DESMI self-priming centrifugal pump

TYPE NSA

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Special pump No. ............................................
# Table of contents:

1. **PRODUCT DESCRIPTION** ..........................................................................................................................................................................3
   1.1 DELIVERY ........................................................................................................................................................................................................3

2. **TECHNICAL DATA** ..................................................................................................................................................................................3
   2.1 EXPLANATION OF THE TYPE NUMBER .................................................................................................................................................3
   2.2 TECHNICAL DESCRIPTION .................................................................................................................................................................4

3. **INSTALLATION** ......................................................................................................................................................................................5
   3.1 MOUNTING/FASTENING .................................................................................................................................................................5
   3.2 WIRING ..............................................................................................................................................................................................5

4. **TRANSPORT/ STORAGE** ........................................................................................................................................................................6

5. **INSPECTING THE PUMP** ........................................................................................................................................................................7
   5.1 INSPECTION ...................................................................................................................................................................................7
   5.2 FITTING SHAFT ..............................................................................................................................................................................7
   5.3 FITTING SHAFT SEAL .................................................................................................................................................................7
   5.4 ALIGNING COUPLING .................................................................................................................................................................7

6. **FROST PROTECTION** ...........................................................................................................................................................................8

7. **DISMANTLING** .....................................................................................................................................................................................8

8. **START-UP** .........................................................................................................................................................................................9
   8.1 STARTING ......................................................................................................................................................................................9

9. **SYSTEM BALANCING** .........................................................................................................................................................................9

10. **INSPECTION AND MAINTENANCE** .....................................................................................................................................................11
   10.1 DRAINING THE PUMP .............................................................................................................................................................12
   10.2 BEARINGS ..................................................................................................................................................................................12

11. **REPAIRS - ORDERING SPARE PARTS** ................................................................................................................................................12

12. **OPERATING DATA** ............................................................................................................................................................................12

13. **EU DECLARATION OF CONFORMITY** ..................................................................................................................................................13

14. **INFORMATION RELEVANT FOR DISASSEMBLY OR DISPOSAL AT END-OF-LIFE** ...........................................................14

15. **ASSEMBLY DRAWINGS AND SPARE PARTS LISTS** ....................................................................................................................................................15
   15.1 ASSEMBLY DRAWING NSA50-200/zz-M12 .............................................................................................................................................15
   15.2 ASSEMBLY DRAWING NSA80-250/zz-M12 .............................................................................................................................................16
   15.3 ASSEMBLY DRAWING NSA80-250/zz-M09 .............................................................................................................................................17
1. PRODUCT DESCRIPTION

These operation and maintenance instructions apply to the DESMI NSA-pump series. The pumps are available in the sizes DN50 and DN80 discharge.

DESMI NSA is a single-stage self-priming centrifugal pump with stainless steel shaft, and mechanical shaft seal. The NSA-pump is further equipped with a semi-open impeller, which does not choke as easily as a closed impeller.

The pump is suited for clean and polluted liquids with temperatures between 0 and 80°C. With special shaft seal up to 140°C.

The suction branch of the pump is mounted well above impeller inlet. This is an advantage as the pump will not - in case of a clack flap leakage - loose all the priming water and consequently the priming ability.

As the pump is self-priming, contrary to ordinary centrifugal pumps it will resume pumping if, for a short moment, the liquid has been lowered to a level below the suction pipe.

The pump is particularly suitable for the pumping of water in connection with e.g. cooling of diesel engines, as bilge pump, ballast pump, irrigation, washing plants, air conditioning, cooling systems, and sanitary systems, etc. Furthermore, in the majority of cases where the transport of liquid is required within industry.

1.1 DELIVERY
- Check on receipt that the delivery is complete and undamaged.
- Defects and damages, if any, to be reported to the carrier and the supplier immediately in order that a claim can be advanced.

2. TECHNICAL DATA

The pumps are manufactured in various material combinations which appear from the type number on the name plate. See below.

2.1 EXPLANATION OF THE TYPE NUMBER

All the NSA-pumps are provided with a name plate. The type number indicated on the name plate is built up as follows:

NSAXXX-YYYB/ZZ-MR/O

XXX : Discharge flange diameter.
YYY : Standard impeller diameter.
B  : If mounted with special impeller for 2-pole motor
ZZ  : Height of the impeller blades.
M  : The material combination of the pump.
R  : The assembly combination of the pump.
O  : Actual impeller diameter.
M may be the following:

C : All cast iron.
E : Special bronze casing and/or impeller

The pumps are available in other material combinations at request.

R may be the following:

07 : Mounted on base frame with petrol or diesel engine, or with hydraulic or electric motor.
09 : With bare shaft end.
12 : Flange-mounted with electric motor.

Before putting a pump into operation, the suitability of the material combination of the pump must always be taken into consideration. In case of doubt, contact the supplier.

Pumps in material combinations A and C are primarily used for freshwater.
Pumps in material combination D are primarily used for seawater.

If the pumps are designed for special purposes the following is to be indicated:

Pump No. : 
Pump type : 
Application : 
Comment : 

2.2 TECHNICAL DESCRIPTION
The noise level from the pump depends on the motor type supplied, as the noise from the pump can be calculated as the noise level of the motor + 2dB(A).
The noise level of the motor appears from the instruction manual for the motor.
The pump capacity appears on the nameplate of the pump. If the pump has been delivered without motor, the pump capacity is to be indicated on the plate when mounting the motor.

The permissible loads on the flanges are indicated in the following table:

<table>
<thead>
<tr>
<th>Pump</th>
<th>Fv (N)</th>
<th>Fh (N)</th>
<th>ΣF (N)</th>
<th>ΣMt (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSA-50-200</td>
<td>1250</td>
<td>950</td>
<td>1550</td>
<td>170</td>
</tr>
<tr>
<td>NSA-80-250</td>
<td>1450</td>
<td>1050</td>
<td>1800</td>
<td>270</td>
</tr>
</tbody>
</table>
Fv  :  The max. permissible sum of the vertical forces on the two flanges.
Fh  :  The max. permissible sum of the horizontal forces on the two flanges.
ΣF  :  The vectorial sum of the two forces Fv and Fh.
ΣMt :  The max. permissible sum of the torches on the two flanges.

In connection with the permissible loads on the flanges the following is to be observed:

\[
\left( \frac{\sum F_{\text{calc}}}{\sum F} \right)^2 + \left( \frac{\sum M_{\text{calc}}}{\sum M_t} \right)^2 < 2
\]

where index “calc” is the values calculated by the user.

3. INSTALLATION

3.1 MOUNTING/FASTENING
The pump should be mounted and fastened on a solid base plate with a flat and horizontal
surface to avoid distortion. Check that the centre line of the shaft is horizontal.

The max. permissible loads on the flanges stated in paragraph 2.2. are to be observed.

The suction line to the pump is to be mounted carefully, so that it is absolutely tight, as even
minor leakages may impede the priming. When pumping polluted liquids a strainer is
necessary. The strainer must be equipped with a sieve, the passage area of which is to be 3 x the area of the suction pipe. The mesh size is to be 1-3 mm smaller than the height of the
impeller blades of the pump in question.

The pipes are to be arranged in such a way that stresses resulting from fluctuations in
temperature will not have any effect on the pump. Because of the priming of the pump the
pressure pipe is to be arranged so that water locks in the pipe are avoided. If the pump is to
be driven by a motor through a flexible coupling, motor and coupling are to be placed on a
common base plate. In this connection the following must be observed:

- Avoid distortion of the base plate.
- Avoid distortion of the piping system.
- Check carefully that pump and motor are accurately aligned.

At installations pumping hot or very cold liquids, the operator must be aware that it
is dangerous to touch the pump surface, and, consequently, he must take the
necessary safety measures.

When connecting the pump and a prime mover the power transmission is to be
equipped with a guard in accordance with the provisions of the COUNCIL DIRECTIVE
OF June 14, 1989, on the safety of machines.

3.2 WIRING

Wiring to be carried out by authorised skilled workmen according to the rules and
regulations in force.
4. TRANSPORT/ STORAGE

The weights of the pumps without motor are stated in the following table:

<table>
<thead>
<tr>
<th>Pump</th>
<th>Weight kg</th>
<th>Pump</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSA50-200/zz-A12</td>
<td>60</td>
<td>NSA80-250/zz-A12</td>
<td>95</td>
</tr>
<tr>
<td>NSA50-200/zz-D12</td>
<td>60</td>
<td>NSA80-250/zz-D12</td>
<td>105</td>
</tr>
<tr>
<td>NSA80-250/zz-A09</td>
<td></td>
<td>NSA80-250/zz-D09</td>
<td>102</td>
</tr>
<tr>
<td>NSA80-250/zz-A09</td>
<td></td>
<td>NSA80-250/zz-D09</td>
<td>102</td>
</tr>
</tbody>
</table>

Lift the pump by placing the rope around it and see to it that the pump is balanced. The rope must not bear against sharp edges and corners. Lifting eyes might be mounted in the pump and used instead. The pump weights appear from the above table. Before shipment the pump is to be fastened securely on a pallet or the like. The pump is to be stored in a dry area.
5. INSPECTING THE PUMP

5.1 INSPECTION
When the pump has been dismantled, check the following parts for wear and damage:

- Wear plate/impeller : Max. clearance 0.4 - 0.5 mm.
- Shaft seal/rear cover : Check seat for flatness and cracks.
  Check rubber parts for elasticity.
- Bearings : Replace in case of wear and noise.

5.2 FITTING SHAFT
When the pump has been assembled, check that the shaft rotates freely. If the shaft has been dismantled in the 12-combination, adjust the shaft to the original, axial position on the electric motor to obtain a 0.2-0.5 mm gap between impeller and wear plate. Fasten the pointed screws (if three screws first the middle screw) according to the below table – screws to be secured with Loctite 243 or Omnifit 40M or similar. Check that the wobble, measured as close to the shaft end as possible, is within the limits indicated in the table.

<table>
<thead>
<tr>
<th>Motor size</th>
<th>Torque Pointed screws</th>
<th>Max. wobble</th>
</tr>
</thead>
<tbody>
<tr>
<td>100/112</td>
<td>10 Nm</td>
<td>70 μm</td>
</tr>
<tr>
<td>132</td>
<td>24 Nm</td>
<td>70 μm</td>
</tr>
</tbody>
</table>

5.3 FITTING SHAFT SEAL
Before fitting the seat, clean the recess in the shaft seal cover. When fitting the seat, remove the protective coating without scratching the lapped surface. Dip the outer rubber ring of the seat into soapy water. Now press the seat into place with the fingers and check that all parts are correctly imbedded.

If it is necessary to use tools for assembling, protect the sliding surface of the seat to prevent it from being scratched or cut. Lubricate the inner surface of the slide ring rubber bellows with soapy water and push it over the shaft. The use of a conical fitting bush as shown on the assembly drawing is recommended to avoid that the rubber bellows is cut.

Push the slide ring over the shaft with the hand. If the rubber bellows is tight, use a fitting tool and take care that the slide ring is not damaged. If the carbon ring is not fixed, it is important to check that it is fitted correctly, i.e. the chamfered/lapped side is to face the seat. The carbon ring can be held by a little grease.

When using soapy water on the shaft, the bellows will settle and seat in about 15 minutes, and until then tightness should not be expected. After start, check by viewing the leak hole that there are no leaks.

5.4 ALIGNING COUPLING
In order to avoid break-downs of a pump coupled to a motor on the same base plate through a flexible coupling, the following should be observed:
1. Avoid distortion of the base plate.
2. Avoid distortion in the piping system.
3. Check on the coupling that pump and motor are aligned accurately.

Below please find 2 proposals for alignment. The deviations mentioned cover a complete revolution of the coupling. The distance between the coupling halves is to be between 2 and 4 mm.

* : Steel ruler.
** : Thickness gauge.

6. FROST PROTECTION

Pumps, which are not in operation during frost periods, are to be drained to avoid frost damage. Remove the plug at the bottom to empty the pump. Alternatively, it is possible to use anti-freeze liquids in normal constructions.

7. DISMANTLING

Before dismantling the pump make sure that it has stopped. Empty the pump of liquid before it is dismantled from the piping system. If the pump has been pumping dangerous liquids you are to be aware of this and take the necessary safety measures.

If the pump has been pumping hot liquids, take great care that it is drained before it is removed from the piping system.
8. START-UP

A self-priming centrifugal pump will not function until the pump casing has been filled with liquid. Remove the plug at the top of the pump casing and fill the pump with cold liquid. Fit the plug and the pump is ready for service. The liquid also serves as coolant for the shaft seal. Consequently, the pump must in no circumstances be started before it has been primed with liquid. Furthermore, the pump must never run dry.

WARNING

For safety reasons the pump is only allowed to operate against closed discharge valve for a short time (max. 5 minutes and at a max. temperature of 80°C for standard pumps). Otherwise there is a risk of damage to the pump and, at worst, of a steam explosion. If the pump is not monitored, the installation of a safety device is recommended.

The pump is equipped with a relief valve, which opens at a pre-set pressure. Be careful: If the valve opens, the escaping liquid will most likely be hot. The relief valve must in NO circumstances be removed or re-adjusted!

As regards maintenance of the relief valve - see paragraph 10.

8.1 STARTING

Before starting the pump check that
- the shaft rotates freely without jarring sounds.
- the pump casing is filled with liquid.

Start the pump for a moment to check the direction of rotation. If the direction is correct (i.e. in the direction of the arrow), the pump may be started.

9. SYSTEM BALANCING

It is often difficult to calculate a manometric delivery head in advance. It is, however, decisively important to the quantity of liquid delivered. A considerably smaller delivery head than expected will increase the quantity of liquid delivered, causing increased power consumption and perhaps cavitation in pump and piping. In the pump the impeller may show signs of heavy erosion caused by cavitation (corrosion) which may at times render an impeller unfit for use in a very short time. Not unusually do similar erosions occur in pipe bends and valves elsewhere in the piping system.

Therefore, after start-up, it is necessary to check either the quantity of liquid delivered or the power consumption of the pump e.g. by measuring the current intensity of the connected motor. Together with a reading of the differential pressure the quantity of water delivered can be determined against the characteristics of the pump.

Should the pump not function as intended, please proceed according to the fault-finding list. Bear in mind, though, that the pump was carefully checked and tested at the factory and that the majority of faults stem from the piping system.
<table>
<thead>
<tr>
<th>FAULT</th>
<th>CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>The pump does not prime</td>
<td>1. The pump is not filled with liquid</td>
<td>Fill pump casing with liquid</td>
</tr>
<tr>
<td></td>
<td>2. Leaking non-return valve in pump</td>
<td>Remove foreign body in pump/Remove any coating on mating faces</td>
</tr>
<tr>
<td></td>
<td>3. Wrong direction of rotation</td>
<td>Change direction of rotation</td>
</tr>
<tr>
<td></td>
<td>4. Air is drawn in because of too little</td>
<td>Lower suction pipe/Tighten suction line</td>
</tr>
<tr>
<td></td>
<td>5. Liquid lock in outlet line</td>
<td>Change the pressure line so that the air can pass out freely</td>
</tr>
<tr>
<td></td>
<td>6. Temperature of liquid  too high</td>
<td>Replace liquid in pump casing/Wrong dimensioning/Contact DESMI</td>
</tr>
<tr>
<td></td>
<td>7. Air cannot escape on pressure side</td>
<td>Ventilate the system</td>
</tr>
<tr>
<td>The pump has no or too low capacity</td>
<td>1. Wrong direction of rotation</td>
<td>Change direction of rotation to clockwise when viewed from shaft end</td>
</tr>
<tr>
<td></td>
<td>2. Piping system choked</td>
<td>Change direction of rotation to clockwise when viewed from shaft end</td>
</tr>
<tr>
<td></td>
<td>3. The pump is choked</td>
<td>Clean or replace</td>
</tr>
<tr>
<td></td>
<td>4. Suction line leaks, pump takes air</td>
<td>Clean the pump</td>
</tr>
<tr>
<td></td>
<td>5. Suction lift too high</td>
<td>Find the leakage, repair the fault, non-return valve not submerged</td>
</tr>
<tr>
<td></td>
<td>6. Pump and piping system wrongly</td>
<td>Check data sheet Q/H curve and NPSH or contact DESMI</td>
</tr>
<tr>
<td></td>
<td>dimensioned</td>
<td>As 5</td>
</tr>
<tr>
<td></td>
<td>7. RPM too low</td>
<td>Electric motor running on two phases or lower frequency?</td>
</tr>
</tbody>
</table>
## FAULT | CAUSE | REMEDY
--- | --- | ---
The pump uses too much power | 1. Counter-pressure too low  
2. The liquid is heavier than water  
3. Foreign body in pump  
4. Electric motor is running on 2 phases  
5. RPM too high  
6. Pump and electric motor not aligned. | Insert orifice plate or check valve/Contact DESMI  
Contact DESMI  
Dismantle the pump, remove the cause  
Check fuses, cable connection, and cable  
Frequency too high.  
Align unit (see para. about alignment)
The pump capacity is unstable | 1. Suction line leaks  
2. Air pockets in suction line  
3. The pump takes air | Tighten suction line  
Normally they disappear in a short time  
Liquid reservoir emptied/  
Suction line not sufficiently submerged
The pump makes noise | 1. Cavitation in pump  
2. Incorrect alignment  
3. Defective bearings | Suction lift too high/ Suction line wrongly dimensioned/  
liquid temperature too high.  
Align the pump and motor (see para. about alignment)  
Replace bearings

### 10. INSPECTION AND MAINTENANCE

- Before any inspection of the pump, check that the unit cannot be started unintentionally.

- The system is to be without pressure and drained of liquid.

- The repairman must be familiar with the type of liquid, which has been pumped as well as with the safety measures he is to take when handling the liquid.

- Inspect the shaft seal for leaks at regular intervals.

- Activate the relief valve at regular intervals in order to check the function. If the valve is choked, replace or clean it, if possible.
10.1 DRAINING THE PUMP
When the piping system has been drained, note that there is still some liquid left in the pump. Remove the remaining liquid by dismantling the pipe plug at the bottom of the pump.

10.2 BEARINGS
The pump (09 design only) is equipped with ball bearings, which were lubricated for life before leaving the factory. Therefore, they require no attention but are to be replaced in case of noise or bearing wear. Place a bead of grease on the sides of cleaned or newly mounted bearings. As far as semi-closed bearings are concerned, place grease on the open side of the bearing only.

A recommended grease quality on a lithium-basis is used:

ESSO .......................................................Beacon 2
BP ..............................................................Energrease EP grease 2
Shell ..........................................................Alvania grease 2
Mobil ..........................................................Mobil lux grease EP 2 or Mobil plex 47
Castrol .......................................................Spherol AP2
Texaco ........................................................Multifak EP 2
Q8 .............................................................Rembrandt EP 2 and Rubens
Statoil .........................................................Statoil Uniway U2

11. REPAIRS - ORDERING SPARE PARTS
When ordering spare parts please always state pump type and pump No. (appears on the name plate of the pump). See also spare parts drawing with item Nos.

12. OPERATING DATA
The following working pressures are allowed:

<table>
<thead>
<tr>
<th>PUMP</th>
<th>NSA50-200</th>
<th>NSA80-250</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRESSURE [bar]</td>
<td>8</td>
<td>12</td>
</tr>
</tbody>
</table>

The above-mentioned max. working pressure is NOT valid for pumps approved by a classification society. Pumps approved by classification societies have been pressure tested according to the requirements of these societies, i.e. a test pressure of 1.5 x the permissible working pressure. The test pressure is stated in the test certificate and stamped into the discharge flange of the pump.

The following max. numbers of revolutions are allowed for NSA-pumps with full impeller diameter:

<table>
<thead>
<tr>
<th>Pump</th>
<th>Max. number of revolutions</th>
<th>Pump</th>
<th>Max. number of revolutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSA50-200</td>
<td>3000 RPM</td>
<td>NSA80-250</td>
<td>3000 RPM</td>
</tr>
</tbody>
</table>

The capacities of the pumps appear from the nameplates.
13. EU DECLARATION OF CONFORMITY

DESMI PUMPING TECHNOLOGY A/S, hereby declare that our pumps of the type NSA are manufactured in conformity with the following essential safety and health requirements in the COUNCIL DIRECTIVE 2006/42/EC on machines, Annex 1.

The following harmonized standards have been used:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN/ISO 13857:2008</td>
<td>Safety of machinery. Safety distances to prevent danger zones being reached by the upper limbs</td>
</tr>
<tr>
<td>EN 60204-1:2006/A1:2009</td>
<td>Safety of machinery – Electrical equipment of machines (item 4, General requirements)</td>
</tr>
</tbody>
</table>

Pumps delivered by us connected with prime movers are CE-marked and comply with the above requirements.

Pumps delivered by us without prime movers (as partly completed machinery) must only be used when the prime mover and the connection between prime mover and pump comply with the above requirements.

Nørresundby, March 05 2019

Henrik Mørkholt Sørensen
Managing Director
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9400 Nørresundby
14. INFORMATION RELEVANT FOR DISASSEMBLY OR DISPOSAL AT END-OF-LIFE

No damage materials are used in DESMI pumps – please refer to DESMI Green Passport (can be sent on request – contact a DESMI sales office) – i.e. common recycling companies can handle the disposal at end-of-life. Alternatively the pump and motor can be returned to DESMI at end-of-life for safe recycling.
15. ASSEMBLY DRAWINGS AND SPARE PARTS LISTS

15.1 ASSEMBLY DRAWING NSA50-200/zz-M12

1. Nut
2. Stud
3. Sealing washer
4. Nut
5. Impeller
6. O-ring
7. Washer
8. Washer
9. Nut
10. Wear plate
11. Pump casing
12. Stud
13. Plug/sealing washer
14. Relief valve
15. Shaft/Pointed screw
16. Motor bracket
17. Name plate
18. Screw for nameplate
19. Nut
20. Key
21. Stud
22. Screw/washer
23. Plug/sealing washer
24. Shaft seal
25. Check valve
15.2 ASSEMBLY DRAWING NSA80-250/zz-M12

1 Pump casing
2 Motor bracket
4 Rear cover
6 Pointed screw
7 Impeller
8 Wear plate
9 Set screw
10 Washer
15 Shaft
16 Key
17 Intermediate flange*
18 Spring washer
19 Stud
20 Stud
21 Stud
22 Stud
24 Pointed screw
25 Nut
26 Nut
27 Washer
28 Pipe plug
29 Pipe plug
30 Inlet flange
31 Screw/washer
32 Allen screw**
37 Shaft seal
38 Check valve
41 O-ring
44 Sealing washer
46 Sealing washer
75 Pipe plug
76 Relief valve

*) Only for size 132 motor
**) If B5 motor
15.3 ASSEMBLY DRAWING NSA80-250/zz-M09

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th></th>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pump casing</td>
<td>17</td>
<td>Key</td>
<td>29</td>
</tr>
<tr>
<td>2</td>
<td>Bearing housing</td>
<td>18</td>
<td>Spring washer</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>Rear cover</td>
<td>19</td>
<td>Stud</td>
<td>31</td>
</tr>
<tr>
<td>5</td>
<td>Cover under bearing</td>
<td>20</td>
<td>Stud</td>
<td>32</td>
</tr>
<tr>
<td>6</td>
<td>Lock ring</td>
<td>21</td>
<td>Stud</td>
<td>37</td>
</tr>
<tr>
<td>7</td>
<td>Impeller</td>
<td>22</td>
<td>Stud</td>
<td>38</td>
</tr>
<tr>
<td>8</td>
<td>Wear ring</td>
<td>23</td>
<td>Pointed screw</td>
<td>39</td>
</tr>
<tr>
<td>9</td>
<td>Set screw</td>
<td>24</td>
<td>Support washer</td>
<td>41</td>
</tr>
<tr>
<td>10</td>
<td>Washer</td>
<td>25</td>
<td>Nut</td>
<td>44</td>
</tr>
<tr>
<td>11</td>
<td>Set screw</td>
<td>26</td>
<td>Nut</td>
<td>46</td>
</tr>
<tr>
<td>15</td>
<td>Shaft</td>
<td>27</td>
<td>Washer</td>
<td>75</td>
</tr>
<tr>
<td>16</td>
<td>Key</td>
<td>28</td>
<td>Pipe plug</td>
<td>76</td>
</tr>
</tbody>
</table>