EXpure 191

OPERATING INSTRUCTIONS

Turbidity sensor – 90° scattered light

EXNER
Process Equipment

Imprint

Issued by:

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Table of contents

1 General

The translation of the operating instructions enables the safe and efficient handling of the sensor EXpure 191.

The translation of the operating instructions is part of the product and must be kept in its direct vicinity, accessible to the staff at all times. Before starting any work, the staff must have read and understood the translation of these operating instructions.

If the translation of these operating instructions incorporates suppliers' documentation (as an attachment), Exner Process Equipment assumes no guarantee for their contents, individual statements they include, technical data, etc.

1.1 Manufacturer

Exner Process Equipment GmbH
Carl-Metz-Str. 26
D-76275 Ettlingen

1.2 Depiction of information

In order to simplify working with and to increase the safety of the translation of these operating instructions, uniform safety information and icons are used.

Safety information

Safety information protects against damages to persons or materials. The measures described for averting danger must be adhered to.

The safety instructions are structured as follows:

SIGNAL WORD	
	Type and source of the danger Consequences in case of non-observation Prevention measures / Prohibitive rules

The components have the following meaning:

- Signal word: marks the severity of the danger
- Warning sign: draws attention to the danger
- Type and source of the danger: names the causes of the danger
- Consequences: describes the consequences in case of non-observation
- Measures: provides measures to avert the danger

DANGER

This warning message marks a danger with a high risk which results in death or severe injury if not avoided.

WARNING

This warning message marks a danger with a medium risk which can result in death or severe injury if not avoided.

ATTENTION

This warning message marks a danger with a low risk which can result in minor or moderate injury if not avoided.

NOTE

This note contains information regarding possible material or environmental damages which do not result in injury to persons.

Icons

Marks	Meaning
»	Instruction with no specified sequence
1.	Instruction with a specified sequence
•	List
→	Reference to Chapter
" "	Operating element, Push button, Button
✓	Result

2 Security and protection measures

2.1 General safety instructions

The sensor unit EXpure 191 is designed in a way that when the operating instructions are observed the product does not present any hazards.

- Read the translation of the operating instructions first.
- Only install and operate the sensor after having read and understood all notes on its safe and proper use.
- Keep the translation of the operating instructions in a safe place in order to be able consult it at all times if required.
- Only use the sensor and its accessories if they are in good order and condition.
- Ensure the correct use of the sensor. Its use for unintended applications (e.g. as a step) is prohibited.
- Observe the laws, ordinances, regulations and standards applicable in the country of use and at the place of use.

2.2 Intended use

The measuring cell (including sensor) is connected to tanks or pipes. Here, the optical part of the sensor is immersed in the process liquid in order to determine the turbidity of a medium via a
90° scattered light process.

- Prepare a servicing schedule for the respective process.
- Only perform servicing work described in the operating manual.
- Changes to the sensor or measuring cell may only be made after consulting the manufacturer.

NOTE

The manufacturer is not liable for damages arising from improper or unintended use.

2.3 Danger zones and residual dangers

The sensor units are connected to tanks and pipes which may be under pressure. Process liquid can only leak in case of negligent action or improper operation. Therefore, depressurise the plant or plant component and empty it completely prior to disassembly of the sensor or the measuring cell.

- Before start-up and after each servicing, ensure that all seals and connections are complete and fully functional.
- Take appropriate protection measures prior to touching the sensor or the measuring cell as parts of them may adopt the process temperature.

2.4 Equipment and accessories

Only use tested and approved equipment and accessories.

Seals

The EXpure 191 sensor requires an elastomer seal. Provided by the factory, it consists of the material EPDM. If the medium to be measured is not water,

choose the process seal and O-ring material properties depending on the process medium.

Take the swelling capacity and acid or base resistance of the sealing material into account.

The user must establish that the materials used for both the sensor and the measuring cell demonstrate the required chemical resistance.

2.5 Requirements of the staff

Qualification

Only have the sensor installed and serviced by trained staff!

Protective clothing

When commissioning or servicing, the operating staff must wear safety goggles and appropriate protective clothing.

Accident prevention regulations (UVV)

Please observe the rules and regulations concerning occupational safety in the country and place where the sensor is to be used!

2.6 Pictograms

For better orientation, pictograms and symbols are used in the operating instructions.

Pictogram	Meaning
	General warning sign

3 Technical data

3.1 Standards

The following standards were applied when manufacturing the sensor:

- EN 61326-1: 2013-7
- EN 61326-2-3: 2013-7
- DIN/EN 27027 (ISO 7027)

3.2 Specification

Sensor specifications	
Measurement process	90° scattered light
Measurement range	0...10 NTU
Resolution	0.01 NTU
Precision	± 1 % of measurement range end value
Reproducibility	≤ 1 % of measurement range end value
Wavelength	850 nm (NIR)
Light source	LED
Material finish	Stainless steel, 1.4435 (316L)
Material sealing	EPDM
Material Casing / Measuring cell	Polyoxymethylene (POM), black / Polyethylene (PE-HD), black
Measuring window	Sapphire
Process connector	Female thread G ¼"
Installation position	Vertical
Electrical connection	Pin-and-socket connector
Connector cable length	2 m / 5 m
Interfaces	Modbus RTU (RS485), analogue 4...20 mA (optional)
Electrical connection	9...24 V DC

3.3 Dimensions

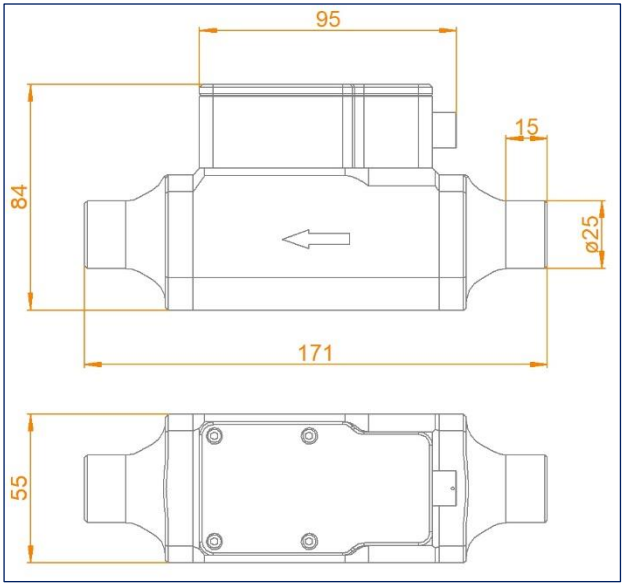


Fig. 1: EXpure 191 dimensions

3.4 Environmental conditions

Ambient temperature	0…60 °C
Transport and storage temperature	-10…80 °C

3.5 Process conditions

Pressure range:	0…6 bar
Temperature range:	1…50 °C
Measuring cell media flow:	30…80 l/h

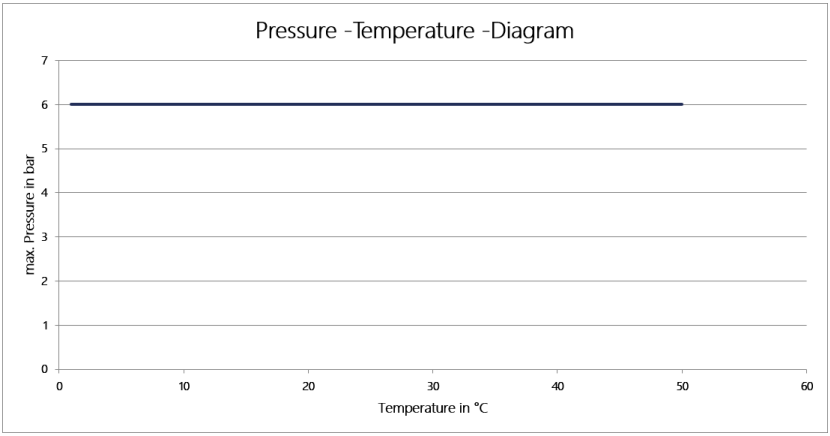


Figure 2: EXpure 191 pressure temperature diagram

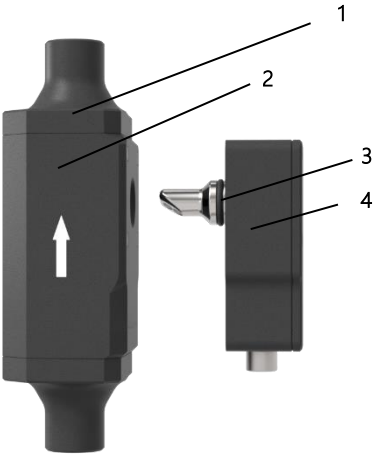
3.6 Identification plate

Fig. 3: Identification plate

4 Product description

4.1 EXpure 191

4.1.1 Components



1	Reducer
2	Measuring cell
3	O-ring
4	Sensor

Fig. 4: EXpure 191

4.1.2 Description and structure

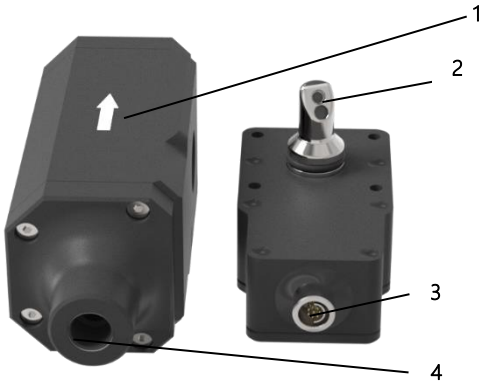
The sensor EXpure 191 is a high-precision turbidity sensor in compact casing for use including the areas of swimming pool technology and drinking water purification.

The sensor is easy to mount and connect. Servicing work is little effort when in operation. Moreover, there is no need for complex calibration.

The sensor is supplied pre-assembled with a measuring cell, which is installed upright in a pipe, preferably a rising pipe, using size G1/4" female thread. Observe the direction of flow when installing. A marking arrow is attached to the EXpure 191 measuring cell for orientation purposes.

Air bubbles in the system can affect the measurement. A bubble trap is available as an accessory to minimise these influences.

When measuring in swimming pool water, for example, various accompanying substances (e.g. chlorine) can influence the measured value. The EXpure 191 sensor with the "SP" parameterisation was fine-tuned for this purpose. This allows reliable measurement of turbidity for use in swimming pools without further calibration steps.



1	Marking arrow (direction of flow)
2	Optical unit with measurement window
3	Fischer Core Series connector plug
4	Process connection G1/4"

Fig. 5: Measuring cell and sensor

4.1.3 Reducers

Reducers are located on both ends of the measuring cell. If they are removed, e.g. for cleaning purposes, observe when re-assembling that the printed arrows point in the medium flow direction or a direction identical to the measuring cell directional arrow.
The arrows are located on the underside of the measuring cell.

5 Delivery

5.1 Scope of delivery

The sensor is inspected at the factory and delivered ready for installation in packaging which provides optimal protection for the complete sensor unit.

The delivery includes:

- Sensor
- Measuring cell
- 2 Retaining clips (DN25)
- 2 Male adapter union Ø 10mm
- Pin wrench 2.5 mm
- Operating instructions

NOTE

Store the sensor in the packaging. This ensures optimal protection until it is installed.

5.2 Checking the delivery

Before you release the sensor unit for assembly, please ensure the following:

- Packaging and device are in apparent good order and condition
- The sensor identification plate corresponds to the order specifications (→ Chapter 3.6 "Identification plate")

6 Assembly

6.1 Assembly

Requirements:

- Sufficient working space is available for operation of the sensor unit.
- The process is deactivated.
- The containers and pipe are depressurised, empty and clean.
- Process connection and measuring cell female thread match.
- Earthing contact/shielding of the connector cable is connected.

6.2 Mechanical connection

ATTENTION

Danger of injury due to escaping process liquid!

Scalding, depending on the properties of the process liquid.

» Check whether the containers or pipes where the sensor unit is connected are depressurised, empty and clean!

NOTE

Ensure that:

» Sufficient working space is available for operation of the sensor unit.

» The process is deactivated.

» The tanks or pipes are depressurised, empty and clean.

» Process connection and measuring cell female thread match.

» Insert the EXpure 191 upright into the process pipe (rising pipe). Depending on the pipe type, the measuring cell can be installed directly inside it or can be attached in advance, e.g. to a wall, using the retaining clips supplied.

» Connect the process pipe to the measuring cell.

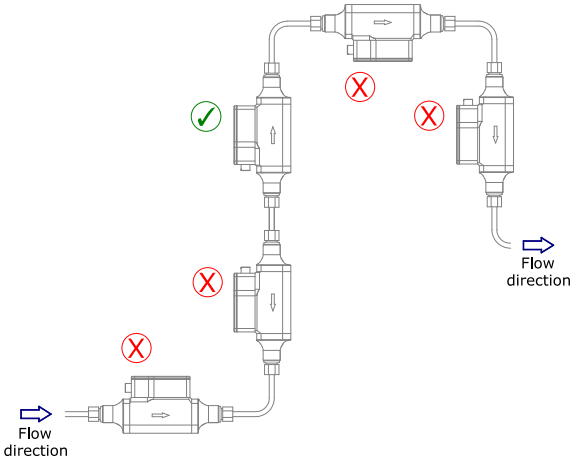


Fig. 6: EXpure 191 installation position

6.3 Mechanical connection bubble trap (option)

The bubble trap, which is available as an accessory, is supplied with two silicone hoses (each 2 m), which can be cut to size as required. One hose has an inner diameter of 8 mm, the second hose has an inner diameter of 10 mm. The set also includes 4 clamps. When installing, make sure that the thin part of the bubble trap is aligned in the direction of the measuring cell.

Assembly:

» Cut the hoses to the appropriate length. Keep the distance between the bubble trap and the sensor as short as possible.

» Fasten the hose Ø 8 mm to the inlet of the measuring cell using a screw connection.

» Push hose pieces Ø 10 mm onto the ends of the bubble trap and fix with clamps

» Insert hose Ø 8 mm into hose Ø 10 mm and also fix with clamp.

» The hose that is already attached to discharge the trapped air bubbles must not be closed. Attention! Process medium can also escape.

6.4 Electrical connection

NOTE

Ensure that you use an original cable with the correct connector plug.

The connector cable has an open cable end, via which the sensors can be connected to a voltage source and various systems such as for data processing.

ATTENTION

Danger of injury due to electrical shock!

- » Pay attention to the correct insulation of open contact points.
- » Do not touch any conductive components or switch them voltage-free beforehand.

The sensor can be operated at a voltage of 9...24 V DC. In addition to the standard sensor version (...DO), a further version (...DA) with an additional analogue output (4-20 mA) and a switch input is available.

NOTE

Observe that both the connector cable shielding and the minus pole of the power supply unit required for voltage supply are connected to the functional earth.

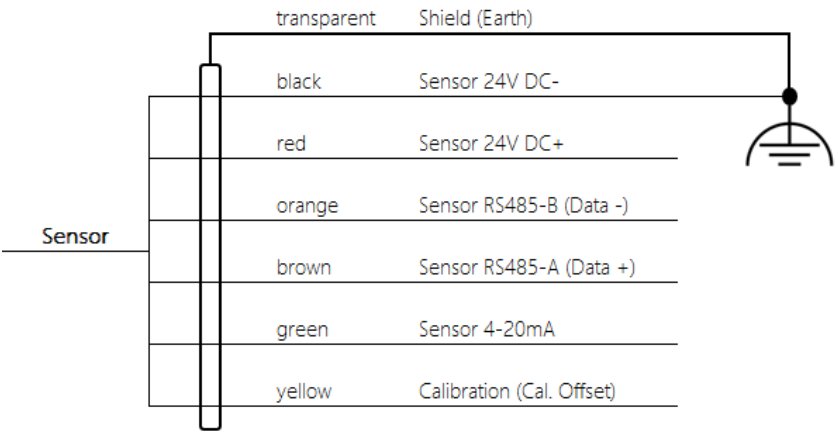


Fig. 7: Connector cable assignment

6.5 Connection Analogue interface

The EXpure 191 is optionally equipped with a 4...20 mA output in order to output the turbidity values.

For the recognition of repeated product conditions, the sensor can be adjusted to these product conditions. The switch input required for this (adjustment input) is connected via the yellow connector cable cord (see Fig. 7).

1. Fill the measuring cell completely with the desired reference liquid. Ensure that, if possible, there are no air bubbles in the medium which could falsify the measurement results.

2. As soon as the measurement value has become stable, the measurement value can be set to "0" by setting a 24 V DC switch signal adjacent at the adjustment input. In order to activate this, offset and simultaneously set the reference liquid value as "zero value", the switch input must be impinged on for approx. 5 sec. with the voltage stated.

If the adjustment input voltage (24 V DC) is only provided for approx. 1 sec., offset can be activated or deactivated. "Zeroing" does not take place.

NOTE

Permanent electrical voltage may not be provided at the adjustment input (yellow cord), also not at the cable connection. The adjustment input must be kept voltage-free. It may only be briefly impinged for the switching processes described with a voltage
(24 V DC)

NOTE

By default, the full measuring range of 0-10 NTU is output via the analog signal of 4...20 mA. This area can be adjusted using the EXpert software. It is important to ensure that an external evaluation unit or PCS is set to the same parameters, otherwise an incorrect conversion will occur and the measured value will therefore be displayed incorrectly.

7 Servicing

7.1 Important servicing notes

- Service the sensor unit regularly. Prepare a servicing schedule for the respective process.
- Only trained personnel is allowed to perform servicing work.
- Always wear appropriate protective clothing when performing servicing work.
- Only perform servicing work or repairs described in the operating instructions.
- Changes to the design may only be carried out after consulting with the manufacturer.
- Before removing the sensor or measuring cell from the process, pipes and tanks must be depressurised, empty and clean.

7.2 Control process connection

The sensor is attached to the measuring cell with 4 screws. When screwing the sensor casing onto the measuring cell, simultaneously process sealing is ensured.

NOTE

Check regularly whether the process connector is sealed. If necessary, tighten screw joints from the process pipe to the measuring cell. The same applies to the hexagon socket screws on the sensor casing and for the measuring cell, which serve as a holder for the female thread G ¼".

7.3 Cleaning the measuring window and measuring cell

Light diffusion is measured via two measuring windows (sapphire) in the process. Impurities or coating falsify the measurement value.

Clean coatings off the measuring windows regularly.

1. Remove the sensor from the measuring cell.
2. Clean coatings off the windows.
3. Check the measuring window for possible damages.

4. Check the condition of the O-ring which serves as the process seal. Should it show damages or ageing, it must be replaced.
5. The measuring cell must always be in a clean state. Check the inside of the measuring cell for dirt and deposits. If necessary, clean it.

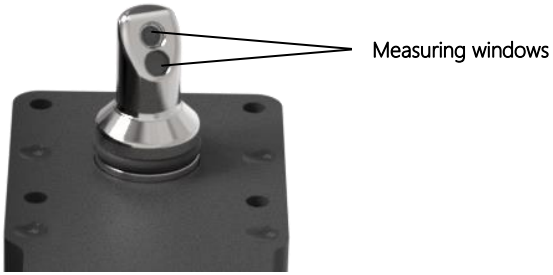


Fig. 8: Measuring window at the sensor

7.4 Checking sensor

The sensor can be checked without any additional tools. To do this, a simple reference measuring must be carried out.

Referencing in 5 steps:

1. Remove the sensor including measuring cell from the process line.
2. Separate the sensor, measuring cell and the two reducers of the measuring cell from each other.
3. Clean all components (see chapter 7.5) and dry them well.
4. Rub the optical unit again with a clean, lint-free cloth and then reassemble all components in the correct position.
5. Carry out reference measurement in a cleaned condition and before installation in the process line.

Fig.: 9: Marked with reference value

NOTE

If the measured value corresponds to the reference value specified on the measuring cell (including a tolerance of ± 10 %), the sensor works perfectly. If there is a larger deviation, please send the sensor to the manufacturer for recalibration.

7.5 Servicing plan

Perform the servicing work at recommended intervals!

Interval	Work
Every three months	Make a visual inspection of the leak-tightness of the process connections. If necessary, tighten the screw joints slightly.
Bi-annually	Remove the sensor and clean the measuring window and measuring cell.

- If necessary, adapt the service intervals to your process conditions.
- Use exclusively original replacement and wear parts.

  Use exclusively warm, lime-free water for cleaning

8 Troubleshooting in case of problems

8.1 No or faulty measurement value

Possible cause	Remedy
No sensor current	» Check/create electrical connection → Chapter 6.3
Measuring windows are coated	» Clean the measuring windows → Chapter 7.3
Faulty adjustment	» Set the sensor to zero with clear, distilled water or adjust to the medium → Chapter 6.4 » Check displacement/zeroing

8.2 Heavily fluctuating measurement value

Possible cause	Remedy
Air bubbles in the system	» Change the installation location » Install a bubble trap
Sensor doesn't immerse fully in the process fluid	» Change the installation location

8.3 Output flow doesn't match the measurement value

Possible cause	Remedy
Flow output incorrectly parameterised	» Check flow output parameterisation and change via EXpert software as applicable
Electrical connection faulty	» Check/create electrical connection → Chapter 6.3

8.4 Switch output doesn't switch correctly

Possible cause	Remedy
Switch output incorrectly parameterised	» Check switch output parameterisation and change via EXpert software as applicable
Electrical connection faulty	» Check/create electrical connection → Chapter 6.3

9 EXpure 191 order structure

	Code	Measurement range					
	A	0...10 NTU					
		Code	Material (fluid-wetted)				
		1	PE-HD / Stainless steel 1.4435 (316L)				
			Code	Structure type / Nominal size			
			F32	Flow-through vessel DN32 (1 ¼")			
				Code	Process connector		
				G14	Female thread G1/4"		
					Code	Parameterisation	
					00	Standard	
					SP	Swimming pool	
						Code	Interface
						D0	Modbus RTU (RS485)
						DA	Modbus RTU (RS485) / analogue 0/4...20 mA
EXpure 191							Order number

10 Spare parts and accessories

The sensor serial number must always be quoted for spare parts and accessories orders.

Accessories	Order number
Connector cable 2 m	2-120-69-001
Connector cable 5 m	2-120-69-002
PC software EXpert 2.x on USB stick (for Windows)	2-120-69-003
Communication interface ECI-01 EXcell / EXpure for PC connection via USB	2-120-69-004
Set Bubble trap	2-120-84-001

10.1 Certificates

Certificates	Order number
Certificate for factory calibration of NIR sensors according to DIN EN 10204-3.1	2-121-01-022

10.2 Factory examination

Factory examination	Order number
Works recalibration for NIR sensors including a certificate (recirculation proof)	2-999-00-013

11 Disposal

Please observe the valid rules and regulations concerning disposal in the country and place of application.

Sensor

Make sure that the sensor is free of hazardous and toxic substances. Components must be disposed of separately in accordance with their respective materials.

Please observe the valid rules and regulations concerning disposal in the country and place of application.

Packaging

The packaging material is cardboard and can be disposed of as waste paper.

12 Certificates and compliance

All freely available certificates and conformities can be found in their most current form in the "Downloads" section of our website.

To access the following address, enter it into your browser or scan the QR code below. Then select the relevant product and document from the list.

https://e-p-e.com/en/downloads

Depending on the product, additional certificates (e.g. material, surface, etc.) are available. If necessary, please send a corresponding request to Exner Process Equipment GmbH.

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