FLOWSERVE

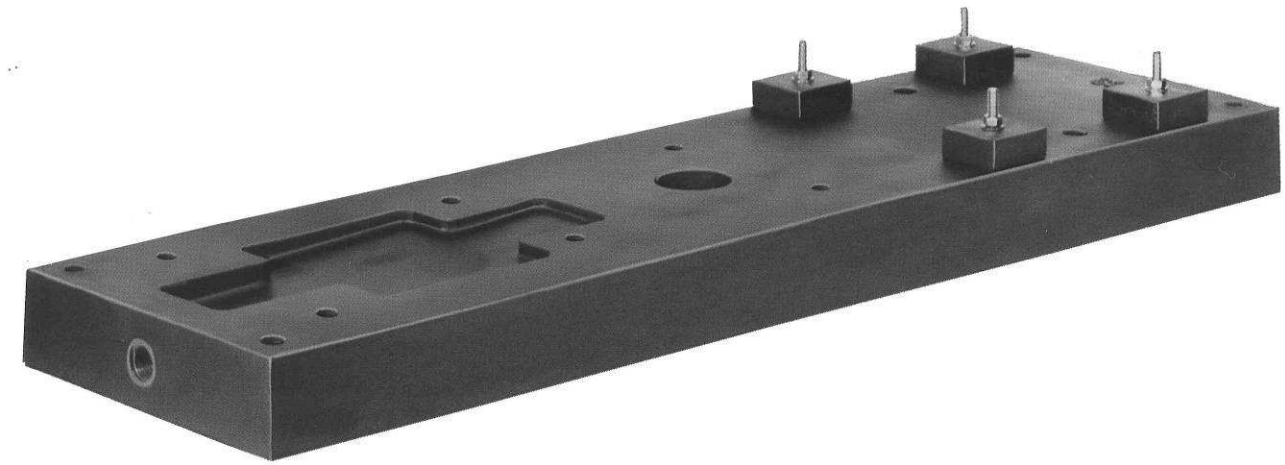
USER INSTRUCTIONS

Polybase baseplates

Installation
Operation
Maintenance

Non-metallic, solid polymer concrete
AMSE B73.1 and ISO 3661 dimensions

PCN=71569284 – 12-10 Original instructions



⚠ *These instructions must be read prior to installing, operating, using and maintaining this equipment.*

Experience In Motion

CONTENTS

1 INTRODUCTION AND SAFETY

1.1 General

These instructions must always be kept close to the product's operating location or directly with the product.

Flowserve products are designed, developed and manufactured with state-of-the-art technologies in modern facilities. The unit is produced with great care and commitment to continuous quality control, utilizing sophisticated quality techniques, and safety requirements.

Flowserve is committed to continuous quality improvement and being at service for any further information about the product in its installation and operation or about its support products, repair and diagnostic services.

These instructions are intended to facilitate familiarization with the product and its permitted use. Operating the product in compliance with these instructions is important to help ensure reliability in service and avoid risks. The instructions may not take into account local regulations; ensure such regulations are observed by all, including those installing the product. Always coordinate repair activity with operations personnel, and follow all plant safety requirements and applicable safety and health laws and regulations.

These instructions must be read prior to installing, operating, using and maintaining the equipment in any region worldwide. The equipment must not be put into service until all the conditions relating to safety noted in the instructions, have been met. Failure to follow and apply the present user instructions is considered to be misuse. Personal injury, product damage, delay or failure caused by misuse are not covered by the Flowserve warranty.

1.2 CE marking and approvals

It is a legal requirement that machinery and equipment put into service within certain regions of the world shall conform with the applicable CE Marking Directives covering Machinery and, where applicable, Low Voltage Equipment, Electromagnetic Compatibility (EMC), Pressure Equipment Directive (PED) and Equipment for Potentially Explosive Atmospheres (ATEX).

Where applicable the Directives and any additional Approvals cover important safety aspects relating to machinery and equipment and the satisfactory provision of technical documents and safety instructions. Where applicable this document incorporates information relevant to these Directives and Approvals.
To confirm the Approvals applying and if the product is CE marked, check the serial number plate markings and the Certification. (See section 9, *Certification*.)

1.3 Disclaimer

Information in these User Instructions is believed to be complete and reliable. However, in spite of all of the efforts of Flowserve Corporation to provide comprehensive instructions, good engineering and safety practice should always be used.

Flowserve manufactures products to exacting International Quality Management System Standards as certified and audited by external Quality Assurance organizations. Genuine parts and accessories have been designed, tested and incorporated into the products to help ensure their continued product quality and performance in use. As Flowserve cannot test parts and accessories sourced from other vendors the incorrect incorporation of such parts and accessories may adversely affect the performance and safety features of the products. The failure to properly select, install or use authorized Flowserve parts and accessories is considered to be misuse. Damage or failure caused by misuse is not covered by the Flowserve warranty. In addition, any modification of Flowserve products or removal of original components may impair the safety of these products in their use.

1.4 Copyright

1.5 Duty conditions

This product has been selected to meet the specifications of your purchaser order. The acknowledgement of these conditions has been sent separately to the Purchaser. A copy should be kept with these instructions.

The product must not be operated beyond the parameters specified for the application. If there is any doubt as to the suitability of the product for the application intended, contact Flowserve for advice, quoting the serial number.

If the conditions of service on your purchase order are going to be changed (for example liquid pumped, temperature or duty) it is requested that the user seeks the written agreement of Flowserve before start up.

1.6 Safety

1.6.1 Summary of safety markings

These User Instructions contain specific safety markings where non-observance of an instruction would cause hazards. The specific safety markings are:

DANGER This symbol indicates electrical safety instructions where non-compliance will involve a high risk to personal safety or the loss of life.

This symbol indicates safety instructions where non-compliance would affect personal safety and could result in loss of life.

This symbol indicates "hazardous and toxic fluid" safety instructions where non-compliance would affect personal safety and could result in loss of life.

CAUTION This symbol indicates safety instructions where non-compliance will involve some risk to safe operation and personal safety and would damage the equipment or property.

This symbol indicates explosive atmosphere zone marking according to ATEX. It is used in safety instructions where non-compliance in the hazardous area would cause the risk of an explosion.

This symbol is used in safety instructions to remind not to rub non-metallic surfaces with a dry cloth; ensure the cloth is damp. It is used in safety instructions where non-compliance in the hazardous area would cause the risk of an explosion.

Note: This sign is not a safety symbol but indicates an important instruction in the assembly process.

1.6.2 Personnel qualification and training

All personnel involved in the operation, installation, inspection and maintenance of the unit must be qualified to carry out the work involved. If the personnel in question do not already possess the necessary knowledge and skill, appropriate training and instruction must be provided. If required the operator may commission the manufacturer/supplier to provide applicable training.

Always coordinate repair activity with operations and health and safety personnel, and follow all plant safety requirements and applicable safety and health laws and regulations.

1.6.3 Safety action

This is a summary of conditions and actions to prevent injury to personnel and damage to the environment and to equipment. For products used in potentially explosive atmospheres section 1.6.4 also applies.

DANGER NEVER DO MAINTENANCE WORK WHEN THE UNIT IS CONNECTED TO POWER (Lock Out)

HANDLING COMPONENTS

Many precision parts have sharp corners and the wearing of appropriate safety gloves and equipment is required when handling these components. To lift heavy pieces above 25 kg (55 lb) use a crane appropriate for the mass and in accordance with current local regulations.

HOT (and cold) PARTS

If hot or freezing components or auxiliary heating equipment can present a danger to operators and persons entering the immediate area, action must be taken to avoid accidental contact (such as shielding). If complete protection is not possible, the machine access must be limited to maintenance staff only with clear visual warnings and indicators to those entering the immediate area. Note: bearing housings must not be insulated and drive motors and bearings may be hot.

If the temperature is greater than 80℃ (175 ℉) or below -5 ℃ (23 ℉) in a restricted zone, or exceeds local regulations, action as above shall be taken.

CAUTION PREVENT EXCESSIVE EXTERNAL PIPE LOAD

Do not use pump as a support for piping. Do not mount expansion joints, unless allowed by Flowserve in writing, so that their force, due to internal pressure, acts on the pump flange.

HAZARDOUS LIQUIDS

When the pump is handling hazardous liquids care must be taken to avoid exposure to the liquid by appropriate pump placement, limiting personnel access and by operator training. If the liquid is flammable and/or explosive, strict safety procedures must be applied.

1.6.4 Products used in potentially explosive atmospheres

Measures are required to:

- Avoid excess temperature
- Prevent build up of explosive mixtures
- Prevent the generation of sparks
- Prevent leakages
- Maintain the pump to avoid hazard

The following instructions for pumps and pump units when installed in potentially explosive atmospheres must be followed to help ensure explosion protection. For ATEX, both electrical and non-electrical equipment must meet the requirements of European Directive 94/9/EC. Always observe the regional legal Ex requirements eg Ex electrical items outside the EU may be required certified to other than ATEX eg IECEx, UL/CSA.

1.6.4.1 Scope of compliance

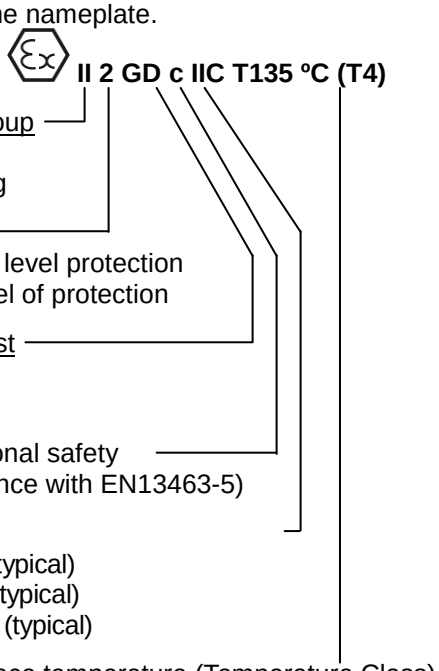
Use equipment only in the zone for which it is appropriate. Always check that the driver, drive coupling assembly, seal and pump equipment are suitably rated and/or certified for the classification of the specific atmosphere in which they are to be installed.

Where Flowserve has supplied only the bare shaft pump, the Ex rating applies only to the pump. The party responsible for assembling the pump set shall select the coupling, driver and any additional equipment, with the necessary CE Certificate/ Declaration of Conformity establishing it is suitable for the area in which it is to be installed. That party are also responsible for CE Marking the complete machine.

The output from a variable frequency drive (VFD) can cause additional heating effects in the motor and so, for pumps sets with a VFD, the ATEX Certification for the motor must state that it is covers the situation where electrical supply is from the VFD. This particular requirement still applies even if the VFD is in a safe area.

1.6.4.2 Marking

An example of ATEX equipment marking is shown below. The actual classification of the pump will be engraved on the nameplate.



1.6.4.3 Avoiding excessive surface temperatures

ENSURE THE EQUIPMENT TEMPERATURE CLASS IS SUITABLE FOR THE HAZARD ZONE

1.6.4.4 Preventing sparks

To prevent a potential hazard from mechanical contact, the coupling guard must be non-sparking.

To avoid the potential hazard from random induced current generating a spark, the earth contact on the baseplate must be used.

Avoid electrostatic charge: do not rub non-metallic surfaces with a dry cloth; ensure cloth is damp.

The coupling must be selected to comply with 94/9/EC and correct alignment must be maintained.

Additional requirement for metallic pumps on non-metallic baseplates

When metallic components are fitted on a non-metallic baseplate they must be individually earthed.

1.6.4.5 Maintenance to avoid the hazard

CORRECT MAINTENANCE IS REQUIRED TO AVOID POTENTIAL HAZARDS WHICH GIVE A RISK OF EXPLOSION

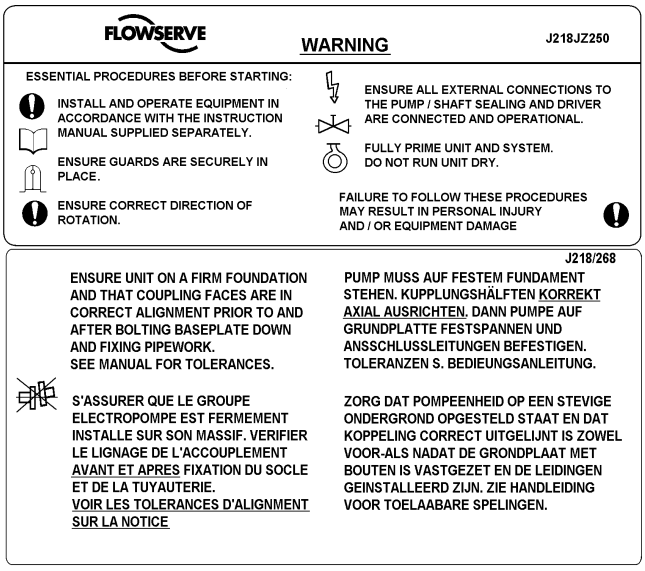
The responsibility for compliance with maintenance instructions is with the plant operator.

To avoid potential explosion hazards during maintenance, the tools, cleaning and painting materials used must not give rise to sparking or adversely affect the ambient conditions. Where there is a risk from such tools or materials, maintenance must be conducted in a safe area.

It is recommended that a maintenance plan and schedule is adopted. (See section 6, *Maintenance.)*

1.7 Nameplate and safety labels

1.7.1 Safety labels



2 TRANSPORT AND STORAGE

2.1 Consignment receipt and unpacking

Immediately after receipt of the equipment it must be checked against the delivery/shipping documents for its completeness and that there has been no damage in transportation. Any shortage and/or damage must be reported immediately to Flowserve Pump Division and must be received in within ten days of receipt of the equipment. Later claims cannot be accepted. Check all crates, boxes or wrappings for any accessories or spare parts that may be packed separately from the equipment or attached to side walls of the box or equipment. After unpacking, protection will be the responsibility of the user.

Each product has a unique serial number. Check that this number corresponds with your order. Use this number in correspondence as well as when ordering spare parts or further accessories.

2.2 Handling

Boxes, crates, pallets or cartons may be unloaded using fork-lift vehicles or slings depending on their size and construction.

2.3 Lifting

Fully trained personnel must carry out lifting in accordance with local regulations. The Polybase baseplate dimensions and weights are shown in Section 8 PARTS LIST AND DRAWINGS.

CAUTION .Do not install eye bolts in the Polybase thread inserts for the purpose of lifting the base. This practice imposes lateral loads on the inserts which they were not designed to withstand. Also, do not use hooks in the baseplate anchor bolt holes.

CAUTION Pumps and motors often have integral lifting lugs or eye bolts. These are intended for use in only lifting the individual piece of equipment.

CAUTION Do not use eye bolts or cast-in lifting lugs to lift pump, motor and baseplate assemblies.

CAUTION Polybase units should be transported via fork truck to the area of their intended installation on the wooden pallets on which they were shipped. Never transport a Polybase over long distances or over rough terrain while it is suspended from slings.

CAUTION Care must be taken to lift components or assemblies above the center of gravity to prevent the unit from flipping.

2.3.1 Lifting Polybase baseplates with no mounted equipment

a) Remove the fasteners that hold the Polybase to the wooden pallet.
b) Slip two slings under the baseplate between pallet cross-members as shown in Figure 2.1. Slings should be positioned approximately one-quarter to one-third the baseplate length from each end.
c) Lift the Polybase a few inches off the pallet and verify that it hangs reasonably level and that the slings are not prone to slipping out of position.
d) If this slinging appears to be unstable, set the baseplate back on the pallet and reposition the slings. After satisfactory slinging has been achieved, the baseplate may be hoisted onto its foundation.

2.3.2 Lifting the Polybase baseplate with pump and motor installed

a) Remove the fasteners that hold the Polybase to the wooden pallet.
b) Install slings around the pump discharge nozzle (except for PGRP pumps where the slings must go around and through the adapter) and around the outboard end of the motor frame using choker hitches pulled tight. The motor sling should be positioned so the weight is not carried through the fan housing. Make sure the completion of the choker hitch on the discharge nozzle (or adapter arms) is toward the coupling end of the pump shaft as shown in Figure 2.2.

2.3.3 Lifting the Polybase baseplate with only the pump installed

a) Remove the fasteners that hold the Polybase to the wooden pallet.
b) Install a sling around the pump discharge nozzle using a choker hitch pulled tight (except for PGRP pumps where the slings must go around and through the adapter).
c) Install a second sling around the motor end of the Polybase using a basket hitch (see Figure 2.2). Make sure the completion of the choker hitch on the discharge nozzle is toward the coupling end of the pump shaft. Refer to section 4.0 INSTALLATION for setting the base on the foundation.

d)

Figure 2.1

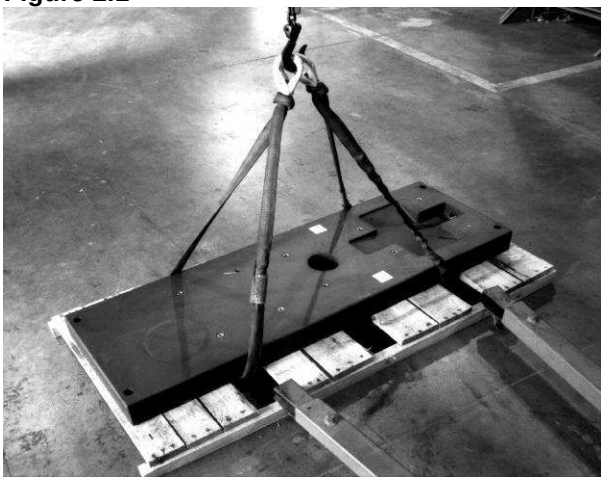
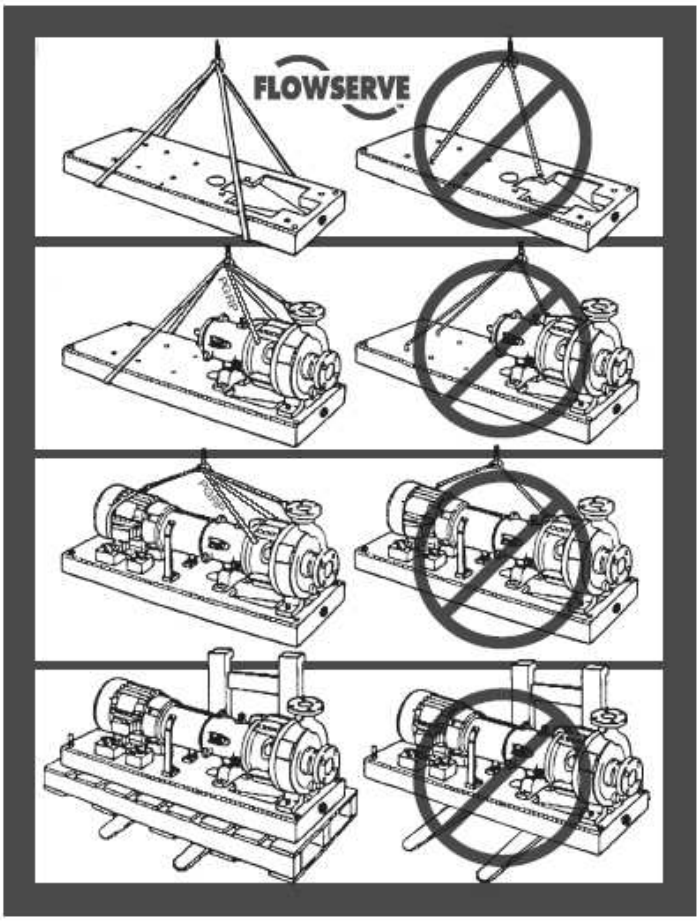


Figure 2.2



2.4 Storage

CAUTION

This section addresses the storage procedures for the Polybase baseplate only. When storing a Polybase baseplate with mounted pump assemblies, it is extremely important that the proper storage procedures for the pump be observed as well. Refer to the User Instruction for the particular pump that is mounted on your baseplate. Flowserve's normal packaging is designed to protect the Polybase baseplate during shipment and handling from the time it is assembled at the factory to installation at the end user's jobsite. If the Polybase baseplate is to be stored for a period of time prior to installation, it is recommended that the following procedures be followed:

a) Leave the baseplate bolted to its wooden shipping pallet.
b) Place the pallet on a solid, dry, level surface in a location where the base cannot be struck by passing fork trucks, falling objects, etc. Make sure that the pallet does not rock.
c) Do not stack heavy objects on top of the baseplate.
d) If the Polybase will be installed in an indoor location, but is to be stored in an outdoor location, cover the base completely with a tarpaulin or dark plastic sheeting to prevent UV degradation of the surface. NOTE: UV degradation (bleaching) of the polymer concrete is the normal result of exposure to sunlight. This phenomenon is purely a visual change in the color of the material which in no way compromises the performance or corrosion resistance characteristics of the Polybase baseplate.
e) Multiple Polybase baseplates without installed equipment may be stacked, provided the bases are level and the stacking is done in a manner which uniformly distributes the weight of the upper base to the top surface of the base on which it rests. A minimum of two pallet cross-members should contact the entire width of the lower base. Cross members must not rest on fasteners or on the corners of the lower base.

   Do not attempt to stand a Polybase baseplate on end to make more efficient use of storage space. Neither the base nor the fasteners that hold the base to its wooden pallet have been designed for vertical storage. Severe personal injury or death, as well as irreparable damage to Polybase baseplate, may result if it tips over.
f) After unpacking, protection will be the responsibility of the user.

2.5 Recycling and end of product life

At the end of the service life of the product or its parts, the relevant materials and parts should be recycled or disposed of using an environmentally acceptable method and in accordance with local regulations. If the product contains substances that are harmful to the environment, these should be removed and disposed of in accordance with current local regulations. This also includes the liquids and/or gases that may be used in the "seal system" or other utilities.

Make sure that hazardous substances are disposed of safely and that the correct personal protective equipment is used. The safety specifications must be in accordance with the current local regulations at all times.

3 DESCRIPTION

3.1 Configurations

The Flowserve Polybase baseplate is a solid, polymer concrete baseplate that is manufactured in versions that conform to both ASME B73.1 and ISO 3661.

ASME Polybase units are manufactured with integral drain basin and grout hole. Integral leveling screw thread inserts facilitate proper installation. Twelve sizes are available ranging from 139 through 398.

ISO Polybase units are manufactured with integral drain basin, and are available in sizes ISO 3, 4, 5, 6, 7 and 8.

Metallic thread inserts are provided in the mounting surfaces for particular combinations of pump and motors. Multiple motor insert patterns are also available, and custom insert configurations can be produced per customer specifications. The standard thread insert material is 304SS (18.10 CrNi stainless steel), with higher alloys available upon request.

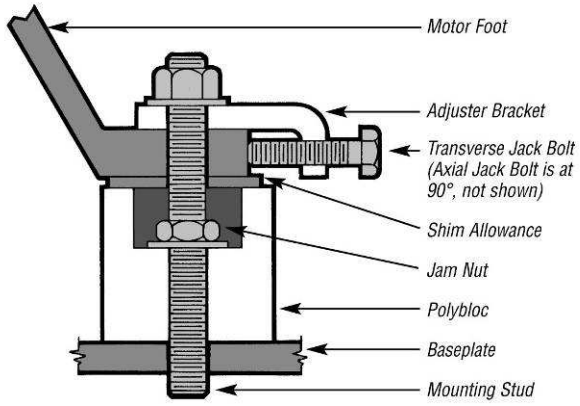
Three different epoxy vinyl ester resin materials are available to support the use of Polybase baseplates in most chemical applications (see 3.3.2).

Additional available options include stilt mounting and flush plan mounting.

The Polybase baseplate utilizes as standard the unique Polybloc mounting system. This system is comprised of corrosion resistant polymer concrete mounting blocks having surface flatness and parallelism equivalent to machined steel blocks. Motor mounting Polyblocs incorporate the unique Bloc-loc™ counterbore/jam nut feature for positive attachment to the baseplate (Figure 3.1).

The optional 8-point™ motor adjusters and the Bloc-loc™ features are joined to provide axial and transverse motor adjustment (Figure 3.1).

Figure 3.1



Counterbore type Mounting Polyblocs are also totally suitable if order requirements do not require that motor Polyblocs must be independently locked to the baseplate. In this case the polymeric block are fitted with the counterbore side of the block facing the surface of the baseplate.

3.2 Nomenclature

Individual baseplate sizes in the Polybase baseplate product line are identified by the ASME B73.1 pump group size they support and the length of the baseplate. For example:

139 = Group 1 pumps; 39 inches long.
264 = Group 2 pumps; 64 inches long.
398 = Group 3 pumps; 98 inches long.

The length of the baseplate determines the motor frame size that can be fitted. The longer baseplates allow larger motors to be fitted.

3.3 Design of major parts

3.3.1 Baseplate materials of construction

The body of a Polybase baseplate is composed of an epoxy vinyl ester resin with integral silica aggregate.

The threaded inserts are made of 304SS. The inserts are retained in the Polybase baseplate by a two-part industrial epoxy (Master Bond EP21LV or equivalent).

3.3.2 Resin options

The standard epoxy resin is Derakane 411-50 (black or gray in color). Novolac GT4500 resin is optional for severe sulfuric acid services (red in color). Novolac GT4000 resin is optional for chlorinated solvent services (blue in color).

3.4 Performance and operation limits

This product has been selected to meet the specification of your purchase order (see section 1.5). The following data are included as additional information to help with your installation. If required, a definitive statement for your application can be obtained from Flowserve.

3.4.1 Temperature ratings

The maximum equipment temperature that can be tolerated by the various Polybase resins is listed below:

Black bases (Derakane) = 149 ℃ (300 ℉)
Red bases (GT 4500) = 82 ℃ (180 ℉)
Blue bases (GT4000) = 104 ℃ (220 ℉)

The minimum acceptable temperature for the Polybase resins is -45 ℃ (-50 ℉).

3.4.2 Polybase corrosion guide (abridged)

Table 3-1 Derakane resin (black)

Chemical	21 ℃ (70 ℉)	60 ℃ (140 ℉)	93 ℃ (200 ℉)
Acetic acid <75%	R	R	S
Acetic, glacial	S	NR	NR
Amines	R	S	NR
Aromatic solvents	S	NR	NR
Benzene	NR	NR	NR
Bleach	R	R	NR
Bromine (dry)	R	NR	NR
Bromine (wet)	R	NR	NR
Calcium chloride	R	R	S
Chlorinated solvents	NR	NR	NR
Chlorobenzene	NR	NR	NR
Chlorine dioxide <15%	R	R	S
Chromic acid <20%	R	NR	NR
Ferric chloride	R	R	R
Fluosilic acid <30%	R	NR	NR
Gasoline	R	R	NR
Hydrobromic acid <50%	R	R	NR
Hydrochloric acid =<20%	R	R	S
Hydrochloric >20%	R	S	NR
Hydrofluoric acid <20%	R	S	NR
Methylene chloride	NR	NR	NR
Nitric acid =<30%	R	S	NR
Nitric acid >30%	NR	NR	NR
Oil, mineral	R	R	R
Petroleum oil	R	R	R
Phosphoric acid	R	R	R
Seawater	R	R	R
Sodium chlorate	R	R	R
Sodium chloride	R	R	R
Sodium hydroxide =<50%	R	R	S
Sodium hydroxide >50%	NR	NR	NR
Sulfuric acid <75%	R	S	S
75% to 93%	NR	NR	NR
93% to 98+%	NR	NR	NR

Table 3-2 Novolac GT4000 resin (blue)

Chemical	21 ℃ (70 ℉)	60 ℃ (140 ℉)	93 ℃ (200 ℉)
Acetic acid <75%	R	R	R
Acetic, glacial	R	R	R
Benzene	R	R	R
Bleach =<18%	R	R	R
Chromic acid <20%	R	R	R
Hydrochloric acid =<20%	R	R	R
Hydrochloric >20%	R	R	R
Hydrofluoric acid <20%	R	S	NR
Methylene chloride	S	NR	NR
Nitric acid to 69%	R	R	R
Sodium hydroxide =<50%	R	R	R
Sodium hydroxide >50%	NR	NR	NR
Sulfuric acid <75%	R	R	R
75% to 93%	S	NR	NR
93% to 98+%	S	NR	NR

Table 3-3 Novolac GT4500 resin (red)

Chemical	21 ℃ (70 ℉)	60 ℃ (140 ℉)
Bleach to 12%	R	R
Chromic acid <20%	R	R
Gasoline	R	R
Hydrochloric acid =<20%	R	R
Hydrochloric >20%	R	R
Hydrofluoric acid <20%	R	S
Methylene chloride	NR	NR
Nitric acid to 50%	R	R
Phosphoric acid to 85%	R	R
Sodium hydroxide =<50%	R	R
Sodium hydroxide >50%	NR	NR
Sulfuric acid <75%	R	R
75% to 93%	R	R
93% to 98+%	R	R

R = Recommended.
S= Satisfactory for occasional contact at some concentrations – consult Flowserve Materials Engineering Department.
NR = Not recommended.

4 INSTALLATION

Equipment operated in hazardous locations must comply with the relevant explosion protection regulations. See section 1.6.4, *Products used in potentially explosive atmospheres.*

4.1 Location

The baseplate should be located to allow room for access, ventilation, maintenance, and inspection with ample headroom for lifting and should be as close as practicable to the supply of liquid to be pumped.

Refer to the general arrangement drawing for the pump set.

4.2 Part Assemblies

The supply of motors and pumps are optional. As a result, it is the responsibility of the installer to ensure that the motor is assembled to the pump and aligned as detailed in section 4.5 and 4.8.

4.3 Foundation

4.3.1 Protection of openings and threads

When the baseplate is shipped, all threads and all openings are covered. This protection/covering should not be removed until installation. If, for any reason, the baseplate is removed from service, this protection should be reinstalled.

4.3.2 Rigid baseplates - overview

The function of a baseplate is to provide a rigid foundation under a pump and its driver that maintains alignment between the two. Baseplates may be generally classified into two types:

- Foundation-mounted, grouted design (Figure 4-1)
- Stilt mounted, or free-standing (Figure 4-2)

Figure 4.1

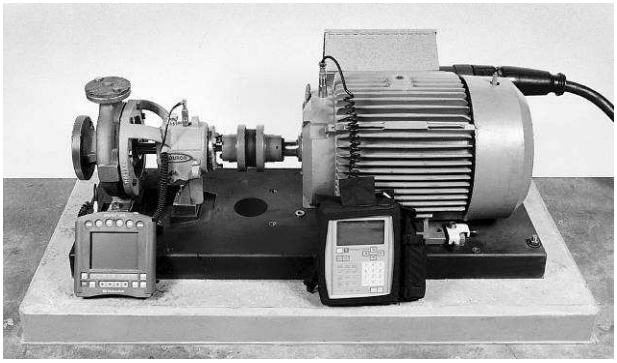


Figure 4.2

Baseplates intended for grouted installation are designed to use the grout as a stiffening member. Stilt mounted baseplates, on the other hand, are designed to provide their own rigidity. Therefore, the designs of the two baseplates are usually different. The Polybase baseplate is solid and has a thick cross-section so it can be both grouted in place and stilt mounted.

Regardless of the type of baseplate used, it must provide certain functions that ensure a reliable installation. Three of these requirements are:

- The baseplate must provide sufficient rigidity to assure the assembly can be transported and installed, given reasonable care in handling, without damage. It must also be rigid enough when properly installed to resist operating loads.
- The baseplate must provide a reasonably flat mounting surface for the pump and driver. Uneven surfaces will result in a soft-foot condition that may make alignment difficult or impossible. Flowserve's experience indicates that a baseplate that has a top surface flatness of 1.25 mm / meter (0.015 inch / foot) across the diagonal corners of the baseplate provides such a mounting surface. Therefore, this is the tolerance to which we supply our standard baseplate. Some users may desire an even flatter surface, which can facilitate installation and alignment. Flowserve will supply flatter baseplates upon request at extra cost. For example, mounting surface flatness of 0.42 mm/m (0.005 in./ft) is offered on the Flowserve Polybase baseplate.
- The baseplate must be designed to allow the user to final field align the pump and driver to within their own particular standards and to compensate for any pump or driver movement that occurred during handling. Normal industry practice is to achieve final alignment by moving the motor to match the pump. If a pump and motor assembly is provided with the baseplate, Flowserve's

practice is to confirm in our shop that the pump assembly can be accurately aligned. Before shipment, the factory verifies that there is enough horizontal movement capability at the motor to obtain a "perfect" final alignment when the installer puts the baseplate assembly into its original, top leveled, unstressed condition.

4.3.3 Stilt mounted Polybase baseplates

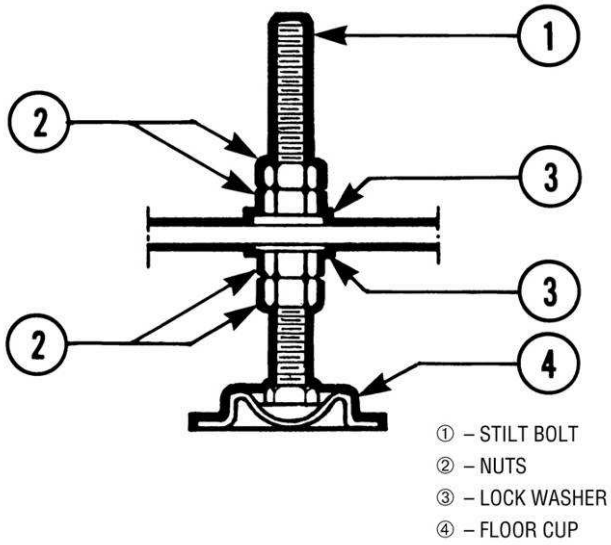
Flowserve offers a stilt mounted option for Polybase baseplates (See Figure 4-5). The baseplate is set on a flat surface with no tie down bolts or other means of anchoring it to the floor.
General instructions for assembling these baseplates are given below. For dimensional information, please refer to the appropriate Flowserve "Sales Print."

Note: The following assembly procedure should be carried out as closely to the final installation location as possible. DO NOT remove the Polybase from its shipping pallet until it is in the area of the installation and you are ready to assemble the stilts.

4.3.3.1 Stilt mounted baseplate assembly instructions for 264 and shorter Polybase baseplates (Refer to Figures 4-3 and 4-5)

a) Raise or block up baseplate/pump above the floor to allow for the assembly of the stilts.
b) Bolt the cross bars onto the underside of the Polybase baseplate.
c) Predetermine or measure the approximate desired height for the baseplate above the floor.
d) Set the bottom nuts (item 2) above the stilt bolt head (item 1) to the desired height.
e) Assemble lock washer (item 3) down over the stilt bolt.
f) Assemble the stilt bolt up through hole in the cross bar and hold in place.
g) Assemble the lock washer (item 3) and nut (item 2) on the stilt bolt. Tighten the nut down on the lock washer.
h) After all four stilts have been assembled, position the baseplate in place, over the floor cups (item 4) under each stilt location, and lower the baseplate to the floor.
i) Level and make final height adjustments to the suction and discharge pipe by first loosening the top nuts and turning the bottom nuts to raise or lower the baseplate.
j) Tighten the top and bottom nuts at the lock washer (item 3) first then tighten the other nuts.
k) It should be noted that the connecting pipelines must be individually supported, and that the stilt mounted baseplate is not intended to support total static pipe load.

Figure 4.3



4.3.3.2 Stilt mounted baseplate assembly instructions for 268 and longer Polybase baseplates (Refer to Figures 4-4 and 4-5)

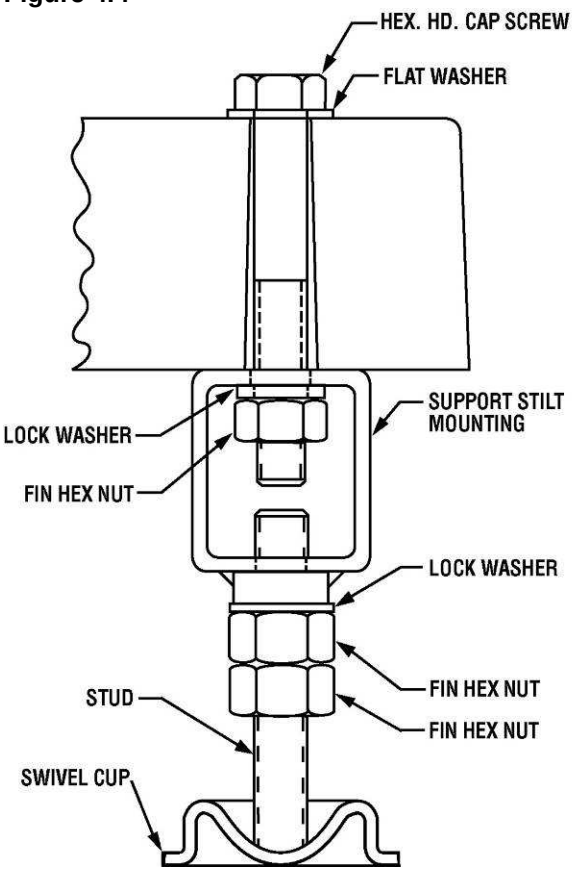
a) Determine or measure the approximate desired height for the baseplate above the floor.
b) Sling and hoist the baseplate/pump assembly off its shipping pallet in accordance with the procedures shown in Section 2.3.
c) Bolt the stilt beams to the underside of the Polybase using the fasteners provided as shown in Figure 4.4. Torque the 7/8" bolts to 217Nm (160 lbf*ft).
d) Thread two hex nuts onto each stud. Install one internal-tooth lockwasher over the FLAT ends of each stud. Thread the flat ends of the studs into the weld nuts on the undersides of the longitudinal support beams until the low point of each SPHERICAL end is at the desired distance from the bottom surface of the Polybase. Do not tighten the nuts at this point.
e) After all four stilts have been assembled, position the Polybase in place over the floor cups under each stilt location, and GENTLY lower the assembly to the floor.
f) Using two wrenches, lock the two hex nuts on each stud together. Turn the studs by means of these locked nuts to raise or lower the assembly. When the desired leveling is achieved, unlock the pairs of nuts and thread the upper ones (with lockwashers on top) up until they make contact with the weld nuts on the beams. Tighten securely. Thread the lower nuts up and tighten to lock the assembly in place.
g) Recheck levels and adjust if necessary.
h) It should be noted that the connecting pipe lines must be individually supported, and that the stilt mounted Polybase is not intended to support total static pipe load.

4.3.3.3 Stilt mounted baseplates - motor alignment

The procedure for motor alignment on stilt mounted baseplates is similar to grouted baseplates. The difference is primarily in the way the baseplate is leveled.

a) Level the baseplate by using the stilt adjusters. (Shims are not needed as with grouted baseplates.) After the base is level, it is locked in place by locking the stilt adjusters.
b) Next the initial pump alignment must be checked. The vertical height adjustment provided by the stilts allows the possibility of slightly twisting the baseplate. If there has been no transit damage or twisting of the baseplate during stilt height adjustment, the pump and driver should be within 0.38 mm (0.015 in.) parallel, and 0.0025 mm/mm (0.0025 in./in.) angular alignment. If this is not the case, check to see if the driver mounting fasteners are centered in the driver feet holes.

Figure 4.4



c) If the fasteners are not centered there was likely shipping damage. Re-center the fasteners and perform a preliminary alignment to the above tolerances by shimming under the motor for vertical alignment, and by moving the pump for horizontal alignment.
d) If the fasteners are centered, then the baseplate may be twisted. Slightly adjust (one turn of the adjusting nut) the stilts at the driver end of the baseplate and check for alignment to the above tolerances. Repeat as necessary while maintaining a level condition as measured from the pump discharge flange. Lock the stilt adjusters.

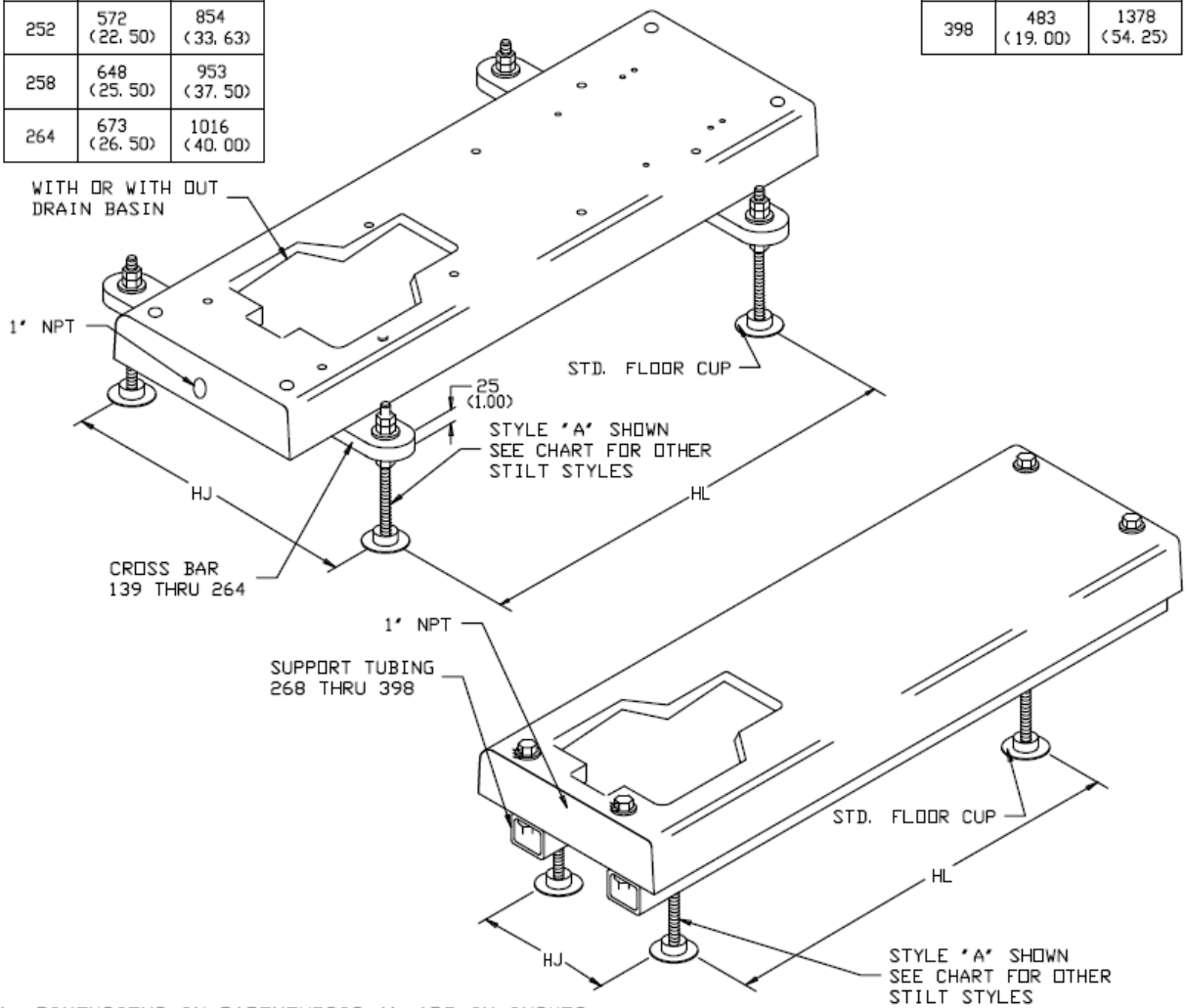
The remaining steps are the same as for new grouted baseplates.

Figure 4.5

CROSS BAR STYLE		
BASE NO.	HJ	HL
139	495 (19.50)	610 (24.00)
148	572 (22.50)	752 (29.62)
153	648 (25.50)	816 (32.13)
245	495 (19.50)	787 (31.00)
252	572 (22.50)	854 (33.63)
258	648 (25.50)	953 (37.50)
264	673 (26.50)	1016 (40.00)

THIS DRAWING IS INTENDED AS A SUPPLEMENT TO THE STANDARD DIMENSIONAL SP'S. SHOWING BASEPLATE AND MOUNTING DIMENSIONS

SUPPORT TUBING STYLE		
BASE NO.	HJ	HL
268	483 (19.00)	981 (38.63)
280	483 (19.00)	997 (39.25)
368	483 (19.00)	981 (38.63)
380	483 (19.00)	1130 (44.50)
398	483 (19.00)	1378 (54.25)

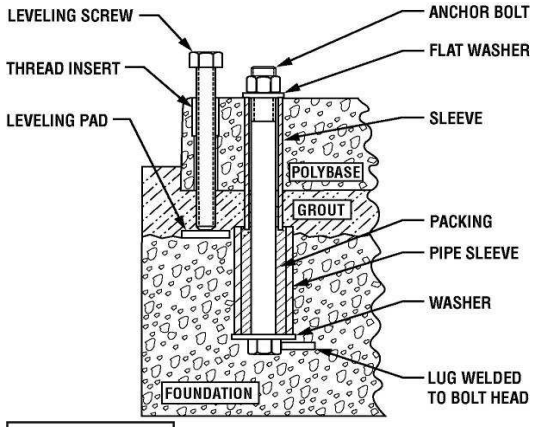


1. DIMENSIONS IN PARENTHESIS () ARE IN INCHES.

4.4 Grouting

a) The pump foundation should be located as close to the source of the fluid to be pumped as practical. There should be adequate space for workers to install, operate, and maintain the pump. The foundation should be sufficient to absorb any vibration and should provide a rigid support for the pump and motor. Recommended mass of a concrete foundation should be three times that of the pump, motor and base. Refer to Figure 4-6 for a cross-section of the recommended foundation and baseplate arrangement. Note that foundation bolts are imbedded in the concrete inside a sleeve to allow some movement of the bolt.

Figure 4.6



b) CAUTION Gently set the Polybase baseplate down onto the foundation. Do not subject a Polybase baseplate to heavy shock loading.

c) Level the pump baseplate assembly. The proper surfaces to reference when leveling the pump baseplate assembly are the pump suction and discharge flanges.

Note: DO NOT stress the baseplate.

Note: DO NOT bolt the suction or discharge flanges of the pump to the piping until the baseplate grouting has been completed If equipped, use leveling jackscrews to level the baseplate. If jackscrews are not provided, shims and wedges should be used. Check for levelness in both the longitudinal and lateral directions. Shims should be placed at all base anchor bolt locations, and in the middle edge of the base if the base is more than 1.5 m (5 ft) long.

Note: DO NOT RELY ON THE BOTTOM OF THE POLYBASE BASEPLATE TO BE FLAT. This is an as-molded surface which is not as flat as the mounting (top) surface.

d) After leveling the baseplate, install flat washers and nuts on the anchor bolts.

CAUTION ENSURE THE NUTS HAVE A SNUG FIT, BUT DO NOT TORQUE THEM AT THIS POINT.

If shims are used, make sure to shim the baseplate near each anchor bolt and snug the nut firmly with a wrench. Failure to do this may result in a twist of the baseplate, which could make it impossible to obtain final alignment. Check the level of the baseplate to ensure that it was maintained, else adjust the jackscrews or shims as needed until the baseplate is level

e) Check initial alignment. If the pump and motor were removed from the baseplate, install them so that prior to grouting it can be verified that alignment can be achieved. If the pump and motor were properly reinstalled to the baseplate or if they were not removed from the baseplate and there has been no transit damage, and also if the above pre-grout steps where done properly, the pump and driver should be within 0.38 mm (0.015 in.) FIM (Full Indicator Movement) parallel, and 0.0025 mm/mm (0.0025 in./in.) FIM angular. If this is not the case, first check to see if the driver mounting fasteners are centered in the driver feet holes. If not, re-center the driver on its fasteners and perform a preliminary alignment to the above tolerances by shimming under the motor for vertical alignment, and by moving the pump for horizontal alignment.

f) Grout the baseplate. A non-shrinking grout should be used. Make sure that the grout fills the area under the baseplate. After the grout has cured, check for voids and fill them if possible. Jackscrews, shims and wedges should be removed from under the baseplate at this time. If they were to be left in place, they could rust, swell, and cause distortion in the baseplate.

g) Lubricate the anchor bolt threads and torque the nuts using a torque wrench to values noted in table 4-1 below.

Table 4-1

Bolt size	Recommended torque Nm (lbf·ft) lubricated
M12 & ½ in.	27(20)
M20 & ¾ in.	96 (70)
M22 & $^{7}/_{8}$ in.	150 (110)
M24 & 1 in.	220 (160)

h) CAUTION Tighten pump and motor hold down fasteners using a torque wrench. Apply recommended torque given in clause 6.7, DO NOT exceed the maximum allowable torque values provided.

i) Run piping to the suction and discharge of the pump. There should be no piping loads transmitted to the pump after connection is made. Recheck the driver and pump alignment to verify it is still acceptable. Significant loads being carried through the pump connections can cause misalignment.

5 COMMISSIONING, STARTUP, OPERATION AND SHUTDOWN

Pre start-up checks
Prior to starting the equipment mounted on a Polybase baseplate, it is essential that the following pump-based checks be made.

- Pump and motor properly secured to the baseplate
- All fasteners tightened to the correct torque
- Coupling guard in place and not rubbing
- Seal support system (if used) properly secured to the baseplate
- Inspect the baseplate for cracks
- Ensure the mounted equipment is ready to run

6 MAINTENANCE

⚠ It is the plant operator's responsibility to ensure that all maintenance, inspection and assembly work is carried out by authorized and qualified personnel who have adequately familiarized themselves with the subject matter by studying this manual in detail. (See also section 1.6)

Any work on the machine must be performed when it is at a standstill. It is imperative that the procedure for shutting down the machine is followed.

On completion of work all guards and safety devices must be re-installed and made operative again.

Oil and grease leaks may make the ground slippery. Machine maintenance must always begin and finish by cleaning the ground and the exterior of the machine.

If platforms, stairs and guard rails are required for maintenance, they must be placed for easy access to areas where maintenance and inspection are to be carried out. The positioning of these accessories must not limit access or hinder the lifting of the part to be serviced.

Place a warning sign on the starting device:
"Machine under repair: do not start".

With electric drive equipment, lock the main switch open and withdraw any fuses. Put a warning sign on the fuse box or main switch:
"Machine under repair: do not connect".
Never clean equipment with flammable solvents or carbon tetrachloride. Protect yourself against toxic fumes when using cleaning agents.

6.1 Maintenance schedule

It is recommended that a maintenance plan and schedule be implemented to support the equipment mounted on a Polybase baseplate. The Polybase baseplate does not require any maintenance, but the following should be checked during routine maintenance of the mounted equipment:

- clean the surface of the baseplate to prevent long term chemical attack from degrading the surface (refer to 1.6.4.4 to prevent sparks when product must comply with ATEX)
- check that the mounted equipment is securely fastened to the baseplate
- inspect the surface of the baseplate for any cracks.

6.2 Spare parts

The Polybase baseplate does not require any spare parts unless it is damaged. If one of the threaded inserts in the Polybase baseplate comes loose, or the owner needs to add additional inserts to an installed Polybase baseplate, the inserts are available from Flowserve. A two-part industrial epoxy (Master Bond EP21LV, Loctite E-120HP, or equivalent) is required to bond the inserts in place. Replacement parts for stilt mounted assemblies can also be supplied by Flowserve.

To order spare parts
Flowserve keeps records of all products that have been supplied. Spare parts can be ordered from your local Flowserve Sales Engineer or from a Flowserve Distributor or Representative. When ordering spare parts the following information should be supplied:

1) Baseplate size
2) Motor size
3) Material of construction (color)
4) For thread repairs -- insert size and quantity required

5) For stilt mounts, the type and number must be specified

If the spare Polybase baseplate is intended to be used with equipment which is or will be installed in a potentially explosive atmosphere, Flowserve should be given the complete ATEX classification of the equipment in order to check compliance.

6.3 Recommended spares and consumable items

There are no recommended spare parts for the Polybase baseplate. In the rare instances when a threaded insert needs to be replaced or a Polybase baseplate needs to be drilled and inserted for a different size motor, the following materials and procedure would apply.

6.4 Tools required

For drilling holes in the Polybase material, use a masonry bit or a carbine-tipped drill bit.

6.5 Field thread insert installation procedure

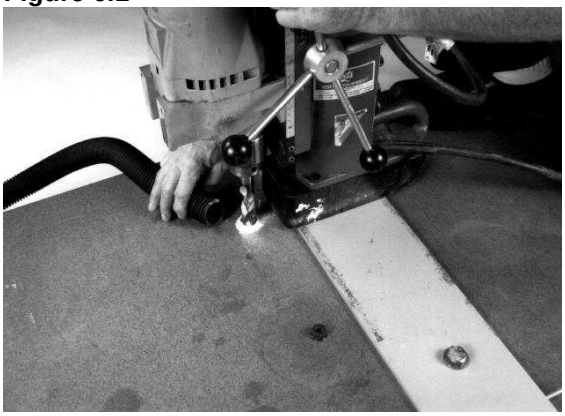
The procedure detailed below may be used either to replace a damaged original thread insert or to install an insert in a new location.

Note: Thread inserts properly installed in the field will yield performance characteristics and service life equivalent to inserts installed at the factory. Field installation should only be undertaken when absolutely necessary, and then only by qualified personnel using suitable drilling equipment. In order to achieve a successful installation the following procedures must be followed PRECISELY and the drilling operation must be carried out AS ACCURATELY AS POSSIBLE.

a) Drill out the damaged insert (or drill a new hole in a location that has been carefully laid out) taking care not to enlarge or elongate the hole into which the replacement insert will be installed. It is critical that the hole be drilled perpendicular to the surface of the Polybase and that the hole center line location be maintained. The recommended method for achieving this is to use a carbide tipped bit with a magnetic base drill mounted on a steel plate that has been bolted to the adjacent inserts in the baseplate (see Figure 6.1). Correct drill diameters and depths are shown in Table 6-1.

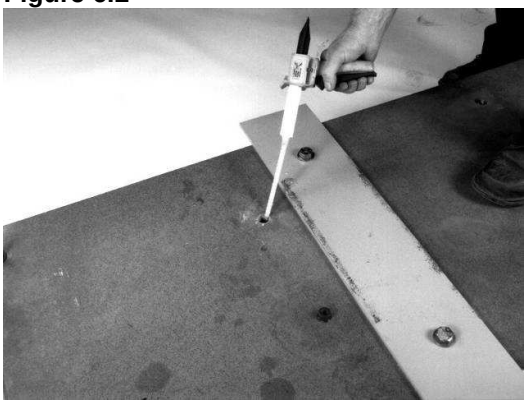
Note: DO NOT USE OIL OR CUTTING FLUID - HOLES MUST BE DRILLED DRY.

Figure 6.1



b) Remove all dust and metal chips from the drilled hole using dry, oil-free compressed air.
c) If the drilled hole has become contaminated with oil or other foreign substance, flush thoroughly with acetone or ethyl acetate and dry completely with oil-free compressed air.
d) If the replacement insert has been contaminated with oil or other foreign substance, flush thoroughly with acetone or ethyl acetate and dry completely with oil-free compressed air.
e) Dispense adhesive into the drilled hole (see Figure 6.2) following the instructions provided. Fill the hole to within approximately 12 mm (1/2 inch) of the baseplate surface.

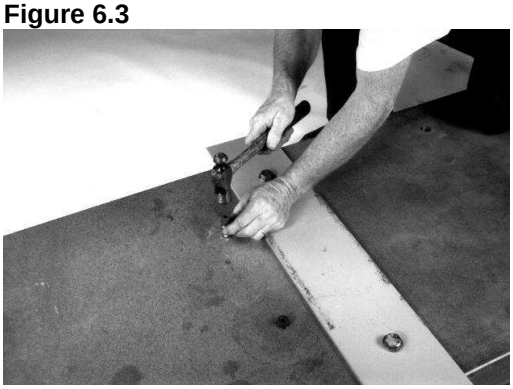
Figure 6.2



f) After applying oil to the threads of a properly sized socket head cap screw (or hex head bolt), thread it into the insert. Be careful not to get any oil on the outside surfaces of the insert.

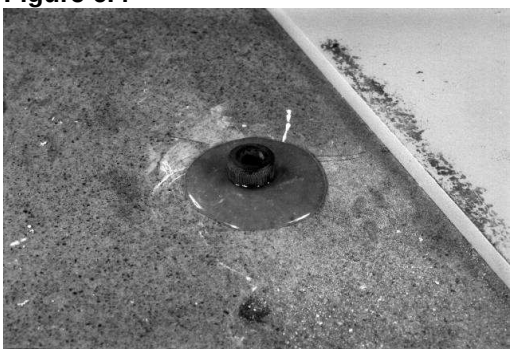
g) Engage the blind end of the stainless steel insert in the hole. Tap on the cap screw head with light hammer or soft mallet to drive the insert into the hole (see Figure 6.3). Hold the insert straight until it has been driven in to approximately half its length; the insert is self-aligning once it has passed this point.

Figure 6.3



h) CAUTION Drive the insert in **slowly** to give the adhesive time to flow around the grooves in the insert. Drive the insert in to the point where its top surface is flush with or just below the surface of the baseplate. Excess adhesive will squeeze out and pool around the top of the insert as shown in Figure 6.4. Do not remove this excess material. As the adhesive cures, some of this excess will draw down into the space between the insert and the wall of the hole. Do not remove the cap screw at this time.

Figure 6.4



i) Allow the adhesive to cure undisturbed for 48 hours.

j) Following cure remove the screw. Excess adhesive may be chipped off with a putty knife. If desired, lightly sand the surface of the baseplate to a flat, smooth condition.

k) OPTIONAL. It is up to the user to decide if a sample insert axial pullout test is needed using torque values given in clause 6.6.

l) The baseplate is now ready to be put back into service. The equipment fasteners mounting torques are given in clause 6.7 Table 6-3.

CAUTION Do not exceed the maximum torque value given in Table 6-3in relation to fastener mechanical properties.

Table 6-1

	Drill Diameter	
Thread Size	mm	inches
5/16-18 UNC	18	45/64 (.703)
3/8-16 UNC	18	45/64 (.703)
M6	18	45/64 (.703)
M8	18	45/64 (.703)
M10	18	45/64 (.703)
1/2-13 UNC	21	53/64 (.828)
M12	21	53/64 (.828)
5/8-11 UNC	29	1-1/8 (1.125)
3/4-10 UNC	29	1-1/8 (1.125)
M16	29	1-1/8 (1.125)
M20	29	1-1/8 (1.125)
7/8-9 UNC	32	1-1/4 (1.250)
M24	32	1-1/4 (1.250)
Depth (all)	46	1-13/16 (1.81)

6.6 Field installed thread insert testing (Optional)

If user elects to assess the validity of his installation or replacement of thread inserts, here are provided the necessary bolts torques for the axial pull-out testing of the insert sample(s).

Note: The torque values tabulated below are maximums that the inserts in the Polybase baseplate can withstand without any damage. These values may exceed the material strength of the bolts being used to do the test. The end user must consider the type of bolt and lubrication used (if any) before tightening.

Table 6-2 Insert testing unlubricated torque limits

Test boltsize	Nm (lbf•ft)
M6	16 (12)
M8 and 5/16 in.	22 (16)
M10 and 3/8 in.	45 (33)
M12 and ½ in.	105 (77)
M16 and 5/8 in.	150 (111)
M20 and ¾ in.	220 (162)
7/8 in.	275 (203)
M24 and 1 in.	410 (302)

All torques in table are for dry threads.

Note: 1.) For lubricated threads, use 75% of the values.
2.) Excessive torque can damage the Polybase baseplate by pulling out the inserts.
3) These are maximum values valid for testing the inserts, Fastener torquefor mounting the equipmentis given clause 6.7.
4) As a default, the bolts used for insert testing should be scrapped. They must not be reused if the torque during test has attained 90% or more of the proof test value of the bolt material or 80% of its yield strength, whichever is the lower.

6.7 Recommended fastener mounting torques

Tighten pump and motor hold down fasteners using a torque wrench. Apply table 6-3 recommended torques.

⚠ CAUTION DO NOT EXCEED THE HIGHEST TORQUE VALUE.

Any fastener material used for mounting the equipment to the Polybase must have a minimum yield strength of 210 MPa (30 KSI) at room temperature.

Table 6-3 Equipment fasteners mounting torques

Fastener Size	Fastener Mechanical Property	
	X Strength(1) **Max Torque** (dry)	**Y** Strength(2) **Max Torque** (dry)
	Nm (lbf•ft)	**Nm (lbf•ft)**
M6	8 (6)	12 (9)
5/16 in.	8 (6)	17 (13)
M8	11 (8)	17 (13)
M10 and 3/8 in.	15 (11)	35 (25)
M12 and ½ in.	35 (26)	80 (60)
M16 and 5/8 in.	75 (55)	115 (85)
M20 and ¾ in.	130 (95)	165 (125)
7/8 in.	185 (135)	205 (150)
M24 and 1 in.	280 (205)	310 (230)

Above torque values are for unlubricated threads. For lubricated threads use 75% of tabulated torques.

(1) X STRENGTH fasteners materials have yield strengths within 210 - 440 MPa (30 – 64 KSI) at room temperature. They need to be tightened within +/-5% of the value given in table above. THESE FASTENERS MUST NOT BE TIGHTENED MORE THAN 105% OF THE X STRENGTH FASTENER TORQUE VALUES PER TABLE 6-3.
Commonly used X strength hold down fasteners are:

- UNC fasteners in carbon steel per ASTM A307 Grades A&B (SAE J429 Gr.1&2) and the common AISI 300 stainless steel series;
- Metric fasteners in carbon steel per ISO 898-1 Classes 4.6 and those in stainless steel per ISO 3506 Gr. A1, A2 and A4, all in Class 50.

(2) Y STRENGTH fasteners materials have a minimum yield strength of 450 MPa (65 KSI) at room temperature. These Y strength fasteners need to be torqued to values not lower than those for of the X strength fasteners, but Y STRENGTH FASTENERS MUST NOT BE TIGHTENED MORE THAN THE VALUES LISTED IN TABLE 6-3. The Polybase baseplate material properties and the thread inserts bonding are the limiting factors imposing the tabulated ceiling values for torques.
Usual Y strength hold down fasteners include:

- UNC fasteners in carbon steel per SAE J429 Grades 4 and above, and per ASTM A193 Grade B7;
- Metric fasteners in carbon steel per ISO 898-1 Classes 8.8 and above, and in stainless steel per ISO 3506 Gr. A1, A2 and A4, Classes 70 & 80.

7 FAULTS: CAUSES AND REMEDIES

TROUBLESHOOTING

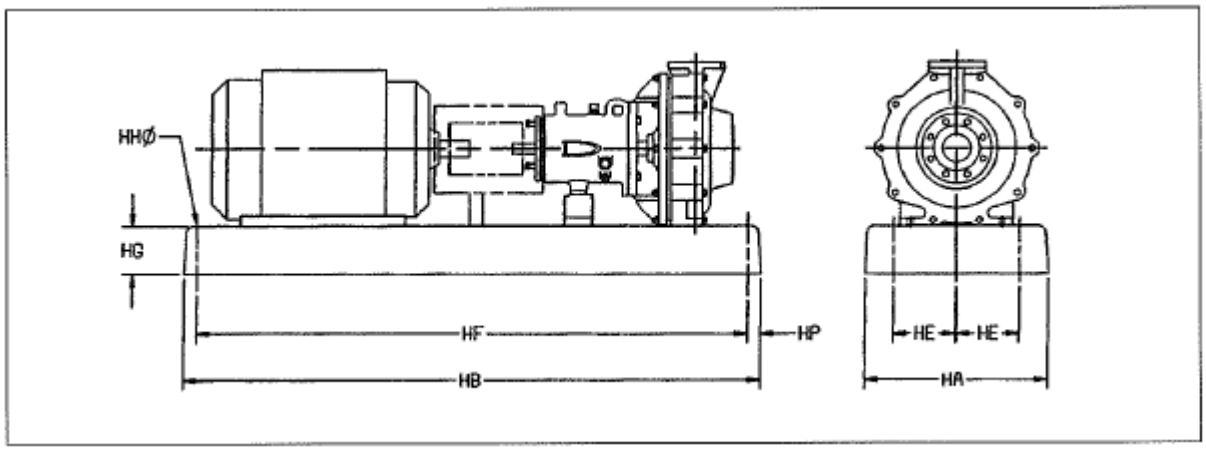
The following is a guide to troubleshooting problems with Flowserve Polybase baseplates. Common problems are analyzed and solutions offered. Obviously, it is impossible to cover every possible scenario. If a problem exists that is not covered by one of the examples, then contact a Flowserve Sales Engineer or Distributor/Representative for assistance.

FAULT SYMPTOM

Threaded insert is chemically attacked ⇓	Threaded insert pulls out ⇓	Corner of baseplate breaks off ⇓	Baseplate breaks during rigging ⇓	Motor is bolt bound and alignment is not possible ⇓	⇓	⇓	⇓	⇓	⇓	PROBABLE CAUSES	POSSIBLE REMEDIES
●	●									Leaking product.	Fix leak source. Replace the damage insert(s) per the direction given in Section 6.3.
	●									High vibration combined with excessive mounting forces.	Reduce the amount of vibration energy in the system. Only torque bolts to the values recommended in Section 6.5.
		●								Anchor bolts or nuts are tightened too much prior to grouting.	Do not tighten the anchor bolt or nuts prior to grouting. Arrange the shims under the baseplate so that they are directly under the anchor studs or bolts to prevent a bending moment from over tightening.
		●	●							Rough handling of the Polybase baseplate.	Follow the handling recommendations in Section 2.
	●			●						Piping loads are too large.	Construct suction and discharge piping so that the flanges mate to the pump without inducing high loads.
				●						Motor studs are not perpendicular to the baseplate.	For small diameter studs, they can be lighted impacted with a rubber mallet to bend them slightly (with the motor removed) to facilitate alignment. Larger stud diameters will require the motor foot holes be enlarged or the baseplate to be reworked or replaced.

8 PARTS LIST AND DRAWINGS

Polybase Dimensional and Weight Information



Baseplate Size	HA mm (in.)	HB mm (in.)	HE mm (in.)	HF mm (in.)	HG mm (in.)	HH mm (in.)	HP mm (in.)	Weight kg (lb)
ANSI 139	330 (13)	990 (39)	114 (4.5)	927 (36.5)	92 (3.63)	19 (0.75)	32 (1.25)	59 (130)
ANSI 148	413 (16.25)	1219 (48)	152 (6)	1156 (45.5)	102 (4)	19 (0.75)	32 (1.25)	100 (220)
ANSI 153	489 (19.25)	1346 (53)	190 (7.5)	1283 (50.5)	102 (4)	19 (0.75)	32 (1.25)	132 (290)
ANSI 245	330 (13)	1143 (45)	114 (4.5)	1080 (42.5)	92 (3.63)	19 (0.75)	32 (1.25)	68 (150)
ANSI 252	413 (16.25)	1320 (52)	152 (6)	1257 (49.5)	102 (4)	19 (0.75)	32 (1.25)	109 (240)
ANSI 258	489 (19.25)	1473 (58)	190 (7.5)	1410 (55.5)	102 (4)	25 (1)	32 (1.25)	143 (315)
ANSI 264	489 (19.25	1625 (64)	190 (7.5)	1562 (61.5)	102 (4)	25 (1)	32 (1.25)	159 (350)
ANSI 268	660 (26)	1727 (68)	241 (9.5)	1664 (65.5)	108 (4.25)	25 (1)	32 (1.25)	243 (535)
ANSI 280	660 (26)	2032 (80)	241 (9.5)	1968 (77.5)	108 (4.25)	25 (1)	32 (1.25)	286 (630)
ANSI 368	660 (26)	1727 (68)	241 (9.5)	1664 (65.5)	108 (4.25)	25 (1)	32 (1.25)	243 (535)
ANSI 380	660 (26)	2032 (80)	241 (9.5)	1968 (77.5)	108 (4.25)	25 (1)	32 (1.25)	286 (630)
ANSI 398	660 (26)	2489 (98)	241 (9.5)	2426 (95.5)	108 (4.25)	25 (1)	32 (1.25)	350 (770)
ISO 3	390 (15.35)	900 (35.43)	175 (6.89)	600 (23.62)	73 (2.87)	19 (0.75)	150 (5.9)	56 (123)
ISO 4	450 (17.72)	1000 (39.37)	200 (7.87)	660 (25.98)	88 (3.46)	24 (0.94)	170 (6.69)	87 (191)
ISO 5	490 (19.29)	1120 (44.09)	220 (8.66)	740 (29.13)	88 (3.46)	24 (0.94)	190 (7.48)	106 (233)
ISO 6	540 (21.26)	1250 (49.21)	245 (9.65)	840 (33.07)	88 (3.46)	24 (0.94)	205 (8.07)	131 (288)
ISO 7	610 (24.02)	1400 (55.12)	275 (10.83)	940 (37.01)	110 (4.33)	28 (1.1)	230 (9.06)	207 (455)
ISO 8	660 (26)	1600 (62.99)	300 (11.81)	1060 (41.73)	110 (4.33)	28 (1.1)	270 (10.63)	250 (550)

9 CERTIFICATION

Certificates, determined from the contract requirements, are provided with these instructions where applicable. If required, copies of other certificates sent separately to the Purchaser should be obtained from Purchaser for retention with these User Instructions.

10 OTHER RELEVANT DOCUMENTATION AND MANUALS

10.1 Supplementary user instructions

Supplementary instructions such as for a pump, driver, instrumentation, controller, seals, sealant systems etc are provided as separate documents in there original format. If further copies of these are required they should be obtained from the supplier for retention with these user instructions.

10.2 Change Notes

If any changes, agreed with Flowserve Pump Division, are made to the product after it is supplied, a record of the details should be maintained with these User Instructions.

10.3 Additional sources of information

The following are excellent sources for additional information on centrifugal pumps in general.

Pump Engineering Manual
R.E. Syska, J.R. Birk,
Flowserve Corporation, Dayton, Ohio, 1980.

Specification for Horizontal End Suction Centrifugal Pumps for Chemical Process, ASME B73.1
The American Society of Mechanical Engineers, New York, NY.

American National Standard for Centrifugal Pumps for Nomenclature, Definitions, Design and Application (ANSI/HI 1.1-1.3)
Hydraulic Institute, 9 Sylvan Way, Parsippany, New Jersey 07054-3802.

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