

Ws+

CENTRIFUGAL PUMP

FORM NO.: L453261UK

REVISION: 01/2013

READ AND UNDERSTAND THIS MANUAL PRIOR TO OPERATING OR SERVICING THIS PRODUCT.



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Spare parts, see separate spare parts list

1. General description

This operating manual should be read carefully by the competent operating and maintenance personnel.

We point out that we will not accept any liability for damage or malfunctions resulting from the non-compliance with this operating manual.

Descriptions and data given herein are subject to technical changes.

1.1 Intended Use

The centrifugal pump Ws+ is exclusively intended for pumping liquids, especially in beverage and food installations.

Its use is permissible only within the admissible pressure and temperature margins and under consideration of chemical and corrosive influences.

Any use exceeding the margins and specifications set forth is considered to be not intended.

Any damage resulting therefrom is not within the responsibility of the manufacturer.

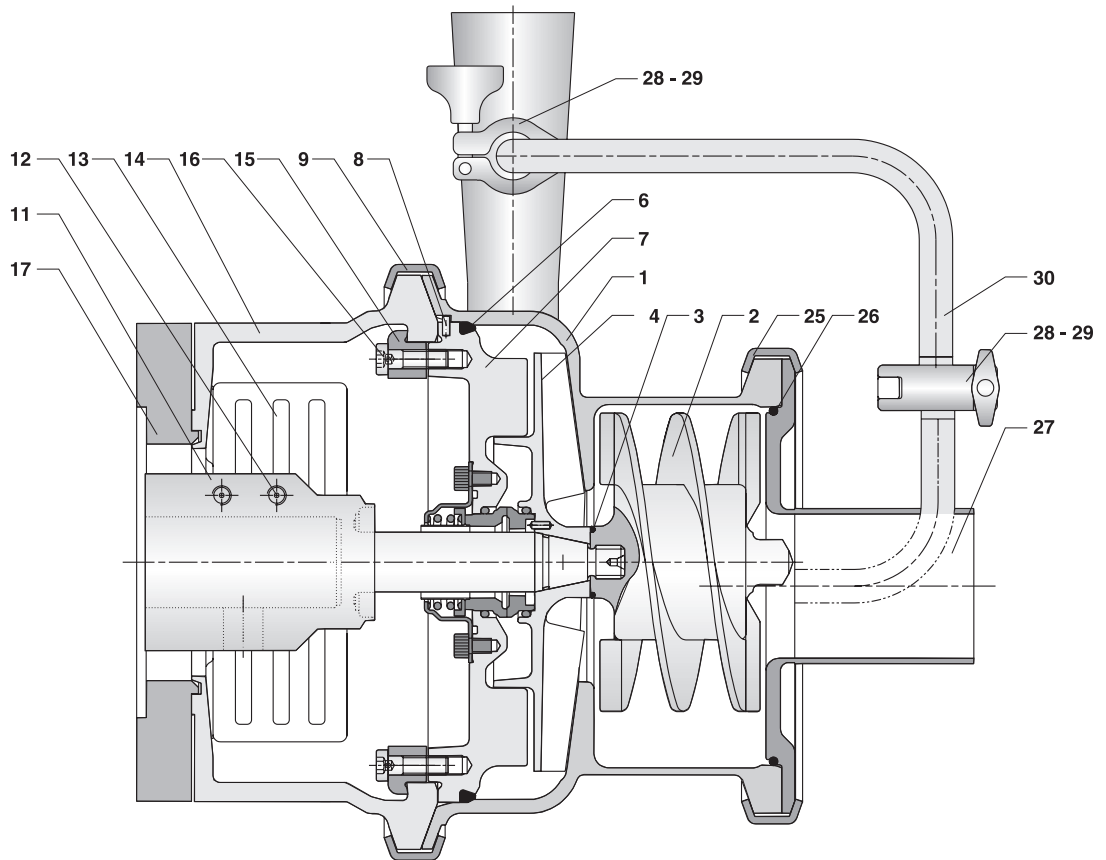
The user will bear the full risk.

**Caution!**

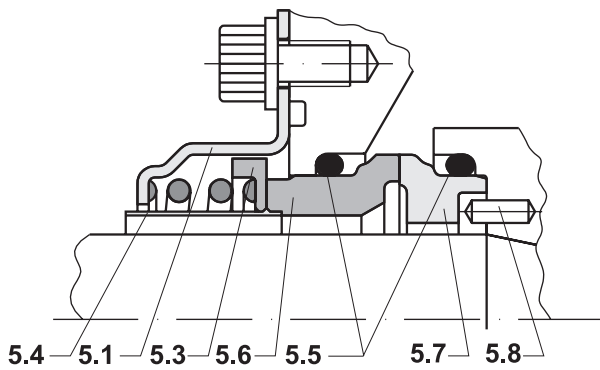
Improper use of the pump leads to:

- damage
- leakage
- destruction.
- Failures in the production process are possible.

2. Sectional drawing

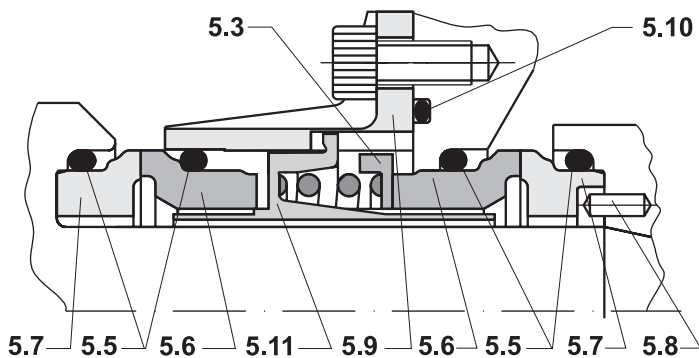


Section 1
Shaft size $\varnothing 25$ and $\varnothing 35$



- | | |
|----------------|-----------------------|
| 1 pump housing | 14 extension frame |
| 2 air screw | 15 bracket |
| 3 o-ring | 16 screw |
| 4 impeller | 17 spacer flange |
| 6 o-ring | 25 clamp ring |
| 7 back plate | 26 o-ring |
| 8 pin | 27 front cover |
| 9 clamp ring | 28 clamp ring |
| 11 shaft | 29 gasket |
| 12 screw | 30 recirculation pipe |
| 13 shaft guard | |

Section 2
Shaft size $\varnothing 25$ and $\varnothing 35$



Section 1: Single mechanical shaft seal
Section 2: Double mechanical shaft seal

- | |
|------------------------------|
| 5.1 fixing kit – single seal |
| 5.3 pressure ring |
| 5.4 drain pipe |
| 5.5 o-ring |
| 5.6 stationary seal face |
| 5.7 rotary seal face |
| 5.8 pin |
| 5.9 fixing kit – double seal |
| 5.10 o-ring |
| 5.11 pressure ring |

3. Warnings



1. Read through the instructions before installing the pump and starting it up. If in doubt, contact your local SPX Flow Technology representative.
2. Check that the specifications of the motor and motor control unit are correct. This applies in particular for applications with risk of explosion.
3. Do not start the pump before all pipe connections have been fitted carefully and tightened, especially the pumps with clamp rings which are secured with wing nuts, i.e. the connections at the recirculation pipe and (if existent) at the pump in- and outlet. Special precautions must be taken when the pump is used to pump hot and/or hazardous liquids. In such cases follow the local regulations for personal safety when working with these products.
4. Do not start the pump before the motor shroud or shaft guard has been securely fitted.
5. The pump contains rotating parts. Never put your hands, fingers or objects into a pump while it is in operation.
6. Never touch the shroud during operation, as it can become very hot.
7. Never touch the pump body during operation if the pump is being used for hot media where there is the risk of burning.
8. Never close both the intake and outlet valve of the pump while it is in operation. If the pump runs with liquid in it without circulation, the liquid will heat up and may turn into vapour, causing the risk of explosion.
9. Always remove all assembly and auxiliary tools from the pump before starting it up.
10. Never hose down or clean the electric motor directly with water or cleaning fluid.
11. Never lift the pump at the shroud, as it is not designed to carry the weight of the motor. Remove the shroud before lifting the pump. Always use securely fitted lifting straps when lifting with a crane or similar lifting gear.
12. Never dismantle the pump before the motor has been disconnected from the power supply. Remove the fuses and disconnect the cable from the motor terminal box.
13. All electrical installations must be carried out by qualified personnel.
14. Never dismantle the pump until the pipe system has been drained. Remember that liquid will always collect in the pump body. If the pump is to be used for hot and/or hazardous liquids, special precautions must be taken. In such cases follow the local regulations for personal safety when working with these products.

3. Warnings

15. The following values specified for the permissible pressure must not be exceeded:

Ws+20/15: Max. 6 bar

Ws+30/30: Max. 8 bar

Ws+44/50: Max. 13 bar

It is important to remember that the values for the maximum outlet pressure apply to water at a temperature of 20 °C.

16. The risk of unauthorized tampering or inadvertent loosening by untrained personnel of the clamp rings with wing nuts (see para. 6) should be assessed and obviated.

4. Introduction

4.1 The Ws+ range

This manual covers the standard versions of the Ws+ pump which is supplied with pre-fitted recirculation connection, and a simplified version which has no recirculation.

4.2 Selection of the standard or simplified pump

1. The standard Ws+ pump should be installed as a normal liquid ring pump, i.e. with a “swan neck” (two x 90° bends) on the inlet and a length of vertical pipe on the outlet (see length H on the next page).
2. However, in many CIP pump applications it is possible with the Ws+ pump to simplify the pipe layout and bring the inlet pipe direct (horizontally) to the pump inlet and to eliminate the recirculation connection. For the pump to function in this manner there is one condition for the inlet pipework which must be fulfilled, see Section 4.2. If in doubt, the standard Ws+ with swan neck and recirculation connection must be used.

4.3 The Ws+ pump, options and extras

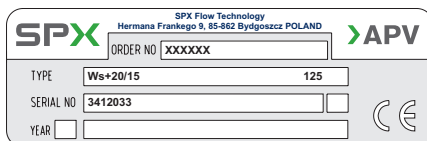
The following standard options are available in the Ws+ range:

- polished to 3A requirements
- with or without shroud
- with frame and adjustable feet or fixed bracket
- with shaft seal in carbon/SiC or SiC/SiC
- with O-rings in EPDM or FPM (Viton)
- with single-acting shaft seal or double-acting shaft seal prepared for water-flushed shaft seal
- with US motor instead of IEC

Extras:

- drain valve
- pump trolley
- Ws+ pumps can be supplied with all standard connections such as unions, clamp rings or flanges.

Fig. 1



SPX Flow Technology Hermans Franko 9, 85-882 Bydgoszcz POLAND		APV
ORDER NO	XXXXXX	
TYPE	Ws+20/15	125
SERIAL NO	3412033	
YEAR		

4.4 Identifying the pump model

A nameplate as shown in Fig. 1 is fitted on the extension frame.

Example:

Type Ws+20/15: indicates pump model, here Ws+20/15
125: Indicates diameter of impeller.

Serial No.: The “unique” serial number of the pump.

Order No.: SPX FT order number.

Year: indicates the year of manufacture.

The vacant field can be used to identify the pump in terms of its position in the plant.

4. Introduction

Fig. 2

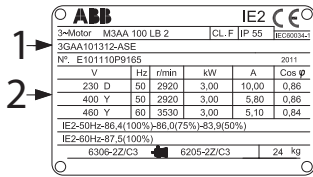


ABB		IE2		CE	
3-Motor M3AA 100 LB 2		CL.F	IP 55	IEC60335	
3GAA101312-ASE					
N°: E101110P9165 2011					
V	f Hz	n/min	kW	A	cos φ
230 D	50	2920	3,00	10,00	0,86
400 Y	50	2920	3,00	5,80	0,86
460 Y	60	3530	3,00	5,10	0,84
IE2-50Hz-86,4(100%)-86,0(75%)-83,9(50%)					
IE2-60Hz-87,5(100%)					
6306-2Z/C3		6205-2Z/C3		24 kg	

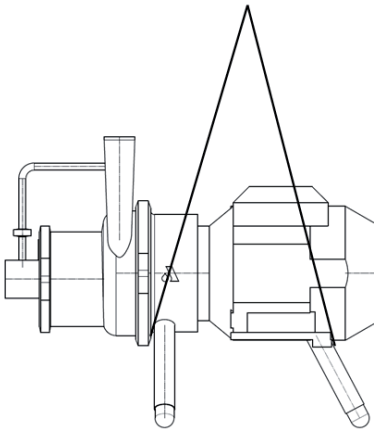
4.5 Identifying the motor model

The motor is equipped with a data label, see Fig. 2. The label indicates the motor type and overall height (pos. 1), motor capacity (kW) (pos.2) and speed.

4.6 Special note

The Ws+ pump is designed to run at 2-pole speeds (i.e. 3000/3600 rpm). Attempts to run at 4-pole speeds (1500/1800 rpm) results in very poor suction performance.

Fig. 3



4.7 Handling and Transport

Act with caution when lifting the pump. All parts with a weight of more than 20 kg must be handled with a suitable hoisting device. Use a crane, fork-lift truck or another suitable hoisting device, always together with 2 lifting ropes (Fig. 3).

Place the hoisting belts around the rear part of the motor and around the extension frame. Take care that the belts are evenly loaded when the pump is lifted.

Caution!

Always use 2 hoisting belts and never fasten them at the front pump body.

4.8 Weights

Pump type	Motor size					
	90	100	112	132	160	180
	1,5 kW 2,2 kW	3,0 kW	4,0 kW	5,5 kW 7,5 kW	11,0 kW 15,0 kW 18,5 kW	22,0 kW 30,0 kW
Ws+20/15	37 39	51	57	74 88	-----	-----
Ws+30/30	43 45	57	63	84 98	125 139 157	-----
Ws+44/50	-----	67	74	94 108	139 153 171	176 194

The weights indicated above are for standard pumps with motor shrouds. The weights can vary depending on accessories and fittings and shall be considered as reference value for handling, transport and packaging, only.

5. Installation of pump

5.1 Notes



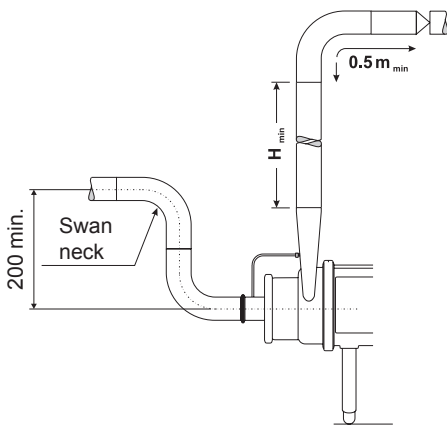
The Ws+ pump, like all self-priming pumps of its type, requires an initial charge of liquid, the priming liquid, in order to form the liquid ring within the pump which is essential for its self-priming function. See table.

Pump Ws+	20/15	30/30	44/50
Priming volume litre	1.7	2	3.7

5.2 Installation of standard pump

In the standard Ws+ pump the priming volume of liquid must be retained either within the body of the pump or where it can circulate back to the inlet. To this end the pump must be installed with outlet vertically upwards and with a length of vertical pipe coupled to it. A swan neck coupled directly to the pump's inlet prevents loss of that priming volume down the inlet pipe. To provide space for discharged air, any non-return valve must be mounted at least 0.5 m downstream of the specified length of vertical pipe. See table and fig. 4.

Fig. 4



Ws+ pump	20/15	30/30	44/50
H min. (fig. 2) × pipe \varnothing	1 m × 2"	1.5 m × 2"	1.5 m × 3" or 2 m × 2"

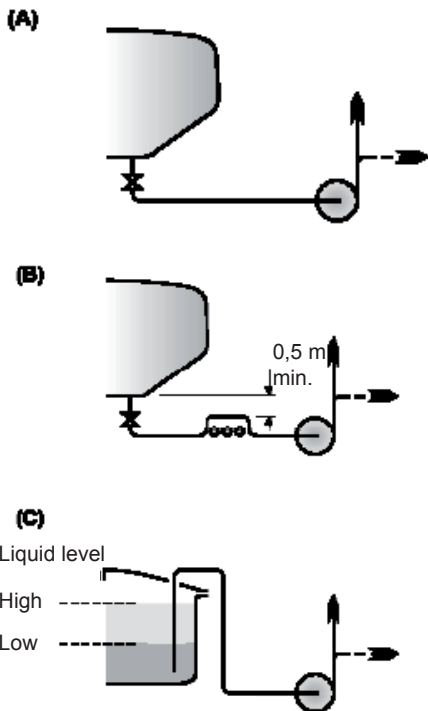
Shorter pipe lengths will adversely affect the time taken for the pump to self-prime.

Note that the pump should not be left running too long without pumping (typically max. 15 minutes, but less if the pumped liquid is hot) as it gets warm and loses priming liquid by evaporation.

Keep the number of valves, bends and T-pieces on the suction side to an absolute minimum.

There must be sufficient space around the pump for piping and access for maintenance.

5. Installation of pump

Fig. 5


5.3 Installation of pump without recirculation.

In this case, where the simplified pipe layout is to be used, one important requirement must be met:

as the suction tank starts to refill, some liquid will be able to run from the tank into the pump to replenish any priming liquid lost when the tank was previously pumped dry.

Typical applications can be seen in fig. 5.

As with the ZMS pump, the pump body must always be mounted with outlet vertically upwards and all the other conditions apply.

Note!

Any eccentric reducer should be mounted such that the pump center line is lower than the inlet pipe's center line.

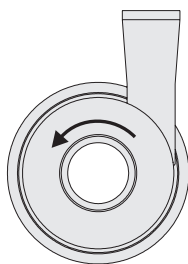
5.4 Lining up the pipe system

Line up the pipes carefully to the pump suction and discharge nozzles.

Make sure that the pipe system is adequately supported by Pipe supports so that the pump body is not subject to strains and weight from the pipe system.

Note!

During priming the pump may tend to vibrate. A pipe support should be placed close to the pump suction to prevent pipework vibration creating excessive noise.

Fig. 6


5.5 Power supply

The motor should be connected to the mains via a motor switch box in accordance with local regulations. The motor should be connected in accordance with the instructions inside the cover of the motor's terminal box.

The motor should be connected such that the direction of rotation of the motor (and thus of the impeller) is anticlockwise when viewed from the front towards the suction nozzle of the pump body (fig. 6).

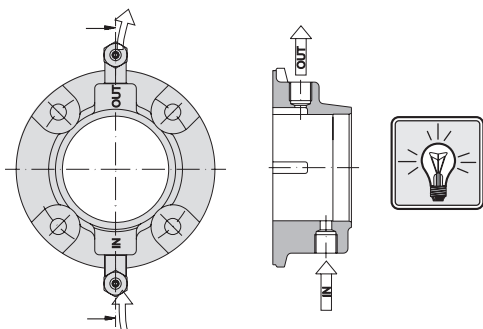
5.6 Water supply for water-flushed shaft seal

Pumps with a water-flushed shaft seal have two hose connectors on the seal flange. The hose connectors are 1/8" and fit a 6.0 mm hose. The necessary liquid flow rate is 15–30 l/h. Max. pressure 7 bar.

The hose connection in the seal flange should always be positioned vertically with the fluid inlet underneath and the outlet on top.

Water consumption can be limited by installing a solenoid valve for the flushing water on the supply side.

The open/close function of the solenoid valve can be controlled by the pump's start/stop sequence.

Fig. 7


6. Start-up and Operation

Before starting the pump, dismantle and clean the suction pipe. Any foreign material in the pump should be removed.

6.1 Checking the pump for foreign material

Dismantle the pump as described below. The sectional drawing (page 2) is to be used for reference.

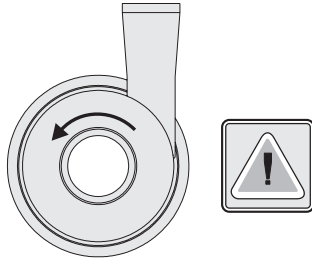
1. Disconnect the power supply.
2. Remove the front cover by unscrewing the clamp ring (item 25), after disconnecting the re-circulation connection (item 30, if fitted).
3. Unscrew the air screw (item 2) (use a pipe C-spanner or a round bar in the balance hole in the shaft muff to secure the shaft).
4. Remove similarly the housing clamp ring (item 9) and carefully pull off the pump/screw housing.
5. Turn the impeller (item 4) to ensure that there is no foreign material behind it.
6. If there is any foreign material in the pump, remove it.
7. When the pump is clean and free of foreign material, reassemble the pump.
8. When mounting the pump/screw housing check that the location pin (item 8, where fitted) in the top of the back plate (item 7), mates with the half hole in the pump body and press the pump/screw housing in over the O-ring (item 6). Re-fit the clamp ring.
9. Screw the air screw on to the shaft. Remember the correct tightening torque – see section 7.2.18.
10. Press the front cover into place and fit the clamp ring. Re-assemble the re-circulation connection (if fitted).
11. Install suction and discharge pipes. Check that the pipe unions have been tightened properly and that pipe supports have been fitted.



To make the front cover and the pump/screw housing easier to fit, we recommend that you give the O-ring a thin layer of foodapproved, acid-free grease or soap.

6. Start-up and Operation

Fig. 5



6.2 Testing the pump

To check that the pump is working satisfactorily, pour water into the pump and start it for a moment. Check the direction of rotation (fig. 8). Listen for any unusual noises. In pumps with water-flushed shaft seals, the seal chamber must be filled with water.

Never allow the pump to run without liquid, as this will ruin the shaft seal.

6.3 Putting the pump into service

Check the following before starting the pump:

- that the shaft guard has been fitted properly.
- that there is free access for liquid and the pump is primed.
- that the valve on the discharge side (if fitted) is closed.

The valve on the discharge side is closed during start-up to prevent the motor from overloading, but should be opened again as soon as the pump has been started.



Note!

The Ws+ pump should not be left running too long without pumping (typically 15 minutes, if the pumped liquid is not hot), as it gets warm and loses priming liquid by evaporation.

6.4 Flushing liquid



In pumps with a flushed shaft seal, check that the supply of flushing medium is open and that the flow of the medium is adequate (approx. 15–30 l/hour).

7. Service and Maintenance

7.1 Checking the shaft seal

Check the pump's shaft seal for leaks on a regular basis. If the shaft seal is leaking, replace it or its relevant parts.

7.2 Replacing the shaft seal

The sectional drawing (page 2) shows the position and construction of the shaft seal – both ordinary seals and seals with liquid/steam flushing.

Dismantling the pump

To replace the shaft seal it is necessary to dismantle the pump. Follow the steps described below and refer to the sectional drawing (page 2).



1. Disconnect the power supply in the motor isolator by removing the fuses and disconnecting the cables.
2. Turn off the flushing liquid supply.
3. Close the inlet and discharge of the pump, and drain the pump/screw housing.
4. Once the inlet and outlet pipes have been properly isolated and the re-circulation connection (if fitted) removed, remove the clamp ring (item 25) and front cover (item 27).
5. Unscrew the air screw (item 2) (use a pipe C-spanner or a round bar in the balance hole in the shaft muff to secure the shaft). Then open the clamp ring (item 9), take off the pump/screw housing (item 1) and remove the impeller (item 4).
6. Remove the stationary seal face (item 5.6), mounted in the back plate (item 7) with your fingers.
7. Remove the O-ring (item 5.5) from the stationary seal face.
8. Use your fingers to remove the rotary seal face (item 5.7) mounted in the impeller (item 4).
9. Remove the O-ring (item 13) from the rotary seal face.
10. Clean the stator and rotary seal face locations, if necessary with air or water.

Dismantling the shaft seal

- 10a** In the case of water-flushed shaft seals and aseptic shaft seals, the back plate must be removed to dismantle the rear shaft seal. The rear stationary seal face (item 5.6) is mounted in the pressure ring (item 5.11) and the rotary seal face (item 5.7) is mounted on the shaft (item 11).
These are removed in the same way as the front seal components.

7. Service and Maintenance

Checking parts for wear



11. Check the o-ring for signs of cracks, lack of elasticity, brittleness and/or chemical attack. Replace worn or defective parts.
12. Check the stationary (item 5.6) and rotary (item 5.7) seal faces for signs of wear too. The wearing surfaces must be completely free of scratches/cracks. If not, both rings must be replaced.

12a In the case of water-flushed shaft seals and aseptic shaft seals, check the rear seal rings (items 5.6, 5.7) for wear and replace if necessary.

Fitting

13. Fit new o-rings on the stationary seal face and rotary seal face.

Note! Remember to moisten these with water.

14. Fit the rotary seal face on the impeller without using tools.

Note! Note! The notch in the rotary seal face must be fitted so that it mates with the driving pin (item 5.8) in the impeller hub.

In the case of water-flushed seals, also fit a rotary seal face (with o-ring) in the location on the shaft – again without using tools.

15. Fit the stationary seal face in the back plate without using tools.

Note! Note! The notches in the stationary seal face must mate with the driving dogs on the carrier in the back plate. Check that the stationary seal face is positioned so that it easily slides backwards and forwards within the back plate.

If liquid-flushed shaft seals are fitted, remove the “drain pipe” (item 5.4) and do not fit.

16. After fitting, clean the wearing surfaces.

16a For liquid-flushed, re-mount the back plate.

17. Fit the impeller. Check that the location pin (item 8, where fitted) in the top of the back plate, mates with the half hole in the pump body and carefully, to avoid damaging the o-ring, press the pump/screw housing (item 1) in over the o-ring (item 6). Fasten with the clamp ring (item 9).

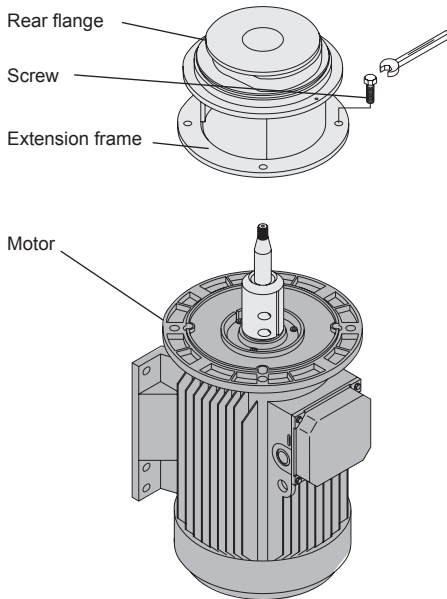
18. Re-mount the air screw. Remember to use the proper tightening torque:

M14:	70 Nm (52 ft-lb)
M20:	200 Nm (148 ft-lb)

19. Press the front cover into place and fit the clamp ring. Re-assemble the re-circulation connection (if fitted).

7. Service and Maintenance

Fig. 9



7.3 Replacing the motor

The standard motor for the Ws+ pump has a drive-end located bearing. If the motor is replaced, the new motor must also have a drive-end located bearing. The motor bearing is enclosed and permanently lubricated.

The motor has both feet and flange, “small flange” (B34) for frame sizes 80-132, “large flange” (B35) for frame 160 and larger.

Follow the instructions below when replacing the motor. For the replacement of bearings, see the motor supplier’s service instructions.

1. Disconnect the pump from the power supply.
2. Removal of the front cover, air screw, pump/screw housing and impeller (items 27, 2, 1 and 4) is begun as in para. 6.2, points 1–5.
3. Remove the motor shroud and, if possible, stand the pump upright on the motor’s fan cover. See Fig. 9.
4. Undo the four motor flange bolts and remove them. See Fig. 9.
5. Lift the backplate (item 7) and extension frame which are still bolted together, up and off the shaft. See Fig. 9. Remove the washer (item 17), where fitted.
6. See Fig. 10. Loosen the screws in the shaft muff, pull the shaft off and replace the motor.
7. See Fig. 11. Before re-mounting the pump shaft, remove any dirt and grease from the motor shaft and the muff’s internal claming surfaces. Mount the pump shaft loosely. Position the balance hole over the keyway.
8. Fit the back plate and extension frame over the shaft.
9. Tighten the bolts.
10. Stand the pump back on its legs/bracket.
11. Fit the impeller and secure it temporarily with the nut (M14 or M20) which is supplied as a tool with the pump 12.
12. Lay the plastic star against the impeller. Fig. 12.

Fig. 10

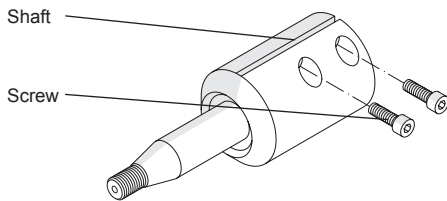


Fig. 11

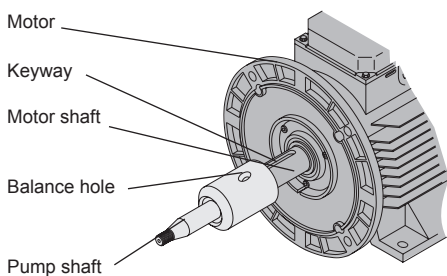
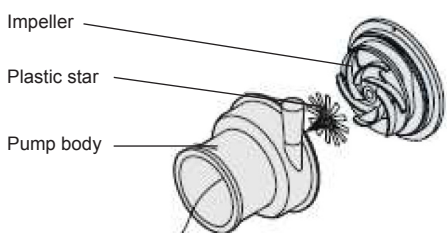
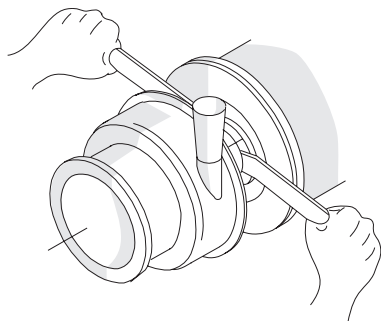


Fig. 12



7. Service and Maintenance

Fig. 13


13. Fit the pump/screw housing and fasten with the clamp ring.
14. Push the shaft forward until the impeller is touching the plastic star. Fig. 13.
15. Tighten the shaft screws (item 11) to 30 Nm for 8 mm screws and 55 Nm for 10 mm screws.
16. Remove the star by pulling it out through the inlet.
17. Replace the temporary nut with the air screw.
Remember to use the proper tightening torque:
M14: 70 Nm (52 ft-lb)
M20: 200 Nm (148 ft-lb)
18. Press the front cover in and fasten the clamp ring.
Reassemble the re-circulation connection, if fitted.

7.4 Recommended inventory of spare parts

Seal kits

We recommend that you keep both seal kits and service kits for the Ws+ pumps in stock. The seal kit for the Ws+ pump consists of the wearing parts of the pump, as specified in the spare parts list.

	Number of pumps in service		
	0–5	5–20	>20
Seal kits	number	number	kits/ 10 pumps
Normal operation	2	3	1
Special needs	3	6	2

Service kits

The service kit is made up of a number of the main components of the pump which are not wearing parts, but which you still may have to replace: shaft, impeller, cap nut and fixing kit.

	Number of pumps in service		
	0–5	5–20	>20
Service kits	number	number	kits/ 10 pumps
Normal operation	0	1	1
Special needs	1	2	1

8. Technical Data

8.1 Sound pressure and sound power level for Ws+ pumps

The noise levels in the table below can only be taken as indicative, and apply to a pump mounted on a ABB motor which has been sized for maximum power consumption when pumping water, fitted with ball feet and with a standard shroud.

The pump is fitted with a full size impeller, is pumping 100% cold water and operates at 10 m NPSH, i.e. simulation of pumping from an atmospheric tank.

Measurements have been carried out in compliance with the sound intensity measurement method of ISO 9614-2.

Tolerance level is ± 3 dB.

Operating conditions/ noise levels	Flow quantity m ³ /h (100% and 60% nominal flow)	Sound pressure level dB (A) LpA*	Sound power level dB (A) LwA
Ws+20/15	15	74	86
	9	72	84
Ws+30/30	30	74	87
	18	75	88
Ws+44/50	50	82	95
	30	80	92

*Calculated maximum sound pressure in a free field, 1 m distance from the (notional) pump surface.

When operating at 60 Hz (3500 rpm), the noise levels are approximately 3 dB(A) higher.

The noise level may increase considerably, if reducers (reduction/expanding fittings) are mounted on the inlet/outlet.

Note that the noise emitted by a pump varies widely, depending on size/speed/manufacture of motor and diameter of impeller supplied, and whether or not it is fitted with a shroud. It is also influenced by its mounting, i.e. ball feet, skid-mounted or bolted direct to the floor and by the adjacent piping system and its mounting method. In the case of a self-priming pump, noise levels are also profoundly influenced by whether it is pumping air or liquid, and, when pumping liquid, by the available NPSH and the liquid temperature.

8. Technical Data

8.2 Maximum permissible outlet pressure for Ws+ pumps

The maximum pump outlet pressures specified below must not be exceeded (applies to water at 20 °C).

Pump	Ws+20/15	Ws+30/30	Ws+44/50
Maximum permissible pressure	6 bar	8 bar	13 bar

8.3 Tightening torque for shaft and air screw

Required torques to tighten the pump shaft on the motor shaft:

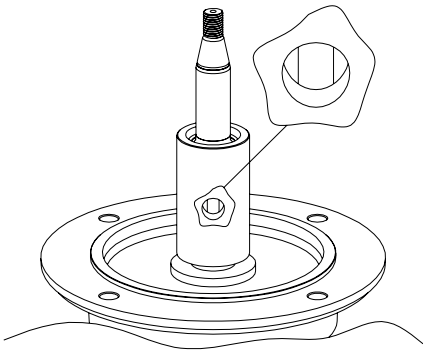
M8:	30 Nm (22 ft-lb)
M10:	55 Nm (41 ft-lb)
M12:	80 Nm (59 ft-lb)



Note!

Make sure that the key-groove of the motor shaft is to be seen through the hole in the stub shaft. Fig. 14.

Fig. 14



Required torques to tighten the cap nut or air screw:

M14:	70 Nm (52 ft-lb)
M20:	200 Nm (148 ft-lb)

Required torques to tighten the clamp connection at the pump body and body cover:

M10:	max. 35 Nm (25 ft-lb)
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8.4 Cleaning recommendation

The product-wetted parts of the pumps are cleaned by the cleaning liquid of the connected pipelines.

Depending on the degree and constituents of soiling, cleaning liquids, times and cycles must be adjusted for the individual application.

Verify the compatibility of the individually selected cleaning processes and liquids with the respectively used seal materials.

Ws+

CENTRIFUGAL PUMP



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