

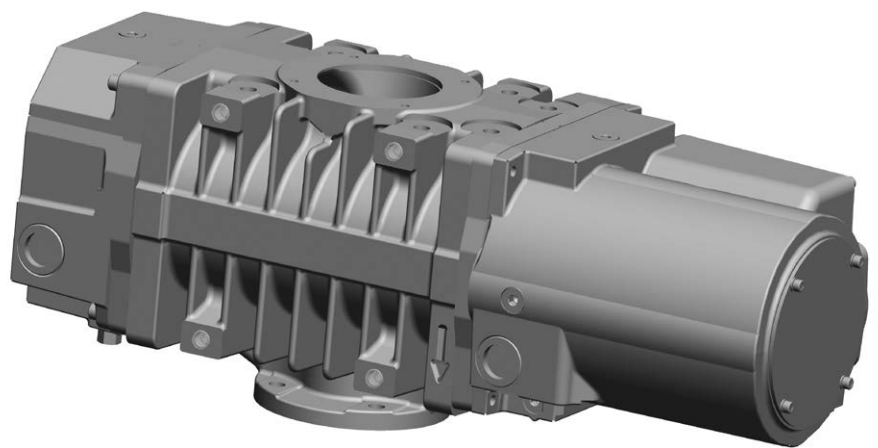
RUVAC WH 700

Roots booster with synthetic oil or PFPE-filling

Installation and Operating Instructions GA03122_002_C0

Part Numbers

155 202 – 155 209V
167 186V



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These installation and operating instructions are the original instructions.

Safety information

NOTICE



Obligation to Provide Information

Before installing and commissioning the pumps, carefully read these Operating Instructions and follow the information so as to ensure optimum and safe working right from the start

The Leybold **RUVAC WH** has been designed for safe and efficient operation when used properly and in accordance with these Operating Instructions. It is the responsibility of the user to carefully read and strictly observe all safety precautions described in this Section and throughout the Operating Instructions. **The pump must only be operated in the proper condition and under the conditions described in the Operating Instructions.** It must be operated and maintained by trained personnel only. Consult local, state, and national agencies regarding specific requirements and regulations. Address any further safety, operation and/or maintenance questions to our nearest office

DANGER



DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING



WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION



CAUTION indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE



NOTICE is used to notify users of installation, operation, programming or maintenance information that is important, but not hazard related.

We reserve the right to modify the design and the specified data. The illustrations are not binding.

Retain the Operating Instructions for further use.

0 Important Safety Information

0.1 Mechanical Hazards

- 1 Avoid exposing any part of the human body to the vacuum.
- 2 Even during standstill of the RUVAC it is dangerous to grasp into the pump casing. Fingers can easily be squeezed between impellers due to the high inertia of the parts. Please use caution when grasping into the pump and make sure that the pump is secured against unwanted rotation due to differential pressures.
- 3 The lifting eyes of the RUVAC must never be used to lift any pump combinations (Roots pump + backing pump). Exceptions are allowed only after approval by Leybold. Use a crane to secure the pump at the lifting eyes provided until a firm link has been established with the backing pump or a corresponding fixture.
- 4 Do not operate the pump with an opened casing. There exists the risk of suffering injury.
- 5 Never operate the pump without connected intake line or a blank flange at the intake.
- 6 Make sure that the gas flow at the discharge is not blocked or restricted in any way.
- 7 It is recommended to always only operate the RUVAC with a suitable exhaust line which is properly connected.
- 8 If exhaust gases must be collected or contained, do not allow the exhaust line to become pressurized.
- 9 When moving the RUVAC always use the allowed means. Two lifting eyes are provided on this pump as standard.
- 10 Do not allow the ingestion of small objects (screws, nuts, washers, pieces of wire, etc.) through the intake port. The use of an inlet screen is expressly recommended. In case the pump is operated without inlet screen the operator has to make sure that no objects can enter the pump through the intake port. Objects falling into the pump can cause severe damage at the pump including leaks to atmosphere.
- 11 In case malfunctions affect the pump, in particular seized rotors due to hard deposits or foreign objects, the occurrence of leaks in the casing cannot be ruled out. When pumping hazardous gases, the operator must ensure that such a malfunction cannot occur, respectively that leaks at the pump casing will not present a hazard.
- 12 In order to avoid the destruction of systems and injury to operating personnel we urgently recommend to observe the information and installation information provided in these Operating Instructions

WARNING



Safety information

- 13 First open the cooling water discharge, then the cooling water supply. Otherwise an excessively high water pressure can build up within the pump. When shutting down the cooling water supply proceed in the reverse order: first shut off the water supply, then the water discharge.
- 14 The pumps must only be operated at the allowed speeds. In particular when using frequency converters not approved by Leybold you must ensure an effective protection against overspeeding.

DANGER



0.2 Electrical Hazards

- 1 Potentially lethal voltages are present at the mains connections. Before beginning with any maintenance or service work on the pump, disconnect the pump from all power supplies (lockout/tagout).
- 2 The electrical connection must only be provided by a trained person. Please observe the national regulations in the country of use like EN 50110-1 for Europe, for example.
- 3 Before starting the electric motor for the first time provide upfront a suitable motor protection switch. Please notice the information provided in these Operating Instructions and on the electric motor (wiring diagram).
- 4 Before starting, check to ensure that the junction box is undamaged, run a visual inspection on the seals.
- 5 Install add-on parts (pressure switches, for example) without any mechanical tensions and protect these against being damaged by impacts, for example.
- 6 Lay the connecting lines so that these cannot be damaged. Protect the lines against humidity and contact with water. Avoid thermally stressing the lines by unfavourable laying. Comply with the required standards when designing and laying the electrical connections.
- 7 Provide strain relief for the connecting lines so that the plugs and the line connectors are not subjected to excessively high mechanical stresses.
- 8 Lay electric lines so that there is no risk of tripping over these.
- 9 The RUVAC if must be integrated in the system control arrangement so that the pump can not run-up automatically after it has been shut down due to overtemperature. This applies equally to emergency shut-down arrangements. After having determined the fault cause, the pump should be switched on manually again.
- 10 The following applies to FC operated pumps: after a mains power failure the pump will automatically run up once the mains power returns.

0.3 Thermal Hazards

- 1 Hot surfaces, risk of suffering burns
Under certain ambient conditions the pump may attain temperatures over 80° C. There then exists the risk of suffering burns. Note the danger symbols on the pump and in the case of a hot pump wear the required protection equipment.
If there is the risk of touching hot surfaces inadvertently, install corresponding protection. When working on a pump which is still warm from operation, always wear protective gloves.
- 2 The pump must only be operated at ambient temperatures between 12 to 45 °C. The thermal radiation produced by the pump must be removed to a sufficient extent. If for whatever reason the pump needs to be operated at higher ambient temperatures, then reduced maximum pressure differences apply (derating). For operation under such conditions please consult Leybold.
- 3 Operating the pump with less than the specified amount of cooling water will result in excessively high surface temperatures which can damage the pump. Moreover, there exists the risk of suffering burns.
- 4 Before disassembling any cooling water lines, leave the pump to cool down first, then shut off the feed line.
- 5 Before doing any servicing or maintenance work, always let the pump cool down first.
- 6 Take note of the warning information on the casing surface. If this warning information was removed, covered or obstructed, then provide corresponding additional warning information.

CAUTION



0.4 Hazards Caused by Materials and Substances

- 1 The vacuum line must be leaktight. Hazardous process gases may escape or the pumped gases can react with air or atmospheric humidity. After installation of the pump and after servicing work on the vacuum system, a leak test will always be necessary.

When pumping hazardous gases we recommend a leak test on a regular basis. Leaks in the pump cannot be ruled out under all circumstances. When pumping hazardous gases, the operator must ensure that leaks at the pump will not be a hazard.
- 2 Since not all application related hazards for vacuum systems can be described in detail in these Operating Instructions, Leybold has available a separate document (Safety Booklet) in which the hazards and general safety concepts for design, operation and maintenance of vacuum systems are explained.

DANGER



When planning to pump hazardous substances with this pump, read the related chapters in the Safety Booklet and in these Operating Instructions first. You can download the Safety Booklet from our homepage.

Safety information

3 Before commissioning the pump, make sure that the media which are to be pumped are compatible with each other so as to avoid hazardous situations.

4 If required additional monitoring of the purge gas quantities is necessary from the side of the operator when a well-defined and ensured dilution is necessary from the side of the process.

The type of protection depends on the specific process and needs to be assessed by of the customer.

5 The cooling water from the return is not of drinking water quality and should not be used for this purpose.

After having operated the pump, the cooling water lines may suffer from microbiological contamination. Take appropriate safety precautions.

6 When the pump has been used to pump hazardous gases before, introduce appropriate safety precautions before opening the intake or the discharge connections. Before opening the pump, purge it for a longer period of time with an inert gas. If necessary, wear suitable personal protection equipment like gloves, breathing protection and protection clothing, for example (see Material Safety Data Sheets for the substances in use, the chemical reactions and the by-products). Firmly seal off the pump. When shipping the contaminated pump for servicing please also indicate the type of hazard. For this see Section 5.5 Service at Leybold.

7 Leybold is not in a position to perform servicing (repairs) and waste disposal of radioactively contaminated pumps. Both needs to be ensured from the side of the user.

8 When disposing of the pump, used lubricants and used oil filters, observe the applicable environment regulations.

9 When pumping hazardous gases you must assume the presence of hazardous residues in the pump.

10 If the pump has been contaminated by the process or through environmental influences, it must be decontaminated professionally.

Contaminated parts can be detrimental to health and the environment. Before beginning with any repair and maintenance work inform yourself about any possible contamination. When handling contaminated parts observe the pertinent regulations and comply with the necessary protection measures.

When shipping contaminated pumps which require approval by the authorities, note the applicable regulations regarding packaging and shipping.

- 11 Some pumps use perfluoropolyether (**PFPE**) as lubricant. When handling PFPE you should observe the following:
During thermal decomposition at temperatures over 290 °C toxic and corrosive gases are released. When handling PFPE keep it away from open fires. Do **not smoke** with PFPE on your fingers.
Touch the inner sections of the pumps only while wearing clean gloves, and use clean tools;
do the necessary work in clean and dry rooms;
after having removed the pump from its packaging, start it up as quickly as possible;
as cleaning agents, solvents, based on hydrofluorether compounds may be used.
- 12 Fluoropolymers are used as sealants (FKM) and as lubricants (PFPE) in the pumps. In case the pump suffers a severe mechanical failure, the possibility of hazardous substances being released owing to their thermal decomposition cannot be excluded. The hazards caused by such decomposition are described in the Material Safety Data Sheets for the materials, for example.



0.5 Ignition Risk

- 1 As a rule, the RUVAC pumps must not be used with flammable or explosive mixtures. In particular cases the composition of the substances may not be critical. In this case the user is obliged to analyse this carefully and to take appropriate precautions introduced by competent experts.
- 2 Before pumping oxygen (or other highly reactive gases) at concentrations exceeding the concentration in the atmosphere (> 21 % for oxygen) it will be necessary to use a special pump. Such a pump will have to be modified and degreased, and an inert special lubricant (like PFPE) must be used.
- 3 Before commissioning the pump, make sure that the media which are to be pumped are compatible with each other so as to avoid hazardous situations. All relevant safety standards and regulations must be observed.
- 4 The standard version of the RUVAC is not suited for operation in explosion hazard areas. Contact us before planning to use the pump under such circumstances.

DANGER



Safety information



0.6 Noise Hazard

- 1 The noise level produced by the RUVAC is between 63 and 75 dB(A). When operating the pump temporarily at pressures above 100 mbar the noise level can be very much higher. Make sure that suitable protection measures are taken to protect your hearing ability.
- 2 When the pump is being started with open flanges, a noise level which is detrimental to health will be produced. If such operation is unavoidable, then it is mandatory to wear hearing protectors (ear muffs).



0.7 Danger of Damaging the Pump

- 1 The pump is not suited for applications that produce abrasive or adhesive substances or condensable vapours which leave adhesive or high viscosity deposits. Please contact Leybold in order to select proper separators, for example.
- 2 Do not allow the ingestion of any objects (screws, welding beads, nuts, washers, pieces of wire, etc.) through the intake port of the pump.

If possible, use the intake screen which has been fitted as standard and clean it regularly.

In case the pump is operated without intake screen the operator has to make sure that no objects can enter the pump through the intake port. Objects falling into the pump can cause severe damage at the pump including leaks to atmosphere.

The intake screen does not replace a filter. Prevent the intake of particles from the side of the process by fitting suitable filters.

- 3 Vapours which condense upon being compressed within the pump to liquids must be avoided when their vapour pressure exceeds the vapour tolerance of the pump.
- 4 Before pumping condensable vapours the pump should be at operating temperature. The pump will attain its operating temperature approximately one hour after having started the pump. During this warm-up phase, the pump should be left separated from the process by a valve in the intake line, for example.
- 5 In order to prevent the transfer of vibrations from the RUVAC to other system components which have been connected, we recommend fitting of corrugated hoses respectively compensators on the intake and the discharge side.
- 6 Do not operate the RUVAC in connection with backing pumps where an ultimate pressure exceeding 10 mbar is specified. This will prevent excessively high temperatures when the RUVAC is running idle.
- 7 Maximum cooling water pressure: 6 bar. When exceeded, there is the risk of leaks.
- 8 In the case of wet processes we recommend the installation of liquid separators, upstream and downstream of the pump so as to avoid the influx of liquid into the pump.

Safety information

- 9 The discharge line should be laid so that it slopes down and away from the pump so as to prevent condensed vapours from backstreaming into the pump.
 - 10 The ingress of particles and liquids must be avoided.
 - 11 Before installing, all flange covers must be removed.
 - 12 The location of the RUVAC should be such that all controls are easily accessible.
 - 13 In order to ensure an adequate oil supply, the location at which the pump (including its accessories) is operated should be such that angles over $> 5^\circ$ from the vertical are avoided.
-

Description

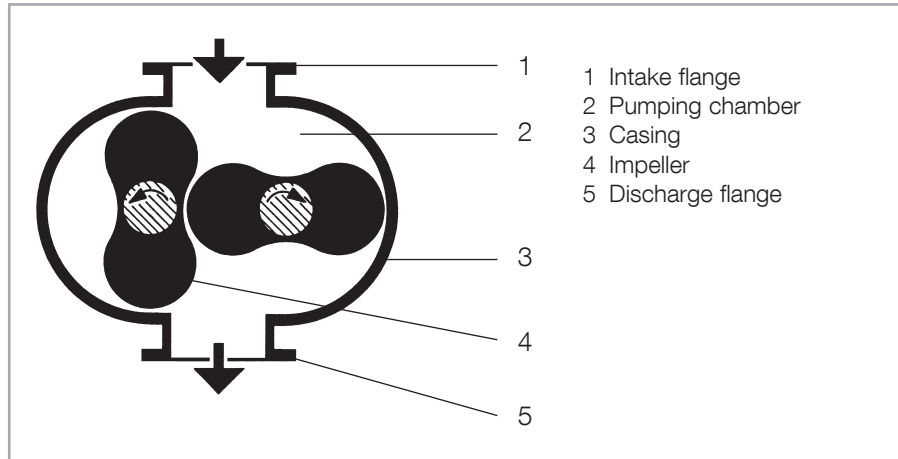


Fig. 1.1 Schematic cross-section of a Roots pump (vertical flow)

1 Description

1.1 Design and Function

The RUVAC pumps are Roots vacuum pumps which are driven by a water cooled hermetically sealed motor. They are lubricated with synthetic oil or perfluorized polyether (PFPE). The WH 700 may be connected directly to the mains power or an external frequency converter.

The pumps have been designed to pump gas in the vertical direction.

Although the pumping chamber of Roots pumps is free of sealing agents and lubricants, the two gearwheels of the synchromesh gearing and the bearings are lubricated with synthetic oil or PFPE. The two bearing chambers are separated from the pumping chamber by the impeller seals.

RUVAC pumps are driven by a water cooled hermetically sealed motor. The motor runs completely under vacuum and is sealed against atmosphere. Thus a shaft feedthrough to the atmosphere is not needed.

The RUVAC 700 is available with two different motors:

- for mains powered 50/60 Hz operation
- for frequency converter operation at frequencies from 20 to 120 Hz.

Temperature sensors

PTC temperature resistors have been integrated in the stator coil of the motors.

At the RUVAC WH 700, Part No. 167186V, the frequency converter is mounted to the pump with a matching housing.

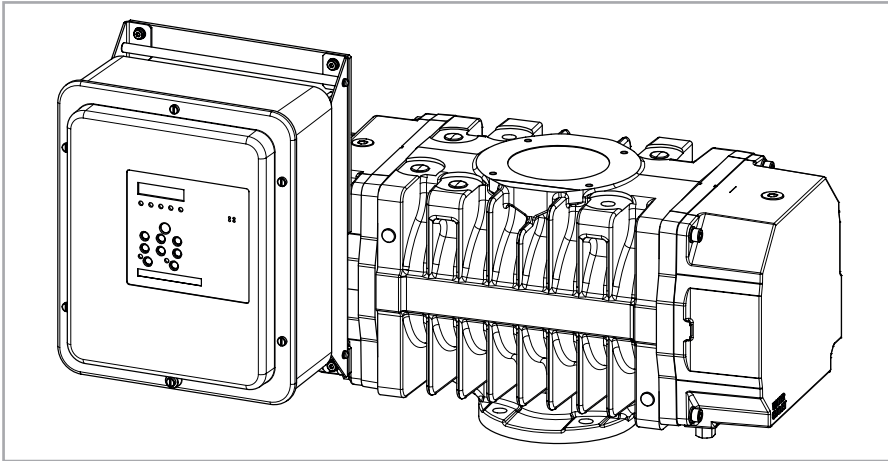


Fig. 1.2 RUVAC WH 700, Part No. 167186V

Lubricants

The RUVAC WH 700 pumps are prepared for use with synthetic oil or for use with PFPE special lubricant (perfluoropolyether).

Only the pumps with PFPE lubricant may be used to pump highly aggressive and hazardous gases. Under such operating conditions it is mandatory to consult Leybold for detailed information.

Since mineral oil and PFPE emulsify when coming into contact with each other, the pumps may only be operated with the type of lubricant specified for the specific pump. Conversion to a different type of lubricant should be left to Leybold only.

For operation with synthetic oil we recommend our vacuum pump oil LVO 210, and in the case of operation with PFPE we recommend LVO 400.

1.2 Standard Specification

Before delivery of the pump, the oil has been drained out. It is supplied separately with the pump.

The pump is supplied with ISO-K gasket (including inlet screen) for use on the intake side.

The pump has been vented with nitrogen to protect it against corrosion.

NOTICE



Description

1.3 Technical Data

RUVAC WH 700		50 Hz	60 Hz	80 Hz ¹⁾	120 Hz ¹⁾
Nominal pumping speed ²⁾	m ³ · h ⁻¹	710	860	1150	1730
Max. effective pumping speed with backing pump SOGEVAC SV 300 B	m ³ · h ⁻¹	620	740	950	1310
Max. permissible pressure difference during continuous operation ^{3), 4), 5)}	mbar	75	65	50	30
Leak rate, integral	mbar · l · s ⁻¹	< 1 · 10 ⁻⁵			
Mains voltage	V				
FC operation		340 to 530 180 to 260	340 to 530 180 to 260 ⁶⁾	340 to 530 180 to 260	340 to 530 180 to 260
Mains operation		360 to 440 180 to 260	410 to 500 210 to 260 ⁶⁾	– –	– –
Max. permissible pressure difference at mains voltage ⁵⁾	mbar				
200 V		50	50	40	25
400 V		60	60	45	25
Permissible ambient temperatures	°C	+5 to +45			
Nominal power consumption	kW				
FC operation		3.5	3.5	3.5	3.5
Mains operation		2.2	2.6	–	–
Idle mode power consumption	kW	0.5			
Energy efficiency class		IE 2			
Nominal speed	rpm	3000	3600	4800	7200
Max. permissible speed ⁷⁾	rpm	7200			
Type of protection	IP	55			
Water connection (4 pcs.)	G	1/4", female			
Cooling water quantity ⁸⁾	l/min	1 to 3			
Cooling water admission temperature	°C	5 to 35			
Permissible cooling water pressure	bar	2 to 6			
Lubricant ⁹⁾	l				
gear side		0.6			
motor side		0.3			
Connection flange	DN ISO-K				
Inlet		100			
Outlet		63			
Weight	kg	125			
Dimension (W x B x H)	mm	709 x 265 x 270			
Noise level ¹⁰⁾	dB(A)	< 56	< 56	< 60	< 60

Notes to the technical data

- 1) Only possible with frequency converter motor and external frequency converter
- 2) To DIN 28 426 and subsequent numbers
- 3) Higher pressure differences are possible. Please contact Leybold
- 4) Gas temperatures over 40 °C can result in a reduction of the pressure difference values; please consult Leybold on this
- 5) The optional frequency converter automatically reduces the rotational speed of the rotors so as to compensate for overloads. During operation do not expose the pump to sudden pressure increases like shock venting to atmospheric pressure, for example
- 6) Requires 200 V FC variant and 200 V motor
- 7) Min. permissible speed: 1200 rpm if run for more than 1 hour
- 8) The cooling water quantity can be reduced provided the temperature of the discharged water does not exceed 45 °C
- 9) Authoritative, however, is the oil level at the oil-level glass
- 10) Valid under ultimate pressure conditions. Pressures over 10 mbar produce a higher operating noise

Description

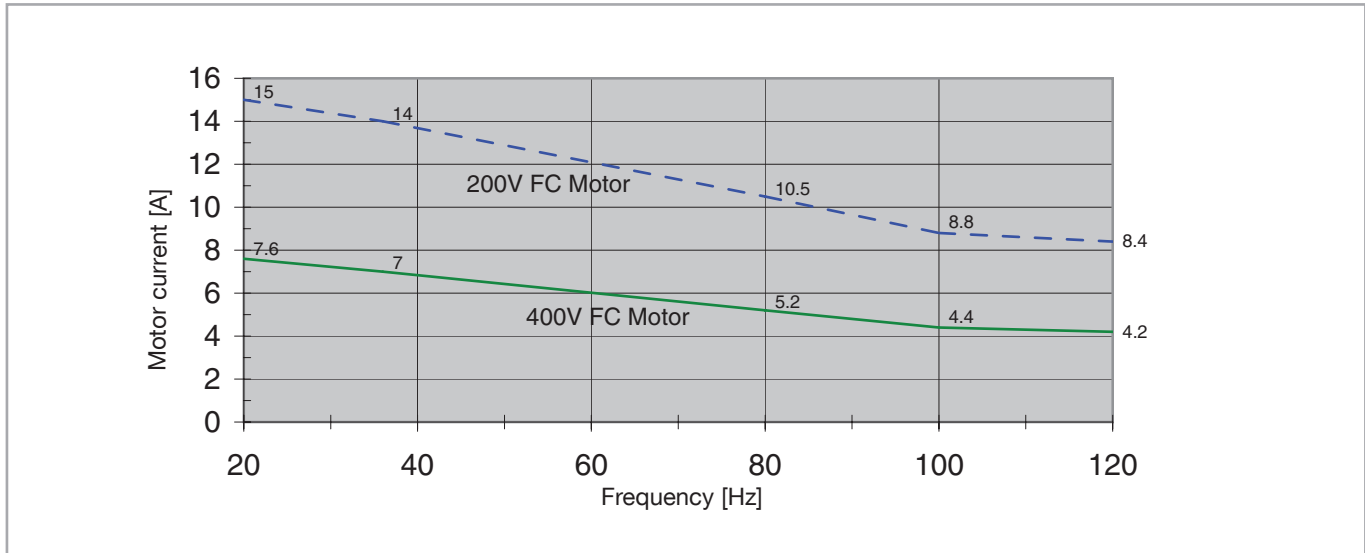


Fig. 1.3 Motor current limits for overload protection for the WH 700

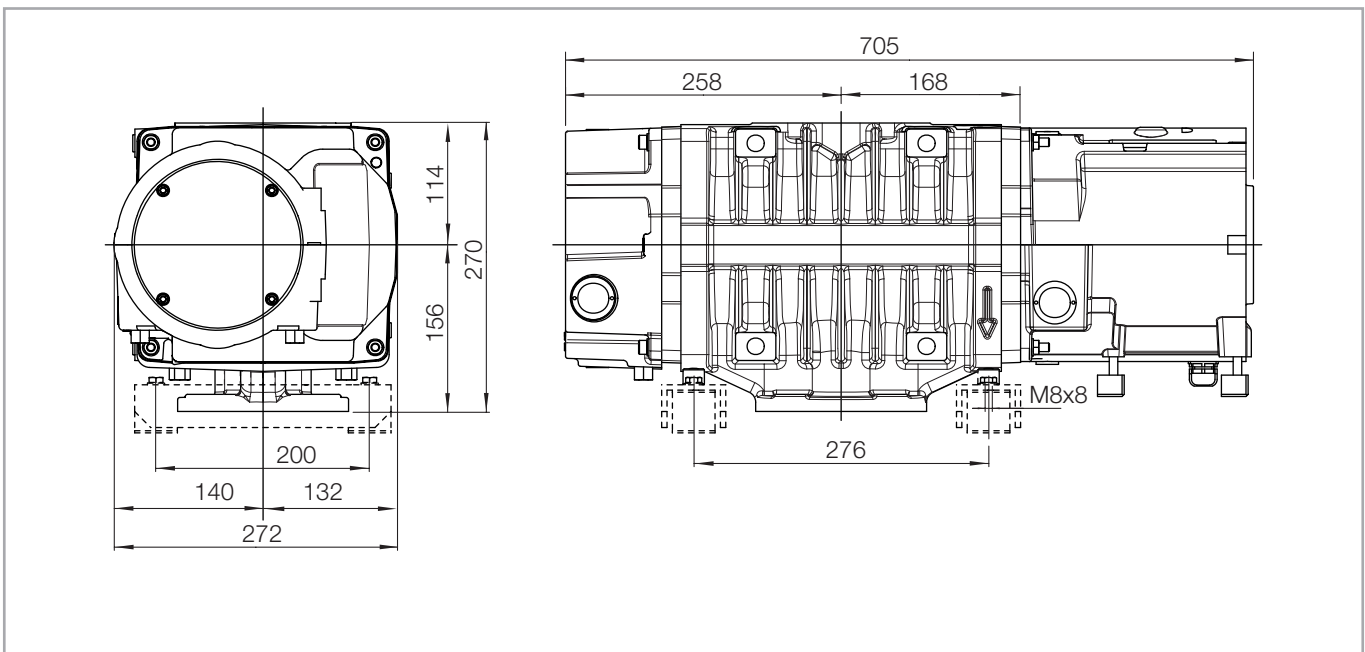


Fig. 1.4 Dimensional drawing

1.4 Ordering Information

P/N	Motor type	Motor power	Motor voltage	Motor frequency	Frequency converter	Type of oil
WH 700						
155 202	DOL	2.2 kW/ 2.6 kW	200 V/240 V ± 10 %	50 Hz / 60 Hz	no	LVO 210
155 203	DOL	2.2 kW/ 2.6 kW	400 V/460 V ± 5 %	50 Hz / 60 Hz	no	LVO 210
155 204V	FC	3.5 kW at 80 Hz	200 V ± 5 %	20 Hz to 120 Hz	yes (external)	LVO 210
155 205V	FC	3.5 kW at 80 Hz	400 V ± 5 %	20 Hz to 120 Hz	yes (external)	LVO 210
155 207V	FC	3.5 kW at 80 Hz	400 V ± 5 %	20 Hz to 120 Hz	yes (external)	LVO 400 (PFPE)
155 208V	DOL	2.2 kW / 2.6 kW	200 V/240 V ± 10 %	50 Hz / 60 Hz	no	LVO 400 (PFPE)
155 209V	FC	3.5 kW bei 80 Hz	200 V ± 5 %	20 Hz to 120 Hz	yes (external)	LVO 400 (PFPE)
167 186V	FC	3.8 kW	400 V ± 5 %	20 Hz to 120 Hz	yes (internal)	LVO 400 (PFPE)

1.5 Accessories

Frequency converter incl. mains filter 200 / 240 V, motor power 4 kW (for P/N 155 204V)	155 218V
400 / 480 V, motor power 4 kW (for P/N 155 205V and 155 207V)	155 217V
LCD Display (for P/N 155 217V and 155 218V)	155 213V
USB Copy Unit (for P/N 155 217V and 155 218V)	155 214V
Profibus DP Module (for P/N 155 217V and 155 218V)	155 212V
ProfiNet Module	112005A35
EtherCAT Module	112005A36
Relay module (digital output)	112005A01
Ethernet interface board	112005A02
Oil drain facility (M 16 x 1.5) with 90° discharge coupling	200 14 271
Reducer DN 100/63 ISO-K	267 47
Spare Part: Major maintenance kit	EK 110 002 691

Frequency converter dimensions incl. mains filter

Part No.	Yaskawa Designation	for RUVAC	Description	W x H x D incl. mains filter
155 217V	CIMR-VC 4A0011BAA	WH 700	400 V 4 kW	140 x 128 x 190
155 218V	CIMR-VC 2A0020BAA	WH 700	200 V 4 kW	140 x 128 x 190

Transport and storing

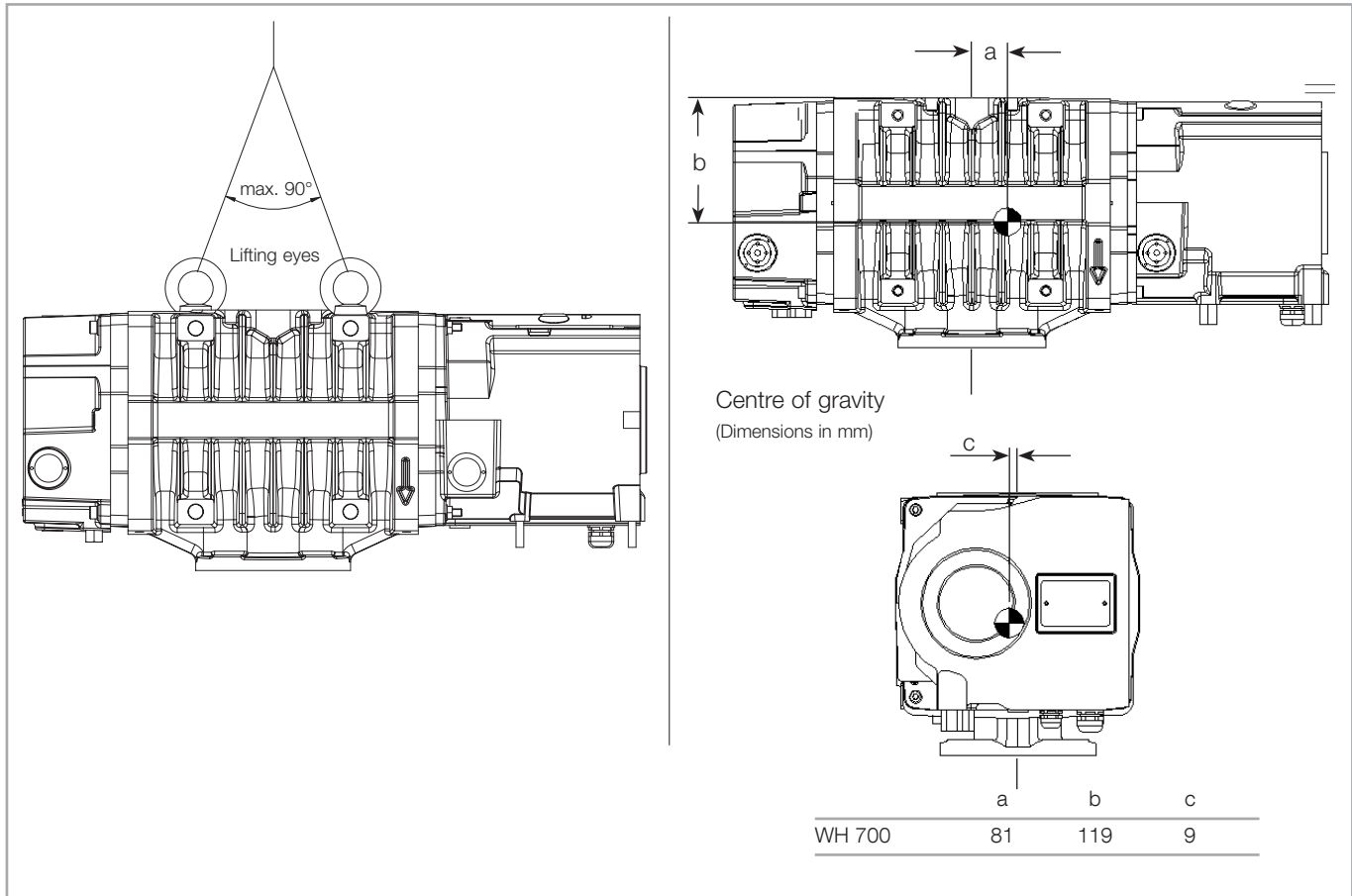


Fig. 2.1 Transporting the pump

2 Transport and Storing

Roots pumps are heavy machines made of cast iron and thus should only be lifted using suitable lifting equipment tied to the lifting eyes provided for this purpose.

See fig. 2.1 for correct lifting of the pump.

CAUTION



Please be aware that the RUVAC is not designed to be tilt resistant without affixing it to a suitable supporting structure. Serious injury can result if the pump is dropped or not handled properly.

When the pump is connected to a backing pump or mounted to a frame, ensure sufficient resistance against toppling (for this, note the centre of gravity depicted in fig. 2.1).

When the pump is removed from the shipping container it has to be secured with suitable lifting equipment until it is safely joined to a vacuum flange or a rack that is stable enough to support the weight of the pump.

Transport and storing

Before transporting, the cooling water must be drained out first so as to avoid damage caused by frost.

Before transporting the pump always drain out the oil. Screw the oil-drain plug with its gasket back in and wipe any oil droplets off from the casing.

The pump should be transported and stored in a horizontal position. Otherwise there is the danger that oil from the side chambers may enter the pump chamber, even before the pump is filled with oil for the first time.

When shelving the pump for a longer period of time you should seal off the flanges of the pump with the plastic discs and blanking off collars supplied for shipping. If require place a bag with desiccant in the pump chamber. Before operating the pump once more do not forget to remove this bag first.

Pumps having a filling of PFPE should be sealed off in a gas-tight manner and vented with nitrogen so as to prevent corrosion.

NOTICE



Temperature (only when stored without cooling water!) -20 °C ... +60 °C

Storage location dry

Max. relative atmospheric humidity 95 %, not condensing

The pump must be stored at the most for one year only. Longer storing without turning the rotors will damage the bearings. Connect the pump to operate it briefly and then decommission it as described in the following sections.

Refer to the frequency converter Operating Instructions when a frequency converter was longer than 2 years on stock.

Installation

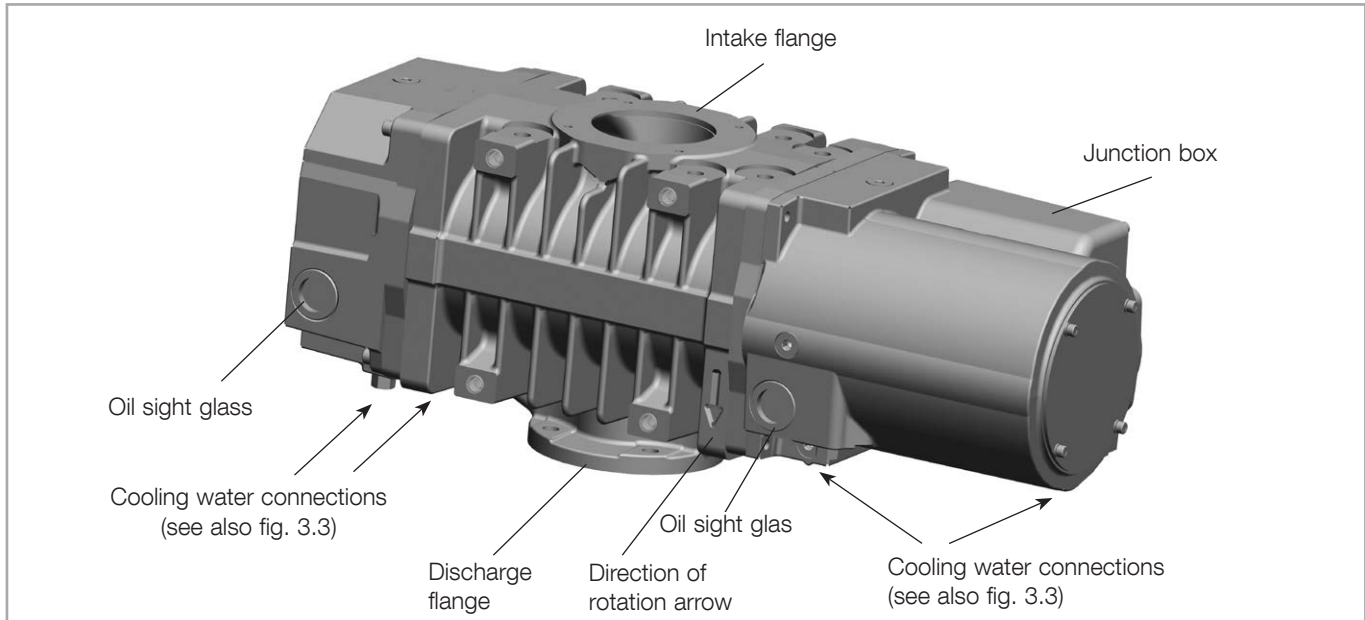


Abb. 3.1 Connections at the pump

3 Installation

NOTICE



Only fill in the oil after having horizontally installed the pump.

If the pump is connected to a backing pump or bolted to a rack, sufficient protection against toppling must be ensured (for this note the centre of gravity depicted).

Before pumping oxygen (or other highly reactive gases) at concentrations exceeding the concentration in the atmosphere (> 21 % for oxygen) it will be necessary to use a special pump. Such a pump will have to be modified and de-greased, and an inert special lubricant (like PFPE) must be used.

3.1 Placement

Install RUVAC pumps on a flat, horizontal surface (2° max. tilt).

If the pump is not levelled, lubricant may enter the pumping chamber from the gear chambers.

The pump's ambient temperature should be between 12 °C and 45 °C. Lower temperatures hamper run-up; higher ones shorten the lubricant change intervals and may lead to greater wear. Moreover, the pump attains its thermal operating limit faster.

Secure the pump. Four bores in the bottom of the pump casing (M8) are provided for this purpose.

When bolting the pump down, make sure there is no stress applied to the pump casing. Stress can affect the narrow clearances between the impellers and the pump casing and cause damage on the pump. Use suitable elastic elements, for example rubber bounded metal to protect the pump from excessive stress and vibrations of the backing pump.

If compensation elements (bellows) must be attached to the flanges on the suction and pressure sides, the pump must always be mounted on a suitable rack.

3.2 Connection of the Flanges

Already small quantities of liquids (from the vacuum chamber or the piping) can lead to liquid damages within the pump. These may lead to a deformation of the impellers and may entirely destroy the pump. Suitable protective measures should be provided as required in the piping on the suction side (separator, T-piece).

The RUVAC pumps are vented with nitrogen. Only remove the packing flanges before immediate connection.

If not already done, remove the plastic discs, foil or packing flanges from the flanges at the pump casing.

We recommend that you retain the transport flanges in case you want to store the pump at a later date.

Clean the flanges and check that the sealing surfaces are in perfect condition. Flange the pump to the system.

Don't place any stress on the pump casing when installing the intake and exhaust lines. Fit compensation elements in order to avoid such stresses.

When attaching the pump directly to the forevacuum pump, you must always use on the pressure side the full number of screws defined by the flange standard (ISO-K, DIN or ASA) whereby these must comply with the demanded property class rating.

You must also check whether the backing pump is rigid and stable enough to support the load of the RUVAC WH in each case. If this is not the case the RUVAC WH be mounted on a suitable rack.

The supplied inlet screen should always be fitted into the intake flange in those cases where there is the risk that contamination from the vacuum vessel or from the piping may enter into the pump.

Even with clean vacuum processes, contaminants from the system may enter upon initial start-up. Depending on the operating conditions, the inlet screen may reduce the pumping speed of the pump.

NOTICE



NOTICE



NOTICE



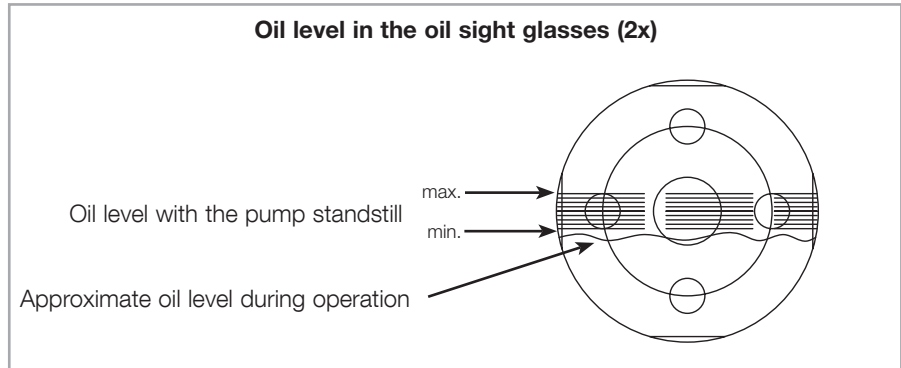


Fig. 3.2 Oil level in the oil sight glass

3.3 Filling in of the Lubricant

The lubricant is supplied separately upon delivery.

Unscrew the oil-fill plug from the oil-fill opening (see fig. 5.1) and fill the lubricant into both side chambers.

As PFPE we recommend the LVO 400 oil sold by us, as synthetic type of oil LVO 210. When planning to operate the pump with a different type of oil or with special lubricants, please consult us first.

With the pump at standstill, the correct oil level will be at the centre of the oil sight glass, see fig. 3.2 and fig. 5.1.

NOTICE



If the oil level is too low, the bearings and gearwheels are not lubricated adequately; if it is too high oil may enter the pumping chamber.

Clean the oil-fill port and screw the plug back in using a gasket which is in perfect condition.

Please observe the tightening torque shown in fig. 5.1.

The oil-fill port must be sealed air-tight. Entry of air from the outside may cause oil-containing gas to enter the pumping chamber via the impellers seals

3.4 Conforming Use

The RUVAC pumps are vacuum pumps which in connection with suitable backing pumps are capable of pumping gases and vapours.

They are employed to increase the pumping speed of backing pumps below 10-100 mbar by a very significant factor or for the purpose of attaining a lower ultimate pressure.

Alternatively the RUVAC vacuum pumps may be used to pump gases in closed circuits provided the permissible pressure differences are not exceeded and provided the absolute pressure within the circuit does not exceed 1.2 bar.

Accessories which have not been specified by Leybold may only be used after approval by Leybold.

3.4.1 Non-conforming Use

Non-conforming use for the pump are among other things:

- Pumping of gases and vapours for which the materials of the pump are not suited.
- Pumping of condensable vapours without adequately controlling the temperature of the pump. Upon compression in the pump, these vapours may condense or form deposits.
- Pumping of dusts and solids without suitable traps and filters.
- Pumping of liquids.
- Pumping of ignitable gas mixtures.
- Operation at an impermissibly high differential pressures.
- Pumping of process gases which form hard or sticky deposits which may cause the pump to seize.
- The use of pump and frequency converter in the explosion hazard areas.
- Non-compliance with the described maintenance and service intervals.
- Use in systems and pump systems in which the pressure may increase over 1.2 bar abs.
- Operation with an inadequately affixed pump.
- Operation without suitable backing pump.
- Operation at impermissibly high gas temperatures.
- Use in systems where pump, frequency converter and cables are subjected to impact stresses.
- Operation on movable systems or system components (locks or mobile pump systems).
- Use of pump, fitted add-on components, drive electronics, flanges and cables to climb onto the system.
- Removing, covering or obstructing warning notices.
- Standstill or storing of pump and drive electronics without suitable sealing and drying. When stored in a humid atmosphere corrosion can occur.
- Conversions, manipulations and maintenance work by persons not authorised by Leybold.

The non-conforming utilisation of pump and accessories may result in severe injury or damage to the components.

WARNING



Installation

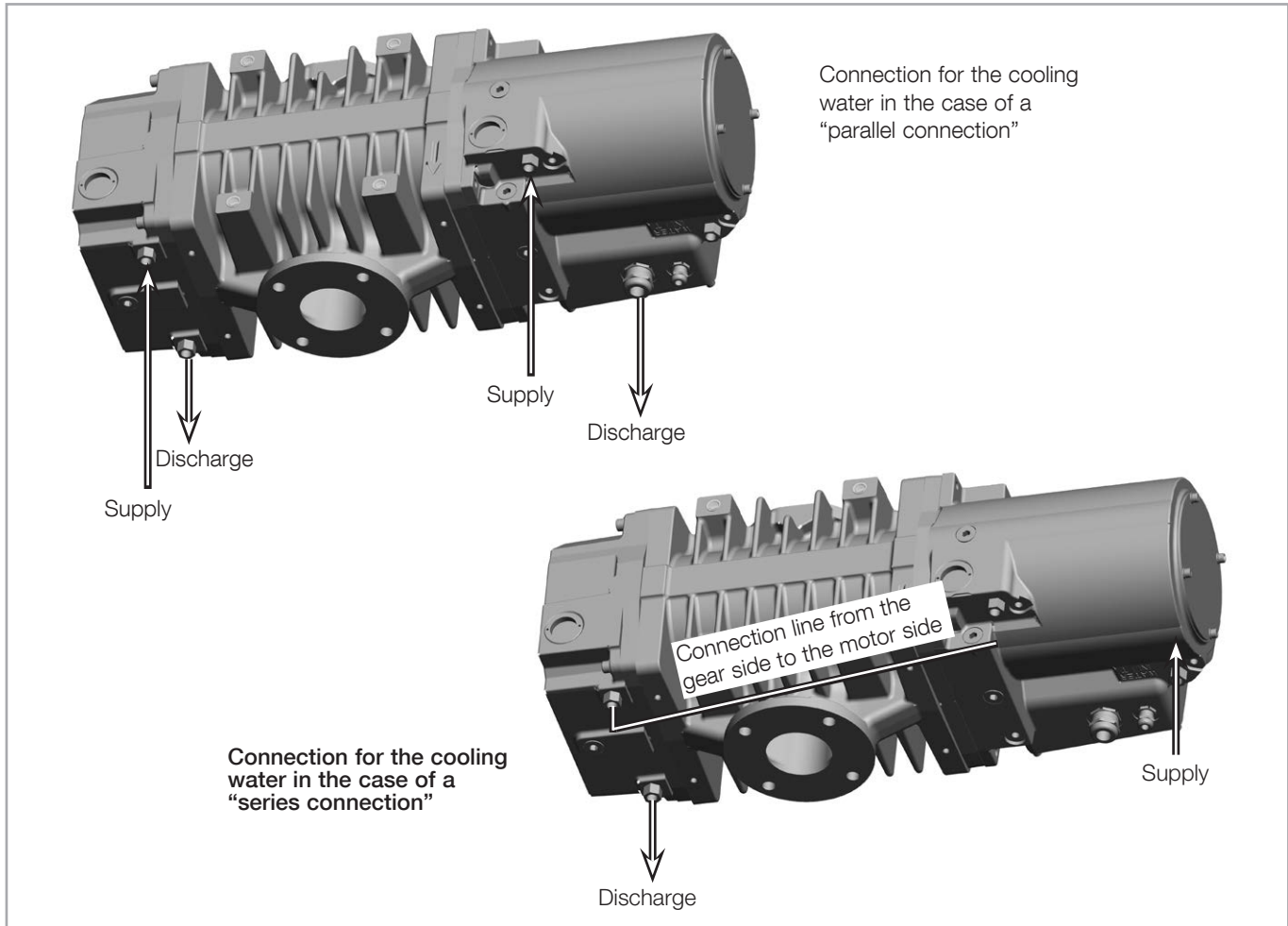


Fig. 3.3 Cooling water connections

3.5 Connecting the Cooling Water

NOTICE



Operation without cooling water will damage the pump.

A cooling water throughput of at least 1 litre per minute (60 l/h) is required.

Connect the cooling water lines to the cooling water connections of the motor and the gearbox cover.

The water cooling arrangement may be implemented either by way of a "parallel connection" or a "series connection".

When connecting the cooling water by way of a "series connection" a connection line needs to be fitted running from the gear side to the motor side.

NOTICE



When connecting the cooling water by way of a "parallel connection" the supply and return lines must not be confused.

Ensure that the cooling water lines are leak tight. Water leaks can damage the electronics of the pump.

3.5.1 Water Quality

In order to ensure long trouble-free operation the cooling water must not contain any oils, greases and suspended solids. Moreover, we recommend compliance with the following limit values:

Appearance	Clear, free of oils and greases
Suspended matter	< 250 mg/l
Particle size	< 150 µm
Electrical conductivity	< 700 µS/cm
pH value	7.0 to 9,0
Total hardness (total alkaline earths)	< 8 °dH
Aggressive carbon dioxide	None, not detectable
Chloride	< 100 mg/l
Sulfate	< 150 mg/l
Nitrate	≤ 50 mg/l
Iron	< 0.2 mg/l
Manganese	< 0.1 mg/l
Ammonium	< 1.0 mg/l
Free chlorine	< 0.2 mg/l

8 °dH (degrees German hardness) = 1.4mmol/l

= 10 °e (degrees English hardness)

= 14 °f (degrees French hardness)

If there is the danger of frost, you may use a water glycol mixture of up to 30 %.

DS water (softened or fully desalinated water) can be used for cooling the system, if the pH value corresponds to the range indicated above.

3.6 Electrical Connection

CAUTION



Notice safety information 0.2!

The pump is not equipped with any switching facilities of its own. All protection measures related to the power supply need to be implemented from the side of the system whereby the customer will bear full responsibility.

Proper connection requires the utilisation of a corresponding protection facility against excessively high currents and short-circuits.


Never allow the pump to run in the wrong direction or with open flanges for a longer period of time.

After switching off, wait for a least 2 minutes for the residual voltages to decay.

NOTICE



For pumps with an integrated frequency converter observe the following: Before applying mains power to the frequency converter please make sure that the 24 V contact is not closed. Otherwise the impellers would start rotating immediately.

Always ensure that the ground conductor  has been connected professionally and without introducing any additional joins. Never leave the protective ground conductor for the pump unconnected. Since the leakage currents with reference to ground may exceed 3.5 mA, the frequency converter must always be connected to ground in accordance with the national and local regulations. The wire cross-section must amount to at least 10 mm² or it must consist of two separately connected ground connections.

The RUVAC is suitable for operation in industrial applications only. It is not suitable for operation with mains supplies of residential areas since it could cause radio frequency interference.

The connection voltage must agree with the voltage stated on the nameplate.

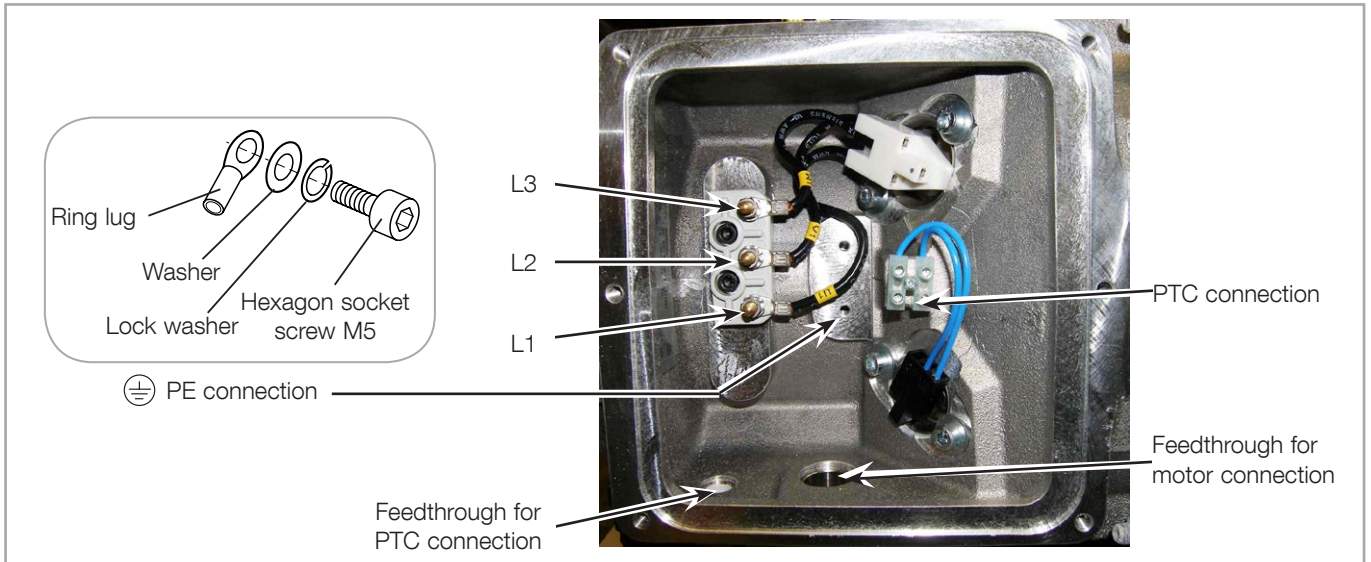


Fig. 3.4 Electrical connections in the motor junction box

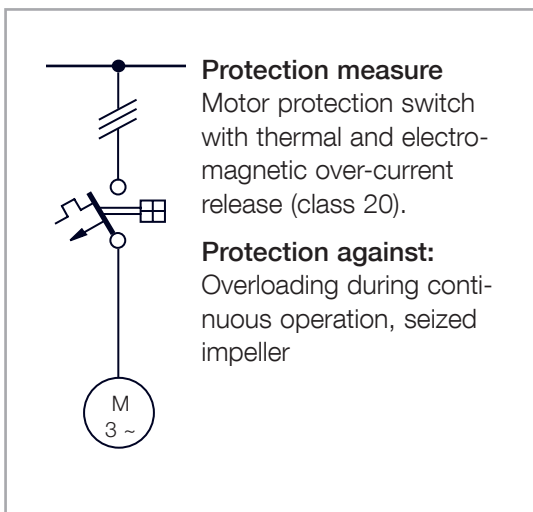


Fig. 3.5 Circuit example for motor protection

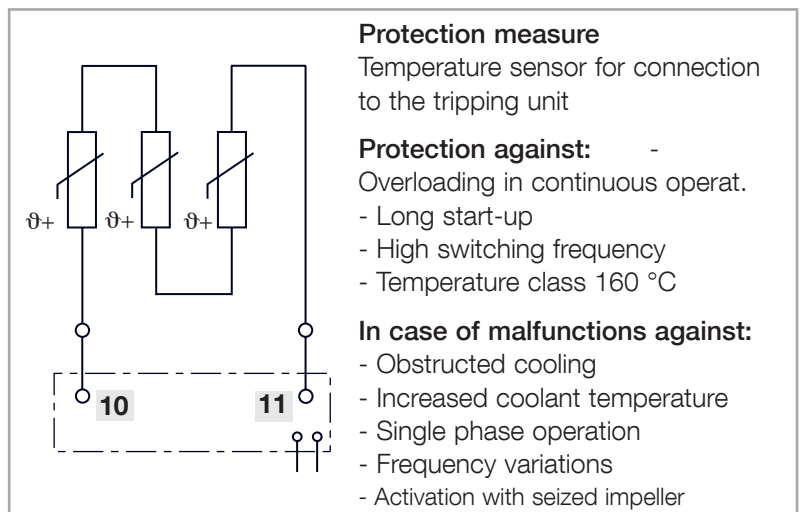


Fig. 3.6 Circuit example for the temperature sensor

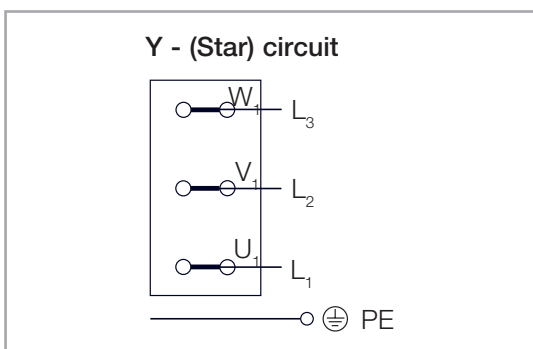


Fig. 3.7 Mains power connection (circuit diagram in the junction box)

Installation

Mains power connection

CAUTION



Take note of the information on the name plate!

The cable cross-section of the power feed line must be calculated in consideration of cable length and fusing for the power feed line. The cable cross-section of the power feed line must be based on the technical data of the motors (Section 1.3).

The terminal assignment is provided in fig. 3.4 to fig. 3.7.

Located at the junction box are two cable feedthroughs M 20 x 1.5 and M 16 x 1.5. In the case of the FC motors, EMC compliant cable glands are used.

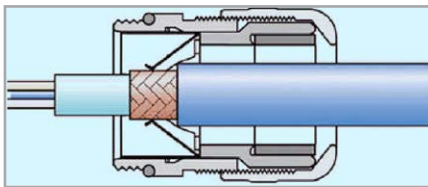


Fig. 3.8 Contacting of the EMC compliant cable glands

Standard contacting of EMC compliant cable glands

- Strip outer sheath and shield
- At approximately 15 mm from the end, cut around the outer sheath but do not pull off
- Run the cable through the cable gland
- Strip the outer sheath
- Pull the cable back until a connection between cable shield and contact spring has been established
- Screw down ... done!

For thin cables without inner jacket:

- Strip the outer sheath
- Push the shielding braid back by approximately 15-20 mm over the outer sheath
- Run the cables through the cable gland until a connection has been established between shield and contact spring
- Screw down ... done!

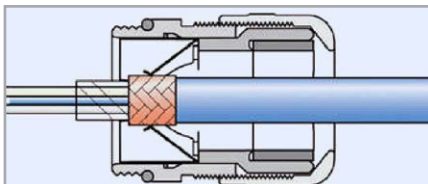


Fig. 3.9 Contacting of the EMC compliant cable glands for thin cables without inner sheath

The RUVAC WH 700 must be integrated in the system control arrangement so that the pump can not run-up automatically after it has been shut down by the temperature switches in the motor. This applies equally to emergency shut-down arrangements. After having determined the fault cause, the pump should be switched on manually again.

Direct Switch-on (for mains powered motors only)

The motor connections are provided according to fig. 3.4 and 3.7.

Temperature sensors (PTC resistors in accordance with DIN 44082) have been integrated within the motor coil which are connected in the junction box to the terminals 10 and 11. This signal needs to be processed such that as soon as the permissible coil temperature is exceeded, the motor circuit is interrupted. For this, connect these terminals exclusively via an electrically insulated tripping unit to be pump controller (Klöckner Möller EMT6DBK, for example).

Internally the motor has been wired according to the corresponding mains voltage.

Soft Start-up (for mains powered motors only)

In order to cut current consumption from the power supply it is possible to electronically control the supply voltage for the motor while it is running up. Here processing of the signal from the temperature sensor is mandatory. During the start-up time, the motor must reliably attain its nominal values.

External Frequency Converter (FC operation)

Frequency converter operation serves the purpose of controlling the speed of the pump (process pressure control). Only frequencies between 20 Hz and 120 Hz may be set up.

The maximum speed of 120 Hz must not be exceeded! We specifically recommend the use of frequency converters and mains filters which are listed under the heading "Accessories".

When selecting a suitable frequency converter, the motor data for FC operation detailed in 1.3 must be observed.

Depending on the level and the quality of the output voltage from the frequency converter the circumstances may be such that not all operating modes of the pump can be run constantly owing to the additional heat produced in the motor coils. For this reason the signals from the temperature sensors (PTCs) in the motor must be processed.

For the motor power supply line, shielded types of cable must be used.

In the case of FC operation considerable electromagnetic interference occurs. Here the limits specified in the pertinent standards and guidelines need to be complied with. In order to reduce the level of electromagnetic interference, shielded motor cables, shielded cable feedthroughs, mains filters and EMC compliant ground connections are required between frequency converter and pump.

In order to protect the pump, current limits in the frequency converter as a function of the frequency must be taken into account. See diagram for 200 V and 400 V FC motor (Section 1.3, Technical Data).

DANGER



Installation

WARNING



The aforementioned frequency converters serve exclusively the purpose of being able to infinitely vary the speed of the WH 700 and have been parameterised correspondingly for the FC motors specified in Section 1.3.

NOTICE



Observe the information on the frequency converter provided in the enclosed Operating Instructions issued by the manufacturer.

The frequency converter has been designed to be installed within an electrical cabinet.

Please note particularly the safety information relating to installation and operation.

Further information can be found on the home page of the manufacturer of the frequency converter under “Technical Documentation” for the respective unit.

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting
Multifunction digital inputs	S1	Multifunction input 1 (Closed: Forward. Open: Stop)	Photocoupler 24 V DC, 8 mA Notice: Drive preset to sinking mode. When using source mode set DIP switch S3 to allow for a 24 V DC (+/-10%) external power supply.
	S2	Multifunction input 2 (Closed: Reversing. Open: Stop)	
	S3	Multifunction input 3 (External fault (normally open))	
	S4	Multifunction input 4 (Fault reset)	
	S5	Multifunction input 5 (Multistep speed reference 1)	
	S6	Multifunction input 6 (Multistep speed reference 2)	
	S7	Multifunction input 7 (Jog reference)	
	SC	Multifunction input common (Control common)	
	HC	Power supply for safety disable input	+ 24 V DC (max. 10 mA) are allowed
Safety disable input	H1	Safety disable input	Open: Output disabled. Closed: Normal operation. Notice: Disconnect wire jumper between HC and H1 when using the safety disable input. The wire length should not exceed 30 cm.

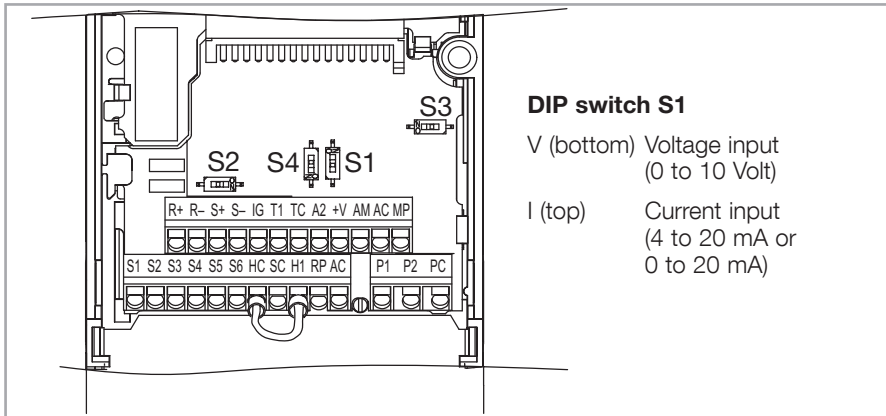


Fig. 3.10 Terminal strips and DIP switches of the frequency converter

The frequency converter has been set up in the factory so that the following functions have been assigned to the inputs and outputs listed in the following:

Connection Start/Stop

Bridge SC and S6 to enable the drive.

Bridge SC and S1 to start the drive, open SC and S1 to stop the drive.

Connection of the Motor PTC to the Frequency Converter

In order to process the signals provided by the PTCs in the motor, the following connections need to be provided:

- Resistor 12 kOhm 0.25 W between terminals +V and A2
- PTC between terminals A2 and AC
- DIP switch S1 in position "V" (bottom position)

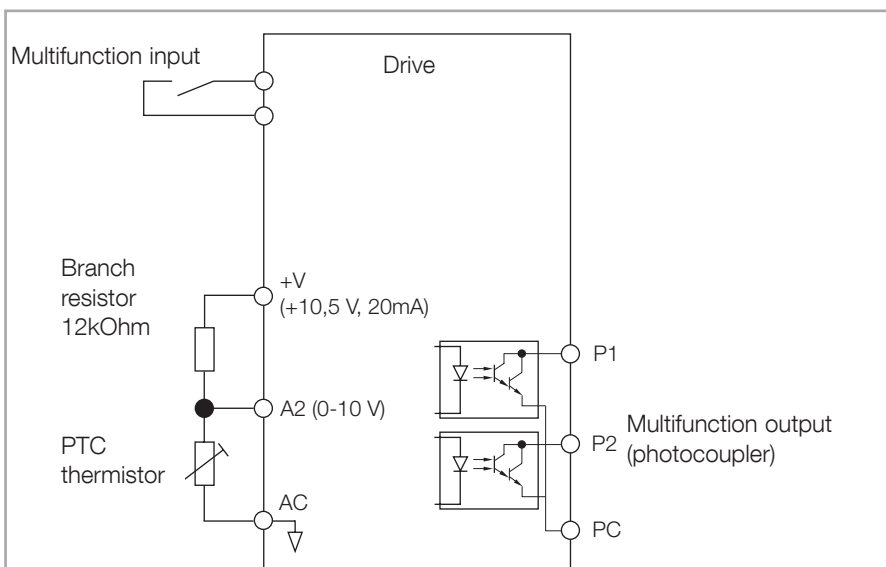


Fig. 3.11 Connection of the motor PTC

Installation

Establishing Potential Equalisation

NOTICE



In the case frequency converter operation and ground leakage currents of over 3.5 mA, the protective ground conductor must have a cross-section of the least 10 mm². Or a further protective ground conductor having at least the same cross-section as the connection cable must be provided.

An M8 thread is provided at the motor casing for connecting the external potential equalisation cable.

The potential equalisation conductor must be connected as depicted in fig. 3.12.

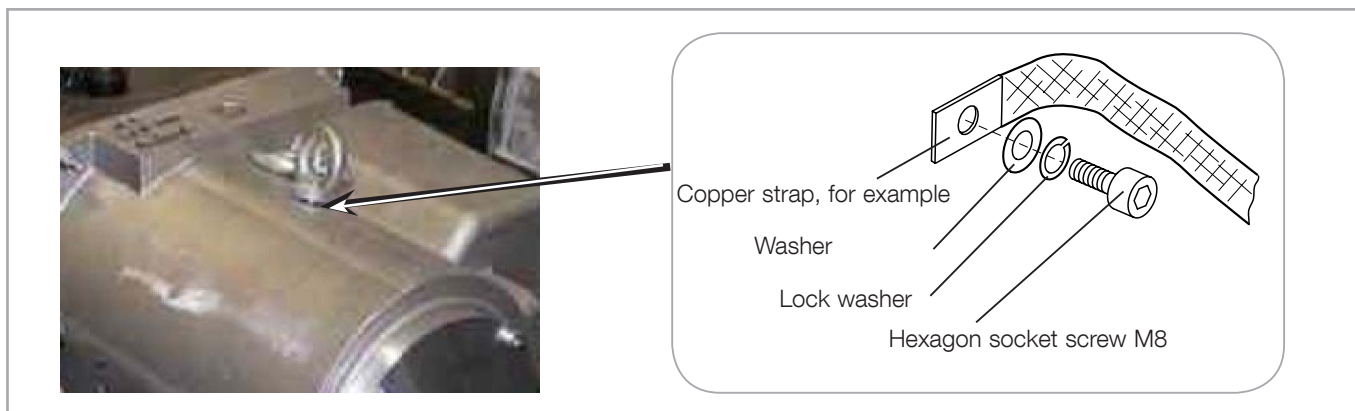


Fig. 3.12 Establishing the potential equalisation at the pump casing

3.6.1 Checking the Direction of Rotation

After connecting the motor and every time you alter the wiring, check the direction of rotation.

An arrow on the motor flange (see fig. 3.1) shows the correct direction of rotation for the impeller connected to the motor shaft. To check rotation, switch on the motor briefly and observe the direction of impeller rotation through the pump's intake and then immediately switch off again.

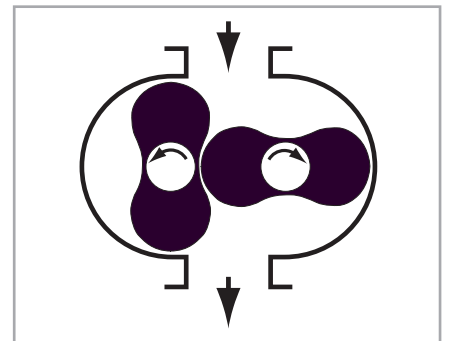
Wear protective goggles for protection against particles which may be forced out of the flange opening. Keep your hands away from the flange opening. Wear suitable hearing protection.

The impellers should move up from the center and drop down to the side. If this is not the case, disconnect the pump from the mains and interchange two mains phases.

Even if the pump has been already firmly connected to the piping, you may determine the direction of rotation.

For this, evacuate the vacuum system down to a pressure below 20 mbar with the aid of the backing pump. Then switch on the RUVAC briefly; now the pressure must drop. If the pressure increases or remains constant, the RUVAC is turning in the wrong direction.

CAUTION



4 Operation

4.1 Start-up

NOTICE



Check the pump motor's direction of rotation (see Section 3.6.3).

If condensable vapours are pumped, it is advisable to evacuate the vacuum vessel via a roughing line to the cut-in pressure. Electrically switch on the Roots pump together with the backing pump and cut it in upon reaching the cut-in pressure. The initial bypassing of the Roots pump serves to prevent condensation of vapours in the cold pump.

The RUVAC with frequency converter can be started at atmospheric pressure and will run with reduced rpm until the backing pump has evacuated the vessel below the cut-in pressure.

The RUVAC without frequency converter must only be started after the cut-in pressure has been attained.

The permissible cut-in pressure depends on the ratio between the Roots pump and the backing pump.

$$p_E = \frac{\Delta p_{\max}}{k_{\text{eff}} - 1}$$

Since k_{eff} is not known in all cases, the following equation may be used for a first approximation:

$$p_E \sim \frac{\Delta p_{\max}}{k_{\text{th}} - 1}$$

p_E = Cut-in pressure

Δp_{\max} = Maximum permissible pressure difference
(see Technical Data)

k_{th} = Theoretical compression ratio = $\frac{\text{Nominal pumping speed}^{1)} \text{ RUVAC}}{\text{Nominal pumping speed of the backing pump}}$

k_{eff} = Effective compression ratio = $\frac{\text{Effective pumping speed RUVAC}}{\text{Effective pumping speed of the backing pump}}$

Example - Pump combination:

RUVAC WH 700²⁾ / Sogevac SV 100

$$k_{\text{th}} = \frac{710 \text{ m}^3 \cdot \text{h}^{-1}}{100 \text{ m}^3 \cdot \text{h}^{-1}} \sim 7$$

$$p_E \sim \frac{75 \text{ mbar}}{7 - 1} \sim 12 \text{ mbar}$$

¹⁾ at the respective operating frequency

²⁾ for 50 Hz operation

4.2 Operation

Do not operate the pump without having connected the flanges to a vacuum system.

The screws of the flanges on the suction and the pressure side must not be loosened in the presence of a vacuum or while the pump is still running.

During operation of the RUVAC, check the lubricant level from time to time and also the condition of the lubricant. Correct as required (see Section 5.2). When using PFPE as intended, PFPE will not be subject to aging.

However, dark colour is a sign of oil contamination with process products and should be watched closely.

Dirt Ingress into the Oil via the Piston Rings

In the case of dusty processes which are frequently vented with atmospheric air, there is the risk of dust being forced into the oil chambers. This can be prevented by a pressure equalisation between the oil chamber and the pump chamber. For this, install a valve at the oil inlet which during operation is opened simultaneously with the venting valve.

Run the Roots pump exclusively under the operating conditions for which it has been designed. Any modification of the operating parameters (e. g. intake pressure, intake temperature, ratio between Roots pump and backing pump) for a longer period may place an inadmissible thermal load on the pump. Increases in temperature which are not compensated by taking suitable measures may damage the Roots pump and/or the backing pump.

Hot surfaces, risk of suffering burns.
Notice safety information 0.3.

Never open the oil-fill or oil-drain plugs in the presence of a vacuum or while the pump is running. There is the danger that oil may squirt out.

CAUTION



NOTICE



CAUTION



4.2.1 Operation with External Frequency Converter

NOTICE



Note the permissible speed range (see Section 1.3.)
Note the Operating Instructions for the frequency converter.

The RUVAC is started/stopped through the 24 V Start/Stop contact.

When closing the 24 V contact, the frequency converter will start up the impellers following a defined rpm ramp. Depending on the ambient noise it can take several seconds until the operation of the RUVAC can be heard or detected otherwise.

When operated off a frequency converter, the RUVAC can be started at atmospheric pressure and will run with reduced speed until the backing pump has evacuated the vessel below the cut-in pressure.

During operation the frequency converter will not exceed a defined power output. In case the cut-in pressure of the pump is exceeded, the frequency converter will slow down the impellers to reduce the power output and accelerate again after the pressure has dropped.

When shutting down the RUVAC the impellers are not actively slowed down. Depending on the vacuum conditions it can take several minutes until the impellers have stopped turning. For safety reasons please consider this fact when operating the pump.

It is not allowed to expose the RUVAC to sudden pressure increases above the cut-in pressure as for example when pumping down a vacuum chamber from atmospheric pressure. Sudden venting during operation will damage the pump and/or the frequency converter or reduce the lifetime of the bearings drastically.

In case a chamber pumpdown from pressures above cut-in pressure is needed, either bypass the RUVAC or shut it down and allow the impellers to slow down before starting pumpdown.

4.3 Switching off and Decommissioning

For shutdown, close the valve between the Roots pump and the vacuum system. First switch off the Roots pump and wait for the impellers to arrive at a standstill and thereafter switch off the backing pump.

After working with corrosive gases, the system should be vented with dry protective gas (e.g. N₂) to prevent corrosion during standstill.

When decommissioning the pump and removing it from the system, it is advisable to seal the connecting flanges tightly.

Vent the RUVAC only from the intake side to prevent any oil backstreaming from the backing pump.

Before removing pump from the vacuum system, disconnect it from the mains supply.

Note any contamination affecting the pump.

Comply with all safety information 0.2.

RUVAC pumps with a PFPE filling **must** upon removal from the system be flooded with nitrogen and sealed off in a gas-tight manner because PFPE does not have a conserving effect. For RUVAC pumps with synthetic oil we recommend this protection measure.

For transportation and storing of the pump, observe the information provided in Section 2.

WARNING



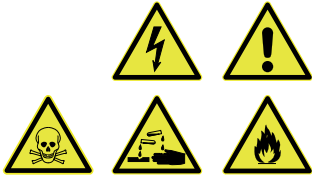
Maintenance

5 Maintenance

5.1 Safety Information

The safety information given in the following applies to all maintenance work.

WARNING



Observe safety informations 0.1 to 0.4.

Disconnect the electrical power before disassembling the pump. Make absolutely sure that the pump cannot be accidentally started even by an occurring pressure difference, for example.

If the pump has been pumping harmful substances, determine the nature of the hazard and introduce suitable safety measures.

Improper maintenance or repairs may affect the service life and performance of the pump, and cause problems when filing warranty claims.

Advanced repair work not described here should be left to the Leybold Service.

We would like to point out that Leybold offers training courses on the maintenance, repair, and troubleshooting of RUVAC pumps. Further details are available on request.

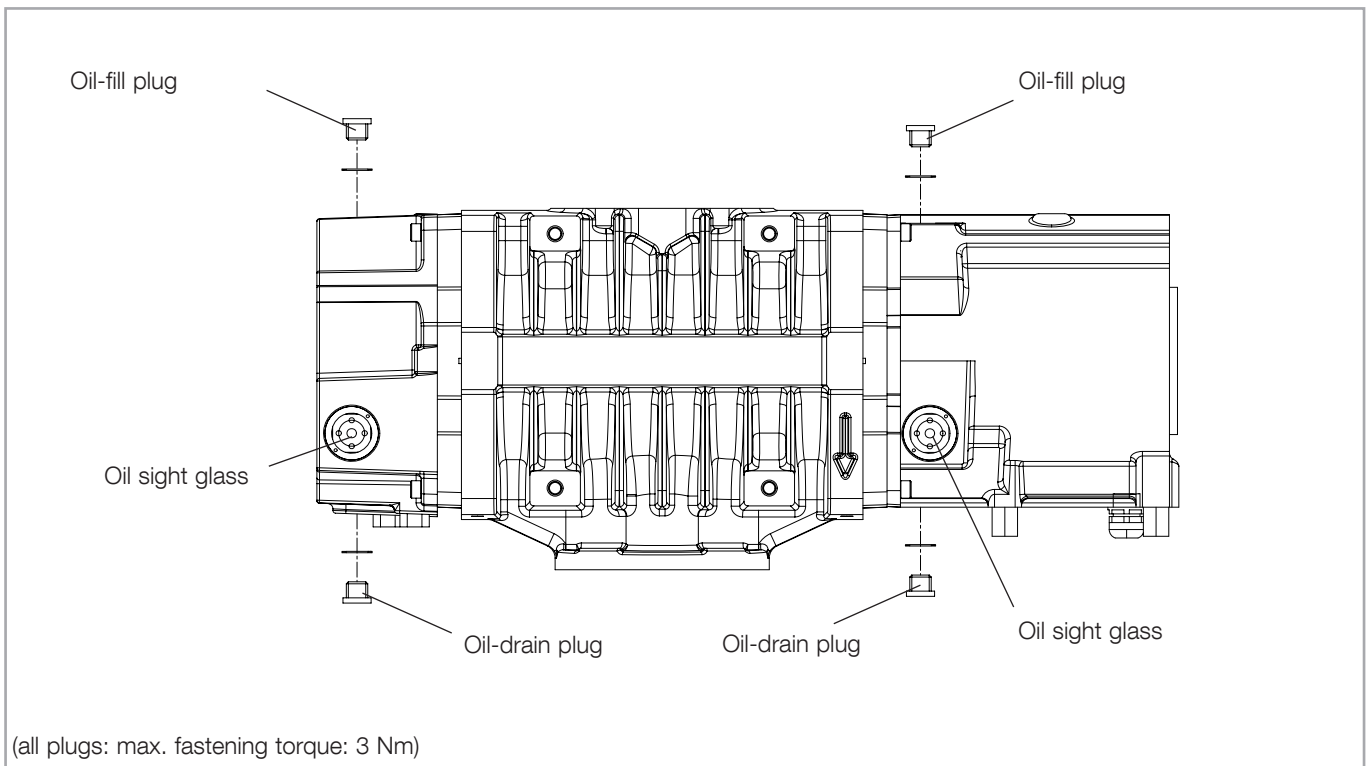


Fig. 5.1 Oil change

5.2 Changing the Lubricant

Observe all safety information provided in Sections 0.3 to 0.5.

When using PFPE as intended, PFPE is not subject to ageing. It must only be changed if it is contaminated by the process gas. It can only be determined for each individual case when the PFPE is so contaminated that it must be changed.

In case the pump suffers a severe mechanical failure, the possibility of hazardous substances being released owing to their thermal decomposition cannot be excluded. When opening the pump wear suitable personal protection equipment.

Under normal operating conditions, change the synthetic oil after every 8,000 hours of operation.

Change the synthetic oil more frequently when pumping corrosive vapours or large amounts of dust or when cycling frequently from atmospheric to working pressure.

CAUTION



DANGER



Maintenance



WARNING

Before removing the oil-drain or oil-fill plug always switch off the pump first and vent to atmospheric pressure.

When the pump has become warm during operation the casing and the oil temperature may exceed 80 °C.

Leave the pump to cool down. Always wear protective gloves also to protect yourself against aggressive residues in the oil.

Unscrew the oil-drain plugs (fig. 5.1) and the oil-fill plugs and drain the oil out of the oil reservoirs.

Clean the sealing surface and firmly reinstall the oil-drain plug using a gasket which is in perfect condition. Please note the max. fastening torque specified in fig. 5.1.

Wipe off any oil residues from the casing.

Fill in new oil into both oil reservoirs. For this use a clean funnel.

The required amount of oil is ~600 ml on the gear side and ~300 ml on the motor side.

Make sure to use the right kind of oil.

Only use Leybold oil.

NOTICE



Mineral oils, synthetic oils and PFPE do not mix.

For the correct oil level, please refer to Section 3.3.

NOTICE



If the oil level is too low, the bearings and gearwheels are not lubricated adequately; if it is too high, oil may enter the pumping chamber thereby contaminating the pump.

Clean the oil-fill port and reinstall the plugs (fig. 5.1) using a gasket which is in perfect condition. Wipe off any oil residues from the casing.

NOTICE



The oil-fill ports must be sealed air-tight. In the presence of a vacuum, the entry of air may cause oil-containing gas to enter the pumping chamber via the impeller seals.

Do not exceed a fastening torque of 3 Nm. Otherwise the thread of the pump casing could get damaged.

For recycling contaminated PFPE we ask you to consult us. As PFPE we recommend our LVO 400.

5.3 Cleaning the Inlet Screen

Observe all safety information provided in Sections 0.1 to 0.3 and 5.1.

An inlet screen is located in the intake port to collect foreign objects. It should be kept clean in order to avoid a reduction of the pumping speed.

To do so, take off the intake line. Remove the inlet screen from the intake flange and rinse it using a suitable solvent. Then thoroughly dry it with compressed air. If the inlet screen is damaged, replace it.

5.4 Cleaning the Pump Chamber

Observe all safety information provided in Sections 0.1 to 0.3 and 5.1.

Under dirty operating conditions, contaminants may be deposited in the pumping chamber or on the impellers. After removing the two connecting lines, the contaminants can be blown out with dry compressed air or flushed out with a suitable solvent.

Contaminants that cannot be blown or flushed out, can be removed completely from the pumping chamber with a wire brush, metallic sponge or scraper.

Then change the lubricant.

During cleaning, the blower must be turned only by hand or a suitable tool such as a stick made of soft material. Please mind that even when turned by hand the impellers can squeeze hands/fingers easily.

The loosened deposits must not remain in the pump. After cleaning, check the pump by slowly turning the impellers by hand. They should move freely and without any resistance.

Generally, the Roots pump does not need to be disassembled. If necessary, this should only be done by our after-sales service.

CAUTION



CAUTION



CAUTION



NOTICE



Maintenance

5.5 Service at Leybold

If you send a pump to Leybold indicate whether the pump is free of substances damaging to health or whether it is contaminated.

If it is contaminated also indicate the nature of the hazard. To do so, you must use a pre-printed form which we shall send to you upon request.

A copy of this form is reproduced at the end of these Operating Instructions: "Declaration of Contamination of Compressors, Vacuum Pumps and Components". Moreover, you may download a suitable form from the Internet: www.leybold.com → Documents → Download Documents.

Please attach this form to the pump or enclose it with the pump.

This "Declaration of Contamination" is required to meet the requirements of German Law and to protect our personnel.

Leybold must return any pumps without a "Declaration of Contamination" to the sender's address.

Before packaging (respectively shipping) the pump it should, if possible, be purged with inert gas, but as a minimum requirement it should be completely emptied of all pumped substances.

This may also include all parts which belong to the pump system like coolers, vessels etc.

CAUTION



The pump must be packed in such a way, that it will not be damaged during shipping and so that any contaminants are not released from the package.

Before shipping the pump, the oil must be drained out!

5.6 Maintenance Intervals

Process	Meas./test quantity	Maintenance interval	Remark
Check oil level	Min./max. oil level in oil sight glass	Before switching on and daily	Check oil level with the pump at standstill, see Section 3.3
Check oil quality	Visual	Weekly	In the normal state PFPE is light, clear and transparent. LVO 210 is yellow, clear and transparent. In the case of black oil an oil change is necessary, see Section 5.2
Oil change		Under normal operating conditions annually When pumping corrosive vapours, in the case of much dust and in the case of cycling operation, weekly to quarterly yearly	See Section 5.2
PFPE change		not required	
Check cooling water connections at the motor for leak tightness		Quarter yearly	
Clean motor fan and cooling fins		Depending on the ambient conditions	See Section 5.3

Troubleshooting

6 Troubleshooting

Malfunction	Possible cause	Remedy	Repair
Pump does not start up.	Motor/frequency converter incorrectly connected.	Connect motor/frequency converter correctly.	3.4
	Overtemperature switch or motor stator defective.	Leybold Service.	-
	Lubricant is too thick.	Change lubricant or warm up pump and lubricant.	5.2
	Pump has seized: defective impellers, bearings or toothed gears.	Leybold Service.	-
Pump gets too hot.	Cooling water supply is not sufficient. Cooling water lines are clogged.	Ensure sufficient cooling water supply.	3.5
	Cooling water temperature is too high.	Ensure sufficient cooling water supply.	3.5
	Ambient temperature is too high.	Install the pump at a suitable place.	3.1
	Pressure differences too high.	Check pressure conditions in the system	-
	Gas temperature is too high.	Check the system	-
	Clearances between casing and rotors are too small due to - contamination - distortion of the pump.	Clean pump chamber Affix and connect the pump free of tension	5.4 3.1/3.5
	Friction resistance is too high due to contaminated bearings and/or contaminated lubricant.		
	Wrong lubricant was filled in.	Drain lubricant, fill in correct lubricant. When changing between mineral oil, ester oil or PFPE the pump will have to be cleaned first by the Leybold Service.	5.2
	Defective bearings.	Leybold Service..	
	Power consumption of the motor is too high.	Like malfunction "Pump gets too hot".	Like malfunction "Pump gets too hot".
Incorrect mains voltage for the motor.		Connect the motor to the correct mains voltage.	1.3/3.4
Pump is too loud.	Motor stator defective.	Leybold Service.	-
	Oil level is too low.	Top up oil	5.2
	Distances between casing and impellers is too small due to - contamination - distortion of the pump	Clean pump chamber Fix and connect pump free of tension.	5.4 3.1/3.5
	Bearing or gear damage.	Leybold Service, shutdown pump immediately.	-
	Pistons make contact with the casing.		-
	Rotor is running untrue.	Leybold Service, shutdown pump immediately.	-
		Leybold Service, shutdown pump immediately.	-
		Leybold Service, shutdown pump immediately.	-

Troubleshooting

Malfunction	Possible cause	Remedy	Repair
Pump is losing lubricant.	Lubricant leak is apparent: Oil drain plug is leaky.	Drain lubricant, firmly screw in a new oil drain plug with the gasket, fill in correct lubricant quantity	5.2
	Oil sight glasses leaky.	Leybold Service.	-
	Gear cover is leaky.	Replace the O-ring of the gear cover.	-
	Puddle under the motor, leak in the seal.	Leybold Service, shutdown pump immediately.	-
	No lubricant leak is apparent: See malfunction "Lubricant in the pump chamber".	See malfunction "Lubricant in the pump chamber".	-
Oil gets too dark.	Oil has been used up.	Exchange the oil.	5.2
	Pump gets too hot.	See malfunction "Pump gets too hot"; after remedy of the malfunction, exchange the oil.	-
Lubricant in the pump chamber.	Lubricant level is too high.	Drain the lubricant down to the correct level.	5.2
	Lubricant is ejected from the system.	Check system.	-
	Pump is not standing horizontally.	Place the pump correctly.	3.1
	Pump has a gas leak towards the outside.	Check to ensure that the oil-fill and oil drain plugs are correctly seated. If required replace the gaskets. Replace the O-ring of the gearbox cover.	5.2
	Pump has an internal leak.	Leybold Service.	-
	Piston rings are defective.	Leybold Service.	-
Pump does not attain its pumping speed.	Inlet screen is clogged.	Clean inlet screen.	5.3
	Motor incorrectly connected.	Connect motor correctly.	3.4
	Speed is too low.	Set up the correct speed.	-
	Motor stator is defective.	Leybold Service	-
	Pump system has a gas leak.	Detect leak and seal it off.	-
	Too much impeller play.	Leybold Service.	-
	Bearing defective.	Leybold Service	-

Spare Parts / Disposal

7 Wearing and Original Spare Parts

Original spare parts are available from the Leybold Service facilities.

8 Waste Disposal

The pump may have been contaminated by the process or by environmental influences. In this case the equipment must be professionally decontaminated in accordance with the relevant regulations. We offer this service at fixed prices. Further details are available on request.



Contaminated parts can be detrimental to health and environment. Before beginning with any work, first find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

Separate clean pumps according to their materials, and dispose of these accordingly. We offer this service. Further details are available on request.

When sending us a pump, observe the regulations given in Section “5.5 Leybold Service”. We offer this service. Further details are available on request.

Disposal of Waste Oil

Owners of waste oil are entirely self-responsible for proper disposal of this waste.

Waste oil from vacuum pumps must not be mixed with other substances or materials.

Waste oil from vacuum pumps (Leybold oils which are based on mineral oils) which are subject to normal wear and which are contaminated due to the influence of oxygen in the air, high temperatures or mechanical wear must be disposed of through the locally available waste oil disposal system.

Waste oil from vacuum pumps which is contaminated with other substances must be marked and stored in such a way that the type of contamination is apparent. This waste must be disposed of as special waste.

European, national and regional regulations concerning waste disposal need to be observed. Waste must only be transported and disposed of by an approved waste disposal vendor.

PFPE from vacuum pumps may be regenerated, if required, and provided the quantities are large enough. For this, please contact us for assistance.

EU Declaration of Conformity

(Translation of original Declaration of Conformity)

The manufacturer: Leybold GmbH
Bonner Strasse 498
D-50968 Köln
Germany

herewith declares that the products specified and listed below which we have placed on the market, comply with the applicable EU Directives. This declaration becomes invalid if modifications are made to the product without agreement of Leybold GmbH.

Product designation: Ruvac

Type designation: WH 700

Part numbers: 155202, 155203, 155204V, 155205V, 155207V, 155208V, 155209V

The products complies to the following Directives:

Machinery Directive (2006/42/EC)

The safety objectives of the Low Voltage Directive 2014/35/EU were complied with in accordance with Appendix 1 No. 1.5.1 of Machinery Directive 2006/42/EC.

Electromagnetic Compatibility (2014/30/EU)

The following harmonized standards have been applied:

EN 1012-2:1996+A1:2009 Compressors and vacuum pumps - Safety requirements
Part 2: Vacuum pumps

EN 61010-1:2010 Safety requirements for electrical equipment for measurement,
control, and laboratory use — Part 1: General requirements

EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use —
EMC requirements — Part 1: General requirements
Emissions: Group 1, Class A
Immunity: Industrial electromagnetic environment

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Cologne, September 01, 2016

Cologne, September 01, 2016



ppa. Martin Tollner
VP / Head of Product Lines



ppa. Dr. Monika Mattern-Klosson
Head of Quality & Business Process Management

Declaration of Contamination of Compressors, Vacuum Pumps and Components

The repair and / or servicing of compressors, vacuum pumps and components will be carried out only if a correctly completed declaration has been submitted. Non-completion will result in delay. The manufacturer can refuse to accept any equipment without a declaration.

A separate declaration has to be completed for each single component.

This declaration may be completed and signed only by authorized and qualified staff.

Customer/Dep./Institute : _____ Address : _____ _____ Person to contact: _____ Phone : _____ Fax: _____ End user: _____	Reason for return: <input checked="" type="checkbox"/> applicable please mark Repair: <input type="checkbox"/> chargeable <input type="checkbox"/> warranty Exchange: <input type="checkbox"/> chargeable <input type="checkbox"/> warranty <input type="checkbox"/> Exchange already arranged / received Return only: <input type="checkbox"/> rent <input type="checkbox"/> loan <input type="checkbox"/> for credit Calibration: <input type="checkbox"/> DKD <input type="checkbox"/> Factory-calibr. <input type="checkbox"/> Quality test certificate DIN 55350-18-4.2.1
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A. Description of the Leybold product: Material description : _____ Catalog number: _____ Serial number: _____ Type of oil (ForeVacuum-Pumps) : _____	Failure description: _____ Additional parts: _____ Application-Tool: _____ Application- Process: _____
--	---

B. Condition of the equipment	No¹⁾	Yes	No	Contamination :	No¹⁾	Yes
1. Has the equipment been used	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	toxic	<input type="checkbox"/>	<input type="checkbox"/>
2. Drained (Product/service fluid)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	corrosive	<input type="checkbox"/>	<input type="checkbox"/>
3. All openings sealed airtight	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	flammable	<input type="checkbox"/>	<input type="checkbox"/>
4. Purged	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	explosive ²⁾	<input type="checkbox"/>	<input type="checkbox"/>
If yes, which cleaning agent				radioactive ²⁾	<input type="checkbox"/>	<input type="checkbox"/>
and which method of cleaning				microbiological ²⁾	<input type="checkbox"/>	<input type="checkbox"/>
¹⁾ If answered with "No", go to D. ←				other harmful substances	<input type="checkbox"/>	<input type="checkbox"/>

C. Description of processed substances (Please fill in absolutely)

1. What substances have come into contact with the equipment ?
 Trade name and / or chemical term of service fluids and substances processed, properties of the substances
 According to safety data sheet (e.g. toxic, inflammable, corrosive, radioactive)

X	Tradename:	Chemical name:
a)		
b)		
c)		
d)		

2. Are these substances harmful ? **No** **Yes** ←

3. Dangerous decomposition products when heated ? ←

If yes, which ? _____

²⁾ Components contaminated by microbiological, explosive or radioactive products/substances will not be accepted without written evidence of decontamination.

D. Legally binding declaration

I / we hereby declare that the information supplied on this form is accurate and sufficient to judge any contamination level.

Name of authorized person (block letters) : _____

Date signature of authorized person

firm stamp

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