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VISATRON®

**Oil Mist Detectors
VN115/87plus EX**

Operation Manual

Part-No. 180081



IACS UR M67 type approved

**SCHALLER
AUTOMATION**



About this Manual

This operation manual was designed to answer your questions concerning the handling, operation and maintenance of the Oil Mist Detector (OMD) VISATRON® VN115/87plus EX. It contains no details about repairs.

The operating instructions are applicable for:

VN115/87plus EX

Should you encounter any interruption or breakdown of your VISATRON® OMD device during operation, please contact your local representative (refer to chapter 10 'Service Partners') or Schaller Automation, Industrielle Automationstechnik GmbH & Co. KG directly. The repair of OMD devices should be carried out by Schaller Automation directly. You can expect safe and reliable operation of your OMD only when the device is operated in accordance with this manual.

Please take note of the following:

- Please read this manual thoroughly and acquaint yourself with the correct installation, operation and maintenance of your VISATRON® VN115/87plus EX device.
- Installations of the VISATRON® VN115/87plus EX devices have to be in accordance to the IACS UR M10 if applicable.
- Use the VISATRON® VN115/87plus EX devices only for the purpose described in the operation manual.
- Incorrect maintenance and handling errors may cause possible device failure or an unsafe operating environment.
- The VISATRON® VN115/87plus EX devices may only be used by authorised staff.
- This operation manual must be available at the place of installation at all times.

Terms and conditions of sale

The standard terms and conditions of sale of SCHALLER AUTOMATION shall apply to all VISATRON® and related products.

SCHALLER AUTOMATION Industrielle Automationstechnik GmbH & Co. KG warrants that under proper use, handling and maintenance OMD VISATRON® VN115/87plus EX is free from defects in material, design and/or workmanship. Claims of buyers/operators, in particular compensation for damage, which does not arise at OMD VISATRON® VN115/87plus EX itself or for natural wear and tear of consumable supplies, e.g. filters etc., are excluded. SCHALLER AUTOMATION Industrielle Automationstechnik GmbH & Co. KG is not responsible for defects, which arise as a result of:

- a) natural wear and tear, improper commissioning, improper use/handling, use of unsuitable power supply, welding processes on the engine as well as non-observance of commissioning, installation, operating and service instructions as given in this Operation Manual







- b) components and design other than the OMD VISATRON® VN115/87plus EX
- c) alterations or modifications of the OMD VISATRON® VN115/87plus EX carried out by the buyer/operator or third parties without written authorization of SCHALLER AUTOMATION Industrielle Automationstechnik GmbH & Co. KG
- d) incorrect combination of devices and/or components or operation of devices and/or components which are not certified to be compatible or not permitted by the manufacturer - SCHALLER AUTOMATION Industrielle Automationstechnik GmbH & Co. KG



Safety instructions

The VN115/87plus EX devices are manufactured according to the high quality standards of SCHALLER AUTOMATION and must pass stringent factory tests. In order to keep the device in a smooth and problem free operation, the user has to take note of the safety hints and warnings. In the instruction manual they are marked with the following symbols.

Used symbols	
	CAUTION! Do not ignore the text in this box. Personnel safety can be endangered or the device can be damaged.
	WARNING! The marked text contains important information.
	The marked text contains only a hint for faster processing.
	EX-Symbol contains important interactions about Explosion proof. CAUTION! Personnel safety can be endangered!

	CAUTION! Unplug the OMD during welding processes on the engine.
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Reset of Oil Mist Alarms



CAUTION!










Use a monitoring device at a safe location (e.g. ECR) to check for the actual oil mist concentration that is requested by the IACS. In case of an Oil Mist Alarm, Schaller Automation strongly recommends to approach the engine only after indicated oil mist concentration (LED chain) has lowered to half of its bar indication (VISATRON®-device and Remote Indicator II).

Follow the instructions of engine builder, ship yard and ship owner!

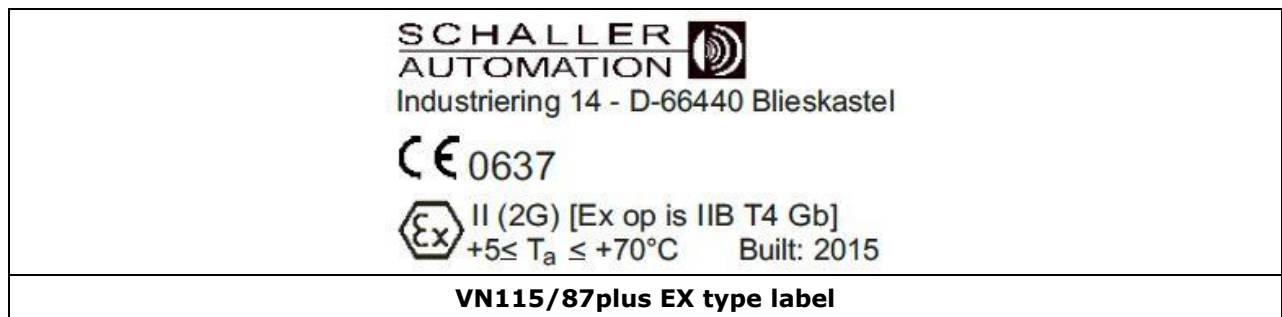
In case of a High Oil Mist Alarm the Detector can be reset if the Oil Mist Concentration has lowered below the Alarm level.



Advice for secure operation in potentially explosive atmospheres

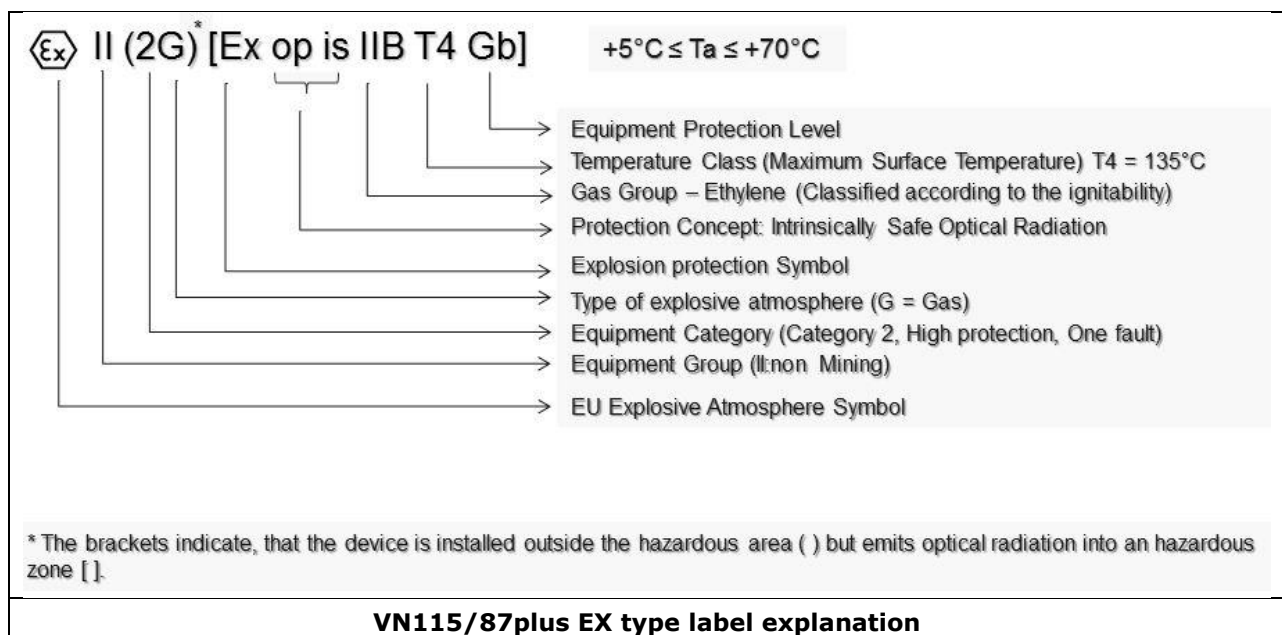
Intended purpose	
	Operation in internal potentially explosive atmospheres corresponding classification II-/2G (group II, category 2G, operating resource for gas atmosphere). The requirements of EN60079-0:2012+A11:2013 and EN60079-28:2007 are met)
	Labelling: II (2G) [Ex op is IIB T4 Gb]
	Permissible ambient temperature (during intended purpose): Ta: +5°C ≤ Ta ≤ +70°C
	Typical gasses of the ignition protection T4: T4 maximum surface temperature ≤ 135°C Methane, acetone, ammonia, methanol, propane, toluol, acetic acid, city gas, hydrogen, ethanol, n-butane, ethylene, acetylene, automotive gas, diesel, heating oil, hydrogen sulphide, acetaldehyde, diethyl ether.
	Do always connect the OMD's exhaust tube back to the engine's crankcase. The correct suction pressure in the measuring head should be of 60mmWC!
	In order to ensure the correct function of the OMD, the pressure inside the engine's crankcase shall be limited to +/-500mmWC! If the pressure is higher (or lower), Schaller Automation has to be contacted!
	Warning! The OMD has not to be cleaned with a steam cleaner, high-pressure cleaner or solvent!
	Warning! Do not interchange components of VN115/87plus (non-EX) with VN115/87plusEX. Especially the detector's baseplate shall be of type VN115/87plusEX.
	Important: The device is not intended to be mounted in an EX area, it is designed to extract gases from a potentially explosive atmosphere (e.g. the crankcase of a gas engine).





Only expert staff is allowed to mount, connect and put into operation the devices. The staff must have knowledge of the ignition protection, instructions and prescriptions of the operating resources in EX-area.

Check, if the classification (see above "labelling" and labeling on the device) is practical for this case of operation!



EC Declaration of Conformity

We, the manufacturer

SCHALLER AUTOMATION
Industrielle Automationstechnik GmbH & Co. KG
Industriering 14
D-66440 Blieskastel
Germany
Tel.: 06842 / 508-0
Fax: 06842 / 508-260

declare on our own responsibility, that the product:

Kind of equipment: **Oil Mist Detector**
Type-designation: **VISATRON® VN115/87plus EX**
Marking: **CE 0637 Ex II (2G) [EX op is IIB T4 Gb]**

to which this declaration relates exclusively used for the detection and signaling of oil mist in diesel aggregates and complies with the following EU-directives

Machinery directive 2006/42/EC
EMC directive 2004/108/EC
ATEX Equipment Directive 2014/34/EU

is in compliance with following standards:

EN ISO 4414: 2010
EN 60529: 1991+ A1: 2000+ A3: 2013
EN 55022: 2010
EN 61000-part 6-1: 2007, EN 61000-part 6-2: 2005, EN 61000-part 6-3: 2007+ A1:2011, EN 61000-part 6-4: 2007+ A1:2011
EN ISO 12100: 2010
EN 60079-0: 2012+ A11:2013
EN 60079-28: 2007
CSPRI 16-1
CSPRI 16-2
IACS UR M10: Rev.4 2013
IACS UR M67: Rev.2 2015

A technical documentation is completely available. The operating manual according to the oil mist detectors is available in the original version.

D-66440 Blieskastel, 2016/06/15



Stephan Schaller
- Managing Director -



Table of Contents

1	Introduction and functional overview	10
2	Installation instructions	14
2.1	Mechanical installation	14
2.1.1	Basics	14
2.1.2	Pipe dimensions	16
2.1.3	Installation of pipe siphons	17
2.1.4	Installation of the siphon block connection units	19
2.1.5	Suction funnels in the crankcase compartment	20
2.1.6	Compressed air connection	21
2.1.7	Air cleaner module	21
2.2	Electrical installation	22
2.2.1	VISATRON® VN115/87plus EX device	22
2.2.2	Connection of monitoring devices	25
2.2.3	Schematic electrical wiring diagram	27
3	Commissioning	28
3.1	Adjusting or checking the suction pressure	28
3.2	Filling of siphon blocks VN180 for VN115/87plus EX system with oil	29
3.3	Filling of pipe siphons for VN115/87plus EX system with oil	30
3.4	Adjusting the sensitivity of the OMD	31
3.5	Commissioning check list	32
4	Operating instructions	33
4.1	Display	33
4.2	Reset of Oil Mist Alarms	35
5	Troubleshooting	36
5.1	Clean fresh air bores	37
5.2	Clean infrared (IR-) filter	37
5.3	Exchange air filters in the measuring head	38
5.4	Exchange air filter cartridge in air cleaner module	38
5.5	Exchange measuring head	39
5.6	Exchange bellows and suspension-system	41
5.7	Measuring head fuses	43
5.8	Check for earth fault problem	44



6	Maintenance procedures	46
7	Functional test	47
7.1	On board test	47
7.2	Factory test at engine builder with smoke generator on VN115/87plus EX installations	49
7.3	Additional pressure measurement on VN115/87plus EX installations	50
7.4	Factory test at engine builder with fog machine on all installations	51
8	Optional Spare Parts and Accessories	53
8.1	Optional Service Box	55
8.2	VN-Smoke Test Box	57
9	Technical data	59
10	Service Partners	62



1 Introduction and functional overview

The newly developed VISATRON® VN87plus EX Oil Mist Detector (OMD) from SCHALLER AUTOMATION protects large diesel engines against oil mist explosion, caused by spontaneously occurring oil mist. It is part of a safety system that secures the life and health of the operating staff and prevents heavy damages to the engine.

SCHALLER AUTOMATION developed this device to meet the IACS UR M10. The VN115/87plus EX is compliant to ATEX 2014/34/EU.

It is not possible to directly monitor all potential sources of oil mist inside a large diesel engine. There are main bearings, large end bearings, pistons, liners, sliders, pumps, camshaft bearings, chains, gears or even tools left behind from installation – all of these parts could produce oil mist e.g. in case of lubrication problems. Therefore the philosophy of SCHALLER AUTOMATION is that only OMD-systems can securely prevent oil mist explosions by detecting the primary origin of danger: the oil mist itself.

The VISATRON® VN115/87plus EX OMD-System uses the approved wear-free suction system to continuously extract the atmosphere of the crankcase compartments and other engine locations. The system works actively and is not simply waiting for oil mist clouds. This ensures proper reaction times from the beginning of oil mist generation to an oil mist alarm.

To avoid false alarms, caused by splash oil, the suction system makes use of Schaller's special suction funnels working independent of the rotation sense of the engine. Additional draining components ensure correct working under all operating conditions. This includes the application in power plants as well as on vessels with their static or dynamic inclinations. False alarms initiated by condensing water vapour are prevented by an integrated heater inside the measuring head housing.

The OMD-System consists of following parts:

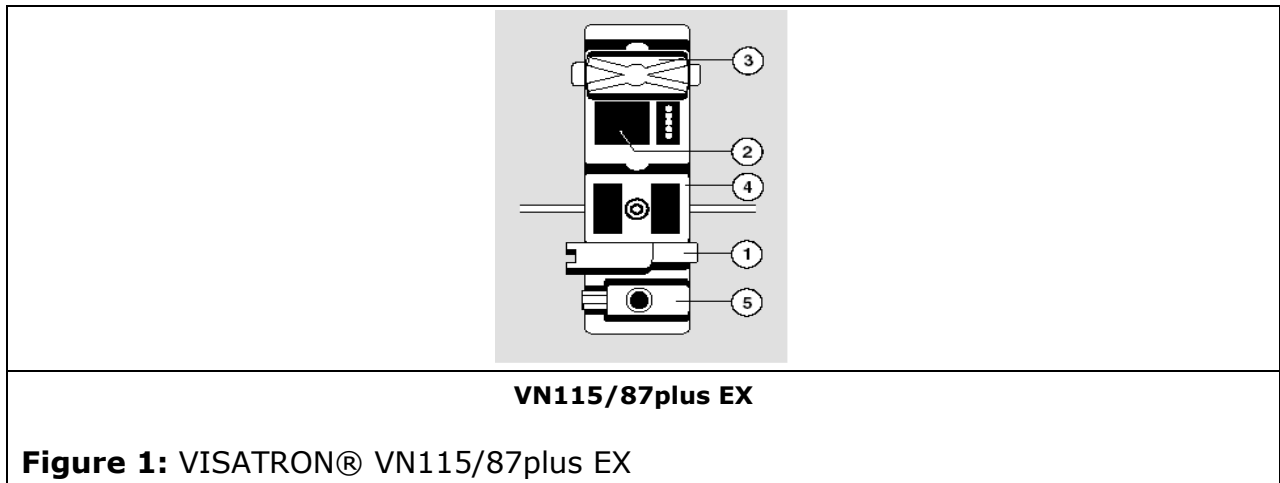
- VISATRON® VN115/87plus EX oil mist detector
- Protection cover
- Suction system including pressure regulator
- Monitoring device (optional)
- Filter for air support / water and oil separator

The VN115/87plus EX (see **Figure 1**) is approved to work and use in potentially explosive atmospheres.

All devices have a measuring head (2) which includes the optical measuring track under the control cover (3) and a display to give the user all important information for normal operations conditions. The measuring head is mounted on a vibration protected base plate.



The negative pressure for the suction system is generated by an air jet pump (1) working with the Venturi principle. The electrical interface is integrated within a socket housing (5). The mating plug contains the Oil-Mist-Alarm button. The device can be connected directly to the engine safety system. The interface includes two Oil-Mist-Alarm outputs, a Pre-Alarm output and a Ready signal.



VN115/87plus EX

The suction system is connected to the common "Connecting Box" (4). This type of oil mist detector is able to detect an oil mist development, without identifying the location of the oil mist source inside the engine.

In normal operation mode the VN115/87plus EX samples the atmosphere of the engine at all suction points in parallel through the suction system to the measuring head.

The VN115/87plus EX offers two alarm levels.

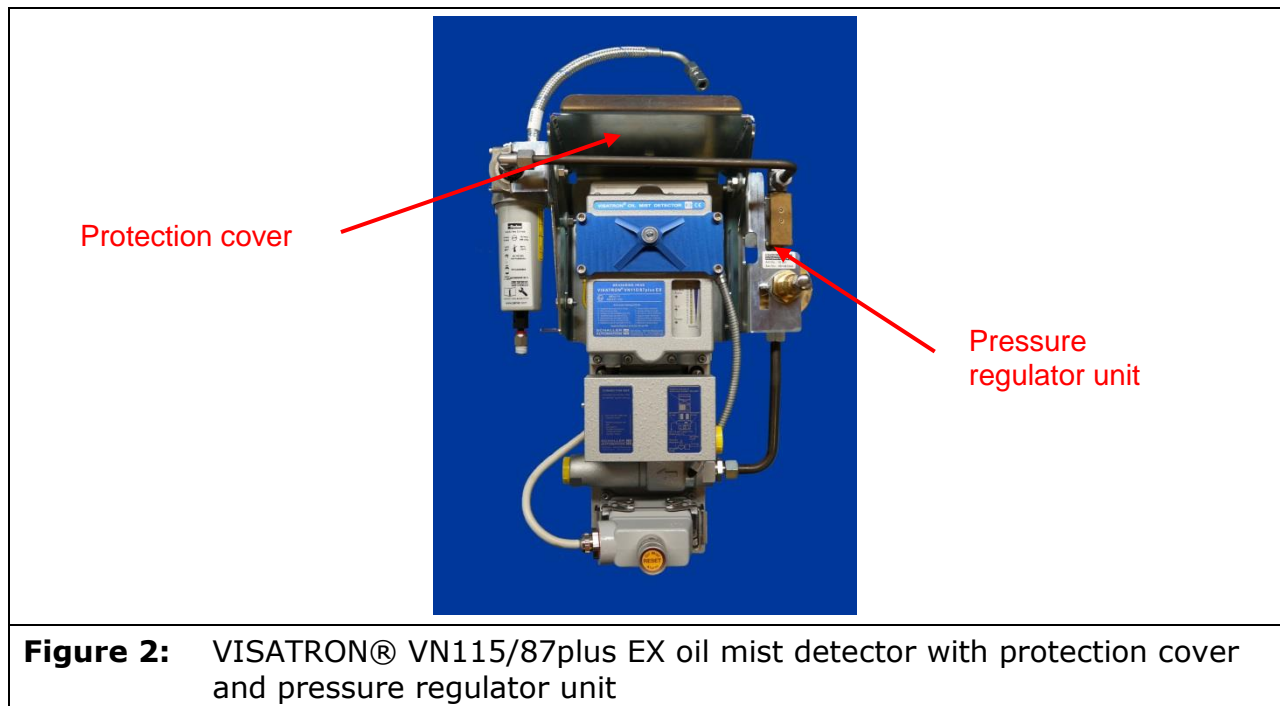
The Main-Alarm level can be adjusted with a switch at the rear side of the measuring head.

The Pre-Alarm will be activated at fix 70% of the Main-Alarm level.

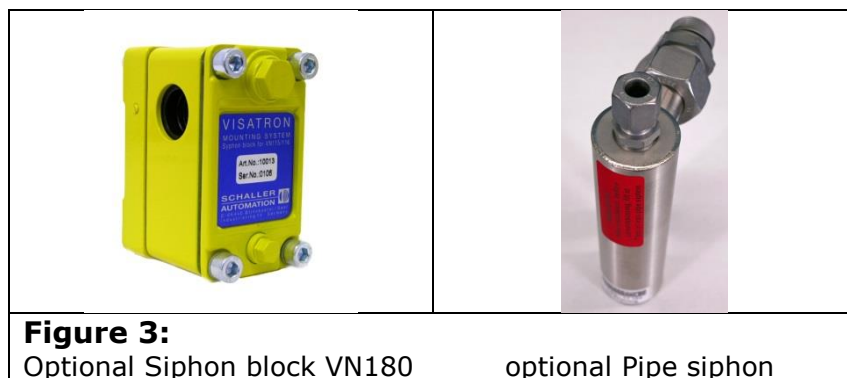
To keep the optical track clean, the VN115/87plus EX use clean scavenging air in front of the filter glasses. This air is derived from the compressed air driving the air jet pump.

The device is integrated in a mounting unit. The scope of supply includes an air cleaner, an additional pressure regulator unit and a protection cover.





The suction system always requires a so called 'suction funnel' (see page 20, **Figure 13**) at each suction point. This prevents the system against incoming splash oil. During normal operation mode of an engine the OMD sucks out a small concentration of oil mist which was generated by blow-by or mechanical spraying. This oil mist may fall out in the suction pipes and must be drained out the pipes. Ideally, drainage flow back ends inside the engine's crankcase.



The best method on a VN115/87plus EX installation to drain the system is to use pipe siphons. Also recommended is the use of siphon blocks.

On 2-stroke engines the crankcase and the combustion chambers are separated by stuffing boxes, which let the crankcase be nearly free of blow-by. Therefore it's also possible to use the suction funnel as draining device. In this case it is necessary to mount the suction pipes with an inclination of greater than 6°.

It is not allowed to blow the air into the engine room!



Caution! The exhaust from the air jet pump must be blown back into the crankcase. It's not allowed to blow the air into the engine room! It could be dangerous for personnel safety, because of the air-fuel-mixture.

Remote monitoring devices:

The OMD device can be connected to Schaller's monitoring devices Remote Indicator II to monitor the oil mist concentration and the status of the OMD device from a safe location as requested by IACS UR M10. The connection to the monitoring devices is realized by a RS485 two-wire bus.



Figure 4: Optional Remote Indicator II

Additionally Schaller realized an integration of the VISATRON® VN115/87plus EX into ship automation systems (e.g. Mega-Guard of Praxis Automation).

Thus, the VN115/87plus EX is a further contribution to safety at sea. Our goal is to avert damage to assets, personnel and the environment.



2 Installation instructions

2.1 Mechanical installation

2.1.1 Basics

There are multiple potential sources of oil mist inside an engine. These are for example defective main bearings, connecting rod bearings as well as piston seizures, chains and covers of pumps. For each of these individual sources you could determine the "optimum" suction point. The result would be a vast number of holes to be distributed over the entire engine. To find out a safe and economic solution to monitor oil mist SCHALLER AUTOMATION recommends the OMDEA-test (Oil Mist Detection Efficiency Approval). In each case the following rules are recommended.



CAUTION! Do not ignore the warnings. The safety of persons can be endangered

Following rules are recommended by SCHALLER AUTOMATION:

- Use at least one suction point per compartment.
- Use always the long version of the suction funnels. This makes the installation independent from the rotation sense of the engine.
- At least one suction point per chain drive or gear drive is necessary.
- Avoid the splash oil disk of the crankshaft bearings.
- Select points in the upper area of the crankcase, as oil mist tends to rise upwards!
- The detection unit has to be placed above the suction points.
- Installation Rules: it is not allowed to make U-bends or kinks in the tubing system.
 - VN115 with pipe siphons: Mount one pipe siphon at each end of the horizontal header pipes, place the pipes a little bit above the suction points and connect the pipes and the engine wall connections with flexible tubes.
 - VN115 with siphon blocks: Use one siphon block at each compartment.
- If possible mount the device on the engine side opposite to the crankcase relief valves, to reduce danger to the crew during a damage situation.
- If possible place the VISATRON® detection unit in the center of the engine to avoid long pipe runs.
- Select only suction points which allow the use of long suction funnels. In this case the installation side is independent from the rotation sense of the engine. Installations without any suction funnels are not allowed.



- If recommended by engine builder, determine an additional suction point at the camshaft bed.

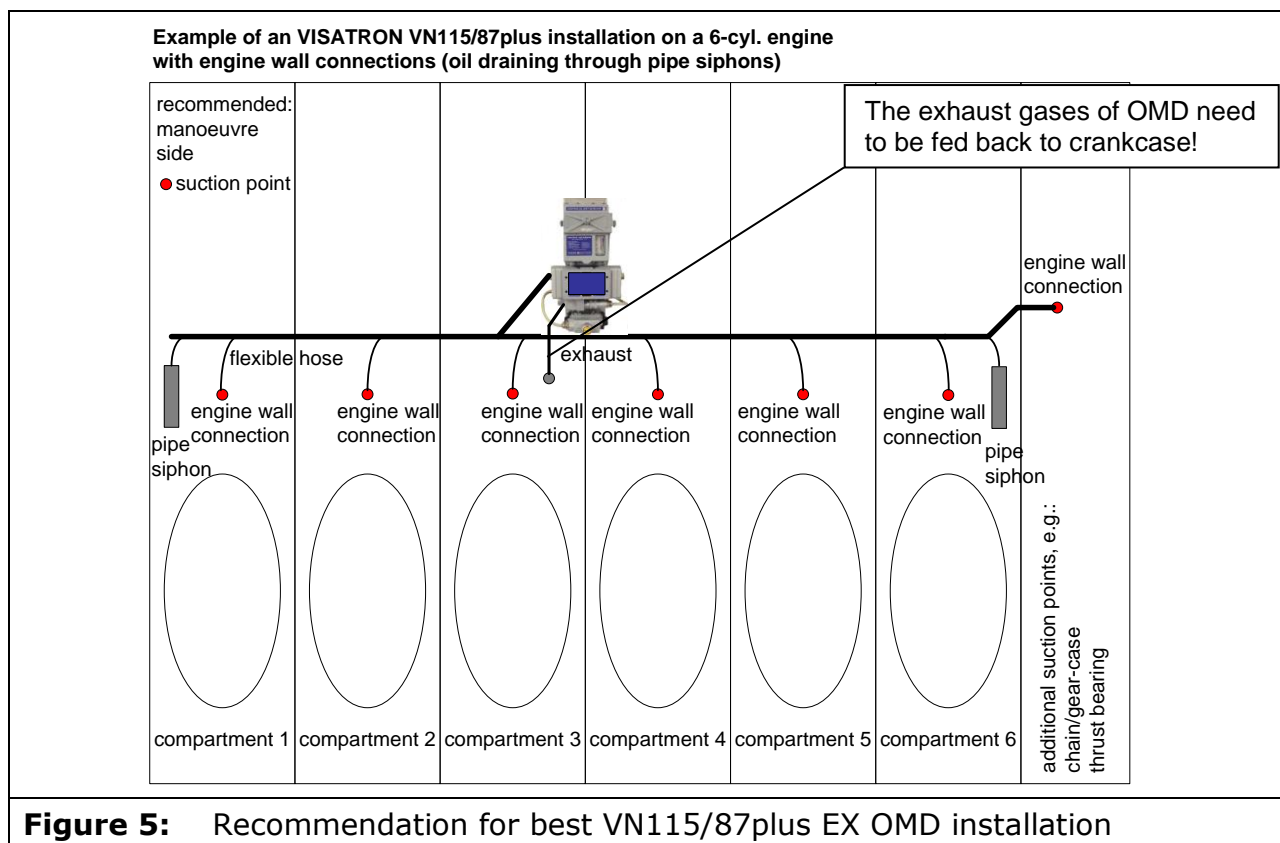
SCHALLER AUTOMATION recommends a final test procedure per engine type called OMDEA (Oil Mist Detection Efficiency Approval).

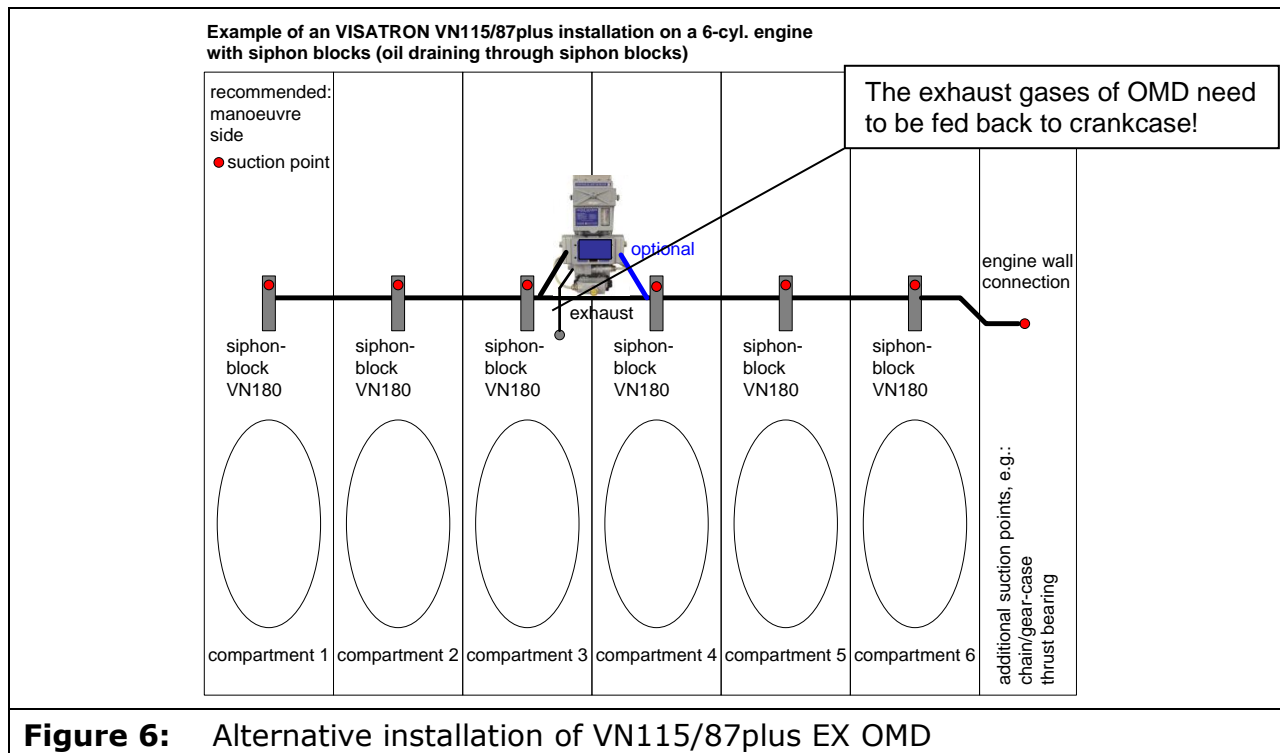
According to the IACS unified requirement M10 the installation drawings have to be approved from engine builder and SCHALLER AUTOMATION. The installations have to be executed in compliance with these drawings and the contents of this manual.



Important: As an engine maker, you need a Declaration of Conformity from the OMD maker

The following figures show typical installation arrangement on a 6 cylinder engine.





2.1.2 Pipe dimensions

- For VN115 standard applications:
 - Seamless steel pipes: 22 mm outer diameter, 2 mm wall thickness
 - Flexible hoses: inner diameter not less than 6 mm

The length of exhaust air pipe (outlet of the venturi injector) should be limited to max 4m. If a longer tube is required, please contact Schaller Automation. The inner diameter has to be ≥ 18 mm. U-bends and kinks are forbidden.

All installation solutions must have written agreements by SCHALLER AUTOMATION as required by IACS UR M10.



2.1.3 Installation of pipe siphons

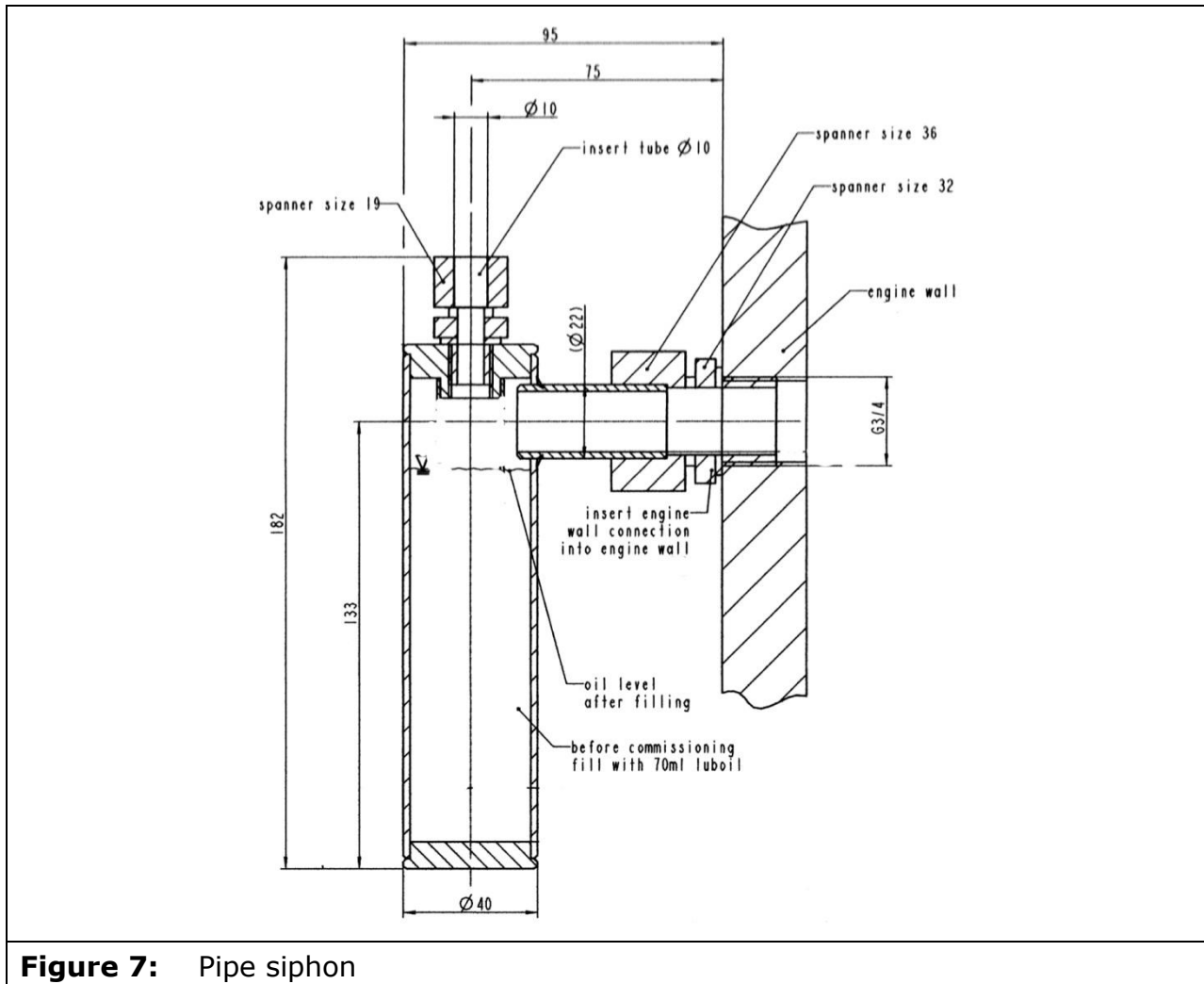


Figure 7: Pipe siphon

- Mount the engine wall connection into the G3/4" thread with 110 Nm torque
- Put the pipe siphon in the hole
- Fix the clamping nut
- Fill the pipe siphon with oil (see chapter 'commissioning')
- Fix the flexible tube on the top fitting



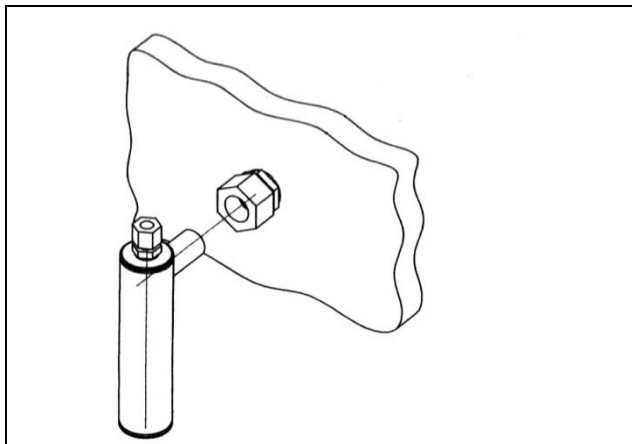


Figure 8: Pipe siphon at engine wall



Figure 9: Image of pipe siphon

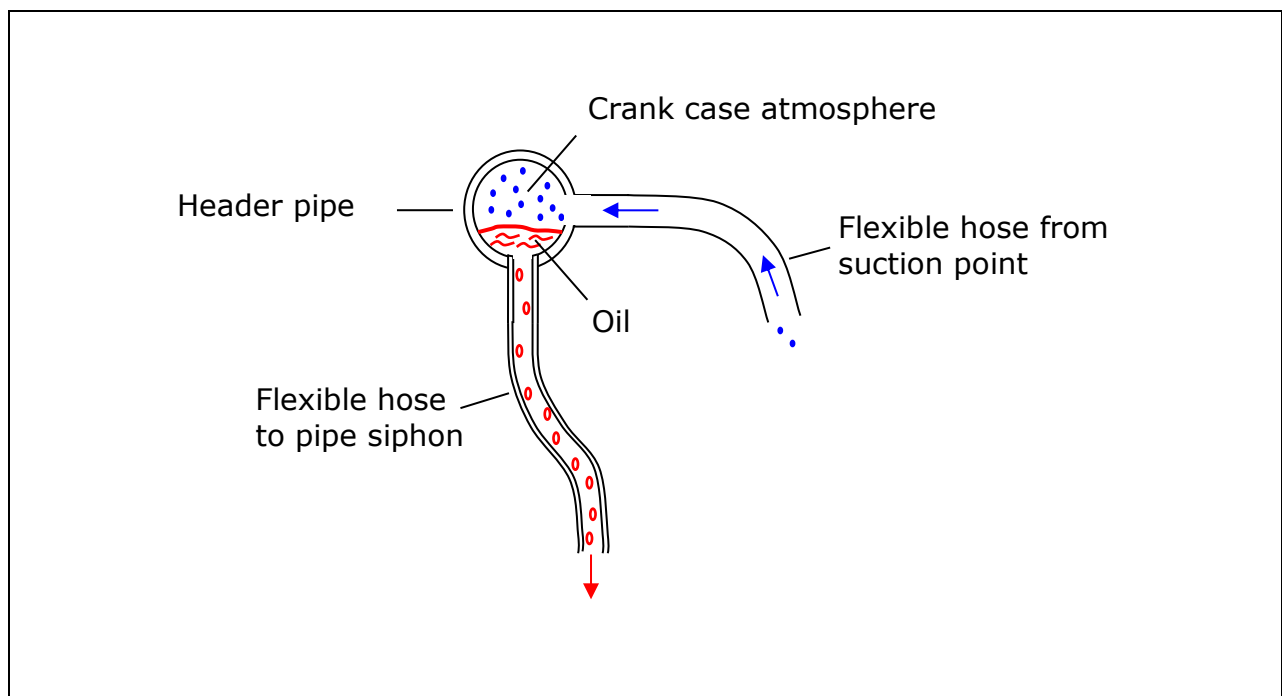


Figure 10: Oil draining principle

2.1.4 Installation of the siphon block connection units

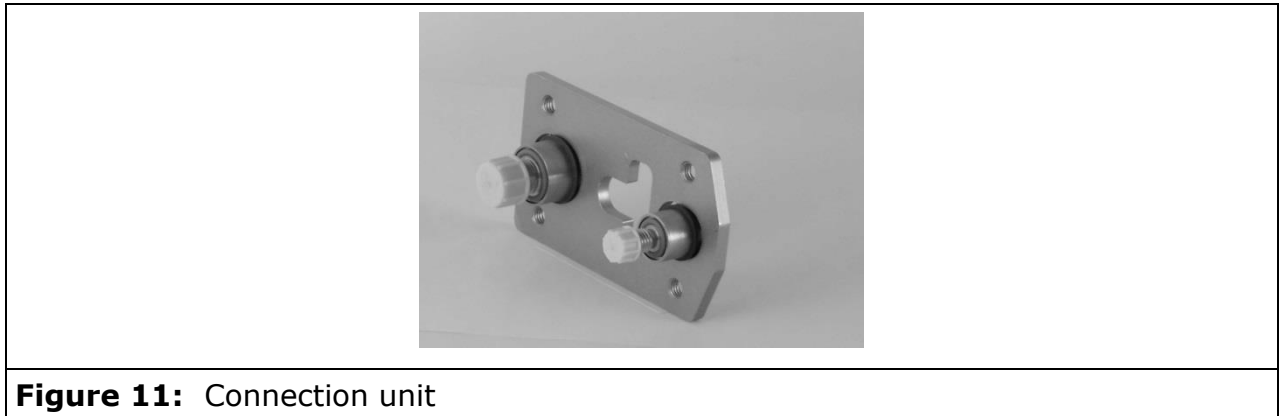


Figure 11: Connection unit

Consider the following points:

- Take note of the drilling template (made of paper, included with the connection units)
- Drill through
- Seal all threads with 'Loctite 572'
- Max. torque = 30 Nm

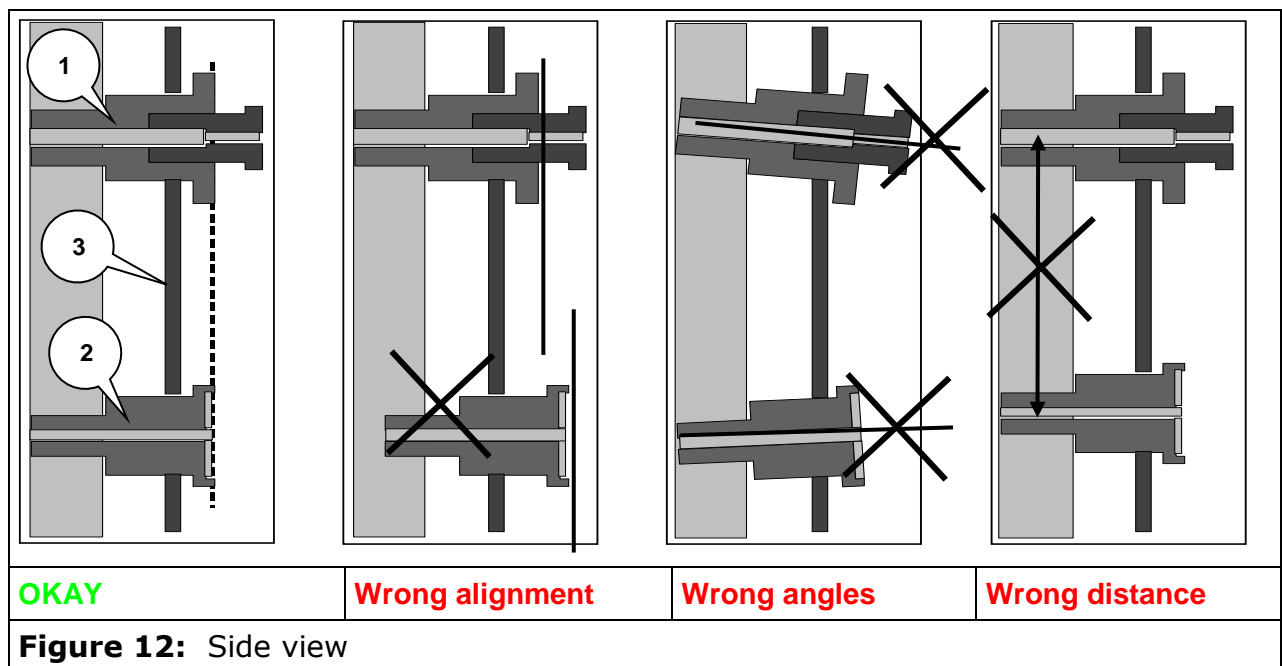


Figure 12: Side view

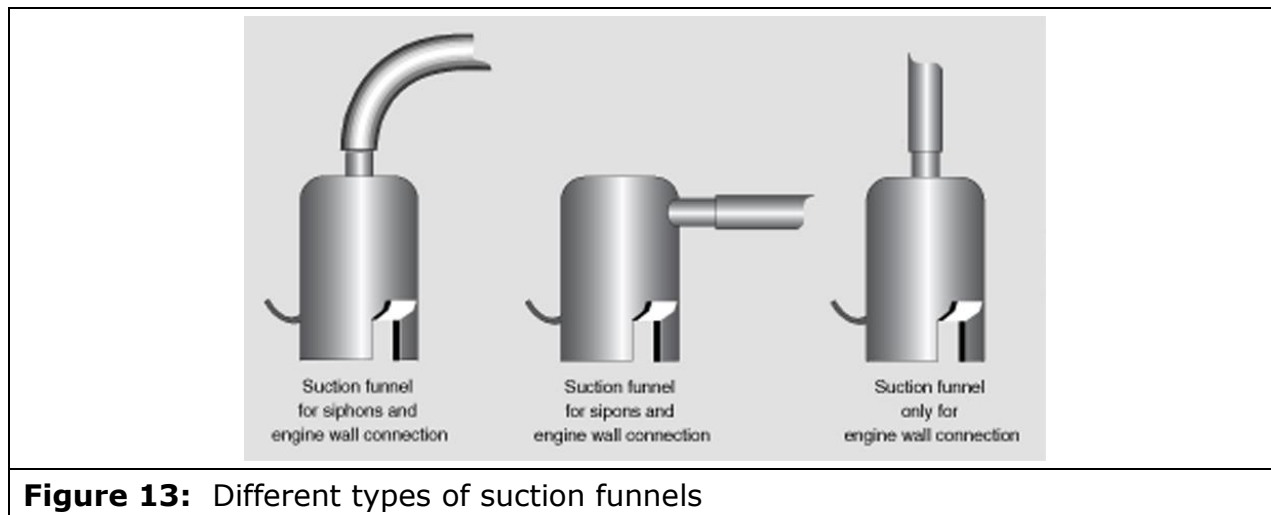
- Avoid wrong alignment, wrong angles and incorrect distances (see **Figure 12**)
- Insert the suction funnel from the crankcase side into the siphon block, align it in a vertical position (see **Figure 13**) **with the opening at the bottom** and fix the small clamping nut.

2.1.5 Suction funnels in the crankcase compartment

The suction funnels have to be fitted in such a way that flooding by splashing bearing oil or returning piston cooling oil is avoided (see **Figure 13**).

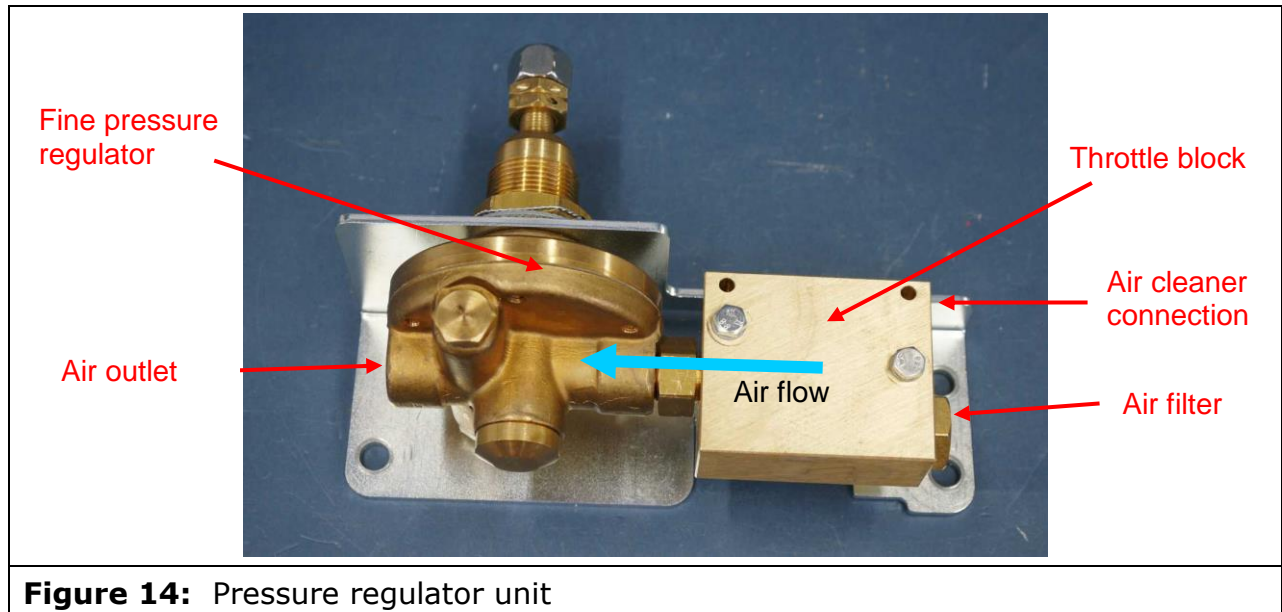


CAUTION! Make sure funnels do not interfere with rotating or moving parts of the engine.



2.1.6 Compressed air connection

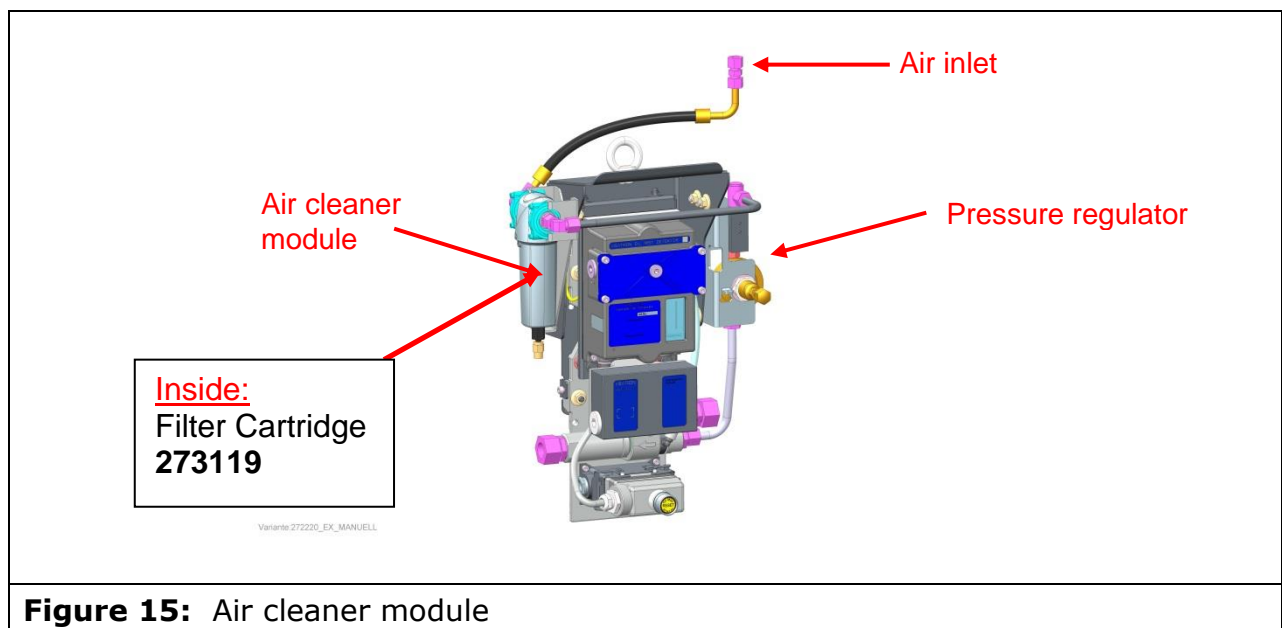
The SAB pressure regulator (see **Figure 14**) is connected to the Air cleaner module.



2.1.7 Air cleaner module

Do always connect OMD to engine's control air system, pressure range 2 - 15bar. A **dry and clean (ISO8573-1:2010 – 6-4-4)** air with low humidity/oil contamination is of high importance.

The Air cleaner module has an integrated float lever, when the filling level should be too high, it will release the fluid automatically.



2.2 Electrical installation

2.2.1 VISATRON® VN115/87plus EX device

The electrical terminal is inside the socket housing (see **Figure 16**) on the base plate of the VISATRON® device. The pin assignment is specified in **Figure 19**. The cable entry points are located on either side.

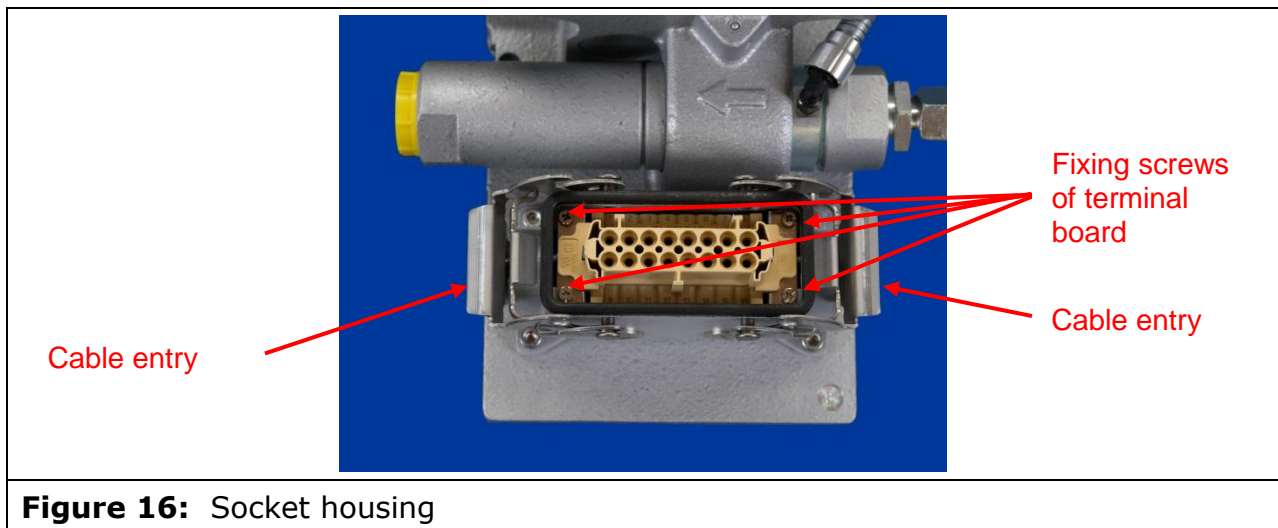


Figure 16: Socket housing

According to the pin assignment of **Figure 19** connect the VISATRON® device to the 24 Volts power supply. The supply voltage can be potential free or not. The earth connection between the OMD and the engine is carried out by the fixings screw of the base plate or protection cover.

Additionally connect one alarm relay output to the safety system of the engine. As specified by the classification societies the 'Alarm' relay must be connected either to the shutdown or to the slow-down input.

During normal operation the alarm relay is switched off. In case of an oil mist alarm the relay is switched on. To monitor this output, a wire break resistor is installed (between pin 7 and 8 and between 15 and 16 as shown in **Figure 19**).

To replace the wire break resistors the measuring head has to be dismounted. The resistors (see **Figure 18**) are located on the rear side under the plastic cover (see **Figure 17**). The plastic cover can be removed via the screws. Do not forget to write the resistor value on the plastic cover with a permanent marker.

Also placed on the rear side two jumpers are available to select the interface mode: RS485 bus or 4- 20mA output of the relative opacity at pin 11 and 13.

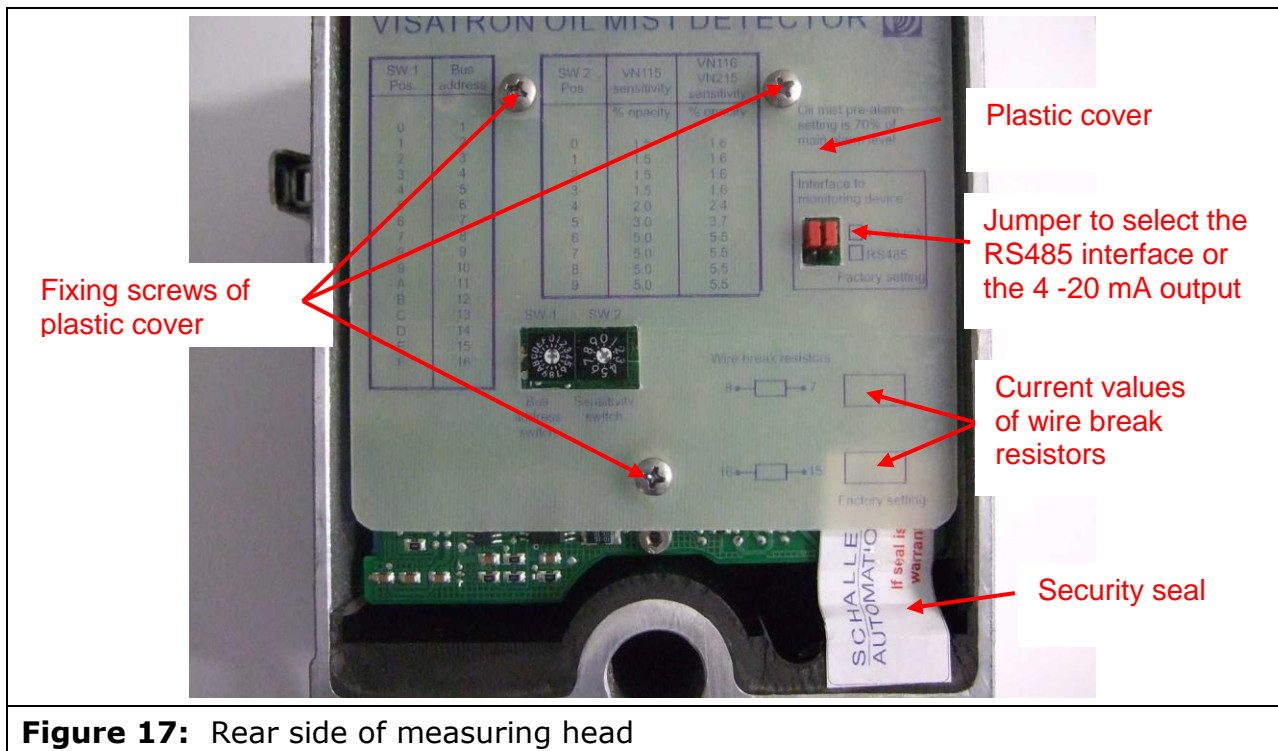


Figure 17: Rear side of measuring head

Second 'Alarm' output and 'Ready' output must be connected to separate channels on vessel's or power plant's alarm monitoring system. The 'Ready' relay is switched on when OMD is in correct operation (see **Figure 19**).

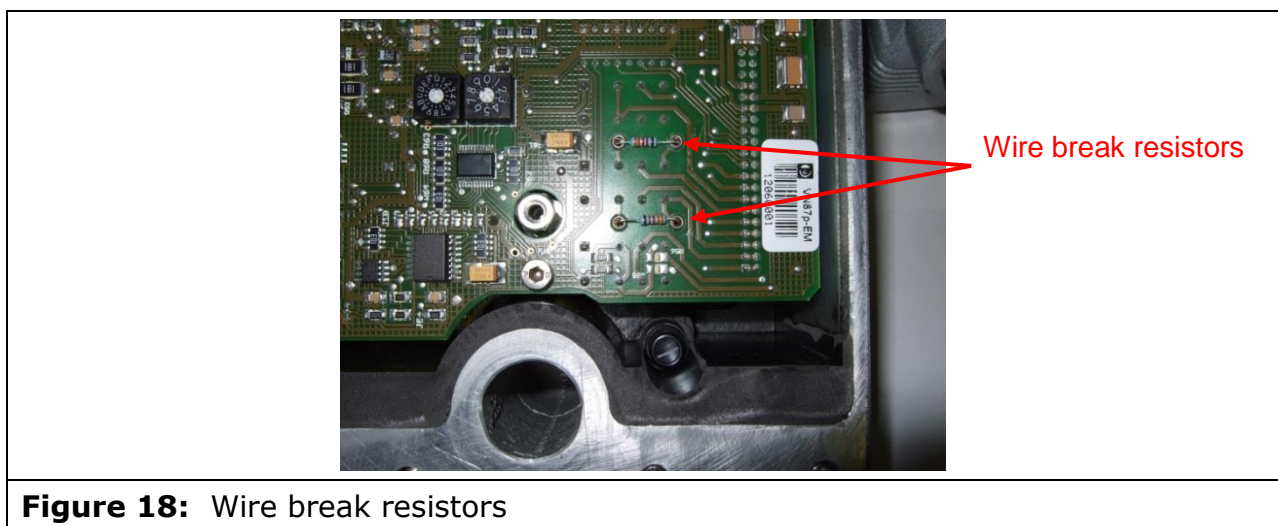


Figure 18: Wire break resistors

The optional pre-alarm output can be used to initiate either a pre-warning signal or slow-down signal. The pre-alarm relay is switched on when the oil mist concentration has risen up to 70% of the Oil Mist alarm level. Please note that depending on the characteristics of an oil mist occurrence, the time between 'Pre-alarm' and 'Main Alarm' could be only a fraction of a second.

Shown is non-operated relay condition

Description	Pin		Description
24 Volts DC +	1	9	'Pre-alarm' relay
24 Volts DC GND	2	10	'Pre-alarm' relay
'Ready' relay closed	3	11	RS485 B (opt. 4 - 20 mA -)
'Ready' relay open	4	12	Reserved, do not use
'Ready' relay common	5	13	RS485 A (opt. 4 - 20 mA +)
'Alarm' 1 relay closed	6	14	'Alarm' 2 relay closed
'Alarm' 1 relay open	7	15	'Alarm' 2 relay open
'Alarm' 1 relay common	8	16	'Alarm' 2 relay common

Figure 19: Pin assignment

- We recommend connecting 'Alarm' 1 to the alarm system and 'Alarm' 2 to the safety system.
- Alarms 1 and 2 are getting switched simultaneously by same relay.
- The relay outputs are potential-free.
- In case of a High Oil Mist Alarm, contacts 7 and 8 as well as 15 and 16 are closing
- In case detector goes into 'READY'-Mode, contacts 4 and 5 are closing
- In case Pre-Alarm is activated, contacts 9 and 10 are opening. Pre-Alarm will be switched as soon as 70% of High Oil Mist Alarm level is reached.

Power supply	18 – 31.2 Volts DC, max. 2 A
Nominal voltage	24 Volts DC
Relay Outputs	Max. 60 Volts DC, 1 A
Internal fuse	2 A semi time lag

Table 1: Electrical specification

2.2.2 Connection of monitoring devices

As required by IACS UR M10 the OMD device can be connected to Schaller's remote monitoring device Remote Indicator II to monitor the oil mist concentration and the OMD status from a safe location.

The connection to the monitoring device is accomplished via a RS485 two-wire bus. In case of a Remote Indicator II the connection is only a two point link. The bus system at the OMD device must be terminated by the resistor. It is integrated in the terminator (see **Figure 21**), which is supplied with the monitoring device.

The used communication cable must be twisted pair and shielded. We recommend LAPPKABEL UNITRONIC-FD CP (TP) plus UL-CSA, AWG20. The total bus length is limited to 400 m. The VISATRON® device cable entry (see **Figure 20**) at the VISATRON® device is designed for cable diameter between 7.5 and 10.0 mm.

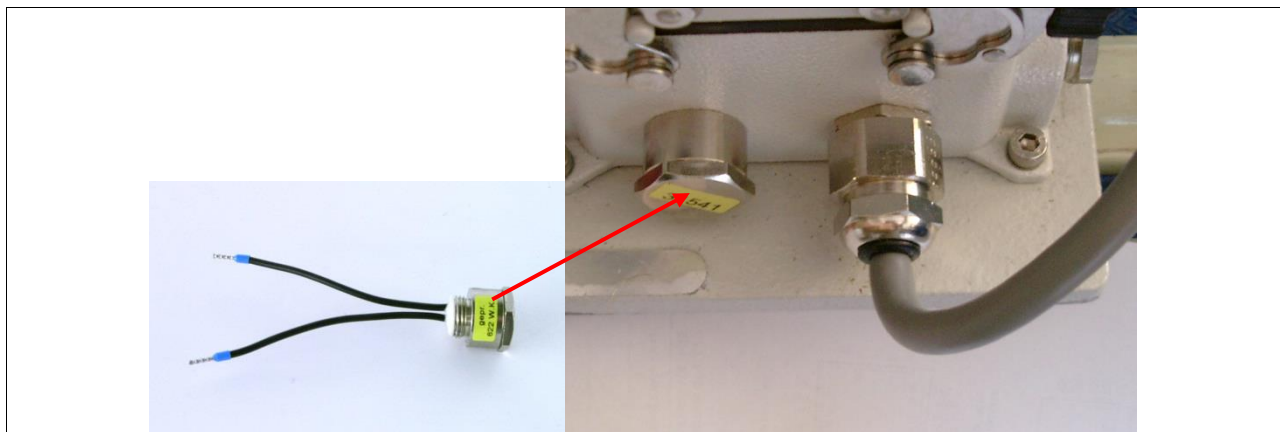


Figure 20: Cable entry and bus-terminator on the bottom side of the VISATRON® device

The connection between the OMD device and the monitoring device for standard applications is shown in the following wiring diagram (see **Figure 21**)



WARNING! The shield must be connected directly at the cable grommet.



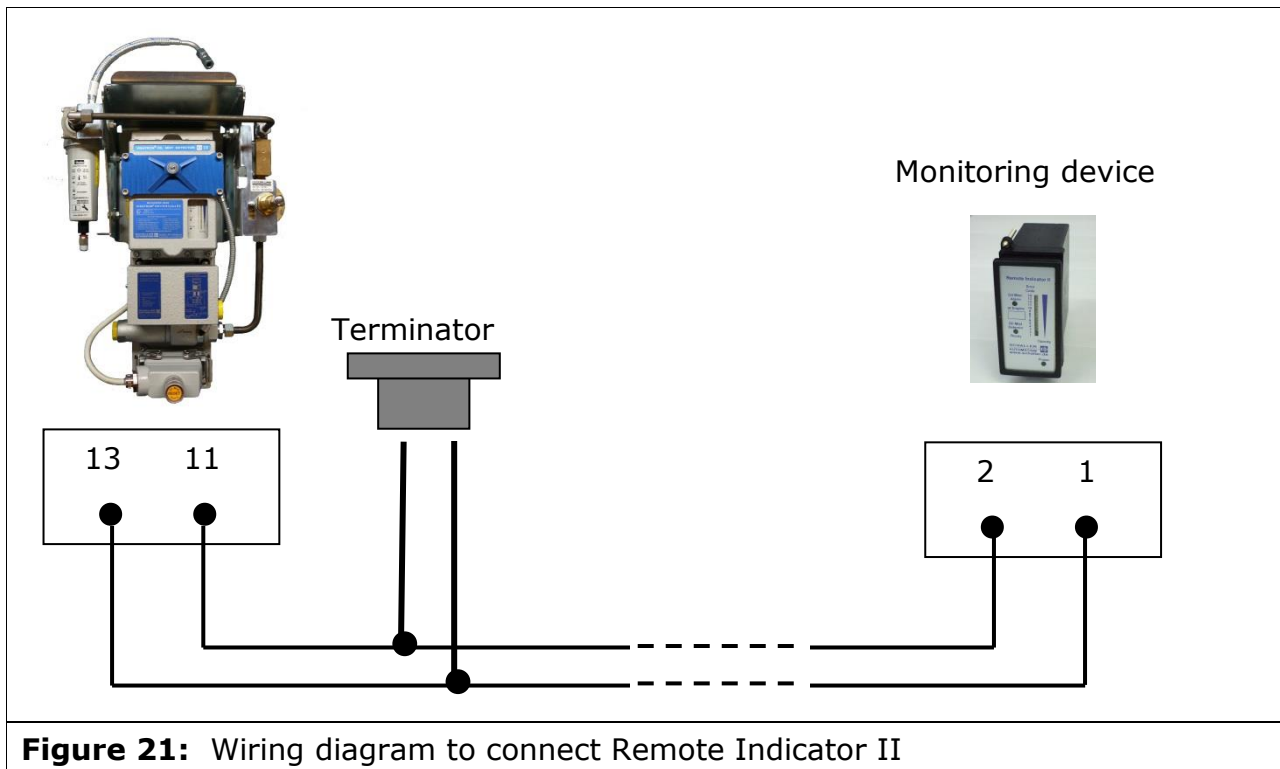


Figure 21: Wiring diagram to connect Remote Indicator II

The monitoring device is the bus master and the OMD devices are the slaves. It's necessary to adjust different bus addresses at each slave device. Normally the first OMD device gets the address '1' and so on. The switch is on the rear side of the measuring head (see **Figure 22**).

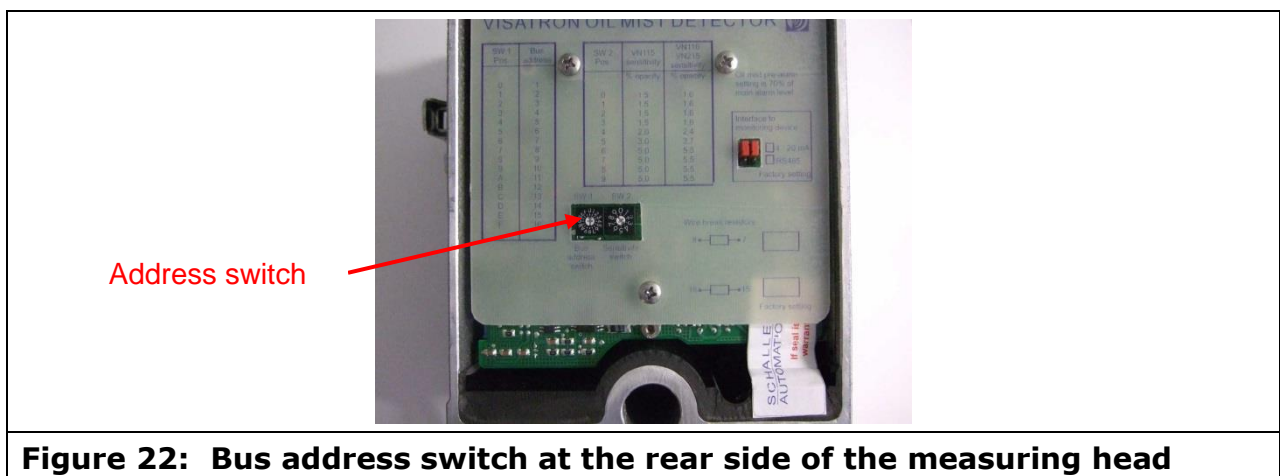
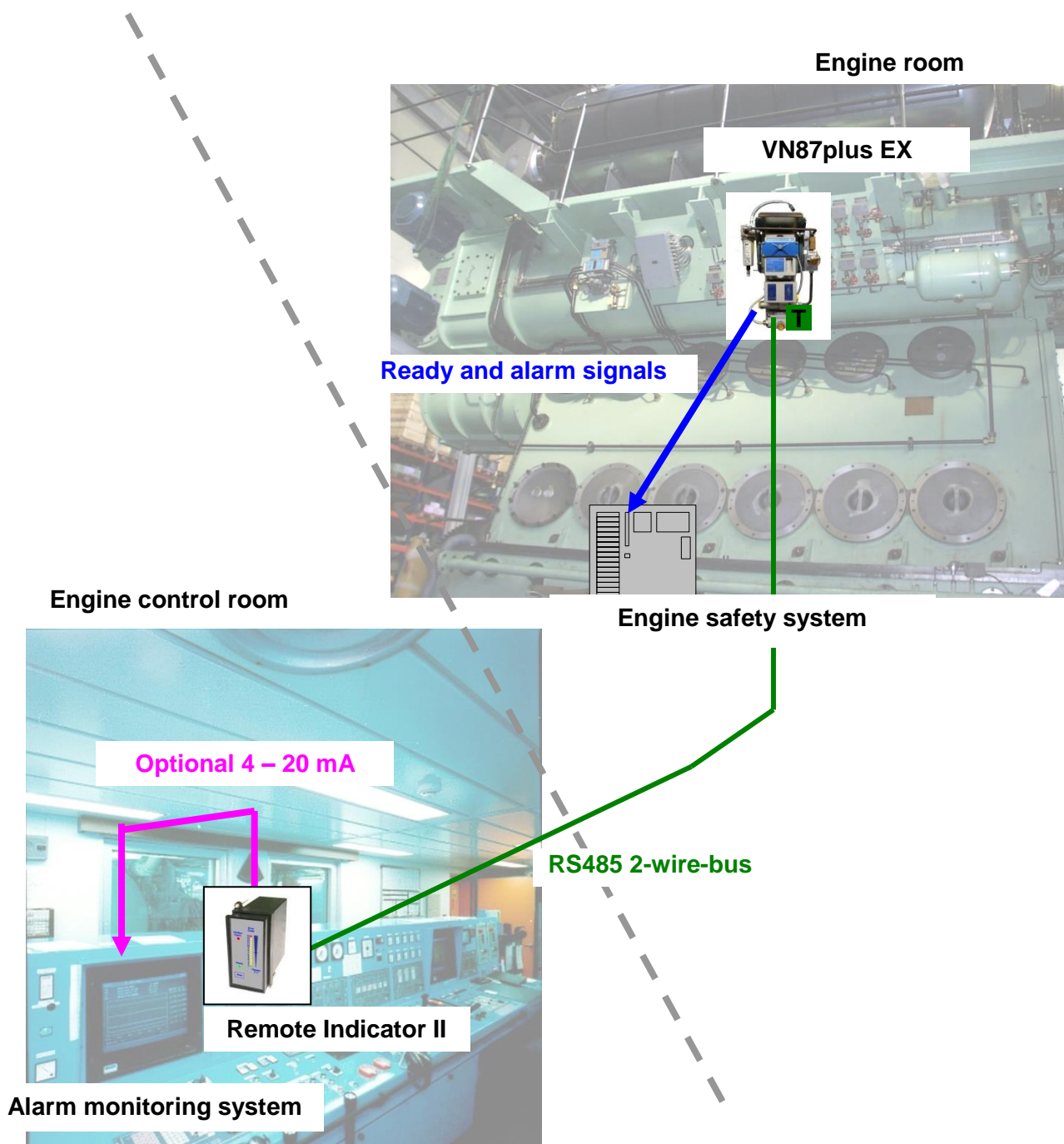


Figure 22: Bus address switch at the rear side of the measuring head

2.2.3 Schematic electrical wiring diagram



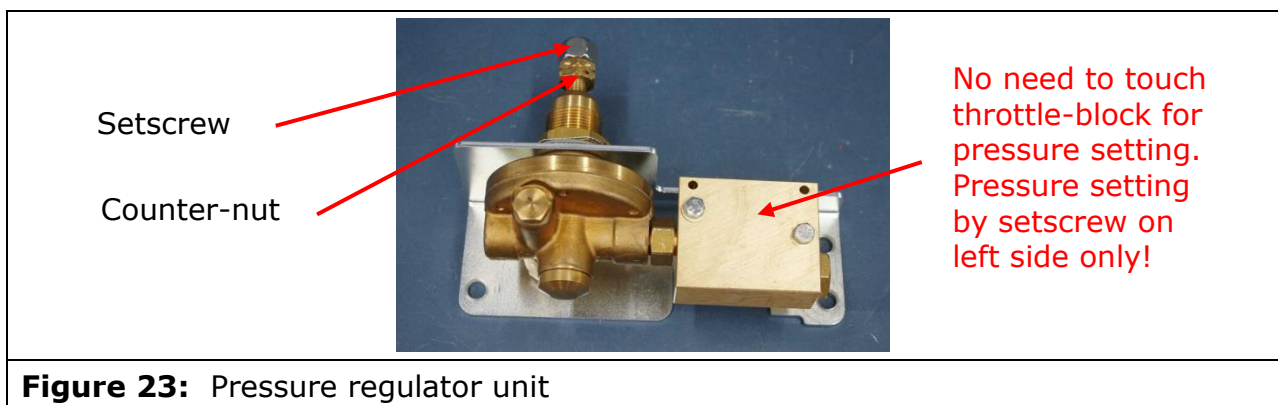
3 Commissioning



CAUTION! Unplug the OMD during welding processes on the engine.

3.1 Adjusting or checking the suction pressure

The suction pressure must be set by adjusting the pressure regulator when the engine is at standstill. Make sure ventilation of the engine room is in operation.



WARNING! Adjust 60 mm WC negative pressure. After adjustment, remove U-tube pressure gauge and **screw in the previously removed plug.**



CAUTION! A pressure setting much higher than 60 mm WC negative pressure may cause a change in detecting sensitivity and can impact the functionality of the siphon blocks.

- Connect a U-tube manometer at inspection cover (see **Figure 24**). (U-tube manometer is included in the service box, available as an option).
- Switch on compressed air supply with inlet pressure in a range from **2 to 15 bar (before connecting the OMD the first time check the pressure).**
- If the negative suction pressure is already adjusted to 60 mm WC within a tolerance of ± 5 mm remove the U-tube manometer and finish the procedure.
- Otherwise loosen counter-nut.
- Turn setscrew until the negative pressure is only 60 mm WC.
- Tighten counter-nut.



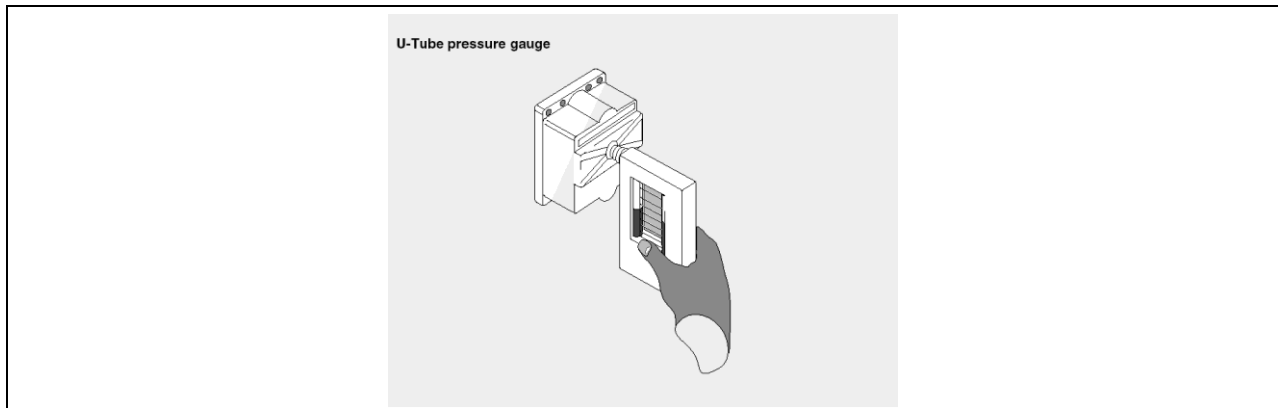


Figure 24: U-tube manometer connected to OMD control cover

- Remove U-tube manometer
- Screw in the removed plug

3.2 Filling of siphon blocks VN180 for VN115/87plus EX system with oil

- Press the pump lever of the filling pump (see **Figure 26**) as many times until first oil drops are coming out.
- Unscrew the lower siphon block plug (see **Figure 25**).
- Insert filling pump nozzle (see **Figure 27**).



Figure 25: Siphon block VN180

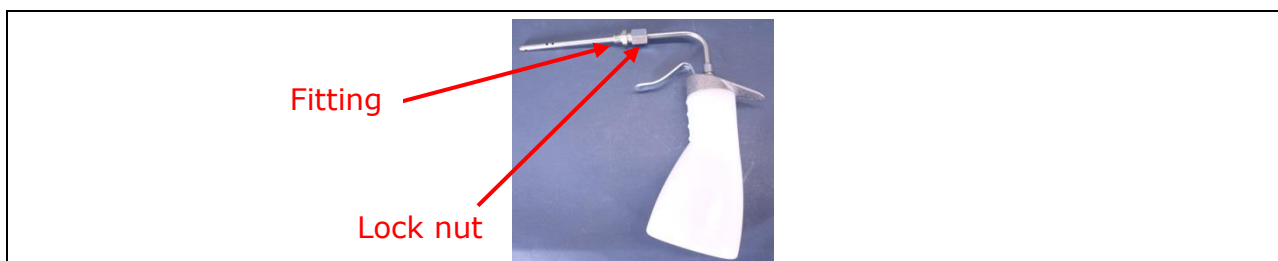


Figure 26: Filling pump

- Screw in the fitting of the filling pump.
- Press the nozzle to stop position.

- Tighten the lock nut.
- Fill the siphon with 8 strokes.



CAUTION! Do not fill with more than 8 strokes. The excess oil may flow in the suction tubes. Additionally the excess oil can remove the required oil in the siphon by a physical suction effect through the draining channel.



Figure 27: Filling pump inserted and fixed in the siphon block

- Remove the filling pump.
- Close the threaded hole with the plug (a small amount oil coming out does not impact the functionality).
- Clean the siphon block.
- Continue with the next block.

3.3 Filling of pipe siphons for VN115/87plus EX system with oil

Fitting to
flexible hose
and oil input



Figure 28: Pipe siphon

- Remove flexible hose
- Fill in 70ml lubrication oil
- Fix flexible hose again





CAUTION! Do not fill in more than 70ml; the excess oil can remove the required oil in the siphon by a physical suction effect through the draining channel.

3.4 Adjusting the sensitivity of the OMD

The detector determines the oil mist concentration by an optical measurement. The calculated values have the unit 'opacity'. 100% opacity means that no light is transmitted through the oil mist sample. This is equivalent to a complete white wall.

The LEL (Lower Explosion Level) is equal to 47mg/l oil mist concentration in air at a temperature of 25 °C. IACS UR M67 rules do request that OMD's do indicate an oil mist alarm latest at approx. 2.5mg/l. The lesser sensitivity level of all VN/87plus OMD's, level 6, still ensures an Oil Mist Alarm at oil mist concentrations inside the engine of <2.5mg/l. This complies fully with the requirements given by the IACS UR M67.

Position	Relative VN115 alarm level in opacity
3	1.5%
4	2.0%
5	3.0%
6	5.0%

Table 2: Sensitivity switch position and corresponding oil mist alarm level



Standard switch position 3 or 4 normally should be sufficient for all sorts of engines. However if necessary, choose the lower sensitivity level 5 or 6.

The sensitivity of the VISATRON® oil mist detector can be adjusted by a switch on the rear side of the measuring head (see **Figure 29**).

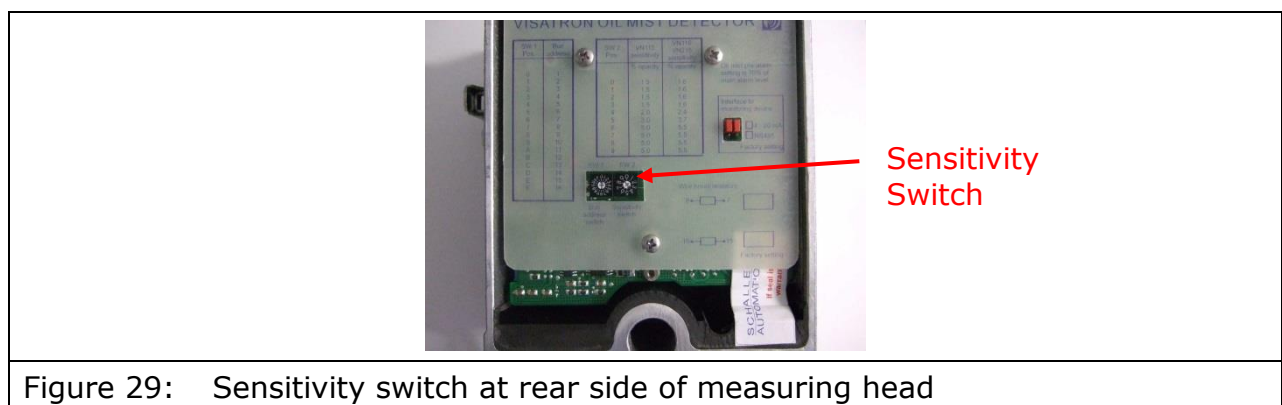


Figure 29: Sensitivity switch at rear side of measuring head



3.5 Commissioning check list

Mechanical check	
Are all suction pipes installed as specified in the installation drawing?	<input type="checkbox"/> yes / <input type="checkbox"/> no
Are all fittings fastened and tight?	<input type="checkbox"/> yes / <input type="checkbox"/> no
On installations with siphon blocks: Are all siphon blocks filled with oil and all un-used openings closed?	<input type="checkbox"/> yes / <input type="checkbox"/> no
On installations with pipe siphon: Are all siphons filled with oil?	<input type="checkbox"/> yes / <input type="checkbox"/> no
On installations with oil separator: Is the separator filled with oil?	<input type="checkbox"/> yes / <input type="checkbox"/> no
Is the negative pressure at the measuring head adjusted to 60 mmWC?	<input type="checkbox"/> yes / <input type="checkbox"/> no
Adjusted negative pressure	mmWC
Is the screw removed from the control cover	<input type="checkbox"/> yes / <input type="checkbox"/> no

Electrical check	
Is the power supply connected to the terminal and is the voltage within the specified range?	<input type="checkbox"/> yes / <input type="checkbox"/> no
Measured supply voltage	Volts
Is the monitoring device installed?	<input type="checkbox"/> yes / <input type="checkbox"/> no
Are the 'Alarm' and 'Ready' signals connected to the engine control and safety system?	<input type="checkbox"/> yes / <input type="checkbox"/> no
Are the correct wire break resistors installed	<input type="checkbox"/> yes / <input type="checkbox"/> no
Value of wire break resistor	kOhm
Is the correct interface mode at pin 11 and 13 selected?	<input type="checkbox"/> yes / <input type="checkbox"/> no

Functional check	
On vessels perform the on-board test with test plate. Test positive?	<input type="checkbox"/> yes / <input type="checkbox"/> no
At engine factory perform smoke test. Test positive?	<input type="checkbox"/> yes / <input type="checkbox"/> no
As an alternative to the smoke test, measure the negative pressure at the end of the suction pipes. Values as specified?	<input type="checkbox"/> yes / <input type="checkbox"/> no



4 Operating instructions

4.1 Display

After power-on LED 1 is blinking for 30 seconds. The device will show the following display.

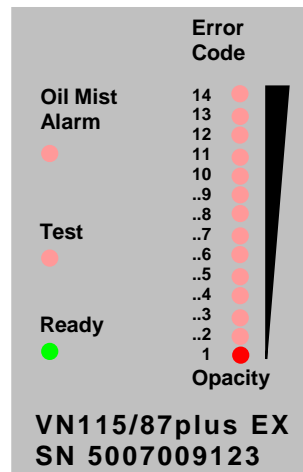


Figure 30: Normal display mode

In case of a high oil mist concentration the LED bar goes up and at 70 % opacity compared to the adjusted alarm level the 'Oil-Mist Alarm' LED switches on. At 100% opacity, compared to the alarm level, the 'Oil-Mist Alarm' LED starts blinking. If the opacity later goes down, the alarm condition will be stored.

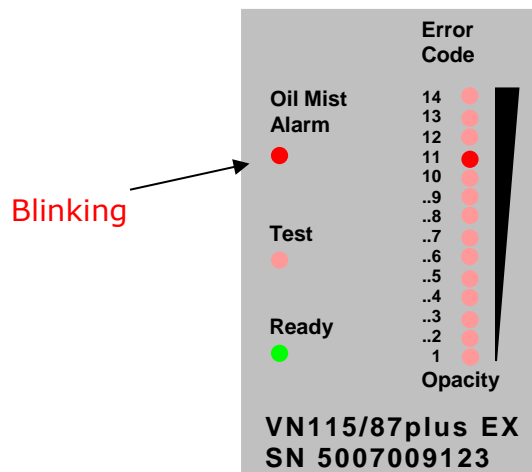


Figure 31: Example of an oil mist alarm state

The opacity is shown in the right LED bar. If highest LED is switched on, the opacity has reached / exceeds the Oil Mist Alarm level.

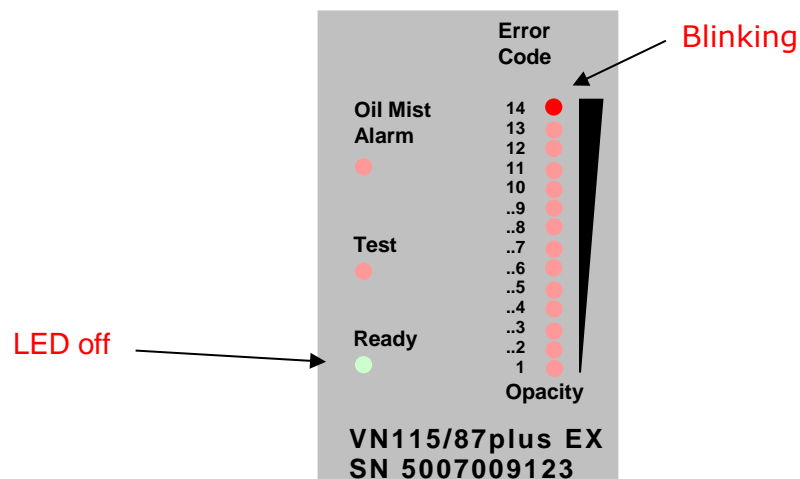


Figure 32: Device not ready, example of 'Negative pressure out of range'

If a device internal error or a system failure occurs the diagnostics system shows the failure condition by a blinking LED on the LED bar. The error codes are shown in Table 3. A detected oil mist alarm is displayed at this time with the 'Test' LED. In this case the alarm relay or shutdown relay is not switched on.

Blinking LED on display	VN115/87plus EX device failures
14	Negative pressure out of range
13	Optical sensor dirty
12	Voltage of internal battery too low
11	Ambient temperature too low (<0°C)
10	Ambient temperature too high (>70°C)
9	Electronics temperature too low (<0°C)
8	Electronics temperature too high (>75°C)
7	Reset button defective
6	Supply voltage too high
5	Sensitivity switch defective
4	Optical sensor defective
3	Pressure sensor defective
2	Electronic module defective
1	Blinking: Startup phase

Table 3: Error codes

4.2 Reset of Oil Mist Alarms



CAUTION!

Use a monitoring device at a safe location (e.g. ECR) to check for the actual oil mist concentration that is requested by the IACS. In case of an Oil Mist Alarm, Schaller Automation strongly recommends to approach the engine only after indicated oil mist concentration (LED chain) has lowered to half of its bar indication (VISATRON®-device and Remote Indicator II).

Follow the instructions of engine builder, ship yard and ship owner!

In case of a High Oil Mist Alarm the Detector can be reset if the Oil Mist Concentration has lowered below the Alarm level.

The alarm condition can be reset only by pressing the Oil-Mist-Alarm RESET button.



Figure 33: Oil-Mist-Alarm RESET button



5 Troubleshooting

Error	Description	remedy	Chapter
14	Negative pressure out of range	<ol style="list-style-type: none"> 1. Adjust suction pressure 2. Exchange air filters 3. Clean fresh air bores 4. Check suction system 5. Exchange bellows 6. Exchange filter cartridge 7. Exchange measuring head 	3.1 page 28 5.3 page 38 5.1 page 37 5.6 page 41 5.4 page 38 5.5 page 39
13	Optical sensor dirty	<ol style="list-style-type: none"> 1. Clean infrared filter 	5.2 page 37
12	Voltage of internal battery too low	<ol style="list-style-type: none"> 1. Exchange measuring head 	5.5 page 39
11	Ambient temperature too low (<0°C)	<ol style="list-style-type: none"> 1. Remove ambient cooling components 	
10	Ambient temperature too high (>70°C)	<ol style="list-style-type: none"> 1. Remove or turn away ambient heating components 2. Install metal heat shields against radiation 	
9	Electronics temperature too low (<0°C)	<ol style="list-style-type: none"> 1. Remove ambient cooling components 	
8	Electronics temperature too high (>75°C)	<ol style="list-style-type: none"> 1. Remove or turn away ambient heating components 2. Install metal heat shields against radiation 	
7	Reset button defective	<ol style="list-style-type: none"> 1. Eliminate blocking 2. Exchange Measuring head 	5.5 page 39
6	Supply voltage too high	<ol style="list-style-type: none"> 1. Measure supply voltage 2. Exchange measuring head 	5.5 page 39
5	Sensitivity switch defective	<ol style="list-style-type: none"> 1. Exchange measuring head 	5.5 page 39
4	Optical sensor defective	<ol style="list-style-type: none"> 1. Clean infrared filter 2. Exchange measuring head 	5.2 page 37 5.5 page 39
3	Pressure sensor defective	<ol style="list-style-type: none"> 1. Exchange measuring head 	5.5 page 39
2	Electronic module defective	<ol style="list-style-type: none"> 1. Exchange measuring head 	5.5 page 39
	All LED off	<ol style="list-style-type: none"> 1. Measure supply voltage 2. Activate Self-repair of Polyfuse 3. Replace measuring head fuse 4. Check for earth fault problem 5. Exchange measuring head 	5.7 page 36 5.7 page 36 5.8 page 44 5.5 page 39



5.1 Clean fresh air bores

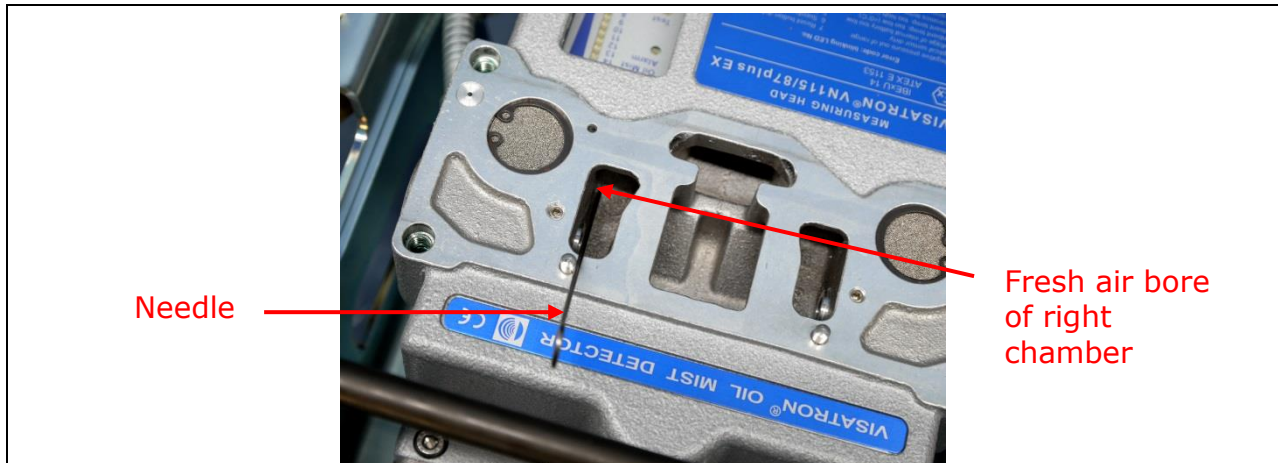


Figure 34: Cleaning of fresh air bore in the left and the right chambers

5.2 Clean infrared (IR-) filter



CAUTION! Dirty IR-filter glass may cause a loss of sensitivity of the device. Clean filters acc. maintenance plan (page 46)

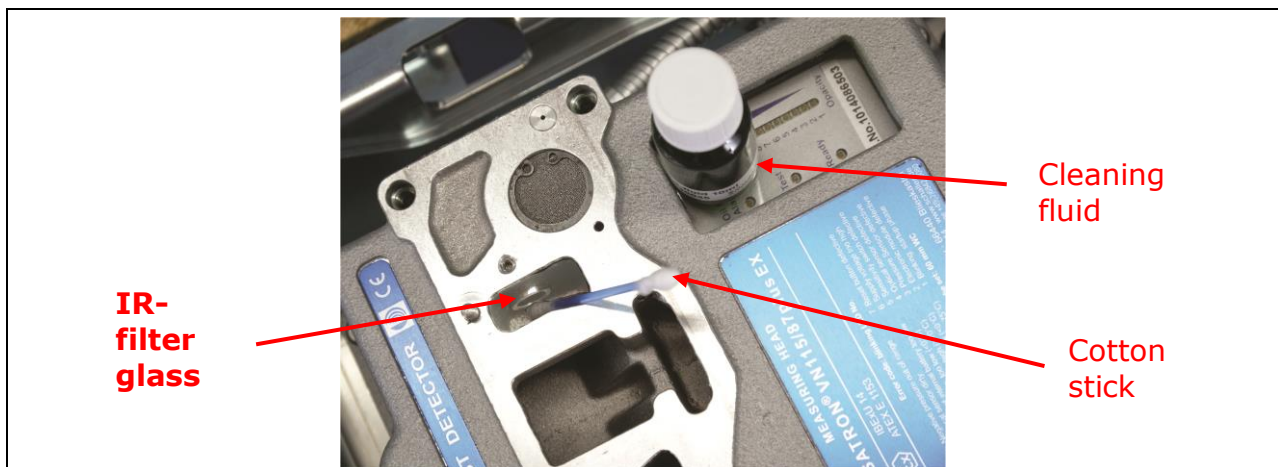


Figure 35: Cleaning of IR-Filter glass in the left and the right chamber



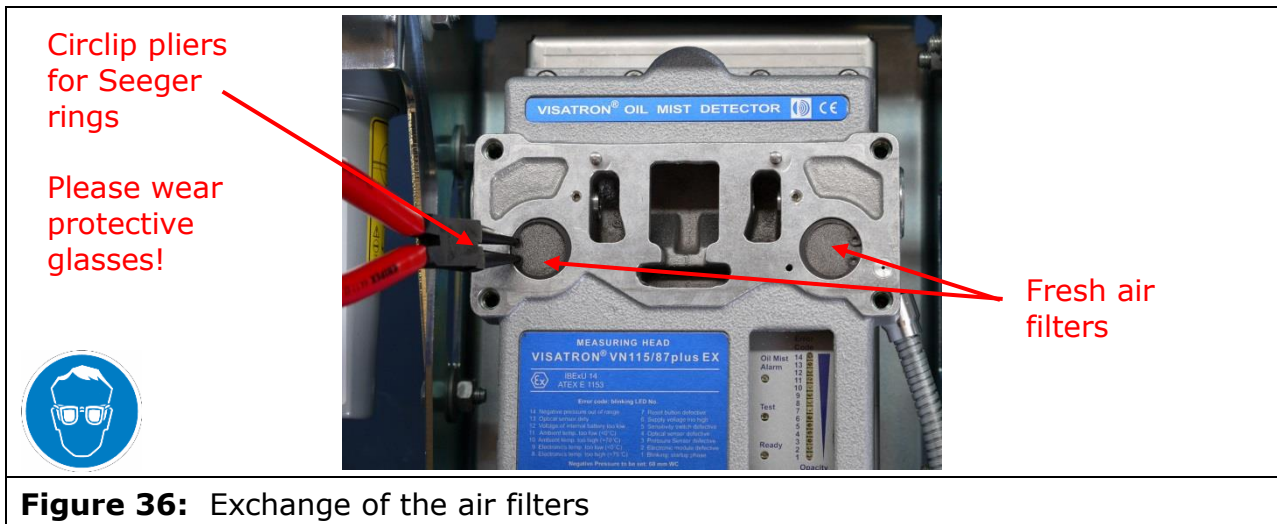
WARNING! Use only cleaning fluids for optical components as delivered in the service box.



To remove the control cover you have to unscrew it. After finishing the cleaning, don't forget to reinstall the control cover again!
Do not open the Cover during engine operation (System not ready)! Explosive atmosphere may emit from the engine causing an explosion hazard.

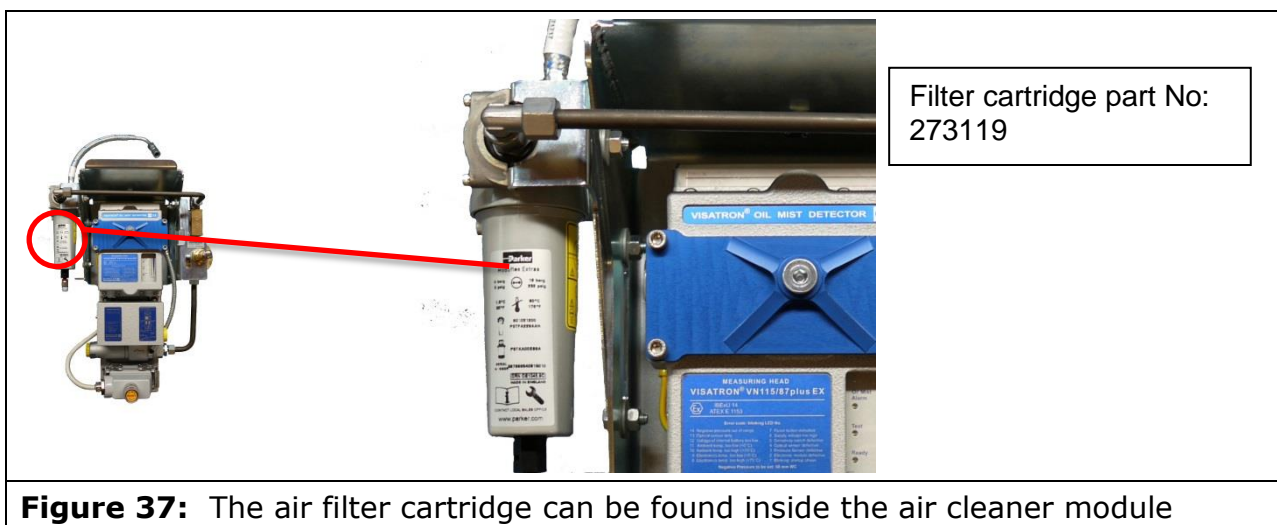


5.3 Exchange air filters in the measuring head



WARNING! Do not try to clean the filters, use always new ones.

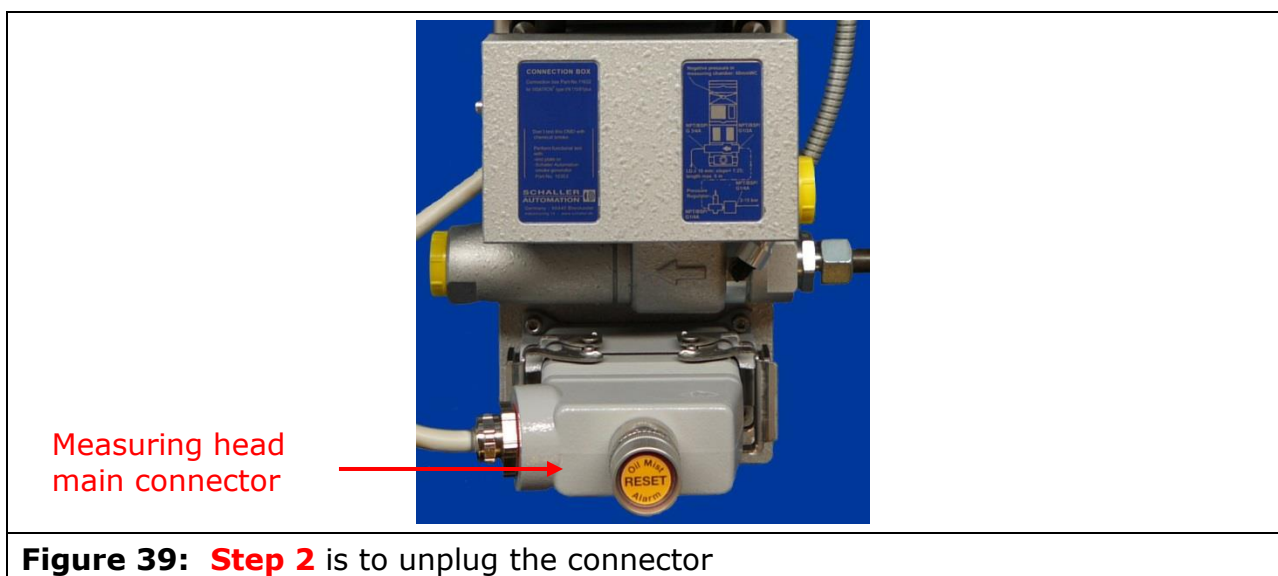
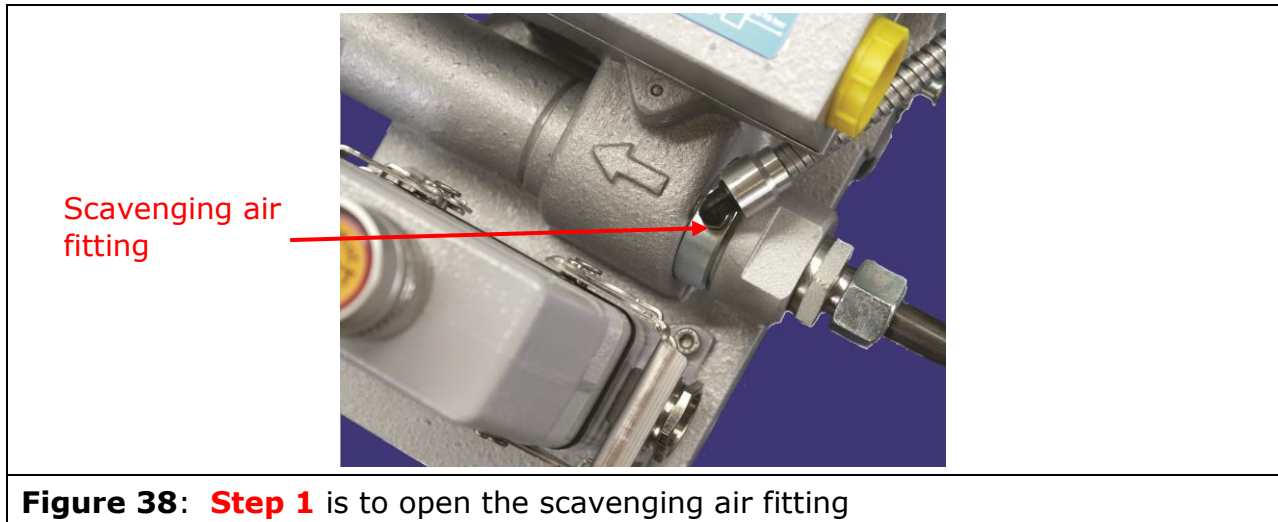
5.4 Exchange air filter cartridge in air cleaner module



WARNING! Switch off the compressed air supply during the maintenance work. After the exchange re-check the negative suction pressure.



5.5 Exchange measuring head



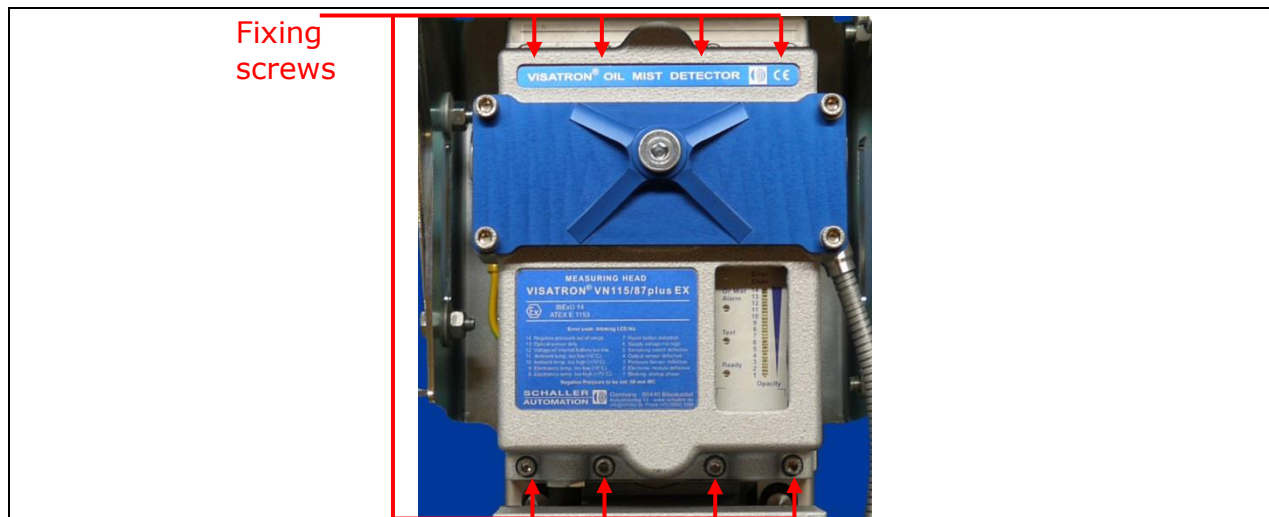


Figure 40: **Step 3** is to unscrew the measuring head

To mount the new measuring head execute the 3 steps in reverse order.



WARNING! Check the values of the wire break resistors or in case of doubt use the old ones.



5.6 Exchange bellows and suspension-system

Step 1 is to dismount the measuring head.

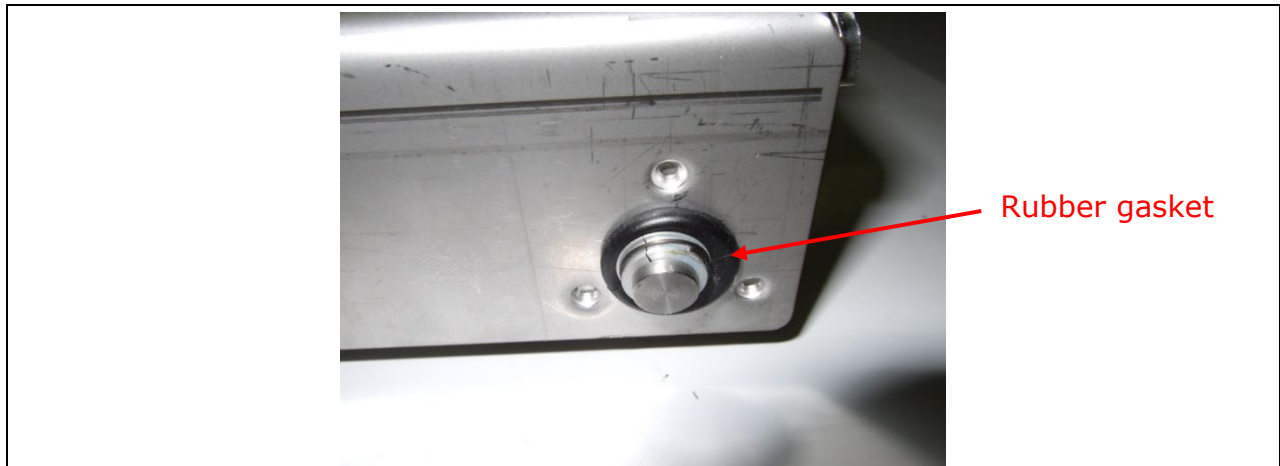


Figure 41: **Step 2** is to press out the 4 rubber gaskets with a blunt tool and finally to remove the carrier plate

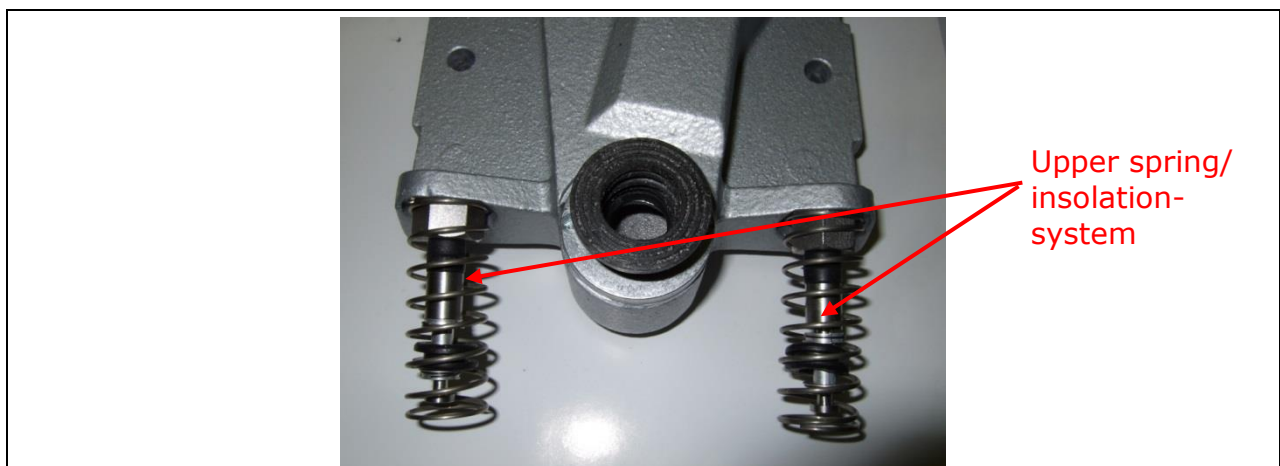


Figure 42: **Step 3** is to exchange the suspension-system if necessary

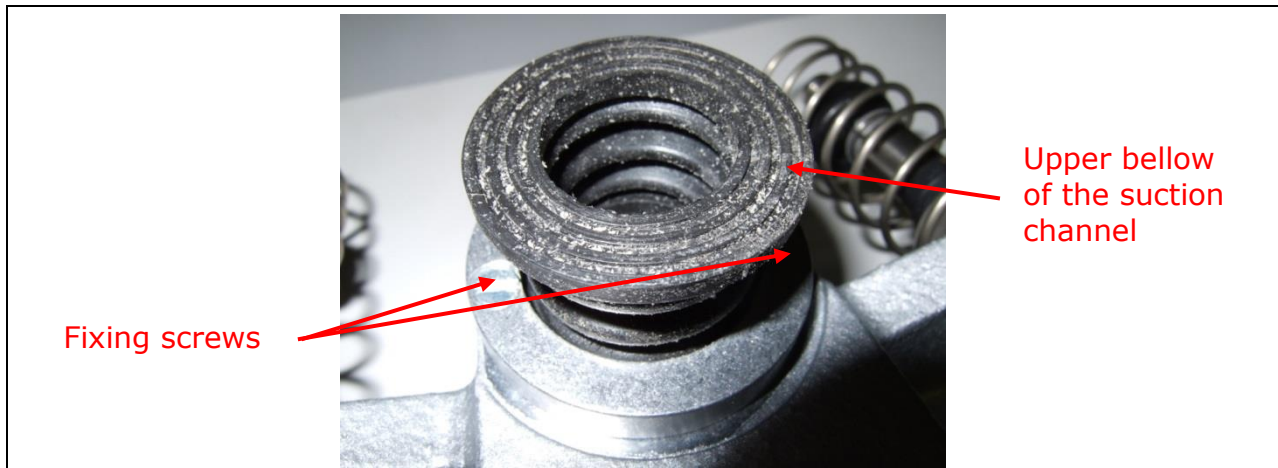


Figure 43: **Step 4** is to exchange the 2 bellows if necessary. The bellow is secured by a ring which is fixed by two screws.

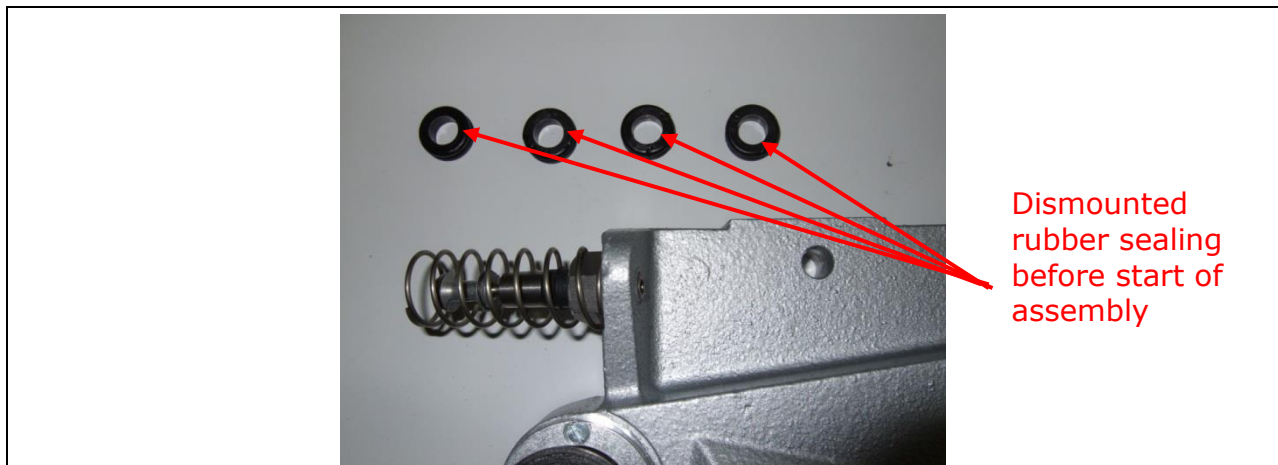


Figure 44 **Step 5** is to pull out the gaskets before the carrier plate is mounted

To finish the assembly execute the first 2 steps in reverse order.

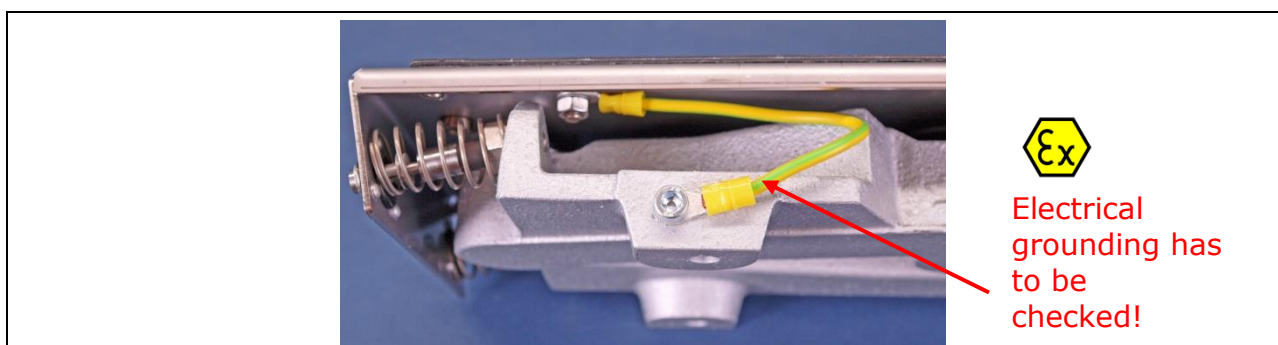


Figure 45 **Step 6** is to check the electrical grounding

5.7 Measuring head fuses



Figure 46 Fuse on the rear side of the measuring head

The device has two internal fuses. The first is located in the main connector of the measuring head. This is a 'self-repairing' fuse which protects the filter circuit in the connector.

To reset this fuse, unplug the main connector and **wait 5 minutes** before you plug it again.

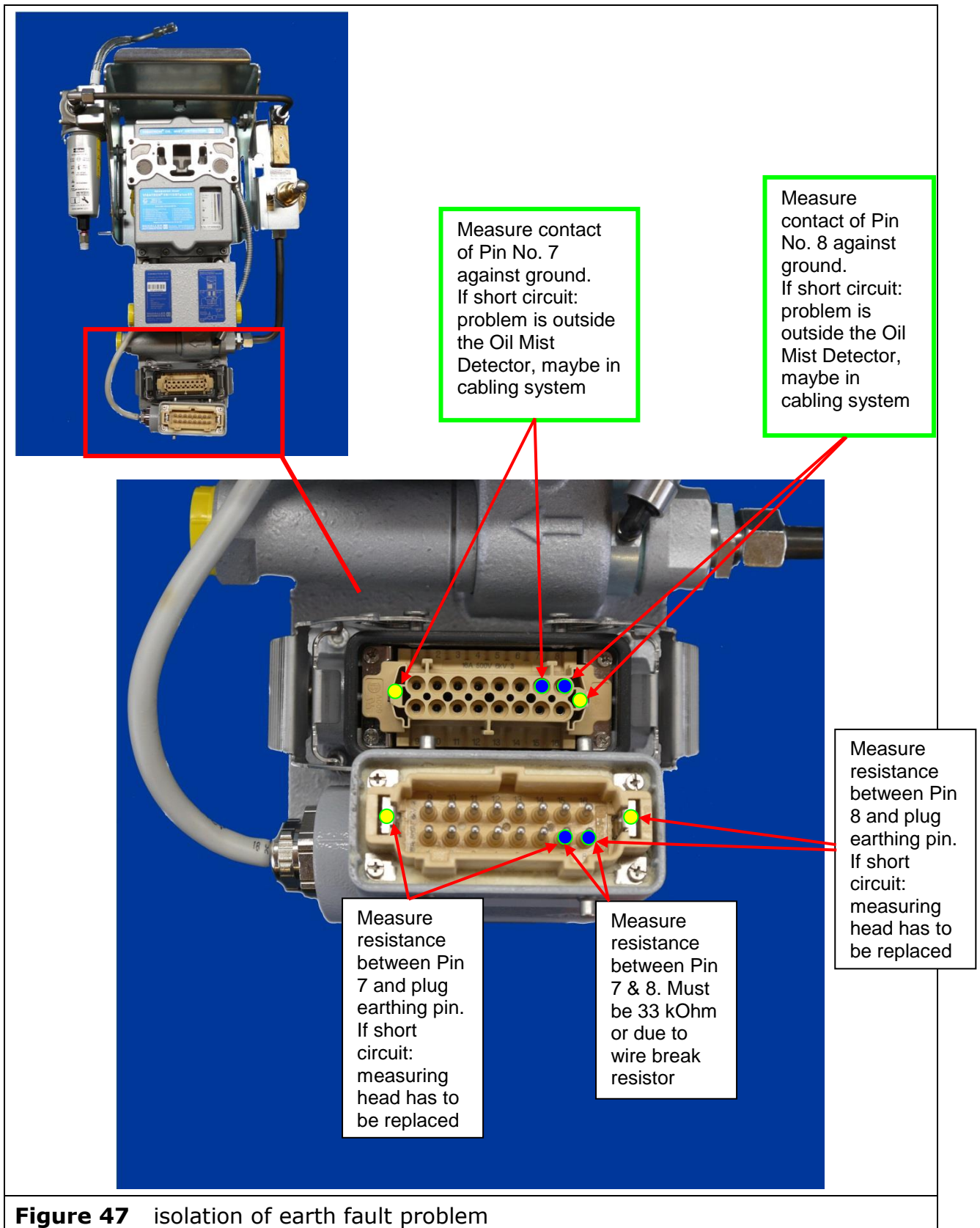


WARNING! Unplug the main connector during the exchange of the fuse.

If all LED's remain off exchange the 2A semi lag fuse II at the rear side of the measuring head (see **Figure 46**).



5.8 Check for earth fault problem



In case all LED's remain off despite fuses are ok, perform check as shown in **Figure 47**. Often it happens during welding work around the engine or in engine room that electrical current of high energy passes through detector and its electrical wiring.

As a result, possible bursts and peaks may cause damage inside the measuring head. In that case, only a replacement of the measuring head helps.

**WARNING!**

Unplug the main connector during welding work around the engine or in engine room!



6 Maintenance procedures




CAUTION! Maintenance work has to be done when engine is stopped.

Quarterly or after 2000 operating hours, whatever comes first		
1	Check negative pressure in the measuring head: under 55 mmWC → adjust pressure between 55 mmWC and 65 mmWC → okay between 65 mmWC and 85 mmWC → adjust pressure over 85 mmWC → check pressure regulator unit	See chapter 3.1 page 28
2	Clean infrared filters in the measuring head	See chapter 5.2 page 37
3	Clean fresh air bores in the measuring head	See chapter 5.1 page 37
4	Check air cleaner module	See chapter 2.1.7 page 21
Half-yearly or after 4000 operating hours, whatever comes first		
5	Perform quarterly maintenance procedure 1 - 4	
6	Exchange air filters in the measuring head	See chapter 5.3 page 38
Yearly or after 8000 operating hours, whatever comes first		
7	Perform half-yearly maintenance procedure 5 - 6	
8	Exchange filter in air cleaner module	See chapter 5.4 page 38
9	Clean suction system with compressed air. ATTENTION, do not forget to refill siphons!	See chapter 3 page 29/30
10	Check the bellows and the suspension-system between measuring head and base plate, check the scavenging air outlet behind the control cover (see Figure 35) by feeling the air stream to control scavenging air system	
11	Perform functional test with smoke-tubes	See chapter 7.1 page 47
Bi-yearly or after 16000 operating hours, whatever comes first		
12	An inspection of the entire OMD installation onboard has to be executed by service staff being trained and authorized for this job by Schaller Automation	
13	Perform functional test of entire OMD system with smoke	See chapter 7.2 Page 49
Additional every 5 years or 40000 operating hours, whatever comes first		
14	Exchange suspension-system and bellows	See chapter 5.6 page 41




7 Functional test

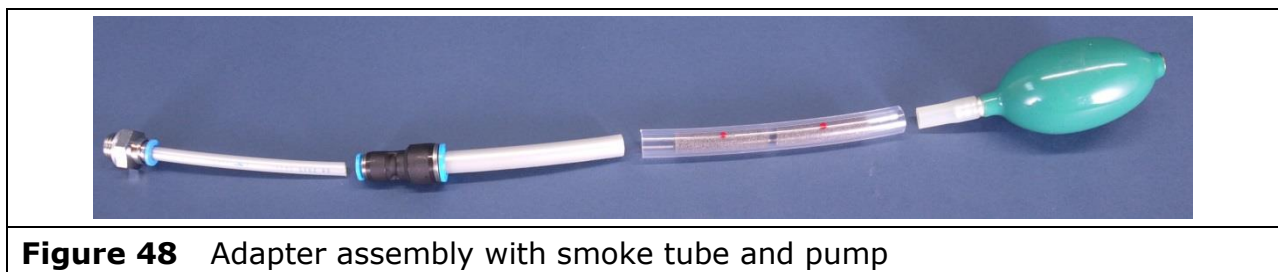
7.1 On board test

	<p>Attention: Before starting the on board test, make sure, the OMD has been maintained according maintenance schedule (chapter 6). If used make sure, that all siphons have to be filled with oil (refer to chapter 2.1.3.)</p>
---	--



By using the VN Smoke Test-Box you can easily test the functionality of the VISATRON® oil mist detector and its connection to the safety system of the engine. The set can be ordered separately under Part.-No. 151780. It consists of the following parts:










<p>Smoke Test-Box 151780</p> <ul style="list-style-type: none"> • Smoke tubes • Hand pump kit • Working instruction 	<p>A</p>  <p>B</p> 
---	--


	<p>Attention: You will stop or slow down the engine</p>
--	---




Test procedure step by step:

<p>Step 1</p>	<p>Remove the lock screw.</p>	
<p>Step 2</p>	<p>Mount the adapter for the smoke tube.</p>	

Step 3	Add the flexible hose. 	
Step 4	Mount the smoke tube and hand pump and then add them to the flexible hose. 	
Step 5	Use the hand pump to generate smoke (it may work even without the pump)	
Step 6	Wait for the 'Alarm'-LED. At this comes on, the engine has to stop or to enter the slowdown mode	
Step 7	Dismount the test equipment and carefully reinstall the lock screw.  Caution! Do not forget the gasket underneath the lock screw, otherwise you will risk a mixture of explosion zones!  Always use a new gasket for the lock screw after removing for testing!	
Step 8	Wait for the 'Ready'-LED.	
Step 9	Press the Oil-Mist-Alarm RESET button to acknowledge the alarm state and enter the normal monitoring mode. 	

	If LED14 is blinking and the Oil-Mist-Alarm RESET button is pressed the OMD device enters a test mode. In this test mode the LED bar displays the measured opacity. After pressing the Oil-Mist-Alarm RESET button again the OMD device exits the test mode and LED14 is blinking again.
---	--

	Attention: Always use a new gasket for the lock screw after removing it for testing! (Step 7)
---	---

If applicable perform an additional pressure measurement to check the tightness of the suction system as described in chapter 7.3. Instead of an electronic gauge you can use the U-pipe manometer of the service box.



7.2 Factory test at engine builder with smoke generator on VN115/87plus EX installations

Due to vessels not normally having the equipment and SCHALLER AUTOMATION recommends this procedure only for the factory test by using the SCHALLER smoke generator (see **Figure 49**). If a smoke generator is available on a vessel, this test can be also performed. However, in this case observe the following warning.



Attention: Before starting the on board test execute the procedures as specified in the maintenance schedule. The pipe system has to be clean and if used **all siphons have to be filled with oil** refer to chapter 2.1.3.

A test of the entire OMD system (incl. tubing system) can be done only at standstill of the engine. The crankcase service covers must be opened first. Put a small amount of smoke fluid (see Chapter 'Accessories') into the reservoir and switch on the generator for a few seconds until the storage tank is completely filled with smoke. The last step is to hold the flexible hose directly into the suction funnels until an oil mist alarm is indicated.

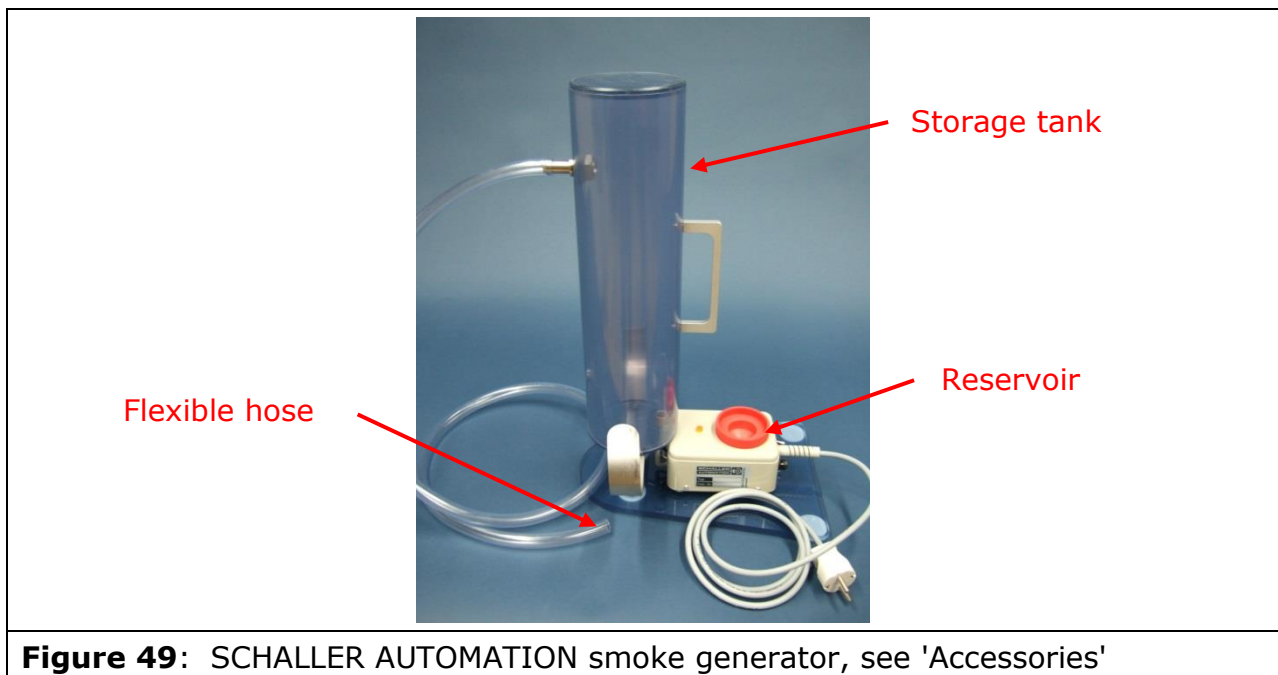


Figure 49: SCHALLER AUTOMATION smoke generator, see 'Accessories'

If it's not possible to open the service covers a functional test can be performed without testing the suction funnels.

In this case the flexible hose has to be pressed over the opening under the lock screws of the siphon blocks as seen in **Figure 50** or has to be pressed over the open header pipe end after removing the lock nut.





Figure 50: Test inlet on the siphon blocks VN180



Attention: In case of siphon block VN180 installation you have to test all compartments and the additional suction points at running engine.

7.3 Additional pressure measurement on VN115/87plus EX installations

Perform the functional and smoke test as shown in the previous chapters 'On board test' and 'Factory test with smoke generator'.

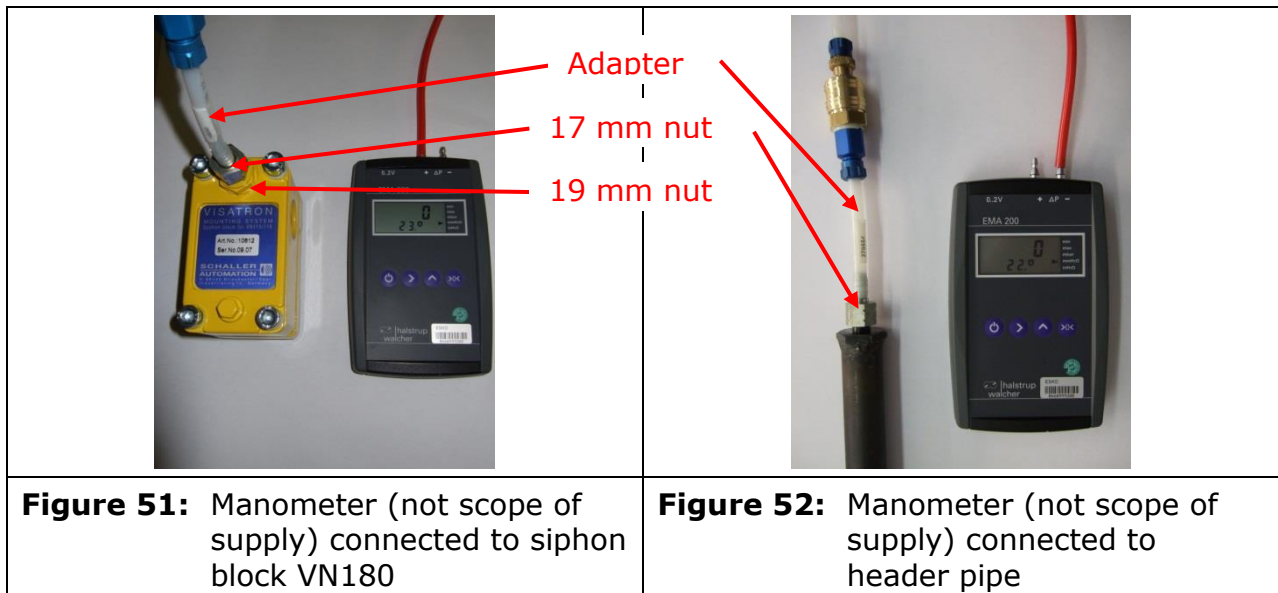


Figure 51: Manometer (not scope of supply) connected to siphon block VN180

Figure 52: Manometer (not scope of supply) connected to header pipe

Then carry out a pressure measurement at the end of the suction system. The engine including the oil pump must be at standstill.



Attention: You will only measure correct values with engine and lube oil pump at standstill.



On a VN115/87plus EX installation the tightness of the suction system can be determined by a pressure measurement at the outer siphon blocks or at the end of the header pipes.

This siphon block has an additional fitting for a manometer (see **Figure 51**). To remove the 17 mm lock nut you have to counter the 19 mm nut with a jaw wrench.

The pressure measurement procedure can also be performed at the end of the 22 mm diameter suction pipes which are delivered from SCHALLER AUTOMATION. These pipes have also fittings for the manometer at the pipe end (see **Figure 52**).

Use only a digital manometer with a differential measuring method. On completion do not forget to lock all openings.

The minimal negative pressure values are defined in the table below. They are only valid if a negative pressure of **60 mm WC** is adjusted at the measuring head.

Minimal suction pressure at the far left and right end of the suction tubing system
VN115/87plus EX >6.5 mmWC

7.4 Factory test at engine builder with fog machine on all installations

This test includes the indication of an oil mist alarm as well as the indication of the affected compartment. Instead of the above mentioned smoke generator you have to use the more powerful fog machine (see **Figure 53**) with a fog bag with adapter (see **Figure 54**).



Figure 53: optional Fog machine

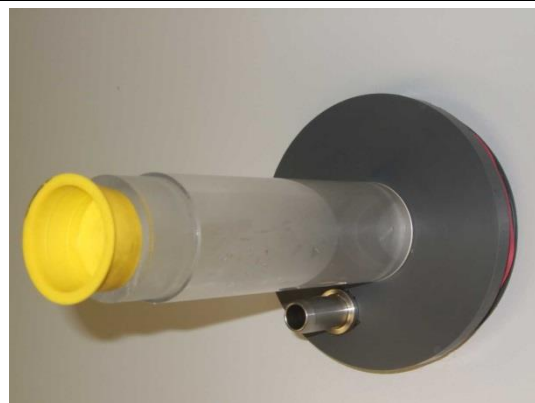


Figure 54: optional Fog bag adapter

This equipment guarantees a constant fog concentration during the test and due to high density no influence of the additionally sucked in crankcase atmosphere.

Due to the increasing request of the ship owners and classification societies to test the OMD-System at running engines SCHALLER AUTOMATION recommends now following procedure.

The first test must be performed at standstill to secure, that the engine is well protected by the OMD system. If it is not possible to open the service covers or if it is not possible to access the suction funnels, e.g. on large 2-stroke engines, a functional test can be performed alternatively using a special connection on the siphon block or respectively on the T-engine wall connection.

Fill the fog bag completely with fog and close the adapter with the yellow cap. The next step is to press the flexible hose of the fog bag adapter over the opened plug at the side of the siphon blocks as seen in **Figure 55** or over the open tube end at T-engine wall connections. Do not remove the hose until an oil mist alarm is indicated and the search run to indicate the affected compartment is finished. The plugs can be countered by an 11 mm jaw wrench to open or close the lock screw.



Attention: Let in fog at sampling points of all compartments including chain/gear drive.

The second test can be performed on request at running engine using the plugs of the siphon block or the T-engine-wall connection to induce the fog.



Lock screws

Figure 55: Test fog inlet on the siphon blocks



8 Optional Spare Parts and Accessories

Part-No. new	Part-No. old	Description	Quantity per OMD
150516		Service box series VN87plus EX	1
12601		Measuring head VN115/87plus EX; 33k (wire break resistor); RS485; sensitivity level 4	1
12602		Measuring head VN115/87plus EX; 24k; 4-20mA; sensitivity level 4	1
12603		Measuring head VN115/87plus EX; 3k; 4-20mA; sensitivity level 4	1
12604		Measuring head VN115/87plus EX; 10k; RS485; sensitivity level 4	1
12605		Measuring head VN115/87plus EX; 33k; 4-20mA; sensitivity level 4	1
12606		Measuring head VN115/87plus EX; 33k; RS485; sensitivity level 5	1
12607		Measuring head VN115/87plus EX; 10k; RS485; sensitivity level 6	1
12608		Measuring head VN115/87plus EX; 33k; RS485; sensitivity level 6	1
270975		Control cover measuring head VN115/87plus EX devices	1
355970		Gasket control cover VN87plus EX	1
150994		Base plate VN115/87plus EX compl.	1
270440		Mounting plate VN87plus EX compl.	1
365206	10002	Air filter for pressure regulator unit	1
365197	10042	Scavenging air filter (10 pcs.)	2
270090	10035	Bottle with cleaning fluid	1
190003	10135	Cleaning needle	1
452176	10036	Cotton buds to clean IR-filters (min. 10 pcs.)	1
200548	10046	U-pipe manometer	1
270502		Manometer adapter for siphon block VN180	1
270089	10040	Bottle with slacked water	1
270493	10053	Manometer adapter for control cover	1
310526	10087	Fuse cap	1
436551	10973	Semi lag fuses 3.15A (10 pcs.)	1
365193	10023	Bellow of suction Channel	2
365198	10041	Circlip for scavenging air filter (10 pcs.)	2
200175	11004	Main connector socket	1
273119		Air filter for oil/water separator	1
270416		Scavenging air hose assembly	1
270611		L-connection set	1
366663		Pressure regulation element VA M12x1,5	1
366664		Pressure regulation adapter	1



365280		Gasket G½" oil proof	1
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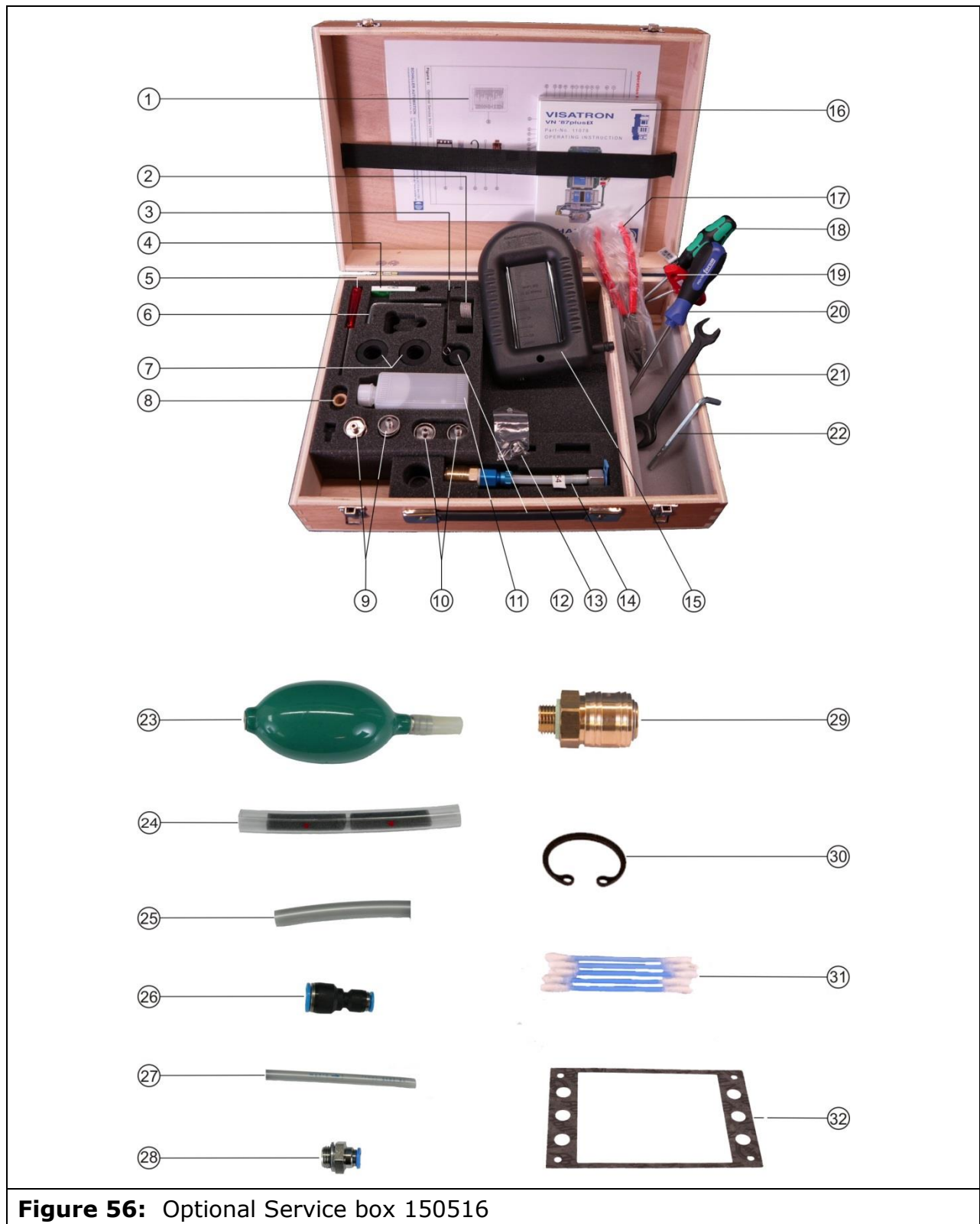
Table 4: Optional Spare parts

Part-No. new	Part-No. old	Description
150516		Service box series VN87plus EX
151780		VN-Smoke Test-Box
180080		Manual DVD series VN87plus EX
151072	10001	Pressure regulator unit with input throttle
270888	10753	Protection cover
150938	11163	Oil separator for air outlet
150939	11164	Pipe siphon
150260	10013	Siphon block VN180
150166	10612	Siphon block VN180 with manometer fitting
270504	10089	Mounting plate VN180
270371	10062	Oil pump VN180
340375	10640	Blind plug VN180
150740	10353	Smoke generator, 230 Volts
151067	11089	Smoke generator, 110 Volts
451209	10097	Smoke fluid
151167	11049	Fog machine complete
450137	11052	Fog fluid
272059		Smoke tube (6 pcs.)
450421		Smoke hand pump
150998	11506	Monitoring device Remote Indicator II
230140	11503	Bus-cable 10m for monitoring devices
	Depends on engine type	Suction funnel
	Depends on engine type	Engine wall connection

Table 5: Optional Accessories



8.1 Optional Service Box



Item	Description	Quantity	For spares
01	Service box VN87plus EX content list	1	180509
02	Scavenging air filters	6	365197 / 10042
03	Cleaning needle	1	190003 / 10135
04	Fuse 2A semi time lag	10	436551 / 10973
05	Screwdriver 3 mm	1	190143 / 10038
06	Hex key 5 mm L-shape	1	190138 / 10044
07	Flexible bellows of suction channels	2	365193 / 10023
08	Air filter for pressure regulator unit	1	365206 / 10002
09	Suspension elements bottom	2	355055
10	Suspension elements top	2	355054
11	Bottle with slacked water	1	270089 / 10040
12	Bottle with cleaning fluid	1	270090 / 10035
13	Service kit O-ring pressure regulator unit	1	270610
14	Manometer adapter for siphon block VN180	1	270502
15	U-pipe manometer	1	200548 / 10046
16	Manual series VN87plus EX in English	1	180080
17	Circlip pliers for Seeger rings	1	190146 / 10048
18	Screwdriver 4 mm	1	190046 / 10157
19	Hex key 4 mm with handle bar	1	190052
20	Philips screwdriver	1	190053
21	Double jaw wrench 14/17 mm	1	190050 / 10356
22	Hex key 6 mm L-shape	1	190206 / 10047
23	Hand pump	1	450421
24	Smoke tube	1	450420
25	Flexible hose D10	1	270705
26	Connection QS-10-6	1	366633
27	Flexible hose D6	1	366655
28	Connection QS-G¼-6	1	270704
29	Manometer adapter for control cover	1	270493 / 10053
30	Seeger circlip rings	4	365198 / 10041
31	Cotton sticks to clean IR-filters	5	452176 / 10036
32	Gasket for valve box	1	330721 / 10405

Table 6: Contents of optional service box VN87plus EX 150516



8.2 VN-Smoke Test Box

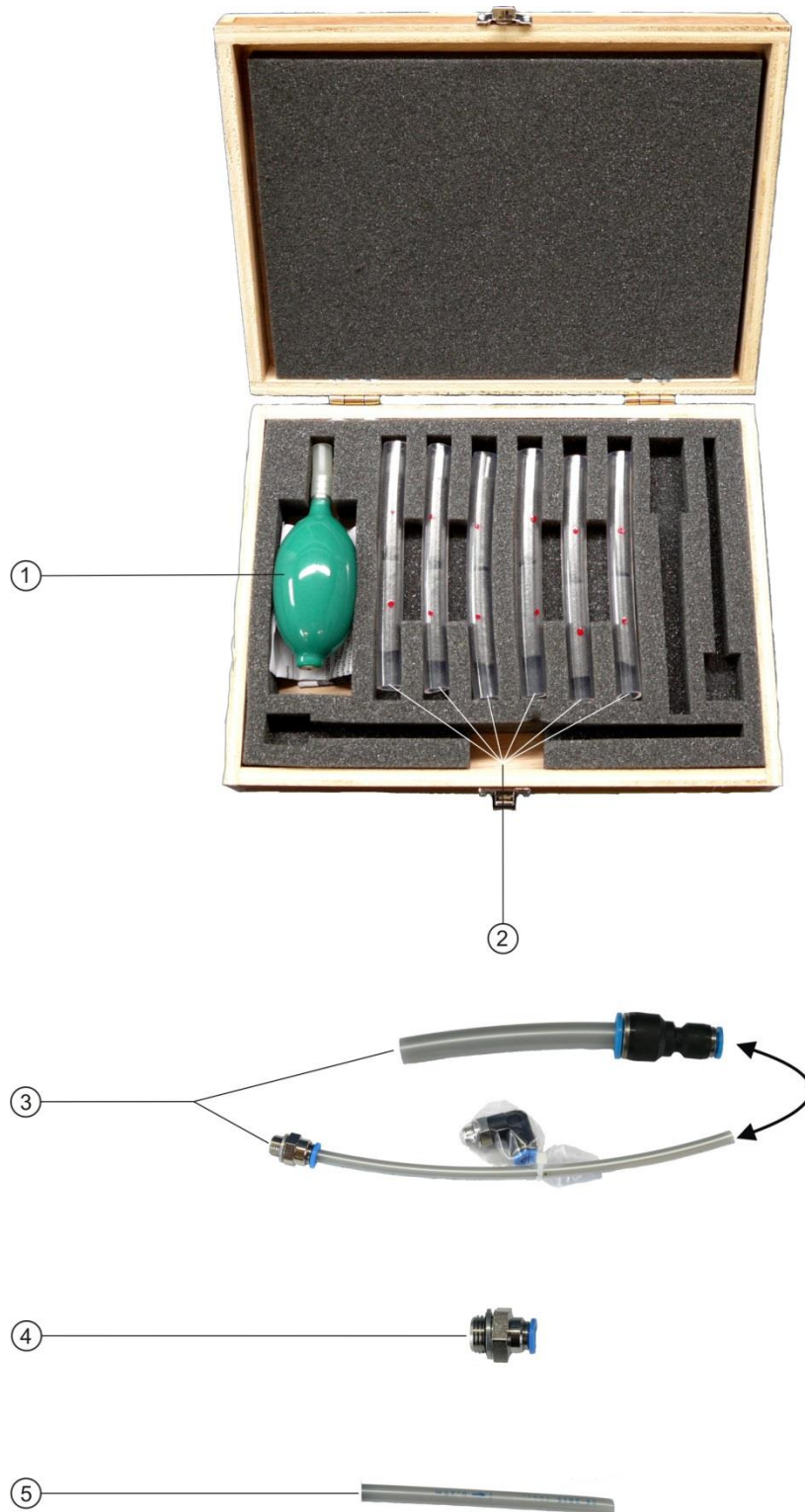


Figure 57: VN-Smoke Test-Box 151780

Item	Description	Quantity	For Spares
01	Hand pump	1	450421
02	Smoke tube	1 (6 pcs.)	272059
03	Adapter flexible hose f. smoke tubes	1	270710
04	Connection QS-G¼-6	1	270704
05	Flexible hose D6	1	366655

Table 7: Contents of VN-Smoke Test-Box 151780



9 Technical data

Mechanical data	
Dimensions	See drawings (Figure 58)
Weight	VN115/87plus EX 8.4 kg
Display	LED-bar with 14 LED's 1 green Ready LED 1 red High Oil Mist Alarm LED 1 red Test LED
Suction pipes	VN115/87plus EX \varnothing 22 x 2 x max. 9m
Pipe connections	VN115/87plus EX 2 x G3/4
Venturi injector connections	In NTP/BSP/G1/2A Out NTP/BSP/G3/4A
Pressure reducer connections	In NTP/BSP/G1/4A Out NTP/BSP/G1/4A
Electrical data	
Power supply	18 Volts – 31.2 Volts DC, max. 2A
Nominal voltage	24 Volts DC
Relay Outputs	2 x 'High Oil Mist Alarm' 1 x 'Ready' 1 x 'Oil Mist Pre-Alarm' (max. 60 Volts DC, 1A)
Cable entry	2 x M25
Communication interface to monitoring device	2 wire RS485, galvanically isolated (opt. 4-20 mA, galvanically isolated)
Communication cable recommendation	LAPPKABEL UNITRONIC-FD CP (TP) plus UL-CSA, 2 x 2 x AWG20, max 400 m length, 7.5-10.0mm \varnothing
Air data	
Air pressure	Pressure reducer inlet 2 – 15 bar Air jet pump inlet max. 500 mbar
Air consumption	Depends on the suction system (max. 2,5 m ³ /h)
Negative pressure in measuring head	- 60 mm WC or – 6 mbar
Air quality	ISO8573-1:2010 – “6-4-4”



Environmental conditions	
Operating temperature	+5 - +70 °C
Storage temperature	-25 - +80 °C
Max. vibrations	4 g (25-100Hz)
Relative humidity	up to 95%
Protection class	IP54
Approval of classes	
	Type approved for closed areas, designed for installation on combustion engines, environmental category D (GL), IACS UR M67 conform, list of type approvals see www.schaller.de

EC-Type examination for equipment and Components intended for use in potentially explosive atmosphere (directive 94/9/EC)


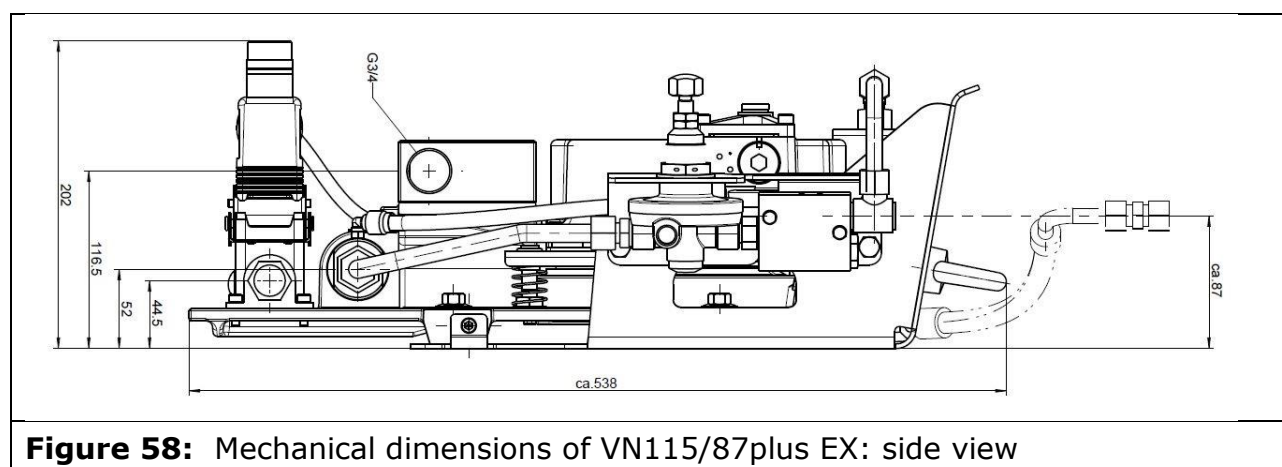
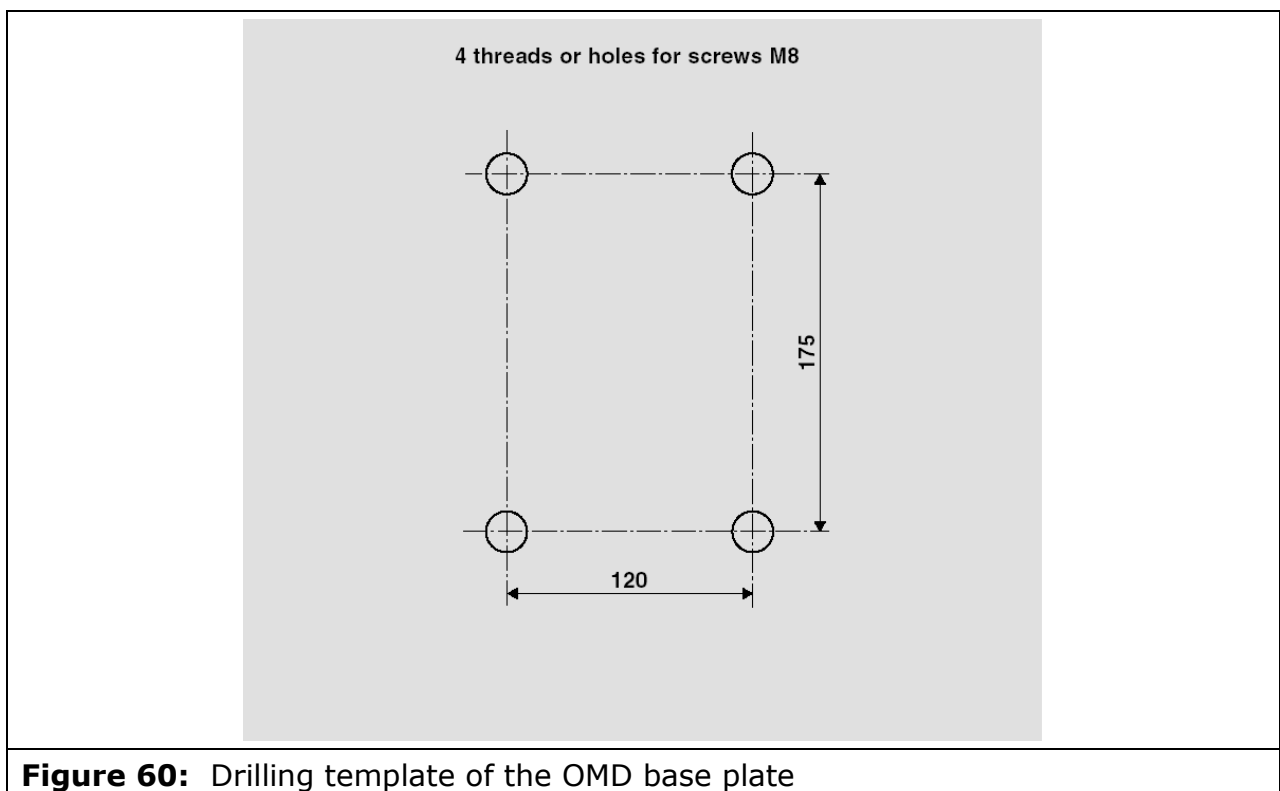
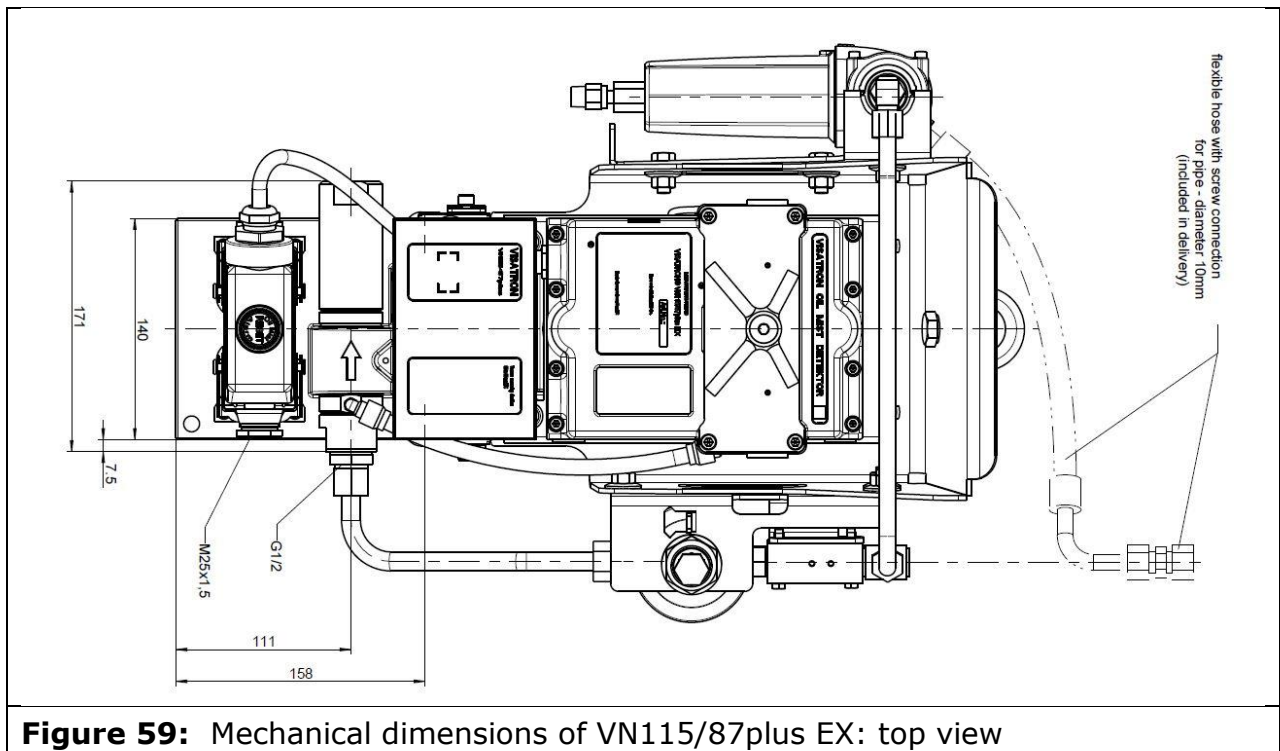
	II (2G) [Ex op is IIB T4 Gb]
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Table 8: Technical data





10 Service Partners

Schaller Automation maintains a worldwide network of service partners in following countries:

Argentina	Latvia
Australia	Lithuania
Bahrain	Mauritania
Belgium	Mexico
Belize	Morocco
Bolivia	Netherlands
Brazil	Nicaragua
Canada	Norway
Cape Verde Islands	Oman
Chile	Panama
Colombia	Peru
Costa Rica	Philippines
Denmark	Poland
Ecuador	Portugal
El Salvador	Qatar
Estonia	Saudi Arabia
France	Senegal
Germany	Singapore
Greece	Spain
Guatemala	Sweden
Honduras	Taiwan
Iceland	Turkey
India	United Arabian Emirates
Iran	United Kingdom
Ireland	United States of America
Italy	Caribbean Islands
Japan	
Korea	
Kuwait	

For an up-to-date list of our representatives including address and contact details please visit our website:

www.schaller.de

or call our technical support center at the German headquarter:

Tel. +49 6842 508 0

