

# IOM manual

2013 rev 1

Instructions for installation, operation and maintenance.  
PE & PTFE series air operated diaphragm pumps.

## Pump models:

TR/TXR9  
TR/TXR20  
T/TX50  
T/TX100  
T/TX200  
T/TX400  
T/TX800



Read this instruction manual carefully,  
before you install and operate the pump

topflo®



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## **Declaration of conformity**

**Machinery directive 2006/42/EC**

Tapflo AB declares that:

Product name: **Air operated diaphragm pumps**  
Models: **T...**

Is in conformity with the essential health and safety requirements and technical construction file requirements of the EC Machinery directive 2006/42/EC.

Manufacturer: **Tapflo AB**

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**Tapflo AB**, June 1:st 2009

Håkan Ekstrand  
Managing director



## 0.1 Introduction

The Tapflo Air Operated Diaphragm Pump range is a complete serie of pumps for industrial applications. The pumps are designed to be safe simple and easy to use and maintain. The construction is sealless and without rotating parts. The pumps are suitable for almost all different chemicals used by the industry today..

With proper attention to maintenace, Tapflo Pumps will give efficient and trouble free operation. This instruction manual will familiarise operators with detailed information about installing, operating and maintaining the pump.

## 0.2 The warning symbols

The following warning symbols are present in this instruction manual. This is what they say.



This symbol stands next to all safety instructions in this instruction manual where danger to life and limb may occur. Observe these instructions and proceed with utmost caution in these situations. Inform also other users of all safety instructions. In addition to the instructions in this instruction manual, the general safety and accident prevention regulations must be observed.



This signal stands at points in this instruction manual of particular importance for compliance with regulations and directives, for correct work flow and for the prevention of damage to and destruction of the complete pump or its subassemblies.

# 1. INSTALLATION



## 1.1 Receiving inspection

Although precaution is taken by us when packing and shipping, we urge you to carefully check the shipment on receipt. Make sure that all parts and accessories listed on the packing list are accounted for. Immediately report any damage or shortage to the transport company and to us.

## 1.2 Storage



If the equipment is to be stored prior to installation, place it in a clean location. Do not remove the protective covers from the suction, discharge and air connections which have been fastened to keep pump internals free of debris. Clean the pump thoroughly before installation.

## 1.3 Foundation



The pump is furnished with vibration absorbing rubber feet. The pump will operate properly without being fixed to a foundation. If fixation is needed for an installation, make sure the foundation is able to absorb vibrations. It is essential for the operation of the pump to mount the pump with the feet in a downward direction (see sketch).

## 1.4 Suction and discharge pipings

Suction and discharge piping should be fully supported and anchored near to but independent of the pump. The piping to the pump should be a hose, to prevent undue stress and strain on the pump connections and the pipings.

### 1.4.1 Turnable connections

The suction and discharge connections are turnable 180°. This simplifies the assembling and installation considerably. If you wish to turn the connections, screw a threaded nipple into the connection and turn. On the larger models T200, T400 and T800 it will simplify if the housing nuts are slightly released while turning the connections.

### 1.4.2 Connection of suction pipe

Remember that the suction pipe/connection is the most critical point, especially if the pump is priming. Just a small leakage will dramatically reduce the suction capability of the pump. When connecting the suction pipe, following is recommended.

- 1) For satisfactory operation, use reinforced hose or corresponding (the suction power may otherwise shrink the hose). The internal diameter of the hose should be the same as on the suction connection (at the bottom of the pump) to have best suction capability.
- 2) Make sure that the connection hose - pump is completely tight, otherwise the suction capability will be reduced.
- 3) Always use as short suction pipe as possible. Avoid air pockets which can arise with long pipings.

### 1.4.3 Connection of discharge pipe



For this connection it is only recommended a simple and positive flow connection. Use a hose or flexible piping (minimum one meter) between the discharge connection and any rigid fixed piping. Coil the hose at least one turn. All components (hose, pipe, valves etc) on the discharge piping must be designed for minimum PN 10.

## 1.5 Air connection

Screw the air hose into the air intake on the center block of the pump with for example a bayonet coupling. For best efficiency, use the same hose diameter as the internal diameter of the connection on the air intake.

# 1. INSTALLATION



## 1.5.1

### Air treatment system



The air valve is constructed for oilfree air. Lubrication of the air is **not allowed**. However, if the air is **very dry** (laboratory air), the air may be lubricated with water. Maximum air pressure is 8 bar. As prevention purpose, a filtration of the air by means of a 5 micron filter or finer is recommended. Dirt in the air can under unfortunate circumstances be the cause of breakdown. Recommended air quality according to PN-ISO8573 is particles class 3, water class 4 and oil class 3 .

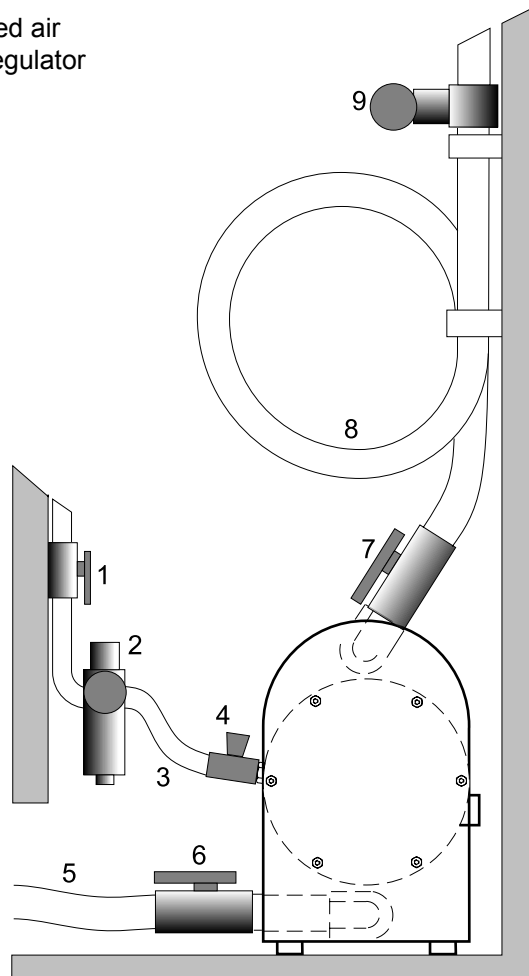
To facilitate the operation of the pump we recommend an air treatment system connected to the air supply. These components should be included:

- 1) Regulator to adjust the air pressure
- 2) Manometer to read the actual pressure
- 3) Needle valve to adjust the air flow
- 4) Filter

These components are included in Tapflo **Air treatment system** which can be ordered from us.

## 1.6 Example of installation

- 1) Gate valve compressed air
- 2) Filter and pressure regulator
- 3) Flexible hose
- 4) Needle valve
- 5) Flexible piping
- 6) Gate valve suction
- 7) Gate valve discharge
- 8) Coiled flexible piping
- 9) Flow gauge



# 1. INSTALLATION



## 1.7 Recommended installations

The Tapflo pump is flexible in the way you are able to install it. The in- and outlet ports are infinitely turnable more than 180° to fit various piping systems.

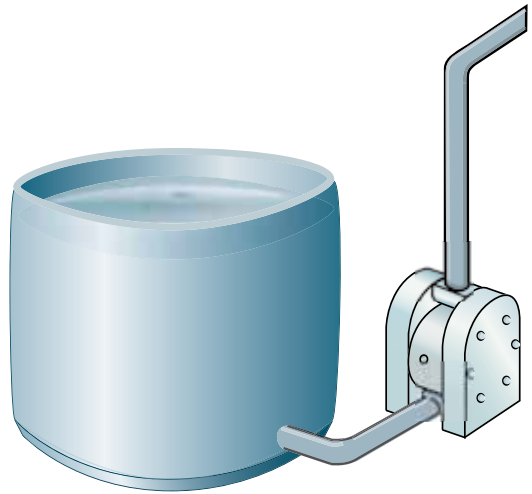
### 1.7.1 Flooded

The piping system is designed with a positive suction head. This is the best way of installation where it is necessary to completely evacuate all liquid from the container, or where viscous (thick) products are transferred.



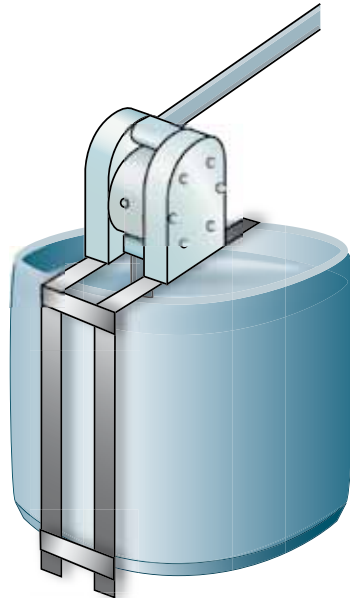
#### Important

Do not exceed 0,7 bar suction pressure. Higher pressure may cause premature diaphragm failure and irregular pump operation.



### 1.7.2 Selfpriming

The Tapflo pump is designed to pull a high vacuum. It is able to evacuate an empty suction pipe without any damage to the pump. The suction lift is up to 5 meter (16.4 ') from an empty suction pipe and up to 8 meter (26.2') from a wetted pipe. The suction capability depends on the pump size (see chapter 5.4)



### 1.7.3 Submerged

All Tapflo pumps may be submerged into the liquid. It is important to make sure that all components which are in contact with the liquid are chemically compatible. The air exhaust must be led to the atmosphere by means of a hose.

#### Air exhaust port dimension

Pump size	Air exhaust port
TR9, TR20 and T50	1/2" BSP
T100, T200, T400 and T800	1" BSP



## 2. OPERATION



### 2.1 Health and safety

The pump must be installed according to local and national safety rules.



**The pumps are constructed for particular applications. Do not use the pump on applications different from that for which it was sold without consulting us to ascertain its suitability.**

#### 2.1.1 Protection



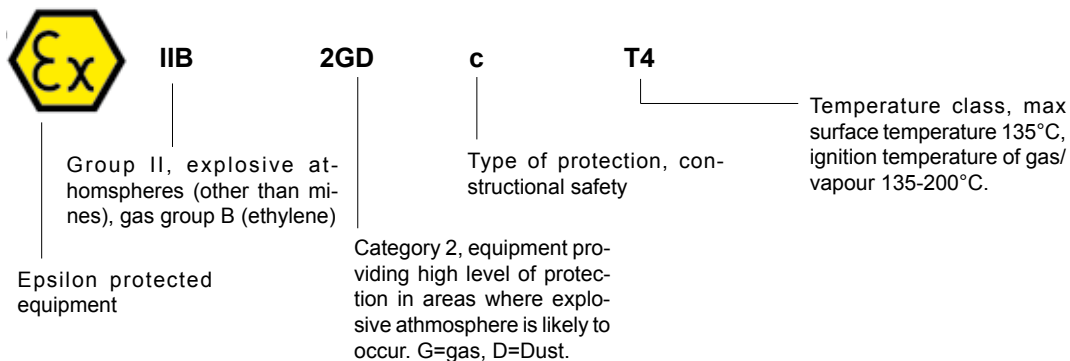
In the interest of health and safety it is essential to wear protective clothing and safety goggles when operating, and/or working in the vicinity of Tapflo pumps.

#### 2.1.2 Environments in danger of explosion - ATEX



The standard PE or PTFE series pumps are not allowed to operate in environments in danger of explosion. Static electricity may occur in the pump under operation, which may cause explosion and injury. Special conductive pumps TX are available for such applications. If you have purchased a TX pump, follow below instructions and local/national rules for safe use.

**ATEX (directive 94/9/EC) classification of Tapflo TX pumps:**



#### Earth connection of pump and other equipment

Connect a suitable earth wire to the stainless steel earth connection that is placed on the inside of one of the pump housings. Connect the other end of the earthwire to earth and also make sure that other equipment like hoses/pipes/containers etc are properly earthed/connected.

#### 2.1.3 Air pressure

The maximum air pressure for Tapflo pumps is 8 bar. Higher air pressure than 8 bar can damage the pump and may cause injury to personnel in vicinity of the pump. If you intend to apply a higher air pressure than 8 bar, please consult us.

#### 2.1.4 Noise level



At tests, the noise level from a Tapflo pump has not exceeded 80 dB(A). Under some circumstances, for example if the pump is operating under high air pressure at low discharge head, the noise can be inconvenient or hazardous for personnel staying for long periods in vicinity of the pump. This hazard can be prevented by:

- using suitable ear protection
- lower the air pressure and/or raise the discharge head
- lead the outcoming air from the place by connecting a hose from the muffler connection of the pump. You will find the air exhaust dimension in chapter 1.7.3.
- use elastomer valve balls (EPDM, NBR or polyurethane) instead of PTFE, ceramic or stainless steel, provided that the elastomer is compatible with the pumped liquid.



## 2. OPERATION



### 2.1.5 Temperature hazards



Raised temperature can cause damage on the pump and/or pipings and may also be hazardous for personnel in the vicinity of the pump/pipings. Avoid quick temperature changes and do not exceed the maximum temperature specified when the pump was ordered. See also general max temperatures based on water in chapter 5 "Data".

### 2.2 Before starting the pump



- Make sure the pump is installed according to the installation instruction (section 1).

- Filling of the pump with liquid before start is not necessary.

- When installation is new or reinstalled, a test run of the pump with water should be conducted to make sure the pump operates normally and does not leak.



- When installation is new or reinstalled, check the pump housing nut tightening torque (see chapter 5.5 "Data"). After approx 1 week operation, the torque should be checked again. This is important to prevent leakage.

### 2.3 Starting and operating

- Open the discharge valve.

- **Note! Considering the suction capacity when air is still in the suction pipe, it is recommended to start with low air pressure/flow in the beginning. This is not necessary if the pump is filled with liquid before start.**

- When the pump has been filled with liquid, the air pressure/flow may be raised to increase the suction capacity of the pump.

- The performance of the pump can be adjusted through the air supply by using a needle valve and a pressure regulator. The performance can also be adjusted by normal flow control on the discharge side of the system.

#### 2.3.1 Dry running

The pump may run dry without any problem.

#### 2.3.2 Optimizing the pump lifetime

Running at full frequency (maximum air pressure/flow) continuously will cause premature wear of the components. As a general rule, we recommend to run at half of the maximum capacity of the pump. For instance, a T100 pump should run continuous maximum at 50 l/min.

### 2.4 Pump stopping

The pump can be stopped in two ways:

1) Close the discharge valve. The pressure from the system will stop the pump automatically. This will not do any damage to the pump. The pump restarts easy when the valve is opened again.

2) Stop the air supply.

# 3. MAINTENANCE



## 3.1 When the pump is new or reassembled



If the pump is new or reassembled after maintenance it is important to retighten the pump housing nuts (pos 37) after a few days of operation. Make sure to use the right torque, see chapter 5.5.

### 3.1.1 Performance test

When installation is new, a test run of the pump should be conducted. Gauge the capacity at specific air pressure/flow. This information is for use in checking performance as wear takes place. You will be able to set schedules for maintenance of the pump and to select spare parts to be kept on stock.

## 3.2 Routine inspection



Frequent observation of the pump operation is recommended to detect problems. A change in sound of the running pump can be an indication of worn parts (see below "location of faults"). Leaking liquid from the pump and changes of performance may also be detected. Routine inspections should be conducted frequently.

## 3.3 Complete inspection



The intervals for a complete inspection depend upon the operation conditions for the pump. The characteristics of the liquid, temperature, materials used in the pump and running time decide how often a complete inspection is necessary.

If a problem has occurred, or if the pump is in need of a complete inspection, see later this chapter "location of faults" and "dismantling of the pump". You are of course warmly welcome to consult us for further help.

Worn parts should be carried in stock, see our recommendation in chapter 4.4.

## 3.4 Location of faults

Problem	Possible fault
The pump does not run	The air pressure is too low The air connection is blocked Muffler is blocked Air valve is defect Dirt in the pump chamber Diaphragm breakdown
The suction is bad	Suction connection is not tight Suction connection is blocked Muffler is blocked Valve balls are blocked Valve balls are damaged
The pump runs irregularly	Valve balls are blocked Sealings are defect in air valve or center block Diaphragm breakdown
Bad flow/pressure	Pressurefall in incoming air Suction or air connection blocked Muffler is blocked Air valve is defect Valve balls worn out/broken Air in liquid Diaphragm breakdown
Liquid leaks from the pump	Screws on the housing not properly fastened
Liquid comes out of the muffler	Diaphragm breakdown

# 3. MAINTENANCE



## 3.5 Dismantling the pump

The numbers put in brackets, refer to the part numbers in the spare part drawings and spare part lists in chapter 4.

### 3.5.1 Before the dismantling procedure



Be sure to drain all liquid from the pump. Cleanse or neutralize the pump thoroughly. Disconnect the air connection and then the suction and discharge connections.

### 3.5.2 Mainparts

This instruction applies to PTFE pumps from serial No 1012 ....



**Fig 5.1.** Unscrew the plugs (571) by means of a circlip plier. Carefully lift off the PE covers (1181).



**Fig 5.2.** Unscrew the housing nuts (37). Carefully pull out the pin screws (14). Lay the pump with one housing facing down and carefully lift the loose housing (11). Proceed as in fig 5.3.



### **Fig 5.3.** PE pumps

Unscrew the housing nuts (37). Carefully pull out the pin screws (14). Lay the pump with one housing facing down and carefully lift the loose housing (11).

### *All pump types*

Carefully lift the suction and discharge connections (13) and the center block (12) from the remaining housing (11).

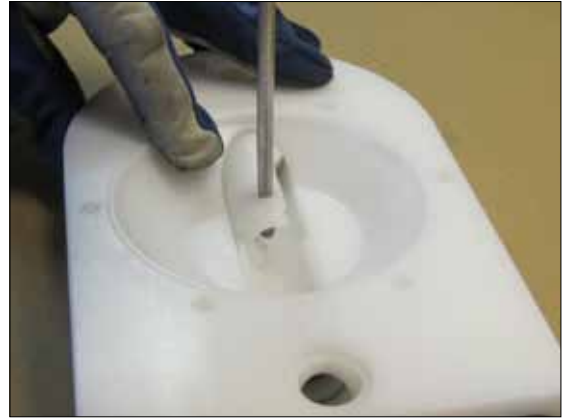
# 3. MAINTENANCE



## 3.5.3 Valve seats and valve balls (T50 and bigger)



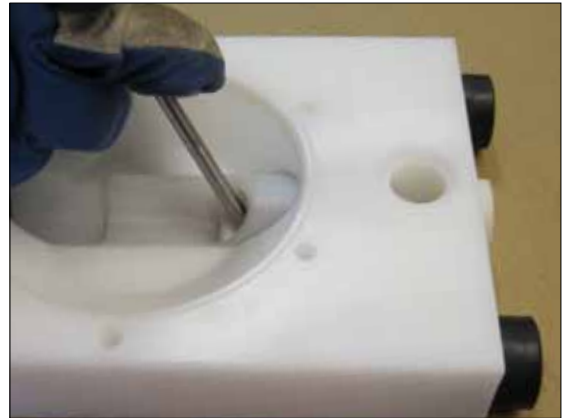
**Fig 5.4.** To remove the spacer sleeve (19), use a piece of plastic and a hammer to carefully knock to turn it.



**Fig 5.5.** Put one of the pin screws in the hole of the spacer sleeve (19) and turn it all the way 180°.



**Fig 5.6.** Carefully pull out the the spacer sleeve (19). Please note that force never shall be used by for dismantling.



**Fig 5.7.** Push out the lower sleeve (212) and valve seat (222) by means of one of the pin screws.



**Fig 5.8.** Push out the upper sleeve (202), to remove valve seat assembly and remove blocking pin (2021)

# 3. MAINTENANCE



## 3.5.4 Rod valves (TR9 and TR20)



**Fig 5.9.** Screw a pinscrew into the hole of the spacer sleeve (19). On newer models of TR9 this hole does not exist, then lift instead carefully by means of a screwdriver.



**Fig 5.10.** Lift and pull down the spacer sleeve (19).

## 3.5.5 Centerblock with circlips (TR9, TR20, T50, T100 and T800)

This instruction applies to above mentioned pumps and older models of T200 (serial numbers 0803 and earlier) and T400 (serial numbers 0801 and earlier).

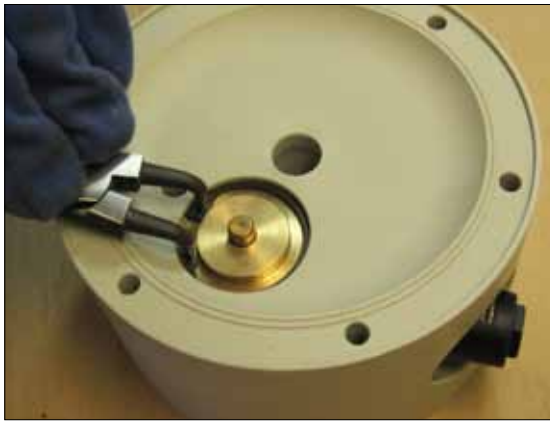


**Fig 5.11.** Press the diaphragms (15) to their neutral position (both have the same distance to the center block). Hold one of the diaphragms (15) and unscrew the other. Then pull out the remaining diaphragm (15) with the diaphragm shaft (16).



**Fig 5.12.** If the shaft sealings (36) seem to be worn out (by internal leakage of air), carefully remove them with a pointed tool. During this operation, the sealing (36) and backup o-ring (47) usually get destroyed, so make sure to have replacement spares available.

### 3. MAINTENANCE



**Fig 5.13.** Carefully remove the circlip (27) with a circlip plier. While doing this, cover with your other hand, the circlip easily flips away! Do the same with the circlip (27) on the other side.



**Fig 5.14.** Press out the air valve (61) by means of a pressing device. Be careful not to damage the brass edges of the air valve.

#### 3.5.6 Centerblock with threaded air valve (T200 and T400)

This instruction applies to T200 from serial No 0803 .... until 1105 .... and T400 from serial No 0801 .... until 1105 ....

Remove diaphragms (15), diaphragm shaft (16) and shaft seals (36) as described in fig 9-10.



**Fig 5.15.** Carefully unscrew the air valve endcap by means of the mounting tool (282). Do the same with the endcap on the other side.



**Fig 5.16.** Now when both endcaps are removed, push out by hand the shaft and piston.



**Fig 5.17.** To push out the cylinder, use the other side of the mounting tool that fit into the cylinder.



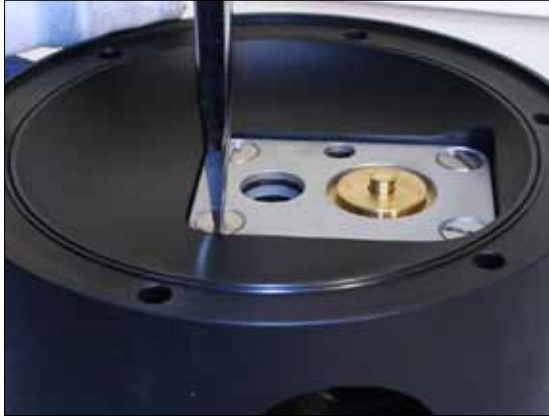
**Fig 5.18.** Press out the cylinder, be careful not to damage the edges of the cylinder.



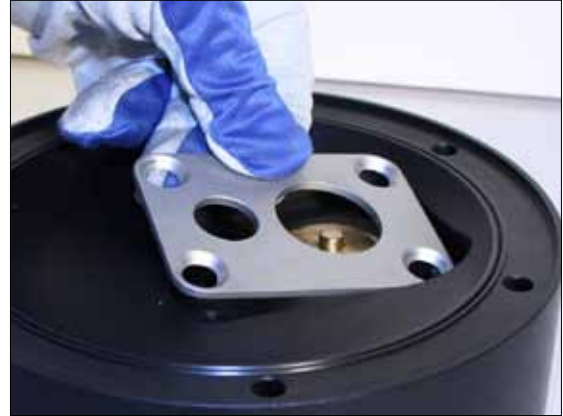
### 3.5.7

#### Center block with plate mounted air valve, TX100, T/TX200 and T/TX400

This instruction applies to TX100 from serial No 0907 ....., T/TX200 and T/TX400 from serial No 1106 ....



**Fig 5.19.** Unscrew the plate screws (2711).



**Fig 5.20.** Take out the plate (271). Do the same on the other side. Press out the air valve as described in fig 5.14.

Check seals and brass parts for wear or damage. If these are worn or damaged, replace the complete air valve assembly. If you are able to re use the air valve, replace the external o-rings (6 pcs pos 30) with new ones prior to assembly.

# 3. MAINTENANCE



## 3.6 Assembly of the pump

### 3.6.1 Centerblock with circlips (TR9, TR20, T50, T100 and T800)

This instruction applies to above mentioned pumps and older models of T200 (serial numbers 0803 and earlier) and T400 (serial numbers 0801 and earlier).



Fig 6.1. Mount the circlip (27) on one side.



Fig 6.2. Put a little water on the o-rings (30), other lubricants should not be used. Carefully push the air valve (61) into the housing. Mount the circlip (27) on the remaining side (see fig. 6.1).

### 3.6.2 Centerblock with threaded air valve (T200 and T400)

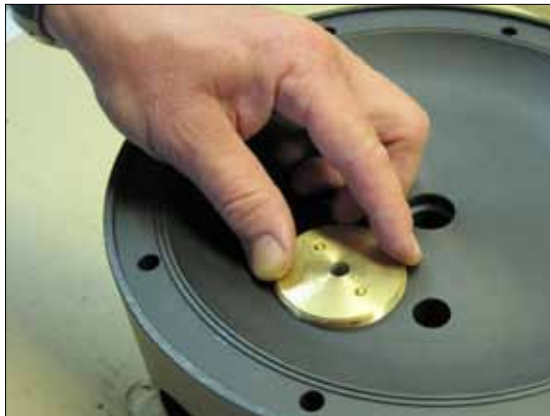


Fig 6.3. Carefully screw the endcap by hand into the centerblock. Sometimes you have to first screw counter clockwise until the threads match.

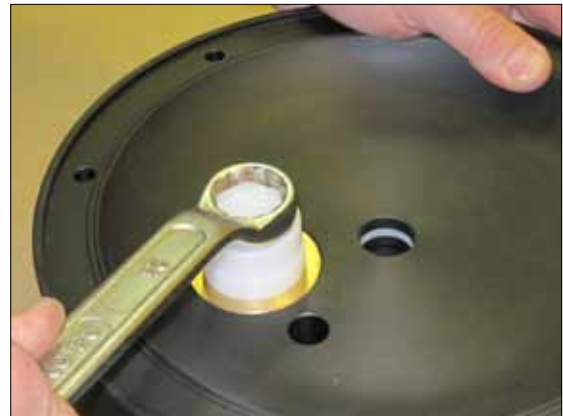


Fig 6.4. Tighten carefully by means of the mounting tool (pos 282) and a spanner.



### 3. MAINTENANCE



**Fig 6.5.** Place one of the o-rings (pos 30) on the endcap.



**Fig 6.6.** Make sure all four o-rings (pos 30) are mounted on the cylinder. Use a little water on the o-rings to easier slide the cylinder into the centerblock. Other lubricants should not be used.



**Fig 6.7.** Place the last o-ring (pos 30) on the cylinder.



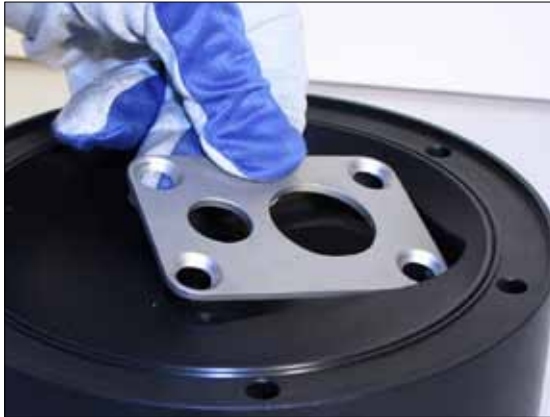
**Fig 6.8.** Carefully mount the piston and shaft by hand. Repeat steps Fig 6.3 and Fig 6.4 on the remaining side. Carefully secure the endcaps equally on both sides.

# 3. MAINTENANCE

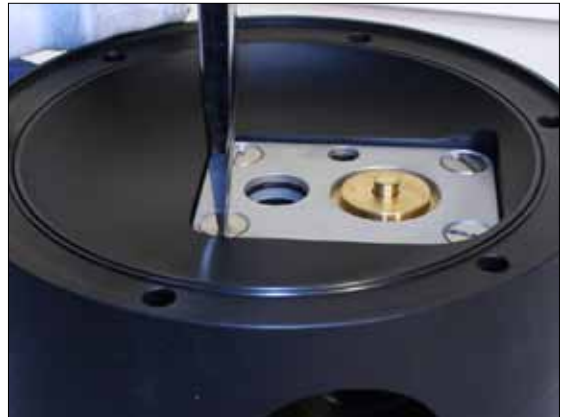


## 3.6.3 Center block with plate mounted air valve, TX100, T/TX200 and T/TX400

This instruction applies to TX100 from serial No 0907 .... and T/TX200 and T/TX400 from serial No 1106 ....



**Fig 6.9.** Put on the air valve plate (271) on one side of the centerblock (122) and mount with the screws (2711). Push the air valve from the other side as described in fig 6.2.



**Fig 6.10.** Mount the plate (271 with the screws (2711) on the remaining side.

## 3.6.4 Diaphragms

Fig 6.9 until 6.11 do not apply to models TR9 and TR20.



**Fig 6.11.** Insert the shaft seal o-rings (47) in the groove.



**Fig 6.12.** To mount the shaft seal (36), bend it to a kidney shape and insert carefully to the groove.



**Fig 6.13.** Mount the pin screw (part of the diaphragm shaft pos 16) securely in the diaphragm (15) by means of an allen key.

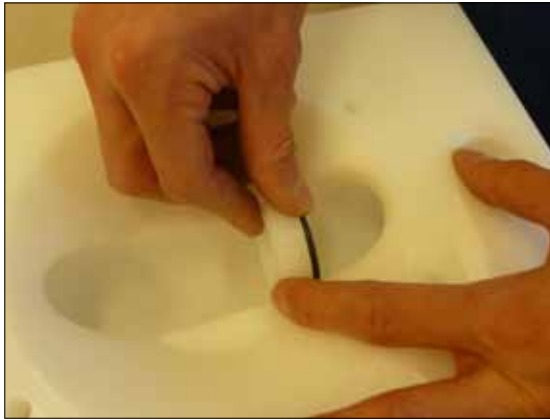


**Fig 6.14.** Mount the diaphragm shaft (16) on the diaphragm (15) and push the assembly carefully through the hole in the centerblock (12).

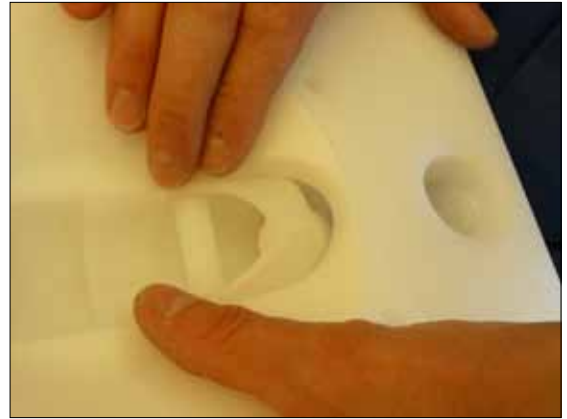
# 3. MAINTENANCE



## 3.6.5 Valve seats and valve balls



**Fig 6.15.** Place an O-ring (43) on the valve seat (222) and push the assembly into pump housing (11)



**Fig 6.16.** Mount the ball stop (22) in the lower sleeve (212) place the valve ball and push sleeve assembly.



**Fig 6.17.** Mmount blocking pin (2021) in special cut in pump housing. Fix the ball stop (22) in upper sleeve and mount it in the pump housing.



**Fig 6.18.** Mount the valve seat O-ring on the bottom of the valve seat (222) and push seat assembly into the housing (11)



**Fig 6.19.** Place the spacer sleeve (19) upside down and press it up towards the the upper valve seat (20).

# 3. MAINTENANCE



**Fig 6.20.** Put one of the pin screws into the hole of the spacer sleeve (19) and turn it gently. Knock also carefully with a plastic hammer to easier force down the spacer sleeve.



**Fig 6.21.** Make sure the seat and sleeve assembly is flat inside the housing.

## 3.6.6 Rod valves (TR9 and TR20)



**Fig 6.22.** First insert the lower rod valve (21) and upper rod valve (20). Push the spacer sleeve (19) with its pin (22) into the housing (11). You may need to knock gently with a plastic hammer.

## 3.6.7 Main unit assembly



**Fig 6.23.** Make sure all pin screws (14) have one nut (37) and one washer (38) each. Nut should only be put on one or two threads. Put the pin screws through the housing and mount carefully the center block assembly.



**Fig 6.24.** Put the small o-ring (pos 18) in the seat of the housing. On older pumps with PTFE diaphragms (serial number 1105 ... and older) the PTFE u-ring with its o-ring shall be mounted with o-ring facing upwards.

## 3. MAINTENANCE



**Fig 6.25.** Put on the inlet and outlet connections (13), make sure all o-rings (18) are mounted.



**Fig 6.26.** Carefully lift on the remaining housing.



**Fig 6.27.** Fasten the nuts (37) alternatingly, with or without washers depending on how much of the thread comes out. If some of the nuts were fastened without washer, unscrew those and put washers underneath. Tighten the nuts according to recommended tightening torques in chapter 5.

### 3.6.8 Test run and follow up draft

We recommend you to conduct a test run of the pump before installing it to the system so no liquid gets wasted if the pump leaks or perhaps does not start according to wrong assembling of the pump.

After a few weeks operation a follow up draft of the nuts is recommended.



# 4. SPARE PARTS



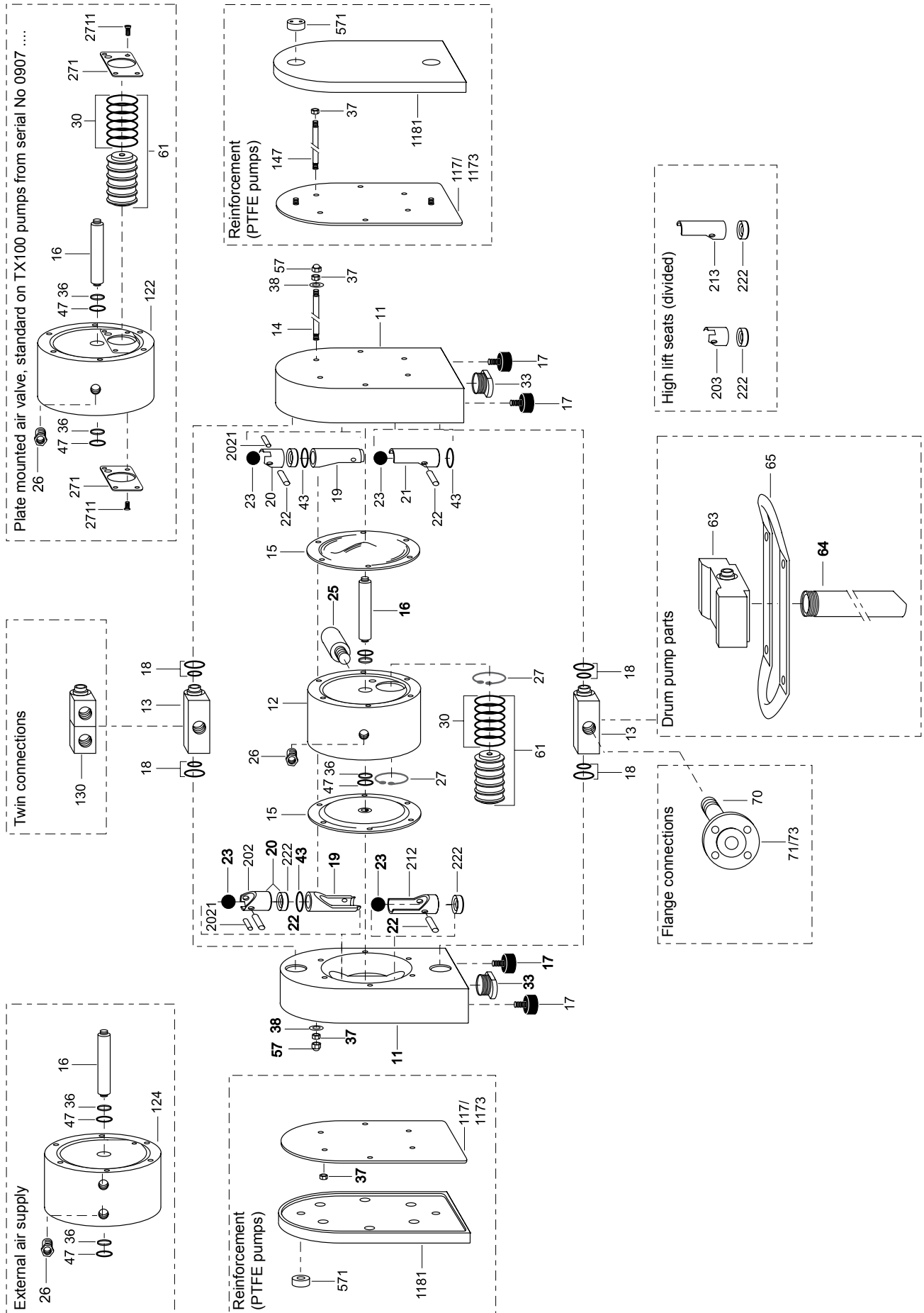
## 4.2 Spare part list TR9 and TR20

Pos	Description	Qty/pump	Material options	Spare part kits	
				KIT LIQ	KIT AIR
11	Housing	2	PE or PTFE		
12	Center block	1	PP		
13	In/Outlet	2	PE or PTFE		
14	Pin screw	4	AISI 316		
15	Diaphragm	2	EPDM*, PTFE, NBR* or FKM	•	
17	Rubber foot	4	NBR		
18	O-ring set (in/outlet)	4	PTFE/EPDM, EPDM, FKM, NBR* or FEP/FKM***	•	•
19	Spacer sleeve	2	PE or PTFE		
20	Lower rod	2	PTFE	•	
21	Upper rod	2	PTFE	•	
22	Pin	2	PTFE	•	
25	Muffler	1	PP		•
27	Circlip	2	Phosphor bronze		
30	O-ring	6	NBR (standard), EPDM or FKM		
33	Plug	2	PE or PTFE		
37	Nut	8	AISI 304		
38	Washer	8	AISI 304		
57	Nut cover	8	PP		
61	Air valve complete	1	Body brass (standard), AISI 316 or PET, o-rings NBR (standard), EPDM or FKM		•
<b>Options</b>					
<b>Stainless steel reinforcement (standard on ATEX PTFE pumps)</b>					
117	Reinforcement plate	2	AISI 316		
147	Pin screw for reinforced ver.	4	AISI 316		
<b>Stainless steel/PE reinforcement**</b>					
1173	Reinforcement plate	2	AISI 316		
1181	Cover	2	PE		
147	Pin screw for reinforced ver.	4	AISI 316		
571	Plug	4	PE		
<b>Twin connections</b>					
130	Twin in/outlet	2	PE or PTFE		
<b>Drum pump parts</b>					
63	Drum inlet	1	PE or PTFE		
64	Pump tube	1	PP (on PE pumps) or PTFE (on PTFE pumps)		
65	Handle	1	AISI 316		
<b>Flange connections*</b>					
70	Flange pipe (threaded)	2	PE or PTFE		
71	Loose flange ring ANSI	2	PP, PTFE or AISI 316		
73	Loose flange ring DIN	2	PP, PTFE or AISI 316		
73-12	Loose flange JIS	2	PP, PTFE or AISI 316		
<b>Valve ball version*</b>					
23	Valve ball	4	EPDM, PTFE, NBR, FKM, AISI 316, PU or ceramic		
191	Spacer sleeve	2	PE or PTFE		
201	Upper sleeve	2	PE or PTFE		
212	Lower sleeve	2	PE or PTFE		
221	Valve ball stop	4	PTFE		
<b>External air supply</b>					
36	Center block sealing	2	PE		
47	O-ring (back up for 36)	2	NBR (standard), EPDM or FKM		
124	Centerblock	1	PP		
161	Shaft for external control	1	AISI316		
* = TR20 only					
** = Standard on PTFE pumps from serial number 1012 ....					
***= Standard in pumps with PTFE diaphragms from serial No 1301 .... FEP/FKM o-rings do not fit on older in/outlets (pos 13). Older pumps have PTFE/EPDM as standard.					

# 4. SPARE PARTS



## 4.3 Spare part drawing T50 and T100





# 4. SPARE PARTS



## 4.4 Spare part list T50 and T100

Pos	Description	Qty/pump	Material options	Spare part kits		
				KIT LIQ	KITAIR	KIT VAL
11	Housing	2	PE or PTFE			
12	Center block	1	PP			
13	In/Outlet	2	PE or PTFE			
14	Pin screw	6	AISI 304			
15	Diaphragm	2	EPDM, PTFE, NBR or FKM*	•		
16	Diaphragm shaft	1	AISI 316		•	
17	Rubber foot	4	NBR			
18	O-ring set (in/outlet)	4	PTFE/EPDM, EPDM, FKM, NBR or FEP/FKM****	•	•	
19	Spacer sleeve	2	PE or PTFE			•
20	Upper valve seat	2	PE or PTFE			
202	Upper sleeve	2	PE, PTFE OR AISI 316			•
2021	Blocking pin	2	PTFE, PE**			•
212	Lower sleeve	2	PE, PTFE, AISI 316			•
22	Valve ball stop	4	PE1000, PTFE, PU, AISI 316			•
222	Valve seat insert (divided seat)	4	PE1000, PTFE, PU or AISI 316			•
23	Valve ball	4	EPDM, PTFE, NBR, FKM, AISI 316, PU or ceramic	•		
25	Muffler	1	PP		•	
26	Air intake adapter	1/2*****	Galvanized brass			
27	Circlip	2	Cr3 coated stell			
30	O-ring	6	NBR (standard), EPDM or FKM			
33	Plug	2	PE or PTFE			
36	Center block sealing	2	PE		•	
37	Nut	12	AISI 304			
38	Washer	12	AISI 304			
43	O-ring (valve seat)	4	EPDM, PTFE, NBR or FKM	•		
47	O-ring (back up for 36)	2*/4**	NBR (standard), EPDM or FKM		•	
57	Nut cover	12	PP			
61	Air valve complete	1	Body brass (standard), AISI 316 or PET, o-rings NBR (standard), EPDM or FKM		•	
<b>Options</b>						
<b>Stainless steel reinforcement (standard on ATEX PTFE pumps)</b>						
117	Reinforcement plate	2	AISI 316			
147	Pin screw for reinforced ver.	6	AISI 316			
<b>Stainless steel/PE reinforcement (standard on PTFE pumps from serial No 1012 ....)</b>						
1173	Reinforcement plate	2	AISI 316			
1181	Cover	2	PE			
147	Pin screw for reinforced ver.	6	AISI 316			
571	Plug	4*/8**	PE			
<b>Plate mounted air valve (standard on TX100 pumps from serial No 0907 ....), not available for T/TX50</b>						
122	Centerblock	1	PP or conductive PP			
271	Set 2 x plates (left and right)	1	AISI 316			
2711	Screw	8	AISI 316			
<b>Twin connections</b>						
130	Twin in/outlet	2	PE or PTFE			
<b>High lift seats</b>						
203	Upper sleeve high lift type	2	PE or PTFE			
213	Lower sleeve high lift type	2	PE or PTFE			
<b>Drum pump parts</b>						
63	Drum inlet	1	PE or PTFE			
64	Pump tube	1	PP (on PE pumps) or PTFE (on PTFE pumps) or AISI 316			
65	Handle	1	AISI 316			
<b>Flange connections</b>						
70	Flange pipe (threaded)	2	PE or PTFE			
71	Loose flange ring ANSI	2	PP, PTFE or AISI 316			
73	Loose flange ring DIN	2	PP, PTFE or AISI 316			
73-12	Loose flange JIS	2	PP, PTFE or AISI 316			
<b>External air supply</b>						
124	Centerblock	1	PP			

\* = T50 only

\*\* T100 only

\*\*\* = Divided seat type standard on all pumps

\*\*\*\* = FEP/FKM standard on pumps with PTFE diaphragms from serial No 1106 ....  
FEP/FKM o-rings do not fit on older in/outlets (pos 13). Older pumps have PTFE/  
EPDM as standard.

\*\*\*\*\* = Pumps with external air supply



# 4. SPARE PARTS



## 4.6 Spare part list T200 and T400

Pos	Description	Qty/pump	Material options	Spare part kits		
				KIT LIQ	KITAIR	KIT VAL
11	Housing	2	PE or PTFE			
122	Center block	1	PP			
13	In/Outlet	2	PE or PTFE			
14	Pin screw	6	AISI 304			
15	Diaphragm	2	EPDM, PTFE, NBR Or PTFE 1705b	•		
16	Diaphragm shaft	1	AISI 316		•	
17	Rubber foot	4	NBR			
18	O-ring set (in/outlet)	4	PTFE/EPDM, EPDM, FKM, NBR or FEP/FKM****	•	•	
19	Spacer sleeve	2	PE or PTFE			•
20	Upper valve seat complete ***	2	PE or PTFE			
2021	Blocking pin	2	PE or PTFE			•
202	Upper sleeve	2	PE, PTFE or AISI 316			•
21	Lower valve seat complete ***	2	PE, PTFE			
212	Lower sleeve	2	PE, AISI 316PTFE			•
22	Valve ball stop	4	PE1000 PTFE			•
222	Valve seat insert (divided seat)	4	PE1000, PTFE, PU or AISI 316, PTFE 1635			•
23	Valve ball	4	EPDM, PTFE, NBR, FKM or PU	•		
25	Muffler	1	PP		•	
26	Air intake adapter	1/2**	Galvanized brass			
271	Set 2 x plates (left and right)	1	AISI 316			
2711	Screw	8	AISI 316			
30	O-ring	6	NBR (standard), EPDM or FKM			
33	Plug	2	PE or PTFE			
36	Center block sealing	2	PE		•	
37	Nut	16	AISI 304			
38	Washer	16	AISI 304			
43	O-ring (valve seat)	4	EPDM, PTFE, NBR or FKM	•		
47	O-ring (back up for 36)	2	NBR (standard), EPDM or FKM		•	
57	Nut cover	12	PP			
61	Air valve complete	1	Body brass (standard), AISI 316 or PET, o-rings NBR (standard), EPDM or FKM		•	
<b>Options</b>						
<b>Stainless steel reinforcement (standard on ATEX PTFE pumps)</b>						
117	Reinforcement plate	2	AISI 316			
147	Pin screw for reinforced ver.	8	AISI 316			
<b>Stainless steel/PE reinforcement (standard on PTFE pumps from serial No 1012 ....)</b>						
1173	Reinforcement plate	2	AISI 316			
1181	Cover	2	PE			
147	Pin screw for reinforced ver.	8	AISI 316			
571	Plug	8	PE			
<b>Threaded air valve*</b>						
123	Center block (threaded)	1	PP			
61-123	Air valve complete	1	Body brass (standard), AISI 316 or PET, o-rings NBR (standard), EPDM or FKM			
<b>Twin connections</b>						
130	Twin in/outlet	2	PE or PTFE			
<b>High lift seats</b>						
203	Upper sleeve high lift type	2	PE or PTFE			
213	Lower sleeve high lift type	2	PE or PTFE			
<b>Flange connections</b>						
70	Flange pipe (threaded)	2	PE or PTFE			
71	Loose flange ring ANSI	2	PP, PTFE or AISI 316			
73	Loose flange ring DIN	2	PP, PTFE or AISI 316			
73-12	Loose flange JIS	2	PP, PTFE or AISI 316			
<b>External air supply</b>						
124	Centerblock	1	PP			

\* = T200 from serial No 0803 .... until 1105 .... and T400 from serial No 0801 .... until 1105. On older pumps circlip mounted air valves pos 61 are used.

\*\* = Pumps with external air supply

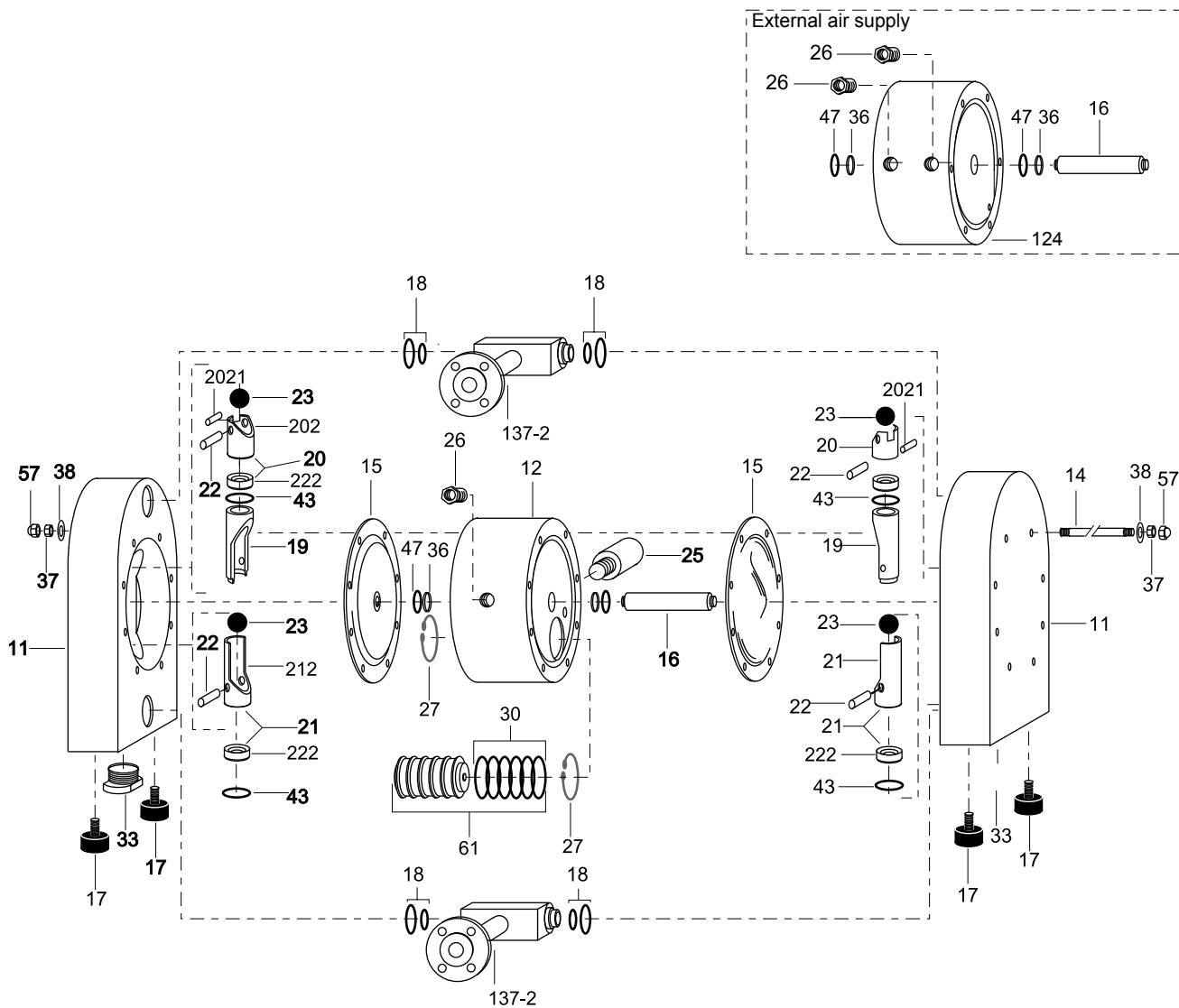
\*\*\* = Divided seat type standard on all pumps

\*\*\*\* = FEP/FKM standard on pumps with PTFE diaphragms from serial No 1106 .... and T400 from serial No 1301 FEP/FKM o-rings do not fit on older in/outlets (pos 13). Older pumps have PTFE/EPDM as standard.

# 4. SPARE PARTS



## 4.7 Spare part drawing T800



# 4. SPARE PARTS



## 4.8 Spare part list T800

Pos	Description	Qty	Material options	KIT LIQ	Spare part kits	
					KITAIR	KIT VAL
11	Housing	2	PE			
12	Center block	1	PP			
13	In/Outlet	2	PE			
14	Pin screw	8	AISI 316			
15	Diaphragm	2	EPDM, PTFE or NBR	•		
16	Diaphragm shaft	1	AISI 316		•	
17	Rubber foot	4	NBR			
18	O-ring set (in/outlet)	4	PTFE/EPDM, EPDM, FKM, NBR or FEP/FKM*	•	•	
19	Spacer sleeve	2	PE			•
20	Upper valve seat	2	PE			
202	Upper sleeve	2	PE or PTFE			•
2021	Blocking pin	2	PE or PTFE			•
21	Lower valve seat	2	PE			
212	Lower sleeve	2	PE or PTFE			•
22	Valve ball stop	4	PE1000			•
222	Valve seat insert (divided seat)	4	PE1000			•
23	Valve ball	4	EPDM, PTFE, NBR or PU	•		
25	Muffler	1	PP		•	
26	Air intake adapter	1/2**	Galvanized brass			
27	Circlip	2	Cr3 coated stell			
30	O-ring	6	NBR (standard), EPDM or FKM			
33	Plug	2	PE or PTFE			
36	Center block sealing	2	PE			•
37	Nut	16	AISI 304			
38	Washer	16	AISI 304			
43	O-ring (valve seat)	4	EPDM, PTFE or FKM	•		
47	O-ring (back up for 36)	2	NBR (standard), EPDM or FKM			•
57	Nut cover	16	PP			
61	Air valve complete	1	Body PET, shaft brass (standard) or AISI 316, o-ringsFKM			•
70	Flange pipe (threaded)	2	PE or PTFE			
71	Loose flange ring ANSI	2	PP, PTFE or AISI 316			
73	Loose flange ring DIN	2	PP, PTFE or AISI 316			
73-12	Loose flange ring JIS	2	PP, PTFE or AISI 316			
<b>External air supply</b>						
124	Centerblock	1	PP			

\* = Standard in pumps with PTFE diaphragms from serial No 1301 .... FEP/FKM o-rings do not fit on older in/outlets (pos 13). Older pumps have PTFE/EPDM as standard.  
 \*\* = Pumps with external air supply

# 4. SPARE PARTS



## 4.9 Stocking recommendation

Even at normal operation some details in the pump will be subject to wear. In order to avoid expensive breakdowns we recommend having a few spare parts in stock.

Depending on the severity of the operation and the importance of not having a breakdown. We offer three different spare part **KITS**, **KIT LIQ** and **KIT VAL** includes parts on pump wetted side, while **KIT AIR** includes worn parts on air side.

### TR9 and TR20 :

	Pos	Description	Qty
KIT LIQ	15	Diaphragm	2
	18	O-ring set in/outlet	4
	20	Lower rod	2
	21	Upper rod	2
	22	Pin	2

KIT AIR	18	O-ring set in/outlet	4
	61	Air valve complete	1
	25	Muffler	1
	22	Pin	2

### T50, T100, T200, T400, T800:

	Pos	Description	Qty
KIT LIQ	15	Diaphragm	2
	18	O-ring set in/outlet	4
	23	Valve ball	2
	43	O-ring (valve seat)	2

KIT AIR	18	O-ring set in/outlet	4
	61	Air valve complete	1
	16	Diaphragm shaft	1
	36	Center block seal	2
	47	O-ring(back up for 36)	2/4*
	25	Muffler	1

KIT VAL	19	Spacer sleeve	2
	2021	Blocking Pin	2
	202	Upper sleeve (divided seat)	2
	212	Lower sleeve (divided seat)	2
	222	Valve seat (divided seat)	4
	22	Valve ball stop	4

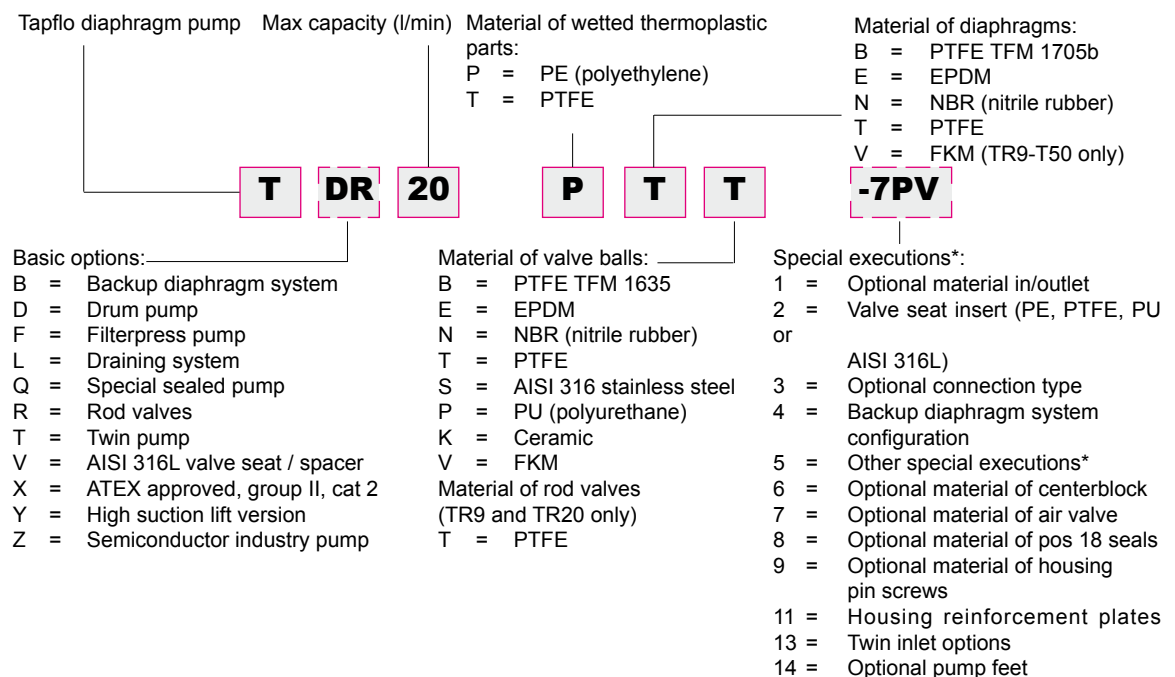
\*= for T100

## 4.10 How to order parts

When ordering spare parts for Tapflo Pumps, please let us know the **model number** and **serial number** from pump housing/centerblock. Then just indicate the part numbers (referred to the spare part list) and quantity of each item.

## 4.11 Pump code

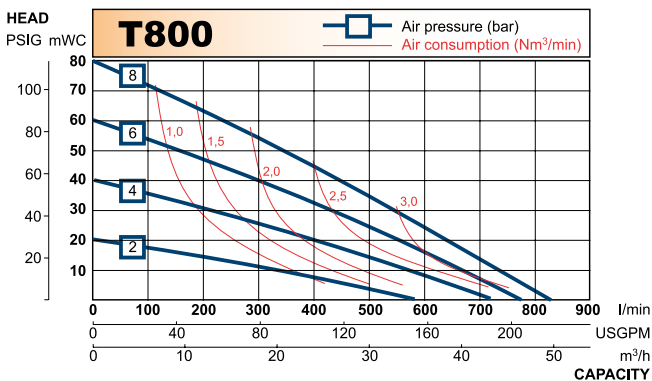
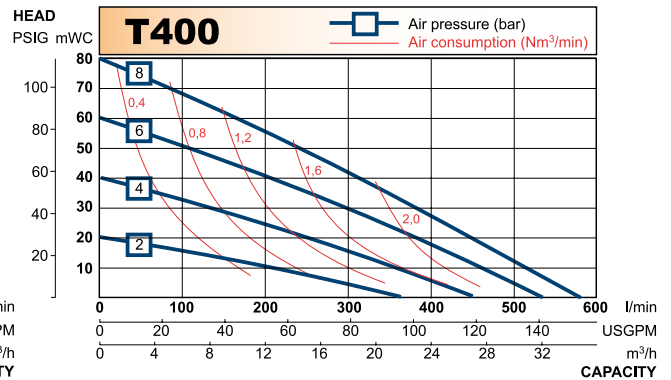
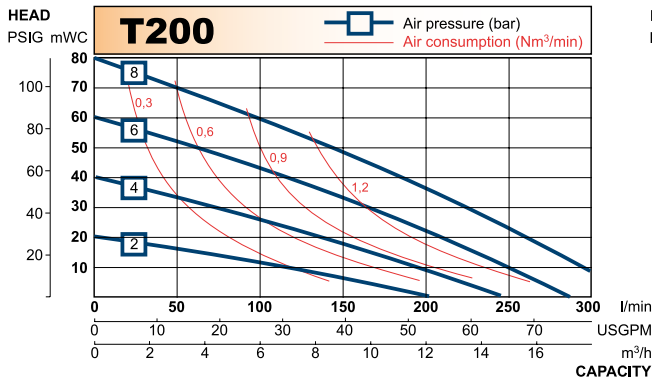
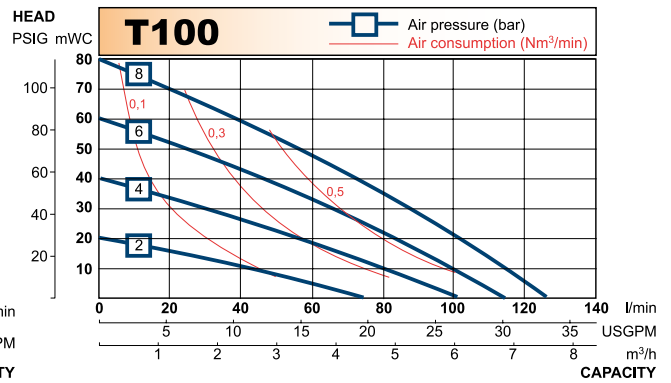
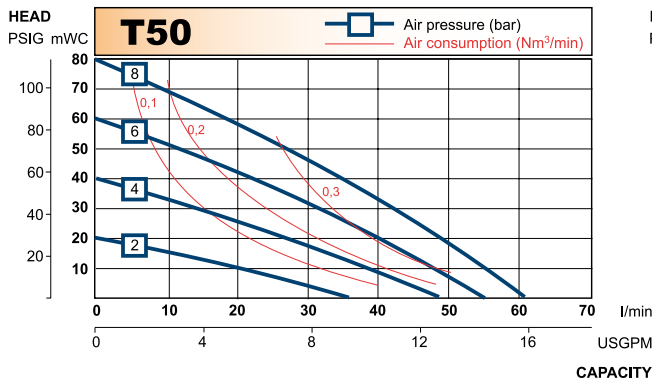
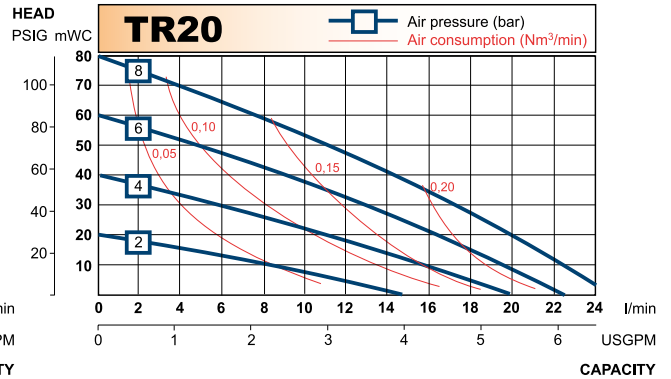
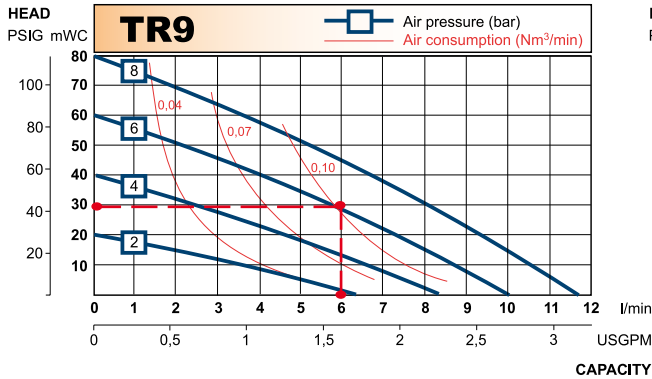
The model number on the pump tells the pump size and material of the pump components.



# 5. DATA

## 5.1 Capacity curves

The performance curves are based on water at 20°C. Other circumstances might change the performance. See page chapter 5.6 how the capacity will change at different viscosities and suction lifts.



### Example

(see the red line at the TR9 curve):

A flow of 6 liter/minute is desired. The discharge head is calculated to 30 mWC. We choose a TR9. It requires an air pressure of 6 bar and will consume approximately 0.10 Nm<sup>3</sup> air per minute.

# 5. DATA

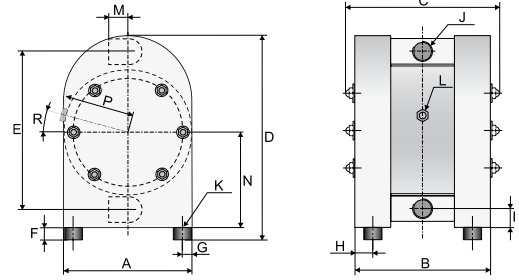
## 5.2 Dimensions

Dimensions in mm (where other is not indicated)  
Dimensions in inch (where other is not indicated)

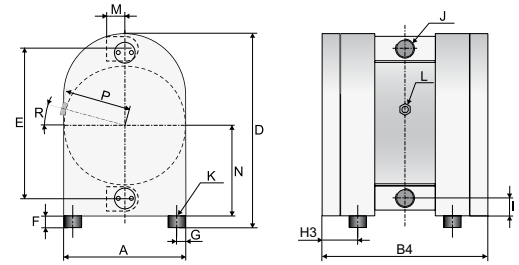
Dim	Pump size						
	9	20	50	100	200	400	800
<b>A</b>	70	105	150	200	270	350	460
	2.76	4.13	5.91	7.87	10.63	13.78	18.11
<b>A2</b>	-	-	150	300	300	404	-
	-	-	5.91	11.81	11.81	15.91	-
<b>B</b>	94	112	160	214	310	380	589
	3.70	4.41	6.30	8.43	12.20	14.96	23.19
<b>B2</b>	-	-	168	221	320	390	-
	-	-	6.61	8.70	12.60	15.35	-
<b>B3</b>	-	-	277	391	490	598	-
	-	-	10.91	15.39	19.29	23.54	-
<b>B4</b>	134	152	200	254	350	420	-
	5.28	5.98	7.87	10.00	13.78	16.54	-
<b>C</b>	115	135	190	250	345	425	637
	4.53	5.31	7.48	9.84	13.58	16.73	25.08
<b>D</b>	123	168	243	320	450	563	830
	4.84	6.61	9.57	12.60	17.72	22.17	32.68
<b>D2</b>	-	175	250	325	-	-	-
	-	6.89	9.84	12.80	-	-	-
<b>D3</b>	-	-	385	550	700	770	-
	-	-	15.16	21.65	27.56	30.31	-
<b>D4</b>	-	-	343	477	630	690	-
	-	-	13.50	18.78	24.80	27.17	-
<b>E</b>	92	132	190	252	345	440	650
	3.62	5.20	7.48	9.92	13.58	17.32	25.59
<b>E2</b>	-	147	210	280	-	-	-
	-	5.79	8.27	11.02	-	-	-
<b>E3</b>	-	-	250	333	467	588	-
	-	-	9.84	13.11	18.39	23.15	-
<b>F</b>	8	8	15	15	30	30	30
	0.31	0.31	0.59	0.59	1.18	1.18	1.18
<b>F2</b>	-	15	21	21	-	-	-
	-	0.59	0.83	0.83	-	-	-
<b>G</b>	9	15	17	30	30	30	30
	0.35	0.59	0.67	1.18	1.18	1.18	1.18
<b>H</b>	10	15	16	30	30	30	15
	0.39	0.59	0.63	1.18	1.18	1.18	0.59
<b>H2</b>	-	-	19	33	35	35	-
	-	-	0.75	1.30	1.38	1.38	-
<b>H3</b>	30	35	36	50	50	50	-
	1.18	1.38	1.41	1.97	1.97	1.97	-
<b>I</b>	12	15	20	28	38	48	80
	0.47	0.59	0.79	1.10	1.50	1.89	3.15
<b>J</b>	1/4"	3/8"	1/2"	1"	1 1/2"	2"	3"
	1/4	3/8	1/2	1	1 1/2	2	3
<b>J2</b>	1/4"	3/8"	1/2"	3/4"	1"	1 1/2"	-
	1/4	3/8	1/2	3/4	1	1 1/2	-
<b>K</b>	M4x20M4x20	M8x25	M8x25	M8x25	M8x25	M8x25	M8x25
	M4	M4	M8	M8	M8	M8	M8
<b>L</b>	1/8"	1/8"	1/4"	1/4"	1/2"	1/2"	1/2"
	1/8	1/8	1/4	1/4	1/2	1/2	1/2
<b>M</b>	15	17	25	38	54	70	95
	0.59	0.67	0.98	1.50	2.13	2.76	3.74
<b>N</b>	58	81	115	154	211	268	410
	2.28	3.19	4.53	6.06	8.31	10.55	16.14
<b>P</b>	35	52	80	105	143	183	238
	1.38	2.05	3.15	4.13	5.63	7.20	9.37
<b>R</b>	0°	0°	15°	15°	0°	0°	0°
	0°	0°	15°	15°	0°	0°	0°
<b>S</b>	13	15	21	27	35	42	-
	0.51	0.59	0.83	1.06	1.38	1.65	-
<b>ØT</b>	-	20	33	33	-	-	-
	-	0.79	1.30	1.30	-	-	-
<b>U</b>	-	1270*	1270*	1270*	-	-	-
	-	50.0*	50.0*	50.0*	-	-	-
<b>V</b>	-	285	360	400	-	-	-
	-	11.22	14.17	15.75	-	-	-

\* = Any length up to 2000 mm upon request  
\* = Any length up to 79" upon request

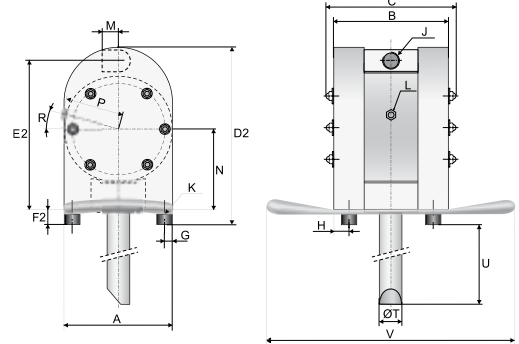
Standard PE pumps



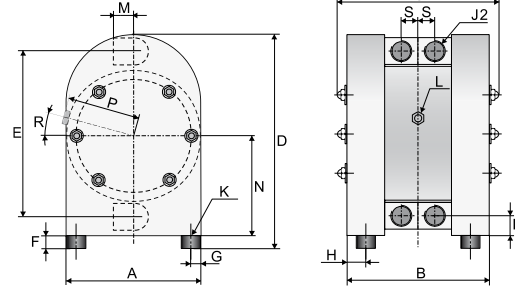
Standard PTFE pumps



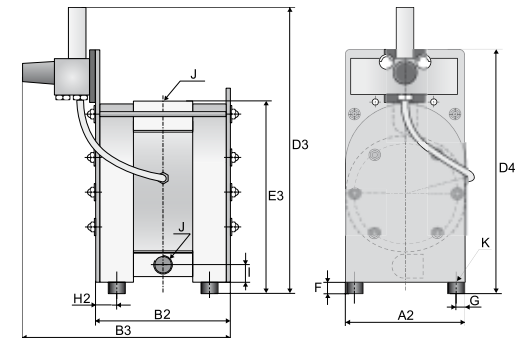
Drum pumps TD



Twin pumps TT



Filterpress pumps TF



Changes reserved without notice



# 5. DATA



## 5.3 Technical data

Data	Pump size						
	9	20	50	100	200	400	800
<b>General characteristics</b>							
*Max capacity (l/min) / (US gpm)	11 / 2.9	24 / 6.3	60 / 15.8	125 / 33	330 / 87	570 / 150	820 / 216
**Volume per stroke (ml) / (cu in)	13 / 0.80	50 / 3.05	87.5 / 5.34	280 / 17.1	933 / 56.9	2300 / 140.3	5125 / 312.7
Max discharge pressure (bar) / (psi)	8 / 116	8 / 116	8 / 116	8 / 116	8 / 116	8 / 116	8 / 116
Max air pressure (bar) / (psi)	8 / 116	8 / 116	8 / 116	8 / 116	8 / 116	8 / 116	8 / 116
****Max suction lift dry (m) / (Ft)	1 / 3	1.5 / 5	2.5 / 8	3.5 / 11	4 / 13	4 / 13	5 / 16
Max suction lift wet (m) / (Ft)	8 / 26	8 / 26	8 / 26	8 / 26	8 / 26	8 / 26	8 / 26
Max size of solids (ø in mm) / (in)	2 / 0.08	3 / 0.12	4 / 0.16	6 / 0.24	10 / 0.39	15 / 0.59	15 / 0.59
Max temp, pump in PE (°C) / (°F)	70 / 158	70 / 158	70 / 158	70 / 158	70 / 158	70 / 158	70 / 158
Max temp, pump in PTFE (°C) / (°F)	100 / 212	100 / 212	100 / 212	100 / 212	100 / 212	100 / 212	-
Min temperature (°C) / (°F)	-20 / -4	-20 / -4	-20 / -4	-20 / -4	-20 / -4	-20 / -4	-20 / -4
<b>Weight</b>							
Standard pump T in PE (kg) / (lb)	1 / 2.2	1.5 / 3.3	5 / 11	10 / 22	24 / 53	44 / 97	140 / 309
Standard pump T in PTFE (kg) / (lb)	1.5 / 3.3	2.5 / 5.5	7 / 15	17 / 38	44 / 97	90 / 199	-
Drum pump TD in PE (kg) / (lb)	-	2 / 4.4	6 / 13	11 / 24	-	-	-
Drum pump TD in PTFE (kg) / (lb)	-	3.5 / 7	9 / 19	-	-	-	-
Filterpress pump TF in PE (kg) / (lb)	-	-	8 / 17	18 / 40	37 / 82	66 / 146	-
<b>Material of components</b>							
Pump housing and all wetted thermoplastic details	PE or PTFE						PE
Centre block (not wetted)	PP						
Diaphragms	PTFE, FKM, EPDM, NBR, AISI 316L****, PTFE TFM 1705B or NBR						
Valve balls	PTFE, EPDM, NBR, AISI 316L***, PU, Ceramic***						
Rod valves (TR9 and TR20)	PE or PTFE						
Air valve	Brass (std), stainless steel AISI 316L, PET with NBR (std), EPDM or FKM o-rings						
O-rings (wetted)	EPDM, PTFE or FKM						
Housing pin screws	Stainless steel AISI 304						
Diaphragm shaft	Stainless steel AISI 304						
Drum handle (TD pumps)	Stainless steel AISI 316L						
Reinforcement plates (TF pumps)	Stainless steel AISI 316L						

\* = Recommended flow is half of the the max flow, i.e. recommended flow for a T50 is 30 l/min (7.9 US gpm)

\*\* = The value is based on pumps with EPDM diaphragms. Pumps with PTFE diaphragms have about 15% less volume

\*\*\* = Not available on T800

\*\*\*\* = This is max value with stainless steel valve balls, other valve ball materials may reduce the suction. Please consult us

\*\*\*\*\* = Available for T50 only

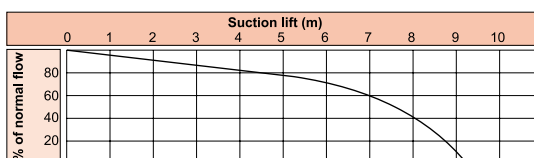
## 5.4 Tightening torques

The following tightening torques are recommended.

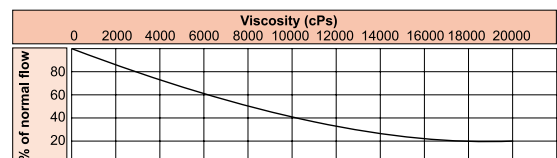
Pump size	Mounting torque (Nm)
TR9	4
TR20	5,5
T50	8
T100	16
T200	20
T400	23
T800	30

## 5.5 Capacity changes

Capacity changes at different suction lifts



Capacity changes at different viscosities



# 6. WARRANTY & REPAIR



## 6.1 Returning parts

When returning parts to Tapflo AB please follow this procedure:

- Consult Tapflo AB for shipping instructions.
- Cleanse or neutralize and rinse the part/pump. Make sure the part/pump is completely empty from liquid.
- Pack the return articles carefully to prevent any damage under transport.

***Goods will not be accepted unless the above procedure has been complied with.***

## 6.2 Warranty

Tapflo warrants products under conditions as below for a period of not more than 5 years from installation and not more than 6 years from date of manufacture, whichever comes first.

1. The following terms and condition apply to the sale of machinery, components and related services and products, of Tapflo (hereinafter "the products").
2. Tapflo (the manufacturer) warrants that:
  - a.) its products as being free of defects in material, design and workmanship at the time of original purchase;
  - b.) its products will function in accordance with Tapflo operative manuals; Tapflo does not guarantee that the product will meet the precise needs of the Customer, except for those purposes set out in any invitation to render documents or other documents specifically made available to Tapflo before entering into this agreement;
  - c.) high quality materials are used in the construction of the pumps and that machining and assembly are carried out to the highest standards.

Except as expressly stated above, Tapflo makes no warranties, express or implied, concerning the products, including all warranties of fitness for a particular purpose.

3. This warranty shall not be applicable in circumstances other than defects in material, design, and workmanship. In particular warranty shall not cover the following:
  - a.) Periodic checks, maintenance, repair and replacement of parts due to normal wear and tear (seals, O-rings, rubber items, diaphragms, air valves etc.);
  - b.) Damage to the product resulting from:
    - b.1.) Tampering with, abuse or misuse, including but not limited to failure to use the product for its normal purposes as stated at the time of purchase or in accordance with Tapflo instructions for use and maintenance of the product, or the installation or improper ventilation or use of the product in a manner inconsistent with the technical or safety standard in force;
    - b.2.) Repairs performed by non-skilled personnel or use of non-original Tapflo parts;
    - b.3.) Accidents or any cause beyond the control of Tapflo, including but not limited to lightning, water, fire, earthquake, and public disturbances, etc.;
4. The warrantee shall cover the replacement or repairing of any parts, which is documented faulty due to construction or assembling, with new or repaired parts free of charges delivered by Tapflo. Parts subjected to normal tear and wear shall not be covered by the warranty. Tapflo shall decide as to whether the defective or faulty part shall be replaced or repaired.
5. The warrantee of the products shall be valid for a period in accordance to the current law from the date of delivery, under the condition that notice of the alleged defect to the products or parts thereof be given to Tapflo in written within the mandatory term of 8 days from the discovery.

## 6. WARRANTY & REPAIR



- 6 Repair or replacement under the terms of this warranty shall not give a right to an extension to, or a new commencement of, the period of warranty. Repair or replacement under the terms of this warranty may be fulfilled with functionally equivalent reconditioned units. Tapflo qualified personnel shall be solely entitled to carry out repair or replacement of faulty parts after careful examination of the pump. Replaced faulty parts or components will become the property of Tapflo.
- 7 The products are built in accordance with standard CE normative and are tested (where applicable) by Tapflo. Approval and tests by other control authority are for the customer's account. The products shall not be considered defective in materials, design or workmanship if they need to be adapted, changed or adjusted to conform to national or local technical or safety standards in force in any country other than that for which the unit was originally designed and manufactured. This warranty shall not reimburse such adaptations, changes or adjustments, or attempt to do so, whether properly performed or not, nor any damage resulting from them, nor any adaptation, change or adjustments to upgrade the products from their normal purpose as described in the products operative manual without the prior written consent of Tapflo.
- 8 Installation, including electric and other connections to utility mains according to Tapflo drawings, is for the cost and responsibility of the customer, unless otherwise agreed in writing.
- 9 Tapflo will not be liable on any claim, whether in contract, tort, or otherwise, for any indirect, special, incidental, or consequential damages, caused to the customer or to third parties, including loss of profits, arising by any possible infringement of par. 3 above or by the customer or third parties being in the impossibility of using the products.

Steady the above, Tapflo liability to the customer or third parties from any claim, whether in contract or otherwise, shall be limited to the total amount paid by the customer for the product that caused the damages.









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