

OiISET-1000

Oil Separator Alarm Device with SET/DM3AL sensor



Installation and Operating Instructions



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SYMBOLS



Warning / Attention



Pay special attention to installations at explosive atmospheres



Device is protected by double or reinforced insulation

1 GENERAL

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/DM3AL sensor and a cable joint.

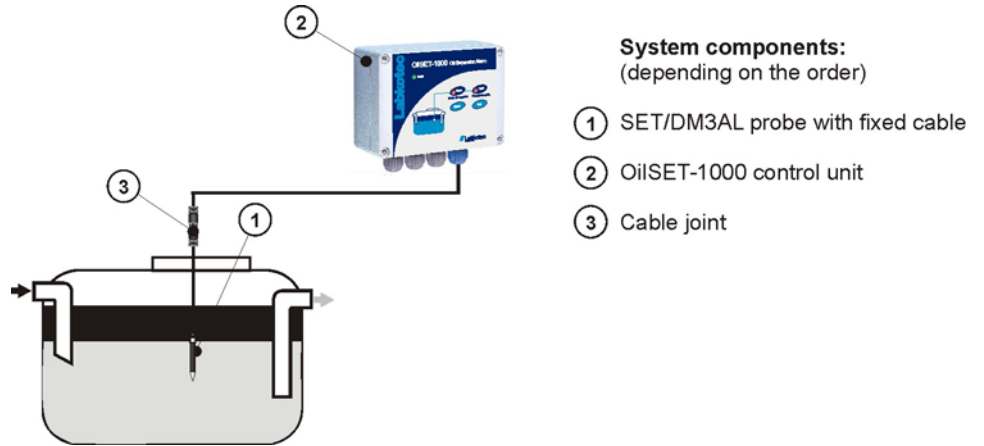


Figure 1. Oil separator alarm system

SET/DM3AL sensor is installed into the light liquid storage chamber and gives an alarm when the chamber is filled to a pre-determined degree. The sensor 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/DM3AL sensor 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.

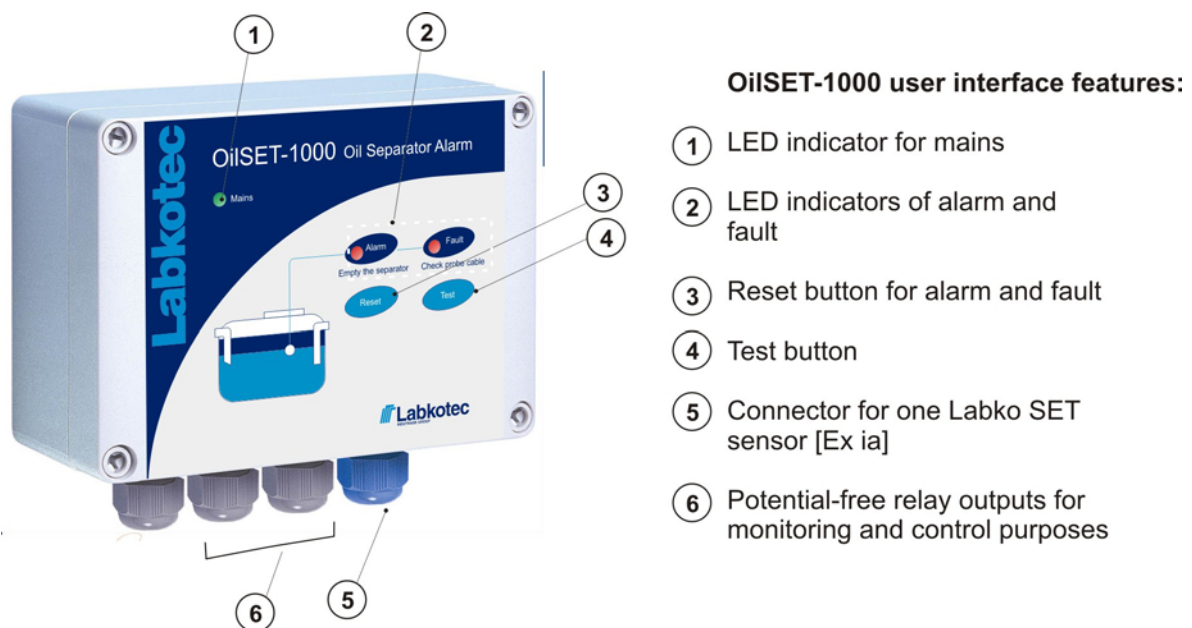


Figure 2. OilSET-1000 control unit - features

2 INSTALLATION

2.1 OiISET-1000 control unit

OiISET-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 !

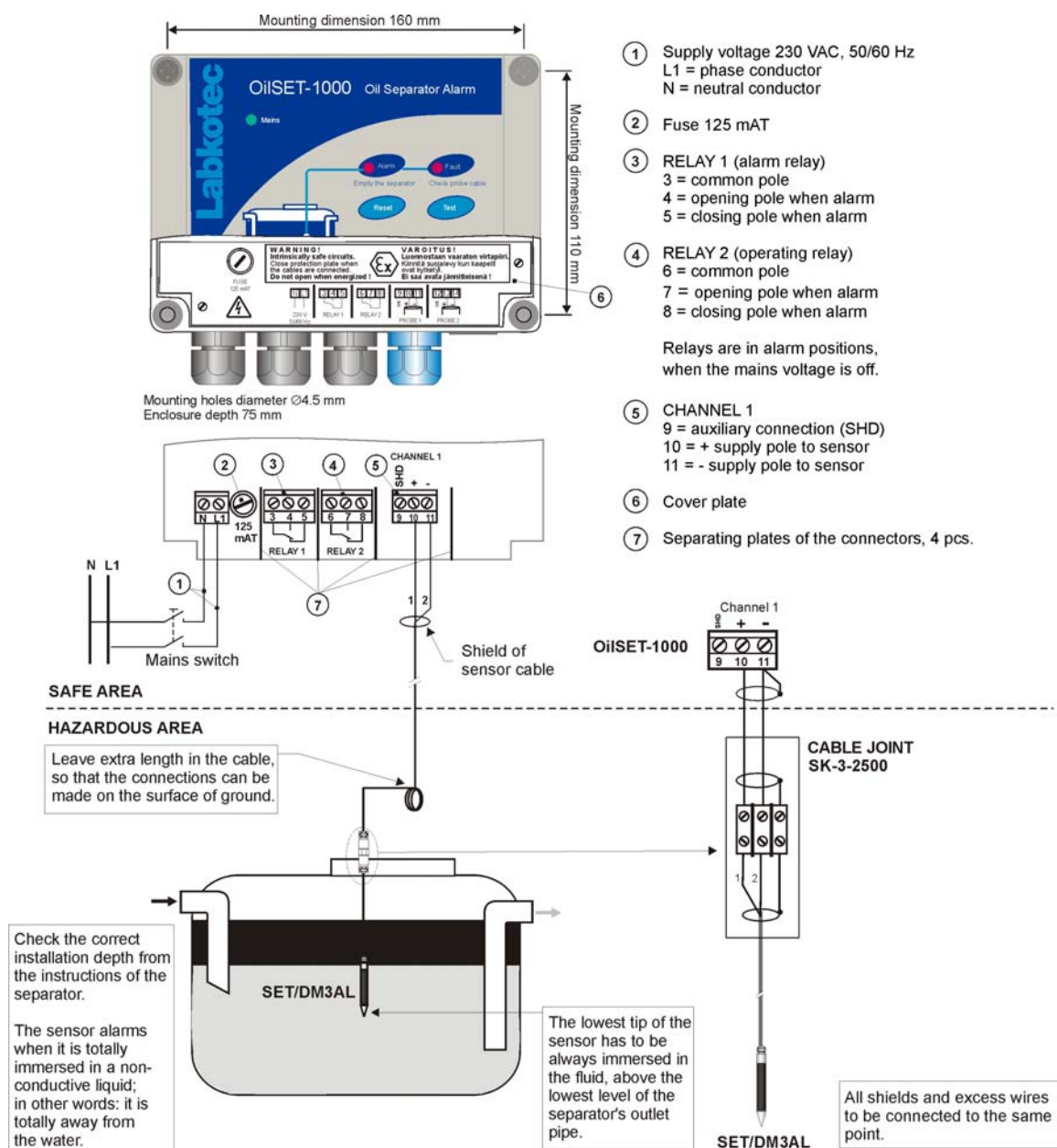


Figure 3. OiISET-1000 alarm device installation.

2.2 SET/DM3AL sensor

SET/DM3AL sensor should be installed as described in figure 3.

The sensor gives an alarm when the upper electrode is in oil.

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

2.3 Cable joint



Fig. 4 Cable joint SK-3-2500

Connections of the sensor cable inside the cable joint are explained in figure 3. Cable shields and possible excess wires need to be connected to the same point in galvanic contact.

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

IP rating of the cable joint is IP67. Make sure, that the cable joint is closed properly.

If the sensor cable must be extended and there is a need for equipotential grounding, it should be done with the junction box LJB2. The cabling between the OilSET-1000 control unit and the junction box should be done with a shielded twisted pair instrument cable.



Fig. 5. Cable installation example



Fig. 6. Installation accessories

3 OPERATION AND SETTINGS

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

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

Functionality test

1. Immerse the sensor into water. The device should be in normal mode.
2. Lift the sensor up in air or oil. An Oil alarm should be generated (see chapter 3.1 for more detailed description).
3. Immerse the sensor back into water. The alarm should go off after a delay of 5 sec. Clean up the sensor 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/DM3AL sensor is totally immersed in water.
 Mains LED indicator is on.
 Other LED indicators are off.
 Relays 1 and 2 are energized.*

Oil alarm

*SET/DM3AL sensor is immersed in oil. (The sensor gives an alarm when the upper electrode is in oil.)
 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/DM3AL sensor 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

*Sensor cable break, short circuit or a broken sensor, i.e. too low or too high sensor signal current.
 Mains LED indicator is on.
 Sensor 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.
 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 7. 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.

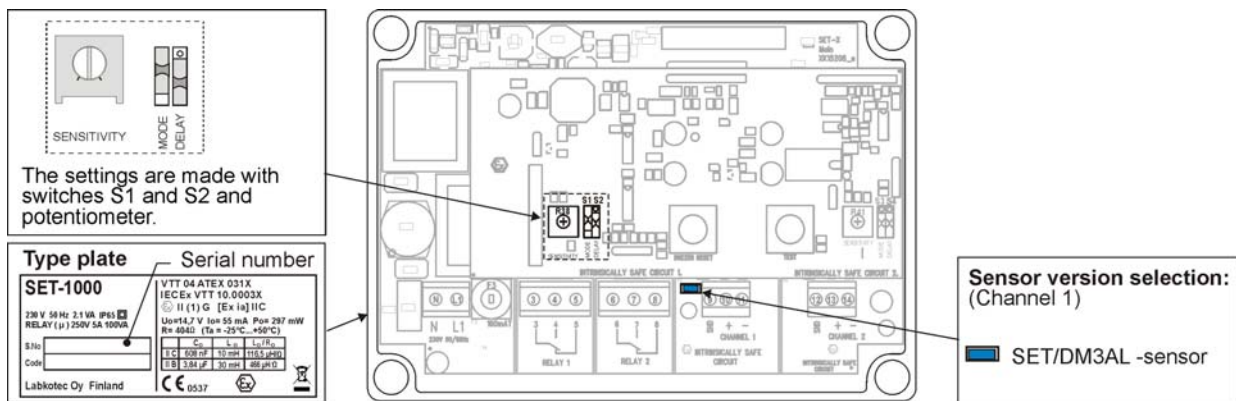
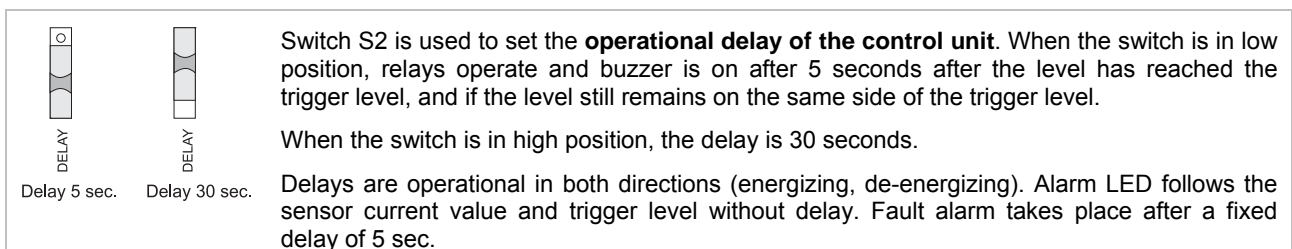


Figure 7. Factory settings

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 7). In figure 7, the switches are as set in the factory.



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 \pm 10 %.

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

Possible reason: The SENSITIVITY setting is wrong in the control unit (see figure 7), or sensor is dirty.

- To do:**
1. Clean-up the sensor and lift it up in the air or immerse it into oil.
 2. Turn the SENSITIVITY potentiometer slowly anticlockwise until the sensor gives an alarm.
 3. Immerse the sensor 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 sensor up in the air or oil. The sensor should give an alarm again.

Problem: FAULT LED indicator is on

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

- To do:**
1. Make sure, that the sensor cable has been connected correctly to the OilSET-1000 control unit. See sensor 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 sensor current. Do as follows:
 - 3.1 Disconnect sensor's [+] wire from sensor connector (pole 10).
 - 3.2 Measure short circuit current between [+] and [-] poles.
 - 3.3 Connect mA-meter as in figure 8.

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 Labkotec Oy's local distributor or Labkotec Oy's service.



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

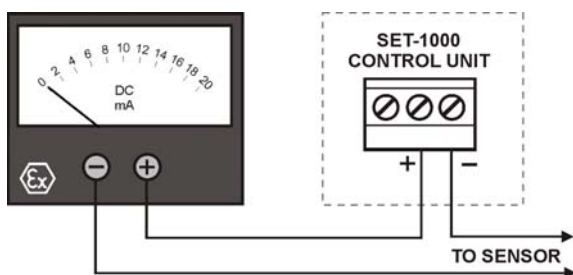


Figure 8. Sensor current measurement

	SET/DM3AL, channel 1 Poles 10 [+] ja 11 [-]
Shortcircuit	20 mA – 24 mA
Sensor in the air	9 – 11 mA
Sensor in oil (εf . 2)	9 – 11 mA
Sensor in the water	3 – 4 mA
Factory setting for alarm point	approx. 6.5 mA

Table 1. Sensor currents

5 REPAIR AND SERVICE

The sensor 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 sensor 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 mA) can be changed to another glass tube fuse 5 x 20 mm / 125 mA complying IEC/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 Labkotec Oy's service:

labkotec.service@labkotec.fi.

6 SAFETY INSTRUCTIONS



OilSET-1000 control unit must not be installed in potentially explosive atmosphere. Sensors 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 *IEC/EN 60079-25 and/or IEC/EN 60079-14* must be taken into account.

Warning! If the cabling is voltage-tested, the sensor must be disconnected.



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 *IEC/EN 60079-17 and IEC/EN 60079-19* about instructions of Ex-devices must be obeyed.

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
Operation temperature	-25 °C...+50 °C
Supply voltage	230 VAC ± 10 %, 50/60 Hz Fuse 5 x 20 mm 125 mA (IEC/EN 60127-2/3) The device is not equipped with a mains switch
Power consumption	2 VA
Sensors	One SET sensor (SET/DM3AL)
Max. resistance of the current loop between the control unit and a sensor	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	IEC/EN 61010-1, Class II  , CAT II / III
Insulation level Sensor / Mains supply voltage	375V (IEC/EN 60079-11)
EMC Emission Immunity	IEC/EN 61000-6-3 IEC/EN 61000-6-2
Ex-classification Special conditions (X) ATEX IECEX	 II (1) G [Ex ia] IIC (Ta = -25 °C...+50 °C) VTT 04 ATEX 031X IECEX VTT 10.0003X
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
Manufacturing year: Please see the serial number on the type plate	xxx x xxxxx xx YY x where YY = manufacturing year (e.g. 10 = 2010)

Due to non-linear characteristics of the sensor 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	0,15 mH
			458 nF	0,5 mH
			388 nF	1,0 mH
			328 nF	2,0 mH
			258 nF	5,0 mH
II B	3,84µF	30 mH	3,5 µF	0,15 mH
			3,1 µF	0,5 mH
			2,4 µF	1,0 mH
			1,9 µF	2,0 mH
			1,6 µF	5,0 mH

$$L_o/R_o = 116,5 \mu\text{H}/\Omega \text{ (IIC) and } 466 \mu\text{H}/\Omega \text{ (IIB)}$$

Table 2. OilSET-1000 electrical parameters

SET/DM3AL sensor	
Principle of operation	Measurement of conductivity
Signal Supply voltage	Analog 3 mA / 10 mA 8 V...16 V (DC)
Material	PVC (black); AISI 316, NBR, PA
IP-classification	IP68
Temperature	Operation: 0 °C...+60 °C Safety: -30 °C...+60 °C
Cable	Shielded oil-proof cable 2 x 0.75 mm ² . Standard length 5 m. Other lengths optional. The max. length of the fixed cable is 15 m. Can be extended with a shielded cable. The recommended maximum cable loop resistance is 75 Ω.
EMC Emission Immunity	IEC/EN 61000-6-3 IEC/EN 61000-6-2
Ex-classification Special conditions (X) ATEX IECEX	 II 1 G Ex ia IIA T5 Ga (Ta -30 °C...+60 °C) – The risk of electrostatic charge must be observed! VTT 09 ATEX 026X IECEX VTT 10.0001X
Electrical parameters	U _i = 16,5 V I _i = 80 mA P _i = 400 mW C _i = 3,5 nF L _i = 85 µH
Manufacturing year: Please see the serial number on the type plate	x xxx x xxxxx xx YY x where YY = manufacturing year (e.g. 10 = 2010)

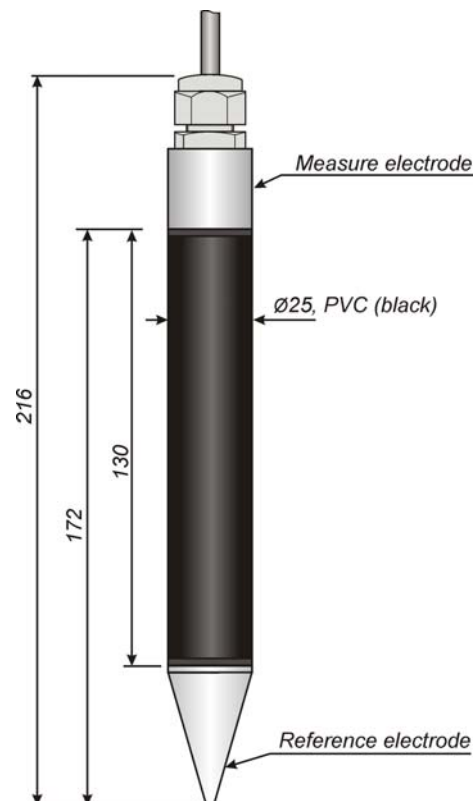


Figure 9. Dimensional drawing of SET/DM3AL sensor

Declaration of Conformity

This declaration certifies that the below mentioned apparatus conforms to the essential requirements of the EMC directive 2004/108/EY, Low-Voltage directive (LVD) 2006/95/EC and ATEX directive 94/9/EC.

Description of the apparatus: Measuring and control unit
Type: SET-1000 and SET-2000 series
Manufacturer: Labkotec Oy
Myllyhaantie 6
FI-33960 Pirkkala
FINLAND

The construction of the appliance is in accordance with the following standards:


EMC:

EN 61000-6-2 (2005) Electromagnetic compatibility, Generic immunity standard, class: Industrial environment.
EN 61000-6-3 (2007) Electromagnetic compatibility, Generic emission standard, class: Residential, commercial and light industry.
EN 61000-3-2 (2000) Electromagnetic compatibility, Product family standard: Harmonic current emissions.
EN 61000-3-3 (1995) +A1:2001+A2:2005 Electromagnetic compatibility, Product family standard: Voltage fluctuations and flicker sensation.

LVD:

EN 61010-1 (2001) Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1: General requirements.

ATEX:

EN 60079-0 (2009) Electrical apparatus for explosive gas atmospheres — Part 0: General requirements.
EN 60079-11 (2007) Explosive atmospheres — Part 11: Equipment protection by intrinsic safety 'i'.
EC-type examination certificate: VTT 04 ATEX 031X
Ex-classification:  II (1) G [Ex ia] II C Ta = -25...+50°C
Production quality assurance notification: VTT 01 ATEX Q 001
Notified Body: VTT Expert Services Ltd; notified body number 0537.
Address of the notified body: P.O. Box 1001, FI-02044 VTT, Finland

The product is CE-marked since 2004.

Signature

The authorized signatory to this declaration, on behalf of the manufacturer, and the Responsible Person based within the EU, is identified below.

Pirkkala 02.11.2010


Heikki Helminen
CEO
Labkotec Oy

Declaration of Conformity

This declaration certifies that the below mentioned apparatus conforms to the essential requirements of the EMC directive 2004/108/EC and ATEX directive 94/9/EC.

Description of the apparatus: Level sensor
Type: SET/DM3D, SET/DM3DL, SET/DM3AL
Manufacturer: Labkotec Oy
Myllyhaantie 6
FI-33960 Pirkkala
FINLAND

The construction of the appliance is in accordance with the following standards:


EMC:

EN 61000-6-2 (2005) Electromagnetic compatibility, Generic immunity standard, class: Industrial environment.
EN 61000-6-3 (2007) Electromagnetic compatibility, Generic emission standard, class: Residential, commercial and light industry.

ATEX:

EN 60079-0 (2009) Electrical apparatus for explosive gas atmospheres — Part 0: General requirements
EN 60079-11 (2007) Explosive atmospheres — Part 11: Equipment protection by intrinsic safety 'i'
EN 60079-26 (2007) Explosive atmospheres — Part 26: Equipment with equipment protection level (EPL) Ga

EC-type examination certificate: VTT 09 ATEX 026X

Ex-classification :  II 1 G Ex ia II B T5 Ga Ta = -30...+60°C (SET/DM3D)
 II 1 G Ex ia II A T5 Ga Ta = -30...+60°C (SET/DM3DL, SET/DM3AL)

Production quality assessment notification:

VTT 01 ATEX Q 001

Notified Body:

VTT Expert Services Ltd; notified body number 0537.

Address of the notified body:

P.O. Box 1001, FI-02044 VTT, Finland

Signature

The authorized signatory to this declaration, on behalf of the manufacturer, and the Responsible Person based within the EU, is identified below.

Pirkkala 14.10.2011


Heikki Helminen
CEO
Labkotec Oy