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.

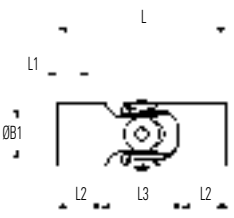
Huco-Pol joints and teleshafts have only a fraction of the torque capability of steel joints and are not intended to substitute for these in the normal way.

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

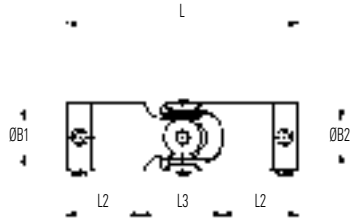
Alternative polymers are available for high temperature operation.







Type 101, 105, 601



Type 103, 603

SINGLE JOINTS - DIMENSIONS & ORDER CODES

Size	① Brass Cross-piece	② Plastic Cross-piece	Dimensions								Fasteners		
	Hub Ref		OD	L	L1	L2	L3	B1, B2 Max	Moment of inertia kgm2 x 10-8	Mass kg x 10-3	Size	Torque (Nm)	A/F (mm)
06	101.06	-	7.1	19.1	3.3	5.3	8.6	4.76	0.3	0.7	-	-	-
	-	601.06							0.2	0.4			
	103.06	-		27.2	-	9.3		3.18	1.1	3.1	M3	0.94	1.5
	-	603.06							1.0	2.8			
09	101.09	-	11.1	28.5	4.3	8.6	11.4	6.35	4.0	2.7	-	-	-
	-	601.09							4.0	1.5			
	103.09	-		37.6	-	13.1		5.0	13.5	9.3	M3	0.94	1.5
	-	603.09							12.6	8.1			
13	101.13	-	14.3	35.6	5.6	10.4	14.8	8.0	14.3	5.7	-	-	-
	-	601.13							11.9	3.6			
	103.13	-		46.2	-	15.7		6.35	44.6	17.7	M3	0.94	1.5
	-	603.13							38.0	15.6			
16	101.16	-	17.5	53.3	8.9	15.2	23.0	11.0	32.3	12.2	-	-	-
	-	601.16							18.3	5.0			
	103.16	-		67.6	-	22.3		10.0	136	35.0	M4	2.27	2.0
	-	603.16							122	31.4			
20	105.20	-	23.0	62.0	8.0	17.0	28.0	12.7	147	25.7	-	-	-
25	105.25	-	28.5	74.0	10.0	20.0	34.0	14	463	56	-	-	-
32	105.32	-	36.5	86.0	10.0	21.0	44.0	20	1339	103	-	-	-

SINGLE JOINTS - PERFORMANCE (at 20°C)

Size	Brass Cross-piece 101, 103, 105				Plastic Cross-piece 601, 603				Max angular compensation @ 1000 rev/min	Max axial loading N
	Peak Torque Nm	Static Break Torque Nm	Torsional Rate deg/Nm	Torsional Stiffness Nm/Rad	Peak Torque Nm	Static Break Torque Nm	Torsional Rate deg/Nm	Torsional Stiffness Nm/Rad		
06	0.11	0.45	19.7	2.9	0.09	0.3	22	2.6	45	18
09	0.36	1.9	6.8	8.4	0.6	1.5	6.8	8.4	45	38
13	0.85	4.5	3.2	18	0.7	2.5	3.6	16.0	45	67
16	1.6	6.8	1.7	34	1.0	5.0	2.8	20.0	45	98
20	2.8	17	0.94	61	-	-	-	-	40	138
25	5.6	34	0.51	112	-	-	-	-	40	222
32	10.7	72	0.25	229	-	-	-	-	40	334

FOR STANDARD BORES SEE FACING PAGE

Materials & Finishes

Bodies: Acetal

Cross-pieces: Brass BS 2874 CZ121,CZ122 (101, 103, 109, 111)
Nylon Glass filled (601, 603, 609, 611)

Bore Inserts: Brass BS 2874 CZ121 (103, 111, 603, 611)
Al. Alloy 2014A T6 (105)

Fasteners: Alloy steel, black oiled

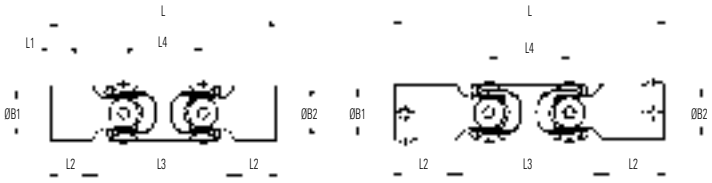
Operating Temperature Range

- 20°C to +60°C

Maximum Rotational Speed

1000 rev/min





Type 109, 609 **Type 111, 611**

DOUBLE JOINTS - DIMENSIONS & ORDER CODES

Size	① Brass Cross-piece	② Plastic Cross-piece	Dimensions									Fasteners		
	Hub Ref		OD	L	L1	L2	L3	L4	B1, B2 Max	Moment of inertia kgm2 x 10-8	Mass kg x 10-3	Size	Torque (Nm)	A/F (mm)
06	109.06	-	7.1	27.2	3.3	5.3	16.7	8.1	4.76	0.6	1.1	-	-	-
	-	609.06								0.4	0.6			
	111.06	-		35.3	-	9.3			3.18	1.3	3.5	M3	0.94	1.5
	-	611.06								1.1	3.0			
09	109.09	-	11.1	41.7	4.3	8.6	24.6	13.2	6.35	5.9	4.5	-	-	-
	-	609.09								5.8	2.0			
	111.09	-		50.8	-	13.1			5.0	15.3	11.1	M3	0.94	1.5
	-	611.09								14.0	8.6			
13	109.13	-	14.3	51.4	5.6	10.4	30.7	15.9	8.0	23.7	9.6	-	-	-
	-	609.13								21.5	7.5			
	111.13	-		62.1	-	15.7			6.35	50.4	21.6	M3	0.94	1.5
	-	611.13								50.4	15.6			
16	109.16	-	17.5	75.5	8.9	15.2	45.2	22.2	11.0	63.5	19.7	-	-	-
	-	609.16								35.5	12.5			
	111.16	-		89.8	-	22.3			10.0	178.0	42.4	M4	2.27	2.0
	-	611.16								150.0	35.2			

SINGLE JOINTS - PERFORMANCE (at 20°C)

Size	Brass Cross-piece 109, 111				Plastic Cross-piece 609, 611				Max angular compensation @ 1000 rev/min	Max radial compensation mm
	Peak Torque Nm	Static Break Torque Nm	Torsional Rate deg/Nm	Torsional Stiffness Nm/Rad	Peak Torque Nm	Static Break Torque Nm	Torsional Rate deg/Nm	Torsional Stiffness Nm/Rad		
06	0.08	0.34	81.9	0.7	0.08	0.3	115	0.5	90	5.6
09	0.16	1.9	13.3	4.3	0.16	1.5	17.3	3.3	90	9.1
13	0.59	3.4	8.1	7.1	0.59	2.5	10.4	5.5	90	10.9
16	1.3	6.8	4.5	12.6	1.0	5.0	7.5	7.6	90	15.5

STANDARD BORES

Size	Bore tolerences 101, 601, 109, 609 = +0.04/-0.0mm • 103, 603, 111, 611 = +0.03/-0.0mm																		
	3	3.175	4	4.763	5	6	6.350	8	9.525	10	12	12.700	14	15.875	16	18	19	19.050	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

● Moulded bores only ○ Sleeved bores only ● Moulded or sleeved bores available

Constant velocity

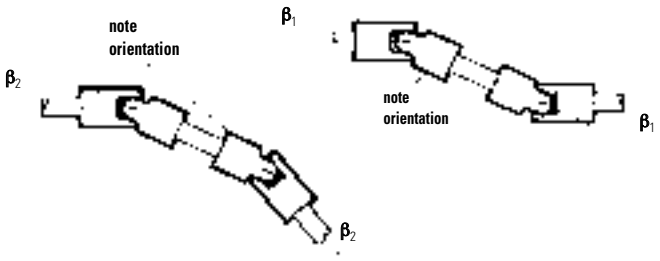
The velocity ratio of single universal joints is not constant when the working angle is greater than zero. Their geometry gives rise to sinusoidal fluctuations at the output that increase with the working angle and which vary between:

$\omega \cos \beta$ 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°

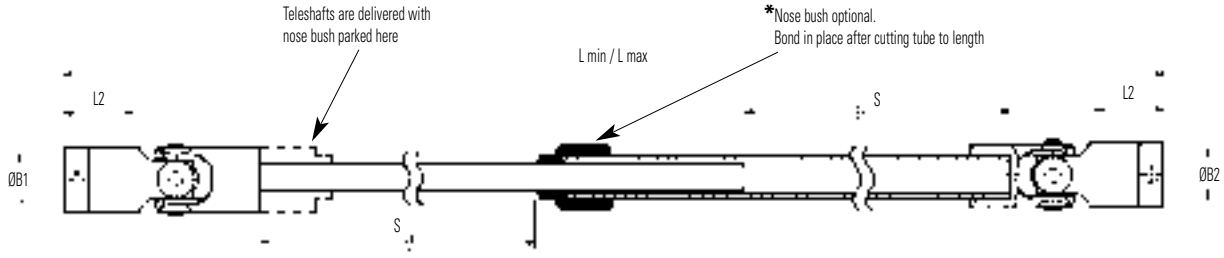
Accordingly:

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.

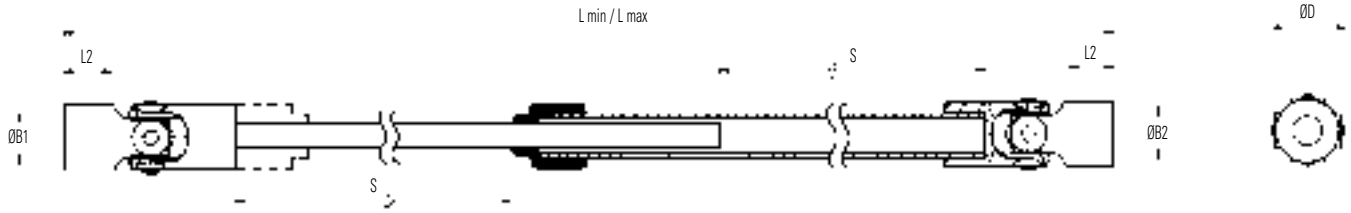




Refs. 128 & 495
Joints sleeved with headed brass inserts fitted 2 screws per end

End A (inner tube)

End B (outer tube)



Refs. 130 & 497
Joints sleeved with metal inserts. Attach to shafts by cross-pinning or bonding

Typical

DIMENSIONS & ORDER CODES

Teleshaft size	① Teleshaft options		ØD	L	L	Stroke	L2	ØB1, ØB2 max	Mass	Corresponding joints.
	Standard tubes self-colour brass	Wear-resistant tubes Niflor coated		±1.0 min	max	S	②		kg x 10–3 ③	For dimensions see
	teleshaft REF									
09	128.09.240	495.09.240	11.1	240	389	149	13.1	5	36	103.09
13	128.13.300	495.13.300	14.3	300	484	184	15.7	6.35	58	103.13
16	128.16.450	495.16.450	17.5	450	730	280	22.3	10	168	103.16
20	130.20.464	497.20.464	23.0	464	745	281	17.0	12.70	241	105.20
25	130.25.500	497.25.500	28.5	500	784	284	20.0	14	457	105.25
32	130.32.564	497.32.564	36.5	564	868	304	21.0	20	827	105.32

① Niflor is a proprietory PTFE impregnated electroless nickel plating process.

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

Teleshaft size	ØB1, ØB2 +0.03 / –0mm														
	3.175	4	4.763	5	6	6.350	8	9.525	10	12	12.700	15.875	16	19.050	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 60* for details.

Huco Teleshafts

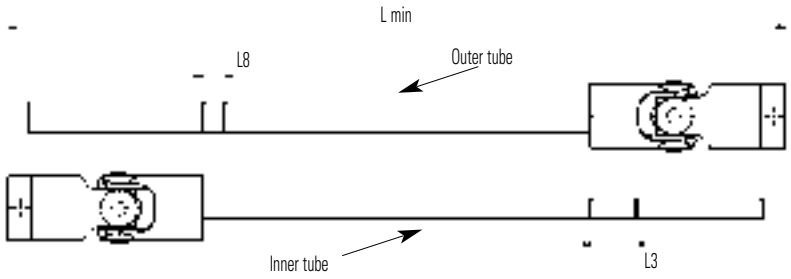
Plastic Universal Joints Brass Cross Pieces and Tubes

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 customised 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).

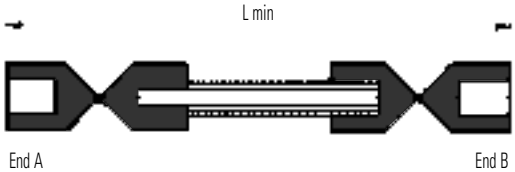


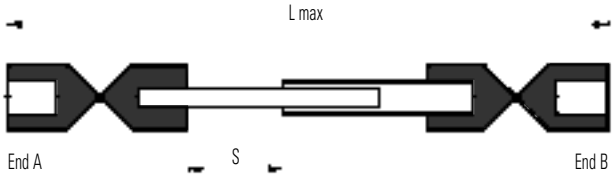
Size	L3	L8
09	8.6	3.2
13	10.4	4.3
16	15.2	6.1
20	17.0	8.2
25	20.0	10.3
32	21.0	18.0

- 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 customised teleshafts

Please specify your teleshaft by completing the questionnaire.





Teleshaft size 09 13 16 20 25 32

Teleshaft ref. 128 130 495 497

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

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