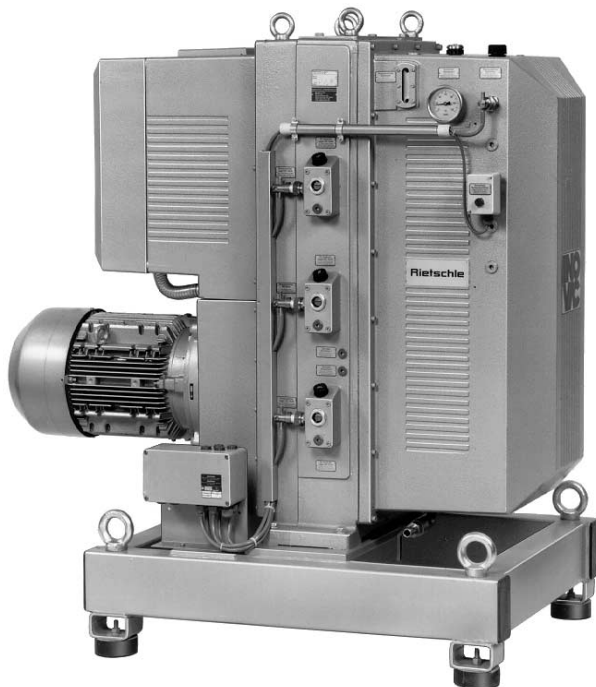


Roots vacuum pumps

VWP-3

INOVAC

VWP 160-3 / 250-3



VWP 160-3

VWP 250-3

VWP 400-3

INOVAC



VWP 400-3

BE 221

2.4.99

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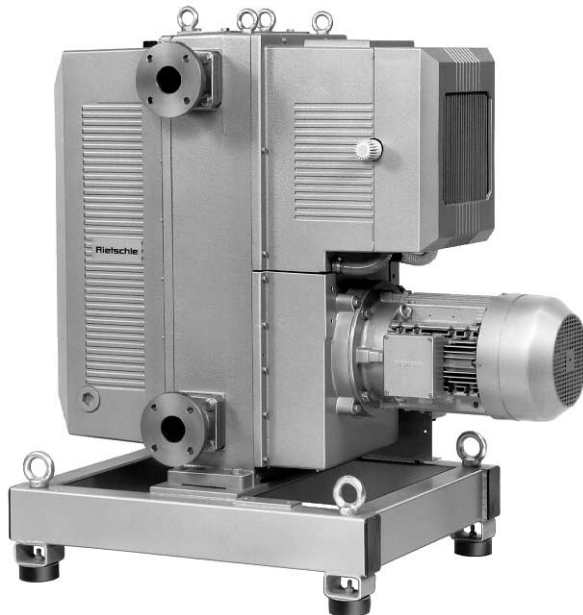
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VWP 160-3 / 250-3 with external cooling



VWP 160-3 / 250-3 with closed circulation cooling



VWP 400-3 with closed circulation cooling

1

1. Introduction

To prevent contamination from possible dangerous substances contained in the process, the exhaust outlet must always be connected to an appropriate emission control system.

⚠ All units being returned to our works for maintenance or any other reason must be free of harmful and dangerous material. A health and safety certificate should always be provided.

The customer has the responsibility for providing and checking explosion proof safety requirements for the total site in which vacuum pumps are used.

An appropriate agreement should be obtained from the local licensing authorities.

2. Application

The **INOVAC** vacuum pumps are particularly suitable for the handling of extremely humid gases. These pumps have a high water vapour tolerance.

⚠ The ambient temperatures may be between 5 and 40°C. The suction temperatures should not exceed 60°C. For temperatures out of this range please contact your supplier.

⚠ Liquid slugs and solids cannot be handled by INOVAC.

Handling of explosive gases or vapours only on request with our company.

⚠ For installations that are higher than 1000 m sea level there will be a loss in capacity. For further advice please contact your supplier.

The standard versions may not be used in hazardous areas. Special versions with Ex-proof motors can be supplied.

⚠ All applications where an unplanned shut down of the pump could possibly cause harm to persons or installations, then the corresponding safety backup systems must be installed.

3. Design

The **INOVAC** is a 3 stage dry running and non-contact vacuum pump of modular design. The **INOVAC** is available in three sizes i.e. 160, 250 and 400 m³/hr.

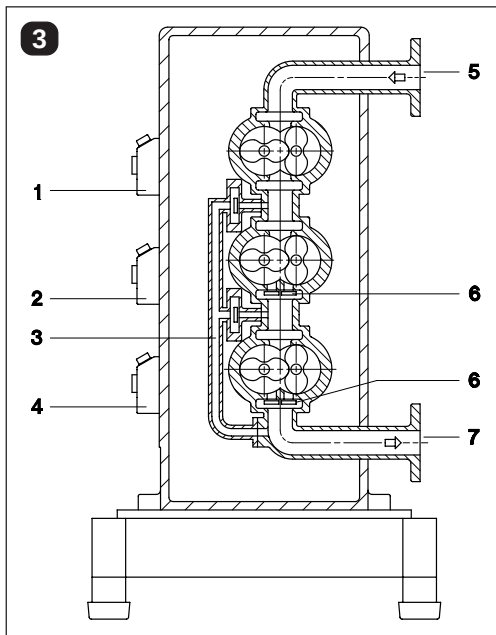
3.1 Construction

With the design of **INOVAC** the main components are grouped into four sections:

Drive motor • Power transmission • Vacuum cylinders • Cooling

The reason for separation and the resulting advantages are:

1. Optimum ease of servicing in case of a stage failure:
 - quick exchange of the pump stages without removing the pump from site
 - the vacuum and exhaust pipework need not be removed
 - the drive or power transmission parts need not be touched
 - no adjustment or alignment operations are necessary due to the flange connection of the stages
2. Short down time can be achieved (approximately 3 hours) in the event of failure of a pumping stage.



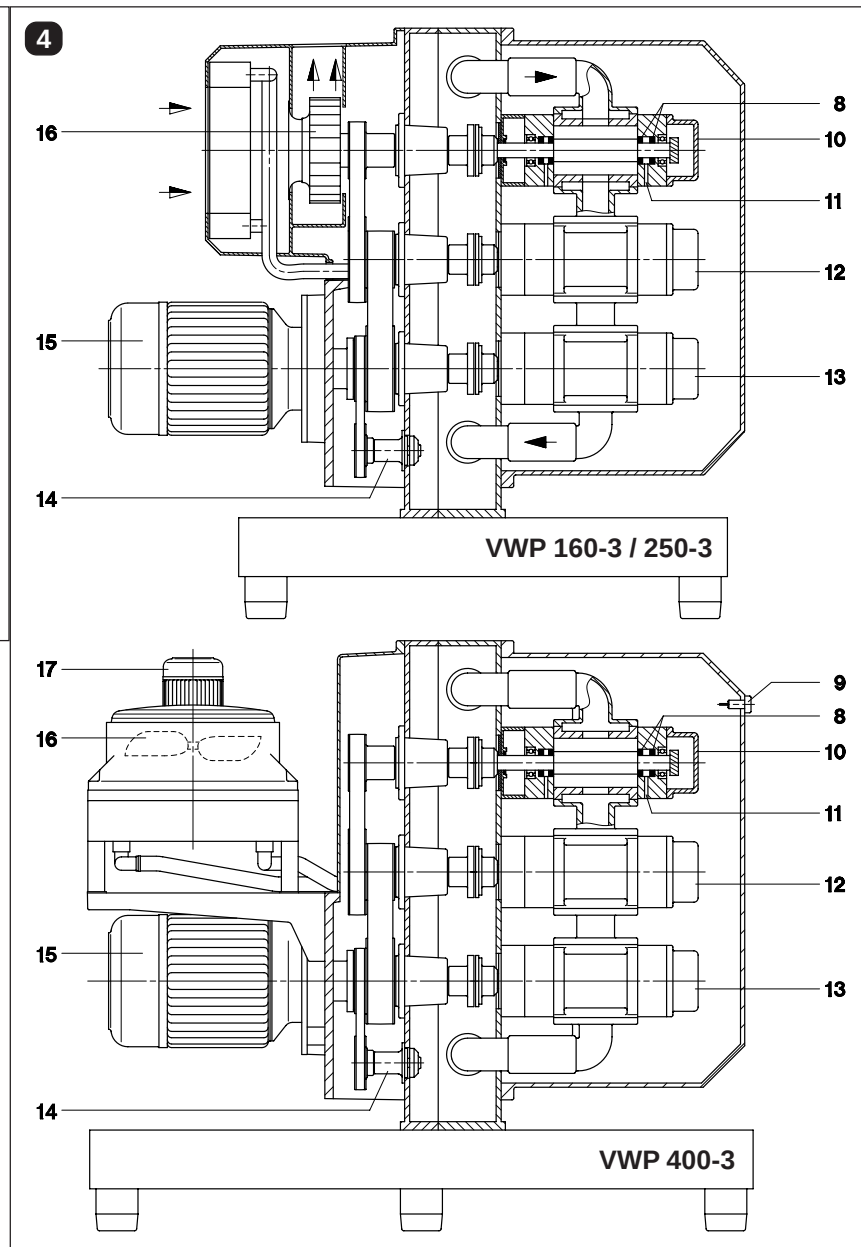
3.2 INOVAC sectional drawings

3.2.1 Cross section through compressor stages

- 1 Bearing lubrication LP
- 2 Bearing lubrication MP
- 3 Bypass system
- 4 Bearing lubrication HP
- 5 Vacuum connection
- 6 Outlet valves
- 7 Exhaust air connection

3.2.2 Longitudinal section INOVAC

- 8 Sealing
- 9 Service temperature sensor (VWP 400-3)
- 10 LP stage
- 11 Sealing gas
- 12 MP stage
- 13 HP stage
- 14 Cooling pump
- 15 Main drive
- 16 Cooling fan
- 17 Cooling fan motor (VWP 400-3)



3.3 Principle of operation

The **INOVAC** multi-stage vacuum pump utilises the Roots principle which has been used in vacuum engineering for over 100 years. The mode of operation is illustrated in pict. 5. Compression is achieved by two figure of eight rotors, rotating in opposite directions. The rotor contours are such as to keep the same clearance between rotors or between the rotor and casing. A Roots blower operates without internal compression of the transported gas. Compression to a higher pressure is achieved at the exhaust side of the blower, when the air is exhausted against the existing pressure in the exhaust port. This back pressure causes a back flow of gases through the rotor gap towards the vacuum side. The higher this back pressure and the higher the pressure difference between the vacuum and pressure side, the greater the reduction in suction capacity and greater heat generation of the pumping unit. This generated heat can only partially be removed via the cooling of the housing and therefore a danger of over heating and seizure could be possible. This is the reason why a basic Roots pump can never compress against atmospheric pressure. All Roots vacuum pumps that are currently available on the market require some degree of intermediate cooling when they are operating against atmosphere without a backing pump.

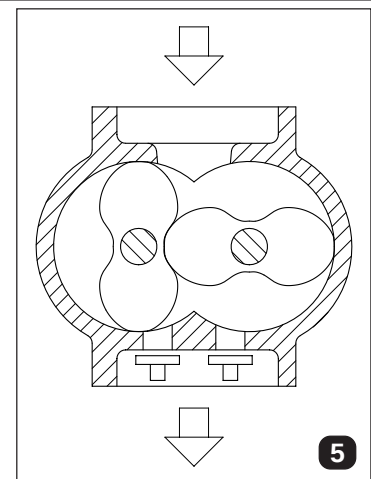
INOVAC is the only known Roots vacuum pump that has been especially designed to provide a solution to this problem. The back flow which causes the excess heat generation of the pump has been eliminated utilising valves on the exhaust side of the medium and high pressure stages (see pict. 3 and 5).

The vertical arrangement of the three pumping stages prevents condensates accumulating during compression, with natural drainage making sure that any condensate is exhausted.

A by-pass system fitted between the LP/MP stage and MP/HP stage allows start up and operation of the **INOVAC** at any level of suction pressure. Due to the contact free compression, lubrication within the pumping chamber is not necessary. Consequently lubrication is limited to the drive and bearing areas which are separated from the pumping chamber by rotary seals.

As there are no frictional forces within the chamber, the stages operate at high speeds, approximately 4000 rpm.

Due to the Roots principle operation and the precision dynamic balancing of the rotors **INOVAC** operates extremely quietly at these speeds.



3.4 INOVAC individual components

3.4.1 Drive

The **INOVAC** vacuum pump is driven by a flanged electric motor, normally the standard drive supplied with a basic design is 400/690 V, 50 Hz, IP 54, 1450 rpm, B 5 flange:

- VWP 160-3	7.5 kW
- VWP 250-3	7.5 kW
- VWP 400-3	11 kW

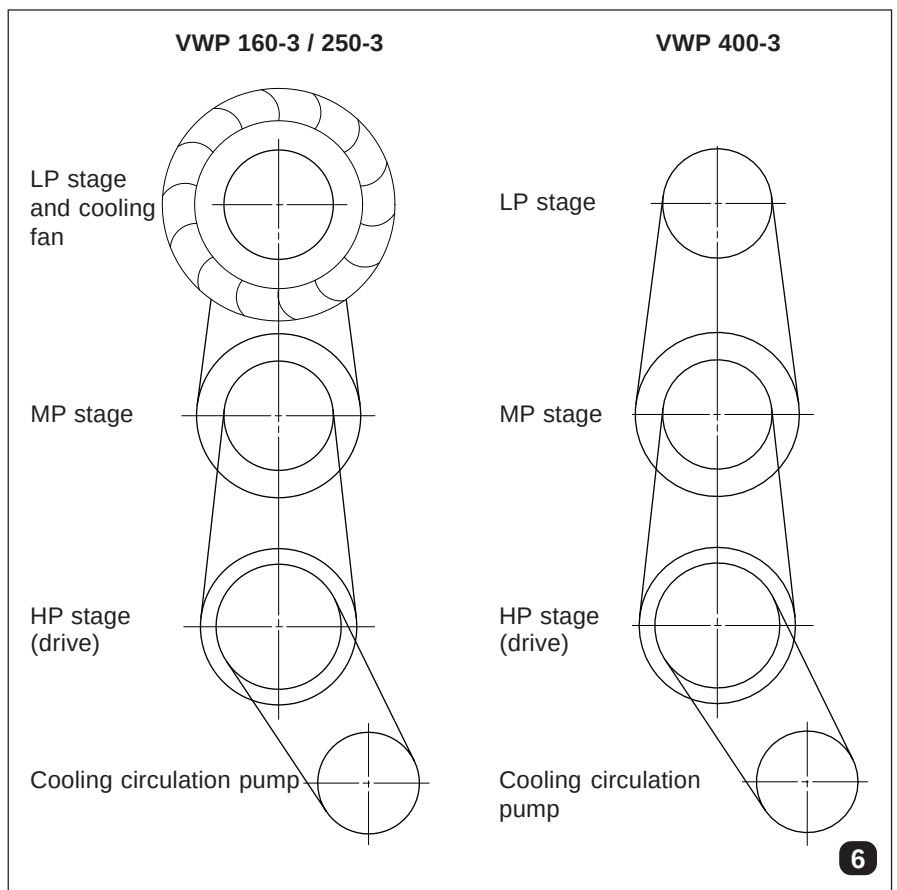
There is no problem to fit other types of electric motors, including explosion proof and increased safety models.

3.4.2 Power transmission (pict. 6)

The HP stage is directly driven by the drive motor. The LP stage, MP stage and cooling water pump and fan are driven by anti-static flat belts from the HP stage.

The drive motor and the stages are connected to the flat belt drive using pin and rubber bush couplings.

At the VWP 400-3 the cooling water fan are driven by an own motor.



3.4.3 Compressor stages (pict. 7)

The three compressor stages of the **INOVAC** consist of the casing (GGG-40), two end covers (DE fixed bearing, NDE floating bearing, material GGG-40), two rotors (GGG-40), the synchronising drive gears, the bearing and the sealing systems. In addition there are valves in the exhaust side of the MP and HP stages.

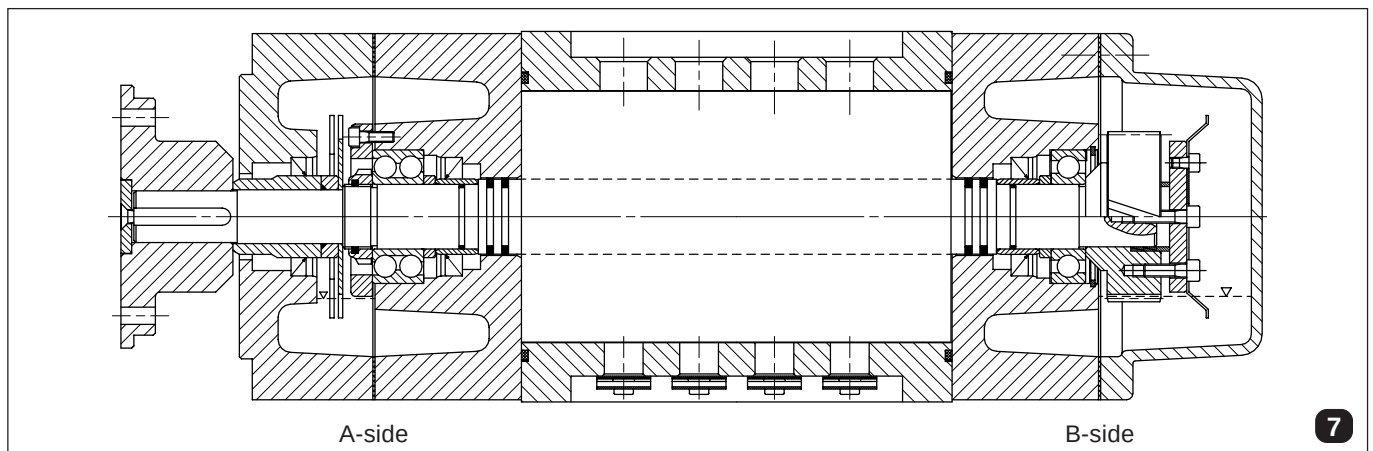
The rotors of all three stages are the same length as are the casings of the MP and HP stages. The casing of the LP stage is somewhat shorter due to lower heat of compression.

In both end covers the compression chamber is sealed from the bearing housing by a labyrinth seal consisting of two piston rings (PTFE). In addition a shaft sealing ring (PTFE) running on a hardend pressed on shaft sleeve prevents bearing oil from entering the labyrinth seal. Furthermore it is possible to connect sealing gas between the shaft oil seal and the piston ring labyrinth seal to prevent any possibility of leakage from the compression chamber to the seal area.

The fixed bearing is a twin deep groove ball bearing and the floating bearing is a single deep groove ball bearing. Both bearings are lubricated with oil contained within the bearing housing by means of a splash disc. On the A-side the discs are attached to the rotor shaft using spacer rings, and on the B-side they are mounted on the synchronising gear so as to lubricate the gear and the bearing at the same time.

The synchronisation of the rotors is adjusted by means of a conical clamping arrangement of the helical cut synchronising gears. The drive end bearing housing is sealed by means of a further sealing ring running on a pressed-on shaft sleeve. The non-drive end is closed by an bearing cover (GGG-40). The end covers are bolted to the rotor casing and are fitted with a PTFE encapsulated viton O-ring.

The stages and the connections between them and the by-pass system are designed for a hydraulic test of 10 bar.



3.4.4 Lubrication

The **INOVAC** vacuum pump is a dry running pump and consequently the only lubrication to the stages is to the bearing and gear drive areas. This is by means of splash discs (see picture 7). Depending upon stage size the total oil fill quantity, including pipelines and storage reservoir is approximately 1.31 l.

Oil is supplied from the external reservoirs to the stages via the flange at the A-side. Located on the right hand side of drive side flange (seen from the drive end) are two oil pipes which feed the B-side. The lower, larger pipe is the oil supply (pressure free) and the upper pipe is for equalisation.

The oil reservoir should be changed at approximately every 8000 operating hours or at least yearly.

At a malfunction, which can lead to the intrusion of products in the bearing rooms, is to be explored the oil on his lubrication property.

All other bearings are sealed for life requiring no maintenance.

3.4.5 By-pass system (pict. 8)

The by-pass system connects the interstage LP/MP chamber and the interstage MP/HP chamber with the exhaust duct.

The by-pass system enables the **INOVAC** vacuum pump to operate at any suction pressure without overheating which would result from the over pressure of the MP and HP stages. The by-pass valves close when the interstage pressures are lower than the exhaust pressure.

3.4.6 Sealing gas

The **INOVAC** is supplied as standard with the facility to pressurise the shaft sealing ring chamber with an inert sealing gas. This prevents ingress of process material through the labyrinth piston rings, which could otherwise build up on the shaft leading to premature wear and damage to sealing rings. Two thread connections (**S** → D 221) are provided on the **INOVAC** for inlet and outlet of sealing gas which is fed to the stages via a distribution block and connecting lines. The feed to the stages is through the drive end flange. The non-drive end is fed via lines on the left side of the stage (seen from the drive end).

There occur two kinds of sealing gas operation.

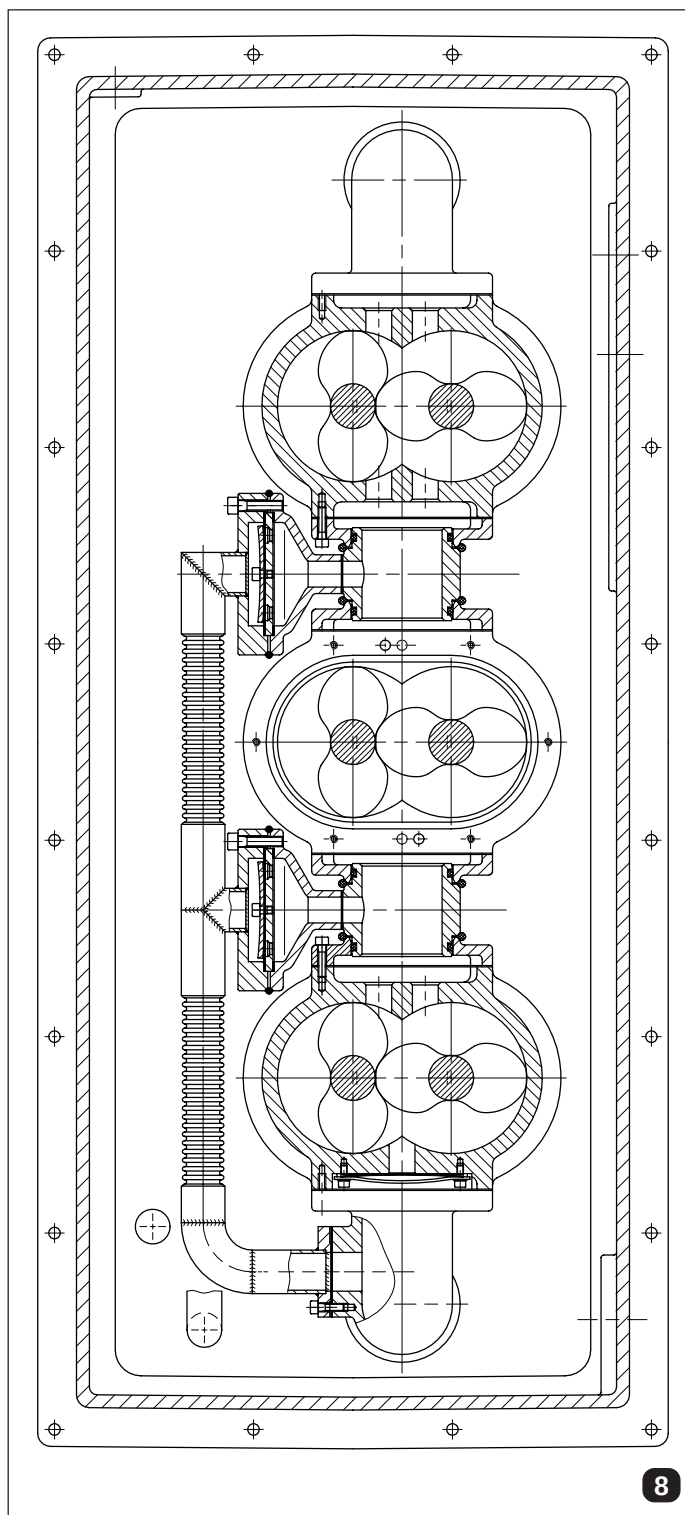
1. Pressurising with sealing gas

The sealing gas system can be pressurised by admitting gas to the top sealing gas port with the bottom port closed. The sealing gas then escapes past the labyrinth and piston ring seals into the compressor chamber, so preventing process deposits on the seals.

The supply pressure should be 0.3 to 0.4 barG consumption will be approximately 1Nm³/hr.

2. Finishing the sealing gas system

If it is thought that deposits may be present between the sealing rings and the labyrinth. These can be flushed out before starting the **INOVAC**. The sealing gas bottom port is opened for 3-5 minutes, then re-closed. The system then returns to the pressurised state.



3.4.7 Cooling system

The INOVAC vacuum pumps are liquid-cooled. There are two cooling variants.

3.4.7.1 Radiator cooling (pict. 9)

With the radiator cooling the medium is circulated, unpressurized in a closed circuit via a small rotary pump, independent of the coolant temperature.

VWP 160-3 / 250-3:

When the coolant temperature reaches that set on the thermosensor in the cooling system, the 3-way-valve opens automatically towards the cooler. The coolant temperature can be adjusted by the button of the thermostatic valve (see chapter 6.2.1).

VWP 400-3:

When the coolant temperature reaches that set on the thermostat in the top of the cooling jacket, the cooling fan on the radiator switches on automatically.

3.4.7.2 External cooling (pict. 10)

With external cooling the cooling medium is circulated unpressurized in a closed circuit by a small rotary pump, independent of the coolant temperature.

Over a thermostatic valve the discontinued coolant temperature streams at overstep cold coolant in the circuit.

The permissible coolant temperature can be set with the regulation knob of the thermostatic valve (see chapter 6.1) discontinue.

External coolant enters via a thermostatically controlled valve and heated coolant is discharged from the top of the water jacket free of any back-pressure.

Max. backpressure 0.3 bar !

44 Application of INOVAC

Because of it's contact free operation the **INOVAC** is ideally suited for processes where recovery of non-contaminated solvents is desired. The other main application area are for distillation and drying processes.

In all applications the following operational limits of the **INOVAC** should be observed:

- Compatibility of pump materials with the process products
- Maximum gas stream temperature at pump inlet 60°C
- Maximum operating temperature of cooling system 55°C (fan thermostat set point)
- Maximum exhaust back-pressure 0.3 barg
- Pre-run and post-run operations must be carried out before and after process use

5 Installation

5.1 Mechanical installation (see data sheet D 221)

5.1.1 Mounting



Pumps that have reached operating temperature may have a surface temperature of more than 70° C depending on a set temperature at the thermostat. Especially the cooling water jacket (Y₄) might be very hot. WARNING! Do not touch.

As the **INOVAC** pumps operate free of vibration, special holding down arrangements are not required. When positioning the pump it is important to ensure that it is mounted horizontally and that there is easy access for routine checking of instruments, topping up of oil and water systems and for repair work on the motor and pump.

The cooling air entries (E) and the cooling air exits (F) must have a minimum distance of 0.5 m from any obstruction. The discharged cooling air must not be recirculated. Ambient temperature should not exceed 40 °C.



The INOVAC pumps can only be operated reliably if they are installed horizontally.

All relevant regulations regarding installation of machinery and Health and Safety at work should be observed.

5.1.2 Vacuum connection

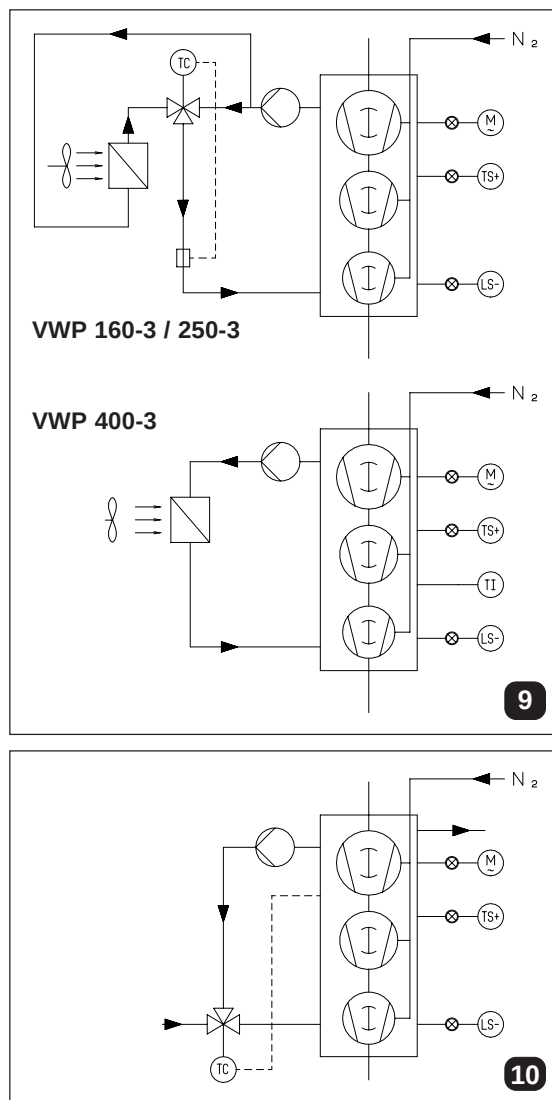
Connect the vacuum pipe at the vacuum flange (A) normally an ISO flange. The length of the vacuum line should be as short as possible. If longer than 5 m then it may be necessary to select a larger line size. The vacuum line should be supported so that no strain is imparted to the pump flange, if necessary using flexible bellows.

To protect the pump from entry of solids and liquids appropriate separators should be fitted in the vacuum line.

5.1.3 Exhaust connection

If the exhaust pipe is connected directly at the exhaust connection (A), then the pipe should be sloped to drain away from the pump. If a rising exhaust line is unavoidable then a condensate collection vessel must be installed as close as possible to the pump exhaust. The exhaust condenser or exhaust condensate collector must be fitted with a level switch to prevent back-flow into the pump in event of failure of drainage.

If an exhaust condenser is being fitted the exhaust pipe should be connected directly at the exhaust connection of this condenser. **The maximum exhaust back-pressure should not exceed 0.3 bar.**



5.2 Electrical installation

5.2.1 General (see data sheet D 221)

The electrical data can be found on the data plate (N) or the motor data plate. The motors correspond to DIN / VDE 0530 and have IP 54 protection and insulation class B or F. The connection diagram can be found in the terminal box on the motor. Check the electrical data of the motor and the control gear for compatibility with your available supply (voltage, frequency, permissible current etc.). Connect the motor to the incoming supply. It is advisable to use thermal overload motor starters to protect the motor and wiring. All cabling used on starters should be secured with good quality cable clamps. We recommend that motor starters should be used that are fitted with a time delayed trip resulting from running beyond the amperage setting. When the unit is started cold overamperage may occur for a short time.

 **The electrical installation may only be made by a qualified electrician under the observance of EN 60204. The main switch must be provided by the operator.**

5.2.2 Approximate values for setting motor overload protection

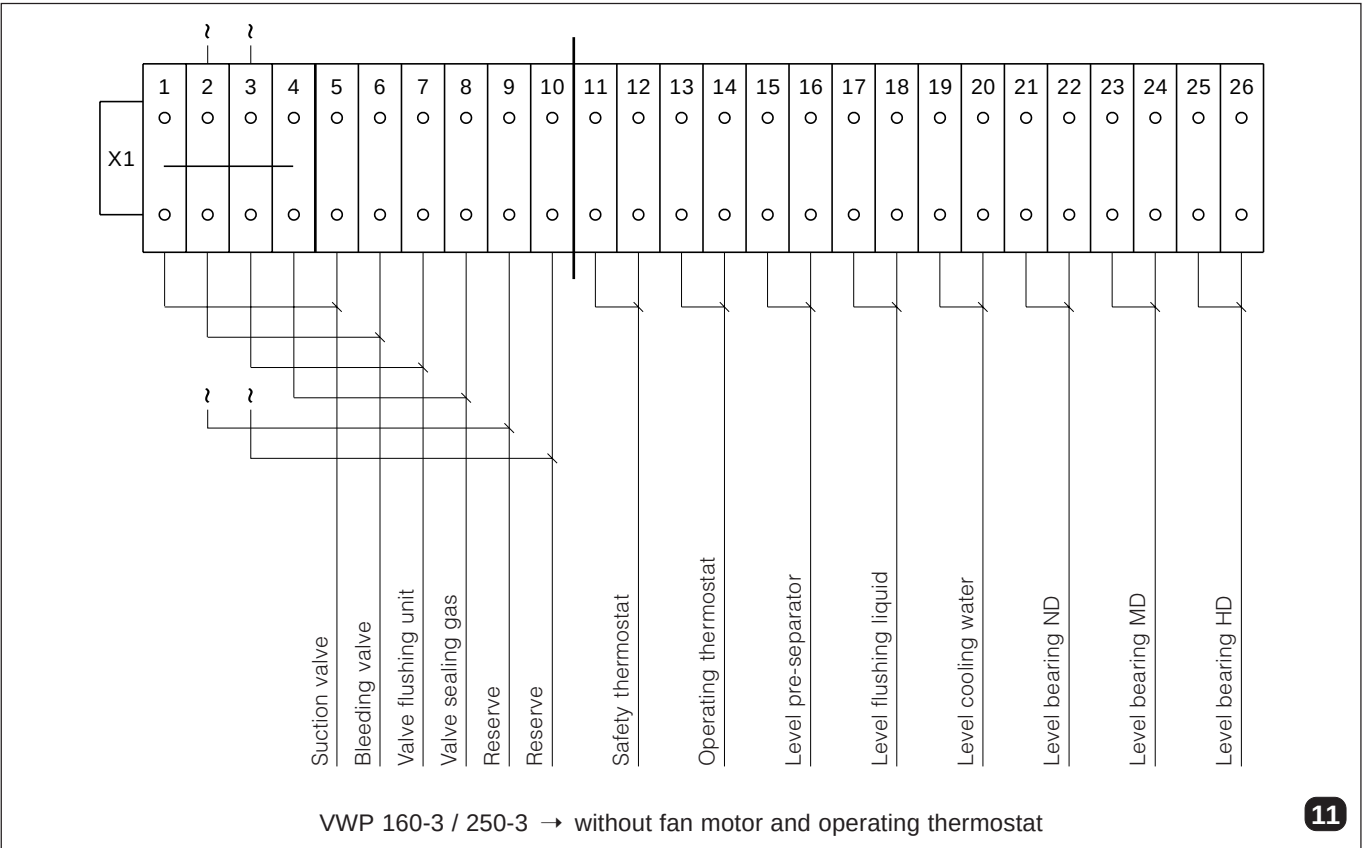
 **The approximate values for setting motor overload protection should be obtained from the motor manufacturer or motor nameplate.**

5.2.3 Electrical connection

The electrical connections for the control equipment are located in a junction box. The motors may be connected at this junction box or separately according to local regulations. The terminal strips are numbered and correspond to the control devices (see wiring diagram pict. 11). We recommend this layout arrangement is adhered to in the event of re-fitting or repairing devices.

5.2.4 Junction box layout radiator cooled version

Fresh water cooling version → without fan motor and operating thermostat



6. Coolant

6.1 External cooling (pict. 13)

The cooling supply is connected to the hose connection (C) and the water jacket (Y₄) is filled by pressing the spring loaded priming valve (U₄).

! Use only clean and filtered water for the cooling. Dirt particle and aggressive water can lead to premature wear in the cooling system.

The valve should be depressed until the cooling water flows from the outlet hose connection (D). The outlet hose may then be connected. If rigid pipework has been connected to the inlet and outlet points then the vent valve (U₈) should be removed prior to filling. This should be replaced when the cooling water flows from the opening. The water outlet pipe should exert no backpressure on the water jacket.

According to requirement of the process, the operating temperature can be adjusted by the water-valve (U₃) like follows:

- Turn the regulation knob clockwise → the operating temperature of the pump will be decreased
- Turn the regulation knob anti clockwise → the operating temperature of the pump will be increased

Operating temperature can be seen on the thermometer (T).

If for any reason the temperature should rise above the set point the high temperature cut out (U₁) will shut the pump down at a temperature of 75°C. This temperature is set in our works and should not be adjusted. Higher operating temperatures are possible for certain processes, but should be referred back to our works.

In order to keep the thermostatic valve clean a dirt filter is fitted (U₅). The valve should be cleaned periodically depending on the water quality. To do this unscrew the nut and clean the element.

6.2 Radiator cooling (pict. 14)

Fill the water jacket with coolant via filler (H₄), taking care not to pressurise the water jacket. Coolant should be water/glycol 1:1. We recommend following types of glykol: Aral anti-frost A, BP anti-frost X 2270 A, Glacelf, Glysantin, Glycoshell AF 405, Veedol Antifreeze. The water must be ph-neutral. The liquids should be well mixed before fill in. A simple pouring together is not sufficient because of their different specific weights. You can see the quantity of coolant in the data (9.7). For other coolants please contact Rietschle. The coolant can be drained by opening the drain valve (K₄) near the base of the water jacket (Y₄) and unscrewing the filler plug (H₄) to allow venting.

6.2.1 Cooling liquid monitoring

The coolant level is automatically monitored by a level switch (V₄) which switches the pump off if the level falls below the minimum. The safety thermostat (U₁) controls the maximum temperature of the coolant.

VWP 160-3 / 250-3:

When the pump is running and the coolant temperature reaches that set on the thermo sensor in the circuit, the 3-way-valve opens automatically towards the cooler. The permissible temperature can be adjusted by the regulation knob of the thermostatic valve (U₇):

- Turn the regulation knob clockwise → the operating temperature of the pump will be decreased
- Turn the regulation knob anti clockwise → the operating temperature of the pump will be increased

Operating temperature can be seen on the thermometer (T).

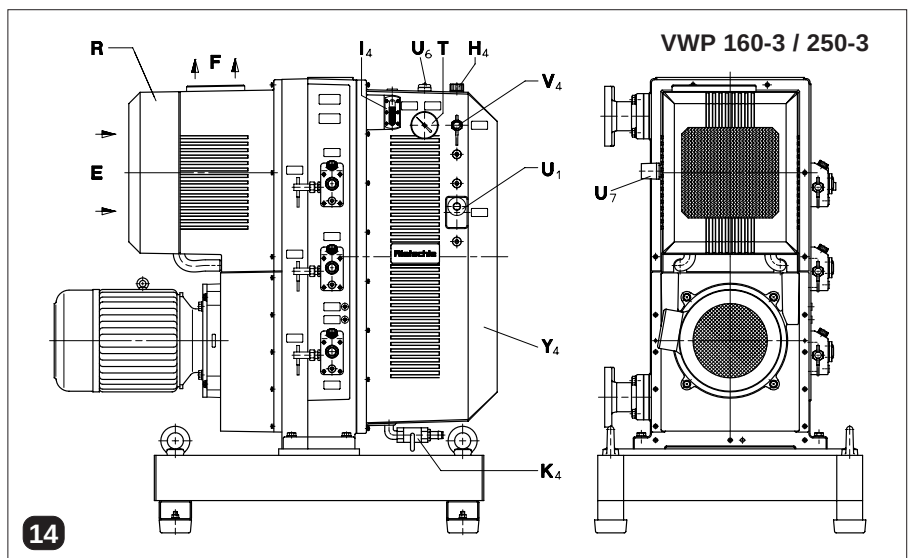
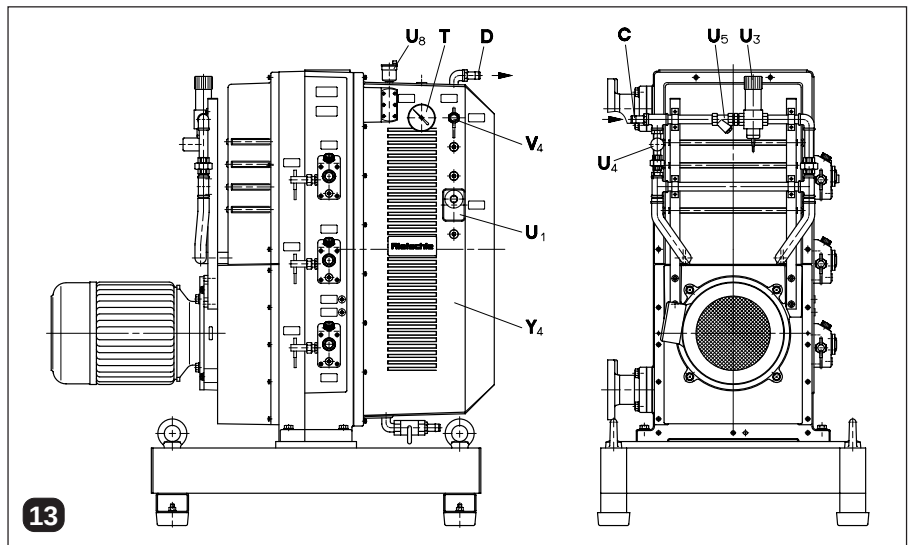
VWP 400-3:

When the pump is running the operating temperature thermostat (U₁) controls the switching on and off of the cooling fan to maintain the pump at constant temperature.

VWP 160-3→400-3:

The safety temperature can be set according to process requirements within the range of 65° - 100° C. The safety thermostat limits the maximum temperature in the water jacket to 75°C, above which pump is shut down automatically. Higher temperature (adjusted by the company) than 75°C are possible for certain processes by reference to our offices. In the event of high temperature shut down the cooling system should be checked.

If the location of the pump is such that there is a danger of freezing then appropriate measures should be taken for both external cooling and radiator cooled versions.



7. Initial Operation (see data sheet D 221)

Warning → Start-up with pipework

At start-up, severe damage may occur if there is debris in the pipework.

We therefore recommend a vacuum tight inlet filter of 5 micron rating is installed for start-up.

The pump will normally be delivered with the bearing oil reservoirs filled but these should be checked before first start up. The correct level is in the middle of the sight glass (I_1 , I_2 , I_3 pict. 2).

The oil reservoirs will normally be supplied with oil level switches (V_1 , V_2 , V_3 pict. 2) which will prevent start up or shut the pump down, in the event of low level.

The pump should be started and stopped momentarily to check the direction of rotation (see direction arrow O).

 **NOTE! When handling humid or aggressive gases the pump must be operated before and after the process against a closed inlet, but with an air bleed into the pump. This pre and post run operation should be carried out for 20-30 minutes.**

Pre-run should ensure that the pump reaches the appropriate operating temperature so that condensation of the pumped gases is avoided within the pump chambers.

7.1 Potential risks for operating personnel

Noise Emission: The worst noise levels taking into consideration direction and intensity measured according to DIN 45635 part 3 (as per 3. GSGV), are shown in chapter 9.2. When working permanently in the vicinity of an operating pump, we recommend wearing ear protection to avoid any damage to hearing.

8. Maintenance

 When maintaining these units and having such situations where personnel could be hurt by moving parts or by live electrical parts the pump must be isolated by totally disconnecting the electrical supply. It is imperative that the unit cannot be re-started during the maintenance operation.

Do not work a pump that is at its normal operating temperature as there is a danger from hot parts, hot lubricant or hot coolant.

8.1 Oil lubrication

8.1.1 Bearing oil:

Please make sure that there is always sufficient bearing oil in the oil tanks (1,2, 3).

Oil change interval: We recommend that the oil should be changed completely after 8,000 operating hours or at least yearly.

The viscosity must correspond to ISO-VG 100 according to DIN 51519.

We recommend the following oil brands: Bechem VBL 100, BP Energol RC 100, Esso rotary oil 100, Mobil vacuum pump oil heavy, Shell Tellus oil C 100 or Aral Motanol HK 100.

8.1.2 Changing the bearing oil (see D 221))

Oil drain:

LP stage (K_1), MP stage (K_2), HP stage (K_3).

Oil fill port:

LP stage (H_1), MP stage (H_2), LP stage (H_3).

 The waste oil removal should be done according to environmental regulations. In case of lubricant change please empty oil tank totally.

8.2 Flat belt (pict. 15)

8.2.1 Maintenance

The flat belts for the drive HP/MP stage (R_1), MP/LP stage (R_2), motor/cooling liquid pump (R_3) do not require any maintenance and need not be pretensioned.

8.2.2 Flat belt change interval

We would recommend the changing of the Flat Belt (R_1 , R_2 , R_3) after 15,000 operating hours.

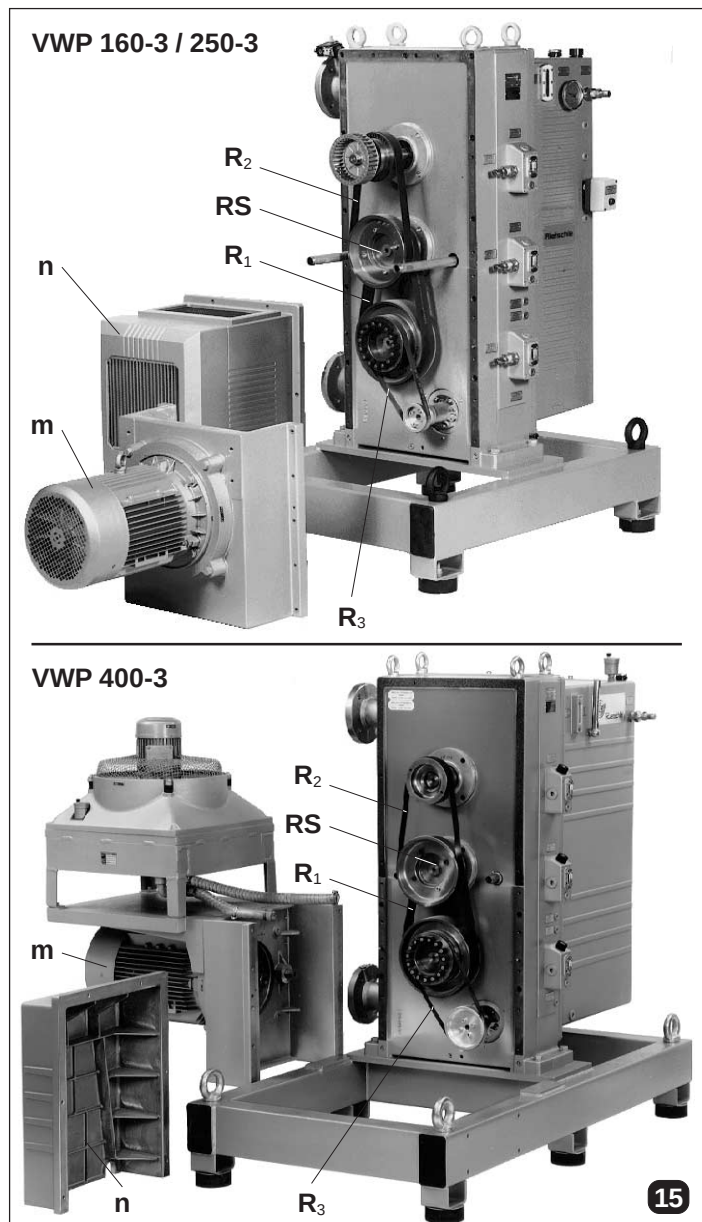
8.2.3 Disassembly/assembly of flat belts

Drain off coolant!

Loosen the screws and push the drive motor (m) as far back as possible and put aside. Remove the cover (n) after loosening the screws. Remove the belt from the drive motor/cooling water pump (R_3), remove the belts of the MP / LP stage (R_2), remove the belt discs (RS) on MP stage by loosening the appropriate screws. Take off the HP / MP stage belt (R_1).

The new belt can be assembled in the reverse order, the new belts need not be pretensioned after assembly.

For assembly and disassembly a special belt tool is required.



8.3 Exchanging stages

8.3.1 Disassembly and assembly of cooler housing (pict. 16)

Switch off the pump and vent to atmospheric pressure. Open the de-aeration screw (H_4) for venting the cooler housing (Y_4) drain the coolant by opening the drain valve (K_4). On the external cooled version make sure the coolant entry is closed off. Remove the cable from the level switch (V_4) after loosening terminal screw connection on this switch. Remove the safety thermostat (U_1) from the cooler housing. Screw in 2 lifting eyes and support the cooler housing using an appropriate tackle and crane. Loosen and remove the flange screws and pull away the cooler housing (Y_4). Assembly is carried out in reverse order. Prior to assembly, check the sealing of the cooler housing as well as the thermostat sealing and replace them if necessary. Before use charge the cooling system with coolant according to chapter 6.

8.3.2 Stage change (pict. 16, 17 and 18)

Drain the bearing oil of the stages by opening the plugs (K_1 , K_2 , K_3). Remove the by-pass system (BY) after having removed the flange screws on both the valve housing covers and the connection flange of the outlet conduit. Please make sure that neither the flange surfaces or the valves themselves are damaged by the valve body. Disassemble the vacuum pipe on the LP stage (NS) support the stage by suitable tackle and crane. Remove the flange bolts securing the LP stage and loosen the stage by gently prising away from the centre ring and the drive coupling half. Remove the intermediate flange on the NP stage (MS). Removing the MP stage (HS) is carried out in the same manners as with LP stage.

Assembly of the stages is in reverse order. Prior to re-fitting the individual sealings should be checked and replaced as necessary. After re-fitting the stages fill the bearing oil (see chapter 7 and 9.5) check all connections for possible leakage. Mount the cooler housing (see chapter 8.3.1). The stages themselves can be checked and repaired at an authorised Rietschle service centre, therefore they should be returned with the appropriate Health and Safety certificate.

8.3.3 Commissioning

As regards commissioning please refer to chapter 7.

8.4 Trouble shooting

The optional control system when operating the pump should be to either give a clear warning or switch off the pump in a controlled manner when one of the safety devices has been activated.

8.4.1 Shortage of cooling liquid

Check and top up the level of coolant according to chapter 6.

8.4.2 Shortage of oil

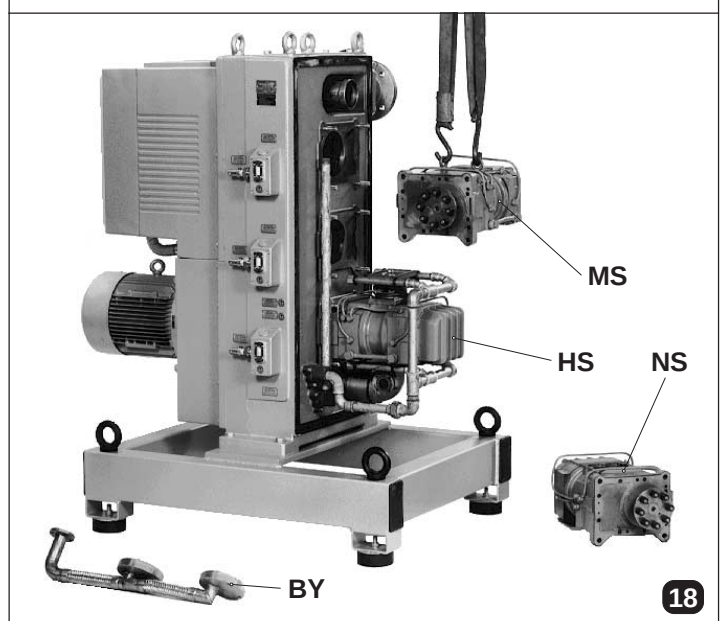
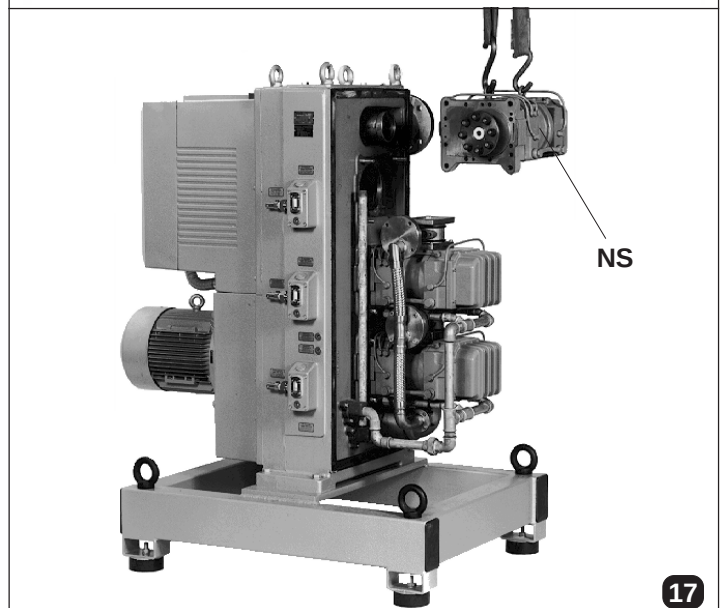
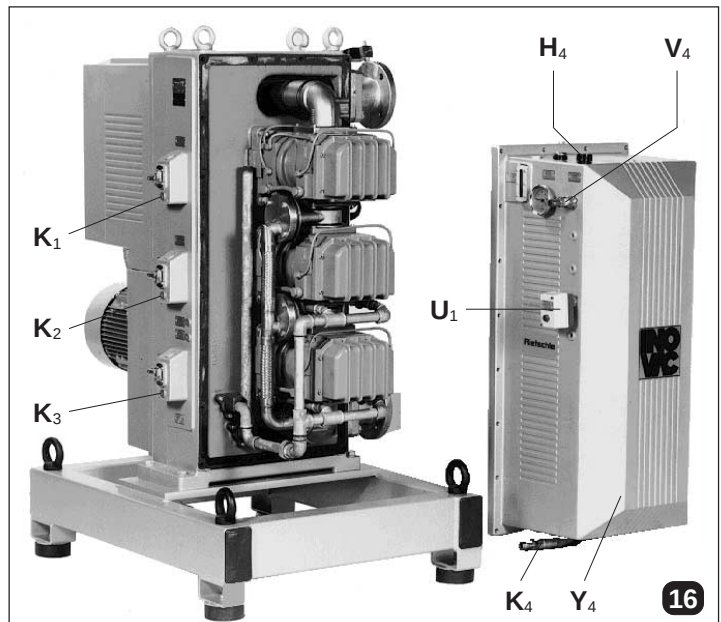
Check and top up the oil level according to chapter 8.1.

8.4.3 Running over amperage

- Check for excessive bearing oil, reduce to normal level if appropriate.
- Check back pressure in the exhaust pipework, clean the exhaust air passage or knock out pots, condensers as necessary.
- By turning the fan of the motor check that the stages and pump are free to turn.
In case of resistance change and clean each vacuum stages.

8.4.4 Poor vacuum levels

- Check vacuum at the inlet of the pump, clean the filter if necessary.
- Check back pressure in the exhaust pipework (exhaust back pressure may not climb over 0,3 bar).
- Check the belt connection of the HP, MP, and LP stages (see chapter 8.2.).



8.5 Bearings (see pos. 48 and 541 E 220/1 → VWP 400-3 resp. E 221/1 → VWP 160-3/250-3)

Check bearings for wear after 15,000 operating hours, however exchange the bearings at the latest after 20,000 operating hours.

8.6 Valves (see pos. 4 E 220/1 → VWP 400-3 resp. E 221/1 → VWP 160-3/250-3)

Check the exhaust valves (see also pos. 6 pict. 3) of the MD- resp. HD-stage after 8,000 operating hours for wear or damaging. If necessary exchange the valves.

9. INOVAC datas

9.1 INOVAC dimension drawing

Dimensions of the INOVAC → see data sheet D 221 or DA 221 (USA).

9.2 Relevant pump data

- maximum product entry temperature: 60°C
- maximum exhaust gas back pressure: 0.3 bar overpressure
- average noise level → see data sheet D 221
- maximum noise level: → approx. 80 dB(A) at VWP 160-3 / 250-3 and approx. 82 dB(A) at VWP 400-3

9.3 Drive motor data

Motor data see chapter 5.2.2

9.4 Relevant stage data

Material: rotary piston → GGG-40 • housing → GGG-40 • piston rings → PTFE • shaft sealing rings → PTFE
O-Rings → Viton, PTFE encapsulated • stage connection pipes → GGG-40, chemically nickel plated

9.5 Relevant data for lubrication

- Oil volume stages LP,MP and HP 1.31 litres each stage
- Interval of change every 8,000 operating hours or at least yearly
- Recommendations for lubricating oil: Bechem VBL 100, BP Energol RC 100, Esso rotary oil 100, Mobil vacuum pump oil heavy, Shell Tellus oil C 100 or Aral Motanol HK 100
- All other bearings are sealed for life variety

9.6 By-pass system data

Material: valves and flexible connection line with valve housing 1.4571 stainless steel

9.7 Relevant cooling data

- Quantity of coolant: VWP 160-3 → 110 l, VWP 250-3 → 105 l, VWP 400-3 → 150 l
- Capacity of coolant pump: approx. 20 l/min → 50 Hz, approx. 25 l/min → 60 Hz
- Maximum permissible pressure in system 0.3 bar overpressure

9.8 Sealing gas system relevant data

- Entry pressure sealing gas 0.3 to 0.4 bar overpressure
- Average capacity of sealing gas approx. 1 Nm³/hr (this may be reduced when pump is new)

9.9 Spare parts lists

VWP 400-3: E220/1 drive and gearbox • E220/2 radiator cooling • E220/3 fresh/external Cooling • E220/4 basic unit

VWP 160-3/250-3: E221/1 drive and gearbox • E221/2 radiator cooling • E221/3 resh/external Cooling • E221/4 basic unit

10. Instructions for storing and conservation of INOVAC-Vacuum pumps

In case of storing the vacuum pump longer than 12 months after delivery (up to 3 months), please consider one of the following instructions.

1. Protection of compressing chamber by preservative oil:

- The suction side of the warm vacuum pump must be filled with small quantities of oil BP Vanellus C 3 SAE 30 until the surface is totally moistened.
- Surplus oil can be drained at the exhaust flange.
- Suction- and exhaust flange should be sealed with blank flanges.

2. Protection of compressing chamber by sealing gas:

- The suction side must be sealed with a blank flange.
- Sealing gas can be flushed into the vacuum pump when using the bleeding valve connection.
- After that the exhaust side should be sealed with a blank flange.
- The compressing chamber will be filled until 50 mbar overpressure and afterwards sealed.

In both cases the cooling liquid (usually a water/glycols-mixture 1:1) must be filled into the the vacuum pump up to a maximum from the customer.

The store room for the pumps must be dry and free of all corrosive materials. The ambient temperature should be constant and don't come under 5°C.

For storing the vacuum pumps more than 12 months, please contact your supplier.

If the vacuum-pump is shut down between two operations for longer time, maximum 12 months, so there are two possibilities to the preservation:

- a.) Preservation of the vacuum pump by means of oil and nitrogen as described under point 1 and 2.
- b.) Preservation of the vacuum pump by monthly running.

Procedure: Operate the vacuum pump once per month until the coolant temperature reaches 50°C. Ensure the suction is closed and the discharge open.

The procedures above are also suitable if the pump is not run on process duty for prolonged periods. However, it is essential to ensure that all product deposits, which are liable to stick in the vacuum pump, are totally removed by flushing with a suitable solvent.