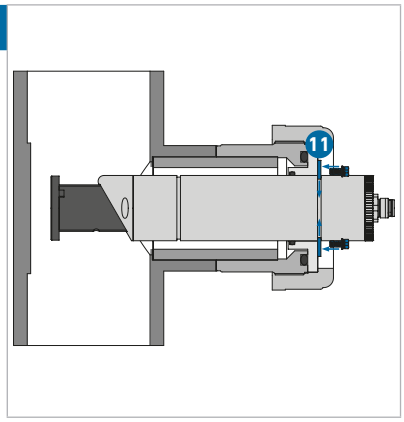
Step 3
Carefully slide in Type 4170 Turbidity Sensor (1).

4



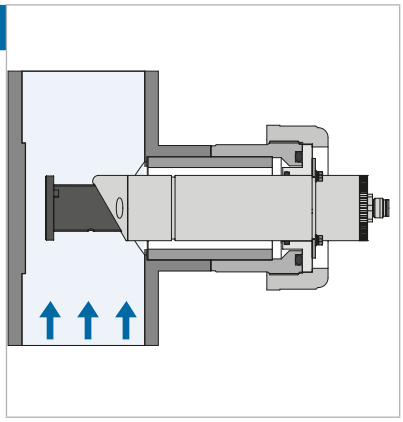
Step 4
Rotate the Type 4170 Turbidity Sensor (1) until the slanted sensor head (2) faces against the flow direction (11). Check the flow direction marking (3).

5



Step 5
Mount installation brackets (11) and fix screws.

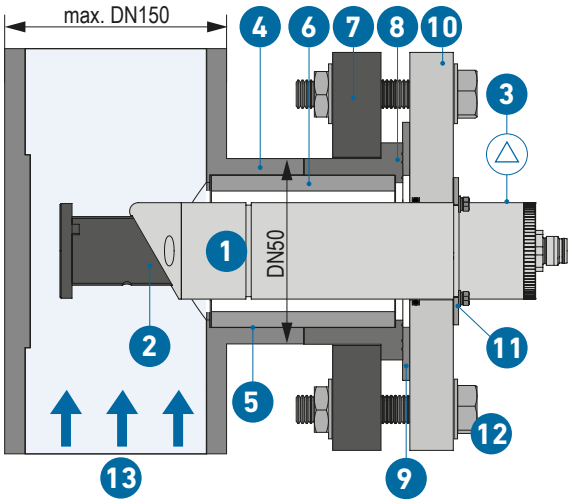
6



Step 6
Ready for operation.

4.2.2 Flange installation

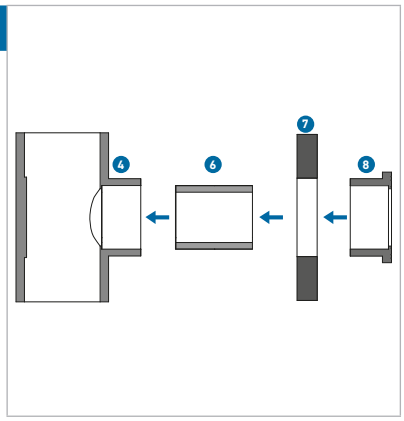
Overview



Pos.	Designation
1	Type 4170 Turbidity Sensor
2	Slanted sensor head
3	Flow direction marking, outlet side
4	Tee DN50 / 2"
5	DN50 Reduction (optional)
6	Pipe/Nipple DN50 / 2"
7	Turbidity Flange Adapter
8	Flange Adapter DN50 / 2"
9	Flange Seal
10	Turbidity flange end adapter
11	Installation brackets
12	Screw connection 4x M16 x 75mm
13	Medium flow direction

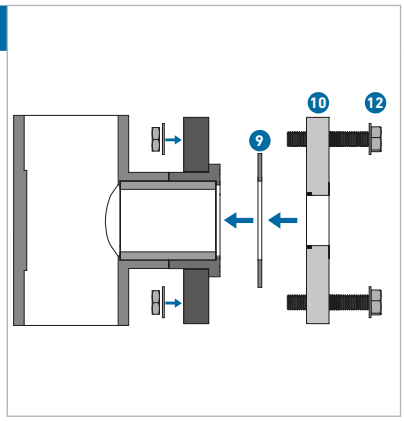
4.2.3 Installation procedure

1



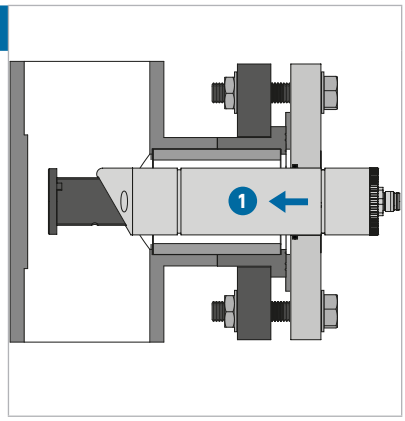
Step 1
Slide Turbidity Flange Adapter (7) over Flange Adapter DN50 (8), cement the pipe/nipple (6) and Flange Adapter DN50 (8) into the tee (4). Optional: DN50 reduction.

2



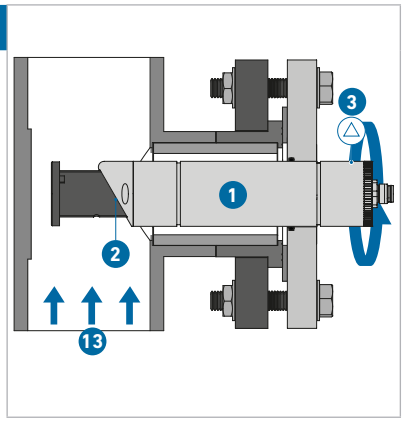
Step 2
Mount Turbidity flange end adapter (10) with flange seal (9) and fix flange with 4x screws (12).

3



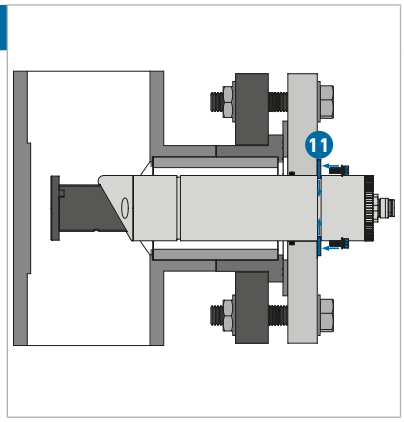
Step 3
Carefully slide in Type 4170 Turbidity Sensor (1).

4



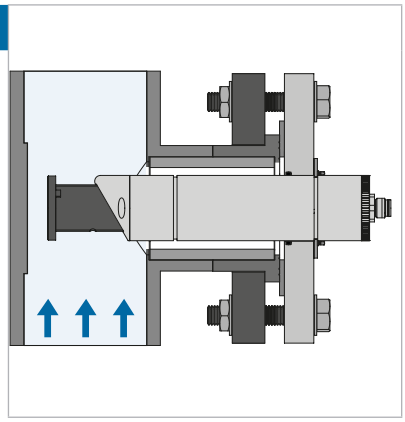
Step 4
Rotate the Type 4170 Turbidity Sensor (1) until the slanted sensor head (2) faces against the flow direction (13). Check the flow direction marking (3).

5



Step 5
Mount installation brackets (11) and fix screws.

6



Step 6
Ready for operation.

4.3 Online (bypass) installation

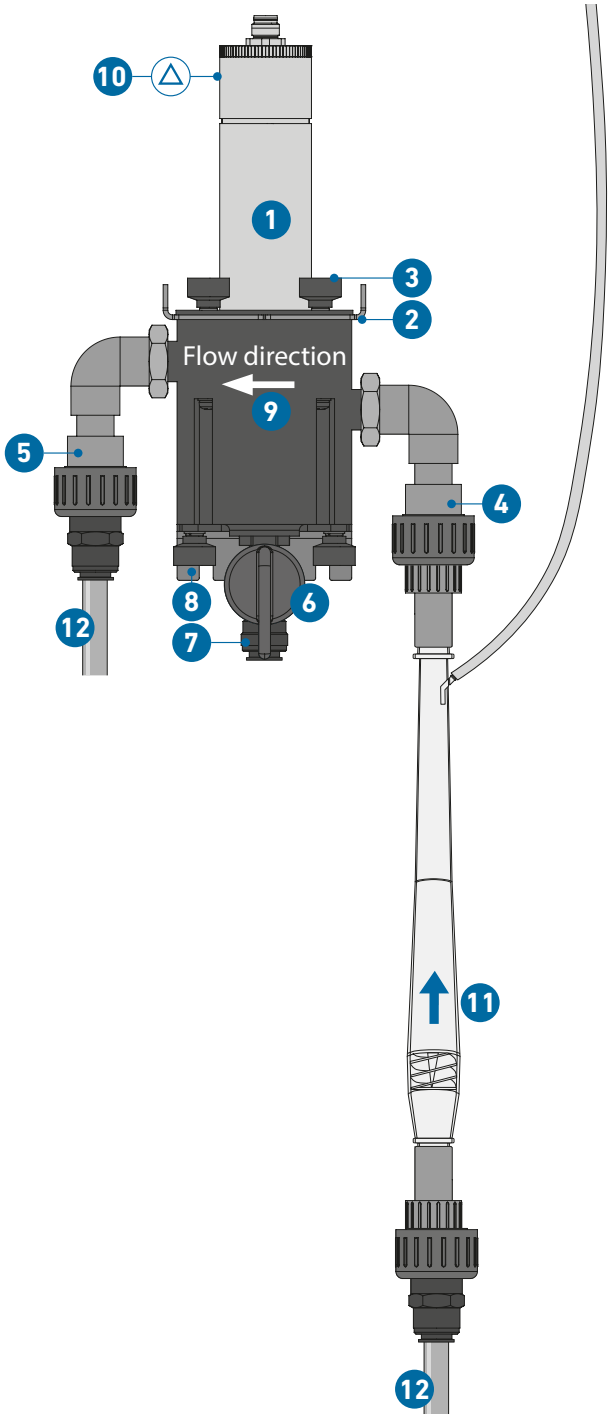
While direct inline installation is the recommended and preferred method for the Type 4170 Turbidity Sensor, an optional bypass flow cell is available to accommodate specific site or customer requirements. In a bypass setup, a portion of the process medium is diverted through the flow cell for measurement and discharged to drain, allowing turbidity monitoring without interrupting the main flow.

Bypass installations should be considered only when inline mounting is not feasible, as they can introduce challenges such as air bubble interference, particularly in systems with pressure fluctuations. To ensure measurement stability, a deaeration kit (available as an accessory) is recommended upstream of the flow cell to eliminate entrained air.

For accurate and representative readings, bypass lines must be kept short and positioned near the main process line to avoid particle settling.

In summary, the bypass flow cell provides flexibility for special installations, but for maximum accuracy, real-time response, and minimal maintenance, inline installation remains the optimal choice.

Overview

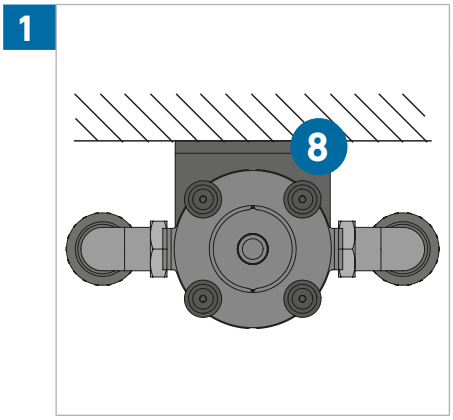


Pos.	Designation
1	Type 4170 Turbidity Sensor
2	Installation brackets
3	Fastening screws
4	Inlet
5	Outlet
6	Valve for Drain Flow Cell
7	Drain
8	Wall mount bracket
9	Medium flow direction
10	Sensor flow direction marking
11	Deaeration kit (optional)
12	Flexible hoses

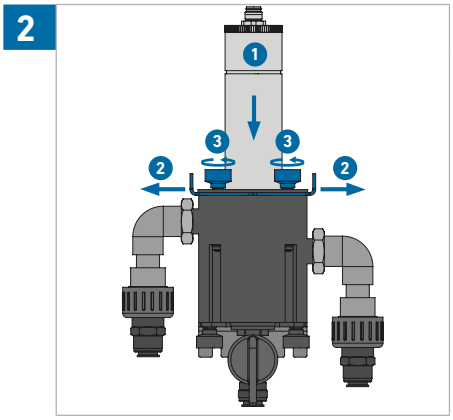
NOTICE!

Online installations may lead to air bubble formation, which can disturb turbidity measurements. If air bubbles are present or expected, it is recommended to install a deaeration kit (11) upstream of the inlet (4).

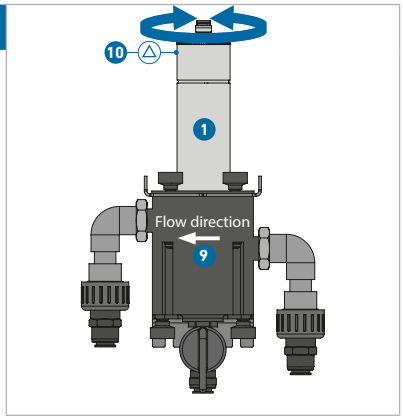
4.3.1 Installation procedure



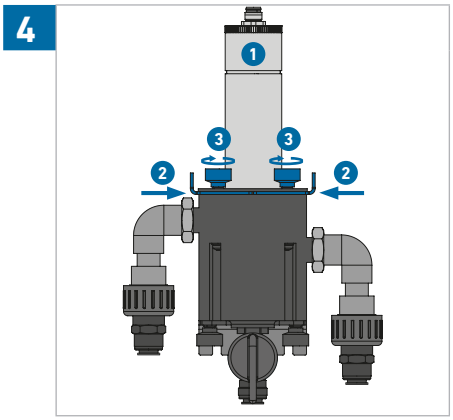
Step 1
Mount Bypass on wall with wall mount bracket (8).



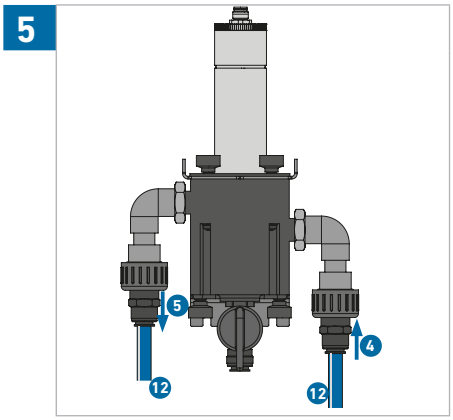
Step 2
Loosen fastening screws (3) and open installation brackets (2) to mount sensor (1).
Carefully slide in Type 4170 Turbidity Sensor (1).



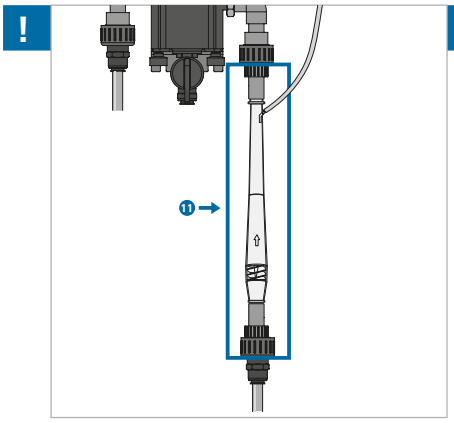
Step 3
Rotate the Type 4170 Turbidity Sensor (1) until the flow direction marking (10) aligns with the medium flow direction (9).



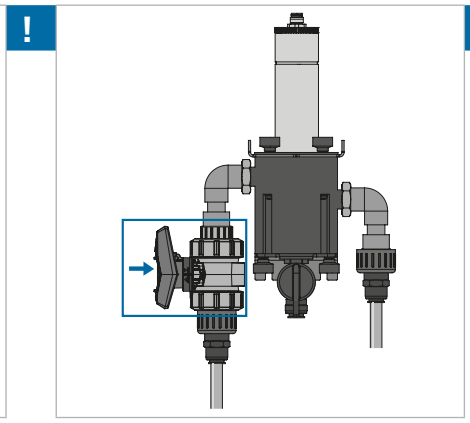
Step 4
Close installation brackets (2) and fasten the fastening screws (3) to lock the sensor (1).



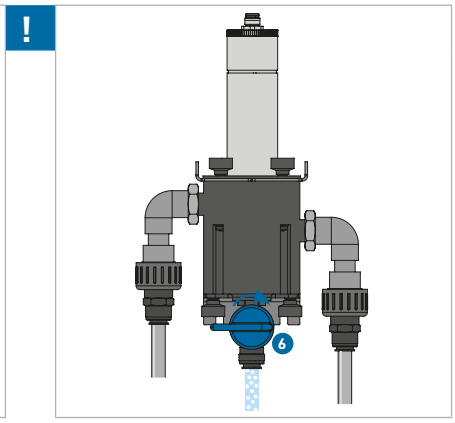
Step 5
Connect flexible hoses (12).
1 Inlet (4)
2 Outlet (5)



Note
Remove trapped air from the bypass.
The deaeration kit (11) is used for this purpose (see accessories).



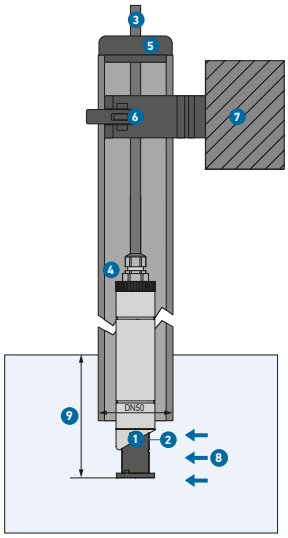
Note
Good to know: As an alternative solution, a ball valve can be installed on the outlet side and kept slightly closed to maintain pressure in the bypass line and minimize bubble formation.



Note
To drain dirt (e.g. after maintenance), open the drain valve (6). Close again after draining.

4.4 Submersible installation

4.4.1 Submerge tube free float installation

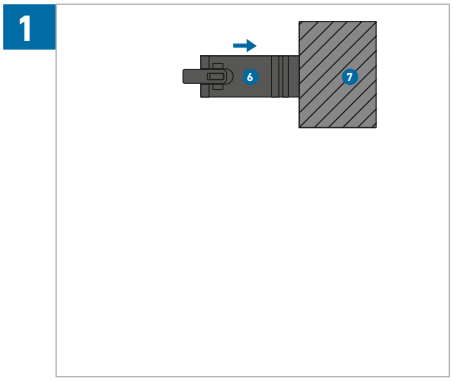


Pos.	Designation
1	Type 4170 Turbidity Sensor (fixed cable version)
2	Slanted sensor head
3	Sensor-cable
4	Pipe DN50 / 2"
5	Cable gland (customer supplied)
6	KLIP-IT pipe clip
7	Wall
8	Medium flow direction
9	Insertion depth

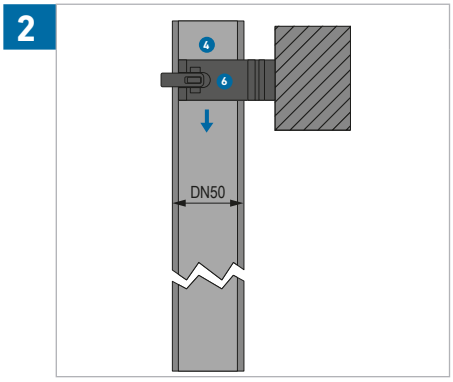
When installing the immersion tube, the following points must be observed:

- ► For submersible installations, always use the Type 4170 Turbidity Sensor with the fixed cable version.
- ► The immersion depth of the sensor must be observed, so there is sufficient clearance to the bottom (sludge and sediment on the bottom).

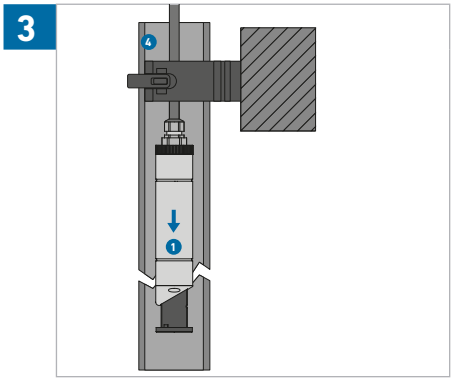
4.4.2 Installation procedure



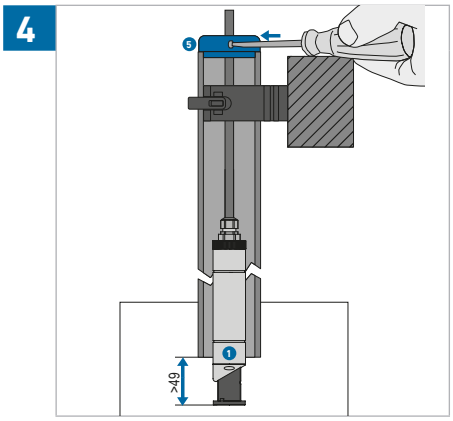
Step 1
Attach pipe clip (6) to wall (7).



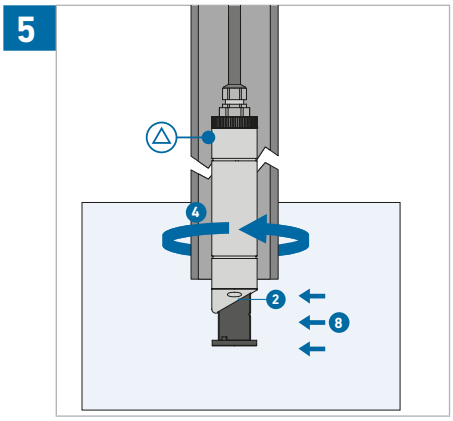
Step 2
Insert the pipe (4) into the pipe clip (6).



Step 3
Carefully slide the Type 4170 Turbidity Sensor (1) through the pipe (4). Guide the sensor cable out of the top of the pipe.

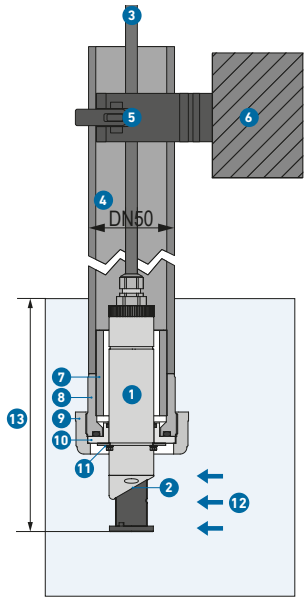


Step 4
Align the Type 4170 Turbidity Sensor (1) vertically and secure the cable gland (5). Ensure that the sensor protrudes at least 49 mm from the pipe.



Step 5
Rotate the pipe (4) until the slanted sensor head (2) faces against the medium flow direction (8).

4.4.3 Submerge tube union installation

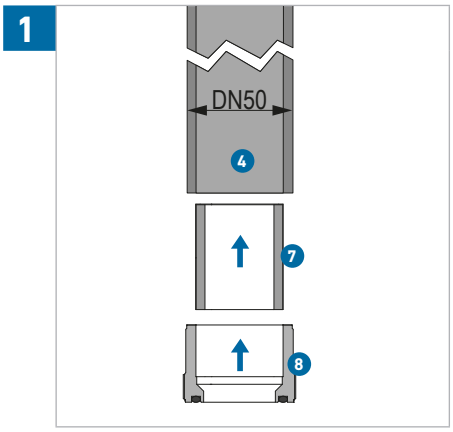


Pos.	Designation
1	Type 4170 Turbidity Sensor (fixed cable version)
2	Slanted sensor head
3	Sensor-cable
4	Pipe DN50 / 2"
5	KLIP-IT pipe clip
6	Wall
7	Pipe/Nipple DN50 / 2"
8	Union Bush DN50 / 2"
9	Union Nut DN50 / 2"
10	Turbidity Union End Adapter
11	Installation brackets
12	Medium flow direction
13	Insertion depth
14	Cable gland (customer supplied)

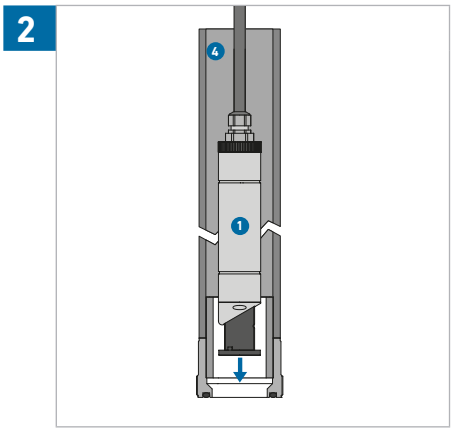
When installing the immersion tube, the following points must be observed:

- ► For submersible installations, always use the Type 4170 Turbidity Sensor with the fixed cable version.
- ► The immersion depth of the sensor must be observed, so there is sufficient clearance to the bottom (sludge and sediment on the bottom).

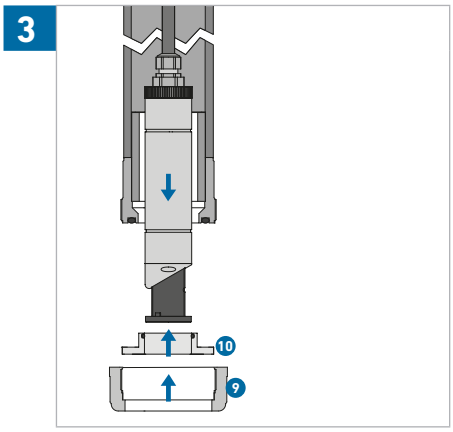
4.4.4 Installation procedure



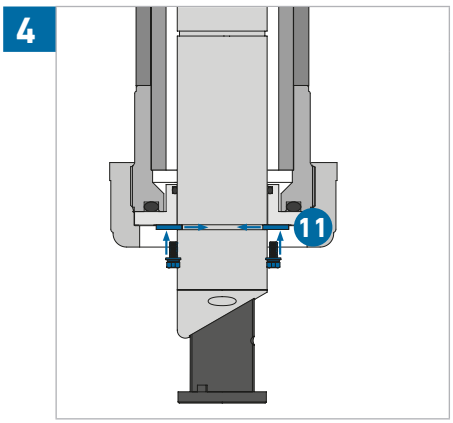
Step 1
Cement the pipe/nipple (7) and union bush (8) into the pipe (4).



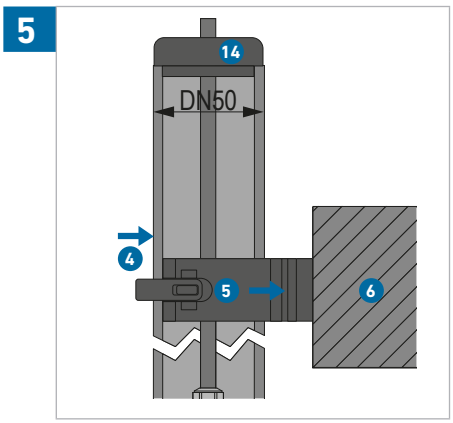
Step 2
Carefully slide the Type 4170 Turbidity Sensor (1) through the pipe (4). Guide the sensor cable out of the top of the pipe.



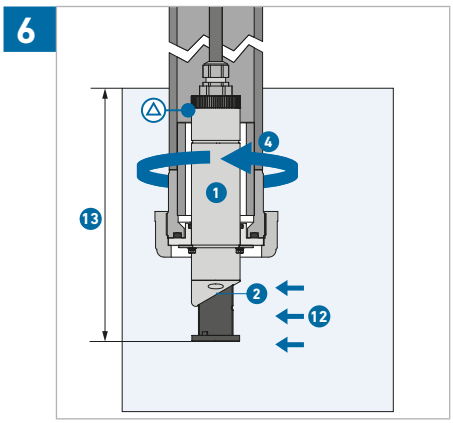
Step 3
Fix Turbidity Union End Adapter (10) with Union Nut (9).



Step 4
Mount installation brackets (11) and fix screws.



Step 5
Secure the cable gland (14).
Attach pipe clip (5) to wall (6).
Insert the pipe (4) into the pipe clip (5).

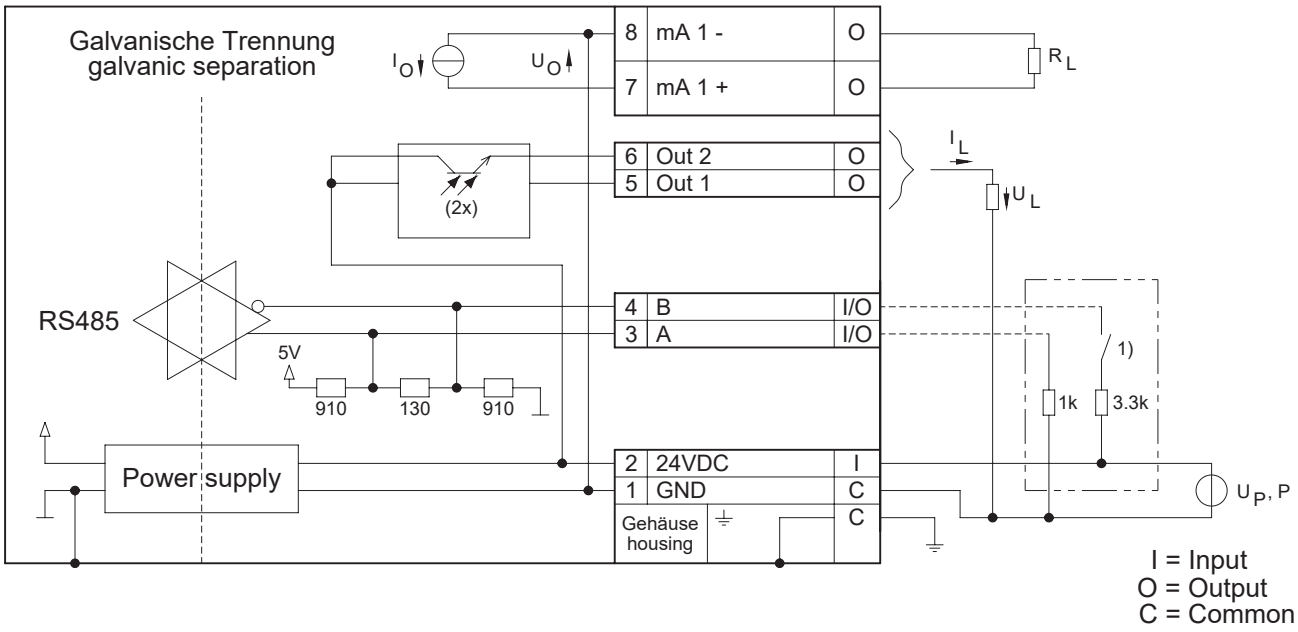


Step 6
Align the pipe (4) according to the immersion depth (13). Rotate the pipe (4) until the slanted sensor head (2) faces against the medium flow direction (12).

5 Electrical installation

5.1 Connector M12 version

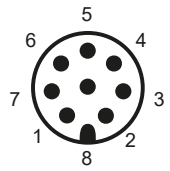
5.1.1 Connection overview



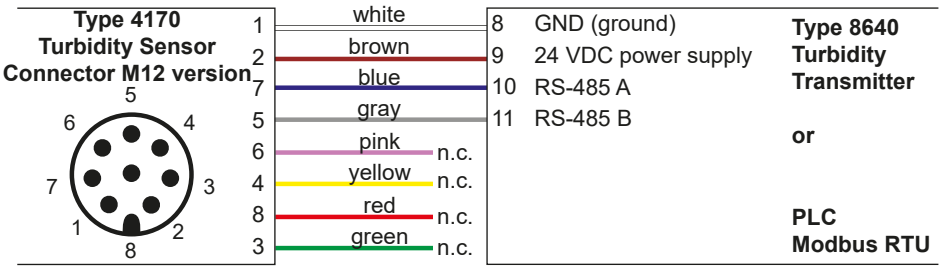
Parameter	min.	typ.	max.	Unit
U_P	22	24	26	VDC
P			2	W
U_L		24	26	VDC
I_L	0		25	mA
I_O	0		25	mA
U_O		20		VDC
R_L			600	Ω

1) Wenn die RS485 nicht benutzt wird, kann über diese ein Nullabgleich ausgelöst werden
if the RS485 is not used, then a zero adjustment can be activatet

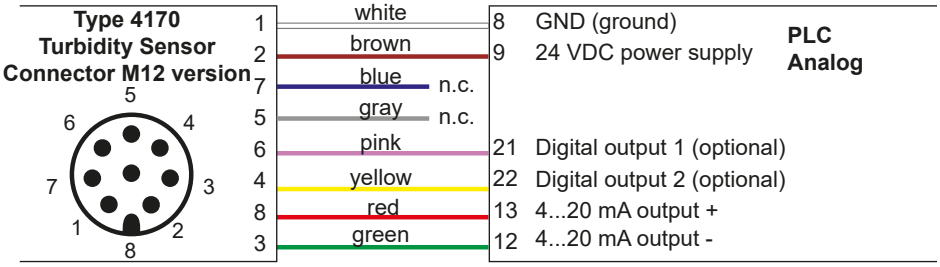
5.1.2 Connector assignment

Description	Connector pin (male)	Connector pin assignment	Wire color for M12, 8-pin	Remarks
GND (ground)	1		white	⏚
24 VDC power supply	2		brown	24 V ± 10%
RS-485 A	7		blue	Serial Modbus RTU interface
RS-485 B	5		gray	
Digital output 1	6		pink	Switches against 24 V
Digital output 2	4		yellow	Switches against 24 V
Current output +	8		red	The minus pole is connected to GND. Max. 600 Ω burden
Current output -	3		green	
Shielding			Screen	The housing is galvanically isolated relative to ground. The housing can be connected to the ground potential via the shielding

5.1.3 Wiring to Type 8640 Turbidity Transmitter or PLC (Modbus RTU)

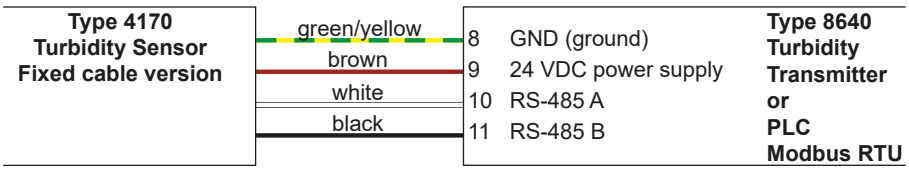


5.1.4 Wiring to PLC for direct integration with analog 4...20 mA output



5.2 Fixed cable version

5.2.1 Wiring to Type 8640 Turbidity Transmitter or PLC (Modbus RTU)



6 Commissioning

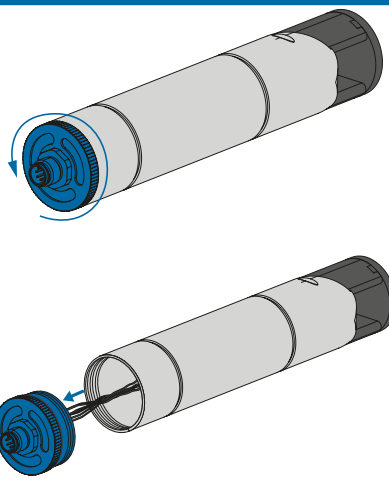
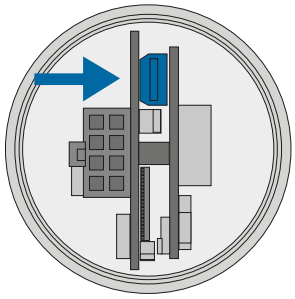
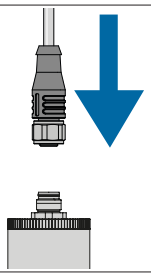
6.1 Commissioning with Type 8640 Turbidity Transmitter

Proceed with the initial startup in accordance with the following table:

Step	
1	Ensure that the Type 4170 Turbidity Sensor and Type 8640 Turbidity Transmitter are correctly mounted and connected.
2	Establish the service voltage.
3	1 The welcome screen appears on the display. **NOTICE** The factory setting language is English. 
	2 The Type 8640 Turbidity Transmitter carries out an internal functional check. 
	3 The Type 8640 Turbidity Transmitter is ready for measurement. 
3	Set the language.
4	Set the current outputs.
5	Set the limits.
6	Set the outputs.
7	If an optional Profibus module is present, set the Profibus parameters.
8	If an optional Profinet IO module is present, set the Profinet parameters.
9	If an optional Modbus module is present, set the Modbus parameters.
10	Set the date and time.
11	Enter the access code.
12	Back up the configured data.

6.3 Commissioning without Type 8640 Turbidity Transmitter

Proceed with the initial startup in accordance with the following table:

Step		
1	Connect the Type 4170 Turbidity Sensor to the PC as follows: Remove the cover on the Type 4170 Turbidity Sensor.	
2	Connect the USB cable to the Type 4170 Turbidity Sensor (arrow) and connect to the PC. The Type 4170 Turbidity Sensor is automatically detected as a removable disk (Windows operating system).	
3	Connect the M12 connector to the Type 4170 Turbidity Sensor.	
4	Establish the service voltage to Type 4170 Turbidity Sensor.	
5	Depending on the Windows configuration, either a window for the removable disk is opened automatically or Windows Explorer must be started and the removable disk opened manually. The following files are shown: Info.txt: Information on the Type 4170 Turbidity Sensor, such as serial number, software version and operating hours. Config.txt: Configuration file. Zero.txt: File used for initiating zero calibration.	

6	**1**	Open the Config.txt file.	
	2	Change the parameters as required. To do this, enter a number after "=" and confirm with the Enter button (e.g. 0 for German or 1 for English).	**Language:** 0: German, 1: English Setting the operating language **Current from:** 0.000 Setting the lower value of the current range **Current to:** 1000 Setting the upper value of the current range **Limits, Mode:** 0: Inactive, 1: Exceeded, 2: Undershot. Default = 0 **Limits, Upper limit:** 1.000. Enter the limit with the upper threshold value. **Limits, Lower limit:** 0.900. Enter the limit with the lower threshold value. **Integration:** Integration time of the measuring value from 0 .. 255 sec-onds. Default = 5 s **Output 1, Invert:** 0: No, 1: Yes Invert: Inverts output 1 (alarm) **Output 2, Invert:** 0: No, 1: Yes Invert: Inverts output 2 (limit) **Factory set.:** 0: No, 1: Yes Yes loads the factory setting.
	3	Close the file after making your entries. Changes are saved automatically. The window of the removable disk closes and then reopens after a short time.	
	4	If configuration was successful, an additional file Config. OK appears. If configuration was unsuccessful, an additional file Config.ERR appears. The configuration can fail if values outside the permitted range are entered or if text fields have been deleted or changed. In the event of an incorrect configuration, the Config.txt file is regenerated automatically and the procedure can be repeated.	
7	Power off the service voltage to Type 4170 Turbidity Sensor.		
8	Remove the USB connector, replace the desiccant and reattach the cover.		

7 Operation

Safety Precaution Before Service or Maintenance

In the event of a failure or malfunction, the system containing the sensor must first be placed in a safe condition before any intervention. This includes depressurizing the line, draining or flushing the process medium, and rinsing with clean water if required. Ensure the area is well ventilated to remove any residual pressure or hazardous vapors before beginning service or maintenance.

8 Maintenance

8.1 Maintenance schedule

	Who	Activity	Purpose
Annually or in the event of a warning	Operator	Replace the desiccant and gasket	This is a mandatory precaution to prevent moisture damage to electronic components inside the device and to maintain measurement accuracy.
As needed	Operator	Clean the Type 4170 Turbidity Sensor	Obligatory measure for maintaining measuring accuracy. Interval dependent on measuring medium.
As needed	Operator	Recalibrate the Type 4170 Turbidity Sensor	To make sure the measurement accuracy is correct and to detect sensor deviations or errors, measure the measurement accuracy. The interval depends on the measurement conditions.

8.2 Maintenance operations

8.2.1 Humidity Check

The Type 4170 Turbidity Sensor is equipped with an integrated humidity sensor that continuously monitors the internal humidity level of the sensor's electronic compartment. The measured humidity value is available via Modbus RTU and can be accessed through either the Type 8640 Turbidity Transmitter or any connected PLC or SCADA system.

The sensor performs automatic surveillance of the internal humidity. If the relative humidity reaches 50% or higher, the sensor will generate a humidity warning. This indicates a potential risk of internal condensation, which could lead to long-term damage of electronic components. In this case, the desiccant must be replaced immediately, as outlined in this section.

To prevent humidity-related malfunctions, GF recommends replacing the desiccant at least once per year, even if no warning has been triggered. This ensures continued protection of the sensor's sensitive electronics and extends the product lifetime.

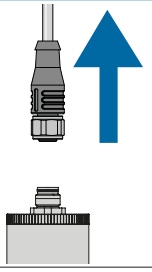
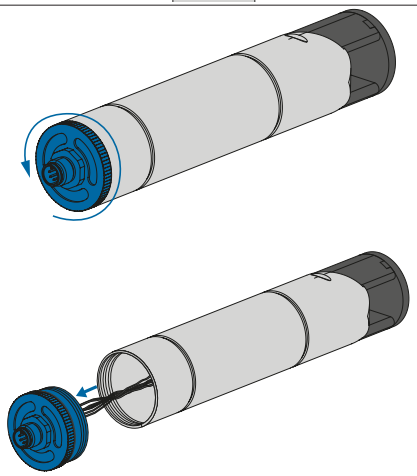
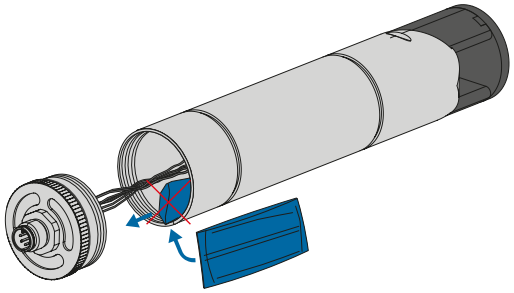
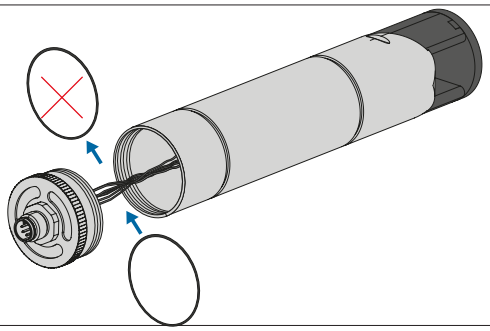
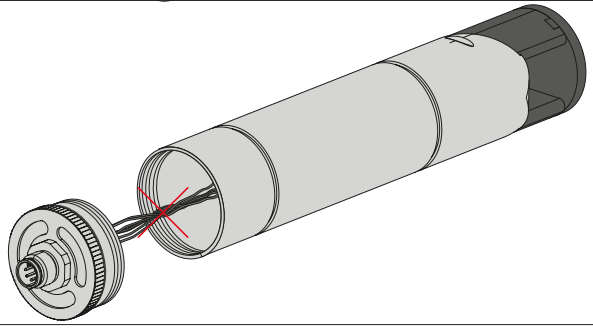
The sensor automatically clears the humidity warning once the internal level falls below the critical threshold.

NOTICE

After desiccant replacement, it may take several hours for the internal humidity level to return to an optimal condition. If humidity does not decrease after replacement, or if warning messages persist, contact your local GF Piping Systems service representative for support.

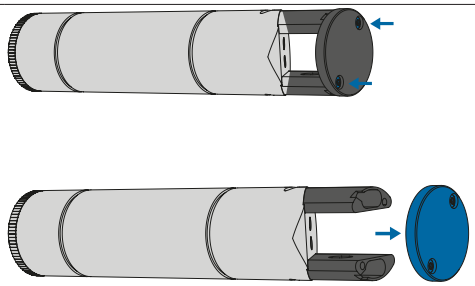
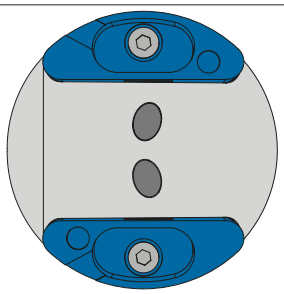
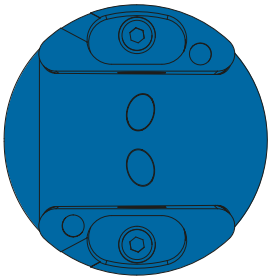
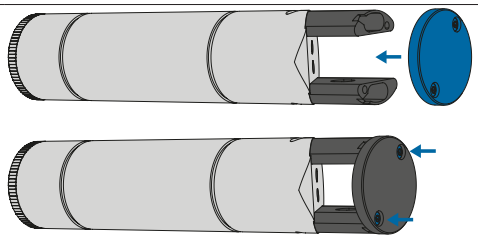
8.2.2 Replacing the desiccant and gasket on the Type 4170 Turbidity Sensor

The following procedure describes how the desiccant is changed in the Type 4170 Turbidity Sensor:

Step		
1	Interrupt the service voltage to the Type 4170 Turbidity Sensor.	
2	Unscrew the cover on the Type 4170 Turbidity Sensor. Note: The cable connection between the cover and transmitter remains in place.	
3	Replace the old desiccant bag with a new one. Replacement article, see accessories.	
4	Replace the 35 x 1.5 gasket on the cover. Note: In order for the cable between the cover and transmitter to remain connected, the gasket should be removed and attached from the outside.	
5	Screw the cover back onto the Type 4170 Turbidity Sensor. Note: In doing so, ensure that the cables are not twisted before screwing the cover into place.	

8.2.3 Cleaning the Type 4170 Turbidity Sensor

The following procedure describes how to clean the measuring cell and how to check the condition of the Type 4170 Turbidity Sensor.

Step		
1	Stop the medium flow and remove the Type 4170 Turbidity Sensor from the line. **⚠ WARNING!** **Danger due to pressurized line!** Before retracting the sensor from the process line, the line must be completely depressurized and emptied. Otherwise, serious injury may result from leaking process fluid or pressure relief. ► Always follow the correct lockout and safety procedures.	
2	Loosen the two screws (highlited) and remove the cover from the sensor head.	
3	Rinse out the absorber (highlited).	
4	Clean the sapphire windows and the surrounding surface with household dish detergent.	
5	Place the cover back onto the sensor head and fasten in place with the two screws. Note: Tighten the screws carefully as plastic threads are used.	
6	Reinstall the Type 4170 Turbidity Sensor according to chapter "Installation" and put it back into operation.	

8.2.4 Replacing the absorber on the Type 4170 Turbidity Sensor

The light absorber on the Type 4170 Turbidity Sensor is a fixed external component located around the sensor's optical window (black PPSU part). It is engineered to reduce stray light and external optical interference, ensuring stable and accurate turbidity measurements.

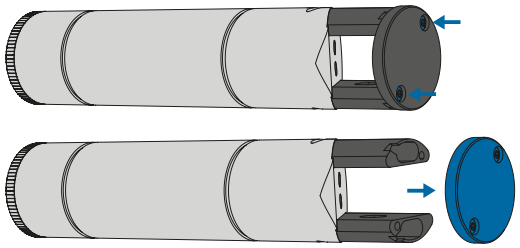
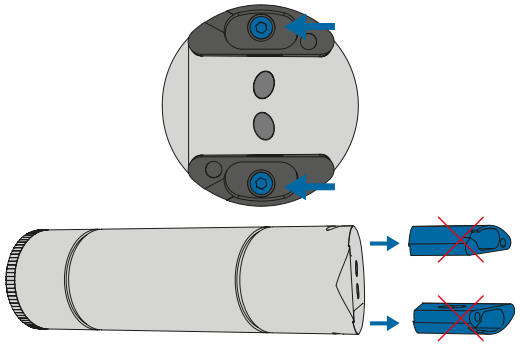
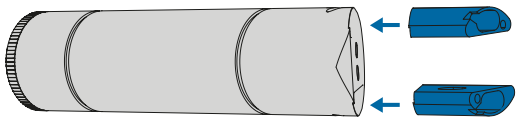
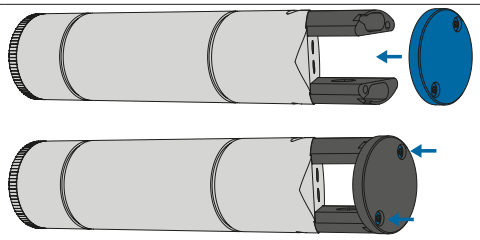
Important: The light absorber is an integral part of the sensor's optical design and is not intended to be replaced during regular maintenance. It plays a critical role during factory calibration, where external interferences are measured and compensated. These calibrated conditions carry forward into normal sensor operation.

Do not remove or replace the light absorber unless it is physically damaged or defective. Improper replacement may lead to inaccurate measurements, particularly in high-purity water applications, where even minimal optical deviations can become significant.

In the rare case that the light absorber must be replaced, a 1-point on-site calibration is required after installation to re-establish baseline compensation for external interference.

NOTICE

While the influence of a replaced light absorber is generally minor and may be negligible in standard applications, it is crucial to recalibrate in sensitive measurement environments.

Step		
1	Remove the Type 4170 Turbidity Sensor as described in the Instruction Manual.	
2	Loosen the two screws (highlited) and remove the cover from the sensor head.	
3	Remove the two screws (arrows) and then remove the left and right absorber.	
4	Position the new left and right absorber in the milled recess (arrows) on the sensor head and fasten in place with the two screws.	
5	Place the new cover back onto the sensor head and fasten in place with the two screws. Note: Tighten the screws carefully as plastic threads are used.	

8.3 Recalibration

8.3.1 Recalibration/Verification with Checking Unit

Component overview

Pos.	Designation
1	Type 4170 Turbidity Sensor
2	Container with demin water
3 + 4	Checking Unit with Syringe hose (available as an accessory)

The Type 4170 Turbidity Sensor can be recalibrated/referenced using a dedicated Checking Unit (available as an accessory). This Checking Unit contains a solid-state optical reference that does not represent a fixed turbidity value. Instead, during commissioning – while the sensor is still in its factory-calibrated state – a matching procedure is performed: the sensor is inserted into the checking unit, and the displayed turbidity value is recorded as the reference value.
This reference value serves as a baseline for all future verifications using the same sensor and checking unit. A consistent reading confirms sensor stability, while significant deviations may indicate the need for cleaning, recalibration, or further inspection.

The recommended verification interval depends on your plant's standard operating procedures (SOPs). In general, verification should be performed every 3 to 6 months, or as required by process conditions and quality assurance protocols.

A deviation of 1-2% of the reference value is considered typical.
If there is a deviation of more than 20% after cleaning the sensor, contact the GF representative.

NOTICE

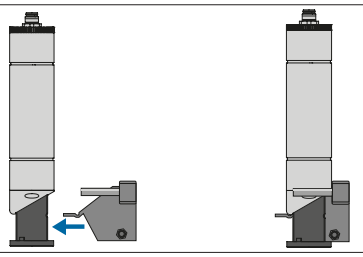
It is strongly recommended to order the checking unit together with the sensor to establish a reliable reference (matching) during initial commissioning.

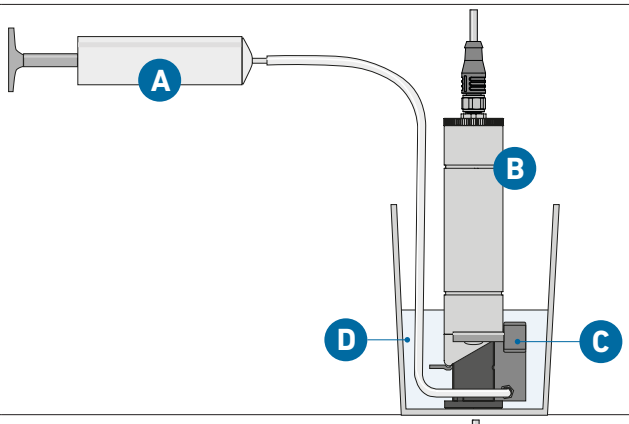
Recalibration procedure with Checking Unit

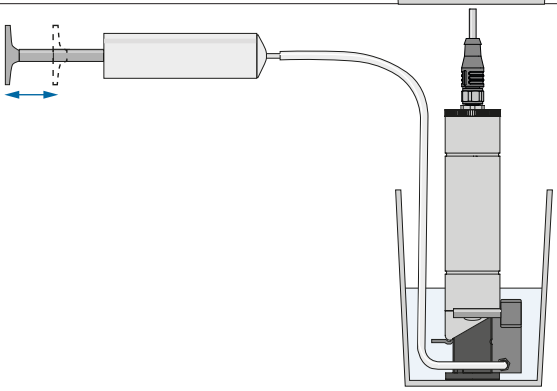
NOTICE

Recalibrating the Type 4170 Turbidity Sensor can result in deviations from the previous measuring value as the transmitter is newly reset to a reference value.

Step	
1	Stop the medium flow and remove the Type 4170 Turbidity Sensor from the line. **⚠ WARNING!** **Danger due to pressurized line!** Before retracting the sensor from the process line, the line must be completely depressurized and emptied. Otherwise, serious injury may result from leaking process fluid or pressure relief. ► Always follow the correct lockout and safety procedures. Note: If a retractable assembly is used, the medium flow must not be interrupted.
2	Clean the sapphire windows and the surrounding surface with household dish detergent. **NOTICE** Dirt, fouling, or deposits could influence the result. Clean optics are essential for accurate and repeatable verification.
3	Check whether the checking unit is clean.
4	Insert the checking unit into the sensor head until it snaps into place.
5	Place this unit vertically in a vessel filled with demin water. A: Syringe with hose B: Type 4170 Turbidity Sensor C: Checking Unit D: Vessel filled with demin water
6	Slowly draw out the syringe (A) until water is drawn in and no more bubbles are visible. Repeat pulling out and push back the syringe several times. Make sure that all air bubbles have been pushed out and that there are no air bubbles in the slanted head of the sensor or in the solid-state Check Unit. Note: The Checking Unit must be covered by at least one finger width of water.







7 Carry out recalibration with Type 8640 Turbidity Transmitter:

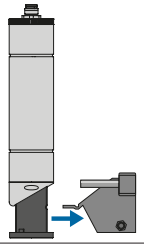
1. Switch the Type 8640 Turbidity Transmitter to service mode.
2. Select the Recalibration menu and then press C1. Check whether the nominal value is correct.
3. Press the initiate... button.
4. Recalibration is carried out.

8 Adjustment successful:
If the adjustment was successful, this is confirmed with Adjustment OK. Recalibration is now complete.

Adjustment not successful:
If the adjustment was not successful, this is indicated with Adjust. fault. In this case, check the points in the following list one after the other:

- Cleanliness of the checking unit?
- Correct checking unit used?
- Soiled sapphire windows?
- In this case, clean the sapphire windows and then repeat the procedure.
- Demin water used?
- Is the checking unit correctly locked in place?
- Is there still free space between the checking unit and the sapphire window?
- Is air trapped between sapphire windows and Checking Unit?

9 Remove the checking unit from the Type 4170 Turbidity Sensor and dry it.



8.3.2 Calibration with Formazin

Component overview

Pos.	Designation
1	Type 4170 Turbidity Sensor
2	Container with Magnetic stirrer (recommended) and filled with NIST-traceable Formazin (20 FNU)

The Type 8640 Turbidity Transmitter supports 1-point calibration using a NIST certified Formazin standard solution. This calibration allows the operator to fine-tune the measurement system to meet specific process or regulatory requirements.

Requirements

- NIST-traceable Formazin standard (e.g., 20 FNU), purchased from a certified local supplier
- Clean beaker or calibration container
- Magnetic stirrer (recommended)
- Clean water for rinsing

NOTICE

For full-range recalibration or in the case of significant deviation from expected performance, the sensor should be returned to the factory or an authorized service partner. Please contact your local GF Piping Systems representative for assistance.

NOTICE

Ensure that there are no air bubbles present in the Formazin calibration solution and that no bubbles are adhered to the sensor's optical surfaces. Air bubbles can scatter light and significantly compromise the accuracy of the calibration.

⚠ DANGER!

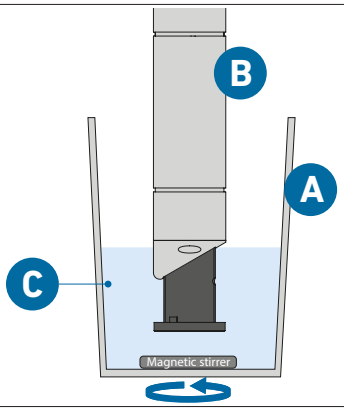
Hazardous Substance!

Formazin is classified as a carcinogenic and hazardous chemical. Direct contact or inhalation may pose health risks.

► Always handle Formazin solution with appropriate personal protective equipment (PPE), such as gloves, safety goggles, and lab coats.

► Work in a well-ventilated area and follow all local health and safety regulations regarding the handling and disposal of hazardous substances.

Calibration procedure with Formazin

Step	
1	Stop the medium flow and remove the Type 4170 Turbidity Sensor from the line. **⚠ WARNING!** **Danger due to pressurized line!** Before retracting the sensor from the process line, the line must be completely depressurized and emptied. Otherwise, serious injury may result from leaking process fluid or pressure relief. ► Always follow the correct lockout and safety procedures.
2	Clean the sapphire windows and the surrounding surface with household dish detergent. **NOTICE** Dirt, fouling, or deposits could influence the result. Clean optics are essential for accurate and repeatable verification.
3	Prepare the Formazin solution: Pour the Formazin standard into a clean beaker or suitable container. Use a magnetic stirrer to maintain continuous mixing and prevent sedimentation during calibration. **NOTICE** Always use freshly prepared or certified Formazin solutions. Avoid dilution, and store solutions per manufacturer recommendations. Calibration accuracy depends on proper solution handling and sensor cleanliness.
4	Insert the Sensor: Gently insert the Type 4170 Turbidity Sensor into the container. Ensure the optical window and light absorber are fully submerged in the Formazin solution. Avoid air bubbles on the optics. A: Container with magnetic stirrer B: Type 4170 Turbidity Sensor C: Formazin solution 
5	Allow the sensor reading to stabilize. This may take up to a few minutes depending on temperature and fluid conditions.
6	Perform 1-Point Calibration: 1. Navigate to the calibration function. 2. Select 1-point calibration. 3. Enter the certified turbidity value of the Formazin standard (e.g., 20.0 FNU) when prompted.
7	Confirm and Save: Confirm the calibration once the reading is stable and within acceptable tolerance. The transmitter will store the offset value for ongoing measurements.
9	Cleaning: After calibration, thoroughly rinse the sensor with clean water to remove any residual Formazin before returning it to process operation.

9 Decommissioning/Storage

9.1 Decommissioning the Type 4170 Turbidity Sensor

The aim of decommissioning is to prepare the individual components of the system properly for storage.

Step	
1	Interrupt the service voltage and remove the connector from the Type 4170 Turbidity Sensor.
2	Remove the Type 4170 Turbidity Sensor from the line.
3	Clean and dry the Type 4170 Turbidity Sensor.
4	Remove the electrical connections from the Type 8640 Turbidity Transmitter or the PLC.
5	Remove and pack all components.

9.2 Storing the Type 4170 Turbidity Sensor

There are no special requirements for storing the transmitters. However, please note:

- ► The system contains electronic components. Storage for such components must fulfill the usual conditions. It is important to note that the storage temperature must be between -20 and +50 °C.
- ► All components that come into contact with the medium during operation have to be dry and clean for a long time before being put into storage.
- ► The measuring equipment with all of the accessory parts must be protected against weather factors, condensing humidity and aggressive gases during storage.

9.3 Packaging/Transport/Returning

⚠ DANGER!

Hazardous media!

Products that have come into contact with hazardous media may not be sent without the appropriate information on the corresponding repairs or professional decontamination (see RMA form).

- ► Precise information on the medium must be received by GF Piping Systems in advance to be repaired so that the necessary precautions can be taken when unpacking it.

Use the original packaging materials for packaging the Type 4170 Turbidity Sensor. If the original packaging is no longer available, note the following information:

- ► All peripheral devices and accessory parts must be packaged separately and marked with the serial number of the Type 4170 Turbidity Sensor. This prevents confusion and mixups later while also making it easier to identify parts.
- ► The RMA form (14711E) must be filled in and enclosed for all returned products and spare parts. This can be downloaded at www.gfps.com.

When packaged as described above, the products can be transported via all usual shipping methods.

9.4 Disposal

NOTICE

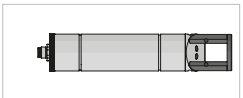
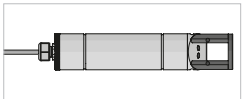
Disposal of the system and its peripheral devices is to be carried out in compliance with regional statutory regulations.
Consult local authority if in doubt.

The system has no environmentally damaging sources of radiation. The materials listed below should be disposed of or recycled as described in the following table:

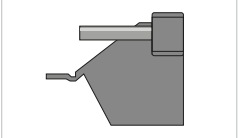
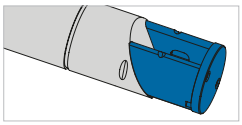
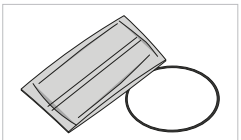
CATEGORY	Materials	Disposal possibilities
Packaging	Cardboard, paper	▶ Reuse as packaging material, local disposal center, incineration plants
	Protective foils	▶ Reuse as packaging material, recycling
Electronics	Circuit boards, electromechanical components, display, touchscreen, transformer and cable	▶ To be disposed of as electronic waste
Parts which come into contact with water	PPSU	▶ Local disposal center
	Stainless steel	▶ Waste metal disposal centers
Optics	Sapphire glass	▶ Recycling via centers for recycling glass and waste metal
Type 4170 Turbidity Sensor housing	Stainless steel	▶ Local disposal center
Desiccant	Rubingel	▶ Normal waste disposal (chemically safe)

10 Order overview

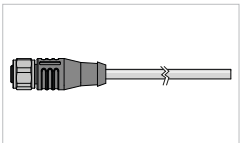
Type 4170 Turbidity Sensor

Mfr. Part No.	Code	Description	
3-4170-1	**159 002 290**	Type 4170 Turbidity Sensor, M12-Connector Version 10 m device cable provided	
3-4170-2	**159 002 291**	Type 4170 Turbidity Sensor, 10 m Fixed cable version	
3-4170-20	**159 002 292**	Mobile Unit, contains Type 4170 Turbidity Sensor (5m fixed cable), Type 8640 Turbidity Transmitter, power bank and wall socket for charging	

Consumable and maintenance parts

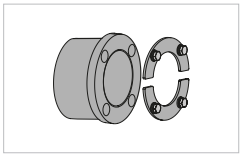
Mfr. Part No.	Code	Description	
3-4170.390	**159 002 298**	**Checking unit for Type 4170 Turbidity Sensor** Makes precise recalibration possible without Formazin	
3-4170.398	**159 002 301**	**Sensor Light-Absorber** PPSU-cover-Absorber - 4 screws included	
3-4170.399	**159 002 302**	**Type 4170 Turbidity Sensor Service Set** Includes: 1x Desiccant bag, and 1x EPDM O-ring	

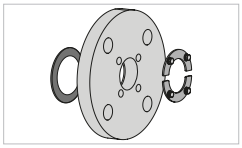
Cables

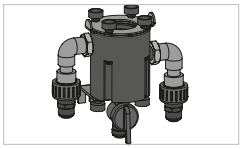
Mfr. Part No.	Code	Description	
4170.260-10	**159 002 308**	Device cable, 8-pins, M12, 10 m	
4170.260-20	**159 002 309**	Device cable, 8-pins, M12, 20 m	
4170.260-30	**159 002 310**	Device cable, 8-pins, M12, 30 m	

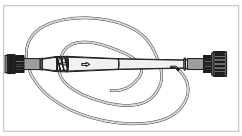
Installation and Fittings

Mfr. Part No.	Code	Description	
3-4170.391-1	**159 002 303**	Turbidity 4170 stainless steel union end for DN50 / 2"	
3-4170.392-15E	**159 002 305**	Turbidity 4170 Pipe Flange DN40	PN10-40, 1.4404 / 316L
3-4170.392-2E	**159 002 304**	Turbidity 4170 Pipe Flange DN50	PN16, 1.4404/316L
3-4170.392-2A	**159 002 306**	Turbidity 4170 Pipe Flange ASME	ASME B16, 2" Class 150, 1.4404 / 316L
3-4170.396	**159 002 299**	Flowcell for bypass installation	
3-4170.397	**159 002 300**	Deaeration kit (for bypass installation)	



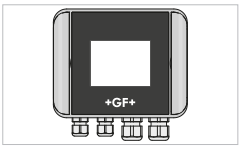


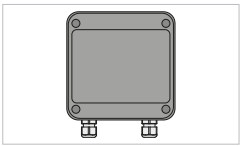


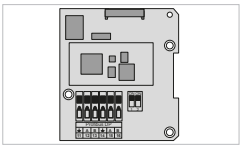


Transmitters

Mfr. Part No.	Code	Description
3-8640-1	**159 002 293**	Type 8640 Turbidity Transmitter
3-4170-21	**159 002 294**	Power supply 230V AC 24V DC 24 VDC mains device 20 W, input 100 ... 240 VAC, 47 to 63 Hz, IP66, Polycarbonate, 130 x 155 x 55 mm
3-8640-10.401	**159 002 295**	Type 8640 Turbidity Transmitter Profibus DP interface printed circuit board
3-8640-10.402	**159 002 296**	Type 8640 Turbidity Transmitter Profinet IO interface printed circuit board
3-8640-10.403	**159 002 297**	Type 8640 Turbidity Transmitter Modbus RTU interface printed circuit board

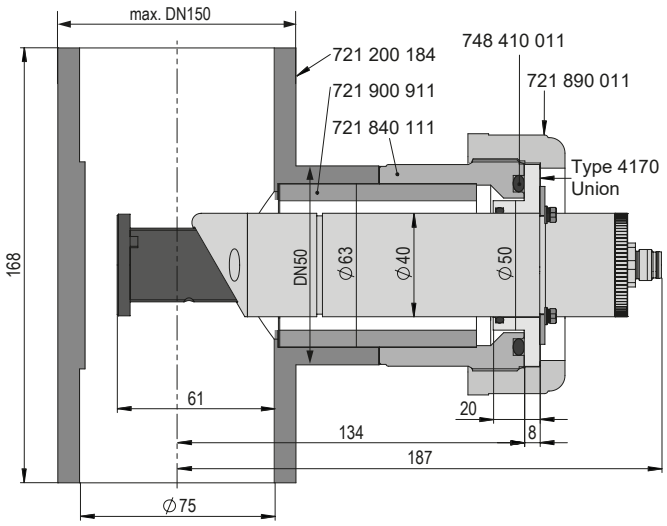




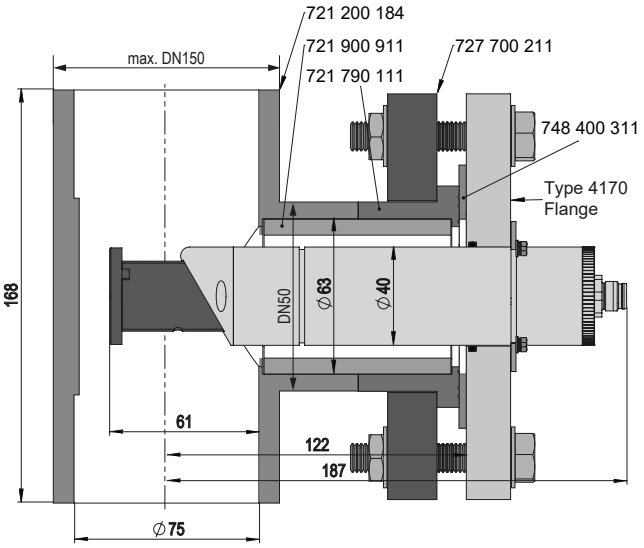


10.1 Installation examples with GF Fittings and Flanges

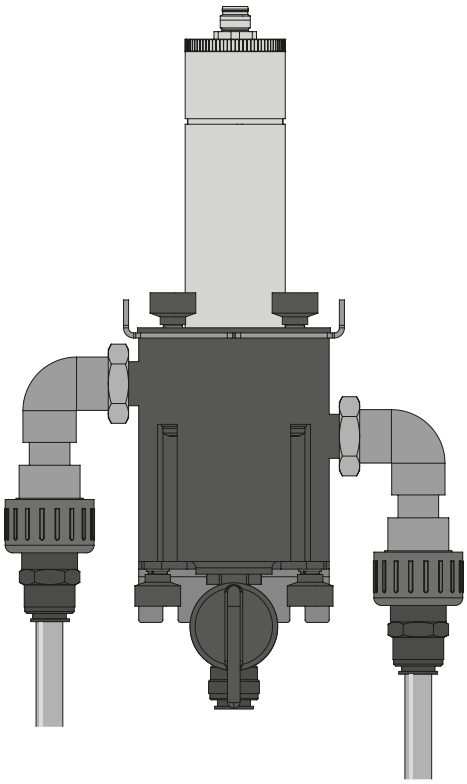
Union installation



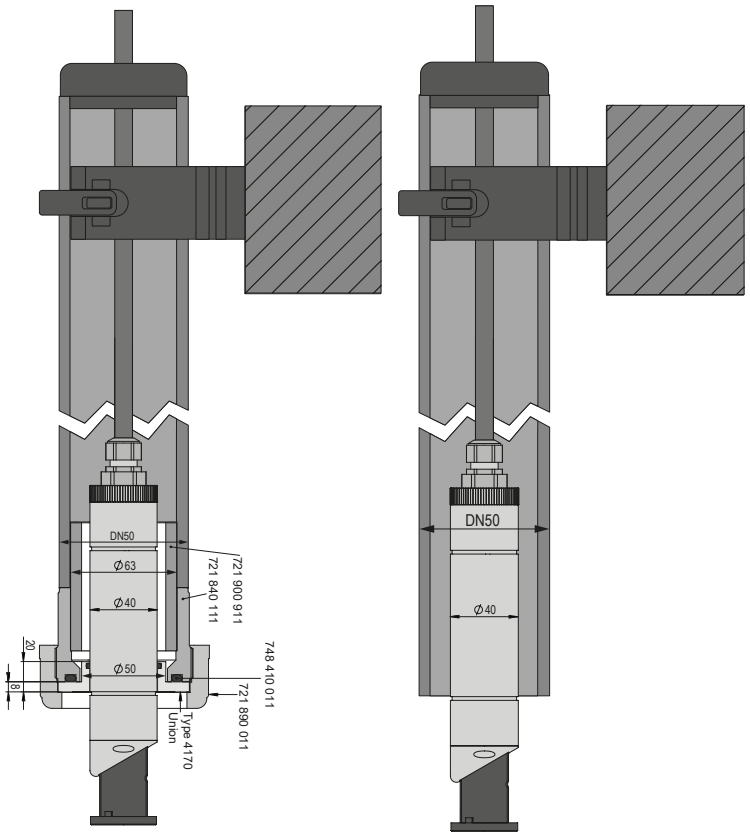
Flange installation



Online Installation (Bypass)



Submersible installation



11 Fieldbus interface

11.1 General

11.1.1 Implementation

The Type 8640 Turbidity Transmitter can be operated via the Modbus RTU, Profibus DP, Profinet IO or HART field buses. The following requirements must be met:

- The computer and/or the management or control system must be compatible with the Profibus DP, Modbus RTU or Profinet IO.
- The computer and/or the management or control system must have software that can properly process the data provided by the measuring instrument.
- GF Piping Systems cannot offer support for this.
- The Type 8640 Turbidity Transmitter must be equipped with the appropriate field bus interfaces.
- The Type 8640 Turbidity Transmitter must be connected to the bus system.

11.1.2 Fault codes

The fault codes apply for all fieldbus versions. The meaning of the individual faults and the measures to be implemented are described in the Instruction Manual.

No faults	Prioritized faults	Faults	Warnings
0: NO FAULTS	1: DEFAULT VALUES	7: SLAVE SW VERS	2: WATCHDOG
	3: CRC EXPERTS	8 .. 15: SERIAL 1 .. 8	25: V IN
	4: CRC USER	16: V ANALOG	27: ADJUSTMENT
	5: CRC DISPLAY	17: MEASUR.FAULT	29: OVER TEMP
	6: EXT RAM	19: LIGHTSOURCE 1	30: HUMIDITY
	63: SW VERS	53: IO PORT	33 .. 40: CURRENT 1..8
		54: MASTER SW VERS	41: TEMP.SENSOR
		55: POWERBOX	43: EXTERNAL ON
		77: HUMIDITY	78: SERVICE
			79: SD CARD VERS.

The EXTERNAL (43) code can be configured by the user as a warning, fault or prio fault.

11.2 Modbus RTU

11.2.1 Modbus RTU, general settings

- The electrical installation of the Modbus is described in the Instruction Manual.
- To connect to the Modbus RTU, the optionally available Modbus module must be integrated.
- The Digi.interf. \ General \ Modul type menu must be set to Auto or Modbus.
- To be able to work with the Modbus, the bus parameters in the Digi.interf. \ Modbus menu must be set correctly. If the associated parameters are changed, the function only becomes effective after a restart.
- If the instrument is used as a terminal device, DIL switch S2/1 must be switched ON on the connection module.

CAUTION!
Writing data in undocumented addresses can render the instrument inoperative.
► Only the following documented addresses may be used.

The following values can be read with Modbus function 4:

REGISTER	ADDRESS	DATA TYPE	FUNCTION	VALUES
30001	0x0000	Unsigned integer bits 15-0	Status	
30002	0x0001	Unsigned integer bits 15-0	Fault source	0: Local (Type 4170 Turbidity Sensor)
30003	0x0002	Real 32-bit Intel single precision bits 15-0	Meas. channel 1	Measuring value
30004	0x0003	Real 32-bit Intel single precision bits 31-16		
30005	0x0004	Real bits 15-0	Meas. channel 2	
30006	0x0005	Real bits 31-16		
30007	0x0006	Real bits 15-0	Meas. channel 3	
30008	0x0007	Real bits 31-16		
30009	0x0008	Real bits 15-0	Meas. channel 4	
30010	0x0009	Real bits 31-16		
30011	0x000A	Real bits 15-0	Meas. channel 5	
30012	0x000B	Real bits 31-16		
30013	0x000C	Real bits 15-0	Meas. channel 6	
30014	0x000D	Real bits 31-16		
30015	0x000E	Real bits 15-0	Meas. channel 7	
30016	0x000F	Real bits 31-16		
30017	0x0010	Real bits 15-0	Meas. channel 8	
30018	0x0011	Real bits 31-16		
30019	0x0012	Real bits 15-0	Math. channel 1	
30020	0x0013	Real bits 31-16		
30021	0x0014	Real bits 15-0	Math. channel 2	
30022	0x0015	Real bits 31-16		
30023	0x0016	Real bits 15-0	Math. channel 3	
30024	0x0017	Real bits 31-16		

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