Installation, Operating & Maintenance Manual

(Original Instructions)

WITTIG

ROLM 190/280/400/500

T-BA-2000-3-GB
September 2013

Gardner Denver

Form 1085

Gardner Denver Drum Ltd
PO Box 178
Springmill Street
Bradford
West Yorkshire, UK
BD5 7YH
Tel: +44 (0) 1274 718100
Fax: +44(0) 1274 718101

EC Machinery Directive

2006/42/EC

DECLARATION OF INCORPORATION

Machine Name:
ROLM 190-500 Series

Machine Assembly Numbers:
TW14221400/14233900/14251100/14260500/14260600/ 14262400/14335500/14348500/3000001440/3000001441/ 3000001481/3000001487/3000001578/3000002124/ 3000002685/3000002746/3000002795/TW3000002828/ TW3000003433

Machine to be Installed & Operated as per Instructions:
T-BA-2000-3-GB-01-10 (Original Language)

Is in conformity with the provisions of the following other EEC Directives:

N/A

Harmonised standards applied (including parts/clauses of):

N/A

The equipment above must not be put into service until the machinery into which it has been incorporated has been declared in conformity with the provisions of the directive.

Signed: B Thomas. Date: 20th March 2012.

Name: Barry Thomas

Position: Director Engineering (Gardner Denver Drum Ltd)

Being the responsible person appointed by the manufacturer.

Dear Customer,

Your new rotary compressor with oil injection cooling is the result of an intensive development process, based on decades of experience in the construction of rotary compressors. The combination of our modern production facility and strict compliance with the highest of quality requirements plus careful testing guarantees reliability, great availability and a long service life for your machine.

Of course, this machine requires proper handling, particularly when under demanding operating conditions. Commissioning, operation and maintenance must therefore only be carried out by trained and authorised personnel.

These operating instructions contain all the information that you will require to operate the compressor in a safe and proper manner. Careful observance of the operating instructions will ensure that the machine operates perfectly over a long period of time.
The operating instructions should be kept close to the machine.
Please understand that we cannot be held liable for any damages that occur as a result of not observing these instructions.

Please also take note that repairs are only to be carried out by authorised workshops using original replacement parts, otherwise our warranty expires.

We hope you enjoy using your Gardner Denver Wittig rotary compressor. We will always be glad to be of assistance should any of your queries have not been answered sufficiently.

Yours sincerely,

Gardner Denver Wittig GmbH
Schopfheim

Operating Principle

Rotary compressors with oil injection cooling are single-stage sliding vane compressors that operate according to the positive displacement principle. They pump air with low pulsation and an extremely low oil content.

The single-shaft machines have a cylindrically drilled out housing. The similarly cylindrical rotor is mounted inside this in an eccentric position, so that a crescent-shaped working space is formed. Free-moving working vanes are fitted in the longitudinal grooves of the rotor. These slide along the wall of the housing due to the centrifugal force exerted when the rotor rotates.

The vanes divide the crescent-shaped working space into cells of varying size. When the rotor rotates, the volume of the cells on the inlet side increases, and the underpressure thus produced sucks air into the open cell leading to the air intake. As it rotates further the cell closes and the cell volume is reduced. The trapped air is thus compressed and pumped out on the delivery side through the pressure joint.

During compression, a quantity of oil corresponding to the relevant operating pressure is continually injected into the compression space. This oil absorbs most of the heat energy generated during compression. At the same time it seals the rotor vanes against the casing walls and the casing cover and ensures intensive internal lubrication.

The cooling inside the working space also leads to low compression temperatures and thus to a thermodynamically favourable compression process with a high degree of efficiency.

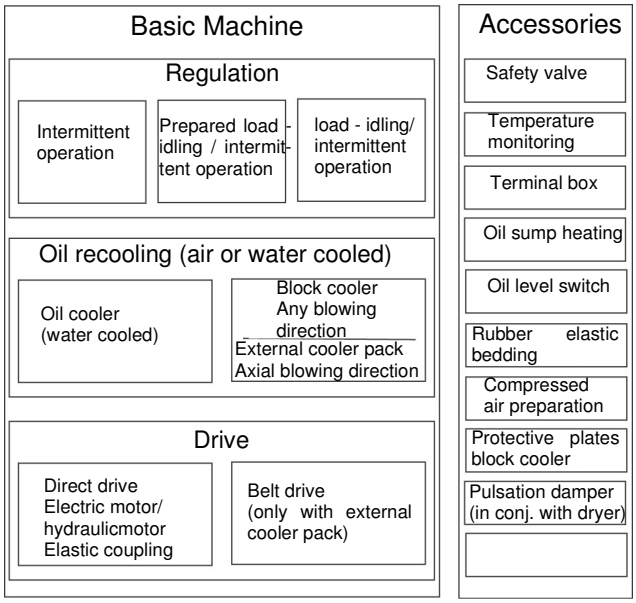
Guide to numbering in the diagram annotation:
The first number in the diagram annotation refers to the figure number and the second number refers to the position within that figure, E.g. (7.2/3) means Figure 7.2, Position 3.

Models

Types code

	RO	L	500
Rotary compressor with oil recooling	= RO		
Oil recooling by air cooling	= L		
Compressor suction capacit	(e.g. 500=500 litre/ min)		

The different models differ with respect to the regulation, the oil cooler, and the drive. Numerous special fittings permit individually customised configurations. The diagram below provides an overview.



1.1 Machine Data

You will find the most important data beside the machine number on the type plate of each machine.

Figure 1.1 Type plate ROL180...ROL500M

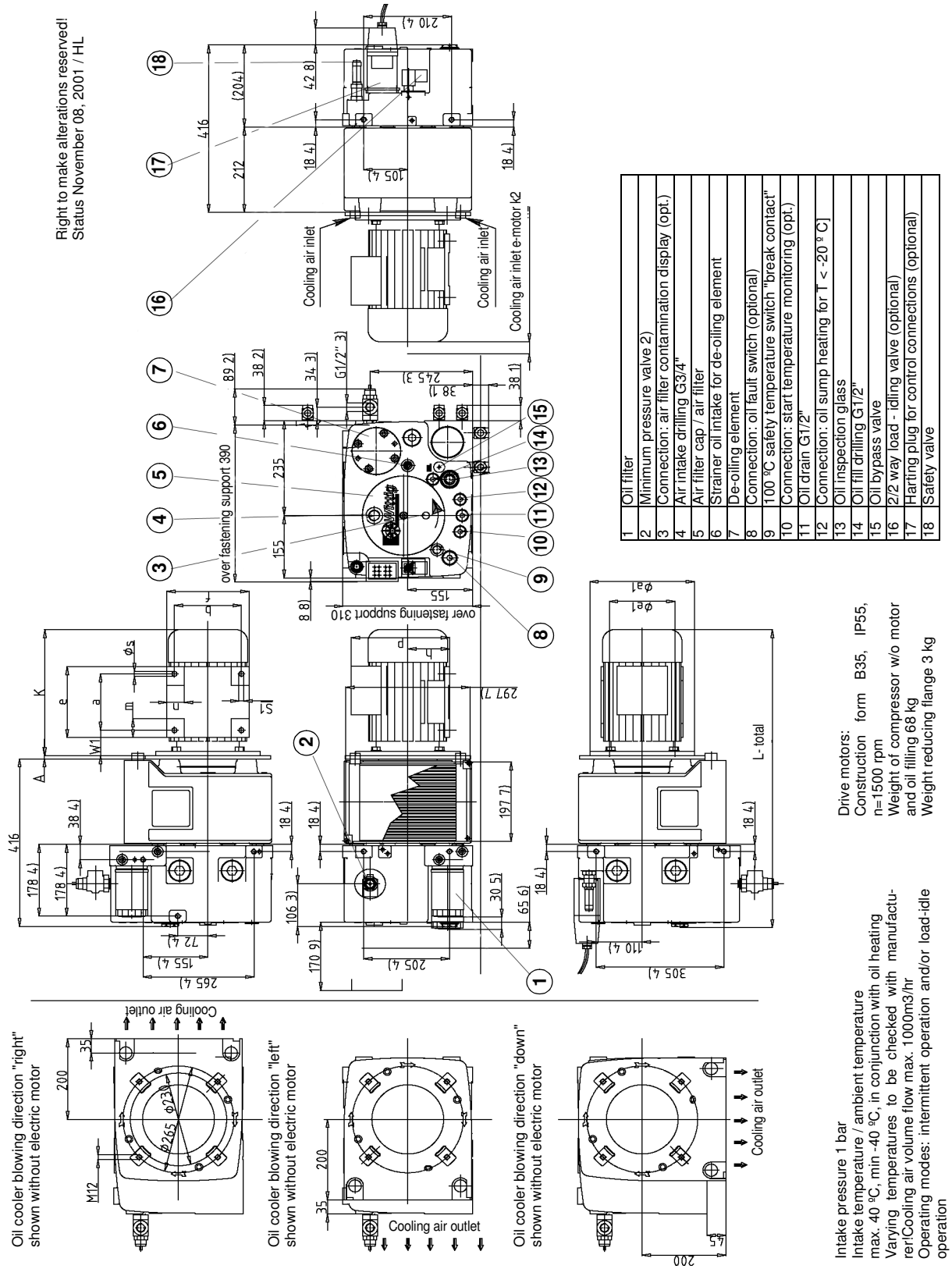
Data for this type series

Rotary Compressor	Type	190M	280M	290M	400M	500M
Volume flow [1) 2)]	m^3/h	10,2/10	15,5/15,2	19,5/19,1	22,4/22	30,2/29,7
Final pressure (abs) [4)]	bar	11/13	11/13	11/13	11/13	11/13
Speed	rpm	1420	1420	1440	1440	1455
Shaft power requirement [2)]	kW	2,0/2,2	2,7/3,0	3,0/3,5	3,6/4,0	4,6/5,1
Final pressure range(abs)	bar	4-11/13	4-11/13	4-11/13	4-11/13	4-11/13
Speed range	rpm	1000-2200	1000-2200	1000-2200	1000-2200	1000-1800
Sound pressure level [3)]	db(A)	68	70	71	71	71
Oil content	litre	approx. 2,0	approx. 2,0	approx. 2,0	approx. 2,0	approx. 2,0
Residual oil content in compressed air [5)]	mg/m^3	<5	<5	<5	<5	<5
Weight without drive motor	kg	approx. 68	approx. 68	approx. 68	approx. 68	approx. 68

1) Intake volume flow for 20 °C, 70% relative humidity. Acceptance test in accordance with DIN 1945/ISO 1217.
2) For a final pressure of 11 bar/13 bar.
3) Sound pressure level in accordance with DIN 45635, with n=1420/1450 rpm, drive via three-phase motor and operating pressure 8 bar_{abs} at a distance of 1m. For drive via direct current or transformer-operated three-phase motor, the sound pressure level may exceed the values stated.
4) Operating pressure >10 bar only in conjunction with idling regulation!
5) In static operation or dynamically in conjunction with pulsation damping valve.

Data and diagrams correspond to status of Jan. 2010. Subject to alterations.

1.2 Dimensions



1	Oil filter
2	Minimum pressure valve 2)
3	Connection: air filter contamination display (opt.)
4	Air intake drilling G3/4"
5	Air filter cap / air filter
6	Strainer oil intake for de-oiling element
7	De-oiling element
8	Connection: oil fault switch (optional)
9	100 ºC safety temperature switch "break contact"
10	Connection: start temperature monitoring (opt.)
11	Oil drain G1/2"
12	Connection: oil sump heating for T < -20 ° C]
13	Oil inspection glass
14	Oil fill drilling G1/2"
15	Oil bypass valve
16	2/2 way load - idling valve (optional)
17	Harting plug for control connections (optional)
18	Safety valve

Figure 1.2 Dimensions for oil injection rotary compressor - type ROL 190/280/400/500/M

Index for Figure 1.2

1) Connector line to oil cooler, standard "lateral", alternative "down"
2) Minimum pressure valve, standard attachment "lateral", alternative "in the compressed air line; supplied unattached"
3) Compressed air outlet
4) Fastening drillings M12 x 15 deep
5) Removable chamber for oil filter
6) Removable chamber for air filter
7) Clear width oil cooler
8) Harting plug for control connections
9) Removable chamber for de-oiling element

Dimensions table for Figure 1.2

Nominal motorpower	Motor size	Weight	Dimensions [mm]											
[KW]		[Kg]	a	b	e	f	h	k	m	n	p	s	s1	w1
2,2	100L	24	140	160	176	196	100	313	47	42	235	12	16	63
3	100L	26	140	160	176	196	100	313	47	42	235	12	16	63
4	112M	31	140	190	176	226	112	334	47	46	260	12	16	70
5,5	132S	45	140	216	180	256	132	374	49	53	299	12	16	89
7,5	132M	56	178	216	218	256	132	374	49	53	299	12	16	89

Compressor-type ROL M construction size	Intakevolume flow for 8 to 12 barg [l/min]	Shaftpower 10 barg/ 12 barg [kW]		Allocated motor 10 barg/ 12 barg [kW]		Reduction required dimension A = 11 mm 10 barg/12 barg		Dimension L total 10 barg/12 barg [mm		Weight total 10 barg/ 12 barg [kg]	
190	185	2,1	2,4	2,2	3	yes	yes	729	729	95	97
280	280	2,9	3,3	3	4	yes	yes	729	750	97	102
400	410	3,8	4,4	4	5,5	yes	no	750	800	102	113
500	510	4,7	5,4	5,5	5,5	no	no	800	800	113	124

Oil cooler dimensions for ROL 190/280/400/500 M

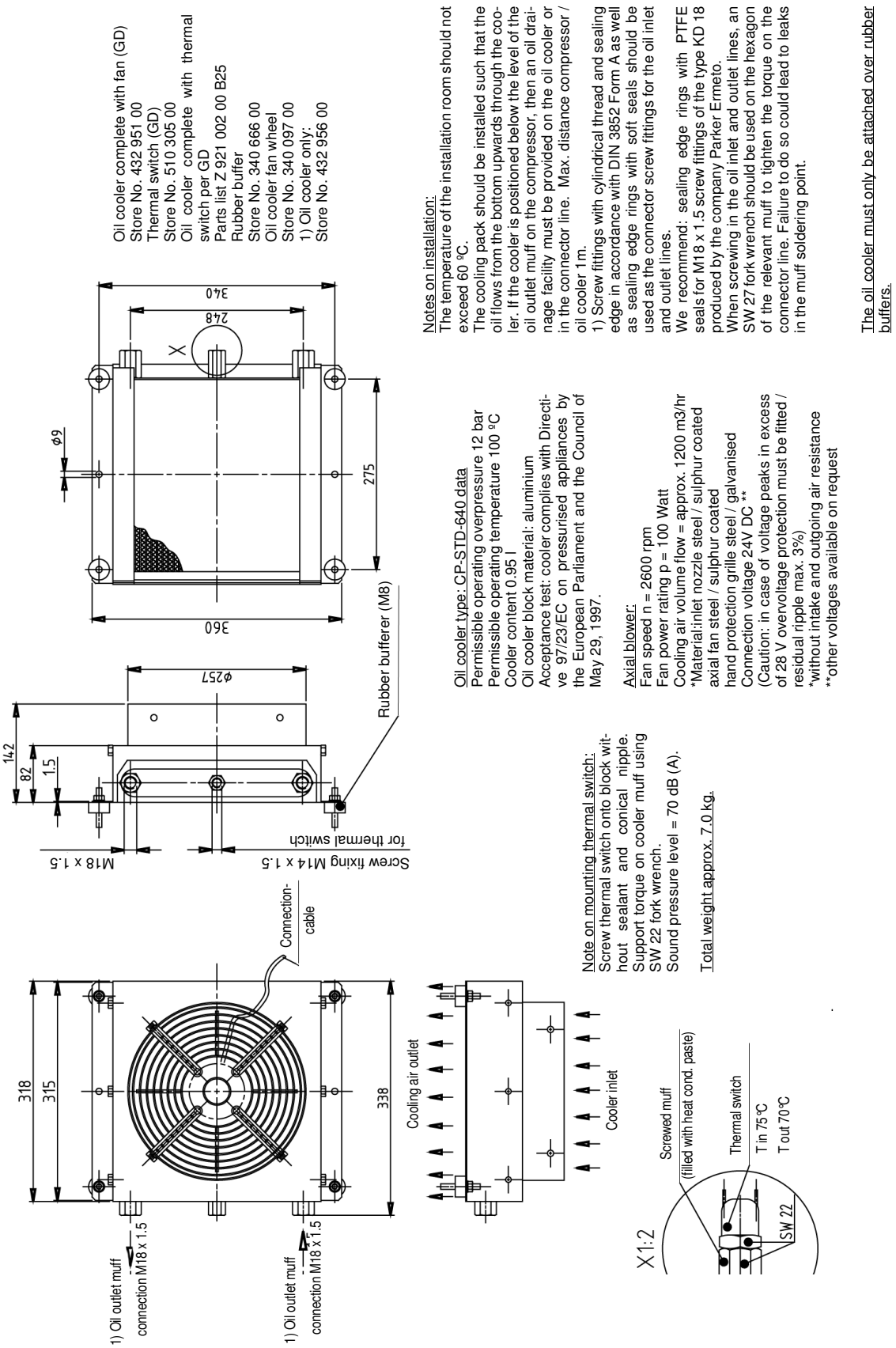


Figure 1.3 Oil cooler dimensions for ROL 190/280/400/500 M

1.3 Design Variations

Model with mounted block cooler and electric motor / hydraulic motor

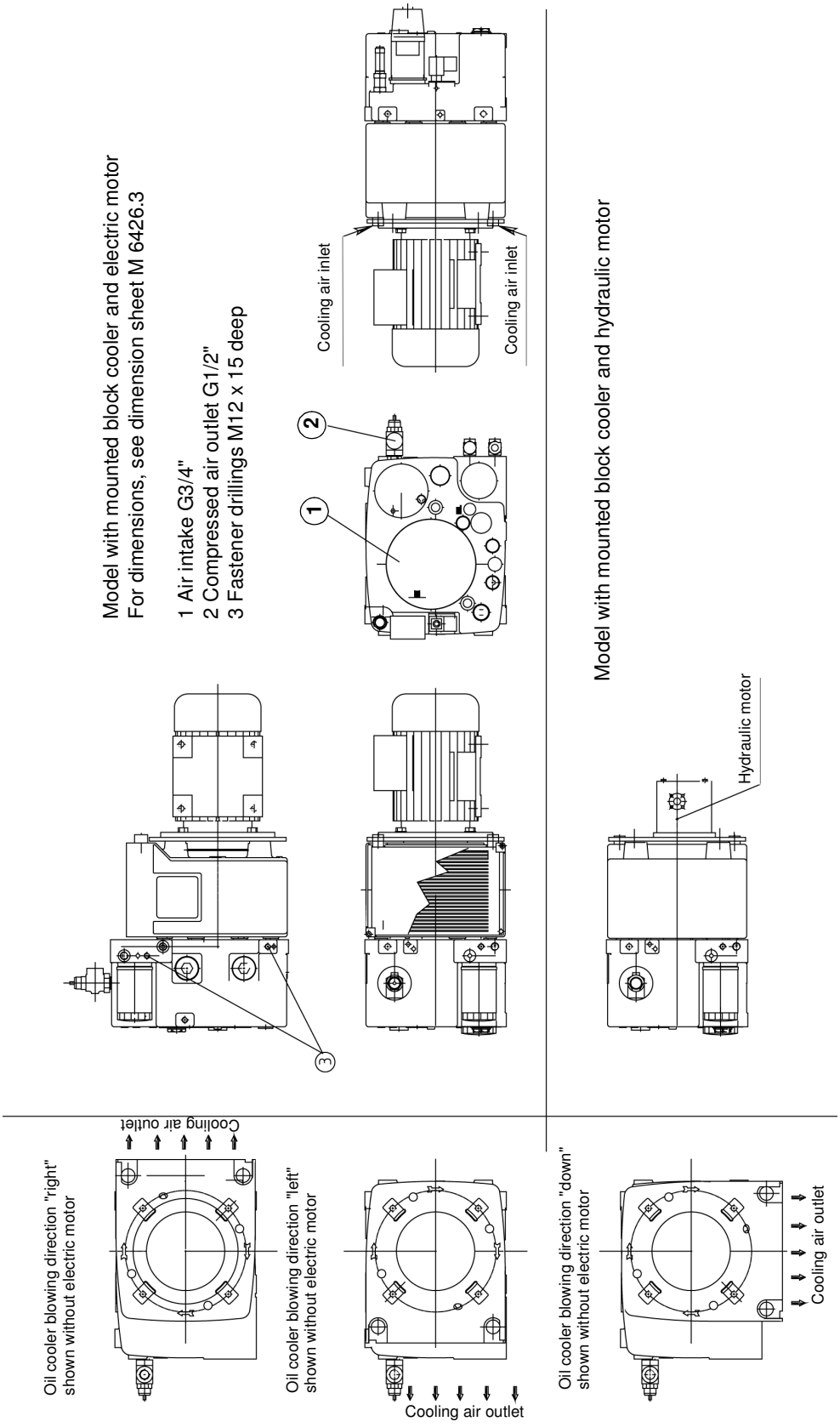


Figure 1.4 Model with mounted block cooler and electric motor / hydraulic motor

Models with external air-cooled oil cooler

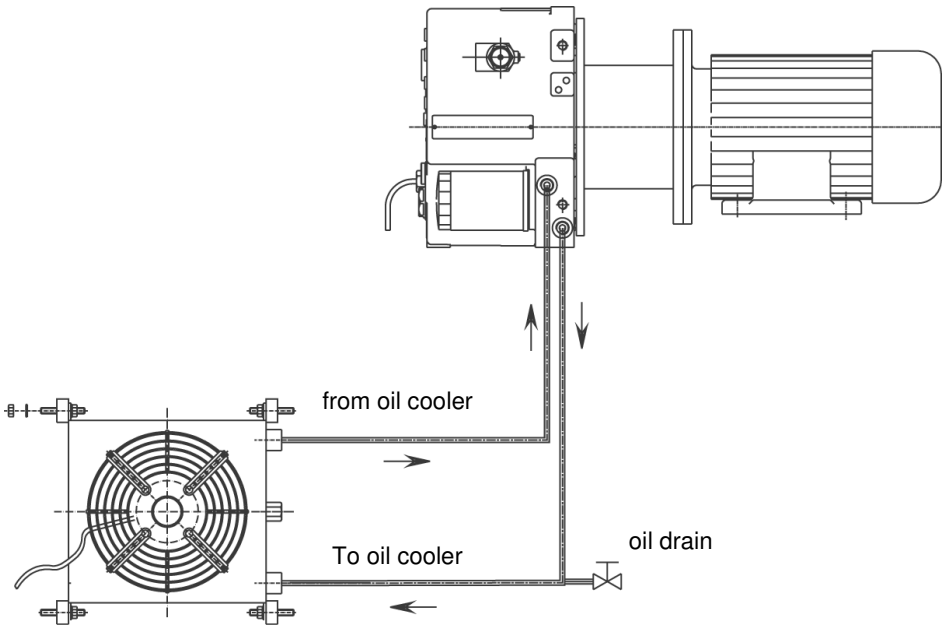


Figure 1.5 Block cooler, models with external air-cooled oil cooler

Models with external water-cooled oil cooler

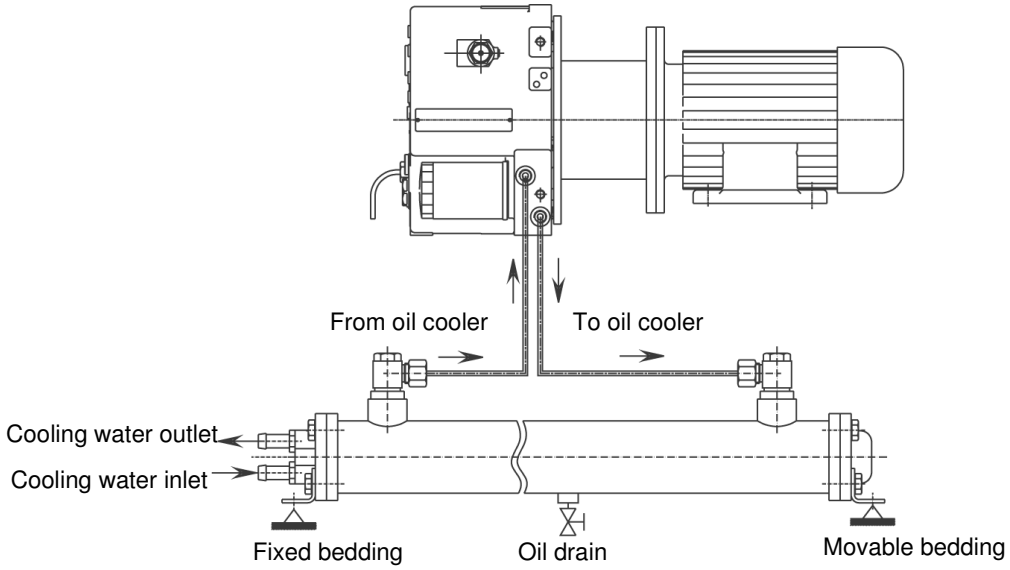


Figure 1.6 Block cooler, models with external water-cooled oil cooler

Caution!
The external oil cooler (air and water-cooled) must not be mounted above the level of the compressor!

Model with drive via V-belt (only in conjunction with external oil cooler)

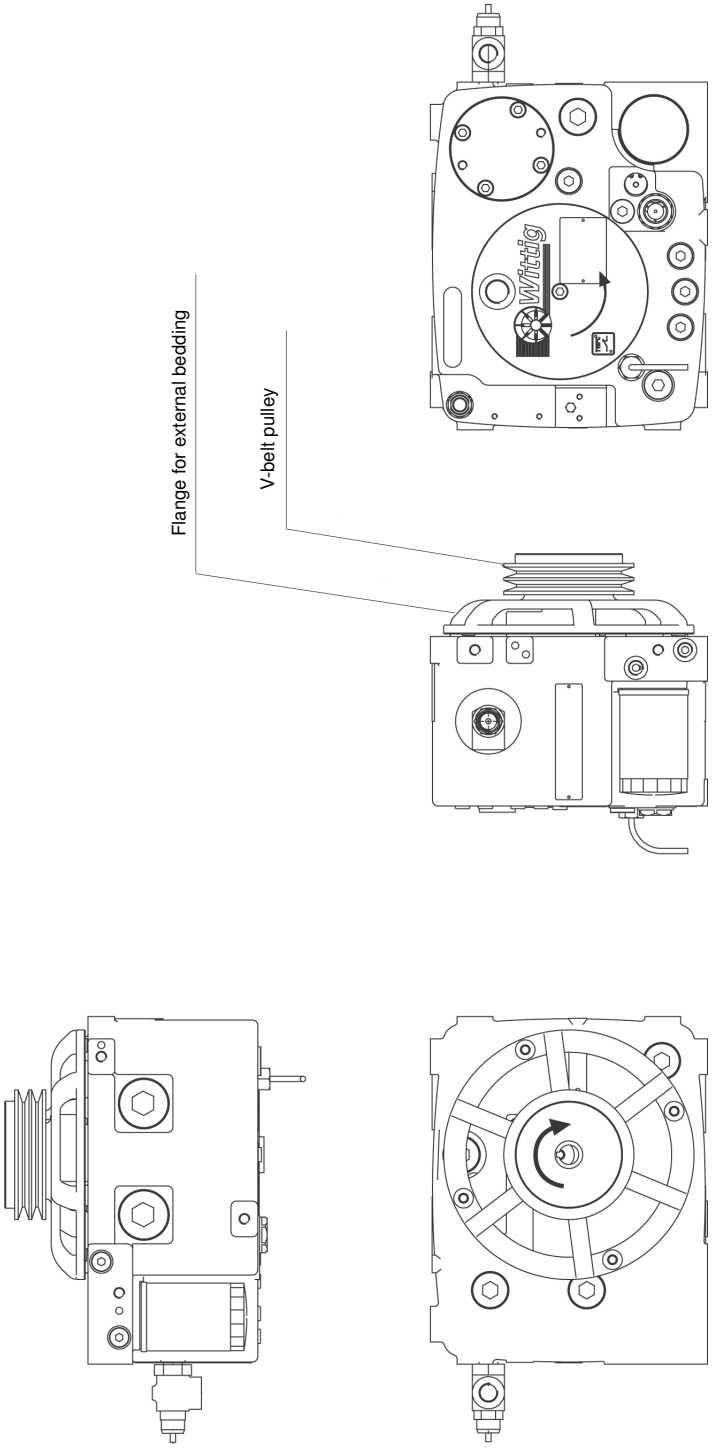


Figure 1.7 Model with drive via V-belt

1.4 Oil Injection

The cooling oil is injected from the integral oil container into the compressor stage by means of pressure differential. The amount injected is adjusted using nozzles.

Lubricating cooling oil specification for normal operating conditions:	
Multigrade engine oils	SAE 10 (15) W-40:

For lubricant selection table, see chap. 7.4 - Lubricants!

1.5 Drive

1.5.1 Direct Drive

The compressor is driven directly by an electric motor via an elastic coupling.

1.5.2 Drive via V-belt

All compressors in the 190…500M series may also be driven via an externally bedded V-belt drive in the permissible speed range (see 1.1). When equipped with a belt pulley, the recooling of the oil must be carried out by an external cooler pack. Block coolers cannot be delivered in this configuration (see Figure 1.7).

2.1 Intended Use

The compressor is intended for the sole purpose of compressing cleaned air. Other uses or uses above and beyond said purpose are to be viewed as inappropriate.

Part and parcel of the intended use is also the observance of the operational data stated in the operating instructions and of the maintenance schedule set out therein.

2.2 Acceptance and Monitoring

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

In as far as any special regulations apply to the place of use of the compressor, it is the responsibility of the operator that said regulations are observed.

The safety and accident prevention regulations stipulated by the local social insurance organisations must be observed at all times.

2.3 Hazard and Information Symbols

"WARNING"
This symbol points out possible hazards to persons. Health & Safety at Work requires that instructions identified in this way must be strictly adhered to.
All users must be aware of safety notices!

"CAUTION"
This symbol designates guidelines and regulations that are intended to prevent any damage from being caused to the machine.

This symbol refers to information that is important for the operator of the system.

DThis symbol indicates that you must wear ear protection.

This symbol indicates that this area must not be entered by unauthorised persons.

Risk of burns!
This symbol indicates that there is a hot surface present here.

This symbol indicates that environmental protection regulations must be observed.

2.4 Health & Safety at Work

The compressor is built in accordance with current technology and with recognised safety regulations. However, during its use hazards may arise with regard to life and limb of users and third parties and/or with regard to damage to the machine or other plant.

Personnel operating the compressor must have read the operating instructions before commencing work, in particular the chapter on safety regulations.

- Only use the compressor in a technically perfect condition, for the purpose for which it is intended, and in observance of safety regulations.
  In particular, faults that affect safety must be remedied immediately.

- Alterations to, additions to and reconfigurations of the compressor, which could impair its safe operation, are not permitted without prior consultation with the manufacturer.

- Maintenance and repair work on the machine must only be carried out when it has been shut down.

- Before commencing maintenance and repair work, the drive must be secured against unintentional start-up (e.g. by locking the main switch or removing the fuses).

- During maintenance and repair work the system must not be pressurised.
  Close the main stop valve in the vehicle supply network.Vent the pressure line between the system and the main stop valve.
  Release the overpressure by hand using the safety valve.
  Check the manometer display (if there is one).

- The drive safety devices may only be removed

when the machine is shut down.

- Only remove the contact protection when the machine and pressure line have cooled down.
- Before initiating the machine it must be ensured that all safety devices have been fitted again.
  All social insurance requirements must be fulfilled.
- Any work involving electrical plant must be carried out by a specialist electrician in accordance with electrical regulations.
- All warning signs on the machine must be observed and kept in a clearly legible condition.
- Fire alarm and fire fighting instructions must be observed.

Environmental protection regulations require that all fluids emitted during maintenance work, e.g. cooling water and lubrication oil, must be collected and disposed of in an environmentally appropriate manner.

3. Transport, Scope of Supply, Storage

Symbols on the packaging:

Top

Fragile

Keep dry

3.1 Transport

Unless otherwise agreed, the packaging will be in accordance with the HPE packaging guidelines issued by the German Federal Association for Pallets and Export Packaging and by the VDE (Association of German Electrical Fitters).

Always prevent the effects of knocks and careless loading and unloading during transport. The machine may only be lifted using the lifting bolts.

3.2 Storage

Until it is installed, the machine should be stored in a dry, heated room. Leave the covering on the pressure joints in place until final installation.

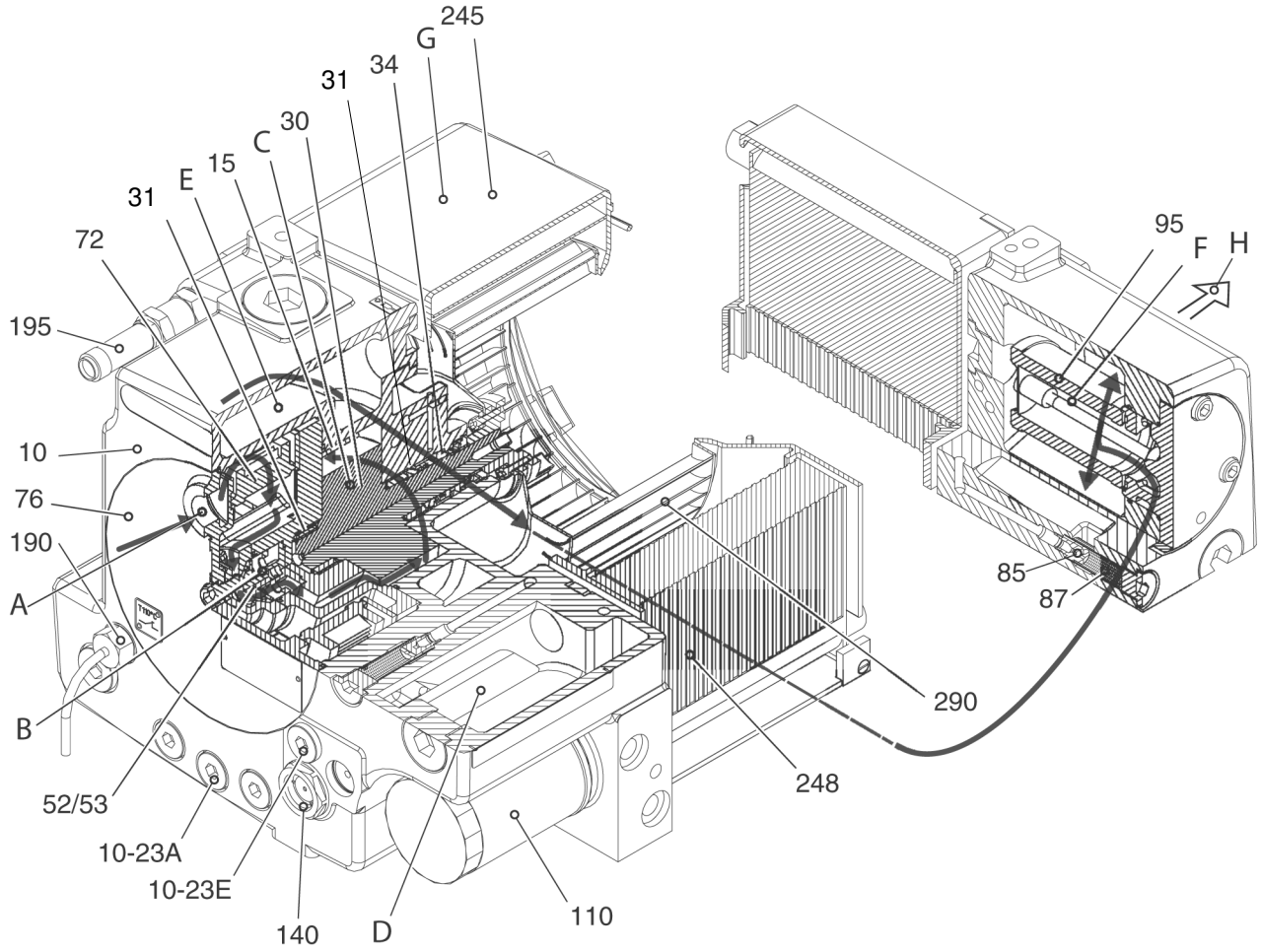
The preservation of brightwork will last for approximately one year.
In case of longer storage it should be renewed.

3.3 Scope of Supply

The contents of the shipment are listed on the delivery note. Please check immediately that the shipment is complete.
Transport damage and faults can only be recognised following immediate written notification.

4. Assembly and Description of Components

4.1 Description of Unit



10	Casing	52/53	Non-return Valve with Intake	87	Strainer/Oil Intake	195	Safety Valve
15	Rotor Vane			95	De-oiling Element	245	Intermediate Flange
30	Rotor	72	Air Filter	110	Oil Filter	248	Oil Cooler
31	Needle Bearing	76	Air Filter Cap	140	Oil Inspection Glass	290	Axial Fan Wheel
34	Axial Face Seal	85	Nozzle with Non-return Valve Oil Intake	190	Safety Temperature Switch	10-23E	Oil Filling Lock
						10-23A	Oil Drain Plug

A	Air Inlet	D	Oil Pre-Separator Space	G	Intermediate Flange with Oil Cooler and Axial Filter
B	Intake Regulator	F	Oil Fine Separator		
C	Compression Space			H	Compressed Air Outlet

Figure 4.1 Assembly of rotary compressor from series ROL Type M

WITTIG rotary compressors with oil injection cooling from the ROL M series are compact, ready-to-install, single-stage compressors built for the compression of air in accordance with the regulations for the prevention of accidents stipulated for compressors (VGB 16). They are designed for continuous operation overpressures of up to 10/12 bar. The recooling of the injected oil is carried out by heat exchangers using either air or

water.While producing a virtually pulsation-free output, the compressors deliver compressed air with an extremely low oil content and an outlet temperature at the machine of approximately 65 to 85 °C.

The compressor design permits the following types of operation:

- Intermittent operation
- Load-idling operation
  Operating overpressure >10 bar
  (only in conjunction with idling regulation)
- A combination of both types of operation

The compressor assembly (Figure 4.1) is described in terms of the air path and of the oil circulation.

Description of the Air Path:

After passing the air filter (4.1/72) and the intake regulator (4.1/B), the air enters the compressor stage (4.1/C). Here it is compressed by the volume reduction of the compression spaces, with cooling oil being injected into the closed cells. From the compressor stage the air enters the annular oil pre-separator space (4.1/D), where a large proportion of the oil contained in the air is removed.

From there the air passes on to the air de-oiling element (4.1/95), where the residual oil content in the air is reduced to less than 5 mg/m3, and then on through the minimum pressure and non-return valve before leaving the compressor. A safety valve (4.1/195) ensures additional overpressure protection.

Description of Oil Circulation:

There is a thermostat fitted on the oil circuit. For oil temperatures below 75 °C the oil passes from the pressurised integral oil container directly via the oil filter (4.1/110) and the injection nozzles into the compressor stage. If the oil temperature exceeds 75 °C, the oil is fed through the oil cooler (4.1/248) before the oil filter. In the compressor stage (4.1/C) the oil is mixed with the air to be compressed and is subsequently separated from the air again on the air path described above.
It then flows back into the oil supply and separation container again.

4.2 Compressor Stage Operating Principle

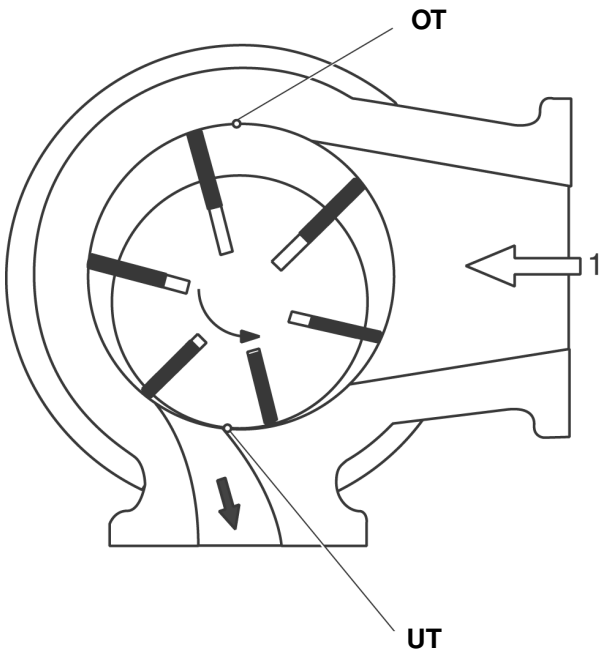


Figure 4.2 Schematic of compressor stage operating principle

The air enters the compressor stage (4.2/1) at the air intake and enters the compression space via the inlet channel. When it reached its maximum volume, the cell sucking the air in is closed at approximately upper dead centre (4.2/OT) by the following vane. As the rotor rotates further, the volume of the cell is reduced and the air is compressed. The compressed air is expelled just before bottom dead centre (4.2/UT) is reached.

During the compression process, oil is injected via nozzles into the cells as they contract, which absorbs the heat generated by compression and friction and prevents backflow losses.

4.3 Intake Air Filter

To keep the air being sucked in by the compressor stage clean, a dry air filter (4.1/72) is mounted on the suction side of the machine.

4.4 Oil Filter

The circulating oil is cleaned by an oil filter (4.1/110). This prevents the accumulation of dirt particles.

4.5 Minimum Pressure and Non-return Valve

The combined minimum pressure and non-return valve (4.4/180) at the compressed air outlet is designed and set up in such a way that it only allows air to flow into the connected pressure line at an operating overpressure of approximately 2 bar. The circulation of oil in the machine is therefore guaranteed, even if the pressure in the customer-side feed only builds up very slowly or - in case of large-scale delivery - sinks to below approximately 2 bar operating overpressure. In addition, when the machine is at a standstill, any backflow into the compressor is prevented.

The set-up of the opening pressure for the minimum pressure and non-return valve must not be altered

4.6 Motor, Coupling, and Belt Pulley

The electric motor, built in accordance with protection system IP 54/65, can be given a positive-locking connection to the compressor stage (4.4/1) via a torsionally elastic coupling. It is also possible for the drive to be via a V-belt and belt pulley.

Depending on the design, the electric motor is started either directly or via a star-delta starting switch. The motor is switched off or on again as required by the particular demand and/or compressed air consumption.

The electric motor must be connected and regulated by the operator in such a way that the permissible connecting frequency (see manufacturer's specification) is not exceeded!

4.7 Pressure and Volume Flow Regulation

4.7.1 Intermittent Regulation

The intermittent regulation system is assembled in such a way that, after the desired network pressure has been reached, the compressor is switched off automatically by a pressure monitor to be supplied by the customer and the intake regulator (4.1/B) closes.

As soon as the network pressure falls below the minimum pressure setting on the pressure monitor, the compressor is switched on again.

4.7.2 Load-Idling Regulation

Compressors with load-idling regulation differ from the model with intermittent regulation in that they have an additional control valve (4.5/6).

In this operating mode, the intake regulator (4.1/B) is closed when the maximum operating pressure is reached and the machine runs in idling operating mode. The power consumed by the drive motor drops accordingly.

As soon as the operating pressure falls below the minimum pressure setting on the pressure monitor, the intake regulator is opened via the control valve.

4.8 Oil Cooler

The oil fed from the integral oil supply container to the compressor stage (4.1/C) is recooled with an air-cooled or water-cooled heat exchanger (4.1/248).

Both block coolers and external cooler packs can be used for this.

The fan in the external cooler pack is controlled via a thermal switch (1.3/Detail X and 1.4/Detail X) and can therefore suddenly start running if the control power supply is switched on, even when the compressor is not running!

For water-cooled oil coolers, make sure that cooling water containing anti-freeze protection is used at temperatures below 0 ºC. The cooling water / anti-freeze mixing ratio will determine the cooling performance!

4.9 Sound Insulation Hood

In order to reduce sound levels, the machine can be supplied ex-works with a fitted sound insulation hood. Installation in customers' own sound insulation hoods is also possible.

When installing the machine in a sound protection hood, care must be taken that a quantity of cooling air sufficient to dissipate the amount of heat energy generated (from additional units as well) is guaranteed. Furthermore, the separation of feed air and exhaust air should be designed effectively. It may be necessary to install an external oil cooler. We recommend that you consult our works in this regard.

4.10 Accessories

4.10.1 Oil Sump Heating

To guarantee perfect operation, particularly in the case of intermittent regulation and ambient temperatures below -20 °C, a thermostat-controlled 24 V DC oil sump heating device can be installed in the integral oil supply container.

The electrical connection must be set up so that the heating device can be started independently of the compressor.

4.10.2 Oil Level Monitoring

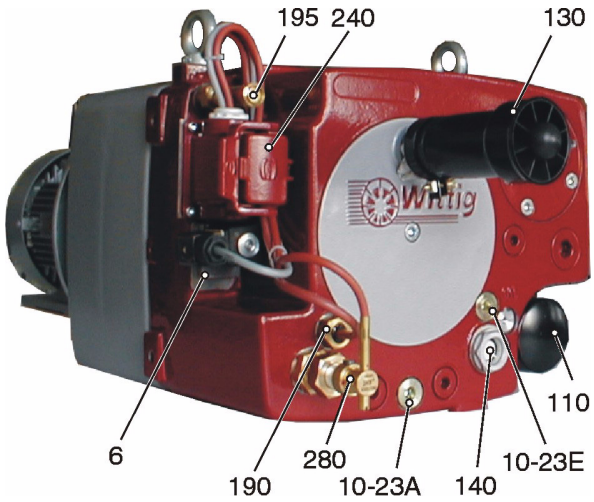


Figure 4.3 Oil level monitoring (140: oil level display)

All compressors in the ROL series are fitted with a visual oil level display (4.3/140) as standard. On request an additional level switch (4.3/26) can be installed in the compressor, designed as a break contact or a make contact.

Corresponding electrical warning devices can be connected to the level switch.

4.10.3 Air Intake Dust Separator

To separate larger particles of dust out of the air sucked in, and thus to increase the service life of the air filter cartridge, we recommend that a cyclone dust separator (4.3/50) is attached. The attachment can be straight or angled, direct or via a hose.

4.10.4 Compressed Air Drying

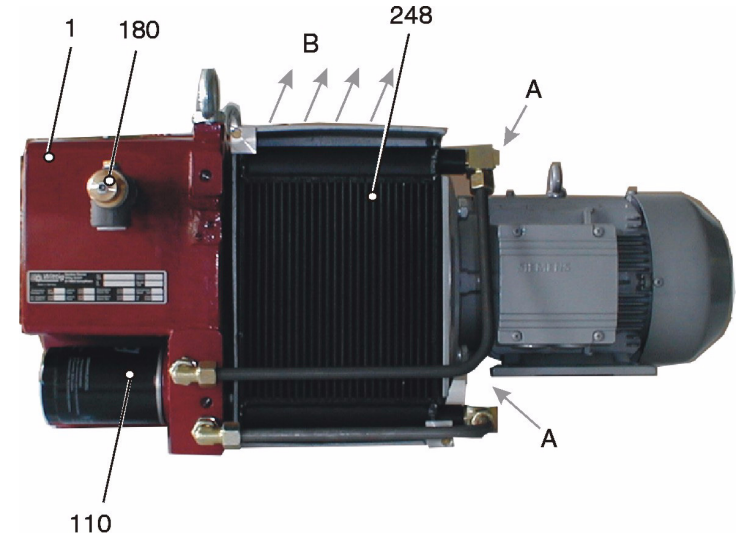
To dry the compressed air delivered, a highly effective adsorption dryer can be fitted after the compressor. Depending on the connecting frequency, this can be designed as a single- or twin-chamber dryer (see Figure 4.7).

Dryers fitted downstream from the compressor can lead to pulsation in the pressure line. In this case a pulsation damping valve must be fitted after the compressor (see Chapter 5.10).

4.10.5 Rubber Elastic Bedding

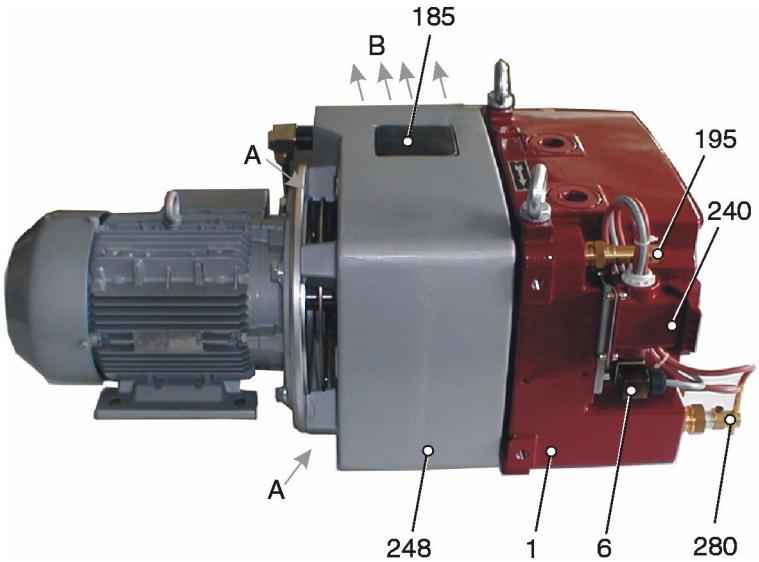
For elastic mounting, rubber elastic bedding can be supplied on request.

Views of Rotary Compressor Type ROL M



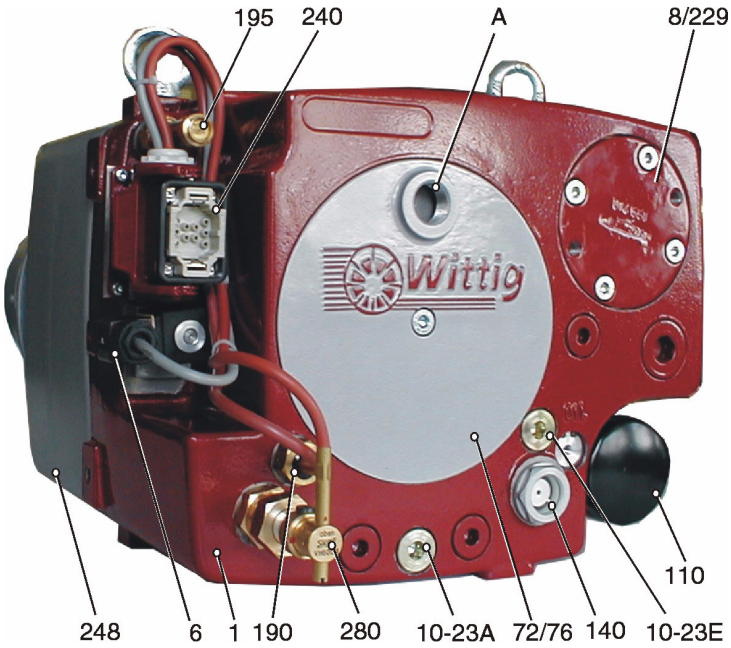
1	Compressor unit	A	Cooling air inlet
110	Oil filter	B	Cooling air outlet
180	Minimum pressure valve		
248	Block cooler, cooling air blowing direction front		

Figure 4.4 ROL M with block cooler (cooling air blowing direction front) and minimum pressure valve



1	Compressor stage	195	Safety valve	280	Oil level switch
6	Control valve for load-idling regulation	240	Harting plug (control connections)	A	Cooling air inlet
185	Cover for cleaning hole	248	Block cooler (rear view)	B	Cooling air outlet

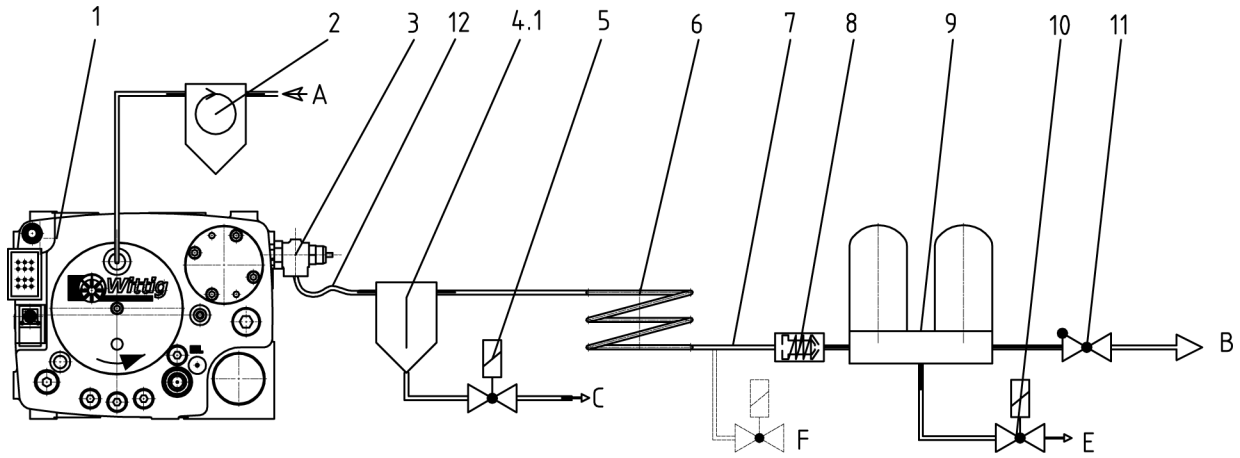
Figure 4.5 ROL M with block cooler (cooling air blowing direction rear) and load-idling intermittent regulation (delivery side)



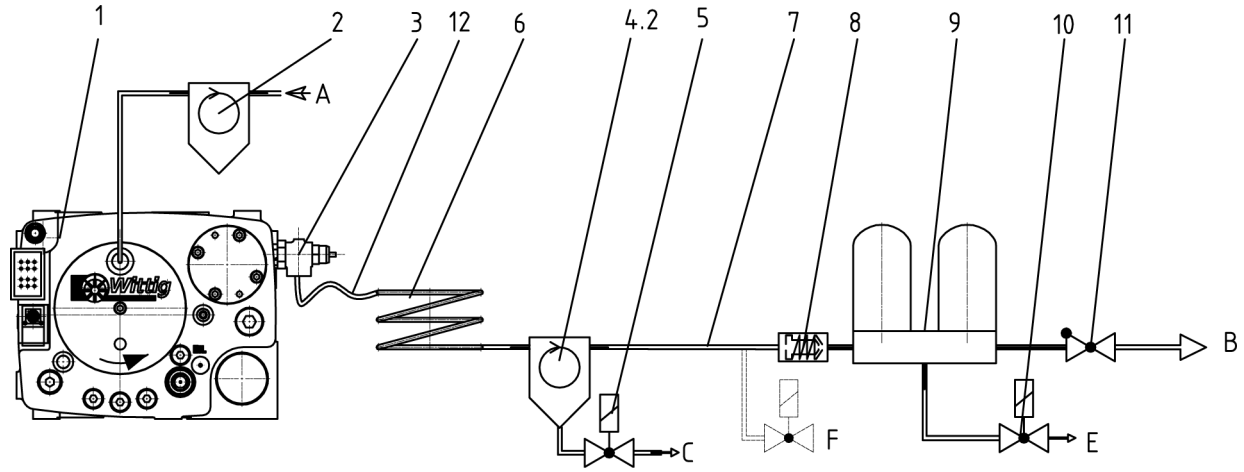
1	Compressor stage	10-23E	Oil filling screw	140	Oil inspection glass	248	Block cooler
6	Control valve for load-idling regulation	10-23A	Oil drain plug	190	Temperature switch	280	Oil level switch
		72	Air filter cartridge	195	Safety valve	A	Air intake drilling
8	Cap for air de-oiling element	76	Air filter cap	229	Air de-oiling element		
		110	Oil filter	240	Harting plug		

Figure 4.6 ROL M with block cooler and load-idling intermittent regulation

Wiring and instrument schematic of compressor system with flexible line / fine filter / cooling coil / pulsation damper valve / dryer / non-return valve



Wiring and instrument schematic of compressor system with flexible line / cooling coil / cyclone dust separator / pulsation damper valve / dryer / non-return valve



1	Compressor	7	Connecting line (compressor / fine filter / cooling coil/ dryer) nominal width DN20	A	Suction air inlet
2	Air intake cyclone pre-separator (optional)			B	To compressed air consumer
3	Compressed air outlet / minimum pressure valve	8	Pulsation damping valve(before dryer entry)	C	Condensation drainage (customer side, condensation contains oil!)
4.1	Fine filter - oil / separator	9	Absorption dryer (twin- or single-chamber)	E	Water drainage dryer
4.2	Cyclone dust separator / liquid strainer	10	Water drainage valve dryer	F	Relief valve (necessary for design without pos.4 and/or 8)
5	Solenoid valve for condensation drainage / relief	11	Non-return valve		
6	Cooling coil 1)	12	Flexible line G 1/2"		

Figure 4.7 Wiring and instrument schematics of compressor type ROL M

1 The cooling coil is of such dimensions that the temperature of the compressed air going into the dryer <50 °C. Higher temperatures result in poor separation of water. The temperature of the compressed air at the compressor is approximately 65-70 °C.

5. Installation

5.1 General Notes

We recommend that the installation and commissioning be carried out and/or inspected by our service technicians. We accept no liability for any damage resulting from improper installation.

The compressor unit is supplied ready for installation but **not filled with oil.**

During transport the compressor must only be lifted using the lifting bolts!

It is the responsibility of the installer who incorporates this machine into a compressed air system to declare conformity with Machinery Directive 2006/42/EC (CE marking). They must also supply adequate information to the end user (manuals, warning labels, etc.) regarding the safe operation of the compressor, i.e. rotating machinery, hot surfaces, pressurised machinery.

5.2 Selecting the installation position in the vehicle

We would be pleased to help you when choosing a suitable point of installation within the vehicle. Just contact us.

- The installation position in the vehicle must be easily accessible and protected from being struck by stones and water spray by suitable protective plates.
- If possible the compressor should not be directly exposed to relative wind.
- When installed above the roof, the drive motor for the compressor must be protected from direct sunlight (e.g. with suitable plate covering).
- The compressor must be installed in such a way that the maintenance side (the side with the air filter, oil filter, oil level display…) is accessible, so that the necessary inspections and maintenance work can be carried out without difficulty.
-
- Sufficient space must be provided for the line connections on the intake and delivery sides.
- The entire compressor unit including the drive motor should be installed in the vehicle on rubber elastic bedding (available from us as an accessory) that is secure under pressure and against sliding and that insulates structure-borne sound.

Good aeration and ventilation must be guaranteed in the installation position. For cooling air volume flow, see Chapter 5.7.

For ambient temperatures below -20 °C the compressor unit must be fitted with an oil sump heating device that can be switched on and off independently of the compressor. For ambient temperatures above -20 °C and a compressor duty cycle above 30%, the installation of an oil sump heating device can be omitted if oils are used in accordance with the specification in Chapter 7.4.

For operating overpressures >10 bar, the compressor should be operated with load-idling regulation in order to prevent the formation of condensation in the compressor!

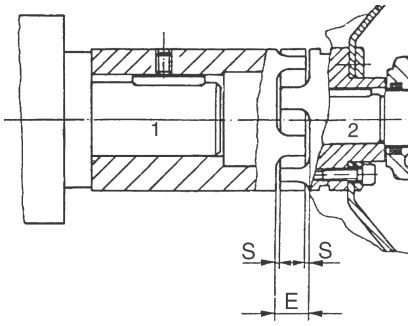
5.2.1 Fixing the unit

The compressor unit is fixed to the vehicle using M12 x 15 fastening drillings (see Figure 1.2/index4).

5.3 Drive

When installing the drive motor at a later stage, it must be possible to connect the two halves of the coupling easily.

Do not use force!
When attaching the coupling half onto the ends of the shaft, no axial force must be transmitted! The coupling half must therefore never be knocked into position, but screwed on using the screw thread on the face of the end of the shaft**.**



1 Motor end 2 Compressor end

Figure 5.8 Coupling play

Installation dimensions

Type	S [mm]	E [mm]
ROL 180-500 M	2,5	20 ±1,5

Mounting the V-belt drive

- Carefully ensure all surfaces align precisely on the driving and the driven shafts.
- The grooves on the pulley must not be misaligned.
- For uniform belt tension, select V-belt by length.
- Observe the V-belt manufacturer's instructions!
- Smallest permissible effective diameter of the pulleys = 140 mm.

5.4 Line connection

To prevent the ingress of condensation into the compressor, the pressure line from the compressor must be laid with a descending gradient. This guarantees that condensation flows into the pressurised container positioned downstream.

The compressor can become badly damaged by the ingress of condensation. In case of damage caused by the ingress of condensation due to an incorrectly laid pressure line, Gardner Denver Wittig shall not be liable with regard to warranty claims.

A flexible pressure tube must be fitted between the compressor and the customer's pressurised network in order to prevent vibrations from being transmitted to the line network.

Minimum diameter of the pressure line

Type	DN [mm]
ROL 190-500 M	DN 20

5.5 Air intake cyclone dust separator

The air intake cyclone dust separator must be fitted as close as possible to the air inlet. Ideally it is screwed into the screw thread in the air inlet using an adapter.

The direction of the air intake passing through the unit must be the same as that of the arrow on the cyclone dust separator.

With regard to models with dust and liquid extraction openings, these must face downwards.

5.6 Oil filling

The compressor is supplied without a filling of oil! Oil must be filled before commissioning of the machine (see Chapter 7.3)!

5.7 Cooler

The oil fed to the compressor stage is re-cooled by a heat exchanger. The cooling air volume flows for series ROL 190…500M compressors are shown in the following table.

Type ROL M	Operating pressure	Block cooler cooling air volume flow	Block cooler maximum cooling air intake temperature 1) 3)	External oil cooler, air cooled cooling air volume flow	External oil cooler, air cooled	External oil cooler, air cooled max. cooling air intake temperature	External oil cooler, water cooled 2) cooling water flow
Size	[bar]	[m^3/h]	[°C]	[m^3/h]	GDW-No.	[°C]	[l/hr]
190	11	600	50	650	432 953 00	50	450
	13		50				500
280	11	600	50	650			610
	13		50				700
400	11	700	45	800	432 951 00		800
	13		45				900
500	11	700	40	800			1000
	13		40				1150

1) Temperature of the air sucked in by the cooler blower
2) Calculated for 50/50 alcohol/water mix ratio, Twin = 70 °C, Twout = 75 °C
3) for n = 1500 rpm.

5.7.1 Installation notes for external cooler pack

- The maximum length of the line between the cooler and the compressor is 1 metre.

Lines longer than this are not permissible without consulting us, as the oil injection pressure is impaired and the compressor can be damaged.

- The temperature in the installation room for the external oil cooler (=cooling air intake temperature) should not exceed the limiting values stated in the table.

- The cooler pack must be installed in such a way that the oil flows upwards from below through the cooler.

- If the cooler is mounted below the level of the compressor, an oil drain tap must be fitted in the oil cooler or in the connecting line at the lowest point.

5.7.2 Hose connections

When screwing in the oil inlet and outlet lines on the cooler, the torque on the muff hexagon must be supported. Failure to observe this can lead to leaks in the muff soldering point.

Nominal width of the cooling oil hoses

Type	DN [mm]
ROL 190/280/400/500 M	DN 12

The cooling oil hoses must have a Teflon or Viton core and fulfil the requirements of DIN 20024. It is possible order suitable tubing from us.

5.8 Relief valve

On the vehicle side a relief valve must be installed in the pressure line between the compressor and the nonreturn valve on the compressed air reservoir, if the devices fitted downstream from the compressor have no relief capabilities, which release the pressure between the compressor and the nonreturn valve/compressed air reservoir when the compressor cuts out.

For arrangements of units in accordance with Figure 4.7, it is possible not to use external relief, if pos. 5 and/or pos. 10 opens when the system cuts out.

When restarting the compressor against the relieved pressure line, the run-up power required by the electric motor is smaller, which means that excessive heating of the electric motor coil is opposed during frequent start-stop cycles.

The relief valve must be switched in such a way that, when the maximum operating temperature is reached and the drive motor is switched off, it opens and slowly (at least 10 - 15 seconds) relieves the line network to approximately atmospheric pressure.

The pressure in the compressor before the minimum pressure valve lies between approximately 1.8 and 2.2 bar overpressure after pressure relief of the vehicle side network.

5.9 Electrical connection to the mains

The compressor is prepared in our works for connection to the vehicle controls.
The electrical connections must be carried out by a **specialist electrician**.
Before connecting the electrical lines, the voltage, frequency and requisite strength of current must be checked.

We can on request supply an electrical plan for the compressor unit.

After the electrical connections have been made, the direction of rotation should be checked in accordance with Chapter 7.5.

5.10 Pulsation in systems connected after the compressor

If any devices are connected downstream from the compressor, which cause abrupt pressure surges (pulsation) (e.g. dryers), a pulsation- damping valve must be fitted downstream from the compressor.

Abrupt pressure surges (pulsation), caused in the compressed air network downstream from the compressor by for example system-related processes in the dryer (drying, regenerating, water drainage), lead to faulty operating behaviour in the compressor!

To improve the quality of the compressed air even more, a cyclone dust separator and/or a fine filter can additionally be fitted downstream (see Figure 4.7).

6.1 Pressure control and pressure monitoring

For the control and monitoring of pressure, suitable regulating and control elements must be fitted by the customer and set up in such a way that the compressor's operating data can be maintained (see Chapter 1, Technical Data).

6.1.1 Safety valve

To ensure that the maximum permissible operating overpressure is not exceeded, a safety valve (6.1/195) is fitted on the integral oil supply container in accordance with German accident prevention regulations (VBG 16 and DGRL). Please observe national regulations regarding safety items.

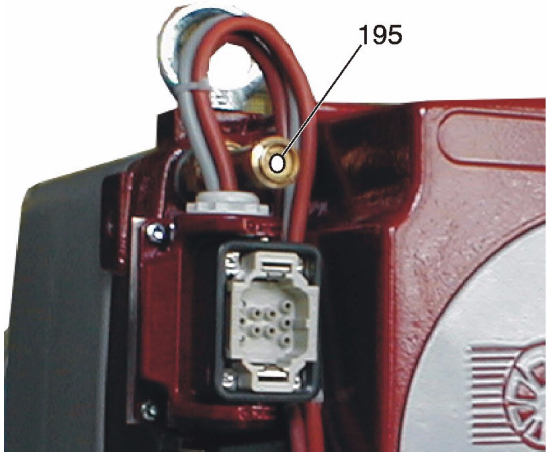


Figure 6.1 Safety valve

Risk of explosion!
Manipulating the safety valve causes risk of increased pressure and temperature.

To vent the system, the cap on the safety valve should be turned ANTI-CLOCKWISE as far as it will go and kept open until no more compressed air escapes.

After bleeding the overpressure, **always** turn the cap on the safety valve CLOCKWISE again as far as it will go.

Inspecting the safety valve

To inspect the safety valve, the pressure monitor on the vehicle must be bridged, in order to prevent the compressor from being switched off. To achieve this, a bridging switch can be installed in the control system.

In addition, a manometer must be connected between the compressed air outlet on the compressor and the main stop valve on the delivery side (by the customer).

When the compressor is running, the main stop valve on the delivery side is closed until the safety valve opens as a result of the rise in pressure.

The opening pressure can be read off the manometer.

Pressure is as follows:

Compressor final overpressure [bar]	**Threshold safety valve [bar]**
10	12
12	14

If the pressure rises above the permissible value, the compressor must be shut down immediately.

If the opening pressure for the safety valve does not lie within the necessary range, the safety valve must be inspected and if necessary replaced. In this case please notify our customer service department.

6.2 Control and monitoring of cooling

6.2.1 Thermostat

To prevent the formation of condensation in the compressor casing during operation, the final compression temperature is regulated by means of a thermostatic valve fitted in the oil circuit. The oil is only fed through the cooler once the oil temperature rises above 75 °C.

As the formation of condensation depends on the air inlet and outlet temperatures, on the compression ratio and on the relative air humidity, care should be taken to ensure that the compressor is run within the specified temperature limits.

The operating temperature for the compressor must lie between 75 and 90 °C. In intermittent operation care must therefore be taken to ensure that the cut in intervals are sufficiently long.

If the operating temperature is not achieved (see above) during intermittent operation, there is a risk of condensation entering the oil circuit.
This leads to the oil aging prematurely with possible pigmenting of components and the compressor failing. Any repairs must only be carried out by our customer service department.
Should the requisite operating temperature not be achieved during intermittent operation due to a very short duty cycle, the compressor's control system must be adjusted. Our customer service department will be pleased to assist in this.

In the meantime the compressor must not be run in intermittent operating mode.

The external cooler pack that is also available includes a cooler blower that also has temperature-dependent switching and cuts in and out at oil temperatures of 75 °C and approximately 70 °C respectively.

The switch activation of the cooler blower is temperature-dependent and it can therefore suddenly start running if the control power supply is switched on, even when the compressor is not running.

6.2.2 Temperature safety valve

According to German accident prevention regulations (UVV "compressors", VBG 16) the final compression temperature in oil injection compressors for installation in rail and motor vehicles must not exceed a maximum of 110 °C.

Compressors are equipped with safety switches (break contacts), which shut down the compressor at 105 °C

The overheating safety switches must be connected by the customer in such a way that the compressor is switched off when the cut out point of 105 ºC is reached.Gardner Denver Wittig shall not be liable regarding any warranty claims for overheating damage resulting from incorrectly connected overheating safety switches.

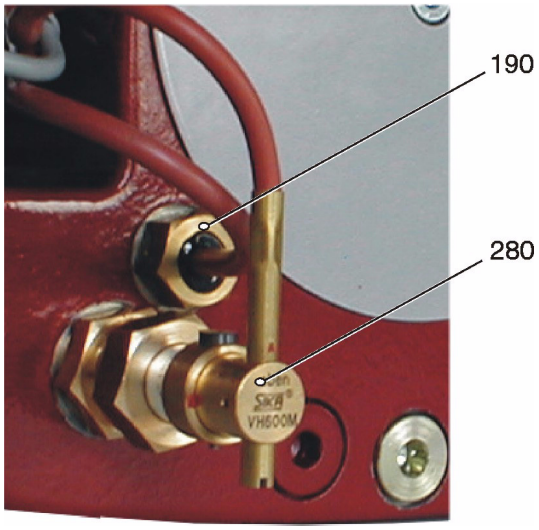


Figure 6.2 Temperature safety switch (190)

6.3 Pressure and volume flow regulation

There is a regulator with a nonreturn valve with a combined function mounted on the air intake fitting of the compressor step.

The following description is based on the assumption that the customer has installed suitable pressure monitors.

Load-idling regulation

When the maximum operating pressure (pmax) set on the pressure monitor is reached, the control valve (4.6/6) opens. The control air now flowing through closes the intake regulator. The air intake is closed.

The compressor is simultaneously discharged by the relief valve (customer side, see Chapter 5.8) to a minimum pressure of approximately 2 bar overpressure. The compressor now runs in idling mode.

Long running times for the compressor during idling mode can be avoided by installing a time lag relay.

If the network pressure falls below the minimum pressure setting (pmin) on the pressure switch (supplied by the customer) during the idling phase, the control valve closes, the intake regulator opens and the compressor goes into delivery operating mode.

If on the other hand the time interval expires on the additionally installed time lag relay without the network pressure falling below the minimum pressure setting, the drive motor is switched off. It is only switched on

again when the network pressure falls below the minimum setting.

Intermittent regulation

The drive motor switches off when the maximum operating pressure (pmax) setting on the pressure switch is reached. The line network must be vented via a relief valve installed by the customer (see Chapter 5.8).

If the network pressure falls below the minimum pressure setting (pmin) on the pressure switch (installed by the customer), the drive motor is restarted.

Care must be taken during intermittent regulation in particular to ensure that the permissible connection frequency for the drive motor is not exceeded.

6.4 Oil level monitoring

Compressors in the ROL M series can on request be equipped with a level switch, which may be connected as either a make contact or a break contact.

Oil level monitoring in vehicle-mounted compressor units is made simpler by connecting suitable warning devices (warning tone, warning lamp). It is even possible to achieve a complete compressor shut down in case of lack of oil by using the oil level switch.

It is recommended that a time lag relay (delay approximately 2 minutes, depending on the travel distance and the operating mode of the vehicle) be connected between the level monitor and the warning device. Doing this prevents the warning device from cutting in when the oil level is below the minimum oil level for short periods of time, e.g. when going round corners.

For further information regarding the level switch, please refer to the installation and operating instructions relating to the level switch.

7.1 General notes before commissioning

With regard to the operation of compressors it is essential to read the accident prevention regulations for compressors and pressure vessels (e.g. in Germany: VGB16/DGRL) before setting up and operating. Please observe national regulations regarding safety items.

The presence of components contained in the air that are aggressive or that form residues can lead to damage being caused to the compressor and to a reduction in the oil service life. Sufficient air preparation is therefore essential.

Please pay particular attention to our notes on commissioning and maintenance, which are intended to allow identification of faults and impairments before any damage is caused to the compressor.

Any damage resulting from gas-related deposits and reactions - whether by contamination, by condensation or chemical reaction - as well as any damage resulting from failure to change the oil at the correct time is excluded from the warranty.

Before commissioning the compressor after a long period without use (longer than 6 months) or after frequent very short connecting intervals (e.g. during testing operation for the vehicle), we recommend that our specialist installation staff carry out an inspection.
In this case an oil change must be carried out before the compressor is initiated, as the quality of the oil is severely reduced by the formation of condensation during the operating conditions mentioned.

7.2 Inspection of installation and mounting

The following checks must be carried out with a positive result:

- No transportation or mounting damage to the entire compressor unit
- Screw and flange connections are secure
- Proper mounting of compressed air lines and any accessories
- Oil is filled in accordance with regulations, oil level at the lower rim of the oil filling fitting
- The oil filling screw is firmly closed
- The main stop valve on the pressure line is open.

7.3 Oil filling

The compressor is supplied without a filling of oil! Oil must be filled before commissioning the compressor!

Fill oil via the filler (7.1/10-23E) into the integral oil supply container in accordance with the following specification.

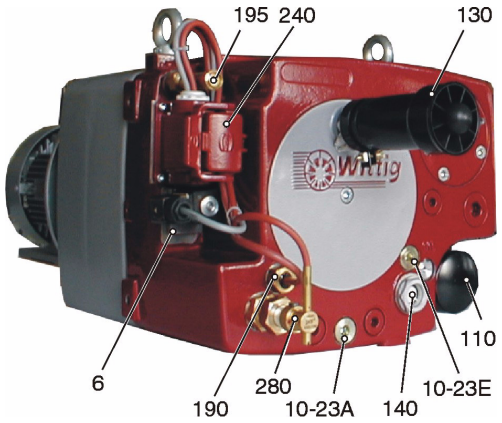


Figure 7.1 Filling with oil

The oil filling screw must only be opened when the unit is switched off and not pressurised.Secure the compressor against unintentional switching on. Ensure the compressor is horizontal in order to fill with oil to the correct level.

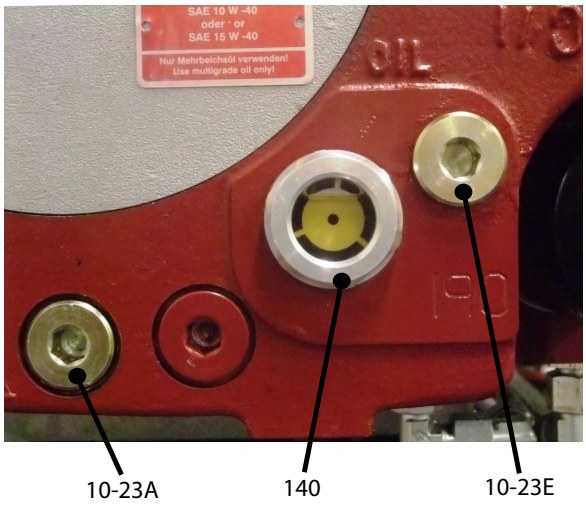
- Vent the compressor casing using safety valve (7.1/195), release the overpressure completely.
- Open the oil filling screw and fill with oil (7.1/10-23E) until level with the hole.

Filling volume

Type		ROL 190-500 M
Oil filling	litre	2,0

Do not fill above the plug level, allow excess oil to drain out. Oil level should always be below the top of the sight glass (7.2/140).

Figure 7.2 Oil Level



Close the oil filling screw (7.2/10-23E) securely again after filling and screw the cap on the safety valve (7.2/195) back into position.

Whilst functional checks are performed (7.8/ 7.9) ensure the oil level is above the lower edge of the inspection glass (7.2/140). After completing the functional checks, switch off, de-pressurise & secure the compressor from unintentional starting. Remove the oil filling screw (7.2/10-23E) & check the oil level is correct.

7.4 Oil specification

7.4.1 Approved oil types

The compressor must only be operated using multigrade oils or synthetic oils with the following specifications or other oils that can be proven to be equivalent.

7.4.1.1 Multigrade motor oils

Lubricating cooling oil specification for normal operating conditions:

Multigrade motor oils	SAE 10 (15) W-40:

Manufacturer	Designation
ARAL	Multi Turboröl SAE 15W-40
BP	Vanellus FE 10W-40
DEA	Cronos Super DX SAE 15W-40
ELF	ECOMAX FE PLUS 10W-40
ESSO	Essolube XT-201 SAE 15W-40
MOBIL	Delvac 1400 Super 15W-40
SHELL	Myrina TX 10W-30
WINTERSHALL	Multi-Rekord 15W-40

7.4.1.2 Synthetic oils

Synthetic oils	MIL-L 2104C or L 2104 D API CC/SF or CD/
ARAL	Super Tronic; SAE 0W-40
ANDERÖL	Anderol 900; SAE 5W-40
MOBIL	Delvac 1; SAE 5W-40

The oils mentioned have been tested by us and approved with regard to their suitability and service lives.

Please take note that all warranty claims are null and void when an oil type is used that has not been approved by us!

7.4.2 Oil service life

The oil service life may be significantly reduced by varying concentrations of contaminants. We therefore recommend that you have the manufacturer inspect the oil and - if necessary - determine new oil changing intervals (see also Chapter 9.2).

7.5 Direction of rotation

To check the direction of rotation, a rotation direction arrow is located on the intermediate flange.

Switch the drive motor for the compressor step ON briefly and then OFF again immediately. Check the direction of rotation on the coupling.

If the drive is switched on several times in rapid succession, damage to the coil can be expected as a result of thermal overloading.

Also check that the fan motor on the external cooler pack - if one is installed - rotates in the correct direction when this is switched on at the final compression temperature of 75°C. The direction of rotation is correct when the fan blows air through the cooler.

7.6 Oil sump heating

If the ambient temperature is below -25°C, oil sump heating with a 120 W heating rating must be switched on for at least 30 minutes, whereas oil sump heating with a heating rating of 200/240 W (accessory) must be switched on for at least 15 minutes before starting, and the oil pre-heated.

7.7 Switching on the compressor

- Switch on the motor in accordance with the manufacturer's specification.

7.8 Functional inspection

Carry out the following inspections while the compressor unit is switched on:

7.9 General functioning

- All connections are secure
- Final compression pressure has been reached
- Fan motor on the external cooler pack switches at final compression temperature of approximately 75 °C.
  Direction of cooling air is correct.
- Final temperature is in order, between 75 °C and 90°C (see Chapter 6.2.1)General functioning

7.10 Inspection of vehicle pressure switches

- The pressure switches installed on the vehicle side for volume flow regulation must be checked for correct functioning in accordance with manufacturer's specifications.

8. Operating faults, causes, remedies

This machine is intended to compress air automatically controlled by demand from components within a pressurised air system. The compressor is liable to start without warning, is pressurised whilst at rest & can reach temperatures of 105 deg C. Operating faults should be investigated by qualified personnel familiar with the machinery & these operating instructions.

Fault	Possible cause	Remedy
8.1 Compression temperature too high, max.100°C	✗ Cooling air and/or intake temperature is too high	✓ Ensure improved aeration and ventilation of the installation room
	✗ Wrong oil being used	✓ Fill oil in accordance with specification (see Chapter 7.3)
	✗ Oil level too low	✓ Check oil level, top up oil if necessary (Chapter 7.3)
	✗ Oil filter (7.1/110) contaminated	✓ Take out oil filter and replace cartridge (Chapter 9.6)
	✗ Oil badly aged	✓ Change the oil. Clean all parts that come into contact with oil. Replace oil filter and air de-oiling element (Chapter 9.6 / Chapter 9.8)
	✗ Oil cooler badly contaminated on oil and cooling air side	✓ Clean the oil cooler
	✗ Thermostatic valve in oil circuit is defective	✓ Inspect the valve and replace if necessary
8.2 Volume flow too low	✗ Intake regulator with nonreturn valve (4.1/B) does not open	✓ Remove and inspect regulator with nonreturn valve
	✗ Control solenoid valve does not close	✓ Inspect valve, replace entire valve if necessary
	✗ Wrong oil being used	✓ Fill new oil in accordance with specification (see Chapter 7.3)
	✗ Minimum pressure and nonreturn valve is defective	✓ Remove minimum pressure and nonreturn valve, inspect, and replace if necessary (Chapter 9.11)
	✗ Air intake filter blocked (4.6/248)	✓ Clean filter, replace cartridge if necessary (Chapter 9.5)
	✗ Air intake cyclone dust separator (accessory) contaminated	✓ Inspect air intake cyclone dust separator, clean if necessary (Chapter 9.3)
	✗ Relief valve (supplied by customer) does not close	✓ Check pressure switch (supplied by customer) and valve

Fault		Possible cause	Remedy
8.3	**Large quantity of oil at the compressed air consumption point**	✗ Nozzle with nonreturn valve in the oil intake line is blocked or nonreturn valve is defective	✓ Remove nozzle with nonreturn valve, check, clean or replace if necessary, completely replace nonreturn valve
		✗ Air de-oiling element (4.6/229) contaminated, defective or not mounted correctly (O-ring seal)	✓ Check air de-oiling element and replace if necessary (Chapter 9.8). Ensure air de-oiling element is positioned correctly.
		✗ Wrong oil being used	✓ Fill new oil in accordance with specification (see Chapter 7.3)
		✗ Downstream cyclone dust separator (accessory) not functioning perfectly	✓ Check cyclone dust separator, drain condensation if necessary (Chapter 9.3)
		✗ Downstream fine oil strainer (accessory) contaminated	✓ Take out fine strainer, inspect and replace filter set if necessary
		✗ Strong pulsation in the compressed air line, e.g. due to air dryer	✓ Fit pulsation damper and/or fine strainer, see Figure 4.7.
8.4	**Intake regulator with nonreturn valve does not close or open**	✗ Control solenoid valve (4.6/6) defective	✓ Check valve is functioning correctly, replace if necessary
		✗ Pressure monitor (supplied by customer) defective	✓ Check pressure switch's initial values are intact using circuit diagram, replace if necessary
		✗ Pneumatically controlled regulator piston with nonreturn valve jammed	✓ Remove regulator piston and make sure it moves smoothly, have compressor serviced by authorised workshop
8.5	**Noisy operation of compressor**	✗ Oil badly aged	✓ Change the oil, dismount the compressor, check and clean all parts that come into contact with oil. Change oil filter and air de-oiling element (see Chapter 9.6/Chapter 9.8) Make positive identification of cause of fault and rectify!
		✗ Bearings defective, rotor vane or casing defective	✓ Have the compressor serviced by authorised workshop
8.6	**Compressor system has switched off and/or cannot be restarted**	✗ Overpressure switch (supplied by customer) has switched off the compressor	✓ Pressure switch set too high for regulator control system
		✗ Final temperature too high, overheating safety switch(connection by customer) has switched off compressor after reaching 105 °C	✓ Ensure better room aeration; clean cooler if necessary, change oil & oil filter (Chapter 9.6), clean oil cooler, check thermostat in oil circuit & replace if necessary
		✗ Overload relay or PTC-resistor sensor on the drive motor has cut in	✓ Room temperature and/or cooling air temperature too high at motor. Ensure better aeration and ventilation. Check motor and compressor, return to works if necessary
8.7	**Oil leaking on compressor drive shaft**	✗ Rotary shaft seal not sealed	✓ Have the compressor serviced by authorised workshop.
		✗ Axial face seal on the drive shaft not sealed	✓ Have the compressor serviced by authorised workshop

Fault		Possible cause	Remedy
8.8	**Oil leaking in air intake regulator**	✗ Intake regulator or nonreturn valve jammed	✓ Remove intake regulator with nonreturn valve and check it functions correctly. Replace parts if necessary
		✗ O-ring on intake nonreturn valve damaged	✓ Replace intake nonreturn valve completely
8.9	**Compressor Pressure Relief Valve Operating**	✗ Air system blockage (Faulty Components, ice)	✓ Stop machine and check air system

After switching off the compressor, it should no circumstances be started again without having established the cause!

If necessary, please contact Gardner Denver Wittig Service Department. See final page for address and telephone number.

9. Maintenance

9.1 Maintenance schedule

Important notes that must always be observed!

- All maintenance work should be carried out with the **compressor unit switched off** and **de-pressurised**! Secure the compressor against unintentional switching on!
- **Accident hazard!**
  Vent the unit using the safety valve (Chapter 6.1).
- **Pressure check** at the manometer (supplied by customer)!
- For checking and maintenance purposes and for any repairs, only one safety function may be switched off at a time!
- Erect a warning sign **"CAUTION MAINTENANCE WORK!"**
- When using cleaning agents always make sure to:
  Observe the safety regulations!
  Use suitable cleaning agents!
  Remove the cleaning agent completely, particularly in the oil circuit!

Maintenance and check points	Figure / position	See chapter	Service Hours or time period [1]			
			200 or every month	1000 or every 6 months	1500 or every year	3000 or every 2 years
Check oil level	9.1/140	9.2	•			
Check V-belt tension		c.m.s.[3]	•			
Check air intake cyclone dust separator (if installed), clean if necessary	9.2/130	9.3		•		
Vent safety valve	6.1/195	6.1.1		•		
Clean strainer assembly in oil intake line	9.3/63	9.4		•		
Clean air filter assembly, replace if necessary	9.4/72	9.5			•	
Replace compressed air dryer & cartridge, clean upstream water filter/fine filter, renew if necessary		c.m.s.[3]			•	
Change the oil (see separate table)		9.2				
Change oil filter	9.4/110	9.6			•	
Clean oil cooler		9.7			•	
Change air de-oiling element	9.6, 9.7	9.8			•	
Check oil level switch	9.2/280	9.9			•	
Air intake regulator with nonreturn valve	9.8	9.10				•
Check/clean minimum pressure and nonreturn valve	9.9	9.11				•
Compressor stage		9.12	Preventive maintenance after 10,000 operating hours or 8 years			
Hose lines and compensators		9.13	Replace after 10,000 operating hours or 6 years			

[1] depending on which event occurs first
[2] only ROL 400 + 500 M
[3] as per component manufacturer specification

9.2 Oil level check / oil change

Oil change interval				
Type ROL-M	**190**	**280**	**400**	**500**
Change interval for motor oil in [h] 1)	2000	1800	1500	1500
Change interval for synthetic oil in[h] 1	4000	3800	3000	3000

1) Oil change at least once a year

The oil change intervals can be extended after consultation with our works and the oil producer. However, to do this it is necessary to have the oil quality tested by a specialist.

Regular monitoring of the oil quality is necessary to guarantee long service life for the oil and fault-free operation of the compressor unit.

The oil in the oil container must be changed regularly.

The service life of the oil depends on the operating conditions and the final temperature. If the unit is not run within the operational limits specified in Chapter 6.2, the service life of the oil is reduced accordingly.

Any damage resulting from failure to change the oil at the correct time is excluded from the warranty.

Oil level check

Vent the compressor safety valve (Chapter 6.1.1).

Visual check at the oil inspection glass (9.1/140). The oil level must be above the lower edge of the inspection glass. The maximum level is pre-determined by the position of the oil filling hole and should always be below the top of the sight glass (9.1/140)

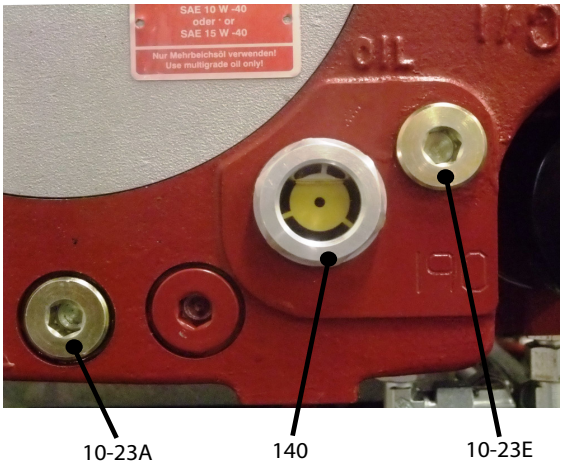


Figure 9.1 Oil level check at the inspection glass/Oil Filling Screw

No angles/extensions must be screwed into the oil filling hole, as this can lead to the compressor being overfilled, which can cause damage! Too low an oil level can lead to damage as a result of insufficient lubrication!

Procedure:

- Vent the compressor safety valve (Chapter 6.1.1).
- Unscrew the oil filling screw & check the level. Add oil as required to bring it level with the hole.

Do not fill above the plug level, allow excess oil to drain out

Oil Change

The oil must be changed when the unit is warm, but switched off and de-pressurised: the oil temperature should be 30 to 40 °C.

Procedure:

- Check the pressure on the manometer (vehicle side).
- Unscrew the oil drain plug (9.1/10-23A) on the oil container.

Drain oil into a suitable receptacle, empty the unit completely and dispose of the old oil in an environmentally acceptable way.

- Screw the oil drain plug (9.1/10-23A) back in again.
- Unscrew the oil filling screw (9.1/10-23E) and fill with new oil. For filling volume and oil type, see Chapters 7.3 and 7.4.

Do not fill above the plug level, allow excess oil to drain out. The oil level should always be below the top of the sight glass (9.1/140).

- Screw the oil filling screw (9.1/10-23E) firmly closed
- Operate the machine until the final compression pressure is achieved
- Switch off, de-pressurise & secure the compressor from unintentional starting.
- Remove the oil filling screw (7.1/10-23E) & check the oil level is correct.

9.3 Air intake cyclone dust separator

If the compressor is equipped with an air intake cyclone dust separator in accordance with Figure 9.2/130 (optional), its dust extraction opening must be checked regularly - every 1000 hours or every 6 months - and cleaned if necessary.

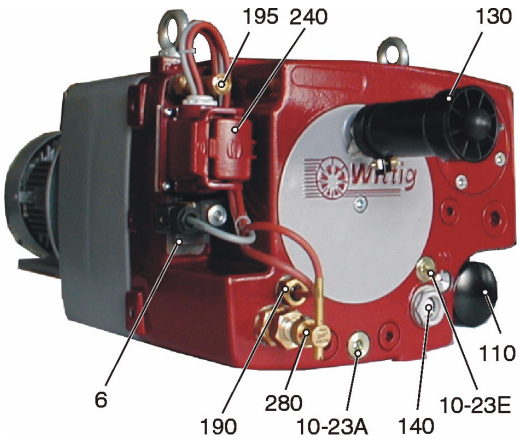


Figure 9.2 Air intake cyclone dust separator

9.4 Strainer assembly in the oil intake line

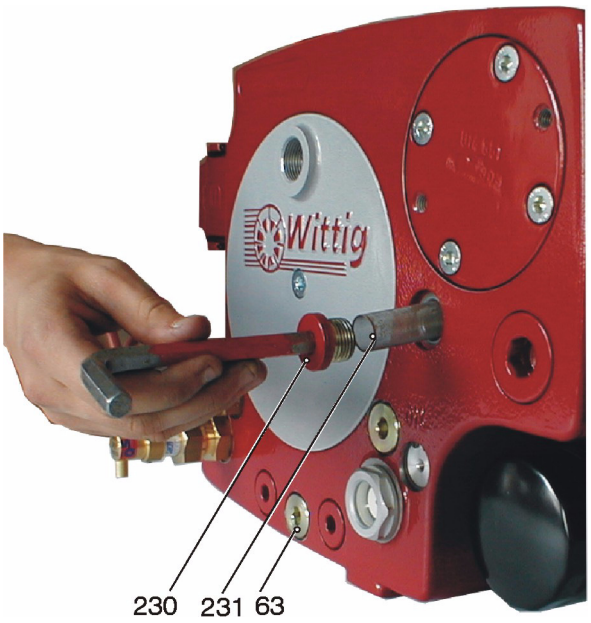


Figure 9.3 Cleaning the strainer assembly

To guarantee perfect functioning of the oil intake, the strainer assembly must be cleaned as follows every 1000 service hours or at least after 6 months.

- Vent the compressor in accordance with Chapter 6.1.1.
- Unscrew socket pipe plug with hexagon socket screw key (9.3/230).
- Remove strainer (9.3/231) from the bore and remove contamination (with cleaning agent and compressed air); when doing this ensure at the same time that the nonreturn valve (remains in the compressor casing) nozzle bore is not blocked.
- Insert the strainer and screw the socket pipe plug firmly closed again.

9.5 Air intake filter

The air filter assembly must be replaced in accordance with the maintenance schedule in 9-1 and/or depending on the degree of contamination of the intake air.

If necessary the air filter assembly can be cleaned once and then inserted again.

- Unscrew the socket head cap screw (9.4/94).
- Take off the lid (9.4/76) of the filter housing and take out the filter assembly (9.4/72).
- To clean, tap out the filter assembly and clean from the inside outwards with compressed air.
- Cleaned or new filter assembly to be inserted again in the reverse order.

Make sure the conical nipple on the filter lid is in the correct position.

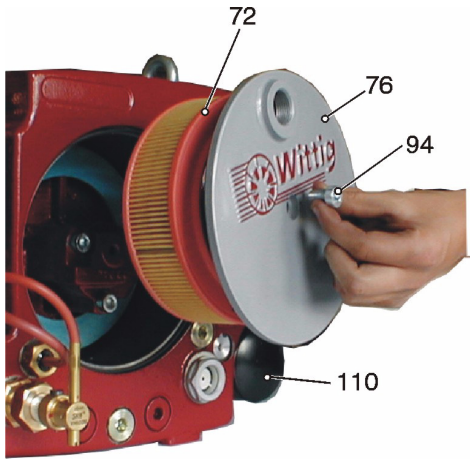


Figure 9.4 Extraction and insertion of air intake filter assembly

9.6 Oil filter

The oil filter cartridges should be changed in accordance with the maintenance schedule in Chapter 9.1.

It is recommended that the oil filter change and the oil change be carried out together..

- Vent the compressor in accordance with Chapter 6.1.1.
- Drain the oil in accordance with Chapter 9.2
- Loosen and unscrew the filter cartridge (9.4/110) with a draw spindle screw by turning ANTI-CLOCKWISE and dispose of it in an environmentally acceptable way.
- Cover the conical nipple on the new oil filter cartridge with film of oil and mount the new filter cartridge by turning CLOCKWISE (screw firmly closed by hand to approximately 10 Nm)
- Fill with oil before commissioning again (see Chapter 7.3).

9.7 Oil cooler

To ensure that the cooling function continues to operate sufficiently well, the oil cooler must be cleaned at least every 1500 service hours or at the latest after one year.

Cleaning the block cooler and external cooler pack:

- The block cooler is installed in the intermediate flange on the compressor unit. To clean the cooler lamellas from the inside (cooling air inlet side), the plastic cap must be removed (see Figure 9.5).

Figure 9.5 Cleaning the cooler

- Clean the cooler lamellas carefully and blow compressed air through the cooler against the direction of flow.

If the cooler is removed for cleaning, it should be installed again in accordance with Chapter 5.7!

9.8 Air de-oiling element

The air de-oiling element must be changed in accordance with the maintenance schedule in Chapter 9.1.

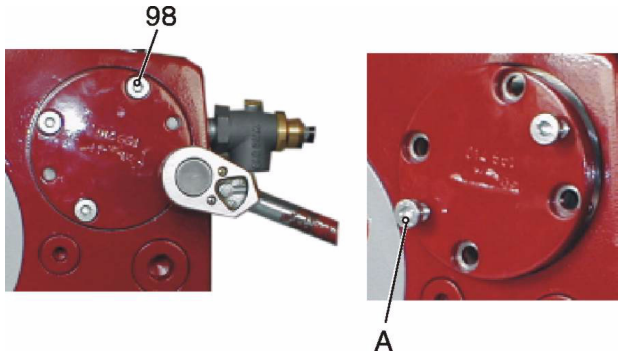


Figure 9.6 Removing the air de-oiling element

The de-oiling element must only be changed with the compressor switched off, with the power supply disconnected and de-pressurised!

- Unscrew four screws (9.6/98).
- Screw two of these screws into the screw thread (9.2/A) and use them to pull the lid with the air de-oiling element out of its seat.
- Unscrew the filter assembly on the de-oiling element (9.7/95) from the lid by turning ANTI-CLOCKWISE.

The O-rings (9.7/147) and flat packing (9.7/52) must be renewed.

Assembly in the reverse order:

Make sure that the flat packing and the O-rings are not damaged.

- Lubricate the O-rings and the flat packing.
- Mount the new air de-oiling element (hold on the end cap) on the lid by turning CLOCKWISE by hand (torque approximately 5 Nm).

- Gently twist the filter lid with the de-oiling element fixed on it while inserting.
- Screw the lid with the de-oiling element firmly closed again.

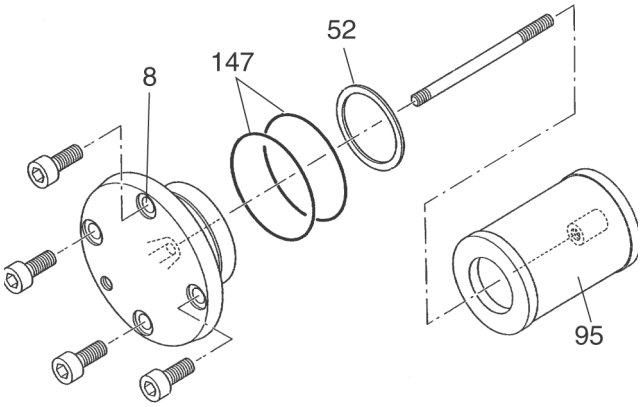


Figure 9.7 Air de-oiling element / individual parts

9.9 Oil level monitor

The oil level switch (accessory) must be checked for correct functioning in accordance with the maintenance schedule in Chapter 9.1.

It is sensible to carry out an inspection of the level switch when changing the oil.

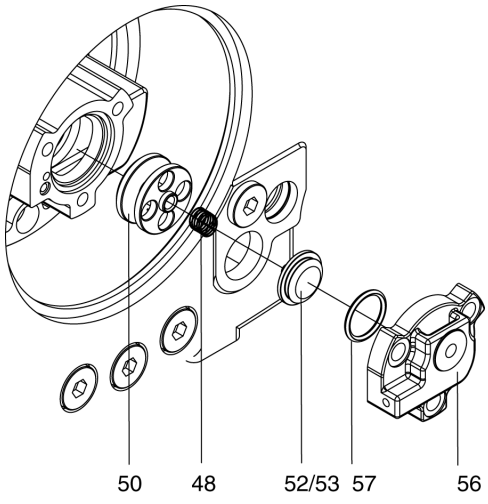
- Connect a suitable pilot lamp on the oil level switch
- Drain the oil in accordance with Chapter 9.2
- When the level switch indicates a level below the screw level of the level switch, the connected pilot lamp must switch on! Otherwise remove the level switch, check and renew if necessary.

If the compressor is running with a defective oil level alarm and as a result of this low oil is not identified, the compressor can suffer damage.

9.10 Air intake regulator with nonreturn valve

The air intake controller with non-return valve must be inspected in accordance with the maintenance plan and the seal (9.8/57) replaced.

Do not use force when installing the intake regulator; the conical nipple (9.8/57) must not be damaged.



48	Pressure spring for non-return valve	52/53	Nonreturn valve
		57	Conical nipple
50	Air intake regulator	58	Casing cover

Figure 9.8 Air intake regulator with nonreturn valve ROL M

9.11 Minimum pressure and nonreturn valve

The minimum pressure non-return valve (9.9/180) must be inspected in accordance with the maintenance plan.

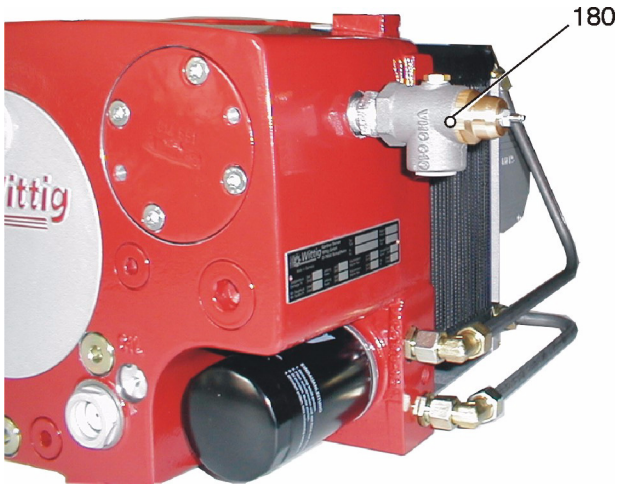


Figure 9.9 Minimum pressure valve (180)

9.12 Compressor stage

Maintenance of the compressor stage is generally not necessary.

Should any abnormal noises occur, the compressor stage should only be serviced by specialists authorised by the manufacturer.

After approximately 10000 service hours and/or
8 years we recommend that our specialists inspect the compressor stage as a preventative maintenance measure (bearings, rotor vane, axial face seal).

A summary of authorised workshops can be found in the contract documentation or can be obtained from our service department.

9.13 Hose lines and compensators

The operation and service life of hose lines (oil line for use of external oil cooler) and compensators (flexible connection between compressor and compressed-air outlet to the compressed-air recooler) can be impaired by vibrations, external factors and aging. We therefore recommend that all hose lines and compensators are checked

- at least once a month
- within the framework of maintenance work
- before commissioning after long periods without operating

for external damage, tears and leaks and that they be replaced immediately if necessary.

Furthermore, we recommend preventative replacement of all hose lines and compensators every 10000 service hours or every 6 years (including a storage period of 1 year), even if there are no evident signs of safety-related faults.

9.14 Motor

The operation and maintenance instructions issued by the relevant motor manufacturer must always be observed!

Maintenance of the drive motor after commissioning is generally restricted to:

- temporary observation of the bearings
- checking air passages
- condition of pertinent switching devices and connections

9.15 Long periods without use

When compressors already mounted on vehicles are not used for a long period of time, we recommend operating the compressor for approximately 1.5 hours every 6 weeks. If this is not possible, the compressor must be put through the commissioning procedure in accordance with Chapter 7.1.

10.1 Replacement parts

Keeping a stock of the most important replacement parts (maintenance parts and parts subject to wear) at the place the unit is installed is an important pre-condition for the compressor's continual functional ability and readiness for use.

To order replacement parts, please refer to the separate replacement parts list.

We only accept warranty claims for original replacement parts supplied by us.

With regard to the installation and fitting of replacement parts and additional devices that were not supplied by us, the warranty extended by Gardner Denver Wittig expires. Please take note that particular manufacturing and supply specifications often exist with regard to our own and other parts and that we can always offer you replacement parts that comply with the latest technology and with the latest legal regulations.

When ordering replacement parts, please provide the following information:

	Example
*Type of machine.	ROL
*Machine No.	C3329
*Year of construction	2009
Part number (TW)	TW4325740
Quantity	1
Designation	Air de-oiling element

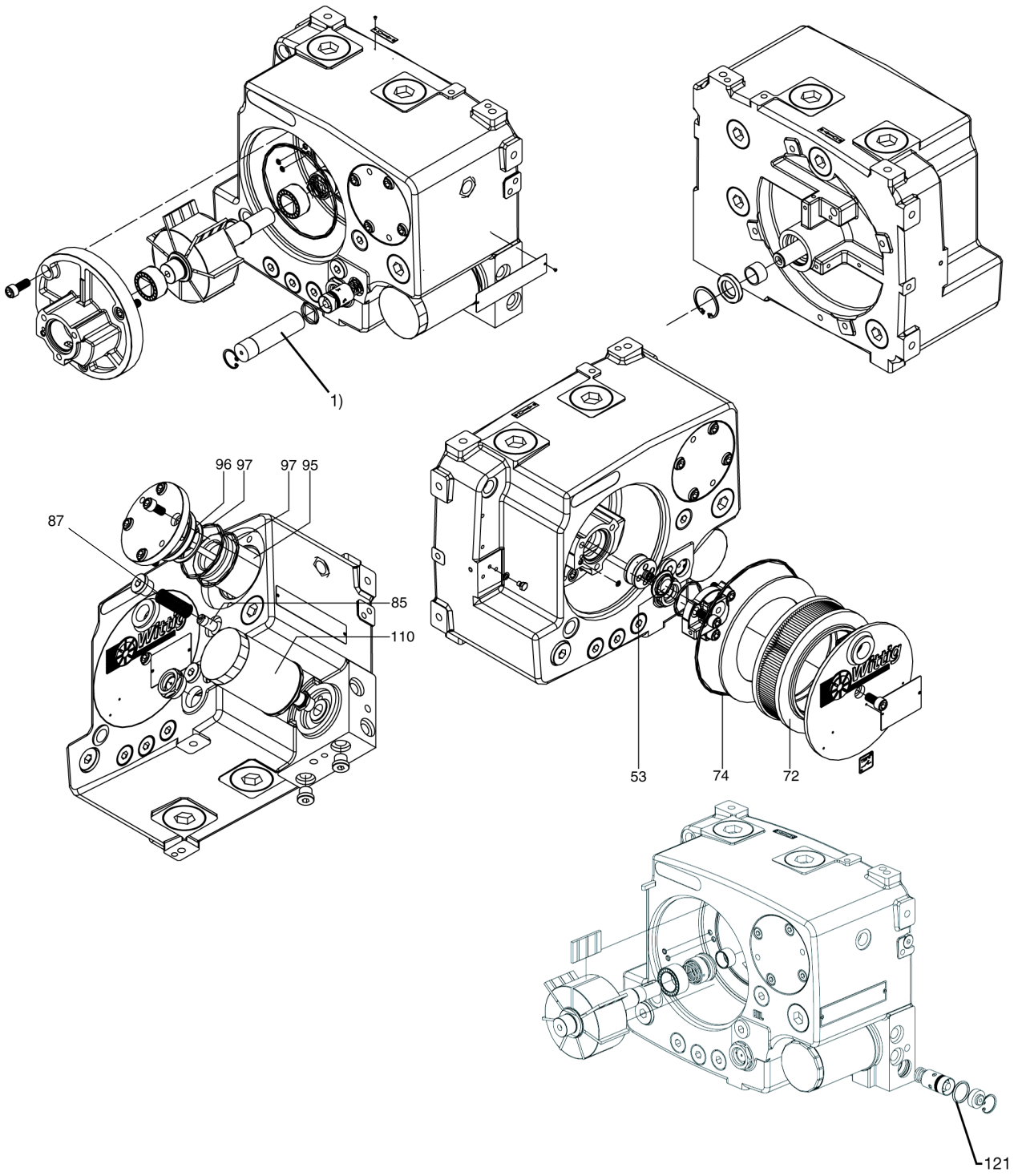
Items marked with a * can be obtained from the machine data plate.

10.2 Parts subject to wear

We recommend you keep the following stock: (see Figure10.1):

Pos. No.	Order No.	Quantity	Designation	Dimensions	Explanation
72	432 424 00	1	Air filter assembly	120/170/60	Air filter
74	463 693 00	1	O-ring seal		from air filter lid
53	463 526 00	1	O-ring seal		for nonreturn valve - intake regulator
110	432 991 00	1	Oil filter cartridge		Oil filter cartridge
95	432 574 00	1	Air de-oiling element		Air de-oiling element
97	463 611 00	2	O-ring seal		O-ring seal for air de-oiling element
96	463 130 00	1	Seal		Seal for air de-oiling element
85	921 013 00	1	Nonreturn valve with nozzle		Nonreturn valve with nozzle for oil intake line

Please contact your Gardner Denver representative for pricing and lead times.



53	Nonreturn valve with RDR intake	87	Strainer for oil intake
72	Air filter	95	De-oiling element
74	O-ring seal	96	Seal
85	Nozzle with RV oil intake	97	O-ring seal
		110	Oil filter
		121	O-ring seal

Figure 10.1 Compressor ROL M

[1] Made until 01/2006; later machines have the thermostat at the side as shown in Fig. 10.1/121.

Maintenance work carried out

For the fault-free operation of your compressor, it is essential that the little maintenance work required is carried out regularly. Please make use of the following overview to provide yourself and our customer service department with a summary of the maintenance work that has been carried out. Should there be insufficient space on the pages provided, please make a copy of the table to continue with the overview.

We would also be glad to carry out your maintenance work for you. This can be at any time or within the framework of an agreed maintenance contract.

Please contact us! Our customer service department will be pleased to provide you with further information.

Maintenance overview

Please check!

Date	Service hours	Maintenance	Repairs	Other	Work completed	Comments	Work done by: (department, name, signature)

Contact Us

Americas
Gardner Denver, Inc.
Industrial Products Group - Americas
1800 Gardner Expressway
Quincy, IL. 62305
Toll Free: 1-800-682-9868
Phone: 217-222-5400
Fax: 217-221-8780
email: mobilesolutions@gardnerdenver.com

Australia
Gardner Denver Ind. Australia Pty Ltd
30 Bearing Road
Seven Hills
New South Wales
2147 Australia
Phone: +61 2 96207000
Fax: +61 2 96207955
email: hermant.malik@gardnerdenver.com

Belgium
Gardner Denver Belgium N.V.
Luithagen 7A
Haven 200
B-2030 Antwerpen
Belgium
Phone: +32 (0)3 5415040
Fax: +32 (0)3 5416509
email: info.be@gardnerdenver.com

France
Gardner Denver France SA
Division Compresseurs
42, rue du Montmurier, BP 604
38070 Saint-Quentin-Fallavier, France
Phone: +33 (0)474941673
Fax: +33 (0)474941689
email: contact.lyon@gardnerdenver.com

Germany
Gardner Denver Deutschland GmbH
Am Dorn 14
48308 Senden
Germany
Phone: +49 (0)253634840
Fax: +49 (0)25363484010
email: info.de@gardnerdenver.com

Netherlands
Gardner Denver Nederland BV
Barwoutswaarder 3B
3449 He Woerden
The Netherlands
Phone: +31 (0)348410150
Fax: +31 (0)348418079
email: sales.nl@gardnerdenver.com

UK Sales & Service
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
email: sales.uk@gardnerdenver.com

Spain
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
email: aurelio.fernandez@gardnerdenver.com

Rest of the World
Gardner Denver Ltd
PO Box 178
Springmill Street
Bradford, West Yorkshire
United Kingdom
BD5 7YH
Phone: +44 (0)1274 718100
Fax: +44 (0)1274 655272
email: gdtransportsales@gardnerdenver.com

Gardner Denver

For additional information, contact your local representative or

Gardner Denver Ltd
PO Box 178,
Springmill Street,
Bradford,
West Yorkshire, UK
BD5 7YH

Tel: +44 (0)1274 718100
Fax: +44 (0)1274 655272
Email: gdtransportsales@gardnerdenver.com
Web: www.gd-transport.com