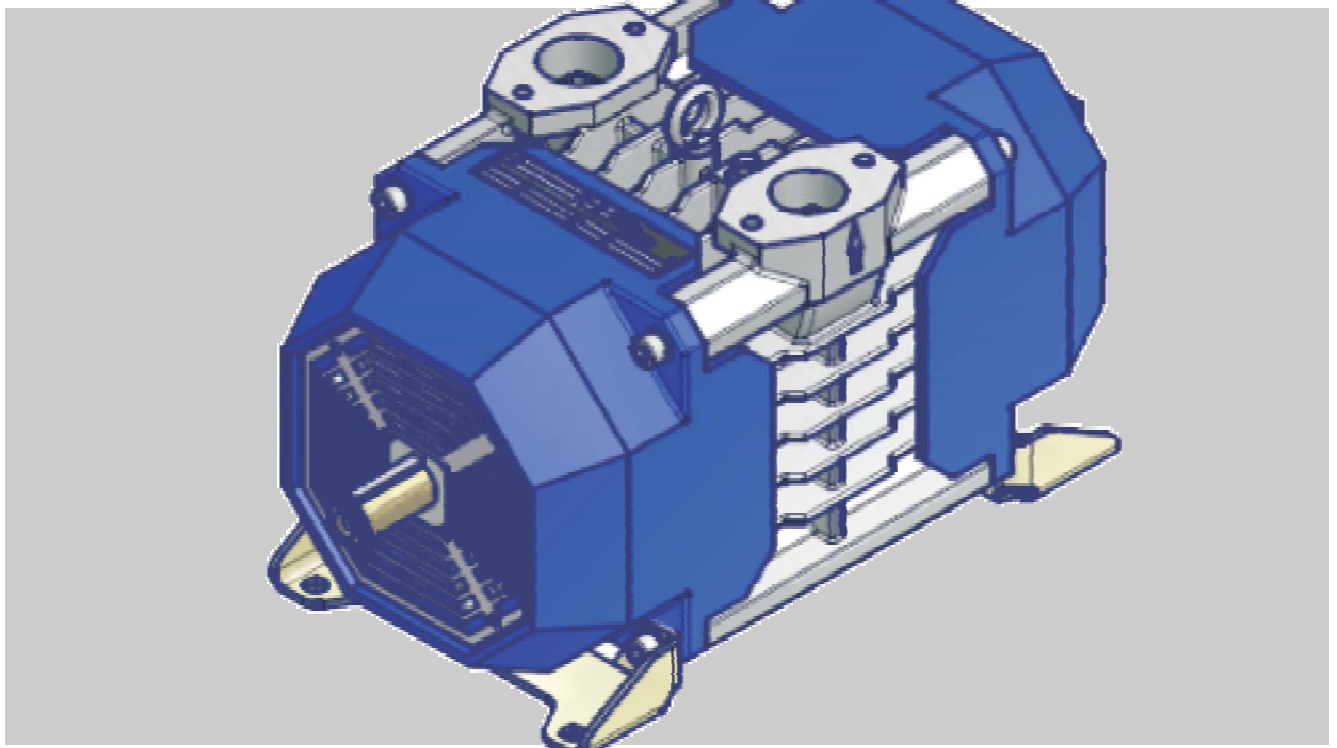


Installation instructions

Multi-cell compressor
RKL 160



Doc-ID: 5006-00/27.06.2012/EA/EN

Release: 06/2012

Prior to installing the machine 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!

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1 General

1.1 Information about the installation instructions

These installation instructions provide important information about installation and start-up of the machine. 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 machine must be observed.

You must have read and understood the installation 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 machine, well accessible to the personnel at all times. All safety instructions of the operating instructions must additionally be observed.

General

1.2 Pictogram explanation

Warning notes

Warning notes are identified by icons in these operating 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 a potentially dangerous situation, which can lead to death or serious injuries if it is not avoided.

**ATTENTION!**

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

**CAUTION!**

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

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 "RKL160".

1.4 Copyright protection

Information regarding the copyright can be found in the operating instructions "RKL160".

1.5 Spare parts

Information regarding the spare parts can be found in the operating instructions "RKL160".

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, Part 1, Section B, Annex II) see page 25.

Safety

2 Safety

2.1 Intended use

The compressor is intended for the installation in a superior machine (upstream). 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 RKL160 is intended exclusively for the compression of filtered air.

2.2 Acceptance and Monitoring

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

2.3 Operator's responsibility

See operating instructions "RKL160" for information about the responsibility of the operating company.

2.4 Requirements placed upon the specialised staff

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

- **Specialised staff**
is due to its technical training, knowledge and experience as well as due to its knowledge of the pertinent regulations able to carry out the work assigned to it and to independently recognise 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.

2.5 Personal protective equipment

Information regarding the personal protection can be found in the operating instructions "RKL160".

2.6 Occupational safety and special risks

Please observe all safety instructions as per the operating instructions "RKL160", Chapter "Occupational safety and special danger".

3 Technical data

3.1 Dimensions

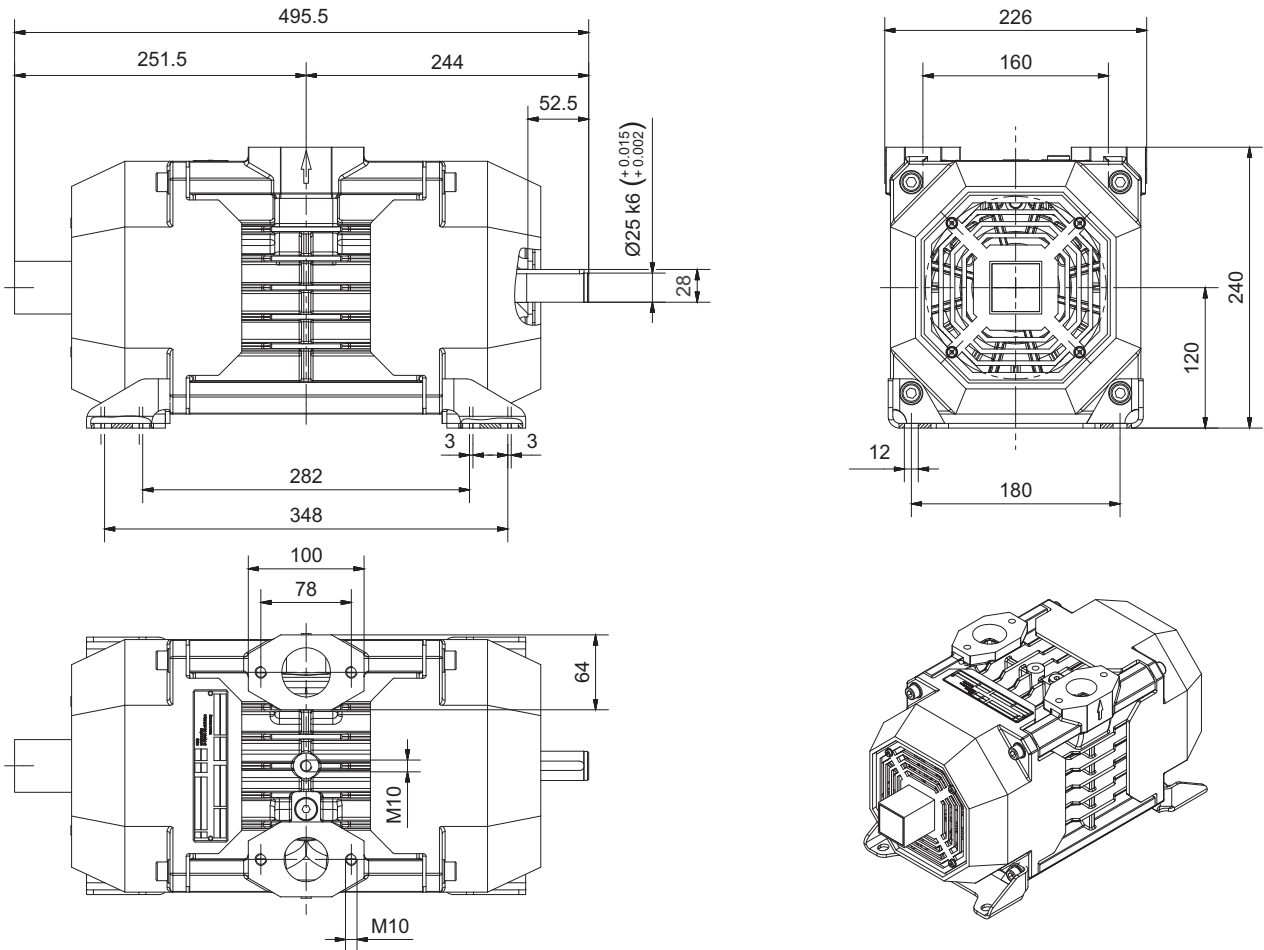


Fig. 1: Dimensions

Technical data

3.2 Technical data

General data	Unit	RKL 160
Angular momentum on the drive shaft	[kgm ²]	0,034
Compressor weight	[kg]	33
Rated speed	[1/min]	1500
Sound pressure level at final overpressure = 2.0 bar ¹⁾	[dB(A)]	75

1) Distance to compressor 7 m

Table 1: General Data

Permissible working range	Unit	RKL 160
Speed range	[1/min]	1200...1600
Suction temperature ¹⁾	[°C]	-10...+40
Geodetic height ¹⁾	[m]	0...1000
Vacuum suction side	[mbar]	0...65
Maximum final overpressure at the pressure flange ²⁾	[bar]	2,5

1) Consult CVS for suction temperature and/or altitudes outside the permissible working range.

2) Intake pressure at the suction flange = 1 bar, suction and ambient temperature = 20 °C

Table 2: Permissible working range

Performance characteristics at rated speed	Unit	RKL 160
Suction volume flow at final overpressure	0.0 bar	145
	2.0 bar	115
Coupling output at final overpressure	0.0 bar	4,5
	2.0 bar	8,1

1) Intake pressure at the suction flange = 1 bar, suction and ambient temperature = 20 °C

Table 3: Performance characteristics at rated speed

4 Design

4.1 Design

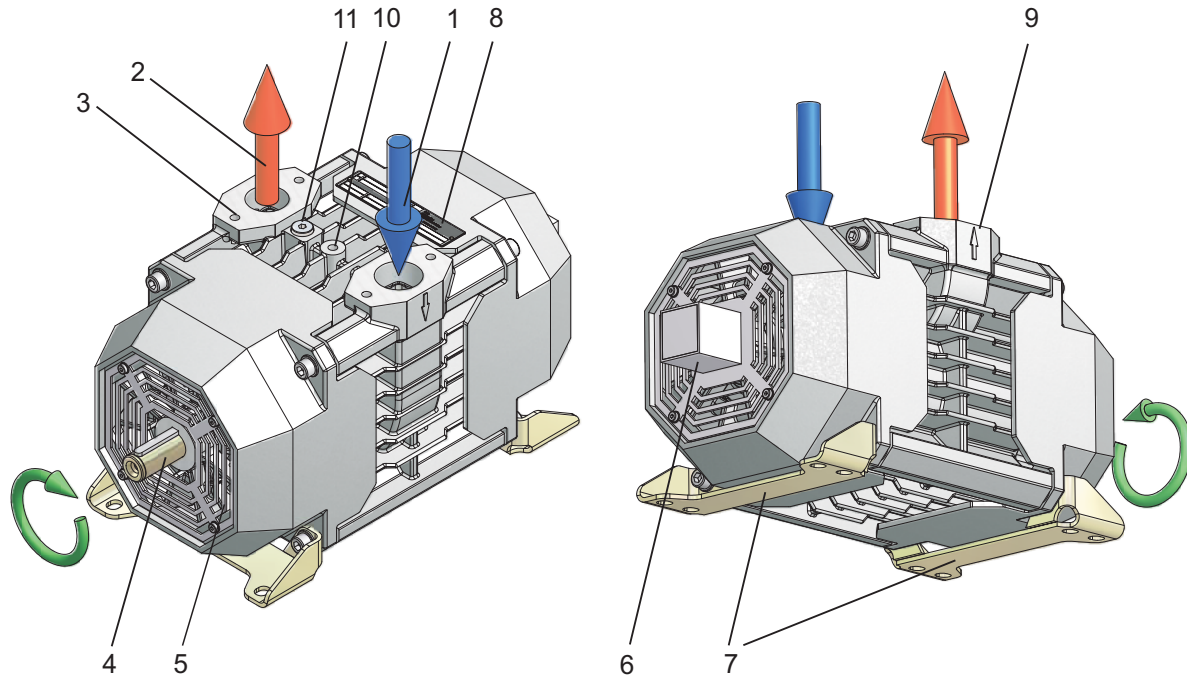


Fig. 2: Design

- | | | | |
|---|----------------------------------|----|--|
| 1 | Suction flange – air entry DN 40 | 6 | Shaft protection grid counter-side |
| 2 | Pressure flange – air exit DN 32 | 7 | Fixing feet |
| 3 | Attachment thread for flanges | 8 | Rating plate |
| 4 | Drive shaft | 9 | Rotation arrow |
| 5 | Shaft protection grid drive side | 10 | Thread for eye bolt M10 |
| | | 11 | Connection for pressure or temperature monitoring G 1/4" |

Design

4.2 Function

Functional principle

In the working area, self-lubricating sliders in conjunction with the impeller and the casing form cells that are separated from each other and steadily grow (sucking) or shrink (compressing) with each revolution.

Lubrication

Lubrication of the rotor bearing is warranted by a permanent grease fill.

Cooling

Heat removal is performed by casing ribs on the entire casing surface with targeted cooling air guidance, via a ventilation wheels.

Drive

Drive is possible via:

- Articulated shaft
- Hydraulic motor
- V-belt (only in connection with an upstream shaft)

4.3 Sense of rotation

The compressor has a continuous drive shaft. It can be driven from either side. The rotating direction therefore may be chosen either clockwise or counter-clockwise (see page 16). The standard rotating direction at delivery is clockwise with view of the drive shaft.

5 Transport and storage

5.1 Safety notes for transport

Improper transport



Danger!
Danger by falling down or tilting of the machine!

The weight of the machine may injure a person and cause serious bruising!

Therefore:

- Use suitable lifting gear for lifting up the machine.
- Use the attachment point at the ring screw.

Also observe the safety instructions in the operating instructions "RKL 160", Chapter "Occupational safety and special danger"!

5.2 Transport

For future transports:

- Seal all open connections with protective caps (prevents penetration of dirt and water).
- Secure against vibrations.
- Securely fasten the machine prior to transport.

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.
- In case of extended storage or extended downtimes, one desiccant bag each should be inserted in the inlets and outlets. The bags must be removed again before the compressor is started.

Installation and assembly

6 Installation and assembly

6.1 Safety notes

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.

Also observe the safety instructions in the operating instructions "RKL 160", Chapter "Occupational safety and special danger"!

6.2 Installation

The figure gives a schematic illustration of the compressor with accessories and drive variants.

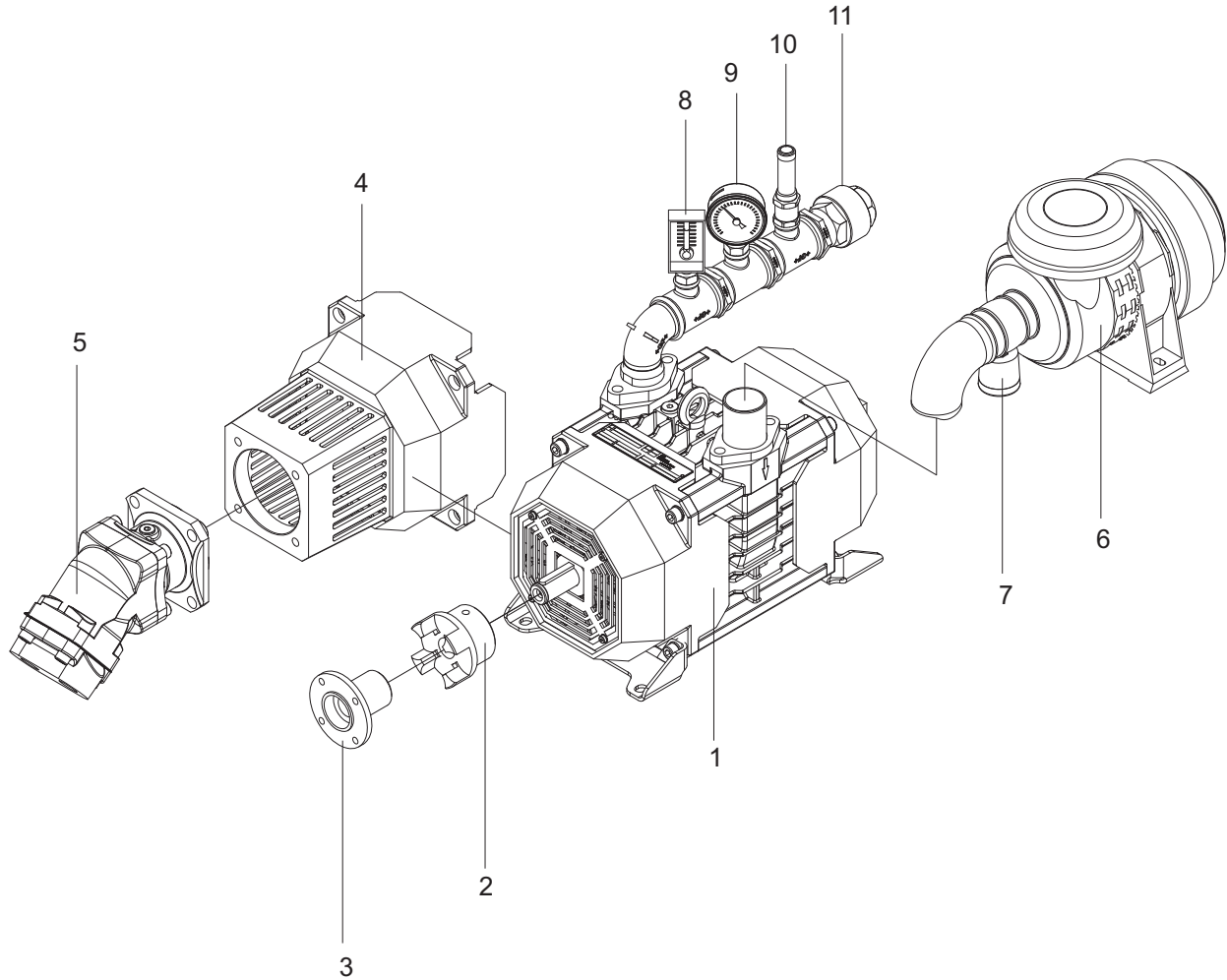


Fig. 3: Setup with accessories and drive variants

- | | | | | | |
|---|--|---|--------------------------------|----|------------------------------|
| 1 | Compressor | 5 | Hydraulic motor | 9 | Manometer installation point |
| 2 | Flexible coupling | 6 | Suction air filter | 10 | Safety valve |
| 3 | Articulated shaft mounting flange | 7 | Vacuum display | 11 | Non-return valve |
| 4 | Intermediate flange for hydraulic motor installation | 8 | Thermometer installation point | | |

Installation and assembly

6.3 Necessary work

The following work is necessary to install the compressor:

- Installing the compressor with suction and pressure lines.
- Installing safety and monitoring equipment.
- Installing accessories.
- Connecting the drive with the compressor.

6.4 Changing the rotating direction of the multi-cell compressor

The standard rotating direction at delivery is clockwise with view of the drive shaft.

To change the rotating direction, swap the shaft protection grids (see Fig. 2, Fig. 5, and Fig. 6). Tightening torque of the 4 attachment screws: 4.5 Nm.

6.5 Attachment and installation space

Attachment of the compressor feet to the compressor

Attachment of the compressor to the vehicle takes place by two compressor feet connected to the compressor; connection takes place right to the chassis or the traverses.

- The compressor feet can be installed at all 4 longitudinal sides (right, left, top, bottom) of the compressor.
If the compressor feet position must be changed, the attachment screws must be coated with installation paste again and tightened with 34 Nm.

Requirements placed upon the installation points

- The attachment points on the vehicle must feature a sufficient load capacity and rigidity.
- The attachment points must be on the same level.

Requirements placed upon the installation point

The installation location must fulfil the following requirements:

- Protect from dirt, falling rocks and spray water.
- Offer sufficient space for accidental contact protection.
- 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).
- The superstructure side of the compressor must have enough free space for cooling.

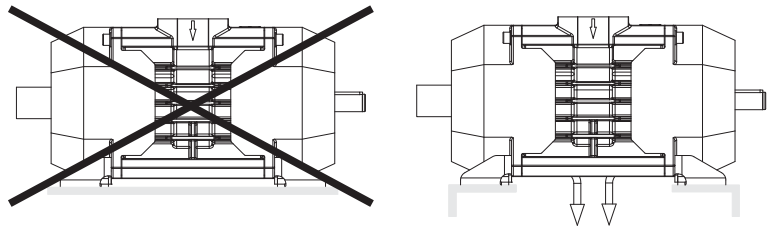


Fig. 4: Installation position
Left: Impermissible installation position, cooling air exit covered.
Right: Intended installation position, cooling air exit open.

Installation position of the compressor

- Pressure and suction flange may point up, right or left (down is not permissible).
- Install the machine horizontally or with tilt matching the inclination of the auxiliary drive. But do not incline by more than $\pm 5^\circ$ degrees for a horizontal vehicle.

Installation at the vehicle

Attach the compressor feet with screws (M10-8.8) without tightening them.

Installation and assembly

6.6 Suction and pressure flanges

Assembly

1. Coat all threads with anti-fretting paste.
2. Install flanges with stud bolts M10 8.8 with a tightening torque of 40 Nm for the hexagon nut.

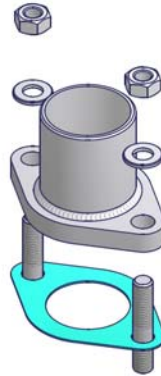


Fig. 5: Assembly example for suction flange

6.7 Suction and pressure lines

Requirements

- Corrosion-proof
- Minimum inside diameter:
 - Suction side: 40 mm
 - Pressure side: 35 mm

Installation

Install the lines as follows:

- The connected lines must not have any reaction force on the compressor. Support the lines, if necessary.
- Lay the suction line rising to the compressor; pressure line falling away from the compressor. Provide a condensate sack with drain outlet at the lowest point.
- Check for tightness when using a plastic hose on the suction side
- Install a sieve in front of the suction flange if initial contamination is expected on the suction side (recommended mesh width 1 mm)

6.8 Safety equipment

The following safety equipment must be installed:

- Suction filter
- Safety valve
- Non-return valve
- Protection against contact

6.8.1 Safety valve

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.
- Use the safety valve only as intended.
- Never block the safety valve.

The German accident prevention regulations require a non-lockable safety valve to be installed after the compressor 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.

Assembly

- Install the safety valve directly after the compressor.
- The nominal opening pressure may not exceed the maximum permissible final overpressure (refer to table 2) or the permissible system pressure, provided the latter is lower.
- Protect the settings against unauthorised or erroneous changes.

6.8.2 Non-return valve

The non-return valve prevents the reverse operation of the compressor after it has been switched off when the silo is not relieved. The valve is not suitable for retaining material to be conveyed.

Assembly

- Install non-return valve right behind the safety valve.
- **Install a second** non-return valve at the transfer to the consumer to securely avoid any material to be conveyed in the pressure line.

6.8.3 Suction filter

Requirements

Liquids and solids may not be sucked in.

- Provide combination filter with integrated cyclone
- Filter mesh < 5 Micron
- Filter resistance when it is new < 15 mbar
- Use filter with dust extraction valve, control flap and maintenance display.

Installation and assembly

Installation

- Connect filter via stiff line or hose at the inlet.
- Protect the filter from spray water, e.g. from wheels, exhaust gases and heat.
- Observe the flow direction.
- Mount the filter horizontally.
- Provide removal space for filter insert.

6.8.4 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 294, for example, for the distances and the layout of the protective grid.

6.8.5 Display and monitoring equipment

Pressure gauge, maintenance display and thermometer must be provided to ensure smooth and trouble-free operation.

We also recommend the installation of a speed counter.

Designation	Monitoring parameters	Place of installation (see fig. 2)	Measuring range
Pressure gauge	Positive working pressure	Pressure line, right after outlet	According to the operating pressure to be ensured
Maintenance display	Degree of contamination of the suction filter	Between suction filter and compressor	0...65 mbars
Thermometer	Condenser end temperature	Pressure line, right after outlet	0...250 °C
Speed counter (option)	Speed	Drive shaft	1,200...1,600 min ⁻¹

Table 4: Display and monitoring equipment

6.9 Cooling

The compressor is air-cooled. Ensure at installation that no heat accumulation results and that the cooling air can circulate freely. The front cooling air entry openings must not be covered; see page 21, Fig. 6.

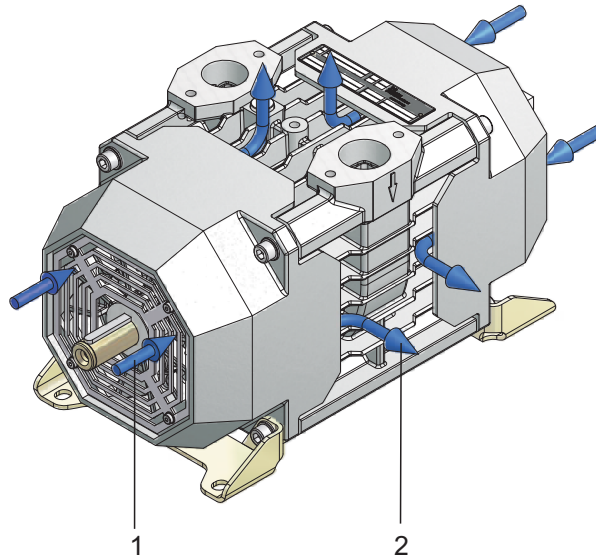


Fig. 6: Cooling air guide

- 1 Cooling air entry
- 2 Cooling air exit

6.10 Drive



CAUTION!

- The drive components must not exert any axial forces on the compressor shaft.
- Do not exert any axial forces on the compressor during assembly work at the drive shaft.
- Do not hammer or knock connecting components on the shaft, but pull them instead.
- Check the torque and the sense of rotation.

Drive types

Drive is possible via:

- V-belt via the auxiliary drive of the heavy goods vehicle, diesel engine or electric motor
- Articulated shaft by the auxiliary drive of the heavy goods vehicle (PTO)
- Flexible coupling and intermediate flange by a hydraulic motor

Installation and assembly

6.10.1 V belt drive



CAUTION!

Only in connection with a layshaft via elastic coupling. Assembly of the V-belt pulley on the compressor shaft is not permitted. No radial forces must be introduced into the compressor shaft.

Observe the ratings, installation instructions and inspection intervals from the manufacturer.

6.10.2 Articulated shaft drive



CAUTION!

Observe the ratings, installation instructions and inspection intervals from the manufacturer.

Requirement articulated shaft

- Bending angle of the joint shafts: max. 15 degrees.
- Articulated shaft must be:
 - a spline shaft
 - balanced.
- The central axes of the articulated shafts must be parallel to each other.

Components that match the compressor can be ordered from CVS.

Installing the articulated shaft flange

1. Coat all threads with anti-fretting paste.
2. Install articulated shaft flange with attachment screw M10 8.8 with a tightening torque of 40 Nm.

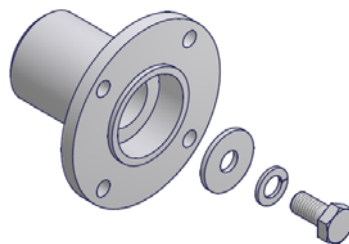


Fig. 7: Installing the articulated shaft flange

6.10.3 Drive via flexible coupling and hydraulic motor



CAUTION!

Observe the ratings, installation instructions and inspection intervals from the manufacturer.

The hydraulic motor is installed to the compressor via an intermediate flange. The power is transmitted via a flexible coupling.

Components that match the compressor can be ordered from CVS.

7 Start-up

7.1 Safety notes for 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 authorized representatives or by trained personnel.
- Start-up and operation may only be performed by adequately qualified personnel who have been authorized 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 "RKL 160", Chapter "Occupational safety and special danger".

Start-up

7.2 Start-up

Inspection prior to initial start-up

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

- Transport damage to the compressor
- Conduits for free passage and leak tightness.
- Screw connections for tightness.
- Drive's sense of rotation by briefly switching it on and off (observe rotation direction arrow).
- Direction of installation and function of non-return valve.
- Safety valve function.
- Accidental contact protection function.

Start-up

Proceed as follows during start-up:

- Pay attention to permissible compressor inclination
- Open shut-off devices
- Switch on drive (engage gently)
- Adjust input speed

Inspections during operation

The following inspections have to be carried out during operation:

- The speed must be between 1200...1,600 min⁻¹
- Check positive working pressure at the pressure gauge (permissible pressure refer to rating plate).

7.3 Switching off

Switching off of the compressor

- Switch off drive.
- Close shut-off valves.
- Drain the condensate tank.

Declaration of Incorporation

(pursuant to EC Machinery Directive 2006/42/EC, Annex II, part 1, Section B)

Manufacturer: CVS engineering GmbH
 Grossmattstraße 14
 79618 Rheinfelden / Germany

Documentation authorised by: Rolf Jäger
 Grossmattstraße 14
 79618 Rheinfelden / Germany

The manufacturer hereby declares that the "incomplete machine" of type "RKL 160" complies with the requirements of the directive 2006/42/EC up to the interfaces described in the included operating instructions, datasheets and technical documents.

The manufacturer undertakes to furnish the special technical documents of the partial machine to the national authorities on request.

The special technical documents for the machine have been created according to Annex VII, part B.

The special technical documentation according to Annex VII B of the Machinery Directive is available for a possible inspection by the responsible supervisory body.

Start-up of the partial machine is not permitted until it has been determined that the machine or machinery into which this partial machine has been integrated or of which it constitutes a component complies with the basic safety requirements and provisions of Directive 2006/42/EC.

Machine design: **Multi-cell compressor for dry compression of filtered air.
 With air cooling via the casing surface.
 Suitable for direct drive via elastic coupling or by means of articulated shaft.**

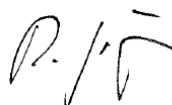
Machine models: **RKL 160**

Applied harmonized standards: **DIN EN ISO 12100-1/-2**
 Safety of machinery, basic concepts, general design
 Part 1: Basic terminology
 Part 2: Technical guidelines

DIN EN ISO 14121-1
 Safety of machinery - Risk assessment
 Part 1: Guidelines

DIN EN 1012 Part 1 / 2
 Compressors and vacuum pumps - Safety requirements
 Part 1: Air compressors
 Part 2: Vacuum pumps

The validity of this declaration shall lapse with immediate effect in case of conversions or changes to the machine as a whole or to individual components



Rheinfelden, December 31, 2009

i.V. Rolf Jäger
 Design and Development Manager

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