

# Operation Manual

## DVP

1:1 ratio Pneumatic Diaphragm Pump



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# Operation Manual

## DVP

### 1:1 Ratio Pneumatic Diaphragm Pump



#### Important

**Read and follow all instructions and Safety Precautions before using this equipment**

#### Description

DVPS; DVPE, DVPS-F, DVP-670, DVP-685 are for use with water based paints. These pumps comply to ATEX regulations **94/9/EC**, protection level; **II 2 G c T4..T5 X, Suitable for use in Zones 1 and 2**

**IMPORTANT:** If you are using the pump with corrosives or abrasives materials, you will need to clean the pump more often and may replace parts more frequently. The maximum surface temperature of the pump will depend on the temperature of the fluid being pumped. Max fluid temperature allowed is 90°C.

**CAUTION BEFORE USE :** All pumps are tested with water soluble oil. It is necessary to clean the pump with an appropriate solvent before use. The air supply should be clean, with oil and moisture removed.

#### Models

Technical data for the basic pump:  
 DVP-510 Standard/Solvent based  
 DVP-AN Water based

Weight : 4.5 kg (9.9 lb)  
 Height : 155 mm (6' 10")  
 Width : 240 mm (9' 5")  
 Depth : 200 mm (7' 9")

Pump ratio	1:1
Regulated air pressure	7 bar
Max paint viscosity	60 sec
Universal threaded air connector	1/4"
Ambient temp range	0 - 40°C
Max fluid temperature	90°C
Recommended operating speed: Cycle/min	60
Max. fluid pressure	7 bar
Max fluid flow	17 l/min
Universal fluid thread connector	3/8"

#### EC Declaration of Conformity

We, ITW Oberflächentechnik GmbH & Co. KG, Germany, as the manufacturer of the **DVP Pump**, declare, under our sole responsibility that the equipment to which this document relates conforms to the following standards or other normative documents:

**BS EN 292-1 PARTS 1 & 2: 1991, BS EN 1953: 1999;** and thereby conforms to the protection requirements of Council Directive **98/37/EEC** relating to **Machinery Safety Directive**, and: **EN 13463-1:2001, EN 13463-5:** for council Directive **94/9/EC** relating to **Equipment and Protective Systems intended for use in Potentially Explosive Atmospheres protection level II 2 G c T4.**

**Andre De'Neergaard** General Manager  
3<sup>rd</sup> March 2007.



Note: TW Industrial Finishing reserves the right to modify equipment specification without prior notice.



# SAFETY WARNINGS

**Important** Read and follow all instructions, recommendations and safety precautions before using this equipment. It's the responsibility of the employer to place this information into the hands of the operator.

## **FIRE AND EXPLOSION**

Solvents and coating materials can be highly flammable or combustible, especially when sprayed. Work stations must be provided with adequate ventilation to prevent the build-up of flammable vapours. Smoking and naked flames must not be allowed in the spraying or mixing areas. Fire extinguishing equipment must be provided in the spraying and mixing areas. Users must comply with all local and national codes of practice and insurance company requirements governing ventilation, fire precautions, operation, maintenance and housekeeping of work stations.

**WARNING** : Maximum surface temperature limits. Maximum surface temperatures depend on the operating conditions of the pump and the temperature of the fluid; do not allow the pump to run dry as this will increase the surface temperature.

Daily or weekly cleaning is recommended on the pump surface to eliminate dust or paint building up on the pump to reduce the risk of fire or explosive ignition.

**HALOGENATED HYDROCARBON SOLVENTS** : for example: 1,1,1 - Trichloroethane and Methylene Chloride can chemically react with aluminium, galvanised or zinc coated parts and cause an explosion hazard. Read the label or Data Sheet of the material you intend to spray.

**DO NOT USE SOLVENTS OR MATERIALS CONTAINING HALOGENATED HYDROCARBONS WITH THIS EQUIPMENT.**

## **STATIC ELECTRICITY:**

Static electricity can be generated by fluid moving through pipes and hoses. A static spark, capable of igniting certain solvents and coating materials, could be produced by high fluid flow rates. To prevent the risk of fire or explosion, earth continuity to the spray equipment and object being sprayed should be maintained.

**IMPORTANT;** Use the specific earthing screw on the top plate of the pump for connection of the ground wire to a good earthing source. Secure pump and all the components of the air and fluid circuits to avoid vibration and generation of contact or static spark. Check periodically the continuity of electrical path to ground. Test with an ohmmeter from each part of the pump and the components of the pumping system to ground to ensure continuity. Ohmmeter should show 0,1 ohms or less. Pumping potentially explosive materials with pumps from containers can create an explosive atmosphere inside the container. Pump and container must be earthed at the same source and the suction fluid tube must always be immersed.

## **PERSONAL PROTECTIVE EQUIPMENT : TOXIC VAPOURS**

When sprayed, certain material may be poisonous, create irritation or otherwise be harmful to health. Always read all labels and safety performance data carefully for the material being sprayed and follow any recommendations. **IF IN DOUBT, CONSULT THE MATERIAL SUPPLIER.** The use of respiratory protective equipment is recommended at all times when spraying. The type of respiratory protective equipment used must be compatible with the material being sprayed and the level of concentration. Always wear protective eye protection when spraying or cleaning the equipment.

Gloves must be worn for spraying or cleaning the equipment when certain coating materials and solvents are used.

## **TRAINING**

Personnel should be given adequate training in the safe use and maintenance of this equipment.

Training courses on all aspects of the equipment are available at ITW. For details contact your local

representative. The instructions and safety precautions contained in this and the literature supplied with the coating material should be read and understood before the equipment is used.

### **MISUSE**

All spray guns project particles at high velocity and must never be pointed at any part of the body. Never exceed the maximum inlet air/hydraulic pressures as stated on the pump model plate and as detailed in this service bulletin.

Make sure that the hoses and connections used are able to withstand fluid pressures delivered by these pumps. Damaged hoses could leak flammable liquids and create potentially explosive atmospheres. Check all hoses for damage and wear. Be certain that the pump system is clean and in proper working order.

Before dismantling the equipment for cleaning or maintenance, all pressures, air and material, must be isolated and released.

Keep containers closed when not in use, inert gas media must be pumped into the container to fill the void. The disposal of non-metallic materials must be carried out in an approved manner. Burning may generate toxic fumes. The removal of waste solvents and coating materials should be carried out by an authorised local waste disposal service.

### **PARTS LIST**

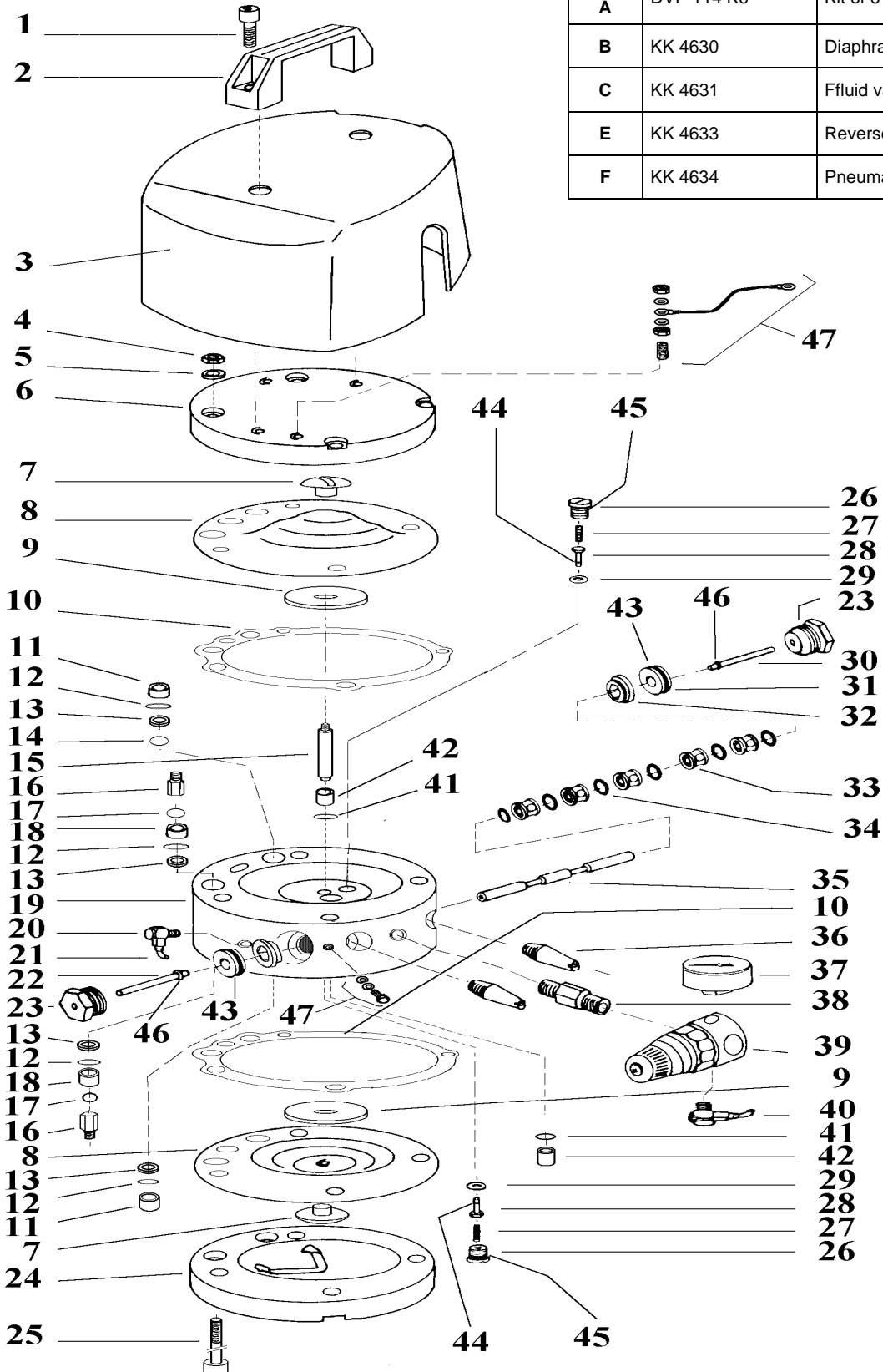
	Reference	Description	Qty
1	SSF 3153 ZN	Cap screw	2
2	ZZ-1617-D	Handle	1
3	DVP-22	Plastic cover (conductive plastic)	1
4	SSF 8151	Nut	4
5	ZZ 1660 D	Washer spring	4
6	DVP131 /...AN	Top plate (Anodised for DVP-AN)	1
7	B	Retaining nut	2
8	B	Diaphragm	2
9	B	Pressure plate	2
10	ABCE	Gasket	2
11	C	Bush	2
12	C	O ring	4
13	C	Stainless steel valve seat	4
14	C	Teflon ball 16 mm	1
15	B	Stud	1
16	DVP 75	Stud	2
17	C	Teflon ball 14 mm	2
18	C	Bush	2
19	DVP83 / ..AN	Body (Anodised for DVP-AN)	1
20	SSP 6462	Swivel elbow	1
21	S-1817	Nylon tube	1
22 / 46	F	Manual restart stem with snap ring	1
23	F	Distributor nut	2
24	DVP130 /...AN	Bottom plate (Anodised for DVP-AN)	1
25	SSF 3152	Cap screw	4
26	E	Retaining nut	2
27	E	Spring	2
28	E	Reverse valve	2

29	E	O ring valve seat	2
30 / 46	F	Manual restart stem assembly	1
31	F	Air valve piston	2
32	F	Sleeve nut	2
33	F	Cylinder	5
34	F	O ring	6
35	F	Slide valve	1
36	DVP 17	Air muffler	2
37	DVP 31	Manometer	1
38	DVP 20	Double nipple	1
39	DVP 30	Air regulator	1
40	DVP 35	Swivel elbow	1
41	B	O ring	2
42	B	Bush	2
43	F	Seal ring quad ring	2
44	E	Seal ring quad ring for reverse switch	2
45	E	O ring	2
47	KK-4635	Earthing Kit (2 screws, 4 washers, 4 nuts & Earthing wire)	1
37	DVP-31	Manometer	1
50	MSG-21	Air connector 1/4" NPS/BSP	1
51	DVP-52-1	By-pass 3/8" NPS/BSP for pump DVP-610 / DVP-630	1
52	DVP-37	Cover	1
53	DVP-2-W	Stainless steel suction fluid tube Length. 385mm	1
53a	ZZ-3075	Stainless steel suction fluid tube Length. 520mm	1
54	41-2661	stainless steel Strainer	1
55	SS-10-D	Hexagonal head bolt	2
60	ZZ-3085	Adapter F1/2R	1
61	DVP-50	Wall mounting bracket	1
62	DVP-56	Stainless steel By pass hose tube	1
63	DVP-41	Suction hose	1
64	ZZ-3088	Nut	1
65	ZZ-3081	Stainless steel tube (303) Dia 10x1 Length 480mm	1
65a	ZZ-3076	Stainless steel tube (303) Dia 10x1 Length 520mm	1
66	DVP-154-A	Kit Filter (alu anodised) with valves F1/4" & Connectors	1
		Filter (Standard 60 mesh):	
	DVP-156-100	Filter 100 mesh	
	DVP-156-200	Filter 200 mesh	
	DVP-156-30	Filter 30 mesh	
	DVP-156-60	Filter 60 mesh	
67	ZZ-3073	Air regulator 0-6 bar F1/4".	1
68	DVP-31	Manometer	1
69	ZZ-3077	T-piece M1/4".	1
70	0114-020027	Elbow connector MF1/4"	1
71	ZZ-2417	Connector F1/4"	1
72	DVP-35	Connector for tube diameter 4x6	1
73	0114-016021	SS fluid outlet connector M1/4;M3/8 NPS/BSP universal	1
74	0110-011802	Tripod	1
75	0114-014640	Trolley for pump	1
76	-----	Screw CHC M8x16 & nut H M8	2
-	0114-011498	Earthing/Grounding wire, not presented.	1

**CONTENTS OF KITS**

The contents of repair kits are identified with letters A through F.  
 Example: kit KK-4630 ("B") is made up of part numbers identified with the letter "B".  
 Use a medium strength sealing compound on threaded joints to prevent leakage.

Rep	Reference	Description
A	DVP 114 K6	Kit of 6 gaskets
B	KK 4630	Diaphragm and stud kit
C	KK 4631	Ffluid valve kit
E	KK 4633	Reverse switch kit
F	KK 4634	Pneumatic distributor kit



**MODEL ON PAIL LID:**

Pumps used for standard Euro-pail 20 Litres.

Standard model

Ref. DVP-610

Water based model

Ref. DVPS

These products include:

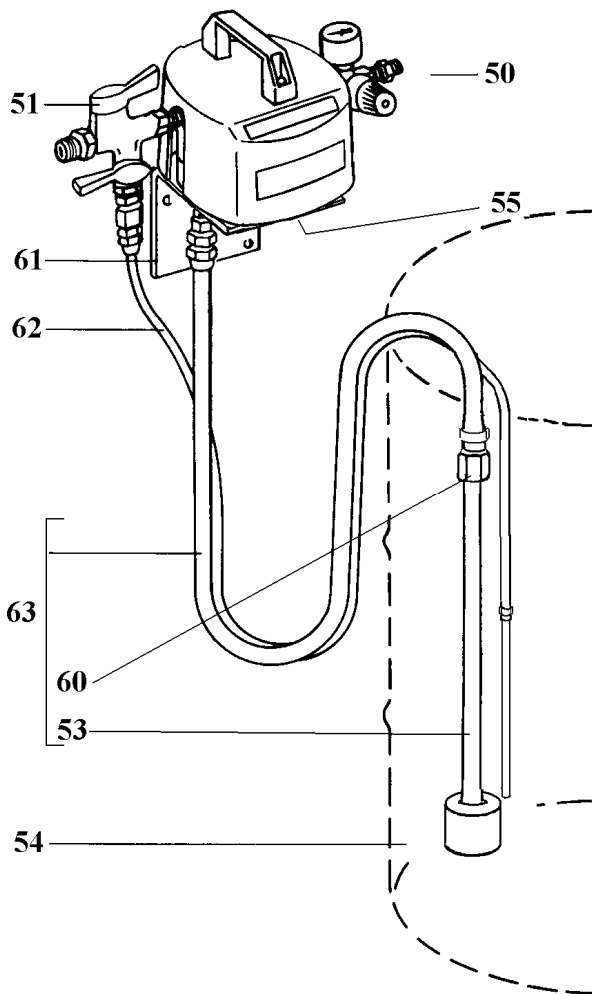
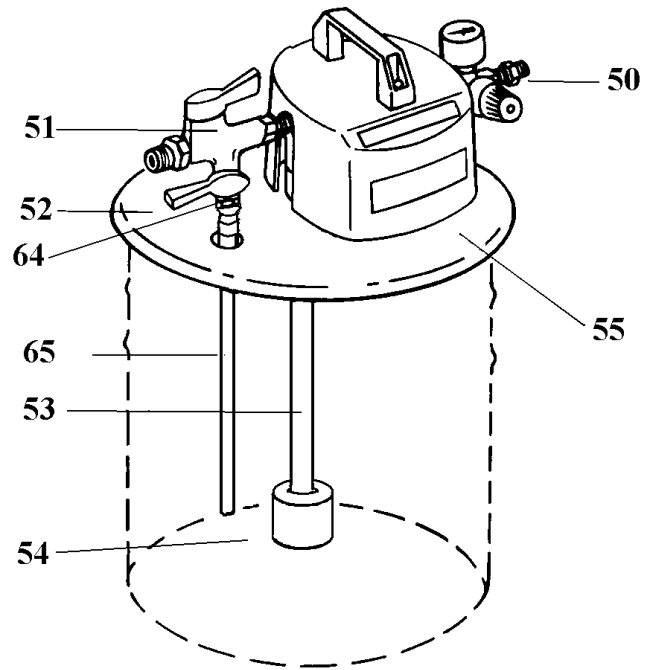
- air regulator,
- sound insulated
- carrying handle,
- suction tube with filter,
- by-pass with fluid back tube,
- universal lid that fits all Euro-pails Diameter less than 400mm.

Height (incl. suction pipe): 560 mm (22")

Height under lid : 400 mm (15,7")

Weight: 6,2 kg. (13,7 lb.)

Grounding wire in option. 0114-011498

**MODEL FOR WALL MOUNTING :**

Pumps for wall mounting

Standard model

Ref. **DVP-630,**

Water based model

Ref **DVPE**

Pumps for wall mounting with:

- air regulator,
- sound insulated
- carrying handle,
- suction hose combination with fluid strainer,
- by-pass and return hose,
- wall mounting adapter.

Pump height with wall mounting : 270 mm (10,6")

Height (incl. suction pipe): 1700 mm (67")

Width : 350mm (13,8")

Depth : 220 mm (8,7")

Weight: 6,4 kg (14,1 lb.)

Grounding wire in option. 0114-011498

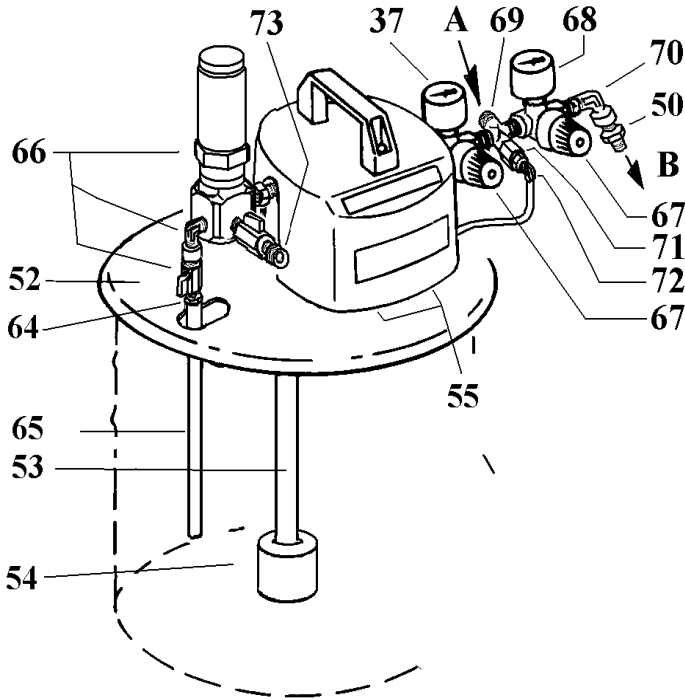
PUMP PACKAGES AND ASSEMBLIES

The DVP pump assemblies are able to supply one or two spray guns, using hose kit H-6505. It includes twin air regulators to adjust air pressure to the pump and spray gun. The in-line Fluid filter and pressure dump assembly ensures the safe release of fluid pressures from the system for paint changes and cleaning

The air inlet and outlet connectors are in 1/4" (Air inlet in "A" & Spray air supplied in "B")

Fluid outlet connector is in 3/8"NPS/BSP universal thread.

The pumps are supplied with earth/grounding wire kit. Please ensure this equipment id "earthed" at all times using the grounding wire provided.



**MODEL ON PAIL LID:**  
 Pumps used for standard Euro-pail 20 Litres.  
 Standard/solvent based model                      Ref. **DVP-610-F**  
 Water based model                      Ref. **DVPS-F**

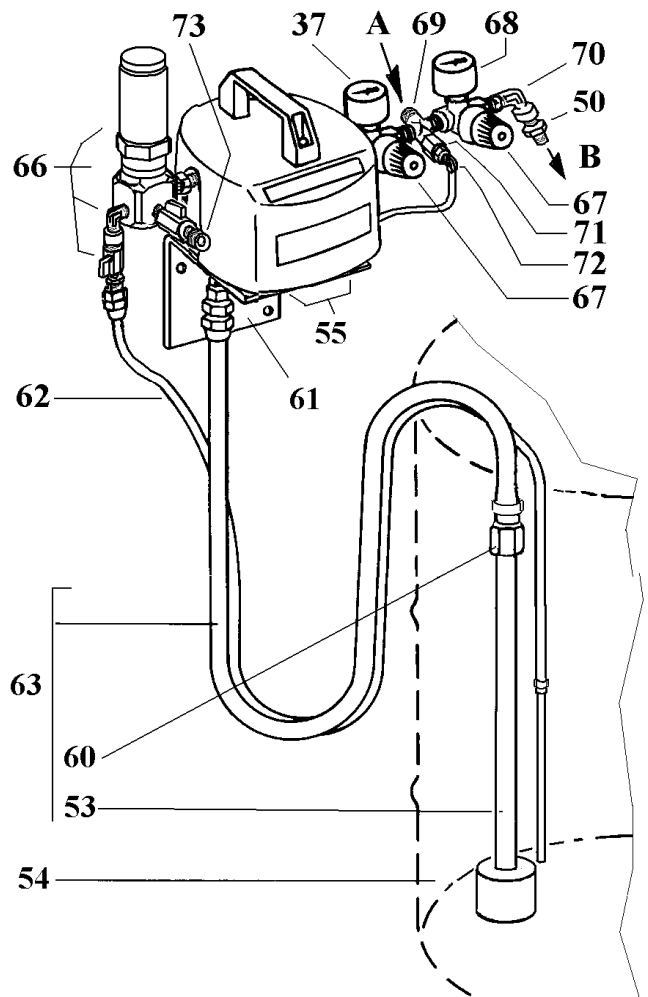
Universal lid that fits Euro-pails;  
 Diameter less than 400mm.

Height (incl. suction pipe):    730 mm (28,7")  
 Height under lid :                400 mm (15,7")  
 Weight:                                7,0 kg. (15,4 lb.)

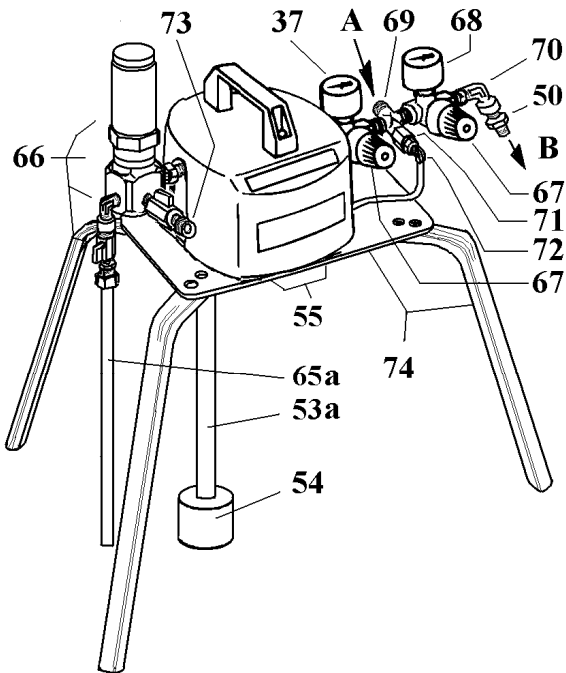
**MODEL FOR WALL MOUNTING :**

Standard/solvent based model                      Ref. **DVP-630-F**  
 Water based model                      Ref. **DVPE-F**  
 Wall mounting adapter.

Pump height with wall mounting :    440 mm (17,3")  
 Height (incl. suction pipe):            1700 mm (67")  
 Width :                                    350mm (13,8")  
 Depth :                                    220 mm (8,7")  
 Weight:                                    7,2 kg (15,9 lb.)





**MODEL ON TRIPOD:**Standard/solvent  
based modelRef. **DVP-660**

Water based model

Ref. **DVP-670**

Tripod

Height on fluid filter : 840 mm (33")

Height (incl. suction pipe): 510 mm (20")

Base dimension 540 x 570 mm (21,2" x 22,4")

Weight: 8,7 kg (19,2 lb)

**MODEL ON CART :**

Standard/solvent model

Ref. **DVP 675**

Water based model

Ref. **DVP 685**

Wall mounting adapter fixed on the cart panel.

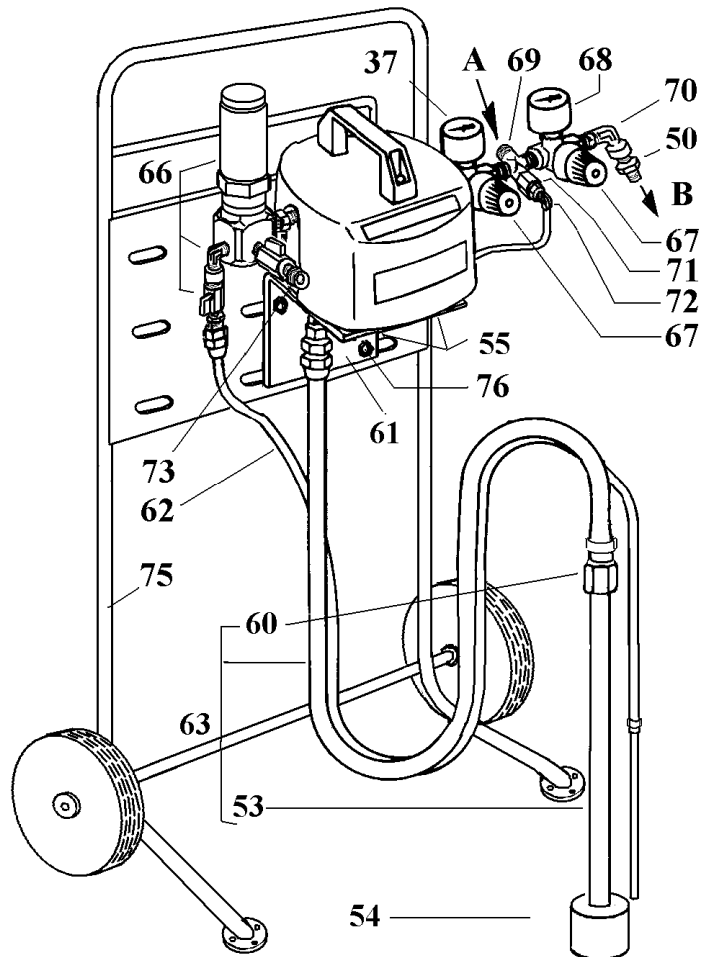
Length suction pipe): 1700 mm (67")

Base dimension : 580 x 400 mm (22,8"x 15,7")

Height under the pump: 700 mm (27,6")

Total Height : 1000 mm (39,4")

Weight: approx. 18,0 kg (39,7 lb.)

**OPTIONAL ACCESSORIES**

H-6505: Hose assembly air &amp; fluid length 7,5 meters, Air Connection 1/4" NPS and Fluid 3/8" NPS.

H-6503: Hose assembly air &amp; fluid length 15 meters, Connection 1/4" NPS for air and 3/8" NPS for product.

**IMPORTANT**

The air hose for these two kits are conductive (Ref. S-1806).

Please note that fluid hose are not conductive (Ref. H-3053), It is recommended to stay below 1 m/s fluid flow equivalent to 1,6 litre/minute if your product is low or non-conductive.

## PERFORMANCE AND CONSUMPTION

The chart shows the relation between air consumption and material flow rate and number of pump cycles.

**Example:** At an air input pressure of 5 bar and fluid flow rate of 8.3 l/min, at 60 cycles/min, the air consumption is 60 l/min.

## OPERATING INSTRUCTIONS

DVP Pumps are suitable for use with all common materials, within PH range of 4.5 to 8.5, with exception of halogenated hydrocarbon solvents and materials which contain such solvents.

1. Mix, prepare and strain the material to be sprayed according to the paint manufacturer's instructions. Use a lint free mesh to strain the material
2. To start and prime the pump, open the by-pass valve and/or trigger the spray gun.

Adjust the air pressure by turning the air regulator knob clockwise until the pump begins to cycle. Allow the pump to operate until all the air is purged from the pump and fluid line. Turn off the by-pass valve and trigger the spray gun.

Adjust the fluid pressure to obtain the required material flow (see spray gun operation manual).

## CAUTION

If the required material flow is low while the gun is triggered (less than 5 pump cycles per minute) partially open the by-pass valve to increase the cycle rate to a minimum of 5 cycles per minute. This will eliminate the possibility of the pump stalling during the spray operation

**IMPORTANT :** Do not run these pumps dry. Runaway cycling could cause diaphragms to warp and affect the pumps performance and increase surface temperature.

## CLEANING

The cleaning frequency depends on fluid/material, general operating conditions, and running time. In general, the pump should be cleaned at least once a day, and before a long shut-down, to ensure a long service life. Under no circumstance should paint be allowed to settle, or dry within the pump. Do not flush pump dry, leave pump under pressure to keep solvent in the fluid section. This protects against material curing. It is advisable to establish a regular cleaning schedule.

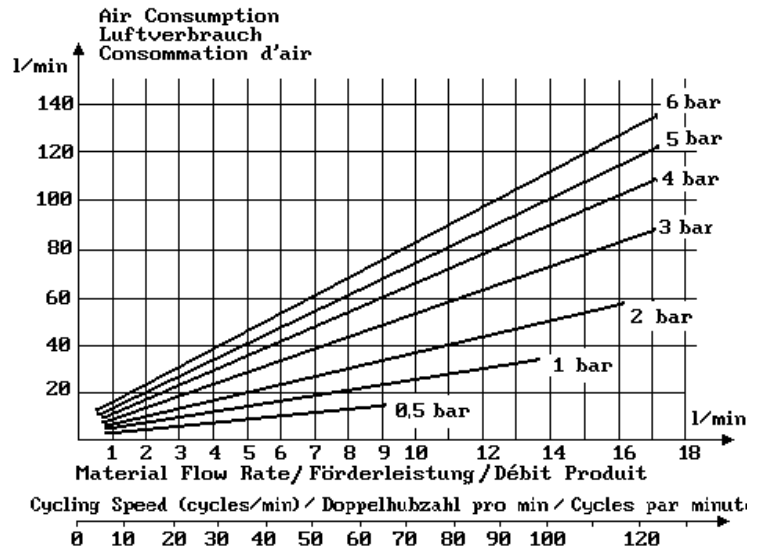
Clean pump with a solvent appropriate to fluid sprayed as follows.

1. Close material valve to spray gun, open the by-pass valve.
2. Close air regulator. Relieve pressure from system by triggering the spray gun.
3. Supply solvent to pump instead of spray material. Open air regulator.
4. Operate pump to flush paint from system. Continue flushing until whole system is clean.
5. Close the by-pass valve.
6. Open material valve to spray gun and operate gun until clean and clear solvent flows.
7. Clean exterior of pump with a solvent dampened cloth.

The pump can be stored for long periods in a cleaned and flushed condition.

## CARE AND MAINTENANCE/LUBRICATION

Additional information is contained in the operation manual for the spray gun. All moving parts are factory pre-lubricated, and under normal conditions require no further lubrication.



## REPLACEMENT OF PARTS

**WARNING:** The pump must not be dismantled when a potentially explosive atmosphere is present. Handling and cleaning of some internal pump parts may create an electrostatic hazard. Remove to an area away from the normal ZONED working area.

### **DIAPHRAGMS (8): KIT Ref. KK 4630**

1. Unscrew suction pipe (53), and remove lid (52) or wall mounting bracket (61).
2. Disassemble carrying handle (2) and cover (3). Remove the 4 cap screws (25) from top plate (6) and bottom plate (24) and remove plates. Caution the two balls (diameter 14 mm) can be easily lost.
3. Unscrew the 2 diaphragm nuts (7) from the stud (15), remove the two diaphragms (8) & plates (9). (Replace the two diaphragms)
4. Replace "O ring" (41) and sleeves (42), lubricate stud (15) and refit. Check plates (9) and replace if necessary. Align holes in gasket (10) and diaphragms (8) with pump body (19).
5. Re-assemble top and bottom plates (6, 24) with screws (25), washers (5) and nuts (4) see fig.7. Tighten nuts (4) recommended torque 22-25 Nm (194-220 lbf.in).

**NOTE :** The top face of the pump body is marked "O" in order to facilitate the reassembly of the pump. Attach the top plate to this side.

### **REPLACEMENT OF REVERSING VALVES : Kit Ref. KK 4633**

1. Both reversing valves are accessible after removal of the diaphragms (8).
2. Unscrew the plug with the "O Ring" (26,45).
3. Pull out the spring (27), pull out the stem valve with its "O Ring" (28,44) and the "O" Ring Seal (29). Check the condition of internal holes in the body. Fit new parts lubricated with bearing grease. Always replace both reversing valves at the same time.

**NOTE :** excessive grease can block the air passage.

### **REPLACEMENT OF THE BALL (14) & (17), & VALVES SEAT (13) : Kit Ref. KK 4631**

1. Both diaphragms must be disassembled in order to carry-out this operation (see "replacement of diaphragms", 1-5. Remove balls (dia. 14 mm) (17).
2. Disassemble bushes (11) and (18). Remove the 4 "O" Rings (12) and the 4 valve seats (13), remove the 16 mm dia ball (14).
3. Inspect parts and replace if necessary and assemble new components in the reverse order.

### **IMPORTANT:**

When reassembling ensure that all the components are in the right position (see fig. 8 and 9).

- Bushes chamber (for the O Ring (12) is positioned to valve seat). O ring (12). Stainless steel valve

### **REPLACEMENT OF PNEUMATIC DISTRIBUTOR Components : Kit Ref. KK 4634**

1. Disconnect the nylon tube (21) from connector (20).
2. Unscrew the regulator assy (21-40-39-37-38-50) from pump body (19).
3. Unscrew the air mufflers (36). Remove screw (23) on one side (socket wrench 24 mm).
4. Press in piston (35) as far as possible. Turn body and using flat of your hand release the pin (30 for example). Piston (31) with its seal ring is ejected from opposite side.
5. Remove the second screw (23) and press out slider valve (35).
6. Unscrew sleeves (32) from both sides using 10 mm Allen Key.
7. Remove 5 cylinders (33) and 6 "O" Rings (34).
8. Check the condition of the pump body and replace with new components. Assemble in the reverse order.

**Reassemble:**

1. Screw in sleeve (32) on one side, and insert "O Ring" (34) and cylinders (33) in the correct order. Screw in second sleeve (32), and insert slider valve (35) after light greasing.
2. Insert pistons (31) complete with seal rings on both sides of body. Note order of assembly. Reassemble nuts (23) and pins (30,46), put the longer pin on air connector side (20).
3. Reassemble steps 1 to 3 in reverse order.
4. Seal thread of double nipple (38) with a medium strength thread sealing compound.

Fig 7

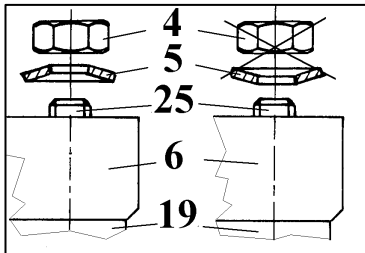
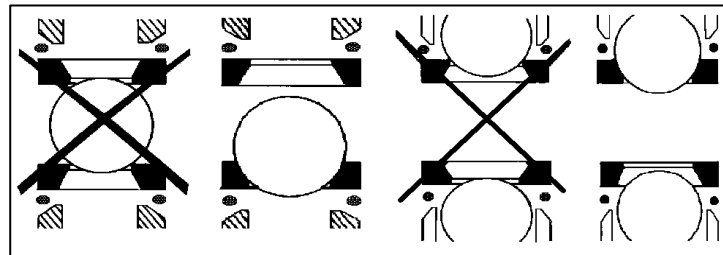


Fig 8 : Outlet valves

Inlet valves



**POSSIBLE PROBLEMS/CAUSES AND CORRECTIVE ACTION.**

Service checks	CAUSES	CORRECTION
Air in the material.	Material viscosity too high.	Reduce viscosity.
	Suction tube not properly tightened & sealed.	Tighten Seal with PTFE tape if necessary.
Air in the material and irregular pump operation.	Leak between top and/or bottom plate body and diaphragm.	Remove the cover and tighten the four bolts
	Diaphragm damaged	Replace if material has leaked into pneumatic distributor, remove & clean it
Pump operates irregularly	Material inlet or outlet blocked	Flush material system.
	Dirty or worn material inlet or outlet valves	Flush pump or if necessary replace balls & valves seats.
Pump will not operate.	Blockage in material in pump outlet	Check and clean tubes, filters, orifices and so on.
	Slider valve in neutral position.	Push manual restart stem (22-30).
Pump exhausts continuously	Slider valve in neutral position	Push manual restart stem (22-30).
	Reverse switch staying in open position.	Dismantle the reverse switches, clean or replace
Pump will not prime	Viscosity too high.	Reduce viscosity.
	Suction pipe not properly tightened and sealed.	Tighten. Seal with PTFE tape if necessary.
Pump will not prime and exhausts through suction tube.	Top or bottom plates wrongly assembled.	Disassemble top and bottom plates and re-assemble correctly.

**BINKS**  
**DVP 1:1 RATIO**  
**DIAPHRAGM PUMP**  
**PACKAGES**



- Rapid delivery of up to 17 litres per minute (max)
- Even material flow at up to 60 cycles/minute
- Economic air consumption at pressures up to 7 bar (100 psi)
- Corrosion resistant models for ceramic/abrasive materials
- Functions as a material transfer or delivery pump
- Choice of pail, wall, tripod or cart mounted outfits
- ATEX/CE approved.

**PRESSURE FEED**  
**TANKS & CUPS**

- Sizes to suit all applications
- 10, 40 & 60 litre capacity tanks complete with nylon inner container for easy colour changes and cleaning
- Stainless steel and mild steel options
- Compatible with your standard gun and hose connections
- Remote pressure cups – aluminium and stainless steel options
- 2 litre capacity
- ATEX/CE approved.



**ITW Industrial Finishing – Masters of Finishing Technology**  
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