

SHAFT ALIGNMENT

Shaft Alignment

WHY ?

- to allow two shafts to run as one
- to reduce vibration
- to prolong the life of the equipment

Flexible Couplings

Misalignment

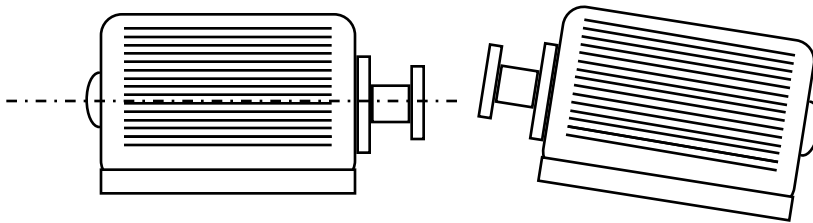
There are two types of misalignment :

- Angular (in elevation, in plan)
- Parallel (in elevation, in plan)
- Axial

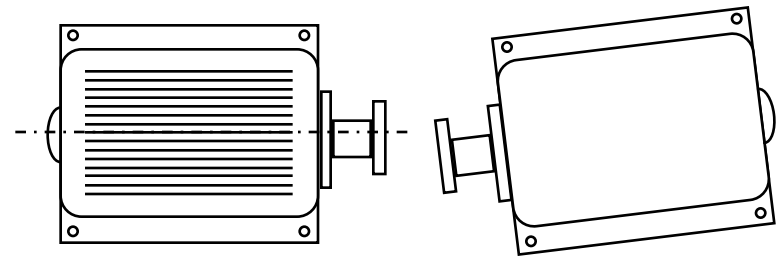
Alignment

Angular

Elevation

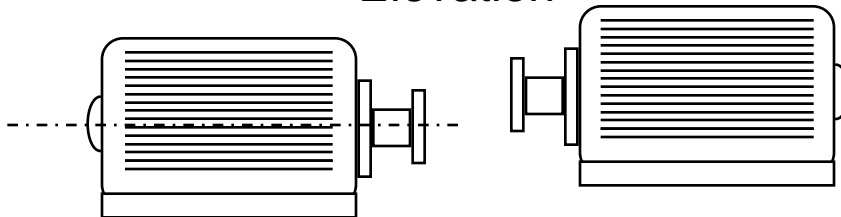


Plan

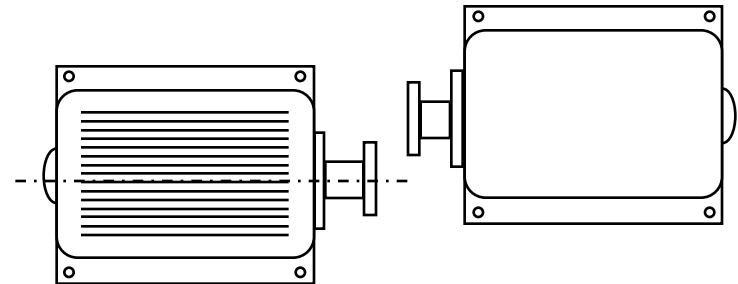


Parallel

Elevation



Plan



Shaft Alignment

- To achieve accurate alignment, the process must be carried out in logical stages
- The pump should be placed in position with relative pipework installed. This is your Datum
- Ensure the pump is secure and under no stresses, i.e. pipework
- Use DTIs to check for eccentricity of shaft and coupling
- Use DTI to check end float of shafts pump and motor

NB : Always record readings

Shaft Alignment

There are three methods used in industry to align shafts :

Taper gauges / Straight edge feeler gauge

- Basic method
- Limited accuracy ($\pm 0.002''$)

Lasers

- Most accurate (± 0.001 and below)
- Quick to use
- Initial cost high
- Training required

Dial Test Indicators :

- Increased accuracy ($\pm 0.001''$)
- Can be time consuming
- training required

SHIMS

These come in various thicknesses and various materials :

Brass } Do not

Plastic } corrode

Steel } Tends to corrode

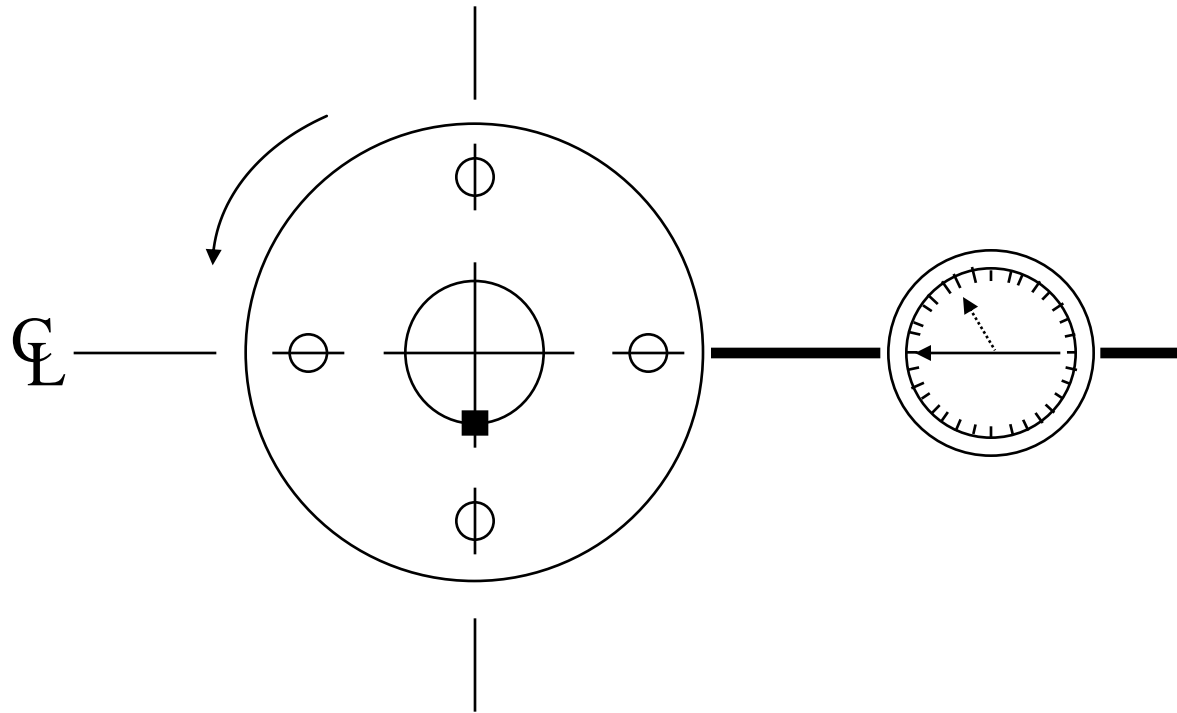
You must ensure they are undamaged

Ensure a minimum amount are used, i.e. if you require 0.075" of shim, use one large shim or plate 0.062" or above then a minimum of small shims until you have the required thickness.

*NB : Failure to do this will cause problems,
i.e. variations when tightening down !*

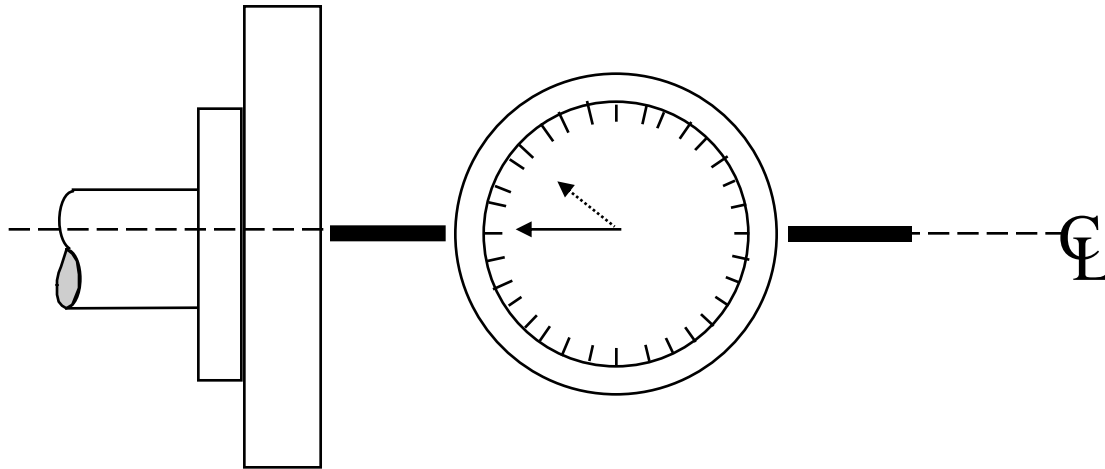
Shaft Alignment

DTI set up for eccentricity check



Shaft Alignment

DTI set up for End thrust check



- Push coupling to its max. away from DTI
- Set DTI to zero
- Pull Coupling toward the DTI
- Note the reading

Shaft Alignment

- Check condition of bed (clean as necessary)
- Replace motor and, using straight edge, align shaft couplings (this should be continuously checked)
- Check Motor for soft foot

How to Check for Soft foot

- Tighten down diagonally opposite bolts
- Use feeler gauge under remaining feet, check for gap under all of foot
- If found, insert correct amount of shim to accommodate gap
- Tighten down, release other feet and repeat check

NB : The soft foot must be eliminated to prevent distortion of the motor which will result in vibration and eventual breakdown

Shaft Alignment

The Process

Three types of misalignment are countered in industry :

Angular (Elevation and Plan)

Parallel (Elevation and Plan)

Axial (D.B.S.E. -Distance between Shaft Ends)

NB : all these must be eliminated to permitted tolerance before machinery can be used

Shaft Alignment

The steps to be taken when aligning equipment are :

- Check for soft foot
- Check angular in elevation
- Check parallel in elevation
- Check angular in plan
- Check parallel in plan

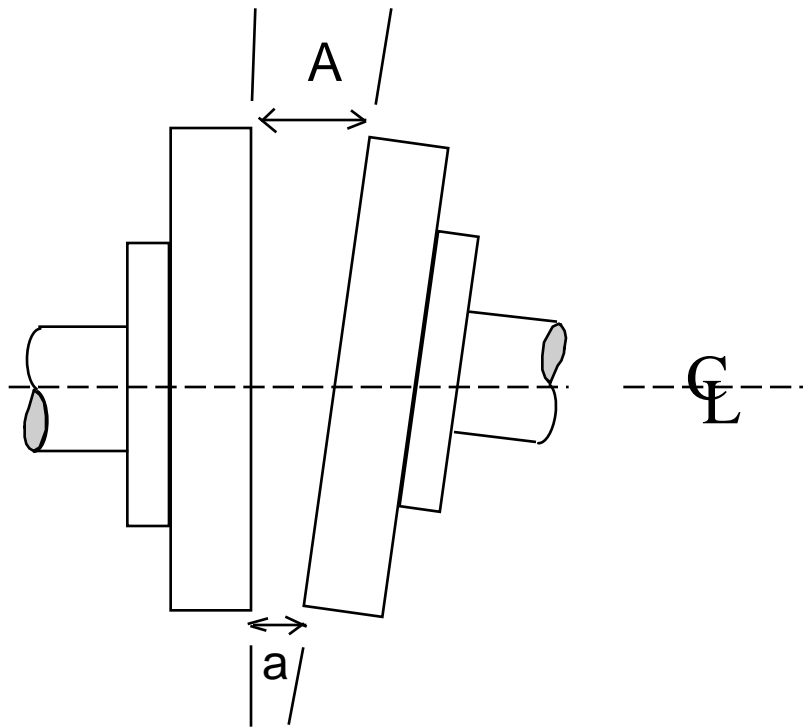
Shaft Alignment - Step 1

Check angular in elevation

(NB : Elevation means side on view)

With motor and pump bolted down,
check with taper gauge and feelers,
the gap at the top of the coupling
and the bottom of the coupling

Shaft Alignment - Step 1



$$A - a = M$$

Note difference "m" (net misalignment)

Using the formula $S = M L / D$

S = thickness of shim required

L = distance between front and rear motor holding down bolts measured in inches.

D = diameter of the coupling

M = The Net misalignment in inches of the couples

This calculation will ensure the motor is flat in relation to the pump

Shaft Alignment - Example

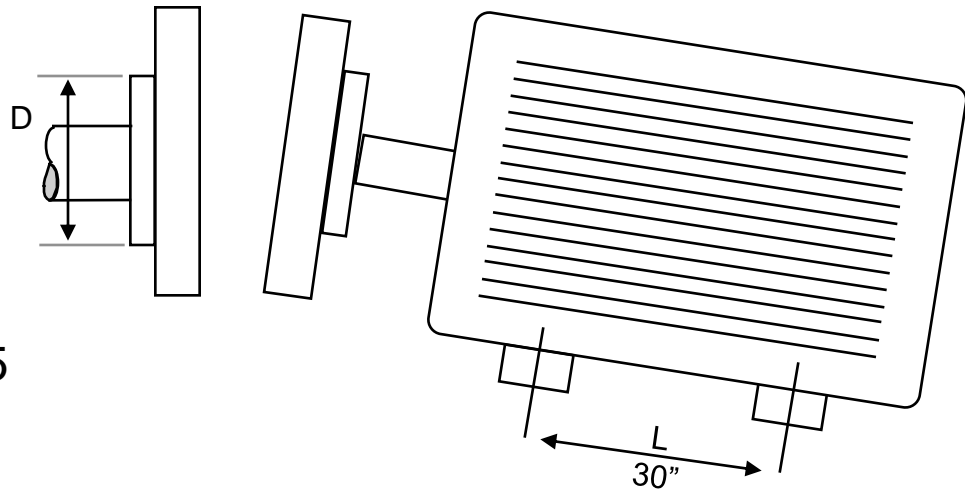
- A coupling has a diameter of 5" (D)
- The distance between motor front & rear holding down bolts is (L) 30"
- The Net angular mismatched $M = 0.012^\circ$

Therefore :

$$S = ML / D$$

$$S = 30 \times 0.012 / 5$$

$$S = 0.072"$$



Shaft Alignment - Example

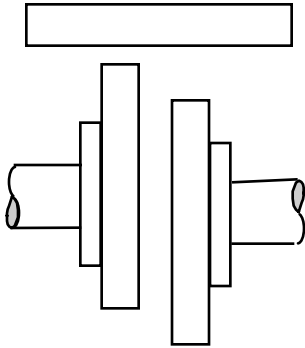
A Shim / Shims to the value of 0.072" can be inserted under the front or rear holding down bolts of the motor

How can you tell where to find them ?

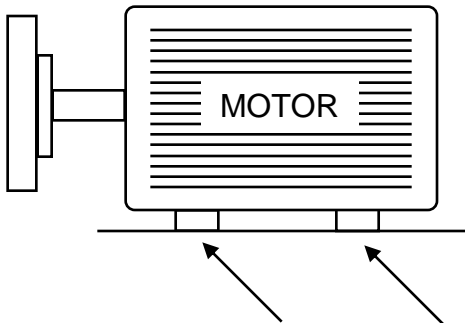
- If gap is greater at top, place under rear feet or remove from front
- If gap is greater at bottom, place under front or remove from rear

Shaft Alignment - Step 2

Parallel in Elevation



- Place straight edge on top of pump coupling, having first tapped the motor in line
- Place feeler gauges between s/e and top of motor coupling
- Record reading
- Place required shim under all motor feet
- Tighten down / check



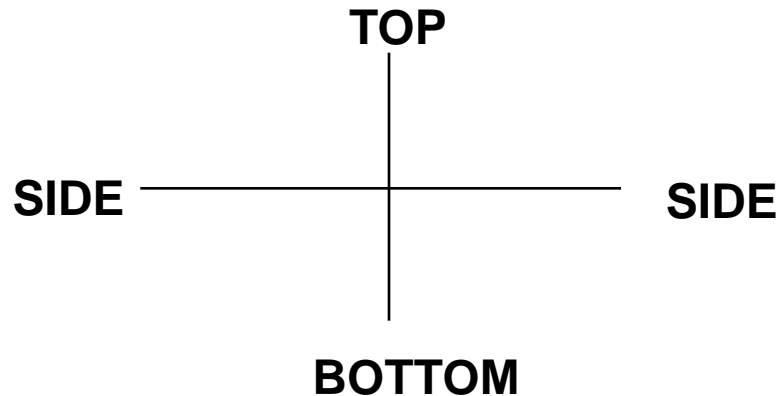
NB :

- *Always try to maintain motor / pump on centre line. Check after each movement This will put the motor / pump at the same height*
- *All Checks must be done with motor feet bolted down*

Shaft Alignment - Step 3

With motor and pump flat to each other, and at the same height, the next step is angular in plan ...

NOTE READINGS



Shaft Alignment Parallel in Plan

Tap motor into position and Check. Remember to tighten down before checking,