Version 2.0, 07/2008

VISATRON®

Oil Mist Detectors

VN115/93
VN116/93
VN215/93

Operation Manual

Part-No. 10980

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® series VN93. It contains no details about repairs.

The operating instructions are applicable for:

VN115/93
VN116/93
VN215/93

Should you encounter any interruptions or breakdowns during operation, please contact SCHALLER AUTOMATION Industrielle Automationstechnik GmbH & Co. KG. You can expect a safe and reliable operation of the series VN93 devices only when the device is operated in accordance with this operation manual.

Please note the following rules:

- Installations of the VISATRON® series VN93 devices have to be in accordance to the IACS UR M10 if applicable.
- Please acquaint yourself with the operation manual.
- Read the operation manual carefully and take note of the given advice.
- Use the VISATRON® series VN93 devices only for the purpose described in the operation manual.
- Incorrect maintenance and handling errors may cause failures and accidents!
- The VISATRON® series VN93 devices may be used by authorised specialised staff only.
- This operation manual must be available at the place of installation at all times.

The manufacturer does not accept any guarantees resulting from improper handling or insufficient maintenance and service.

SCHALLER AUTOMATION Industrielle Automationstechnik GmbH & Co. KG precludes all guarantees for the case that incorrect device combinations are operated with devices not certified to be compatible or not admitted by the manufacturer.

Conditions of Sale

The standard conditions of sale of SCHALLER AUTOMATION (current version) shall apply to all sales of VISATRON® and connected products to any of our customers.

Safety instructions

The series VN93 devices are manufactured according to the high quality standard of SCHALLER AUTOMATION and pass the 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 and at the device they are marked with the following symbols.

Used symbols	
	CAUTION! Do not ignore the warnings. The safety of persons 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.

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

Reset of Oil Mist Alarms

Ensure, that the oil mist concentration inside the engine has fallen under the Lower Explosion Level (LEL) before acknowledging an oil mist alarm by pressing the Oil-Mist-Alarm button. Otherwise you risk an oil mist explosion!

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

Use a monitoring device at a safe location to read off the current oil mist concentration. SAB recommends to wait until more than the half of the indication LED's are switched off (VISATRON®-device and Remote Indicator II) or the oil mist alarm level has to reduce below 50 % (ReCon DS23).

Declaration of Conformity

We, the manufacturer

SCHALLER AUTOMATION
Industrielle Automationstechnik GmbH & Co. KG
Industriering 14
D-66440 Blieskastel
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® VN115/93**
VISATRON® VN116/93
VISATRON® VN215/93

is in compliance with following standards :

EN 61000-4-2
EN 61000-4-3
EN 61000-4-4
EN 61000-4-5
EN 61000-4-6
CISPR 16-1
CISPR 16-2
IACS UR M67

D-66440 Blieskastel, 2007/07/25

Stephan Schaller
- Managing Director -

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1 Introduction and functional overview

The VISATRON® series VN93 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.

This device is conform to the IACS UR M10 which is valid since January 2006.

It is not possible to monitor directly 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 forgotten mounting tools – all of these parts could produce oil mist e.g. in case of lubrication problems. Therefore SCHALLER AUTOMATION philosophy is that only OMD-systems can securely prevent oil mist explosions by detecting the primary origin of danger: the oil mist itself.

The VISATRON® series VN93 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 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® series VN93 oil mist detector
- Protection cover
- Suction system including pressure regulator
- Monitoring device

Three different types of the VISATRON® series VN93 oil mist detectors are available (see Figure 1):

- VN115/93
- VN116/93
- VN215/93

All devices have a measuring head (2) which includes the optical measuring track under the control cover (3), a label on the front side 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 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.

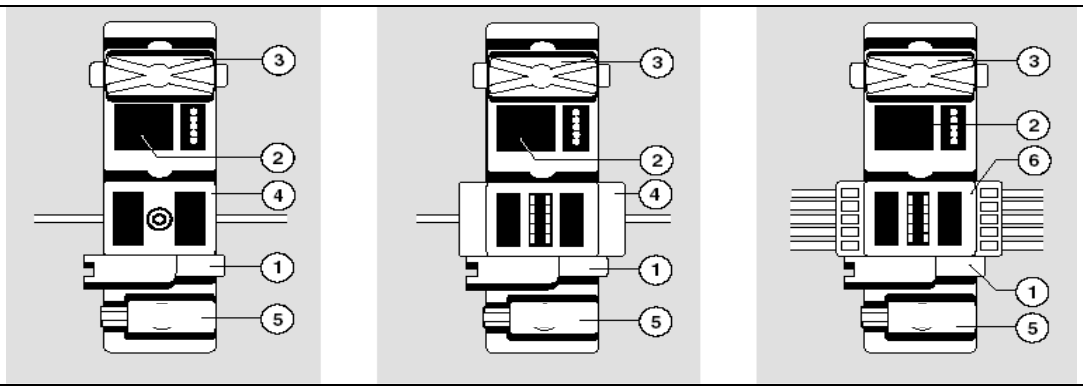


Figure 1: Types of VISATRON® series VN93

VN115/93
The suction system is connected to the common "Connecting Box" (4). This type of oil mist detector is able to detect an oil mist alarm, without identifying the location of the oil mist source inside the engine.

VN116/93
The suction system is connected to the "Valve Box 116" (4). This type of oil mist detector is able to detect an oil mist alarm, indicating in the valve box window the left or right side of the detector with the highest oil mist concentration.

VN215/93
The suction system is connected to the "Valve Box 215" (6). This type of oil mist detector is able to detect an oil mist alarm, indicating in the valve box window the compartment with the highest oil mist concentration.

In normal operation mode all models are sampling in parallel the atmosphere of the engine at all suction points through the suction system to the measuring head. On detection of an oil mist alarm the models VN116 and VN215 start an additional search run to determine the location of the highest oil mist concentration. The reaction time to an alarm is totally independent of the search run.

The devices offer two alarm levels: Main-Alarm and Pre-Alarm. They can be adjusted by the light buttons (see chapter 4).

To keep the optical track clean all models using clean scavenging air in front of the filter glasses. This air is derived from the compressed air driving the air jet pump.

The devices can be ordered as single OMD device or integrated in a mounting unit. In this case the scope of supply includes an additional pressure reducer and a protection cover.

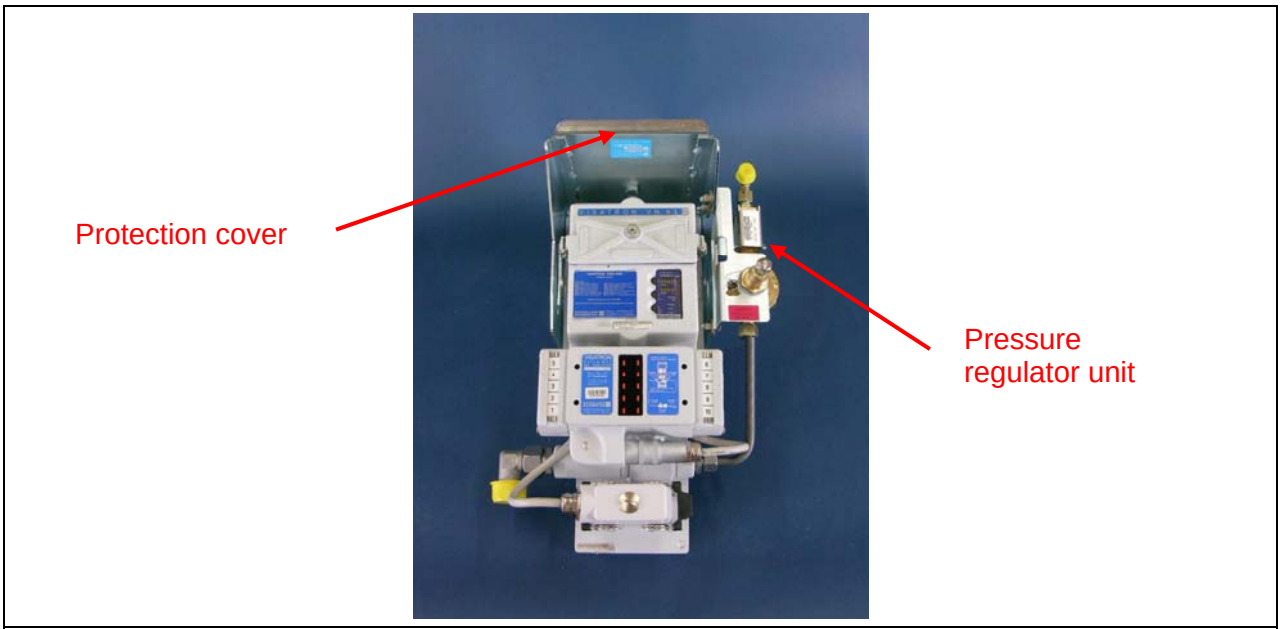


Figure 2: VISATRON® VN215/93 oil mist detector with protection cover and pressure regulator unit

The suction system always requires a so called 'suction funnel' 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 intercepts in the suction pipes and must be drained back to the crankcase.

siphon block VN180

siphon block VN280plus

pipe siphon

Figure 3:

The best method on a VN115/93 and VN116/93 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°.

To become independent from fast changes of the engine room air pressure, it is recommended that the output of the air jet pump is blown back into the crankcase. If the air is blown into the engine room, SCHALLER AUTOMATION offers an optional oil separator which should be mounted directly to the output of the pump.

Figure 4: Oil separator for air outlet

The OMD device can be connected to Schaller's monitoring devices Remote Indicator II or ReCon DS23 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 5: Remote Indicator II

Figure 6: ReCon DS23

Thus, the series VN93 is a further contribution to safety at sea. Our goal is to avert lasting damage to real assets, the individuals and 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: in general avoid U-bends or kinks in the tubing system.
    - VN115/116 with pipe siphons: Mount one pipe siphons 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.

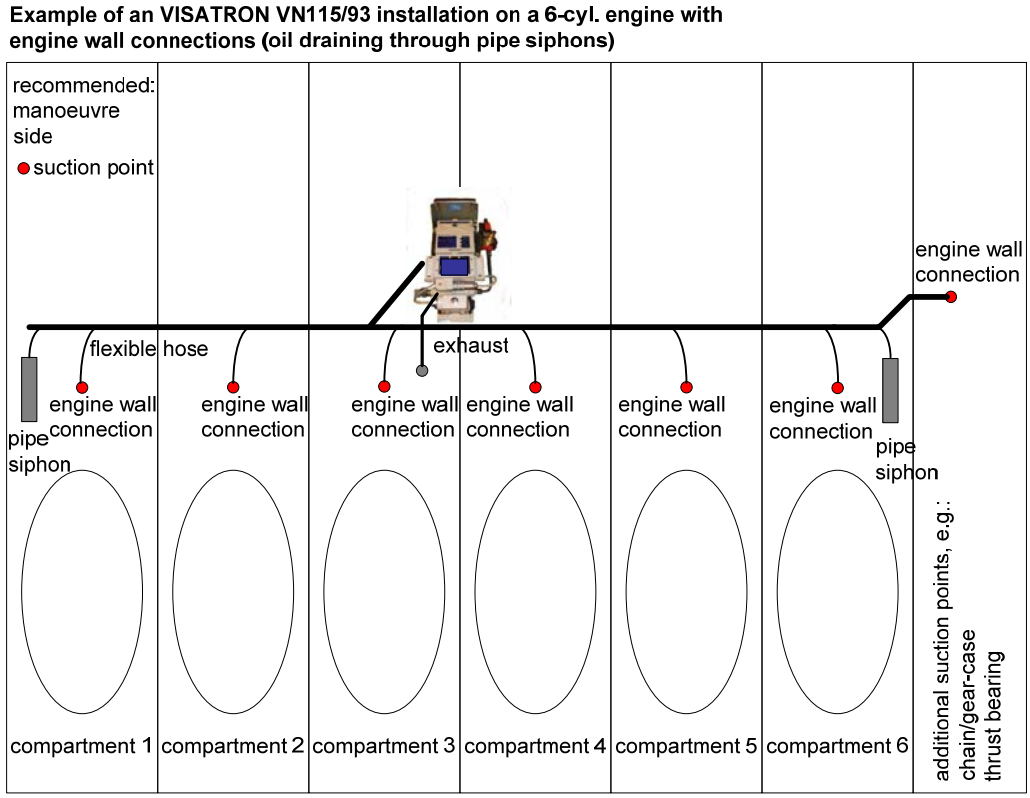


Figure 7: Recommendation for best VN115/93 OMD installation

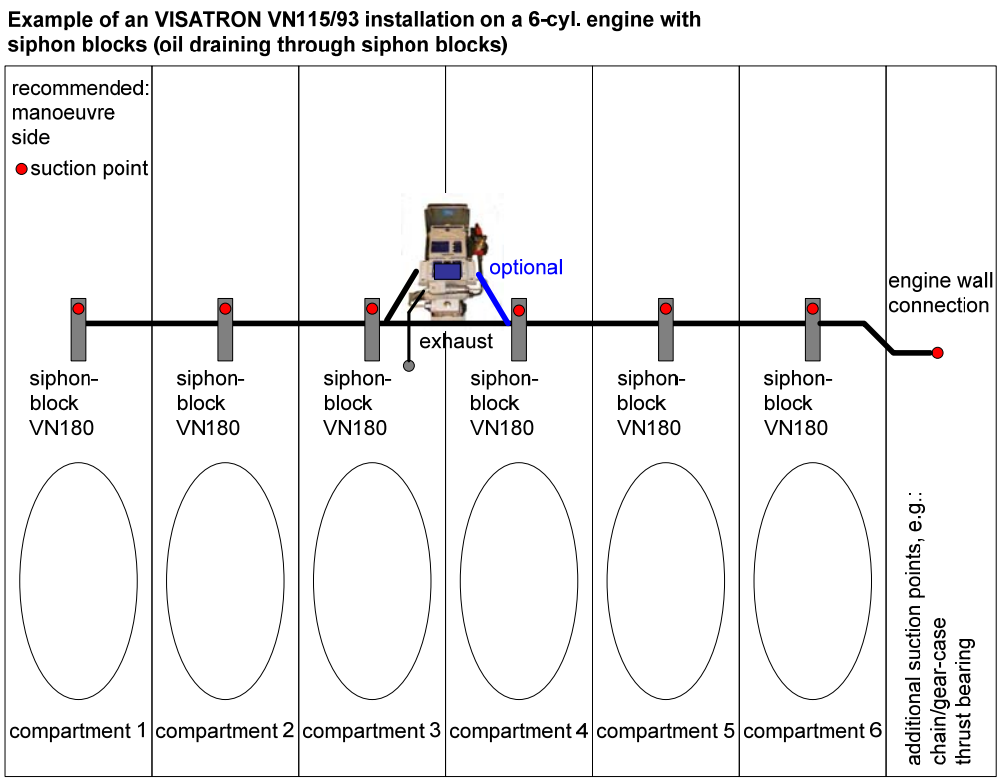


Figure 8: Alternative installation of VN115/93 OMD

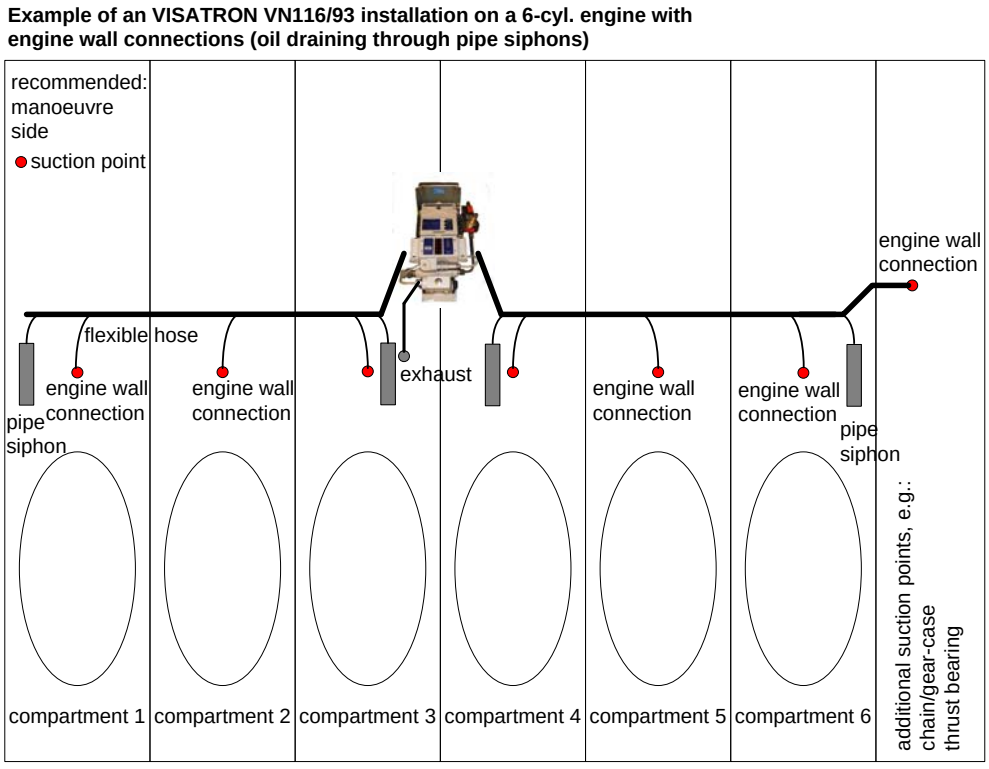


Figure 9: Recommendation for best VN116/93 OMD installation

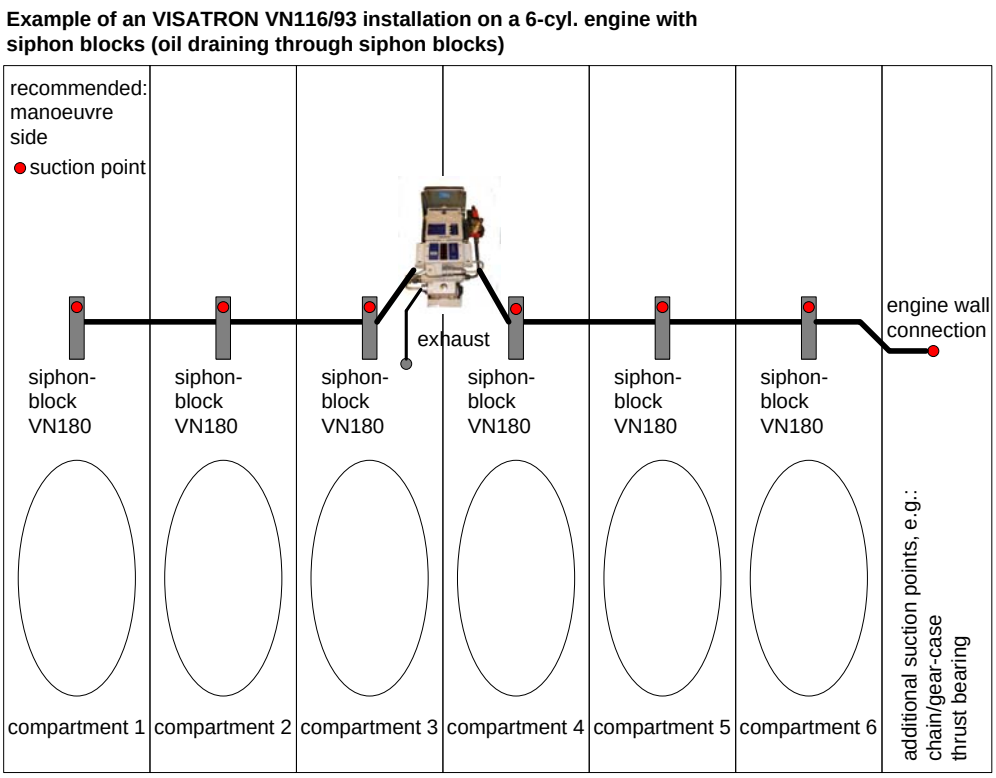


Figure 10: Alternative installation of VN116/93 OMD

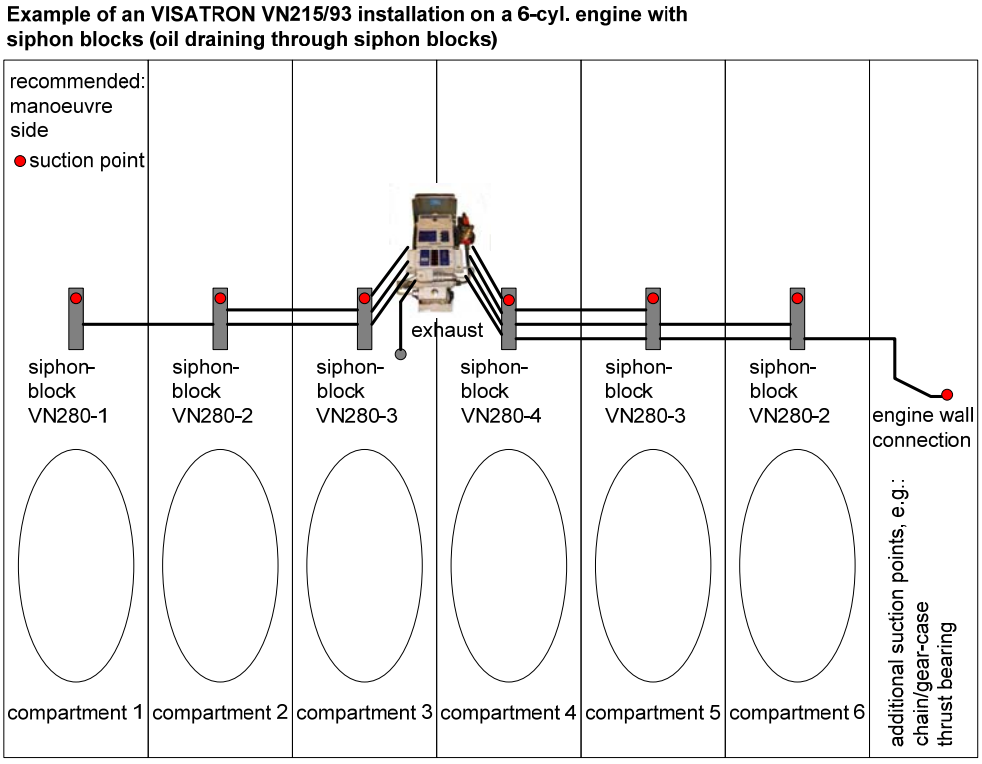


Figure 11: Recommendation for best VN215/93 OMD installation

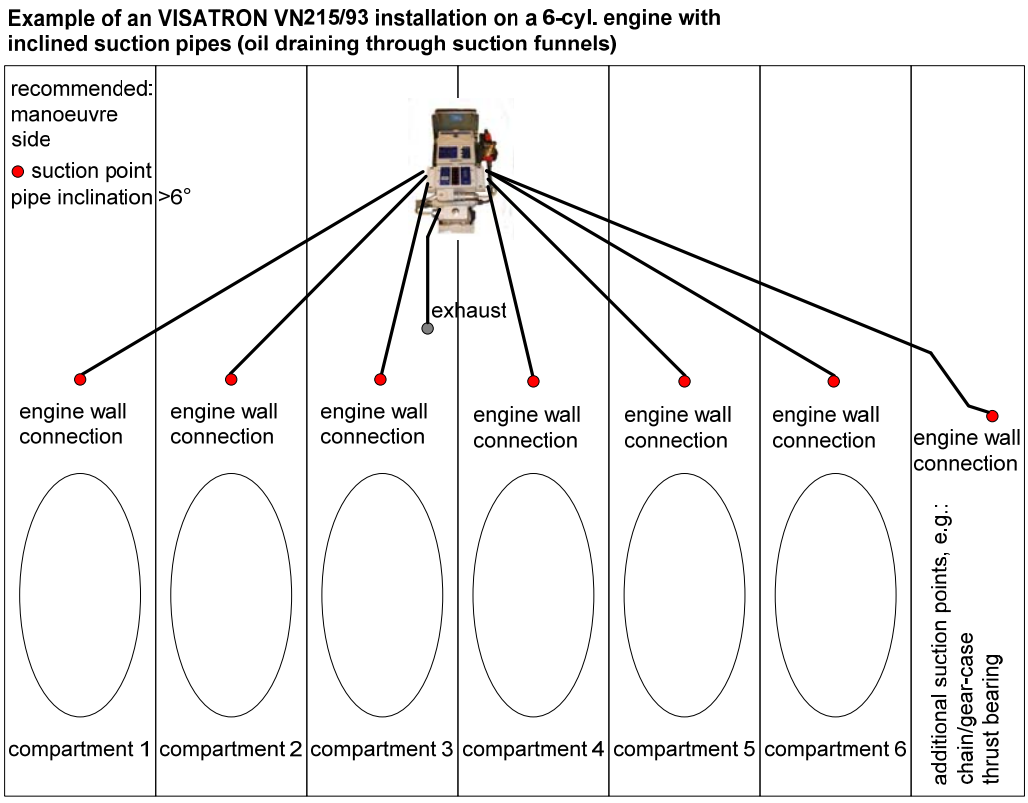


Figure 12: Alternative installation of VN215/93 OMD

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 the exhaust pipe (outlet of the venturi injector) is restricted to max. 2m. The inner diameter has to be ≥ 18 mm. Pointed elbows are forbidden.

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

2.1.3 Installation of pipe siphons

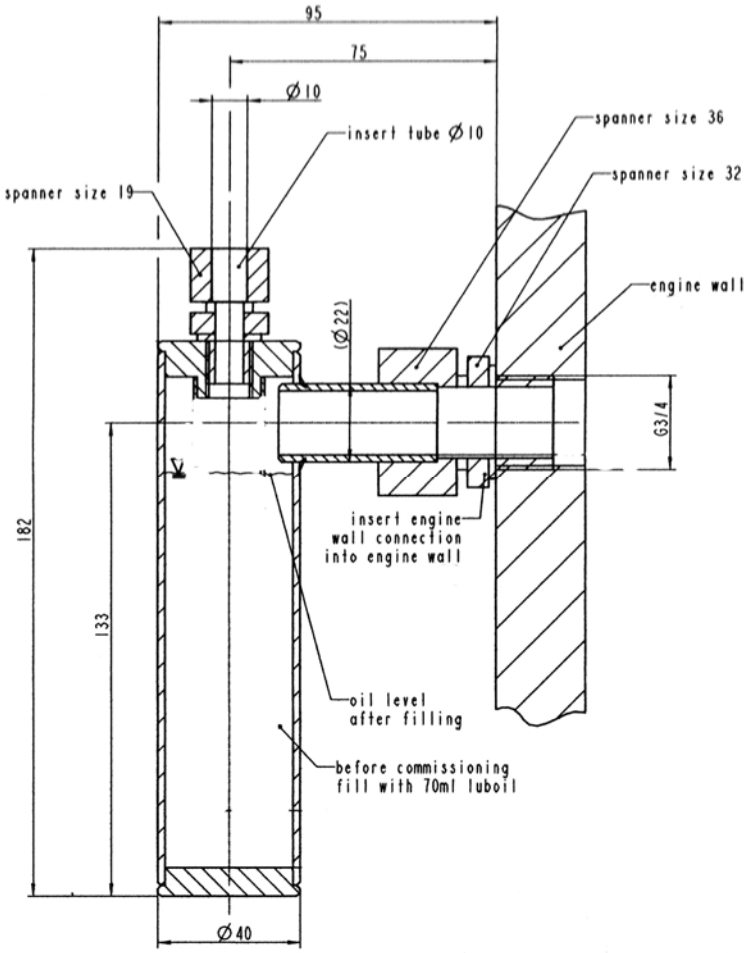


Figure 13: Pipe siphon

- 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

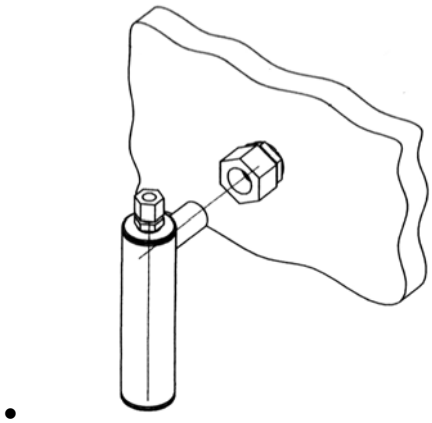


Figure 14: Pipe siphon at engine wall

Figure 15: Image of pipe siphon

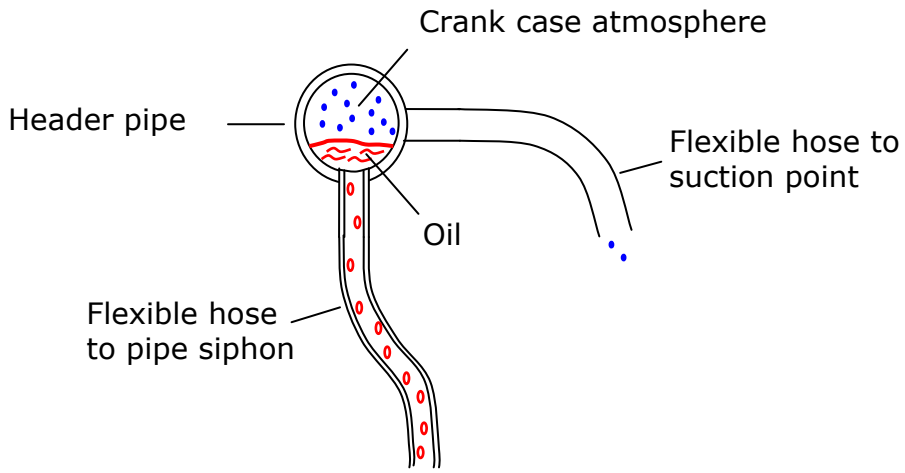


Figure 16: Oil draining principle

2.1.4 Installation of the siphon block connection units

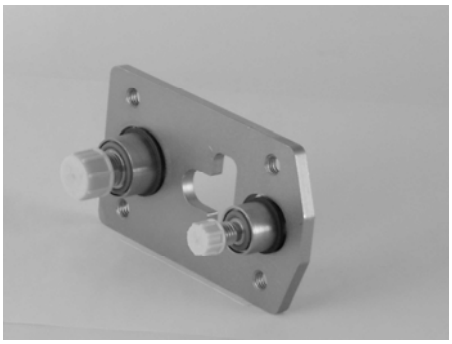


Figure 17: Connection unit

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

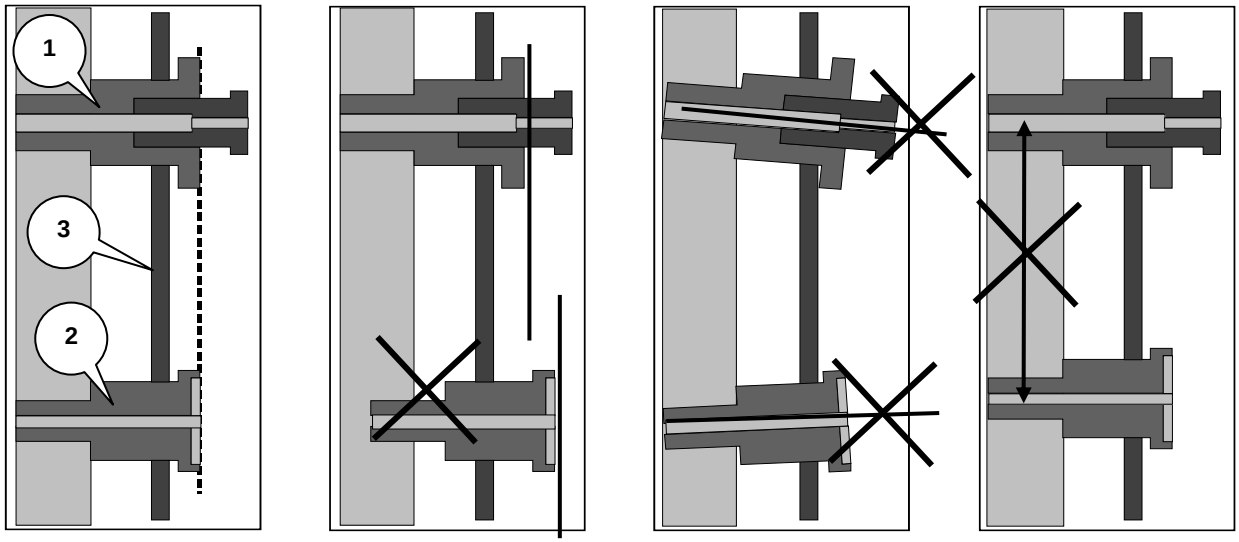


Figure 18: Side view

- Avoid wrong alignment, wrong angles and incorrect distances (see Figure 18)

- Insert the suction funnel from the crankcase side into the siphon block, align it in a vertical position (see Figure 19) **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 19).

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

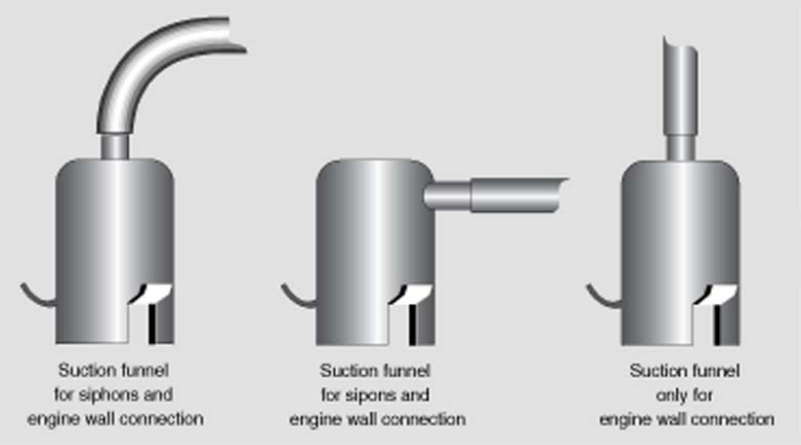


Figure 19: Different types of suction funnels

2.1.6 Pipe arrangement at valve box (VN215/93 system only)

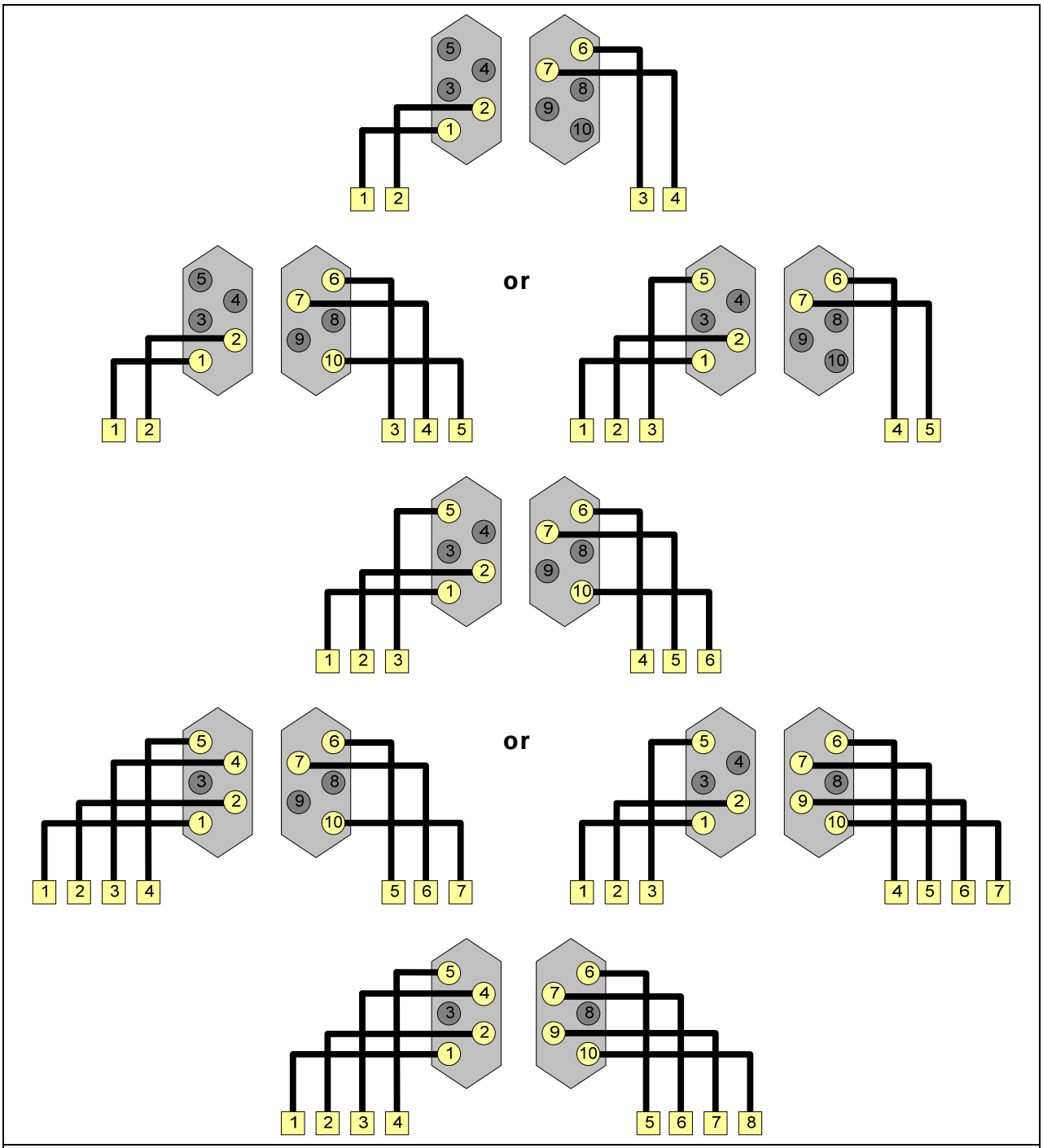


Figure 20: Pipe arrangement for 4 to 8 suction points

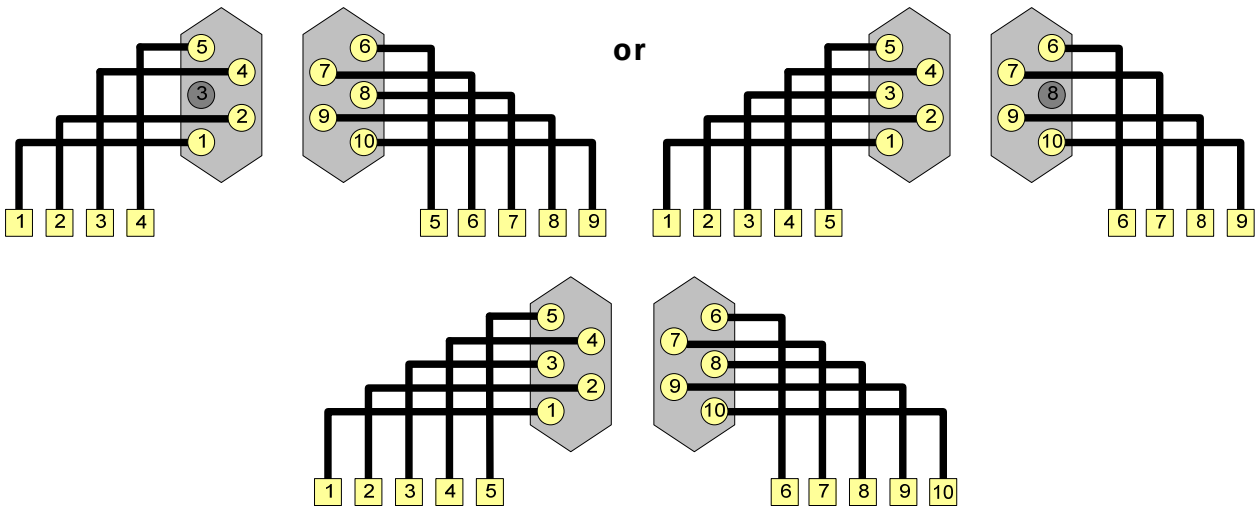


Figure 21: Pipe arrangement for 9 and 10 suction points

	CAUTION! Other arrangements are not valid. Unused connection points (see Figure 20 and Figure 21, marked dark grey) have to be closed by supplied rubber plugs.

2.1.7 Compressed air connection

If the SAB pressure regulator (see Figure 22) is used connect the compressed air supply at the NTP/BSP/G1/4A fitting. Use only **dry** and **clean** compressed air within a range of 2 - 15bar.

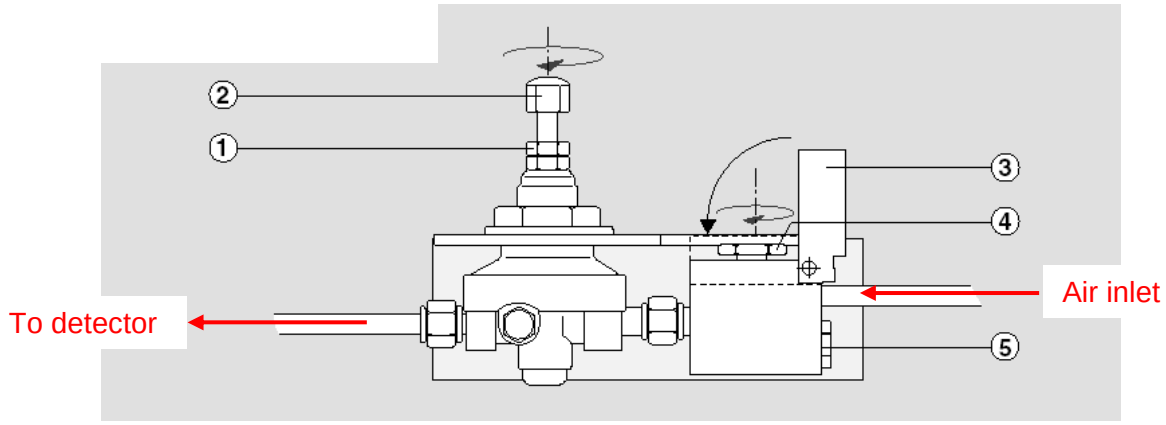


Figure 22: SAB pressure regulator unit

2.2 Electrical installation

2.2.1 VISATRON® series VN93 device

The electrical terminal is inside the socket housing (see Figure 23) on the base plate of the VISATRON® device. The pin assignment is specified in Figure 26. The cable entries are on the small sides.

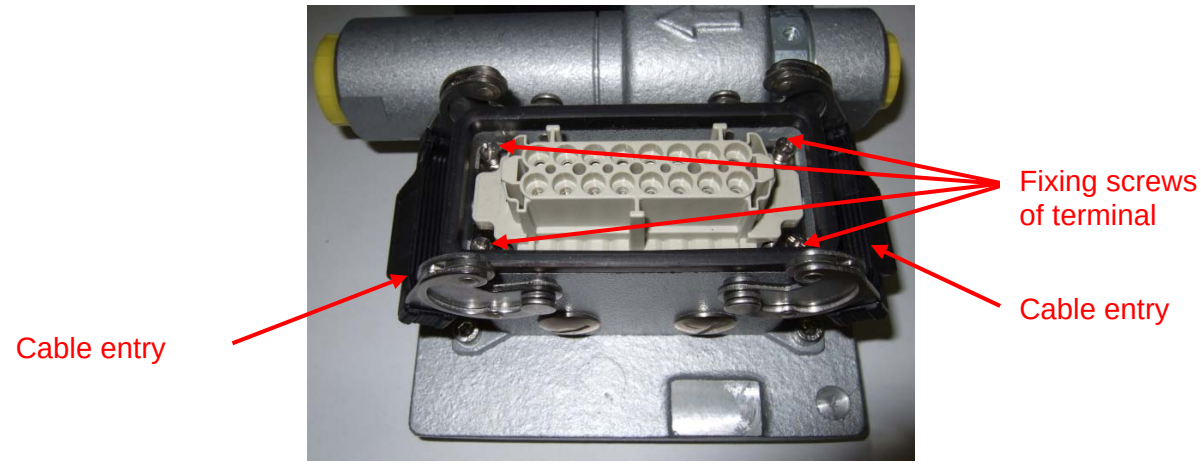


Figure 23: Socket housing

According to the pin assignment of Figure 26 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 26).

To replace the wire break resistors the measuring head has to be dismounted. The resistors (see Figure 25) are located at the rear side under the plastic cover (see Figure 24). The plastic cover can be removed be opening the screws. Do not forget to write the resistor value on the plastic cover with a permanent marker.

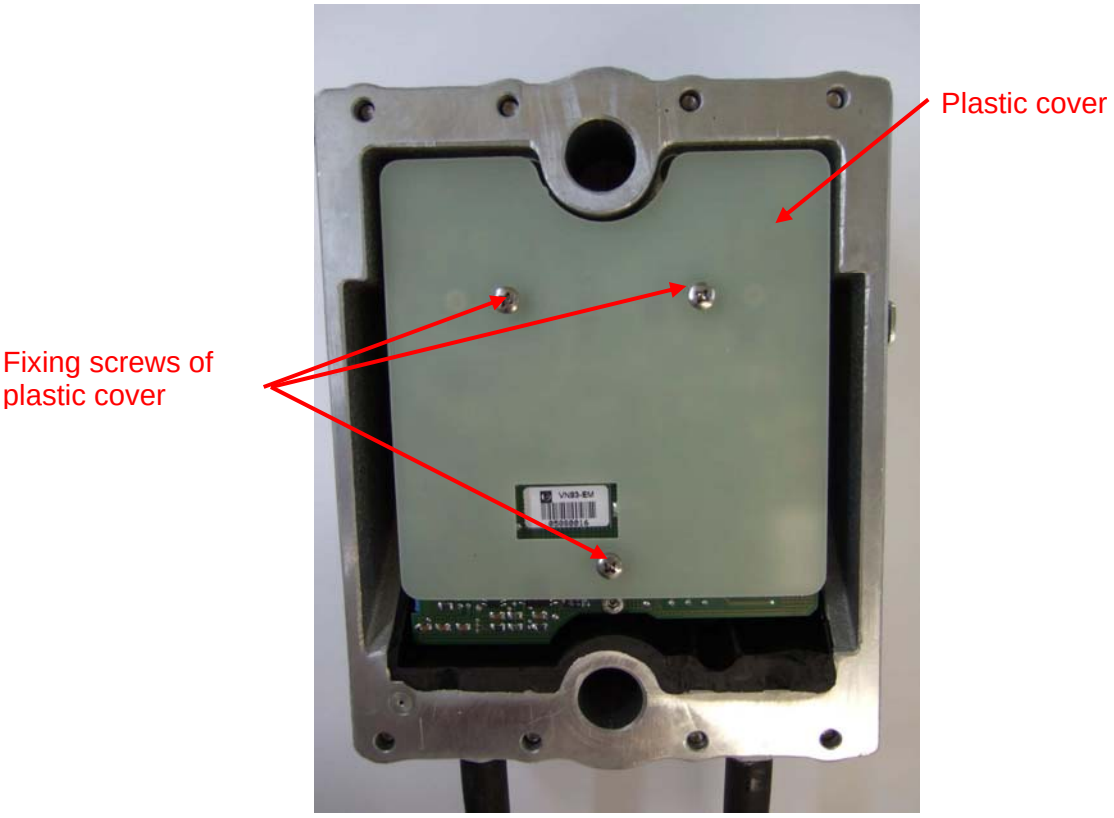


Figure 24: Rear side of measuring head

The second 'Alarm' output must be connected to separate channels on alarm monitoring system of the vessel or power plant and the 'Ready' output. The 'Ready' relay is switched on when the OMD is in correct operation (see Figure 26).

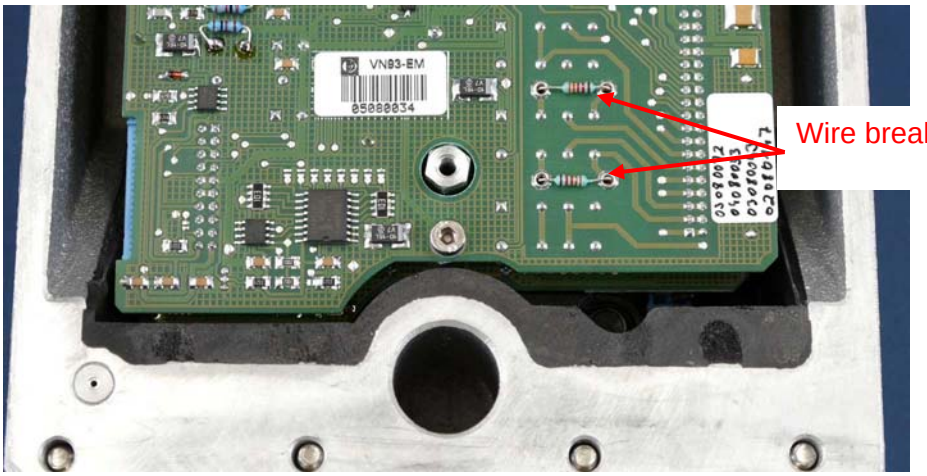


Figure 25: Wire break resistors

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 is rises up to the adjusted level. Depending on the characteristics of an oil mist occurrence the time between 'Pre-alarm' and 'Alarm' could be only a fraction of a second.

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
'Ready' relay open	4	12	Reserved, do not use
'Ready' relay common	5	13	RS485 A
'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 26: Pin assignment

The relay outputs are potential-free.

Power supply	18 – 31.2 Volts DC, max. 3 A
Nominal voltage	24 Volts DC
Relay Outputs	Max. 60 Volts DC/AC, 60W, 125VA, 2A
Internal fuse	3.15 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 or ReCon DS23 to monitor the oil mist concentration and the OMD status from a safe location.

The connection to the monitoring devices is realized by a RS485 two-wire bus. In case of a Remote Indicator II or a standard ReCon DS23 installation 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 27), 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 27) at the VISATRON device is designed for cable diameter between 7.5 and 10.0 mm.

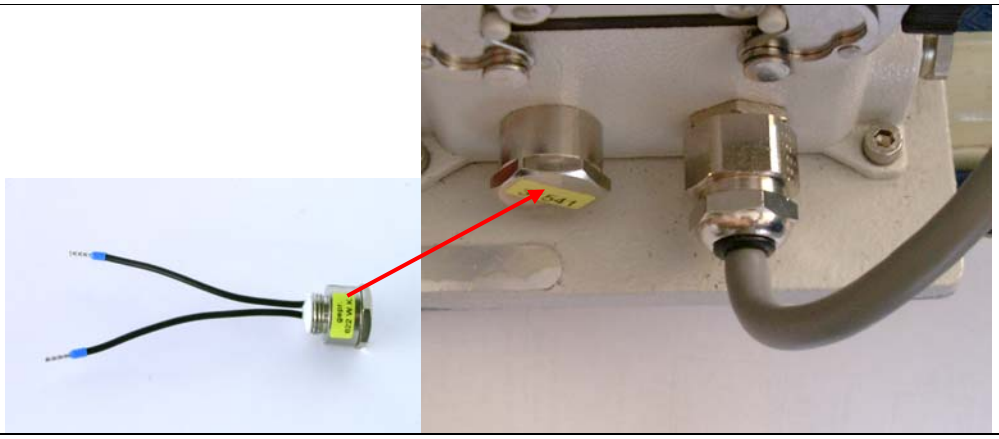


Figure 27: Cable entry and bus-terminator on the bottom side of the VISATRON® device

The connection between the OMD device and the monitoring device for standard application is shown in the following wiring diagram (see Figure 28). If more than one OMD device is connected to a ReCon DS23 unit following the installation instructions in the ReCon DS23 manual.

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

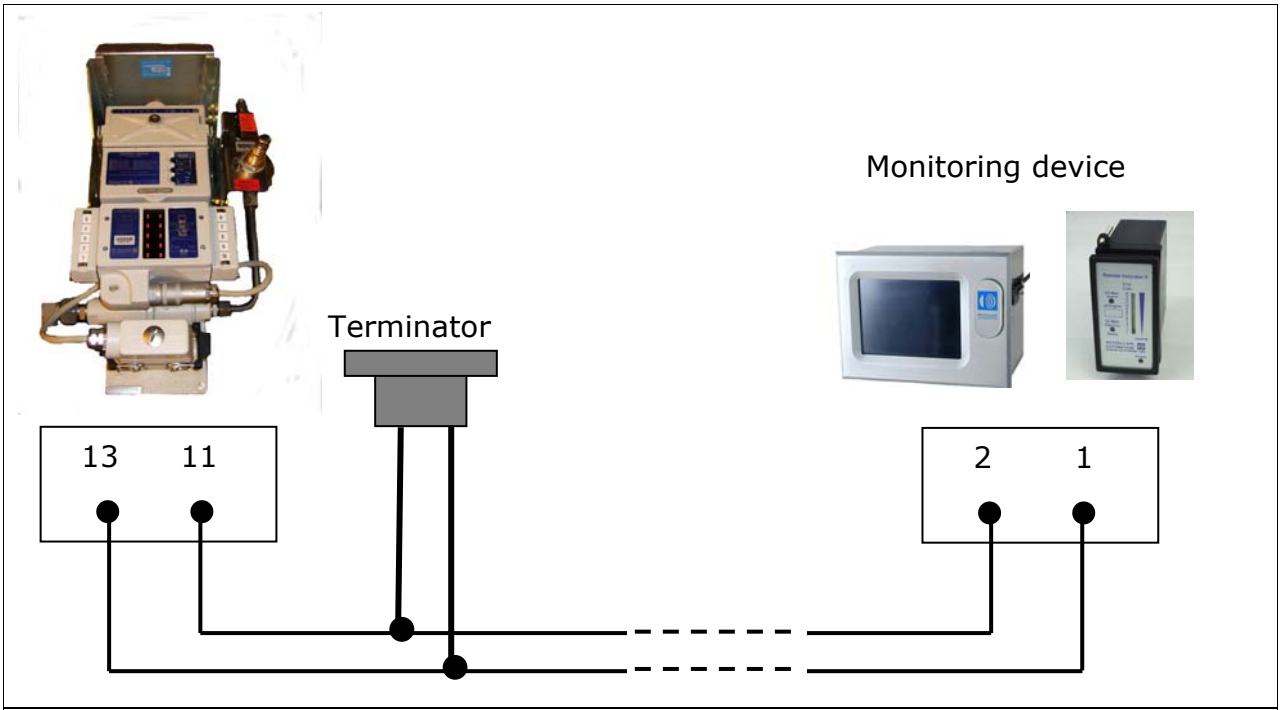
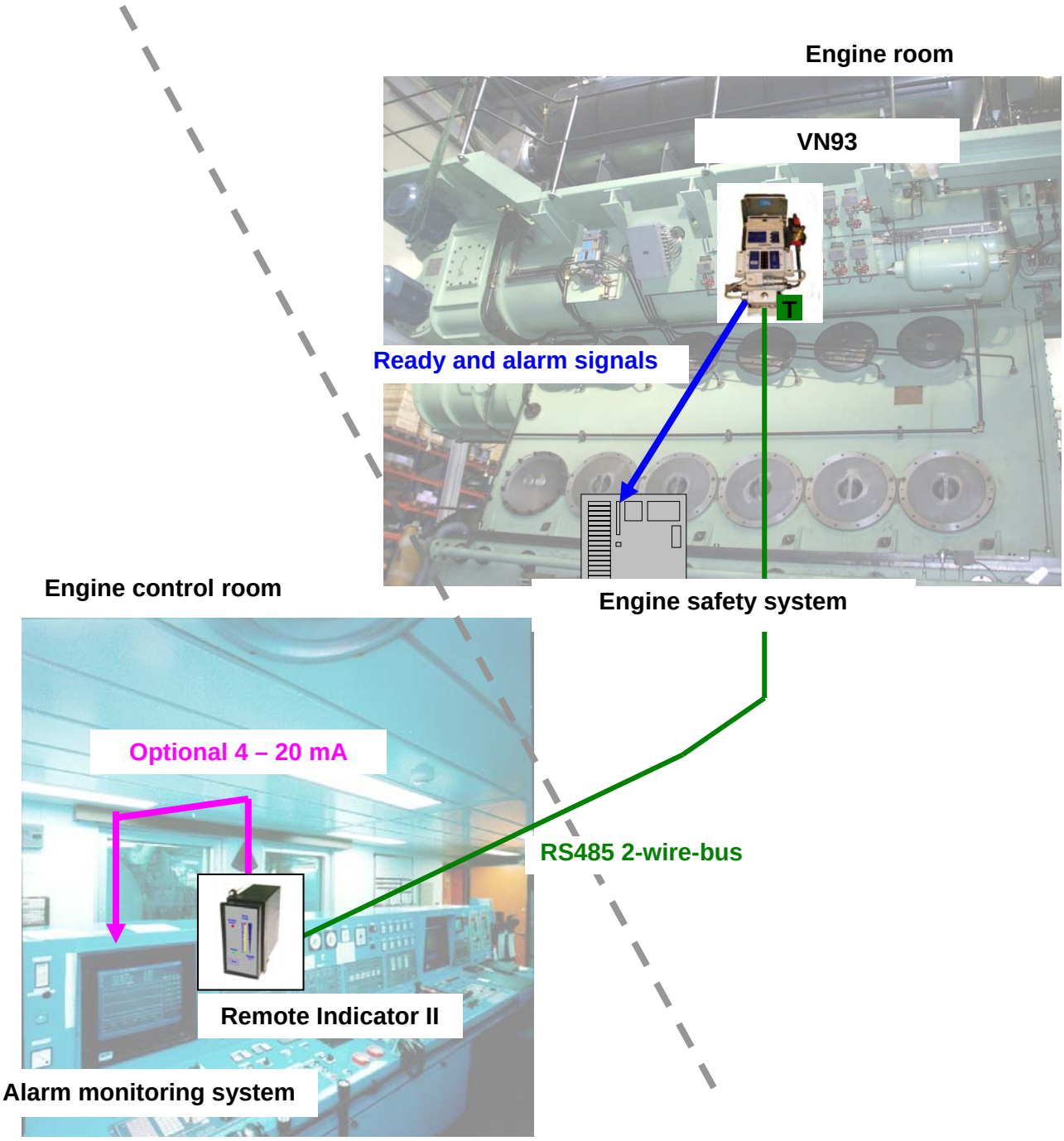


Figure 28: Wiring diagram to connect Remote Indicator II or ReCon DS23

⚠	WARNING! Install only 1 terminator at the end of the bus system, if multiple VISATRON® VN93 devices are connected to 1 ReCon DS23 unit.

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 address can be adjusted by the light buttons (see chapter 4).

2.2.3 Schematic electrical wiring diagram



3 Commissioning

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.

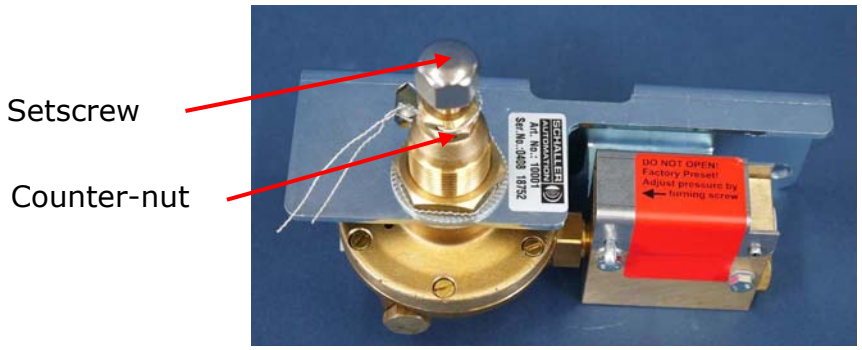


Figure 29: Pressure regulator unit

	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.

- Connect 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.

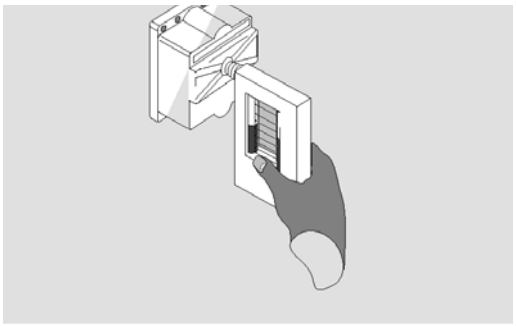


Figure 30: U-tube manometer connected to OMD control cover

- Remove U-tube manometer

3.2 Filling of siphon blocks VN280plus of VN215/93 system with oil

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

Figure 31: Siphon block VN280plus

Figure 32: Filling pump

- Press the black nipple into the opening of the block.

- Push the nozzle to the first mark (see Figure 33).

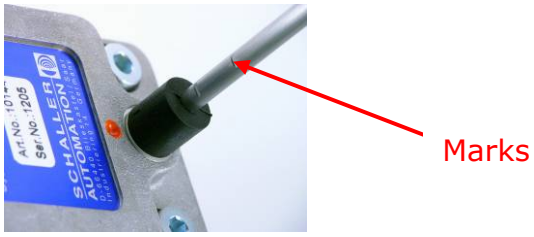


Figure 33: Marks on the nozzle

- Fill the siphon with 12 strokes, push the nozzle to the next mark and repeat the procedure until the nozzle reaches the rear plate.

	CAUTION! Do not fill with more than 12 strokes, waste oil flow in the tubes and could suck out of the block internal siphons.

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

3.3 Filling of siphon blocks VN180 for VN115/93 and VN116/93 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

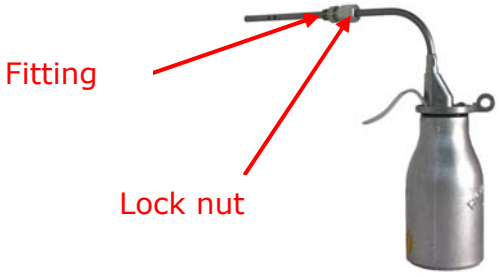


Figure 35: Filling pump

- 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, waste oil flow in the tubes can cause a malfunction of the siphon block.

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 VN115/93 and VN116/93 system with oil

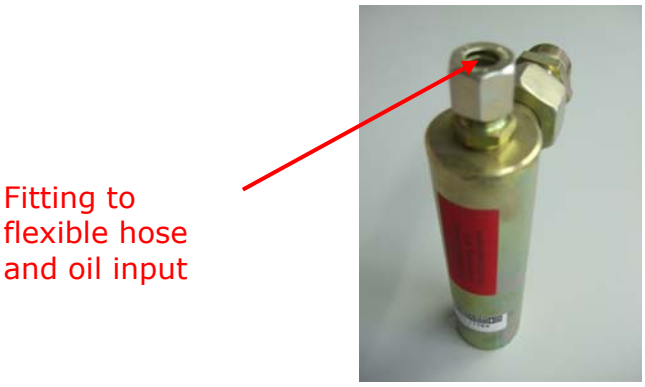


Figure 37: Pipe siphon

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

	CAUTION! Do not fill in more than 70ml, waste oil could suck out the pipe internal siphon.

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 'relative opacity', a Schaller specific definition. 100% relative opacity means that no light is transmitted through the oil mist sample. This is equivalent to a complete white wall.

The IACS UR 67 requires an oil mist alarm at 5% of the Lower Explosion Level (LEL). The LEL is equal to 47mg/l oil mist concentration in air at a temperature of 25 °C, which means that the OMD is required to indicate an oil mist alarm at approx. 2.5mg/l.

Position	VN115 alarm level in relative opacity	VN116/VN215 alarm level in relative 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

Inside the measuring head 2.5mg/l oil mist concentration is approx. 23% absolute opacity compared to the full measuring range.

The number of suction points, the different oil mist concentration in the compartments and the progress of oil mist occurrence can influence the amount of oil mist be sucked out of the engine to the measurement head and be detected.

	CAUTION! Use only level 3 or 4 for normal diesel engines. Level 5 and 6 must be confirmed in writing by SCHALLER AUTOMATION.

The sensitivity of the VISATRON® oil mist detector can be adjusted by the light buttons (see chapter 4).

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 VN215/93 installation: Is the arrangement of the pipes at the valve box correct?	□ yes / □ no
On VN215/93 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 VN115/93 installations, as an alternative to the smoke test, measure the negative pressure at the end of the suction pipes. Values as specified?	□ yes / □ no

4 Operating instructions

4.1 Display

After power-on the VISATRON® device starts a 30 seconds count down before the device enters the normal display mode. The device type appears in the upper 'Code' window and the current opacity in the 'Value' window. The 'Ready' LED indicates, that the device is running well.

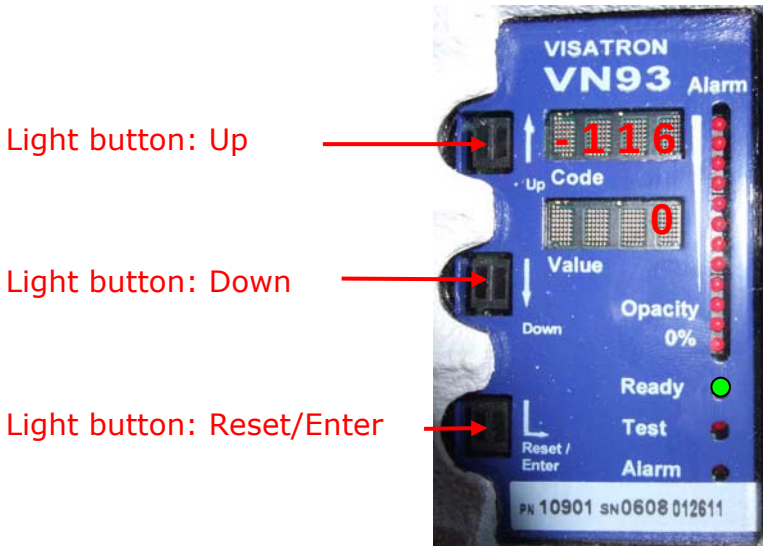


Figure 38: Normal display mode (VN116/93 as example)

The device offers a user interface to display and to adjust some parameters. The handling happens by three light buttons (see Figure 38). By touching the glass plate the infrared light from the transmitter is reflected to the optical receiver which generates a signal for the micro-controller.

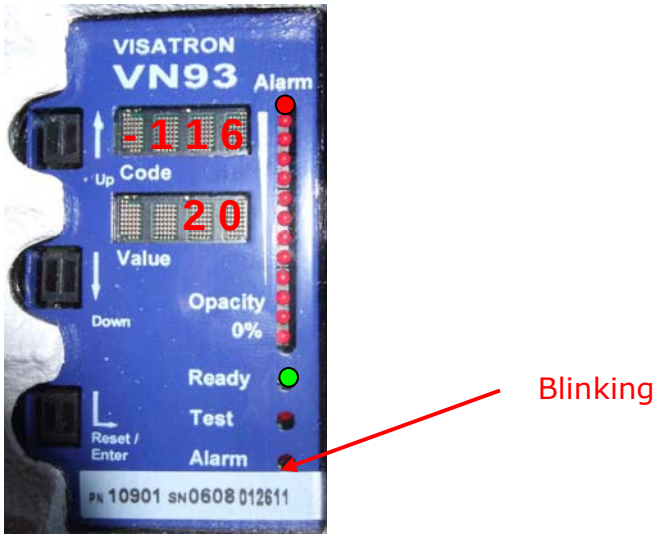


Figure 39: Example of an oil mist alarm state with 20% opacity

In case of a high oil mist concentration the LED bar goes up. 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. The opacity is shown in the right LED bar. If the highest LED is switched on the opacity is equal or higher, compared to the alarm level.

By touching the light button 'Up' for longer than 3 seconds the 'Parameter display mode' is activated. The available parameters are listed in Table 3. The 'Up' and 'Down' button can be used to navigate within this list.

If no button is touched for one minute the 'Parameter display mode' will be left.

Code	Description	Unit / Format
-215/-116/-115	Opacity	%
-001	Oil mist alarm level	%
-002	Opacity relative to alarm level	%
-003	Not used	
-004	Not used	
-005	Negative pressure inside measuring head	mmWC
-006	Ambient temperature	°C
-007	Electronic temperature	°C
-008	Time	hh.mm
-009	Date	dd.mm
-010	Alarm level (see chapter 3.5)	
-011	Oil mist pre-alarm level relative to the main alarm level (40 -100)	%
-012	Not used	
-020	A/D converter: opacity	
-021	A/D converter: air flow sensor	
-022	A/D converter: ambient temperature	
-023	A/D converter: electronic temperature	
-024	For internal use	
-025	For internal use	
-026	For internal use	
-027	Up-Counter	s

Table 3: Parameters

4.2 Parameter Adjustment

By touching the light button 'Up' and the light button 'Down' for longer than 3 seconds simultaneously the 'Parameter adjustment mode' is activated. The 'Up' and 'Down' button can also be used for navigation.

	WARNING! The engine is **not** monitored In the 'Parameter adjustment mode'.

To enable the setting of all parameters, a password must be entered in parameter P000 first. Otherwise the parameters are only readable.

The value of the password is **4711** and is not changeable. To enter the password touch the 'Enter' button first and select than the number digit for digit using the 'Up' and 'Down' button. To step to the next digit touch 'Enter'.

By touching the light button 'Up' and the light button 'Down' for longer than 3 seconds simultaneously again the 'Parameter adjustment mode' is left or if no button is touched for one minute.

Code	Description	Range	Factory presetting	Unit / Format
P001	Oil mist alarm level	3-6	4	
P002	Used for service purpose, must be always 0			
P003	Used for service purpose, must be always 0			
P004	Oil mist pre-alarm level relative to the main alarm level	40 - 100	100	%
P005	RS485 bus-address	1 - 16	1	
P006	Restore presetting by enter '1'	0 or 1	0	
P050	Date	01.01 – 31.12		dd.mm
P051	Date	1990 -		yyyy
P052	Time	00.00 – 23.59		hh.mm

Table 4: Adjustable Parameters

4.3 Diagnostics

If a device internal error or a system failure occurs the diagnostics system displays the failure condition in the 'Code' window and the 'Ready' LED is off. The error codes are shown in Table 5.

Error Codes	Value	Series VN93 device failures
E018		Voltage of internal battery too low
E017		Electronic module defective
E016		Electronic module defective
E015	% of max.	Optical sensor very dirty
E014	mm WC	Negative pressure/airflow too low
E013	% of max.	Optical sensor dirty
E012		Checksum error
E011	Temperature	Ambient temperature too low (<0°C)
E010	Temperature	Ambient temperature too high (>70°C)
E009	Temperature	Electronics temperature too low (<0°C)
E008	Temperature	Electronics temperature too high (>75°C)
E007		Light button defective
E006	Voltage	Supply voltage too high
E005		Not used
E004	Digital value	Optical sensor defective
E003	Digital value	Airflow-sensor defective
E002	Digital value	Airflow-sensor defective

Table 5: Error codes

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.

Figure 40: Device not ready, example of 'Negative pressure too low'

4.4 Reset of Oil Mist Alarms

	Ensure, that the oil mist concentration inside the engine has fallen under the Lower Explosion Level (LEL) before acknowledging an oil mist alarm by pressing the Oil-Mist-Alarm button. Otherwise you risk an oil mist explosion! **Follow the instructions of the engine builder, ship yard and ship owner.** **Use a monitoring device at a safe location to read off the current oil mist concentration. SAB recommends to wait until more than the half of the indication LED's are switched off (VISATRON®-device and Remote Indicator II) or the oil mist alarm level has to reduce below 50 % (ReCon DS23).**

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

Figure 41: Oil-Mist-Alarm reset light button

5 Troubleshooting

Error	Description	Measure	Chapter
18	Voltage of internal battery too low	1. Exchange measuring head	5.5 page 44
17	Electronic module defective	1. Exchange measuring head	5.5 page 44
16	Electronic module defective	1. Exchange measuring head	5.5 page 44
15	Optical sensor dirty	1. Clean infrared filter	5.2 page 42
14	Negative pressure / airflow too low	1. Exchange air filters 2. Clean fresh air bores 3. Check suction system 4. Adjust suction pressure 5. Adjust suction pressure 6. Exchange measuring head	5.3 page 43 5.1 page 42 3.1 page 28 3.1 page 28 5.5 page 44
13	Optical sensor dirty	1. Clean infrared filter	5.2 page 42
12	Checksum Error	1. Repeat parameter setting	
11	Ambient temperature too low (<0°C)	1. Remove ambient cooling components	
10	Ambient temperature too high (>70°C)	1. Remove or turn away ambient heating components 2. Install metal heat shields against radiation 3. Install vortex coolers	
9	Electronics temperature too low (<0°C)	1. Remove ambient cooling components	
8	Electronics temperature too high (>75°C)	1. Remove or turn away ambient heating components 2. Install metal heat shields against radiation 3. Install vortex coolers	
7	Light button defective	1. Clean glass plate 2. Exchange Measuring head	 5.5 page 44
6	Supply voltage too high	1. Measure supply voltage 2. Exchange measuring head	 5.5 page 44
4	Optical sensor defective	1. Clean infrared filter 2. Exchange measuring head	5.2 page 42 5.5 page 44
3	Airflow-sensor defective	1. Exchange measuring head	5.5 page 44
2	Airflow-sensor defective	1. Exchange measuring head	5.5 page 44
	All LED off	1. Measure supply voltage 2. Activate Self-repair of Polyfuse 3. Replace measuring head fuse 4. Exchange measuring head	 5.6 page 41 5.6 page 41 5.5 page 44

5.1 Clean scavenging air bores

Figure 42: Cleaning of scavenging air bore in the left and the right chamber

5.2 Clean infrared filter

	CAUTION! Dirty optical filter glass can also cause a non detected high oil mist concentration (e.g. when the device was switched off for a long period).

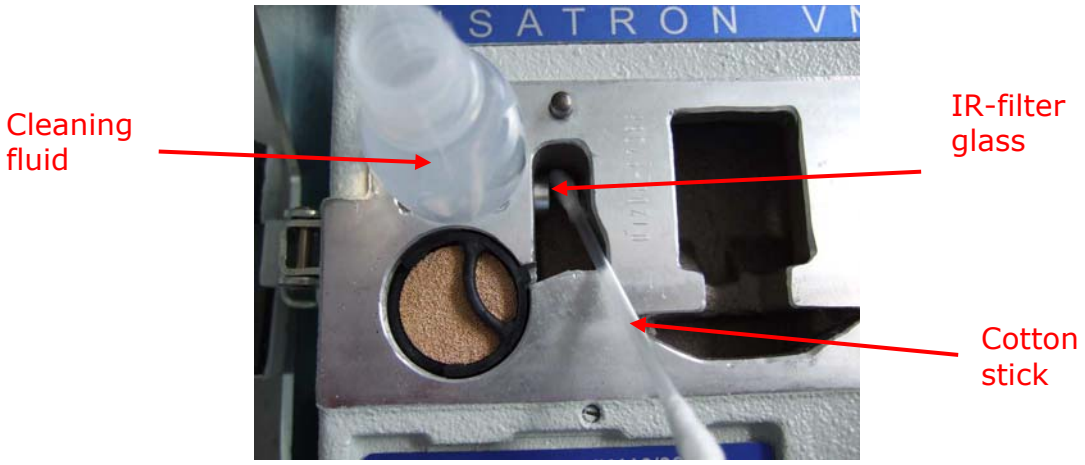


Figure 43: Cleaning of IR-Filter glass in the left and the right chamber

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

5.3 Exchange air filters in the measuring head

Figure 44: Exchange of the air filters

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

5.4 Exchange air filter in pressure regulator unit

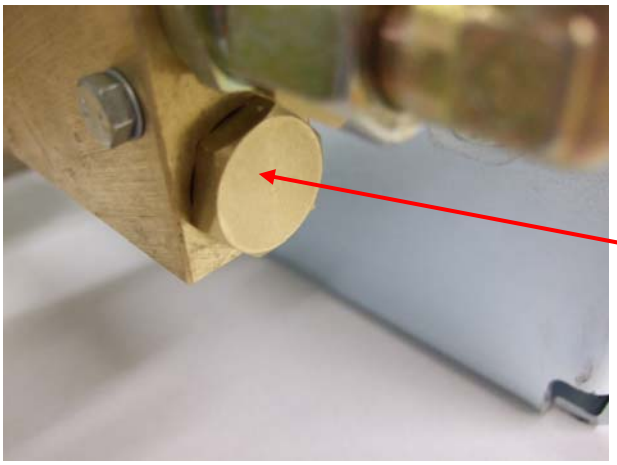


Figure 45: The air filter is behind the lock screw of the throttle block

⚠	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

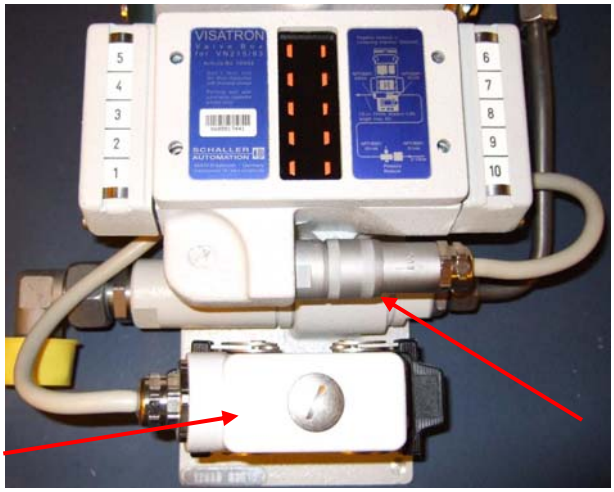


Figure 46: **Step 1** is to unplug the connectors

Figure 47: **Step 2** is to unscrew the measuring head

To mount the new measuring head execute the 2 steps in reverse order.

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

5.6 Measuring head fuses

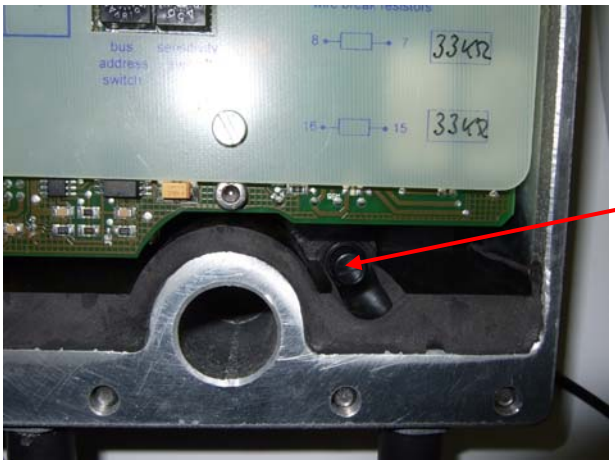


Figure 48 Fuse on the rear side of the measuring head

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 dark exchange the 3.15 A semi lag fuse II at the rear side of the measuring head (see Figure 48).

6 Maintenance procedures

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

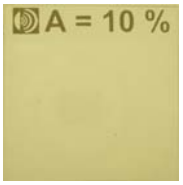
Quarterly		
1	Check negative pressure in the measuring head: under 55 mmWC → adjust pressure between 55 mmWC and 65 mmWC → okay between 65 mmWC and 85 mmWC → adjust pressure over 85 mmWC → check pressure regulator unit	See chapter 3.1 page 28
2	Clean infrared filters in the measuring head	See chapter 5.2 page 42
3	Clean fresh air bores in the measuring head	See chapter 5.1 page 42
4	Exchange air filters in the measuring head	See chapter 5.3 page 43
Half-yearly		
5	Perform quarterly maintenance procedure 1 - 4	
6	Exchange air filter in pressure regulator unit	See chapter 5.4 page 43
Yearly		
7	Perform half-yearly maintenance procedure 5 - 6	
8	Clean suction system with compressed air. **ATTENTION, do not forget to refill the siphons!**	See chapter 3 page 28
9	Check the bellows and the suspension-system between measuring head and base plate, check the scavenging air outlet behind the control cover (see Figure 43) by feeling the air stream to control scavenging air system	
10	Perform functional test	See chapter 7 page 47
Additional every 5 years		
11	Exchange bellows	Use services of our partners (see chapter 10)

7 Functional test

7.1 On board test

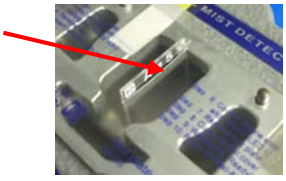
⚠	Attention: Before starting the on board test execute the procedures as specified in the maintenance schedule. The pipe system has to be clean and if used all siphons have to be filled with oil (regarding chapter 2.1.3.)

Using the test plate set, included in this manual folder, you can easily test the functionality of the VISATRON® oil mist detectors and their connection to the safety system of the engine. The set can also be ordered separately under Part.-No. 11072. It consists of the following parts:

• Test plate (A) • Test glass (B) • Working instruction	**A** 	**B** 

⚠	**Attention: You will stop or slow down the engine.**

Test procedure step by step:

Step 1	Open the **bolts** of the OMD control cover and turn the cover to the left side.	
Step 2	Press the test plate onto the **openings**. Ensure that the openings are completely covered. Now the device starts to create the negative suction pressure again.	
Step 3	Waiting for the 'Ready'-LED on the display.	
Step 4	Insert the **test glass into the slot** of the test plate. The glass simulates oil mist and generates an oil mist alarm.	

Step 5	Waiting for the 'Alarm'-LED. At this comes on, the engine has to stop or to enter the slow down mode.	
Step 6	Remove the test plate and put it together with the test glass back into the bag.	
Step 7	Close the control cover carefully.	
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 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 with smoke generator on VN115/93, VN116/93 and VN215/93 installations

All installations can be proved by a smoke test. Due to vessels not normally having the equipment and the increasing world wide ban of smoking cigarettes SCHALLER AUTOMATION recommend 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 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 regarding chapter 2.1.3.

A complete test can be done only at standstill of the engine. The crankcase service covers must be opened first. Then fill in 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. This is important so that the tank can provide sufficient smoke to complete the search run of a VN215/93 installation to determine the right compartment. The last step is to hold the flexible hose directly under the suction funnel until an oil mist alarm is indicated.

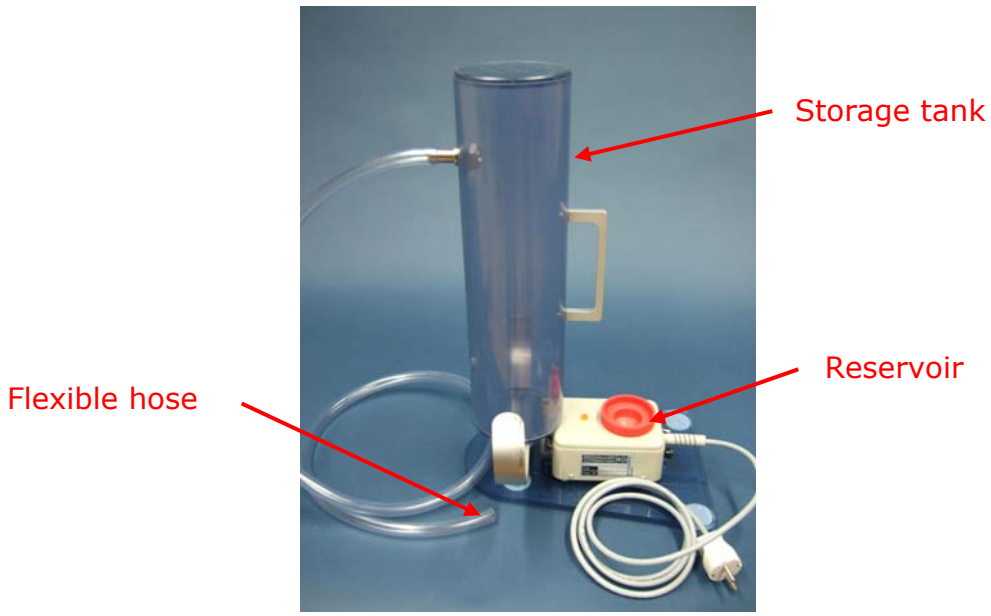


Figure 49: SCHALLER AUTOMATION smoke generator, see 'Accessories'

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

In this case the flexible hose has to be positioned over the openings under the lock screws of the siphon blocks as seen in Figure 50 or has to be pressed over the open tube at T-engine-wall connection.

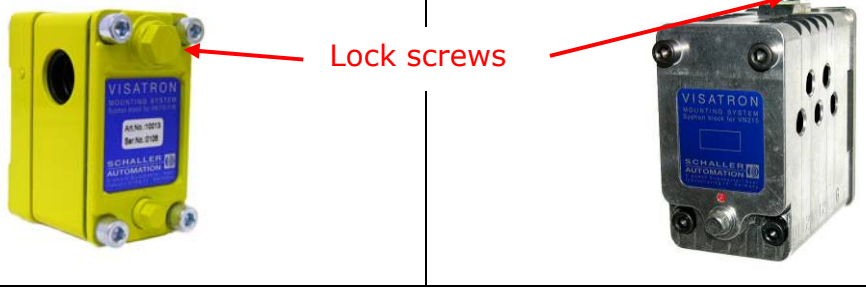


Figure 50: Test inlet on the siphon blocks

7.3 Additional pressure measurement on VN115/93 and VN116/93 installations

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

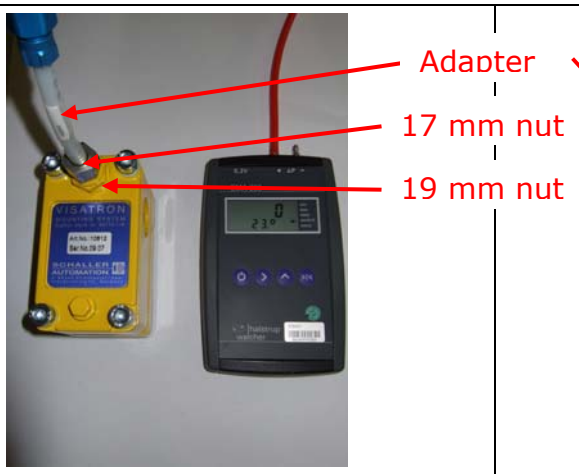


Figure 51: Manometer connected to siphon block VN180

Figure 52: Manometer 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 stillstand.

⚠	Attention: You will only measure correct values at standstill of the engine and the luboil pump.

On a VN115/93 and VN116/93 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 17mm lock nut you have to counter the 19 mm nut with a jaw wrench.

The pressure measurement procedure can also 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 Table 6. They are only valid if a negative pressure of **60 mm WC** is adjusted at the measuring head.

VN115/93	6.5 mm WC
VN116/93	1.5 mm WC

Table 6: Minimal pressure values **at the end** of the suction system

8 Spare Parts and Accessories

Part-No.	Description
11201	Measuring head VN115/93; 33k; sensitivity level 4
11401	Measuring head VN116/93; 33k; sensitivity level 4
10901	Measuring head VN215/93; 33k; sensitivity level 4
10969	Measuring head seal
11233	Base plate VN115/93
10904	Base plate VN116/93 and VN215/97plus
11432	Valve box VN116/93
10902	Valve box VN215/93
10993	Pipe connection for valve box VN116/93
10995	Pipe connection for valve box VN215/93 right
10994	Pipe connection for valve box VN215/93 left
10411	Rubber insert for valve box pipe connection VN215
11232	Connection box VN115/93
10023	Bellow of suction channel
10990	Bellow of scavenging air channel
10042	Scavenging air filter
10002	Air filter for pressure regulator unit
10727	Control cover measuring head series VN93 devices
10973	Semi lag fuses 3.15 A
10087	Fuse cap

Table 7: Spare parts

The listed measuring heads are the standard units. Other versions are also available on enquiry.

Part-No.	Description
10950	Service box series VN93
10189	Maintenance kit series VN93
10980	Manual series VN93
10001	Pressure regulator unit with input throttle
10753	Protection cover
11163	Oil separator for air outlet
11164	Pipe siphon
10140	Siphon block VN280 1 connection
10142	Siphon block VN280 2 connection
10143	Siphon block VN280 3 connection
10144	Siphon block VN280 4 connection
10145	Siphon block VN280 5 connection
10141	Siphon block VN280 1 connection with manometer fitting
10160	Mounting plate VN280
11062	Oil pump VN280
10013	Siphon block VN180
10612	Siphon block VN180 with manometer fitting
10089	Mounting plate VN180
10062	Oil pump VN180
10813	Sampling funnel STD
10353	Smoke generator 230 Volts
11072	Test-plate kit
10046	U-pipe manometer
11073	G1/4 engine wall T-connection for 14 mm pipes
11506	Monitoring device Remote Indicator II
11500	Monitoring device ReCon DS23
11503	Bus-cable 10m for monitoring devices

Table 8: Accessories

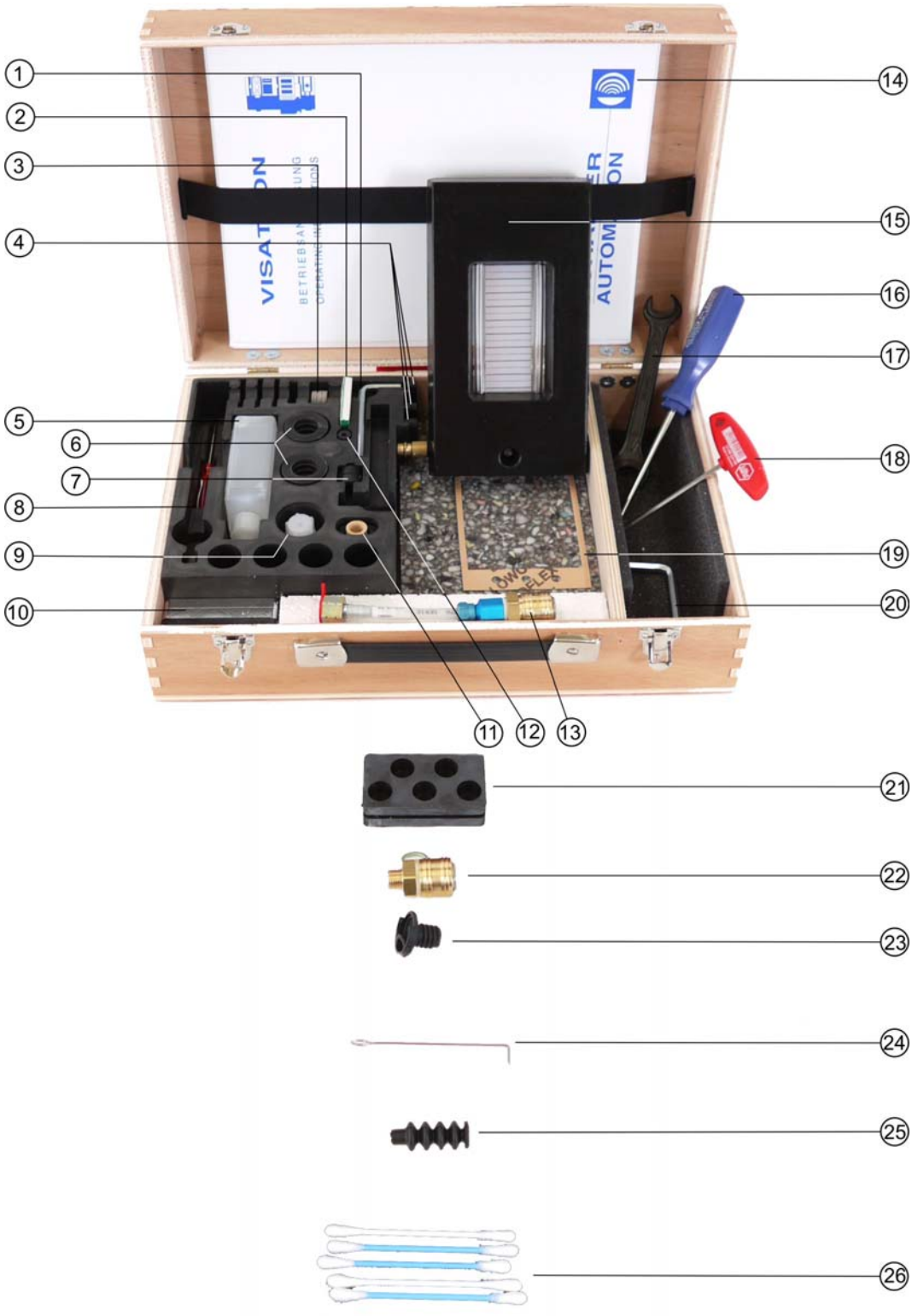


Figure 53: Service box

Item	Part-No.	Description	Quantity
01	10044	Hex key 5 mm L-shape	1
02	10973	Fuse 3.15 A semi time lag	10
03	10042	Scavenging air filters	6
04	10412	Rubber plugs for unused valve box connections	3
05	10040	Bottle with slacked water	1
06	10023	Bellows of suction channel	2
07	10407	Sealing for suction channel in valve box	2
08	10038	Screwdriver 3 mm	1
09	10035	Bottle with cleaning fluid	1
10	10409	Clamp plate VN215 valve box connection	2
11	10002	Air filter for pressure regulator unit	1
12	10406	Sealing for oil draining valve box	1
13	11080	Manometer adapter for siphon block VN180	1
14	10980	Manual series VN93 in English	1
15	10046	U-pipe manometer	1
16	10354	Philips screwdriver	1
17	10356	Double jaw wrench 14/17 mm	1
18	10355	Hex key 4 mm with handle bar	1
19	10405	Gasket for valve box	1
20	10047	Hex key 6 mm L-shape	1
21	10411	Rubber plate for VN215 valve box connection	2
22	10053	Manometer adapter for control cover	1
23	10975	Scavenging air inserts	2
24	10135	Cleaning needle	1
25	10990	Bellow of scavenging air channel	1
26	10036	Cotton buds to clean IR-filters	5

Table 9: Contents of service box series VN93

Item	Part-No.	Description	Quantity
01	10046	U-pipe manometer	1
02	10053	Manometer adapter for control cover	1
03	10040	Bottle with slacked water	1
04	10405	Gasket for valve box	1
05	10042	Scavenging air filters	6
06	10975	Scavenging air inserts	2
07	10002	Air filter for pressure regulator unit	2
08	10973	Fuse 3.15 A semi time lag	5

Table 10: Contents of maintenance kit series VN93

9 Technical data

Mechanical data	
Dimensions	See drawings (Figure 54 to Figure 59)
Weight	VN115/93 9 kg VN116/93 11 kg VN215/93 11 kg
Display	LED-bar with 14 LED's 1 green Ready LED 1 red Alarm LED 1 red Test LED 2 x 4 alpha-numerical displays
Suction pipes	VN115/93 ø 22 x 2 x max. 9m VN116/93 ø 22 x 2 x max. 9m VN215/93 ø 14 x 2 x max. 9m
Pipe connections	VN115/93 2 x G1/2 or G3/4 VN116/93 2 x G1/2 or G3/4 VN215/93 10 x ø 14
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
Air pressure	Before pressure reducer 2 – 15 bar Before air jet pump max. 500 mbar
Negative pressure in measuring head	- 60 mm WC or – 6 mbar
Air consumption	Depends on the suction system (about. 1 m^3/h)
Electrical data	
Power supply	18 Volts – 31.2 Volts DC, max. 3 A
Nominal voltage	24 Volts DC
Relay Outputs	2 x 'Alarm' 1 x 'Ready' 1 x 'Pre-Alarm' (max. 60 Volts DC/AC, 60W, 125VA, 2A)
Cable entry	2 x M25
Communication interface to monitoring device	2 wire RS485, galvanic separated

Communication cable recommendation	LAPPKABEL UNITRONIC-FD CP (TP) plus UL-CSA, 2 x 2 x AWG20, max 400 m length, 7.5-10.0mm Ø
Environmental conditions	
Operating temperature	0 - 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

Table 11: Technical data

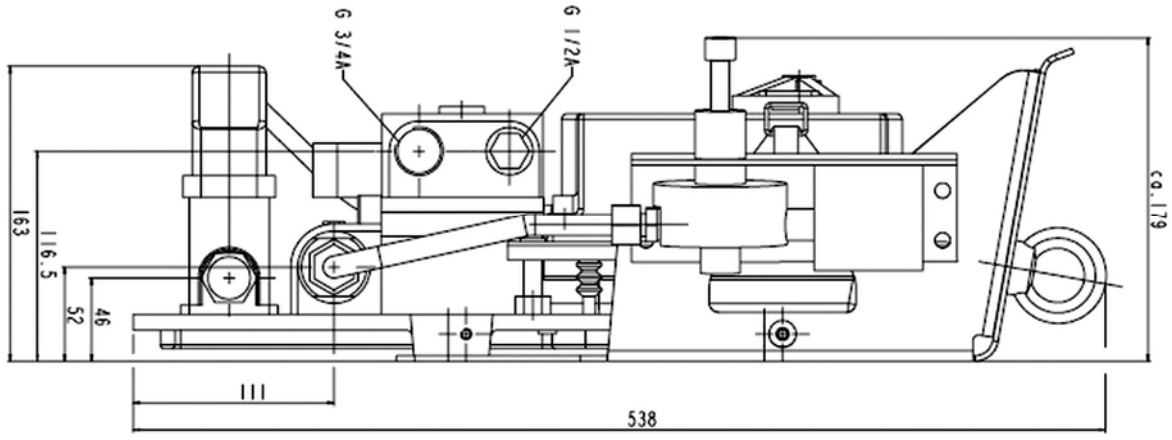


Figure 54: Mechanical dimensions of VN115/93: side view

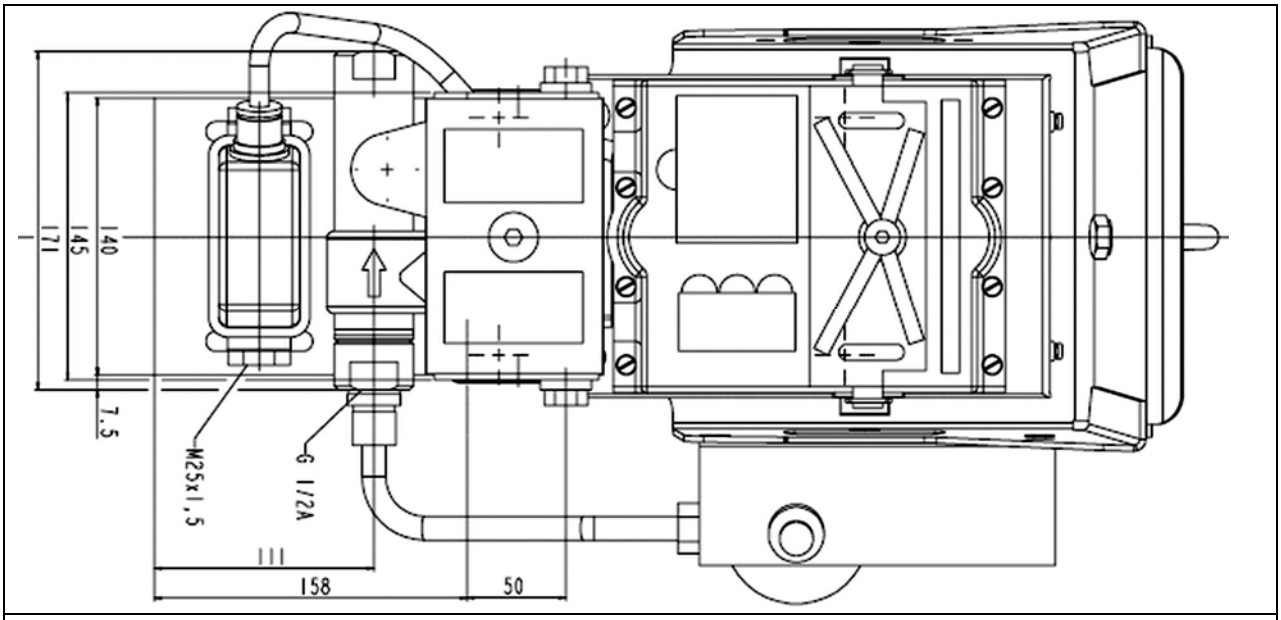


Figure 55: Mechanical dimensions of VN115/93: top view

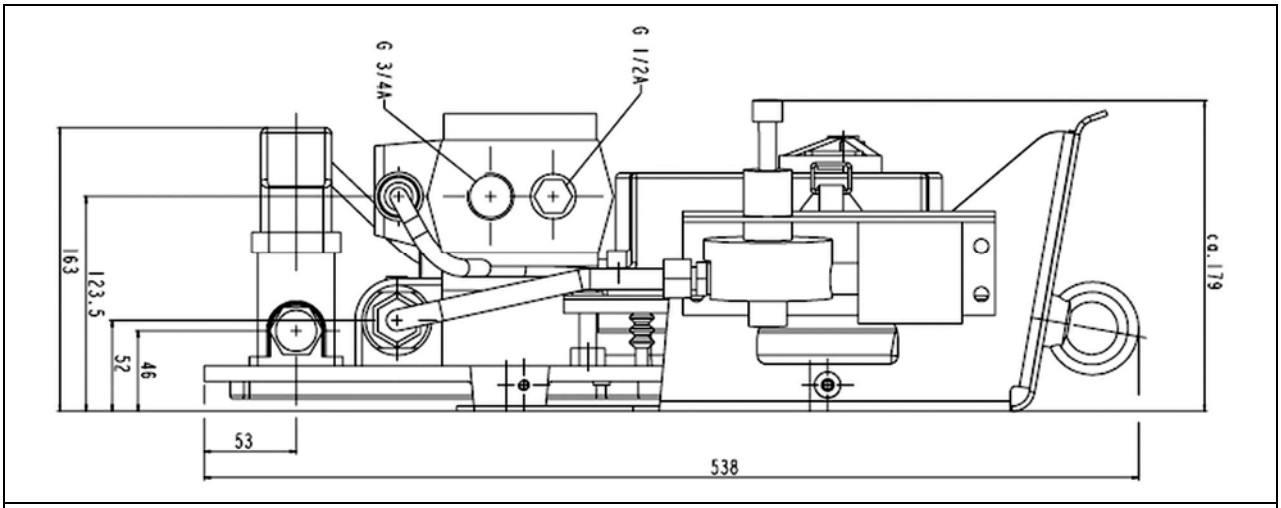


Figure 56: Mechanical dimensions of VN116/93: side view

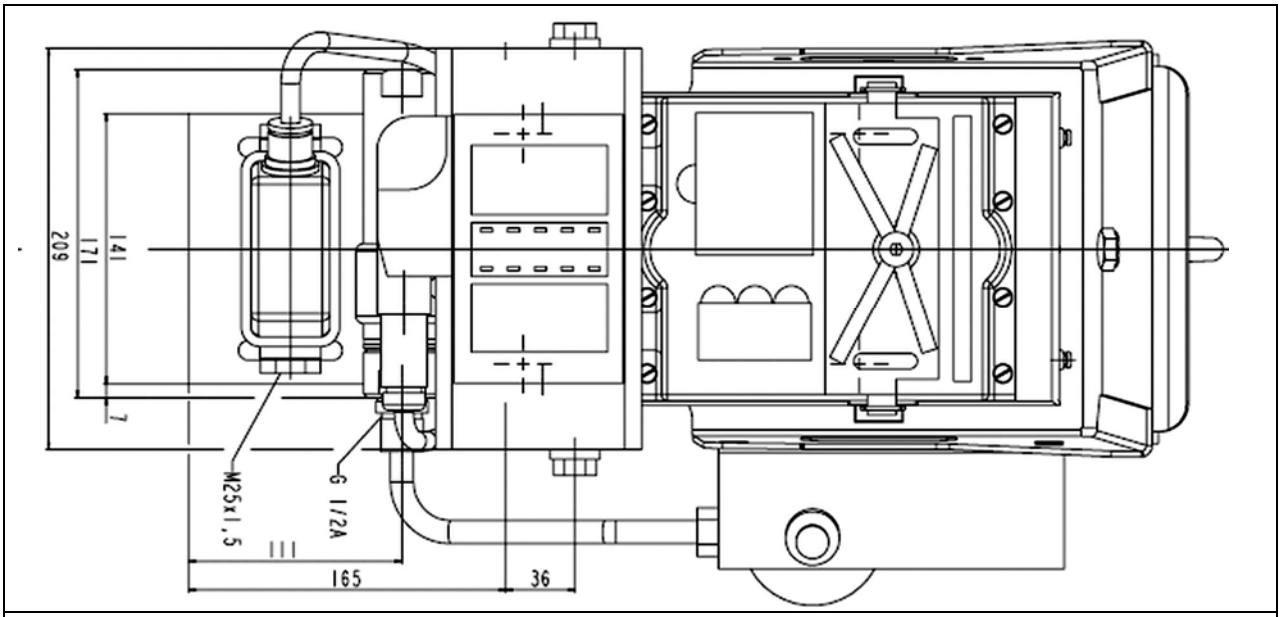


Figure 57: Mechanical dimensions of VN116/93: top view

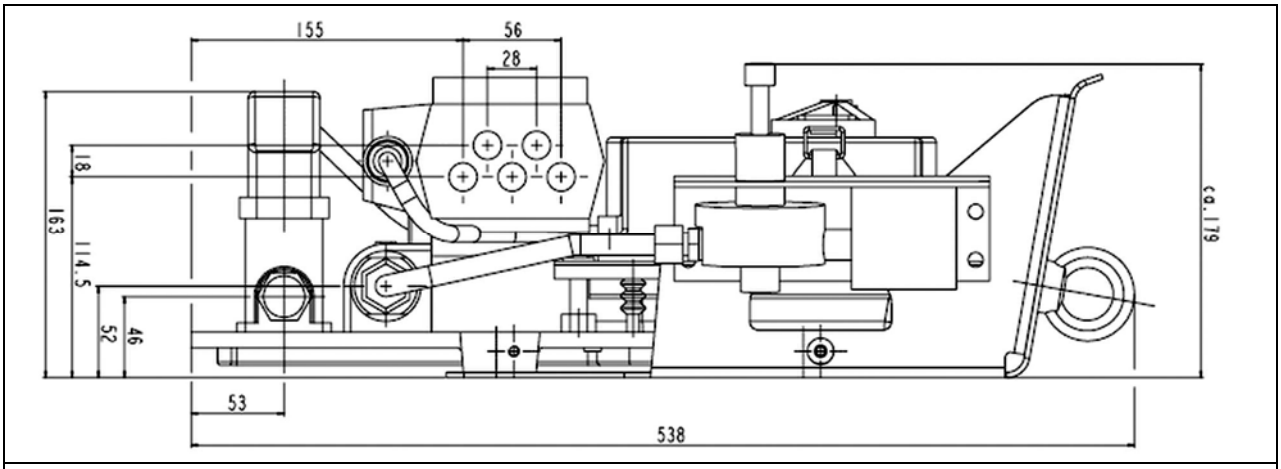


Figure 58: Mechanical dimensions of VN215/93: side view

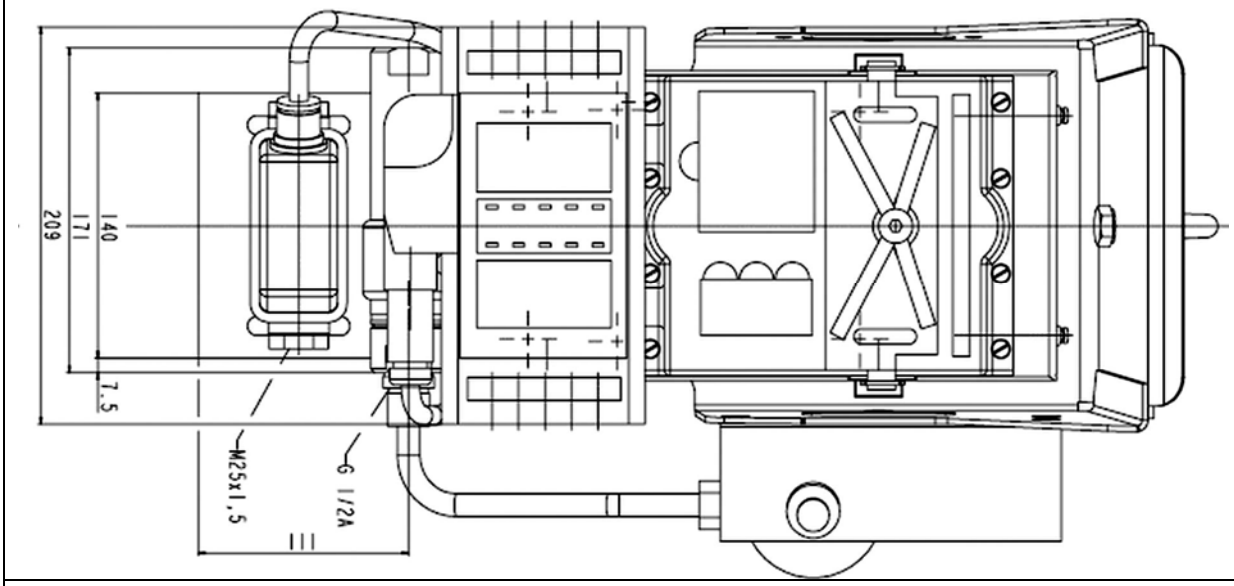


Figure 59: Mechanical dimensions of VN215/93: top view

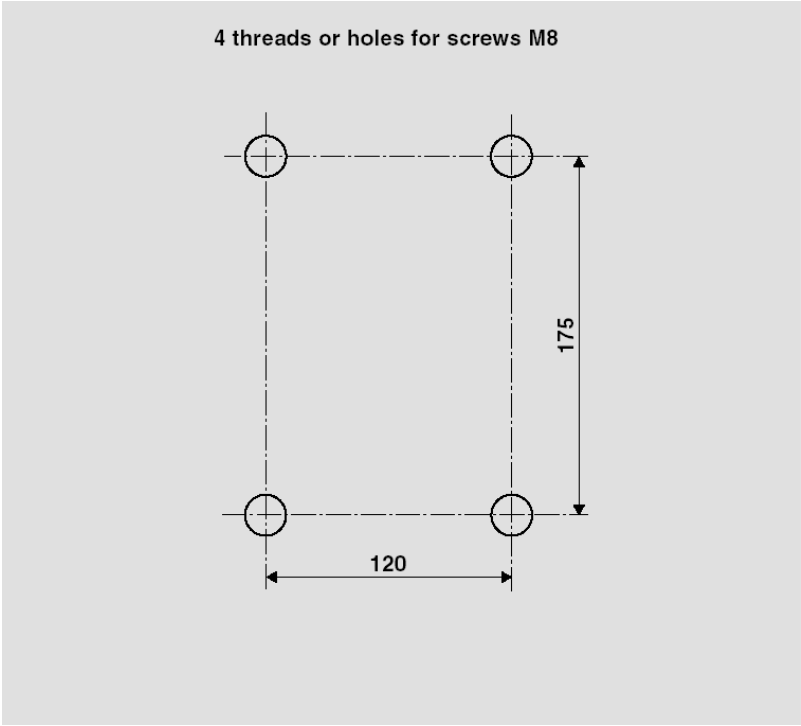


Figure 60: Drilling template of the OMD base plate

10 Service Partners

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

Australia
Brazil
China
Denmark
Germany
Greece
Italy
Japan
South Korea
Netherlands
Norway
Poland
Singapore
Spain
United Arabian Emirates
United Kingdom
United States of America

As details in relevant addresses are supposed to change, please find actual addresses of the relevant service partner under

www.schaller.de

or call our technical support center at the German headquarter:

Tel. +49 6842 508 0