



Instruction handbook

Machine:	Centrifugal pump ACP
Equipment No.:	
Year of manufacture:	2022
Order code:	STANDARD
Order no.:	C-01-000000
Original language:	German

Issued: KPRop/Schorn, 11-2022
Checked: HPUSP/Poglitsch, 11-2022

Rev.: 2.9
Checked:



Table of contents

1	Introduction	7
1.1	General information.....	7
1.2	Gender declaration.....	7
1.3	Use.....	7
1.4	Standards and guidelines.....	8
1.5	Use of manual	8
1.5.1	Item numbering.....	8
1.6	Warranty and liability.....	9
1.7	Service address	9
1.8	Copyright.....	9
2	Safety.....	11
2.1	General information about the safety notes	11
2.2	Warnings and hazard symbols.....	11
2.3	Intended use	12
2.4	General information about machine safety	13
2.5	Hazardous applications.....	13
2.6	Operating company's obligations	13
2.7	General obligations of personnel	14
2.8	Safety devices.....	15
2.8.1	Safety covers	16
2.8.2	Warning signs	17
2.8.3	Information signs	17
2.9	Personal protective equipment.....	19
2.10	Safety at the installation site	20
2.11	Temperature.....	20
2.12	Noise	20
2.12.1	Sound output level	20
2.12.2	Table of sound power levels	21
2.13	Electrical equipment.....	24
2.13.1	High-voltage protection.....	24
2.14	Welding work.....	24
2.15	Fluids (liquids, gases, steam or smoke).....	25
2.16	Oils and greases	25
2.17	Chemicals	26
3	Data sheet, characteristic curve, drawing	27
4	Description.....	29
4.1	Field of application	29
4.1.1	Centrifugal pump ACP	29
4.2	Functional description	29
4.3	Type specification	30
4.3.1	Type code	30
4.3.2	Applicable standards	30
4.3.3	Name plate	31
4.4	Application limiting values	31
4.4.1	Permitted loads on connecting branches.....	32
4.5	Main components.....	38
4.5.1	Centrifugal pump	39
4.5.2	Bearing support	42
4.5.3	Shaft seal	46
5	Installation	61
5.1	General information.....	61
5.2	Safety regulations	61
5.3	Transport.....	61

5.3.1	Lifting the pump	63
5.4	Storage.....	65
5.5	Installation	66
5.5.1	Pump installation	67
5.5.2	Pipes.....	69
5.5.3	Coupling.....	70
5.5.4	Instruments	70
5.5.5	Electrical equipment	71
5.6	Cold test.....	73
5.7	Disassembly and disposal.....	74
6	Commissioning	75
6.1	General	75
6.2	Safety regulations	75
6.3	Prerequisites for commissioning	76
6.3.1	General prerequisites	76
6.3.2	Special prerequisites	76
6.4	Start-up	78
6.5	Reports.....	79
7	Operation	81
7.1	General	81
7.2	Safety regulations	81
7.3	Control by means of the process control system	81
7.4	Start.....	81
7.5	Checks after initial commissioning	82
7.6	Normal operation.....	82
7.7	Vibrations or oscillations	82
7.8	Bearing temperatures.....	83
7.9	Pump requirements.....	83
7.10	Shutdown	85
7.11	Operating malfunctions and troubleshooting.....	86
8	Maintenance and inspection	89
8.1	General information.....	89
8.2	Safety regulations	89
8.3	Regular maintenance	91
8.4	Maintenance schedule	92
8.5	Fasteners	93
8.5.1	Checks	94
8.6	Aligning the coupling.....	94
8.7	Lubrication.....	95
8.7.1	Lubrication with grease	96
8.7.2	Oil lubrication	99
8.8	Pump.....	103
8.8.1	Installing and removing the pull-out unit	103
8.8.2	Installing and dismantling the impeller and the front lining	107
8.8.3	Turning off (machining) the impeller	109
8.8.4	Balancing the impeller	109
8.9	Changing the seal	110
8.9.1	ANDRITZ cartridge seal – single-action	111
8.9.2	ANDRITZ cartridge seal – double-action	113
8.9.3	Mechanical seal – single-action	115
8.9.4	STANDARD cartridge seal – single-action	117
8.9.5	STANDARD cartridge seal – double-action	119
8.9.6	Stuffing box.....	121
8.10	Bearing change – bearing with grease lubrication	125
8.11	Bearing change – bearing with oil lubrication.....	127
9	Supplier documentation	129



- 9.1 COUPLING 129
- 9.2 SHAFT SEAL 129
- 9.3 MOTOR..... 129
- 9.4 FOUNDATION WORK 129
 - 9.4.1 Adhesive anchor capsule - HVU (HILTI) - Instruction..... 130
- 10 Certificates..... 141**
 - 10.1 Declaration of Conformity..... 142
 - 10.2 ANDRITZ Certificate ISO9001 143

1 Introduction

1.1 General information

This instruction handbook is part of the technical documentation from ANDRITZ for the machine. It is intended to provide the operating company with the essential knowledge for safe, proper and economical use of the machine supplied by ANDRITZ. Paying attention to these instructions helps prevent hazards, reduce repair costs and downtime, and increase the reliability and service life of the machine.

The instruction handbook in the original language specified on the cover sheet is the original instruction handbook in accordance with the Machinery Directive. Any other language version is a translation of the original instruction handbook. With these language versions, the original instruction handbook is delivered additionally and exclusively in electronic form.

1.2 Gender declaration

For better legibility, designations referring to persons are used in the masculine form only.

The designations are to be understood as gender-neutral. This is neither sex-based discrimination nor a violation of the principle of equity.

1.3 Use

Target group

These instructions are intended for users with knowledge of mechanical engineering and for the exclusive use by the operating company and its personnel.

Personnel entrusted with working on the machine must read and understand these instructions and comply with them. In particular, this concerns the following tasks:

- Transport
- Erection work, installation and commissioning
- Operation, start-up and shut-down
- Troubleshooting
- Servicing and maintenance
- Maintenance and disposal of operating materials and consumables, cleaning the machine and its surroundings

The following must be observed in particular:

- Chapter >> Safety
- Safety notes contained in the text of the individual chapters

Supplementary instructions

The operating company must supplement this instruction handbook with instructions based on existing national regulations and taking into account special operational conditions for safety at work, health protection and environmental protection.

Storage

The complete instruction handbook must be kept handy at all times at the location where the machine is used.



1.4 Standards and guidelines

The pump is delivered together with a CE declaration of conformity according to Machinery Directive 2006/42/EC Annex II, 1.A. It is confirmed that harmonized European standards EN 809 and EN ISO 12100, Parts 1 and 2, have been observed. Any electrical equipment supplied (motor, measuring instruments, etc.) has CE marking if it falls within the scope of a directive, for example the low-voltage or EMC Directive.

1.5 Use of manual

Display Names of chapters and sections are displayed in continuous text in upper-case letters: e.g. SAFETY

Pictograms The operating manual makes use of the following pictograms:

 	<p>Indication of hazards. Only use together with the explanation of the hazard. The SAFETY chapter describes what the individual safety notes mean.</p>
>>	Indicates a reference (e.g. >> SAFETY)

Work steps Work instructions are laid out as enumerated lists. The work steps are numbered and must be carried out in this sequence.

Bulleted lists without numbering mean that there is no set order for the tasks

Abbreviations

Tab.	Table
Fig.	Figure
Rev.	Revision (correction after reading through, e.g. 0 = Version 1)

Figures and graphics The figures and graphics used show the basic version of the machine. This does not necessarily correspond exactly to the version delivered.

For detailed information on the supplied equipment:

>> BILLS OF MATERIALS, DRAWINGS and SUBSUPPLIER DOCUMENTATION

1.5.1 Item numbering

(411.2)

The item numbers depicted in this format refer to the assembly drawing and the bill of materials.

1.6 Warranty and liability

The ANDRITZ general terms of delivery and sale shall apply.

Warranty and liability claims against ANDRITZ shall become void if personal injury or material damage is caused by one or more of the following:

- Use of the machine/system for any purpose other than its designated use.
- Improper installation, commissioning and operation of the machine/system.
- Failure to observe the safety notes in the instruction handbook.
- Unauthorised structural changes to the machine/system.
- Failure to observe the maintenance and upkeep instructions.
- Use of non-original spare parts.

In the event of a warranty claim, ANDRITZ reserves the right to assess damage to the machine/system.

1.7 Service address

Our service department is available for ordering spare parts, for troubleshooting and for extensive maintenance and repair work.

ANDRITZ AG
Statteggerstraße 18
A-8045 Graz, Austria

Pump engineering service department

Phone: +43/316-6902-0
Fax: +43/316-6902-413
Email: pump.service@andritz.com

1.8 Copyright

These instructions are protected by copyright. All other rights are reserved. The duplication of these instructions, including any extracts thereof, is permitted only with the approval of ANDRITZ. Any contraventions shall obligate the perpetrator to pay compensation for damages and could result in criminal prosecution. We reserve all rights if a patent is granted and if a utility model is registered, and we reserve the right to make technical changes without prior notice.

© 2022 ANDRITZ AG

2 Safety

2.1 General information about the safety notes

The SAFETY chapter contains general safety notes that must be observed during work with/on the machine/system.

Supplementary safety notes relating to individual tasks are set out in the individual chapters of the instructions. These are highlighted in the text by special warning notices.

Safety notes for components not supplied by ANDRITZ are contained in the sub-supplier documentation.

These safety notes supplement the ANDRITZ instructions.

All safety notes must be heeded and followed. Failure to observe the safety notes can lead to personal injury, environmental damage and/or property damage.

ANDRITZ requires the operating company to ensure the following:

The operating company has developed a comprehensive, general safety program. Anyone working at or in the vicinity of the machine must have received training for working on systems of this type and on the process running there, including where to mount barriers and markings.

2.2 Warnings and hazard symbols

All information in the SAFETY chapter is important and safety-related. Thus, the information in this chapter is not marked with special hazard symbols.

The warnings listed in the individual chapters of these instructions are marked with a pictogram, signal word and signal colour as follows:

DANGER



This marking warns of an imminent hazard to the life and health of people.

Failure to observe these instructions will lead to death or serious injury.

WARNING



This marking warns of a potentially hazardous situation to the life and health of people.

Failure to observe these instructions can lead to death or serious injury.

CAUTION



This marking warns of a hazardous situation to the health of people.

Failure to observe these instructions can lead to minor or moderate injury.

NOTICE



This marking indicates potential property damage.

Failure to observe these instructions may cause property damage.

2.3 Intended use

The machine may only be used for the process described in the chapter "Application area".

Any other use or secondary use is considered improper use.

Any modifications to the scope of delivery not approved by ANDRITZ qualify as improper use.

Proper use includes compliance with the installation, operating and instruction handbook.

The limit values stated in the operating instructions may not be exceeded under any circumstances.

If not otherwise specified, the pump is intended for use with water or water with stock or pulp.

Observe the type specification and the application limit values in the chapter "Technical description".

The machine is intended for installation in an indoor system.

ATEX

The machine was built for installation in non-explosive atmospheres. Proper use provides for operation outside of a zone as defined in ATEX guideline 1999/92/EC.

If changes are planned and the pump is to be used for a non-specified application or in an ATEX area, ANDRITZ must be contacted.

NOTICE! Depending on the scope of delivery, the CE declaration and the CE marking can guarantee a safe machine only under the following requirements:

- The motor must be selected according to the technical data sheet of the instruction handbook.
- The pump is installed with the motor using a suitable coupling with coupling guard according to the harmonized standards on a suitable frame according to the Installation chapter of the instruction handbook.
- The completely assembled unit (pump, coupling, coupling guard, motor and frame) is installed on the foundation according to the requirements of the erection drawing in the instruction handbook.

2.4 General information about machine safety

The machine/system is designed in accordance with state-of-the-art standards and the recognised safety rules. Nevertheless, its use may constitute a risk to life and limb of the user and of third parties, or cause damage to the machine/system and to other material assets.

Malfunctions and unforeseen changes to the machine/system must be remedied immediately.

The machine/system may only be operated when in perfect condition and with due consideration to safety and the risks involved.

All protective devices and safety devices must be present and fully functional.

2.5 Hazardous applications

The machine has been designed especially for the specific process stated in the technical datasheet. All changes to the process must be reviewed and approved, as ANDRITZ does not have full details on the chemical and biological properties of the numerous materials that can be processed in this machine. In a condition ready for sale, the machine is not designed to safely process hazardous media unless additional precautionary measures are taken.

Before processing media that are combustible, explosive, toxic or otherwise hazardous, or that can take on these properties through a reaction, the operating company must perform a thorough hazard analysis and risk assessment for the entire process. This includes the development of contingency plans for handling process errors and faults.

The following must be noted in particular:

1. If combustible or potentially explosive media are processed, all electric motors, cables and operating elements must be explosion-proof. Furthermore, maintenance of the systems must be performed with non-sparking tools. Smoking is prohibited.
2. If the medium being processed is hazardous (e.g. toxic, explosive, flammable, etc.), appropriate safety measures must be taken.

2.6 Operating company's obligations

Intended use	The operating company of the machine/plant is responsible for ensuring that the machine/plant is not used for anything other than its intended purpose.
Work instructions	In addition to the operating instructions, the applicable legal regulations in the user countries and other rules governing safety at work, health and environmental protection must be observed and personnel instructed in these matters.
Qualification of personnel assigned	The machine/plant may only be operated, maintained, and serviced by authorized, skilled personnel with hands-on training. The minimum legal age must be taken into account. Any person undergoing training, in apprenticeship, or under instruction may only work on the machine/plant after receiving instruction on the theory and only under the supervision of an experienced person.
Instructions	The operating and maintenance personnel of the operating company must be instructed by qualified persons after completion of the installation work. The user undertakes to have new, additional operating and maintenance personnel instructed in machine/plant operation and maintenance to the same extent and applying the same care, and with due consideration to the safety instructions. Workers entrusted with the transportation, erection work, operation, and maintenance of the machine/system must have read and understood the operating instructions, es-

	<p>pecially the chapter on SAFETY, the safety instructions concerning a certain activity, as well as the safety instructions issued by sub-suppliers.</p>
Definition of areas of responsibility	<p>The operating company is responsible for the following:</p> <ul style="list-style-type: none"> • definition of the machine operator's responsibility and his right to give instructions, • definition of the contents and responsibility for keeping the records on functioning and any failure of the monitoring equipment (log book), • personnel areas of responsibility in terms of operating, tooling, maintenance and upkeep.
Inspections	<p>The operating company must:</p> <ul style="list-style-type: none"> • check at regular intervals whether the safety instructions and regulations governing work on the machine/plant are observed. • carry out regular training to confirm the level of knowledge of the operating and maintenance personnel.
Attachment of safety features	<p>The operating company shall ensure that all safety-relevant instructions are observed and that all symbols and notices are attached in the production area in accordance with the local regulations.</p> <p>In addition, ANDRITZ recommends mounting the following devices, symbols and signs in as far as these are not already included in the local regulations.</p> <ul style="list-style-type: none"> • Markings on the floor for vehicle routes, protective fencing and danger areas (yellow) • Barriers and covers • Handrails (foot, center and chest height) • Emergency lighting • Lockable maintenance switch at the motors (shut-off device for power) • Means of shutting off all auxiliaries (water, chemicals, compressed air, etc.) • Information signs – fire prevention equipment • Information signs – emergency phone number • Direction signs – exits • Direction signs – escape routes • Information signs (first-aid post) • Fire-fighting equipment as required by national regulations

2.7 General obligations of personnel

To avoid personal injury and material damage, all persons working on the plant must observe the following safety instructions:

- Observe the safety regulations in the operating instructions and on the machine/plant.
- Stop and secure the pump immediately if there is a safety-relevant functional disorder. Report disorders and have them repaired immediately.
- All safety-critical modes of operation are prohibited.
- Use only the machine accesses, paths and passages intended for this purpose.
- Do not touch moving and rotating parts and/or reach out beyond them.
- Keep the machine and the workplace clean. Do not lay tools or other items on the machine.
- Do not wear any garments/pieces of jewelry that might get caught on moving machine/plant parts. This includes ties, scarves, rings, and necklaces.
- Do not wear long hair loose.

- Familiarize yourself with the function and any failure of monitoring equipment (log book) before starting work.
- No smoking in the vicinity of the machine/plant.
- Wear personal protective apparel when working on the machine/plant.
- If chemicals are used, the measures prescribed in the safety data sheets for the individual chemicals must be observed.

2.8 Safety devices

	<p>Operation of the machine/unit is allowed only with effective safety devices.</p> <p>Safety devices are not allowed to be bypassed, removed or disabled. Safety devices are there to protect the operator.</p> <p>Safety devices and the access ways to them must be kept clear.</p>
Lockable switches	<p>In the case of a maintenance switch or operating mode switch for setting machines locally, the keys to these switches must be removed and taken away to prevent third parties from changing the switch setting and thereby to prevent hazards!</p>
Isolating the power supply	<p>The operating company must ensure that the electrical supply of the pump unit is equipped with a device for isolating the power supply.</p> <p>These devices must ensure an immediate switch-off during operation or in case of emergencies.</p>
Information, warning and prohibition signs	<p>Information, warning and prohibition signs must be heeded and observed. They must be checked at regular intervals for legibility and completeness, and must not be removed or obstructed.</p>

2.8.1 Safety covers

The following safety devices are provided on the machine:

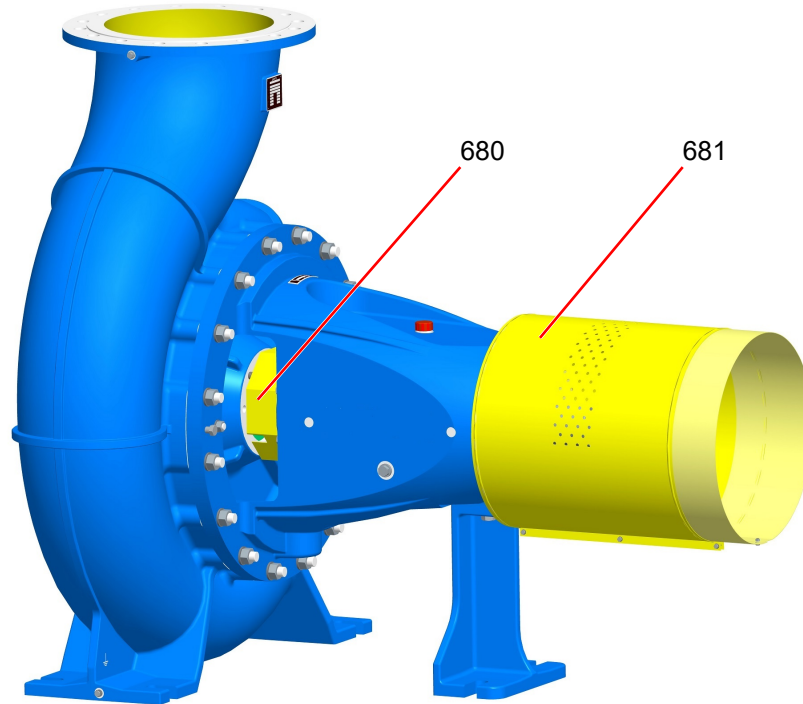


Fig. 1: Safety covers

Pos.	Designation	Pos.	Designation
680	Safety cover at the sealing chamber	681	Coupling guard

2.8.2 Warning signs

If surface temperatures of more than 65°C should occur, the safety sign with the wording "Danger - hot surface" must be affixed.

Warning: hot surface!			

Tab. 1: Safety signs

Chemicals

If the machine is used in the chemicals sector, the operating company must install appropriate safety notes on the plant.

Examples of signs required where chemicals are used:

1	2	3	
Warning against toxic substances!	Warning against corrosive substances!	Warning against oxidising substances!	


Tab. 2: Safety signs where chemicals are used

2.8.3 Information signs

Information signs must be checked at regular intervals for legibility and completeness and they must not be removed or covered up.

The information sign for lubrication is attached to the top of the bearing support.

No.	Description	Symbol
01	Marked components or machines are to be lubricated with grease. >> Grease lubrication	

No.	Description	Symbol
02	Marked components or machines are to be lubricated with oil. >> Oil lubrication	

Tab. 3: Lubrication sign

2.9 Personal protective equipment

Personal protective equipment must be used and carried along in accordance with the country-specific regulations or the regulations of the system operator. Wearing safety shoes and eye protection should be mandatory on the entire plant grounds.

In addition to the applicable regulations, we recommend using the following protective equipment for certain tasks.

Task	Protective equipment			
Lingering in the immediate vicinity of the running machine				
Taking stock samples				
Installation and maintenance tasks during which parts of the machine are removed				

Tab. 4: Recommended protective equipment for specific tasks

	Protective clothing to prevent skin contact with the stock		Safety shoes to protect against foot injuries
	Protective gloves to prevent hand injuries		Hearing protection to prevent hearing loss
	Eye protection to prevent eye injuries		Standards-compliant safety helmet to protect against head injuries
	Safety belt to prevent falling. (For work at a height, at points with a fall hazard, entry points into vessels, etc.)		Wear breathing protection in case of risks due to gases and vapours that are hazardous or harmful to health.
	Face protection to prevent facial injuries		

Tab. 5: Purpose of the protective equipment

2.10 Safety at the installation site

The machine does not have a permanent workstation. Presence at the machine is only necessary for inspection and maintenance tasks.

All operating and maintenance areas of the machine must have adequate lighting and ventilation (industrial lighting).

The foundation must be sized to withstand the loads caused by the machine.

The area around the machine and the escape routes must be kept clear. The area around the machine must be marked as a danger zone.

Make sure the machine and its surroundings are kept clean. Above all, oil and lubricants on the floor and on machine parts can easily lead to slipping. As such, they pose a considerable risk of injury, particularly in conjunction with tools that have been set down improperly. The working area must be kept free of waste material, tools and other foreign objects.

The area around the machine must have a nonslip floor.

Stepping on machine elements or climbing onto the machine (apart from intended stepping areas) is prohibited to prevent falls and damage to the machine. Standards-compliant climbing aids must be used.

Posture problems and excessive physical exertion must be prevented by the use of operating and maintenance platforms and lifting equipment.

Trained personnel must have been instructed to identify unprotected locations with a falling hazard and to initiate the necessary protective measures.

2.11 Temperature

Personal protective gear must be worn to prevent burns/scalds during work on parts of the machine where the temperature exceeds 65°C.

The operating company shall be responsible for taking the necessary safety measures (e.g. insulation, protective gloves, proper training, etc.).

No maintenance work should be carried out until the hot surfaces have cooled.

2.12 Noise

When the machine is operating, the sound output level of the motor is often higher than the sound output level of the machine itself. Consequently, depending on the motor type, the overall sound output level may change.

The sum of noise emissions from all machines in the production facility can impede verbal communication and cause hearing loss.

The machine is designed so that no operation is required directly at the machine during normal operation. Wear suitable ear protection for the duration of maintenance and/or adjustment tasks at the machine when it is running.

2.12.1 Sound output level

The sound power levels have been determined in accordance with ISO 9614.

It is not possible to measure all of the various machine applications. Therefore, the values have been calculated based on measurements with similar machines and in accordance with the Europump Directive 001/30/E, Forecasting the Airborne Noise Emission of Centrifugal Pumps.

2.12.2 Table of sound power levels

	595 rpm	745 rpm	990 rpm	1180 rpm	1450 rpm	1780 rpm	3000 rpm	3560 rpm
ACP 32-125	58	58	58	59	60	61	-	-
ACP 32-160	62	62	62	64	65	66	68	69
ACP 32-200	63	63	63	65	66	67	69	70
ACP 32-250	66	66	66	68	69	70	72	74
ACP 40-125	59	59	59	60	61	62	-	-
ACP 40-160	63	63	63	65	66	67	69	70
ACP 40-200	65	65	65	66	67	68	71	73
ACP 40-250	67	67	67	69	71	72	75	77
ACP 40-315	68	68	68	69	71	73	75	77
ACP 50-125	61	61	61	63	64	65	67	68
ACP 50-160	64	64	64	65	67	68	71	73
ACP 50-200	66	66	66	67	68	69	72	74
ACP 50-250	67	67	67	69	71	72	75	77
ACP 50-315	68	68	68	69	72	74	76	78
ACP 65-125	62	62	62	64	65	66	68	69
ACP 65-160	65	65	65	66	68	69	72	74
ACP 65-200	69	69	69	71	73	74	76	78
ACP 65-250	69	69	69	71	73	74	76	78
ACP 65-315	70	70	70	70	72	74	80	83
ACP 65-330	70	70	70	70	72	74	-	-
ACP 80-160	69	69	69	71	73	74	76	78
ACP 80-200	70	70	70	72	74	75	77	79
ACP 80-250	69	69	69	71	73	74	77	79
ACP 80-315	70	70	70	71	73	75	82	84
ACP 80-400	68	68	68	70	72	74	77	79
ACP 100-200	71	71	71	73	75	76	78	80
ACP 100-250	71	71	71	71	72	75	79	81
ACP 100-265	71	71	71	71	72	75	-	-
ACP 100-315	70	70	70	71	73	75	80	82
ACP 100-330	70	70	70	71	73	75	-	-
ACP 100-400	69	69	69	71	73	75	77	79
ACP 100-480	70	70	70	70	71	75	-	-
ACP 100-500	70	70	70	70	72	76	-	-
ACP 125-250	71	71	71	71	75	76	80	82
ACP 125-265	71	71	71	71	75	76	-	-
ACP 125-315	70	70	70	71	73	77	-	-
ACP 125-400	70	70	70	71	74	76	-	-
ACP 125-625	73	73	73	75	77	81	-	-
ACP 150-250	72	72	72	72	73	74	77	79
ACP 150-315	70	70	70	71	73	75	-	-
ACP 150-400	70	70	70	72	75	78	-	-

	595 rpm	745 rpm	990 rpm	1180 rpm	1450 rpm	1780 rpm	3000 rpm	3560 rpm
ACP 150-480	70	70	70	71	74	77	-	-
ACP 150-500	70	70	70	72	75	78	-	-
ACP 200-400	71	71	71	73	76	79	-	-
ACP 200-480	72	72	72	73	76	79	-	-
ACP 200-500	71	71	71	73	76	79	-	-
ACP 200-625	74	74	74	76	-	-	-	-
ACP 250-315	70	70	70	71	74	77	-	-
ACP 250-480	72	72	72	74	77	80	-	-
ACP 250-625	75	75	75	77	-	-	-	-
ACP 300-400	72	72	72	74	77	80	-	-
ACP 300-500	72	72	74	77	78	78	-	-
ACP 300-550	72	72	74	77	78	78	-	-
ACP 300-700	76	76	76	78	-	-	-	-
ACP 350-480	73	73	73	75	78	81	-	-
ACP 350-650	76	76	76	78	-	-	-	-
ACP 400-330	72	72	72	73	75	79	-	-
ACP 400-530	72	72	74	77	-	-	-	-
ACP 400-700	76	76	76	78	-	-	-	-
ACP 400-820	76	76	76	78	-	-	-	-
ACP 450-410								
ACP 450-370	72	72	73	74	76	79	-	-
ACP 450-550	72	72	74	77	-	-	-	-
ACP 500-470								
ACP 500-455	74	74	76	79	-	-	-	-
ACP 500-650	77	77	77	79	-	-	-	-
ACP 600-505	72	73	73	74	76	79	-	-
ACP 600-555	74	74	76	79	-	-	-	-
ACP 600-565	74	74	76	79	-	-	-	-
ACP 600-625	75	75	77	80	-	-	-	-
ACP 600-700	77	77	77	79	-	-	-	-
ACP 600-730	77	77	78	79	-	-	-	-
ACP 700-595	78	78	78	81	-	-	-	-
ACP 700-640	78	78	78	81	-	-	-	-
ACP 800-730	78	78	79	-	-	-	-	-
ACP 900-800	79	80	-	-	-	-	-	-
ACP 100-315 BS48-2 (HD)	72	72	72	73	75	77	82	84
ACP 125-315 BS48-2 (HD)	73	73	75	78	79	81	-	-
ACP 300-550 BS100-2 (HD)	73	73	75	78	79	81	-	-
ACP 150-315 BS60-2 (HD)	72	72	72	73	75	77	84	-

	595 rpm	745 rpm	990 rpm	1180 rpm	1450 rpm	1780 rpm	3000 rpm	3560 rpm
ACP 200-400 BS75-2 (HD)	72	72	72	74	77	80	-	-
ACP 450-550 BS100-2 (HD)	73	73	75	78	79	81	-	-

Tab. 6: Sound power level (dB)

2.13 Electrical equipment

All work on the electrical equipment, without exception, must be carried out by skilled electricians.

Any form of contact with electrical equipment may cause fatal injuries.

Before beginning any maintenance or repair work, the operating company must disconnect the electric power supply to all drives securely. This can be achieved with a lockable maintenance switch, lockable racks in the MCC, or with other suitable measures that comply with the safety regulations applying.

If any work is necessary on live parts, it is essential to proceed according to the applicable standards.

Users of medical electronic equipment (e.g. pacemakers) must not enter the electric danger zone.

The electrical equipment must conform to the general requirements of standard EN 60204-1 and, regarding electromagnetic compatibility, with the requirements of the series of standards (or applicable parts) of EN 61000.

The machine must be grounded to avoid electrostatic loading or contact voltage. Machine, standpipe, motor and local equipment (tanks, control panel, etc.) must be connected to the grounding system.

Upon completion of any maintenance work, proper grounding must be re-established. (For example by checking and specifying the grounding resistance.)

2.13.1 High-voltage protection

The operating company is responsible for the corresponding lightning protection measures especially in case of outdoor set-up.

2.14 Welding work

In general, welding work is only permitted after consultation with the national authorities and after consultation with ANDRITZ. Welding work that is described in detail in the maintenance instructions is exempt from this rule. The relevant safety regulations must be observed for welding work.

In the case of electric-arc welding, all motors must be disconnected before work is begun.

The earthing for electric-arc welding must never be routed over the roller bearing assembly. An earthing cable must be connected in the immediate vicinity of the welding point.

Fire and explosion hazard

There is a considerable risk of fire and explosions when welding.

- A hot work permit is required!
- Before starting work, appropriate fire protection measures must always be taken, e.g. providing fire extinguishers!

2.15 Fluids (liquids, gases, steam or smoke)

In various media, in case of a longer standstill, unwanted chemical reactions can occur and vapours harmful to health can be generated.

After prolonged stoppages, the machine must be thoroughly cleaned.

Sufficient ventilation and degassing must be ensured.

All infeed and discharge lines must be protected against opening through lockable devices.

Before any work on the machine is begun, it must be ensured that no liquids, gases, vapours or smoke can escape from infeed lines, discharge lines or ducts and flow into the work area.

DANGER! Toxic gases or chemicals can escape from pipelines. The operating company must ensure the safe discharge of these substances and ensure sufficient ventilation!

If it is not possible to reliably rule out the risk of liquid, gas, vapours or smoke inflow, all persons working in the hazard area must be equipped with a safety harness and a safety rope. Each worker must be monitored by a second person outside the hazard area.

It must be possible to evacuate any worker from the hazard area immediately at any time.

Leakages (e.g., the shaft seal), hazardous material to be conveyed (e.g. explosive, toxic) as well as hot liquids (over 60°C) must be collected or guided away by the operator so that no hazards are generated for persons or the environment. Statutory regulations must be adhered to.

DANGER! If liquids leak out of the machine or out of the pipelines, stop the machine immediately, clarify the cause and repair the leak.

Due to high temperatures and high humidity, wearers of glasses may experience fogging of lenses and thereby incur injuries (e.g. stumbling).

2.16 Oils and greases

The safety instructions for the products concerned must be observed when handling oil, grease, and other chemical substances.

Suitable skin protection is required when handling aggressive media. See manufacturers' information for the type of skin protection required.

Also observe the relevant requirements for disposal.

2.17 Chemicals

Chemicals can damage the skin and cause the formation of hazardous gases, which may subsequently cause breathing problems. Personnel handling these materials must not be allergic to them.

Safety data sheets If chemicals are used, the measures prescribed in the safety data sheets of each chemical must be adhered to.

The operating company shall be responsible for:

- Safety measures
- Wearing personal protective equipment, especially sufficient eye protection.
 - The installation of water connections or emergency showers so that affected eyes and sections of skin can be rinsed off under flowing water in emergencies and, in case of ingestion, water can be drunk.
 - Medical treatment in case of emergencies.
 - The prevention of chemical reactions which can lead to a risk of fire or explosions.
 - Recurring training courses on the properties and handling of the chemicals used.
 - Affixing chemical safety data sheets in the area of application of the chemicals to be processed/produced.
 - Affixing safety signs on the system (e.g. "Warning; Toxic material" or "Warning; Corrosive substances").
 - Attaching a flushing system for the machines.
 - Locking the chemical supply so that no more chemicals can flow into the machine when it is shut down.
 - Secure discharge of condensate and drainage piping in order to prevent possible contact with chemicals.
 - Sufficient ventilation of the workplace.
 - Thorough cleaning of the equipment prior to maintenance work.
 - Adherence to the national disposal regulations.
 - The filling, handling and processing of chemicals by trained, instructed and authorised persons only.
 - Inspection of the seals on an ongoing basis so that no chemicals can escape.
 - The creation of an escape plan and regular training courses with regard to escape measures.
 - Installation of a control system for the detection, warning, locking and shut-down of the system parts or the initiation of further appropriate steps for the protection of personnel and system parts.
 - Storage of the chemicals.
 - During work in the hazard area, a second person must be present at all times.

3 Data sheet, characteristic curve, drawing

4 Description

4.1 Field of application

The centrifugal pump is used to convey the specified media or materials in compliance with the manufacturer's instructions. If modifications are planned or the pump is to be used for a non-specified application or in an ATEX environment, ANDRITZ must be contacted.

>> Data sheet [▶ 27]

4.1.1 Centrifugal pump ACP

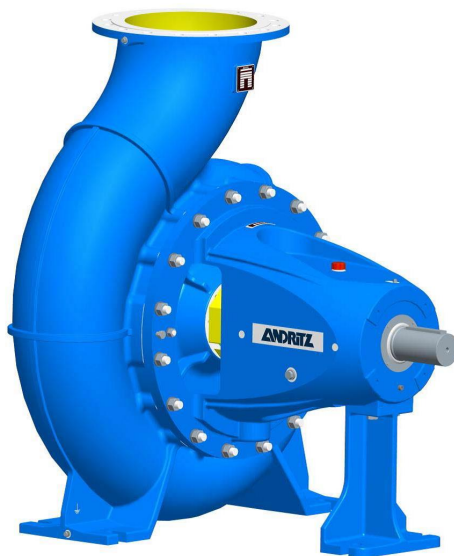


Fig. 2: ACP

4.2 Functional description

Using sufficient inlet pressure, the medium to be transported is moved to the extraction area of the impeller via the horizontal axial flange. The medium is accelerated radially in the impeller and thus achieves a velocity energy depending on the rotational energy and the shape of the impeller blades (change from axial to radial). In the spiral casing, the velocity energy is converted to pressure energy. The medium then enters the pressure pipe, which is connected to the pressure flange.

4.3 Type specification

4.3.1 Type code

ACP	400	-	700	.	5	S	CL	e1	e2	Description
ACP										ACP series centrifugal pump
	xxx									Nominal width of delivery branch (mm)
			xxx							Nominal impeller diameter (mm)
					x					Number of impeller blades
						x				Impeller variant <ul style="list-style-type: none"> • F = open impeller • C = closed impeller • S = semi-open impeller
							x			Arrangement <ul style="list-style-type: none"> • CL = centreline • VS = Vertical Standard • VM = Vertical Motor "close coupled" • VC = Vertical with universal shaft
								x	x	Extra (feature) <ul style="list-style-type: none"> • S = Separator • I = Internal vacuum pump • E = External vacuum pump

Tab. 7: Type code

Examples:

ACP 400-700.5S (ACP pump, delivery branch 400 mm, impeller diameter 700 mm, number of impeller blades = 5, semi-open impeller "S")

ACP 400-700.5S_SI (ACP pump, delivery branch 400 mm, impeller diameter 700 mm, number of impeller blades = 5, semi-open impeller "S"), separator and internal vacuum pump (I)

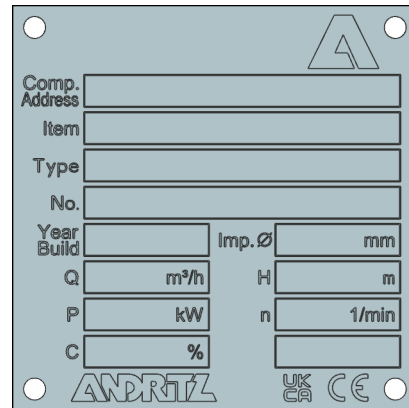
4.3.2 Applicable standards

Standard	Title
ISO 2858	Dimensions
ISO 5199	Design
ISO 9906	Test (Q, H, NPSH)
EN 809, ISO 12100	Product safety
DIN EN 1092-1 or DIN EN 1092-2	Drilled hole of the flange
DIN EN 12162	Pressure test
JIS B2220 10K	Special drilled hole of the flange
JIS B2220 16K	Special drilled hole of the flange
ASME/ANSI B 16.5 Class 150	Special drilled hole of the flange
ASME/ANSI B 16.5 Class 300	Special drilled hole of the flange

Tab. 8: Applied standards

4.3.3 Name plate

On each pump there is a type plate installed on the spiral casing detailing the most important data on the pump.



- Q Flow rate [m³/s]
- P Motor power [kW]
- Imp. Ø Impeller diameter [mm]
- H Delivery head [m]
- n Motor speed [rpm]
- C Consistency [%]

Free field for pump weight (pump incl. motor) [kg]

Tab. 9: Type plate

4.4 Application limiting values

Medium	The centrifugal pump serves to pump incombustible liquids and fibrous pulps. It is essential to consult ANDRITZ before any planned pumping of combustible liquids (solvents, fuel, alcohol, etc.)! If combustible liquids with a low flash point are pumped, there is a risk of risk of fire and explosion.
Area allocation	The centrifugal pump is NOT intended for use in a potentially explosive environment or atmosphere. The centrifugal pump is not intended for use outside a specific area complying with the directive 1999/92/EC (gases, vapors, dust). A change of area, for example to area 2 or 22, must be documented in writing and may entail additional costs or delays in delivery.
Shaft seal	Information on the application limit of the respective shaft seal can be requested in writing from the pump manufacturer and is also provided in the seal manufacturer's data sheet. >> Supplier documentation
Sealing water for shaft seal	Sealing water quality: 75 microns (fresh water) Sealing water temperature: 10°C min.-30°C max. Solid content: 2 mg/l max. Necessary sealing water quantities and pressures >> shaft seal

4.4.1 Permitted loads on connecting branches

The permitted forces and torques stated in the following tables must not be exceeded. In general, the suction and delivery pipes must be connected up stress-free. We recommend checking this item before start-up.

4.4.1.1 Spiral casing made of grey cast iron

The specified values apply to a spiral casing made of grey cast iron with a moulded base frame.

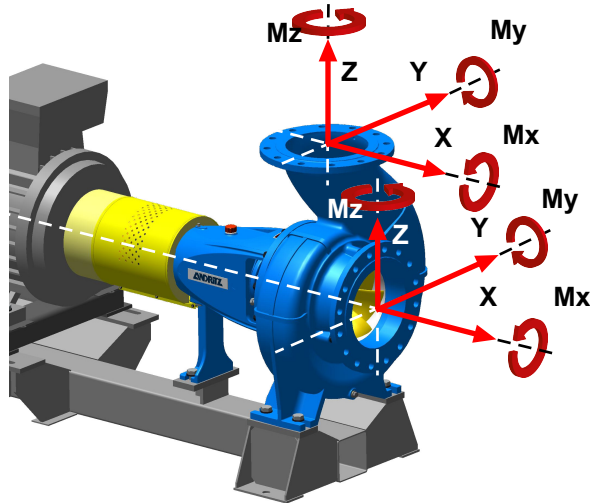


Fig. 3: Flange forces

ΣF and ΣM are vector sums of the forces or torques.

Pressure flange

Nominal Ø (DN)	Force (N)				Torque (Nm)			
	F _x	F _y	F _z	ΣF^b	M _x	M _y	M _z	ΣM^b
25	262.5	245	297.5	455	315	210	245	455
32	315	297.5	367.5	577.5	385	262.5	297.5	560
40	385	350	437.5	682.5	455	315	367.5	665
50	525	472.5	577.5	910	490	350	402.5	717.5
65	647.5	595	735	1155	525	385	420	770
80	787.5	717.5	875	1382.5	560	402.5	455	822.5
100	1050	945	1176	1837.5	612.5	437.5	507.5	910
125	1242.5	1120	1382.5	2170	735	525	665	1067.5
150	1575	1417.5	1750	2747.5	875	612.5	717.5	1277.5
200	2100	1890	2345	3658	1138	805	928	1680
250	2980	2700	3340	5220	1780	1260	1460	2620
300	3580	3220	4000	6260	2420	1720	1980	3560
350	4180	3760	4660	7300	3100	2200	2540	4560
400	4780	4300	5320	8340	3880	2760	3180	5720
450	5380	4840	5980	9380	4780	3400	3920	7040
500	5980	5380	6640	10420	5780	4100	4720	8520
550	6580	5920	7300	11460	6840	4880	5620	10120
600	7180	6460	7960	12500	8080	5760	6640	11960

Nominal Ø (DN)	Force (N)				Torque (Nm)			
	F _x	F _y	F _z	Σ F ^b	M _x	M _y	M _z	Σ M ^b
700	8384	7540	9308	14604	11360	8120	9200	16200
800	9584	8620	10640	16696	13840	10480	11600	18800
900	10784	9696	11972	18784	16320	12840	14000	21400
1000	11988	10776	13304	20876	18800	15200	16400	24000
1100	13188	11855	14636	22968	21280	17560	18800	26600
1200	14388	12936	15968	25060	23760	19920	21200	29200

Tab. 10: Permitted forces and torques on the pressure flange

Suction flange

Nominal Ø (DN)	Force (N)				Torque (Nm)			
	F _x	F _y	F _z	Σ F ^b	M _x	M _y	M _z	Σ M ^b
25	297.5	262.5	245	455	315	210	245	455
32	367.5	315	297.5	577.5	385	262.5	297.5	560
40	437.5	385	350	682.5	455	315	367.5	665
50	577.5	525	472.5	910	490	350	402.5	717.5
65	735	647.5	595	1155	525	385	420	770
80	875	787.5	717.5	1382.5	560	402.5	455	822.5
100	1172.5	1050	945	1837.5	612.5	437.5	507.5	910
125	1382.5	1242.5	1120	2170	735	525	665	1067.5
150	1750	1575	1417.5	2747.5	875	612.5	717.5	1277.5
200	2345	2100	1890	3658	1138	805	928	1680
250	3340	2980	2700	5220	1780	1260	1460	2620
300	4000	3580	3220	6260	2420	1720	1980	3560
350	4660	4180	3760	7300	3100	2200	2540	4560
400	5320	4780	4300	8340	3880	2760	3180	5720
450	5980	5380	4840	9380	4780	3400	3920	7040
500	6640	5980	5380	10420	5780	4100	4720	8520
550	7300	6580	5920	11460	6840	4880	5620	10120
600	7960	7180	6460	12500	8080	5760	6640	11960
700	9308	8384	7540	14604	11360	8120	9200	16200
800	10640	9584	8620	16696	13840	10480	11600	18800
900	11972	10784	9696	18784	16320	12840	14000	21400
1000	13304	11988	10776	20876	18800	15200	16400	24000
1100	14636	13188	11855	22968	21280	17560	18800	26600
1200	15968	14388	12936	25060	23760	19920	21200	29200

Tab. 11: Permitted forces and torques on the suction flange

4.4.1.2 Spiral casing made of steel casting

The values stated apply to a spiral casing made of steel casting with grouted base frame.

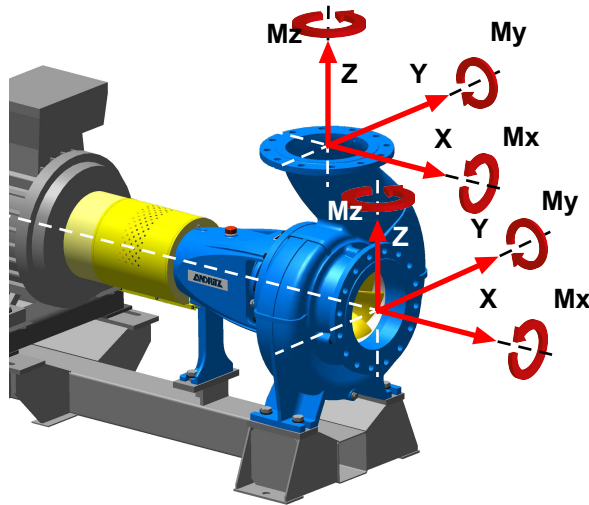


Fig. 4: Flange forces

ΣF and ΣM are the vector sums of the forces and moments.

Delivery flange

Nom. Ø (DN)	Force (N)				Torque (Nm)			
	F _x	F _y	F _z	ΣF^b	M _x	M _y	M _z	ΣM^b
25	525	490	595	910	630	420	490	910
32	630	595	735	1155	770	525	595	1120
40	770	700	875	1365	910	630	735	1330
50	1050	945	1155	1820	980	700	805	1435
65	1295	1190	1470	2310	1050	770	840	1540
80	1575	1435	1750	2765	1120	805	910	1645
100	2100	1890	2352	3675	1225	875	1015	1820
125	2485	2240	2765	4340	1470	1050	1330	2135
150	3150	2835	3500	5495	1750	1225	1435	2555
200	4200	3780	4690	7315	2275	1610	1855	3360
250	5215	4725	5845	9135	3115	2205	2555	4585
300	6265	5635	7000	10955	4235	3010	3465	6230
350	7315	6580	8155	12775	5425	3850	4445	7980
400	8365	7525	9310	14595	6790	4830	5565	10010
450	9415	8470	10465	16415	8365	5950	6860	12320
500	10465	9415	11620	18235	10115	7175	8260	14910
550	11515	10360	12775	20055	11970	8540	9835	17710
600	12565	11305	13930	21875	14140	10080	11620	20930
700	14672	13195	16289	25557	19880	14210	16100	28350
800	16772	15085	18620	29218	24220	18340	20300	32900
900	18872	16968	20951	32872	28560	22470	24500	37450
1000	20979	18858	23282	36533	32900	26600	28700	42000
1100	23079	20747	25613	40194	37240	30730	32900	46550
1200	25179	22638	27944	43855	41580	34860	37100	51100

Tab. 12: Permitted forces and torques at the delivery flange

Suction flange

Nom. Ø (DN)	Force (N)				Torque (Nm)			
	F _x	F _y	F _z	Σ F ^b	M _x	M _y	M _z	Σ M ^b
25	595	525	490	910	630	420	490	910
32	735	630	595	1155	770	525	595	1120
40	875	770	700	1365	910	630	735	1330
50	1155	1050	945	1820	980	700	805	1435
65	1470	1295	1190	2310	1050	770	840	1540
80	1750	1575	1435	2765	1120	805	910	1645
100	2345	2100	1890	3675	1225	875	1015	1820
125	2765	2485	2240	4340	1470	1050	1330	2135
150	3500	3150	2835	5495	1750	1225	1435	2555
200	4690	4200	3780	7315	2275	1610	1855	3360
250	5845	5215	4725	9135	3115	2205	2555	4585
300	7000	6265	5635	10955	4235	3010	3465	6230
350	8155	7315	6580	12775	5425	3850	4445	7980
400	9310	8365	7525	14595	6790	4830	5565	10010
450	10465	9415	8470	16415	8365	5950	6860	12320
500	11620	10465	9415	18235	10115	7175	8260	14910
550	12775	11515	10360	20055	11970	8540	9835	17710
600	13930	12565	11305	21875	14140	10080	11620	20930
700	16289	14672	13195	25557	19880	14210	16100	28350
800	18620	16772	15085	29218	24220	18340	20300	32900
900	20951	18872	16968	32872	28560	22470	24500	37450
1000	23282	20979	18858	36533	32900	26600	28700	42000
1100	25613	23079	20746	40194	37240	30730	32900	46550
1200	27944	25179	22638	43855	41580	34860	37100	51100

Tab. 13: Permitted forces and torques at the suction flange

4.4.1.3 Spiral casing made of steel casting – Centerline version

The values stated apply to a spiral casing made of steel casting, pump design "Centerline" with grouted base frame.

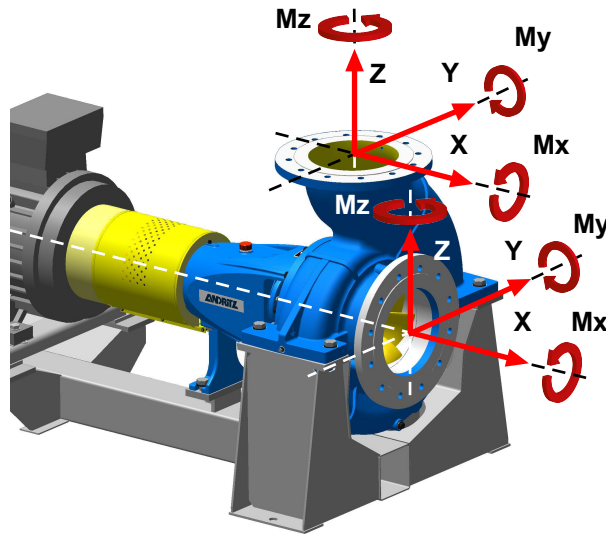


Fig. 5: Flange forces - Centerline version

ΣF and ΣM are the vector sums of the forces and moments.

Delivery flange

Nom. \varnothing (DN)	Force (N)				Torque (Nm)			
	Fx	Fy	Fz	ΣF^b	Mx	My	Mz	ΣM^b
25	750	700	850	1300	900	600	700	1300
32	900	850	1050	1650	1100	750	850	1600
40	1100	1000	1250	1950	1300	900	1050	1900
50	1500	1350	1650	2600	1400	1000	1150	2050
65	1850	1700	2100	3300	1500	1100	1200	2200
80	2250	2050	2500	3950	1600	1150	1300	2350
100	3000	2700	3360	5250	1750	1250	1450	2600
125	3550	3200	3950	6200	2100	1500	1900	3050
150	4500	4050	5000	7850	2500	1750	2050	3650
200	6000	5400	6700	10450	3250	2300	2650	4800
250	7450	6750	8350	13050	4450	3150	3650	6550
300	8950	8050	10000	15650	6050	4300	4950	8900
350	10450	9400	11650	18250	7750	5500	6350	11400
400	11950	10750	13300	20850	9700	6900	7950	14300
450	13450	12100	14950	23450	11950	8500	9800	17600
500	14950	13450	16600	26050	14450	10250	11800	21300
550	16450	14800	18250	28650	17100	12200	14050	25300
600	17950	16150	19900	31250	20200	14400	16600	29900
700	20960	18850	23270	36510	28400	20300	23000	40500
800	23960	21550	26600	41740	34600	26200	29000	47000
900	26960	24240	29930	46960	40800	32100	35000	53500
1000	29970	26940	33260	52190	47000	38000	41000	60000
1100	32970	29638	36590	57420	53200	43900	47000	66500

Nom. Ø (DN)	Force (N)				Torque (Nm)			
	F _x	F _y	F _z	Σ F ^b	M _x	M _y	M _z	Σ M ^b
1200	35970	32340	39920	62650	59400	49800	53000	73000

Tab. 14: Permitted forces and torques at the delivery flange

Suction flange

Nom. Ø (DN)	Force (N)				Torque (Nm)			
	F _x	F _y	F _z	Σ F ^b	M _x	M _y	M _z	Σ M ^b
25	850	750	700	1300	900	600	700	1300
32	1050	900	850	1650	1100	750	850	1600
40	1250	1100	1000	1950	1300	900	1050	1900
50	1650	1500	1350	2600	1400	1000	1150	2050
65	2100	1850	1700	3300	1500	1100	1200	2200
80	2500	2250	2050	3950	1600	1150	1300	2350
100	3350	3000	2700	5250	1750	1250	1450	2600
125	3950	3550	3200	6200	2100	1500	1900	3050
150	5000	4500	4050	7850	2500	1750	2050	3650
200	6700	6000	5400	10450	3250	2300	2650	4800
250	8350	7450	6750	13050	4450	3150	3650	6550
300	10000	8950	8050	15650	6050	4300	4950	8900
350	11650	10450	9400	18250	7750	5500	6350	11400
400	13300	11950	10750	20850	9700	6900	7950	14300
450	14950	13450	12100	23450	11950	8500	9800	17600
500	16600	14950	13450	26050	14450	10250	11800	21300
550	18250	16450	14800	28650	17100	12200	14050	25300
600	19900	17950	16150	31250	20200	14400	16600	29900
700	23270	20960	18850	36510	28400	20300	23000	40500
800	26600	23960	21550	41740	34600	26200	29000	47000
900	29930	26960	24240	46960	40800	32100	35000	53500
1000	33260	29970	26940	52190	47000	38000	41000	60000
1100	36590	32970	29638	57420	53200	43900	47000	66500
1200	39920	35970	32340	62650	59400	49800	53000	73000

Tab. 15: Permitted forces and torques at the suction flange

4.5 Main components

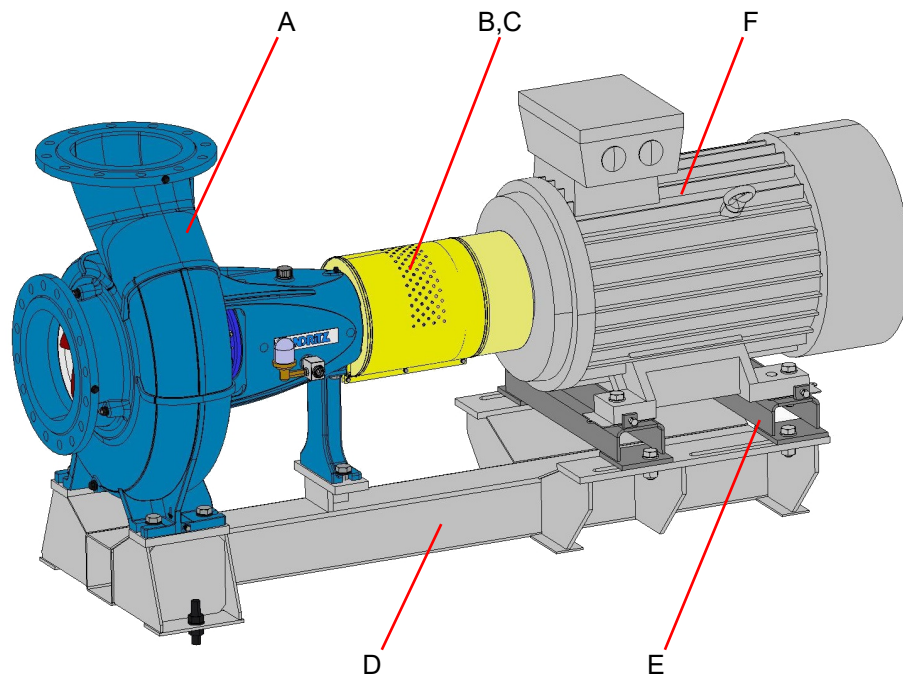


Fig. 6: Main components

Pos.	Designation	Pos.	Designation
A	Centrifugal pump	D	Base frame (891)
B	Coupling (840)	E	Slide rails (593) or supports (592)
C	Coupling guard (681)	F	Motor (800)

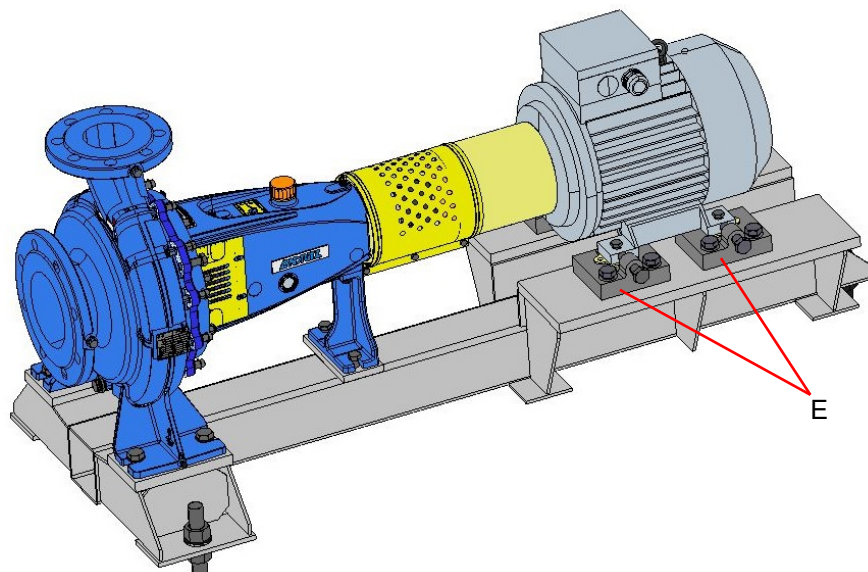


Fig. 7: ACP pump with motor block

4.5.1 Centrifugal pump

The design of the centrifugal pump with spiral casing is suitable for use in industrial processes. The impeller, the wear lining, the casing cover, and the stuffing box housing with shaft seals and bearing support can be assembled and disassembled without detaching the suction and delivery pipes.

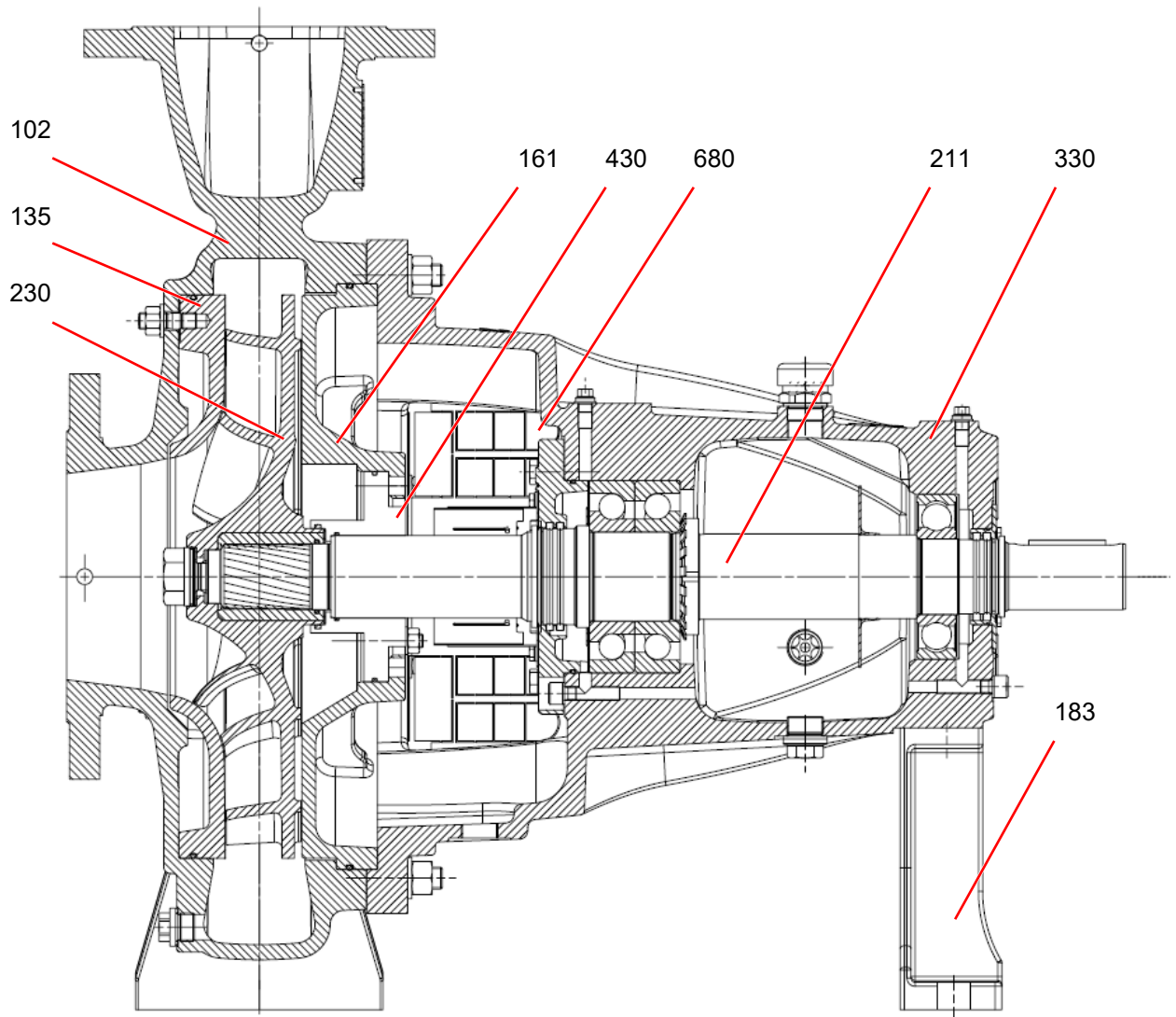


Fig. 8: ACP centrifugal pump – principal section (semi-open impeller)

Pos.	Designation	Pos.	Designation
102	Split casing	230	Impeller
135	Front lining	330	Bearing support
161	Housing cover	430	Shaft seal
183	Supporting leg	680	Safety cover
211	Pump shaft		

Spiral casing (102)

Function	Guiding the medium with a favourable flow pattern. Converting the speed energy into pressure energy.
Design	Pressure-sealed, single-flow pump casing with delivery and suction channels.

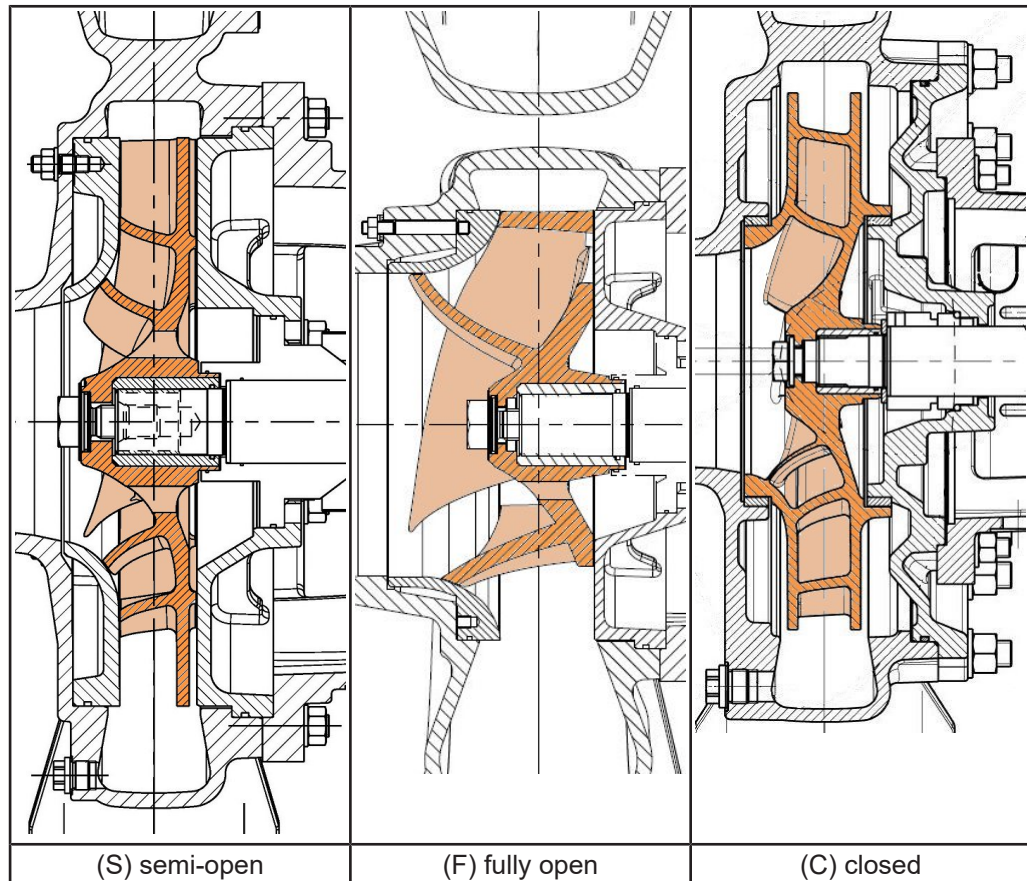
- Suction and delivery flanges
- Holding the bearing housing with bearing assembly, shaft, and impeller
- Standard design: single spiral casing or double spiral casing

Impeller (230)

Function
Designs

Increased twist by charging the medium with rotational energy.

- Semi-open impeller with vanes on the back (S)
- Fully open impeller (F)
- Closed impeller with split rings at the front and split rings or vanes on the back (C)



Tab. 16: Impeller variants

Pump shaft (211)

Function

Holding the impeller, shaft seal, bearing unit, and coupling. Transmitting the drive energy to the impeller and thus, to the medium.

Design

Sturdily dimensioned drive shaft

Bearing support (330)

Function

Interface between stationary and rotating parts. Absorption of axial and radial forces.

Design

- Impeller end: Two angular contact ball bearings (321.1)
- Drive side: One deep groove ball bearing (321.2)

Shaft seal (430)

Function Shaft seal between medium (suction side) and the atmosphere. (See data sheet for specification)

Design There are different types of shaft seal depending on operational requirements.

- Mechanical cartridge seal from ANDRITZ – single-action
- Mechanical cartridge seal from ANDRITZ – double-action
- Mechanical standard seal – single-action
- Mechanical standard cartridge seal – single-action
- Mechanical standard cartridge seal – double-action
- Stuffing box

Base frame (891)

Function Holding the pump and motor.

Design Welded steel frame.

4.5.2 Bearing support

4.5.2.1 Bearing support with grease lubrication

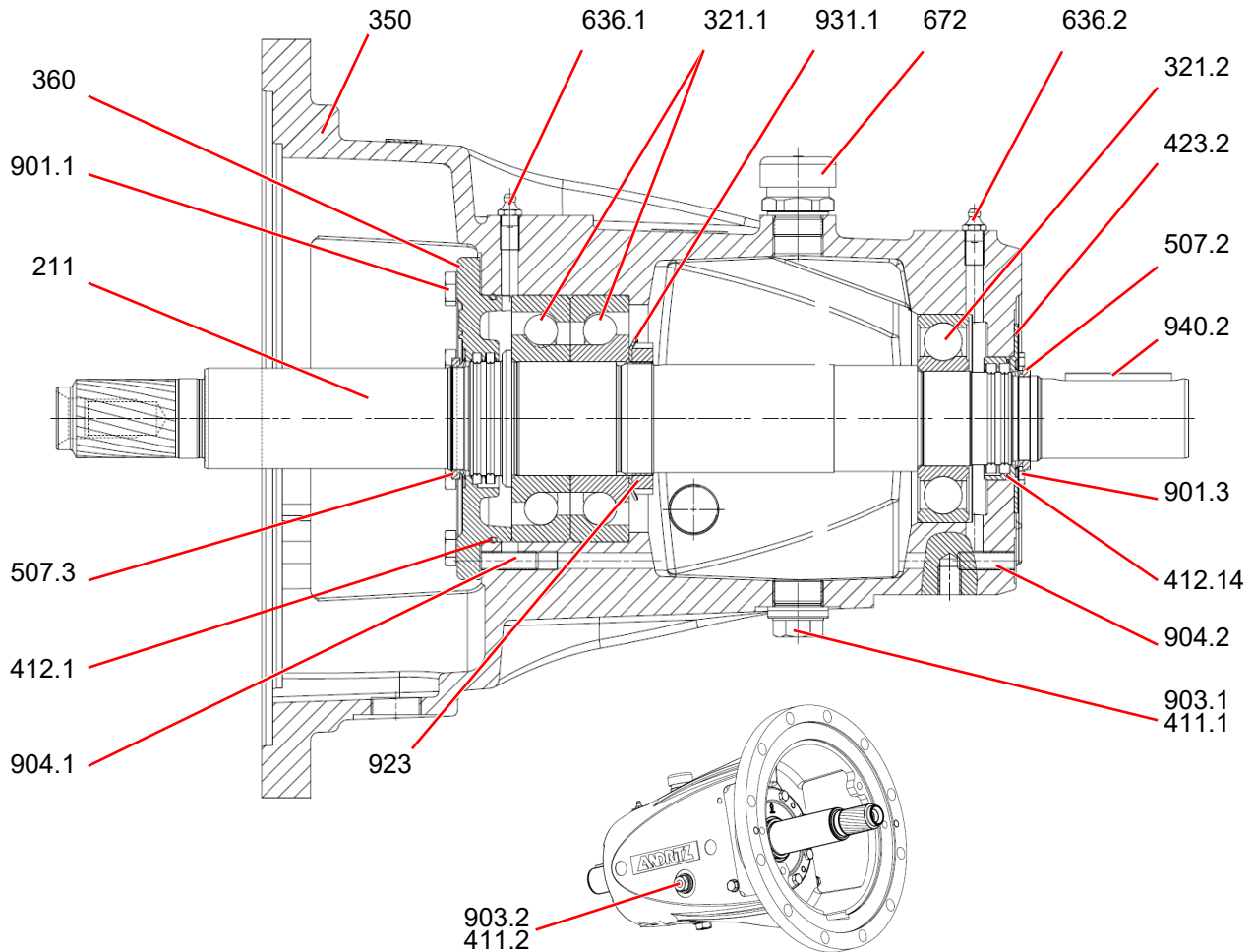


Fig. 9: Bearing support with grease lubrication

Item	Component	Item	Component
350	Bearing housing	904.2	Threaded pin
636.1	Lubricating nipple	903.1	Hex head plug
321.1	Angular contact ball bearing (2x)	411.1	Seal
931.1	Locking washer	923	Locknut
672	Breath plug	904.1	Threaded pin
636.2	Lubricating nipple	412.1	O-ring
321.2	Deep groove ball bearing	507.3	V-ring
423.2	Labyrinth seal	211	Shaft
507.2	Sealing ring	901.1	Hex head screw
940.2	Parallel key on the coupling end	360	Bearing cover
901.3	Hex head screw	903.2	Hex head plug
412.14	O-ring	411.2	Seal

4.5.2.2 Bearing support with oil lubrication

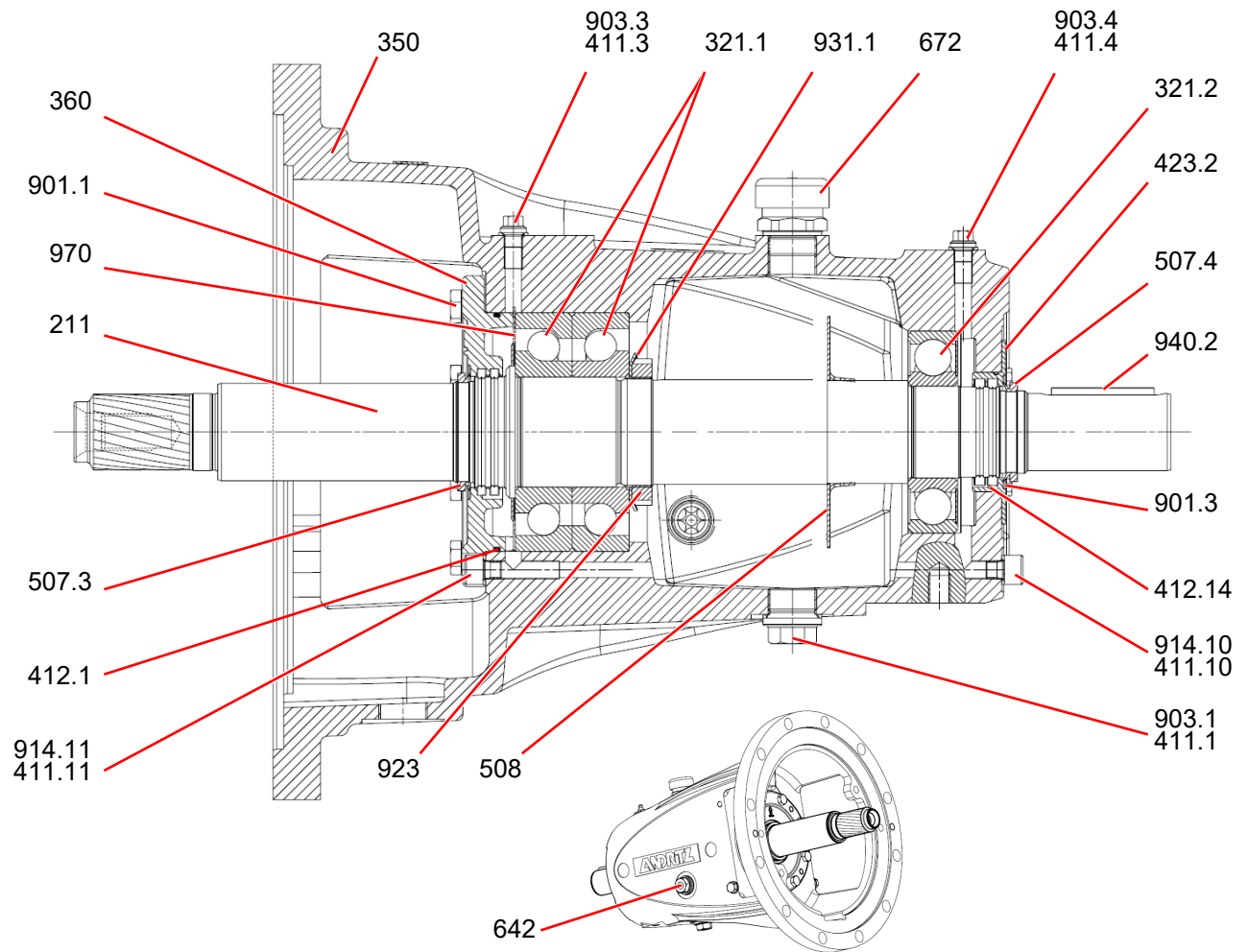


Fig. 10: Bearing support with oil lubrication

Item	Component	Item	Component
350	Bearing housing	411.10	Seal
903.3	Hex head plug	903.1	Hex head plug
411.3	Seal	411.1	Seal
321.1	Deep groove ball bearing	508	Oil slinger ring
931.1	Locking washer	923	Locknut
672	Breath plug	914.11	Allen screw
903.4	Hex head plug	411.11	Seal
411.4	Seal	412.1	O-ring
321.2	Deep groove ball bearing	507.3	V-ring
423.2	Labyrinth seal	211	Shaft
507.4	V-ring	970	Plain washer for bearing
940.2	Parallel key on the coupling end	901.1	Hex head screw
901.3	Hex head screw	360	Bearing cover
412.14	O-ring	642	Oil sight glass
914.10	Allen screw		

4.5.2.3 Bearing types

Bearing support	Pump type	Bearing type Pump end	Bearing type Coupling end	
			Grease-lubricated bearings	Oil-lubricated bearing
BS24	ACP 32-125 ACP 32-160 ACP 32-200 ACP40-125 ACP 40-160 ACP 40-200 ACP 50-125 ACP 50-160 ACP 50-200 ACP 65-125	2 x 7307 BECBP or 2 x 7307B-TVP-UA	6305/C3	6305Z/C3
BS32	ACP 40-250 ACP 50-250 ACP 50-315 ACP 65-160 ACP 65-200 ACP 65-250 ACP 65-330 ACP 80-160 ACP 80-200 ACP 80-250 ACP 100-200 ACP 100-265 ACP 100-330 ACP 125-265	2 x 7309 BECBP or 2 x 7309B-TVP-UA	6307/C3	6307Z/C3
BS42	ACP 65-315 ACP 80-315 ACP 80-400 ACP 100-250 ACP 100-315 ACP 100-400 ACP 125-250 ACP 125-315 ACP 150-250 ACP 150-315 ACP 250-315 ACP 400-330	2 x 7312 BECBP or 2 x 7312B-TVP-UA	6310/C3	6310Z/C3
BS48	ACP 100-480 ACP 125-400 ACP 150-400 ACP 450-370	2 x 7313 BECBP or 2 x 7313B-TVP-UA	6311/C3	6311Z/C3
BS48-2 (HD)	ACP 100-315-2	2 x 7314 BECBP or 2 x 7314B-TVP-UA		6312Z/C3

Tab. 17: Bearing types

Bearing support	Pump type	Bearing type Pump end	Bearing type Coupling end	
			Lubricated with grease	Lubricated with oil
BS60	ACP 100-500 ACP 200-400 ACP 250-480 ACP 300-400 ACP 450-370 ACP 450-410 ACP 600-505	2 x 7316 BECBP or 2 x 7316B-TVP-UA	6314/C3	6314Z/C3
BS60-2 (HD)	ACP 125-315-2 ACP 150-315-2	2 x 7318 BECBP or 2 x 7318B-TVP-UA		6314Z/C3
BS75	ACP 125-625 ACP 150-500 ACP 200-500 ACP 200-625 ACP 250-625 ACP 300-500 ACP 350-480 ACP 350-650 ACP 400-530 ACP 450-550 ACP 500-470 ACP 500-455 ACP 600-555 ACP 600-565	2 x 7320 BECBP or 2 x 7320B-TVP-UA	6318/C3	6318Z/C3
BS100	ACP 300-700 ACP 400-700 ACP 400-820 ACP 500-650 ACP 600-730 ACP 700-640 ACP 800-730 ACP 900-800	2 x 7326 BECBM or 2 x 7326B-MP-UA	6322/C3	6322Z/C3
BS100-1	ACP 200-625 ACP 600-625 ACP 700-595	2 x 7326 BECBM or 2 x 7326B-MP-UA	6322/C3	6322Z/C3

Tab. 18: Bearing types

4.5.3 Shaft seal

4.5.3.1 ANDRITZ Cartridge seal - single

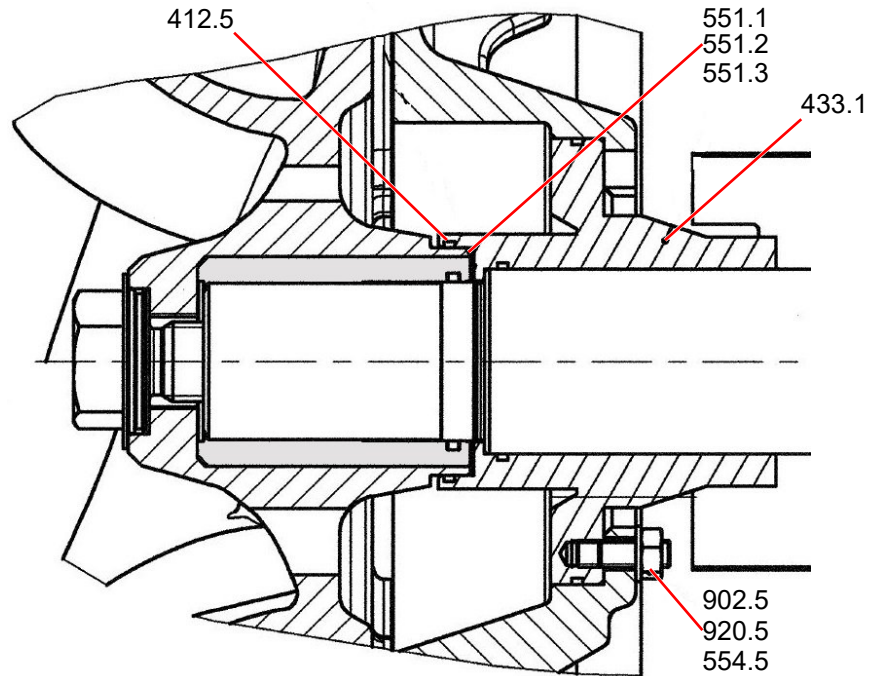


Fig. 11: ANDRITZ – Cartridge seal (BS42 – BS100)

Pos. Designation	Pos. Designation
433.1 Shaft seal	920.5 Hexagon nut
902.5 Stud bolt	412.5 O-ring
554.5 Washer	551 Spacer plates

Function Seal between the medium and the atmosphere. The mechanical seal is lubricated by the medium to be pumped.

Application limits The application limits listed in the table must be observed at all times. Contact ANDRITZ if these limits are exceeded!

T max	p max	n max
90 °C	16 bar	3600 r.p.m.

Tab. 19: Application limits

Sizes

Bearing support size	Shaft diameter [mm]	Seal diameter [mm]
BS24	24	33
BS32	32	43
BS42	42	53
BS48	48	60
BS60	60	70
BS75	75	85
BS100	100	115

Tab. 20: Size

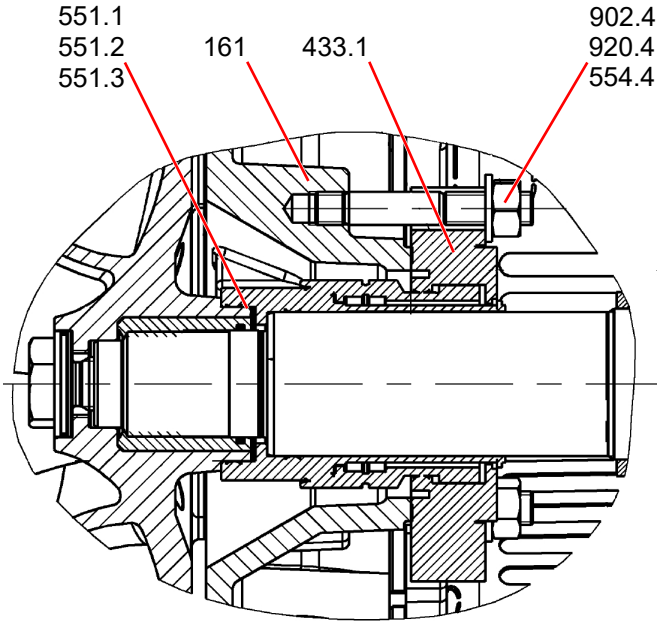


Fig. 12: ANDRITZ – Cartridge seal (BS24 – BS32)

4.5.3.2 ANDRITZ Cartridge seal - double

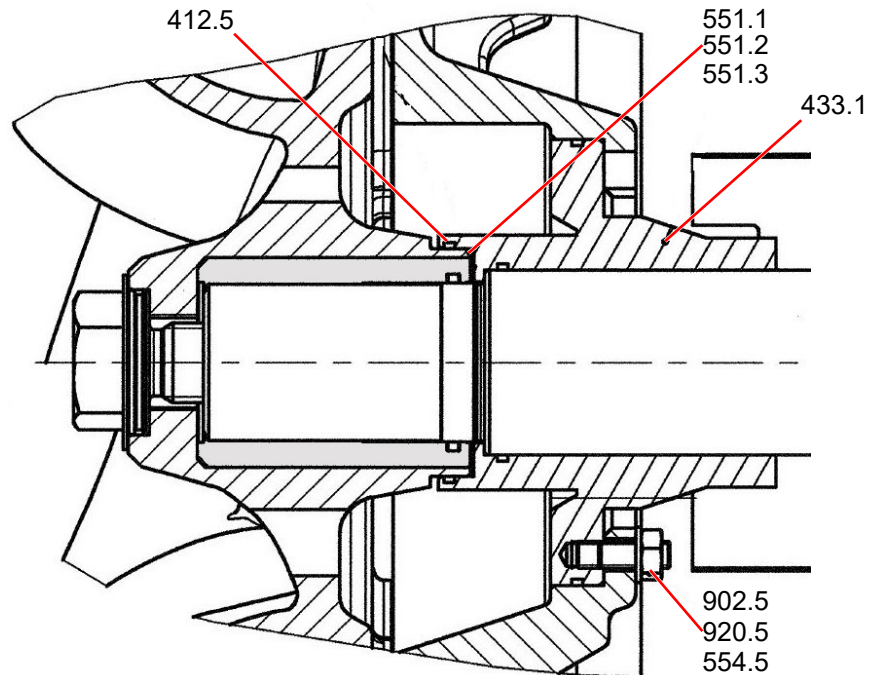


Fig. 13: ANDRITZ – Cartridge seal (BS42 – BS100)

Pos. Designation	Pos. Designation
433.1 Shaft seal	920.5 Hex nut
902.5 Stud	412.5 O-ring
554.5 Plain washer	551 Spacer plates

Function

Sealing between medium and the atmosphere by the use of sealing water.

Application limits

The limit values listed in the table below must be observed in any event. If the limit values are exceeded, ANDRITZ must be contacted!

T max	P max	N max
180 °C	25 bar	3600 rpm

Tab. 21: Application limits

Dimensions

Bearing support	Shaft Ø [mm]	Seal Ø [mm]	Sealing water quantity [l/min]	Sealing water pressure [bar]
BS24	24	33	1.5	$H \text{ [bar]} \times 0.2 + H_{\text{inlet}} \text{ [bar]} + 0.5 \text{ bar}$ with semi-open impeller $H \text{ [bar]} \times 0.3 + H_{\text{inlet}} \text{ [bar]} + 0.5 \text{ bar}$ with closed impeller $H \text{ [bar]} \times 0.4 + H_{\text{inlet}} \text{ [bar]} + 0.5 \text{ bar}$ with open impeller
BS32	32	43	2	
BS42	42	53	2	
BS48	48	60	3	
BS60	60	70	4	
BS75	75	85	4	
BS100	100	115	4	

Tab. 22: Dimensions and seal water

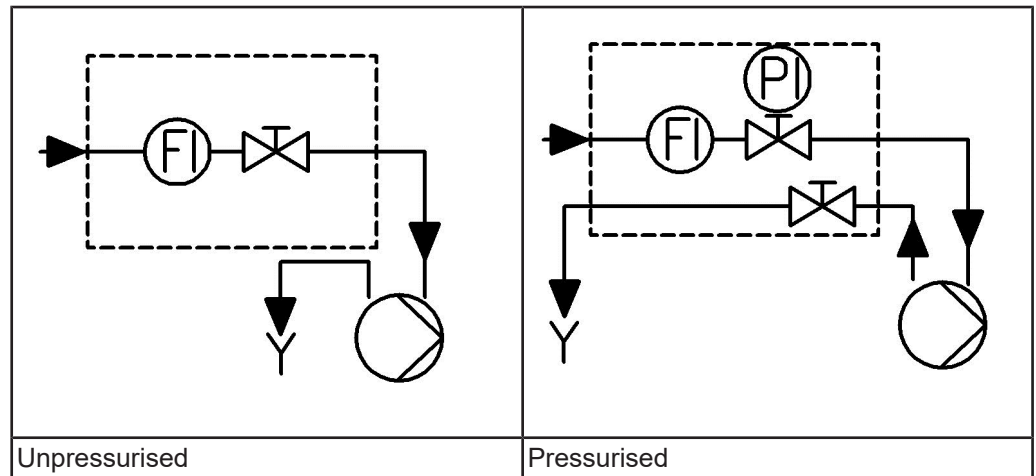
If the calculated sealing water pressure exceeds the value of 10 bar, please contact the product management.

Connections

The sealing water connections are to be taken from the supplier documentation in accordance with the manufacturer's specifications.

Monitoring

In order to guarantee proper operation, the seal water must be monitored by suitable monitoring units in accordance with the diagrams provided below.



Tab. 23: Sealing water monitoring

Sealing water quality

Sealing water quality: 75 microns (fresh water)
Sealing water temperature: min. 10 °C – max. 30 °C
Solids content: 2 mg/l max.

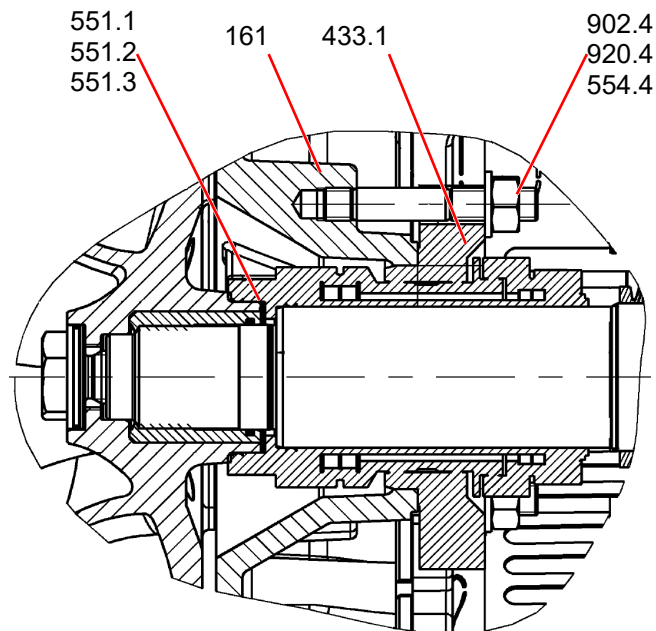


Fig. 14: ANDRITZ – Cartridge seal (BS24 – BS32)

4.5.3.3 Mechanical seal – single-action

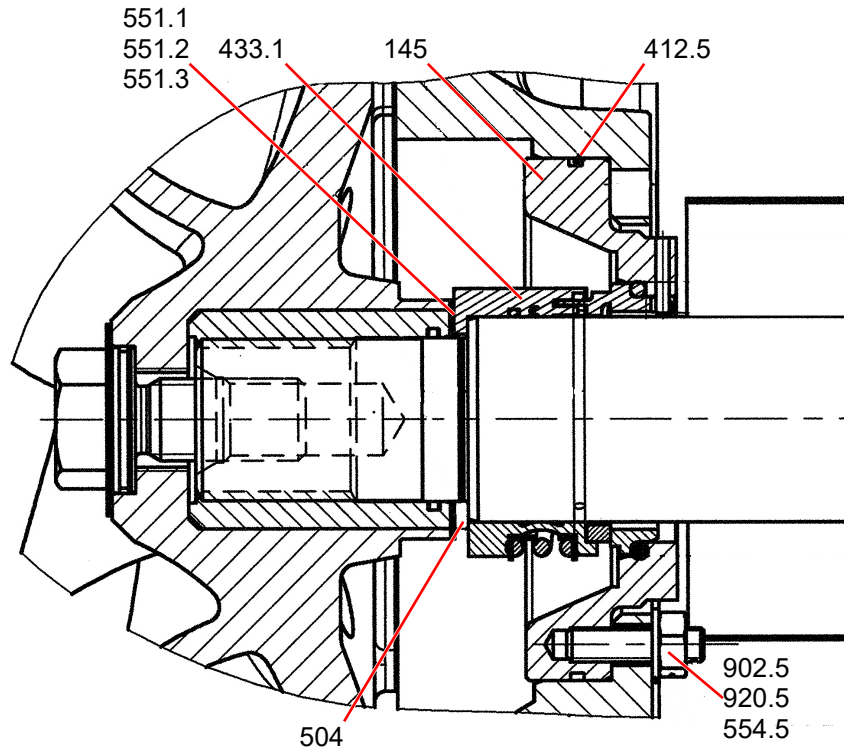


Fig. 15: Mechanical seal – single-action (BS42 – BS100)

Pos. Designation	Pos. Designation
433.1 Shaft seal	145 Adapter
902.5 Stud bolt	412.5 O-ring
554.5 Washer	504 Spacer ring
920.5 Hexagon nut	551 Spacer plates

Function Seal between the medium and the atmosphere. The mechanical seal is lubricated by the medium to be pumped.

Application limits The application limits listed in the table must be observed at all times. Contact ANDRITZ if these limits are exceeded!

T max	p max	n max
90 °C	16 bar	3600 r.p.m.

Tab. 24: Application limits

Sizes

Bearing support size	Shaft diameter [mm]	Seal diameter [mm]
BS24	24	33
BS32	32	43
BS42	42	53
BS48	48	60
BS60	60	70
BS75	75	85
BS100	100	115

Tab. 25: Size

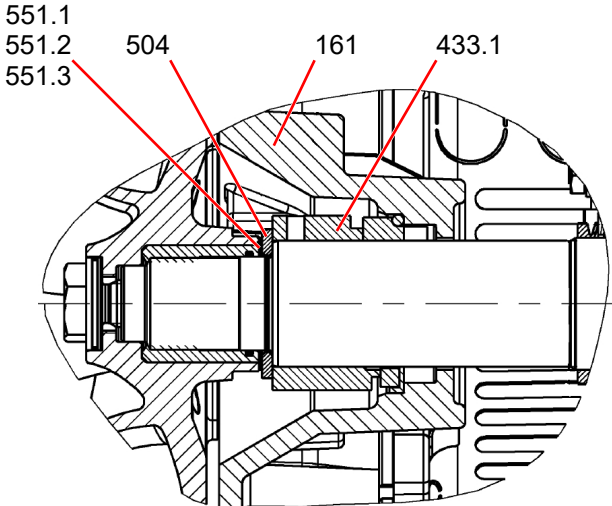


Fig. 16: Mechanical seal – single-action (BS24 – BS32)

4.5.3.4 STANDARD Cartridge seal - single

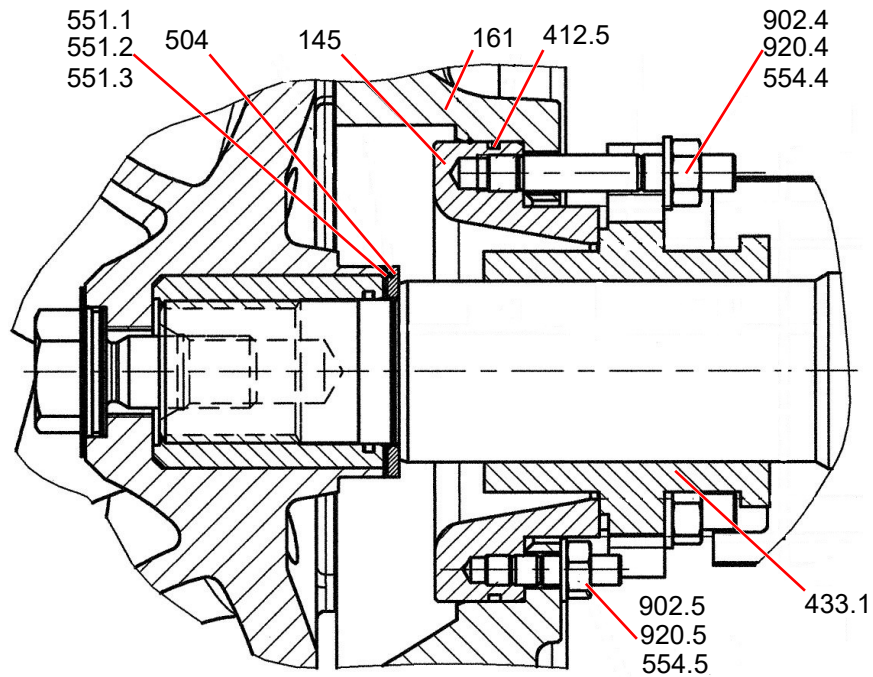


Fig. 17: STANDARD Cartridge seal (BS42 – BS100)

Pos. Designation	Pos. Designation
433.1 Shaft seal	920.5 Hexagon nut
145 Adapter	412.5 O-ring
902.4 Stud bolt	504 Spacer ring
554.5 Washer	551 Spacer plates
920.4 Hexagon nut	554.5 Washer
902.5 Stud bolt	

Function Seal between the medium and the atmosphere. The mechanical seal is lubricated by the medium to be pumped.

Application limits The application limits listed in the table must be observed at all times. Contact ANDRITZ if these limits are exceeded!

T max	p max	n max
120 °C	16 bar	3600 r.p.m.

Tab. 26: Application limits

Sizes

Bearing support size	Shaft Ø [mm]	Seal Ø [mm]
BS24	24	33
BS32	32	43
BS42	42	53
BS48	48	60
BS60	60	70
BS75	75	85
BS100	100	115

Tab. 27: Sizes

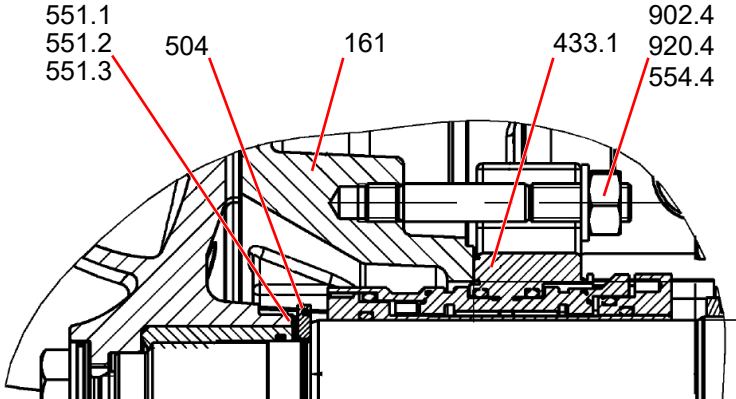


Fig. 18: STANDARD Cartridge seal (BS24 – BS32)

4.5.3.5 STANDARD Cartridge seal - double

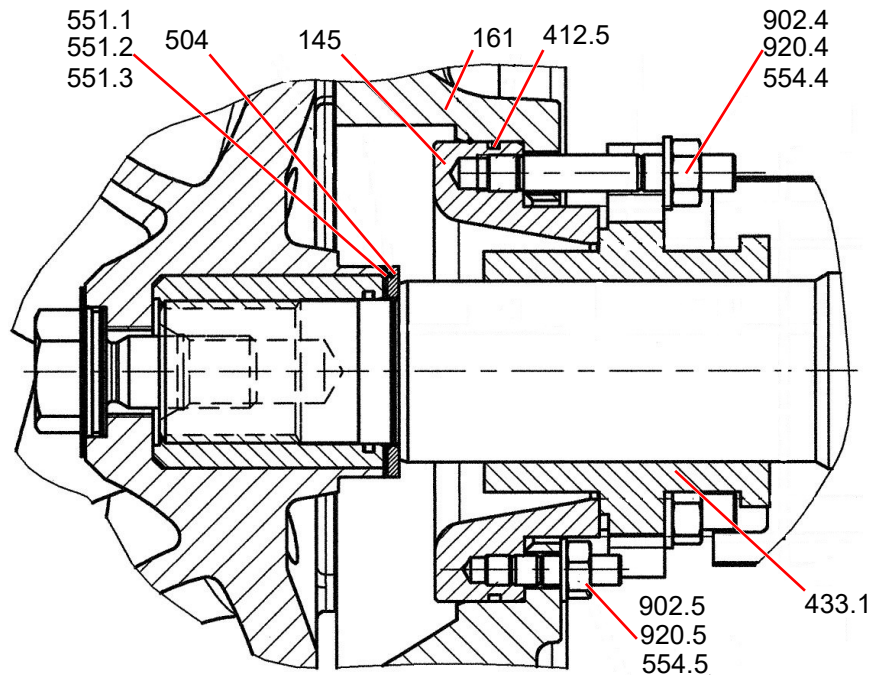


Fig. 19: STANDARD cartridge seal (BS42 – BS100)

Pos. Designation	Pos. Designation
433.1 Shaft seal	920.5 Hex nut
145 Adapter	412.5 O-ring
902.4 Stud	504 Distance ring
554.5 Plain washer	551 Spacer plates
920.4 Hex nut	554.5 Plain washer
902.5 Stud	

Function

Sealing between medium and the atmosphere by the use of sealing water.

Application limits

The limit values listed in the table below must be observed in any event. If the limit values are exceeded, ANDRITZ must be contacted!

T max	P max	N max
180 °C	25 bar	3600 rpm

Tab. 28: Application limits

Dimensions

Bearing support	Shaft Ø [mm]	Seal Ø [mm]	Sealing water quantity [l/min]	Sealing water pressure [bar]
BS24	24	33	1.5	H [bar] x 0.2 + H _{inlet} [bar] + 0.5 bar with semi-open impeller
BS32	32	43	2	
BS42	42	53	2	H [bar] x 0.3 + H _{inlet} [bar] + 0.5 bar with closed impeller
BS48	48	60	3	H [bar] x 0.4 + H _{inlet} [bar] + 0.5 bar with open impeller
BS60	60	70	4	
BS75	75	85	4	
BS100	100	115	4	

Tab. 29: Dimensions and seal water

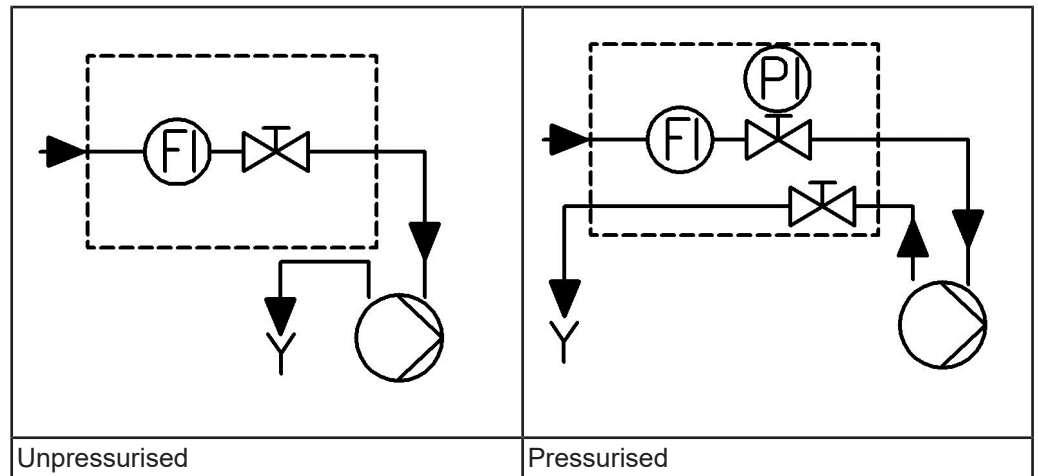
If the calculated sealing water pressure exceeds the value of 10 bar, please contact the product management.

Connections

The sealing water connections are to be taken from the supplier documentation in accordance with the manufacturer's specifications.

Monitoring

In order to guarantee proper operation, the seal water must be monitored by suitable monitoring units in accordance with the diagrams provided below.



Tab. 30: Sealing water monitoring

Sealing water quality

Sealing water quality: 75 microns (fresh water)
Sealing water temperature: min. 10 °C – max. 30 °C
Solids content: 2 mg/l max.

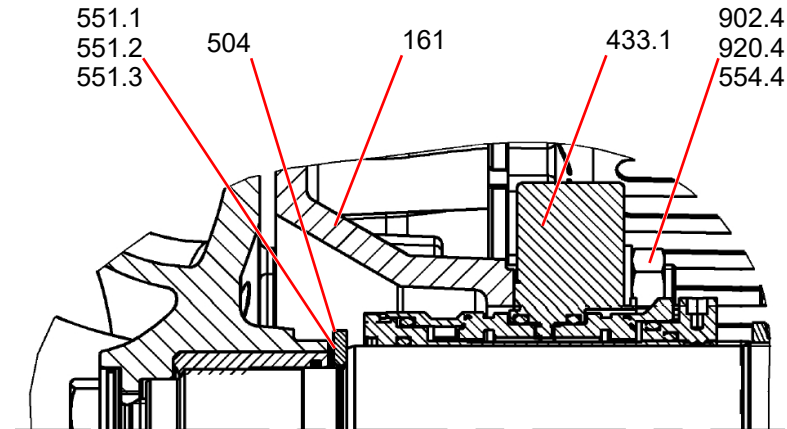


Fig. 20: STANDARD cartridge seal (BS24 – BS32)

4.5.3.6 Stuffing box

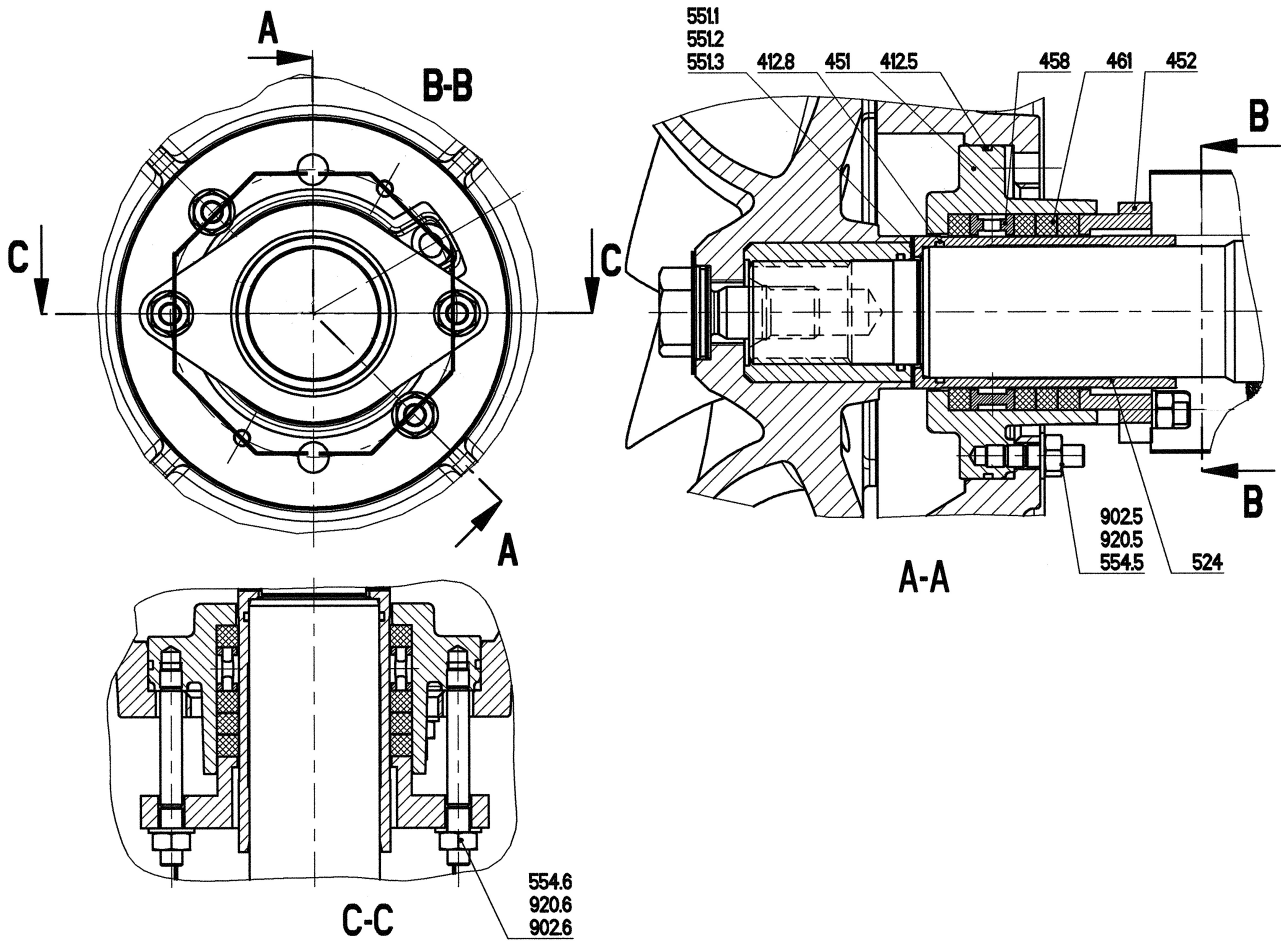


Fig. 21: Stuffing box (BS42 – BS100)

Pos.	Designation	Pos.	Designation
451	Stuffing box casing	920.5	Hex nut
452	Stuffing box gland	412.5	O-ring
458	Seal water ring	412.8	O-ring
461	Stuffing box packing	524	Shaft protective sleeve
902.5	Stud	551	Spacer plates
554.5	Disc		

Function Seal between the medium and the atmosphere. The seal is formed by the packing rings and the seal water.

Application limits Pressure: The maximum pressure that may be present at the stuffing box packing depends on the maximum permitted casing pressure but must not exceed 16 bar.

Temperature: The medium temperature is limited to 90 °C if a stuffing box is used.

Dimensions

Bearing support size	Shaft Ø [mm]	Seal Ø [mm]	Packing Ø [mm]	Packing [mm]	No. of packings
BS24	24	33	41	8x8	1+3
BS32	32	43	51	10x10	1+3
BS42	42	53	65	10x10	1+3
BS48	48	60	70	10x10	1+3
BS60	60	70	80	10x10	2+3

Bearing support size	Shaft Ø [mm]	Seal Ø [mm]	Packing Ø [mm]	Packing [mm]	No. of packings
BS75	75	85	100	12x12	2+3
BS100	100	115	130	12x12	2+3

Tab. 31: Dimensions

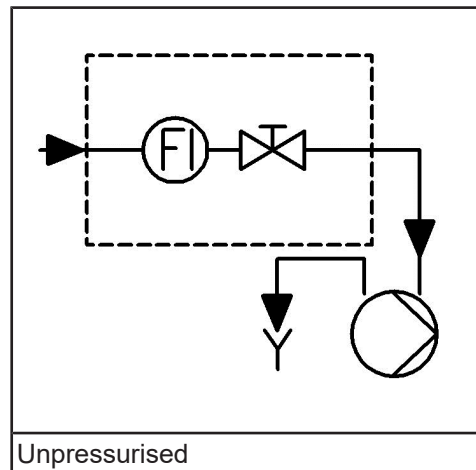
Seal water

Bearing support size	Seal water pressure [bar]	Seal water quantity [l/min]
BS24	3-5	1.5
BS32		2
BS42		2
BS48		3
BS60		3
BS75		3
BS100		4

Tab. 32: Seal water

Monitoring

In order to guarantee proper operation, the seal water must be monitored by suitable monitoring units in accordance with the diagram below.



Tab. 33: Seal water monitor

Seal water quality

Seal water quality: 75 microns (fresh water)

Seal water temperature: min. 10 °C – max. 30 °C

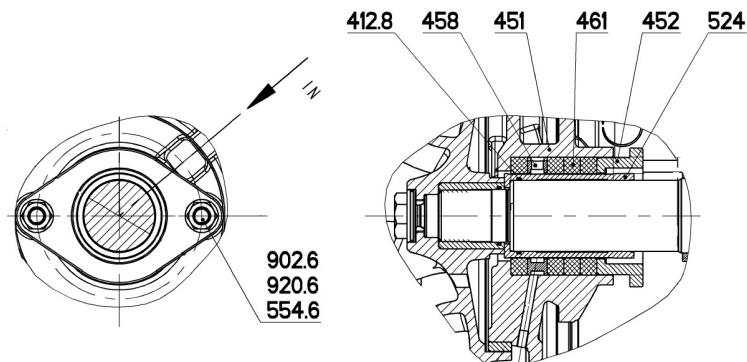


Fig. 22: Stuffing box (BS24 – BS32)

4.5.3.7 Dynamic seal

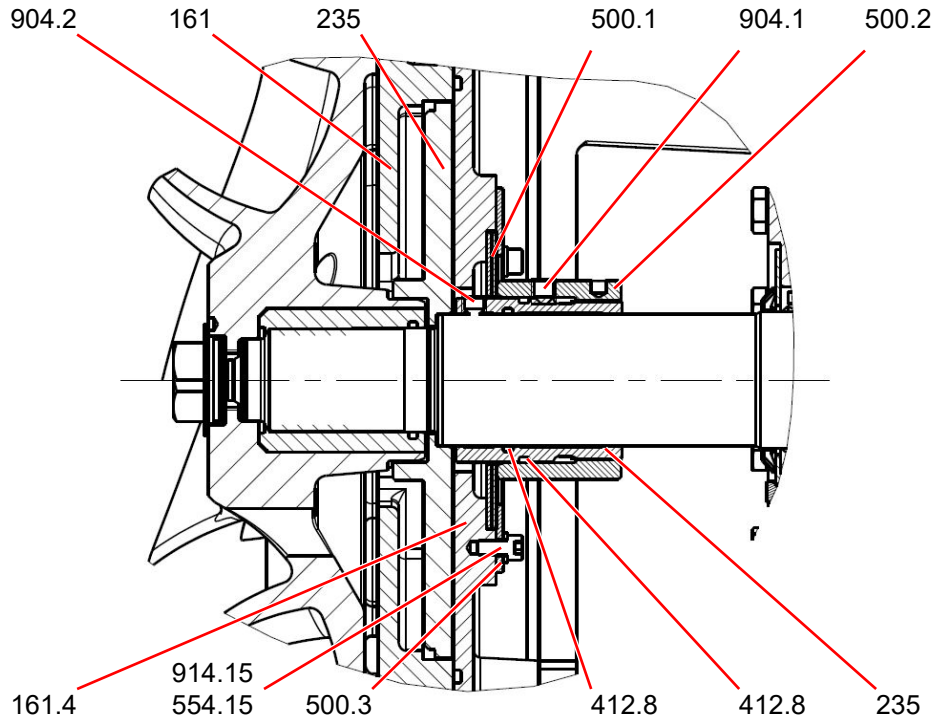


Fig. 23: Dynamic seal (BS42 - BS100)

Pos. Designation	Pos. Designation
904.2 Fixing screw	914.1 Cylinder screw 5
161 Housing cap	554.1 Plain washer 5
235 Separator	500.3 Thrust ring
500.1 Standstill seal gasket	412.8 O-ring
904.1 Fixing screw	412.9 O-ring
500.2 Adjusting ring	540 Bush for dynamic seal
161.4 Cover for dynamic seal	

Function Contactless sealing between medium and atmosphere. The sealing effect is achieved by the formation of a ring of liquid.

Application limits The limit values listed in the table below must be observed in all cases. If the limit values are exceeded, ANDRITZ must be contacted!

During a shutdown, the inlet pressure must be atmospheric at least so that the seal is tight.

T max	Suction pressure	N max
90 °C	See the following diagram	3600 rpm

Tab. 34: Application limits

Size	Min. [rpm]	Max. [rpm]	Diagram
BS42	1200	3000	<p>pre pressure limit [bar, abs]</p> <p>Fill level in tank at ($p_{amb}=1\text{bar}$)</p> <p>Operating speed [rpm]</p> <p>minimum operating speed</p> <p>possible leakage through Separator system --> Difference pressure control + Control valve for degassing line needed</p> <p>no leakage through Separator system --> On/Off valve for degassing line ok --> usage as dynamic seal OK</p>
BS48	850	1800	<p>pre pressure limit [bar, abs]</p> <p>Fill level in tank at ($p_{amb}=1\text{bar}$)</p> <p>Operating speed [rpm]</p> <p>minimum operating speed</p> <p>possible leakage through Separator system --> Difference pressure control + Control valve for degassing line needed</p> <p>no leakage through Separator system --> On/Off valve for degassing line ok--></p>
BS60	740	1800	<p>pre pressure limit [bar, abs]</p> <p>Fill level in tank at ($p_{amb}=1\text{bar}$)</p> <p>Operating speed [rpm]</p> <p>minimum operating speed</p> <p>possible leakage through Separator system --> Difference pressure control + Control valve for degassing line needed</p> <p>no leakage through Separator system --> On/Off valve for degassing line ok --> usage as dynamic seal OK</p>

Size	Min. [rpm]	Max. [rpm]	Diagram
BS75	600	1800	
BS100	800	1200	

5 Installation

5.1 General information

This chapter describes work processes for the erection of the machine/system that may be the responsibility of the operating company.

The description does not include tasks of pre-assembly work carried out by ANDRITZ at its factory.

5.2 Safety regulations

General safety regulations

All applicable accident prevention rules must be observed.

Installation work must not be performed in explosive atmospheres.

Potential risks caused by gases and vapours forming must be analysed in detail. The appropriate safety measures must be implemented.

Do not exceed permissible crane loads and weights on lifting gear and ropes/shackles. Secure loads against falling from a height.

Do not stand or walk below suspended loads! Standing below suspended loads can result in life-threatening injuries and is thus strictly forbidden!

Jolts must be avoided. This refers especially to the handling of pre-assembled machines.

Qualification of personnel assigned

Transport and unloading is to be carried out by personnel specially familiar with such work.

Workers entrusted with lifting and conveying equipment must have the national qualifications required.

Erection work may only be carried out by trained, skilled personnel.

Personal protective apparel

Personal safety equipment must be worn when working (>> Personal protective equipment [► 19]).

5.3 Transport

DANGER



Falling of machine parts

Falling of machine parts during transport or during loading/unloading poses a potentially life-threatening hazard.

- The machine and transport boxes may only be lifted at the attachment points marked for cranes and forklifts!
- When the entire machine is lifted and multiple eyelets of different types are available, use only suitable eyelets (according to the transport sketch)!
- Do not walk or stand under suspended loads!
- Wear personal protective equipment!

NOTICE



Damage to painted surfaces

Corrosion due to damaged paint.

- Do not use steel ropes to lift painted machine parts!

Delivery	<p>The machine/system is supplied pre-assembled. The machine components and auxiliary materials are packed in crates.</p> <p>Transport sizes and weights are stated in the shipping documents.</p> <p>Largest supply weights: >> Data sheet, characteristic curve, drawing</p>
Acceptance	<p>Check against shipping documents and packing lists whether the supply is complete and in perfect condition.</p> <p>Do not accept the goods in the event of transport damage or short supply, and notify the forwarder and the ANDRITZ shipping department accordingly.</p>
Stability	<p>Stability during transport or erection work is also guaranteed at an angle of 10° out of the normal position.</p>
Lifting equipment	<p>WARNING! The lifting equipment must show the name of the manufacturer, the name of the material, and the permitted load!</p>

5.3.1 Lifting the pump

The pump and components may be lifted only in accordance with the following instructions and figures. The lifting equipment must be short enough to prevent the pump from tipping.

 **DANGER**



Lifting the pump incorrectly

Danger due to the pump tilting when raised.

- Do not lift the complete centrifugal pump at the window of the bearing support only.
 - Do not stand or walk below suspended loads!
 - Wear your personal protective equipment!
 - Ensure that the pump is always properly balanced when being lifted.
-

Entire pump

Lifting the entire pump (pump is mounted on the base frame)

Appropriate lifting equipment must be attached under the suction flange and on the base frame (as shown in the figure).

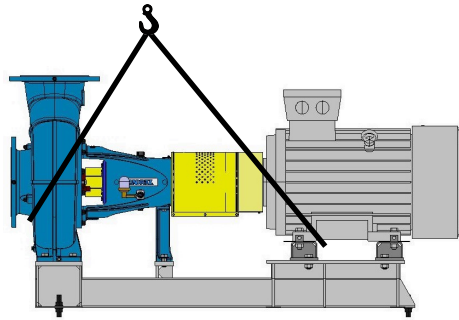


Fig. 24: Lifting the entire pump (with the base frame)

Pump with free shaft

Lifting the pump with free shaft

Appropriate lifting equipment must be attached under the suction flange and on the shaft end (as shown in the figure).

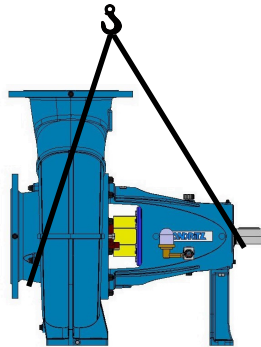


Fig. 25: Lifting the pump with free shaft

Removable unit

Lifting the removable unit

Appropriate lifting equipment must be attached through the windows of the bearing support and between the coupling half and bearing cap (as shown in the figure).

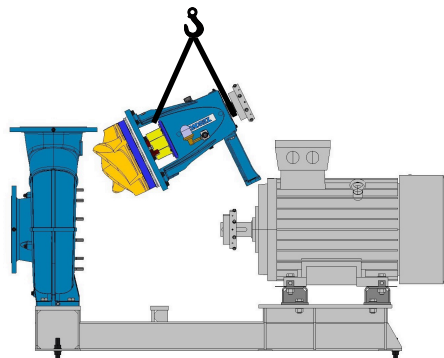


Fig. 26: Lifting the removable unit

5.4 Storage

Short-term storage	<p>If the pump is stored for less than 3 months until the start of installation, observe the following notes:</p> <ul style="list-style-type: none">• Store the machine in a dry location where it is protected against dirt and corrosion.• Do not remove the packaging until just prior to the start of installation.• If there is no lubricant in the bearing housing, it must be filled with lubricant (oil or grease) to protect the bearing from corrosion.• Crank the shaft manually every two weeks to prevent damage to the shaft bearings.
Long-term storage	<p>If the pump is stored for more than 3 months before its installation begins, observe the following additional notes:</p> <ul style="list-style-type: none">• Protect small parts against damage and unauthorised removal by storing them in lockable rooms.• Drain all liquids (water and pulp residue) from the pump.• In the case of centrifugal pumps with a grey cast iron housing and stuffing box seal, remove the packing cords and coat the stuffing box body with an anti-rust agent.

NOTICE



Old lubricant

Damage to the machine due to old lubricant.

- The oil or grease in the bearing housing must be replaced after long periods of storage and before commissioning.
 - ⇒ For oil lubrication, it is sufficient to top up with operating oil. However, the first oil change must be carried out after approx. 200 operating hours!
- Anti-rust agents must be removed completely!

5.5 Installation

General Completion of the various steps must be documented in the certificate of completion of erection work.

⚠ CAUTION



Risks during assembly

Disregarding the installation procedure and installation instructions may result in hazardous situations causing a danger to life and limb.

- Observe installation instructions.
- Observe the installation sequence.

⚠ WARNING



Trapping and crushing

Trapping or crushing of body parts during work.

- Do not reach under suspended loads!
- Wear personal protective equipment!
- Moving parts that can change their position and thus have crushing or shearing points must be secured using support bars or equivalent measures (e.g. lowering)!

⚠ DANGER



Risk of accidents during assembly

Risk of falling, stumbling, crushing and slipping.

- All protective measures (barriers, etc.) must be applied continuously during assembly.
- Sufficient lighting must be provided in all working areas.

Requirements at installation site Electricity, water, and compressed air are available.

Documentation The following documentation must be available at the beginning of installation work:

- Foundation and arrangement drawings
- Parts lists
- Electrical, and measurement and control technology documents
- Packing lists for each individual consignment

Foundation The foundations and foundation mountings are built according to the foundation drawings, and the dimensioning must be checked before starting the installation work.

The ambient temperature should not fall below 10-15°C during the installation work.

5.5.1 Pump installation

Erecting and foundation laying

	Steps
---	-------

- 1) Mark the fixing points of the base frame according to the installation plan on the foundation.
- 2) Drill the anchor holes and insert the compound anchor cartridges (6).
⇒ >>Subsupplier documentation / FOUNDATION [▶ 129]
- 3) Screw the threaded rods (5) into the compound anchor cartridges (6).
- 4) Screw the adjusting nuts (4) on the threaded rods (5).
⇒ Fit the washers.
- 5) Lift the pump unit onto the foundation and position it on the base rails (12).
⇒ Height of the base rails = 50 – 100 mm
⇒ >>Lifting the pump
- 6) Align the axes and pump height according to the system specifications.
- 7) Lift the pump unit with the setting nuts (4) and remove the base rails (12).
⇒ Align the pump unit with the adjusting nuts (4) and secure it with the nuts (3).
- 8) If necessary, cut off and deburr the threaded rods (5) with 5 mm projection.
- 9) Fill the pump base frame with non-shrinking grouting mortar (13).
⇒ Hardening time 1 to 2 days, concrete strength class conforming to EN206-1 at least C25/30

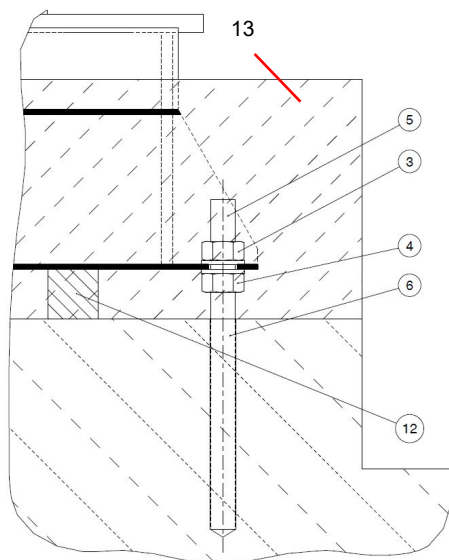


Fig. 27: Laying foundations

5.5.1.1 Mounting the motor

Mount the motor if it has not yet been installed.

 Steps

- 1) Mount the drilled coupling half flush on the motor stub and secure on the feather key with a set screw.
- 2) Bolts or threaded rods cut to a suitable length are used to secure the motor in place. These must be tightened with the required tightening torque.

Distance from the wall

To ensure adequate motor cooling, the following spacing from the wall must be observed:

Motor size	L3 [mm]
100L	25
112M	30
132S/M	40
160M/L	45
180M/L	55
200M/L	70
225S/M	80
250S/M	90
280S/M	100
315S/M/L	115
355S/M/L	130
500L	180

Tab. 35: Distance between motor and wall

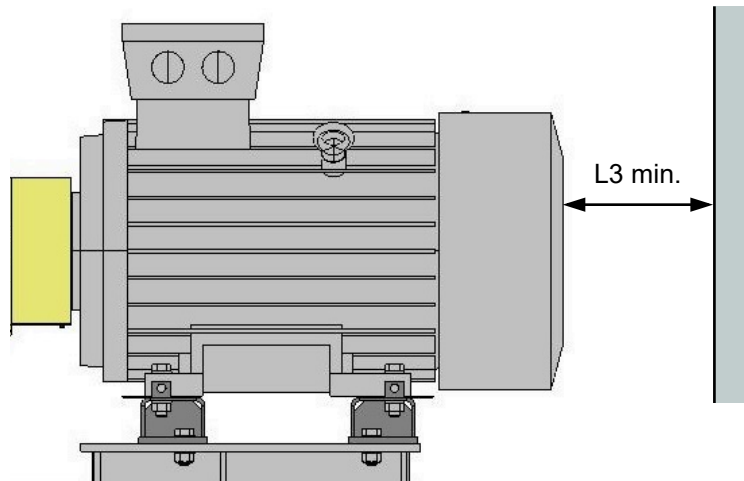


Fig. 28: Distance between motor and wall

5.5.2 Pipes

CAUTION



Potential injury hazard from breaking machine parts

Improperly installed pipe and hose lines can cause machine parts to break.

- All pipes must be free of stress and vibration when installed!
- The pipes must be installed so that they do not cause stress on the machine during operation (e.g. due to thermal expansion of the pipes)!

WARNING



Danger from backflow

Danger as a result of backflow after the pump has been switched off.

- If there is a risk of dangerous backflow after the pump is shut down, a non-return device must be installed in the delivery pipe!

If there is a risk of dangerous backflow after the pump is shut down, a non-return device must be installed in the delivery pipe!

When planning the pipework, an allowance must be included for thermal expansion.

Support

Pipes should always be mounted stress-free. During erection work, ensure that the pipes are supported in such a way that no forces, vibrations or weight can be transferred to the pump.

The suction and delivery pipes should be supported so that the weight of the pipe is not transferred to the pump.

Maximum permitted forces and torques that the pump can absorb can be found in the Chapter headed "Permitted loads on connectors [▶ 32]".

Suction pipe

The following must be observed at the suction pipe:

- The suction pipe should be kept as short as possible to keep pipe friction losses to a minimum.
- Run a pressure test to check the pipe for leaks.
- The suction pipe should be laid horizontally or sloping slightly downwards in the direction of the pump.
- If a reducing piece has been installed immediately before the pump, the taper must always be at the bottom.
- Feeds to the suction pipe should be located at a distance from the pump suction flange that is equivalent to a minimum of 5 times the diameter of the suction pipe.

If a cleaning port is provided in the suction pipe, the following points relevant to safety must be observed:

- The port may only be opened when the pump is at a standstill.
- If chemicals are used, flush out properly before opening.
- For safety reasons, the pump must be prevented from starting up before it is opened (lockable maintenance switch or mains disconnecter).

5.5.3 Coupling

Data on the coupling used (tolerances, application limits, aligning information, etc.) can be found in the manufacturer's operating instructions.

>> Supplier documentation

The coupling must be aligned with a suitable device.

The tolerances observed when aligning the coupling are to be recorded in the erection work report on the coupling.

After the coupling has been set, it must be fitted with a coupling guard according to the official regulations.

5.5.4 Instruments

Sealing water control device

The sealing water monitoring unit has to be connected up to the sealing water system and to the connections provided on the pump in accordance with the manufacturer's instructions.

Optional accessories

Optional accessories (for temperature monitoring, vibration measurements, etc.) are to be connected up to the centrifugal pump according to the manufacturer's instructions. Please contact ANDRITZ if you have special requirements.

5.5.5 Electrical equipment

The complete electrical installation must be set up and carried out in accordance with valid standards.

The motor and the instruments must be connected in accordance with the operating instructions of the suppliers.

>> Supplier documentation

Earthing

In addition to operational earthing, the following measures must be provided to protect machine components:

- The earthing of the pump must be ensured via the screw **(901.3)** on the pump base with the earth symbol.

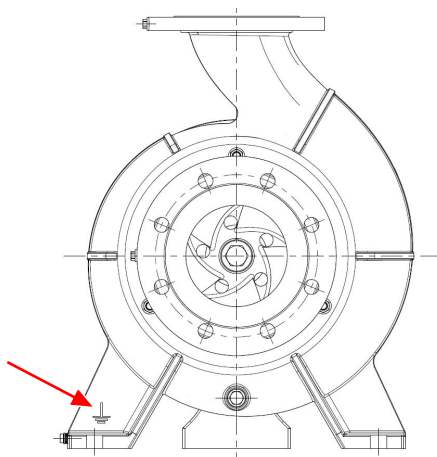


Fig. 29: Earth symbol on the pump base

- Use of shielded energy cable (3 wires) with separate earthing cable for frequency converter drives. The shield is to be installed at the motor and the drive in a manner that accounts for high frequencies.
- All machine parts, gearboxes and motors controlled by frequency converters must be connected by earthing straps.
- Use insulated bearings for the non-drive-side bearing of the motor.
- The outputs of frequency converters must be equipped with du/dt filters.
- The instructions from the manufacturer of the frequency converter must be complied with.

Specified cables

NYCWY for all frequency converter drives.

NYCWY is used as a mains and control line in static systems, buildings, outdoors, underground and underwater. The use of NYCWY cables is described in VDE 0298 Part 1, their current carrying capability in HD 603 S1 and VDE 0276 Part 1000.

Design: single-wire or multi-wire conductors, with concentric, ceander-shaped, blank copper conductor, double helix of copper band below the outer sheath. Wires insulated by PVC, different wire colours according to VDE 0293, common conductor shielding, outer sheath made of PVC, standard colour black, flame-retardant. Cable configuration according to VDE 0295/IEC 60228.

Technical data

Minimum bending radius $12 \times \varnothing$

Temperature range

While laying: $-5 \text{ }^{\circ}\text{C}$ to $+50 \text{ }^{\circ}\text{C}$

After laying: -40 °C to +70 °C

Nominal voltage (U0/U) 0.6/1.0 kV

Test voltage 4 kV

Identification code of the conductor VDE 0293

5.6 Cold test

Requirements	<ul style="list-style-type: none">• The shaft seal has been adjusted.• Sealing water line is flushed and sealing water of specified quality is available.• Motor for main drive is electrically connected.• Safety covers have been correctly installed.• All connections (flanges, screw connections etc.) must be checked to confirm that they are correctly installed (screws tight, seals present, welded seams complete etc.).
Lubrication	First filling of lubricants in accordance with lubrication instructions (bearing assemblies, etc.).

NOTICE



Use of the wrong lubricants

Damage to machine due to use of wrong lubricants.

- Only use lubricants with the properties listed in the lubrication schedules.

Cold test	The cold test should be carried out together with a representative of the orderer. The activities carried out must be logged.
Final inspection	Upon completion of the cold test, a final inspection must be performed by the orderer and erection supervisor.

5.7 Disassembly and disposal

DANGER



Electric voltage

Electric voltage at the machine results in a potentially life-threatening hazard.

- The machine must be de-energised before disassembly and secured against being switched on again!
- Disassembly may only be performed by qualified and authorised personnel!

Machine parts

If the machine/system is to be shut down, the following must be taken into account for subsequent disposal:

- The machine parts must be disassembled according to the different materials, lubricant fillings and different contamination.
- Disposal of the materials must take into account the applicable laws about the disposal of waste.
- Proof must be created about the properties and the method of disposal of the different materials according to the applicable proof regulations (e.g. declaration and entry in the register).
- Before disposal, create the required documents and dispose of the materials according to the regulations, taking into account the documents.

WARNING



Combustible plastic parts

Risk of fire and injury due to burning plastic parts.

- Observe local fire safety regulations. When separating the materials, do not work with welding devices or other devices that generate sparks!

Additives

- Oils, operating material and cleaning agents must be disposed of according to the local provisions and taking into account the respective manufacturer specifications.

Other material groups to be separated are:

- Surface-treated sheet steel, such as powder-coated or wet-painted doors, covers, etc.
- Coated structural steel, such as rotating parts, grates, screws, etc.
- Copper (electrical copper or silver-plated electrical copper) such as busbars, connecting links, connection pieces, etc.
- Cables and lines
- Built-in devices, electrical components or components that emit radiation (radio-active probe), etc.

6 Commissioning

6.1 General

This chapter describes the preparations and steps required for initial start-up of the machine.

6.2 Safety regulations

Follow safety instructions

Disregarding the safety instructions can lead to dangerous situations. All measures to prevent hazards must be strictly obeyed!

General safety regulations

All applicable accident prevention rules must be observed.

Potential risks caused by gases and vapors forming must be analyzed in detail. The appropriate safety measures must be implemented.

Qualification of personnel assigned

Start-up may only be carried out by skilled workers with the appropriate training.

Protective devices during commissioning

As the systems are still being tested, there is a risk of the protective devices not working.

These hazards must be pointed out during the safety training.

Protective devices that are missing or not yet functional must be compensated by temporary measures to guarantee safety at work.

Personal protective apparel

Personal safety equipment must be worn when working (>> Personal protective equipment [▶ 19]).

6.3 Prerequisites for commissioning

6.3.1 General prerequisites

Before commissioning begins, the following conditions must be met:

- Before commissioning, ensure that all the necessary measures mentioned in the engineering documents supplied with the equipment have been duly implemented.
- Erection work is completed.
- Cold test is completed.
- Pump has been checked for foreign bodies.
- Installation site has been cleared and cleaned.
- All pipes have been cleaned.
- First filling of lubricants (gear unit, bearings, etc.).
- All protective devices have been installed.
- The safety system has been tested and validated.
- All electric interlocks and safety devices are functional and have been checked.
- All control circuits have been installed and tested.
- Process control system has been installed and tested.

6.3.2 Special prerequisites

WARNING



Inadvertent start-up of the motor

Inadvertent start-up of the motor may lead to damage to the machine or its components. Ensure that the motor cannot be started up under any circumstances!

Leak check	<p>Before beginning the commissioning, the following points must be checked:</p> <p>Before commissioning, the pumps and pipelines must be tight.</p> <p>The Pressure Equipment Directive 2014/68/EU has been taken into account within the scope of the risk analysis in accordance with Machinery Directive 2006/42/EC</p>
Direction of rotation	<p>The direction of rotation of the machine has been checked</p> <p>In order to check the direction of rotation, the machine must be decoupled. The direction of rotation of the motor must accord with the direction arrow on the housing.</p>
Free rotation	<p>The pump must rotate freely. To do this, the two coupling halves must be disconnected from each other. By rotating the pump-side half of the coupling, check whether the shaft can rotate freely.</p>
Check the alignment of the coupling	<p>Check again whether the coupling is correctly aligned. Create a protocol for the alignment.</p> <p>Please find data on the coupling used (tolerances, application limits, alignment notes etc.) in the manufacturer's operating manual.</p> <p>>> Supplier documentation</p>
Lubrication	<p>Prior to commissioning, the lubricant (oil or grease) for lubrication of the bearing is to be checked.</p>

⚠ WARNING



Improper lubrication of the pump

Incorrect or no lubrication of the pump can result in hazardous situations for personnel and damage to the machine

- Under no circumstances may the pump be operated without suitable lubricant!!

If the pump is stored for a prolonged period of time prior to commissioning, dirt and water can penetrate. In case of larger temperature fluctuations, condensation can also occur. The lubricant must be changed after a prolonged standstill (>6 months).

Shaft seal and seal
water

Seal water with sufficient pressure and flow must be provided.

Information on seal water >>

6.4 Start-up

NOTICE



Incorrect start-up procedure

Machine may be damaged if incorrect start-up procedures are used.

- All electric interlocks must be functional and checked!


Before commissioning is started, the procedure for starting the machine is determined together with our commissioning engineer. The machine is commissioned in accordance with the commissioning protocol.

Practical training on the machine is also carried out during the commissioning. The participants must have already received theoretical training.

After commissioning, the machine is handed over to the operator in a condition that is safe and ready to operate.

Starting up the pump

If all preliminary requirements have been met, the pump can be started up as follows:

	Steps
	<ol style="list-style-type: none"> 1) Check and adjust the sealing water quantity and pressure. sealing water quantity and pressure may only be reduced in the outlet. <ul style="list-style-type: none"> ⇒ The shaft seal must be supplied with a sufficient amount of sealing water. For stuffing box design, sufficient water must escape (30-80 drops/min). 2) Suction pipe and pump housing must be filled with the medium to be conveyed. The pump must be bled using the bleed screw (depending on the model). 3) Check the interlocks in the control system (if pump is integrated in the control system). 4) The valve in the suction line must be opened completely. 5) The valve in the pressure line should be closed. 6) Start the pump and open the pressure-side valve until the desired flow rate is achieved. 7) In the case of stuffing box seals, proceed as follows: During operation, check the stuffing box to verify whether an abundant amount of liquid that escapes. If this is not the case, the stuffing box gland should be loosened immediately. If the packing material becomes too hot even after the lid is loosened, stop the pump and look for the cause. After the stuffing box has functioned without any problems for approx. 10 minutes, it can be gently tightened. Refer to the "Maintenance" chapter for information on adjusting the stuffing box. 8) After approx. 2 hours in continuous operation, check the temperature of the bearing.

DANGER



Pump running dry

If the pump is run dry, this can result in risks to life and limb and in damage to the machine.

- The pump should never be allowed to run dry under any circumstances, not even briefly.

First trial run

Functioning of the pump must be monitored carefully during the first few hours in operation.

Particular attention must be paid to the following:

- Temperature of the shaft seal
- Required amount of seal water to the shaft seal
- Bearing temperature and vibration
- Pump pressure and flow rate

Operation on closed slider

The pump is also designed for operation on a closed slider. However, a delayed shut-down after 600 seconds is to be included in the design of the control system for operation on a closed slider.

⚠ CAUTION



If there are any unusual noises that occur, the cause of these noises must be found immediately and corrected!

6.5 Reports

The following certificates must be completed and signed after commissioning:

- Records of commissioning
- Validation report on safety functions

7 Operation

7.1 General

This chapter describes the activities required for starting, operating and stopping the machine. Possible malfunctions and troubleshooting methods are also presented.

7.2 Safety regulations

General safety regulations	The applicable accident prevention regulations must be observed. Operating the machine/system is permissible only with all the required protective devices installed.
Qualification of the personnel deployed	Operation may be performed only by qualified specialist personnel. Operating personnel must be familiar with the escape routes. The operating personnel must be informed about the function and failure of all machine monitoring devices.
Personal protective equipment	Personal protective equipment must be worn during work (>> Personal protective equipment).
Safety covers	Operating the machine is only permissible with installed safety covers.

7.3 Control by means of the process control system

The pump can be started up and operated entirely from the process control system.
The pump does not have a permanent workstation. Presence at the machine is only necessary for inspection and maintenance tasks.

7.4 Start

All preliminary requirements for start-up must be fulfilled before switching on the pump. The plant is started up as described under "Start-up".
>> Commissioning

DANGER



Pump running dry

If the pump is run dry, this can result in risks to life and limb and in damage to the machine.

- The pump should never be allowed to run dry under any circumstances, not even briefly.

Automatic start-up All the necessary steps are performed automatically by the distributed control system during automatic start-up.

Manual start-up Carry out the following steps for manual start-up:

	Steps
	<ol style="list-style-type: none"> 1) Open suction-side valve 2) Switch on motor 3) Open delivery-side valve <p>⇒ Immediately after starting up the pump, open the valve in the delivery pipe far enough to obtain the desired flow rate. The required flow rate must always be set using the valve on the delivery side!</p>

NOTICE! If the operating pressure (see instruments) is not obtained within a short time, the pump must be stopped and the cause of the problem found!

7.5 Checks after initial commissioning

The pump function must be monitored carefully during the first few hours in operation.

Particular attention must be paid to the following:

- Temperature of the shaft seal
- Required amount of sealing water to the shaft seal
- Temperature and vibration of the bearings
- Pump pressure and flow rate

⚠ CAUTION



If there are any unusual noises that occur, the cause of these noises must be found immediately and corrected!

7.6 Normal operation

Operating personnel must record the data during operation and perform the following tasks:

Daily work and checks

Component	Task
Complete pump	Visual inspection (sealing water, leakage, etc.), vibrations

Tab. 36: Daily work and checks

7.7 Vibrations or oscillations

The table indicates the general limits for vibration velocities acc. ISO 5199. The arrangement of the measuring points corresponds to ISO 10816-1. For the positions of the measuring points, refer to the "Description" chapter.

In delivery condition, the pump is balanced in accordance with ISO 1940-1:2004-04, balancing quality G6.3. Its vibration velocities should be less than the values listed in the table.

	Speed range	Reference value	Alarm	Shut-down	Unit
Vibration velocity for shaft height > 225 mm	n < 1800 rpm	4.5	5.5	7.0	[mm/s]
	n > 1800 rpm	7.1	8.5	10.0	[mm/s]
Vibration velocity for shaft height < 225 mm	n < 1800 rpm	2.8	4.0	5.5	[mm/s]
	n > 1800 rpm	4.5	5.5	7.0	[mm/s]

Values in excess of the specified values can have the following causes:

- Design flow rate exceeded by 10% (overload operation).
- Design flow rate undershot by 35% (partial-load operation).
- Rotating parts are unbalanced due to corrosion or mechanical damage.
- The bearings have reached the end of their service life and should be replaced.

Vibration measurements are carried out at the manufacturer/supplier's facility in accordance with ISO5199:

Horizontal pumps The limit values stated for the unfiltered vibration velocities in the table above must not be exceeded on the manufacturer's/supplier's test bench. These values are measured radially on the bearing housing at only one operating point at nominal speed ($\pm 5\%$) and at nominal flow rate ($\pm 5\%$) when the pump is operating without cavitation.

Vertical pumps The limit values stated for the vibration velocities in the table above as vibration limit values for pumps with roller and slide bearings must not be exceeded on the manufacturer's/supplier's test bench if the measurement takes place at nominal speed ($\pm 5\%$) and at nominal flow rate ($\pm 5\%$) without cavitation.

7.8 Bearing temperatures

The temperature limits refer to 20 °C ambient temperature. An increase of the bearing temperature by approximately 20 °C - 30 °C over ambient temperature is normal.

The alarm value can be adapted accordingly at high ambient temperatures. However, the shutoff limit may not be changed.

	Reference value	Alarm	Shutdown	Unit
Bearing temperatures	65	80	95	[°C]

Tab. 37: Limit values for bearing temperatures

When using temperature sensors for bearing monitoring, the hollow cavity must be filled with temperature-resistant silicone grease for improved heat transmission.

7.9 Pump requirements

Sizing The data on the rating plate (head, flow rate) refer to the pump sizing. The values stated for delivery head and flow rate relate to a specific impeller diameter and the specified operating speed. If the impeller diameter or speed of the pump is changed, the duty point moves to a different performance curve for head and flow rate.

Change in power consumption The power consumption point on the curve can be changed by opening or closing the valve in the delivery pipe further or by altering the pump speed.

Operation on closed slider

The pump is also designed for operation on a closed slider. However, a delayed shutdown after 600 seconds is to be included in the design of the control system for operation on a closed slider.

NOTICE! If the suction head is too low (NPSH availableNOTICE!), there is a risk of damage to the impeller!

Changes in the operating conditions If the operating parameters for which the pump has been sized are changed, the following should also be considered:

- All parameters for the pump (pressure, impeller diameter, etc.) were sized for the original duty point. These factors should be fully checked for the new operating conditions.

- For continuous operation, a minimum flow rate is required. The curve shown in the performance diagram for the required suction pressure (set NPSH pump) begins at the point of the permitted continuous minimum flow rate.
- The efficiency of the pump and the suction head properties of the system (NPSH_{plant}) are a deciding factor for the total service life, so the motor and shaft outputs must be checked if the operating conditions change.
- The performance diagram is based on values with specific stock data. If other liquids are pumped, the values for the delivery head, flow rate, and power requirement may change. These factors were taken into account when the pump was originally selected and should also be considered if the operating conditions are changed.

7.10 Shutdown

Automatic shutdown In an automatic shutdown, all the required steps will be carried out automatically by the process control system.

Manual shutdown **Manual short-term shutdown**

For a manual short-term shutdown of the machine, the following steps must be carried out:

	Steps
--	-------

- 1) Stop the pump motor.
- 2) Close the valve in the pressure line.

Manual long-term shutdown

For a long-term shutdown of the machine, proceed as follows:

	Steps
--	-------

- 1) Stop the pump motor.
- 2) Close the valve in the pressure line.
- 3) Close the valve in the suction line.
- 4) Depressurise the pump, and drain the pump.
- 5) If aggressive media have been pumped, rinse the pump.
- 6) Close the sealing water supply.
- 7) **NOTICE! If the medium is at risk of freezing, drain the pump and pipes!**

7.11 Operating malfunctions and troubleshooting

Malfunction	Possible cause	Rectification
Pump does not convey medium	Pump not sufficiently pre-filled, formation of vapour lock in the draft tube	Repeat pre-filling of the system, increase NPSH _{System}
	Differential pressure between inlet pressure and steam pressure of the medium too low	Check the suction line, increase NPSH _{System}
	Air ingress into suction line or shaft seal	Check the suction line and shaft seal
	Suction line, suction valve or impeller are blocked	Check the suction line and the entire pump for blockage
	Speed too low	Check the speed conditions
	Flow resistance of the pipe is greater than the delivery head of the pump	Checking the pipe resistances
	Pressure-side valve closed	Open valve
	Pressure line blocked	Flush pressure line
High power consumption or power loss	Speed too high	Check motor speed
	Incorrect direction of rotation	Check the direction of rotation of the motor
	Flow resistance in the pipe is greater than the delivery head of the pump	Check the pipe resistance, check and/or correct the valve setting
	Unexpectedly high density and/or viscosity of the medium being conveyed	Contact ANDRITZ for further instructions
	Deformed or eccentric pump shaft	Replace pump shaft and bearing assembly
	Rotating objects or pump components rubbing in the pump	Dismantle the pump and check the interior of the pump
	Pump components are worn, damaged or blocked	Check pump; replace worn or damaged parts as necessary
Pump does not reach the specified values for delivery head and flow rate regularly or not at all	Pump not sufficiently pre-filled, formation of vapour lock in the draft tube	Repeat pre-filling of the system, increase NPSH _{System}
	Differential pressure between inlet pressure and steam pressure of the medium too low	Check the suction line, increase NPSH _{System}
	Air ingress into suction line or shaft seal	Check the suction line and shaft seal
	Incorrect direction of rotation	Check the direction of rotation of the motor
	Incorrect speed	Check the speed of the motor
	Suction line, suction valve or impeller are blocked	Check the suction line and the entire pump for blockage
	Flow resistance of the pipe is greater than the delivery head of the pump	Checking the pipe resistances
	Pressure-side valve throttled	Open valve
	Unexpected air/gas proportion in the medium being conveyed	Contact ANDRITZ for further instructions
	Unexpectedly high viscosity of the medium being conveyed	Contact ANDRITZ for further instructions

Malfunction	Possible cause	Rectification
	Pump components are worn, damaged or blocked	Check pump; replace worn or damaged parts as necessary
	Damaged bearings	Dismantle pump and replace bearings
Excess noises and/or vibrations	Differential pressure between inlet pressure and steam pressure of the medium too low	Check the suction line, increase NPSH _{System}
	Unexpected air/gas proportion in the medium being conveyed	Contact ANDRITZ for further instructions
	Air ingress into suction line or shaft seal	Check the suction line and shaft seal
	Suction line, suction valve or impeller are blocked	Check the suction line and the entire pump for blockage
	Speed too high	Check motor speed
	Speed too low	Check motor speed
	Flow resistance of the pipe is greater than the delivery head of the pump	Check the pipe resistances and valve settings
	The output of the pump is below the permitted minimum flow rate	The requirements of the pump system must be checked
	The foundation is unsuitable	Lay a new foundation
	Insufficient support of the pipe	Check the support of the pipe, reinforce as necessary
	Pump and motor not sufficiently aligned	Check the alignment of pump and motor or realign them
	Broken or eccentric shaft	Replace the shafts and bearings
	Rotating objects or pump components rubbing in the pump	Dismantle the pump and check the interior of the pump
	Pump components are worn, damaged or blocked	Check pump; replace worn or damaged parts as necessary
	Bearings worn or loose	Dismantle the pump and replace the bearings if necessary
	Insufficient or excess lubrication	Check the pump for appropriate lubrication
Impeller damaged or unbalanced	Dismantle the pump and replace the impeller if necessary	
Excess bearing wear	Pump and motor not sufficiently aligned	Check the alignment of pump and motor or realign them
	Broken or eccentric pump shaft	Replace pump shaft and bearing assembly
	Rotating objects or pump components rubbing in the pump	Dismantle the pump and check the interior of the pump
	Impeller damaged or unbalanced	Dismantle the pump and replace the impeller if necessary
	Insufficient or excess lubrication	Check the pump for appropriate lubrication
	Poorly installed or soiled bearings	Replace the bearings if necessary and check the lubrication for contamination
	Incorrect bearings or bearings that are not original parts installed in the pump	Install original bearings

Malfunction	Possible cause	Rectification
Overheating or blocking of the pump	Pressure-side valve closed	Open valve
	Pump insufficiently pre-filled	Repeat pre-filling of the system
	The output of the pump is below the permitted minimum flow rate	The requirements of the pump system must be checked
	Pump and motor not flush with each other	Check the alignment of pump and motor or realign them
	Bearings worn or loose	Dismantle the pump and replace the bearings if necessary
	Broken or eccentric pump shaft	Replace pump shaft and bearing assembly
	Impeller damaged or unbalanced	Dismantle the pump and replace the impeller if necessary
	Rotating objects or pump components rubbing in the pump	Dismantle the pump and check the interior of the pump
	Flow resistance of the pipe is greater than the delivery head of the pump	Check and minimise the pipe resistances

Tab. 38: Malfunction table

8 Maintenance and inspection

8.1 General information

This chapter describes the maintenance and repair which is the responsibility of the operating company.

The ANDRITZ service department is available for troubleshooting and comprehensive maintenance and repair work.

>> Service address [▶ 9]

8.2 Safety regulations

Follow safety instructions

Disregarding the safety instructions can lead to dangerous situations. All measures to prevent hazards must be strictly obeyed!

General safety regulations

All applicable accident prevention rules must be observed.

Sufficient space for maintenance work must be included right away in the arrangement planning.

Do not exceed permissible crane loads and weights on lifting gear and ropes/shackles. Secure loads against falling from a height.

Do not stand or walk below suspended loads! Standing below suspended loads can result in life-threatening injuries and is thus strictly forbidden!

The machine must be thoroughly cleaned before carrying out any maintenance work.

Service and maintenance work should not be performed until the machine has come to a standstill and all supply and discharge lines have been closed off.

Do not perform any maintenance work until the hot surface has cooled down.

Use only original spare parts.

Safety devices

After completion of maintenance work, all required safety devices must be mounted again.

Power supply

The energy supply to all drives must be disconnected securely before beginning any maintenance and service work. This can be achieved with a maintenance switch, lockable racks in the MCC, or with other suitable measures that comply with the safety regulations.

Lighting

The operating company shall ensure that adequate lighting is provided (with extra-low-voltage bulbs) during service and maintenance work.

Qualification of personnel assigned

Maintenance and service work must be carried out by specially trained, skilled personnel only.

All work on the electrical equipment, without exception, must be carried out by skilled electricians.

Personal protective apparel

Personal safety equipment must be worn when working (>> Personal protective equipment [▶ 19]).

Chemicals

If chemicals are used, proceed as follows in order to avoid corrosion or chemical burns:

- Secure closure of the inlet pipe (interlocking, manual valve, etc.)
- Interlocking the chemicals feed so that no more chemicals can flow into the machine when it is shut down.
- Emptying the pump unit and the storage tank (standpipe)
- Thorough cleaning and flushing out

8.3 Regular maintenance

NOTICE



Regular monitoring of the operation and performance of the pump enables early detection of any necessary servicing. This ensures excellent efficiency, a malfunction-free workflow and minimises servicing costs!

General inspection
of the machine

The outlet pressure, flow rate and power consumption must be monitored continuously.

In the case of machines which are operated continuously (24 hours/day, 7 days/week), we recommend a maintenance interval of two weeks. During these periods, the machine must be shut down, cleaned thoroughly and inspected for wear.

For machines that are in operation less than 24 h/day, these routine checks and cleaning should be done whenever the machine is being switched off.

When the machine is at a standstill, the following checks must be performed:

Component	Checks
Shaft seal	Tight-sealing and wear
Bearing	Grease quantity or oil quantity
Static seals	Leaks
Coupling	Wear of the coupling packages
Entire pump	Visual check
Foundation	Stability and anchoring

In order to ensure fault-free functioning of the entire unit, all add-on units should be inspected at the same time as the general inspection of the machine. The enclosed maintenance and servicing regulations of the manufacturing companies must be observed for this purpose.

>> Subsupplier documentation

Any malfunctions and unforeseen changes ascertained during the inspections must be rectified immediately.

Cleaning

Thoroughly clean the pump by hosing it down and brushing it off when it is at a standstill.

⚠ WARNING



Contact with the medium

Contact with the medium can lead to skin damage and chemical burn injuries.

- Persons who handle the medium must not be allergic to it!
- Wear personal protective equipment!

NOTICE



Incorrect cleaning

Damage due to incorrect cleaning agent.

- Only the permitted cleaning agents may be used for cleaning!
- Water, steam or other cleaning agents must not be allowed to ingress into any electrical machine parts.
- Do not use any pressure washers to clean the surface of painted parts, since these can lead to chipping of paint and subsequent corrosion!

8.4 Maintenance schedule

Monthly

Component	Tasks
Bearing	Temperature control Vibration measurement Check oil level or lubricant quantity Listen for unusual noises
Spiral casing	Check for corrosion and wear
Shaft with bearing	Check for ease of movement
Coupling	Check alignment Check packages for wear
Shaft seal	Check for leaks Check for wear
Pipes	Check for leaks
Entire pump	Check for leaks Clean

Tab. 39: Monthly

Every six months

Component	Tasks
Entire pump	Check the attachment of the pump to the foundation
Motor	Check the attachment of the motor to the foundation

Tab. 40: Every six months

Annually

Component	Tasks
Entire pump	Complete service under instruction by ANDRITZ (oil or grease change, inspection of rotating parts)

Tab. 41: Annually

8.5 Fasteners

The specified installation values are valid for standard screwed connections on the machine and must be used only if no special installation values are specified on the assembly drawings or in the instructions! The specifications of the following table apply to commercially available hexagon-head screws and cap screws with metric ISO threads.

	Pretensioning forces (kN)							μ	Tightening torques (Nm)						
	5.6	8.8	10.9	A4-5 0	A4-7 0	A4-8 0	C3-8 0		5.6	8.8	10.9	A4-5 0	A4-70 0	A4-8 0	C3-80
M8	7	15	21	5	11	14	15	0.1	8	17	24	6	12	16	17
								0.125	10	21	29	7	15	19	21
								0.14	11	23	32	7	16	21	23
M10	11	24	34	8	17	23	24	0.1	16	34	47	11	24	32	34
								0.125	19	41	57	13	29	38	41
								0.14	21	45	63	15	32	42	45
M12	16	35	49	12	25	33	35	0.1	27	58	82	19	41	54	58
								0.125	33	70	99	23	49	66	70
								0.14	36	77	109	25	54	72	77
M16	31	65	92	21	46	61	65	0.1	66	140	197	46	99	132	140
								0.125	80	170	240	56	120	160	170
								0.14	88	188	265	62	133	177	188
M20	48	102	143	33	72	95	102	0.1	129	275	387	90	193	258	275
								0.125	156	334	469	110	235	313	334
								0.14	173	369	519	121	259	346	369
M24	69	147	206	48	103	137	147	0.1	222	474	666	156	333	444	474
								0.125	269	575	808	189	404	539	575
								0.14	298	635	894	209	447	596	635
M27	90	191	269	63	134	179	191	0.1	325	693	974	227	-	-	693
								0.125	395	843	1185	277	-	-	843
								0.14	437	933	1312	306	-	-	933
M30	109	233	328	77	109	219	233	0.1	443	945	1329	310	443	-	945
								0.125	538	1149	1615	377	538	-	1149
								0.14	596	1271	1787	417	596	-	1271
M36	159	340	478	111	159	319	340	0.1	767	1637	2302	537	767	-	1637
								0.125	934	1992	2801	654	934	-	1992
								0.14	1034	2205	3101	724	1034	-	2205
M42	219	466	656	153	328	437	466	0.1	1223	2609	3669	-	-	-	2609
								0.125	1490	3178	4469	-	-	-	3178
								0.14	1650	3520	4949	-	-	-	3520
M48	287	612	861	201	431	574	612	0.1	1841	3928	5524	-	-	-	3928
								0.125	2245	4789	6734	-	-	-	4789
								0.14	2487	5305	7460	-	-	-	5305

Tab. 42: Installation values for set screws

Coefficients of friction and lubrication

Refer to the following table, depending on the lubrication, for the coefficient of friction:

μ	Lubrication	
	5.6 / 8.8 / 10.9 / C3-80	A4-50/A4-70/A4-80
0.1	MoS2	-
0.125	dry or oiled	-
0.14	-	Anti-seize assembly pastes

Tab. 43: Recommended lubrication and coefficients of friction

If non-listed special lubricants are used, the manufacturer's specifications must be taken into consideration.

Bolts and screws are manufactured in different material classes. A mark indicating the strength class is stamped into the screw head. If a fastener has to be replaced, only elements made of the same material may be used.

The manufacturer's specifications must be observed for supplied parts for machinery.

⚠ CAUTION



Incorrectly tightened screws

Incorrect torque tightening may cause machine damage and hazards leading to personal injury.

- Please observe installation values as shown in the drawings and tables!

8.5.1 Checks

Inspection

If any screws are not tightened in accordance with the regulations, they can work loose or break under operating conditions. For this reason, all connecting screws must be checked in the course of the maintenance work.

In the first 6 months: every 2 to 2½ months

After the first six months: half-yearly

Tightening

In the course of the checks and maintenance work, it is imperative that all connecting screws are retightened to the torque specified on the drawings or to the torque shown in the table.

8.6 Aligning the coupling

The coupling alignment must be checked after each of the following assembly steps and corrected if necessary.

- after mounting and before grouting in the pump
- after grouting in
- after installing the pipework
- after the trial run with water
- after replacing the bearings

If the alignment changes during production, the pump can also be aligned at operating temperature.

Alignment tolerances >> documentation from the coupling manufacturer

Checking

The coupling linings must be checked after a maximum of 4000 operating hours.

8.7 Lubrication

Before start-up, check whether all lubrication points have been filled with the appropriate lubricants.

Please also observe maintenance instructions on the maintenance signs and rating plates attached to the machine and components.

NOTICE



Improper disposal of lubricants

Improper disposal of lubricants is hazardous to the environment.

- Collect drained oil and grease and dispose of it in an environmentally friendly manner!
 - Always collect and dispose of oil based on plant-based raw material separately!
-

8.7.1 Lubrication with grease

8.7.1.1 Types of lubricating grease

For operating conditions where the surface temperature of the bearing housing is around +60°, use an ISO6743-9 classification XBCEB2 lubricant.



Recommended greases	
Manufacturer	Type
Exxon	EXXON Beacon 2
Mobil	Mobilux EP2
Shell	SHELL Alvania RL3
SKF	SKF LGMT2
FAG	FAG Arcanol MULTI 3

Tab. 44: Lubricant

NOTICE



If the surface temperature of the bearing housing exceeds 80°C, please contact ANDRITZ.

8.7.1.2 Lubricating schedule

NOTICE



The bearings are filled with grease during assembly at the factory. Prior to initial commissioning, the grease quantity stated in the table “Relubrication” must be added to the bearings.

⚠ WARNING



Improper lubrication of the pump

Incorrect or no lubrication of the pump can result in hazardous situations for personnel and damage to the machine

- Under no circumstances may the pump be operated without suitable lubricant!!
- Only those lubricants listed in the table may be used!
- Different lubricant types and/or lubricant qualities must not be mixed!

Bear- ing sup- port	First lubrication [g]		Relubrication [g]		Relubrication interval at different speeds [h] and 60°C surface temperature of the bearing pedestal							
	Impeller side	Coupling side	Impeller side	Cou- pling side	750 rpm	900 rpm	1000 rpm	1200 rpm	1500 rpm	1800 rpm	3000 rpm	3600 rpm
BS24	25	20	10	5	16000	14000	12000	9750	7500	5500	3500	3000
BS32	50	35	20	10	15000	13000	11000	9000	7000	5000	3000	2600
BS42	85	55	25	15	14000	12000	10000	8250	6500	4500	2500	1900
BS48	135	85	30	20	12000	10000	8000	7000	6000	4000	2000	
BS60	230	150	40	25	10000	8750	7500	6250	5000	3000		
BS75	300	180	50	30	10000	8750	7500	6250	5000	3000		
BS100	500	300	75	55	8500	7250	6000	5000	4000	2000		

Tab. 45: Lubrication instructions

The relubrication intervals in the table apply to temperatures < 60 °C and must be observed.

Every further increase in the surface temperature of the bearing housing by 15 °C halves the specified relubrication interval.

Under certain conditions, mainly in case of applications outside or in case of large fluctuations in the ambient temperature, condensation water may collect in the bearing housing. For this reason, it must be ensured that no condensation water is located inside the bearing housing during each relubrication process by opening the locking screw (903.1). Should this be the case, then this interval must be shortened!

8.7.1.3 Grease change

The grease should be changed after approx. 24000 operating hours as described in the following table.

	Steps
---	-------

- 1) Remove the screw plug (903.1).
- 2) Extract the old grease through the bore hole (903.1) by applying suction.
- 3) Insert plug screw (903.1) again with new sealing ring (411.1).
- 4) Dispose of used lubricant according to the regulations.
- 5) Apply fresh grease to the bearings through the lubricating nipples (636.1, 631.2).

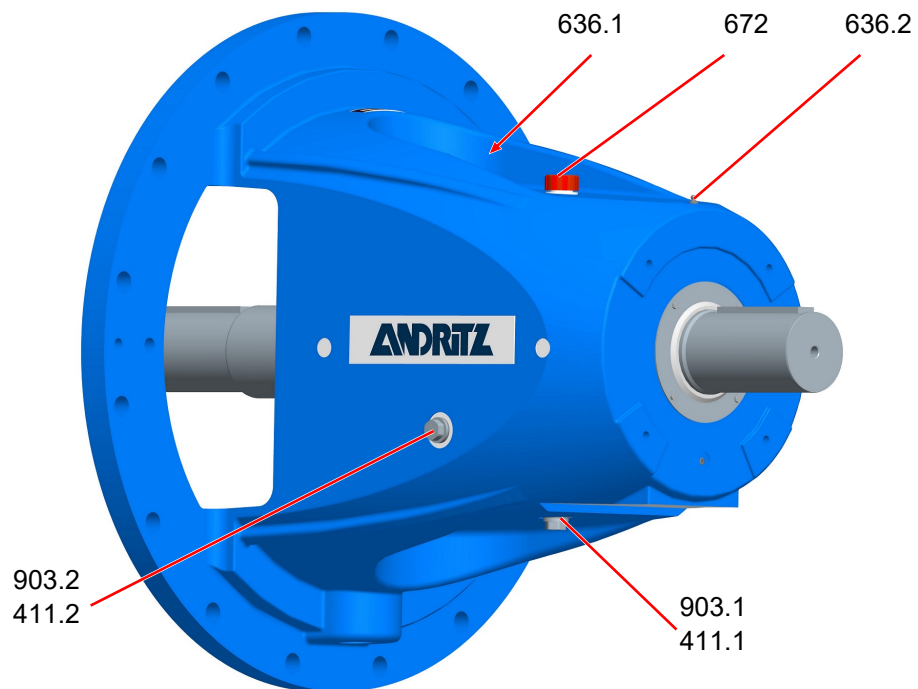


Fig. 30: Grease change

8.7.2 Oil lubrication

8.7.2.1 Lubricating oil brands

For operating conditions where the surface temperature of the bearing housing is around +65°, use a ISO VG68 (64cST at 40 °C) oil.



Recommended lubricants Viscosity: 64 cST at 40 °C (ISO VG68)	
Manufacturer	Type
BP	BP Energol HLP 68
Esso	Teresso 68
Mobil	D.T.E. Heavy Medium
Shell	Shell Tellus Oil S 68
Castrol	Hyspin AWS 68

Tab. 46: Lubricant

For operating conditions where the oil temperature of the bearing housing is around 80°C, use a ISO VG68 (64cST at 40 °C) synthetic oil.



Recommended lubricants Viscosity: 64 cST at 40 °C (ISO VG68)	
Manufacturer	Type
Mobil	SHC626
Shell	Tellus S4 ME68
Castrol	Alphasyn T68

Tab. 47: Lubricant

NOTICE



If the surface temperature of the bearing housing exceeds 80°C, please contact ANDRITZ.

8.7.2.2 Lubricating schedule

NOTICE



During works assembly, the bearings and the oil chamber are filled with a preserving oil providing protection for approximately 6 months. Before start-up, oil according to the table must be filled up to the middle of the oil inspection glass. There is no need to remove the preserving oil.

WARNING



Improper lubrication of the pump

Incorrect or no lubrication of the pump can result in hazardous situations for personnel and damage to the machine

- Under no circumstances may the pump be operated without suitable lubricant!!
- Only those lubricants listed in the table may be used!
- Different lubricant types and/or lubricant qualities must not be mixed!

If the machine is shut down, the oil level is in the middle of the sight glass and may decline slightly during operation. If an oil level controller is installed, it also must be filled with oil.

Oil quantity

Bearing support	Oil quantity (l)
BS24	0.25
BS32	0.45
BS42	0.90
BS48	1.70
BS48-2 (HD)	
BS60	2.40
BS60-2 (HD)	
BS75	4.00
BS75-2 (HD)	
BS100	7.90
BS100-1	
BS100-2 (HD)	

Tab. 48: Required oil quantity

Oil change intervals

The oil change intervals according to the table must be observed.

The intervals in the table apply to temperatures < 60 °C and must be observed. Any further increase in the surface temperature of the bearing housing by 15 °C halves the specified interval. The first oil change must be carried out after 200 operating hours.

Pump speed [rpm]	Oil change interval mineral	Oil change interval synthetic
< 1800	Annually	18 months
> 1800	Every 6 months	Annually


Tab. 49: Oil change intervals

The oil change intervals listed above are recommended reference values. During the oil change, we recommend carrying out an oil analysis to adapt the oil change interval to actual circumstances and ensure safe and efficient operation.

8.7.2.3 Oil change

Oil change

The oil change should be performed in the following manner at operating temperature and while the machine is at a standstill:

	Steps
	<ol style="list-style-type: none"> 1) Open the screw plug (903.1) and drain the used oil into a prepared container (note the quantity of oil). 2) Screw in the screw plug (903.1) again with a new sealing ring (411.1). 3) Dispose of used oil according to the appropriate regulations. 4) Fill with new oil via the bleed screw (672) up to the middle of the oil level glass (642).

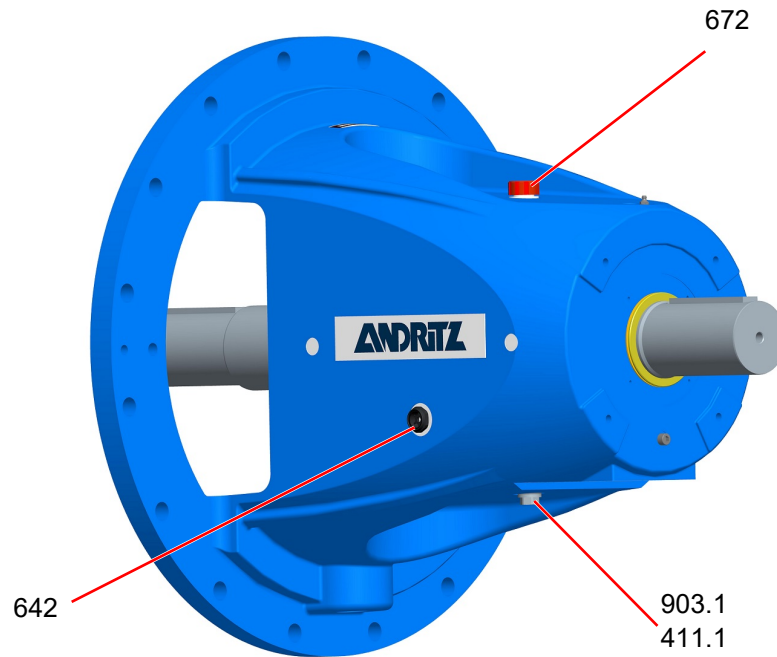


Fig. 31: Oil change

8.8 Pump

The item numbers in the following chapters refer to the arrangement, dimensioned and sectional drawings included in the full documentation. The illustrations in the present chapter only show a detail of the pump in order to explain the work steps in more detail.

>> Data sheet, characteristic curve, drawing

8.8.1 Installing and removing the pull-out unit


8.8.1.1 Preparations

Before beginning the removal of the removable unit, the following parts are to be prepared:

- Tools
- Lifting gear
- Belts, cables
- Spare parts

The pump should be thoroughly cleaned before starting work.

Before the actual removal, the following preparation work must be performed:

	Steps
	<ol style="list-style-type: none">1) Switch off drives and secure them to prevent reactivation.2) Close the valve in the pressure line.3) Close the valve in the suction line.4) Empty and rinse the pump or receiver tank.5) Close the seal water supply.6) Remove the coupling guard.7) Remove the coupling spacer after loosening the screws. >> Supplier documentation / Coupling8) Disconnect the seal water couplings.

8.8.1.2 Removing the pull-out unit

The removable unit consists of a bearing support (330), impeller (230), housing cap (161) and shaft seal (430).

	Steps
---	-------

- 1) Attach lifting slings as shown in the figure.
 - ⇒ Through the bearing support windows and between the coupling half and bearing cap
 - ⇒ Attach the slings to the lifting hook and tension them slightly.
- 2) Remove the nuts (902.3) and washers (554.3) on the spiral casing (102).
- 3) Remove the bolts (901.12) on the support foot (183).
- 4) Detach the removable unit from the spiral casing (102) using the pre-assembled jackscrews (901.2).
- 5) Lift the removable unit as shown in the figure and put it down on a suitable support.
 - ⇒ CAUTION: Make sure the load is balanced!

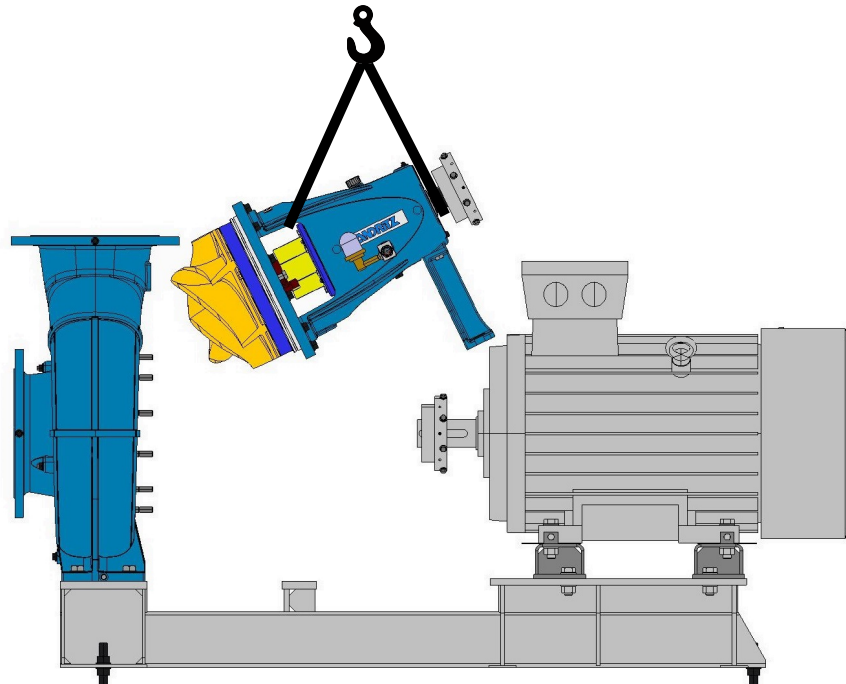


Fig. 32: Lifting the removable unit

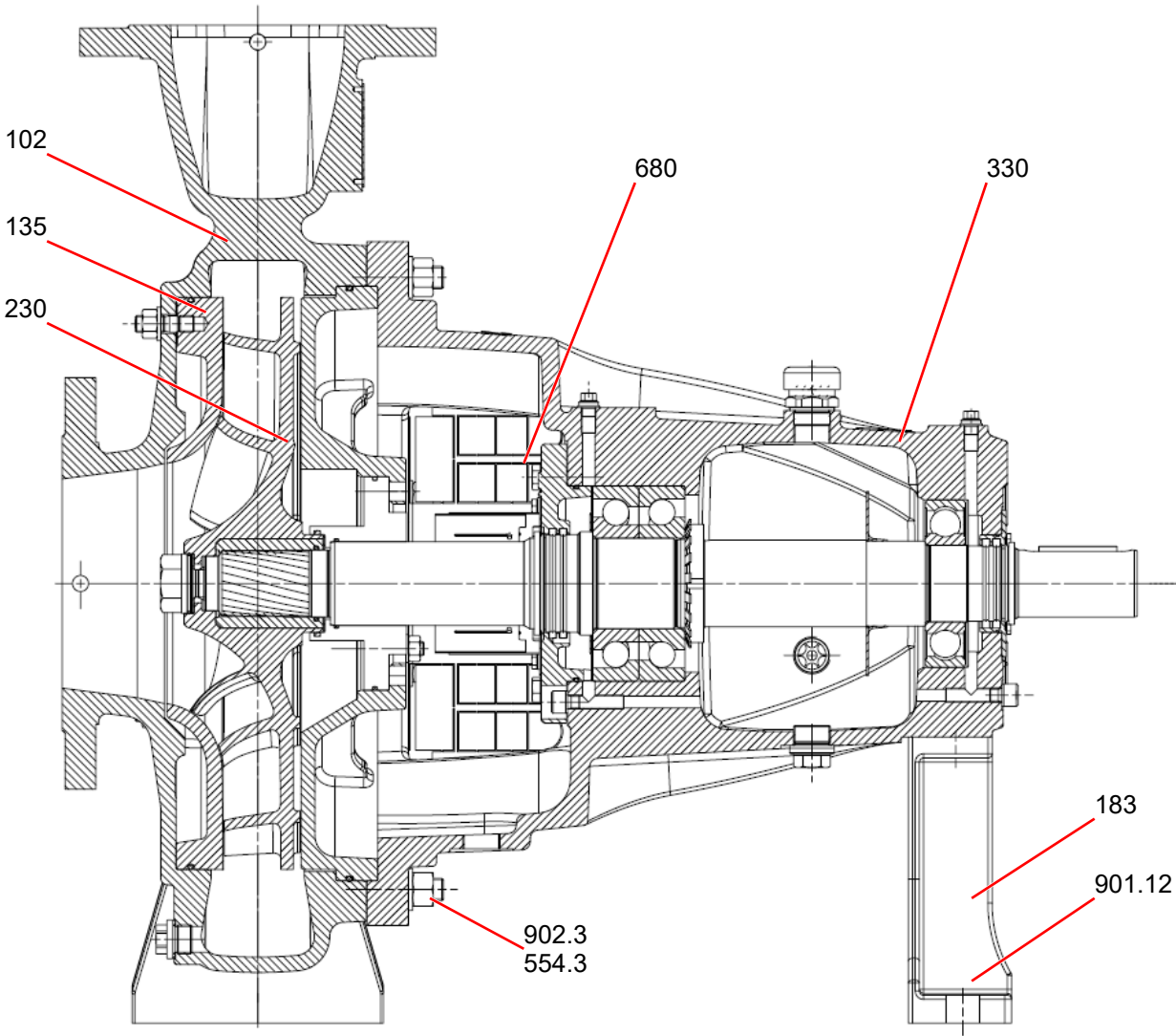



Fig. 33: Pump

8.8.1.3 Mounting the pull-out unit

	Steps
	<ol style="list-style-type: none"> 1) Visually check the impeller (230) and front insert (135.1) for defects. 2) Manually rotate the shaft to check how easily it moves. 3) Clean the sealing surfaces of the bearing housing (350) and of the spiral casing (102). 4) Replace the O-ring (412.1 or 412.3) and thinly lubricate it with silicone grease. 5) Loosen the jackscrews (901.2). 6) Attach lifting slings as shown in the figure. 7) Lift the removable unit into the spiral casing (102) as shown in the figure. 8) Put washers (554.3) on the stud screws and tighten the nuts (902.3) on the spiral casing (102). <ul style="list-style-type: none"> ⇒ Tightening torque >> Fasteners 9) Screw in and tighten the bolts (901.12) on the support foot (183). <ul style="list-style-type: none"> ⇒ Tightening torque >> Fasteners 10) Manually turn the pump through one complete revolution and check whether it rotates freely and without difficulty. <ul style="list-style-type: none"> ⇒ If the pump does not rotate without difficulty, check the gap between the impeller (230) and the front insert (135). 11) Mount the seal water couplings. 12) Mount the coupling in accordance with the instructions of the coupling manufacturer. 13) Mount the coupling guard (681) and protective plate (680).

8.8.2 Installing and dismantling the impeller and the front lining

DANGER



Improper lifting of the impeller

Hazard due to suspended load.

- According on the size and weight of the impeller, use suitable lifting gear!
- Do not walk or stand under suspended loads!
- Wear personal protective equipment!

WARNING




Unsecured bump key and sharp-edged impeller


Risk of injury due to slipping bump key and from worn and sharp-edged impeller.

- Wear personal protective equipment!
- Hold the bump key steady with one hand when striking the nut!
- Cover sharp-edged impeller blades (cloth, etc.) and debur them if necessary!


Removing the impeller

 Steps
<ol style="list-style-type: none">1) Remove the pull out unit, put down in a suitable assembly area and secure to prevent it from tipping over. >> Installing and removing the pull-out unit2) Unscrew the fastening bolt (901.4) and remove it.3) Pull off the impeller (230).

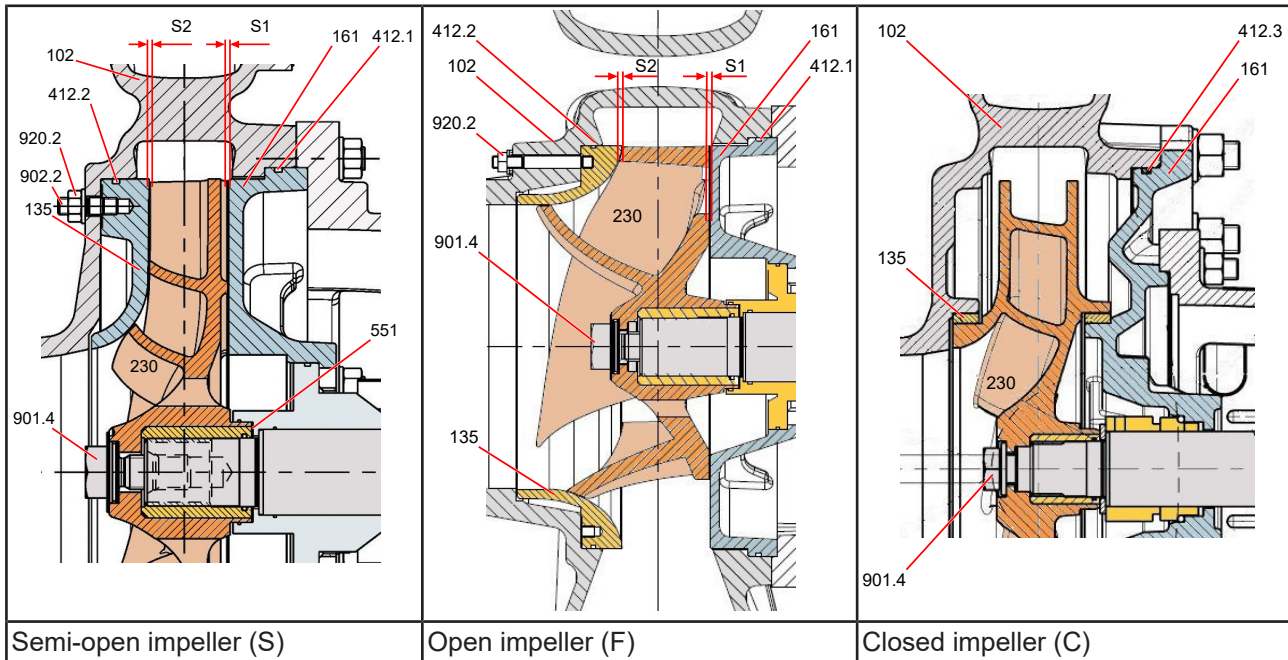
Removing the front lining

 Steps
<ol style="list-style-type: none">1) Remove nuts (920.2) at the front lining (135.1).2) Unscrew the stud bolts (902.2) from the lining.3) Push the front lining out of the spiral casing (102).

Installing the impeller and the front lining

 Steps
<ol style="list-style-type: none">1) Install the new impeller (230) in such a way that the required gap is created between the casing cap (161) and the impeller blades.<ul style="list-style-type: none">⇒ Refer to the pump assembly drawing for the gap data.⇒ For open and semi-open impellers: This gap "S1" is created by inserting spacer washers (551) of various thicknesses between the casing cap (161) and impeller (230).2) Tighten the bolt (901.4) and measure the gap "S1" using a feeler gauge. When the gap corresponds to the drawing, secure by hammering in the collar of the screw.<ul style="list-style-type: none">⇒ For tightening torque, see assembly drawing for the pump

- 3) Screw the stud bolts (**902.1**) into the lining and mount the required spacer washers.
- 4) Insert new O-ring (**412.1**) and grease well with silicone grease.
- 5) Remove the jackscrews and mount the front lining into the spiral casing (**102**).
- 6) Tighten the nuts (**920.2**) using the required torque.
- 7) Measure the front gap "S2" of the impeller using a feeler gauge. If the gap does not match the specifications of the drawing, remove the impeller and adjust using spacer washers (**551**).
- 8) Installation of the pull out unit. >> Installing and removing the pull-out unit



8.8.3 Turning off (machining) the impeller

Because of the different impeller diameters, different pumping data for the pump can be achieved. The required diameter for certain pumping data can be seen in the characteristic curve or in the data sheet. A new impeller must be lathed down to the required diameter before installation.

	Steps
--	-------

- 1) Use a replacement impeller that exhibits the full diameter and is balanced.
- 2) Take the required diameter from the documentation or the new diameter from the characteristic curve.
- 3) Machine the new impeller diameter according to the ANDRITZ **turning specification**.
- 4) The new impellers must be balanced according to the ANDRITZ **balancing specification**.

If needed, the turning specification and balancing specification can be requested from ANDRITZ.

8.8.4 Balancing the impeller

Balance the impeller according to the ANDRITZ **balancing instructions**.

	Steps
--	-------

- 1) All contact surfaces between the pump shaft and the balancing machine must be cleaned carefully.
- 2) Mount the impeller and secure adequately.
⇒ Always take account of the centrifugal forces arising!
- 3) Balance the impeller according to the ANDRITZ **balancing instructions**.

When needed the balancing instructions can be requested from ANDRITZ.

8.9 Changing the seal

DANGER



Adjustment of the shaft seal

During inspection and adjustment work on the shaft seal, there is a significant risk of crushing and being drawn in as well as a risk of scalding or chemical burns as a result of escaping medium.

- Before opening flanges, connections and closures, secure the pump against any and all media infeed (e.g. water)!
- Adjustment of the seal may only be performed by trained and authorised personnel.
- Wear personal protective equipment!

To avoid greater damage, the mechanical seal must be replaced immediately if leaks occur on the atmospheric pressure side.

In order to prevent damage, the machine must always be switched off in the following conditions:

- Sealing water is escaping on the atmospheric pressure side
- Abnormal consumption of seal water
- Decrease of the seal water pressure
- Medium in seal water

WARNING



Escape of hot medium.

If a shaft seal leaks, there is a risk of scalding or chemical burns as a result of escaping medium.

- Wear personal protective equipment!
- Disassembly may only be performed by qualified and authorised personnel!

8.9.1 ANDRITZ cartridge seal – single-action

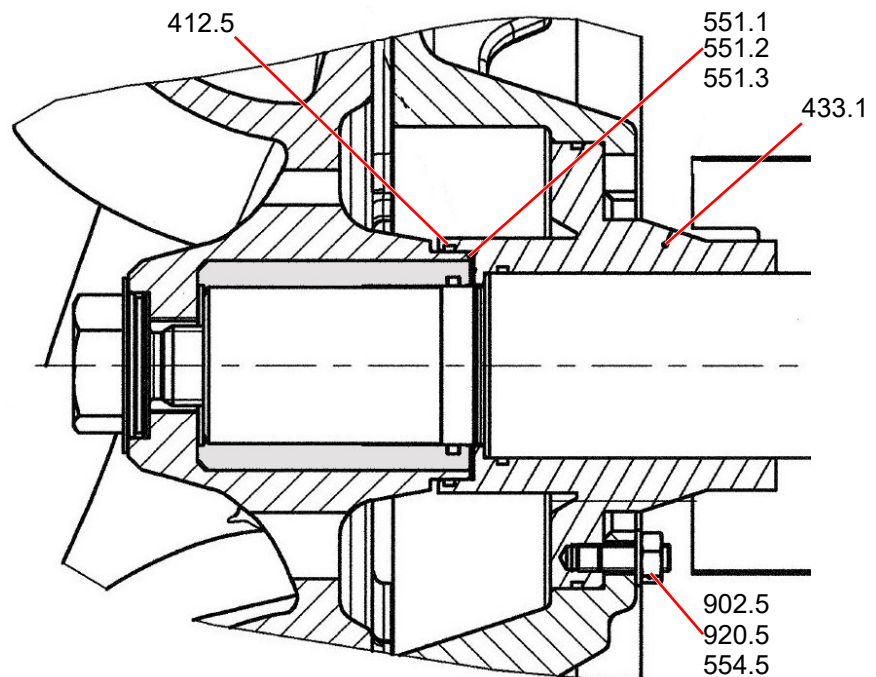


Fig. 34: ANDRITZ – Cartridge seal BS42 – BS100

Pos. Designation	Pos. Designation
433.1 Shaft seal	412.5 O-ring
902.4/ 902.5 Stud bolt	551.1 Spacer plate
554.4/ 554.5 Washer	551.2 Spacer plate
920.4/ 920.5 Hexagon nut	551.3 Spacer plate

WARNING




Escape of hot medium.

If a shaft seal leaks, there is a risk of scalding or chemical burns as a result of escaping medium.

- Wear personal protective equipment!
- Disassembly may only be performed by qualified and authorised personnel!

Changing the seal

	Steps
	<ol style="list-style-type: none"> 1) Dismounting the pull-out unit >> Installing and removing the pull-out unit 2) Dismounting the impeller >> Installing and dismounting the impeller and the front lining [▶ 107] 3) Detach the nuts (920.4, 920.5) and remove the washers (554.4, 554.5). 4) Remove shaft seal (433.1) with the aid of forcing screws. ⇒ CAUTION: Ensure that the spacers (551.1, 551.2, 551.3) are not lost! 5) Check the seal and try to find the cause of the fault (pump running dry, wear, etc.). Consult the seal manufacturer's experts if necessary. 6) Clean all parts and mount the new seal. (>> Follow the seal manufacturer's instructions) 7) Secure seal in casing cover (161) with the bolts (902.4, 902.5). 8) Mount the impeller. 9) Mount the pull-out unit.

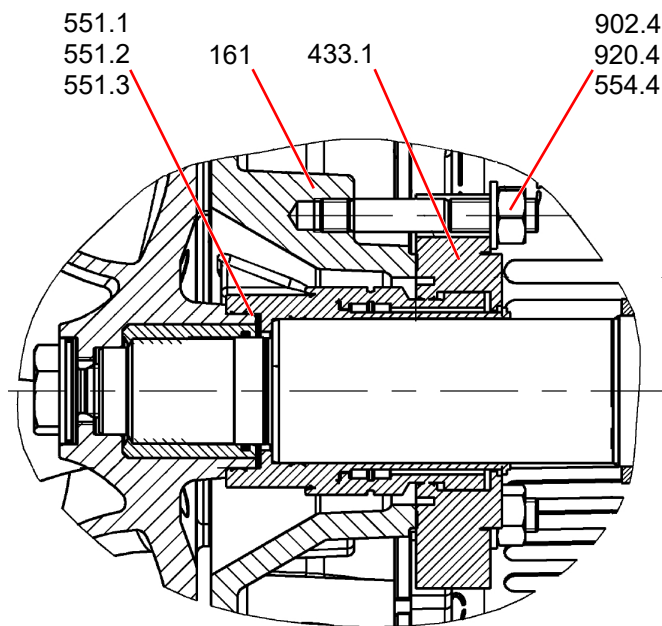


Fig. 35: ANDRITZ – Cartridge seal BS24 – BS32

8.9.2 ANDRITZ cartridge seal – double-action

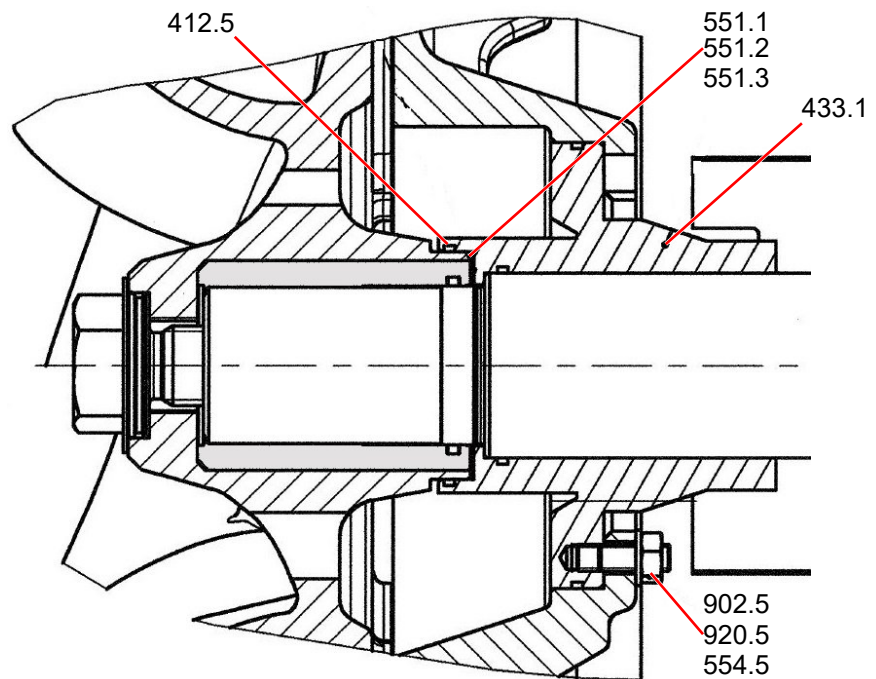


Fig. 36: ANDRITZ – Cartridge seal BS42 – BS100

Pos. Designation	Pos. Designation
433.1 Shaft seal	412.5 O-ring
902.4/ 902.5 Stud bolt	551.1 Spacer plate
554.4/ 554.5 Washer	551.2 Spacer plate
920.4/ 920.5 Hexagon nut	551.3 Spacer plate

WARNING




Hot medium escaping

There is a risk of scalding and chemical burns from escaping medium.

- Wear your personal protective equipment!
- The machine may only be disassembled by qualified and authorized personnel.

Changing the seal

	Steps
	<ol style="list-style-type: none"> 1) Dismounting the pull-out unit >> Installing and removing the pull-out unit 2) Dismounting the impeller >> Installing and dismounting the impeller and the front lining [▶ 107] 3) Detach the nuts (920.4, 920.5) and remove the washers (554.4, 554.5). 4) Remove shaft seal (433.1) with the aid of forcing screws. ⇒ CAUTION: Ensure that the spacers (551.1, 551.2, 551.3) are not lost! 5) Check the seal and try to find the cause of the fault (pump running dry, wear, etc.). Consult the seal manufacturer's experts if necessary. 6) Clean all parts and mount the new seal. (>> Follow the seal manufacturer's instructions) 7) Secure seal in casing cover (161) with the bolts (902.4, 902.5). 8) Mount the impeller. 9) Mount the pull-out unit.

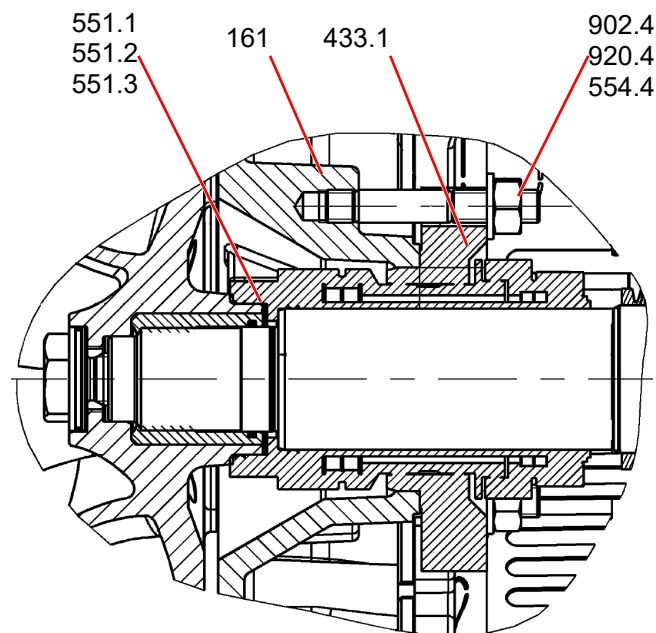


Fig. 37: ANDRITZ – Cartridge seal BS24 – BS32

8.9.3 Mechanical seal – single-action

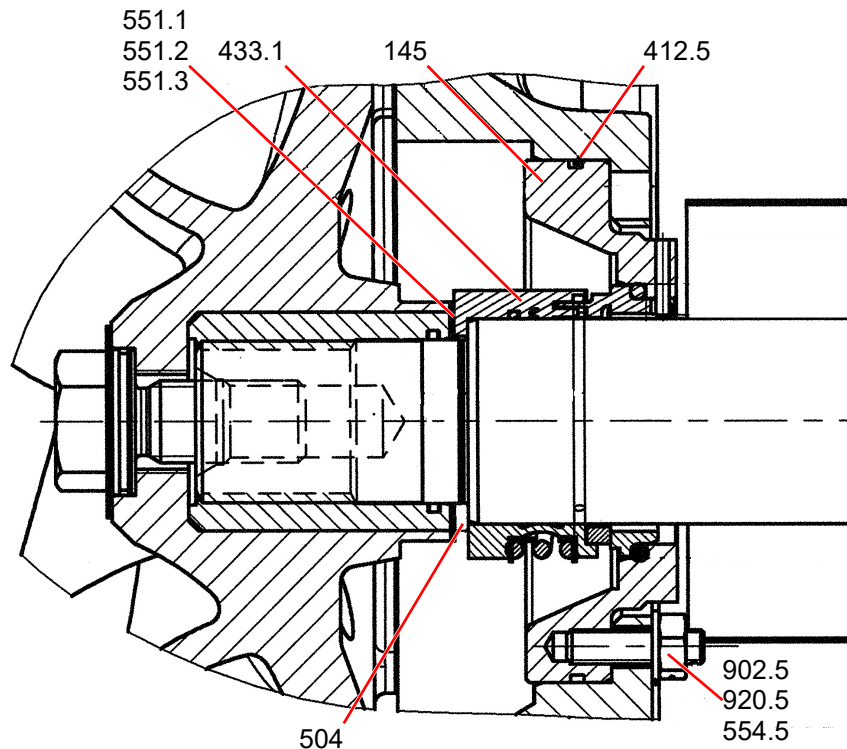


Fig. 38: Mechanical seal – single-action (BS42 – BS100)

Pos.	Designation	Pos.	Designation
433.1	Shaft seal	412.5	O-ring
902.4/ 902.5	Stud bolt	504	Spacer ring
554.5/ 554.5	Washer	551.1	Spacer plate
920.4/ 920.5	Hexagon nut	551.2	Spacer plate
145	Adapter	551.3	Spacer plate

WARNING




Hot medium escaping

There is a risk of scalding and chemical burns from escaping medium if the shaft seal is leaking.

- Wear your personal protective equipment!
- The machine may only be disassembled by qualified and authorized personnel.

Changing the seal

	Steps
	<ol style="list-style-type: none"> 1) Dismounting the pull-out unit >> Installing and removing the pull-out unit 2) Dismounting the impeller >> Installing and dismounting the impeller and the front lining [▶ 107] 3) Remove the mechanical seal (433.1). (>> Follow the seal manufacturer's instructions) ⇒ CAUTION: Ensure that the spacers (551.1, 551.2, 551.3) are not lost! 4) Check the seal and try to find the cause of the fault (pump running dry, wear, etc.). Consult the seal manufacturer's experts if necessary. 5) Clean all parts and mount the new seal. (>> Follow the seal manufacturer's instructions) 6) Mount the impeller. 7) Mount the pull-out unit.

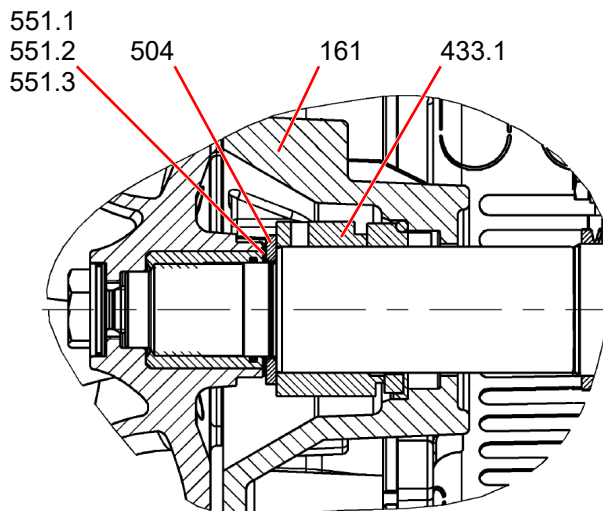


Fig. 39: Mechanical seal – BS24 – BS32

8.9.4 STANDARD cartridge seal – single-action

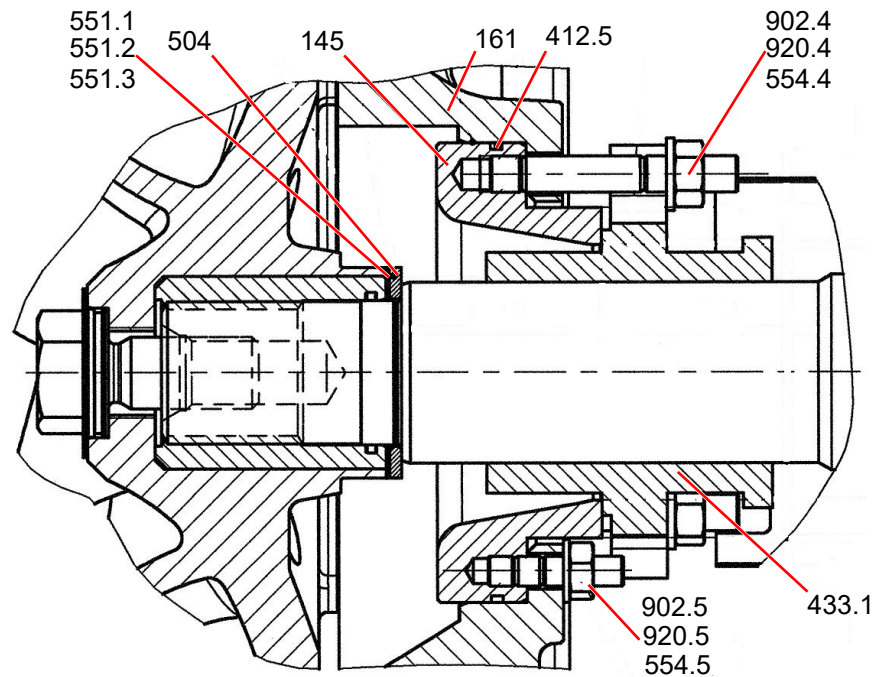


Fig. 40: STANDARD Cartridge seal BS42 – BS100

Pos. Designation	Pos. Designation
433.1 Shaft seal	412.5 O-ring
145 Adapter	504 Spacer ring
902.4 Stud bolt	551.1 Spacer plate
554.5 Washer	551.2 Spacer plate
920.4 Hexagon nut	551.3 Spacer plate
902.5 Stud bolt	554.5 Washer
920.5 Hexagon nut	

WARNING




Hot medium escaping

There is a risk of scalding and chemical burns from escaping medium if the shaft seal is leaking.

- Wear your personal protective equipment!
- The machine may only be disassembled by qualified and authorized personnel.

Changing the seal

	Steps
	<ol style="list-style-type: none"> 1) Dismounting the pull-out unit >> Installing and removing the pull-out unit 2) Dismounting the impeller >> Installing and dismounting the impeller and the front lining [▶ 107] 3) Detach the nuts (920.4) and remove the washers (554.4). 4) Separate the shaft seal (433.1) from the adapter (145). (>> Follow the seal manufacturer's instructions) 5) Dismount casing cover (161) with adapter (145). ⇒ CAUTION: Ensure that the spacers (551.1, 551.2, 551.3) are not lost! 6) Pull the shaft protection sleeve (433.1) off the pump shaft. Check the seal and try to find the cause of the fault (pump running dry, wear, etc.). Consult the seal manufacturer's experts if necessary. 7) Clean all parts and mount the new seal. (>> Follow the seal manufacturer's instructions) 8) Mount the impeller. 9) Mount the pull-out unit.

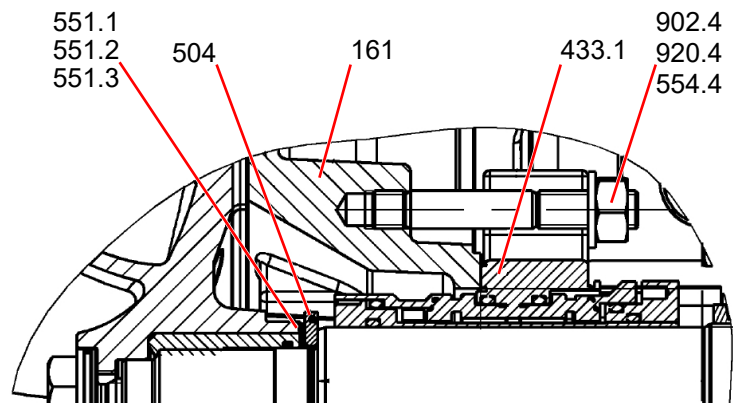


Fig. 41: STANDARD Cartridge seal BS24 - BS32

8.9.5 STANDARD cartridge seal – double-action

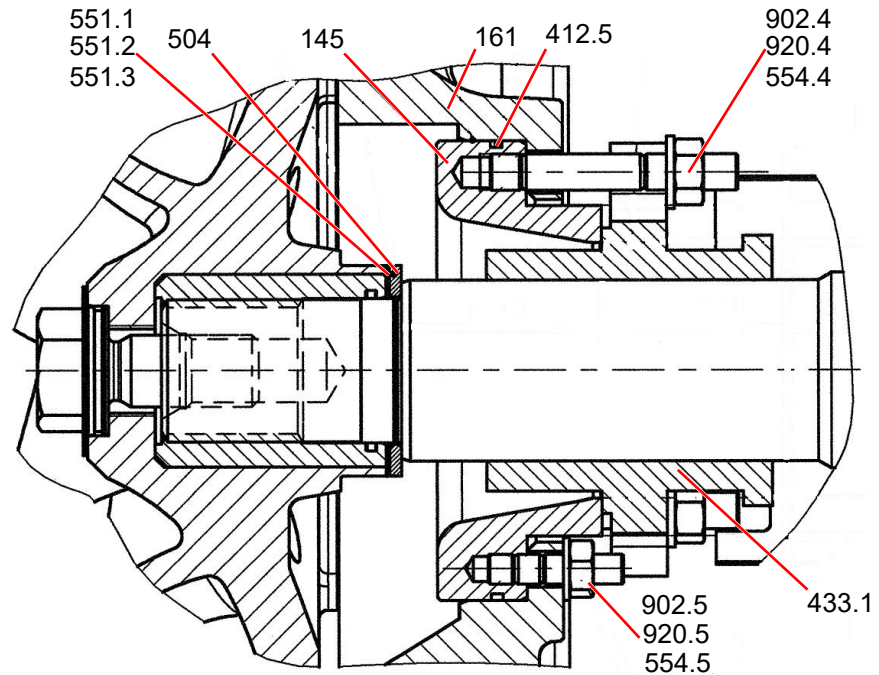


Fig. 42: STANDARD Cartridge seal BS42 – BS100

Pos. Designation	Pos. Designation
433.1 Shaft seal	412.5 O-ring
145 Adapter	504 Spacer ring
902.4 Stud bolt	551.1 Spacer plate
554.5 Washer	551.2 Spacer plate
920.4 Hexagon nut	551.3 Spacer plate
902.5 Stud bolt	554.5 Washer
920.5 Hexagon nut	

WARNING




Hot medium escaping

There is a risk of scalding and chemical burns from escaping medium if the shaft seal is leaking.

- Wear your personal protective equipment!
- The machine may only be disassembled by qualified and authorized personnel.

Changing the seal

	Steps
	<ol style="list-style-type: none"> 1) Dismounting the pull-out unit >> Installing and removing the pull-out unit 2) Dismounting the impeller >> Installing and dismounting the impeller and the front lining [▶ 107] 3) Detach the nuts (920.4) and remove the washers (554.4). 4) Separate the shaft seal (433.1) from the adapter (145). (>> Follow the seal manufacturer's instructions) <ul style="list-style-type: none"> ⇒ CAUTION: Ensure that the spacers (551.1, 551.2, 551.3) are not lost! 5) Dismount casing cover (161) with adapter (145). 6) Pull the shaft protection sleeve (433.1) off the pump shaft. Check the seal and try to find the cause of the fault (pump running dry, wear, etc.). Consult the seal manufacturer's experts if necessary. 7) Clean all parts and mount the new seal. (>> Follow the seal manufacturer's instructions) 8) Mount the impeller. 9) Mount the pull-out unit.

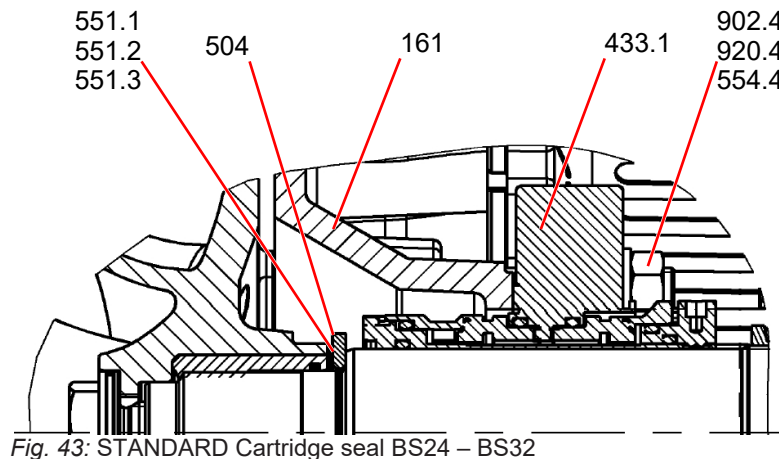


Fig. 43: STANDARD Cartridge seal BS24 – BS32

8.9.6 Stuffing box

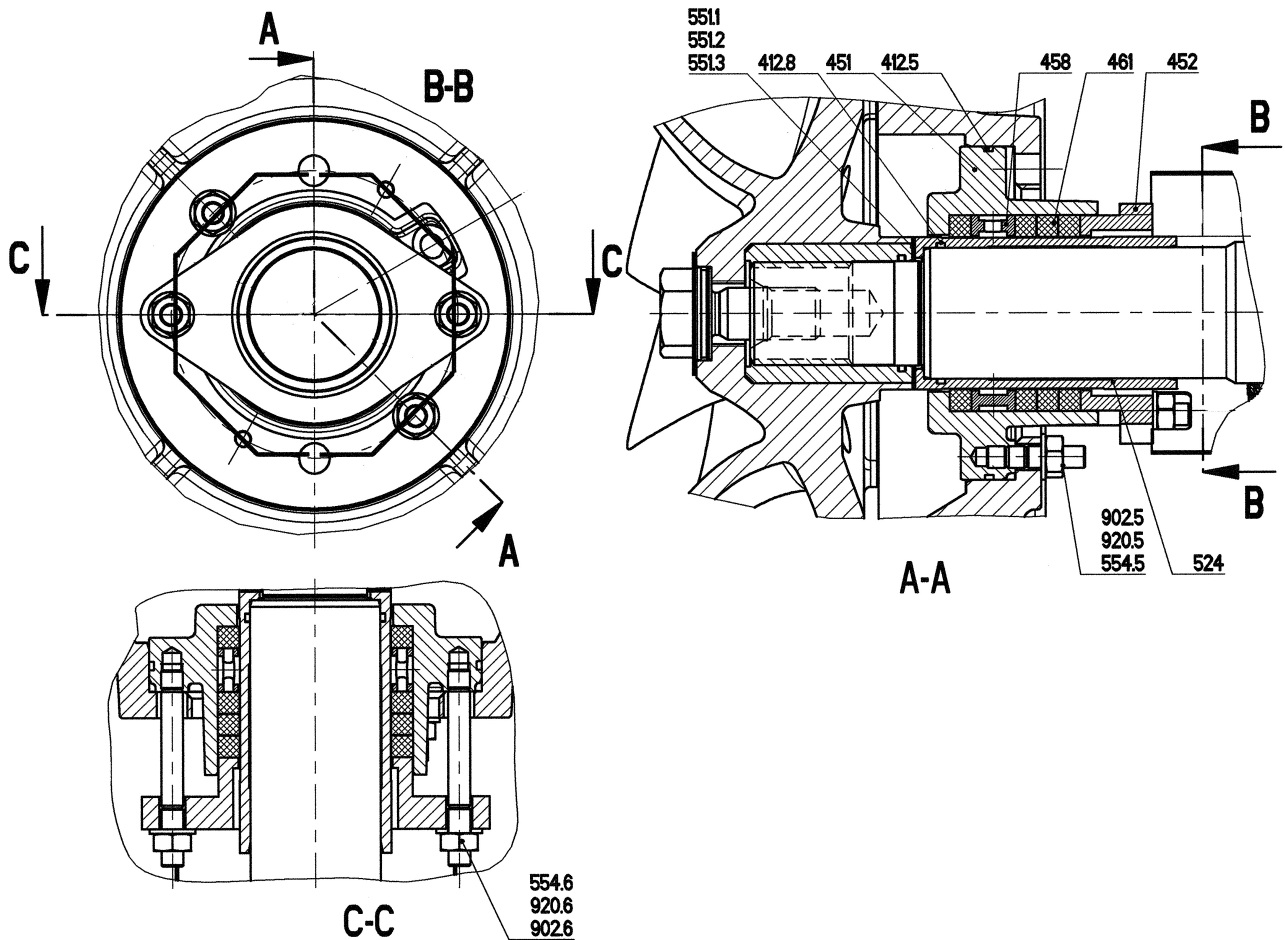


Fig. 44: Stuffing box BS42 – BS100

Pos. Designation	Pos. Designation
451 Stuffing box body	412.5 O-ring
452 Stuffing box gland	412.8 O-ring
458 Sealing water ring	524 Shaft protection sleeve
461 Packing cord	551.1 Spacer plate
902.5 Stud bolt	551.2 Spacer plate
554.5 Washer	554.3 Spacer plate
920.5 Hexagon nut	

The stuffing box packing is a wear part. If the stuffing box gland (452) is less than 5 mm away from the parallel surface of the stuffing box housing (451), the packing must be changed.

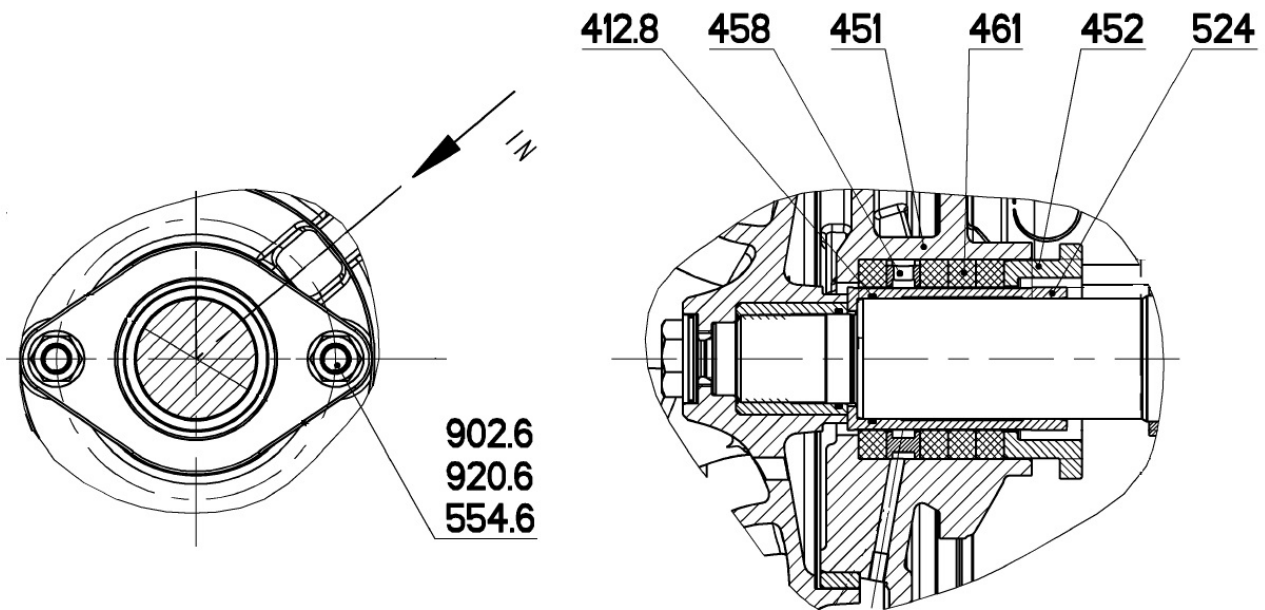



Fig. 45: Stuffing box BS24 – BS32

8.9.6.1 Removing the stuffing box

	Steps
	<ol style="list-style-type: none"> 1) Removal of the removable unit >> Installing and removing the pull-out unit 2) Removal of the impeller >> Installing and dismounting the impeller and the front lining [▶ 107] 3) Loosen nuts (920) and remove the washers (554). 4) Remove the stuffing box body (451) and take off the stuffing box gland (452). 5) Remove the packing cords (461) and the seal water ring (458). 6) Thoroughly clean the stuffing box gland, stuffing box body, seal water ring and packing space. 7) Check the shaft protective sleeve (524) and replace if necessary. ⇒ A notched or irregular surface of shaft protective sleeve will cause excessive wear of the gland seal packing! 8) Disassemble the washers (551.1, 551.2, 551.3) and shaft protective sleeve 9) Lubricate the new original shaft protective sleeve (524) together with the new o-ring (412.8) with special lubricant and push onto the shaft to the shaft shoulder.

8.9.6.2 Installing the stuffing box

	Steps
---	-------

- 1) Mark stuffing box packing (>> Marking the stuffing box packing [▶ 123]) and cut to the appropriate length.
⇒ Keep stuffing box clean, do not stretch or squash stuffing box when measuring and cutting.
- 2) Wrap the gland packing round the shaft protection sleeve, then push the first packing ring into the stuffing box, starting at the butt joint.
- 3) The ends of the ring must form a butt joint with no gap.
- 4) Insert the first packing rings fully with a suitable tool.
- 5) Insert the remaining packing rings and the sealing water ring (458). Mount the remaining packing cords with the butt joints offset by 120 degrees.
- 6) When the stuffing box gland has been installed, tighten all nuts evenly according to the setting guidelines.
- 7) Mount the impeller.
- 8) Mount the pull-out unit.

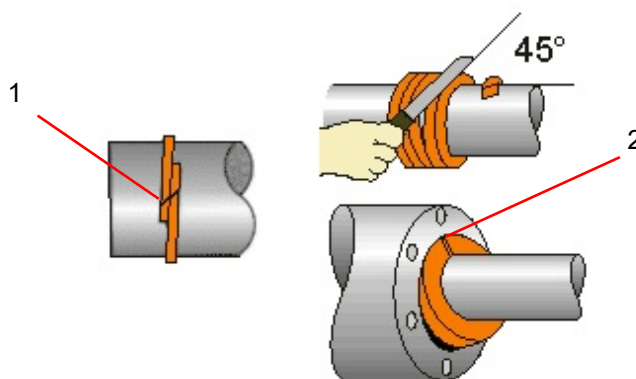


Fig. 46: Marking the stuffing box packing

Pos.	Designation	Pos.	Designation
1	Mark the packing	2	Flush joint with no gap

8.9.6.3 Setting the stuffing box

DANGER



Setting the stuffing box

There is a considerable risk of crushing and being drawn into the machine when setting the stuffing box.

- The stuffing box may only be set by trained and authorized personnel!



Steps

- 1) Tighten the screw fitting slightly at the stuffing box gland.
- 2) Turn on supply of sealing water.
- 3) Start up the machine when sealing water is seen to escape.
- 4) Shut down the machine after a few minutes and check the temperature of the stuffing box seal.
 - ⇒ The temperature of the seal housing must not exceed 60°C.
- 5) Tighten the stuffing box gland further until there is a little sealing water escaping.

Setting instructions

- Never tighten the stuffing box gland so far that drainage of sealing water is brought to a complete halt. Approximately 30-80 drops should drain off per minute in order to avoid excessive friction and wear on the shaft.
- The stuffing box should be checked at short intervals during the first few hours in operation.
- Set the stuffing box such that the shaft is always damp at the stuffing box gland.
- The stuffing box should leak excessively at start-up and then be set to a normal slow leak after the running-in period (approx. 12 hrs).
- If the stuffing box overheats, loosen the screw fitting at the stuffing box gland and check the sealing water quantity.
- Do not tighten gland nuts more than 1/6 of a turn over 15 minutes running time.

NOTICE




Stuffing box gland tightened too tight

Damage to the stuffing box packaging may occur due to over-tightening of the stuffing box gland. A stuffing box gland that is tightened too tight will burn the sealing surfaces.

8.10 Bearing change – bearing with grease lubrication

The bearings are designed for continuous operation at full load for about 50000 operating hours. An increased bearing temperature and vibrations on the bearing support are a sign of imminent bearing damage. If these symptoms occur, the bearings have to be replaced.

Proceed as follows to replace the bearings:

	Steps
	<ol style="list-style-type: none"> 1) Remove the pull-out unit >> Installing and removing the pull-out unit 2) Remove the impeller >> Installing and dismounting the impeller and the front lining [▶ 107] 3) Remove the shaft seal >> Changing the seal 4) Remove the bearing cover (360), sealing rings (507.2, 507.3) and labyrinth seal (423.2). 5) Pull the shaft (211) with the bearings (321.1, 321.2), the tab washer (931.1) and the locknut (923) out of the bearing support. 6) Unscrew the tab washer (931.1) and locknut (923). 7) Pull the bearing off the shaft. 8) Carefully clean any parts that are to be reused. Prepare new parts. 9) Mount the angular contact ball bearings (321.1) on the shaft by applying heat. Use a tab washer (931.1) and locknut (923) to lock the bearings in place. 10) Mount the deep groove ball bearing (321.2) on the shaft by applying heat. 11) Position the bearing housing vertically with the coupling side facing down. 12) Lift the shaft (211) vertically at the pump end by means of lifting gear and install it in the bearing support. 13) Install the bearing cover (360) and labyrinth seal (423.2), new O-rings (412.1, 412.14) and new sealing rings (507.2, 507.3). 14) Check the function by means of manual rotation. 15) Install the bearing support.

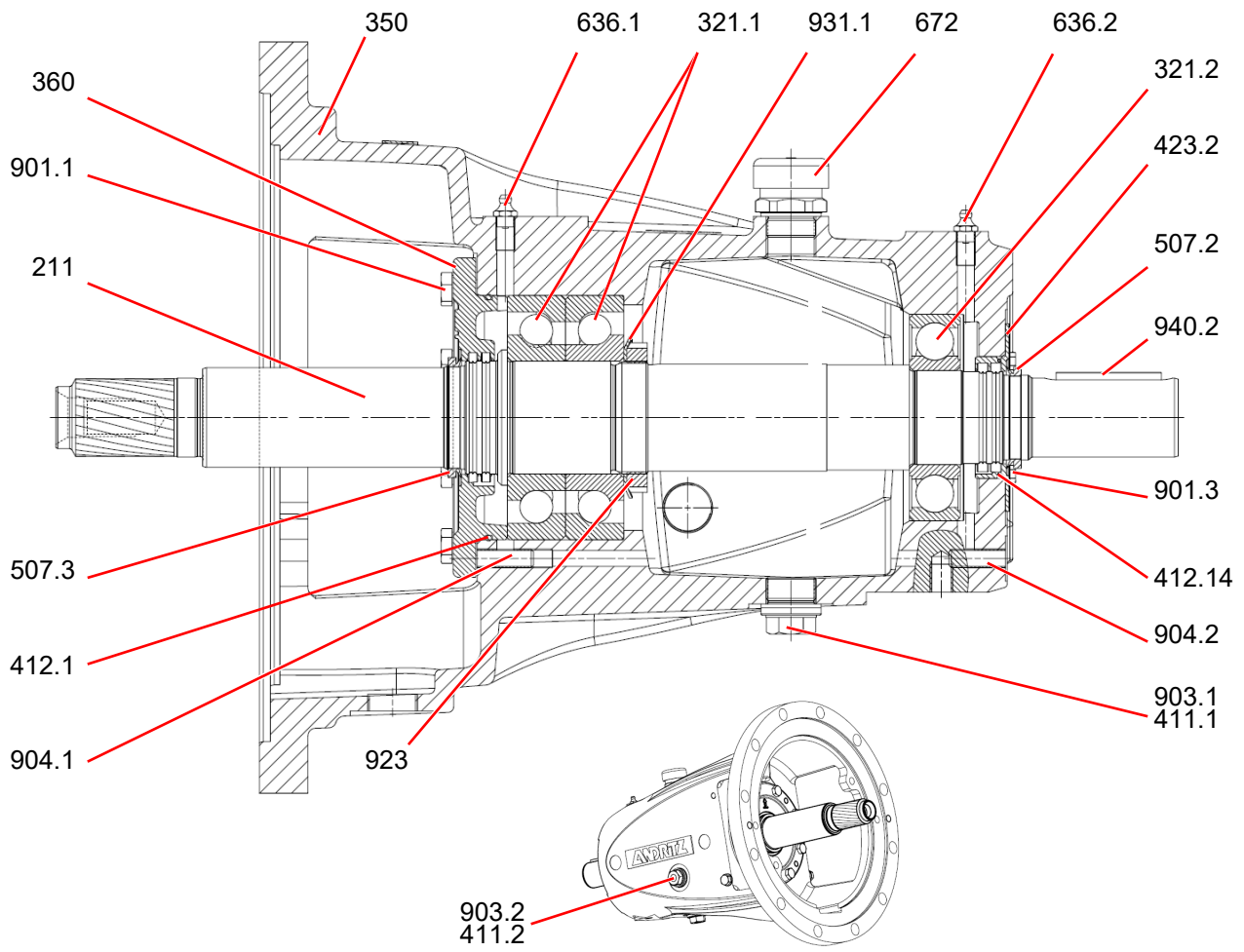



Fig. 47: Bearing support with grease lubrication

8.11 Bearing change – bearing with oil lubrication

The bearings are designed for continuous operation at full load for about 50000 operating hours. An increased bearing temperature and vibrations on the bearing support are a sign of imminent bearing damage. If these symptoms occur, the bearings have to be replaced.

Proceed as follows to replace the bearings:

	Steps
	<ol style="list-style-type: none">1) Drain the oil.2) Remove the pull-out unit >> Installing and removing the pull-out unit3) Remove the impeller >> Installing and dismantling the impeller and the front lining [▶ 107]4) Remove the shaft seal >> Changing the seal5) Pull the coupling hub off the pump shaft.6) Remove the bearing cover (360), sealing rings (507.2, 507.3), plain washer for the bearing (970) and labyrinth seal (423.2).7) Pull the shaft (211) with the bearings (321.1, 321.2), the tab washer (931.1) and the locknut (923) out of the bearing support.8) Detach the tab washer (931.1), locknut (923) and oil slinger ring (508).9) Pull the bearing off the shaft.10) Carefully clean any parts that are to be reused. Prepare new parts.11) Mount the angular contact ball bearings (321.1) on the shaft by applying heat. Use a tab washer (931.1) and locknut (923) to lock the bearings in place.12) Install the oil slinger ring (508).13) Mount the deep groove ball bearing (321.2) on the shaft by applying heat.14) Position the bearing housing vertically with the coupling side facing down.15) Lift the shaft (211) vertically at the pump end by means of lifting gear and install it in the bearing support.16) Install the plain washer for bearing (970), bearing cover (360), labyrinth seal (423.2) and new O-rings (412.1, 412.14).17) Check the function by means of manual rotation.18) Install the bearing support.19) Fill with oil.

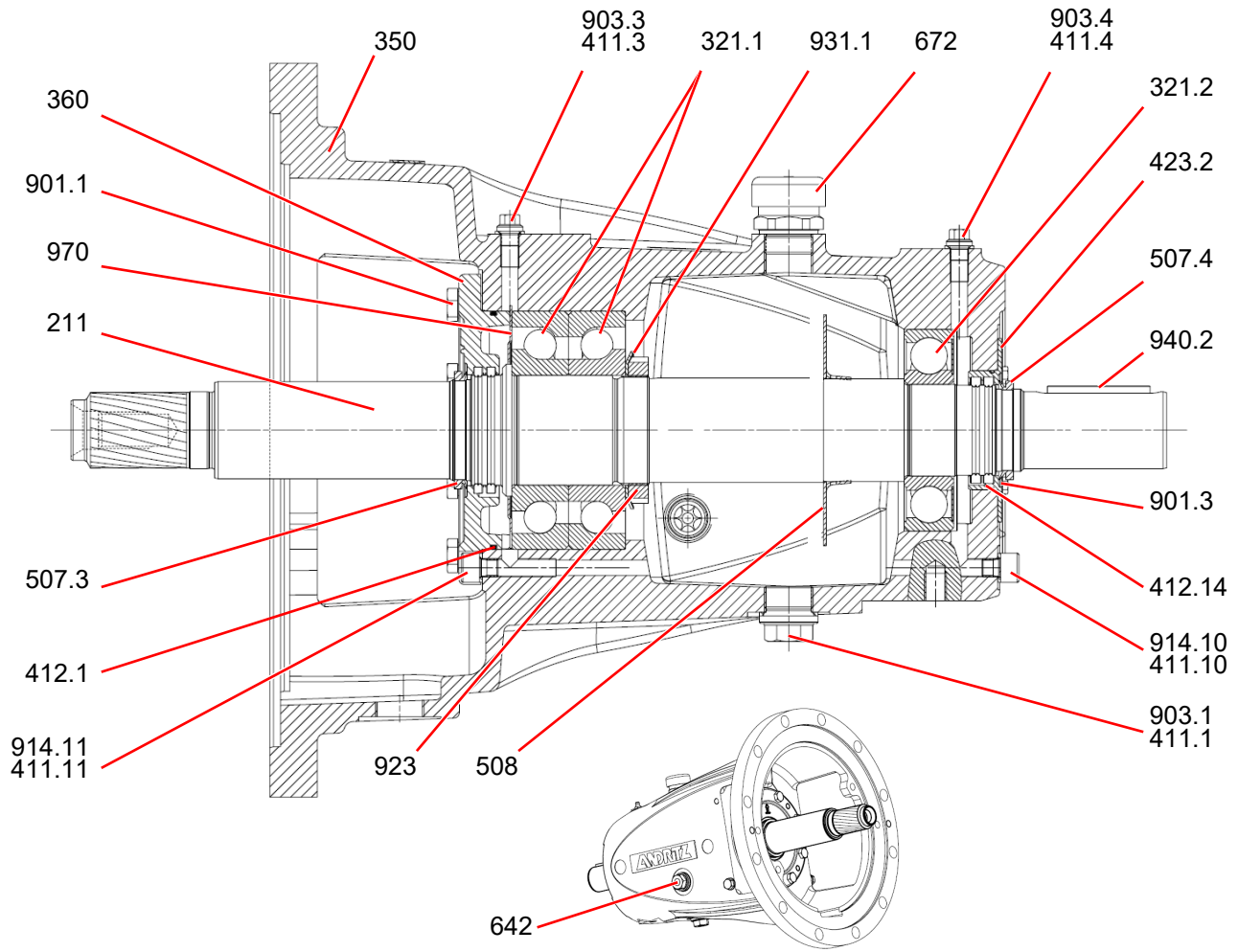


Fig. 48: Bearing support with oil lubrication

9 Supplier documentation

9.1 COUPLING

9.2 SHAFT SEAL

9.3 MOTOR



9.4 FOUNDATION WORK

See also

- 📄 Adhesive anchor capsule - HVU (HILTI) - Instruction [▶ 130]

10 Certificates

See also

-  Declaration of Conformity [[▶ 142](#)]
-  ANDRITZ Certificate ISO9001 [[▶ 143](#)]



Declaration of Conformity

as defined by Machinery Directive 2006/42/EC, Annex II 1.A.

Hereby we declare that the following designated machine conforms to the essential health and safety requirements of the EC Directive.

Designation of machines:

Process Pumps Series "ACP"	Centrifugal Pumps Series „ISO“
Centrifugal Pumps Series „S“	Self Priming Pumps Series „AD“
Centrifugal Pumps Series „SP“	Centrifugal Pumps Series "KS"
Vortex Pumps Series „CP“	Process Pumps Series "ES05"
Vortex Pumps Series „VP“	Centrifugal Pumps Series "AICP"
Centrifugal Pumps Series "ASAT"	Centrifugal Pumps Series "SAT"
Centrifugal Pumps Series "VAT"	Centrifugal Pumps Series "CAT"

Pertinent prescriptions for pumps:

Machinery directive 2006/42/EC in the applicable version
EMC directive 2014/30/EU in the applicable version

Applied European harmonized standards for pumps:

EN ISO 12100:2011, EN 809:1998+A1: 2009+AC:2010, EN 60204-1:2018,

Authorised person to compile the technical file:

Georg Poglitsch (Product Manager Standard Pumps)
Stattegger Strasse 18, 8045 Graz, Austria

EC-Declaration of conformity drawn up by:

Head of Product Management
- Jörg Pichler -

Manager Assembly Workshop
- Bernhard Pesenhofer -

Place, Date: **Graz, 08.09.2022**



qualityaustria
Succeed with Quality



CERTIFICATE

Quality Austria - Trainings, Zertifizierungs und Begutachtungs GmbH awards this **qualityaustria** certificate to the following organisation:

This **qualityaustria** certificate confirms the application and further development of an effective



ANDRITZ AG
A-8045 Graz, Stattegger Strasse 18

QUALITY MANAGEMENT SYSTEM
complying with the requirements of standard
ISO 9001:2015

incl. Sites: Wien, Raaba, St. Pölten

QUALITY MANAEGMENT SYSTEM
for design, engineering, manufacturing, construction
and service for plants and equipment

Registration No.: 00047/0

Date of initial issue: 17 December 1992

Valid until: 07 June 2023



 **qualityaustria**



Vienna, 30 July 2020

The validity of the **qualityaustria** certificate will be maintained by annual surveillance audits and one renewal audit after three years.

Quality Austria - Trainings, Zertifizierungs und Begutachtungs GmbH,
AT-1010 Vienna, Zelinkagasse 10/3

Signatures removed for security reasons

Konrad Scheiber
General Manager

Dr. Mag. Anni Koubek
Specialist representative

Quality Austria - Trainings, Zertifizierungs und Begutachtungs GmbH is accredited according to the Austrian Accreditation Act by the BMWFV (Federal Ministry of Science, Research and Economy).

Quality Austria is accredited as an organisation for environmental verification by the BMLFUW (Federal Ministry of Agriculture, Forestry, Environment and Water Management).

Quality Austria is authorized by the VDA (Association of the Automotive Industry).

For accreditation registration details please refer to the applicable decisions or recognition documents.

Quality Austria is the Austrian member of IQNet (International Certification Network).



Dok. Nr. FO_24_028

ec475d56-019a-4f5d-bb88-9edc6816dff

The current validity of the certificate is documented exclusively on the Internet under <http://www.qualityaustria.com/en/cert> EAC: 18

Centrifugal pump ACP
STANDARD, C-01-000000

