



PD BLOWERS & VACUUM PUMPS
RFL SERIES |

Owner's Manual

RFL 102

RFL-7-500
Version 03
April 11, 2018

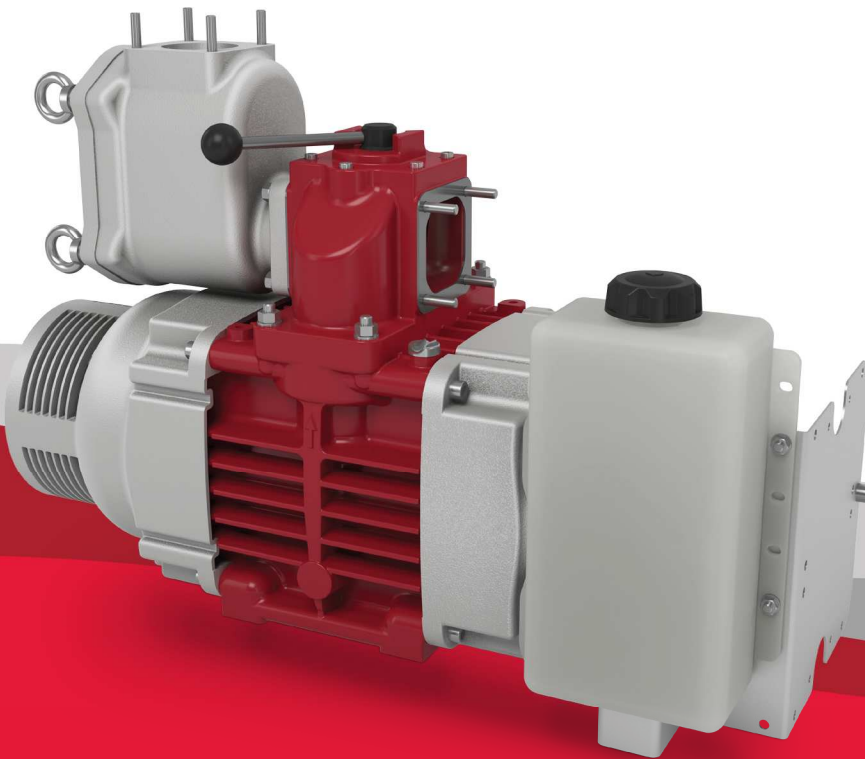


TABLE OF CONTENTS

| | |
|--|-----------|
| 1. HEALTH AND SAFETY | 3 |
| 2. SAFETY RULES & NOTES ON DANGER | 4 |
| 2.1 INTENDED USAGE | 4 |
| 2.2 ACCEPTANCE & MONITORING | 4 |
| 2.3 OPERATIONAL SAFETY | 4 |
| 2.4 ENVIRONMENTAL PROTECTION | 4 |
| 2.5 ATTENTION | 4 |
| 2.6 INFORMATION | 4 |
| 2.7 POINTS TO NOTE | 4 |
| 3. TECHNICAL DATA | 6 |
| 3.1 MACHINE DATA | 6 |
| 3.2 DIMENSIONS | 7 |
| 3.3 LUBRICATION | 8 |
| 3.4 COOLING | 8 |
| 3.5 DRIVE METHODS | 8 |
| 4. TRANSPORT & STORAGE | 9 |
| 4.1 TRANSPORT | 9 |
| 4.2 STORAGE | 9 |
| 4.3 SCOPE OF DELIVERY | 9 |
| 5. INSTALLATION | 10 |
| 5.1 INSTALLATION LOCATION AND ATTACHMENT | 11 |
| 5.2 PREVENTION OF SUCTION INTAKE OF DIRT AND RESIDUE | 12 |
| 5.2.1 Suction Pipe | 12 |
| 5.2.2 Vacuum Intake Filter | 12 |
| 5.2.3 Safety Dome | 12 |
| 5.2.4 Safety Tank | 12 |
| 5.2.5 Combination Air Filter | 13 |
| 5.3 NOISE SUPPRESSION (LOW NOISE INSTALLATION) | 13 |
| 5.4 SAFETY AND MONITORING FEATURES | 14 |
| 5.4.1 Vacuum Gauge | 14 |
| 5.4.2 Vacuum Intake Filter | 14 |
| 5.4.3 Ventilation Valve | 14 |
| 5.4.4 Maintenance Indicator on Suction Air Filter | 15 |
| 5.4.5 Non-return Valve | 15 |
| 5.4.6 Thermometer | 15 |
| 5.4.7 Safety Valve | 15 |
| 5.4.8 Manometer | 15 |
| 5.4.9 Contact Prevention | 15 |
| 5.4.10 Oil Level Monitoring | 16 |
| 5.4.11 Rotation Speed Monitor | 16 |
| 5.5 COOLING | 16 |
| 5.6 DRIVE | 16 |
| 5.6.1 Hydraulic Motor | 16 |
| 5.6.2 Flexible Coupling | 17 |
| 5.6.3 Drive Shaft | 17 |
| 5.6.4 V-Belt | 17 |

| | |
|---|-----------|
| 6. INITIAL OPERATION | 19 |
| 6.1 CHECKING THE SYSTEM | 19 |
| 6.2 LUBRICATING OIL..... | 19 |
| 6.3 VALVES..... | 19 |
| 6.4 ROTATING DIRECTION..... | 19 |
| 6.5 DRIVE | 19 |
| 6.6 CHECKING THE ROTATION SPEED, VACUUM AND PRESSURE..... | 20 |
| 6.7 LUBRICATION OILS FOR COMPRESSOR/VACUUM PUMPS..... | 20 |
| 7. OPERATION | 21 |
| 7.1 START UP..... | 21 |
| 7.2 REGULAR CHECKS..... | 21 |
| 7.2.1 Safety Valve..... | 21 |
| 7.2.2 Ventilation Valve..... | 22 |
| 7.2.3 Checking Intervals | 22 |
| 7.3 POSSIBLE OPERATING ERRORS..... | 22 |
| 7.4 PRECAUTIONS FOR LONG STANDSTILL PERIODS..... | 23 |
| 7.5 RINSING AFTER MACHINE WAS OVER-SUCKED | 23 |
| 7.6 PROCEDURE IF FAULTS OCCUR | 23 |
| 8. MAINTENANCE..... | 25 |
| 8.1 WARRANTY | 25 |
| 8.2 MAINTENANCE PLAN | 25 |
| 8.2.1 Cooling System | 26 |
| 8.2.2 Compressor/Vacuum Pump | 26 |
| 8.2.3 Vacuum Filter..... | 26 |
| 8.2.4 V-Belts and V-Belt Tension | 27 |
| 8.2.5 Cleaning the Oil Tank..... | 27 |
| 8.2.6 Non-Return Valve..... | 28 |
| 8.2.7 Ventilation Valve..... | 28 |
| 8.2.8 Rotor Vane Wear Measurement..... | 29 |
| 9. SERVICE PARTS | 30 |
| 9.1 SPARE PARTS | 30 |
| 9.2 PARTS SUBJECT TO WEAR | 30 |
| 9.3 KITS FOR REBUILD..... | 30 |

1. HEALTH AND SAFETY

Read the whole manual before commencing installation.



Static Electricity

Ensure, that where required, the compressor and ancillaries are earthed in accordance with BS5958 Part 1 1983; 'Control of Undesirable Static Electricity'

Powder-air combinations are potentially explosive.



Drive Line

It is the responsibility of the installer of the equipment to ensure all rotating and moving parts of the installation are adequately guarded to a standard which complies with the prevailing safety legislation.



Compressor

The compressor has internal moving parts, some of which may be accessed through the inlet and outlet orifices. Do not place any objects, especially fingers, into the orifices since personal injury could result.



Installation

A relief valve must be fitted in the appropriate machine port or in the outlet pipe work as close to the compressor as possible. The valve must be positioned so as not to vent air onto any personnel, since the air discharged will be hot and can cause severe burns.



Storage/Low use

Before the machine is installed or when it will not be used for long periods:

- Store in a dry, heated building.
- Handle with care and keep the inlet and discharge ports covered.
- Rotate the drive shaft of the machine monthly, in the direction shown by the arrows on the sides of the machine body.
- Where the compressor is mounted on the vehicle and located outside, it should be operated for at least 15 minutes each week (twice a week in damp/cool conditions).



Fire & Heat

The compressor includes seals made of fluoroelastomer polymers which degrade if exposed to temperatures above 300°C. If the material has been exposed to such temperatures, then it must not be handled with bare hands.

Surface temperatures can exceed 150°C. Highly combustible materials must not come into contact with the discharge or compressor body.



Relief Valve Check

This procedure should be carried out every month to clear the valve seat and check the valve is functional (Ear protection is recommended).



Noise

Tests carried out by Gardner Denver Drum show that the maximum noise levels for the RFL 102 should typically not exceed 77 dB(A) in the worst case (1500rpm, 2.0 barg). Other vehicle/equipment noise levels are likely to be greater.

IN ACCORDANCE WITH OUR POLICY OF CONTINUOUS PRODUCT IMPROVEMENT, GARDNER DENVER DRUM RESERVE THE RIGHT TO ALTER DETAILS AND SPECIFICATIONS WITHOUT NOTICE.

2. SAFETY RULES & NOTES ON DANGER

2.1 Intended Usage

The compressor/vacuum pump is designed exclusively for compression or suction of filtered air. Use for any other purpose is not considered intended use.

Intended use also requires adherence to the operating data and listed maintenance as set forth in this manual.

2.2 Acceptance & Monitoring

The compressor/vacuum pump itself is not subject to any general acceptance and monitoring requirements.

The operator is responsible for meeting any special regulations that are in effect at the site of operation.

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 personnel who use the machine!

2.4 Environmental Protection



This symbol shows that environment protection regulations must be observed.

2.5 ATTENTION



“ATTENTION” defines 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!

2.7 Points to Note



The compressor/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 personnel 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 intended 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 compressor/vacuum pump which may affect the safety of the machine are not acceptable 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 legal 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.

- 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 subjected to pressure or vacuum.
- On the vehicle side:
 - Close the shut-off valve
 - Bleed or vent the pressure pipe between the machine and the shut-off valve.
 - Release 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 guards 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 harm the environment.



ATTENTION

"MAX SURFACE TEMPERATURE 150°C!"

3. Technical Data

3.1 Machine Data

The RFL 102 is an air-cooled, oil lubricated rotary vane compressor.

On the rating plate of each machine you will find, in addition to the machine number, the most important data.

| | | | |
|--|--|----------------------------------|-----------------------------|
| Gardner Denver Assembled in the USA | 1800 Gardner Expressway, Quincy, IL 62305 - USA 866 376 8181 | Type <input type="text"/> | Medium <input type="text"/> |
| | | No. <input type="text"/> | Year <input type="text"/> |
| Max. Discharge Pressure[psig] <input type="text"/> | Min. Suction Pressure[psi] <input type="text"/> | Speed [rpm] <input type="text"/> | |
| Mass [lb] <input type="text"/> | | Power [hp] <input type="text"/> | |

| Compressor/Vacuum Pump | Units | RFL 102 |
|---|-------------------|---------|
| Max. pressure in compression operation ²⁾ | psig | 2.9 |
| Nominal vacuum ¹⁾ | psiA | 2.9 |
| Max. permitted vacuum (up to 3 minutes per hour) ¹⁾ | psiA | 2.18 |
| Power requirement at drive shaft for 2 bar pressure | hp | 41.6 |
| Min. speed | rpm | 1000 |
| Max. speed | rpm | 1500 |
| Nominal speed | rpm | 1500 |
| Oil consumption | g/h | 0.26 |
| Capacity of oil tank | g | 1.25 |
| Mass moment of inertia | lbft ² | 5.72 |
| Sound pressure at a distance of 7m at 2 barg operating pressure | db(A) | 76 |
| Weight with non-return valve | lb | 397 |



¹⁾ Protect with ventilation valve!

²⁾ Protect with safety valve!

3.2 Dimensions

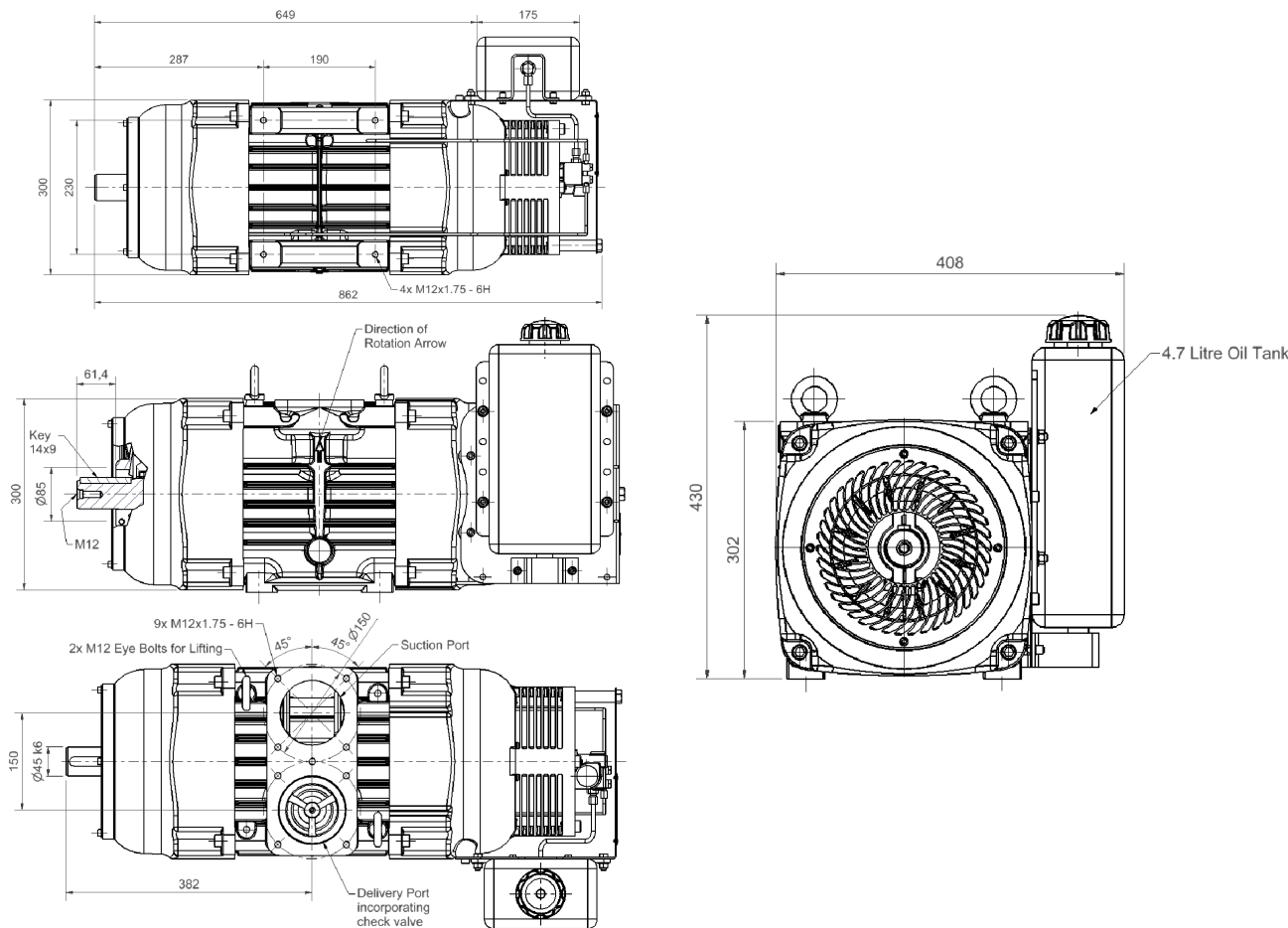


Fig 3.1 Dimensions of RFL 102

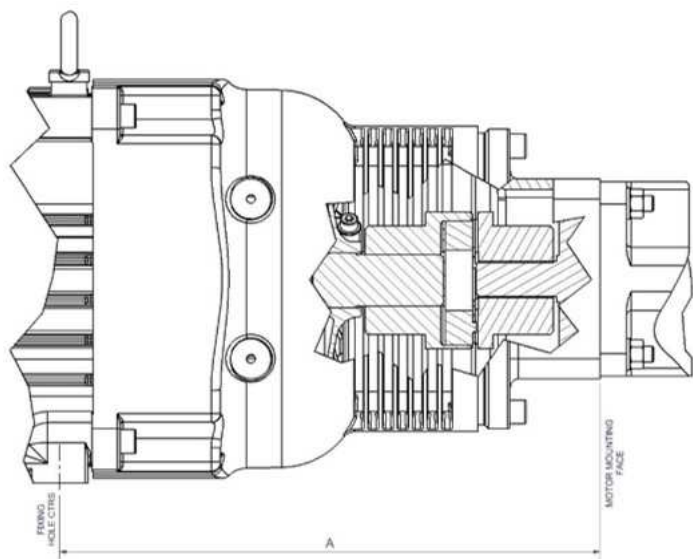


Fig 3.2 Hydraulic Drive Dimensions

| Gearbox Details | |
|-------------------|-----------|
| Kit Number | TEN009819 |
| Motor Flange Type | SAE |

| Hydraulic Drive Details | |
|-------------------------|----------------|
| Kit Number | TEN009820 |
| Motor Flange Type | SAE 'C' 4-BOLT |

3.3 Lubrication

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

Lubrication oil specification: Single range oils of classes:

API: CD/SF and higher

MIL-L: 2104 C and higher

| Compressor/Vacuum Pump | Units | RFL 102 |
|-------------------------------|---------------|--------------|
| Oil Tank Capacity | l (gal) | 4.75 (1.25) |
| Oil Consumption | l/h (gal/min) | 0.1 (0.0004) |
| Add Oil After Operating Hours | h | 40 |
| Oil Level Checks per Day | | once |

3.4 Cooling

Air cooling is carried out by means of two fans mounted at either end of the rotor shaft, which draw in cool air to pass over the cooling fins on the machine body.

When the machine is installed, care must be taken to ensure that cooling air can circulate, providing sufficient cooling.

3.5 Drive Methods

From the vehicle engine:

- by auxiliary drive and drive shaft
- by V-Belt
- by Hydraulic Motor

From a diesel or electric engine:

- by flexible coupling
- by gearbox
-

For exact details, see [section 5.6](#).

4. Transport & Storage

Symbols on the packaging:

Top



Fragile



Protect from rain



4.1 Transport

Avoid use of force and load/unload packages with care. Attach lifting equipment only to the firmly installed eyebolts.

Remove all packaging before installation.

4.2 Storage

Store the machine in a dry and heated room until installation. Remove the covers on inlet and discharge ports only at the time of actual installation.

Rotate the drive shaft of the machine monthly, in the direction shown by the arrows on the machine body.

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.

4.3 Scope of Delivery

The contents of the consignment are described in the delivery note. Check for short delivery and transit damage on receipt. Claims for damages can only be accepted if made promptly in writing.

5. Installation

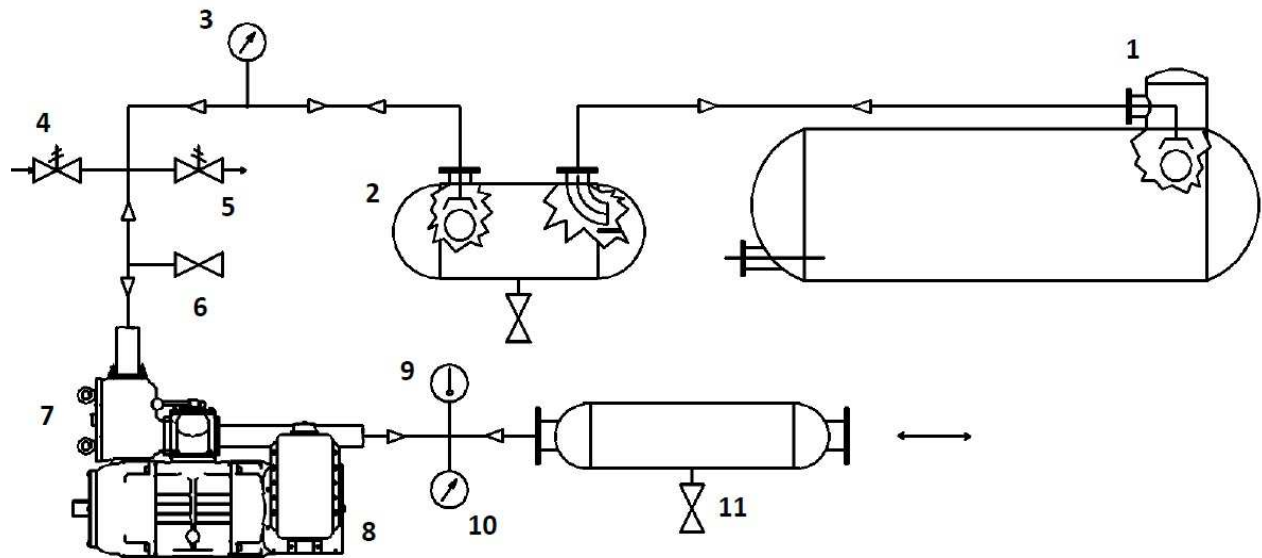


Fig. 5.1 Machine diagram with a compressor/vacuum pump

- | | |
|--|---|
| 1. Vehicle tank with overfill protection | 2. Safety vessel with overfill protection |
| 3. Manometer | 4. Vacuum relief valve |
| 5. Overpressure safety valve | 6. Venting shut-off valve |
| 7. Vacuum intake filter | 8. Compressor/Vacuum pump |
| 9. Thermometer | 10. Manometer |
| 11. Silencer/Oil separator | |

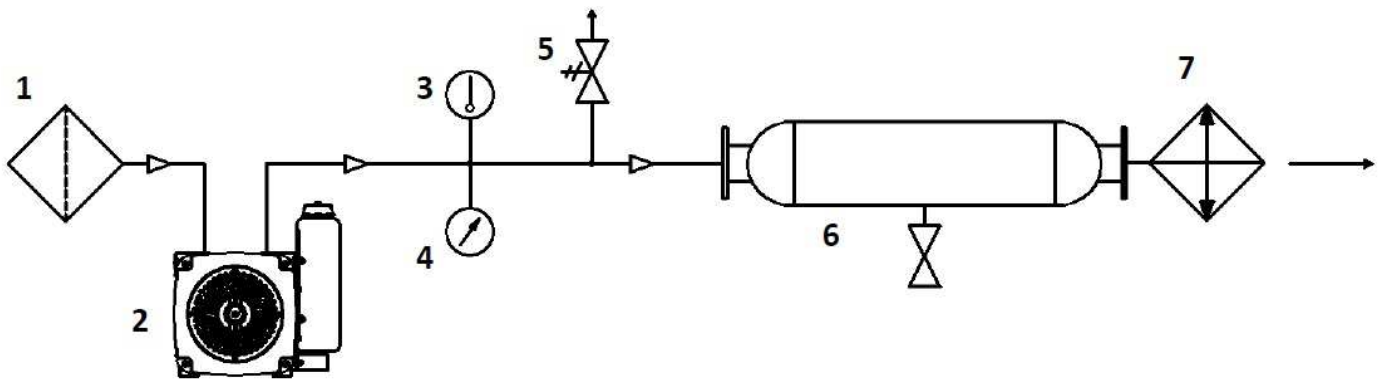


Fig. 5.2 Machine diagram with a compressor

- | | |
|--------------------------------|---------------------------|
| 1. Combination air filter | 2. Compressor |
| 3. Thermometer | 4. Manometer |
| 5. Pressure safety valve | 6. Silencer/Oil Separator |
| 7. Compressed air cooling unit | |

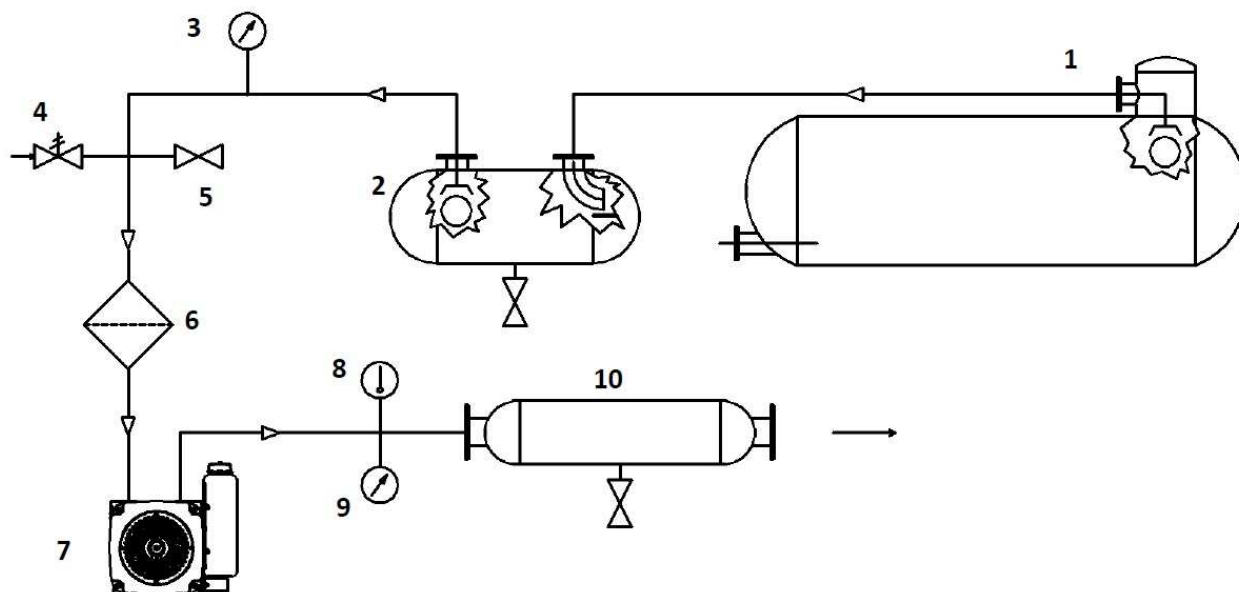


Fig. 5.3 Machine diagram with a vacuum pump

- | | | | |
|----|--|-----|---|
| 1. | Vehicle tank with over-fill protection | 2. | Safety vessel with over-fill protection |
| 3. | Manometer | 4. | Vacuum pump Vacuum relief valve |
| 5. | Venting shut-off valve | 6. | Air filter |
| 7. | Vacuum pump | 8. | Thermometer |
| 9. | Manometer | 10. | Silencer/Oil separator |

Notes

- Installation and start-up operation must only be carried out by trained personnel. Gardner Denver will not be liable for warranty claims caused by operator error.
- The machine is delivered ready for connection.
- Please make sure that the rotor shaft can be turned by hand; if not, contact our service department.
- The machine should only be lifted by means of the securely fitted eye bolts.

5.1 Installation Location and Attachment

The installation location on the vehicle must:

- be easily accessible,
- be protected from dirt, flying debris and water splash,
- provide enough clearance for the connection of the suction and pressure pipes,
- provide easy access for maintenance (e.g. oil filler cap).

The machine is mounted by means of the 4 feet (screw thread M12) on the bottom.

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

The compressor/vacuum pump can be rotated a maximum of 90° around the longitudinal axis. The oil tank must be disconnected and turned so that the filler cap is at the top and the oil pickup at the bottom. It may be necessary to use a different oil intake suction pipe.

If help is needed to adapt the installation of the machine, please contact our service department.

Mounting brackets on the vehicle chassis must be strong enough to support the machine, pipework and any ancillaries; thin profiles should not be used.

For dimensions and weights, see [section 3](#).

5.2 Prevention of Suction Intake of Dirt and Residue

5.2.1 Suction Pipe

The pipe must be non-corroding. Before installation it must be cleaned internally; weld debris, burn residue and rust must be carefully removed.

The suction pipe must incline downwards from the machine to prevent condensate from entering, and a safety tank with a drain cock 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 inadequately sized, warranty provided by Gardner Denver will be void.

| Compressor/Vacuum pump | Required minimum diameter for suction pipe |
|------------------------|--|
| RFL 102 | DN100 |

5.2.2 Vacuum Intake Filter

The vacuum intake filter is installed directly before the machine. It protects it from contaminants and reduces suction noise.

The filter element must be removable for maintenance.

5.2.3 Safety Dome

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

5.2.4 Safety Tank

The safety tank (located at the lowest point of the suction pipe) must be constructed in such a way that:

- incoming material does not directly flow onto the liquid surface,
- sufficient settling room is available,
- the filter element never dips into the liquid (even filters of non-absorbent material absorb liquid through capillary action).

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 tank,
- in atmospheric pressure, no more than 1 litre per hour must be drawn in.

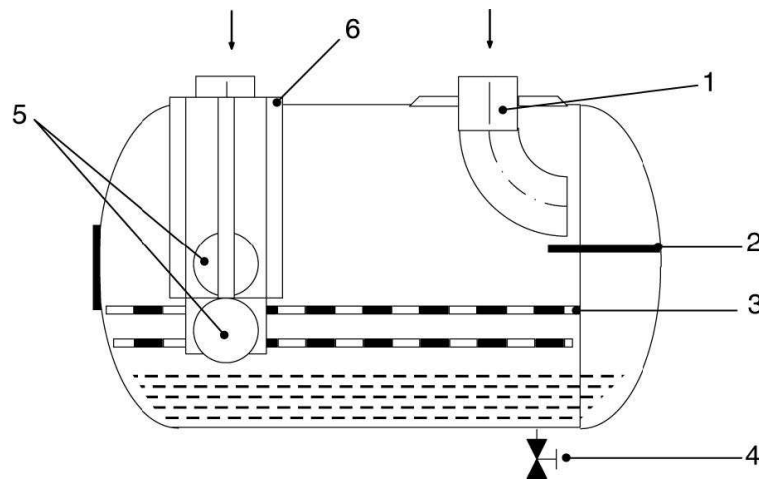


Fig. 5.4 Safety Tank

- | | | | |
|----|-------------------------|----|-----------------|
| 1. | Bent inlet pipe | 2. | Splash sheet |
| 3. | Double perforated sheet | 4. | Drain cock |
| 5. | Two ball floats | 6. | Four guide rods |

5.2.5 Combination Air Filter

The intake suction air filter designed for the compressor 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.
- The filter must not be fitted vertically.
- The dust discharge valve of the intake filter must point downwards.
- The intake filter must be sufficiently protected from water splashes, rain, exhaust gases, and engine heat.

5.3 Noise Suppression (Low Noise Installation)

The noise level of the RFL 102 is far below the value permitted for commercial vehicles. To preserve these values when the machine is installed, the low noise installation is necessary.

Air noise suppression by noise suppressing oil separator

The combined silencer and oil separator suppresses the exhaust noise of the compressor/vacuum pump, and reduces oil emissions.

The silencer is installed in the exhaust pipe.

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

The de-oiling element 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".

| For compressors: | For vacuum pumps: |
|--|--|
| Suction side <ul style="list-style-type: none"> Combination air filter | <ul style="list-style-type: none"> Vacuum filter Ventilation valve Vacuum meter |
| Pressure side <ul style="list-style-type: none"> Non-return valve Thermometer Manometer Safety valve | <ul style="list-style-type: none"> Non-return valve Thermometer Manometer |
| Contact protection <ul style="list-style-type: none"> Protection against rotating parts and burns | |
| Machine protection <ul style="list-style-type: none"> Speed monitor Maintenance indicator on the combination air filter Oil level safety feature | |

The draining pipes between the oil separator and the collecting tank, should have a 4mm minimum bore diameter. 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.

Body noise insulation

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

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

5.4 Safety and Monitoring Features

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



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

5.4.1 Vacuum Gauge

For adherence to the acceptable operating vacuum, the vacuum gauge is installed in the suction pipe directly in front of the suction port.

5.4.2 Vacuum Intake Filter

The vacuum intake filter protects the machine from mechanical contamination. This is also installed in the suction line.

5.4.3 Ventilation Valve

The ventilation valve is the regulator for the appliance. It is absolutely essential.

Should the suction vacuum sink below the preset minimum value, the ventilation valve opens and the machine draws in atmospheric air. In this way the suction pressure is limited to the minimum pressure.



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

5.4.4 Maintenance Indicator on Suction Air Filter

By means of the optical maintenance indicator 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.

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

5.4.5 Non-return Valve

The non-return valve prevents reverse flow when the machine is stopped. It is not completely gas-tight.

In the RFL 102, the non-return valve is integrated into the discharge port.

5.4.6 Thermometer

The thermometer for monitoring the compression temperature must be positioned together with the non-return valve in the pressure pipe directly after the discharge port (for this purpose, attach a screw sleeve R $\frac{1}{2}$ "). The thermometer must be inserted into the pipe, at a depth of half the pipe diameter.



The indication range of the thermometer must cover the range from 0 to 300°C.

5.4.7 Safety Valve

After each compressor, a non-lockable safety valve must be fitted. The valve should be designed and adjusted to prevent exceeding more than 10% above the higher permitted operating pressure. It must be able to expel the entire flow capacity of the compressor/vacuum pump. The valve must also be fitted with a manual ventilation device.



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

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

- Installation must be directly behind the machine before any other shut-off mechanism (especially the shut-off valve),
- The setting must correspond to the maximum permitted operating pressure ([section 3.1](#)).
- The setting must be secure against unauthorized or accidental alteration,
- The safety valve must not be blocked,
- The safety valve must not be used to regulate the air volume in pressure operation.



Proper function must be confirmed each week by activating the manual ventilation device while the machine is operating. The safety valve is mounted, fitted incorrectly or interfered with, an increase of the pressure and temperature could CAUSE AN EXPLOSION!

5.4.8 Manometer

Used for continuous pressure monitoring. Measurement range conforming to the operating pressure. Installed directly after the discharge port.

5.4.9 Contact Prevention

The drive of the machine and the hot pressure pipe must be provided with a contact guard. Unintentional touching of rotating or moving machine parts must be impossible.

The surface temperature must not exceed 80°C.

5.4.10 Oil Level Monitoring

A mark is cut into the bracket which supports the oil tank. This mark indicates the minimum level of oil required to run the machine.



The minimum oil level must be maintained by the operator in accordance with [section 7.2](#) (Oil level). The indication range of the thermometer must cover the range from 0 to 300°C.

5.4.11 Rotation Speed Monitor

We recommend a rotation speed monitor on the compressor/vacuum pump with the indicator visible to the operator during use. See [section 6.6](#) for details.

5.5 Cooling

The RFL 102 is air cooled, which means that during installation it must be ensured that the cooling air can circulate freely and that the openings of the ventilating system must not be covered.

The machine should not be mounted against a closed surface. This would impair the flow of cooling air, thus causing the possible failure of the machine due to overheating.

5.6 Drive



The rotation direction must correspond to the direction of the arrows located on the machine body.

Permitted speed ranges:

| | |
|-----------------------|-------------------------------------|
| Driven by drive shaft | 1000...1500 min ⁻¹ (RPM) |
|-----------------------|-------------------------------------|



We recommend a rotation speed monitor on the machine with a display which is visible to the operator.

In any case, the rotational speed must be monitored after assembly of the compressor/vacuum pump, and operating instructions for the operator of the vehicle must be available.

With drive via combustion engine, a rotational speed control device which prevents excessive speed when load decreases, must be installed on the engine.

A soft start mechanism should be incorporated into the drive system if necessary, to ensure a smooth increase in speed from stationary.



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

Drive couplings should be fitted on the rotor shaft with the existing M12 thread.

Drive couplings must not be hammered onto the rotor shaft.

A coupling guard must be installed in every case.

5.6.1 Hydraulic Motor

Selection and assembly of the hydraulic motor is the responsibility of the company completing the installation.

We can supply the correct mounting trunk as well as a coupling.

The compressor side of the coupling has already been mounted by us. After fitting of the mounting flange, the motor side of the coupling must not transfer axial thrust to the compressor/vacuum pump.

5.6.2 Flexible Coupling

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

5.6.3 Drive Shaft

The drive shaft must:

- be constructed with a splined section,
- 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 compressor.

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

The drive shaft angle must not exceed 12° at a rotation speed of 1500 min^{-1} .



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

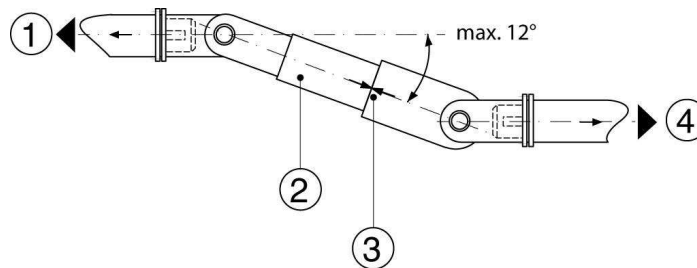


Fig. 5.5 Drive shaft

- | | | | |
|----|--------------------|----|---------|
| 1. | Drive | 2. | Spline |
| 3. | Positional Marking | 4. | RFL 102 |

5.6.4 V-Belt

If the engine speed must be geared up or down, a V-Belt drive is recommended. The nominal rotation speeds as in [section 3.1](#) must be observed.

| Units | | |
|--|------------------|---------------|
| Belt profile | | SPA |
| Belt pulley diameter DW | mm (in) | 200 (2.874) |
| Max. operating pressure for V-Belt drive | barg (psig) | 2.0 (29.0) |
| Max. operating vacuum for V-Belt drive | mbar (in. Hg.) | 300 (8.859) |
| Number of belts | | 5 |

Between the V-Belt pulley and the grille at least 12mm gap should be allowed, as it will restrict the intake of cooling air.

Assembly of the V-Belt drive

- Ensure accurate parallel alignment of the axes in all planes of the driving and driven shaft.
- 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 20mm per 1000mm (0.63 to 0.79 in. Per 39.37 in.) axle span. V-Belt via electric motor is not permissible due to break-down torque.

| | |
|----------------|---|
| 1 | Deflection: 16...20 mm for every 1 m axle spacing, (0.63 to 0.79 in. Per 39.37 in.) |
| 2 | Axle spacing |
| D _w | Belt pulley diameter: min. 200 mm (8 in) |

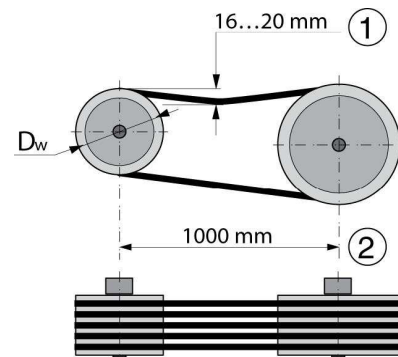
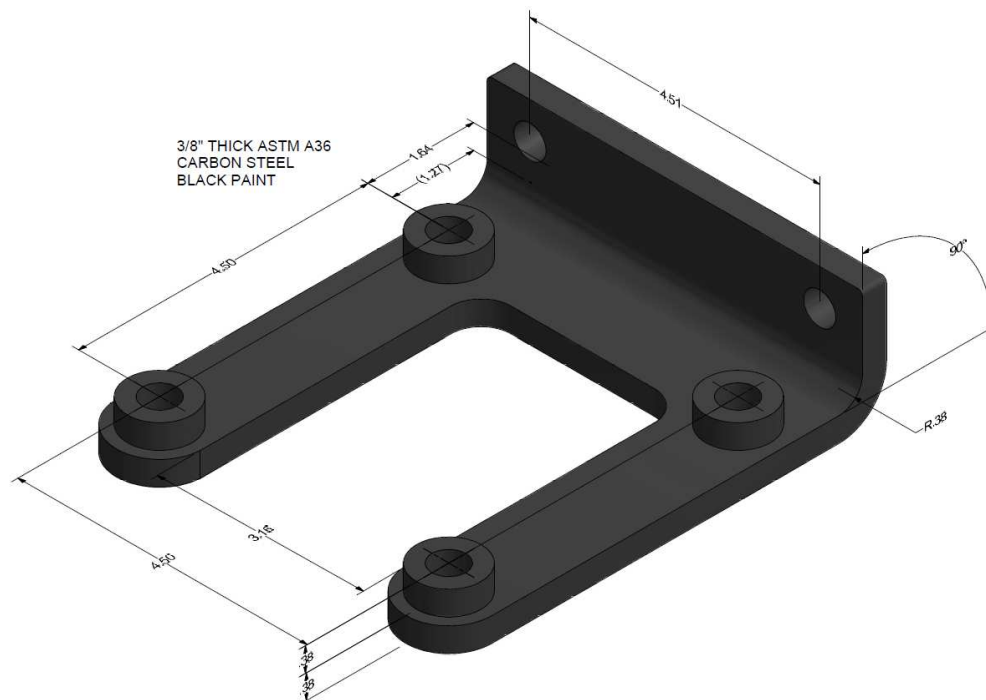
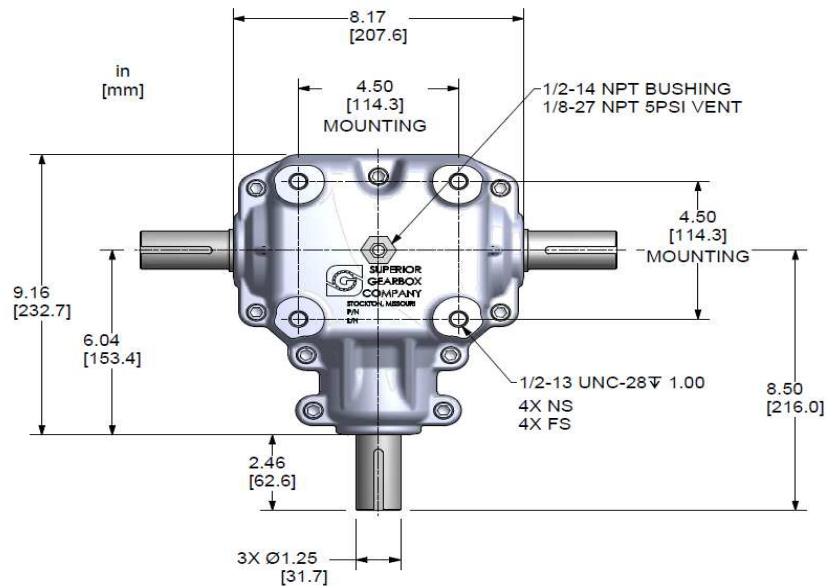


Fig. 5.6 Correct V-Belt tension

5.6.5 Gearbox

- Be mounted on a rigid, structurally sound base plate
- Flatness within 0.010 in.
- Can be driven by direct coupling, flexible coupling, or V-belt drive
- Check oil level every 24 hours of operation. Change oil when gear drive has been in service for 50 hours.
- Oil temperature not to exceed 200°F.
- Gearbox bracket is shown below.



6. Initial Operation

6.1 Checking the System

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



We recommend that you take sufficient time for initial operation of the machine. Undue haste could lead to the omission of important steps, and possible damage to the machine, or injury to personnel.



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

Before initial operation

- Check the machine (transport damage, faulty assembly),
- Check that the drive guard and contact guards on the discharge pipework are in place,
- Check the operating data on the machine's rating plate,
- Instruct the operating personnel,
- Communicate information concerning the operation and maintenance of the machine.

6.2 Lubricating Oil

See [section 6.7](#), for types of oil.



For the RFL 102, single-grade oils are prescribed. Use of multi-grade oils may result in damage to the machine; in addition to this, such use cancels the warranty obligations on the part of Gardner Denver.

- Fill the oil tank to approximately 10 mm below the shoulder.
- For pre-lubrication, inject approximately ¼ litre of oil into the inlet port. Repeat every 15 minutes for the first 1-2 hours of operation.

6.3 Valves

Open all manually operated valves.

Always turn the reverse flow valve through its full rotation. Turning the valve partially is not acceptable as hot exhaust air may be taken back into the machine, causing the machine to overheat.

6.4 Rotating Direction

In initial operation, turn on the drive briefly and check the direction of rotation. Take note of the rotation direction arrows on the machine body.

6.5 Drive

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

6.6 Checking the Rotation Speed, Vacuum and Pressure

Rotation Speed

Permitted speed ranges:

Driven by drive shaft 1000...1500 min⁻¹ (RPM)

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

Check manually whether the ventilation valve responds.

Pressure at the Manometer

The maximum permissible value can be seen on the rating plate (see [section 3.1](#), for details).



Check manually whether the safety valve blows off.

6.7 Lubrication Oils for Compressor/Vacuum Pumps

The permissible oils are single-grade oils of the specifications:

API: CD/SF or higher

MIL: L2104 C or higher



The standard lubricating oil type for the RFL 102 is SAE 30.



For ambient temperatures above 40°C — use SAE 40

For ambient temperatures below 0°C — use SAE 20

For the RFL 102, single-grade oils are recommended. Use of multi-grade oils can cause damage to the machine. Such use also causes the warranty from Gardner Denver to become void.

If the machine is used for suction or compression of gases, please contact us and ask about the correct oils to use!

7. Operation

7.1 Start up

Normal startup of the compressor/vacuum pump (referred to in the following text as the “machine”) is carried out as described in [section 0](#).

7.2 Regular Checks

During Compression Operation

Check operating pressure on the manometer (see rating plate on the machine for the permissible pressure).

During Suction Operation

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

Final Compression Temperature

The final compression temperatures are approximately:

| Type | RFL 102 |
|------------------------------|---------|
| • Operating vacuum 400 mbar | 160°C |
| • Operating pressure 1.5 bar | 160°C |
| • Intake suction temperature | 25°C |

Drain Condensate

Drain condensate from the condensate and safety tanks.

Rotation Speed

Check the permissible rotation speed.

Permitted speed ranges:

| | |
|-------------------------|-------------------------------------|
| • Driven by drive shaft | 1000...1500 min ⁻¹ (RPM) |
| • Gearbox | 1000...min ⁻¹ (RPM) |

Oil Level

Check the oil level by observing the oil tank.

If the oil level reaches the minimum mark on the tank bracket, add more lubricating oil.

For the lubricating oil specification, see [section 6.7](#).

7.2.1 Safety Valve

A non-lockable safety valve must be installed in the pressure line after every compressor. It must be set so that the highest permissible operating pressure cannot be exceeded by more than 10%.

The setting of the valve must be safeguarded against unauthorised or erroneous alteration.

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

Avoid expelling the entire volume via the safety valve when the pressure line is closed, as doing so may cause harmful pressure pulses.

The safety valve must not be used as a pressure regulation device!



Check the valve for proper functioning upon initial startup, and thereafter once a week, by activating the manual ventilation while the machine is running.

7.2.2 Ventilation Valve

The ventilation valve is the regulator for a vacuum system.

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



We recommend the installation of the vacuum meter on the suction port.

Check weekly for proper functioning by observing the vacuum meter on the suction port or the compressor/vacuum pump.

7.2.3 Checking Intervals

The vacuum must not fall below the operating vacuum for continuous operation!

| Checking Intervals | | | | | |
|---|--------------|-----------------------------------|----------------------|-------|--------|
| | See Section | During operation every 10-20 mins | After each operation | Daily | Weekly |
| Operating Rotation Speed | 7.2 | • | | | |
| Operating Pressure/Vacuum | Rating Plate | • | | | |
| Air Discharge Temperature | 7.2 | • | | | |
| Drain Condensate (contains oil!) | 7.2 | | | | |
| • Silencer/Oil Separator | | | • | | |
| • Safety Tank | | | • | | |
| Check Oil Level | 7.2, 6.7 | | | • | |
| Activate Safety Valve | 7.2.1 | | | | • |
| Check Ventilation Valve | 7.2.1 | | | | • |
| Clean Machine | | | | | • |
| Clean Inlet/Outlet Openings for Cooling Air | | | | | • |
| Check grilles for any blockages | | | | | • |

7.3 Possible Operating Errors



Operating errors can lead to machine failure.

The following must be avoided:

- Rotation speeds too high or too low (see [section 7.2](#) or Rating Plate),
- Pressure too high (see [section 7.2](#) or Rating Plate),
- Expelling the entire volume via the safety valve when the pressure line is closed,
- Vacuum too low (see [section 7.2](#) or Rating Plate),
- Compressed air temperature too high (see [section 7.2](#)),
- Poor cooling (cooling air supply blocked),
- Clogged vacuum intake filter,
- Blocked exhaust silencer,
- Intake of fluids,
- Intake of water as a result of failing to drain the condensate from safety vessels according to the maintenance schedule (danger of freezing in winter),
- Insufficient lubricating oil,
- Inappropriate lubricating oil.

7.4 Precautions for Long Standstill Periods

- Clean the machine thoroughly.



If the machine is cleaned with a high pressure jet wash, 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 stoppage of the compressor/vacuum pump installed on the vehicle lasts longer than one month, we recommend operating the machine for at least 15 minutes once a month. This ensures that all parts subject to corrosion are supplied with fresh oil.

7.5 Rinsing After Machine was Over-sucked

After over sucking (liquids or mud have come into the machine) proceed as follows:

- Remove screws in the inlet flange,
- Open the vehicle tank, so the machine can be operated without vacuum or pressure,
- Switch machine on and with slightly reduced speed, put approximately half a litre of diesel into the inlet port,
- Switch off the machine, perform pre-lubrication according to [section 6.2](#) before restarting the machine.



Turning the reverse flow valve partially is not allowed during the rinsing. The dirt leaving the machine through the discharge port could get into the suction side again.

7.6 Procedure if Faults Occur

If a malfunction occurs, the following table may provide the cause and solution to the problem.

| Fault | Possible cause | Elimination |
|--|--|---|
| Volume flow performance of compressor/vacuum pump deteriorates | <ul style="list-style-type: none">• Vacuum filter or combination filter contaminated• Leaking suction pipe• Leaking fittings• Rotation speed too low• Worn rotor vanes; perhaps contamination (water, dirt, etc.) has got into the machine (e.g. by excess suction) | <ul style="list-style-type: none">• Clean filter, if necessary replace filter element• Find and seal leaks• Replace fittings• Adhere to range of rotation speed• Replace rotor vanes or have machine overhauled in authorised repair workshop |
| Abnormal noise level | <ul style="list-style-type: none">• Machine is poorly aligned• Worn bearing• Insufficient lubricating oil• Incorrect lubricating oil• Rotor vanes knock due to lateral wear• Machine bore has scores or undulations due to intake of dirt• Incorrect rotor speed• Altered pressure• Altered vacuum• Foreign object in the machine• Rotor contact | <ul style="list-style-type: none">• Align machine• Replace bearing/have bearing replaced• Add oil, clean oil tank and intake filter• Add oil according to section 6.7• Replace rotor vanes• Have machine bore rebored and honed in an authorised repair shop - Install a fine filter if suction air is highly contaminated• Adhere to rotation speed limits• Adhere to nominal pressure• Adhere to nominal vacuum/check exhaust system and clean if necessary• Remove foreign object immediately and flush the machine• Stop and repair the machine |

| Fault | Possible cause | Elimination |
|--|---|--|
| Compressed air temperature too high | <ul style="list-style-type: none"> Final pressure too high Exhaust silencer clogged Four-way changeover valve in incorrect position Poor cooling Valve plate in non-return valve Vacuum intake filter clogged Vacuum too low | <ul style="list-style-type: none"> Adhere to nominal pressure Replace exhaust silencer Put four-way changeover valve in correct position Check grilles and vents for any blockages and remove if necessary Clean non-return valve Clean vacuum intake filter Adhere to nominal vacuum |
| Operating pressure or operating vacuum is not reached | <ul style="list-style-type: none"> Manometer or vacuum meter gives incorrect reading Drive belts slip Four-way changeover valve in incorrect position Condensate drain is open | <ul style="list-style-type: none"> Replace manometer or vacuum meter Check belt tension and tighten if necessary Turn four-way changeover valve in correct position Close condensate drain |
| Mud or liquid has got into the machine | <ul style="list-style-type: none"> Excess suction into vehicle | <ul style="list-style-type: none"> Flush with diesel while running at lowest permissible rotation speed and without pressure or vacuum – Then add lubricating oil (see sections 7.5 & 6.2) |
| Power requirement too high | <ul style="list-style-type: none"> Rotation speed too high Discharge pressure too high Manometer gives incorrect reading Exhaust silencer blocked | <ul style="list-style-type: none"> Adhere to rotation speed limits Adhere to nominal pressure – activate/check safety valve Replace manometer Replace exhaust silencer |
| Lack of lubricating oil although oil tank has sufficient amount of oil | <ul style="list-style-type: none"> Suction filter in oil tank blocked | <ul style="list-style-type: none"> Clean oil tank and suction filter |
| Safety valve blows off | <ul style="list-style-type: none"> Closed valves in pressure line Clogged pressure system Clogged exhaust silencer | <ul style="list-style-type: none"> Open valves Eliminate blockage Replace exhaust silencer |
| Ventilating valves activates | <ul style="list-style-type: none"> Closed valves in suction line Suction filter blocked | <ul style="list-style-type: none"> Open valves Clean suction filter |
| Compressed air blows from shaft end and oil escapes | <ul style="list-style-type: none"> Seals are damaged | <ul style="list-style-type: none"> Replace radial shaft seal rings in cover of damaged cover |
| Smell of rubber (with V-Belt drive) | <ul style="list-style-type: none"> V-Belts slip due to insufficient belt tension Final pressure too high | <ul style="list-style-type: none"> Check belt tension and tighten if necessary Adhere to nominal pressure |
| Shifting of V-Belts | <ul style="list-style-type: none"> Low belt tension Worn V-Belts Pulley out of alignment Worn belt pulleys | <ul style="list-style-type: none"> Check belt tension and tighten if necessary Replace and install new V-Belts Align pulleys Replace pulleys |

If the problem is not solved (or not fully solved) by the above actions, please contact our service department.



Only restart the machine after it is absolutely clear that the fault has been resolved completely.

8. Maintenance

8.1 Warranty

We cannot accept liability for damages resulting from failure to observe the installation and operating instructions.

Please note that repairs to compressor/vacuum pumps must be carried out only by authorised repair shops using original replacement parts; otherwise, the warranty becomes invalid. You will find a list of our service centres on the back page of the manual.

8.2 Maintenance Plan

Safety regulations ([section 2](#)) must be observed during maintenance and inspection procedures.

Operating failures due to insufficient or incorrect maintenance can cause extremely high repair costs and machine downtime; therefore, regular maintenance is imperative.

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

The table below contains information concerning scheduling, monitoring and type of maintenance tasks necessary under normal use of the compressor/vacuum pump.

| Maintenance points | Type of work | See section | Maintenance intervals | | | |
|-------------------------|-----------------------------|----------------------|-----------------------|---------|----------|--------------------------|
| | | | 1 week | 1 month | 3 months | Other |
| Coolant air path | Check, clean | 8.2.1 | • | | | |
| Compressor/Vacuum pump | Clean | 8.2.2 | • | | | |
| Vacuum filter | Clean | 8.2.3 | • | | | |
| Safety valve | Check, clean | 7.2.1 | • | | | |
| Ventilation valve | Check | 7.2.2 | • | | | |
| V-Belts, V-Belt tension | Check, tighten | 8.2.5 | • | | | |
| Oil tank | Clean | 8.2.6 | | • | | |
| Non-return valve | Check | 8.2.7 | | | • | |
| Rotor vane | Check wear (via inlet port) | 8.2.8 | | | • | |
| Radial shaft seal | Inspect for leaks | Service Instructions | | | | 10,000 run hours/3 years |
| Bearings | Replace | Service Instructions | | | | 15,000 run hours/3 years |

The indicated maintenance intervals are based on an operating period of approximately five hours per day. Intervals can be extended accordingly in case of shorter operating periods.



After work is completed, all protective devices must be refitted.



When disposing oil, grease, cleaning solvents or components (e.g. shaft seals) the environmental regulations must be observed.

Due to differing operating circumstances, one cannot predict how often checks for wear, maintenance and inspections will be necessary. We advise you to draw up a plan after consideration of your operating circumstances.

8.2.1 Cooling System

The cooling air must be able to circulate freely.

- Check the cooling air inlet/outlet openings every week, and if necessary, remove and clean any dirt and dust deposits.



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

8.2.2 Compressor/Vacuum Pump

- The machine must be cleaned weekly.



Washing or rinsing with high-pressure water jets may result in water penetration, which can cause failure of the compressor/vacuum pump.

- Carefully clean/remove any dirt on the oil tank.
- After wet cleaning the machine should be run warm for a few minutes to prevent the rotor vanes from sticking.

8.2.3 Vacuum Filter

Clean the filter daily or at least once a week, depending on the amount of dirt.



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

The filter element consists of a stainless steel mesh.

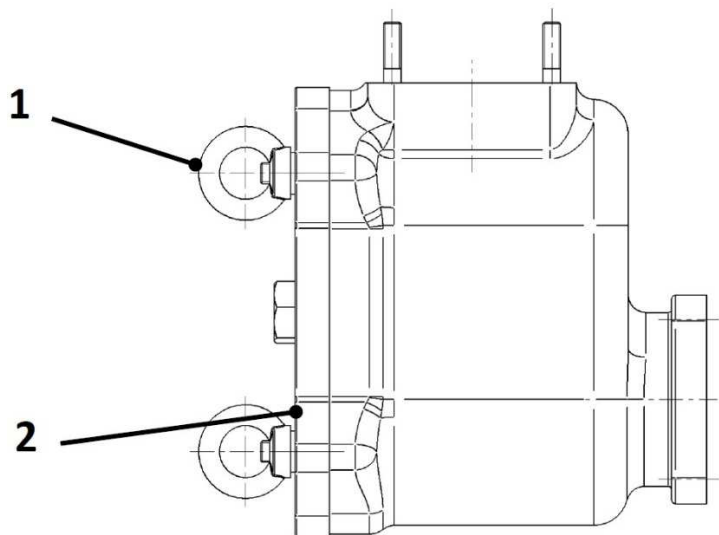


Fig. 8.1 Vacuum intake filter

1. Eye nut

2. Cover

To open the filter

- Unscrew the 4 off eye nuts (8.1/1) and pull the cover out of the housing (8.1/2).

To clean the filter



Rinse the filter housing with petrol or cold degreasing solvent.



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

Assembly of the filter

- Ensure that the o-ring seal is in the cover.
- Insert the cover back into the housing.
- Tighten the 4 off eye nuts

8.2.4 V-Belts and V-Belt Tension



Drive guards 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 (see [section 5.6.4](#) for details).

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

8.2.5 Cleaning the Oil Tank

Clean the oil tank every month and add fresh oil if necessary, according to [section 6.7](#).



Ensure the oil tank is empty before cleaning.
Only empty the oil tank when the machine is stopped.

Rinse the oil tank with rinsing oil.



The oil tank must not be rinsed with solvent or cold cleaning agents.

Pre-lubricate the machine before restarting! (See [section 6.2](#)).

8.2.6 Non-Return Valve

No maintenance is necessary for the non-return valve. We recommend a first inspection after 300 hours of operation.

Inspect the valve for oil carbon deposits and determine the interval for the next inspection on the basis of the valve condition. The thickness of the oil carbon layer must not exceed 1mm.

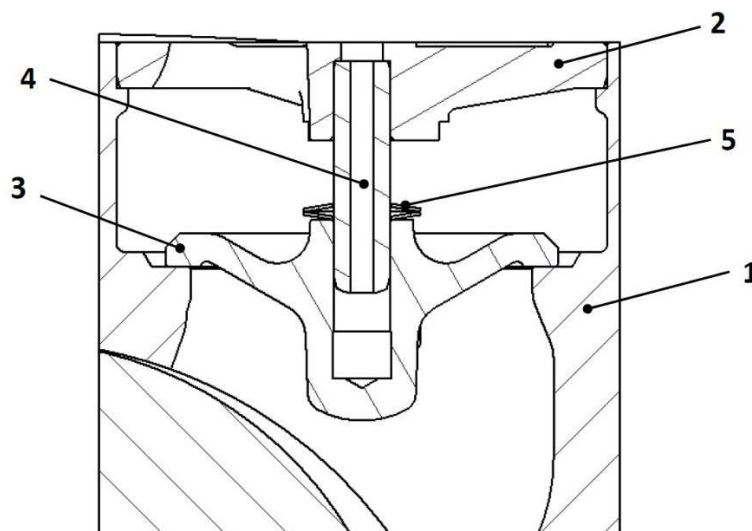


Fig. 8.2 Non-return valve

- | | | | |
|----|------------------------|----|--------------|
| 1. | Machine body | 2. | Guide plate |
| 3. | Valve plate | 4. | Cylinder pin |
| 5. | Two Belleville washers | | |

Sealing and gliding surfaces must be free of oil carbon deposits in order to guarantee proper functioning of the non-return valve.

Should cleaning be necessary, the valve must be removed.

- Insert a slide hammer into the M6 tapped end of the cylinder pin (4) and carefully remove the guide plate (2), valve seat (3) and pin from the body.
- After careful cleaning, check the valve seat for the quality of seal. If the seal leaks, regrind it with grinding paste.
- Before reassembling the valve, which is carried out in reverse order, the sliding surfaces of the cylinder pin (4) should be coated with MOLYKOTE oil, type M 55 (manufactured by Dow Corning).

8.2.7 Ventilation Valve

If the ventilation valve is mounted in a dirty position, the pressure compensation bore can gradually close with dirt which would restrict the function of the valve.

To avoid this, make a visual inspection of the ventilation valve at regular intervals (at least every 3 months or more frequently if the ventilation valve is covered with dirt). Clean if necessary.

8.2.8 Rotor Vane Wear Measurement

To inspect the rotor vane wear, remove the reverse flow valve (if fitted) or suction flange.

Press the rotor vane in the rotor slot and measure the distance to the rotor surface with a reliable depth gauge (see fig 8.2)

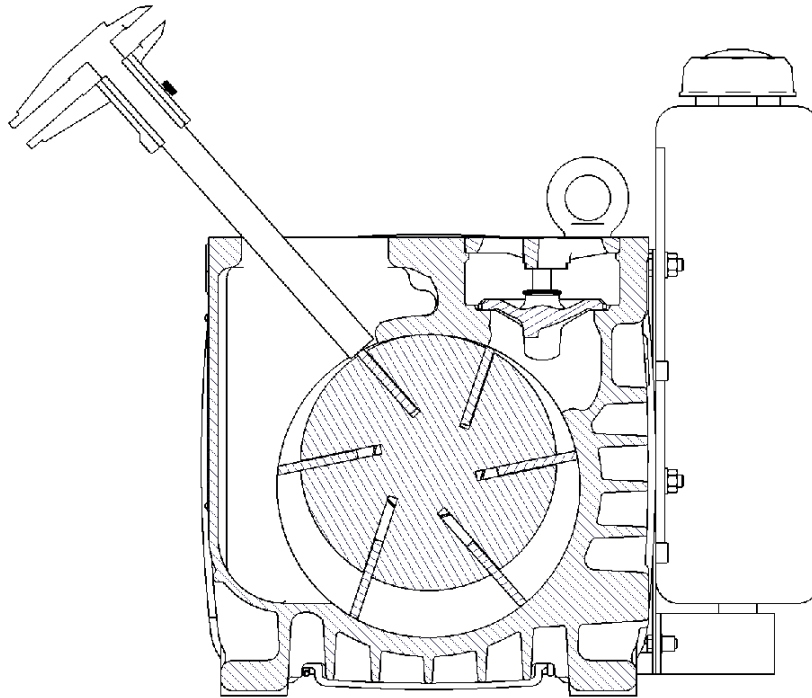


Fig. 8.2 Vane Wear Inspection

The dimension should not exceed 5mm.



If the wear limit reaches 5mm, the rotor vanes must be replaced (see [section 9](#) for details).

The first inspection should be made after approximately 6 months and further inspections every 3 months (assuming 3-4 hours operation every day).

9. Service Parts

9.1 Spare Parts

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

Our warranty only covers original spare parts provided by us.

Installation or attachment of spare parts and additional appliances not supplied by us will invalidate the warranty provided by Gardner Denver.

Please note that there are often special manufacturing and delivery specifications for both our own parts and those provided by third parties. We always offer you spare parts that meet the latest legal requirements.

When ordering spare parts please provide the following information:

Example

| | |
|-----------------------------|------------|
| *Machine type | RFL 102 |
| *Machine no. | L0001 |
| *Year of manufacture | 2015 |
| Part no. | TW34278100 |
| Quantity | 6 |
| Description | Rotor vane |

Information marked with * can be obtained from the machine rating plate.

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

9.2 Parts subject to wear

We recommend storage of the following spare parts:

| RFL102 | Quantity | Description |
|---------------|-----------------|--------------------------------------|
| TW34278100 | 6 | Rotor vanes |
| TW46105400 | 2 | Shaft seal ring 72x50x8 |
| TW46105600 | 2 | Shaft seal ring (double lip) 72x50x8 |
| TW46368600 | 2 | O-Ring seal 205x3 |
| TW46365900 | 2 | O-Ring seal 120x3 |
| TW41122900 | 2 | Cylinder rolling bearing 110x50x27 |
| TW45187900 | 2 | Shim 100x120x0.10 |

9.3 Kits for rebuild

- | | | |
|----|----------------------|--------------|
| a. | Complete Rebuild: | TWSP961018-4 |
| b. | Rebuild No Bearings: | TEN010525 |
| c. | Vane Kit: | TW34278100 |
| d. | Bearing Kit: | RTLSP002 |

| | | |
|---|--|--|
| <p>Americas</p> <p>Gardner Denver, Inc. Industrial Products Groups – Americas 1800 Gardner Expressway Quincy, IL. 62305 Toll Free: 1-800-682-9868 Phone: 217-222-5400 Fax: 217-221-8780</p> <p>Email: mobilesolutions@gardnerdenver.com</p> | <p>Australia</p> <p>Gardner Denver Ind. Australia Pty Ltd 30 Bearing Road Seven Hills New South Wales 2147 Australia Phone: +61 2 96207000 Fax: +61 2 96207955</p> <p>Email: hermant.malik@gardnerdenver.com</p> | <p>Belgium</p> <p>Gardner Denver Belgium N.V. Luithagen 7A Haven 200 B-2030 Antwerpen Belgium Phone: +32 (0)3 5415040 Fax: +32 (0)3 5416509</p> <p>Email: info.be@gardnerdenver.com</p> |
| <p>France</p> <p>Gardner Denver France SA Division Compresseurs 42, rue de Montmurier, BP 604 38070 Saint-Quentin-Fallavier, France Phone: +33 (0)474941673 Fax: +33 (0)474941689</p> <p>Email: contact.lyon@gardnerdenver.com</p> | <p>Germany</p> <p>Gardner Denver Deutschland GmbH Am Dorn 14 48308 Senden Germany Phone: +49 (0)253634840 Fax: +49 (0)25363484010</p> <p>Email: info.de@gardnerdenver.com</p> | <p>Netherlands</p> <p>Gardner Denver Nederland BV Barwoutswaarder 3B 3449 He Woerden The Netherlands Phone: +31 (0)348410150 Fax: +31 (0)348418079</p> <p>Email: sales.nl@gardnerdenver.com</p> |
| <p>UK Sales & Service</p> <p>Gardner Denver UK Ltd PO Box 468 Cross Lane, Tong Bradford, West Yorkshire United Kingdom BD4 0SU Phone: +44 (0)1274 683131 Fax: +44 (0)1274 651006</p> <p>Email: sales.uk@gardnerdenver.com</p> | <p>Spain</p> <p>Gardner Denver Iberica S.L. Calle Primavera, 20 Poligono Industrial Las Monjas 28850 Torrejon de Ardoz Madrid, Spain Phone: +34 (0)916560056 Fax: +34 (0)916770496</p> <p>Email: aurelio.fernandez@gardnerdenver.com</p> | <p>Rest of the World</p> <p>Gardner Denver Ltd PO Box 178 Springmill Street Bradford, West Yorkshire United Kingdom BD5 7HW Phone: +44 (0)1274 718100 Fax: +44 (0)1274 655272</p> <p>Email: gdtransportsales@gardnerdenver.com</p> |

This image shows a full page of blank white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for writing or drawing. There are no margins, text, or other markings on the page.

This image shows a full page of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for writing or drawing. There are no margins, text, or other markings on the page.

[illegible]



Gardner

Denver®

Gardner Denver, Inc.

1800 Gardner Expressway
Quincy, IL 62305

Customer Service Department
Telephone: (866) 376-8181
Mobile.cs.qcy@gardnerdenver.com

www.gardnerdenverproducts.com

©2016 Gardner Denver, Inc. Printed in U.S.A.