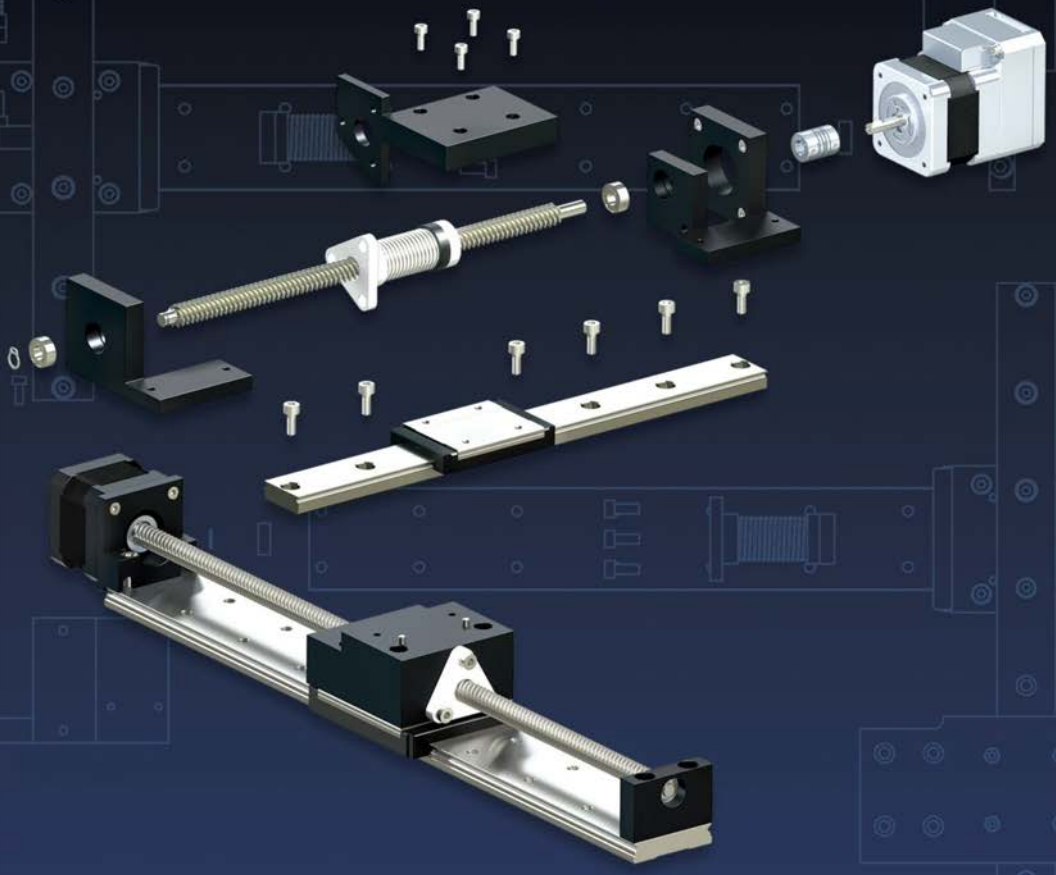
RELIANCE™
PRECISION



Precise Motion Control Solutions

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Reliance World-wide

For international sales representatives,
please see appendices page A-6

Reliance On-line

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www.relianceprecision.nl

Component data and information included in this RG36 catalogue supersedes that stated in all previous publications. Reliance Precision Limited is committed where possible to supply products listed in previous catalogues; please contact us if the component or part number is not listed in RG36.

Reliance would like to acknowledge the support of its customers and suppliers who have kindly given permission to show images of their equipment.

Rowley Mills, Huddersfield
1980 to present

Introduction to Reliance

Union Street, Huddersfield,
right 1920 to 1955

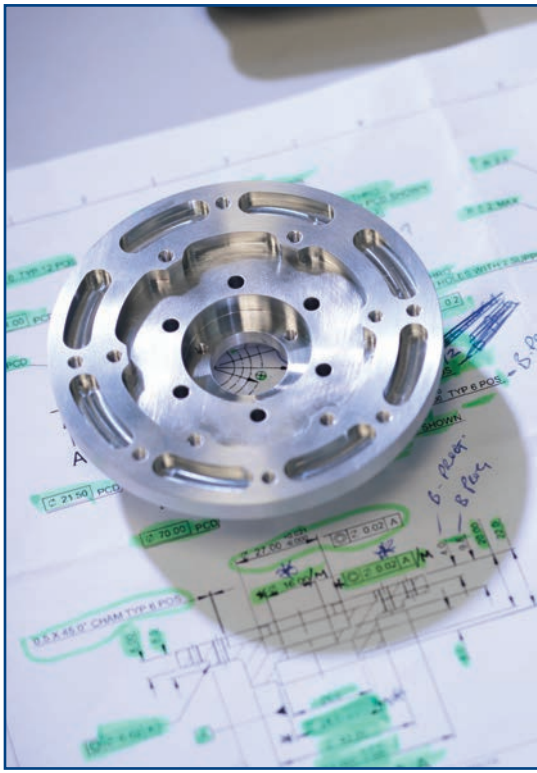
St Helen's Gate, Huddersfield,
below 1955 to 1996

Bandon, Ireland
1969 - present

Reliance - a specialist engineering company

Welcome to Reliance. We are a specialist engineering company, unique in our offering of catalogue products and fully bespoke solutions.

Our product catalogue provides a one-stop-shop for the design engineer – from basic essentials, such as captive screws, to complete sub-assemblies for rotary and linear motion. We offer a carefully selected mix of in-house designed and manufactured products together with products from leading global manufacturers, all of which can be modified to suit individual requirements. We are able to provide design support at the early stages of new product development to create complete prototyping solutions and cost-effective integrated assemblies for full production requirements.



As well as providing catalogue products we have extensive design, development, manufacturing, assembly and test facilities in the UK and Ireland, recently enhanced by a £6million investment programme. From here we offer turnkey technical services for customers requiring bespoke components, assemblies, and systems, not only helping bring new products to market, but also resolving technical problems and extending the life of established products.

Our aim is to provide choice and flexibility for our customers. From standard ex-stock components to custom-designed and manufactured sub-systems or even complete instruments.

Wherever your starting point is with Reliance you should expect technical excellence, high quality solutions and our total commitment to the success of your project.

Managing Director

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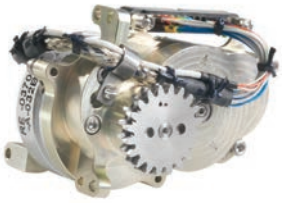
Satellite Antenna Pointing Mechanism gear, in production for SSTL, and now working in orbit

Standard Components

Modified Components

Integrated Solutions



Bespoke Assemblies

Reliance - established in diverse, global markets

We are an accredited supplier to global OEMs and product developers, covering a wide variety of markets and applications.

In Switzerland our tubular round racks provide a space-saving solution for laboratory automation, locating fluid tubes and fibre optic cables inside the rack to give a more compact instrument. In the UK over 5,000 syringe drive mechanisms, using our motors and leadscrews, are in operation in drug dispensing systems. In Asia our precision anti-backlash gears are used in military applications where our innovative, two-piece gear design is ideal for high reliability applications.

Our gears and leadscrews provide motorised actuation for the fingers and thumb of the *bebionic* prosthetic hand. This is a demanding application requiring high efficiency, high gripping force and low noise, to be achieved under tight space and weight constraints in order to give the patient the necessary dexterity, strength and practical wearability.

Our appetite for problem-solving and for providing creative technical solutions, underpinned by a culture of strong teamwork, has led to long-standing relationships built on close technical, operational and commercial co-operation. An enquiry for a standard catalogue gear was the first step in our journey with RSL Steeper, developers of the prosthetic hand. As we began to develop an understanding of the hand at a complete product level a design engineering relationship began which has strengthened year-on-year.

"We appreciate it's a total team effort to deliver a project, it's a pleasure to work with a company so well co-ordinated who keep us informed all the way through."

RSL Steeper

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Providing solutions for diverse markets

BS EN ISO 9001

AS9100

BS EN ISO 14001

SC21 Supply Chain

Reliance – helping you make an informed choice

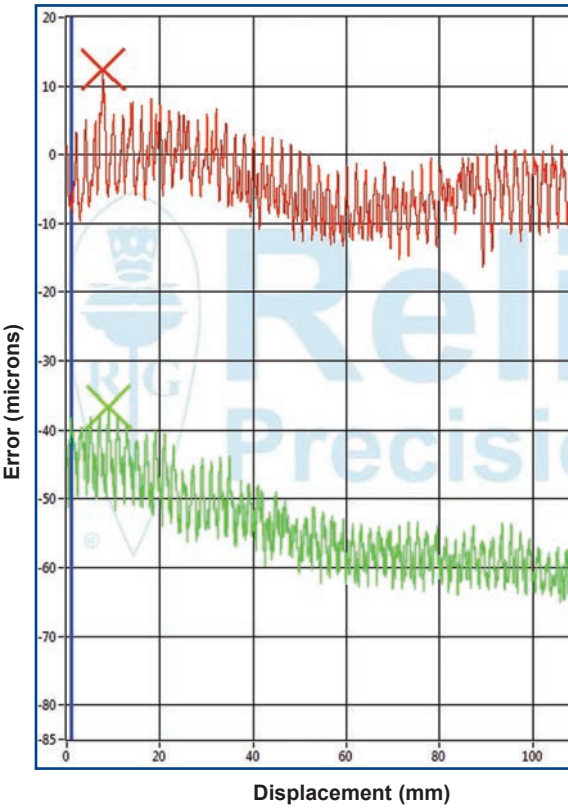
As an engineering company it is important to us to build a thorough understanding of your wider system design and application in order to recommend the most appropriate product. We consider not only the technical specification, but also the product's suitability to the operational environment and any implications of technical and commercial trade-offs.

Discussion of the technical, operational and commercial requirements are a key part of our product support philosophy. Our aim is to help you make an informed choice about our products before you make a purchasing decision; we want to be confident that what we deliver is going to work for you.

Underpinning our engineering knowledge is a sustained investment in test development facilities, which provide an in-depth understanding of the capabilities of our catalogue products. In discussing their suitability for your application we are able to draw upon our test data and experience of designing and supplying components and assemblies into a diverse range of markets.

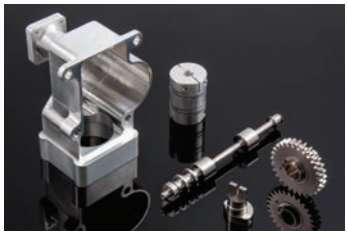
As a manufacturer we are able to provide a high level of versatility in our range with extensive modifications available. In our precision gears range we offer, for example, options in materials, gear quality, bore diameters, face widths and an extensive choice of teeth cut to order in short lead-times. Our manufacturing capability also helps provide insight into the fitness-for-purpose of the products, based on an understanding of the manufacturing methods used, quality control, surface finish, accuracies and other key criteria which ultimately impact on the performance of your product.

You can contact us by telephone, email or via our website. Alternatively we are happy to arrange a visit to your premises, which has often proved to be an efficient, effective route to understanding the wider aspects of your design programme and providing the appropriate support.

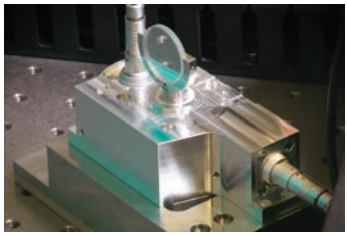


Applications Engineering

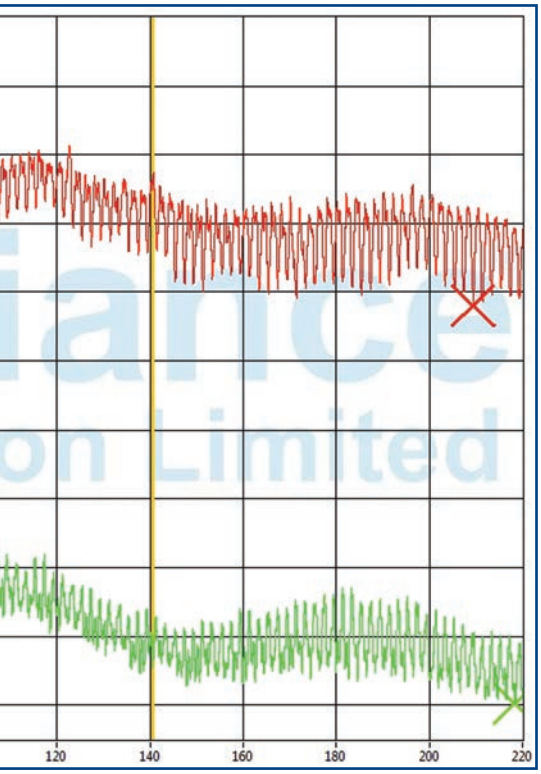
Test Development



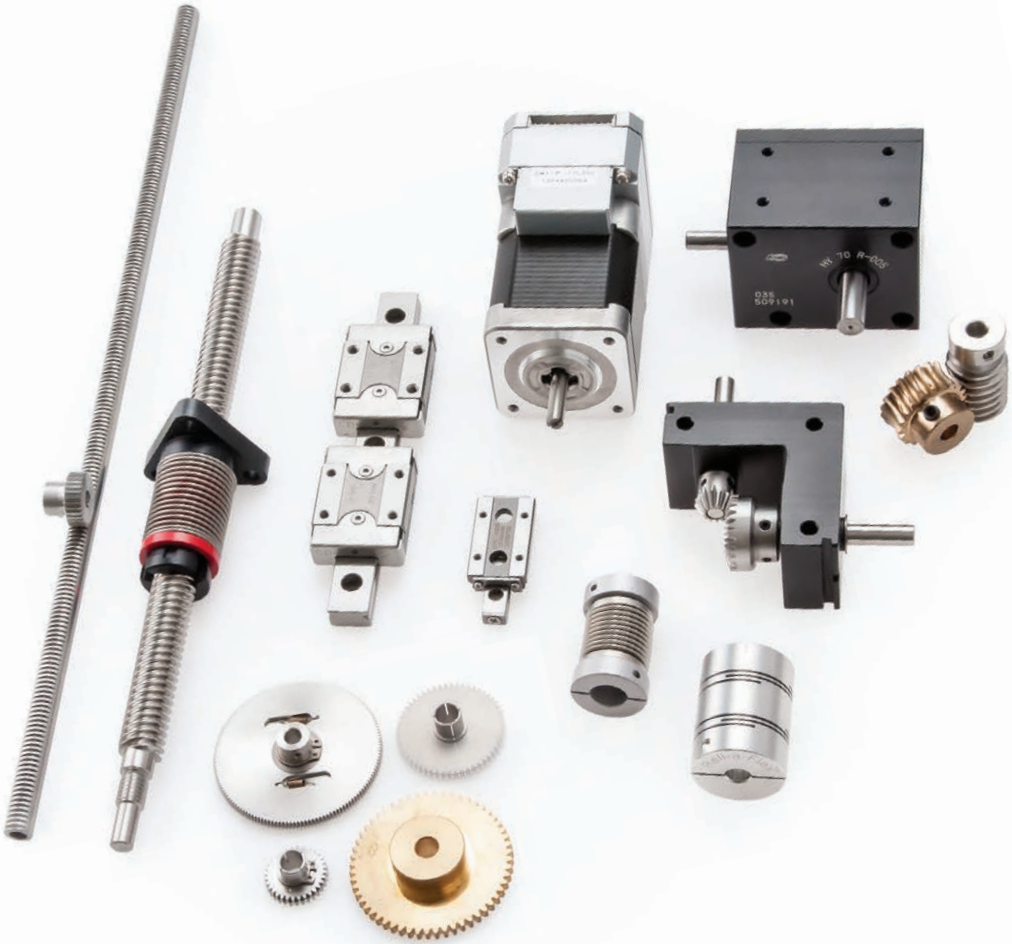
Manufacturing



Production Test



Leadscrew transmission error measurement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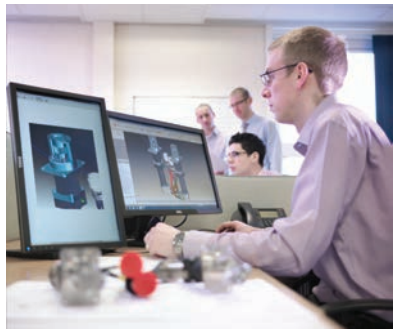
Bespoke Solutions ..... Page 1-12

Precise motion control solutions

The Reliance catalogue provides a one-stop-shop - from components and assemblies for rotary and linear motion to intelligent control and actuation products. Each product is offered with a refined, considered range of options and associated products, such as circlips and screws, all of which have been engineered to interface correctly.

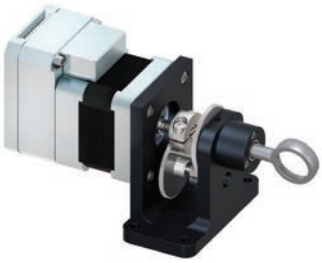


To help design engineers develop prototypes quickly and effectively, we are able to supply small quantities at stock prices, whilst our manufacturing facilities enable larger quantities to be supplied for full production requirements, available with scheduled delivery, consignment stocking and stock management services.

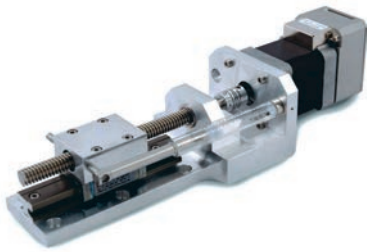
Our catalogue products can be readily modified to support applications which require a tailored solution. If you are not sure whether we offer the specification you need for any of the products in this catalogue then please contact us and we will endeavour to find a solution.

For design engineers seeking integrated solutions, we are able to combine catalogue products and assemblies to provide cost-effective sub-systems. Should a fully bespoke solution be required, further in-depth design engineering support can also be provided which, together with specialist manufacturing, assembly and test facilities, enables production of a wide range of custom-designed electro-mechanical, opto-mechanical, clean and high-vacuum solutions.

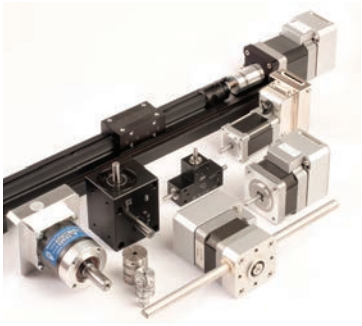
The following pages give an overview of the range of products available in the catalogue, shown in the context of both rotary and linear motion systems. We have also provided case study examples of how the catalogue products, together with engineering, manufacturing, assembly and test support, have been used to provide integrated solutions. Highlights of some of our custom design and manufacturing capabilities are also shown on pages 1-12 to 1-15.



Rotary motion



Linear motion



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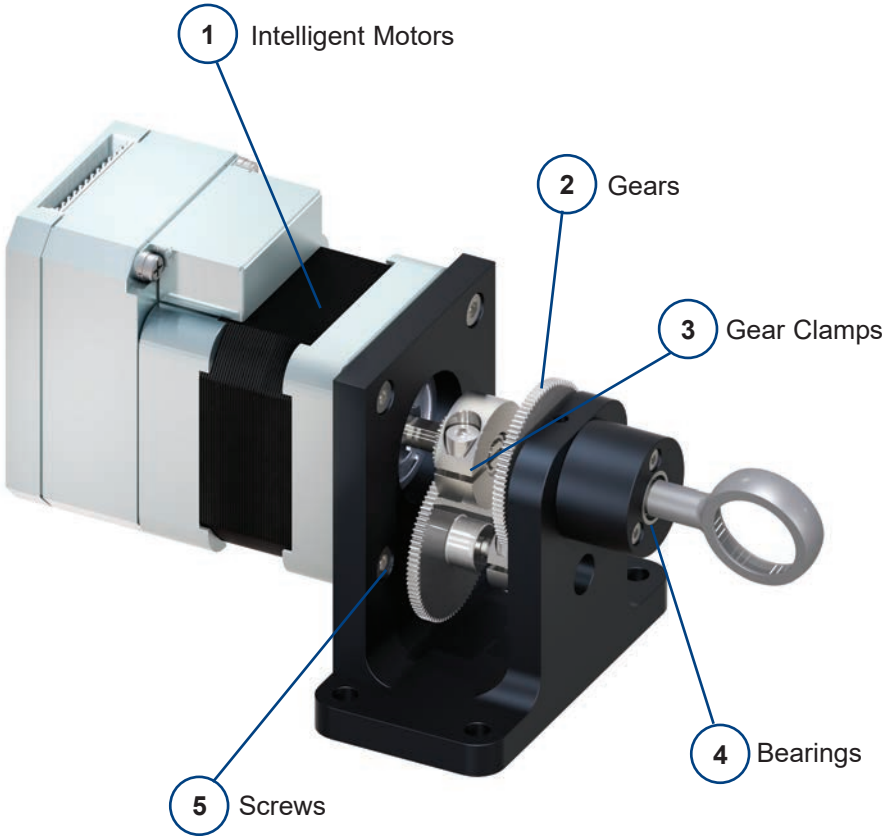
Circlips	Section 13
Washers	Section 13

Motorised rotary drive system

A motorised rotary system for a medical device, using the Reliance Cool Muscle intelligent servo system together with standard precision gears, which provide very low velocity fluctuation at the final drive, enabling predictable scanning.



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1 Reliance Cool Muscle Intelligent Servo System

Section 2

2 Precision Pin Hub and Clamp Hub Gears

Section 4

3 Gear Clamps, Shafts and Accessories

Section 11

4 Shaft Bearings

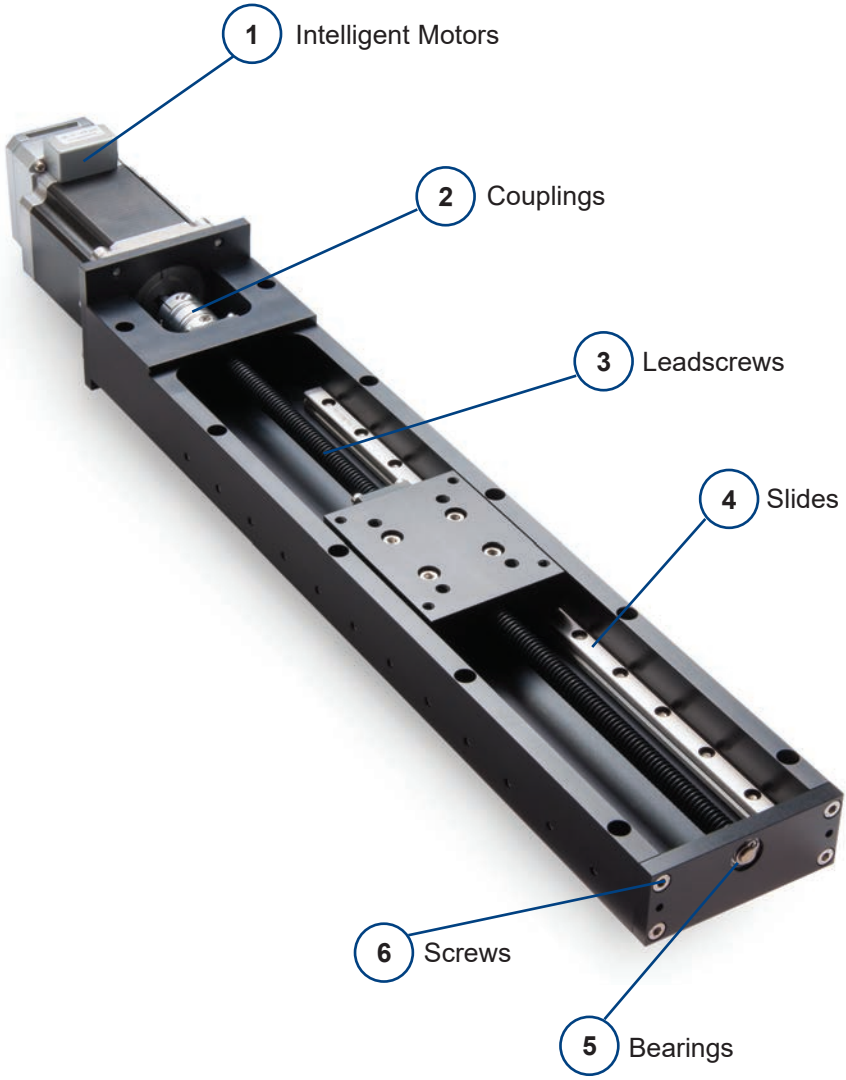
Section 12

5 Machine Screws, Dowel Pins and Circlips

Section 13

Motorised linear stage

A motorised linear stage containing high stiffness crossed roller slides, for use in an application requiring vertical motion with a very high moment load.



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1 Reliance Cool Muscle Intelligent Servo System
Section 2

2 Flexible Shaft Couplings
Section 8

3 Precision Leadscrews
Section 7

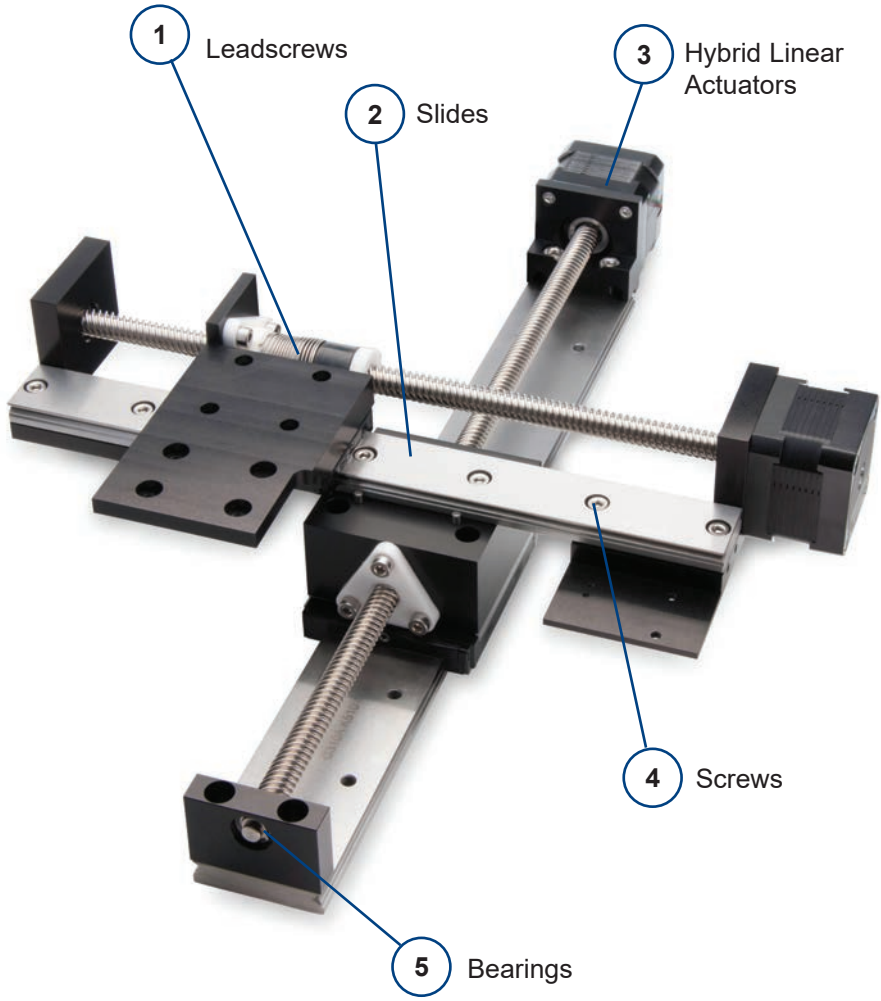
4 Linear Guides and Slides
Section 9

5 Shaft Bearings
Section 12

6 Machine Screws, Dowel Pins and Circlips
Section 13

XY positioning stage

A self-contained XY positioning stage utilising extra wide slides to cater for moment loads and internal screw motors for reduced part count, with anti-backlash leadscrews providing accurate positional repeatablility.



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1 Precision Anti-Backlash Leadscrew and Nut Assemblies
Section 7

2 Linear Guides and Slides
Section 9

3 Hybrid Linear Actuators
Section 2

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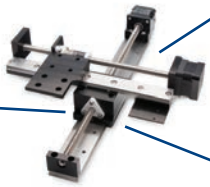
Applications Engineering



Bracket Manufacture

Assembly and Test

Leadscrew actuator

A geared leadscrew actuator which provides low backlash and quiet operation, whilst balancing the difficulties of high speed and non-backdrivability.

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1 Precision Pin Hub and Clamp Hub Gears

Section 4

2 Bespoke Leadscrew and Nut Assembly

Section 7

3 Machine Screws, Circlips and Hardware

Section 13

4 Shaft Bearings

Section 12

Design and Development

Housing Manufacture

Assembly and Test

Bespoke geared system

A ring gear motion control system containing an actuation motor with integral brake and with separate coarse and fine positional feedback.

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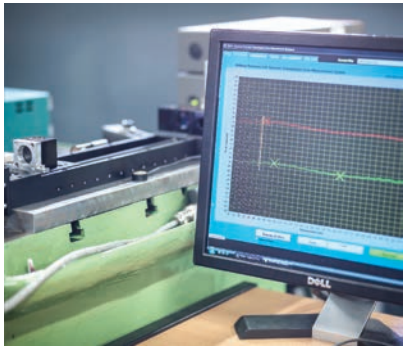
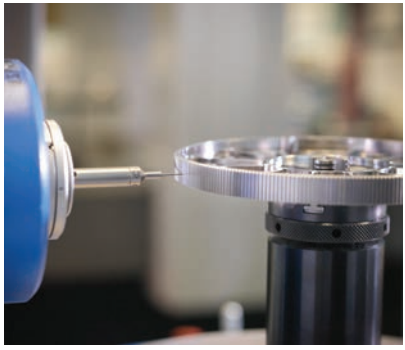
System design to specification



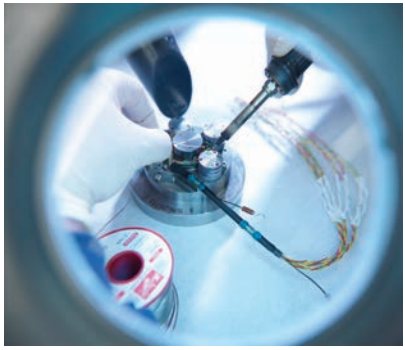
Prototyping and validation testing

Gear manufacture



Gear metrology

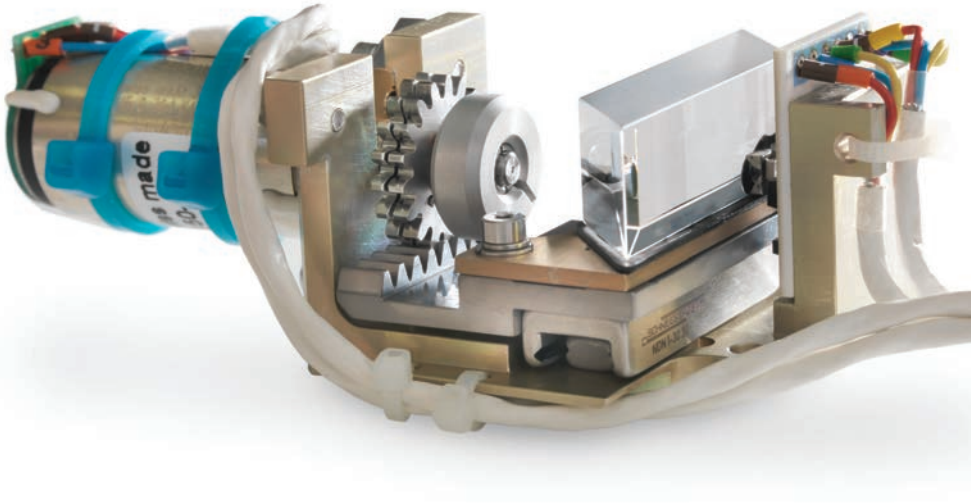
Housing manufacture



Electro-mechanical assembly

Opto-mechanical assembly

An opto-mechanical switch assembly combining precision motion control with precise optical placement.



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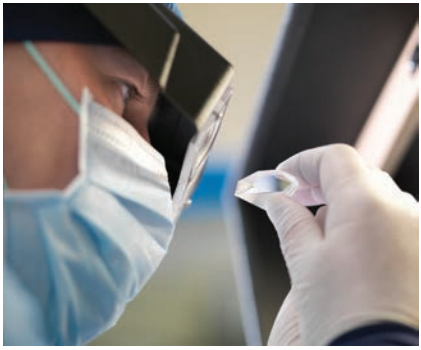
Catalogue gears

Rack and housing manufacture

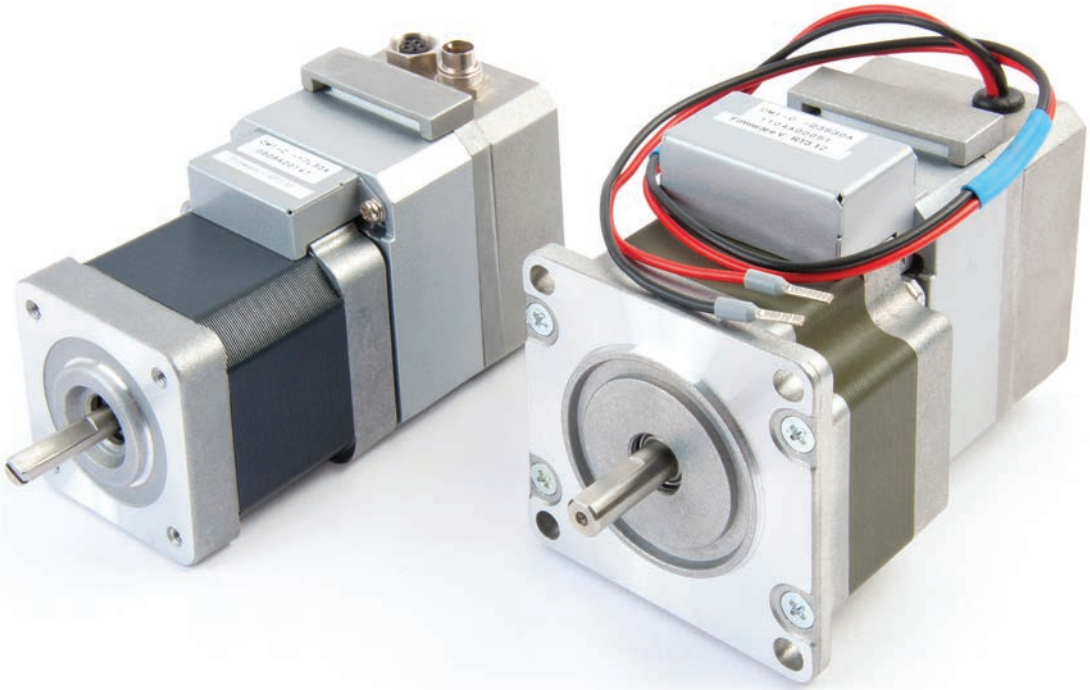


Optic inspection

Wiring

Opto-mechanical assembly

Recyclable packaging



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Linear Actuators - Overview ..... Page 2-24

Linear Rail Actuator - Overview ..... Page 2-26

- Linear Rail Actuator Size 17 ..... Page 2-27

Motorised Leadscrew Linear Slide - Overview ..... Page 2-28

Technical Information ..... Page T2-1

A complete motion control solution

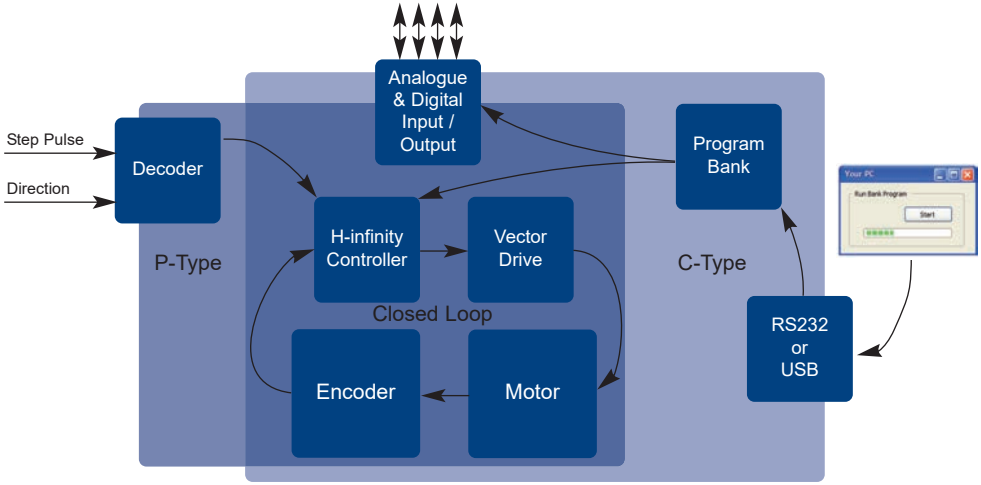
This cost-effective miniature servo system combines a precision stepper motor and high resolution encoder with sophisticated drive and control electronics in a single, compact unit.

- NEMA sizes 11, 17 and 23 each with two frame lengths
- Encoder resolution of 50,000 counts per revolution
- Speeds from 0 to 3,000 RPM
- Continuous torques from 0.027 to 0.87 Nm (1.24 Nm peak)
- H-infinity controller and vector drive for fully closed loop control of position, speed and torque. Tuning not required in most applications.
- Fully programmable for standalone operation
- RS232 and USB communications as standard
- Options for RS485 and Ethernet
- Digital and analogue input and output
- Safe and efficient 24V DC operation

Compared with an equivalent size of stepper motor Cool Muscle works faster, with more available torque, it is more efficient and generates less heat.

Closed loop control means no step loss. In an open loop system it is possible for the motor to fail to move the exact number of steps if it is overloaded. Cool Muscle, being a closed loop control system, is able to identify any potential for step loss and to correct it.

Cool Muscle is available with two types of control interface: Pulse Type (P) and Computer Type (C). The P-Type is applicable for a drive and stepper system with step-pulse control, such as a PLC. Cool Muscle provides an effective drop-in solution to resolve step loss problems and also provides a more integrated solution, having a combined stepper and drive. The C-Type offers a higher level of computer control in a single integrated unit which can remove the need for a separate controller or, in more complex systems, reduce the investment required in additional controllers.



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Cool Muscle's unique features include the ability to link up to 15 motors which can operate together in complex sequences without an additional controller. Cool Muscle is able to use a physical limit of travel as its reference position, using torque sensing to safely and accurately find the limits of travel without needing a position sensor (e.g. limit switch).

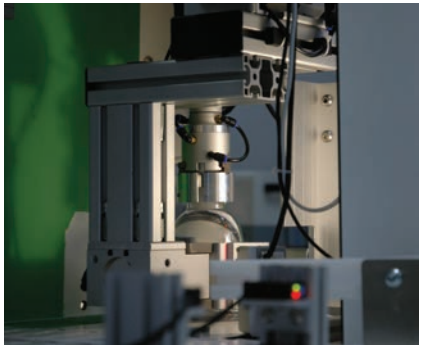
The high level of integration provided by Cool Muscle reduces cabling, keeps components to a minimum and speeds up system assembly.

Cool Muscle is ideal for laboratory and test equipment or for light industrial automation.

Customised XYZ positioning table

Precision linear stage

Medical pipetting systems



Laboratory automation

Motorised actuators

Reliance supplies pre-built motion stages with integrated Cool Muscle motors, see page 2-19. We also manufacture unique, high-speed precision rack actuators fitted with Cool Muscle, available with solid racks or tubular racks, ideal for pipette systems, see page 2-14.

All dimensions in mm

Associated Products
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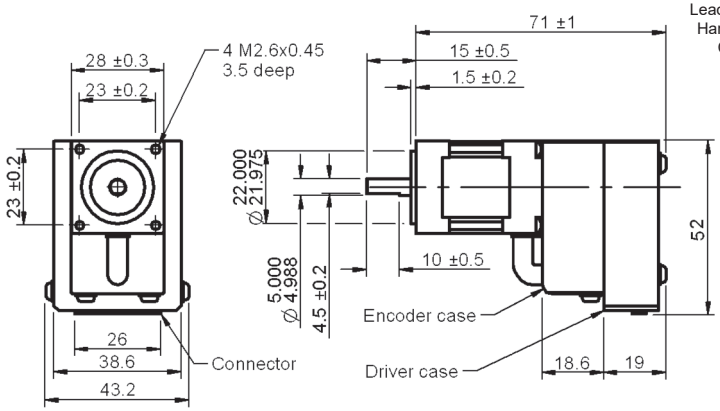


RCM1 - P - 11 S 30 - E - RT3

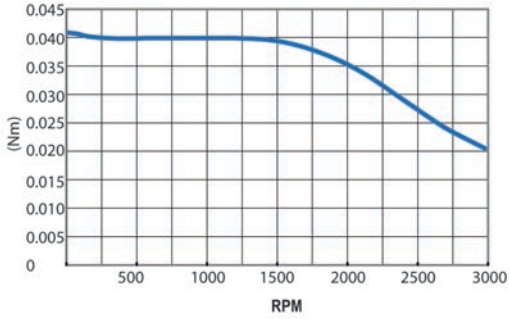
Generation
Interface
P = Pulse
C = Computer
Speed
30 = 3000 rpm

Specification table

	RCM1-_-11S30-E-RT3
Motor output power	9 W
Maximum speed	3,000 rpm
Continuous torque	0.027 Nm
Peak torque	0.039 Nm
Load inertia allowance	80 g-cm^2
Motor inertia	8g -cm^2
Input supply current rated (Continuous torque/rated peak torque)	0.8 A/1.0 A
Weight	246 g

Torque curve

RCM1-_-11S30-E-RT3



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- Technical information - see page T2-1
- P & C interface - see page T2-2
- Software interface - see page T2-3
- Electrical interface - see page T2-5
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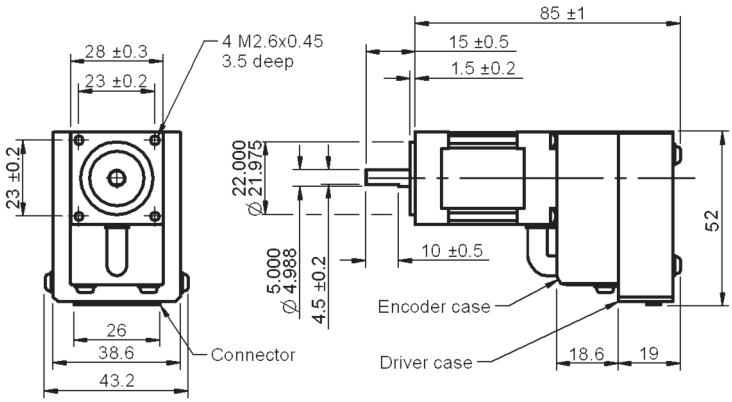
Associated Products
Couplings: page 8-1
Leadscrews: page 7-1
Hardware: page 13-1
Cables: page 2-11

All dimensions in mm



RCM1 - P - 11 L 30 - E - RT3

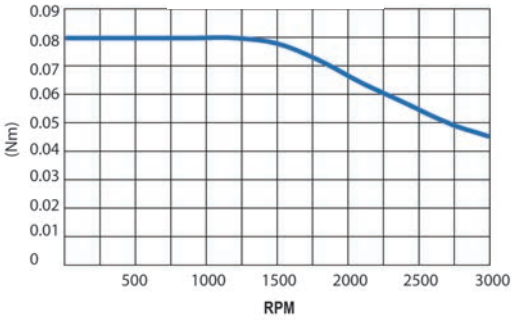
- Generation
- Interface: P = Pulse, C = Computer
- Speed: 30 = 3000 rpm

Specification table

	RCM1-_-11L30-E-RT3
Motor output power	18 W
Maximum speed	3,000 rpm
Continuous torque	0.055 Nm
Peak torque	0.078 Nm
Load inertia allowance	180 g-cm^2
Motor inertia	18 g-cm^2
Input supply current rated (Continuous torque/rated peak torque)	1.2 A/1.5 A
Weight	300 g

Torque curve

RCM1-_-11L30-E-RT3



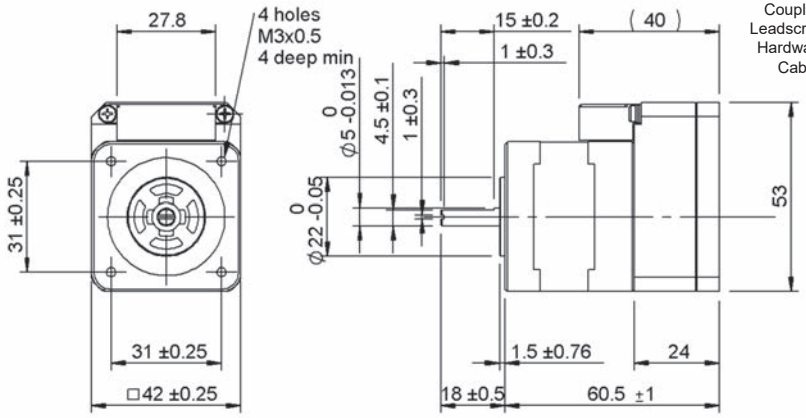
Technical support

- Product overview - see page 2-2
- Technical information - see page T2-1
- P & C interface - see page T2-2
- Software interface - see page T2-3
- Electrical interface - see page T2-5
- Cables - see page 2-11
- Accessories - see page 2-12

Reliance Cool Muscle Motor

All dimensions in mm

Associated Products
Planetary Gearboxes: page 3-3
Couplings: page 8-1
Leadscrews: page 7-1
Hardware: page 13-1
Cables: page 2-11



RCM1 - P - 17 S 30- E - RT3

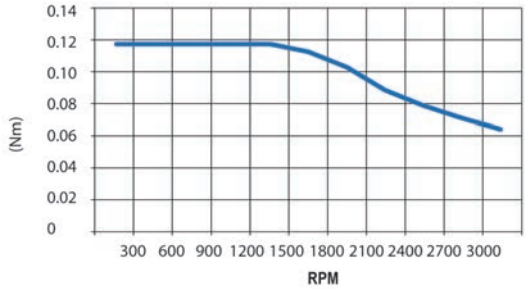
- Generation
- Interface: P = Pulse, C = Computer
- Speed: 30 = 3000 rpm

Specification table

	RCM1-_-17S30-E-RT3
Motor output power	18 W
Maximum speed	3,000 rpm
Continuous torque	0.082 Nm
Peak torque	0.117 Nm
Load inertia allowance	380 g-cm^2
Motor inertia	36 g-cm^2
Input supply current rated (Continuous torque/rated peak torque)	0.8 A/1.0 A
Weight	325 g

Torque curve

RCM1-_-17S30-C-RT3



Technical support

- Product overview - see page 2-2
- Technical information - see page T2-1
- P & C interface - see page T2-2
- Software interface - see page T2-3
- Electrical interface - see page T2-5
- Cables - see page 2-11
- Accessories - see page 2-12

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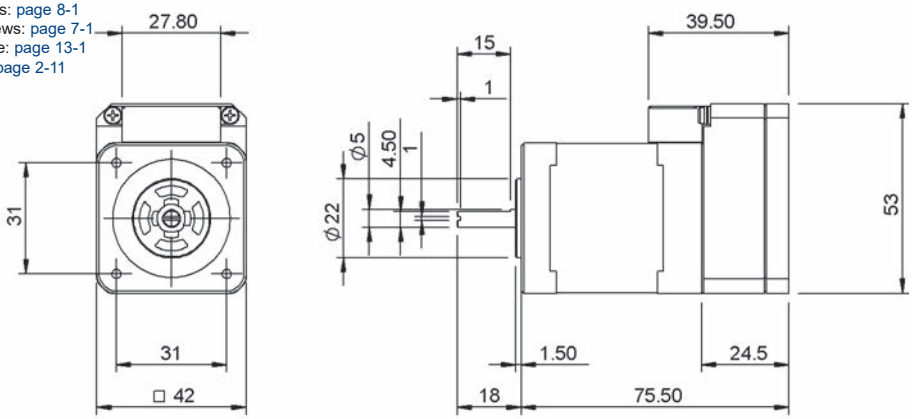
Associated Products
Planetary Gearboxes: page 3-3
Couplings: page 8-1
Leadscrews: page 7-1
Hardware: page 13-1
Cables: page 2-11

All dimensions in mm



RCM1 - P - 17 L 30- E - RT3

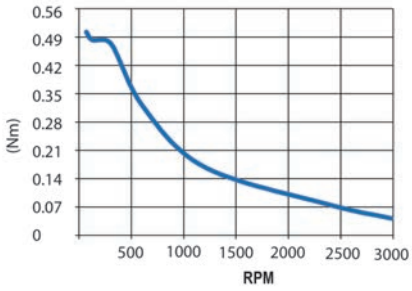
- Generation
- Interface: P = Pulse, C = Computer
- Speed: 30 = 3000 rpm

Specification table

	RCM1-_-17L30-E-RT3
Motor output power	18 W
Maximum speed	3,000 rpm
Continuous torque	0.36 Nm
Peak torque	0.518 Nm
Load inertia allowance	760 g-cm^2
Motor inertia	74 g-cm^2
Input supply current rated (Continuous torque/rated peak torque)	1.5 A/1.8 A
Weight	470 g

Torque curve

RCM1-_-17L30-E-RT3



Technical support

- Product overview - see page 2-2
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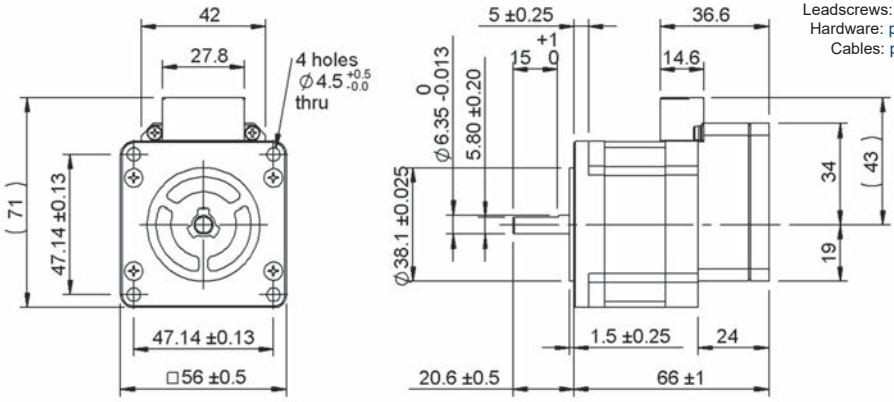
- P & C interface - see page T2-2
- Software interface - see page T2-3
- Electrical interface - see page T2-5
- Cables - see page 2-11
- Accessories - see page 2-12

All dimensions in mm

Associated Products
Planetary Gearboxes: page 3-3
Couplings: page 8-1
Leadscrews: page 7-1
Hardware: page 13-1
Cables: page 2-11



RCM1 - P - 23 S 30- E - RT3

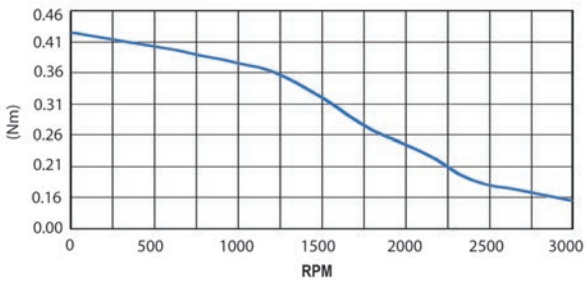
- Generation
- Interface: P = Pulse, C = Computer
- Speed: 30 = 3000 rpm

Specification table

	RCM1-_-23S30-E-RT3
Motor output power	45 W
Maximum speed	3,000 rpm
Continuous torque	0.29 Nm
Peak torque	0.42 Nm
Load inertia allowance	$1.0x10^3$ g-cm^2
Motor inertia	$1.0x10^2$ g-cm^2
Input supply current rated (Continuous torque/rated peak torque)	3.9 A/5.1 A
Weight	580 g

Torque curve

RCM1-_-23S30-C-RT3



Technical support

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- Software interface - see page T2-3
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Associated Products
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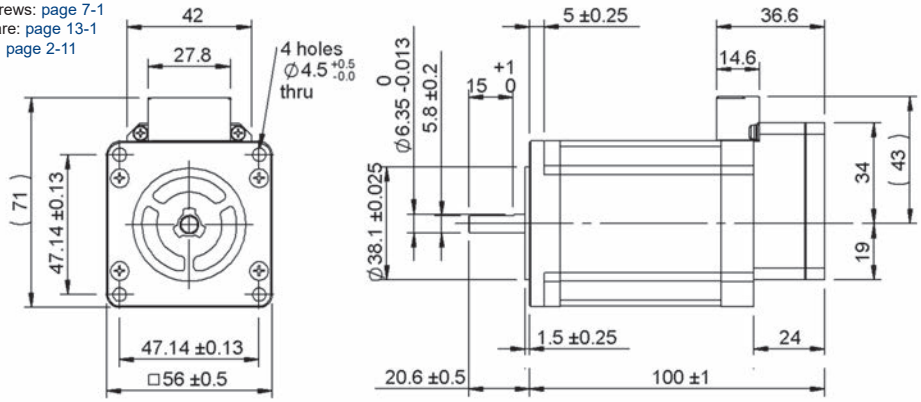
Cables: page 2-11

All dimensions in mm



RCM1 - P - 23 L 20- E - RT3

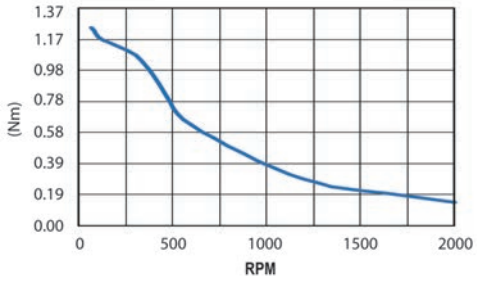
- Generation
- Interface: P = Pulse, C = Computer
- Speed: 20 = 2000 rpm

Specification table

	RCM1-_-23L20-E-RT3
Motor output power	30 W
Maximum speed	2,000 rpm
Continuous torque	0.87 Nm
Peak torque	1.24 Nm
Load inertia allowance	$3.6x10^3$ g-cm^2
Motor inertia	$3.6x10^2$ g-cm^2
Input supply current rated (Continuous torque/rated peak torque)	2.6 A/3.4 A
Weight	1100 g

Torque curve

RCM1-_-23L20-E-RT3



Technical support

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- Software interface - see page T2-3
- Electrical interface - see page T2-5
- Cables - see page 2-11
- Accessories - see page 2-12

Intelligent Motors

General and environmental specifications

Encoder	Incremental magnetic encoder (50,000 pulses per rotation)
Control Method	Closed loop vector control
Input Supply Voltage	DC24 V±10%
Resolution Pulse Rotation (Pulse/Rotation)	200, 400, 500, 1000(default), 2000, 2500,5000, 10000, 25000,50000 Select by parameter
Ambient Operating Temperature	0°C to 40°C
Storage Temperature	-20°C to +60°C
Operating Humidity	Less than 90%RH
Shock	Less than 10 G
Vibration	Less than 1 G

Pin layout

For Reliance Cool Muscle electrical interfacing and connector pin layout see Technical Information page T2-5.

Input/output signal

Pulse Interface	CW/CCW	Step/Direction
Input Signal Pulse Input P	CW/CCW Pulse Maximum frequency: 500 Kpps Minimum pulse width: 0.8 µsec Voltage level H (with pulse) > +3.0 V (+24 Vmax) 7 mA-1 5mA Voltage level L (no pulse) < +0.8 V	Step Pulse Maximum frequency: 500 Kpps Minimum pulse width: 0.8 µsec Voltage level H (with pulse) > +3.0 V (+24 Vmax) 7 mA-15 mA Voltage level L (no pulse) < +0.8 V

Variable Voltage Interface - Now integrated into the C-Type motor	
Input Signal Analogue Input V	Speed Ccontrol setting Increase the voltage from 2.6 V to 4.8 VDC to increase speed in the CW direction Decrease the voltage from 2.4 V to 0 VDC, to increase speed in the CCW direction. Use OP AMP for maximum resolution Position control setting Travel distance is proportionate to voltage input (between 0 V and 4.8 VDC) Maximum travel distance is set by a parameter

Computer Control Interface		
Input Signal Control C	Via supplied cabling - motor interface is TTL, please specify RS232 or RS485 interface option	
Input Signal Level	Voltage level high> 3 V (minimum 7 mA)	Voltage level low< 0.8 V

RT3 Real Time Interface	
Co-ordinated Motion	Allows 2 axes to work together to create accurate complex motion
Logic Banks	Embedded PLC up to 200 steps for mathematical calculation of motion
Quadrature	Simulated AB outputs from the magnetic encoder. Maximum frequency 20 kHz
Shared I/O	Inputs or outputs are available to be read and accessed by all motors running programs and logic banks
RT3	

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Software interface

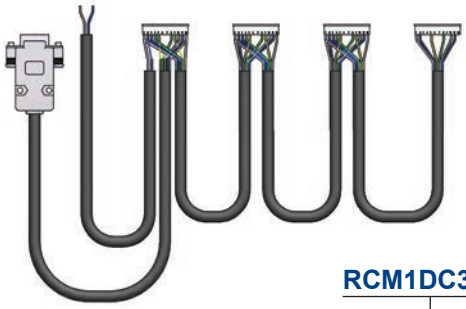
For programming details for the C-Type Reliance Cool Muscle see Technical Information pages T2-3 to T2-5.

'Y' cables

RCM1C3 - xx

- xx: Length of wires to first connector (xx-xx if the two lengths are different)
- RCM1C3: Generic part number

Standard and customised daisy chain cables



RCM1DC3A - xx - N - xx - xx - xx

- xx: Length of wire between connectors (Only one number required if the lengths are all the same)
- N: Number of connectors
- xx: Length of wires to first connector (xx-xx if the two lengths are different)
- RCM1DC3A: Generic part number

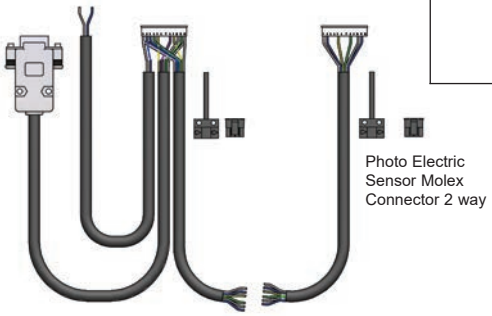
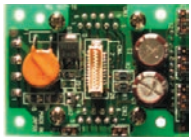


Photo Electric Sensor Molex Connector 2 way

Product options

- For further information about customising cables, please contact us
- Customised cables are available with photosensors option



Communication cards

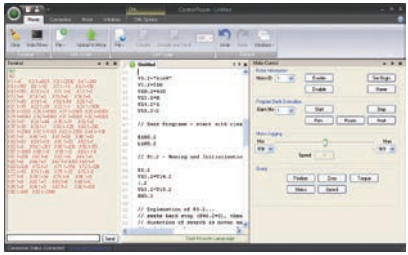
RS485, PROFIBUS and Ethernet cards are available as options for the Reliance Cool Muscle servo system. Our engineers provide technical support based on extensive experience integrating the Reliance Cool Muscle with third party controllers, HMIs and PLCs.

Power supply

Designed specifically for the Reliance Cool Muscle, this power supply is built to withstand the current draw spikes which the hard stops or starts often require. Specification of the power supply is 150 W/300 W, 6 A/10 A.

Cables

A standard motor cable (40 cm) and varistor are supplied with every motor. Longer motor cables are available as an option.
A Y-cable is required to connect the Reliance Cool Muscle to a USB or serial port,
see page 2-11
Multi-motor custom cables can be made to suit your application.



Control room

Control Room is a free application which provides basic tools for setting parameters and creating motion profiles. A user friendly interface makes it easy to work with the Reliance Cool Muscle.

Control Room replaces the CoolWorks software.

CoolWorks continues to be supported by Reliance.

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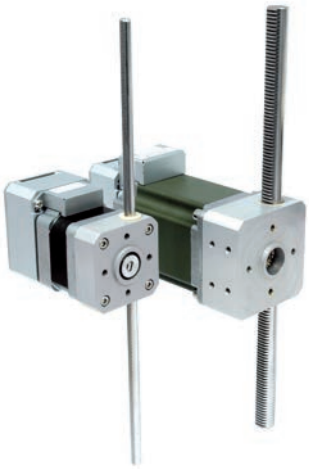
We provide a range of associated products which compliments the Reliance Cool Muscle and enhance its performance, including couplings, gearboxes and linear motion components.

Reli-a-Flex® flexible shaft couplings

The Reli-a-Flex® range of one piece slit couplings has been specially designed to provide accurate transfer of motion between two rotating shafts while at the same time catering for parallel and angular misalignment as well as protecting the bearing systems.
See page 8-6 for more information on the Reli-a-Flex® range.

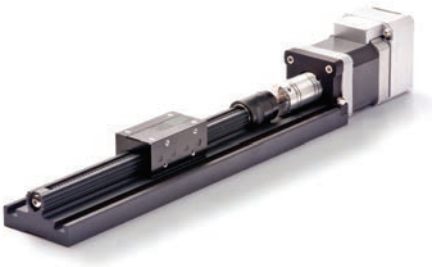
Planetary gearboxes

A range of high quality planetary gearboxes is available to suit your application needs. Combine a low backlash, zero maintenance and high durability gearhead with the Reliance Cool Muscle to maximise performance. Available in NEMA 17 and 23, ratios 3:1 to 512:1.
See page 3-3 for more information.



Intelligent actuator systems

A range of intelligent actuators is available to support your precision motion control needs. These include rack actuators and positioning stages for use with the Reliance Cool Muscle. Please contact us or visit the website for more information; www.reliance.co.uk/shop
See pages 2-14 to 2-23 for more information.



Precise, efficient linear motion

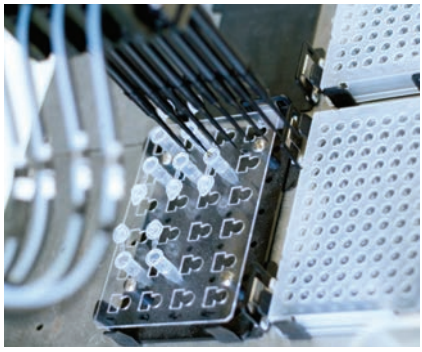
This compact actuation system combines the Reliance Cool Muscle servo system with a rack and pinion drive to give precise linear motion for high speed applications.

Multiple configurations are available developing peak forces up to 150 N and rated speeds of 300 mm per second, with resolutions of better than 1 micron and standby power consumption of less than 1.7 watts. The assembly has a number of different mounting options for ease of mechanical installation.

The Racktuator™ has built-in closed loop control with an integrated 32 bit CPU, magnetic encoder and PLC. This intelligent assembly can be programmed to decide for itself where it should be at any given time and to send out continuous motion data such as speed, position and torque. The unit is fully integrated, saving space and cost, and makes system integration faster and simpler with control at the point of use. The Racktuator™ is fully programmable and can store onboard discrete positions, speeds, accelerations, timers, torque limits and custom variables, all to be recalled by up to 15 separate motion control programs. It also has built-in maths and S curve functions for advanced motion control.

Multiple Racktuators™ can work in sequence, either to produce circles, ellipses, or complex arc motions, or in a daisy chain network to automate pick-and-place machines. The Racktuator™ can be operated independently or communicate with a PC host via RS232 or USB. It can also be fitted with a traditional stepper motor, being driven by step and direction signals or with CW/CCW pulses to bring the advantages of an AC servo system to any stepper motor application.

The Racktuator™ is available with both solid and tubular racks, suitable for a variety of applications from scientific research to food preparation and packaging.



Laboratory automation

Industrial automation

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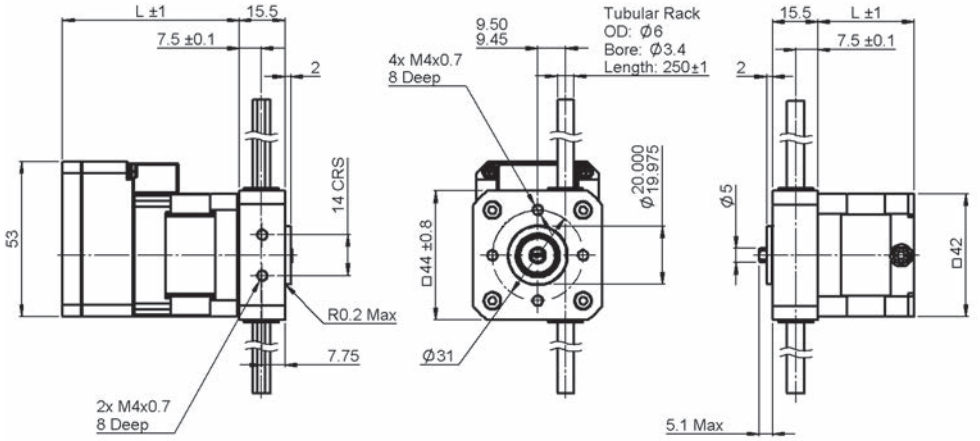
Associated Products
Hardware: page 13-1

All dimensions in mm



Reliance Cool Muscle Motor Option

Hybrid Stepper Motor Option

Part number selection table

Part Number	Motor	Pinion Material	L	Axial Load (N)	Momentary Load (N)	Travel Range (mm)
RCMRA17S-6-250-C	Reliance Cool Muscle Motor[1]	PEEK	60.5	3	12	200
RCMRA17L-6-250-C-S		St steel	75.3	15	25	
RRA17-6-250	Hybrid Stepper Motor[2]	PEEK	33.0	3	12	
RRA17-6-250-S		St steel	33.0	15	25	

[1] Reliance Cool Muscle motor option, see pages 2-6 and 2-7 for motor details (if a pulse interface is required change **-C** to a **-P**)
[2] Hybrid stepper motor option, see page T2-10 for motor details

Technical specification

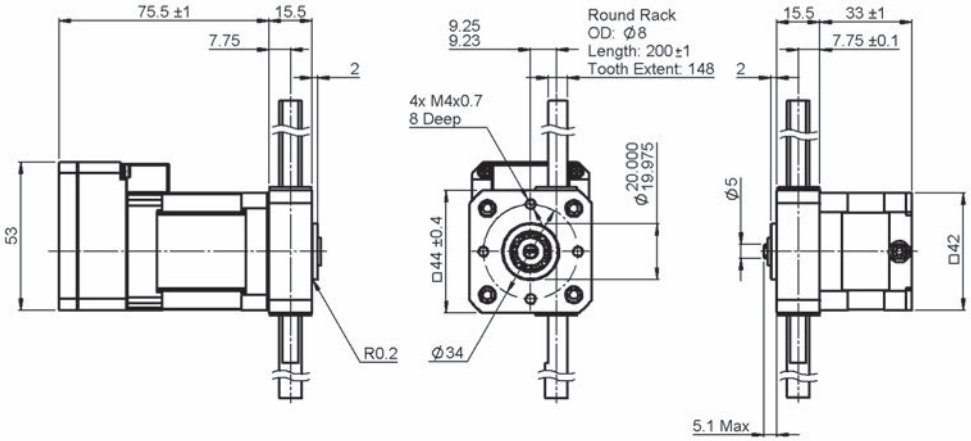
		RCMRA17 Reliance Cool Muscle	RRA17 Hybrid Stepper
Resolution		0.00085 mm with 50,000 steps/rev	0.21 mm with 200 steps/rev
Max speed		300 mm/sec	
Temperature range		Between 0ºC and 40ºC	Between -20ºC and +50ºC
Repeatability		0.025 mm	
Side wobble (fully extended)		±0.2 mm	
Life time		5 million cycles minimum	
Wire length		N/A	200 mm
Backlash		0.08 mm linear movement	
Rack material		316 grade stainless steel	
Lubrication	St steel	PTFE based grease	
	PEEK	Lubrication free, provides smooth quiet operation	

Technical support

• Product overviews see pages 2-2, 2-14 and 6-2 • Technical information see pages T2-9 and T6-1

All dimensions in mm

Associated Products
Hardware: page 13-1



Reliance Cool Muscle Motor Option **Hybrid Stepper Motor Option**

Part number selection table

Part Number	Motor	Pinion Material	Axial Load (N)	Momentary Load (N)	Travel Range (mm)
RCMRAK17L-8-200-C	Reliance Cool Muscle Motor[1]	St steel 304	25	50	100
RRAK17-8-200	Hybrid Stepper Motor[2]		25	50	

[1] Reliance Cool Muscle motor option, see page 2-7 for motor details (if a pulse interface is required change **-C** to a **-P**)
[2] Hybrid stepper motor option, see page T2-5 for motor details

Technical information

	RCMRAK17 Reliance Cool Muscle	RRAK17 Hybrid Stepper
Resolution	0.00075 mm with 50,000 steps/rev	0.19mm with 200 steps/rev
Max speed	500 mm/sec	
Temperature range	Between 0ºC and +40ºC	Between -20ºC and +50ºC
Repeatability	0.025 mm	
Side wobble (fully extended)	±0.29 mm	
Life time	5 million cycles minimum	
Wire length	N/A	200 mm
Backlash	0.08 mm linear movement	
Rack material	304 grade stainless steel	
Lubrication	PTFE based grease	

Technical support

• Product overviews see pages 2-2, 2-14 and 6-2 • Technical information see pages T2-9 and T6-1

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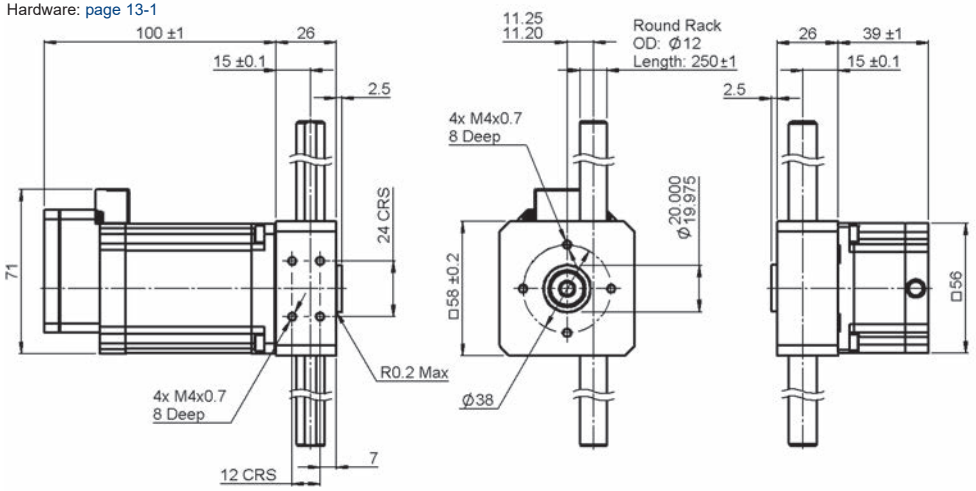
Associated Products
Hardware: page 13-1

All dimensions in mm



Reliance Cool Muscle Motor Option

Part number selection table

Part Number	Motor	Pinion Material	Axial Load (N)	Momentary Load (N)	Travel Range (mm)
RCMRA23L-12-250-C	Reliance Cool Muscle Motor[1]	St steel 17-4Ph coated	90	150	150
RRA23-12-250	Hybrid Stepper Motor[2]		90	150	

[1] Reliance Cool Muscle motor option, see page 2-9 for motor details (if a pulse interface is required change **-C** to a **-P**)
[2] Hybrid stepper motor option, see page T2-5 for motor details

Technical information

	RCMRA23 Reliance Cool Muscle	RRA23 Hybrid Stepper
Resolution	0.0008 mm with 50,000 steps/rev	0.2 mm with 200 steps/rev
Max speed	300 mm/sec	
Temperature range	Between 0ºC and 40ºC	Between -10ºC and +50ºC
Repeatability	0.012 mm	
Side wobble (50mm from housing)	±0.2 mm	
Life time	5 million cycles minimum (based on 40 mm stroke)	
Wire length	N/A	200 mm
Backlash	0.06 mm linear movement	
Rack material	440B grade stainless steel	
Lubrication	PTFE based grease	

Technical support

• Product overviews see pages 2-2, 2-14 and 6-2 • Technical information see pages T2-9 and T6-1

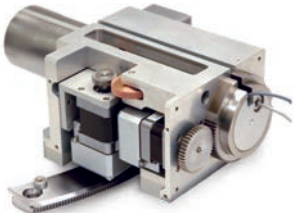
Providing custom-built solutions

As well as offering a range of standard actuators Reliance is able to develop bespoke solutions to suit individual requirements. Bespoke motorised actuators are based on our range of catalogue components and assemblies, together with housings and fittings manufactured by Reliance in the UK and Ireland.

XYZ theta stage

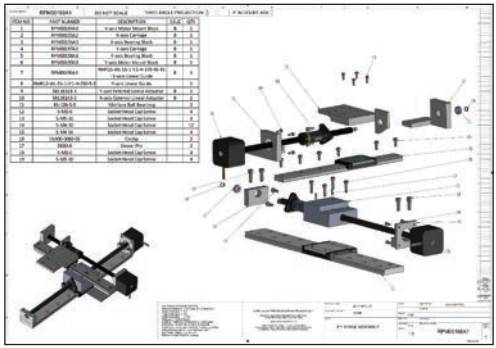
Working closely with our customers to understand the application and design specification, we are able to offer design engineering support to help develop an appropriate assembly, bringing knowledge and experience from working in a variety of industries and applications.

Typical examples shown below include a miniature motorised leadscrew actuator for a drug dispensing system, a motorised leadscrew driven slide assembly, using multiple Reliance Cool Muscle motors, for an XYZ theta position system, and a 3-axis rotary-linear actuator for a medical scanner.



Actuator for a medical scanner

Modular linear actuator



Design engineering support

Manufacturing and assembly

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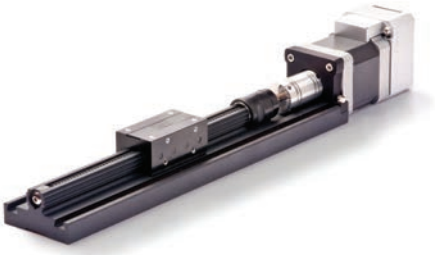
Motorised leadscrew-driven linear slide

The RCMS series of leadscrew stages combines the high speeds and programmability of Reliance Cool Muscle motors with the accuracy and reliability of a leadscrew-driven linear slide.



The RCMS is available with two different motor sizes and in a wide range of travel lengths and leadscrew and carriage configurations.

The precision slide's aluminium guide and carriage are driven by a rolled stainless steel leadscrew, available with metric and imperial leads. High performance polymers and TFE coating extend the life of the slide's moving parts.

The Reliance Cool Muscle motor, in NEMA sizes 17 and 23, integrates an efficient vector drive and H-infinity controller with a 50,000-count encoder to form a servo positioning system operating at speeds from 0 to 3,000 rpm with minimum power consumption. Cool Muscle's torque sensing and software travel limits give the option of eliminating home and limit switches from your system.

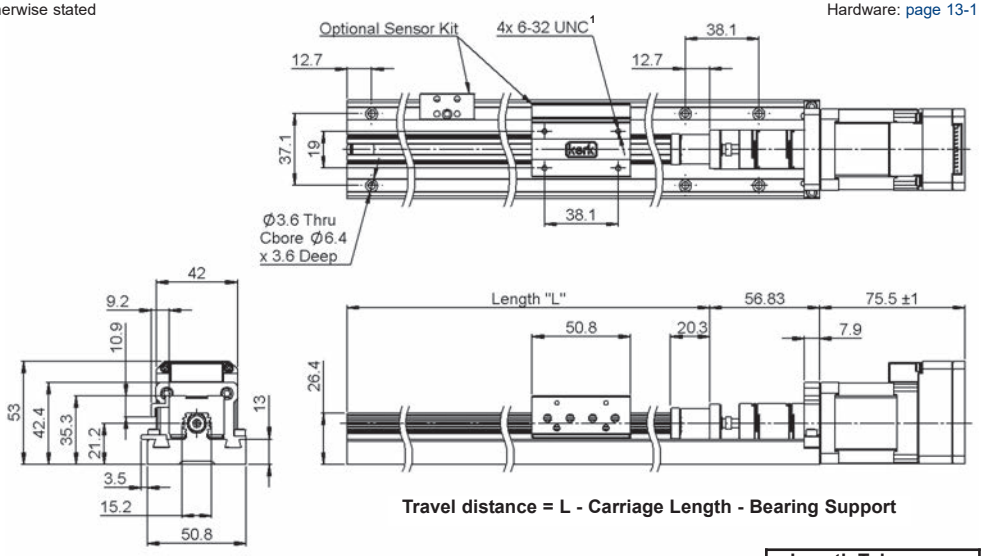
Typical applications for the RCMS include test instrumentation used in industrial automation and university laboratory research equipment used by the energy industry.

Test equipment for solar cell manufacture

Packaging test equipment

All dimensions in mm
unless otherwise stated

Associated Products
Hardware: page 13-1



Travel distance = L - Carriage Length - Bearing Support

Length Tolerances	
< L4	± 0.1
4 < L ≤ 16	± 0.15
16 < L ≤ 63	± 0.2
63 < L ≤ 250	± 0.3

Part number selection table

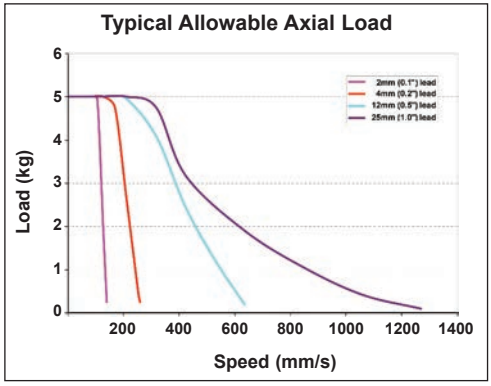
Example Part No. **RCMS17L-M04-C-1-18**

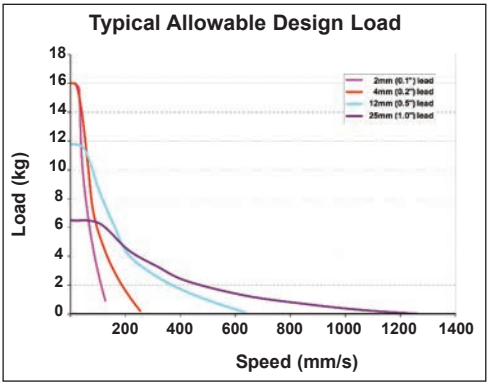
Basic Part Number	Screw Lead mm (Inch)	Motor Interface[2]	No. Carriages[3]	Linear Resolution (Default) mm	Max Drag Torque Nm	Standard Guide Lengths "L" Inch
RCMS17L-M02	2.0	**C** (Computer) **P** (Pulse)	1	0.002	0.03	12 18
RCMS17L-M04	4.0			0.004	0.04	12 18
RCMS17L-M12	12.0			0.012	0.04	12 24
RCMS17L-M25	25.0		2	0.025	0.05	18 24
RCMS17L-0100	(0.100)			0.00254	0.03	10 12 15 18 24
RCMS17L-0200	(0.200)		3	0.00508	0.04	10 12 15 18 24
RCMS17L-0500	(0.500)			0.0127	0.04	12 15 18 24
RCMS17L-1000	(1.000)			0.0254	0.05	12 18 24 36

[1] Metric mounting configuration available, please enquire
[2] For explanation of **-C** and **-P** type interfaces, see pages 2-2 and T2-2
[3] Carriage information:
1 = 1 driven carriage
2 = 1 driven and 1 passive carriage
3 = 1 driven and 2 passive carriages

Technical specification

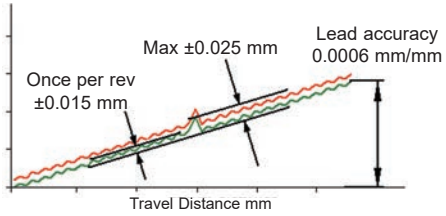
Basic Part Number	Life @ ¼ Design Load mm	Torque to Move Carriage Design Load Nm/kg	Carriage Design Load kg	Max Linear Speed mm/sec	Axial Load kg	Screw Inertia kgm^2/m	Carriage Roll Angle Deg.
RCMS17L-M02	$254x10^6$	0.016	16	127	5	$4.2x10^{-6}$	1
RCMS17L-M04		0.023		254			
RCMS17L-M12		0.039		635			
RCMS17L-M25		0.070		1270			
RCMS17L-0100		0.016		127			
RCMS17L-0200		0.023		254			
RCMS17L-0500		0.039		635			
RCMS17L-1000		0.070		1270			





Typical RCMS Accuracy Graph

Based on 0.500 inch lead with a 3 kg load Backlash <0.003 mm



Technical support

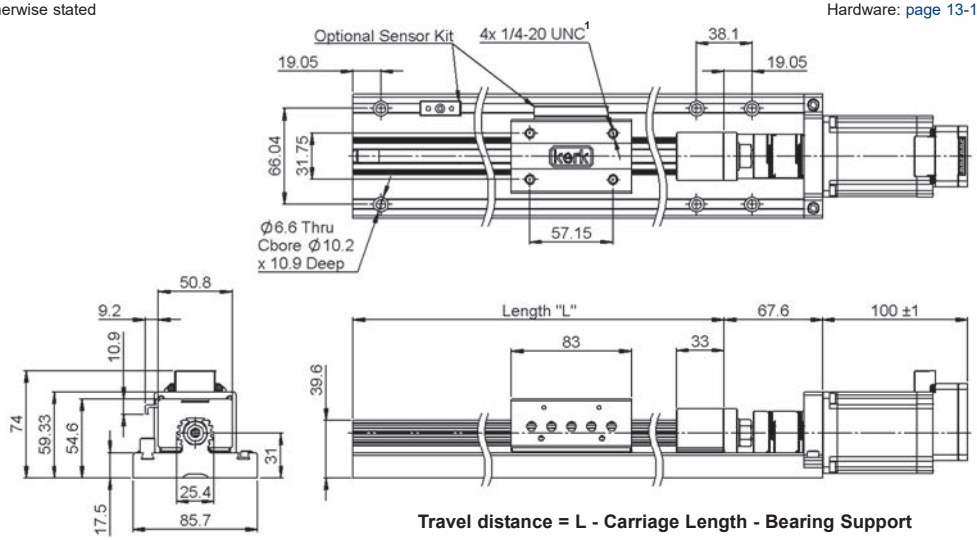
- Product overviews - see pages 2-19 and 2-2
- Technical information - see pages T2-1 to T2-8

Product options

- Special carriage, rail, screw or metric mounting configurations
- Higher accuracy leadscrew
- Left Hand (LH) or Left/Right (L/R) thread
- Metric leads and guide lengths
- Alternative guide lengths
- Sensor kits, add -S to the end of the part number e.g. RCMS17L-M04-C-1-18-S

All dimensions in mm
unless otherwise stated

Associated Products
Hardware: page 13-1



Travel distance = L - Carriage Length - Bearing Support

Length Tolerances	
< L4	± 0.1
4 < L ≤ 16	± 0.15
16 < L ≤ 63	± 0.2
63 < L ≤ 250	± 0.3

Part number selection table

Example Part No. RCMS23L-M08-C-1-18

Basic Part Number	Screw Lead mm (Inch)	Motor Interface[2]	No. Carriages[3]	Linear Resolution (Default) mm	Max Drag Torque Nm	Standard Guide Lengths "L" (Inch)
RCMS23L-M08	8.0	C (Computer) P (Pulse)	1	0.0080	0.04	18 24
RCMS23L-0100	(0.100)			0.00254	0.04	12 18 24 36
RCMS23L-0200	(0.200)		2	0.00508	0.04	12 18 24 36
RCMS23L-0500	(0.500)			0.0127	0.05	12 18 24 36
RCMS23L-1000	(1.000)		3	0.0254	0.06	12 18 24 36

[1] Metric mounting configuration available, please enquire
[2] For explanation of **-C** and **-P** type interfaces, see pages 2-2 and T2-2
[3] Carriage information:
1 = 1 driven carriage
2 = 1 driven and 1 passive carriage
3 = 1 driven and 2 passive carriages

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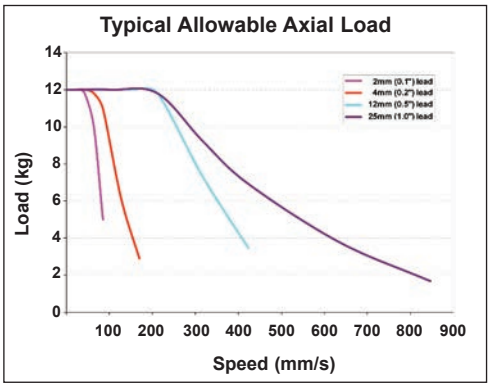
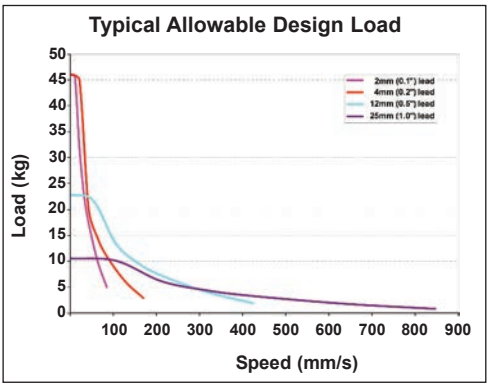
Technical information

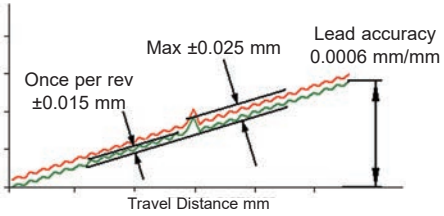
Basic Part Number	Life @ ¼ Design Load mm	Torque to Move Carriage Design Load Nm/kg	Carriage Design Load kg	Max Linear Speed mm/sec	Axial Load kg	Screw Inertia kgm^2/m	Carriage Roll Angle Deg.
RCMS23L-M08	$254x10^6$	0.038	46	267	14	$3.9x10^{-5}$	1
RCMS23L-0100		0.020		85			
RCMS23L-0200		0.031		169			
RCMS23L-0500		0.047		423			
RCMS23L-1000		0.101		847			





Typical RCMS Accuracy Graph

Based on 0.500 inch lead with a 3 kg load Backlash <0.003 mm



Technical support

- Products overview - see pages 2-19 and 2-2
- Technical information - see pages T2-1 to T2-8

Product options

- Special carriage, rail, screw or metric mounting configurations
- Higher accuracy leadscrew
- Left Hand (LH) or Left/Right (L/R) thread
- Metric leads and guide lengths
- Alternative guide lengths
- Sensor kits, add -S to the end of the part number e.g. RCMS17L-M04-C-1-18-S

Hybrid linear actuators

Reliance offers a range of low maintenance hybrid linear actuators for equipment designers who require high performance and exceptional endurance in a very small package. The actuators are engineered with custom thermoplastics in the rotor drive nut and a stainless steel leadscrew. This allows the linear actuator to be quieter, more efficient and more durable than the standard acme thread and bronze nut configuration commonly used in other linear actuators.

The hybrid linear actuators are available in NEMA frame sizes 8 to 34, with up to 400 full steps per revolution and travel increments as small as 0.003 mm/step.

There are three configurations:
- captive shaft
- non-captive linear
- external linear

Captive linear actuators offer a short stroke in a compact package where anti-rotation of the shaft is not possible by any other means. These units convert rotary to linear motion via an integrated leadscrew and nut. The integrated leadscrew is held captive within the motor housing, welded to a stainless steel spline arrangement. This provides anti-rotation of the leadscrew enabling precise linear movement.

The non-captive linear actuator leadscrew travels through the motor giving an extremely short footprint. As with the captive shaft actuator, conversion of rotary to linear motion takes place within the motor itself by means of the integrated leadscrew and nut, therefore eliminating the use of belts and pulleys, couplings and other mechanical transmission components.

Size 8

Size 11 and Size 14

Size 17 and Size 23

Size 34

External linear actuators combine conventional leadscrew and nut technology with stepper motor technology. The leadscrew forms part of the motor shaft negating the need for a shaft to shaft coupling, thus providing zero transmission error from motor to screw and shortening the overall linear footprint.

Contact us for details of products and specifications.

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Can-Stack linear actuators

For volume applications we also offer Can-Stack linear actuators, which are a threaded rotor in conjunction with a leadscrew shaft to provide rapid linear movement in two directions (inward and outward). They are available in captive shaft, non-captive linear or external linear variants.

Unique features give ruggedness and reliability that assure long life and consistent performance. Rare earth magnets are available for even higher thrust. The actuators are built with dual ball bearings for greater motion control, precise step accuracy and long life.

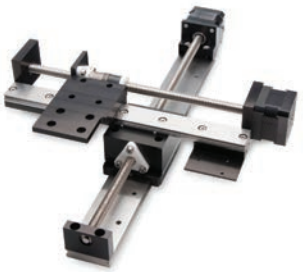
Applications for the Can-Stack linear actuators include medical instrumentation, machinery automation, robotics and other automated devices which require precise, remote controlled linear movement in a broad range of temperature environments, whilst the hybrid linear actuators are ideal for applications requiring precise positioning, rapid motion and long life, including XY tables, medical equipment and semi-conductor handling equipment.

Micro dispensing syringe drive

Pharmaceutical testing equipment

Customised configurations

In addition to standard configurations the actuators can be modified to meet specific application requirements. Reliance's applications engineering experience, manufacturing and assembly capabilities enable us to provide modified products and bespoke assembly solutions, see page 2-18.



Linear rail actuators

The linear rail actuator consists of a stationary base and load bearing carriage that travels along a rigid extruded aluminium rail, together with a single stack size 17 stepper motor.

The carriage design is unique; it controls slide bearing play with a self-adjusting linear bearing. Integrated along the entire length rail system are “T” slots allowing mounting of limit switches and sensors.

The leadscrew is made from 303 stainless steel with a Black Ice™ TFE coating for durable and permanent lubrication.

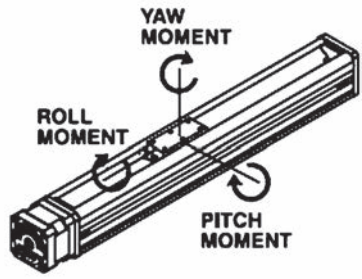
The features of the linear rail actuator include:

- “T” slots integrated into exterior rail bottom and sides that accommodate full length support and various mounting options
- Loads easily attach to the compact, moving carriage with four or six M4 x 0.7 size screws
- Load bearing carriage moves efficiently and smoothly within the internal rail geometry of this specially designed aluminum extrusion
- Rail provides end-to-end axial stability and precise motion system accuracy
- Automatic adjustments of slide bearing play with a patent pending “anti-backlash” linear bearing
- Rated life equals that of the existing leadscrews of similar size
- Leadscrew end configurations adapt to various rotary motion sources
- Black Ice™ TFE coatings on a 303 stainless steel leadscrew

For optimum performance, the system can be fitted with the Size 17 Hybrid Linear Actuator, see page 2-24 available in a wide variety of resolutions - from 0.001524 mm/step to 0.048768 mm/step, delivering thrust of up to 222 N. For greater performance Size 17 Hybrid Double Stack Linear actuators provide 0.0158mm/step to 0.127 mm/step and deliver thrust of up to 337 N.

Load ratings

	RLRW04
Top load (Z direction)	225 N
Overhang	225 N
Moment roll	8.5 Nm
Moment yaw	8.5 Nm
Moment pitch	8.5 Nm
Twist	±0.75º/m



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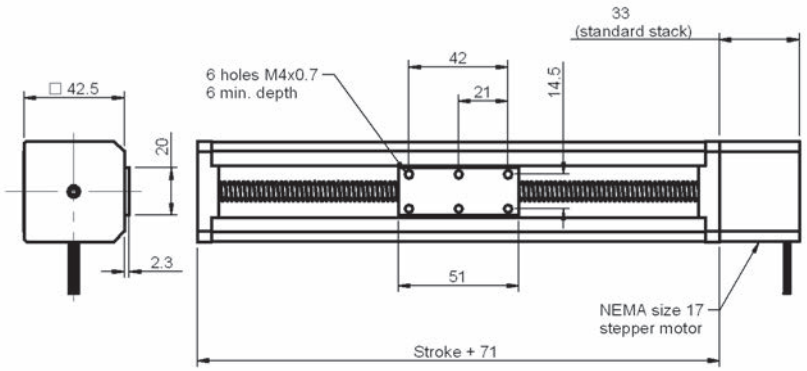
Associated Products
Hardware: page 13-1

All dimensions in mm
unless otherwise stated



Part number selection table

Example Part No. RLRW04 - B - R[2] - M[3] - 43[4] - 0025 - 12

Basic Part Number	Screw Coating[1]	Performance Specifications: Max Stroke Length (mm)	Performance Specifications: Max Speed (m/sec)	Performance Specifications: Straight Line Accuracy (mm/m)	Thread Code	Lead (mm)	Lead (inch)	Stroke[5] Rounded Up (inch)
RLRW04	B (Black Ice™) S (Uncoated) N (No screw)	1,000	0.5	±1.0	0025	0.635	0.025	07 = 7in 08 = 8in 12 = 12in
					0031	0.794	0.03125	
					0039	1.0	0.0394	
					0050	1.27	0.05	
					0063	1.588	0.0625	
					0079	2.0	0.0787	
					0100	2.54	0.1	
					0125	3.175	0.125	
					0197	5.0	0.1969	
					0250	6.35	0.25	
					0394	10.0	0.3937	
					0500	12.70	0.5	
					0750	19.05	0.75	
					1000	25.40	1.0	

[1] Alternative screw coatings available, please contact our sales team for more information
[2] R = right handed, L = left handed, N = no screw
[3] M = motorised
[4] Size 17 stepper motor
[5] Stroke length in inches and will be rounded up. Maximum length 24 inch

Introducing the motorised leadscrew linear slide range

Reliance offers a range of motorised actuator systems including the motorised leadscrew linear slide. It offers exceptional linear speed, accurate positioning, and long life in a compact assembly. One of its many advantages is that the length and speed are not limited by critical screw speed, allowing high RPM and linear speeds, even over long spans. Lengths up to 2.4 metres can readily be built, and longer lengths are possible on a special order basis.

The motorised leadscrew linear slide features wear-compensating, anti-backlash carriages to ensure repeatable and accurate positioning. The pre-assembled unit combines a screw-driven linear actuator with an integrated stepper motor drive reducing part count and improving system integration.

It is available in standard and wide base options, each capable of supporting a range of load capacities. There are four variants of the standard base supporting 67 N, 156 N, 222 N and 445 N, and two of the wide base to support 156 N and 445 N. Both are available with a right or left hand thread; the nominal thread leads are shown in the table opposite. The stepper motor is available in three sizes - NEMA size 11, 17 and 23, alternatively the actuator can be supplied integrated with the Reliance Cool Muscle motor, see pages 2-19 to 2-23, or as a non-motorised leadscrew linear slide see page 7-38.

Typical considerations when selecting a linear actuator include:

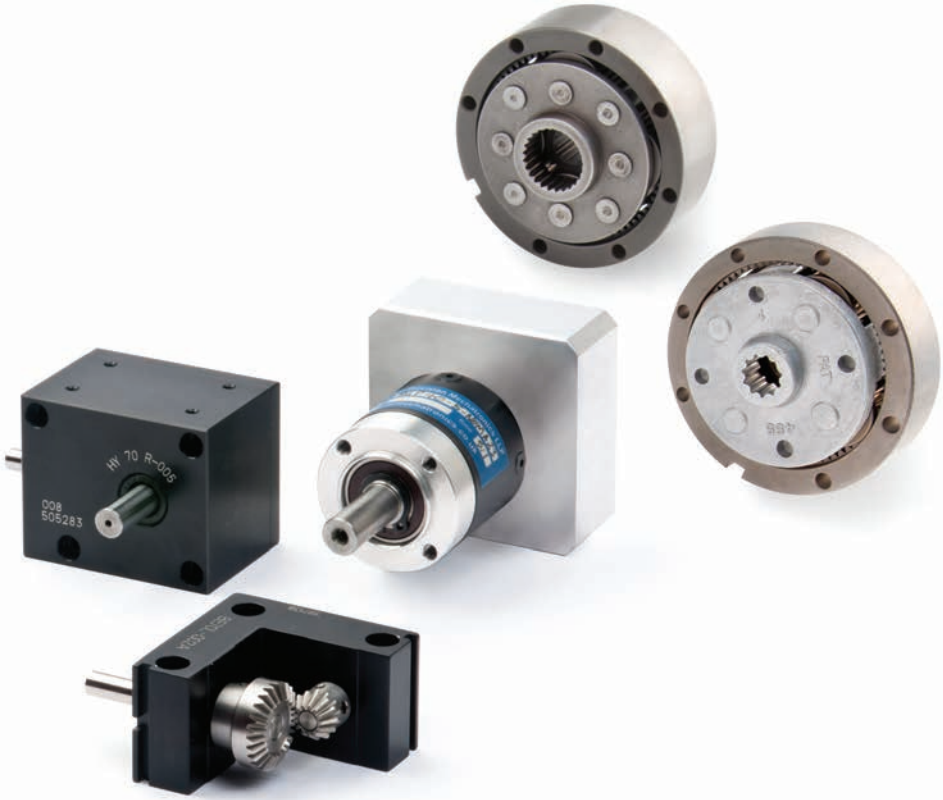
- How much force is required from the linear actuator?
- What is the duty cycle of the linear move?
- What is desired step increment from the linear actuator?
- What is the step rate or speed of travel?
- Bipolar or unipolar coils in the stepper motor prime mover?
- Stepper motor coil voltage?
- Must the lead screw hold position with power off or must it be “backdrivable” with power off?
- Are there size restrictions (max footprint of the linear actuator)?
- What is the anticipated life requirement?
- Temperature of operating environment?

Please contact us to discuss your requirements.

Product selection table

Nominal Thread Lead		Standard Base Option				Wide Base Option	
		Standard 1	Standard 2	Standard 3	Standard 4	Wide 1	Wide 2
		67 N	156 N	222 N	445 N	156 N	445 N
		Size 11DS Size 17SS Size 17DS	Size 17SS Size 17DS Size 23SS Size 23DS	Size 23SS Size 23DS	Size 23SS Size 23DS	Size 17SS Size 17DS Size 23SS Size 23DS	Size 23SS Size 23DS
Inches	mm						
0.025	0.635	•					
0.039	1.00	•					
0.050	1.27	•	•			•	
0.0625	1.59	•					
0.079	2.00	•	•			•	
0.098	2.50			•			
0.100	2.54	•	•	•	•	•	•
0.118	3.00	•					
0.125	3.18				•		•
0.157	4.00		•			•	
0.197	5.00		•	•		•	
0.200	5.08	•	•	•	•	•	•
0.250	6.35	•	•		•	•	•
0.315	8.00				•		•
0.375	9.53		•			•	
0.394	10.00	•					
0.400	10.16		•			•	
0.472	12.00		•			•	
0.500	12.70	•	•	•	•	•	•
0.630	16.00			•	•		•
0.750	19.05	•	•			•	
0.984	25.00		•			•	
1.000	25.40		•	•	•	•	•
1.200	30.48		•			•	
1.500	38.10				•		•
2.000	50.80				•		•

Notes
The wide base option provides parallel guide tracks for traversing sensor mount devices
SS = Single Stack, standard linear actuator stepper motor
DS = Double Stack, hybrid linear actuator stepper motor
For further infomation regarding the single and double stack motors, please contact us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Bevel and Hypoid Gearboxes - Overview ..... Page 3-14

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Introduction to the range

Our standard product range includes planetary, bevel and hypoid gearboxes, which provide housed, modular solutions, as well as an epicyclic gear module, which can be used in single or multiple stacks to build a customised gearbox. We also provide design, manufacturing, assembly and test services to create custom gearbox solutions, designed to specification.

Standard gearboxes

Planetary gearboxes

Bevel gearboxes

Epicyclic modules

Custom gearboxes

Custom-designed gearboxes

Concept development and prototype

Gearboxes for harsh environments

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Planetary gearboxes

Planetary gearboxes give the ability to increase the torque and lower the speed of an electric motor, such as a stepper motor, thereby transforming the power and improving control of an electro-mechanical system.

The Reliance planetary gearboxes offer low backlash, high torsional stiffness, and high levels of efficiency, suitable for industrial automation applications. They are ideally suited to working with the Reliance Cool Muscle intelligent servo system in high torque applications where positional feedback is important.

We offer 3 planetary gearboxes – the RGP40 and RGP60 provide a compact solution for integration with Reliance Cool Muscle, whilst the RGPN70 is for higher precision, higher stiffness, higher torque and lower backlash applications.

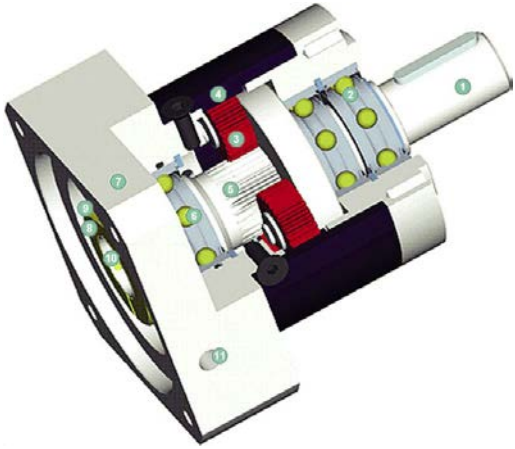
Reliance Cool Muscle servo system

RGP40 series

RGP60 series

Pharmaceutical testing equipment

Industrial automation



RGP40, RGP60

- standard backlash
  (RGP40 from <22′)
  (RGP60 from <18′)
- high output torque
- novel motor clamp system
- high efficiency (up to 96%)
- ratios i=3,...,512
- low noise
- high quality
- any mounting position
- easy motor mounting
- lifetime lubrication
- direction of rotation equidirectional

1 Output shaft
High strength one piece planet carrier and output shaft

2 Output shaft bearing
Deep groove ball bearings with contact seals

3 Planet gear
Precision zero helix angle gear with optimised profile modifications and crowning, case hardened and hard finished by honing

4 Housing with integrated ring gear
Ring gear case hardened for high load capacity, minimum wear, consistent backlash

5 Sun gear
Precision machined optimised gear profile, case hardened and honed for higher load capacity, low noise, minimum wear and consistent backlash

6 Bearing for sun gear
High speed, deep groove ball bearings eliminating thrust loads from thermal expansion, whilst providing exact sun gear position for easy mounting

7 Motor adaptor plate
Allows matching up of the gear head with NEMA 17 and 23 motors, made from aluminium for enhanced thermal conductivity (other adaptors and motors on request)

8 Clamping ring
Balanced ring suitable for high rpm, made from steel to allow greater clamping forces for safe torque transfer

9 Clamping screw
High strength steel with special low pitch thread to generate a greater clamping force

10 Motor shaft clamp
Multiple closed slot precision clamping system for improved reliability

11 Assembly hole
Access hole for the clamping screw

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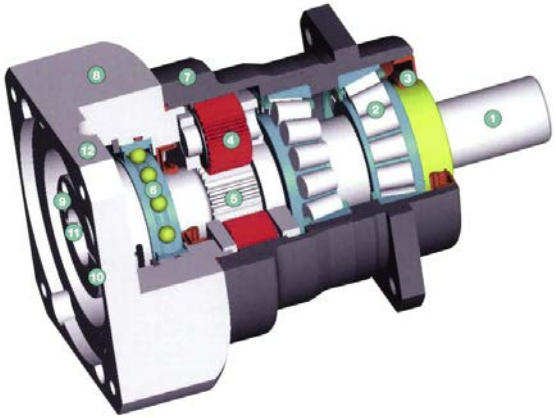
RGPN70

- low backlash (<5′)
- high output torque
- novel motor clamp system
- high efficiency (up to 98%)
- honed gearing
- ratios i=3,...,100
- low noise (< 58 dB)
- high quality
- any mounting position
- easy motor mounting
- lifetime lubrication
- direction of rotation equidirectional



1 Output shaft
High strength, one piece planet carrier and output shaft

2 Output shaft bearing
High precision, preloaded taper roller bearings for zero clearance

3 Sealing ring
Dedicated double lip seal. The lubricant is kept in while contaminants remain outside the gearbox; IP65 rated

4 Planet gear
Precision zero helix angle gear with optimised profile modifications and crowning, case hardened and hard finished by honing

5 Sun gear
Precision machined optimised gear profile, case hardened and honed for higher load capacity, low noise, minimum wear and consistent backlash

6 Bearing for sun gear
High speed, deep groove ball bearings eliminating thrust loads from thermal expansion, whilst providing exact sun gear position for easy mounting

7 Housing with integrated ring gear
Ring gear case hardened for high load capacity, minimum wear, consistent backlash

8 Motor adaptor plate
Allows matching up of the gearhead with NEMA 23 motors, made from aluminium for enhanced thermal conductivity (other adaptors and motors on request)

9 Clamping ring
Balanced ring suitable for high rpm, made from steel to allow greater clamping forces for safe torque transfer

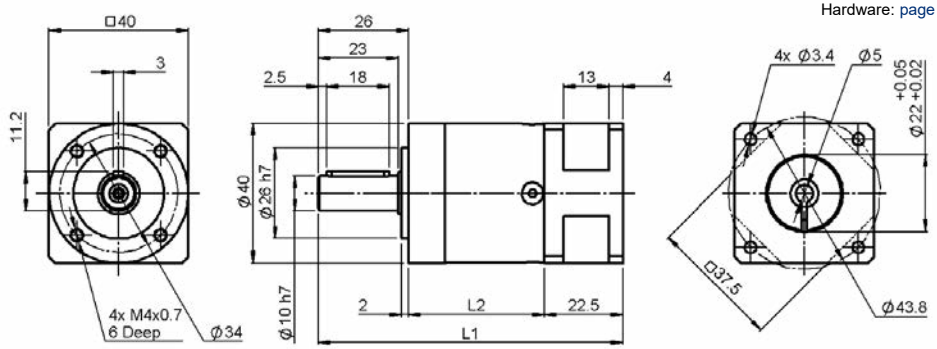
10 Clamping screw
High strength steel with special low pitch thread to generate a greater clamping force

11 Motor shaft clamp
Precision clamping system for improved reliability

12 Assembly hole
Access hole for the clamping screw

All dimensions in mm

Associated Products
Reliance Cool Muscle: page 2-2
Couplings: page 8-1
Hardware: page 13-1



Part number selection table

Example Part No:- RGP40 - 60 - NEMA17

Basic Part Number	Ratio	Stage	L1	L2	Output Torque		Inertia	Efficiency[6] with full load
					Nominal	Max		
			mm	mm	Nm [2]	Nm	kgcm²	%
RGP40	3	1	87.5	39	11	17.6	0.031	98
	4				15	24	0.022	98
	5				14	22	0.019	98
	7				8.5	13.6	0.018	97
	8				6	10	0.017	96
	10				5	8	0.016	95
RGP40	9	2	100.5	52	16.5	26	0.030	97
	12				20	32	0.029	96
	15				18	29	0.023	96
	16				20	32	0.022	96
	20				20	32	0.019	96
	25				18	29	0.019	95
	32				20	32	0.017	95
	40				18	29	0.016	94
	64				7.5	12	0.016	86
RGP40	60	3	113	64.5	20	32	0.029	92
	80				20	32	0.019	90
	100				20	32	0.019	89
	120				18	29	0.029	87
	160				20	32	0.016	86
	200				18	29	0.016	82
	256				20	32	0.016	81
	320				18	29	0.016	76
	512				7.5	12	0.016	48

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Technical information

Specification	Unit	RGP40	Stage
Backlash	arcmin	<15 <19 <22	1 2 3
Torsional stiffness	Nm/arcmin	1.0 1.1 1.0	1 2 3
Weight	kg	0.35 0.45 0.55	1 2 3
Lifetime[3]	h	30,000	
Radial load for 20,000h[4]	N	200	
Axial load for 20,000h[4]	N	200	
Running noise[5]	dB(A)	58	
Maximum input speed	rpm	18,000	
Input speed at >50% torque		5,000	
Operating temperature	max ºC	90	
	min ºC	-25	
Motor mounting clamp torque M2.5	Nm	2	
Lubrication		Greased for life	
Degree of protection		IP54	

[1] Gearboxes for use with NEMA motors are supplied with a motor output shaft bush
[2] Emergency stop torque equals twice nominal torque, maximum 500 times
[3] Based on nominal torque and output shaft speed 100 rpm
[4] Based on output shaft speed 100 rpm, centrally positioned along shaft
[5] Distance 1 metre, idle running, input speed 3,000 rpm, ratio 5
[6] Degree of efficiency at nominal output torque, reference temperature 70°C at 1,000 rpm

Technical support

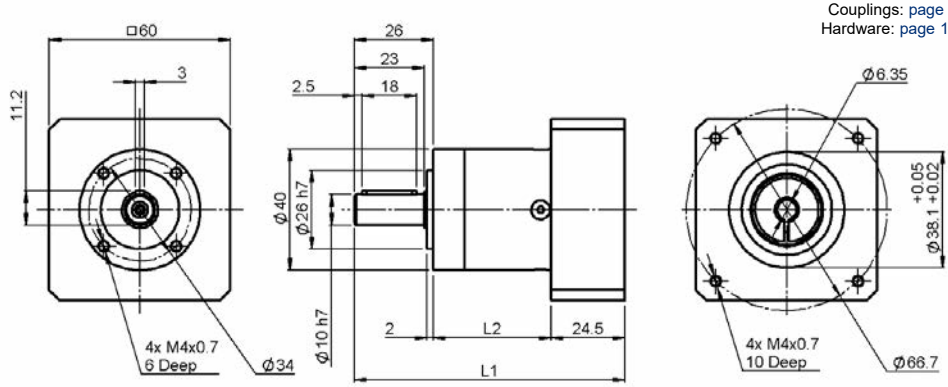
- Product overview - see page 3-3
- Technical information - see pages T3-1 to T3-3
- Section view - see page 3-4
- For detailed duty cycle and life calculation, please contact us
- Gearbox complements the Reliance Cool Muscle servo system - see page 2-2
- For system design information when using the RGP40 series with Reliance Cool Muscle, please contact us

Features and options

- Gearbox may be used in any mounting orientation
- Housing material: Steel - black
- Input and output flanges material: Aluminium - untreated
- Optional smooth output shaft if required
- Other motors may be utilised, please contact us

All dimensions in mm

Associated Products
Reliance Cool Muscle: page 2-2
Couplings: page 8-1
Hardware: page 13-1



Part number selection table

Example Part No:- RGP40 - 60 - NEMA23

Basic Part Number	Ratio	Stage	L1	L2	Output Torque		Inertia	Efficiency[6] with full load
					Nominal	Max		
			mm	mm	Nm [2]	Nm	kgcm²	%
RGP40	3	1	89.5	39	11	17.6	0.031	98
	4				15	24	0.022	98
	5				14	22	0.019	98
	7				8.5	13.6	0.018	97
	8				6	10	0.017	96
	10				5	8	0.016	95
RGP40	9	2	102.5	52	16.5	26	0.030	97
	12				20	32	0.029	96
	15				18	29	0.023	96
	16				20	32	0.022	96
	20				20	32	0.019	96
	25				18	29	0.019	95
	32				20	32	0.017	95
	40				18	29	0.016	94
	64				7.5	12	0.016	86
RGP40	60	3	115	64.5	20	32	0.029	92
	80				20	32	0.019	90
	100				20	32	0.019	89
	120				18	29	0.029	87
	160				20	32	0.016	86
	200				18	29	0.016	82
	256				20	32	0.016	81
	320				18	29	0.016	76
	512				7.5	12	0.016	48

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Technical information

Specification	Unit	RGP40	Stage
Backlash	arcmin	<15 <19 <22	1 2 3
Torsional stiffness	Nm/arcmin	1.0 1.1 1.0	1 2 3
Weight	kg	0.35 0.45 0.55	1 2 3
Lifetime[3]	h	30,000	
Radial load for 20,000h[4]	N	200	
Axial load for 20,000h[4]	N	200	
Running noise[5]	dB(A)	58	
Maximum input speed	rpm	18,000	
Input speed at >50% torque		5,000	
Operating temperature	max ºC	90	
	min ºC	-25	
Motor mounting clamp torque M2.5	Nm	2	
Lubrication		Greased for life	
Degree of protection		IP54	

[1] Gearboxes for use with NEMA motors are supplied with a motor output shaft bush
[2] Emergency stop torque equals twice nominal torque, maximum 500 times
[3] Based on nominal torque and output shaft speed 100 rpm
[4] Based on output shaft speed 100 rpm, centrally positioned along shaft
[5] Distance 1 metre, idle running, input speed 3,000 rpm, ratio 5
[6] Degree of efficiency at nominal output torque, reference temperature 70°C at 1,000 rpm

Technical support

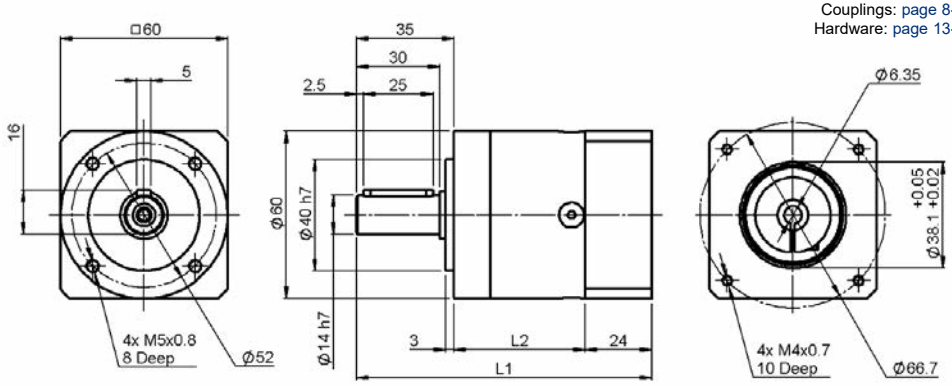
- Product overview - see page 3-3
- Technical information - see pages T3-1 to T3-3
- Section view - see page 3-4
- For detailed duty cycle and life calculation, please contact us
- Gearbox complements the Reliance Cool Muscle servo system - see page 2-2
- For system design information when using the RGP40 series with Reliance Cool Muscle, please contact us

Features and options

- Gearbox may be used in any mounting orientation
- Housing material: Steel - black
- Input and output flanges material: Aluminium - untreated
- Optional smooth output shaft if required
- Other motors may be utilised, please contact us
- Available as a right angle gearbox, please contact us

All dimensions in mm

Associated Products
Reliance Cool Muscle: page 2-2
Couplings: page 8-1
Hardware: page 13-1



Part number selection table

Example Part No:- RGP60 - 60 - NEMA23

Basic Part Number	Ratio	Stage	L1	L2	Output Torque		Inertia	Efficiency[6] with full load
					Nominal	Max		
			mm	mm	Nm [2]	Nm	kgcm²	%
RGP60	3	1	106	47	28	45	0.135	98
	4				38	61	0.093	98
	5				40	64	0.078	98
	7				25	40	0.072	97
	8				18	29	0.065	97
	10				15	24	0.064	96
RGP60	9	2	118.5	59.5	44	70	0.131	97
	12				44	70	0.127	96
	15				44	70	0.077	96
	16				44	70	0.088	96
	20				44	70	0.075	96
	25				40	64	0.075	95
	32				44	70	0.064	95
	40				40	64	0.064	94
	64				18	29	0.064	87
RGP60	60	3	131	72	44	70	0.076	92
	80				44	70	0.075	91
	100				44	70	0.075	89
	120				44	70	0.064	88
	160				44	70	0.064	86
	200				40	64	0.064	83
	256				44	70	0.064	81
	320				40	64	0.064	77
	512				18	29	0.064	51

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Technical information

Specification	Unit	RGP60	Stage
Backlash	arcmin	<12 <15 <18	1 2 3
Torsional stiffness	Nm/arcmin	2.3 2.5 2.5	1 2 3
Weight	kg	0.9 1.1 1.3	1 2 3
Lifetime[3]	h	30,000	
Radial load for 20,000h[4]	N	400	
Axial load for 20,000h[4]	N	500	
Running noise[5]	dB(A)	58	
Maximum input speed	rpm	13,000	
Input speed at >50% Torque		4,500	
Operating temperature	max ºC	90	
	min ºC	-25	
Motor mounting clamp torque M3	Nm	4.5	
Lubrication		Greased for life	
Degree of protection		IP54	

[1] Gearboxes for use with NEMA motors are supplied with a motor output shaft bush
[2] Emergency stop torque equals twice nominal torque, maximum 500 times
[3] Based on nominal torque and output shaft speed 100 rpm
[4] Based on output shaft speed 100 rpm, centrally positioned along shaft
[5] Distance 1 metre, idle running, input speed 3,000 rpm, ratio 5
[6] Degree of efficiency at nominal output torque, reference temperature 70°C at 1,000 rpm

Technical support

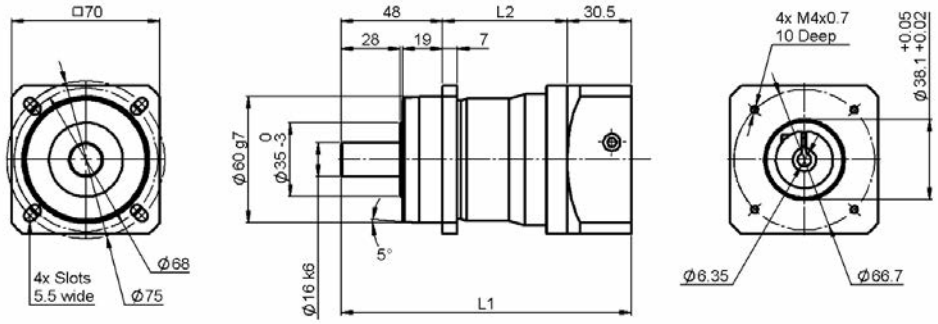
- Product overview - see page 3-3
- Technical information - see pages T3-1 to T3-3
- Section view - see page 3-4
- For detailed duty cycle and life calculation, please contact us
- Gearbox complements the Reliance Cool Muscle servo system - see page 2-2
- For system design information when using the RGP60 series with Reliance Cool Muscle, please contact us

Features and options

- Gearbox may be used in any mounting orientation
- Housing material: Steel - black
- Input and output flanges material: Aluminium - untreated
- Optional smooth output shaft if required
- Other motors may be utilised, please contact us
- Available as a right angle gearbox, please contact us

All dimensions in mm

Associated Products
Reliance Cool Muscle: page 2-2
Couplings: page 8-1
Hardware: page 13-1



See page 3-10 for motor mount details

Part number selection table

Example Part No:- **RGPN70 - 40 - NEMA23**

Basic Part Number	Ratio	Stage	L1	L2	Output Torque		Inertia	Input Speed at 50% Torque	Input Speed at 100% Torque
					Nominal	Max			
			mm	mm	Nm (2)	Nm	kgcm²	rpm	rpm
RGPN70	3	1	137.5	59	45	72	0.40	1,900	1,650
	4				60	96	0.32	2,200	1,800
	5				65	104	0.28	2,500	2,000
	7				45	72	0.26	3,200	2,800
	8				40	64	0.25	3,500	3,100
	10				27	43	0.25	4,000	3,700
RGPN70	12	2	166.5	88	68	109	0.40	3,350	2,750
	15				68	109	0.38	3,800	3,150
	16				77	123	0.35	3,600	3,000
	20				77	123	0.33	4,000	3,350
	25				65	104	0.30	4,400	3,800
	32				77	123	0.32	4,500	4,200
	40				65	104	0.29	4,500	4,500
	64				40	64	0.26	4,500	4,500
	100				27	43	0.25	4,500	4,500

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Technical information

Specification		Unit	RGP70	Stage
Backlash		arcmin	<3 <5	1 2
Torsional stiffness		Nm/arcmin	6 7	1 2
Efficiency with full load		%	98 95	1 2
Weight		kg	1.9 2.4	1 2
Lifetime[3]		h	20,000	
Radial load for 20,000h[4]		N	3,200	
Axial load for 20,000h[4]		N	4,400	
Running noise[5]		dB(A)	58	
Maximum input speed		rpm	14,000	
Operating temperature		max ºC	90	
		min ºC	-25	
Motor mounting clamp torque	M3 M4	Nm	4.5 9.5	
Lubrication			Greased for life	
Degree of protection			IP65	

[1] Gearboxes for use with NEMA motors are supplied with a motor output shaft bush
[2] Emergency stop torque equals twice nominal torque, maximum 500 times
[3] Based on nominal torque and output shaft speed 100 rpm
[4] Based on output shaft speed 100 rpm, centrally positioned along shaft
[5] Distance 1 metre, idle running, input speed 3,000 rpm, ratio 5

Technical support

- Product overview - see page 3-3
- Technical information - see pages T3-1 to T3-3
- Section view - see page 3-5
- For detailed duty cycle and life calculation, please contact us
- Gearbox complements the Reliance Cool Muscle servo system - see page 2-2
- For system design information when using the RGPN70 series with Reliance Cool Muscle, please contact us

Features and options

- Gearbox may be used in any mounting orientation
- Housing material: Steel - black
- Input and output flanges material: Aluminium - untreated
- Optional keyway output shaft if required
- Other motors may be utilised, please contact us
- Available as a right angle gearbox, please contact us

Economic, space saving solutions

The Reliance bevel and hypoid gearboxes provide an economic, space saving solution for right angle motion in a restricted space envelope. There are 3 types of gearbox available:

The BE series

The BE series is the most economical choice, offered with stainless steel bevel gears mounted in plain bearings, with either 1:1 or 2:1 ratios. It is a small, compact, anodised aluminium unit, with a removable, plastic, clip-on cover. The unit can be easily mounted into an assembly to provide a 90º drive where space prevents a direct layout.

The BS series

The BS series is a one-piece, slim-line aluminium housing with stainless steel bevel gears and shafting, offered in single or double output configurations with either 1:1 or 2:1 ratios. Using ISO 8 quality bevel gears, when assembled the backlash of the assembly is as low as <20 arcmins. It has a completely sealed casing providing a dust free and safe operation, with pre-tapped holes for alternative easy mounting. It is lubricated with high quality grease before sealing, providing lifetime lubrication and low maintenance.

The HY series

The BS and BE series bevel gearboxes are suited to low-load industrial applications. For higher ratio requirements, between 5:1 and 10:1, we offer the HY series hypoid gearbox, also with a fully sealed aluminium housing and carbon steel gears and shafting. The hypoid gear pass allows for a high torque transmission coupled with a high ratio all within a compact package. Mounted in ball bearings the unit is fully lubricated and sealed for life. The variation of mounting holes allows the gearbox to be mounted on any face for greater assembly flexibility.

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The BE series

Pictured without its removable cover, the BE series gearbox shown with Reli-a-Flex™ couplings, leadscrew and Reliance Cool Muscle motor in a typical right angled drive system.

The BS series

A single input, dual output BS series shown with Reli-a-Flex™ couplings, leadscrews and Reliance Cool Muscle motor.

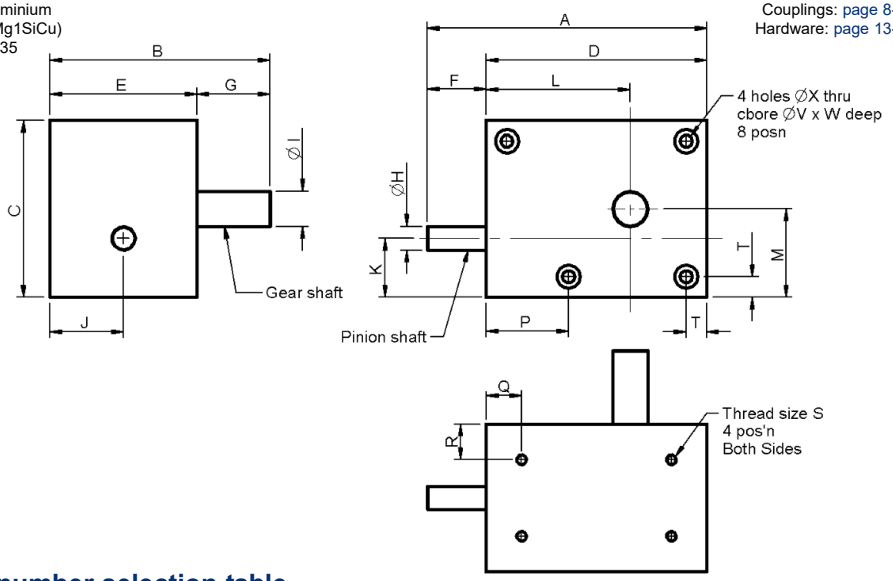
Part number structure

BE 70 L - 002 B

Gearbox Type	Overall Length	Gearbox Shape	Gear Ratio	Shaft Diameter Identification
HY - Hypoid Gearbox BS - Bevel Gearbox BSB - Bevel Gearbox BSH - Bevel Gearbox BE - Bevel Gear Set	Distance from back face to shaft end	R = Rectangular L = L shape T = T shape	001 = 1:1 002 = 2:1 005 = 5:1 010 = 10:1	A = Smaller output/input shaft option B = Larger output/input shaft option

All dimensions in mm
Materials:
Body - Anodised aluminium
(ISO AlMg0.7Si, AlMg1SiCu)
Pinion shaft - SCM435
Gear shaft - S45C

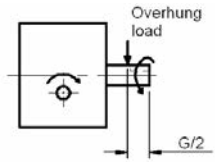
Associated Products
Motors: page 2-1
Couplings: page 8-1
Hardware: page 13-1



Part number selection table

Part Number	Gear Ratio	A	B	C	D	E	F	G	ØH (h7)	ØI (h7)	J	K	L	M	T	P	Q	R
HY70R-005	5	70	58	45	55	40	15	18	6	8	20.0	17.5	36	22.5	5	14	10	10
HY90R-010	10	90	68	60	75	50	15	18	6	8	25.0	20.0	47	30.0	7	26	12	12
HY95R-005	5	95	75	60	75	50	20	25	8	12	25.0	20.0	49	30.0	7	28	12	12
HY120R-010	10	120	80	80	100	55	20	25	8	12	27.5	25.0	62	40.0	10	27	15	12

Part Number	Hole Dims		Drilled Holes & C/Bores			Maximum Overhang Load (N)	Weight (kg)
	S	Depth	Drill Hole ØX	Counter Bore ØV	C/Bore Depth W		
HY70R-005	M3	5	3.2	6.5	3.2	19	0.3
HY90R-010	M4	6	4.2	8.0	4.3	19	0.6
HY95R-005	M4	6	4.2	8.0	4.3	39	0.7
HY120R-010	M5	8	5.2	9.5	5.3	39	1.3



Position of overhung load and directions of rotation

Allowable rated torque table

Part Number	Module	Teeth	Input Torque Ncm at:							
			100rpm	250rpm	500rpm	800rpm	1000rpm	1500rpm	2000rpm	2500rpm
HY70R-005	0.75	8/40	76.0	71.8	66.0	59.0	53.9	44.2	36.6	28.4
HY90R-010	0.71	7/70	75.8	70.8	63.8	56.0	50.7	41.3	34.3	27.3
HY95R-005	1.1	8/40	247.4	232.1	211.8	187.7	170.3	137.7	112.6	86.0
HY120R-010	1.0	7/70	186.3	172.7	155.7	136.6	123.5	100.0	82.7	65.0

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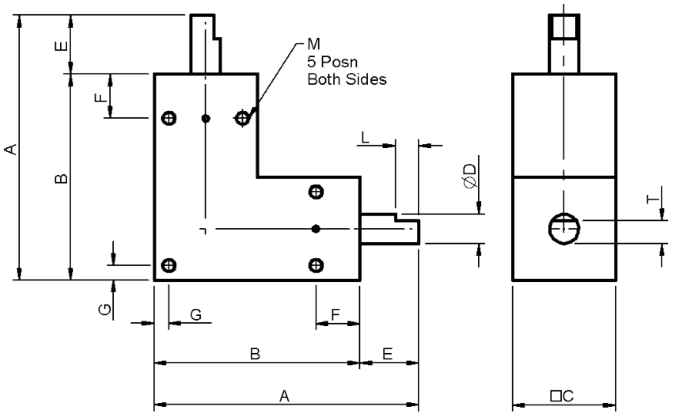
Associated Products
Motors: page 2-1
Couplings: page 8-1
Hardware: page 13-1

All dimensions in mm
Materials:
Body - Anodised aluminium
(ISO AlMg0.7Si, AlMg1SiCu)
Shaft - Stainless steel (SUS303)



Part number selection table

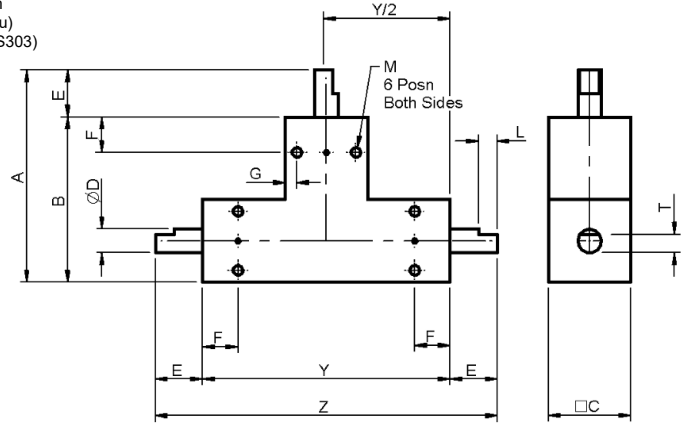
Part Number	Gear Ratio	C	A	B	ØD (h7)	E	F	G	Shaft End T	Shaft End L	Hole Dims M	Hole Dims Depth	Backlash (arcmin)	Weight (g)
BS35L-001	1	14	35	27	3	8	4	2	2.7	5	M2	4	20	27
BS45L-001		18	45	33	4	12	5	3	3.3	8	M3	4	15	55
BS65L-001		25	65	50	6	15	12	3.5	-	-	M4	6	15	175
BS80L-001		30	80	60	8	20	15	5	-	-	M5	6	15	290
BS90L-001		35	90	70	10	20	15	5	-	-	M5	7	15	496
BS105L-001		40	105	80	12	25	20	5	-	-	M6	7	15	725
BS65L-002	2	25	65	50	6	15	12	3.5	-	-	M4	6	15	175
BS80L-002		30	80	60	8	20	15	5	-	-	M5	6		290
BS90L-002		35	90	70	10	20	15	5	-	-	M5	7		496
BS105L-002		40	105	80	12	25	20	5	-	-	M6	7		725

Allowable rated torque table

Part Number	Module	Teeth	Input Torque Ncm at: 50rpm	100rpm	250rpm	500rpm	800rpm	1000rpm	1500rpm	2000rpm
BS35L-001	0.4	20	7.1	7.0	6.8	6.5	6.2	6.0	5.5	5.3
BS45L-001	0.5		18.7	18.6	18.1	17.3	16.5	16.0	15.0	14.0
BS65L-001	0.8		73.7	72.6	69.8	65.6	61.0	58.4	52.6	47.9
BS80L-001	1.0		137.9	135.6	129.1	119.5	109.7	104.0	92.0	82.6
BS90L-001	1.25		271.8	266.1	250.4	228.0	205.8	193.3	167.8	148.2
BS105L-001	1.5		442.6	431.6	401.6	360.0	320.1	298.1	254.3	221.9
BS65L-002	0.6	14/28	20.2	20.1	19.7	19.0	18.3	17.8	16.7	15.7
BS80L-002	0.8	13/26	39.8	39.5	38.4	36.8	35.1	34.0	31.5	29.5
BS90L-002	1.0	13/26	77.6	76.7	74.3	70.5	66.4	64.0	58.6	54.4
BS105L-002	1.25	13/26	141.5	139.6	134.0	125.7	116.9	111.7	100.7	91.5

All dimensions in mm
Material:
Body - Anodised aluminium
(ISO AlMg0.7Si, AlMg1SiCu)
Shaft - Stainless steel (SUS303)

Associated Products
Motors: page 2-1
Couplings: page 8-1
Hardware: page 13-1



Part number selection table

Part Number	Gear Ratio	Z	Y	C	A	B	ØD (h7)	E	F	G	Shaft End T	Shaft End L	Set Screw M	Set Screw Depth	Backlash (arcmin)	Weight (g)
BS45T-001	1	72	48	18	45	33	4	12	5	3.0	3.3	8	M3	4	15	75
BS65T-001		105	75	25	65	50	6	15	12	3.5	-	-	M4	6		246
BS80T-001		130	90	30	80	60	8	20	15	5.0	-	-	M5	6		410
BS90T-001		145	105	35	90	70	10	20	15	5.0	-	-	M5	7		679
BS65T-002	2	105	75	25	65	50	6	15	12	3.5	-	-	M4	6	15	246
BS80T-002		130	90	30	80	60	8	20	15	5.0	-	-	M5	6		410
BS90T-002		145	105	35	90	70	10	20	15	5.0	-	-	M5	7		679

Allowable rated torque table

Part Number	Module	Teeth	Input Torque Ncm at: 50rpm	100rpm	250rpm	500rpm	800rpm	1000rpm	1500rpm	2000rpm
BS45T-001	0.5	20	18.7	18.6	18.1	17.3	16.5	16.0	15.0	14.0
BS65T-001	0.8		73.7	72.6	69.8	65.6	61.0	58.4	52.6	47.9
BS80T-001	1.0		137.9	135.6	129.1	119.5	109.7	104.0	92.0	82.6
BS90T-001	1.25		271.8	266.1	250.4	228.0	205.8	193.3	167.8	148.2
BS65T-002	0.6	14/28	20.2	20.1	19.7	19.0	18.3	17.8	16.7	15.7
BS80T-002	0.8	13/26	39.8	39.5	38.4	36.8	35.1	34.0	31.5	29.5
BS90T-002	1.0	13/26	77.6	76.7	74.3	70.5	66.4	64.0	58.6	54.0

Features and options

- Product overview - see page 3-14

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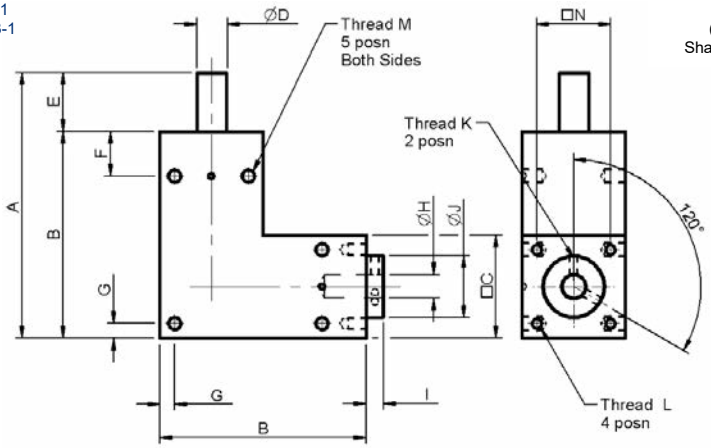
Associated Products
Motors: page 2-1
Couplings: page 8-1
Hardware: page 13-1

All dimensions in mm
Material:
Body - Anodised aluminium
(ISO AlMg0.7Si, AlMg1SiCu)
Shaft - Stainless steel (SUS303)



Part number selection table

Part Number	Gear Ratio	C	A	B	ØD h7	Bore ØH (H7)	Bore Depth	E	I	ØJ	K	F	G	M	Depth	Set Screw L	Set Screw N	Weight (g)
BSB65L-001A	1	25	65	50	6	5	15	15	5	16	M3	12	3.5	M4	6	M3	19	169
BSB65L-001B		25	65	50	6	6	15	15	5	16	M3	12	3.5	M4	6	M3	19	167
BSB80L-001A		30	80	60	8	6	19	20	5	19	M3	15	5	M5	6	M3	23	293
BSB80L-001B		30	80	60	8	8	19	20	5	19	M3	15	5	M5	6	M3	23	289
BSB90L-001A		35	90	70	10	8	19	20	6	21	M4	15	5	M5	7	M4	25	465
BSB90L-001B		35	90	70	10	10	19	20	6	21	M4	15	5	M5	7	M4	25	460
BSB105L-001A		40	105	80	12	10	23	25	6	26	M4	20	5	M6	7	M4	30	722
BSB105L-001B		40	105	80	12	12	23	25	6	26	M4	20	5	M6	7	M4	30	713

Backlash: 15 arcmin

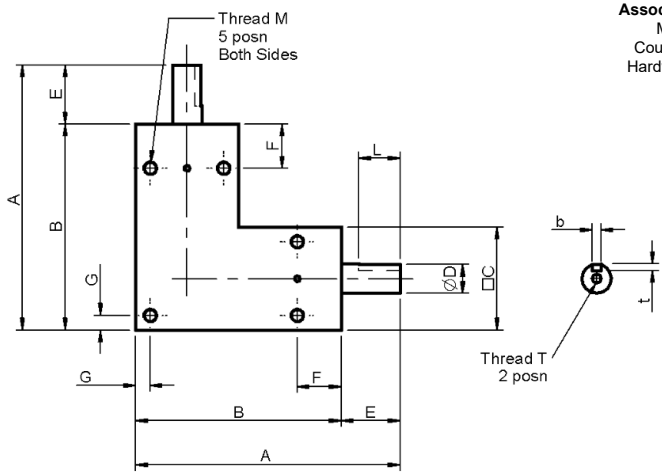
Allowable rated torque table

Part Number	Module	Teeth	Input Torque Ncm at: 50rpm	100rpm	250rpm	500rpm	800rpm	1000rpm	1500rpm	2000rpm
BSB65L-001A/B	0.8	20	73.7	72.6	69.8	65.6	61.0	58.4	52.6	47.9
BSB80L-001A/B	1.0		137.9	135.6	129.1	119.5	109.7	104.0	92.0	82.6
BSB90L-001A/B	1.25		271.8	266.1	250.4	228.0	205.8	193.3	167.8	148.2
BSB105L-001A/B	1.5		442.6	431.6	401.6	360.0	320.1	298.1	254.3	221.9

Features and options

- Product overview - see page 3-14

All dimensions in mm
Material:
Body - Aluminium (ISO AlMg0.7Si, AlMg1SiCu) and cast iron castings (JIS G5501)
Shaft - Stainless and carbon steels (SUS303, S45C)



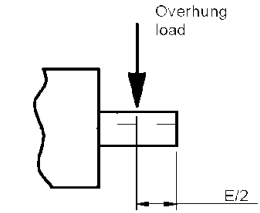
Associated Products
Motors: page 2-1
Couplings: page 8-1
Hardware: page 13-1

Part number selection table

Part Number	Gear Ratio	Body Matl*	C	A	B	ØD h7	E	F	G	Keyway b	Keyway t	Keyway L	Set Screw M	Set Screw Depth	Shaft End T	Shaft End Depth
BSH70L-001	1	AL	27	70	54	6	16	9	4	-	-	-	M4	6	-	-
BSH85L-001		AL	32	85	64	8	21	10	5	3	1.8	14	M5	7	-	-
BSH95L-001		AL	36	95	72	10	23	13	5	3	1.8	15	M5	8	-	-
BSH115L-001		FC	45	115	90	12	25	20	5	4	2.5	20	M5	12	M4	8

Part Number	Backlash (arcmin)	Maximum Overhang Load (N)	Weight (kg)
BSH70L-001	15	25	0.2
BSH85L-001	15	36	0.4
BSH95L-001	15	58	0.5
BSH115L-001	10	83	1.8

*Body material and surface treatments
(AL) Al Alloy: A6063, A6061, black anodised with stainless steel shaft
(FC) Cast iron: FC200, FC250, black oxide with carbon steel shaft



Position of overhung load

Allowable rated torque table

Part Number	Module	Teeth	Input Torque Nm at: 250rpm	500rpm	800rpm	1000rpm	1500rpm	2000rpm	2500rpm	3000rpm
BSH70L-001	0.8	19	0.89	0.89	0.89	0.89	0.86	0.81	0.77	0.73
BSH85L-001	1.0	19	1.95	1.95	1.95	1.95	1.81	1.69	1.59	1.50
BSH95L-001	1.25	18	3.68	3.68	3.68	3.58	3.30	3.04	2.85	2.77
BSH115L-001	1.5	19	5.23	5.23	5.15	5.01	4.69	4.40	4.25	4.13

Features and options

- Product overview - see page 3-14

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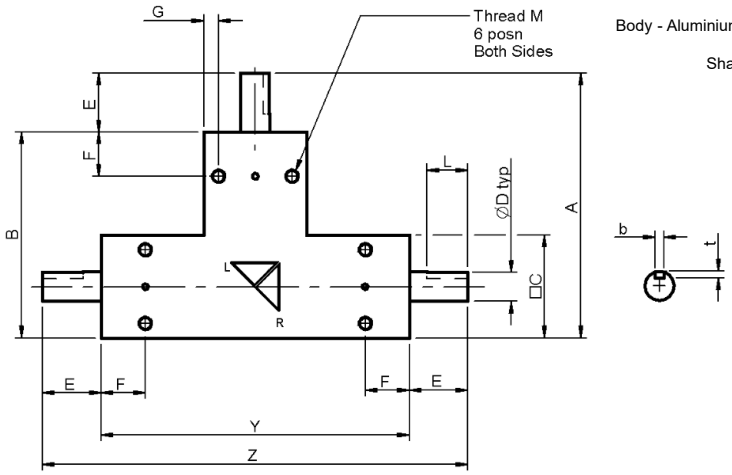
Associated Products
Motors: page 2-1
Couplings: page 8-1
Hardware: page 13-1

All dimensions in mm
Material:
Body - Aluminium (ISO AlMg0.7Si, AlMg1SiCu)
Shaft - Stainless steel (SUS303, S45C)

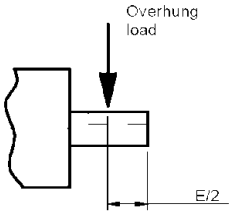


Part number selection table

Part Number	Gear Ratio	Body Matl*	Z	Y	C	A	B	ØD h7	E	F	G	Keyway b	Keyway t	Keyway L	Set Screw M	Set Screw Depth
BSH70T-001	1	AL	113	81	27	70	54	6	16	9	4	-	-	-	M4	6
BSH85T-001			138	96	32	85	64	8	21	10	5	3	1.8	14	M5	7
BSH95T-001			154	108	36	95	72	10	23	13	5	3	1.8	15	M5	8

Part Number	Backlash (arcmin)	Maximum Overhang Load (N)	Weight (kg)
BSH70T-001	15	25	0.3
BSH85T-001		36	0.5
BSH95T-001		58	0.7

*Body material and surface treatments
(AL) Al Alloy: A6063, A6061, black anodised



Position of overhung load

Allowable rated torque table

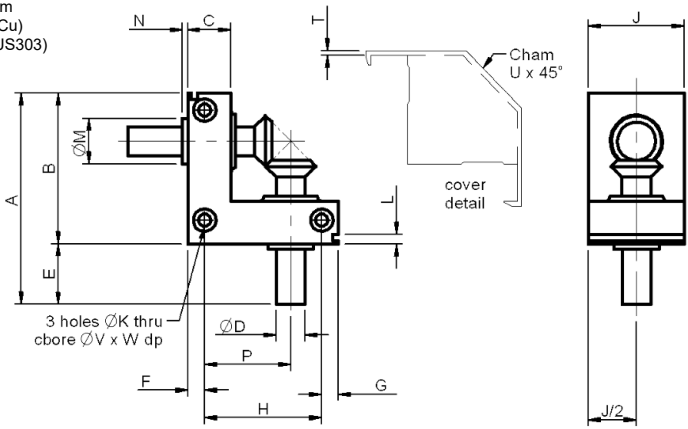
Part Number	Module	Teeth	Input Torque Nm at: 250rpm	500rpm	800rpm	1000rpm	1500rpm	2000rpm	2500rpm	3000rpm
BSH70T-001	0.8	19	0.89	0.89	0.89	0.89	0.86	0.81	0.77	0.73
BSH85T-001	1.0	19	1.95	1.95	1.95	1.95	1.81	1.69	1.59	1.50
BSH95T-001	1.25	18	3.68	3.68	3.68	3.58	3.30	3.04	2.85	2.77

Features and options

- Product overview - see page 3-14

All dimensions in mm
Material:
Body - Anodised aluminium
(ISO AlMg0.7Si, AlMg1SiCu)
Shaft - Stainless steel (SUS303)

Associated Products
Motors: page 2-1
Couplings: page 8-1
Hardware: page 13-1



Part number selection table

Part Number	Gear Ratio	A	B	C	ØD h8	E	F	G	H	P	J	Drilled Holes & C/Bores		
												Drill Hole ØK	C/Bore ØV	C/Bore Depth W
BE40L-001	1	40	30	10	4	10	5.0	4.5	20.5	15.0	18	3.4	6.5	3.5
BE55L-001		55	40	13	5	15	6.5	5.0	28.5	21.5	25	3.4	6.5	3.5
BE70L-001A		70	50	16	6	20	8.0	6.0	36	27.0	30	4.3	8.0	4.5
BE70L-001B		70	50	16	8	20	8.0	6.0	36	27.0	30	4.3	8.0	4.5
BE88L-001A		88	63	20	10	25	10.0	7.0	46	33.0	40	5.2	9.5	5.5
BE88L-001B		88	63	20	12	25	10.0	7.0	46	33.0	40	5.2	9.5	5.5

Part Number	L	ØM	N	T	U	Weight (g)
BE40L-001	2.5	7	2.1	1.7	13	30
BE55L-001	4.0	9	1.8	1.9	16	85
BE70L-001A	4.5	11	1.8	2.1	20	155
BE70L-001B	4.5	14	2.0	2.1	20	170
BE88L-001A	5.0	18	2.0	2.1	27	375
BE88L-001B	5.0	19	2.2	2.1	27	380

Allowable rated torque table

Part Number	Module	Teeth	Input Torque Ncm at:			
			50rpm	100rpm	250rpm	500rpm
BE40L-001	0.5	20	9.8	9.7	9.4	9.0
BE55L-001	0.8		38.6	38.0	36.5	34.3
BE70L-001A	1.0		72.3	71.0	67.6	62.6
BE70L-001B	1.0		72.3	71.0	67.6	62.6
BE88L-001A	1.5		232.3	226.5	210.8	188.9
BE88L-001B	1.5		232.3	226.5	210.8	188.9

Features and options

- Product overview
  - see page 3-14
- BE series gearboxes are supplied with a clip-on plastic cover

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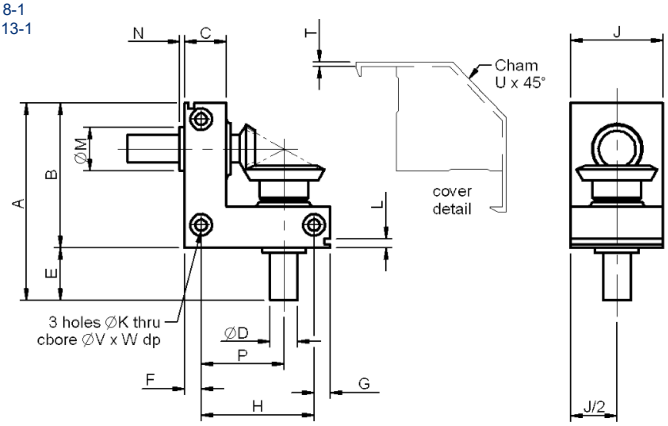
Associated Products
Motors: page 2-1
Couplings: page 8-1
Hardware: page 13-1

All dimensions in mm
Material:
Body - Anodised aluminium
(ISO AlMg0.7Si, AlMg1SiCu)
Shaft - Stainless steel (SUS303)



Part number selection table

Part Number	Gear Ratio	A	B	C	ØD h8	E	F	G	H	P	J	Drilled Holes & C/Bores		
												Drill Hole ØK	C/Bore ØV	C/Bore Depth W
BE55L-002	2	55	40	13	5	15	6.5	5	28.5	21.5	25	3.4	6.5	3.5
BE70L-002A		70	50	16	6	20	8.0	6	36	27.0	30	4.3	8.0	4.5
BE70L-002B		70	50	16	8	20	8.0	6	36	27.0	30	4.3	8.0	4.5
BE88L-002A		88	63	20	10	25	10.0	7	46	33.0	40	5.2	9.5	5.5
BE88L-002B		88	63	20	12	25	10.0	7	46	33.0	40	5.2	9.5	5.5

Part Number	L	ØM	N	T	U	Weight (g)
BE55L-002	4.0	9	1.8	1.9	16	80
BE70L-002A	4.5	11	1.8	2.1	20	140
BE70L-002B	4.5	14	2.0	2.1	20	165
BE88L-002A	5.0	18	2.0	2.1	27	345
BE88L-002B	5.0	19	2.2	2.1	27	375

Allowable rated torque table

Part Number	Module	Teeth	Input Torque Ncm at:			
			50rpm	100rpm	250rpm	500rpm
BE55L-002	0.6	14/28	10.5	10.4	10.2	9.9
BE70L-002A	0.8	13/26	20.7	20.6	20.1	19.3
BE70L-002B	0.8	13/26	20.7	20.6	20.1	19.3
BE88L-002A	1.25	13/26	74.2	73.2	70.3	65.9
BE88L-002B	1.25	13/26	74.2	73.2	70.3	65.9

Features and options

- Product overview
  - see page 3-14
- BE series gearboxes are supplied with a clip-on plastic cover

Epicyclic Modules

Reliance offers a component gear set with a modular design approach for building a custom gearbox based on standard modules. It can be used as an individual stage, providing ratios of up to 5:1, or the modules can be stacked to create a higher ratio gearbox. It is ideal for heavier duty, or long-life, torque amplification, and speed reduction applications; the units have been used successfully in sealed sub-sea applications and in motorsports mechanisms.

The gear modules can also be supplied mounted in an aluminium housing complete with output shaft and support bearings, or as a housed unit completed with input and output shaft.

Transmission efficiency

98% per single unit, 95% in double units, the power source may be smaller than with many other reduction gears.

Noise reduction

Gear noise is reduced by a special construction of disk-sided planetary gears.

Load equalised structure

The inherent problem of loadsharing with planetary gear systems is solved by the load equalised construction.

High torque transmission

The epicyclic module is a compact unit with high torque transmission because it is designed to equalise the loads of each planetary gear.

Many reduction ratios

It is possible to obtain many reduction ratios by combining standard units (3:1, 4:1, 5:1).

Sub-sea systems

Motorsports industry

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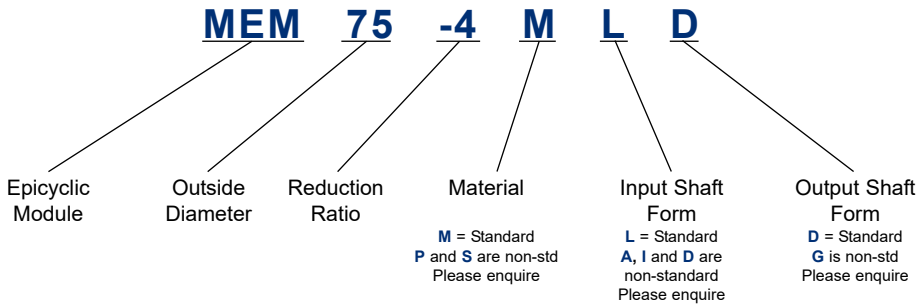
Part number structure



Material

M = Metal carrier
Metal housing
Metal internal/planet gears
Metal sun gear

P = Plastic carrier
Plastic housing
Plastic internal/planet gears
Metal sun gear

S = Metal carrier
Plastic housing
Plastic internal/planet gears
Metal sun gear

Input shaft form

L = splined shaft 11 teeth 1.0 module 45º P.A. (standard)
A = D shaped shaft 8 mm diameter x 7mm
I = splined hole 8 mm diameter with 9 splines 0.75 module 20º P.A.
D = splined hole 11 teeth 1.0 module 45º P.A. (standard)

Output shaft form

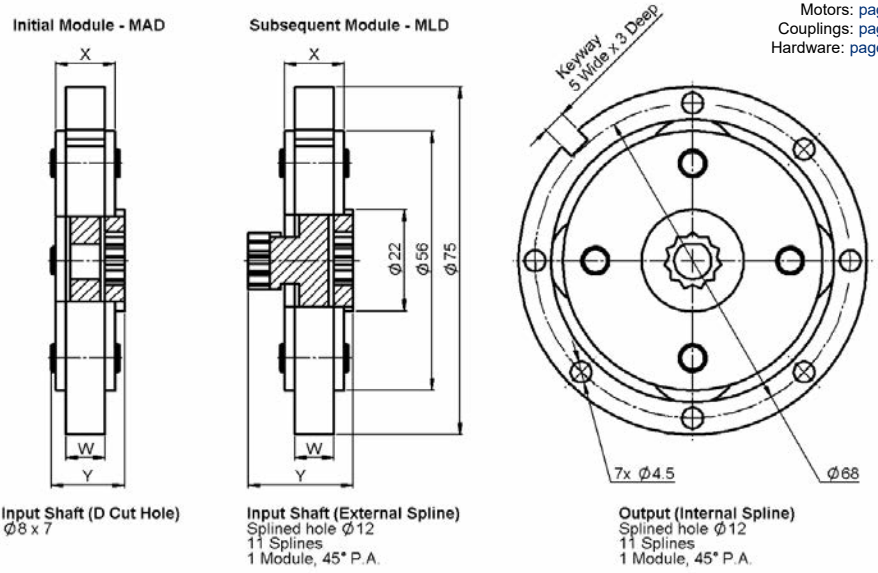
D = splined hole 12 mm diameter 11 splines 1.0 module 45º P.A. (standard)
G = splined hole 19.5 mm diameter 25 splines 0.75 module 45º P.A.

Reduction ratios

Metal units (M) Hybrid units (S) 3:1, 4:1, 5:1
Plastic units (P) 3.11:1, 3.71:1, 4.8:1
Insert 3 for 3:1, 4 for 4:1, 5 for 5:1

All dimensions in mm

Associated Products
Motors: page 2-1
Couplings: page 8-1
Hardware: page 13-1



Input Shaft (D Cut Hole)
Ø8 x 7

Input Shaft (External Spline)
Splined hole Ø12
11 Splines
1 Module, 45° P.A.

Output (Internal Spline)
Splined hole Ø12
11 Splines
1 Module, 45° P.A.

Part number selection table

Unit Part Number	Ratio	Weight (g)	W	X	Y	Inertia kg/cm²
MEM75-3MAD	3:1	231	8.4	12.6	14.8	4.22
MEM75-4MAD	4:1	228				4.25
MEM75-5MAD	5:1	248				4.38
MEM75-3MLD	3:1	240			22.6	4.24
MEM75-4MLD	4:1	248				4.27
MEM75-5MLD	5:1	257				4.39
MEM75-3MLD8	3:1	321	12.4	16.6	26.6	4.53
MEM75-4MLD8	4:1	315				4.44
MEM75-5MLD8	5:1	327				4.58
MEM75-4MDG12	4:1	500	16.4	20.8	25	4.96
MEM75-4MLG12					32.5	5.01
MEM75-5MLG12	5:1					5.16

Technical support

- Torque graphs - see page T3-4
- Complete gearhead information - see page T3-5
- Handling information - see page T3-6
- Mounting and assembly - see page T3-5
- Further technical information - see page T3-4
- Product overview - see page 3-24

Product options

- Higher output variants available
- Housed units available (LGH and MEM26) - see page T3-6
- For range of accessories - see page 3-27

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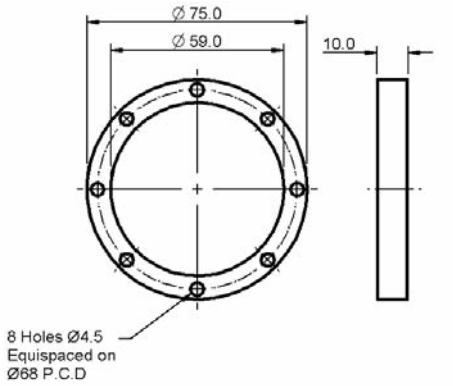
All dimensions in mm

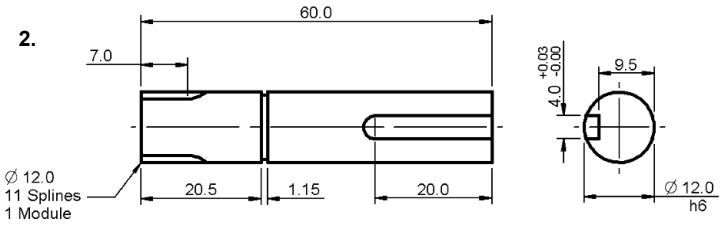
ACCESSORIES

The initial module accepts a D-shaped motor shaft. Subsequent modules use the input shaft (external spline) to plug into the output (internal spline). Finally, output internal spline adaptors are available, see below, and spacer rings should be inserted between each module as required.

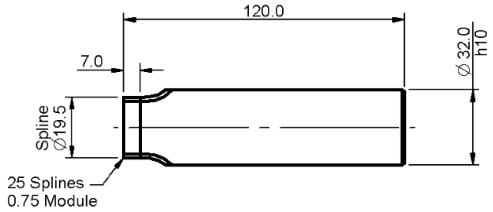
1.



2.



3.



	Function	Part Number	Material	Weight g	Description
1.	Spacer ring	**MEM75-903**	POM	12	For spacing modules at the correct distance
2.	Ø12 O/P shaft	**MEM75-907**	SCM435	50	10 Nm torque rated
3.	Ø32 O/P shaft	**MEM75-906**	S45C	720	For customer to machine to requirements

Custom gearboxes

As well as offering a range of standard gearboxes we also design and manufacture bespoke gearboxes. As with our bespoke gears (see page 4-4) these are typically used in the aerospace and defence markets, and other industries with performance-critical requirements.

With over 50 years' experience in gearbox design, manufacture, assembly and test Reliance's engineers have a wealth of knowledge to draw upon when designing a solution to a customer's specification. We have designed and built gearboxes for prime contractors and leading OEMs in the aerospace industry which are used in flight critical applications on global programmes such as Eurofighter Typhoon, Sea Harrier and Tornado.

We specialise in fine pitch gearing for long-life applications, short-life, high power applications and rotary to linear actuation drive mechanisms.

Our manufacturing capability extends to component cleaning and clean assembly, allowing us to address requirements for geared solutions for vacuum applications.

An extensive suite of test equipment enables thorough validation of the gearbox design and construction. This includes a Transmission Error Measurement System (TEMS) which enables investigation of the accuracy and backlash of the full geared system, environmental test equipment and accelerated life testing, all of which help ensure that the gearbox will perform within specification for the entire life of the product.

Land defence

Military aerospace

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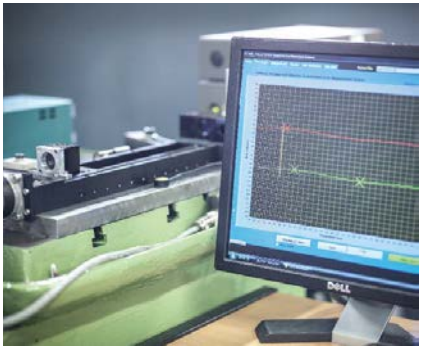
Design engineering

Environmental testing



Gearbox Transmission Error Measurement (TEMS) trace

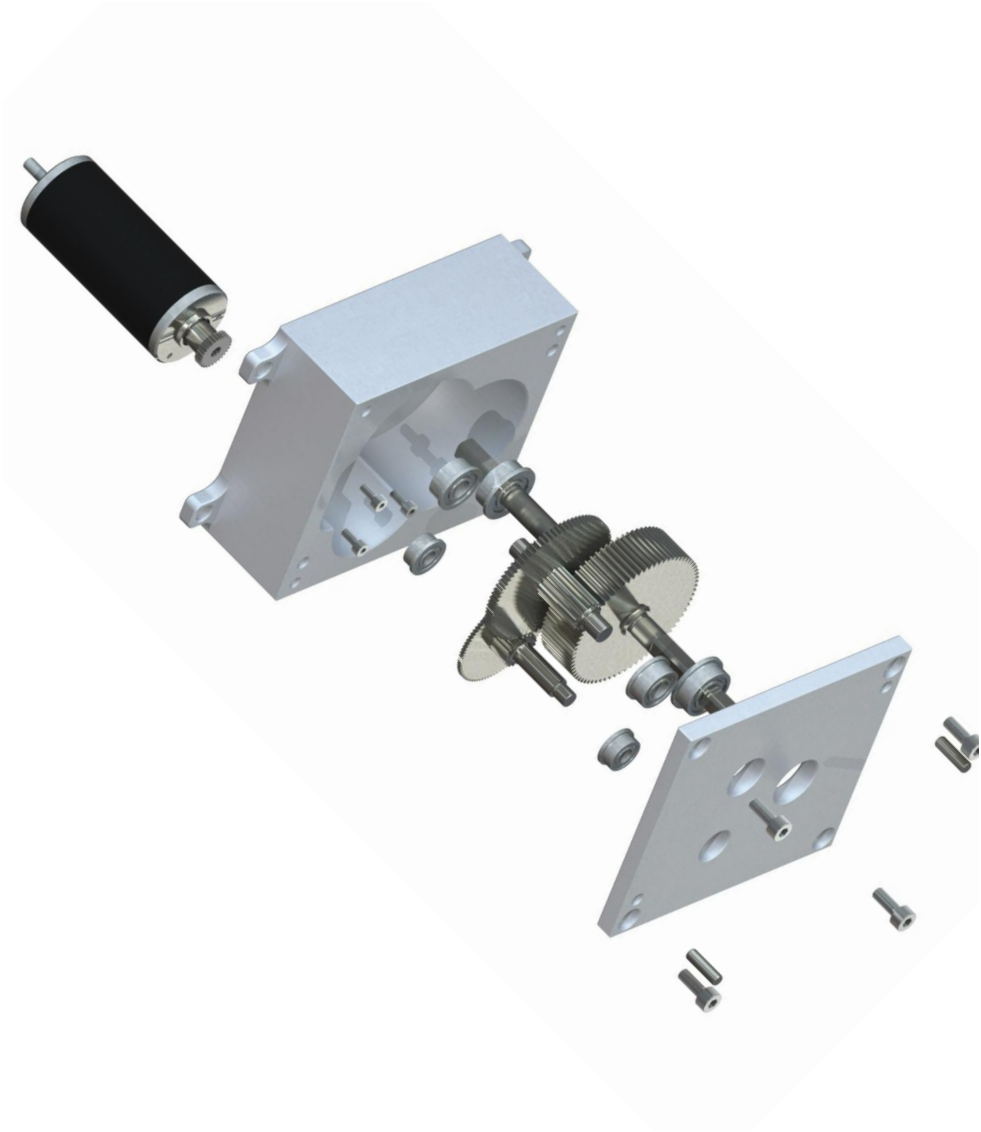
Gearbox characterisation

Production

Production testing

Example modular gearbox

Modular gearbox designed and manufactured to custom specification for system test equipment.



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Example planetary gearbox

High performance gearbox designed and manufactured to customer specification for airborne gimbal actuation.

Brass, Ground and Precision Spur Gears

4

Section Contents

Gear Range - Overview ..... Page 4-2

Precision Gears ..... Page 4-6

- Part Numbering ..... Page 4-6
- Anti-backlash Pinions, Miniature ..... Page 4-7
- Anti-backlash Pinions (pin and clamp hub) ..... Page 4-12
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- Spur Gears (pin and clamp hub) ..... Page 4-36
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Ground Gears - Overview ..... Page 4-60

- Ground Spur Pinion Gear Shafts ..... Page 4-61
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Brass Gears and Pinions- Overview ..... Page 4-70

- Brass Pinions ..... Page 4-71
- Brass Pin Hub Spur Gears ..... Page 4-72
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A complete precision gear range

With over 50 years of experience in the design and manufacture of precision spur gears, Reliance has developed an extensive range to suit a wide variety of customer applications. Alongside precision cut gears we offer hardened and precision ground gears for applications requiring higher load capacity and a very competitive range of brass gears for applications where there is a need to balance accuracy and load capacity against cost. Typical diameters range from 5 mm to 100 mm.

Precision cut gears

Our precision cut spur gear range offers anti-backlash, spur, hubless and hardened gears with many hundreds of thousands of combinations of bore size, face width, material, module and number of teeth. In line with our commitment to meeting customer requirements, any tooth number that can be configured for any given gear diameter can be supplied. This allows our customers ultimate flexibility when selecting their gear ratio and the ability to use the smallest or most practical centre distance.

Gears are available in standard modules from 0.2–1.5, bore sizes from 2–25 mm and to a minimum quality class of AQ10 (for definition of AQ10 see page T4-1). Manufactured from aerospace standard stainless steel and aluminium alloy Reliance standard precision gears can be specified for the most demanding applications. For customers that require higher transmission accuracy, to measure position more accurately or extend life in high speed applications, all Reliance's precision gears are available up to quality AQ14.

For applications that require more torque transmission, a standard range of 17-4 PH, hardened to condition H1025, is available. Further material choices are offered, commonly PEEK or acetal can be specified where low noise and/or insulating properties are required. For other application-specific requirements our engineers can help in the selection of exotic materials or add some customisation features to the component.

Reliance anti-backlash gears have been developed over a number of years and are manufactured with a two-piece construction. The fixed plate and hub are manufactured in one piece, which provides maximum integrity when attaching the gear to a shaft. This manufacturing method is far superior when compared to alternative anti-backlash designs which use a three-piece construction, with the hub and fixed plate joined together by a metal deformation technique such as swaging or riveting.

Plain precision gears

Anti-backlash gears

Hubless gears

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Modification service

Reliance has a dedicated manufacturing cell where modifications can be carried out quickly and economically to customer specification. Typically weight reduction features or alternative fixing methods are requested – please contact us to discuss your requirement.

On-line gear builder

For fast, efficient and accurate selection of our precision cut gears we provide a gear builder facility which is available to use on-line. The on-line selection process gives all the required technical and commercial information appropriate to the gear specification, including a 3D image, drawing, part description and item number, together with the price and delivery lead time.

Gear manufacture and test

On-line gear builder

Precision ground gears

The precision ground spur gear range, manufactured from chromium molybdenum steel hardened to 49-55 HRc, and with tooth profiles manufactured to ISO grade 5, is ideal for higher loaded, mechatronic applications. Available from stock or on short delivery the bore and the faces of the gears are purposely left soft to enable quick modification to suit alternative fixing or shaft diameter requirements.

Brass gears

The brass spur gear range is also available from stock or on a short delivery and provides customers with an economical alternative for less demanding applications. Manufactured from high grade brass, ISO CuZn39Pb3, the standard range of spur gears also includes pinion shafts with tooth numbers as low as 10 and a small range of internal gears (see page 5-15).

Design and manufacture of custom gears

Alongside our extensive range of standard catalogue gears Reliance also designs and manufactures bespoke gears to customers' requirements. Reliance has over 50 years of experience in gearing, ranging from high accuracy, long life applications such as radar and optical payload applications, to very short life highly loaded aerospace applications.

Gear specialists at Reliance are very happy to offer advice on the design strategy for custom gears and can help with datum positioning and dimensioning to achieve the best possible accuracy at the most economical cost. For example, simply utilising the mounting feature of the gear as the datum for the gear cutting operation avoids unnecessary tolerance build ups and interim manufacturing operations.

Reliance's engineers have a detailed knowledge of the principles of gear tooth generation and the resulting contact conditions. This enables them to work with engineers in other industries to offer advice on the modification of gear teeth to provide bespoke contact conditions that enhance the performance of the gear pair, or to achieve an imposed centre distance within the constraints of the design environment.

Typical market areas are aerospace, space, defence and down-hole instrumentation where performance-critical applications demand a deep understanding of gear geometry. Both external, internal and combination gears can be manufactured using high accuracy hobbing and shaping machines with a module range of between 0.2 to 1.5 module and a diameter range from 2 to 330 mm.

Custom gears can be manufactured from a range of materials such as, but not limited to, stainless steel, aluminium alloy, precipitation hardening steel, phosphor bronze, titanium and other speciality metals, as well as high performance polymers such as PEEK. Reliance also works very closely with accredited and formally approved surface coating and heat treatment specialists to provide most industry standard processes.

During manufacturing all gears are individually inspected for gear quality and size using a dual flank inspection process with maximum accuracies of 3 microns tooth-to-tooth and 5 microns total composite error. For demanding applications gears are inspected for lead, pitch and profile on our Klingelnberg P40 gear measuring machine.

Our expertise also extends to the associated structure in geared assemblies where we can provide design for manufacture advice or a full design from specification service. Typical projects can involve concept design, development testing, prototype manufacture, performance validation testing and production manufacture with final acceptance testing, see page 3-28.

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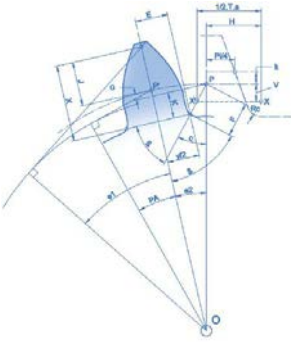
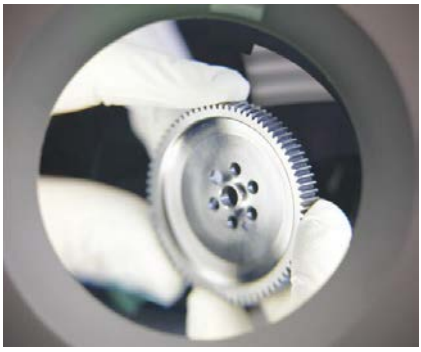


Custom gear design and development

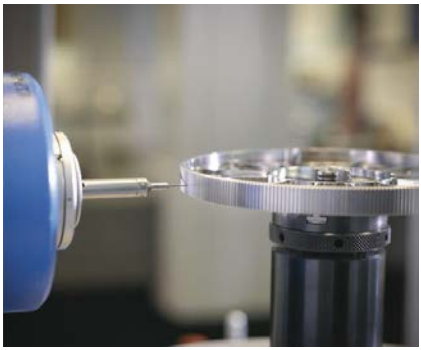
Satellite gear, manufactured for SSTL, working in orbit

Custom gear manufacture

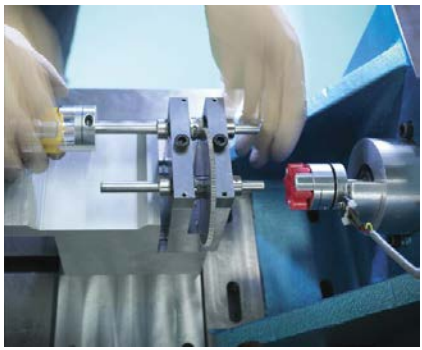


Gear deburring

Gear testing



Gear metrology



Wear and coating life test

Precision Gear Part Numbering

AP 05 S1 B4 F45 A - 55 B

Gear Type

Pin hub	**P**
Clamp hub	**C**
Hubless	**F**
Anti-backlash pin hub	**AP**
Anti-backlash clamp hub	**AC**
Anti-backlash clamp hub, miniature	**AR**

Drawing Issue / Separator / Number of Teeth

Gear Quality

AQ14	**A**
AQ12	**B**
AQ11	**C**
AQ10 (leave blank)*	

*Standard accuracy AQ10 (1.25 Mod, 20DP or finer), AQ9 (1.5 Mod, 16 DP or coarser).

Pitch

Module		DP	
1.5	**150**	16	**16#**
1.25	**125**	20	**20#**
1.0	**10**	32	**32#**
0.8	**08**	48	**48#**
0.6	**06**	64	**64#**
0.5	**05**	72	**72#**
0.4	**04**	80	**80#**
0.3	**03**	96	**96#**
0.25	**025**	100	**100#**
0.2	**02**	120	**120#**
1 mmCP	**1M**	1/10 "CP	**31#**
2 mmCP	**2M**	1/20 "CP	**62#**
2.5 mmCP	**25M**		

Face Width

2 mm	**F2**
3 mm	**F3**
3.3 mm	**F33**
3.5 mm	**F35**
4 mm	**F4**
4.5 mm	**F45**
5 mm	**F5**
6 mm	**F6**
6.5 mm	**F61**
7 mm	**F7**
8 mm	**F8**
8.9 mm	**F89**
10 mm	**F10**
12 mm	**F12**

Material Code

Aluminium alloy	**A1**
Stainless steel 303	**S1**
Stainless steel 316	**S2#**
Hardened stainless steel 17-4PH	**S8**
Brass	**B2#**
Acetal	**D1#**
PEEK polymer	**P1#**

Bore

Metric		Imperial	
2 mm	**B2**	5/64"	**B078#**
3 mm	**B3**	1/8"	**B125#**
4 mm	**B4**	0.12"	**B120#**
5 mm	**B5**	3/16"	**B187#**
6 mm	**B6**	1/4"	**B250#**
8 mm	**B8**	5/16"	**B312#**
10 mm	**B10**	3/8"	**B375#**
12 mm	**B12**	11/16"	**B687#**
15 mm	**B15**	1"	**B1000#**

# indicates non-standard items. Please enquire for details regarding large modules, imperial pitches and bores, and alternative materials.

Part numbering information on this page refers to the precision gears from pagse 4-7 to 4-59.

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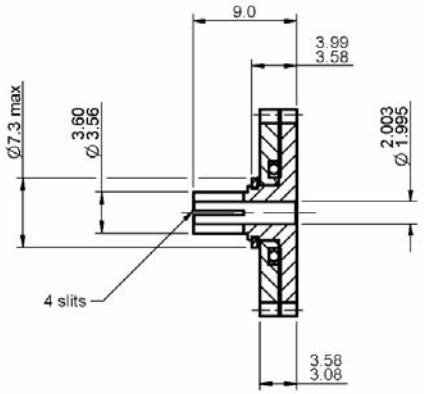
Associated Products
Clamp hub gears: page 4-36 to 4-50
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Part number selection table

Example Part No:- **AR06S1B2F33A- 25**

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
0.8	AR08S1B2F33A-	AR08A1B2F33A-	16 †	21
0.6	AR06S1B2F33A-	AR06A1B2F33A-	21	29
0.5	AR05S1B2F33A-	AR05A1B2F33A-	24	36
0.4	AR04S1B2F33A-	AR04A1B2F33A-	30	45
0.3	AR03S1B2F33A-	AR03A1B2F33A-	38	61
0.25	AR025S1B2F33A-	AR025A1B2F33A-	45	74
0.2	AR02S1B2F33A-	AR02A1B2F33A-	56	93

† Gears of 16 teeth will be modified - see page T4-8

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

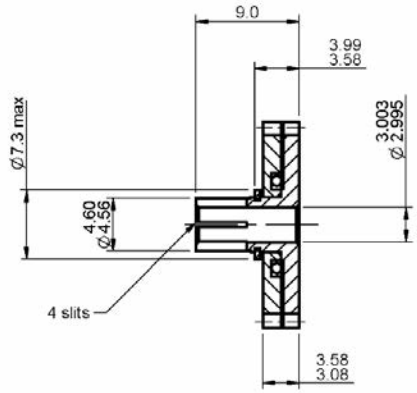
Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

Anti-Backlash Pinions Miniature

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°

Associated Products
Clamp hub gears: page 4-36 to 4-50
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4



Part number selection table

Example Part No:- AR06S1B3F33A- 25

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
0.8	AR08S1B3F33A-	AR08A1B3F33A-	16 †	21
0.6	AR06S1B3F33A-	AR06A1B3F33A-	21	29
0.5	AR05S1B3F33A-	AR05A1B3F33A-	24	36
0.4	AR04S1B3F33A-	AR04A1B3F33A-	30	45
0.3	AR03S1B3F33A-	AR03A1B3F33A-	38	61
0.25	AR025S1B3F33A-	AR025A1B3F33A-	45	74
0.2	AR02S1B3F33A-	AR02A1B3F33A-	56	93

† Gears of 16 teeth or fewer will be modified - see page T4-8

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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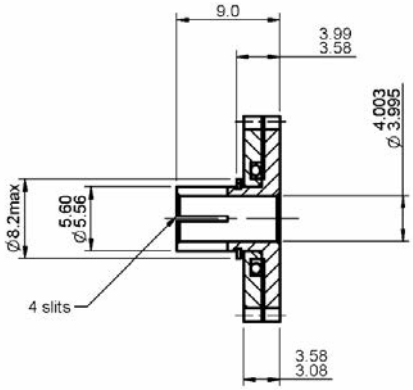
Associated Products
Clamp hub gears: page 4-36 to 4-50
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Part number selection table

Example Part No:- AR06S1B4F33A- 25

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
0.8	AR08S1B4F33A-	AR08A1B4F33A-	18	21
0.6	AR06S1B4F33A-	AR06A1B4F33A-	22	29
0.5	AR05S1B4F33A-	AR05A1B4F33A-	26	36
0.4	AR04S1B4F33A-	AR04A1B4F33A-	32	45
0.3	AR03S1B4F33A-	AR03A1B4F33A-	41	61
0.25	AR025S1B4F33A-	AR025A1B4F33A-	49	74
0.2	AR02S1B4F33A-	AR02A1B4F33A-	60	93

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

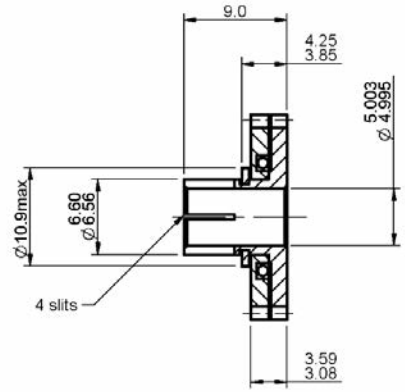
Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

Anti-Backlash Pinions Miniature

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°

Associated Products
Clamp hub gears: page 4-36 to 4-50
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4



Part number selection table

Example Part No:- AR06S1B5F33A- 25

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
0.8	AR08S1B5F33A-	AR08A1B5F33A-	19	21
0.6	AR06S1B5F33A-	AR06A1B5F33A-	24	29
0.5	AR05S1B5F33A-	AR05A1B5F33A-	28	36
0.4	AR04S1B5F33A-	AR04A1B5F33A-	34	45
0.3	AR03S1B5F33A-	AR03A1B5F33A-	44	61
0.25	AR025S1B5F33A-	AR025A1B5F33A-	52	74
0.2	AR02S1B5F33A-	AR02A1B5F33A-	65	93

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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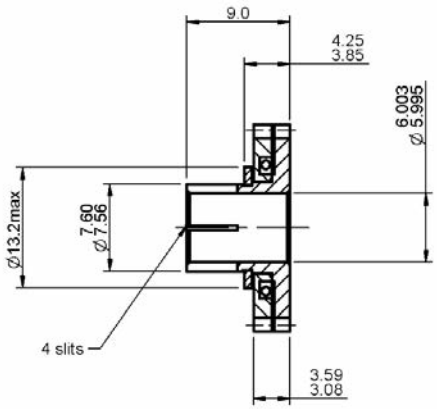
Associated Products
Clamp hub gears: page 4-36 to 4-50
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Part number selection table

Example Part No:- AR06S1B6F33A- 26

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
0.8	AR08S1B6F33A-	AR08A1B6F33A-	21	21
0.6	AR06S1B6F33A-	AR06A1B6F33A-	26	29
0.5	AR05S1B6F33A-	AR05A1B6F33A-	31	36
0.4	AR04S1B6F33A-	AR04A1B6F33A-	38	45
0.3	AR03S1B6F33A-	AR03A1B6F33A-	49	61
0.25	AR025S1B6F33A-	AR025A1B6F33A-	58	74
0.2	AR02S1B6F33A-	AR02A1B6F33A-	72	93

Features and options

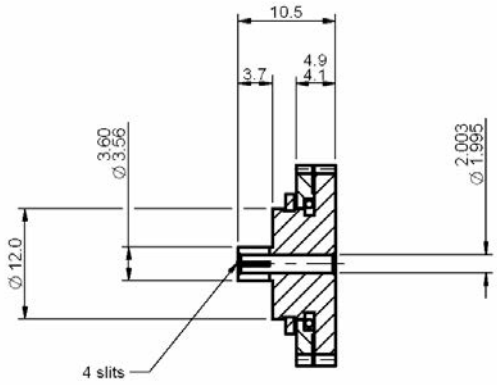
- Gear quality AQ10 as standard - see page T4-1
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

Anti-Backlash Clamp Hub Pinions

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Associated Products
Clamp hub gears: page 4-36 to 4-50
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

Part number selection table

Example Part No:- AC06S1B2F45A- 35

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AC150S1B2F45A-	AC150A1B2F45A-	14 †	22
1.25	AC125S1B2F45A-	AC125A1B2F45A-	16 †	27
1.0	AC10S1B2F45A-	AC10A1B2F45A-	19	35
0.8	AC08S1B2F45A-	AC08A1B2F45A-	23	44
0.6	AC06S1B2F45A-	AC06A1B2F45A-	29	59
0.5	AC05S1B2F45A-	AC05A1B2F45A-	34	72
0.4	AC04S1B2F45A-	AC04A1B2F45A-	42	90
0.3	AC03S1B2F45A-	AC03A1B2F45A-	55	121
0.25	AC025S1B2F45A-	AC025A1B2F45A-	65	146
0.2	AC02S1B2F45A-	AC02A1B2F45A-	80	183

† Gears of 16 teeth or fewer will be modified - see page T4-8

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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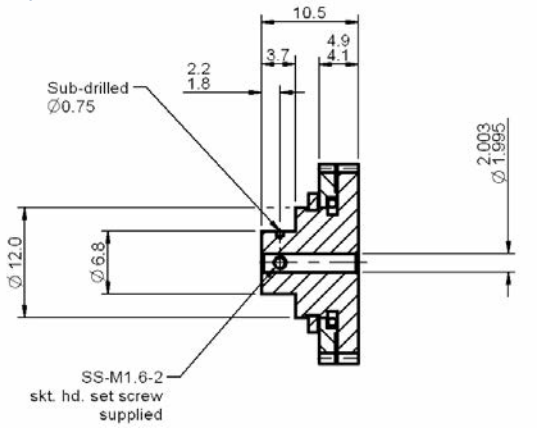
Associated Products
Pin hub gears: page 4-37 to 4-51
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Part number selection table

Example Part No:- AP06S1B2F45A- 35

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AP150S1B2F45A-	AP150A1B2F45A-	14 †	22
1.25	AP125S1B2F45A-	AP125A1B2F45A-	16 †	27
1.0	AP10S1B2F45A-	AP10A1B2F45A-	19	35
0.8	AP08S1B2F45A-	AP08A1B2F45A-	23	44
0.6	AP06S1B2F45A-	AP06A1B2F45A-	29	59
0.5	AP05S1B2F45A-	AP05A1B2F45A-	34	72
0.4	AP04S1B2F45A-	AP04A1B2F45A-	42	90
0.3	AP03S1B2F45A-	AP03A1B2F45A-	55	121
0.25	AP025S1B2F45A-	AP025A1B2F45A-	65	146
0.2	AP02S1B2F45A-	AP02A1B2F45A-	80	183

† Gears of 16 teeth or fewer will be modified - see page T4-8

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

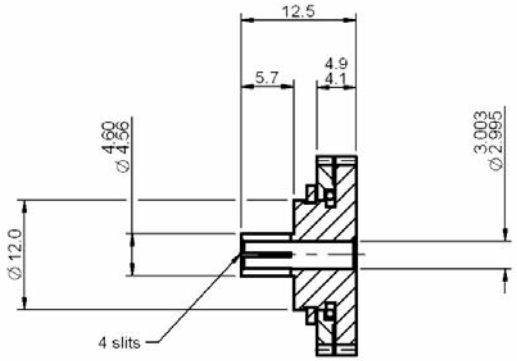
Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

Anti-Backlash Clamp Hub Pinions

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°

Associated Products
Clamp hub gears: page 4-36 to 4-50
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4



Part number selection table

Example Part No:- AC06S1B3F45A- 35

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AC150S1B3F45A-	AC150A1B3F45A-	14 †	22
1.25	AC125S1B3F45A-	AC125A1B3F45A-	16 †	27
1.0	AC10S1B3F45A-	AC10A1B3F45A-	19	35
0.8	AC08S1B3F45A-	AC08A1B3F45A-	23	44
0.6	AC06S1B3F45A-	AC06A1B3F45A-	29	59
0.5	AC05S1B3F45A-	AC05A1B3F45A-	34	72
0.4	AC04S1B3F45A-	AC04A1B3F45A-	42	90
0.3	AC03S1B3F45A-	AC03A1B3F45A-	55	121
0.25	AC025S1B3F45A-	AC025A1B3F45A-	65	146
0.2	AC02S1B3F45A-	AC02A1B3F45A-	80	183

† Gears of 16 teeth or fewer will be modified - see page T4-8

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

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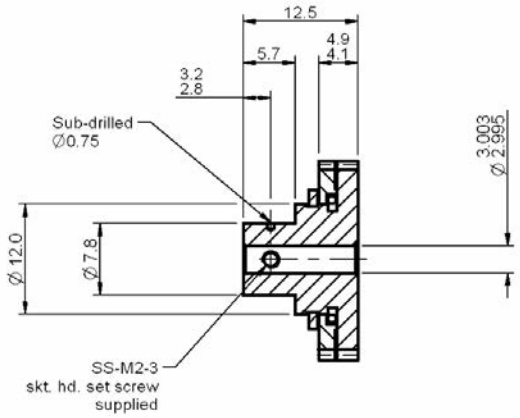
Associated Products
Pin hub gears: page 4-37 to 4-51
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Part number selection table

Example Part No:- **AP06S1B3F45A-** **35**

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AP150S1B3F45A-	AP150A1B3F45A-	14 †	22
1.25	AP125S1B3F45A-	AP125A1B3F45A-	16 †	27
1.0	AP10S1B3F45A-	AP10A1B3F45A-	19	35
0.8	AP08S1B3F45A-	AP08A1B3F45A-	23	44
0.6	AP06S1B3F45A-	AP06A1B3F45A-	29	59
0.5	AP05S1B3F45A-	AP05A1B3F45A-	34	72
0.4	AP04S1B3F45A-	AP04A1B3F45A-	42	90
0.3	AP03S1B3F45A-	AP03A1B3F45A-	55	121
0.25	AP025S1B3F45A-	AP025A1B3F45A-	65	146
0.2	AP02S1B3F45A-	AP02A1B3F45A-	80	183

† Gears of 16 teeth or fewer will be modified - see page T4-8

Features and options

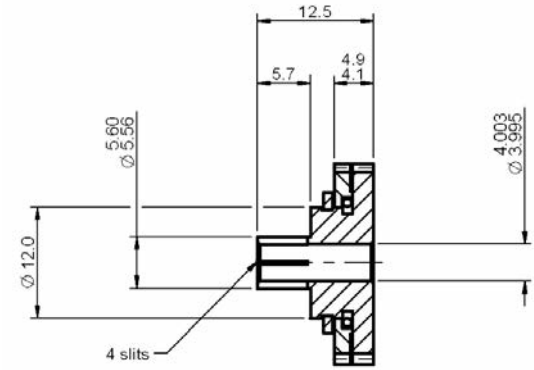
- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

Anti-Backlash Clamp Hub Pinions

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Associated Products
Clamp hub gears: page 4-36 to 4-50
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

Part number selection table

Example Part No:- AC06S1B4F45A- 35

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AC150S1B4F45A-	AC150A1B4F45A-	14 †	22
1.25	AC125S1B4F45A-	AC125A1B4F45A-	16 †	27
1.0	AC10S1B4F45A-	AC10A1B4F45A-	19	35
0.8	AC08S1B4F45A-	AC08A1B4F45A-	23	44
0.6	AC06S1B4F45A-	AC06A1B4F45A-	29	59
0.5	AC05S1B4F45A-	AC05A1B4F45A-	34	72
0.4	AC04S1B4F45A-	AC04A1B4F45A-	42	90
0.3	AC03S1B4F45A-	AC03A1B4F45A-	55	121
0.25	AC025S1B4F45A-	AC025A1B4F45A-	65	146
0.2	AC02S1B4F45A-	AC02A1B4F45A-	80	183

† Gears of 16 teeth or fewer will be modified - see page T4-8

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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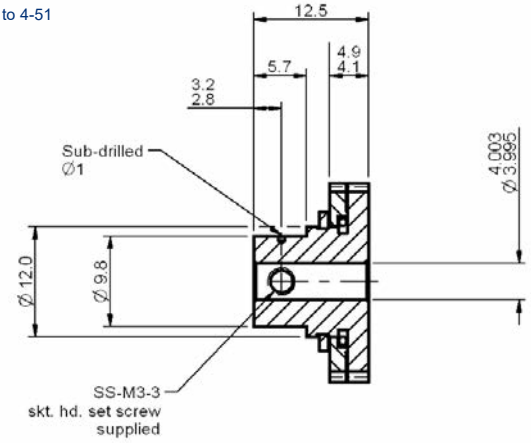
Associated Products
Pin hub gears: page 4-37 to 4-51
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Part number selection table

Example Part No:- AP06S1B4F45A- 35

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AP150S1B4F45A-	AP150A1B4F45A-	14 †	22
1.25	AP125S1B4F45A-	AP125A1B4F45A-	16 †	27
1.0	AP10S1B4F45A-	AP10A1B4F45A-	19	35
0.8	AP08S1B4F45A-	AP08A1B4F45A-	23	44
0.6	AP06S1B4F45A-	AP06A1B4F45A-	29	59
0.5	AP05S1B4F45A-	AP05A1B4F45A-	34	72
0.4	AP04S1B4F45A-	AP04A1B4F45A-	42	90
0.3	AP03S1B4F45A-	AP03A1B4F45A-	55	121
0.25	AP025S1B4F45A-	AP025A1B4F45A-	65	146
0.2	AP02S1B4F45A-	AP02A1B4F45A-	80	183

† Gears of 16 teeth or fewer will be modified - see page T4-8

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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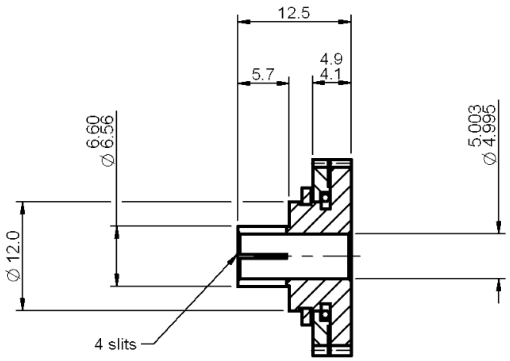
Anti-Backlash Clamp Hub Pinions

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Associated Products
Clamp hub gears: page 4-36 to 4-50
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

Part number selection table

Example Part No:- **AC06S1B5F45A- 35**

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AC150S1B5F45A-	AC150A1B5F45A-	14 †	22
1.25	AC125S1B5F45A-	AC125A1B5F45A-	16 †	27
1.0	AC10S1B5F45A-	AC10A1B5F45A-	19	35
0.8	AC08S1B5F45A-	AC08A1B5F45A-	23	44
0.6	AC06S1B5F45A-	AC06A1B5F45A-	29	59
0.5	AC05S1B5F45A-	AC05A1B5F45A-	34	72
0.4	AC04S1B5F45A-	AC04A1B5F45A-	42	90
0.3	AC03S1B5F45A-	AC03A1B5F45A-	55	121
0.25	AC025S1B5F45A-	AC025A1B5F45A-	65	146
0.2	AC02S1B5F45A-	AC02A1B5F45A-	80	183

† Gears of 16 teeth or fewer will be modified - see page T4-8

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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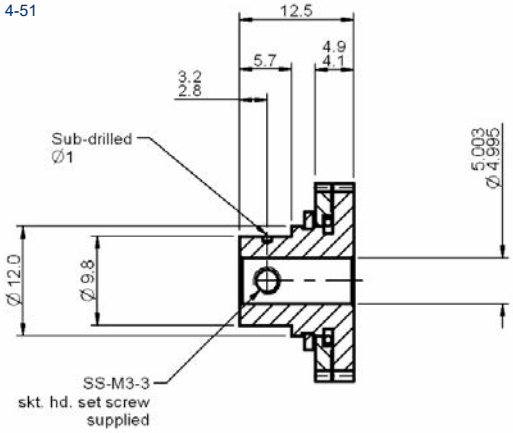
Associated Products
Pin hub gears: page 4-37 to 4-51
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Part number selection table

Example Part No:- **AP06S1B5F45A-** **35**

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AP150S1B5F45A-	AP150A1B5F45A-	14 †	22
1.25	AP125S1B5F45A-	AP125A1B5F45A-	16 †	27
1.0	AP10S1B5F45A-	AP10A1B5F45A-	19	35
0.8	AP08S1B5F45A-	AP08A1B5F45A-	23	44
0.6	AP06S1B5F45A-	AP06A1B5F45A-	29	59
0.5	AP05S1B5F45A-	AP05A1B5F45A-	34	72
0.4	AP04S1B5F45A-	AP04A1B5F45A-	42	90
0.3	AP03S1B5F45A-	AP03A1B5F45A-	55	121
0.25	AP025S1B5F45A-	AP025A1B5F45A-	65	146
0.2	AP02S1B5F45A-	AP02A1B5F45A-	80	183

† Gears of 16 teeth or fewer will be modified - see page T4-8

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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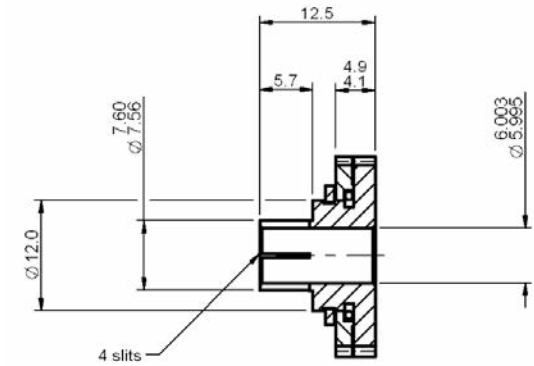
Anti-Backlash Clamp Hub Pinions

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Associated Products
Clamp hub gears: page 4-36 to 4-50
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

Part number selection table

Example Part No:- AC06S1B6F45A- 35

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AC150S1B6F45A-	AC150A1B6F45A-	14 †	22
1.25	AC125S1B6F45A-	AC125A1B6F45A-	16 †	27
1.0	AC10S1B6F45A-	AC10A1B6F45A-	19	35
0.8	AC08S1B6F45A-	AC08A1B6F45A-	23	44
0.6	AC06S1B6F45A-	AC06A1B6F45A-	29	59
0.5	AC05S1B6F45A-	AC05A1B6F45A-	34	72
0.4	AC04S1B6F45A-	AC04A1B6F45A-	42	90
0.3	AC03S1B6F45A-	AC03A1B6F45A-	55	121
0.25	AC025S1B6F45A-	AC025A1B6F45A-	65	146
0.2	AC02S1B6F45A-	AC02A1B6F45A-	80	183

† Gears of 16 teeth or fewer will be modified - see page T4-8

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
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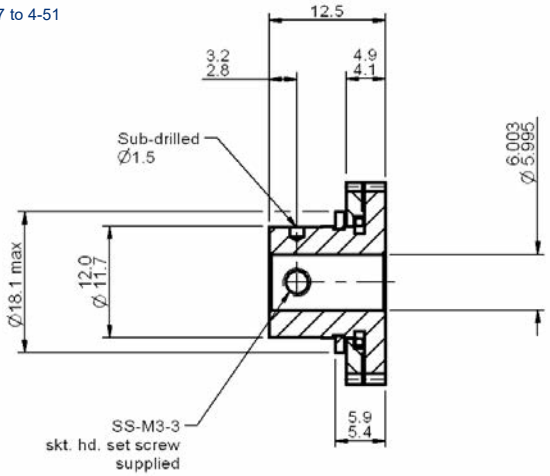
Associated Products
Pin hub gears: page 4-37 to 4-51
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Part number selection table

Example Part No:- AP06S1B6F45A- 35

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AP150S1B6F45A-	AP150A1B6F45A-	14 †	22
1.25	AP125S1B6F45A-	AP125A1B6F45A-	16 †	27
1.0	AP10S1B6F45A-	AP10A1B6F45A-	19	35
0.8	AP08S1B6F45A-	AP08A1B6F45A-	23	44
0.6	AP06S1B6F45A-	AP06A1B6F45A-	29	59
0.5	AP05S1B6F45A-	AP05A1B6F45A-	34	72
0.4	AP04S1B6F45A-	AP04A1B6F45A-	42	90
0.3	AP03S1B6F45A-	AP03A1B6F45A-	55	121
0.25	AP025S1B6F45A-	AP025A1B6F45A-	65	146
0.2	AP02S1B6F45A-	AP02A1B6F45A-	80	183

† Gears of 16 teeth or fewer will be modified - see page T4-8

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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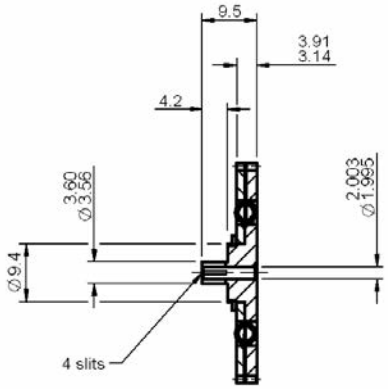
Anti-Backlash Clamp Hub Gears

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Associated Products
Clamp hub gears: page 4-36 to 4-50
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

Part number selection table

Example Part No:- AC06S1B2F35A- 65

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AC150S1B2F35A-	AC150A1B2F35A-	24	46
1.25	AC125S1B2F35A-	AC125A1B2F35A-	28	56
1.0	AC10S1B2F35A-	AC10A1B2F35A-	34	70
0.8	AC08S1B2F35A-	AC08A1B2F35A-	42	88
0.6	AC06S1B2F35A-	AC06A1B2F35A-	55	119
0.5	AC05S1B2F35A-	AC05A1B2F35A-	66	143
0.4	AC04S1B2F35A-	AC04A1B2F35A-	81	179
0.3	AC03S1B2F35A-	AC03A1B2F35A-	107	240
0.25	AC025S1B2F35A-	AC025A1B2F35A-	128	289
0.2	AC02S1B2F35A-	AC02A1B2F35A-	159	361

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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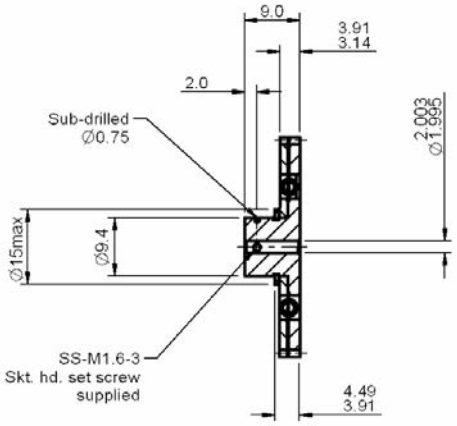
Associated Products
Pin hub gears: page 4-37 to 4-51
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Part number selection table

Example Part No:- AP06S1B2F35A- 65

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AP150S1B2F35A-	AP150A1B2F35A-	24	46
1.25	AP125S1B2F35A-	AP125A1B2F35A-	28	56
1.0	AP10S1B2F35A-	AP10A1B2F35A-	34	70
0.8	AP08S1B2F35A-	AP08A1B2F35A-	42	88
0.6	AP06S1B2F35A-	AP06A1B2F35A-	55	119
0.5	AP05S1B2F35A-	AP05A1B2F35A-	66	143
0.4	AP04S1B2F35A-	AP04A1B2F35A-	81	179
0.3	AP03S1B2F35A-	AP03A1B2F35A-	107	240
0.25	AP025S1B2F35A-	AP025A1B2F35A-	128	289
0.2	AP02S1B2F35A-	AP02A1B2F35A-	159	361

Features and options

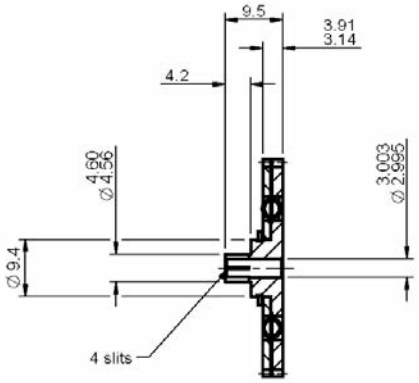
- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

Anti-Backlash Clamp Hub Gears

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Associated Products
Clamp hub gears: page 4-36 to 4-50
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

Part number selection table

Example Part No:- **AC06S1B3F35A- 65**

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AC150S1B3F35A-	AC150A1B3F35A-	24	46
1.25	AC125S1B3F35A-	AC125A1B3F35A-	28	56
1.0	AC10S1B3F35A-	AC10A1B3F35A-	34	70
0.8	AC08S1B3F35A-	AC08A1B3F35A-	42	88
0.6	AC06S1B3F35A-	AC06A1B3F35A-	55	119
0.5	AC05S1B3F35A-	AC05A1B3F35A-	66	143
0.4	AC04S1B3F35A-	AC04A1B3F35A-	81	179
0.3	AC03S1B3F35A-	AC03A1B3F35A-	107	240
0.25	AC025S1B3F35A-	AC025A1B3F35A-	128	289
0.2	AC02S1B3F35A-	AC02A1B3F35A-	159	361

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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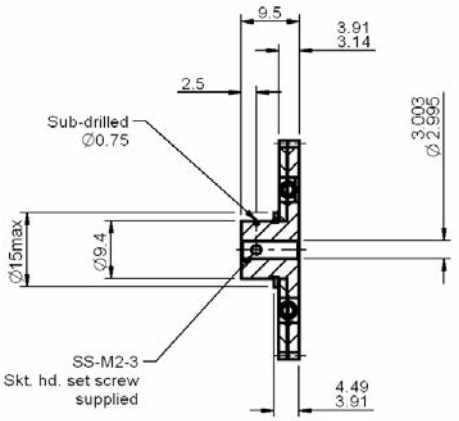
Associated Products
Pin hub gears: page 4-37 to 4-51
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Part number selection table

Example Part No:- AP06S1B3F35A- 65

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AP150S1B3F35A-	AP150A1B3F35A-	24	46
1.25	AP125S1B3F35A-	AP125A1B3F35A-	28	56
1.0	AP10S1B3F35A-	AP10A1B3F35A-	34	70
0.8	AP08S1B3F35A-	AP08A1B3F35A-	42	88
0.6	AP06S1B3F35A-	AP06A1B3F35A-	55	119
0.5	AP05S1B3F35A-	AP05A1B3F35A-	66	143
0.4	AP04S1B3F35A-	AP04A1B3F35A-	81	179
0.3	AP03S1B3F35A-	AP03A1B3F35A-	107	240
0.25	AP025S1B3F35A-	AP025A1B3F35A-	128	289
0.2	AP02S1B3F35A-	AP02A1B3F35A-	159	361

Features and options

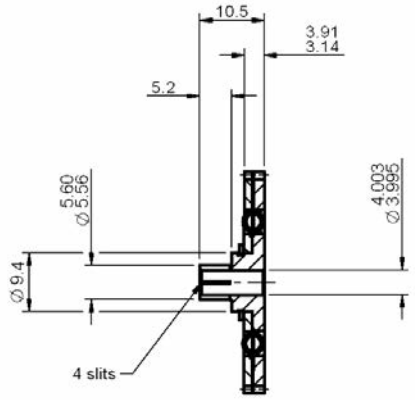
- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

Anti-Backlash Clamp Hub Gears

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Associated Products
Clamp hub gears: page 4-36 to 4-50
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

Part number selection table

Example Part No:- **AC06S1B4F35A- 65**

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AC150S1B4F35A-	AC150A1B4F35A-	24	46
1.25	AC125S1B4F35A-	AC125A1B4F35A-	28	56
1.0	AC10S1B4F35A-	AC10A1B4F35A-	34	70
0.8	AC08S1B4F35A-	AC08A1B4F35A-	42	88
0.6	AC06S1B4F35A-	AC06A1B4F35A-	55	119
0.5	AC05S1B4F35A-	AC05A1B4F35A-	66	143
0.4	AC04S1B4F35A-	AC04A1B4F35A-	81	179
0.3	AC03S1B4F35A-	AC03A1B4F35A-	107	240
0.25	AC025S1B4F35A-	AC025A1B4F35A-	128	289
0.2	AC02S1B4F35A-	AC02A1B4F35A-	159	361

Features and options

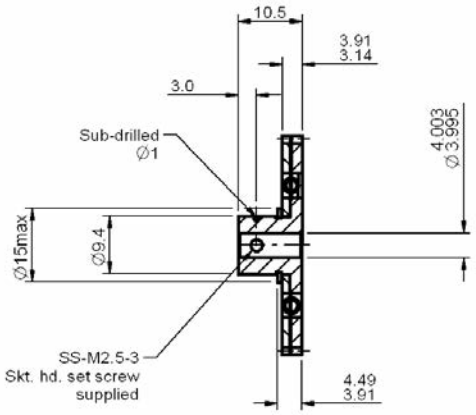
- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

Associated Products
Pin hub gears: page 4-37 to 4-51
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Part number selection table

Example Part No:- AP06S1B4F35A- 65

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AP150S1B4F35A-	AP150A1B4F35A-	24	46
1.25	AP125S1B4F35A-	AP125A1B4F35A-	28	56
1.0	AP10S1B4F35A-	AP10A1B4F35A-	34	70
0.8	AP08S1B4F35A-	AP08A1B4F35A-	42	88
0.6	AP06S1B4F35A-	AP06A1B4F35A-	55	119
0.5	AP05S1B4F35A-	AP05A1B4F35A-	66	143
0.4	AP04S1B4F35A-	AP04A1B4F35A-	81	179
0.3	AP03S1B4F35A-	AP03A1B4F35A-	107	240
0.25	AP025S1B4F35A-	AP025A1B4F35A-	128	289
0.2	AP02S1B4F35A-	AP02A1B4F35A-	159	361

Features and options

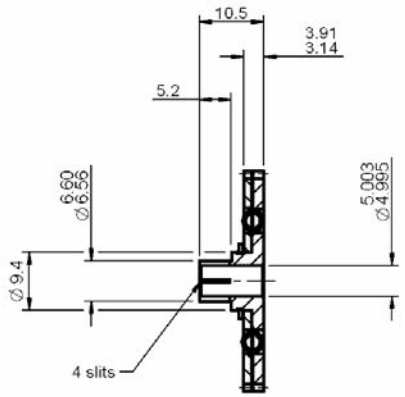
- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

Anti-Backlash Clamp Hub Gears

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Associated Products
Clamp hub gears: page 4-36 to 4-50
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

Part number selection table

Example Part No:- AC06S1B5F35A- 65

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AC150S1B5F35A-	AC150A1B5F35A-	24	46
1.25	AC125S1B5F35A-	AC125A1B5F35A-	28	56
1.0	AC10S1B5F35A-	AC10A1B5F35A-	34	70
0.8	AC08S1B5F35A-	AC08A1B5F35A-	42	88
0.6	AC06S1B5F35A-	AC06A1B5F35A-	55	119
0.5	AC05S1B5F35A-	AC05A1B5F35A-	66	143
0.4	AC04S1B5F35A-	AC04A1B5F35A-	81	179
0.3	AC03S1B5F35A-	AC03A1B5F35A-	107	240
0.25	AC025S1B5F35A-	AC025A1B5F35A-	128	289
0.2	AC02S1B5F35A-	AC02A1B5F35A-	159	361

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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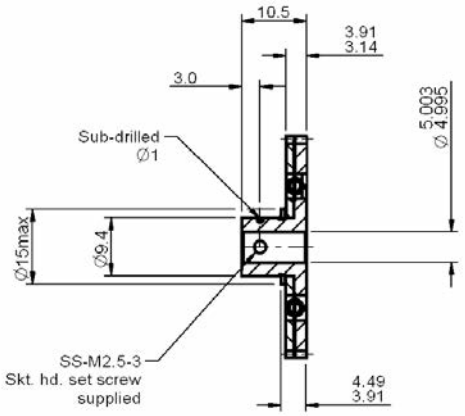
Associated Products
Pin hub gears: page 4-37 to 4-51
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Part number selection table

Example Part No:- AP06S1B5F35A- 65

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AP150S1B5F35A-	AP150A1B5F35A-	24	46
1.25	AP125S1B5F35A-	AP125A1B5F35A-	28	56
1.0	AP10S1B5F35A-	AP10A1B5F35A-	34	70
0.8	AP08S1B5F35A-	AP08A1B5F35A-	42	88
0.6	AP06S1B5F35A-	AP06A1B5F35A-	55	119
0.5	AP05S1B5F35A-	AP05A1B5F35A-	66	143
0.4	AP04S1B5F35A-	AP04A1B5F35A-	81	179
0.3	AP03S1B5F35A-	AP03A1B5F35A-	107	240
0.25	AP025S1B5F35A-	AP025A1B5F35A-	128	289
0.2	AP02S1B5F35A-	AP02A1B5F35A-	159	361

Features and options

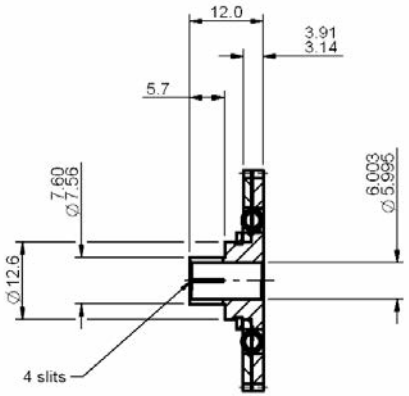
- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

Anti-Backlash Clamp Hub Gears

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Associated Products
Clamp hub gears: page 4-36 to 4-50
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

Part number selection table

Example Part No:- AC06S1B6F35A- 65

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AC150S1B6F35A-	AC150A1B6F35A-	24	46
1.25	AC125S1B6F35A-	AC125A1B6F35A-	28	56
1.0	AC10S1B6F35A-	AC10A1B6F35A-	34	70
0.8	AC08S1B6F35A-	AC08A1B6F35A-	42	88
0.6	AC06S1B6F35A-	AC06A1B6F35A-	55	119
0.5	AC05S1B6F35A-	AC05A1B6F35A-	66	143
0.4	AC04S1B6F35A-	AC04A1B6F35A-	81	179
0.3	AC03S1B6F35A-	AC03A1B6F35A-	107	240
0.25	AC025S1B6F35A-	AC025A1B6F35A-	128	289
0.2	AC02S1B6F35A-	AC02A1B6F35A-	159	361

Features and options

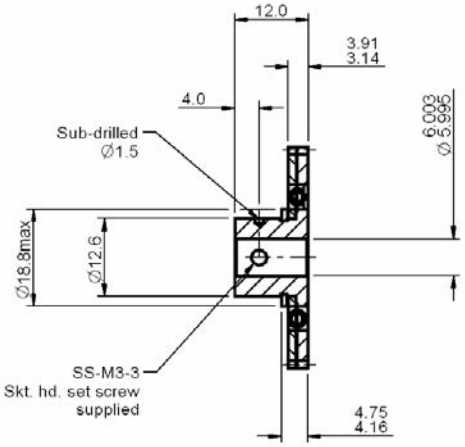
- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

Associated Products
Pin hub gears: page 4-37 to 4-51
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Part number selection table

Example Part No:- AP06S1B6F35A- 65

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AP150S1B6F35A-	AP150A1B6F35A-	24	46
1.25	AP125S1B6F35A-	AP125A1B6F35A-	28	56
1.0	AP10S1B6F35A-	AP10A1B6F35A-	34	70
0.8	AP08S1B6F35A-	AP08A1B6F35A-	42	88
0.6	AP06S1B6F35A-	AP06A1B6F35A-	55	119
0.5	AP05S1B6F35A-	AP05A1B6F35A-	66	143
0.4	AP04S1B6F35A-	AP04A1B6F35A-	81	179
0.3	AP03S1B6F35A-	AP03A1B6F35A-	107	240
0.25	AP025S1B6F35A-	AP025A1B6F35A-	128	289
0.2	AP02S1B6F35A-	AP02A1B6F35A-	159	361

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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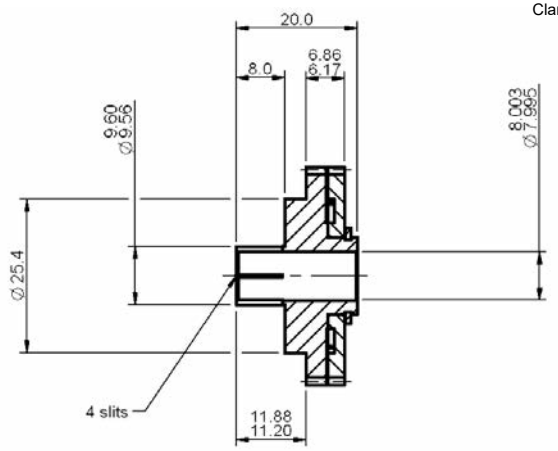
Anti-Backlash Clamp Hub Gears

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Associated Products
Clamp hub gears: page 4-36 to 4-50
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

Part number selection table

Example Part No:- AC06S1B8F61A- 90

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AC150S1B8F61A-	AC150A1B8F61A-	21	75
1.25	AC125S1B8F61A-	AC125A1B8F61A-	25	91
1.0	AC10S1B8F61A-	AC10A1B8F61A-	30	114
0.8	AC08S1B8F61A-	AC08A1B8F61A-	37	143
0.6	AC06S1B8F61A-	AC06A1B8F61A-	48	192
0.5	AC05S1B8F61A-	AC05A1B8F61A-	56	230
0.4	AC04S1B8F61A-	AC04A1B8F61A-	70	289
0.3	AC03S1B8F61A-	AC03A1B8F61A-	92	386
0.25	AC025S1B8F61A-	AC025A1B8F61A-	110	463
0.2	AC02S1B8F61A-	AC02A1B8F61A-	136	580

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
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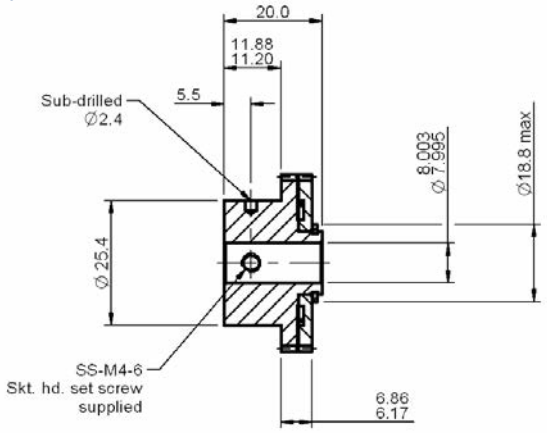
Associated Products
Pin hub gears: page 4-37 to 4-51
Shafts: page 11-1
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Part number selection table

Example Part No:- AP06S1B8F61A- 90

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AP150S1B8F61A-	AP150A1B8F61A-	21	75
1.25	AP125S1B8F61A-	AP125A1B8F61A-	25	91
1.0	AP10S1B8F61A-	AP10A1B8F61A-	30	114
0.8	AP08S1B8F61A-	AP08A1B8F61A-	37	143
0.6	AP06S1B8F61A-	AP06A1B8F61A-	48	192
0.5	AP05S1B8F61A-	AP05A1B8F61A-	56	230
0.4	AP04S1B8F61A-	AP04A1B8F61A-	70	289
0.3	AP03S1B8F61A-	AP03A1B8F61A-	92	386
0.25	AP025S1B8F61A-	AP025A1B8F61A-	110	463
0.2	AP02S1B8F61A-	AP02A1B8F61A-	136	580

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

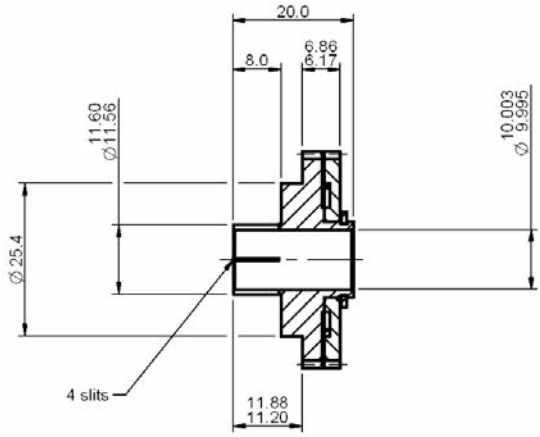
Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

Anti-Backlash Clamp Hub Gears

All dimensions in mm
General tolerances ±0.13mm
Pressure angle 20°

Associated Products
Clamp hub gears: page 4-36 to 4-50
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4



Part number selection table

Example Part No:- AC06S1B10F61A- 90

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AC150S1B10F61A-	AC150A1B10F61A-	21	75
1.25	AC125S1B10F61A-	AC125A1B10F61A-	25	91
1.0	AC10S1B10F61A-	AC10A1B10F61A-	30	114
0.8	AC08S1B10F61A-	AC08A1B10F61A-	37	143
0.6	AC06S1B10F61A-	AC06A1B10F61A-	48	192
0.5	AC05S1B10F61A-	AC05A1B10F61A-	56	230
0.4	AC04S1B10F61A-	AC04A1B10F61A-	70	289
0.3	AC03S1B10F61A-	AC03A1B10F61A-	92	386
0.25	AC025S1B10F61A-	AC025A1B10F61A-	110	463
0.2	AC02S1B10F61A-	AC02A1B10F61A-	136	580

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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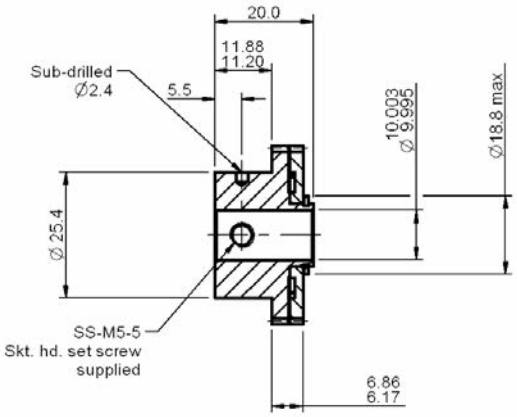
Associated Products
Pin hub gears: page 4-37 to 4-51
Shafts: page 11-1
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13mm
Pressure angle 20°



Part number selection table

Example Part No:- **AP06S1B10F61A- 90**

Standard Modules	Basic Part Number Standard Materials		Number of Teeth	
	Stainless Steel	Aluminium Alloy	Min	Max
1.5	AP150S1B10F61A-	AP150A1B10F61A-	21	75
1.25	AP125S1B10F61A-	AP125A1B10F61A-	25	91
1.0	AP10S1B10F61A-	AP10A1B10F61A-	30	114
0.8	AP08S1B10F61A-	AP08A1B10F61A-	37	143
0.6	AP06S1B10F61A-	AP06A1B10F61A-	48	192
0.5	AP05S1B10F61A-	AP05A1B10F61A-	56	230
0.4	AP04S1B10F61A-	AP04A1B10F61A-	70	289
0.3	AP03S1B10F61A-	AP03A1B10F61A-	92	386
0.25	AP025S1B10F61A-	AP025A1B10F61A-	110	463
0.2	AP02S1B10F61A-	AP02A1B10F61A-	136	580

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

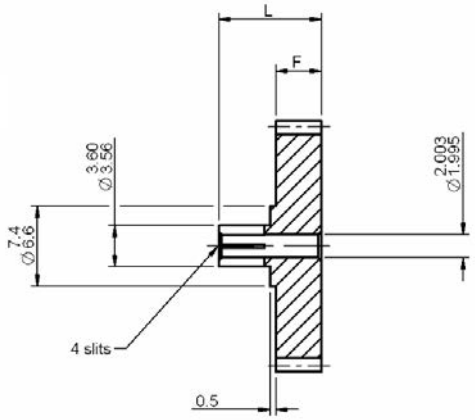
Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°

Associated Products
Anti-backlash gears: page 4-7 to 4-34
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

When F=2, L=7
F=4, L=9



Part number selection table

Example Part No:- **C06S1B2** **F2A-** **25**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth		
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max F2A	Max F4A
1.5	**C150S1B2**	**C150A1B2**	**F2A-** (2 mm) or **F4A-** (4 mm)	**12 †**	**21**	**72**
1.25	**C125S1B2**	**C125A1B2**		**12 †**	**25**	**86**
1.0	**C10S1B2**	**C10A1B2**		**12 †**	**32**	**109**
0.8	**C08S1B2**	**C08A1B2**		**13 †**	**41**	**136**
0.6	**C06S1B2**	**C06A1B2**		**14 †**	**56**	**183**
0.5	**C05S1B2**	**C05A1B2**		**14 †**	**67**	**220**
0.4	**C04S1B2**	**C04A1B2**		**15 †**	**85**	**275**
0.3	**C03S1B2**	**C03A1B2**		**17**	**114**	**368**
0.25	**C025S1B2**	**C025A1B2**		**18**	**137**	**442**
0.2	**C02S1B2**	**C02A1B2**		**20**	**172**	**553**

† Gears of 16 teeth or fewer will be modified - see page T4-8
# Alternative materials - replace **S1** in the part number with **B2** for brass

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

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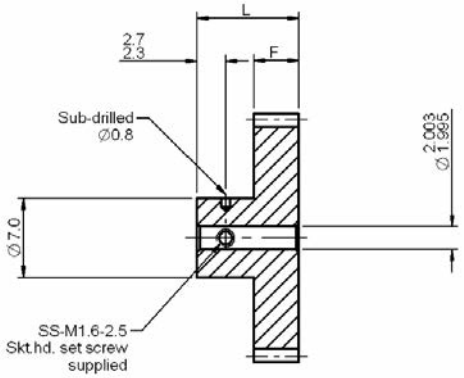
Associated Products
Anti-backlash gears: page 4-13 to 4-35
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



When F=2, L=7
F=4, L=9

Part number selection table

Example Part No:- **P06S1B2** **F2A-** **25**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth		
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max F2A	Max F4A
1.5	**P150S1B2**	**P150A1B2**	**F2A-** (2 mm) or **F4A-** (4 mm)	**12 †**	**21**	**72**
1.25	**P125S1B2**	**P125A1B2**		**12 †**	**25**	**86**
1.0	**P10S1B2**	**P10A1B2**		**12 †**	**32**	**109**
0.8	**P08S1B2**	**P08A1B2**		**13 †**	**41**	**136**
0.6	**P06S1B2**	**P06A1B2**		**15 †**	**56**	**183**
0.5	**P05S1B2**	**P05A1B2**		**18**	**67**	**220**
0.4	**P04S1B2**	**P04A1B2**		**21**	**85**	**275**
0.3	**P03S1B2**	**P03A1B2**		**27**	**114**	**368**
0.25	**P025S1B2**	**P025A1B2**		**31**	**137**	**442**
0.2	**P02S1B2**	**P02A1B2**		**38**	**172**	**553**

† Gears of 16 teeth or fewer will be modified - see page T4-8
# Alternative materials - replace **S1** in the part number with **B2** for brass, or **S8** for hardened stainless steel

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

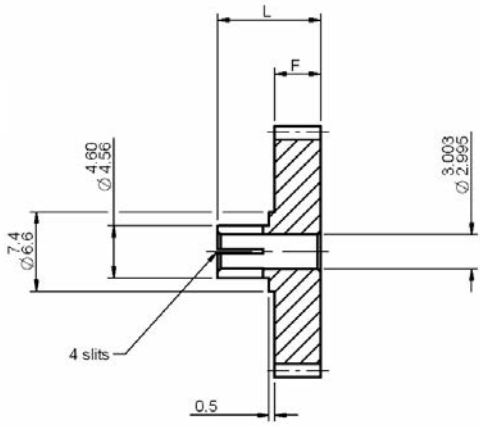
Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°

Associated Products
Anti-backlash gears: page 4-7 to 4-34
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

When F=2, L=7
F=4, L=9



Part number selection table

Example Part No:- **C06S1B3** **F2A-** **25**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth		
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max F2A	Max F4A
1.5	**C150S1B3**	**C150A1B3**	**F2A-** (2 mm) or **F4A-** (4 mm)	**12 †**	**21**	**72**
1.25	**C125S1B3**	**C125A1B3**		**13 †**	**25**	**86**
1.0	**C10S1B3**	**C10A1B3**		**13 †**	**32**	**109**
0.8	**C08S1B3**	**C08A1B3**		**14 †**	**41**	**136**
0.6	**C06S1B3**	**C06A1B3**		**15 †**	**56**	**183**
0.5	**C05S1B3**	**C05A1B3**		**16 †**	**67**	**220**
0.4	**C04S1B3**	**C04A1B3**		**18**	**85**	**275**
0.3	**C03S1B3**	**C03A1B3**		**20**	**114**	**368**
0.25	**C025S1B3**	**C025A1B3**		**22**	**137**	**442**
0.2	**C02S1B3**	**C02A1B3**		**25**	**172**	**553**

† Gears of 16 teeth or fewer will be modified - see page T4-8
# Alternative materials - replace **S1** in the part number with **B2** for brass

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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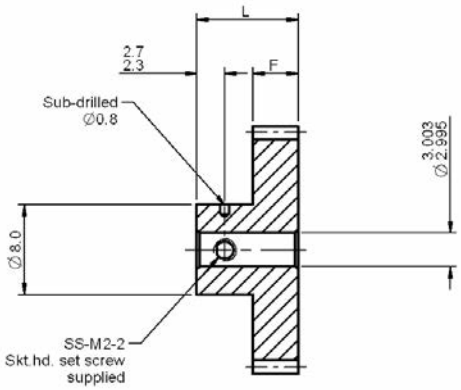
Associated Products
Anti-backlash gears: page 4-13 to 4-35
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



When F=2, L=7
F=4, L=9

Part number selection table

Example Part No:- **P06S1B3** **F2A-** **25**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth		
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max F2A	Max F4A
1.5	**P150S1B3**	**P150A1B3**	**F2A-** (2 mm) or **F4A-** (4 mm)	**12 †**	**21**	**72**
1.25	**P125S1B3**	**P125A1B3**		**13 †**	**25**	**86**
1.0	**P10S1B3**	**P10A1B3**		**13 †**	**32**	**109**
0.8	**P08S1B3**	**P08A1B3**		**14 †**	**41**	**136**
0.6	**P06S1B3**	**P06A1B3**		**17**	**56**	**183**
0.5	**P05S1B3**	**P05A1B3**		**20**	**67**	**220**
0.4	**P04S1B3**	**P04A1B3**		**23**	**85**	**275**
0.3	**P03S1B3**	**P03A1B3**		**30**	**114**	**368**
0.25	**P025S1B3**	**P025A1B3**		**35**	**137**	**442**
0.2	**P02S1B3**	**P02A1B3**		**43**	**172**	**553**

† Gears of 16 teeth or fewer will be modified - see page T4-8
# Alternative materials - replace **S1** in the part number with **B2** for brass, or **S8** for hardened stainless steel

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

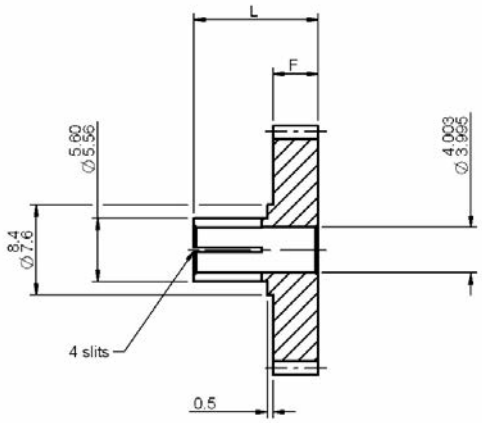
Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°

Associated Products
Anti-backlash gears: page 4-7 to 4-34
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

When F=2, L=9
F=4, L=11



Part number selection table

Example Part No:- **C06S1B4** **F2A-** **25**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth		
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max F2A	Max F4A
1.5	**C150S1B4**	**C150A1B4**	**F2A-** (2 mm) or **F4A-** (4 mm)	**13 †**	**21**	**72**
1.25	**C125S1B4**	**C125A1B4**		**14 †**	**25**	**86**
1.0	**C10S1B4**	**C10A1B4**		**14 †**	**32**	**109**
0.8	**C08S1B4**	**C08A1B4**		**15 †**	**41**	**136**
0.6	**C06S1B4**	**C06A1B4**		**17**	**56**	**183**
0.5	**C05S1B4**	**C05A1B4**		**18**	**67**	**220**
0.4	**C04S1B4**	**C04A1B4**		**20**	**85**	**275**
0.3	**C03S1B4**	**C03A1B4**		**24**	**114**	**368**
0.25	**C025S1B4**	**C025A1B4**		**26**	**137**	**442**
0.2	**C02S1B4**	**C02A1B4**		**30**	**172**	**553**

† Gears of 16 teeth or fewer will be modified - see page T4-8
# Alternative materials - replace **S1** in the part number with **B2** for brass

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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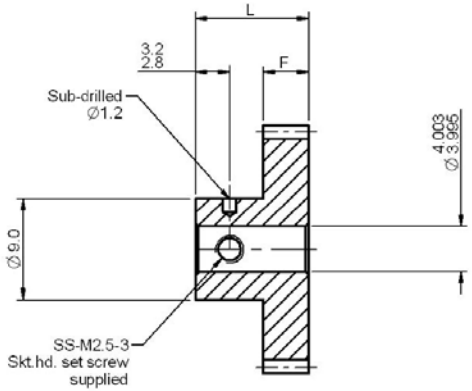
Associated Products
Anti-backlash gears: page 4-13 to 4-35
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



When F=2, L=8
F=4, L=10

Part number selection table

Example Part No:- P06S1B4 F2A- 25

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth		
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max F2A	Max F4A
1.5	P150S1B4	P150A1B4	F2A- (2 mm) or F4A- (4 mm)	13 †	21	72
1.25	P125S1B4	P125A1B4		14 †	25	86
1.0	P10S1B4	P10A1B4		14 †	32	109
0.8	P08S1B4	P08A1B4		15 †	41	136
0.6	P06S1B4	P06A1B4		19	56	183
0.5	P05S1B4	P05A1B4		22	67	220
0.4	P04S1B4	P04A1B4		26	85	275
0.3	P03S1B4	P03A1B4		34	114	368
0.25	P025S1B4	P025A1B4		39	137	442
0.2	P02S1B4	P02A1B4		48	172	553

† Gears of 16 teeth or fewer will be modified - see page T4-8
# Alternative materials - replace **S1** in the part number with **B2** for brass, or **S8** for hardened stainless steel

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

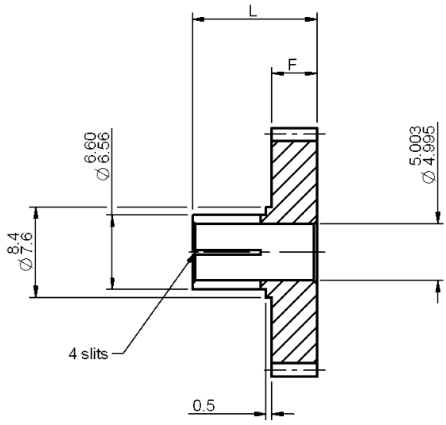
Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°

Associated Products
Anti-backlash gears: page 4-7 to 4-34
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

when F=2, L=9
F=4, L=11



Part number selection table

Example Part No:- **C06S1B5** **F2A-** **25**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth		
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max F2A	Max F4A
1.5	**C150S1B5**	**C150A1B5**	**F2A-** (2 mm) or **F4A-** (4 mm)	**14 †**	**21**	**72**
1.25	**C125S1B5**	**C125A1B5**		**14 †**	**25**	**86**
1.0	**C10S1B5**	**C10A1B5**		**15 †**	**32**	**109**
0.8	**C08S1B5**	**C08A1B5**		**17**	**41**	**136**
0.6	**C06S1B5**	**C06A1B5**		**19**	**56**	**183**
0.5	**C05S1B5**	**C05A1B5**		**20**	**67**	**220**
0.4	**C04S1B5**	**C04A1B5**		**23**	**85**	**275**
0.3	**C03S1B5**	**C03A1B5**		**27**	**114**	**368**
0.25	**C025S1B5**	**C025A1B5**		**30**	**137**	**442**
0.2	**C02S1B5**	**C02A1B5**		**35**	**172**	**553**

† Gears of 16 teeth or fewer will be modified - see page T4-8
# Alternative materials - replace **S1** in the part number with **B2** for brass

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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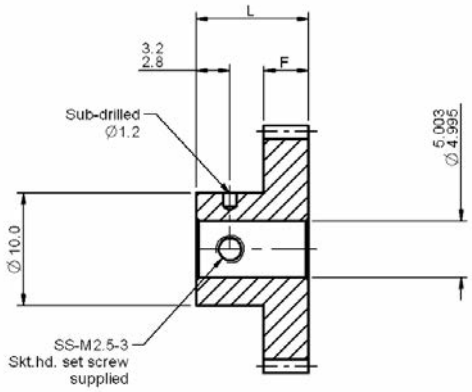
Associated Products
Anti-backlash gears: page 4-13 to 4-35
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



when F=2, L=8
F=4, L=10

Part number selection table

Example Part No:- **P06S1B5** **F2A-** **25**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth		
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max F2A	Max F4A
1.5	**P150S1B5**	**P150A1B5**	**F2A-** (2 mm) or **F4A-** (4 mm)	**14 †**	**21**	**72**
1.25	**P125S1B5**	**P125A1B5**		**14 †**	**25**	**86**
1.0	**P10S1B5**	**P10A1B5**		**15 †**	**32**	**109**
0.8	**P08S1B5**	**P08A1B5**		**17**	**41**	**136**
0.6	**P06S1B5**	**P06A1B5**		**21**	**56**	**183**
0.5	**P05S1B5**	**P05A1B5**		**24**	**67**	**220**
0.4	**P04S1B5**	**P04A1B5**		**29**	**85**	**275**
0.3	**P03S1B5**	**P03A1B5**		**37**	**114**	**368**
0.25	**P025S1B5**	**P025A1B5**		**43**	**137**	**442**
0.2	**P02S1B5**	**P02A1B5**		**53**	**172**	**553**

† Gears of 16 teeth or fewer will be modified - see page T4-8
# Alternative materials - replace **S1** in the part number with **B2** for brass, or **S8** for hardened stainless steel

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

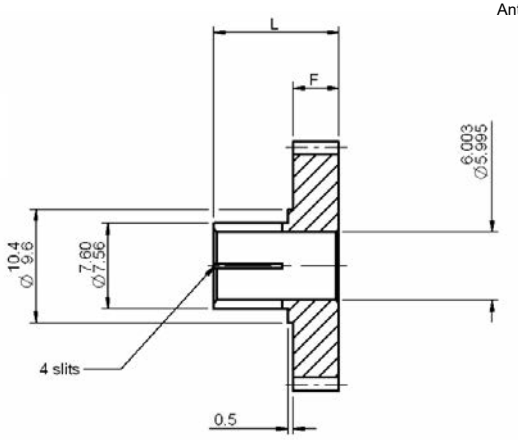
Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°

Associated Products
Anti-backlash gears: page 4-7 to 4-34
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

When F=3, L=10
F=4, L=11
F=6, L=13



Part number selection table

Example Part No:- **C06S1B6** **F3A-** **75**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth	
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max
1.5	**C150S1B6**	**C150A1B6**	**F3A-** (3 mm)	**14 †**	**72**
1.25	**C125S1B6**	**C125A1B6**		**15 †**	**86**
1.0	**C10S1B6**	**C10A1B6**	or	**16 †**	**109**
0.8	**C08S1B6**	**C08A1B6**		**18**	**136**
0.6	**C06S1B6**	**C06A1B6**	**F4A-** (4 mm)	**20**	**183**
0.5	**C05S1B6**	**C05A1B6**		**22**	**220**
0.4	**C04S1B6**	**C04A1B6**	or	**25**	**275**
0.3	**C03S1B6**	**C03A1B6**		**30**	**368**
0.25	**C025S1B6**	**C025A1B6**	**F6A-** (6 mm)	**34**	**442**
0.2	**C02S1B6**	**C02A1B6**		**40**	**553**

† Gears of 16 teeth or fewer will be modified - see page T4-8
# Alternative materials - replace **S1** in the part number with **B2** for brass

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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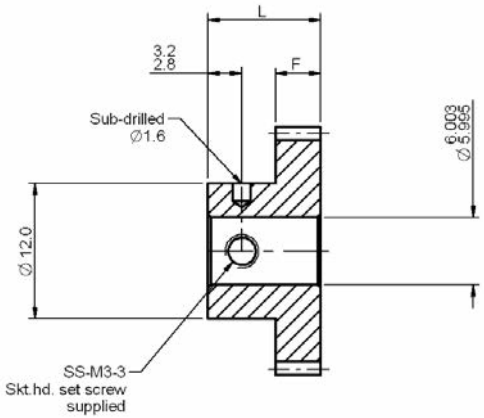
Associated Products
Anti-backlash gears: page 4-13 to 4-35
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



When F=3, L=9
F=4, L=10
F=6, L=12

Part number selection table

Example Part No:- **P06S1B6** **F3A-** **75**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth	
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max
1.5	**P150S1B6**	**P150A1B6**	**F3A-** (3 mm)	**14 †**	**72**
1.25	**P125S1B6**	**P125A1B6**		**15 †**	**86**
1.0	**P10S1B6**	**P10A1B6**	or	**16 †**	**109**
0.8	**P08S1B6**	**P08A1B6**		**19**	**136**
0.6	**P06S1B6**	**P06A1B6**	**F4A-** (4 mm)	**23**	**183**
0.5	**P05S1B6**	**P05A1B6**		**27**	**220**
0.4	**P04S1B6**	**P04A1B6**	or	**33**	**275**
0.3	**P03S1B6**	**P03A1B6**		**43**	**368**
0.25	**P025S1B6**	**P025A1B6**	**F6A-** (6 mm)	**50**	**442**
0.2	**P02S1B6**	**P02A1B6**		**62**	**553**

† Gears of 16 teeth or fewer will be modified - see page T4-8
# Alternative materials - replace **S1** in the part number with **B2** for brass, or **S8** for hardened stainless steel

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

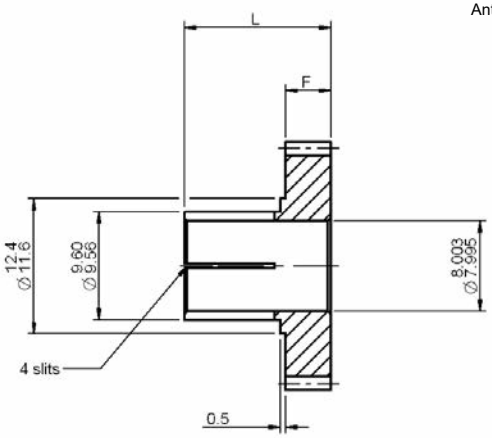
Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°

Associated Products
Anti-backlash gears: page 4-7 to 4-34
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

When F=4, L=13
F=6, L=15



Part number selection table

Example Part No:- C06S1B8 F4A- 75

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth	
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max
1.5	C150S1B8	C150A1B8	F4A- (4 mm) or F6A- (6 mm)	16 †	72
1.25	C125S1B8	C125A1B8		17	86
1.0	C10S1B8	C10A1B8		18	109
0.8	C08S1B8	C08A1B8		20	136
0.6	C06S1B8	C06A1B8		24	183
0.5	C05S1B8	C05A1B8		26	220
0.4	C04S1B8	C04A1B8		30	275
0.3	C03S1B8	C03A1B8		37	368
0.25	C025S1B8	C025A1B8		42	442
0.2	C02S1B8	C02A1B8		50	553

† Gears of 16 teeth will be modified - see page T4-8
# Alternative materials - replace **S1** in the part number with **B2** for brass

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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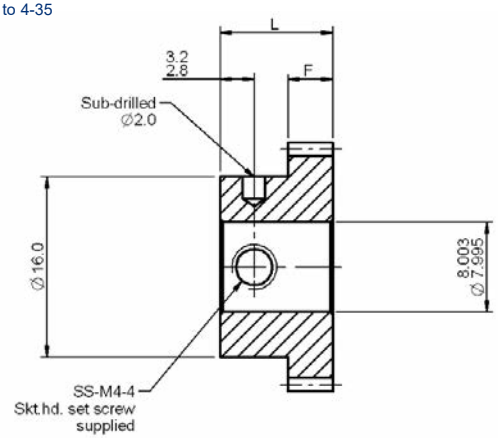
Associated Products
Anti-backlash gears: page 4-13 to 4-35
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



When F=4, L=10
F=6, L=12

Part number selection table

Example Part No:- **P06S1B8** **F4A-** **75**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth	
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max
1.5	**P150S1B8**	**P150A1B8**	**F4A-** (4 mm) or **F6A-** (6 mm)	**16 †**	**72**
1.25	**P125S1B8**	**P125A1B8**		**17**	**86**
1.0	**P10S1B8**	**P10A1B8**		**20**	**109**
0.8	**P08S1B8**	**P08A1B8**		**24**	**136**
0.6	**P06S1B8**	**P06A1B8**		**30**	**183**
0.5	**P05S1B8**	**P05A1B8**		**35**	**220**
0.4	**P04S1B8**	**P04A1B8**		**43**	**275**
0.3	**P03S1B8**	**P03A1B8**		**56**	**368**
0.25	**P025S1B8**	**P025A1B8**		**66**	**442**
0.2	**P02S1B8**	**P02A1B8**		**82**	**553**

† Gears of 16 teeth will be modified - see page T4-8
# Alternative materials - replace **S1** in the part number with **B2** for brass, or **S8** for hardened stainless steel

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

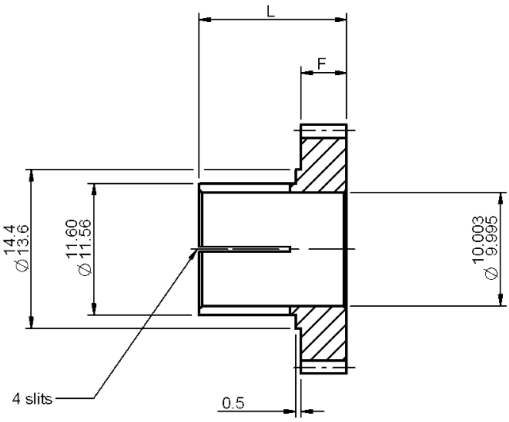
Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°

Associated Products
Anti-backlash gears: page 4-7 to 4-34
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

When F=4, L=13
F=6, L=15



Part number selection table

Example Part No:- **C06S1B10** **F4A-** **75**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth	
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max
1.5	**C150S1B10**	**C150A1B10**	**F4A-** (4 mm) or **F6A-** (6 mm)	**17**	**72**
1.25	**C125S1B10**	**C125A1B10**		**18**	**86**
1.0	**C10S1B10**	**C10A1B10**		**20**	**109**
0.8	**C08S1B10**	**C08A1B10**		**23**	**136**
0.6	**C06S1B10**	**C06A1B10**		**27**	**183**
0.5	**C05S1B10**	**C05A1B10**		**30**	**220**
0.4	**C04S1B10**	**C04A1B10**		**35**	**275**
0.3	**C03S1B10**	**C03A1B10**		**44**	**368**
0.25	**C025S1B10**	**C025A1B10**		**50**	**442**
0.2	**C02S1B10**	**C02A1B10**		**60**	**553**

Alternative materials - replace **S1** in the part number with **B2** for brass

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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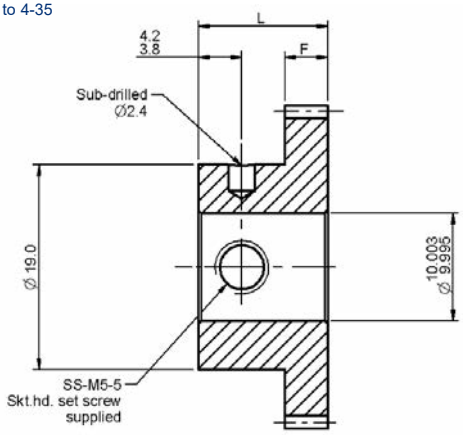
Associated Products
Anti-backlash gears: page 4-13 to 4-35
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



When F=4, L=12
F=6, L=14

Part number selection table

Example Part No:- **P06S1B10** **F4A-** **75**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth	
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max
1.5	**P150S1B10**	**P150A1B10**	**F4A-** (4 mm) or **F6A-** (6 mm)	**17**	**72**
1.25	**P125S1B10**	**P125A1B10**		**19**	**86**
1.0	**P10S1B10**	**P10A1B10**		**22**	**109**
0.8	**P08S1B10**	**P08A1B10**		**27**	**136**
0.6	**P06S1B10**	**P06A1B10**		**34**	**183**
0.5	**P05S1B10**	**P05A1B10**		**40**	**220**
0.4	**P04S1B10**	**P04A1B10**		**50**	**275**
0.3	**P03S1B10**	**P03A1B10**		**65**	**368**
0.25	**P025S1B10**	**P025A1B10**		**77**	**442**
0.2	**P02S1B10**	**P02A1B10**		**95**	**553**

Alternative materials - replace **S1** in the part number with **B2** for brass, or **S8** for hardened stainless steel

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

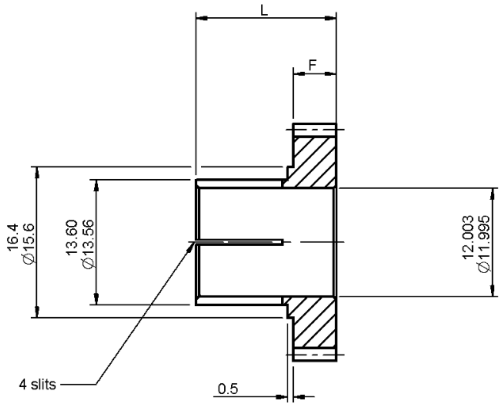
Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°

Associated Products
Anti-backlash gears: page 4-7 to 4-34
Shafts: page 11-2
Bearings: page 12-1
Gear clamps: page 11-4

When F=6, L=15
F=10, L=19



Part number selection table

Example Part No:- **C06S1B12** **F6A-** **75**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth	
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max
1.5	**C150S1B12**	**C150A1B12**	**F6A-** (6mm) or **F10A-** (10 mm)	**18**	**72**
1.25	**C125S1B12**	**C125A1B12**		**20**	**86**
1.0	**C10S1B12**	**C10A1B12**		**22**	**109**
0.8	**C08S1B12**	**C08A1B12**		**25**	**136**
0.6	**C06S1B12**	**C06A1B12**		**30**	**183**
0.5	**C05S1B12**	**C05A1B12**		**34**	**220**
0.4	**C04S1B12**	**C04A1B12**		**40**	**275**
0.3	**C03S1B12**	**C03A1B12**		**50**	**368**
0.25	**C025S1B12**	**C025A1B12**		**58**	**442**
0.2	**C02S1B12**	**C02A1B12**		**70**	**553**

Alternative materials - replace **S1** in the part number with **B2** for brass

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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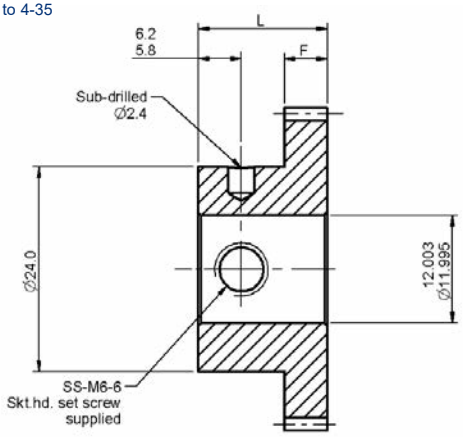
Associated Products
Anti-backlash gears: page 4-13 to 4-35
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



When F=8, L=20
F=12, L=24

Part number selection table

Example Part No:- **P06S1B12** **F8A-** **75**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth	
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max
1.5	**P150S1B12**	**P150A1B12**	**F8A-** (8 mm) or **F12A-** (12 mm)	**19**	**72**
1.25	**P125S1B12**	**P125A1B12**		**22**	**86**
1.0	**P10S1B12**	**P10A1B12**		**26**	**109**
0.8	**P08S1B12**	**P08A1B12**		**32**	**136**
0.6	**P06S1B12**	**P06A1B12**		**41**	**183**
0.5	**P05S1B12**	**P05A1B12**		**48**	**220**
0.4	**P04S1B12**	**P04A1B12**		**59**	**275**
0.3	**P03S1B12**	**P03A1B12**		**77**	**368**
0.25	**P025S1B12**	**P025A1B12**		**92**	**442**
0.2	**P02S1B12**	**P02A1B12**		**113**	**553**

Alternative materials - replace **S1** in the part number with **B2** for brass, or **S8** for hardened stainless steel

Features and options

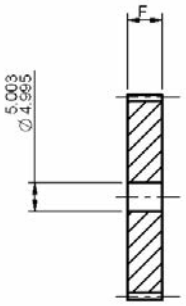
- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°

Associated Products
Anti-backlash gears: page 4-7 to 4-35
Shafts: page 11-2



Note
Delrin gear bore
Ø5.02/4.97

Part number selection table

Example Part No:- **F06S1B5** **F3A-** **75**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth	
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max
1.5	**F150S1B5**	**F150A1B5**	**F3A-** (3 mm) or **F6A-** (6 mm)	**14 †**	**72**
1.25	**F125S1B5**	**F125A1B5**		**14 †**	**86**
1.0	**F10S1B5**	**F10A1B5**		**15 †**	**109**
0.8	**F08S1B5**	**F08A1B5**		**17**	**136**
0.6	**F06S1B5**	**F06A1B5**		**19**	**183**
0.5	**F05S1B5**	**F05A1B5**		**20**	**220**
0.4	**F04S1B5**	**F04A1B5**		**23**	**275**
0.3	**F03S1B5**	**F03A1B5**		**27**	**368**
0.25	**F025S1B5**	**F025A1B5**		**30**	**442**
0.2	**F02S1B5**	**F02A1B5**		**35**	**553**

† Gears of 16 teeth or fewer will be modified - see page T4-8
# Alternative materials - replace **S1** in the part number with **B2** for brass, **D1** for Delrin or **S8** for hardened stainless steel

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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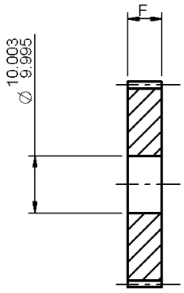
Associated Products
Anti-backlash gears: page 4-7 to 4-35
Shafts: page 11-2

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Note
Delrin gear bore
Ø10.02/9.97

Part number selection table

Example Part No:- **F06S1B10** **F6A-** **75**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth	
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max
1.5	**F150S1B10**	**F150A1B10**		**17**	**72**
1.25	**F125S1B10**	**F125A1B10**		**18**	**86**
1.0	**F10S1B10**	**F10A1B10**	**F3A-** (3 mm)	**20**	**109**
0.8	**F08S1B10**	**F08A1B10**		**23**	**136**
0.6	**F06S1B10**	**F06A1B10**	or	**27**	**183**
0.5	**F05S1B10**	**F05A1B10**		**30**	**220**
0.4	**F04S1B10**	**F04A1B10**	**F6A-** (6 mm)	**35**	**275**
0.3	**F03S1B10**	**F03A1B10**		**44**	**368**
0.25	**F025S1B10**	**F025A1B10**		**50**	**442**
0.2	**F02S1B10**	**F02A1B10**		**60**	**553**

Alternative materials - replace **S1** in the part number with **B2** for brass, **D1** for Delrin or **S8** for hardened stainless steel

Features and options

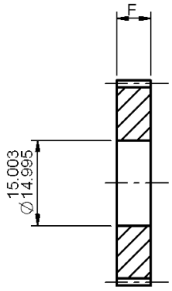
- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°

Associated Products
Anti-backlash gears: page 4-7 to 4-35



Note
Delrin gear bore
Ø15.02/14.97

Part number selection table

Example Part No:- **F06S1B15** **F3A-** **75**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth	
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max
1.5	**F150S1B15**	**F150A1B15**	**F3A-** (3 mm) or **F6A-** (6 mm)	**20**	**72**
1.25	**F125S1B15**	**F125A1B15**		**22**	**86**
1.0	**F10S1B15**	**F10A1B15**		**25**	**109**
0.8	**F08S1B15**	**F08A1B15**		**29**	**136**
0.6	**F06S1B15**	**F06A1B15**		**35**	**183**
0.5	**F05S1B15**	**F05A1B15**		**40**	**220**
0.4	**F04S1B15**	**F04A1B15**		**48**	**275**
0.3	**F03S1B15**	**F03A1B15**		**60**	**368**
0.25	**F025S1B15**	**F025A1B15**		**70**	**442**
0.2	**F02S1B15**	**F02A1B15**		**85**	**553**

Alternative materials - replace **S1** in the part number with **B2** for brass, **D1** for Delrin or **S8** for hardened stainless steel

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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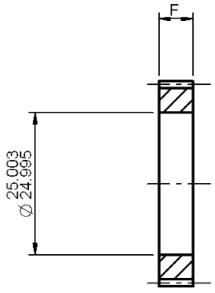
Associated Products
Anti-backlash gears: page 4-7 to 4-35

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°



Note
Delrin gear bore
Ø25.02/24.97

Part number selection table

Example Part No:- **F06S1B25** **F6A-** **75**

Standard Modules	Basic Part Number Standard Materials #		Face Width	Number of Teeth	
	Stainless Steel	Aluminium Alloy	Dim F	Min	Max
1.5	**F150S1B25**	**F150A1B25**		**27**	**72**
1.25	**F125S1B25**	**F125A1B25**		**30**	**86**
1.0	**F10S1B25**	**F10A1B25**	**F3A-** (3 mm)	**35**	**109**
0.8	**F08S1B25**	**F08A1B25**		**42**	**136**
0.6	**F06S1B25**	**F06A1B25**	or	**52**	**183**
0.5	**F05S1B25**	**F05A1B25**		**60**	**220**
0.4	**F04S1B25**	**F04A1B25**	**F6A-** (6 mm)	**73**	**275**
0.3	**F03S1B25**	**F03A1B25**		**94**	**368**
0.25	**F025S1B25**	**F025A1B25**		**110**	**442**
0.2	**F02S1B25**	**F02A1B25**		**135**	**553**

Alternative materials - replace **S1** in the part number with **B2** for brass, **D1** for Delrin or **S8** for hardened stainless steel

Features and options

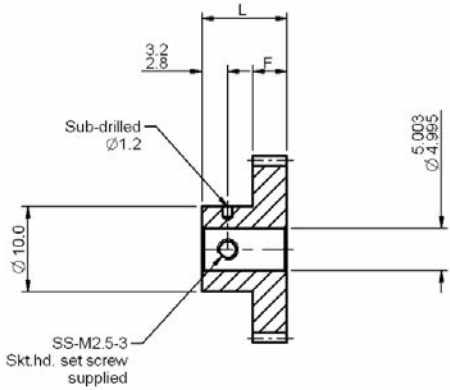
- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

All dimensions in mm
General tolerances ±0.13 mm
Material: Stainless steel 17-4 PH, hardened to 35-42 HRc
Pressure angle 20°

When F=2, L=8
F=4, L=10



Associated Products
Pin hub spur gears: page 4-37 to 4-51
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

Part number selection table

Example Part No:- **P06S8B5** **F2A-** **25**

Standard Modules	Basic Part Number	Face Width	Number of Teeth		
	Hardened Stainless Steel	Dim F	Min	Max F2A	Max F4A
1.5	**P150S8B5**		**14 †**	**21**	**72**
1.25	**P125S8B5**		**14 †**	**25**	**86**
1.0	**P10S8B5**		**15 †**	**32**	**109**
0.8	**P08S8B5**	**F2A-** (2 mm)	**17**	**41**	**136**
0.6	**P06S8B5**		**21**	**56**	**183**
0.5	**P05S8B5**	or	**24**	**67**	**220**
0.4	**P04S8B5**		**29**	**85**	**275**
0.3	**P03S8B5**	**F4A-** (4 mm)	**37**	**114**	**368**
0.25	**P025S8B5**		**43**	**137**	**442**
0.2	**P02S8B5**		**53**	**172**	**553**

† Gears of 16 teeth or fewer will be modified - see page T4-8

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Additional bore sizes 2 mm to 12 mm available
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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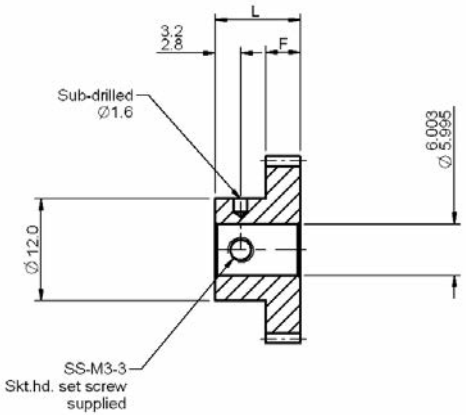
Associated Products
Pin hub spur gears: page 4-37 to 4-51
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Material: Stainless steel 17-4 PH, hardened to 35-42 HRc
Pressure angle 20°

When F=3, L=9
F=4, L=10
F=6, L=12



Part number selection table

Example Part No:- P06S8B6 F4A- 25

Standard Modules	Basic Part Number	Face Width	Number of Teeth	
	Hardened Stainless Steel	Dim F	Min	Max
1.5	P150S8B6	F3A- (3 mm)	14 †	72
1.25	P125S8B6		15 †	86
1.0	P10S8B6	or	16 †	109
0.8	P08S8B6		19	136
0.6	P06S8B6	F4A- (4 mm)	23	183
0.5	P05S8B6		27	220
0.4	P04S8B6	or	33	275
0.3	P03S8B6		43	368
0.25	P025S8B6	F6A- (6 mm)	50	442
0.2	P02S8B6		62	553

† Gears of 16 teeth or fewer will be modified - see page T4-8

Features and options

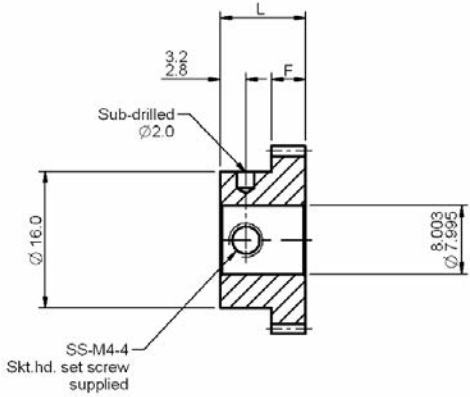
- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Additional bore sizes 2 mm to 12 mm available
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

All dimensions in mm
General tolerances ±0.13 mm
Material: Stainless steel 17-4 PH, hardened to 35-42 HRc
Pressure angle 20°

When F=4, L=10
F=6, L=12



Associated Products
Pin hub spur gears: page 4-37 to 4-51
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

Part number selection table

Example Part No:- **P06S8B8** **F4A-** **50**

Standard Modules	Basic Part Number	Face Width	Number of Teeth	
	Hardened Stainless Steel	Dim F	Min	Max
1.5	**P150S8B8**		**16 †**	**72**
1.25	**P125S8B8**		**17**	**86**
1.0	**P10S8B8**		**20**	**109**
0.8	**P08S8B8**	**F4A-** (4 mm)	**24**	**136**
0.6	**P06S8B8**		**30**	**183**
0.5	**P05S8B8**	or	**35**	**220**
0.4	**P04S8B8**		**43**	**275**
0.3	**P03S8B8**	**F6A-** (6 mm)	**56**	**368**
0.25	**P025S8B8**		**66**	**442**
0.2	**P02S8B8**		**82**	**553**

† Gears of 16 teeth or fewer will be modified - see page T4-8

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Additional bore sizes 2 mm to 12 mm available
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
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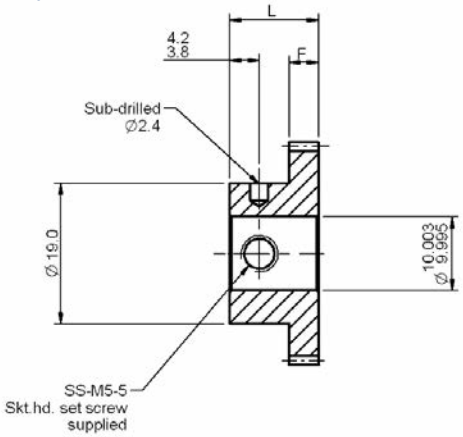
Associated Products
Pin hub spur gears: page 4-37 to 4-51
Shafts: page 11-2
Bearings: page 12-1
Pins: page 13-18

All dimensions in mm
General tolerances ±0.13 mm
Material: Stainless steel 17-4 PH, hardened to 35-42 HRc
Pressure angle 20°

When F=4, L=12
F=6, L=14



Part number selection table

Example Part No:- **P06S8B10** **F4A-** **65**

Standard Modules	Basic Part Number	Face Width	Number of Teeth	
	Hardened Stainless Steel	Dim F	Min	Max
1.5	**P150S8B10**		**17**	**72**
1.25	**P125S8B10**		**19**	**86**
1.0	**P10S8B10**		**22**	**109**
0.8	**P08S8B10**	**F4A-** (4 mm)	**27**	**136**
0.6	**P06S8B10**		**34**	**183**
0.5	**P05S8B10**	or	**40**	**220**
0.4	**P04S8B10**		**50**	**275**
0.3	**P03S8B10**	**F6A-** (6 mm)	**65**	**368**
0.25	**P025S8B10**		**77**	**442**
0.2	**P02S8B10**		**95**	**553**

Features and options

- Gear quality AQ10 as standard - see page T4-1
- Gear quality AQ9 for 1.5 mod
- Higher gear qualities available - see page T4-1
- Additional bore sizes 2 mm to 12 mm available
- Imperial gears available
- For all gear types and options - see page 4-6
- Product overview - see pages 4-2 to 4-6

Technical support

- Material specifications - see page T4-4
- Lubrication - see page T4-10
- Installation information - see page T4-9
- Treatment specifications - see page T4-4
- Technical information - see pages T4-1 to T4-18
- For modified or fully bespoke gear solutions, please contact us

Ground spur gears

Ground spur gears are ideal for high speed mechatronic applications where higher loads and accurate motion are required.

- Modules 0.5 to 1.0 available.
- Manufactured from chromium molybdenum steel, hardened to 49-55HRc.
- Standard gear quality: ISO 5
- Bore diameter, outside diameter and other surfaces are ground to provide location datums when additional machining is required. Additional machining of the bore is not recommended.
- Keyway features available - see page 4-69

Part number structure

SG 50 S 50 B - 10 08

Gear Type	Module	Material	Number of Teeth	Shaft Type	Bores Types*	Face Width	Bore Diameter
Ground Spur Gear	0.5 50 0.8 80 1.0 1	Chromium Molybdenum Steel 49-55HRc	14 - 120	L = solid shaft on both sides B = Bore with hub on one side	- Ground bore without threaded hole + Ground bore with threaded hole and sub-drilled hole, set screw not supplied	8 10	05 5 06 6 08 8 10 10 12 12

* See bore type designator in part number, - or +

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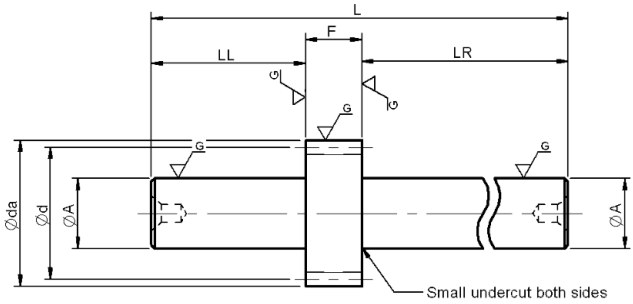
Associated Products
Bearings: page 12-1

All dimensions in mm
Pressure angle 20°



Part number selection table

Part Number	Module	Number of Teeth	PCD Ød	OD Øda	Face Width F	Shaft Dia (h7) ØA	Shaft Length LL	Shaft Length LR	Overall Length L
SG50S20L-0806	0.5	20	10.0	11.0	8	6	22	50	80
~~SG50S22L-0808~~		~~22~~	~~11.0~~	~~12.0~~		~~8~~			
~~SG50S24L-0810~~		~~24~~	~~12.0~~	~~13.0~~		~~10~~			
~~SG50S25L-0810~~		~~25~~	~~12.5~~	~~13.5~~		~~10~~			
~~SG50S26L-0810~~		~~26~~	~~13.0~~	~~14.0~~		~~10~~			
SG80S15L-0806	0.8	15	12.0	13.6	8	6	22	60	90
~~SG80S16L-0806~~		~~16~~	~~12.8~~	~~14.4~~		~~6~~			
~~SG80S18L-0808~~		~~18~~	~~14.4~~	~~16.0~~		~~8~~			
~~SG80S20L-0810~~		~~20~~	~~16.0~~	~~17.6~~		~~10~~			
~~SG80S24L-0810~~		~~24~~	~~19.2~~	~~20.8~~		~~10~~			
~~SG80S25L-0810~~		~~25~~	~~20.0~~	~~21.6~~		~~10~~			
~~SG1S14L-1008~~	1.0	~~14~~	~~14.0~~	~~16.0~~	10	~~8~~	25	60	95
SG1S15L-1010		15	15.0	17.0		10			
SG1S16L-1010		16	16.0	18.0		10			
SG1S18L-1010		18	18.0	20.0		10			

NOTE: Part numbers that have been crossed out have been discontinued, please contact us for alternative suitable gears.

Features

- Material: Chromium molybdenum steel (ISO 34CrMo4, 42CrMo4)
- Gear tooth treatment: Induction hardened to 49-55 HRc
- Gear quality: ISO 5
- Gear tooth surface finish $\sqrt{}^{1.6}$

Technical support

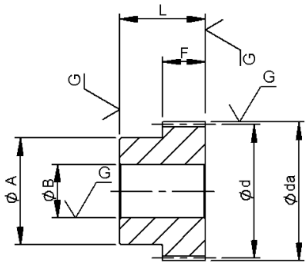
- For transmission capacity - see page T4-17
- Part number structure - see page 4-60
- For modified or fully bespoke gears, please contact us

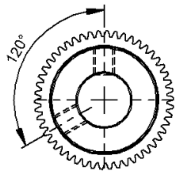
Precision Gears

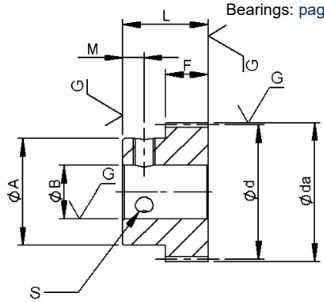
Ground Pin Hub Spur Gears

All dimensions in mm
Pressure angle 20°

Associated Products
Set screws: page 13-1
Shafts: page 11-2
Bearings: page 12-1







- in part number denotes no threaded hole

***** in part number denotes two threaded holes (set screws not supplied)

Part number selection table

Part Number	Number of Teeth	PCD Ød	OD Øda	Bore Dia (H7) ØB	Hub Dia ØA	Face Width F	Overall Length L	Set Screw S	Set Screw M
SG50S28B-0805	28	14.0	15.0	5	10			-	-
~~SG50S30B-0805~~	~~30~~	~~15.0~~	~~16.0~~	~~5~~	~~12~~			-	-
~~SG50S30B-0806~~	~~30~~	~~15.0~~	~~16.0~~	~~6~~	~~12~~			-	-
SG50S30B*0806	30	15.0	16.0	6	12			M3	4
~~SG50S32B-0805~~	~~32~~	~~16.0~~	~~17.0~~	~~5~~	~~12~~			-	-
~~SG50S32B-0806~~	~~32~~	~~16.0~~	~~17.0~~	~~6~~	~~12~~			-	-
~~SG50S35B-0805~~	~~35~~	~~17.5~~	~~18.5~~	~~5~~	~~14~~			-	-
~~SG50S36B-0806~~	~~36~~	~~18.0~~	~~19.0~~	~~6~~	~~16~~			-	-
SG50S36B-0808	36	18.0	19.0	8	16			-	-
SG50S40B-0806	40	20.0	21.0	6	16	8	16	-	-
~~SG50S40B-0808~~	~~40~~	~~20.0~~	~~21.0~~	~~8~~	~~16~~			-	-
SG50S40B*0808	40	20.0	21.0	8	16			M4	4
~~SG50S45B-0808~~	~~45~~	~~22.5~~	~~23.5~~	~~8~~	~~16~~			-	-
~~SG50S48B-0808~~	~~48~~	~~24.0~~	~~25.0~~	~~8~~	~~20~~			-	-
~~SG50S50B-0808~~	~~50~~	~~25.0~~	~~26.0~~	~~8~~	~~20~~			-	-
~~SG50S50B-0810~~	~~50~~	~~25.0~~	~~26.0~~	~~10~~	~~20~~			-	-
~~SG50S50B*0810~~	~~50~~	~~25.0~~	~~26.0~~	~~10~~	~~20~~			~~M4~~	~~4~~
~~SG50S54B-0808~~	~~54~~	~~27.0~~	~~28.0~~	~~8~~	~~20~~			-	-
~~SG50S55B-0808~~	~~55~~	~~27.5~~	~~28.5~~	~~8~~	~~20~~			-	-

NOTE: Part numbers that have been crossed out have been discontinued, please contact us for alternative suitable gears.

Features

- Material: Chromium molybdenum steel (ISO 34CrMo4, 42CrMo4)
- Gear tooth treatment: Induction hardened to 49-55 HRc
- Gear quality: ISO 5
- Gear tooth surface finish 1.6
- Keyway features available - see page 4-69

Technical support

- For transmission capacity - see page T4-17
- Part number structure - see page 4-60
- For modified or fully bespoke gears, please contact us

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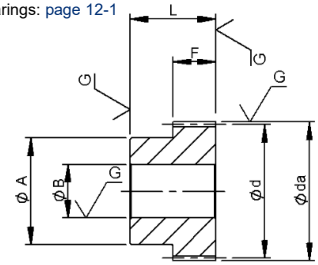
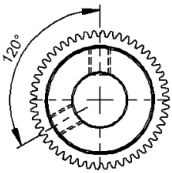
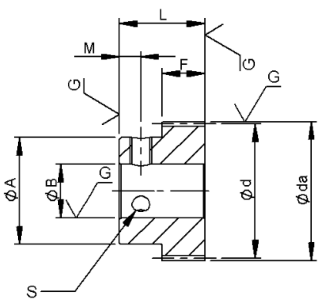
Associated Products
Set screws: page 13-1
Shafts: page 11-2
Bearings: page 12-1

All dimensions in mm
Pressure angle 20







- in part number denotes no threaded hole

***** in part number denotes two threaded holes (set screws not supplied)

Part number selection table

Part Number	Number of Teeth	PCD Ød	OD Øda	Bore Dia (H7) ØB	Hub Dia ØA	Face Width F	Overall Length L	Set Screw S	Set Screw M
~~SG50S56B-0808~~	~~56~~	~~28.0~~	~~29.0~~	~~8~~	~~20~~			-	-
~~SG50S60B-0808~~	~~60~~	~~30.0~~	~~31.0~~	~~8~~	~~22~~			-	-
~~SG50S60B-0810~~	~~60~~	~~30.0~~	~~31.0~~	~~10~~	~~22~~			-	-
~~SG50S60B*0810~~	~~60~~	~~30.0~~	~~31.0~~	~~10~~	~~22~~			~~M4~~	~~4~~
~~SG50S64B-0808~~	~~64~~	~~32.0~~	~~33.0~~	~~8~~	~~22~~			-	-
~~SG50S70B-0808~~	~~70~~	~~35.0~~	~~36.0~~	~~8~~	~~22~~			-	-
SG50S72B-0808	72	36.0	37.0	8	25			-	-
~~SG50S75B-0808~~	~~75~~	~~37.5~~	~~38.5~~	~~8~~	~~25~~			-	-
~~SG50S80B-0808~~	~~80~~	~~40.0~~	~~41.0~~	~~8~~	~~25~~			-	-
~~SG50S80B-0810~~	~~80~~	~~40.0~~	~~41.0~~	~~10~~	~~25~~	8	16	-	-
~~SG50S80B-0812~~	~~80~~	~~40.0~~	~~41.0~~	~~12~~	~~25~~			-	-
~~SG50S80B*0812~~	~~80~~	~~40.0~~	~~41.0~~	~~12~~	~~25~~			~~M5~~	~~4~~
~~SG50S90B-0810~~	~~90~~	~~45.0~~	~~46.0~~	~~10~~	~~30~~			-	-
~~SG50S96B-0810~~	~~96~~	~~48.0~~	~~49.0~~	~~10~~	~~30~~			-	-
~~SG50S100B-0810~~	~~100~~	~~50.0~~	~~51.0~~	~~10~~	~~30~~			-	-
~~SG50S100B-0812~~	~~100~~	~~50.0~~	~~51.0~~	~~12~~	~~30~~			-	-
~~SG50S100B*0812~~	~~100~~	~~50.0~~	~~51.0~~	~~12~~	~~30~~			~~M5~~	~~4~~
~~SG50S108B-0810~~	~~108~~	~~54.0~~	~~55.0~~	~~10~~	~~35~~			-	-
~~SG50S112B-0810~~	~~112~~	~~56.0~~	~~57.0~~	~~10~~	~~35~~			-	-
~~SG50S120B-0810~~	~~120~~	~~60.0~~	~~61.0~~	~~10~~	~~35~~			-	-

NOTE: Part numbers that have been crossed out have been discontinued, please contact us for alternative suitable gears.

Features

- Material: Chromium molybdenum steel (ISO 34CrMo4, 42CrMo4)
- Gear tooth treatment: Induction hardened to 49-55 HRc
- Gear quality: ISO 5
- Gear tooth surface finish $\sqrt{1.6}$
- Keyway features available - see page 4-69

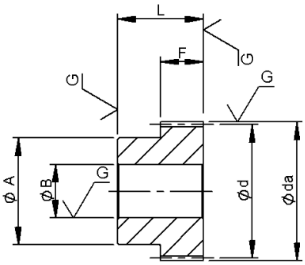
Technical support

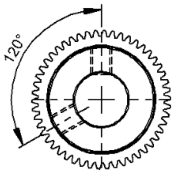
- For transmission capacity - see page T4-17
- Part number structure - see page 4-60
- For modified or fully bespoke gears, please contact us

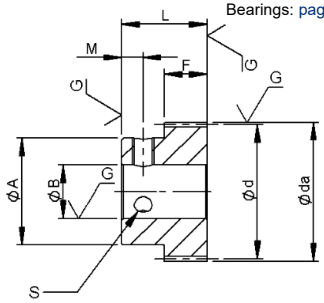
Ground Pin Hub Spur Gears

All dimensions in mm
Pressure angle 20°

Associated Products
Set screws: page 13-1
Shafts: page 11-2
Bearings: page 12-1







- in part number denotes no threaded hole

***** in part number denotes two threaded holes (set screws not supplied)

Part number selection table

Part Number	Number of Teeth	PCD Ød	OD Øda	Bore Dia (H7) ØB	Hub Dia ØA	Face Width F	Overall Length L	Set Screw S	Set Screw M
~~SG80S22B-0806~~	~~22~~	~~17.6~~	~~19.2~~	~~6~~	~~14~~			-	-
~~SG80S24B-0806~~	~~24~~	~~19.2~~	~~20.8~~	~~6~~	~~16~~			-	-
SG80S25B-0806	25	20.0	21.6	6	16			-	-
~~SG80S28B-0808~~	~~28~~	~~22.4~~	~~24.0~~	~~8~~	~~18~~			-	-
~~SG80S30B-0810~~	~~30~~	~~24.0~~	~~25.6~~	~~10~~	~~20~~			-	-
~~SG80S30B*0810~~	~~30~~	~~24.0~~	~~25.6~~	~~10~~	~~20~~			~~M4~~	~~5~~
~~SG80S32B-0810~~	~~32~~	~~25.6~~	~~27.2~~	~~10~~	~~20~~			-	-
~~SG80S35B-0810~~	~~35~~	~~28.0~~	~~29.6~~	~~10~~	~~20~~			-	-
~~SG80S36B-0810~~	~~36~~	~~28.8~~	~~30.4~~	~~10~~	~~20~~	8	18	-	-
SG80S40B-0810	40	32.0	33.6	10	25			-	-
~~SG80S40B*0812~~	~~40~~	~~32.0~~	~~33.6~~	~~12~~	~~25~~			~~M5~~	~~5~~
SG80S45B-0810	45	36.0	37.6	10	25			-	-
~~SG80S48B-0810~~	~~48~~	~~38.4~~	~~40.0~~	~~10~~	~~25~~			-	-
~~SG80S50B-0810~~	~~50~~	~~40.0~~	~~41.6~~	~~10~~	~~25~~			-	-
~~SG80S50B*0812~~	~~50~~	~~40.0~~	~~41.6~~	~~12~~	~~25~~			~~M5~~	~~5~~
~~SG80S54B-0810~~	~~54~~	~~43.2~~	~~44.8~~	~~10~~	~~25~~			-	-
~~SG80S55B-0810~~	~~55~~	~~44.0~~	~~45.6~~	~~10~~	~~25~~			-	-

NOTE: Part numbers that have been crossed out have been discontinued, please contact us for alternative suitable gears.

Features

- Material: Chromium molybdenum steel (ISO 34CrMo4, 42CrMo4)
- Gear tooth treatment: Induction hardened to 49-55 HRc
- Gear quality: ISO 5
- Gear tooth surface finish 1.6
- Keyway features available - see page 4-69

Technical support

- For transmission capacity - see page T4-17
- Part number structure - see page 4-60
- For modified or fully bespoke gears, please contact us

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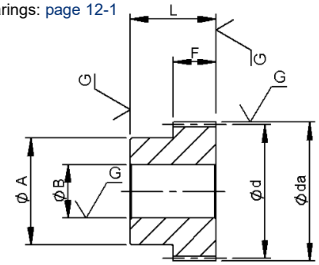
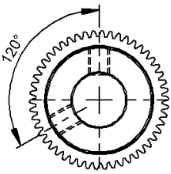
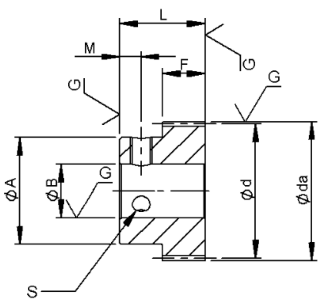
Associated Products
Set screws: page 13-1
Shafts: page 11-2
Bearings: page 12-1

All dimensions in mm
Pressure angle 20°







- in part number denotes no threaded hole

***** in part number denotes two threaded holes (set screws not supplied)

Part number selection table

Part Number	Number of Teeth	PCD Ød	OD Øda	Bore Dia (H7) ØB	Hub Dia ØA	Face Width F	Overall Length L	Set Screw S	Set Screw M
SG80S56B-0810	56	44.8	46.4	10	25			-	-
~~SG80S60B-0810~~	~~60~~	~~48.0~~	~~49.6~~	~~10~~	~~25~~			-	-
~~SG80S60B*0812~~	~~60~~	~~48.0~~	~~49.6~~	~~12~~	~~25~~			M5	5
~~SG80S64B-0812~~	~~64~~	~~51.2~~	~~52.8~~	~~12~~	~~30~~			-	-
~~SG80S70B-0812~~	~~70~~	~~56.0~~	~~57.6~~	~~12~~	~~30~~			-	-
~~SG80S72B-0812~~	~~72~~	~~57.6~~	~~59.2~~	~~12~~	~~30~~			-	-
~~SG80S75B-0812~~	~~75~~	~~60.0~~	~~61.6~~	~~12~~	~~30~~			-	-
SG80S80B-0812	80	64.0	65.6	12	30	8	18	-	-
~~SG80S90B-0812~~	~~90~~	~~72.0~~	~~73.6~~	~~12~~	~~35~~			-	-
~~SG80S96B-0812~~	~~96~~	~~76.8~~	~~78.4~~	~~12~~	~~35~~			-	-
~~SG80S100B-0812~~	~~100~~	~~80.0~~	~~81.6~~	~~12~~	~~35~~			-	-
~~SG80S108B-0812~~	~~108~~	~~86.4~~	~~88.0~~	~~12~~	~~40~~			-	-
~~SG80S112B-0812~~	~~112~~	~~89.6~~	~~91.2~~	~~12~~	~~40~~			-	-
~~SG80S120B-0812~~	~~120~~	~~96.0~~	~~97.6~~	~~12~~	~~40~~			-	-

NOTE: Part numbers that have been crossed out have been discontinued, please contact us for alternative suitable gears.

Features

- Material: Chromium molybdenum steel (ISO 34CrMo4, 42CrMo4)
- Gear tooth treatment: Induction hardened to 49-55 HRc
- Gear quality: ISO 5
- Gear tooth surface finish 1.6
- Keyway features available - see page 4-69

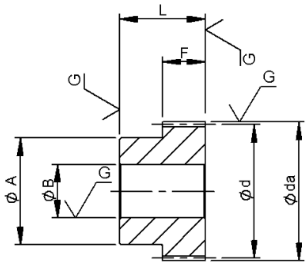
Technical support

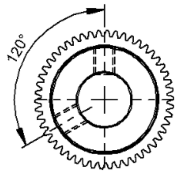
- For transmission capacity - see page T4-17
- Part number structure - see page 4-60
- For modified or fully bespoke gears, please contact us

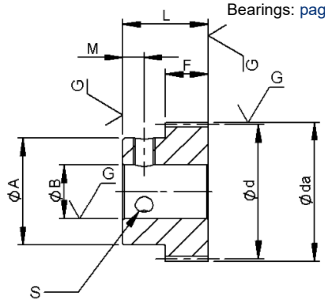
Ground Pin Hub Spur Gears

All dimensions in mm
Pressure angle 20°

Associated Products
Set screws: page 13-1
Shafts: page 11-2
Bearings: page 12-1







- in part number denotes no threaded hole

***** in part number denotes two threaded holes (set screws not supplied)

Part number selection table

Part Number	Number of Teeth	PCD Ød	OD Øda	Bore Dia (H7) ØB	Hub Dia ØA	Face Width F	Overall Length L	Set Screw S	Set Screw M
SG1S17B-1006	17	17.0	19.0	6	12			-	-
SG1S18B-1008	18	18.0	20.0	8	15			-	-
SG1S20B-1008	20	20.0	22.0	8	16			-	-
~~SG1S20B*1008~~	~~20~~	~~20.0~~	~~22.0~~	~~8~~	~~16~~			~~M4~~	~~5~~
SG1S20B*1010	20	20.0	22.0	10	16			M4	5
~~SG1S21B-1008~~	~~21~~	~~21.0~~	~~23.0~~	~~8~~	~~16~~			-	-
~~SG1S22B-1008~~	~~22~~	~~22.0~~	~~24.0~~	~~8~~	~~18~~			-	-
~~SG1S23B-1008~~	~~23~~	~~23.0~~	~~25.0~~	~~8~~	~~18~~			-	-
~~SG1S24B-1008~~	~~24~~	~~24.0~~	~~26.0~~	~~8~~	~~20~~	10	20	-	-
~~SG1S24B*1008~~	~~24~~	~~24.0~~	~~26.0~~	~~8~~	~~20~~			~~M4~~	~~5~~
~~SG1S24B*1010~~	~~24~~	~~24.0~~	~~26.0~~	~~10~~	~~20~~			~~M4~~	~~5~~
SG1S25B-1008	25	25.0	27.0	8	20			-	-
~~SG1S26B-1008~~	~~26~~	~~26.0~~	~~28.0~~	~~8~~	~~20~~			-	-
~~SG1S27B-1008~~	~~27~~	~~27.0~~	~~29.0~~	~~8~~	~~20~~			-	-
~~SG1S28B-1008~~	~~28~~	~~28.0~~	~~30.0~~	~~8~~	~~20~~			-	-
SG1S30B-1010	30	30.0	32.0	10	26			-	-
~~SG1S30B*1010~~	~~30~~	~~30.0~~	~~32.0~~	~~10~~	~~26~~			~~M4~~	~~5~~

NOTE: Part numbers that have been crossed out have been discontinued, please contact us for alternative suitable gears.

Features

- Material: Chromium molybdenum steel (ISO 34CrMo4, 42CrMo4)
- Gear tooth treatment: Induction hardened to 49-55 HRc
- Gear quality: ISO 5
- Gear tooth surface finish 1.6
- Keyway features available - see page 4-69

Technical support

- For transmission capacity - see page T4-17
- Part number structure - see page 4-60
- For modified or fully bespoke gears, please contact us

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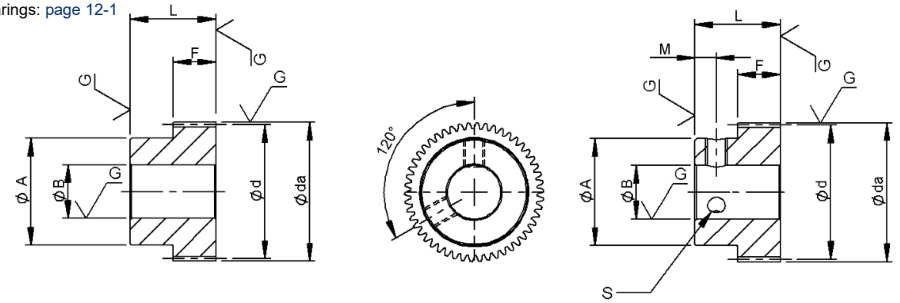
Associated Products
Set screws: page 13-1
Shafts: page 11-2
Bearings: page 12-1

All dimensions in mm
Pressure angle 20°



- in part number denotes no threaded hole

* in part number denotes two threaded holes (set screws not supplied)

Part number selection table

Part Number	Number of Teeth	PCD Ød	OD Øda	Bore Dia (H7) ØB	Hub Dia ØA	Face Width F	Overall Length L	Set Screw S	Set Screw M
~~SG1S30B*1012~~	~~30~~	~~30.0~~	~~32.0~~	~~12~~	~~26~~			M4	5
~~SG1S32B-1010~~	~~32~~	~~32.0~~	~~34.0~~	~~10~~	~~26~~			-	-
~~SG1S34B-1010~~	~~34~~	~~34.0~~	~~36.0~~	~~10~~	~~26~~			-	-
SG1S35B-1010	35	35.0	37.0	10	26			-	-
SG1S36B-1010	36	36.0	38.0	10	26			-	-
~~SG1S38B-1010~~	~~38~~	~~38.0~~	~~40.0~~	~~10~~	~~26~~			-	-
~~SG1S40B-1010~~	~~40~~	~~40.0~~	~~42.0~~	~~10~~	~~26~~	10	20	-	-
~~SG1S40B-1012~~	~~40~~	~~40.0~~	~~42.0~~	~~12~~	~~26~~			-	-
~~SG1S42B-1010~~	~~42~~	~~42.0~~	~~44.0~~	~~10~~	~~35~~			-	-
SG1S44B-1010	44	44.0	46.0	10	35			-	-
SG1S45B-1012	45	45.0	47.0	12	35			-	-
SG1S48B-1012	48	48.0	50.0	12	35			-	-
~~SG1S50B-1012~~	~~50~~	~~50.0~~	~~52.0~~	~~12~~	~~35~~			-	-

NOTE: Part numbers that have been crossed out have been discontinued, please contact us for alternative suitable gears.

Features

- Material: Chromium molybdenum steel (ISO 34CrMo4, 42CrMo4)
- Gear tooth treatment: Induction hardened to 49-55 HRc
- Gear quality: ISO 5
- Gear tooth surface finish 1.6
- Keyway features available - see page 4-69

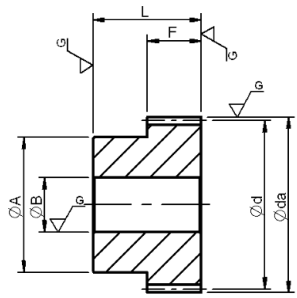
Technical support

- For transmission capacity - see page T4-17
- Part number structure - see page 4-60
- For modified or fully bespoke gears, please contact us

Ground Pin Hub Spur Gears

All dimensions in mm
Pressure angle 20°

Associated Products
Set screws: page 13-1
Shafts: page 11-2
Bearings: page 12-1



- in part number denotes no threaded hole

Part number selection table

Part Number	Number of Teeth	PCD Ød	OD Øda	Bore Dia (H7) ØB	Hub Dia ØA	Face Width F	Overall Length L
SG1S52B-1012	52	52.0	54.0		35		
SG1S54B-1012	54	54.0	56.0		35		
~~SG1S55B-1012~~	~~55~~	~~55.0~~	~~57.0~~		~~35~~		
SG1S56B-1012	56	56.0	58.0		35		
SG1S60B-1012	60	60.0	62.0		40		
~~SG1S64B-1012~~	~~64~~	~~64.0~~	~~66.0~~	12	~~40~~	10	20
SG1S70B-1012	70	70.0	72.0		40		
~~SG1S72B-1012~~	~~72~~	~~72.0~~	~~74.0~~		~~45~~		
~~SG1S75B-1012~~	~~75~~	~~75.0~~	~~77.0~~		~~45~~		
~~SG1S80B-1012~~	~~80~~	~~80.0~~	~~82.0~~		~~45~~		
~~SG1S100B-1012~~	~~100~~	~~100.0~~	~~102.0~~		~~50~~		

NOTE: Part numbers that have been crossed out have been discontinued, please contact us for alternative suitable gears.

Features

- Material: Chromium molybdenum steel (ISO 34CrMo4, 42CrMo4)
- Gear tooth treatment: Induction hardened to 49-55 HRc
- Gear quality: ISO 5
- Gear tooth surface finish 1.6
- Keyway features available - see page 4-69

Technical support

- For transmission capacity - see page T4-17
- Part number structure - see page 4-60
- For modified or fully bespoke gears, please contact us

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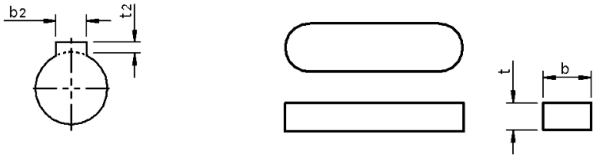
Associated Products
Ground pin hub spur gears: page 4-62

All dimensions in mm



Tolerances for key

b x t	3 x 3	4 x 4
b Tolerance (h)	h9	h9
t Tolerance (h)	h9	h9

Keyway information

Bore Dia Ø	Keyway b_2 x t_2	Width		Depth	
		b_2	Tolerance Js 9	t_2	Tolerance
8	3 x 1.4	3	±0.0125	1.4	+0.1 -0
10					
12	4 x 1.8	4	±0.015	1.8	

Features

- The keyways above are available as options, add -K to the end of the part number
- Additional custom keyways are available, please contact us

Brass gears

Brass gears are ideal for lightly loaded applications, an economic balance of accuracy and load capacity against cost.

- Modules 0.3 to 0.75 available
- Manufactured from brass (ISO CuZn38Pb2, CuZn39Pb3)
- Standard gear quality: ISO 9 - 10

Part number structure

S 50 B 20 K + 02 03

Gear Type	Module	Material	Number of Teeth	Shaft Types	Bore Types	Face Width	Bore Diameter
Spur Gear	0.3 30 0.5 50 0.75 75	Brass	8 - 120	A - Hubless with bore B - Bore with hub on one side K - Pinion shaft	- Gear shaft + Gear shaft with bore and threaded hole, set screw not supplied	2 02 3 03 4 04 8 08 10 10	2 02 3 03 5 05 6 06 8 08 12 12 15 15

Precision Gears

Additional brass gears are available in the precision gear range - see page 4-6

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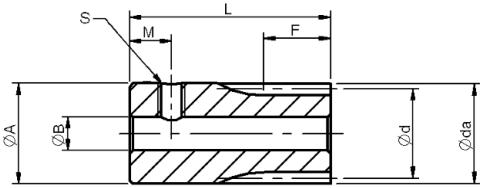
Associated Products
Set screws: page 13-1
Shafts: page 11-2
Bearings: page 12-1

All dimensions in mm
Pressure angle 20°

Shaft Pinion

- in part number denotes shaft pinion type

Pinion



Part number selection table

set screw not supplied

Part Number	Module	Number of Teeth	PCD Ød	OD Øda	Bore Dia (H8) ØB	Hub Dia ØA	Face Width F	Overall Length L	Set Screw S	Set Screw M
S30B14K+0402	0.3	14	4.2	4.8	2	5.0	4	12	M1.6	2.5
S30B15K+0402		15	4.5	5.1		5.5		12	M1.6	2.5
S30B16K+0402		16	4.8	5.4		5.5		12	M1.6	2.5
S30B18K+0402		18	5.4	6.0		6.0		12	M2	2.5
S50B10K-1006	0.5	10	5.0	6.0	-	6.0	10	55	-	-
S50B12K-1007		12	6.0	7.0	-	7.0	10	55	-	-
S50B14K-1008		14	7.0	8.0	-	8.0	10	55	-	-
S50B15K+0803		15	7.5	8.5	3	9.0	8	18	M3	3.0
S50B16K+0803		16	8.0	9.0	3	9.0	8	18	M3	3.0
S50B18K+0803		18	9.0	10.0	3	10.0	8	18	M3	3.0
S50B20K+0803		20	10.0	11.0	3	11.0	8	18	M3	3.0
S75B10K-0809	0.75	10	7.5	9.0	-	9.0	8	55	-	-
S75B12K-0811		12	9.0	10.5	-	11.0		55	-	-
S75B14K+0805		14	10.5	12.0	5	12.0		20	M3	3.0
S75B15K+0805		15	11.25	12.75	5	12.75		20	M3	3.0
S75B16K+0805		16	12.0	13.5	5	13.5		20	M3	3.0
~~S75B18K+0805~~		~~18~~	~~13.5~~	~~15.0~~	~~5~~	~~15.0~~		~~20~~	~~M3~~	~~3.0~~
S75B20K+0805		20	15.0	16.5	5	16.5		20	M3	3.0

NOTE: Part numbers that have been crossed out have been discontinued, please contact us for alternative suitable gears.

Features

- Material: Brass (ISO CuZn39Pb3)
- Gear quality: ISO 9 - 10

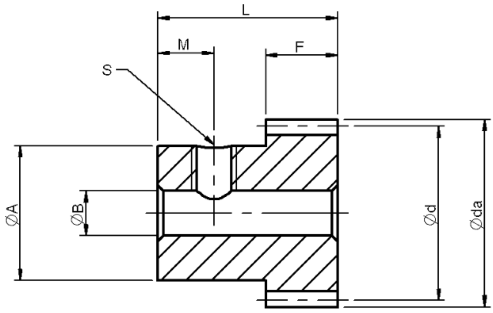
Technical support

- Allowable backlash - see page T4-17
- For modified or fully bespoke gears, please contact us
- Product overview - see page 4-70

Brass Pin Hub Spur Gears

All dimensions in mm
Pressure angle 20°

Associated Products
Set screws: page 13-1
Shafts: page 11-2
Bearings: page 12-1



Part number selection table

set screw not supplied

Part Number	Number of Teeth	PCD Ød	OD Øda	Bore Dia (H8) ØB	Hub Dia ØA	Face Width F	Overall Length L	Set Screw S	Set Screw M
S30B20B+0302	20	6.0	6.6	2	5	3.2		M1.6	2.5
S30B24B+0302	24	7.2	7.8	2	6	3.2		M2	2.5
S30B25B+0302	25	7.5	8.1	2	6	3.2		M2	2.5
S30B28B+0302	28	8.4	9.0	2	7	3.2		M2	2.5
S30B30B+0302	30	9.0	9.6	2	8	3.2		M2	2.5
S30B32B+0202	32	9.6	10.2	2	8	2.0	8	M2	3.0
S30B35B+0202	35	10.5	11.1	2	8	2.0		M2	3.0
S30B36B+0203	36	10.8	11.4	3	9	2.0		M3	3.0
S30B40B+0203	40	12.0	12.6	3	10	2.0		M3	3.0
S30B45B+0203	45	13.5	14.1	3	10	2.0		M3	3.0
S30B48B+0203	48	14.4	15.0	3	10	2.0		M3	3.0

Features

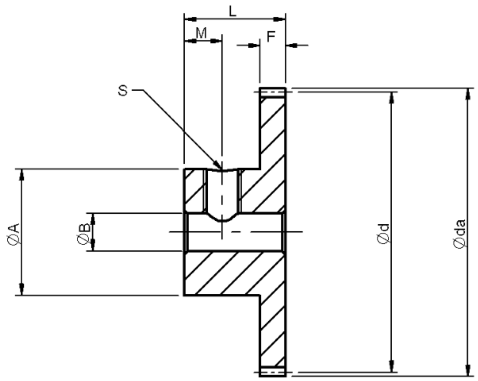
- Material: Brass (ISO CuZn39Pb3)
- Gear quality: ISO 9 - 10

Technical support

- Allowable backlash - see page T4-17
- For modified or fully bespoke gears, please contact us
- Product overview - see page 4-70

Associated Products
Set screws: page 13-1
Shafts: page 11-2
Bearings: page 12-1

All dimensions in mm
Pressure angle 20°



Part number selection table

set screw not supplied

Part Number	Number of Teeth	PCD Ød	OD Øda	Bore Dia (H8) ØB	Hub Dia ØA	Face Width F	Overall Length L	Set Screw S	Set Screw M
S30B50B+0203	50	15.0	15.6						
S30B56B+0203	56	16.8	17.4						
S30B60B+0203	60	18.0	18.6						
S30B64B+0203	64	19.2	19.8						
~~S30B66B+0203~~	~~66~~	~~19.8~~	~~20.4~~						
S30B70B+0203	70	21.0	21.6						
S30B72B+0203	72	21.6	22.2	3	10	2	8	M3	3
S30B75B+0203	75	22.5	23.1						
S30B80B+0203	80	24.0	24.6						
S30B90B+0203	90	27.0	27.6						
S30B96B+0203	96	28.8	29.4						
S30B100B+0203	100	30.0	30.6						
S30B108B+0203	108	32.4	33.0						

NOTE: Part numbers that have been crossed out have been discontinued, please contact us for alternative suitable gears.

Features

- Material: Brass (ISO CuZn39Pb3)
- Gear quality: ISO 9 - 10

Technical support

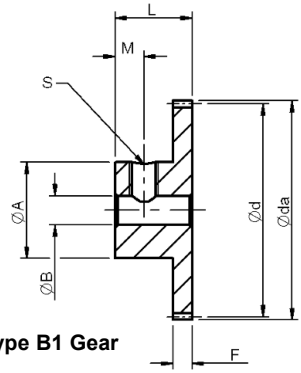
- Allowable backlash - see page T4-17
- For modified or fully bespoke gears, please contact us
- Product overview - see page 4-70

Precision Gears

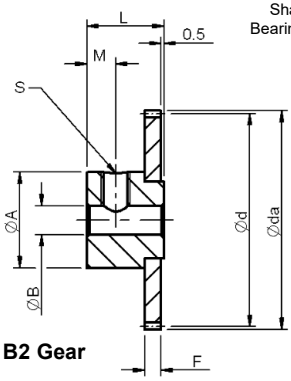
Brass Pin Hub Spur Gears

All dimensions in mm
Pressure angle 20°

Associated Products
Set screws: page 13-1
Shafts: page 11-2
Bearings: page 12-1



Type B1 Gear



Type B2 Gear

Part number selection table

set screw not supplied

Part Number	Number of Teeth	Type	PCD Ød	OD Øda	Bore Dia (H8) ØB	Hub Dia ØA	Face Width F	Overall Length L	Set Screw S	Set Screw M
S50B20B+0303	20	B1	10.0	11.0	3	8.2	3	8	M3	2.5
S50B24B+0303	24	B1	12.0	13.0		10.0	3	8		
S50B25B+0303	25	B1	12.5	13.5		10.0	3	8		
S50B26B+0303	26	B1	13.0	14.0		10.0	3	8		
S50B28B+0303	28	B1	14.0	15.0		10.0	3	8		
S50B30B+0303	30	B1	15.0	16.0		10.0	3	8		
S50B32B+0303	32	B1	16.0	17.0		10.0	3	8		
S50B35B+0303	35	B1	17.5	18.5		10.0	3	8		
S50B36B+0303	36	B1	18.0	19.0		10.0	3	8		
S50B40B+0203	40	B2	20.0	21.0		10.0	2	7.5		
S50B42B+0203	42	B2	21.0	22.0		10.0	2	7.5		
S50B45B+0203	45	B2	22.5	23.5		10.0	2	7.5		
S50B48B+0203	48	B2	24.0	25.0		10.0	2	7.5		
S50B50B+0203	50	B2	25.0	26.0		10.0	2	7.5		
S50B55B+0203	55	B2	27.5	28.5		10.0	2	7.5		
S50B56B+0203	56	B2	28.0	29.0		10.0	2	7.5		
S50B58B+0203	58	B2	29.0	30.0		10.0	2	7.5		
S50B60B+0203	60	B2	30.0	31.0		10.0	2	7.5		

Type B2 gears have riveted hub

Features

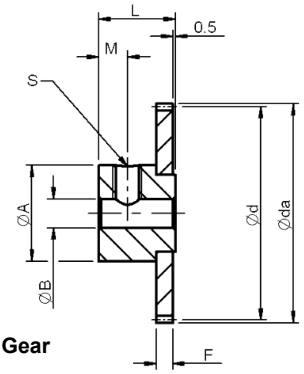
- Material: Brass (ISO CuZn38Pb2, CuZn39Pb3)
- Gear quality: ISO 9 - 10

Technical support

- Allowable backlash - see page T4-17
- For modified or fully bespoke gears, please contact us
- Product overview - see page 4-70

Associated Products
Set screws: page 13-1
Shafts: page 11-2
Bearings: page 12-1

All dimensions in mm
Pressure angle 20°



Type B2 Gear

Part number selection table

set screw not supplied

Part Number	Number of Teeth	Type	PCD Ød	OD Øda	Bore Dia (H8) ØB	Hub Dia ØA	Face Width F	Overall Length L	Set Screw S	Set Screw M
~~S50B62B+0203~~	~~62~~	~~B2~~	~~31.0~~	~~32.0~~		~~10.0~~		~~7.5~~		~~2.5~~
S50B64B+0203	64	B2	32.0	33.0		10.0		7.5		2.5
S50B65B+0203	65	B2	32.5	33.5		10.0		7.5		2.5
S50B68B+0203	68	B2	34.0	35.0		10.0		7.5		2.5
S50B70B+0203	70	B2	35.0	36.0		10.0		7.5		2.5
S50B72B+0203	72	B2	36.0	37.0		10.0		7.5		2.5
S50B75B+0203	75	B2	37.5	38.5		10.0		7.5		2.5
S50B80B+0203	80	B2	40.0	41.0	3	10.0	2	7.5	M3	2.5
S50B84B+0203	84	B2	42.0	43.0		10.0		7.5		2.5
S50B85B+0203	85	B2	42.5	43.5		10.0		7.5		2.5
S50B90B+0203	90	B2	45.0	46.0		10.0		7.5		2.5
S50B95B+0203	95	B2	47.5	48.5		10.0		7.5		2.5
S50B100B+0203	100	B2	50.0	51.0		15.0		9.5		3.5
S50B105B+0203	105	B2	52.5	53.5		15.0		9.5		3.5
S50B110B+0203	110	B2	55.0	56.0		15.0		9.5		3.5

Type B2 gears have riveted hub

NOTE: Part numbers that have been crossed out have been discontinued, please contact us for alternative suitable gears.

Features

- Material: Brass (ISO CuZn38Pb2, CuZn39Pb3)
- Gear quality: ISO 9 - 10

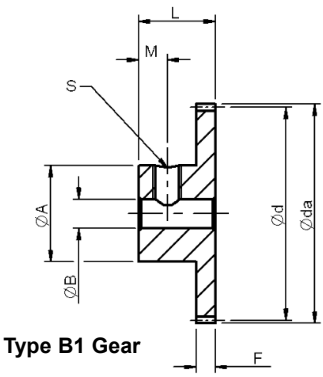
Technical support

- Allowable backlash - see page T4-17
- For modified or fully bespoke gears, please contact us
- Product overview - see page 4-70

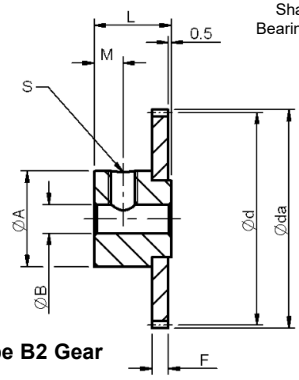
Brass Pin Hub Spur Gears

All dimensions in mm
Pressure angle 20°

Associated Products
Set screws: page 13-1
Shafts: page 11-2
Bearings: page 12-1



Type B1 Gear



Type B2 Gear

Part number selection table

set screw not supplied

Part Number	Number of Teeth	Type	PCD Ød	OD Øda	Bore Dia (H8) ØB	Hub Dia ØA	Face Width F	Overall Length L	Set Screw S	Set Screw M
S75B16B+0305	16	B1	12.0	13.5	5	10.0		10.0	M3	
S75B18B+0305	18	B1	13.5	15.0	5	11.0		10.0	M3	
S75B20B+0306	20	B1	15.0	16.5	6	12.0		10.0	M4	
S75B24B+0306	24	B1	18.0	19.5	6	14.0		10.0	M4	
S75B25B+0306	25	B1	18.75	20.25	6	14.0		10.0	M4	
S75B26B+0306	26	B1	19.5	21.0	6	14.0		10.0	M4	
S75B28B+0306	28	B1	21.0	22.5	6	14.0		10.0	M4	
S75B30B+0306	30	B1	22.5	24.0	6	15.0		10.0	M4	
S75B32B+0306	32	B1	24.0	25.5	6	15.0		10.0	M4	
S75B35B+0306	35	B1	26.25	27.75	6	18.0	3	10.0	M4	3.5
S75B36B+0306	36	B1	27.0	28.5	6	18.0		10.0	M4	
S75B40B+0306	40	B1	30.0	31.5	6	20.0		10.0	M4	
S75B42B+0306	42	B1	31.5	33.0	6	20.0		10.0	M4	
S75B45B+0306	45	B1	33.75	35.25	6	20.0		10.0	M4	
S75B48B+0306	48	B1	36.0	37.5	6	20.0		10.0	M4	
S75B50B+0306	50	B2	37.5	39.0	6	20.0		10.5	M4	
S75B55B+0306	55	B2	41.25	42.75	6	20.0		10.5	M4	
S75B56B+0306	56	B2	42.0	43.5	6	20.0		10.5	M4	
S75B58B+0306	58	B2	43.5	45.0	6	20.0		10.5	M4	

Type B2 gears have riveted hub

Features

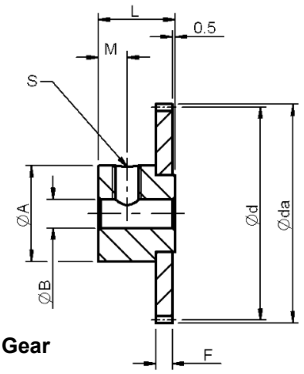
- Material: Brass (ISO CuZn38Pb2, CuZn39Pb3)
- Gear quality: ISO 9 - 10

Technical support

- Allowable backlash - see page T4-17
- For modified or fully bespoke gears, please contact us
- Product overview - see page 4-70

Associated Products
Set screws: page 13-1
Shafts: page 11-2
Bearings: page 12-1

All dimensions in mm
Pressure angle 20°



Type B2 Gear

Part number selection table

set screw not supplied

Part Number	Number of Teeth	Type	PCD Ød	OD Øda	Bore Dia (H8) ØB	Hub Dia ØA	Face Width F	Overall Length L	Set Screw S	Set Screw M
S75B60B+0306	60	B2	45.0	46.5						
S75B62B+0306	62	B2	46.5	48.0						
S75B64B+0306	64	B2	48.0	49.5						
~~S75B65B+0306~~	~~65~~	~~B2~~	~~48.75~~	~~50.25~~						
S75B66B+0306	66	B2	49.5	51.0						
S75B68B+0306	68	B2	51.0	52.5						
S75B70B+0306	70	B2	52.5	54.0						
S75B72B+0306	72	B2	54.0	55.5						
S75B75B+0306	75	B2	56.25	57.75						
S75B80B+0306	80	B2	60.0	61.5	6	20.0	3	10.5	M4	3.5
S75B85B+0306	85	B2	63.75	65.25						
S75B90B+0306	90	B2	67.5	69.0						
S75B95B+0306	95	B2	71.25	72.75						
S75B100B+0306	100	B2	75.0	76.5						
S75B105B+0306	105	B2	78.75	80.25						
S75B110B+0306	110	B2	82.5	84.0						
S75B115B+0306	115	B2	86.25	87.75						
S75B120B+0306	120	B2	90.0	91.5						

Type B2 gears have riveted hub

NOTE: Part numbers that have been crossed out have been discontinued, please contact us for alternative suitable gears.

Features

- Material: Brass (ISO CuZn38Pb2, CuZn39Pb3)
- Gear quality: ISO 9 - 10

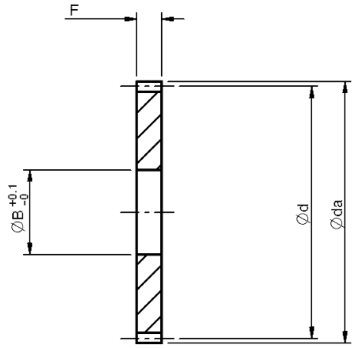
Technical support

- Allowable backlash - see page T4-17
- For modified or fully bespoke gears, please contact us
- Product overview - see page 4-70

Brass Hubless Spur Gears

All dimensions in mm
Pressure angle 20°

Associated Products
Gears: page 4-1
Shafts: page 11-2



Part number selection table

Part Number	Number of Teeth	PCD Ød	OD Øda	Face Width F	Bore Dia ØB
S50B40A-0208	40	20.0	21.0	2	8
S50B42A-0208	42	21.0	22.0		
S50B45A-0208	45	22.5	23.5		
S50B48A-0208	48	24.0	25.0		
S50B50A-0208	50	25.0	26.0		
S50B55A-0208	55	27.5	28.5		
S50B56A-0208	56	28.0	29.0		
S50B58A-0208	58	29.0	30.0		
S50B60A-0208	60	30.0	31.0		
S50B62A-0208	62	31.0	32.0		
S50B64A-0208	64	32.0	33.0		
S50B65A-0208	65	32.5	33.5		

Features

- Material: Brass (ISO CuZn38Pb2, CuZn39Pb3)
- Gear quality: ISO 9 - 10

Technical support

- Allowable backlash - see page T4-17
- For modified or fully bespoke gears, please contact us
- Product overview - see page 4-70

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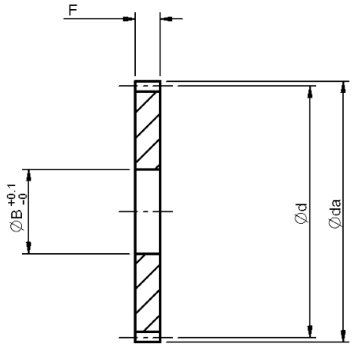
Associated Products
Gears: page 4-1
Shafts: page 11-2

All dimensions in mm
Pressure angle 20°



Part number selection table

Part Number	Number of Teeth	PCD Ød	OD Øda	Face Width F	Bore Dia ØB
S50B68A-0208	68	34.0	35.0		8
S50B70A-0208	70	35.0	36.0		8
S50B72A-0208	72	36.0	37.0		8
S50B75A-0208	75	37.5	38.5		8
S50B80A-0208	80	40.0	41.0		8
S50B84A-0208	84	42.0	43.0	2	8
S50B85A-0208	85	42.5	43.5		8
S50B90A-0208	90	45.0	46.0		8
S50B95A-0208	95	47.5	48.5		8
~~S50B100A-0212~~	~~100~~	~~50.0~~	~~51.0~~		~~12~~
S50B105A-0212	105	52.5	53.5		12
S50B110A-0212	110	55.0	56.0		12

NOTE: Part numbers that have been crossed out have been discontinued, please contact us for alternative suitable gears.

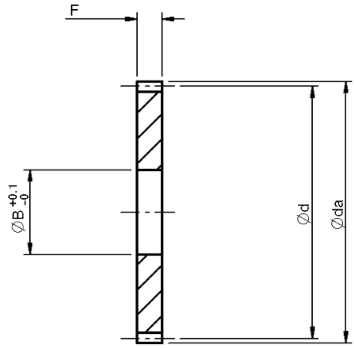
Features
- Material: Brass (ISO CuZn38Pb2, CuZn39Pb3)
- Gear quality: ISO 9 - 10

Technical support
- Allowable backlash - see page T4-17
- For modified or fully bespoke gears, please contact us
- Product overview - see page 4-70

Brass Hubless Spur Gears

All dimensions in mm
Pressure angle 20°

Associated Products
Gears: page 4-1



Part number selection table

Part Number	Number of Teeth	PCD Ød	OD Øda	Face Width F	Bore Dia ØB
S75B50A-0315	50	37.5	39.0	3	15
S75B55A-0315	55	41.25	42.75		
S75B56A-0315	56	42.0	43.5		
S75B58A-0315	58	43.5	45.0		
S75B60A-0315	60	45.0	46.5		
S75B62A-0315	62	46.5	48.0		
S75B64A-0315	64	48.0	49.5		
~~S75B65A-0315~~	~~65~~	~~48.75~~	~~50.25~~		
S75B66A-0315	66	49.5	51.0		
S75B68A-0315	68	51.0	52.5		
S75B70A-0315	70	52.5	54.0		
S75B72A-0315	72	54.0	55.5		

NOTE: Part numbers that have been crossed out have been discontinued, please contact us for alternative suitable gears.

Features

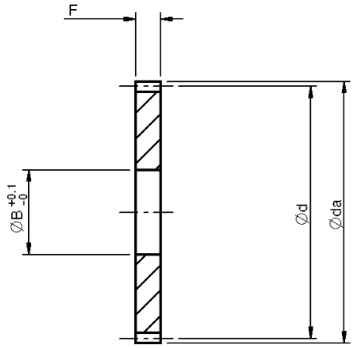
- Material: Brass (ISO CuZn38Pb2, CuZn39Pb3)
- Gear quality: ISO 9 - 10

Technical support

- Allowable backlash - see page T4-17
- For modified or fully bespoke gears, please contact us
- Product overview - see page 4-70

Associated Products
Gears: page 4-1

All dimensions in mm
Pressure angle 20°



Part number selection table

Part Number	Number of Teeth	PCD Ød	OD Øda	Face Width F	Bore Dia ØB
S75B75A-0315	75	56.25	57.75	3	15
S75B80A-0315	80	60.0	61.5		
S75B85A-0315	85	63.75	65.25		
S75B90A-0315	90	67.5	69.0		
S75B95A-0315	95	71.25	72.75		
S75B100A-0315	100	75.0	76.5		
S75B105A-0315	105	78.75	80.25		
S75B110A-0315	110	82.5	84.0		
S75B115A-0315	115	86.25	87.75		
S75B120A-0315	120	90.0	91.5		

Features
- Material: Brass (ISO CuZn38Pb2, CuZn39Pb3)
- Gear quality: ISO 9 - 10

Technical support
- Allowable backlash - see page T4-17
- For modified or fully bespoke gears, please contact us
- Product overview - see page 4-70

Section Contents

Product Range - Overview ..... Page 5-2

Precision Worms and Wheels ..... Page 5-3

Worms and Wheels ..... Page 5-6

Precision Bevel Gears ..... Page 5-8

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Brass Internal Gears ..... Page 5-15

Technical Information ..... Page T4-1

Worms, bevels and internal gears

Reliance offers a range of worms and wheels, bevel and internal gears that are designed to complement our spur gear range by offering additional motion options. As with the spur gears these gears are offered as precision grade in stainless steel and brass as a more economical alternative for less demanding applications.

Worms and wheels

Worm and wheel drives provide high ratio right angled motion in a small space. Both precision cut and precision cold rolled worms are available (refer to the features, options and technical information on the individual product pages). In general, for more accurate applications the precision cut worms will give the best results and for applications requiring a little more torque transmission precision rolled worms should be used.

Please note that this catalogue only shows a limited range of worms and wheels. Reliance has the ability to cut worms and wheels from 0.2 module up to 1 module; please contact us for requirements for special variants.

Bevel gears

Bevel gears are more efficient than worms and wheels for right angle drives, but they are typically used for lower ratio applications; if high ratios are required a spur gear reduction stage can be incorporated. Typically shaft angles of 90 degrees are used but other angles are possible – please contact us to discuss your application.

As with the worms and wheels, bevel gears are available in stainless steel and brass; the stainless steel option being higher precision than the brass option. It is important to note that with the bevel gears, where two gears are shown on the page the part number refers to the gear pair. Where only one gear is shown on the page the part number applies to individual gears only – for a pair, two gears must be ordered.

Internal gears

A small range of brass internal gears is offered for use with the brass gear range.

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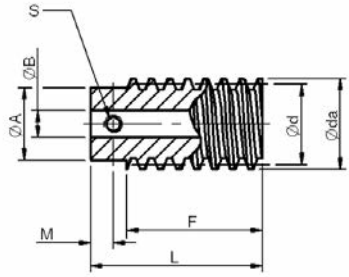
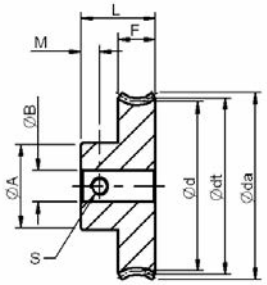
Associated Products
Set screws: page 13-11
Shafts: page 11-2
Bearings: page 12-1

All dimensions in mm
Pressure angle 20°





Part number selection tables

Worm

Set screw supplied

Part Number	Number of Starts	Thread Direction	PCD Ød	OD Øda	Bore Dia (H8) ØB	Hub Dia ØA	Face Width F	Overall Length L	Lead Angle	Set Screw S	M
W50SUR1+B	1	Right	9	10	3	7.6	13	18	3°11'	M2.5	2.5

Wormwheel

Set screw supplied

Part Number	Number of Teeth	Throat Dia Ødt	PCD Ød	Add Mod Coef x	OD Øda	Bore Dia (H8) ØB	Hub Dia ØA	Face Width F	Overall Length L	Set Screw S	M
G50B20+R1	20	11	10	-0.015	11.3	3	9	5	11	M3	3
G50B30+R1	30	16	15	-0.023	16.3	4	12		11	M3	3
G50B40+R1	40	21	20	-0.031	21.3	5	15		13	M4	4
G50B50+R1	50	26	25	-0.038	26.3	5	16		13	M4	4

Dimension x: Negative modification to allow for use of standard centres

Features

- Worm material: Stainless steel SUS304, precision cold rolled
- Wormwheel material: Brass CuZn39Pb3
- Single start worm, right hand thread

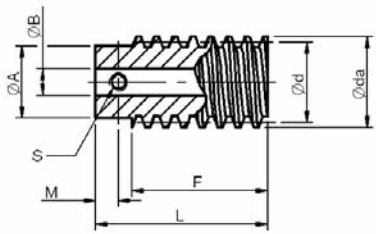
Technical support

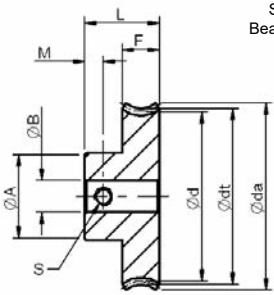
- Worm gear formulae - see page T4-19
- Backlash at nominal centres - see page T4-17
- For modified or fully bespoke worms and wheels, please contact us
- Product overview - see page 5-2

All dimensions in mm
Pressure angle 20°

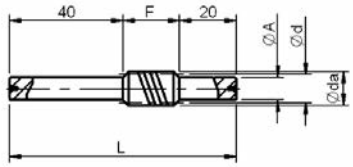
Associated Products
Set screws: page 13-11
Shafts: page 11-2
Bearings: page 12-1

Type B





Type L (Worm shaft)



Part number selection tables

Worm

Set screw not supplied

Part Number	Number of Starts	Thread Direction	PCD Ød	OD Øda	Bore Dia (H8) ØB	Hub Dia ØA	Face Width F	Overall Length L	Lead Angle	Set Screw S	M
W80SUR1+B	1	Right	10.4	12	5	10.3	14	26	4°24'	M3	3
W80SUR1-L					-	8.0(h9)	20	80		-	-

the dash (**-L**) in part number denotes worm shaft type

Wormwheel

Set screw supplied

Part Number	Number of Teeth	Throat Dia Ødt	PCD Ød	Add Mod Coef x	OD Øda	Bore Dia (H8) ØB	Hub Dia ØA	Face Width F	Overall Length L	Set Screw S	M
G80A20+R1	20	17.6	16	-0.029	18.1	5	12	6	12	M3	3
G80A30+R1	30	25.6	24	-0.044	26.1	5	16		12	M3	3
G80A40+R1	40	33.6	32	-0.059	34.1	6	18		14	M4	4
G80A50+R1	50	41.6	40	-0.074	42.1	6	20		14	M4	4

Dimension x: Negative modification to allow for use of standard centres

Features

- Worm material: Stainless steel SUS304, precision cold rolled
- Wormwheel material: Aluminium bronze casting JIS CAC702
- Single start worm, right hand thread
- Wormwheel suited to right hand, single thread worm

Technical support

- Worm gear formulae - see page T4-19
- Backlash at nominal centres - see page T4-17
- For modified or fully bespoke worms and wheels, please contact us
- Product overview - see page 5-2

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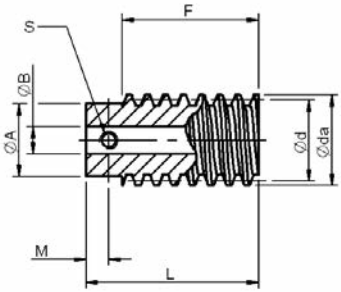
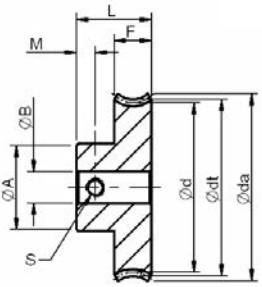
Associated Products
Set screws: page 13-11
Shafts: page 11-2
Bearings: page 12-1

All dimensions in mm
Pressure angle 20°





Part number selection tables

Worm

Set screw not supplied

Part Number	Number of Starts	Thread Direction	PCD Ød	OD Øda	Bore Dia (H8) ØB	Hub Dia ØA	Face Width F	Overall Length L	Lead Angle	Set Screw S	M
W1SUR1+B	1	Right	16	18	6	15.85	15.5	32	3°35'	M4	3.5
W1SUR2+B	2						15.0		7°11'		

Wormwheel

Set screw supplied

Part Number	Number of Teeth	Throat Dia Ødt	PCD Ød	Add Mod Coef x	OD Øda	Bore Dia (H8) ØB	Hub Dia ØA	Face Width F	Overall Length L	Set Screw S	M
G1A20R1+6	20	22	20	-0.019	23.5	6	17	10	18	M5	4
G1A30R1+6	30	32	30	-0.029	33.5	6	22				
G1A40R1+8	40	42	40	-0.039	43.5	8	25				
G1A50R1+8	50	52	50	-0.048	53.5	8	30				
G1A20R2+6	20	22	20	-0.079	23.5	6	17				
G1A30R2+6	30	32	30	-0.118	33.5	6	22				
G1A40R2+8	40	42	40	-0.158	43.5	8	25				
G1A50R2+8	50	52	50	-0.197	53.5	8	30				

Dimension x: Negative modification to allow for use of standard centres

Features and options

- Worm material: Stainless steel SUS304, precision cold rolled
- Wormwheel material: Aluminium bronze casting JIS CAC702
- Single **(R1)** and double **(R2)** start worm, right hand thread
- Left hand thread direction available, replace R with L in the part number

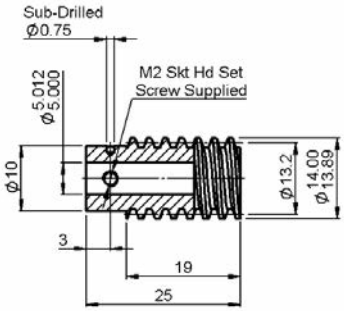
Technical support

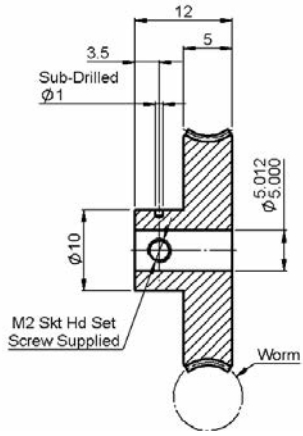
- Worm gear formulae - see page T4-19
- Backlash at nominal centres - see page T4-17
- For modified or fully bespoke worms and wheels, please contact us
- Product overview - see page 5-2

Precision Worms and Wheels

All dimensions in mm
General tolerances ±0.13 mm

Associated Products
Set screws: page 13-11
Shafts: page 11-2
Bearings: page 12-1





Part number selection tables

Worm	
Lead Angle	1º 44'
Lead	1.257
P.A.	14.5º
Part Number	**WGS-5S**

Wormwheel	Dimensions	
Part Number	**Number of Teeth**	**Pitch Diameter**
Single Start		
WGB83-S40	40	16.00
WGB83-S50	50	20.00
WGB83-S60	60	24.00
WGB83-S70	70	28.00
WGB83-S80	80	32.00
WGB83-S90	90	36.00
WGB83-S100	100	40.00
WGB83-S110	110	44.00
WGB83-S120	120	48.00

Features and options

- Gear quality AQ10 - see page T4-1
- Worm material: Stainless steel (DIN 1.4305)
- Wormwheel material: Naval brass QQ-B-637
- Anti-backlash wormwheels available
- Alternative number of starts available

Technical support

- Worm gear formulae - see page T4-19
- For modified or fully bespoke worms and wheels, please contact us
- Product overview - see page 5-2

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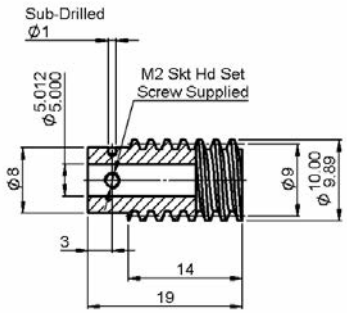
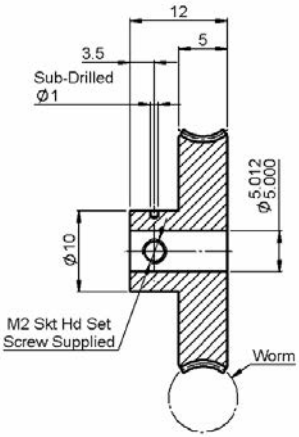
Associated Products
Set screws: page 13-11
Shafts: page 11-2
Bearings: page 12-1

All dimensions in mm
General tolerances ±0.13 mm





Part number selection tables

Worm	
Lead Angle	3º 10'
Lead	1.571
P.A.	14.5º
Part Number	**WFS-5S**

Wormwheel	Dimensions	
Part Number	**Number of Teeth**	**Pitch Diameter**
Single Start		
WFB83-S30	30	15.00
WFB83-S40	40	20.00
WFB83-S50	50	25.00
WFB83-S60	60	30.00
WFB83-S70	70	35.00
WFB83-S80	80	40.00
WFB83-S90	90	45.00
WFB83-S100	100	50.00
WFB83-S120	120	60.00

Features and options

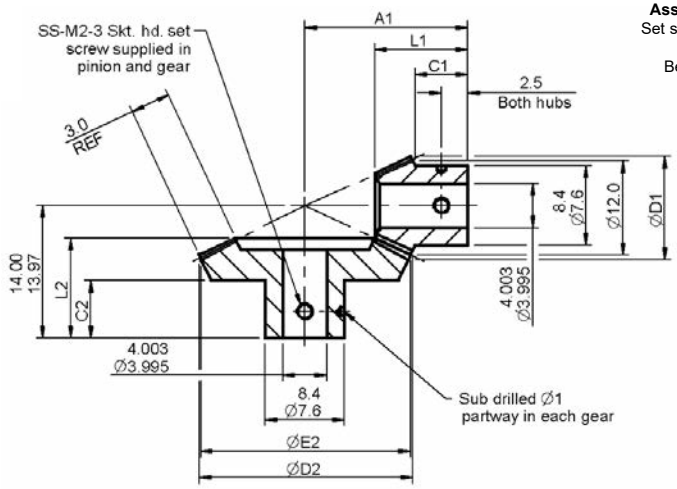
- Gear quality AQ10 - see page T4-1
- Worm material: Stainless steel (DIN 1.4305)
- Wormwheel material: Naval brass QQ-B-637
- Anti-backlash wormwheels available
- Alternative number of starts available

Technical support

- Worm gear formulae - see page T4-19
- For modified or fully bespoke worms and wheels, please contact us
- Product overview - see page 5-2

Precision Bevel Gears

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°
Material: Stainless steel 303



Associated Products
Set screws: page 13-11
Shafts: page 11-2
Bearings: page 12-1

Part number selection table

Gears supplied as a pair

Part Number (pair)	Ratio	Module	Number of Teeth		Max. TTCE (pair)	Max. TCE (pair)
			Pinion	Gear		
M04N-1S	1:1	0.4	30	30	0.025	0.050
M04N-2S	2:1		30	60		
M04N-3S	3:1		30	90		
M04N-4S	4:1		30	120		

Dimension table

Part Number (pair)	Overall Length ±0.15		Outside Dia +0.00 / -0.05		Pitch Dia	Hub Length ±0.25		Distance to Apex +0.00 / -0.03
	Pinion L1	Gear L2	Pinion ØD1	Gear ØD2	Gear ØE2	Pinion C1	Gear C2	Pinion A1
M04N-1S	10.28	10.28	12.56	12.56	12.0	6.00	6.00	14.00
M04N-2S	9.86	9.50	12.96	24.23	24.0	6.00	5.00	19.00
M04N-3S	9.00	9.13	13.07	36.15	36.0	5.33	5.00	24.00
M04N-4S	8.03	8.91	13.11	48.11	48.0	4.50	5.00	29.00

Features

- Gleason system
- Precision bevel gears supplied as a pair

Technical support

- For modified or fully bespoke gears, please contact us
- Product overview - see page 5-2

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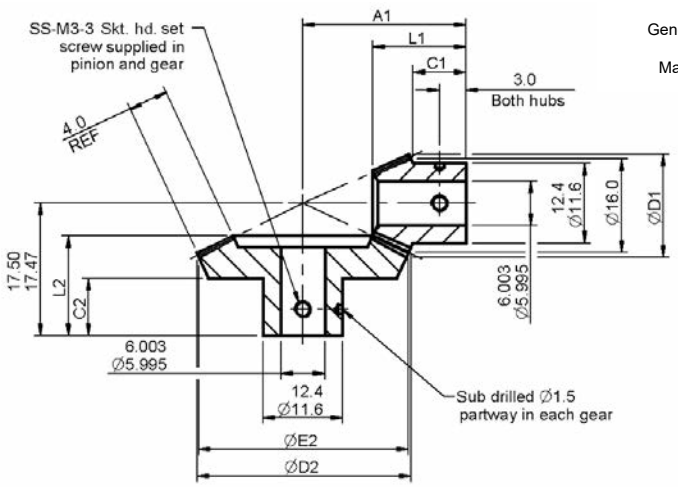
Associated Products
Set screws: page 13-11
Shafts: page 11-2
Bearings: page 12-1



All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°
Material: Stainless steel 303

Part number selection table

Gears supplied as a pair

Part Number (pair)	Ratio	Module	Number of Teeth		Max. TTCE (pair)	Max. TCE (pair)
			Pinion	Gear		
M05N-1S	1:1	0.5	32	32	0.025	0.050
M05N-2S	2:1		32	64		
M05N-3S	3:1		32	96		
M05N-4S	4:1		32	128		

Dimension table

Part Number (pair)	Overall Length ±0.15		Outside Dia +0.00 / -0.05		Pitch Dia	Hub Length ±0.25		Distance to Apex +0.00 / -0.03
	Pinion L1	Gear L2	Pinion ØD1	Gear ØD2	Gear ØE2	Pinion C1	Gear C2	Pinion A1
M05N-1S	12.52	12.52	16.71	16.71	16.0	7.50	7.50	17.50
M05N-2S	11.80	11.49	17.20	32.29	32.0	7.00	6.00	24.00
M05N-3S	9.98	10.98	17.34	48.19	48.0	5.30	6.00	30.00
M05N-4S	10.03	10.70	17.39	64.14	64.0	5.50	6.00	38.00

Features

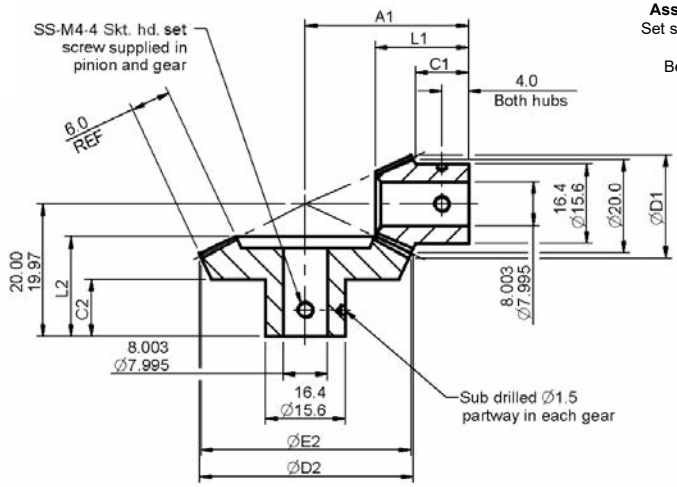
- Gleason system
- Precision bevel gears supplied as a pair

Technical support

- For modified or fully bespoke gears, please contact us
- Product overview - see page 5-2

Precision Bevel Gears

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°
Material: Stainless steel 303



Associated Products
Set screws: page 13-11
Shafts: page 11-2
Bearings: page 12-1

Part number selection table

Gears supplied as a pair

Part Number (pair)	Ratio	Module	Number of Teeth		Max. TTCE (pair)	Max. TCE (pair)
			Pinion	Gear		
M08N-1S	1:1	0.8	25	25	0.025	0.050
M08N-2S	2:1		25	50		

Dimension table

Part Number (pair)	Overall Length ±0.15		Outside Dia +0.00 / -0.05		Pitch Dia	Hub Lengths ±0.25		Distance to Apex +0.00 / -0.03
	Pinion L1	Gear L2	Pinion ØD1	Gear ØD2	Gear ØE2	Pinion C1	Gear C2	Pinion A1
M08N-1S	14.51	14.51	21.13	21.13	20.0	8.30	8.30	20.00
M08N-2S	15.70	13.00	21.93	40.47	40.0	9.00	7.50	30.00

Features

- Gleason system
- Precision bevel gears supplied as a pair

Technical support

- For modified or fully bespoke gears, please contact us
- Product overview - see page 5-2

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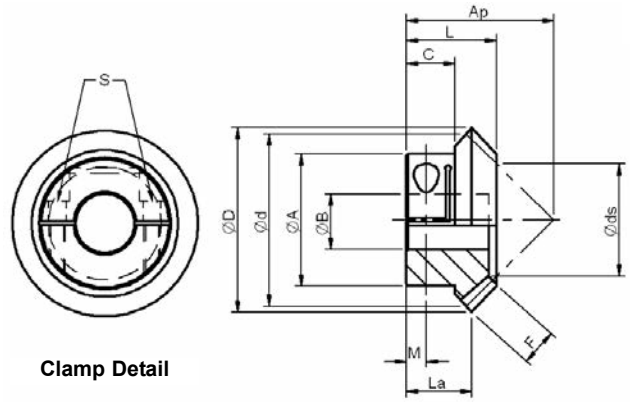
Mitre Bevel Gears
Integral Clamp

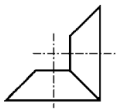
0.8, 1.0 & 1.5 Module

Associated Products
Set screws: page 13-11
Shafts: page 11-2
Bearings: page 12-1

All dimensions in mm
Pressure angle 20°
Material: Stainless steel SUS304



Clamp Detail



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Gears supplied separately

Supplied with two clamp screws

Part number selection table

Part Number	Ratio u	Module	Number of Teeth	Face Width F	Set Screw S	M	Face Angle	Distance to Apex Ap
ML80SU20-1605	1:1	0.8	20	3.7	M2.5	3	49º3'	16.00
ML1SU20-2106		1.0	20	4.3	M3	4	49º3'	21.00
ML1SU30-2808		1.0	30	6.2	M4	5	47º42'	28.00
ML1.5SU20-3010		1.5	20	6.8	M4	5	49º3'	30.00

Dimension table

Part Number	Overall Length L	Outside Dia ØD	Pitch Dia Ød	Bore Dia (H8) ØB	Hub Dia ØA	Hub Length C	Tip Distance La	Øds
ML80SU20-1605	10.95	17.13	16	5	14.5	7.25	8.57	9.5
ML1SU20-2106	14.48	21.41	20	6	16.0	9.00	11.71	11.8
ML1SU30-2808	17.84	31.41	30	8	24.0	11.00	13.71	19.4
ML1.5SU20-3010	20.38	32.12	30	10	24.0	12.00	16.06	17.7

Features and options

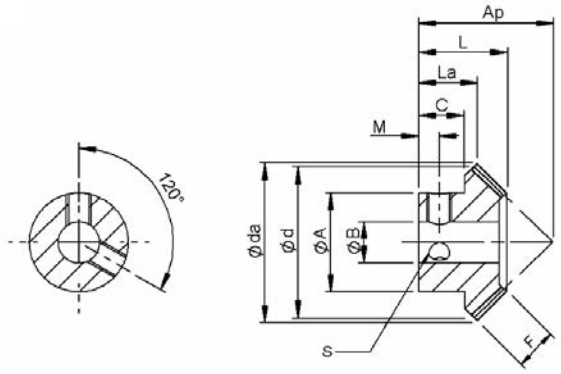
- Gear quality: ISO 8
- Recommended shaft tolerance h7 or better
- Recommended shaft surface finish 1.6Ra or better
- Small quantities of selected items available ex-stock, please visit our on-line store www.reliance.co.uk/shop

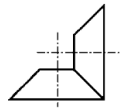
Technical support

- Mitre bevel gears are not supplied as a pair and need to be ordered separately
- For allowable backlash - see page T4-17
- Product overview - see page 5-2

All dimensions in mm
Pressure angle 20°
Material: Stainless steel SUS304

Associated Products
Set screws: page 13-11
Shafts: page 11-2
Bearings: page 12-1





Gears supplied separately
Set screw not supplied

Part number selection table

Part Number	Ratio u	Module	Number of Teeth	Face Width F	Set Screw S	M	Face Angle	Distance to Apex Ap
M80SU20*1605	1:1	0.8	20	3.7	M3	3.0	49º3'	16.00
M80SU25*1805		0.8	25	4.7	M3	3.0	48º51'	18.00
M80SU30*2006		0.8	30	5.6	M4	3.5	47º42'	20.00
M1SU20*2106		1.0	20	4.3	M4	4.5	49º3'	21.00
M1SU25*2306		1.0	25	5.3	M4	4.0	48º51'	23.00
M1SU30*2608		1.0	30	6.2	M5	4.5	47º42'	26.00

* in part number denotes two threaded holes

Dimension table

Part Number	Overall Length L	Outside Dia Øda	Pitch Dia Ød	Bore Dia (H8) ØB	Hub Dia ØA	Hub Length C	Tip Distance La
M80SU20*1605	11.00	17.13	16.0	5	12.0	6.00	8.57
M80SU25*1805	11.67	21.13	20.0	5	16.0	6.00	8.57
M80SU30*2006	12.34	25.13	24.0	6	18.0	6.00	8.57
M1SU20*2106	14.53	21.41	20.0	6	16.0	9.00	11.71
M1SU25*2306	14.70	26.41	25.0	6	20.0	8.00	11.21
M1SU30*2608	15.89	31.41	30.0	8	22.0	8.90	11.71

Features

- Gear quality: ISO 8
- Small quantities of selected items available ex-stock, please visit our on-line store www.reliance.co.uk/shop

Technical support

- Mitre bevel gears are not supplied as a pair and need to be ordered separately
- For allowable backlash - see page T4-17
- Product overview - see page 5-2

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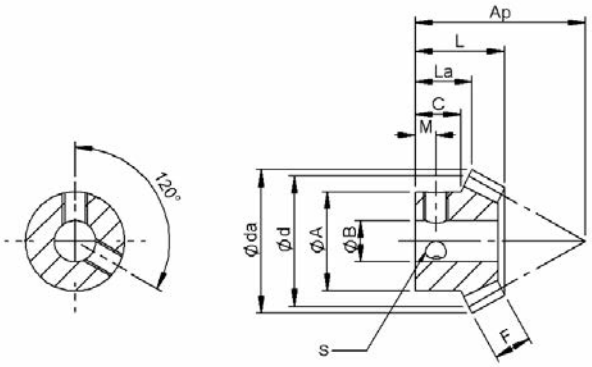
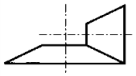
Associated Products
Set screws: page 13-11
Shafts: page 11-2
Bearings: page 12-1

All dimensions in mm
Pressure angle 20°
Material: Stainless steel SUS304





Gears supplied separately
Set screws not supplied

Part number selection table

Part Number	Ratio u	Module	Number of Teeth	Face Width F	Set Screw S	Set Screw M	Face Angle	Distance to Apex Ap
B80SU20*5	2:1	0.8	20	4.5	M3	2.5	29º8'	22.50
B80SU40*6		0.8	40	4.5	M4	3.5	66º0'	16.46
B1SU20*6		1.0	20	5.7	M4	4.0	29º8'	29.60
B1SU40*8		1.0	40	5.7	M5	4.0	66º0'	21.80

* in part number denotes two threaded holes

Dimension table

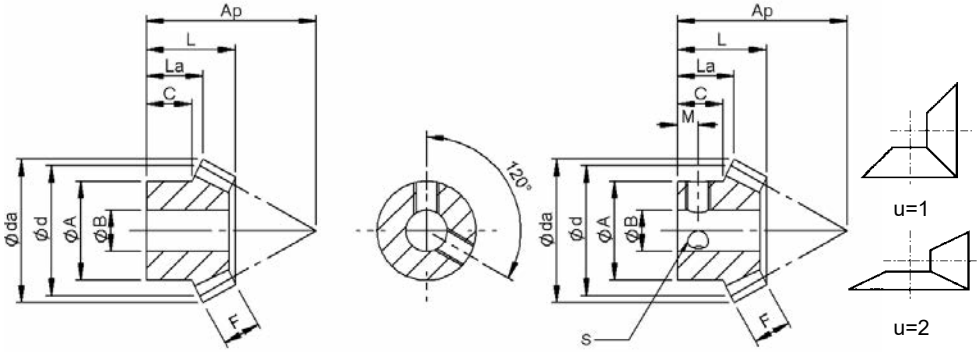
Part Number	Overall Length L	Outside Dia Øda	Pitch Dia Ød	Bore Dia (H8) ØB	Hub Dia ØA	Hub Length C	Tip Distance La
B80SU20*5	10.79	17.43	16.0	5	12.0	5.5	6.86
B80SU40*6	11.01	32.72	32.0	6	20.0	6.0	9.18
B1SU20*6	15.03	21.79	20.0	6	16.0	8.6	10.05
B1SU40*8	15.02	40.89	40.0	8	25.0	8.0	12.69

Features
- Gear quality: ISO 8
- Small quantities of selected items available ex-stock, please visit our on-line store www.reliance.co.uk/shop

Technical support
- Mitre bevel gears are not supplied as a pair and need to be ordered separately
- For allowable backlash - see page T4-17
- Product overview - see page 5-2

All dimensions in mm
Pressure angle 20°
Material: Brass ISO CuZn39Pb3

Associated Products
Shafts: page 11-2
Bearings: page 12-1



Gears supplied separately

Set screw supplied

Part number selection table

Part Number	Ratio u	Module	Number of Teeth	Face Width F	Face Angle	Distance to Apex Ap
M50B20-1103	1:1	0.5	20	2.5	49º3'	11.00
B50B20	2:1	0.5	20	3.2	29º8'	15.52
B50B40	2:1	0.5	40	3.2	66º0'	10.56
M80B20-1605	1:1	0.8	20	3.7	49º3'	16.00
B80B20	2:1	0.8	20	4.5	29º8'	22.50
B80B40	2:1	0.8	40	4.5	66º0'	16.46
M1B20*2106	1:1	1.0	20	4.3	49º3'	21.00

* in part number denotes two threaded holes

Dimension table

Part Number	Overall Length L	Outside Dia Øda	Pitch Dia Ød	Bore Dia (H8) ØB	Hub Dia ØA	Hub Length C	Tip Distance La	Hole Detail S	Hole Detail M
M50B20-1103	8.00	10.71	10.0	3	8	5.0	6.35	-	-
B50B20	8.54	10.89	10.0	3	8	5.0	5.74	-	-
B50B40	7.31	20.45	20.0	4	12	4.0	6.01	-	-
M80B20-1605	11.00	17.13	16.0	5	12	6.0	8.57	-	-
B80B20	10.79	17.43	16.0	5	12	5.5	6.86	-	-
B80B40	11.01	32.72	32.0	6	20	6.0	9.18	-	-
M1B20*2106	14.53	21.41	20.0	6	16	9.0	11.71	M4	4.5

Features

- Gear quality: ISO 8
- Small quantities of selected items available ex-stock, please visit our on-line store www.reliance.co.uk/shop

Technical support

- Bevel gears are not supplied as a pair and need to be ordered separately
- For allowable backlash - see page T4-17
- Product overview - see page 5-2

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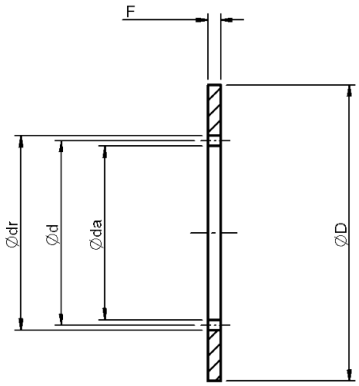
Associated Products
Spur gears: from page 4-36

All dimensions in mm
Pressure angle 20°
Material: Brass ISO CuZn38Pb2, CuZn39Pb3



Part number selection table

Part Number	Module	Number of Teeth	PCD Ød	Gear O/D Øda	Root Dia Ødr	Face Width F	Ring O/D ØD
IS50B60A-0350		60	30.0	29.0	31.25		50
IS50B80A-0360		80	40.0	39.0	41.25		60
IS50B90A-0370	0.5	90	45.0	44.0	46.25	3	70
IS50B100A-0375		100	50.0	49.0	51.25		75
IS50B120A-0380		120	60.0	59.0	61.25		80

Features and options

- 0.8 module and 1.0 module available
- Designed to fit housings with bore tolerance H8
- 1.0 module also available in carbon steel ISO C45, please contact us
- Small quantities of selected items available ex-stock, please visit our on-line store www.reliance.co.uk/shop

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Racks and Pinions - Overview ..... Page 6-2

Precision Ground Rack - Hardened Rectangular ..... Page 6-3

Precision Ground Rack - Hardened Round ..... Page 6-4

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Hobbed Brass Rack - Rectangular ..... Page 6-9

Plain Rack Pinions ..... Page 6-10

Hardened Rack Pinions ..... Page 6-10

Anti-backlash Rack Pinions ..... Page 6-11

Technical Information ..... Page T6-1

Accurate conversion from rotary to linear motion

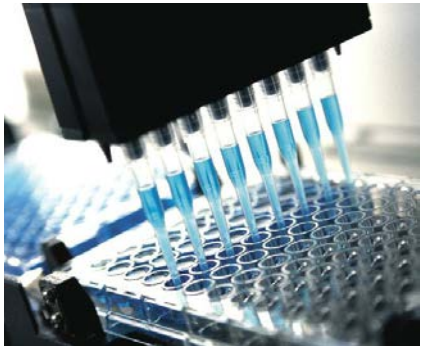
A rack and pinion system gives the ability to transfer rotary to linear motion, with all the accuracy expected of a geared system.

The racks are manufactured from ground, hardened stainless steel or ground stainless steel and available with a choice of accuracies, pitches, and lengths, plus the facility to provide modifications such as flats, journals or custom ends. Hobbed stainless steel and brass racks are also available. The rack pinions are plain or anti-backlash, also with a choice of accuracies, pitches, bore sizes, alternative materials and coatings.

Ground racks can be used for both measurement and actuation. In general the smaller pitches (1 mm) suit measurement as the smaller pinion diameter gives higher linear resolutions. The larger pitches (2 mm and 2.5 mm) allow for a higher load capacity. For most applications the rack can be used for both the feedback and the actuation; however in very precise applications it is best to us a non-drive section of the rack for feedback, alternatively a separate rack can be used. Hobbed racks are more suited to light actuation applications where cost is a key consideration.

We offer three types of rack – rectangular racks, solid round racks and tubular racks. Rectangular racks are used when the application requires the rack to be stationary and the rack pinion provides the element of motion. Our rectangular racks are used with a motor, slide and carriage for example in the printing industry for the actuation of paper cutting knives in a printing press. Round racks are a more flexible alternative, with regard to mounting, used for example in XY stages. The tubular racks allow for the passage of fluids, fibre-optics, gasses etc, making them ideal for medical and scientific applications, such as laboratory automation pick and place mechanisms.

For a fully integrated solution the Racktuator™ (see page 2-14) is a combined rack and intelligent motor actuation system. Bringing together Reliance's racks and Cool Muscle servo system, the Racktuator™ provides a very high level of control and accuracy in a compact, space saving package.



Laboratory automation systems

Printing automation systems

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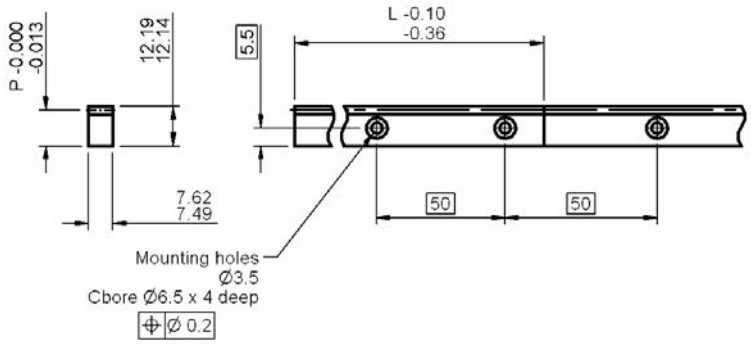
Associated Products
Rack pinions: page 6-10

All dimensions in mm
Material: Stainless steel grade 416
Treatment: Hardened to 35-45 HRc
Pressure angle 20°



Part number selection table

Part Number	Circular Pitch (mm)	Length L	Pitch Height P	Number of Holes
R9-1M-300	1	300	11.869	6
R9-2M-300	2		11.550	
R9-25M-300	2.5		11.391	

Features and options

- Cumulative pitch error less than 0.008 mm per 300 mm
- Ground teeth, accuracy grade 4 as standard
- Alternative grades available - see page T6-1
- Unlimited axis lengths possible by setting individual racks together
- Shorter lengths available
- Alternative pitches, including module
- Small quantities of selected items available ex-stock, please visit our on-line store: www.reliance.co.uk/shop

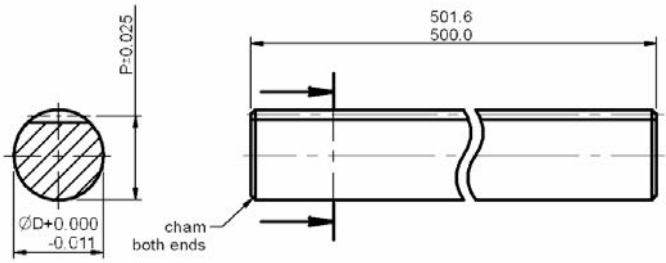
Technical support

- Installation information - see page T6-4
- Technical information - see pages T6-1 to T6-6
- PTFE based grease is recommended for lubrication
- For modified or fully bespoke racks, please contact us

Precision Ground Rack Hardened Round

All dimensions in mm
General tolerances ±0.13 mm
Material: Linear bearing shaft stainless steel grade 440C or X90CrMoV18
Treatment: Case hardened to 55 HRc min
Pressure angle 20°

Associated Products
Rack pinions: page 6-10



Part number selection table

Part Number	Circular Pitch (mm)	Outer Dia ØD	Pitch Height P	Rack Thrust (N)
RR12-1M-500	1	12	11.841	30*
RR12-2M-500	2		11.682	60*

* Rack thrust based on meshing with a 60 tooth hardened rack pinion, theoretically calculated.

Features and options

- Cumulative pitch error less than 0.025 mm
- Ground teeth, accuracy grade 3 as standard
- Higher accuracy grades available
- Bearing surface and drive in one component
- Shorter lengths available
- Alternative pitches available
- Flats, journals and end modifications
- Small quantities of selected items available ex-stock, please visit our on-line store: www.reliance.co.uk/shop

Technical support

- Installation information - see page T6-4
- Technical information - see pages T6-1 to T6-6
- PTFE based grease is recommended for lubrication
- Can be used with both open and closed linear bearings with either 4, 5 or 6 ball tracks (the bearing must be positioned so the balls do not run on the edges of the teeth - see page T6-3).
- For modified or fully bespoke racks, please contact us

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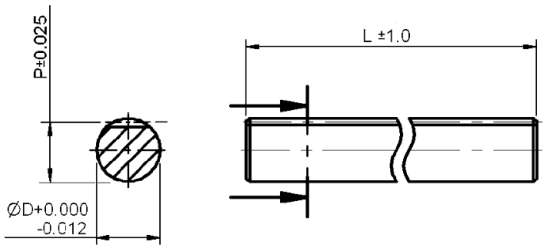
Precision Ground Rack
Soft Round Solid

1mm Circular Pitch
0.5 Module

Associated Products
Rack pinions - CP: page 6-10
Rack pinions - Module: page 4-12

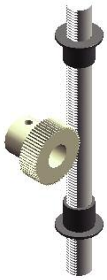
All dimensions in mm
General tolerances ±0.13 mm
Material: Stainless steel grade 300
Pressure angle 20°



Part number selection table

Part Number	Pitch (mm)	Length L	Outer Dia ØD	Bore Dia Ød	Pitch Height P	Rack Thrust (N)
RRS06-1M-500	1 mm CP	500	6	-	5.682	20*
RRS10-050-500	0.5 module		10	-	9.500	40*

* Rack thrust based on meshing with a 50 tooth stainless steel pinion, 3 N if used with a 50 tooth PEEK polymer pinion.



Features and options

- Cumulative pitch error less than 0.050 mm
- Ground teeth, accuracy grade 2 as standard
- High resistance to pitting corrosion
- Flats, journals and end modifications
- Ideal for medical and scientific applications
- Bearing surface and drive in one component
- Shorter lengths available
- Alternative pitches available
- Small quantities of selected items available ex-stock, please visit our on-line store: www.reliance.co.uk/shop

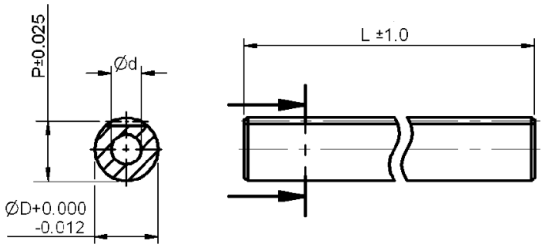
Technical support

- Installation information - see page T6-4
- Technical information - see pages T6-1 to T6-6
- PTFE based grease is recommended for lubrication
- For modified or fully bespoke racks, please contact us

Precision Ground Rack
Soft Round Tubular

All dimensions in mm
General tolerances ±0.13 mm
Material: Stainless steel grade 316
Pressure angle 20°

Associated Products
Rack pinions - CP: page 6-10
Rack pinions - Module: page 4-12



Part number selection table

Part Number	Pitch (mm)	Length L	Outer Dia ØD	Bore Dia Ød	Pitch Height P	Rack Thrust (N)
RRT06-1M-500 **RRT06-030-500**	1 mm CP 0.3 module	500	6	3.6	5.682 5.700	20*

* Rack thrust based on meshing with a 50 tooth stainless steel pinion, 3 N if used with a 50 tooth PEEK polymer pinion.

Features and options

- Cumulative pitch error less than 0.050 mm
- Ground teeth, accuracy grade 2 as standard
- High resistance to pitting corrosion
- Hollow shaft allows for the passage of fluids, fibre-optics and gasses etc
- Ideal for medical and scientific applications
- Bearing surface and drive in one component
- Flats, journals and end modifications
- Shorter lengths available
- Alternative pitches available
- Small quantities of selected items available ex-stock, please visit our on-line store: www.reliance.co.uk/shop

Technical support

- Installation information - see page T6-4
- Technical information - see pages T6-1 to T6-6
- PTFE based grease is recommended for lubrication
- For modified or fully bespoke racks, please contact us

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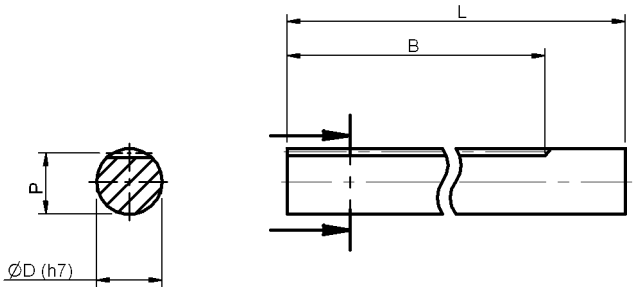
Associated Products
Rack pinions: page 4-12

All dimensions in mm
Material: Stainless steel grade 304
Pressure angle 20°



Part number selection table

Part Number	Module	Number of Teeth	Length L	Pitch Height P	Extent of Teeth B	Diameter D	Weight (g)
ORK50SU2-0815	0.5	95	202	7.5	149	8	78
ORK75SU2-0815	0.75	63	202	7.25	148	8	76
ORK80SU2-0815	0.8	59	202	7.2	148	8	76
ORK1SU3-1024	1.0	76	305	9.0	238	10	177

Features and options

- Longer tooth lengths available, please contact us
- Small quantities of selected items available ex-stock, please visit our on-line store: www.reliance.co.uk/shop

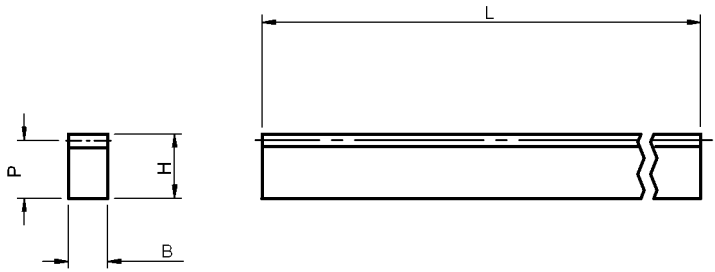
Technical support

- PTFE based grease is recommended for lubrication
- Installation information - see page T6-4
- Technical information - see pages T6-1 to T6-6
- For modified or fully bespoke racks, please contact us

Precision Hobbed Rack
Soft Rectangular

All dimensions in mm
Material: Stainless steel grade 304
Pressure angle 20°

Associated Products
Rack pinions: page 4-12



Part number selection table

Part Number	Module	Number of Teeth	Length L	Pitch Height P	Face width B (h12)	Height H (h12)	Weight (g)
RK50SU2-0310	0.5	126	202~205	9.5	3	10	45
RK50SU2-0808				7.5	8	8	95
RK75SU2-0310	0.75	83	202~205	9.25	3	10	44
RK75SU2-0808				7.25	8	8	91
RK80SU5-0510	0.8	198	505~508	9.2	5	10	183
RK1SU5-0810	1.0	158	505~508	9	8	10	280

Features and options

- Racks are manufactured from cold drawn stainless steel
- Small quantities of selected items available ex-stock, please visit our on-line store: www.reliance.co.uk/shop

Technical support

- PTFE based grease is recommended for lubrication
- Installation information - see page T6-4
- Technical information - see pages T6-1 to T6-6
- For modified or fully bespoke racks, please contact us

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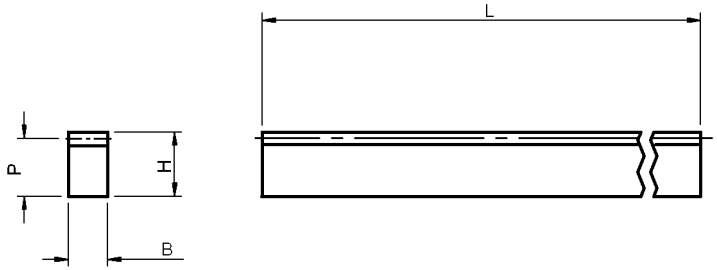
Hobbed Brass Rack Rectangular

0.3, 0.5, 0.75 & 0.8 Module

Associated Products
Rack pinions: page 4-12

All dimensions in mm
Material: Brass grade CuZn39Pb3
Pressure angle 20°



Part number selection table

Part Number	Module	Number of Teeth	Length L	Pitch Height P	Face width B (h11)	Height H (h11)	Weight (g)
RK30B2-0308	0.3	210	200	7.7	3	8	38
RK50B2-0808	0.5	125	200	7.5	8	8	98
RK75B2-0808	0.75	82	200	7.25	8	8	95
RK80B5-0510	0.8	198	505	9.2	5	10	191

Features and options

- Brass racks, ideal for lightly loaded applications, an economic balance of accuracy and load capacity against cost
- Manufactured from cold drawn material
- Small quantities of selected items available ex-stock, please visit our on-line store: www.reliance.co.uk/shop

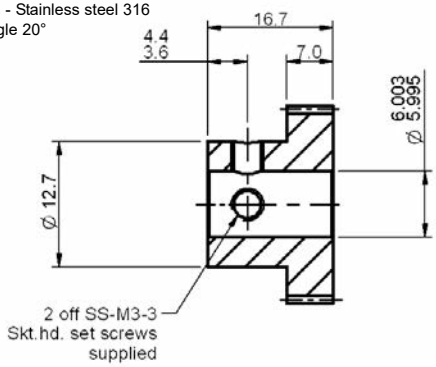
Technical support

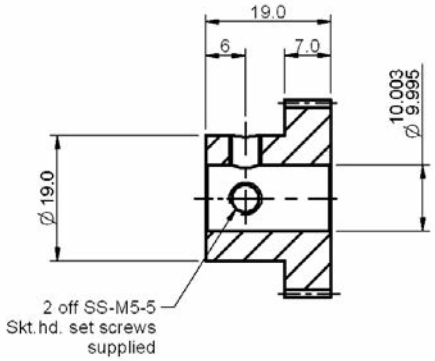
- Installation information - see page T6-4
- Technical information - see pages T6-1 to T6-6
- For modified or fully bespoke racks, please contact us

Plain and Hardened Rack Pinions

All dimensions in mm
General tolerances ±0.13 mm
Material: Hardened pinions - 17-4 PH, 35-42HRc
Plain pinions - Stainless steel 316
Pressure angle 20°

Associated Products
Racks: page 6-3





Part number selection table

Example Part No:- **SH25MS2B6F7A- 32**

Basic Part Number		Circular Pitch (mm)	Bore Size	Number of Teeth	
Plain	Hardened			Min	Max
SH1MS2B6F7A-	SH1MS8B6F7A-	1	6	43	111
SH2MS2B6F7A-	SH2MS8B6F7A-	2		23	54
SH25MS2B6F7A-	SH25MS8B6F7A-	2.5		19	43
SH1MS2B10F7A-	SH1MS8B10F7A-	1	10	63	104
SH2MS2B10F7A-	SH2MS8B10F7A-	2		33	51
SH25MS2B10F7A-	SH25MS8B10F7A-	2.5		27	40

Features and options

- Standard accuracy AQ10 - see page T4-1
- Hardened pinions provide longer pinion life, higher load capacity and higher thrust
- Higher accuracies available
- Alternative pitches available
- Alternative bore sizes, including imperial available
- Alternative materials available
- Special wear resistant coating available
- For modified or fully bespoke pinions, please contact us

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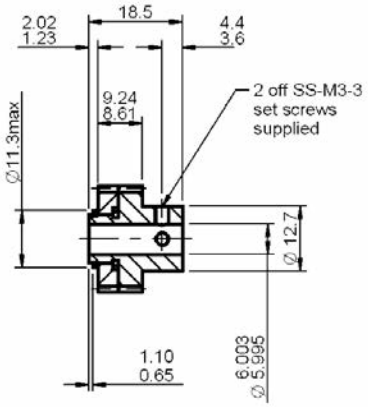
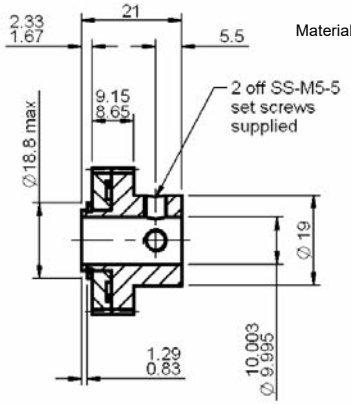
Associated Products
Racks: page 6-3

All dimensions in mm
General tolerances ±0.13 mm
Pressure angle 20°
Material: Stainless steel 316





Part number selection table

Example Part No:- AH25MS2B6F89A- 20

Basic Part Number	Circular Pitch (mm)	Bore Size	Number of Teeth	
			Min	Max
AH1MS2B6F89A-	1	6	46	54
AH2MS2B6F89A-	2		24	26
AH25MS2B6F89A-	2.5		20	20
AH1MS2B10F89A-	1	10	87	104
AH2MS2B10F89A-	2		45	51
AH25MS2B10F89A-	2.5		37	40

Features and options

- Standard accuracy AQ10 - see page T4-1
- Higher accuracies available
- Ideal for use with Reliance soft and hardened, round and rectangular racks
- Ideal for lightly loaded measurement applications
- Alternative pitches available
- Alternative bore sizes, including imperial available
- Alternative materials available
- Special wear resistant coating available
- For modified or fully bespoke pinions, please contact us

Section Contents

Leadscrew and Nut Assemblies

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Leadscrew Assemblies

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- Leadscrew Linear Slide - RGLS ..... Page 7-38
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Precise, efficient linear motion

Reliance's leadscrew and nut assemblies provide a flexible, integrated solution for linear motion. Available in a wide choice of leadscrew sizes and nut styles, with options for custom designed nuts and leadscrew end modifications, the range offers the flexibility to address a wide variety of requirements.

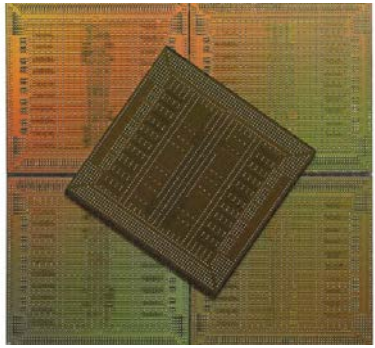
Leadscrews are provided with leads from 0.3 mm to 92 mm, screw diameters from 3 mm to 19 mm and thread lengths of up to 4 metres, making them an effective solution, even for high linear speed applications. They are available in a range of materials and coatings, with a choice of cut or standard interfacing ends, or with the option of custom machined ends. The screw thread form has been specifically designed for long life and quiet operation. It is manufactured using a rolled process, a highly consistent method of production resulting in a cost-effective, quality product.

The leadscrew and nut assemblies have been designed specifically for motion control applications, rather than using adaptations of general purpose screws and nuts. There are 11 different leadscrew nut styles, with a choice of mounts and also options for custom-designed nuts. The leadscrew nuts are made from moulded plastic, which enables custom nuts to be produced with features of the drive system, such as bushings, carriages, pulleys and gears, integrated within the nut. This type of custom, multi-functional nut can offer a significant reduction in part count, reducing cost and assembly time in the overall mechanism.

The polyacetal nuts have a lubricating additive to provide longer life which, when combined with low friction leadscrew coatings, can extend the life of a standard leadscrew assembly by up to 300%. The assemblies are self-lubricating, making them ideally suited to medical and laboratory applications.

With lead accuracies up to 0.0001 mm/mm and positional bi-directional repeatability within 1.5 micron (0.0015 mm) on anti-backlash designs, the leadscrew and nut assemblies are ideal for applications requiring precise, efficient linear motion.

Micro dispensing syringe drives



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Part number structure

LNTGF8 - 0500 - 350MM C A - TFE - LH

- **Nut Series** — See pages 7-4 to 7-6
- **Screw Diameter** — See pages 7-7 to 7-11
- **Lead** — See pages 7-7 to 7-11
- **Thread Length** — See pages 7-7 to 7-11
- **End Modifications** — See pages 7-27 to 7-35
- **Leadscrew Coatings** — Leave blank for no coating or TFE and BFE for coated
- **Thread Direction** — Leave blank for standard right-hand or LH for left-hand, where available. See pages 7-7 to 7-11

Leadscrew materials

Leadscrews are rolled from a premium grade, corrosion resistant and non-magnetic 303 stainless steel. Other materials are available including 316 and 400 series stainless steel, precipitation hardened steels, aluminium and titanium. These materials are ideally suited for industries such as medical, vacuum, cleanroom, food and human contact, salt spray and cryogenics.

Leadscrew coatings

Standard leadscrew nuts are manufactured from self-lubricating plastics. We also offer soft TFE and hard BFE low friction coatings for the leadscrew; lubrication to the screw/nut interface occurs by the nut picking up TFE particles from the coating as well as from migration of the internal lubricant from within the plastic nut.

We also supply leadscrews with specialist nickel/TFE coatings and offer a choice of coatings used in medium vacuum applications (up to 10^{-5}). Alternatively a BFE coating can be provided. This is a special proprietary hard coating which shares many of the benefits of TFE coating but offers exceptional durability in more aggressive environments and where reduced friction and a permanent coating is desired.

Although care should be taken to ensure that chips and voids do not occur in the coating, small voids have been shown to have little effect on the system performance. The lubricant, although solid, has some of the “spreading” ability of fluid lubricants. When machining bearing ends, soft fixtures are recommended to protect the coating.

TFE coated screws provide the maximum level of self-lubrication and should not be additionally lubricated or used in environments where oils or other lubricant contamination is possible.

Coatings, available for only a small additional cost, give the best results on wear life, coefficient of friction and torque to drive the leadscrew assembly. To select a coating add -TFE or -BFE to the part number shown above.

Leadscrew ends

Leadscrews are provided with the options of cut ends or a range of standard end modifications suitable for interfacing with ball bearings, circlips, couplings, pulleys and gears. Alternatively custom end modifications can be supported. See pages 7-27 to 7-35.

LBF MINI series - Miniature nut for applications that do not require anti-backlash or wear compensation.

LPX series - Long life for applications that do not require anti-backlash or wear compensation.

LNTG series - Adjustable drag, compact design, anti-backlash nut assembly allows drag torque to be pre-set according to system requirements.

LAB series - Incorporates a lockable, adjustable sleeve to set the drag torque of the nut and to provide manual backlash control.

LNTB MINI series - Miniature anti-backlash nut for applications requiring axial stiffness through life with minimal drag torque.

LNTB series - Flexible design, self-compensating anti-backlash nut assembly maintains axial stiffness throughout its life with minimum system drag torque.

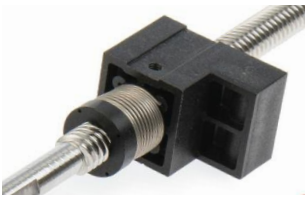
LAF series - Light loads. Precise position accuracy and repeatability. Anti-backlash.

LAK series - Moderate loads. Delivers increased load capacity and greater axial stiffness with low drag torque. Anti-backlash.

LWD series - Moderate loads. An anti-backlash, self-lubricating acetal nut. Compact design provides stiffness and accuracy for precise positioning.

LCM series - Light loads, compact design. Anti-backlash.

LAX series - Heavy loads. Delivers maximum load carrying capacity with highest axial and radial stiffness. Anti-backlash.



Custom Design - Specials to suit your application.

Alternative nut styles

Reliance offers a wide variety of standard nut designs and the matrix below is intended as a general guide to help select the most appropriate nut for the application. More detailed technical data is provided on pages 7-12 to 7-25.

Comparative star rating:	
●●●	best
●	good
☒	not applicable

Nut feature matrix

Nut Feature	Nut Style									
	LBF	LPX	LNTG	LAB	LNTB	LAF	LAK	LWD	LCM	LAX
Compactness	●●●	●●●	●●●	●●	●●	●●	●●	●●●	●●●	●
Dynamic load capability	●●●	●●●	●●	●●	●●	●	●●	●●	●●	●●●
Minimal drag torque	☒	☒	●●	●●	●●	●●	●●●	●●	●	●●●
Vibration damping (horizontal)	☒	☒	●●	●●●	●	●●●	●●	●	●	●●
Vibration damping (vertical)	☒	☒	●	●●●	●	●●●	●	●	●	●
Smoothness of operation (printing/scanning)	●	●	●●●	●●●	●●	●●	●●	●●	●	●●
Backlash/wear compensation capability	☒	☒	●	●	●●●	●●	●●●	●●●	●●●	●●●
Ease of user adjustment of drag torque/backlash	☒	☒	●●●	●●●	●	☒	●●	☒	☒	●●
Stiffness (less axial bi-directional compliance)	☒	☒	●●	●●	●●●	●●	●●●	●●●	●●●	●●●
Ability to add modifications	●●●	●●●	●	●	●●●	●●	●	●	●	●
Ability to manufacture with custom material	●●●	●●●	●●	●●	●●●	●●	●	●	●	●
Ability to work with finer leads <5.08 mm	●●●	●●●	●●●	●●●	●●	●●●	●●●	●●●	●●●	●●●
Ability to work with long leads >25.4 mm	●●●	●●●	●	●●●	●●●	●●●	●●●	●●●	●●●	●●●

Nut mounting options

The nuts are available in several different designs including anti-backlash, adjustable anti-backlash, general purpose and miniature. Most nuts are available with a triangular, round or threaded mount. Custom requirements can be supported using specialist mould designs, see page 7-26

Modified and custom nuts

All of the nuts can be modified to some degree to help tailor them to specific requirements, alternatively fully customised nuts can be supplied, see page 7-26.

Nut materials

Due to the controlled manufacturing processes, we can offer nuts in different types of plastics that can be moulded, e.g. PEEK, special carbon or other fibre filled plastics. Even though the standard design and materials developed for the leadscrew nut assemblies are commonly plastics, metal nuts made from bronze, brass or aluminium alloy can also be supplied. For the optimum technical and cost effective solution, we are able to supply special moulded nuts impregnated with carbon fibre for strength, or nuts over-moulded on metal to help minimise the number of components in the assembly.

Leadscrew and Nut Assembly Selection Guide

										
Nominal Screw Diameter	**Property**	**LBF[1] LPX[2] Series**	**LNTG Series**	**LAB Series**	**LNTB Series**	**LAF Series**	**LAK Series**	**LWD Series**	**LCM Series**	**LAX Series**
3 mm	Dynamic load	11 kg	2.3 kg		2.3 kg					
	Static friction drag torque	free wheeling	0.001 - 0.004Nm		0.001 - 0.004Nm					
5 mm	Dynamic load	11 kg	2.3 kg		2.3 kg			4.5 kg	2.3 kg	
	Static friction drag torque	free wheeling	0.001 - 0.004Nm		0.001 - 0.004Nm			0.03 Nm max	0.03 Nm	
6 mm	Dynamic load	20 kg	4.6 kg	2.3 kg	4.6 kg	2.3 kg		4.5 kg	2.3 kg	
	Static friction drag torque	free wheeling	0.004 - 0.014Nm	0.004 - 0.014Nm	0.004 - 0.014Nm	0.002Nm		0.03Nm max	0.03Nm	
8 mm	Dynamic load	35 kg	10 kg	5 kg	10 kg	5 kg	10 kg	11.3 kg	3.6 kg	
	Static friction drag torque	free wheeling	0.007 - 0.02Nm	0.01 - 0.02Nm	0.01 - 0.02Nm	0.01 - 0.03Nm	0.01 - 0.02Nm	0.04Nm max	0.04Nm	
10 mm	Dynamic load	35 kg	10 kg	5 kg	10 kg	5 kg	10 kg	11.3 kg	3.6 kg	
	Static friction drag torque	free wheeling	0.007 - 0.02Nm	0.01 - 0.02Nm	0.01 - 0.02Nm	0.01 - 0.03Nm	0.01 - 0.02Nm	0.04Nm max	0.04Nm	
11 mm	Dynamic load	40 kg		7 kg	13 kg	7 kg		34 kg		
	Static friction drag torque	free wheeling		0.014 - 0.03Nm	0.007 - 0.02Nm	0.014 - 0.04Nm		0.06Nm max		
13 mm	Dynamic load	68 kg		11 kg	45 kg	11 kg		34 kg		68 kg
	Static friction drag torque	free wheeling		0.014 - 0.03Nm	0.014 - 0.04Nm	0.02 - 0.05Nm		0.06Nm max		0.014 - 0.04Nm
16 mm	Dynamic load	100 kg		16 kg	56 kg	16 kg				113 kg
	Static friction drag torque	free wheeling		0.02 - 0.05Nm	0.014 - 0.04Nm	0.028 - 0.055Nm				0.014 - 0.04Nm
19 mm	Dynamic load	160 kg		25 kg	68 kg					159 kg
	Static friction drag torque	free wheeling		0.03 - 0.063Nm	0.02 - 0.05Nm					0.02 - 0.05Nm
See Pages		**7-12 to 7-14**	**7-15 & 7-16**	**7-17**	**7-18 to 7-20**	**7-21**	**7-22**	**7-23**	**7-24**	**7-25**

[1] LBF available in 3 mm and 5 mm screw diameter only.
[2] LPX available from 6mm screw diameter.

Information

- For technical information see pages T7-1 to T7-5
- Larger screw diameters available, contact us

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Compatible Nut Styles	Lead mm	Nominal Screw Diameter	Part Number	Root Dia mm	Outside Diameter	Efficiency %*	Left Hand Available
LBF	0.30	2 mm	2-0012	1.73	2.01	24**	
	0.40		2-0016	1.47	1.91	30**	
	0.50		2-M005	1.45	1.96	36**	
	1.00		2-M010	1.50	2.01	52**	
	2.00		2-M020	1.45	1.96	66**	
LBF, LNTG, LNTB	0.61	3.2 mm	3.2-0024	2.36	3.28	44	
	1.00		3.2-M010	2.39	3.28	57	
	1.22		3.2-0048	2.36	3.28	61	
	1.91		3.2-0075	2.36	3.28	70	
	2.44		3.2-0096	2.36	3.28	75	✓
	3.18		3.2-0125	1.98	3.18	80	LH only
LBF, LNTG, LNTB	0.50	3.3 mm	3.3-M005	2.64	3.35	42	
	1.00		3.3-M010	2.03	3.35	61	
	2.00		3.3-M020	2.03	3.35	75	
	4.00		3.3-M040	2.03	3.35	84	
	8.00		3.3-M080	2.03	3.35	87	
LBF, LNTG, LNTB	0.30	3.6 mm	3.6-0012	3.12	3.56	26	
	0.61		3.6-0024	2.67	3.56	43	
	1.22		3.6-0048	2.06	3.56	62	
	2.44		3.6-0096	2.06	3.56	75	
	10.00		3.6-M100	2.59	3.56	86	
LBF, LNTG, LNTB	0.84	4 mm	4-0033	2.95	3.96	45	✓
	1.27		4-0050	2.44	3.96	59	LH Only
	2.39		4-0094	3.25	4.17	67	
	3.18		4-0125	3.30	4.27	74	
	6.35		4-0250	3.30	3.96	83	
	9.53		4-0375	3.30	3.96	85	
	12.7		4-0500	3.30	3.96	86	
LNTB, LNTG, LBF, LWD, LCM	0.50	5 mm	5-M005	4.14	4.78	30	
	0.64		5-0025	3.81	4.78	39	
	1.00		5-M010	3.66	4.78	47	
	1.27		5-0050	3.15	4.78	58	
	2.54		5-0100	3.45	4.78	69	
	4.76		5-0188	4.24	4.78	78	
	5.08		5-0200	3.15	4.78	82	
	9.53		5-0375	4.09	4.78	84	
	10.16		5-0400	3.15	4.78	84	
	10.85		5-0427	4.11	4.78	85	
	12.70		5-0500	3.61	4.78	86	✓

* Listed efficiencies are theoretical values based on a TFE coated leadscrew
** Listed efficiencies for 2mm diameter leadscrews are theoretical values based on non-coated leadscrews
Note: Thread lengths can be specified up to 4m, depending on diameter and lead.

Compatible Nut Styles	Lead mm	Nominal Screw Diameter	Part Number	Root Dia mm	Outside Diameter	Efficiency %*	Left Hand Available
LNTB, LNTG, LBF, LWD	0.61	5.6 mm	5.6-0024	4.60	5.54	31	
	0.79		5.6-0031	4.06	5.18	39	
	1.22		5.6-0048	3.96	5.49	50	
	1.27		5.6-0050	3.43	5.08	52	
	1.59		5.6-0063	3.61	5.54	60	
	2.44		5.6-0096	3.96	5.54	66	
	4.88		5.6-0192	3.96	5.54	78	
	6.35		5.6-0250	3.56	5.18	81	✓
	9.75		5.6-0384	4.04	5.54	86	
LCM, LAF, LAB, LNTB, LNTG, LPX, LWD	0.61	6 mm	6-0024	5.54	6.35	28	
	0.64		6-0025	5.44	6.35	30	
	0.79		6-0031	5.28	6.35	34	
	1.00		6-M010	4.83	6.35	40	
	1.22		6-0048	4.83	6.35	45	
	1.27		6-0050	4.85	6.35	46	✓
	1.50		6-M015	4.37	6.35	52	
	1.59		6-0063	4.32	6.35	52	
	2.00		6-M020	4.32	6.35	59	
	2.44		6-0096	4.83	6.35	61	
	2.54		6-0100	4.83	6.35	62	
	3.00		6-M030	4.45	6.35	68	
	3.18		6-0125	4.83	6.35	67	
	5.00		6-M050	4.37	6.35	72	
	5.08		6-0200	4.32	6.35	65	
	6.35		6-0250	4.27	6.35	79	✓
	7.94		6-0313	4.67	6.35	81	
	8.46		6-0333	4.32	6.35	82	
	10.00		6-M100	4.32	6.35	78	
	10.16		6-0400	4.32	6.35	84	
	12.70		6-0500	4.29	6.35	85	✓
	19.05		6-0750	4.32	6.35	86	
	25.40		6-1000	4.32	6.35	84	✓
LCM, LAF, LAB, LNTB LNTG, LPX, LWD, LAK	1.00	8 mm	8-M010	6.63	8.00	34	
	1.44		8-0057	6.17	8.00	43	
	1.88		8-0074	5.36	7.92	51	
	2.82		8-0111	5.89	7.92	60	
	4.24		8-0167	5.36	7.92	69	
	6.35		8-0250	5.94	7.92	76	
	12.70		8-0500	5.89	7.92	83	
	20.32		8-0800	6.17	7.77	86	
LCM, LAF, LAB, LAK, LNTB, LNTG, LPX, LWD	0.64	10 mm	10-0025	8.56	9.53	21	
	1.00		10-M010	8.89	10.01	28	
	1.06		10-0042	8.13	9.53	34	
	1.27		10-0050	7.65	9.53	36	✓
	1.40		10-0055	7.70	9.53	38	

* Listed efficiencies are theoretical values based on a TFE coated leadscrew
Note: Thread lengths can be specified up to 4 m, depending on diameter and lead.

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Compatible Nut Styles	Lead mm	Nominal Screw Diameter	Part Number	Root Dia mm	Outside Diameter	Efficiency %*	Left Hand Available
LCM, LAF, LAB, LAK, LNTB, LNTG, LPX, LWD	1.50	10 mm	10-M015	7.95	9.88	38	✓
	1.73		10-0068	7.49	9.86	42	
	2.00		10-M020	6.71	9.53	47	
	2.12		10-0083	7.44	9.53	48	
	2.54		10-0100	6.76	9.53	53	✓
	3.18		10-0125	7.49	9.53	59	
	4.00		10-M040	6.96	9.53	65	
	4.23		10-0167	6.63	9.42	61	
	5.00		10-M050	6.76	9.53	69	
	5.08		10-0200	6.76	9.53	69	✓
	6.35		10-0250	6.81	9.53	70	
	7.62		10-0300	6.48	9.53	76	
	8.46		10-0333	6.22	9.53	78	
	9.22		10-0363	6.60	9.53	79	✓
	9.53		10-0375	6.73	9.53	79	
	10.00		10-M100	6.60	9.53	79	
	10.16		10-0400	7.44	9.53	79	
	12.00		10-M120	7.29	9.86	82	
	12.70		10-0500	6.73	9.86	81	✓
	16.94		10-0667	6.93	9.53	83	
	19.05		10-0750	6.93	9.86	84	
	25.00		10-M250	6.65	9.53	84	
	25.40		10-1000	6.45	9.73	84	
	30.48		10-1200	6.45	9.73	84	✓
	31.75		10-1250	7.06	9.53	84	
	38.10		10-1500	6.71	9.53	83	
LAF, LAB, LNTB, LPX, LWD	1.27	11 mm	11-0050	9.19	11.10	30	
	1.59		11-0063	9.09	11.07	38	✓
	2.00		11-M020	9.50	11.99	42	
	2.82		11-0111	8.31	11.10	52	
	3.00		11-M030	9.22	11.13	52	
	3.18		11-0125	9.07	11.13	54	
	5.00		11-M050	8.00	11.13	65	
	6.00		11-M060	7.95	11.00	70	
	6.35		11-0250	8.26	11.23	70	
	7.80		11-0307	8.71	11.30	73	
	8.26		11-0325	8.69	11.28	74	
	10.00		11-M100	8.41	11.33	78	
	12.00		11-M120	8.08	11.13	80	
	12.70		11-0500	8.31	11.48	80	
	15.62		11-0615	9.55	12.07	82	

* Listed efficiencies are theoretical values based on a TFE coated leadscrew
Note: Thread lengths can be specified up to 4 m, depending on diameter and lead.

Compatible Nut Styles	Lead mm	Nominal Screw Diameter	Part Number	Root Dia mm	Outside Diameter	Efficiency %*	Left Hand Available
LAF, LAB, LNTB, LAX, LPX, LWD	1.27	13 mm	13-0050	11.00	12.57	29	
	2.00		13-M020	9.02	12.01	41	
	2.50		13-M025	9.73	12.70	46	
	2.54		13-0100	9.25	12.45	46	✓
	3.18		13-0125	9.50	12.70	51	
	4.00		13-M040	9.75	12.70	58	
	4.06		13-0160	9.86	12.70	67	
	4.23		13-0167	9.75	12.70	58	
	5.00		13-M050	9.27	12.70	62	
	5.08		13-0200	9.30	12.50	63	✓
	6.35		13-0250	9.70	12.70	67	
	8.46		13-0333	9.19	12.62	73	✓
	10.00		13-M100	9.19	12.62	76	
	10.16		13-0400	9.25	12.62	76	
	12.70		13-0500	8.94	12.40	79	
	16.00		13-M160	9.50	12.70	80	
	19.05		13-0750	10.13	13.34	83	
	20.32		13-0800	9.40	12.70	83	
	25.00		13-M250	9.37	12.70	84	
	25.40		13-1000	9.45	12.45	84	✓
	38.10		13-1500	9.50	12.45	85	
	50.80		13-2000	9.60	12.40	87	
LAF, LAB LNTB, LAX LPX	2.54	16 mm	16-0100	12.65	15.62	40	
	3.18		16-0125	11.94	15.88	45	✓
	5.08		16-0200	12.57	15.88	53	
	6.35		16-0250	11.91	15.88	63	
	8.00		16-M080	12.52	15.93	68	
	12.70		16-0500	12.14	15.88	76	✓
	16.00		16-M160	12.47	15.88	78	
	25.40		16-1000	12.22	15.88	83	
	38.10		16-1500	12.67	15.88	85	
	50.80		16-2000	12.67	15.88	86	✓
LAB, LNTB LAX, LPX	1.59	19 mm	19-0063	17.04	19.05	25	
	2.50		19-M025	15.90	18.85	35	
	2.54		19-0100	15.85	18.95	35	✓
	4.23		19-0167	16.38	18.47	47	
	5.00		19-M050	15.85	18.92	51	
	5.08		19-0200	16.05	18.82	52	
	6.35		19-0250	16.23	18.57	57	
	7.00		19-M070	15.85	19.05	59	
	8.46		19-0333	15.85	19.05	64	
	12.70		19-0500	15.82	18.90	73	
	14.00		19-M140	15.85	19.05	73	
	15.00		19-M150	15.82	19.02	74	

* Listed efficiencies are theoretical values based on a TFE coated leadscrew
Note: Thread lengths can be specified up to 4 m, depending on diameter and lead.

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Compatible Nut Styles	Lead mm	Nominal Screw Diameter	Part Number	Root Dia mm	Outside Diameter	Efficiency %*	Left Hand Available
LAB LNTB LAX LPX	18.00	19 mm	19-M180	16.51	19.81	77	
	19.00		19-M190	13.89	17.07	80	
	20.00		19-M200	16.46	19.81	78	
	20.32		19-0800	15.70	19.05	79	
	24.00		19-M240	16.08	18.64	80	
	25.40		19-1000	15.72	18.87	81	✓
	38.10		19-1500	14.99	18.08	84	✓
	50.00		19-M500	15.75	19.08	84	
	50.80		19-2000	15.52	18.85	84	✓
	60.96		19-2400	15.75	19.05	84	✓
	92.00		19-M920	16.10	19.05	87	✓

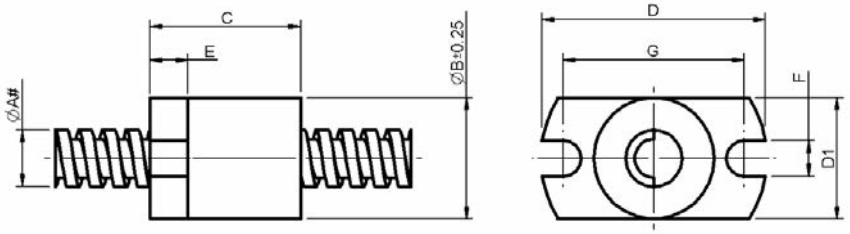
* Listed efficiencies are theoretical values based on a TFE coated leadscrew
Note: Thread lengths can be specified up to 4m, depending on diameter and lead.

Information

- Larger screw diameters available, visit www.reliance.co.uk/shop
- For leadscrew and nut ordering configurations - see page 7-3
- For leadscrew end modifications - see pages 7-27 to 7-35
- For product overview - see pages 7-2 to 7-6
- For technical information - see pages T7-1 to T7-5

All dimensions in mm
General tolerances ±0.5 mm
Detailed tolerances: Please contact us
Material: Polyacetal

Associated Products
Reli-a-Flex® couplings: page 8-6
Linear slides: page 9-1
Intelligent motors: page 2-2
Plain bearings: page 12-1

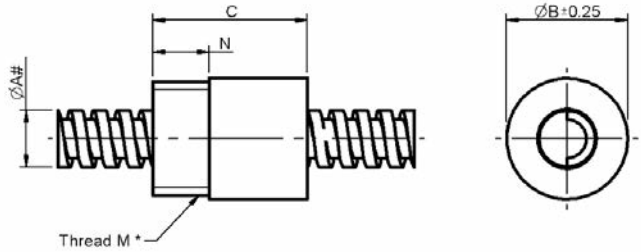


Part number selection table - LBB and LBF series, barrel and flange mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Flange D	Flange Width E	Flange Height D1	Slot F	Centres G	Dynamic Load kg	Drag Torque Nm
LBB2-	2.0	5.5	8	--	--	5.08	--	--	4.5	Free wheeling
LBF2-	2.0	5.5	8	11.9	2.0	5.5	1.80	9.00	4.5	
LBF3-	3[1]	10.2	13	19.1	3.2	10.2	3.05	15.24	11	
LBF4-	4.0									
LBF5-	5[2]									

[1] LBF3 for Ø 3.2, 3.3 and 3.6 [2] LBF5 for Ø 5.0 and 5.6

The LBB nut series is a flangeless style barrel nut with two flats at 5.08mm diametrically opposed running the full length of the nut.



Part number selection table - LBY series, thread mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Thread M*	Thread Length N	Dynamic Load kg	Drag Torque Nm
LBY3-	3[1]	10.2	13	3/8-24	4.75	11	Free wheeling
LBY4-	4.0						
LBY5-	5[2]						

[1] LBY3 for Ø 3.2, 3.3 and 3.6 [2] LBY5 for Ø 5.0 and 5.6

*Thread shown imperial as standard, metric available, please specify diameter and pitch

For the full range of nominal diameters, see table on pages 7-7 to 7-11

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Associated Products
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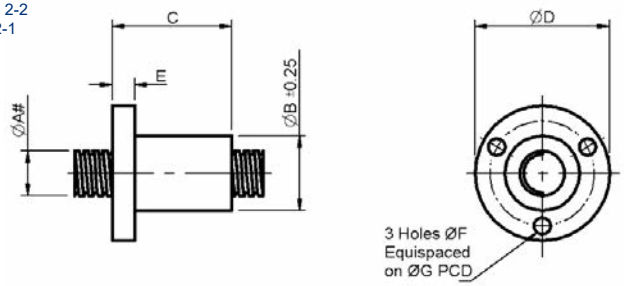
Intelligent motors: page 2-2
Plain bearings: page 12-1

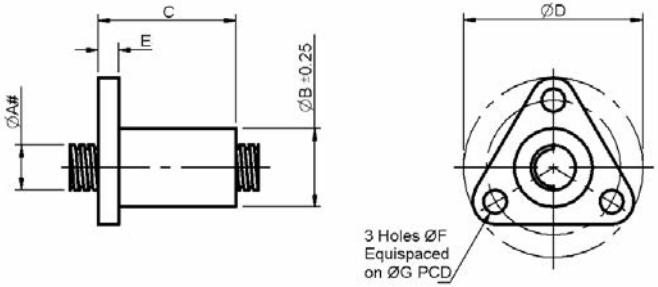
All dimensions in mm
General tolerances ±0.5 mm
Detailed tolerances: Please contact us
Material: Polyacetal



Part number selection table - LPX series, flange mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Flange ØD	Flange Width E	Hole Dia ØF	Mounting Holes PCD ØG	Dynamic Load kg	Drag Torque Nm
LPX6-	6.4	12.7	25.4	25.4	4.8	3.56	19.05	20	Free wheeling
LPX8-	8.0	15.9		28.7			22.23	35	
LPX10-	9.6								
LPX11-	11.3	19.1	38	38.1		5.16	28.58	40	
LPX13-	12.7							68	
LPX16-	15.9	22.2					30.18	100	
LPX19-	19.1	28.4	51	44.4	6.4		36.53	160	

Screw sizes 22 and 24 mm available



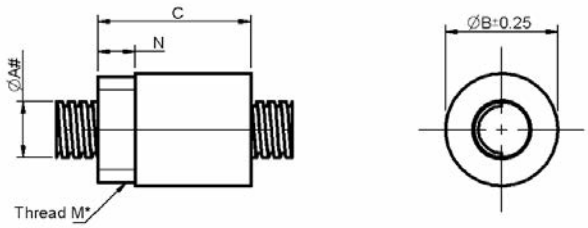
Part number selection table - LPXZ series, flange mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Flange ØD	Flange Width E	Hole Dia ØF	Mounting Holes PCD ØG	Dynamic Load kg	Drag Torque Nm
LPXZ6-	6.4	12.7	25.4	25.4	4.3	3.63	19.05	20	Free wheeling
LPXZ8-	8.0	16.6	48.3	38.1		5.00	28.58	35	
LPXZ10-	9.6								
LPXZ11-	11.3	19.1						40	
LPXZ13-	12.7							68	

Plain Nuts - General Purpose

All dimensions in mm
General tolerances ±0.5 mm
Detailed tolerances: Please contact us
Material: Polyacetal

Associated Products
Reli-a-Flex® couplings: page 8-6
Linear slides: page 9-1
Intelligent motors: page 2-2
Plain bearings: page 12-1



Part number selection table - LPXY series, thread mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Thread M*	Thread Length N	Dynamic Load kg	Drag Torque Nm
LPXY6-	6.4	15.9	25.4	9/16-18	4.75	20	Free wheeling
LPXY8-	8.0	19.1		5/8-18	6.35	35	
LPXY10-	9.6						
LPXY11-	11.3	25.4	38	15/16-16	9.53	40	
LPXY13-	12.7					68	
LPXY16-	15.9					100	
LPXY19-	19.1	38.1	51	1 3/8-16	12.70	160	

Note: All LPX, LPXZ and LPXY nuts are free wheeling
*Thread shown imperial as standard, metric available, please specify diameter and pitch
Screw sizes 22 and 24 mm available
For the full range of nominal diameters, see table on pages 7-7 to 7-11

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Associated Products
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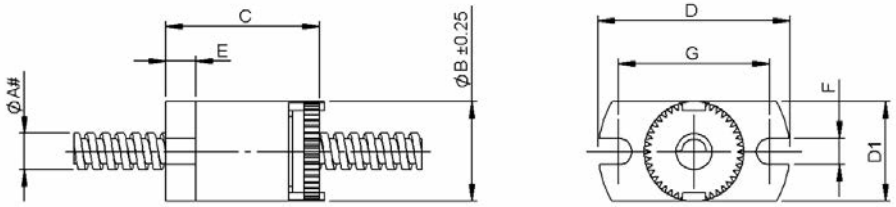
Linear slides: page 9-1
Intelligent motors: page 2-2
Plain bearings: page 12-1

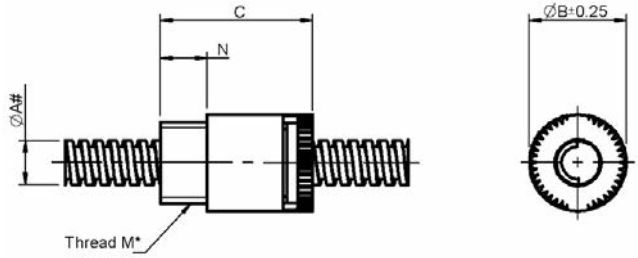
All dimensions in mm
General tolerances ±0.5 mm
Detailed tolerances: Please contact us
Material: Polyacetal



Part number selection table - LNTGF series, flange mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Flange D	Flange Width E	Flange Height D1	Slot F	Centres G	Dynamic Load kg	Drag Torque Nm
LNTGF3-	3[1]	10.2	12.7	19.1	3.2	10.2	3.05	15.24	2.3	0.004
LNTGF4-	4.0									
LNTGF5-	5[2]									

[1] LNTGF3 for Ø 3.2, 3.3 and 3.6 [2] LNTGF5 for Ø 5.0 and 5.6



Part number selection table - LNTGY series, thread mount

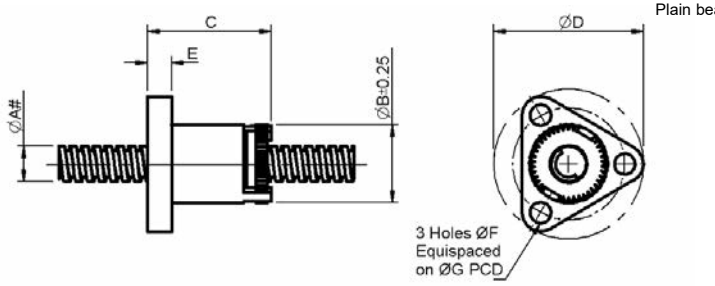
Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Thread M*	Thread Length N	Dynamic Load kg	Drag Torque Nm
LNTGY3-	3[1]	10.2	12.7	3/8-24	4.06	2.3	0.004
LNTGY4-	4.0						
LNTGY5-	5[2]						

[1] LNTGY3 for Ø 3.2, 3.3 and 3.6 [2] LNTGY5 for Ø 5.0 and 5.6
*Thread shown imperial as standard, metric available, please specify diameter and pitch
For the full range of nominal diameters, see table on pages 7-7 to 7-11

Adjustable Anti-Backlash Special Purpose Nuts

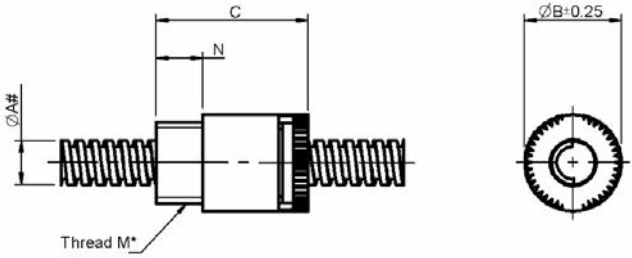
All dimensions in mm
General tolerances ±0.5 mm
Detailed tolerances: Please contact us
Material: Polyacetal

Associated Products
Reli-a-Flex® couplings: page 8-6
Linear slides: page 9-1
Intelligent motors: page 2-2
Plain bearings: page 12-1



Part number selection table - LNTGF series, flange mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Flange ØD	Flange Width E	Hole Dia ØF	Mounting Holes PCD ØG	Dynamic Load kg	Drag Torque Nm
LNTGF6-	6.4	13.2	20.3	25.4	4.0	3.63	19.1	4.5	0.004-0.014
LNTGF8-	8.0	20.3	25.4	38.1	5.1	5.00	28.6	9.1	0.007-0.02
LNTGF10-	9.6								



Part number selection table - LNTGY series, thread mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Thread M*	Thread Length N	Dynamic Load kg	Drag Torque Nm
LNTGY6-	6.4	13.2	22	7/16-20	6.35	4.5	0.004-0.014
LNTGY8-	8.0	20.3	30	3/4-20	9.53	9.1	0.007-0.02
LNTGY10-	9.6						

*Thread shown imperial as standard, metric available, please specify diameter and pitch
For the full range of nominal diameters, see table on pages 7-7 to 7-11

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Associated Products
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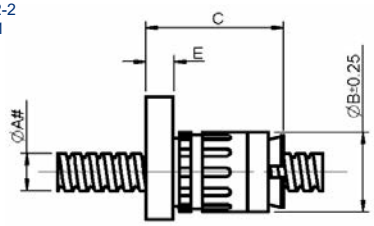
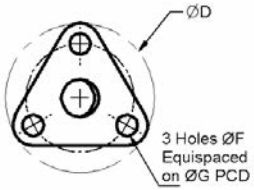
Linear slides: page 9-1
Intelligent motors: page 2-2
Plain bearings: page 12-1

All dimensions in mm
General tolerances ±0.5 mm
Detailed tolerances: Please contact us
Material: Polyacetal

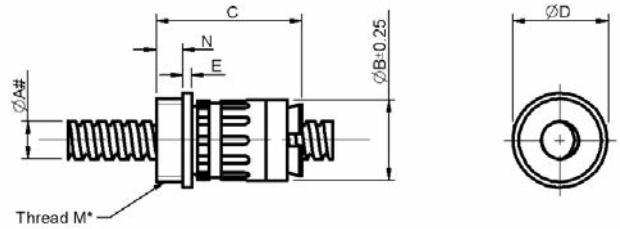




Part number selection table - LAB series, flange mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Flange ØD	Flange Width E	Hole Dia ØF	Mounting Holes PCD ØG	Dynamic Load kg	Drag Torque Nm
LAB6-	6.4	13.5	25.4	25.4	4.6	3.6	19.05	2.3	0.004-0.014
LAB8-	8.0	18.8	48.0	38.1		5.1	28.58	5.0	0.007-0.02
LAB10-	9.6								
LAB11-	11.3	20.3						7.0	0.014-0.03
LAB13-	12.7	22.6	50.8	41.2	7.1		31.75	11.0	
LAB16-	15.9	26.9		44.5			34.93	16.0	0.02-0.05

Screw sizes 19, 22 and 24 mm available



Part number selection table - LABY series, thread mount

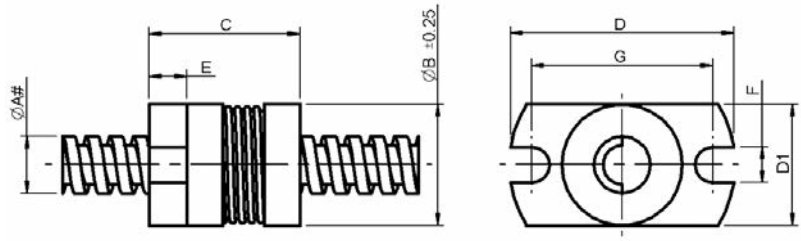
Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Flange ØD	Flange Width E	Thread M*	Thread Length N	Dynamic Load kg	Drag Torque Nm
LABY6-	6.4	13.5	33.0	20.3	3.1	5/8 - 18	4.1	2.3	0.004-0.014
LABY8-	8.0	18.8	56.0	25.4	3.8		9.7	5.0	0.007-0.02
LABY10-	9.6								
LABY11-	11.3	20.3	59.0		2.5	15/16 - 16		7.0	0.014-0.03
LABY13-	12.7	22.6		26.4				11.0	
LABY16-	15.9	26.9	58.9	26.9	3.6		12.7	16.0	0.02-0.05

*Thread shown imperial as standard, metric available, please specify diameter and pitch
For the full range of nominal diameters, see table on pages 7-7 to 7-11

Miniature Anti-Backlash Nuts

All dimensions in mm
General tolerances ±0.5 mm
Detailed tolerances: Please contact us
Material: Polyacetal

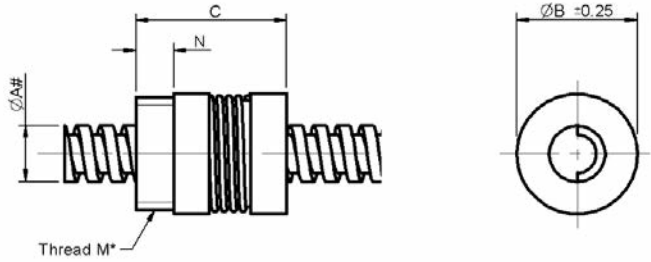
Associated Products
Reli-a-Flex® couplings: page 8-6
Linear slides: page 9-1
Intelligent motors: page 2-2
Plain bearings: page 12-1



Part number selection table - LNTBF series, flange mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Flange D	Flange Width E	Flange Height D1	Slot F	Centres G	Dynamic Load kg	Drag Torque Nm
LNTBF3-	3[1]	10.2	12.7	19.1	3.2	10.2	3.05	15.24	2.3	0.004
LNTBF4-	4.0									
LNTBF5-	5[2]									

[1] LNTBF3 for Ø 3.2, 3.3 and 3.6 [2] LNTBF5 for Ø 5.0 and 5.6



Part number selection table - LNTBY series, thread mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Thread M*	Thread Length N	Dynamic Load kg	Drag Torque Nm
LNTBY3-	3[1]	10.2	12.7	3/8-24	3.18	2.3	0.004
LNTBY4-	4.0						
LNTBY5-	5[2]						

[1] LNTBY3 for Ø 3.2, 3.3 and 3.6 [2] LNTBY5 for Ø 5.0 and 5.6
*Thread shown imperial as standard, metric available, please specify diameter and pitch
For the full range of nominal diameters, see table on pages 7-7 to 7-11

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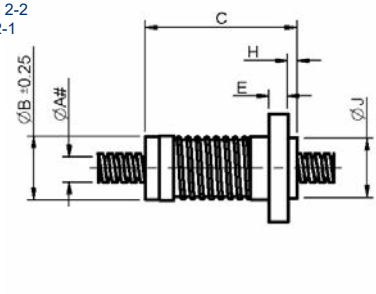
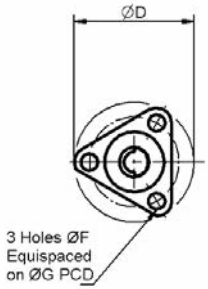
Intelligent motors: page 2-2
Plain bearings: page 12-1

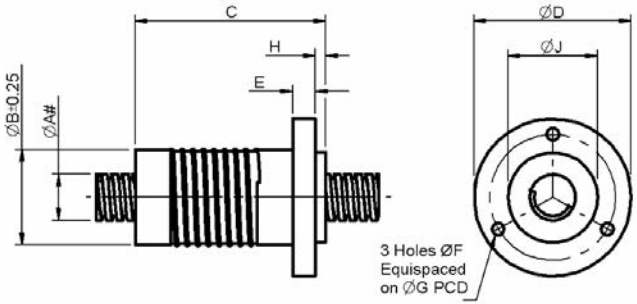
All dimensions in mm
General tolerances ±0.5 mm
Detailed tolerances: Please contact us
Material: Polyacetal





Part number selection table - LNTBF series, flange mount

Nut Series	Nom Screw ØA#	Nut ØB	Nut Length C	Flange ØD	Flange Width E	Hole Dia ØF	Mounting Holes PCD ØG	Hub Width H	Hub ØJ	Dynamic Load kg	Drag Torque Nm
LNTBF6-	6.4	13.2	28	25.4	4.0	3.63	19.1	2.00	12.7	4.5	0.004-0.014
LNTBF8-	8.0	20.3	46	38.1	5.1	5.08	28.6	2.54	19.1	9.1	0.007-0.02
LNTBF10-	9.6										
LNTBF11-	11.3	22.9		41.2	5.7		31.8		22.2	13.6	



Part number selection table - LNTBF series, flange mount

Nut Series	Nom Screw ØA#	Nut ØB	Nut Length C	Flange ØD	Flange Width E	Hole Dia ØF	Mounting Holes PCD ØG	Hub Width H	Hub ØJ	Dynamic Load kg	Drag Torque Nm
LNTBF13-	12.7	26.9	54	44.5	6.4	5.59	35.71	3.0	25.4	45.5	0.014-0.04
LNTBF16-	15.9	34.9	59	54.1	7.0		44.45	2.5	31.8	56.8	
LNTBF19-	19.1	39.6	67	60.5	7.9		50.80		38.1	68.2	0.02-0.05

Screw sizes 22 and 24 mm available
For the full range of nominal diameters, see table on pages 7-7 to 7-11

Anti-Backlash Nuts

All dimensions in mm
General tolerances ±0.5 mm
Detailed tolerances: Please contact us
Material: Polyacetal

Associated Products
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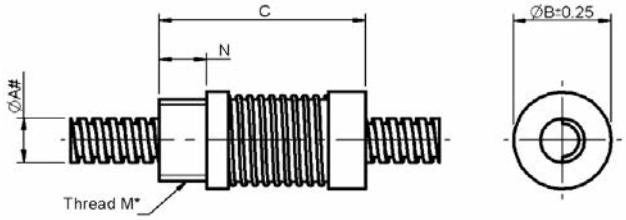
Plain bearings: page 12-1



Part number selection table - LNTBY series, thread mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Thread M*	Thread Length N	Dynamic Load kg	Drag Torque Nm
LNTBY6-	6.4	13.2	28	7/16 - 20	6.4	4.5	0.004-0.014
LNTBY8-	8.0	20.3	45	3/4 - 20	9.5	9.1	0.007-0.02
LNTBY10-	9.6						
LNTBY11-	11.3	22.9	46	13/16 - 16		13.6	
LNTBY13-	12.7	26.9	54	15/16 -16		45.5	0.014-0.04
LNTBY16-	15.9	34.9	59	1 1/8 - 16		56.8	
LNTBY19-	19.1	39.6	67	1 3/8 - 16	12.7	68.2	0.02-0.05

*Thread shown imperial as standard, metric available, please specify diameter and pitch
Screw sizes 22 and 24 mm available
For the full range of nominal diameters, see table on pages 7-7 to 7-11

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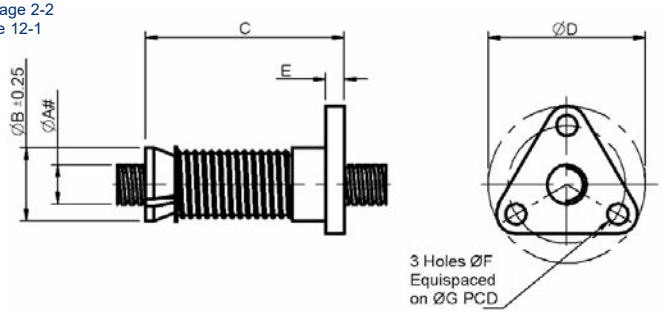
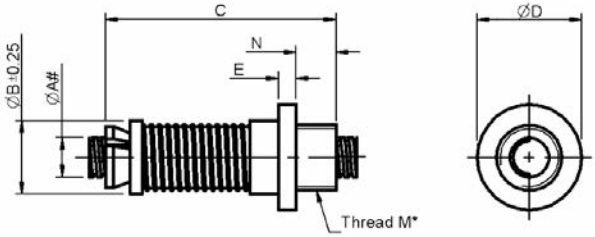
Plain bearings: page 12-1

All dimensions in mm
General tolerances ±0.5 mm
Detailed tolerances: Please contact us
Material: Polyacetal



Part number selection table - LAF series, flange mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Flange ØD	Flange Width E	Hole Dia ØF	Mounting Holes PCD ØG	Dynamic Load kg	Drag Torque Nm
LAF6-	6.4	12.7	26	25.4	4.6	3.6	19.1	2.3	0.004-0.02
LAF8-	8.0	17.8	48	38.1		5.1	28.6	5	0.007-0.03
LAF10-	9.6								
LAF11-	11.3	20.3						7	0.014-0.04
LAF13-	12.7	22.6	51	41.2	6.6		31.8	11	0.02-0.05
LAF16-	15.9	26.9		44.5			34.9	16	0.028-0.055



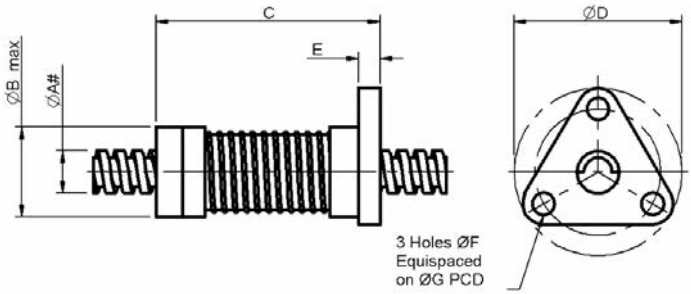
Part number selection table - LAFY series, thread mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Flange ØD	Flange Width E	Thread M*	Thread Length N	Dynamic Load kg	Drag Torque Nm
LAFY6-	6.4	12.7	33	20.3	5.6	5/8 - 18	4.1	2.3	0.004-0.02
LAFY8-	8.0	17.8	56	25.4	4.3		9.7	5.0	0.007-0.03
LAFY10-	9.6								
LAFY11-	11.3	20.3	59		3.1	15/16 - 16		7.0	0.014-0.04
LAFY13-	12.7	22.6		25.9				11.0	0.02-0.05
LAFY16-	15.9	26.9	61	26.9	3.8		12.7	16.0	0.028-0.055

*Thread shown imperial as standard, metric available, please specify diameter and pitch
For the full range of nominal diameters, see table on pages 7-7 to 7-11

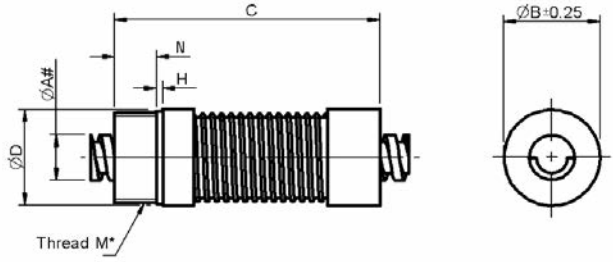
All dimensions in mm
General tolerances ±0.5 mm
Detailed tolerances: Please contact us
Material: Polyacetal

Associated Products
Reli-a-Flex® couplings: page 8-6
Linear slides: page 9-1
Intelligent motors: page 2-2
Plain bearings: page 12-1



Part number selection table - LAK series, flange mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Flange ØD	Flange Width E	Hole Dia ØF	Mounting Holes PCD ØG	Dynamic Load kg	Drag Torque Nm
LAK8-	8.0	20.3	50.8	38.1	4.8	5.08	28.58	10	0.007-0.02
LAK10-	9.6								



Part number selection table - LAKY series, thread mount

Nut Series	Nominal Screw ØA#	Nut ØB	Flange ØD	Nut Length C	Thread M*	Thread Length N	Hub Width H	Dynamic Load kg	Drag Torque Nm
LAKY8-	8.0	20.3	19.1	55.9	3/4-20	8.9	1.27	10	0.007-0.02
LAKY10-	9.6								

*Thread shown imperial as standard, metric available, please specify diameter and pitch
For the full range of nominal diameters, see table on pages 7-7 to 7-11

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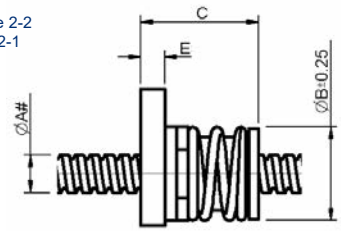
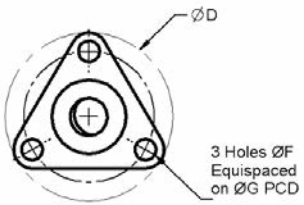
Associated Products
Reli-a-Flex® couplings: page 8-6
Linear slides: page 9-1
Intelligent motors: page 2-2
Plain bearings: page 12-1

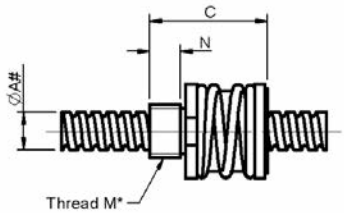
All dimensions in mm
General tolerances ±0.5 mm
Detailed tolerances: Please contact us
Material: Polyacetal

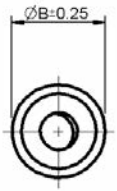




Part number selection table - LWD series, flange mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Flange ØD	Flange Width E	Hole Dia ØF	Mounting Holes PCD ØG	Dynamic Load kg	Drag Torque Nm
LWD5-	5.0	16	26.6	28.6	4.10	3.7	22.2	4.5	0.03
LWD5.6-	5.6								
LWD6-	6.4								
LWD8-	8.0	19	33.5	38.1	5.10	5.1	28.6	11.3	0.04
LWD10-	9.6								
LWD11-	11.3	25.4	52.8	44.5	6.35	5.6	35.7	34.0	0.06
LWD13-	12.7								





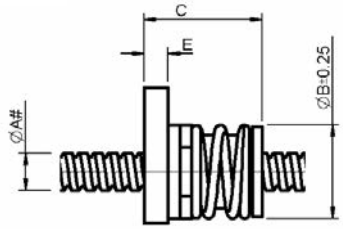
Part number selection table - LWDY series, thread mount

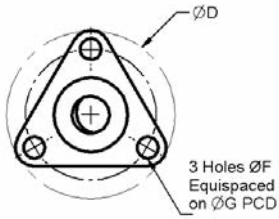
Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Thread M*	Thread Length N	Dynamic Load kg	Drag Torque Nm
LWDY5-	5.0	16	26.6	9/16 - 18	6.1	4.5	0.03
LWDY5.6-	5.6						
LWDY6-	6.4						
LWDY8-	8.0	19	33.5	5/8 -18	8.1	11.3	0.04
LWDY10-	9.6						
LWDY11-	11.3	25.4	52.8	15/16 - 16	12.7	34.0	0.06
LWDY13-	12.7						

*Thread shown imperial as standard, metric available, please specify diameter and pitch
For the full range of nominal diameters, see table on pages 7-7 to 7-11

All dimensions in mm
General tolerances ±0.5 mm
Detailed tolerances: Please contact us
Material: Polyacetal

Associated Products
Reli-a-Flex® couplings: page 8-6
Linear slides: page 9-1
Intelligent motors: page 2-2
Plain bearings: page 12-1

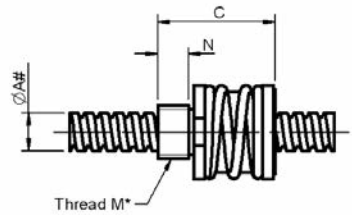


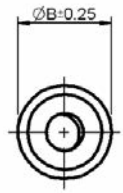


Part number selection table - LCM series, flange mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Flange ØD	Flange Width E	Hole Dia ØF	Mounting Holes PCD ØG	Dynamic Load kg	Drag Torque Nm
LCM5-	5	16	26.6	28.6	4.1	3.7	22.2	2.3	0.03
LCM5.6-	5.6								
LCM6-	6.4								
LCM8-	8.0	19	33.5	38.1	5.1	5.1	28.6	3.6	0.04
LCM10-	9.6								

The LCM5, 5.6 and 6 nuts are available with a pilot hub, Ø15.9 mm x 2.04 wide
The LCM8 and 10 nuts are available with a pilot hub, Ø19.1 mm x 3.05 wide, please contact us





Part number selection table - LCMY series, thread mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Thread M*	Thread Length N	Dynamic Load kg	Drag Torque Nm
LCMY5-	5.0	16	26.6	9/16 - 18	6.1	2.3	0.03
LCMY5.6-	5.6						
LCMY6-	6.4						
LCMY8-	8.0	19	33.5	5/8 -18	8.1	3.6	0.04
LCMY10-	9.6						

*Thread shown imperial as standard, metric available, please specify diameter and pitch
For the full range of nominal diameters, see table on pages 7-7 to 7-11

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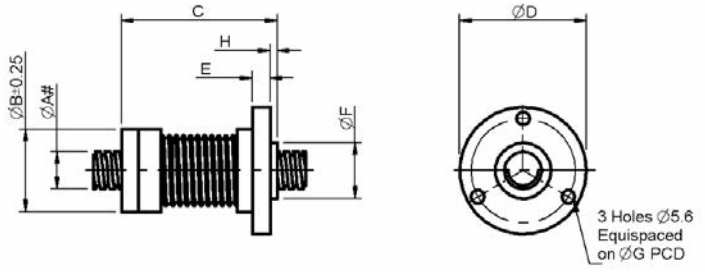
Heavy Duty Anti-Backlash Nuts

Associated Products
Reli-a-Flex® couplings: page 8-6
Linear slides: page 9-1
Intelligent motors: page 2-2
Plain bearings: page 12-1

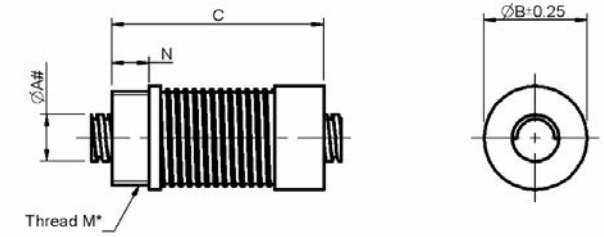
All dimensions in mm
General tolerances ±0.5 mm
Detailed tolerances: Please contact us
Material: Polyacetal with bronze anti-backlash mechanism



Part number selection table - LAX series, flange mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Flange ØD	Flange Width E	Mounting Holes PCD ØG	Hub Length H	Hub ØF	Dynamic Load kg	Drag Torque Nm
LAX13-	12.7	28.5	59	44.5	5.9	35.71	3.1	23.62	68	0.014-
LAX16-	15.9	35.1	66	53.0	7.1	44.45	--	--	113	0.02
LAX19-	19.1	41.2	71	60.5	7.9	50.80	--	--	159	0.02-0.05

Screw size 22 available



Part number selection table - LAXY series, thread mount

Nut Series	Nominal Screw ØA#	Nut ØB	Nut Length C	Thread M*	Thread Length N	Dynamic Load kg	Drag Torque Nm
LAXY13-	12.7	28.5	64	15/16-16	12.7	68	0.014-0.04
LAXY16-	15.9	35.1	72	1 1/4-16		113	
LAXY19-	19.1	41.2	79	1 3/8-16		159	0.02-0.05

*Thread shown imperial as standard, metric available, please specify diameter and pitch
Screw size 22 available
For the full range of nominal diameters, see table on pages 7-7 to 7-11

Modified, custom and multi-functional nuts

In addition to the standard nut types, custom configurations are available as well as simple modifications such as different mounting hole patterns or mounting threads, small dimensional changes or special materials.

Custom nut designs can offer multi-functionality, eliminating additional components, simplifying product manufacture, saving space and reducing cost. Multi-functional nuts can be produced using custom moulds and special machining to integrate components into the nut, such as guide bushings, carriages, timing pulleys, gears, syringe components, sensor mounts and flags, encoder features, clamps and many other complementary elements. In addition, custom designed nuts can offer quick release mounts, partial thread engagement, half nut construction or alternative shapes and geometries.

Special materials are available to extend the performance of the assemblies. We offer a range of Kerkite® composite polymers. Each member of the Kerkite® family is compounded with lubricants, reinforcements and thermoplastic polymers formulated to provide optimum performance in its target conditions and applications. In addition to the Kerkite® composite polymers, materials such as PEEK, polyester, Torlon, Vespel, PVDF, UHMW, Ertalyte® are available. Materials can be chosen for extreme temperature, chemical compatibility, autoclaving, agency approvals, special loadings and many other specific requirements.

Custom geometries and materials can be combined for a wide variety of product application requirements. Small quantities of custom nuts can be machined individually to suit specific requirements, alternatively large quantities can be moulded for reduced costs.

To achieve the most effective nut design we consider a combination of tolerancing and geometric shape of the nut. Tighter tolerances can be achieved by designing in geometric features to control important diameters, for example use of a ribbed feature on a bearing location diameter will reduce the need for tighter manufacturing tolerances.

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End modifications

Leadscrews are supplied with cut ends as standard. Alternatively we supply a selection of standard machined ends suitable for interfacing with a range of associated products including; bearings, circlips, coupings, pulleys and gears.

End **A** - Ball bearing : page 7-28
End **B** - Ball bearing & circlip : page 7-29
End **C** - Ball bearing & coupling : page 7-30
End **D** - Twin bearings & coupling : page 7-31
End **E** - Ball bearing & pulley : page 7-32
End **F** - Ball bearing & gear : page 7-33

Ordering your modified end detail

To order a leadscrew with machined ends, use the ordering example below. If only one end is to be machined leave the 2nd end machining suffix blank.

Example part no. - **LPX10 - M050 - 350MM - C A**

Thread Length	1st end machined detail	2nd end machined detail

Custom machined leadscrew ends

We are also able to supply custom machined ends to drawing; the drawing and specification details required and tolerances available are provided on page 7-34 and 7-35. Please contact us to discuss your requirements.

Associated products

Leadscrew Diameter	Standard Bearing P/No.[1]	Standard Circlip P/No.	Standard Coupling P/No.[2]
6	B1-104-S-P4	D1400-0040-SS	RCLA13C-*-*
10	B1-106-S-P4	D1400-0060-SS	RCLA16C-*-*
11	B1-108-S-P4	D1400-0080-SS	RCLA20C-*-*
13	B1-108-S-P4	D1400-0080-SS	RCLA20C-*-*

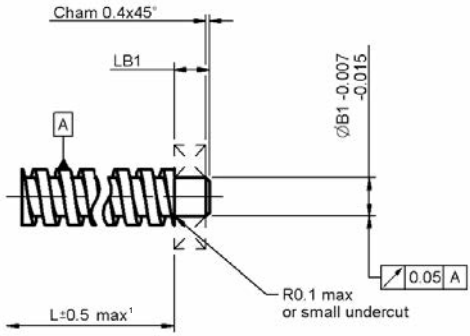
[1] Bearings for low to medium loads, see page 12-2. For high loads please contact us.
[2] Add bore diameters to complete part number, see pages 8-10, 8-12, 8-14

Leadscrew Diameter	Standard Pulley P/No.[3]	Standard Shim P/No.	Standard Gear P/No.[4]
6	TPMP25 F6-**	SS1-104	P**S1B4 F4A**
10	TPMP25 F6-**	SS1-108	P**S1B6 F4A**
11	TPMP25 F6-**	SS1-112	P**S1B8 F6A**
13	TPMP25 F6-**	SS1-112	P**S1B8 F6A**

[3] Add required number of teeth to complete part number, see page 10-3
[4] Add gear module and required number of teeth to complete part number, see from page 4-1
For all other accessories shown above, please refer to sections 12 and 13.

All dimensions in mm
General tolerances ±0.13 mm

Ball bearing journal, End A



Drawing dimension table

Leadscrew Diameter	Screw Diameter	Journal	
		Diameter ØB1	Length LB1
6	6.35	4	4.5
10	9.53	6	5.5
11	11.11	8	6.5
13	12.70	8	6.5

[1] L tolerance is dependent on the length of the leadscrew - see page 7-35 for actual tolerance.

Information

- Ordering instructions - see page 7-3 and 7-27
- Associated products - see page 7-27
- Custom end machining - see page 7-34 and 7-35
- Technical information - see pages T7-1 to T7-5

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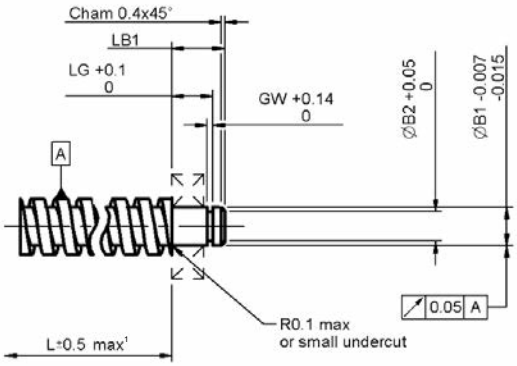
All dimensions in mm
General tolerances ±0.13 mm

Ball bearing journal with circlip groove, End B



Drawing dimension table

Leadscrew Diameter	Screw Diameter	Journal		Groove		Length
		Dia ØB1	Length LG	Dia ØB2	Width GW	LB1
6	6.35	4	4.8	3.75	0.5	7.0
10	9.53	6	6.1	5.65	0.8	8.5
11	11.11	8	7.2	7.54	0.9	9.5
13	12.70	8	7.2	7.54	0.9	9.5

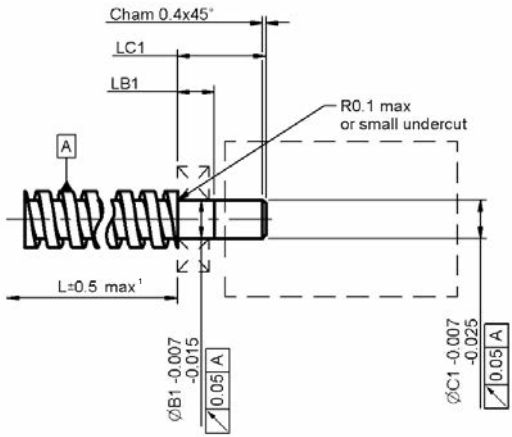
[1] L tolerance is dependent on the length of the leadscrew - see page 7-35 for actual tolerance.

Information

- Ordering instructions - see page 7-3 and 7-27
- Associated products - see page 7-27
- Custom end machining - see page 7-34 and 7-35
- Technical information - see pages T7-1 to T7-5

All dimensions in mm
General tolerances ±0.13 mm

Ball bearing journal for coupling, End C



Drawing dimension table

Leadscrew Diameter	Screw Diameter	Journal		Coupling Diameter ØC1	Length LC1
		Dia ØB1	Length LB1		
6	6.35	4	4.5	4	14.0
10	9.53	6	5.5	6	15.0
11	11.11	8	6.5	8	20.5
13	12.70	8	6.5	8	20.5

[1] L tolerance is dependent on the length of the leadscrew - see page 7-35 for actual tolerance.

Information

- Ordering instructions - see page 7-3 and 7-27
- Associated products - see page 7-27
- Custom end machining - see page 7-34 and 7-35
- Technical information - see pages T7-1 to T7-5

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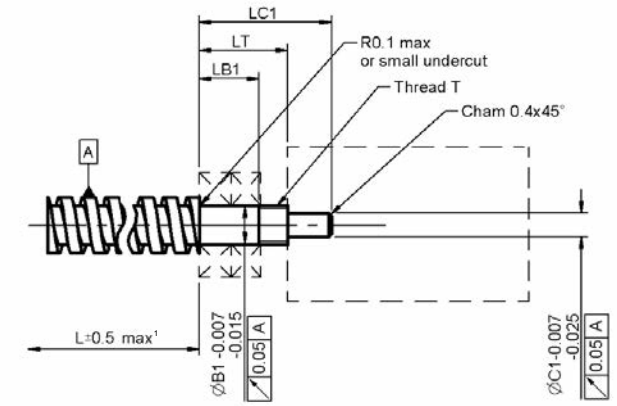
All dimensions in mm
General tolerances ±0.13 mm

Twin ball bearing journal for coupling, End D



Drawing dimension table

Leadscrew Diameter	Screw Dia	Journal		Thread		Coupling	
		Dia ØB1	Length LB1	Distance LT	T	Dia ØC1	Length LC1
6	6.35	4	7.5	11.2	M4	3	17.5
10	9.53	6	9.5	15.0	M6	4	22.5
11	11.11	8	11.5	18.5	M8	6	28.5
13	12.70	8	11.5	18.5	M8	6	28.5

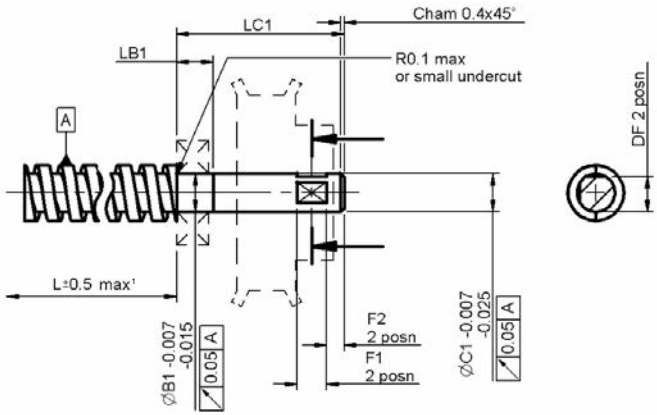
[1] L tolerance is dependent on the length of the leadscrew - see page 7-35 for actual tolerance.

Information

- Ordering instructions - see page 7-3 and 7-27
- Associated products - see page 7-27
- Custom end machining - see page 7-34 and 7-35
- Technical information - see pages T7-1 to T7-5

All dimensions in mm
General tolerances ±0.13 mm

Ball bearing journal for drive pulley, End E



Drawing dimension table

Leadscrew Diameter	Screw Dia	Journal		Pulley Dia ØC1	Length LC1	Flats		
		Dia ØB1	Length LB1			Width F1	Length F2	Distance DF
6	6.35	4	4.5	4	27.5	4	3	3.5
10	9.53	6	5.5	6	28.5	5	3	5.5
11	11.11	8	6.5	8	29.5	6	3	7.5
13	12.70	8	6.5	8	29.5	6	3	7.5

[1] L tolerance is dependent on the length of the leadscrew - see page 7-35 for actual tolerance.

Information

- Ordering instructions - see page 7-3 and 7-27
- Associated products - see page 7-27
- Custom end machining - see page 7-34 and 7-35
- Technical information - see pages T7-1 to T7-5

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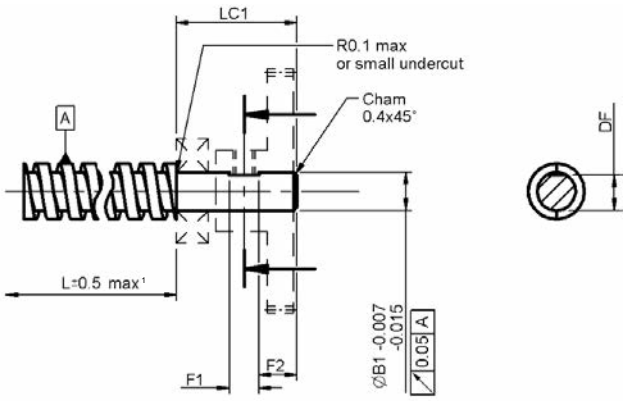
All dimensions in mm
General tolerances ±0.13 mm

Ball bearing journal for drive gear, End F



Drawing dimension table

Leadscrew Diameter	Screw Dia	Journal		Flat Width F1	Length F2	Flat Distance DF
		Dia ØB1	Length LC1			
6	6.35	4	17.5	4	5.0	3.5
10	9.53	6	20.5	5	6.5	5.5
11	11.11	8	21.5	6	6.0	7.5
13	12.70	8	21.5	6	6.0	7.5

[1] L tolerance is dependent on the length of the leadscrew - see page 7-35 for actual tolerance.

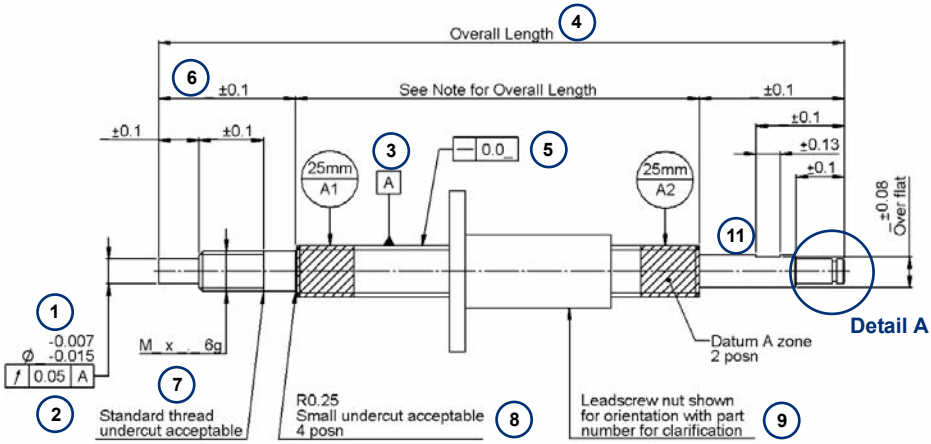
Information

- Ordering instructions - see page 7-3 and 7-27
- Associated products - see page 7-27
- Custom end machining - see page 7-34 and 7-35
- Technical information - see pages T7-1 to T7-5

All dimensions in mm

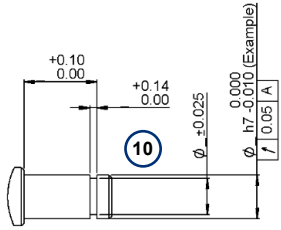
Required drawing details

To order a leadscrew with custom machined ends please provide the following drawing infomation:



Drawing tolerances

General manufacturing tolerance ISO2768-mK.
If a shoulder is required for bearing location at the extremities of the leadscrew thread then a bearing journal diameter of less than the leadscrew thread root should be selected.
All journals that are larger than the thread root of the leadscrew will have the scroll of the leadscrew thread root evident.



Further machined features

Cross holes: Symmetry 0.25mm
Hole position 0.1mm
Hole diameter 0.025mm
Bored end holes; drilled depth 0.5mm
Bored hole depth 0.25mm
For bored holes up to a length of 4 x the diameter a tolerance of 0.013mm can be achieved.
For bored holes over a length of 4 x the diameter a tolerance of 0.025mm can be achieved.
Width of keyways 0.025mm.

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Custom Leadscrew End Machining

1. **Machined journal recommended tolerances**
For journals over Ø3.2 mm and under 19 mm long and for use with Reliance bearings and gears for the optimum assembly and function we recommend a tolerance of or greater than:
-0.005
-0.017
For journals under Ø3.2 mm and over 19mm long and for use with Reliance couplings, pulleys etc. we recommend a diameter tolerance of or greater than:
-0.005
-0.027
For an additional charge Reliance can provide a minimum journal tolerance of 0.008 mm. This is dependant upon the journal length, geometry, diameter and material.

2. **Runout**
To geometrically control journals and end machined features, Reliance measure runout as opposed to concentricity. The standard runout tolerance is 0.05 mm referenced to the datum A zones.
0.035 mm is available for precision journals of lengths less than 25 mm.
0.025 mm is achievable for journals less than 13 mm.

3. **Datum**
The leadscrews are manufactured using a cold rolling process therefore a datum is located on the outside diameter of the leadscrew thread. The datum is specified at the marked datum 1 zones which are as standard 25 mm from each end of the leadscrew thread.

4. **Overall length and leadscrew thread length**
Tolerancing for lengths:
From 25.4 mm to 228 mm tolerance ±0.25
Over 228 mm to 812 mm tolerance ±0.5
Over 812 mm tolerance ±1.0

5. **Straightness**
0.025 mm per 100mm of length.
For screws less than 300 mm long the default value is 0.075 mm.

6. **Journal length**
The tolerance of ±0.1 or greater should be used in general. For shorter journals of less than 25 mm ±0.06 can be achieved.

7. **Secondary threads**
Include the size and pitch of the required thread e.g. M6x1, and include the thread fit tolerance i.e. 6g. A standard thread undercut may be used at the discretion of Reliance, the undercut will be 1-3 x thread pitches wide and to the thread root diameter.

8. **Corner radius**
A small manufacturing undercut may be required to achieve the required corner radius, dependant upon the manufacturing method used. In general this will be for a corner radius of 0.25 mm or smaller.

9. **Leadscrew nut**
Reliance strongly recommends that wherever possible the leadscrew nut is included on the leadscrew drawing and they are supplied as an assembly. This ensures the fit between leadscrew nut and leadscrew is completely controlled. The orientation of the nut should be defined.

10. **Circlip grooves**
Circlip grooves can be achieved when manufactured in line with the tolerances shown above.

11. **Flats**
If the flat is for location purposes then we recommend specification of a flatness of 0.03 mm across the face.

Introduction

Reliance's range of Leadscrew Linear Slides and ScrewRail™ assemblies provide a further level of component integration as opposed to a standalone leadscrew and nut assembly. These higher level assemblies combine leadscrew and nut assemblies with additional system elements such as bearings, carriages and housings, helping to simplify the design and manufacture of motion systems.

Leadscrew linear slide

ScrewRail™ assembly

Leadscrew linear slide

The leadscrew driven slide offers reliable, continuous linear speed whilst maintaining accurate positioning. It is not limited by critical screw speed, allowing high rpm and linear speeds. It has a unique, compact profile that provides exceptional torsional stiffness and stability for its size and weight.

The unit is a single piece aluminium extrusion which houses a stainless steel leadscrew together with an integrated pre-loaded nut and carriage. It is designed for connection to a motor drive mechanism and is provided with appropriate leadscrew machined end(s) and bearing(s) for connection via a coupling, a series of pulleys or a geared system.

It is a fully supported leadscrew actuator, which enables longer travel, higher speeds and higher loads, compared to a standard leadscrew and nut assembly arrangement, without the need for additional support elements. The integral mounting base provides support over the entire length.

The Leadscrew Linear Slide provides linear actuation with 0.0006 mm/mm lead accuracy. It is offered in an extensive range of travel lengths, from 11 mm up to 1000 mm, range of diameters to support loads up to 46 kg and range of leads to provide different linear speeds. It has a double bearing design and is Teflon coated across all surfaces, giving smooth, accurate movement.

This robust, integrated unit is suitable for a variety of applications including laboratory automation equipment and industrial automation.

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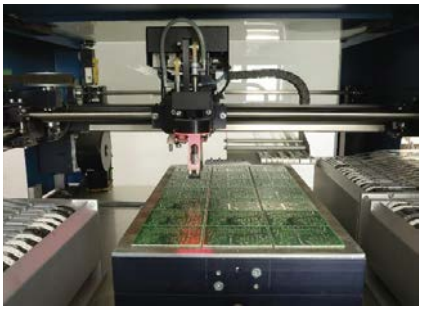
ScrewRail™ assembly

Where linear motion has traditionally required separate components to handle both the drive and support/guidance the compact ScrewRail™ combines both functions in a single, coaxial component. By eliminating the need for external rail-to-screw alignment the ScrewRail™ simplifies the design, manufacture and assembly of the motion system, saving as much as 80% of the space used by a two-rail system and helping reduce component and assembly costs.

The ScrewRail™ consists of a precision rolled leadscrew, supported by sealed bearings, contained within a concentric steel guide rail, driving an integrated nut/bushing. Because all the alignment requirements are achieved within the ScrewRail™, support and positioning of the ScrewRail™ is much less critical than with traditional slide assemblies. TFE coating and self-lubricating nut/bushing materials ensure long life, without maintenance. Standard end supports are available to mount the ScrewRails™.

With lengths of up to 1200 mm and with four diameter options, the ScrewRail™ is capable of moving loads from 5 kg up to 45 kg. Two versions are available, with either plain or anti-backlash nuts.

The ScrewRail™ gives three-dimensional motion from a single unit. When mounted vertically it can be used to simultaneously lift and rotate (Z-theta motion). With one motor driving the screw and a second rotating the rail, a compact pick and place mechanism can be created.



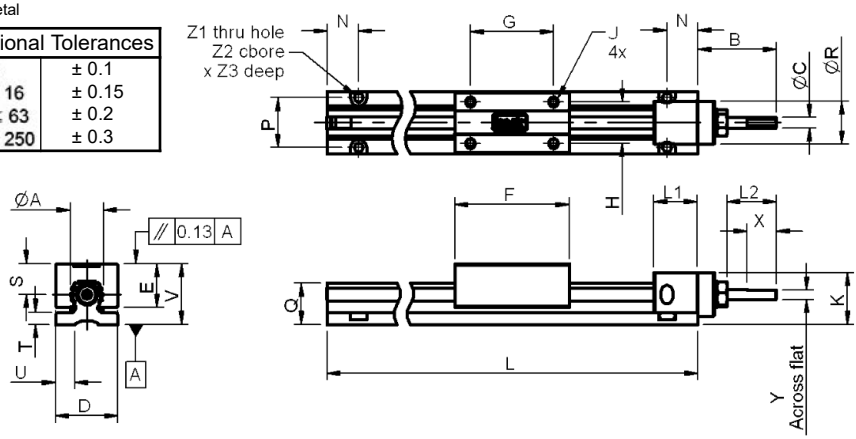
Semi-conductor pick and place robotics

Laboratory automation

All dimensions in mm
Materials:
Guide and carriage - Aluminium alloy TFE coated
Leadscrew - Stainless steel TFE coated
Follower nut - Polyacetal

Associated Products
Intelligent motors: page 2-2
Reli-a-Flex® couplings: page 8-6
Hardware: page 13-1

Dimensional Tolerances	
< L4	± 0.1
4 < L ≤ 16	± 0.15
16 < L ≤ 63	± 0.2
63 < L ≤ 250	± 0.3



Technical specification

Total Travel = L - L1 - F

Series	A Nominal Rail Ø	B	ØC	D	E	F	G	H	J[1]	K	L1	L2	N
RGLS6	10.2	21.1	3.175	19.1	13.5	36	25.4	12.7	4-40 UNC 4.45 deep	15	13.5	11.9	9.53
RGLS10	15.2	31.8	4.762	28.6	20.1	51	38.1	19.1	6-32 UNC 6.35 deep	23	20.3	20.3	12.70
RGLS13	20.3	38.1	6.350	40.6	26.9	69	44.45	25.4	10-24 UNC 9.60 deep	33	27.7	19.6	15.88
RGLS16	25.4	44.5	7.938	50.8	33.5	83	57.15	31.8	1/4-20 UNC 10.80 deep	41	33.0	33.0	19.05

[1]Metric mounting configuration available, please enquire

Series	P	Q	ØR	S	T	U	V	X	Y	Z1	Z2	Z3
RGLS6	15.24	12.7	13.2	9.4	3.8	5.8	18.5	9.7	2.92	2.8	5.1	2.3
RGLS10	22.86	18.8	20.3	14.0	5.6	8.9	27.9	12.7	4.32	3.6	6.4	3.3
RGLS13	31.75	25.4	26.4	18.8	7.6	13.0	37.3	17.8	5.59	5.1	8.4	4.8
RGLS16	38.10	31.8	33.0	23.4	9.5	16.3	46.5	22.4	7.11	6.6	12.7	5.6

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Standard product sizes

	Series (Screw Size)																			
	RGLS6				RGLS10						RGLS13					RGLS16				
	Guide Length L ±1 mm																			
Lead mm	152	203	254	305	254	305	381	457	610	914	254	305	457	610	914	254	305	457	610	914
2.54	★	★	★	★	★	★	★	★	★			★					★			
5.08	★	★	★	★	★	★	★	★	★			★					★			
12.7	★	★	★	★		★	★	★	★			★	★	★			★	★	★	
25.4	★	★	★	★		★		★	★	★		★	★	★	★		★	★	★	★

★Indicates standard available lengths

Product performance

Basic Part Number	Lead mm	Typical Drag Torque* Nm	Life @ ¼ Design Load m	Torque To Move Load Nm/kg	Design Load kg	Screw Inertia kgm^2/m
RGLS6-0100	2.54	0.02	2,540,000	0.016	7	6.5×10^{-6}
RGLS6-0200	5.08	0.03		0.023		
RGLS6-0500	12.70	0.04		0.039		
RGLS6-1000	25.40	0.04		0.070		
RGLS10-0100	2.54	0.03	2,540,000	0.016	16	4.2×10^{-6}
RGLS10-0200	5.08	0.04		0.023		
RGLS10-0500	12.70	0.04		0.039		
RGLS10-1000	25.40	0.05		0.070		
RGLS13-0100	2.54	0.04	2,540,000	0.018	22	20×10^{-6}
RGLS13-0200	5.08	0.04		0.027		
RGLS13-0500	12.70	0.05		0.047		
RGLS13-1000	25.40	0.06		0.096		
RGLS16-0100	2.54	0.04	2,540,000	0.020	46	3.9×10^{-5}
RGLS16-0200	5.08	0.05		0.031		
RGLS16-0500	12.70	0.05		0.047		
RGLS16-1000	25.40	0.06		0.101		

* Assemblies with lengths over 915 mm and/or leads higher than 12.7 mm are likely to have higher drag torques than listed values.

Part number structure

RGLS6-0100-1-305

- **RGLS6-0100-1-305** — Linear Slide and Series Designator
  - **RGLS6** series = 6 mm screw
  - **RGLS10** series = 10 mm screw
  - **RGLS13** series = 13 mm screw
  - **RGLS16** series = 16 mm screw
- **0100** — Lead
- **1** — No. of Carriages
  - **1** = 1 driven (standard)
  - **2** = 1 driven & 1 passive
  - **3** = 1 driven & 2 passive
- **305** — Guide Length (Dimension "L")

Product options

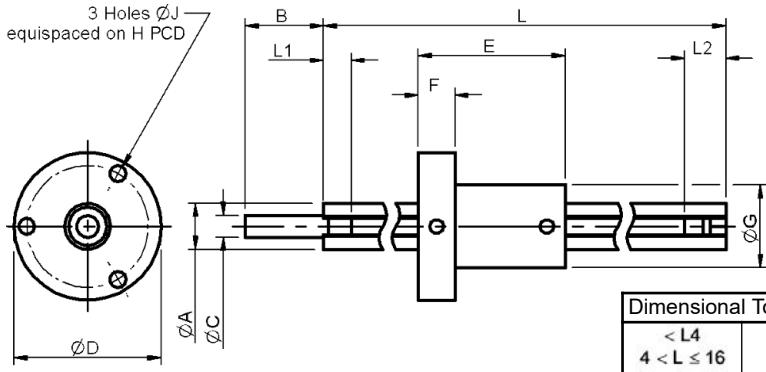
- Special carriage, rail, screw or mounting configuration
- Higher accuracy leadscrew, Left Hand (LH) or Left/Right (L/R) threads
- Alternative guide lengths up to 1000 mm available

Technical support

- Product overview
  - see page 7-36

All dimensions in mm
Materials:
Guide - Aluminium alloy TFE coated
Leadscrew - Stainless steel TFE coated
Nut - Aluminium and polyacetal composite

Associated Products
Reli-a-Flex® couplings: page 8-6
Intelligent motors: page 2-2
Hardware: page 13-1



Dimensional Tolerances	
< L4	± 0.1
4 < L ≤ 16	± 0.15
16 < L ≤ 63	± 0.2
63 < L ≤ 250	± 0.3

Technical specification

Total Travel = L- (L1 + L2 + E)

Series	ØA	B	ØC	ØD	E	F	ØG	ØH	ØJ	L1	L2
RSRA5	9.24/9.33	9.56	3.16/3.18	24.9	25.4	7.2	14.3	19.1	2.39	9.4	9.66
RSRA6	12.42/12.5	15.75	4.75/4.76	31.8	36.0	9.5	19.1	26.2	3.56	6.6	9.1
RSRA10	18.77/18.85	19.05	6.33/6.34	44.5	51.0	12.7	28.4	37.6	4.39	9.7	17.8
RSRA13	25.12/25.2	19.05	6.33/6.34	56.6	64.0	15.9	38.0	48.8	5.08	12.2	19.6

Standard product sizes - RSRA5 and RSRA6 ScrewRail®

	Series													
	RSRA5							RSRA6						
	Length L ±1 mm													
Lead mm	102	152	203	254	305	381	457	102	152	203	254	305	381	457
1.27	★	★	★	★				★	★	★	★			
2.54														
5.08														
6.35			★	★	★	★				★	★	★	★	
12.70				★	★	★	★				★	★	★	★
25.40				★	★	★	★				★	★	★	★

★Indicates standard lengths

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Standard product sizes - RSRA10 and RSRA13 ScrewRail®

	Series													
	RSRA10								RSRA13					
	Length L ±1 mm													
Lead mm	152	203	254	305	381	457	610	914	254	305	381	457	610	914
1.27														
2.54	★	★	★	★	★					★				
5.08		★	★	★	★					★				
6.35														
12.70		★	★	★	★		★			★		★	★	
25.40				★	★	★	★	★		★		★	★	★

★Indicates standard available lengths

Product performance

Basic Part Number	Nominal Rail Dia. mm	Nominal Screw Dia. mm	Lead mm	Max. Drag Torque Nm	Life @ ¼ Design Load m	Torque to Move Load Nm/kg	Design Load kg	Screw Inertia kgm²/m	Equiv. Dia. *
RSRA5-0050	9.53	4.76	1.27	0.014	2,500,000	0.007	5	0.4 x10^{-6}	7.6
RSRA5-0100			2.54	0.018		0.016			
RSRA5-0250			6.35	0.020		0.019			
RSRA5-0370			9.53	0.025		0.030			
RSRA6-0050	12.70	6.35	1.27	0.015	3,800,000	0.007	10	1.3 x10^{-6}	9.9
RSRA6-0250			6.35	0.020		0.023			
RSRA6-0500			12.70	0.030		0.039			
RSRA6-1000			25.40	0.040		0.070			
RSRA10-0100	19.05	9.53	2.54	0.020	4,500,000	0.016	20	6.5 x10^{-6}	15.2
RSRA10-0200			5.08	0.030		0.023			
RSRA10-0500			12.70	0.040		0.039			
RSRA10-1000			25.40	0.045		0.070			
RSRA13-0100	25.40	12.70	2.54	0.030	7,100,000	0.016	45	20 x10^{-6}	20.5
RSRA13-0200			5.08	0.040		0.023			
RSRA13-0500			12.70	0.045		0.039			
RSRA13-1000			25.40	0.060		0.070			

* ScrewRail® stiffness may be modelled using Classical Beam Deflection Theory with equivalent solid stainless steel beam of diameter given.

Part number structure

RSRA6-1000-305MM

ScrewRail® and Series Designator — Lead — Screw Length

Product options

- End support modifications
- Higher accuracy leadscrew, Left Hand (LH) or Left/Right (L/R) threads
- Alternative ScrewRail® lengths up to 1200 mm available
- Other leads available as custom orders

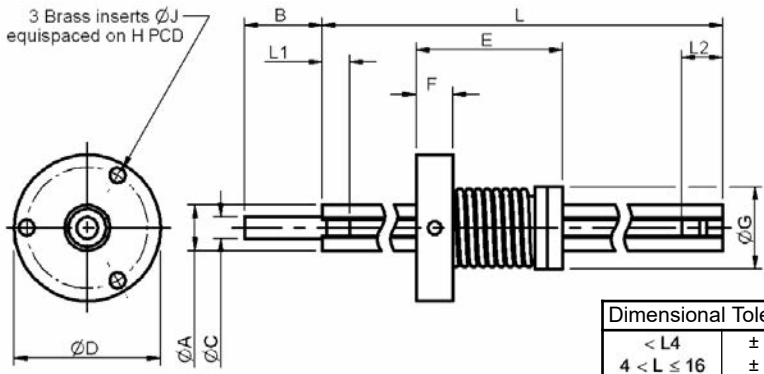
Technical support

- Product overview
  - see page 7-37

Anti-Backlash ScrewRail® Assembly

All dimensions in mm
Materials:
Guide - Aluminium alloy TFE coated
Leadscrew - Stainless steel TFE coated
Nut - Aluminium and polyacetal composite

Associated Products
Reli-a-Flex® couplings: page 8-6
Intelligent motors: page 2-2
Hardware: page 13-1



Dimensional Tolerances	
< L4	± 0.1
4 < L ≤ 16	± 0.15
16 < L ≤ 63	± 0.2
63 < L ≤ 250	± 0.3

Technical specification

Total Travel = L- (L1 + L2 + E)

Series	ØA	B	ØC	ØD	E	F	ØG	ØH	ØJ Brass Inserts	L1	L2
RSRZ5	9.24/9.32	9.56	3.16/3.18	24.9	27.94	7.2	18.5	19.05	2-56 UNC	9.4	9.66
RSRZ6	12.42/12.5	15.75	4.75/4.76	33.3	36	9.5	24.7	26.2	6-32 UNC	6.6	9.1
RSRZ10	18.77/18.85	19.05	6.33/6.34	46.0	51	12.7	35.1	37.6	10-32 UNF	9.7	17.8
RSRZ13	25.12/25.2	19.05	6.33/6.34	58.4	64	15.9	43.7	48.8	10-32 UNF	12.2	19.6

Standard product sizes - RSRZ5 and RSRZ6 ScrewRail®

	Series													
	RSRZ5							RSRZ6						
	Length L ±1 mm													
Lead mm	**102**	**152**	**203**	**254**	**305**	**381**	**457**	**102**	**152**	**203**	**254**	**305**	**381**	**457**
1.27	★	★	★	★				★	★	★	★			
2.54														
5.08														
6.35			★	★	★	★				★	★	★	★	
12.70				★	★	★	★				★	★	★	★
25.40				★	★	★	★				★	★	★	★

★Indicates standard lengths

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Standard product sizes - RSRZ10 and RSRZ13 ScrewRail®

	Series														
	RSRZ10									RSRZ13					
	Length L ±1 mm														
Lead mm	152	203	254	305	381	457	533	610	914	254	305	381	457	610	914
1.27															
2.54	★	★	★	★	★						★				
5.08		★	★	★	★						★				
6.35															
12.70		★	★	★	★		★	★			★		★	★	
25.40				★	★	★	★	★	★		★		★	★	★

★Indicates standard lengths

Product performance

Basic Part Number	Nominal Rail Dia. mm	Nominal Screw Dia. mm	Lead mm	Max. Drag Torque Nm	Life @ ¼ Design Load m	Torque to Move Load Nm/kg	Design Load kg	Screw Inertia kgm^2/m	Equiv. Dia. *
RSRZ5-0050	9.53	4.76	1.27	0.014	1,300,000	0.007	5	0.4 x10^{-6}	7.6
RSRZ5-0100			2.54	0.018		0.016			
RSRZ5-0250			6.35	0.020		0.019			
RSRZ5-0370			9.53	0.025		0.030			
RSRZ6-0050	12.70	6.35	1.27	0.020	1,900,000	0.007	10	1.3 x10^{-6}	9.9
RSRZ6-0250			6.35	0.030		0.023			
RSRZ6-0500			12.70	0.040		0.039			
RSRZ6-1000			25.40	0.045		0.070			
RSRZ10-0100	19.05	9.53	2.54	0.045	2,300,000	0.016	20	6.5 x10^{-6}	15.2
RSRZ10-0200			5.08	0.047		0.023			
RSRZ10-0500			12.70	0.050		0.039			
RSRZ10-1000			25.40	0.053		0.070			
RSRZ13-0100	25.40	12.70	2.54	0.057	3,500,000	0.016	45	20 x10^{-6}	20.5
RSRZ13-0200			5.08	0.060		0.023			
RSRZ13-0500			12.70	0.064		0.039			
RSRZ13-1000			25.40	0.067		0.070			

* ScrewRail® stiffness may be modelled using Classical Beam Deflection Theory with equivalent solid stainless steel beam of diameter given.

Part number structure

RSRZ6-1000-305MM

ScrewRail® and Series Designator — Lead — Screw Length

Product options

- End support modifications
- Higher accuracy leadscrew, Left Hand (LH) or Left/Right (L/R) threads
- Alternative ScrewRail® lengths up to 1200 mm available
- Other leads available as custom orders

Technical support

- Product overview
  - see page 7-37

Flexible Shaft Couplings, Clutches and Collars

8

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Reli-a-Flex® Couplings, Reli-a-Grip™ Clamp Type ..... Page 8-14

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Introduction to the range

In many cases machine designers give limited thought to the shaft coupling. They devote their time to the more expensive components, overlooking the fact that the performance of a machine is only as good as the connections of its shafts. Reliance is fully aware of the importance of the shaft coupling and that they are often a critical part of the drive system. The Reliance range of shaft couplings has been carefully designed and tested to provide trouble free operation over many millions of cycles.

Perfect alignment is not practical in applications where two shafts need to be joined and therefore some level of misalignment will always occur. This misalignment is usually the result of the support block manufacturing tolerances and structural alignment. Unless these tolerances are very precise use of a solid coupling will result in high shaft loading and significant bearing loads. In certain cases this misalignment is limited to angular or radial misalignments, but is more often a combination of the two. Therefore, careful shaft coupling selection is important as differing configurations of coupling are designed to perform very differently dependent upon the application, and, as a consequence, have very different benefits and drawbacks.

Reliance engineers have many years of experience working with and specifying shaft couplings and are very happy to offer applications advice on coupling selection.

Reli-a-Flex®

The Reli-a-Flex® range of couplings is an aluminium alloy, one piece configuration, which has been designed in-house at Reliance to provide very smooth transmission of motion, high torsional stiffness, low bearing loads, and long life. The patented slot pattern was developed after many months of analysis and test to provide the best balance between zero backlash, torsional stiffness and low bearing load, whilst attaining an operational life in excess of 50,000,000 cycles at rated load and 80% offset. With two sets of identical slots, the Reli-a-Flex® coupling is constant velocity by design and handles angular, parallel and axial offset. Available in sizes from 6 to 40 mm outside diameter and allowable speeds up to 70,000 rpm, the Reli-a-Flex® coupling provides a very reliable one piece coupling design that approaches the performance of a bellows coupling.

Also for customers that require a modified or completely bespoke Reli-a-Flex® coupling, Reliance has developed a unique computer-based design and performance prediction tool. This tool allows our engineers to experiment quickly with different coupling configurations and to design a coupling to meet either space envelope restrictions or performance requirements.

Oldham

Oldham couplings are ideal where high degrees of parallel misalignment are present, assembly access is restricted and electrical insulation is required. Their construction of aluminium alloy hubs and nylon or acetal centre blocks allows separate assembly of hubs onto shafts and then simple engagement with the centre block on assembly where shaft movement is restricted. In addition, the construction of the centre block allows it to act as a torque limiter or overload device.

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Bellows

Maintenance free zero-backlash bellows couplings are available with three construction options: for highest accuracy, nickel bellows; for torque transmission, stainless steel bellows; and where space is restricted, bronze bellows are available down to 12 mm outer diameter. Shaft fixing options are both set screw and clamp for the stainless steel and nickel bellows options, with the brass bellows option available in clamp type only.

Flexible disc

A number of different options of flexible disc couplings are available, based on both single and double disc spring construction. Please note that single disc spring couplings should only be used where the misalignment between the shafts is restricted to angular and axial. Single disc spring couplings cannot be used where radial misalignments are present. The RFSXK-2213 and 3019 type uses a novel design which places the clamps inboard of the disc springs to give the shortest possible overall length. The RFSXK-3850 type has an extended centre piece which allows high radial misalignment capability whilst maintaining good accuracy of transmission.

Curved jaw

Curved jaw couplings are available with both set screw and clamp hub type fixing methods. They are an ideal solution for reducing system torque ripple with a choice of three damping elements for high, medium and low torques.

Spiral beam

Available in stainless steel or aluminium and with a clamp or set screw style fixing, spiral beam couplings are suitable for general applications. Manufactured in one piece, spiral beam couplings are also maintenance-free.

Friction clutches

Friction clutches are available with two spring types. For lower torques up to 30 Ncm, the wire compression spring type should be used. For higher torques up to 120 Ncm, the disc spring version is the ideal choice.

Radial tooth

Radial tooth couplings are self centering on assembly and can be used to transmit high torques. These couplings must not be used where radial and axial misalignments are present and may require light lubrication depending on the application conditions.

Solid

Stainless steel or aluminium solid couplings, in one or two piece construction, can be used for connecting two accurately aligned shafts. Screws are prevented from loosening during operation by precision honed bores and Nypatch anti-vibration hardware, providing superior holding strength.

Bespoke coupling designed for a medical dosing machine

Reli-a-Flex® - Unique design, maximises torsional stiffness without introducing high bearing loads.

Bellows - High accuracy, light duty. Maintenance free.

Flexible disc spring - Ideal for low torque applications requiring accuracy. Both external and internal hubs available.

Oldham - Large offset, designed to separate for assembly. Electrically insulating disc.

Membrane - Light duty, with an insulating fibreglass reinforced centre. Compact overall length. Zero backlash.

Curved jaw - Shock absorbing, low cost general purpose coupling, ideal for reducing torque ripple.

Spiral beam - Universal one piece coupling. Aluminium and stainless steel versions available.

Radial tooth - Positive connection, minimal axial misalignment.

Friction clutches - Variable torque settings. Gear manufactured to requirement.

Solid - One and two piece options. Excellent for accurately aligned shafts with high torque loads.

Clamp collars - No shaft marking, integral location face. One or two piece construction.

Custom Design - Designed and manufactured to suit your application, please contact us.

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The couplings featured in this catalogue have been carefully selected to accommodate varying degrees of shaft misalignment whilst offering minimum distortion of rotation.

No one coupling provides a universal solution but the selection table below summarises the salient performance features for ease of comparison.

Full details for each coupling can be found on the product pages, with further technical information on pages T8-1 to T8-4. If you require technical support please contact us to dicuss your application and we will be happy to help you select an appropriate coupling.

Comparative star rating:
●●●● most suitable
● least suitable
⊠ not applicable
■ please enquire

Coupling Feature / Coupling Style	Electrically insulating	Vibration damping	High reliability	No inherent backlash	Torque capacity	Misalignment capability	Low bearing load	Accuracy	Price / performance
Reli-a-Flex®	■	●●	●●●●	●●●●	●●●●	●●●	●●●●	●●●	●●●●
Bellows	⊠	●	●●●●	●●●●	●●●	●●●	●●●●	●●●●	●●
Flexible disc spring*	⊠	●	●●●	●●●●	●●	●●	●●●*	●●●	●●
Oldham	●●●●	●●	●●●	⊠	●●●	●●●●	●	●	●●●
Membrane	●●●●	●●●	●●	●●●●	●●	●●●	●●	●●	●●●
Curved jaw	●●●●	●●●	●●	⊠	●●●●	●●	●	●	●●●
Spiral beam	⊠	●●	●●	●●●	●●●	●●●	●●●	●●	●●●●
Radial tooth	⊠	⊠	●●●	●●	●●●●	⊠	●	●	●●
Friction clutches	⊠	●	⊠	⊠	■	⊠	■	⊠	●●
Solid	⊠	⊠	●●●●	●●●●	●●●●	⊠	●	●●●●	●●●●

*single disc suitable for angular offset only

Reli-a-Flex®, specifically designed and manufactured by Reliance to:

- **Improve system accuracy**
  The Reli-a-Flex® coupling provides excellent kinematic transfer of motion with high torsional stiffness, zero backlash and constant velocity.

- **Extend system life**
  The Reli-a-Flex® coupling introduces negligible radial and axial bearing loads, extending system life.

The range of Reli-a-Flex® flexible shaft couplings

	**Short or Long**	• RCS type (short) where space is limited • RCL type (long) where greater parallel offset and greater accuracy are required
	**Reli-a-Grip™**	• The Reli-a-Grip™ clamp enables Reli-a-Flex® coupling to be used to its full potential. Greater torques can be transmitted without the need to use set screws, which can potentially damage the shaft
	**Precision or Micro**	• Precision coupling with outer diameters from 13 to 25 mm • Micro coupling with outer diameters from 6 to 10 mm
	**Clamp or Set screw**	• Clamp type leaves shafts unmarked • Set screw type where higher speeds are required
	**Electrically insulated**	• Protects delicate instructions from powered drive • Available with selected bores on RCL type aluminium couplings, sizes 20 and 25 Please enquire
	**Custom designs**	• Predictable performances • Available with outer diameters from 6 to 40 mm • Alternative materials may be specified Please enquire

Patented Reli-a-Flex®

UK Number	2316735
US Number	6,203,437 B1
European Number	EP 0922168 B1
Japanese Number	4,083,227

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Picture perfect scanning with Reli-a-Flex® coupling

With the latest advances in digital optical scanning speed, professional flatbed scanner manufacturers are demanding more accuracy from their drive systems. A European company with leading edge technology in drum and flatbed scanners, image setting and integrated media processor products uses Reli-a-Flex® couplings in all their flatbed products. With XY technology, speeds of up to 50 scans per hour and resolutions of up to 5400 dpi, the accuracy and reliability of the Reli-a-Flex® coupling makes it the ideal choice.

Prior to the introduction of the Reli-a-Flex® coupling slight variations in the speed of the CCD element caused errors when trying to capture high resolution images. These errors manifest themselves as a colour registration defect, which resulted in an unacceptable banding effect across the image. Although these errors were small (typically 3.0 microns) they could easily be detected by the naked eye.

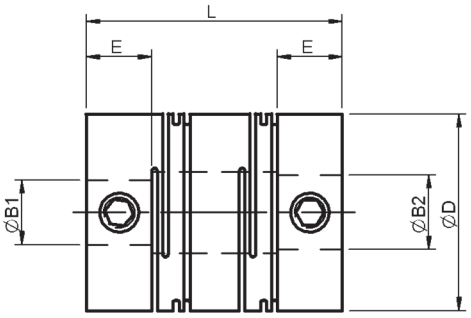
The cause of these errors was identified as the flatbed drive system. Introduction of a Reli-a-Flex® coupling manufactured from low inertia Grade 7075-T6 Aluminium was instrumental in bringing these registration defects under control. The unique slit pattern with radial rather than spiral slits gives the Reli-a-Flex® coupling high torsional stiffness and unsurpassed accuracy. However, with Reli-a-Flex® couplings high torsional stiffness does not mean high bearing loads, the Reli-a-Flex® coupling slit pattern has been carefully designed to give low bearing loads in conjunction with its high torsional stiffness.

Having been tested to 50 million cycles at rated torque, the Reli-a-Flex® coupling is also ideal for high duty cycle applications such as busy printing and typesetting applications. All in all the Reli-a-Flex® coupling has proved itself to be ideal for accurate positioning and responsive servo systems.

Micro Reli-a-Flex® Couplings

All dimensions in mm
General tolerances ±0.13 mm
Material: Aluminium alloy grade 7075-T6
Finish: Surtec 650

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2



RCL (long type) **RCS** (short type)

Part number selection table

Example Part No:- **RCS A 8 - 4-2**

Basic Part No	Material	Size	Standard Bore Sizes ØB1 and ØB2 (bore tolerance +0.010/-0.000)					O/D ØD	Length L	Hub Length E	Fitted Screw
RCS (short)	**A**	**6**	**1.5**	**2**	**3**			6.0	9.35	2.80	M1.2*
		8		**2**	**3**	**4**		8.0	11.70	3.20	M1.6
		10			**3**	**4**	**5**	10.0	13.65	4.00	M2
RCL (long)	**A**	**6**	**1.5**	**2**	**3**			6.0	12.50	2.80	M1.2*
		8		**2**	**3**	**4**		8.0	14.50	3.20	M1.6
		10			**3**	**4**	**5**	10.0	17.00	4.00	M2

Maximum shaft intrusion when fitted = E+2 mm.
* Coupling fitted with stainless steel slotted head set screws.
Note: bores may be left unalocromed.

Product options

- Alternative bore sizes
- Imperial bores
- Alternative materials
- Custom designs - see page 8-16
- Product overview - see pages 8-2 to 8-7
- Selected items in stock, at reduced prices - see page 8-17

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Technical specification

Basic Part No	Material	Size	Torsional[1] Stiffness Nm/rad	Radial Compliance microns/N	Misalignment			Max Inertia gcm²	Max Mass g
					Parallel mm	Angular deg	Axial mm		
RCS (short)	A	6	4.19	21.0	±0.02	±1.7	±0.06	0.03	0.65
		8	8.70	35.0	±0.05	±2.0	±0.10	0.11	1.27
		10	16.80	28.0	±0.06	±2.0	±0.17	0.33	2.34
RCL (long)	A	6	4.30	79.0	±0.04	±1.7	±0.06	0.05	0.95
		8	8.70	102.0	±0.10	±2.0	±0.10	0.15	1.66
		10	16.81	83.0	±0.12	±2.0	±0.17	0.43	3.05

Specifications vary according to bore size. For exact figures, please enquire.
[1] Typical torsional stiffness.

Torque and speed capacity

Basic Part No	Material	Size	Typical Torque Capacity			Max Speed rpm
			Reversing Nm	Non Reversing Nm	Peak Nm	
RCS (short)	A	6	0.10	0.15	0.25	70,000
		8	0.20	0.30	0.50	40,000
		10	0.30	0.45	0.75	35,000
RCL (long)	A	6	0.10	0.15	0.25	32,000
		8	0.20	0.30	0.50	24,000
		10	0.30	0.45	0.75	22,000

Specifications vary according to bore size. For exact figures, please enquire.

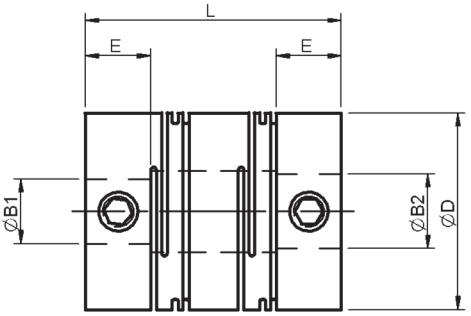
Technical support

- Zero backlash, reliable one-piece construction
- Unique design maximises torsional stiffness without inducing high bearing loads
- Minimal velocity and positional fluctuations
- Over 50,000,000 test cycles at rated load and 80% offset without failure
- Maintenance free
- Recommended temperature range -80ºC to +80ºC
- Technical information - see page T8-1
- Installation information - see page T8-3

Reli-a-Flex® Precision Couplings Set Screw Type

All dimensions in mm
General tolerances ±0.13 mm
Material: Aluminium alloy grade 7075-T6
Finish: Surtec 650

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2



RCL (long type) **RCS** (short type)

Couplings are chambered for ease of assembly and fitted with stainless steel screws.

Part number selection table

Example Part No:- **RCS A 20 - 8-5**

Basic Part No	Material	Size	Standard Bore Sizes ØB1 and ØB2 (bore tolerance +0.020/-0.000)	O/D ØD	Length L	Hub Length E	Fitted Screw
RCS (short)	A	13	3 4 5 6	13.0	16.80	5.00	M2.5
		16	4 5 6 8	16.0	19.75	5.90	M3
		20	5 6 8 10	20.0	21.50	6.60	M4
		25	6 8 10 12	25.0	25.80	7.60	M5
		30	8 10 12 15	30.0	30.30	9.10	M6
		40	10 12 15 20	40.0	35.95	10.60	M8
RCL (long)	A	13	3 4 5 6	13.0	20.00	5.00	M2.5
		16	4 5 6 8	16.0	23.50	5.90	M3
		20	5 6 8 10	20.0	26.00	6.60	M4
		25	6 8 10 12	25.0	34.00	7.60	M5
		30	8 10 12 15	30.0	44.00	9.10	M6
		40	10 12 15 20	40.0	57.00	10.60	M8

Maximum shaft intrusion when fitted = E+2 mm. Note: bores may be left unalocromed.

Product options

- Alternative bore sizes
- Imperial bores
- Alternative materials
- Electrically insulated, sizes 20 and 25
- Reli-a-Grip™ clamp type - see page 8-14
- Custom designs - see page 8-16
- Product overview - see pages 8-2 to 8-7
- Selected items in stock, at reduced prices - see page 8-17

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Technical specification

Basic Part No	Material	Size	Torsional[1] Stiffness Nm/rad	Radial Compliance microns/N	Misalignment			Max Inertia gcm²	Max Mass g
					Parallel mm	Angular deg	Axial mm		
RCS (short)	A	13	45.00	29.2	±0.08	±2.5	±0.30	1.1	4.74
		16	67.00	28.9	±0.10	±2.5	±0.40	3.0	8.42
		20	107.50	23.4	±0.12	±3.0	±0.50	8.8	14.62
		25	173.60	20.0	±0.16	±3.0	±0.70	24.0	27.50
		30	246.10	15.4	±0.20	±3.5	±0.85	58.0	45.98
		40	465.20	13.4	±0.25	±3.5	±1.25	220.0	97.30
RCL (long)	A	13	53.50	64.3	±0.15	±2.5	±0.30	1.3	5.83
		16	81.00	65.1	±0.20	±2.5	±0.40	3.6	10.33
		20	130.00	62.0	±0.25	±3.0	±0.50	9.9	18.20
		25	216.10	82.2	±0.40	±3.0	±0.70	33.0	38.40
		30	315.10	85.0	±0.60	±3.5	±0.85	89.0	71.82
		40	606.20	89.0	±0.95	±3.5	±1.25	370.0	168.57

Specifications vary according to bore size. For exact figures, please enquire. [1] Typical torsional stiffness.

Torque and speed capacity

Basic Part No	Material	Size	Typical Torque Capacity			Max Speed rpm
			Reversing Nm	Non Reversing Nm	Peak Nm	
RCS (short)	A	13	0.50	0.70	1.20	30,000
		16	0.75	1.15	1.90	25,000
		20	1.30	1.95	3.25	20,000
		25	2.05	3.10	5.20	15,000
		30	2.90	4.40	7.35	11,000
		40	5.50	8.30	13.80	6,500
RCL (long)	A	13	0.50	0.70	1.20	20,000
		16	0.75	1.15	1.90	17,000
		20	1.30	1.95	3.25	15,000
		25	2.05	3.10	5.20	12,000
		30	2.90	4.40	7.35	10,000
		40	5.50	8.30	13.80	6,500

Specifications vary according to bore size. For exact figures, please enquire.

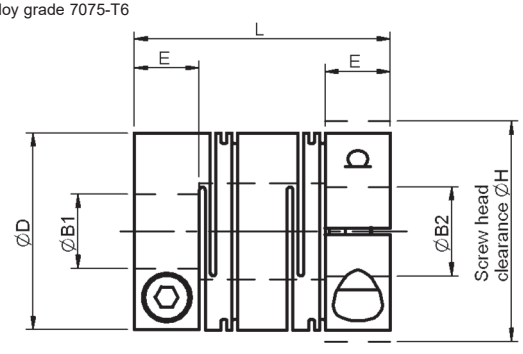
Technical support

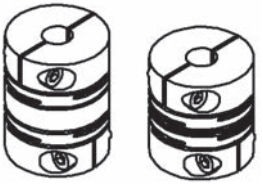
- Zero backlash, reliable one-piece construction
- Unique design maximises torsional stiffness without inducing high bearing loads
- Minimal velocity and positional fluctuations
- Over 50,000,000 test cycles at rated load and 80% offset without failure
- Maintenance free
- Recommended temperature range -80ºC to +80ºC
- Technical information - see page T8-1
- Installation information - see page T8-3

Reli-a-Flex® Precision Couplings Clamp Type

All dimensions in mm
General tolerances ±0.13mm
Material: Aluminium alloy grade 7075-T6
Finish: Surtec 650

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2





RCL (long type) **RCS** (short type)

Couplings are chambered for ease of assembly and fitted with stainless steel screws.

Part number selection table

Example Part No:- **RCS A 20C - 8-5**

Basic Part No	Material	Size	Standard Bore Sizes ØB1 and ØB2 (bore tolerance +0.020/-0.000)	Dimensions (mm) O/D ØD	ØH	Length L	Hub Length E	Fitted Screw
RCS (short)	A	13C	3 4 5 6	13.0	14.5	16.80	5.00	M1.6
		16C	3 4 5 6 8	16.0	18.0	19.75	5.90	M2
		20C	4 5 6 8 10	20.0	21.8	21.50	6.60	M2.5
		25C	5 6 8 10 12	25.0	26.9	25.80	7.60	M3
		30C	6 8 10 12 15	30.0	32.3	30.30	9.10	M4
		40C	8 10 12 15 20	40.0	41.0	35.95	10.60	M5
RCL (long)	A	13C	3 4 5 6	13.0	14.5	20.00	5.00	M1.6
		16C	3 4 5 6 8	16.0	18.0	23.50	5.90	M2
		20C	4 5 6 8 10	20.0	21.8	26.00	6.60	M2.5
		25C	5 6 8 10 12	25.0	26.9	34.00	7.60	M3
		30C	6 8 10 12 15	30.0	32.3	44.00	9.10	M4
		40C	8 10 12 15 20	40.0	41.0	57.00	10.60	M5

Maximum shaft intrusion when fitted = E+2 mm. Note: bores may be left unalocromed.

Product options

- Alternative bore sizes
- Imperial bores
- Alternative materials
- Electrically insulated, sizes 20 and 25
- Set screw fixing
- Reli-a-Grip™ clamp type - see page 8-14
- Custom designs - see page 8-16
- Product overview - see pages 8-2 to 8-7
- Selected items in stock, at reduced prices - see page 8-17

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Technical specification

Basic Part No	Material	Size	Torsional[1] Stiffness Nm/rad	Radial Compliance microns/N	Misalignment			Max Inertia g.cm²	Max Mass g
					Parallel mm	Angular deg	Axial mm		
RCS (short)	A	13C	45.00	29.2	±0.08	±2.5	±0.30	1.0	4.4
		16C	67.00	28.9	±0.10	±2.5	±0.40	2.9	8.2
		20C	107.50	23.4	±0.12	±3.0	±0.50	7.8	14.3
		25C	177.60	20.0	±0.40	±3.0	±0.70	23.0	27.5
		30C	258.10	15.4	±0.60	±3.5	±0.85	55.0	46.4
		40C	481.20	13.4	±0.95	±3.5	±1.25	200.0	97.2
RCL (long)	A	13C	53.50	64.3	±0.15	±2.5	±0.30	1.2	5.5
		16C	81.00	65.1	±0.20	±2.5	±0.40	3.2	10.1
		20C	133.00	62.0	±0.25	±3.0	±0.50	9.0	18.7
		25C	223.10	82.2	±0.40	±3.0	±0.70	31.0	38.5
		30C	330.60	85.0	±0.60	±3.5	±0.85	86.0	72.6
		40C	627.30	89.0	±0.95	±3.5	±1.25	350.0	168.7

Specifications vary according to bore size. For exact figures, please enquire.
[1] Typical torsional stiffness.

Torque and speed capacity

Basic Part No	Material	Size	Typical Torque Capacity			Max Speed rpm
			Reversing Nm	Non Reversing Nm	Peak Nm	
RCS (short) or RCL (long)	A	13C	0.35	0.55	0.80	12,000
		16C	0.55	0.85	1.25	10,000
		20C	0.95	1.45	2.45	7,500
		25C	1.55	2.35	3.90	5,000
		30C	2.40	3.65	5.50	3,800
		40C	4.40	6.65	11.10	2,000

Specifications vary according to bore size. For exact figures, please enquire.

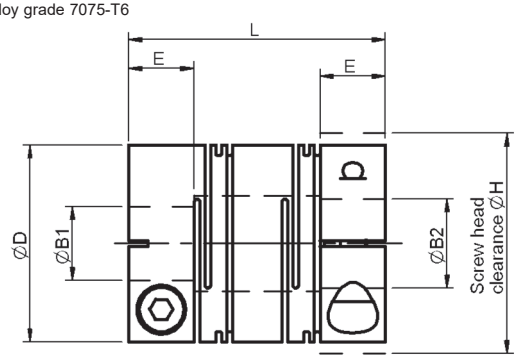
Technical support

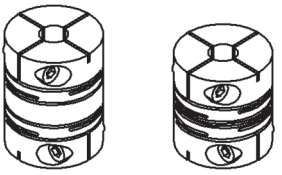
- Zero backlash, reliable one-piece construction
- Unique design maximises torsional stiffness without inducing high bearing loads
- Minimal velocity and positional fluctuations
- Over 50,000,000 test cycles at rated load and 80% offset without failure
- Maintenance free
- Recommended temperature range -80ºC to +80ºC
- Technical information - see page T8-1
- Installation information - see page T8-3

Reli-a-Flex® Precision Couplings
Reli-a-Grip™ Clamp

All dimensions in mm
General tolerances ±0.13 mm
Material: Aluminium alloy grade 7075-T6
Finish: Surtec 650

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2





RCL (long type) **RCS** (short type)

Couplings are chambered for ease of assembly and fitted with stainless steel screws.

Part number selection table

Example Part No:- **RCS A 20G - 8-5**

Basic Part No	Material	Size	Standard Bore Sizes ØB1 and ØB2 (bore tolerance +0.020/-0.000)	O/D ØD	ØH	Length L	Hub Length E	Fitted Screw
				Dimensions (mm)				
RCS (short)	A	13G	3 4 5 6	13.0	14.5	16.80	5.00	M1.6
		16G	3 4 5 6 8	16.0	18.0	19.75	5.90	M2
		20G	4 5 6 8 10	20.0	21.8	21.50	6.60	M2.5
		25G	5 6 8 10 12	25.0	26.9	25.80	7.60	M3
RCL (long)	A	13G	3 4 5 6	13.0	14.5	20.00	5.00	M1.6
		16G	3 4 5 6 8	16.0	18.0	23.50	5.90	M2
		20G	4 5 6 8 10	20.0	21.8	26.00	6.60	M2.5
		25G	5 6 8 10 12	25.0	26.9	34.00	7.60	M3

Maximum shaft intrusion when fitted = E+2 mm.
Note: bores may be left unalocromed.

Product options

- Alternative bore sizes
- Imperial bores
- Alternative materials
- Electrically insulated
- Custom designs - see page 8-16
- Product overview - see pages 8-2 to 8-7

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Technical specification

Basic Part No	Material	Size	Torsional[1] Stiffness Nm/rad	Radial Compliance microns/N	Misalignment			Max Inertia gcm²	Max Mass g
					Parallel mm	Angular deg	Axial mm		
RCS (short)	A	13G	45.00	29.2	±0.08	±2.5	±0.30	1.0	4.4
		16G	70.00	28.9	±0.10	±2.5	±0.40	2.9	8.6
		20G	115.00	23.4	±0.12	±3.0	±0.50	7.9	14.9
		25G	182.00	20.0	±0.16	±3.0	±0.70	23.0	27.5
RCL (long)	A	13G	53.50	64.3	±0.15	±2.5	±0.30	1.2	5.5
		16G	84.00	65.1	±0.20	±2.5	±0.40	3.3	10.6
		20G	139.00	62.0	±0.25	±3.0	±0.50	9.0	18.7
		25G	227.00	82.2	±0.40	±3.0	±0.70	31.0	38.5

Specifications vary according to bore size. For exact figures, please enquire.
[1] Typical torsional stiffness.

Torque and speed capacity

Basic Part No	Material	Size	Typical Torque Capacity			Max Speed rpm
			Reversing Nm	Non Reversing Nm	Peak Nm	
RCS (short) or RCL (long)	A	13G	0.45	0.60	0.70	12,000
		16G	0.75	1.15	1.65	10,000
		20G	1.30	1.95	3.25	7,500
		25G	2.05	3.10	5.20	5,000

Specifications vary according to bore size. For exact figures, please enquire.

Technical support

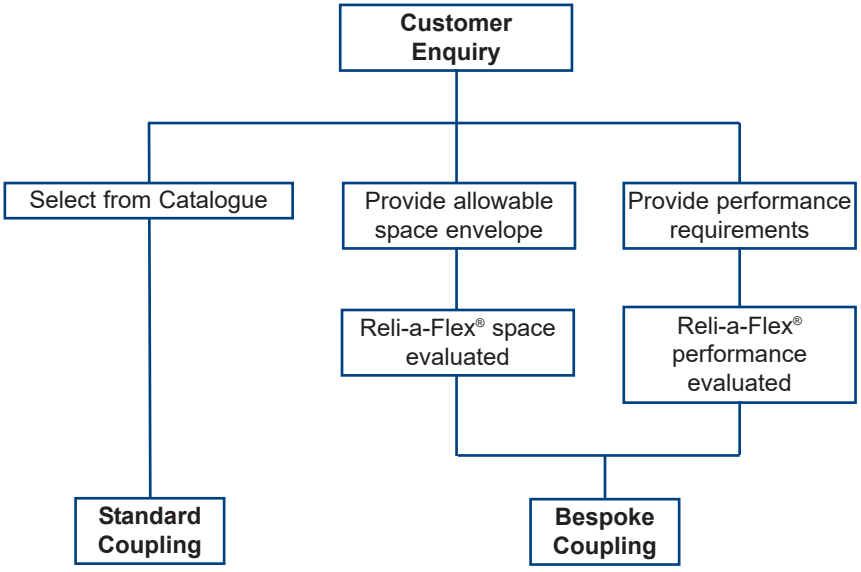
- Zero backlash, reliable one-piece construction
- Unique design maximises torsional stiffness without inducing high bearing loads
- Minimal velocity and positional fluctuations
- Over 50,000,000 test cycles at rated load and 80% offset without failure
- Maintenance free
- Recommended temperature range -80ºC to +80ºC
- Technical information - see page T8-1
- Installation information - see page T8-3

Bespoke designs

The Reli-a-Flex® coupling can be customised to suit individual applications. For example, special interfaces can be incorporated into the design to allow easier interaction between the coupling and other components within the assembly. Alternative materials such as PEEK polymer and other plastics are available.

Reliance's design engineers can predict the achievable performance of Reli-a-Flex® confidently when provided with details of the allowable space envelope.

Please contact us to discuss your requirements.



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Stocked range of Reli-a-Flex® couplings

The range of couplings below is held in stock and available on short delivery at reduced prices.
It is subject to change from time to time, please visit our website at **www.reliance.co.uk/shop** for the latest details.

Long type

Size 6
RCLA6-1.5-1.5
RCLA6-3-1.5

Size 8
RCLA8-2-2
RCLA8-3-3

Size 10
RCLA10-0.250-0.250
RCLA10-5-5

Size 13
RCLA13-0.250-0.250
RCLA13-4-4
RCLA13-6-5
RCLA13C-4-2
RCLA13C-4-4
RCLA13C-6-6

Size 16
RCLA16C-4-4
RCLA16C-5-4
RCLA16C-6-6

Size 20
RCLA20C-6-6
RCLA20C-8-8
RCLA20C-10-10
RCLA20C-0.250-0.250
RCLA20C-0.250-5
RCLA20C-0.250-6

Size 25
RCLA25C-6-6
RCLA25C-8-8
RCLA25C-10-10
RCLA25C-0.250-0.250
RCLA25C-0.375-0.375
RCLA25C-0.500-0.500

Short type

Size 6
RCSA6-1.5-1.5
RCSA6-3-1.5

Size 8
RCSA8-2-2
RCSA8-3-3

Size 10
RCSA10-5-3
RCSA10-5-5

Size 13
RCSA13-4-4
RCSA13-5-3
RCSA13-0.250-0.250
RCSA13C-3-3
RCSA13C-5-5

Size 16
RCSA16C-6-6
RCSA16C-0.250-5

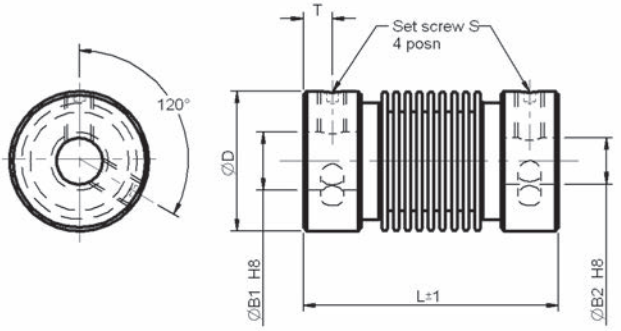
Size 20
RCSA20C-6-5
RCSA20C-6-6
RCSA20C-8-8
RCSA20C-10-10

Size 25
RCSA25C-6-5
RCSA25C-6-6
RCSA25C-8-6
RCSA25C-8-8

Bellows Couplings
Set Screw Hub

All dimensions in mm
General tolerances ±0.13 mm

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2



H8	
Bore Size	Tolerance
3	+0.014
4 5 6	+0.018
8 10	+0.022
12 14 16	+0.027

Part number selection table

Part Number	Hub Material	Bellows Material	Bore ØB1	Bore ØB2	O/D ØD	Length L	Screw Position T	Screw Thread S
RBKBS-1222-03-03	Brass (Nickel Plated)	Bronze (Nickel Plated)	3	3	12	22	2.2	M2.5
RBKBS-1222-04-04			4	4				
RBKBS-1222-06-04			6	4				
RBKBS-1222-05-05			5	5				
RBKBS-1222-06-06			6	6				
RBKXS-1520-03-03	Aluminium (Anodised)	Stainless steel	3	3	15	20	2.0	M3
RBKXS-1520-04-04			4	4				
RBKXS-1520-05-04			5	4				
RBKXS-1520-05-05			5	5				
RBKXS-1520-06-06			6	6				
RBKXS-1522-03-03	Aluminium (Anodised)	Stainless steel	3	3	15	22	2.0	M3
RBKXS-1522-04-04			4	4				
RBKXS-1522-05-04			5	4				
RBKXS-1522-05-05			5	5				
RBKXS-1522-06-06			6	6				
RBKXS-1525-03-03	Aluminium (Anodised)	Stainless steel	3	3	15	25	2.0	M3
RBKXS-1525-04-04			4	4				
RBKXS-1525-05-04			5	4				
RBKXS-1525-05-05			5	5				
RBKXS-1525-06-06			6	6				
RBKXS-1924-04-04	Aluminium (Anodised)	Stainless steel	4	4	19	24	2.0	M3
RBKXS-1924-05-05			5	5				
RBKXS-1924-06-06			6	6				
RBKXS-1924-08-08			8	8				
RBKXS-1924-10-10			10	10				

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Part number selection table continued

Part Number	Hub Material	Bellows Material	Bore ØB1	Bore ØB2	O/D ØD	Length L	Screw Position T	Screw Thread S
RBKXS-2029-04-04	Aluminium (Anodised)	Stainless steel	4	4	20	29	3.2	M4
RBKXS-2029-06-04			6	4				
RBKXS-2029-06-06			6	6				
RBKXS-2029-10-06			10	6				
RBKXS-2029-08-08			8	8				
RBKXS-2029-10-10			10	10				
RBKXS-2029-12-10			12	10				
RBKXS-2029-12-12			12	12				
RBKXS-2035-04-04	Aluminium (Anodised)	Stainless steel	4	4	20	35	3.2	M4
RBKXS-2035-06-04			6	4				
RBKXS-2035-06-06			6	6				
RBKXS-2035-10-06			10	6				
RBKXS-2035-08-08			8	8				
RBKXS-2035-10-10			10	10				
RBKXS-2035-12-10			12	10				
RBKXS-2526-06-06	Aluminium (Anodised)	Stainless steel	6	6	25	26	2.8	M4
RBKXS-2526-08-08			8	8				
RBKXS-2526-10-10			10	10				
RBKXS-2526-12-12			12	12				
RBKXS-2526-14-14			14	14				
RBKXS-2526-16-16			16	16				

Technical specifications

Size Ref	Max Speed	Max Torque	Misalignment			Torsional Stiffness	Radial Stiffness	Moment of Inertia	Max Screw Torque	Approx Weight
			Radial	Axial	Angular					
	min^{-1}	Ncm	mm	mm	deg	Nm/rad	N/mm	gcm^2	Ncm	g
1222	10,000	15	±0.20	±0.40	±2.5	45	30	1.8	50	8.0
1520		40	±0.20	±0.40	±3.0	90	40	2.0	70	6.0
1522		40	±0.25	±0.45	±4.0	85	20	2.1	70	6.5
1525		40	±0.30	±0.50	±4.0	70	15	2.3	70	7.0
1924		80	±0.25	±0.40	±4.0	150	25	7.0	70	10.0
2029		80	±0.25	±0.40	±4.0	150	25	8.0	150	15.0
2035		80	±0.30	±0.50	±4.0	140	10	9.0	150	16.0
2526		200	±0.30	±0.40	±4.0	220	45	19.0	100	17.5

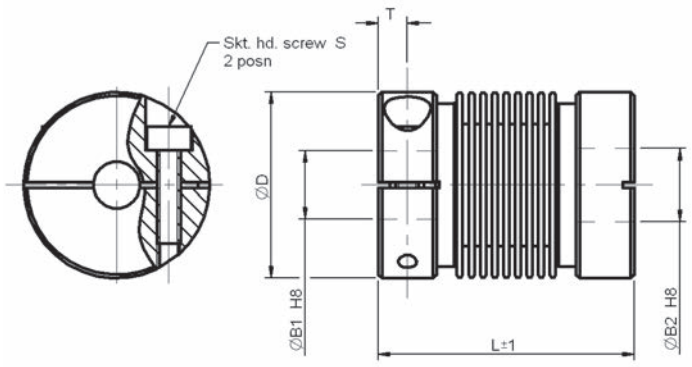
Technical support

- Zero backlash
- High torsional stiffness and low bearing loads
- Complete absorption of eccentricity, angularity and end play by spring action of the bellows
- Maintenance free
- Recommended temperature range -30ºC to +120ºC
- Product overview - see pages 8-2 to 8-7
- Technical information - see page T8-1

Bellows Couplings Clamp Hub

All dimensions in mm
General tolerances ±0.13 mm

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2



H8	
Bore Size	Tolerance
3	+0.014
4 5 6	+0.018
8 10	+0.022
12 14 16	+0.027

Part number selection table

Part Number	Hub Material	Bellows Material	Bore ØB1	Bore ØB2	O/D ØD	Length L	Screw Position T	Screw Thread S
RBKXK-1622-03-03	Aluminium (Anodised)	Stainless steel	3	3	16	22	2.3	M2
RBKXK-1622-04-04			4	4				
RBKXK-1622-05-04			5	4				
RBKXK-1622-06-04			6	4				
RBKXK-1622-05-05			5	5				
RBKXK-1622-06-06			6	6				
RBKXK-1624-03-03	Aluminium (Anodised)	Stainless steel	3	3	16	24	2.3	M2
RBKXK-1624-06-03			6	3				
RBKXK-1624-04-04			4	4				
RBKXK-1624-05-04			5	4				
RBKXK-1624-06-04			6	4				
RBKXK-1624-05-05			5	5				
RBKXK-1624-06-06			6	6				
RBKXK-1627-03-03	Aluminium (Anodised)	Stainless steel	3	3	16	27	2.3	M2
RBKXK-1627-06-03			6	3				
RBKXK-1627-04-04			4	4				
RBKXK-1627-05-04			5	4				
RBKXK-1627-05-05			5	5				
RBKXK-1627-06-06			6	6				
RBKXK-2129-06-06	Aluminium (Anodised)	Stainless steel	6	6	21	29	3.0	M2.5
RBKXK-2129-10-06			10	6				
RBKXK-2129-08-08			8	8				
RBKXK-2129-10-10			10	10				

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Part number selection table continued

Part Number	Hub Material	Bellows Material	Bore ØB1	Bore ØB2	O/D ØD	Length L	Screw Position T	Screw Thread S
RBKXK-2135-06-06	Aluminium (Anodised)	Stainless steel	6	6	21	35	3.0	M2.5
RBKXK-2135-10-06			10	6				
RBKXK-2135-08-08			8	8				
RBKXK-2135-10-10			10	10				
RBKXK-2429-12-06	Aluminium (Anodised)	Stainless steel	12	6	24	29	3.0	M2.5
RBKXK-2429-12-10			12	10				
RBKXK-2429-12-12			12	12				
RBKXK-2435-12-06	Aluminium (Anodised)	Stainless steel	12	6	24	35	3.0	M2.5
RBKXK-2435-12-10			12	10				
RBKXK-2435-12-12			12	12				
RBKXK-3030-12-10	Aluminium (Anodised)	Stainless steel	12	10	30	30	3.0	M3
RBKXK-3030-12-12			12	12				
RBKXK-3030-14-14			14	14				
RBKXK-3030-16-16			16	16				

Technical specifications

Size Ref	Max Speed min^{-1}	Max Torque Ncm	Misalignment Radial mm	Misalignment Axial mm	Misalignment Angular deg	Torsional Stiffness Nm/rad	Radial Stiffness N/mm	Moment of Inertia gcm^2	Max Screw Torque Ncm	Approx Weight g
1622	10,000	40	±0.20	±0.40	±3.0	90	40	2.1	50	6.0
1624		40	±0.25	±0.45	±4.0	85	20	2.2	50	6.5
1627		40	±0.30	±0.50	±4.0	70	15	2.6	50	7.0
2129		80	±0.25	±0.40	±4.0	150	25	9.0	100	15.0
2135		80	±0.30	±0.50	±4.0	140	10	9.5	100	16.0
2429		80	±0.25	±0.40	±4.0	150	25	15.0	100	17.0
2435		80	±0.30	±0.50	±4.0	140	10	15.2	100	18.0
3030		200	±0.30	±0.40	±4.0	220	45	37.0	100	31.0

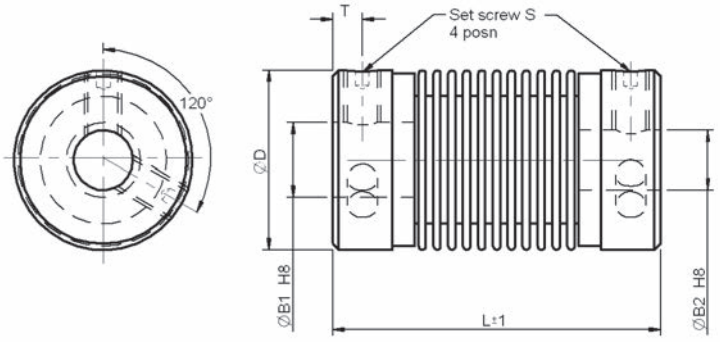
Technical support

- Zero backlash
- High torsional stiffness and low bearing loads
- Complete absorption of eccentricity, angularity and end play by spring action of the bellows
- Maintenance free
- Recommended temperature range -30ºC to +120ºC
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

Nickel Bellows Couplings
Set Screw Hub

All dimensions in mm
General tolerances ±0.13 mm

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2



H8	
Bore Size	Tolerance
2 3	+0.014
4 6	+0.018
8 10	+0.022
12	+0.027

Part number selection table

Part Number	Hub Material	Bellows Material	Bore ØB1	Bore ØB2	O/D ØD	Length L	Screw Position T	Screw Thread S
RBKNS-1223-02-02	Stainless steel	Nickel	2	2	12	23	2.0	M2.5
RBKNS-1223-03-02			3	2				
RBKNS-1223-03-03			3	3				
RBKNS-1223-04-04			4	4				
RBKNS-1223-06-04			6	4				
RBKNS-1223-06-06			6	6				
RBKNS-1730-04-04	Aluminium (Anodised)	Nickel	4	4	17	31	2.0	M3
RBKNS-1730-06-04			6	4				
RBKNS-1730-06-06			6	6				
RBKNS-1730-10-06			10	6				
RBKNS-1730-08-08			8	8				
RBKNS-1730-10-10			10	10				
RBKNS-2533-06-06	Aluminium (Anodised)	Nickel	6	6	25	33	2.3	M3
RBKNS-2533-10-06			10	6				
RBKNS-2533-12-06			12	6				
RBKNS-2533-08-08			8	8				
RBKNS-2533-10-10			10	10				
RBKNS-2533-12-12			12	12				

Technical specifications

Size Ref	Max Speed min^{-1}	Max Torque Ncm	Misalignment Radial mm	Misalignment Axial mm	Misalignment Angular deg	Torsional Stiffness Nm/rad	Radial Stiffness N/mm	Moment of Inertia gcm^2	Max Screw Torque Ncm	Approx Weight g
1223	10,000	13	±0.54	±2.29	±15	28	4.2	1.85	60	10.0
1730		39	±0.72	±3.09	±14	70	3.0	3.81	80	10.0
2533		200	±0.46	±2.77	±8	210	29.0	16.10	80	19.5

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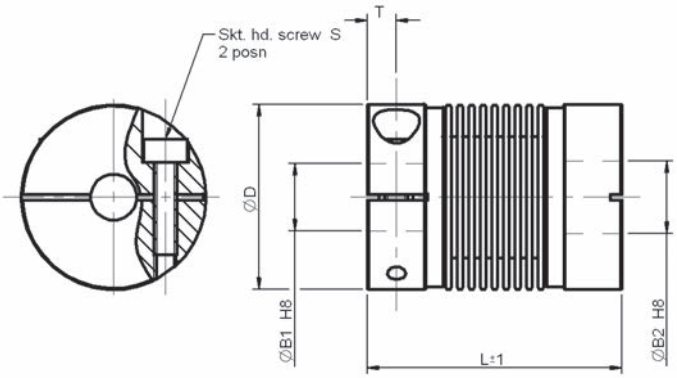
Nickel Bellows Couplings
Clamp Hub

3 - 12 mm Bore

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2

All dimensions in mm
General tolerances ±0.13 mm

H8	
Bore Size	Tolerance
3	+0.014
4 6	+0.018
8 10	+0.022
12	+0.027



Part number selection table

Part Number	Hub Material	Bellows Material	Bore ØB1	Bore ØB2	O/D ØD	Length L	Screw Position T	Screw Thread S
RBKNK-1733-03-03	Aluminium (Anodised)	Nickel	3	3	16.3	33	2.5	M2
RBKNK-1733-04-04			4	4				
RBKNK-1733-06-04			6	4				
RBKNK-1733-06-06			6	6				
RBKNK-2537-06-06	Aluminium (Anodised)	Nickel	6	6	25	37	2.8	M2.5
RBKNK-2537-10-06			10	6				
RBKNK-2537-08-08			8	8				
RBKNK-2537-10-10			10	10				
RBKNK-2537-12-12			12	12				

Technical specifications

Size Ref	Max Speed min^{-1}	Max Torque Ncm	Misalignment Radial mm	Misalignment Axial mm	Misalignment Angular deg	Torsional Stiffness Nm/rad	Radial Stiffness N/mm	Moment of Inertia gcm^2	Max Screw Torque Ncm	Approx Weight g
1733	10,000	39	±0.72	±3.09	±14	70	3.0	4.89	35	11.5
2537		200	±0.46	±2.77	±8	210	29.0	25.40	66	28.5

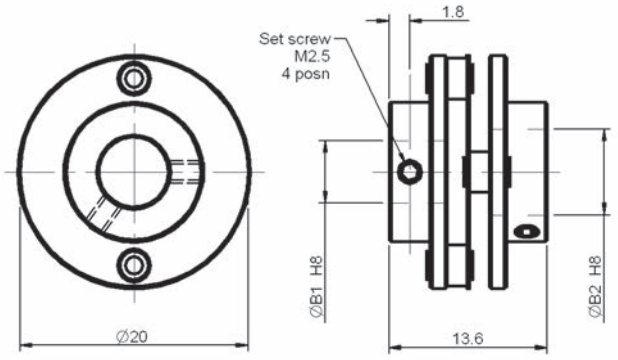
Technical support

- Zero backlash
- High torsional stiffness and low bearing loads
- Complete absorption of eccentricity, angularity and end play by spring action of the bellows
- Maintenance free
- Recommended temperature range -30ºC to +120ºC
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

Flexible Disc Spring Couplings
Set Screw Hub

All dimensions in mm
General tolerances ±0.13 mm

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2



H8	
Bore Size	Tolerance
2	+0.014
4 6	+0.018

Part number selection table

Part Number	Hub Material	Disc Springs Material	Bore ØB1	Bore ØB2
RFSXS-2014-02-02	Aluminium (Anodised)	Stainless steel	2	2
RFSXS-2014-04-02			4	2
RFSXS-2014-04-04			4	4
RFSXS-2014-06-06			6	6

Technical specifications

Size Ref	Max Speed	Max Torque	Misalignment			Torsional Stiffness	Radial Stiffness	Moment of Inertia	Max Screw Torque	Approx Weight
			Radial	Axial	Angular					
	min^{-1}	Ncm	mm	mm	deg	Nm/rad	N/mm	gcm^2	Ncm	g
2014	10,000	50	-	±0.3	±2.5	100	-	2.6	60	5.0

Technical support

- Zero backlash
- High torsional stiffness
- Maintenance free
- Recommended temperature range -30ºC to +120ºC
- Vibration isolation
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

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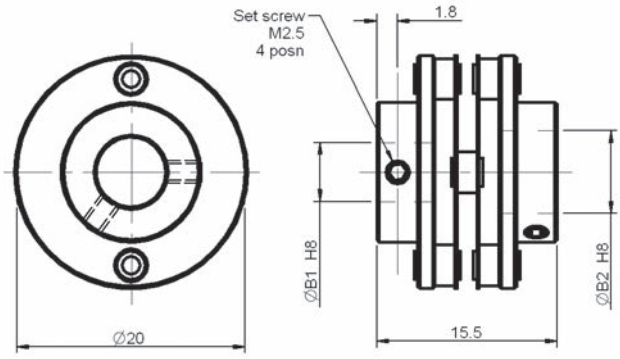
Flexible Disc Spring Couplings
Set Screw Hub

2 - 6 mm Bore

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2

All dimensions in mm
General tolerances ±0.13 mm

H8	
Bore Size	Tolerance
2	+0.014
4 6	+0.018



Couplings and Collars

Part number selection table

Part Number	Hub Material	Disc Springs Material	Bore ØB1	Bore ØB2
RFSXS-2016-02-02	Aluminium (Anodised)	Stainless steel	2	2
RFSXS-2016-04-02			4	2
RFSXS-2016-04-04			4	4
RFSXS-2016-06-06			6	6

Technical specifications

Size Ref	Max Speed	Max Torque	Misalignment			Torsional Stiffness	Radial Stiffness	Moment of Inertia	Max Screw Torque	Approx Weight
			Radial	Axial	Angular					
	min^{-1}	Ncm	mm	mm	deg	Nm/rad	N/mm	gcm^2	Ncm	g
2016	10,000	50	±0.2	±0.4	±3.0	20	125	2.8	60	6.0

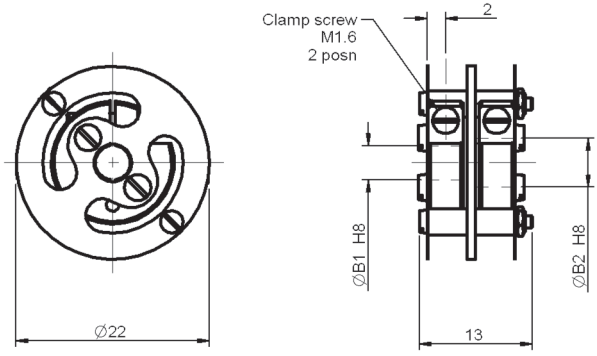
Technical support

- Zero backlash
- High torsional stiffness and low bearing loads
- Maintenance free
- Recommended temperature range -30ºC to +120ºC
- Vibration isolation
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

Flexible Disc Spring Couplings Clamp Hub

All dimensions in mm
General tolerances ±0.13 mm

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2



H8	
Bore Size	Tolerance
2 3	+0.014
4	+0.018

Part number selection table

Part Number	Hub Material	Disc Springs Material	Bore ØB1	Bore ØB2
RFSXK-2213-02-02	Nickel plated steel	Stainless steel	2	2
RFSXK-2213-03-02			3	2
RFSXK-2213-03-03			3	3
RFSXK-2213-04-04			4	4

Technical specifications

Size Ref	Max Speed	Max Torque	Misalignment			Torsional Stiffness	Radial Stiffness	Moment of Inertia	Max Screw Torque	Approx Weight
			Radial	Axial	Angular					
	min^{-1}	Ncm	mm	mm	deg	Nm/rad	N/mm	gcm^2	Ncm	g
2213	10,000	20	±0.3	±0.3	±2.0	14	3.0	3.2	20	9.5

Technical support

- Zero backlash
- High torsional stiffness and low bearing loads
- Maintenance free
- Recommended temperature range -30ºC to +120ºC
- Vibration isolation
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

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Associated Products
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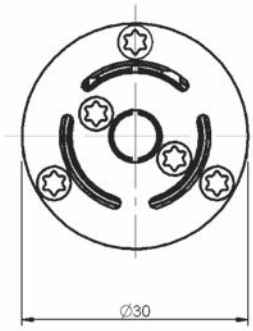
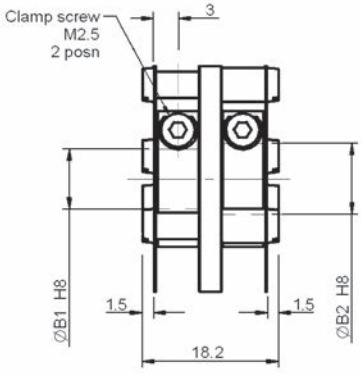
Intelligent motors: page 2-2

All dimensions in mm
General tolerances ±0.13 mm

H8	
Bore Size	Tolerance
3	+0.014
4 5 6	+0.018
8	+0.022





Part number selection table

Part Number	Hub Material	Disc Springs Material	Bore ØB1	Bore ØB2
RFSXK-3019-03-03	Aluminium (Anodised)	Stainless steel	3	3
RFSXK-3019-04-04			4	4
RFSXK-3019-05-05			5	5
RFSXK-3019-06-05			6	5
RFSXK-3019-06-06			6	6
RFSXK-3019-08-06			8	6
RFSXK-3019-10-08			10	8

Technical specifications

Size Ref	Max Speed	Max Torque	Misalignment			Torsional Stiffness	Radial Stiffness	Moment of Inertia	Max Screw Torque	Approx Weight
			Radial	Axial	Angular					
	min^{-1}	Ncm	mm	mm	deg	Nm/rad	N/mm	gcm^2	Ncm	g
3019	12,000	80	±0.4	±0.4	±3.0	150	6	19	80	16

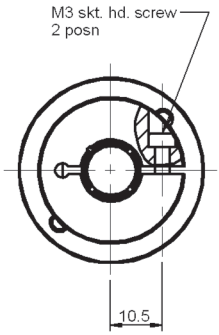
Technical support

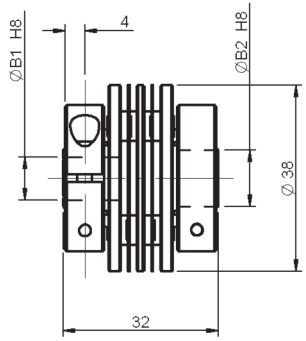
- Zero backlash
- High torsional stiffness and low bearing loads
- Maintenance free
- Recommended temperature range -30ºC to +120ºC
- Vibration isolation
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

Flexible Disc Spring Couplings
Clamp Hub

All dimensions in mm
General tolerances ±0.13 mm

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2





H8	
Bore Size	Tolerance
6	+0.018
9.53 10	+0.022
12 14	+0.027

Part number selection table

Part Number	Hub Material	Disc Springs Material	Bore ØB1	Bore ØB2
RFSXK-3832-06-06	Aluminium (Anodised)	Stainless steel	6	6
RFSXK-3832-95-95			9.53	9.53
RFSXK-3832-10-10			10	10
RFSXK-3832-12-10			12	10
RFSXK-3832-12-12			12	12
RFSXK-3832-14-12			14	12
RFSXK-3832-14-14			14	14

Technical specifications

Size Ref	Max Speed	Max Torque	Misalignment			Torsional Stiffness	Radial Stiffness	Moment of Inertia	Max Screw Torque	Approx Weight
			Radial	Axial	Angular					
	min^{-1}	Ncm	mm	mm	deg	Nm/rad	N/mm	gcm^2	Ncm	g
3832	8,000	200	±0.3	±0.3	±2.5	250	220	82	100	53

Technical support

- Zero backlash
- High torsional stiffness and low bearing loads
- Maintenance free
- Recommended temperature range -30ºC to +120ºC
- Vibration isolation
- Suitable for high number of revolutions at high torque
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

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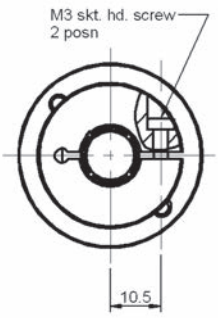
Flexible Disc Spring Couplings
Clamp Hub

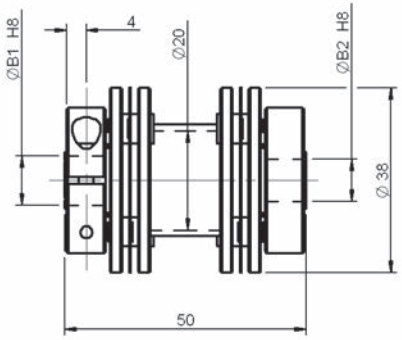
6 - 14 mm Bore

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2

All dimensions in mm
General tolerances ±0.13 mm

H8	
Bore Size	Tolerance
6	+0.018
9.53 10	+0.022
12 14	+0.027





Part number selection table

Part Number	Hub Material	Disc Springs Material	Bore ØB1	Bore ØB2
RFSXK-3850-06-06	Aluminium (Anodised)	Stainless steel	6	6
RFSXK-3850-95-95			9.53	9.53
RFSXK-3850-10-10			10	10
RFSXK-3850-12-10			12	10
RFSXK-3850-12-12			12	12
RFSXK-3850-14-12			14	12
RFSXK-3850-14-14			14	14

Technical specifications

Size Ref	Max Speed	Max Torque	Misalignment			Torsional Stiffness	Radial Stiffness	Moment of Inertia	Max Screw Torque	Approx Weight
			Radial	Axial	Angular					
	min^{-1}	Ncm	mm	mm	deg	Nm/rad	N/mm	gcm^2	Ncm	g
3850	8,000	200	±0.8	±0.8	±2.5	250	12	106	100	63

Technical support

- Zero backlash
- High torsional stiffness and low bearing loads
- Maintenance free
- Recommended temperature range -30ºC to +120ºC
- Vibration isolation
- Suitable for high number of revolutions at high torque
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

All dimensions in mm
Hub material: Aluminium alloy grade 2024 T351 or 7075 T651
Finish: Black sulphuric anodised MIL-A-8625 Type II, class 2
Spacer material: Acetal or nylon 11

Associated Products
Shafts: page 11-2
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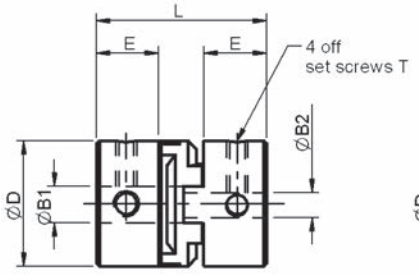
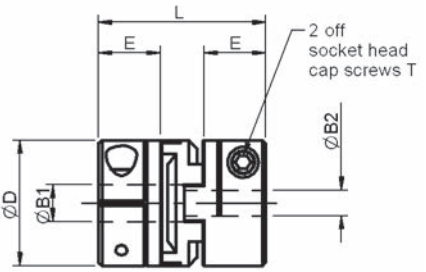
Intelligent motors: page 2-2



M0ST (set screw)



M0CT (clamp)

Part number selection table

Example Part No:- **M0ST AT - 13 - 3-3**

Basic Part No	Disc Material	Size	Standard Bore Sizes ØB1 and ØB2 (bore tolerance +0.050/-0.000)							Dimensions (mm) O/D ØD	Length L	Hub Length E	Fitted Screw T
M0ST (set screw)	**AT** (Acetal) **NL** (Nylon)	**13**	**3**	**4**	**5**	**6**				12.7	15.9	5.6	M3
		19		**4**	**5**	**6**	**8**			19.1	22.2	7.6	M3
		25				**6**	**8**	**10**	**12**	25.4	28.6	9.9	M4
		33					**8**	**10**	**12**	33.3	47.6	15.0	M4
		41						**10**	**12**	41.3	50.8	18.0	M5
M0CT (clamp)	**AT** (Acetal) **NL** (Nylon)	**19**		**4**	**5**	**6**	**8**			19.1	25.4	9.7	M2.5
		25				**6**	**8**	**10**	**12**	25.4	31.8	11.9	M3
		33					**8**	**10**	**12**	33.3	47.6	15.0	M3
		41						**10**	**12**	41.3	50.8	18.0	M4

Note: Oldham couplings sizes 13 and 19 use only two set screws 'T'

Product options

- Larger or alternative bore sizes
- Imperial bores
- Product overview - see pages 8-2 to 8-7

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Technical specifications

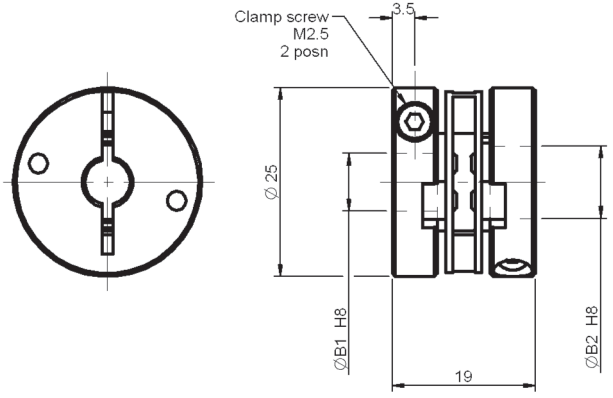
Size Ref	Disc Material	Torsional Stiffness Deg/Nm	Torque Capacity		Misalignment	
			Rated Nm	Break Nm	Parallel mm	Axial mm
13	AT	0.636	0.68	3.9	0.10	0.05
	NL	2.560	0.17	2.8	0.10	0.05
19	AT	0.380	2.25	10.5	0.20	0.10
	NL	1.240	0.57	9.6	0.20	0.10
25	AT	0.291	4.75	19.0	0.20	0.10
	NL	1.110	1.13	15.9	0.20	0.10
33	AT	0.079	8.00	39.5	0.20	0.15
	NL	0.460	2.05	34.0	0.20	0.15
41	AT	0.068	14.75	54.5	0.25	0.15
	NL	0.330	3.65	45.3	0.25	0.15

Technical support

- Zero backlash with acetal disc
- High parallel misalignment capability
- Electrically insulated discs act as a mechanical fuse preventing damage to other components
- Temperature range:-
  Acetal disc: -23ºC to +65ºC.
  Nylon disc: -23ºC to +54ºC.
- Max speed: 4,500 rpm
- Acetal discs provide high torsional stiffness
- Nylon discs provide vibration and shock absorption
- Technical information - see page T8-1
- Installation information - see page T8-3

Membrane Couplings
Clamp Hub

All dimensions in mm
General tolerances ±0.13 mm



Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2

H8	
Bore Size	Tolerance
6	+0.018
8 10	+0.022

Part number selection table

Part Number	Hub Material	Membrane Material	Bore ØB1	Bore ØB2
RFSKK-2519-06-06	Aluminium (Anodised)	Polyamide 6.6 re-inforced fibreglass	6	6
RFSKK-2519-10-06			10	6
RFSKK-2519-08-08			8	8
RFSKK-2519-10-10			10	10

Technical specifications

Size Ref	Max Speed	Max Torque	Misalignment			Torsional Stiffness	Radial Stiffness	Moment of Inertia	Max Screw Torque	Approx Weight
			Radial	Axial	Angular					
	min^{-1}	Ncm	mm	mm	deg	Nm/rad	N/mm	gcm^2	Ncm	g
2519	12,000	40	±0.25	±0.4	±2.5	22	60	13.5	65	16

Technical support

- Zero backlash
- Maintenance free
- Recommended temperature range -10ºC to +80ºC
- Electrical isolation
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

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Associated Products
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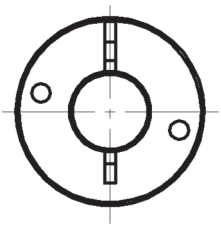
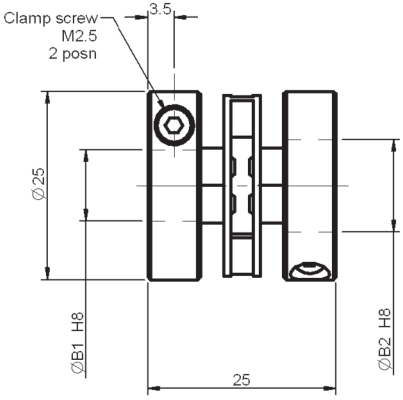
All dimensions in mm
General tolerances ±0.13 mm

H8	
Bore Size	Tolerance
6	+0.018
8 10	+0.022
12	+0.027





Part number selection table

Part Number	Hub Material	Membrane Material	Bore ØB1	Bore ØB2
RFSKK-2525-06-06	Aluminium (Anodised)	Polyamide 6.6 re-inforced fibreglass	6	6
RFSKK-2525-10-06			10	6
RFSKK-2525-08-08			8	8
RFSKK-2525-10-10			10	10
RFSKK-2525-12-10			12	10
RFSKK-2525-12-12			12	12

Technical specifications

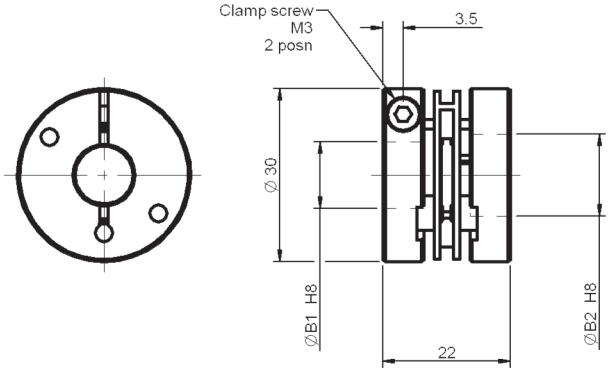
Size Ref	Max Speed	Max Torque	Misalignment			Torsional Stiffness	Radial Stiffness	Moment of Inertia	Max Screw Torque	Approx Weight
			Radial	Axial	Angular					
	min^{-1}	Ncm	mm	mm	deg	Nm/rad	N/mm	gcm^2	Ncm	g
2525	12,000	40	±0.25	±0.4	±2.5	22	60	15	65	18

Technical support

- Zero backlash
- Maintenance free
- Recommended temperature range -10ºC to +80ºC
- Electrical isolation
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

Membrane Couplings
Clamp Hub

All dimensions in mm
General tolerances ±0.13 mm



Associated Products
Shafts: page 11-2
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Leadscrews: page 7-1
Intelligent motors: page 2-2

H8	
Bore Size	Tolerance
6	+0.018
8 10	+0.022
12 14	+0.027

Part number selection table

Part Number	Hub Material	Membrane Material	Bore ØB1	Bore ØB2
RFSKK-3022-06-06	Aluminium (Anodised)	Polyamide 6.6 reinforced fibreglass	6	6
RFSKK-3022-10-06			10	6
RFSKK-3022-08-08			8	8
RFSKK-3022-10-10			10	10
RFSKK-3022-12-10			12	10
RFSKK-3022-12-12			12	12
RFSKK-3022-14-14			14	14

Technical specifications

Size Ref	Max Speed	Max Torque	Misalignment			Torsional Stiffness	Radial Stiffness	Moment of Inertia	Max Screw Torque	Approx Weight
			Radial	Axial	Angular					
	min^{-1}	Ncm	mm	mm	deg	Nm/rad	N/mm	gcm^2	Ncm	g
3022	12,000	60	±0.3	±0.4	±2.5	30	40	35	80	30

Technical support

- Zero backlash
- High torsional stiffness and low bearing loads
- Maintenance free
- Recommended temperature range -10ºC to +80ºC
- Electrical isolation
- High rigidity
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

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Associated Products
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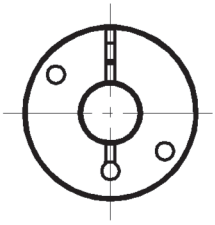
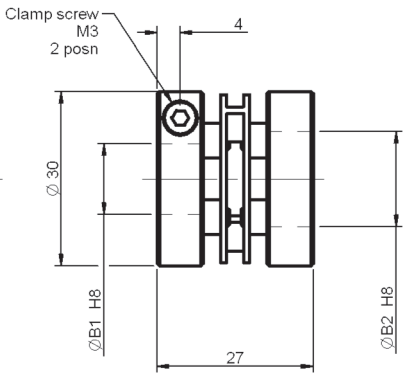
Intelligent motors: page 2-2

All dimensions in mm
General tolerances ±0.13 mm

H8	
Bore Size	Tolerance
6	+0.018
8 10	+0.022
12 14	+0.027





Part number selection table

Part Number	Hub Material	Membrane Material	Bore ØB1	Bore ØB2
RFSKK-3027-06-06	Aluminium (Anodised)	Polyamide 6.6 reinforced fibreglass	6	6
RFSKK-3027-10-06			10	6
RFSKK-3027-08-08			8	8
RFSKK-3027-10-10			10	10
RFSKK-3027-12-10			12	10
RFSKK-3027-12-12			12	12
RFSKK-3027-14-14			14	14

Technical specifications

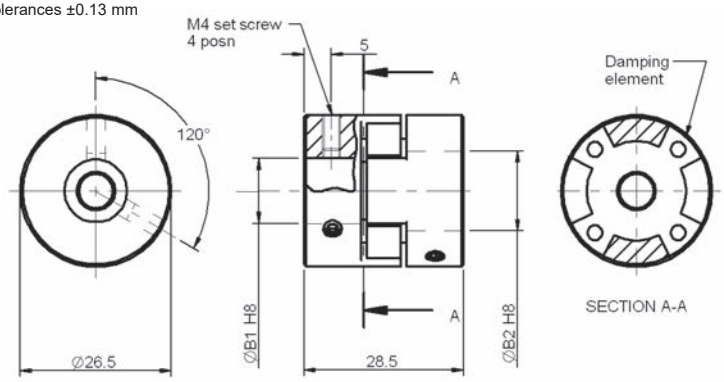
Size Ref	Max Speed	Max Torque	Misalignment			Torsional Stiffness	Radial Stiffness	Moment of Inertia	Max Screw Torque	Approx Weight
			Radial	Axial	Angular					
	min^{-1}	Ncm	mm	mm	deg	Nm/rad	N/mm	gcm^2	Ncm	g
3027	12,000	60	±0.3	±0.4	±2.5	30	40	37	80	32

Technical support

- Zero backlash
- High torsional stiffness and low bearing loads
- Maintenance free
- Recommended temperature range -10ºC to +80ºC
- Electrical isolation
- High rigidity
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

Curved Jaw Couplings
Set Screw Hub

All dimensions in mm
General tolerances ±0.13 mm



Associated Products
Shafts: page 11-2
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Leadscrews: page 7-1
Intelligent motors: page 2-2

H8	
Bore Size	Tolerance
6	+0.018
8 10	+0.022
12	+0.027

Part number selection table

Example Part No:- RKKAS - 1500 - 08 - 06 - 92

Basic Part Number	Hub Material	Damping Element Material	Element Hardness	Bore ØB1	Bore ØB2
RKKAS-1500-06-06	Aluminium (Anodised)	Polyurethane	-80 (blue) -92 (white) -98 (red)	6	6
RKKAS-1500-08-06				8	6
RKKAS-1500-08-08				8	8
RKKAS-1500-10-08				10	8
RKKAS-1500-10-10				10	10
RKKAS-1500-12-10				12	10

Technical specifications

Element Hardness	Max Speed min^{-1}	Max Torque Ncm	Misalignment at 750rpm Radial mm	Axial mm	Angular deg	Twist at Max Torque Deg	Moment of Inertia gcm^2	Max Screw Torque Ncm	Approx Weight g
80	19,000	800	±0.22	±1.0	±1.3	10	30	120	34
92		1500	±0.22	±1.0	±1.3	10	30	120	34
98		2500	±0.22	±1.0	±1.3	10	30	120	34

Technical support

- Zero backlash
- Alternative damping element hardness
- Maintenance free
- Recommended temperature range -30ºC to +80ºC
- Torque ripple reduction
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

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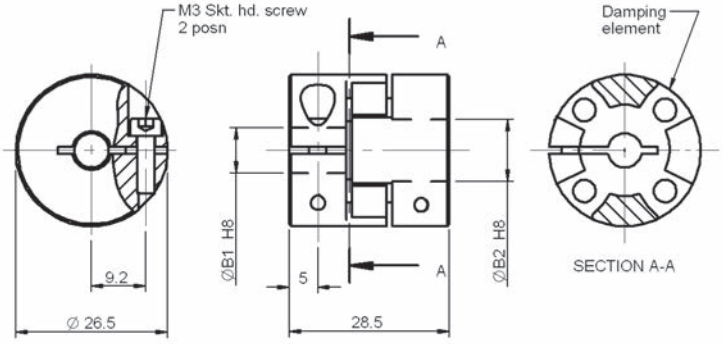
Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2

All dimensions in mm
General tolerances ±0.13 mm

H8	
Bore Size	Tolerance
6	+0.018
8 10	+0.022
12	+0.027



Part number selection table

Example Part No:- RKKAK - 1500 - 08 - 06 - 92

Basic Part Number	Hub Material	Damping Element Material	Element Hardness	Bore ØB1	Bore ØB2
RKKAK-1500-06-06	Aluminium (Anodised)	Polyurethane	-80 (blue) -92 (white) -98 (red)	6	6
RKKAK-1500-08-06				8	6
RKKAK-1500-08-08				8	8
RKKAK-1500-10-08				10	8
RKKAK-1500-10-10				10	10
RKKAK-1500-12-10				12	10

Technical specifications

Element Hardness	Max Speed min^{-1}	Max Torque Ncm	Misalignment at 750rpm Radial mm	Axial mm	Angular deg	Twist at Max Torque Deg	Moment of Inertia gcm^2	Max Screw Torque Ncm	Approx Weight g
80	19,000	800	±0.22	±1.0	±1.3	10	30	150	34
92		1500	±0.22	±1.0	±1.3	10	30	150	34
98		2500	±0.22	±1.0	±1.3	10	30	150	34

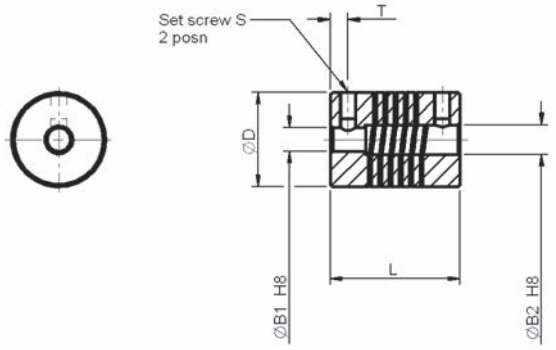
Technical supprt

- Zero backlash
- Alternative damping element hardness
- Maintenance free
- Recommended temperature range -30ºC to +80ºC
- Torque ripple reduction
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

Micro Spiral Beam Couplings
Set Screw Hub

All dimensions in mm
General tolerances ±0.13 mm

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2



H8	
Bore Size	Tolerance
1 2 3	+0.014
4 5	+0.018

Part number selection table

Part Number	Material	Bore ØB1	Bore ØB2	O/D ØD	Length L	Screw Position T	Screw Thread S
RWKAS-6508-01-01	Aluminium	1	1	6.5	8	1.3	M1.6
RWKAS-6508-02-01		2	1				
RWKAS-6508-02-02		2	2				
RWKAS-1015-02-02	Aluminium	2	2	10	15	2.0	M2
RWKAS-1015-03-02		3	2				
RWKAS-1015-04-02		4	2				
RWKAS-1015-05-02		5	2				
RWKAS-1015-03-03		3	3				
RWKAS-1015-05-03		5	3				

Technical specifications

Size	Max Speed min^{-1}	Max Torque Ncm	Misalignment Radial mm	Misalignment Axial mm	Misalignment Angular deg	Torsional Stiffness Nm/rad	Radial Stiffness N/mm	Moment of Inertia gcm^2	Max Screw Torque Ncm	Approx Weight g
6508	8,000	2	±0.10	±0.15	±2.0	0.55	24	0.02	8	0.5
1015		15	±0.15	±0.20	±2.0	2.20	22	0.34	15	2.4

Technical support

- Zero backlash
- High torsional stiffness and low bearing loads
- Maintenance free
- Recommended temperature range -30ºC to +150ºC
- One piece construction
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

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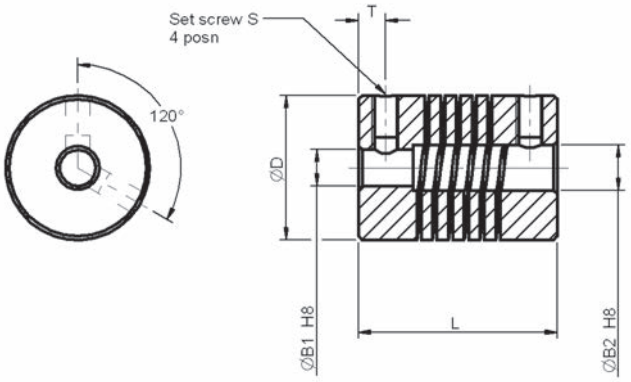
Spiral Beam Couplings
Set Screw Hub

2 - 6 mm Bore

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2

All dimensions in mm
General tolerances ±0.13 mm

H8	
Bore Size	**Tolerance**
2 3	+0.014
4 5 6	+0.018



Part number selection table

Part Number	Material	Bore ØB1	Bore ØB2	O/D ØD	Length L	Screw Position T	Screw Thread S
RWKAS-1218-04-02	Aluminium	4	2	12	18	2.5	M2.5
RWKAS-1218-03-03		3	3				
RWKAS-1218-04-03		4	3				
RWKAS-1218-04-04		4	4				
RWKAS-1622-03-03	Aluminium	3	3	16	22	3.0	M3
RWKAS-1622-05-03		5	3				
RWKAS-1622-04-04		4	4				
RWKAS-1622-05-04		5	4				
RWKAS-1622-05-05		5	5				
RWKAS-1622-06-06		6	6				

Technical specifications

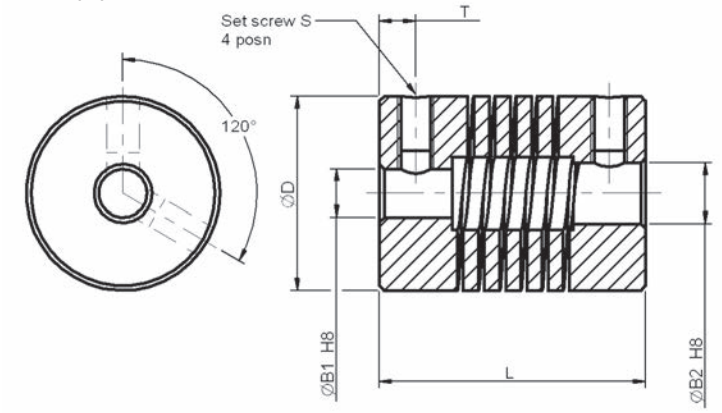
Size	Max Speed min^{-1}	Max Torque Ncm	Misalignment Radial mm	Misalignment Axial mm	Misalignment Angular deg	Torsional Stiffness Nm/rad	Radial Stiffness N/mm	Moment of Inertia gcm^2	Max Screw Torque Ncm	Approx Weight g
1218	8,000	25	±0.15	±0.25	±2.5	2.8	28	0.83	35	4.0
1622		40	±0.20	±0.30	±3.0	5.0	34	3.20	50	9.5

Technical support

- Zero backlash
- High torsional stiffness and low bearing loads
- Maintenance free
- Recommended temperature range -30ºC to +150ºC
- One piece construction
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

Spiral Beam Couplings
Set Screw Hub

All dimensions in mm
General tolerances ±0.13 mm



Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2

H8	
Bore Size	Tolerance
4 5 6	+0.018
8 10	+0.022
12 14	+0.027

Part number selection table

Part Number	Material	Bore ØB1	Bore ØB2	O/D ØD	Length L	Screw Position T	Screw Thread S
RWKAS-1922-04-04	Aluminium	4	4	19	22	3.0	M3
RWKAS-1922-06-04		6	4				
RWKAS-1922-05-05		5	5				
RWKAS-1922-06-06		6	6				
RWKAS-1922-08-06		8	6				
RWKAS-1922-08-08		8	8				
RWKAS-2019-06-04	Aluminium	6	4	20	19	2.8	M3
RWKAS-2019-05-05		5	5				
RWKAS-2019-06-06		6	6				
RWKAS-2019-08-06		8	6				
RWKAS-2524-06-06	Aluminium (Anodised)	6	6	25	24	3	M4
RWKAS-2524-08-06		8	6				
RWKAS-2524-10-06		10	6				
RWKAS-2524-08-08		8	8				
RWKAS-2524-10-08		10	8				
RWKAS-2524-10-10		10	10				
RWKAS-2524-12-12		12	12				
RWKAS-2532-06-06	Aluminium (Anodised)	6	6	25	32	4	M4
RWKAS-2532-08-06		8	6				
RWKAS-2532-10-06		10	6				
RWKAS-2532-08-08		8	8				
RWKAS-2532-10-08		10	8				
RWKAS-2532-10-10		10	10				
RWKAS-2532-12-10		12	10				
RWKAS-2532-12-12		12	12				

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Part number selection table continued

Part Number	Material	Bore ØB1	Bore ØB2	O/D ØD	Length L	Screw Position T	Screw Thread S
RWKAS-3030-10-10 RWKAS-3030-12-10 RWKAS-3030-14-10	Aluminium (Anodised)	10 12 14	10 10 10	30	30	4	M4
RWKAS-3038-10-10 RWKAS-3038-12-10 RWKAS-3038-14-10 RWKAS-3038-12-12	Aluminium (Anodised)	10 12 14 12	10 10 10 12	30	38	5	M4

Technical specifications

Size Ref	Max Speed min^{-1}	Max Torque Ncm	Misalignment Radial mm	Misalignment Axial mm	Misalignment Angular deg	Torsional Stiffness Nm/rad	Radial Stiffness N/mm	Moment of Inertia gcm^2	Max Screw Torque Ncm	Approx Weight g
1922	8,000	60	±0.25	±0.4	±3.5	9	40	6.7	50	13
2019		60	±0.25	±0.4	±3.5	9	40	6.0	50	12
2524		100	±0.30	±0.5	±4.0	20	60	22.2	120	26
2532		100	±0.30	±0.5	±4.0	18	50	30.0	120	35
3030		150	±0.30	±0.5	±4.0	21	60	57.0	120	45
3038		150	±0.30	±0.5	±4.0	21	60	76.0	120	60

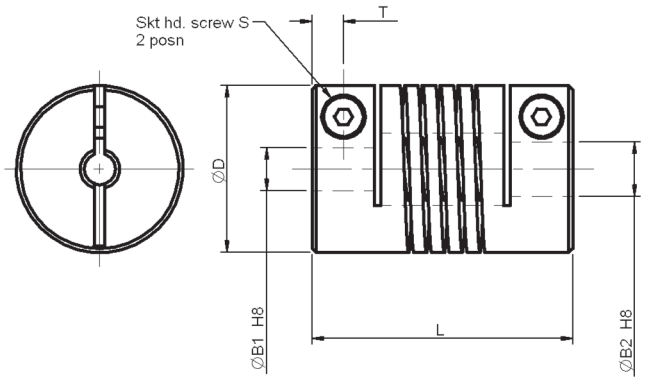
Technical support

- Zero backlash
- High torsional stiffness and low bearing loads
- Maintenance free
- Recommended temperature range -30ºC to +150ºC
- One piece construction
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

Spiral Beam Couplings
Clamp Hub

All dimensions in mm
General tolerances ±0.13 mm

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2



H8	
Bore Size	Tolerance
2 3	+0.014
4 5 6	+0.018
8 10	+0.022
12 14	+0.027

Part number selection table

Part Number	Material	Bore ØB1	Bore ØB2	O/D ØD	Length L	Screw Position T	Screw Thread S
RWKAK-1421-02-02	Aluminium (Anodised)	2	2	14	21	2.6	M2
RWKAK-1421-03-02		3	2				
RWKAK-1421-03-03		3	3				
RWKAK-1421-04-03		4	3				
RWKAK-1421-04-04		4	4				
RWKAK-1625-03-03	Aluminium (Anodised)	3	3	16	25	3.0	M2
RWKAK-1625-05-03		5	3				
RWKAK-1625-04-04		4	4				
RWKAK-1625-06-04		6	4				
RWKAK-1625-05-05		5	5				
RWKAK-1625-06-05		6	5				
RWKAK-1928-04-04	Aluminium (Anodised)	4	4	19	28	3.3	M3
RWKAK-1928-06-04		6	4				
RWKAK-1928-05-05		5	5				
RWKAK-1928-06-05		6	5				
RWKAK-1928-06-06		6	6				
RWKAK-2532-06-06	Aluminium (Anodised)	6	6	25	32	4.0	M3
RWKAK-2532-08-06		8	6				
RWKAK-2532-10-06		10	6				
RWKAK-2532-08-08		8	8				
RWKAK-2532-10-08		10	8				
RWKAK-2532-10-10		10	10				
RWKAK-2532-12-10		12	10				

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Part number selection table continued

Part Number	Material	Bore ØB1	Bore ØB2	O/D ØD	Length L	Screw Position T	Screw Thread S
RWKAK-3038-10-10	Aluminium (Anodised)	10	10	30	38	4.8	M4
RWKAK-3038-12-10		12	10				
RWKAK-3038-12-12		12	12				
RWKAK-3038-14-14		14	14				

Technical specifications

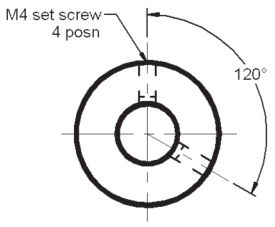
Size Ref	Max Speed min^{-1}	Max Torque Ncm	Misalignment Radial mm	Misalignment Axial mm	Misalignment Angular deg	Torsional Stiffness Nm/rad	Radial Stiffness N/mm	Moment of Inertia gcm^2	Max Screw Torque Ncm	Approx Weight g
1421	6,000	50	±0.20	±0.25	±3.0	4.5	22	1.9	50	6.5
1625		60	±0.20	±0.30	±3.5	5.5	30	3.8	50	10
1928		80	±0.25	±0.40	±4.0	8	36	8.7	80	16
2532		100	±0.35	±0.50	±4.0	16	45	29.0	100	34
3038		150	±0.35	±0.50	±4.0	19	60	76.0	100	58

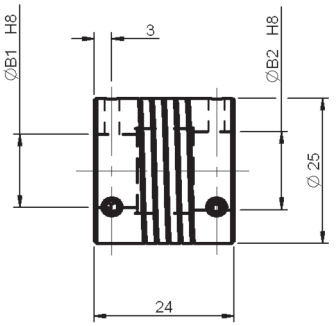
Technical support

- Zero backlash
- High torsional stiffness and low bearing loads
- Maintenance free
- Recommended temperature range -30ºC to +150ºC
- One piece construction
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

Spiral Beam Couplings
Set Screw Hub

All dimensions in mm
General tolerances ±0.13 mm





Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2

H8	
Bore Size	Tolerance
8 10	+0.022

Part number selection table

Part Number	Material	Bore ØB1	Bore ØB2
RWKXS-2524-08-08 RWKXS-2524-10-10	Stainless steel	8 10	8 10

Technical specifications

Size Ref	Max Speed	Max Torque	Misalignment			Torsional Stiffness	Radial Stiffness	Moment of Inertia	Max Screw Torque	Approx Weight
			Radial	Axial	Angular					
	min^{-1}	Ncm	mm	mm	deg	Nm/rad	N/mm	gcm^2	Ncm	g
2524	8,000	200	±0.3	±0.5	±4.0	40	250	64	200	65

Technical support

- Zero backlash
- High torsional stiffness
- Maintenance free
- Recommended temperature range -30ºC to +180ºC
- One piece construction
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

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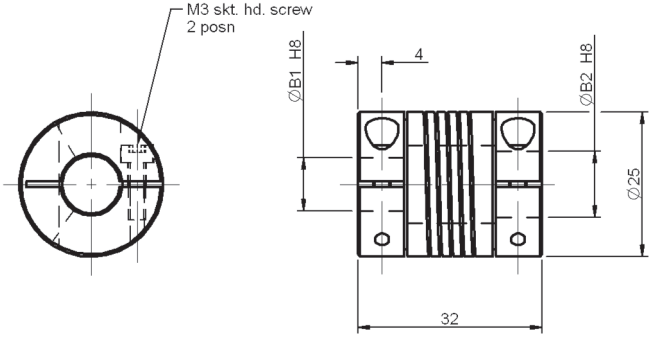
Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2

All dimensions in mm
General tolerances ±0.13 mm

H8	
Bore Size	Tolerance
6	+0.018
8 10	+0.022



Part number selection table

Part Number	Material	Bore ØB1	Bore ØB2
RWKXK-2532-10-06	Stainless steel	10	6
RWKXK-2532-08-08		8	8
RWKXK-2532-10-10		10	10

Technical specifications

Size Ref	Max Speed	Max Torque	Misalignment			Torsional Stiffness	Radial Stiffness	Moment of Inertia	Max Screw Torque	Approx Weight
			Radial	Axial	Angular					
	min^{-1}	Ncm	mm	mm	deg	Nm/rad	N/mm	gcm^2	Ncm	g
2532	6,000	200	±0.35	±0.5	±4.0	29	150	84	200	88

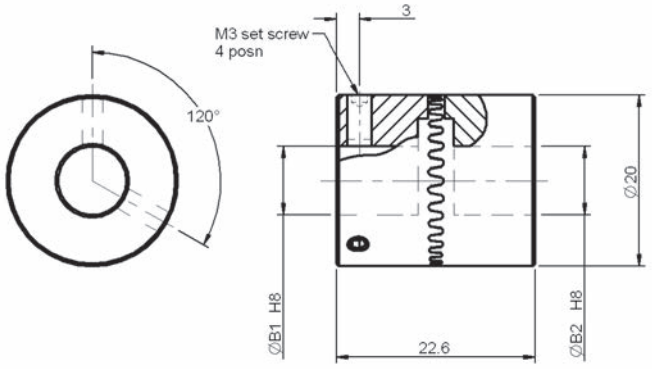
Technical support

- Zero backlash
- High torsional stiffness
- Maintenance free
- Recommended temperature range -30ºC to +180ºC
- One piece construction
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

Radial Tooth Couplings

All dimensions in mm
General tolerances ±0.13 mm

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2



H8	
Bore Size	Tolerance
6	+0.018
8 10	+0.022

Part number selection table

Part Number	Coupling Material	Bore ØB1	Bore ØB2
RSKSS-2022-06-06		6	6
RSKSS-2022-08-06	Steel	8	6
RSKSS-2022-10-06	9S Mn Pb 28	10	6
RSKSS-2022-08-08	(Black finished)	8	8
RSKSS-2022-10-10		10	10

Technical specifications

Size Ref	Max Speed	Max Torque	Misalignment			Module	Radial Stiffness	Moment of Inertia	Max Screw Torque	Approx Weight
			Radial	Axial	Angular					
	min^{-1}	Ncm	mm	mm	deg	mm	N/mm	gcm^2	Ncm	g
2022	8,000	200	N/A	N/A	±0.5	0.7	N/A	26	80	42

Technical support

- Recommended temperature range -30ºC to +120ºC
- Self centering connection
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

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Friction Clutch - Spiral Spring Clamp Hub

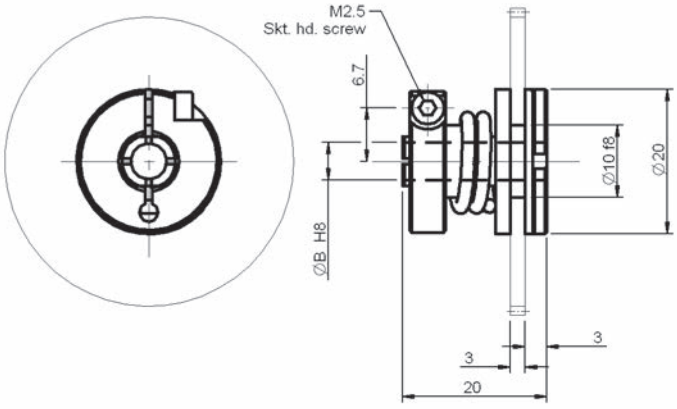
4 - 6 mm Bore

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2

All dimensions in mm
General tolerances ±0.13 mm

H8	
Bore Size	**Tolerance**
4 5 6	+0.018

f8	
Shaft Dia	**Tolerance**
10	-0.013 -0.035



Couplings and Collars

Technical specifications

Part Number	Bore ØB	Max Speed min^{-1}	Max Adjustable Torque Ncm	Moment of Inertia gcm^2	Max Screw Torque Ncm	Material		Approx Weight g
						Flange	Clutch Lining	
RRKSK-2020-04 RRKSK-2020-05 RRKSK-2020-06	4 5 6	50	30	8.4	100	Steel 9S Mn Pb 28 (Black finished)	Nylatron	20

Note: Gear not included, manufactured on request, please enquire

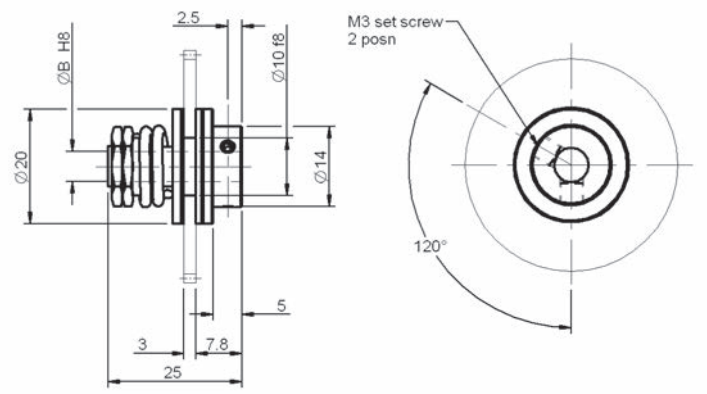
Technical support

- Zero backlash before slipping
- Maintenance free
- Recommended temperature range -10ºC to +50ºC
- Protects actuators from torque damage
- Adjustable torque setting
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

Friction Clutch - Spiral Spring Set Screw Hub

All dimensions in mm
General tolerances ±0.13 mm

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2



H8	
Bore Size	Tolerance
4 5 6	+0.018

f8	
Shaft Dia	Tolerance
10	-0.013 -0.035

Part number selection and technical table

Part Number	Bore ØB	Max Speed min^{-1}	Max Adjustable Torque Ncm	Moment of Inertia gcm^2	Max Screw Torque Ncm	Material		Approx Weight g
						Flange	Clutch Lining	
RRKSS-2025-04 RRKSS-2025-05 RRKSS-2025-06	4 5 6	50	30	8.4	80	Steel 9S Mn Pb 28 (Black finished)	Nylatron	23

Note: Gear not included, manufactured on request, please enquire

Technical support

- Zero backlash before slipping
- Maintenance free
- Recommended temperature range -10ºC to +50ºC
- Protects actuators from torque damage
- Adjustable torque setting
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

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Friction Clutch - Plate Spring Clamp Hub

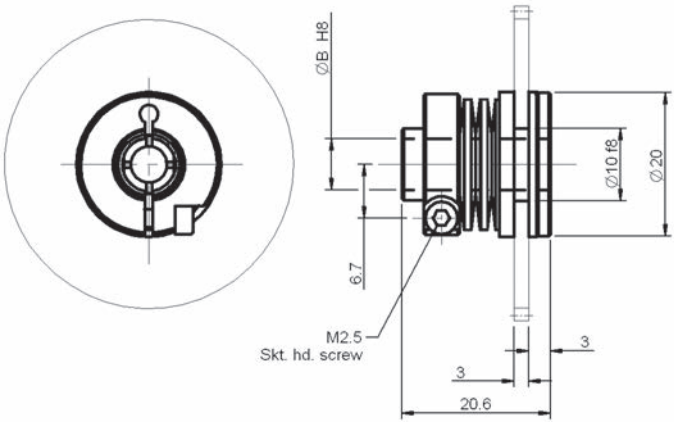
4 - 6 mm Bore

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2

All dimensions in mm
General tolerances ±0.13 mm

H8	
Bore Size	Tolerance
4 5 6	+0.018

f8	
Shaft Dia	Tolerance
10	-0.013 -0.035



Couplings and Collars

Technical specifications

Part Number	Bore ØB	Max Speed min^{-1}	Max Adjustable Torque Ncm	Moment of Inertia gcm^2	Max Screw Torque Ncm	Material		Approx Weight g
						Flange	Clutch Lining	
RRKTK-2020-04 RRKTK-2020-05 RRKTK-2020-06	4 5 6	40	120	7	100	Steel 9S Mn Pb 28 (Black finished)	Nylatron	23

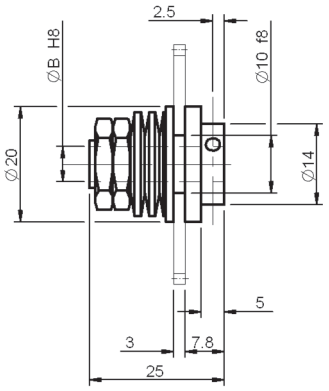
Note: Gear not included, manufactured on request, please enquire

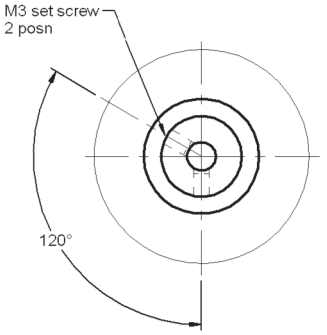
Technical support

- Zero backlash before slipping
- Maintenance free
- Recommended temperature range -10ºC to +50ºC
- Protects actuators from torque damage
- Adjustable torque setting
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

Friction Clutch - Plate Spring Set Screw Hub

All dimensions in mm
General tolerances ±0.13 mm





Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2

H8	
Bore Size	Tolerance
4 5 6	+0.018

f8	
Shaft Dia	Tolerance
10	-0.013 -0.035

Technical specifications

Part Number	Bore ØB	Max Speed min^{-1}	Max Adjustable Torque Ncm	Moment of Inertia gcm^2	Max Screw Torque Ncm	Material		Approx Weight g
						Flange	Clutch Lining	
RRKTS-2025-04 RRKTS-2025-05 RRKTS-2025-06	4 5 6	40	120	9.9	80	Steel 9S Mn Pb 28 (Black finished)	Nylatron	25

Note: Gear not included, manufactured on request, please enquire

Technical support

- Zero backlash before slipping
- Maintenance free
- Recommended temperature range -10ºC to +50ºC
- Protects actuators from torque damage
- Adjustable torque setting
- Technical information - see page T8-1
- Product overview - see pages 8-2 to 8-7

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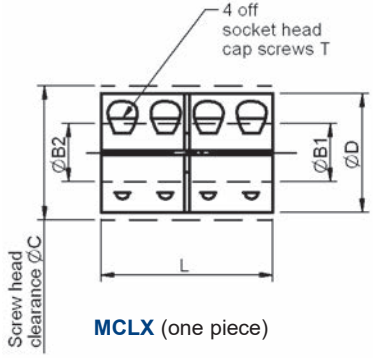
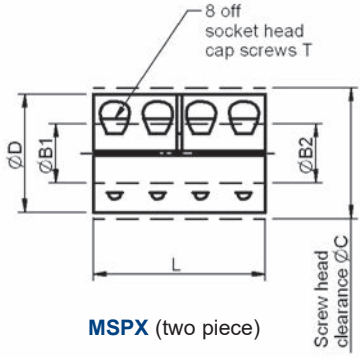
Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2

All dimensions in mm
Materials: Aluminium alloy grade 2024 T351
Stainless steel Grade18.8 type 303
Screws C12L14



MCLX (one piece)



MSPX (two piece)

Part number selection table

Example Part No:- MCLX - A - 3-3

Basic Part Number	Material	Size Ref	Standard Bore Sizes ØB1 and ØB2 (bore tolerance +0.012/+0.050)	O/D ØD	Length L	ØC	Clamp Screw T
MCLX (1-piece)	**A*** (Aluminium)	**3**	3	15	22	15.0	M2
		4	4	15	22	15.0	M2
		5	5	15	22	15.0	M2
MSPX (2-piece)	**SS** (St. steel)	**6**	6	18	30	21.5	M3
		8	8	24	35	27.1	M3
		10	10	29	45	33.0	M4

*Aluminium is only available on MCLX

Product options

- Alternative bore sizes
- Imperial bores
- Set screw clamping
- Stainless steel screws

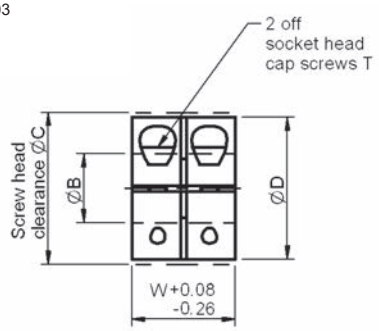
Technical support

- Does not mark the shaft
- Nypatch® anti-vibration hardware
- Precision honed bore
- MSPX, two piece style is balanced by opposing hardware and is easily disassembled and maintained
- Max speed: 4,000 rpm
- Recommended temperature range:
  Stainless steel -40ºC to +175ºC
  Aluminium -40ºC to +100ºC
- Technical information - see page T8-1
- Installation information - see page T8-4
- Product overview - see pages 8-2 to 8-7

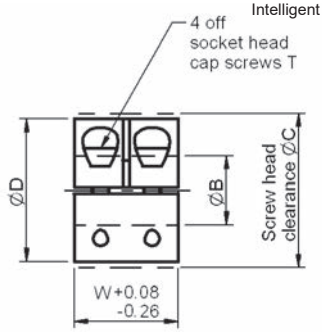
Double Width Shaft Clamp Collars

All dimensions in mm
Materials: Aluminium alloy
grade 2024 T351
Stainless steel
Grade18.8 type 303
Screws C12L14

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2



MWCL (one piece)



MWSP (two piece)

Part number selection table

Example Part No:- **MWCL - A - 6**

Basic Part Number	Material	Size	Dimensions (mm) Standard Bore Sizes ØB (bore tolerance +0.012/+0.050)	O/D ØD	Width W	ØC	Clamp Screw T
MWCL (1-piece)	**A*** (Aluminium)	**6**	6	16	20	20.8	M3
		8	8	18	20	22.4	M3
MWSP (2-piece)	**SS** (St. steel)	**10**	10	24	20	26.3	M3

*Aluminium is only available on MWCL

Product options

- Alternative bore sizes
- Imperial bores
- Set screw clamping
- Stainless steel screws

Technical support

- Does not mark the shaft
- Integral location face
- Excellent for high axial loads
- MWSP, two piece style is balanced by opposing hardware and is easily disassembled and maintained
- Transmits torque in confined spaces
- Recommended temperature range:
  Stainless steel -40ºC to +175ºC
  Aluminium -40ºC to +100ºC
- Installation information - see page T8-4
- Product overview - see pages 8-2 to 8-7

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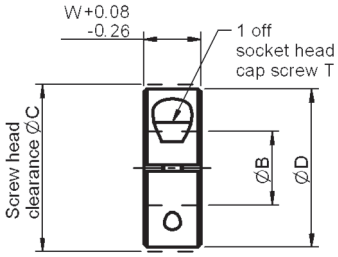
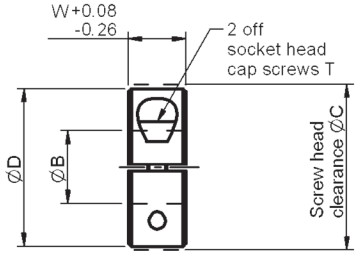
Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2

All dimensions in mm
Materials: Aluminium alloy grade 2024 T351 sulphuric anodised
Stainless steel Grade18.8 type 303
Screws C12L14



MCL (one piece)



MSP (two piece)

Part number selection table

Example Part No:- **MCL - A - 3**

Basic Part Number	Material	Size	Dimensions (mm) Standard Bore Sizes ØB (bore tolerance +0.012/+0.050)	O/D ØD	Width W	ØC	Clamp Screw T
MCL (1-piece) **MSP** (2-piece)	**A** (Aluminium) **SS** (St. steel)	**3**	3	16	9	20.8	M3
		4	4	16	9	20.8	M3
		5	5	16	9	20.8	M3
		6	6	16	9	20.8	M3
		7	7	18	9	22.4	M3
		8	8	18	9	22.4	M3
		9	9	24	9	26.3	M3
		10	10	24	9	26.3	M3

Product options

- Alternative bore sizes
- Imperial bores
- Stainless steel screws
- Plastic collars available
- 316 stainless steel available

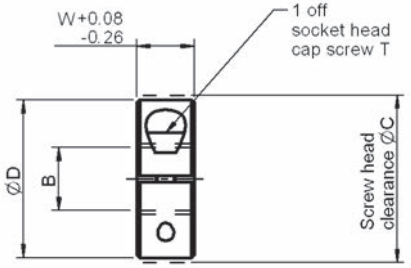
Technical support

- Does not mark shaft
- Integral location face
- MSP, two piece style is balanced by opposing hardware and is easily disassembled and maintained
- Pre-drilled face holes
- Recommended temperature range:
  Stainless steel -40ºC to +175ºC
  Aluminium -40ºC to +90ºC
- Installation information - see page T8-4
- Product overview - see pages 8-2 to 8-7

One Piece Threaded Collars

All dimensions in mm
Material: Stainless steel
grade 18.8 type 303
Screws C12L14

Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2



MTCL (threaded)

Part number selection table

Example Part No:- MTCL - SS - 4			Dimensions (mm)				
Basic Part Number	**Material**	**Size**	**Standard Thread Sizes B**	**O/D ØD**	**Width W**	**ØC**	**Clamp Screw T**
MTCL	**SS** (St. steel)	**4**	M4x0.7	16	9	20.8	M3
		5	M5x0.8	16	9	20.8	M3
		6	M6x1	16	9	20.8	M3
		8	M8x1.25	18	9	22.4	M3
		10	M10x1.5	24	9	26.3	M3

Product options

- Alternative thread sizes
- Imperial threads
- Stainless steel screws
- Acme and left-hand threads available
- Additional sizes available

Technical support

- Does not mark shaft
- Integral location face
- Installation information - see page T8-4
- Product overview - see pages 8-2 to 8-7

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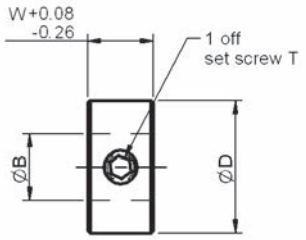
Associated Products
Shafts: page 11-2
Bearings: page 12-1
Leadscrews: page 7-1
Intelligent motors: page 2-2

All dimensions in mm
Material: Stainless steel
grade 18.8 type 303
Screws C12L14



MSC (set screw)

Part number selection table

Example Part No:- MSC - SS - 4			Dimensions (mm)			
Basic Part Number	**Material**	**Size**	**Standard Bore Sizes ØB (bore tolerance +0.012/+0.050)**	**O/D ØD**	**Width W**	**Set Screw T**
MSC	**SS** (St. steel)	**4**	4	8	5	M2.5X3
		5	5	10	6	M3X4
		6	6	12	8	M4X4
		8	8	16	8	M4X4
		10	10	20	10	M5X5

Product options

- Alternative bore sizes
- Imperial bores
- Stainless steel screws
- Plastic collars available

Technical support

- Forged socket set screw
- Installation information - see page T8-4
- Product overview - see pages 8-2 to 8-7

Section Contents

Linear Guides and Slides - Overview ..... Page 9-2

Spline Shafts ..... Page 9-4

Linear Rails ..... Page 9-6

Miniature Linear Guide Series ..... Page 9-7

Miniature Stroke Slides ..... Page 9-12

Ball and Crossed Roller Slides ..... Page 9-14

Rack Driven Ballslides ..... Page 9-16

Technical Information ..... Page T9-1

Low friction linear motion

The Reliance range of precision slides and guides provides a variety of linear actuation solutions for loads up 12,580 N and with lengths in excess of 1 metre. The range includes miniature linear guides, stroke slides, roller slides, rack driven ball slides and linear rails, together with spline shafts which provide both linear and rotary motion.

Miniature linear guides

The linear guides consist of a stainless steel rail with a unique re-circulating ball design in the carriage, which delivers smooth motion, low noise and high accuracy. The guides provide high levels of stiffness to enable the carriage to operate at higher speeds and with a 45º contact angle and a gothic profile design incorporated into the carriage, resulting in an equal load capacity in all directions, they provide high load and moment capacity. With their built-in lubrication reservoirs they provide an effective, low maintenance solution, further enhanced by specially designed seals to prevent dust and foreign objects from entering the system.

Linear guides are available with 3 mm to 15 mm wide rails and lengths up to 870 mm, offered in standard sizes or custom lengths, with carriages available in a variety of widths and lengths. Options are available for both lubrication and seals, with different mounting options accommodated via tapped or counter-bored mounting holes, and options for accuracies and pre-loading of the bearings where additional stiffness and precision are required.

Reliance's cut-to-length capability means that customers can order small quantities and samples for product trials or prototyping on a reduced lead-time.

Miniature stroke slides

The miniature stroke slide offers a compact alternative to the linear guides for applications where a short stroke length is required, making it an ideal choice for a smaller space envelope. They are available in 7 mm to 12 mm wide rails and up to 100 mm length rails, providing up to 94 mm travel length. The stroke slides possess many of the same characteristics as the linear guides however there is no ball re-circulation, rather the balls roll on rails resulting in smooth motion, low friction and high accuracy without vibration.

The linear guides and stroke slides are ideal for use in a linear actuation system, used in conjunction with the Cool Muscle intelligent motor and leadscrews or rack and pinions, to provide stable, accurate load movement.

Ball and crossed roller

Ball and crossed roller slides provide very low friction linear motion in a compact package, with a high load carrying capacity, long life and high accuracy. They are similar to the miniature stroke slides, but available with rails from 4 mm to 38.1 mm widths and up to 381 mm lengths. The ball slides are also

available in a rack driven configuration suitable for controlled motion with a rack and pinion drive system. Rack driven ball slides are ideal for measuring position, driving a mechanism, or both, and can be used at very high speeds and loads.

Linear rails

Linear rails offer a low cost option for systems where light loads are used. The linear rails exhibit a minimal frictional drag and long wear characteristics. They consist of a stainless steel shaft and composite polymer bushing, available with shaft diameters from approximately 6 mm to 19 mm and lengths up to 3,600 mm.

Spline shafts

Spline shafts are suited to light to moderate load applications, where low cost, low friction and long life are the primary design considerations. They provide anti-rotation for one axis motion or a drive mechanism for two axes of motion. The assembly consists of a stainless steel spline shaft treated with low friction TFE coating together with a free-running or anti-backlash composite polymer bushing. Shafts are available in diameters from 3.18 mm to 19.05 mm, with lengths up to 3,600 mm. Bushings are supplied with an integral brass collar to facilitate various mounting configurations without nut distortion. Spline shafts are offered with a wide range of options including alternative materials, end modifications, multiple bushings and bushing modifications. An anti-backlash assembly is available for applications requiring minimum torsional play.

The range of slides and guides are suitable for a variety of applications including accurate XY stages, medical and laboratory automation and scientific analysis equipment.

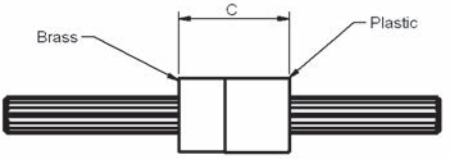
Customised XYZ positioning table

Laboratory automation assembly

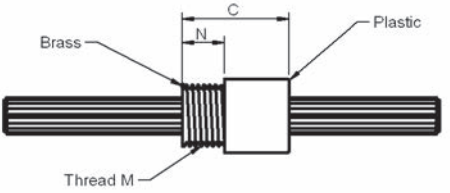
All dimensions in mm
General tolerances ±0.13 mm
Material: See page 9-5

Associated Products
Leadscrews: page 7-1
Hardware: page 13-1

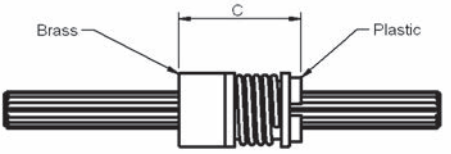
SRSSBP
(Free running)



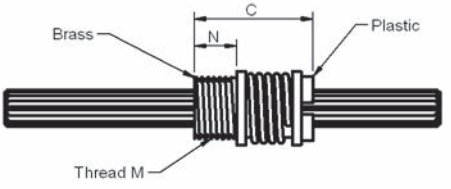
SRSSBY
(Free running)



SRSSZP
(Anti-backlash)



SRSSZY
(Anti-backlash)



Part number selection table

Example Part No:- **SRSS B P 6 T 1 - 100mm**

Number of bushings
TFE coating (standard)

Basic Part No.	Bushing Style	Mount	Size Code	Shaft Dia ØA** ±0.05 mm	Bushing Outside Dia ØB ±0.025 mm	Bushing Length C ±0.25 mm	Thread M* (Inch)	Thread Length N* ±0.05 mm	Max Length
SRSS	B (Free running)	P (Plain Dia)	3	3.18	9.53	12.7	3/8-24	6.35	900
			6	6.35	12.70	19.1	7/16-20	6.35	2400
	Z (Anti-backlash)	Y (Thread)	10	9.53	15.88	25.4	9/16-20	9.53	2400
			13	12.70	20.65	38.1	3/4-20	12.70	2400
			19	19.05	28.58	57.2	1-16	19.05	3600

Note: Code size **19** is only available in material 14L14 carbon steel.
* Only on thread mounting spline shafts.
** 3.18 mm shaft diameter only available in SRSSBP and SRSSBY styles.

Note: Due to the process of manufacture, a small number of localised hollows and hard spots may be created. This will not affect the overall function or performance.

Product options

- Lengths up to 3,600 mm available
- Larger number of bushings
- Bush modifications
- End modifications
- Available in aluminium, please contact us

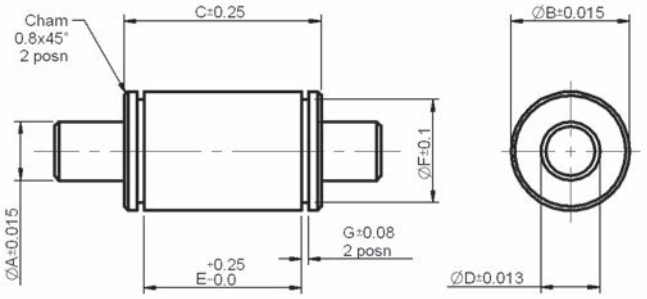
Technical support

- Material:
  Spline shaft - Stainless steel, TFE coated
  Bushing - Graphite filled PTFE thermoplastic with brass collar
- Standard shaft straightness is 0.076 mm per 305 mm
- Typical radial clearance between shaft and bushing for free running assembly is 0.05 to 0.076 mm. Anti-backlash assemblies provide additional system stiffness
- Designed for light load applications
- Maximum twist 3º/305 mm
- Torsional clearance 3º bushing to shaft
- Product overview - see pages 9-2 to 9-3

All dimensions in mm
General tolerances ±0.13 mm
Material: Rail - Stainless steel
Bushing - Composite polymer

Associated Products
Leadscrews: page 7-1
Hardware: page 13-1

The linear rail system has been designed for light load applications where low cost, minimum frictional drag and long wear life are primary design considerations - Product overview - see pages 9-2 to 9-3



Part number selection table

Example Part No:- RGR B P 6 T 1 - 100mm

- Shaft length, (max length 3600 mm)
- Number of bushings
- TFE coating (standard)

Basic Part No.	Bushing Style	Mount Style	Size Code	Rail Dia ØA**	Bushing OD ØB	C	Bushing Bore Dia ØD	Width E	Groove F	G	Radial Load Kg
RGR	B	P	6	6.279	12.70	19.43	6.311	13.59	11.43	1.02	2.3
			10	9.428	19.05	32.39	9.462	25.27	17.17	1.17	4.5
			13	12.603	25.40	42.16	12.637	33.78	22.86	1.17	6.8
			19	18.826	31.75	51.72	18.860	41.15	28.60	1.47	11.4

** Including TFE coating.

Technical support

- The assembly consists of a centreless ground and burnished stainless steel shaft mated with a composite polymer bushing
- The material combinations have been selected so that the thermal fluctuations have minimal effect on system performance
- Standard shaft straightness is 0.05 mm per 300 mm
- Standard typical radial clearance between shaft and bearings on TFE coated assemblies is 0.025 mm
- Bushings are manufactured with standard retaining ring grooves

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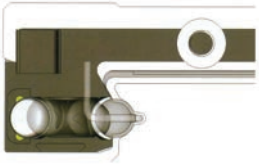
Reinforced design for high speed running

During operation, the steel balls generate an impact force on the end caps when direction of motion changes. The RMR miniature design includes an embedded plastic inverse hook that tightly secures the carriage components and absorbs these impact forces. The high speed running capability of our linear guides has increased in line with the demands of rapid motion automation.

Unique ball re-circulation design

The stainless steel ball re-circulation channels are sealed by plastic end caps, resulting in low noise during operation. The design of the lubricant store, which is embedded within the re-circulation channel, reduces the frequency of lubrication.

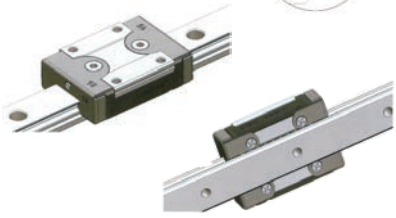


Bottom seal

The bottom seal, available on sizes 9, 12 and 15, prevents foreign objects entering the carriage assembly. The life of the carriage and rail is increased while running smoothness is uncompromised.

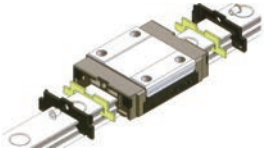
Stainless steel reinforcement plates

The plastic end caps are entirely encased by two stainless steel reinforced plates secured in place with stainless steel screws. The increased stiffness allows the carriage to operate at higher speeds.



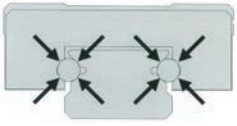
Lubrication reservoir design

Lubrication is injected via holes located at both ends of the carriage and carried efficiently to the raceways by means of the re-circulating balls, thus increasing the maintenance intervals.



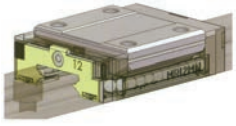
High load and moment capacity

The miniature linear guide series incorporates a gothic profile design with a 45º contact angle, providing equal load capacity in all directions. Large steel balls have been designed into limited space to provide enhanced load bearing and torsional resistance.



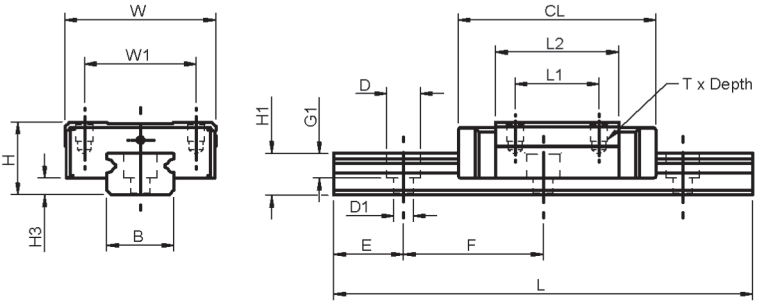
Dust proof design

Specially designed end seals prevent dust and foreign objects entering the system, increasing the product life. These seals are low friction and do not effect the smooth running of the linear guide.



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

Associated Products
Set screws: page 13-11
Machine screws: page 13-2



Part number selection table

Basic Part Number	Max Travel	Carriage Dimensions			Max Rail Length	Load Rating				
						Basic Dynamic Load N	Basic Static Load N	Static Moment Loads		
		Height H	Width W	Length CL				To Nm	Tx Nm	Ty Nm
RMRU3-MNSS-	286.3	4	8	11.7	300	190	310	0.6	0.4	0.4
RMR5-MNSS-	981.3	6	12	16.0	1,000	335	550	1.7	1.0	1.0
RMR7-MNSS-	974.3	8	17	23.7	1,000	890	1,400	5.2	3.3	3.3
RMR9-MNSS-	967.4	10	20	30.6	1,000	1570	2,495	11.7	6.4	6.4
RMR12-MNSS-	962.6	13	27	35.4	1,000	2308	3,465	21.5	12.9	12.9
RMR15-MNSS-	955	16	32	43.0	1,000	3810	5,590	43.6	27.0	27.0
RMRU3-MLSS-	282	4	8	16.0	300	295	575	0.9	1.1	1.1
RMR5-MLSS-	976.8	6	12	19.6	1,000	470	900	2.4	2.1	2.1
RMR7-MLSS-	966.8	8	17	31.2	1,000	1,310	2,440	9.0	7.7	7.7
RMR9-MLSS-	957.1	10	20	40.9	1,000	2,135	3,880	18.2	12.4	12.4
RMR12-MLSS-	950.4	13	27	47.6	1,000	3,240	5,630	34.9	30.2	30.2
RMR15-MLSS-	938	16	32	60.0	1,000	5,350	9,080	70.0	63.3	63.3

Part number structure

RMR **U** **3** **-M** **N** **SS** **-2** **-V1** **-P** **-310** **-15** **-15** **II** **Custom options**

- Custom options: Please contact us
- II: Number of rails
- -15: End hole pitch
- -15: Starting hole pitch
- -310: Rail length
- -P: Accuracy class: P = precision, H = high, N = normal
- -V1: Preload class: V0 = clearance, VS = standard, V1 = light preload
- -2: Number of carriages
- SS: With sealed end
- N: Carriage type: L = long, N = normal
- -M: Rail Type: M = standard
- 3: Rail width
- U: Special rail: U = rail with tapped holes, No mark = standard rail (counterbored holes)
- RMR: Product type: RMR = miniature linear guide

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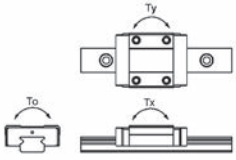
Dimensions

Basic Part Number	Rail Dimensions			Carriage Dimensions				
	Width B	Height H1	Mounting Hole D x D1 x G1	Mounting Length L2	Height H3	Thread T x Depth	Ctrs L1	Ctrs W1
RMRU3-MNSS-	3	2.6	M1.6	6.7	1.0	M1.6 x 1.1	3.5	-
RMR5-MNSS-	5	3.5	3.5 x 2.4 x 1	10.0	1.5	M2 x 1.5	-	8
RMR7-MNSS-	7	4.7	4.2 x 2.4 x 2.3	14.3	1.5	M2 x 2.5	8	12
RMR9-MNSS-	9	5.5	6 x 3.5 x 3.5	20.5	2.2	M3 x 3.0	10	15
RMR12-MNSS-	12	7.5	6 x 3.5 x 4.5	22.0	3.0	M3 x 3.5	15	20
RMR15-MNSS-	15	9.5	6 x 3.5 x 4.5	27.0	4.0	M3 x 5.5	20	25
RMRU3-MLSS-	3	2.6	M1.6	11.0	1.0	M2 x 1.1	5.5	-
RMR5-MLSS-	5	3.5	3.5 x 2.4 x 1	13.5	1.5	M2.6 x 2.0	7	-
RMR7-MLSS-	7	4.7	4.2 x 2.4 x 2.3	21.8	1.5	M2 x 2.5	13	12
RMR9-MLSS-	9	5.5	6 x 3.5 x 3.5	30.8	2.2	M3 x 3.0	16	15
RMR12-MLSS-	12	7.5	6 x 3.5 x 4.5	34.0	3.0	M3 x 3.5	20	20
RMR15-MLSS-	15	9.5	6 x 3.5 x 4.5	44.0	4.0	M3 x 5.5	25	25

Available standard lengths (mm)

Size	3M	5M	7M	9M	12M	15M
Standard Length of One Rail (mm) L	**30** **40** **50**	**40** **55** **70** **85** **100**	**40** **55** **70** **85** **100** **130**	**55** **75** **95** **115** **135** **155** **175** **195** **275** **375**	**70** **95** **120** **145** **170** **195** **220** **245** **270** **320** **370** **470** **570**	**70** **110** **150** **190** **230** **270** **310** **350** **390** **430** **470** **550** **670** **870**
Pitch F	10	15	15	20	25	40
E Min	3	3	3	4	4	4
E Max	5	10	10	20	20	35



Product options

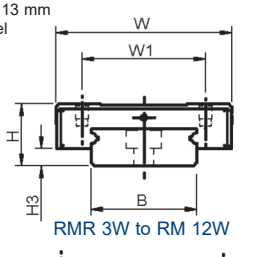
- End seal plus reinforcement plate on sizes 9, 12 and 15. Replace **-SS** with **-EE**
- End seal plus lubrication reservoir on all sizes. Replace **-SS** with **-ZZ**
- Bottom and end seals. Replace **-SS** with **-EU**
- Bottom seal, end seal and lubrication reservoir. Replace **-SS** with **-UZ**
- Customised design, including cut to length

Technical support

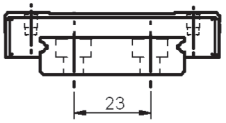
- Key features - see page 9-7
- Technical information - see page T9-3
- Joining guides for longer lengths - see page T9-3
- Product overview - see pages 9-2 to 9-3

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

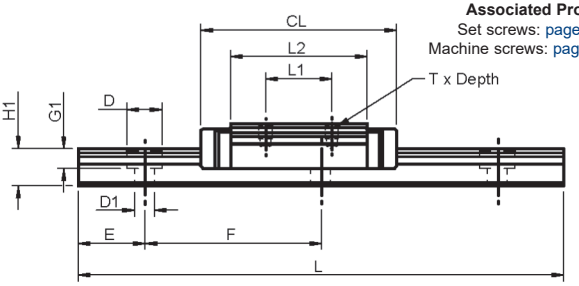
Associated Products
Set screws: page 13-11
Machine screws: page 13-2



RMR 3W to RM 12W



RMR 15W



Part number selection table

Basic Part Number	Max Travel	Carriage Dimensions			Max Rail Length	Load Rating				
						Basic Dynamic Load N	Basic Static Load N	Static Moment Loads		
		Height H	Width W	Length CL				To Nm	Tx Nm	Ty Nm
RMR3-WNSS-	983.0	4.5	12	15	1,000	280	530	1.6	0.9	0.9
RMR5-WNSS-	976.9	6.5	17	21.1		475	900	4.6	2.2	2.2
RMR7-WNSS-	966.4	9.0	25	31.6		1,180	2,095	15.0	7.3	7.3
RMR9-WNSS-	958.9	12.0	30	39.1		2,030	3,605	33.2	13.7	13.7
RMR12-WNSS-	953.6	14.0	40	44.4		3,065	5,200	63.7	26.3	26.3
RMR15-WNSS-	942.7	16.0	60	55.3		5,065	8,385	171.7	45.7	45.7
RMR3-WLSS-	977.9	4.5	12	20.1	1,000	370	800	2.5	1.9	1.9
RMR5-WLSS-	970.8	6.5	17	27.2		615	1,315	6.8	4.1	4.1
RMR7-WLSS-	957.5	9.0	25	40.5		1,570	3,140	22.65	14.9	14.9
RMR9-WLSS-	947.3	12.0	30	50.7		2,550	4,990	45.9	26.7	26.7
RMR12-WLSS-	938.6	14.0	40	59.4		4,070	7,800	95.6	56.4	56.4
RMR15-WLSS-	923.6	16.0	60	74.4		6,725	12,580	257.6	93.1	93.1

Part number structure

RMR U 3 -W N SS -2 -V1 -P -310 -15 -15 II — **Custom options**: Please contact us

- RMR — Product type: RMR = miniature linear guide
- U — Special rail: U = rail with tapped holes, No mark = standard rail (counterbored holes)
- 3 — Rail width
- -W — Rail Type: W = wide
- N — Carriage type: L = long, N = normal
- SS — With sealed end
- -2 — Number of carriages
- -V1 — Preload class: V0 = clearance, VS = standard, V1 = light preload
- -P — Accuracy class: P = precision, H = high, N = normal
- -310 — Rail length
- -15 — Starting hole pitch
- -15 — End hole pitch
- II — Number of rails

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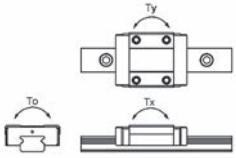
Dimensions

Basic Part Number	Rail Dimensions			Carriage Dimensions				
	Width B	Height H1	Mounting Hole D x D1 x G1	Mounting Length L2	Height H3	Thread T x Depth	Ctrs L1	Ctrs W1
RMR3-WNSS-	6	2.7	4 x 2.4 x 1.5	10.0	1.0	M2 x 1.4	4.5	-
RMR5-WNSS-	10	4.0	5.5 x 3 x 1.6	15.1	1.5	M2.5 x 1.5	6.5	13
RMR7-WNSS-	14	5.2	6 x 3.5 x 3.5	21.2	2.0	M3 x 3	10.0	19
RMR9-WNSS-	18	7.3	6 x 3.5 x 4.5	27.9	3.4	M3 x 3	12.0	21
RMR12-WNSS-	24	8.5	8 x 4.5 x 4.5	31.0	3.9	M3 x 3.5	15.0	28
RMR15-WNSS-	42	9.5	8 x 4.5 x 4.5	38.5	4.0	M4 x 4.5	20.0	45
RMR3-WLSS-	6	2.7	4 x 2.4 x 1.5	15.1	1.0	M2 x 1.4	8.0	-
RMR5-WLSS-	10	4.0	5.5 x 3 x 1.6	21.2	1.5	M2.5 x 1.5	11.0	13
RMR7-WLSS-	14	5.2	6 x 3.5 x 3.5	30.1	2.0	M3 x 3	19.0	19
RMR9-WLSS-	18	7.3	6 x 3.5 x 4.5	39.5	3.4	M3 x 3	24.0	23
RMR12-WLSS-	24	8.5	8 x 4.5 x 4.5	46.0	3.9	M3 x 3.5	28.0	28
RMR15-WLSS-	42	9.5	8 x 4.5 x 4.5	57.6	4.0	M4 x 4.5	35.0	45

Available standard lengths

Size	3W	5W	7W	9W	12W	15W
Standard Length of One Rail (mm) L	**40** **55** **70**	**50** **70** **90** **110** **130** **150** **170**	**50** **80** **110** **140** **170** **200** **260** **290**	**50** **80** **110** **140** **170** **200** **260** **290** **320**	**70** **110** **150** **190** **230** **270** **310** **390** **470** **550**	**110** **150** **190** **230** **270** **310** **430** **550** **670** **790**
Pitch F	15	20	30	30	40	40
E Min	3	4	3	4	4	4
E Max	10	15	25	25	35	35



Product options

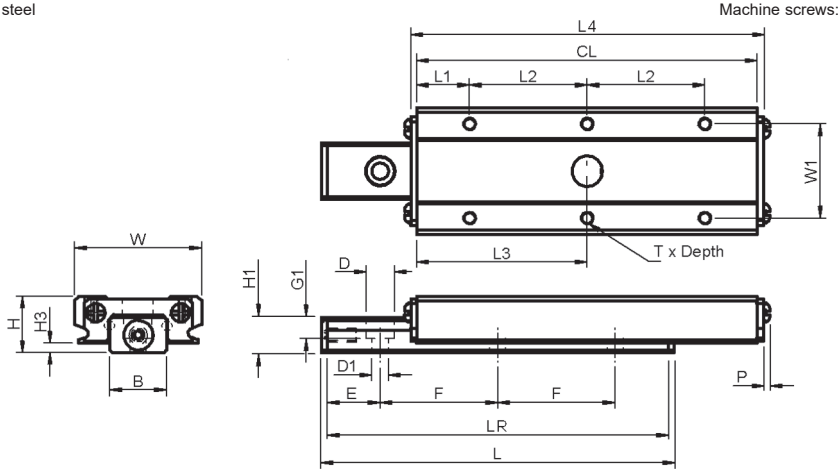
- End seal plus reinforcement plate on sizes 9, 12 and 15. Replace **-SS** with **-EE**
- End seal plus lubrication reservoir on all sizes. Replace **-SS** with **-ZZ**
- Bottom and end seals. Replace **-SS** with **-EU**
- Bottom seal, end seal and lubrication reservoir. Replace **-SS** with **-UZ**
- Customised design, including cut to length

Technical support

- Key features - see page 9-7
- Technical information - see page T9-3
- Joining guides for longer lengths - see page T9-3
- Product overview - see pages 9-2 to 9-3

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

Associated Products
Set screws: page 13-11
Machine screws: page 13-2



Part number selection table

Basic Part Number	Max Travel	Carriage Dimensions					Load Rating				
							Basic Dynamic Load N	Basic Static Load N	Static Moment Loads		
		H	W	CL	L4	L3			To Nm	Tx Nm	Ty Nm
RST7M	27	8	17	28.0	30	14.0	910	1,580	5.9	3.4	3.4
	41			43.0	45	21.5	1,220	2,500	9.1	8.0	8.0
	55			58.0	60	29.0	1,490	3,330	12.4	14.6	14.6
RST9M	38	10	20	38.0	40	19.0	1,590	2,773	13.1	6.8	6.8
	58			58.0	60	29.0	2,080	4,170	19.7	16	16
	78			78.0	80	39.0	2,520	5,547	26.2	29.2	29.2
RST12M	44	13	27	47.4	50	23.7	2,550	4,340	27.0	16	16
	69			72.4	75	36.2	3,350	6,510	40.1	35.6	35.6
	94			97.4	100	48.7	4,050	8,670	54.0	62.8	62.8

Part number structure

RST 7 M -V0 -P -27 -30 -30 -T0

- RST — Product type: RST = miniature stroke slide
- 7 — Rail width
- M — Rail Type: M = standard
- -V0 — Preload class: V0 = clearance, VS = standard, V1 = light preload
- -P — Accuracy class: P = precision, H = high, N = normal
- -27 — Maximum stroke length
- -30 — Carriage length
- -30 — Rail length
- -T0 — Max temp ºC: T0 = 150, T1 = 200, T2 = 300

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Dimensions

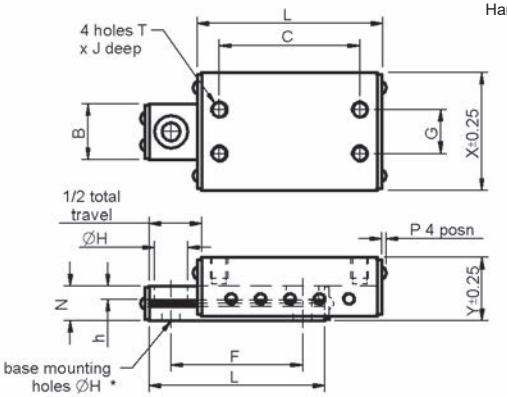
Basic Part Number	Rail Dimensions							Carriage Dimensions					
	B	H1	Mounting Hole D x D1 x G1	LR	L	E	F	H3	L1	T x Depth	L2	W1	P
RST7M	7	4.7	4.2 x 2.4 x 2.3	28 43 58	30 45 60	6.5	7.5 15.0 22.5	1.5	6.5	M2 x 2.5	7.5 15.0 22.5	12	1
RST9M	9	5.5	6 x 3.5 x 3.5	38 58 78	40 60 80	9.0	10.0 20.0 30.0	2.2	9.0	M3 x 3.0	10.0 20.0 30.0	15	1.3
RST12M	12	7.5	6 x 3.5 x 4.5	47.4 72.4 97.4	50 75 100	11.2	12.5 25.0 37.5	3.0	11.2	M3 x 3.5	12.5 25.0 37.5	20	1.3

Technical support

- High load and high moment capacity
- High running accuracy and smoothness
- Easy mounting
- Operating temperature of up to 150ºC as standard. Higher temperatures of up to 300ºC available. Note that the higher temperature options will have a lower load capacity
- Life rating calculations - see page T9-2
- Lubrication details - see page T9-2
- Product overview - see pages 9-2 to 9-3

All dimensions in mm
General tolerances ±0.13mm
Material: See tables

Associated Products
Leadscrews: page 7-1
Hardware: page 13-1



Part number selection table

Ballslide Series	Dimensions: Carriage Width X ±0.25	Height Y ±0.25	Screw P ±0.25	Base Width B ±0.25	Depth N ±0.25	Mounting Details: Base: Hole Dia H ±0.25	Base: Cbore Ø	Base: Cbore Depth h ±0.25	Carriage: Thread Size T	Carriage: Depth J
CA	9.7	5.8	1.3	4.0	3.4	M2*	--	--	M2	2.29
DA & XDA	14.2	8.0	1.0	6.4	4.7	2.2	4.0	2.2	M2	2.54
EA & XEA	19.0	10.4	1.0	9.5	6.3	3.5	6.1	3.4	M3	3.30
MA	25.4	12.7	1.0	12.7	6.3	3.5	6.1	3.4	M4	5.33
NA & XNA	26.9	13.4	1.0	12.7	7.9	4.6	8.1	4.4	M4	4.83
SA1 & XSA1	38.0	15.8	1.3	19.0	8.6	4.6	8.1	4.4	M4	6.35
SA2 & XSA2	44.0	19.0	2.0	22.2	10.2	4.6	8.1	4.4	M4	8.13
SA3 & XSA3	66.5	25.4	2.0	38.1	15.9	5.8	10.0	5.3	M5	8.38

L, C & F dimensions, see part number on page 9-15
* For CA series slides, H holes are threaded and not counterbored.

Specifications

Feature		Ball Slide	Crossed Roller Slide (higher load capacity)
Straight line accuracy		0.0005 mm/mm	0.0001 mm/mm
Positional repeatability		0.005 mm	0.003 mm
Coefficient of friction		0.003 typical	0.003 typical
Construction		Aluminium carriage and base Hardened steel rods and balls/rollers	
		Steel end caps	Stainless steel end caps
Finish:	Carriage	Clear anodised	Black anodised
	Base	Black anodised	Black anodised

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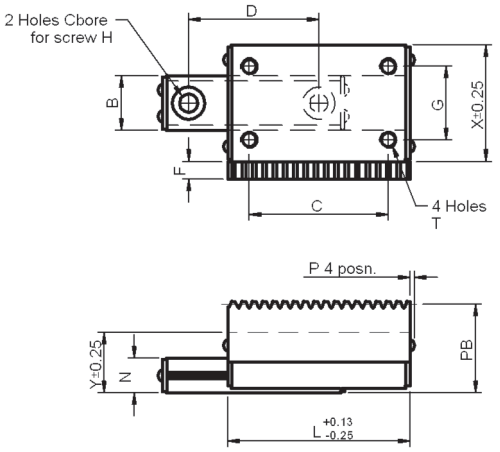
Drawing dimension and mounting table

Part Number		Total Travel	Slide Length	Hole Centres	Hole Centres	Hole Centres	Dynamic Load Capacity (N)	
Ball Bearing	Crossed Roller	Min	L ±0.25	C ±0.25	F ±0.25	G ±0.25	Ball Bearing	Crossed Roller
CA-1	--	13	19	13	10		6.67	--
CA-2	--	25	32	26	20	4	6.67	--
CA-3	--	38	44	37	30		6.67	--
DA-1	XDA-1	13	27	15	19		19.62	137.34
DA-2	XDA-2	25	52	41	35		39.24	245.25
DA-3	XDA-3	50	78	66	60	6	49.05	294.30
DA-4	--	75	103	92	86		58.86	--
DA-5	--	100	128	117	89		78.48	--
DA-6	--	127	154	142	114		78.48	--
EA-1	XEA-1	13	27	15	19		39.24	215.82
EA-2	XEA-2	25	52	41	35		49.05	343.35
EA-3	XEA-3	50	78	66	60	9	49.05	412.02
EA-4	--	75	103	92	86		58.86	--
EA-5	--	100	128	117	89		68.67	--
EA-6	--	127	154	142	114		78.48	--
MA-1	--	13	40	32	32		49.05	--
MA-2	--	25	65	57	57	10	49.05	--
MA-3	--	50	90	82	82		68.67	--
NA-1	--	19	40	32	28		68.67	--
NA-2	XNA-2	38	65	57	54		78.48	588.60
NA-3	XNA-3	50	90	82	79		88.29	981.00
NA-4	XNA-4	75	116	102	82	10	107.91	1177.21
NA-6	--	100	152	140	102		137.34	--
NA-8	--	150	203	190	127		156.96	--
NA-10	--	200	254	240	178		176.58	--
SA1-1	XSA1-1	25	51	35	37		68.67	578.79
SA1-2	XSA1-2	50	76	60	60		88.29	774.99
SA1-4	XSA1-4	100	152	136	100	16	156.96	1363.59
SA1-6	--	150	203	186	128		196.20	--
SA1-8	--	200	254	238	178		245.25	--
SA2-1	XSA2-1	25	51	35	38		88.29	578.79
SA2-2	XSA2-2	50	83	65	65		186.39	774.99
SA2-3	XSA2-3	75	102	85	85	20	235.44	774.99
SA2-4	XSA2-4	100	152	140	100		264.87	1363.59
SA2-8	--	200	254	240	178		402.21	--
SA3-1.5	XSA3-1.5	38	67	42	42		156.96	1167.39
SA3-2	XSA3-2	50	102	75	75		274.68	1549.98
SA3-4	XSA3-4	100	152	125	125	35	529.74	1942.38
SA3-6	XSA3-6	150	229	75 x2	178		667.08	3109.77
SA3-9	--	228	305	75 x3	254		824.04	--
SA3-12	--	304	381	75 x4	330		912.33	--

All dimensions in mm
General tolerances ±0.13 mm

Associated Products
Rack pinions: page 6-10
Hardware: page 13-1



Drawing dimension and mounting table

Ballslide Series	Dimensions							Mounting Details	
	Rack		Slide					Base	Carriage
	Face Width F	Height PB	Carriage Width X	Height Y	Screw P	Base Width B	Depth N	Screw H	Thread Size T
RDA	2.50	11.629	14.22	8.13	1.0	6.35	4.75	M2	M2
REA	3.75	11.500	19.05	10.41	1.0	9.53	6.35	M3	M3
RNA	3.75	14.500	26.92	13.46	1.0	12.70	7.92	M4	M4
RSA2	7.56	20.690	44.45	19.05	2.0	22.23	10.16	M4	M4

L, C & D dimension, see part number on page 9-17

Slide specification

Straight line accuracy	0.0005 mm per mm
Positional repeatability	0.005 mm
Coefficient of friction	0.003 typical
Construction	Aluminium carriage and base Hardened steel rods and balls Steel end caps
Finish: Carriage	Clear anodised standard (black finish available)
Base	Black anodised

Part number selection table

Part Number	Ballslide Travel +1.5/-0.0	Ballslide Length L	Hole Centres C	Hole Centres D	Hole Centres G	Ballslide Load Capacity N
RDA-1	12.7	26.92	15	19		17.8
RDA-3	50.8	77.72	66	60	6.0	53.4
RDA-6	127.0	153.92	142	114		80.1
REA-1	12.7	26.92	15	19		35.6
REA-3	50.8	77.72	66	60	9.0	53.4
REA-6	127.0	153.92	142	114		80.1
RNA-3	50.8	90.42	82	79		89.0
RNA-6	101.6	152.40	140	102	10.0	133.5
RNA-10	203.2	254.00	240	178		178.0
RSA2-2	50.8	82.55	65	65		186.9
RSA2-4	101.6	152.40	140	100	20.0	267.1
RSA2-8	203.2	254.00	240	178		400.6

Rack specifications

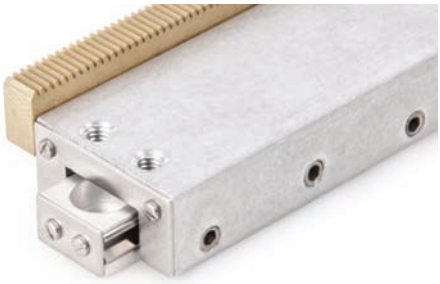
Ballslide Series	Rack Circular Pitch	Material	Hardness	Cumulative Pitch Error per 300mm
RDA	1.0	Stainless steel	35-45 HRc	0.008mm
REA				
RNA				
RSA2	2.5			

Product options

- Product overview - see pages 9-2 to 9-3
- Imperial racks

Technical support

- Technical information - see page T9-1



Section Contents

Timing Belts 2.5mm Pitch .....Page 10-2

Timing Pulleys 2.5mm Pitch .....Page 10-3

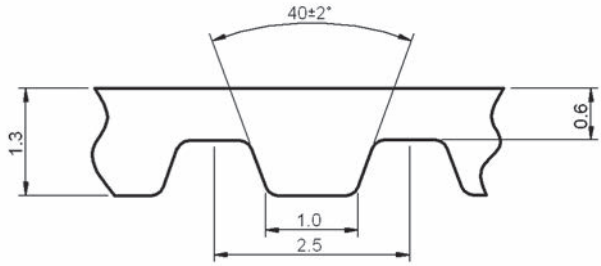
Timing Belts 5mm Pitch .....Page 10-4

Timing Pulleys 5mm Pitch .....Page 10-5

Technical Information.....Page T10-1

All dimensions in mm
Material: High tensile steel reinforced polyurethane

Associated Products
Timing pulleys: page 10-3



Part number selection table

Example Part No:- **TXM25 F6- 168**

Basic Part Number	Belt Width	Standard Lengths#			
		Number of Pitches	Length mm	Number of Pitches	Length mm
TXM25	6 mm F6-	**48**	120.0	**127**	317.5
		58	145.0	**132**	330.0
		64	160.0	**152**	380.0
		71	177.5	**168**	420.0
		72	180.0	**192**	480.0
		73	182.5	**200**	500.0
		80	200.0	**240**	600.0
		92	230.0	**248**	620.0
		98	245.0	**260**	650.0
		106	265.0	**312**	780.0
		114	285.0	**380**	950.0
		116	290.0		

The belt thickness may differ if a non-standard length is ordered

Features and options

- Temperature range: -10°C to +80°C
- Maximum allowable peripheral load: 6 mm wide = 65 N
- Maximum peripheral speed: 80 m/s
- Special polyurethanes available
- Double-sided belt available
- Alternative lengths available#
- Alternative colours available
- Kevlar tension members available
- Anti-static belts available

Technical support

- Technical information - see page T10-1
- Design guidelines - see page T10-2

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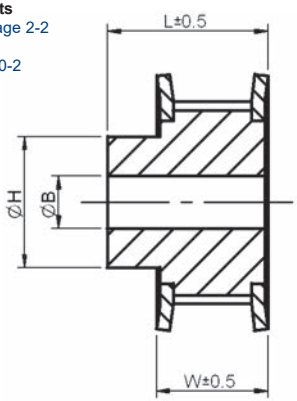
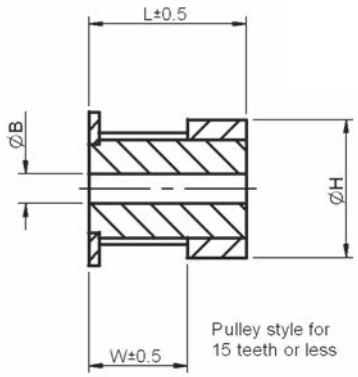
Associated Products
Intelligent motors: page 2-2
Shafts: page 11-2
Timing belts: page 10-2

All dimensions in mm
Materials: Aluminium alloy pulley with zinc plated steel flanges





Part number selection table

When belt width = 6, W=10 & L=16

Example Part No:- **TPMP25 F6- 60**

Basic Part Number	Belt Width	No. of Teeth	Pitch Diameter	Bore ØB (H8)	Hub Diameter ØH ±1.0
TPMP25	6 mm F6-	12	9.55	3	13
		14	11.14		15
		15	11.94		15
		18	14.32	4	10
		19	15.12		10
		20	15.92		11
		24	19.10		12
		25	19.89		13
		30	23.87	6	16
		32	25.46		16
		36	28.65		20
		40	31.83		22
		48*	38.20		26
		60*	47.75	8	34

*Pulleys with 48 and 60 teeth are unflanged

Features and options

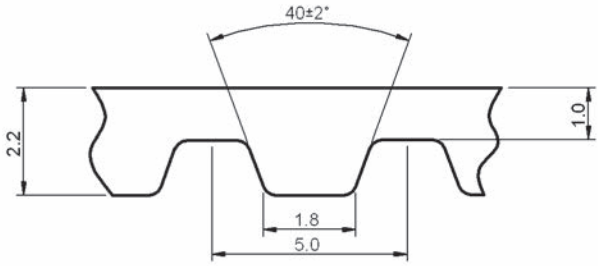
- Zero-backlash pulleys
- Other numbers of teeth available
- 0, 1 or 2 flanges available
- Tapped holes in hubs available
- Alternative bore diameters available
- Alternative mountings available
- Keyed bores available

Technical support

- Technical information - see page T10-1
- Design guidelines - see page T10-2

All dimensions in mm
Material: High tensile steel reinforced polyurethane

Associated Products
Timing pulleys: page 10-5



Part number selection table

Example Part No:- **TXM50 F10- 168**

Basic Part Number	Belt Width	Standard Lengths#					
		Number of Pitches	Length mm	Number of Pitches	Length mm	Number of Pitches	Length mm
TXM50	10 mm F10-	**20**	100	**66**	330	**126**	630
		30	150	**68**	340	**138**	690
		33	165	**73**	365	**140**	700
		36	180	**80**	400	**145**	725
		37	185	**82**	410	**150**	750
		40	200	**84**	420	**156**	780
		42	210	**91**	455	**163**	815
	or	**43**	215	**96**	480	**168**	840
		45	225	**100**	500	**180**	900
		49	245	**102**	510	**185**	925
	16 mm F16-	**50**	250	**105**	525	**188**	940
		52	260	**110**	550	**198**	990
		54	270	**115**	575	**215**	1,075
		56	280	**122**	610	**243**	1,215
		59	295	**124**	620	**276**	1,380

The belt thickness may differ if a non-standard length is ordered

Features and options

- Temperature range: -10°C to +80°C
- Maximum allowable peripheral load: 10 mm wide = 330 N, 16 mm wide = 570 N
- Maximum peripheral speed: 80 m/s
- Special polyurethanes available
- Double-sided belt available
- Alternative lengths available#
- Alternative colours available
- Kevlar tension members available
- Anti-static belts available

Technical support

- Technical information - see page T10-1
- Design guidelines - see page T10-2

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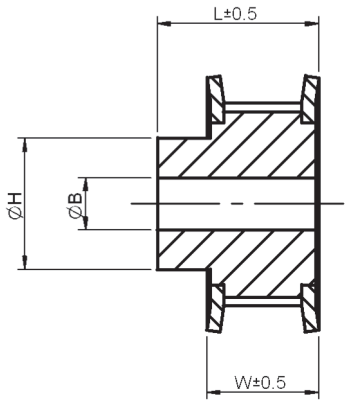
Associated Products
Intelligent motors: page 2-2
Shafts: page 11-2
Timing belts: page 10-4



All dimensions in mm
Materials:Aluminium alloy pulley with zinc plated steel flanges

Part number selection table

When belt width = 10, W=15 & L=21
When belt width = 16, W=21 & L=27

Example Part No:- **TPMP50 F10- 60**

Basic Part Number	Belt Width	No. of Teeth	Pitch Diameter	Bore ØB (H8)	Hub Diameter ØH ±1.0
TPMP50	10 mm F10- or 16 mm F16-	10	15.92	4	8
		12	19.10		11
		14	22.28	6	13
		15	23.87		16
		16	25.46		18
		18	28.65		20
		19	30.24		22
		20	31.83		23
		24	38.20		26
		25	39.79		26
		27	42.97	8	30
		30	47.75		34
		32	50.93		38
		36	57.30		38
		40	63.66		40
		48*	76.39		50
		60*	95.49		65

*Pulleys with 48 and 60 teeth are unflanged

Features and options

- Zero-backlash pulleys
- Other numbers of teeth available
- 0, 1 or 2 flanges available
- Tapped holes in hubs available
- Alternative bore diameters available
- Alternative mountings available
- Keyed bores available

Technical support

- Technical information - see page T10-1
- Design guidelines - see page T10-2

Section Contents

Shafts - Ground Stock ..... Page 11-2

Shaft Retaining Collars ..... Page 11-3

Gear Clamps ..... Page 11-4

Gear Clamps - Low Inertia ..... Page 11-5

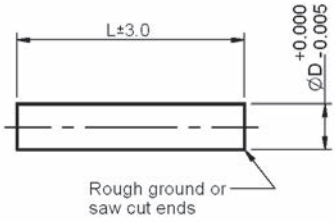
Gear and Dial Hubs - Pin Type ..... Page 11-6

Gear and Dial Hubs- Clamp Type ..... Page 11-7

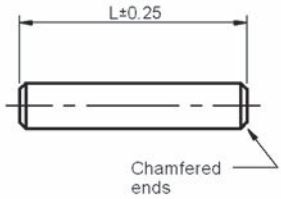
All dimensions in mm
General tolerances ±0.13 mm
Material: Stainless steel 303 series
Straightness: 0.0003 mm/mm
Surface finish: 0.25 µm

Associated Products
Shaft collars: page 11-3
Bearings: page 12-2
Couplings: page 8-1

Cut to Length



Machined to Length



Part number selection table - Cut to length

Basic Part Number	Diameter ØD	Length L	Basic Part Number	Diameter ØD	Length L
SM1-3-	2.993	600	SM1-6A-	6.000	600
SM1-3A-	3.000		SM1-8-	7.993	
SM1-4-	3.993		SM1-8A-	8.000	
SM1-4A-	4.000		SM1-10-	9.993	1,000
SM1-5A-	5.000		SM1-10A-	10.000	
SM1-6-	5.993		SM1-12-	11.993	
			SM1-12A-	12.000	

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

Part number selection table - Machined to length

Basic Part Number	Diameter ØD	Available Lengths					
		Length L	Length Code	Length L	Length Code	Length L	Length Code
SM2-3	2.993	25	-25	70	-70	115	-115
SM2-4	3.993	30	-30	75	-75	120	-120
SM2-6	5.993	35	-35	80	-80	125	-125
SM2-8	7.993	40	-40	85	-85	150	-150
SM2-10	9.993	45	-45	90	-90	175	-175
SM2-12	11.993	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 the part number add length details to part number eg **SM2-8-250**

Product options

- Standard shaft end modifications, similar to those on leadscrews, are available - see page 7-27
- Imperial sizes available

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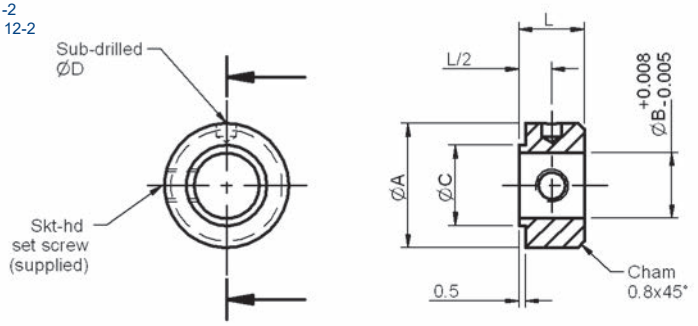
Shaft Retaining Collars

Associated Products
Hubless gears: page 4-52
Hubless brass gears: page 4-78
Shafts: page 11-2
Bearings: page 12-2

All dimensions in mm
General tolerances ±0.13 mm
Material: Stainless steel
303S31 or 303S21



Part number selection table

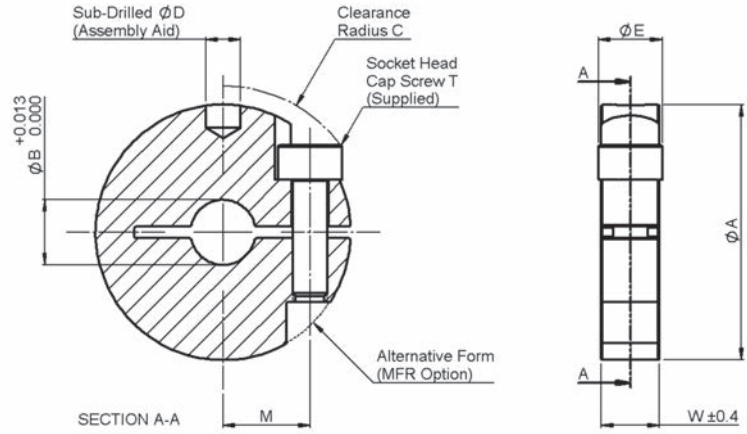
Part Number	Bore ØB	Length L	Outer Dia ØA	Shoulder Dia ØC	Sub-drill ØD	Set Screw Supplied
CSM-2	2.0	5.0	7.0	3.0	0.75	SS-M1.6-2
CSM-3	3.0	5.0	8.0	4.1	0.75	SS-M2-2
CSM-4	4.0	5.0	8.0	5.3	1.00	SS-M2-2
CSM-5	5.0	6.0	10.0	6.7	1.20	SS-M3-3
CSM-6	6.0	6.0	10.0	7.9	1.50	SS-M3-3
CSM-8	8.0	6.0	12.0	10.2	1.80	SS-M4-4
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

Product options

- Imperial sizes available

All dimensions in mm
General tolerances ±0.13 mm
Material: Stainless steel, 303S21

Associated Products
Clamp hub gears: from page 4-36
Anti-backlash gears: from page 4-22



Part number selection table

Part Number	To Suit Gear of Bore Dia	Bore ØB	Outer Dia ØA	Width W	Head Dia ØE (max)	Clearance Radius C	Screw Supplied T	Screw Offset M	Sub-drill ØD
CGM1-2	2	3.6	16.0	4.0	3.8*	8.7	M2	5.3	1.5
CGM1-3	3	4.6							
CGM1-4	4	5.6	22.0	5.0	5.5	12.8	M3	7.5	3.0
CGM1-5	5	6.6							
CGM1-6	6	7.6							
CGM1-8	8	9.6	29.0	6.0	7.0	17.1	M4	9.5	4.0
CGM1-10	10	11.6							
CGM1-12	12	13.6	32.0	7.0		18.0		11.0	

* Socket head on these components is narrower than the clamp

Product options

- Imperial sizes available

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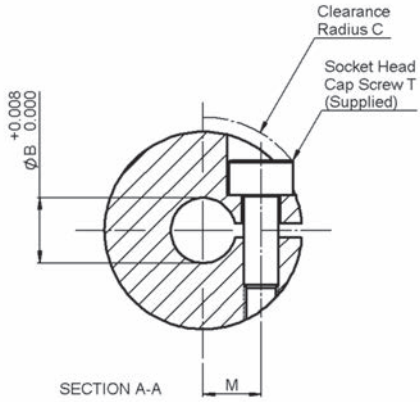
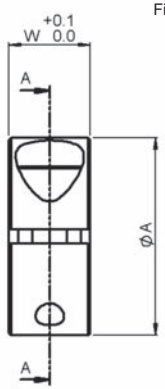
Associated Products
Clamp hub gears: from page 4-36
Anti-backlash gears: from page 4-22
Anti-backlash pinions: page 4-7

All dimensions in mm
General tolerances ±0.13 mm
Material: Aluminium alloy, EN AW-2014-T6511 or L168
Finish: Chromic acid anodise to DEF STAN 03-24





Part number selection table

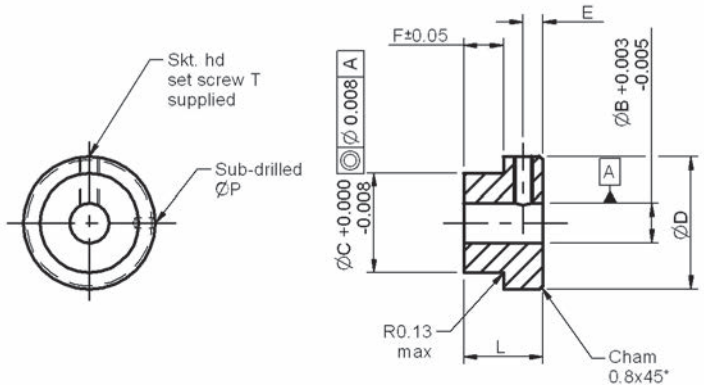
Part Number	To Suit Gear of Bore Dia	Bore ØB	Outer Dia ØA	Width W	Clearance Radius C	Screw Supplied T	Screw Offset M
CGAM-2A	2	3.6	12.0	5.0	7.2	M2	3.5
CGAM-3A	3	4.6	13.0		7.8		4.0
CGAM-4A	4	5.6	17.0	7.0	10.0	M3	5.0
CGAM-5A	5	6.6	18.0		10.6		5.5
CGAM-6A	6	7.6	19.0		11.3		6.2
CGAM-8A	8	9.6	24.0	9.0	13.8	M4	7.5
CGAM-10A	10	11.6	26.0		14.8		8.5
CGAM-12A	12	13.6	28.0		16.2		9.8

Product options

- Imperial sizes available

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

Associated Products
Hubless gears: page 4-52
Hubless brass gears: page 4-78



Part number selection table - Dial hubs

Part Number	Bore ØB	Face F	Length L	Outer Diameter ØD	Mount Diameter ØC	Sub-drill ØP	Distance E	Set Screw Supplied T
PHMD-1	3.0		7.2			0.75		SS-M2-2
PHMD-3	4.0	1.57	7.2	11.0	9.52	1.00	2.8	SS-M2-2
PHMD-5	6.0		8.0			1.50		SS-M3-3

Part number selection table - Gear hubs

Part Number	Bore ØB	Face F	Length L	Outer Diameter ØD	Mount Diameter ØC	Sub-drill ØP	Distance E	Set Screw Supplied T
PHM1-1 PHM1-2	3.0	3.0 6.0	9.0 12.0	12.0	10.0	0.75	3.0	SS-M2-2
PHM1-3 PHM1-4	4.0	3.0 6.0	9.0 12.0	12.0	10.0	1.00	3.0	SS-M2-2
PHM1-5 PHM1-6	6.0	3.0 6.0	9.0 12.0	20.0	15.0	1.50	3.0	SS-M3-3
PHM1-7 PHM1-8	8.0	3.0 6.0	12.0 15.0	20.0	15.0	1.80	4.5	SS-M4-4
PHM1-9 PHM1-10 PHM1-11	10.0	6.0 8.0 10.0	18.0 20.0 22.0	30.0	25.0	3.00	6.0	SS-M5-5

Features and options

- Gears, sprockets or dials assembled on request
- Imperial bores available
- Special hubs for Delrin gears

Technical support

- Recommended assembly procedure: Notch and stake in 4 equi-spaced positions and/or use adhesive (Loctite grade 326)

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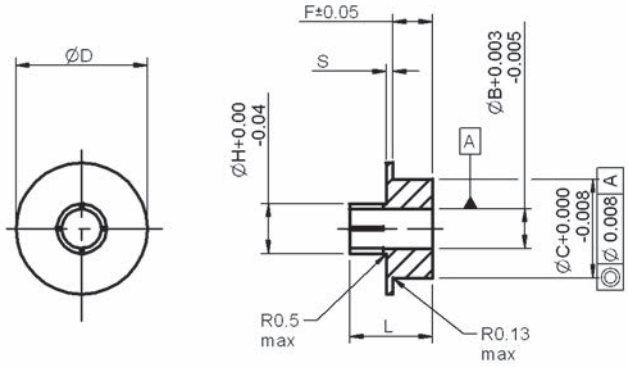
Gear and Dial Hubs
Clamp Type

Associated Products
Hubless gears: page 4-52
Hubless brass gears: page 4-78

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



Part number selection table - Dial hubs

Part Number	Bore ØB	Face F	Length L	Outer Diameter ØD	Mount Diameter ØC	Hub Diameter ØH	Shoulder S	To Suit Clamp
CHMD-1	3.0			12.0		4.6		CGM1-3
CHMD-3	4.0	1.57	8.7	12.0	9.52	5.6	1.0	CGM1-4
CHMD-5	6.0			20.0		7.6		CGM1-6

Part number selection table - Gear hubs

Part Number	Bore ØB	Face F	Length L	Outer Diameter ØD	Mount Diameter ØC	Hub Diameter ØH	Shoulder S	To Suit Clamp
CHM1-1 CHM1-2	3.0	3.0 6.0	8.5 11.5	12.0	10.0	4.6	1.0	CGM1-3
CHM1-3 CHM1-4	4.0	3.0 6.0	9.5 12.5	12.0	10.0	5.6	1.0	CGM1-4
CHM1-5 CHM1-6	6.0	3.0 6.0	9.5 12.5	20.0	15.0	7.6	1.0	CGM1-6
CHM1-7 CHM1-8	8.0	3.0 6.0	11.0 14.0	20.0	15.0	9.6	1.5	CGM1-8
CHM1-9 CHM1-10 CHM1-11	10.0	6.0 8.0 10.0	14.0 16.0 18.0	30.0	25.0	11.6	1.5	CGM1-10

Features and options

- Gears, sprockets or dials assembled on request
- Imperial bores available
- Special hubs for Delrin gears

Technical support

- Recommended assembly procedure: Notch and stake in 4 equi-spaced positions and/or use adhesive (Loctite grade 326)

Section Contents

Ball Bearings - P4 ..... Page 12-2

Bronze Bearings ..... Page 12-3

Moulded Bearings ..... Page 12-4

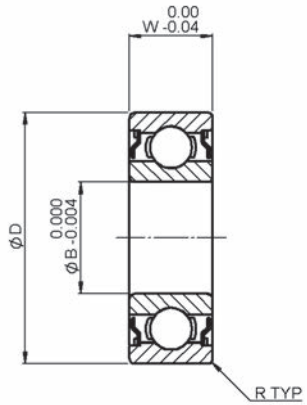
Bearing Pre-load Washers ..... Page 12-5

Bearing Spacers ..... Page 12-6

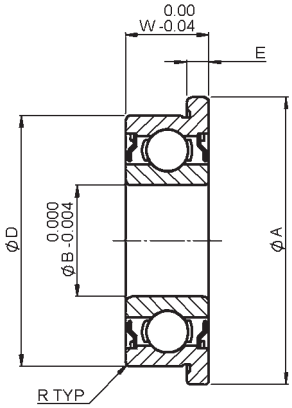
Technical Information ..... Page T12-1

All dimensions in mm
Generally in accordance with ISO 492, tolerance class 4
Material: X65Cr13 stainless steel

Associated Products
Shafts: page 11-2
Bearing pre-load washers: page 12-5
Bearing spacers: page 12-6



Plain



Flanged

Part number selection table

Part Number		Dimensions									Specification	
Plain	Flanged	Bore Dia ØB	O/D ØD		Width W	Radii R (min)	Flange Dia ØA		Flange Width E		Load Ratings N	
			Max	Min			Max	Min	Max	Min	Dynamic C	Static Co
B1-102-S-P4	B2-102-S-P4	2	5	4.996	2.3	0.08	6.15	6.05	0.6	0.56	192	59
B1-103-S-P4	B2-103-S-P4	3	7	6.996	3.0	0.10	8.15	8.05	0.8	0.76	432	149
B1-104-S-P4	B2-104-S-P4	4	9	8.996	4.0	0.10	10.35	10.25	1.0	0.96	658	226
B1-105-S-P4	B2-105-S-P4	5	11	10.996	5.0	0.15	12.55	12.45	1.0	0.92	734	282
B1-106-S-P4	B2-106-S-P4	6	13	12.996	5.0	0.15	15.05	14.95	1.1	1.02	1096	437
B1-108-S-P4	B2-108-S-P4	8	16	15.996	6.0	0.20	18.05	17.95	1.3	1.22	1795	776
B1-110-S-P4	B2-110-S-P4	10	19	18.995	7.0	0.30	21.05	20.95	1.5	1.38	1922	915

Features and options

- Operating temperature range: -73ºC to +121ºC
- Lubricant: grease to MIL-G-21164 and MIL-G-23827
- Double shielded
- Imperial sizes available

Technical support

- Spur gear and bearing load calculation - see page T12-1
- Bearing force sharing - see page T12-3
- Bearing installation and housing considerations - see page T12-4

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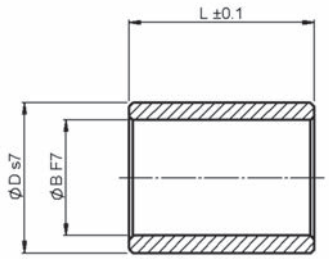
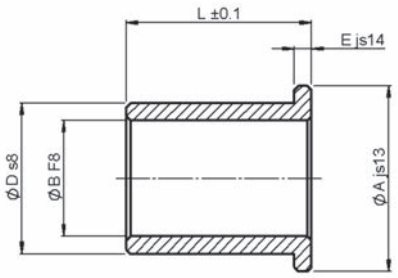
Associated Products
Shafts: page 11-2

All dimensions in mm
General tolerances ±0.13 mm
Material: Bronze ASTM B 438
Type 2, Grade 1



Plain



Flanged

Part number selection table

Part Number		Bore	O/D	Length	Flange Dia	Flange Width
Plain	Flanged	ØB[1]	ØD	L	ØA	E
BBM1-3	BBM2-3	3	6	6	9	1.5
BBM1-4	BBM2-4	4	8	12	12	2.0
BBM1-5	BBM2-5	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

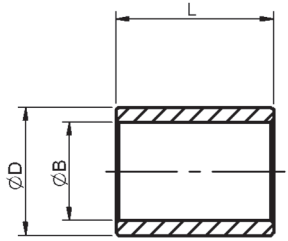
[1] Bearing bore tolerances after assembly are: plain bearings H7, flanged bearings H8.
Recommended housing bore H7

Features and options

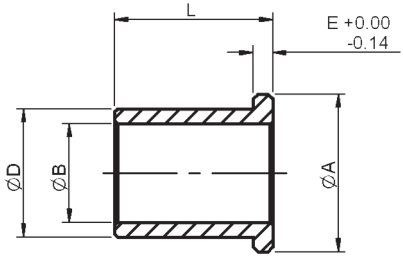
- Operating temperature range: -20ºC to +100ºC
- Oil impregnated
- Max speed 30,000 rpm
- p.v (@0.5 m/s) = 1.75 N/mm^2.m/s
- p_{max} =13.8 N/mm
- v_{max} = 6.1 m/s (rotational)
- Imperial sizes available

All dimensions in mm
General tolerances ±0.13 mm
Material: Self lubricating moulded thermo-plastic

Associated Products
Shafts: page 11-2
Leadscrews: page 7-1
Bearing spacers: page 12-6



Plain



Flanged

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	19.93 19.61	1.00

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

Features and options

- Operating temperature tange: -40ºC to +130ºC
- $(p.v)_{max}$ = 1.0 N/mm².m/s
- p_{max} = 80 N/mm²
- v_{max} = 1.0 m/s (rotational) or 4.0 m/s (linear)
- Imperial sizes available

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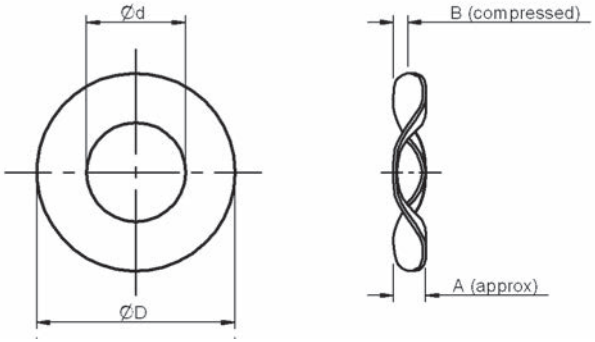
Associated Products
Internal circlips: page 13-21
Bearings: page 12-2

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



Part number selection table

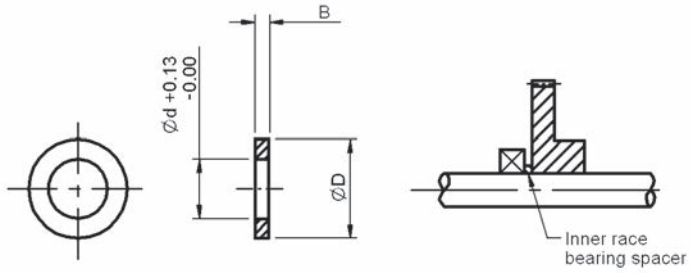
Part Number	Housing Bore (nominal)	O/D ØD	Bore Ød	Free Height A	Compressed Height B	Load in N to Deflect to B
EPL-1	10	9.5	4.5	1.2		15
EPL-2	13	12.5	7.5	1.5		19
EPL-4	16	15.5	10.5	1.5	1.0	19
EPL-8	19	18.5	13.0	1.5		29
EPL-10	21	20.5	15.0	1.8		29

Features and options

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

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

Associated Products
Shafts: page 11-2
Leadscrews: page 7-1
Bearings: page 12-2



Dimensions

Shaft Nominal	Spacer Bore Ød	Spacer O/D ØD
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 Ød	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

Product options

- Imperial sizes available

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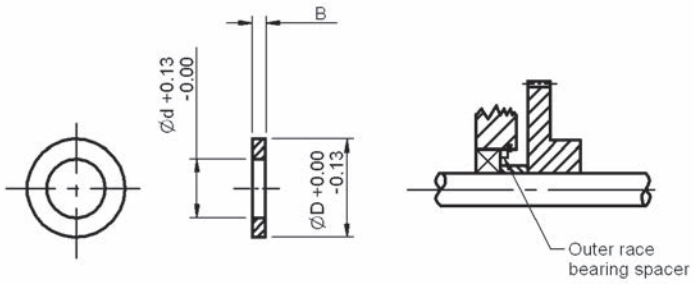
Associated Products
Internal circlips: page 13-21
Bearings: page 12-2

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



Dimensions

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[1]		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

[1] Applies to standard Reliance bearing sizes

Product options

- Imperial sizes available

Machine Screws, Dowel Pins and Hardware

13

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Machine Screws

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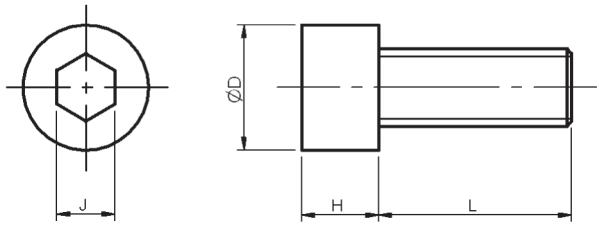
Internal Circlips ..... Page 13-21

Technical Information ..... Page T13-1

Plain Socket Head Screws

All dimensions in mm
Thread specification: BS3643 Pt2
Tolerance class: 6g
Material: A2-70 Austenitic[1]
A4-70 Austenitic[2]
Stainless steel to ISO 3506-1

Associated Products
Disc springs: page 13-15
Nuts: page 13-16
Washers: page 13-17



Part number selection table

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

Basic Part No	Thread Size	ØD max	H max	J nom	Standard Length L	Matl
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	
	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	A47[2]
	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	

Features and options

- 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
- Slotted head available
- Imperial sizes available
- Alternative materials available

Technical support

- ISO metric screw threads, limits and tolerances - see page T13-1
- Torque and tension guidelines - see page T13-1
- Material properties - see page T13-2

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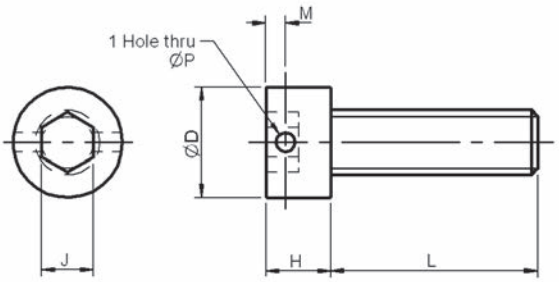
Associated Products
Disc springs: page 13-15
Nuts: page 13-16
Washers: page 13-17

All dimensions in mm
Thread specification: BS3643 Pt2
Tolerance class: 6g
Material:A2-70 Austenitic(1)
A4-70 Austenitic(2)
Stainless steel to ISO 3506-1



Part number selection table

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

Basic Part No	Thread Size	ØD max	H max	J nom	M ±0.1	ØP ±0.1	Standard Length L	Matl
S	M1.6	3.0	1.6	1.5	0.5	0.4	3 4 5 6	A27(1)
	M2	3.8	2.0	1.5	0.7	0.6	4 5 6 8	
	M2.5	4.5	2.5	2.0	0.75	0.7	5 6 8 10	
	M3	5.5	3.0	2.5	0.9	0.8	6 8 10 12 16 20	A47(2)
	M4	7.0	4.0	3.0	1.3	1.0	8 10 12 16 20 25	
	M5	8.5	5.0	4.0	1.5	1.5	10 12 16 20 25 30	
	M6	10.0	6.0	5.0	1.8	1.5	12 16 20 25 30 40	

Features and options

- Plain 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
- Imperial sizes available
- Alternative materials available

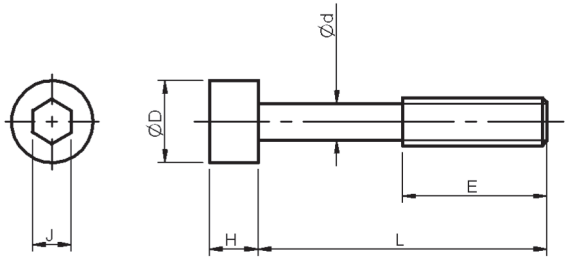
Technical support

- ISO metric screw threads, limits and tolerances - see page T13-1
- Torque and tension guidelines - see page T13-1
- Material properties - see page T13-2

Screws and Hardware

All dimensions in mm
Thread specification: BS3643 Pt2
Tolerance class: 6g
Material: A2-70 Austenitic[1]
A4-70 Austenitic[2]
Stainless steel to ISO 3506-1

Associated Products
Disc springs: page 13-15
Nuts: page 13-16
Washers: page 13-17



Part number selection table

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

Basic Part No	Thread 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	
	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	A47[2]
	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	

Features and options

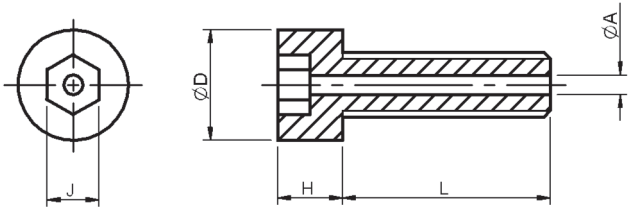
- Socket head cap screw to ISO 4762 with plain shank length for captive assembly of the screw to prevent fastener loss
- Ideal for service covers
- Rolled thread for excellent surface finish, superior thread strength and increased hardness properties
- Slotted head available on sized M2 to M5
- Imperial sizes available
- Alternative materials available

Technical support

- ISO metric screw threads, limits and tolerances - see page T13-1
- Torque and tension guidelines - see page T13-1
- Material properties - see page T13-2

Associated Products
Disc springs: page 13-15
Nuts: page 13-16
Washers: page 13-17

All dimensions in mm
Thread specification: BS3643 Pt2
Tolerance class: 6g
Material:A2-70 Austenitic(1)
A4-70 Austenitic(2)
Stainless steel to ISO 3506-1



Part number selection table

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

Basic Part No	Thread Size	ØD max	H max	J nom	ØA ±0.05	Standard Length L	Matl
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	
	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	A47(2)
	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	

Features and options

- Socket head cap screw to ISO 4762 drilled through on axis to assist cavity ventilation in vacuum assemblies
- Rolled thread for excellent surface finish, superior thread strength and increased hardness properties
- Slotted head available
- Imperial sizes available
- Alternative materials available

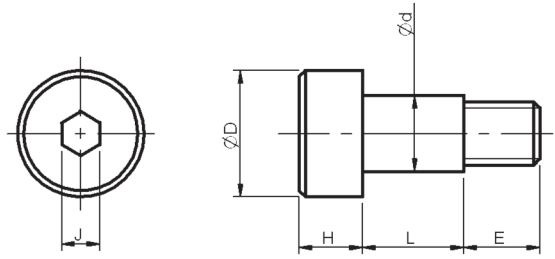
Technical support

- ISO metric screw threads, limits and tolerances - see page T13-1
- Torque and tension guidelines - see page T13-1
- Material properties - see page T13-2

Shoulder Screws

All dimensions in mm
Material: 303 Stainless steel
Tolerance class: 6g

Associated Products
Disc springs: page 13-15
Nuts: page 13-16
Washers: page 13-17



Part number selection table

Example Part No:- MSS2 - M6 - 35

Basic Part Number	Thread Size	Ød +0.000 -0.025	ØD	J nom	H	E ±0.1	Length L +0.05 -0.00	Length Code
MSS2	M3	3.987	6	2	3	4	4.013	1
							5.013	2
							6.013	3
							8.013	4
							10.013	5
	M4	4.987	8	2.5	4	5	4.013	6
							5.013	7
							6.013	8
							8.013	9
							10.013	10
							12.013	11
							14.013	12
							16.013	13
							20.013	14
							25.013	15
							30.013	16
	M5	5.987	10	3	5	6	4.013	17
							5.013	18
							6.013	19
							8.013	20
							10.013	21
							12.013	22
							14.013	23
							16.013	24
							20.013	25
							25.013	26
							30.013	27

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Basic Part Number	Thread 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	6.013	28
							8.013	29
							10.013	30
							12.013	31
							16.013	32
							20.013	33
		9.987					8.013	34
							10.013	35
							12.013	36
							16.013	37
	M8	9.987	14	5	7	12	8.013	38
							10.013	39
							12.013	40
							16.013	41
	M10	11.987	20	6	8	16	12.013	42
							16.013	43
							20.013	44
							25.013	45

Features and options

- 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 and stationary guides
- Slotted head and Phillips head available
- Imperial sizes available
- Alternative materials available (416) add -4 to the end of the part number
- Alternative lengths available

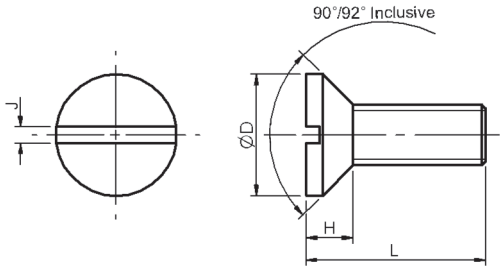
Technical support

- ISO metric screw threads, limits and tolerances - see page T13-1
- Torque and tension guidelines - see page T13-1
- Material properties - see page T13-2

Countersunk Machine Screws

All dimensions in mm
Thread specification: BS3643 Pt2
Head specification: BS4183
Tolerance class: 6g
Material: Stainless steel 300 series

Associated Products
Disc springs: page 13-15
Nuts: page 13-16
Washers: page 13-17



Part number selection table

Example Part No:- K - M3 - 12

Basic Part No	Thread Size	ØD max	H max	J nom	Standard Length L
K	M2	4.4	1.20	0.63	3 4 5 6 8 10 12 16 20
	M2.5	5.5	1.50	0.73	5 6 8 10 12 16 20 25
	M3	6.3	1.65	0.93	5 6 8 10 12 16 20 25 30
	M4	8.4	2.20	1.13	6 8 10 12 16 20 25 30 35
	M5	10.0	2.50	1.38	8 10 12 16 20 25 30 35
	M6	12.0	3.00	1.78	10 12 16 20 25 30 35

Features and options

- Imperial sizes available
- Alternative materials available

Technical support

- ISO metric screw threads, limits and tolerances - see page T13-1
- Torque and tension guidelines - see page T13-1

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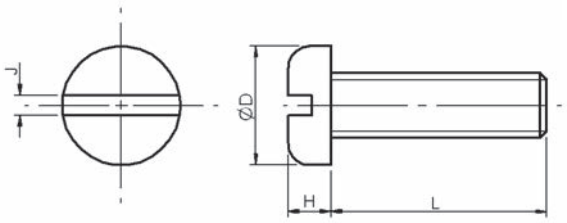
Associated Products
Disc springs: page 13-15
Nuts: page 13-16
Washers: page 13-17

All dimensions in mm
Thread specification: BS3643 Pt2
Head specification: BS4183
Tolerance class: 6g
Material: Stainless steel 300 series



Part number selection table

Example Part No:- P - M3 - 12

Basic Part No	Thread Size	ØD max	H max	J nom	Standard Length L
P	M2	4.0	1.2	0.63	3 4 5 6 8 10 12 16 20
	M2.5	5.0	1.5	0.73	5 6 8 10 12 16 20 25
	M3	6.0	1.8	0.93	5 6 8 10 12 16 20 25 30
	M4	8.0	2.4	1.13	6 8 10 12 16 20 25 30 35
	M5	10.0	3.0	1.38	8 10 12 16 20 25 30 35
	M6	12.0	3.6	1.78	10 12 16 20 25 30 35

Features and options

- Imperial sizes available
- Alternative materials available

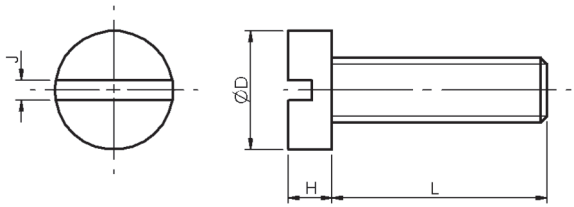
Technical support

- ISO metric screw threads, limits and tolerances - see page T13-1
- Torque and tension guidelines - see page T13-1

Cheese Head Machine Screws

All dimensions in mm
Thread specification: BS3643 Pt2
Head specification: BS4183
Tolerance class: 6g
Material: Stainless steel 300 series

Associated Products
Disc springs: page 13-15
Nuts: page 13-16
Washers: page 13-17



Part number selection table

Example Part No:- C - M3 - 12

Basic Part No	Thread Size	ØD max	H max	J nom	Standard Length L
C	M2	3.8	1.3	0.63	3 4 5 6 8 10 12 16 20
	M2.5	4.5	1.6	0.73	5 6 8 10 12 16 20 25
	M3	5.5	2.0	0.93	5 6 8 10 12 16 20 25 30
	M4	7.0	2.6	1.13	6 8 10 12 16 20 25 30 35
	M5	8.5	3.3	1.38	8 10 12 16 20 25 30 35
	M6	10.0	3.9	1.78	10 12 16 20 25 30 35

Features and options

- Imperial sizes available
- Alternative materials available

Technical support

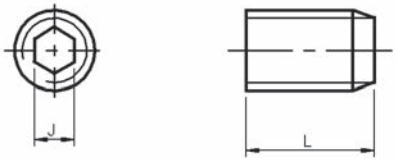
- ISO metric screw threads, limits and tolerances - see page T13-1
- Torque and tension guidelines - see page T13-1

Cup Point Set Screws

M2 - M6

Associated Products
Gears: page 4-1
Reli-a-Flex® couplings: page 8-6

All dimensions in mm
Thread specification: BS3643 Pt2
Tolerance class: 6g
Material: Stainless steel
Manufactured to: BS EN ISO 4029



Part number selection table

Example Part No:- SS - M4 - 12

Basic Part Number	Thread Size	J nom	Standard Lengths L										
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

Features and options

- Used for quick, permanent location of gears, collars and pulleys on shafts
- Suitable for high torque transmission
- Imperial sizes available
- Alternative materials available

Technical support

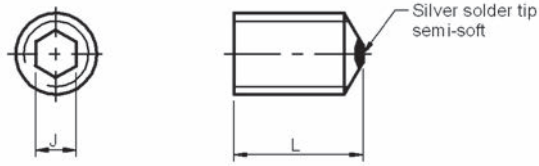
- ISO metric screw threads, limits and tolerances - see page T13-1
- Torque and tension guidelines - see page T13-1

Screws and Hardware

Solder Tip Set Screws

All dimensions in mm
Thread specification: BS3643 Pt2
Tolerance class: 6g
Material: Stainless steel 300 series with silver solder tip

Associated Products
Gears: page 4-1
Couplings: page 8-1



Part number selection table

Example Part No:- SGSS - M6 - 17

Basic Part Number	Thread Size	J nom	Standard Lengths L	Length Code
SGSS	M2	0.9	3 4 5 6	1 2 3 4
	M3	1.5	3 4 5 6	5 6 7 8
	M4	2	4 6 10 14	9 10 11 12
	M5	2.5	6 10 14 20	13 14 15 16
	M6	3	6 10 16 25	17 18 19 20

Features and options

- Stainless steel set screw with semi-soft silver solder tip
- Prevents shaft marking
- Imperial sizes available

Technical support

- ISO metric screw threads, limits and tolerances - see page T13-1
- Torque and tension guidelines - see page T13-1

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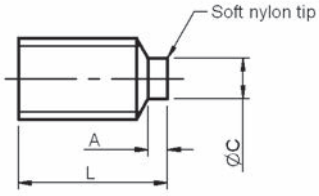
Nylon Tip Set Screws

M2 - M6

Associated Products
Gears: page 4-1
Couplings: page 8-1

All dimensions in mm
Thread specification: BS3643 Pt2
Tolerance class: 6g
Material: Stainless steel screw
Nylon insert



Part number selection table

Example Part No:- NMSS - M5 - 16

Basic Part Number	Thread Size	ØC	A	J nom	Standard Lengths L	Length Code
NMSS	M2	0.8	0.8	0.9	3.8 4.8 5.8 6.8	1 2 3 4
	M3	1.6	0.8	1.5	3.8 4.8 5.8 6.8	5 6 7 8
	M4	2.4	1.2	2	5.2 7.2 11.2 15.2	9 10 11 12
	M5	2.4	1.2	2.5	7.2 11.2 15.2 21.2	13 14 15 16
	M6	3.2	1.6	3	7.6 11.6 17.6 26.6	17 18 19 20

Features and options

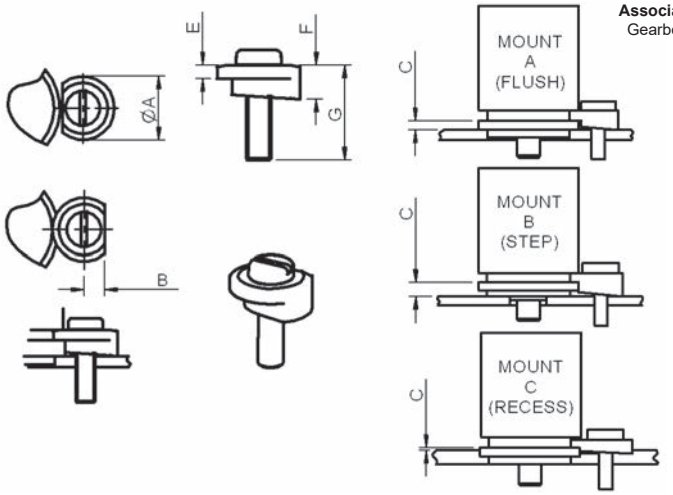
- Stainless steel set screw with nylon tip insert
- Used to prevent shaft marking
- Self locking
- Full face contact
- Imperial sizes available

Technical support

- ISO metric screw threads, limits and tolerances - see page T13-1
- Torque and tension guidelines - see page T13-1

Screws and Hardware

All dimensions in mm
General tolerances ±0.13 mm
Material: Stainless steel clamp
Nylon locking insert



Associated Products
Gearboxes: page 3-1

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	1.80	8.0	M3 x 0.5	9.90
SQM-7	A	1.57		1.02	2.59			
SQM-8		1.57		1.27	2.84	10.0		
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	12.0		
SQM-17	A	6.35		1.60	7.92	16.0		

Features and options

- Ideal for use with resolvers, encoders and potentiometers
- Imperial sizes available
- Self locking
- Quick releasing

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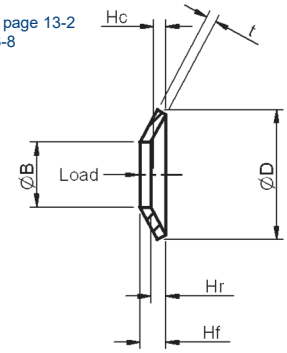
Associated Products
Shafts: page 11-2
Bearings: page 12-2
Socket head cap screws: page 13-2
Machine screws: page 13-8
Nuts: page 13-16

All dimensions in mm
General tolerances ±0.13 mm
Material: Stainless steel X12CrNi 17 7
Manufactured to: DIN2093



Part number selection table

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

Basic Part Number	Screw Size	ØD	ØB	t	Free Height Hf	Ref. Height Hr	Compressed Height Hc (75% Defl.)	Force to 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]	1.65	0.40	1.35	1411
	M12	25.0	12.2	1.50[1]	1.90	0.40	1.60	1944

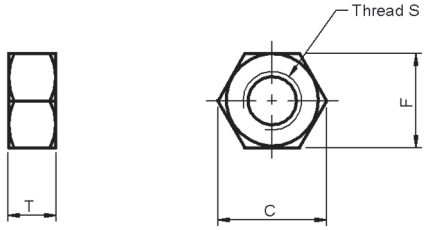
[1] Material: stainless steel X7CrNiAl 17 7

Features and options

- For use where controlled axial force is required
- Good for bearing pre-load configurations
- Imperial sizes available

All dimensions in mm
General tolerances ±0.13 mm
Material: Stainless steel
Thread: BS3692, DIN 934

Associated Products
Disc springs: page 13-15
Plain socket head cap screws: page 13-2
Pan head machine screws: page 13-9
Cheese head machine screws: page 13-10
Washers: page 13-17



Part number selection table

Example Part No:- HN - M3

Basic Part Number	Thread Size S	T max	F max	C nom
HN	M1.6	1.3	3.2	3.4
	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

Product options

- Imperial sizes available

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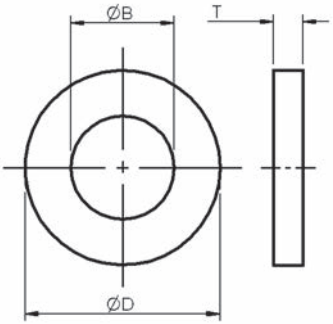
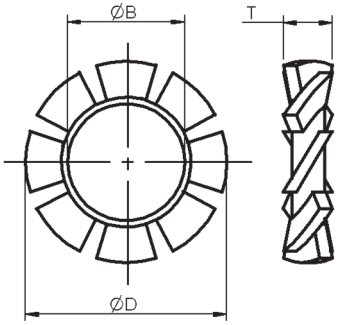
Associated Products
Screws from: page 13-2
Nuts: page 13-16
Disc springs: page 13-15

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



Plain Washers



Tooth Lock Washers

Part number selection tables

Example Part No:- PW - M3

Basic Part Number	Thread Size	ØD max	ØB min	T nom
PW	M1.6	4.0	1.7	0.3
	M2	5.0	2.2	0.4
	M2.5	6.5	2.7	0.6
	M3	7.0	3.2	0.6
	M4	9.0	4.3	0.9
	M5	10.0	5.3	1.1
	M6	12.5	6.4	1.8

Example Part No:- ETW - M3

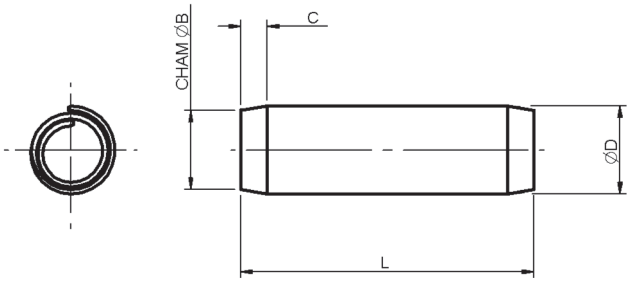
Basic Part Number	Thread Size	ØD max	ØB max	T nom
ETW	M2	4.5	2.2	0.9
	M3	6.0	3.2	1.2
	M4	8.0	4.3	1.5
	M5	10.0	5.3	1.8
	M6	11.0	6.4	2.1

Product options

- Imperial sizes available

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

Associated Products
Pin hub gears: page 4-13
Shaft collars: page 11-3



Part number selection table

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

Basic Part Number	Actual Dia ØD	Nom Dia	Cham Dia ØB	Cham Length C	Ideal 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

Features and options

- Coiled steel pin for location and alignment
- Suitable for locating Reliance's gears on ground shaft
- Imperial sizes available
- Alternative materials available

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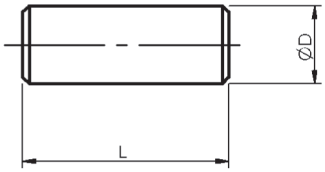
Associated Products
Pin hub gears: page 4-13
Shaft collars: page 11-3

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



Part number selection table

Example Part No:- D 020 - 10

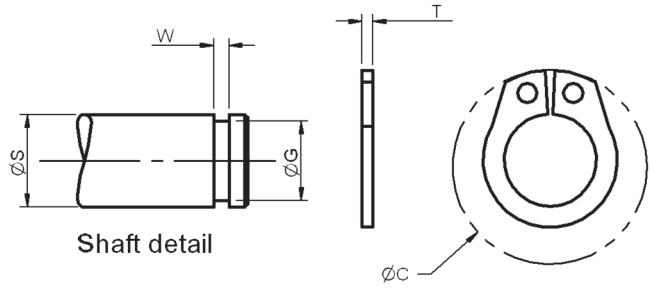
Basic Part Number	ØD ±0.0025	Diameter Code	Standard Lengths L ±0.25
D	1.00	010	3 4 5 6 8 10 12 14
	1.50	015	3 4 5 6 8 10 12 14 16 18
	2.00	020	3 4 5 6 8 10 12 14 16 18 20 22
	2.50	025	3 4 5 6 8 10 12 14 16 18 20 22
	3.00	030	5 6 8 10 12 14 16 18 20 22 25
	4.00	040	10 12 14 16 18 20 22 25
	5.00	050	12 14 16 18 20 22 25
	6.00	060	14 16 18 20 22 25

Features and options

- Precision stainless steel dowel pin, suitable for accurate location and alignment
- Imperial sizes available
- Alternative materials available

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

Associated Products
Shafts: page 11-2
Bearings: page 12-2



Shaft detail

Part number selection table

Example Part No:- D1400 - 0060 - SS

Basic Part Number	Nominal Shaft Dia (ØS)	Dia Code	Circlip		Groove		Matl
			Thickness T	Clearance Dia (ØC)	Width W	Dia ØG	
D1400	3	0030	0.40 0.35	7.00	0.64 0.50	2.80 2.76	SS
	4	0040	0.40 0.35	8.60	0.64 0.50	3.80 3.75	
	5	0050	0.60 0.55	10.30	0.84 0.70	4.80 4.75	
	6	0060	0.70 0.65	11.70	0.94 0.80	5.70 5.65	
	8	0080	0.80 0.75	14.70	1.04 0.90	7.60 7.54	
	10	0100	1.00 0.94	17.00	1.24 1.10	9.60 9.54	
	12	0120	1.00 0.94	19.00	1.24 1.10	11.50 11.39	

Features and options

- Used to axially secure components, such as bearings on shafts
- Imperial sizes available
- Alternative materials available

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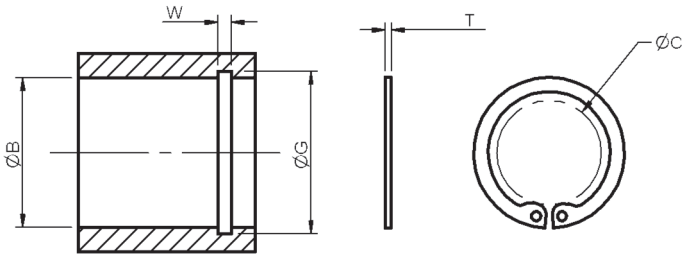
Associated Products
Shafts: page 11-2
Bearings: page 12-2

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



Housing detail

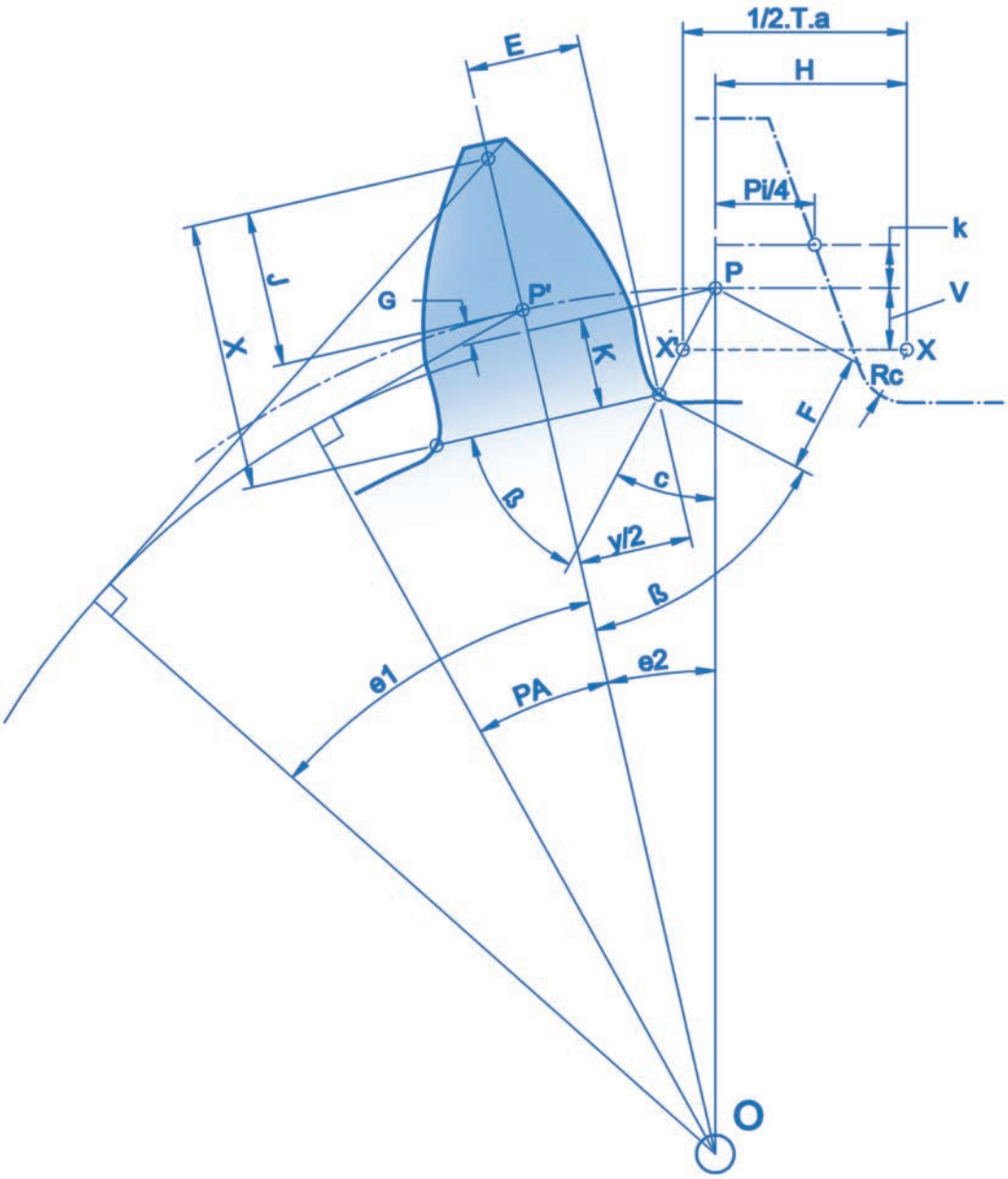
Part number selection table

Example Part No:- D1300 - 0200 - SS

Basic Part Number	Nominal Bore Dia (ØB)	Dia Code	Circlip		Groove		Matl
			Thickness T	Clearance Dia (ØC)	Width W	Dia ØG	
D1300	12	0120	1.00 0.94	5.70	1.24 1.10	12.61 12.50	SS
	15	0150	1.00 0.94	8.30	1.24 1.10	15.81 15.70	
	16	0160	1.00 0.94	9.20	1.24 1.10	16.91 16.80	
	19	0190	1.00 0.94	11.80	1.24 1.10	20.13 20.00	
	20	0200	1.00 0.94	12.60	1.24 1.10	21.13 21.00	
	22	0220	1.00 0.94	14.60	1.24 1.10	23.13 23.00	
	24	0240	1.20 1.14	16.40	1.44 1.30	25.41 25.20	
	28	0280	1.20 1.14	19.80	1.44 1.30	29.61 29.40	
	30	0300	1.20 1.14	21.80	1.44 1.30	31.65 31.40	

Features and options

- Used to axially secure components, such as bearings in housings
- Imperial sizes available
- Alternative materials available


1/2.T.a
E
H
Pi/4
k
V
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P'
G
X
X'
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Rc
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c
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e1
PA
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O

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- Racks and Pinions .....Page T6-1
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- Couplings .....Page T8-1
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- Bearings and Spacers .....Page T12-1
- Hardware .....Page T13-1

Standard Conversion Factors

Length	1mm	= 0.03937 in	1in	= 25.4 mm
Area	$1mm^2$	= 0.00155 in^2	$1in^2$	= 645.16 mm^2
Volume	$1mm^3$	= 61.02 x 10^{-6} in^3	$1in^3$	= 16387 mm^3
	1 litre	= 1 x 10^6 mm^3	1ml	= 1 cm^3
Force and mass	1N	= 0.101972 kgf	1lbf	= 4.4482 N
	1kgf	= 9.80665 N	1N	= 0.2248 lbf
	1kg	= 2.2046 lb	1lb	= 0.4536 kg
Torque	1Nm	= 8.8507 lbfin	1lbfin	= 0.1130 Nm
	1Nm	= 141.612 ozfin	1ozin	= 0.00706 Nm
	1Nm	= 10197.16 gfcm		
Power	1kW	= 1.360 PS (metric hp)	1hp	= 0.7457 kW
	1kW	= 1.341 hp		
Moment of inertia	$1kgm^2$	= 54674.75 $ozins^2$	$1ozins^2$	= 18.29 x 10^{-6} kgm^2
	$1gcm^2$	= 5.467 x 10^{-3} $ozin^2$	$1ozin^2$	= 182.9 gcm^2
	$1kgm^2$	= 23.73 $lbft^2$	$1lb.ft^2$	= 0.0421 kgm^2
Pressure and stress	$1N/m^2$	= 145 x 10^{-6} lbf/in^2	$1lbf/in^2$	= 6.895 x 10^3 N/m^2
	$1N/m^2$	= 64.75 x 10^{-9} $tonf/in^2$	$1tonf/in^2$	= 15.44 x 10^6 N/m^2
Temperature	°C	= (°F-32)*5/9	°F	= (°C*9/5)+32
	K	= °C+273.15	°R	= °F+459.67
Angles	1rad	= 180/π degrees	1 degree	= π/180 rad
	1mrad	= 10.8/π arcmins	1 arcmin	= π/10.8 mrads

S.I. Multiples

Prefix name	Symbol	Factor
tera	T	10^{12}
giga	G	10^9
mega	M	10^6
kilo	k	10^3
hecto	h	10^2
deca	da	10^1
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	µ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}
femto	f	10^{-15}
atto	a	10^{-18}

Angular Resolution

Bits	Counts	arcmins	mrads
7	128	168.75	49.087
8	256	84.375	24.544
9	512	42.188	12.272
10	1024	21.094	6.1359
11	2048	10.547	3.0680
12	4096	5.2734	1.5340
13	8192	2.6367	0.76699
14	16384	1.3184	0.38350
15	32768	0.65918	0.19175
16	65536	0.32959	0.095874
17	131072	0.16479	0.047937
18	262144	0.082397	0.023968
19	524288	0.041199	0.011984
20	1048576	0.020599	0.0059921

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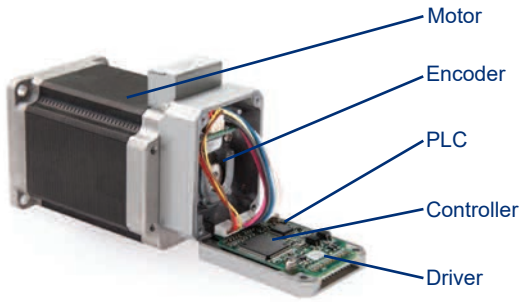
RELIANCE COOL MUSCLE FEATURES

The Reliance Cool Muscle (RCM) is packed with features that help you reduce the size and cost of your machine while reducing development time.

Simple and Compact

An intelligent driver with a 32 bit CPU based motion controller, driver amplifier, magnetic encoder and power management are all built on to the motor.

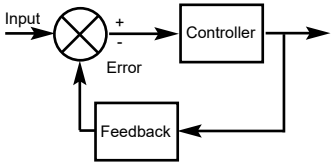


FULL CLOSED LOOP SYSTEM

RCM is a fully closed loop system. With a high resolution magnetic encoder and the intelligent driver board mounted on the back, RCM constantly monitors every aspect of its operation, eliminating any missed steps.

Closed Loop System

By receiving position input from the sensor, the RCM knows its position and can correct itself.

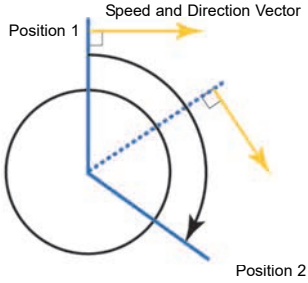


H-Infinity

Using the newest control technology, the RCM goes beyond static PID control by utilising the robust H∞ control system. H∞ responds to dynamic loads across the entire speed range, reduces the need to tune gains and increases the allowable inertia mismatch.

SMOOTH AND ACCURATE MOVEMENTS

The RCM's high resolution encoder gives you exceptionally fine positioning of 50,000 units per rotation. The RCM uses Vector Drive Control to produce extremely smooth motion, even at low speeds, not possible with micro-stepping drivers.



Vector Drive Control

Vector Drive is a control technique used in servo systems; it is a completely different technique from micro-stepping. Unlike micro-stepping, Vector Drive Control is not subject to resonance problems, produces smooth movements, increases torque and increases efficiency.

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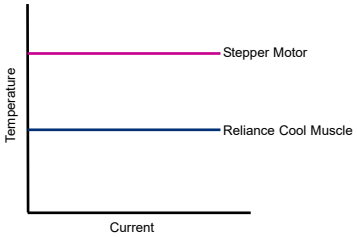
COOL OPERATION

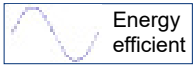
RCM's power management monitors and provides the optimum current based on load, keeping the motor cool. In addition, the RCM generates high torque at low speeds.



RCM applies optimum current to produce motion, whereas an open loop stepper always uses maximum current.

RCM has high torque even at low speeds and excels at both smooth motion and slow speeds.

RCM only draws power for what it needs, making the RCM power efficient and increasing motor life.



CONTROL

P-type RCM is a drop-in step loss free replacement for a step/direction or CW/CCW pulse drive.
C-type RCM takes ASCII commands or MODBUS RTU from your PC, PLC or can use analogue (joystick) control.

	Control	Variations
P Type	Pulses	CW/CCW Step/Direction
C Type	PC Embedded Computer PLC Switch	Pre-programmed Dynamic Command
	Analogue Input	Position Speed

FULLY USER PROGRAMMABLE

Program the RCM to create the motion you need. Define motion profiles and create programs using easy-to-understand RCM Language (RCML). Motion programs you create can be downloaded to the RCM. The programs can be executed via PC, embedded computer or simply using hardware inputs.

RCML

Reliance Cool Muscle Language allows easy creation of motion programs. Programs can be downloaded to the RCM using free Control Room software available from:

www.reliance.co.uk/en/downloads-motors-and-cables

```
P1=1000
P2=2000
S1=200
S2=300
A1=50
A2=150
T1=20
```

Define motion profiles such as speed, acceleration position and timer.

```
B1
A1,S1,P1
S2,P2,P1
C2
B2
A2,S1,P3
```

Define motion programs using the motion parameters defined above.

USER DEFINABLE PARAMETERS

Define the character of your RCM to suit your needs. The RCM gives you over 60 parameters which can easily be set using RCML.

K48=10000	Origin offset distance set to 10000 pulses.
K58=200000	Software limit + side set to 200000 pulses.
K37=3	Motor resolution set to 1000.
K46=1	Automatic home routine using mechanical stopper.
K38=0	Sets analogue interface to speed control mode.

PARAMETER EXAMPLES:

Home Search Method

The home search parameter lets you select a home search method. Home position can be determined using a hard-stop/bumper instead of a home switch. The RCM hits a bumper at low speed and torque and keeps pushing until it reaches a specified current level at which the motor determines that it has reached home. This method eliminates the need for a home switch and wiring.

Software Limit

Set software limits using RCM parameters. Set limits on both CW and CCW sides, to eliminate switches.

These two software features will save you the cost of three sensors and the time needed to install wiring and calibrate them.

SOFTWARE INTERFACE

Serial Protocol

The PC interface to the Cool Muscle 'Y' Cable is RS232. Cool Muscle serial communications use the ASCII character set. Characters are transmitted with 8 data bits, no parity bit, and one stop bit. There is no hardware or software flow control. The baud rate is selectable from 9600, 19200, 38400 (default) and 57600 baud. The command separator is carriage return or comma. Line feeds are optional and are ignored.

Register Model

The data memory of the Cool Muscle is divided into families of registers. Each register is labelled by its family (letter) and register number. General parameters and settings are in the K-family. For example register K58 holds the software limit for maximum travel in the + direction in units of 1000 steps. To read the limit, simply send the register name K58 to the motor and it will respond with K58.1=247 if the limit is 247000 steps. To change the limit to 352000 steps, send command K58=352. The K-parameters are non-volatile. If multiple motors are daisy chained together it is necessary to add the motor number to the command, so K58.2 refers to register K58 in motor 2. Each motor can store 25 positions in P-registers P1 to P25, fifteen speeds in S1 to S15, and so on. There are registers for eight accelerations, seven maximum torques, eight dwell timers, and fifteen unassigned registers for general use. M6.4 is torque limit register number six in motor 4, for example. These registers are volatile, but can be saved into the Cool Muscle controller's EEPROM. The saved values are automatically reloaded into RAM when the motor is switched on.

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Program Banks

Up to 15 programs can be stored in the controller EEPROM. Each is a sequence of commands.

```
B2.5                This is program 2 in motor 5
A3.5,S5.5,M1.5      Load motion parameters from registers
F2.5                Reset OUTPUT 2
X7.5                Start of loop, loop 7 times
 P1.5               Go to position in register P1
 T1.5               Dwell for time in register T1
 P2.5               Go to position in register P2
 T1.5               Dwell for time in register T1
X.5-                End of loop
C3.5                Call program B3.5 as a subroutine
O2.5                Assert OUTPUT 2
END.5               End of program
$.5                 Save to EEPROM, motor 5
```

This program can be started by sending the short command [2.5.

Logic Banks (PLC Function)

Logic banks are similar to bank programs but are run periodically with a maximum frequency of once every 1ms.

```
L1.1                This is logic bank 1 in motor 1
I3.1,J2.1           Test INPUT 3, if set jump to bank 2
END.1

L2.1                Logic bank 2
S.1=S2.1            Load speed from register S2
A.1=A1.1            Load acceleration from register A1
^.1                 Activate new speed and acceleration
J3.1                Jump to bank 3
END.1

L3.1                Logic bank 3
I3.1,T0.1,J4.1      Test INPUT 3, if set ignore (T0.1)
END.1               Otherwise jump to bank 4

L4.1                Logic bank 2
S.1=S3.1            Load speed from register S3
^.1                 Activate new speed
J1.1                Jump to bank 1
END.1

$.1                 Save to EEPROM, motor 1
```

Execution starts in logic bank L1.1. If INPUT 3 is not set, nothing happens until the next periodic run. Then L1.1 runs again.
If INPUT 3 is ever set, a jump occurs. Logic bank L2.1 makes a speed change and control jumps immediately to logic bank L3.1.

Control now remains with L3.1 until INPUT 3 is reset. Then L4.1 makes another speed change and control goes back to the beginning.
The effect is that motor speed is selected using INPUT 3. The speed change is smooth, using the acceleration in register A1.1 and S-curve shaping if parameter K69 is set.
Bank programs and logic banks can both run at the same time, so an ordinary bank program can initiate a motor move and then a logic bank can modify the speed en route.

More Information

A quick reference card listing all registers and commands is on our website, together with a more detailed programming manual: www.reliance.co.uk/en/downloads-motors-and-cables

ELECTRICAL INTERFACE

The RCM has 4 inputs and 2 outputs that can be used as digital, analogue, serial or pulse counter (input only). RCM lets you assign a different function to each edge and level of a signal.

Pin Layout

Pin #			
1	+24 V DC IN	Motor power	+24 V±10%
2	0V	Power ground	Note 7
3	INPUT 2-	Return for pin 9	Notes 2, 8
4	OUTPUT 2+	Digital/analogue output, serial Tx	Note 5
5	OUTPUT 1+	Digital/analogue output, serial Tx	Notes 1, 5
6	INPUT 4+	Digital/analogue input	Notes 3, 4
7	INPUT 3+	Digital input	Note 3
8	INPUT 1-	Return for pin 10	Notes 1, 8
9	INPUT 2+	Digital/counter input, serial Rx	Notes 2, 8
10	INPUT 1+	Digital/counter input, serial Rx	Notes 1, 8
11	0V	Signal ground	Note 7
12	+5V DC OUT	Power out	Note 8

Notes

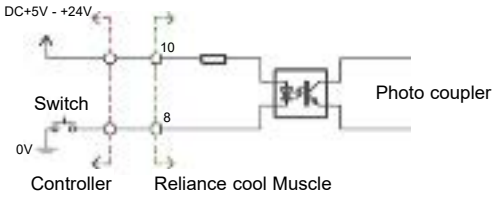
1. Normally used for serial communication with the host PC via an accessory 'Y' or USB cable. In a daisy chain system with multiple motors, used for serial communication with the next upstream, slave or master motor. If the Cool Muscle is being used stand-alone INPUT 1 and OUTPUT 1 can be assigned other functions. These functions are activated when the 'Y' Cable is detached (power off before disconnecting).
2. In a daisy chain system with multiple motors, used for serial communication with the next downstream, slave motor. Otherwise INPUT 2 and OUTPUT 2 can be assigned other functions.
3. When programmed as a digital input, INPUT 3 and INPUT 4 logic levels are:-
   HIGH > +3 V (minimum 7 mA)
   LOW < +0.8 V
4. Analogue input range is 0 V to +4.8 V. Resolution is 10-bit (0 – 1023).
5. When programmed as a digital output this signal is NPN, open collector. When programmed as an analogue output the signal range is 0V to 5V. Resolution is 8-bit (0 – 255).
6. Total output current maximum 50 mA.
7. Pins 2 and 11 are internally connected.
8. When used for STEP/DIRECTION pulse control, INPUT 1 is the step input and INPUT 2 is the direction input. When used for CW/CCW pulse control INPUT 1 steps the motor clockwise and

INPUT 2 steps anti-clockwise.
Maximum pulse frequency: 500 K pulse/s
Minimum pulse width; 0.8 µs
Pulse level high > +3 V (minimum 7 mA)
Pulse level low < +0.8 V

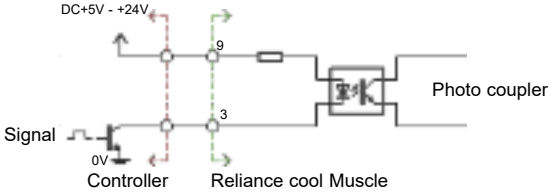
Wiring for INPUT 1 and INPUT 2

These inputs are opto-isolated inputs, minimum 5 V, maximum 24 V. Examples:-

Input 1



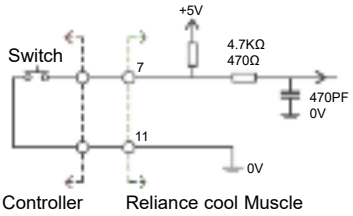
Input 2



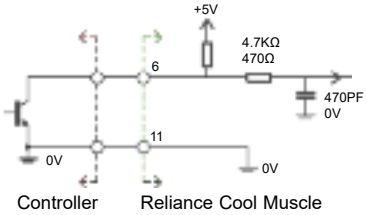
Wiring for INPUT 3 and INPUT 4

These inputs are internally pulled up to +5 V. To operate them connect to 0 V through a switch or open collector (NPN) output. Examples:-

Input 3



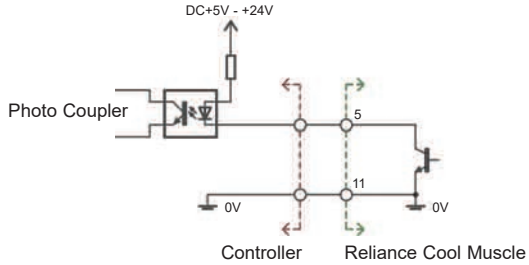
Input 4



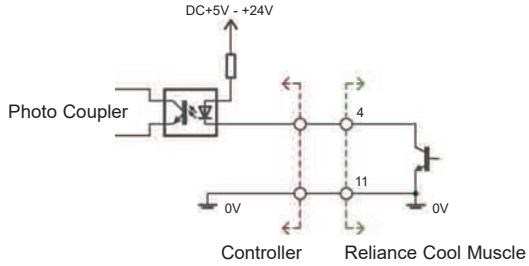
Wiring for OUTPUT 1 and OUTPUT 2

Outputs 1 & 2 can work across a range of voltages from 5 V to 24 V. The collector current of the transistor must be limited to a maximum of 100mA.

Output 1



Output 2



ADVANCED MOTION

Speeds and accelerations can be changed whilst the motor is in operation. RCM supports a range of advanced motion features such as PTP motion incorporating changing accelerations and variable torque control. The powerful push mode is also standard allowing for electric emulation of common pneumatic operations.

Continuous PTP: There are no stops in motion between origin and P3. Speed and acceleration are changed at each point.

Push Mode: Mimics a typical pneumatic motion. It keeps pushing for a given time and at a set current level when a motor encounters a resistance such as a bumper or stopper.

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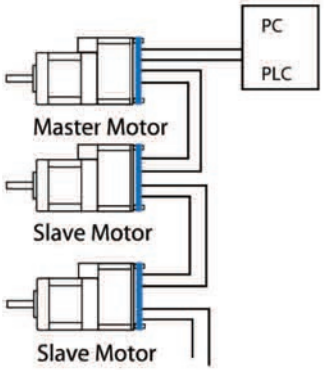
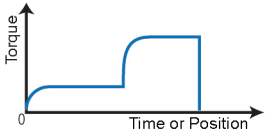
NETWORK

RCM provides you with different networking solutions to suit your needs. When multiple RCMs are connected in a daisy chain network, any RCM can tell other motors to activate programs as well as receive commands from a computer or embedded controller.
In fact, after programming, RCMs can operate without any PC, PLC or HMI control.



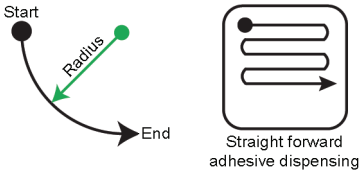
TORQUE CONTROL AND FEEDBACK

The RCM controller uses the integrated current and position sensors to maintain sophisticated torque control during operation. Peak running torque can be easily set within motion programs, or the built in Push Mode function can be quickly implemented to mimic pneumatic cylinder operations.



2-AXIS CO-ORDINATED MOTION

The RCM servo provides 2 axes contouring utilizing a 2+ motor daisy chain network. Additional linear axes can be implemented on the same motor for applications such as dispensing, cutting, or inspection. Programs can be run directly from the motor without the need for a host controller, or can be streamed from a PC for greater flexibility.



LOGIC PROGRAMMING AND PLC FUNCTIONALITY

The RCM real time operating system precisely controls I/O timing allowing for PLC style I/O operation. Logic banks provide a flexible logical and mathematical capability analogous to that offered by traditional ladder logic. User defined actions can be triggered by external inputs or by internal motor conditions such as speed, torque, or position.

RACK ACTUATOR

Installation

Each Racktuator™ is supplied pre-assembled with carefully set clearances and alignments. Disassembly may result in reduced performance and accuracy. The rack should not be removed from the housing to avoid possible damage to teeth when it is re-inserted.

Axial load rating

The axial load rating is dependent upon the rack, pinion and motor. As a general guide the load ratings in the product data pages (see pages 2-15 to 2-17) can be used to determine the allowable rack thrust.

Basic Ratings:

- For axial thrust loads of up to 3 N use a RCMRA17-6-250 tubular rack (see page 2-15) with a PEEK pinion
- For axial thrust loads from 3 N to 20 N use a stainless steel pinion in lieu of PEEK pinion
- For axial thrust loads from 20 N to 90 N use the RCMRA23L (see page 2-16), which utilises a 17-4 PH stainless steel pinion and hardened stainless steel rack

Position accuracy and side wobble

Positioning accuracy depends on the resolution of the motor and the drive system. For the RRA series the full step size of the motor is 1.8° which translates to 0.2 mm of linear motion of the rack. Finer positioning may be achievable with a half-stepping or micro-stepping drive. For the RCMRA series where the angular resolution is 0.0072° the linear resolution is 0.0008 mm, depending on load and dynamic conditions.

Side wobble is dependent upon initial clearance between rack and bearing bore, the length of rack and wear between the rack and plain bearings. For RRA17-6-250 (see page 2-15) the maximum side wobble is ±0.2 mm at end of the rack with maximum protrusion from the housing.

Backlash

This is currently set on assembly between 0.020 mm and 0.060 mm axial clearance of the rack. It is possible to improve this on assembly and also reduce the rotation of the rack in the clearance, please contact us. It is not advisable to reduce backlash to zero as pinion eccentricities and temperature variations could cause binding. A temperature rise of approx. 35°C would be needed to cause possible binding of rack and pinion when a backlash of 0.010 mm is set.

Lubrication

PEEK pinion and stainless steel racks require no lubrication. Stainless steel racks and pinions require a smear of a lithium based grease on to the rack teeth for periodic lubrication.

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RACKTUATOR™ STEPPER MOTORS

Stepper motors operate by rotating the motor shaft at discrete intervals (1.8º for our steppers) as they receive electrical input pulses. This basic characteristic distinguishes stepper motors from other motors and makes them ideal for applications where accurate positioning and control is required, without the need for expensive feedback hardware.

Features of stepper motors

Position holding - (Detent torque)	Even with no power applied to the windings, stepper motors will resist rotation, which may be useful in applications that would normally experience 'drift'. If power is applied, this holding torque is significant.
High acceleration -	They have excellent acceleration performance that allows a start, stop and reverse to be performed at relatively high speed.
Good reliability -	The only components subject to wear are the bearings, as there are no brushes or commutators.
Low component count -	Stepper motors permit open-loop, high precision positioning control, therefore feedback hardware for control is not required, which leads to low cost system design.

Drive methods

There are three main modes of driving a stepper motor - Full Step, Half Step and Micro Step. With Full Step, the angular movement is the basic step angle, ie 1.8º. By manipulating the energisation sequence applied to the motor, it is possible to reduce the basic step angle by half. By manipulating the shape of the pulses applied to the motor, as well as the energisation sequence, the basic step angle can be split into several hundred micro steps. This large increase in resolution can only be achieved by using more complex drive electronics.

There are a number of methods of driving stepper motors, that basically divide into two groups; unipolar and bipolar drives. In unipolar drives the current always travels through the windings in the same direction. This is often achieved by attaching one end of each winding to a fixed voltage supply rail. With bipolar drives the current travels in both directions, which can give benefits in performance, although it usually requires more switching components. In both cases additional components such as resistors are often used to adapt a drive to a specific motor or to modify the characteristics of the motor-load system.

Our Racktuator™ stepper motors have 6 wires, which allow the user to chose between unipolar and bipolar drives. Steppers with less wires do not.

The design and implementation of a suitable drive for a specific application can be quite an involved process and is outside the scope of this technical section. For further advice please contact Reliance Technical Sales.

Technical information

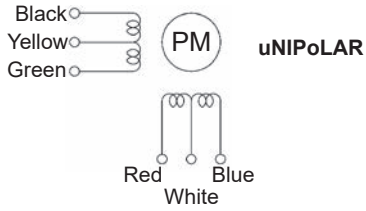
Insulation parameters	Dielectric Strength: 500 VAC Insulation Class: Class B
Insulation resistance	100 MΩ min. (at 500 V DC)
Dielectric strength	500 V AC (1 minute)
Operating temperature range	-20ºC to +50ºC
Permissible temperature rise	80ºC max. (resistance method)

Note: Do not allow the surface temperature of the motor case to rise above 90°C during operation.

Installation - connections

Size 17 steppers have 200mm cables with a EHR-6 connector (JST). Mating parts are available from RS components; top entry (stock no 515-1434) or side entry (stock no 515-1349).

Installation - wiring diagram



CW rotation mounting end

Step	Black	Red	Green	Blue	Yellow	White
0	ON	ON			COM	COM
1		ON	ON		COM	COM
2			ON	ON	COM	COM
3	ON			ON	COM	COM
0	ON	ON			COM	COM

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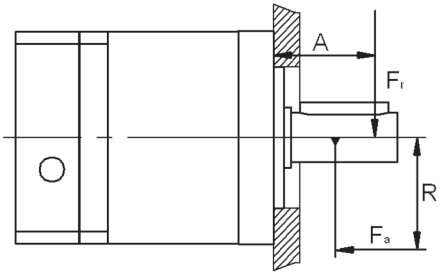
OUTPUT SHAFT BEARING LIFE



1. Calculate F_{rL} with the following formula

$$F_{rL} = \frac{F_a \times R + F_r \times (A + C_2)}{C_1}$$

2. Calculate the force-proportion

$$e = \frac{F_a}{F_{rL}}$$

Please contact us if e>0.22

3. Calculate F_L with the following formula

$$L_h = \frac{16667}{n} \times \left(\frac{C_L}{F_{rL}}\right)^3$$

FORMULA SYMBOLS

L_h	h	lifetime
F_a	N	axial load at the output shaft
F_r	N	radial load at the output shaft
R	mm	distance, axial load to centre of the gearbox
A	mm	distance, radial load to flange plane
n	min^{-1}	output shaft speed
C_x	-	gearbox constants from following table

		RGP40	RGP60	RGPN70
C_1	mm	10.5	11.5	13.5
C_2	mm	12.9	15.5	23
C_L	N	2250	6050	9950

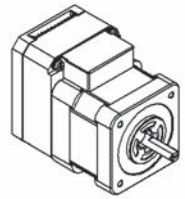
MAXIMUM LOAD IN CENTRE OF THE OUTPUT SHAFT

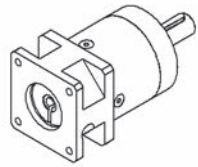
		RGP40	RGP60	RGPN70
F_r	N	200	500	1000
F_a	N	200	600	1200

PLANETARY GEARBOX INSTALLATION MOUNTING

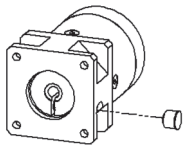
RGP40 NEMA 17

Make sure the gearbox has the correct mounting features for the selected motor.

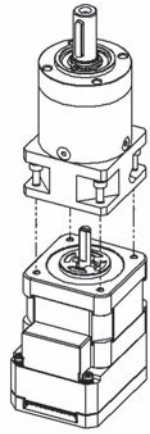


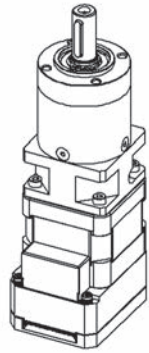


Clean the Cool Muscle and the RGP gearbox so they are grease free, make sure not to get cleaning fluid into either the motor or gearbox.

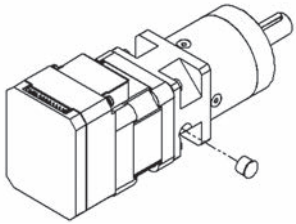


Remove the cover cap, adjust the position of the clamp to be in line with the mounting hole and open the clamp so that clamp diameter is greater than the motor shaft diameter.





The preferred method for mounting is in a vertical orientation as shown, mount the gearbox so it is flush with the motor, secure the gearbox and motor together with 4 off S-M3-8 screws and torque them up to T_{Mount} Nm.



hten the clamp shaft onto the motor T_{Clamp} Nm and re-attach cover cap.

NEMA 17 Mounting Screw Torque	
Socket head cap screw order code	S-M3-8
T_{Clamp} (Nm)	1.1

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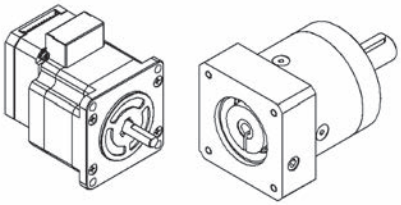
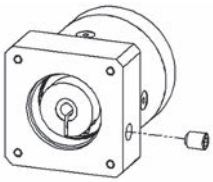
RGP40, RGP60 and RGPN70 NEMA 23

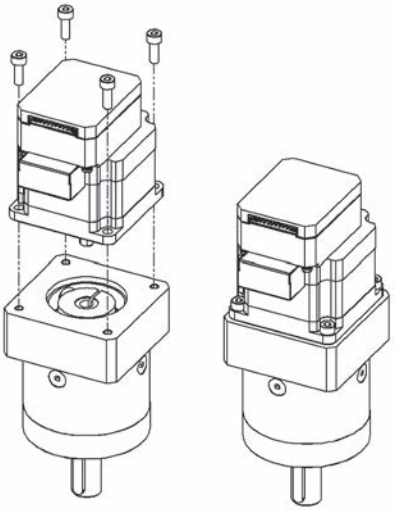
Make sure the gearbox has the correct mounting features for the selected motor.



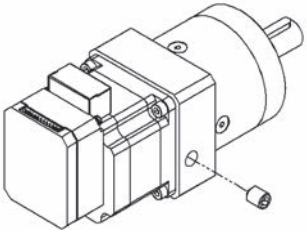
Clean the Cool Muscle and the RGP gearbox so they are grease free, make sure not to get cleaning fluid into either the motor or gearbox.



Remove the cover screw, adjust the position of the clamp to be in line with the mounting hole and open the clamp so that clamp diameter is greater than the motor shaft diameter



The preferred method for mounting is in a vertical orientation as shown, mount the gearbox so it is flush with the motor secure, bolt the two together with 4 off S-M4-12 screws and torque them up to T_{Mount} Nm.

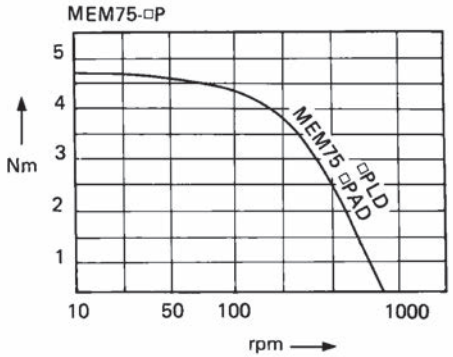


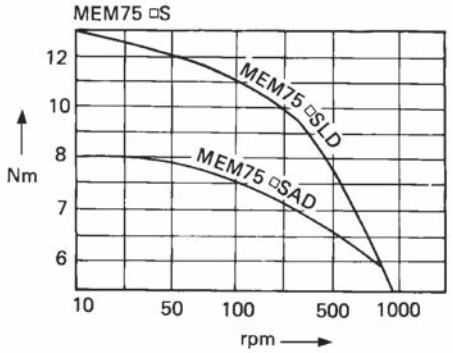
ghten the clamp shaft on
T_{Clamp} Nm and re-attach cover screw.

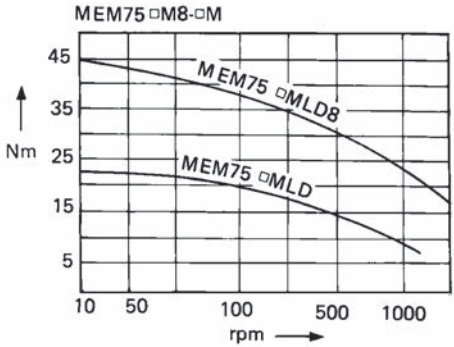
NEMA 23 Mounting Screw Torque	
Socket head cap screw order code	S-M4-12
T_{Clamp} (Nm)	1.1

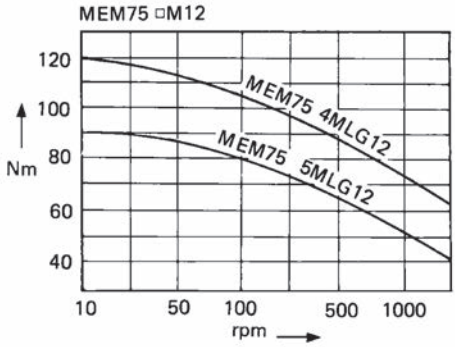
Clamping Screw Torque			
Socket width across flats (mm)	2	4.5	9.5
T_{Clamp} (Nm)	2.5	3	4

TORQUE CURVES









OUTPUT SHAFT TORQUE

This is derived from an eight hour day, continuous unidirectional drive and no impact fluctuating load.

PEAK TORQUE CAPABILITY

Momentarily allowable torque is 250% of rated torque (under the same conditions as output torque).

DYNAMIC LOAD FACTOR

The rated torque has been derated in accordance with the following table:

Dynamic Load Factor (Sf)

Drive	Driven	Load Type		
		Uniform	Medium Impact	Heavy Impact
	Hrs/day	Sf	Sf	Sf
Electric Motor	<3	1.0	1.0	1.5
	3 - 10		1.25	1.75
	24		1.5	2.0

$$\text{Allowable Torque} = \frac{\text{Rated Torque}}{\text{Sf}}$$

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REVERSING MOTION

Should MEMs be used in a reversing drive (eg. servo application) the units should be derated to 80%.

TEMPERATURE RANGE

The unit will operate satisfactorily between -10º and +65ºC. For the all metal units, maximum temperature is 75ºC.

MOUNTING POSITION

The standard position is horizontal. For other planes, please contact our sales team for more information.

REQUIREMENTS FOR ASSEMBLING UNITS

1. Alignment - Radial alignment errors, after fitting the input and output shafts, should be within 0.15mm.

2. Location of Internal Gear - A unit should be located in the manner in which the torque distribution is uniform in the internal gear.

3. Clearance - Axial clearance between the unit's revolving parts (Carrier A & B) and casing should be 2mm to 4mm.

4. Thrust Support when Mounting Vertically - When mounting the units with shafts vertically, care must be taken to ensure that the mass of the module is supported by the shaft bearings and not the planet disks containing the internal gear. If the unit is mounted with the output shaft uppermost, then a shoulder will be required on the input shaft and vice versa.

5. Lubrication - For grease lubrication the casing should be filled with grease to between 50% and 80% of the volume and for oil lubrication to between 30% and 50% of the volume.

OVERHANG LOAD (OHL) - kg

The overhang load is a bending force acting on the shaft generated by external forces.

Calculate the OHL according to following equation and select an appropriate bearing:

$$\text{O.H.L. Capacity} = T \times Ef/R$$

T : Driving torque
R : Pitch circle radius of gear or sprocket
Ef : Element factor:

Gear	1.1 - 1.25
Sprocket	1.25
Flat Belt	2.5 - 3.0
V Belt	1.5 - 2.0

NOTES FOR HANDLING

1. Plastic Unit P - Lubricated with grease when assembled. (Units without grease lubrication are special to order).

2. Sintering Alloy Unit S - Not lubricated with grease when assembled. (Units with grease lubrication are special to order).

3. Metal Unit M - Not lubricated with grease or oil.

4. Do not mix strong acid or oil additives and thinners to the lubricant of the plastic units.

5. Do not allow rapid temperature variations. This will generate moisture.

6. Store the MEM units in a dark room below 40ºC and keep in a dry, dust-free atmosphere.

7. If a unit is mounted on a surface which acts as a sounding-board, the noise will be amplified above the inherent noise level of the unit. Take care when mounting the unit.

HOUSED UNITS (LGH)

MEM modules can be supplied mounted in an aluminium housing complete with output shaft and support bearings. The complete unit is rated at 10Nm output torque, and can have either one, two or three modules. Maximum reduction ratio is 125:1 with 3x5:1 ratio modules. The accompanying motor must have a ‘D’ shaped shaft of 8mm diameter and 7mm over the flat.

Also included is the MEM26. This is a housed unit complete with input and output shaft. Actual ratio is 91.125:1 and the unit is capable of handling 2 Nm output torque.

Larger modules are available up to 1000 Nm output torque. Please enquire.

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GEAR MANUFACTURE

Reliance's precision instrumentation gears are manufactured using high accuracy gearcutting equipment. Standard gears are produced in stainless steel, hardened stainless steel, aluminium alloy and brass (wormwheels only). Alternative materials such as PEEK polymer or Delrin are available on request.

GEAR TOLERANCES

Gears are generally offered as Quality 10 (see the individual product pages). Higher qualities are available as shown in the table below. Most gears in the catalogue can be produced in these qualities to order.
Reliance standard tolerances are largely based on AGMA 390-03 backlash.

Reliance Standard Gear Qualities — Table values in 0.001mm (0.0001")

Quality Class	Modular Range	Total Composite Error	Tooth to Tooth Composite Error	Indicator Limits (Gauge zeroed at std. pitch rad.) Max	Indicator Limits Min	Gear Quality Code
AQ9	1.5mod	26 (10)	18 (7)	-18 (-7)	-69 (-27)	-
AQ10	0.8 to 0.5 mod	26 (10)	13 (5)	-18 (-7)	-61 (-24)	-
AQ11		18 (7)	10 (4)		-53 (-21)	C
AQ12		13 (5)	8 (3)		-48 (-19)	B
AQ14		7 (2.7)	3.6 (1.4)		-41 (-16)	A
AQ10	0.4 to 0.2 mod	26 (10)	13 (5)	-13 (-5)	-51 (-20)	-
AQ11		18 (7)	10 (4)		-43 (-17)	C
AQ12		13 (5)	8 (3)		-38 (-15)	B
AQ14		7 (2.7)	3.6 (1.4)		-33 (-13)	A

Values in the above table refer to measurements obtained by means of the dual flank tester.

To specify a gear, other than the standard quality, add the quality code to the gear part number.
Example of a quality 12 gear - **P05S1B10F6A-100 B**
Quality code

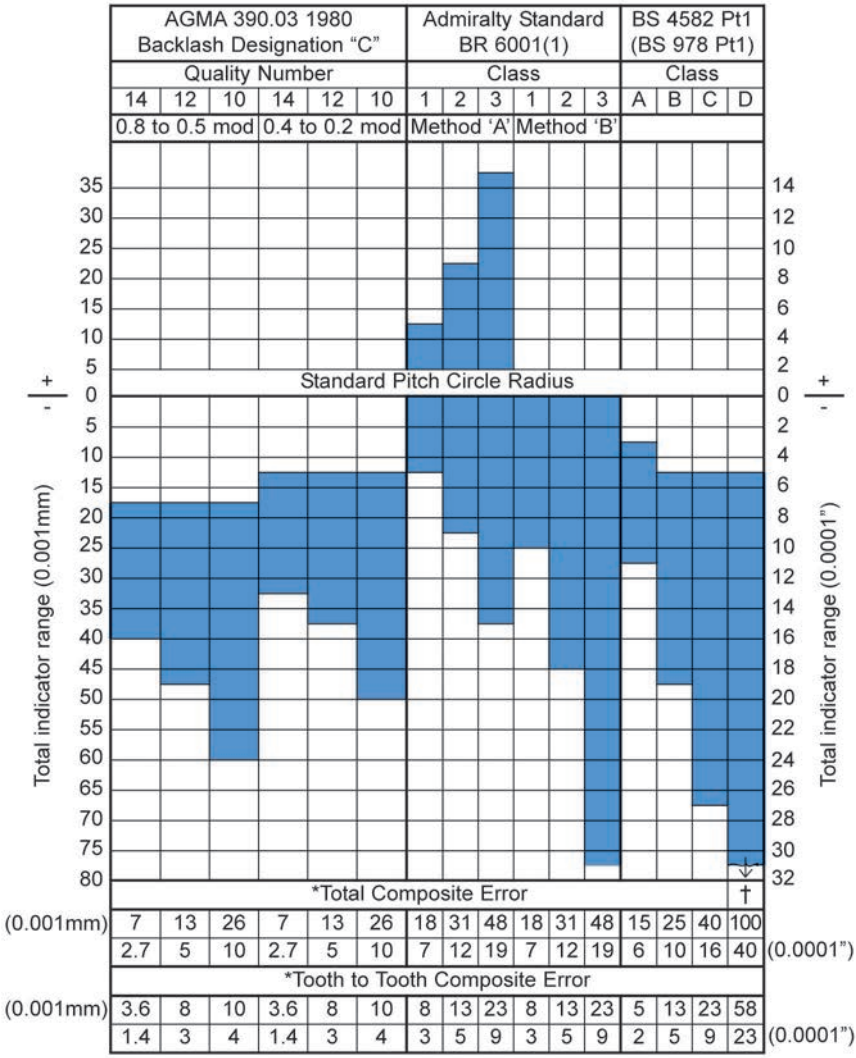
Comparison of National Gear Quality Standards

Reliance Quality Class	American AGMA 390.03 (1980)	British BS. 4582 (pt.1 : 1970)	German DIN. 867 & 3963	International ISo	Japan JIS	Admiralty BR.6001
AQ9	Q 9	Class C	Q 8	8	4	Class 3
AQ10	Q 10	Class B	Q 7	7	3	Class 2
AQ11	Q 11	Class A	Q 6	6	2	Class 1
AQ12	Q 12	Class A	Q 5	5	1	†
AQ14	Q 14	†	Q 3	3	0	†

† Reliance quality higher than any equivalent in this specification.
Table applies to gears up to 50 mm diameter.

RELIANCE GEAR STANDARDS FOR FINE PITCH GEARS

The table below is a comparison between Reliance (AGMA) and equivalent UK specifications:



*AGMA values quoted are for over 20T up to 50 mm (2") diameter. Admiralty and B.S. tooth to tooth errors are for over 30T.
† Minimum indicator level 0.006" or 0.15 mm.

For numbers of teeth outside the range consult the relevant specification.

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STANDARD MODULES AND CIRCULAR PITCHES - METRIC

Reliance's precision instrumentation spur gears are available as standard in the following modules and circular pitches, being those most commonly used in the design and manufacture of gear control mechanisms and instruments:

Module 0.2, 0.25, 0.3, 0.4, 0.5, 0.6, 0.8, 1.0, 1.25, 1.5
Circular pitch 1, 2, 2.5, 3

Pressure Angle and Rack Form

Except where stated otherwise, gears in this catalogue are cut to 20º pressure angle involute form teeth. Reliance standard gears will mesh satisfactorily with gears of the same module cut to the following standards:

(i) BS 4582 (1970) Part 1, Figure 1.

(ii) DIN 867 and 58412.

(iii) AGMA 207.06 (Assuming the pitch is cut to an equivalent module).

The gears will not mesh satisfactorily with gears cut to DIN 58400 unless the outside diameter of the latter is reduced to PCD + (2 x module).

DIN 58400 tooth proportions are:

Addendum	1.1 x Module
Dedendum	1.5 x Module for pitch 0.1 to 0.6 Module

Metric Tooth Proportions (Dimensions in mm)

Module	Circular Pitch	Addendum	Dedendum	Working Depth	Whole Depth	Equivalent Inch Diametral Pitch
1.5	4.712	1.5	1.875	3.0	3.375	16.933
1.25	3.927	1.25	1.563	2.5	2.8125	20.320
1.0	3.142	1.0	1.400	2.0	2.4	25.400
0.8	2.513	0.8	1.120	1.6	1.92	31.750
0.6	1.885	0.6	0.840	1.2	1.44	42.333
0.5	1.571	0.5	0.700	1.0	1.2	50.800
0.4	1.257	0.4	0.560	0.8	0.96	63.500
0.3	0.942	0.3	0.420	0.6	0.72	84.667
0.25	0.785	0.25	0.350	0.5	0.6	101.600
0.2	0.628	0.2	0.280	0.4	0.48	127.000
0.318	1.0	0.318	0.446	0.637	0.764	79.796
0.637	2.0	0.637	0.891	1.273	1.528	39.898
0.796	2.5	0.796	1.114	1.592	1.910	31.919
0.955	3.0	0.955	1.337	1.910	2.292	26.599

The above list is by no means exhaustive. Please enquire if you require a special module as Reliance holds a large stock of non-standard cutters.

MATERIALS AND SPECIFICATIONS

Reliance's precision instrumentation gears are manufactured from the materials listed below. We reserve the right to change the actual material to an equivalent specification without notice depending on availability.

Reliance Precision Gear Materials

Material	Specification		Used On	Material Code
Stainless steel	303S31 (303S21) or 303S42 (303S42) or 302S31 (302S25) or 303 to MIL QQ-S-764	BS 970	Pin hub gears Clamp hub gears Hubless gears Worms Gear clamp & hubs	S1
Stainless steel	316S31 (316S16)	BS 970	Rack pinions	S2
Stainless steel (hardened)	17-4PH1025 Hardened to 34-42 HRc		Hardened pin hub gears	S8
Aluminium alloy	L168 or HE 15-TF or 2024-T4 to MIL QQ-A-225/6	BS 1474	Pin hub gears Clamp hub gears Hubless gears Gear clamp & hubs	A1
Phosphor bronze	PB 102	BS 2874	Worm wheels	B1
Brass	CZ121	BS 2874	Spur gears	B2
Brass (Naval)	Alloy 464 to MIL QQ-B-637		Worm wheels	B3
Acetal	Delrin 150		Hubless gears	D1

Finishes

Stainless steel, bronze and brass gears remain in their natural condition. Passivation to DEF STAN 03-2, process M can be carried out if required. Aluminium components are anodised to specification DEF STAN 03-24 (chromic acid process) or DEF STAN 03-25 (sulphuric acid process). Gear teeth are not normally anodised.

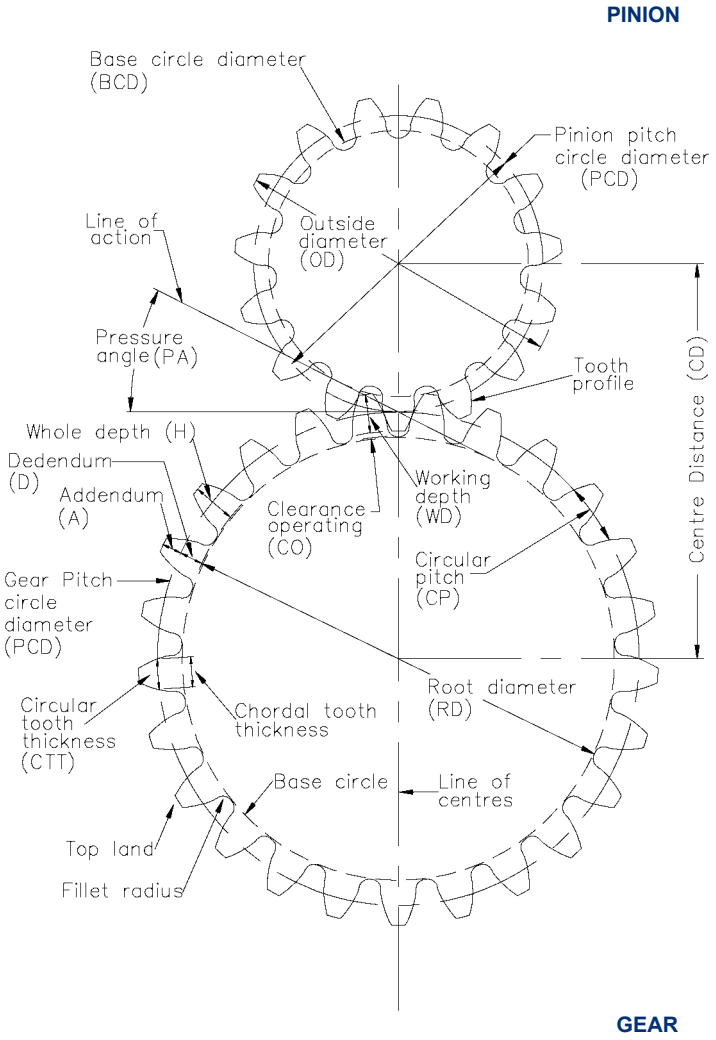
Anti-backlash Gears

Materials and finishes of standard anti-backlash gear components.

Where possible circlips, anti-backlash springs, shims and set screws will be stainless steel. However, some smaller pinions may have beryllium copper or zinc plated carbon steel circlips as standard.

SPUR GEAR GEOMETRY

A basic description of gear tooth terms is shown below. General formulae to enable correct understanding of spur gear geometry is shown opposite.



TERMINOLOGY FOR METRIC SPUR GEARS

TERM	DEFINITION	FORMULAE
Addendum (A)	The radial distance between the pitch circle and the outside diameter.	A=M
Addendum modification (K)	A method of modifying low tooth number gears to avoid undercutting and altering gear size to allow use of non standard centres.	See page T4-8
Backlash (B)	The circumferential clearance between mating gear teeth.	See page T4-15
Base circle diameter (BCD)	The diameter of the base cylinder from which the involute is generated.	BCD = N·Mcos PA
Base pitch (BP)	The pitch along the base circle or line of action.	BP = π Mcos PA
Basic rack	The straight sided rack shape from which teeth are generated.	See BS 4582.
Centre distance (CD)	Distance between the axes of rotation of mating spur gears.	CD = $\frac{PCD_{pinion}}{2}+\frac{PCD_{gear}}{2}$
Circular pitch (CP)	The distance along the pitch circle between corresponding points on adjacent teeth.	CP = π M
Circular tooth thickness (CTT)	The distance between opposite faces on the same tooth measured at the pitch circle diameter.	CTT = $\frac{\pi M}{2}$
Clearance operating (CO)	The amount by which the dedendum in a given gear exceeds the addendum of the mating gear.	CO = D - A
Dedendum (D)	The radial distance between the pitch circle and the root diameter.	D = 1.4M (BS4582) = 1.25M (BS436)
Diametral pitch (DP)	The size of the tooth expressed in teeth per inch of pitch diameter.	
Face width	The width of the tooth in an axial plane.	
Fillet radius	The radius of the fillet curve at the base of the gear tooth.	
Length of action	The distance on an involute line of action through which the point of contact moves during the action of the tooth profiles.	

Indicator limits	The size band of manufacture for the gear measured radially from the PCD.	
Module (M)	The size of the tooth expressed in mm of pitch diameter.	
Number of teeth (N)	Number of teeth on the gear.	
Outside diameter (OD)	The diameter over the tops of the teeth.	OD = PCD + (2M)
Pitch circle diameter (PCD)	An imaginary circle whose diameter is formed by meshing gears so that the circles actually touch each other, as if gears were driven purely by the friction of the circles.	PCD = (N+2K)·M Note: for unmodified gears K=0
Pressure angle (PA)	The angle between a line tangential to the pitch circles and a line perpendicular to the tooth profiles at the point of contact. (Equal to the side angle of the basic rack for standard gears).	Standard = 20º
Root diameter (RD)	The diameter of the base of the teeth.	RD = OD - (2H)
Total composite error (TCE)	The total error in the gear measured by the dual flank gear test. TTCE and pitch line runout are included.	
Tooth to tooth composite error (TTCE)	The change in error of each tooth on the gear measured by the dual flank tester.	
Undercut	The loss of profile in the vicinity of the involute start at the base circle due to tool cutter action generating gears with low tooth numbers. (N_{min} = minimum teeth for no undercut)	$N_{min} = \frac{2}{Sin^2 PA}$
Whole depth (H)	The total depth of a tooth space.	H = A + D
Working depth (WD)	The depth of engagement between mating gear teeth.	WD = 2A

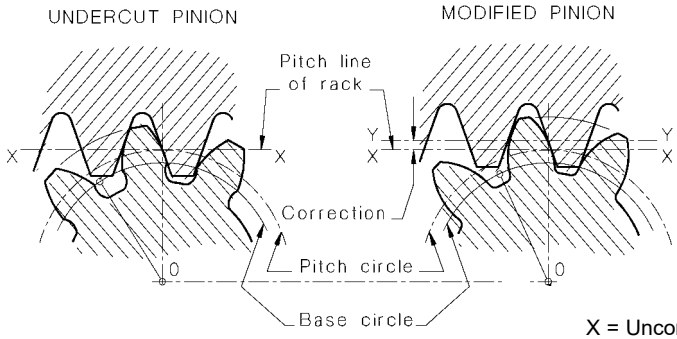
Note: for imperial gears to BS 978 Part 1, Equivalent Module = $\frac{25.4}{DP}$

GEARS WITH SMALL NUMBER OF TEETH

Unless otherwise requested, all gears in this catalogue having 16 teeth or fewer will be enlarged by applying addendum modification in accordance with BS4582 Part 1 (metric) as shown in the table below. These gears are indicated (†) against the appropriate tooth numbers on the product pages.

A small amount of backlash will be introduced between corrected pinions and mating gears when the modification sum is other than zero and the nominal centre distance is adjusted only by an amount equal to the modification sum.

For minimum backlash it will be necessary to either reduce the centre distance further, or to apply a secondary correction to the pinion or wheel. See the above B.S specification for details.



X = Uncorrected PCD
Y = Corrected PCD

data for Addendum Modified Gears of unit Module and unit dP			
No. of Teeth	**Addendum Modification**	**Enlarged PCD**	**Enlarged OD (PCD+2)**
10	0.4151	10.8302	12.8302
11	0.3566	11.7132	13.7132
12	0.2982	12.5964	14.5964
13	0.2397	13.4794	15.4794
14	0.1812	14.3624	16.3624
15	0.1227	15.2454	17.2454
16	0.0642	16.1284	18.1284

Example (Module)

Find P.C.D. and O.D. of enlarged gear having 13 teeth, 0.6 module

P.C.D. =13.4794 (from table) x 0.6 module	=8.088 mm
(Standard P.C.D. would be 13 x 0.6	=7.800 mm)

Similarly,

O.D. =15.4794 (from table) x 0.6 module	= 9.288 mm
(Standard O.D. would be 7.8 + (2 x 0.6)	= 9.00 mm)

Note:

For Imperial (diametral pitch) gears, divide the PCD or OD value in the table by the diametral pitch. The answer will be in inches.

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ENGINEERING DATA

For instrumentation Reliance normally recommend stainless steel pinions mating with aluminium alloy gears. Generally the pinion is subjected to most wear since it experiences a higher number of stress cycles than the wheel. This combination of materials tends to balance the wear between the pinion and the gear.

1. Gear Materials

Stainless steel

The 300 series stainless steels are used for gears when maximum corrosion resistance is required. They are 'true' stainless steels containing 18% chromium and 8% nickel.

Gears made from 303 stainless steel are essentially nonmagnetic and cannot be hardened by heat treatment. They are recommended for low torque applications as their mechanical properties and resistance are low.

Hardened stainless steel

17-4PH is a precipitation hardening stainless steel that offers a remarkable combination of high strength and hardness. Its high chromium content (15-17.5%) makes it an excellent material for arduous environments.

Aluminium alloy

Gears made from aluminium alloy are widely used in measuring applications. Its light weight offers reduced inertia. The inertia of an aluminium alloy gear is approximately 35% that of a steel gear. In particular, aluminium alloy L168 offers excellent corrosion resistance when anodised, moderately good mechanical properties and good stability.

Phosphor bronze

As a gear material phosphor bronze has a fine grain and good resistance to tooth sliding wear hence its use as a worm wheel material.

2. Installation

Gears in this catalogue are designed to be a slide fit on the shafts. The gears are available with four fixing methods: standard clamp, pins, set screws and Reli-a-Grip™ clamp.

Traditional clamp hub style gears have a gear hub with a relatively thin wall partially split. The clamp is a close fit on the hub and is compressed when the clamp screw is tightened. Clamping gears onto the shaft offers extremely easy assembly with the best assembled accuracy. However, as the fastening depends upon friction it can only be used in low torque applications.

Pin type gears are supplied as standard with a set screw and a sub-drilled hole. The set screw should be used to position the gear on the shaft during the drilling and pinning operation and can be removed once the gear is secure.

The sub-drilled hole provides a lead in for the drilling operation. It is recommended that drilling and pinning is completed outside the gearbox and the gear is thoroughly cleaned afterwards.

In less critical applications the set screw may be used to retain the gear on the shaft. To avoid damaging the shaft and to make removal of the gear easier the set screw should seat on a small flat, or dimple on the shaft.

3. Lubrication

All gears should be lubricated, but there are variations in degree.

Highly loaded precision gears should be in enclosed assemblies with complete lubrication to obtain the best possible hydrodynamic film. The system can be splash, spray or force fed, depending on the application. Moderately loaded precision gears, such as fractional horsepower systems, should be enclosed with oil or grease lubrication which can be spread by splash or dip lubrication.

Lightly loaded gears in instrumentation systems only need to have a marginal boundary lubrication as provided by periodically wiped on oils or grease. In many instances a light coat of Rocol MT LM or similar molybdenum disulphide grease will suffice for the life of the system. Anti-backlash gears should not be directly lubricated except via a very light application on the mating pinion.

Negligibly loaded fine instrument gears only need a brushed on film of light oil as a simple means of reducing friction.

4. Speed

The maximum pitch line velocity for stainless steel meshing with aluminium alloy with boundary lubrication is approximately 5,300 mm/sec (for a pair of meshing actuation gears correctly lubricated, this rises to approximately 8,000 mm/sec). This represents 5,000 rpm on measurement gears of 20 mm diameter (and 7,500 rpm on actuation gears of 20 mm diameter).

For speeds in excess of this and other material combinations please consult Reliance technical sales.

5. Gear Loading

The gears in this catalogue can be used for both feedback and actuation systems. The loads and material selection will depend on the application. In general a feedback system is designed to maintain accuracy and an actuation system is designed to transmit power.

5.1. Actuation Gears

The following analysis is intended to give a guide to the load capacity of a pair of spur gears. To simplify the calculations, a number of assumptions have been made. It must be noted that in many applications this will give a conservative estimate of the gear capacity, therefore, in critical applications an exact analysis must be completed.
Please consult the relevant gear standards or Reliance Technical Sales.

The analysis is based on AGMA 2001-B88 and assumes the following:

1. The gears are simply supported in rolling element bearings.
2. Pinion revolutions $>10^7$.
3. Gears are grease lubricated.
4. Reliability of 1 failure in 100 is acceptable.
5. Gear material is 17-4PH hardened.

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The basic load capacity (F_b) of a pair of spur gears is defined as the maximum tangential force at which they can operate indefinitely.

F_b has two values: one calculated from tooth root strength (F_{bs}), and one for tooth flank pitting (F_{bw}). The useful or transmitted load capacity, F_t, is usually less than F_b due to transient or dynamic loads generated within the mechanism.

For tooth root strength	$F_{ts} = F_{bs}/K_a$	K_a & C_a = Application factors
For tooth flank pitting (wear)	$F_{tw} = F_{bw}/C_a$	

Both calculations should be made and the lower value used.

The application factors K_a and C_a make allowance for any externally applied loads in excess of the nominal tangential force F_b and they are most accurately determined by direct measurement. In determining application factors, consideration should be given to the fact that many prime movers develop momentary peak torques appreciably greater than those determined by the nominal ratings of either the prime mover or the driven equipment. There are many possible sources of overload which should be considered including system vibrations, acceleration torques, overspeeds, variations in system operation and changes in process load. Impact loads due to reversing across backlash can be significant in servo systems.

As a general guide application factors for a motor gear system range from 1.0 for uniform loads up to 1.75 where heavy shock loads are anticipated.

For strength $F_{bs} = 177.7 \times J \times F \times M \times K_v$ [N]

For wear $F_{bw} = 14.64 \times N \times I \times F \times M \times K_v$ [N]

F_b = Basic load capacity (F_{bs} & F_{bw})
N = Number of teeth
J = Geometry factor, strength
I = Geometry factor, wear
F = Face width of smallest gear
M = Module
K_v = Dynamic factor

(i) Number of teeth
This is the number of teeth in the gear being analysed.

(ii) Geometry factors, I and J
These factors take account of the effect of tooth proportions on stress. The bending strength geometry factor, (J) takes account of the shape of the tooth. The wear resistance geometry factor, (I) takes account of the radii of curvature of the contacting tooth profiles. Please see the graphs on page T4-13.

(iii) Face width, F
This is the face width of the smallest gear in mm. (Face width in contact).

(iv) Module, M
This is the gear module expressed as shown on the respective gear pages.

(v) Dynamic factor, Kv
This accounts for internally generated gear tooth loads which are induced by the non-conjugate meshing action of the gear teeth.

$$K_v = \left(\frac{84}{84 + \sqrt{200V_t}} \right)^{0.4}$$

For quality 10 gears only
V_t = Pitch line velocity (m/s)

Example calculation to find the theoretical load capacity of a 5:1 pass of 17-4PH spur gears as follows:

Pinion - P06S8B6F4A-25
Gear - P06S8B8F6A-125

Pinion speed is 500 rpm.

(i) Number of teeth from part number = 25

(ii) Geometry factors from graph

J = 0.37
I = 0.118

(iii) Smallest gear face width from part number

F = 4

(iv) Gear module from part number

M = 0.6

(v) Dynamic factor from equation

$$K_v = \left(\frac{84}{84 + \sqrt{200V_t}} \right)^{0.4} = \left(\frac{84}{84 + \sqrt{200 \times 0.393}} \right)^{0.4} = 0.96$$

$$\text{where : } V_t = \frac{\text{rpm} \times \pi \times N \times M}{60000} \left[\text{m/s}\right]$$

F_{bs} = 177.7 x 0.37 x 4 x 0.6 x 0.96 = 151.5 N

F_{bw} = 14.64 x 25 x 0.118 x 4 x 0.6 x 0.96 = 99.5 N

For alternative materials the above values need to be modified as shown below:

Gear Material Modification Factors

Material	Specification	Strength	Wear
Hardened stainless steel	17-4PH	1.00	1.00
Stainless steel	303S31	0.43	0.15
Stainless steel	316S31	0.47	0.20
Aluminium alloy	L168	0.37	0.10
Brass	CZ121	0.35	0.13

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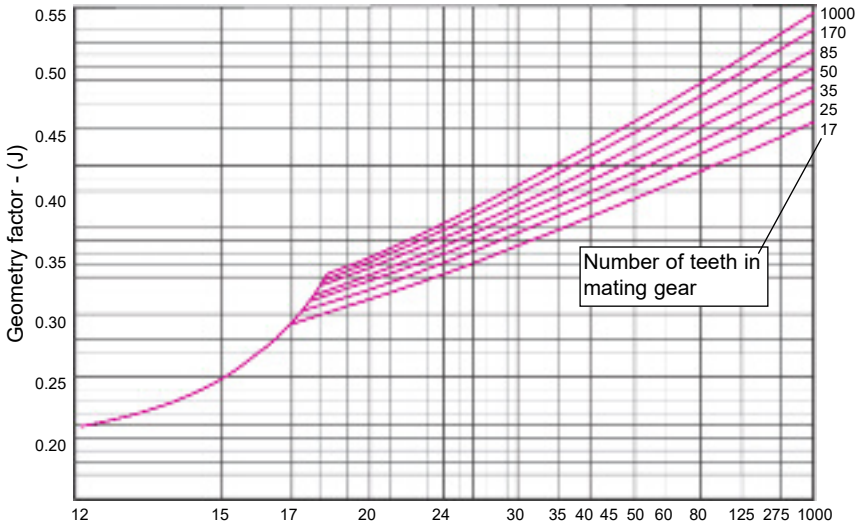
Example:
If the gears in the example on the previous page were made from 303S31

Fbs = 151.5 x 0.43 = 65.1 N
Fbw = 99.5 x 0.15 = 14.9 N

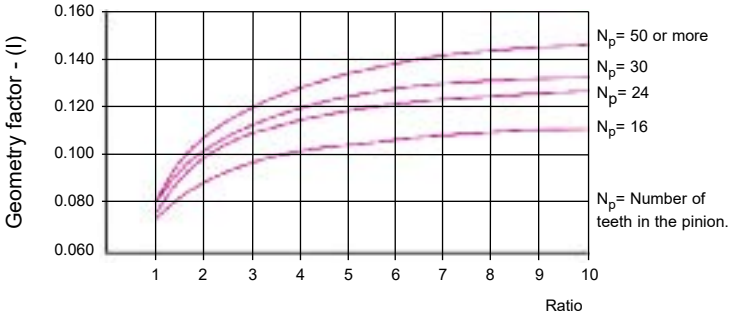
The application factors should be applied after the reduction for material.

Geometry factor, Strength (J), 20º spur



Number of teeth in gear for which geometry factor is desired

Geometry factor, Wear (I), 20º spur



5.2. Instrumentation and Feedback Systems

Gears and components designed for the precise transmission of angular position generally work at the low torque levels normally associated with servo components such as synchros, resolvers, optical encoders etc. Tooth loads of 1.2 N per mm face width should result in an adequate accurate life. Higher loads will tend to increase deflections of gear teeth, shafts, bearings etc, resulting in significant values of lost motion and a decrease in life.

Example: To find the maximum advisable torque on a gear 40 mm diameter x 3 mm face width.

Torque = force x radius = 1.2 x 3 x 0.04/2 = 0.072 Nm (10 oz.in.)

5.3. Anti-backlash Gear Spring Tension

In order for anti-backlash gears to function as anti-backlash devices, it is necessary to ensure that the spring tension will provide sufficient torque to overcome the friction and acceleration torque in the system, ie the spring torque must be capable of driving/accelerating the gear train and any associated components.

The spring tension capability of anti-backlash gears listed in this catalogue will adequately cope with the low torques normally encountered.

As a general guide, torque settings on anti-backlash gears of 1.059 to 1.765Ncm (1.5 to 2.5 oz.in.) will suffice in most applications. Ideally the spring torque should be set to the minimum at which the anti-backlash gear performs satisfactorily, thus avoiding unnecessary high preload on the gear teeth and premature wear.

6. Lost Motion and Backlash Control

The following section deals with lost motion, which we know to be one of the basic problems in designing fine pitch gear trains. The accepted definition of lost motion is the amount by which the output shaft may be turned without turning the input shaft.

It may be thought that lost motion is a function of the gear cutting operation alone, but, in fact the teeth of the gears may contribute very little to the overall lost motion value. A complete understanding of all the elements which induce lost motion is essential in order to achieve a well designed gear train. The following factors must be individually considered for their own contribution to overall lost motion in the gear train:

(a) Nominal centre distance.
(b) Centre distance tolerance.
(c) Size and tolerance of mating gears.
(d) Total composite error of gears.
(e) Fits between bores, shafts and bearings.
(f) Bearing accuracy (class).
(g) Radial play of bearings.
(h) Shaft straightness and alignment.
(i) Fits between electrical and/or mechanical component spigot diameters, and housing bores.
(j) Eccentricity and radial play of electrical and/or mechanical component shafts.
(k) Torsional elasticity.
(l) Differential expansion.

Each of the previous, except nominal centre distance, tend to induce a change in centre distance which will push together or pull apart the mating gears. This push-pull action produces two backlash values, minimum at the point of the tightest mesh, and maximum at the point of loosest mesh.

(a) Calculation of Nominal Centre Distance

Nominal centre distance can be considered as the starting point in the calculation of overall backlash values. Nominal centre distance is calculated by taking half the sum of the (theoretical) pitch diameters of the mating gears.

$$\text{i.e.} \qquad CD = \frac{PCD_1 + PCD_2}{2}$$

(b) Centre Distance Tolerance

Centre distance tolerance is an extremely important area for consideration. Any increase in centre distance in excess of the nominal value will increase the backlash. A decrease in nominal centre distance will decrease the backlash. In this case caution must be exercised to avoid interference between mating gears as a result of this decrease.

The relationship between centre distance change to backlash for 20º PA spur gear is given by:

$B = 2 \operatorname{Tan} \phi \cdot \Delta C$ where B = Circumferential backlash
ϕ = Pressure angle (Tan 20º = 0.36397)
ΔC = Distance between theoretical nominal and actual centre distance

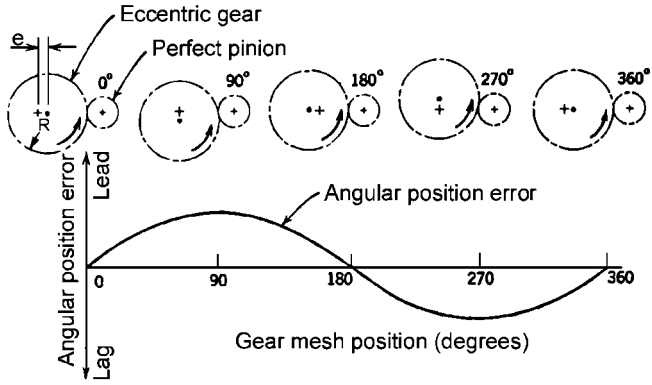
Note: Maximum Angular Backlash (minutes of arc) = $\frac{\text{Maximum Circumferential Backlash} \times 57.3 \times 60}{\text{Pitch Circle Radius}}$

7. Gear Error

The error function of a gear is approximately sinusoidal and for practical considerations can be assumed to be so. The first derivative of the time displacement curve yields the velocity function, therefore, the output velocity variable will also be an approximate sinusoid but the maximum velocity error will be displaced 90º from the maximum position error.

In summation, pitch circle runout will cause a sinusoidal error which is revealed as an output transmission error when meshed with a mating gear. The magnitude is given by the following example:

In the example on page T4-16, if the small pinion were not a perfect gear its error would be seen superimposed on the large gear error cycling at pinion frequency.



Angular position error $E_A = \frac{e}{R}\sin\theta$ Linear position error $E_L = e\sin\theta$

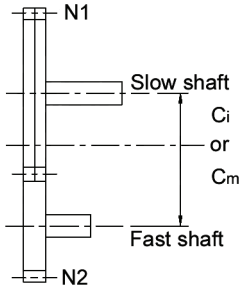
8. Transmission Accuracy of Gear Trains

The following section is based on work carried out by Reliance Gear Company (now known as Reliance Precision Limited) to provide some guidance in the design of accurate data transmission gearing.

The transmission error referred to by equations 1 and 2 below represent the maximum statistical point to point error during a forward and reverse cycle of a single pass of quality 14 anti-backlash gearing assembled in a data transmission gearbox.

For quality 10 or 12 gearing add 50% or 30% respectively to the error calculated for quality 14 gearing.

For average transmission error substitute the numbers 3.25 and 83 in the equations for the numbers 4.4 and 112 respectively.



$$\Sigma_1 = \left(1+\frac{N_2}{N_1}\right)\cdot\left(\frac{112}{C_m}\text{ or }\frac{4.4}{C_i}\right) \text{------(1)}$$

$$\Sigma_2 = \left(1+\frac{N_1}{N_2}\right)\cdot\left(\frac{112}{C_m}\text{ or }\frac{4.4}{C_i}\right) \text{------(2)}$$

C_m and C_i = Centre distance in mm and inches respectively.
N_2 and N_1 = Number of teeth in pinion and wheel respectively.
Σ_1 and Σ_2 = Maximum statistical transmission error in minutes of arc measured at the slow and fast shafts respectively.

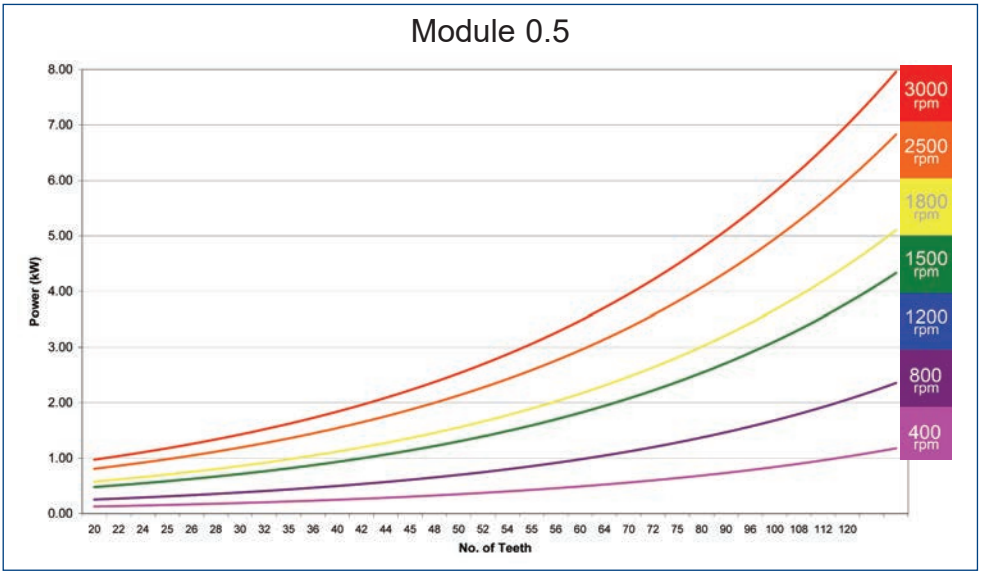
BACKLASH FOR STANDARD GEARS

The table below refers to the allowable backlash within the range of Spur, Bevel, and Worm gear pairs with a designated centre distance. The allowable backlash is necessary to absorb the deviations of noise and oscillation in order to maintain smooth operation.

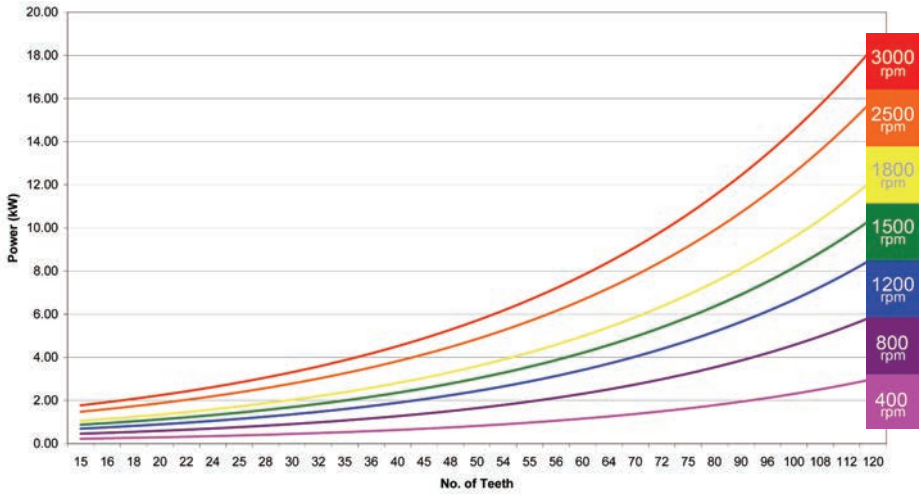
Gear Type	Condition	Module (m)	Backlash (mm)
Spur Gear	Brass/ Ground	< 0.9	0.02 - 0.06
	Brass	0.9 to 0.75	0.04 x m - 0.10 x m
	Ground	0.9 to 1.0	0.04 x m - 0.08 x m
Bevel Gear pair	Stainless steel or Brass	< 0.9	0.02 - 0.08
		0.9 to 1.5	0.05 - 0.12
Worm Gear pair Centres < 50 mm	Worm - Stainless steel Worm wheel - Brass	≤ 1.0	0.08 - 0.20

Note. These figures apply to the standard gear range only.
To convert Circumferential Backlash to Angular Backlash see page T4-15

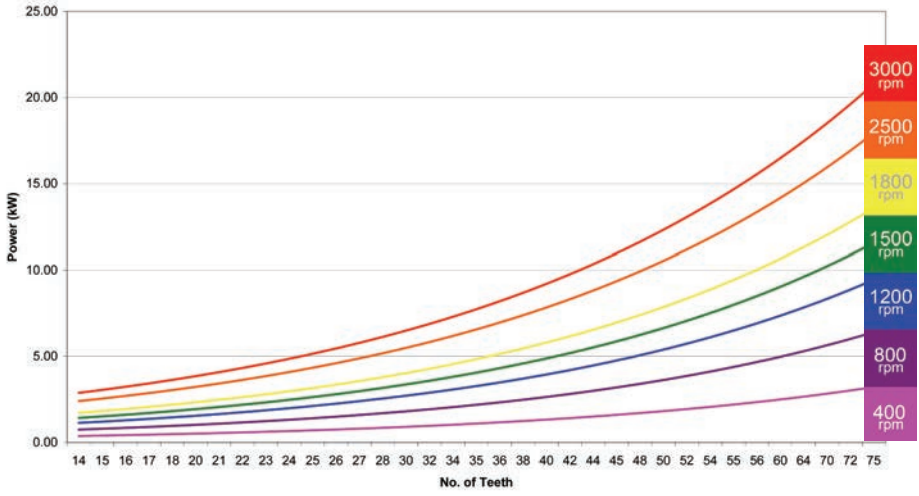
TYPICAL GROUND GEARS ALLOWABLE TRANSMISSIEN CAPACITY



Module 0.8



Module 1.0



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WORMS AND WHEELS FORMULAE

Ratio (R) $= \dfrac{\text{No. of teeth on wormwheel (T)}}{\text{No. of starts on worm (t)}}$

Centre Distance (Cd) $= \dfrac{\text{PCD worm}}{2} + \dfrac{\text{PCD wheel}}{2}$

Lead (L) = The axial distance by which a thread advances in one revolution $= \pi \times t \times m$

Where $m_{(metric)}$ = Axial module

$m_{(imperial)} = \dfrac{1}{DP}$

Actual outside diameter of worm $od_w = PCD + (2 \times m)$

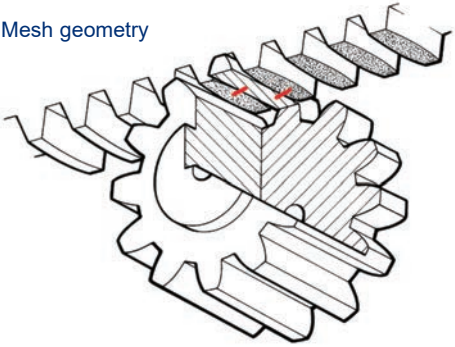
Typical outside diameter of wormwheel $od_{ww} = PCD + (3 \times m)$

RACK MANUFACTURE

Reliance standard precision racks are produced by a thread grinding process, which generates teeth of helicoidal form. This provides two distinct advantages: very good pitch accuracy and sufficient tolerance of meshing conditions (within 0.25º) to make high precision alignment of the pinion unnecessary.

This feature will be appreciated from the diagram below. Slight misalignment of the straight-tooth pinion, in terms of deviation from a true right-angle between the axis and rack in either plane, results merely in a change of position of the contact points across the face.

Mesh geometry



Points of contact.
Standard pressure angle is 20º.
25º pressure angle available on request.

RACK STANDARDS AND TOLERANCES

Reliance precision racks are offered in four basic grades of accuracy through most of the range, please see the individual product pages for details. Grade 4b has been introduced to offer a lower cost grade 4 where a single rack is to be used in a non-butting application.
The tooth form is generally in accordance with BS 4582 part 1. fig 1. for metric racks.

Rack Grade	5	4	4b	3	2	1
Max pitch error between any two points per 300 mm of rack	0.005	0.008	0.008	0.015	0.025	0.050
Max end to end pitch error up to 300 mm of track*	±0.004	±0.004	±0.008	±0.008	±0.013	±0.025
Adjacent tooth error	0.0025	0.0025	0.0025	0.005	0.010	0.013
Pitch height variation	+0 -0.013	+0 -0.013	+0 -0.013	+0 -0.013	+0 -0.018	+0 -0.025

* Applies pro rata to length >300 mm

All dimensions in mm

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ENGINEERING DATA

1. Linear Speed

Linear speeds of up to 10 m/s can be achieved with correctly installed rack and pinion systems. When specifying a system, care needs to be taken to ensure that the transducer count rates are not exceeded. With grease lubrication, care should be taken to ensure that the lubrication is not thrown off the pinion

2. Load Capacity

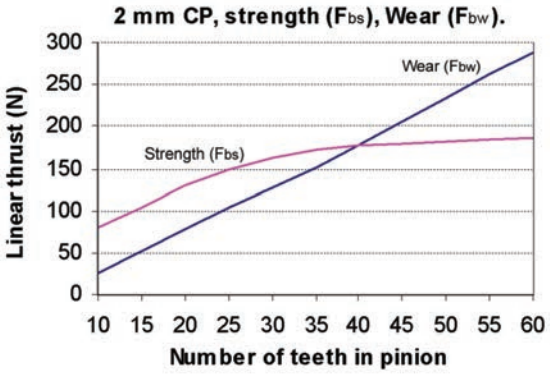
The following analysis is intended to give a guide to the load capacity of a rack system. To simplify the calculation a number of assumptions have to be made. In many applications this will give a conservative estimate of the gear capacity, therefore in critical applications an exact analysis must be completed. Please consult the relevant gear standards or Reliance Technical Sales.
The basic load capacity (F_b) of a rack and pinion is defined as the maximum linear force at which they can operate indefinitely.
F_b has two values: one calculated from tooth strength (F_{bs}) and one for tooth flank wear (F_{bw}). The useful or transmitted load capacity, F_t, is usually less than F_b due to transient or dynamic loads generated within the mechanism.

For tooth root strength $F_{ts} = F_{bs}/K_a$

For tooth flank pitting (wear) $F_{tw} = F_{bw}/C_a$

K_a&C_a = application factors

Both calculations should be made and the lower value used.
The application factors K_a and C_a make allowance for any externally applied loads in excess of the nominal linear force F_b. These are most accurately determined by direct measurement. In determining application factors, consideration should be given to the fact that many prime movers develop momentary peak torques appreciably greater than those determined by the nominal ratings of either the prime mover or the driven equipment.
There are many possible sources of overload which should be considered, including system vibrations, acceleration torques, overspeeds, variations in system operation and changes in process load conditions. Impact loads due to reversing across backlash can be significant in servo systems. As a general guide application factors for a motor gear system range from 1.0 for uniform loads up to 1.75 where heavy shock loads are anticipated.



The previous graph has been calculated in accordance with AGMA 2001-B88 for a life of at least 10^8 load cycles, and a rack hardness exceeding 50 HRc and pinion material 17-4PH. For alternative pitches and materials the graph values need to be modified as shown in the table below:

Pitch and Rack/Pinion Material Modification Factors				
Rack	**Pinion**	**Pitch (mm)**	**Strength**	**Wear**
Hardened Round Rack (hardness>50 HRc)	17-4PH	1	0.50	0.50
	316	1	0.23	0.10
	PEEK polymer	1	0.04	0.01
Rectangular Rack (hardness 35-45 HRc)	17-4PH	1	0.38	0.28
		2	0.75	0.56
		2.5	0.94	0.70
	316	1	0.23	0.10
		2	0.47	0.20
		2.5	0.59	0.25
	PEEK polymer	1	0.04	0.01
Tubular and Round Rack	17-4PH	1	0.23	0.10
	316	1	0.23	0.10
	PEEK polymer	1	0.04	0.01

Example:
A 40 tooth, 1 mm CP pinion material 316 meshing with rack of hardness <50 HRc.
The application factors should be applied after the reduction for material and pitch.

$$F_{bw} = 175 \times 0.10 = 17.5 \text{ N}$$
$$F_{bs} = 170 \times 0.23 = 39.1 \text{ N}$$

3. Bearing Capacity

When linear bearings are used with the hardened round bar racks the capacity of the support bearings needs to be considered. Where possible the bearings should be positioned with all the ball rows running on the rack shaft. However, it is important that the balls do not run on the edges of the teeth. If necessary the 5 and 6 row bearings can be used with 1 row above the teeth. In this scenario, the manufacturer's ratings apply with a modification for the direction of the load application. The factors given in the following charts should be substituted for the bearing manufacturer's load reduction.

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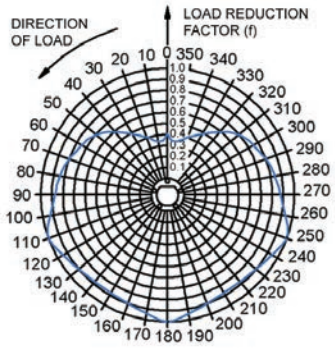
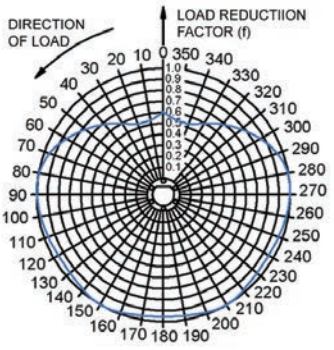
Closed bearing 5 rows of balls



Closed bearing 6 rows of balls



4. Lubrication

Lubrication is not required when using PEEK polymer pinions. For other combinations unlubricated systems are not recommended. Measurement applications should use a very thin coat of light oil, in many machine tool applications stray cutting oil is sufficient. Grease lubrication is recommended for higher loads, but care should be taken to ensure the lubrication is not thrown off the pinion at speed.

INSTALLATION

The installation techniques differ according to the type of rack. All racks should be mounted with teeth pointing downwards wherever possible so that dust etc cannot settle in them.

1. Soft Round and Tubular Rack

Plastic moulded bearings are recommended for use with soft round and tubular racks, these can be found in the Bearings and Spacers section of the Reliance catalogue. Round racks are not recommended for multi-section use.

2. Hardened Round Rack

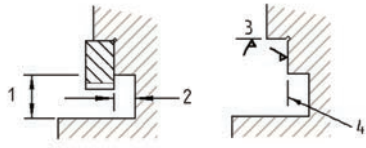
Bearings for the round bar rack should be fitted in accordance with the manufacturer's instructions. It is important that the balls do not run on the edge of the teeth. Round racks are not recommended for multi-section use.

3. Rectangular Rack

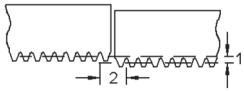
Reliance rectangular section rack is manufactured to enable butting to form infinite lengths. Socket head cap screws, plain washers and a thread locking adhesive are preferred for mounting. Dowels are not recommended. The pitch line of the rack in its constrained position must be straight to obtain maximum accuracy. To avoid distortion, racks should be screwed to a machined flat surface.

Machining requirements for rack location

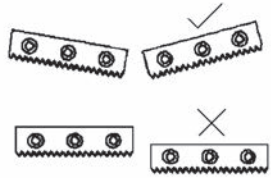
1. Pinion clearance
2. Clearance required if:
   a) anti-backlash pinions are used
   b) full face of rack is to be used
3. Abutment
4. Mounting face



To align racks, two adjustments need to be made, pitch line alignment and pitch adjustment. The pitch line straightness is not critical (see drawing below) but steps at the joints should be avoided as they can lead to excessive noise and wear.



1. Pitch line alignment
2. Pitch adjustment and error compensation



Pitch Line Alignment

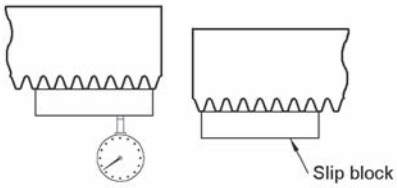
There are three methods of setting the pitch line at a joint. These are:

i) Setting the base of the racks against an abutment perpendicular to the mounting face. The misalignment is then governed by the rack pitch line to base tolerance.

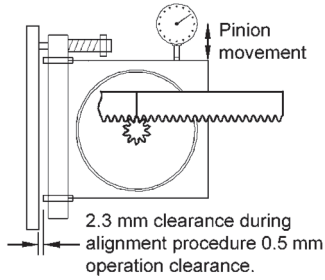
ii) Using the tops of the rack teeth as a reference. These are parallel to the pitch line within 0.008 mm. Use a short straight edge (eg. slip block) as shown below.

iii) The best measurement of the pitch line is with the pinion installed on a flexplate. A dial indicator fitted as shown gives a direct reading of the pitch line straightness.

Pitch line alignment using slip block



Dial indicator carried with flexplate



The flexplate spring loads the pinion into mesh on both flanks of the teeth, ensuring complete backlash elimination.

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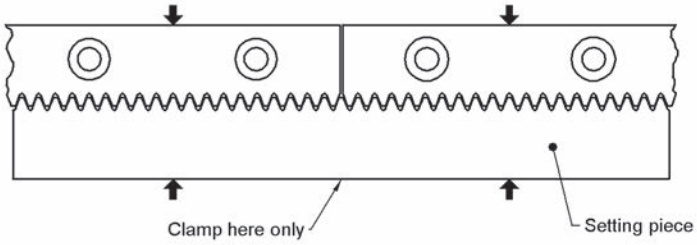
Pitch Adjustment and Error Correction

Pitch accuracy can be obtained by one of three methods depending upon accuracy required.

GRADE 1 (and for the initial setting of all grades)
For pitch accuracy across the joint of ±0.020 mm the Rack Setting Piece is the simplest method.



GRADE 2, 3 or 4
After initial setting and with the measuring system functioning, length bars may be used as references. Checks made against these allow adjustment to be made within the system resolution.

GRADE 3, 4 or 5
After initial setting and with the measuring system functioning, comparison should be made with a laser measuring system. This allows pitch adjustment and machine error compensation within the system resolution over the full travel of the axis.

RACK APPLICATIONS

Reliance precision racks are manufactured in both round and rectangular sections, and can be used for both measurement and actuation. In general the smaller pitches (1mm) are ideal for measurement, as the smaller pinion diameter gives higher linear resolutions.
The larger pitches (2 mm and 2.5 mm) allow a higher load capacity.

For most applications the rack can be used for both the feedback and the actuation. In very precise applications we recommend that an unused section of the actuation rack is used for feedback. Alternatively a separate rack can be used.

All Reliance racks are calibrated to measure correct at 20ºC using a temperature compensated laser. Calibration graphs can be supplied if required.

RACK ACTUATOR

Information about the Racktuator™ is provided on page T2-9.

Leadscrew and Nut Assemblies

FEATURES

Reliance's precision leadscrew assemblies are designed specifically for motion control applications where accuracy must be maintained. Rather than being adaptations of general purpose screws or nuts they have a precision rolled screw thread which has been designed for maximum life and quiet operation.

A further enhancement available on stainless steel leadscrews up to 2.4 metres long is a specially formulated TFE coating which can extend normal nut life by up to 300%.

Innovative anti-backlash nut designs provide assemblies which are wear compensating with low frictional drag torques and excellent positional repeatability.

Reliance stainless steel leadscrews offer the following:

1. High Accuracy
Precision thread rolling process provides a standard lead accuracy of 0.0006 mm/mm. Higher accuracies up to 0.0001 mm/mm can be provided.
The unloaded repeatability of anti-backlash assemblies is within 0.0013 mm.

2. Long Life
More than 7.5 million metres of travel can be expected.

3. Low Drag Torque
An anti-backlash nut design which does not require high spring forces to maintain bi-directional anti-backlash characteristics gives very low nut to screw friction.

4. Low Maintenance
Self lubricating and wear compensating nuts eliminate the need for repeated lubrication or adjustment.

5. Wide Range
Diameters from 3.2 mm to 24 mm.
Leads from 0.30 mm to 92 mm.
Lengths up to 4 metre.

6. Custom Thread Design
Unique thread form designed specifically for leadscrews in anti-backlash applications.

7. Smooth Quiet Operation
No recirculating ball noise or metal to metal contact.

8. Lower Cost
Less than comparable ball screws or ground leadscrews, while still providing high accuracy and long life.

9. Modifications
Special leadscrew ends and other leads are available on the stainless steel leadscrew range in selected sizes. Please contact Reliance Technical Sales or refer to the leadscrews modification section of this brochure.

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ENGINEERING DATA

1. Lead

The lead of the screw is the amount of linear movement of the nut for one revolution of the leadscrew.

2. Drive Torque

The required motor torque to drive a leadscrew assembly is the sum of three components: inertial torque, static friction torque and torque to move the load. Additional torque associated with driving and supporting the leadscrew must also be considered.

Inertial torque: $T = I\alpha$

I = Inertia of leadscrew (kgm^2)
α = Angular acceleration ($rads/s^2$)

Static friction torque: Anti-backlash leadscrews are typically supplied with a static frictional torque of 0.007 - 0.05 Nm. Higher pre-load forces lead to higher frictional drag torques but better anti-backlash characteristics.

Torque to move load: The torque to move a certain load is a function of the lead and efficiency of the leadscrew assembly.

$$\text{Torque} = \frac{\text{Load} \times \text{Lead}}{2\pi \times \text{Efficiency}}$$

Torque = Newton metres
Load = Newtons
Lead = Metres

(Note - efficiency of 70% would require 0.7 in these equations)

4. Backdriving

In general when the screw pitch is less than 1/3 its diameter and the screw is uncoated, backdriving will not occur. (Coated screws require to be 1/4 diameter). For higher leads where backdriving is likely, the torque required for holding a load is as follows:

$$\text{Backdrive torque} = \frac{\text{Load} \times \text{Lead} \times \text{Efficiency}}{2\pi}$$

Torque = Newton metres
Load = Newtons
Lead = Metres

Small vibrations in the system may break the static friction initiating backdriving, therefore, for small critical applications use smaller lead or an external locking device.

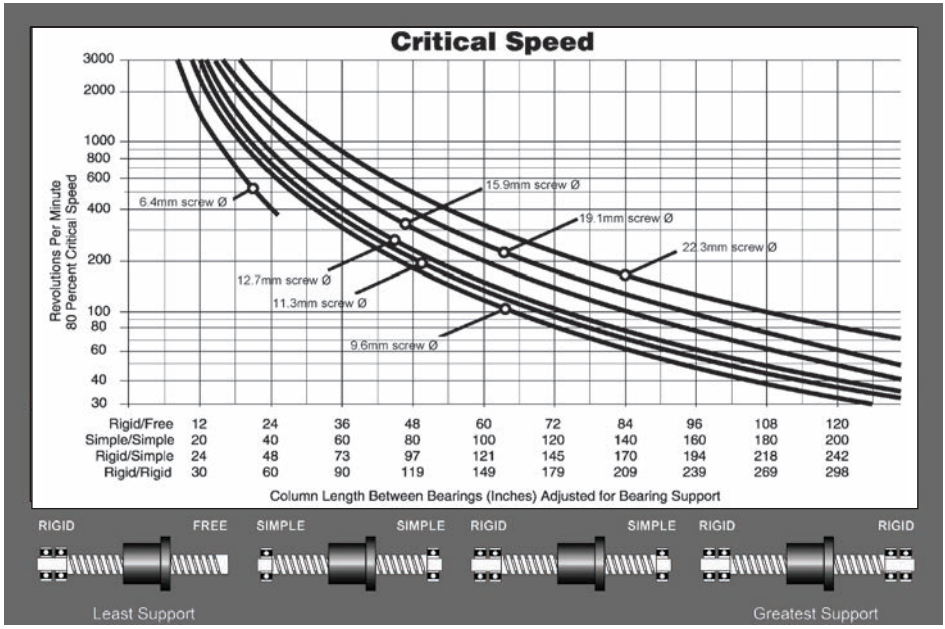
5. Traverse Speed

The polyacetal nut materials provide long wear-life over a wide variety of conditions, but very high loads and/or high speeds will accelerate nut wear. We recommend the following maximum linear traversing speeds for optimum life:

Lead	Maximum traverse speed
2.5 mm - 12 mm	100 mm/sec
12 mm - 25 mm	250 mm/sec
25 mm - 60 mm	760 mm/sec

6. Critical Speed

This is the rotational speed at which a leadscrew will experience vibration or other dynamic problems. See the critical speed chart below to determine if the application parameters result in speeds approaching critical.
To minimise critical speed problems use a longer lead, choose a larger diameter screw or increase the bearing mount support.



7. Maximum Load

Although the leadscrew assemblies are able to withstand relatively high loads without catastrophic failure, these units have been designed to operate with the loads shown on the product pages.

8. Efficiency

The efficiency of a leadscrew varies with the lead angle of the screw. The theoretical maximum efficiencies of all our leadscrews are given in the part number tables on the product pages. These have been calculated using the static coefficient of friction 0.08. For applications where the dynamic efficiency is critical please contact Reliance Technical Sales.

9. Leadscrew Inertia

Values of leadscrew inertia are given in the Typical Mechanical Properties chart on the next page.

10. Screw Straightness

Typical screw straightness is 0.25 mm/metre.

11. Leadscrew Interfacing

Examples of machined end options can be found on pages 7-27 to 7-35.

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Physical Properties

Leadscrew		Nuts		Assembly	
Material	**Surface Finish**	**Material**	**Tensile Strength**	**Operating Temp. Range**	**Coefficient of Friction Nut to Screw**
Stainless steel 303 series	Better than 0.4 µm	Polyacetal with lubricating additive	67 N/mm² 9,700 psi	0 - 93°C	Static = 0.08 0.08# Dynamic = 0.15 0.09# # - with TFE coating

Typical Mechanical Properties

Leadscrew Series	Static Frictional Drag Torque (Nm)	Screw Inertia kg m²/m	Anti-backlash Life +	
			Plain Screw	TFE Coated Screw
LPX6	Free wheeling	8.340×10^{-7}	N/A Typical Backlash 0.076-0.25 mm	N/A Typical Backlash 0.076-0.25 mm
LPX10		4.170×10^{-6}		
LPX11		9.730×10^{-6}		
LPX13		1.446×10^{-5}		
LPX16		3.948×10^{-5}		
LPX19		8.479×10^{-5}		
LPX22		1.612×10^{-4}		
LPX24		2.030×10^{-4}		
LNTG6	0.004-0.01	8.340×10^{-7}	0.12 - 0.25 million metres	0.38 - 1.0 million metres
LNTG8	0.01-0.02	1.390×10^{-6}		
LNTG10	0.01-0.02	4.170×10^{-6}		
LAB6	0.004-0.01	8.340×10^{-7}	0.12 - 0.25 million metres	0.38 - 1.0 million metres
LAB10	0.01-0.02	4.170×10^{-6}		
LAB11	0.015-0.03	9.730×10^{-6}		
LAB13	0.015-0.03	1.446×10^{-5}		
LAB16	0.02-0.05	3.948×10^{-5}		
LAB19	0.03-0.063	8.479×10^{-5}		
LAB22	0.03-0.063	1.612×10^{-4}		
LAB24	0.03-0.063	2.030×10^{-4}		
LAF6	0.004-0.02	8.340×10^{-7}	1.0 - 1.5 million metres	3.8 - 5.0 million metres
LAF8	0.01-0.03	1.390×10^{-6}		
LAF10	0.01-0.03	4.170×10^{-6}		
LAF11	0.015-0.04	9.730×10^{-6}		
LAF13	0.02-0.05	1.446×10^{-5}		
LAF16	0.03-0.055	3.948×10^{-5}		
LAK8	0.01-0.02	1.390×10^{-6}	2.0 - 2.5 million metres	4.5 - 5.8 million metres
LAK10	0.01-0.02	4.170×10^{-6}		
LWD6	0.03 max	8.340×10^{-7}	2.5 - 3.15 million metres	5.0 - 6.35 million metres
LWD8	0.04 max	1.390×10^{-6}		
LWD10	0.04 max	4.170×10^{-6}		
LWD11	0.06 max	9.730×10^{-6}		
LWD13	0.06 max	1.446×10^{-5}		

Typical Mechanical Properties (continued)				
Leadscrew Series	Static Frictional Drag Torque (Nm)	Screw Inertia Kg m^2/m	Anti-backlash Life +	
			Plain Screw	TFE Coated Screw
LNTB6	0.004-0.01	$8.340x10^{-7}$	2.5 - 3.15 million metres	5.0 - 6.35 million metres
LNTB8	0.01-0.02	$1.390x10^{-6}$		
LNTB10	0.01-0.02	$4.170x10^{-6}$		
LNTB11	0.01-0.02	$9.730x10^{-6}$		
LNTB13	0.015-0.04	$1.446x10^{-5}$		
LNTB16	0.015-0.04	$3.948x10^{-5}$		
LNTB19	0.02-0.05	$8.479x10^{-5}$		
LNTB22	0.03-0.06	$1.612x10^{-4}$		
LNTB24	0.03-0.06	$2.030x10^{-4}$		
LCM6	0.03	$8.340x10^{-7}$	1.0 - 1.5 million metres	3.8 - 5.0 million metres
LCM8	0.04	$1.390x10^{-6}$		
LCM10	0.04	$4.170x10^{-6}$		
LAX13	0.015-0.04	$1.446x10^{-5}$	5.0 - 5.7 million metres	7.6 - 8.8 million metres
LAX16	0.015-0.04	$3.948x10^{-5}$		

+ Life will vary with loading, operating environment and duty cycle. Longer screw leads generally give longer life.

TFE COATED LEADSCREW ASSEMBLIES

The TFE coating is designed to supply a more even distribution of lubricant than is normally achieved when using standard self lubricating plastics on steel. The entire screw surface is coated which gives an extremely even lubrication distribution and an expected increase in normal nut life of up to 300%. Lubrication to the screw/nut interface occurs by the nut picking up TFE particles from the coating as well as from migration of the internal lubricant from within the plastic nut.

Although care should be taken to ensure that chips and voids do not occur in the coating, small voids have been shown to have little effect on the system performance. The lubricant, although solid, has some of the “spreading” ability of fluid lubricants. When machining for bearing ends, soft fixtures are recommended.

TFE coated screws provide the maximum level of self-lubrication and should not be additionally lubricated or used in environments where oils or other lubricant contamination is possible.

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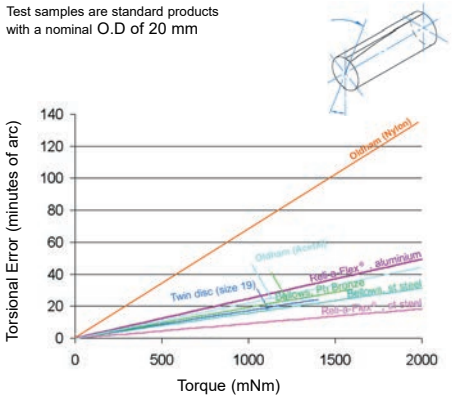
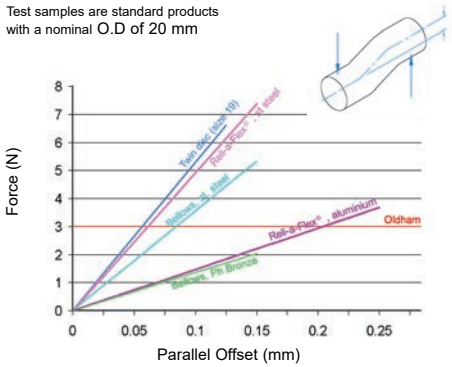
TORSIONAL STIFFNESS

This is the characteristic that describes the angular deflection when a torque is applied. High torsional stiffness contributes to increased accuracy and system response. It is essential for accurate feedback applications.
Applications that are subject to shock loads may require a less stiff coupling to reduce the peak torques and avoid premature failure or slipping clamps.



RADIAL COMPLIANCE

This is the characteristic that describes the force the coupling applies on the support bearings when the shafts are misaligned. High radial compliance is essential to provide low bearing loads.



TORQUE CAPACITY

In general, the rated torque figures are based on $>10^6$ torque reversals and the peak torque should not be applied for more than 1% of the duty cycle.

SHAFT MISALIGNMENT

The most common type of misalignment is a combination of angular, parallel and axial misalignment and occurs due to the build-up of tolerances as associated parts are assembled together. As these accumulate randomly, worst-case misalignment should be calculated and used to select the correct coupling to avoid premature failure.

Angular

Parallel

Axial

Combined

TRANSMISSION ERROR

Often referred to as kinematic error, this is the total error in the driven shaft position with regardto the driving shaft position. In a system the following factors must be individually considered to determine their overall effect.

a. Backlash ..... internal clearance related
b. Torsional wind up ..... torsional stiffness related
c. Velocity error ..... coupling design related

a. Backlash

Is the amount of free rotational movement inherent in the coupling under zero or near zero torsional loads. Only the Oldham coupling type in this catalogue is susceptible to slight backlash.

b. Torsional Wind Up

In applications where the resistance is frictional, the driven shaft will experience a position lag, which will double with direction reversal, proportional to the torsional stiffness.

During operating mode, the inertia and the torque will cause a momentary lag but this will not be seen at standstill.

c. Velocity Error

In general, couplings with double flexing elements (Reli-a-Flex®, Bellows and Twin disc couplings) will introduce negligible velocity errors.

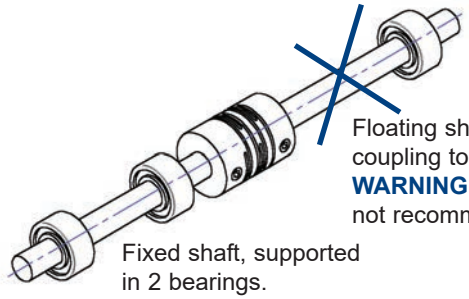
Velocity errors occur with angular misalignment and are proportional to shaft angle.
Only the Oldham coupling type in this catalogue is susceptible to this error.

LUBRICATION

This is not required on any of the couplings in this catalogue.

FLOATING SHAFTS

We do not recommend the use of couplings in this catalogue for floating shafts, where one or both ends of a shaft are supported by a coupling.



Floating shaft, relies on the coupling to support one end.
WARNING: This arrangement is not recommended.

Fixed shaft, supported in 2 bearings.

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TORSIONAL RESONANCE

The torsional natural frequencies of a system are dependent on the mass/elastic characteristics of the various inertias and connecting shafts. Torsional resonance can occur under certain conditions when the natural frequency of the system is close to the excitation frequency of the driving system. It is most likely to occur when the load is predominantly inertial and can occur in closed loop position or velocity control systems, leading to torsional vibrations which in severe circumstances can destroy the coupling.

Choosing a coupling that operates well above or well below the operating frequencies can help to avoid premature failure.

The resonant frequency of a system can be calculated from the following:

$$F_R = 1/2\pi \times \sqrt{(1/J_M + 1/J_L) \times 10.8/\pi \times C_T}$$

where
F_R = Resonant frequency (Hz)
J_M = Motor inertia (Kgm^2)
J_L = Load inertia (Kgm^2)
C_T = Coupling torsional stiffness (mNm/min)

RELI-A-FLEX® INSTALLATION

Couplings are available with either clamp or set screw mounting. Clamp fastening, both Reli-a-Grip™ and traditional, allows repeated repositioning of the coupling on the shaft leaving the shaft unmarked. The effectiveness of the clamp is dependent on the diameter being a 'close' fit in the coupling bore. Use of Reliance components will ensure that the clamp works correctly.

Set screws provide an effective but non-adjustable means of connecting couplings and shafts. Ideally the shafts should have a small flat in the area of the screw, which allows the set screw to seat below the surface of the shaft.

OLDHAM COUPLING, SOLID COUPLING AND COLLAR INSTALLATION

Oldham Couplings

Ensure that the misalignment between shafts is within the coupling's ratings. Slide a hub onto each shaft to be joined with the drive tenons facing each other. Rotate the hubs on the shaft so the drive tenons are located 90° from each other. Place a torque disc so one groove fits over the drive tenons of a hub and centre the disc by hand.

Insert a shim with the thickness of the coupling's axial motion rating into the groove of the torque disc. Slide the tenons of the second hub into the mating groove in the disc until it touches the shim stock.

Fully tighten the screw(s) on each hub to their recommended seating torque. Remove the shim stock to leave a small gap between the top of the drive tenons and the torque disc to allow for axial movement.

Solid Couplings

Align the coupling on the two shafts to be connected. Tighten the Nypatch® clamp screws in two stages. Starting with the inside screws, tighten to half of the recommended seating torque. Repeat for the outside screws, again tightening to half of the recommended seating torque (on two-piece collars be sure to maintain the gap between the two halves of the coupling during installation). Tighten screws to the full recommended seating torque following the same pattern, beginning with the inside screws.

Collars

Use collars as they are received.

Wipe the bore clean and apply a thin coat of light oil to the shaft. Place collar in desired location on shaft and tighten the collar until a slight resistance is felt (on two-piece collars be sure to maintain the gap between the two halves of the collar during installation). Bring collar into final position and tighten screws to the full recommended seating torque.

FEATURES

The Reliance range of precision slides includes both ball and crossed roller units. Load capacities from 1.5 to 12580 N are available. Ballslides are available in both stainless steel and aluminium. Crossed roller slides are available in aluminium only.
These units offer the designer:

- Pre-assembled units allowing quick and simple assembly.
- Factory set preload to prevent side play and backlash and to control friction.
- Low particle production for use in clean/medical environments.
- Low inertia and light weight allowing low powered rapid traverse.
- High straight line accuracy of 0.0001 mm per mm travel.

1. Ballslides

Manufactured from aluminium, these slide units offer ultra low friction, high load capacity and long life. The base and slide are ready machined for mounting. Modifications may be made to suit special requirements. Complete special slides can also be supplied. Please contact us.

2. Crossed Roller Slides

When compared to ballslides these units offer equal size but higher load capacity and accuracy. They are also able to operate with high cycling rates and higher shock or cantilevered loads.

3. Rack Driven Ball Slides

The addition of a small high precision rack along the side of a ballslide offers the option either to drive, measure position, or both, at very high speeds and loads.

ENGINEERING DATA

For the highest accuracy, the load should be centred over the table or bed, allowing enough additional length to avoid reaching the maximum stroke length. To achieve the expected accuracy and life, the mating surfaces used to mount the slide should be flat. In extreme circumstances ‘potting’ of the base may be required.

Please refer to the product dimensions when selecting the fixings to avoid contact between screws and moving slide sections.

1. Vertical Applications

When using ball or crossed roller type slides in vertical applications, the position and manner of the load, and the effects of gravity should be given extra consideration. Limiting the travel with positive stops also extends life instead of relying on the ball or roller retainer to act as a stop.

2. Service Life

The theoretical service life of a slide based on L_{10} life is as follows:

Ballslides	Crossed roller slides
$L_{10} = (C/P)^3 \times 50x10^3$	$L_{10} = (C/P)^{10/3} \times 50x10^3$

Where :
L_{10} = Life at 90% reliability (m)
C = Dynamic load rating (N)
P = Calculated load (N)

3. Lubrication

All types of slides can use similar lubricants but require them under different conditions.

Recommended Lubricants	General Application
	High quality turbine oil
	Lithium soap based grease (NLGI No. 2)
	Clean Environments
	Kluber Isoflex Topas NCA 52

4. Temperature Limits

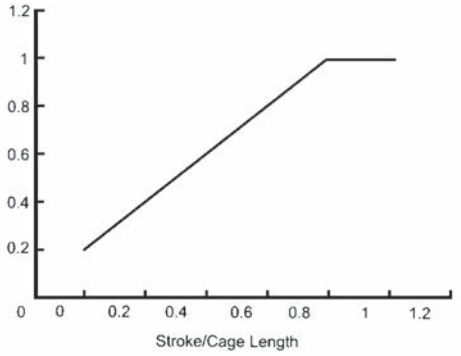
The maximum temperature is limited to 65ºC (150ºF) by the rolling element retainers. High temperature retainers can be supplied to operate up to 100ºC (212ºF) and although the slides can operate at higher temperatures this will reduce their life. Please contact us for further details.

MINIATURE STROKE SLIDES

1. Rating Life Calculation and Short Stroke Factor Diagram

$$L = K_{st} \left(\frac{C_{100B}}{P}\right)^3 \cdot 10^5$$

$$L_h = \frac{L}{2 \cdot s \cdot n \cdot 60} = K_{st} \frac{L}{v_m} \cdot \left(\frac{C_{100B}}{P}\right)^3$$



2. Rating Life L

The rating life of the RST miniature stroke slide series can be calculated by using the formulae above, in accordance with ISO 14728-1.

3. Lubrication

The lubrication of the RST miniature stroke slide series can be fullfilled by directly adding the lubricant onto the raceway of the rail.

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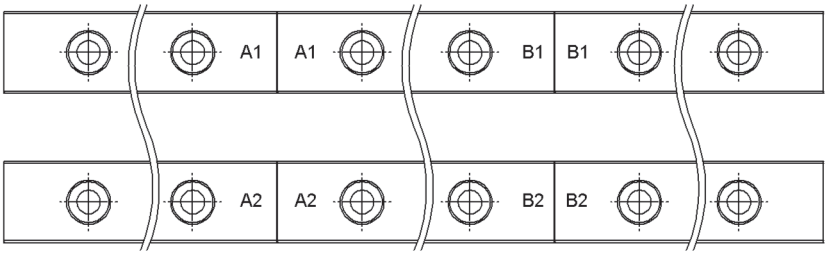
MINIATURE LINEAR GUIDES

1. Rail Butt-Jointing

When a longer rail is required than the maximum standard length available, two or more rails can be butt-jointed to create the desired length. When ordering add a -J to the end of the part number.

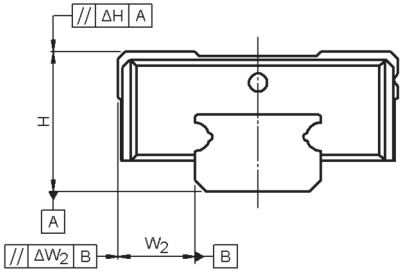
To ensure that the rails are mounted in an accurate and consistent manner they will be marked up as a matching pair when manufactured. The marking system for a rail that has has been ordered as a -J to be butt-jointed is shown below, where matching pairs have the same marking.



2. Accuracy

Miniature Linear Guides are available in three accuracy grades P, H and N.

Accuracy classes (µm)		Precision **P**	High **H**	Normal **N**
Tolerance of dimension height H	H	± 10	± 20	± 40
Variation of height for different runner block on the same position of rail	△H	7	15	25
Tolerance of dimension width W	W_2	± 15	± 25	± 40
Variation of width for different runner block on the same position of rail	△W_2	10	20	30



3. Speed

For the SS/ZZ variant:

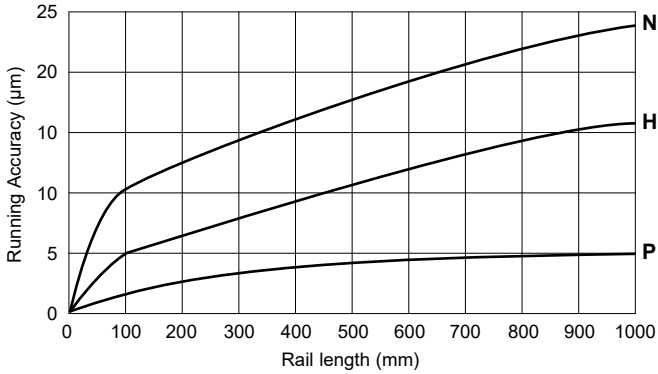
Maximum speed: Vmax = 3 m/s

Maximum acceleration: amax = 250 m/s2 (If preload V0, maximum acceleration is 40 m/s2)

For the EE/EU/UZ variant:

Maximum speed: Vmax = >5 m/s

Maximum acceleration: amax = 300 m/s2 (If preload V0, maximum acceleration is 60 m/s2)



4. Pre-load

Miniature Linear Guides are available in three different grades of pre-load V0, VS and V1. The amount of pre-load can enhance stiffness, precision and torsional resistance but affects life and friction.

Pre-load Type	Model Code	Clearance (µm)						Application
		3	5	7	9	12	15	
Clearance	V0	+3 to 0	+3 to 0	+4 to 0	+4 to 0	+5 to 0	+6 to 0	Very smooth
Standard	VS	+1 to 0	+1 to 0	+2 to 0	+2 to 0	+2 to 0	+3 to 0	Smooth Precision
Light Pre-load	V1	0 to -0.5	0 to -1	0 to -3	0 to -4	0 to -5	0 to -6	High rigidity Minimal vibration High precision Load balance

5. Operating Temperature

Miniature Linear Guides can operate in temperatures ranging from -40°C to +80°C. Temperatures of 100°C can be reached for short term operation.

INTRODUCTION

Timing belts are endless toothed belt systems available in 2.5 mm and 5 mm pitch; intended for applications requiring a level of power transmission.

ENGINEERING DATA

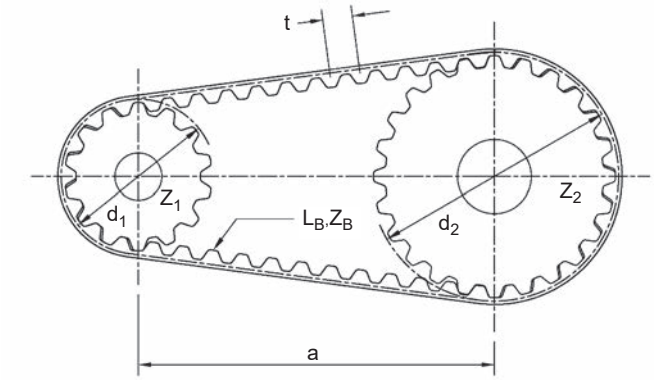
1. Belt and Chain Length

Knowing the centre distance, the belt length can be calculated from the following:

For ratios = 1:1 $$L_B = Z_1 \times t + 2a$$ [mm]

For ratios ≠ 1:1 (approximate formula) $$L_B \approx \frac{t}{2}(Z_2 + Z_1) + 2a + \frac{1}{4a}\left[\frac{(Z_2 - Z)\,t}{\pi}\right]^2$$ [mm]

a	=	Centre distance			
L_B	=	Belt length	t	=	Belt pitch
d_1	=	Pitch diameter small pulley	d_2	=	Pitch circle diameter large pulley
Z_1	=	No of teeth, small pulley	Z_2	=	No of teeth, large pulley
Z_B	=	No of teeth in belt	Z_e	=	No of teeth in mesh



2. Centre Distance Calculation

Knowing the belt length, the centre distance can be calculated from the following;

For ratios = 1:1

$$a = \frac{(Z_B - Z_1)t}{2} \quad [mm]$$

For ratios ≠ 1:1

(approximate formula)

$$a \approx \frac{L_B - \frac{\pi}{2} \times (d_2 + d_1)}{4} + \sqrt{\left(\frac{L_B - \frac{\pi}{2} \times (d_2 + d_1)}{4} \right)^2 - \frac{(d_2 - d_1)^2}{8}} \quad [mm]$$

$$d_1 = \frac{Z_1 \times t}{\pi} \quad [mm] \qquad d_2 = \frac{Z_2 \times t}{\pi} \quad [mm]$$

3. Design Guidelines

Timing belt efficiency ranges from 95 to 98%, better than flat vee belts which rely on friction to transmit power. The 2.5 mm and 5 mm pitch timing belts are manufactured in wear resistant polyurethane with high grade steel wire tension members, therefore any elongation due to load and pre-tension will follow Hookes' law. The manufacturing process for these timing belts produces the 'classical' trapeziodal tooth form to close tolerances. This ensures an even distribution of load during use and the transmission of high torques. These belts are suitable for indexing, positioning and conveying drives.

It is possible to design drives with fixed centres but generally the drive centres should be adjustable or have idler pulleys. This is particularly important in multi-shaft or high power drives. The idler pulleys should be fitted to the slack side of the drive and must not be spring loaded. Timing belt drives do not require as much tension as other belt drives which depend on friction to transmit load. The belt should be installed with a snug fit, neither taut nor loose. As a general guide the correct level of tension can be determined by measuring the force necessary to deflect the belt an amount equal to 1/64th of the span centres "a". Values for the measuring force recorded on a spring balance applied mid-span should be within 20% of the values shown below.

2.5 mm - 0.07kg 5 mm - 0.30kg

The belts must be rigidly mounted. Variation in centre distance can lead to premature wear. The belt and pulley system must be assembled loose to prevent over stretching. The belts are guided on the pulleys by flanges. One pulley should be flanged on both sides, or two alternative flanges provided, one on each pulley. For drives with vertical shafts, both pulleys should be flanged on both sides.

For a belt to transmit full power, a minimum of 6 teeth must be in mesh on each pulley.
The number of teeth in mesh can be determined from the following formula:

$$Ze = \frac{Z_1}{180} * \text{arc cos} \quad \frac{(Z_2 - Z_1) \times t}{2 \pi a}$$

Number of teeth in mesh calculation is always based on the smallest pulley.

To minimise belt fatigue, pulleys with a minimum of 20 teeth are recommended. As a general guide larger pulleys reduce the amount of belt flexing and therefore improve belt life.

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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 next page, it is first necessary to calculate the forces at the gear mesh.

The tangential force at the gear mesh can be calculated from the following equation:

$W_t = T/r$ where T = Torque and r = Radius

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

$W_r' = W_t \tan\phi_t$ where ϕ_t = transverse pressure angle = normal pressure angle for spur gears = 20º for our standard gears

$W_r' = 0.364W_t$ (for 20º pressure angle spur gear)

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

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

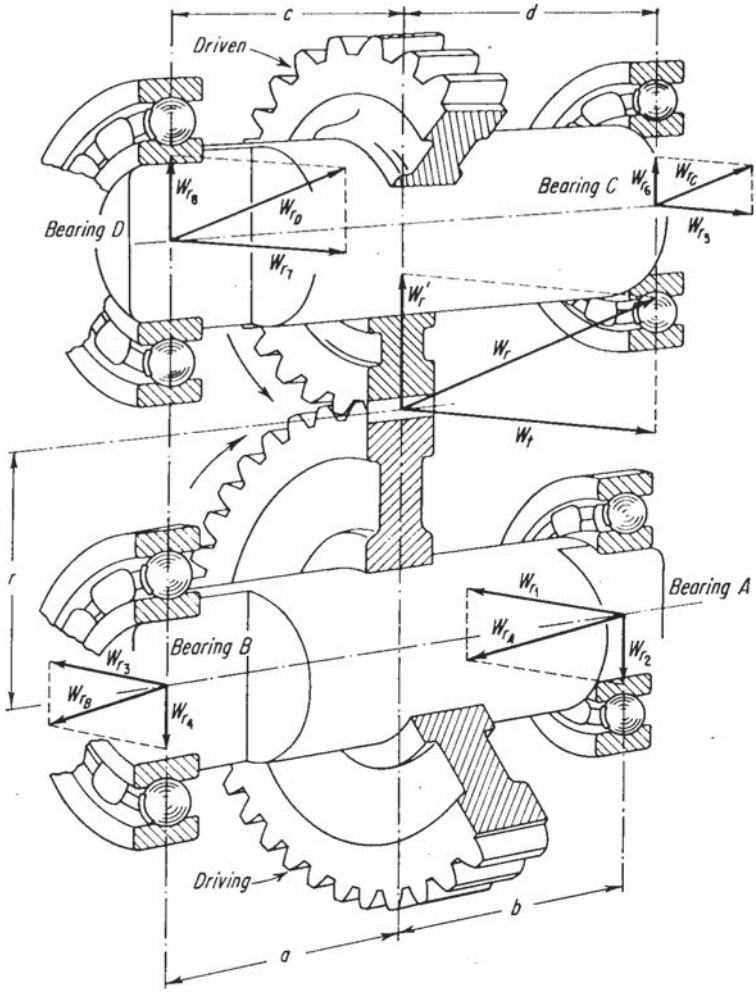
Bearing loads

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 T12-3.

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

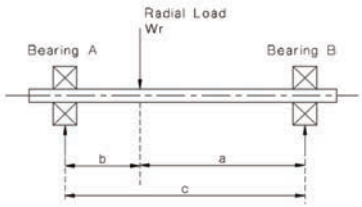


FORCE SHARING

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

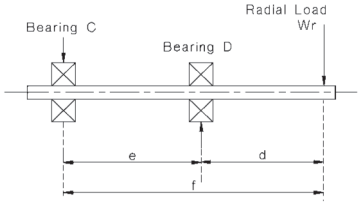
Loads are in constant units



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

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

2. Overhung Radial Load



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

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

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.

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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	5.974	0.180	5.794	5.324	0.112	5.212	-	-	4.597
		6H	-	-	6.000	5.500	0.150	5.350	5.153	0.236	4.917
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, 2007.

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.

Aluminium structural components assumed, as this is typical of the applications for which the Reliance standard products range is designed for.

Screw Size	Tightening Torque for 700 MPa Socket Head Cap Screw (Nm)	Tightening Torque for Stainless Steel Set Screws (Nm)
M1.6	0.13	0.05
M2	0.26	0.05
M2.5	0.52	0.18
M3	0.92	0.32
M4	2.10	0.75
M5	4.20	1.50

RELIANCE STANDARD MATERIALS

Reliance Precision screws are manufactured from the materials listed below. Where the product material is 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 26/32 HRc	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 hardened 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.

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Chosen by engineers for engineers
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Flexible Shaft Couplings
More information
Lead Screws and Nuts
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Cool Muscle Motors
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Linear Actuators
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Gearboxes
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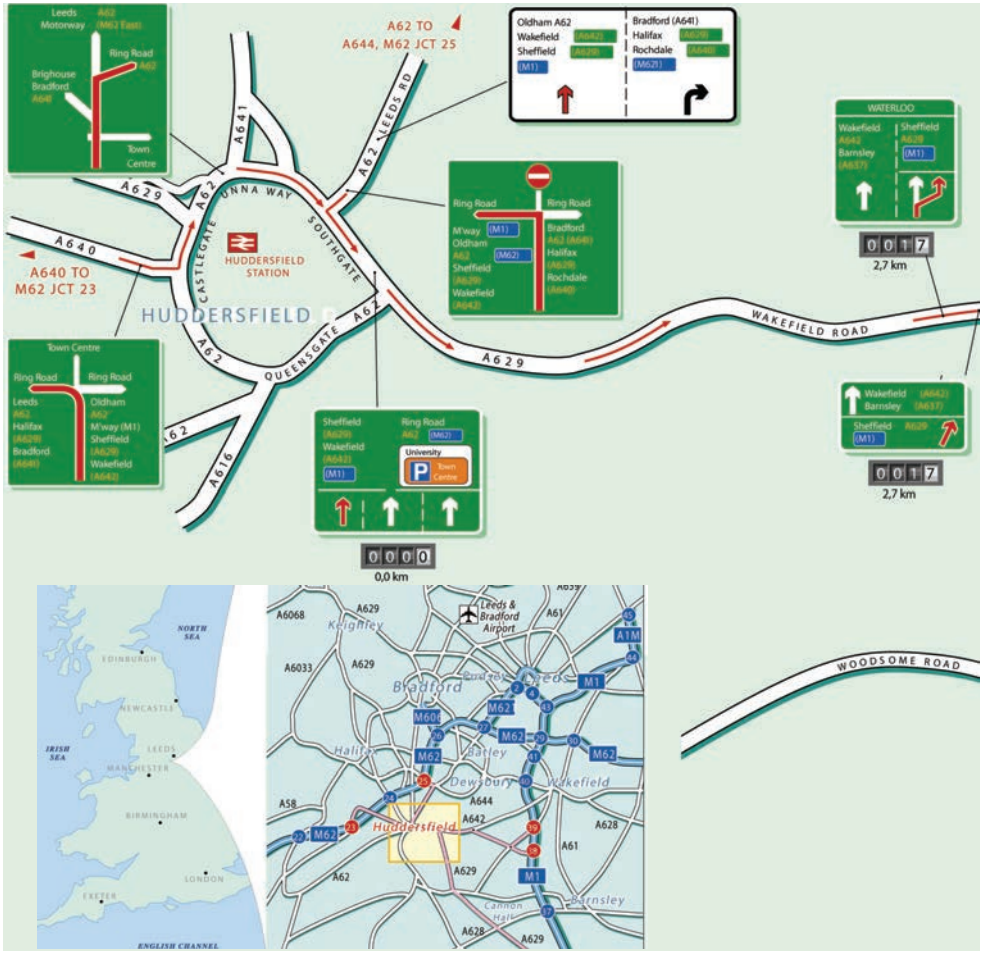

NORTH & SOUTH APPROACHES

From the North: Junction 39 of M1 (Denby Dale turn off), follow the A636 for 3 miles and then turn right on to the A637 for 2 miles. At the next roundabout turn left on to the A642 to Huddersfield. After 1 mile on the A642 turn left through the village of Lepton, to join the A629. Turn left and Reliance is 100 yards on the left.

From the South: Juntion 38 of the M1, follow the A637 for 4.5 miles passing Yorkshire Sculpture Park and straight accross at the second roundabout on to the A642 to Huddersfield.

or

Junction 35A M1, follow the A616 for 3 miles, turn off onto the A629 towards Huddersfield. Follow this road for approximately 15 miles, passing through Thurgoland, Ingbirchworth and Shepley. Reliance is on the right.

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Location Map

EAST & WEST APPROACHES

From the East: Junction 25 of M62, follow the A644 for 2 miles and turn right at the next roundabout on to the A62. Follow the A62 for 5 miles until it joins the Huddersfield ring road. Leave the ring road following the A629 for Sheffield (Sainburys supermarket on your left). Follow the A629 for 3.4 miles. Reliance is on the left.

From the West: Junction 23 of the M62 (or J25 and follow as above), follow the A640 for 3 miles to Huddersfield ring road. Turn right on to the ring road. Follow the ring road for approximately 3/4 miles ignoring the signs for Sheffield (A616) and Manchester (A62) until you pass the University. Turn right at the next roundabout onto the A629, sign posted to Sheffield and Wakefield. Follow the A629 for 3.4 miles. Reliance is on the left.

Public Transport

Wakefield Station
25 minutes by taxi
Huddersfield Station
20 minutes by taxi

Manchester Airport
1 hour by road
Leeds/Bradford Airport
1 hour by road

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Conditions of Sale

In addition to these conditions of sale, our standard Conditions of Sale also apply. A copy of these is available on request and from our website www.reliance.co.uk/en/help

Minimum order charge - Orders are subject to a minimum order charge of £250.00.

Carriage and packing - Additional charges are made for carriage and packing.

Payment - Payment terms are 30 days. New customers are requested to complete an application form for a credit account. Customers who do not have a credit account with Reliance are requested to supply cheque with order. In addition, orders may be paid for by Visa and Mastercard.

Telephone orders - An order number must be quoted by the customer. We reserve the right to supply parts against a telephone order. All telephone orders are accepted subject to these conditions of sale and those detailed on the acknowledgement of order. An acknowledgement will normally be sent by Reliance and goods will be supplied in accordance with the order acknowledgement.

Certificates of Conformance - Reliance's quality management system is certified to AS9100 and ISO 9001. A Certificate of Conformance can be supplied at an additional charge of £10.00 per delivery. Alternatively, a Certificate with full material traceability can be supplied at a charge of £20.00 per delivery.

Confirmation - All orders, other than telephone orders with a value of less than £500 and orders placed through our website, are subject to acceptance in writing by Reliance Precision Limited.

order amendments - Order amendments are subject to our approval and a charge will be made for reasonable compensation for any costs incurred.

Returns - Unused items may, solely at our discretion, be accepted for credit within 90 days of delivery. Any parts so accepted will be subject to a 20% service charge for re-inspection and handling. No credit can be allowed after the above period, or for any used or modified part, or for parts manufactured to a customer's specification.

Additional charges - Reliance reserves the right to charge for all additional expenses and taxes incurred over and above published prices (including without limitation duty, VAT, exchange rate fluctuations etc.)

Alterations - As a result of continuous product development, Reliance reserves the right to alter prices and other details without prior notice and to change dimensions where this does not affect the function of the item.

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