

Operating Instructions

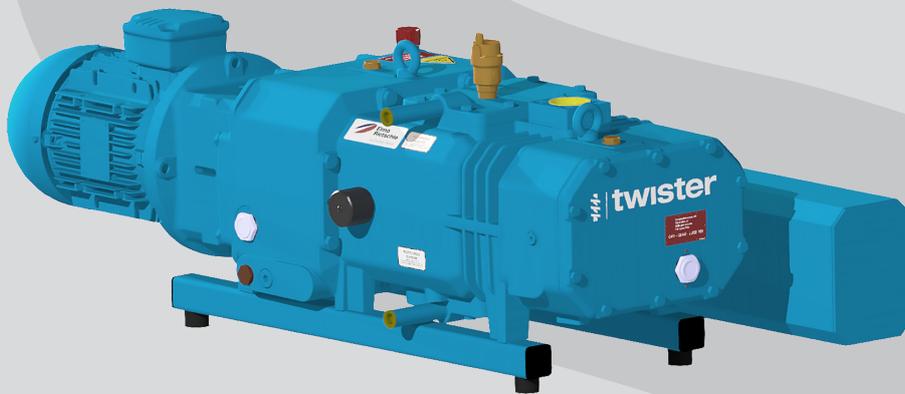
S-VSI 100 OXY

Vacuum pump



**Elmo
Rietschle**

by Gardner Denver



**S-Serie
S Series**

Schraube
Screw



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Preface

1 Foreword

1.1 Principles

These Operating Instructions:

- Are a part of the following screw vacuum pumps of the type S-VSI 100 OXY
- Describes how to use them safely and properly in all life phases
- Must be available where the equipment is used.

1.2 Target group

The target group for these instructions is technically trained personnel.

1.3 Supplier documentation and accompanying documents

Document	Contents	No.
Supplier documentation	Operating Instructions	BA 833-OXY
	Declaration of Conformity	C 0084
	Declaration of no-objection	7.7025.003.17
Spare parts list	Spare parts documents	E 833-OXY
Data sheet	Technical data and characteristic curves	D 833-OXY
Info sheet	Storage guideline for lubricants	I 100
	Storage guideline for machines	I 150
	Recommended water quality	I 832
Manufacturer's declaration	EU Directive 2011/65/EU (RoHS II)	—

1.4 Abbreviations

Fig.	Figure
S-VSI	Vacuum pump
m ³ /h	Pumping capacity
mbar (abs.)	Final vacuum, operating vacuum

1.5 Directives, standards, laws

See Declaration of Conformity.

1.6 Symbols and meaning

Symbol	Explanation
	Instructions, action
a), b),...	Instructions in several steps
	Results
	Reference
<p>Warning signs</p>      	<p>Obey all safety instructions with this symbol in order to avoid injury or death.</p> <p>Warns of potential risk of injury</p> <p>Warns of electrical voltage</p> <p>Warns of suspended loads</p> <p>Warns of hot surface</p> <p>Warns of automatic or unexpected start-up of the machine</p> <p>Warning of potentially explosive substances and mixtures</p>
<p>Mandatory signs</p>      	<p>Obey all instructions with this symbol in order to avoid injury or death.</p> <p>Observe the Operating Instructions</p> <p>Wear eye protection</p> <p>Wear protective gloves</p> <p>Wear safety shoes</p> <p>Wear ear protection</p> <p>Disconnect the plant and secure it against unexpected restart</p>
	Information, note
	Protection of environment

1.7 Specialist terms and meaning

Term	Explanation
Machine	Pump and motor combination ready for connection
Motor	Pump drive motor
Vacuum pump	Machine for creating underpressure (vacuum)
OXY	Vacuum pumps for delivering gases with increased percentage of oxygen and other oxidising agents
Screw	Design or operating principle of the machine
Suction capacity	Vacuum pump volume flow related to the condition in the inlet connection
Final pressure (abs.)	The maximum vacuum that a pump reaches when the inlet opening is closed, indicated as absolute pressure
Permanent vacuum	Vacuum or the inlet pressure range, at which the pump operates in continuous operation. The permanent vacuum or inlet pressure is \geq than the final vacuum and $<$ than the atmospheric pressure.
Noise emission	Noise emitted at a specific loading state indicated as a numeric value, sound pressure level dB(A) as per EN ISO 3744.

1.8 Copyright

Passing on or copying this document, using and providing information on its contents is prohibited unless expressly permitted. Contraventions will lead to claims for damages.

2 Safety

The manufacturer is not responsible for damage due to non-observance of the whole documentation.

2.1 Labelling of warnings

Warning	Danger level	Consequences of non-observance
	Imminent danger	Death, severe bodily injury
	Possible imminent danger	Death, severe bodily injury
	Possible hazardous situation	Slight bodily injury
	Possible hazardous situation	Material damage

2.2 General

These operating instructions contain basic instructions for installation, commissioning, maintenance and inspection work which must be obeyed to ensure the safe operation of the machine and prevent physical and material damage.

Observe the safety instructions in all chapters.

The operating instructions must be read by the responsible technical personnel / user before installing and commissioning and must be fully understood. The contents of the operating instructions must always be available on site for the technical personnel/user. Instructions attached directly to the machine must be obeyed and must always remain legible. For example, this applies:

- Symbols for connections
- Data plate and motor data plate
- Information signs and warning plates

The user is responsible for observing local regulations.

2.3 Intended use

The machine must only be operated in such areas as are described in the operating instructions:

- Only operate the machine in technically perfect condition
- Do not operate the machine when it is only partially assembled
- The machine must only be operated at an ambient temperature and inlet temperature of between 5 and 40 °C
Please contact us for temperatures outside this range.
- The machine may pump, compress or extract the following media:
 - All non-explosive, non-combustible, non-aggressive and non-poisonous dry gases and gas-air mixtures
 - It can also pump extremely damp gases. Water vapour compatibility is very high.
 - It is suitable for exhausting air or other gases with increased percentage of oxygen (content by volume > 21 % and < 60 %) and other gaseous oxidising agents.

If used under critical conditions and/or in case of any doubts, contact the manufacturer. If this is not observed, this can cause personal injuries and property damage.

Safety

2.4 Inadmissible operating modes

- Exhausting, conveying and compressing of explosive, inflammable, aggressive, or poisonous media, e.g. dust as per ATEX zone 20-22, solvents
- Using the machine in non-commercial plants unless the necessary precautions and protective measures are taken in the plant
- Installation in potentially explosive environments
- Using the machine in areas with ionising radiation
- Back pressures on the outlet side:
S-VSI 3.0 kW > +0.2 bar
- Modifications to machine and accessories

2.5 Personnel qualification and training

- Ensure that people entrusted with working on the machine have read and understood these operating instructions before starting work, particularly the safety instructions for installation, commissioning, maintenance and inspection work
- Manage the responsibilities, competences and monitoring of personnel
- All work must only be carried out by technical specialists:
 - Installation, commissioning, maintenance and inspection work
 - Work on the electrical system
- Personnel being trained to work on the machine must be supervised by technical specialists when working on the machine

2.6 Safety-conscious working

The following safety regulations apply in addition to the safety instructions and intended use listed in these instructions:

- Accident prevention regulations, safety and operating regulations
- Standards and laws in force

2.7 Safety instructions for the user

- Hot parts of the machine must not be accessible during operation or must be fitted with a guard
- Persons must not be endangered by the free extraction or discharge of pumped media
- Risks arising from electrical energy must be eliminated
- The machine must not come into contact with flammable materials.
Risk of fire due to hot surfaces, output of hot pumped media or cooling air

2.8 Safety instructions for installation, commissioning and maintenance

- The user ensures that any installation, commissioning and maintenance work is carried out by authorised, qualified specialists who have gained sufficient information by an in-depth study of the operating instructions
- Only work on the machine when it stands still and is secured against accidental switching on
- Strictly observe the procedure for decommissioning the machine described in the operating instructions
- Fit or start up safety and protective devices again immediately after finishing work. Before recommissioning, follow the instructions listed for commissioning
- Alteration works or modifications to the machine are only permissible with the manufacturer's consent
- Only use original parts or parts approved by the manufacturer. The use of other parts may void the liability for any resulting consequences
- Keep unauthorised people away from the machine

2.9 Guarantee terms

The manufacturer's guarantee will no longer apply in the following cases:

- Not intended use
- Nonobservance of these instructions
- Operation by insufficiently qualified staff
- Using spare parts that have not been approved by **Gardner Denver Schopfheim GmbH**
- Unauthorised modifications to the machine or the accessories supplied by **Gardner Denver Schopfheim GmbH**

3 Transport, storage and disposal

3.1 Transport

3.1.1 Unpacking and checking the as-delivered condition

- Unpack the machine on receipt and check for transport damage. Sealing plugs must be undamaged.
- Immediately notify the manufacturer of transport damages.
- Dispose of the packaging in accordance with the local regulations in force.

3.1.2 Lift and transport



WARNING



Death by falling down or tipping over of the transported goods!

Falling down or tipping over of transported goods can cause serious or fatal injuries. Limbs can be crushed.

- Select the lifting device according to the total weight to be transported.
- Secure the machine against tipping over and falling.
- Do not stand underneath a suspended load.
- Put the goods to be conveyed on a horizontal base (max. inclination: 10° in all directions).



WARNING

Bodily injury resulting from improper operation!

Improper operation of the lifting gear and the transported goods can cause serious or fatal injuries.

- Loads crosswise to the eye bolt are not permitted.
- Avoid impact stress.

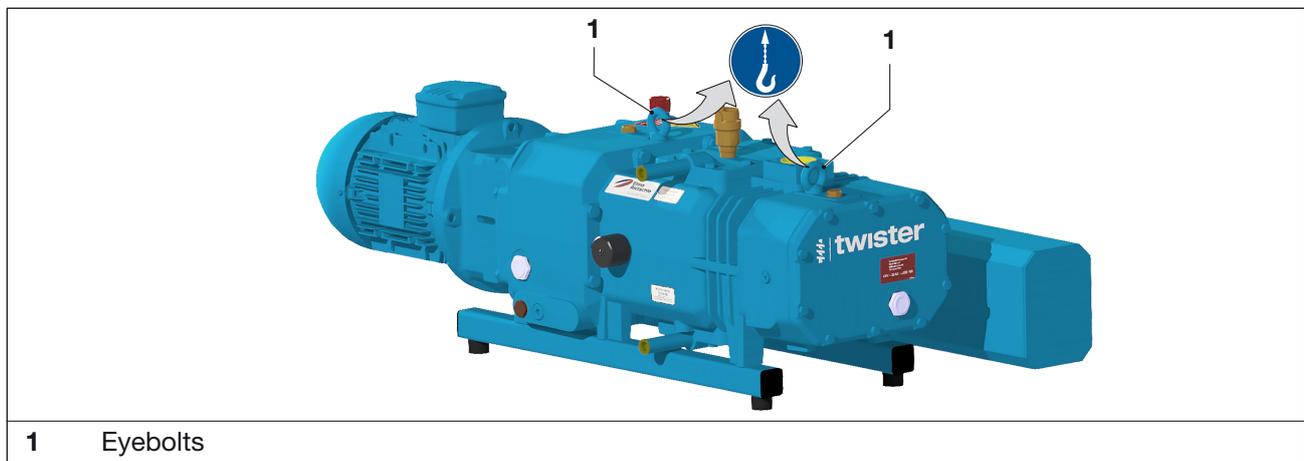


Fig. 1 Lift and transport

- Tighten the eyebolt (Fig. 1/1) firmly.
- The machine must be suspended on the eyebolt using the lifting device for lifting and transporting. In case of longer transports, put the pump in a transport crate or on a pallet. With this, secure the pump against tipping over and slipping away!

3.2 Storage

CAUTION

Material damage caused by improper storage!

Improper storage can damage the machine.

The storage area must meet the following conditions:

- Dust-free
- Vibration free
- Close the inlet and the discharge connection with a locking plug to avoid pollution.

3.2.1 Ambient conditions during storage

Ambient conditions	Value
Relative humidity	0 % to 80 %
Storage temperature	-10 °C to +60 °C



The machine must be stored in a dry environment with normal air humidity. It should not be stored for more than 6 months.

📄 See Info "Storage instructions", page 4.

3.3 Disposal



WARNING

Danger due to flammable, corrosive or poisonous substances!

Machine with contact to hazardous substances can cause serious burns, cauterisation or poisoning.

- Before disposal decontaminate the machine.
- Wear suitable protective clothing.

For disposing of observe the following items:

- a) Collect oils and grease separately and dispose of in accordance with the local regulations in force.
- b) Do not mix solvents, cold cleaning agent and paint residues.
- c) Remove components and dispose of them in accordance with the local regulations in force.
- d) Dispose of the machine in accordance with the national and local regulations in force.
- e) Parts subject to wear and tear (marked as such in the spare parts list) are special waste and must be disposed of in accordance with the national and local waste laws.

4 Product overview and functioning

4.1 Product overview - continuous flow cooling (standard)

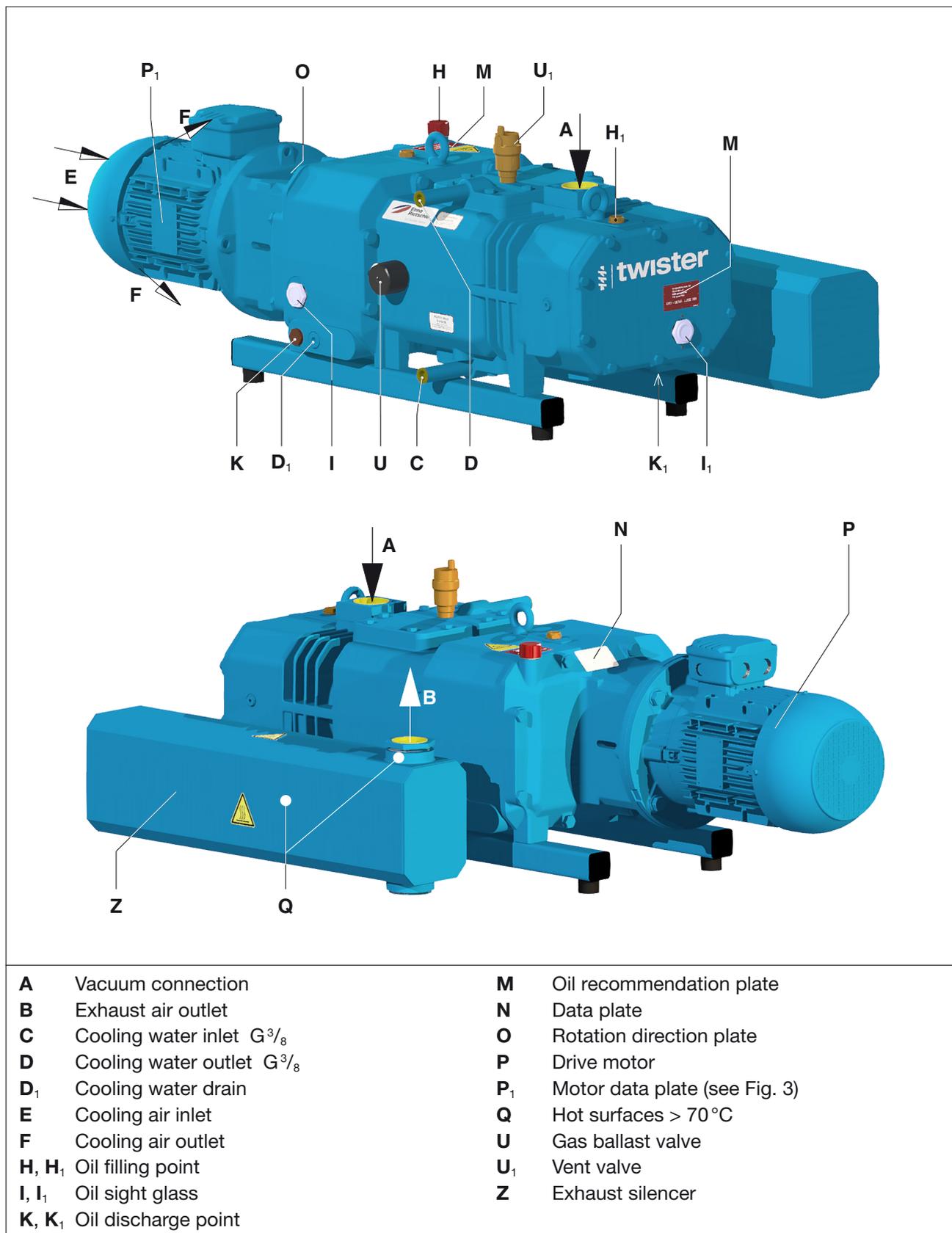
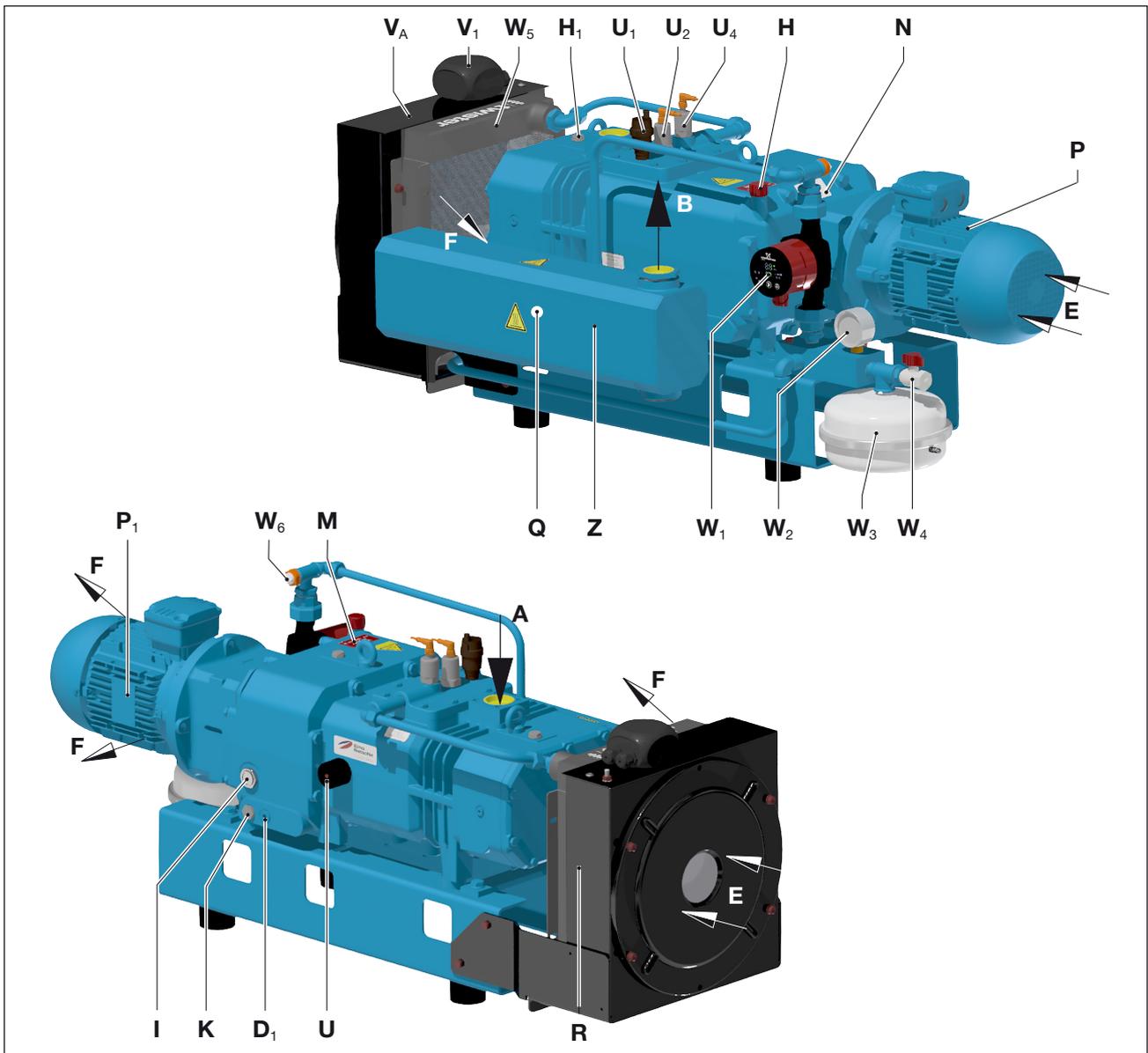


Fig. 2 Screw vacuum pumps S-VSI 100 OXY with continuous flow cooling

4.2 Product overview - circulation cooling (water-air-heat exchanger)



A	Vacuum connection G 2	U	Gas ballast valve
B	Exhaust air outlet G 2	U₁	Vent valve
D₁	Cooling water drain	U₂	Temperature control
E	Cooling air inlet	U₄	Liquid level monitor
F	Cooling air outlet	V_A	Fan (IP 44)
H, H₁	Oil filling point	V₁	Terminal box fan
I	Oil sight glass	W₁	Circulation pump (IP 42)
K	Oil discharge point	W₂	Manometer
M	Oil recommendation plate	W₃	Pressure compensation tank
N	Data plate	W₄	Ball valve (filling cooling water)
O	Rotation direction plate	W₅	Vent screw (heat exchanger)
P	Drive motor	W₆	Vent screw (cooling water circulation)
P₁	Motor data plate	Z	Exhaust silencer
Q	Hot surfaces > 70°C		
R	Heat exchanger		

Fig. 3 Screw vacuum pump S-VSI 100 OXY with circulation cooling

4.3 Data plate

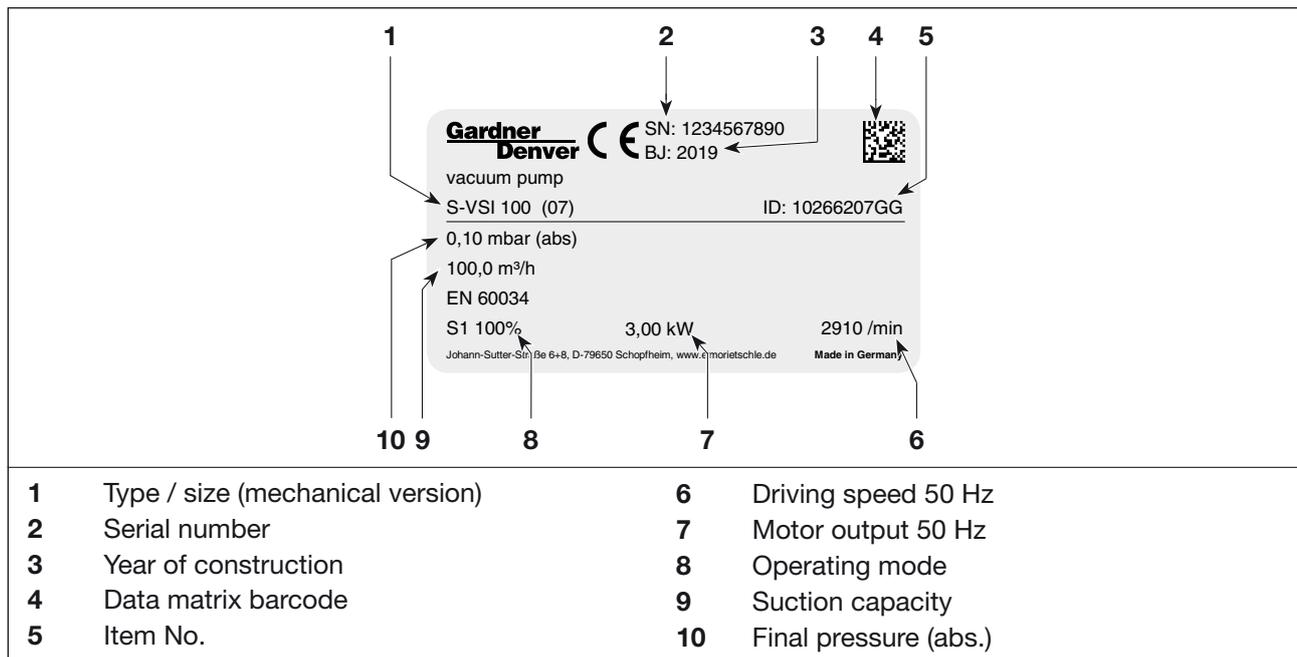


Fig. 4 Data plate

The following information is encoded as barcode:

- Material number (MA)
- Production order (PR)
- Serial Number (SC)

4.4 Description

The TWISTER S-VSI is a twin-screw vacuum pump in which two parallel screw rotors roll off against each other contactless and dry. The gas to be fed in is hereby enclosed in the pump's suction chamber and compressed by the rotary movement of the screw rotors in the direction of the outlet. The gas sucked in is gradually compressed to atmospheric pressure. The counter-rotating screw rotors are synchronised by a gear pair in the gearbox. The gears of the synchronized gearbox and the bearings are lubricated with oil. These components are in a gearbox that also contains the oil supply. Oil conveying devices always ensure that the bearings and the gears are sufficiently supplied with oil at all permissible speeds.

The gearbox and the compression chamber are separated from each other by special seals. The gearbox is sealed from the outside with piston sealing rings and O-rings, the compressor chamber with piston rings.

The TWISTER S-VSI is driven by standard flanged three phase motors via a clutch (with an elastomer component).

To be able to distinguish them from the standard variants, the VSI OXY pumps are blue painted.

4.5 Fields of application

The vacuum pumps VSI OXY are suitable for exhausting air or other gases with increased percentage of oxygen (content by volume between 21 % and 60 %).

They are suitable for the evacuation of closed systems or for a continuous vacuum within the following intake pressure ranges: **0.1 - 1000 mbar (abs.)**

The maximum pumping capacity with unrestricted suction is **110 m³/h at 50 Hz**. Data sheet **D 833-OXY** or **D 833-UK_OXY** shows the dependency of the pumping capacity on the intake pressure.



If the unit is switched on more frequently (at regular intervals of > 10 times per hour) or at higher ambient temperatures and inlet temperatures, excess temperature limit of the motor winding and the bearings may be exceeded.

Contact the manufacturer regarding such operating conditions.



If it is installed in the open air the unit must be protected from environmental influences (e.g. by a protective roof).

CAUTION

Property damage due to not intended operation!

Improper operation can damage the machine.

- The screw vacuum pump S-VSI 100 with 3 kW motor may only be operated in continuous operation S1.

4.6 Accessories

The following accessories are options and on request available from Gardner Denver.

4.7 Cooling of the machine

4.7.1 Continuous flow cooling (standard)

With fresh water cooling, water flows continuously through the cavity of the double walled compressor housing.

4.7.2 Circulation cooling (water-air-heat exchanger)

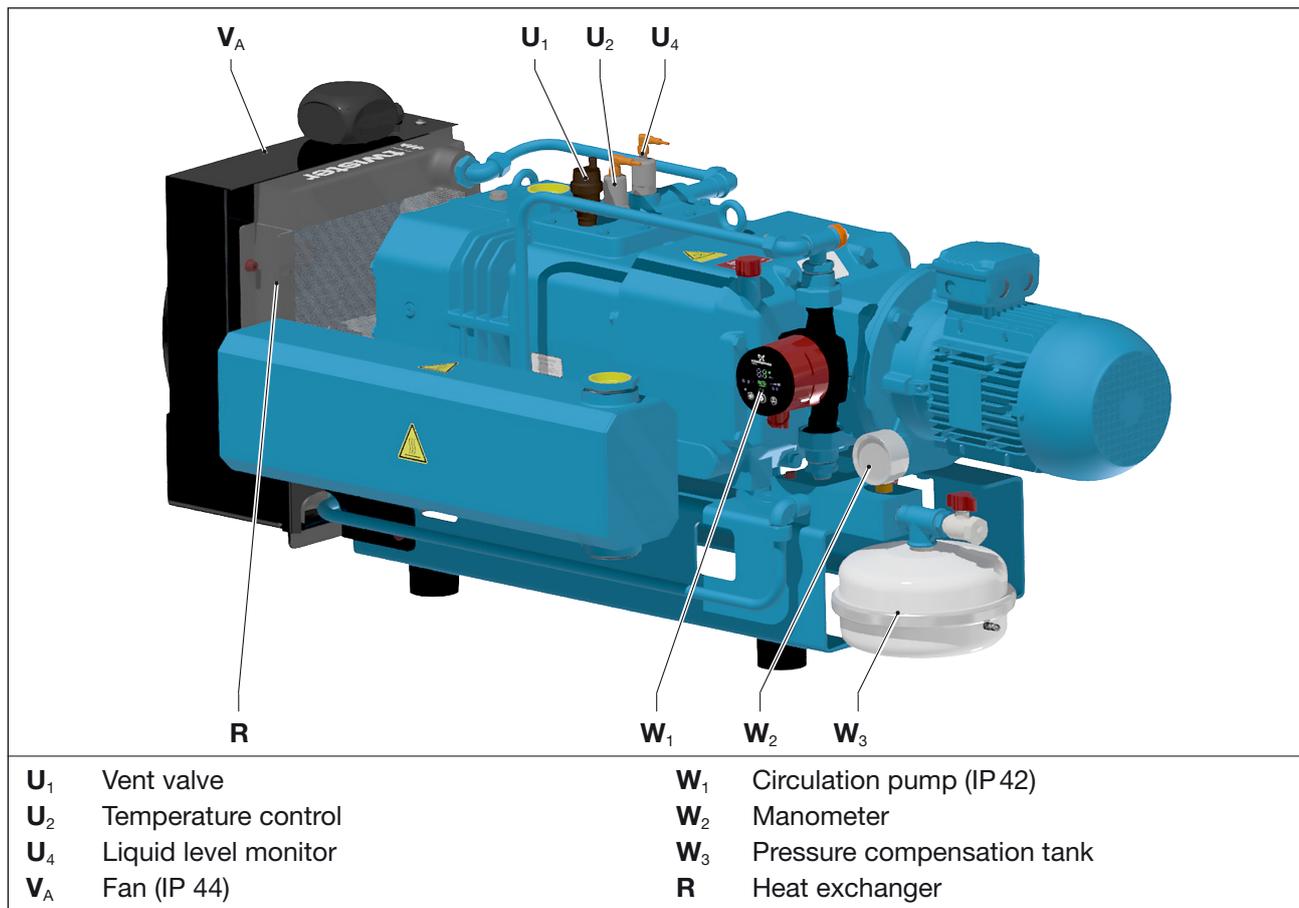


Fig. 5 Circulation cooling

With circulation cooling, the compressor is filled onetime with a water-Glysantin-mixture. This is continuously pumped through the compressor and the heat exchanger using a circulation pump. The heat exchanger is air-cooled (fan).

For safety reasons, the cooling system is fitted with a temperature control.

The required pressure compensation is controlled by a pressure compensation container filled with air.

Temperature control

Monitors the temperature of the cooling water. Default mode: $T_{\max} = 60^{\circ}\text{C}$

Liquid level monitor / manometer

Monitors the filling level of the cooling water. Factory-provided filling quantity (filling pressure): $p_{\max} = 1.2 \text{ bar}$

Pressure compensation container

Controls the operating pressure of the cooling water. System pressure: $p_{\max} = 1.2 \text{ bar}$

Circulation pump

Pumps the cooling water through the compressor. Voltage: 230 V AC

Fan

Cools the cooling water in the heat exchanger. Voltage: 230 V AC

For connection of sensors see chapter 5.4.2 on page 20.

☰ The operating instructions for the monitoring elements are enclosed with the machine.

5 Installation

DANGER



Risk to life due to incorrect installation and commissioning!

Improper or wrong installation can cause serious injuries or death.

- Only authorised specialist personnel that have been trained about the safety regulations for handling of oxygen plants are allowed to install and commission the pump.
- The regulations for safety and health at work BGR 500 issued by the professional associations (Operation of oxygen plants) or other relevant national regulations must be met.

5.1 Preparation of installation

DANGER



Risk of explosion due to inadmissible oxygen concentration!

The vacuum pump VSI OXY is not gas-tight. Oxygen enrichment in the room air can cause explosions.

- Sufficiently vent the place of installation. The oxygen content by volume in the room air may not exceed 21%.

Ensure the following conditions:

- Machine freely accessible from all sides
- Do not close ventilation grids and holes
- Sufficient space for installing and removing pipes and for maintenance work, particularly for the installation and deinstallation of the machine
- No external vibration effects
- Do not suck any hot exhaust air from other machines into the cooling system



Oil filling point (Fig. 2/, 3/H, H1), oil sight glasses (Fig. 2/I, I1, 3/I, I1) and oil drains (Fig. 2/K, K1, 3/K), cooling water inlet (Fig. 2/C, 3/C) and cooling water outlet (Fig. 2/D, 3/D) must be easily accessible.

The cooling air inlets (Fig. 2/E, 3/E) and the cooling air outlets (Fig. 2/F, 3/F) must be at least 30 cm away from the adjacent walls. Cooling air coming out must not be sucked in again.

5.2 Installation

DANGER



Risk of explosion due to pollution in the intake medium!

If pollutants are sucked in, especially organic substances, this can cause a severe danger of explosion!

- To protect the VSI OXY, the user must install an appropriate filter on the inlet side. Alternatively, the vacuum-tight intake filter (ZVF) can be installed.

CAUTION

Property damage caused by improper installation!

Improper erection and installation can damage the machine.

- The machine may only be operated when it is set up horizontally (Max. inclination: 8° in all directions).
- Secure the machine against tipping over and falling.
- The floor must be plane and even.
- The bearing surface must be designed to be able to carry the weight of the machine.
- The non-return valve must not be removed.

Installation



An output reduction is noticeable when installed at more than 1000m above sea level. In this case, please contact us.



It is possible to install the machine on a firm base without anchoring. When installing on a sub-structure we recommend fixing it with flexible buffers.

5.3 Connection of pipes

CAUTION

Material damage resulting from too high forces and torques of the pipes acting on the unit!

If forces and torques during installation and operation are too high, the machine can be damaged.

- Only screw in pipes by hand.
- If necessary, use flexible connections.



CAUTION

Risk of injury due to closed exhaust air opening!

Closed, restricted or covered exhaust air openings can cause too high back pressure in the machine.

- Never close or restrict the exhaust air openings.
- Keep the permissible back pressures on the drain side:
S-VSI 3.0 kW < +0.2 bar
- Prevent liquids from accumulating in the exhaust line.

- Remove the blind plug from the vacuum connection.
- Connect the pipes with the vacuum connection (Fig. 2/A, 3/A).
- The exhausted air can be blown out through the exhaust air outlet (Fig. 2/B, 3/B) on the exhaust silencer or conducted away using a hose or pipe. **CAUTION! This must not cause the oxygen enrichment of the room air!**
To avoid distorting in the piping system, we recommend using compensators.
- Check that the maximum back pressure is not exceeded!



The suction capacity of the vacuum pump is reduced if the inlet pipe is too narrow and/or too long.

5.4 Connect cooling water

CAUTION



Risk of injury due to falling!

Fluid leakages can cause the floor to become slippery and persons can fall.

- Check pump for loss of cooling water and leakages.
- Wear non-slip shoes.

CAUTION

Property damage due to the failing pump!

If the cooling water flow is reduced or interrupted, the cooling of the machine cannot be ensured. This can cause the blackout failure of the machine and damage the machine.

- Make sure that the cooling water flow is not interrupted.

CAUTION

Property damage due to missing cooling water control!

If there is no cooling water control, the machine can be damaged in case of malfunction or failure of cooling of the machine when the malfunction is not remedied immediately.

- Pump is only allowed to be operated with cooling water control.

5.4.1 Cooling water connection for continuous flow cooling

CAUTION

Property damage due to wrong coolant!

Dirt particles and aggressive water may lead to malfunctions or to premature wear in the cooling system.

- Only use pH-neutral, clean and filtered water for cooling.

CAUTION

Property damage due to improper operation!

Improper operation and wrong operating conditions can damage the machine.

- The operating pressure of the cooling water must not exceed 6 bars.
- The cooling water temperature must be between 15 and 45 °C.

- a) Connect the cooling water pipe to the cooling water inlet (Fig. 2/C) and the cooling water outlet pipe to the cooling water outlet (Fig. 2/D).
- b) Check the pump for cooling water leakages.



Suitable cooling water

-  See Info "Recommended water quality", page 4

Installation

5.4.2 Cooling water connection for circulating cooling

On delivery, the pumps with water-air heat exchanger have already been filled with cooling water (Water-Gly-santin-mixture at the ratio of 70:30).

- Check the filling level of cooling water on the manometer (Fig. 3/W₂).
Filling pressure: **0.6 bar (g), max. 1.2 bar (g)**
- Refill cooling water, if necessary.
For refilling see chapter 7.2.2, page 28

WARNING

Danger to health due to improper dealing with anti-freeze agents!

Anti-freeze may contain harmful ingredients, such as ethylene glycol, that could damage your health, especially if swallowed.

- Use the product only as intended and observe the safety instructions issued by the manufacturer.

CAUTION

Property damage due to wrong cooling water pressure!

If the cooling water pressure is too low or too high, cooling of the machine cannot be ensured anymore and the machine can be damaged.

- The cooling water pressure must be within the above mentioned limits.

CAUTION

Property damage caused by frost damage in the cooling water circuit!

Freezing cooling water may lead to extensive damage to the machine.

- Use cooling water with at least 30 % antifreeze agent only.
- The amount of anti-freeze used must be adjusted to the ambient climatic conditions.

5.5 Check lubricating oil

DANGER

Risk of explosion due to wrong lubricating oil!

Using the wrong lubricating oil can cause a severe danger of explosion!



- To lubricate the vacuum pumps VSI OXY it is only allowed to use oil type OXY-GEAR-LUBE 160 of Elmo Rietschle.

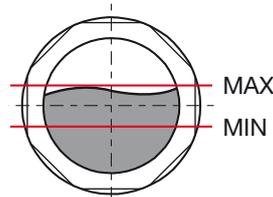


Fig. 6 Oil level

- Check the lubricating oil level through the oil sight glass (Fig. 2/I, I₁, 3/I) and top up, if necessary.
- Refill lubricating oil (For suitable types see “Oil change”, page 26) for the gear wheels and bearings on the oil filling points (Fig. 2/H, H₁, 3/H, H₁) until the centre of the sight glasses (Fig. 2/I, I₁, 3/I).
- Reclose the oil filling points.

5.6 Connect to the energy supply network

DANGER



Danger to life if the electrical installation has not been carried out professionally!

Installation that has not been carried out professionally or properly can cause serious injuries or death. The whole electrical system can be destructed.

- The electrical installation must only be carried out by a qualified electrician observing EN 60204.
- The main switch has to be provided by the user.

CAUTION

Property damage due to wrong energy supply!

Wrong operating voltages, frequencies or currents can cause loss of power or damages to the machine.

- The conditions at the installation location must comply with the details on the motor data plate.
- Permissible tolerances:
 - $\pm 5\%$ voltage deviation
 - $\pm 2\%$ frequency deviation

5.6.1 Connection of motor

- a) The electrical motor data can be found on the data plate (Fig. 2/N, 3/N) or the motor data plate (Fig. 2/P1). The motors comply with DIN EN 60034 and are designed in protection class IP 55 and insulation class F. The appropriate connection diagram is located in the terminal box of the motor (not existing for the version with plug connection). Compare the motor data with the data of the existing mains network (current type, voltage, network frequency, permitted current value).
- b) Connect motor via motor protection circuit breaker (For strain relief provide for a screwed cable connection to connect the connecting cable).
We recommend using motor protection circuit breakers with delayed switch off, depending on a possible excess current. Temporary excess current can occur when the machine is started under cold conditions.

5.6.2 Connection of sensors

- ☰ See product documentation

5.6.3 Connect fan / circulation pump (circulating cooling)

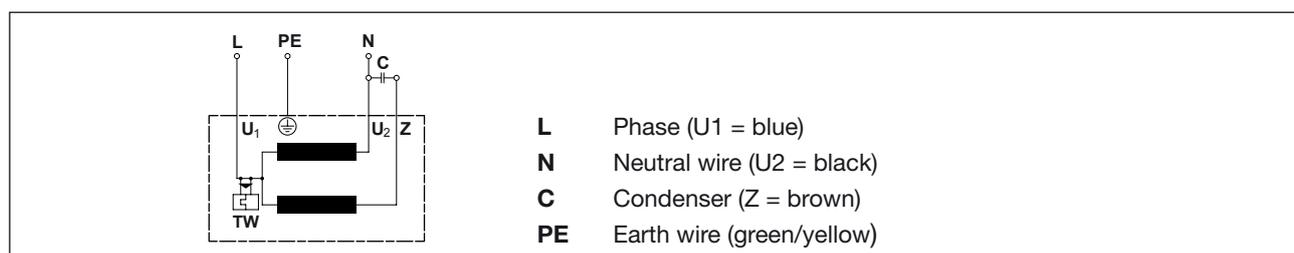


Fig. 7 Connection diagram fan

- a) Connect the circulation pump (Fig. 3/W1) (use supplied connector) and get it run at the highest level (level III).
Voltage: 1~, 230 V (50 Hz / 60 Hz)
☰ See connection diagram of circulation pump (product documentation)
- b) Connect fan (Fig. 3/V_A) to the terminal box (Fig. 3/V₁).
Voltage: 1~, 230 V (50 Hz / 60 Hz)

6 Commissioning and decommissioning

6.1 Start-up

 **DANGER**



Risk of explosion due to wrong or polluted lubricating oil!

Using the wrong or polluted lubricating oil can cause a severe danger of explosion!

- To lubricate the vacuum pumps VSI OXY it is only allowed to use oil type OXY-GEAR-LUBE 160 of Elmo Rietschle.
- Assuming that the lubricating oil could be mixed with organic substances, it must be replaced immediately.

 **DANGER**



Danger of explosion due to explosive mixtures!

If organic substances and oxygen are mixed, this can cause explosive mixtures. There is a serious danger of explosion!

- Assuming that the lubricating oil could be mixed with organic substances, it must be replaced immediately.
- If the vacuum pump is polluted with organic substances, it must be put out of operation and cleaned by specialist personnel authorised by Elmo Rietschle.

 **WARNING**

Risk of injury due to improper operation!

Improper operation of the machine can cause serious or fatal injuries.

- Strictly observe the safety instructions. Especially observe the safety instructions in chapter 2 .

 **CAUTION**



Risk of injury due to hot surfaces!

When the machine is at operating temperature the surface temperatures on the components may rise to above 70 °C. This can cause burns.

- Do not touch hot surfaces (indicated by warning signs).
- Wear suitable protective gloves, if necessary.

 **CAUTION**



Risk of injury due to noise emission!

High sound pressure level can permanently damage hearing.

- Observe measured sound pressure level, see chapter 9.
- When spending a long time in the vicinity of the running machine use ear protection to avoid permanent damage to hearing.

 **CAUTION**

Risk of injury due to drawing in and trapping!

Due to the high pumping capacity it is possible that fingers are drawn in the inlet connection and injured.

- Do not put your hands onto the inlet connection to check the suction.

CAUTION

Property damage due to insufficient cooling!

If the cooling water flow is reduced or interrupted, the cooling of the machine cannot be ensured. This can cause reduced performance or blackout failure of the machine and damage the machine.

- Operation is only allowed with water cooling and sufficient cooling water quantity.
- Make sure that the cooling water flow is not interrupted.

6.1.1 Check the rotation direction



Risk of injury due to wrong direction of rotation!

Rotating backwards for a longer time can cause injuries due to drawing in and can damage the machine.

- Use a phase sequence indicator to check the direction of rotation (anti-clockwise).
- Keep a distance of 1 m to outlet and inlet connections.

The drive shaft direction of rotation is shown by the arrow for the direction of rotation (Fig. 2/O, 3/O) on the motor flange.

- a) Start the motor briefly (max. two seconds) to check the direction of rotation. When looking at the motor fan, it must rotate clockwise.

6.1.2 After-run



Risk of injury due to hot condensate!

If condensate is discharged manually, this can cause burns.



- Regularly drain condensate from the silencer and depending on application. Do not do this when machine is at operating temperature.
- Wear protective gloves.

CAUTION

Property damage due to formation of condensate and impurities!

Due to increased condensate formation and impurities, deposits may adhere to the rotors and the compressor casing after switching off the machine, preventing the start-up when restarting it. Condensate and impurities can cause damage to the machine.

- Before the decommissioning of the machine, drain off the condensate.

Before putting the pump out of operation for more than 2 hours, moisture and contamination must be removed from the pump by running the vacuum pump at **50 - 100 mbar (abs.)** for at least **10 minutes** with dry air.

6.2 Decommissioning/ storing

Decommissioning of the machine

- a) Switch the machine off.
- b) If available, close the cut-off device in the inlet and outlet pipes.
- c) Disconnect the machine from the power supply.
- d) Depressurise the machine:
Open the pipes slowly.
⇒ The pressure reduces slowly.
- e) Remove the pipes and hoses.
- f) Seal the connections for inlet and outlet stubs using adhesive foil to exclude pollution.
- g) In case of continuous flow cooling discharge cooling water (Fig. 2/D₁).
☰ See also chapter 3.2.1, page 11

6.3 Recommissioning

- a) Check the condition of the machine (cleanliness, cabling etc.).
☰ For installation see chapter 5, page 17
☰ For commissioning see chapter 6.1, page 22

7 Maintenance and repair

DANGER



Danger to life due to improper maintenance and repair!

Wrong or improper maintenance or repair can cause hazardous situations.

- Only authorised specialist personnel that have been trained about the applicable safety regulations for handling of oxygen plants are allowed to perform maintenance and repairs.

DANGER



Danger to life from touching live parts!

Touching of live parts cause serious injuries or death.

- Before starting any maintenance work, disconnect the machine by actuation of the main switch or disconnection of the plug and secure it against accidental switching.

CAUTION



Risk of injury due to hot surfaces!

During maintenance there is the risk of burning on hot components of the machine. This can cause burns.

- Wait for the machine to cool down.
- Before maintenance and repair works allow the machine to cool down.
- Wear suitable protective clothes, if necessary.

CAUTION

Risk of injury due to missing safety devices!

Missing safety devices can cause injuries.

- Safety devices as well as safety guards on motor fans and ventilators may not be removed.

7.1 Ensure operational safety

Regular maintenance work must be carried out in order to ensure operational safety.

Maintenance intervals also depend on the operational demands on the machine.

For all works, observe the safety instructions described in chapter 2.8 "Safety instructions for installation, commissioning and maintenance" .

The whole plant should always be kept in a clean condition.

7.2 Maintenance tasks

Interval	Maintenance activities	Chapter
Monthly	Check the pipes and screws for leaks and ensure their tight fit and if necessary re-seal or re-tighten.	–
	Check the terminal box and cable inlet holes for leaks and if necessary re-seal.	–
	Clean the cooling ribs on the machine and the motor.	–
	Clean the fans, safety guards and cooling-air outlets	–
Monthly	Check the oil level	7.2.1
Monthly	Check the cooling water system and the inlet pipes	7.2.3
Depending on the contamination of the cooling water	Replace cooling water	
7,500 h	Oil change	7.2.1
Depending on how dirty the sucked in medium is	Clean inlet air filter Clean gas ballast valve filter	7.2.2
At least 1 x per year	Check couplings for wear	7.2.4

7.2.1 Change the oil



DANGER

Risk of explosion due to wrong lubricating oil!



Wrong or not approved lubricating oils can cause potentially explosive gas mixtures. This causes a serious danger of explosion!

- Exclusively use the type of oil specified by Elmo Rietschle OXY-GEAR-LUBE 160. This lubricating oil has been released by the Federal Institute for Materials Research and Testing (BAM).



CAUTION

Risk of injury due to slipping and falling!



The floor can be slippery due to leaked oil and cause slipping, tripping or falling.

- For oil change wear non-slip shoes.
- Remove leaked oil immediately.



Always change the oil when the machine is at operating temperature and in an atmospherically ventilated area. If it is not completely emptied, the refilling quantity is reduced.

If you change the type of oil, empty the oil tank completely.

A minimum oil quantity may escape from the vent screw due to pressure compensation. If larger quantities of oil escape, wash the internal filter of the vent screw.



The waste oil must be disposed of in compliance with the local environmental protection regulations.

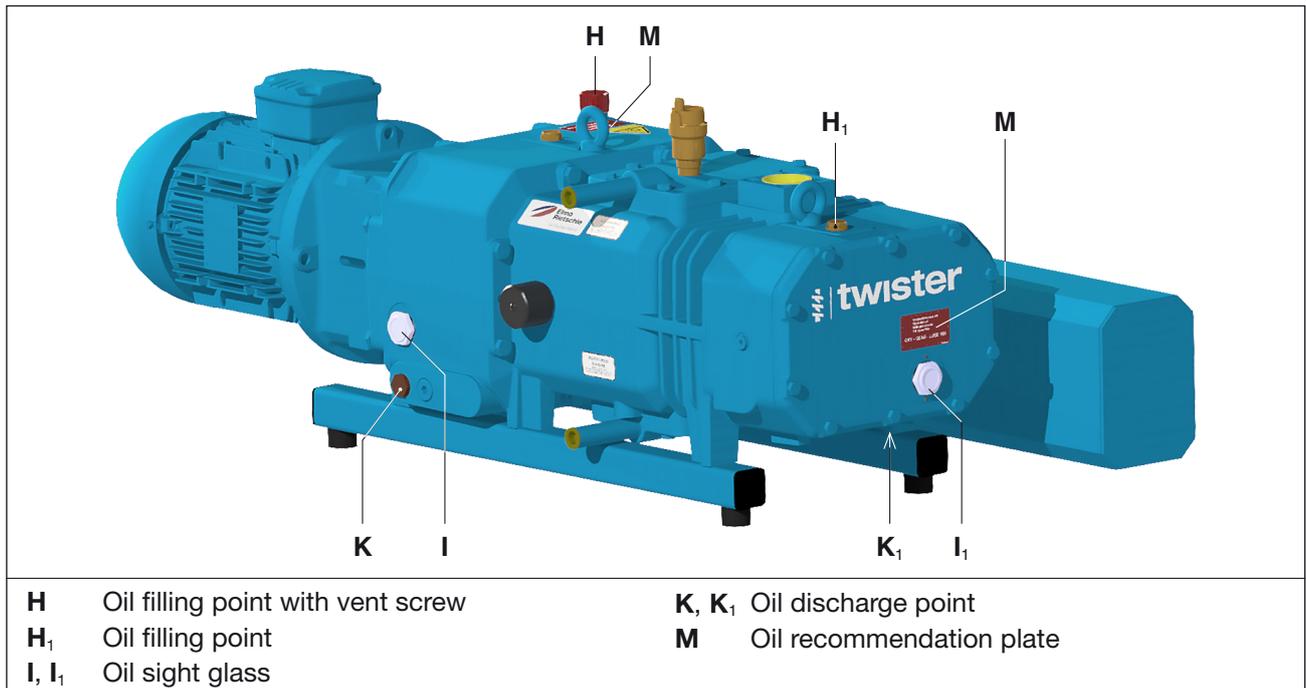


Fig. 9 Change the oil

Check the oil level:

- Check the oil level in the sight glasses (Fig. 9/I, I₁) every month.
- To refill the oil, switch off the machine and bleed to atmospheric pressure.

Change the oil:

Change oil after every 7,500 operating hours.

To refill the oil, switch off the machine and bleed to atmospheric pressure.

We recommend using Elmo Rietschle oils (also see Recommended oil label (Fig. 9/M)) as operating agent. Elmo Rietschle oil types:

OXY-GEAR-LUBE 160 – Synthetic oil, high chemical, thermal and oxidative stability
The lubricating oil is inert and therefore, it does not generate explosive gas mixtures.

The viscosity of the oil used must comply with ISO VG 160 as per DIN 3448. Also consider the safety data sheet of the oil type used.

If you want to change the oil type, please contact us.

7.2.2 Air filter

DANGER



Rick of explosion due a polluted machine!

While cleaning the machine, there will be the risk of pollution due to oil-containing compressed air. This can cause explosive gas mixtures. There is a serious danger of explosion!

- Do not use compressed air for cleaning of the air filters because it cannot be ensured that the compressed air is free from oil.

WARNING



Risk of injuries due to rotating parts!

If the mesh filter has been removed, there will be the risk of injury by the vacuum connection when reaching in.

- Do not reach into the vacuum connection.
- During disassembly/assembly make sure that not parts fall into the inlet flange.

CAUTION

Property damage due to insufficient maintenance of the air filter!

Performance of the machine is reduced by a polluted air filter and insufficient maintenance. This can cause damage of the machine.

- Regularly clean the mesh filter.
- Replace highly polluted or damaged mesh filters.

CAUTION

Property damage due to wrong cleaning agents!

Improper cleaning agent can damage the machine.

- For cleaning use the washing agent Antikor 30-57 (Kluthe) in connection with the wetting agent 200-4 (Kluthe).

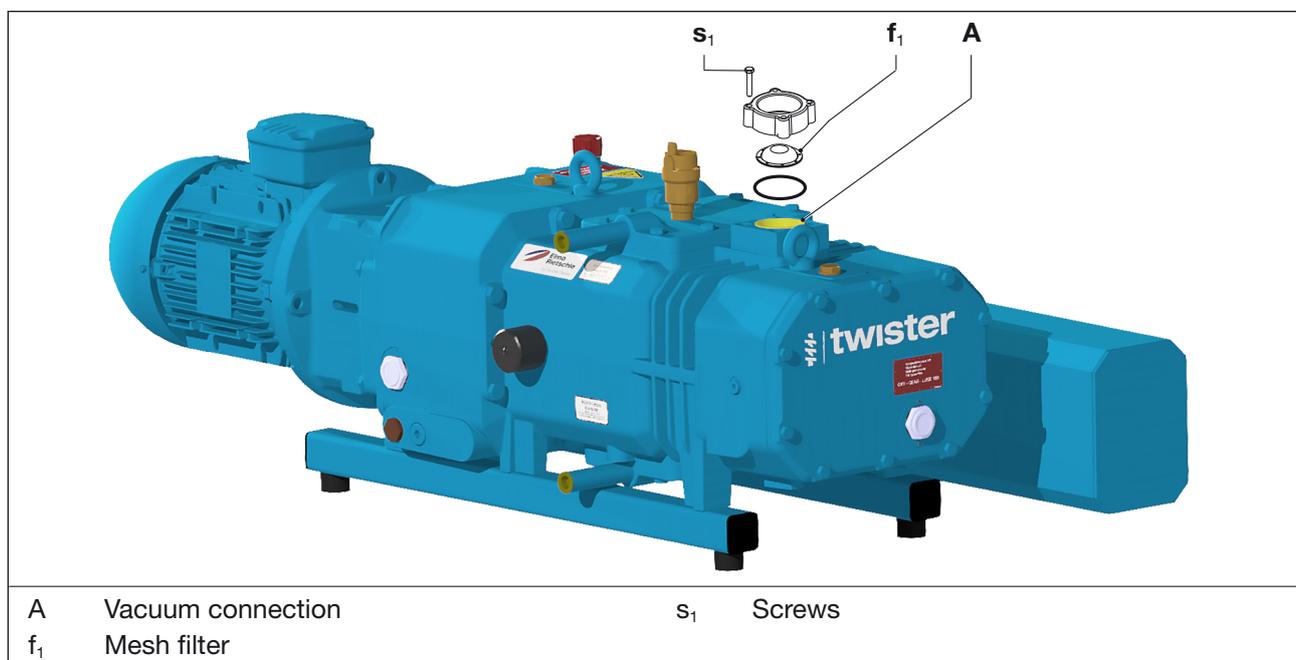


Fig. 10 Air filter

Inlet air filter:

Depending on the pollution of the inlet medium, the mesh filter (Fig. 10/f₁) has to be cleaned more or less often by washing or it must be replaced.

- a) Take off the vacuum connection (Fig. 10/A) after removing the screws (Fig. 10/s₁).
- b) Clean the mesh filter (Fig. 10/f₁).

Also check the valve seat for contamination.

Re-assemble in reverse order.

Gas ballast valve filter:

The pumps work with a gas ballast valve (Fig. 10/U).

Depending on the pollution of the running through medium, clean the installed filter disc (Fig. 11/f₃) and mesh discs (Fig. 11/f₄) more or less often by blowing off.

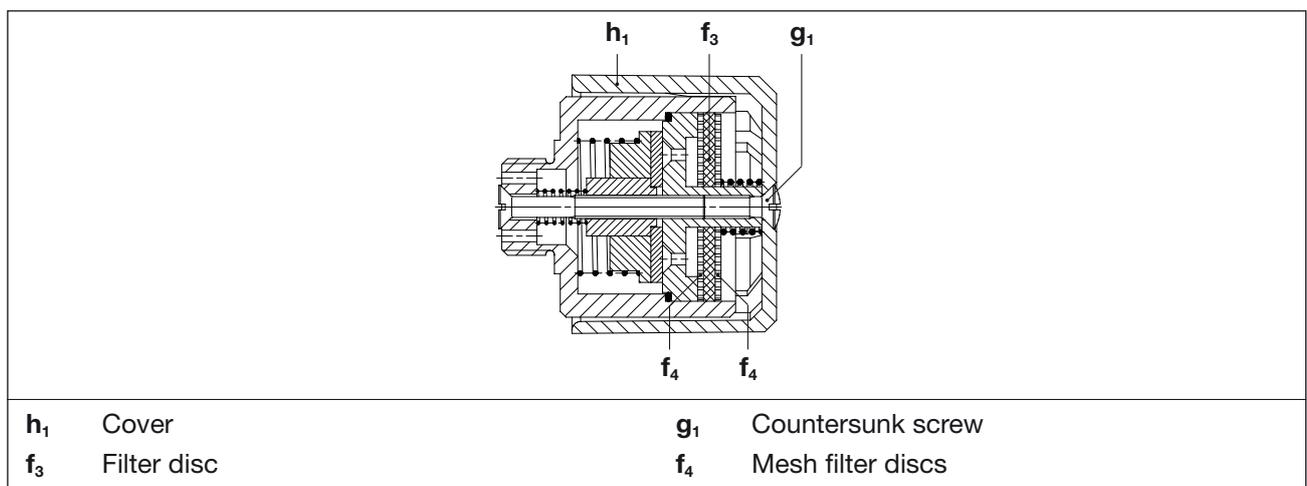


Fig. 11 Gas ballast valve

- a) Release the countersunk screw (Fig. 11/g₁) and remove the plastic hood (Fig. 11/h₁).
- b) Take out the filter parts for cleaning.

Re-assemble in reverse order.

7.2.3 Cooling

Check the cooling water system and the pipes every month.
Replace polluted cooling water.

Circulation cooling

! WARNING

Danger of injury when dealing with compressed air!

When the filter is blown off with compressed air, loose solid particles or powder dust swirling around may cause injury to the eyes. Inhaling can damage lungs.



- Wear protective glasses and dust mask when cleaning the filter with compressed air.

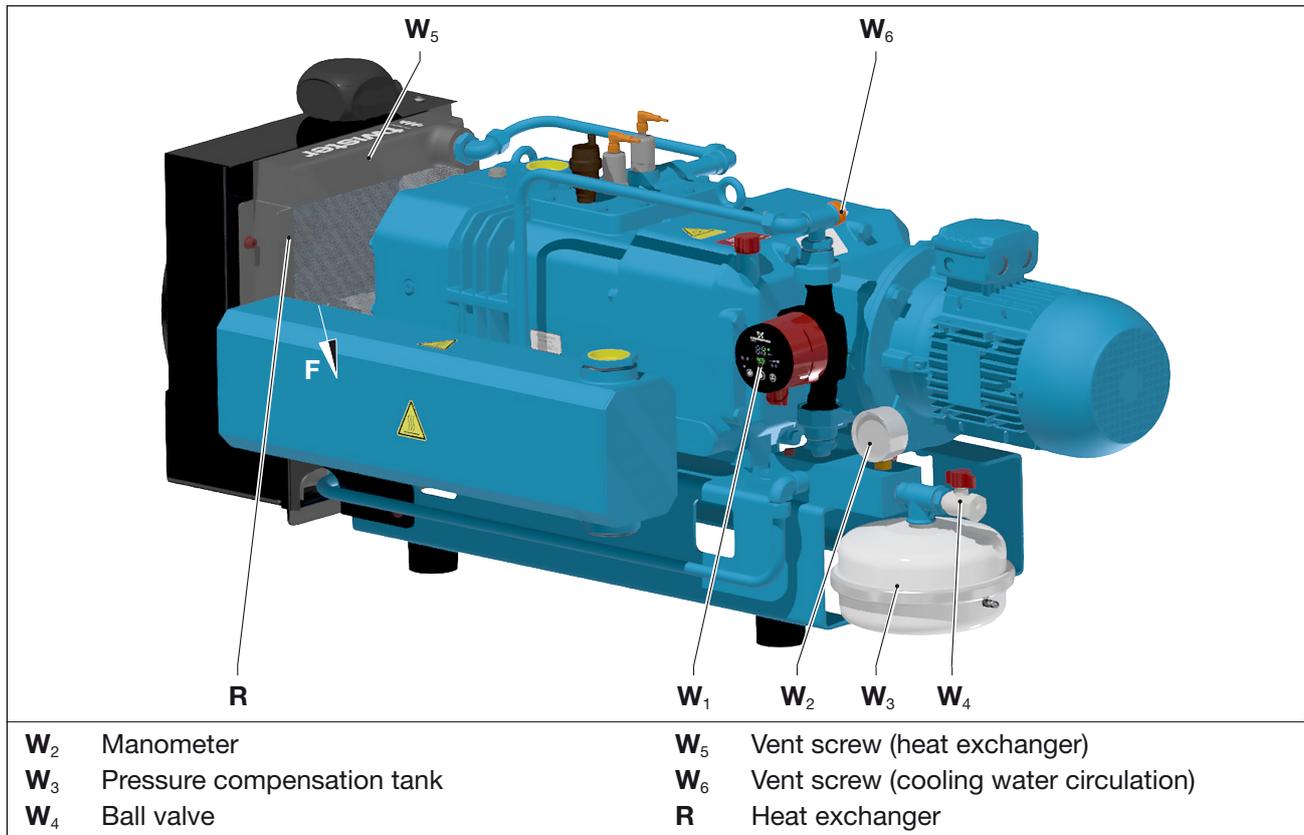


Fig. 12 Circulation cooling

- Regularly check the orifices for the cooling air inlet (Fig. 3/E) and the protective grid of the fan (Fig. 12/V_A) and clean them by blowing off.
- It is also required regularly to inspect the cooling air outlet (Fig. 12/F) on the grid of the heat exchanger (Fig. 12/R) and to clean it by blowing off.
- Check the filling pressure on manometer (Fig. 12/W₂) and refill cooling water if necessary. The filling pressure may not exceed **0.6 bar (g)** and may not get below **1.2 bar (g)**.

Refill cooling water:

- a) Release the vent screw (Fig. 12/W₆) on the cooling water circuit.
- b) Fill the cooling water circuit with water-Glysantin-mixture (ratio 70:30) on the ball valve (Fig. 12/W₄), until the cooling water escapes through the vent screw.(Fig. 12/W₆).
Close the vent screw (Fig. 12/W₆)
- c) Fill the cooling circuit until its pressure is max. **1.2 bar(g)** .
Check pressure by manometer (Fig. 12/W₂).

Replace cooling water:

- a) Open ball valve (Fig. 12/W₄), release vent screws (Fig. 12/W₅, W₆) and drain old cooling water in a suitable container.
- b) Fill air in the pressure compensation tank (Fig. 12/W₃) to 0.5 bar(g).
- c) Release the vent screws on the heat exchanger (Fig. 12/W₅) and on the cooling water circuit (Fig. 12/W₆).
- d) Fill the cooling water circuit with water-Glysantin-mixture (ratio 70:30) on the ball valve (Fig. 12/W₄) until the cooling water escapes through the vent screw.(Fig. 12/W₅) of the heat exchanger.
Close the vent screws (Fig. 12/W₅).
- e) Further fill the cooling circuit until cooling water escapes through the vent screw (Fig. 12/W₆).
Close the vent screws (Fig. 12/W₆).
- f) Fill the cooling circuit until its pressure is max. **1.2 bar(g)** .
Check pressure by manometer (Fig. 12/W₂).

7.2.4 Coupling

CAUTION

Property damage due to defective coupling sprocket!

Defective sprockets can cause breaking of the rotor shaft and blackout failure of the machine.

- Regularly check the coupling tooth for wear.

CAUTION

Property damage due to frequent starting and high ambient temperature!

Frequent starting and high ambient temperature reduces the lifetime of the sprocket.

- Regularly check the coupling tooth for wear.

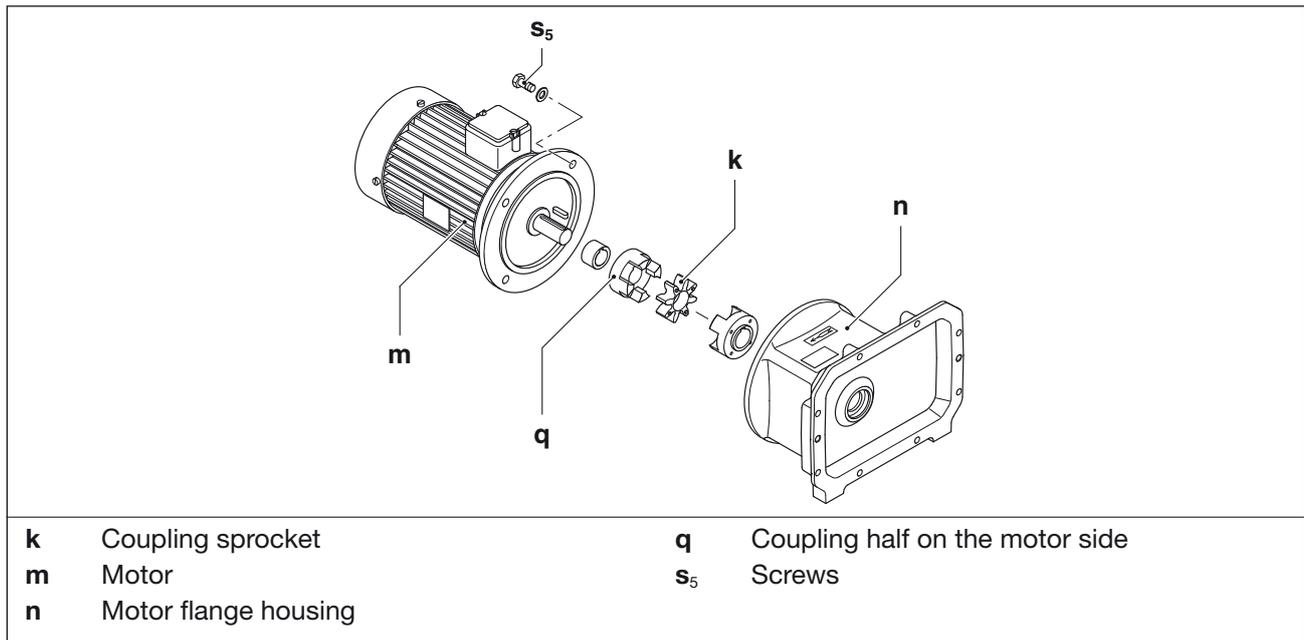


Fig. 13 Coupling

The coupling sprocket (Fig. 13/k) is subject to wear and must be checked regularly (at least 1 x per year).

- Switch the motor off and secure it against unexpected restart.
- Suspend the motor (Fig. 13/m) on the eyebolt using lifting gear.
- Release the screws (Fig. 13/s₅) on the motor flange and axially pull the motor with the half of the coupling on the motor side (Fig. 13/q) off the motor flange housing (Fig. 13/n).
- Check the sprocket (Fig. 13/k). If the sprocket is damaged or worn, replace it.

Re-assemble in reverse order.

7.3 Repair/ service

DANGER



Danger to life from touching live parts!

Touching of live parts cause serious injuries or death.

- Before starting any repair work, disconnect the machine by actuation of the main switch or disconnection of the plug and secure it against unexpected restart.
- Repair works are only allowed to be done by authorised specialists.

For repairs contact the manufacturer, its branch offices or authorised dealers.

Please contact the manufacturer for the address of the authorized service centre (see manufacturer's address at the rear side).

WARNING

Risk of injury due to substances hazardous to health!

Due to contamination with hazardous substances and operating agents during operation, there is a high health risk for the repair personnel.

- For each machine that is sent to an Elmo Rietschle Service centre for inspection, maintenance or repair, a fully completed, signed declaration of harmlessness must be enclosed.
The Declaration of No Objection is part of the supplier's documentation.
- Before returning, properly clean the machine.

After a repair or re-commissioning, the actions listed in chapter 5 "Installation" and chapter 6 "Commissioning and decommissioning" are to be performed as in the first commissioning.

7.4 Spare parts

CAUTION

Property damage due to wrong or defective spare parts!

Wrong or defective spare parts can cause malfunctions or blackout failure of the machine.

- Only use original spare parts or parts approved by the manufacturer.
- The use of other parts may revoke liability or guarantee for any resulting consequences.

Order spare parts according to:

- **List of spare parts:**
E 832 → S-VSI 100 OXY
 - Download the PDF file:
<http://www.gd-elmorietschle.com>
→ Downloads
 - Wearing parts and sealings are separately listed.
- **Website:**
<http://www.service-er.de>
 - Select type, size and design.

8 Malfunctions: Causes and elimination

Malfunction	Cause	Elimination	Note
Machine is switched off by the motor protection switch	Mains voltage/ Frequency does not correspond with the motor data	Check by qualified electrician	Chapter 5.6
	Connection to motor terminal board is not correct		
	Motor protection switch is not set correctly		
	Motor protection switch is triggered too quickly	Use a motor protection switch with an overload-dependent turn-off delay that considers the short excess current at start up (version with short circuit and overload trigger as per VDE 0660 Part 102 or IEC 60947-4-1)	
Suction capacity is insufficient	The mesh filter is plugged	Clean / replace the mesh filter	Chapter 7.2.2 Chapter 7.4
	The inlet pipe is too long or too narrow	Check the hose and/or the pipe	Chapter 5.4
	Machine or system leaking	Check the pipework and screw connections for leaks and check for tight fit	Chapter 7.2
Final pressure (max. vacuum) is not reached	Machine or system leaking	Check the pipework and screw connections for leaks and check for tight fit	Chapter 7.2
	Not enough cooling water	Observe cooling water consumption	Chapter 9
	The mesh filter is plugged	Clean / replace the mesh filter	Chapter 7.2.2 Chapter 7.4
Machine gets too hot	Ambient or inlet temperatures too high	Ensure proper use	Chapter 2.3
	The cooling water system is obstructed	Check the cooling water system and the inlet pipes	Chapter 7.2.3
	Not enough cooling water	Observe cooling water consumption	Chapter 9
	Cooling water inflow is too hot	Observe the max. inlet temperature	Chapter 9
The machine makes a strange noise	Deposits on the rotors	Clean the working space and the rotors	Elmo Rietschle Service
Please contact Elmo Rietschle Service for other malfunctions or those that cannot be eliminated.			

9 Technical Data

S-VSI 100 OXY			Continuous flow cooling 3.0 kW	Circulation cooling 3.0 kW
Sound pressure level (max.) 100 mbar (abs.) → 0.1 mbar (abs.) EN ISO 3744, Tolerance ± 3 dB(A)	dB(A)	50 Hz	75	78
		60 Hz	-	-
Sound power level	dB(A)	50 Hz	86	91
		60 Hz	-	-
Weight *	kg		190	262
Length *	mm		1098	1340
Width	mm		546	555
Height	mm		404	557
Vacuum connection			G 2	
Oil filled volume			1.65 (1.0 → H + 0.65 → H ₁)	
Cooling water consumption max. flow temperature: 40 °C			1.8 l/min	0.5 – 1 m ³ /h
Rated voltage 3~	V	50 Hz	230 / 400 ± 10 %	
		60 Hz	-	-
Current consumption	A	50 Hz	10.0 / 5.77	10.0 / 5.77
		60 Hz	-	-
Motor output	kW	50 Hz	3.0	3.0
		60 Hz	-	-

* Length and weight may differ from the information listed here depending on the motor manufacturer.

Please find more technical data on data sheets **D 833-OXY** and **D 833-UK-OXY**

- Download the PDF file:
D 833 OXY → S-VSI 100 (standard)
D 833-UK-OXY → S-VSI 100 (circulation cooling)
- Download the PDF file:
<http://www.gd-elmorietschle.com>
 → Downloads



Subject to technical changes!



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