



Reliance

Precision Mechatronics LLP

Precision Motion Control Components & Mechatronic Assemblies



Bearings & Fasteners



Bearings & Fasteners

Associated Products



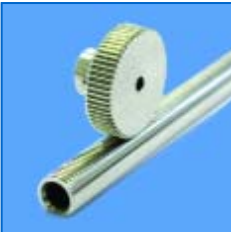
Quality System

Reliance operations are controlled by a quality management system approved to BS EN ISO 9001:2000.



Standard Products and Assemblies

Accurate positioning from modifiable standards for instrumentation, measurement and light actuation applications.



Rack and Pinions

Precision ground racks, soft and hard, round or rectangular section. Plain and anti-backlash pinions manufactured from stainless steel.



Instrumentation Gears

Plain and anti-backlash precision gears and pinions 0.2 to 0.6 module, tolerances up to AGMA Q14. Worm and wheel and bevel gear combinations.



Linear Products

Precision linear components which include leadscrews, slideways, linear bearings and shafting.



Product Index

A general overview of Reliance's complete product range is available on the Reliance Precision Mechatronics LLP website at: www.rpmechatronics.co.uk

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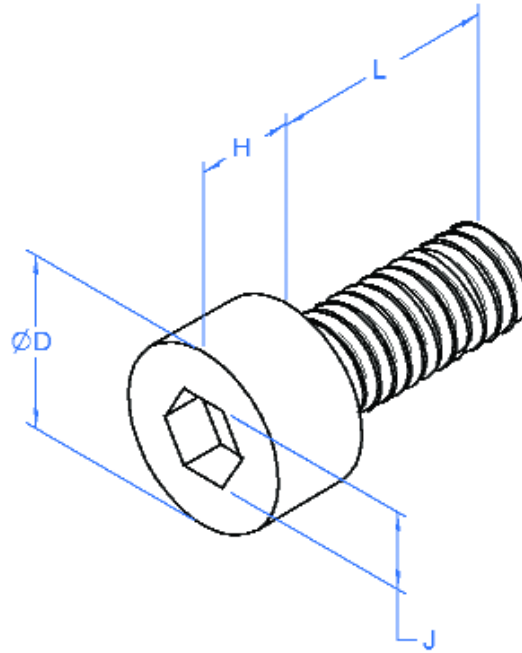


Plain Socket Head Screws

M1.6 - M6

General Information

All dimensions in mm
 Thread Specification:
 BS3643: Pt.2 1981
 Tolerance class: 6g.
 Material:
 A2-70 Austenitic⁽¹⁾
 A4-70 Austenitic⁽²⁾
 Stainless steel to
 ISO 3506-1: 1997



Associated Products

Disc springs
 Nuts and washers

Visit our online
 catalogue for
 associated products

www.rpmechatronics.co.uk

Part number selection table

Example Part No:-							S - M3 - 12 - A47									
Basic Part No.	Std Thd Size	ØD max	H max	J nom	Standard Length L								Matl.			
					3	4	5	6	8	10	12	16		20	25	30
S	M1.6	3.0	1.6	1.5	3	4	5	6	8							A27 ⁽¹⁾
	M2	3.8	2.0	1.5	4	5	6	8								A47 ⁽²⁾
	M2.5	4.5	2.5	2.0		5	6	8	10							
	M3	5.5	3.0	2.5			6	8	10	12	16	20				
	M4	7.0	4.0	3.0				8	10	12	16	20	25			
	M5	8.5	5.0	4.0					10	12	16	20	25	30		
M6	10.0	6.0	5.0						12	16	20	25	30	40		

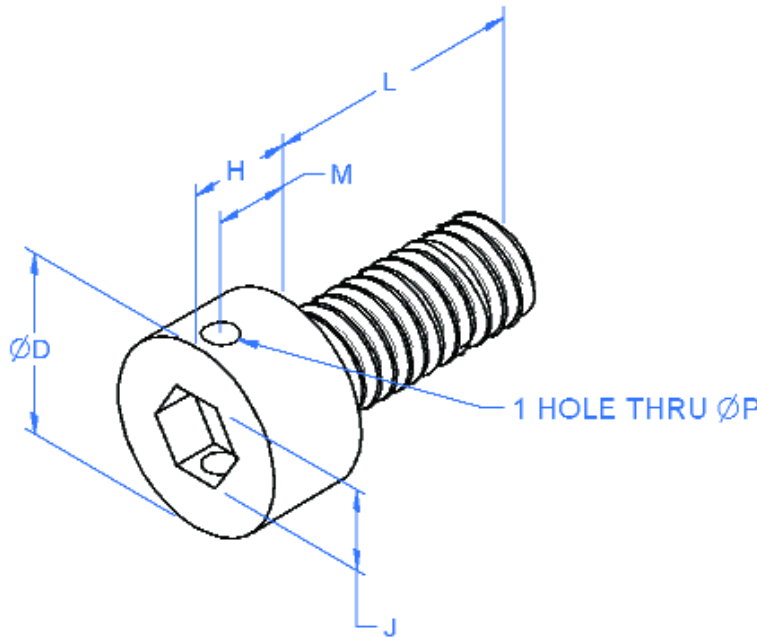
- Plain socket head cap screw to ISO 4762.
- 700 MPa minimum tensile strength.
- Rolled thread for excellent surface finish, superior thread strength and increased hardness properties.

Non-standard options, please enquire....

- Slotted head.
- Imperial sizes.
- Alternative materials.

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General Information

All dimensions in mm
 Thread Specification:
 BS3643: Pt.2 1981
 Tolerance class: 6g.
 Material:
 A2-70 Austenitic⁽¹⁾
 A4-70 Austenitic⁽²⁾
 Stainless steel to
 ISO 3506-1: 1997

Associated Products

Disc springs
 Nuts and washers

Visit our online catalogue for associated products

Part number selection table

Example Part No:- **S - M3 - 12 - A47 - XD**

Basic Part No.	Std Thd Size	ØD max	H max	J nom	M ±0.05	ØP ±0.05	Standard Length L	Matl.
S	M1.6	3.0	1.6	1.5	1.1	0.4	3 4 5 6	A27 ⁽¹⁾
	M2	3.8	2.0	1.5	1.3	0.6	4 5 6 8	A47 ⁽²⁾
	M2.5	4.5	2.5	2.0	1.75	0.7	5 6 8 10	
	M3	5.5	3.0	2.5	2.1	0.8	6 8 10 12 16 20	
	M4	7.0	4.0	3.0	2.7	1.0	8 10 12 16 20 25	
	M5	8.5	5.0	4.0	3.5	1.5	10 12 16 20 25 30	
	M6	10.0	6.0	5.0	4.2	1.5	12 16 20 25 30 40	

- Socket head cap screw to ISO 4762 with cross-drilled head to allow fastener retention by wire locking.
- 700 MPa minimum tensile strength.
- Rolled thread for excellent surface finish, superior thread strength and increased hardness properties.

Non-standard options, please enquire....

- Imperial sizes.
- Alternative materials.

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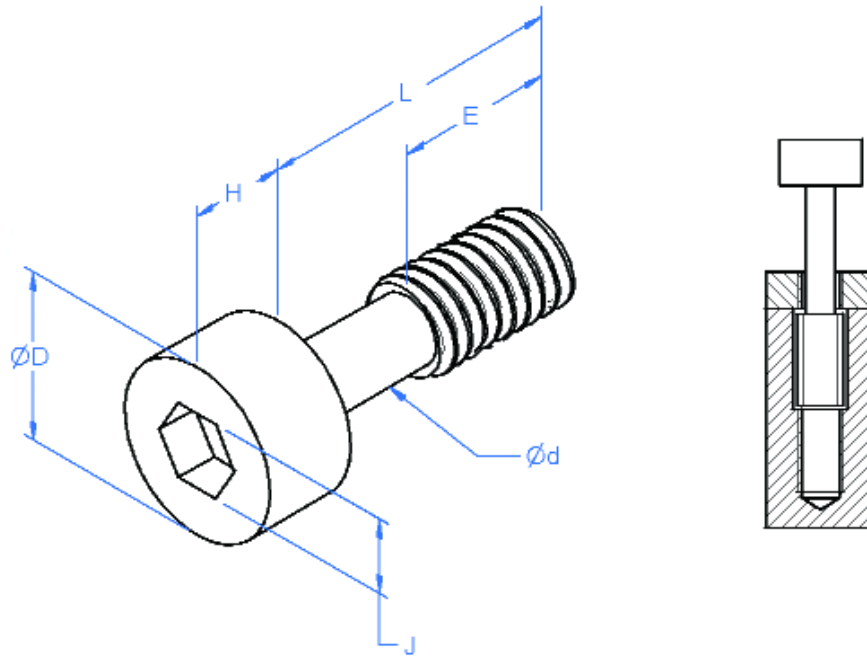


Captive Screws

M2 - M6

General Information

All dimensions in mm
 Thread Specification:
 BS3643: Pt.2 1981
 Tolerance class: 6g.
 Material:
 A2-70 Austenitic⁽¹⁾
 A4-70 Austenitic⁽²⁾
 Stainless steel to
 ISO 3506-1: 1997



Associated Products

Disc springs
 Nuts and washers

Visit our online catalogue for associated products

Part number selection table

Example Part No:- **S - M3 - 16 - A47 - CA**

Basic Part No.	Std Thd Size	ØD max	H max	J nom	Ød ±0.1	E ±0.1	Standard Length L				Matl.
S	M2	3.8	2.0	1.5	1.4	4.0	10				A27 ⁽¹⁾
	M2.5	4.5	2.5	2.0	1.8	5.0	12				A47 ⁽²⁾
	M3	5.5	3.0	2.5	2.2	6.0	16	20			
	M4	7.0	4.0	3.0	3.0	8.0		20	25		
	M5	8.5	5.0	4.0	3.8	10.0			25	30	
	M6	10.0	6.0	5.0	4.5	12.0				30 40	

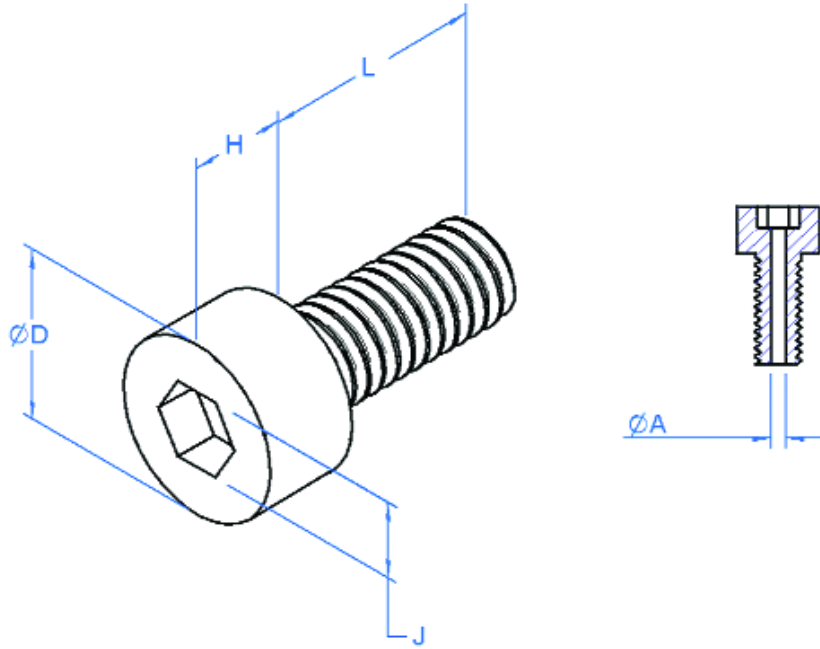
- Socket head cap screw in accordance with ISO 4762 with plain shank length for captive assembly of the screw to prevent fastener loss.
- Ideal for service covers.
- Rolled thread for excellent surface finish, superior thread strength and increased hardness properties.

Non-standard options, please enquire....

- Slotted head.
- Imperial sizes.
- Alternative materials.

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General Information

All dimensions in mm
 Thread Specification:
 BS3643: Pt.2 1981
 Tolerance class: 6g.
 Material:
 A2-70 Austenitic⁽¹⁾
 A4-70 Austenitic⁽²⁾
 Stainless steel to
 ISO 3506-1: 1997

Associated Products

Disc springs
 Nuts and washers

Visit our online catalogue for associated products

Part number selection table

Example Part No:- **S - M3 - 12 - A47 - AD**

Basic Part No.	Std Thd Size	ØD max	H max	J nom	ØA ±0.05	Standard Length L										Matl.	
						3	4	5	6	8	10	12	16	20	25		30
S	M1.6	3.0	1.6	1.5	0.6	3	4	5	6								A27 ⁽¹⁾
	M2	3.8	2.0	1.5	0.7	4	5	6	8						A47 ⁽²⁾		
	M2.5	4.5	2.5	2.0	0.8	5	6	8	10								
	M3	5.5	3.0	2.5	1.0	6	8	10	12	16	20						
	M4	7.0	4.0	3.0	1.0	8	10	12	16	20	25						
	M5	8.5	5.0	4.0	1.5	10	12	16	20	25	30						
M6	10.0	6.0	5.0	1.5	12	16	20	25	30	40							

- Socket head cap screw in accordance with ISO 4762 drilled through on axis for use in vacuum assemblies to assist cavity ventilation.
- Rolled thread for excellent surface finish, superior thread strength and increased hardness properties.

Non-standard options, please enquire....

- Slotted head.
- Imperial sizes.
- Alternative materials.

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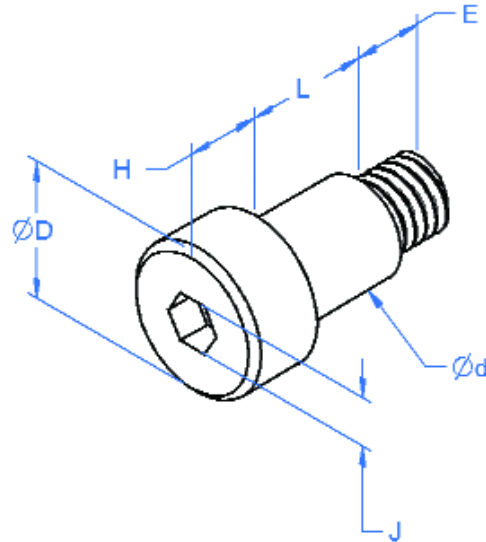
Shoulder Screws

M3 - M10

General Information

All dimensions in mm

Material:
303 Stainless steel.



Associated Products

Disc springs
Nuts and washers

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Part number selection table

Example Part No:- **MSS2 - M6 - 35**

Basic Part No.	Std Thd Size	Ød +0.000 -0.025	ØD	J nom	H	E ±0.1	Length L	
							+0.05	-0.00
MSS2	M3	3.987	6	2	3	4	4.01	1
							5.01	2
							6.01	3
							8.01	4
							10.01	5
	M4	4.987	8	2.5	4	5	4.01	6
							5.01	7
							6.01	8
							8.01	9
							10.01	10
							12.01	11
							14.01	12
							16.01	13
							20.01	14
							25.01	15
							30.01	16
	M5	5.987	10	3	5	6	4.01	17
							5.01	18
							6.01	19
							8.01	20
							10.01	21
							12.01	22
							14.01	23
							16.01	24
							20.01	25
							25.01	26
	30.01	27						

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Basic Part No.	Std Thd Size	Ød +0.000 -0.025	ØD	J nom	H	E ±0.1	Length L +0.05 -0.00	Length Code						
MSS2	M6	7.987	12	4	6	11	6.01	28						
							8.01	29						
							10.01	30						
							12.01	31						
							16.01	32						
							20.01	33						
	M8	9.987	14	5	7	12	8.01	34						
							10.01	35						
							12.01	36						
							16.01	37						
							M10	11.987	20	6	8	16	12.01	42
													16.01	43
20.01	44													
25.01	45													

General Information

All dimensions in mm
Material:
303 Stainless steel.

Associated Products

Disc springs
Nuts and washers

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- Socket head screw with accurate diameter shoulder for precision assemblies.
- May be used to replace components such as shafts, pivots, pins and guides.
- Used for linkages, stationary guides and pivots.

Non-standard options, please enquire...

- Slotted head, Phillips head.
- Imperial sizes.
- Alternative material (416).
- Alternative lengths.

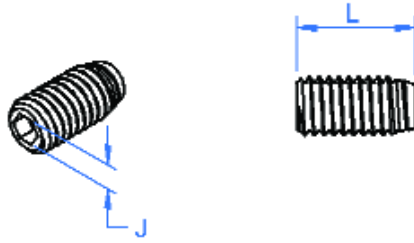
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Cup Point Set Screws

M2 - M6



General Information

All dimensions in mm
 Thread Specification:
 BS3643: Pt.2 1981
 Tolerance class: 6g.
 Material:-
 Stainless steel.
 Manufactured to:-
 BS4168 Part 5.
 (ISO 4029:1993)

Associated Products

Gears
 Pulleys
 Reli-a-Flex® couplings

Visit our online catalogue for associated products

Part number selection table

Example Part No:-		SS - M4 - 12														
Basic Part No.	Std Thread Sizes	J nom	Standard Lengths L													
			2	3	4	5	6	8	10	12	16	20	25			
SS	M2	0.9	2	3	4	5	6	8	10							
	M2.5	1.3		3	4	5	6	8	10							
	M3	1.5		3	4	5	6	8	10	12						
	M4	2			4	5	6	8	10	12	16					
	M5	2.5				5	6	8	10	12	16	20				
	M6	3					6	8	10	12	16	20	25			

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- Used for quick, permanent location of gears, collars and pulleys on shafts.
- Suitable for high torque transmission.

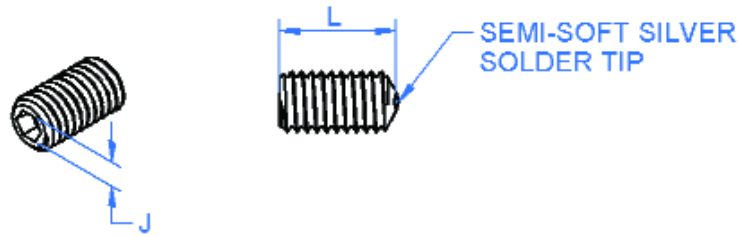
Non-standard options, please enquire....

- Imperial sizes.
- Alternative materials.

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Solder Tip Set Screws



General Information

All dimensions in mm
 Thread Specification: BS3643: Pt.2 1981
 Tolerance class: 6g.
 Material:-
 Screw - Stainless steel.
 Insert - Silver solder.

Part number selection table

Example Part No:- **SGSS - M6 - 17**

Basic Part No.	Std Thread Sizes	J nom	Standard Lengths L	Length Code
SGSS	M2	0.9	3	1
			4	2
			5	3
			6	4
	M3	1.5	3	5
			4	6
			5	7
			6	8
	M4	2	4	9
			6	10
			10	11
			14	12
	M5	2.5	6	13
			10	14
			14	15
			20	16
	M6	3	6	17
			10	18
			16	19
			25	20

Associated Products

Gears
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- Stainless steel set screw with semi-soft silver solder tip insert.
- Prevents shaft marking.

Non-standard options, please enquire....

- Imperial sizes.
- Alternative material.

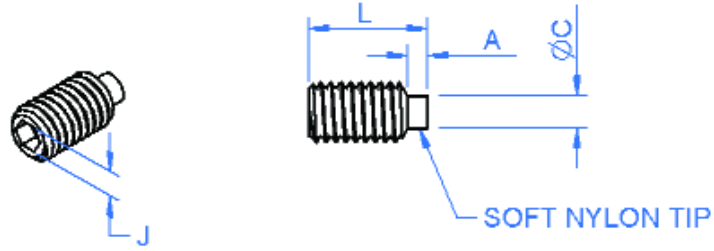


Nylon Tip Set Screws

M2 - M6

General Information

All dimensions in mm
 Thread Specification:
 BS3643: Pt.2 1981
 Tolerance class: 6g.
 Material:-
 Screw - Stainless steel
 Insert - Nylon.



Part number selection table

Example Part No:- **NMSS - M5 - 16**

Basic Part No.	Std Thread Sizes	ØC	A	J nom	Standard Lengths L	Length Code
NMSS	M2	0.8	0.8	0.9	3.8	1
					4.8	2
					5.8	3
					6.8	4
	M3	1.6	0.8	1.5	3.8	5
					4.8	6
					5.8	7
					6.8	8
	M4	2.4	1.2	2	5.2	9
					7.2	10
					11.2	11
					15.2	12
	M5	2.4	1.2	2.5	7.2	13
					11.2	14
					15.2	15
					21.2	16
	M6	3.2	1.6	3	7.6	17
					11.6	18
					17.6	19
					26.6	20

- Stainless steel set screw with nylon tip insert.
- Used to eliminate shaft marking.
- Self locking.
- Full face contact.

Non-standard options, please enquire....

- Imperial sizes.
- Alternative material.

Associated Products

Gears

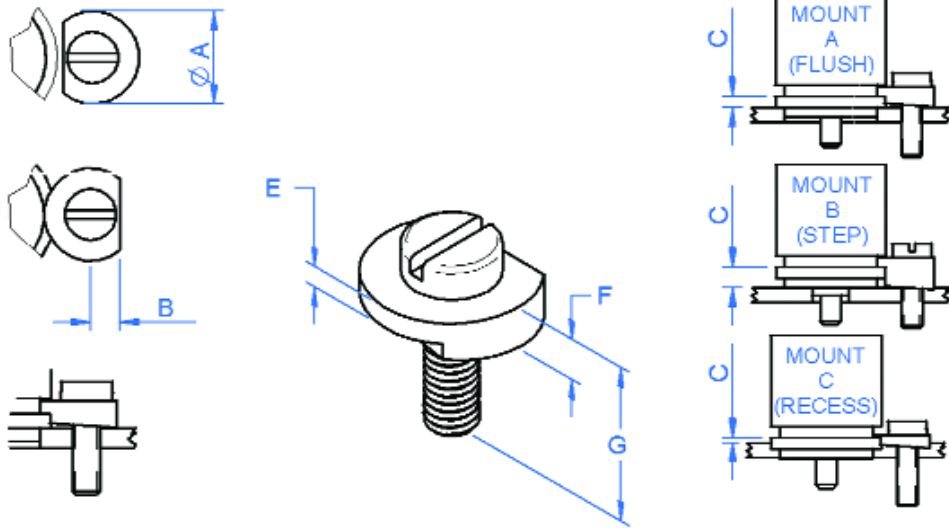
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Clamp Cleats



General Information

All dimensions in mm
 General tolerances:
 ±0.13mm
 Materials:-
 Stainless steel clamp.
 Nylon locking insert.

Associated Products

Gearboxes
 Adaptor plates

Visit our online catalogue for associated products

Part number selection table

Part Number	Mount Type	Height C ±0.08	Flat B	Lip E ±0.08	Height F	Length G +0.0/-0.8	Thread Size	O/D ØA +0.00/-0.13
SQM-6	A & C	0.79	3.18	1.02	1.8	7.0	M3 x 0.5	9.90
SQM-7	A	1.57		1.02	2.59			
SQM-8		1.57		1.27	2.84			
SQM-9		1.57		1.60	3.18			
SQM-10		1.98		1.60	3.58			
SQM-11		2.36		1.02	3.38			
SQM-12		2.36		1.27	3.63			
SQM-13		2.36		1.60	3.96			
SQM-14		B		3.18	1.27	4.45		
SQM-15				3.96	1.02	4.98		
SQM-16				5.72	1.60	7.32		
SQM-17	A	6.35		1.60	7.92	15.0		

- Ideal for use with resolvers, encoders and potentiometers.

Non-standard options, please enquire....

- Imperial sizes.
- Alternative materials.

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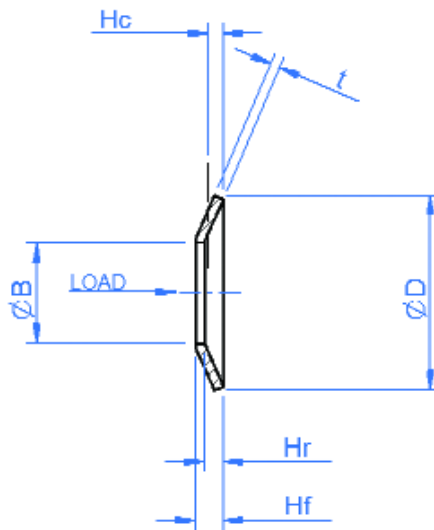


Disc Springs

To Suit M4 - M12 Screws

General Information

All dimensions in mm
 General tolerances:
 $\pm 0.13\text{mm}$
 Material:
 Stainless steel
 X12CrNi 17 7
 (DIN1.4310).



Associated Products

Shafts
 Bearings
 Machine screws
 Nuts and washers

Visit our online catalogue for associated products

Part number selection table

Example Part No:- **BW - M6**

Basic Part No.	Screw Size	ØD	ØB	t	Free Height Hf	Ref. Height Hr	Compressed Height Hc (75% Defl.)	Force Compress to Hc (N)
BW	M4	8.0	4.2	0.40	0.60	0.20	0.45	193
	M5	10.0	5.2	0.50	0.75	0.25	0.56	300
	M6	12.5	6.2	0.70	0.95	0.25	0.76	503
	M7	14.0	7.2	0.80	1.10	0.30	0.87	735
	M8	16.0	8.2	0.90	1.25	0.35	0.99	934
	M10	20.0	10.2	1.10	1.55	0.45	1.21	1403
	M11	22.5	11.2	1.25	1.65	0.40	1.35	1411
M12	25.0	12.2	1.50	1.90	0.40	1.60	1944	

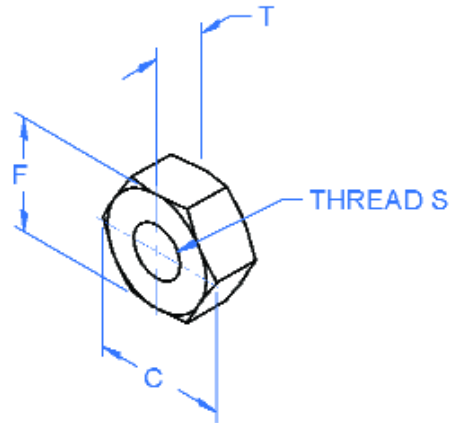
- For use where controlled axial force is required.
- Good for bearing pre-load configurations.

Non-standard options, please enquire....

- Imperial sizes.
- Alternative materials.

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General Information

All dimensions in mm
 General tolerances:
 ±0.13mm
 Material:-
 Stainless steel.

Associated Products

Machine screws
 Disc springs

Visit our online catalogue for associated products

Part number selection tables

Example Part No:- HN - M3				
Basic Part No.	Thread Size S	T max	F max	C nom
HN	M1.6	1.3	3.2	3.41
	M2	1.6	4.0	4.6
	M2.5	2.0	5.0	5.8
	M3	2.4	5.5	6.4
	M4	3.2	7.0	8.1
	M5	4.0	8.0	9.2
	M6	5.0	10.0	11.5

Non-standard options, please enquire....

- Imperial sizes.
- Alternative materials.

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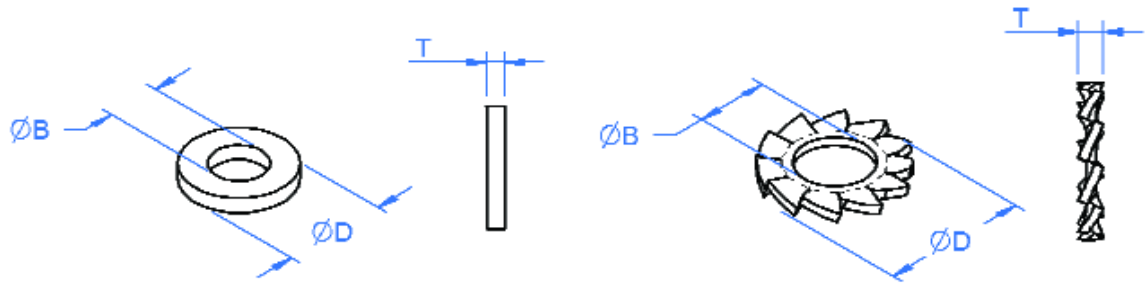


Washers

To Suit M1.6 - M6 Screws

General Information

All dimensions in mm
 General tolerances:
 ±0.13mm
 Materials:-
 Stainless steel.



Associated Products

Machine screws
 Disc springs

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Part number selection tables

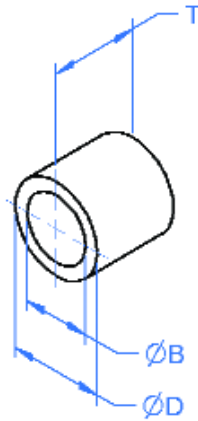
Plain Washer					Tooth Lock Washer				
Example Part No:- PW - M3					Example Part No:- ETW - M3				
Basic Part No.	Thread Size S	ØD max	ØB max	T nom	Basic Part No.	Thread Size S	ØD max	ØB max	T nom
PW	M1.6	4.0	1.7	0.3	ETW	M2	4.5	2.2	0.9
	M2	5.0	2.2	0.4		M3	6.0	3.2	1.2
	M2.5	6.5	2.7	0.6		M4	8.0	4.3	1.5
	M3	7.0	3.2	0.6		M5	10.0	5.3	1.8
	M4	9.0	4.3	0.9		M6	11.0	6.4	2.1
	M5	10.0	5.3	1.1					
M6	12.5	6.4	1.8						

Non-standard options, please enquire....

- Imperial sizes.
- Alternative materials.

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General Information

All dimensions in mm
 General tolerances:
 ±0.13mm
 Material:-
 Ceramic.

Associated Products

Machine screws
 Washers

Visit our online catalogue for associated products

Part number selection tables

Part Number	T	ØD	ØB ±0.05
SPC-C1-1.75	3.5	2.7	1.75
SPC-C1-2.9	2	4.7	2.9

- High working temperature, up to 1200°C.
- High voltage insulator, up to 6kV/mm.
- Used for electrically insulating parts within assemblies.
- High alumina, 95%.

Non-standard options, please enquire....

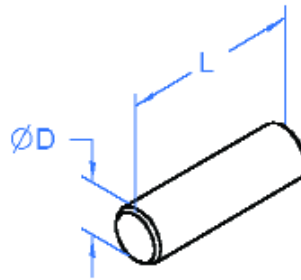
- Alternative bore sizes and lengths.
- Alternative materials.
- Cleaned suitable for ISO 14644-1 Class 7 Cleanrooms.

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Dowel Pins

Ø1 - Ø6mm



General Information

All dimensions in mm
 General Tolerances:
 ±0.13mm
 Material:
 Stainless steel 300 series.

Associated Products

Pin hub gears
 Shaft collars

Visit our online catalogue for associated products

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Part number selection table

Example Part No:- **D 020 - 10**

Basic Part No.	ØD ±0.0025	Diameter Code	Standard Lengths L ±0.25													
			3	4	5	6	8	10	12	14	16	18	20	22	25	
D	1.00	010	3	4	5	6	8	10	12	14						
	1.50	015	3	4	5	6	8	10	12	14	16	18				
	2.00	020	3	4	5	6	8	10	12	14	16	18	20	22		
	2.50	025	3	4	5	6	8	10	12	14	16	18	20	22		
	3.00	030			5	6	8	10	12	14	16	18	20	22	25	
	4.00	040						10	12	14	16	18	20	22	25	
	5.00	050							12	14	16	18	20	22	25	
6.00	060								14	16	18	20	22	25		

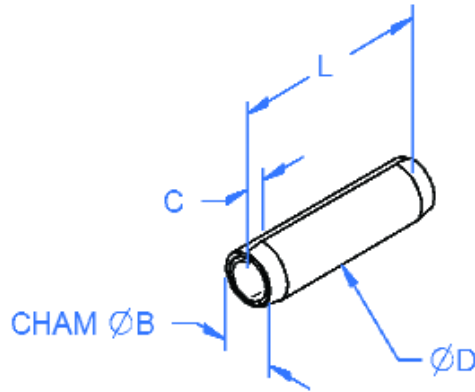
- Precision stainless steel dowel pin suitable for accurate location and alignment.
- Suitable for precision location of Reliance's gears on ground shaft.
- Ideal for high torque applications.

Non-standard options, please enquire....

- Imperial sizes.
- Alternative materials.

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General Information

All dimensions in mm
 General Tolerances: ±0.13mm
 Material: Chrome stainless steel AISI 420.
 Finish: Pickled and oiled.

Part number selection table

Associated Products

Example Part No:- **MSP - 1.5 - 6 - MCP**

Basic Part No.	Actual Dia ØD	Nom. Dia	Cham Dia ØB	Cham Length C	Recom. Hole Dia	Standard Lengths L	
MSP	0.85/0.91	0.8	0.75	0.30	0.80/0.84	4	5 6 8
	1.05/1.15	1.0	0.95	0.30	1.00/1.04	4	5 6 8 10 12
	1.62/1.73	1.5	1.40	0.50	1.50/1.60	5	6 8 10 12 14 16
	2.13/2.25	2.0	1.90	0.70	1.99/2.10	6	8 10 12 14 16 18
	2.65/2.78	2.5	2.40	0.70	2.49/2.60		10 12 14 16 18
	3.15/3.30	3.0	2.90	0.90	2.99/3.10		14 16 18 20

Pin hub gears
 Shaft collars

Visit our online catalogue for associated products

www.rpmechatronics.co.uk

- Coiled steel pin for location and alignment.
- Suitable for locating Reliance’s gears on ground shaft for lower torque or less demanding applications.
- Large hole diameter tolerance.

Non-standard options, please enquire....

- Imperial sizes.
- Alternative materials.



Ball Bearings

ABEC 7

General Information

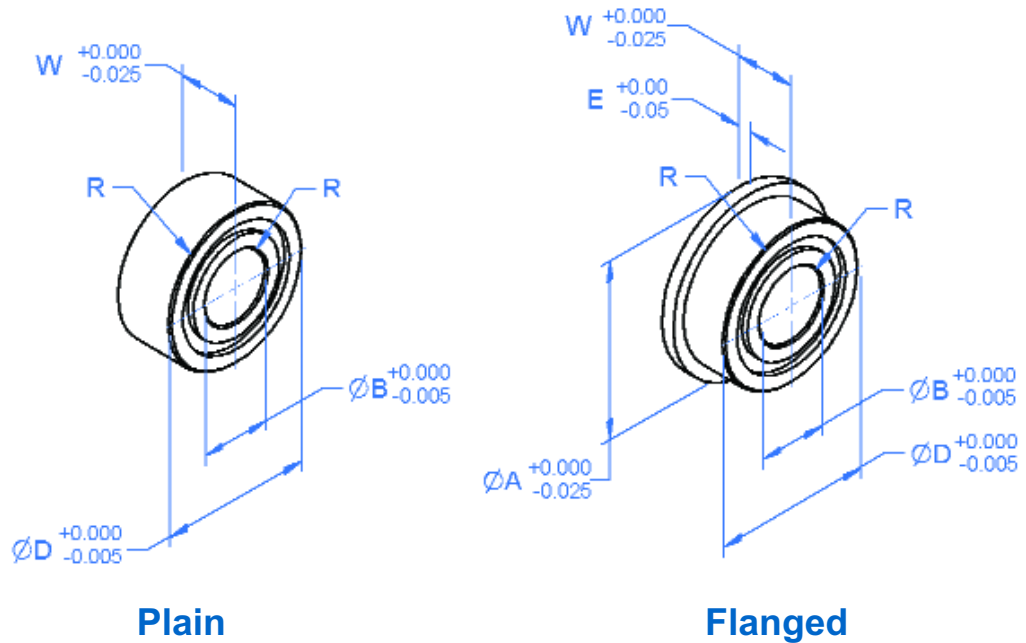
All dimensions in mm
 General Tolerances:
 $\pm 0.13\text{mm}$
 Double shielded
 Material:
 AISI 440C St steel.

Associated Products

Shafts
 Bearing pre-load washers
 Bearing spacers

Visit our online catalogue for associated products

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Part number selection table

Part Number		Dimensions						Specification	
Plain	Flanged	Bore dia. ØB	O/D ØD	Width W	Radii (min) R	Flange Dia. ØA	Flange width E	Load ratings, N	
								Dynamic C	Static Co
B1-102-S-7	B2-102-S-7	2	5	2.3	0.08	6.1	0.6	90	22
B1-103-S-7	B2-103-S-7	3	7	3.0	0.10	8.1	0.8	206	108
B1-104-S-7	B2-104-S-7	4	9	4.0	0.10	10.3	1.0	353	196
B1-105-S-7	B2-105-S-7	5	11	5.0	0.15	12.5	1.0	392	216
B1-106-S-7	B2-106-S-7	6	13	5.0	0.15	15.0	1.1	579	353
B1-108-S-7	B2-108-S-7	8	16	6.0	0.20	18.0	1.3	951	628
B1-110-S-7	B2-110-S-7	10	19	7.0	0.30	21.0	1.5	1020	696

- Operating temperature range, -75°C to $+120^{\circ}\text{C}$.
- Greased to Mil-G-23827A.

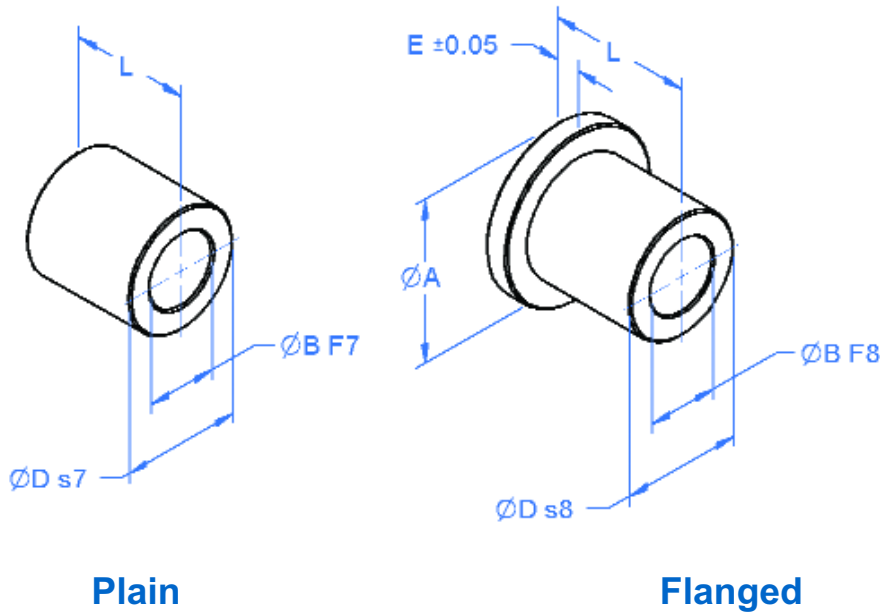
Non-standard options, please enquire....

- Imperial sizes.



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General Information

All dimensions in mm
 General tolerances: ±0.13mm
 Material: Bronze, MIL-B-5687 Type 1, Grade 1.

Associated Products

Shafts
Bearings

Visit our online catalogue for associated products

Part number selection table

Part Number		Bore ØB#	O/D ØD	Length L	Flange dia. ØA	Flange width E
Plain	Flanged					
BBM1-3	BBM2-3	3	6	6	9	1.5
BBM1-4	BBM2-4	4	8	12	12	2.0
BBM1-5	-----	5	8	12	--	--
BBM1-6	BBM2-6	6	10	12	14	2.0
BBM1-8	BBM2-8	8	12	12	16	2.0
BBM1-10	BBM2-10	10	13	16	16	1.5

#Bearing bore tolerances after assembly are; plain bearings H7, flanged bearings H8. Recommended housing bore H7.

- Operating temperature range, -20°C to +100°C.
- Oil impregnated.
- p.v (@0.5m/s) = 1.75 N/mm².m/s.
- p_{max} = 13.8 N/mm².
- v_{max} = 6.1 m/s (rotational).

Non-standard options, please enquire....

- Imperial sizes.



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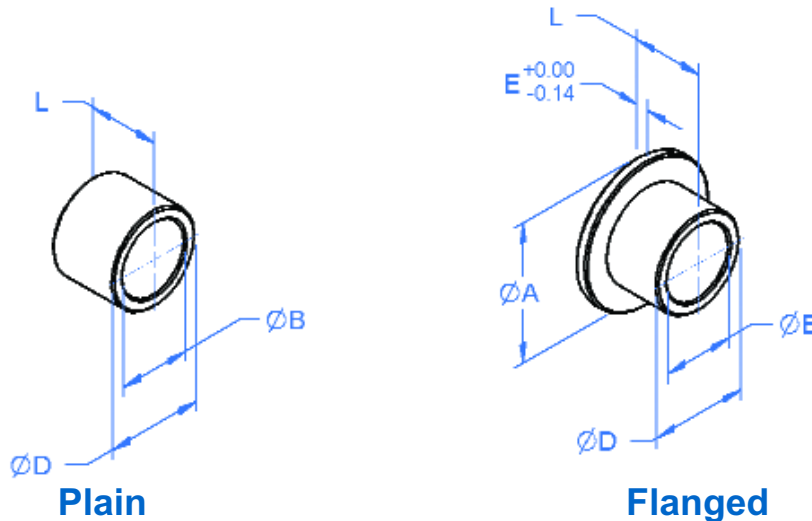


Moulded Bearings

2 - 12mm Bore

General Information

All dimensions in mm
 General Tolerances:
 $\pm 0.13\text{mm}$
 Material:
 Self lubricating
 moulded thermo-plastic.



Associated Products

Shafts
 Leadscrews
 Bearing spacers

Visit our online catalogue for associated products

www.rpmechatronics.co.uk

Part number selection table

Part Number		Bore ØB #	O/D ØD	Length L	Flange Dia. ØA	Flange Width E
Plain	Flanged					
BM8-2	-----	2.054 2.014	3.5	3.00 2.86	-----	-----
BM8-3	BM9-3	3.054 3.014	4.5	3.00 2.86	7.46 7.24	0.75
BM8-4	BM9-4	4.068 4.020	5.5	4.00 3.82	9.46 9.24	0.75
BM8-5	-----	5.040 5.010	7.0	5.00 4.82	-----	-----
-----	BM9-5	5.068 5.020	7.0	5.00 4.82	10.95 10.68	1.00
BM8-6	BM9-6	6.068 6.020	8.0	6.00 5.82	11.95 11.68	1.00
BM8-8	-----	8.083 8.025	10.0	8.00 7.78	-----	-----
-----	BM9-8	8.083 8.025	10.0	9.50 9.28	14.95 14.68	1.00
BM8-10	BM9-10	10.083 10.025	12.0	10.00 9.78	17.95 17.68	1.00
BM8-12	BM9-12	12.102 12.032	14.0	12.00 11.73	19.94 19.61	1.00

Tolerance for ØB is after press fitting into a housing bore of tolerance H7.

- Operating temperature range, -40°C to $+130^{\circ}\text{C}$.
- $(p.v)_{\text{max}} = 1.0 \text{ N/mm}^2.\text{m/s}$.
- $p_{\text{max}} = 80 \text{ N/mm}^2$.
- $v_{\text{max}} = 1.0 \text{ m/s}$ (rotational) or 4.0 m/s (linear).



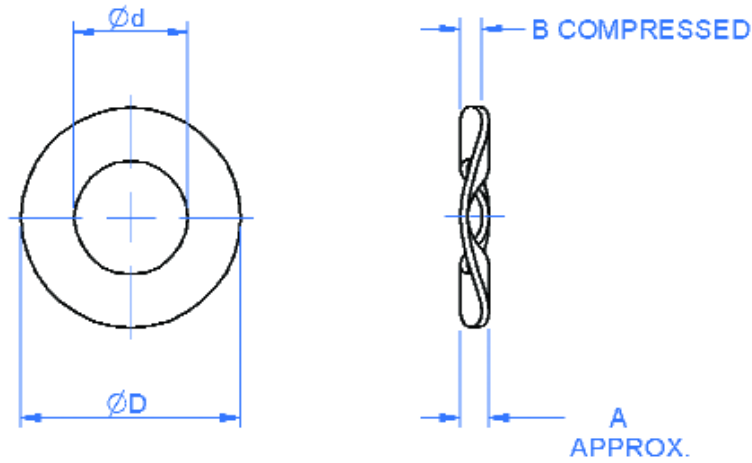
Non-standard options, please enquire....

- Imperial sizes.

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Bearing Pre-load Washers



General Information

All dimensions in mm
 General tolerances: ±0.13mm
 Material: Stainless steel 300 series.
 Treatment: Spring tempered.

Part number selection table

Part Number	Housing Bore (nominal)	O/D ØD	Bore Ød	Free Height A	Compressed Height B	Load in N to deflect to B
EPL-1	10	9.5	4.5	1.5	1.0	15
EPL-2	13	12.5	7.5	1.5	1.0	19
EPL-4	16	15.5	10.5	1.5	1.0	19
EPL-8	19	18.5	13.0	2.0	1.0	29
EPL-10	21	20.5	15.0	2.0	1.0	29

Associated Products

Internal circlips
 Bearings
 Visit our online catalogue for associated products

Non-standard options, please enquire....

- Imperial bearing pre-load washers.
- Available in spring steel, add **-ST** to part number eg **EPL-4-ST**.

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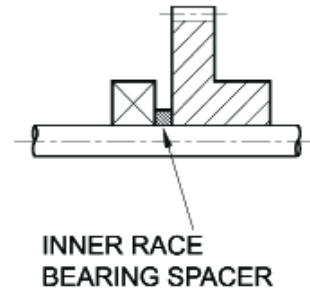
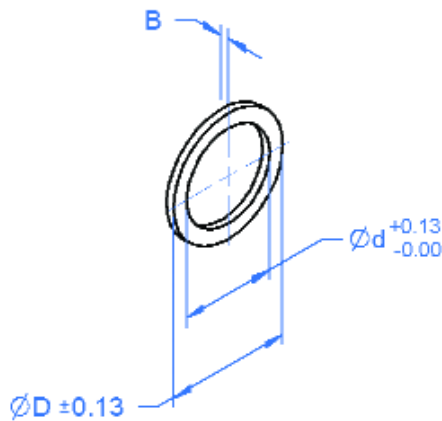


Bearing Spacers

Inner Race

General Information

All dimensions in mm
 General Tolerances:
 $\pm 0.13\text{mm}$
 Material:
 Stainless steel 300 series.



Associated Products

Shafts
 Leadscrews
 Bearings

Visit our online catalogue for associated products

Drawing dimension table

Shaft Nominal	Spacer Bore $\text{\O}d$	Spacer O/D $\text{\O}D$
2	2	3.0
3	3	4.1
4	4	5.3
5	5	6.7
6	6	7.9
8	8	10.2
10	10	12.3

Part number selection table

Nominal Shaft Dia $\text{\O}d$	Thickness B							
	± 0.025							
	0.05	0.10	0.15	0.20	0.25	0.30	0.40	0.50
2	SS1-117	SS1-118	SS1-119	SS1-120	SS1-121	SS1-122	SS1-123	SS1-124
3	SS1-125	SS1-126	SS1-127	SS1-128	SS1-129	SS1-130	SS1-131	SS1-132
4	SS1-133	SS1-101	SS1-102	SS1-134	SS1-103	SS1-135	SS1-104	SS1-136
5	SS1-137	SS1-138	SS1-139	SS1-140	SS1-141	SS1-142	SS1-143	SS1-144
6	SS1-145	SS1-105	SS1-106	SS1-146	SS1-107	SS1-147	SS1-108	SS1-148
8	SS1-149	SS1-109	SS1-110	SS1-150	SS1-111	SS1-151	SS1-112	SS1-152
10	SS1-153	SS1-113	SS1-114	SS1-154	SS1-115	SS1-155	SS1-116	SS1-156

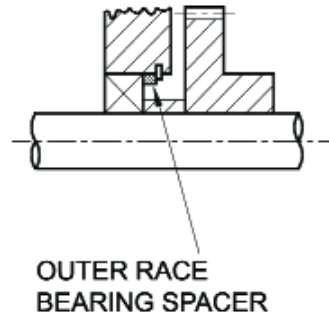
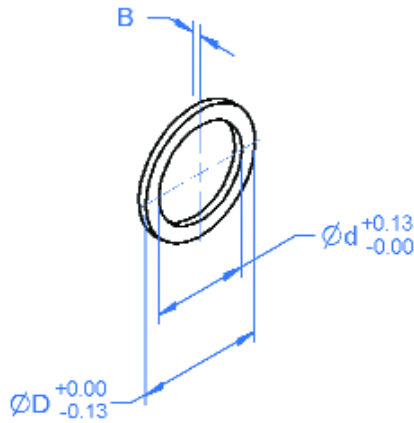
Non-standard options, please enquire....

- Imperial sizes.

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General Information

All dimensions in mm
 General tolerances:
 ±0.13mm
 Material:
 Stainless steel 300 series.

Associated Products

Internal circlips Bearings

Visit our online catalogue for associated products

Drawing dimension table

Bearing OD Nominal	Spacer O/D ØD	Spacer Bore Ød
5	5	4.2
7	7	5.7
9	9	7.8
11	11	9.7
13	13	11.1
16	16	13.8
19	19	16.6

Part number selection table

Bearing		Thickness B							
Bore (nom)	OD (nom)	± 0.025							
		0.05	0.10	0.15	0.20	0.25	0.30	0.40	0.50
2	5	SS3-113	SS3-114	SS3-115	SS3-116	SS3-117	SS3-118	SS3-119	SS3-120
3	7	SS3-121	SS3-122	SS3-123	SS3-124	SS3-125	SS3-126	SS3-127	SS3-128
4	9	SS3-129	SS3-130	SS3-101	SS3-131	SS3-102	SS3-132	SS3-103	SS3-133
5	11	SS3-134	SS3-135	SS3-136	SS3-137	SS3-138	SS3-139	SS3-140	SS3-141
6	13	SS3-142	SS3-143	SS3-104	SS3-144	SS3-105	SS3-145	SS3-106	SS3-146
8	16	SS3-147	SS3-148	SS3-107	SS3-149	SS3-108	SS3-150	SS3-109	SS3-151
10	19	SS3-152	SS3-153	SS3-110	SS3-154	SS3-111	SS3-155	SS3-112	SS3-157

Non-standard options, please enquire....

- Imperial sizes.

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Shaft Retaining Collars

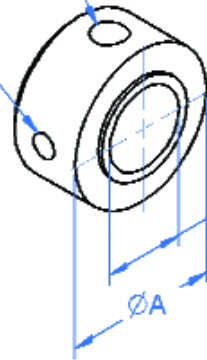
2 - 12mm Bore

General Information

All dimensions in mm
 General Tolerances:
 $\pm 0.13\text{mm}$
 Material:
 Stainless steel.

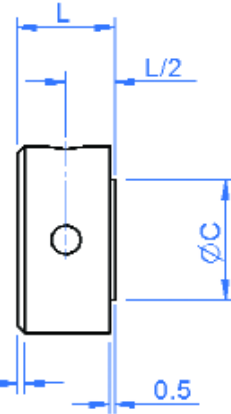
SKT. HD. SET
 SCREW SUPPLIED
 SEE TABLE BELOW

SUB-DRILLED
 $\varnothing D$ PARTWAY



$\varnothing B^{+0.008}$
 -0.005

CHAM
 0.8 X45°



Associated Products

Bearings
 Shaft - ground stock

Visit our online
 catalogue for
 associated products

Part number selection table

Part Number	Bore $\varnothing B$	Length L	O.Dia $\varnothing A$	Shoulder Dia $\varnothing C$	Sub-drill $\varnothing D$	Set Screw Supplied
CSM-2	2.0	5.0	7.0	3.0	0.75	SS-M1.6-2
CSM-3	3.0	5.0	8.0	4.1	0.75	SS-M2-2
CSM-4	4.0	5.0	8.0	5.3	1.00	SS-M2-2
CSM-5	5.0	6.0	10.0	6.7	1.20	SS-M3-3
CSM-6	6.0	6.0	10.0	7.9	1.50	SS-M3-3
CSM-8	8.0	6.0	12.0	10.2	1.80	SS-M4-4
CSM-10	10.0	10.0	19.0	12.3	3.00	SS-M5-4
CSM-12	12.0	11.0	25.0	15.2	3.00	SS-M6-6

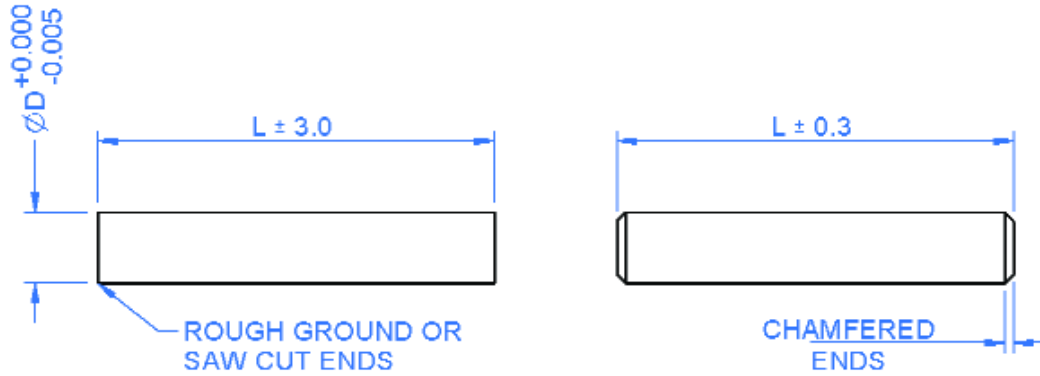
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Non-standard options, please enquire....

- Imperial sizes.

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General Information

All dimensions in mm
 General tolerances: $\pm 0.13\text{mm}$
 Material: Stainless steel 300 series.
 Surface finish: $0.25\mu\text{m}$.

Associated Products

Shaft collars
 Bearings
 Reli-a-Flex® couplings

Visit our online catalogue for associated products

Part number selection table

Cut to Length					
Basic Part Number	Dia. ØD	Length L	Basic Part Number	Dia. ØD	Length L
SM1-3- SM1-3A- SM1-4- SM1-4A- SM1-5- SM1-5A- SM1-6-	2.993 3.000 3.993 4.000 4.993 5.000 5.993	600	SM1-6A- SM1-8- SM1-8A- SM1-10- SM1-10A- SM1-12- SM1-12A-	6.000 7.993 8.000 9.993 10.000 11.993 12.000	600

To complete part number add length details eg **SM1-8-600**

Machined to Length							
Basic Part Number	Dia. ØD	Available Lengths					
		Length L	Length Code	Length L	Length Code	Length L	Length Code
SM2-3 SM2-4 SM2-5 SM2-6	2.993 3.993 4.993 5.993	25	-25	70	-70	115	-115
		30	-30	75	-75	120	-120
		35	-35	80	-80	125	-125
		40	-40	85	-85	150	-150
		45	-45	90	-90	175	-175
		50	-50	95	-95	200	-200
		55	-55	100	-100	225	-225
		60	-60	105	-105	250	-250
65	-65	110	-110	275	-275		

To complete part number add length details eg **SM2-8-175**

Non-standard options, please enquire....

- Standard end modifications available. See page 34 for details.
- Imperial sizes.
- Alternative lengths.
- Larger diameters on the SM2 range.

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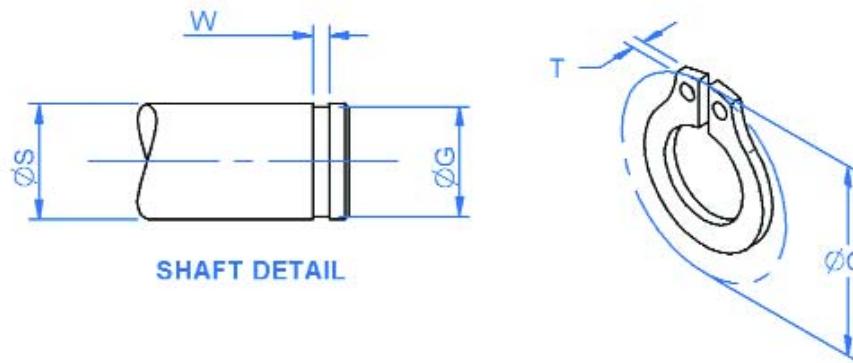


External Circlips

To Suit 3 - 12mm Shafts

General Information

All dimensions in mm
 General Tolerances:
 ±0.13mm
 Material:
 Stainless steel.



Associated Products

Shafts
 Bearings

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Part number selection table

Example Part No:- **D1400 - 0060 - SS**

Basic Part No.	Nominal Shaft Dia (ØS)	Dia Code	Circlip		Groove		Matl.
			Thickness T	Clearance Dia (ØC)	Width W	Dia ØG	
D1400	3	0030	0.40	7.00	0.64	2.80	SS
			0.35		0.50	2.76	
	4	0040	0.40	8.60	0.64	3.80	
			0.35		0.50	3.75	
	5	0050	0.60	10.30	0.84	4.80	
			0.55		0.70	4.75	
	6	0060	0.70	11.70	0.94	5.70	
			0.65		0.80	5.65	
	8	0080	0.80	14.70	1.04	7.60	
			0.75		0.90	7.54	
	10	0100	1.00	17.00	1.24	9.60	
			0.94		1.10	9.54	
12	0120	1.00	19.00	1.24	11.50		
		0.94		1.10	11.39		

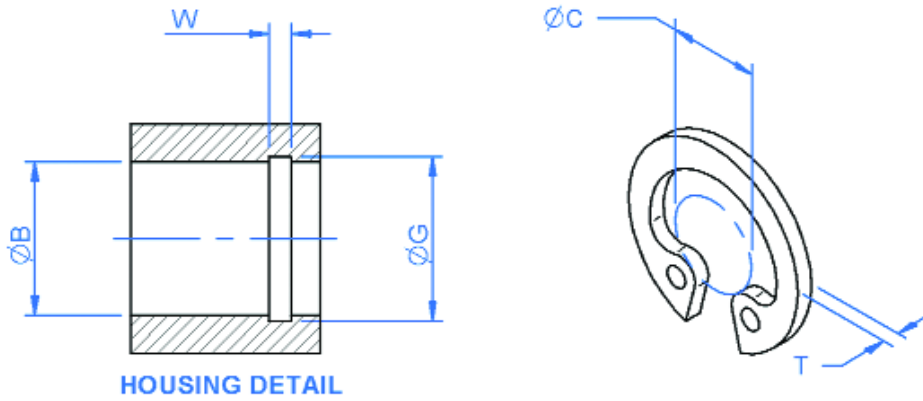
- Used to axially secure components such as bearings on shafts.

Non-standard options, please enquire....

- Imperial sizes.
- Alternative materials.

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General Information

All dimensions in mm
 General tolerances:
 ±0.13mm
 Material:
 Stainless steel.

Part number selection table

Example Part No:- **D1300 - 0200 - SS**

Basic Part No.	Nominal Bore Dia (ØS)	Dia Code	Circlip		Groove		Matl.
			Thickness T	Clearance Dia (ØC)	Width W	Dia ØG	
D1300	12	0120	1.00	5.70	1.24	12.61	SS
			0.94		1.10	12.50	
	15	0150	1.00	8.30	1.24	15.81	
			0.94		1.10	15.70	
	16	0160	1.00	9.20	1.24	16.91	
			0.94		1.10	16.80	
	19	0190	1.00	11.80	1.24	20.13	
			0.94		1.10	20.00	
	20	0200	1.00	12.60	1.24	21.13	
0.94			1.10		21.00		
22	0220	1.00	14.60	1.24	23.13		
		0.94		1.10	23.00		
24	0240	1.20	16.40	1.44	24.41		
		1.14		1.30	25.20		
28	0280	1.20	19.80	1.44	29.61		
		1.14		1.30	29.40		
30	0300	1.20	21.80	1.44	31.65		
		1.14		1.30	31.40		

Associated Products

Shafts
 Bearings

Visit our online catalogue for associated products

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- Used to axially secure components such as bearings in housings.

Non-standard options, please enquire....

- Imperial sizes.
- Alternative materials.



ISO Metric Screw Threads: Limits and Tolerances.

Thread	Pitch	Internal/ External Tol. Class	Major Diameter			Pitch Diameter			Minor Diameter		
			max	tol	min	max	tol	min	max	tol	min
M1.6	0.35	6g (screw)	1.581	0.085	1.496	1.354	0.063	1.291	-	-	1.075
		6H (nut)	-	-	1.600	1.458	0.085	1.373	1.321	0.100	1.221
M2	0.40	6g	1.981	0.095	1.886	1.721	0.067	1.654	-	-	1.408
		6H	-	-	2.000	1.830	0.090	1.740	1.679	0.112	1.567
M2.5	0.45	6g	2.480	0.100	2.380	2.188	0.071	2.117	-	-	1.839
		6H	-	-	2.500	2.303	0.095	2.208	2.138	0.125	2.013
M3	0.50	6g	2.980	0.106	2.874	2.655	0.075	2.580	-	-	2.272
		6H	-	-	3.000	2.775	0.100	2.675	2.599	0.140	2.459
M4	0.70	6g	3.978	0.140	3.838	3.523	0.090	3.433	-	-	3.002
		6H	-	-	4.000	3.663	0.118	3.545	3.422	0.180	3.242
M5	0.80	6g	4.976	0.150	4.826	4.456	0.095	4.361	-	-	3.868
		6H	-	-	5.000	4.605	0.125	4.480	4.334	0.200	4.134
M6	1.00	6g	5.978	0.140	5.838	5.441	0.100	5.391	-	-	4.929
		6H	-	-	6.000	5.645	0.132	5.513	5.378	0.190	5.188
M8	1.25	6g	7.972	0.212	7.760	7.160	0.118	7.042	-	-	6.272
		6H	-	-	8.000	7.348	0.160	7.188	6.912	0.265	6.647
M10	1.50	6g	9.968	0.236	9.732	8.994	0.132	8.862	-	-	7.938
		6H	-	-	10.000	9.206	0.180	9.026	8.676	0.300	8.376

Reference: BS3643 Pt 2, 1981.

Torque and Tension Guidelines.

The usual method for specifying and measuring fastener installation is tightening torque, as this is relatively easy to measure with a torque wrench. Unfortunately, a torque wrench does not give an accurate indication of bolt tension because it does not take friction into account. The friction is dependent on the bolt, nut and washer materials, surface smoothness, machining accuracy, degree of lubrication (including uncured retaining products) and the number of times a fastener has been installed. The torque values provided for the screws in the table below are, therefore, to be used only as a guide, the friction factors mentioned should be considered for each application.

Screw Size	Tightening Torque For 700 MPa Screw (Nm)
M1.6	0.14
M2	0.29
M2.5	0.60
M3	1.10
M4	2.50
M5	5.00



Reliance Standard Materials.

Reliance precision screws are manufactured from the materials listed below. Where the product material is not specified, we reserve the right to change the actual material to an equivalent specification without notice depending on availability.

Material Grade	Treatment	Grain Structure	Tensile Strength MPa (min)	Corrosion Resistance
A2-70	n/a	Austenitic	700	Excellent
A4-70	n/a	Austenitic	700	Excellent
303	n/a	Austenitic	585	Excellent
416	Hardened to HRc 26/32	Martensitic	880	Good

General Properties of Austenitic Stainless Steels.

- Excellent resistance to oxidation and corrosion.
- Essentially non-magnetic.
- Cannot be hardened by heat-treatment.
- Work harden very easily.
- Relatively high coefficient of thermal expansion of 18 microns/metre/°C, close to that of aluminium.

General Properties of Martensitic Stainless Steels.

- Good resistance to oxidation and corrosion.
- Magnetic.
- Readily heat treatable to high strength condition.
- Potential for tensile strengths > 1200 MPa.
- Coefficient of thermal expansion of approximately 11 microns/metre/°C.



SPECIFICATION

The first step in choosing the correct bearing for an application is to determine the forces which it will support in service. The forces will depend on the exact configuration of the system and will probably include some, or all, of the following.

- The weight of the shaft, including gears and other shaft attachments.
- Gear mesh reaction forces, due to torque transmission (see below).
- Gear separation due to anti-backlash forces.
- Forces due to belt or pulley tensions.
- Axial pre-load forces.

GEAR MESH REACTIONS

In order to calculate the loads which will be applied to the bearings in the simply supported spur gear pass arrangement shown on the facing pages, it is first necessary to calculate the forces at the gear mesh.

The tangential forces at the gear can be calculated from the following equation,

$$W_t = T/r \quad \text{where } T = \text{Torque} \\ \text{and } r = \text{Radius}$$

and the separating force at the gear mesh can be calculated from,

$$W_r' = W_t \tan \phi_t \quad \text{where } \phi_t = \text{transverse pressure angle} \\ = \text{normal pressure angle for spur gears} \\ = 20^\circ \text{ for our standard gears}$$

$$W_r' = 0.364 W_t \quad (\text{for } 20^\circ \text{ pressure angle spur gear})$$

If required, the total radial load at the gear mesh can be calculated from the final equation,

$$W_r = \sqrt{(W_t)^2 + (W_r')^2}$$

Bearing loads

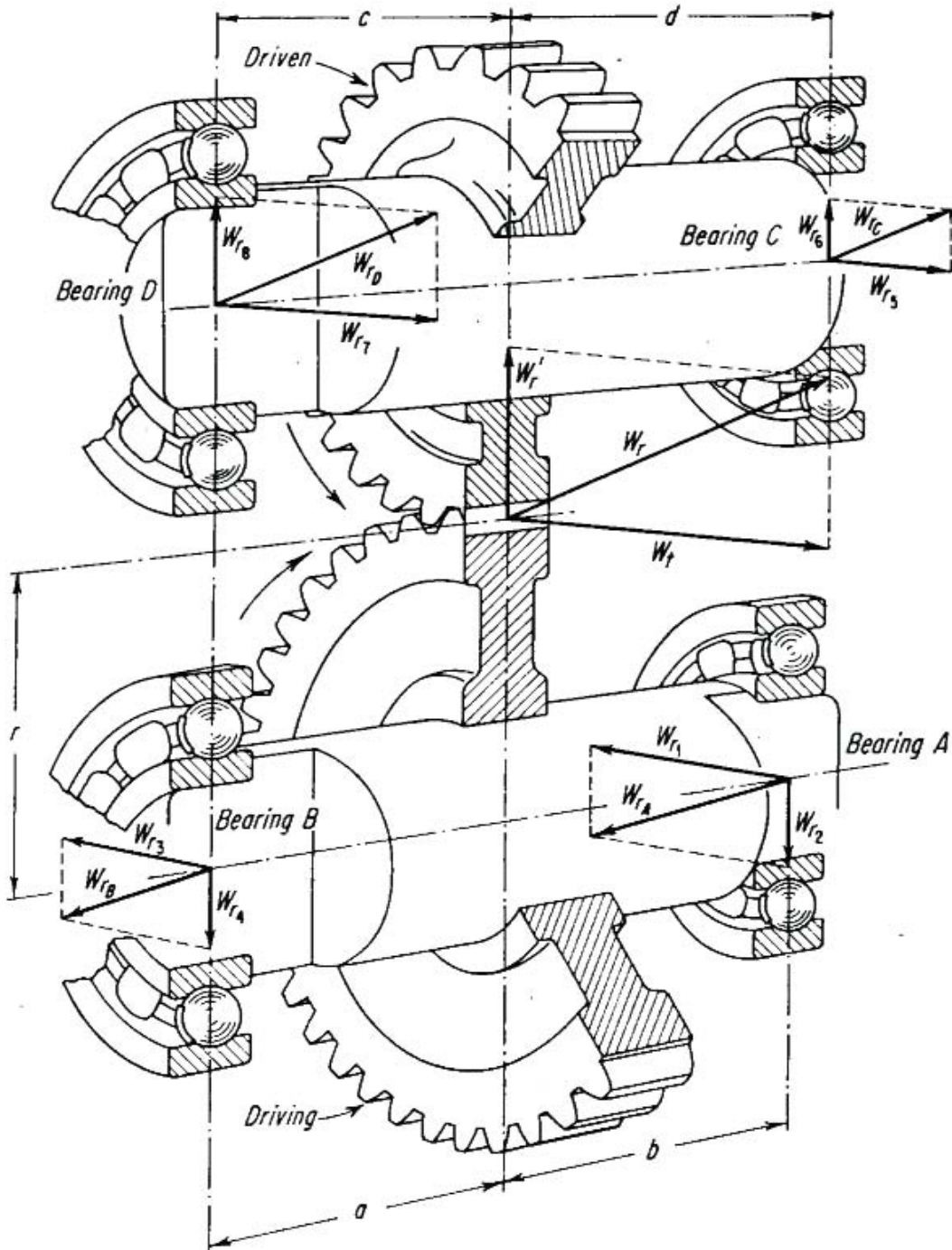
Position	Forces At These Positions		
	Tangential Force	Separating Force	Total Radial Load
Gear Mesh	W_t	W_r'	W_r
Bearing A	$W_{r1} = \frac{W_t a}{a+b}$	$W_{r2} = \frac{W_r' a}{a+b}$	$W_{rA} = \sqrt{(W_{r1})^2 + (W_{r2})^2}$
Bearing B	$W_{r3} = \frac{W_t b}{a+b}$	$W_{r4} = \frac{W_r' b}{a+b}$	$W_{rB} = \sqrt{(W_{r3})^2 + (W_{r4})^2}$
Bearing C	$W_{r5} = \frac{W_t c}{c+d}$	$W_{r6} = \frac{W_r' c}{c+d}$	$W_{rC} = \sqrt{(W_{r5})^2 + (W_{r6})^2}$
Bearing D	$W_{r7} = \frac{W_t d}{c+d}$	$W_{r8} = \frac{W_r' d}{c+d}$	$W_{rD} = \sqrt{(W_{r7})^2 + (W_{r8})^2}$



For bearing life calculations based on these radial loads see page 32.

Note - These equations can only be used for spur gear calculations, because they are not affected by self-generated axial forces.

Bearing loads and gear mesh forces diagram



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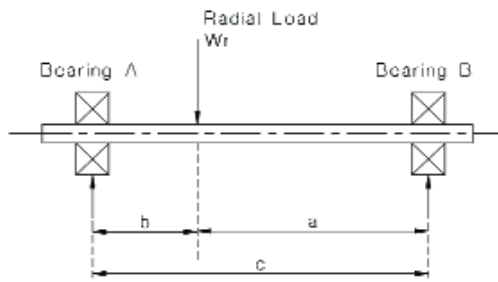


FORCE SHARING

To determine how the forces are shared between a pair of bearings, use the equations below for these two most frequently occurring configurations.

1. Radial Shaft Load Between Two Bearings.

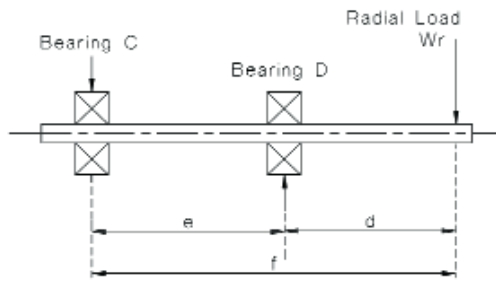
Loads are in constant units



$$\text{Radial load on bearing A} = \frac{W_r * a}{c}$$

$$\text{Radial load on bearing B} = \frac{W_r * b}{c}$$

2. Overhung Radial Load.



$$\text{Radial load on bearing C} = \frac{W_r * d}{e}$$

$$\text{Radial load on bearing D} = \frac{W_r * f}{e}$$

The individual bearing loads can then be used to predict the bearing life.

BEARING LIFE

The life of a bearing is defined as the length of time a bearing will operate satisfactorily in the application at its operating speed under applied load. Life predictions depend on a careful definition of failure criteria and consideration of operating environment, mounting practice, lubrication, operating speed and loading. As a guide, the relationship between actual applied load and bearing fatigue life is given below.

$$L_H = \frac{16667}{N} \left(\frac{C}{P} \right)^3$$

L_H = Rated life in hours

N = Speed in rpm

P = Bearing load (e.g. N)

C = Bearing capacity (e.g. N)

INSTALLATION AND HOUSING CONSIDERATIONS

The installation of a bearing will usually be determined by how it fits with its mating components. Interference or transition fits provide the most positive location of the bearing, however, they will require pressing during installation. Clearance fits allow the bearing to be assembled very easily, but could potentially lead to problems depending on the operating conditions. If a press fit is required, it is essential that no appreciable force is transferred through the rolling elements of the bearing during installation.



Special care must be taken when using bearings in aluminium housings, especially when wide temperature variations are expected. It is possible for the contraction of the housing to squash the bearing raceway and remove the radial clearance required for the bearing to operate.

Potential problems with clearance fits:

Fretting - Wearing away of the surface due to rubbing of the components.

Accuracy - Accuracy can be compromised due to unpredictable movement.

Potential problems with interference fits:

Assembly - Can be difficult or impossible without damaging the bearing.

Radial clearance - Can be reduced if the interference is too great.

Note - As a result of continuous product development, Reliance reserves the right without prior notice to change dimensions where this does not affect the function of the item. Please visit our website for the latest product news and developments.



End Modification

Reliance shafts are available with standard end modifications to suit a wide variety of applications, as illustrated below.

Modification

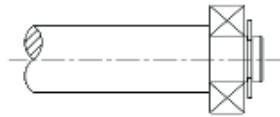
Application notes

1. Ball bearing journals (End A)



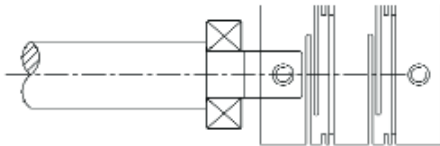
For most lightly loaded applications standard deep groove ball bearings will suffice. For higher loads angular contact or taper roller bearings may be required. A clearance fit is standard however transition fits may be used with care.

2. Ball bearing with circlip (End B)



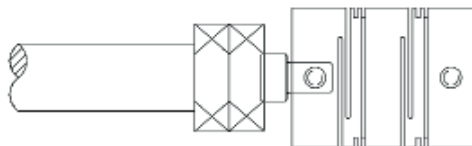
Standard circlip grooves can be provided to give axial location. Circlip grooves are generally used on longer shafts to provide simple retention of an outboard single bearing.

3. Ball bearing & coupling (End C)



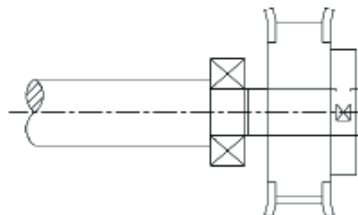
Integral extension can be provided to suit couplings. Couplings are the recommended method of attachment for accurate applications. Use Reli-a-Flex® series couplings.

4. Twin ball bearing & coupling (End D)



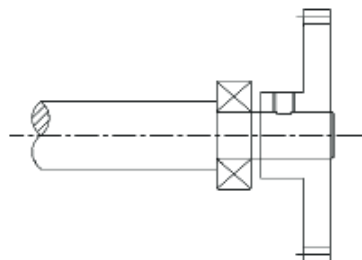
Twin ball bearings with slight pre-load provide the best axial location. The slight pre-load ensures that the bearing clearances do not add to the error budget.

5. Ball bearing & drive pulley (End E)



Drive pulleys provide a useful additional reduction ratio between the motor and the shaft. In applications where axial space is restricted, the motors can be mounted backwards. The drive belt also provides a degree of vibration damping.

6. Ball bearing & drive gear (End F)



Drive gears provide an alternative to drive pulleys, in general they will provide a more accurate drive than a belt and pulley system. If an anti-backlash gear system is used, care must be taken to ensure that the anti-backlash mesh force is not exceeded.

Additional modifications include external/internal threads, and pre-drilled pin holes.







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For our full range of standard and customised components and a complete overview of Reliance's manufacturing capabilities, visit the Reliance Precision Mechatronics website at:

www.rpmechatronics.co.uk

www.rpmechatronics.co.uk

About Us

Reliance Precision Mechatronics LLP, a sister company to Reliance Precision Limited, was established in 2005 as the distribution arm of the business. In addition to distributing Reliance's existing standard product range, the company designs and develops market focused, fully integrated mechatronic assemblies.

Standard Products

For over forty years, Reliance has provided a standard range of precision mechanical components from stock or on short delivery. This service allows design engineers to order in small quantities at stock prices in order to develop prototypes effectively. Dedicated manufacturing facilities enable larger quantities to be supplied for full production requirements.

Reliance Precision Limited (formerly Reliance Gear Company Limited)

Founded in Huddersfield in 1920 and has been under current ownership since 1955. Reliance specialises in gears, gearboxes, assemblies and associated components used in instrumentation, measurement, diagnostic equipment and light actuation systems. Reliance aims to provide its customers with a single source for the design, production, assembly and testing of high quality mechanical components and electro-mechanical assemblies. Reliance also has over 350 square metres of clean room space for the assembly, wiring and testing of precision gearboxes, optical equipment and scientific instruments to customers' specifications. Particle counts in the clean rooms meet ISO 14644-1 Class ISO 7, but are readily adaptable to more stringent standards if required.

ISO 9001

Reliance Precision Limited and Reliance Precision Mechatronics LLP are both quality assured to BS/EN/ISO 9001:2000.



Reliance

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