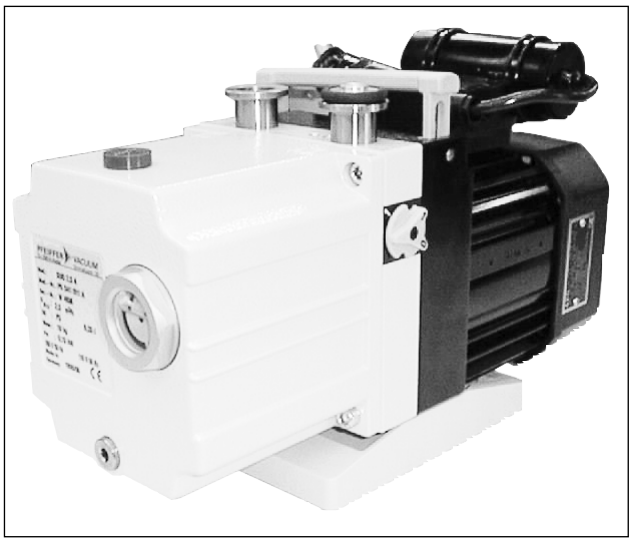
PFEIFFER VACUUM

Service Instructions

UNO/DUO 2.5
DUO 2.5 C
UNO 5

Rotary Vane Vacuum Pumps



PK 800 215 BE/C (0208)

Index

1. Important Information

☞ These service instructions are only valid in conjunction with Operating Instructions PK 800 152 BN for the UNO/DUO 2.5 C, UNO 5 and DUO 2.5 C.

☞ Read and follow all instructions in this manual.

☞ Customers who carry out their own repairs must have completed the necessary PFEIFFER training courses.

Pfeiffer will not be liable for any damages or operating breakdowns which are caused by improper repair work nor for any related personal injuries or material damages; neither will any guarantee claims be accepted.

– Prevent accidental switching on of the motor whenever carrying out inspection work.
– If necessary, remove the pump from the system when carrying out inspection work.
– Only dismantle the pump as far as is necessary to effect repairs.
– Used operating fluid must be disposed of in accordance with local regulations.
– Where operations involve the use of synthetic operating fluids and toxic or with corrosive gas enriched substances, the relevant user instructions must be observed.
– Pump parts may only be cleaned with petrol or similar cleaning agents. Do not use soluble cleaning agents.

For your information

Working instructions in the text:

➡ Here you have to do something.

Position numbers

The same position numbers for components and tools are used throughout in all illustrations in both the service manual and in the operating instructions.

The use of symbols

The following symbols are used throughout in the illustrations.

Ⓥ Vacuum flange

Ⓐ Exhaust flange

Pictogram Definitions

Danger of personal injury.

Danger of burns from touching hot parts.

Danger of damage to the pump or to the system.

Modifications reserved.

2. Troubleshooting

Problem	Possible causes	Remedy
Pump does not attain final pressure	Pump is dirty	Operate the pump for a longer period with open gas ballast valve or change the operating fluid
	Operating fluid is dirty	
	Leak in the system	Repair leck
	Pumping system worn out	Dismantle pump stages; check vanes and vane springs - see Section 4.4.
	Hydraulic valve defective	Check hydraulic valve - see Section 4.2.1.
	Malfunction of high vacuum safety valve	Check high vacuum safety valve and clean if necessary - see Section 4.2.
	Exhaust valve defective	Check valve tongue - See Section 4.3.
Unusual operating noises	Silencer maladjusted or dirty	Clean or replace silencer refer to Operating Instructions PK 800 152 BN/E, Section 4.6.
	Damage to the pump stages	Dismantle pump stages; check vanes and vane springs - see Section 3.4.
	Damage to the coupling part	Dismantle motor, replace coupling - Section 3.1.
	Damage to the motor bearing	Dismantle motor and replace - Section 3.1.
Oil leaking at the foot of the pump	Casing seal defective	Drain off operating fluid, replace casing seal - see Section 4.1.
	Radial shaft seal defective	Dismantle motor and replace radial shaft seal - see Section 3.2.
Pump does not start	Malfunction in power supply	Check mains, mains switch and mains connections
	Motor defective	Dismantle motor and replace - section 3.1., 3.2.
	Ambient temperature < 12 °C	Warm up pump
	Dirty pump stages	Dismantle pump stages and clean - Section 4.
	Damage to the pump stages	Dismantle pump stages and clean - Section 4.

3. Motor And Coupling

3.1. Dismantling And Assembling The Motor Fig. 7

Dismantling
For the purpose of dismantling motor 6 it is not necessary to drain the pump fluid nor to strip the pump.

➡ Loosen screws 62 (countersunk) on support stand 8.
➡ Place the pump upright on casing 9.
➡ Remove screws 62.
➡ Lift out motor 6.

Replacing the motor:
➡ Remove base plate 44 by unscrewing screws 45.
➡ Dismantle handle 10 by knocking out pins 60.
➡ Pull coupling half 56 from the motor shaft with pulling tool A (see Section 5.0); be careful with key 74.
➡ Secure coupling half 56 with Loctite and press on to the shaft of the new motor up to the stop point.

It is necessary to support the motor shaft on the fan side to avoid damaging the motor bearings.

Assembly
Assembly in reverse order to dismantling, but please note the following points:

➡ Take care not to damage radial shaft seal 55 when positioning the motor on the pump.
➡ The pins of coupling half 56 must protrude into the borings of coupling half 57.
➡ Tighten screws 62 evently to 2,6 Nm.

3.2. Changing The Radial Shaft Seal Fig. 7

If pump fluid escapes through the opening between support stand 8 and motor 6 below casing 9, radial shaft seal 55 must be replaced.
It is not necessary to drain pump fluid to replace radial shaft seal 55, or must the pump be stripped.

➡ Dismantle motor as per 3.1.
➡ Lever out radial shaft seal 55 from support stand 8 with a suitable tool; avoid damaging the support stand.
➡ Lightly oil the periphery of new radial shaft seal 55 and place on the boring of support stand 8.
➡ Put guide sleeve B (see Section 5.0) onto support stand 8 and press up to the stop point using mounting tool B. Hold guide sleeve B in position.

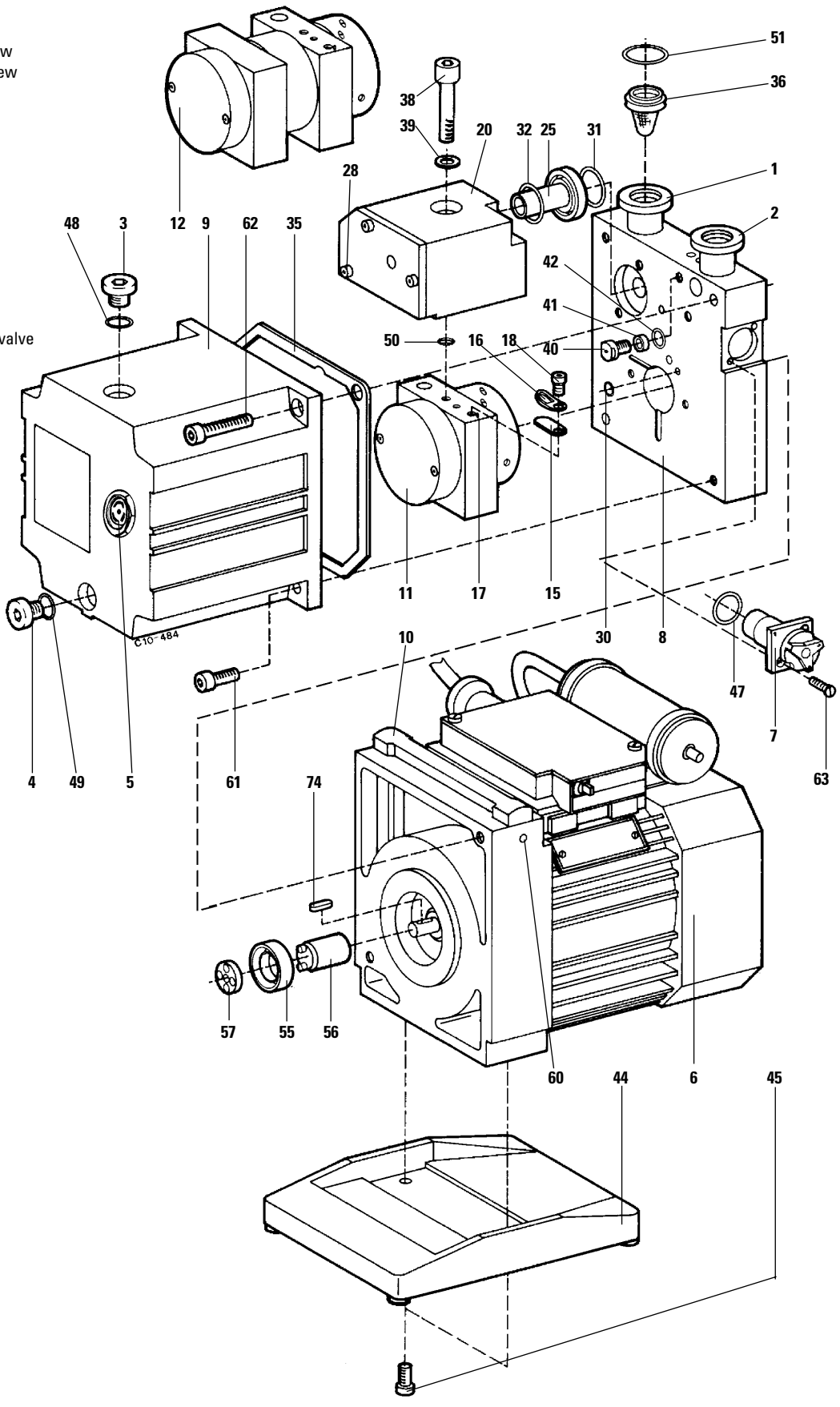
Check the sealed surface of coupling half 56 for wear (grooving). Coupling half 56 will have to be replaced if it has been damaged by the sealing lip of radial shaft seal 55 or the running surface of the radial shaft seal must be re-ground using the plunge cut method. When grinding it must be ensured that the diameter of the coupling half is within the tolerance range specified by the radial shaft seal manufacturer.
➡ Pull coupling half 56 off the motor shaft using pulling tool A (see Section 5.0).
➡ Secure new coupling half 56 with Loctite and press onto the motor shaft up to the stop point.

It is necessary to support the motor shaft on the fan side to avoid damaging the motor bearings.

Further assembly steps in reverse order to dimantling, but note remarks under Section 3.1.

Fig. 7

1 Intake connection
2 Exhaust connection
3 Pump fluid filler screw
4 Pump fluid drain screw
5 Sightglass
6 Motor
7 Gas ballast valve
8 Support stand
9 Casing
10 Handle
11 Pump system (UNO)
12 Pump system (DUO)
15 Valve tongue
16 Valve trap
17 Dowel pin
18 Screw
20 High vacuum safety valve (complete)
22 HV-valve housing
25 Valve seat
28 Cylinder screw
30 O-ring
31 O-ring
32 O-ring
35 Seal
36 Strainer with centering ring
38 Screw
39 Washer
40 Silencer
41 Centering ring
42 O-ring
44 Base plate
45 Screw
47 O-ring
48 O-ring
49 O-ring
50 O-ring
51 O-ring
55 Radial shaft seal
56 Coupling half
57 Coupling washer
60 Dowel pin
61 Screw
62 Screw
63 Screw
74 Key



4. Dismantling And Assembling The Pump System

4.1. Dismantling And Assembling The Casing, Fig. 7

There is a danger of burns from touching hot parts. The temperature of the operating fluid can be as high as 80 °C.
During maintenance and repair work and depending on the application, toxic gases and vapours can escape from the operating fluid and enriched substances which are a health hazard (radioactive, chemical etc.) can be present.
The disposal of operating fluid must be carried out in accordance with local regulations.

➡ Unscrew operating fluid drain screw and drain off operating fluid. Please refer to Operating Instructions PK 800 152 BN/E for the changing of operating fluid.
➡ Screw out two screws 61 (screw head not countersunk).
➡ Remove casing 9 carefully in an axial direction from support stand 8,
➡ Remove seal 35 and replace if necessary.
➡ Assembly in reverse order.

4.2. High Vacuum Safety Valve Fig. 7, Fig. 8

4.2.1. Hydraulic Valve

Dismantling
➡ Drain pump fluid as per 6.1. in operating instructions PK 800 152 BN/E.
➡ Dismantling casing 9 as per 4.1.
➡ Lossen screws 28 and remove valve cover 21.

Caution:
When valve cover 21 is removed, hydrailic valve 23 is forced out of valve housing 22 by the tension of compression spring 26.

➡ Be careful with O-rings 29 and 30 (two pieces each) and 33 and also compression spring 26.
➡ Clean guide and facing surface in valve housing 22.
➡ Replace O-rings 29, 30 and 33 if necessary.

Assembly
➡ Lightly oil the parts before assembling.
➡ Check carefully the position of the O-rings 30 and 33 in the valve housing 22.
➡ Place hydraulik valve 23 with compression spring 26 and O-ring 29 and 30 in valve housing 22 and manually check for manoeuvrability.

When assembling valve cover 21, hydraulic valve 23 must not be tipped; tighten screws 28 evenly to 2,6 Nm.
Ensure valve cover 21 is positioned correctly in valve housing 22.

4.2.2. High Vacuum Safety Valve, Complete

Dismantling
➡ Dismantle hydraulic valve 23 as described under 4.2.1.
➡ Unscrew screws 38; careful with washer 39.
➡ Slightly tilt valve housing 22 and remove from support stand 8; be careful with valve head 24 and compression spring 27.
➡ Remove valve head 24 and compression spring 27 from valve housing 22, possibly by using suitable tools to press out from the other side if necessary.
➡ Remove valve seat 25 from support stand 8.
➡ Clean all parts and check for wear and tear and replace as necessary.

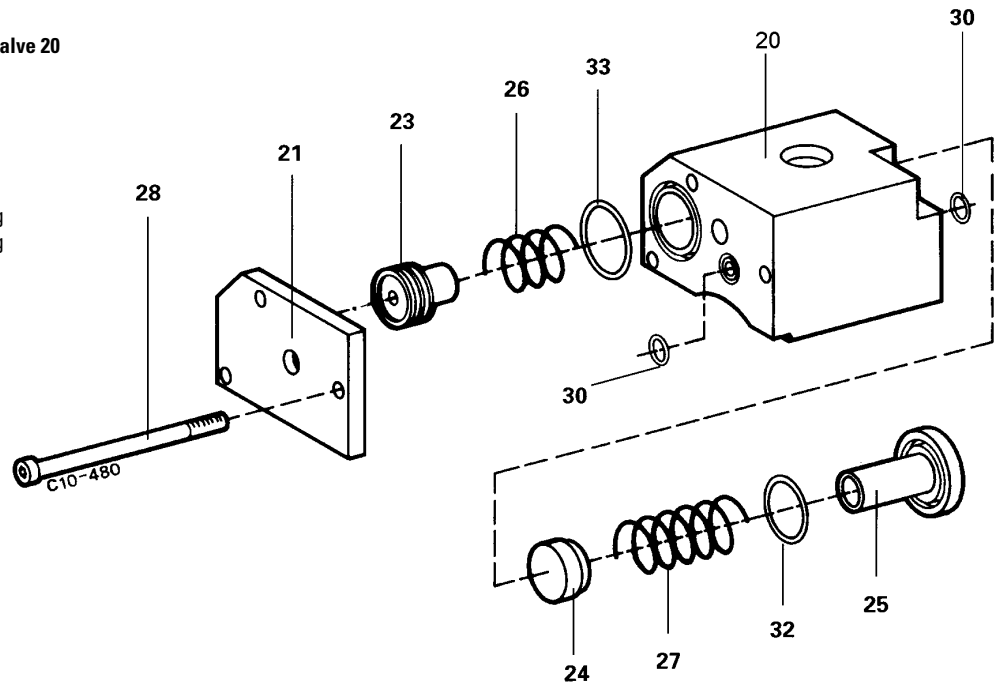
Assembly
➡ Lightly oil parts before assembling.
➡ Place valve seat 25 with O-rings 31 and 32 in support stand 8; ensure clean, tight surfaces.
➡ Insert O-rings 30 (two pieces), 33 and 50 in valve housing 22.
➡ Position valve head 24 with compression spring 27 in the deeper boring of valve housing 22. It is important to ensure a straight fit.
➡ Place valve housing 22 carefully over valve seat 25 onto support stand 8; be careful with compression spring 27.

Screw in screw 38 with washer 39 and tighten to 2.6 Nm (caution: not too tight). When tightening screw 38, valve housing 22 must rest on support stand 8 and touch the pumping system on the right hand side.

➡ Carry out further assembly steps as described in Section 4.2.1.

Fig. 8
High vacuum safety valve 20

21Valve cover
22Valve housing
23Hydraulic valve
24Valve head
25Valve seat
26Compression spring
27Compression spring
28Screw
30O-ring
32O-ring
33O-ring



4.3. Exhaust Valve Fig. 7

➡ Drain pump fluid as per 6.1. in operating instructions PK 800 152 BN/E.
➡ Dismantle casing 9 as per 4.1.
➡ Dismantle valve housing 22 as per 4.2.2.
➡ Unscrew screw 18.
➡ Remove valve trap 16 and valve tongue 15 from the pumping system.

Please note:
Dowel pin 17 secures the position of parts 15 and 16 and must not therefore be removed.

➡ Clean the parts.
➡ Check valve tongue 15 and replace if necessary.
➡ Assembly in reverse order.

4.4. Dismantling And Assembling The Pumping Systems Fig. 9, Fig. 10

➡ Dismantle casing 9 and high vacuum safety valve 20 as per 4.1. and 4.2.

The sealing surfaces of all parts of the pumping systems are either lapped or ground. Ensure that these surfaces are not damaged in any way during assembly and dismantling work.

The pumping system parts are secured with bonded dowel pins which must not be removed.

4.4.1. UNO 2.5 Fig. 7, Fig. 9

➡ Unscrew screws 34 and remove pumping system 11 from support stand 8; be careful with O-ring 30.
➡ Remove coupling washer 57, check for wear and tear and replace as necessary.
➡ Dismantle exhaust valve and valve tongue 15, check for wear and tear.
➡ The pumping system parts are secured with pin. They can be parted in an axial direction (see Fig. 9). Avoid tilting.
➡ Clean all parts.

There is a recess between the intake and exhaust channels of cylinder 66 within which rotor 71 runs with a small tolerance (air gap). The remaining air gap is sealed by the pump fluid.

➡ Check whether rotor 71 has run into the recess or into the bearing journals.
➡ Check vane springs 14.
➡ Check that vane 13 can be lightly moved in rotor 71.
➡ Check that hydraulic vane 52 can be lightly moved in the rotor shaft.
➡ Check if the rotor pins in coupling washer 57 are worn.
➡ Blow out the pump fluid channels with compressed air.
➡ Replace defective or damaged parts.

Parts 66, 68, 69 and 71 are not individually replaceable. If one of these parts is defective, that whole pumping system 11 must be replaced.

4.4.2. DUO 2.5 Fig. 7, Fig. 10

➡ Instructions for dismantling and checking pumping systems 12 can be found in 4.4.1.
➡ Replace defective parts.

Parts 66, 67, 68, 69, 70, 71 ans 72 are not individually replaceable. If one of these parts is defective, the whole pumping system 12 must be replaced.

Assembly, UNO/DUO 2.5

➡ Assembly of pumping system 11 and 12 is in reverse order to dismantling.
➡ Before assembly, all parts should be lightly oiled.
➡ Pumping system parts cannot be mixed up owing to the arrangement of dowel pins 73 and the fastening borings.
➡ When assembling the DUO pumping system 12 be sure that the rough stage (cylinder with exhaust valve) is pointing to support stand 8.
➡ Before mounting pumping system 11 or 12 to support stand 8, check that the rotor turns in the pumping system.
➡ Tighten screws 34 evenly to 2.6 Nm.

UNO-Pumping system 11

Fig. 9

13 Vane
14 Vane spring
17 Tension pin
34 Screw
52 Hydraulik vane
66 Cylinder (rough stage)
67 Cylinder (medium stage)
68 Base plate
69 Bearing cover
70 Intermediate plate
71 Rotor (rough stage)
72 Rotor (medium stage)
73 Dowel pin

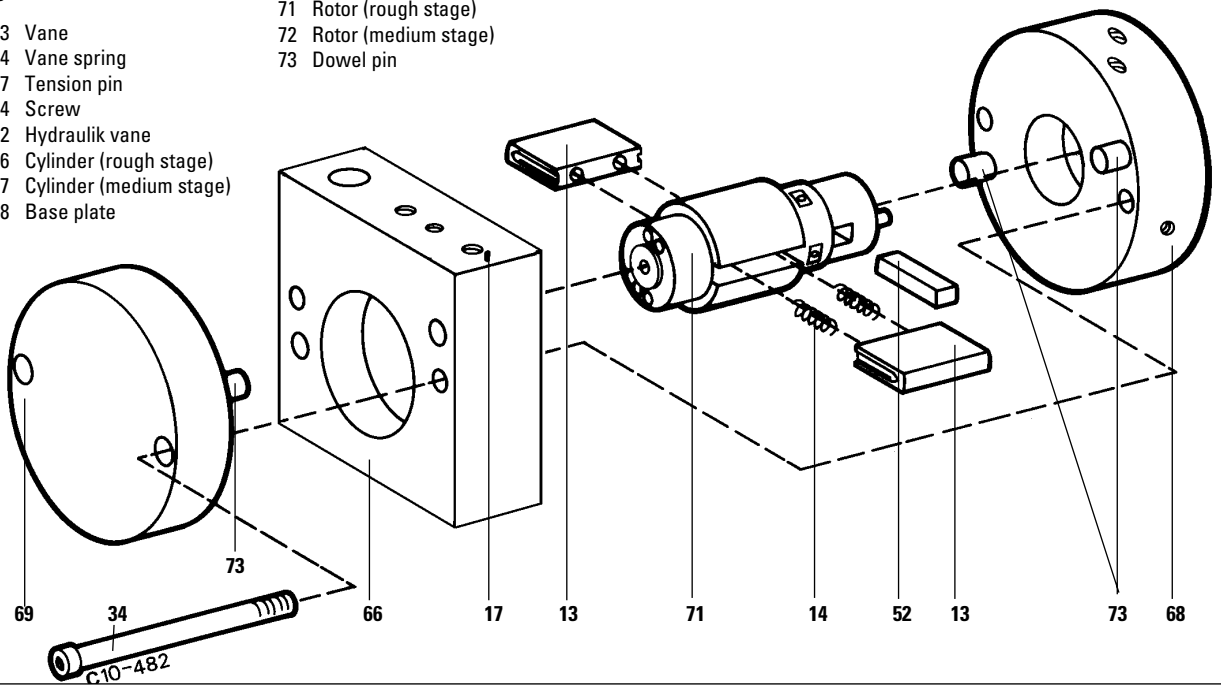
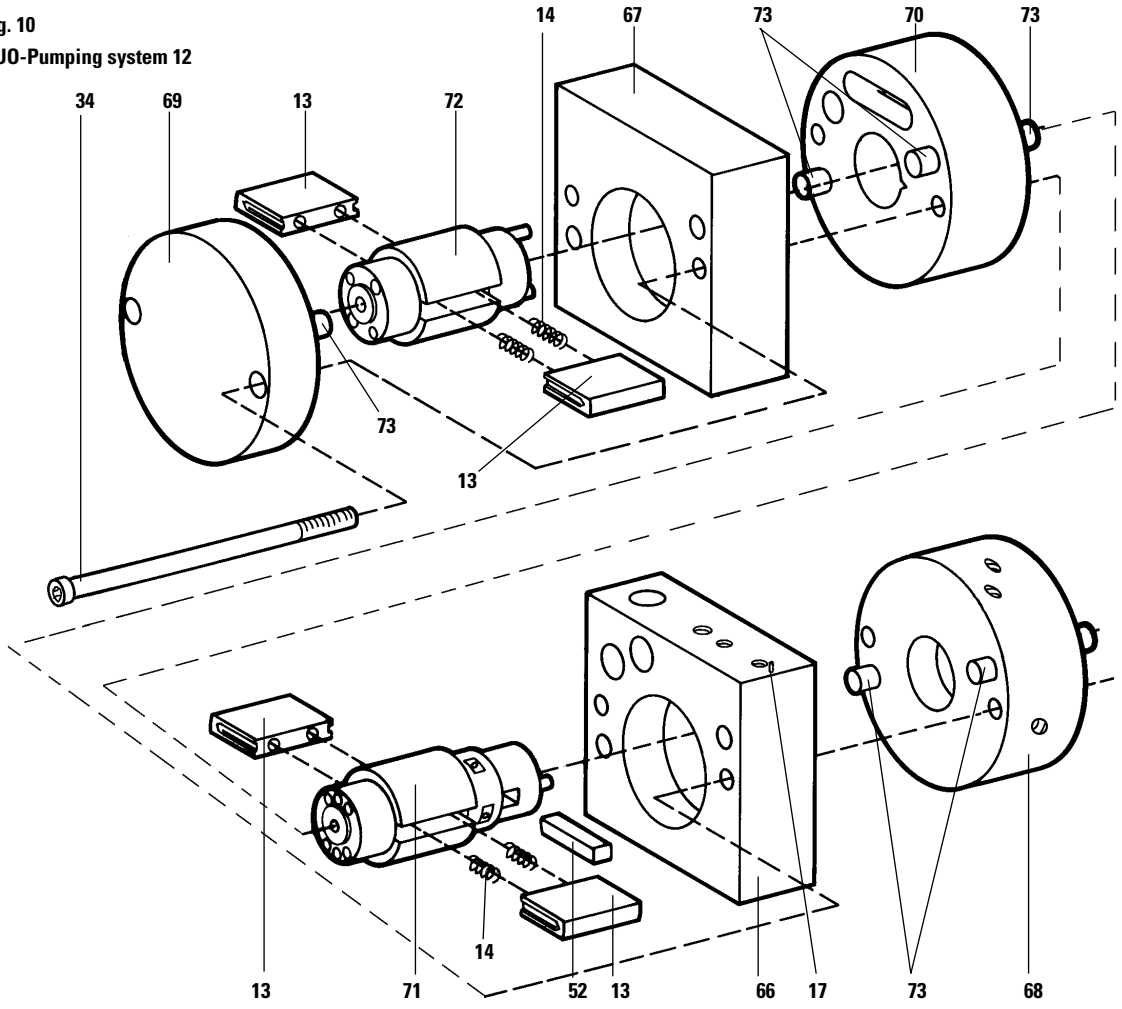


Fig. 10

DUO-Pumping system 12



4.5. Silencer
Fig. 7

Please note the instructions in Section 4.6. in the operating instructions PK 800 152 BN/E.

➡ Unscrew silencer 40; be careful with centering ring 41 and O-ring 42.
➡ Clean the parts and replace if necessary.
➡ Screw back in silencer 40 with centering ring 41 and O-ring 42.

4.6. Gas Ballast Valve
Fig. 7, Fig. 11

Gas ballast valve 7 only becomes dirty if dusty ambient air is sucked in.

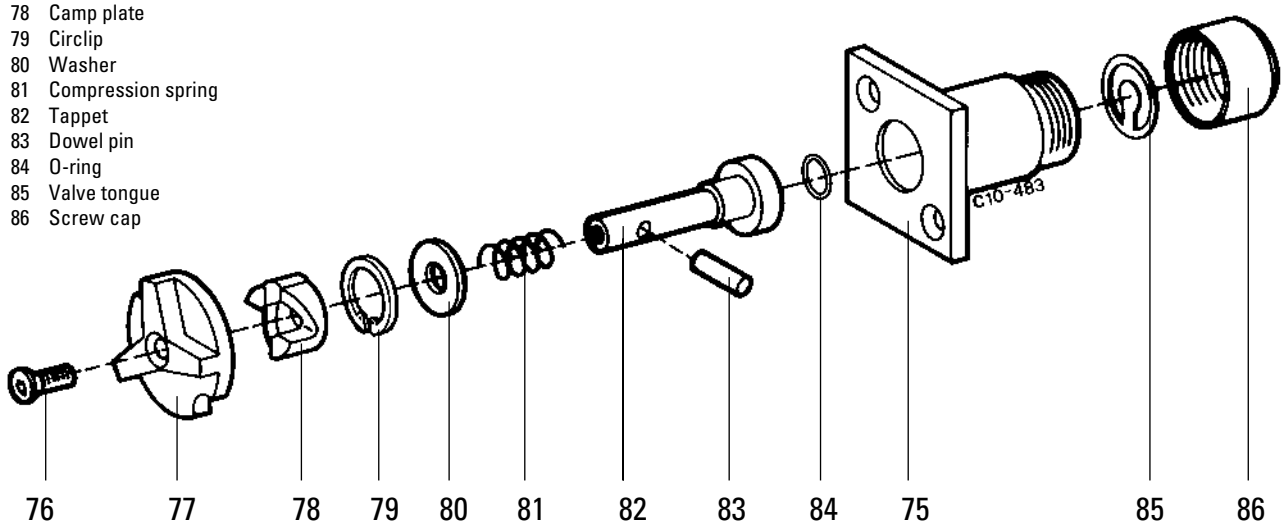
➡ Unscrew screws 63.
➡ Pull out gas ballast valve 7 from support stand 8; be careful with O-ring 47.
➡ Screw off screw cap 86; be careful with valve tongue 85.
➡ Screw out screw 76 and remove nose 77.
➡ Pull out tappet 82 from flange housing 75 far enough to allow dowel pin 83 to be removed.
➡ Remove cam plate 78 and circlip 79 with a suitable pair of pliers; be careful with washer 80 and compression spring 81.
➡ Remove tappet 82 from flange housing 75.
➡ Clean all parts and, if necessary, replace defective parts or gas ballast valve complete.

Assembly
Assembly in reverse order to dismantling, but note the following points:

➡ O-ring 84 must sit in the groove of tappet 82.
➡ The sealing surface of flange housing 75 must be undamaged.
➡ Before fitting nose 75, tappet 82 with dowel pin 83 must be brought into position "1" (open) by turning on cam plate 78.
➡ Insert valve tongue 85 exactly in screw cap 86.
➡ Screw flange housing 75 (complete) onto cap 86 from above.

Fig. 11

75 Flange housing
76 Screw
77 Nose
78 Camp plate
79 Circlip
80 Washer
81 Compression spring
82 Tappet
83 Dowel pin
84 O-ring
85 Valve tongue
86 Screw cap



5. Tools

Special tools for dismantling and assembly the pump, are not supplied with normal delivery consignments and must therefore be ordered separately under order no.:

A	Extractor for pulling coupling half 56 off the motor shaft	PK 194 120-U
B	Mounting tool and guide sleeve for pressing radial shaft seal 55 into support stand 8	PK 194 121-U

6. Accessories

Oil Mist Separator ONF 010 can be fitted to the exhaust port with the help of a reducing ring of the UNO/DUO 2.5 to prevent the expelled pump fluid mist polluting the air. Oil Mist Separator ONF 010 and reducing ring are not included as standard and should therefore be ordered separately.

PFEIFFER´s catalogue contains details of a comprehensive accessory programme which can both extend the range of application of the pump and provide protection against wear and tear under extreme operating conditions.

UNO 5 A, UNO/DUO 2.5, DUO 2.5 C

Pos.	Description	Size	Number	Comments/ Operating Instructions	Order Quantity
	Oil Mist Separator ONF 016		PK Z40 003		
	Oil return unit via special gas ballast valve for ONF 016		PK 194 315 -T	without ONF 016	

7. Spare Parts

Important:
Please always quote product type and number when inquiring about or ordering spare parts.

Spare parts list UNO 5, UNO/DUO 2.5 standard version, and DUO 2.5 with interstage port				
Pos.	**Description**		**Pieces**	**Nr.**
	Set of seals		1	PK 194 324 -T
7	Gas ballast valve		1	PK 194 012 -U
11	Pumping system	UNO 2.5	1	PK 104 080 -U
12	Pumping system Stages I and II	DUO 2.5	1	PK 194 082 -U
13	Vane	DUO 2.5	4	
13	Vane	UNO 2.5	2	
14	Vane spring	DUO 2.5	4	
14	Vane spring	UNO 2.5	2	
15	Valve tongue		1	
23	Plunger hydraulic		1	
24	Valve head, complete		1	
26	Compression spring		1	
27	Compression spring		1	
30	O-ring	5 x 1.5	1	
31	O-ring	15 x 2.5	1	
32	O-ring	22 x 1.5	1	
33	O-ring	22 x 1.5	1	
35	Casing seal		1	
36	Centering ring with strainer		1	
40	Silencer		1	
42	O-ring	6 x 2.2	1	
47	O-ring	15 x 1.5	1	
48	O-ring	10 x 2.5	1	
49	O-ring	6 x 2.2	1	
50	O-ring	10 x 2.5	1	
51	O-ring	18 x 5	2	
52	Hydraulic vane		1	
55	Radial shaft seal	16/28 x 7/6	1	
56	Coupling half		1	
57	Coupling washer		1	
77	Nose		1	
78	Cam plate		1	
81	Compression spring		1	
84	O-ring	6 x 2.2	1	
85	Valve tonguee		1	
86	O-ring	8 x 2	1	

7.1 Spare Part Packs

Spare Part Packs UNO/DUO 2.5

Spare Part Packs PK 082 610 AT, UNO/DUO 2.5			
Pos.	**Discription**	**Pieces**	**Number**
5	Sight glass	1	
64	Locking cap	2	
	Set of seals	1	PK 194 324 -T

Spare Part Packs PK 082 620 -T, UNO 2.5			
Pos.	**Discription**	**Pieces**	**Number**
57	Coupling washer	1	
56	Half of coupling	1	

Spare Part Packs PK 082 630 -T, UNO 2.5			
Pos.	**Discription**	**Pieces**	**Number**
14	Pressure spring	2	
40	Leak nozzle	1	
57	Coupling washer	1	
52	Hydraulic vane	1	
13	Vane	2	

Spare Part Packs PK 082 640 -T, UNO 2.5			
Pos.	**Discription**	**Pieces**	**Number**
40	Leak nozzle	1	
57	Coupling washer	1	
11	Pumping system	1	

Spare Part Packs PK 082 650 -T, UNO 2.5			
Pos.	**Discription**	**Pieces**	**Number**
38	Screw 16KT, A2-70, M5x40	1	
28	Screw 16 KT, 8.8 GSW, M5x75	3	
39	Washer ST-A2B, A5,3/ 15 x 1,5	1	
25	Valve seat	1	
27	Pressure spring	1	
22	Valve housing	1	
21	Valve cover	1	
26	Pressure spring	1	
24	Valve plate cpl.	1	
23	Hydraulic piston	1	

Spare Part Packs PK 082 660 -T, UNO 2.5			
Pos.	**Discription**	**Pieces**	**Number**
18	Cyl. screw 16KT, A2-70, M5x40	1	
17	Dowel pin 16 KT, 8.8 GSW, M5x75	1	
40	Leak nozzle 0,2mm	1	
15	Valve flap	1	
16	Valfe trap	1	

Spare Part Packs PK 082 720 -T, DUO 2.5			
Pos.	**Discription**	**Pieces**	**Number**
57	Coupling washer	1	
56	Coupling half	1	

Spare Part Packs PK 082 730 -T, DUO 2.5			
Pos.	**Discription**	**Pieces**	**Number**
14	Pressure spring	4	
40	Leak nozzle	1	
57	Coupling washer	1	
52	Hydraulic vane	1	
13	Vane	4	

Spare Part Packs PK 082 740 -T, DUO 2.5			
Pos.	**Discription**	**Pieces**	**Number**
11	Pumping system	1	
40	Leak nozzle	1	
57	Coupling washer	1	

Spare Part Packs PK 082 750 -T, DUO 2.5			
Pos.	**Discription**	**Pieces**	**Number**
38	Screw M5x40	1	
28	Screw M5x75	3	
39	Disc	1	
25	Valve seat	1	
27	Pressure spring	1	
22	Housing for high vacuum safety valve	1	
21	Cover for high vacuum safety valve	1	
26	Pressure spring	1	
24	Valve plate	1	
23	Hydraulic piston	1	

Spare Part Packs PK 082 760 -T, DUO 2.5			
Pos.	**Discription**	**Pieces**	**Number**
18	Cyl. screw 16KT, M4x6	1	
17	Clamping pin	1	
40	Leak nozzle	1	
15	Valve flap	1	
16	Valve trap	1	

Spare Part Packs UNO 005

Spare Part Packs PK 082 610 AT, UNO 005			
Pos.	**Discription**	**Pieces**	**Number**
5	Sight glass	1	
64	Locking cap	2	
	Set of seals	1	PK 194 324 -T

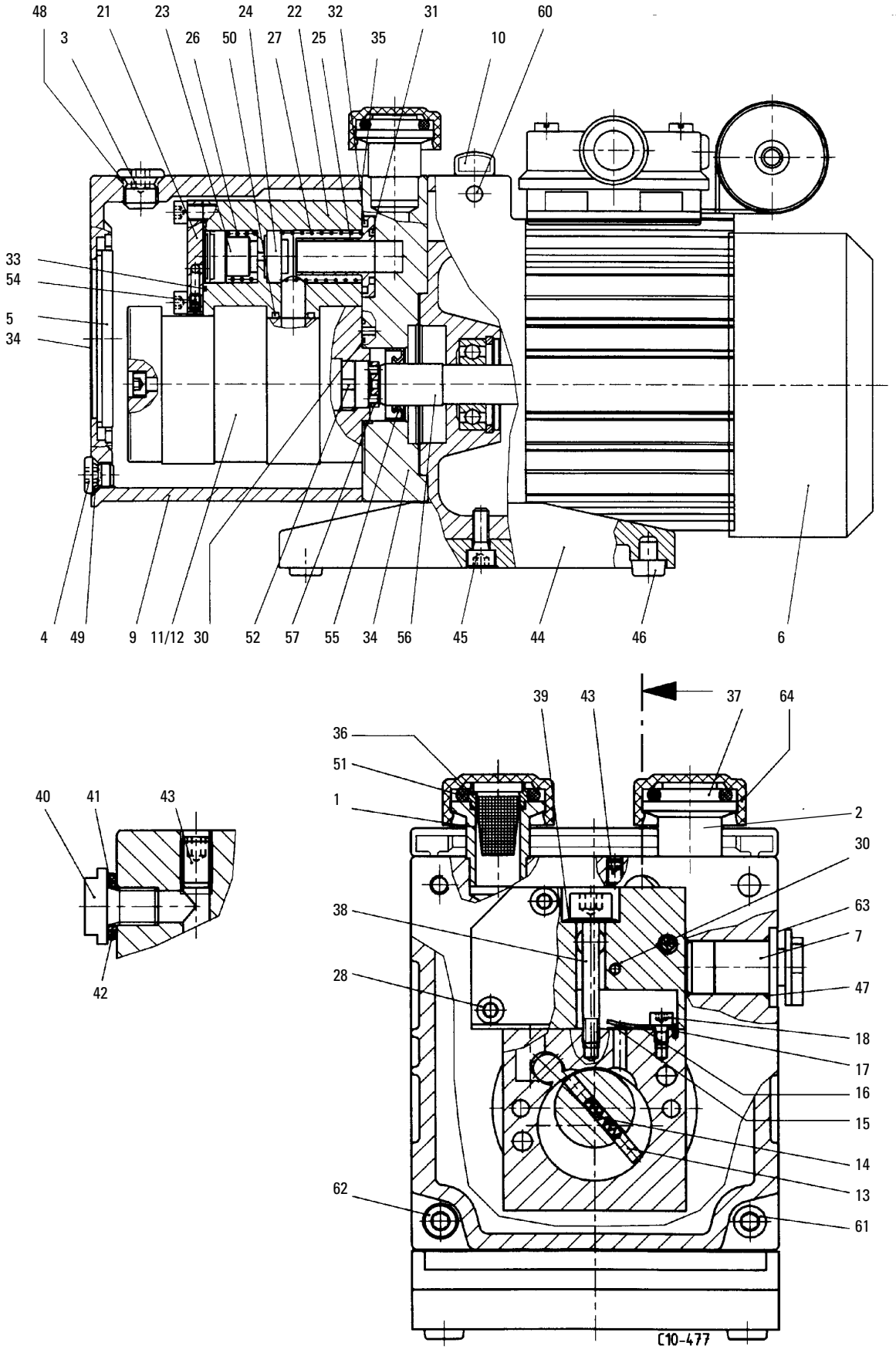
Spare Part Packs PK 082 820 -T, UNO 005			
Pos.	**Discription**	**Pieces**	**Number**
62	Screw 16KT, 8.8-A2B, M 6x35	2	
57	Coupling washer	1	
6	Motor 110 V, 50/60 HZ with Switch	1	
6	Motor 110 V, 50/60 HZ without Switch	1	
6	Motor 230 V, 50/60 HZ with Switch	1	
6	Motor 230 V, 50/60 HZ without Switch	1	
	Half of coupling	1	

Spare Part Packs PK 082 830 -T, UNO 005			
Pos.	**Discription**	**Pieces**	**Number**
14	Pressure Spring 1.430 0,32 x 2,5 x 20,6	4	
40	Leak nozzle 0,2 mm	1	
57	Coupling washer	1	
52	Hydraulic vane	1	
	Vane	2	

Spare Part Packs PK 082 840 T, UNO 005			
Pos.	**Discription**	**Pieces**	**Number**
40	Leak nozzle 0,2 mm	1	
57	Coupling washer	1	
11	Pumping unit	1	

Spare Part Packs PK 082 850 -T, UNO 005			
Pos.	**Discription**	**Pieces**	**Number**
38	Screw 16KT, A2-70, M5x40	2	
28	Washer, ST-A2B, A5,3/15x1,5	2	
39	Screw 16KT, 8.8 GSW, M5x80	3	
25	Valve seat	1	
27	Pressure spring	1	
21	Valve cover	1	
26	Pressure spring	1	
24	Valve plate cpl.	1	
20	Valve housing	1	
23	Hydraulic piston	1	

Ersatzteilpaket PK 082 860 -T, UNO 005			
Pos.	**Discription**	**Pieces**	**Number**
18	Screw -I 6KT, 8.8 GSW, x4 x 6	2	
17	Dowel pin, FED-ST, S 1,5 x 4	2	
40	Leak nozzle 0,2 mm	1	
15	Valve flap	2	
	Valve trap	2	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