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OilSET-1000

Oil Separator Alarm Device

Installation and Operating Instructions

230V AC Supply

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SYMBOLS

Warning / Attention

Pay special attention to installations at explosive atmospheres

Device is protected by double or reinforced insulation

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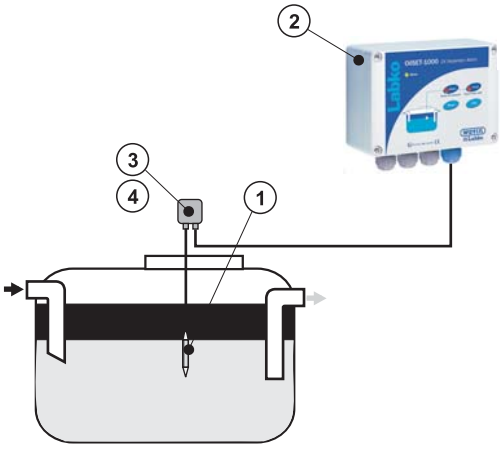
1 GENERAL

The OilSET-1000 is an alarm device for monitoring the thickness of the oil layer accumulating in an oil separator. Depending on the order, the delivery consists of OilSET-1000 control unit, SET DM/3 probe, junction box and installation supplies.



System components:
(depending on the order)

1. SET DM/3 probe with fixed cable
2. OilSET-1000 control unit
3. Junction box
4. Installation supplies

Figure 1. Oil separator alarm system

SET DM/3 probe is installed into the light liquid storage chamber and gives an alarm when the chamber is filled to a pre-determined degree. The probe is normally immersed in water.

The function is based on the measurement of the electrical conductivity of the surrounding liquid – water conducts electricity much better than oil.

Oil separator is regarded as potentially explosive (Ex) area. SET DM/3 probe can be installed in a zone 0, 1 or 2 potentially explosive area but the control unit must be mounted in a safe area.

The LED indicators, push buttons and interfaces of the OilSET-1000 control unit are described in figure 2.

OilSET-1000 user interface features:

1. LED indicator for mains
2. LED indicators of alarm and fault
3. Reset button for alarm and fault.
4. Test button
5. Connector for one SET probe [EEx ia]
6. Potential-free relay outputs for monitoring and control purposes

Figure 2. OilSET-1000 control unit - features

2 INSTALLATION

2.1 OilSET-1000 control unit

OilSET-1000 control unit can be wall-mounted. The mounting holes are located in the base plate of the enclosure, beneath the mounting holes of the front cover.

The connectors of the external conductors are isolated by separating plates. The plates must not be removed. The plate covering the connectors must be installed back after executing cable connections.

The cover of the enclosure must be tightened so, that the edges touch the base frame. Only then do the push buttons function properly and the enclosure is tight.

Before installation, please read the safety instructions in chapter 6 !

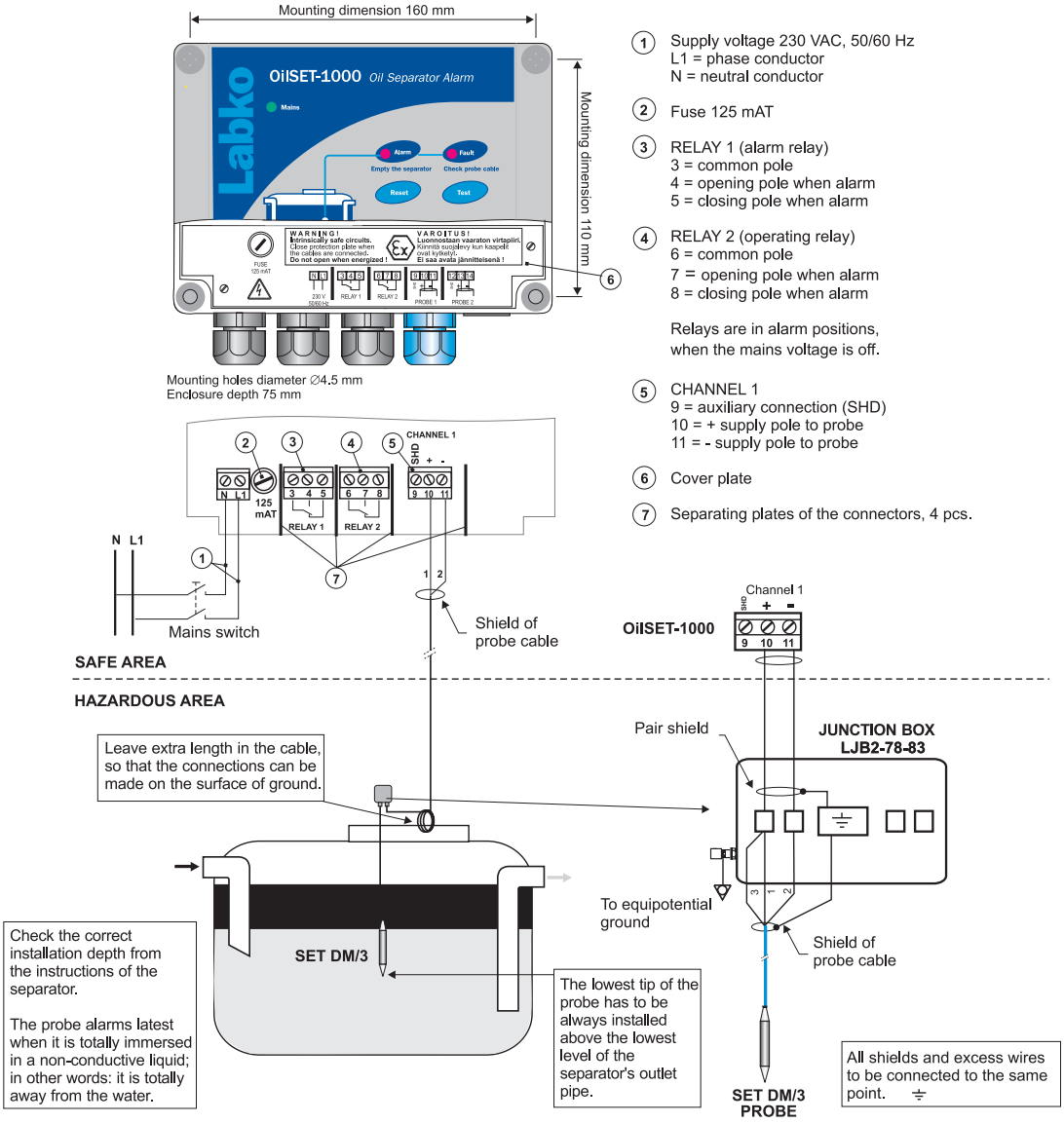


Figure 3. OilSET-1000 alarm device installation.

2.2 SET DM/3 probe

SET DM/3 probe should be installed as described in figure 3.

The probe gives an alarm earliest when the upper electrode is in oil and latest when the probe is totally immersed in a non-conductive liquid - in other words, it is totally away from the water.

Please check the correct installation depth also from the instructions of the oil separator.

2.3 Junction box

If the probe cable must be extended or there is a need for equipotential grounding, it can be done with the cable junction box. The cabling between the OilSET-1000 control unit and the junction box should be done with a shielded twisted pair instrument cable.

The LJB2 junction box enables cable extension in potentially explosive atmospheres.

The junction box can be installed inside the separator by mounting it to the separator or with a separate mounting hook.

In figure 3 the shields and possible excess wires need to be connected to the same point in galvanic contact with metallic frame of the junction box. This point can be connected to equipotential ground thru the ground terminal. Other components of the system that need to be grounded can also be connected to the same ground terminal.

The wire used for equipotential grounding must be min. 2.5 mm² mechanically protected or, when not protected, the minimum cross section is 4 mm².

Please make sure, that the probe and cable between OilSET-1000 control unit and the probe do not exceed the maximum allowed electrical parameters – see chapter 7 Technical data.

Detailed cabling instructions can also be found in the document SET DM/3 Installation and Operating Instructions.

Junction box of type LJB2 includes light alloy parts. When installing in explosive atmosphere, ensure that the junction box is located so that it can not be mechanically damaged or it will not be exposed to external impacts, friction etc. causing sparks which may cause ignition.

Ensure that the junction box is closed properly.

3 OPERATION AND SETTINGS

The OilSET-1000 alarm device is initialized at the factory.

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The operation of the alarm device should be checked always after the installation.

Functionality test

1. Immerse the probe into water. The device should be in normal mode.
2. Lift the probe up in air or oil. An Oil alarm should be generated (see chapter 3.1 for more detailed description).
3. Immerse the probe back into water. The alarm should go off after a delay of 5 sec. Clean up the probe if necessary before placing it back into the oil separator.

A more detailed description of the operation is provided in chapter 3.1. If the operation is not as described here, check the factory settings (chapter 3.2.) or contact a representative of the manufacturer.

3.1 Operation

The operation of a factory-initialized OilSET-1000 is described in this chapter.

Normal mode – no alarms

SET DM/3 probe is totally immersed in water.
Mains LED indicator is on.
Other LED indicators are off.
Relays 1 and 2 are energized.

Oil alarm

SET DM/3 probe is immersed in oil. (The probe gives an alarm earliest when the upper electrode is in oil and latest when the probe is totally immersed in a non-conductive liquid, in other words it is totally away from the water.)
Mains LED indicator is on.
Oil Alarm LED indicator is on.
Buzzer on after 5 sec delay.
Relays de-energize after 5 sec delay.
(Note. The same alarm takes place when SET DM/3 probe is in the air.)

After removal of an alarm, the Oil Alarm LED indicator and buzzer will be off, and relays will be energized after a fixed delay of 5 sec.

Fault alarm

Probe cable break, short circuit or a broken probe, i.e. too low or too high probe signal current.
Mains LED indicator is on.
Probe circuit Fault LED indicator is on after 5 sec delay.
Buzzer is on after 5 sec delay.
The relays de-energize after 5 sec delay.

Reset of an alarm

When pressing the Reset push button.
Buzzer will go off.
Relay 1 energizes.
Relay 2 will stay de-energized until the actual alarm or fault is off.

TEST FUNCTION

Test function provides an artificial alarm, which can be used to test the function of the OilSET-1000 alarm device and the function of other equipment, which are connected to OilSET-1000 via its relays.

Attention! Before pressing the Test button, make sure that the change of relay status does not cause hazards elsewhere!

Normal situation

When pressing the Test push button:
Oil Alarm and Fault LED indicators are immediately on.
Buzzer is immediately on.
Relays de-energize after 2 sec of continuous pressing.

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	When the Test push button is released: *LED indicators and buzzer go immediately off.* *Relays energize immediately.*
Alarm on	*When pressing the Test push button:* *Fault LED indicator is immediately on.* *Oil Alarm LED indicator remains on.* *Buzzer remains on. If it has been reset earlier, it will return to be on.* *If relay 1 was already reset, it will de-energize again after 2 sec. of continuous pressing.* *Test will not affect relay 2, because it is already in alarm status.* *When the Test push button is released:* *The device returns without delay to the preceding status.*
Fault alarm on	*When pressing the Test push button:* *The device does not react to the test at all.*

3.2 Factory settings

If the operation of OilSET-1000 is not as described in the previous chapter, check that the device settings are as in figure 4. Change the settings according to the following instructions if needed.

The following tasks must only be executed by a person with proper education and knowledge of Ex-i devices.

We recommend, that when altering the settings the mains voltage is off or the device is initialized before the installation is executed.

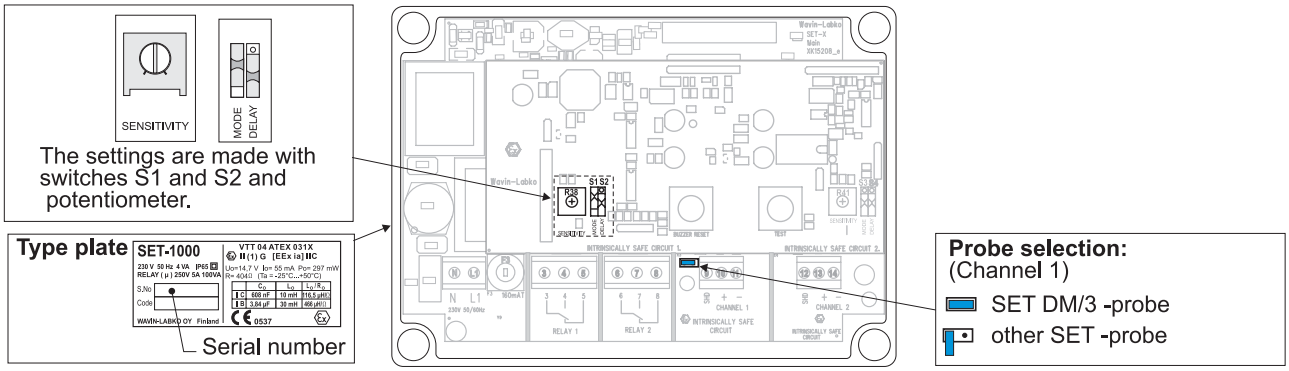
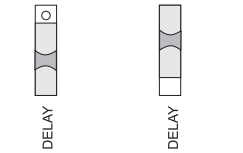


Figure 4. Factory settings

The settings are made with switches (MODE and DELAY) and potentiometer (SENSITIVITY) located in the upper printed circuit board, and the jumper located in the lower board (figure 4). In figure 4, the switches are as set in the factory.



Switch S2 is used to set the **operational delay of the control unit**. When the switch is in low position, relays operate and buzzer is on after 5 seconds after the level has reached the trigger level, and if the level still remains on the same side of the trigger level.

When the switch is in high position, the delay is 30 seconds.

Delays are operational in both directions (energizing, de-energizing). Alarm LED follows the probe current value and trigger level without delay. Fault alarm takes place after a fixed delay of 5 sec.

4 TROUBLE-SHOOTING

Problem: **MAINS LED indicator is off**

Possible reason: Supply voltage is too low or the fuse is blown. Transformer or MAINS LED indicator is faulty.

To do:
1. Check if the two pole mains switch is off.
2. Check the fuse.
3. Measure the voltage between poles N and L1. It should be 230 VAC ± 10 %.

Problem: **No alarm when probe in oil or air, or the alarm will not go off**

Possible reason: The SENSITIVITY setting is incorrect in the control unit (see figure 4), or probe is dirty.

To do:
1. Clean-up the probe and lift it up in the air or immerse it into oil.
2. Turn the SENSITIVITY potentiometer slowly anticlockwise until the probe gives an alarm.
3. Immerse the probe into water and wait until the alarm goes off. If the alarm does not go off, turn the potentiometer slowly clockwise until the alarm goes off.
4. Lift the probe up in the air or oil. The probe should give an alarm again.

Problem: **FAULT LED indicator is on**

Possible reason: Current in probe circuit too low (cable break) or too high (cable in short circuit). The probe might also be broken.

To do:
1. Make sure, that the probe cable has been connected correctly to the OilSET-1000 control unit. See probe specific instructions.
2. Measure the voltage separately between the poles 10 and 11. The voltages should be between 10,3….11,8 V.
3. If the voltage is correct, measure the probe current. Do as follows:
   - 3.1 Disconnect probe's [+] wire from probe connector (pole 10).
   - 3.2 Measure short circuit current between [+] and [-] poles.
   - 3.3 Connect mA-meter as in figure 5.
     Make a comparison to the values in Table 1.
   - 3.4 Connect the wire back to the connector.

If the problem can not be solved with the above instructions, please contact us.

Attention! If the probe is located in an explosive atmosphere, the multimeter must be Exi-approved!

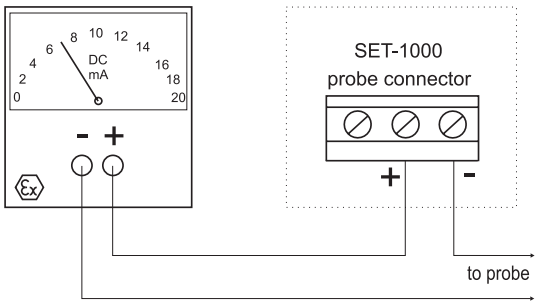


Figure 5. Probe current measurement

	SET DM/3, channel 1 **Poles 10 [+] ja 11 [-]**
Shortcircuit	20 mA – 24 mA
Probe in the air	9 – 10 mA
Probe in oil ($\varepsilon r \approx 2$)	9 – 10 mA
Probe in the water	2 – 3 mA
Factory setting for alarm point	approx. 6.5 mA

Table 1. Probe currents

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5 REPAIR AND SERVICE

The probe should be cleaned and the operation should also be tested when emptying the oil storage chamber or at least once every six months. The easiest way to check the operation is to lift the probe up in the air and to put it back to the separator. The operation is described in chapter 3.

For cleaning, a mild detergent (e.g. washing-up liquid) and a scrubbing brush can be used.

The mains fuse (marked 125 mAT) can be changed to another glass tube fuse 5 x 20 mm / 125 mAT complying EN 60127-2/3. Any other repair and service works on the device may be carried out only by a person who has received training in Ex-i devices and is authorized by the manufacturer.

In case of queries, please contact us:

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6 SAFETY INSTRUCTIONS

OilSET-1000 control unit must not be installed in potentially explosive atmosphere. Probes connected to it may be installed in zone 0, 1 or 2 potentially explosive atmospheres.

In case of installations in explosive atmospheres the national requirements and relevant standards as *EN 50039 and/or EN 60079-14* must be taken into account.

If electrostatic discharges can cause hazards in the operating environment, the device must be connected into equipotential ground according to requirements with regards to explosive atmospheres. Equipotential grounding is made by connecting all conductive parts into same potential e.g. at the cable junction box. Equipotential ground must be earthed.

The device does not include a mains switch. A two pole mains switch (250 VAC 1 A), which isolates both lines (L1, N) must be installed in the main power supply lines in the vicinity of the unit. This switch facilitates maintenance and service operations and it has to be marked to identify the unit.

When executing service, inspection and repair in explosive atmosphere, the rules in standards EN 60079-1 and EN 60079-19 about instructions of Ex-devices must be obeyed.

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7 TECHNICAL DATA

OilSET-1000 Control Unit	
Dimensions	175 mm x 125 mm x 75 mm (L x H x D)
Enclosure	IP 65, material polycarbonate
Ambient temperature	-25 ºC…+50 ºC
Supply voltage	230 VAC ± 10 %, 50/60 Hz Fuse 5 x 20 mm 125 mAT (EN 60127-2/3) The device is not equipped with a mains switch
Power consumption	2 VA
Probes	One SET probe (SET DM/3)
Max. impedance of the current loop between the control unit and a probe	75 Ω.
Relay outputs	Two potential-free relay outputs 250 V, 5 A, 100 VA Operational delay 5 sec or 30 sec. Relays de-energize at trigger point. Operation mode selectable for increasing or decreasing level.
Electrical safety	EN 61010-1, Class II ⧈, CAT II / III
Insulation level Probe / Mains supply voltage	375V (EN 50020)
EMC Emission Immunity	 EN 61000-6-3 EN 61000-6-2
Ex-classification Special conditions (X)	⟨Ex⟩ II (1) G [EEx ia] IIC VTT 04 ATEX 031X (Ta = -25 °C…+50 °C)
Electrical parameters Characteristic curve of the output voltage is trapezoidal See table 2.	U_o = 14,7 V I_o = 55 mA P_o = 297 mW R = 404 Ω

Due to non-linear characteristics of the probe voltage, the interaction of both, capacitance and inductance, must be taken into account. The table below indicates the connecting values in explosion groups IIC and IIB. In explosion group IIA the values of the group IIB can be applied.

Max. permissible value			Combined Co and Lo	
	Co	Lo	Co	Lo
II C	608nF	10 mH	568nF 458 nF 388 nF 328 nF 258 nF	0,15 mH 0,5 mH 1,0 mH 2,0 mH 5,0 mH
II B	3,84µF	30 mH	3,5 µF 3,1 µF 2,4 µF 1,9 µF 1,6 µF	0,15 mH 0,5 mH 1,0 mH 2,0 mH 5,0 mH

L_o/R_o = 116,5 µH/Ω (IIC) and 466 µH/Ω (IIB)

Table 2. OilSET-1000 electrical parameters

SET DM/3 probe	
Principle of operation	Measurement of conductivity
Enclosure	IP68, materials: AISI 316 and PVC
Ambient temperature	-20 ºC…+70 ºC
Supply voltage	Approx. 12 VDC from SET control unit
Cable	Fixed oil resistant PVC cable 3 x 0,5 mm^2, standard length 5 m.
EMC Emission Immunity	 EN 50081-1 EN 50082-1
Ex-classification	⟨Ex⟩ II 1 G EEx ia IIA T4 VTT 02 ATEX 012X
Electrical parameters	U_i = 16,5 V I_i = 80 mA P_i = 330 mW C_i = 700 pF L_i = 10 µH

Special conditions concerning Ex-classification (X):

- Ambient temperature -20 ºC…+70 ºC
- Shielded probe cable shall be connected to equipotential ground
- If probe cable has to be extended, please use LJB2 Junction Box. The junction box must be connected to equipotential ground.

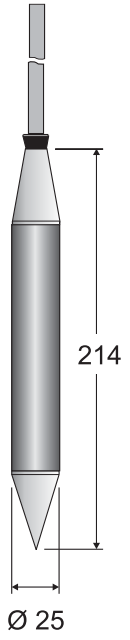

Figure 6. Dimensional drawing of SET DM/3 probe