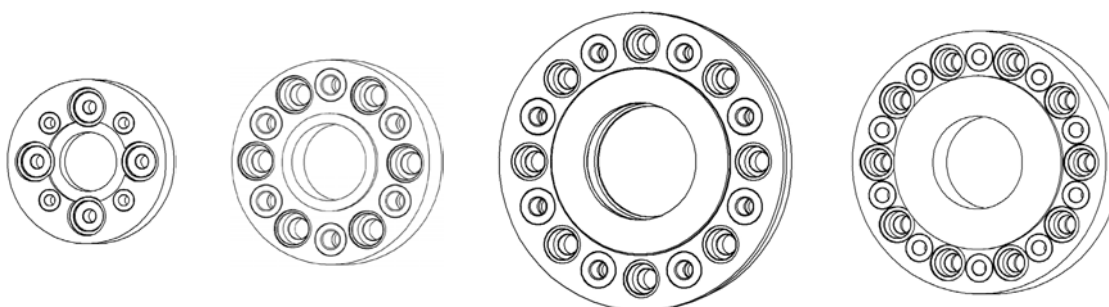




MARINE GEARBOX COUPLINGS

4-BOLT
6-BOLT
8-BOLT
10-BOLT

INSTALLATION INSTRUCTIONS



INSTRUCTIONS Isoflex Gearbox Coupling Installation

Before you begin

Thank you for choosing an Isoflex coupling!

Isoflex couplings help alleviate drive line misalignment and associated vibrations. Couplings also prevent binding and wear of the drive bearings, resulting in a lower long-term cost of ownership. Under normal conditions the polymer coupling is designed to be sacrificed in the event of severe shock load. This helps prevent significant damage to marine gear. It is important to make sure the coupling is correctly installed in order to improve your vessel's performance.

Isoflex couplings are designed to suit a large number of marine gearboxes.

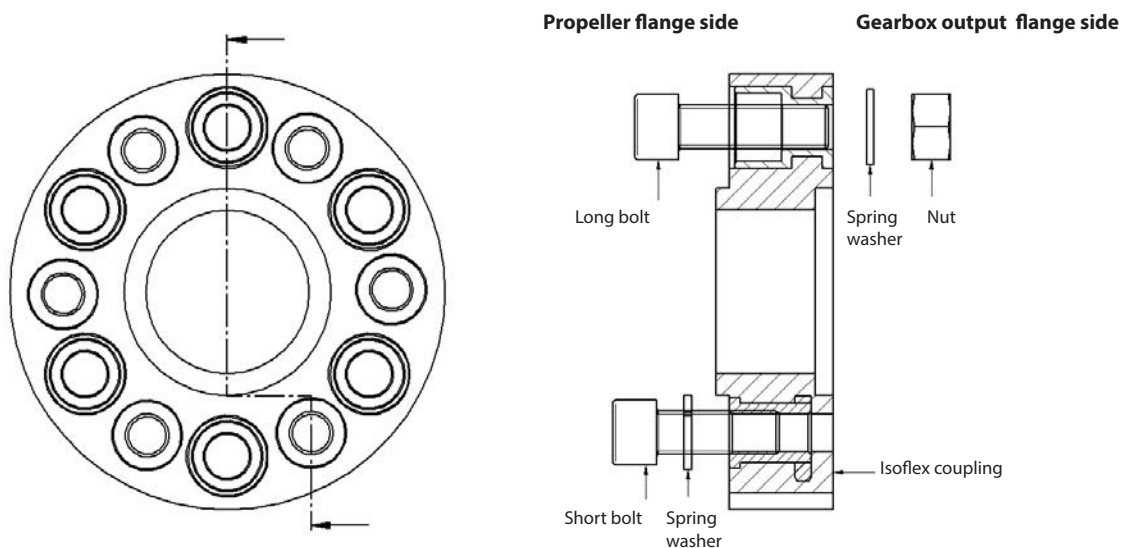
The following general installation instructions show a typical 6 bolt coupling. The installation procedures are fundamentally the same for 4-bolt, 6-bolt, 8-bolt or 10-bolt couplings.

This procedure AND the coupling installation should be completed while the vessel is in the water. If the alignment and installation is carried out while the vessel is supported OUT OF THE WATER, the alignment must be rechecked with the vessel IN THE WATER.

In some instances it may be impossible to perform a correct alignment due to worn or collapsed engine mounts. For more information, refer to Step 1 on page 8, or contact Isoflex.

Components

A bolt set is used to connect the Isoflex coupling between the gearbox flange and the propeller shaft flange.



Components

4 Bolt coupling bolt set includes:

- Four (4) "long" bolts
- Four (4) "short" bolts
- Four (4) hex nuts used with the long bolts
- Eight (8) lock washers - use one with each bolt

6 Bolt coupling bolt set includes:

- Six (6) "long" bolts
- Six (6) "short" bolts
- Six (6) hex nuts used with the long bolts
- Twelve (12) lock washers - use one with each bolt

8 Bolt coupling bolt set includes:

- Eight (8) "long" bolts
- Eight (8) "short" bolts
- Eight (8) hex nuts used with the long bolts
- Sixteen (16) lock washers - use one with each bolt

10 Bolt coupling bolt set includes:

- Ten (10) "long" bolts
- Ten (10) "short" bolts
- Ten (10) hex nuts used with the long bolts
- Twenty (20) lock washers - use one with each bolt

Isoflex supplies bolt kits with the coupling that will suit most manufacturers' standard flange thicknesses.

In some cases the flanges may be modified, custom made or not suit the standard bolt lengths. To ensure the bolts are correct, check both the gearbox flange and propeller shaft flange thickness.

A note about Components: Check bolt length and flange thickness

Long bolts should protrude enough that the nut and washer are completely threaded on, and do not stick out too much to clash with any part of the gearbox.

Short bolts should thread through the majority of the coupling's threaded inserts but not protrude through the coupling.

T bushes: In some cases the pitch circle diameter (PCD) and flange bolt size are such that to fit a flexible coupling in, smaller bolts must be used in the coupling. If this is the case, T bushes will be included for the gearbox flange and the propeller shaft flange to suit the smaller bolts.

Check flange thickness - Gearbox flange and propeller shaft flange

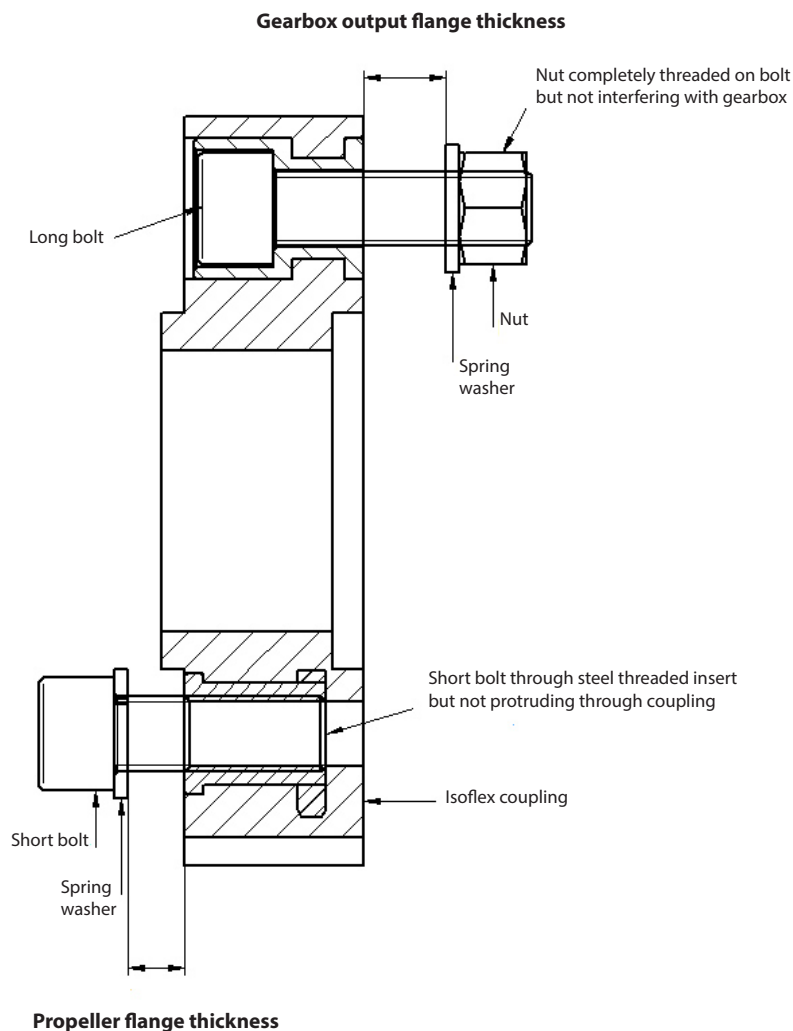
Gearbox flange thickness: With the long bolt fully inserted into the coupling and the spring washer and nut fully threaded on the end of the bolt, measure the distance between the *coupling* and the *spring washer* to make sure it is suitable for your gearbox flange thickness. Also check that the protruding bolt and nut will not interfere with any gearbox components.

With the spring washer on the short bolt, screw it into the threaded insert until the bolt passes through the entire steel section of the insert.

Propeller shaft flange thickness: Measure the distance between the *coupling* and the *spring washer* to ensure there is enough clearance for the propeller flange. This can also be checked by bolting the coupling to the propeller flange before attaching it to the gearbox.

Ensure that the propeller flange is thick enough that the short bolts will not protrude through the coupling when assembled.

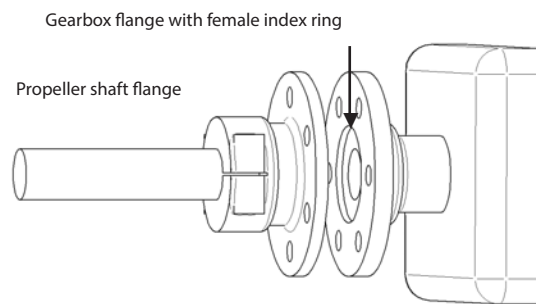
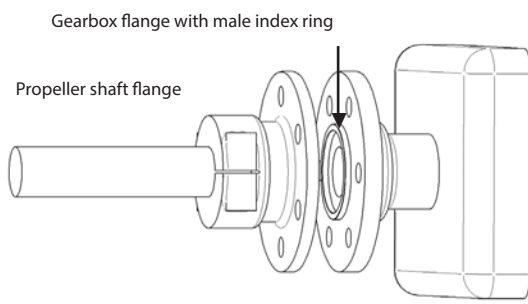
For IV couplings in a V-drive application it is critical that the bolt has enough length to fully engage the internal threaded insert. If the propeller flange is too thick, then it may cause premature failure of the coupling. Please check the coupling general arrangement to ensure the propeller flange thickness is within the allowable range for the bolt kit provided. Thicker flanges will require a different set of bolts.



Flange Types

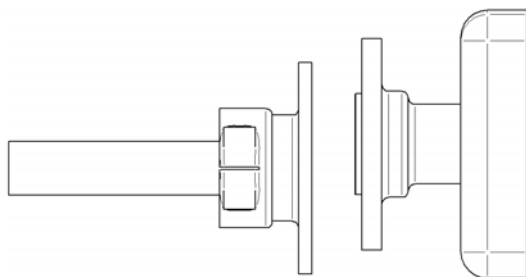
Flange Types (male and female)

The index ring, or pilot/spigot ring, of the coupling is the part that maintains the concentricity of the power transmission shafts.

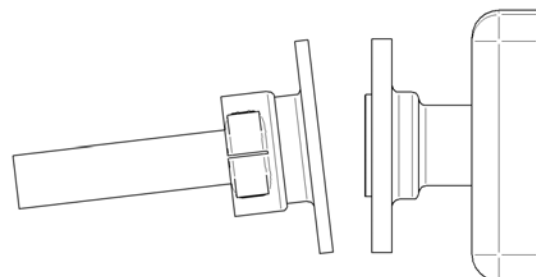


Flange Misalignment

It is important to check for any misalignment of the gearbox and propeller shaft flanges. Both "displaced" and "angular" misalignment can be present at the same time. These types of misalignments need to be minimized.



Displaced misalignment



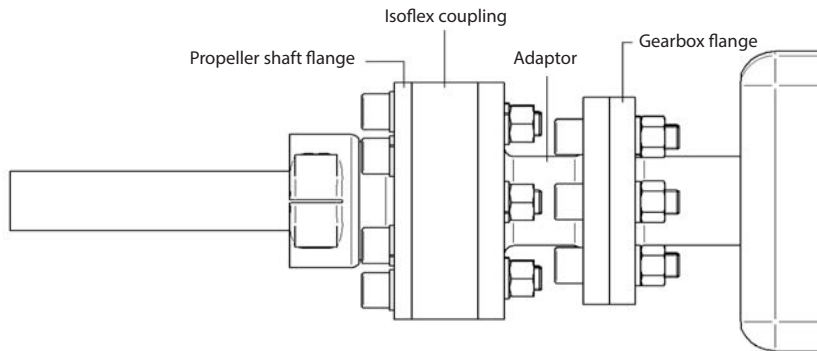
Angular misalignment

The maximum allowable deviation between the flanges is 0.004" (0.1mm). Otherwise, the service life of the coupling will be noticeably reduced. Heat build-up or premature bolt failures in the coupling is an indicator of excessive misalignment being present in the system.

Adaptors

Some applications require an adaptor (sometimes referred to as a cotton reel or spool) to be fitted to the output flange of the gearbox to clear any obstructions (like an oil pump), and/or to allow a different bolt pattern between the output flange and the required coupling.

If your installation requires an adaptor, it is recommended that it be manufactured by a marine engineering company from 1040 grade steel or equivalent and machined to the correct industry tolerances. Check carefully for fit and run-out once installed.



Dimensions

As gearbox manufacturers' dimensions and specifications are subject to change, it is necessary to check all dimensions to ensure the coupling fits and works correctly.

All Isoflex couplings are manufactured from engineering grade polymers. Although these materials are thermosetting polymers, dimensional changes may occur, depending on ambient operating (temperature) conditions. Steel spigots are used in large couplings to minimize the effect of thermal expansion and hence maintain axial run-out.

Tolerances

Tolerances on all machined index rings: $\pm 0.002"$ ($\pm 0.05\text{mm}$) @ 25°C ambient temperature.
Tolerances on all other dimensions: $\pm 0.02"$ ($\pm 0.5\text{mm}$) @ 25°C ambient temperature.

Torque Calculation

For the Isoflex coupling to work correctly, it must be strong enough to meet the torque rating of your installation. This means it must be able to carry the torque loads generated by the engine / transmission during normal operation.

Before installing the coupling, determine the maximum allowable torque rating of your engine / transmission. Use the formulae below to calculate the rating for your specific installation and compare it to the coupling rating.

Regular Isoflex couplings are black in color and for some models a high torque option is available in dark blue.

Conversion factors:

1 ft-lb = 1.356 Nm	1 hp = 0.746 kW
1 Nm = 0.7376 ft-lb	1 kW = 1.34 hp

To determine the approximate engine/gearbox output torque in ft-lbs, use one of the formulae below:

$$\text{Torque (ft-lb)} = \frac{(\text{Engine power (hp)} \times 5252 \times \text{gear reduction ratio})}{\text{Engine RPM}}$$

$$\text{Torque (ft-lb)} = \frac{(\text{Engine power (kW)} \times 7038 \times \text{gear reduction ratio})}{\text{Engine RPM}}$$

$$\text{Torque (ft-lb)} = 0.737 \times \text{Torque (Nm)}$$

To determine the approximate engine/gearbox output torque in Nm, use one of the formulae below:

$$\text{Torque (Nm)} = \frac{(\text{Engine power (hp)} \times 7124 \times \text{gear reduction ratio})}{\text{Engine RPM}}$$

$$\text{Torque (Nm)} = \frac{(\text{Engine power (kW)} \times 9550 \times \text{gear reduction ratio})}{\text{Engine RPM}}$$

$$\text{Torque (Nm)} = 1.356 \times \text{Torque (ft-lb)}$$

Recommended Bolt Assembly Torque

Imperial

Coupling bolt size	Recommended Assembly Torque		High Tensile Grade
	ft-lb	Nm	
			AS 2565 / AS1110
3/8"	20	27	Grade 5 / Class 8.8
7/16"	32	43	Grade 5 / Class 8.8
1/2"	47	63	Grade 8 / Class 10.9
3/4"	155	210	Grade 8 / Class 10.9
7/8"	206	278	Grade 8 / Class 10.9
1"	250	338	Grade 8 / Class 10.9

Metric

Coupling bolt size	Recommended Assembly Torque		High Tensile Grade
	ft-lb	Nm	
			AS 2565 / AS1110
8mm	10	14	Grade 5 / Class 8.8
10mm	31	42	Grade 5 / Class 8.8
12mm	34	46	Grade 8 / Class 10.9
14mm	60	85	Grade 8 / Class 10.9
16mm	83	112	Grade 8 / Class 10.9
20mm	150	200	Grade 8 / Class 10.9

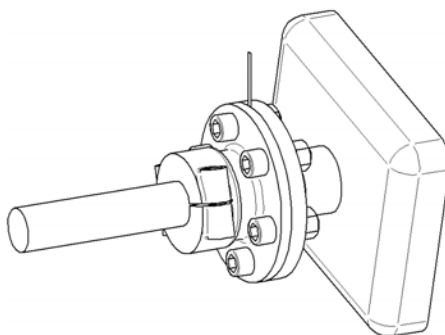
Step 1 - Check the existing flange alignment

This procedure AND the coupling installation should be completed while the vessel is in the water. If the alignment and installation is carried out while the vessel is supported OUT OF THE WATER, the alignment must be rechecked with the vessel IN THE WATER.

You will need a feeler gauge for this.

Loosen the gearbox and propeller shaft flange bolts just enough to insert a feeler gauge between the flanges around the entire circumference of the parts.

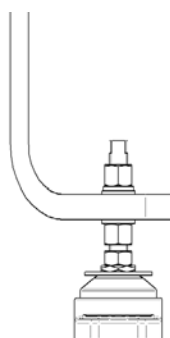
Align the flanges (using the adjusting nuts on the engine mounts) to within 0.003" (0.07mm), with measurements taken around the circumference of the flanges.



A NOTE ABOUT ENGINE MOUNTS

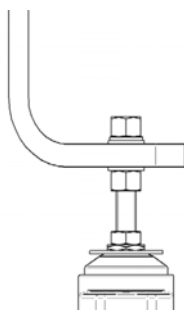
One common cause of misalignment is thrust induced misalignment due to inadequate or compromised engine mounts. If the engine is not held properly in place due to mounts that are too soft in the thrust direction, when the thrust is applied the engine can move forward to a point where the gearbox and propeller shaft move out of alignment. Engine mounts should have less than 0.06" (1.5mm) of movement in the thrust direction under full load.

Another cause of thrust induced misalignment is poorly installed engine mounts. If the engine brackets are sitting at the top of the mount studs it creates a larger lever arm that amplifies any movement. The engine brackets should sit as low as possible on the mount to reduce the leverage and movement in the mounts from the thrust of the engine. If the engine mounts have been poorly installed the brackets may sit high on the studs due to the mount free height being too low for the installation. A collapsed mount may also lead to brackets being on the top of the studs compensating for the loss of height in the mount.



Engine bracket at optimal height.

✓



Engine bracket too high on the mount stud.

X

If you are uncertain about the condition of your mounts, consult your mount manufacturer for original specifications, or contact Isoflex for assistance.

Step 2 - Ensure all mating surfaces fit correctly

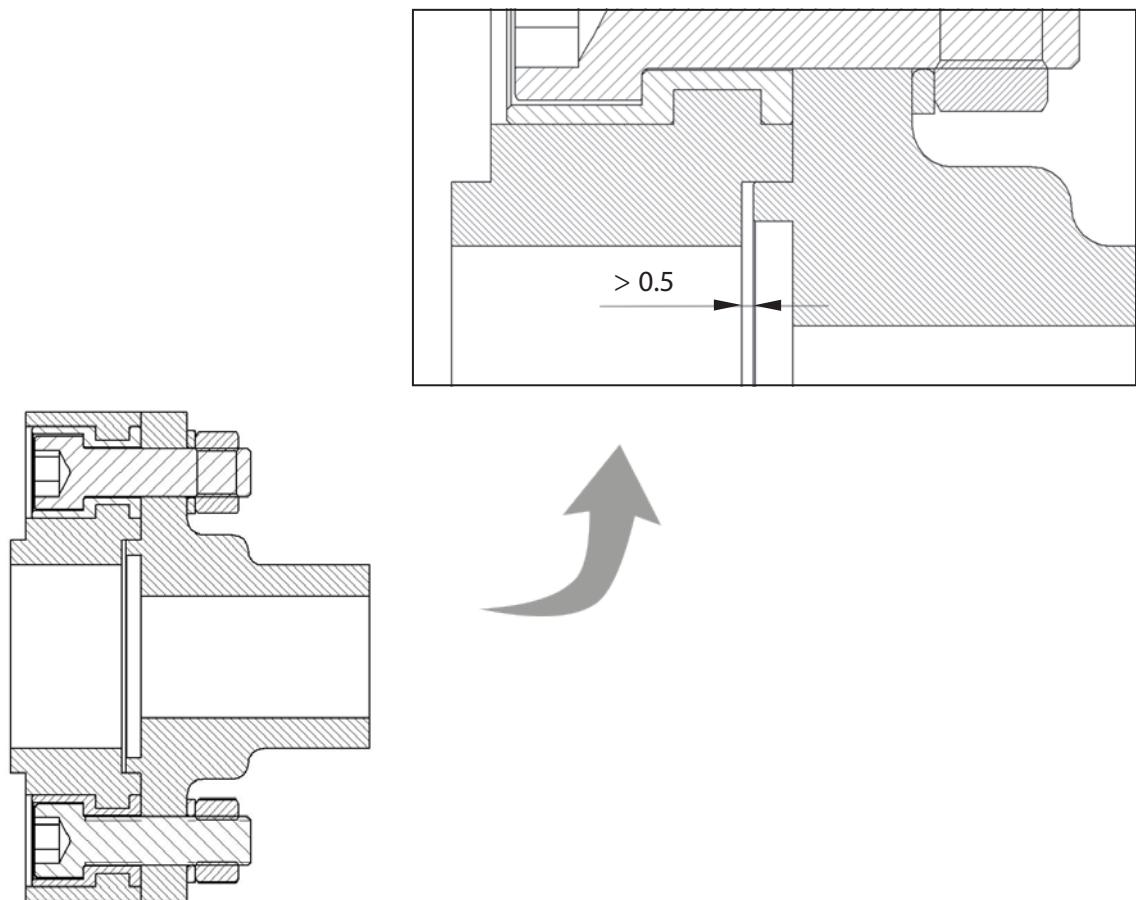
Remove the flange bolts and separate the gearbox flange from the propeller flange enough that you can position the coupling between the flanges.

NOTE:

If the gearbox flange has a *female* index ring, you will press the *male index ring* of the coupling into the gearbox flange. If the opposite is true, then you will press the *female index ring* of the coupling onto the *male* index ring of the gearbox flange.

The index ring on the coupling must fit into the index ring on the gearbox flange without “bottoming out”. This means there should be no visible gaps between the coupling and flange surfaces!

It is critically important to measure the spigot depths and heights to ensure that there is a minimum clearance of 0.02" (0.5mm).

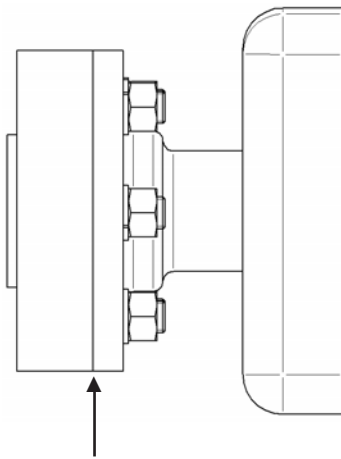


(This means, whatever was the case for the male/female index ring scenario when connecting the coupling to the gearbox flange, the opposite will be true when connecting the coupling to the propeller shaft flange).

Next, press the index ring of the coupling over the index ring on the propeller shaft flange. Again, there should be no visible gaps between the mating surfaces.

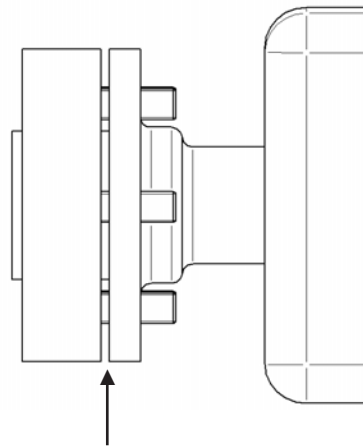
If the coupling “stands away” from **either** flange in the drive train, stop immediately and contact Isoflex or your Isoflex coupling supplier.

Correct and incorrect fit of **coupling to gearbox flange**



Coupling sits flat against gearbox flange

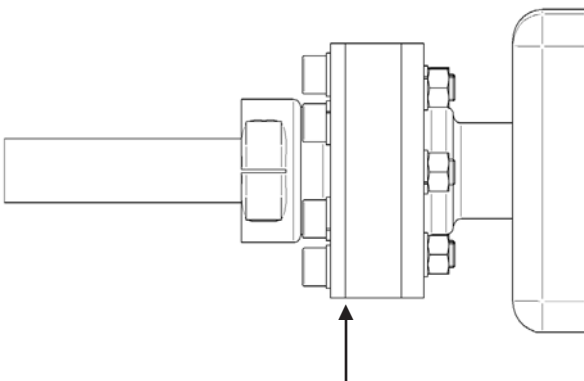
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There should be no space between coupling and flange

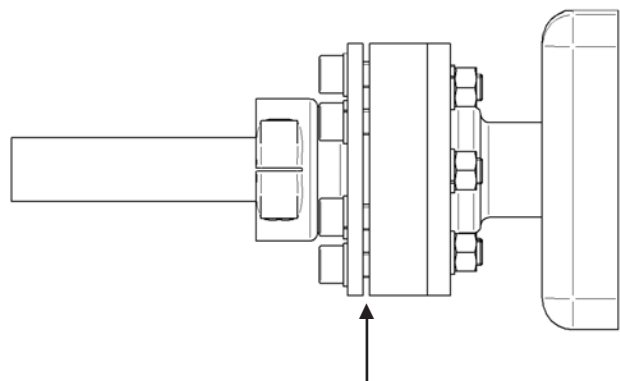
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Correct and incorrect fit of **coupling to propeller shaft flange**



Coupling sits flat against propeller shaft flange

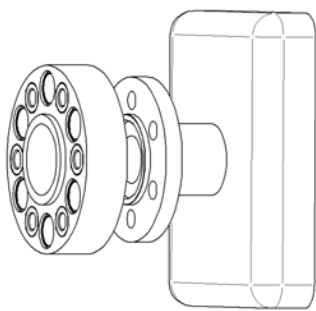
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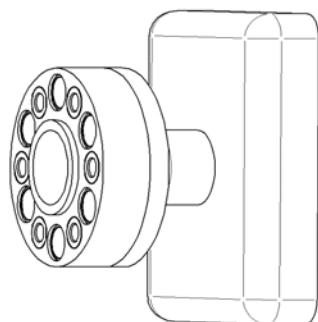
There should be no space between coupling and flange

X

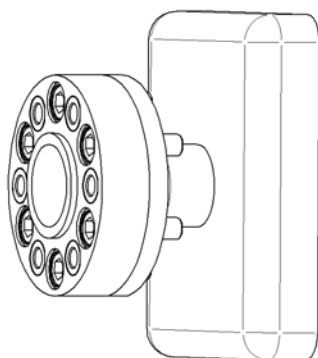
Step 3 - Connect coupling to gearbox flange



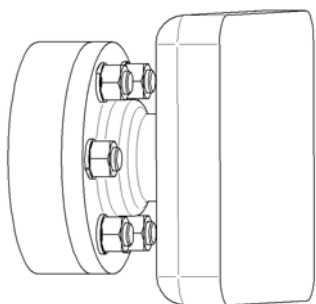
Hold the coupling against the gearbox flange, mating the index features of both parts.



Rotate the coupling to align the countersunk holes (T-bushings) in the coupling with the holes in the gearbox flange.



Insert the "longer" bolts into the countersunk T-bushings and through the gearbox coupling.

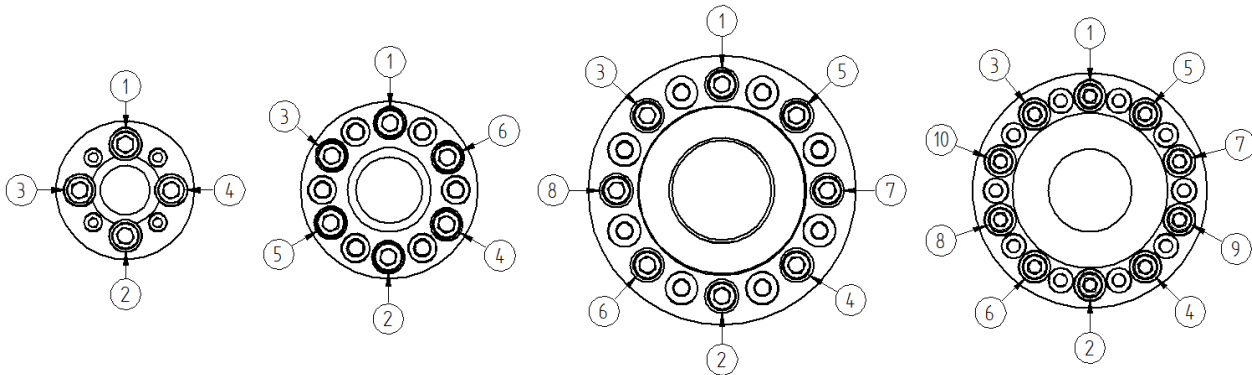


Place the lock washers over the bolts and fasten the nuts. Apply a thread lock liquid/paste like Loctite to the threads before securing the nuts.

Step 3 - continued

Tighten these bolts to the required torque in two steps:

Tighten in the sequence shown (diagrams) to HALF the recommended torque rating for the bolts in your coupling.



Then tighten (using the same sequence) to the final recommended torque rating (see page 7). The lock washers should be fully compressed.



Over tensioning ANY of the bolts during assembly may cause internal damage to the coupling.

In extreme cases, the steel inserts may become distorted or spin within the coupling.

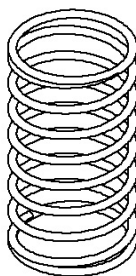
The result is a coupling that will not function properly.

Step 4 - Electrical isolation (optional)

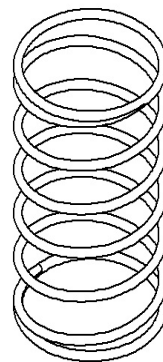
Isoflex couplings electrically isolate the propeller shaft from the engine and gearbox. To ensure a secure electrical connection from the engine to the shaft and propeller, an internal coil spring (optional extra) may be fitted as shown here.



Small bonding spring
(4 bolt couplings)

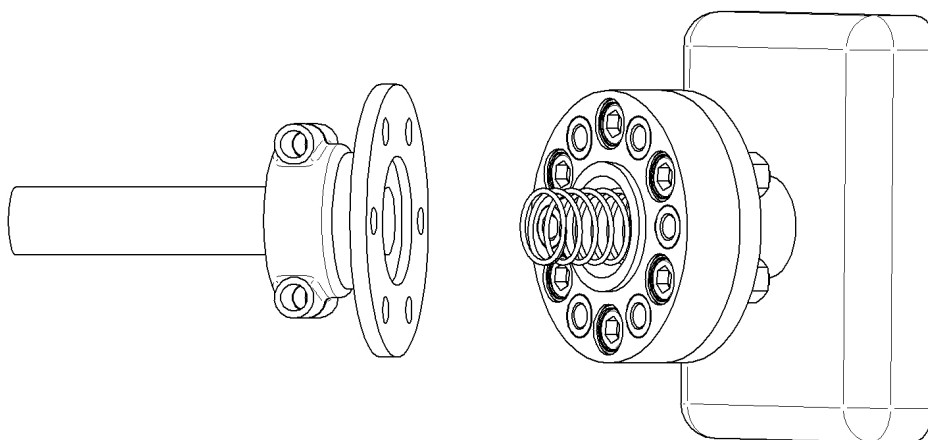


Medium bonding spring
(6 bolt couplings)

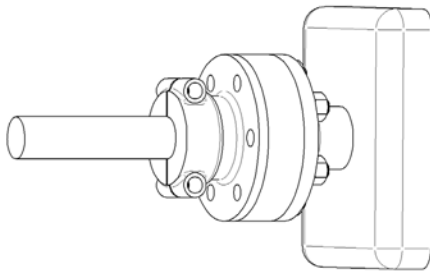


Large bonding spring
(8 and 10 bolt couplings)

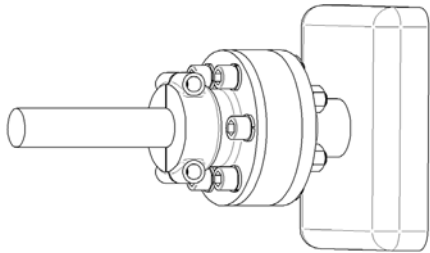
Insert the internal coil spring into the female index ring of the coupling.



Step 5 - Connect propeller shaft flange to the coupling

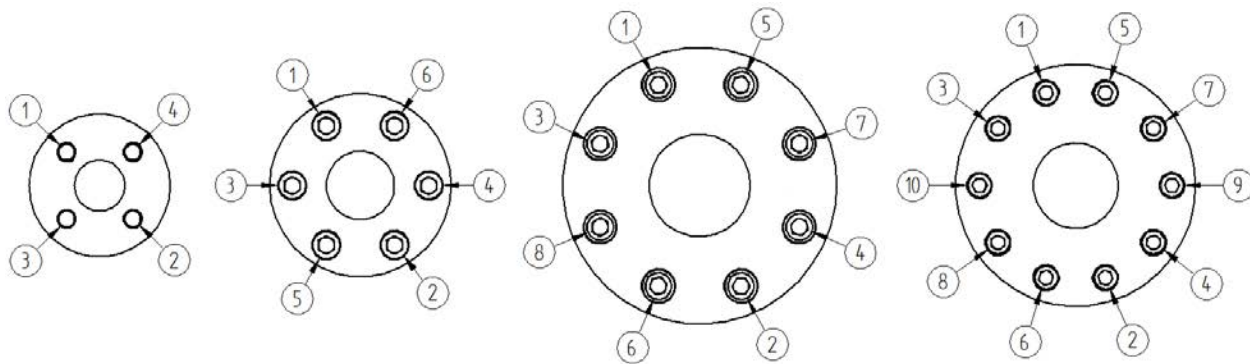


Fit the propeller shaft flange to the coupling, rotating the propeller flange to align the flange holes with the threaded inserts of the coupling. To ensure easy removal of the bolts for future alignment checks, apply a thin layer of waterproof grease before fitting.



Place lock washers onto the “shorter” bolts. Insert the bolts through the propeller shaft flange and thread into the threaded inserts in the coupling.

Tighten these bolts to the required torque using the same procedure and sequence as in Step 3.



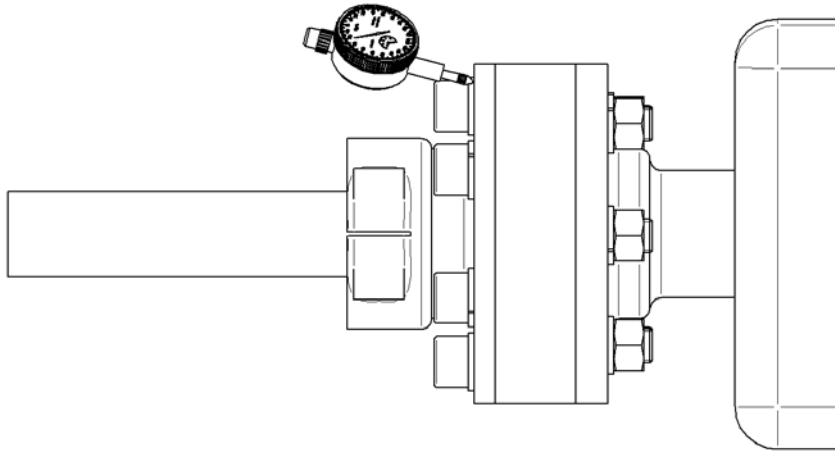
Over tensioning ANY of the bolts during assembly may cause internal damage to the coupling.

In extreme cases, the steel inserts may become distorted or spin within the coupling.

The result is a coupling that will not function properly.

Step 6 - Check for run-out

It is advisable to check for run-out at this stage. Slowly rotate the shaft by hand with a dial indicator on the gearbox output flange, then the propeller shaft flange. Run-out of approximately 0.004" (0.1mm) is acceptable for most power transmission applications.



Step 7 - Sea trials

Check the coupling for heat build-up after 2 hours of sea trials. During normal operation if the coupling is noticeably hotter than the gearbox flange, or if bolts have become loose, the flanges may be misaligned. This will need to be corrected to avoid any damage to the coupling or other drive line components.

The maximum allowable deviation between the flanges is 0.004" (0.1mm).

These types of misalignments should be minimized, otherwise the service life of the coupling will be noticeably reduced.

Re-check the assembly bolts in the propeller flange.

Step 8 - Re-check bolts in propeller shaft flange

After approximately 15 hours of operation, re-check the bolts in the propeller shaft flange for torque accuracy.

Inspection, Care and Maintenance

Couplings should be inspected regularly. Visibly look for deterioration of the coupling and check that the bolts remain tight.

Re-check shaft alignment during annual maintenance.

Special Notes Regarding the Information in this Document

This installation document gives specific instructions and requirements regarding the installation of Isoflex Gearbox Couplings. For the effective operation of Isoflex marine gearbox couplings, the requirements described herein must be met. Failure to meet the requirements may result in decreased reliability and premature wear of the coupling(s) and loss of warranty.



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