

## Introduction

This manual provides general instructions on handling, installation and maintenance of **Cline Universal Shafts**. Carefully follow the instructions in this manual for optimum performance and trouble free service.

Because of the possible danger to person(s) or property from accidents which may result from improper use or installations of products, it is extremely important to follow the selection, installation, maintenance and operational procedures contained in this manual.

## 1. Safety Instructions

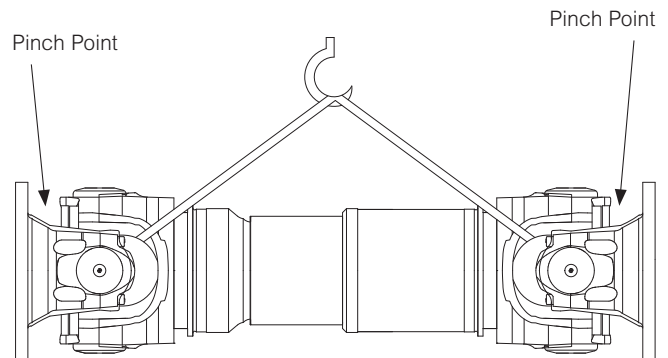
- 1.1 All rotating power transmission products are potentially dangerous and can cause serious injury. They must be properly guarded in compliance with OSHA, ANSI and any other local or governmental standards for the speeds and applications in which they are used. It is the responsibility of the user to provide proper guarding.
- 1.2 Only trained personnel with proper PPE should perform installation, assembly, or maintenance work on **Cline Universal Shafts**.
- 1.3 The maximum operating specifications of the universal shaft, such as maximum torque, speed, deflection angles, lengths, etc. must never be exceeded.
- 1.4 If universal shafts are in any way altered without the written consent of Rexnord Industrial Services, they are no longer covered by warranty.
- 1.5 Universal shafts are elastic bodies. The maximum permissible operating speed must be sufficiently below the first order lateral critical speed.
- 1.6 The balance state of a universal shaft must on no account be altered. Doing so will void all warranty, and may result in harm to surrounding persons or equipment.
- 1.7 The spline section of the shaft should never be pulled completely apart. Incorrectly assembling the male and female may result in imbalance or vibration and safety concerns.

## 2. Transportation and Storage

Universal shafts have several components and moving parts. Special care must be taken when transporting and storing them to prevent injury to surrounding people and damage to the shaft. Please follow the guidelines below when handling and storing a universal shaft.

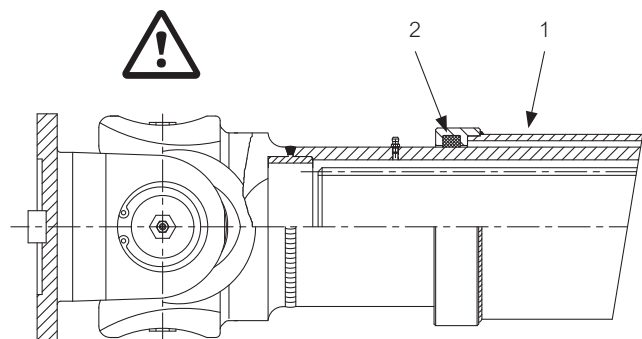
- 2.1 Use nylon lifting slings with a suitable load rating to handle universal shafts. Check the condition and the rating of the sling before each use. If steel cables are used, protect contact points to prevent damage to the shaft.

- 2.2 Transport and store universal shafts in a horizontal position when possible (see Figure 1).



**Figure 1 — Shaft must be transported in a horizontal position when possible**

- 2.3 For non-horizontal transportation, provide additional security to prevent separation of the splined parts.
- 2.4 When handling universal shafts, be aware that the flanges may move and create the potential for a pinch point. Keep hands clear of the universal joint area at all times. Note location of pinch point in Figure 1.
- 2.5 Avoid bumps and shocks to the shaft during transport and storage.
- 2.6 Do not place any stress or load on the spline protection (1) or the seal (2) (see Figure 2). Doing so may result in damage and/or improper sealing of the spline section.



**Figure 2 — Protect the spline protection (1) and seal (2) from stress**

- 2.7 Do not store universal shafts with any load on the flanges.
- 2.8 Use appropriate equipment to prevent the universal shaft from rolling when stored.
- 2.9 Store universal shafts in a clean, dry and temperature controlled environment.

2.10 Rexnord does not recommend storing drive shafts around machinery. Vibration from machinery can cause false brinelling of the bearings and reduce joint life. If shafts are stored around machinery, use precautions to eliminate the damaging effects of vibration, such as damping materials under the storage racks.

### 3. Alignment

Proper alignment is critical to achieve smooth operation of universal shafts. The angles of the two joints (B1 and B2) must be equal within +/- 1 degree. This will ensure constant speed output to connecting equipment. Universal shafts may be setup in two configurations, Z configuration (Figure 3) or W configuration (Figure 4).

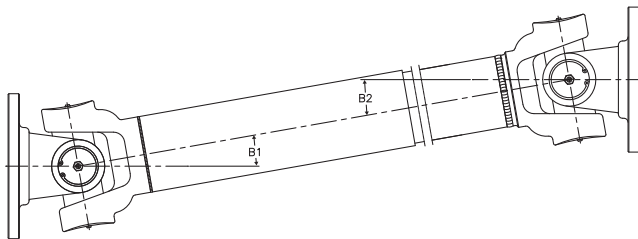


Figure 3 — Z configuration; B1 = B2

In Z configuration the flange faces are parallel to each other, and input and output shafts are offset. Joint operating angle must not exceed the limit for specific shaft series at the maximum operating speed. Contact Rexnord Industrial Services for additional assistance.

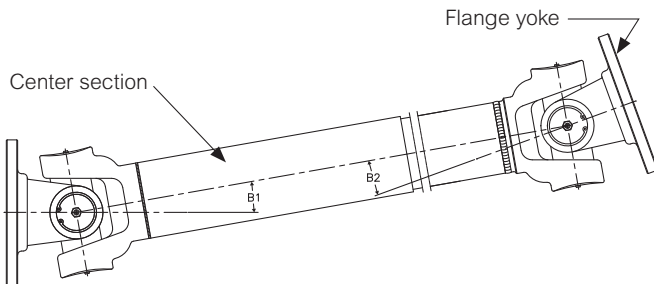


Figure 4 — W configuration; B1 = B2

In W configuration the input and output shafts are offset at a certain angle. If utilizing this configuration, the driver and driven shaft centerlines must offset in the center of the universal shaft ensuring that B1 and B2 are equal. Joint operating angle must not exceed the limit for specific shaft series at the maximum operating speed. Contact Rexnord Industrial Services for additional assistance.

Rexnord recommends universal shafts be setup to run between 2° – 3° joint angle to prolong bearing life and promote bearing oscillation.

Rexnord Industrial Service Field service teams utilize state of the art alignment equipment, specifically designed to

perform proper alignment of universal shaft applications. Contact 1-800-235-6371 for a quote.

### 4. Installation

- 4.1 Unless otherwise specified, universal shaft hubs are manufactured for interference fit with the mating shaft. Heat hubs to 275°F (135°C) using an oven, torch, induction heater or an oil bath. To prevent damage do not heat hubs beyond a maximum temperature of 400°F (205°C). Once the hub has cooled down, make sure that it is firmly fitted on the shaft. Finish the hub installation by tightening the set screws if present.
- 4.2 Check companion hub face runout and pilot runout. Both values should be less than 0.005".
- 4.3 Inspect and clean the flange faces and the centering diameter (pilot, boss) before installation. These must be free of dust, grease, burrs, or paint to guarantee a safe connection.
- 4.4 Check position of the inboard yokes (1) relative to each other (see Figure 5). Unless otherwise specified, these must be in phase and the arrow markings (2) must be in alignment (see Figure 5). The splines are manufactured as a matching set and must not be exchanged or manipulated in any way.

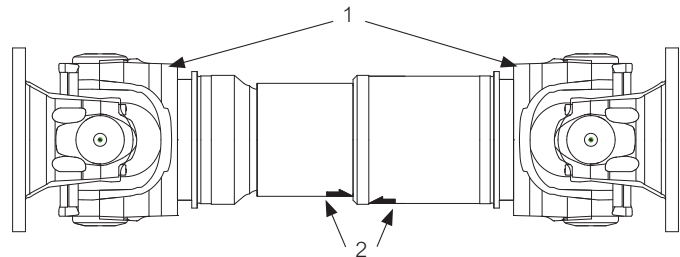
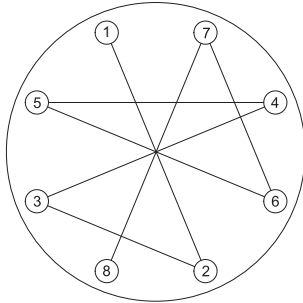


Figure 5 — Shaft arrow markings must be in alignment

- 4.5 Before installation, remove any transportation hardware or brackets.
- 4.6 During installation, take care not to damage grease fittings or relief valves.
- 4.7 Rexnord recommends a fastener set consisting of:
  - 4.7.1 Hexagon bolt with partial thread similar to DIN 931. Use only metric class 10.9 or standard grade 8.
  - 4.7.2 Hexagon nut or Hexagon self-locking all metal nut (DIN980). Use only metric class 10 or standard grade 8.
  - 4.7.3 Split lock washer, if standard nuts are used in lieu of locking nuts.
- 4.8 **Do not use anti-seize on the bolts and nuts.** Anti-seize may interfere with the friction on the flange face and affect torque capacity. This could lead to slippage and cause damage to components.

- 4.9 The fasteners should be evenly tightened with a properly calibrated torque wrench in a star pattern per Figure 6. Each fastener should be tightened to 50% on the first pass, then 75%, and finally to full torque on the third pass. Ensure pilot and face key seat properly with companion hub during tightening. Flange faces should be completely flush with each other with no gaps in the interface.



**Figure 6 — Follow a star pattern to tighten fasteners to specified torque**

- 4.10 All fasteners must be tightened to the specified torque. The tightening torques given are based on a 90% utilization of the elastic limit and apply to dry or slightly oiled fasteners. Refer to the table below for tightening torque. Always utilize a new fastener set when installing a universal shaft. NEVER REUSE HARDWARE.

**TABLE 1 — Hardware Tightening Torque Values for Metric Friction Flange and Face Key Flange**

Bolt Size	Nm	Lb-Ft
M8	35	26
M10	70	52
M12	120	89
M14	200	148
M16	300	221
M18	410	302
M20	600	443
M22	800	590
M24	1000	738
M27	1500	1106
M30	2000	1475

**TABLE 2 — Hardware Tightening Torque Values for SAE Friction Flange**

Bolt Size	Lb-Ft
3/8–24	30
7/16–20	50
1/2–20	75
5/8–18	210

- 4.11 If touchup paint is required, make sure that the shaft is fully compressed, to avoid contamination of the spline.
- 4.12 Universal shafts can be used in a temperature range between  $-25^{\circ}\text{C}$  ( $-13^{\circ}\text{F}$ ) and  $+80^{\circ}\text{C}$  ( $+176^{\circ}\text{F}$ ). Please contact Rexnord if the operating temperature deviates from these values.
- 4.13 **Lubricate shaft at time of installation following the guidelines provided in section 6.**

## 5. Removal

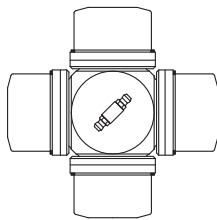
- 5.1 Before removal, secure the universal shaft to prevent spline separation.
- 5.2 Secure the universal shaft against falling before separating it from the companion hubs.
- 5.3 Observe the directions for transport, storage and installation of universal shafts (sections 2 and 4).

## 6. Maintenance

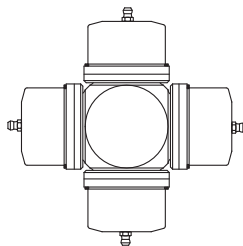
- 6.1 For the re-lubrication of universal shafts, use lithium soap based grease with EP2 additives such as Exxon Mobil Unirex EP2 or equivalent. The grease shall meet or exceed requirements of DIN 51825 KP2N-20. Under no condition should grease with Molycote additives be used.
- 6.2 Clean the grease fittings prior to lubrication. This will prevent any unwanted dust, dirt or debris from entering the bearing.
- 6.3 Do not exceed maximum permissible lubricating pressure of 215 psi.
- 6.4 Lubricate and purge grease from bearing caps on all universal drive shaft bearings. Each bearing must be purged until black spent grease is no longer present. All purged grease must be cleaned up and disposed of according to customer specifications or local regulations.
- 6.5 If all bearings did not purge, unbolt the flange and move it back and forth to attempt to equalize pressure and then re-purge.
- 6.6 Check splines for looseness. This is a manual procedure and only effective in small to medium size drive shafts. Check for severe corrosion.
- 6.7 Replace any missing or damaged grease fittings including grease relief fittings if applicable.
- 6.8 Check that all bolts are torqued to specifications. Refer to section 4.9. Replace any hardware that is loose or damaged.
- 6.9 If the universal shaft is not connected on either end, then pilots, bolt holes, and flange faces should be inspected for nicks, burrs, and elongated holes.

- 6.10 Paint stripes on each bolt head/nut to verify it has been inspected and properly torqued.
- 6.11 Visually check for proper phasing of drive shaft.
- 6.12 When cleaning universal shafts, do not use high pressure water, steam or aggressive chemicals. This may damage the seals and allow dirt, water, or other contaminants to penetrate and damage the shaft. After cleaning and prior to operation, always purge all eight bearing caps with fresh grease and lubricate the spline section per 6.14.
- 6.13 Journal Cross Assemblies: The journal cross assemblies may be re-lubricated via a grease fitting located in the middle of the cross or on each bearing cap depending on the lubrication setup. The location of the grease fittings is shown in Figure 7. Each of the bearings must be purged until all old grease is removed, and fresh grease can be seen exiting the seals.

Central Lubrication



4-pt (Cap) Lubrication



4-pt Blocked Center

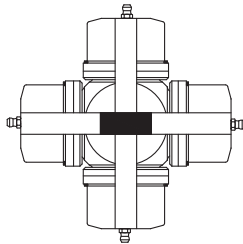


Figure 7 — Use the installed grease fittings for lubricating journal cross assemblies

- 6.14 Length compensation (spline): If the spline is equipped with grease fittings, it shall be re-lubricated every time maintenance of the cross journal assemblies is carried out. It is recommended that the spline be lubricated in the compressed position to prevent hydraulic grease lock. If the spline section is not equipped with a relief fitting, once the spline has been greased, the grease fitting should be removed to relieve grease pressure and prevent the spline from locking. The possible location of the grease fittings is shown in Figure 8.

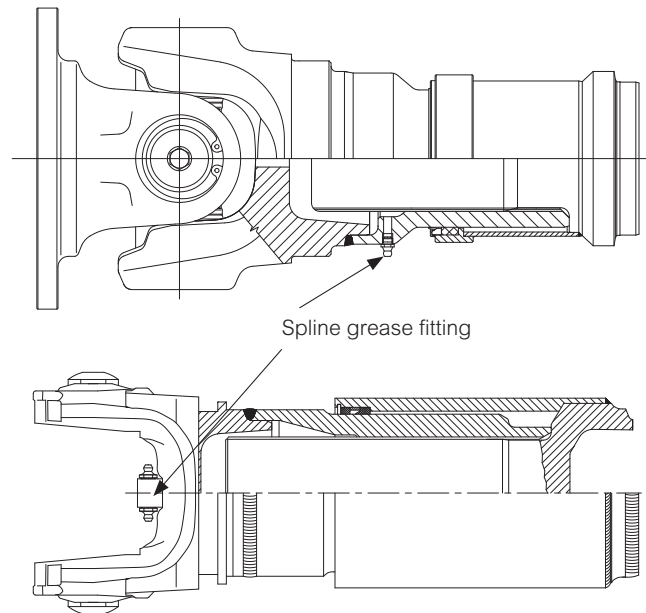


Figure 8 — spline grease fitting location. On the OD (top), or between the yokes (bottom)

- 6.15 Recommended lubrication intervals:
  - 6.15.1 Rexnord Industrial Services recommends that universal shafts be lubricated and inspected every 90 days, or every 1000 run hours, whichever comes first.
  - 6.15.2 Operation in harsh environments (e.g. high ambient temperature, humid, caustic) may necessitate shorter lubrication intervals. Rexnord recommends adapting the lubrication intervals to the operating conditions.
- 6.16 To guarantee quality and performance, the universal shafts should only be repaired by Rexnord Industrial Services.