Framo
Cargo Pump SD200-6

Instruction for Maintenance and Repair
1.0 Sectional drawing of pump unit

Fig. 1
1.1 TECHNICAL DATA SD 200

PUMP TYPE: SD 200-6D*-HH***-***-*

DISCHARGE FLANGE CONNECTION: DN200 PN25 FRAMO

HYDRAULIC CONNECTIONS:
- PRESSURE: DN 35 PN 320 FRAMO
- RETURN: DN 50 PN 16 FRAMO
- PILOT: DN12 PN 320 FRAMO

AIR / INERT GAS CONNECTION:
- FOR PURGING OF COFFERDAM: FRAMO QUICK COUPLING
  MAX. CONSUMPTION, 20M PUMP: 1 NM³
- FOR PURGING OF CARGOPIPE, PUMP: FRAMO QUICK COUPLING
  MAX. CONSUMPTION, 20M PUMP: 5 NM³

HYDRAULIC OIL VOLUME IN 20M PUMP: 165 LITRE (6.6 l/m)

RECOMMENDED HYDRAULIC OILS: SEE FRAMO LUBRICATION CHART

DESIGN PRESSURE:
- CARGO: 25 BAR
- HIGH PRESSURE, HYDRAULIC: 320 BAR
- RETURN PRESSURE, HYDRAULIC: 10 BAR
- COFFERDAM: 10 BAR

SPEED:
- MAX. SPEED: 2550 RPM
- MIN. SPEED: 430 RPM

WEIGHT OF PUMP AND PUMP PARTS:
- PUMP COMPLETE: 20M: 1400 KG (46 kg/m)
- TOP PLATE COMPLETE: 190 KG
- PUMPHEAD COMPLETE: 320 KG
- BEARINGHOUSING COMPLETE: 75 KG
- HYDR. MOTOR: 85 KG
- VOLUTE CASING: 75 KG
- SUCTION COVER: 16 KG
- IMPELLER: 22 KG
2.0 MAINTENANCE INSTRUCTION

Before doing service on pump read the Service Manual for Cargo Pumps, Chapter 3, Maintenance information.

2.1 Dismantling of impeller / wear rings

Standard tools

<table>
<thead>
<tr>
<th>Name</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allen key</td>
<td>10 mm</td>
</tr>
<tr>
<td>Spanner 13 mm</td>
<td></td>
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<tr>
<td>Spanner 16 mm</td>
<td></td>
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<tr>
<td>Spanner 18 mm</td>
<td></td>
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<tr>
<td>Spanner 24 mm</td>
<td></td>
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<tr>
<td>Plastic hammer</td>
<td></td>
</tr>
<tr>
<td>Slides</td>
<td></td>
</tr>
</tbody>
</table>

Special tool

<table>
<thead>
<tr>
<th>Name</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifting Bolt M12 x 90, 4 pcs</td>
<td></td>
</tr>
</tbody>
</table>

Loosen the bottom support. Lift and secure the support to pipestack.

Dismantle wear ring support and wear ring (fig. 3). Dismantle impeller by loosening bolts two turns. Knock carefully on (or press down) all bolts. When impeller is loose remove all bolts. Replace two bolts between volute casing and pump unit on each side of the pump with lifting bolts (M12x90). Remove remaining bolts between volute casing and pump cover/cargo leg. Lower volute casing, suction cover and impeller in one piece (weight approx. 120 kg).

Slide/lift volute casing together with impeller and suction cover out of well (fig. 4). To avoid damage on suction well coating, volute casing must be placed upon slides. Wear rings can now be replaced. Suction cover and impeller can now be dismantled from the volute casing.
Exploded view of wear rings/impeller/volute casing.

Fig. 5
2.2 Dismantling of lip seal arrangement

Standard tools

<table>
<thead>
<tr>
<th>Name</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allen key</td>
<td>10 mm</td>
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<tr>
<td>Spanner</td>
<td>10 mm</td>
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<tr>
<td>Spanner</td>
<td>13 mm</td>
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<tr>
<td>Spanner</td>
<td>16 mm</td>
</tr>
<tr>
<td>Spanner</td>
<td>18 mm</td>
</tr>
<tr>
<td>Snap ring plier</td>
<td>A2</td>
</tr>
</tbody>
</table>

Special tools

<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extractor for impeller hub</td>
</tr>
<tr>
<td>Hook spanner</td>
</tr>
<tr>
<td>Assembling cylinder</td>
</tr>
</tbody>
</table>

Loosen nut with lock washer and remove impeller hub nut. Impeller hub is pulled out by using extractor for impeller hub.

Note! Due to the spline connection, impeller hub may get down easily.

Be very careful not to damage o-rings and ceramic sleeve. Disconnect check pipe from seal ring house and bend pipe away.

NB! The ceramic sleeve must be handled very carefully as it is very brittle and may crack if dropped.

NB! The ceramic sleeve must be handled very carefully as it is very brittle and may crack if dropped.
Exploded view of lip seal arrangement.
2.3 Draining of pump

Before starting dismantling of hydraulic motor, check that hydraulic pressure inlet valve and valve on pilot line are closed. Open local control valve.

Release all pressure chambers by using the bleed plugs in the STC-valve and non return valve.

Remove blind flange at drain connection located under pump cover.

Use drain tool to unscrew plug, and connect the hose with snap-on coupling or the air operated pump to the female snap-on coupling (fig. 9).

(Suitable pump : FRAMO air operated pump type : 0341-0253-2.) Pump the oil to a drum placed on deck.

THE OIL IS NOT TO BE REFILLED

Standard tools

<table>
<thead>
<tr>
<th>Name</th>
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</thead>
<tbody>
<tr>
<td>Drain pump</td>
<td></td>
</tr>
<tr>
<td>Allen key</td>
<td>8 mm</td>
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</table>

Special tools

<table>
<thead>
<tr>
<th>Name</th>
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</thead>
<tbody>
<tr>
<td>Drain tool</td>
</tr>
</tbody>
</table>
2.4 Dismantling of mechanical oil seal

Before dismantling of mechanical oil seal, remove volute casing according to chapter 2.1 and drain pump according to chapter 2.3.

### Standard tools

<table>
<thead>
<tr>
<th>Name</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allen key 3 mm</td>
<td>Allen key 8 mm</td>
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<tr>
<td>Allen key 8 mm</td>
<td>Spanner 10 mm</td>
</tr>
<tr>
<td>Spanner 10 mm</td>
<td>Spanner 18 mm</td>
</tr>
<tr>
<td>Snap ring plier A2</td>
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</tr>
</tbody>
</table>

### Special tools

<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bracket</td>
</tr>
<tr>
<td>Lifting bolt M12x90, 2 pcs</td>
</tr>
<tr>
<td>Bolt M12x 20, 4 pcs</td>
</tr>
<tr>
<td>Tool for lifting bearing bracket</td>
</tr>
<tr>
<td>Tool for removing rotating part of mech. seal</td>
</tr>
</tbody>
</table>

When mechanical oil seal is to be removed, pump unit must be disconnected from the pipestack. Volute casing and impeller must be removed before pump unit is dismantled from pipe stack (see chapter 2.1).

Install the bracket on the flange on top of the cover. Turn the pumphead upside down. (Weight approximately 210 kg). See fig.11. Use protection on tank top to avoid damage to coating.

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Fig. 11

![Diagram of pump head and cover with components labeled](image)
Lifting of bearing housing

Installation of tool
Remove bolts between flange for bearing housing and pump cover.

Install 4 pcs “support bolts” through clearance hole in flange for bearing housing and into M12 holes in pump cover.

Install plate and secure to “support bolts” by nuts (ref. fig. 13).

Install 2 pcs lifting bolt through holes in plate and into M12 hole in flange for bearing housing.

Lifting
Turning the "lifting nuts" can now lift motor and bearing housing assembly.

Note! Check that lifting bolts do not work loose from flange for bearing housing.

Remove 4 out of 8 pcs bolts between bearing housing and flange for bearing housing.

Securing
Lift up seal rings to flange for bearing housing. Place support brackets in correct position according to fig. 15. Secure to pump cover by 4 pcs M12 bolts.

Lower bearing bracket onto “support brackets”.

Remove plate, lifting bolts and support bolts.

Remove remaining 4 bolts between bearing housing and flange for bearing housing, and remove upper seal house.

Note! When assembling the pump, the two seal rings must be installed before flange for bearing housing is installed.
Remove flange for bearing housing. See fig. 16.
Dismantle stationary parts of mechanical seal.

**THE LAPPED FACES OF THE CERAMIC SEAL MUST BE TREATED VERY CAREFULLY. STATIONARY PART IS VERY BRITTLE AND MAY CRACK IF DROPPED OR SCRATCHED AGAINST OTHER PARTS. DO NOT TOUCH. USE CLEAN GLOVES.**

Before remove rotating part of mechanical seal, loosen the 3 locking screws (see fig. 17).

**Note!** Be sure that locking screws are not in contact with shaft when rotating part of mechanical seal is pulled out.

ALL PARTS MUST BE CLEANED THOROUGHLY AND INSPECTED. DEFECTIVE COMPONENTS MUST BE REPLACED. - USE ONLY GENUINE SPARE PARTS -

**Note!** If the rotating part for any reason is stuck, a special extractor tool is available (drg. 0162-0768-3, id.no. A35000, not included in tool kit.)
2.5 Replacing the hydraulic motor

<table>
<thead>
<tr>
<th>Name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Allen key</td>
<td>10 mm</td>
</tr>
<tr>
<td>Allen key</td>
<td>14 mm</td>
</tr>
</tbody>
</table>

Carry out section 2.1 and 2.3. Remove pump unit according to fig. 10 and 11. Hydraulic motor and bearing housing must be pulled out of the cover. (Weight approximately 210 kg)

Remove bolts between motor and bearing housing. (Weight of motor appr. 85kg). When the new hydraulic motor is to be installed, check that shaft seal is removed. Steel plug in return connection must be removed. (See fig. 18). Move the connection pipe from the old motor to the new one.
2.6 Dismantling of bearing housing

Carry out section 2.1, 2.2, 2.3, 2.4 and 2.5. Remove hydraulic motor from bearing housing. Remove circlips and pull out the shaft, ball bearing, rotating part of backstop unit, and roller bearing as one unit.

Standard tools

<table>
<thead>
<tr>
<th>Name</th>
<th>J4</th>
<th>3 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snap Ring Plier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allen key</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 19
2.7 Assembling sequence

CHECK ALL SEAL ELEMENTS, BACK-UP RINGS, SEAL ELEMENT GROOVES, AND SEAL FACES. PAY SPECIAL ATTENTION TO THE TEFLOL RINGS AND BE ABSOLUTE SURE OF NO DEFORMATION NOR RADIAL GROOVES. NEVER INSTALL DAMAGED SEAL RINGS. CHECK SEAL FACES ON PUMP AND BE SURE OF NO CORROSION, CRACKS, DIRT ETC.

- USE ONLY GENUINE SPARE PARTS -

ALL SCREWS AND NUTS HAVE TO BE ASSEMBLED WITH SPECIFIED TORQUE. IF NO TORQUE IS SPECIFIED, USE TORQUE ACCORDING TO FOLLOWING TABLE:

ACID RESISTANT BOLTS AND NUTS, QUALITY A4-80

<table>
<thead>
<tr>
<th>Size</th>
<th>Torque Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>M6</td>
<td>9.2</td>
</tr>
<tr>
<td>M8</td>
<td>22.3</td>
</tr>
<tr>
<td>M10</td>
<td>44.2</td>
</tr>
<tr>
<td>M12</td>
<td>76.2</td>
</tr>
<tr>
<td>M16</td>
<td>190</td>
</tr>
<tr>
<td>M20</td>
<td>370</td>
</tr>
</tbody>
</table>

All bolts and nuts are to be fastened using a torque wrench, and acid resistant bolts are to be coated with "Molybdenum disulphide" (Molycote) on threads and under bolt heads / nuts prior to assembling.

All assembling has to be done in reversed order according to the dismantling sequence.

PAY SPECIAL ATTENTION TO THE FOLLOWING POINTS:

**Hydraulic motor**
If a new hydraulic motor is installed, check that both drain connections are plugged with steel plugs (see fig. 18). Check that the shaft seal is removed.

![Feeler gauge](image)

Check position of hydraulic motor and motor flange according to assembly drawing.
Back Stop Unit
Check direction of back stop unit. (Counter clockwise, seen from impeller side).

Ball bearing
Ball mounting slot pointing downwards against the back stop unit when mounting ball bearing.

When installing shaft into bearing housing, rotate the shaft for easy entering of rotating part of back stop unit.

Mechanical Oil Seal
Assemble mechanical seal according to instruction 0290-0036-4E.
Clean seal faces with clean rags wetted with denaturated alcohol.

Note that the two seal ring between bracket for bearing housing and pump cover must be installed before bracket is installed on the bearing housing.

Lip seal arrangement
Assemble ceramic sleeve and sleeve retainer. Use assembling cylinder to protect lip seals. Do not remove the cylinder before all FRAMO shaft seals have been installed. When assembling lip seals be sure that support ring is tightened up until metallic contact. This to avoid screws to loosen. The spring marked with red colour on the double lip seal shall be mounted against mechanical seal.
(Ref. fig. 7, chapter 2.2).

THE CERAMIC SLEEVE MUST BE HANDLED VERY CAREFULLY AS IT IS VERY BRITTLE AND MAY CRACK IF DROPPED

Impeller Hub
When assembling impeller hub, be careful not to damage seal rings.
Be sure to lock the impeller hub nut properly. Check the shaft alignment according to fig. 21.

Wear Rings
When mounting new wear rings be sure that support ring is tightened until metallic contact. Bolts to be locked by using locking plate (install new plates).

Volute casing with impeller
Slide volute casing and impeller into suction well. Framo seal element is to be placed on top of impeller when volute casing is in position below impeller hub. Check position of the guiding pin in flange connection between pump unit and volute casing.
Lift the complete unit with 2 lifting bolts M12x90 until these bolts can be replaced with the original bolts. Assemble the bolts for impeller hub and volute casing. Tighten all bolts evenly.

Fig. 21
2.8 Pressure test of pump

The cofferdam must be pressure tested by blinding off the exhaust trap vent pipe. Unscrew the complete relief valve and connect a manometer to the G1/4 connection. Connect the air/nitrogen connection on top cover plate and increase pressure to max. 3 bar.

Spray all parts, connections, seals etc., which have been dismantled, with soapy water to be sure of no static leakage.

*Remember to remove blind plug from exhaust trap vent connection and assemble the pipe afterwards. Install the complete relief valve."

Leakage test of cofferdam in pumphead

Use pressure tool: 0367-0175-3, 0367-0162-3. Cofferdam is to be leakage tested with air - 3 bar. After 5 min., check all flange connections with soapy water for possible leakage.

Leakage test of return side of pumphead

Use pressure tool: 0367-0162-3
Hydr. return side is to be leakage tested with air - 5 bar. After 5 min., check all flange connections with soapy water for possible leakage.
Check for pressure drop after 5-15 min.