

Industrial and Off-Highway Americardan Universal Driveshafts



Part of Sumitomo Drive Technologies



Ameridrives designs, sources, manufactures and tests a complete driveshaft product offering with industry leading performance that includes genuine Spicer Universal Joints, patented INTER-SEALED slip sections, wing style (including the former Twin Disc line), and DIN style designs. If you have a driveshaft need, we will meet that need by providing a product of the highest quality, and highest value in its class.

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- Authorized Spicer Components upon Request
- DIN or SAE Designs
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- Closed Eye Designs
- Custom or Standard Solutions
- Complete Assemblies or Individual Components
- Custom Design and Manufacturing
- Complete Rebuild Services of any Shaft Configuration

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- Design a solution and quote
- Upon receipt of your order source or manufacture the components
- Assemble, weld, test and ship to you

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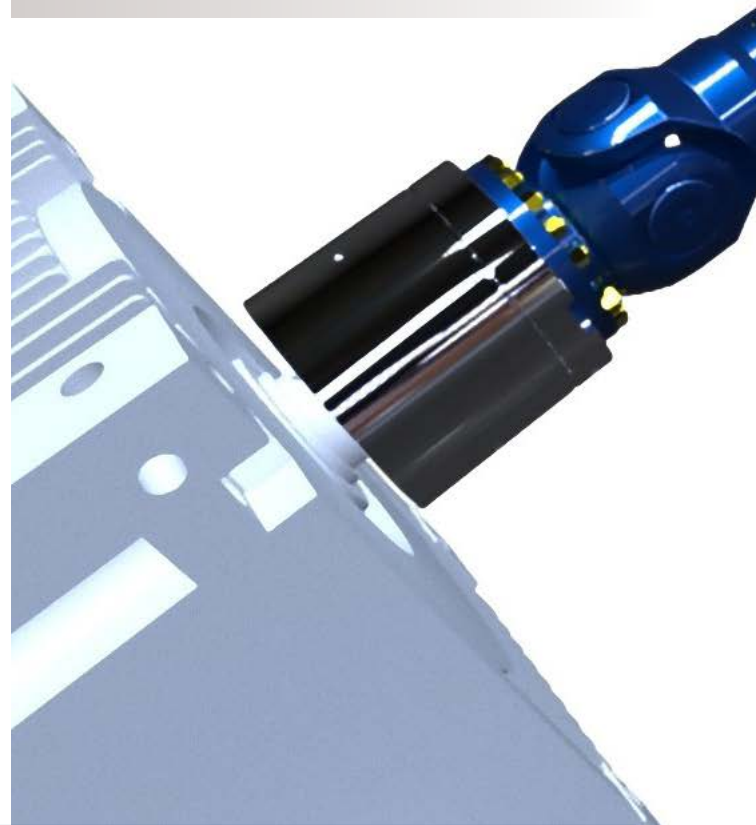


Altra Industrial Motion

Altra is a leading global designer and manufacturer of quality power transmission and motion control products utilized on a wide variety of industrial drivetrain applications. Altra clutches and brakes, couplings, gearing and PT component product lines are marketed under the industries most well known manufacturing brands. Each brand is committed to the guiding principles of operational excellence, continuous improvement and customer satisfaction. Highly-engineered Altra solutions are sold in over 70 countries and utilized in a variety of major industrial markets, including food processing, material handling, packaging machinery, mining, energy, automotive, primary metals, turf and garden and many others.

Altra's leading brands include **Ameridrives**, **Bauer** Gear Motor, **Bibby** Turboflex, **Boston** Gear, **Delroyd** Worm Gear, **Formsprag** Clutch, **Guardian** Couplings, **Huco**, **Industrial** Clutch, **Inertia** Dynamics, **Kilian**, **Lamiflex** Couplings, **Marland** Clutch, **Matrix**, **Nuttall** Gear, **Stieber**, **Stromag**, **Svendborg** Brakes, **TB Wood's**, **Twiflex**, **Warner** Electric, **Warner** Linear and **Wichita** Clutch.

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1802 Pittsburgh Avenue
Erie, PA. 16502-1943
Phone: 814-480-5000
Fax: 814-453-5891
www.ameridrives.com

General Machinery Application Data for Selection and Design

Customer: _____ No. of Units: _____
Contact Name: _____ Phone: _____
Applications: _____ Fax: _____
Inquiry No.: _____

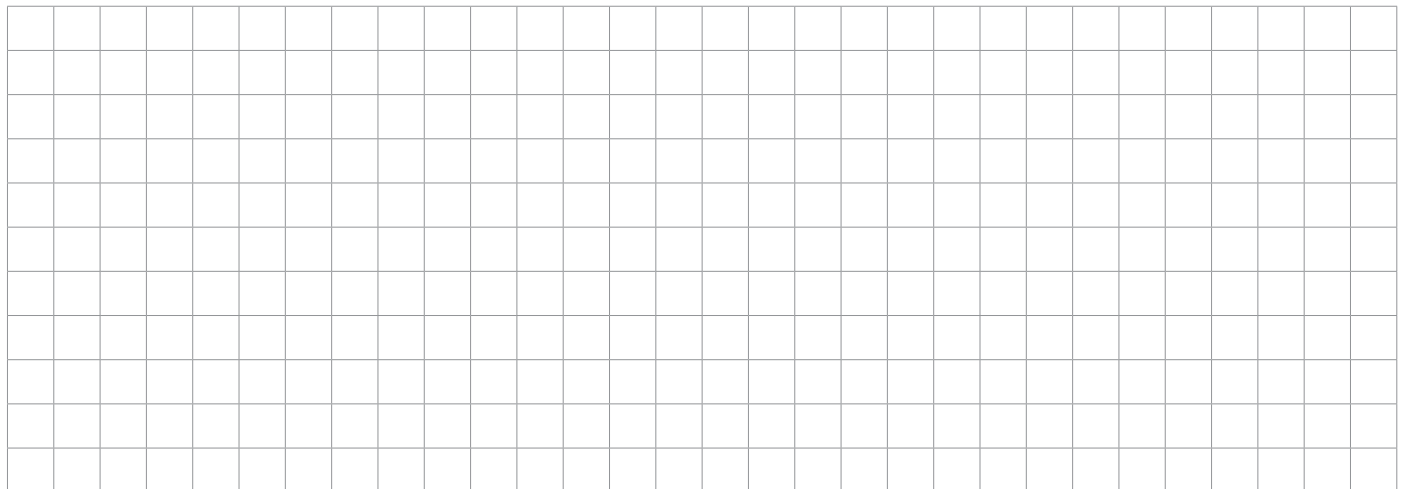
Complete the following information for your application:

1. Motor Horsepower _____	10. No Load Angle _____
2. Motor RPM (Min. and Max.) _____	10a. No Load Offset _____
3. Required Service Factor _____	11. Horizontal Application _____
4. Operating RPM _____	11a. Vertical Application _____
5. Reducer Ratio _____	12. Drive End Bore & Keyway _____
6. Normal Operating Torque _____	13. Driven End Bore & Keyway _____
7. Shaft Separation (Min. and Max.) _____	14. Diameter Limitations _____
8. Required Shaft Axial Slide _____	15. Desired B-10 Life Hours _____
9. Operating Angle _____	
9a. Operating Offset _____	

Comments or special conditions such as: Ambient temperature, atmospheric, etc.: _____

Note: If bolting to existing drive and driven flanges, please specify flange diameter, pilot diameter, bolt circle, number of bolts and bolt size: _____

Space provided below for sketch.



CAUTION:

This product will be selected based on the information supplied to Ameridrives by the Purchaser. Complete and accurate information will help to minimize errors and misapplications. Further, it is the responsibility of the Purchaser to assure the interface connection between couplings and connected equipment (flanges, bolting, keys, hydraulic fits, etc.), are capable of handling anticipated loads. Ameridrives will not be responsible for errors due to inaccurate or incomplete information supplied to Ameridrives.



Ameridrives

1802 Pittsburgh Avenue • Erie, PA. 16502

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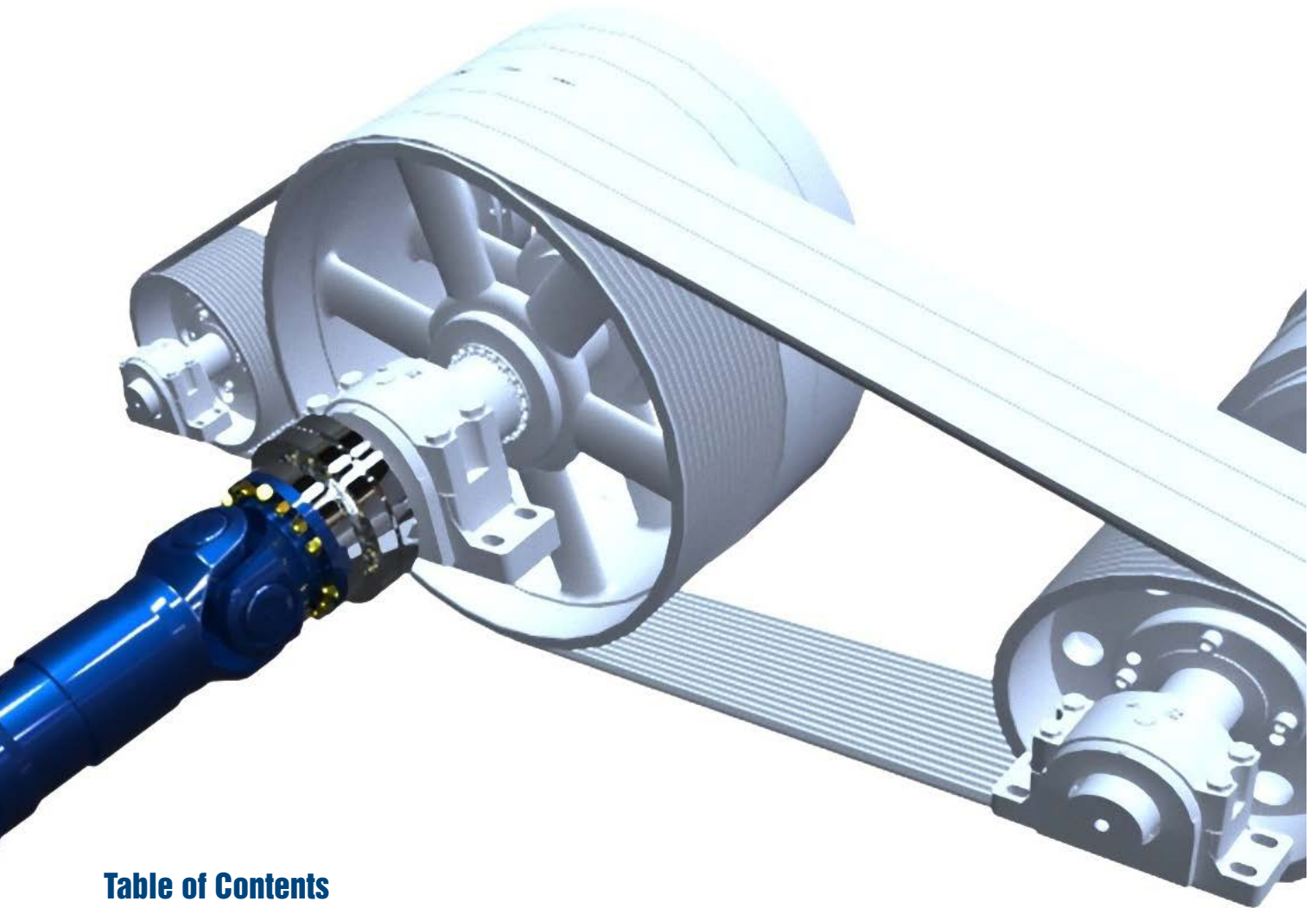


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Part of Sumitomo Drive Technologies

Advantages and Design Typical Applications

Advantages and Features

- High torque capacity
- Long bearing life
- High operating angle capability
- One piece yoke and bearing housing construction
- Eliminates unnecessary bolted connections and serrations in yokes
- Heat treated alloy steel components
- Ideal loading across entire bearing length due to balanced deflection between yokes and cross
- Replaceable inner bearing race on size U3440 and larger significantly reducing cross-maintenance expenses
- Available in four basic types
- Technical support and engineering services available
- Extensive repair facility
- Special sizes and designs available upon request
- Large sizes available



Typical Applications

Following is a partial list of applications for the Ameridrives Universal Joint:

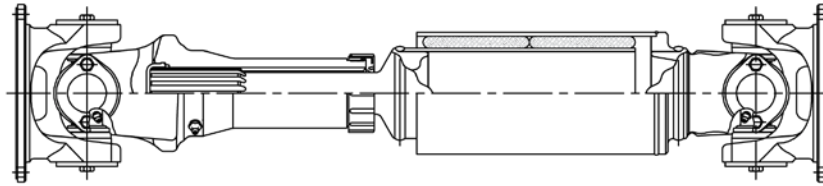
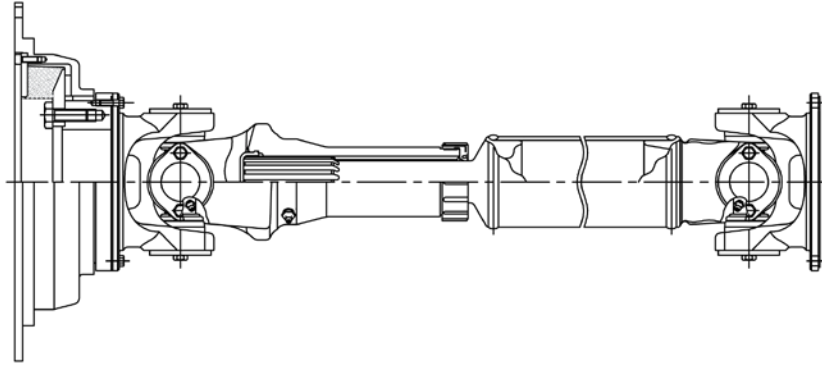
- | | |
|---------------------|--------------------------|
| Agitators | Packaging |
| Balancing Machines | Paper Mills |
| Blowers and Fans | – Calender Drives |
| Compressors | – Sizing and Press Rolls |
| Conveyors | – Couch Rolls |
| Cooling Tower Fans | – Process Pumps |
| Cranes and Hoists | Plastic Manufacturing |
| Crushers | – Melt Pumps |
| Farming Equipment | Printing Presses |
| Generators | Pumps |
| Glass Manufacturing | – Irrigation |
| Lumber Mills | – Lift |
| Marine Propulsion | – Sewage |
| Mining Equipment | Railway Drives |
| Oil and Gas | Rubber Processing |
| – Drilling | – Mixers |
| – Pumps | – Calenders |
| | Shredders |
| | Textile Equipment |

Metals Industry

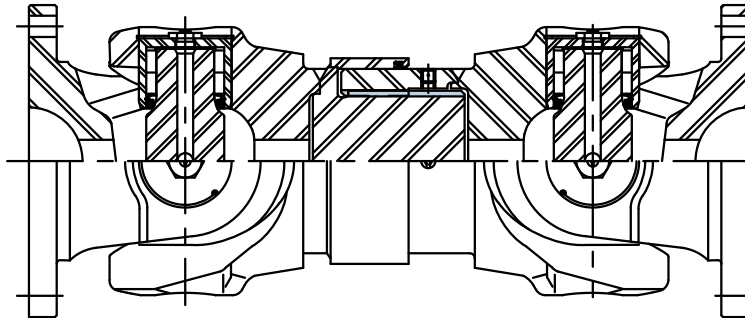
(Steel, Aluminum, Copper and Brass)

- | | |
|--------------------|--------------------|
| Bar and Rod Mills | Runout Tables |
| Cold Reduction | – Piercers |
| Continuous Casters | – Transfer Cars |
| Hot Strip Mills | – Structural Mills |
| Levelers | Scale Breakers |
| Payoff Reels | Shears |
| – Pinch Rolls | Side Trimmers |
| – Coilers | Straighteners |
| – Brush Rolls | Temper Mills |
| – Bridles | Tension Reels |
| – Flatteners | Tube Mills |
| – Slitters | Vertical Edgers |
| Pipe Mills | Wire Mills |

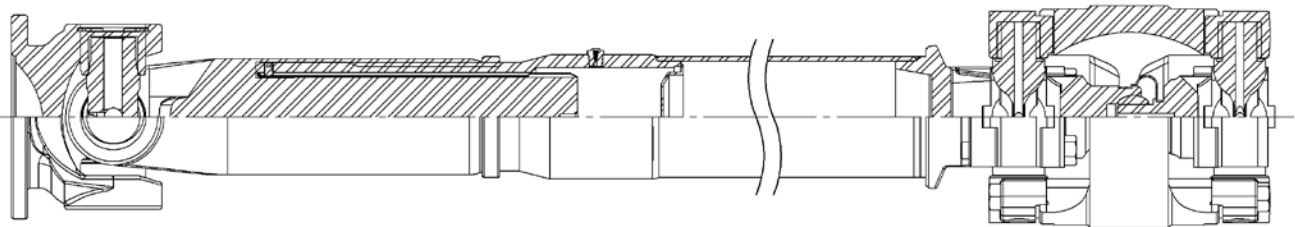
Design Variations Custom Applications



Torsionally Dampened Driveshafts

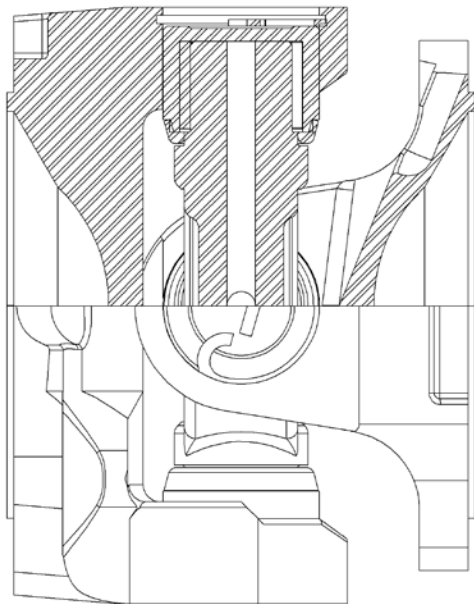
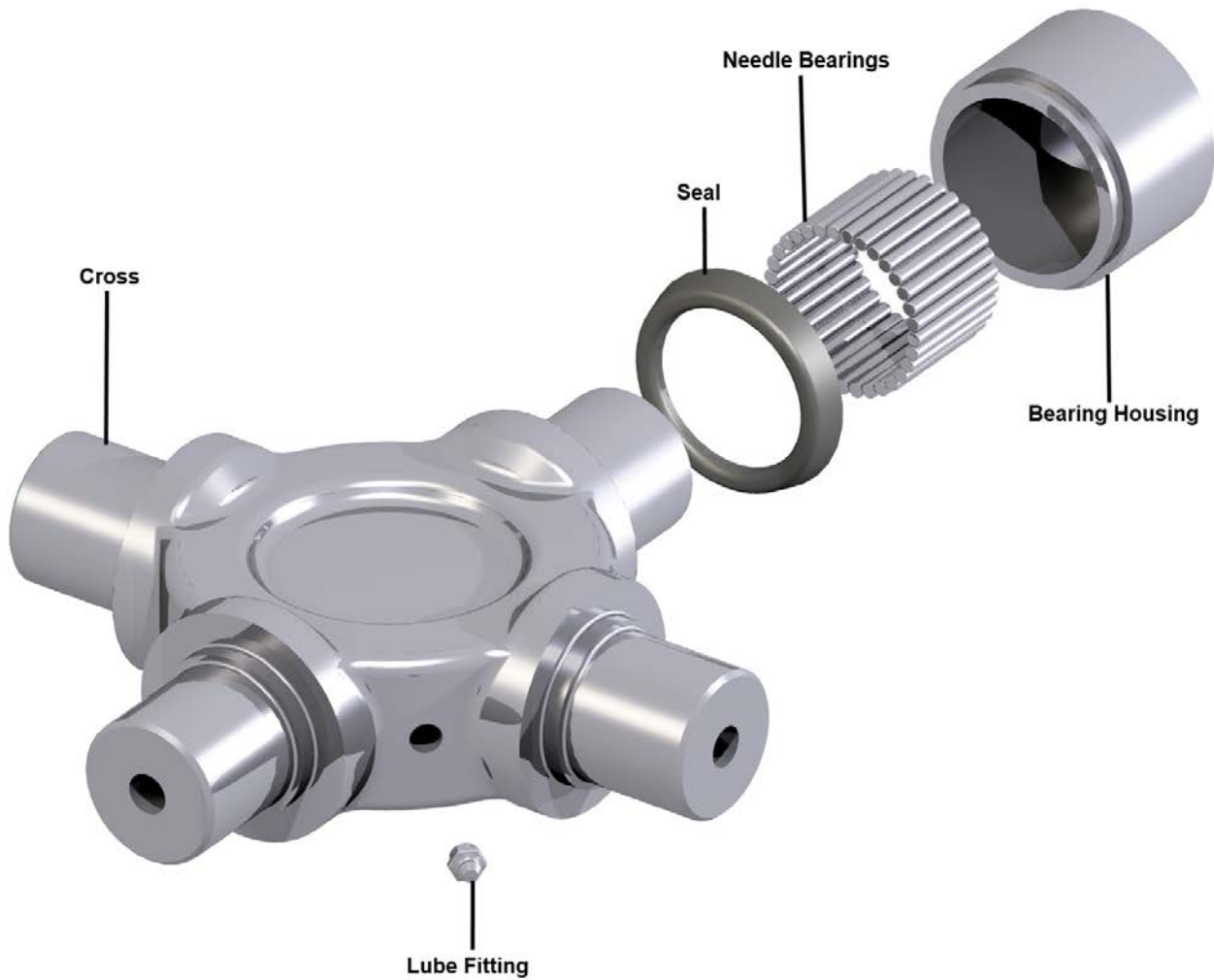


Short Travel Capability



Long Travel Capability With Expansion and CV Joint

Design Features Round Bearing



2000 Series

Sizes U2131-U2155: Needle bearing design. Bearing caps are retained by snap rings.

Sizes U2160-U2188: Needle bearing design. Bearing caps are retained by bolts.

Sizes U2192: Uses two rows of roller bearings. Bearing caps are retained by snap rings. Lube fitting in center of cross.

Authorized Spicer Components upon Request

SPICER[®]
DRIVETRAIN COMPONENTS

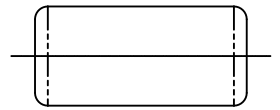
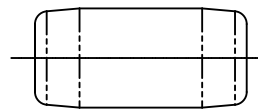
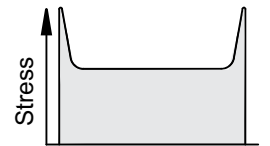
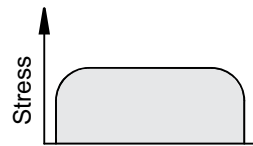
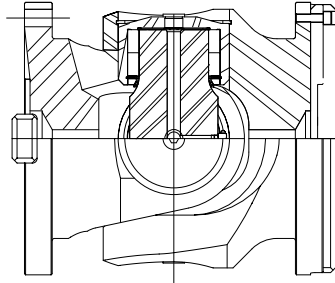
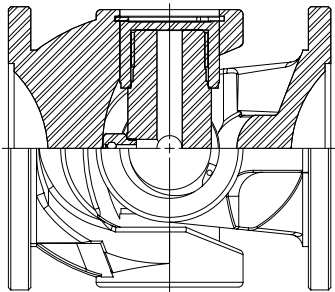
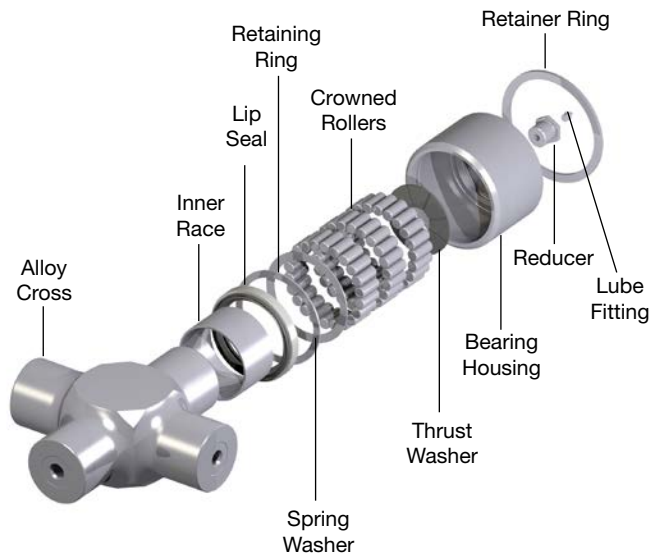
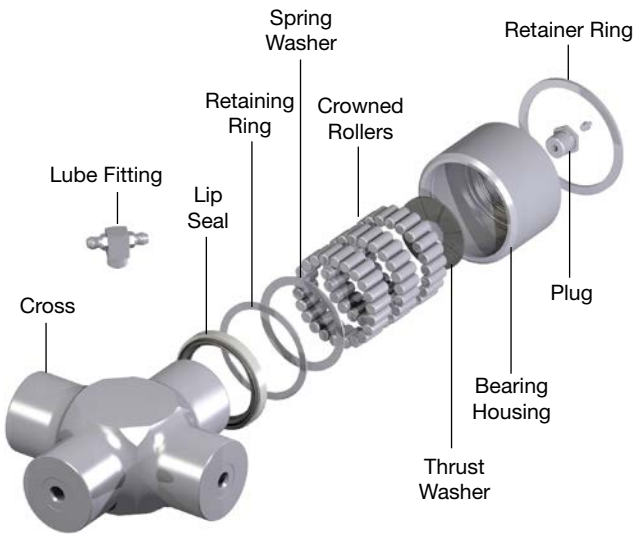
Design Features Round Bearing

Higher Torque

U3055 - U3390 / U5225 - U5800

Americardan

U3440 - U3800



Crowned Roller

Straight Roller

Sizes U3055-U3100: Needle bearing design. Lube fitting in center of cross.

Sizes U3115-U3200: Uses two rows of roller bearings. Bearing caps are retained by snap rings. Lube fitting in center of cross.

Sizes U3225-U3390, U5225 - U5390: Uses two rows of roller bearings. Bearing caps are retained by snap rings. Lube fittings in center bearing cap is optional.

Sizes U3440-U3920, U5440 - U6200: Uses three or more rows of roller bearings. Includes replaceable inner races in the bearing assemblies. Bearing caps are retained by large snap rings. Lube fittings are in each bearing cap.

Inner Bearing Race for U3440-U3800 – Replaceable inner bearing race manufactured from bearing steel fits over forged alloy cross in select sizes. This design provides long bearing life and permits for economical replacement of bearing assemblies.

Radius Shoulder Trunnions – Shoulder has generous radius at base of cross trunnion to reduce stress concentrations.

Double-Lip Seal – Abrasion resistant multi-lip extruder type seals to insure integrity of the bearing lube reservoir. 4 Point lubrication with lube fittings on each bearing housing.

Thrust Bearings – Each cap has a filled nylon compound thrust washer to prevent steel on steel contact of the trunnion to minimize friction and prevent galling under heavy loads. Filled nylon thrust bearings automatically adjust themselves to compensate for minor deflections.

Crowned Rollers – Eliminates stress concentrations at the ends of the rollers. The reduction in stress contributes significantly to increased bearing (B10) life. Three rows of rollers are used to distribute load over length of trunnion.

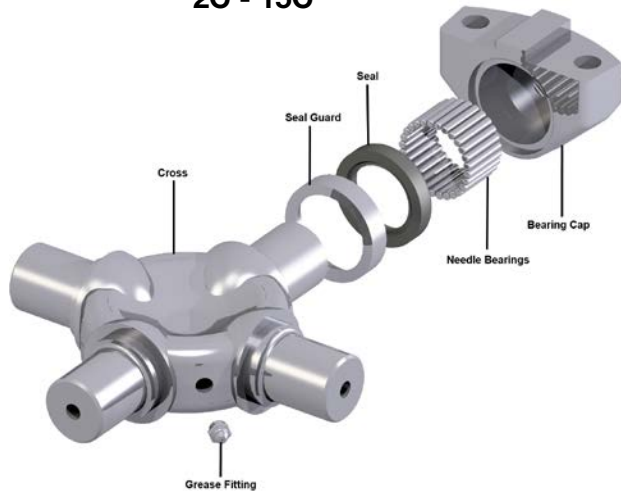
Zero Clearance Assembly – Cross and bearing assembled for zero radial clearance for optimum thrust and radial bearing performance and elimination of radial whirl associated with vibrations.

Contoured Bearing Caps – Allows for longer cross journals for increased torque and bearing capacity.

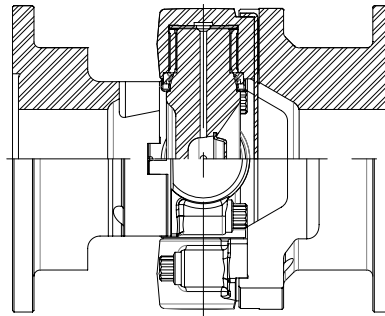
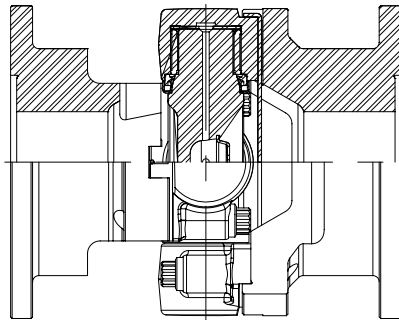
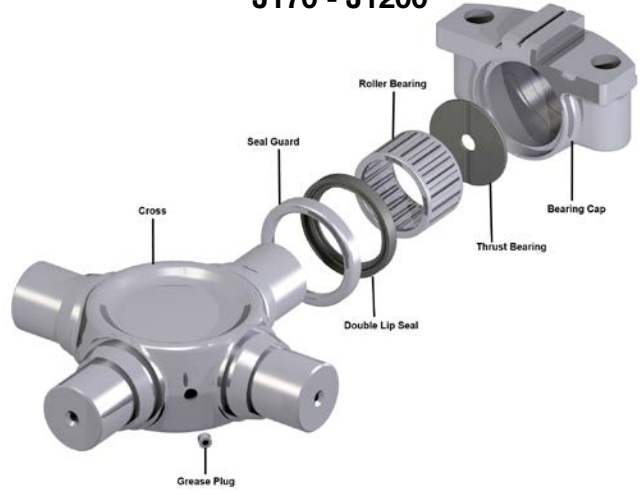
Flanges – Commonly supplied with face pad or hirth flanges to provide a backlash free connection capable of transmitting high torques.

Design Features Wing Bearing

2C - 15C



J170 - J1200



Tapered-Shoulder Trunnions – Shoulder is tapered at base of the cross trunnions to reduce bending stresses. This construction also protects the seal from accidental damage during assembly.

Double-Lip Seal – Provides positive protection against grease leakage.

Thrust Bearings – Each cap has a 30% glass filled nylon compound thrust bearing to prevent steel-on-steel contact of trunnions to minimize friction and prevent galling under heavy loads. Glass-filled nylon bearings automatically adjust themselves to compensate for minor deflections.

Accurately-Guided Roller Bearings –

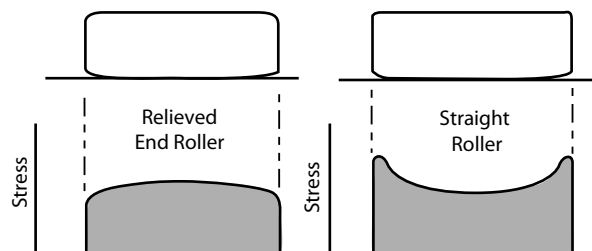
A standard and exclusive feature. Cage prevents skewing by holding each roller parallel to the axis of the trunnion. Each roller thus carries its full share of the bearing load.

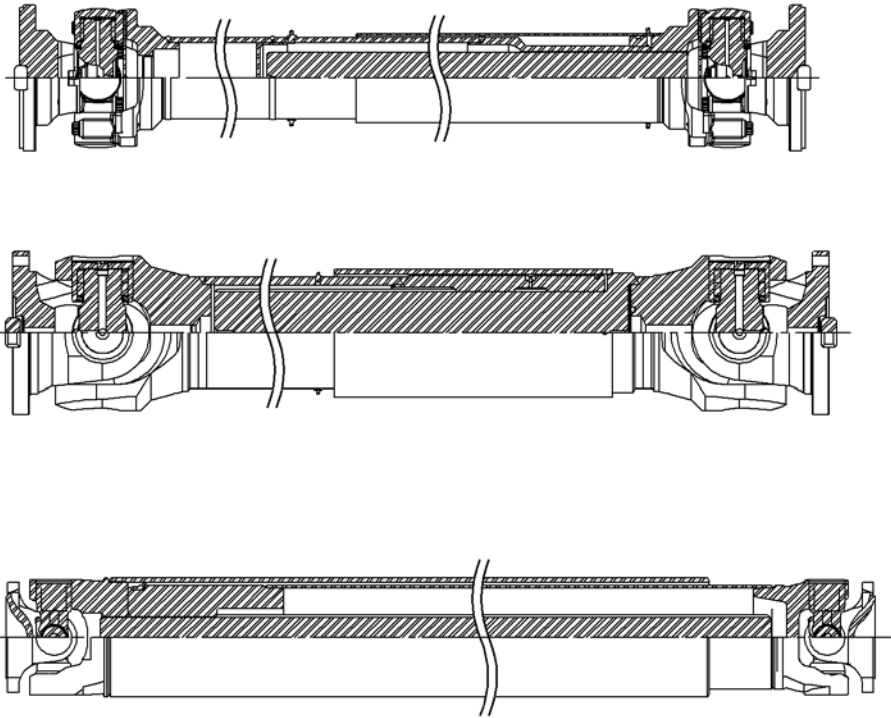
Also, this type bearing retains more grease.

Permanent Grease Feature – Proven successful over years of service in crawler tractor, off-highway trucks and front-end loader applications, Ameridrives now offers this feature to all users. Cross and bearing assemblies are sealed for the normal life of the U-joint driveshaft. This prevents dirt and contamination from entering cross and bearing assemblies through the grease gun from poorly maintained servicing equipment and there is no longer a need to grease an inaccessible U-joint buried beneath shrouds and guards.

“Relieved End” Rollers – Rollers are slightly tapered to eliminate stress concentration normally encountered at the ends (see sketch). The more uniform stress pattern thereby gained adds appreciably to bearing life.

- Accurately guided roller bearings have hardened steel phosphate coated cages.
- .0001" roller manufacturing tolerance for improved bearing life.
- 8620 Vacuum De-Gassed Steel Bearing Caps and Crosses. Clean steel improves fatigue properties.
- Improved thrust bearing-glass filled nylon compound material.





Ameridrives offers a wide array of custom slip designs to fit your unique needs and long travel applications. Long travel slip assemblies are made possible by the inverted spline allowing extended slip lengths far beyond the limits of other designs. Our patented Inter-Sealed® design is the most versatile with options of having a self-lubricating coating on the splines to reduce axial loads and prevent premature wear. A positive full contact seal ensures that the grease remains inside and the contaminants remain out. For more information regarding custom slip lengths please contact an Ameridrives application engineer.

Selection Information Speed Limits

I. Speed Limit Based on Limits of Mass Acceleration

When universal joints are operated at any angle greater than zero, the center section of the universal joint always runs irregularly, being accelerated and decelerated twice in every revolution. The maximum values of mass acceleration torque arising here are dependent on the operating speed and angle of deviation β and upon the moment of inertia of the center shaft section [RPM x A].

To ensure smooth running of the universal joint, the mass acceleration torque must not be allowed to exceed the limits shown in Table 1.

II. Speed Limit Based on Lateral Critical Speed

In applications where long lengths of shafts are required, the speed is restricted by the lateral critical speed of the center section. This speed is a function of the center tube diameter wall thickness, and the effective length. The maximum operating speed must be less than the lateral critical speed N_c shown in Table 2.

NOTE:

Allowable Operating Speed = $N_c \times .75$.

In many applications, operation at 1/2 critical speed will also create unacceptable vibration. For these applications the operating speed should be 8% above or below 50% of the maximum indicated.

For flange-to-flange lengths greater than shown, or if allowable speed is exceeded, contact Ameridrives.

III. Balancing

All standard universal joints under 300 RPM are supplied unbalanced. Between 300-850 RPM they are balanced if required. Consult factory for further information. Over 850 RPM all universal joints are normally supplied balanced. Please consult the factory for special balancing requirements.

Table 1

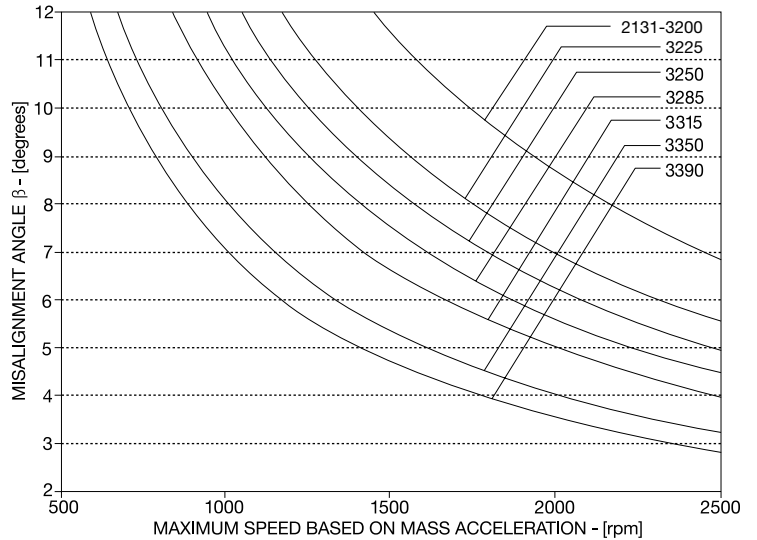
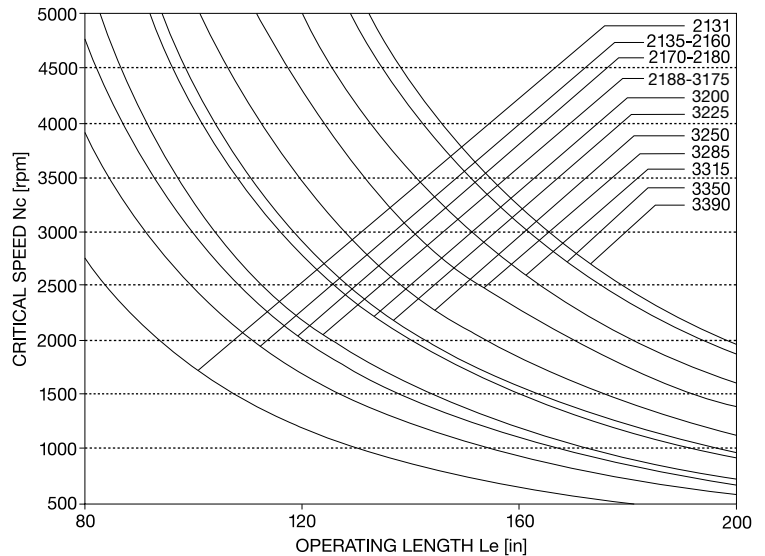


Table 2



The speed limits on this page are only a guide. The actual limits are determined by the characteristics of the system in which the universal joint is installed.

See page 30 for Application Data sheets for easy selection.

Types of torque ratings are given for each joint size.

Endurance torque (T_{dw}) is the normal rating for fully reversing torque based on material strength.

Bearing Life torque (B_L) is the bearing life rating of the universal joint. This torque is based on the B-10 life of the universal joint bearings. The life torque values listed are based on 5000 hours B-10 bearing life at 3° misalignment and 100 RPM. B-10 life is defined as the minimum life expectancy for a 90% probability of survival. Typically the average actual operating life of the bearings is 5X the calculated B-10 life.

Peak torque (T_k) is the maximum allowable torque based on the yield strength capacity of the joint.

The torque ratings are based on material strength. When approaching these limits the capacity of the desired flange connection should be verified. When the selection torque (T_s) approaches the endurance torque (T_{dw}) or when the maximum torque approaches the peak torque capacity (T_k) of the universal joint, integral face pads are recommended. The number of pads and bolts are customized on a per application basis. Hirth radial teeth are also available on a per application basis.

Universal Joint Selection

- I. Calculate application torque (T_a) and selection torque (T_s).

$$T_a = \frac{HP \times 63025}{N} \quad (\text{lb.} \times \text{in.})$$

$$T_a = \frac{KW \times 9550}{N} \quad (\text{Nm})$$

N = Speed (RPM)

T_s = Selection Torque = T_a x Service Factor

T_s must be less than T_{dw} for reversing torque applications or T_{ow} for one way pulsating torque applications.

- II. Check to see if life is sufficient.

$$L_h = \frac{1.5 \times 10^6}{A \times N} \left[\frac{B_L}{T} \right]^{(10/3)}$$

Where:

L_h = B-10 Life in Hours

A = Operating Angle in Degrees

N = Speed (RPM)

B_L = Life Torque

T_a = Application Torque

- III. Duty Cycle: In applications where the torque, speed and operating angle vary predictably during a typical load cycle or operational sequence, a duty cycle can be determined. First the load cycle must be analyzed and divided into groups of fixed combinations of torque, speed and operating angle. These groups represent percentages of the total operating time of the load cycle. Life expectancy can then be calculated using Miner's Theory, which takes into account the cumulative effect resulting from operating at varying conditions.

The total life expectancy can be calculated using the following equation:

$$\text{Total Life Expectancy} = \frac{1}{\frac{N_1}{L_1} + \frac{N_2}{L_2} + \frac{N_3}{L_3} + \dots + \frac{N_m}{L_m}}$$

Where:

N_1 = fraction of total, time at operating condition 1

L_1 = life expectancy at operating condition 1 (hours)

m = total number of operating conditions

- IV. Determine Peak Torque conditions.

T_k must exceed the maximum operating torque.

- V. Other considerations:

There are many other items that can determine the size of a universal joint. These include:

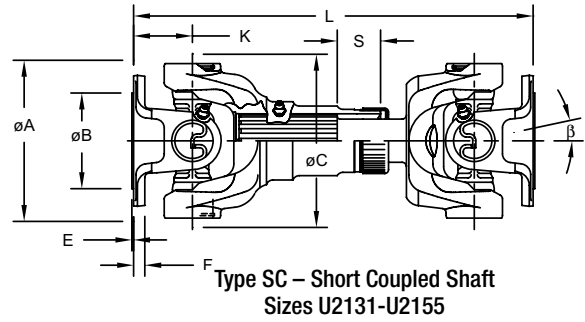
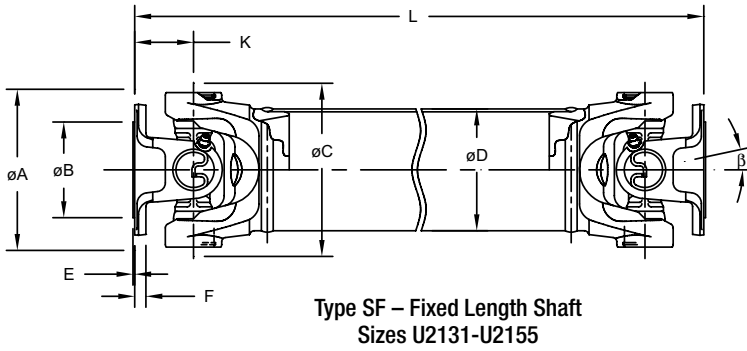
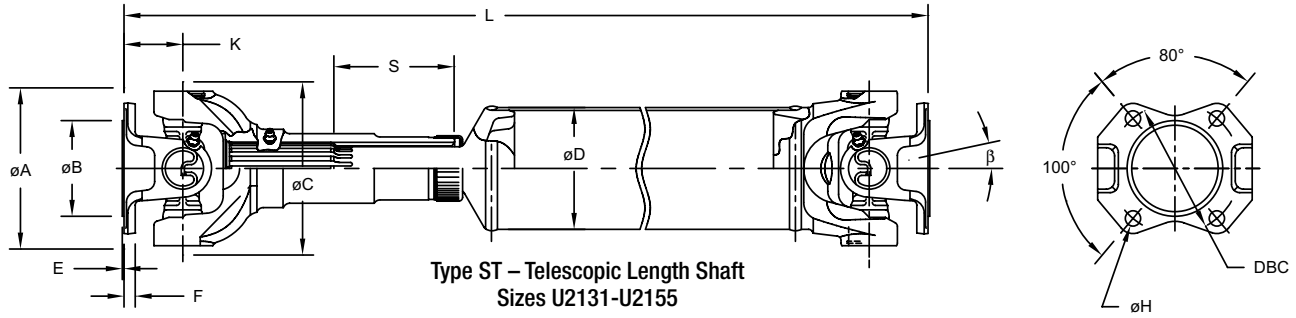
1. Diameter and length limitations.
2. Bore size.
3. Equipment restrictions on forces and moments.
4. Speed limits (see Tables 1 and 2)
 - a. due to mass acceleration as a function of misalignment
 - b. critical speed of center shaft

Telescopic splines are available on ST and FT designs. The splined axial travel sections are required to accommodate movement of the driven end such as a roll position change or axle jounce. SF and FF shaft are properly selected for applications where the roll end has relatively small movements of the driven side along with a clearance or slip fit roll end connection. The amount of required axial movement can be calculated by multiplying the centerline to centerline of the universal joint yokes by 1 minus the cosine of the operating angle for each position.

Nitrided or coated splines are available on request.

Longer or shorter travel is available. Consult Ameridrives.

Engineering Data Series 2000 U2131 - U2155

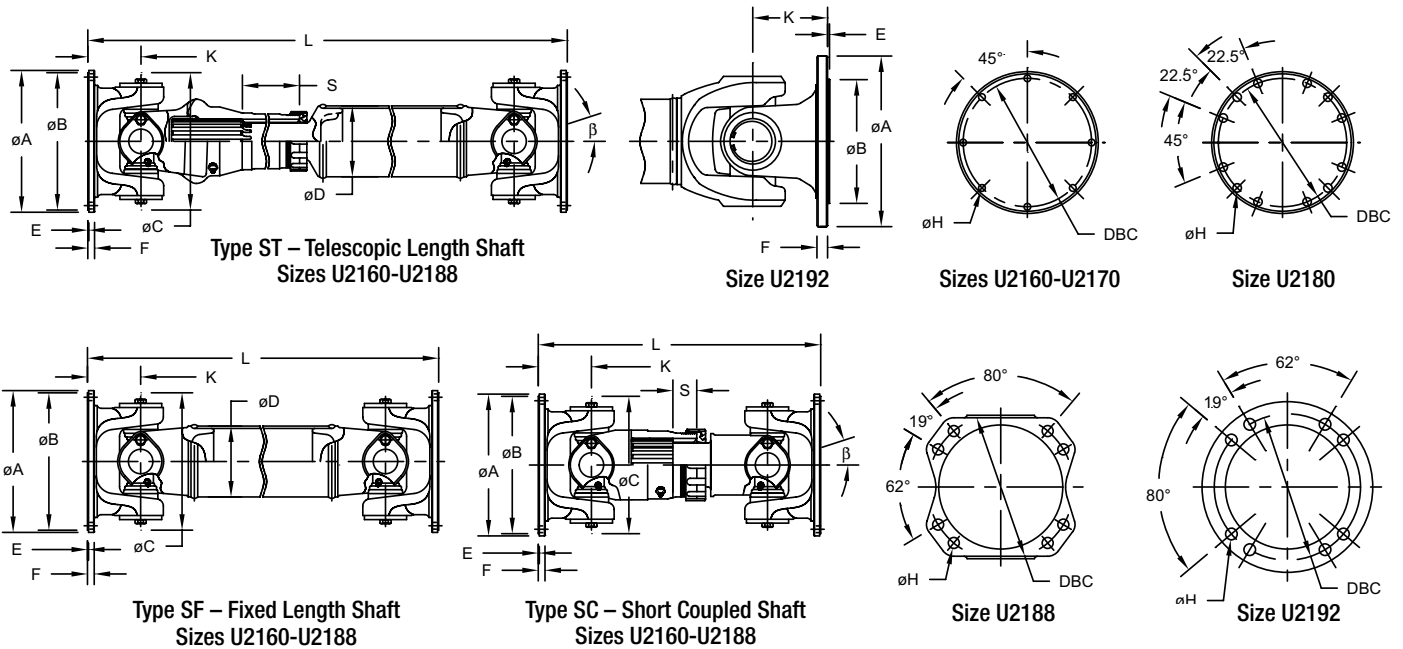


Size	U2131		U2135		U2141		U2148		U2155	
Torque Ratings										
	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm
Tdw	9,419	1,064	13,275	1,500	13,275	1,500	15,171	1,714	19,596	2,214
Tk	19,200	2,169	27,120	3,064	32,400	3,661	39,960	4,515	52,800	5,966
BL	4,800	542	8,160	922	9,840	1,112	13,200	1,492	16,800	1,898
Dimensional Data										
β (ST)	20°		20°		20°		22°		22°	
β (SC)	15°		8°		8°		8°		5°	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
A	3.88	98.60	4.62	117.30	4.62	117.30	5.88	149.40	5.88	149.40
B	2.38	60.50	2.75	69.90	2.75	69.90	3.75	95.30	3.75	95.30
C	3.75	95.30	4.25	108.00	4.69	119.10	4.81	122.20	5.63	143.00
D(1)	2.50	63.50	3.00	76.20	3.50	88.90	3.50	88.90	3.50	88.90
E	0.06	1.50	0.06	1.50	0.06	1.50	0.06	1.50	0.06	1.50
F	0.38	9.70	0.38	9.70	0.38	9.70	0.38	9.70	0.38	9.70
K (ST)	1.38	35.10	1.56	39.60	1.69	42.90	2.00	50.80	2.00	50.80
K (SC)	1.38	35.10	1.56	39.60	1.69	42.90	1.50	38.10	2.00	50.80
DBC	3.12	79.20	3.75	95.30	3.75	95.30	4.75	120.70	4.75	120.70
Bolt Qty.	4		4		4		4		4	
H	0.38	9.70	0.44	11.20	0.44	11.20	0.50	12.70	0.50	12.70
Minimum Length / Length Compensation										
ST / L	13.00	330.20	14.88	378.00	13.72	348.49	15.25	387.40	15.38	390.70
S	3.06	77.70	3.62	91.90	2.34	59.44	2.50	63.50	2.50	63.50
SF / L	7.67	194.80	8.59	218.20	9.03	229.40	10.03	254.80	10.80	274.30
SC / L	8.88	225.60	9.50	241.30	9.50	241.30	8.50	215.90	9.75	247.70
S	1.25	31.80	0.75	19.10	0.75	19.10	1.00	25.40	1.00	25.40

One-Way Endurance Torque Tow = 1.5 x Tdw



Engineering Data Series 2000 U2160 - U2192



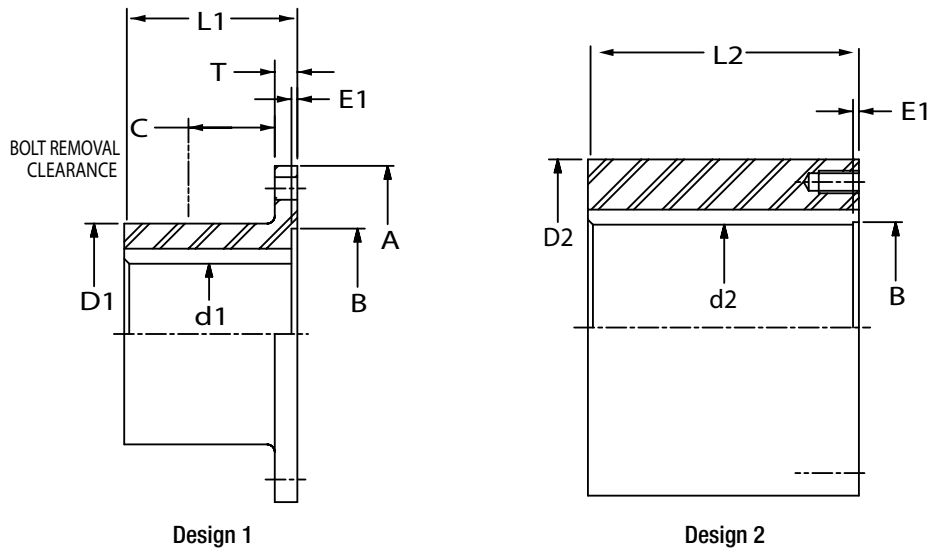
Size	U2160		U2170		U2180		U2188		U2192	
Torque Ratings										
	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm
Tdw	29,521	3,336	39,193	4,429	49,939	5,643	88,816	10,036	100,005	11,300
Tk	78,000	8,814	96,000	10,847	144,000	16,271	192,000	21,695	243,300	27,492
BL	26,400	2,983	35,160	3,973	45,600	5,153	60,000	6,780	124,103	14,023
Dimensional Data										
β (ST)	26°		22°		30°		22°		25°	
β (SC)	8°		8°		12°		8°		25°	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
A	6.88	174.80	8.00	203.20	8.00	203.20	9.63	244.60	9.63	244.60
B	6.62	168.10	7.75	196.90	7.75	196.90	7.00	177.80	7.00	177.80
C	7.00	177.80	7.75	196.90	9.13	231.90	8.63	219.20	8.03	204.00
D(1)	3.50	88.90	4.00	101.60	4.50	114.30	4.50	114.30	5.50	139.70
E	0.06	1.50	0.06	1.50	0.06	1.50	0.09	2.30	0.09	2.30
F	0.38	9.70	0.38	9.70	0.38	9.70	0.63	16.00	0.59	15.00
K (ST)	2.75	69.90	3.00	76.20	3.38	85.90	3.50	88.90	4.33	110.00
K (SC)	1.88	47.80	2.00	50.80	2.59	65.80	2.50	63.50	4.33	110.00
DBC	6.13	155.70	7.25	184.20	7.25	184.20	8.25	209.60	8.25	209.60
Bolt Qty.	8		8		12		8		8	
H	0.38	9.70	0.38	9.65	0.44	11.20	0.63	16.00	0.63	16.00
Minimum Length / Length Compensation										
ST / L	22.94	582.70	23.44	595.40	24.80	629.90	24.81	630.20	27.56	700.00
S	4.88	124.00	3.88	98.60	3.38	85.90	3.50	88.90	2.95	74.90
SF / L	13.81	350.80	14.37	365.00	16.30	414.00	19.31	490.50	21.43	544.30
SC / L	9.12	231.60	10.62	269.70	13.40	340.40	13.62	345.90	21.46	545.10
S	0.75	19.10	0.75	19.10	1.12	28.40	1.00	25.40	1.58	40.10

One-Way Endurance Torque Tow = 1.5 x Tdw



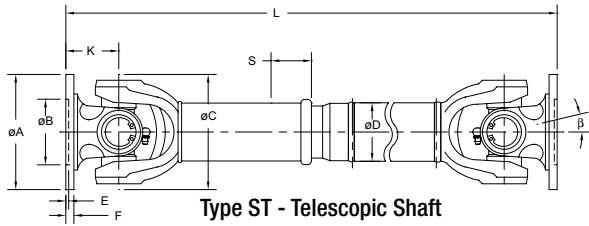
Part of Samtomo Drive Technologies

Companion Flange Dimensions U2131 - U2192

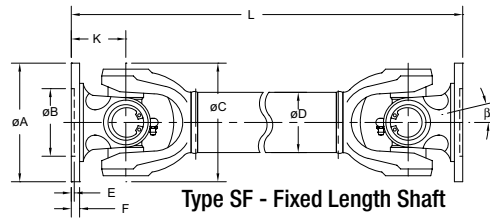


Size	U2131		U2135/U2141		U2148/U2155		U2160		U2170		U2180		U2188/U2192	
	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
A	3.88	98.60	4.63	117.60	5.88	149.40	6.88	174.80	8.00	203.20	8.00	203.20	9.63	244.60
B	2.38	60.50	2.75	69.90	3.75	95.30	6.62	168.10	7.75	196.90	7.75	196.90	7.00	177.80
E	0.08	2.00	0.08	2.00	0.08	2.00	0.04	1.00	0.04	1.00	0.04	1.00	0.11	2.80
F	0.38	9.70	0.50	12.70	0.38	9.70	0.38	9.70	0.38	9.70	0.50	12.70	0.38	9.70
L1	2.00	50.80	2.00	50.80	2.50	63.50	3.50	88.90	4.00	101.60	4.00	101.60	4.50	114.30
D1	2.44	62.00	2.88	73.20	3.75	95.30	5.25	133.40	6.38	162.10	6.38	162.10	6.88	174.80
d1	1.69	42.90	1.88	47.80	2.44	62.00	3.12	88.90	4.00	101.60	4.00	101.60	4.50	114.30
L2	2.50	63.50	3.00	76.20	3.50	88.90	5.00	127.00	6.00	152.40	6.00	152.40	6.00	152.40
d2	2.38	60.50	2.75	69.90	3.75	95.30	4.75	120.70	5.50	139.70	5.50	139.70	6.50	165.10

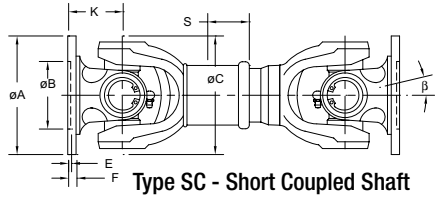
Engineering Data U3055 - U3115



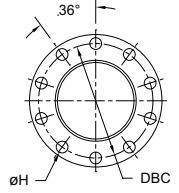
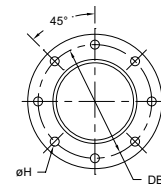
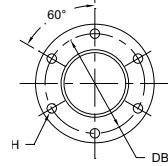
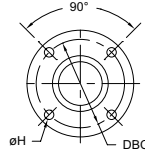
Type ST - Telescopic Shaft



Type SF - Fixed Length Shaft



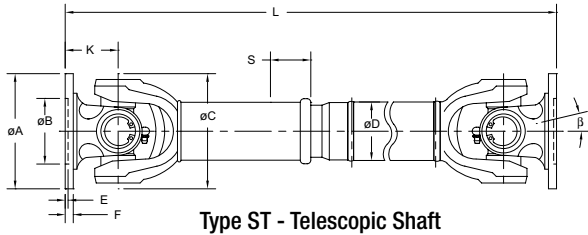
Type SC - Short Coupled Shaft



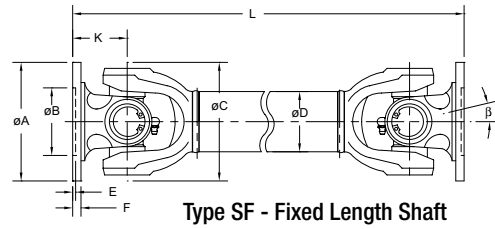
Size	U3055		U3060		U3070		U3090		U3100		U3115					
Torque Ratings																
	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm				
Tdw	1,037	117	1,382	156	2,852	322	6,195	700	8,850	1,000	13,275	1,500				
Tk	2,213	250	4,602	520	10,620	1,200	19,470	2,200	26,550	3,000	38,498	4,350				
BL	1,319	149	2,053	232	3,478	393	5,682	642	9,080	1,026	16,381	1851				
Dimensional Data																
B	30°		25°		30°		20°		30°		18°		20°		18°	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
A	2.28	58	2.56	65	2.56	65	2.95	75	2.95	75	3.54	90	3.54	90	3.94	100
B	1.18	30	1.38	35	1.38	35	1.65	42	1.65	42	1.85	47	1.85	47	2.24	57
C	2.05	52	2.05	52	2.36	60	2.36	60	2.76	70	2.76	70	3.39	86	3.39	86
D	1.12	28	1.12	28	1.25	32	1.25	32	1.56	40	1.56	40	1.97	50	1.97	50
E	0.06	1.5	0.07	1.7	0.07	1.7	0.09	2.2	0.1	2.2	0.1	2.5	0.1	2.5	0.1	2.5
F	0.14	3.5	0.16	4	0.16	4	0.22	5.5	0.22	5.5	0.24	6	0.24	6	0.28	7
K	1.18	30	1.18	30	1.26	32	1.26	32	1.42	36	1.42	36	1.65	42	1.65	42
DBC	1.85	47	2.05	52	2.05	52	2.44	62	2.44	62	2.93	74.5	2.93	74.5	3.31	84
Bolt Qty.	4	4	4	4	4	4	6	6	6	6	4	4	4	4	6	6
H	0.2	5	0.24	6	0.24	6	0.24	6	0.24	6	0.31	8	0.31	8	0.31	8
Minimum Length / Length Compensation																
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm				
ST L/S	10.55/1.57	268/40	11.42/2.36	290/60	11.81/1.38	300/35	13.70/1.57	348/40	14.72/1.57	374/40	18.62/2.36	473/60				
SF L	6.3	160	6.5	165	7.87	200	8.5	216	9.84	250	11.85	301				
SC L/S	6.50/79	165/20	7.09/79	180/20	7.87/98	200/25	8.86/98	225/25	10.04/1.18	255/30	12.80/1.38	325/35				
SC L/S	6.89/98	175/25	7.87/1.18	200/30	8.86/1.38	225/35	9.84/1.57	250/40	11.02/1.57	280/40	14.17/1.97	360/50				
SC L/S	7.68/98	195/25	8.86/1.18	220/30	9.84/1.38	250/35	11.02/1.57	280/40	12.20/1.57	310/40	15.75/2.36	400/60				
SC L/S	8.46/98	215/25	9.25/1.18	235/30	10.63/1.38	270/35	12.20/1.57	310/40	13.38/1.57	340/40	16.93/2.36	430/60				

One-Way Endurance Torque Tow = 1.5 x Tdw

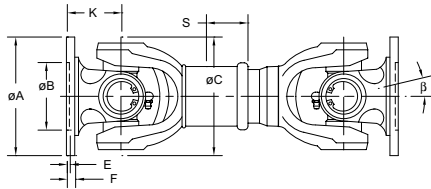
Engineering Data 3000 U3125 - U3200



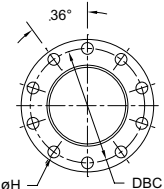
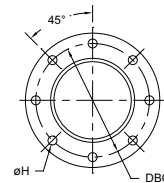
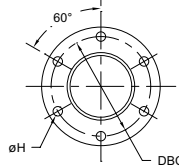
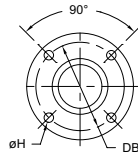
Type ST - Telescopic Shaft



Type SF - Fixed Length Shaft



Type SC - Short Coupled Shaft

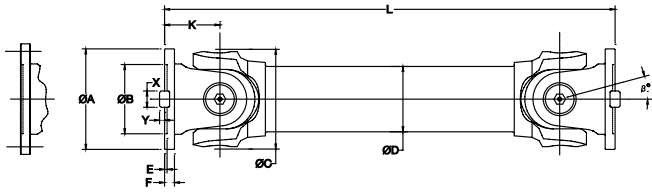


Size	U3125		U3140		U3155		U3160		U3175		U3200			
Torque Ratings														
	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm		
Tdw	15,930	1,800	22,125	2,500	35,400	4,000	39,825	4,500	64,605	7,300	100,005	11,300		
Tk	47,348	5,350	62,393	7,050	94,253	10,650	115,050	13,000	193,815	21,900	309,750	35,000		
BL	22,037	2,490	30,842	3,485	40,462	4,572	51,596	5,830	71,614	8,092	124,100	14,023		
Dimensional Data														
B	20°		18°		20°		20°		20°		20°		25°	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
A	4.72	120.00	5.91	150.00	5.91	150.00	7.09	180.00	5.91	150.00	7.09	180.00	6.50	165.00
B	2.95	75.00	3.54	90.00	3.54	90.00	4.33	110.00	3.54	90.00	4.33	110.00	3.74	95.00
C	4.92	125.00	4.92	125.00	5.43	138.00	5.43	138.00	5.91	150.00	5.91	150.00	6.22	158.00
D	2.76	70.00	2.76	70.00	3.15	80.00	3.15	80.00	3.54	90.00	3.54	90.00	3.94	100.00
E	0.10	2.50	0.12	3.00	0.12	3.00	0.14	3.60	0.12	3.00	0.14	3.60	0.12	3.00
F	0.35	9.00	0.35	9.00	0.39	10.00	0.39	10.00	0.47	12.00	0.47	12.00	0.47	12.00
K	2.36	60.00	2.36	60.00	2.56	65.00	2.56	65.00	2.95	75.00	2.95	75.00	3.39	86.00
DBC	4.00	101.50	5.12	130.00	5.12	130.00	6.12	155.50	5.12	130.00	6.12	155.50	5.51	140.00
Bolt Qty.	8	8	8	8	8	8	8	8	8	8	10	10	8	8
H	0.39	10.00	0.39	10.00	0.47	12.00	0.47	12.00	0.47	12.00	0.55	14.00	0.63	16.00
Minimum Length / Length Compensation														
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm		
ST L/S	19.33/2.36	491/60	21.65/4.33	550/110	27.95/4.33	710/110	25.98/4.33	660/110	29.13/4.33	740/110	32.68/5.51	830/140		
SF L	12.09	307	13.58	345	16.73	425	16.93	430	18.31	465	20.47	520		
SC L/S	13.58/1.38	345/35	14.17/1.57	360/40	15.75/1.97	400/50	15.75/1.57	400/40	18.50/2.17	470/55	21.65/1.57	550/40		
SC L/S	14.76/1.97	375/50	15.75/3.15	400/80	18.31/3.15	465/80	17.32/1.97	440/50	19.69/2.36	500/60	23.62/2.17	600/55		
SC L/S	16.54/2.36	420/60	18.11/3.15	460/80	21.46/1.57	545/40	19.49/1.77	495/45	22.05/1.77	560/45	25.59/3.15	650/80		
SC L/S	17.72/2.36	450/60	—	—	23.03/3.15	585/80	21.85/3.15	555/80	23.62/2.36	600/60	28.35/4.33	720/110		
SC L/S	—	—	—	—	25.20/4.33	640/110	—	—	—	—	—	—		

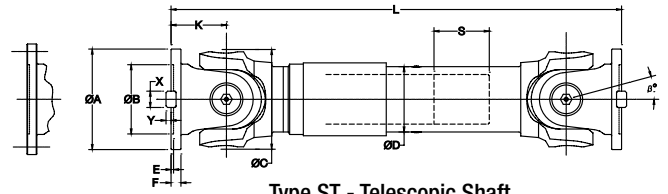
One-Way Endurance Torque Tow = 1.5 x Tdw



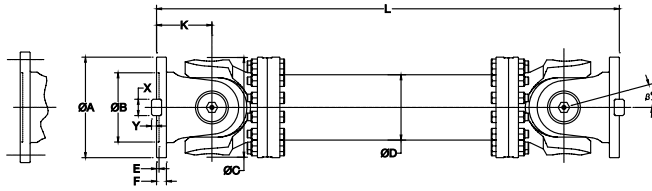
Engineering Data 3000 U3225 - U3390



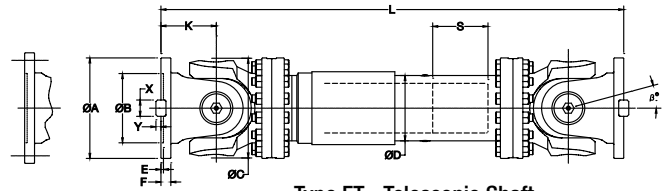
Type SF - Fixed Length Shaft



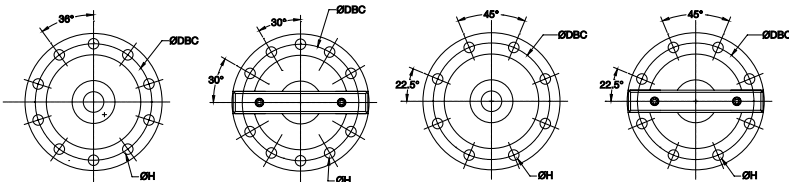
Type ST - Telescopic Shaft



Type FF - Fixed Length Shaft



Type FT - Telescopic Shaft

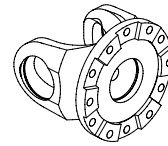


10 Bolt Flange Design

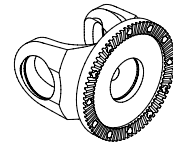
10 Bolt Flange Design with Face Key

8 Bolt Flange Design

8 Bolt Flange Design with Face Key



Intergral Face Pad



Hirth Radial Tooth Connection

Size	U3225		U3250		U3285		U3315		U3350		U3390	
Torque Ratings												
	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm
Tdw	233,800	26,400	265,400	30,000	414,200	46,800	661,600	74,800	979,500	110,700	1,400,000	158,200
Tk	464,800	52,500	538,000	60,800	862,000	97,400	1,348,000	152,300	2,067,000	233,600	2,750,000	310,700
BL	170,800	19,300	248,100	28,000	364,400	41,200	507,400	57,300	733,800	82,900	989,500	111,800
Dimensional Data												
β	15°		15°		15°		15°		15°		15°	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
A	8.86	225	9.84	250	9.84	250	11.22	285	11.22	285	12.4	315
B	4.13	105	5.51	140	4.13	105	6.89	175	4.92	125	6.89	175
C	8.86	225	8.86	225	9.84	250	9.84	250	11.22	285	11.22	285
D	6	152	6	152	6.5	165	6.5	165	7.75	197	7.75	197
E	0.2	5	0.24	6	0.24	6	0.28	7	0.28	7	0.31	8
F	0.63	16	0.71	18	0.98	25	0.79	20	1.06	27	0.87	22
K	4.92	125	4.92	125	5.51	140	5.51	140	6.3	160	6.3	160
DBC	7.72	196	8.58	218	8.58	218	9.65	245	9.65	245	11.02	280
Bolt Qty.	8	8	8	8	8	8	8	8	10	10	10	10
H	0.63	16	0.71	18	0.75	19	0.79	20	0.83	21	0.87	22
X	1.26	32	-	-	1.57	40	-	-	1.57	40	-	-
Y	0.35	9.00	-	-	0.49	13.00	-	-	0.59	15.00	-	-
Minimum Length												
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
ST L	36.42	925	39.79	1010	46.85	1190	51.77	1315	55.51	1410	60.24	1530
S	5.51	140	5.51	140	5.51	140	5.51	140	5.91	150	6.5	165
SF S	22.44	570	24.61	625	28.35	720	31.69	805	33.66	855	37.6	955
FT L	43.31	1100	46.06	1170	47.64	1210	53.15	1350	57.68	1465	62.99	1600
S	5.51	140	5.51	140	5.51	140	5.51	140	5.91	150	6.5	165
FF L	19.69	500	22.05	560	25.2	640	28.35	720	30.55	776	33.86	860

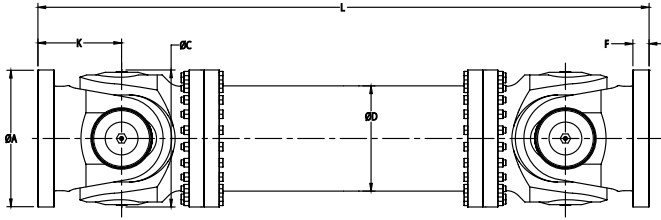
One-Way Endurance Torque Tow = 1.5 x Tdw



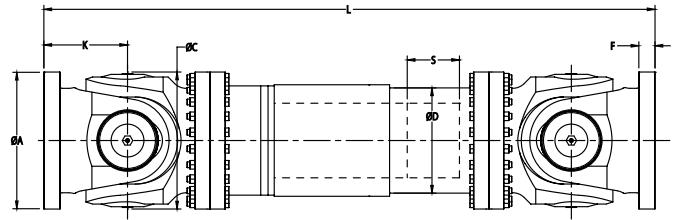
Part of Sumitomo Drive Technologies
P-7420-AC

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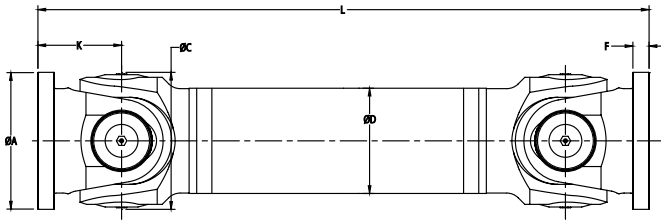
Engineering Data 3000 U3440 - U3800



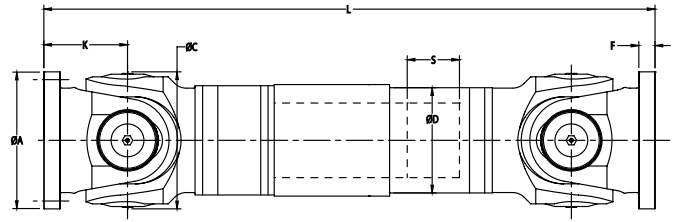
Type FF - Fixed Length Shaft



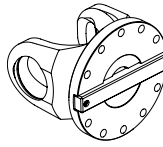
Type FT - Telescopic Shaft



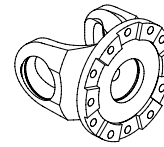
Type SF - Fixed Length Shaft



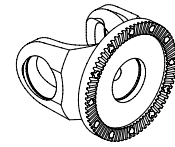
Type ST - Telescopic Shaft



Face Key



Integral Face Pad



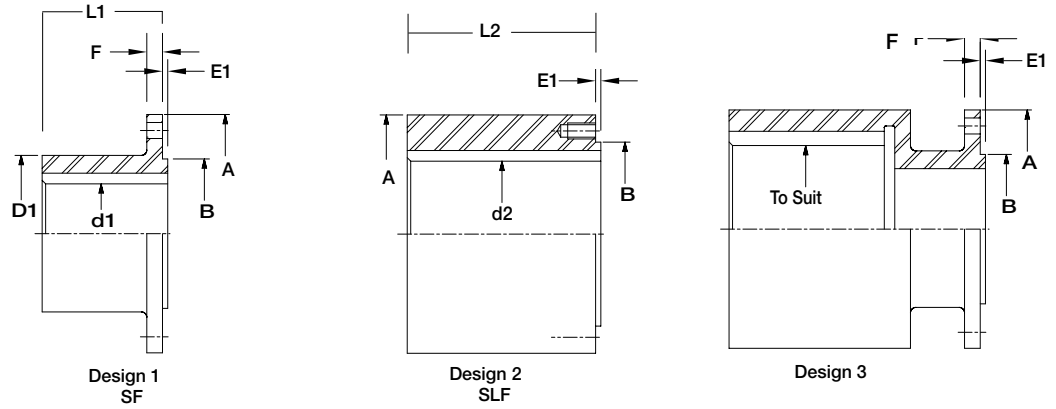
Hirth Radial
Tooth Connection

Size	U3440		U3490		U3550		U3620		U3720		U3760		U3800	
Torque Ratings														
	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	Nm	Lb.in.	KNm	Lb.in.	Nm
Tdw	2,382,000	269,000	3,170,000	358,000	5,253,000	594,000	6,660,000	753,000	9,800,000	1,107,000	11,700,000	1,322,000	13,670,000	1,545,000
Tk	4,890,000	553,000	7,180,000	811,000	11,000,000	1,243,000	15,000,000	1,695,000	20,000,000	2,260,000	23,900,000	2,701,000	27,900,000	3,153,000
BL	1,665,000	188,000	2,126,000	240,000	2,994,000	338,000	4,224,000	477,000	7,077,000	800,000	8,248,000	932,000	9,555,000	1,060,000
Dimensional Data														
B	15°		15°		15°		15°		15°		15°		15°	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
A	17.13	435	18.90	480	21.65	550	24.41	620	28.35	720	29.92	760	31.50	800
C	17.32	440	19.29	490	21.65	550	24.41	620	28.35	720	29.92	760	31.50	800
D	12.12	308	14.00	356	16.50	419	17.76	451	21.77	553	23.27	591	24.76	629
F	1.69	42.9	1.75	44.5	2.00	50.8	2.12	53.8	2.25	57.2	2.38	60.5	2.50	63.5
K	10.24	260	10.63	270	12.01	305	13.39	340	16.44	417.6	17.35	440.7	18.27	464.1
Minimum Length														
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
FT L	73.82	1875	78.35	1990	90.55	2300	95.47	2425	108.27	2750	113.50	2883	117.01	2972
S	7.52	191	7.52	191	9.49	241	9.49	241	10.00	254	10.98	279	10.98	279
FF L	40.94	1040	42.52	1080	48.03	1220	53.54	1360	65.76	1670.4	69.40	1762.8	73.09	1856.4

One-Way Endurance Torque Tow = 1.5 x Tdw

Companion Flange Dimensions

3000 Series Sizes U3055-U3920



Size	U3055		U3060		U3070		U3090		U3100		U3115	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
A	2.28	58.0	2.56	65.0	2.56	65.0	2.95	75.0	2.95	75.0	3.54	90.0
B	1.18	30.0	1.38	35.0	1.38	35.0	1.65	42.0	1.65	42.0	1.85	47.0
E1	0.06	1.4	0.06	1.6	0.06	1.6	0.07	1.9	0.07	1.9	0.09	2.4
F	-	-	-	-	-	-	-	-	0.25	6.4	0.25	6.4
L1	-	-	-	-	-	-	-	-	2.00	50.8	2.00	50.8
D1	-	-	-	-	-	-	-	-	2.12	53.8	2.12	53.8
d1	-	-	-	-	-	-	-	-	1.25	31.8	1.25	31.8
L2	2.00	50.8	2.00	50.8	2.00	50.8	2.25	57.2	2.25	57.2	2.50	63.5
d2	1.18	30.0	1.38	35.0	1.38	35.0	1.65	42.0	1.65	42.0	1.85	47.0

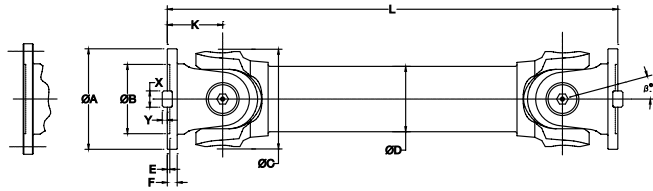
Size	U3125		U3140		U3155		U3160		U3175		U3200	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
A	4.72	120.0	5.91	150.0	5.91	150.0	7.09	180.0	5.91	150.0	7.09	180.0
B	2.95	75.0	3.54	90.0	3.54	90.0	4.33	110.0	3.54	90.0	4.33	110.0
E1	0.09	2.4	0.09	2.4	0.09	2.4	0.09	2.4	0.09	2.4	0.09	2.4
F	0.38	9.7	0.44	11.2	0.44	11.2	0.50	12.7	0.44	11.2	0.50	12.7
L1	3.00	76.2	4.00	101.6	4.00	101.6	4.00	101.6	4.00	101.6	4.00	101.6
D1	3.30	83.8	4.31	109.5	4.31	109.5	5.10	129.5	4.31	109.5	5.10	129.5
d1	2.25	57.2	2.88	73.2	2.88	73.2	3.44	87.4	2.88	73.2	3.44	87.4
L2	4.00	101.6	5.00	127.0	5.00	127.0	4.50	114.3	5.00	127.0	4.50	114.3
d2	2.75	69.9	3.38	85.9	3.38	85.9	4.13	104.9	3.38	85.9	4.13	104.9

Size	U3225		U3250		U3285		U3315		U3350		U3390	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
A	8.86	225.0	9.84	250.0	9.84	250.0	11.22	285.0	11.22	285.0	12.40	315.0
B	4.13	105.0	5.51	140.0	5.51	140.0	6.89	175.0	4.92	125.0	6.89	175.0
E1	0.16	4.0	0.20	5.0	0.20	5.0	0.24	6.0	0.24	6.0	0.24	6.0
F	0.98	25.0	0.98	25.0	0.98	25.0	1.06	27.0	1.06	27.0	1.26	32.0
L1	4.92	125.0	5.91	150.0	5.91	150.0	6.89	175.0	6.89	175.0	8.07	205.0
D1	6.10	155.0	7.48	190.0	7.48	190.0	8.41	213.6	8.41	213.6	9.65	245.0
d1	4.13	105.0	4.92	125.0	4.92	125.0	5.51	140.0	5.51	140.0	6.46	164.0
L2	7.28	185.0	8.27	210.0	8.27	210.0	9.37	238.0	9.37	238.0	10.24	260.0
d2	5.91	150.0	6.50	165.0	6.50	165.0	7.48	190.0	7.48	190.0	8.27	210.0

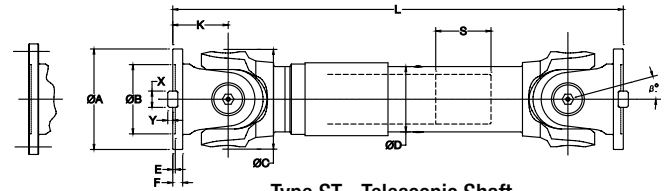
Size	U3440		U3490		U3550		U3620		U3680		U3720		U3760		U3800		U3860		U3920	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
A	17.32	440.0	19.28	490.0	21.62	550.0	24.41	620.0	26.77	680.0	28.35	720.0	29.92	760.0	31.50	800.0	33.85	860.0	36.22	920.0
B	13.00	330.0	13.50	343.0	16.00	406.0	18.00	457.0	19.00	482.6	20.00	508.0	21.00	533.0	22.00	559.0	24.00	610.0	25.00	635.0
T	1.69	43.0	2.25	57.0	2.00	51.0	2.22	56.0	2.22	56.39	2.25	57.0	2.50	64.0	5.20	132.0	2.62	67.0	2.75	70.0
E1	0.31	8.0	0.38	10.0	0.38	10.0	0.38	10.0	0.50	12.7	0.50	13.0	0.50	13.0	0.50	13.0	0.50	13.0	0.62	16.0
C	6.00	152.0	6.50	165.0	6.50	165.0	7.50	191.0	7.50	190.5	7.50	191.0	8.00	203.0	8.00	203.0	8.50	216.0	8.50	216.0
D1	12.25	311.0	14.38	365.0	16.50	419.0	18.50	470.0	20.50	520.7	22.50	572.0	24.00	610.0	25.50	648.0	27.88	708.0	30.00	762.0
d1	8.25	210.0	10.00	254.0	11.25	286.0	12.75	324.0	14.00	355.6	15.50	394.0	16.50	419.0	17.50	445.0	19.00	483.0	20.50	521.0
d2	11.62	295.0	12.88	327.0	14.75	375.0	16.75	425.0	18.38	466.85	19.50	495.0	20.63	524.0	21.62	549.0	23.25	591.0	25.00	635.0



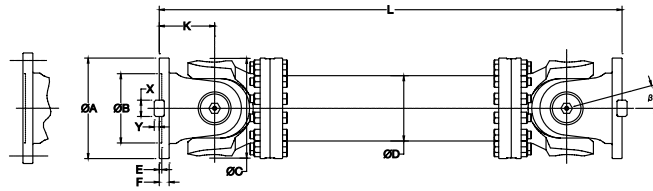
Engineering Data 5000 U5225 - U5390



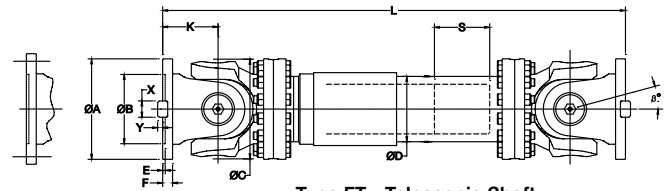
Type SF - Fixed Length Shaft



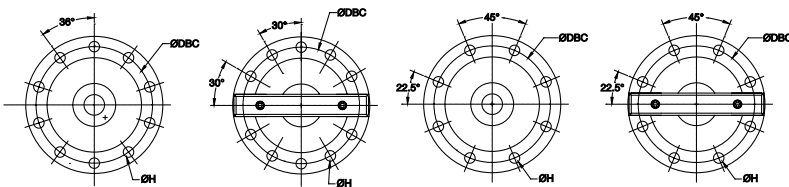
Type ST - Telescopic Shaft



Type FF - Fixed Length Shaft



Type FT - Telescopic Shaft

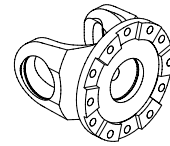


10 Bolt Flange Design

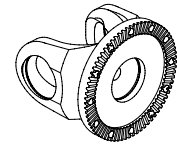
10 Bolt Flange Design with Face Key

8 Bolt Flange Design

8 Bolt Flange Design with Face Key



Intergral Face Pad



Hirth Radial Tooth Connection

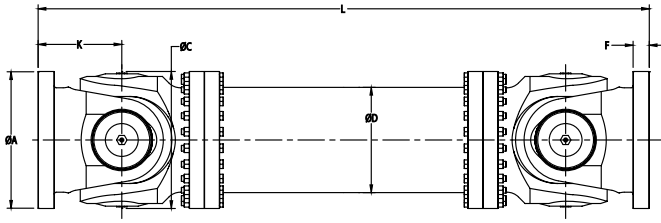
Size	U5225		U5250		U5285		U5315		U5350		U5390	
Torque Ratings												
	Lb.in	NM	Lb.in	NM	Lb.in	NM	Lb.in	NM	Lb.in	NM	Lb.in	NM
Tdw	354,030	40,000	548,746	62,000	787,716	89,000	1,124,045	127,000	1,681,641	190,000	2,177,283	246,000
Tk	840,821	95,000	1,265,656	143,000	1,956,014	221,000	2,354,298	266,000	3,310,178	374,000	4,301,462	486,000
BL	238,970	27,000	345,179	39,000	486,791	55,000	672,657	76,000	902,776	102,000	1,221,403	138,000
Dimensional Data												
B	15°		15°		15°		15°		15°		15°	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
A	8.86	225	9.84	250	9.84	250	11.22	285	11.22	285	12.4	315
B	4.13	105	5.51	140	4.13	105	6.89	175	4.92	125	6.89	175
C	8.86	225	8.86	225	9.84	250	9.84	250	11.22	285	11.22	285
D	6.50	165	6.50	165	7.50	191	7.50	191	8.75	222	8.75	222
E	0.2	5	0.24	6	0.24	6	0.28	7	0.28	7	0.31	8
F	0.63	16	0.71	18	0.98	25	0.79	20	1.06	27	0.87	22
K	4.92	125	4.92	125	5.51	140	5.51	140	6.3	160	6.3	160
DBC	7.72	196	8.58	218	8.58	218	9.65	245	9.65	245	11.02	280
Bolt Qty.	8	8	8	8	8	8	8	8	10	10	10	10
H	0.63	16	0.71	18	0.75	19	0.79	20	0.83	21	0.87	22
X	1.26	32	-	-	1.57	40	-	-	1.57	40	-	-
Y	0.35	9.00	-	-	0.49	13.00	-	-	0.59	15.00	-	-
Minimum Length / Length Compensation												
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
ST L	34.45	875	45.28	1150	50.39	1280	51.77	1315	55.51	1410	60.24	1530
S	5.51	140	5.51	140	5.51	140	5.51	140	5.91	150	6.50	165
SF L	22.44	570	24.61	625	28.35	720	31.69	805	33.66	855	37.60	955
FT L	43.70	1110	46.06	1170	47.64	1210	53.15	1350	57.68	1465	62.99	1600
S	5.51	140	5.51	140	5.51	140	5.51	140	5.91	150	6.50	165
FF L	19.69	500	22.05	560	25.20	640	28.35	720	30.55	776	33.86	860

One-Way Endurance Torque Tow = 1.5 x Tdw

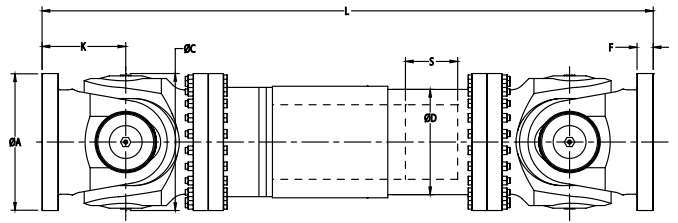


Part of Sumitomo Drive Technologies

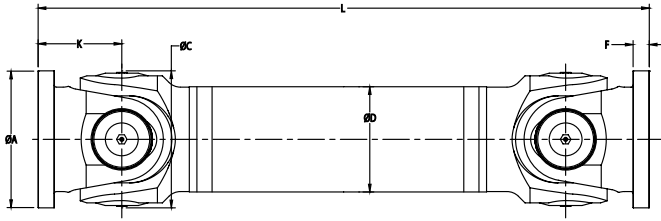
Engineering Data 5000 U5440 - U5800



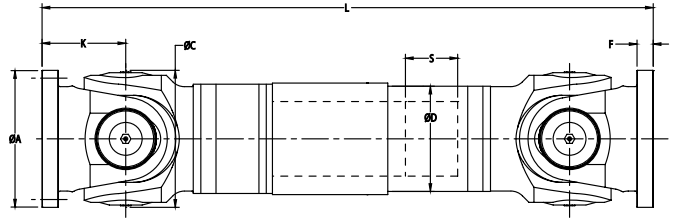
Type FF - Fixed Length Shaft



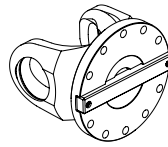
Type FT - Telescopic Shaft



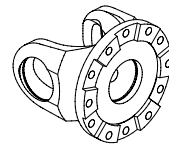
Type SF - Fixed Length Shaft



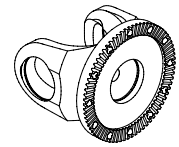
Type ST - Telescopic Shaft



Face Key



Integral Face Pad



Hirth Radial
Tooth Connection

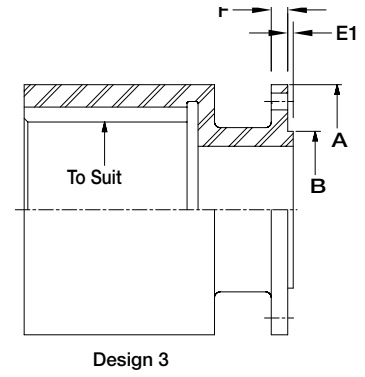
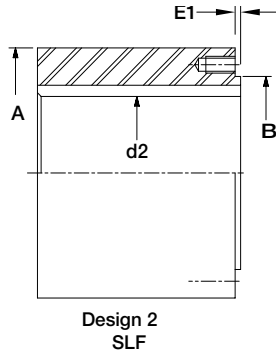
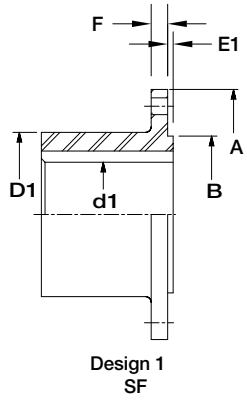
Size	U5440		U5490		U5550		U5620		U5720		U5760		U5800	
Torque Ratings														
	Lb.in	NM	Lb.in	NM	Lb.in	NM	Lb.in	NM	Lb.in	NM	Lb.in	NM	Lb.in	NM
Tdw	3,389,835	383,000	4,487,327	507,000	6,611,506	747,000	9,850,878	1,113,000	15,772,026	1,782,000	17,763,444	2,007,000	22,702,159	2,565,000
Tk	6,682,312	755,000	8,841,893	999,000	13,045,997	1,474,000	19,462,786	2,199,000	31,119,217	3,516,000	35,031,245	3,958,000	44,784,766	5,060,000
BL	1,876,358	212,000	2,566,716	290,000	3,566,850	403,000	5,044,924	570,000	7,726,700	873,000	8,930,401	1,009,000	10,302,266	1,164,000
Dimensional Data														
B	10°		10°		10°		10°		10°		10°		10°	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
A	17.13	435	18.90	480	21.65	550	24.41	620	28.35	720	29.92	760	31.50	800
C	17.32	440	19.29	490	21.65	550	24.41	620	28.35	720	29.92	760	31.50	800
D	14.00	356	14.02	356	16.50	419	21.54	547	22.01	559	24.02	610	24.02	610
F	1.69	42.9	1.75	44.5	2.00	50.8	2.12	53.8	2.25	57.2	2.38	60.5	2.50	63.5
K	10.24	260	10.63	270	12.01	305	13.39	340	16.44	417.6	17.35	440.7	18.27	464.1
Minimum Length / Length Compensation														
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
ST L	64.57	1640	68.50	1740	77.56	1970	83.86	2130	95.67	2430	100.00	2540	108.27	2750
S	7.52	191	7.52	191	9.49	241	9.49	241	10.00	254	10.98	279	10.98	279
SF L	44.49	1130	46.06	1170	52.36	1330	57.87	1470	70.47	1790	74.41	1890	78.35	1990
FT L	73.82	1875	78.35	1990	90.55	2300	95.47	2425	108.27	2750	113.78	2890	117.32	2980
S	7.52	191	7.52	191	9.49	241	9.49	241	10.00	254	10.98	279	10.98	279
FF L	40.94	1040	42.52	1080	48.03	1220	53.54	1360	65.75	1670	69.41	1763	73.07	1856

One-Way Endurance Torque Tow = 1.5 x Tdw

Companion Flange Dimensions

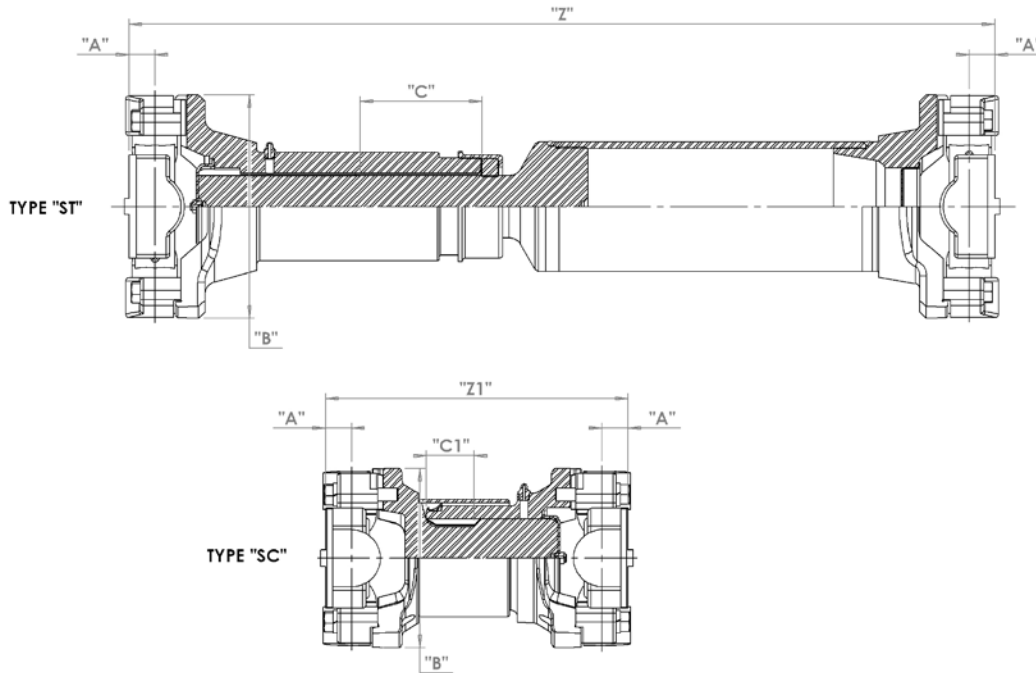
5000 Series

Sizes U5225-U5390



Size	U5225		U5250		U5285		U5315		U5350		U5390													
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm												
A	8.86	225.00	9.84	250.00	9.84	250.00	11.22	285.00	11.22	285.00	12.40	315.00	12.40	315.00	13.78	350.00	13.78	350.00	15.35	390.00	15.35	390.00	17.13	435.00
B	4.13	105.00	5.51	140.00	4.13	105.00	6.89	175.00	4.92	125.00	6.89	175.00	5.12	130.00	8.66	220.00	6.10	155.00	9.84	250.00	6.69	170.00	11.02	280.00
E1	0.16	4.00	0.20	5.00	0.20	5.00	0.24	6.00	0.24	6.00	0.24	6.00	0.24	6.00	0.28	7.00	0.28	7.00	0.28	7.00	0.28	7.00	0.35	9.00
F	0.98	25.00	0.98	25.00	0.98	25.00	1.06	27.00	1.06	27.00	1.26	32.00	1.26	32.00	1.38	35.00	1.38	35.00	1.57	40.00	1.57	40.00	1.65	42.00
L1	4.92	125.00	5.91	150.00	5.91	150.00	6.89	175.00	6.89	175.00	8.07	205.00	8.07	205.00	9.06	230.00	9.06	230.00	10.04	255.00	10.04	255.00	11.22	285.00
D1	6.10	155.00	7.48	190.00	7.48	190.00	8.46	215.00	8.46	215.00	9.65	245.00	9.65	245.00	10.83	275.00	10.83	275.00	12.01	305.00	12.01	305.00	12.20	310.00
d1	4.13	105.00	4.92	125.00	4.92	125.00	5.51	140.00	5.51	140.00	6.46	164.00	6.46	164.00	7.24	184.00	7.24	184.00	8.07	205.00	8.07	205.00	8.27	210.00
L2	7.28	185.00	8.27	210.00	8.27	210.00	9.37	238.00	9.37	238.00	10.24	260.00	10.24	260.00	11.22	285.00	11.22	285.00	12.20	310.00	12.20	310.00	10.83	275.00
d2	5.91	150.00	6.50	165.00	6.50	165.00	7.48	190.00	7.48	190.00	8.27	210.00	8.27	210.00	8.98	228.00	8.98	228.00	10.04	255.00	10.04	255.00	11.61	295.00

Wing Bearing C-Series



Size	2C		3C		4C		5C		6C		7C	
Torque Ratings												
	Lb.in	Nm	Lb.in	Nm	Lb.in	Nm	Lb.in	Nm	Lb.in	Nm	Lb.in	Nm
Tdw	7,200	813	10,200	1,152	12,720	1,437	18,000	2,034	22,980	2,596	37,200	4,203
Tk	8,880	1,003	14,016	1,584	17,676	1,997	22,476	2,539	29,256	3,305	49,908	5,639
BL	3,156	357	5,052	571	6,324	715	10,740	1,213	14,544	1,643	19,596	2,214
Dimensional Data (inches and millimeters except where noted)												
B	20°		20°		25°		15°		30°		20°	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
A	0.52	13.21	0.61	15.95	0.61	15.95	0.69	17.53	0.69	17.53	0.81	20.57
B	3.34	84.84	3.81	96.77	4.50	114.30	4.78	121.41	5.84	148.34	6.22	157.99
Minimum Length / Length Compensation												
Z (ST)	10.80	274.32	12.20	309.88	12.20	309.88	13.76	349.50	15.02	381.51	16.74	425.20
Z1 (SC)	8.42	213.87	9.30	236.22	9.30	236.22	11.26	286.00	12.39	314.71	14.24	361.70
C (ST)	2.00	50.80	2.00	50.80	2.00	50.80	3.00	76.20	3.00	76.20	3.00	76.20
C1 (SC)	1.50	38.10	1.50	38.10	1.50	38.10	1.50	38.10	1.50	38.10	2.00	50.80

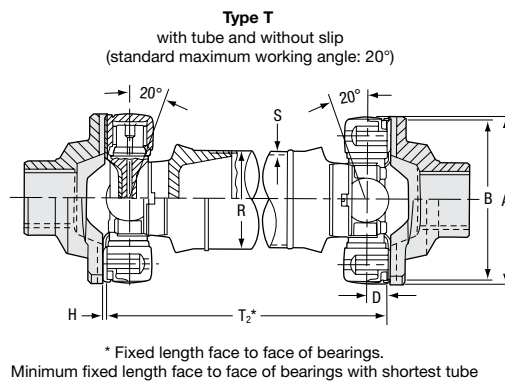
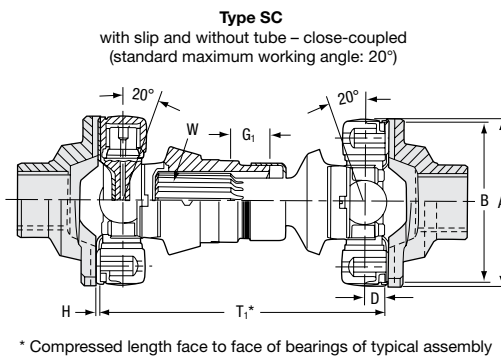
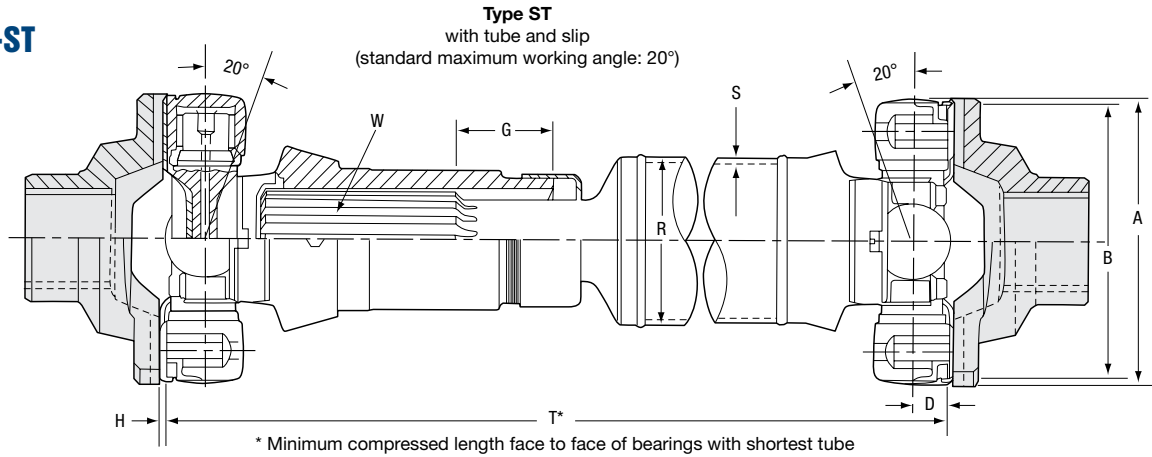
Size	8C		8.5C		9C		10C		10.5C		11C		15C	
Torque Ratings														
	Lb.in	Nm	Lb.in	Nm	Lb.in	Nm	Lb.in	Nm	Lb.in	Nm	Lb.in	Nm	Lb.in	Nm
Tdw	57,000	6,440	83,400	9,423	108,000	12,202	178,800	20,202	180,000	20,337	234,000	26,438	240,000	27,116
Tk	86,700	9,796	98,268	11,103	161,136	18,206	202,320	22,859	298,800	33,760	312,456	35,303	354,120	40,010
BL	29,124	3,291	29,700	3,356	46,728	5,280	72,216	8,159	80,928	9,144	111,276	12,573	168,840	19,076
Dimensional Data (inches and millimeters except where noted)														
B	20°		25°		15°		30°		25°		25°		25°	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
A	0.81	20.57	1.00	25.40	1.00	25.40	1.28	32.51	1.34	34.04	1.58	40.13	1.50	38.10
B	8.50	157.99	6.88	174.75	8.63	219.20	8.88	225.55	9.12	231.65	9.25	234.95	10.75	273.05
Minimum Length / Length Compensation														
Z (ST)	16.74	425.2	18.25	463.55	18.25	463.55	20.62	523.75	28.38	720.85	30.32	770.13	30.60	777.24
Z1 (SC)	14.24	361.7	15.63	397.00	15.63	397.00	17.87	453.90	23.50	596.90	25.00	635.00	24.75	628.65
C (ST)	3.00	76.20	3.00	76.20	3.00	76.20	3.00	76.20	5.00	127.00	5.00	127.00	5.00	127.00
C1 (SC)	2.00	50.80	2.00	50.80	2.00	50.80	2.00	50.80	2.00	50.80	2.00	50.80	2.00	50.80

One-Way Endurance Torque Tow = 1.5 x Tdw

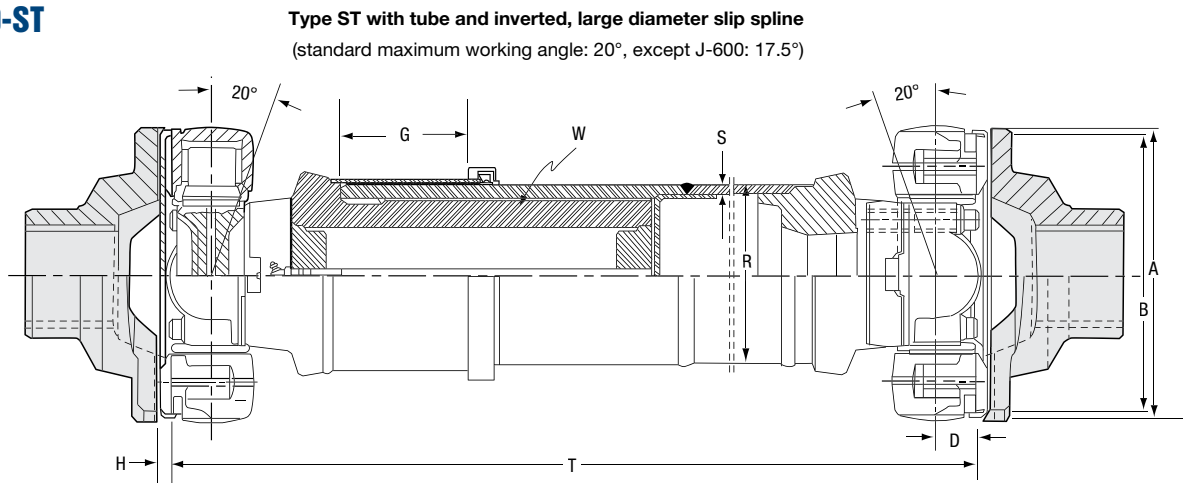


Wing Bearing J-Series

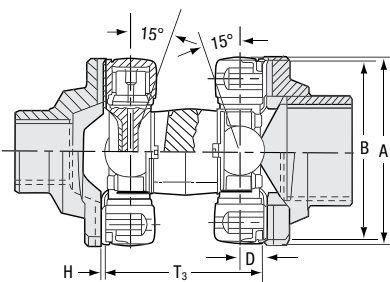
J-170-ST - J-130-ST



J-490-ST - J-1200-ST

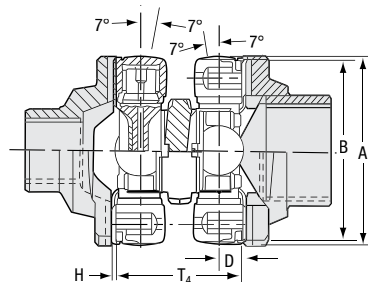


Type "CP" with coupling and without slip –
close-coupled (standard maximum working angle: 15°)

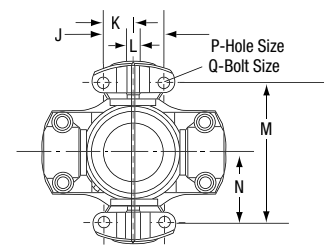


Shortest length face to face of bearings for 15° angle

Type "CP7" with coupling plate and without slip –
extra-close-coupled (standard maximum working angle: 7°)



Shortest length face to face of bearings for 7° angle



End view for all types

Wing Style J Series

Size	J170		J230		J310		J490		J600		J800		J1200	
Torque Ratings														
	Lb.in	Nm	Lb.in	Nm	Lb.in	Nm	Lb.in	Nm	Lb.in	Nm	Lb.in	Nm	Lb.in	Nm
Tdw	40,800	4,610	58,560	6,616	80,400	9,084	120,000	13,558	144,960	16,378	174,000	19,659	249,600	28,201
Tk	51,000	5,762	73,200	8,270	100,800	11,389	150,000	16,948	181,200	20,473	216,000	24,405	312,000	35,251
BL	33,000	3,729	45,972	5,194	62,820	7,098	97,824	11,053	118,824	13,425	160,044	18,083	240,060	27,123
Dimensional Data														
B (ST, SF & SC)	20°		20°		20°		20°		20°		20°		20°	
B (CP)	15°		15°		15°		15°		15°		15°		15°	
B (CP7)	7°		7°		7°		7°		7°		7°		7°	
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
A	6.75	171.45	6.88	174.75	8.62	218.95	9.25	234.95	9.25	234.95	10.75	273.05	12.18	309.37
B	6.375	161.93	6.500	165.10	8.250	209.55	8.750	222.25	8.750	222.25	10.236	259.99	11.500	292.10
D	0.92	23.4	1.11	28.19	1.11	28.19	1.34	34.04	1.58	40.13	1.50	38.10	1.78	45.21
H	0.20	5.08	0.20	5.08	0.20	5.08	0.34	8.64	0.34	8.64	0.44	11.18	0.44	11.18
W	2 3/8-16		2 3/8-16		3.0-16		5.0-29		5.0-29		5 43/64-33		5 43/64-33	
S	0.120	3.05	0.148	3.76	0.220	5.59	0.253	6.43	0.276	7.01	0.340	8.64	0.340	8.64
J	2.440	61.98	2.812	71.42	2.812	71.42	3.500	88.90	3.500	88.90	3.936	99.97	4.640	117.86
K	1.220	30.99	1.406	35.71	1.406	35.71	1.750	44.45	1.750	44.45	1.968	49.99	2.320	58.93
L	0.6235	15.84	0.6235	15.84	0.6235	15.84	0.9985	25.36	0.9985	25.36	1.2485	31.71	1.2485	31.71
M	4.930	125.22	4.874	123.80	6.624	168.25	6.800	172.72	6.800	172.72	7.872	199.95	8.880	225.55
N	2.465	62.61	2.437	61.90	3.312	84.12	3.400	86.36	3.400	86.36	3.936	99.97	4.440	112.78
P	15/32	11.91	17/32	13.49	17/32	13.49	21/32	16.67	25/32	19.84	25/32	19.84	29/32	23.02
Q	7/16-20		1/2-20		1/2-20		5/8-18		3/4-16		3/4-16		7/8-14	
Minimum Length / Length Compensation ¹														
T (ST)	18.06	458.72	21.75	552.45	24.50	622.30	25.66	651.76	26.04	661.42	30.25	768.35	32.37	822.2
T1 (SC)	--	--	14.44	366.78	12.00	304.80	18.62	472.95	21.00	533.40	23.56	598.42	21.62	549.15
T2 (SF)	9.80	248.92	13.12	333.25	13.12	333.25	13.98	355.09	12.94	328.68	17.31	439.67	20.00	508.00
T3 (CP)	--	--	6.50	165.10	7.00	177.80	--	--	--	--	--	--	--	--
T4 (CP7)	5.52	140.21	6.00	152.40	6.00	152.40	7.68	195.07	--	--	9.67	245.62	--	--
G (ST)	3.00	76.20	3.00	76.20	5.00	127.00	5.00	127.00	4.00	101.60	5.00	127.00	5.00	127.00
G1 (SC)	--	--	2.00	50.80	1.25	31.75	2.75	69.85	2.50	63.50	4.00	101.60	1.00	25.40

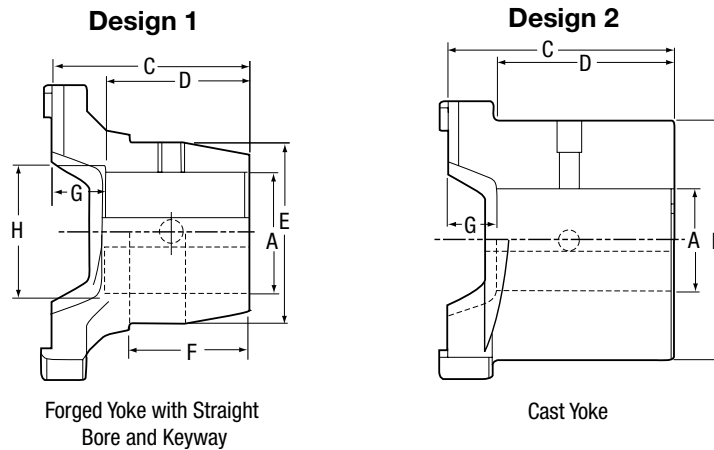
One-Way Endurance Torque Tow = 1.5 x Tdw

- | | |
|---|---|
| A Swing Diameter | M Bolt Hole Spread Across Yoke |
| B Pilot Diameter of Mating Part | N Bolt Hole Location From Center Line |
| D Bearing Height | P Bolt Hole Diameter |
| G Slip | Q Bolt Size |
| H Height of Key | R Outside Tube Diameter |
| J Bolt Hole Spread Across Bearing Wings | S Tube Wall Thickness |
| K Bolt Hole Location from Center Line | T Compressed or Fixed Length Face to Face of Bearings |
| L Key Width of Mating Part | |



Part of Sumitomo Drive Technologies

Fitting Yokes J-Series



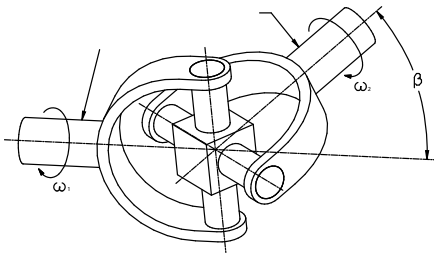
Size	J170		J230		J310		J490		J600		J1200	
DESIGN 1 YOKE												
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
A (min)	1.38	35.05	1.50	38.10	1.50	38.10	2.25	57.15	2.25	57.15	2.25	57.15
A (max)	2.68	38.07	3.14	79.76	3.42	86.87	4.10	104.14	4.70	119.38	5.03	127.76
C	4.68	118.87	4.75	120.65	6.56	166.62	6.16	156.46	6.16	156.46	8.25	209.55
D	3.43	87.12	3.31	84.07	4.94	125.48	4.54	115.32	4.54	115.32	6.00	152.40
F	2	50.8	2.50	63.50	3.50	88.90	3.25	82.55	3.25	82.55	5.00	127.00
G	1.25	31.75	1.44	36.58	1.62	41.15	1.62	41.15	1.62	41.15	2.25	57.15
H	3.25	82.55	3.50	88.90	4.00	101.60	4.88	123.95	4.88	123.95	--	--
DESIGN 2 YOKE												
A (min)	2.75	69.85	2.00	50.80	3.25	82.55	3.88	98.55	4.00	101.60	4.50	114.30
A (max)	4.02	102.11	4.02	102.11	5.20	132.08	5.50	139.70	5.50	139.70	7.04	178.82
C	5.19	131.83	5.36	136.14	6.56	166.62	6.80	172.72	6.80	172.72	10.00	254.00
D	4	101.6	4.00	101.60	5.00	127.00	5.00	127.00	5.00	127.00	7.85	199.39
F	--	--	--	--	--	--	--	--	--	--	--	--
G	1.19	30.23	1.36	34.54	1.56	39.62	1.80	45.72	1.80	45.72	2.15	54.61
H	--	--	--	--	--	--	--	--	--	--	--	--

Universal Joint Weights at Minimum Length (pounds)

SIZE	Flange Dia. (Inches)	TYPE					Tube (Inches)
		ST	SF	FT	FF With Spacer	FF Without Spacer	
U2131	3.88	14	12	-	-	-	0.18
U2135	4.63	25	20	-	-	-	0.22
U2141	4.63	25	20	-	-	-	0.25
U2148	5.88	27	22	-	-	-	0.25
U2155	5.88	37	34	-	-	-	0.29
U2160	6.88	45	36	-	-	-	0.9
U2170	8	68	55	-	-	-	0.46
U2180	8	99	83	-	-	-	0.52
U2188	9.63	152	122	-	-	-	0.98
U2192	9.63	166	166	-	-	-	1
U3200	8.86	288	214	299	252	178	1.78
U3225	9.84	296	222	345	291	194	1.78
U3250	8.86	362	239	426	352	259	2.22
U3285	9.84	370	247	470	391	275	2.22
U3315	9.84	474	291	579	436	335	2.67
U3350	11.22	483	300	617	466	353	2.67
U3390	11.22	714	446	786	564	445	3.22
U3440	12.4	729	461	842	610	475	3.22
U3490	12.4	1,000	648	1,099	801	639	3.67
U3550	13.78	1,020	668	1,172	866	679	3.67
U3620	13.78	1,354	867	1,490	1,056	882	4.22

Kinematics and Motion Characteristics

When a universal joint is operated at an angle (β), non-uniform motion is developed. With the driving yoke of the joint operating at a uniform rotational velocity to (ω_1), the driven yoke rotates non-uniformly with respect to angular displacement, velocity (ω_2), and acceleration.



The average angular displacement and velocity is uniform. That is, if the driving yoke rotates one revolution, the driven yoke also rotates one revolution. However, during this one revolution, the incremental angular displacement and instantaneous angular velocity and acceleration are not transmitted uniformly through the joint. The angular displacement of the driven yoke during one revolution lags and leads the driving yoke twice.

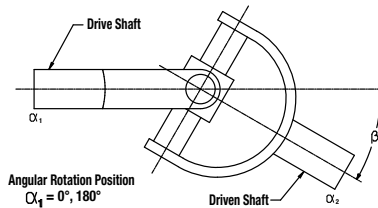
With a constant angular velocity (ω_1), of the driving yoke, the driven yoke has a maximum difference of output angular velocity (ϕ), with respect to the driving yoke when the driving yoke lies in the plane of the joint angle and also when the driving yoke is normal or perpendicular to this plane. The driven yoke has the same angular velocity as the driving yoke at approximately 45° from the joint angle plane for small angles.

The maximum instantaneous angular acceleration and deceleration of the driven yoke occurs when the angular velocity of the driven yoke is the same as the driving yoke. Also, the maximum acceleration and deceleration coincide with the maximum lead and lag respectively. The incremental angular displacement, velocity and acceleration increase as the joint angle is increased, but at an increasing rate.

For dynamic rotation the angular velocity of the driven yoke (ω_2), can be determined for a given angular displacement (α_1), with the formula

$$\omega_2 = \left(\frac{\cos\beta \times \omega_1}{1 - \sin^2\alpha_1 \times \sin^2\beta} \right)$$

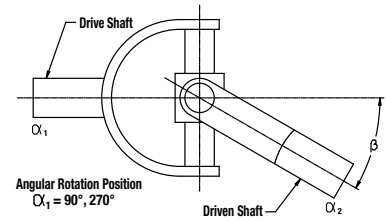
During one revolution of the drive yoke the driven yoke will reach a maximum angular velocity two times at $\alpha = 0^\circ$ and 180° .



The maximum angular velocity will be

$$\omega_2 \text{ max} = \frac{\omega_1}{\cos\beta}$$

The driven yoke will also reach a minimum angular velocity two times during one revolution at $\alpha = 90^\circ$ and 270° .



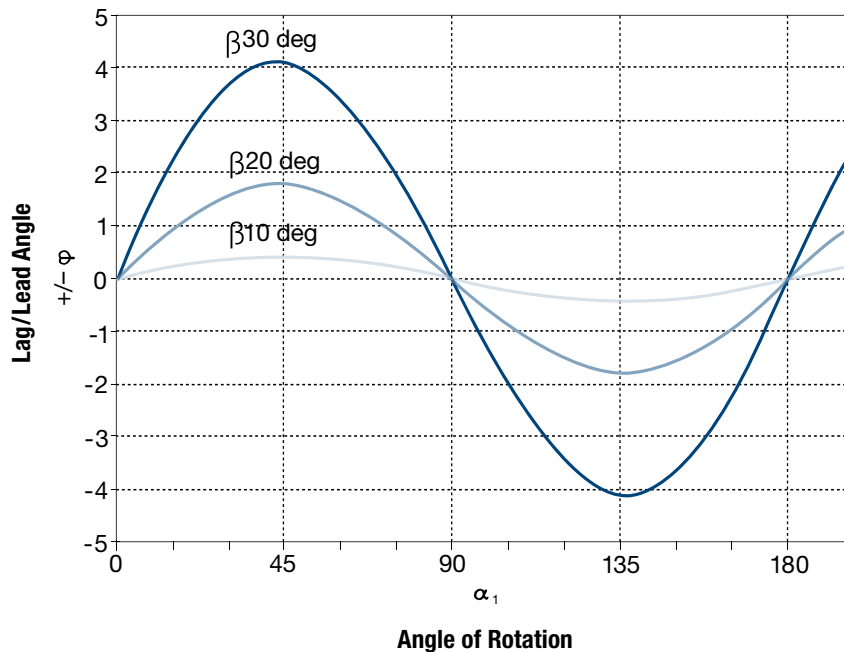
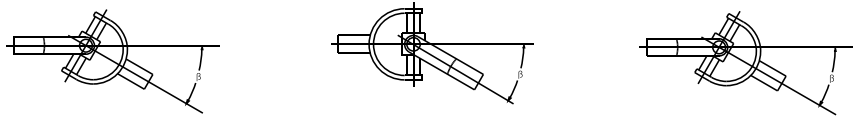
The minimum angular velocity will be

$$\omega_2 \text{ min} = \cos\beta \omega_1$$

Lead and lag angles (ϕ) of the driven shaft can be determined by the following equations

$$\phi = \tan^{-1} \left(\frac{\tan\alpha_2 - \tan\alpha_1}{1 + \tan\alpha_1 \times \tan\alpha_2} \right)$$

$$\alpha_2 = \tan^{-1} \left(\frac{1}{\cos\beta} \times \tan\alpha_1 \right)$$

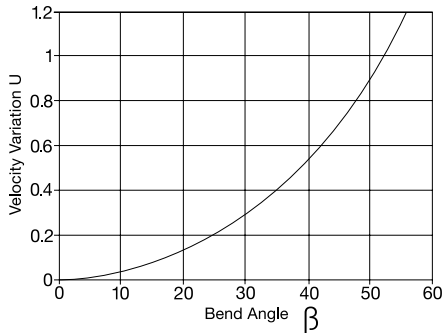


Lag and lead angle (ϕ) as a function of angular rotation (α) of the joint and bend angle (β).

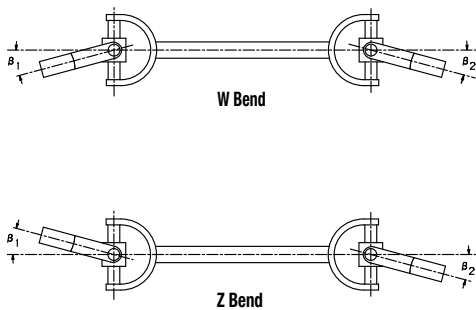
Kinematics and Motion Characteristics

Velocity variation (U) is a means for comparison of the angular velocities of the drive and driven shafts. Velocity variation (U) is calculated using the formula

$$U = \left(\frac{\omega_2 \text{max} - \omega_2 \text{min}}{\omega_1} \right) = \tan\beta \times \sin\beta$$

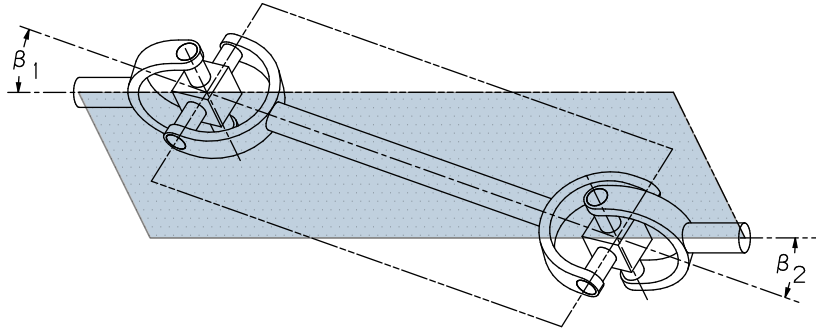


As a result of the non-uniform motion of a universal joint, few applications are suitable for a single universal joint. However, by placing two universal joints in tandem the irregularities of a single joint can be compensated. By arranging the two universal joints in either a “Z” or “W” bend configuration with joint angles β_1 and β_2 , equal, the velocity variations developed in the first joint are in effect cancelled by the velocity variations in the second joint.

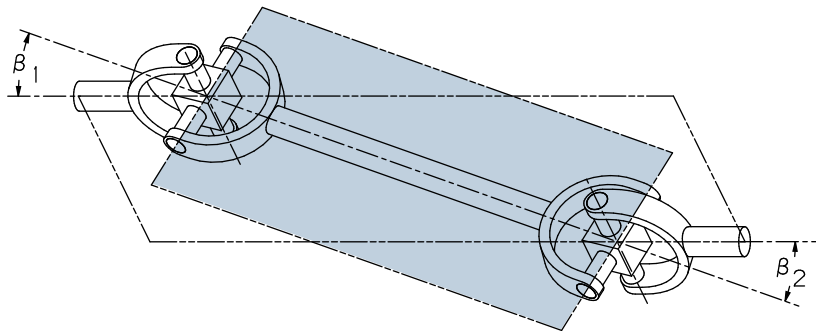


Synchronous rotation of the drive and driven shafts is possible provided that all three of the following conditions are met:

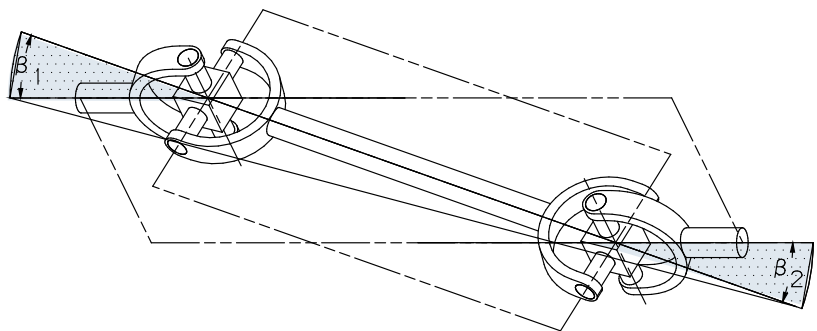
1. The axis of all shaft sections lie in the same plane.



2. The bearing bores of the inboard yokes of the center section lie in the same plane.



3. The bend angles β_1 and β_2 are equal.



This ideal or phased arrangement will result in homokinetic operation of the universal joint driveline assembly. Failure to meet one or more of these requirements will result in some level of velocity fluctuation in the driven shaft. The acceptability of this velocity fluctuation is a function of the speed, system mass and the sensitivity of the application.

Bore Tolerances

Recommended Bore Tolerances

- Recommended standard bore tolerances for interference fits are shown in table (right).
- Bore tolerances conform to AGMA 9002-A86 standards.

Interference Fits

Unless specified, bores will be furnished with an interference fit.

When **shaft sizes only** are stated on order and they consist of fractional or decimal dimensions without tolerance, the bore will be sized for an interference fit in accordance with table (right). If exact **shaft size** and tolerance do not agree with tables, the smallest shaft dimension will be considered “basic” and the standard negative bore tolerance will be applied.

Example: Interference Fit

Shaft Size – 2.000 (Basic Size)
1.999 (With Tolerance)

Bore Size – 1.999
1.998

Interference Fit (Inches)					
Nominal Bore Size		Shaft Tolerance	Bore Tolerance	Interference Range	
Over	Thru				
0.0000	1.5000	+0.0000 / -0.0005	-0.0005 / -0.0010	-0.0000 / -0.0010	
1.5000	3.0000		-0.0010 / -0.0020	-0.0000 / -0.0020	
3.0000	4.0000		-0.0015 / -0.0030	-0.0005 / -0.0030	
4.0000	5.0000		-0.0020 / -0.0035	-0.0010 / -0.0035	
5.0000	7.0000		-0.0025 / -0.0040	-0.0015 / -0.0040	
7.0000	8.0000		-0.0030 / -0.0050	-0.0020 / -0.0050	
8.0000	9.0000		-0.0035 / -0.0055	-0.0025 / -0.0055	
9.0000	10.0000		-0.0040 / -0.0060	-0.0030 / -0.0060	
10.0000	11.0000		-0.0045 / -0.0065	-0.0035 / -0.0065	
11.0000	12.0000		+0.0000 / -0.0010	-0.0050 / -0.0070	-0.0040 / -0.0070
12.0000	13.0000			-0.0055 / -0.0075	-0.0045 / -0.0075
13.0000	14.0000			-0.0060 / -0.0080	-0.0050 / -0.0080
14.0000	15.0000			-0.0065 / -0.0085	-0.0055 / -0.0085
15.0000	16.0000			-0.0065 / -0.0090	-0.0055 / -0.0090
16.0000	17.0000			-0.0070 / -0.0095	-0.0060 / -0.0095
17.0000	18.0000			-0.0075 / -0.0100	-0.0065 / -0.0100
18.0000	19.0000			-0.0080 / -0.0105	-0.0070 / -0.0105
19.0000	20.0000	-0.0085 / -0.0110		-0.0075 / -0.0110	
20.0000	22.0000	+0.0000 / -0.0020		-0.0100 / -0.0130	-0.0080 / -0.0130
22.0000	24.0000		-0.0110 / -0.0140	-0.0090 / -0.0140	
24.0000	26.0000		-0.0120 / -0.0150	-0.0100 / -0.0150	

Standard Recommended Keyways (Inches)				
Nominal Bore Size		Width	Keyway	
Over	Thru		Depth Sq. Key	Depth Red. Key
.312	.438	.094	.047	-
.438	.562	.125	.063	.047
.562	.875	.188	.094	.062
.875	1.250	.250	.125	.094
1.250	1.375	.312	.156	.125
1.375	1.750	.375	.188	.125
1.750	2.250	.500	.250	.188
2.250	2.750	.625	.313	.219
2.750	3.250	.750	.375	.250
3.250	3.750	.875	.438	.313
3.750	4.500	1.000	.500	.375
4.500	5.500	1.250	.625	.438
5.500	6.500	1.50	.750	.500
6.500	7.500	1.75	.875	.750
7.500	9.000	2.000	1.00	.750
9.000	11.000	2.500	1.250	.875
11.000	13.000	3.000	1.500	1.000
13.000	15.000	3.500	1.750	1.250
15.000	18.000	4.000	-	1.500
18.000	22.000	5.000	-	1.750
22.000	26.000	6.000	-	2.000



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