Oil and Turbidity Detector TURBISCOPE®
OR 52/5, OR 52/6

Description
The equipment combination ORG... and ORT 6 is designed for the continuous monitoring of transparent liquids to detect the ingress of insoluble light-scattering foreign matter. Measuring of turbidity and signal evaluation for indication, recording and control. Tripping of alarms, control valves etc. The oil and turbidity detector OR 52/... consists of the measuring sensor ORG 12 or ORG 22 and the measuring transducer ORT 6.

Typical Applications
- Steam boiler plants: Monitoring condensate returned to the boiler for contamination by oils and fats, in particular for boilers operating without constant supervision in accordance with TRD 604 sheet 1 (2 devices are required for 72 hrs. operation).
- Raw-water monitoring and water treatment: sand filters, demineralization plants, reverse osmosis plants.
- Design for Ex zone 1 available on request.
- Breweries and the beverage industry: filtration, monitoring of wort, quality assurance etc.
- Oil content alarm for feedwater and condensate conditioning.

Design
The GESTRA TURBISCOPE consists of a measuring sensor and a measuring transducer:

Measuring Sensor ORG...
The sensor is a photometric measuring device with separate light emitter and light receiver and a glass cylinder serving as sightglass. The sensor is provided with two connections for the inlet and outlet of the liquid to be monitored (with flow reversal) and one connection for the discharge of the rinsing water or for sampling. The upper and lower cover flanges can be interchanged and turned through 90° or 180°. It is possible to clean the inside of the glass cylinder during operation with the aid of the cleaning plunger.
Two different designs are available:
- ORG 12: Grey cast iron GG-25
- ORG 22: Stainless steel 1.4580

Measuring Transducer ORT 6
The measuring transducer ORT 6 is located in a field case for wall installation. The cover of the case is provided with the indicators and operating buttons as well as a seven-segment display indicating the measured values and LEDs for signalling alarm condition or malfunction.

Function
The GESTRA TURBISCOPE is a continuous measuring device of turbidity as produced by foreign matter that is not dissolved in transparent liquids. The system operates on the Tyndall effect (concerning the scattering of light by suspended particles) which provides a high sensitivity of measurement for emulsified oils and greases and other suspended particles.

The light emitted by the light emitter of the sensor is focused by diaphragms fitted in the tube of the light emitter. The light beam penetrates through the glass cylinder into the liquid to be monitored where it is divided into a beam which passes through the liquid and a beam scattered at the foreign particles whose light intensity depends on the concentration of the foreign particles. The light intensity is transformed by a photo-electric cell in the light receiver into a proportional electric current fed to the measuring transducer which determines the concentration of foreign particles.

The light beam passing through the liquid is received by a second photo-electric cell. If the light intensity received deviates from a reference value in the measuring transducer the light intensity of the light emitter is correspondingly readjusted. Extinction and lamp aging are thus compensated. If the deviation can no longer be compensated, for example, because of breaking of lamp filament, heavy contamination of glass cylinder or excessive turbidity, a switch in the measuring transducer immediately de-energizes a relay. Simultaneously the LED malfunction lights up and the output current returns to zero.

The zero point and measuring range can be adjusted on the measuring transducer. The zero-point adjuster (0 %) is used to compensate stray light (reference fluid) which might vary from sensor to sensor. The 100 % adjuster permits the calibration of the measuring range to the specific turbidity of the plant (see "Important Notes").

Measuring Transducer ORT 6
This equipment serves as transmitter for measuring and control purposes. A stabilized output current of 4 to 20 mA is provided at the output. The switchpoints are continuously adjustable over the complete measuring range of 0 to 25 ppm. If the scattered light or the turbidity value exceeds the switchpoint, the output relay is de-energized after a preset time lag (time delay adjustable between 0 to 20 sec.).

Malfunction causes the immediate de-energizing of the limit value relay and is indicated by the lighting-up of a yellow LED.

The readings are indicated on the digital seven-segment display unit.
Technical Data ORT 6

Wiring
- 8 cable glands with integral cable clamps, M 16 x 1.5
- Screw-type terminal strips with wire guard, max. conductor size 1.5 mm²

Mains voltage
- 230 V + 10 / – 15 %, 50 – 60 Hz
- 115 V + 10 / – 15 %, 50 – 60 Hz (optional)
For nominal voltage rating see name plate

Fuse
- Thermal fuse (semi-delay) 0.2 A

Power consumption
- 25 VA

Measured quantity
- Turbidity (ppm = parts per million)

Measuring range
- 0 – 25 ppm (cf. name plate)

Lamp voltage for light emitter
- No-load voltage: 14 V
- with light emitter connected: < 12 V AC, 10 W

Actual value output
- 0/4 – 20 mA

Bus Networking
- CANopen (optional)

Load
- Load 0 to 500 Ω

Output
- 3 volt-free change-over contacts
- Max. contact rating for switching voltages 24/115/230 V: 4 A

Switchpoints
- Continuously adjustable over the whole measuring range. Other measuring ranges available on request.

Time delays
- Adjustable between 0 and 20 sec.
- Other time delays available on request.

Indicators and adjustors
- 4 push buttons for programming one red LED “Alarm 1”, one red LED “Alarm 2”, one yellow LED “Malfunction”, one yellow LED “Program status”, one 7-segment display for three digits

Protection
- IP 65
- Max. ambient temperature 60 °C

Light emitter
- Glow lamp 12 V / 10 W BA 15 s
- cable connection via 4 pole connector

Light receiver
- Two silicon photo-electric cells,
- cable connection via 4 pole connector

Approx. weight
- 6.8 kg

Materials

<table>
<thead>
<tr>
<th>ORG 12</th>
<th>ORG 22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing cover</td>
<td>Grey cast iron GG-25</td>
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<tr>
<td>Wetted parts</td>
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<tr>
<td>Ball valves</td>
<td>Brass 58</td>
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<tr>
<td>Screwed unions</td>
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<td>Glass cylinder</td>
<td>Duran 50</td>
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<tr>
<td>O-rings</td>
<td>EPDM</td>
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<tr>
<td>Housing</td>
<td>0.6025 galvanized</td>
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<tr>
<td>Cleaning disc</td>
<td>EPDM</td>
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</tbody>
</table>

Type approvals
- GL (Germanischer Lloyd) for condensate and feedwater monitoring on ships
- TÜV type approvals for condensate monitoring (land installations), based on WÜ 100 (VdTÜV Bulletin)

Nominal size
- DN 10, connection ¼” BSP to EN ISO 228-1

Nominal pressure
- PN 10

Flowrate
- 0.5 to 50 l/min

Pressure drop
- At a flowrate of 2 l/min and V-shaped flow through the sensor with a pipe length of 1 m (DN 10) and 4 bends; approx. 5 mbar ($\zeta = 6.1$).

Fluids
- Water, condensate, drinks etc.

pH values
- Up to 10.5 (a pH value of 11 and above will lead to wear of the glass, depending on the temperature).

Fluid temperature ranges
- 0 ... 60 °C with drying cartridge,
- 60 ... 120 °C with vent nipple.
Scope of supply

<table>
<thead>
<tr>
<th>Items</th>
<th>OR 52/5</th>
<th>OR 52/6</th>
<th>Stock code (230 V)</th>
<th>Stock code (115 V)</th>
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<tr>
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<td>ORT 6</td>
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<td>392 106</td>
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<td>Measuring sensor incl.</td>
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<td>ORG 22</td>
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<td>385 195</td>
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<tr>
<td>Ball valves</td>
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<td>077 135</td>
<td>077 135</td>
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<td>Screwed unions</td>
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<td>077 133</td>
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<td>Drying cartridge (supplied but not fitted)</td>
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<tr>
<td>Vent nipple (screwed in)</td>
<td>1</td>
<td>1</td>
<td>387 369</td>
<td>387 369</td>
</tr>
</tbody>
</table>

Dimensions

Turbidity Curves

A light beam shines through the liquid and any foreign matter which is not dissolved scatters the beam. The scattered light intensity increases in proportion to the concentration of suspended particles, the degree of turbidity depending on:

1. size of the particles (degree of emulsification)
2. shape and composition of the particles
3. optical properties of the particles.

In the case of oils, fats and greases the degree of emulsification is a decisive factor. These influences have been considered in the following chart:

- **A** Indication
- **B** Concentration
- **1** Fuel oil “EL” at 15 °C, coarse emulsification
- **2** Fuel oil “EL” at 15 °C, fine emulsification
- **3** Fuel oil “EL” at 80 °C, fine emulsification
- **4** Engine oil “SAE 15W40” at 15 °C, fine emulsification
- **5** Vegetable oil at 15 °C, fine emulsification
- **6** Xylene at 20 °C, fine emulsification
- **7** Xylene at 80 °C, fine emulsification
- **8** Red-berry juice, concentrated
- **9** Black-berry juice, concentrated
- **10** Skimmed milk, fat content 0.1 %, referred to fat concentration
- **11** Turbine oil “T 68”, gearbox oil “M 68”
**Important Notes**

**Condensate Monitoring**

Condensate monitoring is recommended upstream of condensate tanks, in particular in steam boiler plants operating in accordance with TRD 604 / EN 12953, part 6. Readings are influenced by live steam and flash steam. Care should therefore be taken that the sensor does not come into contact with steam. For more information see Installation Manual OR.

**Connecting Three-Way Valve**

For condensate monitoring a three-way valve should be controlled via alarm contacts such that contaminated condensate is discharged if the turbidity is too high (ingress of oil or start-up contamination).

Valves with a single-phase a.c. motor can be directly connected, max. power 50 VA. If three-phase actuators are used a reversing contactor has to be inserted. Valves with pneumatic actuators can be triggered via solenoid valves.

**Wiring**

- Light emitting device with screened two-core cable (e.g. LIYC 2 x 0.75 mm², max. length 50 m)
- Light receiving device with screened four-core cable (e.g. LIYC 4 x 0.5 mm², max. length 50 m)

**Order and Enquiry Specifications**

GESTRA Oil and Turbidity Detector TURBISCOPE, consisting of measuring sensor and transducer

- GESTRA oil and turbidity detector OR 52/5, consisting of measuring sensor ORG 12 (grey cast iron GG-25) and measuring transducer ORT 6
- GESTRA oil and turbidity detector OR 52/6, consisting of measuring sensor ORG 22 (stainless steel) and measuring transducer ORT 6

Supply voltage ........................ V (230 V or 115 V)

**Ancillary Units**

Three-way valve
- motorized, series 200
- pneumatic, series 500
  with three-way solenoid valve
Stop valve GAV
DISCO non-return valve type RK 86, 20 mbar opening pressure

**ATEX (Atmosphère Explosible)**

According to the European Directive 94/9/EC the equipment must not be used in potentially explosive areas.

Supply in accordance with our general terms of business.

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**Wiring Diagram**

Measuring sensor ORG... and measuring transducer ORT 6, for connection of three-way valve see “Important Notes”

Typical example of condensate monitoring, water treatment, filtering etc.