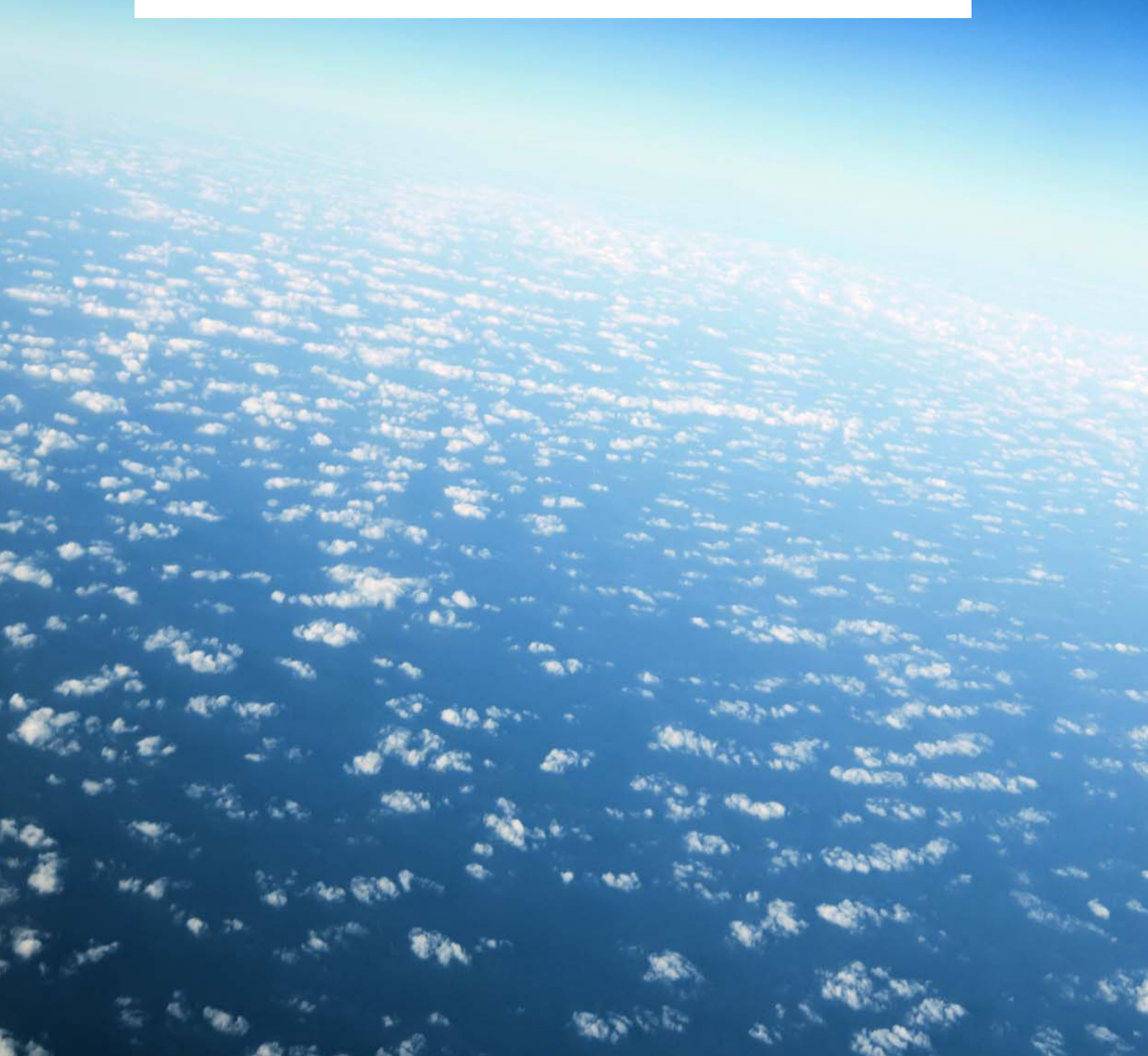


Atlas Copco

Oil-sealed rotary piston pumps
GLS 250, GLS 500

Instruction Book
6996 0222 40
Issue A



EC DECLARATION OF CONFORMITY

We, Atlas Copco Airpower n.v., declare under our sole responsibility, that the product

Machine name: VACUUM PUMP
Machine type: GLS250, GLS500
Serial number: This declaration covers all product serial numbers from the date this Declaration was signed onwards.

Which falls under the provisions of article 12.2 of the EC Directive 2006/42/EC on the approximation of the laws of the Member States relating to machinery, is in conformity with the relevant Essential Health and Safety Requirements of this directive.

The machinery complies also with the requirements of the following directives and their amendments as indicated.

Directive on the approximation of laws of the Member States relating to		Harmonised and/or Technical Standards used
Machinery safety	2006/42/EC	EN 1012-2
Low voltage equipment	2006/95/EC	EN 60034-1

Atlas Copco Airpower n.v. is authorised to compile the technical file.

Conformity of the product to the specification and by implication to the directives

Issued by: Engineering

Name: Andries Desiron

Signature:



Date: 01/06/2014

Atlas Copco

Oil-sealed rotary piston pumps

GLS 250/GLS 500

Instruction book

Original instructions

Copyright notice

Any unauthorized use or copying of the contents or any part thereof is prohibited.

This applies in particular to trademarks, model denominations, part numbers and drawings.

This instruction book is valid for CE as well as non-CE labelled machines. It meets the requirements for instructions specified by the applicable European directives as identified in the Declaration of Conformity.

6996 0222 40 Issue A

www.atlascopco.com



Table of Contents

1	Introduction	6
1.1	Scope	6
1.2	Description	7
2	Technical data	14
2.1	Operating and storage conditions	14
2.2	Pump specifications	14
2.3	Materials in contact with process gases	15
2.4	Electrical data	15
3	Installation	18
3.1	Safety	18
3.2	System design considerations	19
3.3	Unpack and inspect	19
3.4	Locate the pump	20
3.5	Inlet piping	20
3.6	Exhaust piping	23
3.7	Electrical connections	25
3.8	Cooling	27
3.9	Pump lubrication	27
4	Operation	29
4.1	Pre-start check	29
4.2	Pump start	29
4.3	Gas ballast operation	30
4.4	Pump stop	31

4.5	Operating notes	32
5	Maintenance	33
5.1	Safety information	33
5.2	Leak detection	33
5.3	Maintenance plan	34
5.4	Oil change	35
5.5	Oil level check	35
5.6	Valve deck maintenance	36
5.7	Belt maintenance	36
5.8	Drive belt tension	37
5.9	Gas ballast check valve replacement	37
5.10	Fitment or replacement of the motor (GLS 500 models only)	38
5.11	Fault finding	40
6	Storage and disposal	43
6.1	Storage	43
6.2	Disposal	43
7	Spares and accessories	44
7.1	Introduction	44
7.2	Service	44
7.3	Spares	44
7.4	Accessories	44

Illustrations

1	Theory of operation	8
2	GLS 250 pump general arrangement	10
3	GLS 500 pump general arrangement	11
4	GLS 250 pump dimensions	16
5	GLS 500 pump dimensions	17
6	Inlet piping configurations	22
7	Exhaust piping	24
8	Electrical schematic	26
9	Gas ballast setting	31
10	Typical vacuum system piping	34
11	Collar bolt positions and motor frame sizes	39

Tables

1	General data	14
2	Pump technical specifications	14
3	Motor specifications, IEC motors (CE pumps)	16
4	Motor specifications, NEMA motors	17
5	Maintenance plan	34
6	Belt tension	37
7	Motors that can be fitted to GLS 500 pump models	38
8	Fault finding guide	40
9	Accessories	44

Associated Publications


Publication title	Publication number
Vacuum Pump and Vacuum System Safety.....	6996 0222 10
V Lube F SDS.....	0017 5202 31

1 Introduction

1.1 Scope

This manual provides installation, operation and maintenance instructions for GLS 250 and GLS 500 pumps (referenced as ‘GLS pump’ throughout the remainder of the manual). The GLS pump must be used as specified in this manual. Read this manual before installing and operating the pump.


Important safety information is highlighted as WARNING and/or CAUTION instructions which must be followed. The use of WARNINGS and/or CAUTIONS is defined below.

	<p>WARNING</p> <p>Warnings are given where failure to observe the instruction could result in injury or death to people.</p>
---	---

<p>CAUTION</p> <p>Cautions are given where failure to observe the instruction could result in damage to the equipment, associated equipment and process.</p>

The units used throughout this manual conform to SI international system of measurement followed by imperial units in parenthesis; SI (imperial).


The following warning symbols are on the pump:

	<p>WARNING</p> <p>refer to accompanying documentation.</p>
---	---

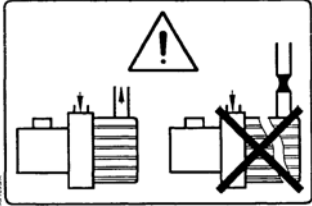
	<p>WARNING</p> <p>risk of electric shock.</p>
---	--

	<p>WARNING</p> <p>hot surfaces.</p>
---	--

	<p>WARNING</p> <p>risk of explosion</p>
---	--

	<p>WARNING use protective equipment.</p>
---	---

	<p>WARNING moving parts.</p>
---	---

	<p>WARNING do not block the pump exhaust.</p>
---	--

1.2 Description

The GLS pumps are self-contained, rotary, oil sealed piston type units. An eccentric mounted on the drive shaft drives the piston. Two free-oscillating floating hinge bars in the pump housing guide the piston slide. The piston assembly rotates clockwise when facing the drive end. Air enters the pump through the intake and passes through the piston slide as the piston performs its intake stroke. As the piston nears the top center position the intake port is closed, separating the system from the pump (see [Figure 1](#)). The air is entrapped on the front side of the piston as it begins the next stroke. As the piston continues to rotate, the entrapped air is compressed and discharged through the exhaust valves and out the reservoir exhaust outlet. The exhaust valves are a corrosion-resistant, heavy duty, poppet type.

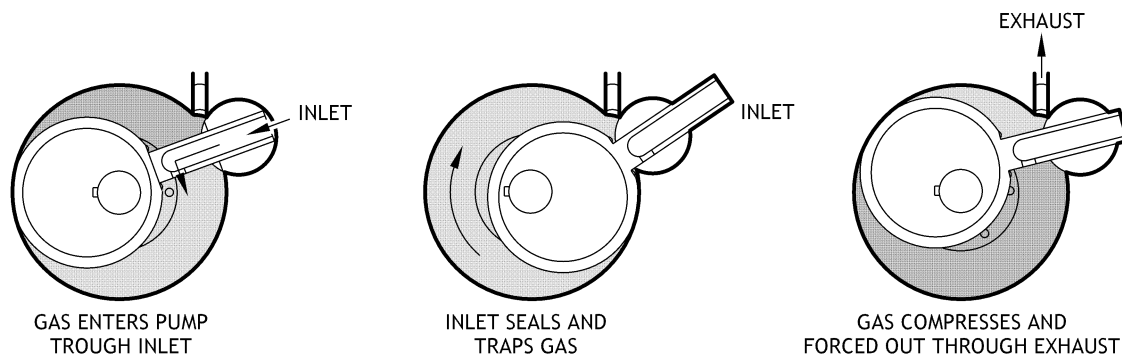


Figure 1 – Theory of operation

When the pump is in operation, lubrication of the internal parts is completely automatic. Oil is forced by atmospheric pressure from the reservoir through internal oil passages to the shaft bearings. The oil is then fed into the pump to provide the necessary piston-to-cylinder oil seal. The oil in the pumping chamber is forced out through the exhaust valves with the compressed air and returns to the reservoir. A solenoid valve prevents oil from flooding the pump in the event of a power failure or when the pump is shutdown without vacuum being broken.


The pump general arrangements are provided in Figures 2 and 3.

1.2.1 Gas ballast

To pump high vapour loads, gas ballast is delivered into the pump to prevent condensation of the vapour carried by the pump gases.

Air can be introduced to the low vacuum stage. Alternatively, an inert gas such as nitrogen can be supplied through a suitable external valve.

1.2.2 Water system

	<p>WARNING</p> <p>Cooling lines must be installed as to not create a trip hazard which can result in injury to personnel.</p>
---	---

A cooling water supply rated at 30 °C (85 °F) and 5.7 litres per minute (1.5 GPM) for the GLS 250, and 7.6 litres per minute (2 GPM) for the GLS 500 maximum is required for efficient pump performance. Internal pump water pressure should not exceed 2.41 bar(g) (35 psig) (Refer to [Section 3.8](#) for information).

Reference	Designation	Reference	Designation
(1)	Motor lift eye-bolt	(10)	Reservoir cover
(2)	Belt guard	(11)	1/4 inch vacuum access port
(3)	Exhaust connection 2 inch ANSI	(12)	Gas ballast adjustment
(4)	Solenoid valve	(13)	Gas ballast purge connection
(5)	Oil flow indicator	(14)	Water inlet connection 1/2 inch NPT (water miser fitted)
(6)	Oil drain valve	(15)	Motor
(7)	Oil fill port	(16)	Vacuum inlet connection 3 inch ANSI
(8)	Oil level sight glass	(17)	1/2 inch vacuum access port
(9)	System lift eye-bolt (x2)	(18)	Water outlet connection 1/2 inch NPT

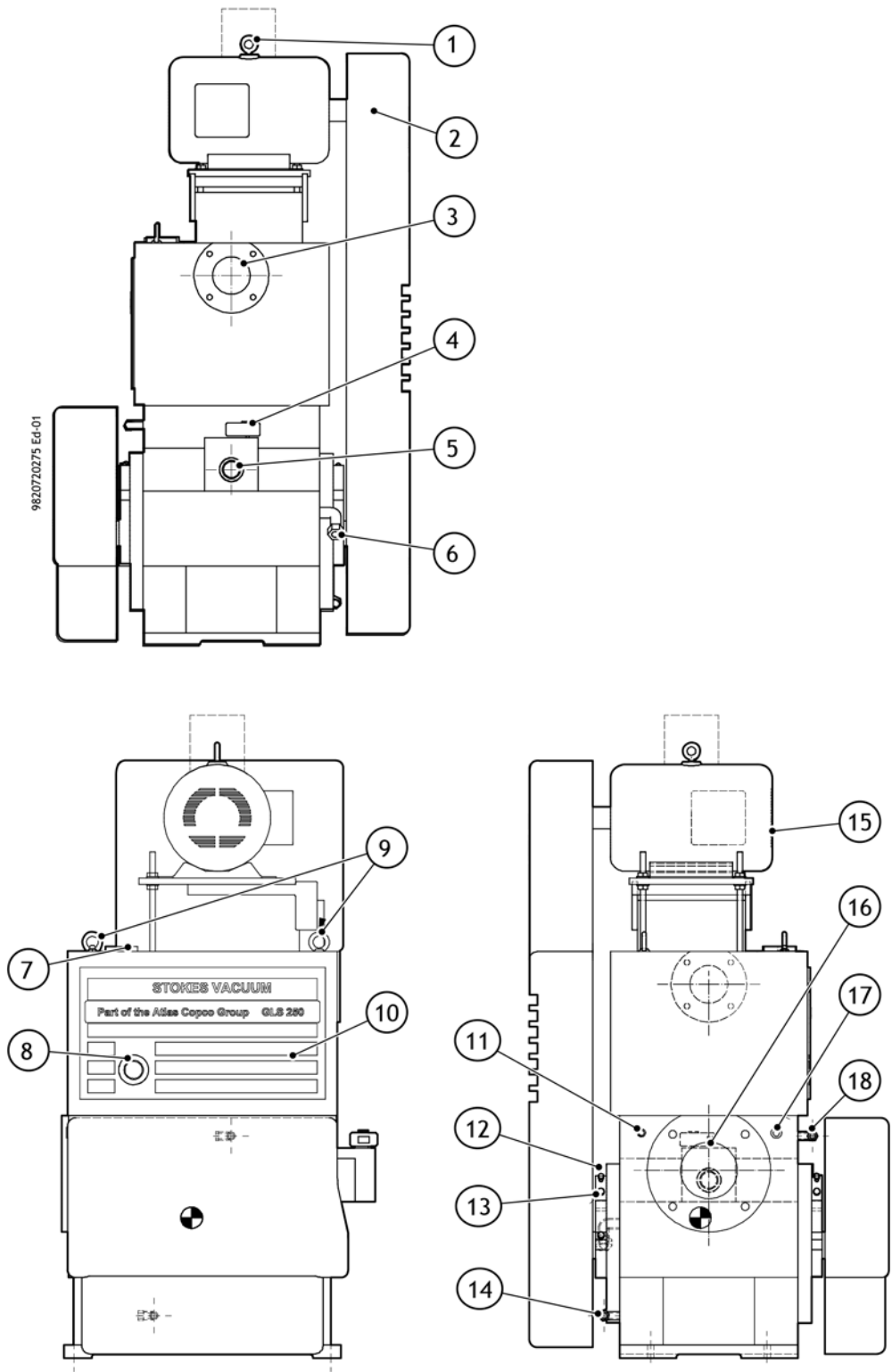
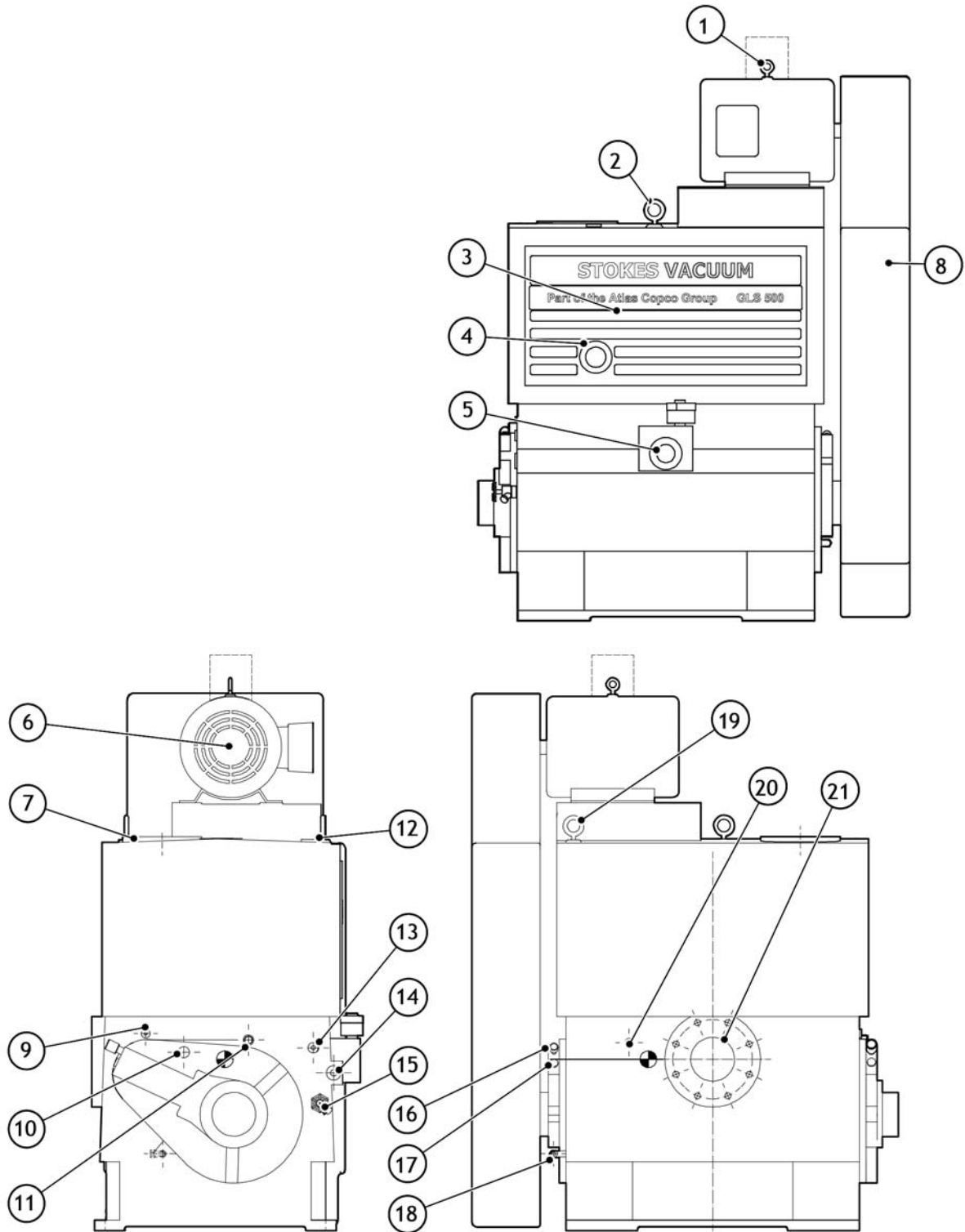


Figure 2 – GLS 250 pump general arrangement



9820720276 Ed-01

Figure 3 – GLS 500 pump general arrangement

Reference	Designation	Reference	Designation
(1)	Motor lift eye-bolt	(12)	Oil fill port/pressure relief
(2)	System lift eye-bolt	(13)	Oil temperature sensor port
(3)	Reservoir cover	(14)	Oil temperature heater port
(4)	Oil level sight glass	(15)	Oil drain valve
(5)	Oil flow indicator	(16)	Gas ballast adjustment
(6)	Motor	(17)	Gas ballast purge connection
(7)	Exhaust connection 3 inch NPT/ ANSI flange	(18)	Water inlet connection 1/2 inch NPT (water miser mounted)
(8)	Belt guard	(19)	System lift eye-bolt
(9)	1/2 inch vacuum access port	(20)	1/4 inch vacuum access port
(10)	Oil drain port, dead end	(21)	Vacuum inlet connection 4" ANSI
(11)	Water outlet connection 1/2 inch NPT		

1.2.3 Electrical system

	<p>WARNING</p> <p>Electrical lines must be installed as to not create a trip hazard which can result in injury to personnel.</p>
--	--

The main power supply is either 415 V 50 Hz, 380 - 400 V 50 Hz or 230/460 V 60 Hz and should be wired through a suitable fused motor starter. Power for the oil solenoid is taken from any two motor leads. Check both motor and solenoid nameplates to insure proper voltage (Refer to [Section 3.7](#) for information).

1.2.4 Lubricants

Refer to [Section 3.9](#) for recommended pump fluids.

1.2.5 Guards

The motor pulley, pump pulley, belts and flywheel are enclosed by guards to prevent accidental contact with these parts. The pump should never be operated with guards removed.

1.2.6 Vacuum access ports

CAUTION

When connecting a gauge to one of the ports, it is necessary to provide a 90° elbow and a minimum of 305 mm (12 inches) of vertical pipe to the gauge sensor to reduce the chance of contaminating the gauge with pump lubricants.

The pump is provided with 1/4 inch and 1/2 inch NPT vacuum access ports. These ports are provided for customer convenience. The ports can be used for gauges to monitor the pump performance or access for introducing purge gases to the pump.

1.2.7 Oil drain port (GLS 500 pump only)

A 1/4 inch oil drain access port has been added to provide a means of removing oil that pools above the valve decks (Refer to [Figure 3](#) Item 10).

2 Technical data

2.1 Operating and storage conditions

Table 1 – General data

General items	Reference data
Ambient temperature range (operation)	12 to 40 °C (54 to 104 °F)
Normal surface temperature of the pump body at ultimate vacuum (operation), ambient temperature of 20 °C (68 °F)	50 to 70 °C (122 to 158 °F)
Maximum humidity (operation)	90 % RH
Ambient temperature range (storage)	-30 to 70 °C (-22 to 158 °F)

2.2 Pump specifications

Technical specifications for GLS pumps are provided in [Table 2](#). Pump dimensions are shown in [Figures 4](#) and [5](#).

Table 2 – Pump technical specifications

Specification	Unit	GLS 250	GLS 500
Ultimate vacuum	mbar(a)	< 3.3 x 10 ⁻² mbar(a)	< 3.3 x 10 ⁻² mbar(a)
	microns Hg	< 25	< 25
Displacement	m ³ /h	255	510
	cfm	150	300
Pump rotation speed	rpm	500	490
Peak pumping speed	rpm	234	442
Inlet and outlet connections			
Vacuum inlet	inch	3 ANSI	4 ANSI
Exhaust	inch	2 NPT/ANSI flange	3 NPT/ANSI flange
Noise level at 1 metre *	dB(A)	77	83
Vibration severity [†]	mm/sec	7	7
Pipe connections			
Water inlet	mm	13	13
	inch	1/2 NPT	1/2 NPT
Water outlet	mm	13	13
	inch	1/2 NPT	1/2 NPT
Oil capacity	litres	15	45
	gal	4	12

Table 2 – Pump technical specifications (continued)

Specification	Unit	GLS 250	GLS 500
Weight			
Net	kg	431	850
	lb	950	1875
Shipping	kg	488	896
	lb	1075	1975
Height	mm	1171	1395
	inch	46	55
Floor space	mm	667 x 610	1022 x 651
	inch	026-1/4 x 24	40-1/4 x 25-5/8
Cooling water consumption (maximum)	litres per minute	5.7	7.6
	gpm	1.5	2
Inlet cooling water temperature (maximum)	°C	30	30
	°F	85	85

* The noise level was measured in accordance with ISO2151 and with the pump running at ultimate pressure. Running at higher inlet pressures will increase the noise level.

† Measured at the inlet port to ISO2372 (1974).

2.3 Materials in contact with process gases

The following material will come in contact with process gases. A safety review should be performed considering the effect of process gases on the following materials: Aluminum; Nitrile; Brass; Cast Iron; Ductile Iron; Fluoroelastomer; Steel; Stainless Steel; Hydrocarbon Oil, and; atmosphere.

2.4 Electrical data

The motor specifications are provided in [Table 3](#) and [Table 4](#).

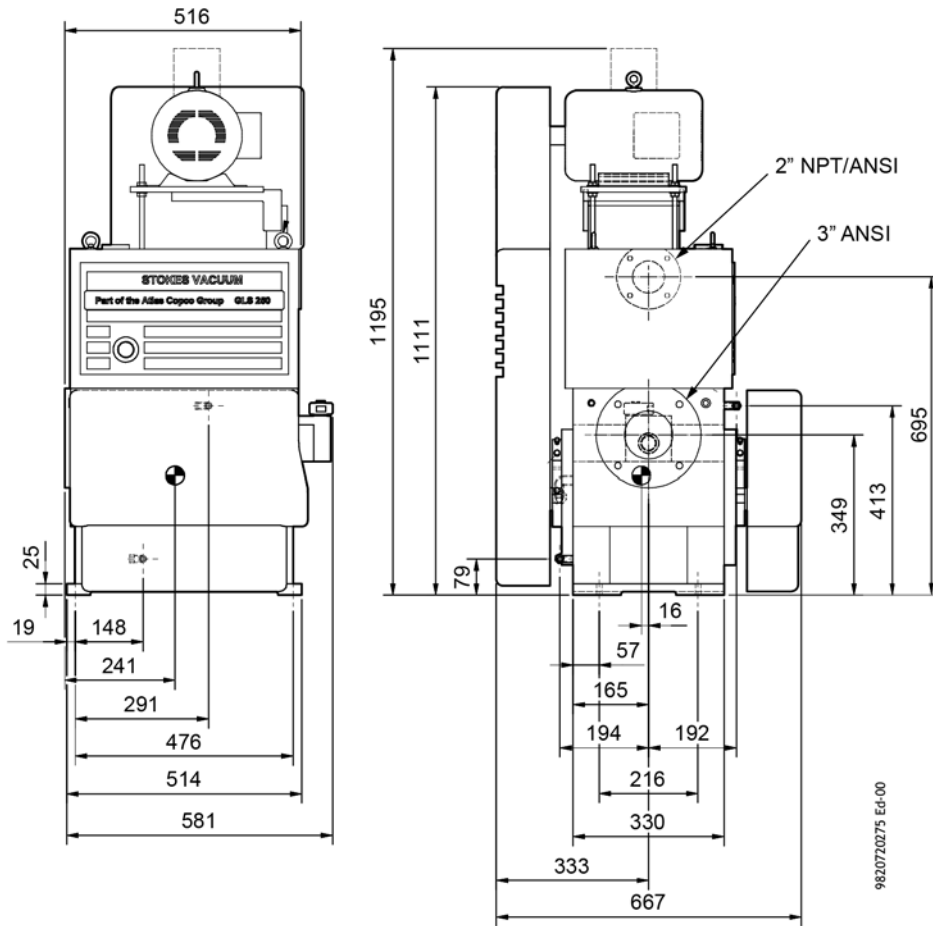


Figure 4 – GLS 250 pump dimensions

Table 3 – Motor specifications, IEC motors (CE pumps)

Specification	GLS 250	GLS 500
Enclosure	IP55	IP55
Ambient temperature	40 °C (104 °F)	40 °C (104 °F)
Frame	132	160
Insulation class	F	F
Electrical supply	415 V or 380 - 400 V	415 V or 380 - 400 V
Mounting	B3	B3
Phase/frequency	3/50 Hz	3/50 Hz
Power	5.5 kW	11.0 kW

NOTE

Refer to motor rating nameplate for weight, efficiency, motor speed, and full load amperage values.

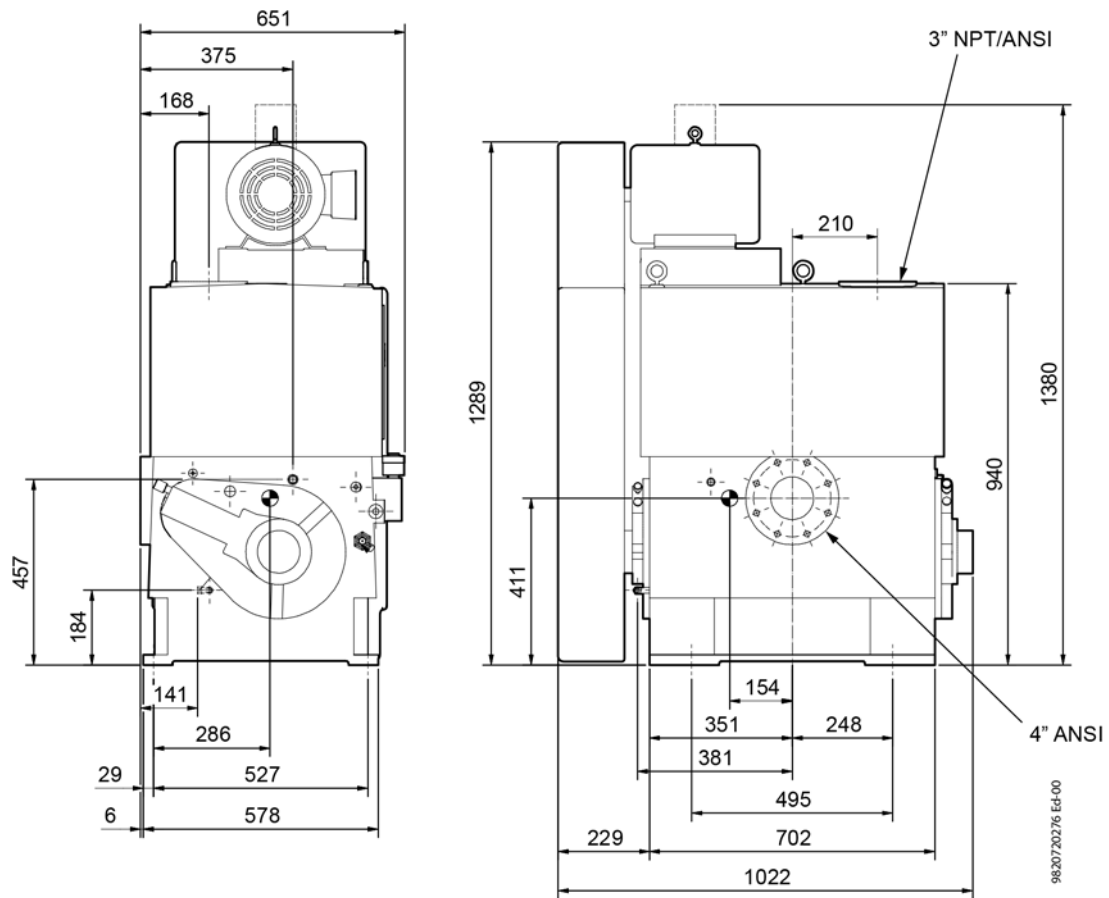


Figure 5 – GLS 500 pump dimensions

Table 4 – Motor specifications, NEMA motors






Specification	GLS 250	GLS 500
Enclosure	TEFC	TEFC
Ambient temperature	40 °C (104 °F)	40 °C (104 °F)
Frame	213T	215T
Insulation class	F	F
Electrical supply	230/460 V	230/460 V
Mounting	B3	B3
Phase/frequency	3/60 Hz	3/60 Hz
Power	7.5 HP	10.0 HP

NOTE

Refer to motor rating nameplate for weight, efficiency, motor speed, and full load amperage values.

3 Installation

3.1 Safety

	<p>WARNING</p> <p>If you use a hydrocarbon oil in this pump, you must not use the pump to process oxygen in concentrations greater than 25% in volume. If you do, there is a risk of fire or explosion in the oilbox of the pump.</p>
	<p>WARNING</p> <p>Atlas Copco recommends that the GLS pumps are not used to pump hazardous substances.</p>
	<p>WARNING</p> <p>Prevent any part of the human body from coming into contact with the vacuum.</p>
	<p>WARNING</p> <p>Ensure that the exhaust pipeline cannot become blocked. If an exhaust isolation valve has been installed, ensure that the pump cannot be operated with the valve closed.</p>
	<p>WARNING</p> <p>The GLS pumps are only approved for use on applications using air, nitrogen and other inert gases.</p> <p>Do not pump oxygen, hydrogen, chemically active, corrosive or flammable gases or gas mixtures, the presence of which can result in an explosion.</p> <p>Refer to the Vacuum pump and vacuum system safety manual (supplied with the pump) for recommendations.</p> <p>Consult Atlas Copco for specific applications assistance prior to operating the pump for hazardous applications.</p>

Ensure that the GLS pump is suitable for the application. Refer to the Atlas Copco guidelines on vacuum pump and vacuum system safety (see the associated publications at the end of the Contents list at the front of this manual).

Installation of the GLS pump must be performed by a suitably trained and supervised technician. Obey the safety instructions listed below when the pump is installed, especially when connecting the pump into an existing system. Details of specific safety precautions are provided at the appropriate point in the instructions.

- Wear appropriate safety clothing when there is potential for contact with contaminated components.
- Vent and purge the vacuum system before installation work is started.
- Ensure that the installation technician is familiar with the safety procedures which relate to the pump oil and other products handled by the pumping system. Take suitable precautions to avoid the inhalation of oil mist and excessive skin contact with pump oil, as prolonged exposure can be harmful.
- Disconnect the other components in the pumping system from the electrical supply to prevent accidental operation.

3.2 System design considerations

Consider the following points when designing the pumping system:

- Use a suitable valve to isolate the pump from the vacuum system if there is a need for the pump to warm up before pumping condensable vapours, or to provide additional system protection when the pump is switched off.
- Avoid high levels of heat input to the pump from the process gases, otherwise the pump may overheat and seize.
- If the pump is used in a high ambient temperature and has a high gas throughput, the temperature of the pump body may exceed 60 - 70 °C (140 - 158 °F) and must be fitted with suitable guards to prevent contact with hot surfaces.
- Ensure that the exhaust pipeline cannot become blocked. If an exhaust isolation valve has been installed, ensure that the pump cannot be operated with the valve closed.

3.3 Unpack and inspect



WARNING

When positioning the pump use suitable lifting equipment to prevent injury to personnel. Ensure that the system is not lifted by the motor eye-bolt, as the motor eye-bolt is not intended to lift the suspended weight of the system. Injury to personnel and/or damage to equipment can result. Refer to [Section 2](#) for pump mass information.

Remove all packing materials, remove the pump from its packing box, remove the protective covers from the inlet and exhaust ports and inspect the pump. If the pump is damaged, notify the supplier and carrier in writing within three days; state the item number of the pump together with the order number and supplier's invoice number. Retain all packing materials for inspection. Do not use the pump if damaged.

If the pump is not used immediately, replace the protective covers. Store the pump in suitable conditions as described in [Section 6](#) of this manual.

3.4 Locate the pump



WARNING

Use suitable lifting equipment to move the pump. Refer to [Section 2](#) for pump mass information.

Locate the pump close to the equipment being evacuated so that the vacuum, water and exhaust connections can be conveniently made without creating a hazard to personnel safety. Provide adequate space around the pump for servicing and maintenance.

Mount the pump on a rigid foundation, such as a concrete floor, and level with shims or by grouting. Mount the pump to the foundation ensuring not to put strain or twist in the pump housing. See [Figures 4](#) and [5](#) for foundation mounting dimensions. The pump should be mounted to the floor using the four (4) pre-drilled mounting holes in the pump base.

Remove the protective caps/covers from the inlet and exhaust flanges just prior to installing piping. If the pump is to be used in temperatures below freezing, drain the water jacket to prevent cracking the housing; blow out the water jacket. If the unit will be stored for a period of time before commissioning, follow the same procedure.

3.5 Inlet piping



WARNING

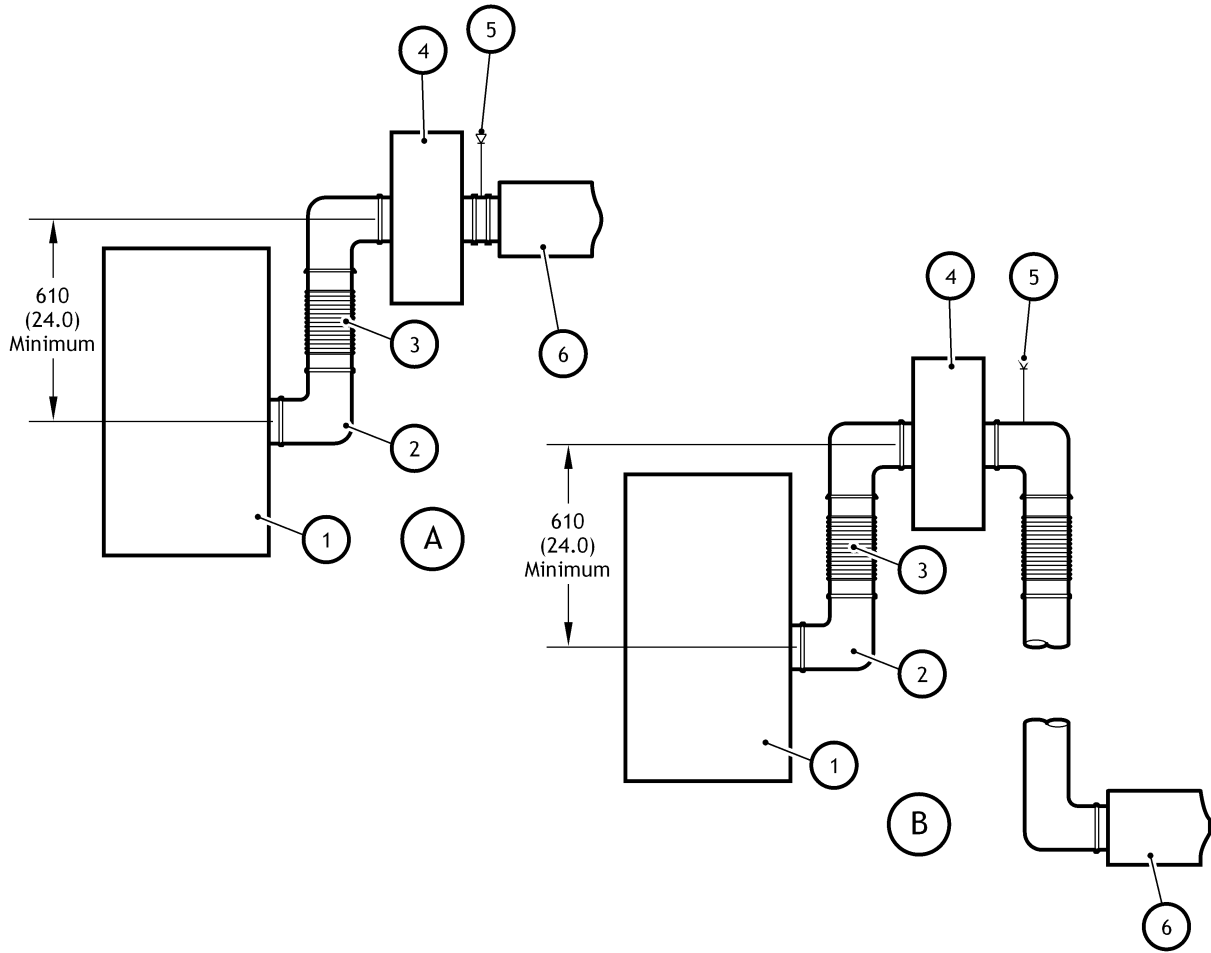
Inlet vacuum piping should be adequately supported. Ensure the piping is secured and will not cause a trip hazard.

CAUTION

Ensure the system to be evacuated and connecting lines are clean and free of weld splatter, dirt or grit. Foreign debris entering the pump can cause failure and possibly damage the internal parts. Adequate traps, filters or screens should be permanently installed if the potential for particles greater than 0.25 mm (0.010") are anticipated on entering the pump. Oil purification is required if a significant amount of particles greater than 0.25 mm (0.010") are pumped. The inlet pressure must not exceed 1.013 bar (760 mm Hg).

All pipe lines should be as short as possible and be no smaller than the inlet to the pump. If long lines can not be avoided, increase the pipe diameter by 50 % or more over the pump inlet diameter. Conductance of long lines must be checked and the line sized large enough, or pumping speed of the system will be negatively impacted. When connecting the pump to the system, provide a vertical pipe at least 610 mm (24.0 inch) long between the pump and the system if the pump inlet is located below the system inlet. If the pump is located above or level with the system inlet, provide an inverted “U” pipe to serve as a trap for system dirt and prevent migration of pump oil toward the system inlet. Ensure all vacuum piping connections are tight. If an inline filter is being used, install according to [Figure 6](#). It is advisable to install a flexible connection between pump inlet and vacuum piping to reduce vibration (See [Figure 6](#)).

A full-opening high vacuum valve is recommended to facilitate start-up and for checking the pump blank off pressure.



dcs/8822/003






Figure 6 – Inlet piping configurations

Reference	Designation	Reference	Designation
(A)	Pump inlet located below system inlet	(1)	GLS pump
		(2)	Close/long radius elbow
(B)	Pump inlet located above or level with system inlet	(3)	Flexible connector
		(4)	In-line filter
		(5)	Vacuum break valve
		(6)	System

3.5.1 Vacuum access port locations

Vacuum access ports are conveniently located on the pump and provide 6.4 mm (1/4 inch) or 12.7 mm (1/2 inch) access (Refer to [Figure 2](#) items 11 and 17 and [Figure 3](#) items 9 and 20). The pipe plugs can be replaced with a small vacuum ball valve to which a gauge can be connected. The gauge should be located approximately 610 mm (24.0 inch) above the port to prevent oil from entering the gauge.

3.6 Exhaust piping

	<p>WARNING</p> <p>Do not block the exhaust of the pump. If this happens, damage to the equipment and injury to personnel can result.</p>
	<p>WARNING</p> <p>Vacuum piping should be adequately supported. Ensure the piping is secured and will not cause a trip hazard.</p>
	<p>WARNING</p> <p>The pump exhaust pressure must not exceed 500 mbar (g) (7 psig). If this happens, damage to equipment and injury to personnel can result.</p>
	<p>WARNING</p> <p>Remove the plastic plug from the exhaust port prior to operating the pump. The pump must not be operated unless it is installed in an appropriate vacuum system.</p>
	<p>WARNING</p> <p>Exhaust filters fitted to GLS 250 and GLS 500 pumps must be drained to prevent hazardous back pressure from developing. Increased back pressure can result in damage to the pump and injury to people.</p>
<p>CAUTION</p> <p>Do not place a valve in the exhaust line. If a valve must be installed in the line, a relief valve must also be inserted between the reservoir and the valve. The relief valve should be equal in size to the line, and set to open at 138 mbar(g) (2 psig).</p>	

The pumps emit tiny oil droplets into the exhaust of the pump. Atlas Copco recommends the use of exhaust filters to prevent these droplets from accumulating in the exhaust piping of the system or where the piping terminates. The oil and condensables will coalesce inside the piping and return to the pump reservoir or be collected inside the filter housing.

For those GLS 250 and GLS 500 pumps that do not use an exhaust filter, it is recommended that the exhaust be piped horizontally a short distance and tied into a vertical exhaust pipe. The lower vertical exhaust pipe must be at least 305 mm (12 inch) long and terminated with a plug or drain cock to allow removal of moisture and/or contaminated oil before it can sufficiently accumulate and drain back into the pump oil reservoir (See [Figure 7](#)).

For GLS 250 and GLS 500 pumps with an exhaust filter, the vertical collection pipe is not required. These filters collect the coalesced oil and condensables inside the filter housing. The housing must be drained of fluids using the drain cocks. Failure to drain the oil from exhaust filters will result in decreased pump performance and significantly increased back pressure.

The exhaust pipe should be no smaller than the pump exhaust outlet and sized as short as possible. Pump exhaust will contain a small amount of oil and should be handled in a manner consistent with applicable federal and local regulations. If exhausted outside the building, point the end of the exhaust pipe downward to prevent the entrance of rain water.

Oil mist separators are available from Atlas Copco which can eliminate oil fog in the majority of applications. The separator will not remove noxious or toxic gases and must be run to a suitable trap. Consult Atlas Copco for recommendations.

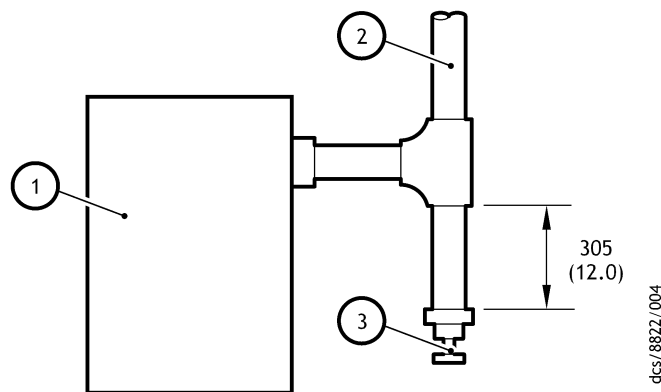





Figure 7 – Exhaust piping

Reference	Designation	Reference	Designation
(1)	GLS pump	(3)	Drain cock
(2)	Vent pipe		

3.7 Electrical connections

	<p>WARNING</p> <p>Install electrical cables while ensuring not to create a trip hazard that could result in injury to personnel.</p>
	<p>WARNING</p> <p>Installation of the electrical connections should be performed by a competent technician familiar with vacuum systems, pumps and controls. The system should be wired as to not create a hazard due to power loss or re-initializing the pump after a power loss. If a power loss occurs, the system should have a manual reset for controls before restart.</p>
	<p>WARNING</p> <p>Ensure that the electrical installation of your pump-motor conforms with your local and national safety requirements. It must be connected to a suitably fused and protected electrical supply and a suitable earth point.</p>

We recommend that you connect the electrical supply to the motor through a starter or a circuit breaker which has thermal over-current protection which can be adjusted to suit the full-load current ratings shown on the motor rating plate. The fuse ratings must be calculated by a qualified electrician. The supplier of your thermal over-current protection device may specify fuse ratings to ensure correct operation of the over-current protection device. Ensure that the fuse you use is suitable for the starting currents given on the motor rating plate.

CAUTION

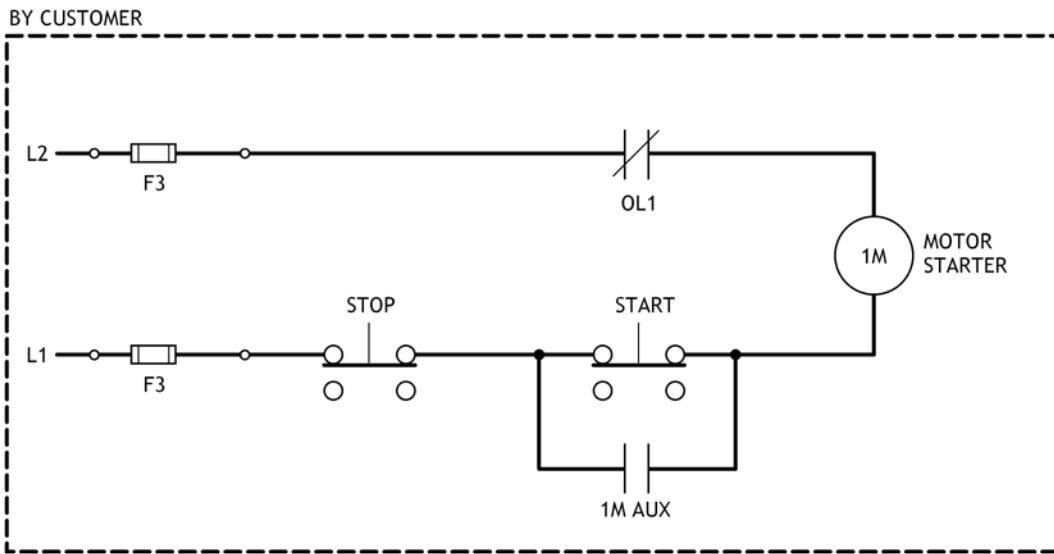
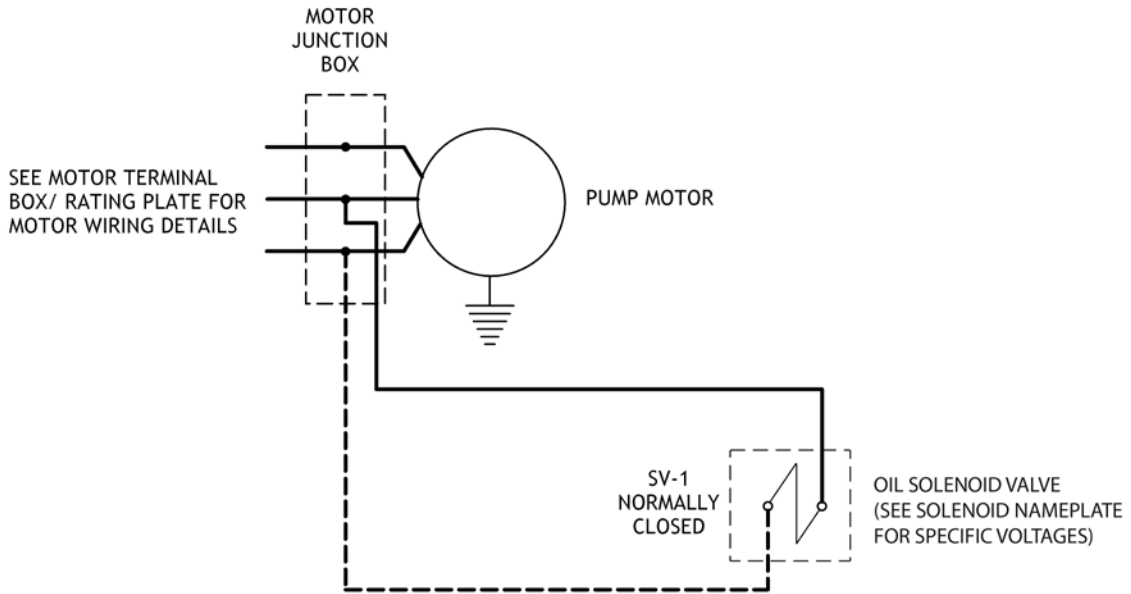
Ensure proper voltage, starters and overloads are supplied to the motor, and proper voltage supplied to the solenoid coil. The pump and/or solenoid may fail to operate if voltage is less than 90 % of rated.

The pump electrical schematic is shown in [Figure 8](#).

Install a motor starter with safety device within easy reach of the operator.

Connect the solenoid valve(s).

Connect the motor so that the pump shaft rotates clockwise when viewed from the drive end. See [Section 4.1](#) for pre-start check procedures.




dcs/8822/005

Figure 8 – Electrical schematic

Reference	Designation	Reference	Designation
L	Leg	M Aux	In-line filter
F	Fuse	OL	Overload
M	Motor contactor	SV	Solenoid valve

3.8 Cooling

	<p>WARNING</p> <p>The temperature of the external pump surfaces can exceed 60 - 70 °C (140 - 158 °F) and cause injury to personnel. Hot surfaces can be found where the pump lubricant is located.</p>
---	---

<p>CAUTION</p> <p>Do not start the pump if the oil temperature is below 12 °C (54 °F).</p>

The GLS pump is water cooled and must be connected to a water supply.

The 1/2 inch NPT water inlet connection is located in the pump housing on the drive side near the bottom (Refer to [Figure 2](#) item 14 and [Figure 3](#) item 18).

A valve is inserted in the water inlet line to regulate water flow so that the temperature of the oil in the reservoir is 60 - 70 °C (140 -158°F). If the pump is located outside a building and subjected to freezing temperatures, the pump water jacket should be drained or filled with anti-freeze.

The 1/2 inch NPT water outlet is located in the pump housing (Refer to [Figure 2](#) item 18 and [Figure 3](#) item 11).

The water outlet should be connected to an open drain to permit the operator to check the flow and temperature of the outlet water periodically. There should not be a valve or back pressure in the drain line. In some cases, cooling water must be discharged to a pressure drain. In such cases, discharge pressure must not exceed 2.41 bar(g) (35 psig) and no block valve should be placed in discharge line unless a 2.41 bar(g) (35 psig) relief valve is provided to protect pump from high inlet pressure.

NOTE


If condensables are present in the process gas and gas ballast is operating, the cooling water supply should be adjusted to raise the operating temperature to the level for gas ballast (Refer to [Section 4.3](#)).

3.9 Pump lubrication

The performance of this pump depends largely on the type of oil used. An initial charge of oil is included with each pump. This standard oil is V-Lube F which is recommended for general operating conditions in a relatively clean environment. V-Lube F is a multi-grade petroleum oil fortified for oxidation protection, containing detergent dispersants with excellent flow characteristics at low temperature.

Special operating conditions may require the use of special oils. Consult Atlas Copco for specific recommendations when oils other than regular hydrocarbon oils are being used.

3.9.1 Initial oil fill

	<p>WARNING</p> <p>The oil fill plug on the top of the pump serves a dual purpose. It is an oil fill port and an over-pressure device that opens at between 552 and 966 bar(g) (8 and 14 psig). This device is to protect the pump from oil box over-pressure and possible side cover fracture. The GLS 500 pumps are fitted with two oil fill plugs, ensure at least one of these is free from obstruction i.e. not connected to anything.</p>
---	---

<p>CAUTION</p> <p>Starting the GLS pump when the oil temperature is below 12 °C (54 °F) can result in motor over-load.</p>

The GLS pump is shipped with an initial charge of oil; 15 litres (4.0 gallons) for the GLS 250 and 45 litres (12 gallons) for the GLS 500. Before connecting the suction manifold, slowly rotate the pump through two (2) revolutions. This will distribute the oil throughout the pump interior.

4 Operation

4.1 Pre-start check

CAUTION

If the oil flow paddle wheel does not rotate, stop the pump immediately. Check the operation of the solenoid. If the solenoid is operating correctly, check the oil lines for blockage.

NOTE

Momentarily jog the pump for at least two revolutions.

Jog the motor momentarily while observing pump rotation. If the pump does not rotate in a clockwise direction, interchange any two of the three-phase leads.

Ensure the oil solenoid valve operates properly by checking the oil flow indicator. The paddle wheel should rotate after system pressure is below 800 mbar(a) (600 mm Hg). Solenoid operation is also apparent as it will create a magnetic field and become warm.

The oil solenoid valve is normally closed and must be energized when the pump starts.

The pressure differential between the oil reservoir (atmospheric pressure) and the pump cavity (vacuum) forces the oil to the bearings and into the pump cavity. The oil lubricates the moving parts and also creates an oil seal.

Oil starts to flow at 800 mbar(a) (600 mm Hg). At 533 mbar(a) (400 mm Hg) the flow is approximately 50%. From 133 mbar(a) (100 mm Hg) to blank-off, flow is 100%.

NOTE

533 mbar(a) (400 mm Hg) must be reached within 10 minutes or a force-feed lubrication system is required to provide adequate oil flow to the pump cavity.

4.2 Pump start

**WARNING**

Solenoid may become hot during operation.

CAUTION

Do not start the pump if the oil temperature is below 12 °C (54 °F).

NOTE

New belts usually lose some tension during initial operation and should be re-checked during the first few days of operation. Always tension the belts according to the specifications of the belt manufacturer. Excessive tension can induce unnecessary loading on the blower bearings, while extreme over-tensioning may cause the shaft to break as a result of fatigue.

1. Turn on the cooling water supply.
2. Ensure the equipment being evacuated is properly cleaned and all vacuum breaks are closed.
3. Depress the **START** button and check the solenoid valve for proper operation.
4. Open the pump inlet valve.

4.3 Gas ballast operation

CAUTION

When opening gas ballast valve, do not open past third marking on valve stem (See [Figure 9](#)).

Open the gas ballast valve for maximum efficiency. Adjust the ballast by turning the valve for desired rate. Full gas ballast will cause pump temperature to rise and is normal. For maximum effect of gas ballast, pump should operate at approximately 60 - 70 °C (140 - 158 °F). The operating temperature can be raised by throttling the cooling water.

If pumping water vapour in excessive quantities, the oil may become contaminated. The oil can be purified by running the pump with full gas ballast while the pump is isolated from the system. When excessive contaminants are present, indicated by high oil level, or thinning, formation of varnish, etc., the oil should be replaced.

NOTE

For dirty applications where condensable contaminants (asphalt, pitch, epoxies, etc.) other than water vapour are present, the pump should be operated near 60 - 70 °C (140 - 158 °F).

Switch on inert gas purge to remove air from the pump and exhaust pipeline before the process starts.

NOTE

Atlas Copco recommends obtaining and reading the Vacuum Pump and Vacuum System Safety manual available from Atlas Copco or the supplier.

- The gas ballast check valve should be inspected every six months for wear or a broken spring when operating on an eight (8) hour a day basis; 3 months for twenty-four (24) hour a day operation.
- The gas ballast valve should be closed when the pump is stopped. If the valve is open, gas will be drawn into the pump through the check valve and the vacuum manifold will be pressurized with atmospheric air. If desired, a solenoid valve attached to the gas ballast inlet and electrically connected to the motor leads can be used to turn off the gas ballast automatically on pump shutdown. Contact Atlas Copco for additional information.

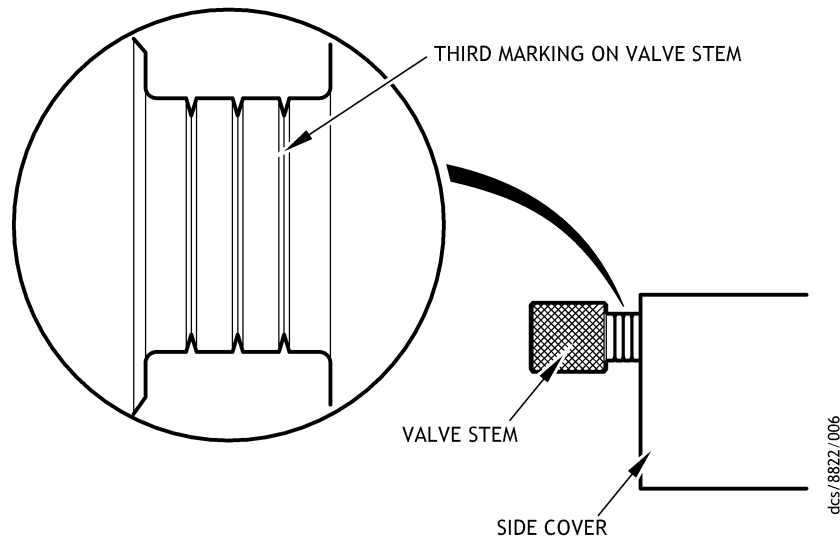


Figure 9 – Gas ballast setting

- When a pressurized gas is used to ballast the pump, the pressure must be reduced to 138 mbar(g) (2 psig) maximum. The use of higher pressures may damage the pump.
- Opening the gas ballast slightly will quiet discharge valve noise when the pump is blanked off, but will prevent reaching the lowest ultimate pressure.
- To maintain a low blank-off noise level on a continuous basis, the valve seal washer can be removed from the valve stem. This will provide a small amount of ballast at all times even when the valve is fully closed. It will also break vacuum when the pump is stopped. If the vacuum break is not permissible, solenoid valves may be installed. With the washer removed and with the gas ballast valve closed, blank-off pressure will be approximately 0.26 mbar(a) (200 microns Hg) . The seal washer can be reinstalled when ballast on a continuous basis is no longer required. Care should be taken not to damage the seal washer if reinstallation is anticipated.

4.4 Pump stop

- Close the inlet valve to system.
- Stop the motor and break vacuum unless system dictates otherwise.

NOTE

The oil solenoid valve closes automatically when the pump is stopped or a power failure occurs. This will prevent the pump and vacuum system from being flooded with oil.

4.5 Operating notes

**WARNING**

The oil fill plug on the top of the pump serves a dual purpose. It is an oil fill port and an over-pressure device that opens at between 552 and 966 mbar(g) (8 and 14 psig). This device is to protect the pump from oil box over-pressure and possible side cover fracture. The GLS 500 pumps are fitted with two oil fill plugs, ensure at least one of these is free from obstruction i.e. not connected to anything.

If large amounts of air pass through the pump, it may become warm and, under severe conditions, hot. This is not an indication of malfunction. The pump is designed for high vacuum work and should not be operated at pressures greater than 533 mbar(a) (400 mm Hg) for more than 10 minutes or at intermediate vacuums for periods which cause oil temperature to exceed 93 °C (200 °F).

For optimum pump operation, the oil temperature in the oil reservoir should be 60 - 70 °C (140 - 158 °F) with the pump operating on the system or process. Oil temperature can be measured by inserting a thermometer in the fill hole or by contact pyrometer on oil block near the solenoid. If the pump is to be operated with oil temperature in excess of 60 - 70 °C (140 - 158 °F), the use of a heavier viscosity oil is recommended.

When starting the pump or handling large amounts of air, oil mist will be released from the exhaust. This is not an indication of trouble. The volume of oil mist will decrease as the pressure in the system decreases.

NOTE


Atlas Copco offers a closed type oil mist separator that will eliminate exhaust oil smog but still requires exhausting to outside. Contact an Atlas Copco representative for information.

If the pump has been shut down for an extended period of time, it will be necessary to turn the pump over at least two (2) revolutions by momentarily jogging before starting to insure the free movement of parts.

Low oil temperature can cause overloading when starting the pump and possibly prevent the pump from sealing. GLS pumps should not be started when the oil temperature is below 12 °C (54 °F). Optimum operating oil temperature after starting is between 60 - 70 °C (140 - 158 °F). Opening the gas ballast valve will help to warm the oil. A water miser is provided to automatically control the oil temperature.

5 Maintenance

5.1 Safety information

	<p>WARNING</p> <p>Obey the safety instructions given below and take note of appropriate precautions. If not, injury to people and damage to equipment can occur.</p>
---	--

- Ensure that maintenance is performed by a suitably trained and supervised technician. Obey local and national safety requirements.
- Ensure that the maintenance technician is familiar with the safety procedures which relate to the pump oil and the products processed by the pumping system.
- Check that all the required parts are available and of the correct type before work is started.
- Isolate the pump and other components from the electrical supply so that they cannot be operated accidentally.
- Allow the pump to cool (so that it is at a safe temperature for skin contact) before maintenance work is started.
- Do not reuse O-rings and seals if damaged.
- After maintenance is complete, recheck the direction of pump rotation if the electrical supply has been disconnected.
- The pump and pump oil will be contaminated with the process chemicals that have been pumped during operation. Ensure that the pump is decontaminated before maintenance and that adequate precautions to protect personnel from the effects of dangerous substances if contamination has occurred.
- Do not touch or inhale the thermal breakdown products of fluorinated materials which may be present if the pump has been heated to 310 °C (590 °F) and above. Fluorinated materials are safe in normal use but can decompose into very dangerous substances (which may include hydrofluoric acid) if heated to 310 °C (590 °F) and above. The pump may have overheated if it was misused or if it was in a fire.
- If necessary, maintain the motor as specified in the manufacturers information supplied with the motor.

5.2 Leak detection

A leak test should be performed if ultimate vacuum cannot be achieved. A proper leak test will isolate sections of the piping until the leak-source is found. The standard vacuum piping is shown in [Figure 10](#). The use of a leak detector will speed the process for detecting leaks.

5.3 Maintenance plan

A typical maintenance plan for the GLS pump is provided in [Table 5](#).

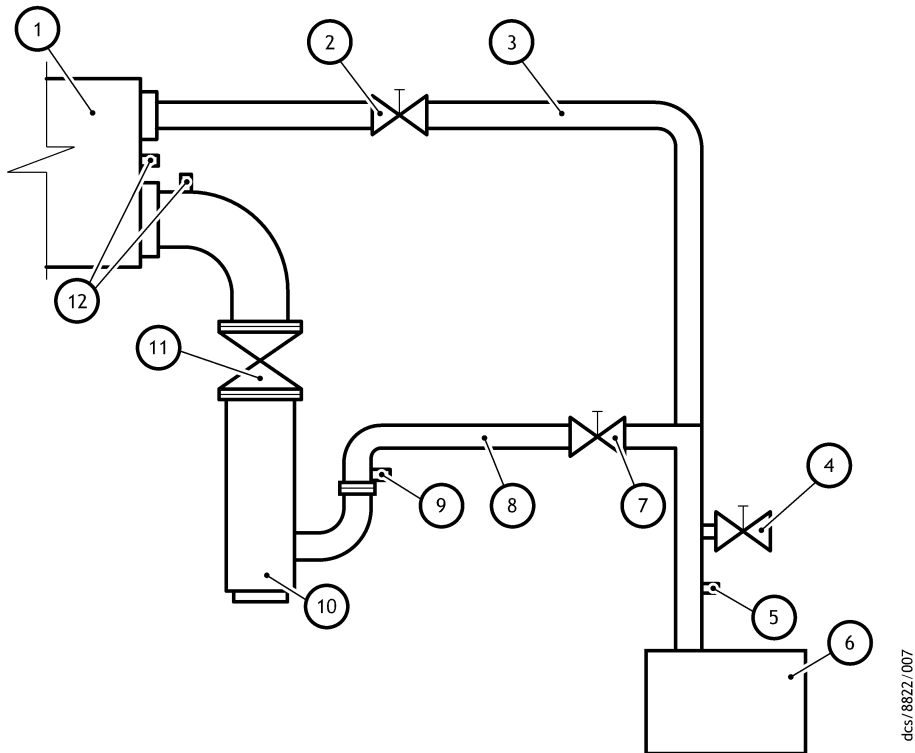


Figure 10 – Typical vacuum system piping

Reference	Designation	Reference	Designation
(1)	Vacuum chamber	(7)	Optional foreline valve connection location
(2)	Roughing valve	(8)	Optional hold pump connection location
(3)	Roughing line	(9)	Gauge port
(4)	Air inlet valve	(10)	Vapour pump
(5)	Gauge port	(11)	Valve
(6)	Mechanical fore pump	(12)	Alternate chamber gauge port location

Table 5 – Maintenance plan


Operation	Frequency
Inspect oil level	Daily
Check operating temperature 60 - 70 °C (140 - 158 °F)	Daily
Replace oil	Application dependent

Table 5 – Maintenance plan (continued)

Operation	Frequency
Inspect valve decks	6 months
Inspect pulleys and belts	6 months
Inspect gas ballast valve	6 months
Inspect bearing condition	12 months
Clean the motor and drive	12 months
Inspect taper lock bushings on pulleys	After break in and 12 months

5.4 Oil change

	<p>WARNING</p> <p>Oil will be hot if pump was just operating. Allow sufficient time for the pump to cool prior to changing oil.</p>
---	--

	<p>WARNING</p> <p>The oil fill plug on the top of the pump serves a dual purpose. It is an oil fill port and an over-pressure device that opens at between 552 and 966 mbar(g) (8 and 14 psig). This device is to protect the pump from oil box over-pressure and possible side cover fracture. The GLS 500 pumps are fitted with two oil fill plugs, ensure at least one of these is free from obstruction i.e. not connected to anything.</p>
--	--

- Lockout all energy sources connected to the pump and vent to atmosphere.
- Review the process contaminants and select proper personal protective equipment (PPE) to protect against media contact.
- Using the drain valve, drain the oil into a suitable container for disposal. Use only Atlas Copco recommended oils when refilling the pump. Refer to [Section 3.9](#) for fluid type and quantities. Fill the pump until the sight glass reaches the 3/4 mark.
- Check the pump and system for potential hazardous conditions. Restore energy sources.

5.5 Oil level check

- Check oil level daily. The oil level should be at center of sight glass when the pump is off or in lower half while pump is operating at high vacuum. The level will change depending on inlet pressure. In most cases, oil is added after operating the pump for a short period of time.
- To avoid the loss of oil out the fill hole, do not add oil to the pump when in operation.

NOTE

When pumping gases that contain water vapour, it may be necessary to remove the water that condenses in the pump reservoir sump. Stop the pump and wait at least 1/2 hour for the oil and water to separate. Open the oil drain valve and drain water; close the valve when oil flow starts. The interval is process dependent and varies with the amount of water vapour and oil temperature. Operating the pump with the oil temperature near 60 - 70 °C (140 - 158 °F) will minimize formation of water but not eliminate it.

Water entrapped in the oil will decrease ultimate vacuum and increase pumpdown times. The presence of water in the oil is evident by a milky appearance of the oil when running.

5.6 Valve deck maintenance

- Lockout all energy sources connected to the pump.
- Drain the oil as described in [Section 5.4](#).
- Remove the reservoir cover, oil baffle, and each valve deck while being very careful not to drop any hardware inside the pump.
- Replace worn valve deck or valve deck parts. Reinstall valve decks with new gaskets. Reinstall oil baffle with new gasket.
- Reinstall oil reservoir cover.
- Refill the oil as described in [Section 5.4](#).
- Check the pump and system for potential hazardous conditions. Restore energy sources.

5.7 Belt maintenance

- Lockout all energy sources connected to the pump and vent to atmosphere.
- Remove the belt guard cover.
- Test the belt tension with proper tester.

NOTE

New belts usually lose some tension during initial operation and should be re-checked during the first few days of operation. Always tension the belts according to the specifications of the belt manufacturer. excessive tension can induce unnecessary loading on the pump and motor bearings, while extreme over-tensioning may cause the shaft to break as a result of fatigue.

- Replace worn pulleys.

- Replace all belts at one time when any one requires changing. Check tension frequently during the first few days of operation. Never apply belt dressing. If customer supplied belt or pulleys are used, follow the manufacturer's recommended installation procedures.
- Reinstall belt guard cover.
- Check the pump and system for potential hazardous conditions. Restore energy sources.

5.8 Drive belt tension

Remove the belt guard. At approximately the center of the span between drive and driven pulleys, apply force to the belt and ensure the resulting deflection provided in [Table 6](#).

Table 6 – Belt tension

Pump	Force		Deflection	
	N	Pounds	mm	Inches
GLS 250	13.3 - 22.2	3 - 5	11.0	7/16
GLS 500	22.2 - 31.2	5 - 7	13.0	1/2

If necessary, adjust the tension by raising or lowering the nuts on the motor support jack screws. Tighten the jackscrew nuts securely after adjustment is complete.


NOTE

Maintenance of proper belt tension is important. Excessive over-tightening of the belts is harmful to the shaft bearings, while under-tightening will allow the belts to slip.

5.9 Gas ballast check valve replacement

- Replace the gas ballast valve(s) every two (2) years, if gas ballast is used on a regular basis.
- Lockout all energy sources connected to the pump.
- Remove the stem valve.
- Use an O-ring pick or suitable tool to pull out the gas ballast check valve. Replace the valve if the spring is damaged or broken.
- Reinstall the stem valve.
- Check the pump and system for potential hazardous conditions. Restore energy sources.

5.10 Fitment or replacement of the motor (GLS 500 models only)

	<p>WARNING</p> <p>A new safety review may be required following fitment of any motor. Particular attention should be made to the effectiveness of the drive guard to restrict finger access to the motor shaft and all other rotating parts.</p>
---	---

The following motors can be fitted to GLS 500 Pump Modules with the Universal Motor Mounting Platform attached.

Table 7 – Motors that can be fitted to GLS 500 pump models

Motor Frame Size	Line frequency	Motor Pulley	Collar Bolt Position	Platform Nominal Inclination	Drive Belt Size
IEC D160M	50 Hz	6 inch	A	-0.5 °	L = 2720 mm
	60 Hz	5 inch	B	-4.1 °	
NEMA 215T	50 Hz	6 inch	C	-7.7 °	L = 2720 mm
	60 Hz	5 inch	C	-3.0 °	
NEMA 254T	60 Hz	5 inch	B	-4.0 °	L = 2720 mm

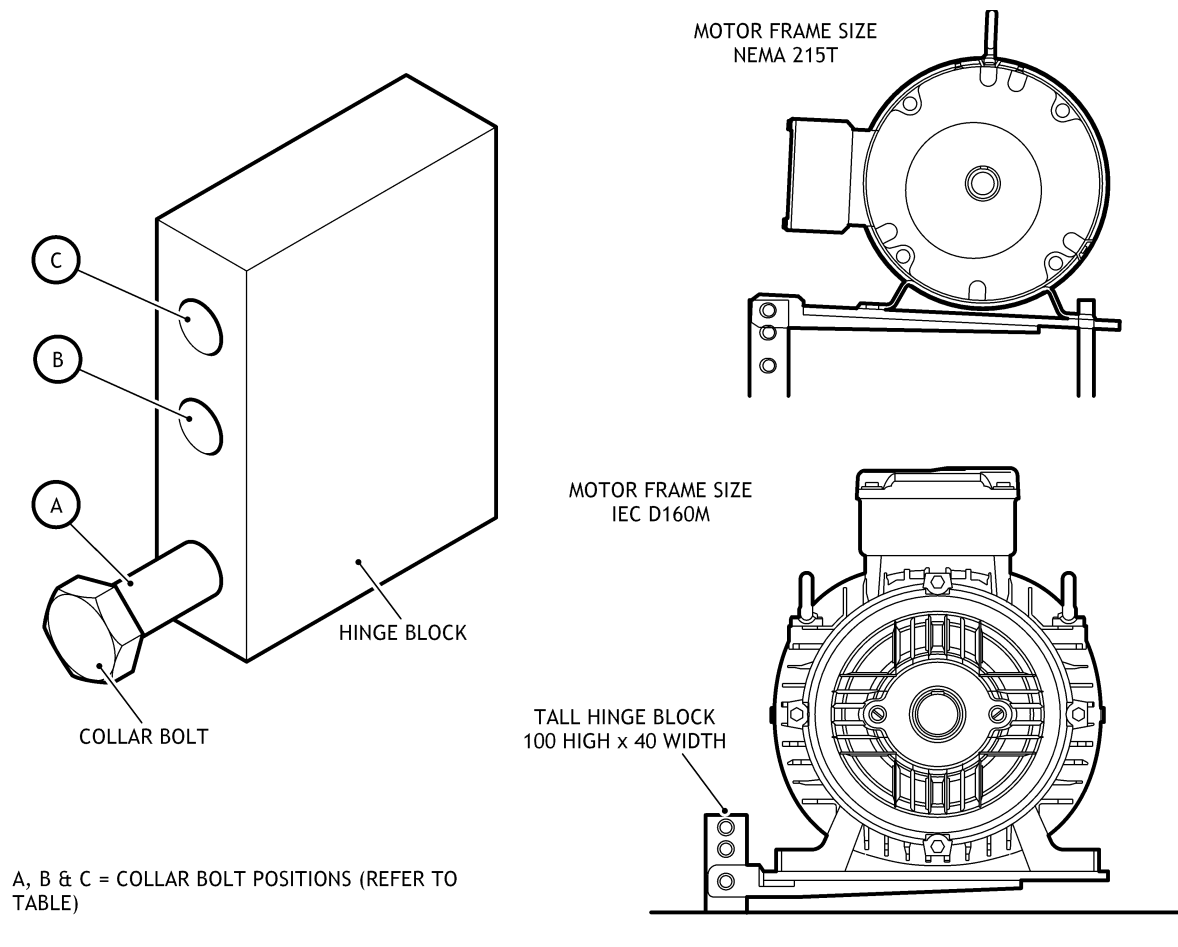


Figure 11 – Collar bolt positions and motor frame sizes

5.11 Fault finding

A list of fault conditions and possible causes is provided in [Table 8](#). If unable to rectify the fault using the table, call your nearest Atlas Copco Customer Center for help.

Table 8 – Fault finding guide

Symptom	Probable Cause	Recommended Solution
Unsatisfactory Vacuum at Pump Inlet	Contaminated or insufficient oil.	Check oil level; utilize gas ballast. Drain and wipe out reservoir and valve chamber. Refill with proper oil.
	Solenoid oil valve not operating properly or inoperative.	Check and if necessary, clean and/or replace solenoid valve or coil.
	Intake flange or cover bolts are loose.	Tighten flange and side cover bolts at regular intervals.
	Oil manifold or integral oil distribution leaking.	Tighten plugs and manifold screws.
	Oil level sight glass leaking.	Carefully tighten screws.
	Exhaust valve not sealing.	Disassemble, clean and check all parts thoroughly. Replace any damaged or worn parts.
	Pump seizes or knocks excessively; internal parts severely worn or broken.	Disassemble piston assembly. Replace broken or worn parts.
Leakage in vacuum system.	Check system as described in Section 5.2 .	

Table 8 – Fault finding guide (continued)

Symptom	Probable Cause	Recommended Solution
Excessive Pump Noise	<p>Pump knocking abnormally.</p> <p>Pump seizure resulting from insufficient lubrication or presence of foreign material.</p>	<p>Knocking is normal at blank-off.</p> <p>Check oil level and oil solenoid valve for proper operation.</p> <p>Broken parts or foreign material in the pump.</p> <p>Disassemble and remove foreign material in the pump.</p> <p>Replace broken parts as required.</p> <p>Check solenoid valve for proper operation.</p> <p>Disassemble and remove foreign material. Ensure oil lines are not clogged.</p> <p>Smooth minor scoring with #500 emery cloth and wash thoroughly then oil before installing. Note: a certain amount of scoring to the piston, cylinder and other parts usually will not seriously affect the vacuum obtainable so long as scoring is not in a continuous gouge around the circumference of the piston surface.</p>
Motor stops or will not start.	<p>Thermal overload units in motor starter fail.</p> <p>Possible internal seizure.</p>	<p>Check Capacity of thermal overload units by comparing ampere rating on motor nameplate with overload table inside starter box. If necessary, use one (1) size larger than standard.</p> <p>Disassemble and correct.</p>

Table 8 – Fault finding guide (continued)

Symptom	Probable Cause	Recommended Solution
Pump does not turn when motor starts.	<p>V-belts too loose.</p> <p>Cylinder flooded with excessive oil due to defective solenoid valve (Valve stuck in open position from previous shutdown, or foreign material in valve seat).</p> <p>Oil viscosity too high or oil temperature too low.</p> <p>Pulley(s) not keyed to shaft.</p>	<p>Tighten V-belts (see Section 5.8).</p> <p>Turn pump over by hand to remove excess oil. Disassemble valve, clean and replace any worn parts. Check solenoid.</p> <p>Change to lighter grade oil or warm oil before filling pump (especially with low ambient temperatures). Pump should not be started when oil temperature is less than 12 °C (54 °F) (When using V-lube F).</p> <p>Turn pump over by hand before starting.</p> <p>Ensure keys are in place and pulley(s) properly tightened.</p>
Pump turns in reverse direction when motor is turned off.	Gas ballast valve in open position on pump shut down.	Close gas ballast valve prior to pump shut down. Atmospheric air prevents reversing direction of pump piston on pump shutdown. Oil will also be prevented from back-streaming into inlet piping.

6 Storage and disposal

6.1 Storage

CAUTION

Observe the storage temperature limits stated in [Section 2](#). Storage below -30 °C (-22 °F) will permanently damage the pump seals.

Use the following procedure to store the pump:

- Purge the vacuum system and the pump with dry nitrogen and disconnect the pump from the vacuum system.
- Shut down the pump as described in [Section 4.4](#).
- Disconnect the pump from the electrical supply.
- Disassemble, clean and reassemble the pump. If the pump is to be stored for long periods, loosen the drive belts and change the oil.
- Place and secure protective covers on the inlet and exhaust ports.
- Store the pump in cool, dry conditions until it is required for use. When required, prepare and install the pump as described in [Section 3](#). If the pump will be subjected to temperatures below freezing, drain or add anti-freeze to the water jacket. If the pump will be stored for more than a year, the pump must be cleaned and overhauled before re-installation.

6.2 Disposal

Dispose of the pump or any components removed from it safely in accordance with local and national safety and environmental requirements.

Particular care should be taken with components and waste oil which have been contaminated with dangerous process substances.

Do not incinerate fluoroelastomer seals and O-rings.

7 Spares and accessories

7.1 Introduction

Atlas Copco products, spares and accessories are available from Atlas Copco Customer Centres a worldwide network of distributors.

Order spare parts and accessories from the nearest Atlas Copco Customer Centre or distributor. When ordering, provide the following information:

- Model and Item Number of equipment.
- Serial number.
- Item number and description of part.

7.2 Service

Atlas Copco products are supported by a worldwide network of Atlas Copco Customer Centres.

For more information about service options, contact your local Atlas Copco Customer Centre.

7.3 Spares

Refer to the corresponding Atlas Copco parts list.

7.4 Accessories

The following is a list of accessories that can be purchased by contacting Atlas Copco.

Table 9 – Accessories

Accessories	Item number
Oil mist separator (GLS 250)	8092 3006 75
Oil mist separator (GLS 500)	8092 3006 83

This page has been intentionally left blank.

Sustainable Productivity

We stand by our responsibilities towards our customers,
towards the environment and the people around us.
We make performance stand the test of time.
This is what we call - Sustainable Productivity.

Atlas Copco AB
(publ) SE-105 23 Stockholm, Sweden Phone: +46 8 743 80 00
Reg. no: 556014-2720 www.atlascopco.com

The Atlas Copco logo consists of the company name in a stylized, italicized serif font, centered between two horizontal white bars on a blue background.

Atlas Copco