GESTRA®

Oil & Turbidity Detector

OR 52-5
OR 52-6

EN
English

Original Installation &
Operating Manual

810731-09

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Content of this Manual

Product:

- Oil & turbidity detector OR 52-5/ -6
- *Only applies to ORT 6 from software version - 20*
- *Only applies to ORG 12 or ORG 22 (max. temperature range + 160 °C)*

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Usage for the intended purpose

Use oil & turbidity detector OR 52-5/ -6 only for monitoring transparent liquids to detect any ingress of light-scattering and insoluble foreign matter.

Chemical and corrosive influences have to be taken into account and the equipment must only be used within its rated pressure and temperature limits. Before installation and operation make sure the equipment is resistant to the fluid in the prevailing operating conditions.

Application

The OR 52-5/-6 oil and turbidity detector consists of a type ORG 12 or ORG 22 measuring sensor and type ORT 6 measuring transducer that acts as an operating and display unit.
The correct measuring sensor is selected depending on the fluid used.

The oil & turbidity detector is used to detect impurities in transparent liquids. It is chiefly employed in industry and the food sector, in which high levels of reliability and ease of maintenance are essential.

In steam plants and hot-water plants, the oil and turbidity detector can monitor any ingress of oil or grease into the condensate, the feedwater or the water circuit (EN 12952-7, EN 12953-6).

In addition, the oil & turbidity detector is suitable for monitoring untreated and treated water (gravel filters, full demineralisation systems, reverse osmosis systems) as well as waste water.

In the food sector, the oil & turbidity detector is used in the brewing and beverage industry (filtration, monitoring of flavouring, quality assurance, etc.) and for monitoring filtration in the production of cooking oil.

Usage for the intended purpose

Function

The measuring sensor is a photometric measuring device. It consists of a light source (light emitter ⓱) and two photo-electric cells that make up a light receiver ❹ (Fig. 10). A constantly maintained beam of light shines through the transparent liquid. Undissolved foreign particles scatter the beam, which is measured using the 15° forward-scattered light principle. This scattered light is then converted into an electrical current and analysed to determine the content of foreign matter.
The measuring transducer is the operating and display unit for actuating the measuring sensor and analysing the signals. It visually displays the measurement results and is used to set the measuring equipment. It displays the actual value, the triggering of ALARM 1 and ALARM 2 limit value alarms and malfunctions in the measuring sensor. Limit values are set and displayed on the measuring transducer.

Safety note

The equipment may only be installed and brought into service by qualified and competent staff.
Retrofitting and maintenance work may only be performed by authorised staff who have undergone specific training.

Danger

The measuring sensor is under pressure during operation.
Hot water or steam escapes when nuts and bolts are unfastened.
The measuring sensor is hot during operation.
Risk of severe burns and scalding all over the body!
Before performing maintenance work on the measuring sensor or disconnecting pipes, make sure all connected pipes are depressurised (0 bar) and cooled down to room temperature (20°C).
The terminal strips of the measuring transducer are live during operation.
There is a risk of serious injuries due to electric shock.
Always **cut off power** to the equipment before working on it or on the terminal strips (installation, removal, connecting lines).
Make sure there is no possibility of inadvertently starting up the depressurised section of the system during the work.
The shut-off valves required for this purpose must be secured separately and marked.
Disconnect the power supply and make sure it cannot inadvertently be switched back on again. Affix one or more warning signs with wording such as “DO NOT SWITCH ON” on each control element in a clearly visible location.
Only equipment where there is proof that it has at least double or reinforced insulation according to EN 61010-1, EN 60730-1, EN 60950-1 or EN 62368-1 may be connected as accessories (secure electrical insulation).

Attention

The name plate indicates the technical features of the equipment. Do not bring into service or operate any equipment that does not bear its own specific name plate.

Improper use

Use in potentially explosive atmospheres

Do not use the equipment in potentially explosive atmospheres.

Technical data

Measuring sensors ORG 12 and ORG 22

Operating pressure
PN 10, 10 bar at max. 160°C

Mechanical connections
DN 10, connections G 3/8 A, ISO 228-1

Flowrate
0.5 – 50 l/min

Pressure drop
5 [mbar] [1])

Fluids
water, condensate, drinks, etc.

Max. pH value of the fluid [2])
10.5

Fluid temperature ranges
0°C – 60°C (with drying cartridge)
60°C – 160°C (with vent nipple)

Ambient temperature
0 – 60°C

Weight
approx. 6.8 kg

Materials

Housing
0.6025 galvanised

Cover
ORG 12: 0.6025 galvanised **ORG 22:** 1.4571

Wetted parts
ORG 12: 0.6025 galvanised **ORG 22:** 1.4571

Ball valves
ORG 12: 1.4436 **ORG 22:** 1.4436

Screwed unions
ORG 12: St **ORG 22:** 1.4571

Glass cylinder
Duran 50

Gaskets
FFKM

Cleaning ring
EPDM

Light emitter
Bulb 12 V / 10 W BA 15s
Protection IP 65

Light receiver
2 silicon photo-electric cells
Protection IP 65

[1]) At a flowrate of 2 l/min and a V-shaped flow through the sensor with a pipe length of 1 m (DN 10), 4 bends and $\zeta = 6.1$.
[2]) A pH value of > 10.5 may cause the glass to suffer wear, depending on temperature.

Technical data

Measuring transducer ORT 6

Inputs
Directly transmitted light (D), scattered light (S)

Outputs
1 voltage output for light transmitter ⓱, 1 – 12 V pulse-width modulated
3 floating relay contacts (alarms 1 and 2, malfunction)
Contact material AgNi 0.15
Max. switching current for switching voltages 24 AC/DC, 115 V and 230 V AC: Resistive/inductive 4 A
1 current output 0/4 – 20 mA, max. output load 500 ohm

Measuring range
0 – 25 ppm

Actual value output
0/4 mA ≙ 0 ppm, 20 mA ≙ 25 ppm

Adjustment range, limit value for alarms 1 and 2
Adjustable between 0 and 15 ppm

Indicators and adjusters
4 membrane keys
8 LEDs for indicating operating modes and dimensions
1 three-digit seven-segment display for actual value, limit value and fault indication
3 internal LEDs for monitoring system voltages

Adjustment range for time delays for alarm 1 and 2
0 to 20 seconds

Supply voltage
230 V +10 / –15 %, 50 – 60 Hz
115 V +10 / –15 %, 50 – 60 Hz (optional)

Power consumption
25 VA

Fuse
Thermal fuse M 0.2 A 5 x 20 at 230 V
Thermal fuse M 0.4 A 5 x 20 at 115 V

Housing
Field housing for wall mounting

Housing material
Die-cast aluminium

Protection
IP 65 to EN 60529

Admissible ambient temperature
0°C – 55°C

Weight
approx. 3.6 kg

Technical data

Scope of supply

- 1 measuring transducer ORT 6,
- 1 measuring sensor ORG 12 or ORG 22

Supplied:

- 3 ball valves,
- 3 screwed unions and nipples with threaded ends,
- 1 vent nipple,
- 1 turbidity standard 20 ppm,
- 1 drying cartridge,
- 1 accessory box,
- 1 glass cylinder,
- 1 Installation & Operating Manual

Technical data

Dimensions of ORG 12, ORG 22, ORT 6

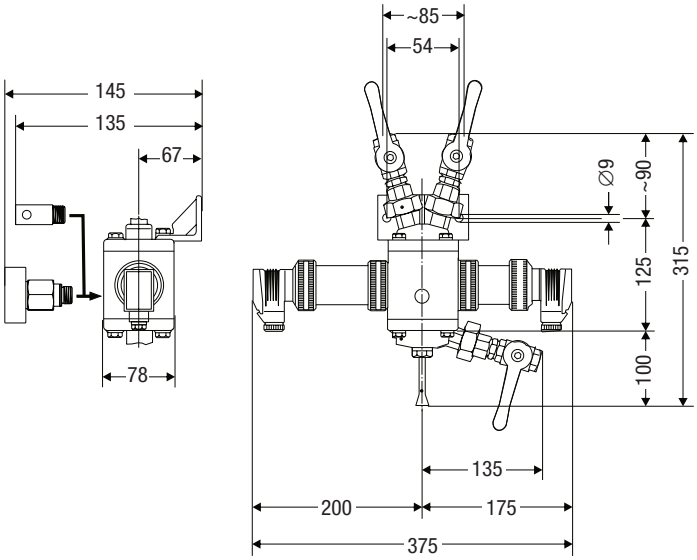


Fig. 1 Measuring sensor ORG 12, ORG 22

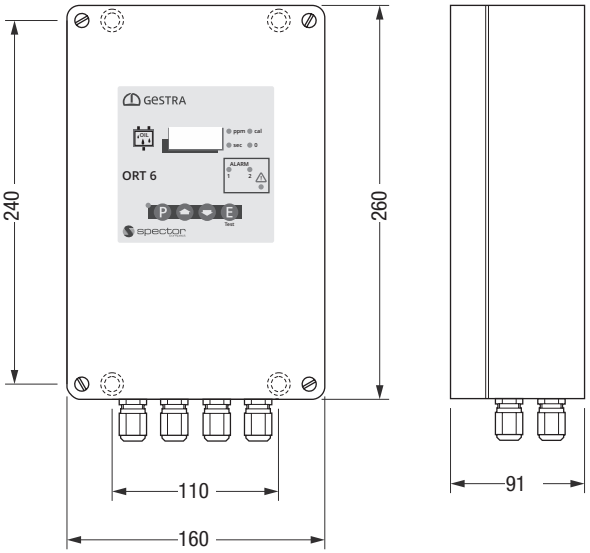


Fig. 2 Measuring transducer ORT 6

Example name plate/identification

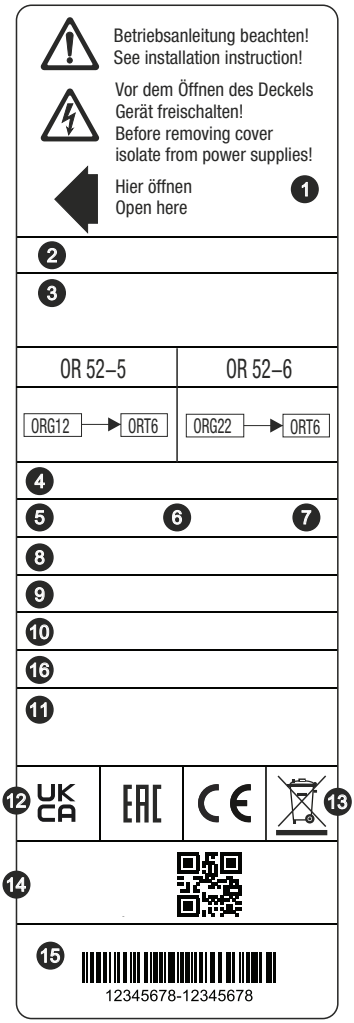


Fig. 3

1. Safety note
2. Equipment designation
3. Equipment function
4. Power supply
5. Frequency
6. Power consumption
7. IP rating
8. Maximum ambient temperature
9. Measuring range in ppm
10. Cutout relay
11. Component type approval
12. Mark of conformity
13. Disposal information
14. Manufacturer
15. Material number

The date of production is printed on the side of the equipment.

Installation

Installation example for oil & turbidity detector OR 52-5, OR 52-6

In steam plants and hot-water plants, the oil and turbidity detector can monitor any ingress of oil or grease into the condensate, the feedwater or the water circuit (EN 12952-7, EN 12953-6).

The typical equipment arrangement shown in **Fig. 4** shows how monitoring can be achieved. Here, the direction of flow is from left to right. If there is an ingress of oil or grease and the set limit value is exceeded, the first oil & turbidity detector actuates a three-way switch-over valve, to remove the contaminated water from the circuit.

In systems without continuous supervision (72 h operation), a second oil and turbidity detector monitors any continuing flow of water, and interrupts the system's safety circuit if the set limit value is exceeded.

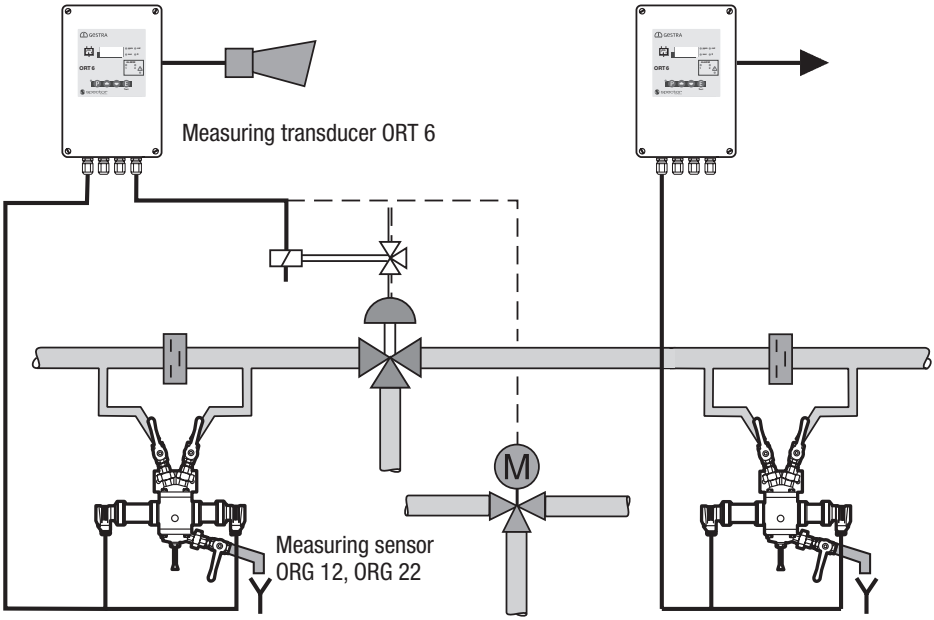


Fig. 4 Installation example of condensate monitoring in steam plants

Installing measuring transducer ORT 6

The measuring transducer is designed for wall installation and should be mounted close to the measuring sensor.

To gain access to the mounting holes, undo the cover screws and open the cover; the hole spacing is stated on the rear of the housing. Fasten the measuring transducer using suitable screws and plugs for the surface in question.

Installation

Safety note

The equipment may only be installed and brought into service by qualified and competent staff.

Use on seagoing vessels

In the event of use on seagoing vessels, a mounting bracket must also be installed. The bracket is available from GESTRA as an accessory.

Connecting measuring sensor ORG 12, ORG 22 to the system

Install the measuring sensor and route the lines as shown in installation examples **Fig. 5** to **9**.

Provide a throttling point in the mainline, e.g. a check valve (GESTRA type RK 86 with special spring 20 mbar). Install the measuring sensor in a bypass at a lower level than the mainline, so that any gas bubbles and flash steam are kept away from the sensor.

Tap the mainline at the side from the bottom to prevent air and dirt particles from flowing into the bypass.

In the event of a media temperature between 60°C and 160°C: Screw in the vent nipple ❻.

In the event of media temperatures between 0°C and 60°C: Remove the plastic cover from the drying cartridge ❼ (blue colour) and screw in the drying cartridge ❼.

If the fluid temperature is very high: Connect a longer, non-insulated pipe upstream of the ORG 12/ORG 22, to make sure the fluid temperature has cooled to the max. admissible temperature of < 160°C before it reaches the ORG 12/ORG 22.

In the presence of large amounts of gas: The tapping point must be at the bottom of the line – use a welding pocket to DIN 2618. **Fig. 8**.

In the event of a large risk of pollution and coarse impurities: Ensure a downward flow through the glass cylinder ㉑ (glass cylinder may get scratched). **Fig. 6**.

If this does not help and/or a lot of flash steam occurs ahead of the measuring sensor, fit a separator upstream of the equipment. **Fig. 9**.

Attention

Prevent outgassing and the flash steam due to a pressure drop upstream of the measuring sensor.

Key

Fig. 5 Installation example of sensor installed in a sample line, e.g. water treatment, beer filtering, permeate downstream of reverse osmosis.

Fig. 6 Installation example of sensor when the condensate contains suspended solids. If the sensor is installed as shown in **Figs. 5 – 9**, solids could be deposited on the cleaning device and would rapidly scratch the glass cylinder ㉑ when the push rod is actuated.

Fig. 7 Installation example of sensor installed in a bypass of a product line with upward flow.

Fig. 8 Installation example for product line with small amount of gas, e.g. sufficiently sized condensate line (due to flash steam) behind the condensate drainage.

Fig. 9 Installation example of sensor in a condensate line with large amount of flash steam.

Installation

Installation examples of measuring sensors ORG 12, ORG 22

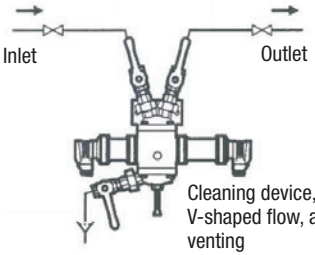


Fig. 5

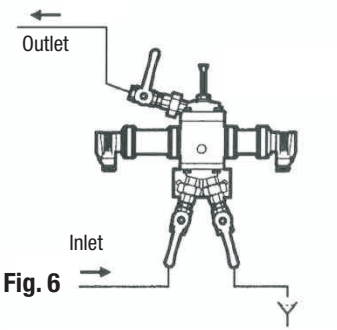


Fig. 6

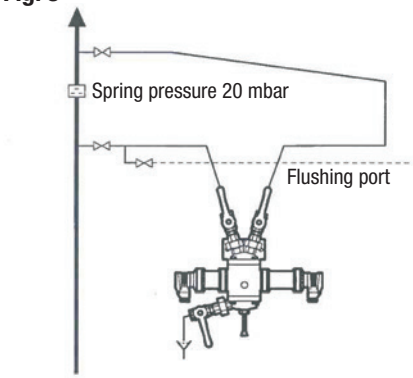


Fig. 7

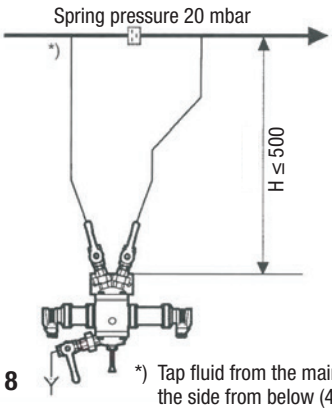


Fig. 8

*) Tap fluid from the mainline at the side from below (45°) to prevent air and dirt flowing into the bypass.

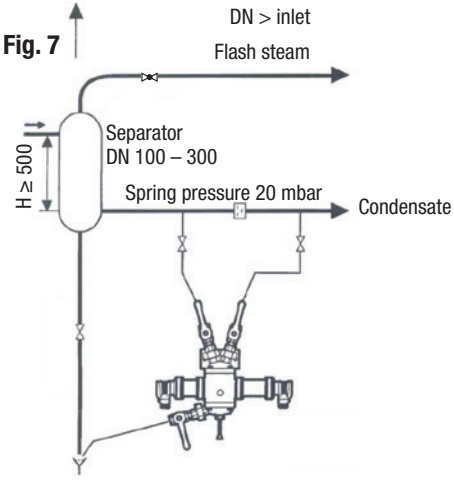


Fig. 9

Installation

Installing measuring sensors ORG 12, ORG 22

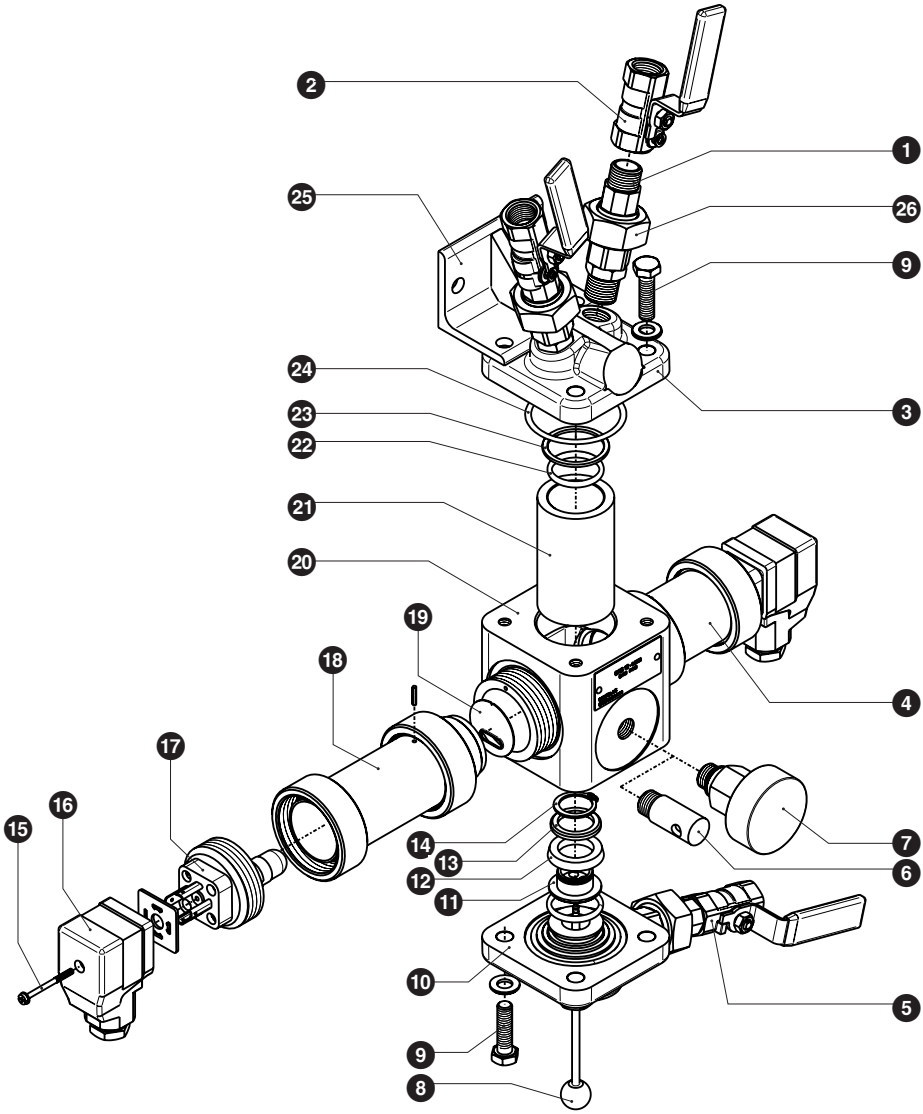


Fig. 10

Installation

Installing measuring sensors ORG 12, ORG 22

The cover ❸ and base ❿ of the measuring sensor can be screwed in rotated 90°.

1. Screw the supplied nipples with threaded ends ❶, screwed unions ㉖ and ball valves ❷ into the cover ❸ and the base ❿. Use Teflon tape or hemp for sealing the thread.
2. Align the ball valves ❷ using the screwed unions ㉖, so that the levers are at the front and their position is easily visible.
3. Fit the ORG 12/ORG 22 in an accessible location with the mounting bracket ㉕. For use on ships, weld the mounting bracket ㉕ to its support.
4. Install the inlet and outlet lines, using 12 x 1 Ermeto, DN 10 gas pipe or suitable flexible tubes (for simple cleaning).
5. Fit the measuring sensor so as to enable visual inspection of the flow once the light receiver ❹ has been removed. You can interchange the light emitter ⓱ and receiver ❹ by slackening the inner union nuts (from the housing ⓴) and swapping the light emitter ⓱ and receiver ❹ over. When refitting, take care to ensure the locating pins in the housing ⓴ fit in the grooves of the light emitter ⓱ and receiver ❹. Tighten the union nuts.

Make sure condensation does not form on the outside of the glass cylinder. Condensation on the outside of the glass cylinder ㉑ results in excessively high readings.

Key

❶ Nipple with threaded ends
❷ Ball valve G 3/8 A, ISO 228-1
❸ Cover
❹ Light receiver with tube
❺ Ball valve for flushing G 3/8 A, ISO 228-1
❻ Vent nipple
❼ Drying cartridge with adapter
❽ Cleaning device / wiper
❾ Hexagon head bolt M 8 x 30 EN 24017
❿ Base
⓫ Support for cleaning ring
⓬ Cleaning ring
⓭ Ring
⓮ Retaining ring 19 x 1.2
⓯ Screw
⓰ Connector of light emitter/ light receiver
⓱ Light emitter
⓲ Tube
⓳ Turbidity standard
⓴ Housing
㉑ Glass cylinder
㉒ O-ring 25 x 3
㉓ O-ring 30 x 2
㉔ O-ring
㉕ Mounting bracket
㉖ Screwed union

Electrical connection

Light emitter/receiver with four-pole connector

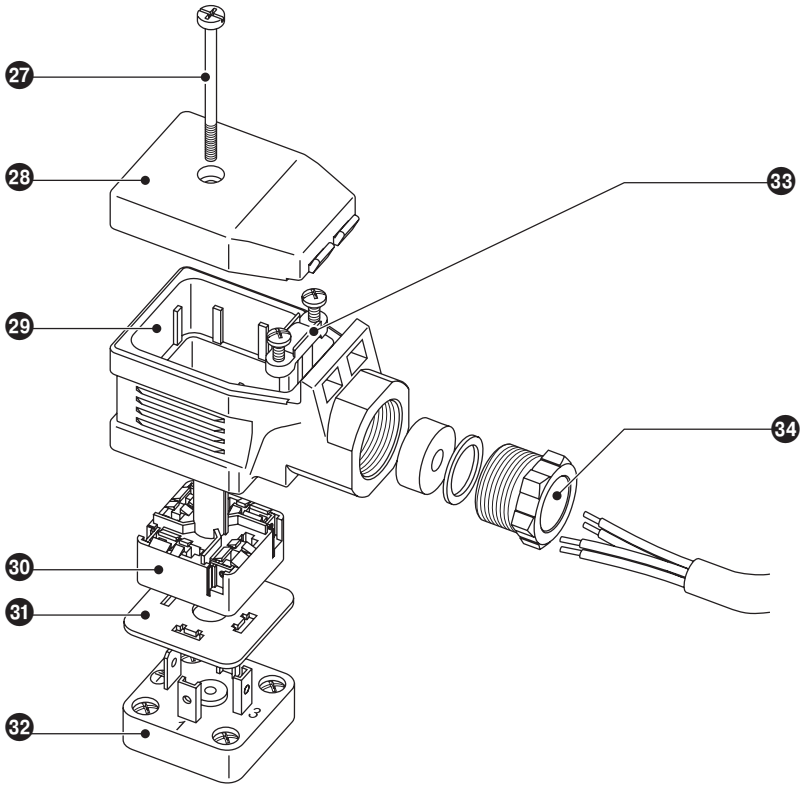


Fig. 11

Key

- 27 Screw M 4
- 28 Cover
- 29 Connector upper part
- 30 Connection panel
- 31 Sealing washer
- 32 Contact panel for light emitter/receiver
- 33 Cable clamp
- 34 Cable gland M 16 (PG 9)

Tools

- Size 1 screwdriver
- Screwdriver, size 2.5, fully insulated to VDE 0680-1

Electrical connection

Connecting the light emitter/receiver

To connect the light emitter/receiver, please use a screened, multi-core control cable with a minimum conductor size of 0.5 mm^2. For the light emitter e.g. LiYCY 2 x 0.5 mm^2 and for the receiver e.g. 4 x 0.5 mm^2.

Connect the shield in the measuring transducer **only once**.

Max. line length between light emitter/receiver and measuring transducer 50 m.

Connecting the four-pole connector of the light emitter/receiver

1. Undo screw ㉗. **Fig. 11**
2. Remove the connector upper part ㉙ from the light emitter/receiver, leaving the sealing washer ㉛ on the contact panel ㉜.
3. Remove the cover ㉘.
4. Press the connection panel ㉚ out of the connector upper part ㉙.

   The connector upper part can be turned in increments of 90°.
5. Detach the cable gland ㉞ and cable clamp ㉝ from the connector upper part ㉙.
6. Pull the cable through the cable gland ㉞ and connector upper part ㉙ and connect the terminals of the connection panel ㉚ as shown in the wiring diagram **Figs. 12 and 13**.
7. Press the connection panel ㉚ into the connector upper part and align the cable correctly.
8. Secure the cable with the cable clamp ㉝ and the cable gland ㉞ .
9. Put on the cover ㉘ and insert the screw ㉗.
10. Position the connector upper part on the light emitter/receiver and secure with the screw ㉗.

Electrical connection

Wiring diagram ORG 12, ORG 22, ORT 6 with three-way valve, switch-over in the event of an alarm

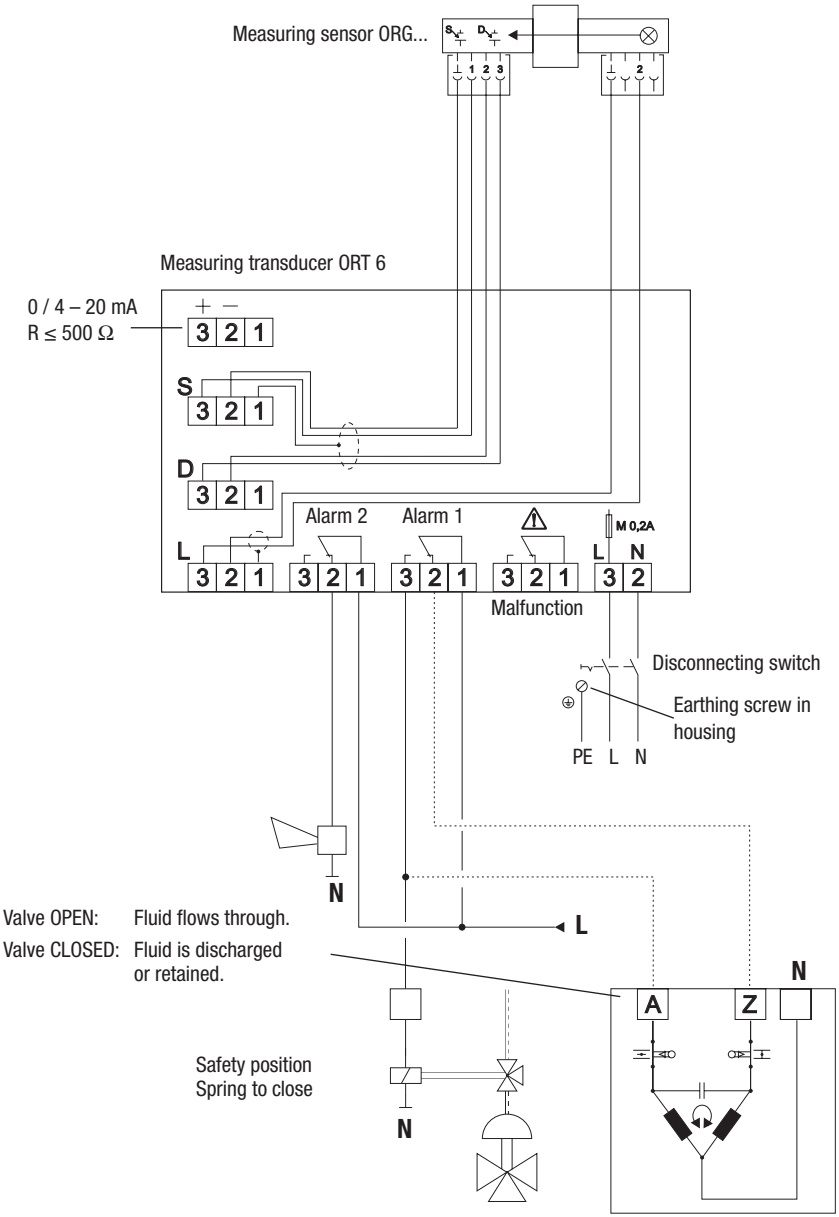


Fig. 12

Electrical connection

Measuring transducer ORT 6

1. Unscrew the cover screws and open the cover.
2. Pull all connecting cables through the cable glands.
3. Strip off approx. 40 mm of cable insulation and remove approx. 5 mm of conductor end insulation.
4. Connect the light emitter and receiver to terminal strips S, D and L as shown in the wiring diagram.
5. Connect the shields.
6. Remove the three-pole terminal strips for alarms 1 and 2, malfunction and mains.
7. Mark the connecting cables as “Alarm 1”, “Alarm 2”, “Malfunction” and “Mains”.
8. Wire the terminal strips as shown in the wiring diagram.
9. Connect the PE to the earthing screw in the housing.
10. Re-insert the terminal strips.
11 Seal the cable glands by tightening the screws.
   Fit the dummy plugs supplied with the equipment to seal unused cable glands.
12. Close the cover and tighten the cover screws.
13. Install the disconnect device (disconnecting switch).

Attention

- Fuse output contacts with a T 2.5 A external fuse to prevent welding of the contacts.
- Voltage peaks occur as the result of switching off inductive loads; these significantly impair the functioning of control and regulation systems. Connected inductive loads must have interference suppression (RC combination) as per the manufacturer's specifications.
- Install an all-pole disconnecting switch in an easily accessible location close to the equipment as a disconnector for the measuring transducer (EN 61010-1).
- Mark the switch as a disconnector for the measuring transducer.
- Only equipment where there is proof that it has at least double or reinforced insulation according to EN 61010-1, EN 60730-1, EN 60950-1 or EN 62368-1 may be connected as accessories (secure electrical insulation).

Tools

- Screwdriver, sizes 1 and 2
- Screwdriver, size 2.5, fully insulated to VDE 0680-1

Electrical connection

Wiring diagram ORG 12, ORG 22, ORT 6 with three-way valve, switch-over in the event of an alarm or malfunction

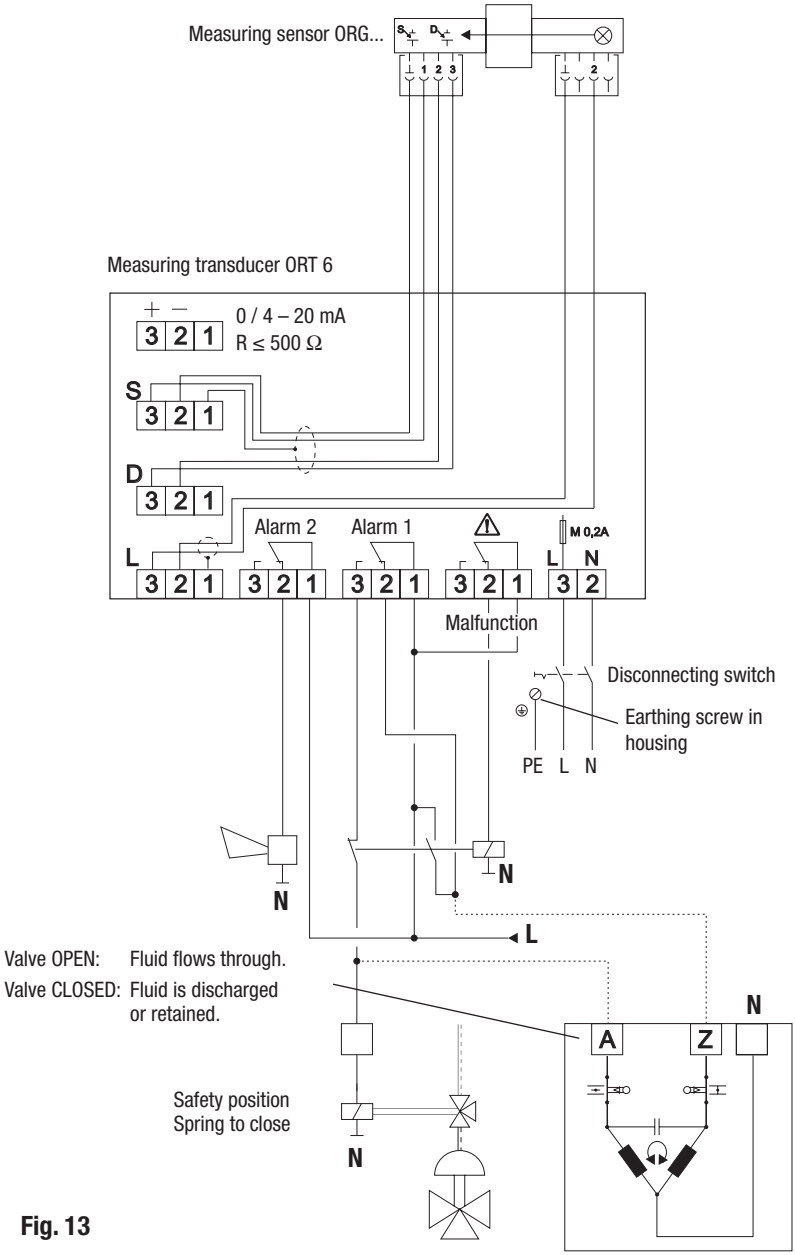


Fig. 13

Electrical connection

Note

To use alarm contact 1 for an initial alarm and alarm contact 2 for the main alarm, for instance, set two different limit values.

For condensate monitoring, alarm contact 1 and the malfunction contact can then be used to control a three-way valve, which will discharge the unusable condensate if the level of turbidity is too high (alarm caused by ingress of oil or start-up dirt). Alarm contact 2 will then trigger the main alarm.

Note that alarm contacts 1 and 2 and the three-way switch-over valve will not be switched over in the event of a malfunction.

However, the malfunction can be included in the control of the three-way switch-over valve as shown in the wiring diagram **Fig. 12** .

Pneumatic valves can be actuated via solenoid valves.

Valves with a single-phase AC motor and max. power rating of 50 VA (see wiring diagram **Fig.12** or **Fig. 13**) can also be connected directly. Install a reversing contact in between in the case of three-phase actuators.

Factory setting

The measuring transducer features the following factory settings:

- Limit value, alarm 1: 3 ppm
- Limit value, alarm 2: 5 ppm
- Time delay, alarm 1: 1 second
- Time delay, alarm 2: 1 second
- Actual value output: 4 – 20 mA
- 7-segment display with decimal point
- Dirt warning: activated
- CANbus: deactivated

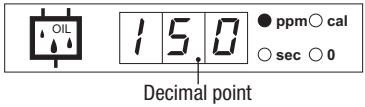
Changing factory setting

Danger

The terminal strips of the measuring transducer are live during operation.
There is a risk of serious injuries due to electric shock.
Always **cut off power** to the equipment before working on it or on the terminal strips (installation, removal, connecting lines).

Setting a decimal point

A decimal point can be activated for the actual value and the alarm limit values in the 7-segment display.
This setting does not affect the time delays.
Cut off the power supply to the equipment!
Open the housing cover of the measuring transducer and set code switch S1-7 on the cover plate to ON (factory setting). **Fig. 14**



Detailed view of cover plate

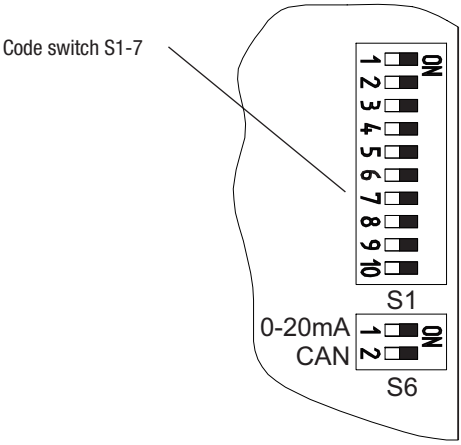


Fig. 14

Activating warning function in the event of pollution

A warning can be emitted in the event of increasing pollution of the glass cylinder. The associated factory default threshold is fixed at 80% bulb modulation and cannot be changed. If the warning function is triggered, the glass cylinder should be cleaned. See 'Maintenance' chapter.

Switch the code switch S1-6 to the position ON (factory setting) to activate the warning function.

The warning is shown on the display by a slowly flashing yellow malfunction LED.

The warning does not initiate switch-off of the relay.

The warning cannot be acknowledged.

Activating actual value output 0 – 20 mA

To change the actual value output scale to 0 – 20 mA, the code switch S6-1 can be switched to the position ON.

The factory default setting for the output is 4 – 20 mA.

Using measuring transducer ORT 6

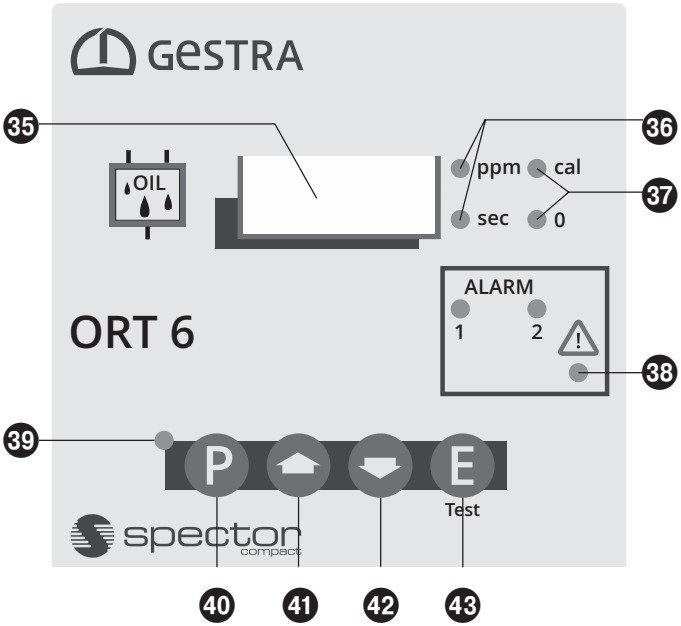


Fig. 15

Key

35 7-segment display
36 Dimension LED
37 Calibration LED
38 Malfunction LED, yellow
39 Programme LED, yellow
40 Programme key
41 Plus key
42 Minus key
43 Acknowledge key/test mode

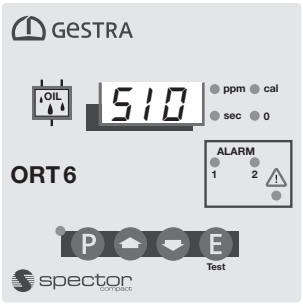
Bringing into service

Danger

Flush the equipment before commissioning. Do not use caustic agents for flushing unless expressly permitted by the manufacturer.

Bringing into service for the first time

1. Switch on measuring transducer (disconnecting switch).
2. Flush measuring sensor ORG 12/22 for at least 15 minutes and operate the cleaning device ❽ if necessary.
3. Make sure the ORG 12/22 is completely free of air.
   For a visual inspection, undo the union nuts (inside) and remove the light receiver ❹. When screwing the light receiver in again, make sure the locating pin fits exactly in the corresponding groove at the front collar of the light receiver ❹.

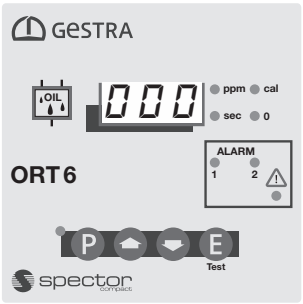


0% calibration

Turbidity zero: Use tap water (with a low fluid temperature) or oil-free condensate.

1. Press Ⓟ, the yellow P-LED lights up.
2. ⓪ ⓫ to change the display until the calibration LED 0 lights up. The most recently saved calibration value (digits) is shown.
3. Press Ⓟ, the yellow P-LED and the 7-segment display flash.
4. Press Ⓔ, the 0% value is saved as basic turbidity. The yellow P-LED and the 7-segment display light up. If the basic turbidity is too high an error message will pop up.
5. Press Ⓔ, the equipment returns to normal operation, 0 ppm is indicated and the dimension LED ppm lights up.

To cancel press Ⓟ twice, the yellow P-LED lights up again.



Bringing into service

100% calibration

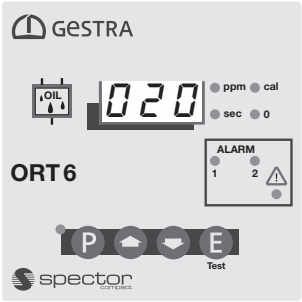
Affix the supplied 20 ppm turbidity standard ⑲ to the light emitter ⑰ of the measuring sensor. Unscrew the union nut (inside) on the tube ⑱ to detach the light emitter ⑰ from the housing ⑳ of the sightglass. Place the turbidity standard ⑲ on the visible part of the black tube ⑱ in such a way that the screen in the turbidity standard ⑲ is exactly congruent with the screen in the tube ⑱. Reattach the light emitter ⑰, making sure the locating pin of the housing ⑳ fits into the groove of the tube ⑱. Tighten the union nuts (inside).

Make sure the liquid used for calibrating the zero point stays in the glass cylinder.

Further settings on the measuring transducer:

1. Press Ⓟ, the yellow P-LED lights up.
2. ▲▼ to change the display until the calibration LED cal lights up. The most recently saved calibration value (digits) is shown.
3. Press Ⓟ, the yellow P-LED and the 7-segment display flash.
4. Press Ⓔ, the 100% value is saved. The yellow P-LED and 7-segment display light up.
5. Press Ⓔ, the equipment returns to normal operation, 20 ppm is indicated and the dimension LED ppm lights up.

To cancel press Ⓟ twice, the yellow P-LED lights up again.



Remove the turbidity standard ⑲ from the measuring sensor once more and store carefully to ensure it cannot be scratched.

Oil/turbidity curves

When the scattered light is measured, its intensity is used to determine the concentration of suspended solids in the fluid. However, where the concentration of solids is the same, the scattered light intensity or degree of turbidity depends on:

- the size of the particles (degree of emulsification)
- the shape and composition of the particles
- the optical properties of the particles

When turbidity is caused by oil and grease, the degree of emulsification is a decisive factor.

Different suspended particles in the fluid

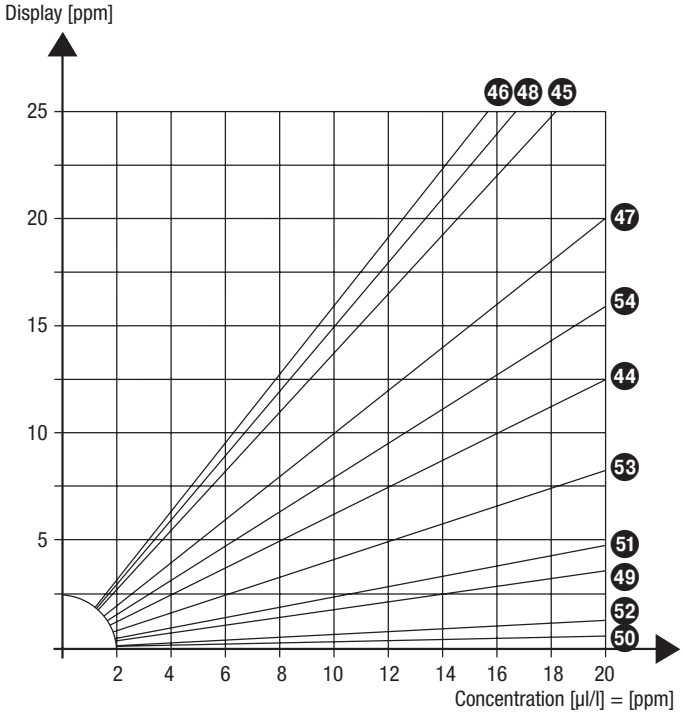


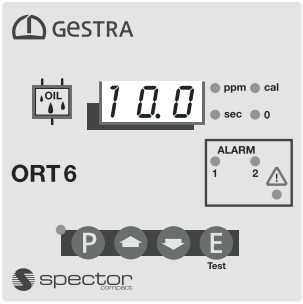
Fig. 16

44 Fuel oil EL, 15°C, coarse emulsification
45 Fuel oil EL, 15°C, fine emulsification
46 Fuel oil EL, 80°C, fine emulsification
47 Engine oil SAE15W40, 15°C, fine emulsification
48 Vegetable oil, 15°C, fine emulsification
49 Xylene, 20°C, fine emulsification
50 Xylene, 80°C, fine emulsification
51 Red berry juice, concentrated
52 Black berry juice, concentrated
53 Skimmed milk, fat content 0.1%, based on fat concentration
54 Turbine oil T 68, gear oil M 68

Bringing into service

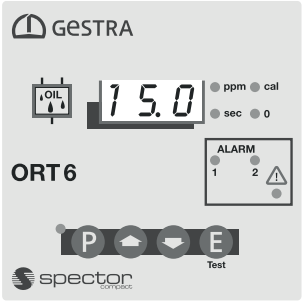
Setting limit alarm 1

1. Press P, the yellow P-LED lights up.
2. ▲▼ to change the display until the Alarm 1 LED and Dimension LED ppm light up. The most recently set value is shown.
3. Press P, the yellow P-LED and the second digit of the 7-segment display flash.
4. Use ▲▼ to change the digit and E to save this setting and move on to the third digit. The third digit now flashes.
5. Use ▲▼ to change the digit and E to save this setting. The yellow P-LED and the 7-segment display light up. A maximum limit value of 15 ppm can be set.
6. Press E, the equipment returns to normal operation, the actual value is displayed and the dimension LED ppm lights up.



Setting limit alarm 2

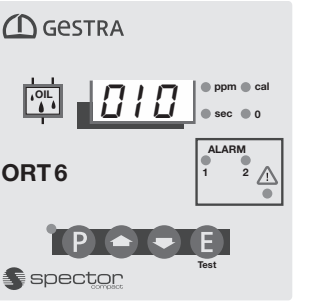
1. Press P, the yellow P-LED lights up.
2. ▲▼ to change the display until the Alarm 2 LED and Dimension LED ppm light up. The most recently set value is shown.
3. Press P, the yellow P-LED and the second digit of the 7-segment display flash.
4. Use ▲▼ to change the digit and E to save this setting and move on to the third digit. The third digit now flashes.
5. Use ▲▼ to change the digit and E to save this setting. The yellow P-LED and the 7-segment display light up. A maximum limit value of 15 ppm can be set.
6. Press E, the equipment returns to normal operation, the actual value is displayed and the dimension LED ppm lights up.



Bringing into service

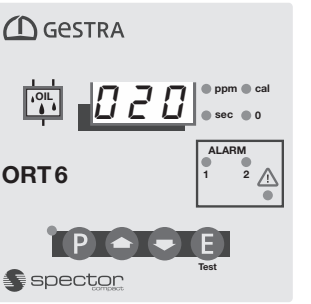
Setting the time delay for Alarm 1

1. Press Ⓟ, the yellow P-LED lights up.
2. ⏶⏷ to change the display until the Alarm 1 LED and Dimension LED sec light up. The most recently set value is shown.
3. Press Ⓟ, the yellow P-LED and the second digit of the 7-segment display flash.
4. Use ⏶⏷ to change the digit and Ⓔ to save this setting and move on to the third digit. The third digit now flashes.
5. Use ⏶⏷ to change the digit and Ⓔ to save this setting. The yellow P-LED and the 7-segment display light up. A maximum delay time of 20 seconds can be set.
6. Press Ⓔ, the equipment returns to normal operation, the actual value is displayed and the dimension LED ppm lights up.



Setting the time delay for Alarm 2

1. Press Ⓟ, the yellow P-LED lights up.
2. ⏶⏷ to change the display until the Alarm 2 LED and Dimension LED sec light up. The most recently set value is shown.
3. Press Ⓟ, the yellow P-LED and the second digit of the 7-segment display flash.
4. Use ⏶⏷ to change the digit and Ⓔ to save this setting and move on to the third digit. The third digit now flashes.
5. Use ⏶⏷ to change the digit and Ⓔ to save this setting. The yellow P-LED and the 7-segment display light up. A maximum delay time of 20 seconds can be set.
6. Press Ⓔ, the equipment returns to normal operation, the actual value is displayed and the dimension LED ppm lights up.



Operation, alarm and testing

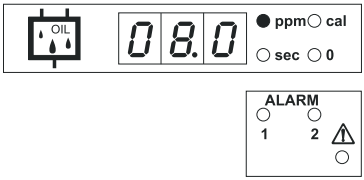
Starting

Switch on the supply voltage.

The 7-segment display briefly shows the version number of the software.

The display then counts up until the actual value is reached.

The dimension LED ppm lights up.



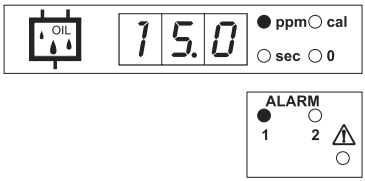
Alarms 1 and 2

When the limit values for alarm 1 or 2 are exceeded, first of all the set time delay is activated.

First the Alarm 1 or Alarm 2 LED flashes.

After the time delay has elapsed, the Alarm 1 or Alarm 2 LED lights up.

The Alarm 1 or Alarm 2 relay contact opens.



Attention

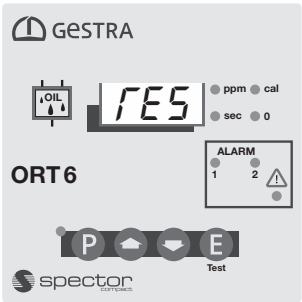
The measuring transducer does not interlock automatically when limit values are exceeded. If the installation requires a lockout function, this must be implemented in the downstream (safety) circuit. This circuit must conform to the requirements of EN 50156.

Function test of OR 52-5, OR 52-6

1. Push the cleaning device ❽ slowly into mid-position to simulate a malfunction.
2. The Malfunction LED lights up and the Malfunction relay contact opens. Error code E01 is displayed.
3. Move the cleaning device ❽ back to its initial position. The equipment must return to normal operation.

Function test of Alarm 1, Alarm 2 and Malfunction relays

1. Briefly press Ⓔ. to activate test mode for 10 seconds. rES appears on the 7-segment display.
2. Press Ⓟ. While you are depressing the button, the Alarm 1 LED lights up and the Alarm 1 relay contact opens.
3. ⌃ must be pressed. While you are depressing the button, the Alarm 2 LED lights up and the Alarm 2 relay contact opens.
4. ⌄ must be pressed. While you are depressing the button, the Malfunction LED lights up and the Malfunction relay contact opens.



Troubleshooting

Indications, diagnosis and remedies

Attention

Please check the following before diagnosis:

Supply voltage:
Is the measuring transducer supplied with the mains voltage specified on the name plate?

Wiring:
Does the wiring conform to the wiring diagram?

Danger

The terminal strips of the measuring transducer are live during operation.
There is a risk of serious injuries due to electric shock.
Always **cut off power** to the equipment before working on it or on the terminal strips (installation, removal, connecting lines).

Safety note

The equipment may only be installed and brought into service by qualified and competent staff.

Retrofitting and maintenance work may only be performed by authorised staff who have undergone specific training.

Error without a display	
The measuring transducer is not working – no function, no display.	
Error	**Remedy**
Faulty equipment fuse.	Replace the equipment fuse. Check the supply voltage connection.
The three green LEDs on the base board do not light up at the same time when the supply voltage is on. **Fig. 17**	Check supply voltage connection or replace measuring transducer

Detailed view of base board

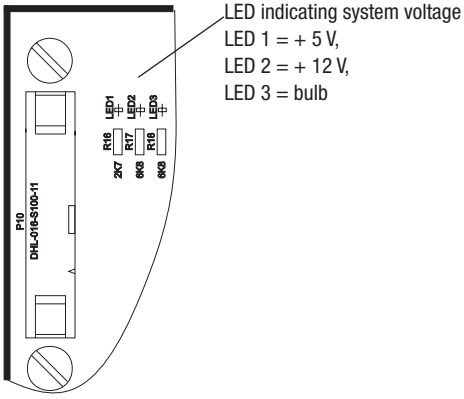


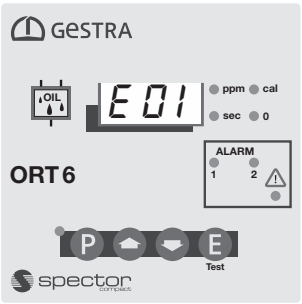
Fig. 17

Troubleshooting

Error indications

In the event of a malfunction, the yellow Malfunction LED lights up, the Malfunction relay contact opens and the 7-segment display shows the error code. In addition, the actual value output is reset to 0 mA.

The triggering of an alarm is not influenced by a malfunction.



Error codes on the 7-segment display		
Error code	**Possible error**	**Remedy**
E01	Bulb in light emitter ⑰ is dirty	Replace bulb
	Glass cylinder ㉑ is dirty	Clean or replace glass cylinder ㉑
	Excessive turbidity	Perform mechanical advance cleaning
	System voltage too low	Check supply voltage
	Cleaning device ⑧ not in its initial position	Return cleaning device ⑧ to its initial position
	Ingress of solids	Perform mechanical advance cleaning
E03	Faulty bulb in light emitter ⑰ faulty (frequent occurrence of this problem indicates heat accumulation in the light emitter ⑰, as despite the fluid temperature exceeding 60°C the drying cartridge ⑦ has been mounted).	Replace bulb, remove drying cartridge ⑦ and install vent nipple ⑥
	Connecting cable to light emitter ⑰ interrupted	Check connecting cable
	Cleaning device ⑧ not in initial position	Return cleaning device ⑧ to its initial position
	Ingress of solids	Perform mechanical advance cleaning

Troubleshooting

Error indications

Error codes on the 7-segment display		
Error code	**Possible error**	**Remedy**
E05	Basic turbidity > 10 ppm	Perform mechanical advance cleaning
	Glass cylinder ㉑ badly scratched (ingress of solids)	Replace glass cylinder ㉑ . Install measuring sensor as shown in suggested installation setup **Fig. 9**
	Glass cylinder ㉑ is dirty	Clean or replace glass cylinder ㉑
	Ingress of solids	Perform mechanical advance cleaning
	Strong formation of bubbles due to outgassing or flash steam	Throttle outflow
E06	Light receiver ❹ faulty or incorrectly connected	Replace light receiver ❹ or check connecting cable
	Faulty measuring transducer	Replace measuring transducer
E08	Bulb in light emitter ⓱ faulty	Replace bulb
	Connecting cable to light emitter ⓱ / receiver ❹ interrupted	Check connecting cable
	Cleaning device ❽ not in its initial position	Return cleaning device ❽ to its initial position
	Ingress of solids	Perform mechanical advance cleaning

Once the fault is remedied, the equipment returns to normal operation.
Additional error messages are possible with CAN bus operation. See page 42.

Maintenance

Replacing the glass cylinder

1. Close the ball valves ❷ for the inlet and outlet. Open the ball valve for flushing ❺.
2. Slacken the eight hexagon head bolts ❾ (do not unscrew completely). Push the cleaning device ❽ into the housing ⓴ (for fitting, pull out as shown in **Fig. 8**), unscrew the four hexagon head bolts ❾ on top and remove the housing ⓴.
3. Pull out the cleaning device ❽ and remove the glass cylinder ㉑. If the equipment has not been used for a longer period of time, the glass cylinder ㉑ might be stuck due to accumulated dirt on the housing cover ❸.
4. Check whether the housing ⓴ cover ❸ and base ❿ are dry on the inside. If not, dry the housing ⓴ with compressed air, as any residual moisture would cause the glass cylinder ㉑ to mist up when cold fluids are used, leading to incorrect measurements.
5. Undo the four hexagon head bolts ❾ at the bottom.
6. Take out the O-rings ㉒ ㉓ ㉔, clean the sealing surfaces and insert new O-rings ㉒,㉓ ㉔.
7. Hold the new, dry glass cylinder ㉑ by the rim and push it over the seat of the housing cover ❸.
8. Secure the housing ⓴ to the cover ❸ using the screws ❾.
9. Insert the plunger ⓫ of the cleaning device ❽ into the glass cylinder ㉑ and screw the base ❿ to the housing ⓴.
10. Close the ball valve for flushing ❺, open the ball valves ❷ for the inlet and outlet.
11. Check the 0% and 100% calibration settings of the measuring transducer.

Maintenance mode during cleaning

An alarm is usually not triggered as well as no malfunction displayed while cleaning the glass cylinder. There is the option of activating maintenance mode for this purpose.

The maintenance mode can be activated on the operating panel by pressing the “plus and minus key” at the same time.

The maintenance mode can be ended by pressing the “plus and minus key” at the same time.

The maintenance mode ends automatically after max. 300 seconds.

There is a waiting time of 30 seconds between two activations.

The maintenance mode is displayed on the home screen by a slowly flashing ppm LED.

If there is an error in the measuring chain, it is not possible to activate the maintenance mode. The maintenance mode can only be activated in the event of an error in CAN communication (E.90ff).

Maintenance

Cleaning glass cylinder

1. Move the wiper ⑫ of the cleaning device ⑧ up and down. This may trigger Alarm 1 and/or Alarm 2 or a Malfunction, depending on which time delay is set.
2. Move the wiper ⑫ of the cleaning device ⑧ back to its initial position (it projects out of the equipment by approx. 70 mm). If the cylinder is still dirty, replace the cleaning ring ⑫ of the cleaning device ⑧.

Clean the glass cylinder ㉑ at regular intervals (1 x week), depending on the pollution degree of the fluid. If the fluid is heavily polluted, replace the glass cylinder ㉑.

Replacing the cleaning device plunger

1. Close the ball valves ❷ for the inlet and outlet. Open the ball valve for flushing ❺.
2. Pull out the cleaning device ⑧ and undo the four hexagon head bolts ❾ from the base ⑩. Remove base ⑩ together with cleaning device ⑧.
3. Using a screwdriver, bend open the inner serrations of the fixing disc and remove the disc.
4. Take out the plunger ⑪ and insert a new one ⑪.
5. Fit a new fixing disc: Make sure the serrations point away from the plunger ⑪.
6. Take out the O-rings ㉒ ㉓ ㉔ from the base, clean the seating surfaces and insert new O-rings ㉒ ㉓ ㉔.
7. Insert the plunger ⑪ of the cleaning device ⑧ into the glass cylinder ㉑ and screw the base ⑩ to the housing ⑳.
8. Close the ball valve for flushing ❺, open the ball valves ❷ for the inlet and outlet.
9. Check 0% and 100% calibration settings of the measuring transducer.

Replacing the drying cartridge

Replace the drying cartridge ❼ when its contents turn pink. If this happens frequently, check the tightness of the following items:

- O-rings on light emitter ⑰ and receiver ❹
- Gaskets on connectors ⑯, front gaskets of glass cylinder ㉑
- Cable glands on connectors ⑯ of the light emitter ⑰ and receiver ❹

Maintenance

Replacing the bulb

1. Unscrew and remove the union nut (outside) from the tube ⓲ of the light emitter ⓱.
2. Replace the bulb with a new one (12V 10W).
3. Reattach the light emitter ⓱. Make sure the locating pin on the light emitter ⓱ fits in the groove of the tube ⓲. Tighten the union nut.
4. Repeat 0% and 100% calibration settings of the measuring transducer.

Danger

The terminal strips of the measuring transducer are live during operation.
There is a risk of serious injuries due to electric shock.
Always **cut off power** to the equipment before working on it or on the terminal strips (installation, removal, connecting lines).

Replacing the equipment fuse

1. Open the cover of the measuring transducer.
2. Turn the screw cap of the fuse holder anti-clockwise and remove.
3. Replace the equipment fuse.
   Type: M 0.2 A 5 x 20 at 230 V, M 0.4 A 5 x 20 at 115 V
4. Fit the screw cap and turn clockwise. Close the cover once more.

Tools

- Spanner for hexagon head screws A.F. 13
- Size 2.5 screwdriver

Maintenance

Spare parts

Spare parts kits containing the following items can be supplied separately:

Item	Spare parts kit 160 °C, stock code 442097	Qty.
㉑	Glass cylinder	1
㉒	O-ring 25 x 3	2
㉓	O-ring 30 x 2	2
㉔	O-ring 48 x 2.5	2
⑲	Turbidity standard 20 ppm	1
⑫	Cleaning ring / wiper	1
	Bulb	1
	Fixing disc	1
Spare parts kit 160 °C for cleaning plunger, stock code 442098		
⑪	Plunger	1
⑬	Ring	1
⑫	Cleaning ring / wiper	1
⑭	Retaining ring 19 x 1.2	1
	Fixing disc	1

In the event of malfunctions or faults that cannot be remedied with the aid of this Installation & Operating Manual, please contact our service centre or authorised agent in your country.

Removal and disposal of the measuring sensor and measuring transducer

Safety note

The equipment may only be installed and commissioned by qualified and competent staff.
Retrofitting and maintenance work may only be performed by authorised staff who have undergone specific training.

Danger

The measuring sensor is under pressure during operation.
Hot water or steam escapes when nuts and bolts are unfastened.
The measuring sensor is hot during operation.

Risk of severe burns and scalding all over the body!
Before performing maintenance work on the measuring sensor or disconnecting pipes, make sure all connected pipes are depressurised (0 bar) and cooled down to room temperature (20°C).

The terminal strips of the measuring transducer are live during operation.
There is a risk of serious injuries due to electric shock.
Always **cut off power** to the equipment before working on it or on the terminal strips (installation, removal, connecting lines).

Make sure there is no possibility of inadvertently starting up the depressurised section of the system during the work.
The shut-off valves required for this purpose must be secured separately and marked.
Disconnect the power supply and make sure it cannot inadvertently be switched back on again.
Affix one or more warning signs with wording such as "DO NOT SWITCH ON" on each control element in a clearly visible location.

Removal and disposal of the measuring sensor

1. Disconnect the four-pole connector ⓰ from the light emitter and receiver.
2. Make sure all inlet and outlet lines are cold and not under pressure before dismantling.
3. Unscrew the fastening screws from the mounting bracket ㉕ and remove the measuring sensor.

Dispose of the measuring sensor in accordance with statutory waste disposal regulations.

Removal and disposal of the measuring transducer

1. **Cut off the power supply** to the equipment.
2. Unscrew the cover screws and open the cover.
2. Disconnect all connecting cables from the terminal strips and pull the cables out of the cable glands.
4. Unscrew the fastening screws and remove the measuring transducer.

Dispose of the measuring transducer in accordance with statutory waste disposal regulations.

Important notes

Safety note

The equipment may only be installed and brought into service by qualified and competent staff. Retrofitting and maintenance work may only be performed by authorised staff who have undergone specific training.

Danger

The terminal strips of the measuring transducer ORT 6 are live during operation!

There is a risk of serious injury due to electric shock!

Before carrying out work the terminal strips (assembly, disassembly, connecting lines), always **de-energise** the equipment!

Only equipment where there is proof that it has at least double or reinforced insulation according to EN 61010-1, EN 60730-1, EN 60950-1 or EN 62368-1 may be connected as accessories (secure electrical insulation).

Additions

CAN bus

The measuring transducer ORT 6 is equipped with a CAN bus interface for processing readings using process visualisation, e.g. SPECTORcontrol. Data is exchanged using the CANopen protocol. The measuring transducer is labelled with an electronic address, the “Node ID”. The four-core bus cable is intended to supply power and as a data line that can be used to digitally transmit information.

An even number between 2 – 126 can be chosen for the CAN address (node ID). The factory default for the CAN bus function is deactivated; it can be activated with the code switch S6-2.

CAN bus technical data

CAN bus interface of the ORT 6

Input/output
CAN bus interface with power supply 18 – 36 V DC, short-circuit-proof

Data exchange
CAN bus according to ISO 11898, CANopen protocol

Indicators and adjusters
1 10-pole code switch for setting the node ID and baud rate
1 2-pole code switch for activating CAN bus and the 0-20mA option

Electrical connection
1 screw-type five-pole terminal strip, wire cross-section 1.5 mm^2

Functional elements

Base board, cover board

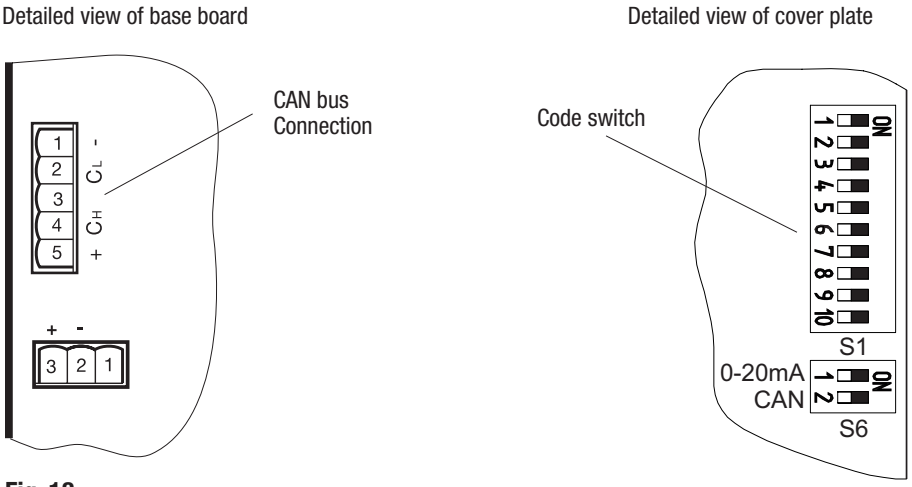


Fig. 18

Electrical connection

Bus line, cable length and cross-section

Use a shielded, multi-core, twisted-pair control cable, e.g. UNITRONIC® BUS CAN 2 x 2 x 0.34 mm² or RE-2YCYV-fl 2 x 2 x 0.34 mm² as the bus line. For EMC reasons, the cable length between the ORT 6 and the receiver must not exceed 30 m. If the cables are longer, additional EMC protective measures should be taken.

Wiring the terminal strip

The terminal strip must be wired according to the wiring diagram.

Electrical connection

Wiring diagram of CAN bus interface

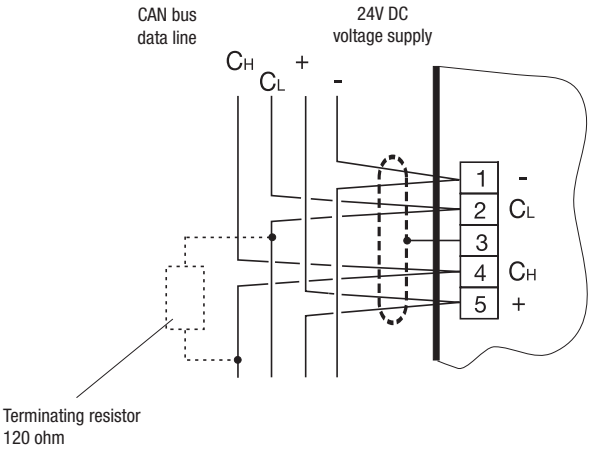


Fig. 19

Attention

- Make sure wiring is in line, no star wiring!
- Connect the bus line shields to one another all the way along, and connect once to the central earthing point (CEP).
- If two or more system components are connected in a CAN bus network, a 120 Ω terminating resistor must be installed to the first and last devices (terminal C_L/C_H).

The CAN bus network must not be interrupted during operation!

If it is, an alarm is triggered.

Bringing into service

Setting node ID and baud rate

An individual address (node ID) has to be set at each node for communication in the CAN bus.

The baud rate (transfer rate) also has to be set.
This is determined by the cable length between the bus terminal devices.
Both settings are made at the code switch S1 on the cover board **Fig. 18**.

1. Switch off measuring transducer ORT 6.
2. Note position of all code switches.
3. Switch to ON on code switch S1.
4. Set node ID. Only **even** numbers can be set

Toggle switch (white)

Toggle switch (white)

		Node ID	98
S2	**ON**	2	
S3	OFF	4	
S4	OFF	8	
S5	OFF	16	
S6	**ON**	32	
S7	**ON**	64	

(Factory setting)

		Node ID	80
S2	OFF	2	
S3	OFF	4	
S4	OFF	8	
S5	**ON**	16	
S6	OFF	32	
S7	**ON**	64	

(Example)

5. Set baud rate

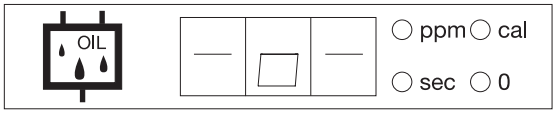
S8	S9	S10	Baud rate	Cable length
OFF	ON	OFF	250 kbit/s	125 m
ON	ON	OFF	125 kbit/s	250 m
OFF	OFF	ON	100 kbit/s	335 m
ON	OFF	ON	50 kbit/s *)	500 m
OFF	ON	ON	20 kbit/s	1000 m
ON	ON	ON	10 kbit/s	1000 m

*) Factory setting

Bringing into service

Setting node ID and baud rate continued

6. Switch on measuring transducer ORT 6.
7. The following appears on the 7-segment display:



The setting of the node ID and the baud rate has been taken over.

8. Switch off measuring transducer ORT 6 again.
9. All code switches back in initial position.
10. Switch back to OFF on code switch S1.
11. Switch on measuring transducer ORT 6 again.

Attention

Node IDs must not be assigned twice in the CAN bus system.
The node ID 0 is not admissible.
Set the same baud rate for all bus nodes.

System malfunctions

Error code

Error code	Possible error	Remedy
E 90, 93, 94, 95	Error in the CAN bus	24-V bus supply, wiring, node ID, baud rate and terminating resistors. If the event of changes, switch off the mains power and switch back on after approx. 5 seconds.

CAN bus telegram

Object directory

Index (hex.)	Subindex (hex.)	Access	Data type	Designation	Description
Tx PDO 1					
2006	1	RO	Uint16		Directly transmitted light 0 – 1023
2006	2	RO	Uint16		Scattered light 0 – 1023
2006	3	RO	Uint16		Actual value in ppm (with imaginary decimal place)
2006	4	RO	Uint16		Controller output 0 to 100%
Tx PDO 2					
2007	1	RO	Uint8	Status	
2007	2	RO	Uint8	Malfunction	
2007	3	RO	Uint8		Version
2007	4	RO	Uint8	nc	----------
2007	5	RO	Uint16	Limit value 1	Limit value 1 (ppm) for alarm 1 (with imaginary decimal place)
2007	6	RO	Uint16	Limit value 2	Limit value 2 (ppm) for alarm 2 (with imaginary decimal place)

Index (hex.)	Subindex (hex.)	Access	Data type	Designation	Description
Pollution warning					
2008	1	RO	Uint8	Warning active	Pollution warning function activated (DIP6). OFF = 0 (FALSE), ACTIVE = 1 (TRUE)
2008	2	RO	Uint8	Warning flag	Warning threshold signalling exceeded. OFF = 0 (FALSE), ACTIVE = 1 (TRUE)
2008	3	RW	Uint16	Warning threshold	Warning threshold [0 to 100%], default = 80%
Service mode					
2009	1	RO	Uint16	Standby time	Elapsed time of standby mode, unit [100 ms]
2009	2	RO	Uint16	Standby dead time	Elapsed dead time before standby mode can be called up again, unit [100 ms]
2009	3	RO	Uint8	Standby active	Standby mode signalling active. OFF = 0 (FALSE), ACTIVE = 1 (TRUE)

PDO

Ident	Statically mapped objects
TxPDO 1 self	2006 01, 2006 02, 2006 03, 2006 04,
TxPDO 2 self	2007 01, 2007 02, 2007 03, 2007 04, 2007 05, 2007 06,

CAN bus telegram

Information content of the CAN bus transmission telegram (PDO 1)

Identifier ORT 6	**180 (hex) + node ID**
Byte 0: L Byte 1: H	Directly transmitted light 0 – 1023
Byte 2: L Byte 3: H	Scattered light 0 – 1023
Byte 4: L Byte 5: H	Actual value in ppm (with imaginary decimal place)
Byte 6: L Byte 7: H	Controller output 0 to 100%

Information content of the CAN bus transmission telegram (PDO 2)

Identifier ORT 6	**280 (hex) + node ID**
Byte 0 Status	Bit 0 relay C Bit 1 relay B Bit 2 relay A Bit 3 Bit 4 Bit 5 flag standby Bit 6 flag pollution warning Bit 7 malfunction
Byte 1 fault number	1 = controller output Y > 95% AND XW > 20% 3 = Directly transmitted light < 1 5 = Calibration error 6 = Directly transmitted light > 1020 8 = Directly transmitted light < 1 AND scattered light < 1 90 = CAN error generic 91 = CAN RX overflow 92 = CAN controller overflow 96 = CAN TX overflow
Byte 2	Version
Byte 3	----------
Byte 4: L Byte 5: H	Limit value 1 (ppm x 10) for alarm 1
Byte 6: L Byte 7: H	Limit value 2 (ppm x 10) for alarm 2

Declaration of Conformity; Standards and Directives

You can find details on the conformity of the equipment and the applicable standards and directives in the Declaration of Conformity and associated certificates.

You can download the Declaration of Conformity from www.gestra.com and request relevant certificates by writing to the following address:

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Modifications to the equipment not approved by us will invalidate the Declarations of Conformity and certificates.

You can find our authorised agents around the world at: **www.gestra.com**

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