

# Original Operating Instructions

## C-VLR 1000

Vakuum pump



**Elmo  
Rietschle**

by Gardner Denver



**C-Serie  
C-Series**

Klaue  
Claw



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## Foreword

### 1 Foreword

#### 1.1 Principles

These operating instructions:

- are a part of the following contact free running claw vacuum pumps C-VLR 1000.
- describe 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 specialists.

#### 1.3 Supplier documentation and accompanying documents

Document	Contents	No.
Supplier documentation	Operating Instructions	BA 880/80-EN
	Declaration of Conformity	C 0080-EN
	Declaration of harmlessness	7.7025.003.17
Spare parts' list	Spare parts document	E 880/80
Data sheet	Technical data and graphs	D 880/80
Info sheet	Storage guidelines for machines	I 150
Manufacturer's declaration	EU Directive 2002/95/EG (RoHS)	—




#### 1.4 Abbreviations

Fig.	Figure
C-VLR	vacuum pump
m <sup>3</sup> /h	suction capacity
mbar (abs.)	Final vacuum, operating vacuum

#### 1.5 Directives, standards, laws

See Conformity Declaration

## 1.6 Symbols and meaning

Symbol	Explanation
▷	Condition, pre-requisite
####	Instructions, action
a), b),...	Instructions in several steps
⇒	Results
 [-> 14]	Cross reference with page number
	Information, note
	Safety symbol Warns of potential risk of injury Obey all the safety instructions with this symbol in order to avoid injury and death.

## 1.7 Technical terms and meaning

Term	Explanation
Machine	Pump and motor combination ready to be connected
Motor	Pump drive motor
Vacuum pump	Machine to create a vacuum
Claw	Machine's design or active principle
Pumping capacity	Vacuum pump volume flow related to the condition in the suction connection
Final pressure (abs.)	The maximum vacuum that a pump reaches when the suction opening is closed. Given as absolute pressure.
Permanent vacuum	The vacuum or the suction range at which the pump operates permanently. The permanent vacuum or intake pressure is $\geq$ than the final vacuum and $<$ than the atmospheric pressure.
Noise emission	The noise emitted at a specific loading given as a figure, 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 are prohibited unless expressly permitted. Contraventions will lead to claims for damages.

## 2 Safety

The manufacturer is not responsible for damage if you do not follow all of this documentation.

### 2.1 Warning instruction markings

Warning	Danger level	Consequences if not obeyed
 <b>DANGER</b>	immediately imminent danger	Death, severe bodily injury
 <b>WARNING</b>	possible imminent danger	Death, severe bodily injury
 <b>CAUTION</b>	possible hazardous situation	Slight bodily injury
 <b>NOTICE</b>	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.

The safety instructions in all sections must be taken into consideration.

The operating instructions must be read by the responsible technical personnel/ operator 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/ operator. Instructions fixed directly onto the machine must be obeyed and must always remain legible. This applies for example to:

- Symbols for connections
- Data and motor data plate
- Instruction and warning plates

The operator is responsible for observing local regulations.

### 2.3 Designated use

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

- only operate the machine in a 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 suction temperature of between 5 and 40°C. Please contact us for temperatures outside this range.
- the machine may convey, compress or extract the following media:
  - all non-explosive, non-flammable, non-aggressive and non-poisonous dry gases and gas air mixtures

### 2.4 Unacceptable operating modes

- extracting, conveying and compressing explosive, inflammable, aggressive or poisonous media, e.g. dust as per ATEX zone 20-22, solvents as well as gaseous oxygen and other oxidants, water vapour, liquids or solid materials
- must not be operated in rooms that are at risk of explosion and in Zone 22 dusty atmospheres that are at risk of explosion
- using the machine in non-commercial plants if the necessary precautions and protective measures have not been taken in the plant
- installing in environments that are at risk of explosions
- using the machine in areas with ionising radiation
- modifications to the machine and accessories

### 2.5 Personal qualifications 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, competence and monitoring of staff
- all work must only be carried out by technical specialists:
  - Installation, commissioning, maintenance and inspection work
  - Working with electricity
- personnel being trained to work on the machine must be supervised by technical specialists only

### 2.6 Safety-conscious work

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
- the standards and laws in force

### 2.7 Safety notes for the operator

- hot parts of the machine must not be accessible during operation or must be fitted with a guard
- People must not be endangered by the free extraction or discharge of pumped media
- Risks arising from electrical energy must be eliminated.



## 2.8 Safety instructions for installing, commissioning and maintenance

- The operator will ensure 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 is idle and cannot be switched on again
- Ensure that you follow the procedure for decommissioning the machine described in the operating instructions.
- Fit or start up safety and protective devices again immediately after finishing work.
- Conversion work 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 invalidate liability for any consequences arising.
- Keep unauthorised people away from the machine

## 2.9 Guarantee conditions

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

- Improper use
- Not complying with 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 Transportation

##### 3.1.1 Unpack and check the delivery condition

- a) Unpack the machine on receipt and check for transport damage.
- b) Notify the manufacturer of transport damage immediately.
- c) Dispose of the packaging in accordance with the local regulations in force.

##### 3.1.2 Lifting and transporting

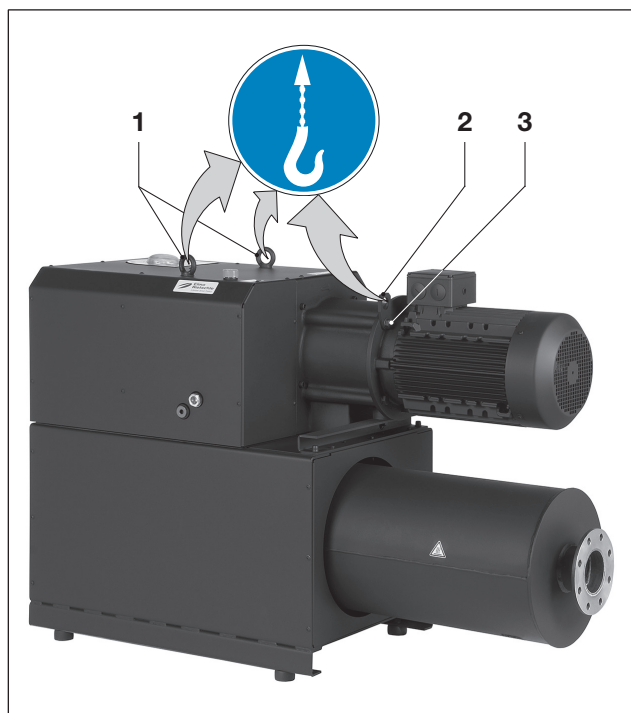


Fig. 1 Lifting and transporting

- 1 Eyebolts
- 2 Transport shackle
- 3 Fixing screw

#### **! WARNING**

**Death or limbs crushed as a result of the items being transported falling or tipping over**

- ▷ Remember the centre of gravity when transporting with a forklift truck or platform lift truck.
- ▷ When transporting with the lifting device remember:
  - a) Select the lifting device suitable for the total weight to be transported.
  - b) Ensure that the machine cannot tip and fall.
  - c) Do not stop under a suspended load.
  - d) Put the goods to be conveyed on a horizontal base.

#### **Lifting device/ Transporting with a crane**

#### **! WARNING**

**Bodily injury resulting from improper operation**

- a) Loads crosswise to the ring level are not permitted.
  - b) Avoid impact stress.
- 
- a) Tighten the eyebolts (Fig. 1/1) and fixing screw (Fig. 1/3) on the transport shackle (Fig. 1/2) firmly.
  - b) The machine must be suspended on the eyebolts and the transport shackle using the lifting device.

## 3.2 Storage

### NOTICE

#### Material damage caused by improper storage.

- ▷ Ensure that the storage area meets the following conditions:
  - a) dust free
  - b) vibration free

### 3.2.1 Ambient conditions for 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 „Machine storage guidelines“, Page 4

## 3.3 Disposal

### ⚠️ WARNING

#### Danger from inflammable, corrosive or poisonous substances.

Machines that come into contact with hazardous substances must be decontaminated before disposal.

- ▷ When disposing ensure the following:
  - a) Collect oils and grease separately and dispose of in accordance with the local regulations in force.
  - b) Do not mix solvents, limescale removers 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 Set up and operation

### 4.1 Setup

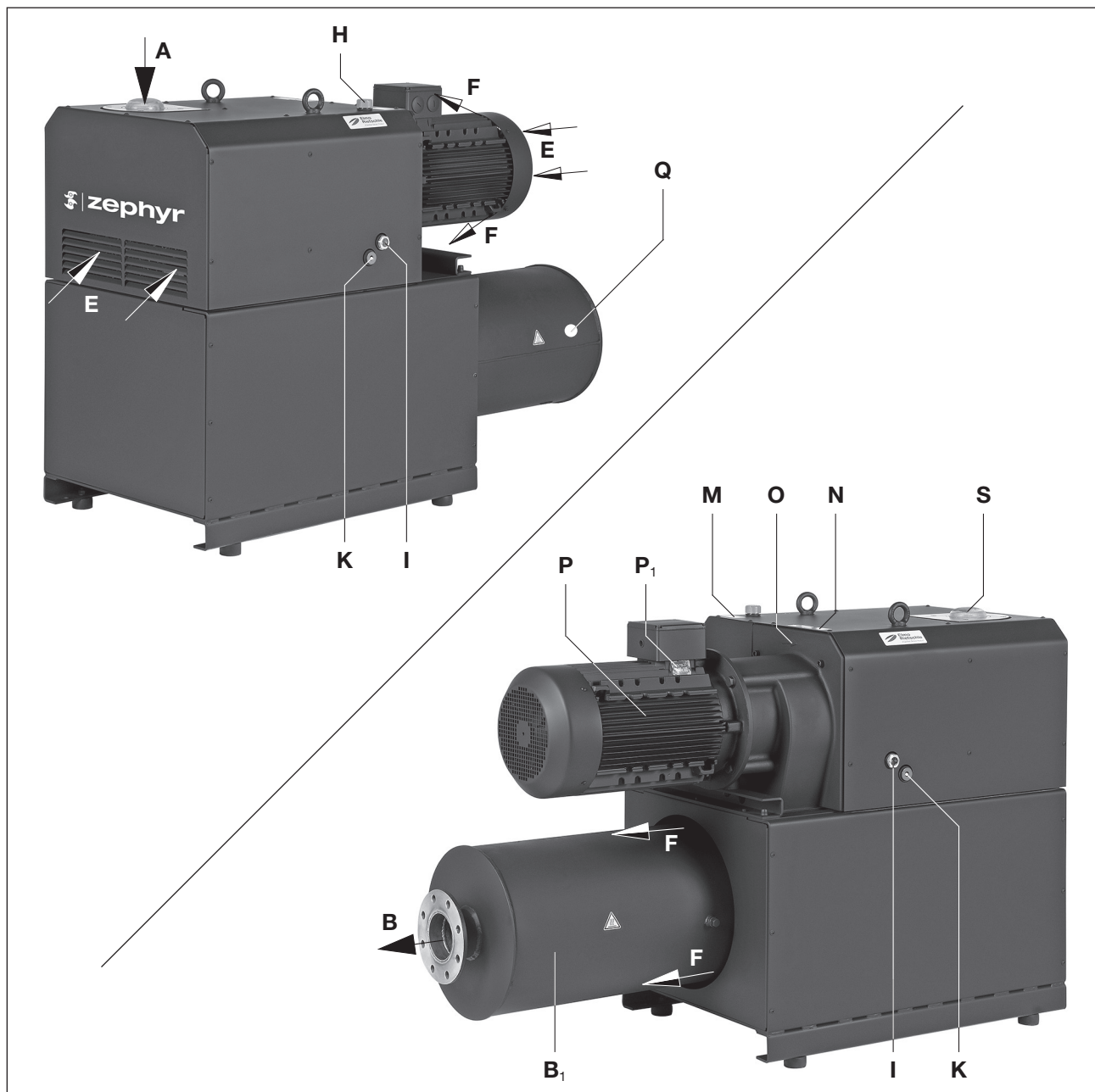
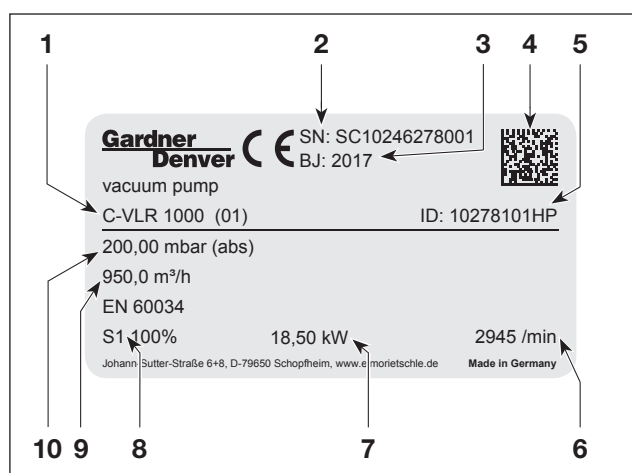


Fig. 2 Vacuum pump C-VLR 1000

- |                      |                       |                      |                             |
|----------------------|-----------------------|----------------------|-----------------------------|
| <b>A</b>             | Vacuum connection     | <b>M</b>             | Oil recommendation plate    |
| <b>B</b>             | Air outlet connection | <b>N</b>             | Data plate                  |
| <b>B<sub>1</sub></b> | Exhaust silencer      | <b>O</b>             | Direction of rotation arrow |
| <b>E</b>             | Cooling air inlet     | <b>P</b>             | Drive motor                 |
| <b>F</b>             | Cooling air outlet    | <b>P<sub>1</sub></b> | Motor data plate            |
| <b>H</b>             | Oil filling point     | <b>Q</b>             | hot surfaces > 70 °C        |
| <b>I</b>             | Oil sight glass       | <b>S</b>             | Mesh filter                 |
| <b>K</b>             | Oil discharge point   |                      |                             |

### 4.1.1 Data plate



- 1 Type/ Size (mechanical version)
- 2 Serial number
- 3 Year of construction
- 4 Data matrix barcode
- 5 Item no.
- 6 Speed
- 7 Motor rating
- 8 Operating mode
- 9 Suction capacity
- 10 Final pressure (abs.)

Following information are encrypted in the barcode:

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

Fig. 3 Data plate (example)

### 4.2 Description

The C-VLR 1000 model has a connection flange on the inlet side and an exhaust silencer on the pressure side (Fig. 2/B<sub>1</sub>). The air sucked in is cleaned by a micro-filter (Fig. 2/S).

The ZEPHYR VLR 1000 is a double shaft rotary piston vacuum pump in which the claws roll off against each other contact free and dry. The counter-rotating claw rotors are synchronised by a gear pair in the gearbox. The synchronous gearbox gear wheels 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 gear wheels 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 shaft seals and O rings, the compressor chamber with piston rings. The VLR 1000 is enclosed in an insulating hood. In order to dissipate compression heat, the cooling air is sucked through between the machine and the hood using a drum fan that sucks in the fresh cooling air (Fig. 2/E) and discharges the heated air out of the cooling air outlet (Fig. 2/F).

The VLR 1000 is driven by standard flanged three-phase motors via a coupling.

A vacuum relief valve is incorporated into the machine.

### 4.3 Areas of application

This contact free running claw vacuum pump, the C-VLR 1000, can be operated constantly at any pressure between atmospheric and an inlet pressure of 200 mbars (abs.).

The pumping capacity with unrestricted suction is 950 m³/h at 50 Hz. Data sheet D 880/80 shows the dependency of the pumping capacity on the intake pressure.



If the unit is switched on more frequently (at regular intervals of about 10 times an hour) or at higher ambient temperatures and intake temperatures, the excess temperature limit of the motor winding and the bearings may be exceeded. Please contact the manufacturer should the unit be used under such conditions.



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

### 5 Installation

#### 5.1 Preparing for installation

Check the following points:

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



The oil filling point (Fig. 2/H), oil sight glass (Fig. 2/I) and the oil outlets (Fig. 2/K) must be easily accessible. The cooling air inlets (Fig. 2/E) and the cooling air outlets (Fig. 2/F) must be at least 30 cm away from adjacent walls. Cooling air coming out must not be sucked in again. For maintenance work there must be a minimum of 40 cm in front of the mesh filter (Fig. 2/S).

#### 5.2 Installation

##### **NOTICE**

**The machine may only be operated when it is set up horizontally.**

**Material damage resulting from the machine tipping over and falling.**

**When installed at more than 1000 m above sea level a reduction in power is noticeable. In this case we would ask you to contact us.**

##### **Contamination in the intake air**

To protect the machine the operator should install appropriate filters on the suction side.

**The C-VLR 1000 must not be operated without covering plates.**

Ensure that the foundation complies with the following conditions:

- Level and straight
- The bearing surface must be designed to be able to take the weight of the machine.



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

### 5.3 Connecting pipes

- a) Remove the adhesive sheets from the vacuum connection (Fig. 2/A) and insert the mesh filter (Fig. 2/S) with the curved side up.
- b) Connect the vacuum line.

#### NOTICE

**Material damage resulting from the forces and torques of the pipes on the unit being too high.**  
Only screw pipes in by hand.

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

- c) The extracted air can be discharged through the exhaust silencer (Fig. 2/B) or conducted away via the flange and a pipe.

#### NOTICE

**Length of the connection pipes**  
With connection pipes that have the same pipe cross section as the machine connection and are more than 3m long, a non-return valve especially for the purpose must be installed in order to avoid reverse operation when the machine has stopped.

**Exhaust air must not be restricted**  
No blocking systems must be built into the exhaust air pipe (max. pressure difference 30 mbars). When the exhaust air pipe is connected it must be checked regularly for impurities.

## Installation

### 5.4 Filling with lubricating oil

- a) Fill the lubricating oil (for suitable types see "Maintenance") for the gear wheels and oil filling point (Fig. 2/H) up to the middle of the sight glasses (Fig. 2/I).
- b) Close the oil filling point.

### 5.5 Connecting the motor



#### **DANGER**

##### **Danger of death if the electrical installation has not been done professionally.**

The electrical installation must only be done by a qualified electrician observing EN 60204. The operating company has to provide the main switch.

- a) The motor's electrical data is given on the data plate (Fig. 2/N) or on the motor data plate (Fig. 2/P<sub>1</sub>). The motors comply with DIN EN 60034 and are in protection class IP55 and insulation class F. The appropriate connection diagram is located in the motor's terminal box (not for the plug connection version). The motor data must be compared with the data of the existing mains network (current type, voltage, network frequency, permitted current value).
- b) Connect the motor via the plug connection or the motor protection switch (for safety reasons, a motor protection switch is required and the connecting cable must be installed via a cable fitting to provide strain relief).  
We recommend using motor protection switches with delayed switch off, depending on possible excess current. Temporary excess current may occur when the machine is started cold.

#### **NOTICE**

##### **Power supply**

The conditions at the installation location must match the information on the motor data plate.

Without derating the following is permissible:

- $\pm 5\%$  Voltage deviation
- $\pm 2\%$  Frequency deviation



## 6 Commissioning and decommissioning

### 6.1 Commissioning

#### WARNING

##### **Improper use**

May lead to severe or fatal injuries. Therefore be sure to obey the safety instructions.



#### CAUTION

##### **Hot surfaces**

When the machine is at operating temperature the surface temperatures on the components (Fig. 2/ Q) may go above 70°C. You must avoid touching the hot surfaces (marked with warning plates).



#### CAUTION

##### **Noise emission**

The highest noise pressure levels measured as per EN ISO 3744 are given in Section 9. When spending a long time in the vicinity of the running machine use ear protectors to avoid permanent damage to your hearing.

#### NOTICE

##### **Wait until the machine stops**

The machine must only be switched on again after it stops.

## Commissioning and decommissioning

### 6.1.1 Checking the rotation direction

- ▷ The intended direction of rotation of the drive shaft is shown by the rotary direction arrow (Fig. 2/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.



#### NOTICE

##### **Incorrect direction of rotation**

Operating in the wrong direction of rotation leads to damage to the machine.

Use a phase sequence indicator to check the direction of rotation (**anti-clockwise rotating field**).

### 6.2 Decommissioning/ storing

#### **Stop the machine**

- a) Switch the machine off.
  - b) If available close the cut off device in the suction and pressure pipe.
  - c) Disconnect the machine from the electricity source.
  - d) Depressurise the machine:  
Open the pipes slowly.  
⇒ The pressure reduces slowly.
  - e) Remove the pipes and hoses.
  - f) Seal the connections for suction and discharge nozzles with adhesive foil.
- 📄 see also Section 3.2.1, Page 11

### 6.3 Re-commissioning

- a) Check the condition of the machine (cleanliness, cabling etc.).
- 📄 For installation see Section 5 Page 16
- 📄 For commissioning see Section 6.1 Page 19

## 7 Maintenance and repair



### DANGER

#### Danger of death from touching live parts.

Before maintenance work disconnect the machine by pressing the main switch or unplugging it and ensure that it cannot be turned on again.



### WARNING

#### Hot surfaces

During maintenance work there is the danger of getting burnt on hot components (Fig. 2/Q) of the machine.

Wait for the machine to cool down.

### 7.1 Ensuring 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.

With any work observe the safety instructions described in Section 2.8 "Safety notes for installation, commissioning and maintenance".

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

### 7.2 Maintenance work

Interval	Maintenance to be carried out	Section
monthly	Check the pipes and screws for leaks and to ensure they are seated properly and if necessary seal again or tighten up.	—
monthly	Check the terminal box and cable inlet holes for leaks and if necessary re-seal.	—
monthly	Clean the ventilation slots on the machine and the motor cooling ribs..	—
monthly	Check the oil level	7.2.1
8.000 h	Changing the oil	
depending on how dirty the discharged medium is.	Clean the mesh filter	7.2.2
Maintenance free	Coupling	7.2.3

7.2.1 Changing the oil

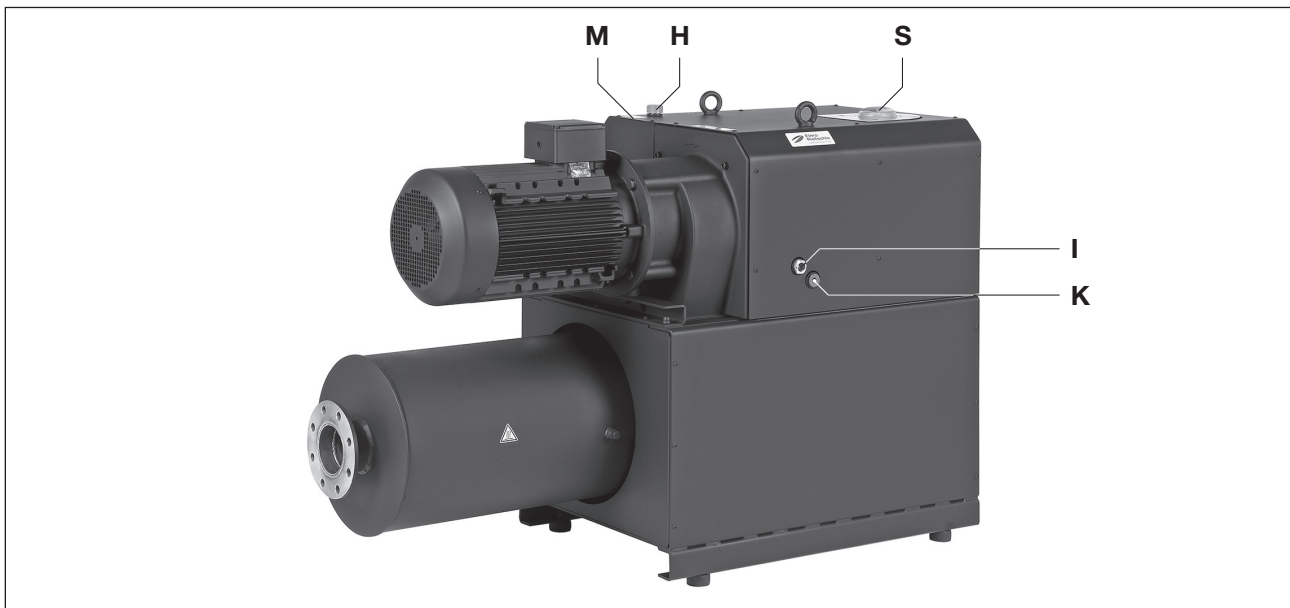


Fig. 4 Changing the oil

- H** Oil filling point with vent screw
- I** Oil sight glass
- K** Oil discharge point
- M** Oil recommendation plate
- S** Mesh filter

**NOTICE**

Always change the oil when the machine is at operating temperature and in an atmospherically ventilated area. If it is not completely emptied the amount that can be refilled is reduced.

The waste oil must be disposed of in compliance with the local environmental protection regulations. If you are going to use another oil type, empty the oil removing device housing and oil cooler completely. A minimum oil quantity can get out of the vent screw due to pressure compensation. If larger quantities of oil escape, wash the internal filter of the vent screw.

The oil level in the sight glasses (Fig. 4/I) must be checked every month. The machine must be switched off and vented to atmospheric pressure to top up the oil. With clean operations the oil must be changed after every 8,000 operating hours. The oil viscosity must comply with ISO VG 150 as per DIN 51519. Designation as per DIN 51502: CLP HC 150. We recommend the following oil brand: GEAR-LUBE 150 or equivalent oils by other manufacturers (also see oil recommendation plate (Fig. 4/M)).

## 7.2.2 Air filtering

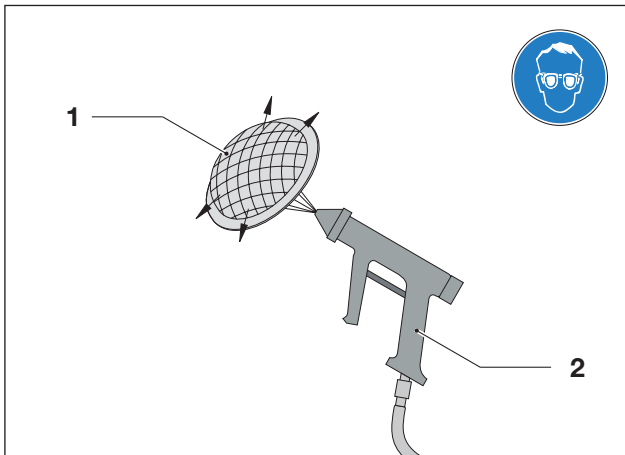


Fig. 5 Blowing out the mesh filter

- 1 Mesh filter
- 2 Compressed air

### NOTICE

#### Insufficient maintenance on the air filter

The power of the machine lessens and damage may occur to the machine.

#### Mesh filter;

The mesh filter (Fig. 4/S) installed on the inlet side must be cleaned by rinsing out or purging or replaced more or less often depending on how dirty the aspirated medium is.

### ⚠ WARNING

#### Danger of injury when dealing with compressed air.

When blowing through with compressed air, solid particles may be carried along or powder dust swirling around may cause injury to the eyes. Therefore, when cleaning with compressed air always wear goggles and a dust mask.

## 7.2.3 Coupling

The coupling needs no maintenance.

7.3 Repair/ Service

- a) For on site repair work the motor must be disconnected from the mains by a qualified electrician so that it cannot be started up again accidentally. For repairs use the manufacturer, its branch offices or authorised dealers. Please contact the manufacturer for the address of the service centre responsible for you (see Manufacturer’s address).

Fig. 6 Clearance certificate 7025.003.17

**NOTICE**

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 harmlessness is part of the supplier’s documentation.

- b) After a repair or re-commissioning, the actions listed under „Installation“ and „Commissioning“ must be carried out as for initial commissioning.

### 7.4 Spare parts

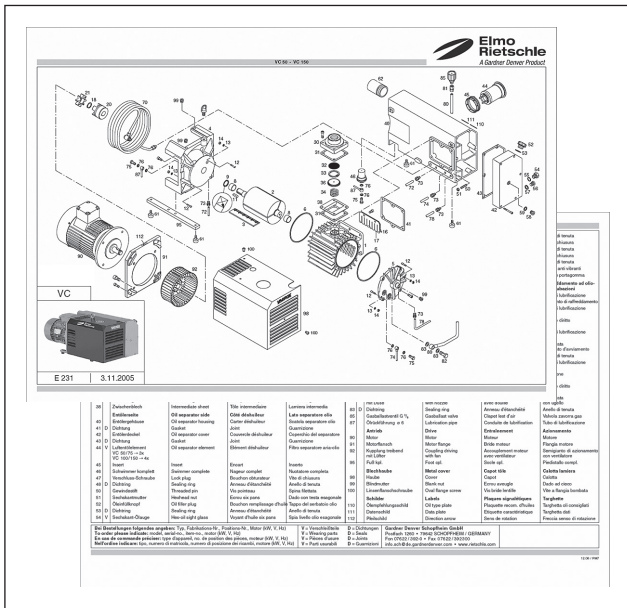


Fig. 7 Spare parts list (example)

Order spare parts in accordance with the:

- **Spare parts list:**  
E 880/80 → C-VLR 1000
  - Download the PDF file  
<http://www.gd-elmorietschle.com>  
→ Downloads  
→ Product Documents  
→ C-Series → Spare Parts
  - Parts subject to wear and gaskets are indicated separately on the list
- **Web site:**  
<http://www.service-er.de>
  - Select the type, size and design.

**NOTICE**

Only use original spare parts or parts approved by the manufacturer. The use of other parts may lead to malfunctions and invalidate liability or the guarantee for any consequences arising.



Fig. 8 Web site  
<http://www.service-er.de>

## 8 Malfunctions: Causes and elimination

Fault	Cause	Troubleshooting	Important
Machine is switched off by the motor protection switch	Mains voltage/ Frequency does not correspond with the motor data	Check by qualified electrician	Section 5.5
	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 delayed switch off that takes into consideration the short term excess current at start up (version with short circuit and overload trigger as per VDE 0660 Part 2 or IEC 947-4)	
Pumping capacity is insufficient	The mesh filter is dirty	Clean or replace the filter	Section 7.2.2 Section 7.4
	The suction pipe is too long or too narrow	Check the hose or the pipe	Section 5.3
	Machine or system leaking	Check the pipework and screw connections for leaks and to ensure that they are firmly seated.	Section 7.2
Final pressure (max. vacuum) is not reached	Machine or system leaking	Check the pipework and screw connections for leaks and to ensure that they are firmly seated.	Section 7.2
Machine gets too hot	Ambient or intake temperature is too high	Ensure it is being used properly	Section 2.3
	Cooling air supply is obstructed	Check environmental conditions	Section 5.1
		Clean ventilation slots	Section 7.2
The machine makes an abnormal noise	Deposits on the rotary piston	Clean the working space and the rotary piston	Elmo Rietschle Service
<b>Please contact Elmo Rietschle Service for other malfunctions or those that cannot be eliminated.</b>			



### 9 Technical Data

C-VLR			1000
Sound pressure level (max.) EN ISO 3744 Tolerance ± 3 dB(A)	dB(A)	50 Hz	85
		60 Hz	89
Sound power level	dB(A)	50 Hz	98
		60 Hz	102
Weight *	kg		790
Length *	mm		1597
Width	mm		666
Height	mm		1123
Vacuum connection	flange		DN 100 PN 6
Exhaust air outlet	flange		DN 100 PN 10
Correct amount of oil	l		2,8

\* The length and the weight may differ from the information listed here depending on the motor manufacturer.

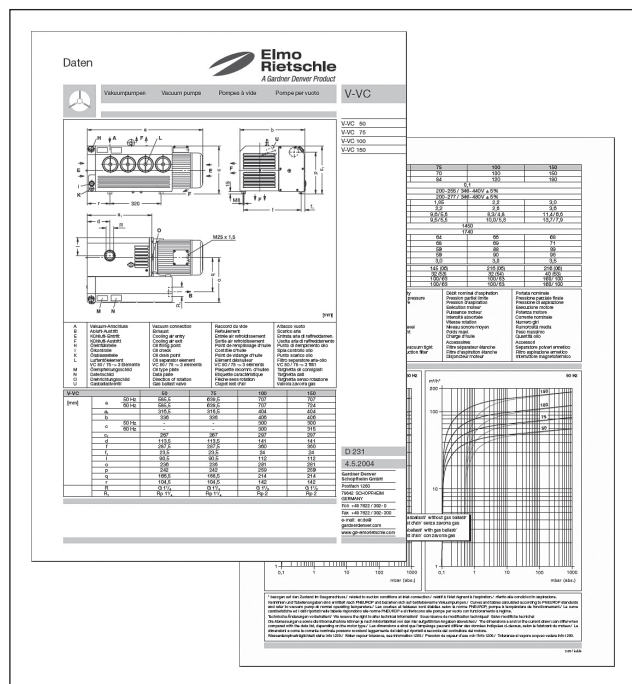


Fig. 9 Data sheet (example)

You will find more technical data on the data sheet **D 880/80**.

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**NOTICE**  
Subject to technical changes.



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