JOHNSON POWER LTD.

UNIVERSAL JOINT COUPLING INSTALLATION & MAINTENANCE GUIDE

IMPORTANT - Read Carefully
These instructions are provided to aid in the proper handling, installation and maintenance of Johnson Power universal joint shafting. They should be carefully read and followed. Failure to do so may result in unsatisfactory service as well as serious personal injury or property damage.

IF THERE ARE ANY QUESTIONS CONCERNING PROPER INSTALLATION, MAINTENANCE OR STORAGE, CONTACT JOHNSON POWER BEFORE PROCEEDING.

HANDLING & STORAGE:

Examine all shafting and related material upon arrival and note any damage or shortage on bill of lading. Such damage is the responsibility of the freight carrier. All transportation and storage should be in a horizontal position only.

Balance weights should not be removed. Unbalance will cause vibrations and premature wear of shafting and the bearings of the connected units.

Shocks, bumps and mishandling must be avoided to assure proper performance. Abuse could result in bending the driveshaft, causing whipping and unbalance problems. Damage of this nature will VOID the warranty.

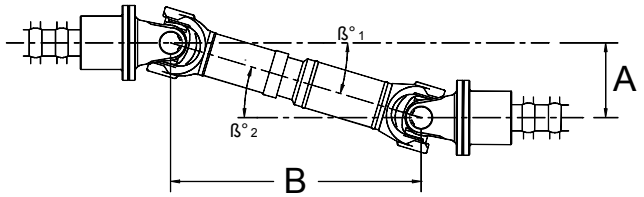
FOR SPECIAL LONG TERM STORAGE INSTRUCTIONS CONTACT JOHNSON POWER.
Shafts that have been stored for a long time, should be re-greased in the working position prior to start up. See Lubrication section.

REPAIR SHOULD ONLY BE DONE BY THOSE WITH EXPERIENCE IN APPLYING, INSTALLING, SERVICING AND REBUILDING INDUSTRIAL UNIVERSAL JOINT TYPE DRIVESHAFTS.

EQUIPMENT ALIGNMENT:

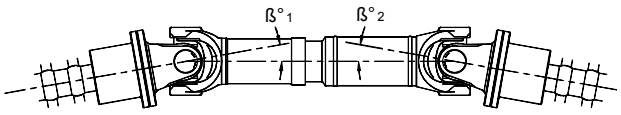
The defection angles ($\beta°_1$ & $\beta°_2$) of both joints must also be equal to one another within ±1°. This can be achieved by either Parallel offset or Angular misalignment. The maximum joint operating angle of 3° is recommended for optimum bearing life. While, in theory, shafts should be offset slightly, to initiate bearing rotation, experience indicates that there is sufficient deviation in most applications for essential bearing rotation. The preferred angle is ½° to 1°, unless the driver or driven produces torque spikes, such as a reciprocating engine or compressor, then an operating angle of 2° to 3° is desirable.

Parallel offset



Driving and driven shaft of your equipment must be parallel to within ±1°. An offset "A", of 1/8" to 3/16" per foot of joint coupling measured joint center to joint center, distance "B", is equivalent to approximately ½° to 1°. ($\beta°_1 = \beta°_2$)

Angular Misalignment



The driver and driven shaft centerlines, of your equipment, must intersect at the center of the drive shaft. ($\beta°_1 = \beta°_2$)

The maximum joint operating angles depends upon the shaft series and operating speed, consult Johnson Power or our master catalog.

FOUNDATIONS / SUPPORTING STRUCTURES:

1. Foundations for all installations must be adequate. The appropriate steel beams and/ or concrete foundation, with hold down bolts, are necessary to maintain alignment and to eliminate damaging vibrations.

2. Steady bearing supports must be rigid enough to sustain steady bearing forces and natural frequency requirements. The following guidelines must be observed:

   A. Keep spans as short as possible.
   B. End connections must be rigid.
   C. Position channel and I - Beams for their greatest strength advantage. The natural frequency of the bearing supports should be a minimum of four times running speed (RPM) forcing frequency, in all direction perpendicular and parallel to shafting centerline.

INADEQUATE FOUNDATIONS OR STEADY BEARING SUPPORTS WILL VOID THE JOHNSON POWER UNIVERSAL JOINT COUPLING WARRANTY.

- 2530 BRAGA DRIVE - BROADVIEW, IL 60155 - PHONE (708)345-4300 - FAX (708)345-4315 -

INSTALLATION:

Check flange bores and shaft diameters for proper fit. All mating surfaces, bores and faces must be clean and free from grease, oil, dirt, nicks and other contaminates to insure a proper fit and function of mating parts. The shaft should not extend beyond the flange face.

Stock bored flanges are bored to +.001 / -.000 tolerance. This allows the flange to be gently tapped onto the driving and driven shafts. One set screw is provided to lock the flange into position.

An additional set screw at 90 degree, is supplied for vertical installations. In vertical applications where the u-joint shafting weight exceeds 300 lbs., we recommend an interference fit, split ring key or jam nut to support the weight.

For light interference or shrink fits heat the flange uniformly (preferably submerged in oil not exceeding 350° F) to expand the bore. Align the keyways in both the shaft and flange, slide flange onto shaft and allow to cool. CAUTION: Do not attempt to hammer an undersized flange on without heat.

Some VB U-joint couplings are provided with a taper bored flange, which is secured in place, with the steady bearing installed. See table 1, for the jam nut torque specifications. The larger VB shafts use straight bored flanges, with two set screws and a locking plate.

After installing companion flanges, check the run-out of the flange face and pilot diameter (.005 T.I.R. maximum permissible).

TABLE 1
VB Torque Specifications

Series	B-Stub Thread	Torque (lb-ft)
31 - 37	3/4" - 16	100 lb-ft
41 - 48	1.00" - 20	230 lb-ft
55 - 61 - 71	1 1/4" - 18	450 lb-ft
81	1 2" - 18	550 lb-ft
88	2.00" - 12	800 lb-ft

NOTE: Above torque based on lightly oiled threads.

Splined telescoping assemblies should not be disassembled to avoid misalignment and unbalance. Shaft yokes must be aligned in phase. Check the match markings.

For fixed length shafts, one companion flange must be free to move to allow slight length variation due to temperature changes, etc.

To insure long life and trouble free operation, units should be regularly inspected to insure that bolts are tight, mating flanges are secure and lubrication seals and zerk fittings are intact.

Any unusual sound or vibration should be located and corrected immediately.

WHEREVER PEOPLE OR EQUIPMENT CAN BE ENDANGERED BY ROTATING UNIVERSAL SHAFTS, SAFETY DEVICES MUST BE PROVIDED BY USER!

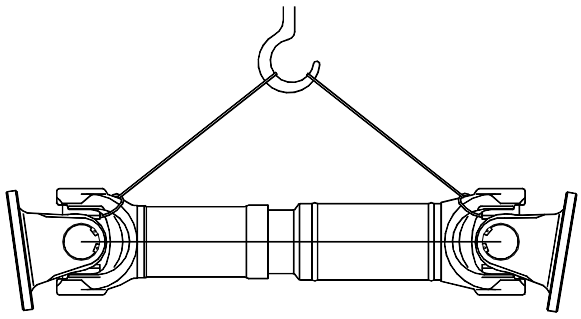
TABLE 2
Companion Flange Torque Specifications

Face Size	Bolt Size	Grade	Torque
31,61,71	3/8 - 24	8	30 lbs. ft.
37,41,81	7/16 - 20	8	50 lbs. ft.
48,55	1/2 - 20	8	75 lbs. ft.
88	5/8 - 18	8	210 lbs. ft.
75	M6	10.9	10 lbs. ft.
90, 100	M8	10.9	25 lbs. ft.
120	M10	10.9	50 lbs. ft.
150	M12	10.9	90 lbs. ft.
180-8	M14	10.9	140 lbs. ft.
180-10, 225	M16	10.9	218 lbs. ft.
250	M18	10.9	298 lbs. ft.
285	M20	10.9	428 lbs. ft.
315, 350	M22	10.9	575 lbs. ft.
390	M24	10.9	738 lbs. ft.
435	M27	10.9	1106 lbs. ft.

NOTE: Torque values based on lightly oiled threads. Once components are properly seated, graduate up to final torque value.

INSTALLATION OF UNIVERSAL JOINT COUPLING HORIZONTAL APPLICATION (Single & Multiple Section)

Lower compressed U-Joint Coupling into position and extend ends so that the pilot is seated firmly into mating companion flange and bolt holes are lined up.



Check that assembly isn't bottomed out or fully extended. Insert bolts/studs and tighten to specified torque indicated in Table 2.

VERTICAL APPLICATION: (Single Section)

Additional protection must be provided to eliminate the possibility of the drive shaft from coming apart at the splined section (Fig1). Compress the slip joint with care to prevent damaging the dust cap or spline seal. Position the universal joint shaft at the top, making sure that the pilots are seated firmly into mating companion flange and that the bolt holes are aligned. Then extend the slip joint and secure at the bottom, making sure to check that the slip joint is not completely extended or bottomed out to insure that there is adequate length adjustment for the application requirements. Torque the companion bolts/studs to the value, shown in table 2.

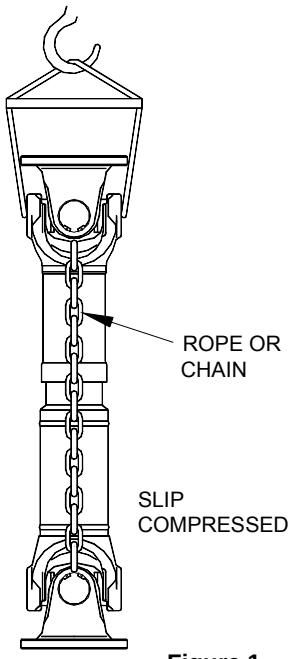


Figure 1

VERTICAL APPLICATION: (Multiple Section)

Match marking is used to insure that the shafting is reassembled as it was manufactured and balanced. Start with the upper-most VB section, universal joint end of shafting (FIG 2), making sure that the pilot is seated into mating companion flange or B-Flange and that the bolt holes are aligned. Insert bolts/studs and tighten specified torque indicated in Table 2.

Allow the shafting to hang plumb, and secure the steady bearing housing to the support structures. Steady bearings supplied by Johnson Power are designed for 1.5 degrees maximum misalignment capability. Shim the bearing as required to minimize the universal joint operating angle and steady bearing alignment, as required. On steady bearings using set screws to friction hold inner race to "B" stub (small to medium duty series), **TIGHTEN EACH SET SCREW ON STEADY BEARING RACE** alternately until they stop and the socket wrench starts to spring. When both sets screws are tightened the bearing is seated. On large series shafting, position grease zerk fitting on the steady bearings so that the zerk is up (opposing gravity). For floating or expansion bearings, position housing at bearing mid- float before securing to the support or "B" stub. Other intermediate VB sections are installed in the same manner, follow match marking and FIG 2.

The lower VA section is installed, the same as the single section vertical. Making sure to install the slip section towards the driven unit.

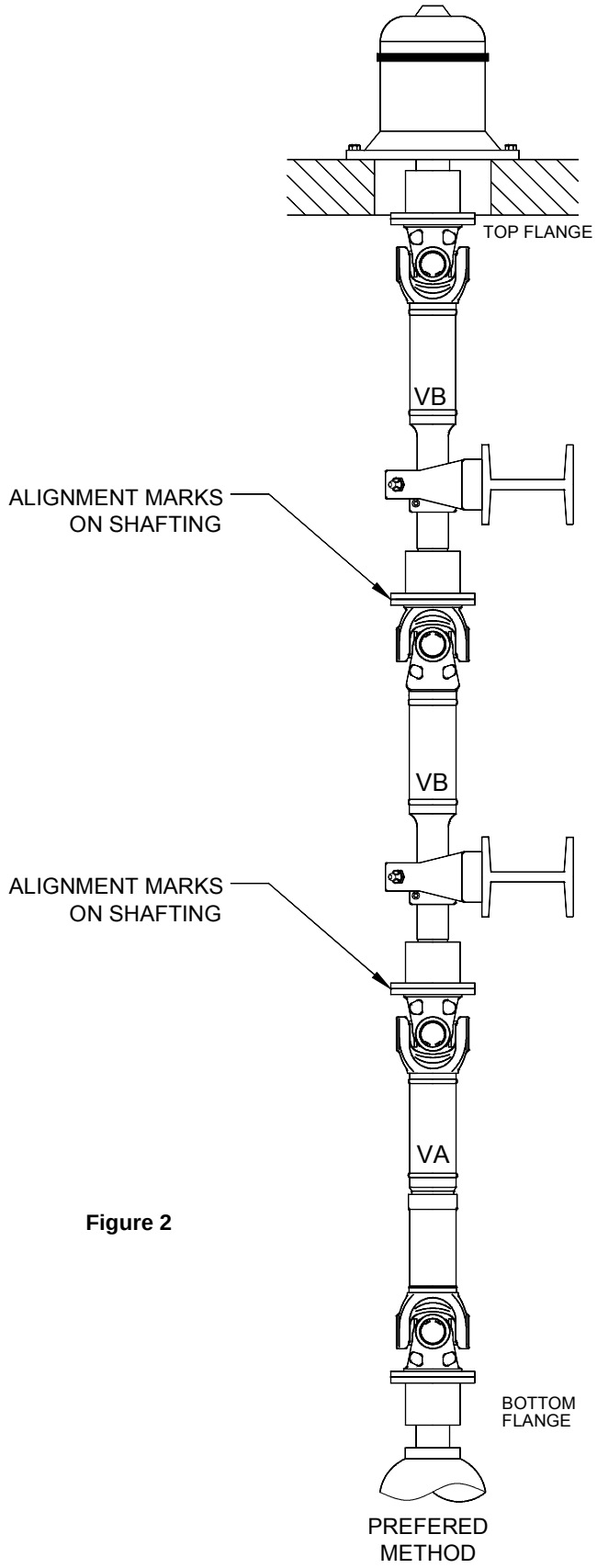


Figure 2

LUBRICATION:

Cross and bearing and sliding splines contain only enough grease to provide protection during shipment. It is necessary to lubricate by zerk fittings prior to start-up to avoid premature failure. The steady bearings do not require lubrication prior to start-up. Use a good quality lithium base E.P. grease meeting N.L.G.I. grade 2. Several greases meeting these specifications Lubriplate 1200-2, Shell Alvania EP2 or Mobil Mobilux EP2.

Add lubricant to universal joint until clean lubricant appears at all four bearing seals and until lubricant appears at pressure relief hole for spline lubrication on VA shafting (series 2300 thru 2395 have lube for life slip sections). It may be necessary, while applying grease gun pressure, to move drive shaft from side to side to allow greater thrust clearance on a seal end that is not purging. Lubrication intervals should be every 500 hours normal service or every 200 hours continuous duty service. Adverse conditions such as extreme temperatures, wet or corrosive environment may require special greases and more frequent lubrication.

MOTOR FLANGE WITH CIRCULAR KEY:

Step 1 - Fig. 1 slide (tap) flange on so that it clears circular key groove.

Step 2 - Install each circular key half.

Step 3 - Fig. 2 lower flange so that weight is suspended on circular key.

Step 4 - Tighten set screw(s) per specifications.

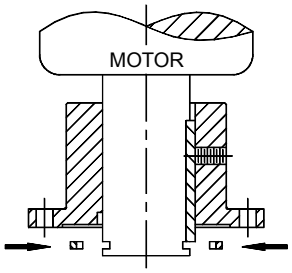


Fig. 1

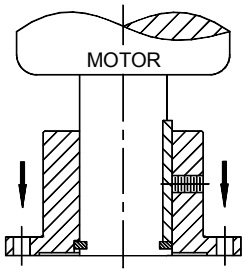


Fig. 2

TROUBLE SHOOTING GUIDE

PROBLEM	CAUSE	SOLUTION
VIBRATIONS	1. Operating near critical or half critical speed resonance.	Change speed, multiple shafting, rework using different tube size.
	2. Operating at or near driver or driven equipment natural frequency.	Consult with equipment manufacture.
	3. Non-rigid foundations, floors or steady bearing beams.	Reinforce and/or perform structural analysis.
	4. Driver or driven components out of balance.	Consult with equipment manufacturer.
	5. Bent shafting during installation or balancing required.	Return for straightening and/or balancing.
	6. Pump noise.	Consult pump manufacturer.
	7. Ears not in phase	Disassemble and align yoke.(Fig 1 or 2)
	8. Flange faces not seated.	Check for burrs or grit and reseat.
	9. Operating speed within a torsional vibration mode.	Perform torsional analysis. Consult Johnson Power.
	10. Driver and driven shafts/Companion flange not parallel within 1°.	Align and adjust, shim structure if necessary.
	11. Driver and driven shaft run-out	Consult Component Manufactures.
	12. Flange face or pilot run-out exceeding .005" TIR.	Check fit, if exceeds consult manufacturer.
	13. Steady bearing inner race not secured to shafting.	Tighten set screw.
	14. Steady bearing not self aligning, failure or binding.	Shim bearing or replace.
	15. Bearings elsewhere in the system failed or binding.	Replace or consult equipment manufacturer.
	16. Exceeding maximum joint acceleration (consult cat.	Reduce angle and/or speed.
	17. Dry or brinelled (needle bearing indentations) Universal Joint	Replace defective joints / Check lubrication section / Review operating parameters
	18. System resonance/vibration	Vibration analysis preformed.
	19. Excessive radial movement at the slip yoke or binding movement	Lack of lubrication, overload, condition, consult manufacturer.
	20. Companion flange, other U-Joint or steady bearing fastener loose.	Secure fastener / Check for vibrations
	21. Slip assembly bottomed out (especially under heavy axial load).	Revise installation.
FLANGE SLIPPING OFF SHAFT	1. Set screw tightened improperly.	Tighten set screw.
	2. Exceeding weight limitations for stock bored flanges/shaft diameter undersize.	Add additional set screw or replace with interference fit bore flange/locking collar.

SAFETY and WARRANTY

"We recommend the use of safety guards to protect personnel from contact with rotating universal joint couplings. Johnson Power agrees to repair or replace without charge, F.O.B. our factory, or at our option allow credit for, any portion of a product which proves to be defective in material or workmanship within a period of 180 days from the date the product is placed in service. Products claimed to be defective in material or workmanship within a period of 180 days from the date the product is placed in service. Products claimed to be defective must be held for our shipping instructions and no claim will be allowed unless we have a reasonable opportunity to examine the products. **WE MAKE NO WARRANTY AS TO MERCHANTABILITY OR AS TO FITNESS OF PRODUCTS FOR A PARTICULAR PURPOSE OR AS TO THE RESULT TO BE OBTAINED FROM THEIR USE BY PURCHASER OR OTHERS**. We make no warranties, express or implied, statutory or otherwise."
These instructions have been complied with best of our knowledge and belief. We cannot accept responsibility for possible errors herein.

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