Installation, Operating & Maintenance Manual

(Original Instructions)

WITTIG

RFL 60-100

BA-40.01.0-GB
September 2013

Dear customer,

Your new rotary compressor/compressor and vacuum pump is the product of intensive development, based on decades of experience in the construction of rotary compressors and compressor and vacuum pumps. Our modern production methods, combined with the fulfilment of the highest quality standards and stringent testing, ensure reliability, high availability and a long service life for your appliance.

This machine naturally requires correct handling, especially under difficult operating conditions. Initial operation, normal operation and maintenance must therefore only be performed by properly trained and authorized personnel.

These operating instructions contain all necessary information, and they apply to all personnel who bear responsibility with regard to the appliance. Only thorough adherence to these instructions will ensure that the appliance works correctly over a long operating period. The complete operating instruction manual must therefore be kept near the appliance. We are sure you will appreciate that we are unable to accept any liability for damage caused by not adhering to these instructions.

Please ensure also that repairs are only carried out by authorized service centres, using original spare parts, as our guarantee otherwise loses its validity.

We wish you much satisfaction with the rotary compressor or compressor and vacuum pump that has been supplied to you by Gardner Denver. If your questions are not satisfactorily answered, we will be pleased to assist you at any time.

Yours sincerely,

Gardner Denver Drum Ltd.

PO Box 178
Springmill Street
Bradford
West yorkshire
BD5 7YH

The first digit of illustration reference numbers refers to the chapter in which the illustration is to be found. Within each chapter the illustrations are numbered in their order of occurence. The last digit of the illustration reference number refers to the item number within the illustration. Thus, for example, the reference (7.2/3) refers to the second illustration in chapter 7, item number 3.

In this manual, the following symbols are used

Operational safety
indicates possible danger to people. Operational safety demand and thus indicated instructions are to be followed exactly. All users must be familiar with the safety notes.

Environmental protection
indicates, that attention must be paid to environmental protection regulations.

Attention
indicates guidelines and regulations which prevent damage to the machine.

Information
indicates information, which is of special importance to the user of the compressor.

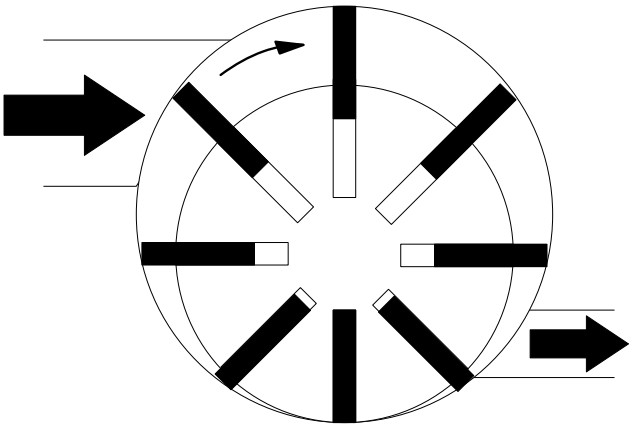
Principle of operation

Rotary compressors and compressor and vacuum pumps are multi-cell compressors which work on the displacement principle. They provide a constant, low-pulsation supply.

The machines are single-phase and have a cylindrical bored housing. The rotor, which is also cylindrical, is fitted eccentrically in the housing, so that a crescent-shaped working chamber is formed. Moveable rotor vanes are fitted in the longitudinal grooves in the rotor; centrifugal force and the forces of the gas cause them to slide along the side of the housing when the rotor turns.

The vanes divide the crescent-shaped chamber into cells of differing sizes. When the rotor turns, the cell volume on the intake side increases, and the resulting underpressure draws air into the cell, which at this point is open to the intake suction nozzle. As the rotor continues to turn, the cell is closed and the volume of the cell decreases. The enclosed air is thus compressed, and it is pressed out on the pressure side by means of the pressure nozzle.

On the basis of this operating principle, the machine works with polytropic compression. The compression ratio p_{OFF}/p_{ON} that can be achieved is limited by the final compression temperature.



Functional principle of a rotary compressor or a compressor and vacuum pump

Machine versions

The various versions of the machine differ in their method of lubrication and cooling.

- Oil-lubricated machines are fed by an automatic dosage pump in the oil reservoir. The rotor shaft directly drives the lubricating oil pump.
- Dry compressors for the supply of compressed air that is absolutely free of oil work completely without oil in the compression chamber. The roller bearings of these machines have permanent lubrication (permanent grease unit) or automatic lubricant input.
- In air-cooled machines, two ventilators on the rotor shaft feed in the coolant air supply axially via the housing ribbing.
- Water-cooled machines have a water sleeve within the housing. The coolant water circulates in a forced circulation system driven by a circulation pump.

Type code

RF	L	60	DVR

Rotary compressor/
compressor vacuum pump
with fresh oil lubrication = RF

Housing cooled by
- Air cooling = L
- Water cooling = W

Size of compressor (or
compressor vacuum pump)

Additional designations
- Pressure operation = D
- Vacuum operation = V
- Clockwise operation= R

In the RFL series, therefore, there are air-cooled and oil-lubricated machines which can be supplied as dedicated compressors, as dedicated vacuum pumps or as combined compressors and vacuum pumps.

Because of these three application areas for the RFL machines, there are some differences in the instructions for installation, operation and maintenance, so that not all points in certain chapters will apply to the entire series. To make it clear which text passages apply to which type, the following abbreviations are used in the relevant chapter headings:

C	Compressor
C-Vp	Compressor and vacuum pump
VP	Vacuum pump

1.1 Machine data

The rotary compressors and compressor and vacuum pumps of the RFL series are air-cooled rotary compressors cooled with fresh oil.

On the rating plate of each machine can be found both the machine number and the most important data.

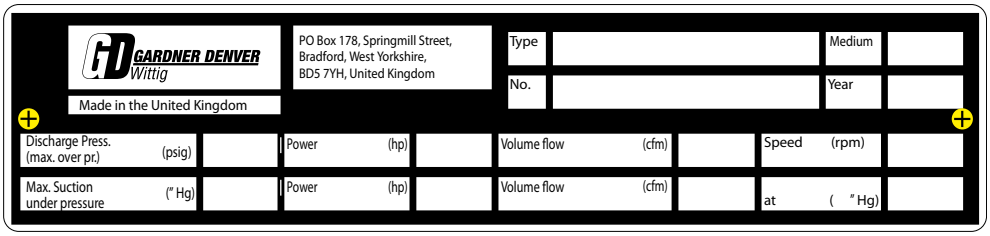


Fig. 1.1 Rating plate of RFL 60 ... 100

Data for the type series

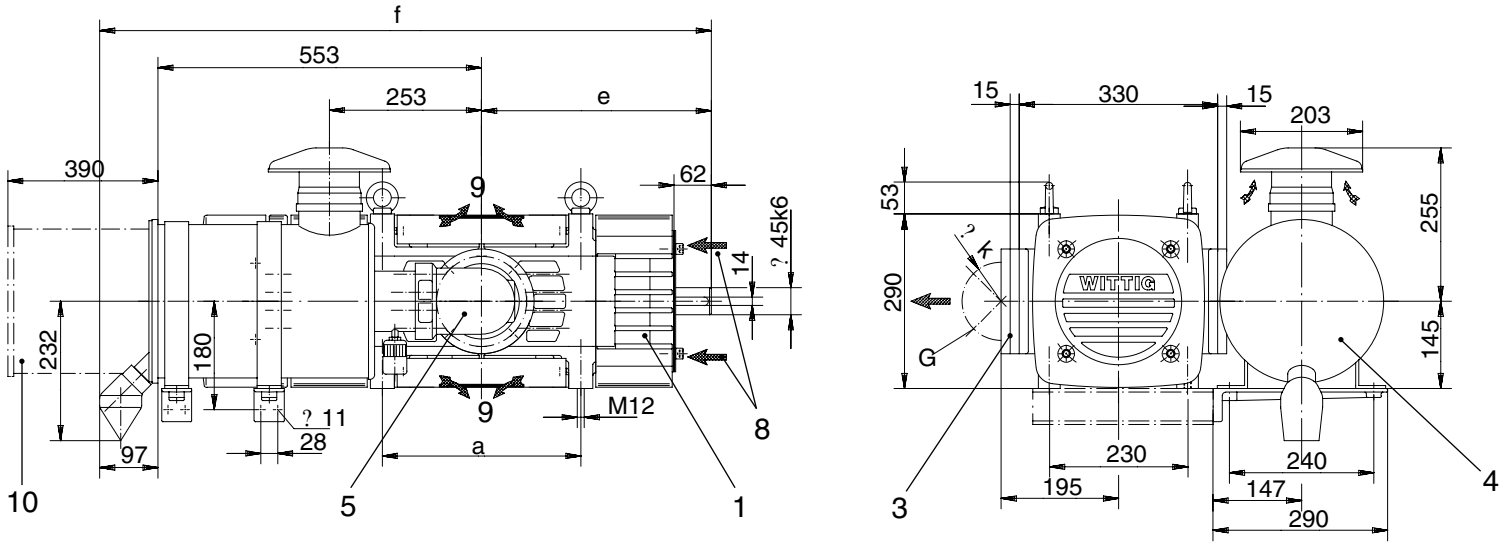
Rotary compressor	Type	RFL 60	RFL 80	RFL 100
Air volume when passage unhindered	m^3/h	400	570	700
Volume flow at 2 bar operating over pressure	m^3/h	350	480	580
Suction temperature	°C	20	20	20
Suction pressure	barg	1	1	1
Maximum Operating Pressure	barg	2.0	2.0	2.0
Safety pressure [1)]	barg	2.0	2.0	2.0
Power requirement at drive shaft at 2 bar operating pressure	kW	20.5	28	37
Drive power requirement	kW	24	32.5	45
Nominal speed	min^{-1}	1500	1500	1500
Oil consumption	l/h	0.06	0.075	0.085
Capacity of oil tank	l	5	5	5
Mass moment of inertia	kgm^2	0.187	0.241	0.241
Sound pressure level at a distance of 7 m. at 2 bar operating over pressure	db(A)	78	80	82
Weight with back pressure valve	kg	135	170	170

1) Protect with a safety valve!

Data and illustrations as of 01.12.2007. Right of alteration reserved.

Compressor&Vacuumpumps	Type	RFL 60 V	RFL 80 V	RFL 100 V
Air volume when passage unhindered	m^3/h	400	570	700
Air volume at residual pressure 400 mbar/60% vacuum	m^3/h	390	525	640
Operating pressure	barg	0.5	0.5	0.5
Max. over pressure in compressor operation [1)]	barg	2.0	2.0	2.0
Nominal vacuum (abs.) [2)]	mbar/%	200/80	200/80	200/80
Max. permitted vacuum (abs.) (short term, up to 3 min. per hour)	mbar	150	150	150
Power requirement at drive shaft at 0.5 bar over pressure	kW	12.5	17	22
Power requirement at drive shaft at 2 bar over pressure	kW	20.5	28	37
Nominal speed	min^{-1}	1500	1500	1500
Oil consumption	l/h	0.065	0.075	0.085
Capacity of oil tank	l	5	5	5
Mass moment of inertia	kgm^2	0.1871	0.241	0.241
Sound pressure level at a distance of 7 m. at 400 mbar/0.5 bar over pressure	db(A)	76/78	78/80	80/82
Weight with back pressure valve	kg	135	170	170

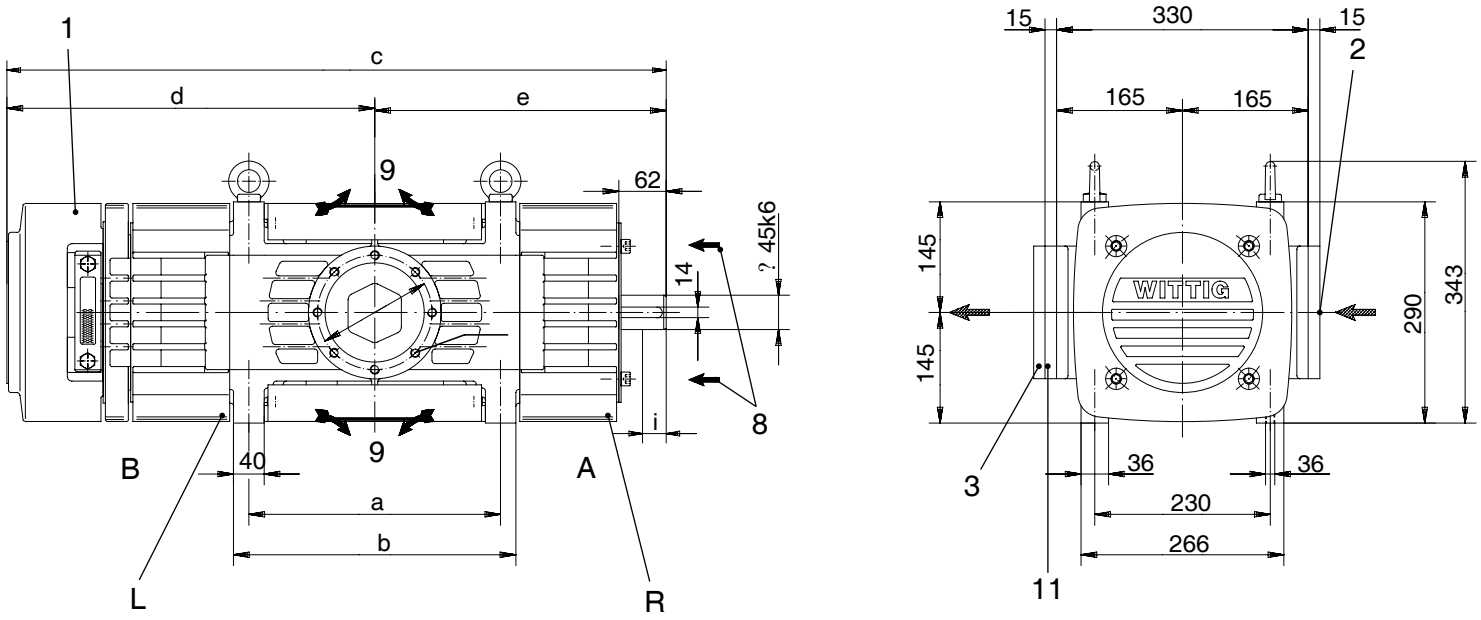
1.2 Dimensions



1 Compressor, complete
3 TW flange (pressure side) as in DIN 28 46
4 Combined air filter
5 Attachment flange 90 joint
8 Cooling air intake
9 Cooling air outlet
10 Space required for removal of filter

Fig. 1.2 Dimenstions of RFL 60 ... RFL 100 as rotary compressors with combination air filters

Rotary compressors	a	e	f	Discharge flange		
				DN	k	G
RFL 60	230	332	982	65	150	8xM12
RFL 80	330	382	1032	80	150	8xM12
RFL 100	330	382	1032	80	150	8xM12



1 Compressor complete
2 Intake flange (DIN 28461)
3 Discharge flange (DIN 28 461)
8 Cooling air intake
9 Cooling air outlet
11 Non-return valve
A A side
B B side
L Anti-clockwise drive (oil supply at A side)
R Clockwise drive (oil supply at B side)

Fig. 1.3 Dimensions of RFL 60 ... RFL 100 in general, without attachments

Rotary compressor/ compressor & vacuum pump	a	b	c	d	e	Intake flange			Discharge flange		
						DN	k	G	DN	k	G
RFL 60	230	270	764	432	332	65/80	150	8xM12	65	150	8xM12
RFL 80	330	370	864	482	382	80/100	150	8xM12	80	150	8xM12
RFL 100	330	370	864	482	382	80/100	150	8xM12	80	150	8xM12

1.3 Lubrication

Lubrication is performed by means of the integrated, fixed drive lubrication oil pump.

Lubrication oil specification: Single range oils of classes:

API: CD/SF and higher
MIL-L: 2104 C and higher

Lubricant selection table: see 5.7, lubricants

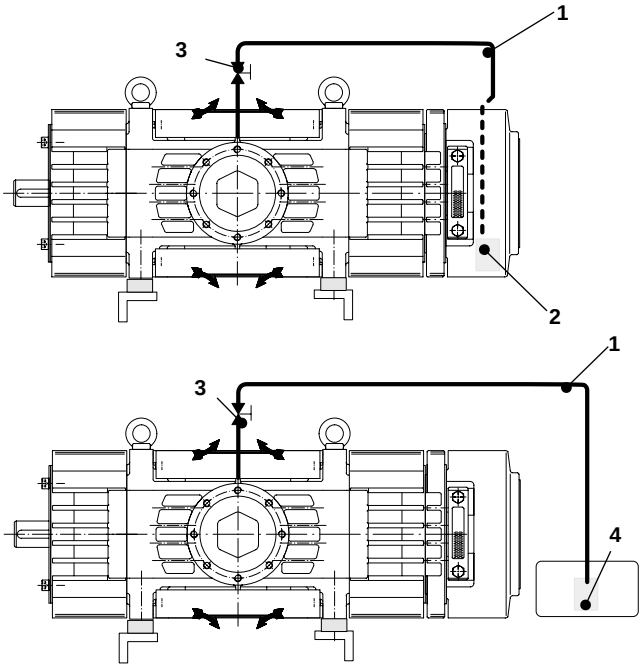
Rotary compressor and compressor and vacuum pumps	Type	RFL 60	RFL 80	RFL 100
Oil tank capacity	l	5	5	5
Oil consumption	l/h	0.06	0.075	0.085
Add oil after operating hours:	h	60	50	40
Oil level checks per day		once	once	once

Additional lubrication

For vehicles subject to extreme operating conditions [1], additional lubrication may be necessary. For this purpose an oil pipe with a regulating tap is screwed into a thread in the machine's intake nozzle. Oil is then drawn in through this pipe from the oil tank or an additional oil vessel.

If your machine is equipped with this type of additional lubrication feature, it must be used as follows in critical operating conditions[1]:

- Open the regulating tap in the oil pipe of the additional lubrication system
- Leave the regulating tap open until approximately ¼ litre of oil has been drawn into the machine.
  Take note of the noises produced by the machine!
  The additional oil intake volume of ¼ litre is reached when the oil level in the oil monitoring window has fallen by approximately 1 cm.



1 Intake suction pipe
2 Oil tank
3 Regulating tap
4 Additional oil vessel

Fig. 1.4 Additional lubrication

[1] Extreme operating conditions apply, for example, in the following circumstances:

- Surrounding temperature 35°C
- Continuous operation (3 hours and more) of the machine at 200 mbar operating vacuum or 2 bar operating over pressure
- Suction or compression of aggressive substances (e.g. solvents, solvent vapours, acid-based substances etc.)

1.4 Cooling

Air cooling is carried out by means of two ventilators mounted on the ends of the shafts which draw in cooling air axially and blow it over the ribbing of the housing.

When the machine is assembled and installed, care must be taken that the cooling air can circulate freely, so that sufficient cooling effect is ensured.

1.5 Drive methods

From the vehicle engine:

- By auxiliary drive and drive shaft
- By V belt; the drive belt disk being mounted onto the free end of the drive shaft
- By a pneumatic shift clutch

By a hydromotor

From a diesel or electric engine

- By an elastic coupling

For exact details see 4.6, drive.

2.1 Designated usage

The rotary compressor or compressor and vacuum pump is designed entirely for compression and/or suction of filtered air. Any other or additional usage is not deemed to be part of the designated usage.

Designated usage also includes adherence to the operating data and the maintenance stipulations given in the operating instructions.

2.2 Acceptance and monitoring

The machine itself is not subject to any general acceptance and monitoring requirements.

If specific legal requirements apply at the site of operation of the rotary compressor/compressor and vacuum pump, the operator is responsible for observation of these requirements.

In every case, the safety and accident prevention regulations of the local working safety authorities must be adhered to.

2.3 Operational safety

This symbol indicates possible dangers for personal safety. Working safety requires exact observation of instructions so marked. Safety instructions must be known to all persons who use the machine!

2.4 Environmental protection

This symbol shows that environment protection regulations must be observed.

2.5 ATTENTION

“ATTENTION” designates regulations and instructions which are designed to prevent damage to the machine.

2.6 Information

This symbol indicates information of particular interest to the operator of the machine!

2.6 Points to note

The rotary compressor/compressor and vacuum pump has been constructed according to the latest technological standards and safety regulations. However, during use of the machine it is still possible that the health and life of the operator or other persons may be endangered, or that damage to the machine or to other property may be caused.

- Only use the machine when it is in a technically perfect condition; such use must be carried out in accordance with the designated usage and with due regard for safety. In particular, any faults which are relevant to the safety of the machine must be repaired immediately.
- Alterations, attachments or modifications to the rotary compressor/compressor and vacuum pump which may affect the safety of the machine are not permissible without consulting the manufacturer.
- All warning notices on the machine must be observed, and care must be taken that all such notices are always in a legible condition.
- Attention must be paid to fire detection and fire fighting features.
- Work on electrical devices must be carried out by a qualified electrician in accordance with the electrical and technical regulations.

All personnel who are required to work with the machine must read the operating instructions, especially the safety instructions, before commencing such work. **When working on the machine, it is too late!**

- Work on the machine must only be carried out when the machine is at a standstill.
- Before such work begins, measures must be taken to prevent the drive from being switched on.
- During such work, the machine must not be subject to excess pressure or underpressure.
- On the vehicle side: close the shut-off slide.
- Bleed or vent the pressure pipe between the machine and the shut-off slide.
- Release over pressure manually at the safety valve, or vent the machine at the ventilation valve.
- Pay attention to the manometer!

- The drive prevention device must only be removed when the machine is at a standstill.
- The contact prevention guard must only be removed when the machine and the pressure pipe are cool.
- Before switching on the machine, ensure that all safety devices are correctly in place.

For the sake of environmental protection, all liquids which come from the machine during maintenance work, e.g. lubricating oil, must be collected and disposed of in a way that does not impair the environment.

ATTENTION

"SURFACE TEMPERATURE MAX 150 deg C!"

Symbols on the packaging:

Top 

Fragile 

Protect from rain 

3.1 Transport

During transport it is essential that violent impact, the use of force and careless loading and unloading should be avoided. The machine must only be suspended by means of the eyebolts that are firmly screwed in.
Any transport protection mechanisms must be removed.

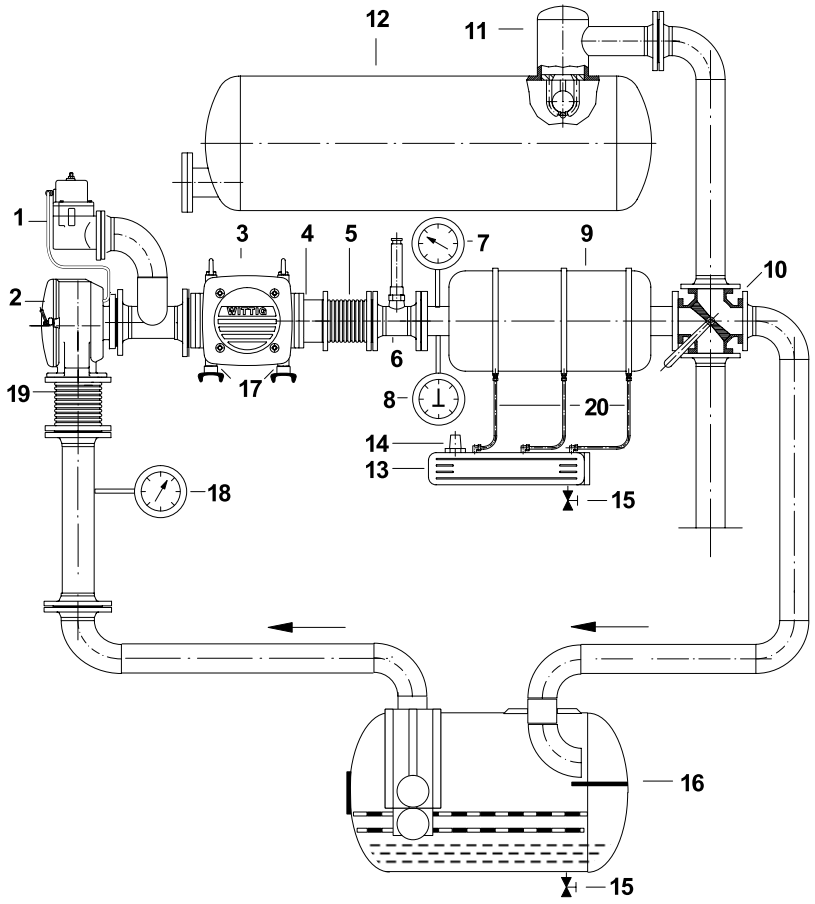
3.2 Storage

Before assembly the machine should be stored in a dry, heated room. The covers on the pressure nozzle should remain in place until the machine is finally installed.

The protective coating on the bare parts remains effective for approximately 1 year. If the machine is stored for a longer period, it must be renewed.

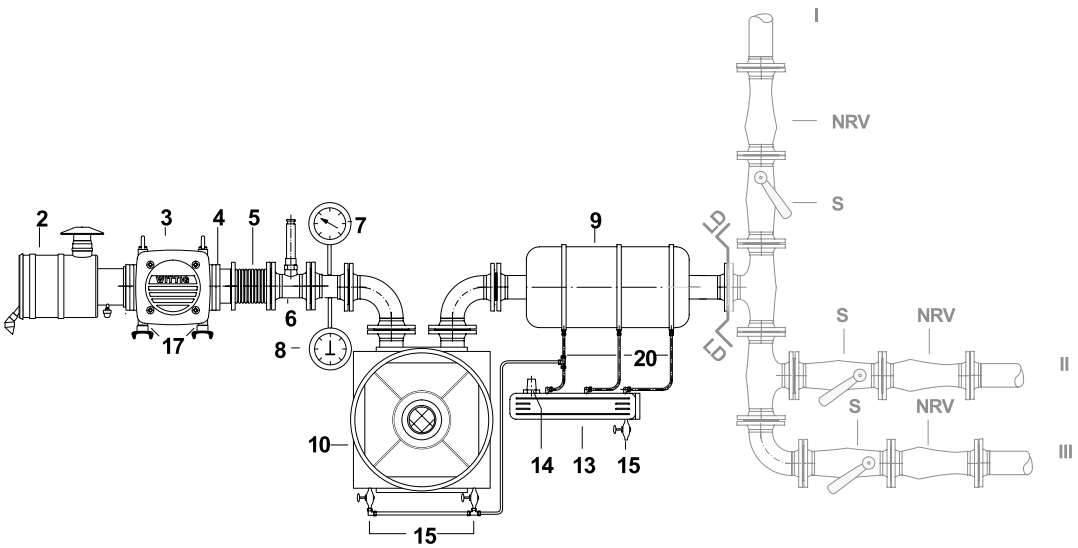
3.3 Delivery contents

The contents of the consignment are listed on the delivery note. Please check it immediately for completeness. Claims for transport damage and errors can only be accepted if they are reported immediately in writing.



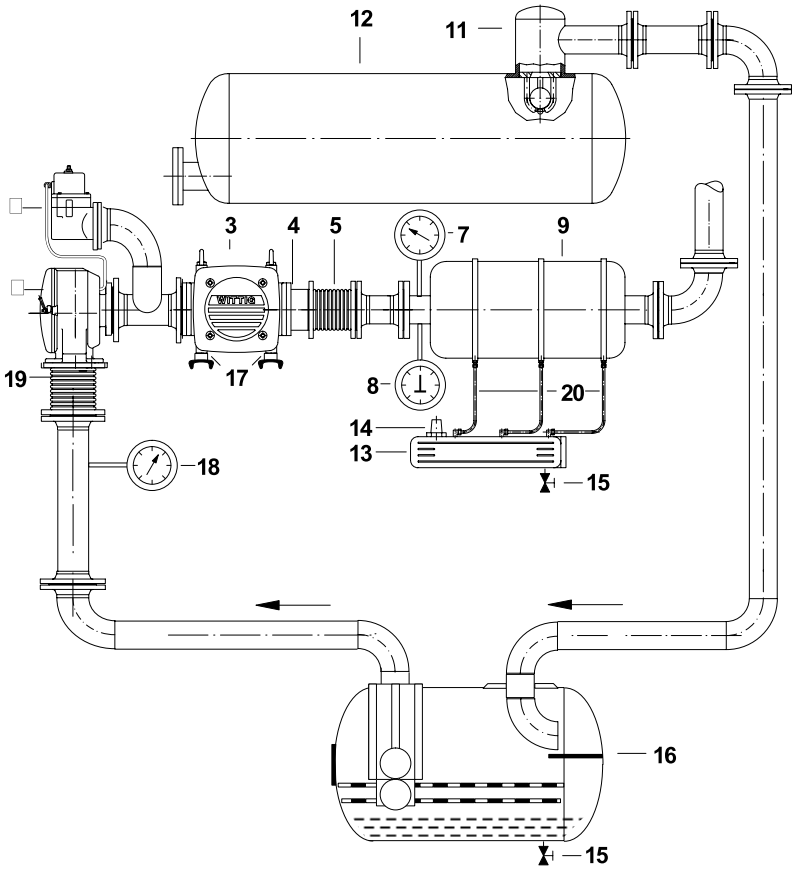
1 Ventilation valve
2 Vacuum filter
3 Compressor and vacuum-pump
4 Non-return valve
5 Compensator
6 Safety valve
7 Manometer
8 Thermometer
9 Silencer/oil separation vessel
10 Four-way tap
11 Safety dome with floating valve
12 Vehicle tank
13 Collection tank
14 Ventilation silencer on collection tank
15 Draining tap
16 Safety vessel with floating valve
17 Elastic mounting
18 Vacuum meter
19 Compensator
20 Oil drain pipes with covers, 4 mm diameter

Fig. 4.1 Machine diagam with a compressor and vacuum pump



2 Combination air filtier
3 Rotary compressor
4 Non-return valve
5 Compensator
6 Safety valve
7 Manometer
8 Thermometer
9 Silencer/oil separation vessel (pressure-proof)
10 Compressed air aftercooler
13 Collecting tank
14 Ventilation silencer on collection tank
15 Draining tap
17 Elastic mounting
20 Oil drain pipes with covers, 4 mm diameter
LD Limit of delivery by Gardner Denver
S Shut-off slide
NRV Non-return valve
I...III Examples of pipe layout

Fig. 4.2 Machine diagram with a rotary compressor



1 Ventilation valve
2 Vacuum filter
3 Vacuum pump
4 Non-return valve
5 Compensator
7 Manometer
8 Thermometer
9 Silencer/oil separation vessel
11 Safety dome with floating valve
12 Vehicle tank
13 Collection tank
14 Ventilation silencer on collection tank
15 Draining tap
16 Safety vessel with floating valve
17 Elastic mounting
18 Vacuum meter
19 Compensator
20 Oil drain pipes with covers, 4 mm diameter

Fig. 4.3 Machine diagram with a vacuum pump

Notes

- Not all points in this chapter apply to the entire series, as machines of the RFL type, depending on the version, can be used as dedicated compressors, as dedicated vacuum pumps or as combined compressors and vacuum pumps. To make it clear which text passages in this chapter apply to which type, the following abbreviations are used in the relevant chapter headings:

C	Compressor
C-Vp	Compressor and vacuum pump
Vp	Vacuum pump

- Installation and start-up operation must only be carried out by instructed personell. If faults should occur that are caused by operating errors, Gardner Denver are not liable for guarantee claims.

- The machine is delivered ready-to-be-connected. There must not be any damages due to transport.

- Please make sure, that the rotor shaft can be turned by hand; if not, contact our after-sales office.

- The machine may only transported by means of the securely fitted eye bolts.

4.1 Installation location and attachment C, C-Vp, Vp

The installation location on the vehicle must:

- be easily accessible,

- be protected from dirt, gravel impact and water splashes,

- provide enough space for the connection of the suction and pressure pipes,

- provide easy access for maintenance (oil inlet screw, oil monitoring window).

The machine is mounted by means of the 4 feet (screw thread M12) at the top or bottom. The machine can be screwed directly to the chassis or to the traverse units.

The drive shaft of the rotary compressor/compressor and vacuum pump must be mounted horizontally (maximum permitted deviation when the vehicle is stationary: 5 °).

The compressor/compressor and vacuum pump can be mounted in steps of 90° around the longitudinal axis. The oil reservoir must then be disconnected and turned so that the inlet opening is at the top and the draining tap at the bottom. It must also be ensured that the oil pump draws in oil at the lowest point of the oil reservoir. It may be necessary to use a different oil intake suction pipe. Please contact us - your after-sales service centre will be pleased to help you adapt the appliance to your installation requirements.

Traverse mountings on the vehicle chassis must be strong enough; thin profiles and flat metal sheets must not be used.

The mounting points (supports for the machine feet) must be exactly balanced.

For dimensions and weights see chapter 1, technical data.

4.2 Prevention of suction intake of dirt and residue

4.2.1 Suction pipe C, C-Vp, Vp

The pipe must be non-corroding on the inside. Before installation it must be cleaned from the inside; weld globules, burn residue and rust must be carefully removed.

The suction pipe must slope upwards to the machine joint, so that condensate flows away from the machine. For compressor/vacuum pumps and dedicated vacuum pumps, a safety tank with a draining tap must be fitted at the lowest point.

The suction pipe must be of a sufficient size. Its diameter should be **at least** as given in the following table.

Otherwise the machine will be overloaded.

If the suction pipe is of an incorrect size, any guarantee provided by Gardner Denver loses its validity.

Rotary compressor/ compressor & vacuum pump	**Required minimum diameter for suction pipe**
RFL 60	DN 65
RFL 80	DN 80
RFL 100	DN 100

4.2.2 Vacuum filter (4.1/2) C-Vp, Vp

The vacuum filter is fitted directly before the machine. It protects it from contamination and suppresses the suction noise.

When fitting the filter unit, the flow direction must be taken into account. For maintenance purposes it must be possible to remove the filter element.

4.2.3 Safety dome (4.1/11) C-Vp, Vp

The safety dome on the vehicle tank must include not only a floating valve, but also a swell protection device to avoid liquid from being drawn off when the liquid surges up.

4.2.4 Safety vessel (4.1/16) C-Vp, Vp

The safety vessel (at the lowest point of the suction pipe) must be so constructed that

- incoming air does not directly flow onto the liquid surface,
- there is a sufficiently large settling space,
- the filter element never dips into the liquid (even filters of non-absorbent material fill up with liquid due to capillary action).

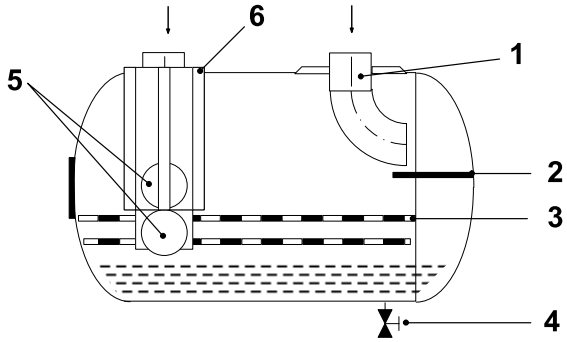
When a vacuum filter of the type SFA-F is used, a filter element is not necessary in the safety vessel.

The following diagram shows an optimized gravity separator. The function must be checked as follows.

When the water volume to be separated is sucked in,

- the volume must remain in the vessel,
- in atmospheric suction, not more than 1 litre per hour must be drawn in.

We will be pleased to support you in the calculation and testing of your safety vessel.



1	Curved inlet pipe	**4**	Draining tap
2	Flow absorption plate	**5**	Two ball floats
3	Double perforated sheet	**6**	Four guide rods

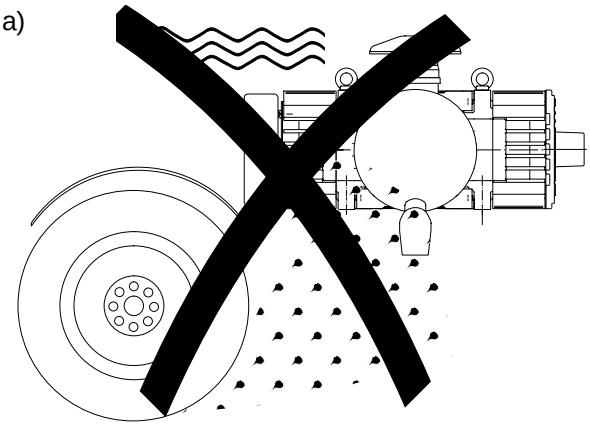
Fig. 4.4 Safety vessel

4.2.5 Combination air filter (4.2/2) C

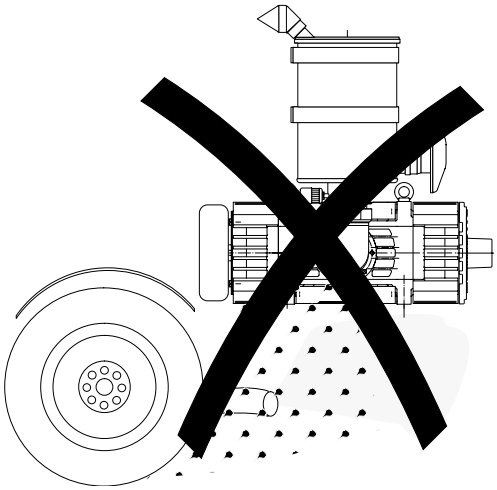
The intake suction air filter designed for the compressor version is a dry air filter with an integrated cyclonic pre-cleaner. This filter is particularly suitable for use with intake air with a high dust content.

- The filter must be supported separately, and mounted with two mount fittings. (4.5c)
- The filter must not be fitted vertically (4.5b). The dust removal valve of the intake filter must point downwards (4.5c).
- The intake filter must be sufficiently protected from water splashes, rain, exhaust gases and engine heat.

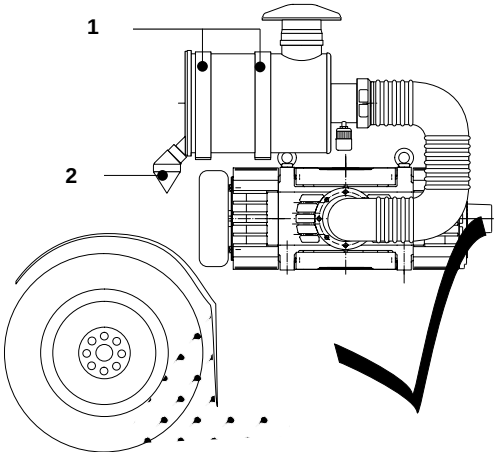
a)



b)



c)



1 Two mounting brackets **2** Dust discharge valve

fig. 4.5 Installing the combination air filter

4.3 Noise suppression (low noise installation) C, C-Vp, Vp

The noise level of the rotary compressors/compressors and vacuum pumps of the RFL series is far below the value permitted for commercial vehicles. To preserve these values when the machine is installed, the low noise installation is necessary.

4.3.1 Air noise suppression by noise suppressing oil separator (4.1/9) C, C-Vp, Vp

The combined silencer and oil separator suppresses the exhaust noise of the compressor and vacuum pump, and it also removes 80% to 90% of the lubricating oil.

The silencer is installed between the machine and the four-way tap, or in the exhaust pipe.

The noise suppressing oil separator must be permissible for the maximum possible operating pressure (e.g. 2 bar excess pressure if the machine is used as a compressor).

The de-oiling elment is connected by 2 or 3 oil draining pipes to a ventilated collecting tank with a capacity of at least 10 litres. The ventilation diameter should be at least 1".
In the draining pipes between the oil separator and the collecting tank, covers of 4 mm diameter are fitted. The collecting tank must have a draining point for condensate.

When mounting the silencer, the flow direction must be taken into account, the oil draining outlet must point vertically downwards.

4.3.2 Body noise insulation (4.1/17) C, C-Vp, Vp

Anti-vibration elements for the elastic mounting of the machine on the traverse units have the effect of insulating the body noise.

In V belt drives, end buffers to support the belt forces and a counter-bearing on the side of the machine opposite the belt drive are necessary.

4.4 Safety and monitoring features

The operating safety of the machine, i.e. operation without danger, requires the following safety and monitoring devices:

For compressors:	For vacuum pumps:
Suction side	
■ Combination air filter	■ Vacuum filter
	■ Ventilation valve
	■ Vacuum meter
Pressure side	
■ Non-return valve	■ Non-return valve
■ Thermometer	■ Thermometer
■ Manometer	■ Manometer
■ Safety valve	
Contact protection	
■ Protection against rotating parts and burns	
Machine protection	
■ Speed monitor	
■ Maintenance indicator on the combination air filter	
■ Oil level safety feature	

If these notes are not adhered to, the guarantee loses its validity.

4.4.1 Vacuum meter (4.1/18) C-Vp, Vp

For adherence to the permitted operating vacuum. Fitted in the suction pipe directly in front of the suction nozzle

4.4.2 Vacuum filter (4.1/2) C-Vp, Vp

The vacuum-sealed filter protects the machine from mechanical contamination. Fitted in the suction pipe.

When fitting, pay attention to the direction of flow and the space required to replace the filter element.

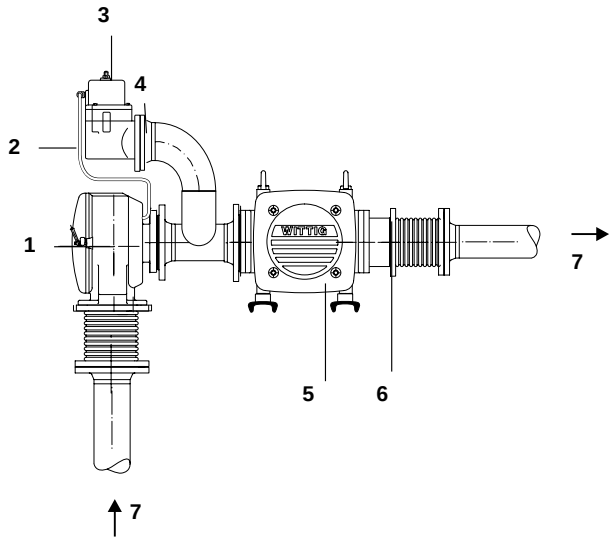
Vacuum filter type SFA is not suitable for excess pressure.
Vacuum filters of the series SFD are pressure shock-proof up to 11 bar.

4.4.3 Ventilation valve (4.1/1) C-Vp, Vp

The ventilation valve is the regulator for the appliance and the safety feature in the suction pipe. It is absolutely essential.

If the intake suction vacuum falls below the pre-set minimum value, the ventilation valve opens and the machine draws in atmospheric air. This serves to limit the suction pressure to the permitted minimum pressure, e.g. 200 mbar.

If the ventilation valve is mounted or fitted incorrectly or interfered with, an increase of the vacuum and the temperature could **CAUSE AN EXPLOSION!**



1 Vacuum filter SFA or SFD
2 Servo-pipe 10x1.5
3 Ventilation valve BV-DN
4 Flange fitting
5 Compressor and vacuum pump
6 non-return valve
7 To/from four-way tap

Fig. 4.6 Installation of the servo-controlled ventilation valve BV-DN

The servo-controlled vacuum regulation and limitation valve from Gardner Denver achieves the highest standard of functional reliability and operating precision. The setting is not dependent on the flow rate. The compact construction facilitates simple, space-saving installation.

4.4.4 Maintenance indicator on suction air filter C

By means of the optical maintenance indicator (4.7/MI) fitted to the combination air filter of the compressor, an unacceptable level of contamination of the filter element is indicated in good time.

The maintenance indicator must be clearly visible after the combination air filter is fitted.

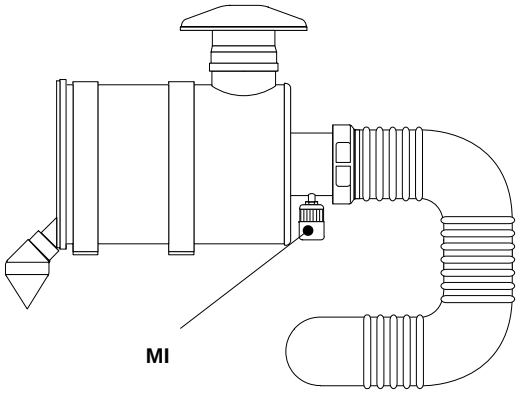


Fig. 4.7 Combination air filter/maintenance indicator

4.4.5 Non-return valve (4.1/4) C, C-Vp, Vp

The non-return valve prevents retro-flow when the machine is switched off. It is not completely gas-tight.

In machines of the RFL series, the non-return valve is mounted to the pressure nozzle.

4.4.6 Thermometer (4.1/8) C, C-Vp, Vp

The thermometer for monitoring the compression temperature must be positioned together with the non-return valve in the pressure pipe directly behind the pressure nozzle (attach threaded sleeve R ½" for this purpose). The thermometer must be inserted into the pipe to half the pipe diameter.

The indication range of the thermometer must cover the range from 0 to 200°C.

4.4.7 Safety valve (4.1/6) C, C-Vp

After each compressor, a non-lockable safety valve must be fitted (accident prevention regulation VBG 16). The valve should be designed and adjusted so that pressures of more than 10% above the permitted operating pressure are prevented. It must be able to expel the entire transport capacity of the rotary compressor/compressor and vacuum pump. The valve must also be fitted with a manual ventilation facility.

If the ventilation valve is mounted or fitted incorrectly or interfered with, an increase of the vacuum and the temperature could **CAUSE AN EXPLOSION!**

When fitting the safety valve, the following points must be observed:

- Installation directly behind the machine before any other shut-off mechanism (especially the shut-off slide),
- The setting must correspond to the maximum permitted operating pressure (cf. chapter 1.1, machine data),
- The setting must be protected from unauthorized or accidental alteration,
- The valve must not be blocked,
- The safety valve must not be used to regulate the air volume in pressure operation.

Correct function must be checked each week by activating the manual ventilation.

4.4.8 Manometer (4.1/7) C, C-Vp, Vp

For continuous pressure monitoring. Measurement range conforming to the operating pressure. Mounted directly behind the pressure nozzle.

4.4.9 Contact prevention C, C-Vp, Vp

The drive of the machine and the hot pressure pipe must be provided with a contact prevention mechanism.
Accidental touching of rotating or moving machine parts must be impossible.
The surface temperature must not exceed 80°C.

4.4.10 Oil level monitoring C, C-Vp, Vp

A monitoring device must be fitted in the oil reservoir to indicate when the oil level is too low.

The oil level monitoring device can be omitted if adherence to the minimum oil level is guaranteed by the operator in accordance with 6.2 (visual control at the oil level window).

4.4.11 Rotation speed monitoring C, C-Vp, Vp

A rotation speed indicator on the machine and an indicator in the operating area are to be recommended. For the permitted rotation speed ranges, see 4.6, drive.

4.5 Cooling

4.5.1 Cooling of rotary compressor/compressor and vacuum pump C, C-Vp, Vp

Machines of the RFL series are air cooled. In installation it must therefore be ensured that the cooling air can circulate freely, and that the inlet and outlet openings of the ventilator cooling system are not covered.

The machine must never be mounted above or below a closed surface (cf. figure 4.8). This would impair the inflow of cooling air and the outflow of heat, thus possibly causing overheating and machine failure.

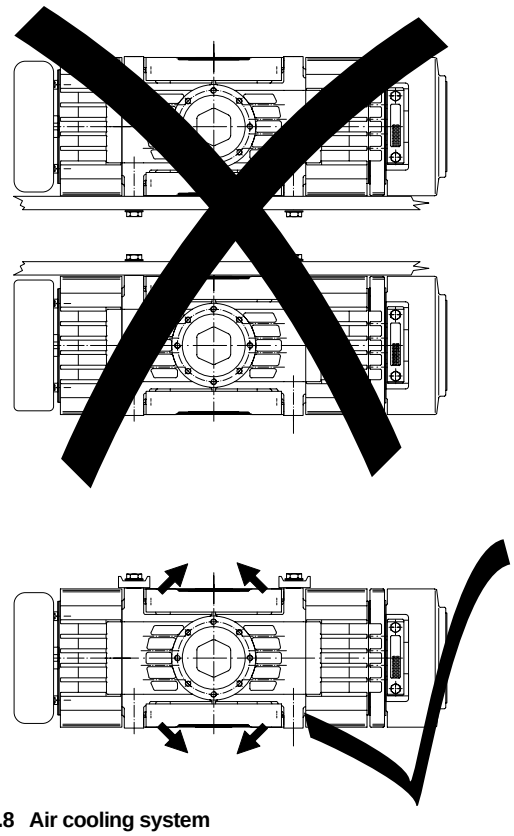


fig. 4.8 Air cooling system

4.5.2 Aftercooling of compressed air (4.3/10) C

When the RFL is used as a compressor, e.g. in silo vehicles, we recommend installing a compressed air aftercooler between the machine's pressure nozzle and the silencer/oil separator. This aftercooler works on an air-cooled basis, considerably increasing the effectiveness of the subsequent oil separator.

It also has the effect of reducing the temperature of the compressed air transported.

We will be pleased to help you to select the most suitable aftercooler for your needs if you get into contact with us.

4.6 Drive C, C-Vp, Vp

The rotation direction must correspond to the direction arrow on the machine.

Permitted speed ranges:

■ Drive by cardan shaft	1200 ... 1500 min^{-1} (rpm)
■ Other drive systems	1000 ... 1500 min^{-1} (rpm)

It is essential to take account of the speed ratio and reduction ratio of the drive (V belt drive, vehicle auxiliary drive, ...).

We recommend a rotation speed monitoring device on the machine with a display in the operating area.

In any case, the rotation speed must be monitored after the assembly of the rotary compressor/compressor and vacuum pump, and an operating notice must be fitted for the vehicle operator.

Drive by means of combustion engines must only be used with controlled rotation speed engines.

Axial thrust from the drive must not be transferred to the rotor shaft.

The drive elements should be fitted to the rotor shaft with the existing thread M12.

The drive elements must not be hammered onto the rotor shaft.

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4.6.1 Hydromotor drive C, C-Vp, Vp

For the engine allocation recommended by us, kindly refer to our measurement sheet M 5689.3.

We will gladly supply you with the correct mounting flange and a coupling.

The compressor side coupling section is already mounted by us. After assembly, the engine side coupling section must not transfer any axial thrust to the compressor and vacuum pump.

4.6.2 Drive by flexible coupling C, C-Vp, Vp

In the case of direct coupling with the drive, e.g. diesel engine, a flexible revolving coupling must be selected in accordance with the details supplied by the engine manufacturer. This coupling must largely compensate the cyclic irregularity of the drive.

The coupling must be adjusted in exact adherence to the details supplied by the manufacturer.

4.6.3 Drive by drive shaft C, C-Vp, Vp

The drive shaft must

- be constructed as a splined shaft,
- be balanced
- have the smallest possible angle and be as short as possible.

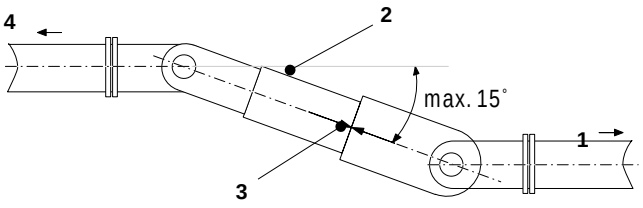
The central axes of the drive shaft flanges must be parallel to each other.

The drive shaft mounting flange must be fitted to the drive shaft of the rotary compressor/vacuum pump.

The splined shaft section of the drive shaft must be screwed to the mounting flange on the compressor shaft.

The resulting propshaft angle must not exceed 15° at a rotation speed of 1500 min^{-1}.

Do not fit the drive shaft the wrong way round - pay attention to the markings.



1 Drive
2 Spline shaft
3 Position marking
4 Rotary compressor

Fig. 4.9 Cardan shaft

4.6.4 V-belt drive C, C-Vp, Vp

If the engine speed must be geared up or down, a V belt drive is to be recommended. The rated engine speeds as in 1.1, machine data, must be observed!

The V belt pulleys listed in the following table can be fitted directly to the free end of the shaft.

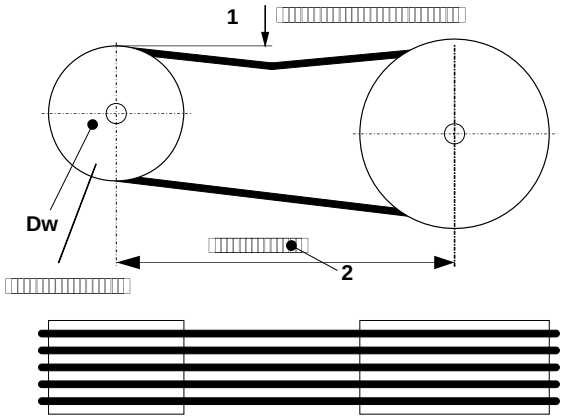
Rotary compressor/ vacuum pump	Type	RFL 60 - 100
Belt profile		SPA
Belt pulley diameter D_W	mm	200
Max. operating pressure for V-belt drive	bar_g	2.0
Max. operating vacuum for V-belt drive	mbar	300
Number of belts		5

Between the V belt pulley and the housing at least 12 mm gap should be allowed, as the intake of cooling air is otherwise impaired.

Assembly of the V belt drive

- The parallel alignment of the axes in all planes must be executed carefully and exactly both for the shafts providing the drive power and for the shafts receiving the drive power.
- The belt grooves in the belt pulleys must not be misaligned.
- V belts of the correct lengths must be selected so that the belt tension is consistent.
- The belt tension is correct if the assembled and tensioned V belts can be pressed down with the thumb by 16 to 20 mm per 1000 mm axle span.

Because of the maximum torque, belt drive by electric motors is not permissible.

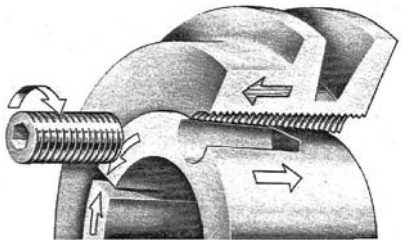


1 Deflection: 16 ... 20 mm for every 1000 mm axle spacing
2 Axle spacing
Dw Belt pulley diameter: min 200 mm (8 in)

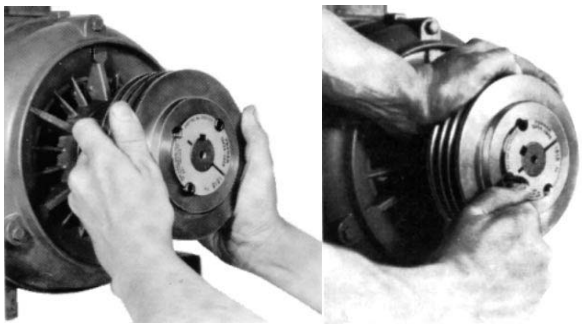
Fig. 4.10 Correct V-belt tension

Mounting of V belt disks with taper-lock clamping bushes

1. Clean and de-grease the bare surfaces. Place the disk and the bush inside each other. Align the holes and insert the screws loosely.

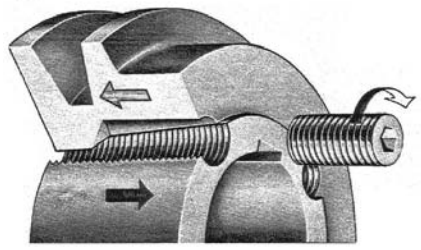


2. Push the disk with the bush onto the shaft, align it and tighten the screws evenly and tightly.



Dismantling

3. Take out the screws, then screw one of them as a leverage screw into the hole with a half thread in the bush, and tighten it. This releases the taper-lock bush.



4. Remove the loose pulley unit by hand, without knocking it or damaging the machine.

5.1 Checking the system

Initial operation, and also the switching on of the system after a longer standstill period (more than 4 weeks) has a great influence on the effective functioning of the rotary compressor or the compressor and vacuum pump.

We urgently recommend that you take sufficient time for initial operation of the machine. Undue haste could lead to important steps being left out, thus causing possible damage to the machine.

For faults caused by incorrect initial operation, no guarantee claims can be accepted.

Before initial operation:

- Check the machine (transport damage, faulty assembly),
- Check that the drive protection and contact protection on the pressure side are correct,
- Check the operating data on the machine's name plate,
- Instruct the operating personnel,
- Pass on instructions for the operation and maintenance of the machine
- Make sure that the rotor shaft can be turned by hand.

5.2 Lubricating oil

- For the oil type, see 5.7, table of lubricating oils.

For the RFL series, single grade oils are prescribed. Use of multigrade oils can lead to damage to the machine.

Such use also causes the guarantee liability of Gardner Denver to lose its validity.

- Fill the oil reservoir to approximately 3 cm below the thread of the filling cap.
- For pre-lubrication, inject approximately ¼ litre of oil into the suction nozzle. Repeat every 15 minutes for the first 1-2 hours of operation.

5.3 Shut-off slides and valves

Check the mounting direction of the non-return valve (cf. direction arrow).

Open all manually operated shut-off slides and valves.

Always turn the four-way tap until it clicks into position. An intermediate position is not possible.

5.4 Rotating direction

In initial operation, turn on the drive briefly and check the direction of rotation. Take note of the rotation direction arrow on the machine housing!

5.5 Drive

Switch on the drive and check whether pressure/vacuum is created.

5.6 Checking the rotation speed, vacuum and pressure

5.6.1 Rotation speed

Permitted speed range	
■ Drive by cardan shaft	1200 ... 1500 min^{-1}
■ Other drive systems	1000 ... 1500 min^{-1}

5.6.2 Vacuum at the vacuum meter

Permitted minimum suction pressures:	
■ Continuous operating vacuum	200 mbar
■ Max. operating vacuum briefly (up to 3 min/h)	150 mbar

Make a manual check of the **venting valve**.

5.6.3 Pressure at the manometer

The maximum permissible value can be seen on the rating plate (cf. also chapter 1.1, machine data).

Check manually whether the **safety valve** expels air.

5.7 Lubrication oils for rotary compressor/compressor vacuum pumps

The permissible oils are single range oils of the specifications

API:	CD/SF or higher
MIL:	L2104 C or higher

Summer oils (SAE 40)

Make	Type
■ ARAL	Basic Turboral
■ BP	Vanellus C3
■ DEA	Cronos Super
■ ELF	Performance XR
■ ESSO	Essolube X 301
■ FUCHS	Titan Universal HD
■ MOBIL	Delvac 1340
■ SHELL	Rimulla X Monograde
■ WINTERSHALL	Rekord

Winter oils (SAE 30)

Make	Type
■ ARAL	Basic Turboral
■ BP	Vanellus C3
■ DEA	Cronos Super 30
■ ELF	Performance XR
■ ESSO	Essolube X 301
■ FUCHS	Titan Universal HD
■ MOBIL	Delvac 1330
■ SHELL	Rimulla X Monograde
■ WINTERSHALL	Rekord

For environmental or intake temperatures of 40C and more, the next higher viscosity group should be used.

For environmental or intake temperatures of 5C and less, the next lower viscosity group should be used.

For the RFL series, single grade oils are prescribed. Use of multigrade oils can lead to damage of the machine.

Such use also causes the guarantee liability of Gardner Denver to lose its validity.

If your machine is used for suction or compression of gases, the use of the above listed oils may not be permissible. Please contact us and ask about the correct oils to use!

6.1 Switching on

Normal switching on of the rotary compressor or compressor & vacuum pump (referred to in the following text as the "machine") is carried out as described in chapter 5, "Initial operation".

6.2 Regular checks

In pressure operation

Check operating excess pressure on the manometer (for the permissible pressure, see the machine's rating plate).

In vacuum operation

Check the operating vacuum on the vacuum meter (for the permissible vacuum, see the machine's rating plate).

Compression final temperature

Read the final compression temperature. It is generally approximately as follows:

	RFL 60 ... 80	RFL 100
■ Operating vacuum 400 mbar	155°C	160°C
■ Operating over pressure 0,5 bar	115°C	125°C
■ Intake suction temperature	25°C	25°C

Depending on the operating status, the final compression temperature may be significantly higher than the values given (**up to approx. 200°C**)!

Drain condensate

Drain the condensate from the condensate and safety tanks.

The tank must not be under pressure when the condensate is drained.

In the winter, the condensate may freeze.

Rotating speed

Check the operating rotation speed

Permitted speed range	
■ Drive by cardan shaft	1200 ... 1500 min^{-1}
■ Other drive systems	1000 ... 1500 min^{-1}

Oil level

Check the oil level on the window of the reservoir.

If the oil level reaches the red marking, add more lubrication oil.

For the lubrication oil specification see chapter 5.7, lubrication oils.

6.2.1 Safety valve

A non-lockable safety valve must be installed in the pressure pipe after every compressor. It must be set so that a pressure greater than 10% above the maximum permitted operating pressure is prevented.

The setting of the valve must be safeguarded against unauthorized or erroneous alteration!

The safety valve must not be blocked, or otherwise manipulated in any way.

Expelling of the entire volume flow from the safety valve when the pressure pipe is closed must be avoided, as harmful pressure vibrations may be caused.

The safety valve must not be used as a pressure regulation instrument.

Check the functionality of the valve during initial operation, and thereafter once a week, by activating the manual ventilation with the machine operating.

6.2.2 Ventilation valve

The ventilation valve is the regulator for a vacuum system.

When the pre-set vacuum is reached, it opens and allows the vacuum pump to draw in additional atmospheric air.

Check its functionality once a week by a test, with observation of the vacuum meter on the suction nozzle of the compressor & vacuum pump.

- Blocked vacuum filter
- Blocked exhaust gas silencer
- Suction intake of liquids
- Foaming of the liquid as a consequence of the condensate from the safety vessels not being drained soon enough (e.g. due to freezing in winter)
- Lack of lubrication oil
- Incorrect lubrication oil

6.2.3 Checking intervals

	See chapter	During operation every 10-20 min	After each operation	daily	weekly
Operating rotation speed	6.2	●			
Operating pressure or operating vacuum	name plate	●			
Air discharge temperature	6.2	●			
Drain condensate (contains oil!) - silencer/ oil separator - safety tank	6.2		● ●		
Check oil level	6.2, 5.7			●	
Activate safety valve	6.2.1				●
Check ventilation valve	6.2.1				●
Clean machine					●
Clean inlet/outlet apertures for cooling air					●
Check fixing of ventilator cowl and covering plates					●

The vacuum must not fall below the permitted vacuum of 200 mbar (cf. chapter 1.1)!

If faults should occur that are caused by operating errors, Gardner Denver is not liable for guarantee claims.

6.3 Possible operating errors

Operating errors can lead to a machine failure.

The following must be avoided:

- Too low or too high rotation speed
- Too high pressure
- Expelling of the entire volume flow via the safety valve with the pressure pipe closed
- Too low vacuum
- Too high compressed air temperature (cf. 6.2)
- Poor cooling (cooling air supply impaired)

6.4 Precautions for long standstill periods

- Clean the machine thoroughly

If the machine is cleaned with high pressure water jets, there is a danger of water intrusion.

- After wet cleaning, allow the machine to warm up for a few minutes to prevent the rotor vanes from sticking.

If the standstill period of the rotary compressor/compressor and vacuum pump lasts more than one month, we recommend that the machine be switched on once a month for at least 15 minutes. By this means, all parts that may be subject to corrosion are supplied with fresh oil.

6.5 Rinsing after machine has oversucked

- After oversucking (liquids or mud have come into the machine) proceed as follows:
- Remove locking screw at the intake flange (dismount the pipe of the addidtional lubrication if necessary)
- Open the vehicle tank, so the machine can be operated without vacuum or pressure
- Switch machine on and with slightly reduced speed, fill in approx. ½ litre diesel-oil mixture through the bore hole in the intake flange
- Switch off the machine, screw in the blocking screw and maintain prelubrication according chapter 5.3 before resatarting the machine.

Intermediate positions of the four-way changeover valve are not allowed during the rinsing. The dirt leaving the machine through the discharge flange could get on the suction side again.

6.6 Procedure if faults occur

Gardner Denver rotary compressors and compressor/vacuum pumps of the RFL series are characterized by the fact that the rotor vanes work with practically no wear under normal operating conditions.

If however any malfunctions should occur, the following overview gives you the possibility to find the cause and to solve the problem.

	Possible cause	Elimination
Volume flow performance of compressor/vacuum pump deteriorates	× Vacuum filter or combination filter contaminated	✓ Clean filter, if necessary replace filter element
	× Leaking suction pipe	✓ Find and seal leaks
	× Leaking fittings	✓ Replace fittings
	× Rotation speed too low	✓ Adhere to rotation range
	× Premature wear to rotor vane; perhaps contamination (water, dirt etc.) has got into the machine (e.g. by excess suction).	✓ Replace rotor vanes or have machine overhauled in authorized repair workshop
Abnormal noise level	× Machine poorly balanced	✓ Balance machine exactly
	× Bearing worn out	✓ Have bearing replaced
	× Too little lubrication oil	✓ Refill with oil; clean oil reservoir and suction filter
	× Unsuitable lubrication oil	✓ Fill with oil in accordance with 5.7, lubrication oil table
	× Rotor vanes knock due to lateral wear	✓ Replace rotor vanes
	× Housing bore has grooves or undulations due to dirt intake	✓ Have housing bore re-bored and honed in authorized repair workshop. If intake air is strongly contaminated, fit a fine filter
	× Incorrect rotation speed	✓ Adhere to rotation speed limitations
	× Altered pressure	✓ Adhere to nominal pressure
	× Altered vacuum	✓ Adhere to nominal vacuum
Compressed air temperature too high	× Discharge pressure too high	✓ Adhere to nominal pressure
	× Exhaust silencer blocked	✓ Replace exhaust silencer
	× Four-way tap in wrong position	✓ Turn four-way tap to correct position
	× Valve plate in non-return valve jammed	✓ Clean non-return valve
	× Vacuum filter/combination fillter blocked	✓ Clean filter
	× Vacuum too low/counter-pressure too high	✓ Adhere to nominal vacuum / check exhaust gas system, clean if necessary
Operating pressure or operating vacuum is not reached	× Manometer or vacuum meter gives incorrect reading	✓ Replace manometer or vacuum meter
	× Drive belts slip	✓ Check belt tension, tighten if necessary
	× Four-way tap in wrong position	✓ Turn four-way tap to correct position
	× Condensate draining tap open	✓ Close condensate draining tap

	Possible cause	Elimination
Mud or liquid has got into the machine	× Excess suction into vehicle	✓ At lowest permissible rotation speed, without pressure or vacuum, rinse with diesel-oil mixture; then add lubrication oil as in 5.2 “initial operation”.
Power requirement too high	× Rotation speed too high	✓ Adhere to rotation speed limitation
	× Discharge pressure too high	✓ Adhere to nominal pressure; activate or check safety valve
	× Manometer gives incorrect reading	✓ Replace manometer
	× Exhaust silencer blocked	✓ Replace exhaust silencer
Lack of lubrication oil although oil tank is full	× Suction filter in oil tank blocked	✓ Clean oil tank and suction filter
Safety valve blows out air	× Closed valves in pressure pipe	✓ Open valves
	× Blockage in pressure system	✓ Remove blockage
	× Blockage in exhaust silencer	✓ Replace exhaust silencer
Ventilation valve is activated	× Closed valves in suction pipe	✓ Open valves
	× Suction filter blocked	✓ Clean suction filter, replace cartridge if necessary
Compressed air blows from shaft end and oil leaks	× Seals are damaged	✓ Have radial shaft seal rings in cover plate replaced
Smell of rubber (with belt drive)	× V belts slip due to insufficient belt tension	✓ Check belt tension, tighten or replace if necessary
	× Discharge pressure too high	✓ Adhere to nominal pressure
Tilting of drive belts	× Low belt tension	✓ Check belt tension, tighten or replace if necessary
	× Worn V belts	✓ Fit new V belts
	× Disks not aligned	✓ Align disks
	× Belt disks worn	✓ Replace disks

If the problem is not solved (or not fully solved) by the above measures, please contact our after-sales service department.

Only start the machine up again when there is no doubt that the fault has been completely cleared!

7.1 Guarantee

We are sure you will appreciate that we can accept no liability for damage caused by non-observance of the installation and operating instructions.

Please note that repairs to the rotary compressors or the compressors and vacuum pumps must only be carried out by authorized repair workshops, using only original spare parts, as the guarantee otherwise loses its validity. A list of our after-sales service centres is part of the complete documentation.

7.2 Maintenance, maintenance plan

In maintenance and inspection work the safety regulations (chapter 2) must be adhered to.

Operational failures due to insufficient or incorrect maintenance can cause extremely high repair costs and long machine standstill periods. Regular maintenance is therefore essential.

Operational reliability and the service life of the machine depend largely on correct maintenance.

The below table contains timing, checking and maintenance information for normal operation of the machine.

The maintenance intervals given are based on an operating time of approx. 5 hours per day. If this operating time is not reached, the maintenance intervals can be extended accordingly.

Because of the differing operating conditions it can not be predicted how often checks of wear and tear, repair, maintenance and inspection work are necessary. On the basis of your operating conditions it is recommended that an inspection plan to suit your circumstances is drawn up.

After work is completed, all protective devices must be fitted again.

When disposing of oil, grease, cleansing solvents or components, e.g. filter cartridges, the environmental protection regulations must be observed.

7.2.1 Cooling system

The cooling air must be able to circulate freely.

- Check the cooling air inlet and outlet apertures everly week, and if necessary clean them from dirt and dust deposits.

For maximum cooling effectiveness the air must be able to circulate unhindered. Dirt impairs the cooling effect and can cause overheating and machine failure!

Maintenance plan

Maintenance points	Type of work	See chapter	Maintenance intervals		
			1 week	1 month	3 months
Coolant air path	check, clean	7.2.1	●		
Compressor/vacuum pump	clean	7.2.2	●		
Vacuum filter	clean	7.2.3	●		
Combination intake suction filter	check, clean	7.2.4	●		
Safety valve	check	6.2.1	●		
Ventilation valve	check	6.2.2	●		
Drive belts, drive belt tension	check/tighten	7.2.5			●
Oil tank	clean	7.2.6			●
Non-return valve	check	7.2.7			●
Rotor vane	check wear (via intake flange)	7.2.8			●

7.2.2 Rotary compressor/compressor and vacuum pump C, C-Vp, Vp

- The machine must be cleaned weekly

When washing or spraying with high pressure water jets there is a danger of water penetration which can cause foaming, and thus lead to a machine failure.

- Carefully clean the oil level monitoring window.
- After wet cleaning the machine should be run warm for a few minutes to prevent the rotor vanes from sticking.

7.2.3 Vacuum filter C-Vp, Vp

Clean the filter, depending on the degree of dirt, every day, but at least once per week.

When the ventilation valve activates, the vacuum filter should always be cleaned.

The filter element consists of high grade steel netting or a fine filter cartridge.

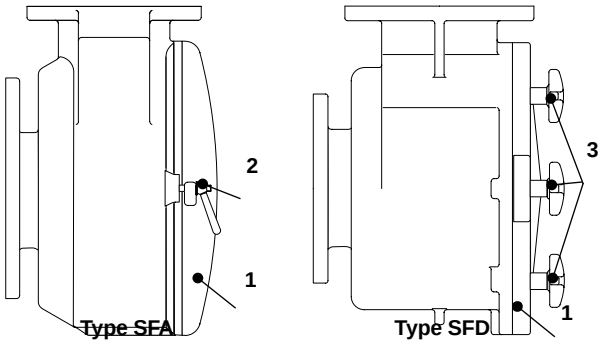
To open the filter

- Loosen or unscrew the cone or cross clamps (7.1/2,3). In the SFA type, turn the cover (7.1/1) anti-clockwise by about 15° out of the stud bolts, and pull the cover out of the housing. In the SFD type, the cover can simply be taken off.

To clean the filter

- Rinse the filter housing with petrol or cold degreasing solvent.
- Filter elements of high grade steel netting can be rinsed with petrol or cold de-greasing solvent.
- Filter elements with a fine filter cartridge can be blown through from the inside to the outside with a steam jet. Check the fine filter cartridge for damage. Damaged cartridges must be replaced.

When cleaning the filter housing, under no circumstances must dirt, cleaning pad remnants or liquid be allowed to get into the compressor/vacuum pump. This can cause the vanes to fracture.



1 Cover
2 Cone clamp (SFA type)
3 Cross clamp (SFD type)

Fig. 7.1 Vacuum filter SFA and SFD

Assembly of the filter

- Insert the filter cartridge
- Place the seal or sealing ring in the cover (7.1/1). Press the washers to the outside against the cone or cross clamps (7.1/2,3).
- Press the cover (7.1/1) into the housing (in the SFA type, twist the cover clockwise into the stud bolts).
- Tighten the cover with the cone clamps or cross clamps (7.1/2,3).

7.2.4 Combination intake air suction filter C,

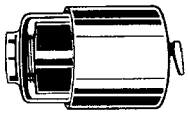
Check the dust removal valve every week for accumulated dust by pressing it together.

The maintenance indicator shows the condition of the filter cartridge in the air intake filter.

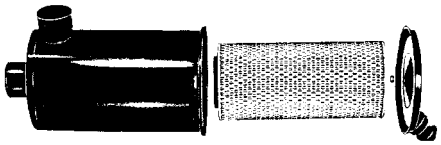
The filter cartridge must be replaced if the red marking becomes visible in the maintenance indicator.

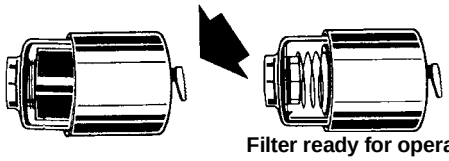
To replace the filter cartridge, carry out the following steps:

- Unscrew the wingnut and take off the housing cover.
- Unscrew the hexagonal nut and pull out the filter cartridge.
- Clean the filter housing, especially the filter cartridge seal surfaces, with a wet cleaner. Make sure that no dirt can intrude into the pipe between the filter and the compressor.



Filter maintenance necessary





Filter ready for operation

Fig. 7.3 Combination intake suction filter

- Assemble the filter in reverse order. When fitting the housing cover, the dust removal valve must face downwards!

- After cleaning, press the hooked push button of the maintenance indicator inwards (colour changes from red to clear). The maintenance indicator is now ready for operation.

The filter cartridge can, as an emergency measure, be cleaned once by blowing it through and then knocking out the contents. On the next occasion, however, it absolutely must be replaced. Gardner Denver can accept no guarantee liability for damage caused by not replacing the filter cartridge in time.

7.2.5 V belts and V belt tension C, C-Vp, Vp

Drive protection devices must only be removed when the machine is at a standstill and the vehicle engine is switched off.

V belts and the V belt tension must be checked every week and, if necessary, tightened or replaced; cf. 4.6.4 “Installation instructions”.

Damaged V belts must only be replaced by a complete set of belts of the appropriate assorted lengths.

7.2.6 Cleaning oil reservoir C, C-Vp, Vp

The oil reservoir must be cleaned every 3 months. Drain the lubricating oil when the machine is at a standstill. Rinse the oil reservoir with rinsing oil.

The oil reservoir must not be rinsed with solvent or cold cleaning liquid.

Before switching on the machine again, do not forget the preliminary lubrication! See chapter 5, “Initial operation”.

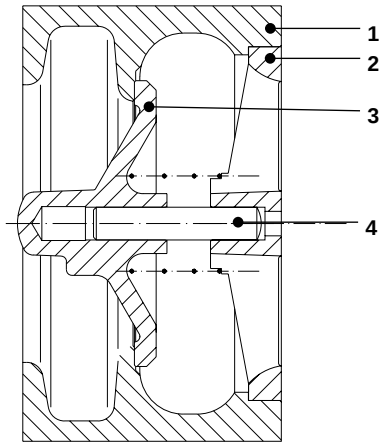
7.2.7 Non-return valve C, C-Vp, Vp

No maintenance of the non-return valve is necessary.

We recommend an initial check after 300 hours of operation.

The valve must be checked for oil carbon deposit, and depending on its condition, the interval for the next check must be fixed. The layer of oil carbon must not exceed 1 mm in thickness.

Sealing and sliding surfaces must be free from oil carbon deposits so that the function of the non-return valve is preserved.



1 Valve housing
2 Guide plate
3 Valve plate
4 Cylinder pin

Fig. 7.2 Non-return valve

If cleaning should be necessary, the valve must first be removed.

- Remove the mounting screws, and pull out the non-return valve between the mounting flanges.
- To dismantle the valve, press down the valve plate (7.3/3) until it touches the guide plate (7.3/2), then remove the latter carefully from the valve housing centre (7.3/1) with a press.
- After thorough cleaning, check the valve seating for the quality of the seal. If there is a leak, grind the valve seating afresh with grinding paste.
- Before assembly, which is carried out in reverse order, the sliding surfaces of the cylinder pin (4) should be coated with MOLYKOTE oil, type M 55 (manufacturer: DOW CORNING).

7.2.8 Ventilation valve

If incorrectly installed the vent hole C, used for pressure compensation of the ventilation valve may block and reduce the function of the ventilation valve.

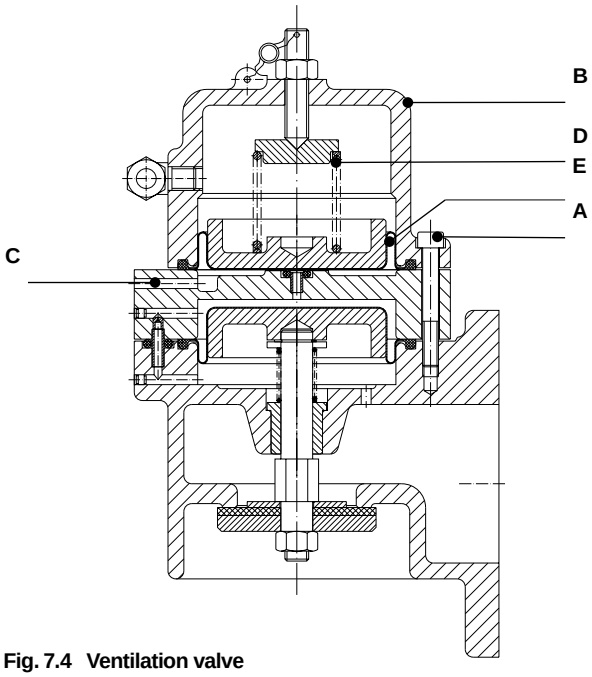


Fig. 7.4 Ventilation valve

To avoid this carry out a visual check of the ventilation valve regularly (at least every 3 months and, if necessary, dismantle the ventilation valve, clean the dirt and blow out the bore hole for pressure compensation with compressed air.

Proceed as follows for dismantling:

- Unscrew fixing screws (7.4/A)
- Remove upper valve part (7.4/B) and clean valve interior
- Blow out the vent hole for pressure compensation (7.4/C) with compressed air from the inside to the outside
- Reassemble in reverse order

Watch for correct centering of the pressure spring (7.4/D) and correct seat of the rolling diaphragm (7.4/E) during assembly.

7.2.9 Rotor vane height wear *C, C-Vp, Vp*

To inspect the rotary vane for height wear, remove the combination air filter and suction line, resp.

Press the rotary vane in the rotor gap through the oblong hole which becomes visible. Measure the depth to the rotor surface by means of a depth gauge (see Fig. 7.5).

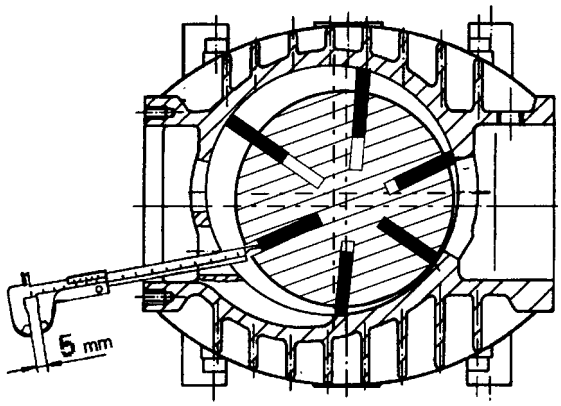


Fig. 7.5 Check rotor vanes for height wear

The depth must not be more than 5 mm!

If the wear limit of 5 mm is reached, the rotor vanes must be replaced. (See the separate instruction manual).

Make the first wear check after about 6 months, then every 3 months (if the machine run time is about 3 - 4 hours daily).

8.1 Spare parts

A supply of the most important spare parts (maintenance and wearing parts) at the installation site is an important prerequisite for constant function and availability of the compressor/vacuum pump.

To order spare parts, please use the following parts list.

We can only provide a guarantee for original spare parts supplied by us.

When spare parts and additional appliances not supplied by us are fitted or attached, the guarantee provided by Gardner Denver loses its validity. Please take into consideration that there are often specific manufacture and delivery requirements for our own parts and parts supplied by third parties, and that we always offer you spare parts in keeping with the latest state of the technology and the latest legal requirements.

When ordering spare parts, please give the following information:

	Example
* Commission No.	77 303 793
* Year of construction	1993
* Machine type	RFW 260 DVR
* Machine No.	961 016/9
Parts list No.	ETB-40.01.0
Item No.	5
Order No.	342 607 00
Quantity	6
Designation	Rotor vanes

The information marked with * can be found on the machine's rating plate.

8.2 Wearing parts

We recommend storage of the following spare parts:

	Order number for type				
Item No.	**RFL 60**	**RFL 80**	**RFL 100**	**Quantity**	**Designation**
5	342 606 00	342 607 00	342 607 00	6	Rotor vanes
26	461 054 00	461 054 00	461 054 00	2	Shaft seal ring BA 50/72x8
27	461 056 00	461 056 00	461 056 00	2	Shaft seal ring A 50/72x9 (double lip)
29	463 686 00	463 686 00	463 686 00	3	O-ring seal 205x3 B
30	463 659 00	463 659 00	463 659 00	2	O-ring seal 120x3 B
32	411 229 00	411 229 00	411 229 00	2	Cylinder rolling bearings 50/110x27
67	426 406 00	426 406 00	426 406 00	1	Oil level monitoring glas

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