MT41920013

BLACK SHARK TORPEDO SYSTEM

TECHNICAL MANUAL

VAND SYSTEM

(VAS103B)

VOLUME 1 of 1

LEONARDO ELECTRONICS

BASE / APRIL 2020

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I-3/ (I-4 blank)	00	U	3.1 to 3.4	00	U	6.1 to 6.2	00	U
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CHAPTER 1

GENERAL DESCRIPTION AND SAFETY PRECAUTIONS

1.1 Introduction

1.1.1 Purpose and Contents of the Manual

This manual illustrates the physical and functional features of the VAND System VAS130B.

The chapters are divided as follows:

Chapter 1	General Description and Safety Precautions
Chapter 2	Detailed Functional Description
Chapter 3	Operation
Chapter 4	Preventive Maintenance
Chapter 5	Troubleshooting
Chapter 6	Corrective Maintenance
Chapter 7	Parts List
Chapter 8	Installation

1.1.2 VAS103B Identification

The overall view of VAND System VAS103B is shown in Figure 1.1.

Table 1.1 - Identification of VAS103B

DESCRIPTION	REFERENCE
VAND System VAS103B	W036721

1.1.3 List of Abbreviations

All the abbreviations utilized in this manual are present in the following list:

BS	:	Black Shark
COTS	:	Commercial Off the Shelf
ET		Electronic Tecnician
FS		Full Scale
HP		High Pressure
LP	:	Low Pressure
MT	:	Mechanical Technician
MTTR	:	Mean Time To Repair
SRU	:	Shop Replaceable Unit
VAC		Volts of Altenating Current
VAND	:	Vacuum And Nitrogen Device

1.2 Safety Precautions

1.2.1 General Rules

The safety precautions measures to be observed by the personnel, in order to properly operate on the VAS103B as well as to prevent any accident or injury, are here below set down.

The equipment is powered by 115 VAC/50-60Hz.

General precautions are:

- Before operating inside the equipment the external power supply cable must be disconnected from the Mains;
- Do not service or adjust alone. Under no circumstances should any person service or adjust the equipment without the presence or assistance of other person capable of rendering aid;
- Personnel working with or near electric or electronic equipment must be familiar with methods of artificial respiration;
- Personnel should observe all standard good practices in installation, replacing, operation and testing of equipment;
- Keep the device away from the heat when the nitrogen bottles are charged.

Before operating inside it, make sure that:

- The external power supply cable is disconnected from the Mains;
- Push the STOP push-button, located on the upper panel;
- The equipment is disconnected from the Torpedo;
- Make sure that the pipes are not pressurised.

For a correct use of the equipment, the following precautions must be observed:

- Before connecting the external power supply cable, push the STOP push-button, located on the upper panel;
- Before energising the VAS103B through the switch START, make sure all foreseen connections have been correctly realised.

1.2.2 Warnings

The safety information given in the manual is distinguished as follows:

- **WARNING**: warning related to precautions that must be taken in carrying out maintenance operations that could cause injury to persons.
- **CAUTION**: warning related to precautions that must be taken in carrying out maintenance operations that could cause damage to the equipment.
- **NOTE**: generic warning to call readers attention to information not referring to any specific hazard to persons or risk of damaging material.

All persons working in the areas where the equipment is used must be familiar with the contents of this paragraph and with current legislation on health and safety at work of the country. Since it is not possible to identify all the potentially dangerous situations that may arise, the fact that a number of risks are not described in this paragraph does not mean that they do not require special precautions.

The staff must understand not only the preventive measures, but also the concepts on which they are based, so that they can recognize the various dangerous situations and act instinctively to remedy them.

It is also essential that personnel are familiar with all danger signs in the vicinity of the installations.

Caution/Warning Signs

	**GENERAL HAZARD**		**ELECTRICAL HAZARD**
	**ATTENTION: CIRCUITS SUSCEIPTIBLE TO STATIC ELECTRICITY**		**ATTENTION: SUSPENDED LOADS**
	**HAZARD: PRESSURISED CONTAINER**		**ATTENTION: MOVING PARTS**

Prohibition signs

	**SMOKING PROHIBITED**		**AUTHORISED PERSONNEL ONLY**
	**DO NOT TOUCH**		**DO NOT HANDLE WITH FORKLIFT TRUCK**
	**DO NOT USE WATER EXTINGUISHERS**		**DO NOT REMOVE OR DISABLE SAFETY DEVICES**

Mandatory signs

	**HARD HATS MUST BE WORN AT ALL TIMES**		**ANTI-STATIC FOOTWEAR MUST BE WORN**
	**POWER MUST BE SWITCHED OFF**		**EYE PROTECTION MUST BE WORN**
	**PROTECTIVE FOOTWEAR MUST BE WORN**		**PROTECTIVE GLOVES MUST BE WORN**
	**PERSONNEL MUST BE FAMILIAR WITH ALL SAFETY PRECAUTIONS**		

1.2.3 General safety precautions

1.2.3.1 Overview

The general standards described in this paragraph form the basis of every effective safety program.

1.2.3.2 General Rules

All personnel must be familiar with and strictly comply with these precautions:

- hazard warning signs must be placed visibly in potentially hazardous areas;
- personnel responsible for system operation and maintenance must have in-depth knowledge of the safety devices mounted on system equipment;
- personnel with little experience may carry out maintenance only under the direct and constant supervision of expert personnel with full knowledge of the system;
- safety procedures must be strictly complied with in all circumstances;
- changes or exceptions to safety procedures must not be allowed, if not by explicit authorisation of the commanding Officer;
- transit zones, doors, hatches or ladders in or in the vicinity of the area of use or commissioning of the system must not be obstructed;
- emergency exits must not be obstructed or hidden;
- in potentially slippery areas the floor must be coated with non-slip material;
- maintenance must be carried out using exclusively the specified equipment and procedures;
- control instruments / tools must be kept in good condition;
- personnel must have in-depth knowledge of the methods and procedures in case of fire, and know the location of fire-fighting equipment and extinguishers in their working areas;
- if fire is discovered, the following actions must be taken immediately:
    - cut all power;
    - inform the Officer responsible;
    - increase ventilation;
    - fight the fire using the appropriate equipment.

WARNING

Poorly ventilated zones where carbon dioxide extinguishers have been used are hazardous to personnel. Authorised personnel only may enter these zones.

1.2.3.2.1 Mechanical risk

In situations where there is the risk of cutting crushing or slipping, personnel must wear suitable protective footwear and gloves; where there is the risk of trapping, machinery must be fitted with suitable safety systems and personnel must not operate such machinery wearing loose clothing that may easily become trapped.

Authorised machine maintenance and repair personnel must not work on machinery while it is operating or intervene on moving parts.

1.2.3.2.2 Hazards due to Pneumatic Systems

The use of high pressure gas demands constant attention to the following points:

- makeshift tools are prohibited;
- when testing mechanisms under high pressure, operators must take shelter or move to a safe distance;
- pipe outlet ends under high pressure must be correctly fastened to prevent it from flailing if the pipe downstream breaks;
- never leave a pipe connected to an air source with its end free, to prevent accidental opening of the valve causing the pipe to flail.

Never tighten or loosen a pneumatic connection while the fluid it contains is under pressure; to tighten a connector, the mandatory procedure is as follows:

- bleed off the pressure
- tighten the connector
- restore the pressure

Only connect equipment capable of withstanding line pressure to H.P. lines.

1.2.3.2.3 Electrical hazards

Where there are risks due to parts under voltage, the machine and/or equipment must be fitted with suitable safety systems and the involved personnel must operate strictly according to the operating instructions and use the individual protection devices provided.

1.2.3.2.4 Hazards due to loads

Operations involving movement of loads by gantry cranes and/or forklifts must be carried out exclusively by authorised personnel.

Operators must make certain the lifting gear (gantry crane, forklift) has load bearing capacity adequate for the weight of the object to lift, and is in a perfectly efficient condition.

Personnel must not work or stand under suspended loads. Personnel responsible for moving loads must wear hard hats and safety footwear at all times.

Personnel responsible for moving parts or packaging manually must not attempt to lift loads heavier than 25 Kg.

1.2.3.2.5 Chemical agents

When working with chemical substances, personnel must strictly comply with the instructions given on the safety sheets of the products use (Material Safety Data Sheet), which can be found on-line, and use the specified personal protection equipment.

1.2.3.2.6 Noise hazards

Personnel working near machinery and/or equipment that emits noise of estimated intensity equal to or greater than 85 dB (A) must use ear protection.

1.2.3.3 Safety precautions for electrical-electronic equipment

1.2.3.3.1 Overview

Although the causes of electrical hazards are well known, there are still risks and accidents that could be prevented.

Preventing the hazards that could arise during use and maintenance of electrical equipment is not difficult, but does require constant attention.

To reduce the possibility of electrical accident, personnel must be aware of the dangers and instructed with regard to safety procedures.

Hazard warning markings are applied to equipment operating at voltages greater than 70V, to warn maintenance personnel of the potential danger present. Such equipment is also adequately protected against accidental contact.

1.2.3.3.2 High voltage hazards

Contact with high voltage may be lethal, cause severe burns and even dangerous falls due to electric shock. The usual outcome of electrical accident is death by electrocution. Electrical accidents are usually caused by insufficient awareness of the dangers of electrical circuits.

The degree of injury is principally related to the intensity of the current passing through the body, the route this takes and the exposure time. If, for example, a circuit under high voltage and significant current is short-circuited, this creates an electric arc which could cause burns, even up to third degree. This may happen when removing fuses from live circuits.

Very often the victim of such a shock suffers violent muscular contractions causing them to lose consciousness.

1.2.3.3.3 Safety precautions for operations on electrically isolated equipment

The following safety precautions are applicable to all cases in which it is possible to conduct operations or maintenance with the equipment electrically isolated.

- the circuits must be powered down before starting any maintenance operation;
- check that all switches are open, and all primary power lines isolated. If possible, remove the plugs or disconnect the connectors from the primary power sockets. Place a “maintenance in progress” sign in the immediate vicinity of the isolator switches;
- before starting the maintenance, check that there is no residual voltage in the equipment;
- clear, clean and dry the working area. If possible, work on an insulating rubber mat;
- do not wear chains, bracelets or other accessories that could become trapped in the equipment or act as conductors;
- discharge any capacitance to earth or short-circuit the terminals before working on powered-down circuits with capacitance.

1.2.3.3.4 Safety precautions for operations on electrically live equipment

In addition to the previously described general precautions, on live equipment proceed as follows:

- never work alone;
- wherever possible, use only one hand;
- periodically check all test instruments and conductors;
- use only the approved methods for by-passing interlocks;
- make certain that personnel are fully familiar with the equipment and maintenance procedures before starting any operation;
- wear rubber gloves with leather protection;
- power down all equipment before making resistance measurements;
- before starting work, check that no high voltage is present in low voltage circuits;
- avoid using magnetic tools in the vicinity of intense magnet fields.

When taking measurements or maintaining circuits with high voltage, take the following precautions:

- place signs and guards to prevent accidental contact by personnel;
- only work on live circuits if another person is present and able to ground the equipment if necessary;
- never touch test conductors or cables when voltage is present.

When measuring voltages in excess of 1000 Volts, take the following precautions:

- power down the equipment under test;
- discharge high voltage capacitance to earth and the conductors to which the tester cables are connected;
- connect the high voltage tester cables to the required points;
- check that the test equipment is used correctly;
- keep a safe distance from the conductors and test equipment;
- do not touch test instruments while voltage is applied;
- power down the equipment after taking the measurement;
- discharge any high voltage capacitance in the terminals to which the test equipment is connected before disconnecting it.

1.2.3.3.5 Electric shock

Overview

The effects of an electric shock can be mitigated if personnel are capable of giving effective first aid to the victim. In many cases, the effects are fatal if the rescuer is not capable of performing artificial respiration immediately.

It is essential that personnel receive first aid training.

In case of shock, every second the victim remains in contact with the power source reduces their chances of survival.

WARNING

Do not touch the victim with bare hands until they are isolated from the power supply.
Break the power supply circuit by opening the line switches; if this is not possible, protect yourself with INSULATING and DRY material then free the victim from the conductor. Examine the victim and if he does not breathe, begin rescue breathing (using universal precautions) if breathing has stopped and heart massage if heart action has stopped.

In case of burns, the effects can be mitigated if personnel are capable of giving effective first aid to the victim. This treatment must be performed after the victim has regained consciousness. It can be applied even during artificial respiration (however this requires at least two rescuers).

WARNING

Do not attempt to remove clothing from the affected area

Do not apply ointments or other oily or greasy substances.

1.2.3.4 Safety precautions during maintenance

WARNING

Only qualified technical personnel are allowed access to equipment for inspections maintenance, problem finding or troubleshooting.

WARNING

It is absolutely forbidden to disable or tamper in any way with equipment safety systems.

Except in cases where the power supply must be present, power circuits must be powered down and disconnected from their power source.

A maintenance operation cannot be considered finished until all parts have been reconnected, all nuts and bolts tightened to torque and the equipment restored to its original operating condition.
Before starting any electrical maintenance works:

- check yourself: do not wear objects likely to come into contact with the equipment or act as conductors;
- check the working area: make sure the floor is clean and dry, and if possible stand on insulating material (for example, a rubber mat);
- check your tools: only use suitable tools that are in a perfectly efficient condition (screwdrivers with insulated handles, fully isolated test instruments);
- check the procedures: study the procedure before taking the first step, keep the circuit diagram on hand for consultation and get to know the equipment hardware.

While carrying out electrical maintenance:

- bear in mind that there may be high voltage at the terminals normally under low voltage (especially after a failure);
- do not take resistance measurements with voltage present;
- wherever possible use one hand while taking measurements on live equipment;
- strictly comply with all safety precautions previously described for electrical and electronic systems.

Parts supplied unpainted must not be subsequently painted. Unpainted surfaces are chemically treated to prevent corrosion and excessive wear. Paintwork can cause malfunctions, for example, by decreasing heat dissipation or impeding free movement.

1.2.3.5 Responsibilities of supervisors

Supervisors must be aware of all electrical risks and hazards, and monitor the operations of maintenance personnel. They must also identify any potentially hazardous conditions and request that maintenance personnel inform them of any problems or faults located.

Any defective or faulty equipment must be repaired immediately. Supervisors must assure the compliance of maintenance personnel with all safety procedures.

Toleration of any exceptions to safety precautions may lead to personal injury and damage to the equipment.

1.3 General Description

The VAND System VAS103B (Figure 1.1) consists of the following main parts:

- A trolley;
- Four nitrogen bottles;
- A motor and vacuum pump unit;
- A sensor lubricating device;
- A series of valves, reducers and pressure gauges interconnected by tubes.

The trolley is made of steel. It is mounted on four pivoted wheels provided with brakes. A door hinged on the left edge closes the rear side of the trolley. Actuating the two keys located on its right side can open the door: on the door rear side, two bins allow the accessories to be stored. The front side is shaped so that its upper and lower parts are inclined and the middle is vertical. The operation and control panel is located on the upper part of the front side (Upper Panel) where the valves and reducers handwheels, the pressure gauge indicators, the motor starting and stopping push-buttons, and the inner lighting lamps control switch are located. On the lower inclined side (front panel) there is a square housing (Connection Square Housing) where the fittings for the connections four low/high pressure and the sensor lubrication are located. This side has a cover fastened with four screws and the blocking nuts of the above connections. On the control panel (upper panel) are installed the devices listed in par. 1.3.1. In the square housing are located the connections as indicated in Figure 1.2 pos.1. On the right side panel a quick air-hose connection is installed to be used either for air-tank loading or externally feeding VAS103B. In the trolley are located: four nitrogen bottles (in vertical position), the vacuum rotating pump unit, pressure reducers, tubes, two luminous indicators and a motor starter (controlled by the STOP and START push-buttons located on the upper panel (Figure 1.3 pos. 5).

1.3.1 Upper panel

On the upper panel (Figure 1.3), there are the following control and checking devices:

- 4 pressure gauges (pos. 1);
- 1 vacuum/pressure gauge (pos. 2);
- 8 valve control knobs (pos. 3);
- 3 pressure reducer control knobs (pos. 4);
- 2 vacuum pump control push-buttons (pos. 5);
- 1 switch for inside lighting lamp turning on (pos. 6).

1.3.2 General Functional Description

The VAND System VAS103B performs the following functions:

- Maintenance operations of Weapon Systems (A244/ MU90 / Black Shark) at dockyard station;

- Test operations of Weapon Systems (A244/ MU90 / Black Shark) prior to launch.

To perform the above functions, the VAND System supplies compressed nitrogen at a variable pressure between 0 and 60 bar. Furthermore, it creates a vacuum of 1 bar with closed aspiration. Relationship between the VAND System and the other equipment are described in Chapter 3.

1.3.3 Interconnections

The external connections are realised by means of tubes and junctions listed in Table 1.2.

Table 1.2 – VAS103B Fittings

DESCRIPTION	FIGURE REF.	Q.TY	LENGTH (MM)	LABEL	APPLY TO SYSTEM
Power supply cable	Figure 1.4	1	3000	Power supply line	A244/MU90/BS
BOTTLE CHARGING HOSE	Figure 1.9	1	2100	Air-flask charging	A244/MU90/BS
BOTTLE CHARGIG HOSE	Figure 1.10	1	2100	Air-flask charging	A244/MU90/BS
LOW PRESSURE HOSE	Figure 1.6	1	700	By-p. Sen. Lub.	A244/MU90/BS
LOW PRESSURE HOSE	Figure 1.7/1	1	2100	Vacuum N-test	A244/MU90/BS
Vacuum-nitrogen junction (thread 1/8-27 NPT)	Figure 1.7/2	1			A244
Vacuum-nitrogen junction (thread 7/16-20 UNF)	Figure 1.7/3	1			MU90/BS
LOW PRESSURE HOSE	Figure 1.8/1	1	2100	Sensor Lubric	A244/MU90
Junction (thread M12)	Figure 1.8/2	1			A244
Junction (thread 7/16-20 UNF)	Figure 1.8/3	1			MU90
LOW PRESSURE HOSE	Figure 1.5/1	2	2100	Sensor Test	A244/MU90
Junction (thread M12)	Figure 1.5/2	2			A244
Junction (thread 7/16-20 UNF)	Figure 1.5/3	2			MU90/BS
Oil Tank	Figure 1.11	1			A244/MU90
T-joint	Figure 1.12	1			A244/MU90/BS
Nitrogen filling fixture	Figure 1.13	1			BS

1.4 Main Characteristics

The VAS103B technical data and the overall dimensions are given in the following:

1.4.1 Overall Dimensions and Weight

- Height: 1100 mm
- Width: 810 mm
- Depth: 720 mm
- Weight: 200 kg

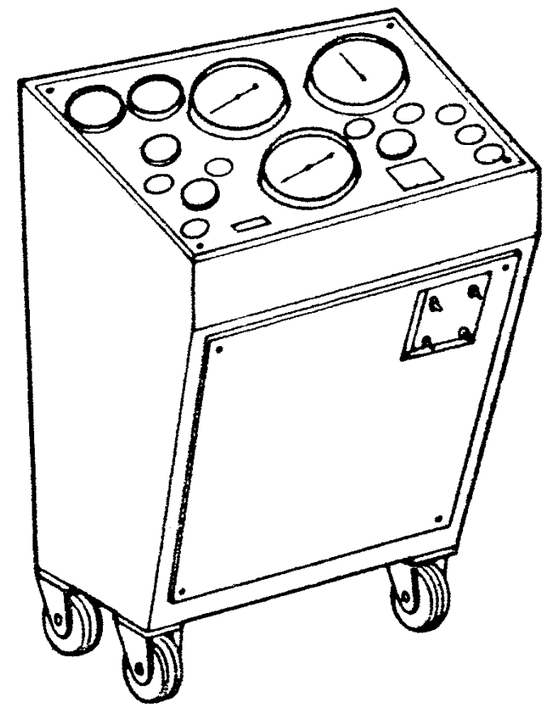
1.4.2 Electrical characteristics

- Power Supply Voltage: 115 Vac / 50-60Hz;

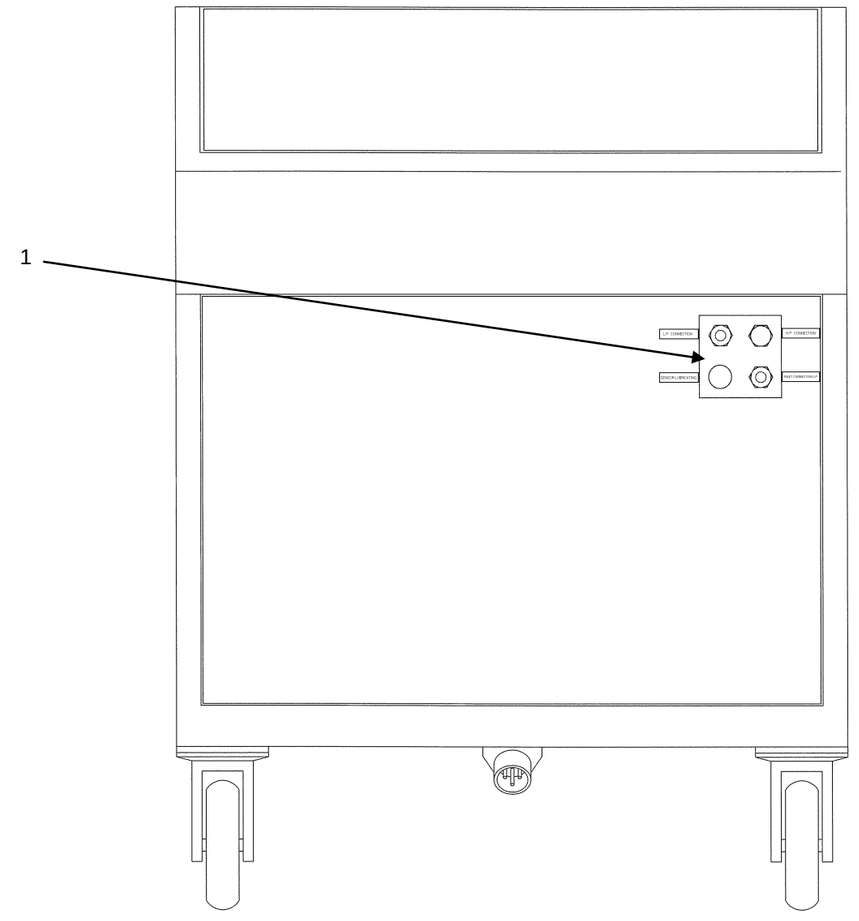
1.4.3 Bottles Characteristics

- Capacity: 10 lt
- Work pressure: 145,1 bar
- Test pressure: 215,7 bar

CHAPTER 1 - FIGURES

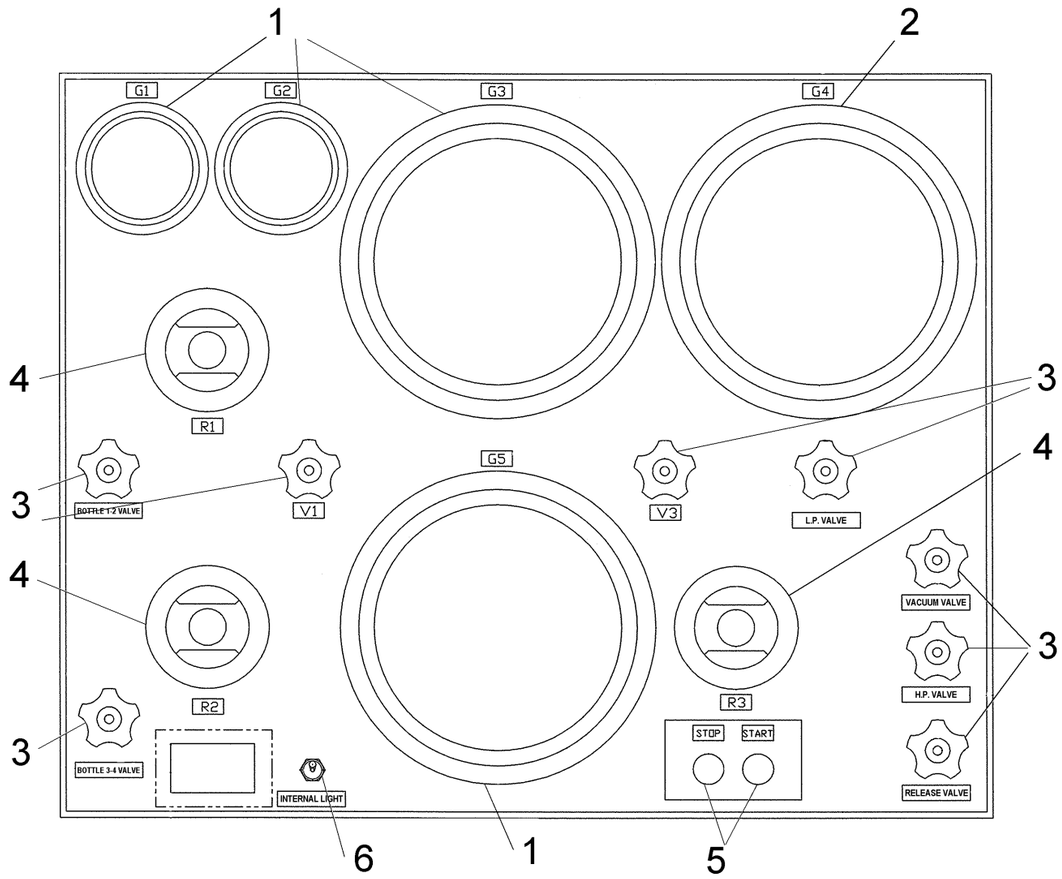


VAS103B	Overall View	Figure 1.1



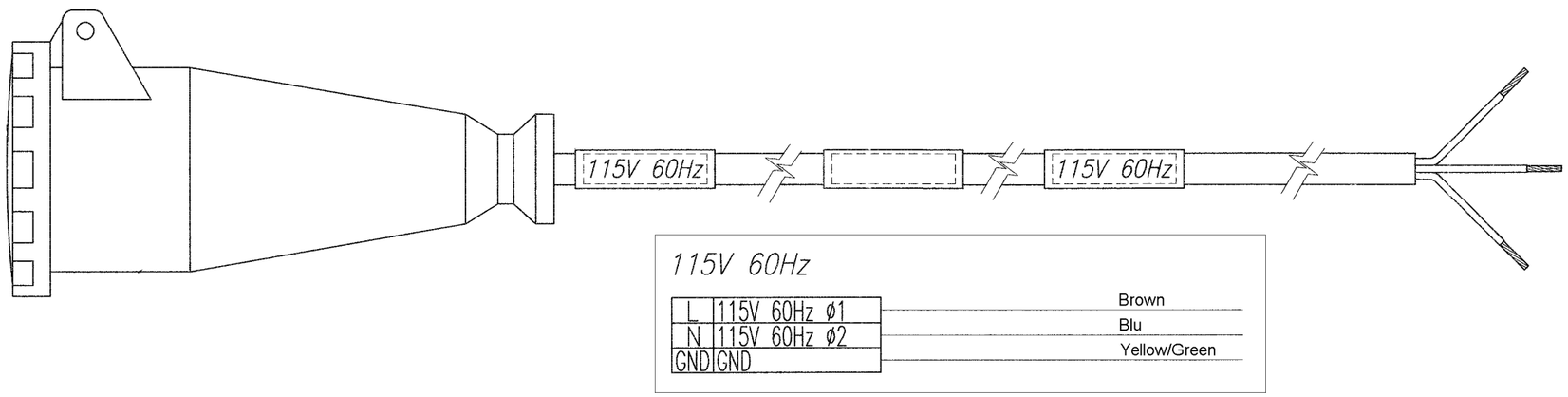
Ref.	Description
1	Connectors

VAS103B	Front View	Figure 1.2

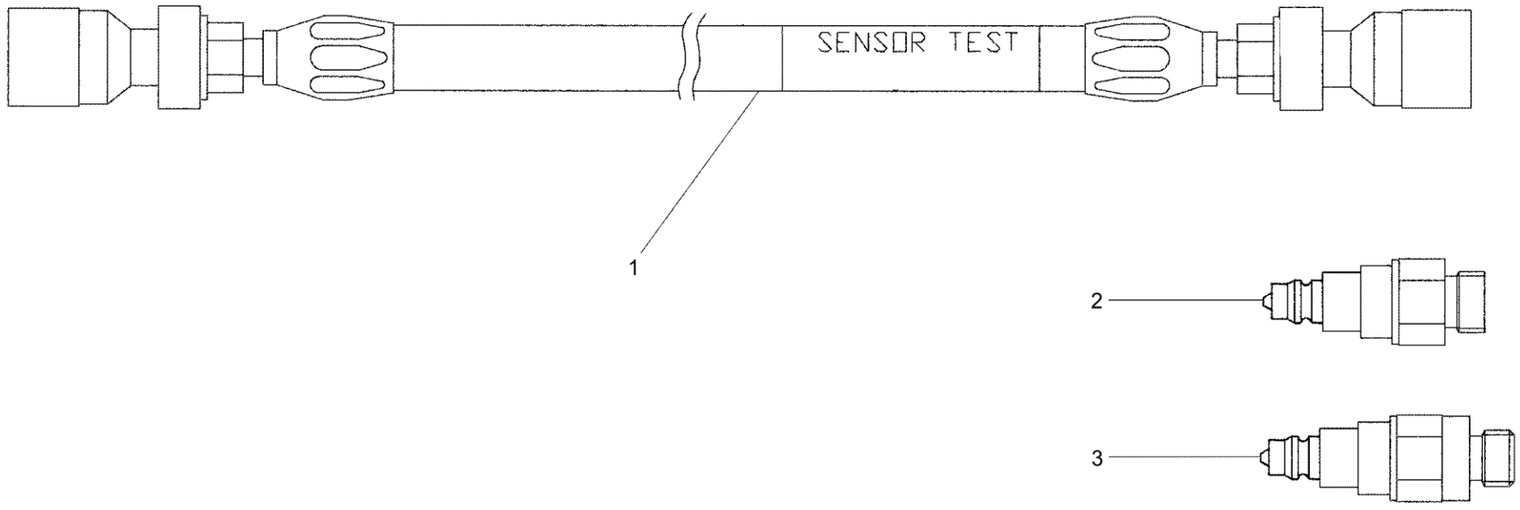


Ref.	Description
1	Pressure Gauges
2	Vacuum Pressure Gauge
3	Valve Control Knobs
4	Pressure Reduces Control Knobs
5	Vacuum Pump Control Push-Buttons
6	Switch for inside lighting lamp turning on

VAS103B	VAND System – Upper Panel	Figure 1.3

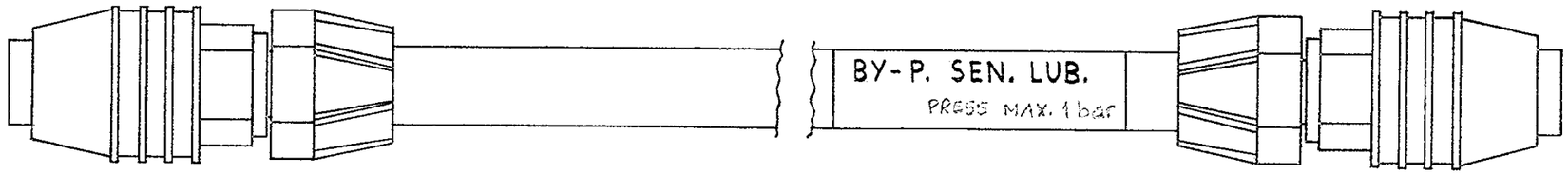


VAS103B	Power Supply Cable	Figure 1.4

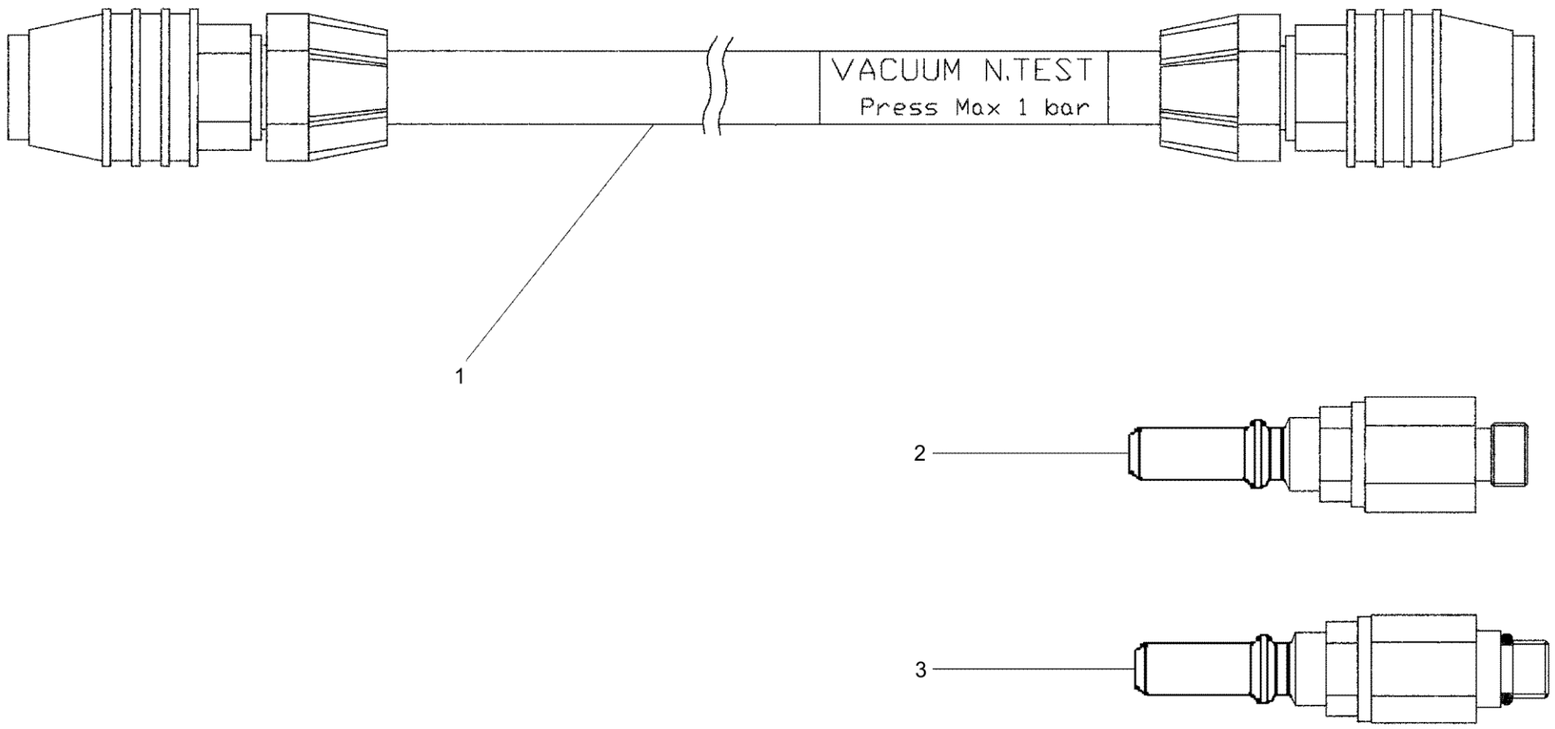


Ref.	Description
1	Pipe
2	Junction (thread M12)
3	Junction (thread 7/16 20 UNF)

VAS103B	SENSOR TEST hose and quick joints	Figure 1.5

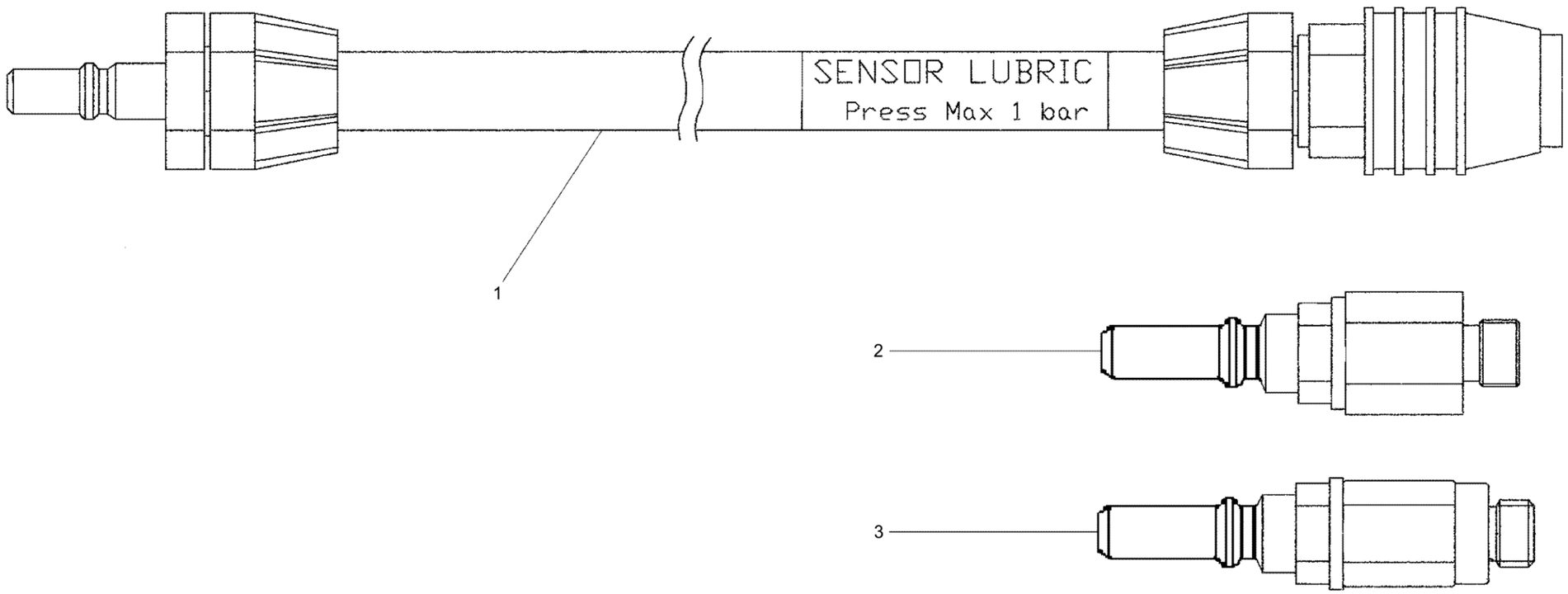


VAS103B	BY-PASS SENSOR LUB. hose	Figure 1.6



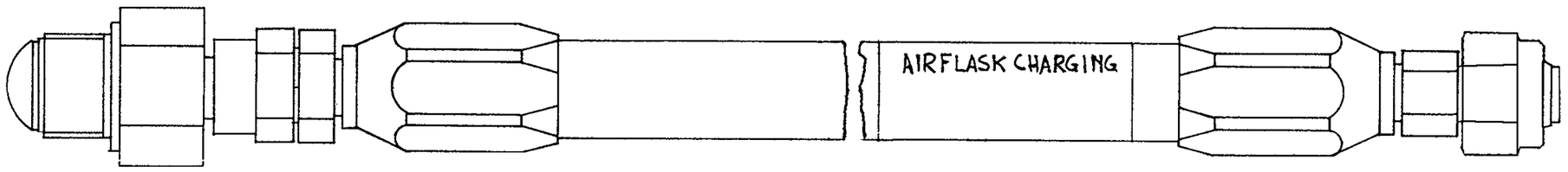
Ref.	Description
1	Pipe
2	Vacuum nitrogen junction (thread 1/8 27 NPT)
3	Vacuum nitrogen junction (thread 7/16 20 UNF)

VAS103B	VACUUM N. TEST hose and quick joints	Figure 1.7

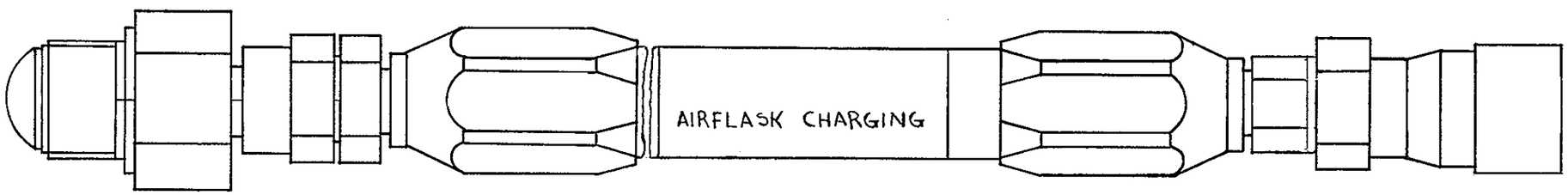


Ref.	Description
1	Pipe
2	Junction (thread M12)
3	Junction (thread 7/16 20 UNF)

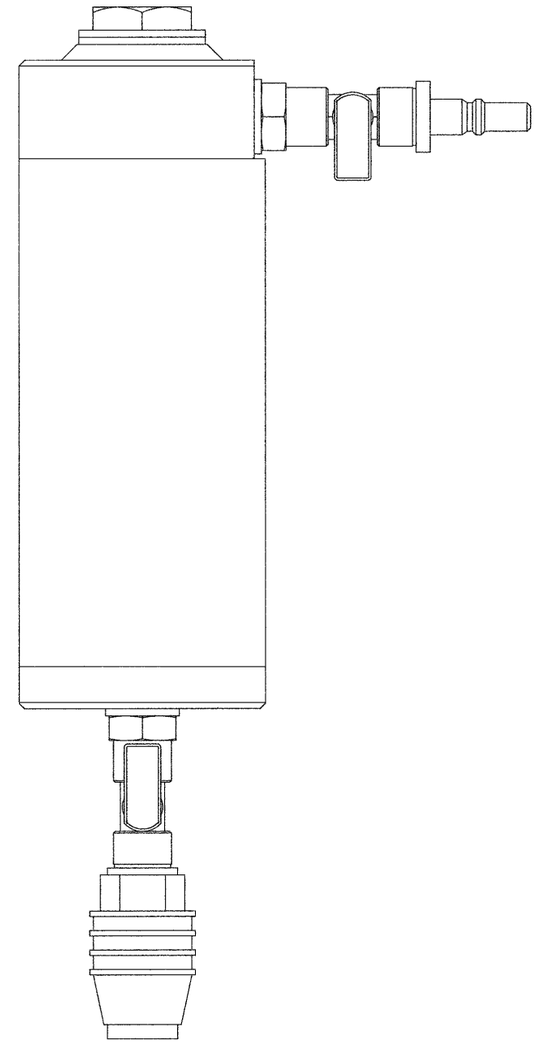
VAS103B	SENSOR LUBRICATING hose and quick joints	Figure 1.8



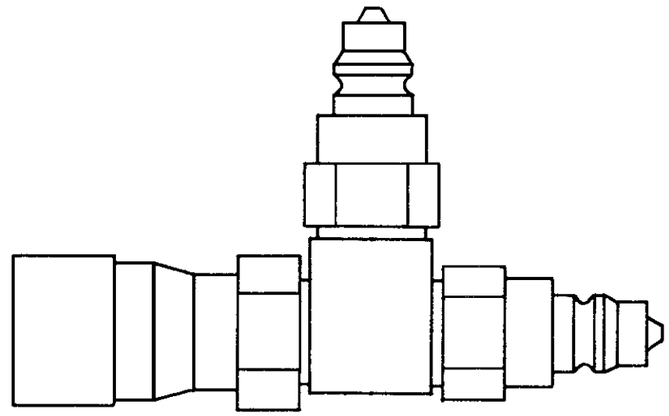
VAS103B	AIR-FLASK CHARGING hose	Figure 1.9



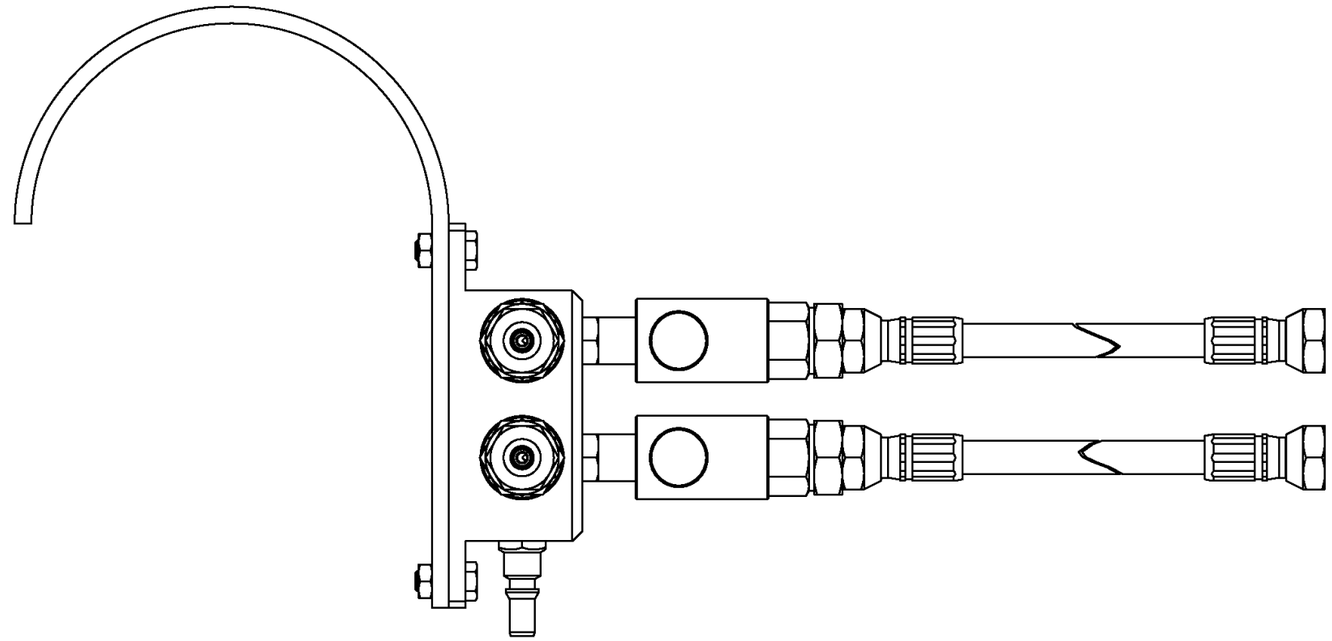
VAS103B	AIR-FLASK CHARGING hose	Figure 1.10



VAS103B	Oil Tank assembly	Figure 1.11



VAS103B	T-Connection joint	Figure 1.12



VAS103B	Nitrogen filling fixture	Figure 1.13

CHAPTER 2

DETAILED FUNCTIONAL DESCRIPTION

2.1 Introduction

This chapter describes the main functions carried out by VAS103B.

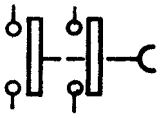
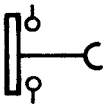
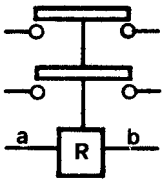
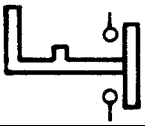
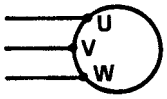
2.2 Functional Description

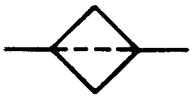
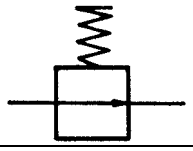
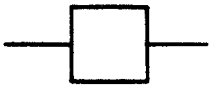
2.2.1 Generalities

The functional diagram of the equipment is shown in Figure 2.1.

The graphic symbols used in the functional diagrams are shown in the following table:

Table 2.1 - Graphic Symbols

SYMBOL	DESCRIPTION
	Switch
	Normally Open Contact push-button
	Normally Closed Contact push-button
	Relay
	Thermomagnetic Switch
	Motor
	Lamp

SYMBOL	DESCRIPTION
	Pressure Gauge
	Filter
	Valve
	Pressure Reducer
	Safety Valve
	Cut-off Valve

The parts shown in Figure 2.1 are listed in Table 2.2.

Table 2.2 – VAS103B Mains operating unit

DESCRIPTIONS	POS.
Bottle valve	1
Nitrogen bottle (capacity 10 l each)	2
Filter (25μm and 5 μm)	3
Pressure gauge 0 to 250 bar (accuracy 1%)	4
Pressure reducer: input 150 bar, output 10 to 60 bar	5
Pressure gauge 0 to 100 bar (accuracy 1%)	6
Safety valve rated at 57 bar	7
Manual stop valve	8
Pressure reducer: input 60 bar, output 0 to 60 bar	9
Cut-Off valve rated at 7,5 bar	10
Pressure gauge 0 to 10 bar (accuracy 0,5%)	11
Pressure gauge 0 to 60 bar (accuracy 0,5%)	12
H.P. valve	13
RELEASE valve	14
H.P. connection	15
Pressure reducer: input 60 bar, output 0 to 1,5 bar	16
Safety valve rated at 0,8 bar	17
L.P. valve	18
Vacuum / pressure gauge –1 to + 1,5 bar (accuracy 0,5%)	19

DESCRIPTIONS	POS.
L.P. connection PRES BLOCK fitted	20
Vacuum valve	21
Sensor lubricating device	22
Single phase motor 0.5 H.P. 115V 60Hz	23
Vacuum pump (max. vacuum rate with closed aspiration 745 mm Hg	24
Safety valve rated at 8 bar	25
Cross-joint	26
Connection for bottle charging	27
Conservation valve for bottles	28
Sensor test	29
Air-flask charging pipe for bottles charging	30
Bypass sensor lubricating	31
Sensor lubricating	32
Vacuum nitrogen test	33
Charging H.P. connection	34
Connection for bottles charging or for the use of an external bottle	35

2.2.2 High Pressure Circuit

The nitrogen is contained in the bottles (Figure 2.1, pos. 2) each one provided with its own conservation valves (Figure 2.1, pos. 28). The cross-joint located on the tube of bottles 3 and 4, is used to fill the bottles with nitrogen. With valves open (Figure 2.1, pos. 28), the compressed nitrogen is controlled by BOTTLE 1-2 VALVE (Figure 3.1, pos. 15) for bottles 1 and 2 and by BOTTLE 3-4 VALVE (Figure 3.1, pos. 12) for bottles 3 and 4, which can be operated from the control panel. By opening this valves, the nitrogen flows trough 25μ filter and reaches pressure gauge G1 (Figure 3.1, pos. 1) whereon the value of the bottle inner pressure can be read; G1 pressure gauge has a 250 Kg/cm^2 (bar) full scale and an accuracy of 1% relative to the max. range. By means of R1 pressure reducer (Figure 3.1, pos. 16), which can be operated from the control panel, the pressure can be reduced from 150 bar to values included within a range of 10 to 60 bar. G2 pressure gauge (Figure 3.1, pos. 2) has a 100 Kg/cm^2 full scale and an accuracy of 1% relative to the max. range. In order to protect G2 pressure gauge, on the pneumatic circuits a safety valve (Figure 2.1 pos. 7) is fitted rated in such a way to release the pressure to atmosphere if it exceeds 57 bar. V1 (Figure 2.1, pos. 8) valve is a manual valve, which can be operated from the control panel. A second R2 (Figure 3.1, pos. 13) pressure reducer, which can be operating from the control panel, can reduce 60 bar input pressure to values within a range of 0 to 60 bar. After R2 reducer the nitrogen flows again by means of a 5μ filter. By opening R2, the nitrogen can reach:

- Pressure gauge G5 (Figure 3.1, pos. 11) through V2 ON-OFF valve;
- Safety valve, rated at 8 bar;
- Pressure gauge G3 (Figure 3.1, pos. 3).

The pressure gauge G5 has a 10 bar full scale and an accuracy of 0,5% relative to the max. range, the second one (G3) has a 60 bar full scale and an accuracy of 0,5% relative to the max. range. Safety valve closes automatically when the output pressure from R2 exceeds 8 bar; therefore it provides a protection for G5 pressure gauge.

Because of the presence of two pressure gauges on this last part of the pneumatic circuit, it is possible to read with greater precision the lowest pressure values on G5 (from 0 to 10 bar) and the highest one on G3.

By opening R2 reducer, the nitrogen reaches other 3 valves:

- V3, (Figure 3.1, pos. 5) which can be operated from the control panel; this is a an ON-OFF valve;
- RELEASE VALVE, (Figure 3.1, pos. 9) which can be operated from the control panel, used to release to atmosphere the pressure existing into the tubes;
- H.P. VALVE, (Figure 3.1, pos. 8) handled from the control panel, which is used to supply air pressure to connection, indicated as H.P. CONNECTION on the square housing.

The above description deals with air pressure circuit, which, at the output, can supply a max. pressure of 57 bar, this limit being determined by the safety valve rating

2.2.3 Low Pressure Circuit

By opening valve V3 (Figure 3.1, pos. 5), the nitrogen can pass in the low-pressure circuit. After the ON/OFF valve, a safety valve (Figure 2.1, pos. 25) is fitted, rated at 8 bar, and the pressure reducer R3 (Figure 3.1, pos. 10), operated from the control panel, supplies output pressure values in a range from 0 to 1,5 bar.

Another safety valve (Figure 2.1, pos. 17), rated at 0,8 bar, is present, which adjusts the max. available pressure value on the ON/OFF valve (Figure 2.1, pos. 18) L.P. VALVE, operated from the control panel (Figure 3.1, pos. 6). By opening this valve, at the output (Figure 2.1, pos. 20), indicated as L.P. CONNECTION on the square housing (Figure 2.3, pos. 1), a 0,8 bar max. pressure is available, this value being limited by the safety valve rating. To this part of circuit is connected a tube which, trough the VACUUM VALVE (Figure 3.1, pos. 7), operated from the control panel, reaches the motor and vacuum pump unit (Figure 2.1, pos. 23 and pos. 24). On the part of circuit included between L.P. VALVE and VACUUM VALVE, the pressure (or depression) values can be read on G4 gauge (Figure 3.1, pos. 4).

This gauge in fact, is scaled from –1 to +1,5 bar and as an accuracy of 0,5 % relative to the max. range.
In order to check the oil level in the vacuum pump and in the sensor lubricating device, the VAS103B is supplied with 2 lamps which can be switched on by means of the INTERNAL LIGHT switch (Figure 3.1 pos. 17) on the upper panel.

The sensor-lubricating device (Figure 2.1, pos. 22) is composed of a plastic cylindrical transparent sealed container. Its upper base is connected to 2 tubes, one of which is simply fastened to the same base and the other one passes trough it, reaching the bottom of the container.

The other end of the first tube is the INLET CONNECTION L.P (Figure 2.3, pos. 3), located on the square housing; the other end of the second tube is the SENSOR LUBRICATING connection (Figure 2.3, pos. 2) of the same square housing.

2.2.4 Motor Power Supply Circuit

Figure 2.2 shows the motor circuit diagram. The two power supply lines are connected to the motor when relay “R” (n. o.) is energised, upon actuation, on the front panel, of push-button START (P1) (Figure 3.1 pos. 19). Vice-versa, where STOP push-button (Figure 3.1 pos. 18) is pressed, relay “R” is de-energised thus causing the power supply to motor to be cut off. The circuit is provided with a thermomagnetic switch (S2), inside the Motor Starter (para.2.2.5), which operates in case of over temperature, with consequent de-energising of relay “R” and cut-off of power supply to motor. Switch S1, located on the front panel, when closed causes lamps L1 and L2, located inside the trolley near the oil container and near the motor respectively, to switch on. Their purpose is to illuminate the inside of the trolley for checking the oil levels.

2.2.5 Motor Starter

The Motor Starter, situated beside the vacuum pump, is a commercial starter that contains the thermomagnetic switch. It allows enable or not the electric connection towards the vacuum pump and to reset the thermomagnetic switch when it trips.

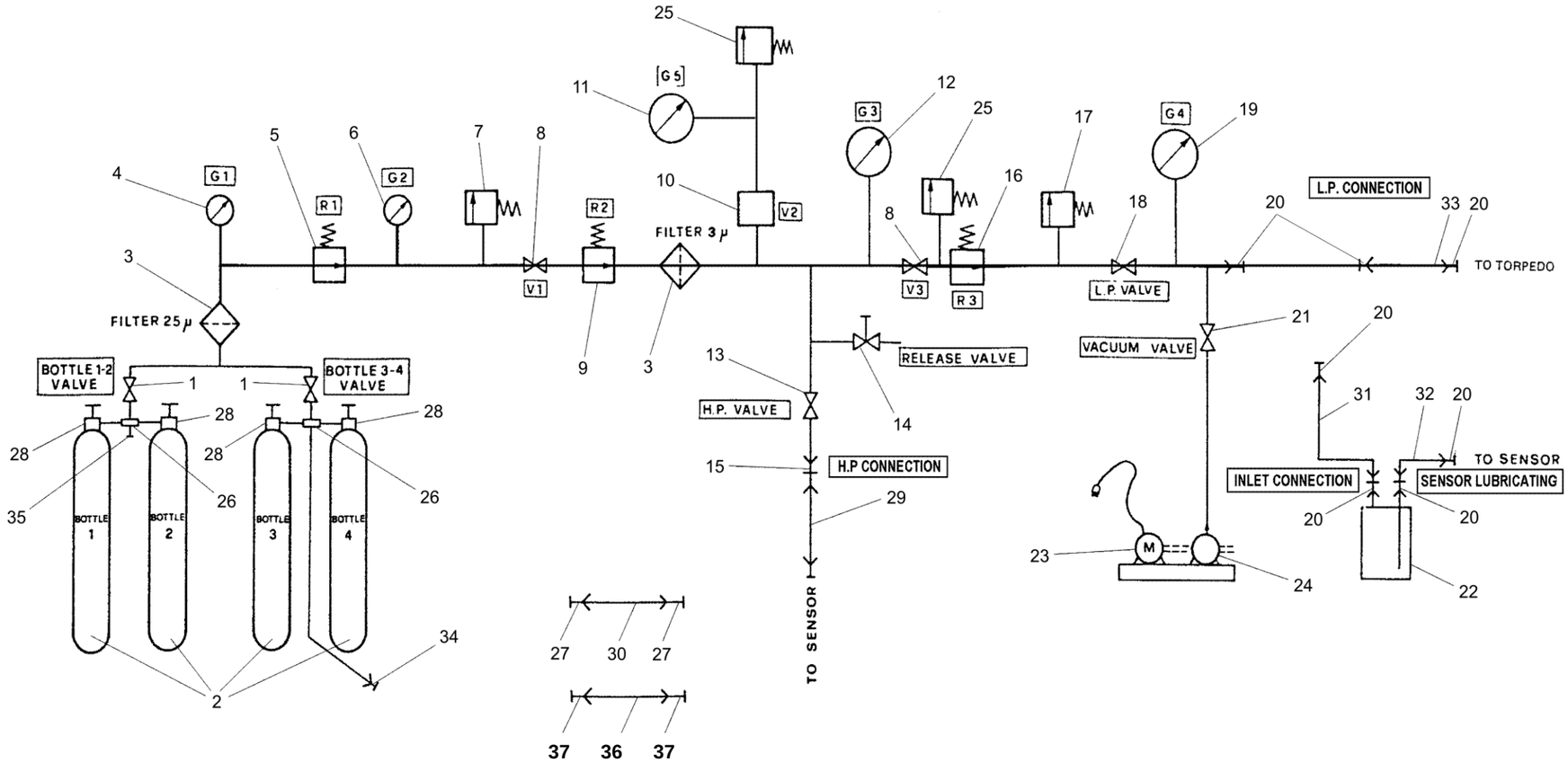
2.2.6 Fittings

The VAS103B is supplied with accessory hoses and their own junctions:

- SENSOR TEST hose (Figure 1.5)
- BY-PASS SENSOR LUBRICATING hose (Figure 1.6)
- VACUUM N. TEST hose (Figure 1.7)
- SENSOR LUBRICATING hose (Figure 1.8)
- AIR-FLASK CHARGING hose for quick air-hose charging (Figure 1.10);
- AIR-FLASK CHARGING hose for bottles charging or for the use of an external bottle (Figure 1.9).

SENSOR TEST, BY-PASS SENSOR LUBRICATING and SENSOR LUBRICATING hoses are used to lubricate A244 pressure sensor. VACUUM N. TEST hose is used for MU90 and Black Shark operations. The two AIR-FLASK CHARGING hoses are used for nitrogen bottles charging in two different modalities. One (Figure 2.1, pos. 30) is used when the bottles charging is performed from the quick air hose on the side panel (Figure 2.1, pos. 34). The other one (Figure 2.1, pos. 36) is used when the charge is performed directly on the bottles on the cross-joint (Figure 2.1, pos. 35) accessible by opening the rear panel. Also it is used when there’s need to use an external nitrogen bottle instead of the four internal ones.

CHAPTER 2 - FIGURES

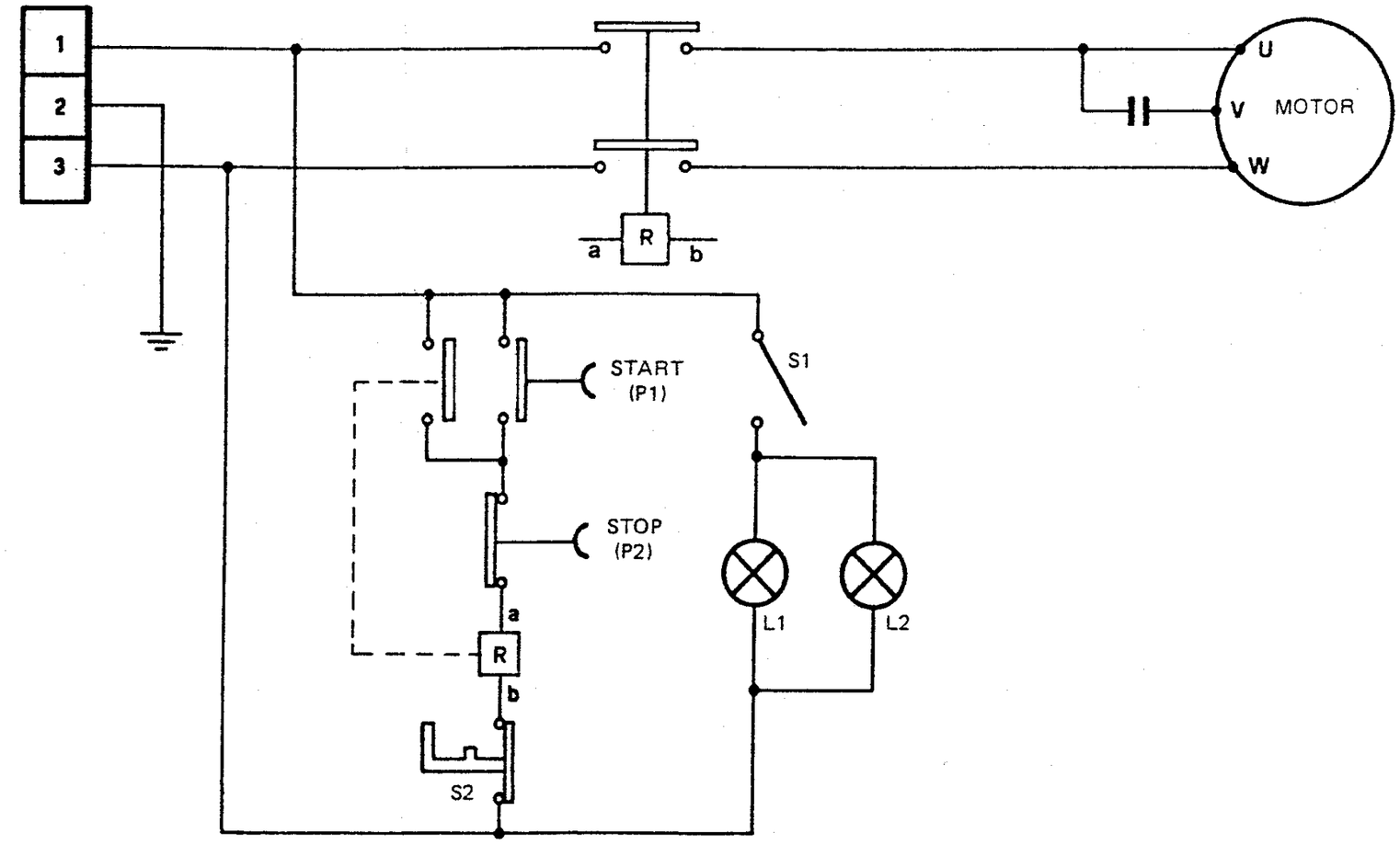


Ref.	Description
1	Bottle valve
2	Nitrogen bottle 150 bar (capacity 10 l each)
3	Filter (25µm and 5 µm)
4	Pressure gauge 0 to 250 bar
5	Pressure reducer: input 150 bar, output 10 to 60 bar
6	Pressure gauge 0 to 100 bar
7	Safety valve rated at 57 bar
8	Manual stop valve
9	Pressure reducer: input 60 bar, output 0 to 60 bar
10	Cut-off valve rated at 7,5 bar
11	Pressure gauge 0 to 10 bar
12	Pressure gauge 0 to 60 bar

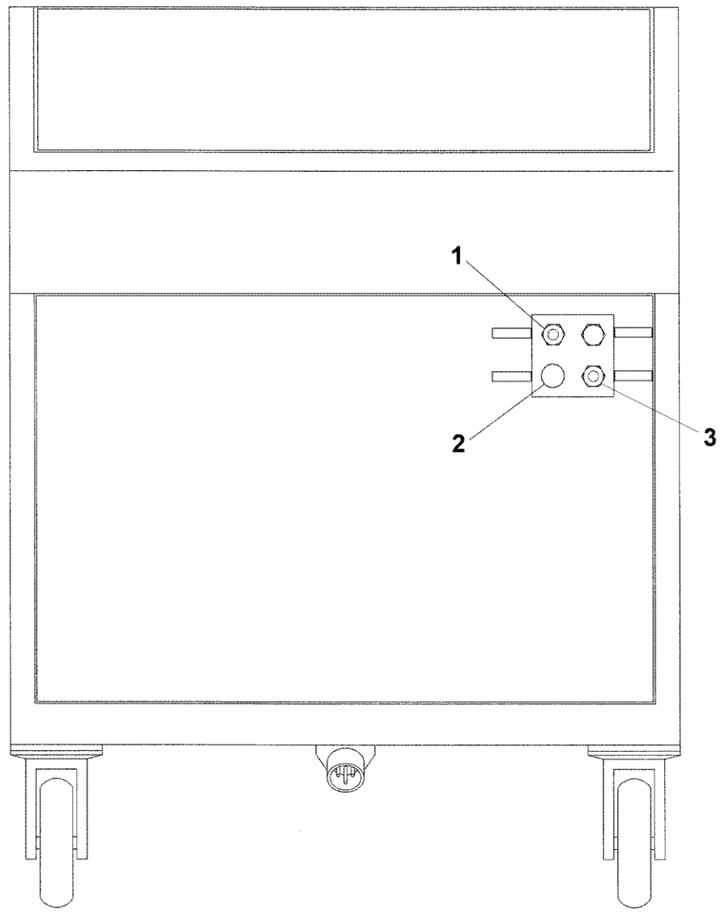
Ref.	Description
13	H.P. valve
14	RELEASE valve
15	H.P. connection
16	Pressure reducer: input 60 bar, output 0 to 1,5 bar
17	Safety valve rated at 0,8 bar
18	L.P. valve
19	Vacuum / pressure gauge –1 to + 1,5 bar
20	L.P. connection PRES BLOCK fitted
21	Vacuum valve
22	Sensor lubricating device
23	Single phase motor 0.5 H.P. 115V 60Hz
24	Vacuum pump

Ref.	Description
25	Safety valve rated at 8 bar
26	Cross-joint
27	Connection for bottle charging
28	Conservation valve for bottles
29	Sensor test
30	Air-flask charging pipe for bottles charging
31	Bypass sensor lubricating
32	Sensor lubricating
33	Vacuum nitrogen test
34	Charging H.P. connection
35	Connection for bottles charging or for the use of an external bottle
36	Air-flask charging pipe for bottles charging by cross joint
37	Cross joint connection

VAS103B	Functional Block Diagram	Figure 2.1



VAS103B	Motor circuit diagram	Figure 2.2



Ref.	Description
1	Square Housing
2	Sensor Lubricating Connection
3	Inlet connection LP

VAS103B	Front view	Figure 2.3

CHAPTER 3
OPERATION

3.1 Introduction

This chapter provides all the information necessary to the operator for a correct use of the VAND System VAS103B.

3.2 Overview

The operation instructions are grouped in the Operation Sheets (OPS). Each sheet provides all the information requires for operating on the main assembly; the operations are given in the order in which they must be carried out.

The OPS sheets are summarised in the List of Operations (LOP).

An explanation of the contents of each sheet is provided below.

1. List of Operations (LOP)

The list provides a summary of all the Operation Sheets (OPS), divided as follows:

- The first line indicates the name of the assembly on which the operations are carried out;
- The second line indicates the type of list, its progressive number and its page number;
- From the third line, the list is divided into the following columns:
  - Name of Operation: indicates the name of the operation to be carried out;
  - Sheet No.: indicates the number of the sheet in which the operations are described;
  - Refer to Chap. 3; indicates the Operation Sheet(s), Chapter 3, cross-referenced by the sheet indicated in the Sheet No. column;
  - Refer to Chap. 4; indicates the Preventive Maintenance Sheet(s), Chapter 4, cross-referenced by the sheet indicated in the Sheet No. column;
  - Refer to Chap. 5; indicates the Troubleshooting Sheet(s), Chapter 5, cross-referenced by the sheet indicated in the Sheet No. column;
  - Refer to Chap. 6; indicates the Corrective Maintenance Sheet(s), Chapter 6, cross-referenced by the sheet indicated in the Sheet No. column;
  - Refer to Chap. 8; indicates the Installation Sheet(s), Chapter 8, cross-referenced by the sheet indicated in the Sheet No. column;

2. Operation Sheet (OPS)

This sheet summarises all the information necessary for correctly carrying out the operation of the assembly; the sheet is divided as follows:

- The first line indicates the name of the assembly to which the operations refer;

- The second line indicates the type of sheet, its progressive number and its the page number;
- The third line indicates:
  - The number of persons required to carry out the operations;
  - The qualifications that personnel must possess to carry out the operations (Mechanical and electrical technician MT or Electronic Tecnician ET);
  - The duration of the operations;
- The fourth line indicates the name of the operation described in the sheet;
- The fifth line indicates the purpose of the operation described in the sheet;
- The equipment table indicates the maintenance equipment, test equipment, measurement equipment etc. necessary to carry out the operation, their type or their reference assigned by the supplier and their nato stock number (if any);
- The REPLACEMENT PARTS table indicates the replacement parts required to carry out the operation, their reference number assigned by the supplier and their NATO stock number (if any);
- The PRODUCTS REQUIRED table indicates the products necessary for cleaning or lubrication, the consumables required to carry out the operations, their type or their reference assigned by the supplier and their NATO stock number (if any);
- The PRELIMINARY SAFETY MEASURES box indicates the procedures considered to be dangerous and which are highlighted by the WARNING or CAUTION caption; the actions to be taken immediately in case of an event that endangers safety must be detailed here as specified below:
  - Symptoms;
  - Immediate action;
  - Probable cause;
  - Possible remedy;
  - Refer to Chap. 1 (indicates the paragraph of Chapter 1 that specifies the secondary actions to be carried out to restore acceptable safety conditions).
- The PRELIMINARY ACTIONS box indicates the measures to be taken before carrying out the operations such as:
  - Any connections of the assembly to the test or measurement equipment;
  - Position of the assembly;
  - Identification of the elements to check and the indicators;
  - Position of controls.
- The PROCEDURES box indicates the sequence in which the steps must be carried out according to the time frame indicated for the operation; the procedure also provides the following information:
  - The access procedure to the subassemblies and to the basic components;
  - The permanent and periodic checks;
  - The procedure for checking parts downgraded by wear, service life, environmental conditions;
  - The recordings and measurements to be made in the order established and the expected results;

- The values or the control conditions permitted during the normal use;
- Other additional data useful for carrying out the procedure.

3.3 Preliminary Measures

3.3.1 Use of Nitrogen bottles

The number of bottles, which can be used, depends on the needs of the operator. It's suggested using them one by one to avoid discharging them altogether. Also, since the two couples of bottles are managed separately, the one that's not used may be charged during normal operation.

3.3.2 Use of Motor Starter

The Motor Starter allows to enable the electrical connection between the START and STOP push buttons and the vacuum pump by means of a 2 position selector (Figure 3.2, pos.1). To enable the connection it has to be turned rightwards in the vertical position, otherwise it has to be turned to the horizontal position. In case of emergency the operator can push the red push-button (Figure 3.2, pos.2) to open the circuit in order to switch the vacuum pump off. In cause of emergency action on the red push-button or in case the thermomagnetic trip, the operator may restore the connection by pushing the black push-button (Figure 3.2 pos.3).

3.4 Controls and Indicators

All the controls and indicators of the VAS103B upper panel are listed in Table 3.1 with reference to Figure 3.1.

Table 3.1 - Controls and Indicators

REF. IN FIGURE	DENOMINATION	DESCRIPTION
1	G1	Pressure Gauge
2	G2	Pressure Gauge
3	G3	Pressure Gauge
4	G4	Vacuum/Pressure Gauge
5	V3	Valve
6	L.P. VALVE	Valve
7	VACUUM VALVE	Valve
8	H.P. VALVE	Valve
9	RELEASE VALVE	Valve
10	R3	Pressure Reducer
11	G5	Pressure Gauge
12	BOTTLE 3-4 VALVE	Valve
13	R2	Pressure Reducer
14	V1	Valve

REF. IN FIGURE	DENOMINATION	DESCRIPTION
15	BOTTLE 1-2 VALVE	Valve
16	R1	Pressure Reducer
17	INTERNAL LIGHT	Internal Light Switch
18	STOP	Push-button
19	START	Push-button

CHAPTER 3 - SHEET COLLECTION

VAS103B		W036721				
LIST OF OPERATIONS		**LOP 3.1 - Page 1 of 1**				
Name of Operation	Sheet No.	Ref. to Chap. 3	Ref. to Chap. 4	Ref. to Chap. 5	Ref. to Chap. 6	Ref. to Chap. 8
Vacuum performing on weapon system	OPS 3.1	OPS 3.7				
Low pressure nitrogen filling	OPS 3.2	OPS 3.7				
Filling pressure-meter with oil	OPS 3.3					
Nitrogen bottle charging	OPS 3.4					
Low pressure nitrogen filling using an external bottle	OPS 3.5	OPS 3.2				
Nitrogen bottle charging by the cross-joint between bottle 1 and bottle 2	OPS 3.6	OPS 3.4				
Stowage conditions setting operations	OPS 3.7					

VAS103B		W036721	
OPERATION SHEET		**SHEET OPS 3.1 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Vacuum performing			
Principle and purpose of operation: Vacuum performing on weapon system			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

- All valves and reducers closed.
- VAND system connected to the mains

PROCEDURES (Figure 3.1)

1. Connect the VACUUM N. TEST hose (Figure 1.7, pos.1) to the L.P. CONNECTION on the front panel.
2. Connect the other side of the VACUUM N. TEST hose to the torpedo by means of its proper junction (see Table 1.2).
3. Open VACUUM VALVE (pos. 7).
4. Press the START push-button (pos. 19) on the upper panel.
5. Read the value of the vacuum on the pressure gauge G4 (pos. 4) and wait until it reaches the desired value.
6. Close the VACUUM VALVE and switch off the vacuum pump pressing the STOP push-button (pos. 18).
7. Disconnect the VACUUM N. TEST hose both from VAND system and from weapon system.
8. By performing the operations of sheet OPS 3.7 restore the stowage conditions.

VAS103B		W036721	
OPERATION SHEET		**SHEET OPS 3.2 - Page 1 of 2**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Low pressure nitrogen filling			
Principle and purpose of operation: Preserving torpedo from humidity and de-coupling of torpedo sections			

EQUIPMENT

Description	Reference	NSN

REPLACEMENT PARTS

Description	Reference	NSN

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

- Nitrogen bottles charged at a pressure of 130÷150 bar
- All valves and reducers closed.

PROCEDURES (Figure 3.1)

NOTE

In case the nitrogen filling is performed to preserve the torpedo from humidity, instead of performing step 1and 2, make the vacuum by performing the operations of sheet OPS 3.1 (except for steps 7 and 8).

1. Connect the VACUUM N. TEST hose (Figure 1.7, pos.1) to the L.P. CONNECTION on the front panel.
2. Connect the other side of the VACUUM N. TEST hose to the torpedo by means of its proper junction (Figure 1.7, pos.3) with the proper thread (see Table 1.2).

NOTE

It’s suggested to use one nitrogen bottle only at a time and to change bottle when the last one used gets discharged.

3. Open the bottle’s conservation valve and BOTTLE 1-2 VALVE (pos. 15), or BOTTLE 3-4 VALVE (pos. 12), according to which bottle is used.

OPERATION SHEET (Continues)	SHEET OPS 3.2 - Page 2 of 2

4. Open V1 (pos. 14) and V3 (pos. 5).

NOTE

To OPEN (and adjust) a reducer, rotate the REDUCER knob clockwise; to CLOSE rotate counterclockwise.

5. By means of pressure reducers R1 (pos. 16) and R2 (pos. 13) tune the pressure until G4 (pos. 4) shows the desired value.
6. Open L.P. VALVE (pos. 6).
7. Read the value of the pressure on G4 that should be the desired one.
8. Close L.P. VALVE.
9. Disconnect the VACUUM N. TEST hose both from VAND system and from torpedo.
10. By performing the operations of sheet OPS 3.7 restore the stowage conditions.

VAS103B		W036721	
OPERATION SHEET		**SHEET OPS 3.3 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Filling pressure-meter with oil			
Principle and purpose of operation: Filling pressure-meter with oil			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

All valves and reducers closed.
VAND system connected to the mains
External oil tank half filled with oil

PROCEDURES (Figure 3.1)

1. Connect the BY-PASS SENSOR LUB. Pipe between the L.P. CONNECTION and INLET connection on the front panel. (see Figure 2.1)
2. Close the L.P. VALVE (pos. 6) and Open VACUUM VALVE (pos. 7).
3. Remove the quick joint of the SENSOR LUBRICATING pipe (Figure 1.8) and connect it to torpedo (pressure meter assembly).
4. Connect the external oil tank (Figure 1.11) to the torpedo by means of the above installed quick joint.
5. Connect the SENSOR LUBRICATING pipe between the SENS.LUB connection on the front panel and the upper plug of the external oil tank.
6. Open the input valve and output valve of the external Oil Tank.
7. Press the START push-button (pos. 19) on the upper panel.
8. Read the value of the vacuum on the pressure gauge G4 (pos.4) and wait until it’s about 0,65 bar. The vacuum will be reached when no air bubbles will pass through the oil inside the external tank.
9. Close the VACUUM VALVE (pos.7) and switch off the vacuum pump pressing the STOP push-button (pos. 18).
10. Close the upper valve of the external Oil Tank.
11. Wait about 30 sec the oil exit from the lower valve of the external oil tank and close it.
12. Remove connections anddisconnect external oil Tank from VAND system
13. By performing the operations of sheet OPS 3.7 restore the stowage conditions

VAS103B		W036721	
OPERATION SHEET		**SHEET OPS 3.4 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	

Name of operation: Nitrogen bottle charging

Principle and purpose of operation: Nitrogen bottle charging

EQUIPMENT

Description	Reference	NSN

REPLACEMENT PARTS

Description	Reference	NSN

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN
Nitrogen feeded by an external charging bottle		

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

All valves and reducers closed.

PROCEDURES (Figure 3.1)

1. Connect the AIRFLASK CHARGING hose (Figure 1.10) to the quick air-hose connection on the side panel.
2. Connect the AIRFLASK CHARGING to an appropriate external nitrogen charging bottle.
3. Open BOTTLE 1-2 VALVE (pos. 15) and BOTTLE 3-4 VALVE (pos. 12) in case of bottle 1 or bottle 2 charging.
4. Open bottle's conservation valve.
5. Charging the bottles verify that G1 gauge slowly increases until reaches the external bottle pressure (max 60-80 bar).
6. Close bottle's conservation valve, BOTTLE 1-2 VALVE (pos. 15) and BOTTLE 3-4 VALVE (pos. 12).
7. Repeat steps 3 to 6 according to the number of bottles to be charged.
8. Open V1 valve (pos. 14), RELEASE valve (pos. 9), R1 reducer (pos.16) and R2 reducer (pos.13) to discharge the circuit till G1 indicate 0 bar.

WARNING

Verify that circuit is completely discharged before disconnect hose.

9. Disconnect the AIRFLASK CHARGING hose (Figure 1.10) from the quick air- hose connection on the side panel.

VAS103B		W036721	
OPERATION SHEET		**SHEET OPS 3.5 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Low pressure nitrogen filling using an external bottle			
Principle and purpose of operation: Preserving torpedo from humidity and de-coupling of torpedo sections			

EQUIPMENT

Description	Reference	NSN

REPLACEMENT PARTS

Description	Reference	NSN

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened
All valves and reducers closed.

PROCEDURES (Figure 3.3)

Disconnect the short pipe from the cross-joint between bottle 1 and bottle 2 (pos. 1):

1. Unscrew the nut (pos. 2) by means of a 22 mm open wrench.
2. Make the nut run along the pipe (pos. 3) until the coupling point is uncovered.
3. Remove the pipe.

Connect the AIRFLASK CHARGING hose (Figure 1.9) to the cross-joint:

4. Make sure that no dust or dirt is present at the coupling point with the cross-joint.
5. Apply the sealer on the thread of the cross-joint.
6. Carefully join the hose fitting to the coupling point.
7. Tighten the nut (pos. 1) by means of a 22 mm open wrench.
8. Connect the AIRFLASK CHARGING hose to the external bottle.
9. Perform the Low pressure nitrogen filling according to OPS 3.2

WARNING

Verify that circuit is completely discharged before disconnect hose.

10. Disconnect the AIRFLASK CHARGING hose from the external bottle.

OPERATION SHEET (Continues)	SHEET OPS 3.5- Page 2 of 2

Disconnect the AIRFLASK CHARGING hose from the cross-joint:

11. Unscrew the nut (pos. 1) by means of a 22 mm open wrench.
12. Remove the hose.

Connect the short pipe to the cross-joint between bottle 1 and bottle 2 (pos. 1):

13. Make sure that no dust or dirt is present at the coupling point with the cross-joint (pos. 1).
14. Apply the sealer on the thread of the cross-joint.
15. Carefully join the pipe (pos. 3) to the coupling point.
16. Make the nut (pos. 2) run along the pipe and screw it manually, holding the pipe well coupled.
17. Tighten the nut by means of a 22 mm open wrench.

VAS103B		W036721	
OPERATION SHEET		**SHEET OPS 3.6 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Nitrogen bottle charging by the cross-joint between bottle 1 and bottle2			
Principle and purpose of operation: Nitrogen bottle charging			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened
All valves and reducers closed.

PROCEDURES (Figure 3.3)

Disconnect the short pipe from the cross-joint between bottle 1 and bottle 2 (pos. 1):

1. Unscrew the nut (pos. 2) by means of a 22 mm open wrench.
2. Make the nut run along the pipe (pos. 3) until the coupling point is uncovered.
3. Remove the pipe.

Connect the AIRFLASK CHARGING hose (Figure 1.9) to the cross-joint:

4. Make sure that no dust or dirt is present at the coupling point with the cross-joint.
5. Apply the sealer on the thread of the cross-joint.
6. Carefully join the hose fitting to the coupling point.
7. Tighten the nut (pos. 1) by means of a 22 mm open wrench.
8. Connect the AIRFLASK CHARGING hose to the external bottle.
9. Perform the nitrogen bottles charging according to OPS 3.4

WARNING

Verify that circuit is completely discharged before disconnect hose.

OPERATION SHEET (Continues)	SHEET OPS 3.6- Page 2 of 2

10. Disconnect the AIRFLASK CHARGING hose from the external bottle.

Disconnect the AIRFLASK CHARGING hose from the cross-joint:

11. Unscrew the nut (pos. 1) by means of a 22 mm open wrench.
12. Remove the hose.
13. Disconnect the AIRFLASK CHARGING hose from the external bottle.

Connect the short pipe to the cross-joint between bottle 1 and bottle 2 (pos. 1):

14. Make sure that no dust or dirt is present at the coupling point with the cross-joint (pos. 1).
15. Apply the sealer on the thread of the cross-joint.
16. Carefully join the pipe (pos. 3) to the coupling point.
17. Make the nut (pos. 2) run along the pipe and screw it manually, holding the pipe well coupled.
18. Tighten the nut by means of a 22 mm open wrench.

VAS103B		W036721	
OPERATION SHEET		**SHEET OPS 3.7 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Stowage conditions setting operations			
Principle and purpose of operation: Discharge the equipment			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

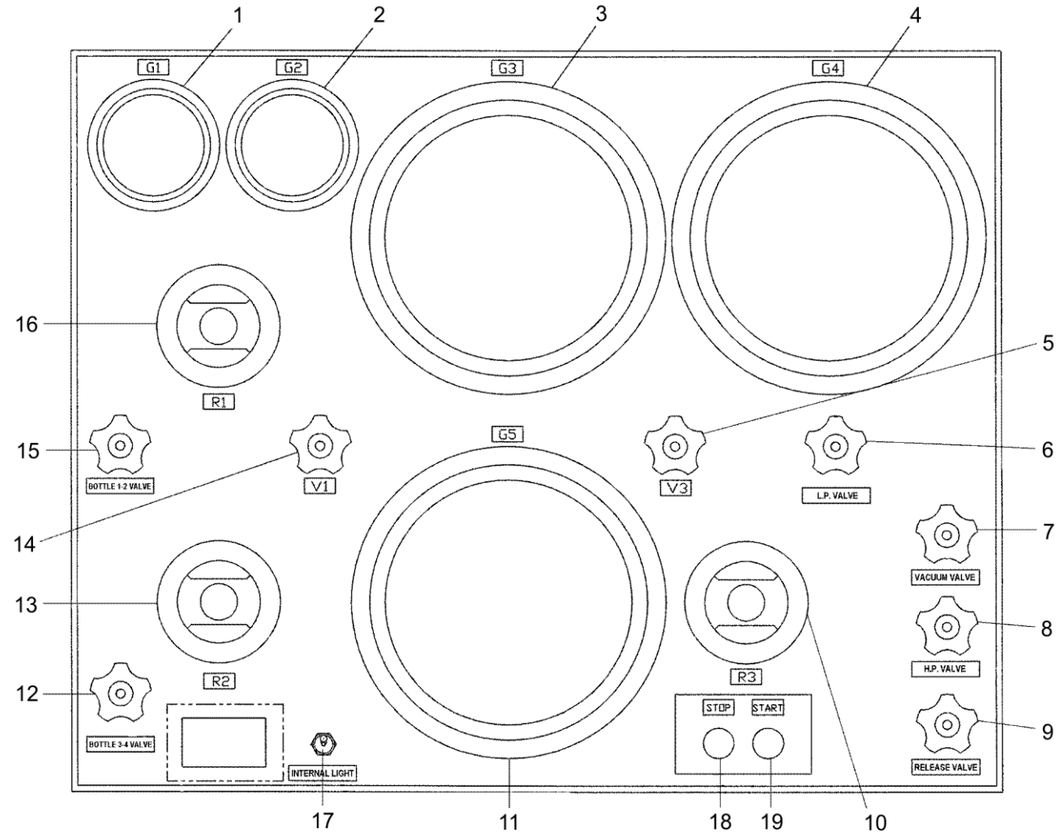
PRELIMINARY ACTIONS

PROCEDURES (Figure 3.1)

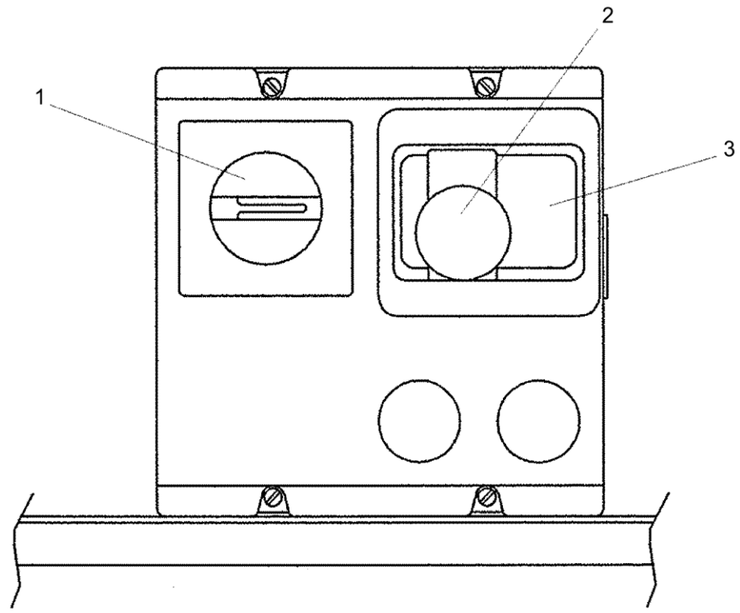
1. Make sure that bottle conservation valves, BOTTLE 1-2 VALVE (pos. 15) and BOTTLE 3-4 VALVE (pos. 12) are closed.
2. Fully open all other valves, with the exception of the RELEASE VALVE (pos. 9).
3. Open RELEASE VALVE gradually to discharge the nitrogen from tubes.
4. Close all valves.
5. Make sure that all the pressure reducers (except R1) are at the lowest distribution pressure. R1 (pos.16) must be set at 50 bars.
6. Make sure that all the nitrogen hoses pipes are bled.

CHAPTER 3 - FIGURES

Ref.	Description
1	Pressure gauge
2	Pressure gauge
3	Pressure gauge
4	Vacuum/Pressure Gauge
5	Manual Stop Valve V3
6	L.P Valve
7	Vacuum Valve
8	H.P Valve
9	Release Valve
10	Pressure Reducer R3
11	Pressure gauge
12	Bottle 3-4 Valve
13	Pressure Reducer R2
14	Manual Stop Valve V1
15	Bottle 1-2 Valve
16	Pressure Reducer R1
17	Internal Light Switch
18	Stop Push-Button
19	Start Push-Button

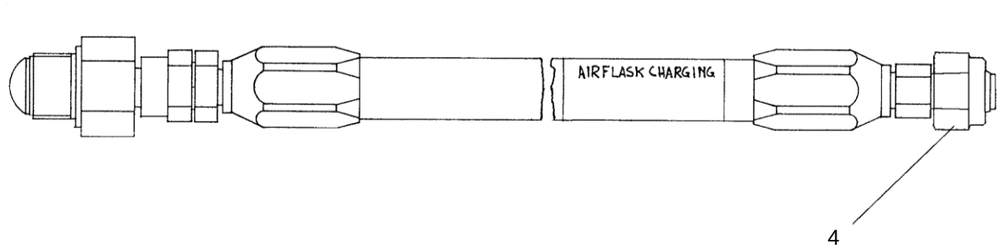


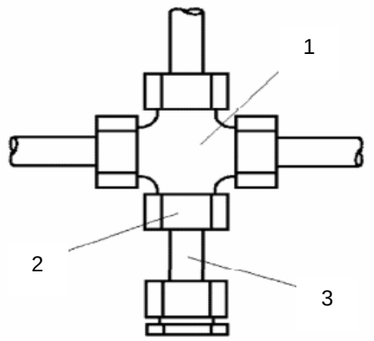
VAS103B	Upper Panel	Figure 3.1

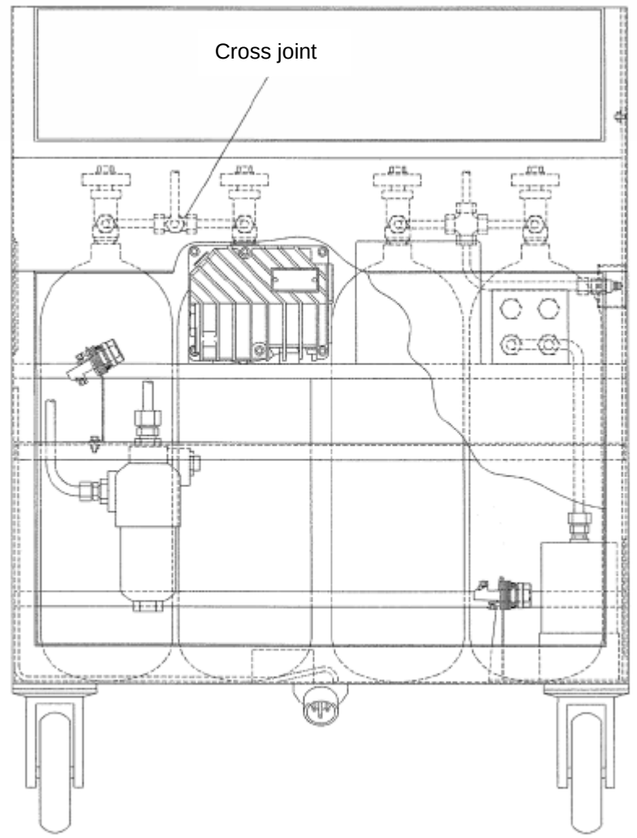


Ref.	Description
1	Position Selector
2	Red Push Button
3	Black Push Button

VAS103B	Motor Starter	Figure 3.2







Ref.	Description
1	Nut
2	Pipe
3	Cross-Joint
4	Nut

VAS103B	Cross-joint	Figure 3.3

CHAPTER 4
PREVENTIVE MAINTENANCE

4.1 Introduction

This chapter provides the instructions necessary to perform the preventive maintenance operations in order to ensure the VAS103B full efficiency.

4.2 Overview

The Preventive Maintenance instructions are grouped in the Preventive Maintenance Sheets (PMS). Each sheet provides all the information required to check, inspect, clean, repair, verify, balance and lubricate the main assembly; the Preventive Maintenance operations are given in the order in which they must be carried out.
If a malfunction or downgrading is detected or a fault is not fully identified or measurements not within tolerance are found, the maintenance procedure establishes that the procedure must be interrupted and indicates the reference to the List of Troubleshooting Operations of Chapter 5

The PMS Sheets are summarised in the List of Preventive Maintenance Operations (LPM).

An explanation of each sheet and of its contents is provided below.

1. List of Preventive Maintenance Operations (LPM)

The list provides a summary of all the Preventive Maintenance Sheets (PMS), divided as follows:

- The first line indicates the name of the assembly on which the preventive maintenance operations are carried out;
- The second line indicates the type of list, its progressive number and its page number;
- From the third line, the list is divided into the following columns:
  - Name of Operation: indicates the name of the preventive maintenance operation to be carried out;
  - Sheet No. indicates the number of the sheet in which the preventive maintenance operations are described;
  - Refer to Chap. 3; indicates the Operation Sheet(s), Chapter 3, cross-referenced by the sheet indicated in the Sheet No. column;
  - Refer to Chap. 4; indicates the Preventive Maintenance Sheet(s), Chapter 4, cross-referenced by the sheet indicated in the Sheet No. column;
  - Refer to Chap. 5; indicates the Troubleshooting Sheet(s), Chapter 5, cross-referenced by the sheet indicated in the Sheet No. column;
  - Refer to Chap. 6; indicates the Corrective Maintenance Sheet(s), Chapter 6, cross-referenced by the sheet indicated in the Sheet No. column;

- Refer to Chap. 8; indicates the PHST Sheet(s), Chapter 8, cross-referenced by the sheet indicated in the Sheet No. column.

2. Preventive Maintenance Sheet (PMS)

This sheet summarises all the information necessary for correctly carrying out the preventive maintenance operations on the assembly; the sheet is divided as follows:

- The first line indicates the name of the assembly to which the preventive maintenance instructions refer;
- The second line indicates the type of sheet, its progressive number and its page number;
- The third line indicates:
  - The number of persons required to carry out the preventive maintenance operations;
  - The qualifications the personnel must possess to carry out the preventive maintenance operations (Mechanical and electrical Technician MT or Electronic Tecnician ET);
  - The duration of the preventive maintenance operations.
- The fourth line indicates the name of the preventive maintenance operation described in the sheet;
- The fifth line indicates the purpose of the preventive maintenance operation described in the sheet;
- The equipment table indicates the maintenance equipment, test equipment, measurement equipment etc. Necessary to carry out the preventive maintenance operation, their type or their reference assigned by the supplier and their nato stock number (if any);
- The replacement parts table indicates the replacement parts required to carry out the preventive maintenance operations, their reference number assigned by the supplier and their nato stock number (if any);
- The products required table indicates the products necessary for cleaning or lubrication, the consumables required to carry out the preventive maintenance operations, their type or their reference assigned by the supplier and their nato stock number (if any);
- The preliminary safety measures box indicates the procedures considered to be dangerous and which are highlighted by the warning or caution caption; the actions to be taken immediately in case of an event that endangers safety must be detailed here as specified below:
  - Symptoms;
  - Immediate action;
  - Probable cause;
  - Possible remedy;
  - Refer to Chap. 1 (indicates the paragraph of Chapter 1 that specifies the secondary actions to be carried out to restore acceptable safety conditions).
- The PRELIMINARY ACTIONS box indicates the measures to be taken before carrying out the preventive maintenance operations such as:
  - Any connections of the assembly to the test or measurement equipment;
  - Position of the assembly;

  - Identification of the elements to check and the indicators;
  - Position of controls.
- The PROCEDURES box indicates the sequence in which the steps must be carried out according to the time frame indicated for the operation; the procedure also provides the following information:
  - The access procedure to the subassemblies and to the basic components;
  - The permanent and periodic checks;
  - The procedure for checking parts downgraded by wear, service life, environmental conditions;
  - The recordings and measurements to be made in the order established and the expected results;
  - The values or the control conditions permitted during the normal use;
  - Other additional data useful for carrying out the procedure.

4.3 Preliminary Measures

For the description of the operator/object interfaces and for the preliminary procedure relative to the indicator and control status, refer to Chapter 3.

CHAPTER 4 - SHEET COLLECTION

VAS103B		W036721				
LIST OF PREVENTIVE MAINTENANCE OPERATIONS		**LPM 4.1 - Page 1 of 1**				
Name of Operation	Sheet No.	Ref. to Chap. 3	Ref. to Chap. 4	Ref. to Chap. 5	Ref. to Chap. 6	Ref. to Chap. 8
General Inspection (6 months)	PMS 4.1				CMS 6.16 CMS 6.13.	
General Cleaning (6 months)	PMS 4.2					
Vacuum Pump Oil Level Check (6 months)	PMS 4.3					
Insulation Check (6 months)	PMS 4.4					
Pressure Gauges and Safety Valve Tests (6 months)	PMS 4.5	OPS 3.4				
High Pressure LeakageTests (6 months)	PMS 4.6					
Vacuum Circuit Test and Loss Test (6 months)	PMS 4.7					
Inner Lamps Test (6 months)	PMS 4.8					
Filter check (6 months)	PMS 4.9				CMS 6.13	
Replacement of Under pressure item and rubber parts (10 years)	PMS 4.10				CMS 6.16	

VAS103B		W036721	
PREVENTIVE MAINTENANCE SHEET		**SHEET PMS 4.1 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: General Inspection (6 months)			
Principle and purpose of operation: Preventive maintenance operations			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

PROCEDURES

1. Check all components integrity.
2. Check absence of dents in the body.
3. Check absence of scratches on painted external sides.
4. Check trolley wheel brakes operation.
5. Check that all external pipes fit in their seats and they do not get separated unless the coupling device is actuated.
6. Check the equipment outside for eventual leaks from oil pump.
7. Check that outside the equipment are present the labels for the following quick air-hose connections:
   - L.P. connection;
   - H.P. connection;
   - Sensor lubricating;
   - Inlet connection.
8. Check for the presence of all labels on the upper panel.
9. Open the rear door.
10. Verify bottle status: integrity, absence of scratches and rust. In case a bottle is wasted replace it by performing CMS 6.16.
11. Check “Filter obstruction indicators” status: if indicators are green filters are OK, in case an indicator is red, change the relative filter according to CMS 6.13.
12. Verify that flexible hoses are not worn-out.
13. Replace flexible hoses got old.

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VAS103B		W036721	
PREVENTIVE MAINTENANCE SHEET		**SHEET PMS 4.2 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: General Cleaning (6 months)			
Principle and purpose of operation: Preventive maintenance operations			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN
Soft Cloth			
PRELIMINARY SAFETY MEASURES Observe standard safety precautions described in Chapter 1.			
PRELIMINARY ACTIONS			
PROCEDURES 1. Clean all the accessible surfaces by using a soft cloth soaked in a mild neutral detergent solution. 2. Rinse and dry the surfaces of the equipment.			

VAS103B		W036721	
PREVENTIVE MAINTENANCE SHEET		**SHEET PMS 4.3 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Vacuum Pump Oil Check (6 months)			
Principle and purpose of operation: Preventive maintenance operations			
EQUIPMENT			
Description		Reference	NSN
Set of allen wrenches			
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN
TELLUS T32 (SHELL) or HAENDEL 32 (Q8) or INVAROL EP46 (ESSO)			

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Equipment connected to the mains
Rear door opened

PROCEDURES(Figure 4.1)

1. Switch on the inner lamps by setting the INTERNAL LIGHT toggle switch (Figure 3.1 pos 17) upwards (ON).
2. Through the special window on the left side panel check the vacuum pump oil level (pos. 2).
3. Refill with oil, if necessary, according to the following procedure:
   - By means of a 10 mm Allen wrench unscrew the oil filling plug (pos. 1);
   - Fill the pump with the oil through the oil topping up hole;
   - By means of a10 mm Allen wrench screw down the filling plug.
4. Switch off the inner lamps by setting the INTERNAL LIGHT switch lever downwards (OFF).

VAS103B		W036721	
PREVENTIVE MAINTENANCE SHEET		**SHEET PMS 4.4 - Page 1 of 1**	
Personnel: 1	Specialisation: ET	Duration:	
Name of operation: Insulation Check (6 months)			
Principle and purpose of operation: Preventive maintenance operations			
EQUIPMENT			
Description		Reference	NSN
Mega-ohmmeter			
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened

PROCEDURES

1. By a 500V mega-ohmmeter, check for an insulation resistance $\geq$ 2 MΩ between motor frame and one of the two phases.

VAS103B		W036721	
PREVENTIVE MAINTENANCE SHEET		**SHEET PMS 4.5 - Page 1 of 4**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Pressure Gauges and Safety Valves Test (6 months)			
Principle and purpose of operation: Check of the equipment functionality			
EQUIPMENT			
Description		Reference	NSN
Standard pressure gauge 0-60 bar 0.5% Standard pressure gauge 0-10 bar 0.5% Standard vacuum pressure gauge -1 to 1.5 bar 0.5%			
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1, HIGH PRESSURE precaution particulary.

PRELIMINARY ACTIONS

Rear door opened
At least one bottle charged at a pressure of 60-80 bar (see OPS 3.4), with its conservation bar opened.
All valves closed and all pressure reducers tuned at their own minimum pressure.

PROCEDURES (Figure 3.1)

G1 pressure meter test

1. Open BOTTLE VALVE 3-4 (pos. 12) or BOTTLE VALVE 1-2 (pos. 15), according to bottles charged.
2. Check that the value measured by G1 (pos.1) is equal to the internal pressure of the bottle previously charged.

G5 pressure meter test

3. Connect the standard pressure gauge (0-10 bar) to H.P. CONNECTION.
4. Open H.P. VALVE
5. Open R1 reducer (pos. 16) until a value of 15-20 bar is read on G2 gauge
6. Open V1 valve (pos.14)
7. Open reducer R2 until a value of 2 bar is read on G5 (pos. 11) pressure gauge.
8. Check that the same pressure is read on the standard pressure gauge and record the eventual error that must be less than 1% F.S.
9. Open reducer R2 until a value of 4 bar is read on G5 and check that the same pressure is read on the standard pressure gauge (the eventual error must be less than 1% F.S. shall be recorded).
10. Open reducer R2 until a value of 6 bar is read on G5 and check that the same pressure is read on the standard pressure gauge (the eventual error must be less than 1% F.S. shall be recorded).
11. Close R2 and open RELEASE VALVE to discharge the circuit.

PREVENTIVE MAINTENANCE SHEET (Continues)	SHEET PMS 4.5 - Page 2 of 4

12. Close RELEASE VALVE and H.P. VALVE.

WARNING

Verify that circuit is completely discharged before disconnect standard pressure gauge.

13. Disconnect standard pressure gauge (0-10 bar) from H.P. CONNECTION

G3 pressure meter and cut-off valve V2 test

14. Connect the standard pressure gauges (0-60 bar) to H.P. CONNECTION.
15. Open H.P. VALVE
16. Open R1 reducer until 50 bar pressure is read on G2.
17. Gradually open R2 reducer and verify that G5 reading stops to increase at 7.5 ±2 bar for V2 cut-off valve action
18. Gradually open R2 until a value of 10 bar is read on G3.
19. Check that the same pressure is read on the standard pressure gauge and record the eventual error
20. Gradually open R2 until a value of 20 bar is read on G3
21. Check that the same pressure is read on the standard pressure gauge and record the eventual error
22. Gradually open R2 until a value of 30 bar is read on G3
23. Check that the same pressure is read on the standard pressure gauge and record the eventual error
24. Gradually open R2 until a value of 40 bar is read on G3
25. Check that the same pressure is read on the standard pressure gauge and record the eventual error
26. Gradually open R2 until a value of 50 bar is read on G3
27. Check that the same pressure is read on the standard pressure gauge and record the eventual error
28. Close BOTTLE VALVE 3-4 (or/and BOTTLE VALVE 1-2 if opened).
29. Open RELEASE VALVE to discharge the circuit.
30. When G1 indicates 0 bar close all reducers and valves.

G2 pressure meter and 57 bar safety valve test.

31. Completely open R2 to read pressure upstream R2.
32. Open BOTTLE VALVE 3-4 (pos. 12) or BOTTLE VALVE 1-2 (pos. 15), according to bottles charged.
33. Gradually open R1 until a value of 10 bar is read on G2.
34. Check that the same pressure is read on the standard pressure gauge and record the eventual error
35. Gradually open R1 until a value of 20 bar is read on G2
36. Check that the same pressure is read on the standard pressure gauge and record the eventual error
37. Gradually open R1 until a value of 30 bar is read on G2
38. Check that the same pressure is read on the standard pressure gauge and record the eventual error
39. Gradually open R1 until a value of 40 bar is read on G2
40. Check that the same pressure is read on the standard pressure gauge and record the eventual error
41. Gradually open R1 until a value of 50 bar is read on G2
42. Gradually open R1 until the “57 bar safety valve” trips.
43. On the standard pressure gauge check that trip value ranges from 55 to 60 bar.

PREVENTIVE MAINTENANCE SHEET (Continues)	SHEET PMS 4.5 - Page 3 of 4

44. Close BOTTLE VALVE 3-4 (or/and BOTTLE VALVE 1-2 if opened).
45. Open RELEASE VALVE to discharge the circuit.
46. Verify that G1 indicates 0 bar and close all reducers and valves

WARNING

Verify that circuit is completely discharged before disconnect standard pressure gauge.

47. Disconnect the standard pressure gauges (0-60 bar) from H.P. CONNECTION.

G4 pressure meter test

48. Connect the standard vacuum gauge (−1÷1.5 bar) to L.P. CONNECTION
49. Open BOTTLE VALVE 3-4 (pos. 12) or BOTTLE VALVE 1-2 (pos. 15), according to bottles charged.
50. Gradually adjust R1 until a value of 15-20 bar is read on G2 (pos. 2).
51. Open V1 valve (pos. 14).
52. Gradually adjust R2 until a value of 3-5 bar is read on G3 (pos. 3).
53. Open V3 (pos. 5) and L.P. VALVE (pos. 6).
54. Gradually open reducer R3 (pos. 10) until a value of 0.2 bar is read on G4.
55. Check that the same pressure is read on the standard pressure gauge and record the eventual error.
56. Gradually open reducer R3 (pos. 10) until a value of 0.4 bar is read on G4.
57. Check that the same pressure is read on the standard pressure gauge and record the eventual error.
58. Gradually open reducer R3 (pos. 10) until a value of 0.6 bar is read on G4.
59. Check that the same pressure is read on the standard pressure gauge and record the eventual error.
60. Gradually open reducer R3 (pos. 10) until a value of 0.8 bar is read on G4.
61. Check that the same pressure is read on the standard pressure gauge and record the eventual error.
62. Close BOTTLE VALVE 3-4 (or/and BOTTLE VALVE 1-2 if opened).
63. Open RELEASE VALVE to discharge the circuit.
64. When manometers indicate 0 bar close all reducers and valves.
65. Open VACUUM valve (pos. 7).
66. Press the START push-button (pos. 19) on the upper panel.
67. Read the value of the vacuum on the pressure gauge G4 (pos. 4)
68. Check that the same pressure is read on the standard pressure gauge and record the eventual error.
69. Before -1 bar pressure is reached close the VACUUM VALVE and switch off the vacuum pump pressing the STOP push-button (pos. 18).
70. Disconnect standard vacuum gauge (−1÷1.5 bar) from L.P. CONNECTION

0.8 bar safety valve test

71. Connect VACUUM N, TEST hose to L.P. CONNECTION.
72. Open BOTTLE VALVE 3-4 (pos. 12) or BOTTLE VALVE 1-2 (pos. 15), according to bottles charged.
73. Gradually adjust R1 until a value of 15-20 bar is read on G2 (pos. 2).
74. Open V1 valve (pos. 14).
75. Open V3 (pos. 5) and L.P. VALVE (pos. 6).

PREVENTIVE MAINTENANCE SHEET (Continues)	SHEET PMS 4.5 - Page 4 of 4

76. Gradually open reducer R2 (pos. 13) until a pressure of 3-5 bar is read on G3 and G5 (G4 should start to increase a bit).
77. Slowly adjust R3 (pos. 10) increasing the pressure read on G4 and check that the safety valve trips (exhausts) with a pressure value of 0.8±0.2 bar (read on G4).
78. Close R2 and open RELEASE valve to discharge the internal pressure.

WARNING

Verify that circuit is completely discharged before disconnect standard pressure gauge.

79. Disconnect VACUUM N. TEST hose from L.P. CONNECTION.
80. Close RELEASE VALVE, V3 valve and R3 reducer

8 bar safety valves and valve V2 test

81. Open reducer R2 reading pressure values on G5 (pos. 11) and G3 (pos. 3) pressure gauges.
82. Open reducer R2 until a pressure of 8 bar is read on G5 and check that the “8 bar safety valve” on G5 trips attaining that value (8±1.5 bar on G3)and that cut-off valve V2 close at 7.5 bar (pos. 10)
83. Open valve V3.
84. Open reducer R2 until a pressure of 8 bar is read and check that the “8 bar safety valve”, located between valve V3 and reducer R3, activates (exhausts).
85. Close BOTTLE VALVE 3-4 (or/and BOTTLE VALVE 1-2 if opened).
86. Open RELEASE VALVE to discharge the circuit.
87. When G1 indicates 0 bar close all reducers and valves.

VAS103B		W036721	
PREVENTIVE MAINTENANCE SHEET		**SHEET PMS 4.6 - Page 1 of 2**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: High Pressure Leakage Tests (6 months)			
Principle and purpose of operation: Check of the equipment functionality			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened
Bottles charged at a pressure of 130÷150 bar.
All valves closed and all pressure reducers tuned at their own minimum pressure.

PROCEDURES (Figure 3.1)

1. Open BOTTLE VALVE 1-2 (pos. 15).
2. Open V1 (pos. 14).
3. Open R1 (pos. 16) and R2 (pos. 13) so that all pressure gauges are under pressure but safety valves don't trip.
4. Close V1.
5. Close BOTTLE VALVE 1-2.
6. Close R1.
7. Record the pressure value indicated by G1 (pos. 1).
8. Record the pressure value indicated by G2 (pos. 2).
9. Record the pressure value indicated by G3 (pos. 3).
10. Record the pressure value indicated by G5 (pos. 11).
11. Stop for 30 $\pm$ 1 min.
12. Check the pressure on G1 (maximum allowable loss 5 bar).
13. Check the pressure on G2 (maximum allowable loss 5 bar).
14. Check the pressure on G3 (maximum allowable loss 2 bar).
15. Check the pressure on G5 (maximum allowable loss 1 bar).

PREVENTIVE MAINTENANCE SHEET (Continues)	SHEET PMS 4.6 - Page 2 of 2

16. Discharge the circuit by opening RELEASE VALVE (pos. 9).
17. Open BOTTLE VALVE 1-2.
18. Record the pressure value on pressure gauge G1.
19. Close BOTTLE VALVE 1-2.
20. Wait for 1 hour and check the pressure on G1 (maximum allowable loss 5 bar).
21. Repeat steps 17 to 20. Losses on G1 are not accepted.
22. Open BOTTLE VALVE 3-4 (pos. 12).
23. Repeat steps 18 to 21 opening BOTTLE VALVE 3-4.
24. Close BOTTLE VALVE 3-4.
25. On completion of test, discharge the circuit by opening valve V1, reducer R1, R2 and RELEASE VALVE.
26. When G1 indicates 0 bar close all reducers and valves.

VAS103B		W036721	
PREVENTIVE MAINTENANCE SHEET		**SHEET PMS 4.7 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Vacuum Test and Loss Test (6 months)			
Principle and purpose of operation: Check of the equipment functionality			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened
L.P. VALVE closed.

PROCEDURES (Figure 3.1)

1. Connect the equipment to the mains by means of power cable (Figure 1.4).
2. Connect the VACUUM N. TEST hose to L.P. CONNECTION.
3. Verify V3 and L.P. valves are closed and Open the VACUUM VALVE (pos.7).
4. Press START push-button (pos. 19) on the control panel for vacuum pump switching on and check for its correct operation for 5 minutes.
5. Switch off, by pressing STOP push-button (pos. 18), and immediately switch on the vacuum pump and check for a value of –0.8 bar at least on pressure gauge G4 (pos. 4).
6. Press STOP push-button to switch off the vacuum pump.
7. Close VACUUM VALVE.
8. Record the depression indicated by G4.
9. Wait for 30 min.
10. Check the depression indicated by G4. A loss of max. 0.01 bar is accepted.
11. Open LOW PRESSURE, V3 and RELEASE valve and verify that G4 shows 0 bar.
12. Remove the VACUUM N. TEST hose.
13. Close all valves
14. Disconnect the equipment from the mains.

VAS103B		W036721	
PREVENTIVE MAINTENANCE SHEET		**SHEET PMS 4.8 - Page 1 of 1**	
Personnel: 1	Specialisation: ET	Duration:	
Name of operation: Inner Lamps Test (6 months)			
Principle and purpose of operation: Check of the equipment functionality			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened

PROCEDURES

1. Connect the equipment to the mains by means of power cable (Figure 1.4).
2. Set INTERNAL LIGHT switch lever (Figure 3.1pos. 17) upwards (ON).
3. Make sure that both lamps light up by looking trough the two windows on the equipment sides.
4. Set INTERNAL LIGHT switch lever downward (OFF).
5. Disconnect the equipment from the mains.

VAS103B		W036721	
PREVENTIVE MAINTENANCE SHEET		**SHEET PMS 4.9 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Filter check (6 months)			
Principle and purpose of operation: Preventive maintenance operations			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

SAFETY PRECAUTIONS MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened

PROCEDURES

1. Check “Obstruction filter indicators”
2. If indicators are green filters are OK
3. If an indicator is red, replacethe relevant filter by performing CMS 6.13.

VAS103B		W036721	
PREVENTIVE MAINTENANCE SHEET		**SHEET PMS 4.10 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Replacement of Under pressure item and rubber parts (10 years)			
Principle and purpose of operation: Preventive maintenance operations			

EQUIPMENT

Description	Reference	NSN

REPLACEMENT PARTS

Description	Reference	NSN
LOW PRESSURE TUBE (By-p sen.lub.) LOW PRESSURE TUBE (Sensor lubric) NITROGEN LOW PRESSURE TUBE (Vac. N.Test) HIGH PRESSURE TUBE (sensor test) BOTTLE CHARGING PIPE (airflask charging) BOTTLE CHARGIG PIPE (airflask charging) SEAL RING T-JOINT (contain a OR5-615 NEOPRENE GASKET)	W003858 WM9863230300 W010832 W010585 W010584 W010837 WM3863230017 W010575	

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN

SAFETY PRECAUTIONS MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened

PROCEDURES

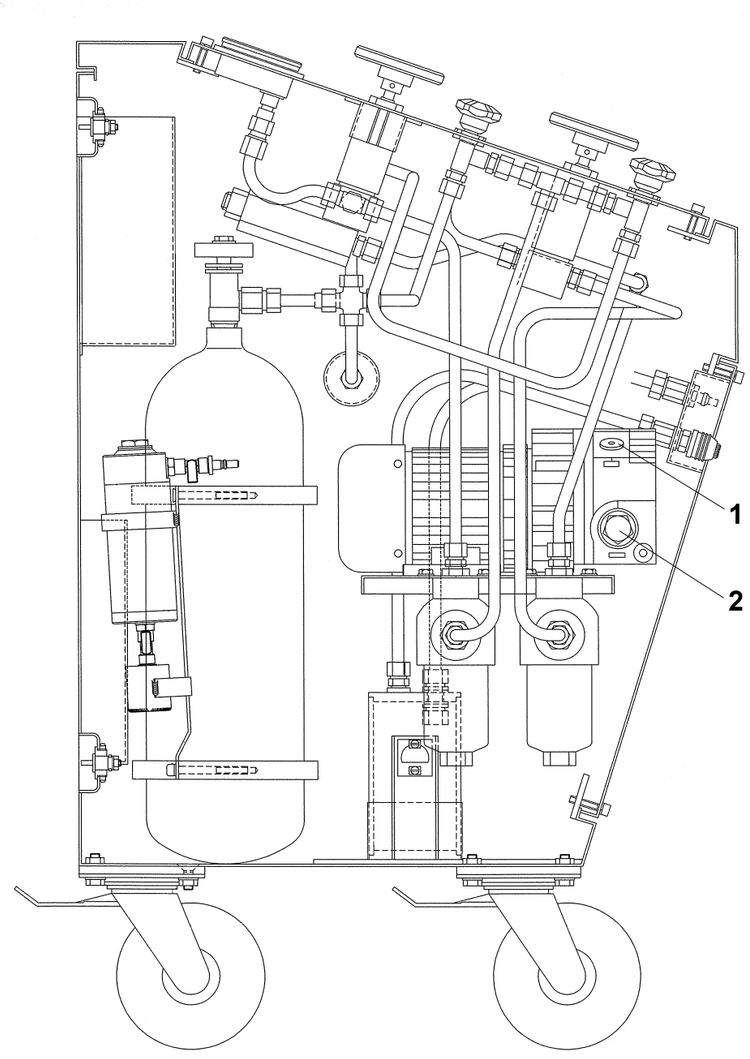
NOTE

Replacement periodicity is ruled by National Laws. For bottles the 10 years time validity starts from the first charge made by LEONARDO during acceptance with sub-supplier.

A lower periodicity has to be observed if foreseen by National Laws.

1. Remove Nitrogen Bottles assy by performing CMS 6.16.
2. Send bottles to a specialized center for revision (to check tight proof).
3. After Bottles has been revisioned set bottles by performing CMS 6.16.
4. Sobstitute T-Joint (no Corrective Maintenance Sheet foreseen for external connection).
5. Sobstitute flexible hoses with their nylon seal rings (no Corrective Maintenance Sheet foreseen for external connection).

CHAPTER 4 - FIGURES



Ref.	Description
1	Oil Filling Plug
2	Vacuum Pump Oil level

VAS103B	Side Section	Figure 4.1

CHAPTER 5
TROUBLESHOOTING

5.1 Introduction

This chapter provides useful information and instructions for correctly carrying out the troubleshooting of the VAND System VAS103B.

5.2 Overview

The troubleshooting operations are grouped in the Troubleshooting Sheets (TSS). Each sheet provides all the information required to locate the component found to be faulty during the preventive maintenance operations. The instructions are provided in the order in which they must be carried out.

The TSS sheets are summarised in the List of Troubleshooting Operations (LTS).

An explanation of each sheet and of its contents is provided below:

1. List of Troubleshooting Operations (LTS)

The list provides a summary of all the Troubleshooting Sheets (TSS), divided as follows:

- The first line indicates the name of the assembly to which the troubleshooting instructions refer;
- The second line indicates the type of list, its progressive number and its page number;
- From the third line, the list is divided into the following columns:
  - Name of Operation: indicates the type of fault dealt in the sheet identified by the sheet No.;
  - Sheet No.: indicates the number of the sheet in which the troubleshooting operations are described;
  - Refer to Chap. 3; indicates the Operation Sheet(s), Chapter 3, cross-referenced by the sheet indicated in the Sheet No. column;
  - Refer to Chap. 4; indicates the Preventive Maintenance Sheet(s), Chapter 4, cross-referenced by the sheet indicated in the Sheet No. column;
  - Refer to Chap. 5; indicates the Troubleshooting Sheet(s), Chapter 5, cross-referenced by the sheet indicated in the Sheet No. column;
  - Refer Chap. 6; indicates the Corrective Maintenance Sheet(s), Chapter 6, cross-referenced by the sheet indicated in the Sheet No. column;
  - Refer Chap. 8; indicates the PHST Sheet(s), Chapter 8, cross-referenced by the sheet indicated in the Sheet No. column.

2. Troubleshooting Sheets (TSS)

This sheet summarises all the information necessary for correctly carrying out the troubleshooting operations on the assembly; the sheet is divided as follows:

- The first line indicates the name of the assembly to which the troubleshooting operations refer;
- The second line indicates the type of sheet, its progressive number and its page number;
- The third line indicates:
  - ・The number of persons required to carry out the troubleshooting operations;
  - ・The qualifications that personnel must possess to carry out the troubleshooting operations (Mechanical and electrical Technician MT or Electronic Tecnician ET);
  - ・The duration of the troubleshooting operations.
- The fourth line indicates the name of the troubleshooting operations described in the sheet;
- The fifth line indicates the purpose of the troubleshooting operations described in the sheet;
- The equipment table indicates the maintenance equipment, test equipment, measurement equipment etc. Necessary to carry out the troubleshooting operations, their type or their reference assigned by the supplier and their nato stock number (if any);
- The replacement parts table indicates the replacement parts required to carry out the troubleshooting operations, their reference number assigned by the supplier and their nato stock number (if any);
- The products required table indicates the products necessary for cleaning or lubrication, the consumables required to carry out the troubleshooting operations, their type or their reference assigned by the supplier and their nato stock number (if any);
- The preliminary safety measures box indicates the procedures considered to be dangerous and which are highlighted by the warning or caution caption; the actions to be taken immediately in case of an event that endangers safety must be detailed here as specified below:
  - ・Symptoms;
  - ・Immediate action;
  - ・Probable cause;
  - ・Possible remedy;
  - ・Refer to Chap. 1 (indicates the paragraph of Chapter 1 that specifies the secondary actions to be carried out to restore acceptable safety conditions);
- The PRELIMINARY ACTIONS box indicates the measures to be taken before carrying out the troubleshooting operations such as:
  - ・Any connections of the assembly to the test or measurement equipment;
  - ・Position of the assembly;
  - ・Identification of the elements to check and the indicators;
  - ・Position of controls.

- The PROCEDURES box indicates the sequence in which the steps must be carried out according to the time frame indicated for the operation; the procedure also provides the following information.
  - The access procedure to the subassemblies and to the basic components;
  - The permanent and periodic checks;
  - The procedure for checking parts downgraded by wear, service life, environmental conditions;
  - The recordings and measurements to be made in the order established and the expected results;
  - The values or the control conditions permitted during the normal use;
  - Other additional data useful for carrying out the procedure.

5.3 Preliminary Measures

The personnel who have to perform the troubleshooting operations must be Mechanics/Electricians with a good knowledge of the equipment.

CHAPTER 5 - SHEET COLLECTION

VAS103B	W036721					
LIST OF TROUBLESHOOTING OPERATIONS	**LTS 5.1 - Page 1 of 1**					
Name of Operation	Sheet No.	Ref. to Chap. 3	Ref. to Chap. 4	Ref. to Chap. 5	Ref. to Chap. 6	Ref. to Chap. 8
G1 pressure gauge doesn't work correctly	TSS 5.1	OPS 3.4	PMS 4.5		CMS 6.1 CMS 6.5	
G2 pressure gauge doesn't work correctly	TSS 5.2	OPS 3.4	PMS 4.5		CMS 6.1 CMS 6.3 CMS 6.5	
G4 pressure gauge does not work correctly	TSS 5.3		PMS 4.5		CMS 6.2 CMS 6.3 CMS 6.5	
Safety valve 0.8 bar does not actuate correctly	TSS 5.4		PMS 4.5		CMS 6.4 CMS 6.5 CMS 6.14	
G5 pressure gauge does not work correctly	TSS 5.5		PMS 4.5		CMS 6.2 CMS 6.6	
Pressure loss exceeds the acceptable value	TSS 5.6		PMS 4.6		CMS 6.1 CMS 6.2 CMS 6.3 CMS 6.4 CMS 6.5 CMS 6.6	
Vacuum pump does not operate correctly	TSS 5.7		PMS 4.7		CMS 6.9 CMS 6.10 CMS 6.11	
Depression loss is higher than the acceptable value	TSS 5.8		PMS 4.7		CMS 6.2	
One or both lamps fail to light up	TSS 5.9		PMS 4.8		CMS 6.7 CMS 6.12	
Vacuum pump does not switch off	TSS 5.10		PMS 4.7		CMS 6.11	
Circuit does not discharge	TSS 5.11				CMS 6.5	
G5 pressure increases over V2 cut-off valve limits	TSS 5.12		PMS 4.5		CMS 6.6	
8 bar safety valve does not actuate correctly	TSS 5.13		PMS 4.5		CMS 6.14	
G3 pressure gauge does not work correctly	TSS 5.14		PMS 4.5		CMS 6.2	
57 bar safety valve does not actuate correctly	TSS 5.15		PMS 4.5		CMS 6.15	
Insulation resistance is < 2 MΩ	TSS 5.16		PMS 4.4		CMS 6.9	
Brakes of one or more wheels are not efficient	TSS 5.17				CMS 6.8	

VAS103B		W036721	
TROUBLESHOOTING SHEET		**SHEET TSS 5.1 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: G1 pressure gauge doesn't work correctly			
Principle and purpose of operation: Fault localisation			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened

PROCEDURES

1. Make sure the bottles are filled with nitrogen.
2. If they are not, by performing the operations of sheet OPS 3.4 fill the bottles.
3. By performing the operations of sheet PMS 4.5 (steps 1-2) check if pressure gauge G1 indicates the correct value.
4. If it doesn't, by performing the operations of sheet CMS 6.1 replace G1.
5. By performing the operations of sheet PMS 4.5 (using once BOTTLE VALVE 1-2 and then BOTTLE VALVE 3-4 steps 1-2) check if pressure gauge G1 indicates the correct value.
6. If it doesn't, by performing the operations of sheet CMS 6.5 replace BOTTLE VALVE 1-2 (or BOTTLE VALVE 3-4).
7. By performing the operations of sheet PMS 4.5 (steps 1-2) check if pressure gauge G1 indicates the correct value.

VAS103B		W036721	
TROUBLESHOOTING SHEET		**SHEET TSS 5.2 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: G2 pressure gauge does not work correctly			
Principle and purpose of operation: Fault localisation			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened
All pressure reducers tuned at their own minimum pressure.

PROCEDURES

1. Make sure the bottles are filled with nitrogen.
2. If they are not, by performing the operations of sheet OPS 3.4 fill at least a bottle.
3. All valves closed except VALVE 1-2 (or VALVE 3-4 according to bottles charged).
4. Fully open R1 reducer.
5. Check that the 57 bar safety bar trips.
6. If it doesn't, or if it trips but G2 does not increase, by performing the operations of sheet CMS 6.1 replace G2 pressure gauge.
7. By performing the operations of sheet PMS 4.5 (steps 31 - 41) check if G2 work correctly
8. If it doesn't, by performing the operations of sheet CMS 6.3 replace R1.
9. By performing the operations of sheet PMS 4.5 (steps 31 - 41) check if G2 work correctly
10. If it doesn't, by performing the operations of sheet CMS 6.5 replace H.P. valve.
11. By performing the operations of sheet PMS 4.5 (steps 31 - 41) check if G2 work correctly.
12. If it doesn't, fully open R1 reducer and check that the 57 bar safety bar trips
13. If it doesn't see TSS 5.15

VAS103B		W036721	
TROUBLESHOOTING SHEET		**SHEET TSS 5.3 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: G4 pressure gauge does not work correctly			
Principle and purpose of operation: Fault localisation			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened

PROCEDURES

1. If G4 pressure gauge doesn't work correctly for positive pressures verify that VALVE 1-2 (or VALVE 3-4 according to bottles charged) is opened.
2. Verify that V1 valve, V3 valve, L.P. valve are opened.
3. Verify that R1 reducer, R2 reducer and R3 reducer are opened according to PMS 4.5 (steps 48 - 64) and check if G4 work correctly.
4. If it doesn't, by performing the operations of sheet CMS 6.2 replace G4.
5. By performing the operations of sheet PMS 4.5 (steps 48 - 64) check if G4 works correctly.
6. If it doesn't, by performing the operations of sheet CMS 6.5 replace V1 valve.
7. By performing the operations of sheet PMS 4.5 (steps 48 - 64) check if G4 works correctly.
8. If it doesn't, by performing the operations of sheet CMS 6.5 replace V3 valve.
9. By performing the operations of sheet PMS 4.5 (steps 48 - 64) check if G4 works correctly.
10. If it doesn't, by performing the operations of sheet CMS 6.5 replace L.P. valve.
11. By performing the operations of sheet PMS 4.5 (steps 48 - 64) check if G4 works correctly.
12. If it doesn't, by performing the operations of sheet CMS 6.3 replace R2 pressure reducer.
13. By performing the operations of sheet PMS 4.5 (steps 48 - 64) check if G4 works correctly.
14. If G4 pressure gauge doesn't work correctly for negative pressures replace VACUUM valve CMS 6.5
15. By performing the operations of sheet PMS 4.5 (steps 65 - 70) check if G4 works correctly.

VAS103B		W036721	
TROUBLESHOOTING SHEET		**SHEET TSS 5.4 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Safety valve 0.8 bar does not actuate correctly			
Principle and purpose of operation: Fault localisation			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened

PROCEDURES

1. By performing the operations of sheet PMS 4.5 (steps 81 - 87) check if 8 bar valve activates at a pressure of 8 bar.
2. If it doesn't, by performing the operations of sheet CMS 6.5, replace V3 valve.
3. By performing the operations of sheet PMS 4.5 (steps 71 - 80) check if 0.8 bar valve operates.
4. If it doesn't, by performing the operations of sheet CMS 6.14, replace 0.8 bar valve.
5. By performing the operations of sheet PMS 4.5 (steps 71 - 80) check if 0.8 bar valve operates.
6. If it doesn't, by performing the operations of sheet CMS 6.4, replace R3 pressure reducer.

VAS103B		W036721	
TROUBLESHOOTING SHEET		**SHEET TSS 5.5 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: G5 pressure gauge does not work correctly			
Principle and purpose of operation: Fault localisation			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened

PROCEDURES

1. Discharge circuit by opening RELEASE VALVE.(if the RELEASE VALVE does not work see TSS 5.11)
2. Check if G5 marks 0 bar.
3. If it doesn't, by performing the operations of sheet CMS 6.2, replace it.
4. By performing the operations of sheet PMS 4.5 (steps 3-11) check if G5 reads the same value of standard pressure gauge.
5. If it doesn't, by performing the operations of sheet CMS 6.6, replace V2 valve.
6. By performing the operations of sheet PMS 4.5 (steps 3-11) check if G5 reads the same value of standard pressure gauge.

VAS103B		W036721	
TROUBLESHOOTING SHEET		**SHEET TSS 5.6 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Pressure loss exceeds the acceptable value			
Principle and purpose of operation: Fault localisation			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN
Foam forming leak tester			

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Open the rear door

PROCEDURES

1. Check leaks on joints by means of “foam forming leak tester”.
2. If leaks are present thighten defective connections, otherwise go to step 5.
3. Verify if leaks are already present on thightened joint by means of “foam forming leak tester”.
4. In case of leak, if the joint has a gasket, replace it.
5. If there are not leaks in the joints check for leaks on pressure gauges by means of “foam forming leak tester”.
6. In case a gauge leaks replace the faulty one by performing the operation of sheet CMS 6.1 (or CMS 6.2), otherwise go to the next step.
7. If there are not leaks on pressure gauges check for leaks on valves and reducers by means of “foam forming leak tester”.
8. In case of presence of leaks on a valves and reducers, by performing the operation of sheet CMS 6.3, CMS 6.4, CMS 6.5 or CMS 6.6 to replace the faulty one.
9. By performing the operations of sheet PMS 4.6 perform the high-pressure loss test.

VAS103B		W036721	
TROUBLESHOOTING SHEET		**SHEET TSS 5.7 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Vacuum pump does not operate correctly			
Principle and purpose of operation: Fault localisation			

EQUIPMENT

Description	Reference	NSN
Voltmeter		

REPLACEMENT PARTS

Description	Reference	NSN

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened

PROCEDURES

1. If the motor doesn't start, check the wiring.
2. In case the motor starts, by performing the operations of sheet CMS 6.9 replace the vacuum pump.
3. If it doesn't, control if the Motor Starter has tripped.
4. If it has, stop and start it again.
5. By performing the operations of sheet CMS 6.11 replace the push-button set.
6. By performing the operations of sheet PMS 4.7 check for correct vacuum pump operation.
7. If the motor doesn't start, by performing the operations of sheet CMS 6.10 replace the Motor Starter.
8. By performing the operations of sheet PMS 4.7 check for correct vacuum pump operation.
9. If the motor doesn't start yet, by performing the operations of sheet CMS 6.9 replace the vacuum pump.
10. By performing the operations of sheet PMS 4.7 check for correct vacuum pump operation.

VAS103B		W036721	
TROUBLESHOOTING SHEET		**SHEET TSS 5.8 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Depression loss is higher than the acceptable value			
Principle and purpose of operation: Fault localisation			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened

PROCEDURES

1. Replace the VACUUM N. TEST hose.
2. By performing the operations of sheet PMS 4.7 check for G4 depression loss.
3. If the depression loss isn't within the limits yet, check the connections among L. P. VALVE, G4 and L.P CONNECTION fitting for leak presence.
4. If leaks on the connections are present, restore defective connections, otherwise by performing the operations of sheet CMS 6.2 replace G4 pressure gauge.
5. By performing the operations of sheet PMS 4.7 check for G4 depression loss.

VAS103B		W036721	
TROUBLESHOOTING SHEET		**SHEET TSS 5.9 - Page 1 of 1**	
Personnel: 1	Specialisation: ET	Duration:	
Name of operation: One or both lamps fail to light up			
Principle and purpose of operation: Fault localisation			
EQUIPMENT			
Description		Reference	NSN
Voltmeter			
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened

PROCEDURES

1. In case only one lamp fails to light up, by performing the operations of sheet CMS 6.12 replace the defective lamp.
2. If both lamps fail to light up, check for 115 Vac presence at terminals of both lamps.
3. If it’s present, by performing the operations of sheet CMS 6.12 replace both lamps, otherwise by performing the operations of sheet CMS 6.7 replace INTERNAL LIGHT switch.
4. By performing the operations of sheet PMS 4.8 perform the inner lamps lighting test.
5. If the test keeps on failing, check the wiring.

VAS103B		W036721	
TROUBLESHOOTING SHEET		**SHEET TSS 5.10 - Page 1 of 1**	
Personnel: 1	Specialisation:	Duration:	
Name of operation: Vacuum pump does not switch off			
Principle and purpose of operation: Fault localisation			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened

PROCEDURES

1. By performing the operations of sheet CMS 6.11 replace push-button STOP.
2. By performing the operations of sheet PMS 4.7 test vacuum pump operation.

VAS103B		W036721	
TROUBLESHOOTING SHEET		**SHEET TSS 5.11 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Circuit does not discharge			
Principle and purpose of operation: Fault localisation			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN
PRELIMINARY SAFETY MEASURES Observe standard safety precautions described in Chapter 1.			
PRELIMINARY ACTIONS Rear door opened			
PROCEDURES 1. By performing the operations of sheet CMS 6.5, replace the RELEASE VALVE.			

VAS103B		W036721	
TROUBLESHOOTING SHEET		**SHEET TSS 5.12 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: G5 pressure increases over V2 cut-off valve limits			
Principle and purpose of operation: Fault localisation			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened

PROCEDURES

1. By performing the operations of sheet CMS 6.6 replace V2.
2. By performing the operations of sheet PMS 4.5 check that G5 doesn't increase over V2 cut-off valve limits.

VAS103B		W036721	
TROUBLESHOOTING SHEET		**SHEET TSS 5.13 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: 8 bar safety valve does not actuate correctly			
Principle and purpose of operation: Fault localisation			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened

PROCEDURES

1. By performing the operations of sheet CMS 6.14 replace 8 bar safety valve between V3 and R3.
2. By performing the operations of sheet PMS 4.5 (steps 81 - 87) check that 8 bar safety valve actuates.

VAS103B		W036721	
TROUBLESHOOTING SHEET		**SHEET TSS 5.14 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: G3 pressure gauge does not work correctly			
Principle and purpose of operation: Fault localisation			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN
PRELIMINARY SAFETY MEASURES Observe standard safety precautions described in Chapter 1.			
PRELIMINARY ACTIONS Rear door opened			
PROCEDURES 1. By performing the operations of sheet CMS 6.2 replace G3. 2. By performing the operations of sheet PMS 4.5 (steps 14 - 30) test G3. 3. If it does not work correctly see TSS 5.5 .			

VAS103B		W036721	
TROUBLESHOOTING SHEET		**SHEET TSS 5.15 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: 57 bar safety valve does not actuate corrrectly			
Principle and purpose of operation: Fault localisation			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened

PROCEDURES

1. By performing the operations of sheet CMS 6.15 replace 57 bar safety valve.
2. By performing the operations of sheet PMS 4.5 check that 57 bar safety valve trips.

VAS103B		W036721	
TROUBLESHOOTING SHEET		**SHEET TSS 5.16 - Page 1 of 1**	
Personnel: 1	Specialisation: ET/MT	Duration:	
Name of operation: Insulation resistance is < 2 MΩ			
Principle and purpose of operation: Fault localisation			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened

PROCEDURES

1. By performing the operations of sheet CMS 6.9 replace vacuum pump.
2. By performing the operations of sheet PMS 4.4 verify that the insulation resistance is ≥ 2MΩ.

VAS103B		W036721	
TROUBLESHOOTING SHEET		**SHEET TSS 5.17 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration: 10 min	
Name of operation: Brakes of one or more wheels are not efficient			
Principle and purpose of operation: Fault localisation			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN
PRELIMINARY SAFETY MEASURES Observe standard safety precautions described in Chapter 1.			
PRELIMINARY ACTIONS			
PROCEDURES 1. By performing the operations of sheet CMS 6.8 replace the wheel support assembly. 2. Verify brake efficiency.			

CHAPTER 6
CORRECTIVE MAINTENANCE

6.1 Introduction

The Corrective Maintenance consists of the operations to be performed to restore the VAS103B functional efficiency if a fault has been detected and the relevant cause has been localised.
The corrective maintenance operations are listed in a general removing/installation sequence, which takes into account the component removing/installation procedures.
The purpose of a maintenance optimisation is to replace an assembly found to be faulty during the Troubleshooting Operations (Chapter 5) or the Preventive Maintenance Operations (Chapter 4).

6.2 Overview

The corrective maintenance instructions are grouped in the Corrective Maintenance Sheet (CMS). Each sheet provides all the information required to check, inspect, clean, repair, verify, balance and lubricate the main assembly; the corrective maintenance operations are given in the order in which they must be carried out.

The CMS sheets are summarised in the List of Corrective Maintenance Operations (LCM).

An explanation of each sheet and of its contents is provided below:

1. List of Corrective Maintenance Operations (LCM)

The list provides a summary of all the Corrective Maintenance Sheets (CMS), divided as follows:

- The first line indicates the name of the main assembly to which the corrective maintenance instructions refer;
- The second line indicates the type of list, its progressive number and its page number;
- From the third line, the list is divided into the following columns:
  - Name of Operation: indicates the name of the operation to be carried out;
  - Sheet No.: indicates the number of the sheet in which the maintenance operations are described;
  - Refer to Chap. 3; indicates the Operation Sheet(s), Chapter 3, cross-referenced by the sheet indicated in the Sheet No. column;
  - Refer to Chap. 4; indicates the Preventive Maintenance Sheet(s), Chapter 4, cross-referenced by the sheet indicated in the Sheet No. column;
  - Refer to Chap. 5; indicates the Troubleshooting Sheet(s), Chapter 5, cross-referenced by the sheet indicated in the Sheet No. column;
  - Refer to Chap. 6; indicates the Corrective Maintenance Sheet(s), Chapter 6, cross-referenced by the sheet indicated in the Sheet No. column;

・Refer to Chap. 8; indicates the PHST Sheet(s), Chapter 8, cross-referenced by the sheet indicated in the Sheet No. column.

2. Corrective Maintenance Sheet (CMS)

This sheet summarises all the information necessary for correctly carrying out the corrective maintenance operations on the assembly; the sheet is divided as follows:

- The first line indicates the name of the assembly to which the corrective maintenance instructions refer;
- The second line indicates the type of sheet, its progressive number and its page number;
- The third line indicates:
  ・The number of persons required to carry out the corrective maintenance operations;
  ・The qualifications that personnel must possess to carry out the corrective maintenance operations (Mecanical and electrical Technician MT or Electronic Tecnician ET);
  ・The duration of the corrective maintenance operations;
- The fourth line indicates the name of the corrective maintenance operation described in the sheet;
- The fifth line indicates the purpose of the corrective maintenance operation described in the sheet;
- The EQUIPMENT table indicates the maintenance equipment, test equipment, measurement equipment etc. Necessary to carry out the corrective maintenance operation, their type or their reference assigned by the supplier and their nato stock number (if any);
- The REPLACEMENT PARTS table indicates the replacement parts required to carry out the corrective maintenance operation, their reference number assigned by the supplier and their nato stock number (if any);
- The PRODUCTS REQUIRED table indicates the products necessary for cleaning or lubrication, the consumables required to carry out the corrective maintenance operations, their type or their reference assigned by the supplier and their nato stock number (if any);
- The PRELIMINARY SAFETY MEASURES box indicates the procedures considered to be dangerous and which are highlighted by the warning or caution caption; the actions to be taken immediately in case of an event that endangers safety must be detailed here as specified below:
  - Symptoms;
  - Immediate action;
  - Probable cause;
  - Possible remedy.
  - Refer to Chap. 1 (indicates the paragraph of Chapter 1 that specifies the secondary actions to be carried out to restore acceptable safety conditions);

- The PRELIMINARY ACTIONS box indicates the measures to be taken before carrying out the corrective maintenance operations such as:
  - Any connections of the assembly to the test or measurement equipment;
  - Position of the assembly;
  - Identification of the elements to check and the indicators;
  - Position of controls.
- The PROCEDURES box indicates the sequence in which the steps must be carried out according to the time frame indicated for the operation; the procedure also provides the following information:
  - The access procedure to the subassemblies and to the basic components;
  - The permanent and periodic checks;
  - The procedure for checking parts downgraded by wear, service life, environmental conditions;
  - The recordings and measurements to be made in the order established and the expected results;
  - The values or the control conditions permitted during the normal use;
  - Other additional data useful for carrying out the procedure.

6.3 Preliminary Measures

For the operator/object interfaces description, as they can appear before the intervention and for the description of the commands and of the signals refer to Chapter 3.

CHAPTER 6 - SHEET COLLECTION

VAS103B		W036721				
LIST OF CORRECTIVE MAINTENANCE OPERATIONS		**LCM 6.1 - Page 1 of 1**				
Description of Operation	Sheet No.	Ref. to Chap. 3	Ref. to Chap. 4	Ref. to Chap. 5	Ref. to Chap. 6	Ref. to Chap. 8
Replacement of Pressure Gauges: G1 and G2	CMS 6.1					
Replacement of Pressure Gauges: G3, G4 and G5	CMS 6.2					
Replacement of Pressure Reducer Valves: R1 and R2	CMS 6.3					
Replacement of Pressure Reducer Valve R3	CMS 6.4					
Replacement of Manual Valves: V1, V3, VACUUM VALVE, BOTTLE VALVE (1-2 and 3-4), RELEASE VALVE, H.P. VALVE and L.P. VALVE	CMS 6.5					
Replacement of of Cut-Off Valve V2	CMS 6.6					
Replacement of INTERNAL LIGHT switch	CMS 6.7					
Replacement of Wheel Support Assembly	CMS 6.8					
Replacement of Vacuum Pump	CMS 6.9				CMS 6.16	
Replacement of Motor Starter	CMS 6.10				CMS 6.16	
Replacement of Push-button Set	CMS 6.11					
Replacement of Lamps	CMS 6.12				CMS 6.16	
Replacement of Nitrogen Filters	CMS 6.13				CMS 6.16	
Replacement of Safety Valves (0.8 bar/ 8 bar)	CMS 6.14					
Replacement of Safety Valve (57 bar)	CMS 6.15					
Replacement of Nitrogen Bottles	CMS 6.16					

VAS103B		W036721	
CORRECTIVE MAINTENANCE SHEET		**SHEET CMS 6.1 - Page 1 of 2**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Replacement of Pressure Gauges: G1 and G2			
Principle and purpose of operation: Corrective maintenance operations on VAS103B			

EQUIPMENT

Description	Reference	NSN
Set of Flat-blade screwdrivers Set of open wrenches		

REPLACEMENT PARTS

Description	Reference	NSN
Pressure Gauge G1 Pressure Gauge G2	N171000600 N171000200	

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN
Sealer Loctite 577 Teflon tape	1N640000011 PTFE tape	

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened.

PROCEDURES (Figure 6.1)

Removal

1. Unscrew the fitting nut (pos. 1) by means of a 22 mm open wrench, holding the fitting fixed part (pos. 2) by means of a 19 mm open wrench.
2. Make the nut run along the pipe (pos. 3) until the coupling point is uncovered.
3. Back off the four screws (pos. 4) fixing the pressure gauge to the upper panel holding the nut below (pos. 5) with a 7 mm open wrench.
4. Draw pressure gauge out from its seat.
5. By means of a 19 mm open wrench, remove the fitting (pos. 2) from the pressure gauge.

Installation

6. By means a 19 mm open wrench install the fitting (pos. 2) with PTFE tape on the pressure gauge, after applying the sealer on the thread of the pressure gauge.
7. Arrange the pressure gauge in its seat.
8. Screw-down the four screws (pos. 4) fixing the pressure gauge to the upper panel holding the nut below (pos. 5) with a 7 mm open wrench.
9. Make sure that no dust or dirt is present at the coupling point with the pipe (pos. 3).
10. Apply the sealer to the thread of the fitting.

CORRECTIVE MAINTENANCE SHEET (Continues)	SHEET CMS 6.1 - Page 2 of 2

11. Carefully join the pipe to the coupling point.
12. Make the fitting nut (pos. 1) run along the pipe and screw it manually, holding the pipe well coupled.
13. Tighten the fitting nut by means of a 22 mm open wrench, holding the fitting fixed part (pos. 2) by means of a 19 mm open wrench.
14. By performing the operations of sheet PMS 4.5 (steps 1-2 or steps 31 - 41) check that replaced gauge works correctly.
15. By performing the operations of sheet TSS 5.6 check leaks presence.
16. In case of leaks presence tighten fittings.
17. Repeat the last three steps until leaks are eliminated.

VAS103B		W036721	
CORRECTIVE MAINTENANCE SHEET		**SHEET CMS 6.2 - Page 1 of 2**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Replacement of Pressure Gauges: G3,G4 and G5			
Principle and purpose of operation: Corrective maintenance operations on VAS103B			

EQUIPMENT

Description	Reference	NSN
Set of Flat-blade screwdrivers Set of open wrenches		

REPLACEMENT PARTS

Description	Reference	NSN
Pressure Gauge G3 Pressure Gauge G4 Pressure Gauge G5	N171000300 N171000400 N171000500	

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN
Sealant Loctite 577 Teflon tape	1N640000011 PTFE tape	

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened.

PROCEDURES (Figure 6.2)

Removal

1. Unscrew the fitting nut (pos. 1) by means of a 24 mm open wrench, holding the fitting fixed part (pos. 2) by means of a 27 mm open wrench.
2. Make the nut run along the pipe (pos. 3) until the coupling point is uncovered.
3. Back off the four screws (pos. 4) fixing the pressure gauge to the upper panel holding the nut below (pos. 5) with a 10 mm open wrench.
4. Draw pressure gauge out from its seat.
5. By means of a 27 mm open wrench remove the fitting (pos. 2) from the pressure gauge.

Installation

6. By means of a 27 mm open wrench install the fitting (pos. 2) with its with PTFE tape on the pressure gauge, after applying the sealer on the thread of the pressure gauge.
7. Arrange the pressure gauge in its seat.
8. Screw-down the four screws (pos. 4) fixing the pressure gauge to the upper panel holding the nut below (pos. 5) with a 10 mm open wrench.
9. Make sure that no dust or dirt is present at the coupling point with the pipe (pos. 3).
10. Apply the sealer to the thread of the fitting.

CORRECTIVE MAINTENANCE SHEET (Continues)	SHEET CMS 6.2 - Page 2 of 2

11. Carefully join the pipe to the coupling point.
12. Make the fitting nut run (pos.1) along the pipe and screw it manually, holding the pipe well coupled.
13. Tighten the fitting nut by means of a 24 mm open wrench, holding the fitting fixed part (pos. 2) by means of a 27 mm open wrench.
14. By performing the operations of sheet PMS 4.5 (steps 3 - 12 or steps 14 - 30 or steps 48 - 70) check that replaced gauge works correctly.
15. By performing the operations of sheet TSS 5.6 check leaks presence.
16. In case of leaks presence tighten fittings.
17. Repeat the last three steps until leaks are eliminated.

VAS103B		W036721	
CORRECTIVE MAINTENANCE SHEET		**SHEET CMS 6.3 - Page 1 of 2**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Replacement of Pressure Reducer Valves: R1 and R2			
Principle and purpose of operation: Corrective maintenance operations on VAS103B			

EQUIPMENT

Description	Reference	NSN
Set of open wrenches Hammer, 250 g Punch Set of Allen wrenches		

REPLACEMENT PARTS

Description	Reference	NSN
Pressure Reducer Valves R1 Pressure Reducer Valves R2 Gasket	W006058 W006057 W003445	

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN
Sealant Loctite 577	1N640000011	

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened.

PROCEDURES (Figure 6.3)

Removal

1. Unscrew the nut (pos. 1) of one of the two fittings by means of a 22 mm open wrench, holding the fitting fixed part (pos. 2) by means of a 19 mm open wrench.
2. Make the nut run along the pipe (pos. 3) until the coupling is uncovered.
3. Repeat steps 1 and 2 to disconnect the other fitting.
4. By means of punch and hammer, carefully remove the pin (pos. 4) locking the handwheel to the shaft and separate the handwheel.
5. Remove the valve fixing collar (pos. 5) by unscrewing the two bolts (pos. 6) by means of a 5 mm Allen wrench.
6. Remove the valve from its seat.
7. By means of a 19 mm open wrench, remove the two fittings (pos. 2) with their gaskets from the valve.

Installation

8. By means of a 19 mm open wrench install the two fittings (pos. 2) with new gaskets on the valve, after applying the sealer on the thread.
9. Arrange the valve in its seat.

CORRECTIVE MAINTENANCE SHEET (Continues)	SHEET CMS 6.3 - Page 2 of 2

10. Apply the fixing collar (pos. 5) to the valve.
11. Tighten the collar fixing bolts by means of a 5 mm Allen wrench (pos. 6).
12. Place the handwheel on the shaft and secure it by the pin (pos. 4).
13. Make sure that no dust or dirt is present at the coupling point of one of the two fittings with the pipe (pos.3).
14. Apply the sealer on the thread of the fitting.
15. Carefully join the pipe to the coupling point.
16. Make the fitting nut (pos. 1) run along the pipe and screw it manually, holding the pipe well coupled.
17. Tighten the fitting nut by means of a 22 mm open wrench, holding the fixed part (pos. 2) by means of a 19 mm open wrench.
18. Repeat steps from 13 to 17 to connect the other fitting.
19. By performing the operations of sheet TSS 5.6 check leaks presence.
20. In case of leaks presence tighten fittings.
21. Repeat the last three steps until leaks are eliminated.

VAS103B		W036721	
CORRECTIVE MAINTENANCE SHEET		**SHEET CMS 6.4 - Page 1 of 2**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Replacement of Pressure Reducer Valve R3			
Principle and purpose of operation: Corrective maintenance operations on VAS103B			

EQUIPMENT

Description	Reference	NSN
Set of open wrenches Set of Allen wrenches Hammer, 250 g Punch Punch		

REPLACEMENT PARTS

Description	Reference	NSN
Pressure Reducer Valves R3 Gasket	W003443 W003446	

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN
Sealant Loctite 577	1N640000011	

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened.

PROCEDURES (Figure 6.4)

Removal

1. Unscrew the nut (pos. 1) of one of the two fittings by means of a 22 mm open wrench, holding the fitting fixed part (pos. 2) by means of a 19 mm open wrench.
2. Make the nut run along the pipe (pos. 3) until the coupling is uncovered.
3. Repeat steps 1 and 2 to disconnect the other fitting at the other side of the joint.
4. By means of punch and hammer, carefully remove the pin (pos. 4) locking the handwheel to the shaft and separate the handwheel.
5. Remove the valve fixing collar (pos. 5) by unscrewing the two bolts (pos. 6) by means of a 5 mm Allen wrench.
6. Remove the valve from its seat.
7. By means of a 19 mm open wrench, remove the two fittings (pos 2) with their gaskets from the valve.

Installation

8. By means of the 19 mm open wrench, install the two fittings (pos 2) with their gaskets on the valve, after applying the sealer on the thread.
9. Arrange the valve in its seat.
10. Apply the fixing collar (pos. 5) to the valve.

CORRECTIVE MAINTENANCE SHEET (Continues)	SHEET CMS 6.4 - Page 2 of 2

11. Tighten the collar fixing bolts (pos. 6) by means of a 5 mm Allen wrench.
12. Place the handwheel on the shaft and secure it by the pin (pos. 4).
13. Make sure that no dust or dirt is present at the coupling point of one of the two fittings with the pipe (pos. 3).
14. Apply the sealer to the thread of the fitting.
15. Carefully join the pipe to the coupling point.
16. Make the fitting nut (pos. 1) run along the pipe and screw it manually, holding the pipe well coupled.
17. Tighten the fitting nut by means of a 22 mm open wrench, holding the fixed part (pos. 2) by means of a 19 mm open wrench.
18. Repeat steps from 13 to 17 to connect the other fitting.
19. By performing the operations of sheet TSS 5.6 check leaks absence.
20. In case of leaks presence tighten fittings.
21. Repeat the last three steps until leaks are eliminated.

VAS103B		W036721	
CORRECTIVE MAINTENANCE SHEET		**SHEET CMS 6.5 - Page 1 of 2**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation:	Replacement of Manual Valves: V1, V3, VACUUM VALVE, BOTTLE VALVE (1-2 and 3-4), RELEASE VALVE, H.P. VALVE and L.P. VALVE		
Principle and purpose of operation:	Restore the functionality of VAS103B		

EQUIPMENT

Description	Reference	NSN
Set of screwdrivers Set of open wrenches Hookwrench with sqared noses DM 34-36		

REPLACEMENT PARTS

Description	Reference	NSN
MANUAL VALVE	N151000400	

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN
Sealant Loctite 577	1N640000011	

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened.

PROCEDURES (Figure 6.5)

Removal

1. Unscrew the nut (pos. 1) of one of the two fittings by means of a 22 mm open wrench, holding the fitting fixed part (pos. 2) by means of a 19 mm open wrench.
2. Make the nut run along the pipe (pos. 3) until the coupling point is uncovered.
3. Repeat steps 1 and 2 to disconnect the other fitting.
4. Back off the screw (pos. 4) locking the knob and separate the knob.
5. By means of the hook wrench (DM 34-36), unscrew the valve fixing ring nut (pos. 5).
6. Draw the valve out from its seat.
7. By means of a 19 mm open wrench, remove the two fittings (pos. 2) with their gaskets from the valve.

Installation

8. By means of a 19 mm open wrench, install the two fittings with the new gaskets on the valve, after applying the sealer on the thread.
9. Arrange the valve in its seat.
10. By means of the hook wrench (DM 34-36), tighten the valve fixing ring nut (pos. 5).

CORRECTIVE MAINTENANCE SHEET (Continues)	SHEET CMS 6.5 - Page 2 of 2

11. Place the knob on valve control shaft and screw down the fixing screw (pos. 4).
12. Make sure that no dust or dirt is present at the coupling point of one of the two fittings with the pipe (pos. 3).
13. Apply the sealer to the thread of the fitting.
14. Carefully join the pipe to the coupling point.
15. Make the fitting nut (pos. 1) run along the pipe and screw it manually, holding the pipe well coupled.
16. Tighten the fitting nut by means of a 22 mm open wrench, holding the fitting fixed part (pos. 2) by means of a 19 mm open wrench.
17. Repeat steps from 12 to 16 to connect the other fitting.
18. By performing the operations of sheet TSS 5.6 check leaks absence.
19. In case of leaks presence tighten fittings.
20. Repeat the last three steps until leaks are eliminated.

VAS103B		W036721	
CORRECTIVE MAINTENANCE SHEET		**SHEET CMS 6.6 - Page 1 of 2**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Replacement of Cut-Off Valve V2			
Principle and purpose of operation: Restore the functionality of VAS103B			

EQUIPMENT

Description	Reference	NSN
Set of open wrenches Set of Screwdrivers		

REPLACEMENT PARTS

Description	Reference	NSN
Cut-off Valve V2 Gasket	N151002200 W003446	

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN
Sealant Loctite 577	1N640000011	

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened.

PROCEDURES (Figure 6.6)

Removal

1. Unscrew the bottom fitting nut (pos. 1) by means of a 22 mm open wrench, holding the fixed part (pos. 2) by means of a 27 mm open wrench.
2. Make the run along the pipe (pos. 3) until the coupling point is uncovered.
3. Unscrew the side fitting nut (pos. 4) by means of a 22 mm open wrench, holding the fitting fixed part (pos.5) by means of a 22 mm open wrench.
4. Withdraw the valve.
5. By means of a 22 mm open wrench, remove the side fitting (pos. 5) with its gasket from the valve.
6. By means of a 27 mm open wrench, remove the bottom fitting (pos. 2) with its gasket from the valve.

Installation

7. By means of a 27 mm open wrench, install the bottom fitting (pos. 2) with new gasket on the valve, after applying the sealer on the thread.
8. By means of a 22 mm open wrench, install the side fitting (pos. 5) with new gasket on the valve, after applying the sealer on the thread
9. Make sure that no dust or dirt is present at the coupling point of the valve with the T joint (pos. 6).
10. Make sure that no dust or dirt is present at the coupling point of the valve with the pipe (pos. 3).
11. Apply the sealer on the thread of the two fittings.

CORRECTIVE MAINTENANCE SHEET (Continues)	SHEET CMS 6.6 - Page 2 of 2

12. Arrange the valve in its seat and carefully join the T-joint to the coupling point with the fitting screwing nut (pos.4) manually
13. Carefully join the pipe (pos. 3) to the coupling point.
14. Make the nut (pos. 1) run along the pipe (pos. 3) and screw it manually, holding the pipe well coupled
15. Tighten the side fitting nut (pos. 4) by means of a 22 mm open wrench, holding the fitting fixed part (pos. 5) by means of a 22 mm open wrench.
16. Tighten the bottom fitting nut (pos. 1) by means of a 22 mm open wrench, holding the fitting fixed part (pos. 2) by means of a 27 mm open wrench.
17. By performing the operations of sheet TSS 5.6 check leaks absence.
18. In case of leaks presence tighten fittings.
19. Repeat the last three steps until leaks are eliminated.

VAS103B		W036721	
CORRECTIVE MAINTENANCE SHEET		**SHEET CMS 6.7 - Page 1 of 1**	
Personnel: 1	Specialisation: ET	Duration:	
Name of operation: Replacement of INTERNAL LIGHT Switch			
Principle and purpose of operation: Restore the functionality of VAS103B			
EQUIPMENT			
Description		Reference	NSN
Phillips screwdriver Set of open wrenches			
REPLACEMENT PARTS			
Description		Reference	NSN
Internal Light Switch		N221004600	
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN
PRELIMINARY SAFETY MEASURES Observe standard safety precautions described in Chapter 1.			
PRELIMINARY ACTIONS Rear door opened.			

PROCEDURES (Figure 6.7)

Removal

1. By means of a 15 mm open wrench, unscrew the fixing nut (pos. 1).
2. Remove the switch from its seat inside the equipment.
3. Disconnect the electric wires by using the cross screwdriver to unloose the clamping screws (pos. 2).

Installation

4. Restore the electric connection by tightening the clamping screws (pos. 2).
5. Arrange the switch in its seat.
6. By means of a 15 mm open wrench, tighten the fixing nut (pos. 1).

VAS103B		W036721	
CORRECTIVE MAINTENANCE SHEET		**SHEET CMS 6.8 - Page 1 of 1**	
Personnel: 2	Specialisation: MT	Duration:	
Name of operation: Replacement of Wheel Support Assembly			
Principle and purpose of operation: Restore the functionality of VAS103B			

EQUIPMENT

Description	Reference	NSN
Set of open wrenches		

REPLACEMENT PARTS

Description	Reference	NSN
Wheel Support Assembly	N100002600	

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

PROCEDURES (Figure 6.8)

Removal

1. Brake the equipment by engaging the wheel brakes not to be replaced.
2. Lightly lift the equipment on the side of wheel to be replaced.
3. Back off the bolts (pos. 1) with their nuts (pos. 2) fixing the concerned wheel support assembly using two 17mm wrenches.
4. Remove the wheel support assembly.

Installation

5. Position the wheel support assembly
6. By means of a 17 mm wrenches, screw down the fixing bolts (pos. 1) with their nuts (pos. 2).
7. Disengage the wheel brakes.

VAS103B		W036721	
CORRECTIVE MAINTENANCE SHEET		**SHEET CMS 6.9 - Page 1 of 2**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Replacement of Vacuum Pump			
Principle and purpose of operation: Restore the functionality of VAS103B			

EQUIPMENT

Description	Reference	NSN
Set of open wrenches		

REPLACEMENT PARTS

Description	Reference	NSN
Vacuum Pump	1N494300001	

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN
Sealant Loctite 577	1N640000011	

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened.

PROCEDURES (Figure 6.9)

Removal

1. By performing the operations of sheet CMS 6.16 remove the bottles.
2. Remove the electrical connection (pos. 1).
3. Unscrew the fitting nut (pos. 2) by means of a 22 mm open wrench.
4. Make the nut run along the pipe until the coupling point is uncovered.
5. Unscrew the 4 screws (pos.3) together with their nuts, situated on the sides, by using a 16 mm open wrench.
6. Draw vacuum pump out from its seat.

Installation

7. Verify that fittings are not damaged (no scratch or dent).
8. Arrange the vacuum pump in its seat.
9. Screw-down the 4 screws (pos.3) together with their nuts, by using a 16 mm open wrench.
10. Make sure that no dust or dirt is present at the coupling point with the pipe.
11. Apply the sealer on the thread of the fitting.
12. Carefully join the pipe to the coupling point.
13. Make the fitting nut (pos. 2) run along the pipe and screw it manually, holding the pipe well coupled.
14. Tighten the fitting nut by means of a 22 mm open wrench.
15. Restore the electrical connection (pos. 1).

CORRECTIVE MAINTENANCE SHEET (Continues)	SHEET CMS 6.9 - Page 2 of 2

16. By performing the operations of sheet CMS 6.16 install the bottles.
17. By performing the operations of sheet TSS 5.6 check leaks absence.
18. In case of leaks presence tighten fittings.
19. Repeat the last three steps until leaks are eliminated.

VAS103B		W036721	
CORRECTIVE MAINTENANCE SHEET		**SHEET CMS 6.10 - Page 1 of 1**	
Personnel: 1	Specialisation: ET	Duration:	
Name of operation: Replacement of Motor Starter			
Principle and purpose of operation: Restore the functionality of VAS103B			

EQUIPMENT

Description	Reference	NSN
Set of screwdrivers		

REPLACEMENT PARTS

Description	Reference	NSN
Motor Starter	1N453000033	

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened.

PROCEDURES (Figure 6.9)

Removal

1. By performing the operations of sheet CMS 6.16 remove the necessary number of bottles for the access to the Motor Starter.
2. By means of the screwdriver, back off the screws (pos. 4) securing the Motor Starter.
3. Remove the cover (pos. 5).
4. Tag conductors and disconnect them unloosing the clamping screws.
5. Remove the Motor Starter.

Installation

6. Arrange the Motor Starter in its place.
7. Restore the electrical connections by tightening the clamping screws.
8. Place the cover (pos. 5).
9. Screw down the fixing screws (pos. 4).
10. By performing the operations of sheet CMS 6.16 install the bottles previously removed.

VAS103B		W036721	
CORRECTIVE MAINTENANCE SHEET		**SHEET CMS 6.11 - Page 1 of 1**	
Personnel: 1	Specialisation: ET	Duration:	
Name of operation: Replacement of Push-button Set			
Principle and purpose of operation: Restore the functionality of VAS103B			

EQUIPMENT

Description	Reference	NSN
Set of Screwdrivers		

REPLACEMENT PARTS

Description	Reference	NSN
Push Button Set	N221005000	

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

PROCEDURES (Figure 6.10)

Removal

1. By means of a screwdriver, back off the fixing screws (pos. 1).
2. Withdraw the push-button set (pos. 2) from its seat.
3. Tag conductors and disconnect them from push-button clamps by loosening the terminal screws.

Installation

4. Restore the electrical connections by tightening the terminal screws.
5. Place the push-button set (pos. 2) in its seat.
6. Screw down the fixing screws (pos. 1).

VAS103B		W036721	
CORRECTIVE MAINTENANCE SHEET		**SHEET CMS 6.12 - Page 1 of 1**	
Personnel: 1	Specialisation: ET	Duration:	
Name of operation: Replacement of Lamps			
Principle and purpose of operation: Restore the functionality of VAS103B			

EQUIPMENT

Description	Reference	NSN
Set of Screwdrivers		

REPLACEMENT PARTS

Description	Reference	NSN
Lamp	1N453000030	

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened.

PROCEDURES (Figure 6.11)

Removal

1. In case the lamp is the one positioned near the Oil Carter Assembly, by performing the operations of sheet CMS 6.16 remove the necessary number of bottles.
2. Manually remove the lamp holder transparent cap (pos. 1).
3. Unscrew the bulb and take it away.

Installation

4. Screw down the bulb on the lamp holder.
5. Manually place the transparent cap (pos. 1) on the lamp holder.
6. By performing the operations of sheet CMS 6.16 install the bottles previously removed.

VAS103B		W036721	
CORRECTIVE MAINTENANCE SHEET		**SHEET CMS 6.13 - Page 1 of 2**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Replacement of Nitrogen Filters			
Principle and purpose of operation: Restore the functionality of VAS103B			

EQUIPMENT

Description	Reference	NSN
Set of open wrenches Set of Allen wrenches		

REPLACEMENT PARTS

Description	Reference	NSN
Nitrogen Filter 25µ Nitrogen Filter 5µ	N157000200 N157000100	

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN
Sealant Loctite 577	1N640000011	

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened.

PROCEDURES (Figure 6.8)

Removal

1. By performing the operations of sheet CMS 6.16 remove the necessary number of bottles.
2. Unscrew the nut (pos. 3) of one of the two fittings by means of a 22 mm open wrench, holding the fitting fixed part (pos. 4) by means of a 19 mm open wrench.
3. Make the nut run along the pipe (pos. 5) until the coupling is uncovered.
4. Repeat steps 1 and 3 to disconnect the other fitting of the filter.
5. Back off the fixing bolts (pos. 6) by means of an 8 mm Allen wrench.
6. Remove the filters.
7. By means of a 19 mm open wrench, remove the two fittings from the filter.

Installation

8. Verify that fittings are not damaged (no scratch or dent).
9. By means of a 19 mm open wrench, install the two fittings (pos 4) on the filter, after applying the sealer on the thread.
10. Position the filter.
11. Screw down the fixing bolts (pos. 6) by means of an 8 mm Allen wrench.
12. Make sure that no dust or dirt is present at the coupling point with the pipe (pos. 5).
13. Apply the sealer to the thread of the fitting.

CORRECTIVE MAINTENANCE SHEET (Continues)	SHEET CMS 6.13 - Page 2 of 2

14. Carefully join the pipe to the coupling point.
15. Make the fitting nut (pos. 3) run along the pipe and screw it manually, holding the pipe well coupled.
16. Tighten the fitting nut by means of a 22 mm open wrench, holding the fitting fixed part (pos. 4) by means of a 19 mm open wrench.
17. Repeat steps from 12 to 16 to connect the other fitting.
18. By performing the operations of sheet CMS 6.16 install the bottles previously removed.
19. By performing the operations of sheet TSS 5.6 check leaks absence.
20. In case of leaks presence tighten fittings.
21. Repeat the last three steps until leaks are eliminated.

VAS103B		W036721	
CORRECTIVE MAINTENANCE SHEET		**SHEET CMS 6.14 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Replacement of Safety Valves (0.8 bar / 8 bar)			
Principle and purpose of operation: Restore the functionality of VAS103B			

EQUIPMENT

Description	Reference	NSN
Set of open wrenches		

REPLACEMENT PARTS

Description	Reference	NSN
0.8 bar Safety Valve 8 bar Safety Valve	1N151500006 N151001600	

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN
Sealant Loctite 577	1N640000011	

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened.

PROCEDURES (Figure 6.12)

Removal

1. Unscrew the safety valve (pos. 1 or pos. 3) from the union by means of a 20 mm open wrench, holding the fitting nut (pos. 2) by means of a 24 mm open wrench.

> **NOTE**
>
> Make always use of a wrench to hold the union while unscrewing the safety valve to prevent the pipe connected to the union from being damaged.

Installation

2. Verify that fittings are not damaged (no scratch or dent).
3. Apply the sealer on the thread of the valve.
4. Screw down the safety valve (pos. 1 or pos. 3) to the union by means of a 20 mm open wrench, holding the fitting nut (pos. 2) with a 24 mm open wrench (see previous note).

VAS103B		W036721	
CORRECTIVE MAINTENANCE SHEET		**SHEET CMS 6.15 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Replacement of Safety Valve (57 bar)			
Principle and purpose of operation: Restore the functionality of VAS103B			

EQUIPMENT

Description	Reference	NSN
Set of open wrenches		

REPLACEMENT PARTS

Description	Reference	NSN
57 bar Safety Valve	1N151500005	

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN
Sealant Loctite 577	1N640000011	

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened.

PROCEDURES (Figure 6.13)

Removal

1. Unscrew the safety valve (pos. 1) from the union by means of a 27 mm open wrench, holding the union nut (pos. 2) with a 22 mm open wrench.

> **NOTE**
>
> Make always use of a wrench to hold the union while unscrewing the safety valve to prevent the pipe connected to the union from being damaged.

Installation

2. Verify that fittings are not damaged (no scratch or dent).
3. Apply the sealer on the thread of the valve.
4. Screw down the safety valve (pos. 1) to the union by means of a 27 mm open wrench, holding the union nut (pos. 2) with a 22 mm open wrench (see previous note).

VAS103B		W036721	
CORRECTIVE MAINTENANCE SHEET		**SHEET CMS 6.16 - Page 1 of 2**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Replacement of Nitrogen Bottles			
Principle and purpose of operation: Restore the functionality of VAS103B			

EQUIPMENT

Description	Reference	NSN
Set of open wrenches Set of Allen wrenches		

REPLACEMENT PARTS

Description	Reference	NSN
Nitrogen Bottle Assy Gasket	W011016 W003445	

PRODUCTS REQUIRED (cleaning, lubrication, consumer)

Description	Reference	NSN
Sealant Loctite 577	1N640000011	

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened.

PROCEDURES (Figure 6.8)

NOTE

When the bottles are removed, not for substitution of a faulty one, but just for having the access to the inner components of the equipment, the bottle's fitting has not to be removed.

Removal

1. Take the oil tank (pos. 7) away from its support.
2. Make sure that the bottle conservation valve (pos. 8) is fully closed.
3. By means of a 8 mm Allen wrench, unscrew the bolts (pos. 12) fixing the bottle security saddles (pos. 13) and the oil tank support (pos. 14).
4. Remove the oil tank support and the saddles.
5. Unscrew the fitting nut (pos. 9) by means of a 22 mm open wrench, holding the fitting fixed part (pos. 10) by means of a 24 mm open wrench.
6. Make the nut run along the pipe (pos. 11) until the coupling point is uncovered.
7. Take the bottle away.

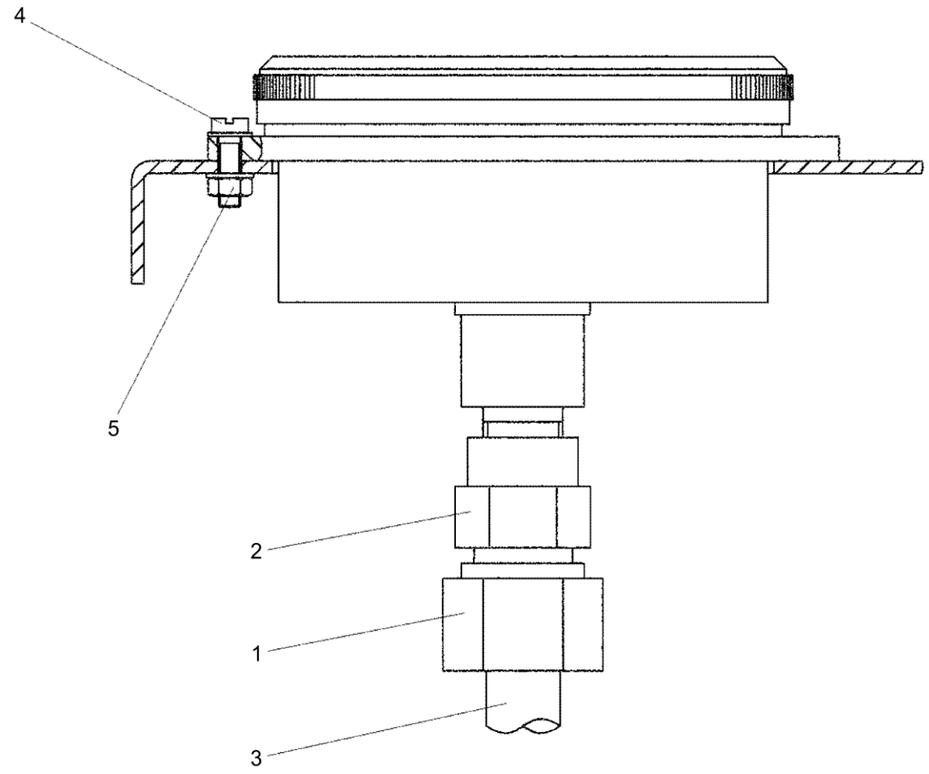
CORRECTIVE MAINTENANCE SHEET (Continues)	SHEET CMS 6.16- Page 2 of 2

8. By means of a 24 mm open wrench, remove the fitting with its gasket from the bottle.
9. Repeat steps 5 to 8 according to the number of bottles to be removed.

Installation

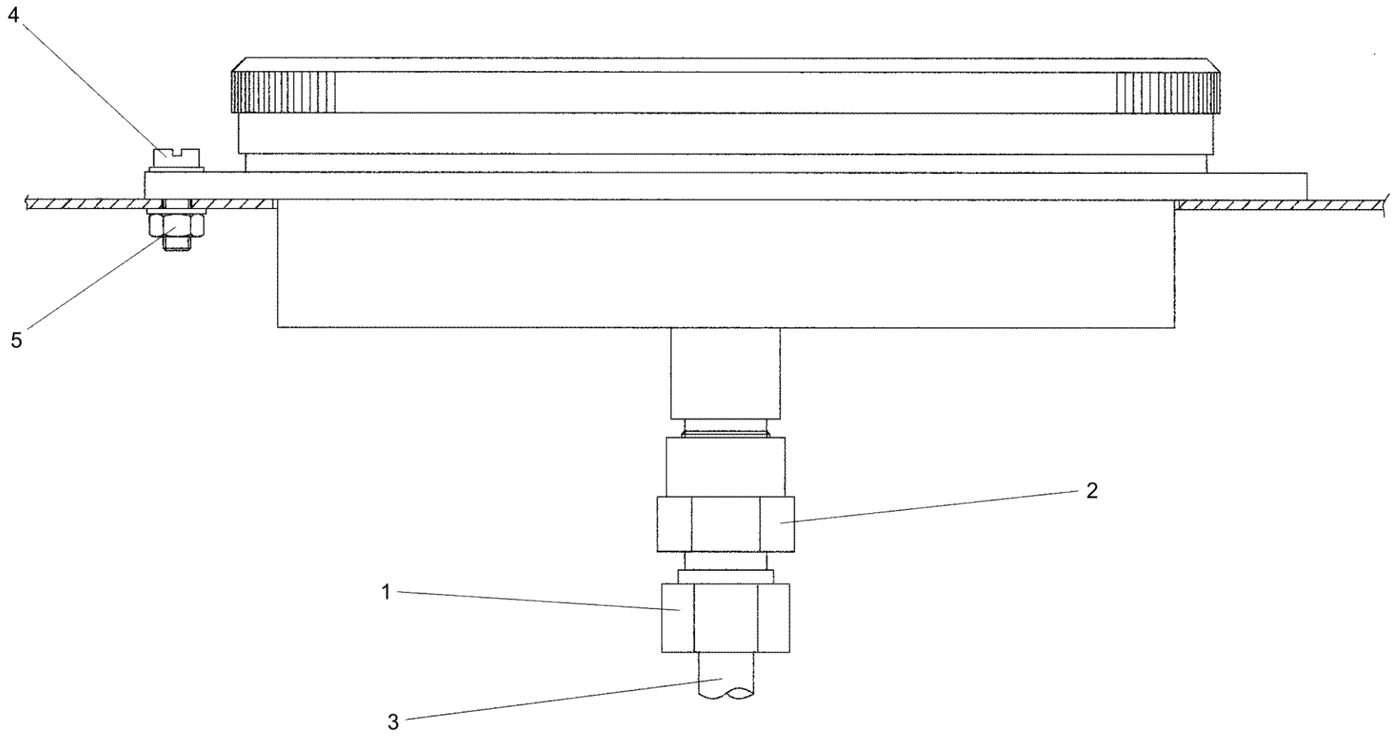
10. By means of a 24 mm open wrench install the fitting with new gasket on the bottle, after applying the sealer on the thread of the bottle's conservation valve.
11. Arrange the bottle in the housing recess.
12. Make sure that no dust or dirt is present at the coupling point with the pipe (pos. 11).
13. Apply the sealer on the thread of the fitting.
14. Carefully join the pipe to the coupling point.
15. Make the fitting nut (pos. 9) run along the pipe and screw it manually, holding the pipe well coupled.
16. Tighten the fitting nut by means of a 22 mm open wrench, holding the fitting fixed part (pos. 10) by means of a 24 mm open wrench.
17. Repeat steps 10 to 16 according to the number of bottles to be installed.
18. Position the security saddles (pos. 13) and the oil tank support (pos. 14).
19. By means of a 8 mm Allen wrench, screw down the saddle fixing bolts (pos. 12).
20. Put the oil tank (pos. 7) in its support.
21. By performing the operations of sheet TSS 5.6 check leaks absence.
22. In case of leaks presence tighten fittings.
23. Repeat the last three steps until leaks are eliminated.

CHAPTER 6 - FIGURES



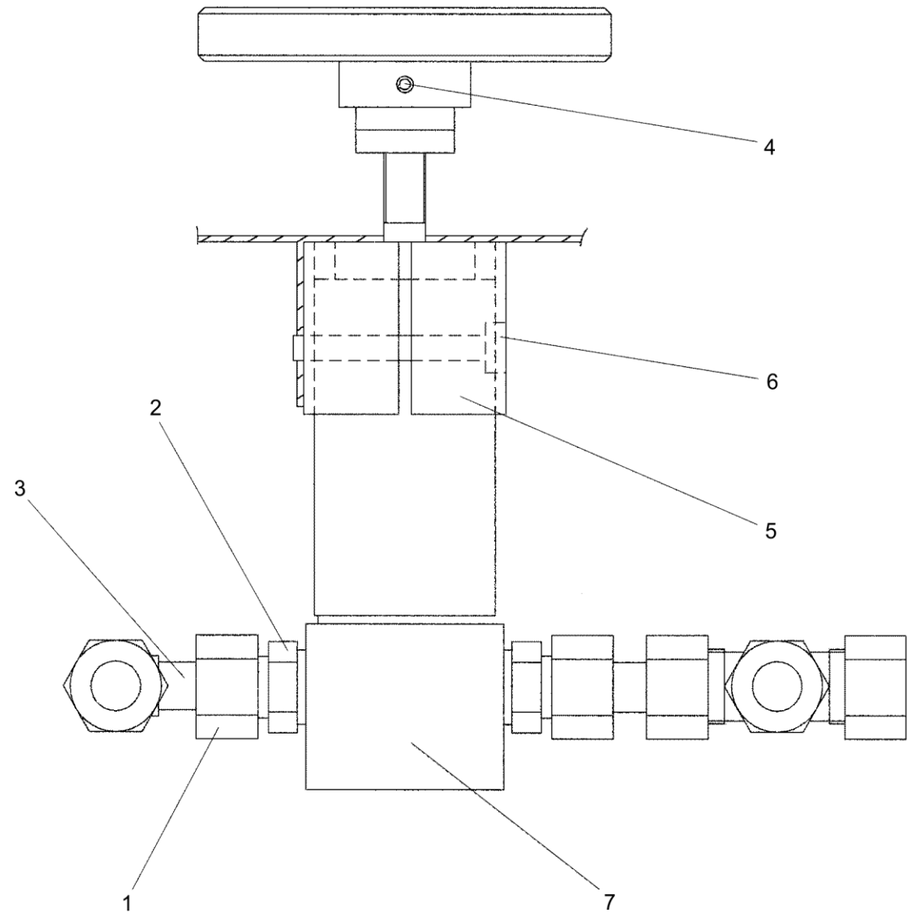
Ref.	Description
1	Fitting Nut
2	Fitting Fixed Part
3	Pipe
4	Screws
5	Nut

VAS103B	Pressure Gauge (G1/G2)	Figure 6.1



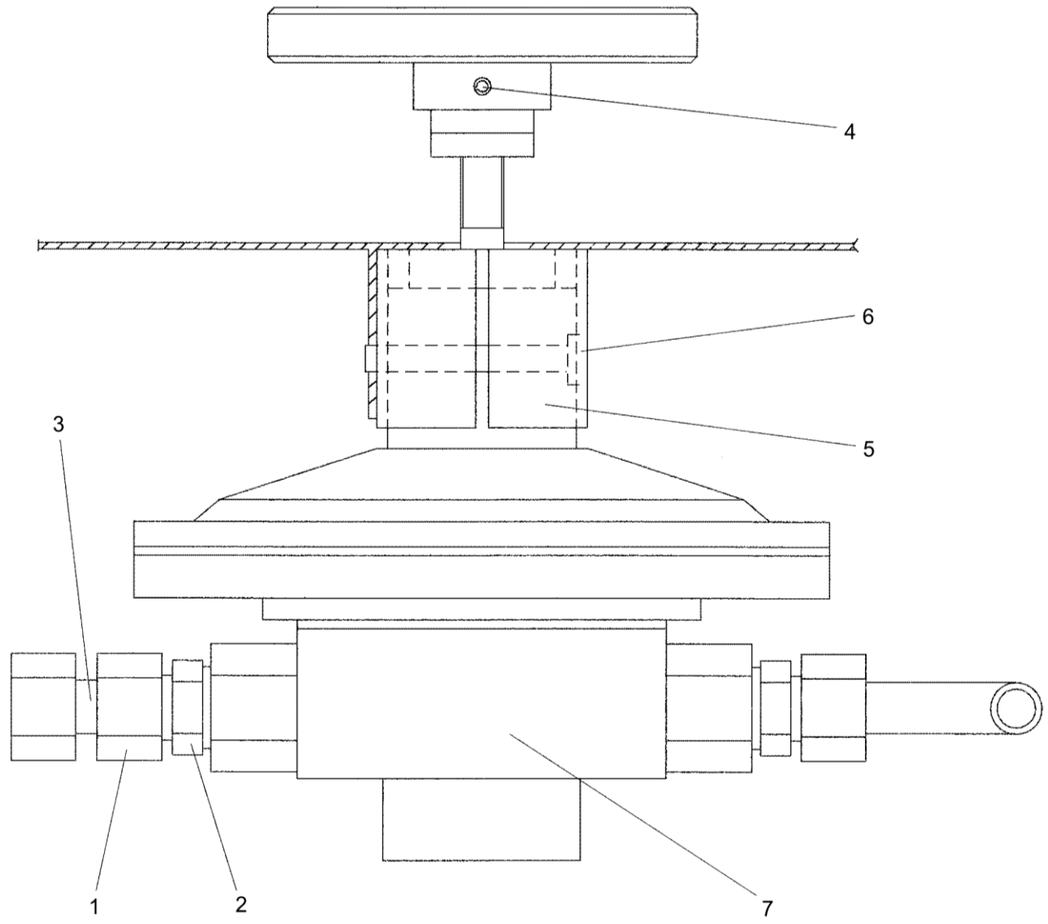
Ref.	Description
1	Fitting Nut
2	Fitting Fixed Part
3	Pipe
4	Screws
5	Nut

VAS103B	Pressure Gauge (G3/G4/G5)	Figure 6.2



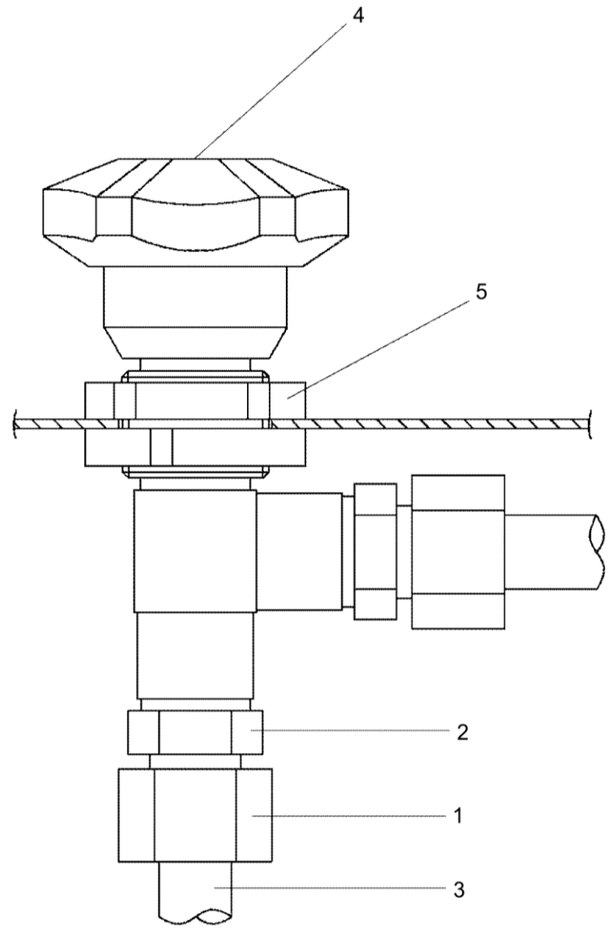
Ref.	Description
1	Nut
2	Fitting Fixed Part
3	Pipe
4	Pin
5	Valve Fixing Collar
6	Collar Fixing Bolts
7	Joint

VAS103B	Pressure Reducer (R1/R2)	Figure 6.3



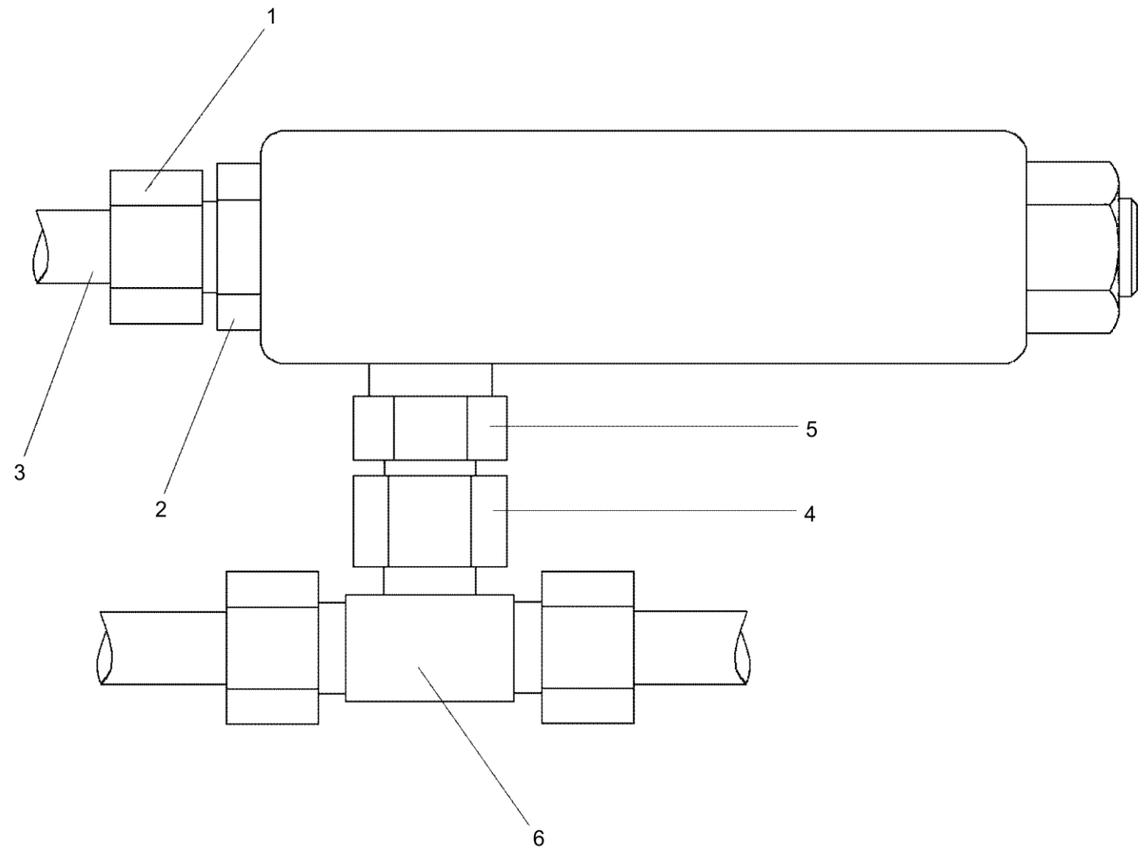
Ref.	Description
1	Nut
2	Fitting Fixed Part
3	Pipe
4	Pin
5	Valve Fixing Collar
6	Collar Fixing Bolts
7	Joint

VAS103B	Pressure Reducer (R3)	Figure 6.4



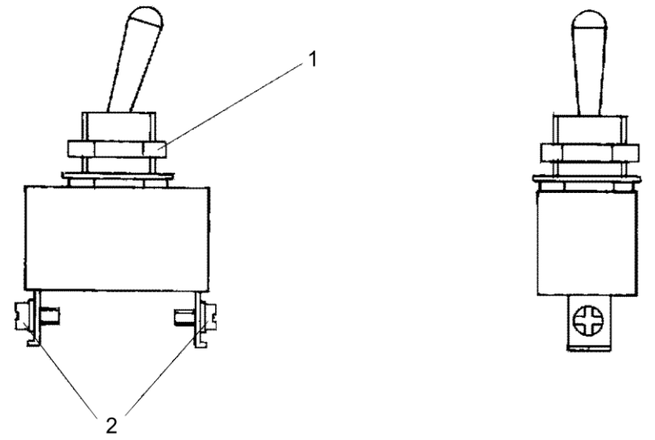
Ref.	Description
1	Nut
2	Fitting Fixed Part
3	Pipe
4	Screw
5	Valve Fixing Ring Nut

VAS103B	Shut Off Valve	Figure 6.5



Ref.	Description
1	Nut
2	Fixed Part
3	Pipe
4	Nut
5	Side Fitting
6	T-Joint

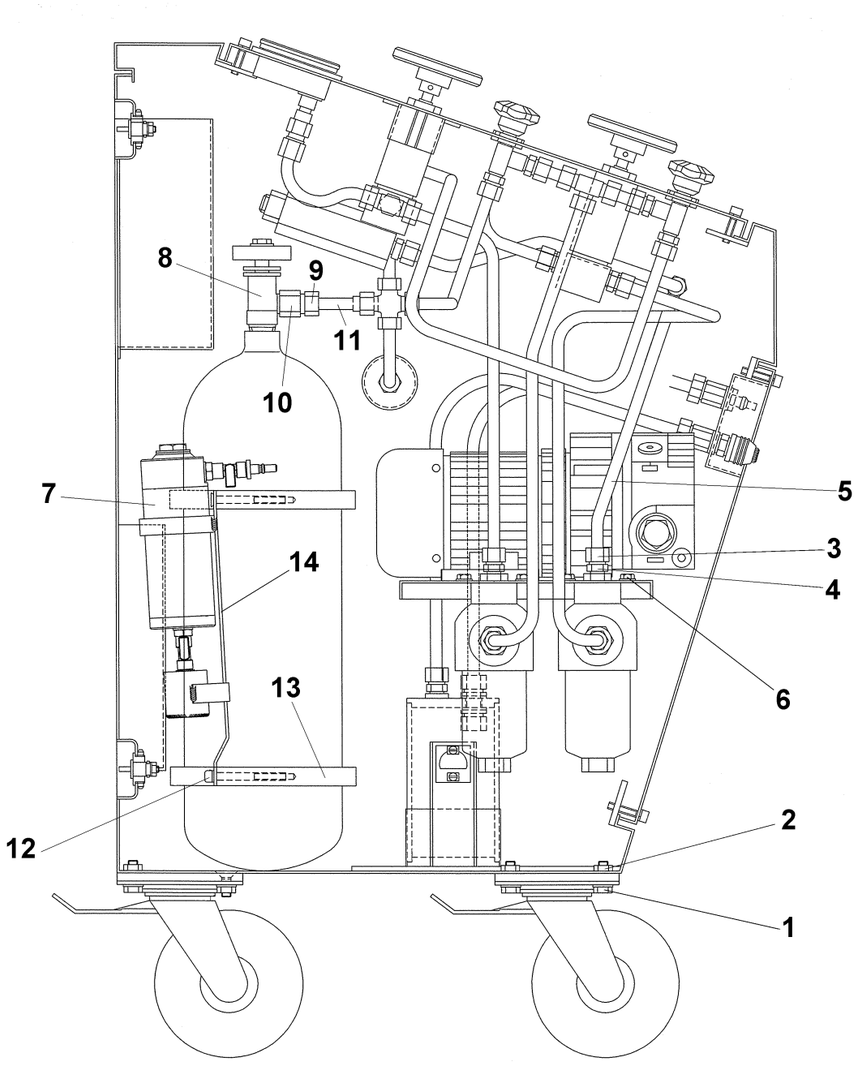
VAS103B	Safety/Shut Off Valve V2	Figure 6.6



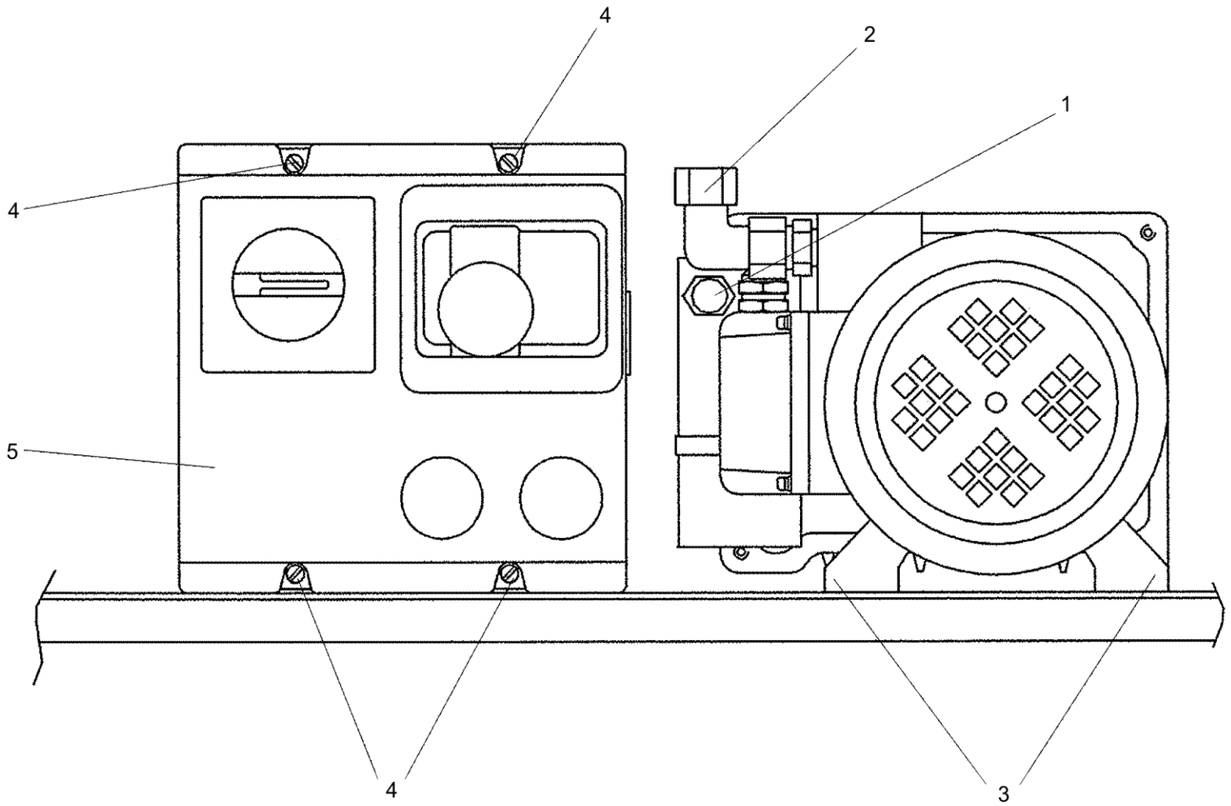
Ref.	Description
1	Nut
2	Screws

VAS103B	INTERNAL LIGHT Switch	Figure 6.7

Ref.	Description
1	Bolts
2	Nuts
3	Nut
4	Fitting Fixed Part
5	Pipe
6	Bolts
7	Oil tank
8	Bottle Conservation Valve
9	Fitting Nut
10	Fitting Fixed Part
11	Pipe
12	Bolts
13	Security Saddles
14	Oil Tank Support

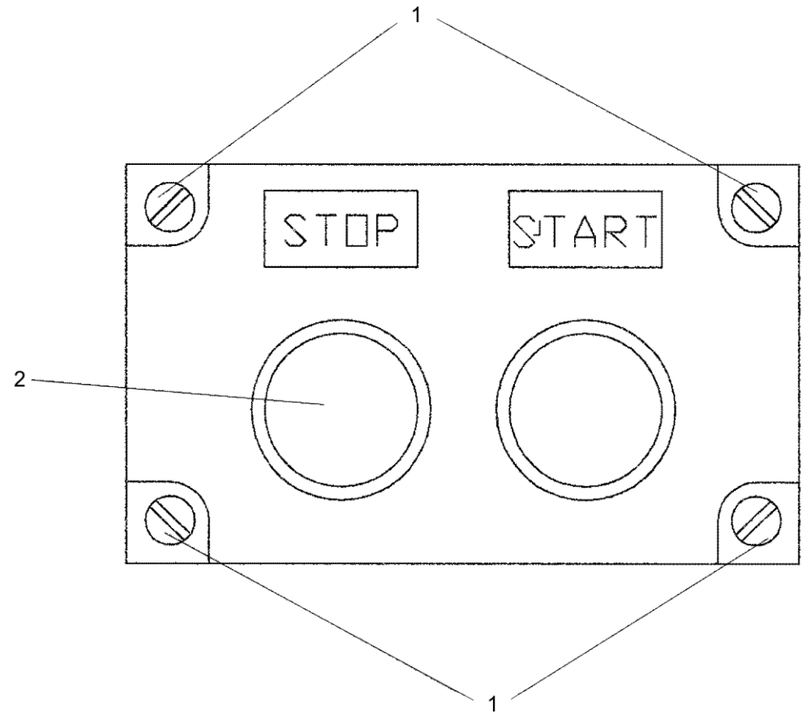


VAS103B	Left Side Section	Figure 6.8



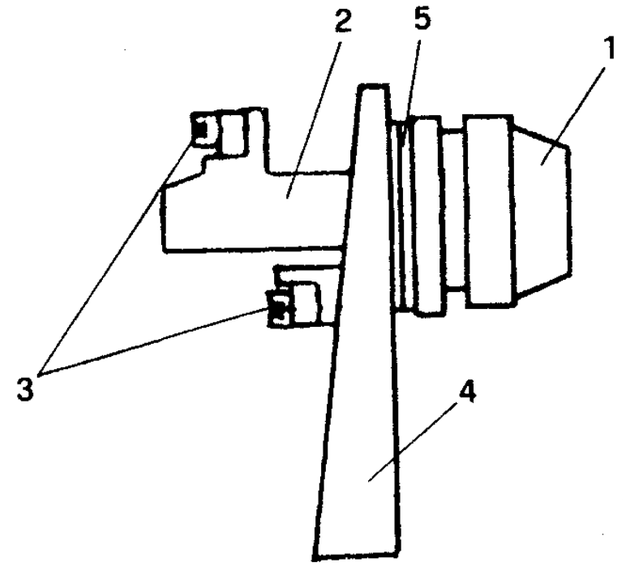
Ref.	Description
1	Electrical Connection
2	Nut
3	Bolts
4	Screws
5	Cover

VAS103B	Vacuum Pump and Motor Starter	Figure 6.9



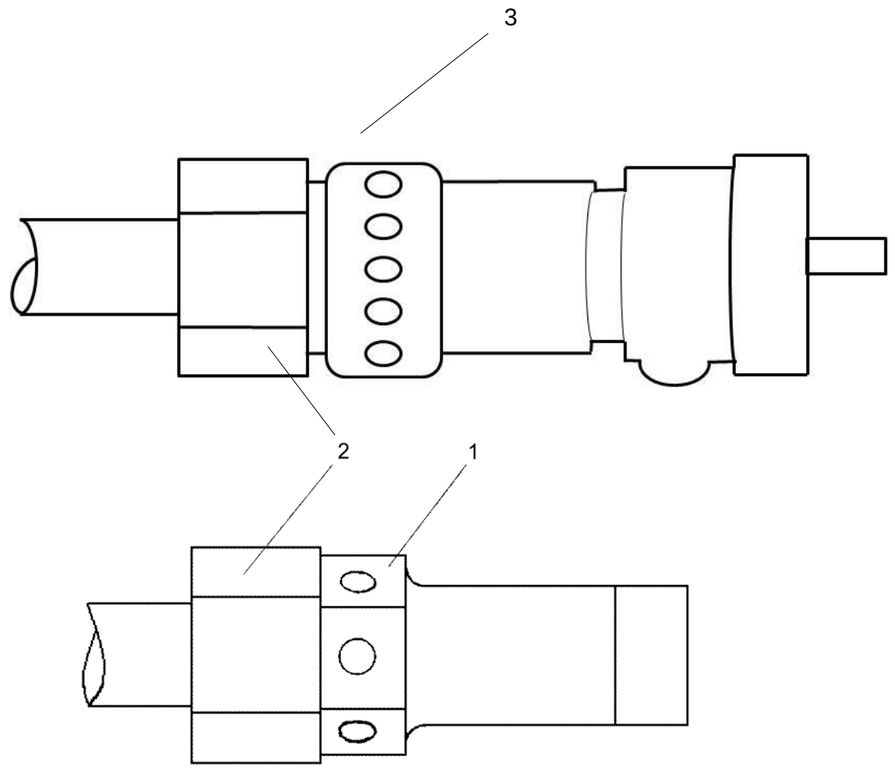
Ref.	Description
1	Screws
2	Push Button

VAS103B	Push-button Set	Figure 6.10



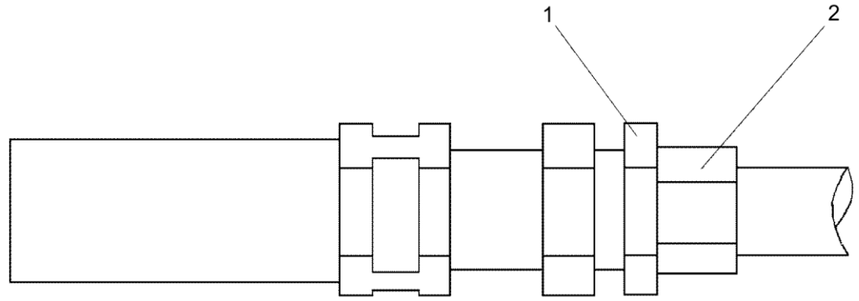
Ref.	Description
1	Transparent Cup
2	Lamp Holder
3	Clamps
4	Supporting Bracket
5	Ring Nut

VAS103B	Lamp Holder	Figure 6.11



Ref.	Description
1	8 bar Safety Valve
2	Fitting Nut
3	0,8 bar Safety valve

VAS103B	Safety Valve (0.8 bar / 8 bar)	Figure 6.12



Ref.	Description
1	Safety Valve
2	Union Nut

VAS103B	Safety Valve (57 bar)	Figure 6.13

CHAPTER 7
PARTS LIST

7.1 Introduction

This chapter lists the description and the figures of all the parts, both mechanical and electrical, of the VAS103B that are defined replaceable.

7.2 Overview

The chapter is composed of the following lists:

1. List of Main Assemblies (LMA) that indicates the main assemblies of the system; the list comprises the following columns:
   - Fig/Ref.: indicates the figure that illustrates the main assembly and the progressive number identifying the main assembly;
   - Denomination: indicates the official name of the main assembly;
   - Supplier Code: indicates the NATO number that identifies the supplier of the main assembly;
   - Supplier Reference: indicates the identification number of the main assembly assigned by the supplier;
   - NSN: indicates the NATO stock number (if any) assigned to the main assembly;
   - Inst. Qty: indicates how many assy are fitted in the main assembly
   - Ref. to PLL: indicates the Parts Location List relating to the main assembly.
2. Parts Location List (PLL) in which the items constituting the assemblies are listed. The Parts Location List (PLL), represented in tabular form, contains the following information:
   - Fig/Ref.: indicates the figure that illustrates the part and the progressive number identifying the part;
   - Denomination: indicates the official name of the part;
   - Supplier Code: indicates the NATO number that identifies the supplier of the part;
   - Supplier Reference: indicates the identification number of the part assigned by the supplier;
   - NSN: indicates the NATO stock number (if any) assigned to the part;
   - Inst. Qty: indicates how many parts are fitted in the main assembly
   - Refer to LMA indicates the List of Main Assemblies relating to the main assembly.

3. List of Suppliers (LSP) which indicates the suppliers of the assemblies and of the parts listed in the previous tables; the list comprises the following columns:
   - Supplier code: indicates the NATO number that identifies the supplier of the assemblies or of the parts;
   - Company name: indicates the company name of the supplier;
   - Full Address: indicates the full address of the supplier.

7.3 Figures

The figures relevant to the Chapter 7, in which each element of the parts list is localised, are composed by the figures from Figure 7.1 to Figure 7.7.

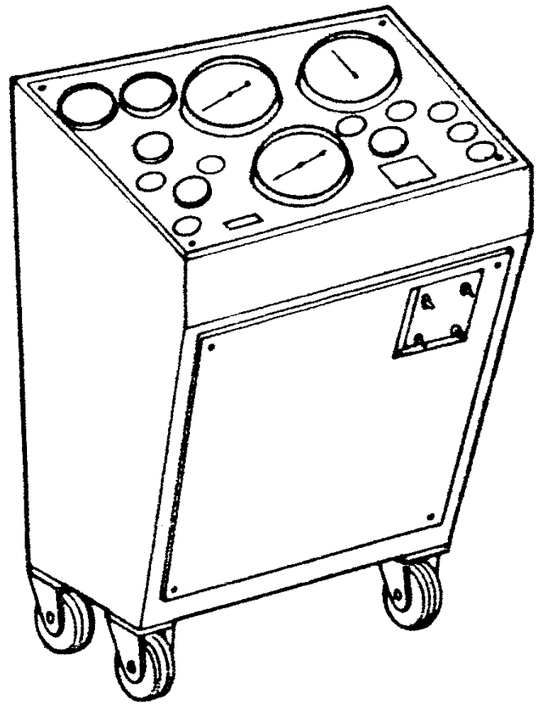
VAS103B			W036721			
LIST OF MAIN ASSEMBLIES			**LMA 7.1 - Page 1 of 1**			
Fig./Ref.	Denomination	Supplier Code	Supplier Reference	NSN	Inst. Qty.	PLL Ref. / SRU
Figure 7.1/1	VAS103B	A2309	W036721		1	PLL 7.1

VAS103B			W036721			
PARTS LOCATION LIST			**LIST PLL 7.1 - Page 1 of 2**			
Fig/Ref.	Denomination	Supplier Code	Supplier Reference	NSN	Inst. Qty.	PLL Ref. / SRU
Figure 7.2/1	Pressure gauge G1 (0-250 bar)	A2309	N171000600		1	SRU
Figure 7.2/2	Pressure gauge G2 (0-100 bar)	A2309	N171000200		1	SRU
Figure 7.2/3	Pressure gauge G3 (0-60 bar)	A2309	N171000300		1	SRU
Figure 7.2/5	Pressure gauge G5 (0-10 bar)	A2309	N171000400		1	SRU
Figure 7.2/4	Vacuum/Pressure gauge G4	A2309	N171000500		1	SRU
Figure 7.2/6	Pressure reducer R1	A2309	W006058		1	SRU
Figure 7.2/7	Pressure reducer R2	A2309	W006057		1	SRU
Figure 7.2/8	Pressure reducer R3	A2309	W003443		1	SRU
Figure 7.2/9	Shut Off Valve	A2309	N151000400		8	SRU
Figure 7.2/10	INTERNAL LIGHT Switch	A2309	N221004600		1	SRU
Figure 7.2/11	Push-button Set	A2309	N221005000		1	SRU
Figure 7.5/1	Safety Valve (8 bar)	A2309	N151001600		2	SRU
Figure 7.5/2	Safety Valve (0.8 bar)	A2309	1N151500006		1	SRU
Figure 7.5/3	Safety Valve (57 bar)	A2309	1N151500005		1	SRU
Figure 7.3/1	Pressure Cut-off Valve V2	A2309	N151002200		1	SRU
Figure 7.3/2	Nitrogen Bottle	A2309	W011016		4	SRU
Figure 7.3/3	Bottle’s Conservation Valve	A2309	N151000610		4	
Figure 7.3/4	Bottle Gasket	A2309	W003451		4	
Figure 7.3/5	Bottle Fitting	A2309	W011017		4	
Figure 7.3/6	Wheel Support Assembly	A2309	N100002600		4	SRU
Figure 7.3/7	Filter (25μ)	A2309	N157000200		1	SRU
Figure 7.3/8	Filer (5μ)	A2309	N157000100		1	SRU
Figure 7.4/6	Obstruction Indicator	A2309	N157000300		2	
Figure 7.4/1	Gasket	A2309	W003456		10	
Figure 7.4/4	Lamp	A2309	1N453000030		2	
Figure 7.4/5	Lamp Holder	A2309	1N453000400		2	
Figure 7.6/1	Motor Starter	A2309	1N453000033		1	SRU
Figure 7.3/9	Vacuum Pump	A2309	1N494300001		1	SRU
Figure 7.4/2	High Pressure Fitting	A2309	N153001300		2	

PARTS LOCATION LIST (Continues)			LIST PLL 7.1- Page 2 of 2			
Fig/Ref.	Denomination	Supplier Code	Supplier Reference	NSN	Inst. Qty.	PLL Ref. / SRU
Figure 7.4/3	Low Pressure Fitting	A2309	N153000310		2	
Figure 7.3/12	Fitting (SENSOR LUBRICATING)	A2309	1N154300001		1	
Figure 7.3/10	Oil Tank assembly	A2309	WM2863230400		1	
Figure 7.3/11	Oil Carter Assembly	A2309	W010563		1	
Figure 7.7/8	T-Connection	A2309	W010575		1	
Figure 7.7/4	BY-PASS SENSOR LUBRICATING hose	A2309	W003858		1	
Figure 7.7/5	AIRFLASK CHARGING hose	A2309	W010584		1	
Figure 7.7/6	AIRFLASK CHARGING hose	A2309	W010837		1	
Figure 7.7/7	Power Cable	A2309	WC9863230500		1	
Figure 7.7/1	VACUUM N. TEST hose As-sembly	A2309	W010832		1	
Figure 7.7/2	SENSOR TEST hose Assembly	A2309	W010585		2	
Figure 7.7/3	SENSOR LUBRIC. hose Assembly	A2309	WM9863230300		1	
Figure 7.7/1a	Vacuum-nitrogen junction (thread 1/8-27 NPT)	A2309	W010831		1	
Figure 7.7/1b	Vacuum-nitrogen junction (thread 7/16-20 UNF)	A2309	WMP863230001		1	
Figure 7.7/2a	Junction (thread M12)	A2309	W010591		2	
Figure 7.7/2b	Junction (thread 7/16-20 UNF)	A2309	WMP863230003		2	
Figure 7.7/3a	Junction (thread M12)	A2309	W010835		1	
Figure 7.7/3b	Junction (thread 7/16-20 UNF)	A2309	WMP863230002		1	

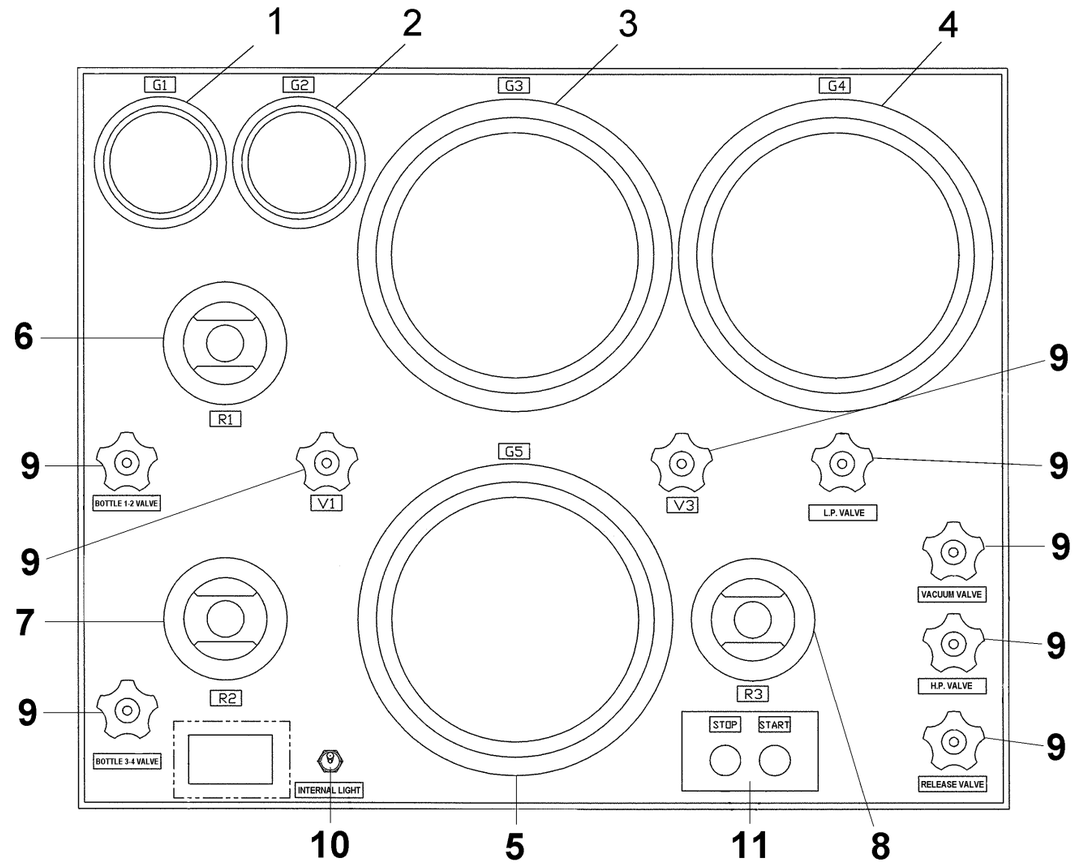
VAS103B		W036721
LIST OF SUPPLIERS		**LSP 7.1 - Page 1 of 1**
Supplier code	Company name	Full Address
A2309	LEONARDO – Electronics	Via di Levante, 48 - 57124 Livorno

CHAPTER 7 - FIGURES



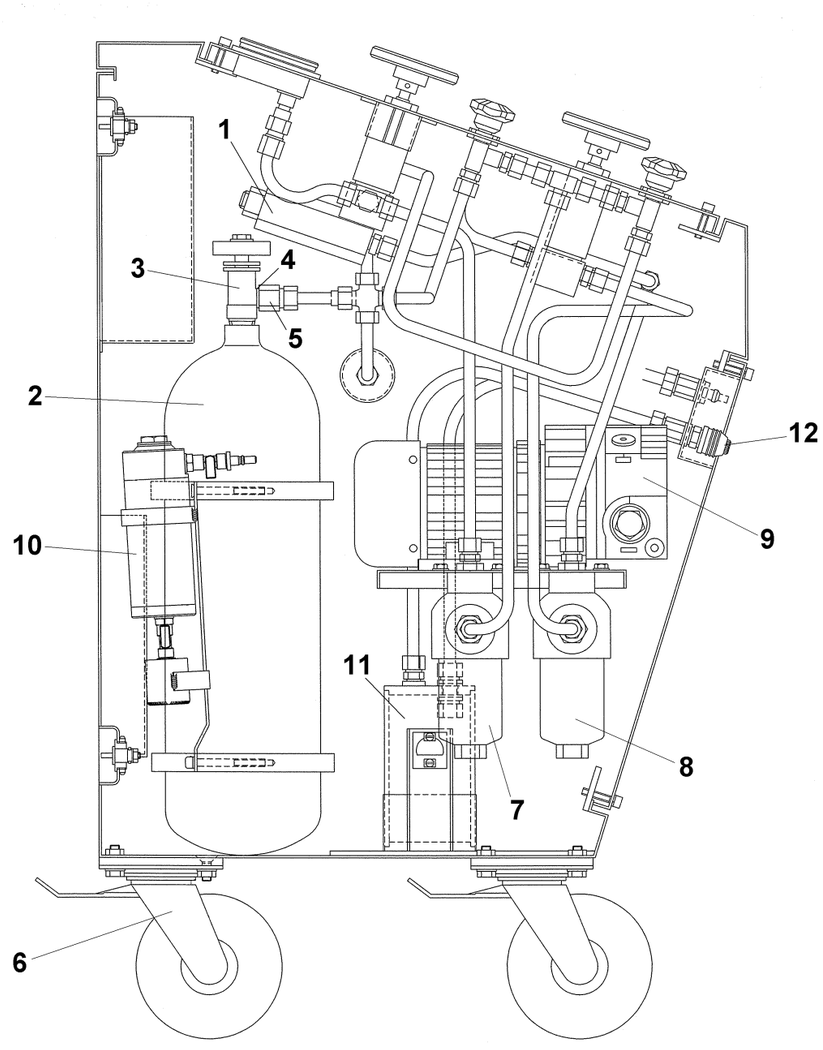
VAS103B	General View	Figure 7.1

Ref.	Description
1	Pressure Gauge G1 (0-250 Bar)
2	Pressure Gauge G2 (0-100 Bar)
3	Pressure Gauge G3 (0-60 Bar)
4	Vacuum/Pressure Gauge G4
5	Pressure Gauge G5 (0-10 Bar)
6	Pressure Reducer R1
7	Pressure Reducer R2
8	Pressure Reducer R3
9	Shut Off Valve
10	Internal Light Switch
11	Push Button Set



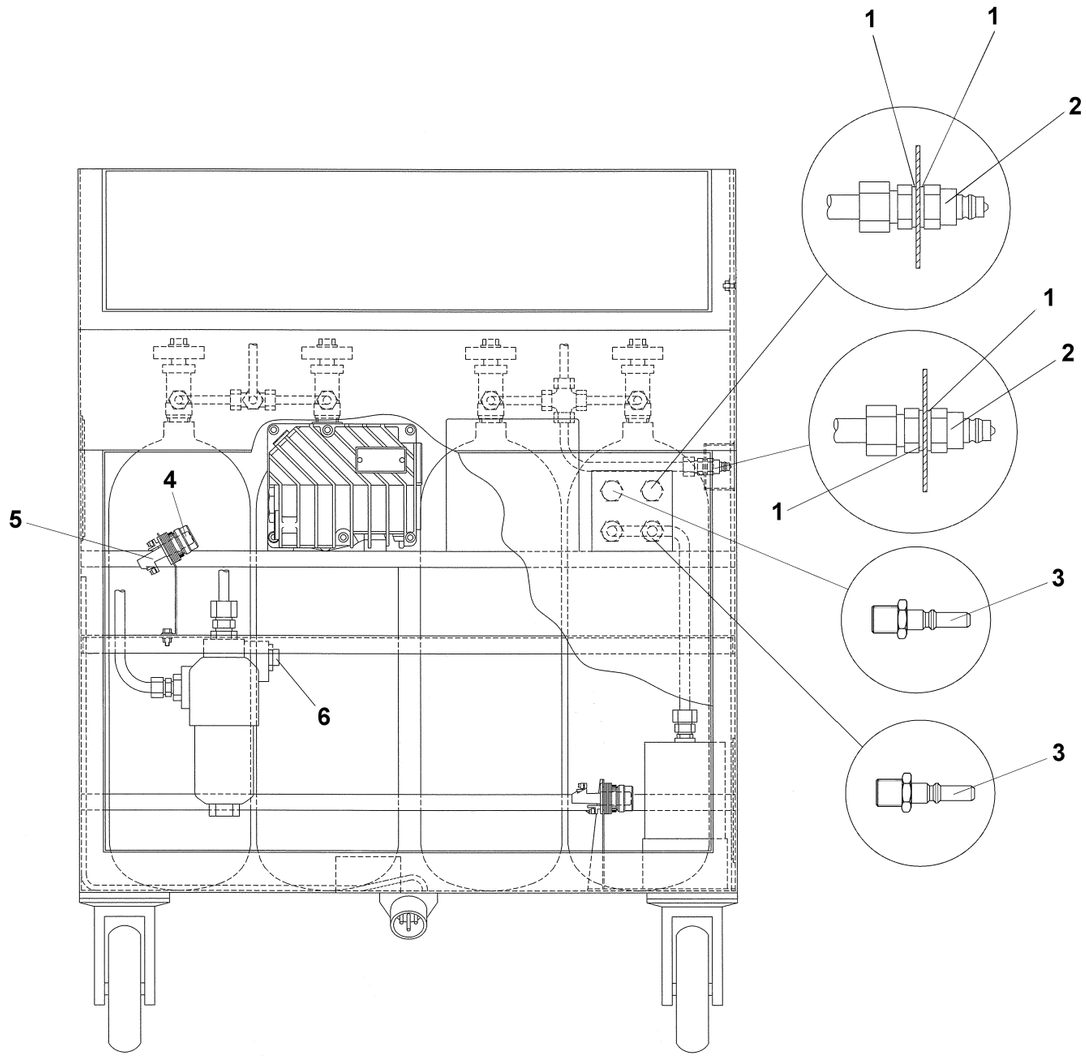
VAS103B	Upper Panel Components	Figure 7.2

Ref.	Description
1	Pressure cut-off Valve V2
2	Nitrogen Bottle
3	Bottles's Conservation Valve
4	Bottle gasket
5	Bottle Fitting
6	Wheel Support Assembly
7	Filter (25µ)
8	Filter (5 µ)
9	Vacuum Pump
10	Oil Tank
11	Oil Carter Assembly
12	Fitting (Sensor Lubricating)

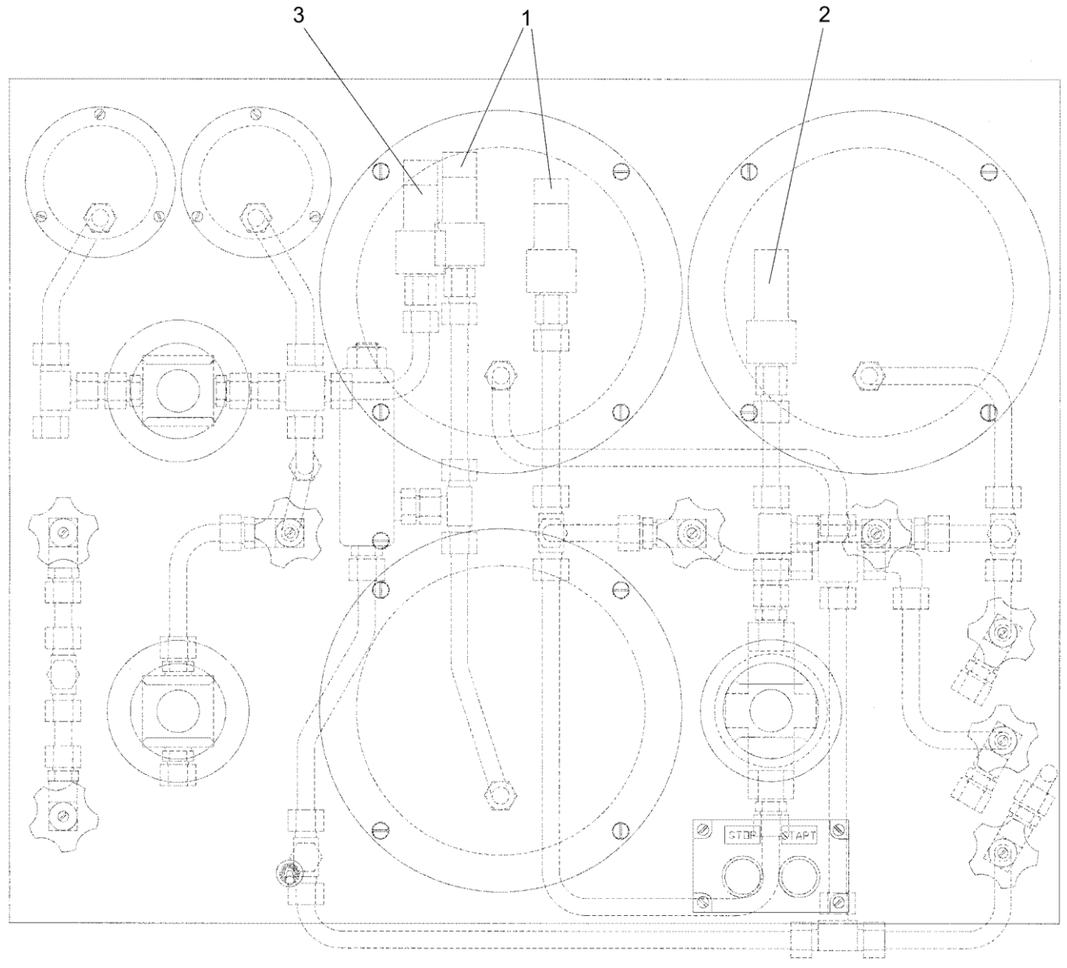


VAS103B	Side Section	Figure 7.3

Ref.	Description
1	Gasket
2	High Pressure Fitting
3	Low Pressure Fitting
4	Lamp
5	Lamp Holder
6	Obstruction Indicator

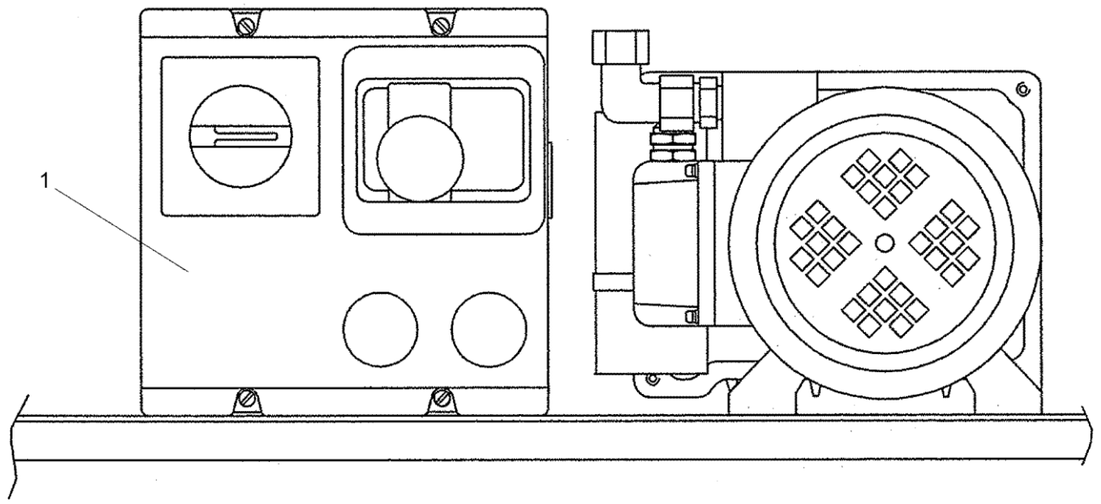


VAS103B	Front Section	Figure 7.4



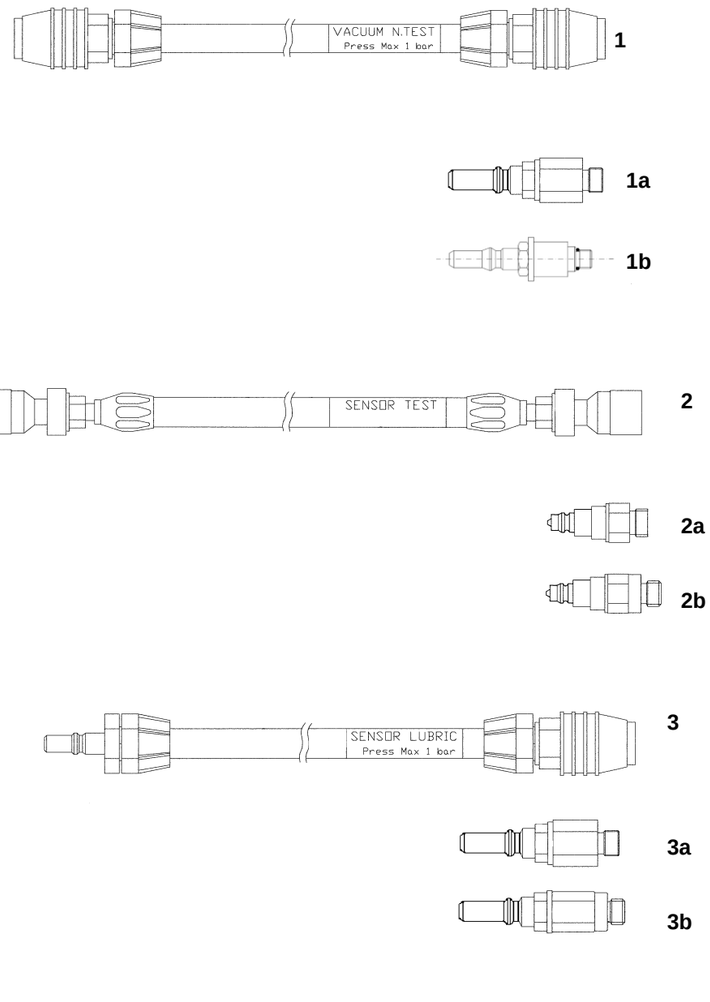
Ref.	Description
1	Safety Valve (8 bar)
2	Safety Valve (0,8 bar)
3	Safety Valve (57 bar)

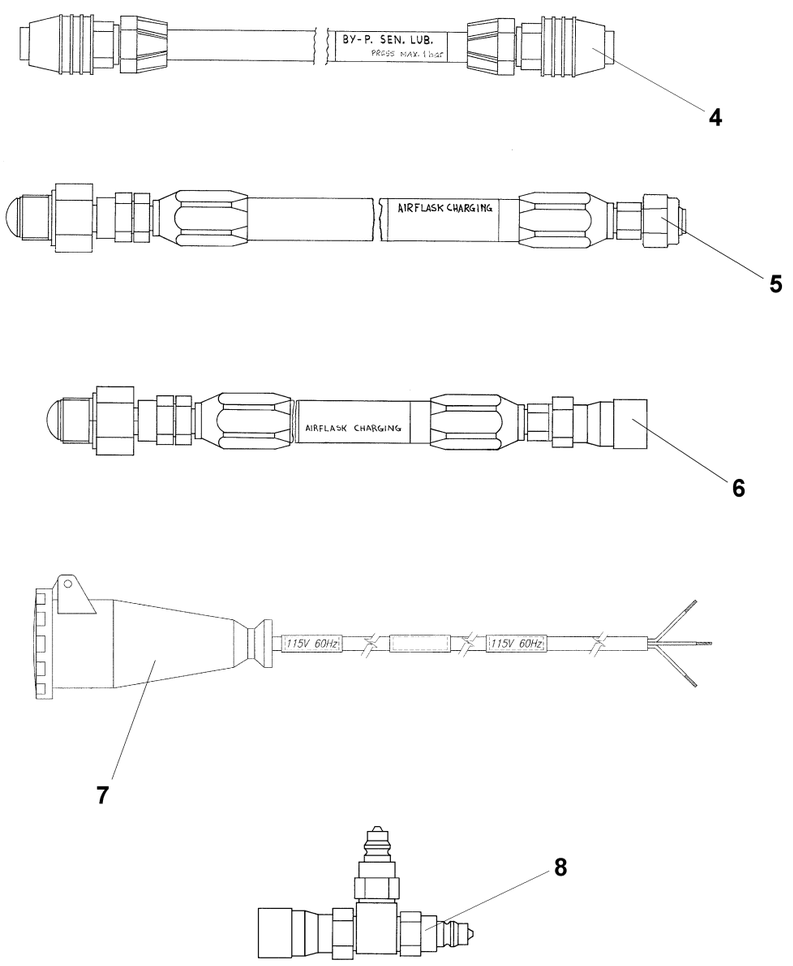
VAS103B	Upper Section	Figure 7.5



Ref.	Description
1	Motor Starter

VAS103B	Motor Starter	Figure 7.6





Ref.	Description
1	Vacuum N. Test Hose Assembly
2	Sensor Test Hose Assembly
3	Sensor Lubric Hose Assembly
4	By Pass Sensor Lubricating Hose
5	Airflask Charging Hose
6	Airflask Charging Hose
7	Power Cable
8	T-joint

VAS103B	Accessories	Figure 7.7

CHAPTER 8
INSTALLATION

8.1 Introduction

This chapter provides the instructions necessary to perform a correct storage, handling and installation of the VAND System (VAS103B).

8.2 Overview

The instructions are grouped in the PHST Sheets (PHS) that provide all the information required for storage, handling and installation of the apparatus.

The PHS Sheets are summarised in the List of PHST Operations (LPH).

In addition there is the List of Tools and Fixtures (LTF), formed by a table placed before the sheets collection.

An explanation of each sheet and of its contents is provided below.

1. List of Tools and Fixtures (LTF)

The list is a table divided as follows:

- The first line indicates the name of the assembly on which the PHST operations are carried out;
- The second line reports the type of list, its progressive number and its page number;
- From the third line the list is divided into the following columns:
  - Denomination: the official denomination of the tools of use, maintenance, check, test and of the containers is reported;
  - Reference: the official reference of the tool is reported;
  - Figure: the reference to the figure of the Chapter 8 in which the tool is shown is reported.

2. List of PHST Operations (LPH)

The list provides a summary of all the PHST Sheets (PHS), divided as follows:

- The first line indicates the name of the assembly on which the operations are carried out;
- The second line indicates the type of list, its progressive number and its page number;
- From the third line, the list is divided into the following columns:
  - Name of Operation: indicates the name of the PHST operation to be carried out;
  - Sheet No.: indicates the number of the sheet in which the PHST operations are described;
  - Refer to Chap. 3; indicates the Operation Sheet(s), Chapter 3, cross-referenced by the sheet indicated in the Sheet No. column;
  - Refer to Chap. 4; indicates the Preventive Maintenance Sheet(s), Chapter 4, cross-referenced by the sheet indicated in the Sheet No. column;

- ・Refer to Chap. 5; indicates the Troubleshooting Sheet(s), Chapter 5, cross-referenced by the sheet indicated in the Sheet No. column;
- ・Refer to Chap. 6; indicates the Corrective Maintenance Sheet(s), Chapter 6, cross-referenced by the sheet indicated in the Sheet No. column;
- ・Refer to Chap. 8; indicates the PHST Sheet(s), Chapter 8, cross-referenced by the sheet indicated in the Sheet No. column.

3. PHST Sheet (PHS)

This sheet summarises all the information necessary for correctly carrying out the operations on the assembly. The sheet is divided as follows:

- The first line indicates the name of the assembly to which the operations refer;
- The second line indicates the type of sheet, its progressive number and its page number;
- The third line indicates:
  - ・The number of persons required to carry out the phst operations;
  - ・The qualifications that personnel must possess to carry out the phst operations (Mecanical Technician MT or Electronic Tecnician ET);
  - ・The duration of the phst operations;
- The fourth line indicates the name of the phst operation described in the sheet;
- The fifth line indicates the purpose of the phst operation described in the sheet;
- The EQUIPMENT table indicates the maintenance equipment, test equipment, measurement equipment etc. necessary to carry out the PHST operations, their type or their reference assigned by the supplier and their NATO stock number (if any);
- The REPLACEMENT PARTS table indicates the spare parts required to carry out the PHST operations, their reference number assigned by the supplier and any NATO stock number;
- The PRODUCTS REQUIRED table indicates the products necessary for cleaning or lubrication, the consumables required to carry out the PHST operations, their type or their reference assigned by the supplier and their NATO stock number (if any);
- The PRELIMINARY SAFETY PRECAUTIONS box indicates the procedures considered to be dangerous and which are highlighted by the WARNING or CAUTION caption; the actions to be taken immediately in case of an event that endangers safety must be detailed here as specified below:
  - ・Symptoms;
  - ・Immediate action;
  - ・Probable cause;
  - ・Possible remedy.
  - ・Refer to Chap. 1 (indicates the paragraph of Chapter 1 that specifies the secondary actions to be carried out to restore acceptable safety conditions).

- The PRELIMINARY ACTIONS box indicates the measures to be taken before carrying out the PHST operations such as:
  - Any connections of the assembly to the test or measurement equipment;
  - Position of the assembly;
  - Identification of the elements to check and the indicators;
  - Position of controls.
- The PROCEDURES box indicates the sequence in which the steps must be carried out according to the time frame indicated for the operation; the procedure also provides the following information:
  - The packing and unpacking operations;
  - The handling inside and outside of packaging operations;
  - The storage inside and outside of packaging operations;
  - The delivery operations and particular consignments;
  - The checks and measurements to be made in the correct order;
  - Other additional data useful for the procedure.

8.3 Storage Methods

8.3.1 Introduction

This paragraph provides information regarding the methods and type of infrastructure required for the correct storage of the VAND System (VAS103B).

VAS103B	W036721	
LIST OF TOOLS AND FIXTURES	**LTF 8.1 - Page 1 of 1**	
Denomination	Reference	Figure
NA		

CHAPTER 8 - SHEET COLLECTION

VAS103B		W036721				
LIST OF PHST OPERATIONS		**LPH 8.1 - Page 1 of 1**				
Name of Operation	Sheet No.	Ref. to Chap. 3	Ref. to Chap. 4	Ref. to Chap. 5	Ref. to Chap. 6	Ref. to Chap. 8
Connection of Power Supply Cable	PHS 8.1					
Connection to an external bottle	PHS 8.2	OPS 3.5				
Disconnection from an external bottle	PHS 8.3	OPS 3.5				

VAS103B		W036721	
PHST SHEET		**SHEET PHS 8.1 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Connection of Power Supply Cable			
Principle and purpose of operation: System Installation : connection to power supply			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN
PRELIMINARY SAFETY MEASURES Observe standard safety precautions described in Chapter 1.			
PRELIMINARY ACTIONS			
PROCEDURES(Figure 8.1) 1. Plug the “Power Cable” (see Figure 1.4) in SWITCH PLUG (pos. 2)			

VAS103B		W036721	
PHST SHEET		**SHEET PHS 8.2 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Connection to an external bottle			
Principle and purpose of operation: Connection to an external bottle			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

Rear door opened
All valves and reducers closed

PROCEDURES(Figure 8.1)

1. By performing the operations of sheet OPS 3.5 (step 1 - 3) disconnect the short pipe from the cross-joint between bottle 1 and bottle 2 (pos. 1).
2. By performing the operations of sheet OPS 3.5 (step 4 -7) connect the AIRFLASK CHARGING hose (Figure 1.9) to the cross-joint.

VAS103B		W036721	
PHST SHEET		**SHEET PHS 8.3 - Page 1 of 1**	
Personnel: 1	Specialisation: MT	Duration:	
Name of operation: Disconnection from an external bottle			
Principle and purpose of operation: Disconnection from an external bottle			
EQUIPMENT			
Description		Reference	NSN
REPLACEMENT PARTS			
Description		Reference	NSN
PRODUCTS REQUIRED (cleaning, lubrication, consumer)			
Description		Reference	NSN

PRELIMINARY SAFETY MEASURES

Observe standard safety precautions described in Chapter 1.

PRELIMINARY ACTIONS

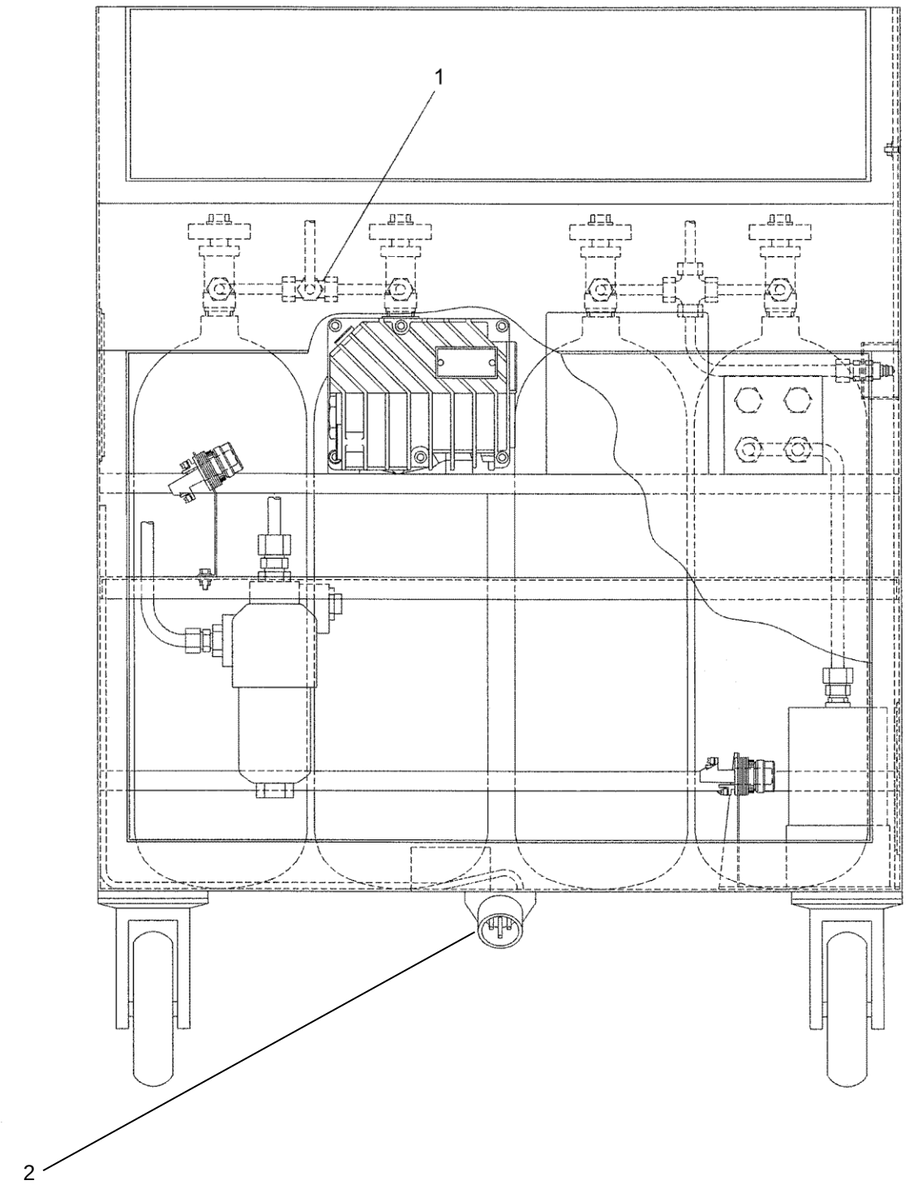
- All valves and reducers closed

PROCEDURES (Figure 8.1)

1. By performing the operations of sheet OPS 3.5 (step 11 - 12) disconnect the AIRFLASK CHARGING hose (Figure 1.9) from the cross-joint between bottle 1 and bottle 2 (pos. 1).
2. By performing the operations of sheet OPS 3.5 (step 13 -17) connect the short pipe to the cross-joint.

CHAPTER 8 - FIGURES

Ref.	Description
1	Cross-Joint
2	Plug (for power supply)



VAS103B	Front Section	Figure 8.1