

Plastic Universal Joints and Teleshafts

- **Backlash-free up to 10^8 turns**
- **Low mass**
- **Low inertia**
- **Corrosion resistant**
- **Electrically isolating**
- **No maintenance**

Huco-Pol is a range of light duty, backlash-free universal joints and teleshafts manufactured of acetal and non-ferrous metals.

They are suitable for intermittent applications where low mass, corrosion resistance and electrical isolation are desirable.

Huco-Pol joints and teleshafts have only a fraction of the torque capability of steel joints and are not intended to substitute for these in the normal way.

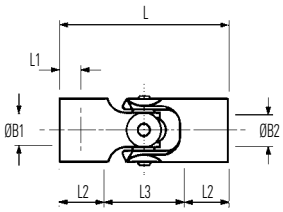
Huco-Pols are used in business machines, food processing plants, laboratory equipment and electro-medical apparatus among others.

Alternative polymers are available for high temperature operation.

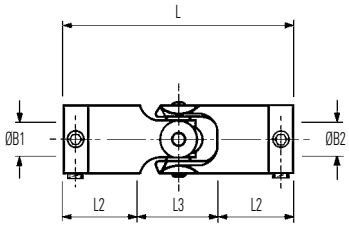


Plastic Universal Joints





Type 105



Type 103

SINGLE JOINTS - DIMENSIONS & ORDER CODES

Size	Order Code	Dimensions								Fasteners		
		OD in. (mm)	L in. (mm)	L1 in. (mm)	L2 in. (mm)	L3 in. (mm)	B1, B2 Max in. (mm)	Moment of inertia kgm2 x 10-8	Mass kg x 10-3	Size	Torque lb.-in. (Nm)	A/F in. (mm)
06	103.06	0.28 (7.1)	1.07 (27.2)	-	0.37 (9.3)	0.34 (8.6)	0.13 (3.18)	1.1	3.1	M3	8.3 (0.9)	0.06 (1.5)
09	103.09	0.44 (11.1)	1.48 (37.6)	-	0.52 (13.1)	0.45 (11.4)	0.20 (5.0)	13.5	9.3	M3	8.3 (0.9)	0.06 (1.5)
13	103.13	0.56 (14.3)	1.82 (46.2)	-	0.62 (15.7)	0.58 (14.8)	0.25 (6.35)	44.6	17.7	M3	8.3 (0.9)	0.06 (1.5)
16	103.16	0.69 (17.5)	2.66 (67.6)	-	0.88 (22.3)	0.91 (23.0)	0.39 (10.0)	136	35	M4	20.1 (2.2)	0.08 (2.0)
20	105.20	0.90 (23.0)	2.44 (62.0)	0.31 (8.0)	0.67 (17.0)	1.10 (28.0)	0.50 (12.7)	147	25.7	-	-	-
25	105.25	1.12 (28.5)	2.91 (74.0)	0.39 (10.0)	0.79 (20.0)	1.34 (34.0)	0.55 (14)	463	56	-	-	-
32	105.32	1.44 (36.5)	3.39 (86.0)	0.39 (10.0)	0.83 (21.0)	1.73 (44.0)	0.79 (20)	1339	103	-	-	-

SINGLE JOINTS - PERFORMANCE at 68°F (20°C)

Size	Peak Torque lb.-in. (Nm)	Static Break Torque lb.-in. (Nm)	Torsional Rate deg/Nm	Torsional Stiffness Nm/Rad	Max angular compensation @ 1000 rev/min	Max axial loading N
06	0.97 (0.11)	3.98 (0.45)	19.7	2.9	45	18
09	3.19 (0.36)	16.8 (1.9)	6.8	8.4	45	38
13	7.52 (0.85)	39.8 (4.5)	3.2	18	45	67
16	14.2 (1.6)	60.2 (6.8)	1.7	34	45	98
20	24.8 (2.8)	151 (17)	0.94	61	40	138
25	49.6 (5.6)	301 (34)	0.51	112	40	222
32	94.7 (10.7)	637 (72)	0.25	229	40	334

FOR STANDARD BORES SEE FACING PAGE

Materials & Finishes

Bodies: Acetal

Cross-pieces: 103, 111 = Brass Cu Zn 21 Si 3P (Lead Free)
105 =CZ122

Bore Inserts: 103, 111 = Brass Cu Zn 21 Si 3P (Lead Free)
105 = Al. Alloy 2014A T6 or 6026 LF

Fasteners: Alloy steel, black oiled

Operating Temperature Range

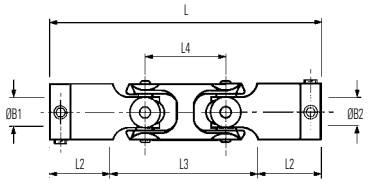
-4°F to +140°F (- 20°C to +60°C)

Maximum Rotational Speed

1000 rev/min

Plastic Universal Joints





Type 111

DOUBLE JOINTS - DIMENSIONS & ORDER CODES

Size	Order Code	Dimensions									Fasteners		
		OD in. (mm)	L in. (mm)	L1 in. (mm)	L2 in. (mm)	L3 in. (mm)	L4 in. (mm)	B1, B2 Max	Moment of inertia kgm2 x 10-8	Mass kg x 10-3	Size	Torque lb.-in. (Nm)	A/F in. (mm)
06	111.06	0.28 (7.1)	1.39 (35.3)	-	0.37 (9.3)	0.66 (16.7)	8.1	3.18	1.3	3.5	M3	8.3 (0.9)	0.06 (1.5)
09	111.09	0.44 (11.1)	2.00 (50.8)	-	0.52 (13.1)	0.97 (24.6)	13.2	5.0	15.3	11.1	M3	8.3 (0.9)	0.06 (1.5)
13	111.13	0.56 (14.3)	2.44 (62.1)	-	0.62 (15.7)	1.21 (30.7)	15.9	6.35	50.4	21.6	M3	8.3 (0.9)	0.06 (1.5)
16	111.16	0.69 (17.5)	3.53 (89.8)	-	0.88 (22.3)	1.78 (45.2)	22.2	10.0	178.0	42.4	M4	20.1 (2.2)	0.08 (2.0)

DOUBLE JOINTS - PERFORMANCE at 68°F (20°C)

Size	Peak Torque lb.-in. (Nm)	Static Break Torque lb.-in. (Nm)	Torsional Rate deg/Nm	Torsional Stiffness Nm/Rad	Max angular compensation @ 1000 rev/min	Max radial compensation in. (mm)
06	0.71 (0.08)	3.00 (0.34)	81.9	0.7	90	49.6 (5.6)
09	1.42 (0.16)	16.82 (1.9)	13.3	4.3	90	80.5 (9.1)
13	5.22 (0.59)	30.1 (3.4)	8.1	7.1	90	96.5 (10.9)
16	11.5 (1.3)	60.2 (6.8)	4.5	12.6	90	137 (15.5)

STANDARD BORES

Size	Bore tolerences • 103, 111 = +0.0012/ -0 (+0.03mm/-0mm)																		
	(3)	1/8"	(4)	3/16"	(5)	(6)	1/4"	(8)	3/8"	(10)	(12)	1/2"	(14)	5/8"	(16)	(18)	(19)	3/4"	(20)
06	●	●																	
09	●	●	●	●	●														
13			●	●	●	●	●												
16						●	●	●											
20								●	●	●	●	●							
25										●	●	●							
32													●	●	●	●	●	●	●
Bore Ref	14	16	18	19	20	22	24	28	31	32	35	36	38	41	42	45	46	47	48

Plastic Universal Joints

Constant velocity

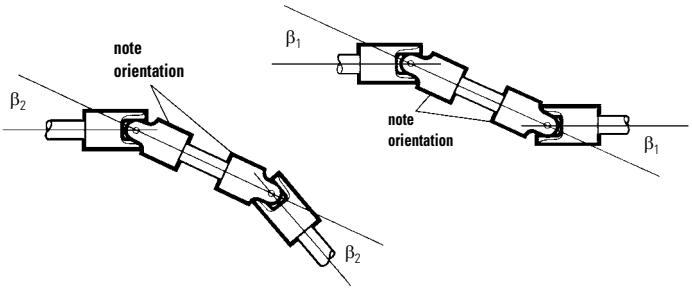
The velocity ratio of single universal joints is not constant when the working angle is greater than zero. Their geometry gives rise to sinusoidal fluctuations at the output that increase with the working angle and which vary between:

$\omega \cos \beta$ and $\omega \sec \beta$

where ω = angular velocity
and β = operating angle

For example, when the operating angle is 5°, the maximum error is ±0.4%; at 7° it is ±0.8%, and at 10° it is ±1.5%. A motor shaft turning at a constant 1000 rpm, driving through a single universal joint set at an operating angle of 5°, produces an output that fluctuates between 996 rpm and 1004 rpm twice each revolution.

The fluctuations are cancelled out when using a double joint or two single joints connected back to back.



To maintain constant velocity ratio, ensure that:

a) The orientation of two single joints is correct; the inboard forks should align as in double joints.

b) The working angle of both joints, or both halves of a double joint, is the same.

ADJUSTED TORQUE

Peak torque values apply when the working angle is zero. Adjusted torque takes account of dynamic loading at the bearings. To find adjusted torque, determine application speed, torque and operating angle,

Then:

a) multiply speed x working angle

b) subtract the result from 10000

c) divide the answer into 10000

d) apply the result to the application torque.

eg. speed	= 400 rpm
application torque	= 0.1Nm
working angle	= 20°

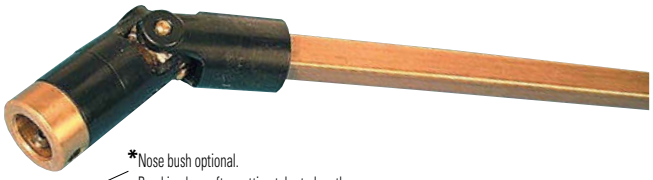
Accordingly:

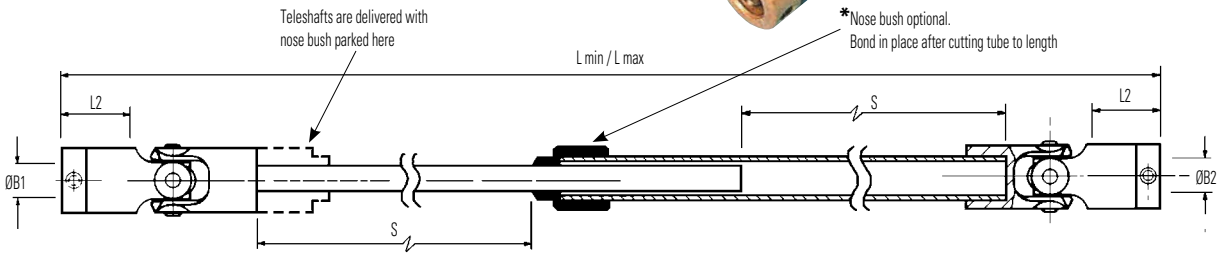
a) 400 rpm x 20°	= 8000
b) 10000 – 8000	= 2000
c) 10000 / 2000	= 5
d) 5 x 0.1Nm	= 0.5Nm

Select a joint where Peak Torque exceeds 0.5Nm, ie., size 13 or larger.

Note: To remain within the capacity of the joint, the result of speed x working angle must be less than 10000.

Plastic Universal Joints Brass Cross Pieces and Tubes

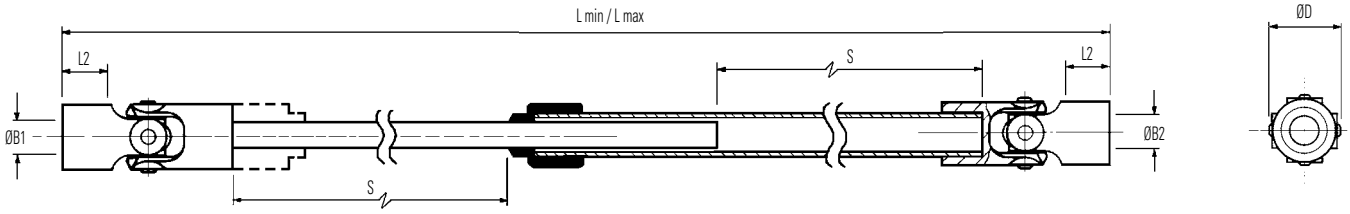




Refs. 128
Joints sleeved with headed brass inserts fitted 2 screws per end

End A (inner tube)

End B (outer tube)



Refs. 130
Joints sleeved with metal inserts. Attach to shafts by cross-pinning or bonding

Typical

DIMENSIONS & ORDER CODES

Teleshaft size	Teleshaft options: Standard tubes self-colour brass — teleshaft REF	ØD in. (mm)	L in. (mm ±1.0) min	L in. (mm) max	Stroke in. (mm) S	L2 in. (mm) ①	ØB1, ØB2 max	Mass kg x 10–3 ②	Corresponding joints. For dimensions see
09	128.09.240	.43 (11.1)	9.45 (240)	15.3 (389)	5.87 (149)	.52 (13.1)	5	36	103.09
13	128.13.300	.56 (14.3)	11.8 (300)	19.0 (484)	7.24 (184)	.62 (15.7)	6.35	58	103.13
16	128.16.450	.69 (17.5)	17.7 (450)	28.7 (730)	11.02 (280)	.88 (22.3)	10	168	103.16
20	130.20.464	.91 (23.0)	18.3 (464)	29.3 (745)	11.06 (281)	.67 (17.0)	12.70	241	105.20
25	130.25.500	1.12 (28.5)	19.7 (500)	30.9 (784)	11.18 (284)	.79 (20.0)	14	457	105.25
32	130.32.564	1.44 (36.5)	22.2 (564)	34.2 (868)	11.97 (304)	.83 (21.0)	20	827	105.32

② Max shaft penetration

③ Values apply with max bores.

- A range of standard telescopes is available which can be shortened to achieve an infinite number of length/stroke requirements. The lengths L min shown in the table above are the longest of the standard range in each size. Specific lengths are produced by cutting an equal amount from both ends of the nearest standard size. See next page for recommended procedure.
- Custom Teleshaft assemblies can be factory made subject to minimum order quantities.
- *The nose bush eliminates any torsional free play that may be apparent in the tubes due to working clearances.
- Full details of the standard range and product order codes are available on request. Please ask for a Huco Teleshaft data sheet.

STANDARD BORES

Sizes indicated in parenthesis are metric (mm).

Teleshaft size	ØB1, ØB2 +0.0012/ -0 (+0.03mm/-0mm)														
	1/8″	(4)	3/16″	(5)	(6)	1/4″	(8)	3/8″	(10)	(12)	1/2″	5/8″	(16)	3/4″	(20)
09	●	●	●	●											
13		●	●	●	●	●									
16					●	●	●	●	●						
20								●	●						
25										●	●				
32												●	●	●	●
Bore ref.	16	18	19	20	22	24	28	31	32	35	36	41	42	47	48
Corresponding bore adaptor				**251**		**253**	**255**		**257**		**259**		**260**		**261**

Diameters for which a bore adaptor is shown can be adapted to smaller shaft sizes. *See page 70* for details.

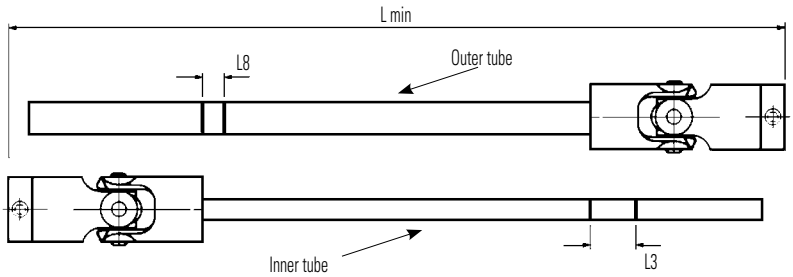
Plastic Universal Joints Brass Cross Pieces and Tubes

Extensible drive shafts (teleshafts), are useful when the distance between actuator and load varies during operation, or needs to accommodate component variances, or when a quick disconnect facility is needed in the drive line.

Huco teleshafts are in keeping with the light duty capabilities of plastics universal joints and employ precision drawn square brass tubes as the telescoping medium. These can easily be cut by the user to provide an extensible drive shaft with customised dimensions.

There are 2 ways to arrive at a customized teleshaft: empirically (shown below), or with tables that provide all necessary data on stroke and tube lengths for teleshafts with and without nose bushes up to 520mm retracted length.

Empirical method (based on the retracted length).

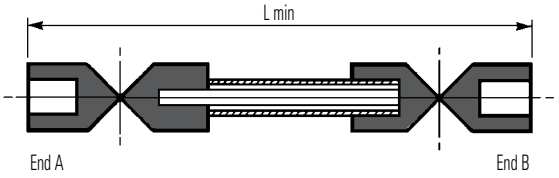


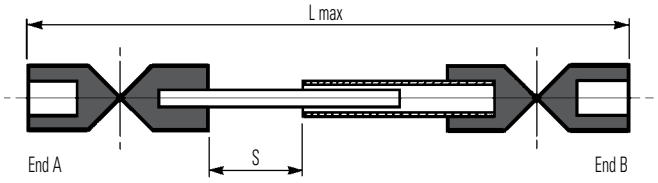
Size	L3	L8
09	0.34 (8.6)	0.13 (3.2)
13	0.41 (10.4)	0.17 (4.3)
16	0.60 (15.2)	0.24 (6.1)
20	0.67 (17.0)	0.32 (8.2)
25	0.79 (20.0)	0.41 (10.3)
32	0.83 (21.0)	0.71 (18.0)

- Disengage the teleshaft, remove the nose bush parked on the inner tube and keep it in case you need to use it later. Then lay the 2 halves of the teleshaft side by side.
- Slide one half alongside the other so that overall length L *min* matches the intended length of the teleshaft when *fully retracted*. With a felt tip pen, draw a line across the outer tube at the point where this is level with the inboard end of the universal joint.
- If you are sure that the teleshaft will satisfactorily extend the required amount, cut the tube at the line.
- Mark the inner tube in the same way, then add an amount equivalent to dimension L3 for your teleshaft size and draw a second line. Cut the tube at this second line.
- Now re-engage the tubes, taking care to orientate them correctly so that the inboard forks of the joints are in the same plane, and retract the teleshaft. The overall length should be as intended, and both tubes should bottom out simultaneously.
- If required, the nose bush can now be fitted by bonding it to the outer tube with an instant adhesive, (factory fitted bushes are retained by a barbing technique). The bush will add an amount equivalent to dimension L8 to the retracted length. Cutting this amount from the outer tube will reinstate the intended retracted length.
- The purpose of the nose bush is to eliminate any torsional free play that may be apparent in the tubes due to working clearances.

How to order customized teleshafts

Please specify your teleshaft by completing the questionnaire.





Teleshaft size 09 13 16 20 25 32

Teleshaft ref. 128 130

Bore diameter End A .....

Bore diameter End B .....

Fitted nose bush (end B only) ☐

Speed of rotation ☐ rpm

Please specify:

L min ..... and/or

L max ..... and/or

Stroke S .....

If more than one parameter is specified, which one is critical? .....

Please quote ..... pcs

Projected annual qtys ..... pcs