ABS Dry Installed Waste Water Pumps Series FR

Installation

Close-coupled, Bearing Assemblies 3R, 4R, 5R, 5F and 6F

1.1 Storage

If the pump unit is to be stored for a lengthy period, the following points should be noted:

- ☐ Vibrations that could damage the bearings must be avoided.
- ☐ The covers fitted to the suction and discharge ports should be retained in place undamaged.

ATTENTION

- ☐ If there is a risk of freezing temperatures, any cavities that cannot be emptied should be filled with anti-freeze.
- ☐ If the casing and impeller are made of cast iron, rust preventative should be introduced into the pump interior, i.e. between the impeller and the wear disc/wear ring.
- ☐ The motor should be protected from moisture and dust.
- ☐ If the pump is to be stored for a very long time, gland packing should be removed.

1.2 Handling

ATTENTION ⚠

Care in handling is required, particularly to prevent damage to parts such as the terminal box or fan cover of the motor and sealing and cooling liquid pipes on the pump. Smooth lifting of the pump unit as in Fig. 1 is suggested. Never lift by means of the pump or motor shafts.

See also ”Transport” in our safety instruction.

1.3 Location

Pumps should preferably be installed to make inspection and servicing easy. Ensure adequate space exists for dismantling.

For Close-coupled pumps the socket for ABS lifting arm can be placed on the floor, see Fig. 2a.

Large pumps will require suitable lifting equipment as shown in Fig. 2b.

Note the turning circle of the lifting arm when positioning valves and cable trays.

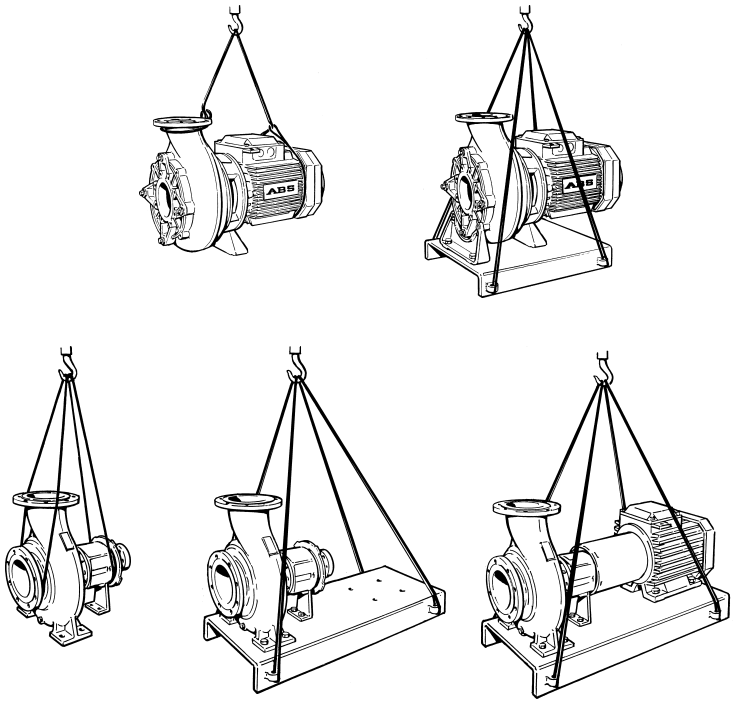
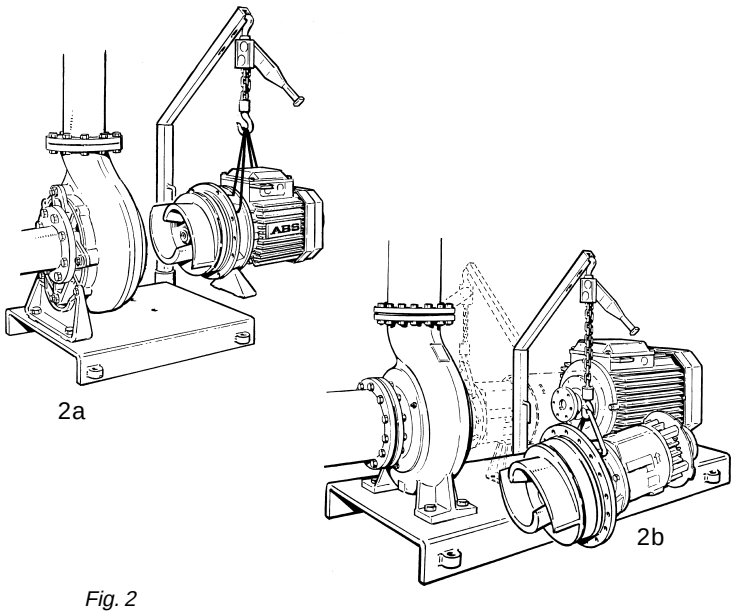


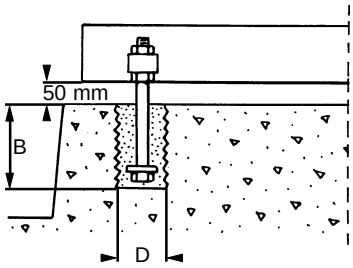
Fig. 1
Lifting of Typical Pump Units.



2a

2b

Fig. 2
When servicing large pumps, the rotor can be lifted out using an ABS Lifting Arm.



Foundation bolts	ØD mm	B min. mm
M16	100	≥200
M20	100	≥250
M24	150	≥300

Fig. 3
Foundation dimensions for fabricated baseplate fixing.

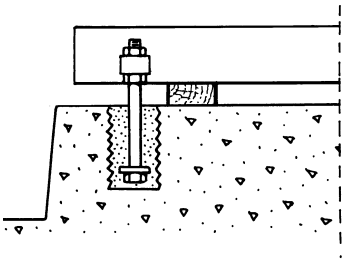


Fig. 4
Grouting of foundation bolts

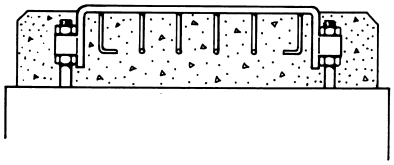


Fig. 5
Grouting of fabricated baseplate.

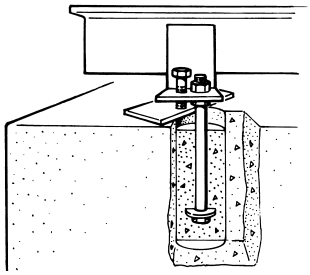


Fig. 6
Grouting of foundation bolts for a baseframe.

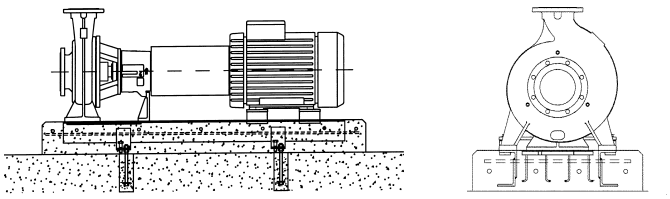


Fig. 7
Insert reinforcement bars in two directions.

1.4 Fixing

The construction of the foundation and securing of the baseplate should be so that vibrations are prevented, pipe stresses absorbed or distributed and pump/motor alignment maintained.

There are several suitable methods for securing the pump unit to the foundation and some of them are described on the following pages.

1.4.1 Short Fabricated Baseplate

For Close-coupled versions with baseplate it is enough to fasten the unit with expanding bolts directly in the grouted ground.

1.4.2 Fabricated Baseplate

The foundation bolt pocket dimensions are to be found in Fig. 3.

Position the baseplate with the foundation bolts suspended in their pockets. Align the baseplate with packers, so that the pump is correctly located both horizontally and laterally. See Fig. 4. Grout the foundation bolts with quick setting concrete to the surface level of the foundation. When the concrete has hardened sufficiently, remove the packers. The nuts under the baseplate can now be used for adjustment.

Build an edge fillet and grout under the baseplate with fine, nonshrinking concrete, see Fig. 5. Space between the baseplate and foundation should be completely filled to increase the rigidity and vibration absorbing ability. Final alignment should be carried out later according to Para 1.6.

1.4.3 Fabricated Baseframe

Align the baseframe with the ”jacking screws” and grout the foundation bolts, see Fig. 6, as in Para. 1.4.2. Remove the packers. Adjust the position when the grout has hardened sufficiently any height adjustment can be achieved with the nut.

A rough alignment of the pump and the motor must be made before casting. In many cases the baseframe must be adjusted to allow for final alignment, see Para. 1.6.

ATTENTION

Insert reinforcement bars in two directions. Those reinforcement bars that are perpendicular to the frame are to go through holes in the frame. Build the shuttering and pour concrete to the upper side for the baseframe. See Fig. 7.

1.5 Fitting a Coupling or Pulley

Check that the key fits properly and lubricate the shaft end with graphite grease or equal. Preferably fit the coupling using a screw press device as shown in Fig. 8 or a fully threaded screw, a nut and steel plate. Alternatively, the coupling halves can be heated to about 80°C and pushed on by hand.

For couplings with a spacer element, see Fig. 9, the distance S must be enough to permit the spacer to be removed. The distance according to Table 1 or manufacturer's recommendation.

Table 1
*Distance **S** between the coupling halves*

Diameter D	<140 mm	140-225 mm	>225 mm
With spacer	5^{+1}	6^{+1}	8^{+1}

Always fit an ABS coupling guard, especially for fan cooled bearing assemblies, where the fan guard forms the support for the coupling guard.

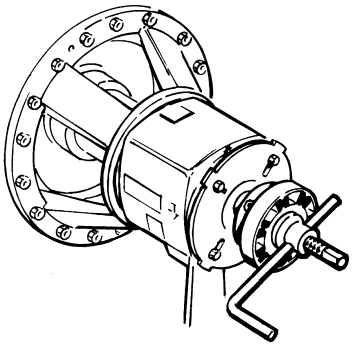


Fig. 8
Couplings can be fitted using a special pressing tool.

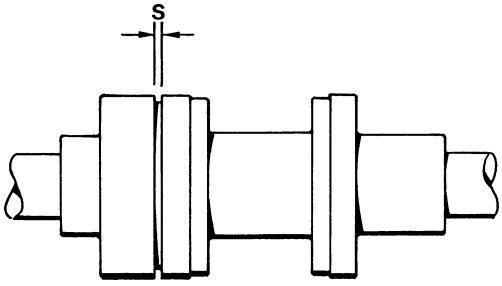


Fig. 9
Coupling with spacer.

1.6 Alignment (Not for close-coupled pumps)

The pump/motor alignment is done prior to despatch from our works but very probably will be affected when the piping is connected.

ATTENTION

Final alignment must be carried out after the following site activities are completed:

- ☐ Baseplate has been grouted and fixing bolts tightened.
- ☐ Piping has been connected.
- ☐ Pipe system and tanks have been filled.
- ☐ Pump is at operation temperature.
- ☐ Always check that the support foot is without stress.

Proper alignment will prevent vibrations, excessive wear on coupling parts and shaft seals and overheating of bearings. Alignment can be made with feeler gauge, clock gauge or laser.

ATTENTION

The tolerance for angular displacement, see Fig. 10, is maximum 1/1000th of coupling diameter. For radial displacement, see Fig. 12, the maximum tolerance is 1/2000th of the coupling diameter e.g. 0.05mm for each Ø100mm of dia.

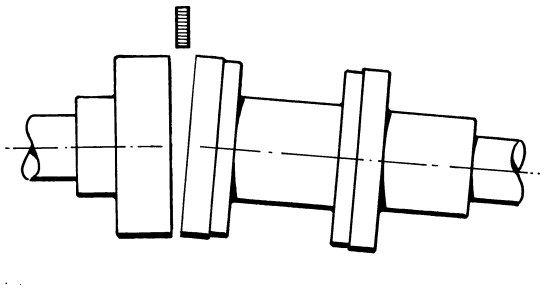


Fig. 10
Begin coupling alignment by eliminating angular displacement.

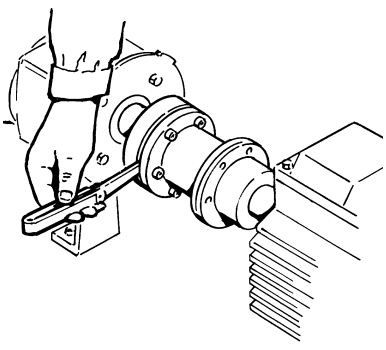


Fig. 11
Use a feeler gauge for measuring between the coupling halves.

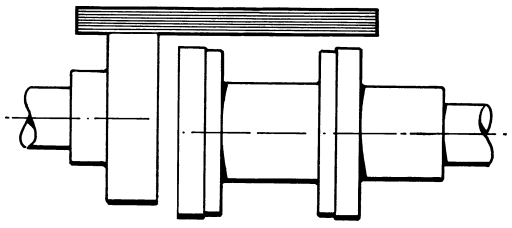


Fig. 12
Radial alignment is required.

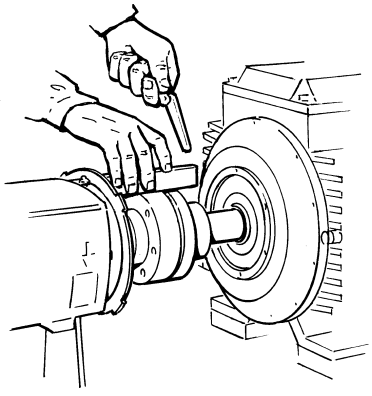


Fig. 13
Measure the misalignment with a steel rule and feeler gauge.

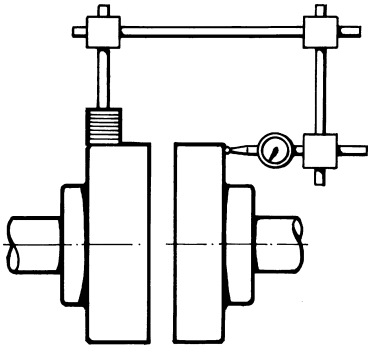


Fig. 14
Measuring the angular displacement with a clock gauge.

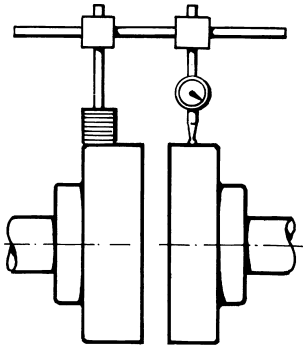
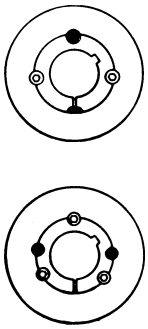


Fig. 15
Measuring the radial displacement with a clock gauge.



Bush size	2012	2517	3020	3525
Screw tightening torque (Nm)	30	50	90	115
Screw qty	2	2	2	3
Hex socket size	5	6	8	10
Large end dia. (mm)	70	85,5	108	127
Approx mass (kg)	0,7	1,5	2,7	3,8

Fig. 16
Screw and bush placement in hub for belt drive.

Table 2
Tightening torque etc for bushing.

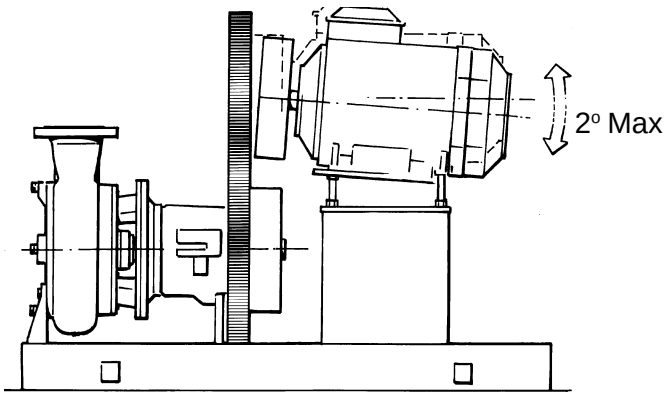


Fig. 17
Alignment of pulleyes should be within 2º.

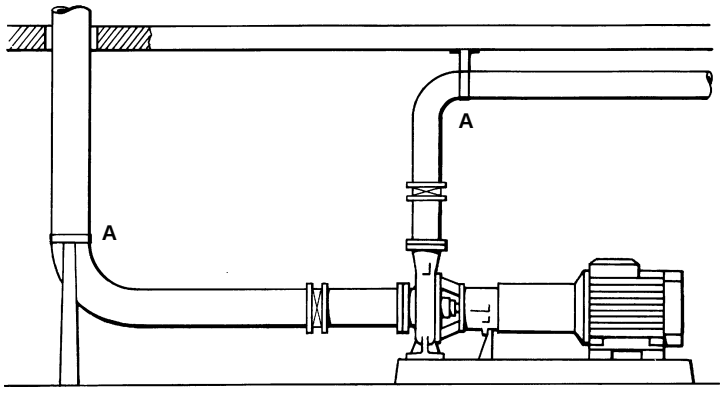


Fig. 18
The pump must not carry piping loads.

1.6.1 Alignment with feeler gauge

Start by ensuring the shafts are aligned correctly, i.e. eliminating angular misalignment, see Fig. 10 on the previous page. Mark reference points on the coupling flanges. Measure the distance between the coupling halves with a feeler gauge, see Fig. 11 on the previous page. Measure at one quarter, one half and three-quarter turns from the original position. Adjust with shims - preferably under the motor - so that the difference will be max. 1/1000th of coupling dia e.g. 0.1mm for each 100mm of dia.

To obtain concentric alignment, see Fig. 12 on the previous page, place a steel rule on the coupling and measure the difference at four positions around the periphery, see Fig. 13 on the previous page. By adjusting uniformly under the motor feet the difference should be brought down to an acceptable value, of 1/2000th of the coupling diameter e.g., 0.05mm for each Ø100mm of diameter.

1.6.2 Alignment with Clock Gauge

An accurate method is to attach a clock gauge to one of the coupling halves, letting the point of the gauge rest on the other half. Turning the shafts and reading the gauge will reveal necessary adjustments.

Place the clock gauge on the side of the opposite half to measure the angular displacement, see Fig 14. The clock gauge should be placed on top of the opposite half to measure the radial displacement, see Fig. 15.

1.6.3 Alignment with Laser

To align by laser contact the laser manufacturer.

1.7 Belt Drive

For bearing assemblies 5F and 6F a Belt Drive Unit (BDU) should be used. See separate instruction 1.1146.

1.7.1 Installation of pulleys and bushes

1. Insert the bush in hub so that the holes lines up.
2. Place the screw loosely in the holes threaded in the hub. See Fig. 16.
3. Fit the hub to the shaft as one unit and locate in position desired, remembering that bush will nip the shaft first and then hub will be slightly drawn on to the bush.
4. Using a hexagon wrench tighten screws gradually and alternately to torque shown in Table 2.
5. Hammer against the large end of the bush, using a block or sleeve to prevent damage. (This will ensure that the bush is seated squarely in the bore.) Screws will now turn a little more. Repeat this alternate once or twice to achieve maximum grip on shaft.
6. Make sure that the key has **top clearance.**
7. After drive has been running under load for a short time, stop and check tightness of the screws.
8. Fill empty holes with grease to exclude dirt.

1.7.2 Installing belt(s)

1. Place the belt(s) on the pulley(s) without using any tool or force.
2. Tensioning the belt by using the four nuts under the motorplate until the accurate stress is achieved in the belt.

3. ***Polly-V and multipule belts***
   a) Draw two lines perpendicularly across the belt back about 80% of the belt strand apart.
   b) Use the nuts under the motor plate to increase the distance between the two lines by 0.5 to 0,75%.
   c) Run the drive under load for 10 minutes, check the tension again and readjust if necessery.
   V-belt
   Force required to deflect belt 16 mm per meter of span.

Small pulley diameter	Force in Newton (N)
112-224	45-65
140-200	65-85

4. Check that the pulleys are aligned (See Alignment, Para. 1.7.3).
5. Lock the position of the motor plate by tighten the four nuts on the top of the motorplate.
6. Install the belt guard and secure it by four screws into baseplate.

1.7.3 Alignment of Belt Drive 3R and 4R
Make sure that the alignment between the pulleys are within 2° by using a steel ruler. See Fig. 17.

1.8 Piping

ATTENTION
Correct functioning of the pump can be affected by external factors. The piping, tanks and valves must be properly engineered into the system. This is particularly important on the suction side. Errors here can cause cavitation, bad inflow angles of liquid into the pump impeller or the formation of ”voids” in the liquid.

Loads on the pump flanges arising from pipe stresses must be minimised. Piping and valves must be carefully supported, see (A) Fig. 18. Excessive pipe stresses can deform the casing resulting in impeller ”binding” and changed alignment.

Ensure that pipes and pump are properly cleaned internally before connection. Debris in the pipe can lead to seizures and unnecessary wear. Bear in mind that the clearance between the impeller and the wear ring may be only a few tenths of a mm.

1.8.1 Tanks or Wells

If a pump takes its suction from an open tank, the tank volume should not be to small. The inlet to the suction tank should be designed to avoid air entrainment. See Fig. 19.

If the tank is equipped with an agitator the pump inlet should be located within 30-90°C of the agitator to obtain the best flow. See Fig. 20. For more information see instructions for the agitator.

To minimise flow losses and reduce the risk of air in the suction pipe, the inlet to the suction pipe should be properly designed. A funnel shaped entry as in Fig. 21.

1.8.2 Valves

Valves in the suction pipe should be used for isolating only. During pump operation they should be fully open and of full flow type. Globe or butterfly valves, see Fig. 22, should not be used as these will disturb the flow path and lead to increased suction losses.

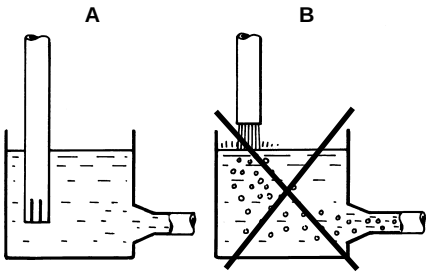


Fig. 19
A: A blanked and slotted pipe end gives a steady flow.
B: Risk of air in pump suction.

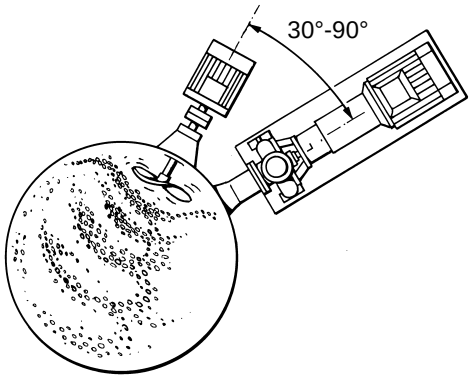


Fig. 20
An agitator should be placed within 30°-90° of the pump.

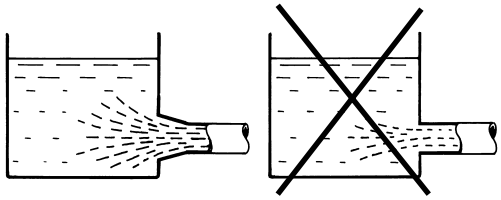


Fig. 21
The outlet of a tank should be funnel-shaped. A parallel entry will throttle the flow.

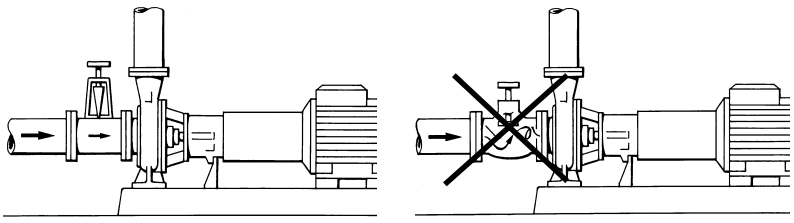


Fig. 22
Valves before the pump suction should be free flow type. The flow path should not be throttled in anyway.

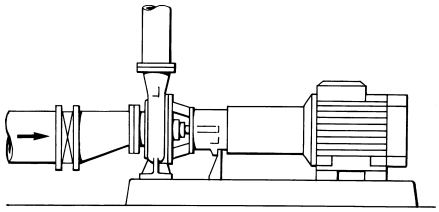


Fig. 23
A taper in front of the pump should have a horizontal top edge.

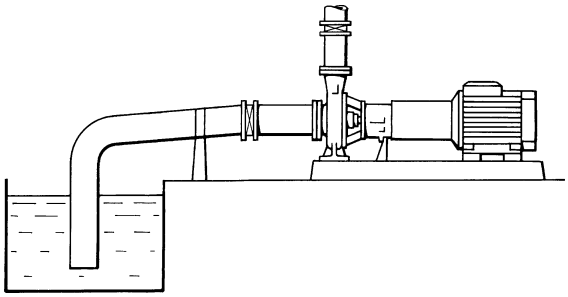


Fig. 24
Suction piping should be continuously rising towards the pump, when the tank is below the pump.

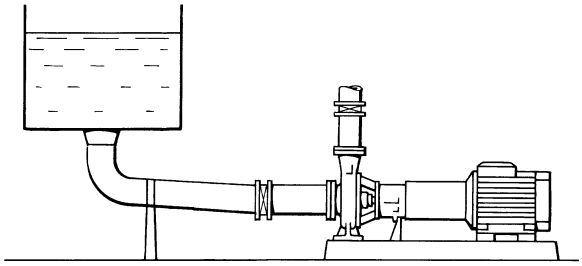


Fig. 25
Suction piping should be continuously falling when the tank is above the pump.

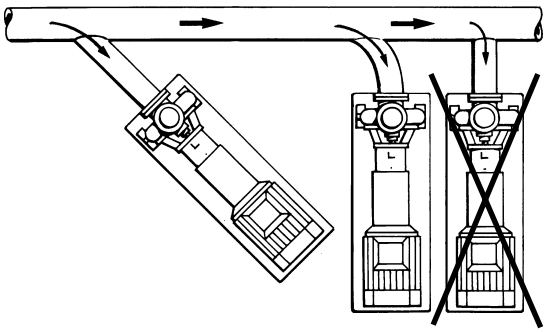


Fig. 26
Connection of pumps to common suction header.

1.8.3 Suction piping

The feed pipe from the suction tank should be as short as possible - particularly for slurries and suspensions. Pipes causing air pockets must be avoided. Flow velocity should be less than 2m per second and the pipe diameter should be calculated accordingly. As a general rule this will result in a pipe diameter one size larger than that of the pump inlet.

Inlet tapers should have a flat top as shown in Fig. 23.

With a suction lift the pipe should rise continuously to the pump, see Fig. 24, and conversely, with a positive suction head, it should fall continuously towards the pump, see Fig. 25.

In a common manifold for two or more pumps avoid straight tee´s. Use swept tee´s or a Y-piece to minimise losses, see Fig. 26.

1.8.4 Discharge Piping

A stop valve should be installed in the discharge piping close to the pump, but down-stream of any non-return valve. See also Para 1.9. When positioning the valve take account of ABS lifting arm operating radius. Acute branches and sudden increases in diameter give unnecessary losses and may cause noise. See Fig. 27.

1.8.5 Minimum Flow

ATTENTION

If its likely that the pump will operate close to or below its minimum flow, then a bypass must be installed to avoid excessive temperature increase and vibration. Consult ABS.

Both suction and discharge valves must never be closed when the pump is running. This could cause an explosion of the pump.

1.9 Pressure Testing of Pipework

ATTENTION

When pressure testing a complete pipe system, the pump must be isolated e.g. by blanking off to avoid damage to the shaft seal.

1.10 Pressure Transients and Fluctuations

ATTENTION

Each pump is designed for its stated pressure rating. If this pressure is exceeded, including instances of overpressurising due to pressure transients (pressure fluctuations), continued satisfactory operation of the pump cannot be guaranteed. Pressure transients occur, if the flow velocity in a pipe is changed. The more rapid the rate of change, the larger the pressure fluctuation. In a long pipe even a slow rate of change may cause a strong pressure surge.

Starting and stopping pumps or opening and closing valves are obvious causes of fluctuations. Centrifugal pumps should be started against a closed or partially closed valve installed near the pump. The valve should then be slowly opened. The pump is normally stopped in the reverse order.

Quick acting valves and long pipelines, particularly those that are inadequately vented or gas- or airfilled, call for special attention with regards to pressure fluctuations.

If the electricity supply should suddenly fail, the pump speed will drop and the flow in the system will change in an uncontrolled way. With very long pipe lines the possible consequences of such an interruption should be considered when the system is being designed.

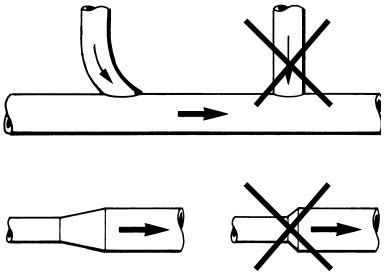


Fig. 27
"Right" and "Wrong" ways of connecting to a common discharge header. The discharge diameter should not be increased suddenly.

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