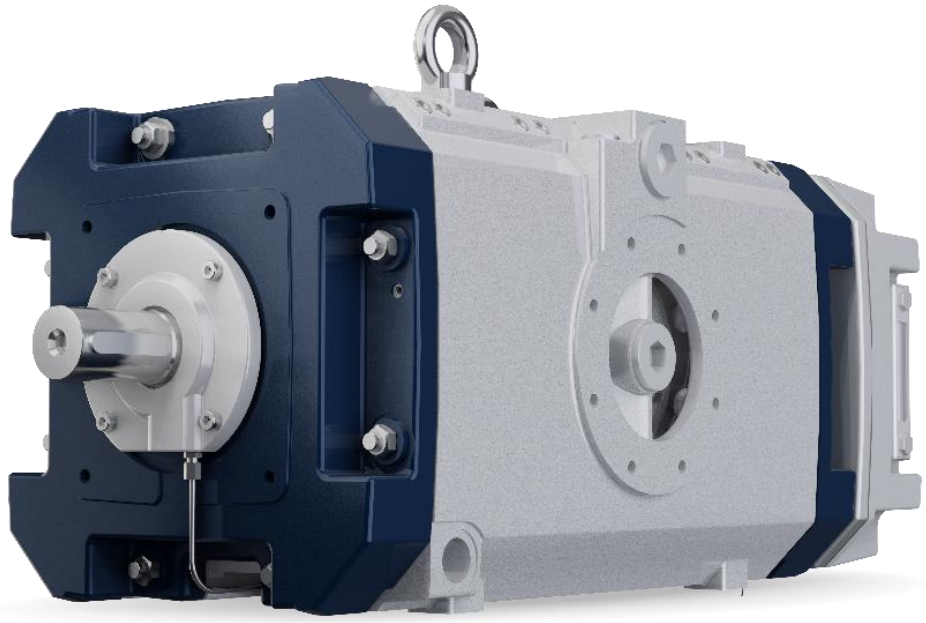
CVS ENG.
THINKING AHEAD

Mounting instructions

VacuStar W900 / W1300 / W1600



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Prior to installing the VacuStar W and putting it into operation you must have read and understood these instructions. These instructions are only valid together with the operating instructions, they do not replace them!

Translation of the Original Assembly Instructions

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1 General

1.1 Information on the assembly instructions

These mounting instructions provide important information about installation and start-up of the VacuStar W. A precondition for safe operation is the observance of all specified safety and handling instructions.
Furthermore, all local accident prevention regulations and general safety regulations valid for the application area of the VacuStar W must be observed.
You must have read and understood the mounting instructions before you start installing the machine and put it into operation! It is a product component and must be kept in direct proximity of the VacuStar W, well accessible to the personnel at all times. All safety instructions of the operating instructions must additionally be observed.

1.2 Pictogram explanation

Warning notes

Warning notes are characterised by pictograms in these mounting instructions. The warning notes are marked by signal words expressing the extent of the hazard.
It is absolutely essential to observe the notes and to proceed with caution in order to prevent accidents as well as bodily injuries and property damage.

DANGER!
points to an immediately dangerous situation, which can lead to death or serious injuries if it is not avoided.

WARNING!
... points to an immediately dangerous situation, which can lead to death or serious injuries if it is not avoided.

CAUTION!
... points to a potentially dangerous situation, which can lead to minor or light injuries if it is not avoided.

ATTENTION!
... points to a potentially dangerous situation, which may lead to property damage if it is not avoided.

Safety note ATEX!
Only for machines with Ex-approval.
This icon shows the special conditions that must be observed according to the approvals when conveying explosive gases and gas mixtures.

Hints and recommendations

NOTE!

… highlights useful hints and recommendations as well as information for an efficient and trouble-free operation.

1.3 Limitation of Liability

Information regarding the limitation of liability can be found in the operating instructions "VacuStar W900 / W1300 / W1600".

1.4 Copyright protection

Information regarding the copy right protection can be found in the operating instructions "VacuStar W900 / W1300 / W1600".

1.5 Spare parts

Information regarding spare parts can be found in the operating instructions "VacuStar W900 / W1300 / W1600".

1.6 Warranty conditions

The warranty conditions are included in the sales documentation as a separate document.

1.7 Customer Service

Our customer service can be contacted for any technical advice. Information about the responsible contact person can be retrieved by telephone, fax, E-mail or via the Internet at any time, refer to manufacturer's address on page 2.

1.8 Declaration of Incorporation

Declaration of incorporation (pursuant to EC Machinery Directive 2006/42/EC and “The supply of Machinery (Safety) Regulations 2008”) see page 42.

1.9 ATEX / UKEX Declaration of Conformity

Declaration of conformity (pursuant to ATEX-directive 2014/34/EU and “UK Government Guidance”) see page 44.

2 Safety

2.1 Intended use

The compressor vacuum pumps series VacuStar W were developed to be installed into a superior system. The manufacturer of the overall system must assess the new risks resulting from the installation. These risks must be included in the operating instructions of the system.
The VacuStar W is intended exclusively for the compression or suctioning of filtered air.

The VacuStar W in the explosion proof design complies with Directive 2014/34/EC (ATEX) and is suitable for conveying potentially explosive gases and gas mixtures of explosion group IIB, temperature class T2/T3 from potentially explosive zone 1 and zone 2 areas.
No explosive atmosphere is allowed in the area around the VacuStar W. The VacuStar W may only be opened when it is stopped and when there is no explosive atmosphere around it.
Marking of the VacuStar W:

II 2G c IIB T2 (i) (for VacuStar W without cell ventilation)
II 2G c IIB T3 (i) (for VacuStar W with cell ventilation and
no potentially explosive external atmosphere).
The gas temperature in temperature class T2 is restricted to 220 °C and in temperature class T3 to 195 °C and must be secured.
The vacuum must be secured to 200 mbar for temperature class T2 and to 100 mbar for temperature class T3 (only with cell ventilation).

2.2 Proper operation

The proper operation is determined mainly by the following criteria:

- Drive speed range: 1000...1500 min^{-1}
- maximum final temperature: 195 °C (T3) / 220 °C (T2)
- Ambient temperature: –20…+40 °C
- max. cooling water temperature: 60 °C
- No coast down of the cooling system after switching off the VacuStar W
- Permissible continuous duty vacuum with cell ventilation: 100 mbar
- Permissible continuous duty vacuum without cell ventilation: 200 mbar
- No counter-pressure on the pressure side in vacuum operation
- Liquids and solids may not get into the VacuStar W or be sucked into the VacuStar W.

If explosive gases and gas mixtures are conveyed, the following guidelines must be observed:

- 2014/34/EC
  Devices and protection systems for the proper use in explosive environments
- 99/92/EC
  Health protection and safety of the employees in potentially explosive areas

Only use VacuStar W for the intended use.
All specifications in these installation and operating instructions have to be strictly complied with (technical data, ATEX regulations, etc.)
All types of claims due to damage arising from improper use are excluded. The operator alone shall be responsible for any damage arising from improper use.

2.3 Acceptance and monitoring

The VacuStar W itself is not subject to any acceptance and monitoring obligation.

2.4 Operator's responsibility

Information regarding the operator's responsibility can be found in the operating instructions "VacuStar W900 / W1300 / W1600".

2.5 Requirements placed upon the specialised staff

The mounting instructions specify the following qualification requirements for the different fields of activity:

- **Specialists**
  are due to their technical training, knowledge and experience and their knowledge of the pertinent regulations able to carry out the work assigned to them and to independently recognize potential hazards.
- **Electrical specialists**
  are, due to their technical training, knowledge and experiences and their knowledge of the relevant standards and regulations, able to work on electrical systems and to independently recognize possible hazards.

2.6 Personal protective equipment

Information regarding personal protective equipment can be found in the operating instructions "VacuStar W900 / W1300 / W1600".

2.7 Occupational safety and special risks

Please observe all safety instructions as per the operating instructions "VacuStar W900 / W1300 / W1600", Chapter "Occupational safety".

3 Technical data

3.1 Dimensions of the VacuStar W900 / W1300 / W1600

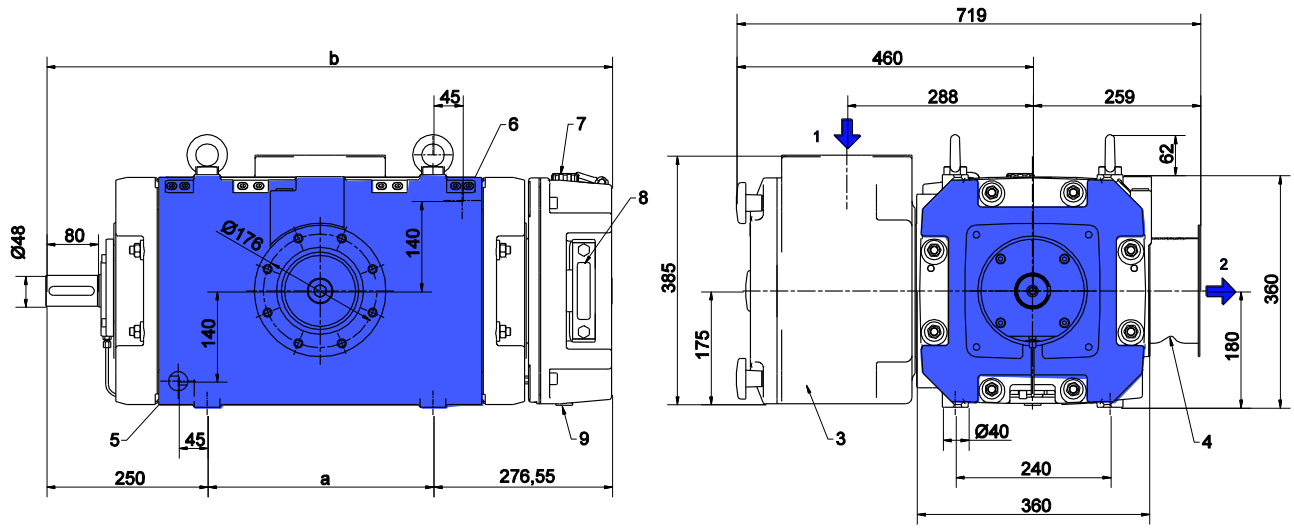

Fig. 1: Dimensions of VacuStar W

VacuStar	W900	W1300	W1600
a	200	350	500
b	727	877	1027

Suction flange, pressure flange, connection for tank vehicle flange (DN 125) as per DIN 28461

Tab. 1: Dimensions of the VacuStar W

3.2 Technical data

VacuStar W operating data	Unit	Model W900	Model W1300	Model W1600
Rated speed / speed range	[min^{-1}]	1500 / 1000…1500		
Nominal operating vacuum [1)]	[mbar]	400		
Permanent operating vacuum with cell ventilation [1)]	[mbar]	100		
Permanent operating vacuum without cell ventilation [2)]	[mbar]	200		
Maximum final overpressure with direct drive [3), 4)]	[bar]	2.0		
Max. final overpressure with V-belt drive [3), 4)]	[bar]	2	1.5	0.5
Sound pressure level at 7 m distance at 400 mbar / 0.5 bar excess pressure	[dB(A)]	71 / 74	75 / 79	76 / 82
Moment of inertia	[kgm^2]	0.52	0.73	0.95
Content of oil container	[l]	7.5	7.5	7.5
Lubricating oil consumption	[l/h]	0.2	0.3	0.4
Weight (without accessories)	[kg]	220	279	339

1) Excess pressure = 0 bar

2) Securing via ventilation valve

3) Vacuum = 0 mbar

4) Securing via safety valve

Tab. 2: Operating data

VacuStar W performance data	Unit	Model W900	Model W1300	Model W1600
Vacuum operation, suction pressure: 400 mbar, speed: 1500 min^{-1} [1)]				
Suction volume flow / coupling performance	[m^3/h] / [kW]	860 / 20.4	1220 / 28.5	1570 / 38.0
Pressure operation, excess pressure: 0.5 bar, speed: 1500 min^{-1} [2)]				
Suction volume flow / coupling performance	[m^3/h] / [kW]	891 / 26.0	1267 / 38.0	1572 / 47.5

1) Excess pressure = 0 bar

2) Vacuum = 0 mbar

Tab. 3: Performance characteristics

VacuStar W cooling water circuit	Unit	Model W900	Model W1300	Model W1600
Heat volume to be ventilated P_{ab}				
Vacuum operation: 400 mbar [1)]	[kW]	11.0	17.0	19.0
Pressure operation: 0,5 bar [2)]	[kW]	11.5	19.0	24.0
Pressure operation: 2,0 bar [2)]	[kW]	14.5	20.0	28.0
Pipe dimension	Inch	R1“		
Radiator surface $A_{radiator}$ [3)]	m^2	0.16	0.32	0.32
Content of water balancing container	[l]	approximately 2.0		

1) Excess pressure 0 bar

2) Vacuum 0 mbar

3) Based on a radiator of a specific cooling capacity P_{spec} = 3.5 kW / (m² • °C)

$P_{spec} = P_{ab} / [(t_{water} - T_{air\ in}) \bullet A_{radiator}]$

Tab. 4: Cooling water circuit

Lubricating oils

Only single grade oils with the following specification are permitted for operating the VacuStar W:

Specification	Value
API:	CF/CF4 or higher
ACEA:	E2 or higher
Viscosity:	Suction temperature > 10 °C: SAE 40 Suction temperature < 10 °C: SAE 30

Tab. 5: Lubricating oils

Recommended oil types

Brand	Suction temp. > 10 °C	Suction temp. < 10 °C
CVS	CVS Lube 4000	CVS Lube 3000

Other oil types on request.

Tab. 6: Lubricating oil types

ATTENTION!

Do not use any synthetic lubricants!

4 Design

4.1 Design

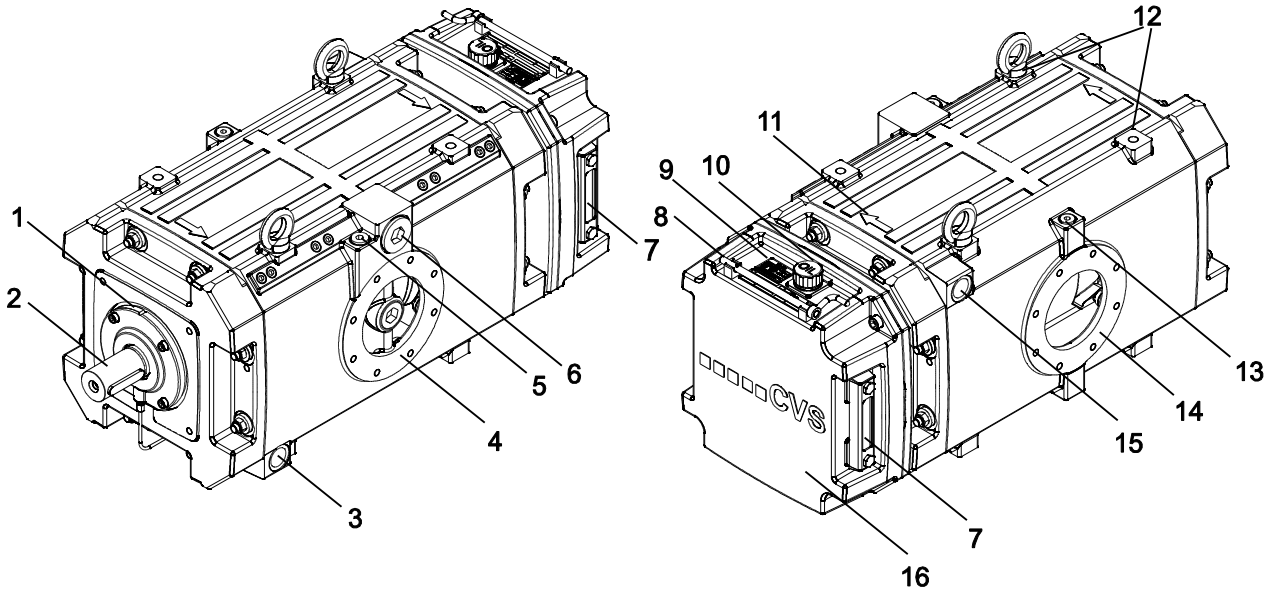

Fig. 2: View VacuStar W and details

1 Centring device and fastening of hydraulic motor mounting flange
2 Drive shaft
3 Cooling water inflow (1“)
4 Pressure connection (flange DIN 28459-125)
5 Temperature measuring point (R ½“)
6 Connection cell ventilation (R 2“)
7 Oil level indicator (bilateral)
8 Crank for manual lubrication
9 Rating plate
10 Oil filler neck cap
11 Rotation arrow
12 Transport and fixing holes (M16)
13 Negative pressure connection (R 3/8“)
14 Suction connection (flange DIN 28459-125)
15 Cooling water outflow (R 1“)
16 Lubricating oil reservoir

4.2 Function

VacuStar W

The VacuStar W is a multi-cell compressor vacuum pump, which works with the displacement principle. It pumps evenly and has low pulsation.

Lubrication

The VacuStar W is lubricated by means of an oil pump. Oil is pumped from the oil reservoir via the oil lines to the VacuStar W's lubricating points.
In extreme conditions, additional lubrication may be required.
See page 34.

Cooling

The VacuStar W is water-cooled. The VacuStar W is equipped with a cooling jacket inside the casing.
An external circulation cooling with an air-cooled cooler is necessary for the return of the cooling water.
See page 32.

Drive

The VacuStar W can be powered via:

- Articulated shaft
- V-belt
- Hydraulic motor.

See page 35.

5 Transport and storage

5.1 Safety notes for transport

Improper transport

Danger!
Danger by falling down or tilting of the VacuStar W!
The weight of the VacuStar W may injure a person and cause serious bruising!
Therefore:

– Depending on the dead weight and size of the VacuStar W, use a pallet on which the VacuStar W can be moved by means of a fork lift.
– For lifting the VacuStar W, use suitable lifting gear (slings, etc.) that is designed for the weight of the VacuStar W.
– When putting the slings in position, take care to avoid putting stress on individual components.
– Only use the provided attachment points with eye bolts.

Please also observe the safety notes in the operating instructions "VacuStar W900 / W1300 / W1600"!

5.2 Transport

The VacuStar W fastened on a baseplate must be transported by means of a fork lift or suitable lifting gear. The lifting gear must be designed for the weight of the VacuStar W.

For future transports:

- Seal all open connections with protective caps (prevents penetration of dirt and water)
- Secure against vibrations
- Drain all process and operating media
- Securely fasten the VacuStar W prior to transport (e.g. screw it onto a pallet)
- Transport and put down the VacuStar W with a fork lift or secure with straps and lift with suitable lifting gear.

5.3 Storage

Storage of packages

Store packages under the following conditions:

- Do not store outdoors.
- Store dry and dust free.
- Do not expose to aggressive media.
- Protect against solar irradiation.
- Avoid mechanical vibrations.
- Storage temperature: −10…+60 °C
- Relative humidity: max. 95%, non-condensing
- If storage lasts longer than 3 months, regularly check the general condition of all parts and of the packaging. If necessary, brush up or recondition the preservation.
- To keep moisture away from the VacuStar W's workspace, bags with desiccant must be placed into the inlets and outlets. Remove these before the VacuStar W is connected to the suction and pressure lines.

6 Installation and assembly

6.1 Safety

Safety

WARNING!
Risk of explosion!
Only use components that are suitable for the zone in which the unit is used when you install the unit in an explosive atmosphere. An equipotential bonding must be installed between the equipment and the vehicle.
The safety equipment described in our mounting instructions and installation instructions are mandatory for a safe operation of the VacuStar W in explosive areas.

Electrical system

DANGER!
Mortal danger due to electric current!
There is mortal danger in case of contact with live components.
Activated electrically driven components can start to move uncontrolled and cause severest injuries. Therefore:
– Switch off the electric power supply before commencing any work and secure against restarting.
– Only skilled electricians are allowed to carry out any work on the electric systems, on electric components and connections.

Dirt and lying about items

CAUTION!
Risk of tripping from dirt and objects lying around!
Contamination and discarded items can lead to slipping and tripping, resulting in substantial injuries.
Therefore:
– Always keep the working area clean.
– Remove objects that are not required.
– Mark tripping points with yellow-and-black tape.

Please observe all safety instructions as per the operating instructions "VacuStar W900 / W1300 / W1600", Chapter Occupational safety

6.2 Installation example

The illustration shows an example of a system with an installed VacuStar W.

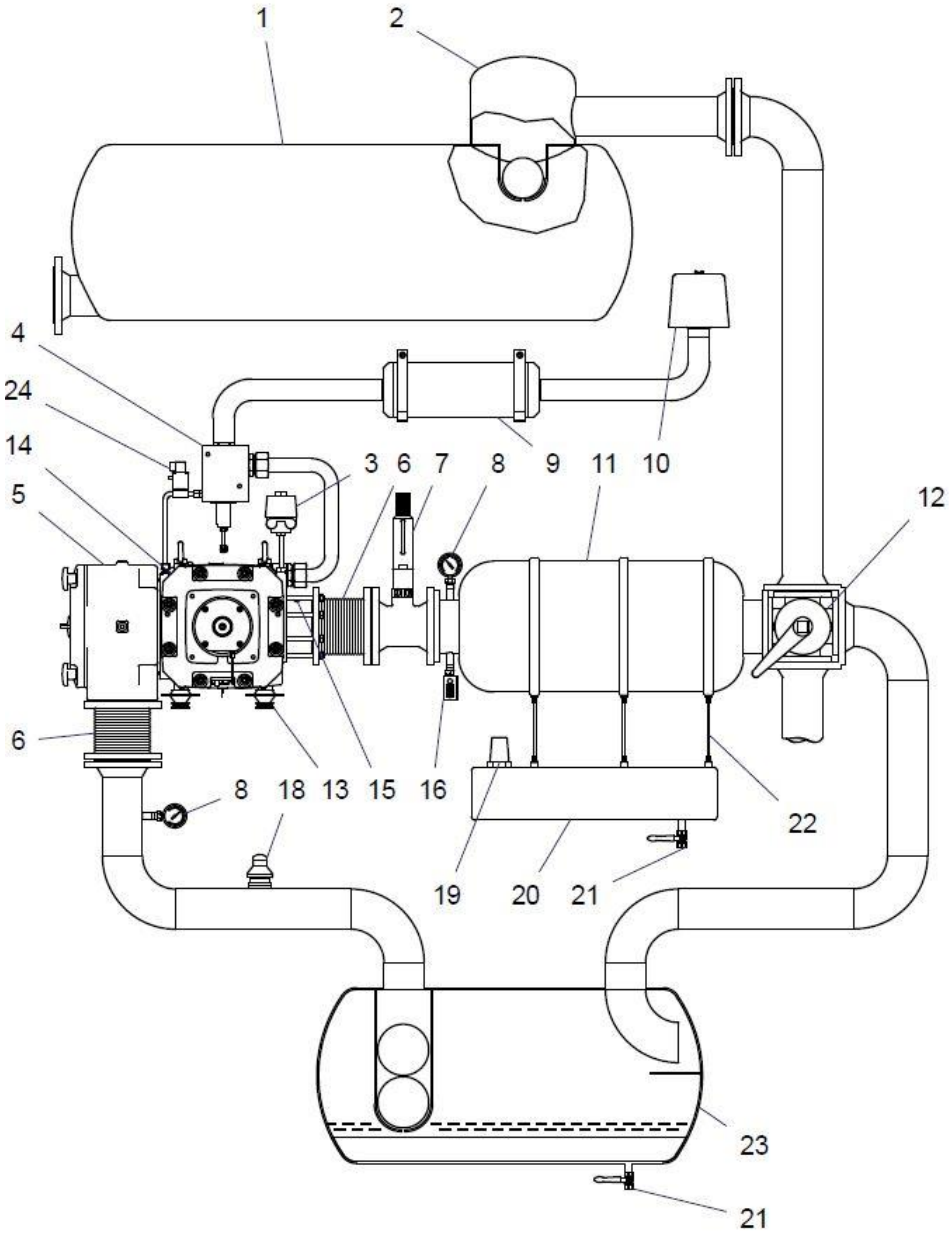

Fig. 3: Installation of the VacuStar W (example)

1 Vehicle tank
2 Safety dome
3 Temperature switch
4 Cell ventilation valve
5 Vacuum suction filter
6 Compensator
7 Safety valve
8 Pressure gauge
9 Cell ventilation muffler
10 Cell ventilation filter
11 Sound absorber - oil separator
12 Changeover four-way cock
13 Elastic attachment
14 VacuStar W
15 Non-return valve
16 Thermometer
17 Vacuum meter
18 Ventilating valve
19 Ventilation muffler
20 Lubricating oil collection container
21 Drain tap
22 Oil drain
23 Safety tank
24 Shut-off valve in the control line

NOTE!

For the water circuit, see chapter 6.11!

6.3 Necessary work

The following work is necessary to install the VacuStar W:

- Install all vehicle components such as oil separators, collection containers, etc.
- Installing VacuStar W with suction and pressure lines.
- Installing safety and monitoring equipment.
- Connect the VacuStar W to the cooling water circuit.
- Connecting the drive with VacuStar W. Here, observe the rotation direction arrow and the speed range.

6.4 Sound insulation

Measures for sound insulation

You can avoid or reduce the triggering of adjacent vehicle components by body sound or media sound as follows:

- Switching a combined muffler-oil separator downstream
- Elastic uncoupling at the attachment points
  (with belt drive, the VacuStar W must be supported with a stop buffer in the direction of the belt pull.)
- Compensators in the suction and pressure lines
- Connect the VacuStar W to the cooling water circuit via hoses.

6.5 Installing VacuStar W

The VacuStar W is attached to the bottom of the VacuStar W with 4 attachment points.

Checking the function before the installation

Check the rotor shaft function. Rotating the rotor shaft with your hand must be possible.

Requirements placed upon installation point and attachment

- The attachment points on the vehicle must feature a sufficient load capacity and rigidness.
- The attachment points must be on the same level.
- The fastening screws must feature a sufficient clamping length.

Requirements upon the installation location

The installation location must fulfil the following requirements:

- protect from dirt, falling rocks and spray water.
- offer sufficient space for accidental contact protection.
- offer sufficient space for the connections of the suction and pressure lines.
- ensure good legibility of the instruments.
- Accessible for maintenance and repair work (e.g. for replacing the air filter, or for checking the safety and non-return valve).

Assembly

1. Attach the VacuStar W with screws as per Tab. 7 without tension.
2. To keep moisture away from the VacuStar W', bags with desiccant must be placed into the inlets and outlets. Remove these before the VacuStar W is connected to the pipe network.

ATTENTION!
If the bag with desiccant remains in the VacuStar W, this may cause property damage!

Use the following screws for securing the VacuStar W:

Screw	Solidity	Torque	Screw-in depth in the housing of the VacuStar W
M16	8.8	190 Nm	22…24 mm

Tab. 7: Fastening screws

6.6 Compensators

Compensators for the suction and pressure lines

On the suction side, compensators with Teflon lining and vacuum support ring should be used.
On the pressure side, you must ensure pressure resistance, overpressures of up to 2.0 bars and temperature resistance up to 240 °C.

6.7 Suction and pressure line

Requirements

The suction and pressure lines must meet the following requirements:

- corrosion-proof
- Nominal diameter according to the following table:

VacuStar	DN suction and pressure line
W900	DN 100
W1300	DN 125
W1600	DN 125

Tab. 8: Fastening screws

Installation

Install the lines as follows:

- The connected lines must not have any reaction force on the VacuStar W. Support the lines adequately.
- Place suction lines rising towards the VacuStar W. The condensate must be able to be drained.
- Remove dirt, welding remainders, rust,. etc. before you put the unit into operation.
- Check the lines for leaks.

6.8 Safety equipment

The following safety equipment must be installed:

- Safety valve
- Ventilating valve
- Monitoring the compression end temperature
- Non-return valve
- Vacuum suction filter
- Protection against contact
- Cell ventilation valve if needed
- Shut-off valve in the control line
- Safety pot

6.8.1 Safety valve (overpressure protection)

Risk of explosions

DANGER!

Risk of injury by explosions!

Explosions can cause severe injuries!

Therefore:

– Install the safety valve as instructed. Observe the manufacturer's instructions.
– Only use the safety valve for its intended purpose.
– Never block the safety valve.

The German accident prevention regulations require a non-lockable safety valve to be installed after the VacuStar W at the pressure side. This valve must be selected such that it prevents the pressure to exceed the highest permissible operating pressure by more than 10 %. It must be identified with a TÜV component test number and be equipped with a manual venting element.

ATTENTION!

The safety valve (overpressure protection) must be chosen to match the maximum permitted operating pressure, the volume flow and the temperature range.

Assembly

1. Install the safety valve directly downstream of the VacuStar W.
2. Set the safety valve to the max. permissible operating pressure, see Tab. 2: Operating data, observe drive type.
3. Protect the settings against unauthorised or erroneous changes.

6.8.2 Ventilation valve (vacuum protection)

Risk of explosions

DANGER

Risk of injury by explosions!

Explosions can cause severe injuries!

Therefore:

– Properly install the ventilation valve. Observe the manufacturer's instructions.

– Do not manipulate the ventilation valve.

The ventilation valve is used to regulate the system and as a safety feature in the suction line. When the set vacuum is reached, the ventilating valve opens and admits atmospheric auxiliary air into the system.

ATTENTION!

The safety valve (vacuum protection) must be chosen to match the maximum permitted operating pressure, the volume flow and the temperature range.

Assembly

1. Install the ventilation valve on the suction side of the VacuStar W.
2. Set minimum permissible vacuum:
   – for system without cell ventilation: 200...1000 mbar
   – for system with cell ventilation: 100…1000 mbar.

NOTE!

The ventilation valve can be procured from CVS!

6.8.3 Monitoring the compression end temperature

The final temperature of the VacuStar W must be monitored. A suitable measuring instrument must be installed that switches the VacuStar W off when the maximum permissible temperature is reached.

Assembly

1. Install the temperature sensor in the provided bore at the pressure socket.
2. Connect the temperature sensor to the superordinate vehicle controller.

ATEX note

- The temperature sensor connection must be intrinsically unbreakable.
- The maximum deactivation temperatures are:
  – for VacuStar W with cell ventilation: 195 °C
  – for VacuStar W without cell ventilation: 220 °C

6.8.4 Non-return valve

The non-return valve prevents a backflow of air into the VacuStar W while the VacuStar W is standing still.

Assembly

Install the non-return valve horizontally between two flanges on the pressure stub of the VacuStar W. Observe the flow direction.

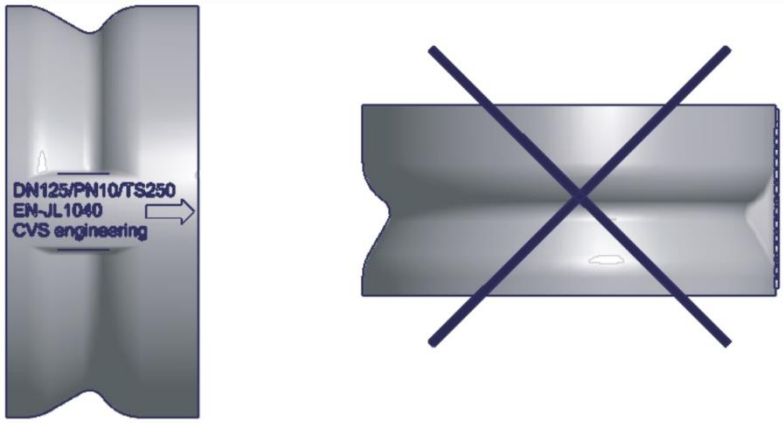

Fig. 4: Non-return valve

6.8.5 Vacuum suction filter

A suitable filtering device is required to prevent suctioning in liquids and solids.

Assembly

Install the vacuum filter into the suction line upstream from the VacuStar W. Observe the flow direction.

ATEX note

For explosion-proof VacuStar W, use only filters that are resistant to the explosion pressure shock.

Such filters can be purchased from CVS.

6.8.6 Protection against contact

Rotating or hot parts of the system must be equipped with a protection against contact.
Please note that the German accident prevention regulations do not allow a maximum surface temperature of 80 °C to be exceeded.
Observe DIN EN ISO 13857, for example, for the distances and the layout of the protective grid.

6.8.7 Cell ventilation valve

Assembly

The VacuStar W has been prepared for operation with cell ventilation. The connection is located above the pressure flange.

Observe the following points during installation:

1. Install cell ventilation valve vertically.
2. Install the fresh air lines between the VacuStar W and cell ventilation valve.
3. Install the control line between the connection at the suction socket and the cell ventilation valve.
4. Set an opening pressure of 200…300 mbar with the VacuStar W running at the setting screw.
5. Check the full stroke. Full stroke = 27 mm.

ATEX note
When transporting explosive gases and gas mixtures, the control and fresh air lines must be explosion and shock-proof (11.6 barg).

Cell ventilation valve, muffler and suction filter can be purchased from CVS

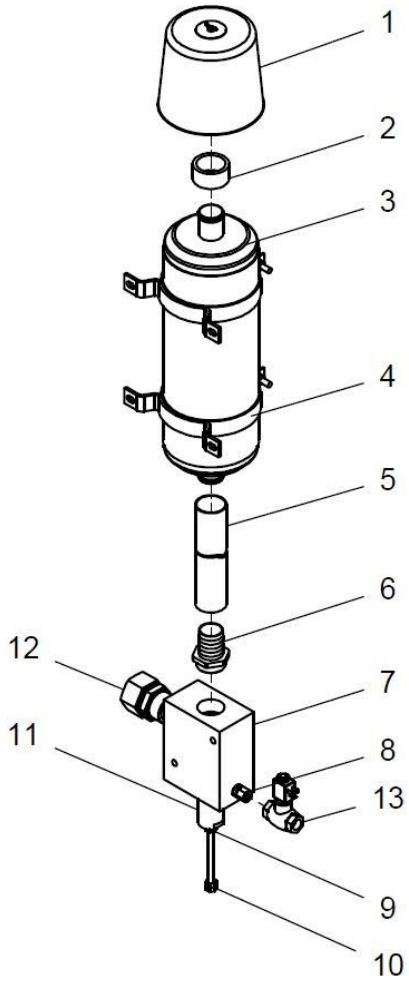

Fig. 5: Cell ventilation valve with muffler and air filter

1 Air filter (installed vertically)
2 Hose adapter
3 Muffler (installed horizontally or vertically)
4 Muffler holder
5 Connection line, max. length 1 m (not included in scope of delivery)
6 Hose stub
7 Cell ventilation valve (installed vertically)
8 Screw connection, connection control line (recommended pipe diameter: 10 x 1 mm)
9 Locknut
10 Adjustment nut for the adjustment and tuning of the oil pressure
11 Spring cage
Caution: Spring is under pressure. Prior to removing the spring cage, the springs must be completely relaxed with the set screw.
12 Connection R1 1/2" fresh air line to VacuStar W, max. length 300 mm
13 Shutoff valve

6.8.8 Shut-off valve in the control line

A shut-off valve must be installed in the control line in order to avoid reversing of the VacuStar W when the tank is evacuated at deactivation.

NOTE!

The shut-off valve must be connected in the control line in parallel to the ancillary drive!

6.8.9 Safety pot

Requirements

The safety tank protects the VacuStar W from sucking in liquids. It must comply with the following requirements:

- Incoming air must not contact the liquid directly
- Sufficiently large settlement room
- Drain tap at the lowest possible level.

Assembly

Install the safety tank at the deepest point of the system.

Functional check

The functional check of the safety tank must satisfy the following requirements:

- Sucked-in liquid is separated and remains in the safety tank.
- In vacuum mode, the suctioned liquid must remain in the safety container.
- With atmospheric suction (pressure operation) no more than 1 l of liquid must be suctioned into the VacuStar W per hour.
- When the liquid volume in the container is reached, the line to the VacuStar W must close.

6.8.10 Display and monitoring equipment

CAUTION!
All display and monitoring devices in a system that is used for conveying explosive material must comply with the Directive 2014/34/EC (ATEX) with respect to equipment category, temperature class and explosion group.

Vacuum meter, manometer and temperature sensor must be installed for safety reasons.

We recommend installing an additional oil shortage fuse and a tachometer.

Designation	Monitoring parameter	Place of installation	Measuring range
Vacuum meter	Operating vacuum	intended site VacuStar W (at the VacuStar's inlet)	0…1000 mbars
Pressure gauge	Positive working pressure	Immediately after the pressure pipe joint of the VacuStar W	0…2.0 bars
Temperature sensor	Compression final temperature	Bore in the pressure flange	to 240 °C
Oil shortage fuse (optional) [1)]	Oil level	Lubricating oil container	–
Speed counter (option)	Speed	Drive shaft	1000…1500 min^{-1}

1) It is recommended to install a monitoring switch. If no monitoring switch is installed, the minimum oil level must be verified visually by the operator.

Tab. 9: Display and monitoring equipment

6.9 40B40BAdditional components of the system

6.9.1 Sound absorber - oil separator

Requirement

The pressure resistance of the muffler separator must be adapted to the permissible system pressure.

Assembly

- Install the muffler oil separator between the VacuStar W and the switch four way tap.
- The oil drain must point straight down.
- Connect the oil separator to a collection container via 2 or 3 oil drains. Install 4 mm diameter diaphragms in the oil drains.

6.9.2 Collection container

Execution

The collection container must be designed as follows:

- At least 10 l capacity
- Ventilation cross section of 1"
- Condensate and oil drain.

6.10 Safety dome

Requirement

The safety dome on the vehicle tank must be equipped with a float valve and a baffle.
The baffle prevents the liquid from being entrained when the liquid sloshes.

6.11 Cooling water system

ATTENTION!

- The maximum permissible cooling water temperature is 60 °C.
- When dimensioning the components, you must take extreme temperatures in the summer and coolant additives into account. See 12, Tab. 4: Cooling water circuit.

The following illustration shows a diagram of a cooling water circuit.

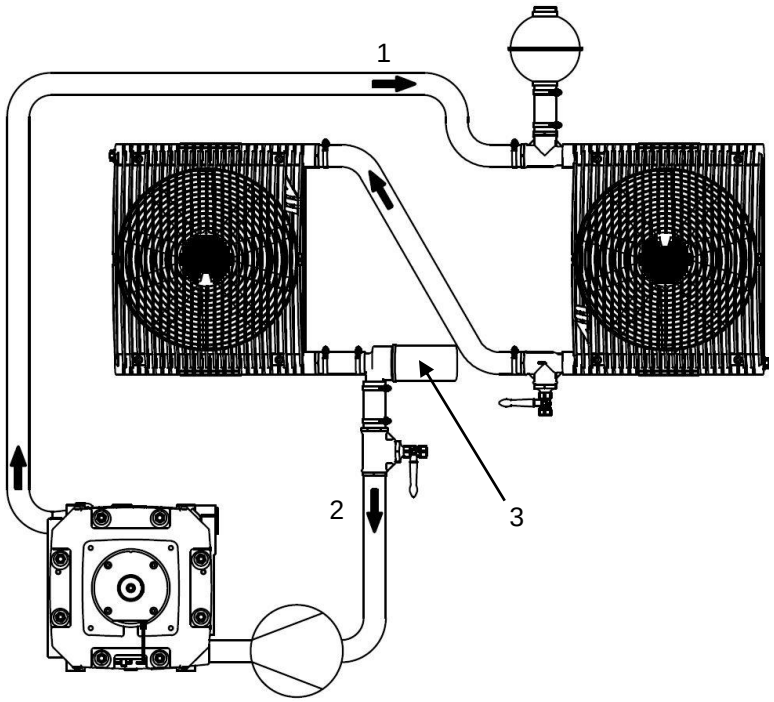

Fig. 6: Diagram of cooling water circuit

1 Cooling water inflow
2 Cooling water outflow
3 Cooling water pump

All components can also be purchased from CVS.

Assembly

Observe the following points during installation:

- Recommended cooling water cycling volume 5,200 l/h at 0.2 bar pressure loss
- Install the radiator stress-free on rubber elements.
- Install the cooling water pump (3) at the lowest point.
- Always connect the cooling water output (2) from the cooler at the lowest possible position on the VacuStar W.
- Install the balancing container at the highest possible location.
- The cooling water pump (3) and the cooler ventilator must not continue to run after the VacuStar W has been switched off.
- Use hoses that are temperature-resistant up to 100 °C.
- Add antifreeze compound for ambient temperatures below 0 °C.

6.11.1 Additional oil lubrication

Additional lubrication in extreme operating conditions

With vehicles used in extreme conditions, additional lubrication may be required.

These are extreme operating conditions:

- Ambient temperature above 35 °C
- Continuous operation of the VacuStar W for more than 3 hours with an operating vacuum of 200 mbar or an operating pressure of 2 bar.
- Suctioning or compressing aggressive media such as solvents, solvent gases or acidic substances, etc.

Installation

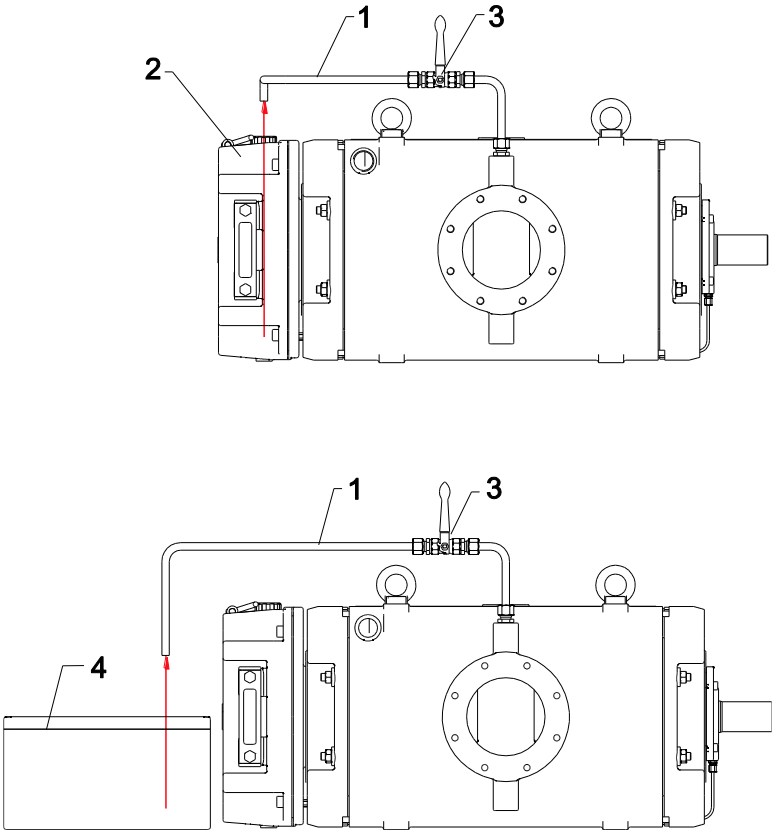

Fig. 7: Additional lubrication
Top figure: suctioning from oil pot
Bottom figure: suctioning from additional tank

1 Connection line
2 Lubricating oil container
3 Shutoff valve
4 Additional lubricating oil tank

6.12 Drive

CAUTION!

Drive and coupling of a system that is used for conveying explosive material must comply with the Directive 2014/34/EC (ATEX) with respect to equipment category, temperature class and explosion group.

ATTENTION!

- Selection and design are within the responsibility of the system builder.
- Do not route axial forces into the VacuStar W shaft when installing drive components.
- Do not tap couplings or other connection components onto the shaft, but slide them on.
- Always slide additional components such as V belt pulleys as far onto the shaft of the VacuStar W as possible.
- Check the torque and the sense of rotation.

The VacuStar W is driven via:

- V-belt
- Articulated shaft
- Flexible coupling

where drives such as lorry P.T.O, electric motors, hydraulic motors or diesel engine are possible.

6.12.1 V belt drive

ATTENTION!
The maximum permissible lateral force on the shaft of the VacuStar W must not exceed 5300 N. Observe the design, installation and inspection instructions of the manufacturer.

The following belt pulleys can directly be installed on the shaft end of the VacuStar W:

VacuStar W V-belt drive		Unit	W900		W1300		W1600	
	V belt profile	[–]	XPB	SPB	XPB	SPB	XPB	SPB
Vacuum operation	Max. performance	[kW]	26		38		47.5	
	Smallest disc diameter	[mm]	170		200		212	
	Number of belts	[–]	3	4	3	4	4	5
Pressure operation	Max. performance	[kW]	49		58		47.5	
	Smallest disc diameter	[mm]	224		250		212	
	Number of belts	[–]	4	5	4	5	4	5
	Permissible final overpressure	[bar]	2		1.5		0.5	

Tab. 10: Belt pulleys

Assembly

- Select V-belt drive according to Table (Tab. 10).
- Align the V belt pulleys accurately to each other.
- Install V-belt pulley (e.g. with Taper-Lock clamping bushes) and V-belt with pretension according to the manufacturer specifications.

6.12.2 Articulated shaft drive

ATTENTION!
Observe the design, installation and inspection instructions of the manufacturer.

Select the bending angle of the joint shafts at max. 15°. The angle should be the same size on both knots.

6.12.3 Drive via flexible coupling and hydraulic motor

ATTENTION!
Observe the design, installation and inspection instructions of the manufacturer.

The hydraulic motor is installed to the VacuStar W via an intermediate flange. The power is transmitted via a flexible coupling.
Components that match the VacuStar W type can be ordered from CVS.

7 Start-up

7.1 Safety during start-up

Start-up, operation

WARNING!
Risk of injury due to improper start-up and operation
Improper start-up and operation can lead to serious bodily injuries or property damage.
Therefore:
- Have all work during initial operation exclusively performed by the manufacturer's employees or by his authorised representatives or by trained personnel.
- Start-up and operation may only be performed by adequately qualified personnel that has been authorised and instructed by the operator.
- Before the start of any work, ensure that all covers and protective devices are correctly installed and function correctly.
- Never override any protective equipment during operation.
- Pay attention to tidiness and cleanliness in the working area! Loosely stacked or scattered components and tools are accident sources.

Please observe all safety instructions as per the operating instructions "VacuStar W900 / W1300 / W1600", Chapter "Occupational safety".

7.2 Start-up

Inspection prior to initial start-up

The following points must be checked prior to initial start-up:

- Inspect the VacuStar W and the entire system
- Check the pipes for continuity and residues (remove blanks if there are any)
- Check the operating data on the rating plate.
- Check whether the rotor shaft can be rotated by hand.
- Fill in **cooling water (clean tap water)** up to the maximum mark on the compensation reservoir. Bleed the circuit. Add antifreeze according to manufacturer's specifications.
- Top up **lubricating oil** according to lubricating oil schedule. Fill oil reservoir with oil up to max. 3 cm below filler neck thread.
  Manually prelubricate the VacuStar W by means of the crank handle (refer to lubricating oil inspection Chapter 7.4).
- Check the sense of rotation (switch briefly on/off). Observe the rotation direction arrow on the casing.
- Check the installation direction and the positioning of the non-return valve (see page 26, Chapter 6.8.4).
- Check the function of the safety valve and the ventilation valve (see page 24 ff, chapter 6.8.1 and 6.8.2).
- Check function of the cell ventilation valve if necessary. (see page 27, chapter 6.8.7.)
- Check the attachment screws. (see page 21, chapter 6.5.)

Start-up

Proceed as follows during start-up:

- Open shut-off devices (if available)
- Start the VacuStar W drive
- Check operating data
- Check the function of the installed cell ventilation.

Inspections during operation

The following inspections have to be carried out during operation:

- Prior to every start-up and during operation, the oil level and the coolant level must be checked and topped up if necessary.
- Open shut-off devices. Always turn the four-way cock until it hits the stop. Intermediate positions are not permitted
- Switch on drive and check whether pressure or vacuum are created.
- Pay attention to abnormal noises and leaks during operation. If necessary, switch off VacuStar W.
- Drain condensate at the condensate and safety traps. Vessel may not be in a state of vacuum when condensate is drained.

Checking the operating data:

- The speed must be between 1000…1,500 min^{-1}
- The cooling water outlet temperature (return flow to radiator) may be max. 60 °C.
- Check positive working pressure at the pressure gauge (permissible pressure refer to rating plate).
- Check the operating vacuum at the vacuum meter (permissible vacuum refer to rating plate).
- The compression end temperature at 20 °C suction temperature may not exceed the following values:
  - 140 °C at 400 mbar operating vacuum
  - 120 °C at 0.5 mbar excess pressure

ATEX note

The following points must be observed when explosive gases and gas mixtures are conveyed:

- Prior to every start of the VacuStar W and during operation:
  – Check coolant
  – Check oil level
  – Check for leaks
- Listen for abnormal noise during the suction process. Switch off the VacuStar W if necessary.
- Check the VacuStar W at regular intervals (daily) for signs of overheating and exceptional deformations. If necessary, switch off the VacuStar W or do not put it into operation.
- Regularly examine the VacuStar W for leaks such as leaking oil or water or escaping gas. If necessary, switch off VacuStar W or do not put into operation.
- If the VacuStar W is extremely hot: Switch off VacuStar W and only switch on again after approximately half an hour, to prevent the rotor from starting.

7.3 Switching off

To switch off the VacuStar W, proceed as follows:

- Switch off drive for the VacuStar W
- Close the shut-off valves (if installed)

7.4 Inspections to be performed

Lubricating oil inspection

Only lubricating oils pursuant to the lubricants specifications on page 13 are approved for the VacuStar W series.
The manual prelubrication of the VacuStar W is always required during the initial operation.
Ölstand am Schauglas kontrollieren und falls erforderlich bis ca. 3 cm unter Gewinde des Einfüllverschlusses mit Öl füllen. The oil level may not drop below the bottom mark on the oil inspection glass.

Procedure to be followed for manual prelubrication:

- Remove the crank handle from the retaining bracket and push it through the oil filler neck onto the oil pump shaft. Push the crank handle down until the drive dog engages and now prelubricate for approximately 40 full turns.
- Afterwards, clip crank handle back into the retaining bracket and screw locking screw back on again.

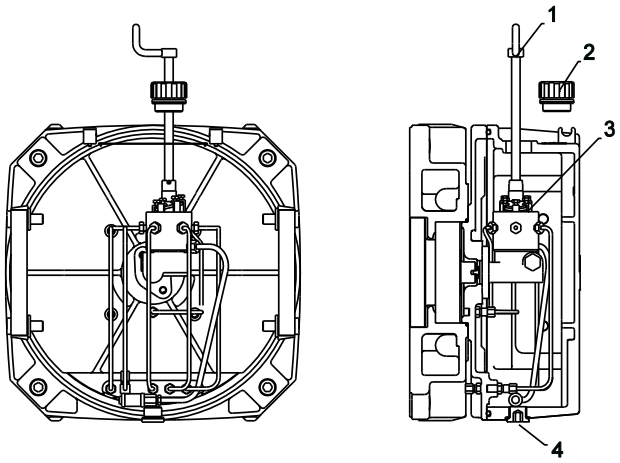

Fig. 8: Oil pump

1	Crank handle	**3**	Lubricating oil pump
2	Oil filler neck screw	**4**	Lubricating oil drain screw

ATEX note
The oil reservoir must be filled up before every suction process!

8 Declaration of Incorporation

Einbauerklärung im Sinne der Maschinenrichtlinie 2006/42/EG Anhang II 1B - Orginaleinbauerklärung

Declaration of Incorporation according to the EC Machinery Directive 2006/42/EC Annex II 1B – Original Declaration of Incorporation

Hersteller / Manufacturer	CVS engineering GmbH Großmattstraße 14 D-79618 Rheinfelden
Bevollmächtigter für die Zusammenstellung der relevanten technischen Unterlagen / Authorised person for compilation of the relevant technical documents:	Fabian Blum Großmattstraße 14 D-79618 Rheinfelden
Kurzbeschreibung & Produkt **Short description & Products:**	Flüssigkeitsring-Kompressor-Vakuumpumpe für Druck- und Vakuumbetrieb Liquid-ring compressor vacuum pump for pressure and vacuum operation VacuStar WR 2500*, WR 3100*, WR 4000 Schraubenkompressor für den Druckbetrieb Screw compressor for pressure operation SKL 700, SKL 1100, SKL 700 LS, SKL 1100 LS, SKL 1200 C, SKL 1500 Drehschieberkompressor für Druck- und Vakuumbetrieb Rotary vane compressor for pressure and vacuum operation VacuStar W900*, W1300*, W1600* Drehschieberkompressor für Druckbetrieb Rotary vane compressor for pressure operation RKL 160 Drehschieberkompressor für Druck- und Vakuumbetrieb Rotary vane compressor for pressure and vacuum operation VacuStar L400
Seriennummer/ Serial number	siehe Typenschild / see type plate

Der Hersteller erklärt, dass das oben genannte Produkt eine unvollständige Maschine im Sinne der Maschinenrichtlinie ist. Das Produkt ist ausschließlich zum Einbau in eine Maschine oder unvollständige Maschine vorgesehen und entspricht daher noch nicht allen Anforderungen der Maschinenrichtlinie. Folgende grundlegenden Anforderungen der Maschinenrichtlinie für dieses Produkt sind angewandt und eingehalten: 1.1.2, 1.1.3, 1.1.5, 1.3.1, 1.3.2, 1.3.4, 1.3.7, 1.5.5, 1.5.7, 1.5.8, 1.5.9, 1.6.1, 1.7.1, 1.7.2, 1.7.3, 1.7.4

The manufacturer declares that the above product is an incomplete machine in the meaning of the machinery directive. The product is only intended for installation in a machine or an incomplete machine and therefore does not meet all requirements of the machinery directive yet. The following basic requirements of the machinery directive for this product have been applied and complied with: 1.1.2, 1.1.3, 1.1.5, 1.3.1, 1.3.2, 1.3.4, 1.3.7, 1.5.5, 1.5.7, 1.5.8, 1.5.9, 1.6.1, 1.7.1, 1.7.2, 1.7.3, 1.7.4

Die speziellen technischen Unterlagen gemäß Anhang VII Teil B wurden erstellt. Der Bevollmächtigte für das Zusammenstellen der technischen Unterlagen verpflichtet sich, die Unterlagen auf begründetes Verlangen an die einzelstaatlichen Stellen zu übermitteln. Die Übermittlung erfolgt postalisch in Papierform oder in elektronischer Form.

The special technical documents have been created according to Annex VII, part B. The person authorised to compile the technical documents commits to submitting the documents to the national offices upon justified request. The submission shall take place on paper in the email or on electronic data carrier.

Die Inbetriebnahme des Produkts ist so lange untersagt, bis festgestellt wurde, dass die Maschine, in die das oben genannte Produkt eingebaut wird, allen grundlegenden Anforderungen der Maschinenrichtlinie entspricht.

Commissioning of the product is forbidden until it has been determined that the machine into which the above product is installed meets all basic requirements of the machinery directive.

Die oben mit "*" markierten Produkte erfüllen die Anforderungen der folgenden einschlägigen Richtlinien:

- ATEX-Richtlinie 2014/34/EU des Europäischen Parlaments und Rates

The products marked with "*" comply with the requirements of the following directives:

ATEX directive 2014/34/EU of the European parliament and council

Rheinfelden, 10.02.2023

i.V. F. Blum

Fabian Blum

Leiter Konstruktion & Entwicklung

Head of Design & Engineering

9 UK Declaration of Incorporation

Declaration of Incorporation according to
The Supply of Machinery (Safety) Regulations 2008 Annex II 1B
Original Declaration of Incorporation

Manufacturer:	CVS engineering GmbH Großmattstraße 14 D-79618 Rheinfelden
Importer:	CompVac Ltd. Mr. Lee Benton 25, Wharfedale Road Euroway Industrial Estate BD4 6SG Bradford
Authorised person for compilation of the relevant technical documents:	Fabian Blum Großmattstraße 14 D-79618 Rheinfelden
Short description & Products:	Liquid-ring compressor vacuum pump for pressure and vacuum operation VacuStar WR 2500*, WR 3100*, WR 4000** Screw compressor for pressure operation SKL 700, SKL 1100, SKL 700 LS, SKL 1100 LS, SKL 1200 C, SKL 1500 Rotary vane compressor for pressure and vacuum operation VacuStar W900*, W1300*, W1600** Rotary vane compressor for pressure operation RKL 160 Rotary vane compressor for pressure and vacuum operation VacuStar L400
Serial numbers:	See type plate

The manufacturer declares that the above product is an incomplete machine in the meaning of 'The Supply of Machinery (Safety) Regulations 2008'. The product is only intended for installation in a machine or an incomplete machine and therefore does not meet all requirements of 'The Supply of Machinery (Safety) Regulations 2008' yet.

The following basic requirements of 'The Supply of Machinery (Safety) Regulations 2008' for this product have been applied and complied with: 1.1.2, 1.1.3, 1.1.5, 1.3.1, 1.3.2, 1.3.4, 1.3.7, 1.5.5, 1.5.7, 1.5.8, 1.5.9, 1.6.1, 1.7.1, 1.7.2, 1.7.3, 1.7.4

The special technical documents have been created according to Annex VII, part B. The person authorised to compile the technical documents commits to submitting the documents to the national offices upon justified request. The submission shall take place on paper in the email or on electronic data carrier.

Commissioning of the product is forbidden until it has been determined that the machine into which the above product is installed meets all basic requirements of 'The Supply of Machinery (Safety) Regulations 2008'.

The products marked with **"*"** comply with the requirements of the following directives:
- Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres Regulations 2016

Rheinfelden, 10.02.2023

i.V. F. Blum

Fabian Blum
Head of Design & Engineering
CVS engineering GmbH

10 ATEX Declaration of Conformity

EU- Konformitätserklärung gemäß Richtlinie 2014/34/EU (ATEX)
Declaration of Conformity according to Directive 2014/34/EC (ATEX)

Wir erklären hiermit als Hersteller in alleiniger Verantwortung, dass die nachfolgend beschriebenen Produkte der Richtlinie 2014/34/EU und den harmonisierten Normen entsprechen.
We hereby declare in sole responsibility that the product described below, to which this declaration of conformity refers to, is in conformity with the essential requirements of the standards listed below.

Hersteller / *Manufacturer*		CVS engineering GmbH Großmattstraße 14 79618 Rheinfelden / Germany
Produkt / *Product*		VacuStar W900, W1300, W1600
Kurzbeschreibung / *Short description*		Rotations-Kompressor-Vakuum-Pumpe für Druck- und Vakuumbetrieb *Rotary vane compressor-vacuum pump for pressure and vacuum operation*
Seriennummer / *Serial number*		see type plate
Kennzeichnung / *Marking*		Ex II 2/- G Ex h IIB T2/T3 Gb
Hinterlegungsnummer / *Depository number*		EPS 23 ATEX 3 074
Benannte Stelle / Designated body		(Bureau Veritas Consumer Product Service Germany GmbH, Oehleckerring 40, 22419 Hamburg / Germany)
Angewandte harmonisierte Normen / Applied harmonized standards:	EN ISO 80079-36:2016	Explosionsfähige Atmosphären - Teil 36: Nicht-elektrische Geräte für den Einsatz in explosionsfähigen Atmosphären - Grundlagen und Anforderungen Explosive atmospheres - Part 36: Non-electrical equipment for explosive atmospheres - Basic method and requirements
	EN ISO 80079-37:2016	Explosionsfähige Atmosphären - Teil 37: Nicht-elektrische Geräte für den Einsatz in explosionsfähigen Atmosphären - Schutz durch konstruktive Sicherheit "c", Zündquellenüberwachung "b", Flüssigkeitskapselung "k Explosive atmospheres - Part 37: Non-electrical equipment for explosive atmospheres - Non-electrical type of protection constructional safety "c", control of ignition sources "b", liquid immersion "k"
	EN IEC 60079-0:2018	Explosionsgefährdete Bereiche - Teil 0: Betriebsmittel - Allgemeine Anforderungen Explosive atmospheres - Part 0: Equipment - General requirements
Other standards/ Specifications:	EN 1127-1:2019	Explosionsfähige Atmosphären - Explosionsschutz – Teil 1: Grundlagen und Methodik; Deutsche Fassung EN 1127-1:2019 Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology
	TRT 006: 2014-05	Technische Richtlinien Tanks - Explosionsdruckstoßfestigkeit Technical Guidelines Tanks - Explosion Pressure Shock Resistance

Rheinfelden, 10.02.2023

i.V. Manfred Wagner
Senior engineer system design
Ex authorized person

11 UKEX Declaration of Conformity

Declaration of Conformity in accordance with UK Government Guidance

Manufacturer:	CVS engineering GmbH Großmattstraße 14 79618 Rheinfelden / Germany
Importer:	CompVac Ltd. Mr. Lee Benton 25, Wharfedale Road Euroway Industrial Estate BD4 6SG Bradford
Product:	VacuStar W900, W1300, W1600
Short description:	Rotary vane compressor-vacuum pump for pressure and vacuum operation
Serial number:	see type plate
Marking:	Ex II 2/- G Ex h IIB T2/T3 Gb
Depository number:	EPS 23 UKEX 3 075
Designated body:	Bureau Veritas Consumer Product Service Germany GmbH, Oehleckerring 40, 22419 Hamburg / Germany

This declaration is issued under the sole responsibility of the product manufacturer.
The object of the declaration described above is in conformity with the relevant UK Statutory Instruments and their amendments:

Equipment and Protective Systems
Intended for use in Potentially Explosive Atmospheres
Regulations 2016

We hereby declare that the product described above, to which this declaration of conformity refers to, is in conformity with the essential requirements of the following standards:

Applied standards:	BS EN ISO 80079-36:2016	Explosive atmospheres - Part 36: Non-electrical equipment for explosive atmospheres - Basic method and requirements
	BS EN ISO 80079-37:2016	Explosive atmospheres - Part 37: Non-electrical equipment for explosive atmospheres - Non-electrical type of protection constructional safety "c", control of ignition sources "b", liquid immersion "k"
	BS EN IEC 60079-0:2018	Explosive atmospheres - Part 0: Equipment - General requirements
	BS EN 1127-1:2019	Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology

The products comply with the requirements of the following directives:
- The Supply of Machinery (Safety) Regulations 2008

Rheinfelden, 10.02.2023

i.V. Manfred Wagner
Senior engineer system design
Ex authorized person

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