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: in general avoid U-bends or kinks in the tubing system.
    - VN115/116 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.
    - VN115/116 with siphon blocks: Use one siphon block at each compartment.
    - VN215 with siphon block: Use one siphon per compartment. If a suction point is placed above the detection unit e.g. at the camshaft use a pipe siphon at the lowest point of the pipe to avoid an oil pocket, which could clog the pipe.
    - VN215 without draining components: The pipes have to be mounted with an angle greater than 6° inclination.

- 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.

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

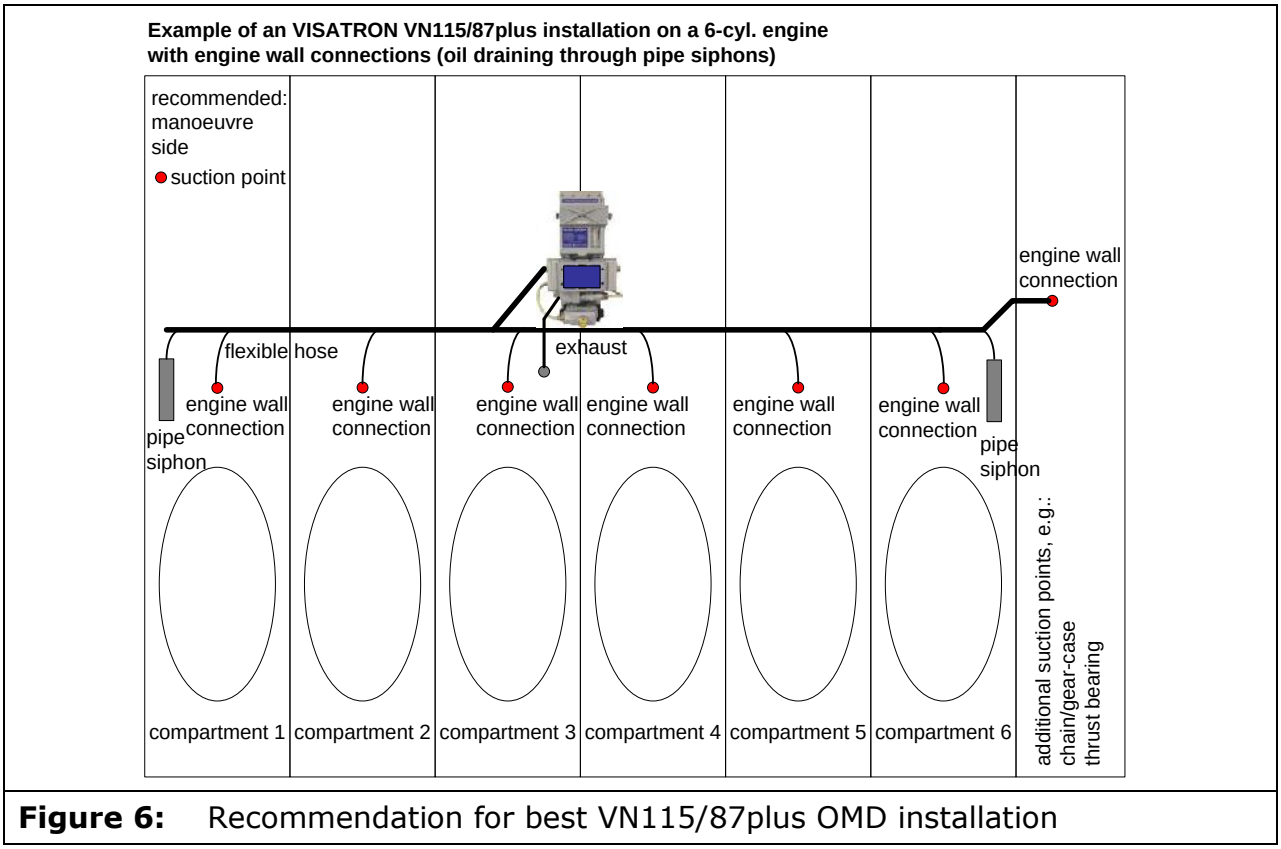


Figure 6: Recommendation for best VN115/87plus OMD installation

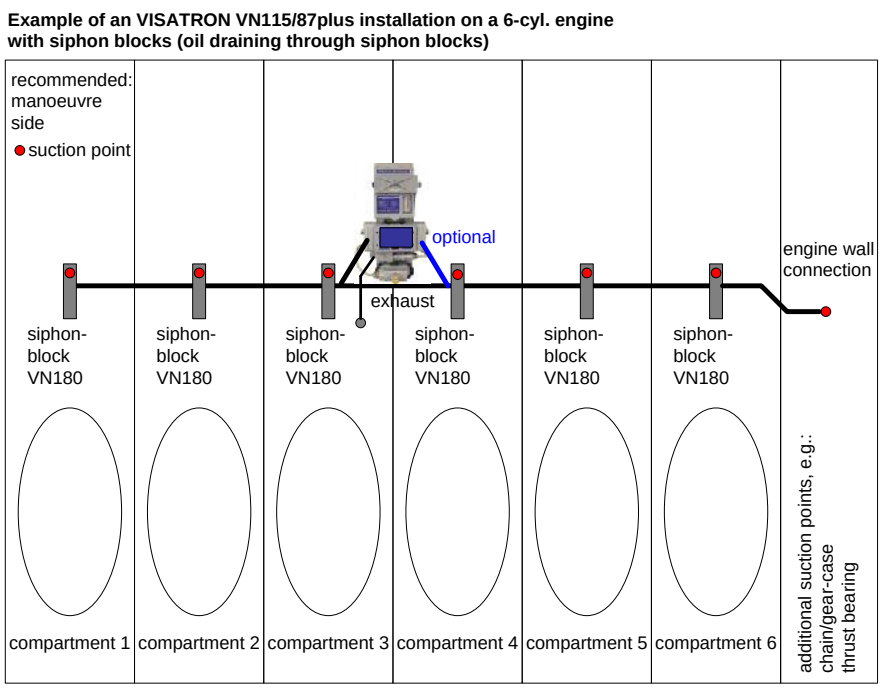


Figure 7: Alternative installation of VN115/87plus OMD

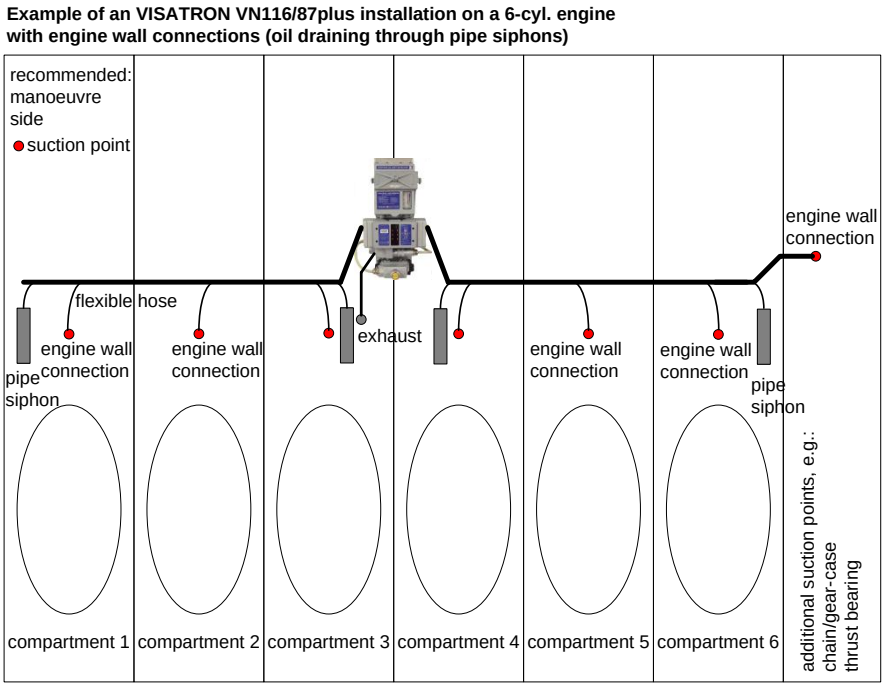


Figure 8: Recommendation for best VN116/87plus OMD installation

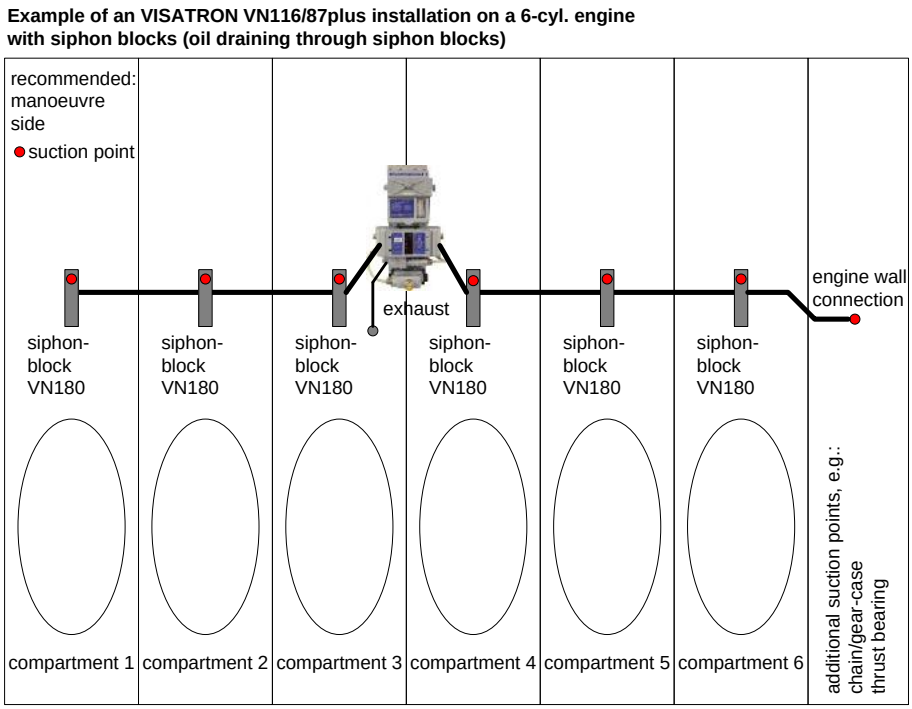


Figure 9: Alternative installation of VN116/87plus OMD

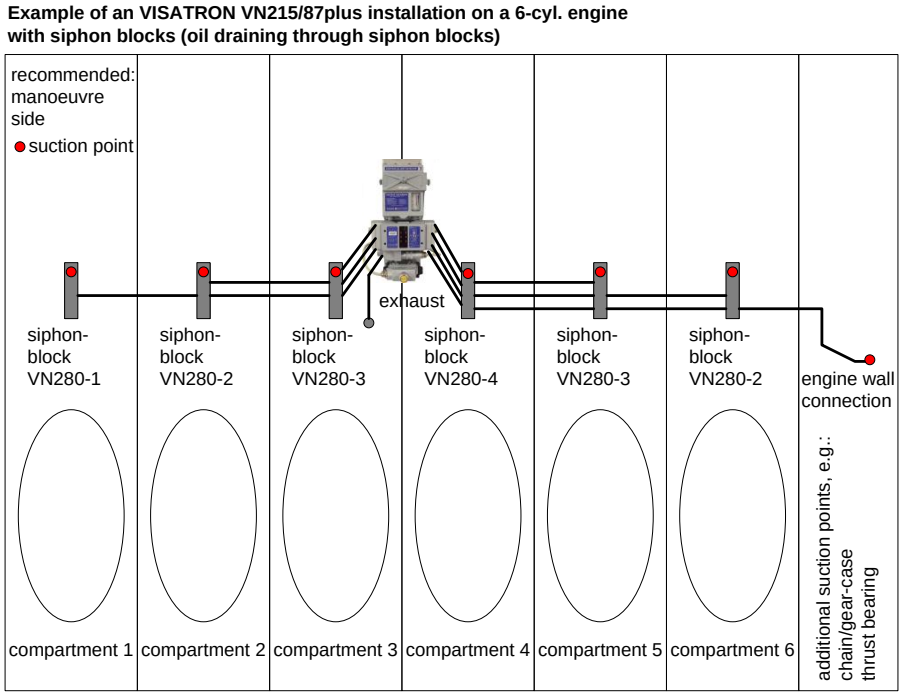


Figure 10: Recommendation for best VN215/87plus OMD installation

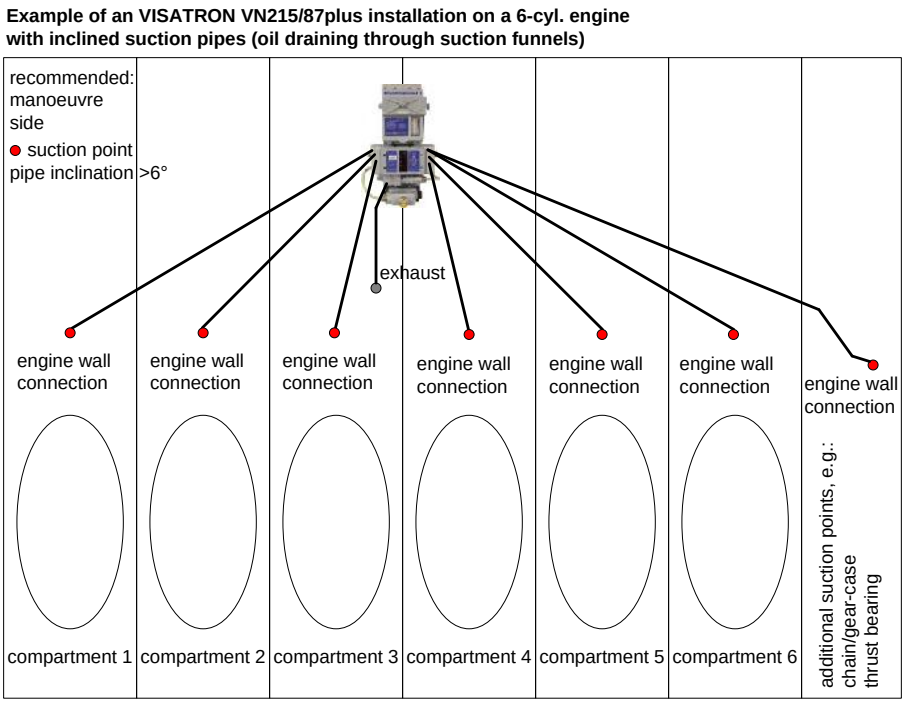


Figure 11: Alternative installation of VN215/87plus OMD

2.1.2 Pipe dimensions

- For VN115 and VN116 standard applications:
  - Seamless steel pipes: 22 mm outer diameter, 2 mm wall thickness
  - Flexible hoses: inner diameter not less than 6 mm

- For VN215 standard applications:
  - Seamless steel Pipes: 14 mm outer diameter, 2 mm wall thickness
    or, if 14 mm is not available
  - Seamless steel Pipes: 13,71 mm (known as1 /4-inch pipes, schedule no. 40, 0.540 inch outer diameter, 0.088 inch wall thickness)

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

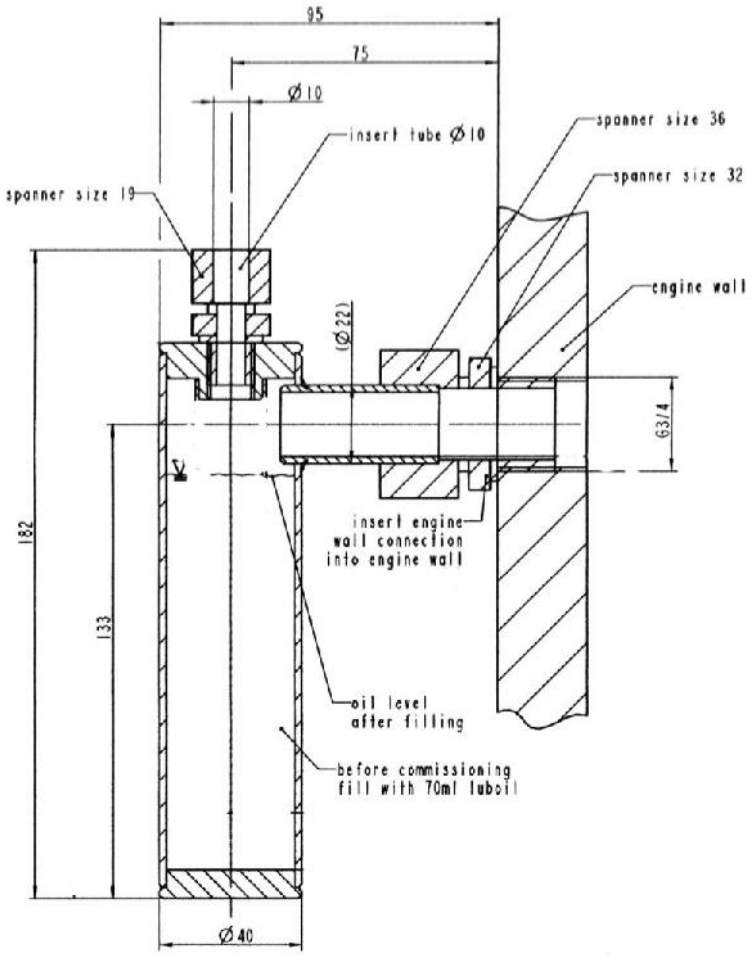


Figure 12: Pipe siphon

- 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

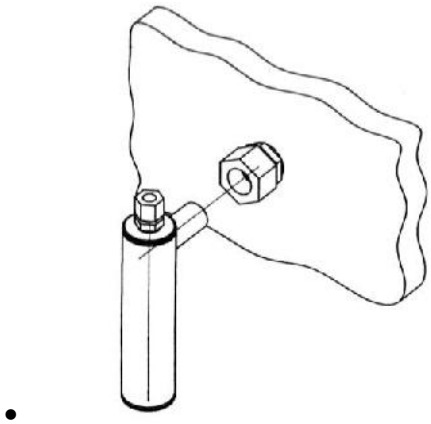


Figure 13: Pipe siphon at engine wall

Figure 14: Image of pipe siphon

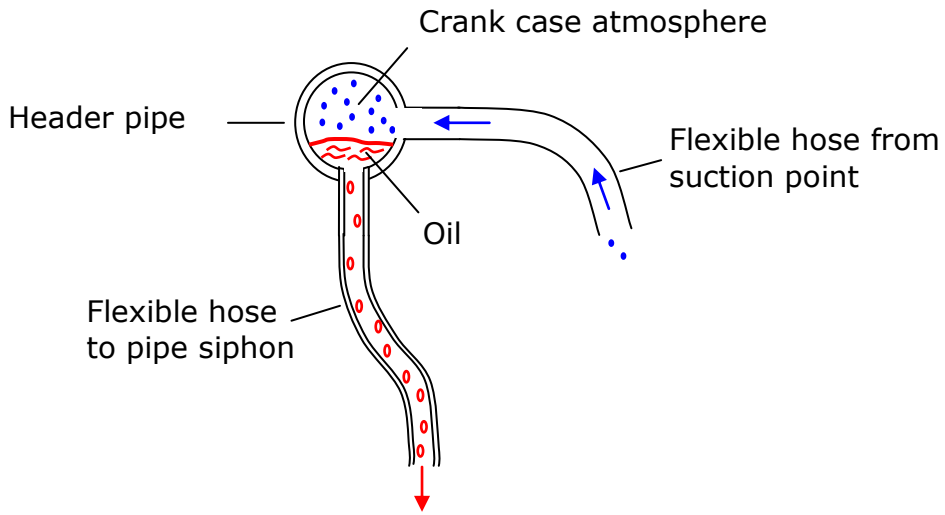


Figure 15: Oil draining principle

2.1.4 Installation of the siphon block connection units

Figure 16: 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

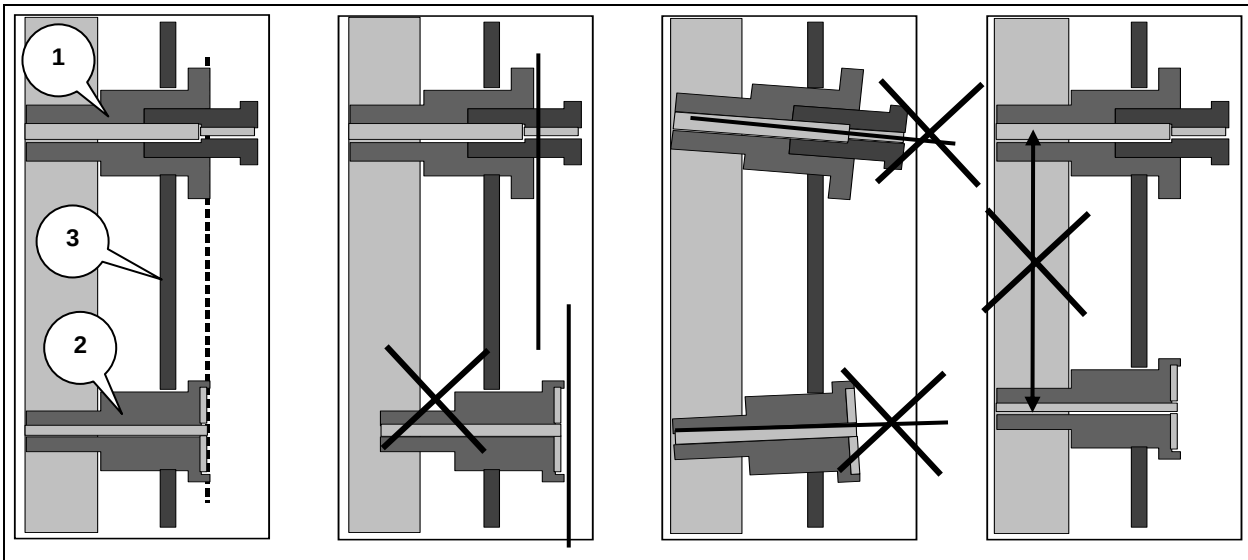


Figure 17: Side view

- Avoid wrong alignment, wrong angles and incorrect distances (see Figure 17)
- Insert the suction funnel from the crankcase side into the siphon block, align it in a vertical position (see Figure 18) **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 18).

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

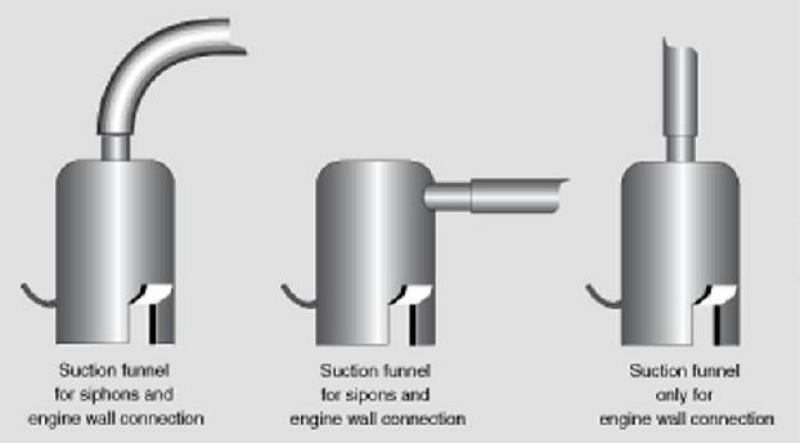


Figure 18: Different types of suction funnels

2.1.6 Pipe arrangement at valve box (VN215/87plus system only)

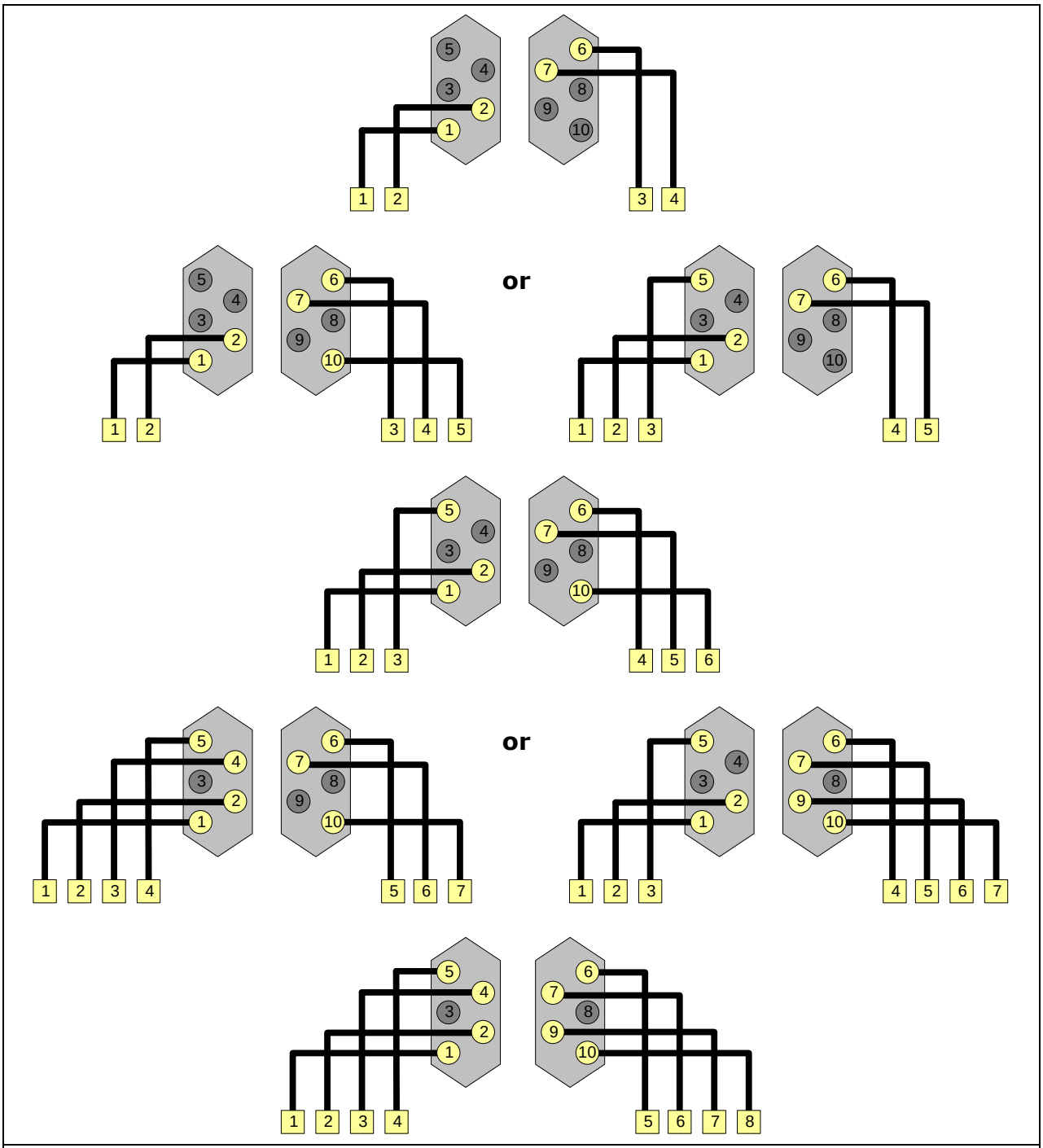


Figure 19: Pipe arrangement for 4 to 8 suction points

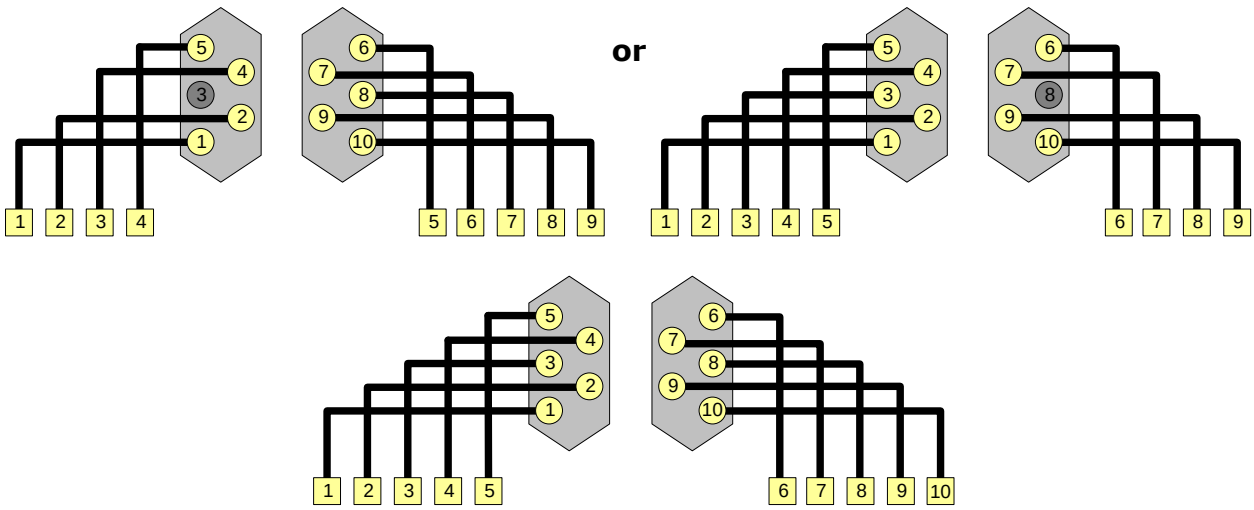


Figure 20: Pipe arrangement for 9 and 10 suction points

	CAUTION! Other arrangements are not valid. Unused connection points (see Figure 19 and Figure 20, marked dark grey) have to be closed by supplied rubber plugs.

2.1.7 Compressed air connection

If the SAB pressure regulator (see Figure 21) is used connect the compressed air supply at the NTP/BSP/G1/4A fitting. Do always connect OMD to engine's control air system, pressure range 2 - 15bar. A **dry and clean** air with low humidity/oil contamination is of high importance.

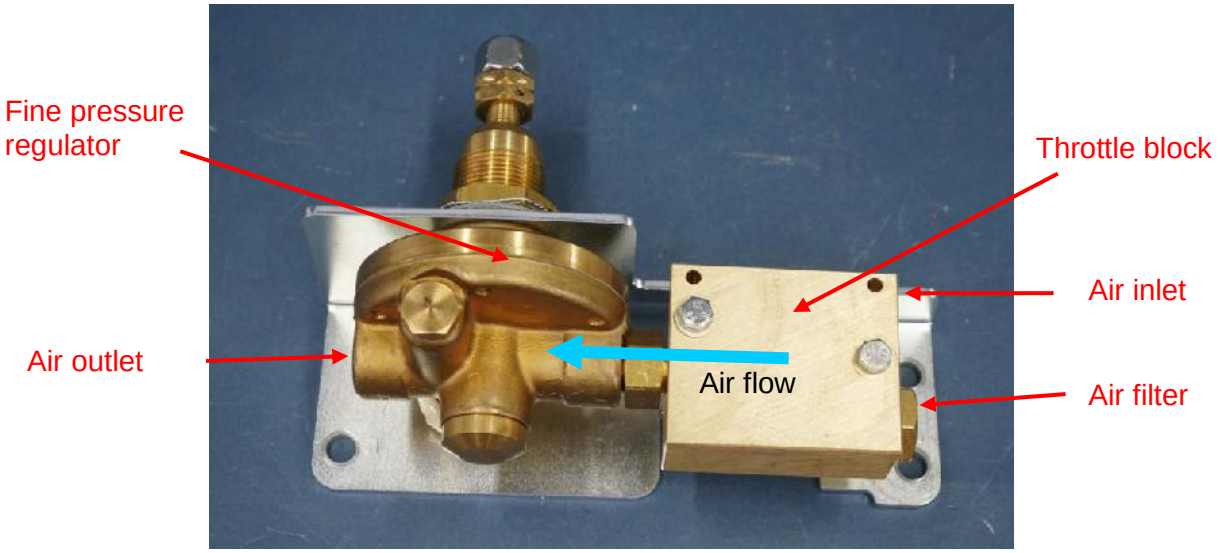


Figure 21: Pressure regulator unit

2.2 Electrical installation

2.2.1 VISATRON® series VN87plus device

The electrical terminal is inside the socket housing (see Figure 22) on the base plate of the VISATRON® device. The pin assignment is specified in Figure 25. The cable entry points are located on either side.

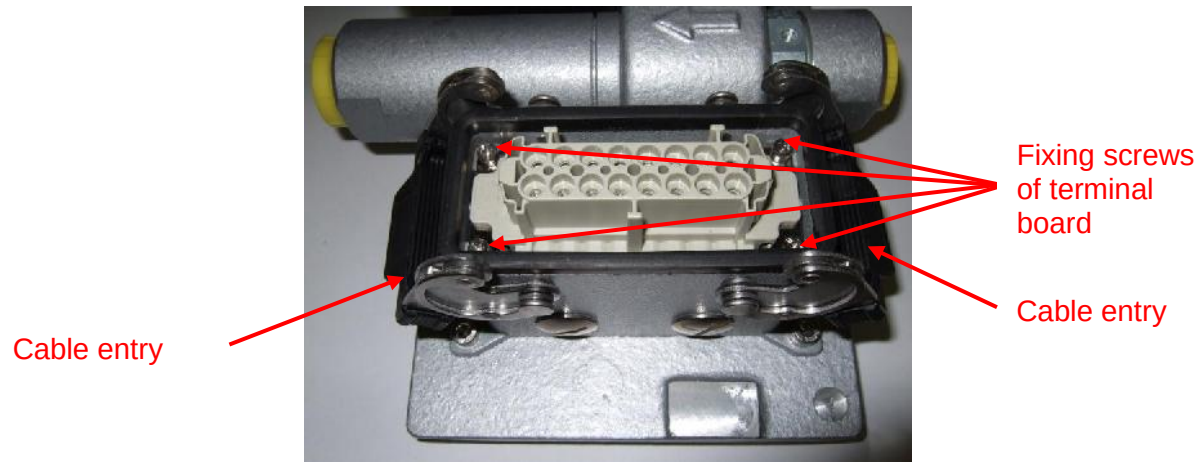


Figure 22: Socket housing

According to the pin assignment of Figure 25 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 25).

To replace the wire break resistors the measuring head has to be dismounted. The resistors (see Figure 24) are located on the rear side under the plastic cover (see Figure 23). 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.

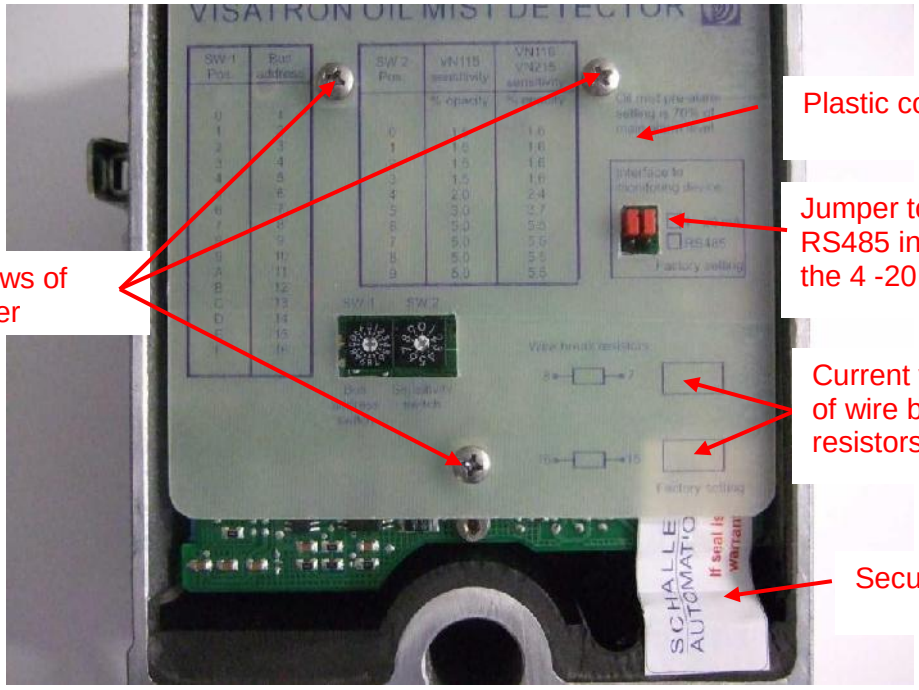


Figure 23: Rear side of measuring head

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 25).

Figure 24: 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 25: Pin assignment

- We recommend to connect '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 devices Remote Indicator II to monitor the oil mist concentration and the OMD status from a safe location.

The connection to the monitoring devices 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 26), 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 26) at the VISATRON® device is designed for cable diameter between 7.5 and 10.0 mm.

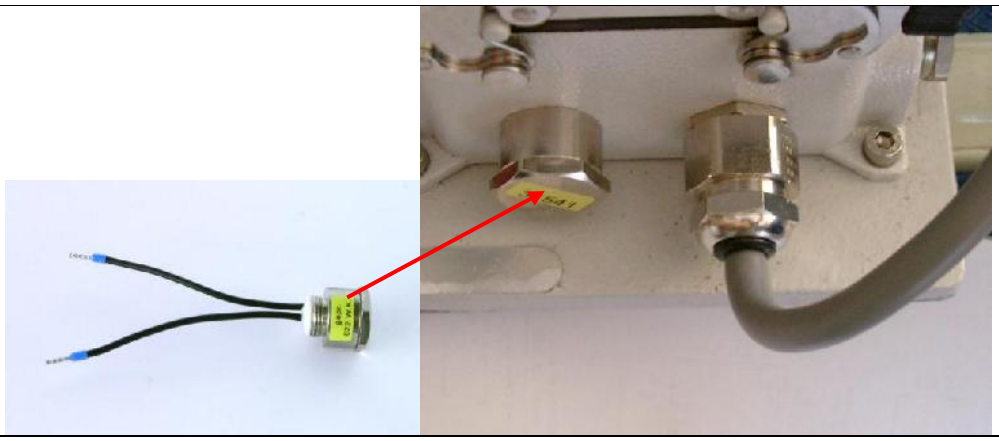


Figure 26: Cable entry and bus-terminator on the bottom side of the VISATRON® device

The connection between the OMD device and the monitoring device for standard applications is shown in the following wiring diagram (see Figure 27)

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

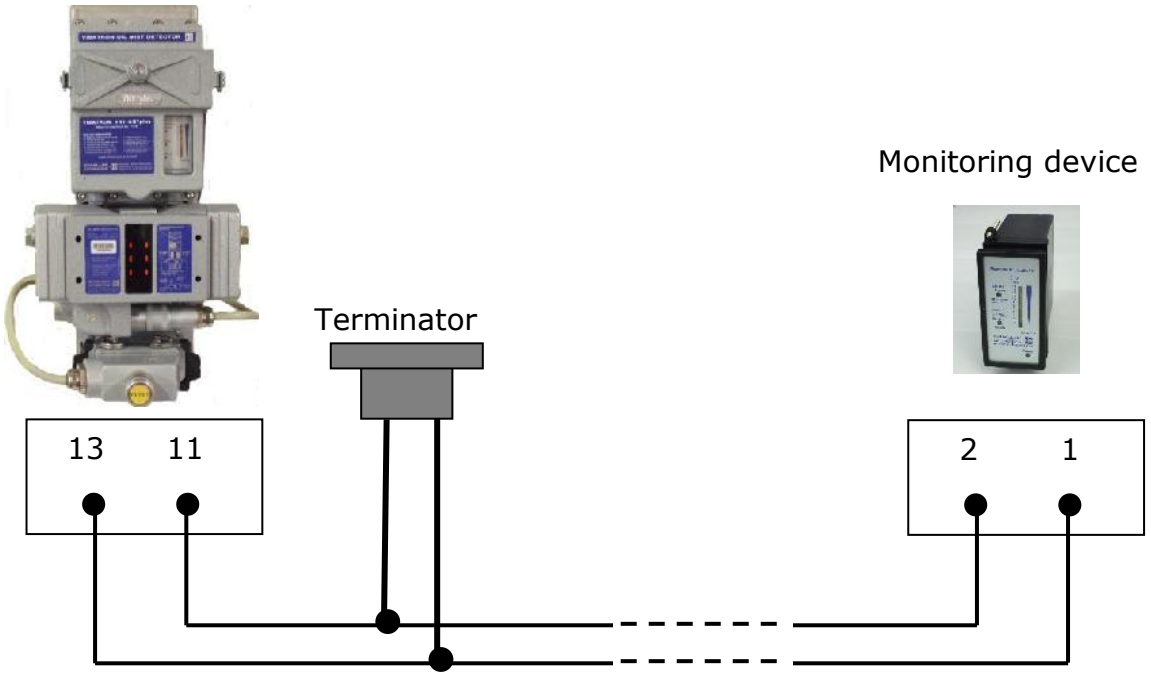


Figure 27: Wiring diagram to connect Remote Indicator II

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 28).

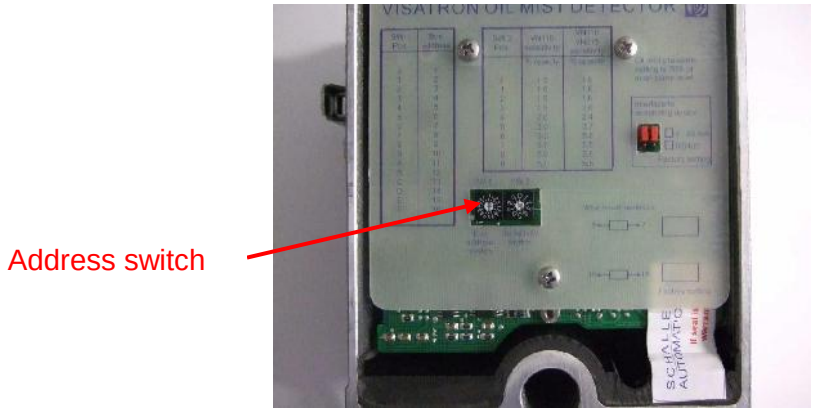
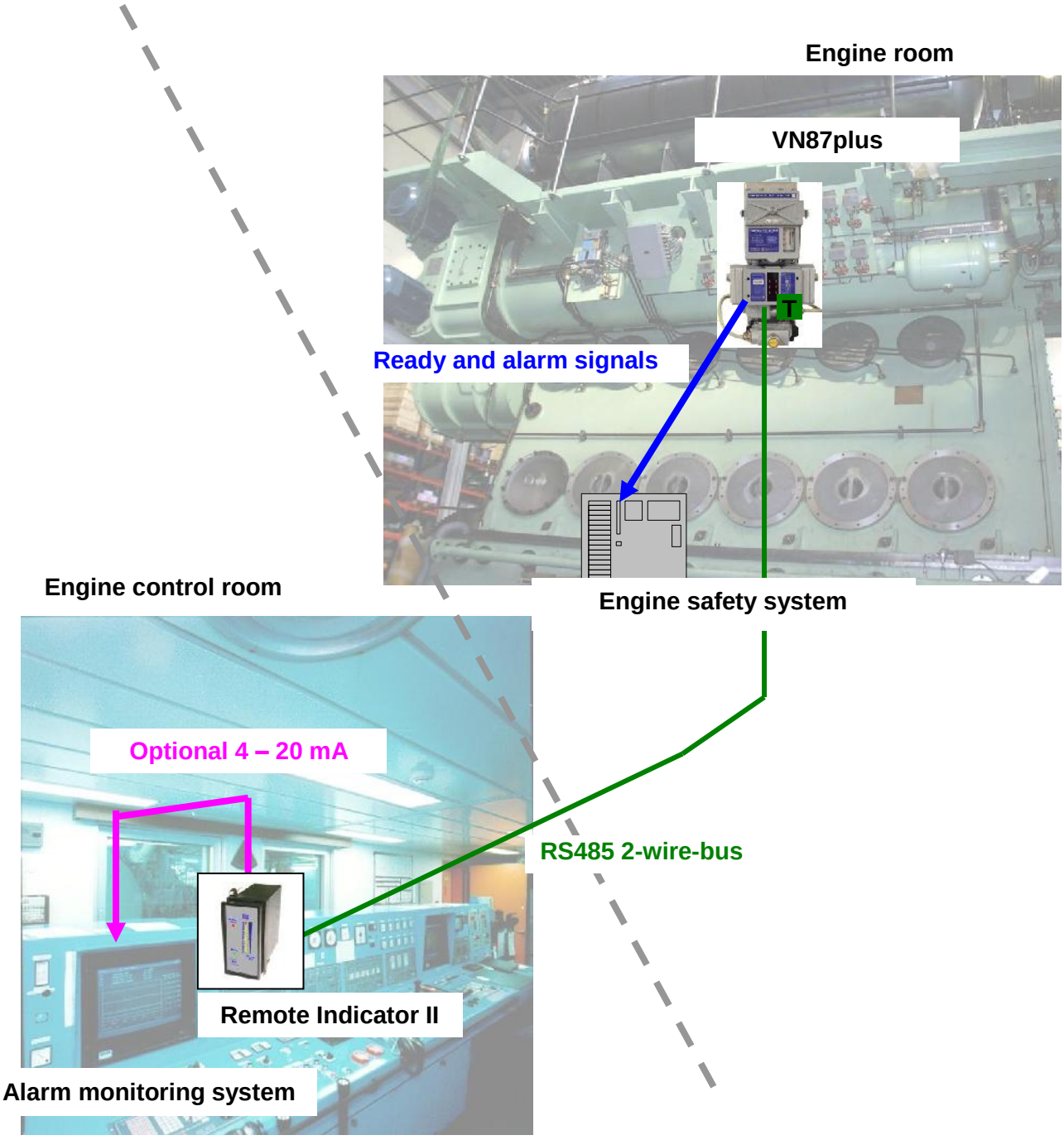


Figure 28: Bus address switch at the rear side of the measuring head

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.

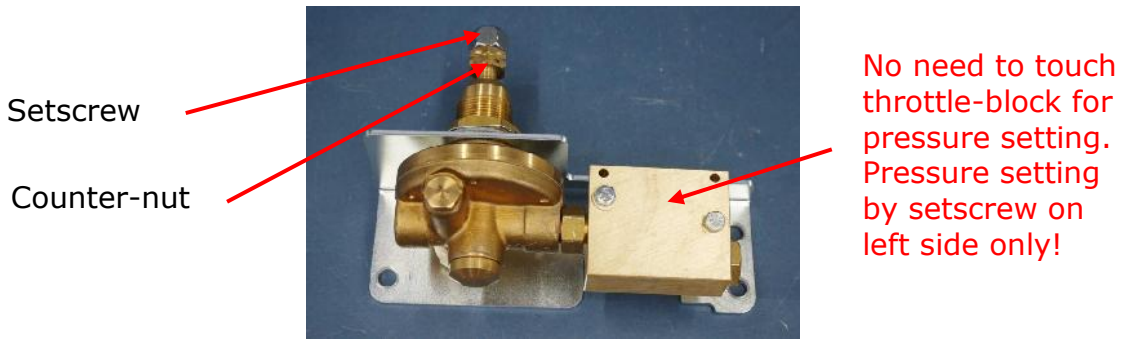


Figure 29: Pressure regulator unit

	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 30). (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.

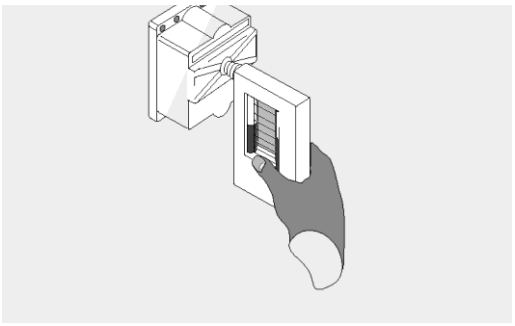


Figure 30: U-tube manometer connected to OMD control cover

- Remove U-tube manometer

3.2 Filling of siphon blocks VN280plus of VN215/87plus system with oil

- Press the pump lever of the filling pump (see Figure 32) as many times until first oil drops come out.
- Unscrew the lower siphon block plug (see Figure 31).
- Insert filling pump nozzle.

Figure 31: Siphon block VN280plus for 5 connecting tubes (5 holes on its side)

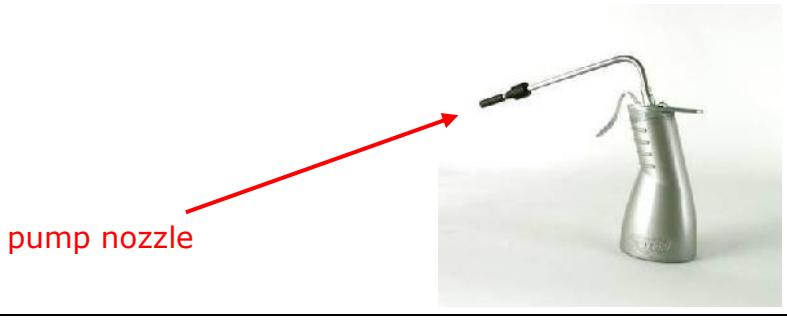


Figure 32: Filling pump

- Press the black nipple into the block's lower screw hole (see Figure 32).

- Pumps nozzle is equipped with 5 marks for max. 5-hole siphon block
- Push in the nozzle to the first mark next to the nozzles tip (see Figure 33).

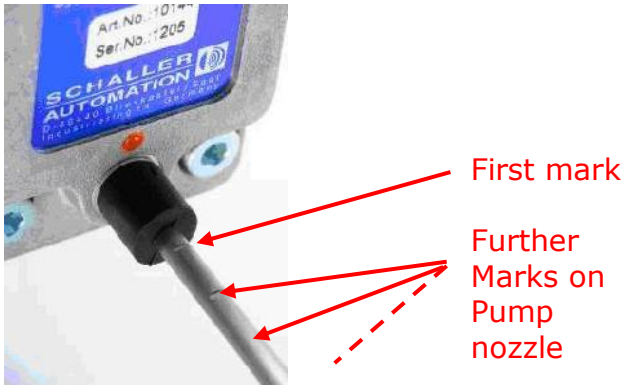


Figure 33: Marks on the nozzle

- Fill in 12 pump strokes, then push in the nozzle ca. 10mm to the next mark and repeat filling in oil with 12 pump strokes
- Repeat procedure at all marks until the nozzle reaches stop at the rear plate.

  At a siphon for 5 connecting tubes you will reach stop at 5th mark, at siphons for e.g. 2 connecting tubes, stop will come after 2nd mark, etc.

	CAUTION! **Do not fill with more than 12 strokes per siphon**. 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.

	The number n of internal siphons is equal to the number of pipe connections. This means, that the pump has to be used n times at varying positions.

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

3.3 Filling of siphon blocks VN180 for VN115/87plus and VN116/87plus system with oil

- Press the pump lever of the filling pump (see Figure 35) as many times until first oil drops are coming out.
- Unscrew the lower siphon block plug (see Figure 34).
- Insert filling pump nozzle (see Figure 36).

Figure 34: Siphon block VN180

Figure 35: 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 36: 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.

3.4 Filling of pipe siphons for VN115/87plus and VN116/87plus system with oil

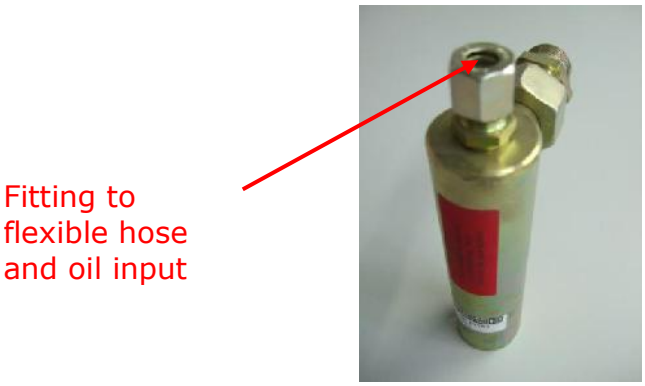


Figure 37: Pipe siphon

- 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.

3.5 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	Relative VN116/VN215 alarm level in opacity
3	1.5%	1.6%
4	2.0%	2.4%
5	3.0%	3.7%
6	5.0%	5.5%

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

	CAUTION! Standard switch position 3 or 4 normally is sufficient for all sorts of engines. In case, sensitivity level needs to get switched to 5 or 6 (less sensitive), it is mandatory that person changing it does inform Schaller Automation about that in writing: info@schaller.de.

The sensitivity of the VISATRON® oil mist detector can be adjusted by a switch on the rear side of the measuring head (see Figure 38).

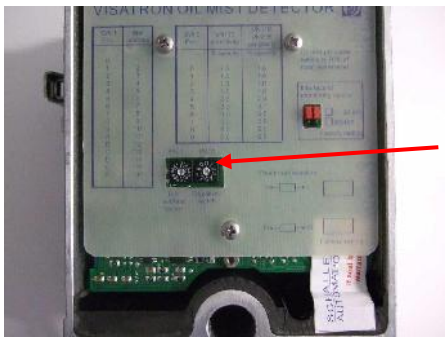


Figure 38: Sensitivity switch at rear side of measuring head

3.6 Commissioning check list

Mechanical check	
Are all suction pipes installed as specified in the installation drawing?	□ yes / □ no
Are all fittings fastened and tight?	□ yes / □ no
On VN215/87plus installation: Is the arrangement of the pipes at the valve box correct?	□ yes / □ no
On VN215/87plus installation: Are all un-used openings at the valve box closed?	□ yes / □ no
On installations with siphon blocks: Are all siphon blocks filled with oil and all un-used openings closed?	□ yes / □ no
On installations with pipe siphon: Are all siphons filled with oil?	□ yes / □ no
On installations with oil separator: Is the separator filled with oil?	□ yes / □ no
Is the negative pressure at the measuring head adjusted to 60 mmWC?	□ yes / □ no
Adjusted negative pressure	mmWC

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

Functional check	
On vessels perform the on-board test with test plate. Test positive?	□ yes / □ no
At engine factory perform smoke test. Test positive?	□ yes / □ no
On VN115/87plus installations, as an alternative to the smoke test, measure the negative pressure at the end of the suction pipes. Values as specified?	□ yes / □ no