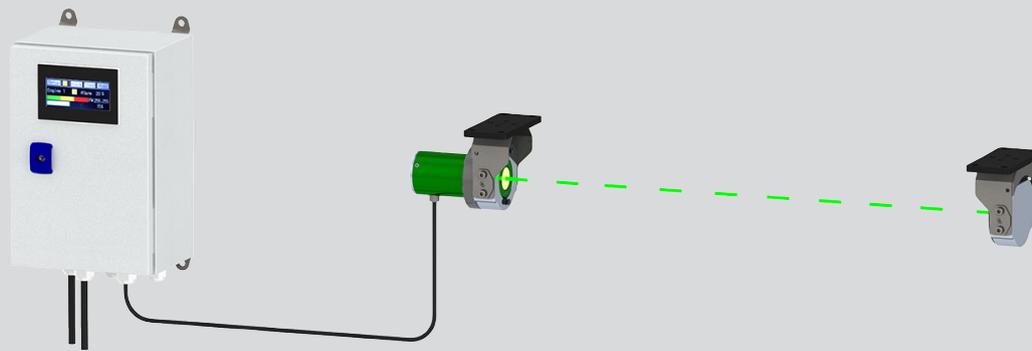


G26

# Ambient Oil Mist Detector

Instruction Manual



Document ID number.: 02892

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# 1 Introduction

## 1.1 About this Manual

This manual contains data and instructions for the installation, operation, and maintenance of the G26 Ambient Oil Mist Detector.

The instructions are given in general terms and do not take into consideration a specific installation. As such, the instruction manual is designed for the Ambient Oil Mist Detector delivered by Green Instruments A/S.

Note that each Ambient Oil Mist Detecting System is configured at the factory according to specifications. Therefore, please study this manual and the Technical Drawings for each system in their entirety for the operation of the system.

The manual does not describe all possible situations, but only the most common and known situations. It cannot replace the necessary education and training of the personnel. Should situations not described in this manual occur that cannot be solved in accordance with normal known practice and good workmanship, the operator should contact Green Instruments A/S for instructions.

### Attention

Before operation, read all instructions and warnings within this manual and associated documentation. Improper use may cause personal injury and/or damage of equipment and may void the warranty. Green Instruments A/S disclaims any responsibility for damage and/or injury caused by improper installation, use or maintenance of the equipment

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Green Instruments A/S reserves the right to minor alterations and improvements owing to developments without being obliged to enter the corresponding changes in this manual.

Green Instruments A/S reserves the copyright of the manual. Without prior written permission of Green Instruments A/S, the manual may not be copied and given to unauthorized people.

## 1.2 Inquiries and Feedback

All claims and inquiries for spare parts shall be addressed to Green Instruments A/S or our distributors. In all correspondence, or when ordering spare parts, please carefully state the equipment type and serial number, which can be found on the label on the equipment.

Green Instruments A/S appreciates all feedback and suggestions for improvement. If any questions appear or any discrepancies are found in this manual, kindly contact Green Instruments:

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## 1.3 About the System

The G26 Ambient Oil Mist Detector is designed to detect small concentrations of oil mist in open spaces and provide an early fire hazard warning.

The system is usually installed in engine rooms, pump rooms, machinery locations and other rooms with hydraulic installations, especially above hydraulic power packs and hydraulic aggregate pumps.

The G26 Ambient Oil Mist Detector uses a green laser light beam based on the principle of light transmission. A light beam with specific spectral characteristics is projected across the space to be monitored for oil mist leakage. The amount of light reflected back to the instrument from the reflector after passing through the space is compared with the maximum possible return when oil mist or smoke and other matters are not present in the area. Thus, the level of return signal is an indication of oil mist or other particulate matters in the space attenuates the projected light beam.

Please note that besides reacting to oil mist, the G26 Ambient Oil Mist Detector also will react to other obstructions intercepting the light beam e.g. smoke and dust. Consequently, the reading will change and possibly trigger an alarm. Depending on the application, this might be perceived as a "false alarm". At the same time, such alarms give you an indication of other malfunctions.

### 1.3.1 System components

As a standard configuration, the G26 Ambient Oil Mist Detector consists of the following standard elements:

#### **Control and Monitoring Unit (HMI)**

The control and monitoring unit is arranged with a touchscreen, connection terminals and cable glands. The control and monitoring unit can be configured to monitor up to 2 transceivers.

#### **Transceiver/Reflector Unit**

The transceiver assembly contains the laser source, optical components, electronics and data processor capacity to control and shape the laser beam projected across to the reflector assembly. The reflector assembly reflects the light back to the Transceiver Assembly where the light attenuation is measured.

The reflector assembly contains a precision reflector to direct the light beam back to the transceiver assembly.

### 1.3.2 Additional components

- Welding and alignment brackets for the transceiver and the reflector assemblies.
- Junction Box (JB). For each transceiver, a junction box is arranged with connection terminals and cable glands.
- For system configured for more than 2 transceivers, another monitoring system can be offered. Please contact our sales department for further information.

## 1.4 Choosing the Right Alarm Levels – Opacity of Oil Mist

The alarm levels of the G26 Ambient Oil Mist Detector can be adjusted to specific requirements. The variable output as well as the display of the monitoring unit states the level of opacity in percent, i.e. how much of the light that does not reach the receiver. The alarm point value is freely programmed from 2 % to 100 % to suit the actual application. There will be a warning alarm at 50 % of the alarm level, e.g. if the alarm is set at 10 % opacity, the warning will be at 5 % opacity.

The opacity of oil mist will depend on the concentration of oil mist, the size of oil droplets, and the path length of the actual oil-mist cloud which intersects the light beam.

Regarding the size of oil droplets, in general, smaller oil droplets have lower ignition temperatures due to the larger surface to volume ratios. Larger oil droplets are less dangerous due to higher ignition temperatures. This corresponds well with the fact that

smaller droplets have a higher opacity effect and are thus easier to detect than larger droplets.

In order to understand the relationship between opacity, oil mist concentration and the path length of the oil mist, two fictive examples are given in Figure 1-1. The figure illustrates different oil mist opacity levels corresponding with different oil concentrations and path lengths for a fictive oil type with oil droplets ranging from 10...20  $\mu\text{m}$ .

The figure shows that:

- An oil mist cloud with a concentration of only 0.2 mg/l and a path length of approximately 2 meters will generate an opacity of approximately 10 %.
- For the concentration of 2.5 mg/l, a mist cloud intersecting the line of sight by only 25 cm will generate an opacity of approximately 16%.

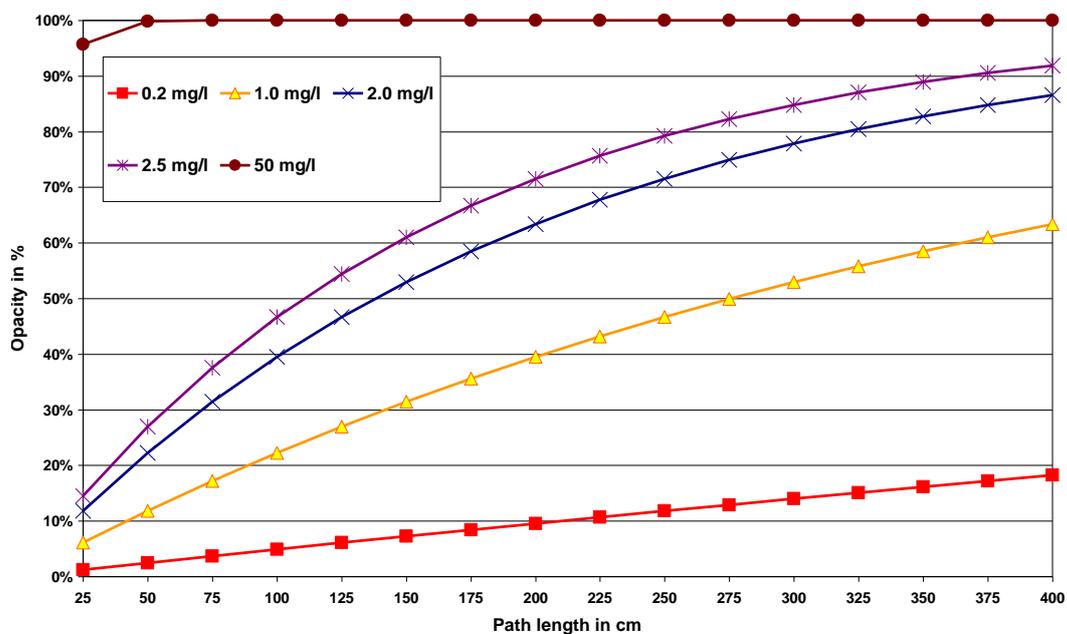


Figure 1-1: Opacity versus path length for different concentration

## 2 Specifications

### Control and Monitoring Unit

Power supply Input	Option 1: 100–240 VAC – 50/60 Hz – 1.4 A Option 2: 20 - 30 VDC – 2 A
Ambient temperature	0 °C–55 °C
Communication options: (All included as standard)	Analog output: 2 x 4...20 mA max. 500 Ω - (active & linearized)
	Digital output: 4 x Alarm Relays
	Bus - Modbus TCP/IP
Alarm levels	Alarm level is configurable Warning level is automatic set at 50% of Alarm level
Alarm delay	Default 0 s (programmable 0–1800 s)
Display	Opacity level [%]
Accuracy	≤ 2 % of full scale
Dimensions/weight	HxWxD: 300 x 200 x 150 mm / 5.5 kg
Enclosure	IP 65 Steel box

### Transceiver

Measurements	Opacity
Measuring principle	Transmission double pass
Measuring range	0–100% Opacity
Scanning distance	1.0 to 15.0 m
Power supply	24 VDC +/- 10%
Ambient temperature	0 °C–55 °C (Class A)
Vibration Class	B
EMC Class	A
Enclosure Class	B/IP 66
Dimensions & weight	LxHxW: 150x116x140 mm/1.7 kg (incl. mounting brackets)

### Reflector

Ambient temperature	0 °C–55 °C (Class A)
Humidity	Above dew point
Vibration Class	B
Enclosure Class	B/IP 66
Dimensions & weight	LxHxW: 52x116x140 mm/1.3 kg (incl. mounting brackets)

**Optional Equipment (refer to spare part section 9)**

Support and alignment brackets	Mild steel for welding. Used in case of mounting on structures with thickness less than 6 mm
Audit targets	100, 22 & 8 % Opacity (+/- 2% of full range) Useable for field validation
Visualization, recorder and data logging (Upon request)	
Remote digital display for panel mounting (Upon request)	

**Approvals and Certificates**

Download all product certificates at <https://greeninstruments.com>

## 3 Installation

**Read this chapter in its entirety before installing the system.**

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### 3.1 General

To avoid possible damage to the equipment or errors in the monitoring readings and alarm function, it is important to observe the following points carefully:

- The transceiver and reflector modules must be placed in areas with low vibration and with ambient temperatures below 55 °C. The location must be suitable for service and cleaning.
- The alignment brackets must be secured to solid structures – typically bulkheads providing a vibration stable location for the transceiver and reflector assemblies. The transceiver and reflector must be properly aligned and mounted firmly and stable, directly opposite each other.
- If mounted on to structures thinner than 6 mm, it is recommended to fit a double plate to the structure in order to support the Welding Brackets.
- The transceiver and reflector must be protected against mechanical damage. After the fine alignment of the transceiver and reflector, all bolts and screws must be firmly secured and tightened. Please see Figure 3-1, Figure 3-2, Figure 3-3 & Figure 3-4 for installation of transceiver & reflector.

#### Attention

Installation and operation of the G26 Ambient Oil Mist Detector and associated equipment must be carried out by skilled personnel. Green Instruments A/S does not take any responsibility of the operation of the system and associated equipment whatsoever.

The equipment must only be applied as specified by Green Instruments. If the equipment is used in a manner not specified by Green Instruments, the protection provided by the equipment may be impaired.

The successful and safe operation of this equipment is dependent upon proper handling, installation, operation, and maintenance.

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### 3.1.1 Control at Delivery

Upon receipt of the G26 Ambient Oil Mist Detector, please inspect and confirm that the received items are in accordance with the packing list and not damaged. Any discrepancy should be reported to the supplier immediately. If any of the received parts are damaged, the shipping company should be informed, and new parts made available before completing the installation.

### 3.1.2 Safety Aspects



#### **WARNING!**

Follow the installation and operating instructions. Please read the instructions carefully in its entirety before working on the system.



#### **WARNING!**

**Hazardous Voltage:** Disconnect power before servicing the system. Ignoring this warning can result in severe personal injury or material damage. Observe the instructions carefully to ensure the correct connection of all power and signal leads.

Ensure that the correct power supply is connected to the control and monitoring unit (see the rating marked on the label of the equipment).

#### **Circuit breaker!**

The installation must include a means of switching off electrical power by a clearly marked switch or circuit breaker external to the control and monitoring unit. The external switch or circuit breaker must be placed in close proximity to the monitoring unit and within reach of the operator.

#### **Overload protection!**

To comply with safety requirements IEC 61010-1 (2003), the installation must include a means of overcurrent protection to protect against excessive energy being drawn from the power supply system in case of a fault in the equipment.

#### **Protective earth!**

The monitoring unit must be connected to protective earth.

#### **Installation and fault finding!**

Electrical installation and fault finding on the system should only be undertaken by a suitable trained and qualified engineer.



#### **Warning Laser Hazard**

Visible laser radiation! Avoid eye exposure to direct or scattered radiation.

### 3.1.3 Symbol identification



Caution, risk of danger



Caution, risk of electrical shock



Warning Laser Hazard. Visible laser radiation! Avoid eye exposure to direct or scattered radiation.



Protective earth



The CE mark proves the compliance of the instrument with the requirements of the relevant EU directives

## 3.2 Standard Installation

A G26 Ambient Oil Mist Detecting System can consist of up to 2 sensors (i.e. transceiver/reflector units). Other systems configuration supporting up to 16 sensors available upon request. The installation of each transceiver/reflector unit is similar to each other. Figure 3-1 illustrates the installation of a system with a transceiver/reflector unit.

The transceiver and reflector are to be mounted and aligned opposite each other in a way that the light beam from the transceiver hits the reflector at the center. After the fine adjustment of the transceiver and reflector alignment, all bolts and screws must be firmly secured.

### 3.2.1 Welding and Alignment Brackets

The transceiver and reflector are installed into solid brackets, i.e. the alignment brackets mounted on the welding brackets, see Figure 3-2.

The solid mild steel welding brackets allow easy mounting to existing structures by welding or alternatively bolting. Please note that thin structures will require additional support in order to secure stable alignment of the Transceiver and Reflector Assemblies.

In order to avoid false alarms caused by people walking in the monitoring area, it is recommended to mount the transceiver and reflector at a position higher than the normal height of people (i.e. > 2200 mm from the floor) if possible.

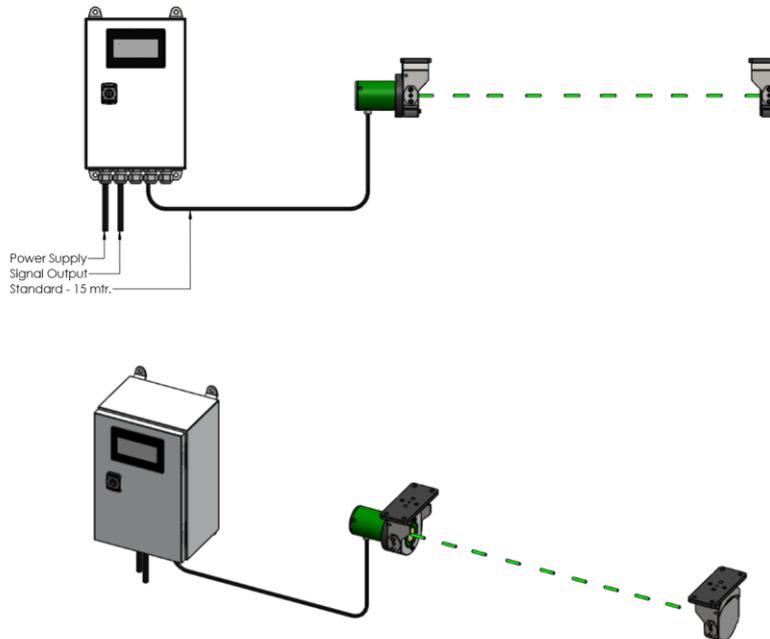


Figure 3-1: Illustration of a G26 Ambient Oil Mist Detector with transceiver/reflector unit

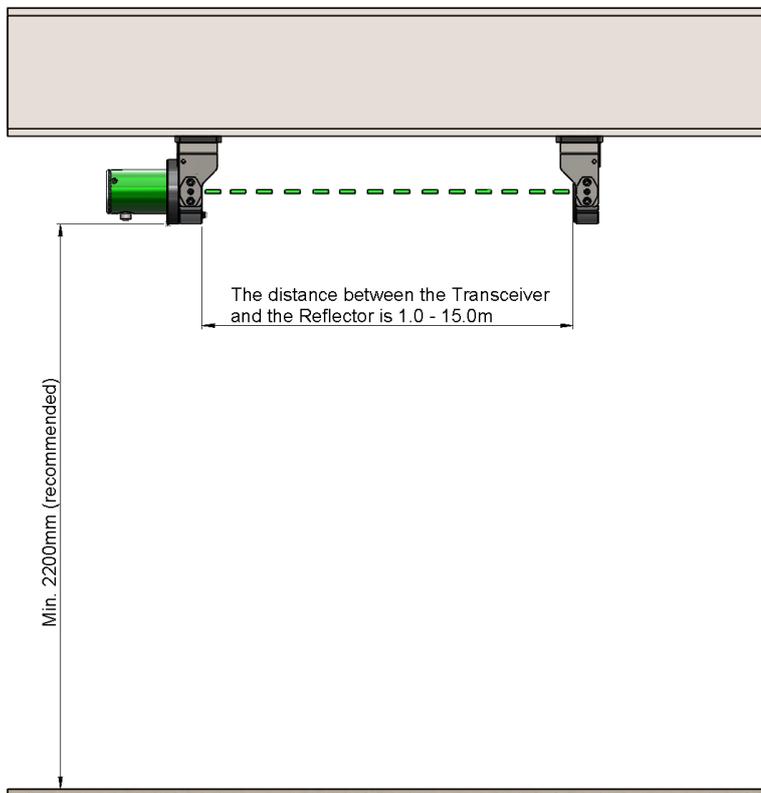


Figure 3-2: Mounting position of the transceiver and the reflector

### 3.2.2 Transceiver and Reflector

The transceiver and reflector are mounted into the alignment brackets as illustrated in Figure 3-3 and Figure 3-4.

Special attention must be given to the alignment, ensuring the transceiver and reflector is mounted precisely centered and directly opposite each other.

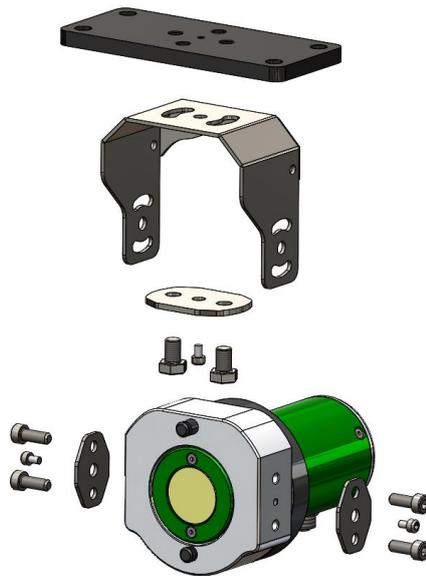


Figure 3-3: Installation of transceiver

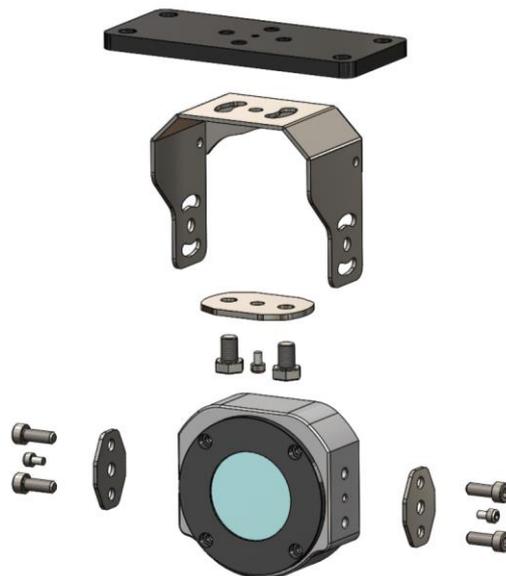


Figure 3-4: Installation of reflector

### **3.2.3 Junction box**

The junction box is an optional item used in cases where the cable between the Control and Monitor unit and the Transceiver exceeds 15 meters and/or in cases where multiple transceivers are daisy chained together. If the scope of supply includes a junction box, the junction box is pre-mounted with a connection cable for easy connection to the transceiver.

The connection terminals are located in the junction box. Four (4) cable glands (M20) are arranged for incoming and outgoing power and data cables. The M20 cable glands are suitable for cable diameters between 7 mm to 13 mm.

### **3.2.4 Control and Monitoring Unit**

The control and monitoring unit can interface with up to 2 transceiver/reflector units. Other systems configuration supporting up to 16 sensors available upon request. It is recommended to install the control and monitoring unit in an easily accessible location.

The control and monitoring unit is arranged with touch screen and connection terminals inside the unit. Five (5) cable glands (M20) are arranged for incoming and outgoing power and data cables. The M20 cable glands are suitable for cable diameters between 7 mm to 13 mm.

## **3.3 Electrical Connections**

### **3.3.1 Connections**

Before connecting the power supply, please make sure that the power supply rating for the control and monitoring unit corresponds with the power supply available.

Please see the electrical drawings relevant for installation attached to each system. The system can be prepared for functions not relevant for all installations. These functions will be marked as spare or as reserved for a specific purpose.

### **3.3.2 Cable types**

Refer to electrical documentation.

## 4 Menu structure & configuration

### 4.1 Transceiver

#### 4.1.1 Transceiver button function



Figure 4-1: Transceiver Interface

The transceiver user interface consists of a green power LED, a yellow warning LED and a red alarm LED, a zero and a span button, and 5 signal strength LEDs.

- Power: Green illuminating LED means power ON
- Warning: Yellow illuminating LED means Warning ON
- Alarm: Red illuminating LED means Alarm ON
- Signal Strength LEDs: Under normal operation, the signal strength LEDs indicate how strong the light beam is reflected to the transceiver. When the first signal strength LED on the right illuminates, it indicates the transceiver is receiving the strongest signal back, i.e., the section between the transceiver and the reflector is transparent with no obstructions to the light beam and the transceiver lens and the reflector are clean. Please see Figure 4-2.



Figure 4-2: Illustration of the strongest signal, no obstructions to the light beam

- When the illumination changes to one of the LEDs to the left, it indicates that the reflecting beam becomes weaker, i.e., the beam is scattered or blocked, or the transceiver lens and/or reflector become contaminated. When the illumination changes to the last LED to the left, it means the opacity level is just above the warning level. Thus, the signal strength illumination can give a quick indication on the opacity level and/or the contamination level of the transceiver lens and/or the reflector. Please see Figure 4-3.



Figure 4-3: Illustration of the weakest signal, obstructions to the light beam

- Beside the indication of signal strength, the blue LEDs are also used for indication in connection with initial alignment and address settings.
- Zero and Span: The Zero and Span buttons are used for calibration and initial settings of light beam strength and transceiver address. Note that during initial setting of the light beam strength, the laser light will be steady providing good access for fine alignment of the beam against the reflector.

## 4.1.2 Set laser aligning function

### WARNING

Once you start laser aligning function (section 4.1.2), you need to continue with setting unit address (section 4.1.3) until the new settings are saved (section 4.1.4).

Visible laser radiation! When the transceiver operates in pulsed mode, the laser is classified as Class 1, which is safe under all conditions of normal use. When it operates in the continuous mode (i.e. there is a steady light beam in the aligning mode), the laser is classified as Class 3R. Thus, please avoid eye exposure to direct or scattered radiation when the transceiver operates in the continuous mode.

During laser aligning step, all possible obstructions to the light beam (such as oil mist, smoke and dust) must be absent in the section between the transceiver and the reflector.



To enter laser alignment mode please press and hold SPAN and ZERO buttons and wait approximately 5 seconds until all signal strength LEDs turn ON. Then release SPAN and ZERO.

The signal strength is indicated by means of one of the blue LEDs. Note that alarm and warning function will be deactivated, while the steady/continuous beam of light is ON.

The laser beam can now be adjusted to hit the centre of the reflector by adjusting the support and alignment bracket.

For centring the laser beam, it is recommended to place a paper or a thin cardboard over the reflector. The beam will be projected onto the paper or cardboard, and the position of the beam will be clearly indicated for fine adjustment to the centre of the reflector.

A cut-off shape which is not centred nicely onto the reflector indicates a poor alignment (Figure 4-4). A circular shape nicely centred onto the reflector indicates a good alignment (Figure 4-5).



Figure 4-4: Illustration of poor alignment



Figure 4-5: Illustration of good alignment

After the fine adjustment, the beam to the centre of the reflector, tighten all the bolts and screws on the alignment brackets. Remove the paper or the cardboard used.

Go to the next step – set unit address.

### 4.1.3 Set unit address

Press and hold SPAN and ZERO buttons and wait approximately 5 seconds until all signal strength LEDs turn ON. Laser is OFF (it might flash a few times before turning off). The unit address is now shown on the signal strength LEDs as described in Figure 4-6.

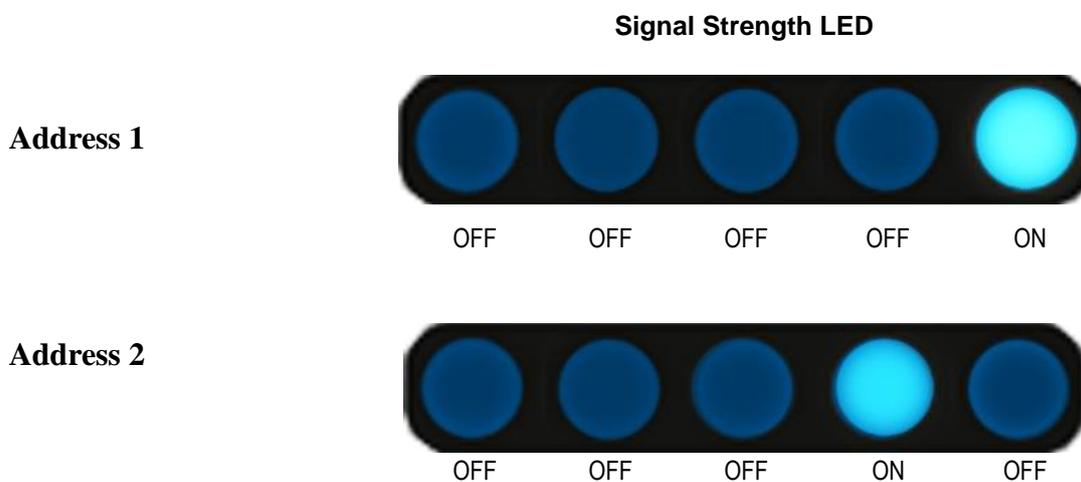


Figure 4-6: Transceiver address settings

#### Attention

Please pay attention when pressing SPAN and ZERO:

Do not press ZERO before SPAN as this might cause an accidental change of address.

Press ZERO button to change unit address to the desired one, e.g., address 1 and 2. Release ZERO button and check if the address is as wanted.

All transceivers are set with address 1 at factory. If the system is configured with 2 transceiver/reflector units, one of the transceivers must be set to address 2. Transceivers with identical address cannot function when connected to the same system.

## Attention

If 2 sensors have the same address, the system will go into alarm state and indicate 100% opacity as shown on Figure 4 7 & Figure 4 8.

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Figure 4-7: Symptom of address conflict

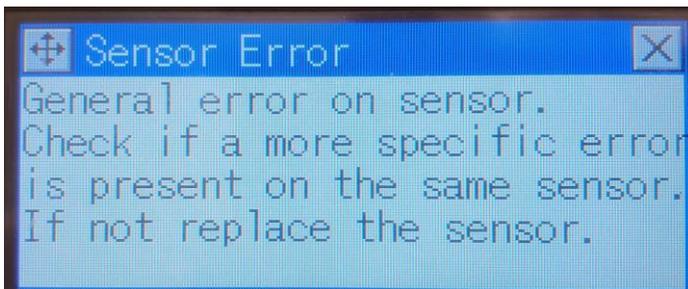


Figure 4-8: Accident address change (2 sensors have the same address)

## Note

Unit address will always appear shortly when the transceiver is connected to power supply.

---

Go to the next step – save new settings.

### 4.1.4 Save new settings

To save the new address settings, press and hold SPAN and ZERO button. Wait approximately 5 seconds until all signal strength LEDs turn ON. Then release the buttons. The far-left signal strength LED remains ON, alarm and warning LEDs will turn ON. The new settings are now saved.

### 4.1.5 Enabling Service Mode

#### Note

The laser can be turned off and transceiver alarms can be ignored by putting the transceiver into service mode.

During service on, in and around the installation, the beam of light can accidentally be blocked causing false alarm. To avoid this, we have implemented a Service Mode function, which can be enabled before service of the installation is carried out.

Service Mode is enabled by pressing and holding ZERO button until the 2 outer signal strength LEDs light up. When this is noticed, immediately release ZERO, then press and hold ZERO again until 2 outer signal strength LEDs light up, then release once this is noticed (See Figure 4-9).



Figure 4-9: The illustration of interface show - Enter to Service Mode

Please note, the ZERO button must be released before the 2 outer signal strength LEDs turn OFF for service mode to be entered.

The unit will now be in service mode which is indicated by a flashing warning LED. In Service mode, the laser and alarms will turn OFF, and reported opacity will be 0%. The default timer sets service mode to 10 minutes (no Signal Strength LEDs illuminated as seen in Figure 4-10).



Figure 4-10: Service Mode (flashing warning LED)

Pressing SPAN will add 10 minutes to the default timer (see Figure 4-11). The service mode can last up to 60 minutes (10 mins. per. LED) (see Figure 4-12). Remaining time can be seen on signal Strength LEDs.



Figure 4-11: Service mode (1 Signal Strength LED represents 10 minutes)



Figure 4-12: The service mode timer indication max 60 minutes

Service mode can be canceled in the same way as it is entered i.e. by pressing and holding ZERO until the 2 outer signal strength LEDs light up (see Figure 4-9), immediately releasing ZERO and pressing and holding ZERO again until 2 outer signal strength LEDs light up once more, then releasing once again.

## 4.2 Control and monitoring unit

The control and monitoring unit uses HMI for the configuration, monitoring and visualization. The description of the menu and system configuration can be found in this section.

### 4.2.1 Home menu



Figure 4-13: Home menu with 1 configured sensor

Home menu is the first screen when the system is turned on. The display depends on the number of transceiver/reflector units configured in the system.

If the system is configured with 1 transceiver/receiver unit, the home menu will be as shown in Figure 4-13.

Figure 4-14 shows the Home Menu with 2 configured sensors. To change the name of the sensor (e.g. from S\_1 to Eng 1), please see the instruction in section 4.2.5.



Figure 4-14: Home menu with 2 configured sensors

The colors at each sensor box shows the status of the sensor. Green light means no alarm and/or warning. Yellow means active warning and red means active alarm. Black means the sensor is not configured or no data is yet received from the sensor.

## 4.2.2 Sensor menu

If only one sensor is configured, the sensor menu will be the same as the home menu. If two sensors are configured, pressing the sensor name (e.g. S\_1) will give access to the sensor menu of that sensor (Figure 4-13). The sensor menu displays the following information:

- Sensor name: S\_1 as default setting for sensor 1
- Global alarm condition (to the right of Setup):
- Green light: No warning and alarm
- Yellow light: Warning
- Red light: Alarm
- Alarm condition of the selected sensor (to the right of the sensor name):
- Black: Sensor not configured, or no data received.
- Alarm level: 2% opacity as default setting
- Software version of the transceiver: e.g. FW 001.001
- Current opacity level: e.g. 10%. When the current opacity level is within the green area, it means no alarm and/or warning. Yellow area means warning. Red area means alarm.

The sensor menu has also 4 functions buttons:

- Setup: to access the sensor setup menu
- Alarm: to access alarm list
- Trend: to access trend menu
- Home: to go back to the home menu



Figure 4-15: Sensor menu

### 4.2.3 Alarm list menu

By pressing Alarm on the Sensor Menu of a specific sensor, the Alarm list menu shown on Figure 4-16 will appear.

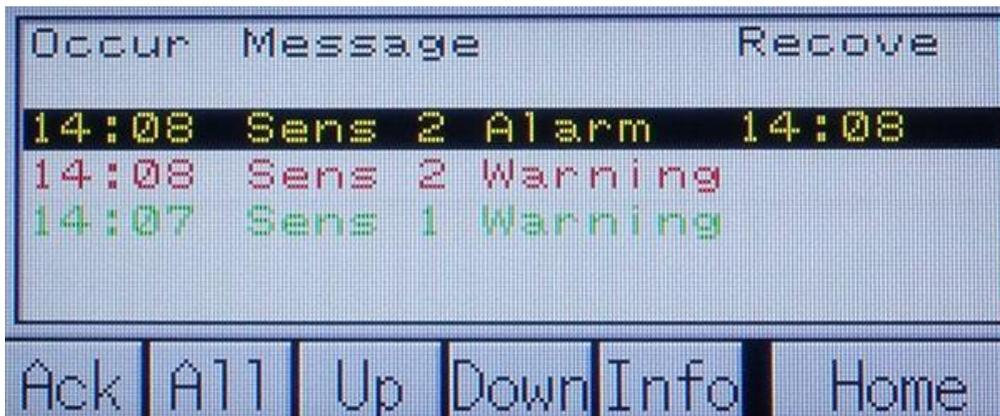
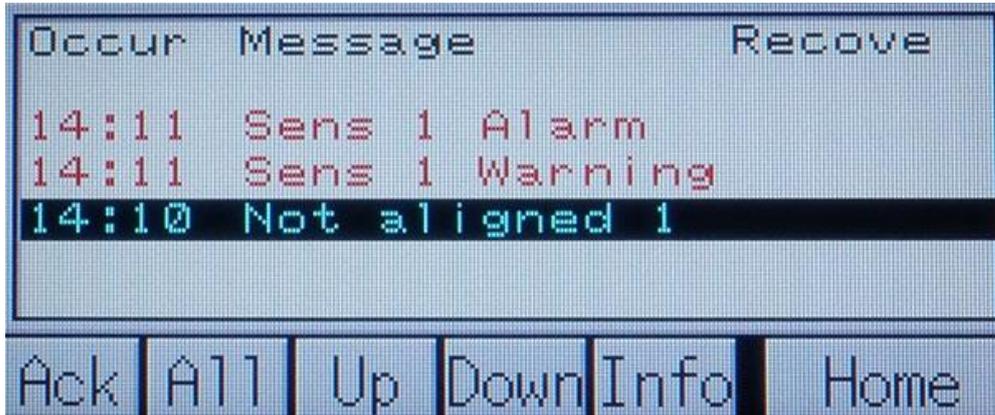


Figure 4-16: Alarm list menu

The alarm list menu has 6 function buttons:

- Ack: Acknowledge the current selected alarm
- All: Acknowledge all alarms
- Up: Select alarm above
- Down: Select alarm below
- Info: Show info screen with description of the current selected alarm
- Home: to go back to the home menu

Figure 4-17 indicates the red alarms mean the alarms are currently active. The green alarm means the alarm is currently active and acknowledged. When an alarm is recovered, the recovered time will be indicated at the Recove column on the screen (as the yellow alarm).



Occur	Message	Recove
14:11	Sens 1 Alarm	
14:11	Sens 1 Warning	
14:10	Not aligned 1	

Ack All Up Down Info Home

Figure 4-17: Select an alarm in the alarm list menu

Select an alarm and press Info, an alarm info screen with information about the current selected alarm and suggestion to solve the alarm condition as shown on Figure 4-17 & Figure 4-18 will appear.

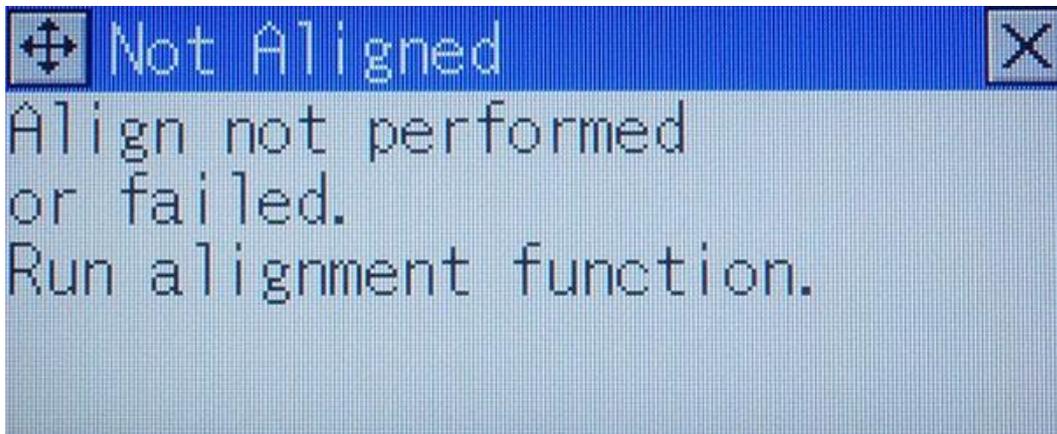


Figure 4-18: Alarm info screen - e.g. Not aligned alarm

**The full alarm list is as follow:**

Alarm	Description	Information
Sens 1 Error	Error at Sensor 1	General error on sensor. Check if a more specific error is present on the same sensor. If not replace the sensor.
Sens 1 Warning	Warning at Sensor 1	Opacity warning level threshold reached. Note this alarm will be set as soon as the sensor detect the high level.
Sens 1 Alarm	Alarm at Sensor 1	Opacity alarm level threshold reached. Note this alarm will be set as soon as the sensor detect the high level.
Ret 1 L Warning	Warning for Low Returned Light Intensity	Returned light low. Run align function again to adjust light intensity and make sure the beam is aligned with reflector. Reduce distance to reflector if possible. Clean optical windows
Ret 1 L Alarm	Alarm for Low Returned Light Intensity	Returned light to low. Run align function to adjust light intensity again and make sure the beam is aligned with reflector. Reduce distance to reflector if possible. Clean optical windows
Ret 1 H Warning	Warning for High Returned Light Intensity	Returned light high. Run align function again to adjust light intensity. Increase reflector distance or use filter.
Ret 1 H Alarm	Alarm for High Returned Light Intensity	Returned light to high. Run align function again to adjust light intensity. Increase reflector distance or use filter.
Ref 1 L Warning	Warning for Low Reference Light Intensity	Reference light low. Run align function to adjust light intensity. Increase reflector distance.
Ref 1 L Alarm	Alarm for Low Reference Light Intensity	Reference light to low. Run align function to adjust light intensity. In-

Alarm	Description	Information
		crease reflector distance. Replace the sensor.
Ref 1 H Warning	Warning for Low Reference Light Intensity	Reference light high. Run align function.
Ref 1 H Alarm	Alarm for Low Reference Light Intensity	Reference light to high. Run align function to adjust light intensity. Replace sensor.
Neg Opa 1 Warn	Negative Opacity Warning	< -2.5% negative opacity measured. Calibrate sensor. Note it's very important that calibration is done without smoke / oil / dust present.
Neg Opa 1 Alarm	Negative Opacity Alarm	< -5.0% negative opacity measured. Calibrate sensor. Note it's very important that calibration is done without smoke / oil / dust present.
Not aligned 1	Alignment not OK	Align not performed or failed. Run alignment function.
Zero 1 cal Err	Zero Calibration Error	Zero calibration not performed or failed. Press ZERO to calibrate. Note: Smoke / oil / dust must not be present.
Span 1 cal Err	Span Calibration Error	Span calibration not performed or failed. Press SPAN to calibrate. Note: Block light during SPAN calibration.

#### 4.2.4 Trend menu

Press Trend on the Sensor Menu, the opacity trends of all sensors will be displayed Figure 4-19.

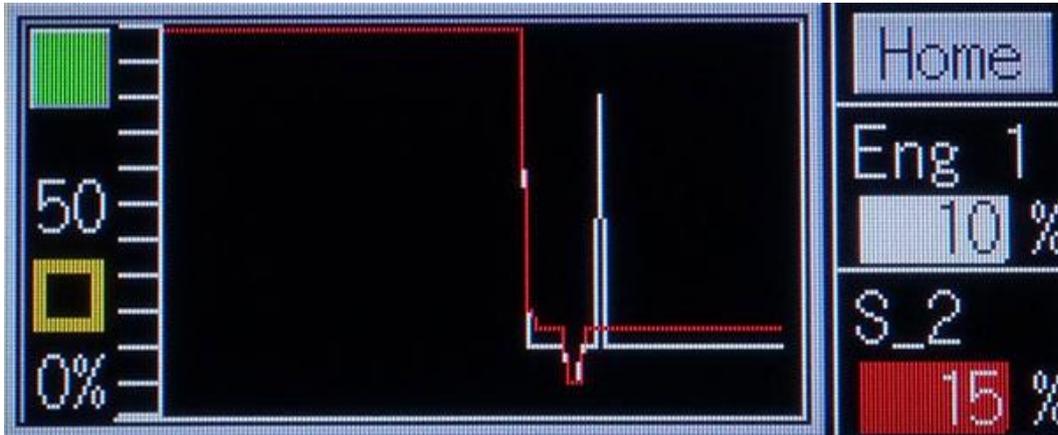


Figure 4-19: Trend menu

The opacity values (vertical axis) are shown on a time scale (horizontal axis). The scale of vertical axis is -10% - 100% opacity. The scale of the horizontal axis is the last 30 minutes.

#### 4.2.5 Sensor Setup

Press Setup on the Sensor Menu to access its Sensor Setup Menu.

It will require a password to enter the menu (see Figure 4-20). The password can be found on the Test and Configuration Sheet delivered to each system. Use the popup keyboard to enter the password (password =“AAAA”). Choose OK by using up/down/right/left buttons on the keyboard then press ENT. The Setup Menu shown on Figure 4-21 will appear.

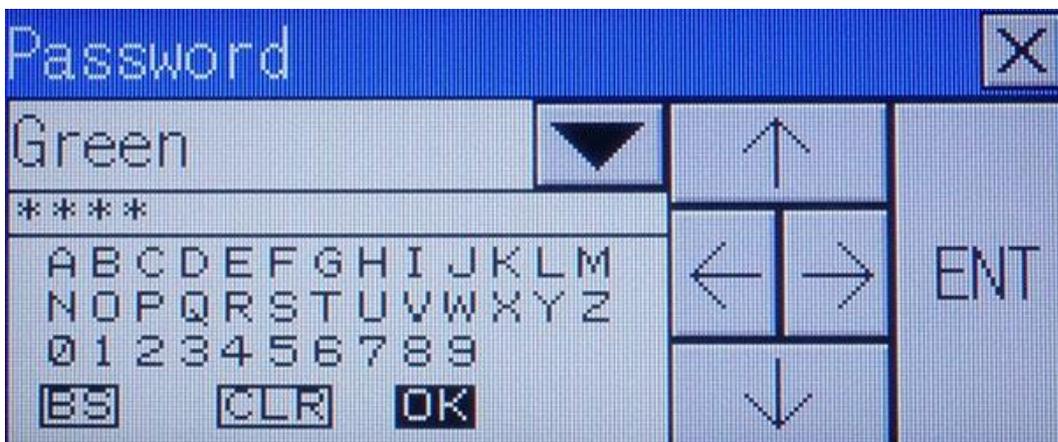


Figure 4-20: Password popup window

The Sensor Setup Menu has two function buttons:

- System Setup: to access to the general System Setup menu
- Home: to go back to the home menu

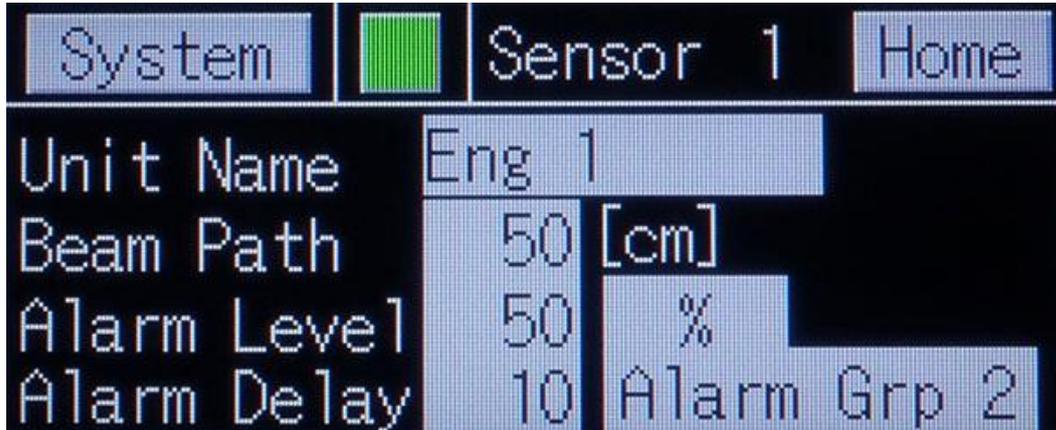


Figure 4-21: Sensor Setup

The light on top of the screen shows the alarm condition. Green/Yellow/Red light means no alarm and/or warning/active warning/active alarm.

The below parameters of each sensor can be configured in its sensor menu:

### Unit name

The default names set up at the factory is S\_1, S\_2..., S\_8. However, the name of each sensor can be changed if it gives more meaning for the operator, e.g. S\_1 can be changed to Pump\_1 (i.e. sensor 1 monitors the pump room 1), S\_2 to Main Engine (i.e. sensor 2 monitors the main engine room) ,etc..

To change the name of the unit, press on the grey box beside Unit Name, a pop-up keyboard will appear for you to enter the designed texts and numbers.

### Beam path

The beam path is the distance between the transceiver and the reflector in cm. This data input is only relevant, if the user wishes to convert the opacity signal [%] to [mg/m<sup>3</sup>]. As default this function is deactivated. Activation requires a software change.

### Alarm level

Alarm level is default set at 2 % opacity. The alarm level can be freely configured upon the requirement of each application.

Note that the monitor and control unit will always provide a warning alarm which is 50% of the Alarm level. During a normal operation, this warning can be interpreted as a lens cleaning warning.

### Alarm Delay

Alarm delay is the delay time in second for the alarm to be activated.

### Alarm group

The system has two alarm groups: Group 1 and Group 2. The alarm outputs are configured as follows:

Alarm Output	Alarm Group	Alarm level
Alarm relay 1	Group 1	Warning level
Alarm relay 2	Group 1	Alarm level
Alarm relay 3	Group 2	Warning level
Alarm relay 4	Group 2	Alarm level

Thus by setting Alarm Group for each sensor, you configure which alarm outputs are connected to that sensor.

### 4.2.6 System Setup

By pressing System on the Sensor Setup Menu of any sensor, the general System Setup Menu shown on Figure 4-22 will appear.

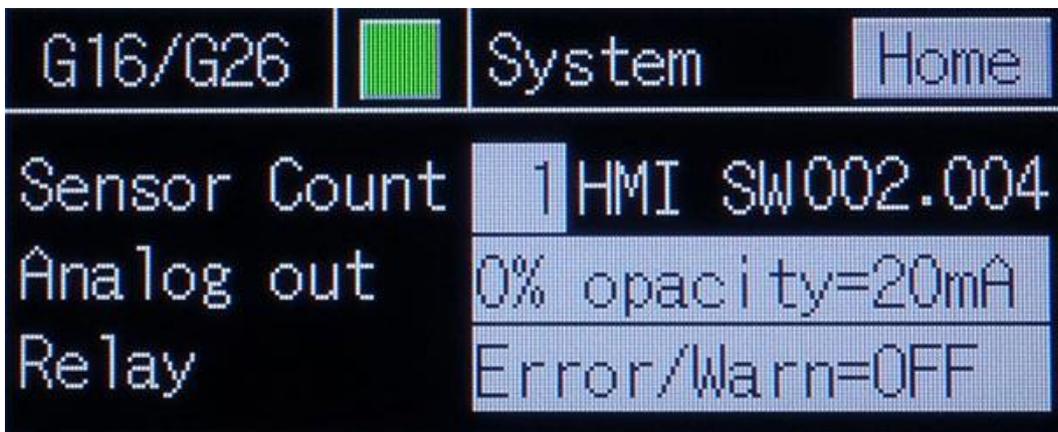


Figure 4-22: System Setup

The menu displays the software version of the control and monitoring unit.

It has a function button:

- Home: to go back to the home menu

The following parameters of the system can be configured in this menu:

### Sensor count

The sensor count is the total number of the monitoring points, i.e. to total number of the transceiver/reflector units to be controlled.

### Analog out

Analog output signals can be configured as follows:

Range	Setting
0% opacity = 4 mA 100% opacity = 20 mA	0% opacity=4 mA
0% opacity = 20 mA 100% opacity = 4 mA	0% opacity=20 mA (default)

### Digital out

The alarm digital output signals can be configured as follows:

Output Signal at Active Warning or Alarm	Setting
Digital output of 0 V	Error/Warn=0V (default)
Digital output of 24 V	Error/Warn=24V

## 5 Calibration

### Note

ZERO and SPAN are adjusted to produce the desired output range covering the lightest and darkest sensing conditions.

ZERO: 0% Opacity = 100% Transmission = All light Transmitted (Clear)

SPAN: 100% Opacity = 0% Transmission = No light Transmitted (Dark)

During ZERO calibration, all possible obstructions to the light beam (such as oil mist, smoke or dust) must be absent in the atmosphere between the transceiver and the reflector.

### 5.1 Zero calibration

First, ensure there are no obstructions to the light beam.

Then, press and hold ZERO until all blue signal LEDs illuminate. Alarm & warning LEDs are ON.

After releasing ZERO, the first and last signal strength LEDs on the far left and far right will turn ON (on firmware version 2.5 or newer). Auto span calibration is available. Please see the next section.

### 5.2 Auto Span calibration

For firmware version 2.5 or newer, the transceiver will automatically store a Span calibration if the beam of light is blocked for at least 1 second (within 60 seconds after Zero calibration is completed). The transceiver interface before the auto span calibration has been accepted will be indicated as shown in Figure 5-1



Figure 5-1: Auto span calibration ready to start after the zero calibration is complete

The transceiver interface will appear as shown in Figure 5-2 , after a valid Span calibration meaning the Auto Span Calibration is registered. The interface will continue to show this until timeout of the Auto span.



Figure 5-2: Laser beam has been blocked – Auto Span calibration registering

Once the Auto Span Calibration has been accepted, the transceiver interface will appear as shown in Figure 5-3. The final step is to remove unblock the beam of light for the system to return to the normal operation.



Figure 5-3: Auto Span Calibration accepted – now unblock the beam of light

The Auto Span Calibration value will be stored to the memory of the transceiver when the timeout period of 60 seconds has passed.

Please note, the beam of light still needs to be blocked – this feature only eliminates the need of pressing the SPAN button, while blocking the beam. This will, thereby give the operator the possibility to block the beam in installations, where this is not possible, while standing beside the transceiver.

It is also possible to perform a manual Span Calibration. Please check the next section.

### 5.3 Manual Span calibration

A manual Span calibration might be considered as another possibility beside an auto Span calibration.

First, block the light beam (e.g. by mounting the AUDIT Target - 100% Opacity (part no. 02947) right after the transceiver. The alarm and warning LEDs turn ON, when the beam is blocked. Alternatively use a hand to block the beam.

Then press and hold SPAN until all blue signal LEDs illuminate.

After releasing SPAN, the first signal strength LED (on the far left) will turn ON. The alarm and warning LEDs will remain ON, as shown in Figure 5-3.

Remove the AUDIT Target for the light beam to return to normal operation. Within a few seconds, the last signal strength LED (on the far right) will turn ON and the warning and alarm LEDs will turn OFF. The transceiver interface will indicate as shown in Figure 5-4, meaning the entire calibration process is complete.



Figure 5-4: The transceiver in normal operation mode

If the alarm and/or warning LEDs remain ON after you unblock the light beam this indicates that the unit has not been calibrated successfully. Thus, the calibration must be carried out again, starting with ZERO, then SPAN calibration. Refer to the alarm log if the cause of the failed calibration is not obvious.

## 6 Commissioning

Before starting the system for the first time after completing the installation, please check and confirm that all parts are installed correctly and according to the instructions, and that all the connections are secured. Check and confirm all the electrical connections are correct according to the instructions.

### 6.1 Start of the system

Now you can switch on the power supply, configure, and finally align the transceiver/reflector.

Following actions should be carried out to configure each transceiver:

**Align the transceiver and reflector:** refer to section 4.1.2

**Set unit address:** refer to section 4.1.3

**Save new settings:** refer to section 4.1.4

### 6.2 Calibration

Now you can calibrate the system following the instructions in chapter 5.

### 6.3 Setting of Alarm Levels

Alarm level shall be set up following the requirement of each application. Please follow the instruction to configure alarm level for each transceiver in section 4.2.5 Sensor Setup.

### 6.4 Setting of Signal outputs

Signal outputs (analog and digital) shall be set up following the requirement of each application. Please follow the instruction to configure signal output for the system in section 4.2.6 System Setup.

## **7 Maintenance**

Besides normal cleaning of the lenses, the system does not require any maintenance.

The lenses must be carefully cleaned with a cleaning pad (part no. 02398).

It is strongly recommended to calibrate the system after cleaning the transceiver lens and the reflector (see chapter 5). Please note that any kind of mist must not be present in the section between the transceiver and reflector during calibration.

Cleaning intervals depend on the usual amount of oil, smoke and dust that contaminate the lenses. The accumulation of dirt on the transceiver lens/reflector will result in higher opacity readings and might therefore give false alarms.

The warning alarm can be interpreted as a lens cleaning alarm. When the warning alarm is ON, please clean the transceiver lens and the reflector. If warning alarm is used for another purpose, please make sure to set sufficiently cleaning intervals.

## 8 Troubleshooting

Trouble shooting should always be carried out by trained and certified personnel. The G26 Ambient Oil Mist Detector is connected to hazardous electric voltages, which can cause personal injury if not handled correctly.



Trouble	Possible Cause → Action
No display at all	Incorrect power supply → Check the power supply & fuse – the power supply needs to be connected to the correct voltage. Check power to HMI screen.
Incorrect indication of opacity level	The alignment has changed (e.g. due to vibration or impact) → realign the transceiver and the reflector – this can be checked by following the instruction in section 4.1.2. Lens contaminated with dirt → clean the transceiver lens and the reflector. The transceiver/reflector might have been damaged → replace the defect part Zero and/or span have drifted → recalibrate. Scanning range out of range → Please see the system specification
Incorrect alarm level	Incorrect alarm level settings → change at the control and monitoring unit (see section 4.2.3).
No alarm despite high opacity between the transceiver & reflector	Incorrect alarm level settings → change at the control and monitoring unit (see section 4.2.3). Damaged/faulty parts → replace the respective part.
False alarm	Opacity is not only caused by oil mist but also by dust and smoke → check there is no contamination in the environment
Alarm despite no opacity between the lenses (multiple transceiver)	More than 1 transceiver with the same unit address → check all unit address are unique (see section 4.1.3).

## 9 Spare Parts

Spare parts are not included in the standard delivery. Spare parts can be ordered when necessary. When ordering spare parts, please mention the serial number of the equipment, which you can find on the label of the equipment.

Part No.	Part Description	The specific appearance of the parts list is subject change without notice; the function however will not change
02915	G26 Transceiver module assembly	
02870	G26 Reflector module assembly	
02974	G26 Control & Monitoring Unit 110-240 VAC	
02907	G26 Control & Monitoring Unit 24 VDC	
02905	Junction box	
03163	Cable with multi - connector	
00493	Fuse	

Part No.	Part Description	The specific appearance of the parts list is subject change without notice; the function however will not change
02892	G26 Ambient Oil Mist Detector Instruction Manual	
<b>Optional</b>		
01057	Alarm annunciator for panel mounting	
02398	Cleaning pads	
02947	Audit Target 100% Opacity (+/- 2% of full range) - G26	
02949	Audit Target 22% Opacity (+/- 2% of full range) - G26	
02950	Audit Target 8% Opacity (+/- 2% of full range) - G26	

Other optional equipment – remote digital display, LED buzzer, visualization and recording system... can be supplied upon request.

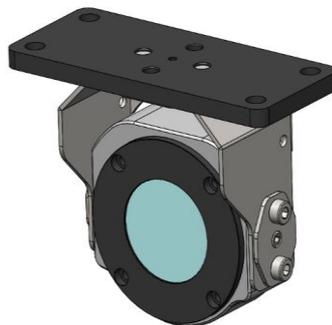
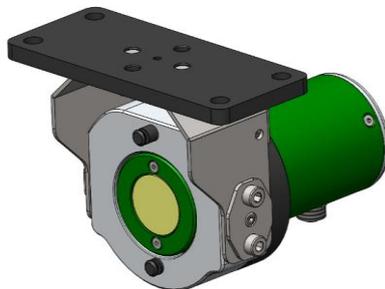
## 10 Maintenance instruction

System Type	G26 Ambient Oil Mist Detection System	MI26-0001	
<b>Task:</b>	<b>Cleaning of Optical Lenses</b>		
<b>Task description:</b>	This instruction identifies cleaning optical lenses. Cleaning of optical lenses must be carried out by a skilled technician.		
Difficulty 1-5	Overhaul Interval	Estimated Time Consumption	
	See note in the bottom of the page	5 min	
<b>Spare Parts</b>		<b>Tools</b>	
<b>Part no:</b>	<b>Description:</b>	<b>Qty.</b>	<b>Item:</b>
02398	Cleaning Pads	2	None

### Instructions

#### Procedure

Cleaning the lenses with the cleaning pads



**Notes:** Cleaning intervals depend on the usual amount of oil, smoke and dust that contaminate the lenses. The accumulation of dirt on the transceiver lens/reflector will result in higher opacity readings and might therefore, give false alarms.

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