Leybold

# SCROLLVAC

## SC 5 D, SC15 D, SC 30 D, SC 60 D

## Oil-free Vacuum Pump

**Operating Instructions GA01423_002_C0**

Part Nos.

133 000
133 001
133 002
133 003
133 004
133 008
133 100
133 101
133 102

# Contents

**Obligation to Provide Information**
Before installing and commissioning the equipment, carefully read these Operating Instructions and follow the information so as to ensure optimum and safe working right from the start.

**NOTICE**

The Leybold **SCROLLVAC** has been designed for safe and efficient operation when used properly and in accordance with these Operating Instructions. It is the responsibility of the user to carefully read and strictly observe all safety precautions described in this section and throughout the Operating Instructions. The pump must only be operated in the proper condition and under the conditions described in the Operating Instructions. It must be operated and maintained by trained personnel only. Consult local, state, and national agencies regarding specific requirements and regulations. Address any further safety, operation and/or maintenance questions to our nearest office.

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

**DANGER**

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

**WARNING**

CAUTION indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

**CAUTION**

NOTICE is used to notify users of installation, operation, programming or maintenance information that is important, but not hazard related.

**NOTICE**

We reserve the right to alter the design or any data given in these Operating Instructions. The illustrations are not binding.

Retain the Operating Instructions for further use.

Original Operating Instructions.

# Safety Information

## 0 Important Safety Information

### 0.1 Mechanical Hazards

**WARNING**

1 Avoid exposing any part of the human body to the vacuum.

2 Never put fingers or foreign matter into the pump‘s inlet or the clearance of fan blades. If done, it can cause injury.

3 Make sure that the gas flow from the exhaust port is not blocked or restricted in any way.

4 Pumps with single-phase motors have an internal thermal protector. These motors restart without warning after the protector trips back.

### 0.2 Electrical Hazards

**DANGER**

1 Wiring must be done by a qualified electrician. Otherwise there is the risk of suffering an electric shock.

2 Prevent short-circuits with a ground fault circuit interruptor (GFCI) of proper capacity. Failure to do so can result in electric shock or fire.

3 Be sure to install a main disconnect switch. Failure to do so can result in damage, fire, or injury.

4 Be sure to disconnect the electric source before changing the wiring or before an inspection. Failure to do so can result in electric shock or damage by the rotating fan.

5 Ensure proper grounding of the pump. Otherwise there exists the risk of suffering an electric shock or igniting a fire.

6 Install in an area which is not exposed to moisture such as rain or steam. Exposure to moisture can cause electric shock.

7 Be sure to check wiring diagram before connecting a power supply. Failure to do so can result in damage.

8 Be sure to disconnect the electric source before changing the wiring or before an inspection. Failure to do so can result in electric shock or damage by the rotating fan.

### 0.3 Thermal Hazards

**CAUTION**

1 Do the maintenance after the pump has fully cooled down. Performing maintenance on a hot pump can cause burns.

### 0.4 Hazards Caused by Materials and Substances

**DANGER**

1 Never pump toxic, explosive, flammable, corrosive gases, chemicals, solvents or powders. Flowing substances, explosion or fire can cause bodily injury.

2 Install the pump in an area without explosive or flammable substances. Otherwise, it can cause explosion or fire.

### 0.5 Danger of Damages to the Pump

**NOTICE**

1 Ask a specialist to perform repairs. Otherwise there exists the risk that the pump may fail, is damaged or its service life is severely reduced. Trained customers may perform maintenance themselves.

2 Use at ambient temperatures of 5 - 40 °C (during operation). Operating outside of this range can cause damage or shorten service life.
Always operate the pump with the fan and terminal covers in place.
Always operate the single-phase pumps with the capacitor cover in place.

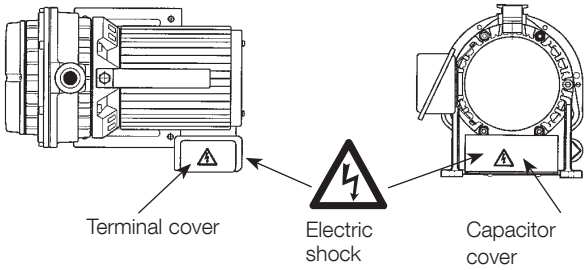
3 Conduct periodic maintenance and inspections. Failure to do so can cause damage or reduced service life.

4 Be sure to close the isolation valve between pump and vacuum system (chamber) during startup and shutdown. If this valve is open, debris attached to the inside of pump can be drawn back into the vacuum chamber.

# Safety Information

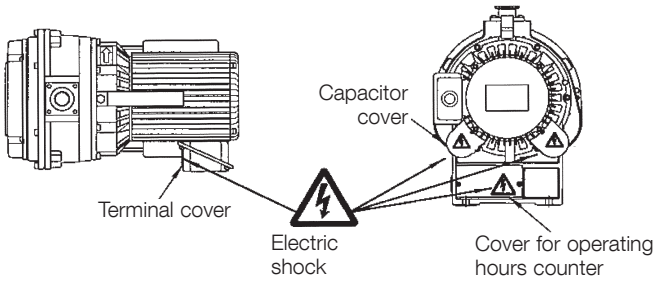
**SC 5 D**

**Single-phase**



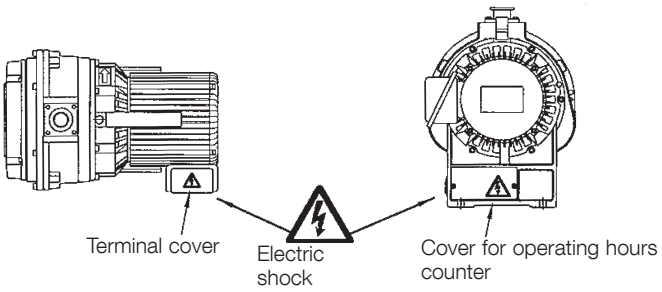

**SC 15 D**

**Single-phase**




**SC 15 D**

**Three-phase**

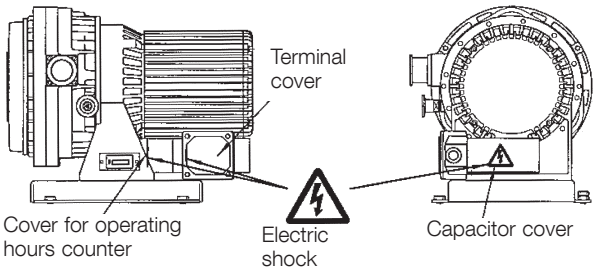



Always keep warning stickers clean. If they become dirty or lost, replace them with new ones.
If you need stickers, contact Leybold.

Fig. 0.1 Placement of the warning stickers

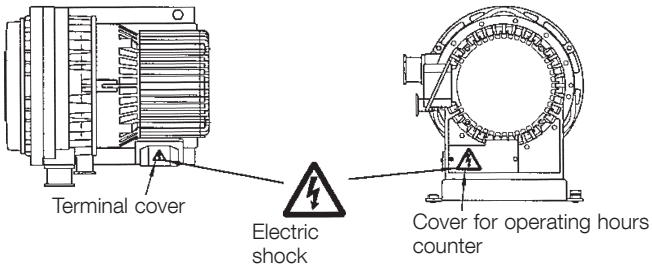
**SC 30 D**

**Single-phase**



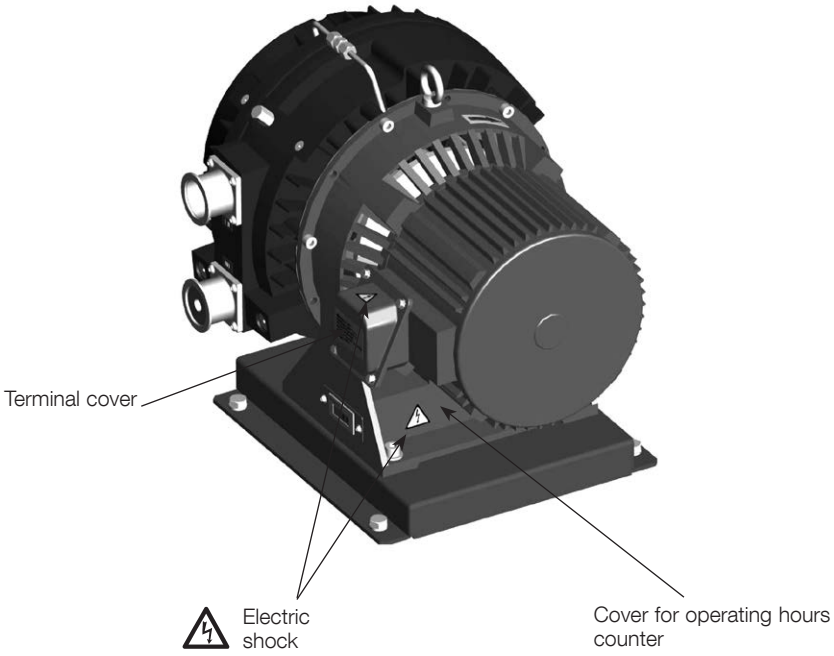

**SC 30 D**

**Three-phase**




**SC 60 D**

**Three-phase**




Always keep warning stickers clean. If they become dirty or lost, replace them with new ones.
If you need stickers, contact Leybold.

Fig. 0.2 Placement of the warning stickers

# Description

## 1 Description

### 1.1 Design and Operation

The SCROLLVAC vacuum pumps are oil-free vacuum pumps. Each SCROLLVAC consists of two Archimedes spirals offset within each other by 180 °. Thus several crescent-shaped pockets of different sizes are created. With the aid of an eccentric drive, the second spiral orbits about the fixed spiral thereby reducing, respectively increasing the volume of the pockets whereby the gases are conveyed from outside to inside thereby being compressed.

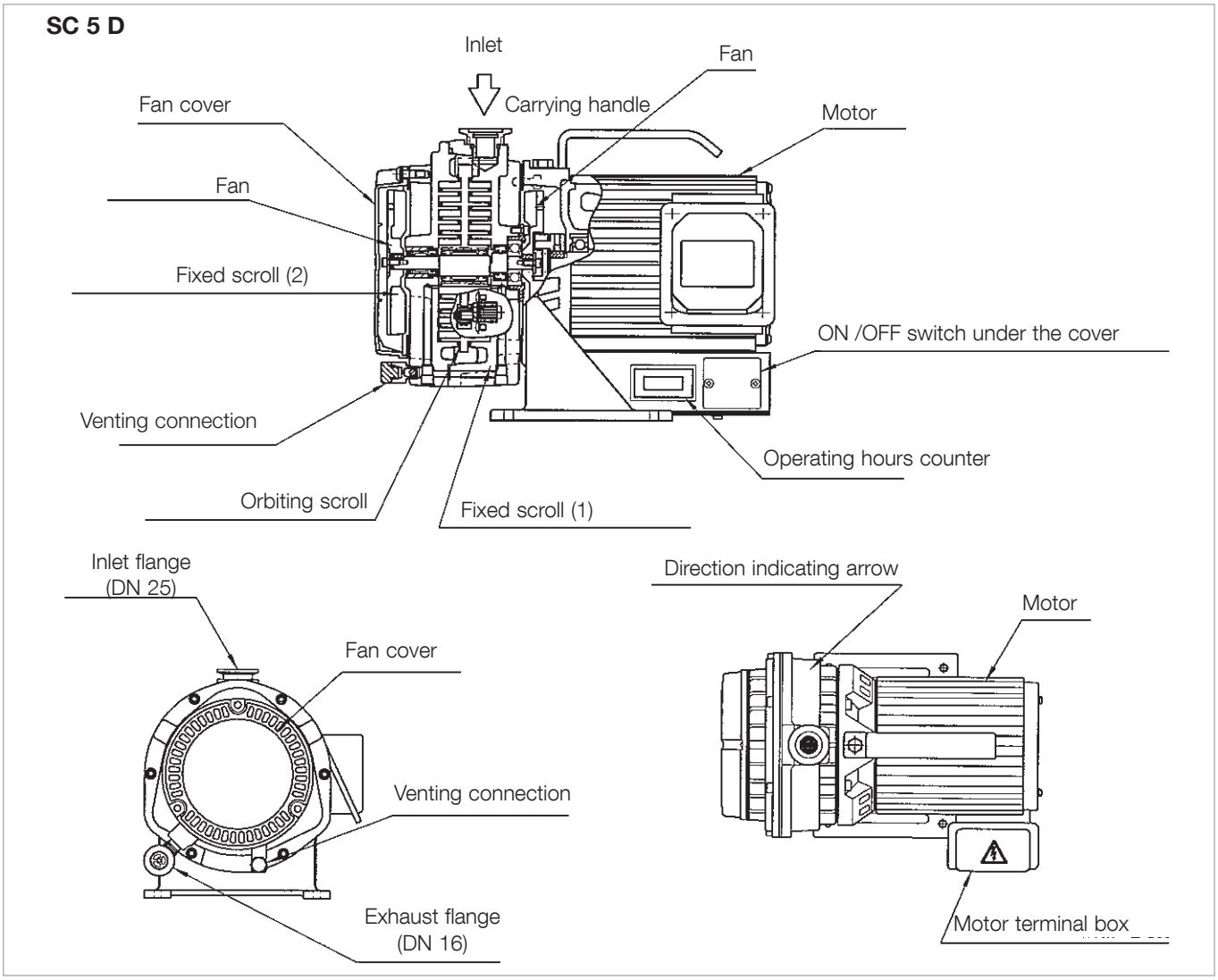



Fig. 1.1 Component designations (SC 5 D)

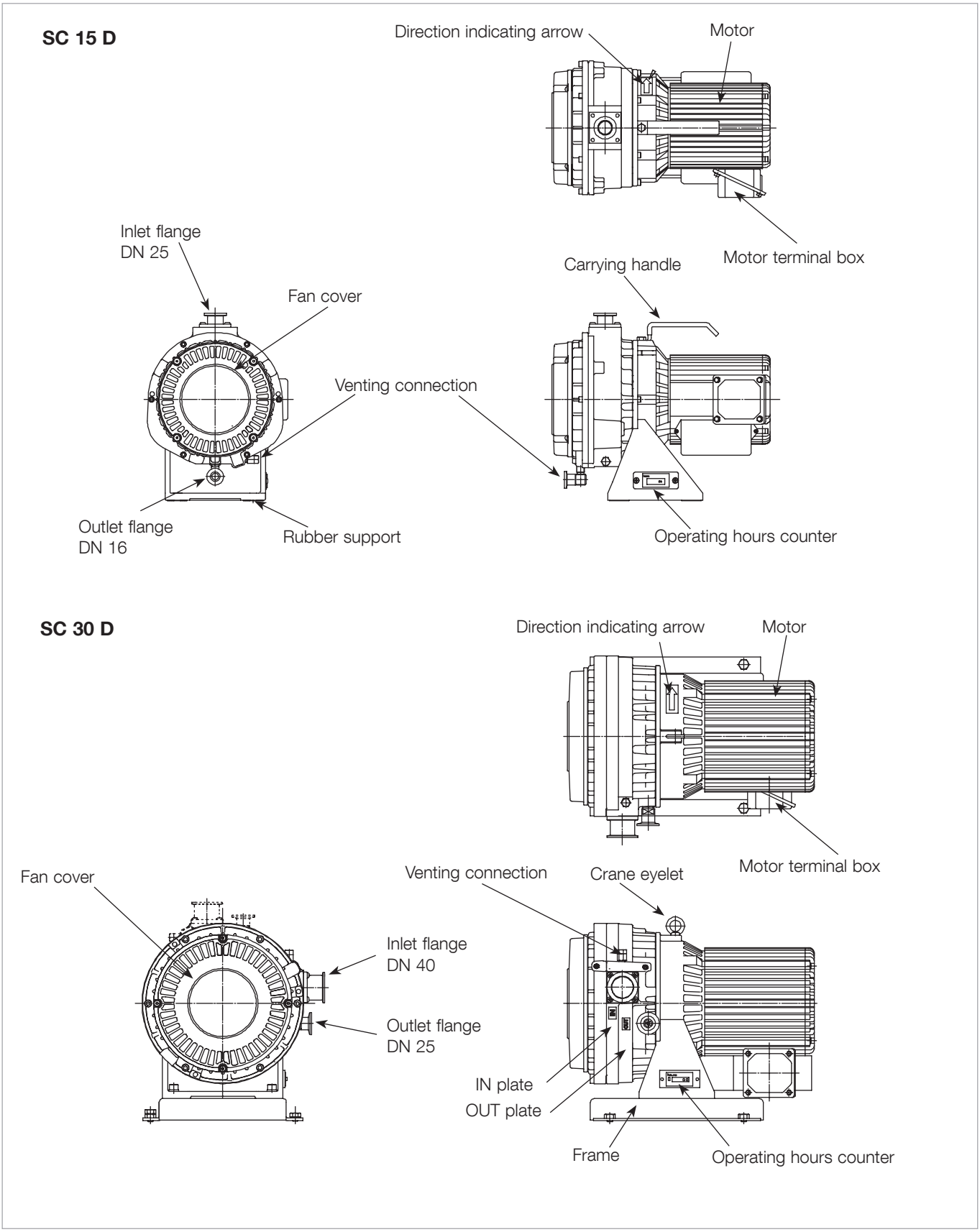



Fig. 1.2 Component designations (SC 15 D/30 D)

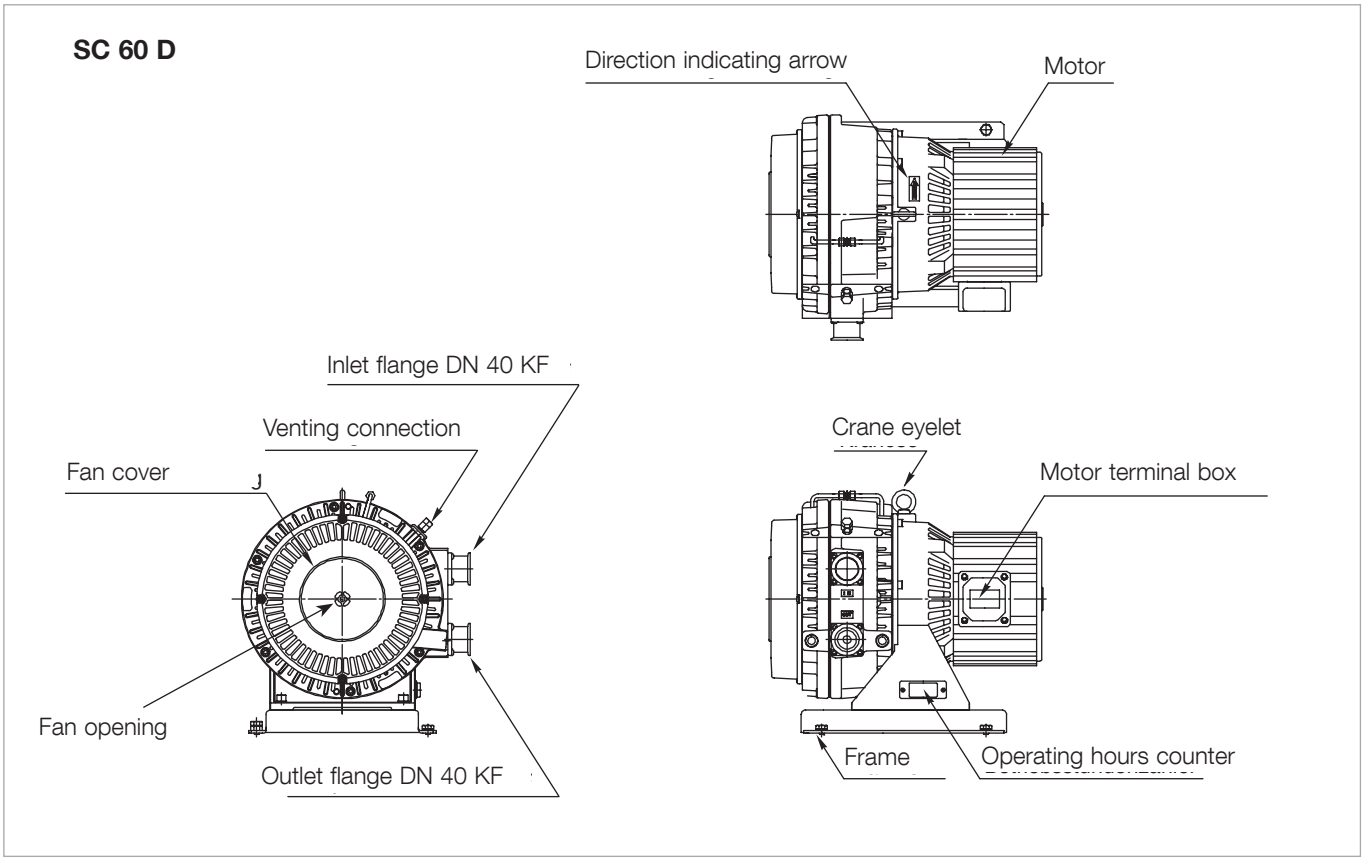



Fig. 1.3 Component designations (SC 60 D)

## 1.2 Component Designations of the Individual Pump Types

### 1.2.1 Ordering Information

| | Part No. |
|---|---|
| SC 5 D, single-phase motor, cable with Schuko plug | 133 000 |
| SC 15 D, single-phase motor, cable with Schuko plug | 133 001 |
| SC 30 D, single-phase motor, cable with Schuko plug | 133 002 |
| SC 15 D, three-phase motor | 133 003 |
| SC 30 D, three-phase motor | 133 004 |
| SC 60 D, three-phase motor | 133 008 |
| SC 5 D, single-phase motor, cable with NEMA plug | 133 100 |
| SC 15 D, single-phase motor, cable with NEMA plug | 133 101 |
| SC 30 D, single-phase motor, cable with NEMA plug | 133 102 |

## 1.3 Technical Data

| Model | | SC 5 D | | SC 15 D | | SC 30 D | | SC 60 D | |
|---|---|---|---|---|---|---|---|---|---|
| | | 50 Hz | 60 Hz | 50 Hz | 60 Hz | 50 Hz | 60 Hz | 50 Hz | 60 Hz |
| Displacement (swept volume) | $l \cdot min^{-1}$ | 90 | 108 | 250 | 300 | 500 | 600 | 1000 | 1200 |
| | $m^3 \cdot h^{-1}$ | 5 | 6,48 | 15 | 18 | 30 | 36 | 60 | 72 |
| | cfm | 3.1 | 3.8 | 8.8 | 10.6 | 17.6 | 21.2 | 35.3 | 42.3 |
| Pumping speed[1] | $l \cdot min^{-1}$ | 80 | 93 | 210 | 230 | 420 | 500 | 880 | 1020 |
| | $m^3 \cdot h^{-1}$ | 4,8 | 6,2 | 13,6 | 16,4 | 26,3 | 31,5 | 52 | 62 |
| | cfm | 2.8 | 3.6 | 8 | 9.6 | 15.4 | 18.5 | 31.0 | 36.0 |
| Ultimate pressure | Pa | ≤ 5 | | ≤ 1.6 | | ≤ 1.0 | | ≤ 1.0 | |
| | mbar | ≤ 0.05 | | ≤ 0.016 | | ≤ 0.01 | | ≤ 0.01 | |
| | Torr | ≤ 0.037 | | ≤ 0.012 | | ≤ 0.0075 | | ≤ 0.0075 | |
| Leak rate[3] | $mbar \cdot l \cdot s^{-1}$ | $1.0 \cdot 10^{-6}$ | | $1.0 \cdot 10^{-6}$ | | $1.0 \cdot 10^{-6}$ | | $1.0 \cdot 10^{-4}$ | |
| Max. inlet pressure | | Atmospheric pressure | | | | | | | |
| Ambient operating temperature range | °C | 5 - 40 | | 5 - 40 | | 5 - 40 | | 5 - 40 | |
| Gas temperature at inlet | °C | max. 50 | | max. 50 | | max. 50 | | max. 50 | |
| Inlet connection | DN | 25 | | 25 | | 40 | | 40 | |
| Exhaust connection | DN | 16 | | 16 | | 25 | | 40 | |
| Cooling | | Air cooling | | | | | | | |
| Protection class | IP | 20 | | 20 | | 20 | | 20 | |
| Class of equipment | | Class 1 | | | | | | | |
| Miscellaneous | | With operating hours counter und purge gas connection | | | | | | | |
| Water vapour tolerance at 25 °C, humidity 60 %, | g/day | 5 | | 25 | | 25 | | 25 | |
| with opened purge gas[4] | $l \cdot min^{-1}$ | 9 | | 10 | | 10 | | 10 | |

# Description

### 1.3.1 Motor Data

| **Motor data** | | **SC 5 D** | | | | | |
|---|---|---|---|---|---|---|---|
| Type | | | Single-phase induction motor / Motor 4P / totally enclosed<br>insulation class B IP 44<br>thermal protector TP 212 - automatic reset type | | | | |
| Power consumption | | W | 150 | | | | |
| Voltage | | V | 100 | 115 | 200 | 230 | |
| Rated current | 50 Hz | A | 2.6 | – | 1.3 | 1.6 | |
| | 60 Hz | A | 2.1 | 2.2 | 1.1 | 1.1 | |
| Speed at | 50 Hz | $min^{-1}$ | 1430 | – | 1430 | 1440 | |
| | 60 Hz | $min^{-1}$ | 1730 | 1740 | 1730 | 1740 | |
| Noise level[2] at 1m<br>with purge gas open (ON) | dB(A)<br>dB(A) | ≤ 52<br>≤ 57 | | | | | |
| Direction of inlet | | | Vertical | | | | |
| Dimensions (L x W x H) | | mm | 308 x 214 x 225 | | | | |
| Weight | | kg | 14 | | | | |
| Part numbers | | | 133 100 | | 133 000 | | |

| **Motor Data** | | **SC 15 D** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | | | **Single ph.** induction motor 4P<br>totally enclosed<br>insulation class B / IP 44<br>thermal protector TP 212<br>automatic reset type | | | | **Three-phase** induction motor[5] 4P<br>totally enclosed<br>insulation class B / IP 44 | | | | | | |
| Power consumption | | kW | 0.4 | | | | 0.4 | | | | | | |
| Voltage | | V | 100 | 115 | 200 | 230 | 200 | 208 | 230 | 380 | 400 | 415 | 460 |
| Rated current | 50 Hz | A | 4.8 | - | 2.6 | 2.4 | 1.6 | - | - | 0.9 | 0.9 | 1.0 | - |
| | 60 Hz | A | 4.8 | 4.3 | 2.8 | 2.4 | 1.9 | 1.9 | 1.8 | - | - | - | 1.0 |
| Speed at | 50 Hz | $min^{-1}$ | 1440 | - | 1430 | 1450 | 1420 | - | - | 1440 | 1440 | 1440 | - |
| | 60 Hz | $min^{-1}$ | 1710 | 1740 | 1700 | 1730 | 1660 | 1660 | 1690 | - | - | - | 1720 |
| Noise level[2] at 1m<br>with purge gas open (ON) | dB(A)<br>dB(A) | | ≤ 58<br>≤ 66 | | | | | | | | | | |
| Direction of inlet | | | Vertical | | | | | | | | | | |
| Dimensions (L x W x H) | | mm | 400 x 252 x 336 | | | | 370 x 252 x 336 | | | | | | |
| Weight | | kg | 25 | | | | 23 | | | | | | |
| Part numbers | | | 133 101 | | 133 001 | | 133 003 | | | | | | |

| **Motor Data** | | **SC 30 D** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | | | **Single-phase** induction motor 4P totally enclosed insulation class B / IP 44 thermal protector TP 212 automatic reset type | | | | | **Three-phase** induction motor[5] 4P totally enclosed insulation class B / IP 44 | | | | | | |
| Power consumption | | kW | 0.6 | | | | | 0.6 | | | | | | |
| Voltage | | V | 100 | 115 | 200 | 230 | | 200 | 208 | 230 | 380 | 400 | 415 | 460 |
| Rated current | 50 Hz | A | 8.5 | - | 4.3 | 3.9 | | 2.7 | - | - | 1.57 | 1.57 | 1.63 | - |
| | 60 Hz | A | 10 | 8.6 | 4.8 | 4.0 | | 2.8 | 2.6 | 2.5 | - | - | - | 1.47 |
| Speed at | 50 Hz | $min^{-1}$ | 1430 | - | 1430 | 1450 | | 1460 | - | - | 1470 | 1470 | 1470 | - |
| | 60 Hz | $min^{-1}$ | 1660 | 1720 | 1690 | 1730 | | 1740 | 1740 | 1760 | - | - | - | 1770 |
| Noise level[2] at 1m | | dB(A) | ≤ 62 | | | | | ≤ 60 | | | | | | |
| with purge gas open (ON) | | dB(A) | ≤ 70 | | | | | ≤ 68 | | | | | | |
| Direction of inlet | | | Horizontal (arranged at the side) | | | | | | | | | | | |
| Dimensions (L x W x H) | | mm | 443 x 328 x 372 (443 x 298 x 397) | | | | | 372 x 328 x 372 (372 x 298 x 397) | | | | | | |
| Weight | | kg | 44 | | | | | 38 | | | | | | |
| Part numbers | | | 133 102 | | 133 002 | | 133 004 | | | | | | | |

| **Motor Data** | | **SC 60 D** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Type | | | Three-phase induction motor[5] 4P totally enclosed insulation class B / IP44 | | | | | | |
| Power consumption | | kW | 1.4 | | | | | | |
| Voltages | | V | 200 | 208 | 230 | 380 | 400 | 415 | 460 |
| Rated current | 50 Hz | A | 5.5 | -- | -- | 3.3 | 3.6 | 3.8 | -- |
| | 60 Hz | A | 5.8 | 5.8 | 5.7 | -- | -- | -- | 3.5 |
| Speed at | 50 Hz | $min^{-1}$ | 1460 | -- | -- | 1470 | 1470 | 1470 | -- |
| | 60 Hz | $min^{-1}$ | 1730 | 1740 | 1750 | -- | -- | -- | 1760 |
| Noise level[2] at 1m | | dB(A) | 67 | | | | | | |
| with purge gas open (ON) | | dB(A) | 74 | | | | | | |
| Direction of inlet | | | Horizontal (arranged at the side) | | | | | | |
| Dimensions (L x W x H) | | mm | 467 x 390 x 421 | | | | | | |
| Weight | | kg | 60 | | | | | | |
| Part number | | | 133 008 | | | | | | |

*Cannot operate at 115V/50 Hz, 208V/50Hz, 230V/50Hz, 460V/50 Hz, 380V/60 Hz or 415V/60 Hz

Note 1: Pumping speed remains unchanged independently of whether the purge gas inlet is open or closed
Note 2: Noise level is measured at ultimate pressure in an anechoic room
Note 3: The leak rate is measured when the pump is stopped and the purge gas supply is closed (condition as delivered)
Note 4: When the pump is delivered, the purge gas inlet is closed
Note 5: The three-phase motors do not have internal thermal protection. Be sure to install the protection from the side of the remaining system.

# Description

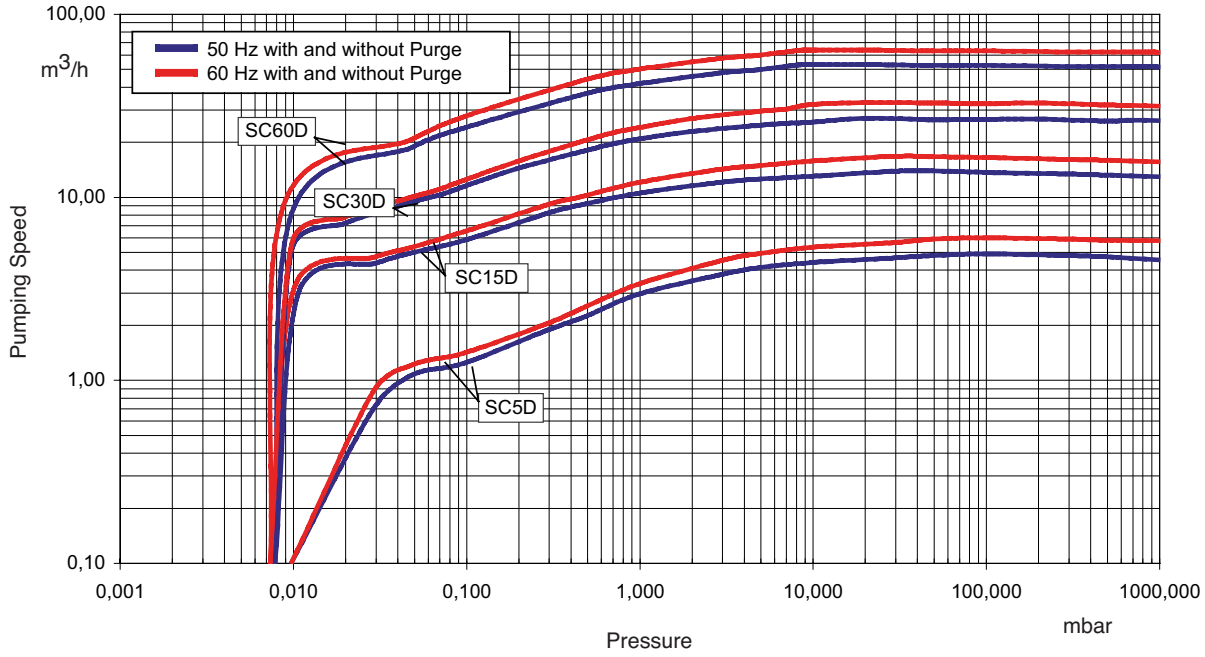
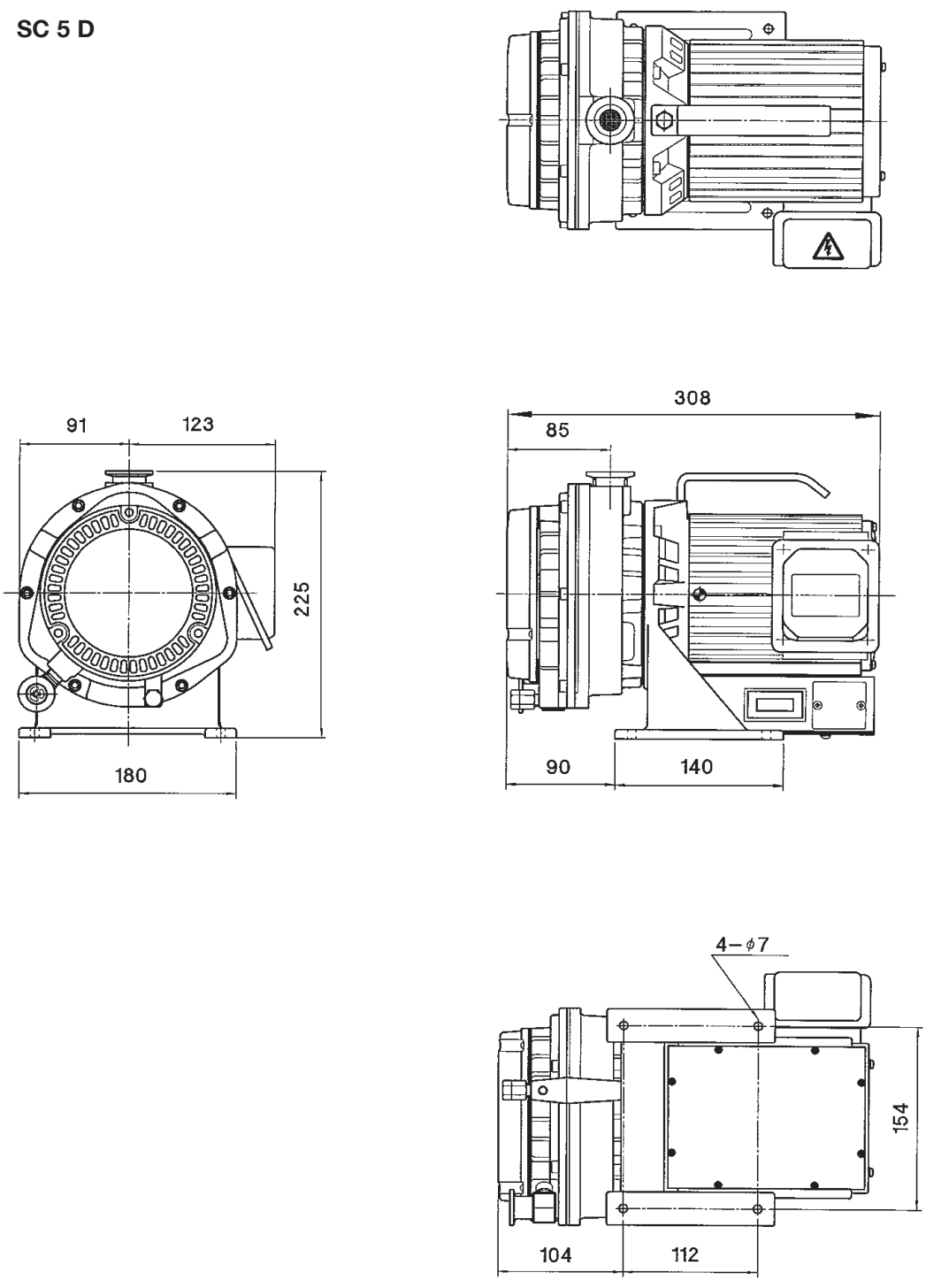



Fig. 1.4 Pumping speed curves of the SCROLLVAC SC 5 D to SC 60 D

### 1.3.2 Dimensions

**SC 5 D**

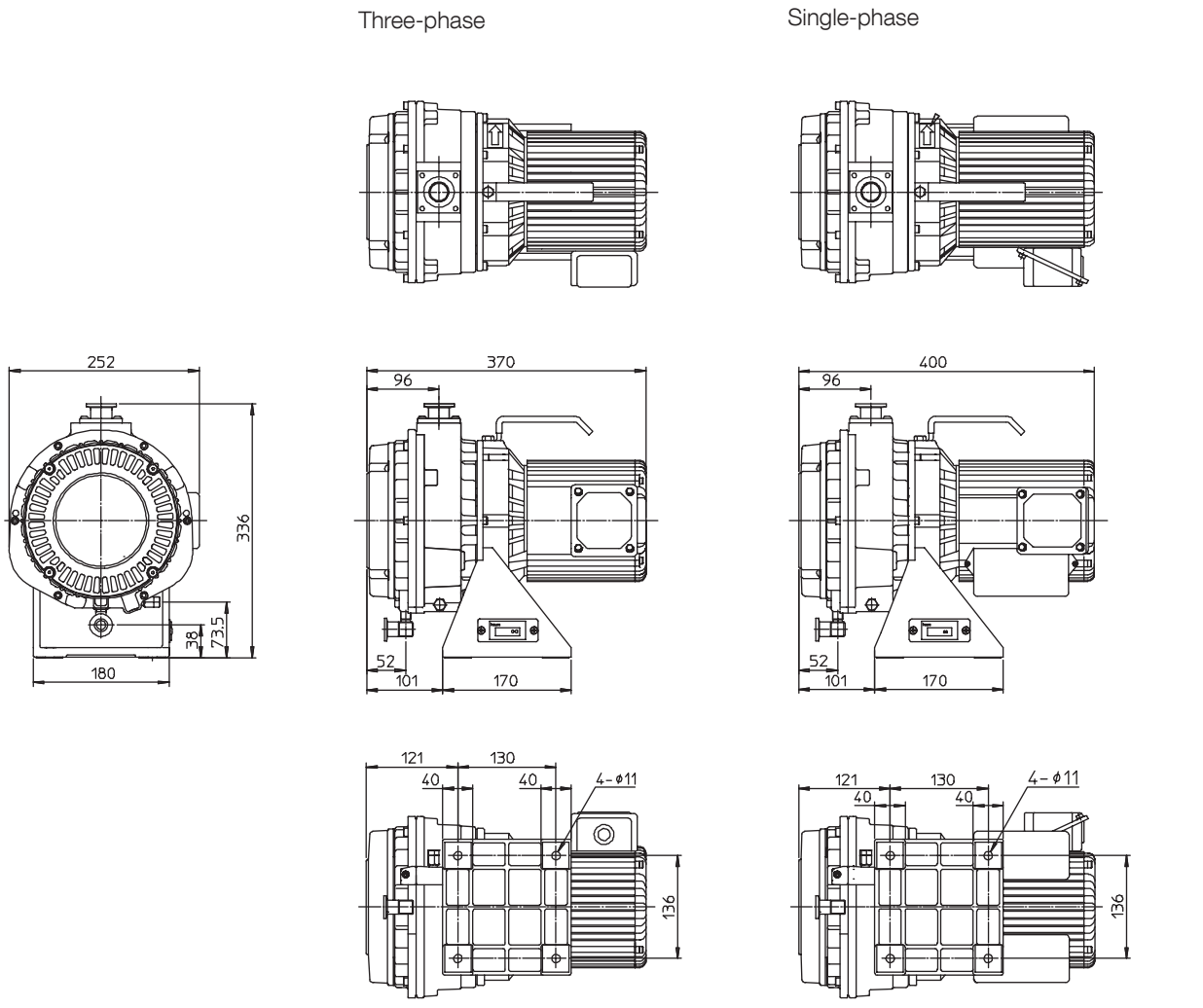



(Dimensions in mm)

Fig. 1.5 Dimensional drawing of the SC 5 D

# Description

**SC 15 D**




(Dimensions in mm)

Fig. 1.6 Dimensional drawing of the SC 15 D

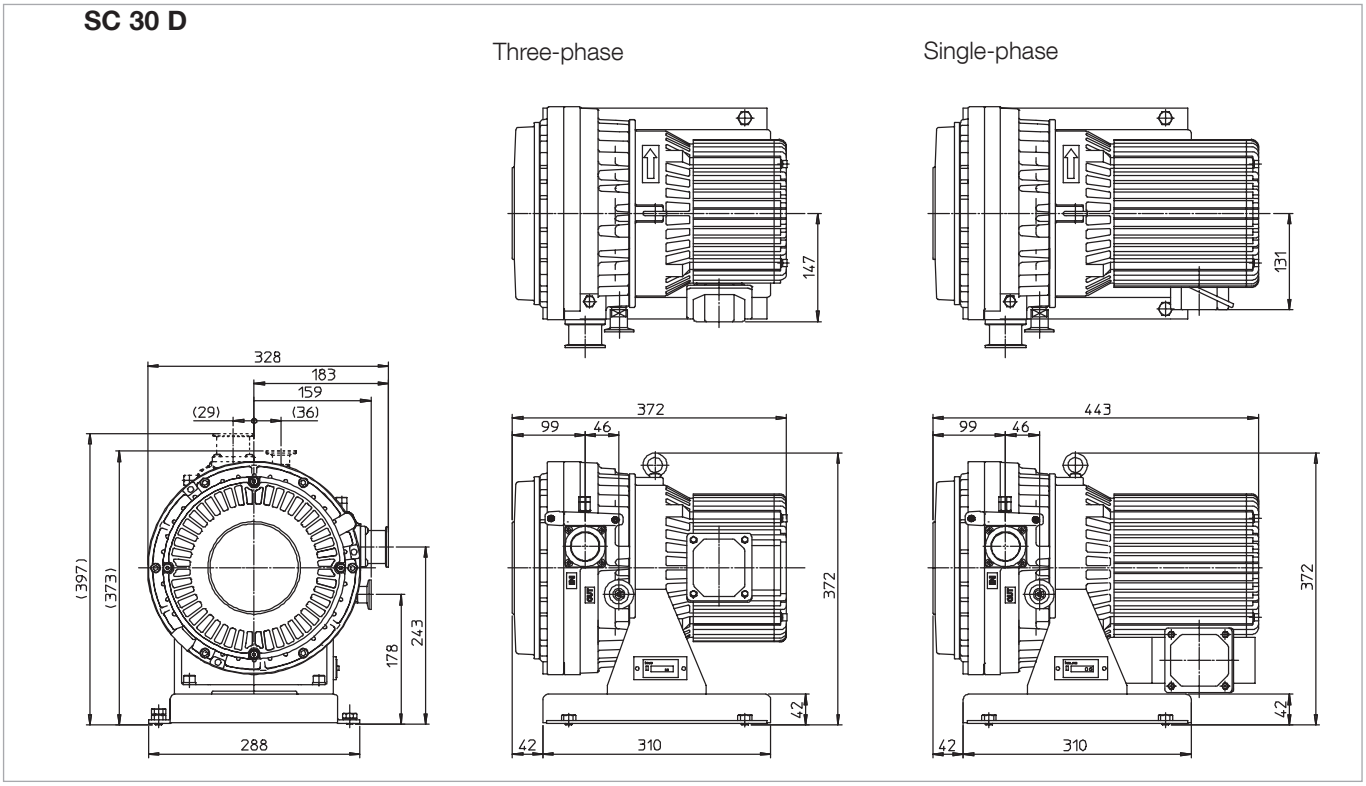



Fig. 1.7 Dimensional drawing of the SC 30 D

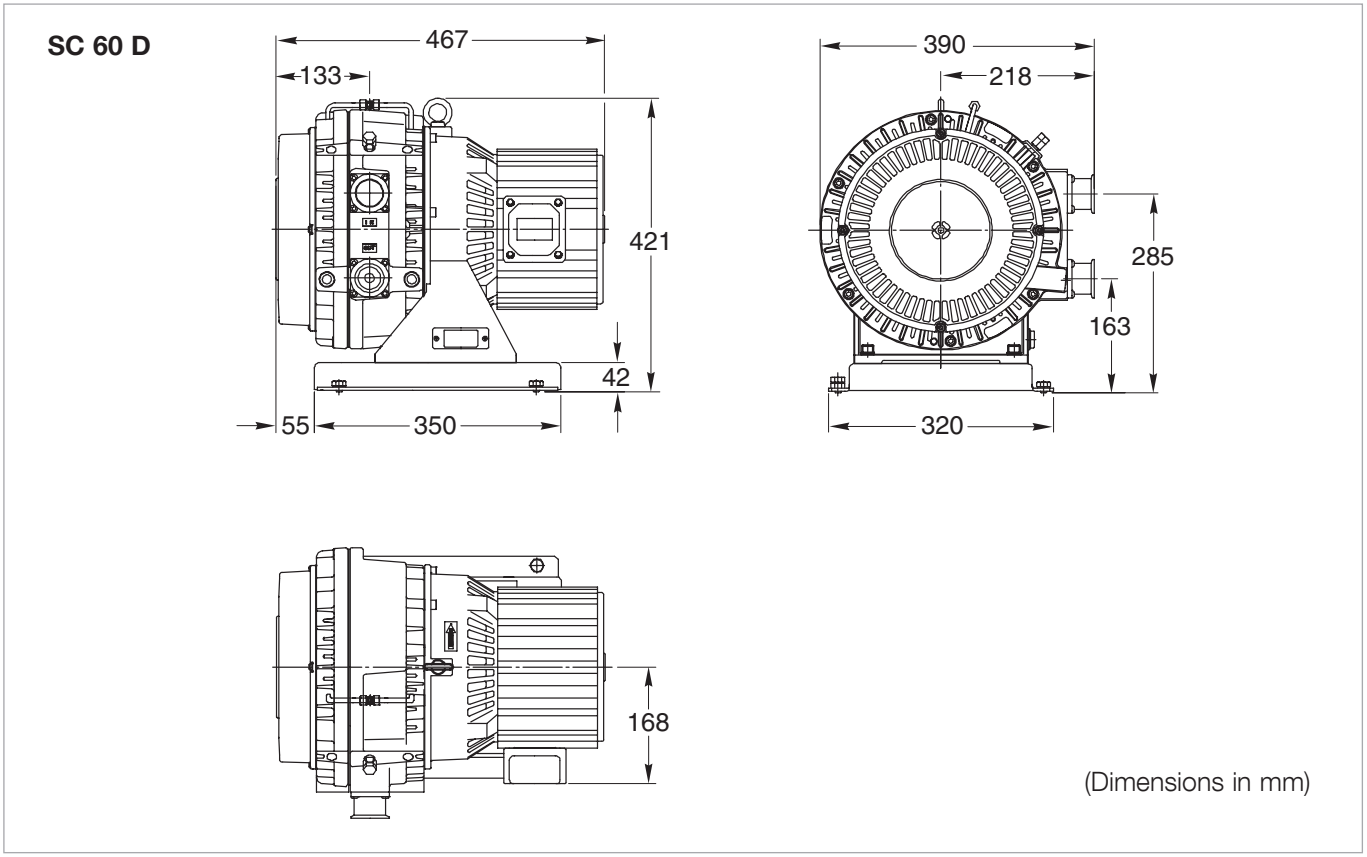



Fig. 1.8 Dimensional drawing of the SC 60 D

# Transport and Storage

## 2 Transport and Storage

**CAUTION**

Lift the pump only at the provided handles, respectively crane eyelets.

Exclusively use lifting facilities with sufficient lifting capability. Never stand under the hanging pump when it is being moved.

Avoid any other orientations during transportation.

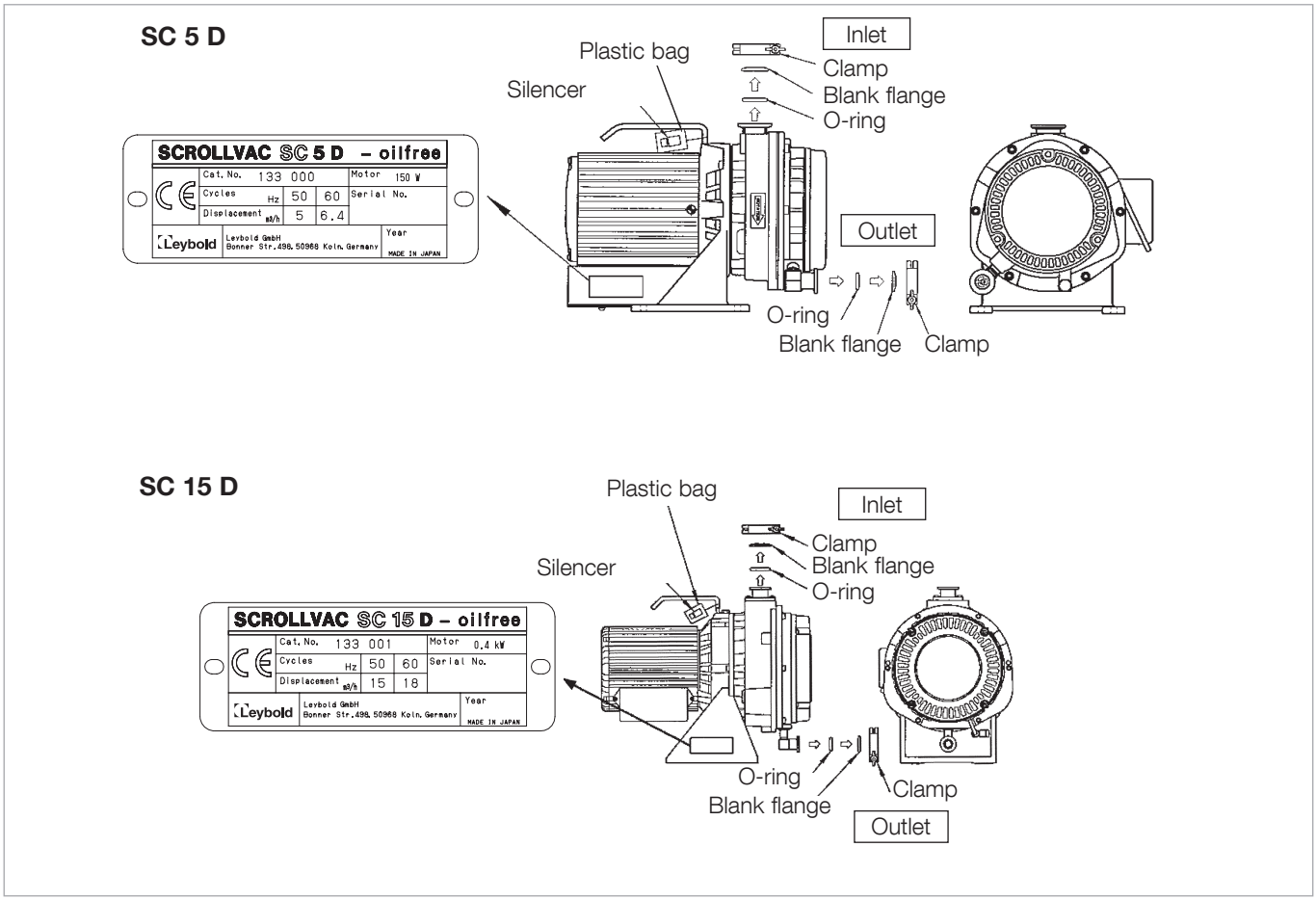



Fig. 3.1 Product check (SC 5 D / SC 15 D)

## 3 Installation

### 3.1 Checking the Product

Check that the package is right-side-up and then open it.

Check that model of the product is one that you ordered.

Check that there is no damage. If there is any damage, file a damage claim with the carrier.

Remove inlet blank flange and outlet blank flange. If you operate the pump with blank flanges in place, it can cause damage.

**NOTICE**

Check that the silencer for the purge gas inlet is present in the plastic bag.

# Installation

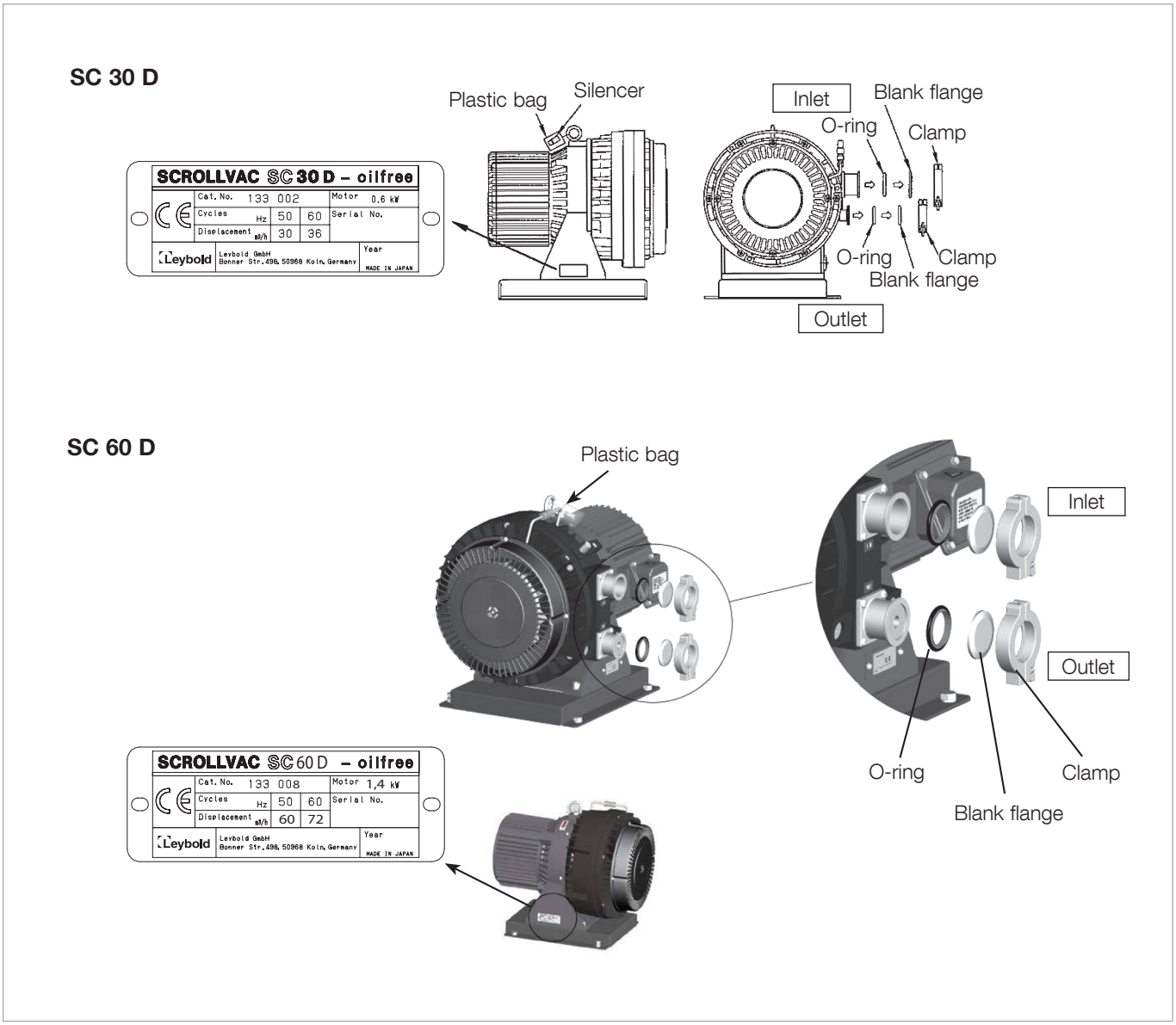



Fig. 3.2 Product check (SC 30 D / SC 60 D)

### 3.2 Conforming Use

SCROLLVAC pumps can pump gases and vapours, and evacuate vessels or vacuum systems in the fine vacuum range.

The pumps are suited for pumping water vapour within the specified water vapour tolerance limits. Avoid vapours that can condense into liquids when being compressed inside the pump, if these substances exceed the vapour tolerance of the pump.

### 3.3 Ambient Conditions

**DANGER**

Danger of electric shock.
Install in an area which is not exposed to moisture such as rain or steam. Moisture on electric power connections can cause bodily injury by short circuit or electric shock.

**DANGER**

Danger of explosion and fire.
Install in an area which is not exposed to explosives, flammable gas, or other related hazards. Otherwise, the pump can cause an explosion or fire.

**Temperature**

Operate at an ambient temperature of 5 °C - 40 °C. Operating outside of this ambient temperature range can cause damage, fire or failure.

Ensure proper ventilation.

Install in a well-ventilated area. Poor ventilation can cause abnormal overheating, fire or failure since the scroll pump is air-cooled.

**Necessary ventilation air:**

| | |
|---|---|
| SC 5 D | over 2 $m^3 \cdot min^{-1}$ |
| SC 15 D | over 4 $m^3 \cdot min^{-1}$ |
| SC 30 D | over 8 $m^3 \cdot min^{-1}$ |
| SC 60 D | over 12 $m^3 \cdot min^{-1}$ |

**Avoid dust**

Install in a proper location. Install in an area which is not exposed to dust or corrosive gas. Failure to install in a proper location can result in damage or failure.

Debris can clog silencers reducing the effectiveness of the purge gas.

**Avoid direct sunlight**

Install in an area which is not exposed to sunshine. Direct sunshine can cause high temperatures and failure.

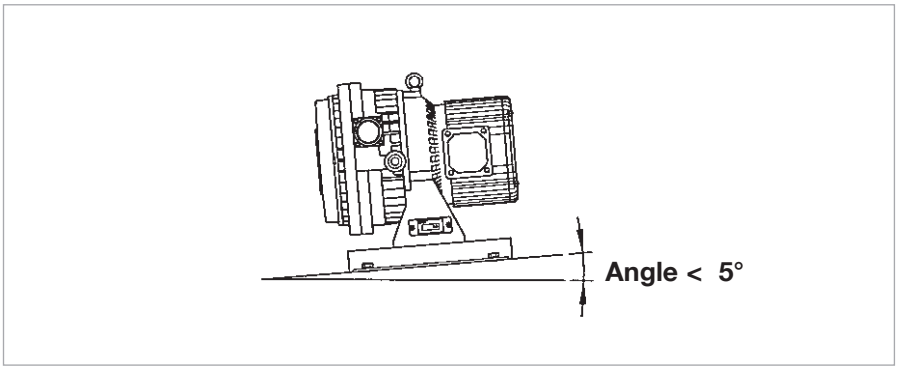



Fig. 3.3 Install on a firm, level floor

### 3.4 Setting up the Pump

The SC 5 D and SC 15 D are equipped with a carrying handle for transporting. The SC 30 D and SC 60 D are provided with a crane eyelet for transporting and placement.

**CAUTION**

Use lifting devices with sufficient carrying capacity. Never stand beneath the suspended pump while it is being moved.

The place where the pump is installed should be free of dust or steel, stone and wood dust. Moreover, the location should be free of corrosive gases.

Install the pump on a stable horizontal floor surface (sloping by no more than 5 °, see Fig. 3.3). Installing the pump on a sloping surface can cause the pump to fail.

If the floor is unstable, secure the pump by using

- 4 x dia. 7 mm holes in the pump base (SC 5 D) or
- 4 x dia. 11 mm holes in the pump base (SC 15 D) or
- 4 x holes in the pump base for M10 screws and (SC 30 D)
- 4 x holes in the pump base for M10 screws and (SC 60 D).

**NOTICE**

When not observing these installation conditions, damage may occur, or performance or service life may be impaired.

### 3.5 Electrical Connections

**DANGER**

Wiring must be done by a qualified electrician. Otherwise, electric shock or fire may occur.

Turn off the incoming main electrical power before wiring the pump. Failure to do so can cause injury from electric shock.

Check electric power and voltage before doing the wiring.

**NOTICE**

The three-phase motor can be operated off two different mains voltages: either 200/380V 50 Hz or 208/460 V 60 Hz.

The single-phase motor can be operated off two different mains voltages: either 100/200V 50 Hz or 115/208-230V 60 Hz.

Check mains voltage and wiring.

#### 3.5.1 Single-phase Motors

**DANGER**

Be sure to install a reliable main disconnect switch (or breaker) for emergency stop. In addition, shut off the SC 5 D by turning off the switch on the motor. Failure to do so can cause damage or fire.

The single-phase motor has an internal thermal protector. The motor restarts without warning after the protector trips back.

**CE Requirements**

Min. circuit current capacity of conductor is 10 A. Max. branch circuit breaker is 15 A (industrial rated).

**DANGER**

Protect the motor by installing the recommended breaker (refer to Table 1). Failure to do so can cause electrical shock or fire.

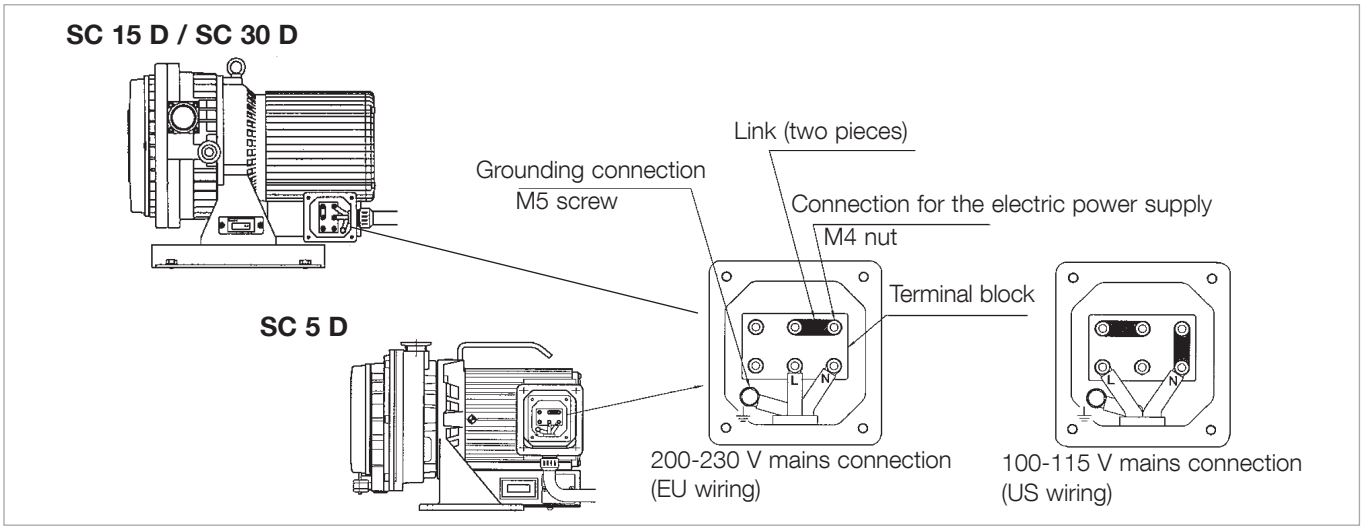



Fig. 3.4 Single-phase connection

**Table 1: Single-phase connection**

| V | Hz | Rated current for the mains circuit breaker - A | | |
|---|---|---|---|---|
| | | **SC 5 D** | **SC 15 D** | **SC 30 D** |
| 100 | 50 | 3.0 | 6.0 | 10.7 |
| 100 | 60 | 2.5 | 6.0 | 12.5 |
| 115 | 60 | 2.5 | 5.4 | 10.8 |
| 200 | 50 | 1.5 | 3.0 | 5.4 |
| 200 | 60 | 1.3 | 3.2 | 6.0 |
| 230 | 50 | 1.9 | 2.7 | 4.9 |
| 230 | 60 | 1.3 | 2.7 | 5.0 |

### Installation Involving Different Mains Voltages

This vacuum pump must be equipped with a mains circuit breaker in accordance with requirements of EN 60204-1. It is recommended to use a circuit breaker as main breaker which is suitable for isolation according to EN 60947-2 and is equipped with an operating handle which is lockable in the OFF position and complies with the other requirements of EN 60947-3.

Remove the terminal cover of the motor and check the terminal block inside. The wiring diagram is shown inside the terminal cover.

You can change between 100-115 V and 200-230 V connection by changing the links. If you want to change the connection, remove the four nuts for the power terminal and change the links as illustrated in Figure 3.4. Two links are used at the 200-230 V connection. Connect the power cord through the cable-gland on the bottom side of terminal blocks.

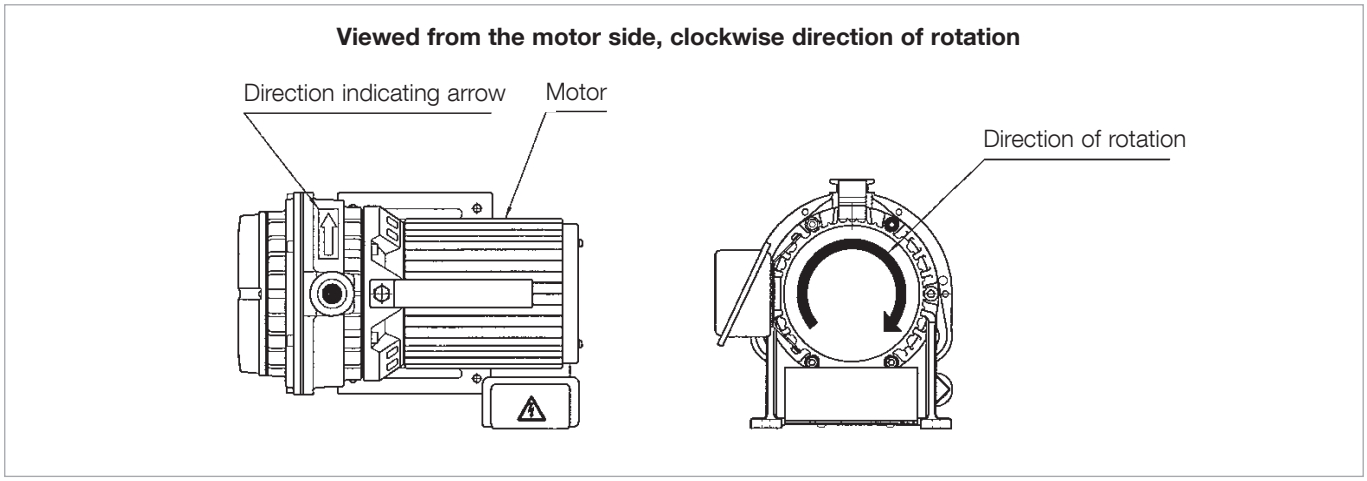



Fig. 3.5 Checking the direction of rotation after having provided the wiring

Activate the emergency stop by the main disconnect switch or breaker.

Protect the motor with a breaker.

Use power cord and ground wire rated at greater than 10 A.

Use round type terminal.

Fit cable-gland.

Connect ground wire to ground terminal.

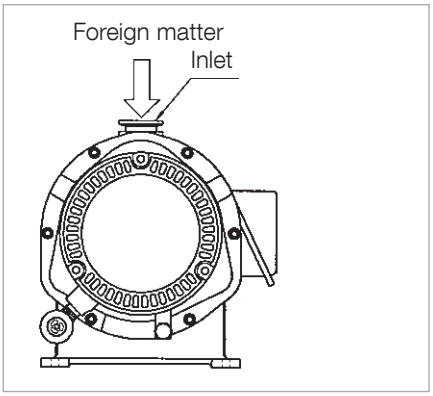



Fig. 3.6 Prevent foreign matter from entering into the pump

After each modification of power supply cable wiring a new electrical safety test has to be done according to the national rules.

**DANGER**

Operate pump with inlet open, and check that air comes out from outlet.

If you plan to switch the pump ON-OFF with remote control, check the pump's rotation direction before connecting it to the vacuum system.

When checking rotation direction, avoid dropping foreign matter into inlet. Dropping foreign matter into the pump can cause failure.

**NOTICE**

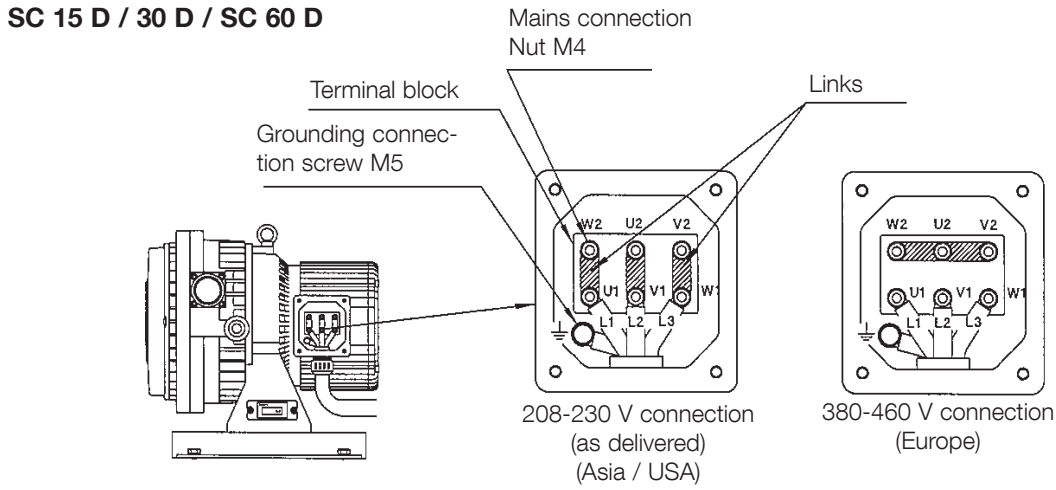



Fig. 3.7 Three-phase connection

### 3.5.2 Three-phase Motors

For SC 15 D / 30 D / 60 D only

**DANGER**

Be sure to install a reliable main disconnect switch (or breaker) which meets the IEC standard for emergency stop. Failure to do so can cause damage or fire.

**CE Requirements**

The 3-phase motor is not protected. External protection must be provided.

- Min. circuit current capacity of the conductors is:
  SC 15 D - 3-phase 7 A
  SC 30 D - 3-phase 15 A
  SC 60 D - 3-phase 15 A
- The main circuit breaker must be rated for the following maximum currents:
  SC 15 D - 15 A
  SC 30 D - 15 A
  SC 60 D - 15 A

**DANGER**

Protect the motor by installing the recommended breaker. Failure to do so can result in injury from electrical shock or fire.

Use a power cord and ground wire of over 2 $mm^2$ (rated at 7 A, 3-phase for SC 15 D) / (rated at 15 A, 3-phase for SC 30 D) / (rated at 15 A, 3-phase for SC 60 D).

When using power cords which are only rated for lower currents, there then exists the risk of excessively heating the wires (risk of starting a fire).

Firmly fit proper round crimp style terminals to electric cord using the appropriate tool and connect to motor terminal. If the connection is loose, it can cause bodily injury or electrical fire

**Table 2: Three-phase connection**

| V | Hz | Rated current for mains power circuit breaker- A | | |
|---|---|---|---|---|
| | | **SC 15 D** | **SC 30 D** | **SC 60 D** |
| 200 | 50 | 1.8 | 3.1 | 5.9 |
| 200 | 60 | 2.2 | 3.2 | 6.2 |
| 208 | 60 | 2.2 | 3.0 | 6.2 |
| 230 | 60 | 2.2 | 2.9 | 6.1 |
| 380 | 50 | 1.1 | 1.8 | 3.7 |
| 415 | 50 | 1.2 | 1.9 | 4.0 |
| 460 | 60 | 1.2 | 1.7 | 3.9 |

**DANGER**

Be sure to connect the electric cord to the terminals by using cable-gland the 20 mm dia. hole at motor terminal box. If the connection is loose, it can cause bodily injury or electrical fire.

Firmly connected the ground cable of the power cord within the motor terminal box. If this connection is loose, this may then cause injury or electric shock.

You can change to 208-230 V or 380-460 V connection by changing the links. It is wired to 208-230 V connection when delivered to you. If you want to change to 380-460 V connection, remove the electric source terminal M4 nuts and change the links as illustrated in Figure 3.8. Connect the power cord through the cable-gland on the bottom side of terminal box. Connect L1-L2-L3 to U1-V1-W 1 terminals of the motor, respectively.

Activate the emergency stop by the main disconnect switch or breaker.

Protect the motor with a breaker.

Use a power cord and ground wire rated for currents over 10A.

Use round type terminal.

Fit cable-gland.

Connect ground wire to ground terminal.

**DANGER**

After each modification of power supply cable wiring, a new electrical safety test has to be done according to the national rules.

# Installation

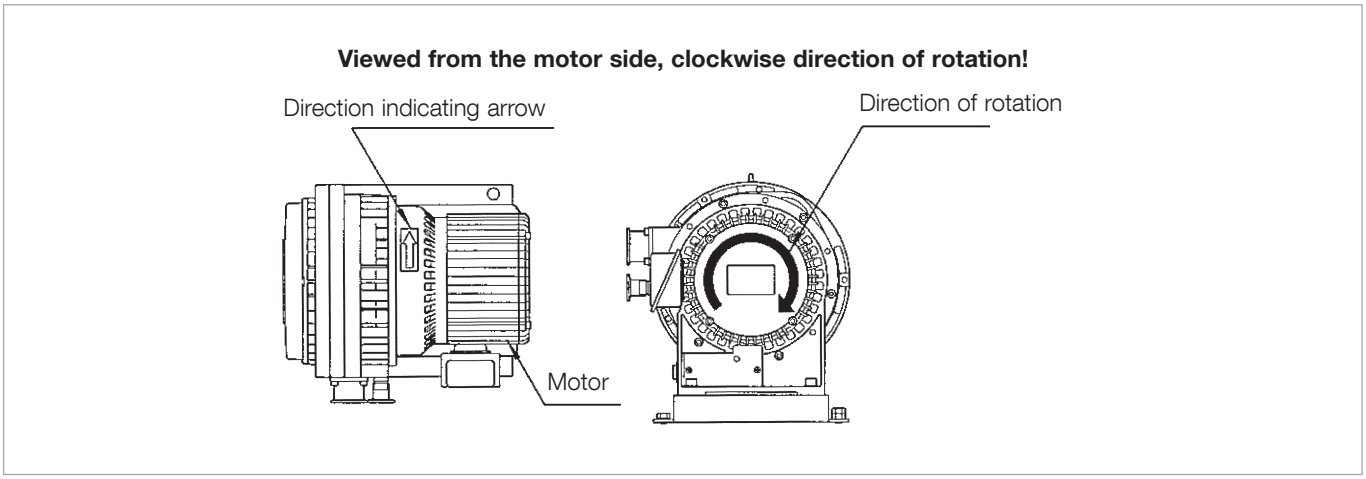



Fig. 3.8 Checking the direction of rotation after having provided the wiring

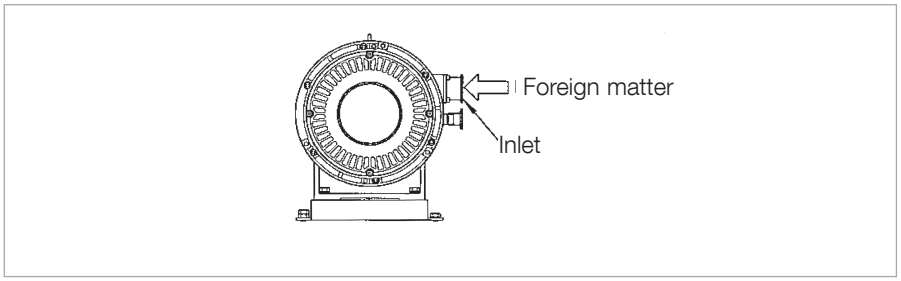



Fig. 3.9 Prevent foreign matter from entering into the pump

Operate the pump with inlet open, and check that air comes out from outlet.

If you plan to switch the pump ON-OFF with remote control, check the pump's rotation direction before connecting it to the vacuum system.

**NOTICE**

When checking rotation, avoid dropping foreign matter into the inlet. Dropping foreign matter into the pump can cause failure.

If the direction of rotation is wrong, ensure that the incoming power is OFF and then interchange two of the input leads.

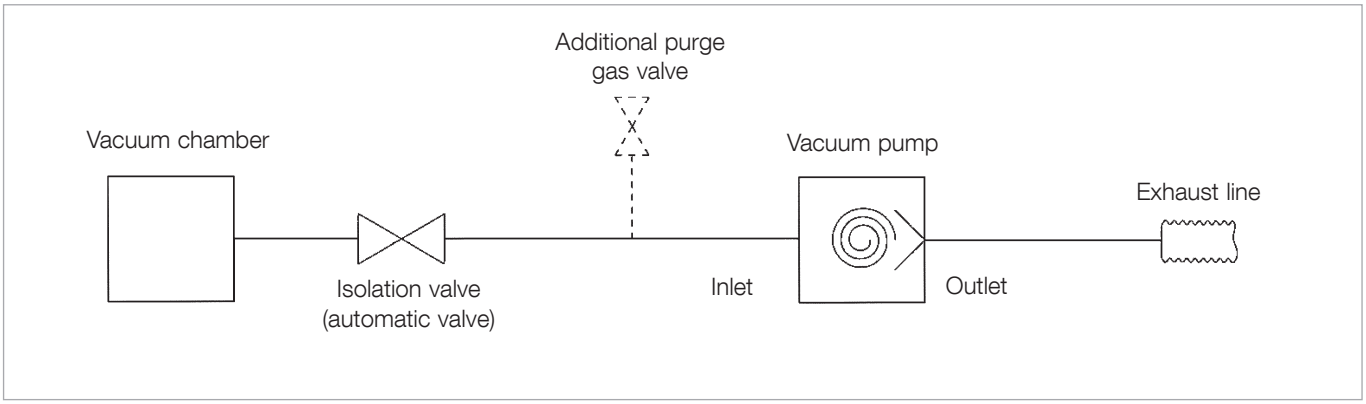



Fig. 3.10 Block diagram of the connection to the vacuum system

### 3.6 Connection to the Vacuum System

Inlet of the SC 5 D is DN 25 and the exhaust is DN 16.

Inlet of the SC 15 D is DN 25 and the exhaust is DN 16.

Inlet of the SC 30 D is DN 40 and the exhaust is DN 25.

Inlet of the SC 60 D is DN 40 and the exhaust is DN 40.

Install an isolation valve between the vacuum chamber and the pump's inlet to prevent the drawback of debris from the vacuum pump into the vacuum chamber during start-up or shutdown.

We recommend the use of an automatic valve as isolation valve which closes during power failure to prevent the drawback of debris from inside the pump into the vacuum chamber.

Install a purge gas valve between the isolation valve and the pump's inlet. Opening this purge gas valve during operation removes dirt and water vapour from the pump.

Use the clean connecting tubing between vacuum chamber and vacuum pump. We recommend the use of flexible tubing between the inlet of pump and the vacuum chamber so that the pump's vibration is not transmitted to the vacuum chamber.

When connecting an exhaust line to the outlet of the vacuum pump, we recommend the following maximum straight length:

SC 5 D: 30 m DN 16 line

SC 15 D: 5 m DN 16 line

SC 30 D: 15 m DN 25 line

SC 60 D: 40 m DN 40 line

Make sure that the exhaust line is not clogged during operation.

Ensure that the pressure at the pump's exhaust is at atmospheric pressure.

## 4 Operation

**DANGER**

Do not pump hazardous gases to humans, or explosive, flammable, toxic or corrosive gases or substances which contain chemicals, solvents or powders. Pumping such gases can cause bodily injury from exposure to harmful substances, explosion or fire.

Never put your fingers or foreign matter into ventilation holes of the fan cover, motor set or clearance between cooling fans of stage 1 and stage 2. If done, you can injure your fingers or foreign matter can blow into your eyes.

**NOTICE**

In order to ensure an adequate air supply, the front side of SCOLLVAC SC 60 D must not be obstructed.

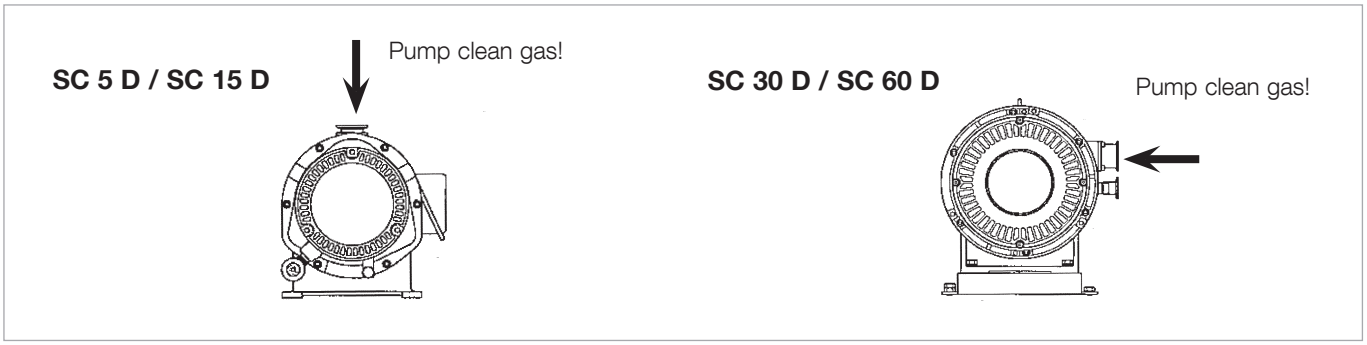



Fig. 4.1 Never pump hazardous gases

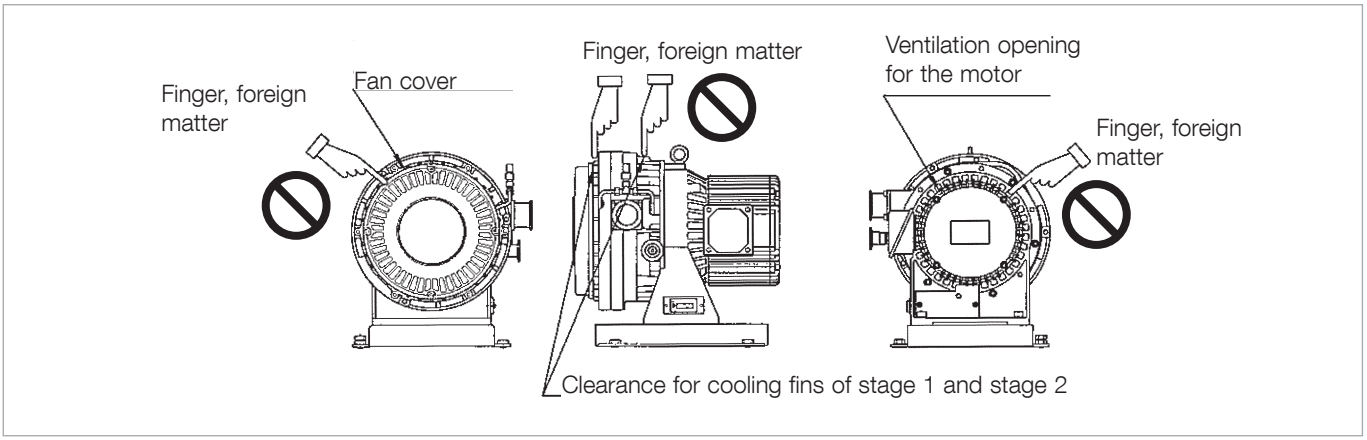



Fig. 4.2 Hazardous points on the pump

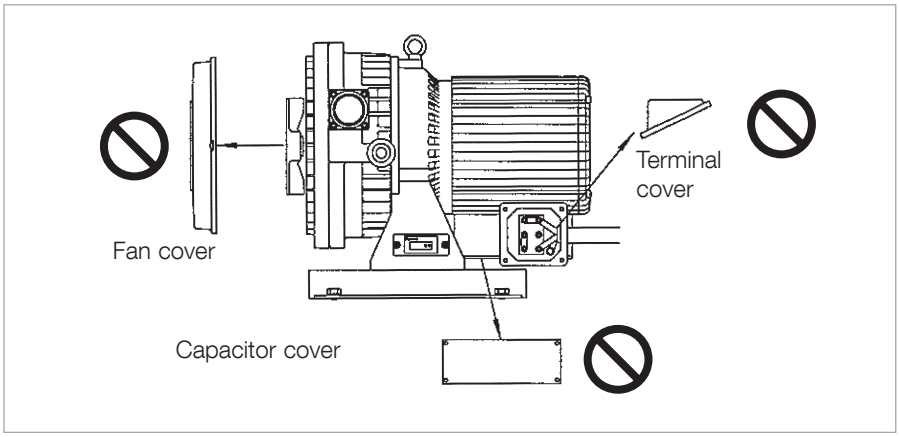



Fig. 4.3 Never alter equipment

**DANGER**

Never remove or alter safety equipment or covers.
Removing or altering this equipment can cause electric shock or bodily injury by rotating objects.
Operate at the pump only with the fan cover and the terminal cover in place.
Operate in the single-phase pump only with the capacitor cover in place.

## 4.1 Start-up

**NOTICE**

Remove blank flanges from the inlet and outlet before starting the pump.
Operation with blank flanges can cause damage.

If you will be pumping humid air or condensable vapors, open the purge gas valve (refer to Sec. 4.3) before starting the pump as described below.

The pump takes 6-8 hours to reach its ultimate pressure during its initial start-up or after a long idle period.

Close the inlet isolation valve and continue operation for further 6-8 hours. Open the purge gas valve for 3-5 seconds to atmosphere 2-3 times per hour. While the pump was off, moisture may have entered the pump extending the time needed to reach ultimate pressure.

Close the isolation valve between the vacuum pump and vacuum chamber during start-up and shutdown of pump. Otherwise, debris from the pump can be drawn back into the vacuum chamber.

When restarting a pump that is already at operating temperature, open the purge gas valve for 3-5 seconds to atmosphere before restarting the pump. Otherwise, the pump‘s temperature can become unbalanced causing it to fail.

**ZProceed as follows to start the pump:**

1. Close the isolation valve to prevent drawback of debris from the vacuum pump into vacuum chamber (open the purge gas valve if one is installed).
2. Switch the vacuum pump ON.
3. Open the isolation valve (close purge gas valve if one is installed) and pump the vacuum chamber.

### 4.2 Pumping

Operating the pump continuously near its ultimate pressure (for example, backing a turbomolecular pump) can cause deposits of foreign matter or moisture in the pump resulting in failure.

Operate the pump with the purge gas valve open (see Sec. 4.3 “Purge Gas Operation”), or close the isolation valve and open the purge gas valve for 3-5 seconds to atmosphere several times once a day to remove foreign matter from inside the pump.

**Operate at specified temperature**

When pumping vapour, the inlet gas temperature must be less than 50 °C. When vapour temperature is more than 50 °C, install a chiller or trap in the piping between the vacuum chamber and the pump to reduce the inlet vapour temperature to less than 50 °C. Pumping vapour of over 50 °C can cause failure.

### 4.3 Purge Gas Operation (pumping of vapours)

**NOTICE**

When pumping vapour, open the purge gas port of the SCROLLVAC. If you pump vapour with the purge gas valve port closed, condensed moisture remains in the pump, resulting in failure.

Use care to avoid damaging the purge gas valve port (especially the silencer).

When the purge gas valve is open, noise level increases and ultimate pressure deteriorates slightly.

**Purpose of the Purge Gas**

The moisture volume drawn into pump varies depending on the temperature and pressure in the vacuum chamber. Pumping humid gas can result in moisture condensing in the pump. This remaining moisture can cause a deterioration of the ultimate pressure or pump failure. When the vacuum chamber contains gas with humidity of over 60 % RH, the pump must be operated with the purge gas valve open. Operating the pump with the purge gas valve open removes the moisture which allows the pump to reach its ultimate pressure.

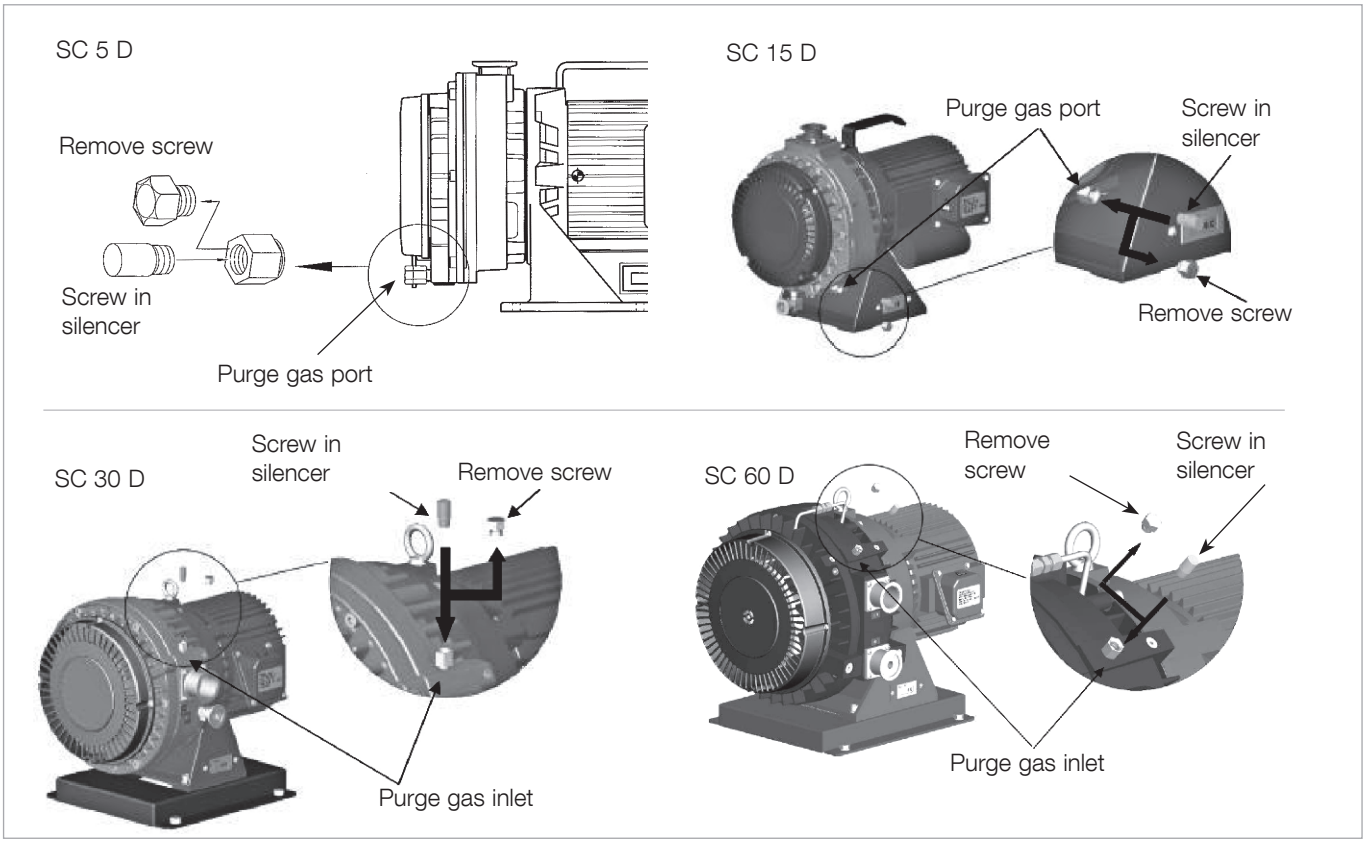



Fig. 4.4 Setting up the pump for purge gas operation

**Never change the purge gas conditions during operation (ON/OFF)**

Open or close the purge gas valve port only after shutting down the pump. Opening or closing the purge gas valve during operation can cause the pump to fail and cause bodily injury.

**NOTICE**

To open the purge gas supply, shutdown the pump, remove the plug from the purge gas port and screw the silencer into the purge gas port. (Fig. 4.4).

To close the purge gas valve, shutdown the pump. Remove the silencer from the purge gas valve port and replace it with the plug. Lightly tighten the plug with a wrench.

When supplying nitrogen gas or dry air to the purge gas valve port, set the pressure equivalent to atmospheric pressure while keeping the flow below:

- 9 l · $min^{-1}$ for the SC 5 D or
- 10 l · $min^{-1}$ for the SC 15 D, SC 30 D and SC 60 D.

Exceeding a purge gas flow of 9 or 10 l/min cause pump failure.

### 4.4 Shutdown

After vapour has been pumped, continue to operate the pump with the purge gas valve open for over one hour. If you close the purge gas valve port or stop the pump soon after vapour has been pumped, condensed moisture remains in the pump, resulting in failure.

- To prevent the drawback of debris from the vacuum pump into vacuum chamber during shutdown, close the isolation valve (open the purge gas valve if one is installed).
- Switch the vacuum pump off.

When the pump stops, atmospheric air is drawn back from the purge gas valve port to the inside of pump, and pressure inside pump rises to about atmospheric pressure. To maintain vacuum in the vacuum chamber and prevent the drawback of debris from vacuum pump into vacuum chamber, close the isolation valve to the vacuum chamber before shutting off the pump.

## 5 Maintenance

**NOTICE**

Neglecting maintenance and inspection can cause poor performance and pump failure.

To remove debris accumulated in the vacuum pump, operate the pump several times for 3-5 seconds (once a day) with its inlet open to atmospheric air (or open the purge gas valve if one is installed).

**DANGER**

Allow the pump to cool down before doing maintenance. Performing maintenance immediately after shutdown can cause bodily injury such as burns.

Be careful of automatic restart
The thermal protection on the single-phase motor automatically resets. This motor restarts without warning after the protector trips back. Be sure to switch off the electric power before maintenance or inspection.

Switch off electric source
Be sure to switch off the electrical power before maintenance or inspection. Failure to do so can cause bodily injury from electric shock or rotating objects.

More frequent maintenance is required if the ambient temperature is too high. The maintenance interval is based on 5 - 40 °C ambient temperature and 25 °C average yearly temperature.

Shorten the maintenance interval if the ambient temperature is higher. Otherwise, the pump may fail prematurely.

The maintenance schedule assumes that the pump is exposed to clean gas only.

You must shorten the maintenance interval when pumping vapour since vapour temperature, disposal volume, disposal frequency and substances in the vapour influence the pump‘s operation.

# Maintenance

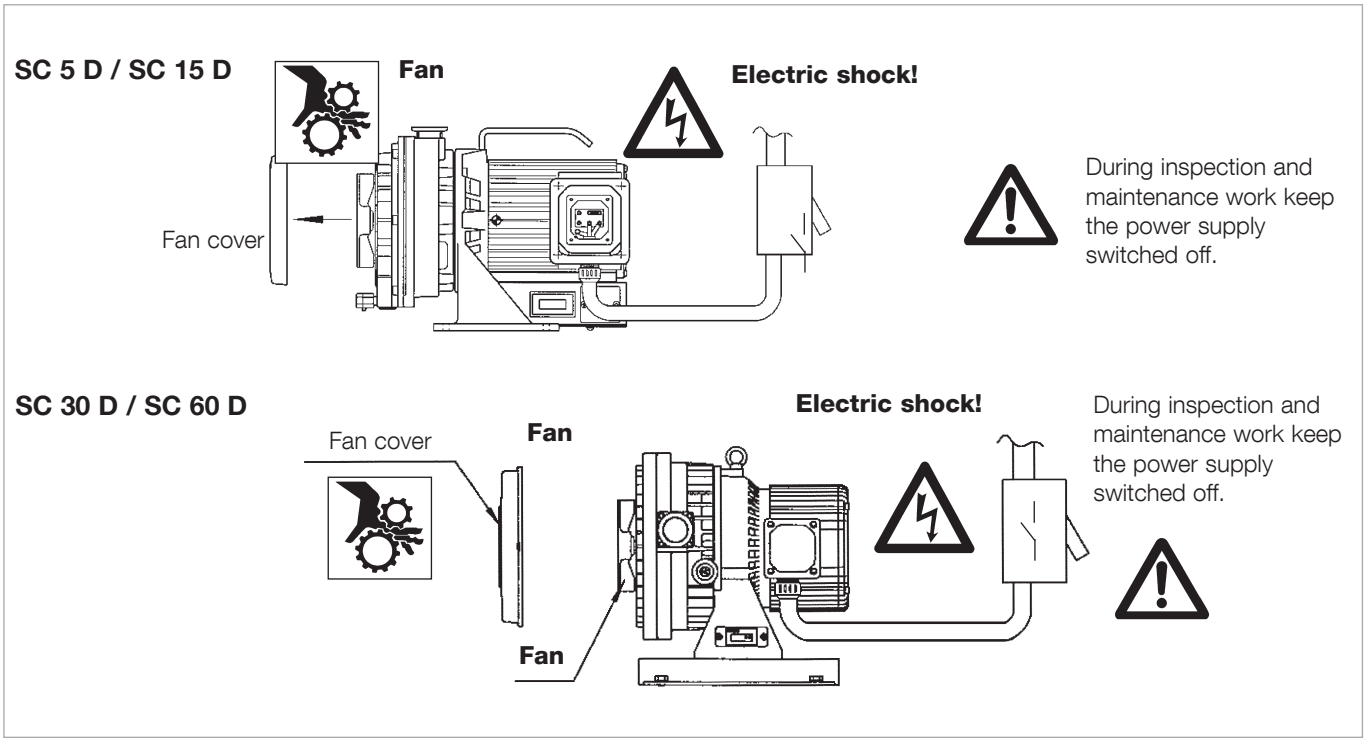



Fig. 5.2

### 5.1 Table - Maintenance

When the maintenance interval has been reached, contact Leybold to arrange the required maintenance. Never disassemble, reassemble or alter the pump yourself. We are not responsible for any accidents caused by disassembly, assembly or alteration which was done by the user or non-specialist.

| | Maintenance interval | | | |
|---|---|---|---|---|
| **Where to inspect** | **Yearly or every 8,000 hours** | **Every two years or every 16,000 hours** | **After having pumped vapours 400x** | **Remarks** |
| Ball bearing | grease / ▲ | ❍ | ▲ | |
| Tip seal | – | ❍ | ▲ | |
| Seal | ✻ | ❍ | ▲ | |
| O-ring | ✻ | ❍ | ▲ | |
| Exhaust valve | ✻ | ❍ | ▲ | |
| Purge | ✻ | ❍ | ▲ | |
| Pin crank | ▲ | ▲ | ▲ | |
| Stopper | ▲ | ▲ | ▲ | |
| Vacuum pump itself | inside cleaning / ▲ | inside cleaning / ▲ | inside cleaning / ▲ | |

✻ Small maintenance kit
❍ Large maintenance kit
▲ Replace in case of malfunction

Note 1: Exclusively use the specified DIS grease.
Note 2 : The maintenance interval is the time interval or running hours whichever is reached first.

### 5.2 Leybold Service

Whenever you send us equipment, indicate whether the equipment is contaminated or is free of substances which could pose a health hazard. If it is contaminated, specify exactly which substances are involved. You must use the form we have prepared for this purpose.

A copy of the form has been reproduced at the end of these Operating Instructions: “Declaration of Contamination for Compressors, Vacuum Pumps and Components”. Another suitable form is available from www.leybold.com → Documents → Download Documents.

Attach the form to the equipment or enclose it with the equipment.

This statement detailing the type of contamination is required to satisfy legal requirements and for the protection of our employees.

We must return to the sender any equipment which is not accompanied by a contamination statement.

**WARNING**

Pack the pump in such a way, that it will not be damaged during shipping and so that any contaminants are not released from the package.

### 5.3 Waste Disposal

The pump may be contaminated by the process or by environmental influences. In this case it must be decontaminated in accordance with the relevant regulations. We offer this service at fixed prices. Further details are available upon request.

**WARNING**

Contaminated parts can be detrimental to health and environment. Before beginning to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

Separate clean components according to their materials, and dispose of accordingly.

If you send equipment to Leybold mind the regulations given in Section 5.2. “Leybold Service”.

## 6 Troubleshooting

If the pump malfunctions, please refer to the following chart for help in solving the problems. If you cannot solve the problem, please contact Leybold.

| Fault | Possible cause | Remedy |
|---|---|---|
| Pump does not rotate. | Breaker malfunction. | Inspect and repair. |
| | Wiring becomes loose or cut. | Repair or replace. |
| | Voltage drops. | Check length and size of cable. |
| | Motor malfunctions. | Inspect and repair. |
| | Pump malfunctions. | Inspect and repair. |
| SC 5 D only | Switch is turned OFF. | Turn switch ON. |
| SC 5 D only | ON-OFF switch is damaged. | Replace. |
| | Thermal protector trips. | Inspect connection |
| | | Inspect voltage. |
| | | Inspect and repair. |
| Ultimate pressure is insufficient. | Air leaks for pumping. | Check tightness of piping. |
| | Moisture or solvent has condensed in pump. | Open inlet to atmosphere and operate for a few minutes and then operate for about 24 hours with the inlet closed. |
| | | Install a trap or a filter to prevent water and solvent from entering the pump. |
| | O-ring is damaged. | Replace. |
| | Purge gas valve port is clogged. | Clean silencer. - Replace |
| Abnormal sound, vibration. | Connections loose. | Tighten connections. |
| | The pump is not level. | Level the pump. |
| | Foreign matter enters inside of Pump. | Inspect and clean. |
| | Failure of exhaust valve. | Inspect and replace. |
| | Failure of motor. | Inspect and replace. |
| | Failure of pump. | Inspect and change resp. replace. |

# Spare Parts

## 7 Spare Parts

| | Part No. for SCROLLVAC | | | |
|---|---|---|---|---|
| | **SC 5 D** | **SC 15 D** | **SC 30 D** | **SC 60 D** |
| Small maintenance kit (after 8,000 h) Minor Kit | EK 870000496 | EK 870000497 | EK 870000498 | EK 870000519 |
| Large maintenance kit (after 16,000 h) Major Kit | EK 870000499 | EK 870000500 | EK 870000501 | EK 870000520 |
| Toolkit | EK 870000502 | EK 870000503 | EK 870000503 | EK 870000521 |
| Scroll profiled seal (Tip Seal) | E 870000510 | E 870000511 | E 870000512 | E 870000522 |
| Shaft installation kit (Pin Crank Kit) | EK 870000507 | EK 870000508 | EK 870000509 | EK 870000523 |
| Eccentric shaft | EK 870000504 | EK 870000505 | EK 870000506 | EK 870000534 |
| Airflush inlet filter | EK 870000515 | EK 870000515 | EK 870000515 | EK 870000515 |

Leybold

CE

# EU Declaration of Conformity

*(Translation of original Declaration of Conformity)*

**The manufacturer**:

Leybold GmbH
Bonner Strasse 498
D-50968 Köln
Germany

herewith declares that the products specified and listed below which we have placed on the market, comply with the applicable EU Directives. This declaration becomes invalid if modifications are made to the product without agreement of Leybold GmbH.

| | |
|---|---|
| **Product designation:** | Scroll Vacuum Pump |
| **Type designation:** | SCROLLVAC SC5D, SC10D, SC30D, SC30DL, SC60D |
| **Part numbers:** | 133000, 133100, 133001, 133003, 133101, 133002, 133004, 133102, 133050, 133051, 133008 |

**The products complies to the following Directives:**

Machinery Directive (2006/42/EC)

The safety objectives of the Low Voltage Directive 2014/35/EU were complied with in accordance with Appendix 1 No. 1.5.1 of Machinery Directive 2006/42/EC.

Electromagnetic Compatibility (2014/30/EU)

RoHS Directive (2011(65/EU)

**The following harmonized standards have been applied:**

| | |
|---|---|
| EN 1012-2:1996+A1:2009 | Compressors and vacuum pumps - Safety requirements Part 2: Vacuum pumps |
| EN 60204-1:2006 | Safety of machinery - Electrical equipment of machines Part1: General requirements |
| EN 61000-6-2:2005/AC:2005 | Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments |
| EN 61000-6-4:2007/A1:2011 | Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments |
| EN 50581:2012 | Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances |

Documentation officer:

Herbert Etges
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documentation@leybold.com

Cologne, October 12, 2016

ppa. Martin Tollner
Head of Product Lines

Cologne, October 12, 2016

ppa. Dr. Monika Mattern-Klosson
Head of Quality & Business Process Management

Leybold

# Declaration of Contamination of Compressors, Vacuum Pumps and Components

The repair and / or servicing of compressors, va cuum pumps and components will be carried out only if a correctly completed declaration has been submitted. Non-completion will result in delay. The manufacturer can refuse to accept any equipment without a declaration.

**A separate declaration has to be completed for each single component.**

This declaration may be completed and signed only by authorized and qualified staff.

Customer/Dep./Institute :

Address :

Person to contact:

Phone : Fax:

**End user:**

Reason for return: ☒ applicable please mark

**Repair**: ☐ chargeable ☐ warranty

**Exchange**: ☐ chargeable ☐ warranty

☐ Exchange already arranged / received

**Return only:** ☐ rent ☐ loan ☐ for credit

**Calibration**: ☐ DKD ☐ Factory-calibr.

☐ Quality test certificate DIN 55350-18-4.2.1

## A. Description of the Leybold product:

Material description :

Catalog number:

Serial number:

Type of oil (ForeVacuum-Pumps) :

**Failure description:**

**Additional parts:**

**Application-Tool**:

**Application- Process**:

## B. Condition of the equipment

| | No[1] | Yes | No |
|---|---|---|---|
| 1. Has the equipment been used | ☐ | ☐ | |
| 2. Drained (Product/service fluid) | | ☐ | ☐ |
| 3. All openings sealed airtight | | ☐ | |
| 4. Purged | | ☐ | ☐ |

If yes, which cleaning agent

and which method of cleaning

[1] If answered with "No", go to **D**.

| Contamination : | No[1] | Yes |
|---|---|---|
| toxic | ☐ | ☐ |
| corrosive | ☐ | ☐ |
| flammable | ☐ | ☐ |
| explosive [2] | ☐ | ☐ |
| radioactive [2] | ☐ | ☐ |
| microbiological [2] | ☐ | ☐ |
| other harmful substances | ☐ | ☐ |

## C. Description of processed substances (Please fill in absolutely)

1. **What substances have come into contact with the equipment** ?
   Trade name and / or chemical term of service fluids and substances processed, properties of the substances
   According to safety data sheet (e.g. toxic, inflammable, corrosive, radioactive)

| X | Tradename: | Chemical name: |
|---|---|---|
| a) | | |
| b) | | |
| c) | | |
| d) | | |

| | No | Yes |
|---|---|---|
| 2. **Are these substances harmful ?** | ☐ | ☐ |
| 3. **Dangerous decomposition products when heated ?** | ☐ | ☐ |

**If yes, which ?**

[2] **Components contaminated by microbiological, explosive or radioactive products/substances will not be accepted without written evidence of decontamination.**

## D. Legally binding declaration

**I / we hereby declare that the information supplied on this form is accurate and sufficient to judge any contamination level.**

Name of authorized person (block letters) :

Date

signature of authorized person

firm stamp

# Notes

# Sales and Service

## Germany

**Leybold GmbH**
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