



Oil & Turbidity Detector

**OR 52-5**

**OR 52-6**

**EN**  
English

Original Installation Instructions  
**810731-04**

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## Important notes

### Usage for the intended purpose

Use oil & turbidity detector OR 52 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.

### Use

The OR 52-5/ -6 oil & 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 boiler and hot water plants, the oil & turbidity detector can monitor any ingress of oil or grease into the condensate, the feed water or the water circuit (EN 12952-7, EN 12953-6, TRD 604 Page 1).

In addition, the oil & turbidity detector is suitable for monitoring untreated and treated water (gravel filters, demineralisation plants, 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.

### Function

The measuring sensor is a photometric measuring device. It consists of a light source (light emitter ⑰) and two photo-electric cells that make up a light receiver ④. 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.

## Important notes continued

### Safety note

The equipment may only be installed and commissioned by qualified and competent staff. Maintenance and modification 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.

There is a risk of severe injuries and scalding over the entire body.  
Before servicing 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 pipes).

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.



#### Attention

The name plate specifies the technical features of the equipment. Do not start up or operate any item of equipment that does not have its own specific name plate.

## Directives and standards

### VdTÜV Bulletin "Wasserüberwachung 100" (= Water Monitoring 100)

The OR 52-5/ -6 oil & turbidity detector is approved for condensate and feed water monitoring in accordance with VdTÜV Bulletin "Wasserüberwachung 100".

The VdTÜV Bulletin "Wasserüberwachung 100" (Water Monitoring 100) describes the requirements for water monitoring equipment.

### Approval for marine use

The oil & turbidity detector is approved for condensate and feed water monitoring in marine installations.

### LV (Low Voltage Directive) and EMC (Electromagnetic Compatibility)

The equipment conforms to the requirements of Low Voltage Directive 2014/35/EU and EMC Directive 2014/30/EU.

### ATEX (Atmosphère Explosible)

The equipment must **not** be used in potentially explosive atmospheres, in accordance with European Directive 2014/34/EU.

### UL/cUL (CSA) approval

The equipment conforms to standards: UL 508 and CSA C22.2 No. 14-13, Standards for Industrial Control Equipment. File E243189.

### Notes on the Declaration of Conformity/Manufacturer's Declaration C €

For details on the conformity of our equipment with European Directives, please refer to our Declaration of Conformity or our Manufacturer's Declaration.

The current Declaration of Conformity/Manufacturer's Declaration is available online at [www.gestra.com](http://www.gestra.com) ➔ Documents, or can be requested from us.

## Technical data

### Measuring sensors ORG 12 and ORG 22

#### Operating pressure

PN 10, 10 bar at max. 120°C

#### Mechanical connections

DN 10, connections G  $\frac{3}{8}$  A, ISO 228

#### Flowrate

0.5 – 50 l/min

#### Pressure drop

5 [mbar] <sup>1)</sup>

#### Fluids

water, condensate, beverages, etc.

#### Max. pH value of fluids <sup>2)</sup>

10.5

#### Fluid temperature ranges

0°C – 60°C (with drying cartridge)

60°C – 120°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:** 1.4580

##### Wetted parts

**ORG 12:** 0.6025 galvanised      **ORG 22:** 1.4580

##### Ball valves

**ORG 12:** Ms 58      **ORG 22:** 1.4436

##### Screwed unions

**ORG 12:** St      **ORG 22:** 1.4571

##### Glass cylinder

Duran 50

##### Gaskets

Silicone

##### 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

<sup>1)</sup> 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  $\zeta = 6.1$ .

<sup>2)</sup> A pH value of > 10.5 may cause the glass to suffer wear, depending on temperature.

### Measuring transducer ORT 6

#### Inputs

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

#### Outputs

1 voltage output for light transmitter (17), 1 – 12 V pulse-width modulated

3 floating relay contacts (alarms 1 and 2, malfunction)

Contact material AgNi 0.15

Max. contact rating for switching voltages 24 AC/DC, 115 V and 230 V AC: Resistive/inductive 4 A

1 current output 0/4 – 20 mA, max. load 500 ohm

#### Measuring range

0 – 25 ppm

#### Actual value output

0/4 mA  $\cong$  0 ppm, 20 mA  $\cong$  25 ppm

#### Adjustment range, limit value for alarms 1 and 2

Adjustable between 0 and 15 ppm

Other ranges on request

#### 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, time delay for alarms 1 and 2

0 to 20 seconds

Other ranges on request

#### Mains voltage

230 V +10 / -15 %, 50 – 60 Hz

115 V +10 / -15 %, 50 – 60 Hz (optional)

24 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

Thermal fuse M 1.0 A 5 x 20 at 24 V

#### Housing

Field case for wall installation

#### Housing material

Die-cast aluminium

#### Protection

IP 65 to EN 60529

#### Admissible ambient temperature

0 °C – 55 °C

#### Weight

approx. 3.6 kg



## Oil & turbidity detector OR 52-5/ -6

### Approvals:

TÜV Certificate

VdTÜV Bulletin "Wasserüberwachung 100" (= Water Monitoring 100):  
Requirements for water monitoring equipment.

Type approval no.: TÜV · WÜF · XX-009 (see name plate)

UL/cUL (CSA) certification

UL 508 and CSA C22.2 No. 14-13, Standards for Industrial Control  
Equipment. File E243189.

Marine applications

In accordance with the guidelines of Germanischer Lloyd GL 94855-94 HH

### Scope of supply

- |   |                                     |
|---|-------------------------------------|
| ■ 1 measuring transducer ORT 6,                       | ■ 1 vent nipple,                    |
| ■ 1 measuring sensor ORG 12 or ORG 22                 | ■ 1 turbidity standard 20 ppm,      |
| Supplied (but not fitted):                            | ■ 1 drying cartridge,               |
| ■ 3 ball valves,                                      | ■ 1 accessory box,                  |
| ■ 3 screwed unions and<br>nipples with threaded ends, | ■ 1 glass cylinder,                 |
|   | ■ 1 installation & operating manual |

### Name plate / marking




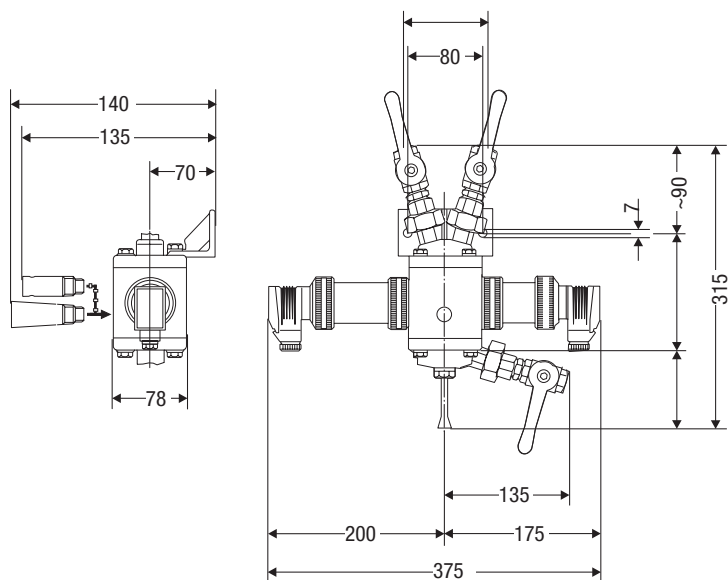
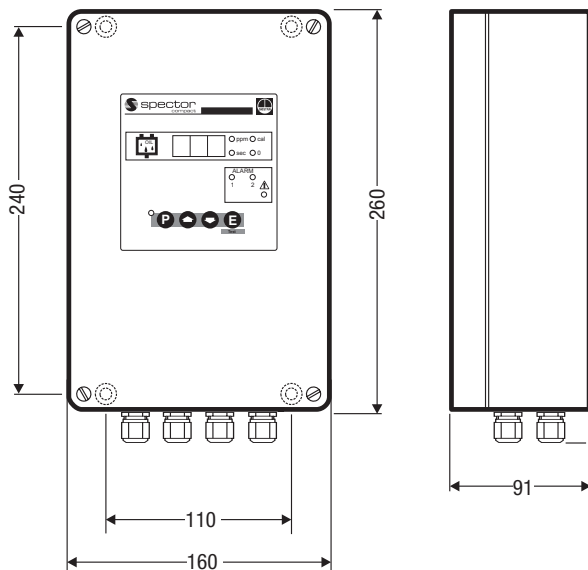
Öl- / Trübungsmelder Oil- / Turbidity Detector Détecteur d'huile et de turbidité		
OR 52-5		OR 52-6
ORG12 → ORT6		ORG22 → ORT6
Manufacturer GESTRA AG, Münchener Str.77 D-28215 Bremen Telefon +49(0)421 3503-0 Telefax +49(0)421 3503-393 E-Mail gestra.ag@flowserve.com		Manufacturer
		Disposal information
Type approval number	TÜV · WÜF · xx - 009	
Marine approval	GL 94855 - 94 HH	CE
Mains voltage, protection	ORT 6 24V <input type="checkbox"/> 115V <input type="checkbox"/> 230V <input checked="" type="checkbox"/>	
50 / 60 Hz 25VA IP 65		Admissible ambient temperature
Tamb = 55 °C (131 °F)		Measuring range
Range 0 - 25 ppm		
← 250 V ~ T2,5 A		
 Vor Öffnen des Deckels Gerät freischalten! . Betriebsanleitung beachten		Safety note
 Before removing cover isolate from power supplies See installation instructions		
 Avant d'ouvrir le couvercle déconnecter complètement l'appareil Voir instructions de montage		
VS.-Nr.:		Mat.Nr.:xxxxxx

Fig. 1

**Dimensions of ORG 12, ORG 22, ORT 6**



**Fig. 3** Measuring sensor ORG 12, ORG 22



**Fig. 4** Measuring transducer ORT 6

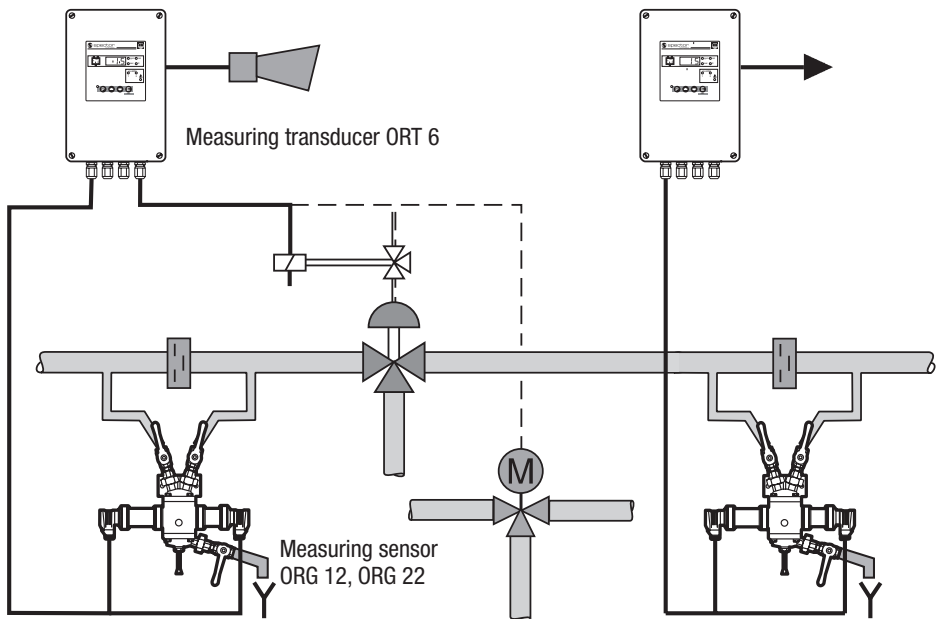
## Installation

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

In steam boiler and hot water plants, the oil & turbidity detector can monitor any ingress of oil or grease into the condensate, the feed water or the water circuit (EN 12952-7, EN 12953-6, TRD 604 Page 1).

The typical equipment arrangement shown in **Fig. 5** 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 & turbidity detector monitors any continuing flow of water, and interrupts the system's safety circuit if the set limit value is exceeded.



**Fig. 5** Installation example of condensate monitoring in steam boiler systems

### 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, slacken 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 dowels for the surface in question.

### Safety note

The equipment may only be installed and commissioned by qualified and competent staff.

### Connecting measuring sensor ORG 12, ORG 22 to the system

Install the measuring sensor and route the lines as shown in installation examples **Fig. 6 to 10**.

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

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

If the fluid temperature is between 60°C and 120°C: Screw in the vent nipple **6**.

If the fluid temperature is between 0°C and 60°C: Remove the plastic cover from the drying cartridge **7** (blue colour) and screw in the drying cartridge **7**.

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 < 120°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. 9**.

If the condensate is/could be highly contaminated: Ensure a downward flow through the glass cylinder **2** (glass cylinder may get scratched). **Fig. 7**.

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. 10**.



### Attention

Prevent outgassing and the presence of air due to a pressure drop upstream of the measuring sensor.

### Key

**Fig. 6** Sensor installed in a sample line, e. g. water treatment, beer filtering, permeate downstream of reverse osmosis.

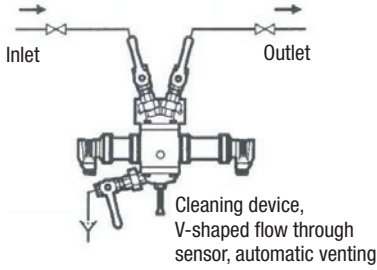
**Fig. 7** Installation of sensor when the condensate contains suspended solids. If the sensor is installed as shown in **Figs. 6 – 10**, solids could be deposited on the cleaning device and would rapidly scratch the glass cylinder **2** when the push rod is actuated.

**Fig. 8** Sensor installed in a bypass of a product line with upward flow.

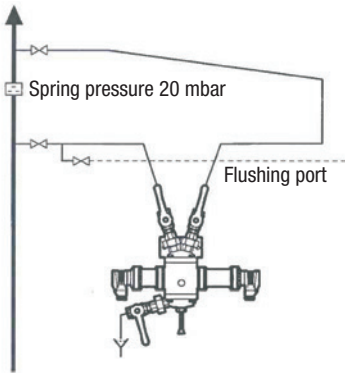
**Fig. 9** Product line with a small amount of gas, e. g. sufficiently sized condensate line (flashing) downstream of steam traps.

**Fig. 10** Installation of sensor in a condensate line with large amount of flash steam.

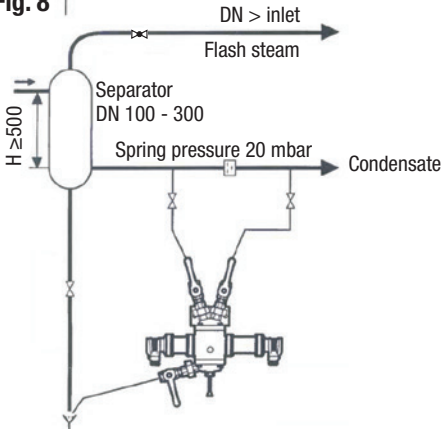
**Installation examples of measuring sensor ORG 12, ORG 22**



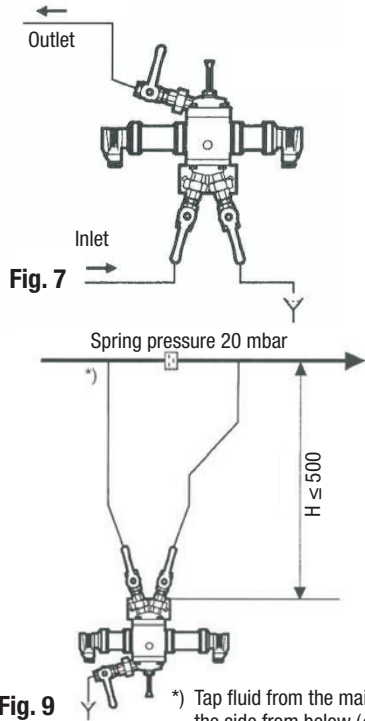
**Fig. 6**



**Fig. 8**



**Fig. 10**



**Fig. 7**

**Fig. 9**

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

Installing measuring sensor ORG 12, ORG 22

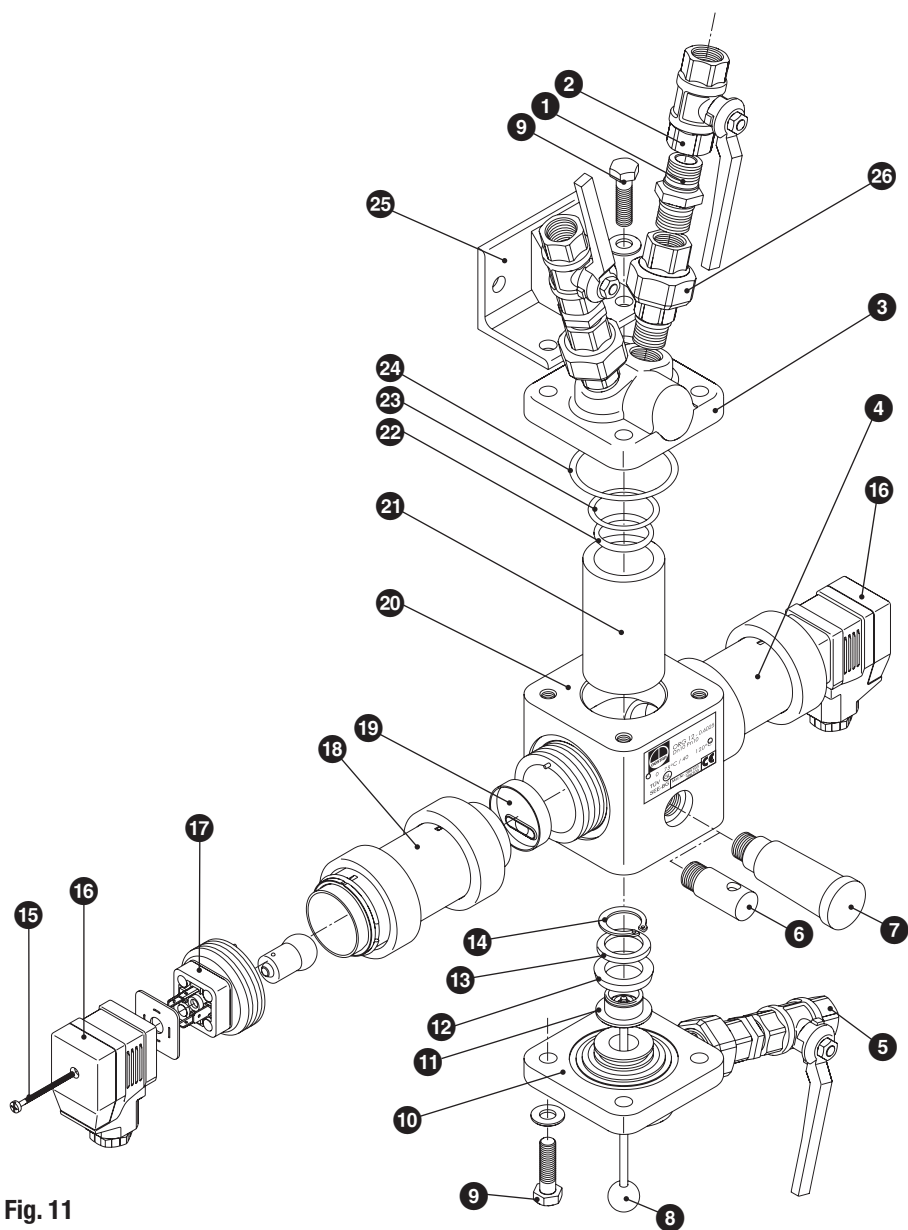


Fig. 11

## Installing measuring sensor ORG 12, ORG 22

The cover **3** and base **10** of the measuring sensor can be screwed in rotated 90°.

1. Screw the supplied nipples with threaded ends **1**, screwed unions **26** and ball valves **2** into the cover **3** and the base **10**. Use Teflon tape or hemp for sealing the thread.
2. Align the ball valves **2** 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 easy removal of the light receiver **4** and visual inspection of the flow. You can interchange the light emitter **17** and receiver **4** by slackening the inner nuts (from the housing **20**) and swapping the light emitter **17** and receiver **4** over. When refitting, take care to ensure the locating pins in the housing **20** fit in the grooves of the light emitter **17** and receiver **4**. Tighten the union nuts.

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

## Key

- |   |  |
|---|--|
| <b>1</b> Nipple with threaded ends                | <b>14</b> Retaining ring 19 x 1.2                    |
| <b>2</b> Ball valve G 3/8 A, ISO 228              | <b>15</b> Screw                                      |
| <b>3</b> Cover                                    | <b>16</b> Connector for light emitter/light receiver |
| <b>4</b> Light receiver with tube                 | <b>17</b> Light emitter                              |
| <b>5</b> Ball valve for flushing G 3/8 A, ISO 228 | <b>18</b> Tube                                       |
| <b>6</b> Vent nipple                              | <b>19</b> Turbidity standard                         |
| <b>7</b> Drying cartridge                         | <b>20</b> Housing                                    |
| <b>8</b> Cleaning device                          | <b>21</b> Glass cylinder                             |
| <b>9</b> Hexagon head screw M 8 x 30 EN 24017     | <b>22</b> O-ring 25 x 3                              |
| <b>10</b> Base                                    | <b>23</b> O-ring 30 x 2                              |
| <b>11</b> Support for cleaning ring               | <b>24</b> O-ring                                     |
| <b>12</b> Cleaning ring                           | <b>25</b> Mounting bracket                           |
| <b>13</b> Ring                                    | <b>26</b> Screwed union                              |

## Electrical connection

### Light emitter/receiver with four-pole connector

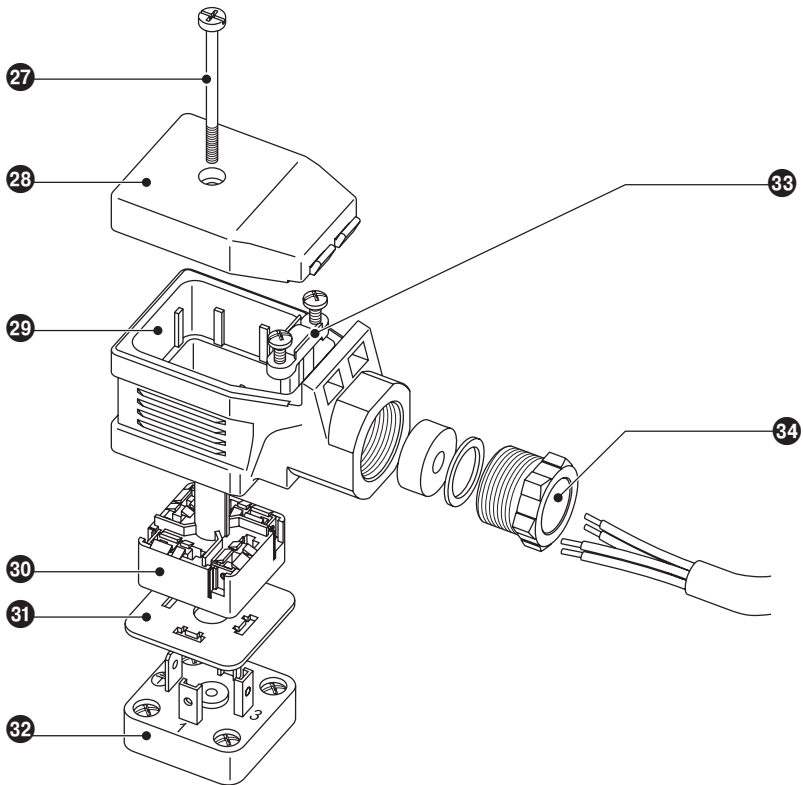


Fig. 12

#### Key

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

#### Tools

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



### Connecting the light emitter/receiver

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

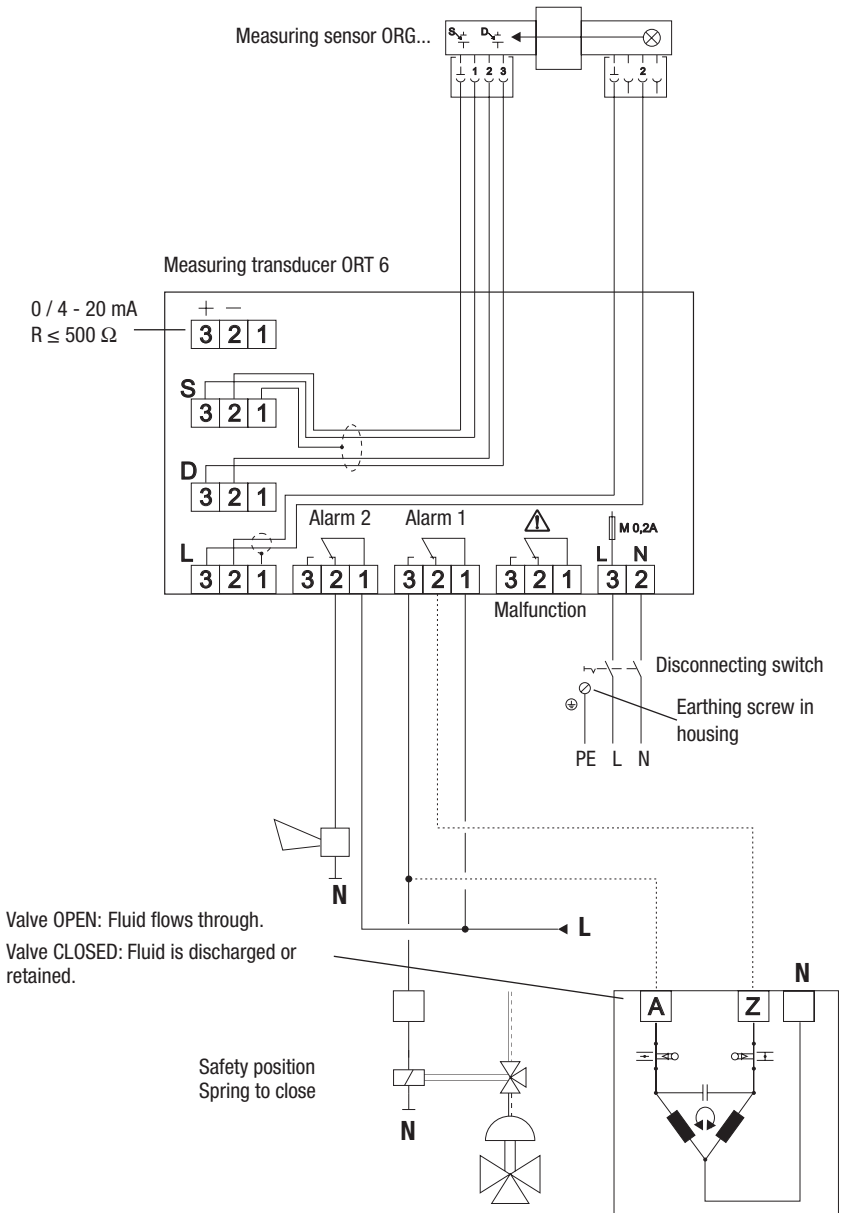
Connect the screen in the measuring transducer **only once**.

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

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

1. Slacken the screw **27**. **Fig. 8**
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. 13 and 14**.
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**.

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



**Fig. 13**

### 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 screens.
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 disconnecting switch.



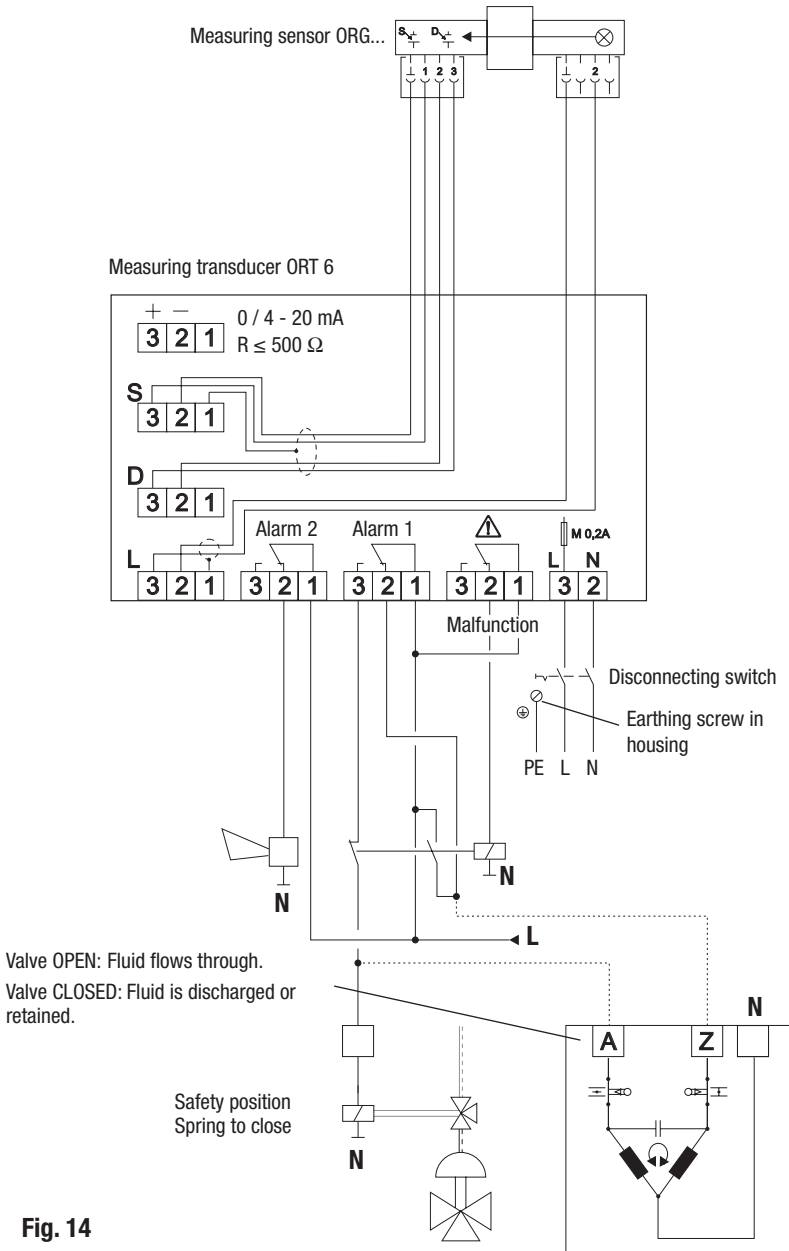
#### Attention

- Fuse circuits with a 2.5 A anti-surge fuse to protect the output contacts.
- Switching off inductive loads produces surges that can have a major adverse effect on open and closed-loop control systems. Therefore, provide inductive loads with RC combinations in accordance with the manufacturer's instructions.
- Install an all-pole disconnecting switch in an easily accessible location close to the equipment as a disconnecter for the measuring transducer (EN 61010-1).
- Mark the switch as a disconnecter for the measuring transducer.

#### Tools

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

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



Valve OPEN: Fluid flows through.  
Valve CLOSED: Fluid is discharged or retained.

**Fig. 14**



### 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 and bilge water monitoring, alarm contact 1 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 protection). 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. 13**.

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.13** or **Fig. 14**) can also be connected directly. Install a reversing contact in between in the case of three-phase actuators.

## Factory settings

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 without decimal point

## Changing the factory settings



### 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 pipes).

## Setting a decimal point

The 7-segment display can show a decimal point. This setting has no effect on the set limit values and time delays.

**Cut off the power supply to the equipment.**

Open the housing cover of the measuring transducer and set code switch 7 on the cover plate to ON. **Fig. 14**

### Detailed view of cover plate

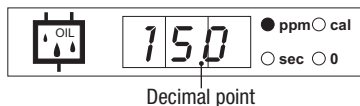
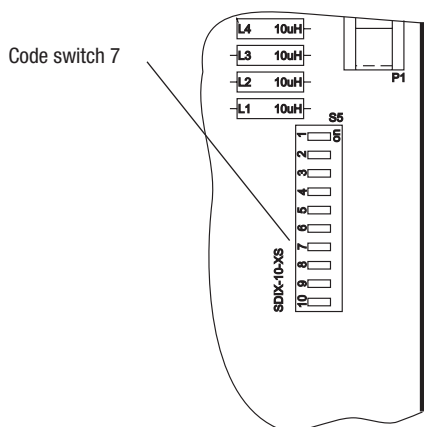


Fig. 15

# Commissioning procedure

## Using measuring transducer ORT 6

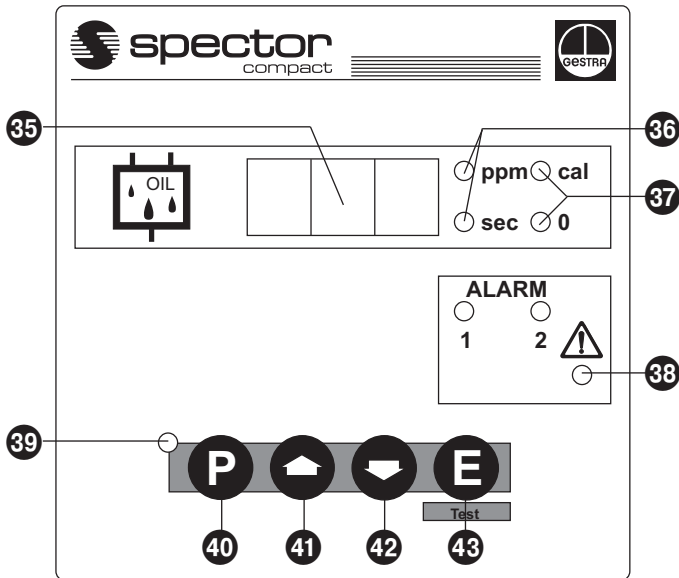


Fig. 16

The functions of the individual keys are as follows:

- P** = programme key
- +** = plus key
- = minus key
- E** = acknowledge key/test mode

### 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

## Commissioning procedure continued

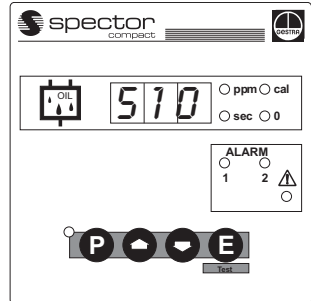


### Danger

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

### Start-up procedure

1. Switch on the measuring transducer (disconnecting switch).
2. Flush measuring sensor ORG 12/22 for at least 15 minutes and operate the cleaning device **B** 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 **4**. 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 **4**.

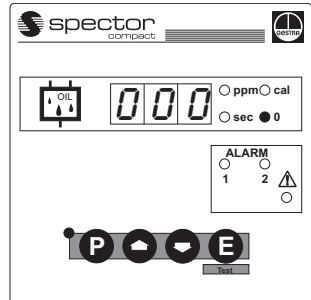


### 0 % calibration

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

1. Press **P**, the yellow P-LED lights up.
2. Use **B** **B** to change the display until the calibration LED 0 lights up. The most recently saved calibration value (digits) is shown.
3. Press **P**, the yellow P-LED and the 7-segment display flash.
4. Press **E**, 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 **E**, the equipment returns to normal operation, 0 ppm is indicated and the dimension LED ppm lights up.

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





## 100 % calibration

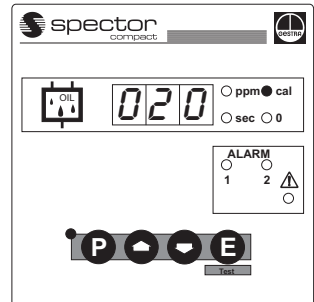
Affix the supplied 20 ppm turbidity standard 19 to the light emitter 17 of the measuring sensor. Unscrew the union nut (inside) on the tube 18 to detach the light emitter 17 from the housing 20 of the sightglass. Place the turbidity standard 19 on the visible part of the black tube 18 in such a way that the screen 19 in the turbidity standard is exactly congruent with the screen in the tube 18. Screw in 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 **P**, the yellow P-LED lights up.
2. Use **←** **→** to change the display until the calibration LED cal lights up.  
The most recently saved calibration value (digits) is shown.
3. Press **P**, the yellow P-LED and the 7-segment display flash.
4. Press **E**, the 100 % value is saved as basic turbidity.  
The yellow P-LED and 7-segment display light up.
5. Press **E**, the equipment returns to normal operation, 20 ppm is indicated and the dimension LED ppm lights up.

To cancel press **P** 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

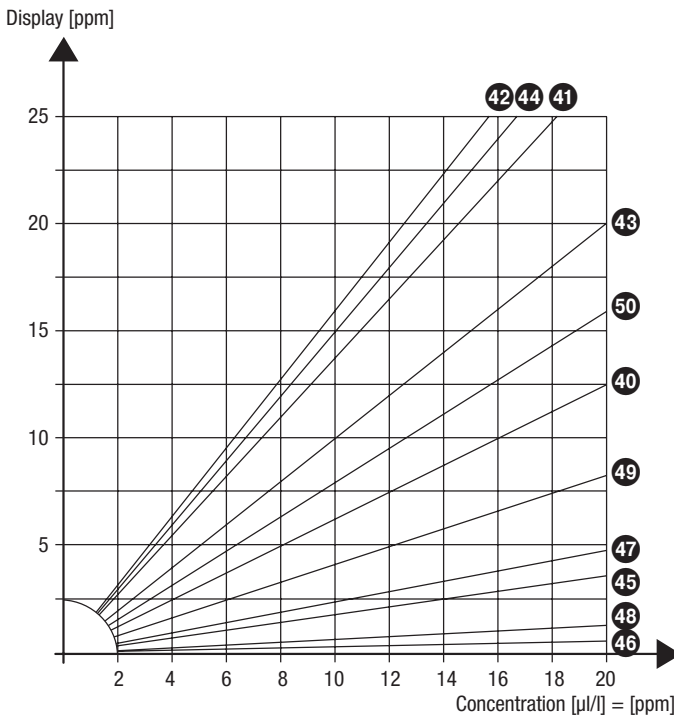


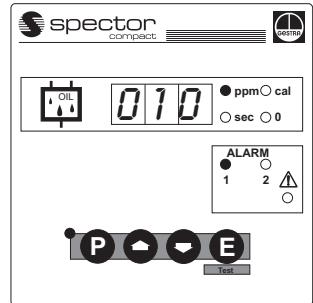
Fig. 15

- |   |  |
|---|--|
| 40 Fuel oil EL, 15°C, coarse emulsification       | 46 Xylene, 80°C, fine emulsification                           |
| 41 Fuel oil EL, 15°C, fine emulsification         | 47 Red berry juice, concentrated                               |
| 42 Fuel oil EL, 80°C, fine emulsification         | 48 Black berry juice, concentrated                             |
| 43 Engine oil SAE15W40, 15°C, fine emulsification | 49 Skimmed milk, fat content 0.1 %, based on fat concentration |
| 44 Vegetable oil, 15°C fine emulsification        | 50 Turbine oil T 68, gear oil M 68                             |
| 45 Xylene, 20°C, fine emulsification              |  |

## Commissioning procedure continued

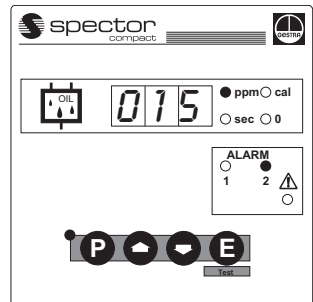
### Setting limit alarm 1

1. Press **P**, the yellow P-LED lights up.
2. Use **←** **→** 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.



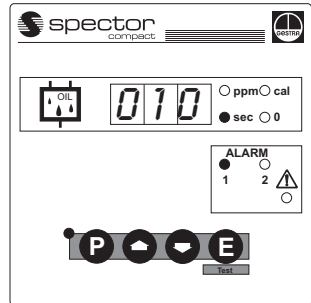
### Setting limit alarm 2

1. Press **P**, the yellow P-LED lights up.
2. Use **←** **→** 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.



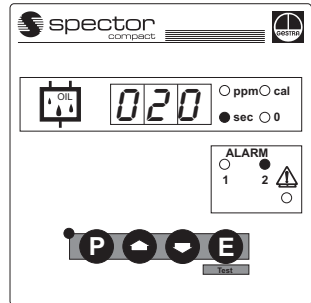
## Setting the time delay for Alarm 1

1. Press **P**, the yellow P-LED lights up.
2. Use **←** **→** to change the display until the Alarm 1 LED and dimension LED sec 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 delay time of 20 seconds 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 the time delay for Alarm 2

1. Press **P**, the yellow P-LED lights up.
2. Use **←** **→** to change the display until the alarm 2 LED and dimension LED sec 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 delay time of 20 seconds can be set.
6. Press **E**, the equipment returns to normal operation, the actual value is displayed and the dimension LED ppm lights up.



## Operation, alarm and testing

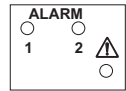
### Start

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.



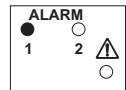
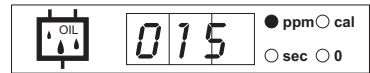
### Alarms 1 and 2

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

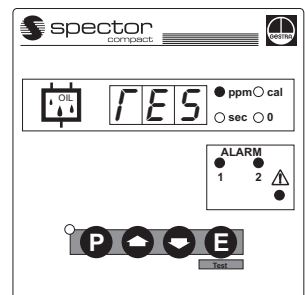
The measuring transducer does not interlock automatically when limit values are exceeded. If the installation requires a lockout function, this must be implemented in the next circuit (safety circuit). This circuit must conform to the requirements of EN 50156.

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

1. Push the cleaning device **8** 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 **8** 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 **E** to activate test mode for 10 seconds.  
*FE5* appears on the 7-segment display.
2. Press **P**. While you are depressing the button, the Alarm 1 LED lights up and the Alarm 1 relay contact opens.
3. Press **←**. While you are depressing the button, the Alarm 2 LED lights up and the Alarm 2 relay contact opens.
4. Press **→**. While you are depressing the button, the Malfunction LED lights up and the Malfunction relay contact opens.



# Fault finding for troubleshooting

## Indications, diagnosis and remedies



### Attention

Please check the following before fault 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 pipes).

## Safety note

The equipment may only be installed and commissioned by qualified and competent staff.

Maintenance and modification 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 mains power connection.
The three green LEDs on the base board do not light up at the same time when the power is on. <b>Fig. 16</b>	Check the mains power connection or replace the measuring transducer

### Detailed view of base board

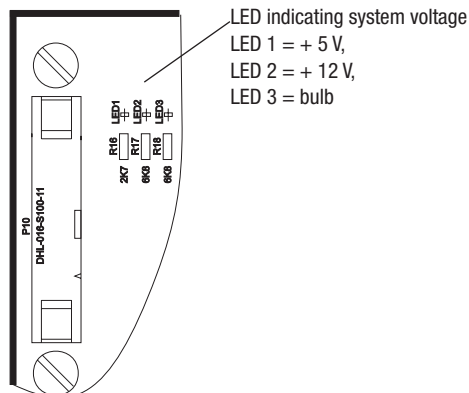
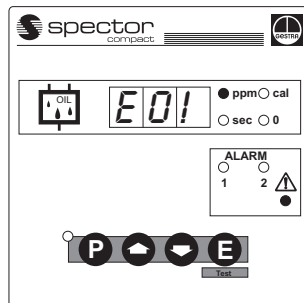


Fig. 16

## Error code 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		
Fault code	Possible fault	Remedy
E01	Bulb in light emitter 17 is dirty	Replace bulb
	Glass cylinder 21 is dirty	Clean or replace glass cylinder 21
	Excessive turbidity	Provide mechanical cleaning stage ahead of equipment
	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	Provide mechanical cleaning stage ahead of equipment
E03	Faulty bulb in light emitter 17 (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	Provide mechanical cleaning stage ahead of equipment

## Error code indications

Error codes on the 7-segment display		
Fault code	Possible fault	Remedy
<b>E05</b>	Basic turbidity > 10 ppm	Provide mechanical cleaning stage ahead of equipment
	Glass cylinder ⑫ badly scratched (ingress of solids)	Replace glass cylinder ⑫ . Install measuring sensor as shown in suggested installation setup <b>Fig. 9</b>
	Glass cylinder ⑫ is dirty	Clean or replace glass cylinder ⑫
	Ingress of solids	Provide mechanical cleaning stage ahead of equipment
	Presence of gas or steam bubbles (flashing)	Throttle outlet
<b>E06</b>	Light receiver ④ faulty or incorrectly connected	Replace light receiver ④ or check connecting cable
	Faulty measuring transducer	Replace measuring transducer
<b>E08</b>	Bulb in light emitter ⑰ faulty	Replace bulb
	Connecting cable to light emitter ⑰/receiver ④ interrupted	Check connecting cable
	Cleaning device ⑧ not in its initial position	Return cleaning device ⑧ to its initial position
	Ingress of solids	Provide mechanical cleaning stage ahead of equipment

**Once the fault is remedied, the equipment returns to normal operation.**



## Maintenance

### Replacing the glass cylinder

1. Close the ball valves **2** for the inlet and outlet. Open the ball valve for flushing **5**.
2. Slacken the eight hexagon head screws **9** (do not unscrew completely). Push the cleaning device **8** into the housing **20** (for fitting, pull out as shown in **Fig. 9**), unscrew the four hexagon head screws **9** on top and remove the housing **20**.
3. Pull out the cleaning device **8** 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 **3**.
4. Check whether the housing **20** cover **3** and base **10** are dry on the inside. If not, dry the housing **20** 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 screws **9** at the bottom.
6. Take out the O-rings **22** **23** **24**, clean the seating 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 **3**.
8. Secure the housing **20** to the cover **3** using the screws **9**.
9. Insert the plunger **11** of the cleaning device **8** into the glass cylinder **21** and screw the base **10** to the housing **20**.
10. Close the ball valve for flushing **5**, open the ball valves **2** for the inlet and outlet.
11. Check the 0 % and 100 % calibration settings of the measuring transducer.

### Cleaning the 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 degree of contamination of the fluid. If the fluid is heavily contaminated, replace the glass cylinder **21**.

### Replacing the cleaning plunger

1. Close the ball valves **2** for the inlet and outlet. Open the ball valve for flushing **5**.
2. Pull out the cleaning device **8** and undo the four hexagon head screws **9** from the base **10**. Remove the base **10** together with the 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 **5**, open the ball valves **2** for the inlet and outlet.
9. Check the 0 % and 100 % calibration settings of the measuring transducer.

### Replacing the drying cartridge

Replace the drying cartridge ⑦ when its contents turn pink. If this happens frequently, check the tightness of the following items:

- O-rings on light emitter ⑰ and receiver ④
- Gaskets on connectors ⑱, front gaskets of glass cylinder ⑳
- Cable glands on connectors ⑱ of the light emitter ⑰ and receiver ④

### Replacing the bulb

1. Unscrew and remove the union nut (outside) from the tube ⑲ of the light emitter ⑰.
2. Replace the bulb with a new one (12V 10W).
3. Refit the light emitter ⑰. Make sure the locating pin on the light emitter ⑰ fits in the groove of the tube ⑲. Tighten the union nut.
4. Repeat the 0 % and 100 % calibration 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 pipes).

### 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, M 1.0 A 5 x 20 at 24 V
4. Fit the screw cap and turn clockwise. Close the cover once more.

### Tools

- Spanner for hexagon head screws A.F. 13
- Screwdriver, size 2.5

**Spare parts**

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

<b>Item</b>	<b>Spare parts kit, stock code 389446</b>	<b>Qty.</b>
<b>21</b>	Glass cylinder	1
<b>22</b>	O-ring 25 x 3	2
<b>23</b>	O-ring 30 x 2	2
<b>24</b>	O-ring 48 x 2.5	2
<b>19</b>	Turbidity standard 20 ppm	1
<b>19</b>	Turbidity standard 40 TUF	1
<b>12</b>	Cleaning ring	1
	Bulb	1
<b>Spare parts kit for cleaning plunger, stock code 189352</b>		
<b>11</b>	Plunger	1
<b>13</b>	Ring	1
<b>12</b>	Wiper	1
<b>14</b>	Retaining ring 19 x 1.2	1
	Fixing disc	1

In the event of faults that cannot be remedied with the aid of this 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.

There is a risk of severe injuries and scalding over the entire body.

Before servicing 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 pipes).

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 **16** 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 fixing screws from the mounting bracket **25** and remove the measuring sensor. Dispose of the measuring sensor in accordance with statutory waste disposal provisions.

### 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 fixing screws and remove the measuring transducer. Dispose of the measuring transducer in accordance with statutory waste disposal provisions.

**For your notes**

**For your notes**

**For your notes**



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**alnab**

Alnab Armatur AB  
433 86 Partille

Tel +46 31 44 94 50  
Fax +46 31 44 24 55  
Org. Nr. 556312-9716

[alnab@alnab.se](mailto:alnab@alnab.se)  
[www.alnab.se](http://www.alnab.se)

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