

# Couplings

**Material**

## Double Universal Joints

Acetal Body



### Materials & Finishes

**Bodies:** Acetal

**Cross-pieces:** Brass BS 2874 CZ121, CZ122, (HPC101, HPC103, HPC109, HPC111)

**Bore Inserts:** Brass BS 2874 CZ121 (HPC103, HPC111)  
Al. Alloy 2014A T6 (HPC105)

**Fasteners:** Alloy steel, black oiled

### General description

Light duty plastic universal joints.

Low mass, corrosion resistant, ideal where conventional steel joints would be under-utilised.

### Where to use

Intermittent applications in business machines, instrumentation, lab equipment, analytical apparatus, etc., where steel joints would be under-utilised.

### Speeds

Up to 1000 rpm

### Electrically isolating

Yes

### Peak torque largest size

10.7 Nm

### Connection

Set Screw, Bonding or Cross-Pinning

### Standard bores

3 to 20 mm

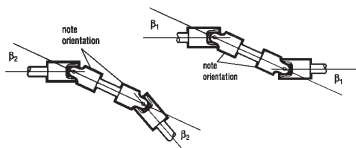
### Temperature range

-20 °C to +60 °C

**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  $\omega$  = angular velocity  
 and  $\beta$  = 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:

- The orientation of two single joints is correct; the inboard forks should align as in double joints.
- The working angle of both joints, or both halves of a double joint, is the same.

**Adjustable 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:

- multiply speed x working angle
- subtract the result from 10000
- divide the answer into 10000
- apply the result to the application torque.

eg. speed = 400 rpm

application torque = 0.1Nm

working angle = 20°

Accordingly:

- 400 rpm x 20° = 8000
- 10000 - 8000 = 2000
- 10000 / 2000 = 5
- 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.

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### Standard Bores

Coupling Size	Bore tolerances HPC101 = +0.04/-0.0mm HPC103 = +0.03/-0.0mm											
	Bore Size	3	3.175	4	4.763	5	6	6.350	8	9.525	10	
06	●	●	●	●								
09	●	●	●	●	●	●	●					
13			●	●	●	●	●	●				
16						●	●	●	●	●	●	
20								●	●	●	●	
25											●	
32												
Bore ref.	14	16	18	19	20	22	24	28	31	32		
●	Moulded bores only		●			Sleeved bores only		●				Moulded or sleeved bores only

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Coupling Size	Bore tolerances HPC101 = +0.04/-0.0mm HPC103 = +0.03/-0.0mm								
	12	12.7	14	15.875	16	18	19	19.05	20
06									
09									
13									
16									
20		•							
25	•	•							
32			•	•	•	•	•	•	•
<i>Bore ref.</i>	35	36	38	41	42	45	46	47	48

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Double Joints - Dimensions and Order Codes

Couplings Universal Joints

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PART NUMBER	Coupling Type & Size	Dimensions						B1, B2 Max	Mi
		OD	L	L1	L2	L3	L4		
HPC109.06.----	06	7.1	27.2	3.3	5.3	16.7	8.1	4.76	0.6
HPC111.06.----			35.3	-	9.3			3.18	1.3
HPC109.09.----	09	11.1	41.7	4.3	8.6	24.6	13.2	6.35	5.9
HPC111.09.----			50.8	-	13.1			5.0	15.3
HPC109.13.----	13	14.3	51.4	5.6	10.4	30.7	15.9	8.0	23.7
HPC111.13.----			62.1	-	15.7			6.35	50.4
HPC109.16.----	16	17.5	75.5	8.9	15.2	45.2	22.2	11.0	63.5
HPC111.16.----			89.8	-	22.3			10.0	178.0

**Order codes:** Please combine the universal joint part number in the above table with the bore reference in the standard bores table (see pages 3.96 & 3.97). Please identify both bores to complete the part number eg. HPC109.06. 14 19

Mi: Moment of inertia  $\text{kgm}^2 \times 10^{-8}$

Part Number  $\varnothing$ B1  $\varnothing$ B2

3.98



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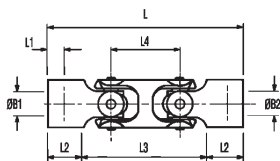
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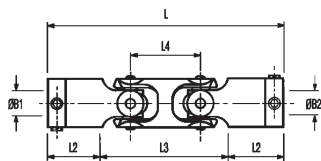
## Double Universal Joints

### DISCOUNTS

1 - 5	6-15	16-40	41-99	100 +
List Price	-5%	-10%	-15%	-20%



Type HPC109



Type HPC111

Fasteners			Mass kg $\times 10^{-3}$	PART NUMBER	PRICE EACH 1-19
Size	Torque (Nm)	A/F (mm)		Size	
-	-	-	1.1	HPC109.06.----	£11.62
M3	0.94	1.5	3.5	HPC111.06.----	£19.56
-	-	-	4.5	HPC109.09.----	£10.48
M3	0.94	1.5	11.1	HPC111.09.----	£19.56
-	-	-	9.6	HPC109.13.----	£11.62
M3	0.94	1.5	21.6	HPC111.13.----	£24.03
-	-	-	19.7	HPC109.16.----	£12.55
M4	2.27	2.0	42.4	HPC111.16.----	£27.22

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