Westfalia Separator AG

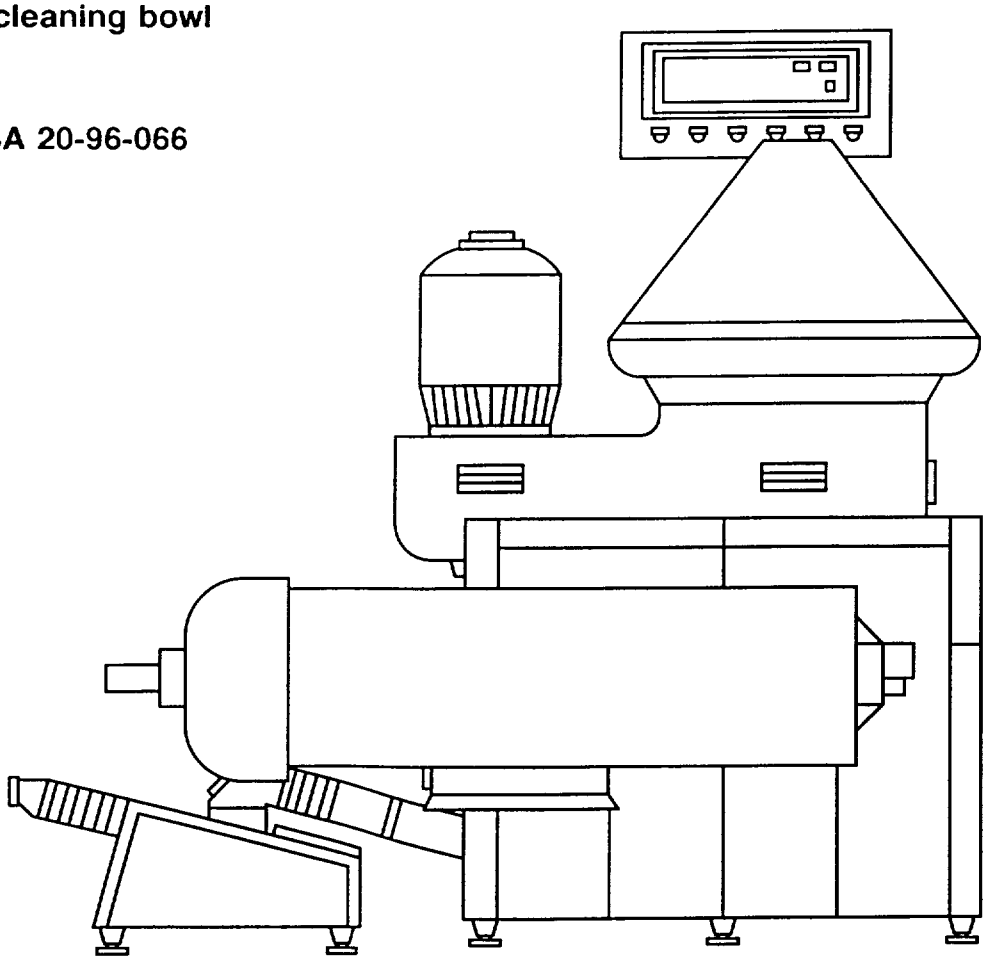
# Instruction Manual and Parts List

**No. 2178-9001-600**

Edition 0890

**Separator with self-cleaning bowl**

**Model OSA 20-96-066**



GEA

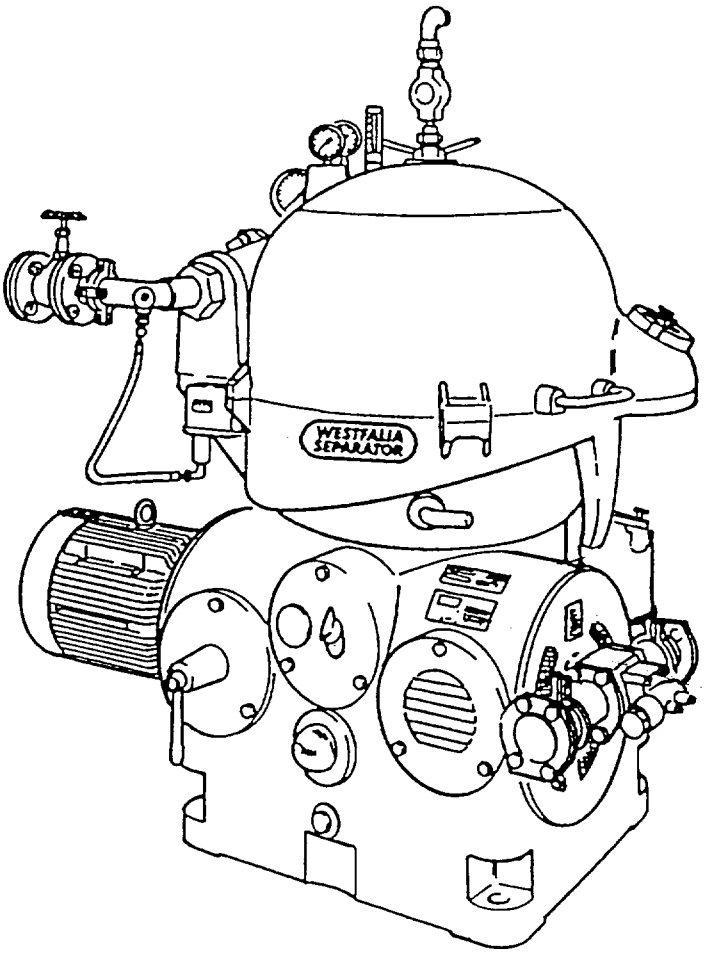
Process Technology Division

WESTFALIA SEPARATOR

Separator
with self-cleaning bowl

Model OSA 20-96-066

LUBOTROL - centrifuge with "self-thinker" control system for clarification




Westfalia Separator AG
D-59302 Oelde ( F.R.Germany)

| | | | |
|---|---|---|---|
| Typ | | M.Nr | |
| Baujahr | | ø Di in mm | |
| Trommeldrehzahl in $min^{-1}$ | | | |
| Zulässige Dichte in $kg/dm^3$ des Schleudergutes | | | |
| Schwere Flüssigkeit | | Feststoff | |

# CONTENTS

**Part III - Installation, maintenance, assembly and disassembly of gear parts**

## Part IV - Parts List

## 2.4 The Bowl

### 2.4.1 General

The bowl is a clarifier bowl with the "self-thinker" system (standard) for the clarification of liquids.

### 2.4.2 Assembling the bowl

#### 2.4.2.1 Assembling the clarifier bowl (unfold page 0/8)

Before assembling the bowl check if contact surfaces of all bowl parts are clean.

During assembly make sure that the "O" marks of the bowl parts are aligned.

If the plant has several separators, be careful not to interchange parts of different bowls since each bowl has been balanced with its component parts. The main parts of the bowl are marked with the last three digits of the Serial-Number of the separator.

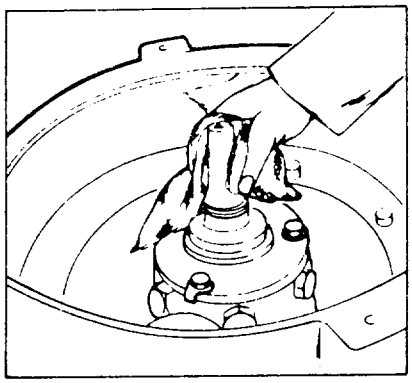


Fig. 2/9a

1) Oil the upper part of worm spindle (thread, cone and cylindrical guide surface for spindle cap). It must be possible to move the spindle cap easily up and down on the spindle.
Then **clean and wipe dry the conical part of the spindle with a smooth rag.**

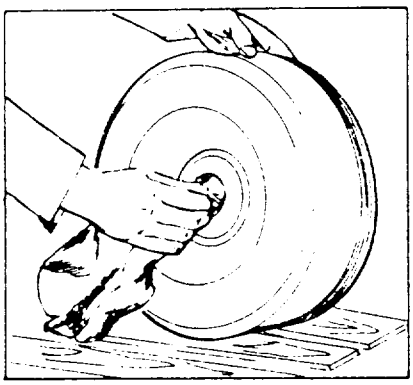


Fig. 2/9b

2) **Carefully clean the inside of the bowl hub as well to assure proper fitting.**

**Do NOT grease the conical parts.**

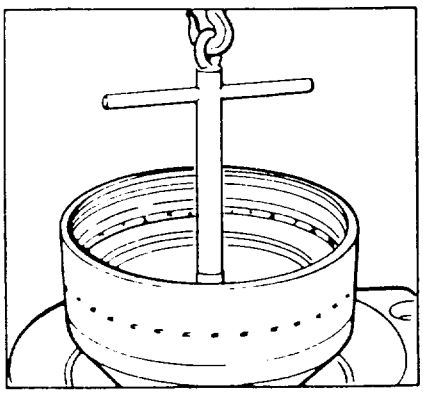


Fig. 2/10a

3) Insert bowl bottom into groove of spindle nut.

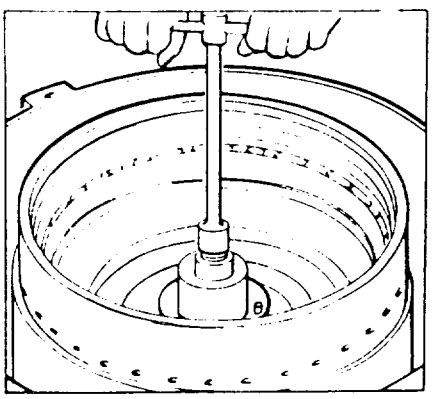


Fig. 2/10b

4) Remove gasket into spindle nut.

Use socket wrench to screw on spindle nut tightly **(left-hand thread).**

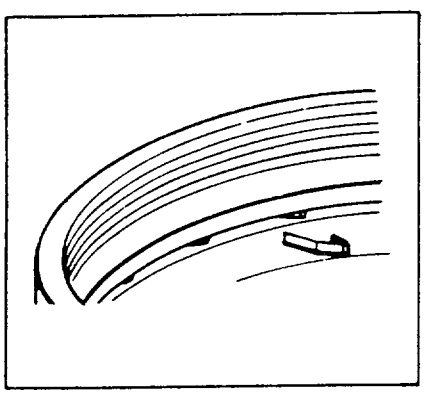


Fig. 2/10c

5) Only on special order:
Press wear insert (for protection against corrosion) between solids discharge ports.

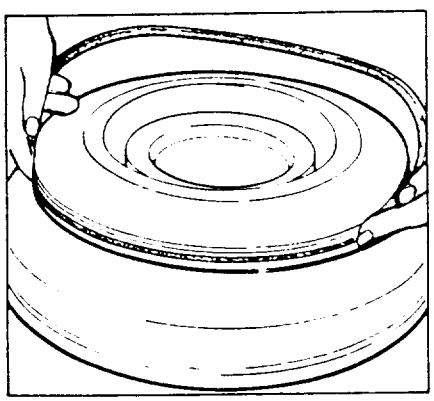


Fig. 2/10d

6) Thoroughly clean grooves in sliding piston for gaskets and and apply a thin film of grease.

In case the gaskets are new and a bit too tight stretch them out evenly all the way around until their outer diameters are almost equal to the outer diameters of the grooves in the sliding piston. Then insert gaskets and in grooves of sliding piston. Make sure not to twist the gaskets.

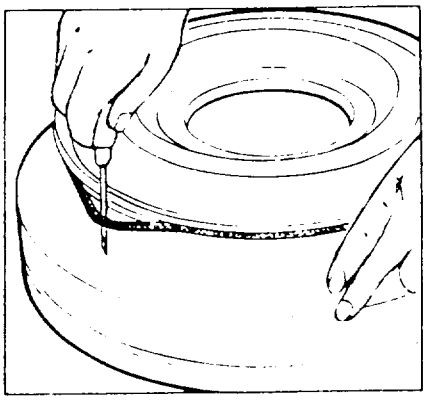


Fig. 2/11a

7) Force the insert gaskets with a screwdriver out of the grooves.
Stick a screwdriver under the gaskets and run it two or three times around the sliding piston. Tap the gaskets back into their grooves with a rubber hammer. The gaskets are now equally stretched all the way around and assure best sealing effect during operation.

If the gaskets have not been removed or replaced (e. g. when cleaning the bowl) pry them out in one place with a small flat screwdriver to allow water which has collected behind the gaskets to flow out. Then tap gaskets back into their grooves with a rubber hammer. Re-installation of the sliding piston (see No. 10) will now be as easy as if new gaskets were used.
The same applies to installation of gasket into centrifugation chamber bottom.

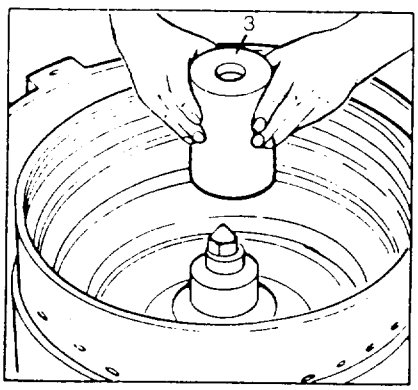



Fig. 2/11b

8) Place pressure piece 3 of jack onto bowl bottom hub. Make sure that the outer surfaces of the pressure piece are perfectly smooth.

9) Apply a thin film of a mixture of molybdenum disulfide paste and high quality lubricating grease (ratio 1 : 4) to guide surfaces of sliding piston and bowl bottom.

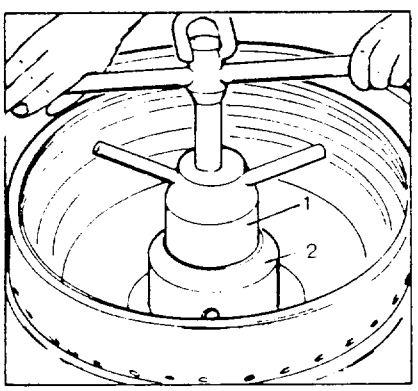



Fig. 2/11c

10) With the aid of jack 1 and housing 2 place sliding piston so into bowl bottom that the "O" marks of sliding piston and bowl bottom are in line with each other. By turning jackscrew in anti-clockwise direction lower the piston slowly until arresting piece of bowl bottom catch into groove of sliding piston. If necessary, tap gently on spindle with a hammer until sliding piston is properly seated.

Be sure not to damage sealing lip of sliding piston.

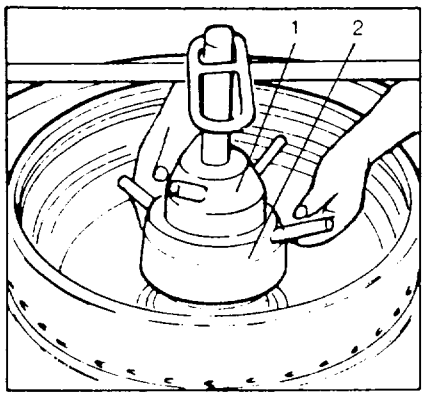



Fig. 2/12a

11) Screw jack 1 out of housing 2, then remove housing from sliding piston. Now use jack (without housing 2) to install centrifugation chamber bottom.

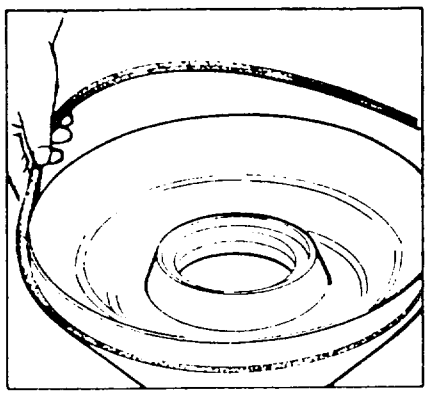


Fig. 2/12b

12) Insert gasket in groove of centrifugation chamber bottom.
Install this gasket in the same manner as when inserting gasket into groove of sliding piston (see No. 7).

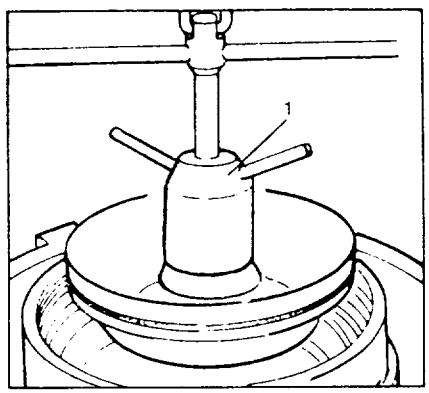



Fig. 2/12c

13) Apply a thin film of a mixture of molybdenum disulfide paste and high quality lubricating grease (ratio 1 : 4) to guide surfaces of centrifugation chamber bottom.
By means of jack 1 place centrifugation chamber bottom so into sliding piston that the "O" marks of both parts are in line with each other.

By turning jackscrew anti-clockwise lower centrifugation chamber bottom until arresting pins of bowl bottom catch into grooves of centrifugation chamber bottom. If necessary, bring the centrifugation chamber bottom in its correct position by shaking it or by lightly hammering on the spindle.

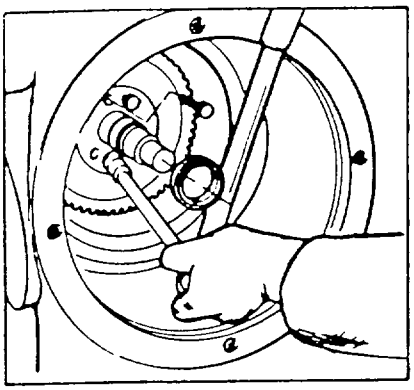


Fig. 3/30a

6) Unscrew hex head screws out of worm wheel.
While doing so, hold clutch drum to prevent worm wheel shaft from turning.
Use two hex head screws to press worm wheel off the worm wheel shaft cone.

### 3.4.9 Mounting the worm wheel

When mounting the worm wheel proceed in reverse order of removal (see 3.4.8) and according to the following instructions:

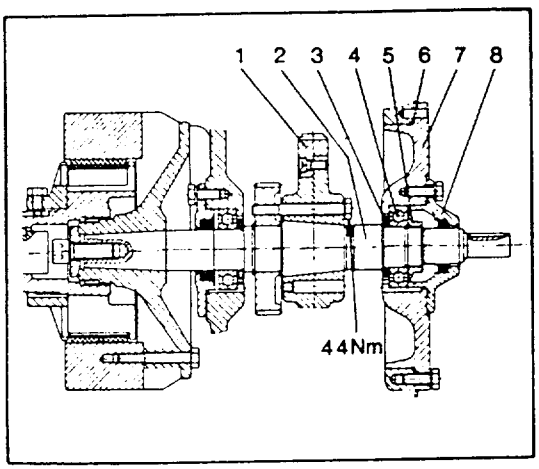



Fig. 3/30b

1) Before installing worm wheel, oil the conical part of the worm wheel shaft. Then clean and wipe dry with a smooth rag. Thoroughly clean the hub of the worm wheel as well to assure proper fitting.

2) The worm wheel must be firmly clamped to the worm wheel shaft, accomplished by tightening hex head screws in worm wheel with torque wrench, giving each screw single consecutive turns (final tightening at 44 Nm on the torque scale).

3) **IMPORTANT:** When toothed rim is worn and needs replacement, the entire worm wheel assembly 1 must be replaced. The worm spindle must be replaced at the same time, since this part, also worn down to some extent, would cause premature wear to the new worm wheel.

4) After having slipped ring 3 onto worm wheel shaft, fit large bearing cover 7 with gasket 6, angular contact ball bearing 4 and screwed-on small bearing cover 8 onto worm wheel shaft and flange it to the separator frame. Watch for proper location. When fitting angular contact ball bearing 4 into the large bearing cover make sure that filling notch of angular contact ball bearing faces the small bearing cover.

   Then remove small bearing cover, screw nut 5 tightly onto shaft end with wrench, and replace small bearing cover.

5) After assembling new gear parts, install the bowl and adjust bowl to proper height (see 3.4.3).

6) Fill gear chamber with oil as specified in sect. 3.2.2. Oil level must be up to upper third of sight glass.

7) **IMPORTANT:** To prevent the gear pump from rotating while the gear parts are being run in, check to be sure that flexible coupling has not been inserted in the pump clutch.

8) Check spindle speed with a hand tachometer (see 3.1.3) and check direction of rotation of bowl (see 3.1.2.3).

9) To run in new gear parts, let separator run - without bowl - for about one hour. During this time, switch motor on and off several times.

### 3.4.10 Removing the clutch drum and the worm wheel shaft

1) Remove the motor (3.4.5).

2) Remove gear pump and pump clutch (3.4.7).

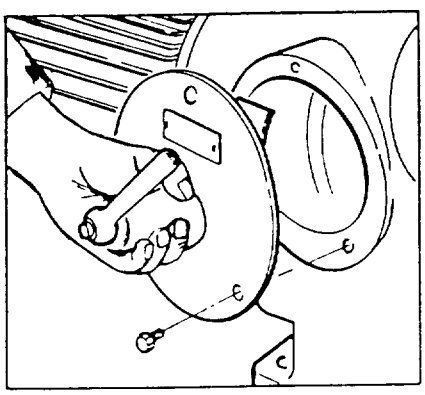


Fig. 3/31a

3) Unscrew brake housing and remove it.

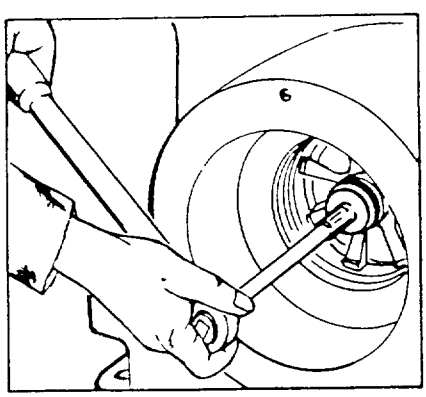


Fig. 3/31b

4) Use wrench to undo Allen screw.

While doing so, block clutch pulley - on pump side - with a screwdriver to prevent worm wheel shaft from turning.
Remove fan-type lock washer and centering disc.

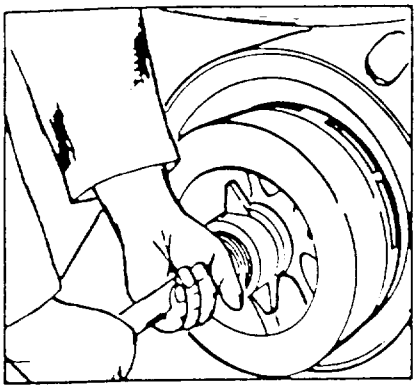


Fig. 3/32a

5) By means of pulling device withdraw clutch drum from worm wheel shaft end by hand.

6) Remove the worm wheel (see 3.4.8).

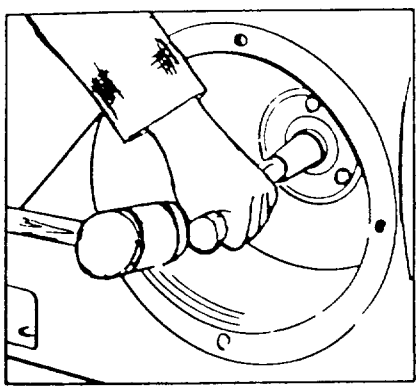


Fig. 3/32b

7) Undo hex head screws of bearing cover. With the aid of the hex head screws force off the bearing cover. Then remove the cover together with sealing ring and gasket.

8) Hold a piece of hard wood against worm wheel shaft and hammer it lightly to drive out shaft together with ring and ball bearing towards pump side.

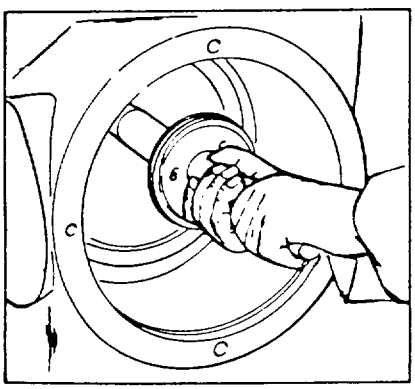


Fig. 3/32c

9) Pull worm wheel shaft carefully out of the frame.

### 3.4.11 Installation of the worm wheel shaft and the clutch drum

For re-installation of the worm wheel shaft and the clutch drum proceed in reverse order of removal (see 3.4.10). The following should be kept in mind:

1) The conical part of the shaft has to be cleaned and wiped dry with a smooth rag and the inside of the clutch hub is to be cleaned as well to assure proper fitting.

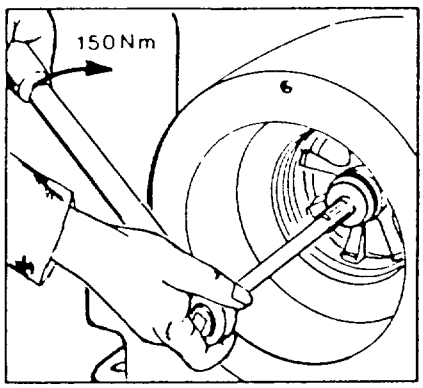



Fig. 3/33

2) The Allen screw has to be tightened at 150 Nm on the scale of the torque wrench.

### 3.4.12 Installation of the sealing rings

When fitting new sealing rings into the bearing covers, apply some oil to the sealing surfaces of the rings (never use grease).

Sealing rings which have dried out or hardened during too long a storage time should be put into 70°C hot oil for about 20 minutes before being installed.

During installation, the side of the ring with the inscription on it must always face the fitter. Be careful not to damage the sealing surfaces of the rings.

The sealing rings are to seal properly. However, the sealing lips of the rings should not fit on the shaft too tightly. It must be possible to rotate the shaft easily by hand.

### 3.4.13 Final check-up

#### 3.4.13.1 Before starting the separator

Before starting the reconditioned separator the following has to be checked:

| | Sect. |
|---|---|
| 1) Bowl height | 3.4.3 |
| 2) Oil level in gear chamber | 3.2.2 |
| 3) Direction of rotation of bowl | 3.1.2.3 |
| 4) Speed of bowl | 3.1.3 |
| 5) Starting time of bowl | 3.1.3 |
| 6) Smooth run of separator | 3.3.1.4 |
| 7) Tightness of suction line of dirty-oil pump | |
| 8) On purifier bowl: correct size of regulating ring | 2.4.3 |

#### 3.4.13.2 During start-up of the separator

During start-up of the reconditioned separator the following has to be checked:

| | Sect. |
|---|---|
| 1) Temperature of feed liquid | 2.2.1 |
| 2) Temperature of make-up water | 2.2.2.2 |
| 3) Adjustment of pre-set valve | 2.3.2.1 |
| 4) Outlets for water, sludge, and oil to be sure that bowl functions properly | |

## IMPORTANT!

When ordering parts, please state the following:

| | |
|---|---|
| 1) Model<br>2) Serial-No. | of the Separator:<br><br>Both designations are shown on the name-plate of the separator. The Serial-No. also appears on the frame rim. |
| 3) Description<br>4) Part-No. | of the part to be replaced:<br><br>For details refer to List of Parts.<br>The Part-No. is also shown on all major parts.<br><br>The encircled parts (e. g. ② ) within an assembly are complete parts. The corresponding parts are shown in a separate drawing referred to in column "Part - No". |
| 5) Bowl Serial-No. | (only required when ordering bowl parts):<br><br>The Bowl Serial-No. appears, in large figures, on bowl lock ring and on bowl bottom. |
| 6) Model<br>7) Serial-No. | of the gear pump:<br><br>(only required when ordering parts for gear pump and pump connection).<br>Both designations are shown on the name-plate of the gear pump. |

Part-Numbers ending with letter "L" (e. g. 3158-1021-L) designate parts which are available in different designs for the separator concerned. To ensure correct delivery of these parts,

**Model and Serial-No. of the Separator MUST be stated.**

| No. in Fig. | Part - No. | Qty. | | Part Description |
|---|---|---|---|---|
| 1 | 2178-1001-020 | 1 | | Lower section of frame |
| (8) | see page 4/6 | 1 | | Intermediate flange (fig. 4/3) |
| 9 | 3036-1066-000 | 1 | | Protective cap |
| 10 | 0019-6973-150 | 2 | | Hex head screw DIN 933 - M 12x45 |
| 11 | 2178-1085-000 | 1 | | Ventilation grid |
| 12 | 0019-6933-150 | 3 | | Hex head screw DIN 933 - M 10x20 |
| 13 | 2170-1038-000 | 1 | | Brake housing |
| 14 | 2170-1031-000 | 1 | | Brake bolt, assembly (14.1 - 14.3) |
| 14.1 | 2170-1042-000 | 1 | | Brake bolt |
| 14.2 | 0026-1086-400 | 1 | | Cylindrical pin DIN 7 - 6h8x14 |
| 14.3 | 0021-4060-880 | 1 | * | Brake lining 135x8 |
| - | 0026-1263-550 | 4 | | Rivet DIN 661 - 4x16 |
| 15 | 0006-4352-160 | 1 | | Cylindrical pressure spring |
| 16 | 0021-3527-000 | 1 | | Tapered handle |
| 17 | 0019-6935-300 | 3 | | Hex head screw DIN 933 - M 10x25 |
| 18 | 0019-8910-030 | 1 | | Lock screw DIN 910 - R 3/4in |
| 19 | 0007-1796-550 | 1 | | Gasket DIN 7603 - A 27x32 |
| 20 | 0004-2199-750 | 1 | | Gasket 55x75x2 |
| 21 | 0001-0028-800 | 1 | | Sight glass |
| 23 | 2169-1124-040 | 1 | | Flange |
| 24 | 0019-6845-150 | 3 | | Hex head screw DIN 933 - M 6x25 |
| 33 | 2178-1045-020 | 1 | | Inspection nipple, assembly (33.1 - 33.6) |
| 33.1 | 2178-1047-000 | 1 | | Inspection nipple |
| 33.2 | 2178-1160-000 | 1 | | Flap |
| 33.3 | 0026-1556-150 | 1 | | Cylindrical notched pin DIN 1473 - 4x35 |
| 33.4 | 2178-1124-020 | 1 | | Flange |
| 33.5 | 0001-0182-030 | 1 | | Flange 40 |
| 33.6 | 0018-3817-300 | 1 | | Hose clamp 50 - 70 |
| 34 | 0004-5457-740 | 1 | | Gasket 52/80x122x2 |
| 35 | 0019-6971-150 | 2 | | Hex head screw DIN 933 - M 12x35 |
| 36 | 0001-0146-000 | 1 | | Welded flange 1 1/2in |
| 37 | 0019-6972-150 | 2 | | Hex head screw DIN 933 - M 12x40 |
| 38 | 0013-0280-150 | 2 | | Hexagon nut DIN 934 - M 12 |
| 50 | 2178-1219-000 | 1 | | Operating-water feed line |
| 54 | 0019-6984-150 | 3 | | Hex head screw DIN 933 - M 12x100 |
| 55 | 0026-5892-600 | 3 | | Tab washer DIN 93 - 13 |

* This part is included in the complete Part - No., but it is also available as separate item.

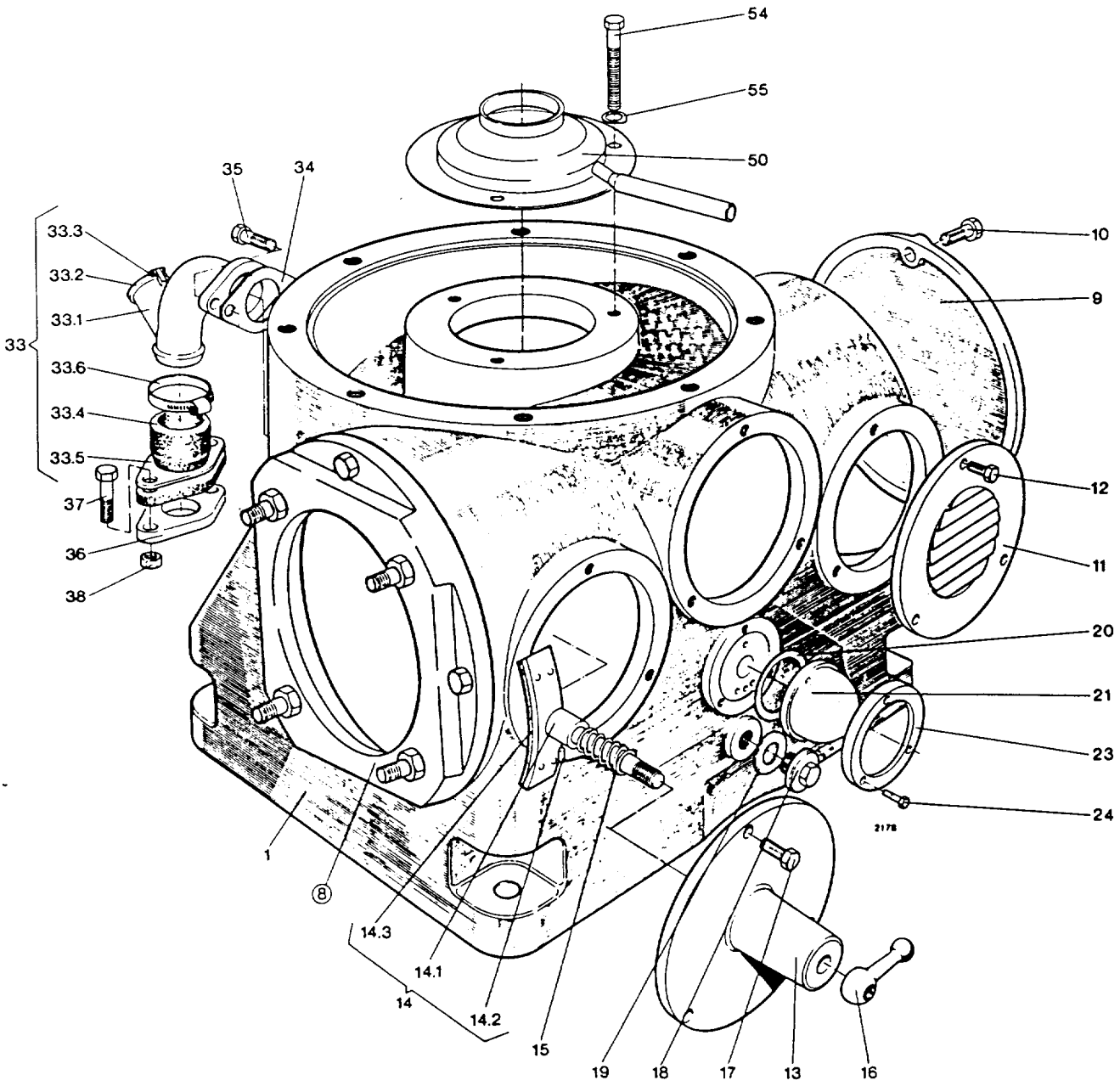

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Fig. 4/1

| No. in Fig. | Part - No. | Qty. | | Part Description |
|---|---|---|---|---|
| 2 | 2178-1002-000 | 1 | | Upper section of frame |
| 4 | 0019-6202-150 | 8 | | Allen screw DIN 912 - M 16x45 |
| 5 | 2178-1795-000 | 1 | | Baffle ring |
| 6 | 0007-2547-750 | 1 | | Gasket 560/4 |
| 7 | 0007-2049-750 | 1 | | Gasket 423/9 |
| 14<br>17<br>18<br>20 | see page 4/8a | | | |
| 25 | 2170-1126-000 | 1 | | Support |
| 26 | 0019-6973-150 | 4 | | Hex head screw DIN 933 - M 12x45 |
| 27 | 2170-1222-000 | 1 | | Hinge sleeve |
| 28 | 0007-1937-750 | 5 | | Gasket 69,2x5,7 |
| 29 | 0019-5196-150 | 2 | | Hex head screw DIN 561 - AM 10x30 |
| 30 | 0019-0235-150 | 4 | | Hex head screw M 12x50 |
| 31 | 0007-2148-750 | 2 | | Gasket 50/66x8 |
| 32 | see page 4/7 | 1 | | Junction assembly (fig. 4/4) |
| (33) | see page 4/7 | 1 | | Junction assembly (fig. 4/4) |
| 39 | 0007-2335-750 | 1 | | Gasket 80x95x15 |
| 40 | 2178-2775-020 | 1 | | Siphon complete (40.1 - 40.5) |
| 40.1 | 2178-2776-020 | 1 | | Siphon |
| 40.2 | 2178-1124-010 | 1 | | Flange |
| 40.3 | 0001-0188-030 | 1 | | Flange 50 |
| 40.4 | 0018-4061-300 | 1 | | Hose clamp 48 - 95 |
| 40.5 | 0018-0991-260 | 1 | | Plug DIN 2950 - 3/4in - T9 |
| 41 | 0004-5460-740 | 1 | | Gasket 65/100x140x2 |
| 42 | 0019-6971-150 | 2 | | Hex head screw DIN 933 - M 12x35 |
| 43 | 0001-0147-000 | 1 | | Welded flange 2in |
| 44 | 0019-6972-150 | 2 | | Hex head screw DIN 933 - M 12x40 |
| 45 | 0013-0280-150 | 2 | | Hexagon nut DIN 934 - M 12 |
| 46 | 2168-1121-000 | 1 | | Flange complete (46.1 - 46.6) |
| 46.1 | 2178-1124-000 | 1 | | Flange |
| 46.2 | 0019-7038-150 | 4 | | Hex head screw DIN 933 - M 16x45 |
| 46.3 | 0026-0209-040 | 1 | | Washer 121x186x4 |
| 46.4 | 0001-0771-000 | 1 | | Flange DIN 2631 - 80/88,9 |
| 46.5 | 0013-0282-300 | 4 | | Hexagon nut DIN 934 - M 16 |
| 46.6 | 0018-3819-300 | 1 | | Hose clamp 83 - 127 |
| 47 | 2178-8851-000 | 1 | | Inspection cover |
| 48 | 0007-1845-750 | 1 | | Gasket 106x7 |
| 49 | 0019-4547-090 | 2 | | Knurled screw DIN 464 - M 8x30 |
| 56 | 2231-1177-000 | 1 | | Bend |
| 58 | 0007-2507-750 | 1 | | Gasket 16x3,5 |
| 59 | 0019-6122-150 | 3 | | Allen screw DIN 912 - M 8x20 |
| 60 | 0004-5274-740 | 1 | | Gasket 12/19x3 |
| 61 | 2168-8769-000 | 1 | | Hose complete (61.1 - 61.4) |
| 61.1 | 0018-3064-600 | 1 | | Hose connection R 1/2in x 10 |
| 61.2 | 0018-2786-758 | 0,2m | | Hose 13 |
| 61.3 | 0018-3816-300 | 2 | | Hose clamp 8 - 22 |
| 61.4 | 0018-1796-600 | 1 | | Hose connection R 1/2in - 13 |
| 70 | 0018-1712-630 | 1 | | Ball-type valve 1/2in |
| 71 | 0018-0934-260 | 1 | | Double nipple DIN 2950 - 3/4in x 1/2in - N8 |
| 72 | 0018-2523-600 | 1 | | Strainer R 3/4in - N 1 |
| - | 0018-2523-300 | 1 | * | Strainer insert |

* This part is included in the strainer 72, but it is also available as separate item.

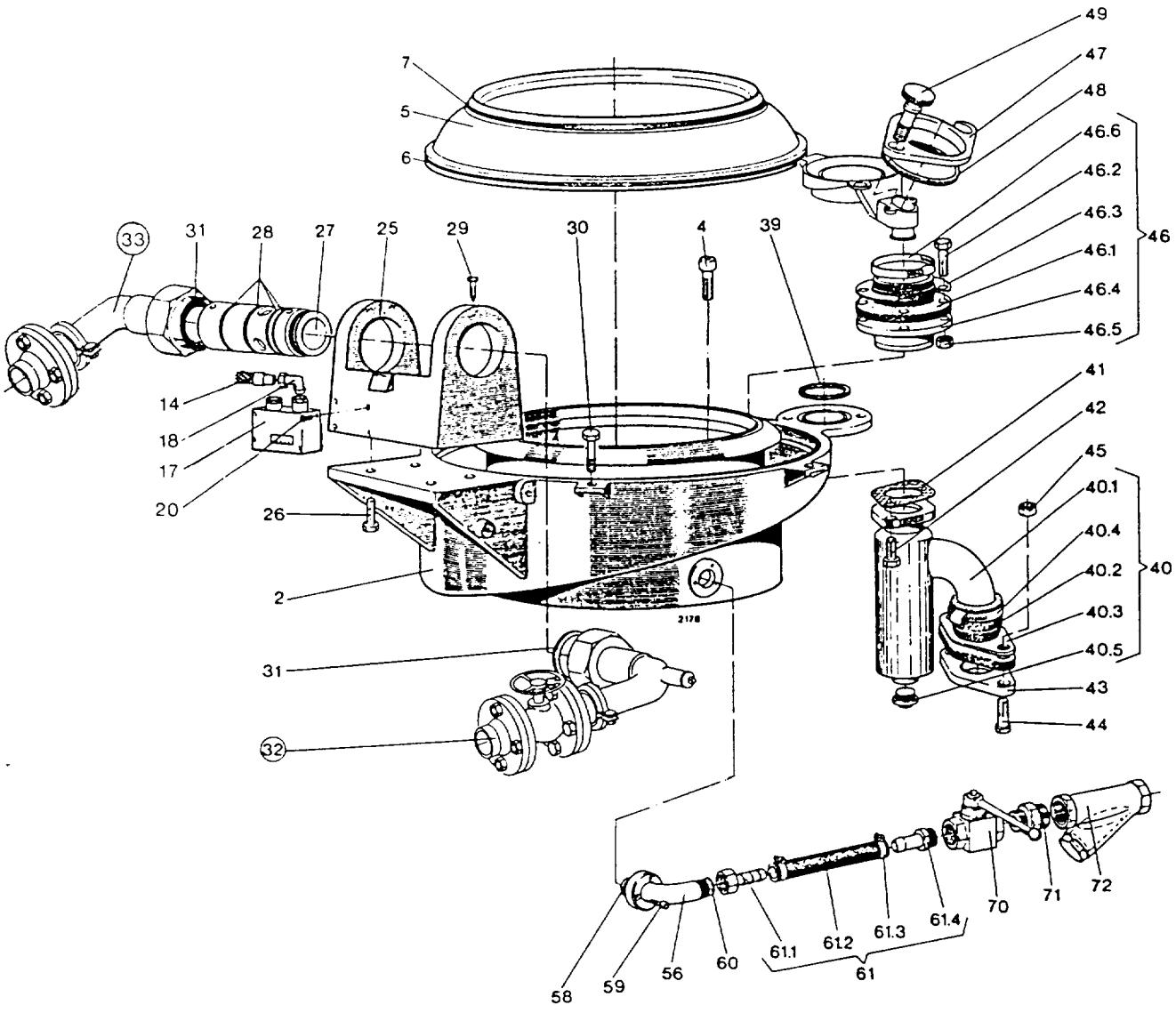
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Fig. 4/2

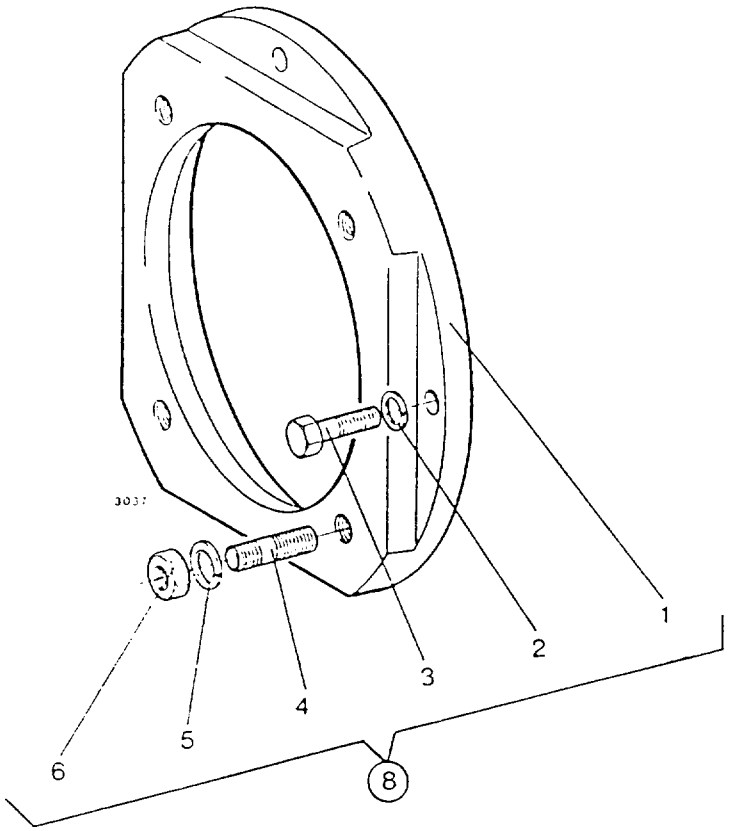


Fig. 4/3

| No. in Fig. | Part - No. | Qty. | Part Description |
|---|---|---|---|
| (8) | 3036-1021-L | 1 | Intermediate flange, compl. (1 - 6) (depending on motor) |
| 1 | 3036-1028-L | 1 | Intermediate flange |
| 2 | 0026-1328-190 | 4 | Lock washer DIN 127 - A 12 |
| 3 | 0019-6972-400 | 4 | Hex head screw DIN 933 - M 12x40 |
| 4 | 0019-7669-090 | 4 | Stud DIN 939 - M 12x40 |
| 5 | 0026-1328-190 | 4 | Lock washer DIN 127 - A 12 |
| 6 | 0013-0280-400 | 4 | Hexagon nut DIN 934 - M 12 |

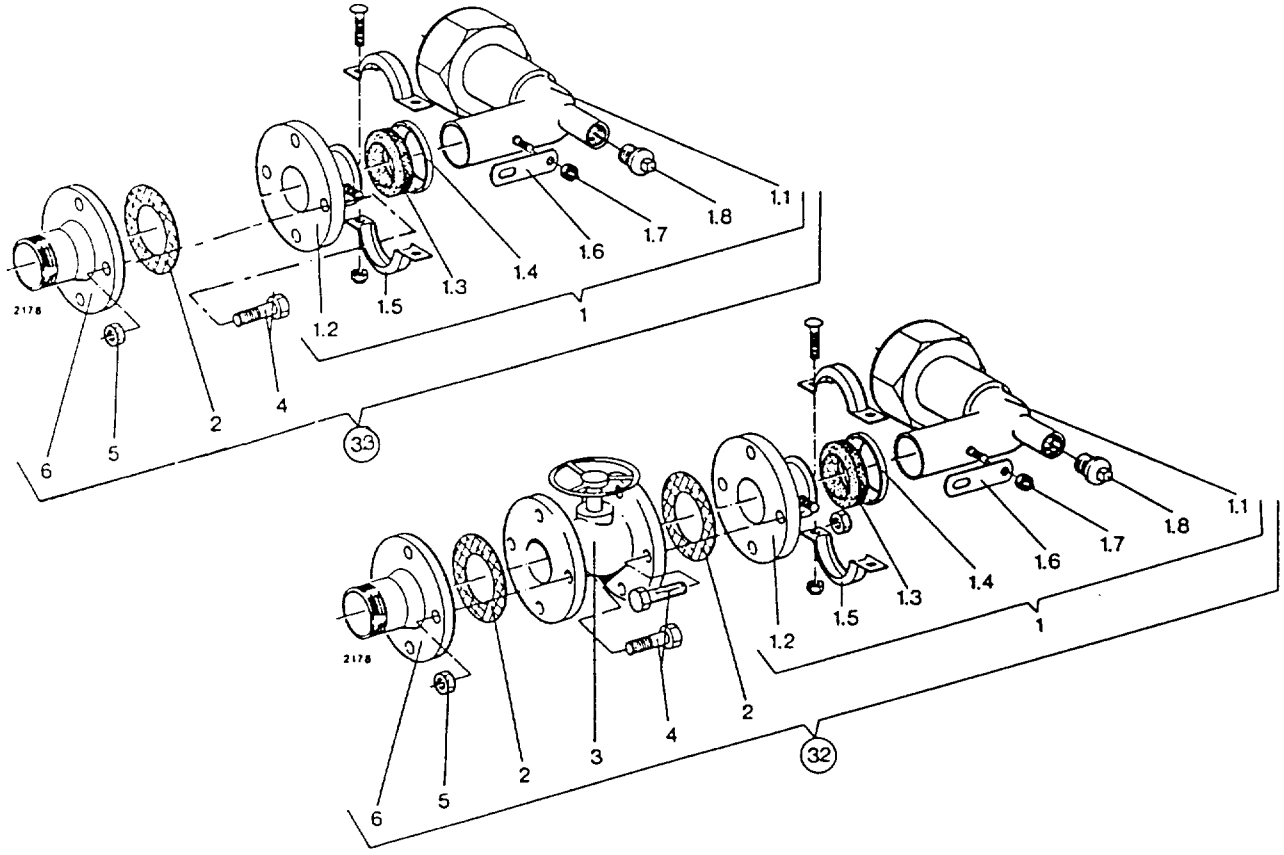


Fig. 4/4

| No. in Fig. | Part - No. | | Qty. | Part Description |
|---|---|---|---|---|
| (32) | 2178-2805-120 | - | 1 | Junction assembly (1 - 6) |
| (33) | - | 2178-2805-110 | 1 | Junction assembly (1 - 6) |
| 1 | 2178-2832-030 | 2178-2832-030 | 1 | Expansion joint, complete (1.1 - 1.8) |
| 1.1 | 2178-2831-040 | 2178-2831-040 | 1 | Expansion joint |
| 1.2 | 2178-2831-050 | 2178-2831-050 | 1 | Expansion joint |
| 1.3 | 0018-4844-750 | 0018-4844-750 | 1 | Gasket 40 |
| 1.4 | 0018-4844-010 | 0018-4844-010 | 1 | Gasket holder 40 |
| 1.5 | 0018-4844-020 | 0018-4844-020 | 1 | Clamp assembly 40 |
| 1.6 | 2178-1108-000 | 2178-1108-000 | 1 | Plate |
| 1.7 | 0013-0291-300 | 0013-0291-300 | 2 | Hexagon nut DIN 985 - M 8 |
| 1.8 | 0018-0990-260 | 0018-0990-260 | 1 | Plug DIN 2950 - 1/2in - T9 |
| 2 | 0004-2215-740 | - | 2 | Gasket DIN 2690 - 40 ND 6 |
| 2 | - | 0004-2215-740 | 1 | Gasket DIN 2690 - 40 ND 6 |
| 3 | 0018-1393-500 | - | 1 | Straight-way valve 40 |
| 4 | 0019-6973-150 | - | 8 | Hex head screw DIN 933 - M 12x45 |
| 4 | - | 0019-6973-150 | 4 | Hex head screw DIN 933 - M 12x45 |
| 5 | 0013-0280-300 | - | 8 | Hexagon nut DIN 934 - M 12 |
| 5 | - | 0012-0280-300 | 4 | Hexagon nut DIN 934 - M 12 |
| 6 | 0001-0768-000 | 0001-0768-000 | 1 | Flange DIN 2641 - 40/48,3 |