



Erection Work, Operating and Maintenance Instructions

ANDRITZ vertical split double suction pump

ASPV series for ASP350-680R

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1 INTRODUCTION

This manual is part of the technical documentation of Andritz. It is intended as a supplement to the training provided, to supply the basic knowledge required for proper, safe and economical use of the plant and machinery delivered by Andritz. Observing these instructions helps avoid hazards and reduce repair and downtime costs, as well as increasing the reliability and useful life of machines.

1.1 Use

Target group

This operating manual is intended for users with a knowledge of mechanical engineering and is for the exclusive use of the operator of the mill and his personnel.

Personnel entrusted with work on the machine must have read and understood these operating instructions and comply with them. This refers in particular to the following tasks:

- Handling, starting and stopping
- Troubleshooting
- Maintenance and upkeep
- Haulage
- Maintenance and disposal of process materials, cleaning of machine and area around the machine.

The following sections are especially important:

- The Chapter on SAFETY,
- The safety instructions contained in various other chapters

Supplementary instructions

The mill operator shall complete this manual by adding national regulations on safety at work, health protection and environmental protection.

Instructions on any special operational conditions concerning work organization, sequence of work/operations and the personnel assigned to the job shall also be added. This also includes instructions on supervising and reporting obligations.

Safekeeping

Keep the entire operating manual near the place where the machine is installed and within easy reach

1.2 Standards and guidelines

The machine/plant has been built in accordance with state-of-the-art standards and the recognized safety rules. The equipment conforms with the equivalent appropriate standards

1.3 How to use the manual

Presentation

- Chapter and paragraph headings are printed in capitals in the continuous text

SAFETY

- Designations of indicating and handling elements are written in inverted commas in the continuous text.

Operate switch "xxx"

- Lists without numbering do not require operations to be carried out in a certain order.

Pictograms

The following pictograms are used in the manual:



Warning signs.

Warning signs are shown with an explanation of the type of the hazard.

The meaning of the different graduations of hazards are described in the Chapter on SAFETY.



Marks an instruction on handling of the machine or system.



Marks a useful piece of information



Marks a cross-reference to another Chapter with absolute path indication.

e.g. → /ASPV PUMP/SAFETY

Work steps (operations)

Work steps are presented in tables. Work steps are numbered and must be carried out in the order specified.

Item numbers

411.2 The item numbers shown in this format refer to the assembly drawing and the parts list.

Numbering of pages, tables and figures

Pages	consecutive numbering of Chapters	2-1
Tables	Tab. + Continuous numbering of Chapters	Tab.2-1
Figures	Fig. + Consecutive numbering of Chapters	Fig.2-1

Abbreviations

Tab.	Table
Fig.	Figure

1.4 Warranty and guarantee

ANDRITZ's general terms of delivery and sale shall apply.

Guarantee and liability claims on ANDRITZ shall become void if personal injury or material damage is caused by one or several of the following:

- Use of the machine/system for any purpose other than its designated use.
- Non-conformity of erection work, start-up and handling of the machine/system.
- Non-observance of the safety instructions in the manual.
- Non-authorized structural changes to the machine/system.
- Non-observance of the maintenance and upkeep instructions.

In the event of a claim for repair under guarantee, ANDRITZ reserves the right to assess the damage to the machine/system.

1.5 Manufacturer's name and address

ANDRITZ (CHINA) LTD

No.83, Zone B, Sanshui Central Technical &
Industrial park, Lexin Road, Leping, Sanshui District, Foshan.

Our service department will be pleased to help you and can be contacted at:

ANDRITZ (CHINA) LTD

No.83, Zone B, Sanshui Central Technical &
Industrial park, Lexin Road, Leping, Sanshui District, Foshan.

Service department for pumps

Tel.: 0757-66633102

Fax: 0757-66633148

Email: service@andritz.com

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2 SAFETY

2.1 General safety regulations

The chapter on safety contains general safety regulations which must be observed when working on the machine/plant.

In addition, the chapters in the operating manual contain further safety regulations. These are marked by DANGER SIGNS.

Safety instructions on components not supplied by ANDRITZ are contained in the descriptions of the components (➔ /ASPV PUMP/SUPPLIER DOCUMENTATION). The safety instructions supplement ANDRITZ's operating instructions.

All safety instructions must be observed. Disregarding the safety instructions may cause a risk to life and limb, environmental pollution hazards and damage to property.

2.2 Danger and warning signs

The entire SAFETY chapter is of extreme importance and relevant to safety. The information in this chapter, therefore, is not marked with special danger symbols.

The Chapters on ERECTION WORK, START-UP, OPERATION and MAINTENANCE in this Manual are marked by a pictogram. The following warning signs are used:



DANGER

This symbol indicates there may be a risk to life and limb.

Non-compliance with the warning signs may lead to serious health problems or even fatal injuries, and can cause extensive damage to property.



WARNING

This symbol points to an imminent health risk, as well as a risk of environmental pollution and of damage to property.

Non-compliance with the warning sign may cause moderate health problems and/or extensive environmental pollution and damage to property.



CAUTION

This symbol points to a dangerous situation.

Non-observance of these signs may cause environmental pollution and damage to property.

Further symbols and pictograms used are described under INTRODUCTION.

2.3 Designated use

The ASPV pump should only be used according to the specifications forming part of the purchase order.

Any change in the application must be checked by the operator and, if necessary, approved by Andritz.

Non-observance of the application can lead to environmental or property damage, or to personal injury.

Any modifications to the scope of supply made without the agreement of andritz are considered contrary to the designated use.

The term designated use shall also include adherence to the operating instructions, observance of the operating, inspection and maintenance conditions and of the regulations on cleaning and upkeep.

2.4 General remarks on machine/plant safety

The ASPV pump has been built in accordance with state-of-the-art standards and the recognized safety rules. Nevertheless, its use may constitute a risk to life and limb of the user or third parties, or cause damage to the machine/plant and to other material property.

The ASPV pump may only be operated when in perfect condition and with due consideration to safety and the risks involved. All protective devices and the emergency cut-out devices must be in place and fully functional.

Malfunctions and unforeseen changes in the ASPV pump must be remedied immediately.

2.5 User's obligations

Designated use	The user of the ASPV pump is responsible for its designated use.
Work instructions	In addition to the operating instructions, applicable legal stipulations and other rules governing the safety at work, health and environmental protection must be observed and personnel instructed in them.
Qualification of assigned personnel	<p>The ASPV pump may only be operated, maintained and serviced by authorized, skilled personnel with hands-on training.</p> <p>Personnel must not be below the legal minimum age.</p> <p>Any person undergoing training, serving an apprenticeship or being instructed must not work on the ASPV pump except under the supervision of an experienced person.</p>
Instructions	<p>The user's operating and maintenance personnel will be instructed by manufacturer personnel or his contractual distributor upon completion of installation work.</p> <p>The user undertakes to have new, additional operating and maintenance personnel instructed in machine and maintenance of the ASPV pump to the same extent and applying the same care, and with due consideration to the safety instructions.</p> <p>Workers entrusted with the transportation, erection work and start-up of the ASPV pump must have read and understood the operating instructions, especially 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 user shall be responsible for:</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

The operator undertakes

- To check at regular interval whether the safety instructions and regulations governing work on the ASPV pump are observed.
- To carry out regular training to confirm the level of knowledge of the operating and maintenance personnel.

Attaching safety devices

The user shall ensure that the following equipment, regulations, symbols and instructions are mounted in the production area;

- Safety devices and regulations (see Chapter 2.7)
- Fire prevention regulations
- Markings on the floor for driveways, protective fencing and danger areas (yellow)
- Fencings and covers
- Railings (foot, center and chest height)
- Emergency lighting
- Emergency-off switch
- Repair switch for drive motors
- Signs on fire-fighting equipment
- Signs for emergency calls
- Direction arrows to exits
- Direction arrows to escape routes
- Signs to first-aid post

2.6 General obligations of personnel

To avoid personal and material damage anybody working on the machine shall

- Observe the safety instructions in the operating regulations and on the ASPV pump.
- Stop and secure the ASPV pump in case of a safety-relevant functional disorder. Report the disorder and have it repaired immediately.
- Not perform any work in a manner disregarding safety considerations.
- Use only the machine accesses, paths and passages foreseen for this purpose.
- Not touch rotating parts and/or reach out beyond them.
- Keep the machine and the work place clean, not place tools or other objects on the ASPV pump.
- Not wear long hair hanging down.
- Familiarize themselves before starting work with the function and any failure of machine monitoring equipment (log book).
- Refrain from smoking in the vicinity of the ASPV pump.
- Personal protective apparel must be worn when working on the ASPV pump. (see Section 2.8)
- Due to the high temperatures and humidity, people wearing glasses may find that their glasses steam up, thus exposing the wearer to a risk of injury.
- The operating personnel must be acquainted with the safety data sheets in order to be able to recognize how dangerous the chemicals can be.

2.7 Safety devices

The ASPV pump must not be operated without effective safety equipment.

Safety equipment must not be circumvented, dismantled or made unserviceable. The safety equipment is here to protect operating personnel.

Safety equipment and access thereto must be kept free.

Safety covers

the ASPV pump must not be operated without safety covers mounted.

Fig. 2-1 shows the protective covers for the ASPV pump.

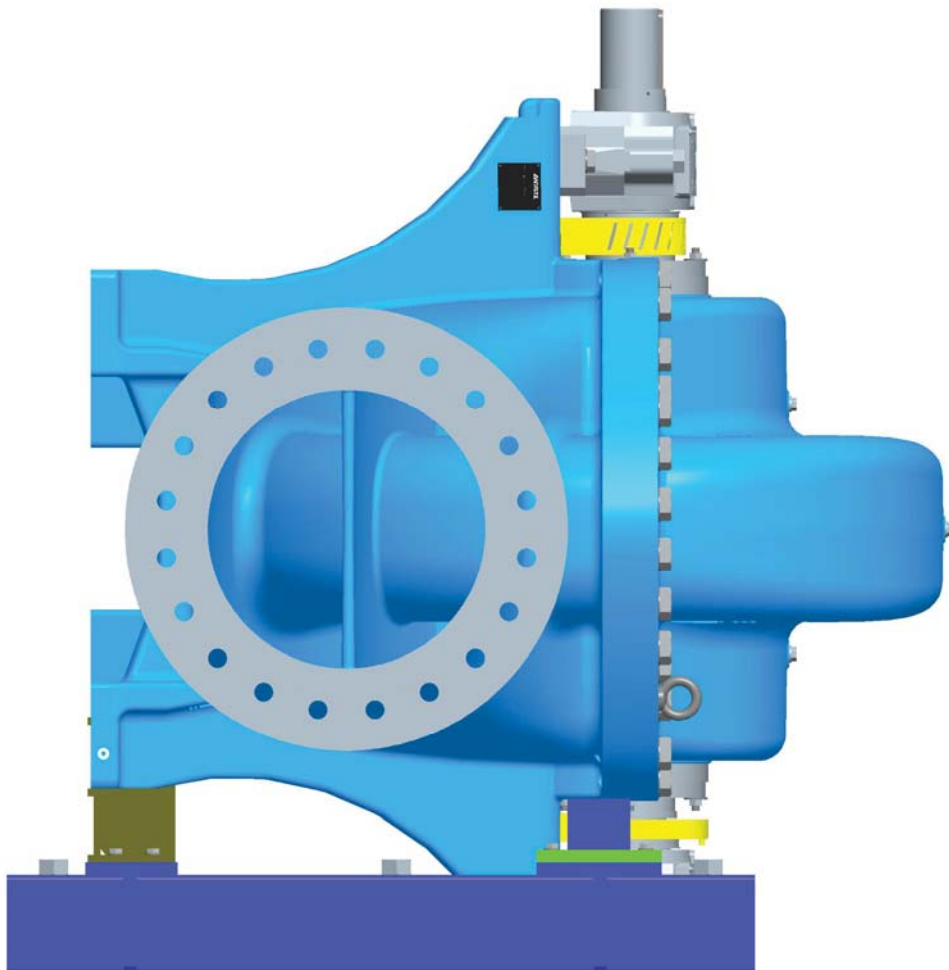


Fig. 2-1 Protective covers for the ASPV pump

2.8 Personal protective apparel

General Safety equipment

The following must always be worn when performing work on the ASPV pump:

- Protective clothing to prevent the pulp from coming into contact with the skin.
- Gloves to prevent hand injuries
- Goggles to prevent eye injuries
- Safety shoes as protection against crushing
- The required personal ear protection to avoid hearing defects
- Standard hard hat as protection against head injuries

2.9 Safety at the machine installation site

Adequate lighting must be provided (industrial lighting).

The foundations must be sized to withstand the loads caused by the ASPV pump. Customer will be provided with a load plan.

Area around machine and marked escapes to be kept free. Area around machine must be marked as danger zone.

Make sure machine and surrounding area are kept clean. In particular, Oil and grease on the floor and on machine elements may cause slipping. This is therefore a considerable source of injuries, as are tools.

The floor around the ASPV pump must be provided with a non-slip finish.

Ramps, platforms and lifts must be used to avoid injury or excessive physical effort.

2.10 Temperature

The ASPV pump is designed for a stock temperature of 55°C. If pulp at temperatures higher than 65°C is to be used, the operator must take the necessary safety measures (e.g. protective gloves, training of operating staff, etc.).

2.11 Noise

The total noise emissions from all machines in the production room can restrict spoken communication and impair hearing.

The machine is designed such that no operator is required in the immediate vicinity of the machine. Appropriate hearing protection should be worn throughout maintenance and adjusting work while the machine is running.

2.12 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.

Employees performing work on live parts should be accompanied by an assistant who can operate the emergency switch if necessary.

Users of medical electronic equipment, such as pacemakers, must not enter the electric danger zone.

Machine must be earthed to avoid electrostatic loading.

2.13 Steam and fumes/smoke

Unusual chemical reactions may take place in the fibre stock during a prolonged standstill and hazardous fumes may be produced.

The machine must be thoroughly cleaned if shut down for longer than 2 hours.

The area must be sufficiently ventilated.

2.14 Greases

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

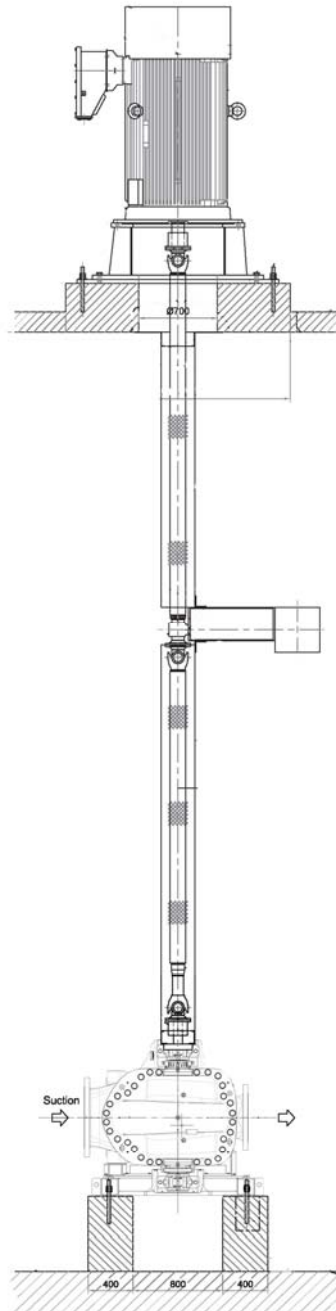
Suitable skin protection is required when handling aggressive media. See manufacturers' information for the type of skin protection required.

Also observe relevant requirements for disposal

3 TECHNICAL DATA

3.1 Dimensioned drawing

3.1-1 Dimension drawing



MISCHPUMPEN
ASPV PUMPS"ASPV"

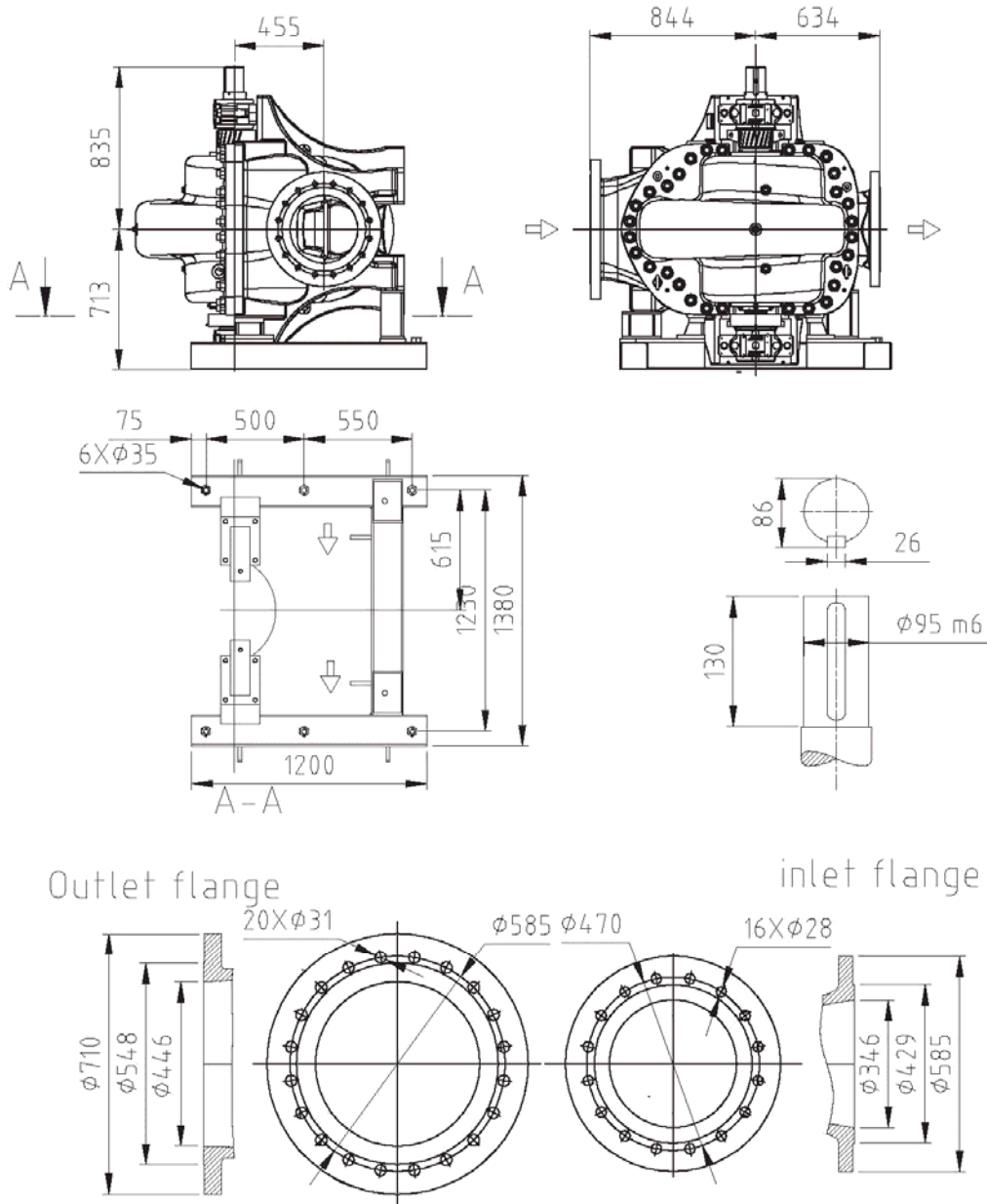


Fig 3-1 Dimensioned drawing

3.2 Assembly drawing

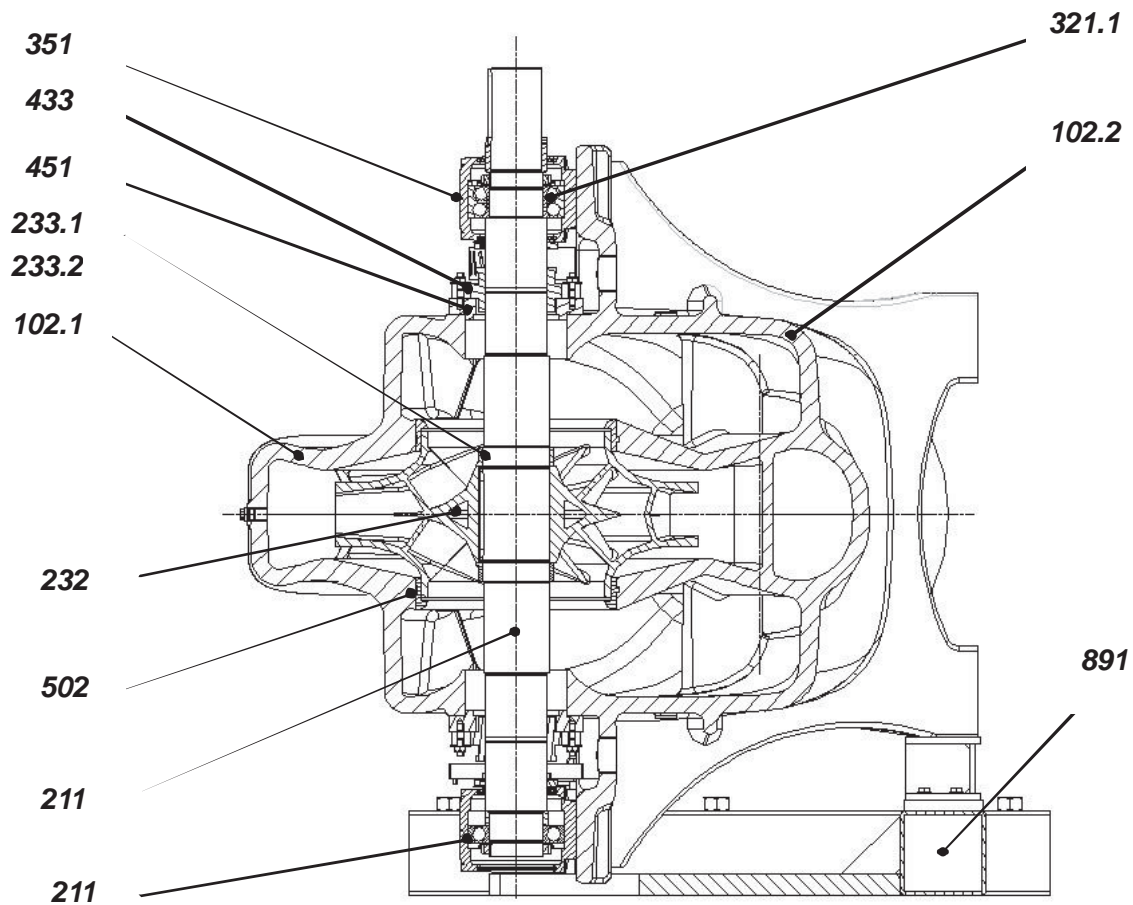


Fig3-2 ASPV pump assembly drawing

This main parts list is designed so that parts can be identified in an overview drawing and in the corresponding parts list.

Pos. No.	Q'ty	Part Name	Pos. No.	Q'ty	Part Name
211	1	Pump shaft	233.2	2	Impeller lock nut
232.1	1	Impeller	433	2	Burgmann cartridge sealing
502.1	2	Wear ring			
321.1	1	Double angular contact ball bearing			
321.2	1	Deep groove ball bearing			
351	2	Bearing housing			
102.1	1	Volute casing-lower part			
102.2	1	Volute casing-upper part			
891	1	Base frame			
233.1	2	Impeller lock plate			

Tab. 3-2 Main components for ASPV pump

3.3 Main components of ASPV 350-680R

We recommend storing spare parts in good time because long delivery times cannot always be avoided.

3.3.1 Main components of ASPV350-680

Option	Pos. No.	Q'ty	Part Name	Specification
public	321	1	Double angular contact ball bearing	SKF 3220A
	321	1	Deep groove ball bearing	SKF 6220
	421	2	V-ring sealing	SKF TSN220A
	502	2	Wear ring	ASP350-680R 385/ 332 X 60
	232	1	Impeller	ASP350-680R 680 X 310 Z= 5
	840	1	Coupling	According to the motor size
Mech. seal	433	2	Mechanical seal	BURGMANN 11-CARTEX-SN - 115 - AQ1EMG
	451	2	Adapter	BS95 250 / 150 x 40

Table 3-3 Spare parts for FPV40-400

DESCRIPTION

4.1 Field of application

The ASPV pump is used in continuous operation to pump clean liquids and various pulps in the paper industry

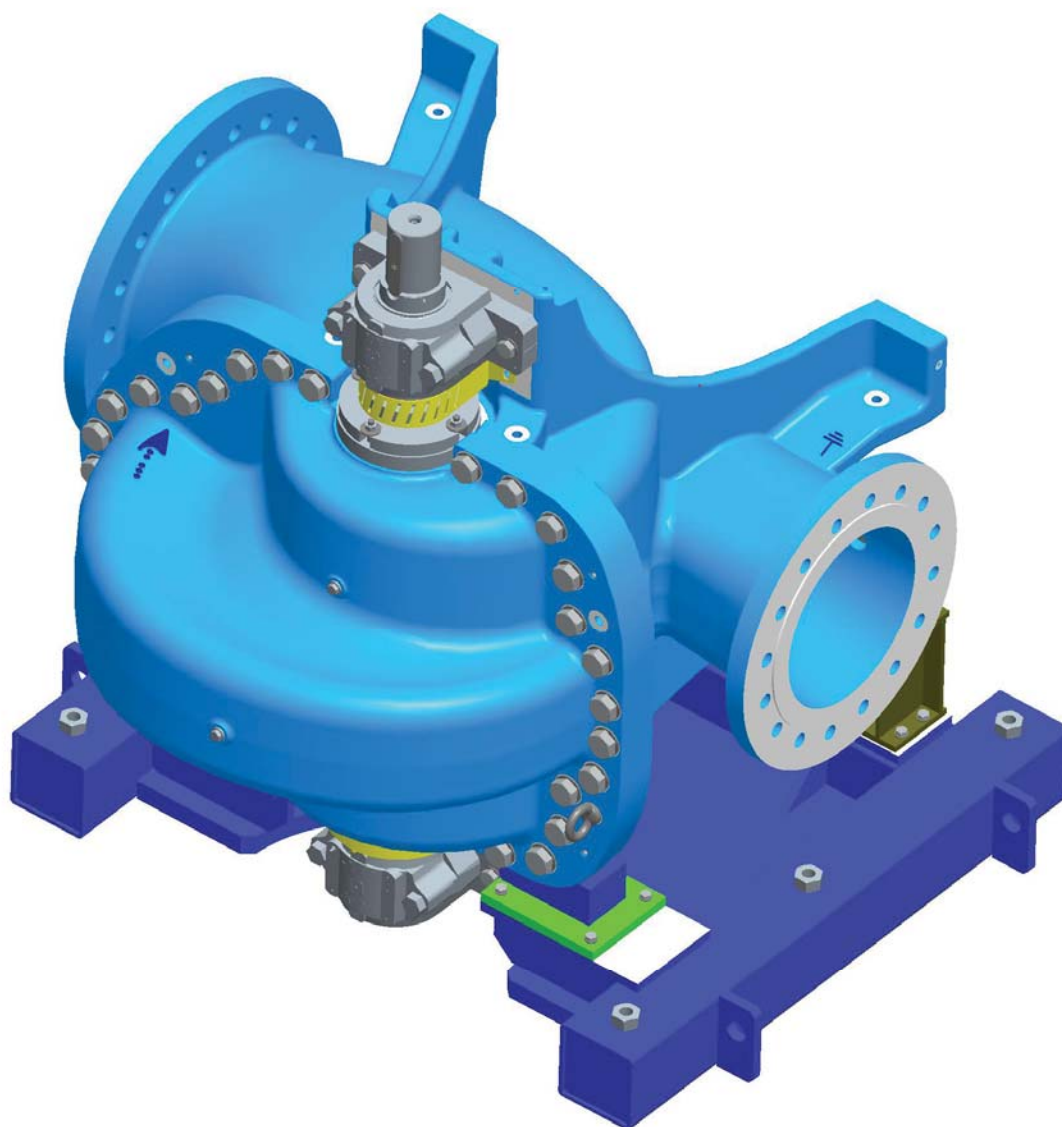


Fig. 4-1 ASPV pump

**Volute casing-
upper part (102.2)
and lower part
(102.1)**

Function: Guiding the medium with a favourable flow pattern. Converting the speed energy into pressure energy.

Design:

- Pressure-sealed, double-flow pump casing with delivery and suction channels
- Suction and delivery flange
- Mounting for the bearing housing with bearing assembly, shaft and impeller.

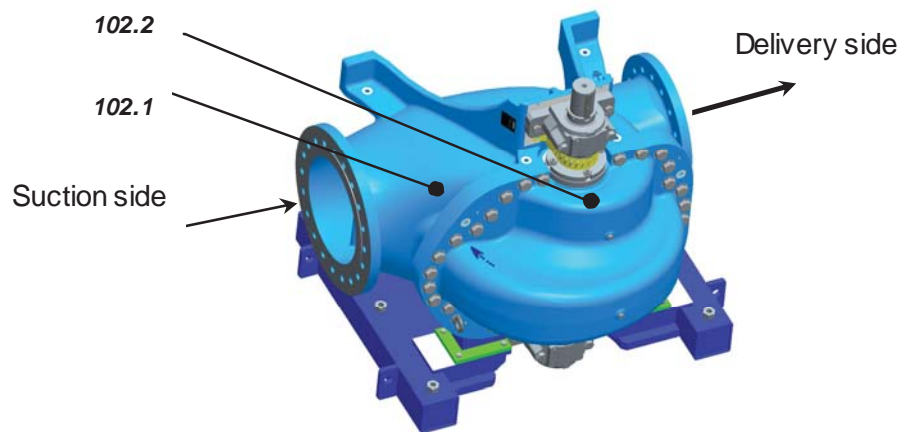


Fig. 4-2 volute casing

Pump shaft (211)

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

Design: Drive shaft made of high-quality, acid-proof stainless steel

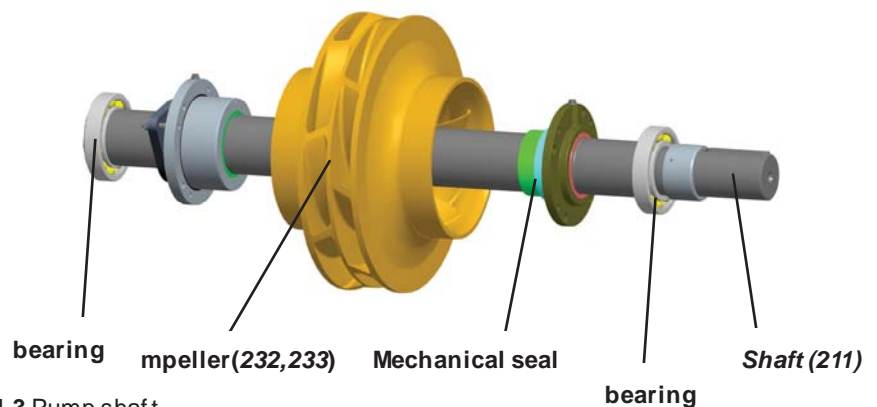


Fig. 4-3 Pump shaft

Impeller (232,233) Function: Accelerating the medium by charging it with energy.
Design: Bipartite, made of acid-proof stainless cast steel.

Wear ring (502) Function: Choke between suction and delivery side of the impeller.
Design: Hydraulically optimized ring made of acidproof stainless steel.

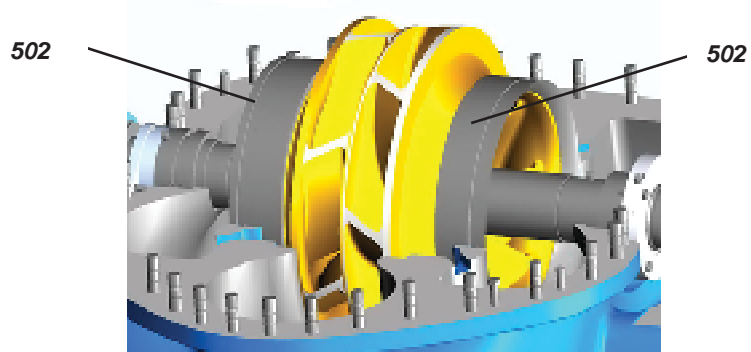


Fig. 4-4 Wear ring

Shaft seal Function: Seal between medium (suction side) and the atmosphere
Design: Stuffing box with stuffing box gland, sealing water ring, adjustable stuffing box gland, and sealing water connection.

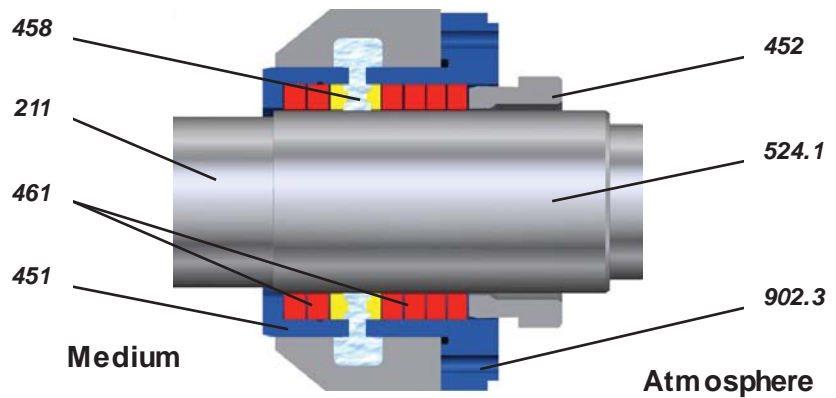


Fig. 4-5 Stuffing box

Item	Component	Item	Component
211	Pump shaft	461	Stuffing box packing
451	Seal casing	458	Seal water ring
452	Stuffing box gland	902.3	Stud bolt
524.1	Shaft protection sleeve		

Tab. 4-1 Stuffing box parts

Design: Two-way mechanical seal with sealing water connection

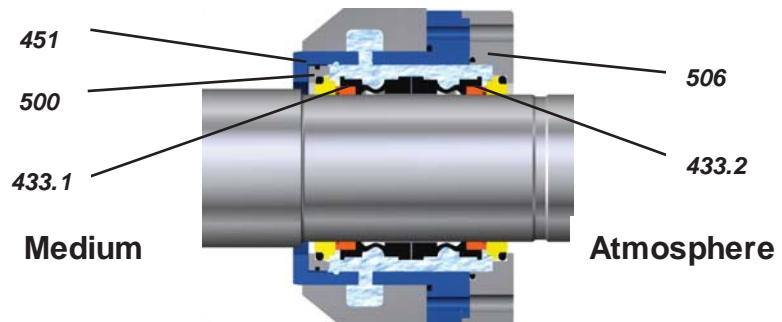


Fig. 4-6 Two-way mechanical seal

Item	Component	Item	Component
433.1	Mechanical seal coming into contact the medium	433.2	Mechanical seal coming into contact with the atmosphere
451	Seal casing	500	Supporting ring
506	Retaining ring		

Tab.4-2 Two-way mechanical seal

Design: cartridge mechanical seal with sealing water connection

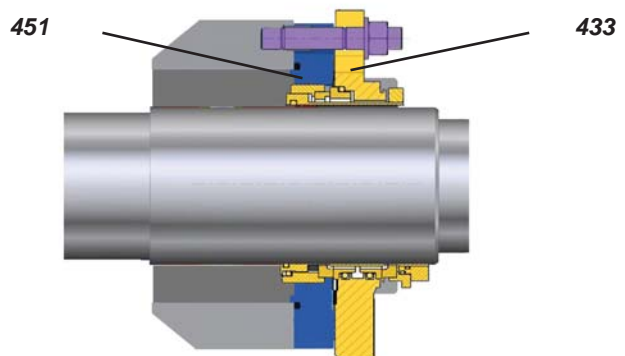


Fig. 4-7 cartridge mechanical seal

Item	Component	Item	Component
433	cartridge mechanical seal	451	adapter

Tab.4-3 cartridge mechanical seal

Bearing

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

Design: Self-aligning roller bearing with steel cage. Designed as fixed and movable bearing, suitable for grease or oil lubrication.

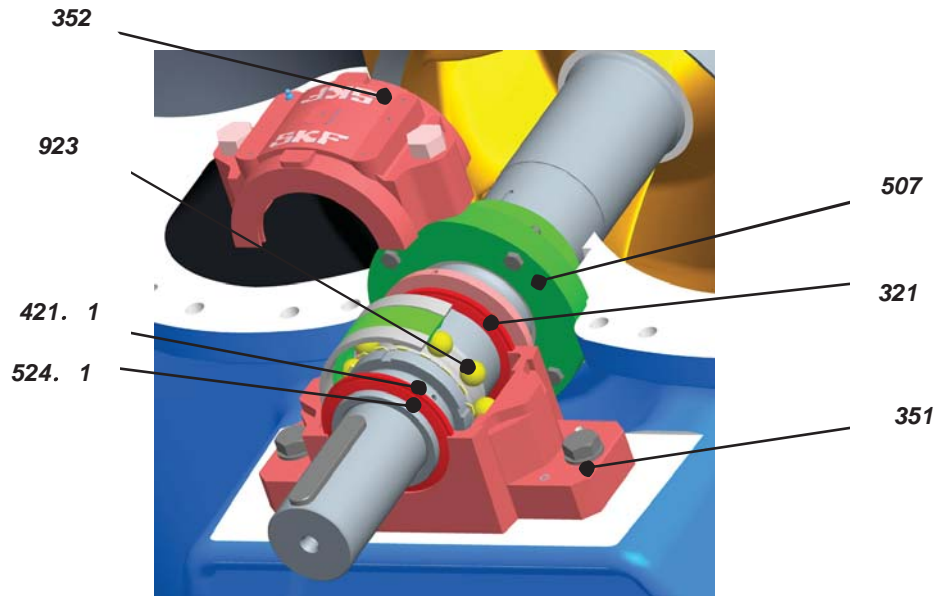


Fig. 4-8 Bearing with bearing housing

Item	Component	Item	Component
321	bearing	524. 1	Sleeve
351	Bearing housing-lower part	507	Splash ring
352	Bearing housing-upper part	923	Locknut
421	Oil seal		

Tab. 4-4 Bearing with bearing housing

**Pedestal
(891)**

Function: Holding the SmartFlow pump for assembly purposes without foundation block. Support pump and support motor.

Design: Grey cast iron



For detailed information on the design of the SmartFlow pump, see:

- Principal section
- Parts list

4.2 Type specification

4.3.1 Applicable standards

Dimensions.....	ISO2858
Design.....	ISO 5199
Inspection (Q, H, NPSH).....	ISO 9906 Class
Product safety.....	EN 809, EN 291-1, EN 292-2
Flanged drilling.....	ISO 2084, PN 10 (DIN 2501, SFS2123)
.....	ISO 2084, PN 16 (DIN 2501, SFS 2123)
.....	JIS B2210 10K standard flange
.....	JIS B2210 16K
.....	ANSI B 16.1 Class 125
.....	ANSI B 16.1 Class 150

4.3.2 Model designation

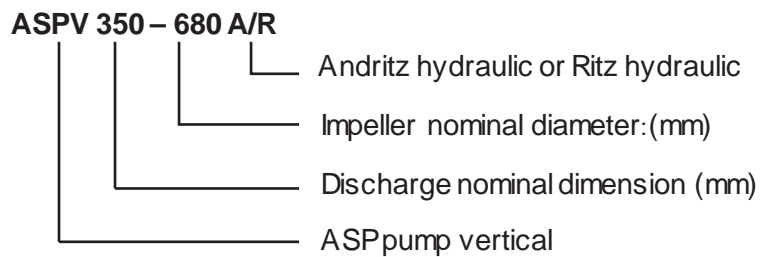
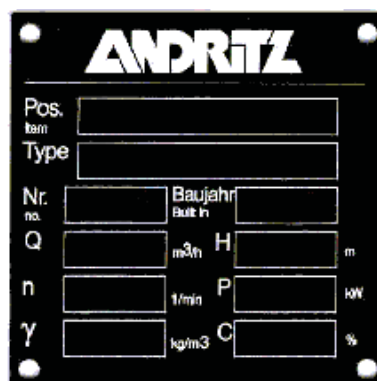


Fig. 4-9 Type code

Type plate

Each ASPV pump has a type plate mounted on the volute casing showing the main pump data.



- Q ... Capacity (m³/h)
- H ... Delivery head (m)
- P... motor power (kw)
- n... Motor speed (rpm)
- C... consistency (%)
- ... Spec. gravity (kg/m³)

Fig. 4-10 Type plate

4.3 Application limiting values

The limit values shown for the ASPV pump in the present Chapter should not be exceeded under any circumstances.

Pressure and temperature limits

The permitted pressure and temperature limit values according to table (tab. 4-5) must be observed.

Type	Pressure in suction branch	Pressure in delivery branch	Temperature Medium
ASPV350-680R	0.2 min / 26 bar max	26 bar max.	50 °C max.

Tab. 4-5 Pressure and temperature limit values

Sealing water – Shaft seal

The permitted pressure and quantity data on the shaft seal according to table (Tab. 4-6 Tab. 4-7) must be observed.

Type	Sealing water – pressure (inlet)	Sealing water – quantity
ASPV350-680R	2 bar min /3 bar max	Min. 2x4 L/min

Tab. 4-6 Sealing water – shaft seal (stuffing box)

Type	Sealing water – pressure (inlet)	Sealing water – pressure (outlet)	Sealing water - quantity
ASP350-680R	2 bar min./3 bar max.	2 bar min /3 bar max	Min. 2x4 L/min

Tab. 4-7 Sealing water – shaft seal (mechanical seal)

Mechanical seal

The limit values for the mechanical seal with regard to pressure and temperature can be found in the manufacturer's operating manual.

➔/SUPPLIER DOCUMENTATION/MECHANICAL SEAL

Permitted load on supports The permitted loads on supports according to table (Tab. 4-8) must be observed.

- Force in **kN**
- Torque in **kNm**

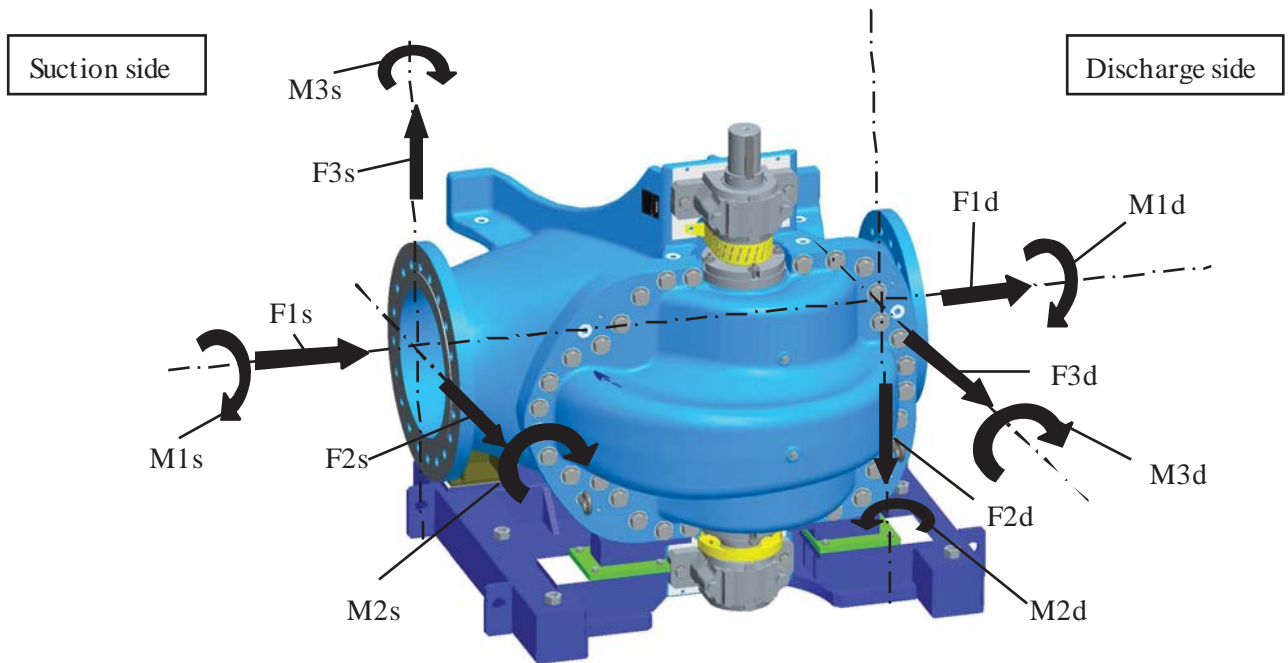
FP types	F_{1S}	F_{1D}	$F_{1S}+F_{1D}$	F_{2S}	F_{2D}	F_{3S}	F_{3D}	$F_{3S}+F_{3D}$	M_{1S}	M_{1D}	M_{2S}	M_{2D}	$M_{2S}+M_{2D}$	M_{3S}	M_{3D}
ASP350-680R	7.8	11.8	6.3	9.4				4.6	6.9				4.6	7.8	11.8

Tab. 4-8 Permitted loads on supports

$F_{1S} + F_{1D}$ values with same direction of dynamic effect

$F_{3S} + F_{3D}$ values with opposite direction of dynamic effect

$M_{2S} + M_{2D}$ values for same direction of torque effect



Forces F.....[kN]

Torques M..[kNm]

Fig. 4-11 Permitted load on supports

Relation between Output and speed The relation between output and speed according to table Tab. 4-9 must be observed.

Pump Type	Shaft material 1.4462
	Relation between output and speed $P(\text{kw}) / n(\text{rpm}) /$
ASP350-680R	0.96

Tab. 4-9 Relation between output and speed

Technological Description

Definition The ASPV pump is used in continuous operation to pump clean liquids and various pulps used in the paper industry, with the aim of obtaining well mixed medium and of increasing the pressure.

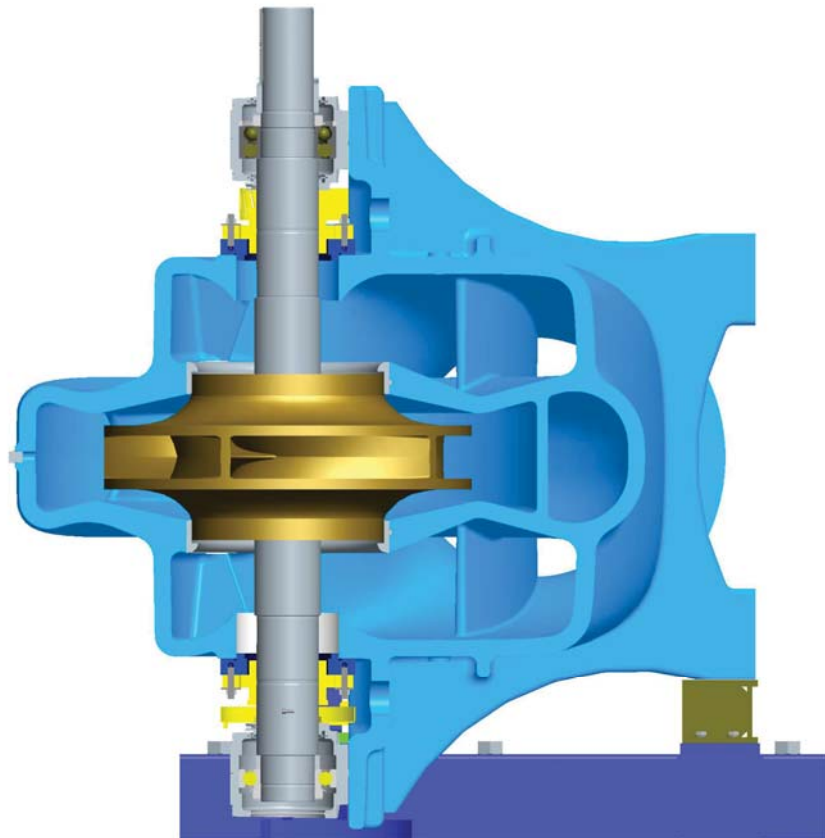


Fig. 4-12 ASPV pump

Supply of medium The medium to be pumped and mixed enters the volute casing through a suction pipe connected to the inlet flange. In the suction channel the medium is split and then enters the suction area of the impeller in two in-flow and with a favourable flow pattern.

Pressure increase The medium is sucked in by the two in-flow impeller from both left and right (two in-flow) in axial direction towards the center of the impeller. In the impeller the medium undergoes radial acceleration, thus receiving speed energy, due to the rotational energy and the shape of the blades (changing from axial to radial). In the volute casing the speed energy is converted into pressure energy. The medium then enters the delivery pipe, which is connected to the outlet flange.

5.1 General

This chapter describes certain steps for transport, storage and installation of the ASPV pump which may be the responsibility of the user.

Activities which are carried out by ANDRITZ, including works assembly, are not the subject of this description.

5.2 Safety regulations



DANGER

Disregarding the safety regulations may cause a risk to life and limb.

Disregarding the safety regulations may cause a risk to life and limb and damage to the machine or its components.

All safety instructions in this Chapter must be strictly observed.

General safety Instructions

All applicable accident prevention rules must be observed.

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

Do not step or walk below suspended loads. Standing below suspended loads is dangerous and thus forbidden.

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

Qualification of assigned personnel

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

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

Start-up may only be carried out by trained, skilled workers.

Personal Protective apparel

The following protective equipment must be worn when carrying out start-up and transport work:

- Hard hat
- Protective gloves
- Protective shoes
- Goggles

Tools

Only use tools of a reputable brand and in good condition for any work performed on the ASPV pump.

5.3 Haulage



DANGER

During transport of the ASPV pump or loading/unloading (pump may fall).

The loading equipment must bear the name of the manufacturer, the type of material and the permitted load!

Do not lift machine and transport crates except at the points marked For lifting by crane or forklift.

Do not step or walk below suspended loads.

Supply

The ASPV pump is supplied pre-assembled. Machine components and auxiliary material are packed in crates.

Transport sizes and weights are stated in the shipping documents.

Largest supply weights:

➔ /ASPV PUMP/TECHNICAL DATA

Acceptance

- Check whether supply is complete (against shipping documents and packing list) and in perfect condition.
- In the event of transport damage or short supply, do not accept goods but notify forwarder and ANDRITZ's shipping department.
- If there is a hidden defect, notify forwarder and ANDRITZ's shipping department within two weeks.

Lifting the entire ASPV pump

The complete ASPV pump should only be raised as follows after unpacking:

The complete ASPV pump should only be raised if the lifting devices have been attached under the suction and delivery flanges. The lifting devices must be short enough to prevent the ASPV pump from tilting (Fig. 5-1).



DANGER

Never lift the complete ASPV pump from the lugs (Fig. 5-1) provided for the upper part of the volute casing. This could cause a risk to life and limb and/or damage to the pump.

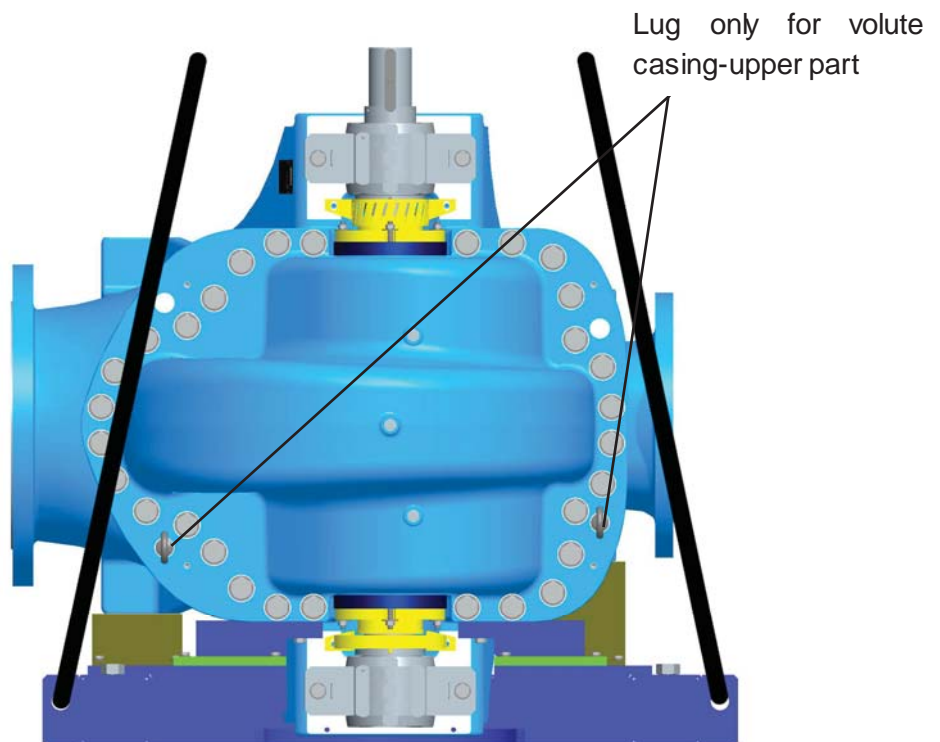


Fig. 5-1 Lifting the ASPV pump

Lifting the pump components

Individual pump components should only be raised as follows:

- The ASPV pump can only be raised if the lifting devices have been attached under the suction and delivery flanges (Fig. 5-2).



Fig. 5-2 Lifting the ASPV pump

- The upper part of the volute case can be raised at the points marked (lugs) with the aid of shackles Fig. 5-3.

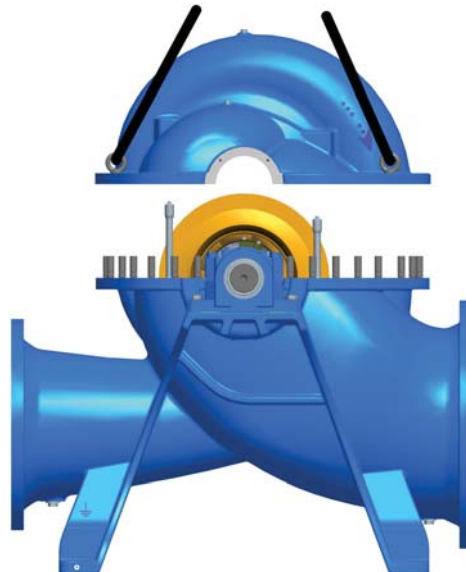


Fig. 5-3 Lifting the upper part

5.4 Storage

Short-term storage If the pump is to be stored for less than three months before erection work begins, please observe the following storage instructions.

- Store the ASPV pump in a dry place, with suitable protection against dirt and corrosion.
- Packing should not be removed until erection work begins.
- If there is no oil or grease in the bearing housing, it must be filled with oil or grease to protect the bearing assembly against corrosion.
- Rotate the pump shaft manually every two weeks to prevent damage to the shaft bearing assembly.

Long-term storage If the pump is to be stored for more than three months before erection work begins, please observe the following storage instructions.

- Store the ASPV pump in a dry place, with suitable protection against dirt and corrosion.
- Incidentals should be protected against damage and unauthorized withdrawal by storing in a lockable room.
- Drain any liquid from the ASPV pump.
- Rotate the pump shaft manually every two weeks to prevent damage to the shaft bearing assembly.
- If the ASPV pump has a casing of grey cast iron and a stuffing box packing, remove the packing cord and coat the stuffing box body with an anti-rust agent.
- If there is no oil or grease in the bearing housing, it must be filled with oil or grease to protect the bearing assembly against corrosion.



CAUTION

The grease or oil in the bearing housing must be renewed before start-up. Anti-rust agents must be removed entirely.

5.5 Installation

General

Installation takes place in accordance with the sequence plan defined by ANDRITZ.



WARNING

Disregarding the sequence plan and the installation instructions may result in hazardous situations causing a danger to life and limb and in machine damage.

The sequence of erection work is important and must be strictly observed.

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



The sequence of erection work is shown in step-by-step tables. Individual activities are numbered in their order of precedence.

Preservation

Those machine components which are not corrosion-resistant should be protected against corrosion with preserving grease.

The preservative grease need not be removed.

Required documentation at installation site

The following supplementary documentation must be available at the beginning of erection work.

- foundation and arrangement drawing
- documentation on electrical, measuring and control equipment
- packing lists for each individual delivery

Space requirement for erection work, operation and maintenance will be defined

together with the ANDRITZ representative in charge before the beginning of erection work.

Ambient temperature during erection work should not be less than 10-15° C.

5.5.1 Erection of the ASPV pump

Foundation

The foundation should be made according to ANDRITZ's foundation plan.

The following preparations have to be made prior to placing the ASPV pump on the foundation:

- Mark axes and levels on the foundation.
- Check the finish of the foundation before beginning erection work.

Mounting and foundation work

The foundations are to be laid according to the following table.

Step	Activity
1	Insert anchor bolts into the bore holes provided at the ASPV pump.
2	Place ASPV pump with anchor bolts on the foundation such that the anchor bolts protrude into the recesses. → Raise the pump according to Chapter 5.3
3	Level the pump to 0.5 mm with lining plates.
4	Grout supports with shrink-free grouting compound (Fig. 5-4 and/or Fig. 5-5)
5	After the hardening period (1 to 2 days), align the pump accurately and tighten the anchor bolts with the required tightening torque. A formal record must be made of pump alignment.

Tab. 5-1 Foundations

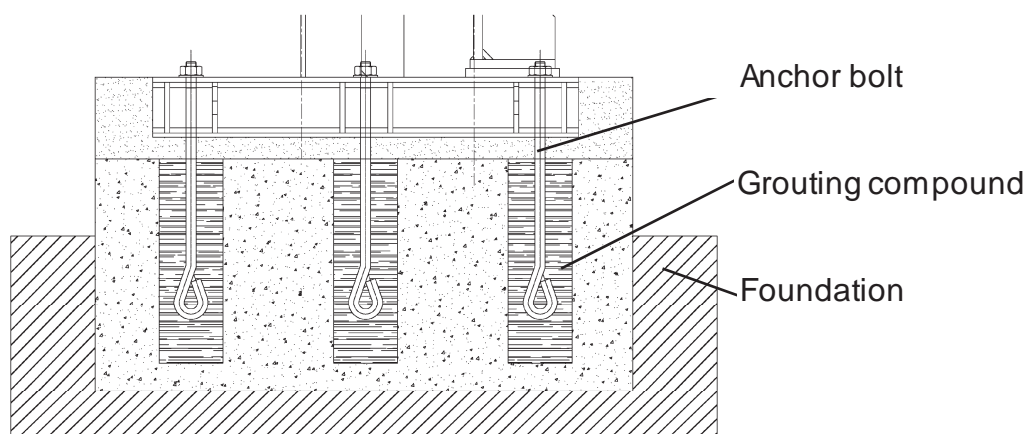


Fig. 5-4 Foundation work with pedestal



DANGER

Due to the ASPV pump or components of the ASPV pump falling during transport on installation site.

Raise ASPV pump according to the transport instructions in Chapter 5.3.

Do not step or walk below suspended loads.



DANGER

Due to parts of the body being jammed or crushed during installation work.

Wear your personal protective apparel.



WARNING

Transport devices that are forgotten may result in risks to life and limb and in damage to the machine.

Remove all transport devices.

5.5.2 Pipework



DANGER

If pipework is not mounted professionally.

This can result in risks to life and limb and in damage to the machine.

Under no circumstances should the ASPV pump be used to support a pipe!



WARNING

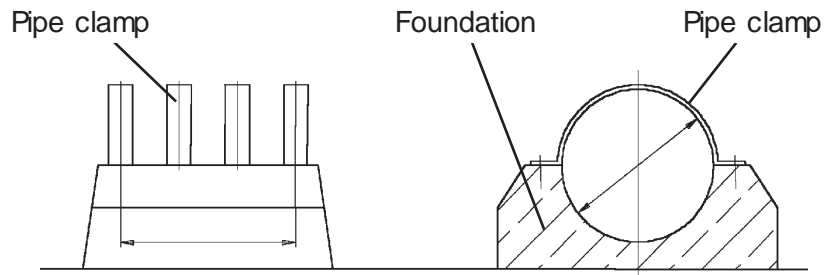
If there is risk of dangerous backflow after the pump is shut down, a reflux check device must be installed in the delivery pipe!

Support

When planning the pipework, a supplement must be included for heat expansion.

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 must be supported on a foundation so that the weight of the pipe is not transferred to the ASPV pump (Fig. 5-6). The pipework is secured to the foundation with pipe clamps.



$$S = (1.2 \dots 2) \times d$$

S = no. of pipe clamps

Fig. 5-6 Pipe foundation

Suction pipe

The following must be observed at the suction pipe:

- The suction pipe should be kept as short as possible to maintain pipe friction losses at a minimum.
- Run a pressure test to check the pipe for leaks.
- The suction pipe should rise or fall slightly towards the ASPV pump,
- If a reducing piece is installed directly upstream of the ASPV pump, the narrowing section thereof should always be at the bottom (Fig. 5-7).
- Inlet points in the suction pipe should be located at a distance from the ASPV pump suction flange that is equivalent to a minimum of 5 times the diameter of the suction pipe.

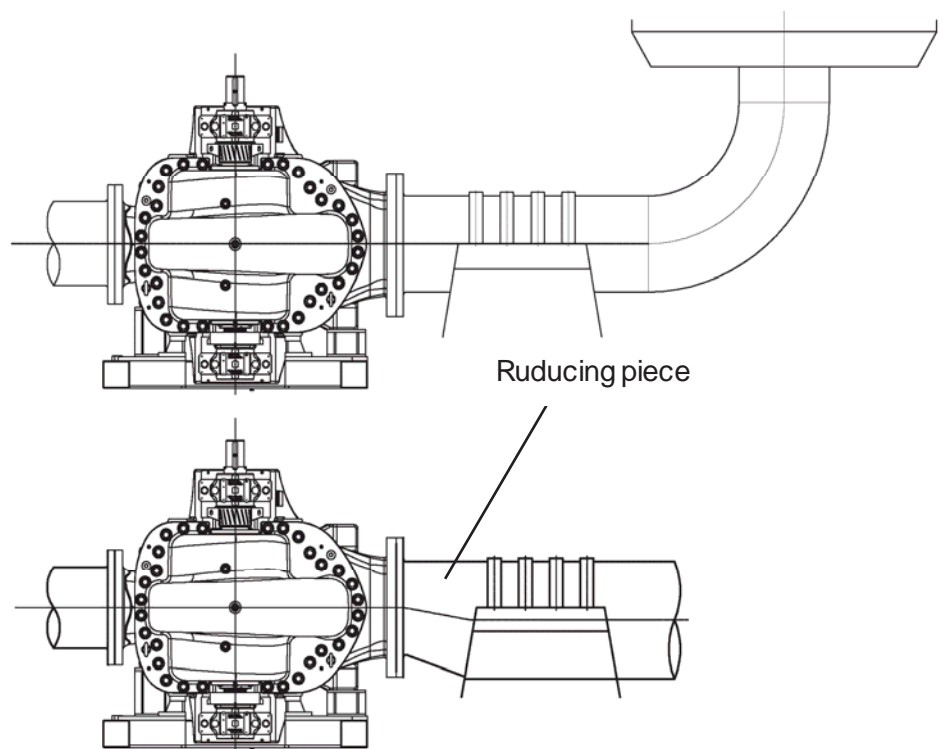


Fig. 5-7 suction pipe

5.6 Instruments

Magnetic-inductive flow meter (690)
(if included in scope of supply)

Instructions on installation and operation of the flow meter can be found in the enclosed description from the manufacturer.

This device must be adjusted under the supervision of Andritz personnel.

5.7 Cold test

Prerequisites

The following utilities must be available:

- Electric power
- Water

Lubrication

- First filling of lubricant and recording of all further lubrication procedures according to the section headed "Lubrication" in the MAINTENANCE chapter.



WARNING

Machine may be damaged if inappropriate oil or grease grades are used as first filling.

Only use oils or greases with the properties listed in the lubrication CAUTION schedules.

Cold test

Cold test is to be carried out together with the customer's authorized representative.

The work steps listed in the cold test certificate shall be carried out for the cold test, and documented.

➔/ATTACHMENT/CERTIFICATES AND BLOCK DIAGRAMS

Final inspection

The customer and the erection work supervisor shall conduct a final inspection of the installation on completion of the cold tests.

Certificates

The following certificates are issued after completion of the ISO cold test

- Cold test certificate
- Certificate of completion of erection work.

Certificates:

➔/ANNEX/CERTIFICATES AND BLOCK DIAGRAMS

4 START-UP

6.1 General

Initial start-up of the ASPV pump shall be prepared and carried out by the Contractor or by ANDRITZ personnel. Start-up takes place in accordance with the start-up sequence plan and ANDRITZ's start-up protocols.



During start-up practical machine training will also take place on the machine. Participants must have undergone theoretical training.

6.2 Safety regulations



DANGER

Disregarding the safety regulations may cause a risk to life and limb.

Disregarding the safety regulations may cause a risk to life and limb and damage to the machine or its components.

All safety instructions in this Chapter must be strictly observed.

General safety instructions

Start-up shall be carried out under the control of ANDRITZ's start-up supervisor or by the Buyer.

All applicable accident prevention rules must be observed.

Qualification of assigned personnel

Start-up may only be carried out by trained, skill workers.

Personal protective apparel

The following protective equipment must be worn when carrying out start-up and erection work:

- Hard hat
- Protective shoes
- Goggles
- Gloves must be worn when handling aggressive media such as oil, cleaning agent, chemicals, lubricants, white water, etc.

6.3 Prerequisites for start-up

The following must be checked before start-up:



Motor may be started up unintentionally.

Risk to life and limb and risk of damaging the machine or its DANGER components.

Take care that the motor cannot be started up!

Check for leaks

The pump and pipework must be leak proof before start-up.

Leaks, particularly in the suction pipe, can reduce performance of the pump substantially and interfere with filling of the pump before start-up.



Parts of the pump which are under pressure are not considered pressure vessels in terms of the official regulations on pressure vessels.

Sense of rotation of motor

Before start-up check that the motor is rotating in the right direction.



Before checking the sense of rotation of the motor, it is essential to remove the coupling spacer.

The motor must rotate in the direction of the arrow provided on the motor casing.

Free rotation

The pump must be able to rotate freely. Here the two coupling halves should be separated from one another.

By rotating the pump end coupling half the operator can check whether the shaft can be rotated freely.

Aligning the coupling

A further check should be performed to ensure that the coupling is properly aligned. Coupling alignment should then be verified in writing.

For assembly and disassembly of the coupling, as well as the tolerances to be observed here, please see:

➔ /ASPV PUMP/SUPPLIER DOCUMENTATION/COUPLING

Pump lubrication

Before start-up, check the lubricant to be used for the pump and the drive bearing.



DANGER

Due to the pump not being lubricated correctly!

This can result in risks to life and limb and in damage to the machine.

The pump should never be operated without a suitable lubricant!



If the pump is kept in storage for a longer period before being put into operation, dirt and water may enter the pump in the meantime. If there are substantial fluctuations in temperature, there may be some condensation.

Shaft seal and sealing water

Some parameters must be checked in order to ensure that the box mechanical seal is functioning well.

- Only clean water from an external source should be used.
- The maximum particle size of 80 microns must not be exceeded.
- The maximum solids content of 2 mg/l (ppm) must not be exceeded.
- The stuffing box mechanical seal must have an adequate supply of sealing water. Throughput 3-5 l/min

6.4 Start-up



CAUTION

Machine may be damaged by inappropriate starting.

All electric interlocks must be functional and checked.

Starting up the ASPV pump

If all preliminary requirements (see Chapter 6.3) have been fulfilled, the pump can then be started up according to the following table:

	Prerequisites
1	Suction pipe and pump casing must be filled with the medium.
2	The pump casing must be vented with the vent screw .
3	The shaft seal must have an adequate supply of sealing water.
4	There must be sufficient sealing water escaping from the stuffing box (30-80 Tropfen/min).
5	The mechanical seal must have a supply of sealing water. The flow of sealing water should only be throttled at the outlet.
6	The valve in the suction pipe is fully open.
7	The valve in the delivery pipe is completely closed.
8	Start up pump and open the delivery side valve far enough to obtain the desired flow rate.
9	Check stuffing box to see whether enough liquid is coming out. If not, the stuffing box gland must be slackened right away. If the packing material still becomes too hot after the gland has been slackened, the operator must shut down the pump and look for the cause of the problem. When the stuffing box has been running for approx. 10 minutes without any problems, it can then be tightened again moderately. To set the stuffing box, see Chapter on "Maintenance".

Tab. 6-1 Starting up the ASPV pump



DANGER

If the pump runs dry!

This can result in risks to life and limb and in damage to the machine.

The pumps 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 sealing water to the shaft seal
- Bearing temperature and vibration
- Pressure and flow rate in the pump



CAUTION

If there are any unusual noises, it is essential to look for the cause without delay and then eliminate the problem!

After start-up, the ASPV pump is handed over to the mill operator in a complete, reliable condition and ready for operation.

6.5 Certificates

The following certificates must be completed and signed after start-up:

- Start-up certificate:
➔ **/ANNEX/CERTIFICATES AND BLOCK DIAGRAMS**
- Provisional acceptance certificate:
➔ **/ANNEX/CERTIFICATES AND BLOCK DIAGRAMS**

5 OPERATION

7.1 General

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

7.2 Safety regulations



DANGER

Disregarding the safety regulations may cause a risk to life and limb.

Disregarding the safety regulations may cause a risk to life and limb and damage to the machine or its components.

All safety instructions in this Chapter must be strictly observed.

General safety instructions

All applicable accident prevention rules must be observed.

Operating the ASPV pump is not permitted without all the required safety devices

Qualification of assigned personnel

The equipment may only be operated by qualified personnel.

Operating personnel must know where the emergency-off switches and the escape routes are located.

Operating personnel must have been instructed in the function and possible failure of machine monitoring equipment, and in carrying out maintenance and inspection work (shift log book, maintenance inspection records).

Personal Protective apparel

The following personal protective equipment/apparel shall be used when performing work on the machine (e.g. troubleshooting):

- Hard hat
- Protective gloves
- Protective shoes
- Goggles

7.3 Control via DCS

The ASPV pump can be started up and operated entirely from the DCS.

7.4 Starting

Prerequisites

All preliminary requirements for start-up must be fulfilled before switching on the pump.

See:

➔ /ASPV PUMP/START-UP/Preliminary requirements for start-up

Before starting the ASPV pump, the following parameters must be fulfilled:

- Suction pipe and pump casing must be filled with the medium.
- The pump casing must be vented.



DANGER

If the pump runs dry!

This can result in risks to life and limb and in damage to the machine.

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

- The shaft seal must have an adequate supply of sealing water.
- There must be sufficient sealing water escaping from the stuffing box. (30-80 drops/min)
- The mechanical seal must have a supply of sealing water.
- The valve in the delivery pipe is completely closed first of all.



CAUTION

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!

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

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

Manual start Carry out the following steps for manual start.

Step	Activity	Operating device
1	Open suction-side valve	OPEN
2	Switch on motor	START
3	Open delivery-side valve	OPEN

Tab. 7-1 Manual start

7.5 Checks after initial start-up

The following items must be checked after initial start-up:

- Temperature of the shaft seal
- Required amount of sealing water to the shaft seal
- Bearing temperature and vibration
- Pressure and flow rate in the pump



CAUTION

If there are any unusual noises, it is essential to look for the cause without delay and then eliminate the problem!

7.6 Normal operation



DANGER

Do not operate without all safety devices ON.

While the pump is in operation the operating personnel should record the relevant data (shift record and data sheets).

Activities during normal operations

Once per shift

The following work has to be performed per shift in normal operation.

Component	Activity
ASPV pump, complete	Visual check (sealing water, etc.)

Tab. 7-2 Activities to be performed in every shift

7.7 ASPV pump requirements (delivery head and flow rate)

Sizing

The pump sizing (delivery head/flow rate) refers to the values shown on the pump's type plate.

The values obtainable for head and flow rate can be read off the impeller diameter and the defined operating speed is shown in the performance diagram.

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.

Flow rate change

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.



CAUTION

Longer periods of pumping with the valves closed can cause damage to the pump!

Too low $NPSH_{plant}$ value can cause damage to the impeller!

Changing the Operating parameters

If the operating parameters for which the pump has been sized are changed, the following considerations should also be taken into account:

- All parameters for the pump (pressure, impeller diameter, ...) were sized for the original duty point. These factors should be fully checked for the new operating conditions.
- The ASPV pump can be operated for a short time with the delivery valve closed. For continuous operation, however, 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 inlet characteristics of the system (actual $NPSH_{plant}$), as well as the drive motor and shaft outputs, must always be checked under changed operating conditions.
- The efficiency of the pump is the deciding factor in its overall service life, thus the power requirement of the pump must be checked.
- The performance diagram is based on values with clean water. If other liquids are pumped, the data on delivery head and flow rate, as well as power requirement, may change. These factors were taken into account when the pump was originally selected and should also be considered in the light of any new operating conditions.

7.8 Stopping

Automatic stop When using the group stop, all necessary steps are carried out automatically with the DCS.

Manual stop Carry out the following steps for manual stop.

- Stop the pump motor
- Close the valve in the delivery pipe
- Close the valve in the suction pipe, if necessary
- Allow the pressure to escape from the pump
- Close the inlet for the sealing liquid



CAUTION

If there is a danger of the pump liquid freezing, the pump and pipe should be emptied!

7.9 Operating malfunctions and troubleshooting

Malfunction	Possible cause	Remedy
Pump is not pumping medium	Insufficient pre-filling of pump Steam bubbles forming in suction pipe (NPSH _{plant})	Repeat pre-filling of the pump and suction pipe
	Pressure difference between inlet pressure and steam pressure is too low	Check the suction pipe
	Air entering the suction pipe, suction port or shaft seal	Check the suction pipe and the shaft seal
	Suction pipe, suction valve or impeller are clogged	Check the suction pipe and the entire pump for clogging
	Speed too low	Check the speed requirements
	Flow resistance in the pipe is greater than the delivery head generated at the pump	Check the resistance in the pipe
Insufficient delivery head	Unexpected air/gas content in pumping medium	Contact ANDRITZ for further instructions
	Unexpectedly high viscosity in the medium	Contact ANDRITZ for further instructions
	Suction pipe, suction valve or impeller are clogged	Check the suction pipe and the entire pump for clogging
	Speed too low	Check the speed requirements
	Wrong direction of rotation	Change sense of rotation of the motor
	Flow resistance in the pipe is greater than the delivery head generated at the pump	Check and minimize the pipe resistance
	Pump parts coming into contact with pressure are worn, damaged or clogged	Check the pump and change any worn or damaged parts if necessary
	Delivery-side valve partly open or closed	Open valve

Tab. 7-3 Operating malfunctions and troubleshooting

Malfunction	Possible cause	Remedy
Inadequate or irregular flow rate	Steam bubbles forming in the suction pipe	Repeat pre-filling of the pump and suction pipe
	Wrong direction of rotation	Change sense of rotation of the motor
	Net positive suction height (NPSH _{plant}) is too low	Check whether the suction valve is fully open and the suction pipe clear
	Pressure difference between NPSH _{plant} and NPSH _{pump} is too low	Check the suction pipe
	Air inlet in the suction pipe, suction port or shaft seal	Check the suction pipe and the shaft seal
	Unexpected air/gas content in pumping medium	Contact ANDRITZ for further instructions
	Unexpectedly high viscosity in the medium	Contact ANDRITZ for further instructions
	Suction pipe, suction valve or impeller are clogged	Check the suction pipe and the entire pump for clogging
	Flow resistance in the pipe is greater than the delivery head generated at the pump	Check the resistance in the pipe
	Pump parts coming into contact with pressure are worn, damaged or clogged	Check the pump and change any worn or damaged parts if necessary
High power loss	Speed too high	Check the motor speed
	Wrong direction of rotation	Check the sense of rotation of the motor
	Flow resistance in the pipe is greater than the delivery head generated at the pump	Check the resistance in the pipe
	Unexpected specific gravitation in pumping medium	Contact ANDRITZ for further instructions
	Unexpectedly high viscosity in the medium	Contact ANDRITZ for further instructions
	Bent or eccentric pump shaft	Replace the pump shaft and bearing
	Rotating objects or pump parts causing friction in the pump	Disassemble and check the inside of the pump
	Pump parts coming into contact with pressure are worn, damaged or clogged	Check the pump and change any worn or damaged parts if necessary

Tab. 7-3 Operating malfunctions and troubleshooting

Malfunction	Possible cause	Remedy
Excessive noise and/or vibration	Pressure difference between $NPSH_{plant}$ and $NPSH_{pump}$ is too low	Check the suction pipe
	Unexpected air/gas content in pumping medium	Contact ANDRITZ for further instructions
	Air inlet in the suction pipe, suction port or shaft seal	Check the suction pipe and the shaft seal
	Suction pipe, suction valve or impeller are clogged	Check the suction pipe and the entire pump for clogging
	Speed too low	Check the speed requirements
	Flow resistance in the pipe is greater than the delivery head generated at the pump	Check the resistance in the pipe
	The pump flow rate is below the permitted minimum level (cavitation)	Check the requirements of the pump system
	The foundation is too weak	Reinforce the foundation
	Pump is subjected to additional load if the pipe is not adequately supported	Check pipe support
	Pump and motor are not in true alignment	Check pump/motor alignment or re-align
	Broken or eccentric pump shaft	Replace the pump shaft and bearing
	Rotating objects or pump parts causing friction in the pump	Disassemble and check the inside of the pump
	Pump parts coming into contact with pressure are worn damaged or clogged	Check the pump and change any worn or damaged parts if necessary
	Bearing worn or loose	Disassemble the pump and replace the bearings if necessary
	Insufficient or excessive lubrication	Check that pump has appropriate lubrication
Impeller damaged or unbalanced	Disassemble the pump and replace the impeller if necessary	

Tab. 7-3 Operating malfunctions and troubleshooting

Malfunction	Possible cause	Remedy
Excessive wear on bearing	Pump and motor are not in true alignment	Check pump/motor alignment or re-align
	Broken or eccentric pump shaft	Replace the pump shaft and bearing
	Rotating objects or pump parts causing friction in the pump	Disassemble and check the inside of the pump
	Impeller damaged or unbalanced	Disassemble the pump and replace the impeller if necessary
	Insufficient or excessive lubrication	Check that pump has appropriate lubrication
	Bearing not installed properly or dirty	Replace bearing assembly if necessary and check the lubricating system for contamination
Pump overheating/jamming	Delivery-side valve closed	Open valve
	Insufficient pre-filling of pump	Repeat pre-filling of the pump and suction pipe
	Pressure difference between $NPSH_{plant}$ and $NPSH_{pump}$ is too low	Check the suction pipe
	The pump flow rate is below the permitted minimum level (cavitation)	Check the requirements of the pump system
	Pump and motor are not in true alignment	Check pump/motor alignment or re-align
	Bearing worn or loose	Disassemble the pump and replace the bearings if necessary
	Broken or eccentric pump shaft	Replace the pump shaft and bearing
	Impeller damaged or unbalanced	Disassemble the pump and replace the impeller if necessary
	Rotating objects or pump parts causing friction in the pump	Disassemble and check the inside of the pump
	Flow resistance in the pipe is greater than the delivery head generated at the pump	Check and minimize the pipe resistance

Tab. 7-3 Operating malfunctions and troubleshooting

6 MAINTENANCE

8.1 General

This chapter describes the maintenance and upkeep of the ASPV pump, which is the responsibility of the machine/mill operator.

All activities mentioned in this chapter must be performed at the correct time.

The ANDRITZ service department is at your disposal for troubleshooting, as well as for extensive maintenance and repair work. (➔/ASPV PUMP/INTRODUCTION)

Workers trained and authorized by ANDRITZ may also carry out repairs on site after obtaining consent from AAG.

8.2 Safety regulations



DANGER

Disregarding the safety regulations may cause a risk to life and limb.

Disregarding the safety regulations may cause a risk to life and limb and damage to the machine or its components.

All safety instructions in this Chapter must be strictly observed.

General safety Instructions

All applicable accident prevention rules must be observed.

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

Maintenance and upkeep must not be performed when the machine is in operation.

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

Do not step or walk below suspended loads. Standing below suspended loads is dangerous and thus forbidden.

Machine must be thoroughly cleaned before carrying out any maintenance work.

Use only genuine spare parts.

Energy supply

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

- Qualification of assigned personnel** Maintenance and upkeep must be carried out by trained and skilled personnel.
- Work on the electrical equipment must be carried out without exception by skilled electricians.
- Personal protective apparel** The following protective equipment must be worn when carrying out cleaning and maintenance:
- Hard hat
 - Protective gloves
 - Protective shoes
 - Goggles
- Tools** Only use tools of a reputable brand and in good condition for any work performed on the ASPV pump.

8.3 Regular maintenance



CAUTION

Regular monitoring of operations and performance of the ASPV pump will allow the operator to detect any need for maintenance and repairs in good time. This guarantees a high level of efficiency, a trouble-free operating sequence, and minimizes the maintenance costs!

The discharge pressure, flow rate and power consumption should be monitored continuously.

For machines operating continuously (24 hours/day, 7 days/week), a prescheduled maintenance period every two weeks is recommended.

During these periods the machine should be shut down, thoroughly cleaned and checked for wear.

Machines operating less than 24 hours per day should be subjected to these routine checks and cleaned at each stoppage.

General machine Checks

The following checks should be made when the machine is at a standstill:

Component	Checks
Shaft seal	Leaks and wear
Bearing	Lubricant quantity (oil level)
Static seals	Leaks
Coupling	Wear on the coupling pads
Complete pump	Visual check

Tab. 8-1 General machine checks

In the course of general machine checks all additional units should also be checked to guarantee that the entire plant functions satisfactorily. For these checks, the attached manufacturer's maintenance and upkeep instructions must be observed.

➔/FANPUMP/SUPPLIER DOCUMENTATION

Malfunctions and unforeseen modifications found during these checks must be eliminated immediately

Cleaning

Clean the fan by hosing down or brushing when it is at a standstill.



CAUTION

Do not use caustic agents for cleaning.

Make sure no water, steam or other cleaning medium enters electrical plant components.

8.4 Maintenance schedule

In addition to the work outlined below, maintenance and work required for normal operations (→/ASPV PUMP/OPERATION/NORMAL OPERATION) must also be carried out.

Monthly

The following maintenance work is to be carried out at monthly intervals.

Component	Activity
Bearings	<ul style="list-style-type: none"> • Check temperature • Measure vibrations • Oil level Grease level is to be checked • Check for strange noises
Volute casing (upper part – lower part)	<ul style="list-style-type: none"> • Check for corrosion and wear
Shaft with bearing	<ul style="list-style-type: none"> • Check for smooth running
Coupling	<ul style="list-style-type: none"> • Check alignment • Check pads for wear
Stuffing box seal	<ul style="list-style-type: none"> • Check for leaks
Mechanical seal	<ul style="list-style-type: none"> • Check for wear
Pipework	<ul style="list-style-type: none"> • Check for leaks
Complete pump	<ul style="list-style-type: none"> • Check for leaks • Cleaning

Tab. 8-2 Monthly maintenance work

Semi-annually

The following maintenance work is to be carried out at 6-monthly intervals

Component	Activity
Complete pump	<ul style="list-style-type: none"> • Check mounting of pump on the foundation
Motor	<ul style="list-style-type: none"> • Check mounting of motor on the foundation

Tab. 8-3 6-monthly maintenance work

Annually

The following maintenance work is to be carried out at annual intervals.

Component	Activity
Complete pump	<ul style="list-style-type: none"> • Complete service according to instructions from ANDRITZ (Oil change Grease change, impeller check, etc.)

Tab. 8-4 Annual maintenance work

8.5 Fasteners

Screw material Bolts and screws are manufactured in several classes of material. The heads of these screws and bolts are marked to identify the strength class of the screw or bolt. Damaged or lost fasteners should only be replaced with fasteners of the same material.

Check Unless they are suitably tightened, screws can work loose or fail under operating conditions. In the course of maintenance work, all fastening screws must be checked.

- During the first six months: every 2 to 2¹/₂ months
- After the first six months: semi-annually

Tighten During checks and maintenance work it is imperative to tighten all fastening screws to the torque specified for each screw in the drawings or in the table below.

Prestressing forces and tightening torques in the table apply to normal screw connections. Please contact ANDRITZ in the event of special requirements.

The thread and screw head should be lubricated with an appropriate lubricant (for example Molyslide Plus from Loctite).

Class (Mat.no.)		Pre-stressing forces (kN)						Tightening torques (Nm)					
		5.6	8.8	A4-50	A4-70	A4-80	C3-80	5.6	8.8	A4-50	A4-70	A4-80	C3-80
Thread	M10	12	26	9	18	24	26	20	42	16	34	45	42
	M12	18	38	12	27	35	38	34	73	27	59	78	73
	M16	33	70	23	49	66	70	83	177	67	143	190	177
	M20	51	110	36	77	103	110	163	347	130	279	373	347
	M24	74	158	52	111	148	158	280	598	225	481	642	598
	M30	118	251	82	-	-	251	559	1.193	449	-	-	1.193
	M36	172	366	120	-	-	366	970	2.070	780	-	-	2.070
	M42	235	502	-	-	-	502	1.548	3.301	-	-	-	3.301
	M48	309	660	-	-	-	660	2.333	4.978	-	-	-	4.978

Tab. 8-5 Tightening Torques and Pre-stressing Forces for Rigid Screws (Normal thread)



CAUTION

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

The above pre-stressing forces and tightening torques must be observed.

8.6 Grease Lubrication



WARNING

The bearings are filled with grease during works assembly.

The bearings should be topped up with approx. 10 g of grease before being put into operation.

Grease types

The following lubricating greases should be used for operating conditions at which the surface temperature of the bearing housing is less than +80°C.

- EXXON Beacon 2
- SHELL Alvania R3
- SHELL Alvania G3
- SKF LGMT2
- FAG Arcanol L71V



WARNING

If the surface temperature of the bearing housing rises above +80°C ANDRITZ should be consulted.

Lubrication

The bearings for the ASPV pump should be re-greased according to the following table.

Pump type	Lubricating point	First filling	Relubricate	Lubricating interval at 1000 rpm
		Per bearing housing		
ASPV350-680R	Bearing	240	80	3000

Tab. 8-6 Lubrication schedule



CAUTION

Bearing damage may be caused by incorrect lubrication.

Different grades of greases should not be mixed.

Grease change

The old grease should be cleaned off the bearing housing each time the rotor unit is removed (annual service). After re-assembly the bearing should be given a filling of fresh grease.

The grease in the bearings is to be changed according to the following table.

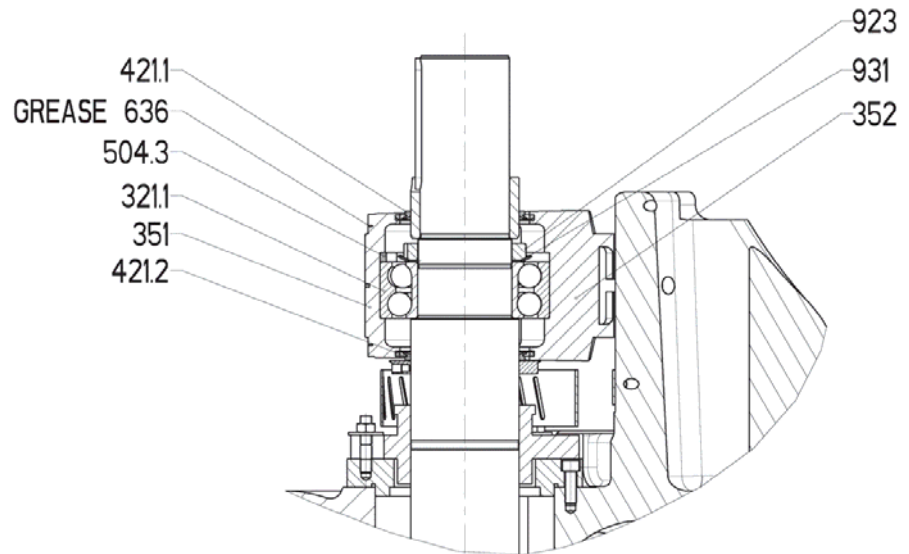


Fig. 8-2 Grease lubricating at the bearing

Step	Activity
1	Remove top section of bearing housing (352)
2	Remove the left and right bearing cover(421.1, 421.2)
3	Remove grease from the bottom section of the bearing housing (351).
4	Re-assemble bearing in reverse order.
5	Top up grease according to Tab. 8-9 at the grease nipple (636).

Tab. 8-7 Grease change

8.7 Aliging the coupling

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

- In particular:
- After mounting and before grouting in the pump
- After grouting in
- After installing the pipework
- After the trial run with water

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

Aligning tolerances Permitted tolerances

➔/ASPV PUMP/SUPPLIER DOCUMENTATION/COUPLING

8.8 Removing and installing the rotor unit

Preparations

The following parts must be prepared before starting to disassemble the rotor unit:

- Tools
- Lifting gear
- Belts, ropes
- Replacement parts

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

Complete the following work before starting to remove the unit itself :

Step	Activity
1	Switch off pump and secure against being switched on again.
2	Remove the hoses leading to the shaft seal.
3	Remove coupling guard (681), cap (683) and covers (683.1).
4	Remove the intermediate coupling piece after loosening the screws.
5	Drain oil out of bearing housings.



DANGER

Limbs can be trapped or crushed during disassembly work.

Wear your personal protective apparel.

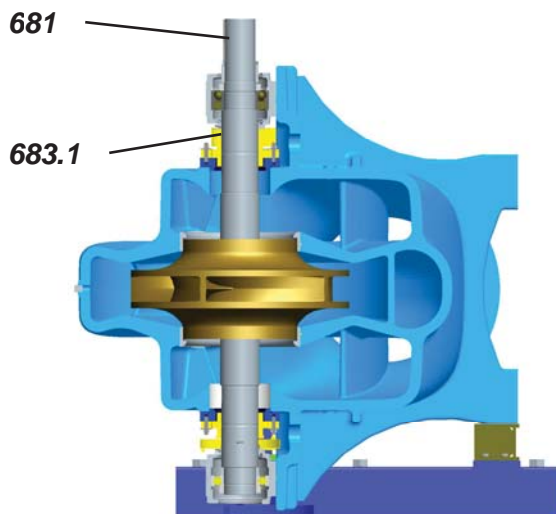


Fig. 8-3 Safety covers

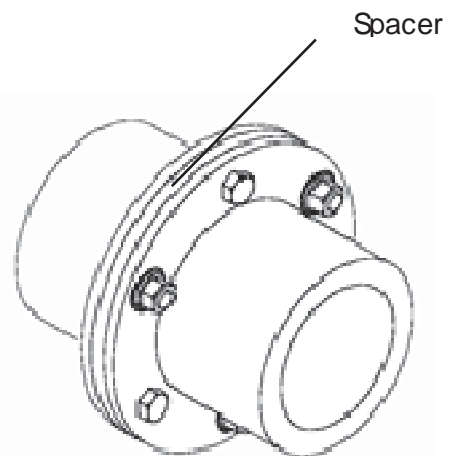


Fig. 8-4 Coupling

Removing the pump unit

Remove the motor and the pump unit according to the following table:

Step	Activity
1	Loosen the screws between the base frame to the pump unit .Lift the pump unit according to Fig. 8-6 and keep the pump unit horizontal according to Fig. 8-7

Tab. 8-8 Removing the motor and the pump unit

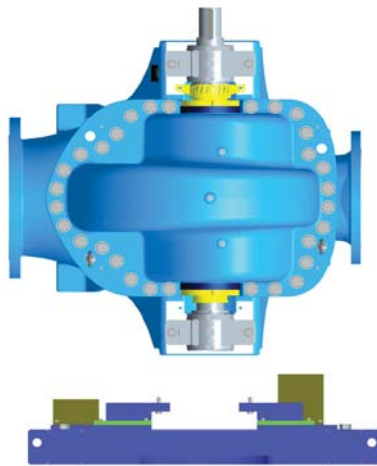


Fig. 8-5 Removing the pump unit



Fig. 8-6 Lift the pump unit

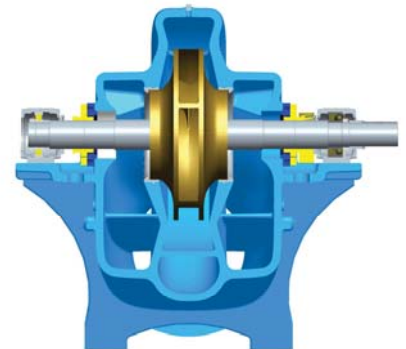


Fig. 8-7 keep the pump unit horizontal

Removing the volute casing upper part

Remove the upper part of pump according to the following table:

Step	Activity
1	Loosen the screws (901.2) at the stuffing box gland (452)
2	Loosen hexagon nuts (920.1) at the upper part of the volute casing (102.2), remove the taper pins (560.1) and raise the upper part of the volute casing. Raise the upper part of the volute casing according to Fig. 8-5.

Tab. 8-9 Removing the volute casing upper part

Removing the rotor unit

The rotor unit comprises the impeller (232), the shaft (211), the bearings, and the sealing units.

Remove the rotor unit according to the following table: The activities listed in the table are to be carried out on both sides of the pump.

Step	Activity
1	Loosen the screws (902.3) at the stuffing box gland (452)
2	Loosen hexagon nuts (920.1) at the upper part of the volute casing (102.2), remove the taper pins (560.1) and raise the upper part of the volute casing. Raise the upper part of the volute casing according to Fig. 8-5.
3	Loosen hexagon nuts (920.2) at the upper part of the bearing casing (352), remove the taper pins (560.4) and raise the upper part of the bearing casing.
4	Lift the rotor unit out of the lower part of the volute casing according to Fig. 8-7 and place on a suitable support (wooden).
5	Dismantle the coupling according to the instructions issued by the coupling manufacturer. →/ASPPUMP/SUPPLIER DOCUMENTATION/COUPLING

Tab. 8-10 Removing the rotor unit

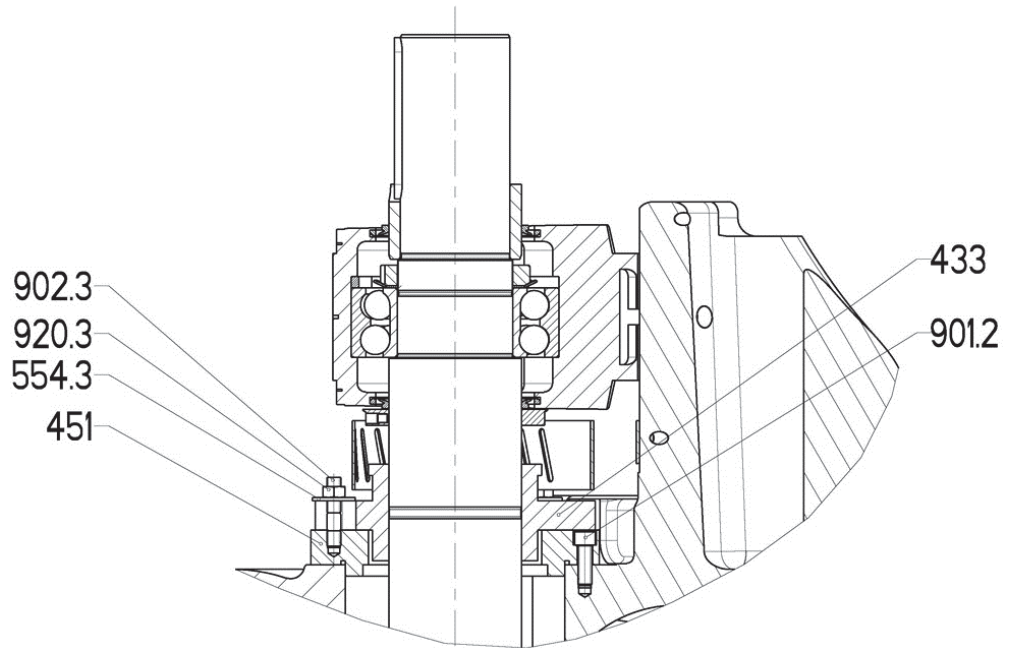


Fig. 8-8 Removing the mechanical seal screws

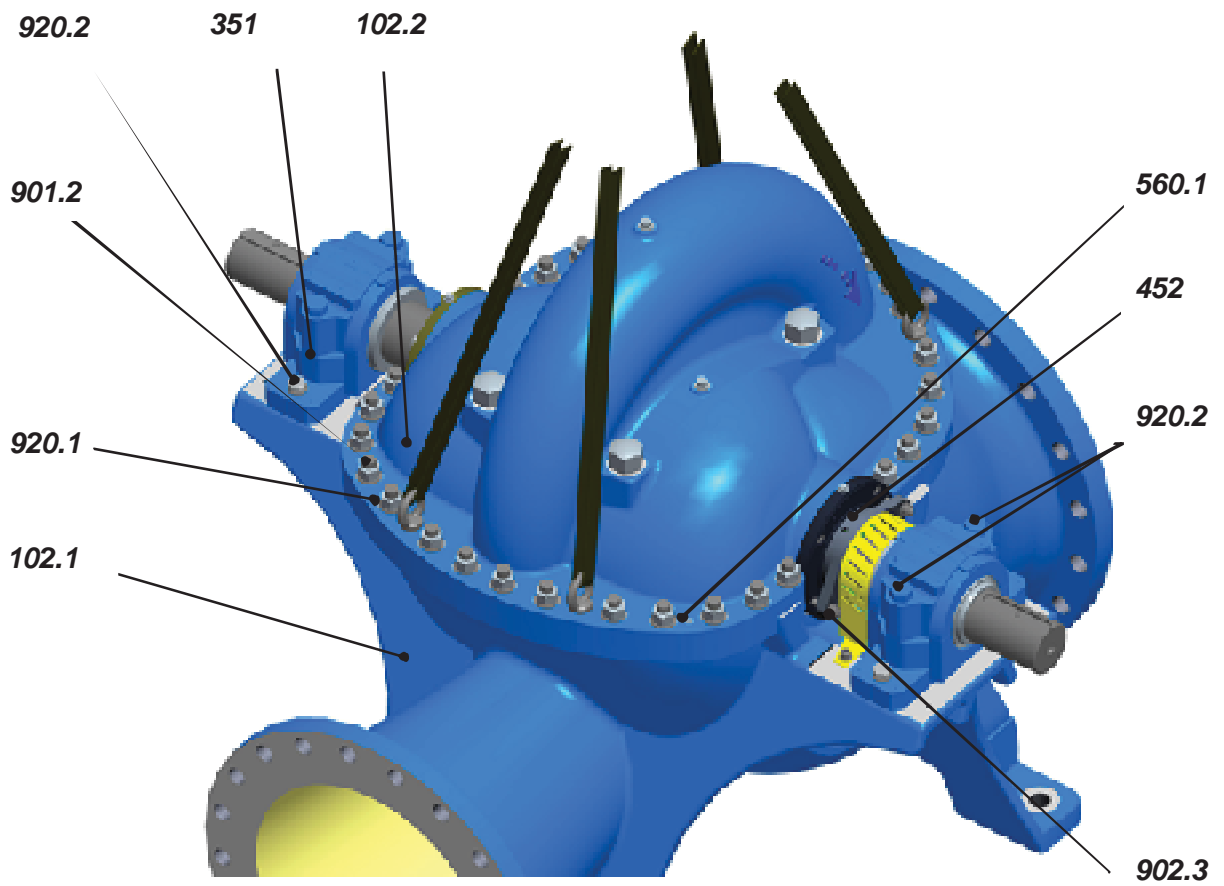


Fig. 8-9 Removing the volute casing

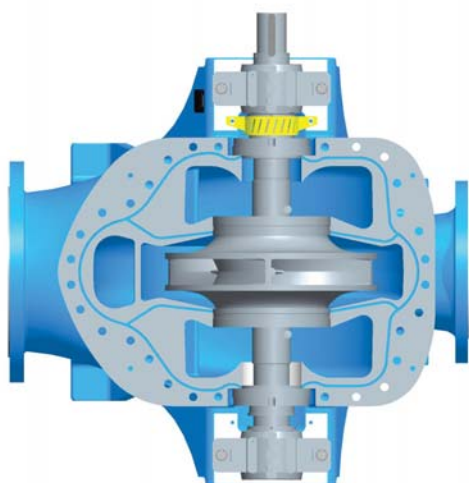


Fig. 8-10 Volute casing seal – partial surface

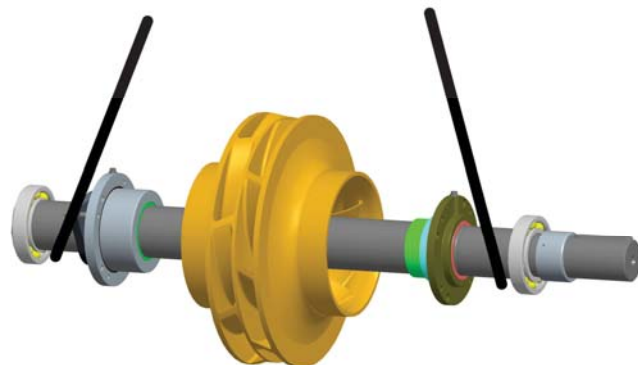


Fig. 8-11 Lifting the rotor unit

Installation of the rotor unit

Proceed according to the following table when installing the rotor unit

Step	Activity
1	Replace O-rings (412.6) in the retaining ring and lift the rotor unit into the lower part of the volute casing (102.1) according to Fig. 8-7.
2	Ensure that all loose parts fit into the positions where they belong. The bore holes in the wear rings (502) must fit exactly over the hexagon socket head cap screws in the lower part of the volute casing (anti-torsion device for the wear rings).
3	Clean the sealing surfaces of the bearing housing (upper and lower part) and seal with surface seal (400.2).
4	Raise upper part of bearing housing (352), insert taper pins (560.4) and screw onto the lower part of the bearing housing with the hexagon nuts (920.2).
5	Sealing surfaces of the volute casing (upper and lower part) are to be cleaned.
6	APTFE surface seal is to be applied to the contact surfaces of the lower part of the volute casing (102.1) according to Fig. 8-6. Seal type: GORE-TEX, DEO6 3.2 x 0.7 Fig. 8-6 should also be sealed with a surface seal (400.1 – Loctite 510).
7	Mount the upper part of the volute casing (102.2) carefully with the taper pins (560.1) inserted. (The taper pins are intended as a guide).
8	Tighten hexagon nuts (920.1) of the volute casing upper part (102.2) alternately. ➔ See Tab. 8-5 f for tightening torques.
9	Assemble the coupling according to the instructions issued by the coupling manufacturer. ➔ /SmartFlow PUMP/SUPPLIER DOCUMENTATION/COUPLING

Tab. 8-11 Installing the rotor unit

After installing the rotor unit as described above, the activities listed in Tab.8-11 should be carried out in reverse order.

8.9 Changing the bearing assembly

In order to avoid damage to the bearing it is essential to observe the lubrication intervals indicated in section 8.6 – Lubrication, as well as to use the recommended oils lubricating greases.



DANGER

Limbs can be trapped or crushed during installation work.

Wear your personal protective apparel.

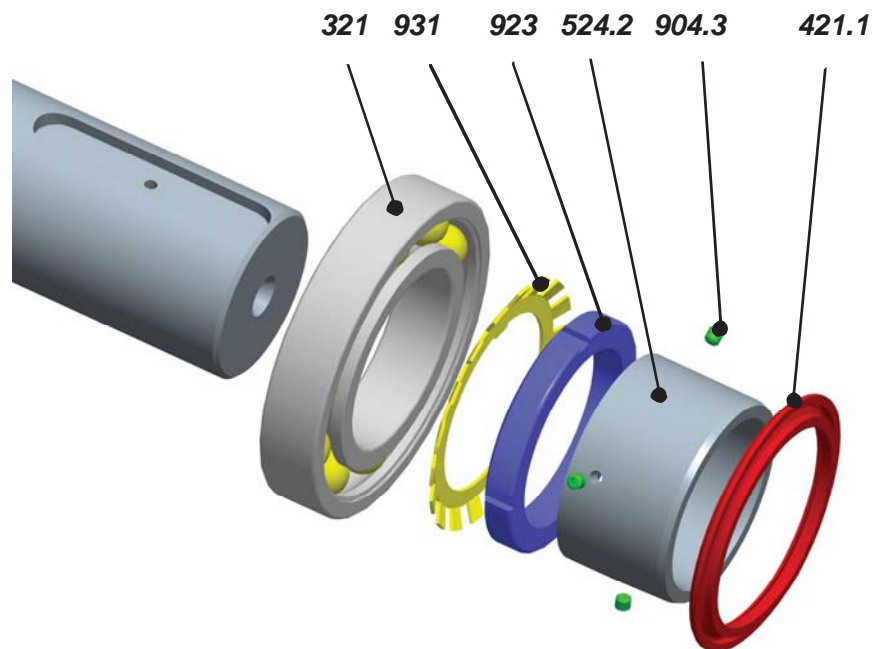


Fig. 8-12 Bearing

Removing the bearing

Proceed according to the following table when changing the antifriction bearing:

Step	Procedure
1	Remove rotor unit as per section 8.8.
2	Remove the feather key (940.2).
3	Remove the fastening screw (904.2) for the sleeve (524.2).
4	Pull off the sleeve (524.2) with the O-ring (412.3) and the rotary shaft seal (421).
5	Loosen the fastening screw (904.4) and push the splash ring (507) towards the center of the shaft.
6	Bend the safety catch on the locking plate (931) out of the groove in the lock nut (923).
7	Remove the lock nut (923) and take the lock washer (931) off the shaft.
8	Pull the ball bearing (321) off the shaft with a stripping device. CAUTION: Do not position the stripping device at the outer bearing race.
9	Take off the ring (504.2) and pull off the bearing cover (360.2, 360.1) with the rotary shaft seal (421).

Tab. 8-12 Removing the bearing

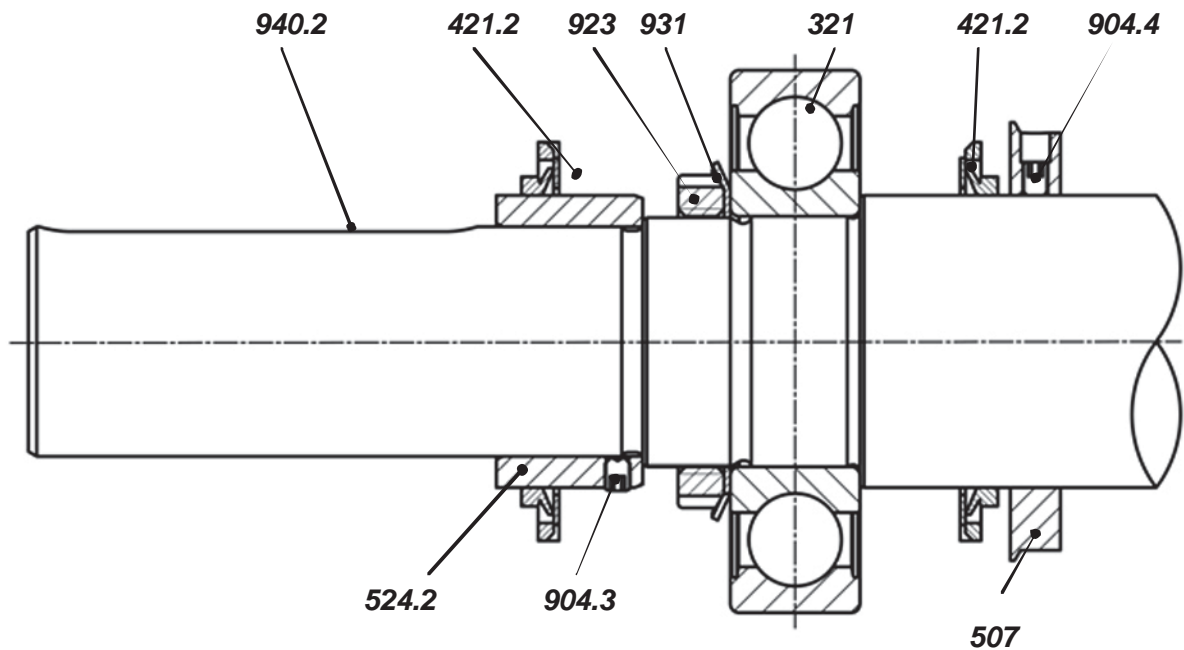


Fig. 8-13 Loose bearing

Installing the bearing Proceed according to the following table when installing the antifriction bearing:

Step	Procedure
1	Loosen the fastening screw (904.4) for the splash ring (507) and push the splash ring towards the center of the shaft.
2	Push on the bearing cover (360.1, 360.2) with the new rotary shaft seal (421) up to the splash ring.
3	Replace ball bearing (321) .
4	Heat the ball bearings (321) according to the instructions from the bearing manufacturer (approx. 80°C) and push onto the shaft as far as the ring (504.2) .
5	Mount the lock nut (923) with the lockwasher (931) and tighten (by turning to the right).
6	Bend the safety catch on the locking plate (931) into the groove in the lock nut (923) .
7	Pull on the sleeve (524.2) using the O-ring (412.3) coated with silicone grease until it is resting on the shoulder of the shaft.
8	Tighten the fastening screw (904.2) for the sleeve (524.2) .
9	Mount the feather key (940.2) .
1	Install rotor unit as per section 8.8. After installing the rotor unit, the splash ring (507) must be tightened so that it has 3 mm clearance to the bearing cover. Caution: On the fixed bearing side, the fixed ring (504.1) is to be installed in the bearing housing.

Tab. 8-13 Mounting the antifriction Bearing

8.10 Changing the mechanical seal

Changing

Change the mechanical seal according to the following table:

Step	Procedure
1	Remove rotor unit as per section 8.8.
2	Remove bearing as per section 8.9.
3	Remove splash ring (507).
4	remove the retaining ring (506).
5	Change mechanical seals (433) and O-rings (412.6). CAUTION: The seal must be installed and removed according to the enclosed instructions from the manufacturer. See → /ASP PUMP/SUPPLIER DOCUMENTATION/ MECHANICAL SEAL
6	Re-assemble in reverse order.

Tab. 8-14 Changing the mechanical seal

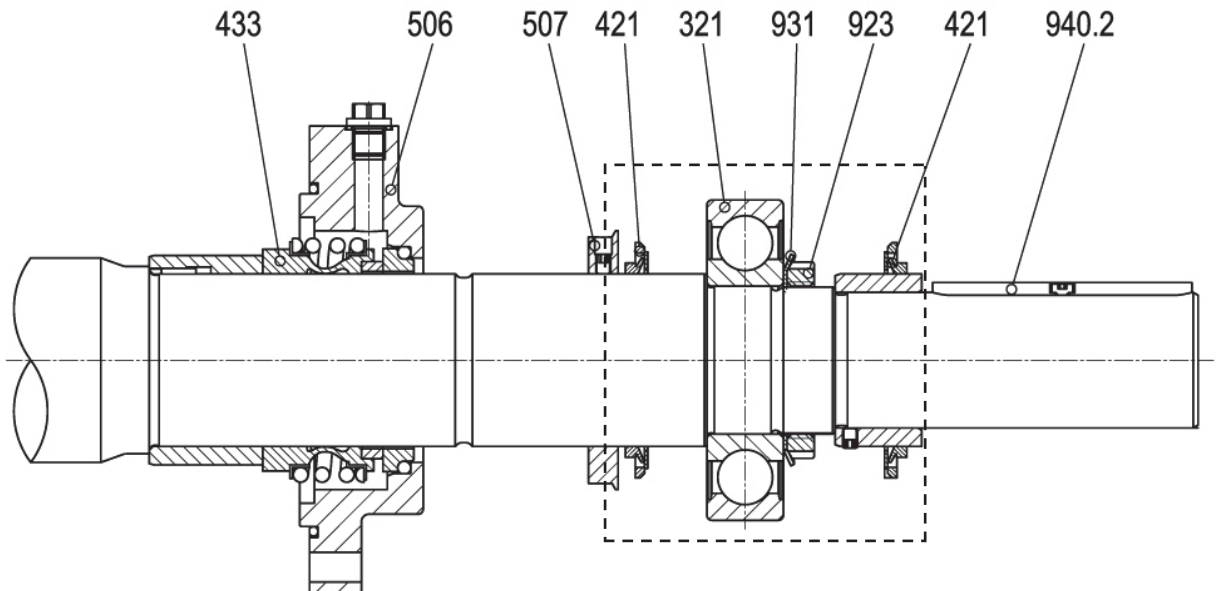


Fig. 8-15 Mechanical seal



DANGER

Limbs can be jammed or crushed during installation work.

Wear your personal protective apparel.

8.11 Removing and installing the impeller



DANGER

Limbs can be trapped or crushed during disassembly work.

Do not touch the shaft with your hands while pushing the impeller off!



DANGER

Injury at the impeller!

Impellers may have very sharp edges, particularly when they are worn.

Wear protective clothing and gloves!



Use a hydraulic pump that can build up a pressure of at least 700 bar to push the impeller off. (PA-133, THAP-150 from SKF).



DANGER

Beware of high pressure in the hydraulic system!

Hydraulic pumps and pipes are under high pressure.

Wear your personal protective apparel!

Always make sure that the connections and joints are in perfect condition!

Pushing off the impeller

Proceed according to the following table when pushing the impeller off:

Step	Activity
1	Remove both wear rings (502) from the impeller.
2	Turn hexagon socket pipe plug (903.1) out of the impeller (232).
3	<p>i Raise the pump shaft on one side and fill the parting liquid slowly into the tap bore hole.</p> <p>Use parting liquid with a viscosity of 900 cST at 20°C (LHDF 900 from SKF) or a comparable grade.</p>
4	Connect hydraulic pump (A) to the oil inlet opening.
5	Apply pressure to the hydraulic pump until the impeller (232) comes away from the shaft. Pull impeller (232) off the shaft.

Tab.8-15 Pushing the impeller off

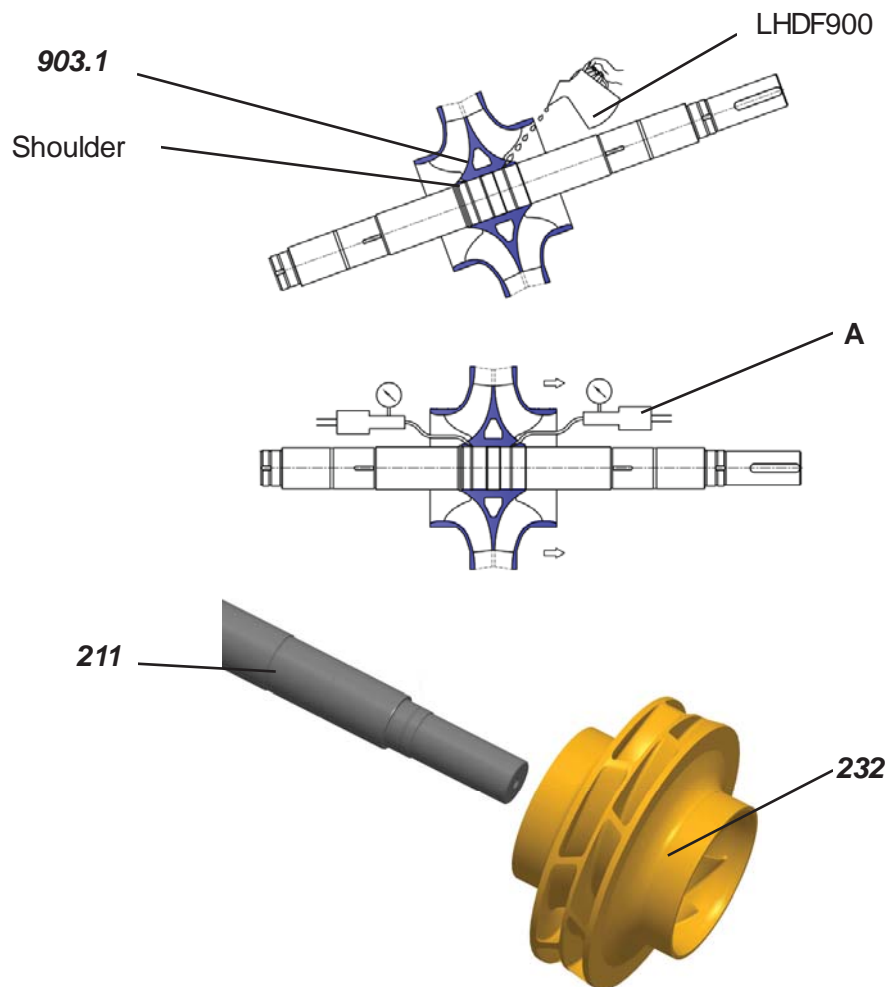


Fig. 8-16 Pushing the impeller off

Installation of the Impeller

Preliminary requirements:

- Clean room with no draft, temperature +20° C
- Lifting device, e.g. crane, for manipulating the shaft
- Ring bolt for manipulating the shaft
- Liquid Nitrogen, cooling container, for cooling the shaft
- Pump shaft and impeller halves comply with the requirements in relation to measuring accuracy, roundness and true running.

Step	Activity
1	Clean pump shaft and impeller, particularly the fitting surfaces of the impeller hub and the pump shaft.
2	Move the pump shaft into the cooling container, inject liquid Nitrogen into the container, cooling the shaft, takes about 20-30 minutes.
3	Place the impeller on the workbench, adjust to make the impeller hole in vertical direction
4	Pull the shaft out and measure the shaft diameter where match the impeller, to make sure can be go through the impeller hub bore hole.
5	Move the pump shaft into position above the hub bore hole in the impeller using a lifting device.
6	Lower the pump shaft rapidly into the impeller hubs until its shoulder is resting on the impeller hub.
7	Wait until the components come to ambient temperature.
8	turn one hexagon socket pipe plug (903.1) into each impeller half, Grind off plug head flush with the flow surface of the impeller.

Tab. 8-16 Installation of the impeller



WARNING

Low temperatures occur during this work.

Liquid Nitrogen can lead to frostbite dangerous.

Personal protective clothing must be worn!



Fig. 8-17 Installation of the impeller

8.12.2 Impeller with key connection remove and install

Pushing off the impeller

Proceed according to the following table when pushing the impeller off:

Step	Activity
1	Remove both wear rings (502) from the impeller.
2	Flatten the impeller locking gasket (233.2) in the impeller locking nut (233.1)
3	Remove both the impeller locking nut (233.1) from the impeller.
4	Remove both the impeller locking gasket (233.2) from the impeller.
6	Then pull off the impeller (232) from the shaft.

Tab.8-17 Pushing the impeller off

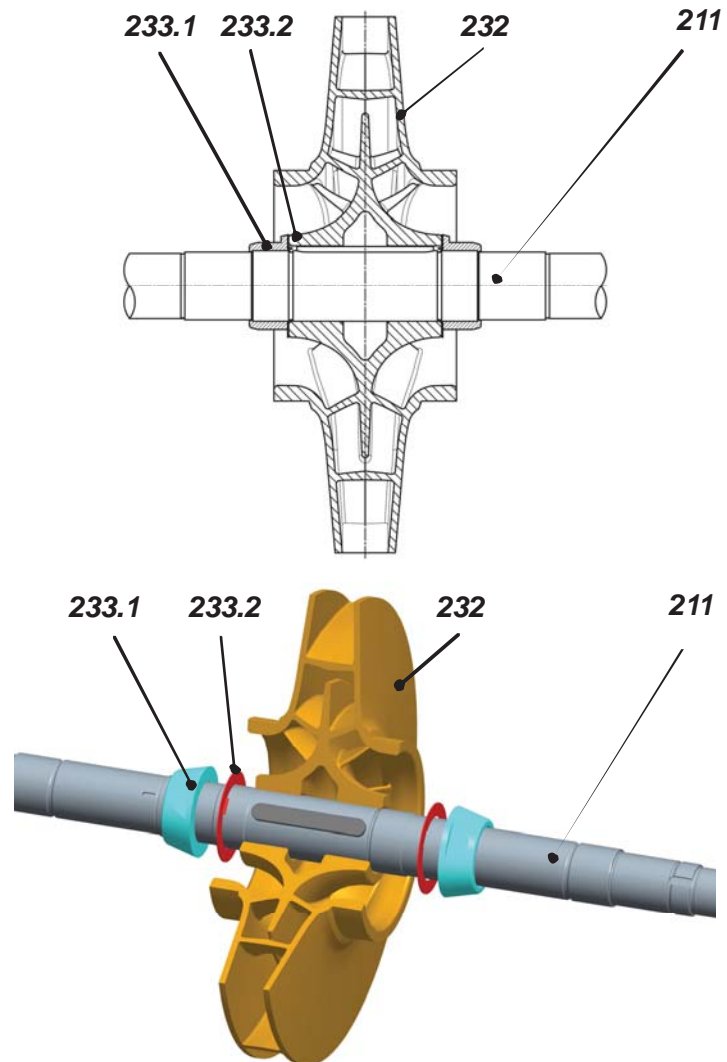


Fig. 8-14 Pushing the impeller off

**Installation
of the
Impeller**

Preliminary requirements:

Step	Activity
1	Place the key (940.3) on the pump shaft.
7	assemble the shaft with the impeller and adjust to the middle position of the shaft
8	assemble the impeller locking gasket and to prevent rotation by the key slot
10	assemble the impeller locking nut and micro-adjusted to the middle position of the impeller, and then tighten the impeller locking nut.

Tab. 8-18 Installation of the impeller

8.12 Turning and balancing the impeller

Turning the Impeller

The impellers are manufactured in standard diameters at intervals of 5 mm.



Since the output (characteristic curve) of the pump depends on the diameter of the impeller, the characteristic curve for the appropriate impeller diameter is shown in the performance diagram.

The performance diagram also indicates the number of blades and the outlet width.

- The turned diameter D_2 is calculated from the performance characteristics, see →/ASPV PUMP/TECHNICAL DATA
- The turning angle always measures 5.63° .

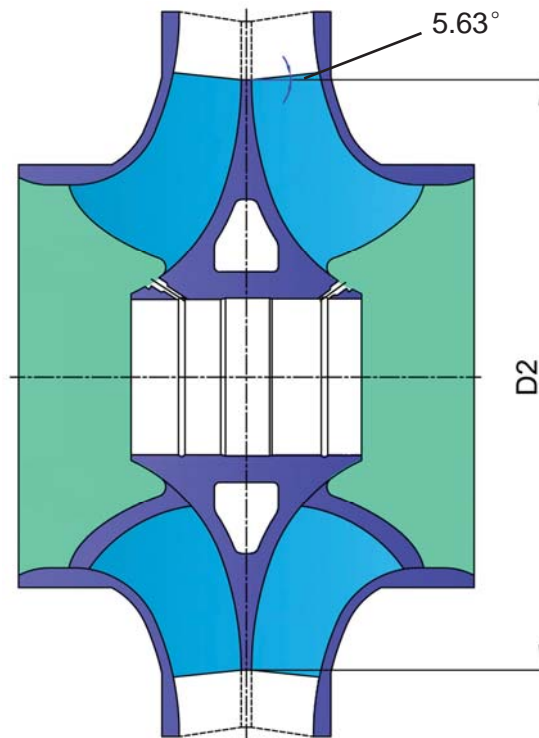


Fig. 8-18 Turning the impeller

Balancing the pump shaft with impeller

All impellers must be balanced dynamically together with the shafts and shaft protection sleeves according to ISO 1904/1 G6.3.

Proceed according to the following table when balancing the impeller:

Step	Activity
1	Clean all contact surfaces of the pump shaft carefully with the balancing machine.
2	Insert steel fillers in the feather key grooves and secure adequately. Always take account of the centrifugal forces arising!
3	Balance the pump shaft with impeller dynamically according to ISO 1904/1, Chapter 7.3.2.3.

Tab. 8-20 Balancing the pump shaft with impeller



CAUTION

If it is necessary to machine the impeller after it has been mounted on the pump shaft, ensure that neither the pump shaft is damaged, nor the impeller distorted.

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