

SHAFT ALIGNMENT

(2) Face and Rim Method

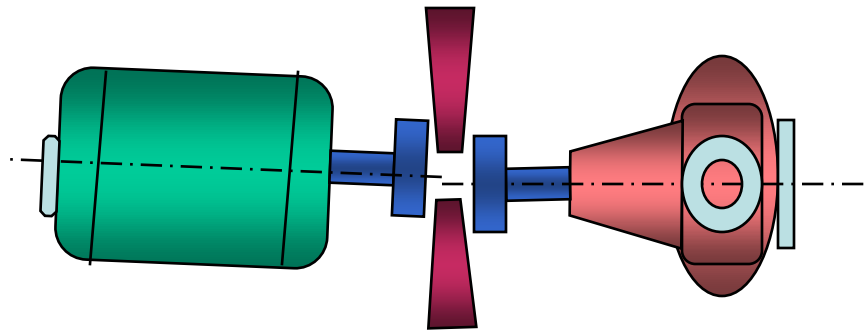
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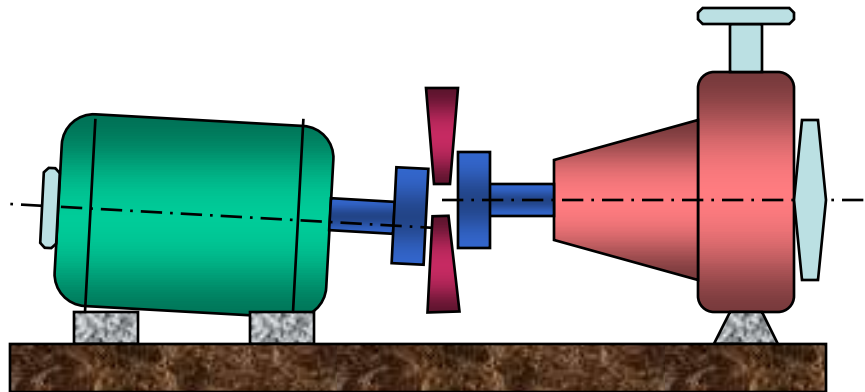
Taper gauge/straight edge & feeler gauge or Face & Rim DTI

This method is mainly used when the coupling components are large in diameter, close together separated by a small gape. The horizontal move is made first to eliminate any accumulative error then the vertical alignment is measured and corrected. This is a two stage process first correction is the angular and then the second correction (move) is to correct parallel misalignment .

Angular Alignment with Taper or Feeler Gage

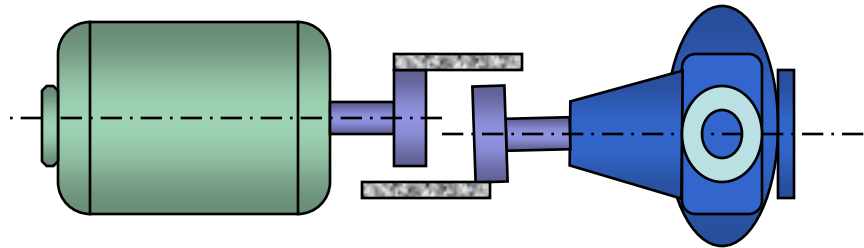


Horizontal

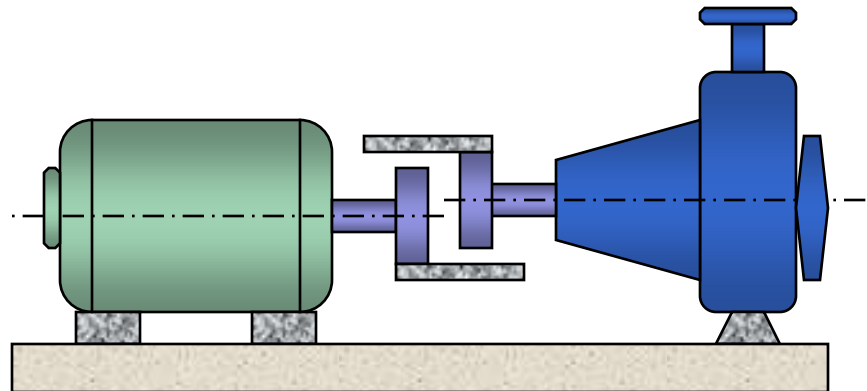


Vertical

Parallel Alignment with Straightedge



Horizontal



Vertical

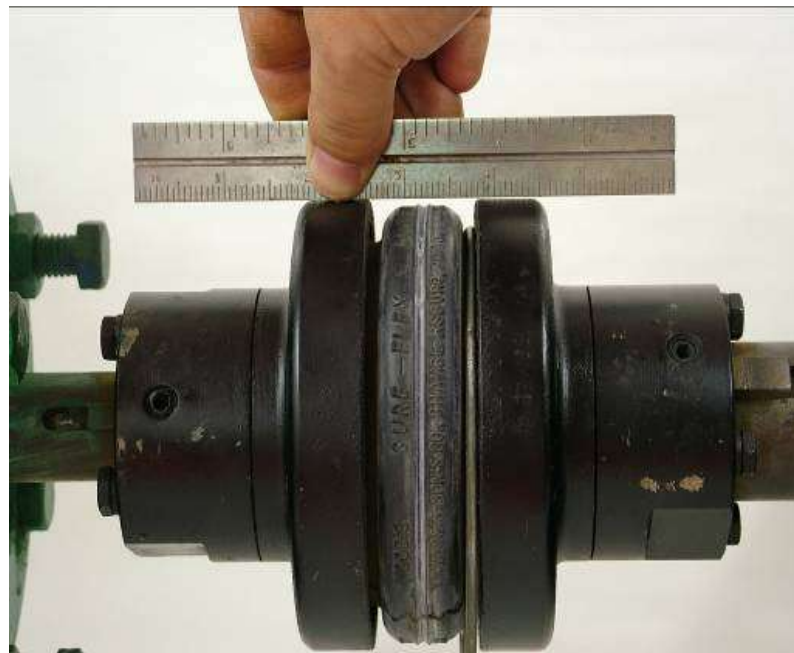
Initial Alignment

Steps:

- Initial alignment is performed prior to precise alignment method.
- Be certain the driver has the shaft placed in the axial centred position or magnetic centre.
- Use a straightedge and taper gage or set of feeler gages.

Roughing in

Straightedge, flashlight, feeler gauges, taper gauge, outside caliper, etc...



Shaft Alignment

After addressing any soft foot issues, the next steps to aligning equipment and are :

- Check angular in elevation
- Check angular in plan
- Check parallel in elevation
- Check parallel in plan

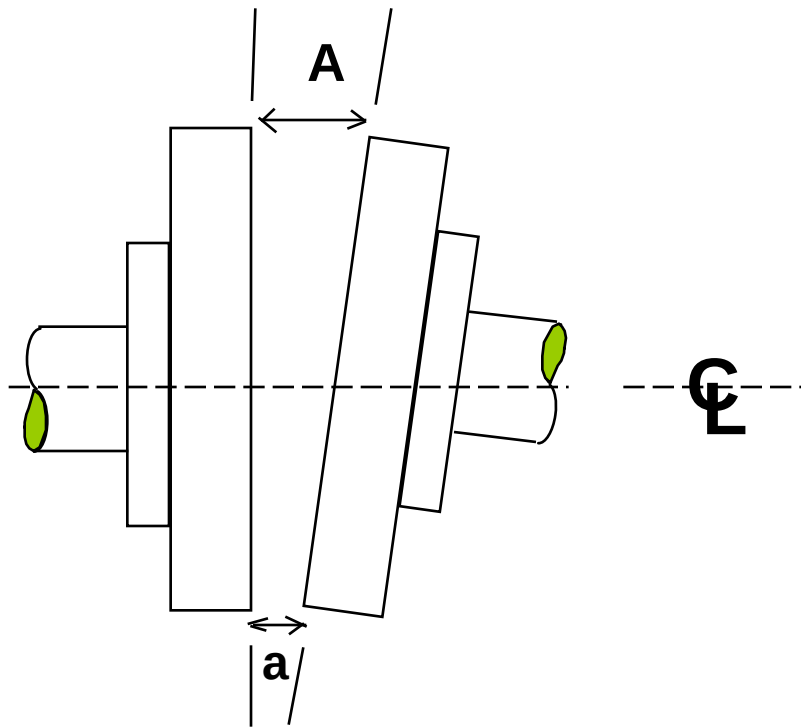
Shaft Alignment - Step 1

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 - Step 1

A coupling has a diameter of 5" (D)

The distance between motor front & rear holding down bolts is (L) 30"

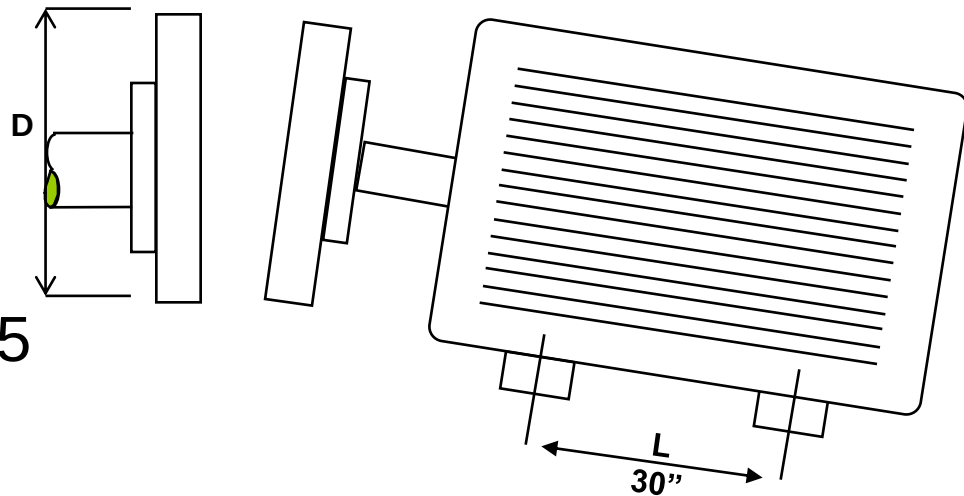
The Net angular mismatched $M = 0.012^\circ$

Therefore :

$$S = ML / D$$

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

$$S = 0.072"$$



Shaft Alignment - Step 1

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 which end to fit them ?

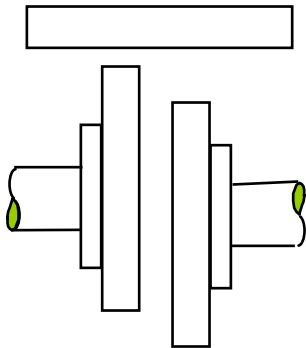
If gap is greater at top, place under rear feet or remove from front

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 moved the motor in line



Place feeler gauges between straight edge and top of motor coupling

Record reading

Place required shim under all motor feet

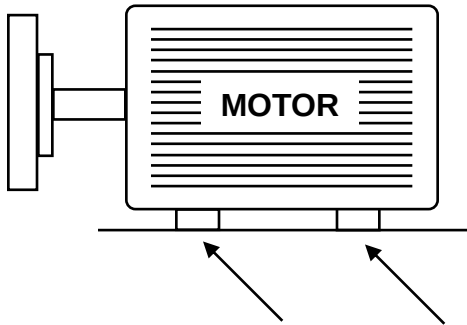
Tighten down / check

Shaft Alignment - Step 2

Parallel in Elevation

Note :

Always try to maintain the motor / pump on centre line.

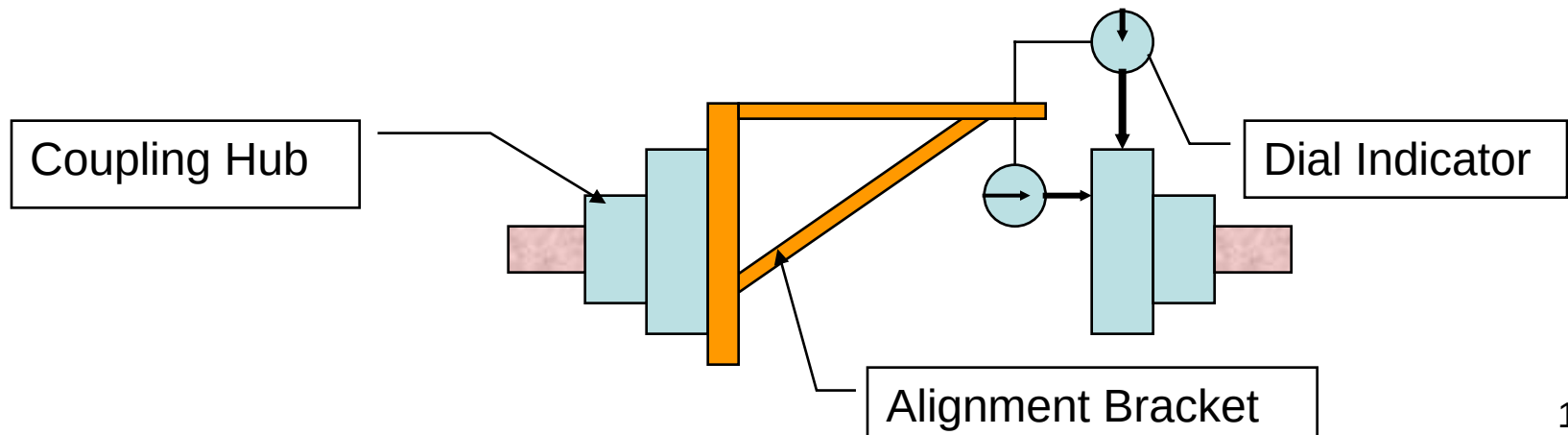


Check after each movement This will put the motor / pump at the same height

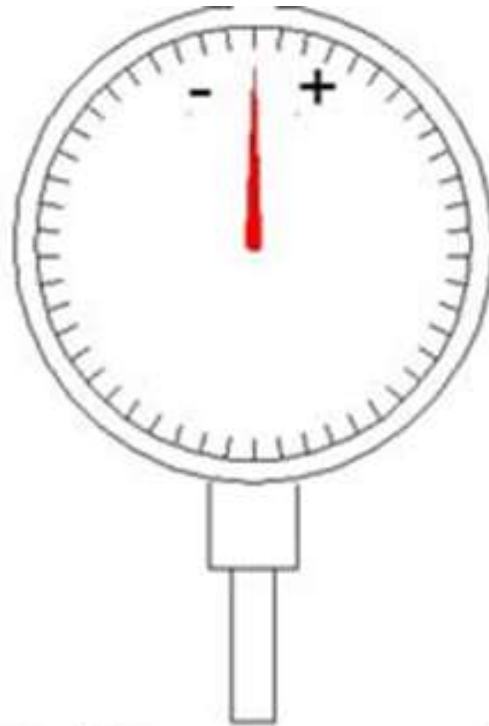
All Checks must be done with motor feet bolted down

Face & Rim Alignment Method

- Figure below illustrates typical arrangement for Face & Rim alignment.
- A bracket is attached to one shaft and extends to the proximity of the coupling hub on the adjacent shaft.
- Dial indicators are affixed to this bracket with the stem of one indicator resting on the face of the coupling hub and second resting upon the outside diameter of the same hub.



READING THE D.T.I.



Plunger Moves Up
Pointer Moves CW (+)



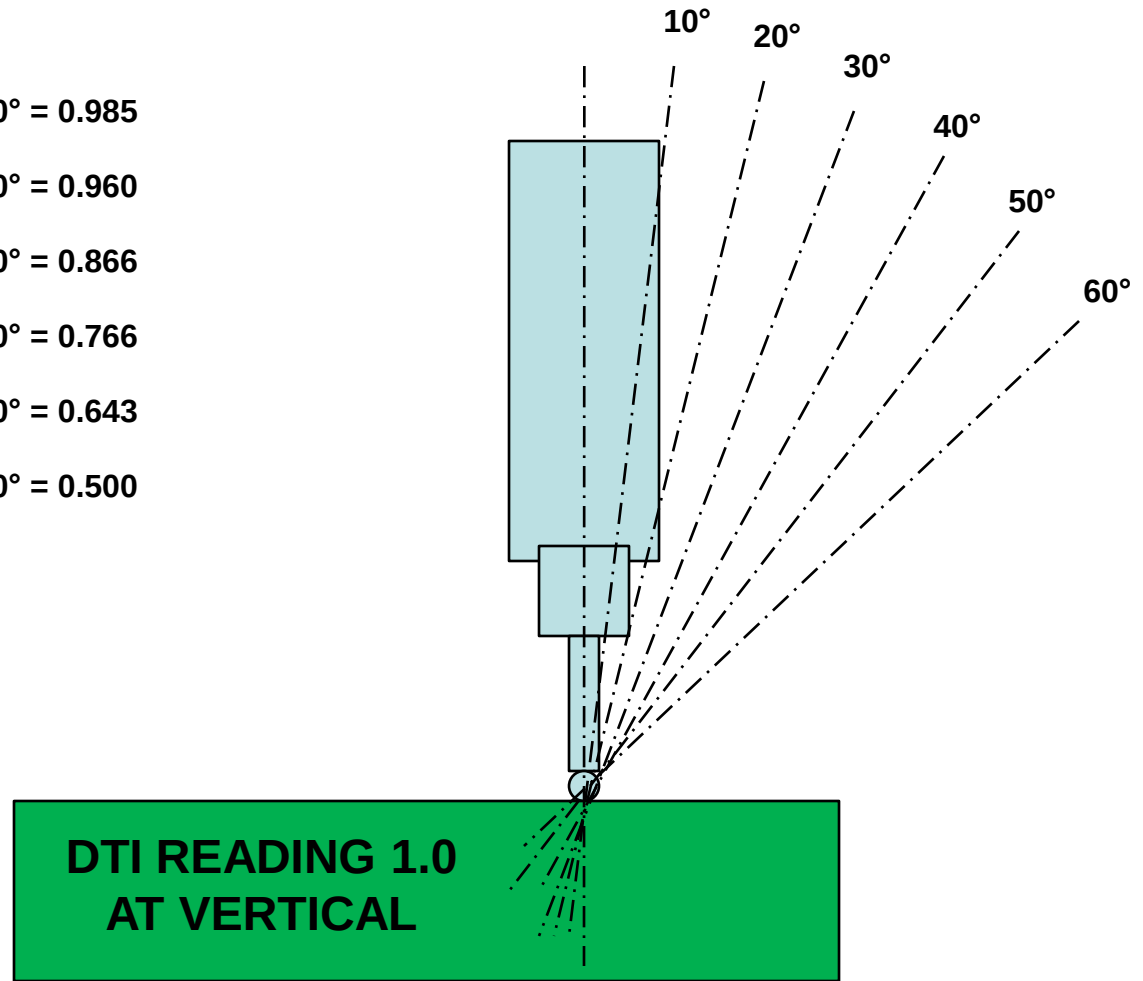
Plunger Moves Down
Pointer Moves CCW (-)

D.T.I. ERROR



**FRONT
VIEW**

$10^\circ = 0.985$
$20^\circ = 0.960$
$30^\circ = 0.866$
$40^\circ = 0.766$
$50^\circ = 0.643$
$60^\circ = 0.500$



Face & Rim Alignment Method

Example of Tolerances

Operating speed (rpm)	Maximum TIR (IN) Parallel	Maximum TIR (IN) Angular(at 12" radius)
1800 & slower	.006	.004
1800-4000	.003	.002
Over 4000	.002	.001

TIR: Total Indicator Reading

Procedure

Procedures:

- Use a clocking assembly designed to hold the two dial indicators.
- Install the assembly to read the driver hub face and rim.
- Take angularity reading at a maximum radius from the shaft centerline.

Procedure cont.

- When ever possible both hubs are turned together with the with the clocking assembly.
- Take four readings at 90 degree intervals.
- Adjust shims as needed to bring angular and parallel misalignment within tolerances.

Considerations

Considerations:

- Turning the hubs together eliminates any errors that can be introduced with coupling hubs that are slightly eccentric or not exactly perpendicular to the shaft.
- The clocking assembly should maintain the distance between hubs, preventing erroneous reading.
- Prevent sag and less accurate readings by using a sturdy dial indicator extensions.(doesn't deflect under its own weight)

Considerations cont.

- Make all measurements with mounting bolts properly tightened.
- Make all allowances for driver and gear thermal expansion as recommended by the manufacturer.
- The shaft axial position and coupling hub separation should remain constant at all times as readings are taken. (Ensure motor magnetic centre position is maintained)

Method Shortcomings

Note:

When it comes to high speed, high horsepower machines or the requirement for precise alignment accuracy, this method does have shortcoming especially when the coupling separation is quite large. Because of this the Reverse Indicator Method is better suited to give a more accurate result.

Method Shortcomings Example

- You will have a reading of .002" on the face of 4" dia. Coupling hub.
- This represent an angularity of .006" per foot.
- It is an error of .030" at the opposite end of a machine five feet long.
- Above an error, that would normally be acceptable.

The End

Any Questions?