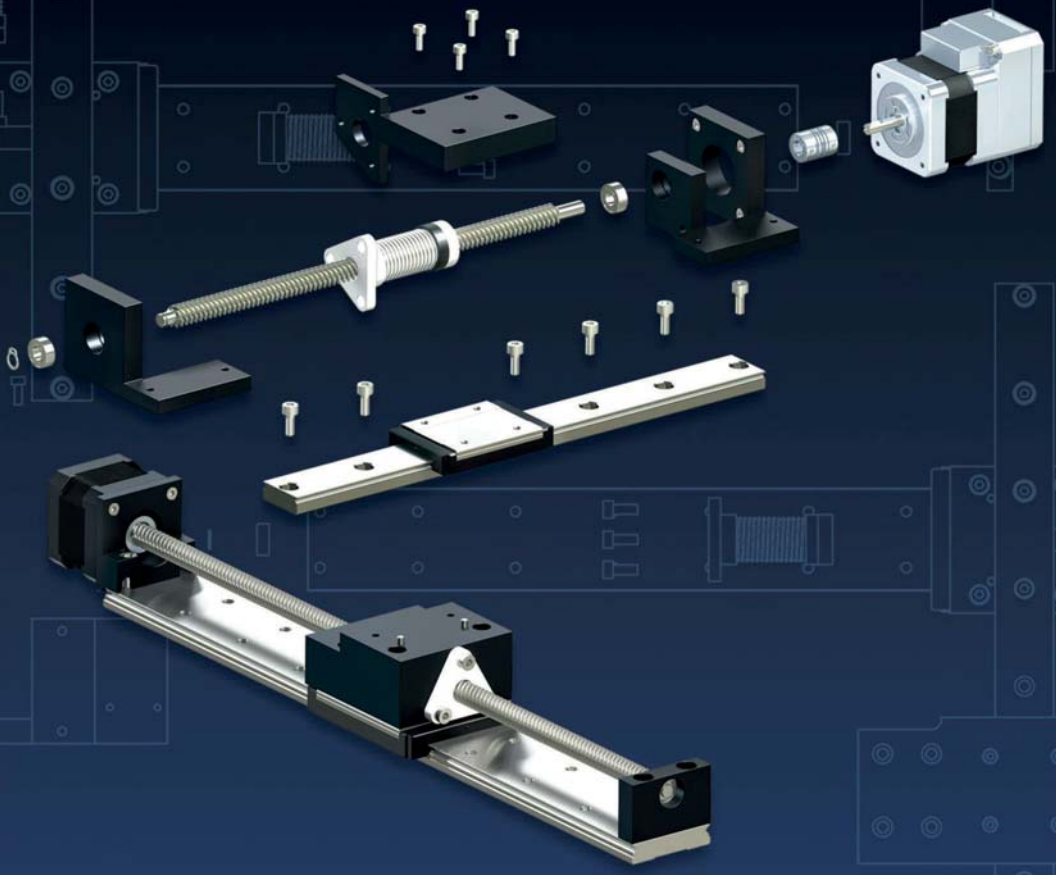
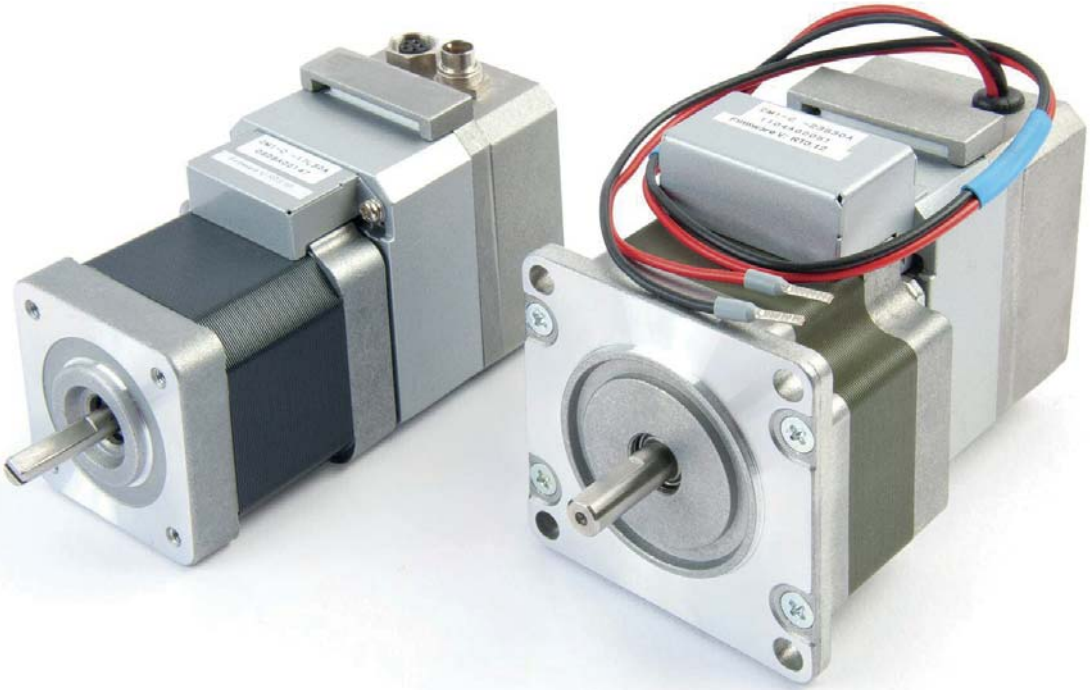
Reliance®
Precision Limited



Precise Motion Control Solutions

Intelligent Motors and Motorised Actuators

Contents



Section Contents

A complete motion control solution

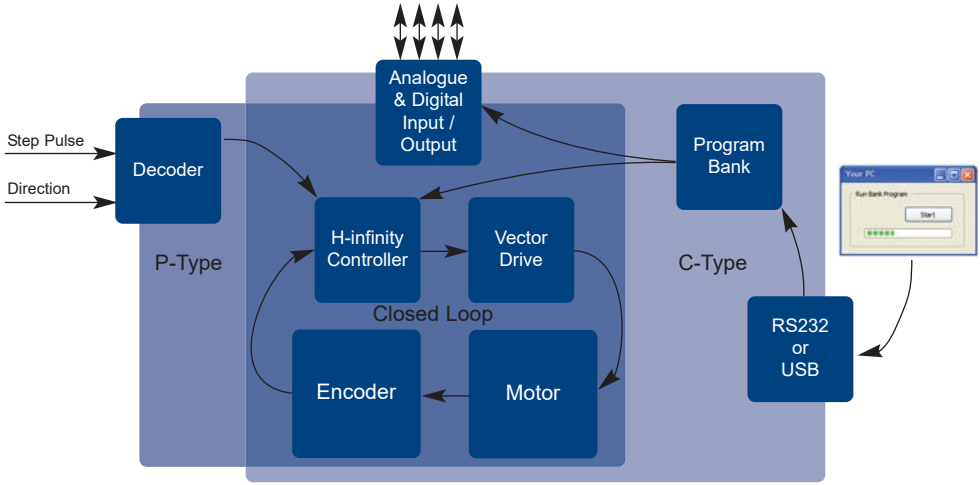
This cost-effective miniature servo system combines a precision stepper motor and high resolution encoder with sophisticated drive and control electronics in a single, compact unit.

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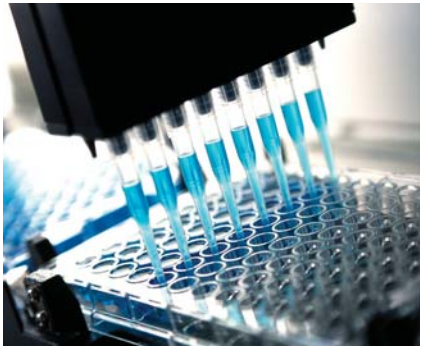
Cool Muscle's unique features include the ability to link up to 15 motors which can operate together in complex sequences without an additional controller. Cool Muscle is able to use a physical limit of travel as its reference position, using torque sensing to safely and accurately find the limits of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

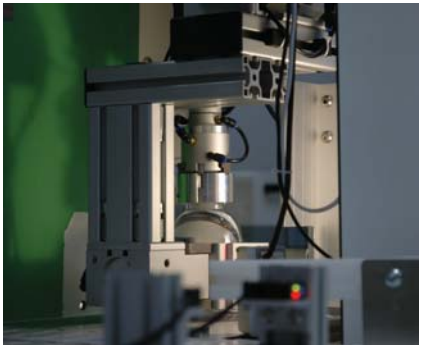
Cool Muscle is ideal for laboratory and test equipment or for light industrial automation.

Customised XYZ positioning table

Precision linear stage



Medical pipetting systems



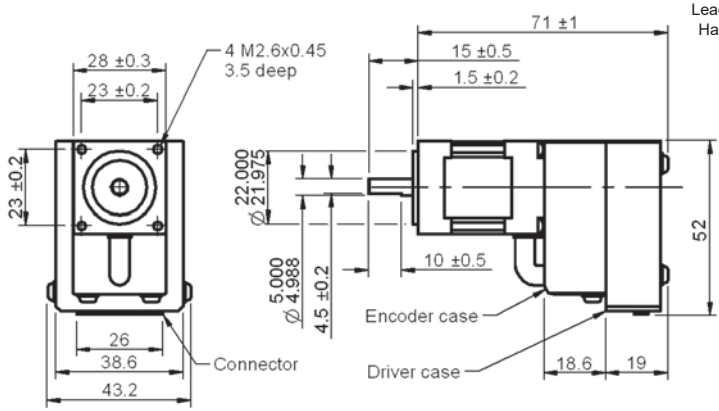
Laboratory automation

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
Couplings: page 8-1
Leadscrews: page 7-1
Hardware: page 13-1
Cables: page 2-11



RCM1 - P - 11 S 30 - RT3

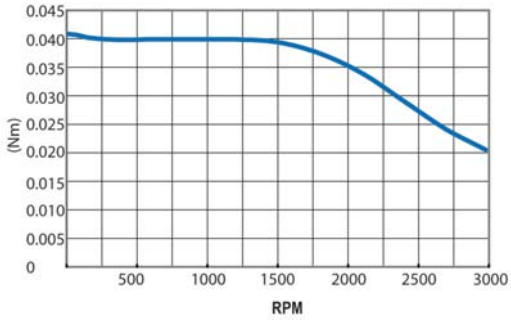
- Generation
- Interface: P = Pulse, C = Computer
- Speed: 30 = 3000 rpm

Specification table

	RCM1- □ -11S30-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-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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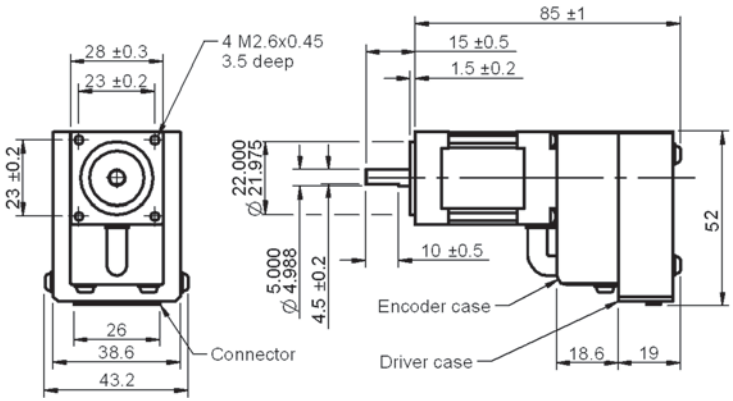
Associated Products
Couplings: page 8-1
Leadscrews: page 7-1
Hardware: page 13-1
Cables: page 2-11

All dimensions in mm



RCM1 - P - 11 L 30 - RT3

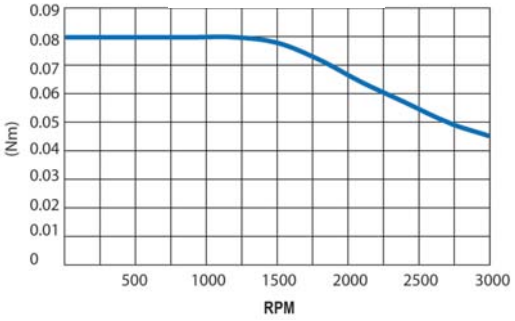
- Generation
- Interface: P = Pulse, C = Computer
- Speed: 30 = 3000 rpm

Specification table

	RCM1- □ -11L30-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-RT3



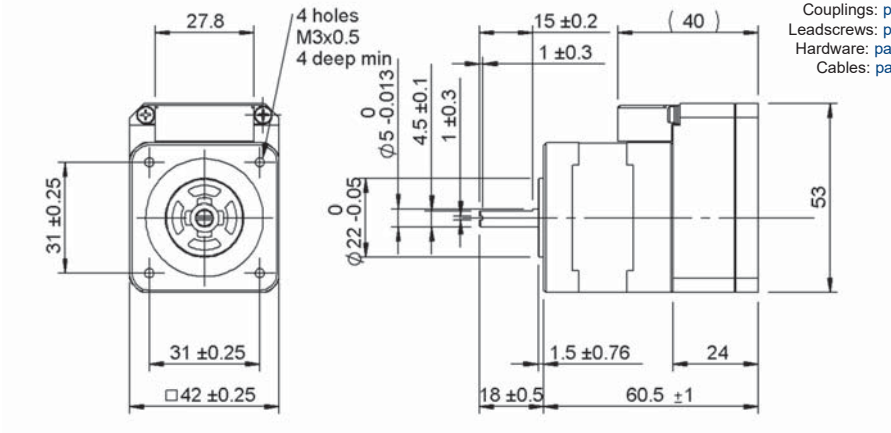
Technical support

- 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

Intelligent Motors

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-C - RT3

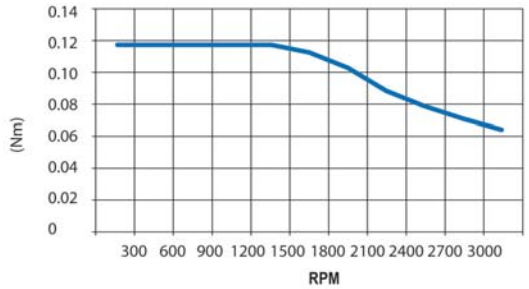
- Generation
- Interface: P = Pulse, C = Computer
- Speed: 30 = 3000 rpm

Specification table

	RCM1- □ -17S30-C-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

Intelligent Motors

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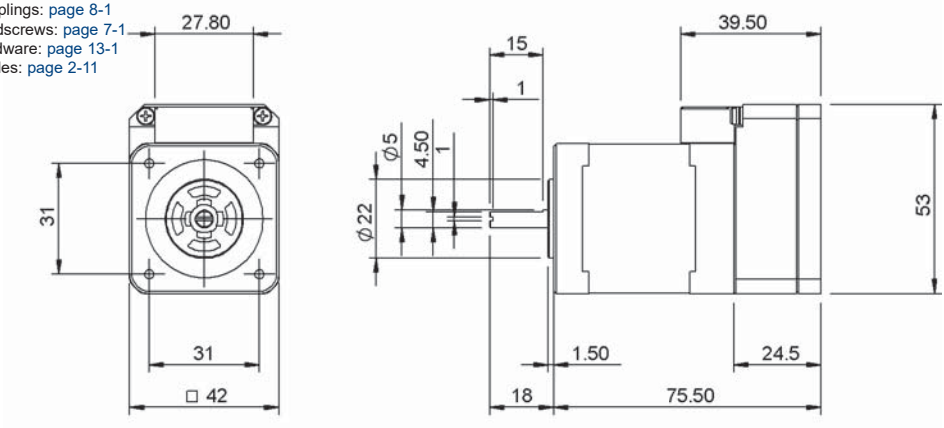
Associated Products
Planetary Gearboxes: page 3-3
Couplings: page 8-1
Leadscrews: page 7-1
Hardware: page 13-1
Cables: page 2-11

All dimensions in mm



RCM1 - P - 17 L 30-C - RT3

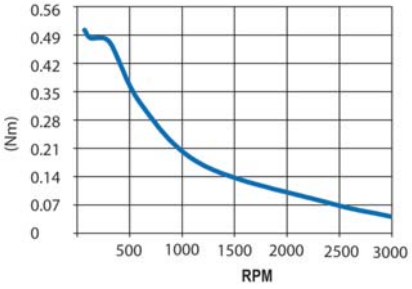
Generation
Interface
P = Pulse
C = Computer
Speed
30 = 3000 rpm

Specification table

	RCM1- □ -17L30-C-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-C-RT3



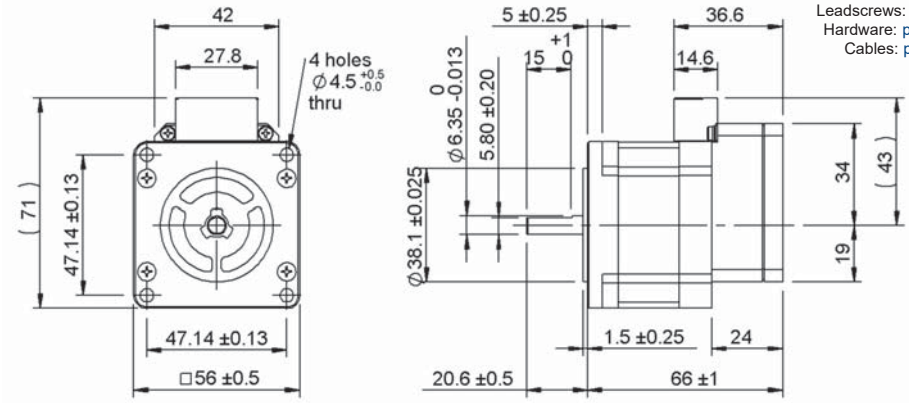
Technical support

- 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

Intelligent Motors

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-C - RT3

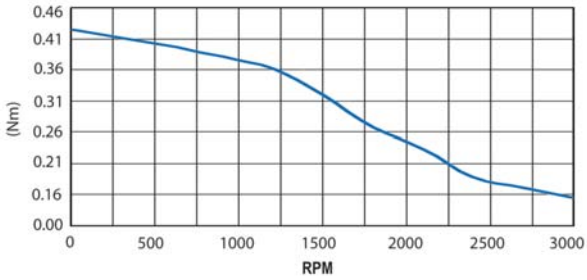
- Generation
- Interface: P = Pulse, C = Computer
- Speed: 30 = 3000 rpm

Specification table

	RCM1- □ -23S30-C-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

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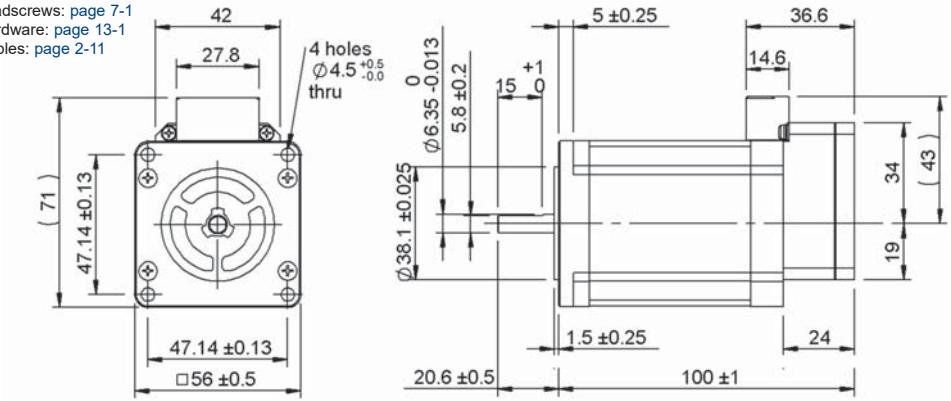
Associated Products
Planetary Gearboxes: page 3-3
Couplings: page 8-1
Leadscrews: page 7-1
Hardware: page 13-1
Cables: page 2-11

All dimensions in mm



RCM1 - P - 23 L 20-C - RT3

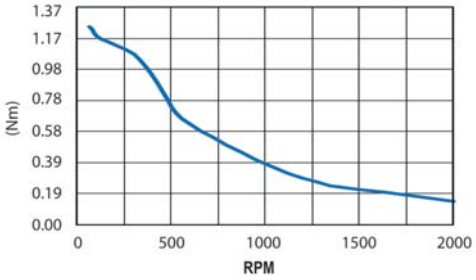
- Generation
- Interface: P = Pulse, C = Computer
- Speed: 20 = 2000 rpm

Specification table

	RCM1- □ -23L20-C-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-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

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 RT3	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

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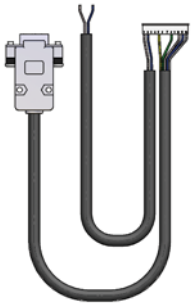
Software interface

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

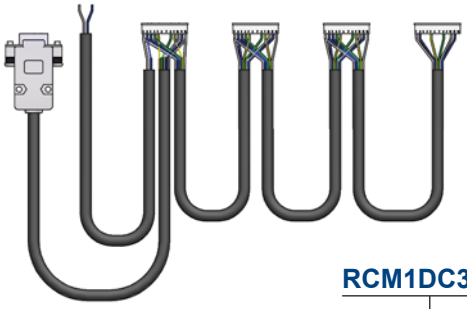
'Y' cables



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

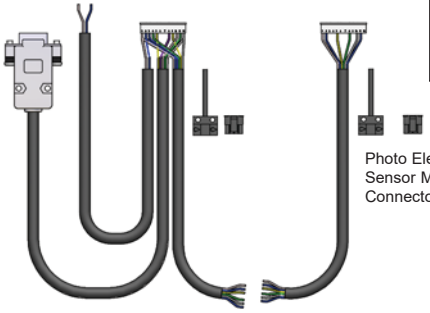


Photo Electric Sensor Molex Connector 2 way

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

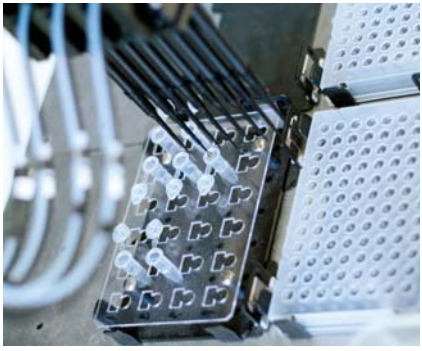
This compact actuation system combines the Reliance Cool Muscle servo system with a rack and pinion drive to give precise linear motion for high speed applications.

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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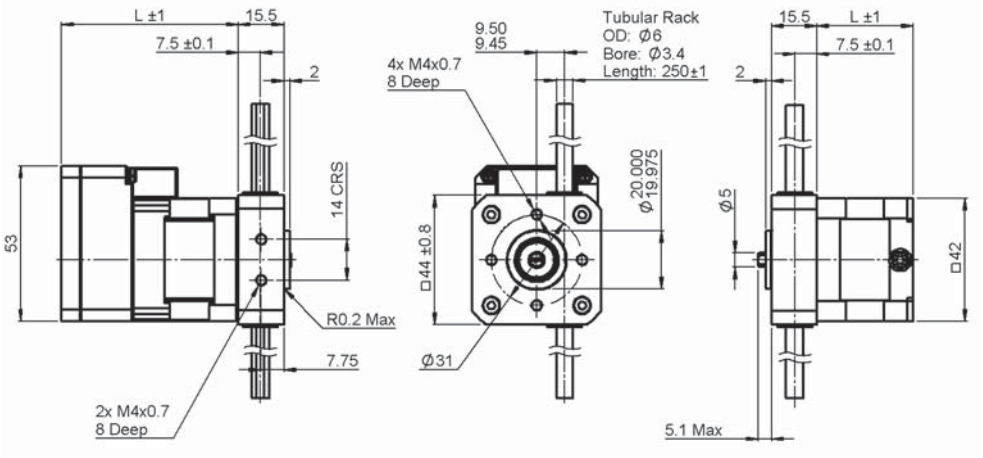
Associated Products
Hardware: page 13-1

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

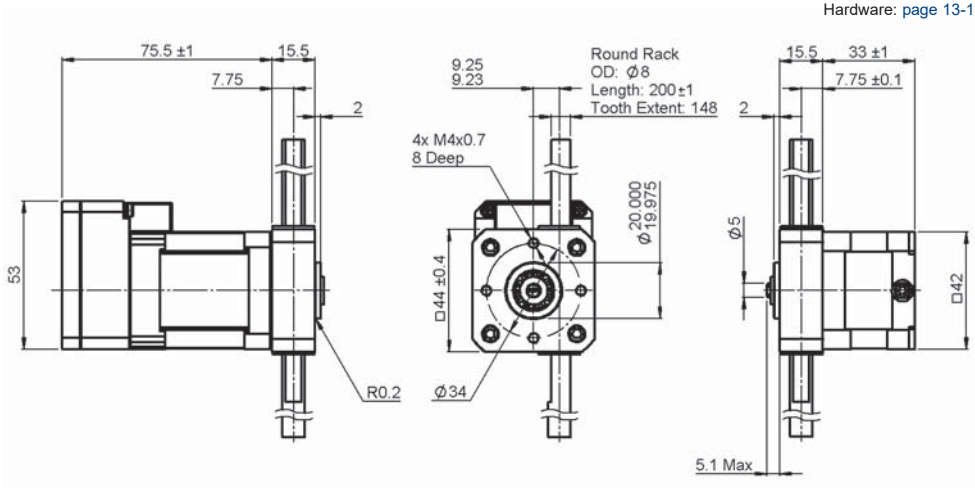
		RCMRA17 Reliance Cool Muscle	RRA17 Hybrid Stepper
Resolution		0.00085 mm with 50,000 steps/rev	0.21 mm with 200 steps/rev
Max speed		300 mm/sec	
Temperature range		Between 0ºC and 40ºC	Between -20ºC and +50ºC
Repeatability		0.025 mm	
Side wobble (fully extended)		±0.2 mm	
Life time		5 million cycles 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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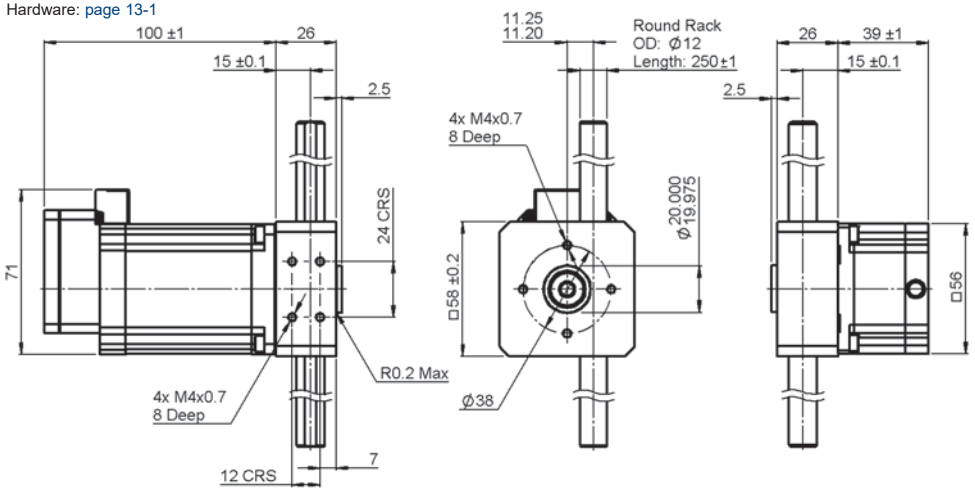
Associated Products
Hardware: page 13-1

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

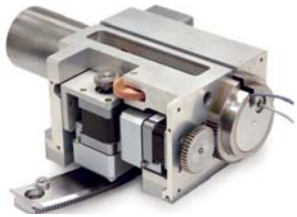
Providing custom-built solutions

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

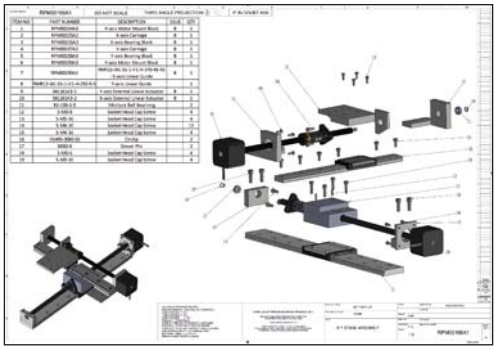
Working closely with our customers to understand the application and design specification, we are able to offer design engineering support to help develop an appropriate assembly, bringing knowledge and experience from working in a variety of industries and applications.

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.

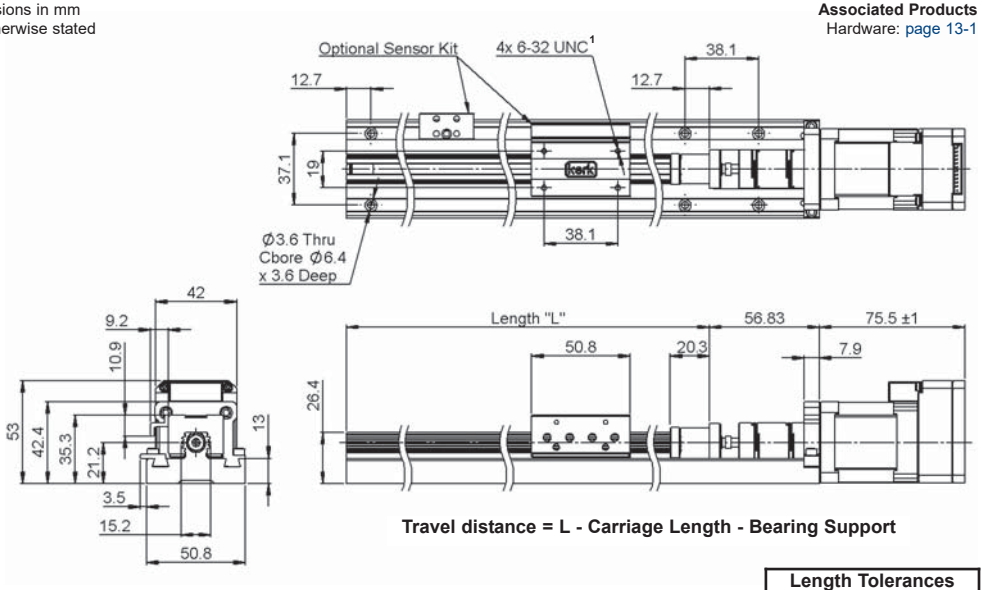
Typical applications for the RCMS include test instrumentation used in industrial automation and university laboratory research equipment used by the energy industry.

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

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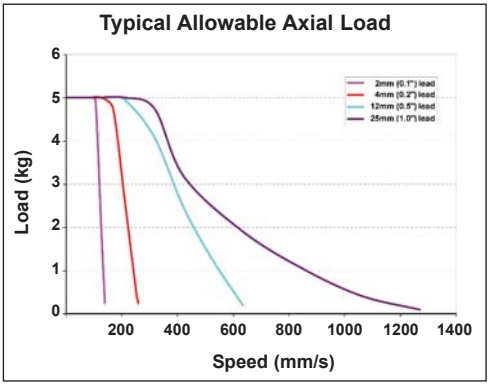
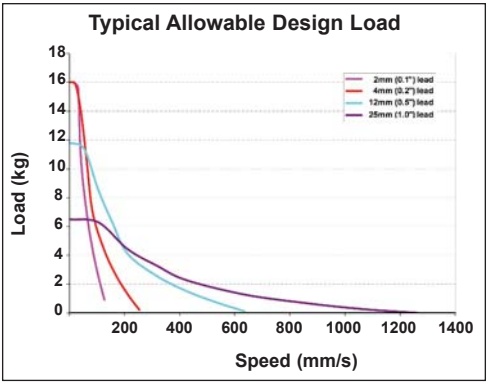
Technical specification

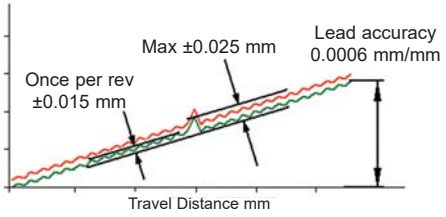
Basic Part Number	Life @ ¼ Design Load mm	Torque to Move Carriage Design Load Nm/kg	Carriage Design Load kg	Max Linear Speed mm/sec	Axial Load kg	Screw Inertia kgm²/m	Carriage Roll Angle Deg.
RCMS17L-M02	$254x10^6$	0.016	16	127	5	$4.2x10^{-6}$	1
RCMS17L-M04		0.023		254			
RCMS17L-M12		0.039		635			
RCMS17L-M25		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

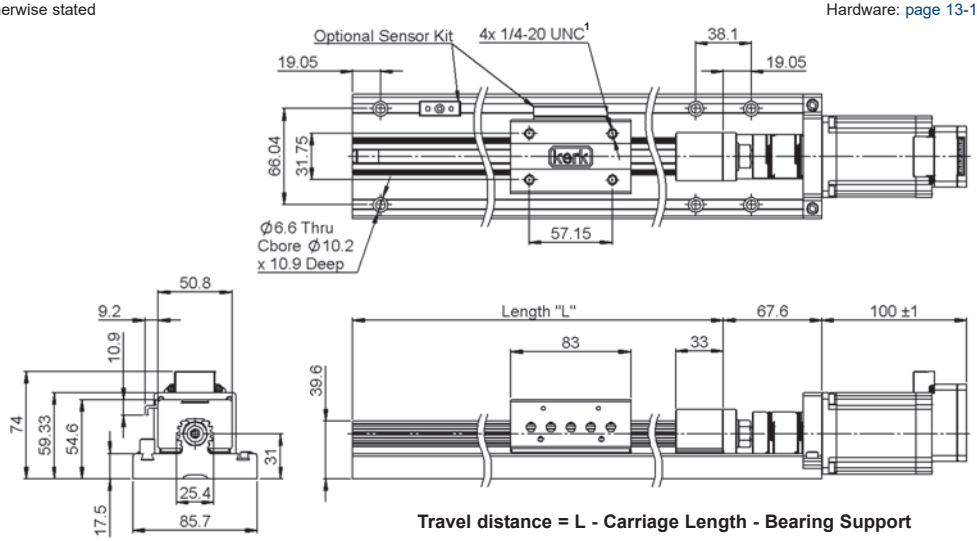
- Product overviews - see pages 2-19 and 2-2
- Technical information - see pages T2-1 to T2-8

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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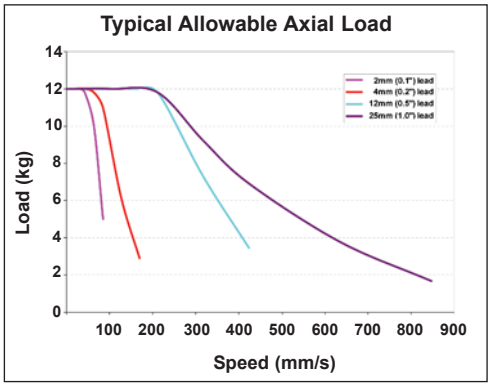
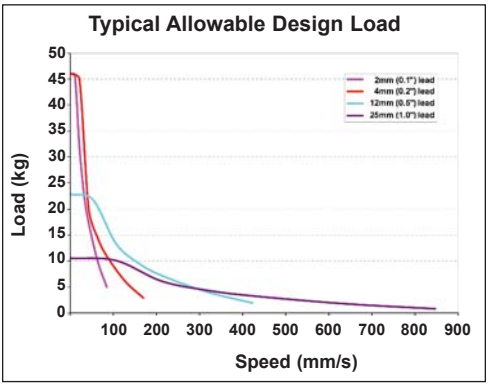
Technical information

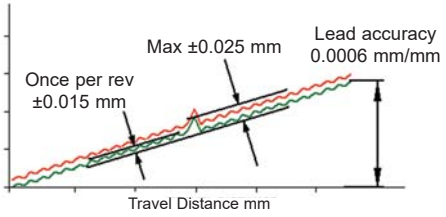
Basic Part Number	Life @ ¼ Design Load mm	Torque to Move Carriage Design Load Nm/kg	Carriage Design Load kg	Max Linear Speed mm/sec	Axial Load kg	Screw Inertia kgm²/m	Carriage Roll Angle Deg.
RCMS23L-M08	254x10⁶	0.038	46	267	14	3.9x10⁻⁵	1
RCMS23L-0100		0.020		85			
RCMS23L-0200		0.031		169			
RCMS23L-0500		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.

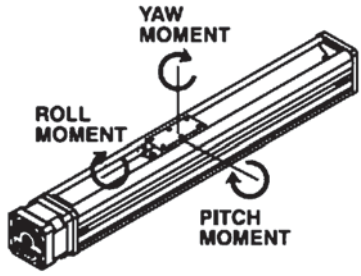
The features of the linear rail actuator include:

- “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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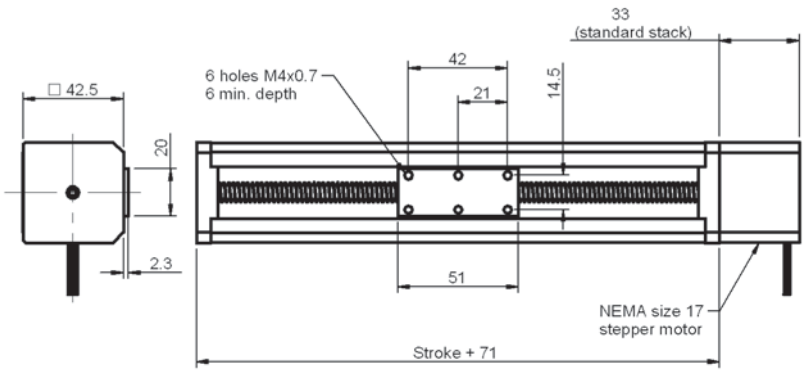
Associated Products
Hardware: page 13-1

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

Motorised Leadscrew Linear Slide

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.

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Product selection table

Nominal Thread Lead Inches	Nominal Thread Lead mm	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
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				•		•

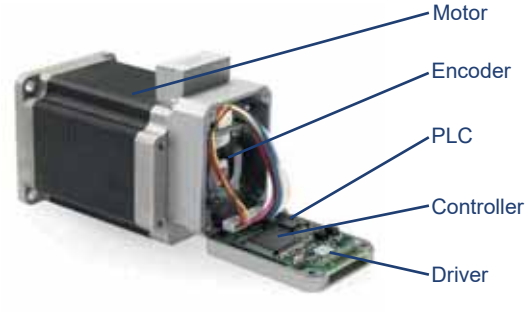
Notes
The wide base option provides parallel guide tracks for traversing sensor mount devices
SS = Single Stack, standard linear actuator stepper motor
DS = Double Stack, hybrid linear actuator stepper motor
For further infomation regarding the single and double stack motors, please contact us

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.

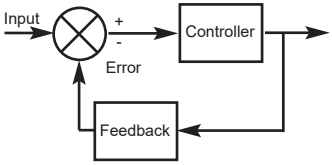


FULL CLOSED LOOP SYSTEM

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.

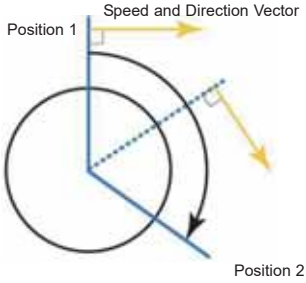


H-Infinity

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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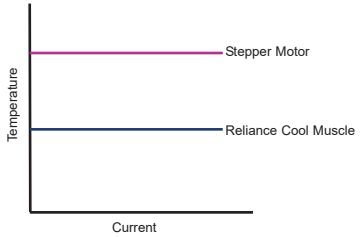
COOL OPERATION

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.

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.

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

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

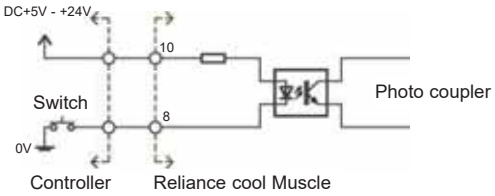
1. Normally used for serial communication with the host PC via an accessory 'Y' or USB cable. In a daisy chain system with multiple motors, used for serial communication with the next upstream, slave or master motor. If the Cool Muscle is being used stand-alone INPUT 1 and OUTPUT 1 can be assigned other 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

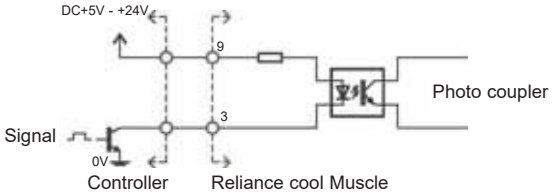
Wiring for INPUT 1 and INPUT 2

These inputs are opto-isolated inputs, minimum 5 V, maximum 24 V. Examples:-

Input 1



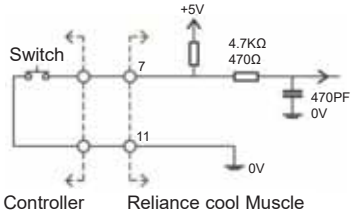
Input 2



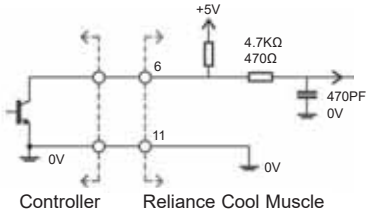
Wiring for INPUT 3 and INPUT 4

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



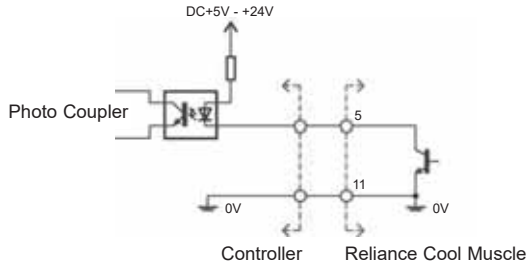
Input 4



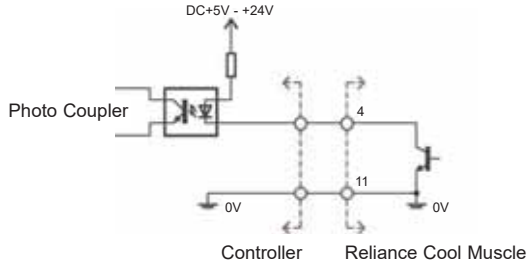
Wiring for OUTPUT 1 and OUTPUT 2

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



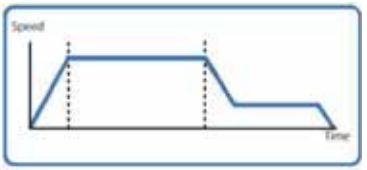
Output 2



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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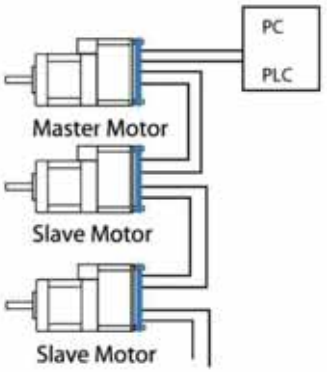
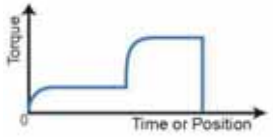
NETWORK

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.



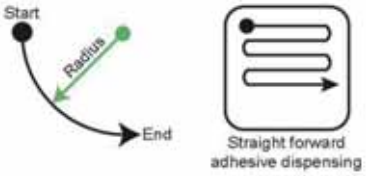
TORQUE CONTROL AND FEEDBACK

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

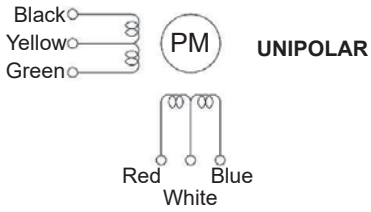
Insulation parameters	Dielectric Strength: 500 VAC Insulation Class: Class B
Insulation resistance	100 MΩ min. (at 500 V DC)
Dielectric strength	500 V AC (1 minute)
Operating temperature range	-20ºC to +50ºC
Permissible temperature rise	80ºC max. (resistance method)

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



UNIPOLAR

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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