

# **USER MANUAL**

**for**

## **GDMS-OMDN09®**

**Gear and Diesel engine Monitoring System  
Oil Mist online Detection Navy**

**Diesel- and -Version**

Part No.: 2 900 00 0000

Release: 100614  
(revision 110901)



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***Declaration of Conformity***  
**EMC-Directives:**  
**2004 / 108 / EC (Diesel- and Ex-Version)**  
**94 / 9 / EC (Ex-Version only)**

We

**MSS AG**

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declare on our own responsibility, that the products

Kind of equipment:

**Gear and Diesel Monitoring System**  
**Oil Mist online Detection Navy**

Type - designations:

**GDMS-OMDN09**  
**GDMS-OMDN09 Ex**

are in compliance with following norms:

**Diesel- and Ex-Versions:**  
**EN 55011, EN 55022,**  
**EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6,**  
**IEC 60068-2-1: 2007-03, IEC 60068-2-2: 2007-07,**  
**IEC 60068-2-30: 2005-08, IEC 60068-2-6: 2007-12**

**Ex-Version only:**  
**EN 60079-0:2009 (General requirements),**  
**EN 60079-11:2007 (Intrinsic safety),**  
**IEC 60079-28:2006 (optical radiation)**



It is recommended to read this manual before commencing the repair, assembly or commissioning of the oil mist detector system!

**Caution:** The manufacturer's warranty will become void if these instructions are not followed!

Unless notified, these operation instructions are applicable for:

GDMS-OMDN09  
GDMS-OMDN09 Ex

**In case of a GDMS-OMDN09 alarm, the operator should take appropriate actions to prevent an explosion or damages from the engine.**

**The recommended measures of the engine manufacturer are to be followed.**



**If the system is installed on a ship, special cases while maneuvering may occur (like docking maneuver) which may override the local safety system!  
So, the engine might not be stopped if an alarm has been triggered.**



**The explosion protection (Ex) design is only provided by the GDMS-OMDN09 Ex Version. The use of GDMS-OMDN09 Ex Version with gas engines requires special safety measures!**

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## 1. System Description

### 1.1. Components

#### 1.1.1. GDMS-OMDN09 Principle

The **GDMS-OMDN09** is an advanced oil mist detection system especially constructed to meet the requirements of large diesel engines, like ship engines or power plant engines. While developing GDMS-OMDN09 MSS AG has used the latest technical knowledge and practical experience.

The issue of highly ignitable oil mist produced when lubricants or fuel come in contact with hot surfaces within the engine has become one of the most significant risks for engine builders and operators. Mist concentration of 50 mg/l and higher is sufficient for an explosion to occur, resulting in large-scaled engine damages and in severe cases in the loss of lives. The presence of oil mist inside the engine can also indicate a damage of sliding surfaces, because the lubricant film can vapour in areas where moving parts begin to rub against each other.

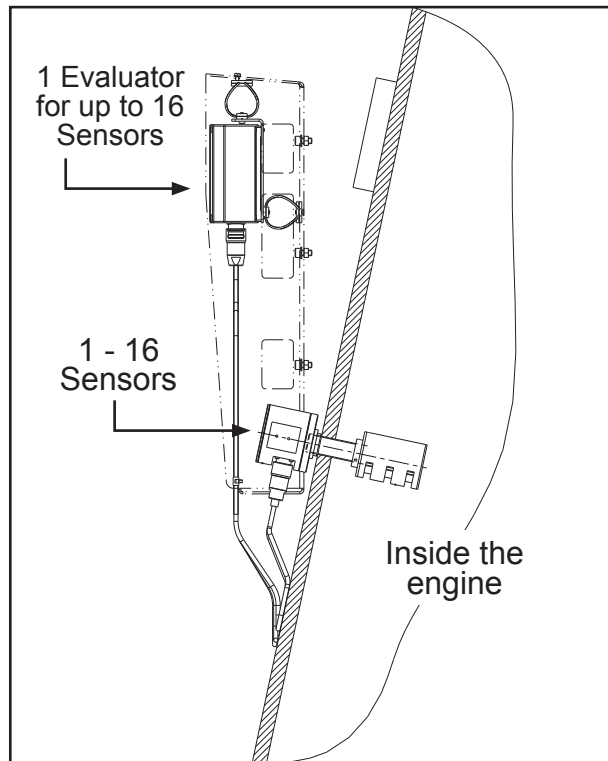


Fig. 1.1. Exemplary assembly of the GDMS-OMDN09 System

The main topics of oil mist detection are:

1. Prevention of larger damages in engines. If the oil mist is detected early, minimal maintenance and repair works are often sufficient to solve the problem, allowing to avoid high repair- and breakdown costs for the engine.
2. Protection of the engine against explosion. Before the concentration of oil mist reaches the LEL, Lower Explosion Level (50 mg/l), the oil mist detector will trigger an alarm.

GDMS-OMDN09 is also capable of detecting water vapour. Due to water vapour, corrosion on major parts inside the engine may occur which will damage the engine.

Oil mist detection systems are also part of rules applied world-wide which are administered by the IACS, the International Association of Classification Society. These rules are called UR, Unified Requirements, and oil mist detection systems are part of UR M10 and UR M67. These Unified Requirements are realized and used in the national rules of the Classification Societies, like the German Lloyd.



Based on a widely-used principle of light measurement, GDMS-OMDN09 does not have the disadvantages of some older OMD systems. The GDMS-OMDN09 is a pipe-free system, with sensors mounted directly at the engine wall, it allows quick and exact measurement of oil mist concentration in each engine compartment. A local control device, the GDMS-OMDN09 Evaluator, processes and displays measurement data received from the sensors. The data can also be monitored on an optional PC (Personal computer).

The light measurement can be performed in two different ways:

1. **Transmission:** Light emitted by a light source (LED) passes through the measuring section and is measured by a semi-conductor receiver diode. The wave length of the light can be between 600nm and 960nm. Oil mist reflects and refracts light, therefore lowering the intensity that can be detected by the receiver. The concentration of oil mist in the measuring section correlates to the intensity of light detected by the receiver. This measuring principle is employed by GDMS-OMDN09.
2. **Remission:** Light of a LED is emitted into a measuring section and the light reflecting on the mist is measured via an optical semi-conductor. The extent of the oil mist concentration in the measuring section correlates to the reflection on the mist.

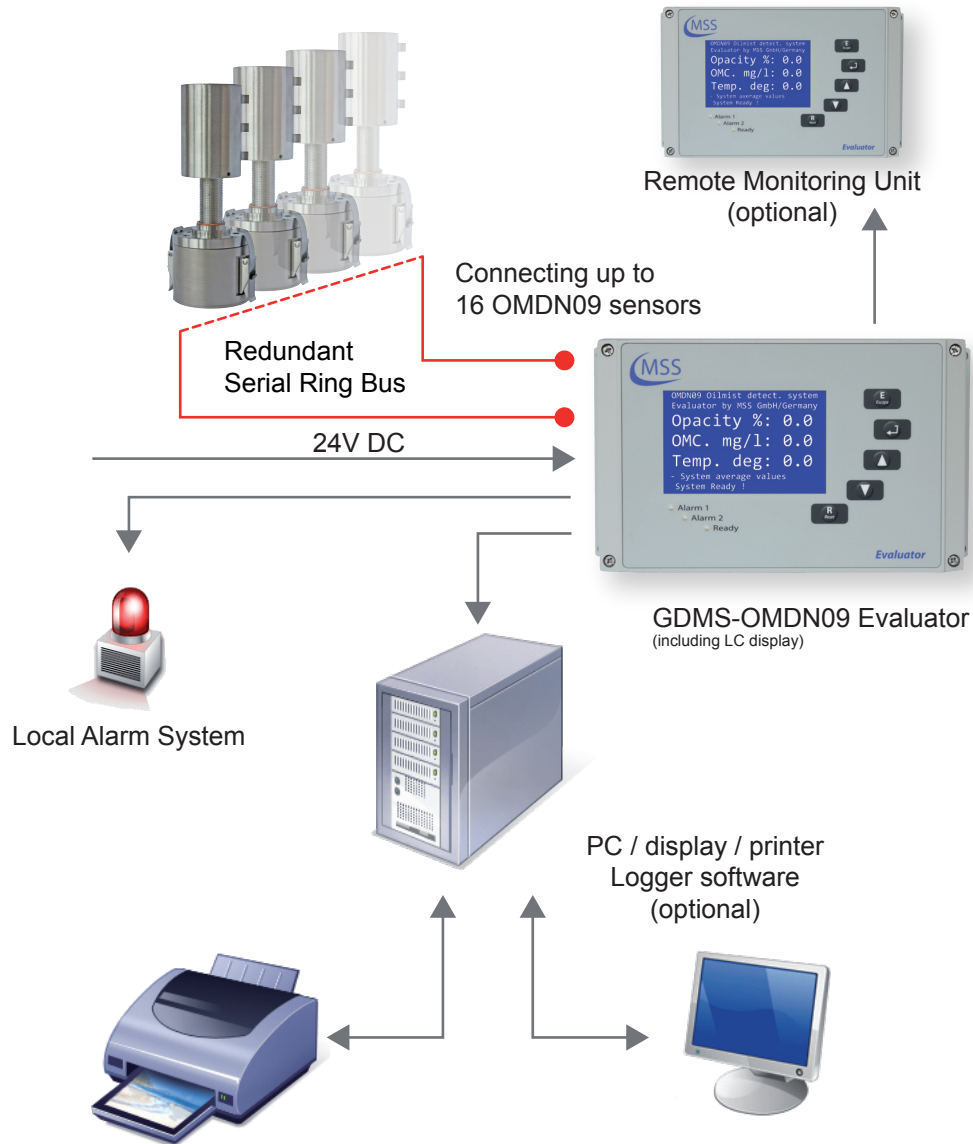
The GDMS-OMDN09 Evaluator as well as the optional PC monitoring software have a warning system which allows to raise an alarm when the measured data indicates high oil mist concentration in the engine.



## Key benefits of the GDMS-OMDN09 System

1. The oil mist is measured inside the engine where it develops. Therefore, the response time from the development of oil mist until the system raises an alarm is very short.
2. The measured data is displayed on the Evaluator which can be mounted near the engine or at any other place. The measured data can also be shown on a Remote Control and/or a PC. This eliminates the risk of being near the faulty engine.
3. If one of the sensors gets dirty, the operator will be alerted immediately. The sensor can be cleaned easily without stopping the engine.
4. Easy handling.
5. Immediate localization and indication of the compartment where the oil mist developed.

### 1.1.2. GDMS-OMDN09 - Delivered Items



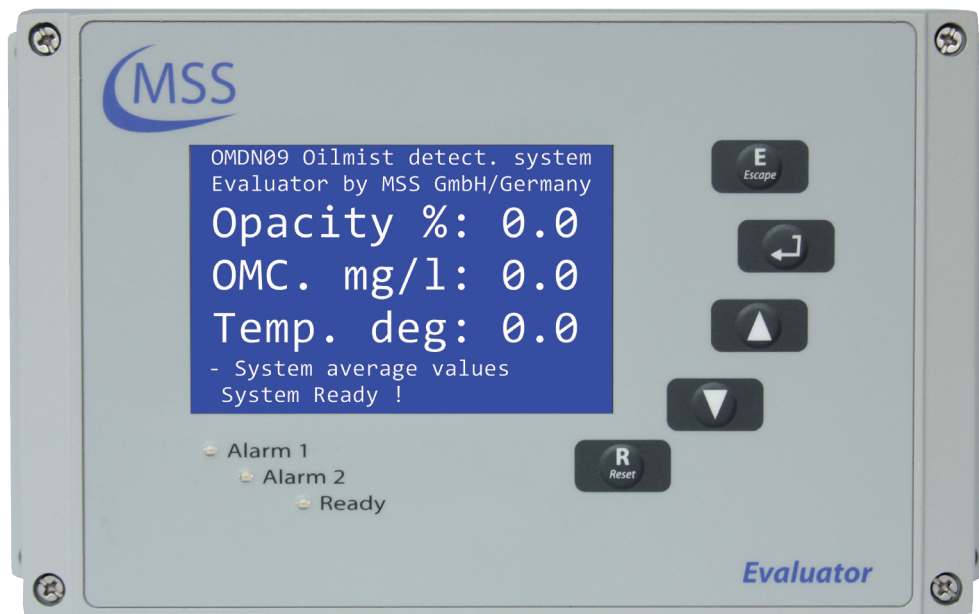
**Fig. 1.2. GDMS-OMDN09 System**

Main components of GDMS-OMDN09 system:

1. Evaluator
2. 1....16 sensors
3. 1....16 SOPS
4. Cables sensor - sensor
5. Cables sensor - Evaluator
6. Cables for power supply

## 1.1.3. GDMS-OMDN09 - System Components

### 1.1.3.1. GDMS-OMDN09 Evaluator



**Fig. 1.3. GDMS-OMDN09 Evaluator**

The Evaluator consists of a metallic case, a liquid crystal display (LCD), three LEDs (Alarm1, Alarm2 and Ready), four control keys (E Escape, ←, ↑, ↓) and one reset button (R Reset).

The electronics and the display of the GDMS-OMDN09 Evaluator are installed in a closed, shock-proofed, water, dust and EMC resistant aluminium case, protection class IP 67.

The Evaluator can be mounted close to the engine or in the engine control room. The Evaluator operates reliably at temperatures between 0°C to 70°C and at relative humidity up to 80%.

The installation of the Evaluator is performed via 2 assembly rigs. If required, the Evaluator can be mounted vibration-free. In either case the connecting cable must be relaxed (e.g. using a loop) without putting any strain on the connectors / plugs.

The Evaluator displays the measurement values and OMDN09 parameter values on its LCD display. It also provides test procedures that can be executed for GDMS-OMDN09 diagnostics.

The control keys of the Evaluator are implemented as membrane buttons. This type of buttons must not be operated using sharp items, including knives, screw-drivers or ball-pens.

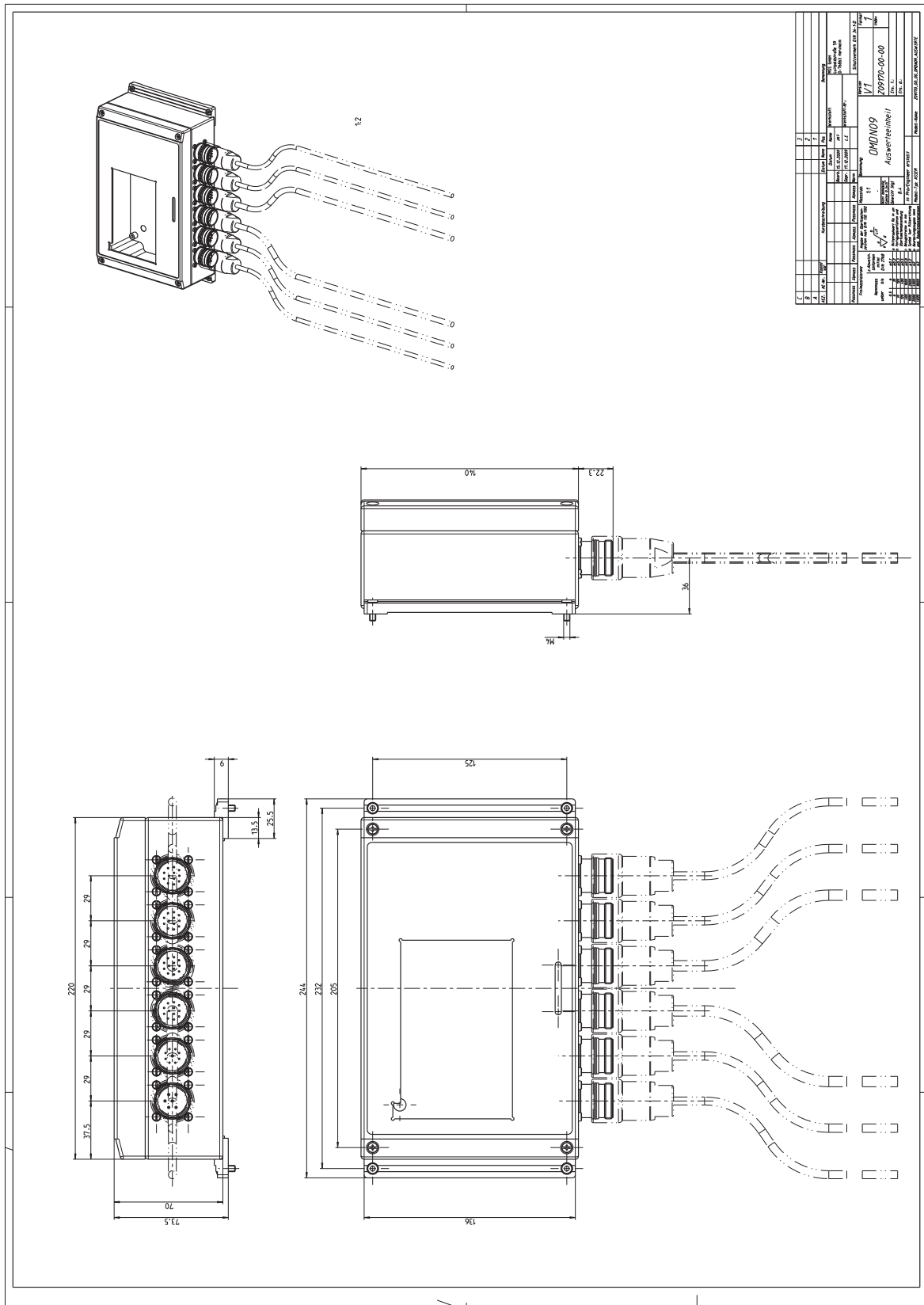
If necessary, the keypad can be wiped with a mild cleaning agent. Never use solvents!



After successful installation and testing by service technicians approved by MSS AG, the settings of the Evaluator should not be changed. The Evaluator does not require regular maintenance.



Note: Firmware updates for the Evaluator will be available and may be applied to your system only by service technicians approved by MSS AG. Firmware updates are generally not free of charge. Please contact MSS AG or an authorized representative for pricing and further information.



### 1.1.3.2. Connectors and pin-out of the GDMS-OMDN09 Evaluator

	Connectors of the Evaluator					
	1	2	3	4	5	6
Pin	Power Supply	Relays	Serial Data Link	OMDN09 OUT	OMDN09 IN	Reserved
1	+24V (brown)	1st Alarm Relay NO	TxD / 232	OMDN09 OUT - 1	OMDN09 IN - 1	
2	0V (black)	1st Alarm Relay COM	RxD / 232	OMDN09 OUT - 2	OMDN09 IN - 2	
3		1st Alarm Relay NC	CAN-H	OMDN09 OUT - 3	OMDN09 IN - 3	
4		2nd Alarm Relay NO	CAN-L	OMDN09 OUT - 4	OMDN09 IN - 4	
5		2nd Alarm Relay COM	RS485 +	OMDN09 OUT - 5	OMDN09 IN - 5	
6		2nd Alarm Relay NC	RS485 -	OMDN09 OUT - 6	OMDN09 IN - 6	
7		Ready Relay NO	RxD + RS485	OMDN09 OUT - 7	OMDN09 IN - 7	
8		Ready Relay COM	RxD - RS485	OMDN09 OUT - 8	OMDN09 IN - 8	
9		Pre Alarm COM	GND	OMDN09 OUT - 9	OMDN09 IN - 9	
10		Pre Alarm NC	GND	OMDN09 OUT - 10	OMDN09 IN - 10	
11			GND	OMDN09 OUT - 11	OMDN09 IN - 11	
12			GND	OMDN09 OUT - 12	OMDN09 IN - 12	
Cable Part No.	2xAWG 20 9200020000	12xAWG 20 9200120000	12xAWG 20 9200120000	12xAWG 20 9200120000	12xAWG 20 9200120000	
Connector Part No.	930006100	9300122000	9300124000	9300122000	9300121000	

**Table 1.1. Connections of Evaluator**

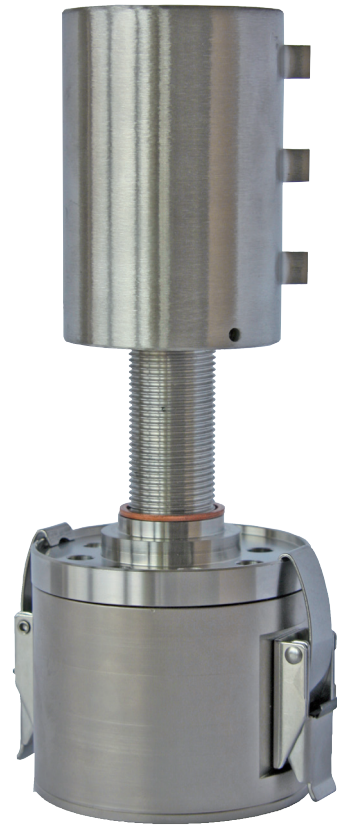
### 1.1.3.3. GDMS-OMDN09 Sensor and SOPS

GDMS-OMDN09 performs compartment specific oil mist monitoring and lubrication oil temperature measurements.

The measuring unit of GDMS-OMDN09 for a compartment consists of a finger-shaped optical sensor with system redundancy, and a multiple chamber Splash Oil Protection System (SOPS) which prevents the sensor from being soiled with splash oil, but allows the oil mist and water vapour to enter the sensor light beam within milliseconds. So, the reaction time of each sensor and the whole system is less than one second.

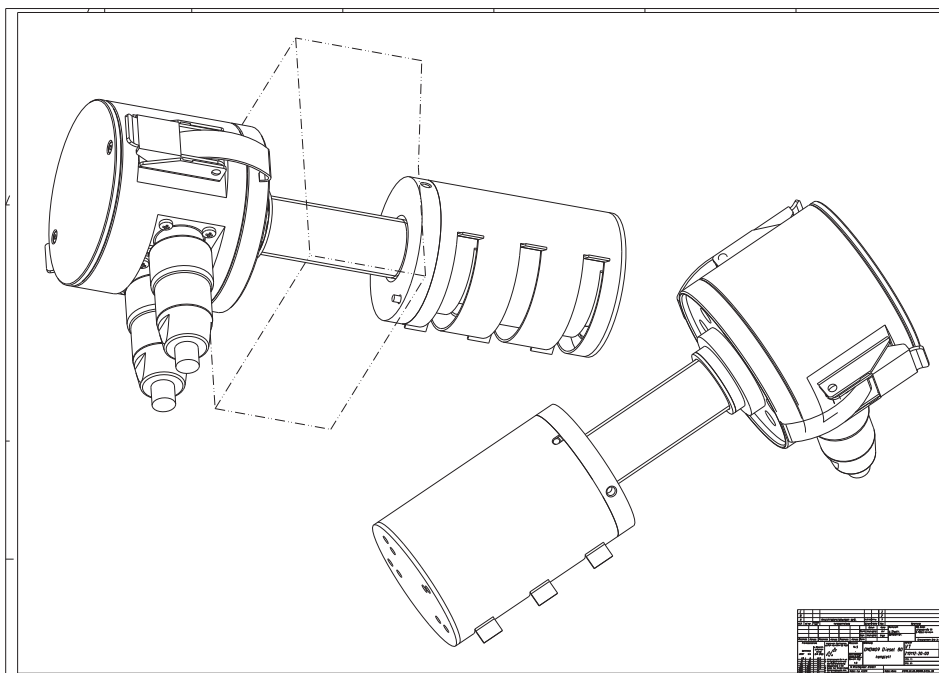
The SOPS is mounted from the inner side of the engine wall into already existing drilling of the crankcase. The sensor is pushed into the installed SOPS. So, the OMDN09 sensor installation is very simple. This also means that **the optical measuring section is positioned inside the crankcase area where oil mist could occur. No piping is needed!**

The GDMS-OMDN09 sensors are interconnected via two redundant serial bus interfaces. If necessary, a sensor can be easily dismantled, for example for cleaning, while the engine is running without affecting the system's functionality.



**Fig. 1.5. GDMS-OMDN09 sensor with SOPS**

GDMS-OMDN09 does not have any movable mechanical parts and hence does not undergo any wear and tear.



**Fig. 1.6. Installation of SOPS and sensor**

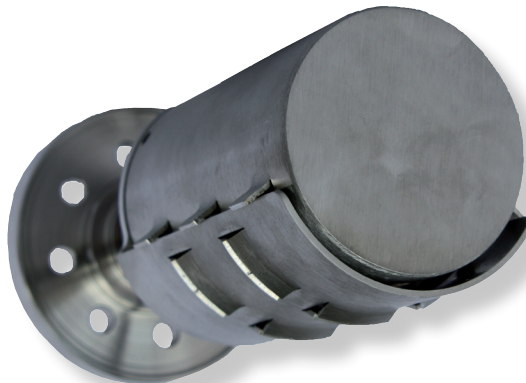


The sensor and alarm system's reaction time is in the range of less than one second.

The SOPS and the sensors are identically for each engine. Due to differences in each engine design which result in different wall thicknesses different SOPS and sensor lengths are required. The needed length will be determined by personell of MSS AG or an authorized partner.



If the SOPS and the sensor are installed near or in a section with a high splash oil concentration the usage of the Diffusor add-on is required (also refer to "2.2. Installation Position" on page 2.2).



**Fig. 1.7. SOPS with Diffusor**

### **Important for users of Gas Engines**



The GDMS-OMDN09 Ex consists of an appropriate component (electronic system) and an intrinsically safe component (Sensor). These components build a mechanical unit.

The GDMS-OMDN09 Ex is mounted to the engine wall, separating the crank case with its Ex-category 2G requirements, from the non explosive engine room.

The cylindrical Aluminium housing containing the electronic system is an assembly of circuit boards and electronic components.

Two plug connectors for connection of the non intrinsically safe electric circuits (current supply and RS 485 interface) and the electronic system of a further Sensor are mounted to the cylinder barrel of the cylindrical housing.

The cylindrically shaped high-grade steel housing of the sensor consists of an optical system and a temperature sensor. The electronic components, except the optical measuring section, are embedded in explosion proof pottant.

The housing of the sensor and the electronic system are connected to each other by a threaded pipe. The multi-core connecting cable of the intrinsically safe electric circuits of the sensor is led through the threaded pipe and connected to circuit board LPT 2 of the electronic system.



## 1.1.3.4. Technical Data of GDMS-OMDN09 Sensor and Evaluator

Power Supply: 24V DC +30/-25%  
 Operating Current:  
     max. 1.5 A  
 Up to 16 (sixteen) GDMS-OMDN09 Sensors can be connected

Sensitivity: Adjustable in 10 steps from 0,2mg/dm<sup>3</sup> to 10 mg/dm<sup>3</sup> (LEL 50 mg/dm<sup>3</sup> refer Chapter 1.)

Sensitivity Level	1	2	3	4	5	6	7	8	9	10
Sensitivity mg/l	0.2	0.3	0.5	0.7	1.0	1.5	2.5	4.0	7.0	10.0

Relay-Outputs: Contact load for all relays:  
     max. 60V AC, 1A, 60VA / max. 60V DC, 1A, 60W

Alarm 1:  
     1 relay with 2 ground-free switch-over contacts, usually configured as main alarm

Alarm 2:  
     1 relay normally closed, usually configured to open if prealarm condition arises

Ready:  
     1 relay, closes if system is fault-free, opens otherwise

Wire break protection with 33 kOhm resistors (standard)

Interface: Serial Interface:  
     • RS485 for standardized industrial, bidirectional communication  
     • RS232 for setup and configuration

Communication Protocol:  
     • Modbus (optional)  
     • Canbus (optional)

User interface: LCD Display 240\*128 dots  
     1 LED green "Ready"  
     1 LED red "Alarm 1" (usually set up as main alarm)  
     1 LED orange "Alarm 2" (usually set up as pre-alarm)

Connection cable: for example:  
     • Huber + Suhner Radox MFHS-EMC (GL approved)  
     • Metrofunk 12 AWG 20UC-L

Environment Conditions: Ambient temperature in service:  
     0°C - 70°C for GDMS-OMDN09 Evaluator  
     0°C - 85°C for GDMS-OMDN09 Sensor Electronics  
     -10°C - 120°C for GDMS-OMDN09 Sensor Measuring Section

Ambient temperature in Storage:  
     -25°C - 85°C

Protection:  
     IP65



### 1.1.3.5. Important for users of Gas Engines



for non intrinsically safe electric circuits

rated voltage for power supply      DC 24V,  $U_m =$  DC 30V

rated voltage for RS 485 interface      DC 24V,  $U_m =$  DC 30V

optical radiation

wavelength      880 nm

optical power of LED       $P_0 \leq 12$  mW

radiant intensity of LED       $\leq 0,6$  mW/mm<sup>2</sup>

Environment Conditions       $0^{\circ}\text{C} \leq T_a \leq +85^{\circ}\text{C}$

#### **1.1.4. Intended Purpose**

The use of a PC with the GDMS-OMDN09 is only permitted by using equipment approved by MSS AG, i.e. interface converter, plugs, etc.

MSS AG can only provide technical support if MSS AG approved equipment is used.

The purpose of this manual is to instruct the operator how to make the best use of the GDMS-OMDN09 System and also to alert them of safety issues that may arise.

All products mentioned in this manual are to be handled only by personnel with appropriate electrical and PC knowledge, such as international ISO standards.

Any damages, either human or material, caused by the use of the products depicted in this manual for any purpose other than that intended, is solely the responsibility of the user and not of the manufacturer.

## 1.1.5. Materials Included

To the scope of supply of a GDMS-OMDN09 System belongs one evaluator for each engine, one sensor for each compartment with the appropriate SOPS (splash oil protection system), cables in the correct length, provided with the necessary plug-in connections as well as all seals, O-rings and small articles for the assembly.



Fig. 1.8. Scope of Delivery for GDMS-OMDN09 System

## 2. Installation

### 2.1. General

Installation and commissioning of GDMS-OMDN09 is conducted or supervised by personnel from MSS AG or its authorized representatives.

A training for the on-site operation personnel and/or the commissioning data on a CD are available on request.

The wiring diagram and schematic given here are guidelines only. The actual wiring will be adapted to the existing alarm and monitoring system on-site.

#### **Important for users of Gas Engines**

The GDMS-OMDN09 Ex has to be installed to the engine wall in the manner specified, that the appropriate component (electronic system) sits in the non explosive engine room outside the crank case and the intrinsically safe component (Sensor) sits inside the crank case with its Ex-category 2G requirements.



For non intrinsically safe electric circuits (current supply and RS 485 interface) Um of DC 30 V is compulsory.

For the connection to the 230V power supply the current supply of the GDMS-OMDN09, inclusive the devices, connected to the RS485 interface have to:

- either be supplied by an electric power supply unit with safe galvanic isolation
- or the supply current circuit and the current circuits of the RS 485 interfaces have to be carried by an engineered safety barrier. Special instructions/requirements, constituted in the certificates of these engineered safety barriers, have to be necessarily carried out.

For further installations instructions refer to the Installation Manual.

## 2.2. Installation Position

The position for the GDMS-OMDN09 sensors and SOPS in the engine wall must be chosen carefully. Using existing drilled holes, for example used by an old oil mist detection system, the installation is easy.

Anyway, the splash oil concentration inside the engine is a very important factor and must be taken into consideration:

Each engine type has got its own characteristics which influence the splash oil concentrations inside the engine. The areas of high splash oil concentration “follow” the rotation of the crankshaft. During engine work splash oil forms discoidal zones with very high splash oil concentration (also called “splash discs”).

In an in-line engine two “splash discs” appear between the conrod and the crankweb. In a V-engine a third “splash disc” appears between two conrods.

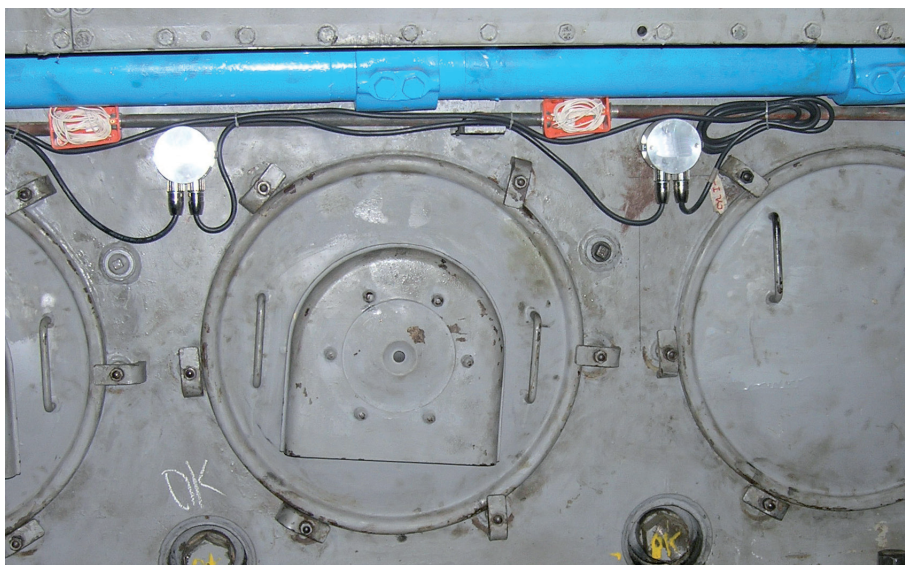
It is important to choose the installation position **outside** the “splash discs”!



In a four-stroke engine the sensors must be installed on the side where splash oil hits the sensors on the top. Otherwise, the GDMS-OMDN09 Diffusor has to be installed to the SOPS.

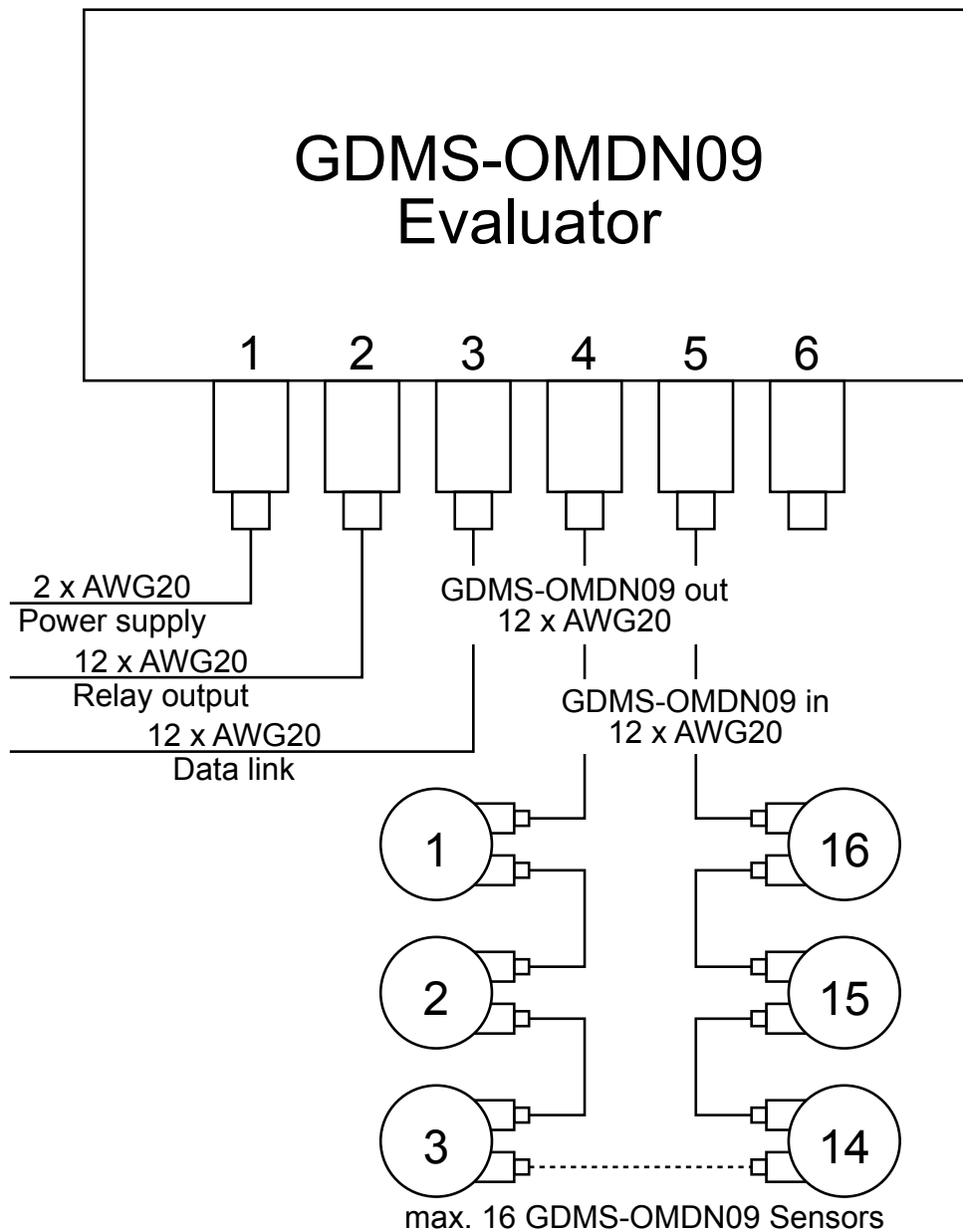
Two-stroke engines have no definite rotational direction, so the splash oil is not always hitting the top of the SOPS! Also the other different characteristics of an two-stroke engine compared to a four-stroke engine require the usage of the Diffusor on two-stroke engines!

In Fig. 2.1. you can see an example for installation for a four-stroke diesel generator set. The left top position of the crankcase was found here the best for oil mist monitoring.



**Fig 2.1. Example of Installation for Sensors and SOPS**

## 2.3. Wiring Diagram



**Fig. 2.2 Principle Connection**

The connection for power supply, relay output, data link and connection of GDMS-OMDN09 sensors is shown in this figure. It is possible to connect up to 16 sensors to one evaluator. For more information please refer Chapter 1.1.3.2.





### 3. Commissioning

#### 3.1. Pre-Commissioning Checks

Check for the following:

- correct wiring as given in Chapter 2.3.
  - correct power supply on GDMS-OMDN09 Evaluator
  - GDMS-OMDN09 Evaluator display is on
- For more detailed information, please have a look at the Installation Manual!

#### 3.2. Data Sampling

As soon as a GDMS-OMDN09 Evaluator is powered up, it starts the initial self check procedure and shows the READY Status if all pre-set conditions are fulfilled. This self check procedure is carried out in a certain cycle.

Regardless of the green ready LED status of the GDMS-OMDN09 Evaluator, if working GDMS-OMDN09 sensors are connected, the GDMS-OMDN09 Evaluator samples the signals from the GDMS-OMDN09 sensors with a certain sampling rate, converts them into digital signals, analyzes, evaluates and displays them on its LCD display.

These data including the detected events are continuously made available through the RS485 interface. A connected Remote Control and/or PC can use the output for remote monitoring and further processing.

It is also possible to set up some OMDN09 Evaluator parameters from the PC using standard Windows HyperTerminal application.

#### 3.3. Alarm Setting and Triggering

There are 3 alarm relays integrated in the GDMS-OMDN09 Evaluator:

- 1<sup>st</sup> Alarm relay: always assigned to main alarm, additionally programmable as pre-alarm or over speed alarm
- 2<sup>nd</sup> Alarm relay: programmable as main alarm or pre-alarm or both and/or over-speed alarm
- 1 Ready relay: indicates the system status

The GDMS-OMDN09 has a self check procedure which is carried out in a certain cycle. If any one of the conditions for the System Ready status is not detected the GDMS-OMDN09 Evaluator switches off the green READY LED and the ready relay opens. An error code and a text error message are shown on the LCD display of the Evaluator and also in the event window of OMD Logger on the optional monitoring PC.

GDMS-OMDN09 enables to set different alarm sensitivity levels by defining different oil mist concentration thresholds as alarm condition. Oil mist concentration alarm levels are encoded as numbers from 1 to 10 (the higher the number is the less

sensitive is the system). Please also refer to the table below.  
The temperature alarm level is given in degree Celsius.

Sensitivity Level	1	2	3	4	5	6	7	8	9	10
Sensitivity mg/l	0.2	0.3	0.5	0.7	1.0	1.5	2.5	4.0	7.0	10.0

Alarm sensitivity levels must be set at the GDMS-OMDN09 Evaluator. If alarm conditions are fulfilled, the firmware of the GDMS-OMDN09 Evaluator triggers the corresponding alarm.

In case of an alarm triggering, it is shown:

- by the LED indicators on the GDMS-OMDN09 Evaluator
- by the optional OMDN09 Logger software on the monitoring PC
- by alarm indicators of the engine alarm devices, depending on wiring

### 3.3.1. Alarm Resetting

- In case of a System Not Ready status:

Only if all conditions for System Ready status are re-established (e.g. the problem indicated on the LC-Display of GDMS-OMDN09 Evaluator is fixed by the operator), the System Ready status will be reactivated automatically by the system.

Exceptional case: In case of a communication error, the Evaluator has to be restarted to reactivate the System Ready status!

- In case of a Pre-Alarm triggered:

If the conditions for a Pre-alarm are not confirmed after pre-set time period, the Pre-Alarm will be reset automatically by the system.

- In case of a Main-Alarm triggered:

The Main Alarm will not be reset automatically by the system even after the conditions that led to it are not met any more. Main Alarm can only be reset manually at the GDMS-OMDN09 Evaluator by pressing the RESET button for 3 seconds.

- In case of a Temperature Alarm triggered:






Temperature Alarm is not being reset automatically by the system either! It must be reset by pressing the RESET button at the Evaluator for 3 seconds

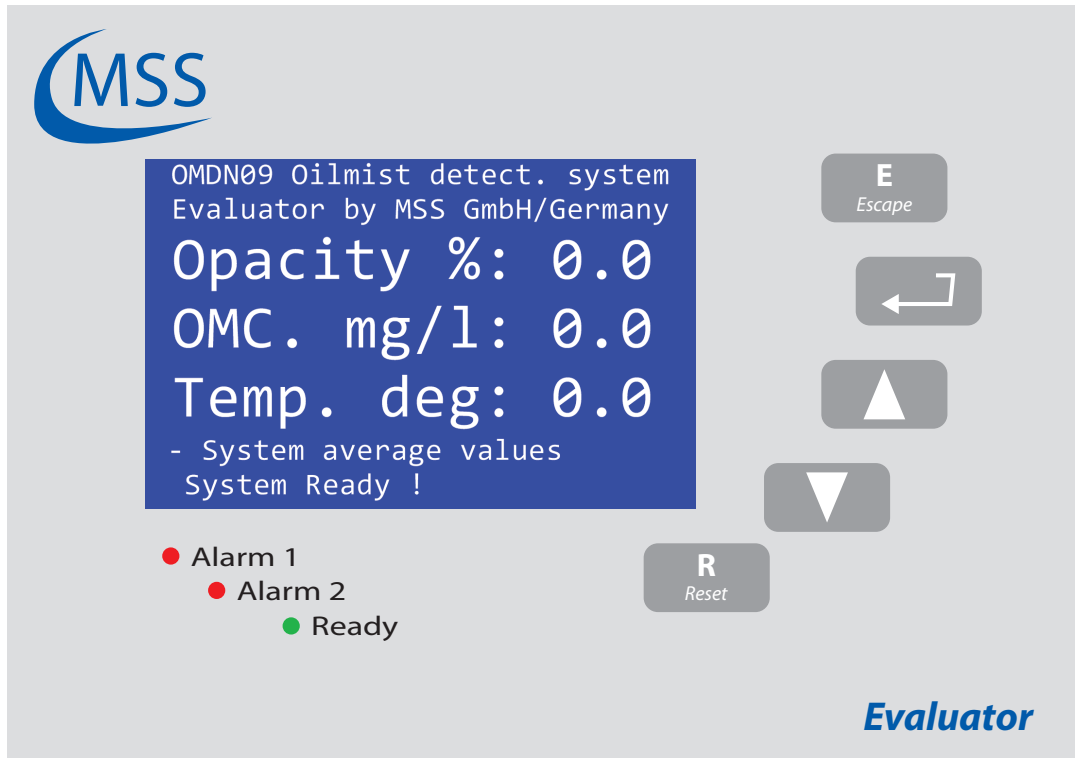


**Attention:** Main-Alarm **cannot** be reset through the OMDN09 Logger software, but only at the GDMS-OMDN09 Evaluator by pressing the RESET-Button for 3 seconds.

## 3.4. Settings & Parameters / Using the Evaluator

### 3.4.1. Basic Usage of the Evaluator


Using the Evaluator is very simple. It has got one large 240x128 LCD, four navigation buttons ( , , ,  ), one reset button  and three LEDs indicating the system status.



**Fig. 3.1. View of the Evaluator with the default screen**

On this sample picture you see the Evaluator displaying Screen 1.1 (page 3.9) which is the default screen while the system is running. On the following pages, each screen is described and the possible actions are given.

Please have a short look at the description of Screen 1.1 (page 3.9).  
On the given table, you can see that

- pushing the button  will display Screen 1.2
- pushing the button  will display Screen 1.4
- pushing the button  will not do anything
- pushing the button  will display Screen 1.5






Note: The button  is only needed to reset an alarm!

On the next page, an example for changing a value is given.

### 3.4.2. How to change a value

In this example the change of the value “LCD brightness” is described.

The screen we need to get to is Screen 1.4.3.1 - LCD brightness.


1. Beginning with the default screen Screen 1.1 - Opacity % / OMC. mg/l / Temp. deg you have to go to Screen 1.4 - OMDN09 setup by pushing  once **or** by pushing  three times.
2. Then, you have to push  to get to the next menu level.
3. Screen 1.4.1 - Parameter setup will be displayed.
4. Since the target screen is at level Screen 1.4.3 - Setup CPU you need to push  twice and after that .

```
OMDN09 Oilmist detect. system
Evaluator by MSS GmbH/Germany

-- Setup CPU -----
LCD brightness : 30
up/down=next, ret=select
Press ESC to leave !

- Change Parameter Setup
System Ready !
```

**Fig. 3.2. Screen 1.4.3.1 as of step 5**

5. Screen 1.4.3.1 - LCD brightness will be displayed:
6. Now, we can change the value by pressing the  button first.




```
OMDN09 Oilmist detect. system
Evaluator by MSS GmbH/Germany

-- Setup CPU -----
LCD brightness : 30
up/down=next, ret=select
Press ESC to leave !

- Change Parameter Setup
System Ready !
```

**Fig. 3.3. Screen 1.4.3.1 as of step 6**

The screen will now look like this:


7. The value is highlighted now which indicates that it may be changed.
8. To change the value use the button  to increase the value and the button  to decrease the value.
9. If you reached the new value, for example “50”, press . The screen will look like that:


```
OMDN09 Oilmist detect. system
Evaluator by MSS GmbH/Germany

-- Setup CPU -----
LCD brightness : 50
up/down=next, ret=select
Press ESC to leave !

- Change Parameter Setup
System Ready !
```

**Fig. 3.4. Screen 1.4.3.1 as of step 9**

10. By pushing  twice, the Evaluator will restart and the default screen Screen 1.1 - Opacity % / OMC. mg/l / Temp. deg will be shown.






Note: If you do not want to change the value while you are in step 8, press the button  and the old value will return.



### 3.4.3. Menu Screen Overview






Screen 0.1 - Startup Screen .....	3.8
Screen 0.2 - Startup Navigation Information .....	3.8
Screen 1.1 - Opacity % / OMC. mg/l / Temp. deg .....	3.9
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Screen 1.4.1.6 - Readjust time s .....	3.16
Screen 1.4.1.7 - O mainalm relcfg .....	3.17
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Screen 1.5 - Do you really want restart? .....	3.10

### Screen 0.1 - Startup Screen

<div> <p>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</p> <p>Evaluator for OMDN09 Oilmist detect. V1.10</p> <p>COPYRIGHT (c) 2010 MSS GmbH Germany</p> </div>		No action
		No action
		No action
		No action
		No action

This screen is displayed right after powering up the Evaluator. It shows the product name, the firmware version and the copyright information.  
This screen is shown for ca. 3 seconds and will automatically jump to screen Screen 0.2






### Screen 0.2 - Startup Navigation Information

<div> <p>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</p> <p>Press up/down to select! Press ret to confirm!</p> <p>Press ESC to leave !</p> </div>		No action
		No action
		No action
		No action
		No action

This screen shows some basic navigation information. Detailed information for each screen is given on the next pages.  
This screen is shown for ca. 3 seconds and will automatically jump to screen Screen 1.1








## Screen 1.1 - Opacity % / OMC. mg/l / Temp. deg

<div> <p>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</p> <p><b>Opacity %: 0.0</b></p> <p><b>OMC. mg/l: 0.0</b></p> <p><b>Temp. deg: 0.0</b></p> <p>- System average values System Ready !</p> </div>		Screen 1.2 will be shown
		Screen 1.4 will be shown
		No action
		Screen 1.5 will be shown
		No action






This screen shows the average values of all sensors: the opacity in %, the oil mist concentraion in mg/l and the temperature in degree Celsius.

## Screen 1.2 - Sensor values

<div> <p>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</p> <p><b>-- Sensor values -----</b></p> <p>Press ret to confirm!</p> <p>- Display detailed values System Ready !</p> </div>		Screen 1.3 will be shown
		Screen 1.1will be shown
		Screen 1.2.1 (page 3.11) will be shown
		Screen 1.5 will be shown
		No action






Via this screen you can access the measured values for each sensor.

## Screen 1.3 - Graphic display






<div> <p>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</p> <p><b>-- Graphic display ----</b></p> <p>Press ret to confirm!</p> <p>- Display values as Graphs System Ready !</p> </div>		Screen 1.4 will be shown
		Screen 1.2 will be shown
		Screen 1.3.1 (page 3.12) will be shown
		Screen 1.5 will be shown
		No action

Via this screen you can access the bar graph visualizations of the different measured values of each sensor: opacity, oil mist concentration and temperature.

### Screen 1.4 - OMDN09 setup

<pre> OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany  -- OMDN09 setup ----- Press ret to confirm!  - Change Parameter Setup System Ready !                     </pre>		Screen 1.1 will be shown
		Screen 1.3 will be shown
		Screen 1.4.1 (page 3.13) will be shown
		Screen 1.5 will be shown
		No action
Via this screen you can access the parameter setup and test feature level.		






### Screen 1.5 - Do you really want restart?

<pre> OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany  Do you really want restart?  Press ret to confirm! Press ESC to leave !  System Ready !                     </pre>		No action
		No action
		Evaluator will restart and will be shown
		will be shown
		No action
This screen is a confirmation prompt which requires you to verify if the system really should restart.		

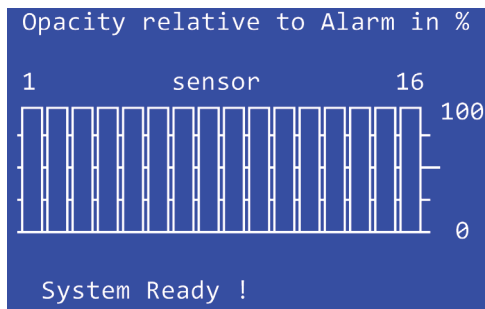


The following screen is identical for each sensor and is only described once in this manual.

## Screen 1.2.1 - Measured values sensor 1

<div> <div>OMDN09 Oilmist detect. system</div> <div>Evaluator by MSS GmbH/Germany</div> <div>Measured values sensor 1:</div> <div>Oilmist Concen. mg/l: 0.0</div> <div>Opacity: 0.0 Oprel: 0</div> <div>Opacref: 0 Temp.: 0</div> <div>Sens.S1 : READY</div> <div>- Display detailed values</div> <div>System Ready !</div> </div>		The next connected sensor will be shown, in this case sensor no. 2
		The previous connected sensor will be shown
		No action
		Screen 1.1 will be shown
		No action
<p>This screen shows the measured values of each sensor:</p> <p>“Oilmist Concen. mg/l”: Oilmist concentration in mg/l (milligrams per litre)</p> <p>“Opacity”: Opacity in %</p> <p>“Oprel”: Opacity in % relative to alarm level</p> <p>“Opacref”: Reference value in digits to opacity calculation</p> <p>“Temp.”: Temperature in degree Celsius</p> <p>“Sens.S1”: Status of sensor: Ready/Dirty/Error</p>		

### Screen 1.3.1 - Opacity relative to Alarm in %



Screen 1.3.2 will be shown



Screen 1.3.3 will be shown



No action



Screen 1.1 will be shown

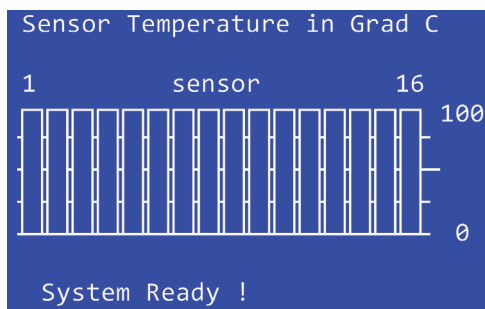


No action

This screen shows bar graphs of all 16 possible sensors.

In this screen the current opacity values (in %) relative to the alarm level are shown.

### Screen 1.3.2 - Sensor Temperature in Grad C



Screen 1.3.3 will be shown



Screen 1.3.1 will be shown



No action



Screen 1.1 will be shown

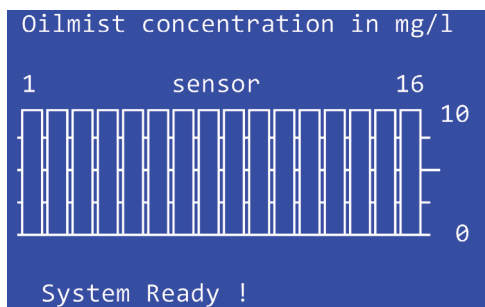


No action

This screen shows bar graphs of all 16 possible sensors.

In this screen the current temperature values are shown.

### Screen 1.3.3 - Oilmist concentration in mg/l



Screen 1.3.1 will be shown



Screen 1.3.2 will be shown



No action



Screen 1.1 will be shown




No action






This screen shows bar graphs of all 16 possible sensors.

In this screen the current oilmist concentration values (in mg/l) are shown.








If you have entered either Screen 1.4.1, Screen 1.4.2, Screen 1.4.3 or Screen 1.4.4, pushing  will make the Evaluator reboot and continue with Screen 0.1!

## Screen 1.4.1 - Parameter setup

<div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div>-- Parameter setup ----</div> <div>up/down=next, ret=select Press ESC to leave !</div> <div>- Change Parameter Setup System Ready !</div>		Screen 1.4.2 will be shown
		Screen 1.4.4 will be shown
		Screen 1.4.1.1 (page 3.15) will be shown
		will be shown
		No action






Via this screen you can access the parameter setup level (for example number of sensors, alarm levels, ...).

## Screen 1.4.2 - Setup Alminhibit

<div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div>-- Setup Alminhibit----</div> <div>up/down=next, ret=select Press ESC to leave !</div> <div>- Change Parameter Setup System Ready !</div>		Screen 1.4.3 will be shown
		Screen 1.4.1 will be shown
		Screen 1.4.2.1 (page 3.21) will be shown
		will be shown
		No action






Via this screen you can access the alarm inhibit setup level.

## Screen 1.4.3 - Setup CPU






<div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div>-- Setup CPU -----</div> <div>up/down=next, ret=select Press ESC to leave !</div> <div>- Change Parameter Setup System Ready !</div>		Screen 1.4.4 will be shown
		Screen 1.4.2 will be shown
		Screen 1.4.3.1 (page 3.22) will be shown
		will be shown
		No action

Via this screen you can access the parameters concerning communications and the display. You will also find the software version information and the PIN input mask.






#### Screen 1.4.4 - Test Features

<div> <div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div>-- Test Features -----</div> <div>up/down=next, ret=select Press ESC to leave !</div> <div>- Change Parameter Setup System Ready !</div> </div>		Screen 1.4.1 will be shown
		Screen 1.4.3 will be shown
		Screen 1.4.4.1 (page 3.25) will be shown
		will be shown
		No action
<p>Via this screen you can access the testing features of the Evaluator.</p> <p><b>⚠ Attention:</b> You need to enter the PIN (see Screen 1.4.3.6 - PIN for Setup (page 3.23)) to be able to access this level!</p>		






## Screen 1.4.1.1 - Number of sens.

<div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div>-- Parameter setup ----</div> <div>Number of sens.: 1</div> <div>up/down=next, ret=select</div> <div>Press ESC to leave !</div> <div>- Change Parameter Setup</div> <div>System Ready !</div>		Screen 1.4.1.2 will be shown
		Screen 1.4.1.17 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.1 (page 3.13) will be shown
		No action
Number of connected sensors in the range from 1 to 16. (default: 16)		






## Screen 1.4.1.2 - OPA Alarm-Level

<div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div>-- Parameter setup ----</div> <div>OPA Alarm-Level: 6</div> <div>up/down=next, ret=select</div> <div>Press ESC to leave !</div> <div>- Change Parameter Setup</div> <div>System Ready !</div>		Screen 1.4.1.3 will be shown
		Screen 1.4.1.1 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.1 (page 3.13) will be shown
		No action
Setting of the opacity main alarm level in the range of 1-10.		
0 means alarm disabled. (default: 6 → 1.5mg/l) (refer to Sensitivity Table on page 3.2)		






## Screen 1.4.1.3 - OPA PreAlm-Level

<div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div>-- Parameter setup ----</div> <div>OPA PreAlm-Level: 70</div> <div>up/down=next, ret=select</div> <div>Press ESC to leave !</div> <div>- Change Parameter Setup</div> <div>System Ready !</div>		Screen 1.4.1.4 will be shown
		Screen 1.4.1.2 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.1 (page 3.13) will be shown
		No action
Setting of the opacity pre-alarm level (in % main alarm) in the range from 40-100%. (default: 70%)		






#### Screen 1.4.1.4 - Tmp Alarm-Level

<div> <p>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</p> <p>-- Parameter setup ----</p> <p><b>Tmp Alarm-Level</b>: 110 up/down=next, ret=select Press ESC to leave !</p> <p>- Change Parameter Setup System Ready !</p> </div>		Screen 1.4.1.5 will be shown
		Screen 1.4.1.3 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.1 (page 3.13) will be shown
		No action
<p>Setting of the temperature alarm level in degree Celsius in the range of 0-150°C in steps of 10°C. Value "0" means temperature alarm disabled. (default: 110°C)</p>		

#### Screen 1.4.1.5 - Tmp PreAlm-Level






<div> <p>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</p> <p>-- Parameter setup ----</p> <p><b>Tmp PreAlm-Level</b>: 90 up/down=next, ret=select Press ESC to leave !</p> <p>- Change Parameter Setup System Ready !</p> </div>		Screen 1.4.1.6 will be shown
		Screen 1.4.1.4 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.1 (page 3.13) will be shown
		No action
<p>Setting of the temperature pre-alarm level (in % main alarm) in the range of 40-100%. (default: 70%)</p>		

#### Screen 1.4.1.6 - Readjust time s

<div> <p>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</p> <p>-- Parameter setup ----</p> <p><b>Readjust time s</b>: 1 up/down=next, ret=select Press ESC to leave !</p> <p>- Change Parameter Setup System Ready !</p> </div>		Screen 1.4.1.7 will be shown
		Screen 1.4.1.5 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.1 (page 3.13) will be shown
		No action
<p>Setting of readjustment time in seconds during which the measuring sections become brighter, in the range of 1-600 seconds. (default: 1)</p>		








## Screen 1.4.1.7 - O mainalm relcfg

<pre>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany  -- Parameter setup ---- O mainalm relcfg:R1 up/down=next, ret=select Press ESC to leave !  - Change Parameter Setup System Ready !</pre>		Screen 1.4.1.8 will be shown
		Screen 1.4.1.6 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.1 (page 3.13) will be shown
		No action






Relay configuration for opacity main alarm.  
Possible values: R1, R1+R2 (R1 = Relay 1 or R2 = Relay 2)

## Screen 1.4.1.8 - O prealm relcfg

<pre>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany  -- Parameter setup ---- O prealm relcfg:R2 up/down=next, ret=select Press ESC to leave !  - Change Parameter Setup System Ready !</pre>		Screen 1.4.1.9 will be shown
		Screen 1.4.1.7 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.1 (page 3.13) will be shown
		No action






Relay configuration for opacity pre-alarm.  
Possible values: OFF, R1, R2, R1+R2 (R1 = Relay 1, R2 = Relay 2)

## Screen 1.4.1.9 - T mainalm relcfg






<pre>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany  -- Parameter setup ---- T mainalm relcfg:R1 up/down=next, ret=select Press ESC to leave !  - Change Parameter Setup System Ready !</pre>		Screen 1.4.1.10 will be shown
		Screen 1.4.1.8 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.1 (page 3.13) will be shown
		No action

Relay configuration for temperature main alarm.  
Possible values OFF, R1, R2, R1+R2 (R1 = Relay 1, R2 = Relay 2)






#### Screen 1.4.1.10 - T prealm relcfg

<pre> OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany  -- Parameter setup ---- T prealm relcfg:R2 up/down=next, ret=select Press ESC to leave !  - Change Parameter Setup System Ready !                     </pre>		Screen 1.4.1.11 will be shown
		Screen 1.4.1.9 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.1 (page 3.13) will be shown
		No action
<p>Relay configuration for temperature pre-alarm. Possible values OFF, R1, R2, R1+R2 (R1 = Relay 1, R2 = Relay 2)</p>		






#### Screen 1.4.1.11 - Time prealm off

<pre> OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany  -- Parameter setup ---- Time prealm off: 5 up/down=next, ret=select Press ESC to leave !  - Change Parameter Setup System Ready !                     </pre>		Screen 1.4.1.12 will be shown
		Screen 1.4.1.10 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.1 (page 3.13) will be shown
		No action
<p>Time for automatical reset of pre-alarm in seconds in the range of 1-60 seconds.</p>		






#### Screen 1.4.1.12 - Invert Sensoradr

<pre> OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany  -- Parameter setup ---- Invert Sensoradr:Off up/down=next, ret=select Press ESC to leave !  - Change Parameter Setup System Ready !                     </pre>		Screen 1.4.1.13 will be shown
		Screen 1.4.1.11 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.1 (page 3.13) will be shown
		No action
<p>With this setting, you can correct the numbering of the GDMS-OMDN09 sensors, so that the sensor numbering matches the compartment numbering.</p>		






## Screen 1.4.1.13 - Max. OP increase

<div> <div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div> <div>-- Parameter setup ----</div> <div>Max. OP increase: 60</div> <div>up/down=next, ret=select</div> <div>Press ESC to leave !</div> <div>- Change Parameter Setup</div> <div>System Ready !</div> </div> </div>		Screen 1.4.1.14 will be shown
		Screen 1.4.1.12 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.1 (page 3.13) will be shown
		No action
Maximum gradient that will be accepted to trigger alarm; Unit: digits/second (default: 60)		






## Screen 1.4.1.14 - Mainalm dly sec

<div> <div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div> <div>-- Parameter setup ----</div> <div>Mainalm dly dec: 3</div> <div>up/down=next, ret=select</div> <div>Press ESC to leave !</div> <div>- Change Parameter Setup</div> <div>System Ready !</div> </div> </div>		Screen 1.4.1.15 will be shown
		Screen 1.4.1.13 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.1 (page 3.13) will be shown
		No action
Time delay until system triggers main alarm; this setting avoids triggering alarm when the alarm-level is exceeded only for a short time. (default: 3 sec)		






## Screen 1.4.1.15 - Prealarm dly sec

<div> <div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div> <div>-- Parameter setup ----</div> <div>Prealarm dly sec: 3</div> <div>up/down=next, ret=select</div> <div>Press ESC to leave !</div> <div>- Change Parameter Setup</div> <div>System Ready !</div> </div> </div>		Screen 1.4.1.16 will be shown
		Screen 1.4.1.14 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.1 (page 3.13) will be shown
		No action
Time delay until system triggers pre-alarm; this setting avoids triggering pre-alarm when the pre-alarm-level is exceeded only for a short time. (default: 3 sec)		






#### Screen 1.4.1.16 - Time dirty Error

<div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div>-- Parameter setup ----</div> <div>Time dirty Error: 10</div> <div>up/down=next, ret=select</div> <div>Press ESC to leave !</div> <div>- Change Parameter Setup</div> <div>System Ready !</div>		Screen 1.4.1.17 will be shown
		Screen 1.4.1.15 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.1 (page 3.13) will be shown
		No action
Time delay until a sensor will be set to the “Dirty” status.		

#### Screen 1.4.1.17 - Default values

<div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div>-- Parameter setup ----</div> <div>Default values :Set?</div> <div>up/down=next, ret=select</div> <div>Press ESC to leave !</div> <div>- Change Parameter Setup</div> <div>System Ready !</div>		Screen 1.4.1.1 will be shown
		Screen 1.4.1.16 will be shown
		You may set the default values if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.1 (page 3.13) will be shown
		No action
Reset all settings to factory defaults. ⚠ <b>Attention:</b> This will delete all personal settings and the installation will not work (correctly) anymore! At least, the number of sensors has to be corrected after a factory reset!		






## Screen 1.4.2.1 - Alm.Inhibit Hyst

<div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div>-- Setup Alminhibit----</div> <div>Alm.Inhibit Hyst: 3</div> <div>up/down=next, ret=select</div> <div>Press ESC to leave !</div> <div>- Change Parameter Setup</div> <div>System Ready !</div>		Screen 1.4.2.2 will be shown
		Screen 1.4.2.3 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.2 (page 3.13) will be shown
		No action
Setting of Alarm Inhibit Hysteresis ranging from 2 to 15 °C.		








The following two screens are identical for each sensor and are only described once in this manual.






## Screen 1.4.2.2 - AlmInh. S1 ena.

<div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div>-- Setup Alminhibit----</div> <div>AlmInh. S1 ena.:Off</div> <div>up/down=next, ret=select</div> <div>Press ESC to leave !</div> <div>- Change Parameter Setup</div> <div>System Ready !</div>		Screen 1.4.2.3 will be shown
		Screen 1.4.2.1 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.2 (page 3.13) will be shown
		No action
Alarm Inhibit for sensor 1.		
ON means enabled, OFF disabled. (default: OFF)		






## Screen 1.4.2.3 - AlmInh. S1 temp

<div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div>-- Setup Alminhibit----</div> <div>AlmInh. S1 temp: 10</div> <div>up/down=next, ret=select</div> <div>Press ESC to leave !</div> <div>- Change Parameter Setup</div> <div>System Ready !</div>		Screen 1.4.2.1 will be shown (for next sensor, here: sensor 2)
		Screen 1.4.2.2 will be shown
		You may change the value if you have entered the PIN at Screen 1.4.3.6 (page 3.23)
		Screen 1.4.2 (page 3.13) will be shown
		No action
Setting of temperature threshold for alarm inhibit, ranging from 1 to 55. Below this temperature no alarm will be triggered. (default: 10)		






### Screen 1.4.3.1 - LCD brightness

<pre> OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany  -- Setup CPU ----- LCD brightness : 30 up/down=next, ret=select Press ESC to leave !  - Change Parameter Setup System Ready !                     </pre>		Screen 1.4.3.2 will be shown
		Screen 1.4.3.7 will be shown
		You may change the value.
		Screen 1.4.3 (page 3.13) will be shown
		No action
Setting of display brightness in the range of 5 to 100. (5 = dark, 100 = bright)		






### Screen 1.4.3.2 - Bargraph at OMALM

<pre> OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany  -- Setup CPU ----- Bargraph at OMALM:ON up/down=next, ret=select Press ESC to leave !  - Change Parameter Setup System Ready !                     </pre>		Screen 1.4.3.3 will be shown
		Screen 1.4.3.1 will be shown
		You may change the value.
		Screen 1.4.3 (page 3.13) will be shown
		No action
If this setting is ON, the Evaluator will show the bargraph as soon as an alarm has been triggered. If this setting is OFF the standard display will be kept displayed.		

### Screen 1.4.3.3 - Modbus enable






<pre> OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany  -- Setup CPU ----- Modbus enable :OFF up/down=next, ret=select Press ESC to leave !  - Change Parameter Setup System Ready !                     </pre>		Screen 1.4.3.4 will be shown
		Screen 1.4.3.2 will be shown
		You may change the value.
		Screen 1.4.3 (page 3.13) will be shown
		No action
Setting of Modbus interface, ON means enabled, OFF disabled.		

## Screen 1.4.3.4 - Modbus adress

<pre>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany  -- Setup CPU ----- Modbus adress : 1 up/down=next, ret=select Press ESC to leave !  - Change Parameter Setup System Ready !</pre>		Screen 1.4.3.5 will be shown
		Screen 1.4.3.3 will be shown
		You may change the value.
		Screen 1.4.3 (page 3.13) will be shown
		No action






Setting of Modbus address in the range of 0-99.

## Screen 1.4.3.5 - Modbus extern

<pre>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany  -- Setup CPU ----- Modbus extern :ON up/down=next, ret=select Press ESC to leave !  - Change Parameter Setup System Ready !</pre>		Screen 1.4.3.6 will be shown
		Screen 1.4.3.4 will be shown
		You may change the value.
		Screen 1.4.3 (page 3.13) will be shown
		No action

ON: The modbus data will be sent out via connector 3 (refer to page 2.3).  
 OFF: The modbus data will be used internally, i.e. for installed CAN Bus transceiver.  
**⚠ Attention:** For internal use, Modbus adress has to be set to "1"!

## Screen 1.4.3.6 - PIN for Setup

<pre>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany  -- Setup CPU ----- PIN for Setup :*** up/down=next, ret=select Press ESC to leave !  - Change Parameter Setup System Ready !</pre>		Screen 1.4.3.7 will be shown
		Screen 1.4.3.5 will be shown
		You may change the value.
		Screen 1.4.3 (page 3.13) will be shown
		No action

The write access to the "OMDN09 Setup" and "Setup Alminhibit" parameters and all "Test Feature" operations require this PIN to be entered. It is only known by authorized personnel!



### Screen 1.4.3.7 - Software Info






<pre>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany  -- Setup CPU ----- Software Info : up/down=next, ret=select Press ESC to leave !  - Change Parameter Setup System Ready !</pre>		Screen 1.4.3.1 will be shown
		Screen 1.4.3.6 will be shown
		Screen 1.4.3.7.1 will be shown
		Screen 1.4.3 (page 3.13) will be shown
		No action
<p>Entering this screen will show you the software version of the firmware installed in the Evaluator.</p>		

### Screen 1.4.3.7.1 - Software Info






<pre>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany  -- Setup CPU ----- Software Info : FW V1.10B1002 10.12.2010(c)DL Press ESC to leave !  - Change Parameter Setup System Ready !</pre>		No action
		No action
		No action
		Screen 1.4.3.7 will be shown
		No action
<p>This screen shows the current firmware version installed in the Evaluator.</p>		








## Screen 1.4.4.1 - Ready Relay






<div> <div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div>-- Test Features -----</div> <div>Ready Relay :OFF</div> <div>up/down=next, ret=select</div> <div>Press ESC to leave !</div> <div>- Change Parameter Setup</div> <div>System Ready !</div> </div>		Screen 1.4.4.2 will be shown
		Screen 1.4.4.4 will be shown
		You may change the value.
		Screen 1.4.4 (page 3.14) will be shown
		No action
The ready relay can be switched on and off manually for testing purposes.		

## Screen 1.4.4.2 - Alarm Relay

<div> <div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div>-- Test Features -----</div> <div>Alarm Relay :OFF</div> <div>up/down=next, ret=select</div> <div>Press ESC to leave !</div> <div>- Change Parameter Setup</div> <div>System Ready !</div> </div>		Screen 1.4.4.3 will be shown
		Screen 1.4.4.1 will be shown
		You may change the value.
		Screen 1.4.4 (page 3.14) will be shown
		No action
The alarm 1 relay can be switched on and off manually for testing purposes.		

## Screen 1.4.4.3 - Alm2/Pre Relay

<div> <div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div>-- Test Features -----</div> <div>Alm2/Pre Relay :OFF</div> <div>up/down=next, ret=select</div> <div>Press ESC to leave !</div> <div>- Change Parameter Setup</div> <div>System Ready !</div> </div>		Screen 1.4.4.4 will be shown
		Screen 1.4.4.2 will be shown
		You may change the value.
		Screen 1.4.4 (page 3.14) will be shown
		No action
The alarm 2 (usually pre-alarm) relay can be switched on and off manually for testing purposes.		

Screen 1.4.4.4 - Sensor cleaning		
<div> <div>OMDN09 Oilmist detect. system Evaluator by MSS GmbH/Germany</div> <div>-- Test Features ----- Sensor cleaning :OFF up/down=next, ret=select Press ESC to leave ! - Change Parameter Setup System Ready !</div> </div>		Screen 1.4.4.1 will be shown
		Screen 1.4.4.3 will be shown
		You may change the value.
		Screen 1.4.4 (page 3.14) will be shown
		No action
<p>Change the value to “ON” for cleaning sensors. You then may pull the sensors out of the engine and clean them. The alarms are disabled until you press “ESC” to restart the system after cleaning.</p>		

## 4. Performance / Maintenance Tests

### 4.1. Function Test

Following the initial installation of GDMS-OMDN09 sensors, evaluator and all mounting parts, all construction units and all connections are controlled.

All parameters and data for the operation of the engine are checked for correct adjustment (please refer to the respective data sheet provided by the MSS AG).

Please note that a start of the GDMS-OMDN09 system is only permitted, if the installation of the GDMS-OMDN09 system has been carried out in accordance with the instructions, technical descriptions and the manuals.

After connecting the 24V DC power supply to the evaluator of the GDMS-OMDN09 system the evaluator runs through a self-test.

After some time the measured values are shown on the screen of the evaluator.

The green ready light at the evaluator is on.

**The procedure after an intermediate stop is described.**

**This description assumes that the plant was already in operation once and was originally installed and put into operation by the employees of the Company MSS AG.**

All cables, sensors, plotters are installed again in such a way, as they were installed before putting out of operation.

All parameters and settings are stored in a permanent memory (EEPROM), it is not necessary to restore them.

In case of using and installing new parts and units of the GDMS-OMDN09 system all settings and parameter are stored during production and final inspection at MSS AG.

Please note that a start of the GDMS-OMDN09 system is only permitted, if the installation of the GDMS-OMDN09 system has been carried out in accordance with the instructions, technical descriptions and the manuals.

After connecting the power supply by 24 V DC to the evaluator of the GDMS-OMDN09 system the evaluator runs through a self-test.

After some time the value "OP" is indicated on the screen of the evaluator.

The green ready light at the evaluator is on.

If there is an alarm indicated or the ready lamp is off you find references for the error correction in the manual, especially in Chapter 5.

For error diagnostics it could be helpful:

- To check all cables and connections, especially the male / female connections.
- To replace the cables systematically
- To replace sensors and to use spare sensors



To run an OMD full check of the GDMS-OMDN09 system is by using an oil mist generator.

While running or stopping engine it is possible to inject oil mist into the crankcase to test the alarm device and the alarm level of the GDMS-OMDN09 system. This test is carried out by MSS AG at the test bench of the engine to obtain the operation licence for this type of engines. Only in case of an older engine this test is carried out on an engine in operation.

## 5. Troubleshooting

### Error code and Error description

If a failure is detected at the GDMS-OMDN09, the green ready relay of the Evaluator opens. If there's at least one OMDN09 sensor online and functioning at this time, the green ready LED will blink as an indicator for reduced system operation. In this case, the system is still able to raise opacity alarm. If none of the installed OMDN09 sensors is online, the green ready LED switches off.

GDMS-OMDN09 Evaluator error messages can be grouped in the following types:

#### 5.1. Failure in GDMS-OMDN09 Sensors

The display shows "Err.Sens.xx: nnnn [text error message]"

with xx: sensor number, for example 01

nnnn: error code (refer to the following table)

Error codes	Error description	Help
0001	must value for IR transmitter LED too high (> 3000)	IR track must be cleaned and sensor must be recalibrated. If the error persists after recalibration, it means that the IR transmitter system is defect. Sensor must be exchanged and repaired by the manufacturer.
0002	must value for IR transmitter LED too low (> 1000)	
0004	calibration of IR measuring track is false	IR track must be cleaned and sensor must be recalibrated. If the error persists after recalibration, it means that the IR measuring track has not the right IR transmission and is defect. Sensor must be exchanged and repaired by the manufacturer.
0008	Transmission of IR measuring track too high (Opbw > 1170)	
0010	("LT dirty") Transmission of IR measuring track too low (Opbw < 400)	
0020	Transmission of IR measuring track too high. If transmitter LED is off, this means that receiver is receiving IR noise from other equipment, which can only be if the sensor is not mounted in the SOPS !!	Sensor cannot be operated in this environment (IR noise) without SOPS. Insert sensor in the SOPS and restart evaluator.

Table continues on next page ...

Error codes	Error description	Help
0040	Temperature of the IR track/sensor front too low ( < -7 °C )	Check the displayed temperature value for this sensor in the "Sensor values" menu of the evaluator. If the value is -99 or 999, the built-in temperature chip is defect, the sensor must be exchanged and repaired by the manufacturer. If the displayed value is feasible at the actual environment of sensor, the sensor is used out of specified temperature range. The error is reset automatically when the sensor temperature is back within the specification range.
0080	Temperature of the IR track/sensor front too high ( > 117 °C )	
0100	Temperature of sensors CPU too high ( > 95 degree)	The sensor CPU temperature is too high. The housing of the sensor must be cooled using airstream.
0200	Temperature of sensors CPU too low ( < -5 degree)	The sensor CPU temperature is too low. The housing of the sensor must be heated up using airstream.
0400	Sensor is in power-up mode after system restart	Disappears automatically after approx. 10 seconds

If multiple errors are detected, the error code is calculated as the hexadecimal sum of individual error codes. Text message for the first detected error code is shown after the sum error code.

## 5.2. Communication Failure

The display shows “Err.Sens.xx Stat: nn”

with       xx: sensor number, for example 01

          nn: error code (refer to the following table)

Error code	Error description	Help
01	Sensor does not respond via interface “loop out” (connector 4)	Restart system by pressing the ESC button
02	Sensor does not respond via interface “loop in” (connector 5)	
03	Sensor does not respond at all	
13	Sensor will not be read any longer	
20	Sensor initialising error	
(connectors see paragraph 1.1.3.2)		

If multiple errors are detected, the error code is calculated as the hexadecimal sum of individual error codes. For example:

The message “Err.Sens.02 Stat: 33” includes the error codes 13 and 20. The meaning of the error message is: sensor 02 cannot be initialised and will not be read.

If the failure persists after restarting, the sensor causing the failure can be detected using the menu “Sensor values”:

Start menu “Sensor values”, select one sensor after another:

The circuit is broken between sensors when sensor status switches from 01 to 02:

E.g.: Sensor 01: Status 01

      Sensor 02: Status 01

      Sensor 03: Status 01

      Sensor 04: Status 02

The circuit is broken here between sensor 03 and sensor 04. Check wiring.

### 5.3. Evaluator Failure

The display shows “OMDN09 - Error nnnn!”  
with nn: error code (refer to the following table)

Error code	Error description	Help
0001	No sensor detected	<ul style="list-style-type: none"> <li>• Check cables</li> <li>• Is the number of sensors set up correctly?</li> </ul>
0002	Date and time invalid in real-time clock	<ul style="list-style-type: none"> <li>• Set date and time</li> <li>• If the error occurs again, replace Evaluator</li> </ul>
0004	Failure in event memory	Read out memory and reinitialise the Evaluator

If multiple errors are detected, the error code is calculated as the hexadecimal sum of individual error codes.

### 5.4. EEprom Parameters Failure

The display shows “CPU Error nnnn!”  
with nn: error code (refer to the following table)

Error code	Error description	Help
01xx	Failure within the CPU parameters	Check CPU parameters (display brightness, ...)
02xx	Failure within the OMDN09 parameters	Check OMDN09 parameters (number of sensors, sensitivity, ...)
04xx		Check manufacturing data

If multiple errors are detected, the error code is calculated as the hexadecimal sum of individual error codes.



## 6. Repair

Before any attempts to repair or dismount the GDMS-OMDN09 devices because of an assumed defect or failure you should contact MSS AG or its authorized partners.


Based on experience, many failures can be cleared easily by fault diagnostics on-site. In most cases a repair is not necessary.

Dismounting may only be performed on demand by MSS AG or its authorized service representatives.

A repair of GDMS-OMDN09 components is done exclusively by MSS AG. Defective parts should be sent to MSS AG including detailed failure description.

Please get in contact with the headquarter of MSS AG for further assistance.

### Attention

Do not use Diesel-only parts for your -certified version of GDMS-OMDN09! Make sure to order appropriate spare parts for your system!

-version parts are specially marked (see example on page 7.3)!



#### Marking



II (2) G [Ex ia] IIA  
II 2G Ex ia IIA T4


(electronic system)  
(Sensor)




## 7. Spare Parts

⚠ Only the original parts supplied and approved by MSS AG should be used; otherwise a proper working system could not be assured.

### Attention

Spare parts marked with  may only be used on Diesel and HFO engines!

Spare parts marked with  may only be used on Gas and Dual Fuel engines!

Spare parts with both markings may be used on all engine types!

### 7.1 Main Spare Parts



Fig. 7.1. GDMS-OMDN09® Evaluator

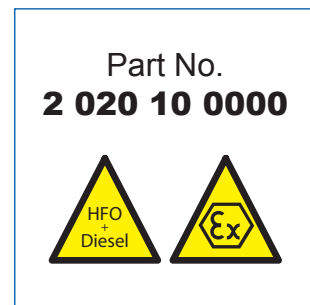


Fig. 7.2. GDMS-OMDN09 Diffusor for SOPS size 65

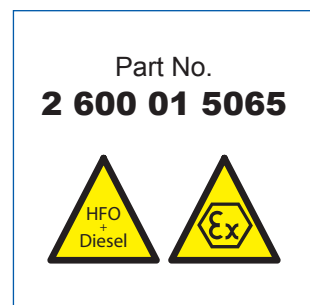
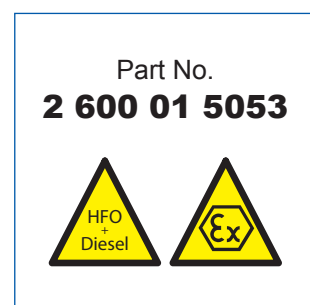
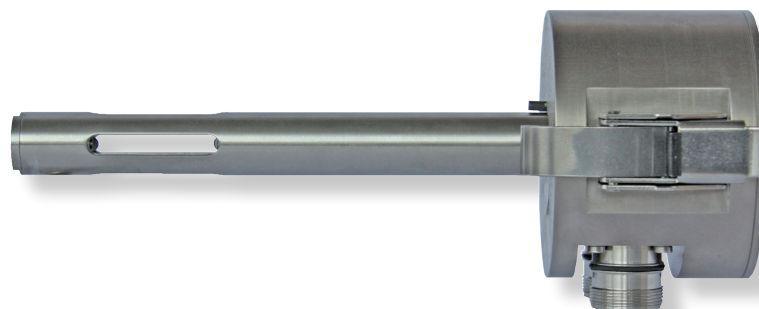


Fig. 7.3. GDMS-OMDN09 Diffusor for SOPS size 53

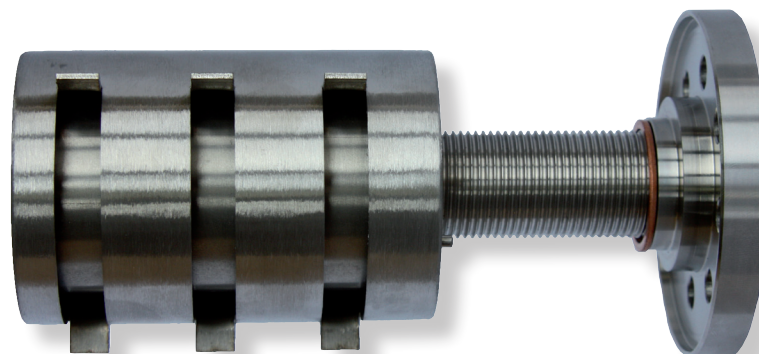


Part No.  
**2 600 01 1000**



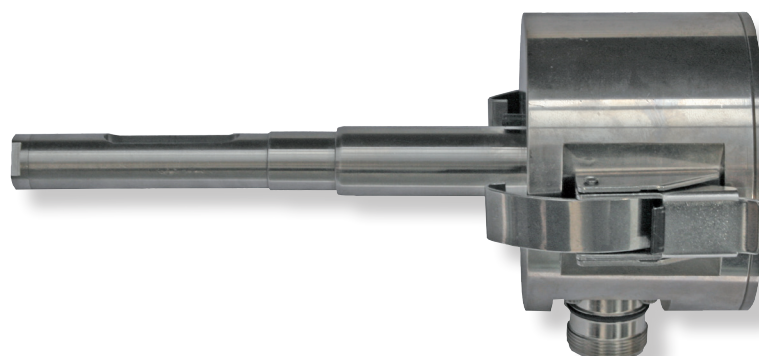
**Fig. 7.4. GDMS-OMDN09® Sensor (for Diesel+HFO Engines)  
Size 20 (for use with SOPS size 65)**

Part No.  
**2 600 01 2000**



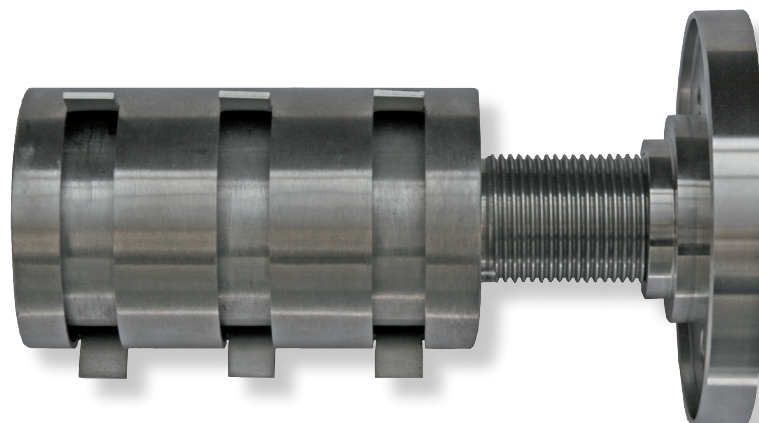
**Fig. 7.5. GDMS-OMDN09® Splash Oil Protection System  
(SOPS) - Size 65 (for use with sensor size 20)**

Part No.  
**2 600 01 3000**



**Fig. 7.6. GDMS-OMDN09® Sensor (for Diesel+HFO Engines)  
Size 16 (for use with SOPS size 53)**

Part No.  
**2 600 01 4000**



**Fig. 7.7. GDMS-OMDN09® Splash Oil Protection System  
(SOPS) - Size 53 (for use with sensor size 16)**

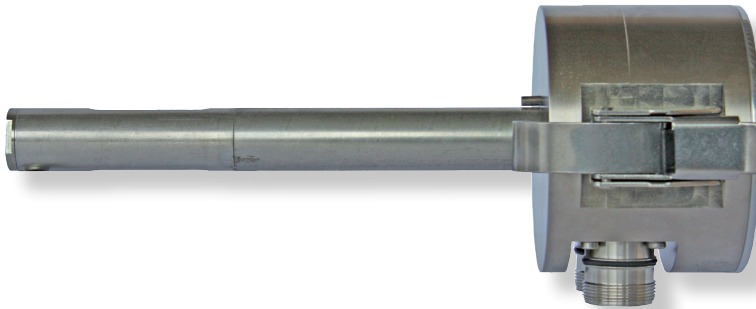


Fig. 7.8. GDMS-OMDN09  Sensor (for Gas and Dual Fuel Engines) - Size 20 (for use with SOPS size 65)

Part No.  
**2 600 02 1000**

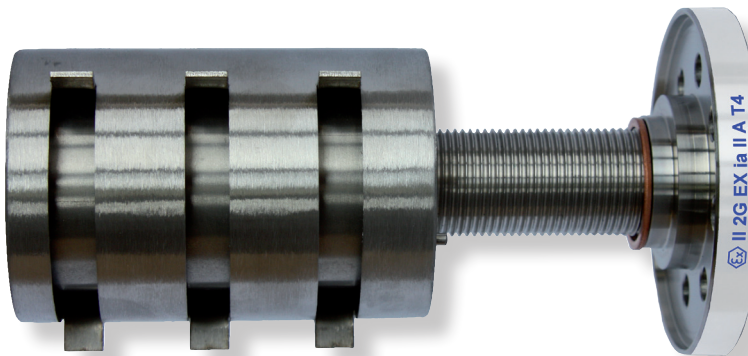


Fig. 7.9. GDMS-OMDN09  Splash oil protection System (SOPS) Size 65 (for use with sensor size 20)

Part No.  
**2 600 02 2000**

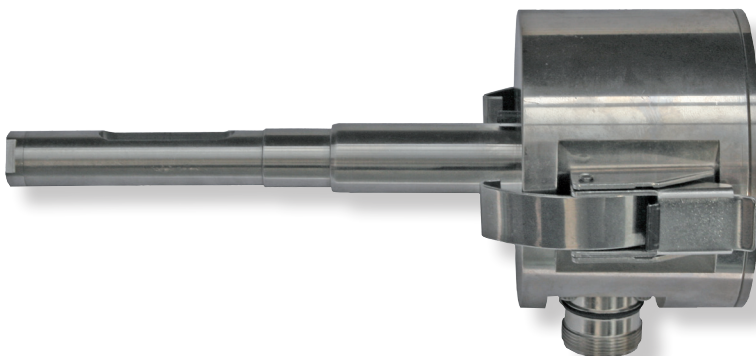


Fig. 7.10. GDMS-OMDN09  Sensor (for Gas and Dual Fuel Engines) - Size 16 (for use with SOPS size 53)

Part No.  
**2 600 02 3000**

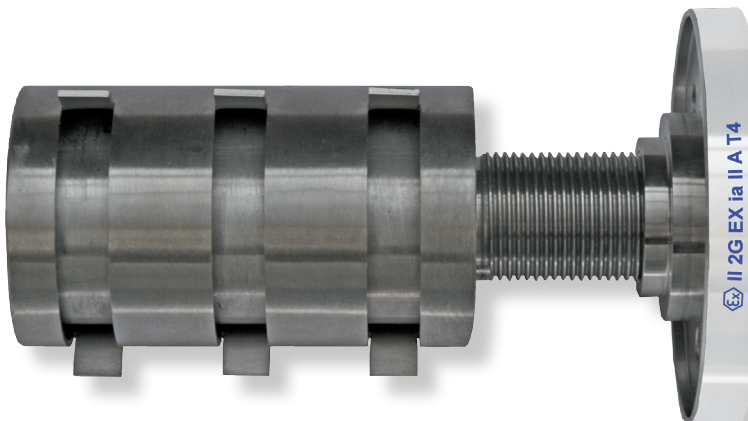


Fig. 7.11. GDMS-OMDN09  Splash oil protection System (SOPS) Size 53 (for use with sensor size 16)

Part No.  
**2 600 02 4000**





## 7.2. Accessories

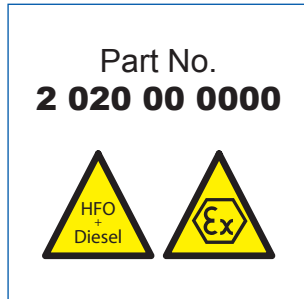


Fig. 7.12. Remote Control

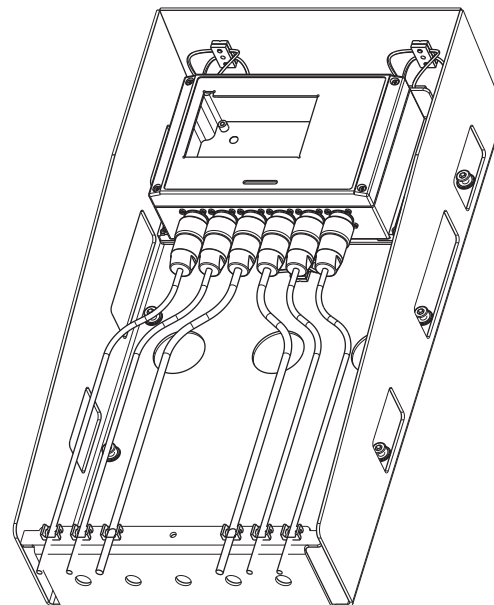
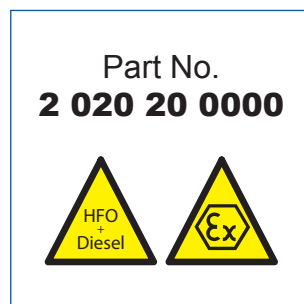


Fig. 7.13. Vibration Damping Module

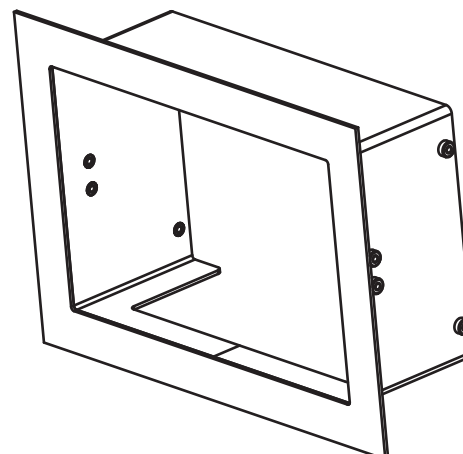
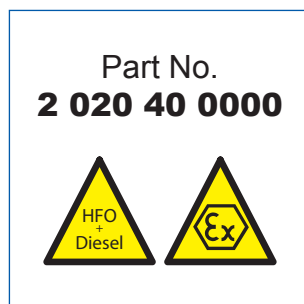
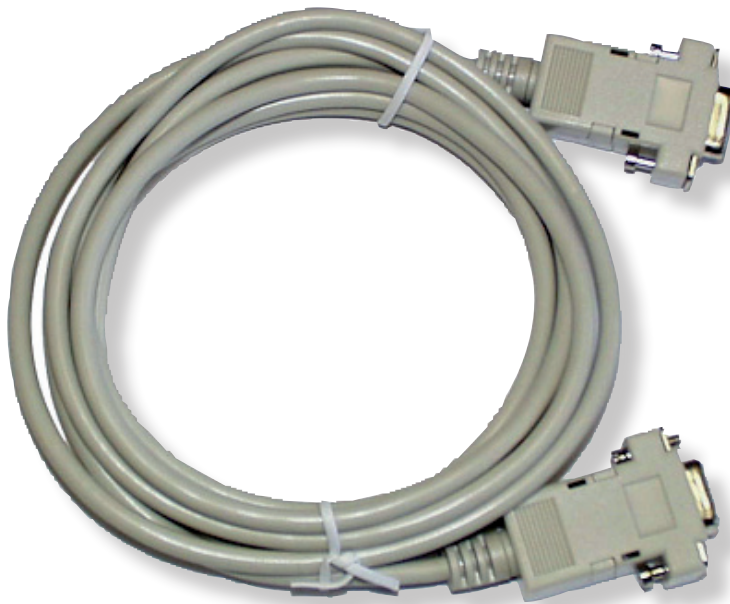


Fig. 7.14. Inlay Module



Part No.  
**9 100 20 0000**



**Fig. 7.15. RS-232 Connection cable for PC to external RS-485 converter**



Part No.  
**9 200 04 2200**



**Fig. 7.16. 2 x 2 twisted pair communication cable**

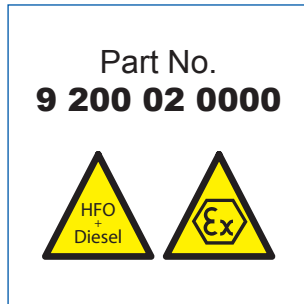


Fig. 7.17. 2 core power cable

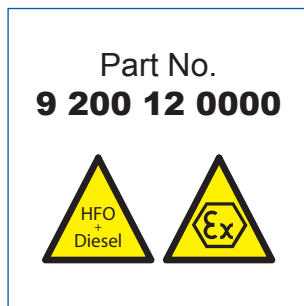


Fig. 7.18. 12 core communication cable

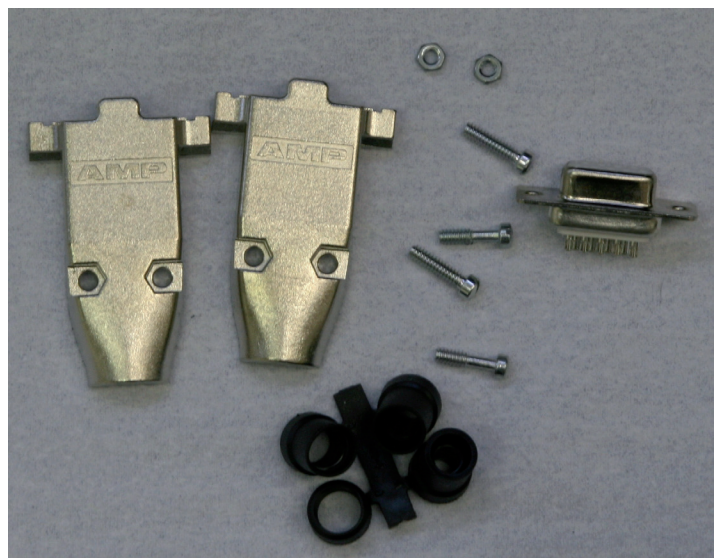
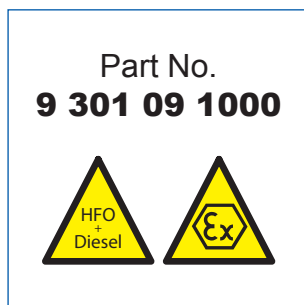


Fig. 7.19. Sub-D9 connector



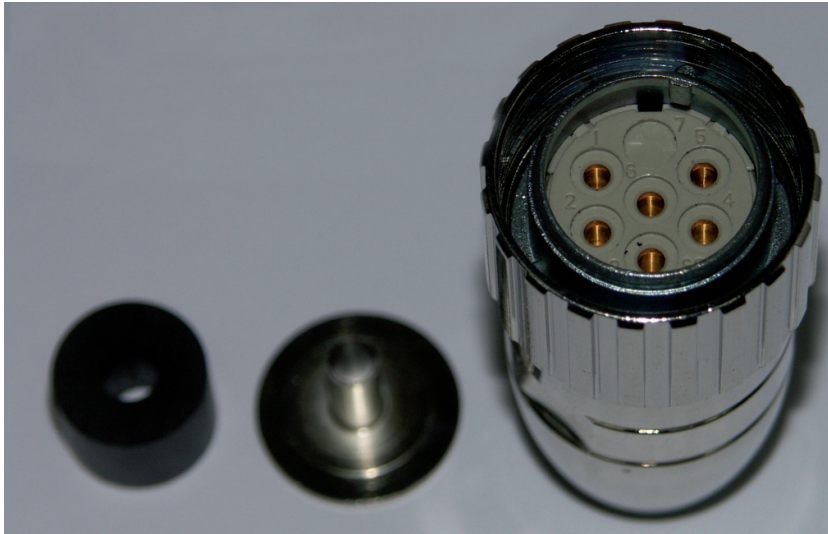


Fig. 7.20. 6-pol. female connector

Part No.  
**9 300 06 1000**



Fig. 7.21. 12-pol. male connector

Part No.  
**9 300 12 2000**

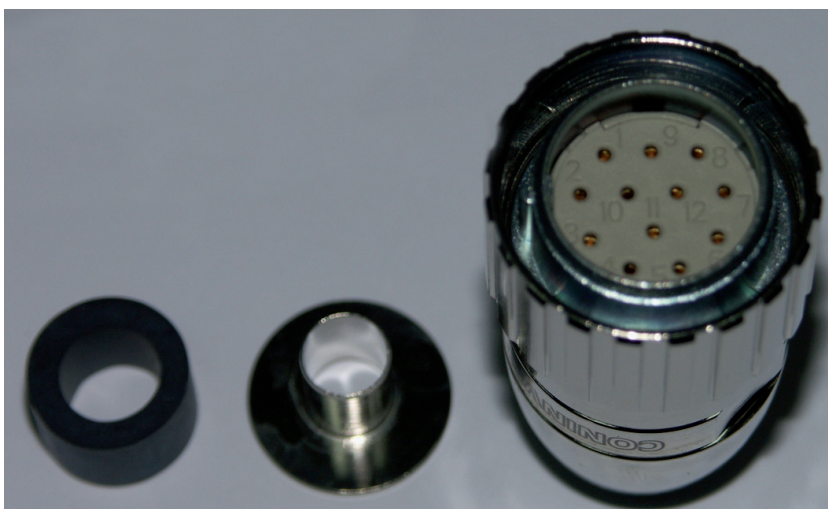


Fig. 7.22. 12-pol. female connector

Part No.  
**9 300 12 1000**



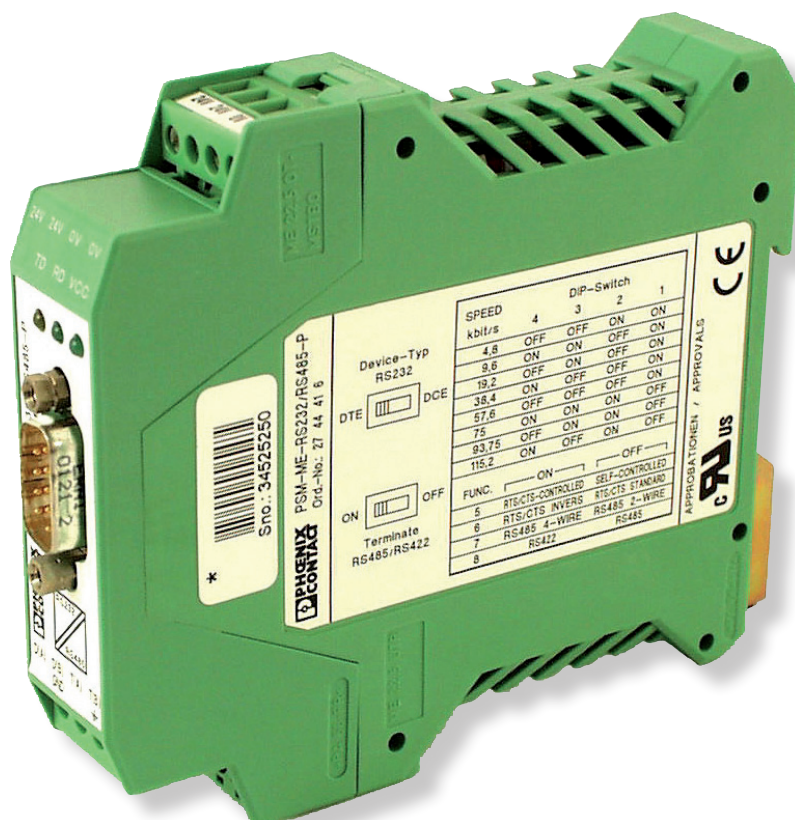
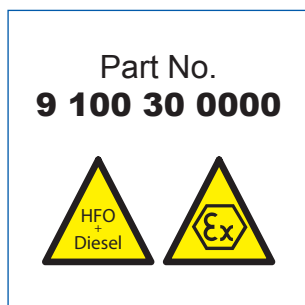


Fig. 7.23. RS-485 Converter (external mounting)

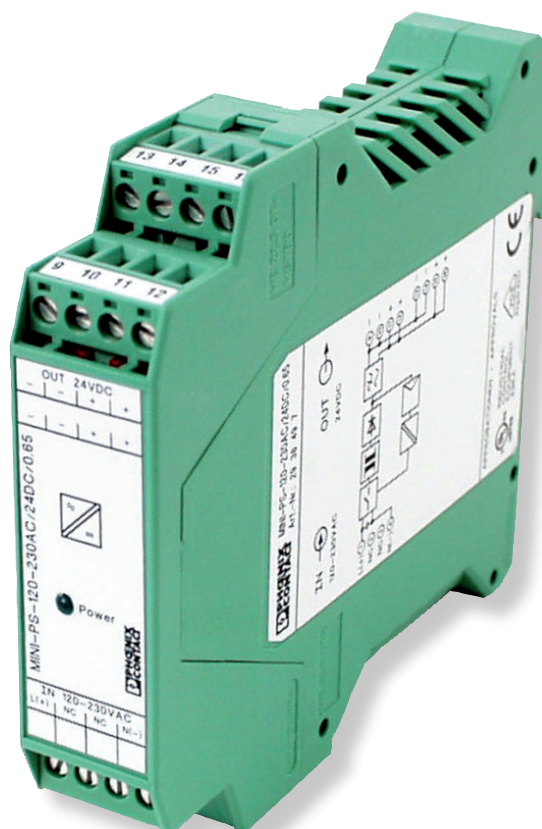
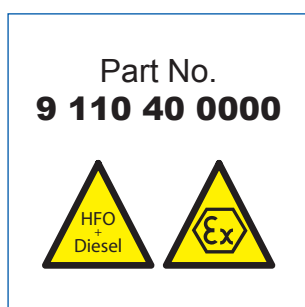
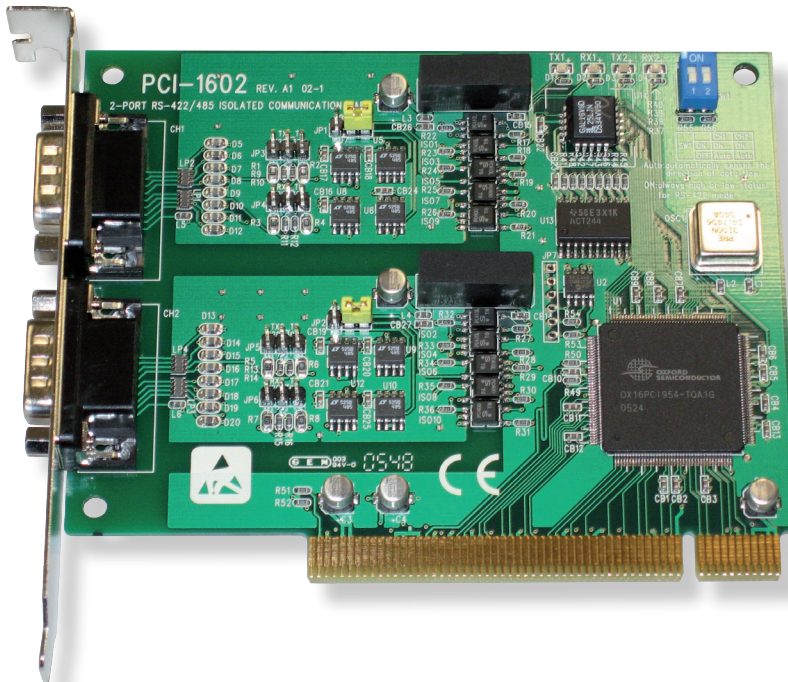


Fig. 7.24. Power supply unit 24V/15W (external mounting)



Part No.  
**9 100 40 0000**






Fig. 7.25. RS 485 Converter PCI Card for mounting inside PC





## 8. Attachments

### 8.1. Connection Assembly Instructions

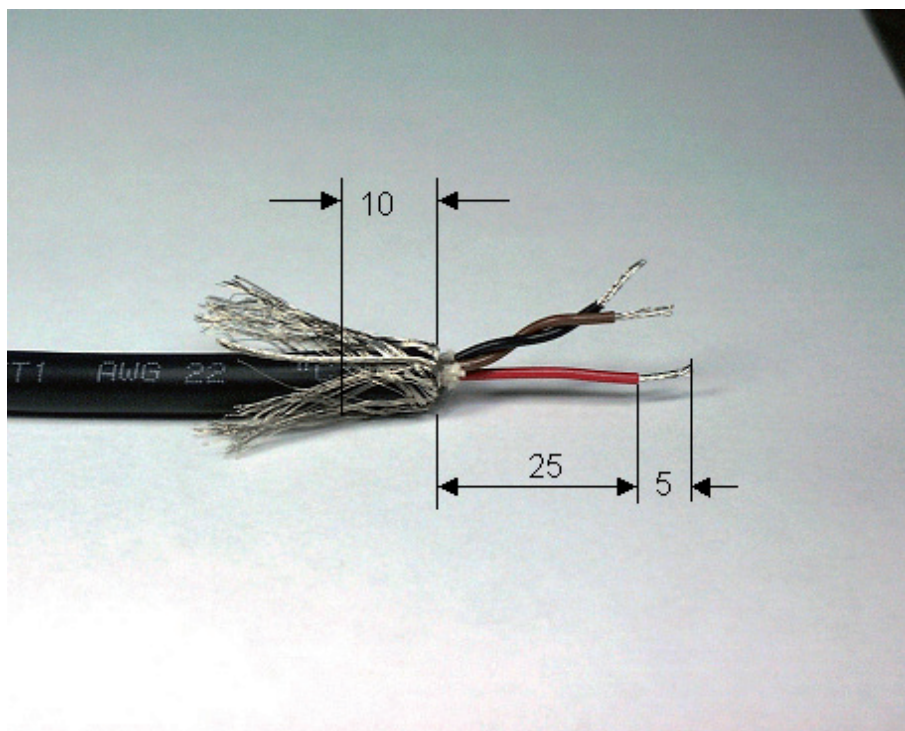
#### 8.1.1. Preparing the Cable

For RS485-Converter  
 (Part No. 9 200 04 2200)

As an example of using 2 X 2 wire twisted cores (Fig 8.1):

- Signal cable: Use a shielded cable, consisting of 2 X 2 wire twisted pair stranded cores, with each core having a nominal section area of 0.25mm<sup>2</sup> and overall cable diameter of 8 to 12mm.
- The recommended cable is Metrofunk 2 X 2 AWG 22, (MSS AG Part No. 9 200 04 2200 - 2 x 2 twisted pair) this is used as an example to show how the connection is made. This cable has 2 twisted pairs of black/brown and black/red.
- Cut away the outer insulation approx. 25mm from the end of the cable and pull back the braided shield.
- Cut the braided shield 10mm from the end as shown in Fig. 8.1.
- In this example: Select a twisted pair black/brown and the red wire of the other twisted pair black/red, and cut away the insulation approx. 5 mm from the end of these 3 wires and solder them to the pins of the plug (as shown in Fig. 8.3, Pos. 6)
- Cut off the unused wires (in this example, the black wire)

Pay attention to the assembly instructions, especially the cable shielding to avoid electromagnetic interference!



**Fig. 8.1. Preparing the cable**

## 8.1.2. Connecting the RS-485 converter (Part. No. 9 100 30 0000)

Preparing and Connecting the Cable to the Converter (Fig. 8.2):

- At the free end of the signal cable, the same wires of the twisted pair black/brown and a red wire of the other twisted pair black/red, should be used. Please refer to the Section “Preparing the Cable”, page 8.1.
- Cut away the outer insulation approx. 40mm from the end of the cable and pull back the braided shield (as shown in Fig. 8.1).
- Cut the braided shield 10mm from the end (see Fig. 8.1)
- Cut away the insulation approx. 5mm from the end of these 3 wires.
- Connect the 3 wires to the terminals on the RS-485/RS-232 converter (as shown in Fig. 8.2).

RS 485 B: brown wire from the black/brown twisted pair to terminal D(B).  
RS 485 GND: red wire from the black/red twisted pair to Ground terminal.  
RS 485 A: black wire from the black/brown twisted pair to terminal D(A).

**Note:** If and only if a connection between the PC and OMD could not be established, please swap the signal cables between D(A) and D(B).

- Cut off the unused wires (black wire).

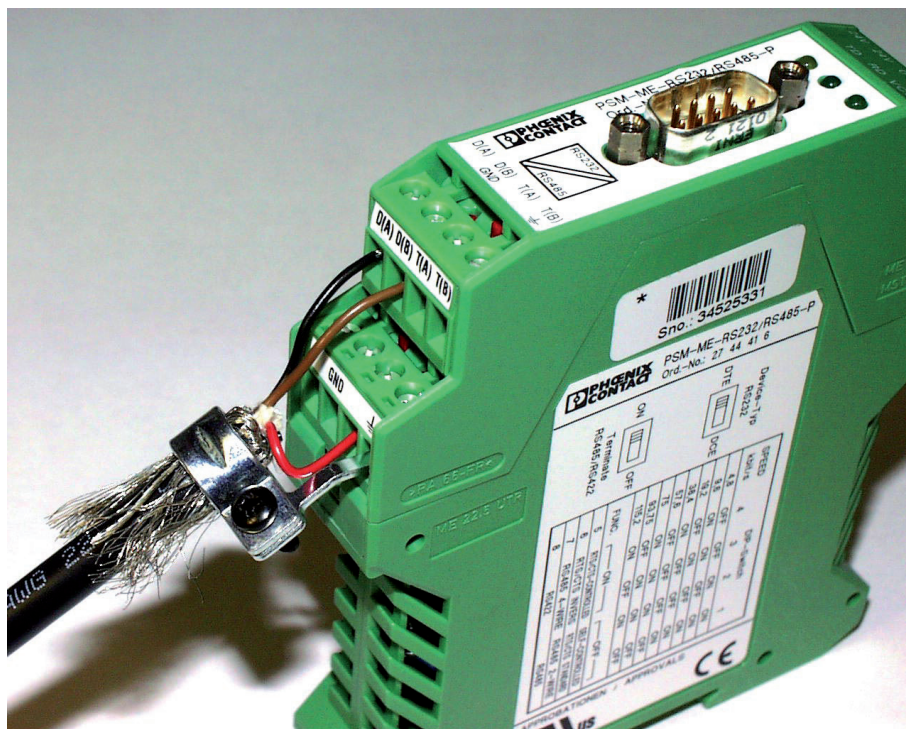


Fig. 8.2. Connecting the RS485-converter

## 8.1.3. Assembling the plug

(Part. No. 9 300 12 1000 and 9 300 12 2000)

- Push the components over the cable starting with the adapter (Pos. 1), coupling nut (Pos. 2) and the seal/strain relief element (Pos. 3),
- Cut away the outer insulation approx. 23mm from the end of the cable.
- Push back the braided shield.
- Push the shielding disc (Pos. 4) over the wires and press it against the braided shield.
- Cut back excess of braided shield close to the shielding disc.
- Cut away the plastic foil, filling material and inner insulation.
- Cut away insulation of wires approx. 3.5mm from the end and twist them.
- Solder brown wire of brown/black pair into pin No. 2 on plug.
- Solder red wire of red/black pair into pin No. 3 on plug.
- Solder black wire of brown/black pair into plug's Pin No. 4.
- Cut off black wire of red/black pair.
- Add the distance ring (Pos. 5) between the shielding disc (Pos. 4) and insert ring (Pos. 6).
- Push taper sleeve (Pos. 7) over the insert ring (Pos. 6) and distance ring (Pos. 5). **Make sure the Coding rib is on the right position!**
- Push in cable with shielding disc (Pos. 4) and seal and strain relief element (Pos. 3).

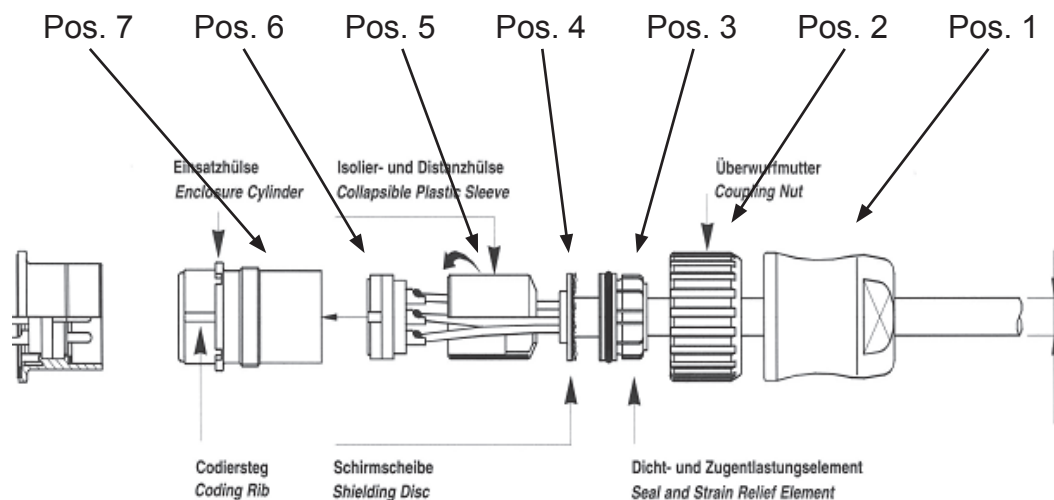
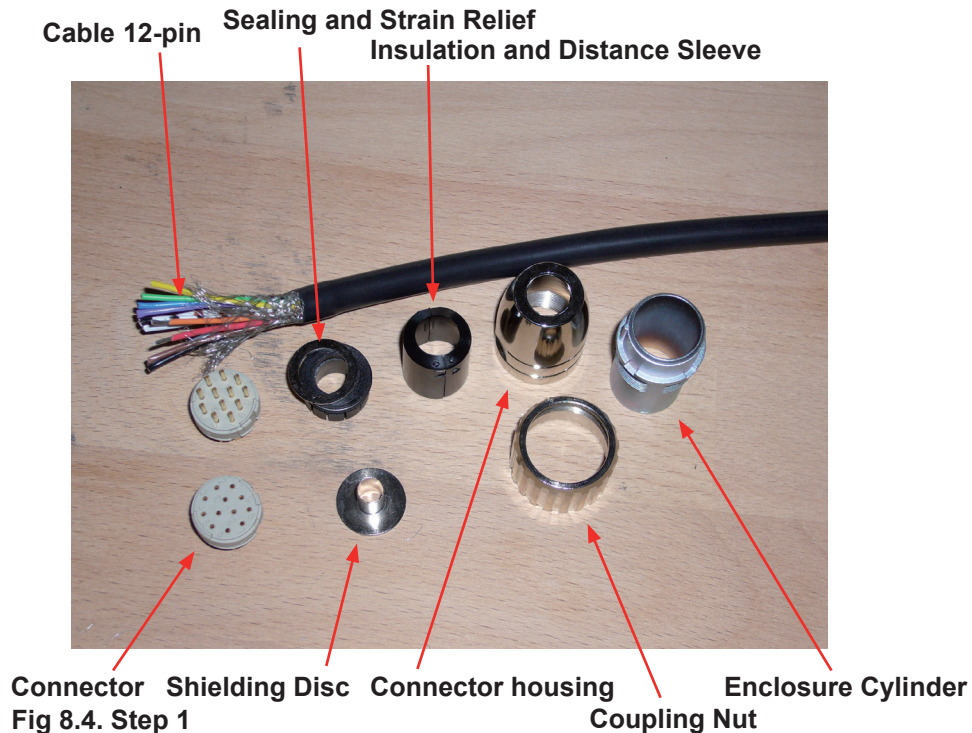


Fig. 8.3. Mounting the plug part. no. 9 300 12 1000 and 9 300 12 2000

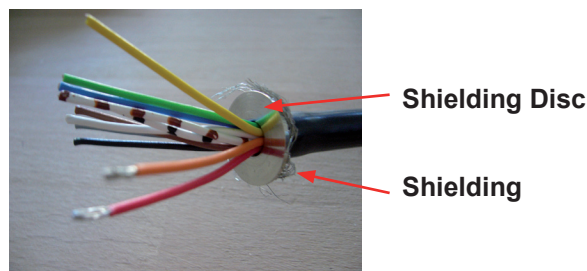
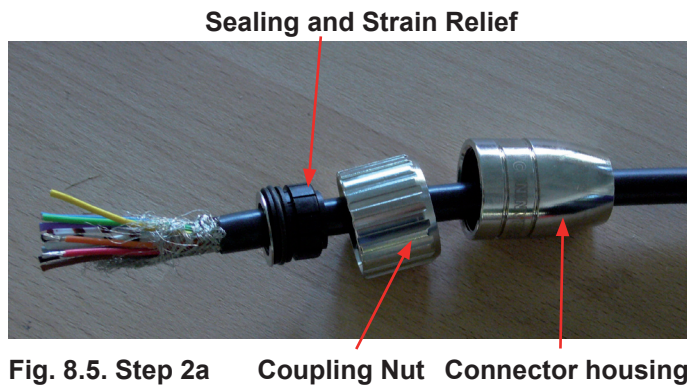


#### 8.1.4. Connection Cable - RS485 PCI Card to Evaluator

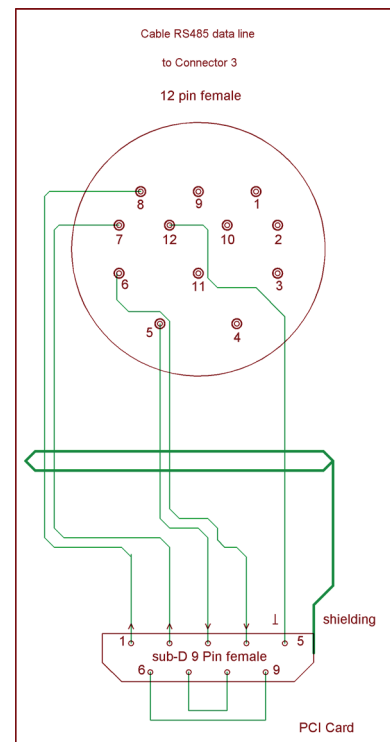
- Cut away the outer insulation approx. 23mm from the end of the cable



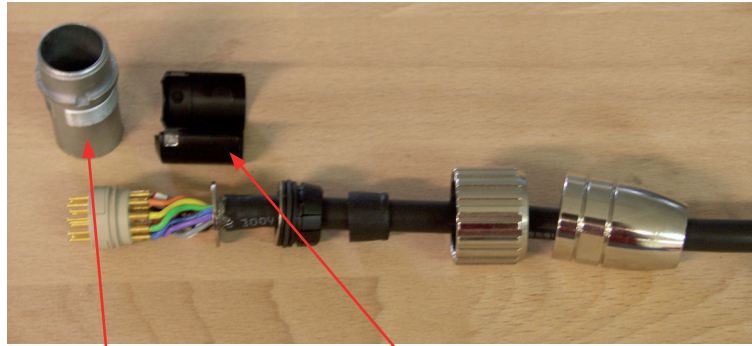
- Push back the braided shield
- Push the sealings over the wires



- Solder wires as shown in Fig 8.7.

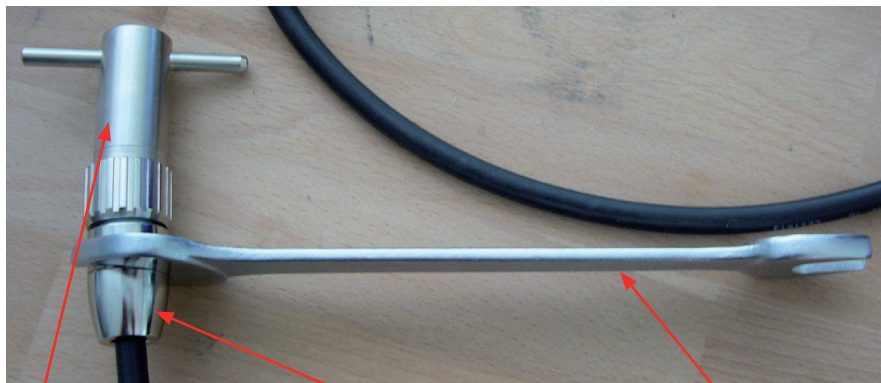






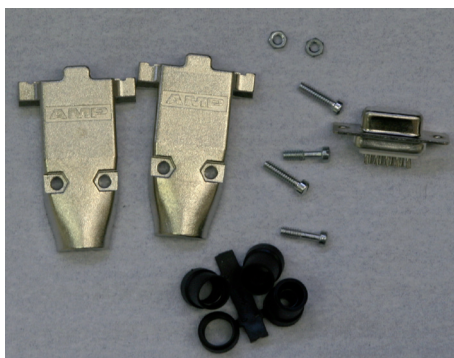
**Enclosure Cylinder      Insulation and Distance Sleeve**  
**Fig 8.8. Step 4**

- After soldering, pull the insulation and distance relief over the wires
- Pull the enclosure cylinder over the soldered wires
- Finally, seize the connector housing by using the installation wrench and a flat wrench No. 22



**Installation Wrench      Connectour Housing      Flat Wrench No. 22**  
**Fig 8.9. Step 5**

Assemble the Sub-D9 connector on the other side of the cable. (Fig 8.7.) Below, you've got two pictures of the connector before and after assembly.



**Fig 8.10. Sub D9 connector before assembly**



**Fig 8.11. Sub D9 connector after assembly**

## 8.2. Installation Procedure of Mechanical Components

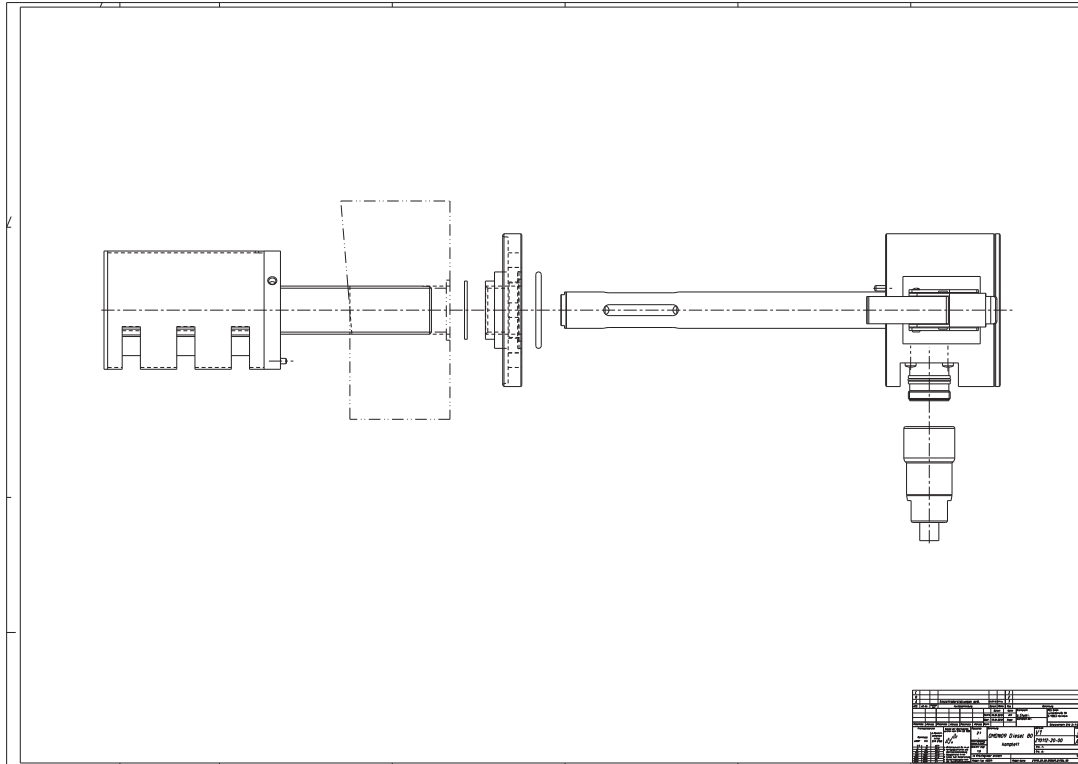
Installation / disassembly procedures are relevant to all designs of the mechanical parts and engines (the illustrations may represent the latest on-site installed assembly).



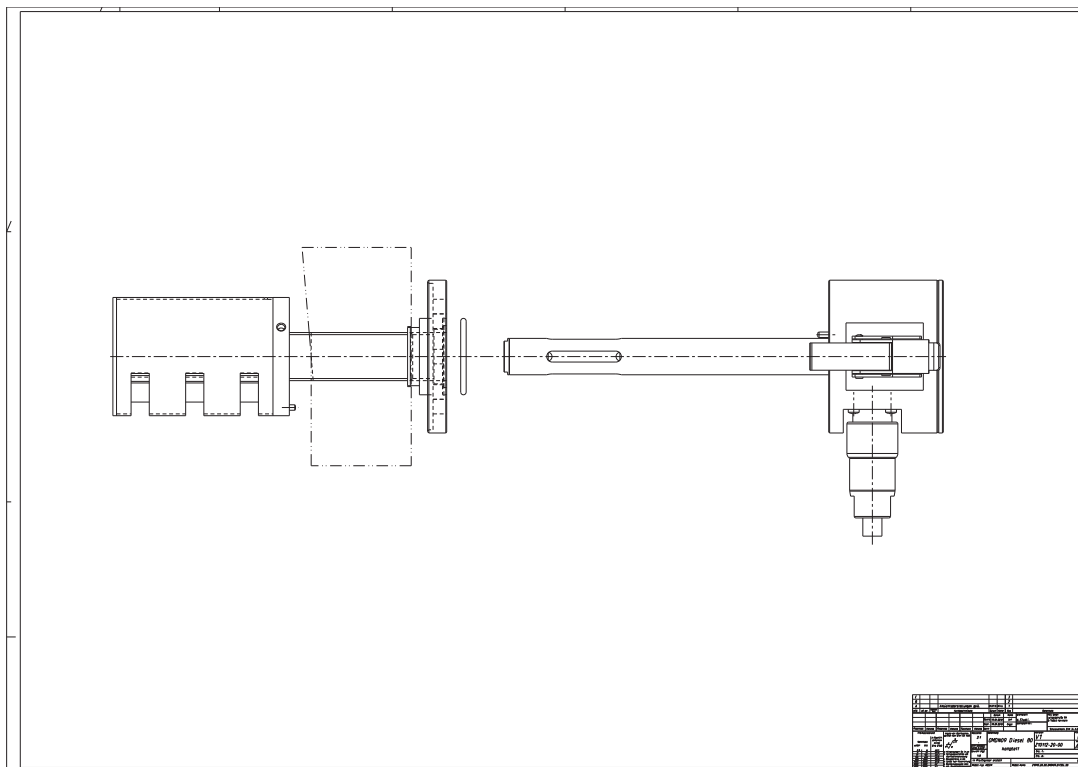
**Attention:** The list shown here is an excerpt of the main installation manual.

### Mechanical installation Procedure on individual Engines

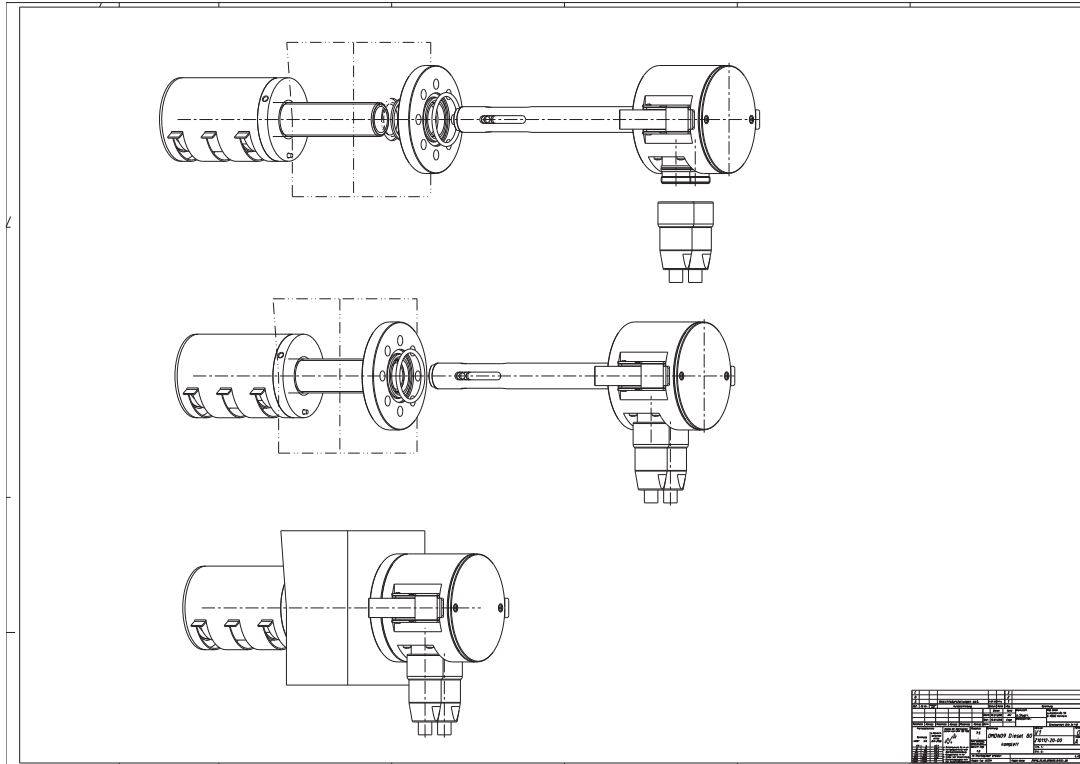
- Locate the installation position for the sensors  
Indicate whether inside the engine is a pretty good place for the SOPS (splash oil protection system) installation and operating of the SOPS, **not less than 170 mm vertical space**, pay attention to moving parts and mechanical components.  
Indicate the space outside of the engine, place for cables in the cable conduit, place for dismantling parts of the engine without bothering the GDMS-OMDN09 sensors.
- Mark the position with a center punch
- Protect the engine, engine crankcase and oil-circulation system against bore chips
- Pre-drilling with a diameter of about 8 to 10 mm
- Fine-drilling with a diameter of **24.2 mm** for the **G3/4" DIN ISO 228-1** tapped through hole
- Cutting the thread **G3/4" DIN ISO 228-1**
- Cleaning the surface 20mm around the hole (metallic blank)
- Clean hole and thread of SOPS until free from oil with MSS AG cleaning kit
- Use richly Loctite 2701 or the older product Loctite 270 for sealing and fastening the SOPS
- Take the SOPS and screw it from the inner side of the crankcase into the hole until 16 mm of the thread overlap the outside surface. The mark TOP and the kerf are on top. This position is important for the correct working of SOPS. Fig. 8.12.
- Clean thread G3/4" and counter nut inner thread until free from oil
- Use richly Loctite 2701 or the older one 270 for sealing and fastening the counter nut.
- Use cupper ring 27x32x1,5 DIN 7603A and fasten the counter nut.
- Install finger sensor using the o-ring 36x2 mm. Fig. 8.15.
- Connect all cables: starting at the evaluator to the first sensor, from first to second sensor, and so on from one sensor to the next and at last from last back to the evaluator. Fig. 2.2.
- Connect relay cables to alarm system as stated in manual from manufacturer
- Connect power supply 24 V DC, refer to manual for voltage tolerance and needed current
- Continue with chapter "3. Commissioning".



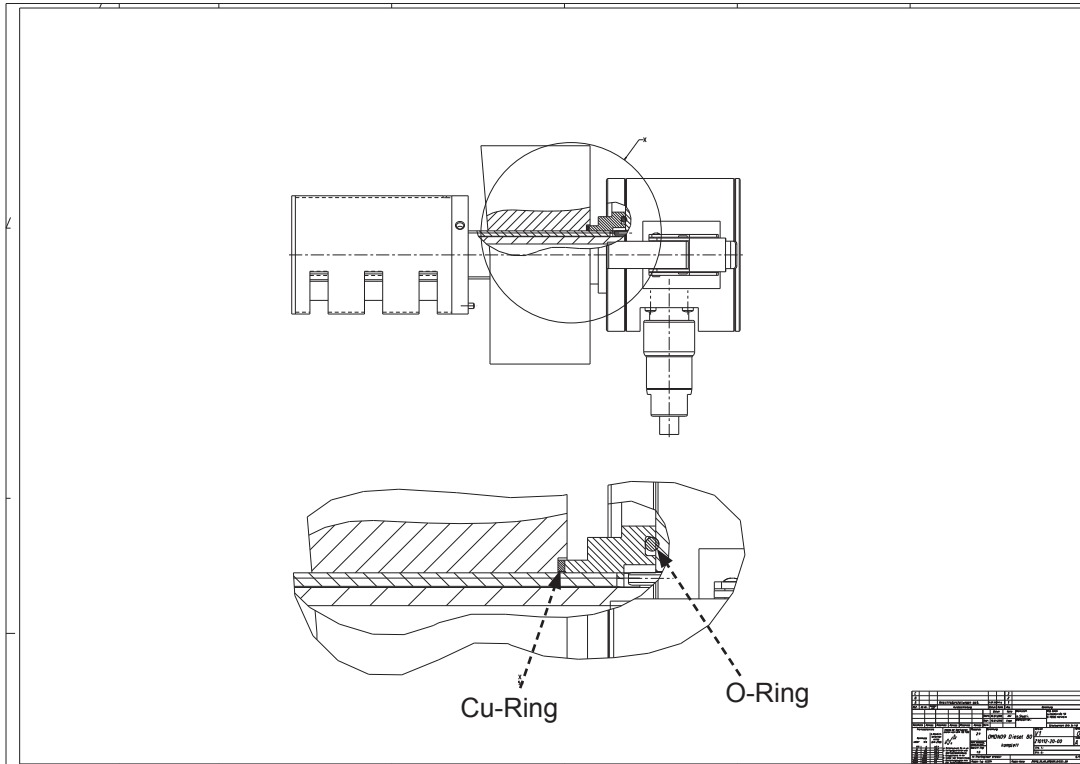
**Fig 8.12. Installation Step 1**



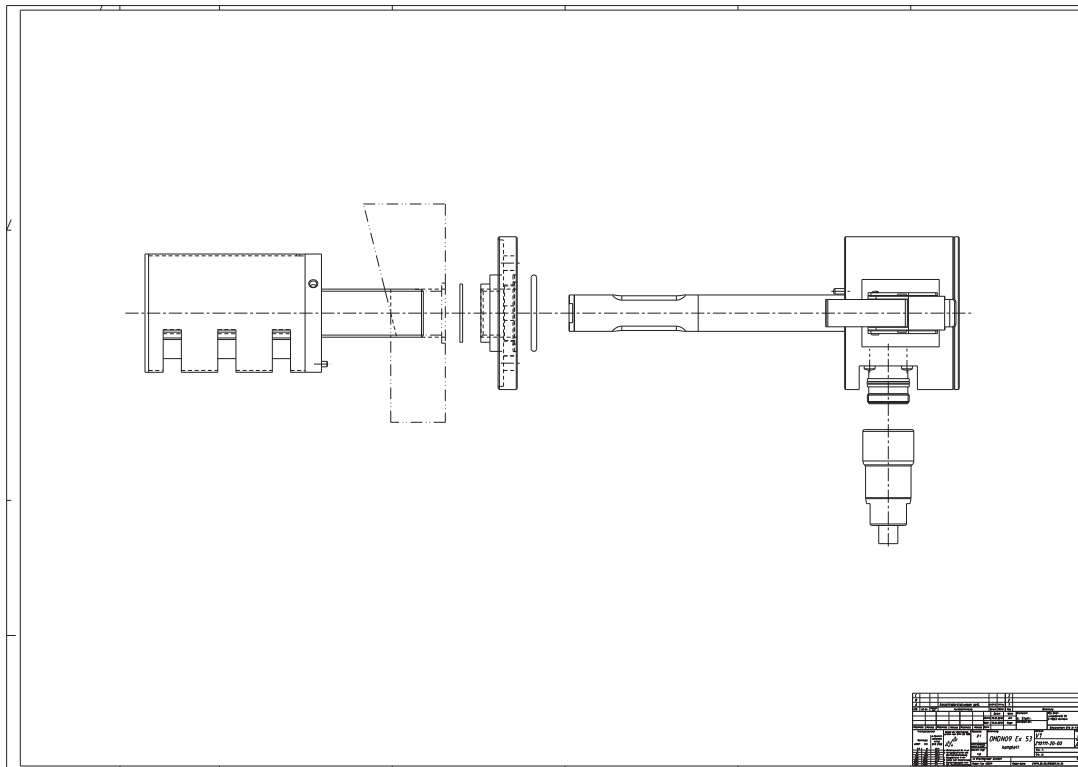
**Fig 8.13. Installation Step 2**



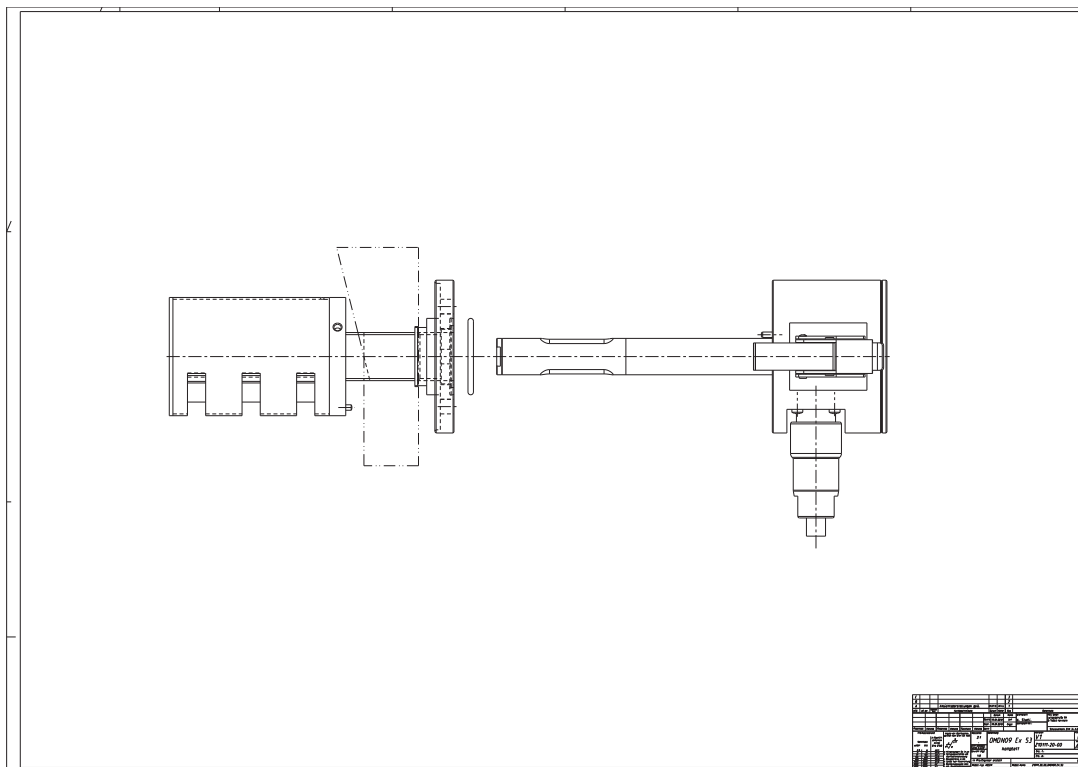
**Fig 8.14. Installation 3-D view**



**Fig 8.15. Position of Seals**

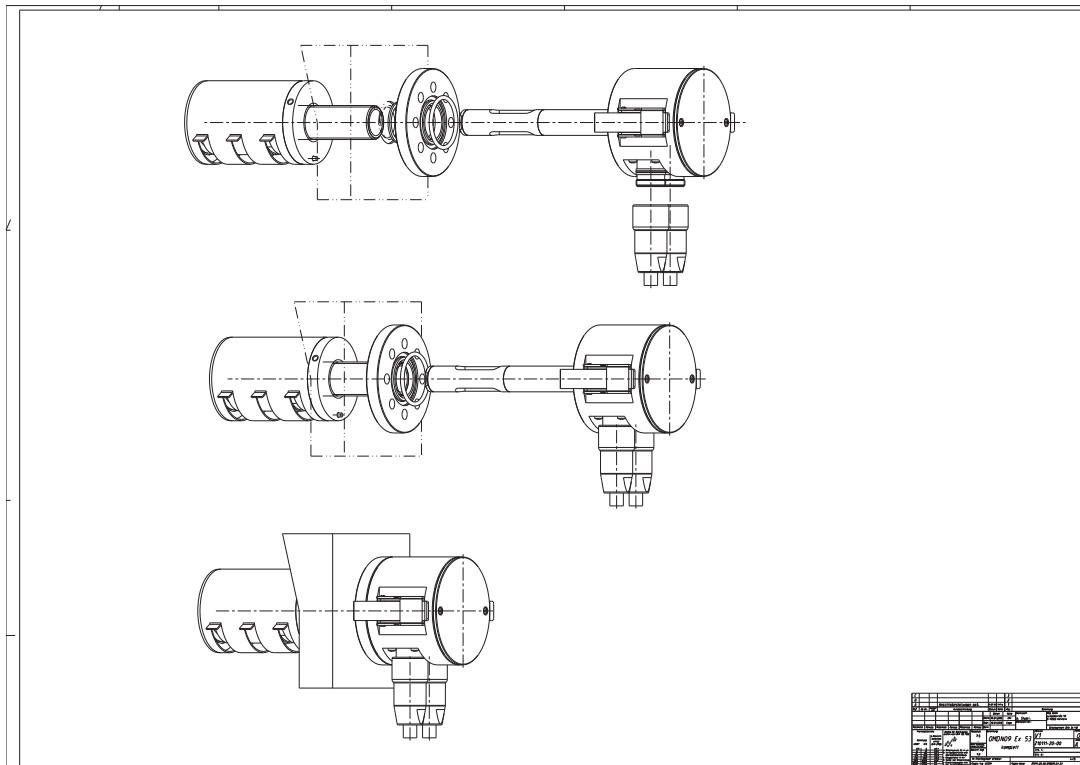


**Fig 8.16. Installation Step 1**

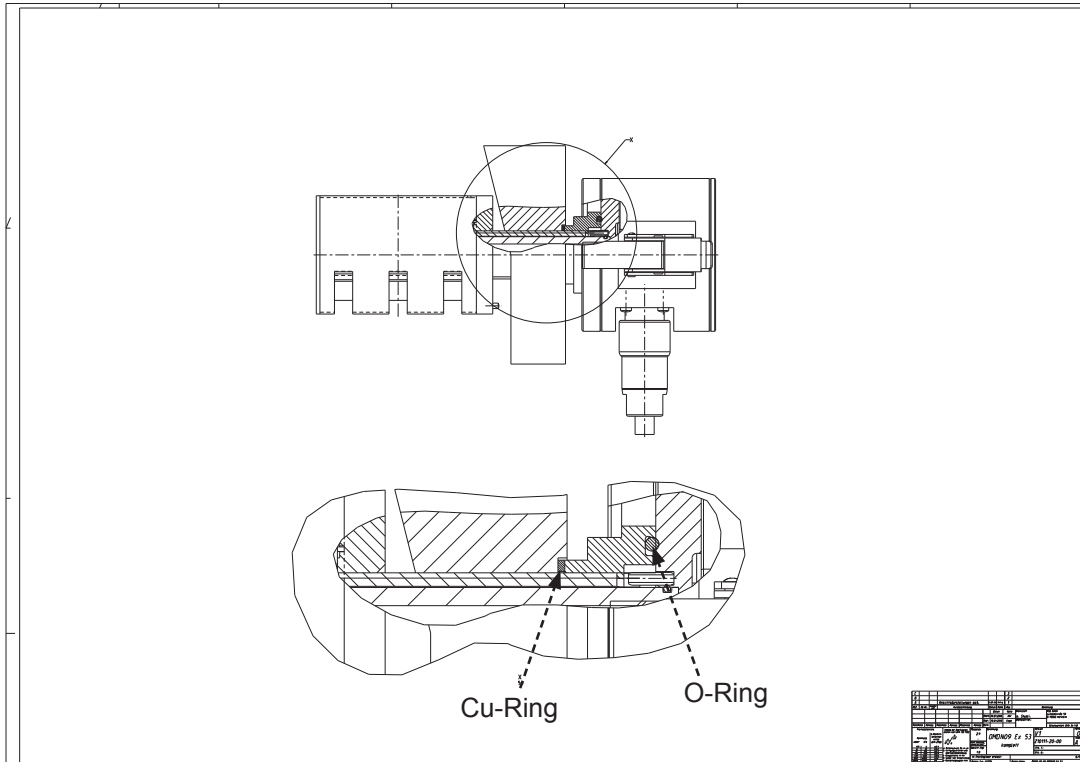


**Fig 8.17. Installation Step 2**



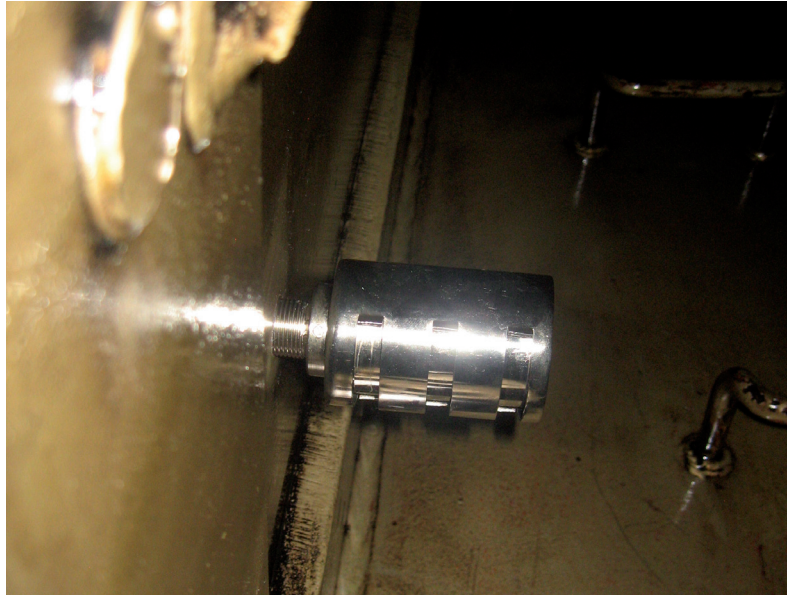


**Fig 8.18. Installation 3-D view**



**Fig 8.19. Position of Seals**





**Fig 8.20. Position of SOPS inside the Crankcase**



**Fig 8.21. Position of Counter Nut**



**Fig 8.22. Installed Sensor of GDMS-OMDN09 System on a 4 stroke engine**



**Fig 8.23. Installed Sensor of GDMS-OMDN09 System on a 2 stroke engine**



## 9. Notes