

COOL MUSCLE™

INTEGRATED SERVO SYSTEMS



CREATING INNOVATION WITH MOTION CONTROL



COOL MUSCLE™

■ Integrated Motion Modules

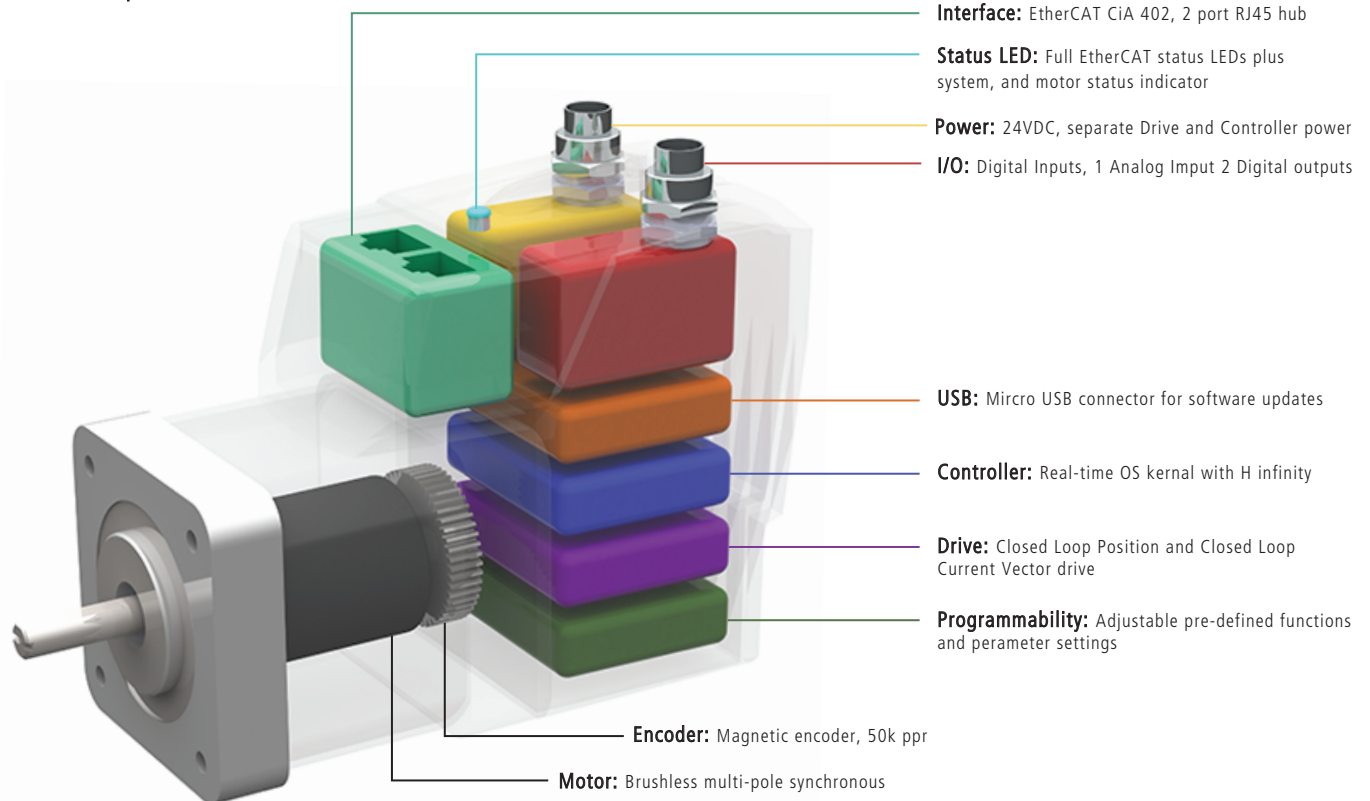
The Cool Muscle line of servo motors provide all the common components required for motion control embedded into the motor itself. The seamless integration of both software and hardware components creates highly efficient motion modules that can be easily integrated into existing designs, or used to shorten the development cycle of your new machine.

The Cool Muscle outperforms traditional servo and stepper systems by virtue of the controller's multiple closed feedback loops with the driver and high resolution encoder. Short wire lengths reduce susceptibility to EMI and noise, while removing servo and encoder cables that often add considerable cost, inventory, and complexity. On-board PLC functionality also reduces machine component count and costs, and allows for modern, elegant machine design. A variety of industrial buses are available for communications and networking with third party host controllers.

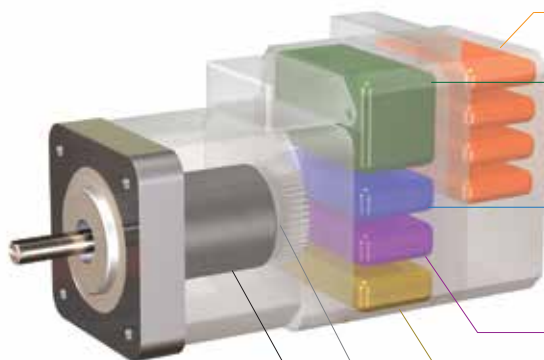
■ Two Series of Cool Muscle Servos

The Cool Muscle line is comprised of two distinct series. The CM1 is a high performance closed loop servo system based on high torque stepper motors, providing a high torque density package for applications such as pick and place, guiding, dispensing, and medical research. The CM2 is based on high speed AC servo motors with high wattages and expanded I/O capabilities, suitable for applications requiring higher running speeds or additional torque through gearing. The CM2 provides the additional benefit of having an integrated AC power supply, compatible with most global voltage standards.

■ CM1-E Component Breakdown



CM1



Interface Options: RS-232, RS-485, USB
MODBUS RTU, TCP/IP Ethernet/IP, EtherCAT, CANopen

Driver: 24VDC Closed loop, sinusoidal, vector

Controller: Real-time OS kernel with torque, speed, and position control. 2-axis coordinated motion

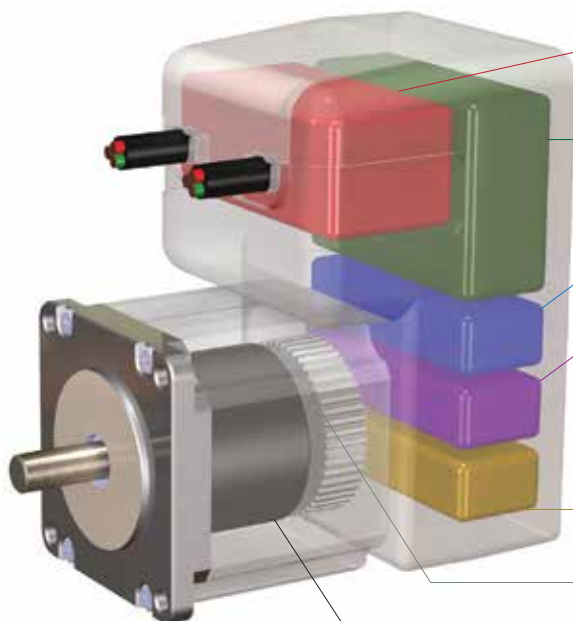
PLC function: Fixed scanning rate programmable I/O with PLC like functions Arithmetic and logic functions

Communication: Two UART ports, daisy chain networkable Onboard digital and analog I/O

Encoder: Magnetic encoder, 50000ppr

Motor: Brushless multi-pole synchronous motor

CM2



Onboard power supply: Direct AC100V-240V

Driver: Closed-loop sinusoidal vector control One parameter tuning

Controller: Torque control Proprietary RT OS Interpolation functions (option)

PLC function: Arithmetic/Logical operations

Communication: Two RS-232C channels 15 axes daisy chain network

Input/Output (I/O): 6 digital inputs/4 digital outputs, 1 Analog Input/1 Analog Output

Encoder: Magnetic, 50000ppr

Motor: Brushless AC synchronous motor

COOL MUSCLE™

FEATURES



Flexible & Convenient Power Input

The CM1 series Cool Muscle uses industry standard 24VDC input voltage for all of the motor sizes simplifying your low voltage power bus. The CM2 series Cool Muscle accepts 100-240VAC, single or 3 phase, removing the need for additional high voltage AC-DC power supplies.



Expensive High Voltage Drive cables are no longer required!



Full Closed Loop System

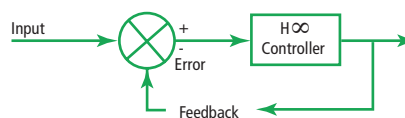
All Cool Muscles are fully closed loop systems. With a high resolution magnetic encoder and the intelligent driver board integrated into a single space efficient package, the Cool Muscle constantly monitors its position, eliminating any missed steps.



Higher repeatability, stability, and accuracy.

Closed Loop System

By monitoring position and current values from built-in sensors the Cool Muscle handles both position and current feedback for optimal positioning and power efficiency.



H ∞

Using novel modern control technology, the Cool Muscle goes beyond antiquated static PID control by utilizing 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 between motor and load.

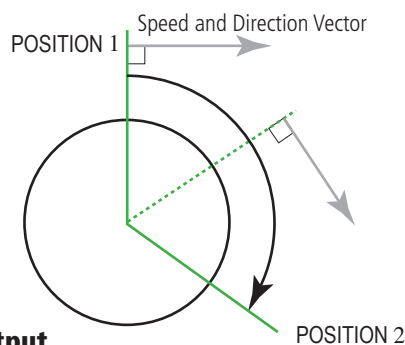


Smooth and Accurate Movements

The Cool Muscle's high resolution magnetic encoder gives you an exceptionally fine resolution of 50,000 units per rotation. All Cool Muscles employ Vector Drive control, resulting in incredibly smooth motion and high torque at low speeds.



Aggressive acceleration ramps not possible with microstepping decrease your machine's cycle time and increase output.



Vector Drive Control

Vector drive uses onboard phase current sensors as feedback in a closed loop current controller. This system optimizes torque in static and dynamic loading conditions, drastically increasing the torque density of the motor system, while micro-managing current for optimum efficiency.



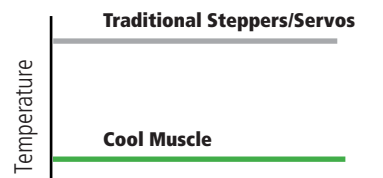
Energy Efficient

The Cool Muscle's power management monitors and provides the optimum current based on load, keeping the motor cool. In addition, using a stepping motor, the CM1 Cool Muscle generates high torque at low speeds in a small space envelope.



Longer motor life. Increased power efficiency with as much as a 75% power savings over other systems. Great for enclosed spaces.

The Cool Muscle applies optimum current to produce motion whereas an open loop stepper typically runs with a fixed current draw.



Battery Operation

The CM1 Series Cool Muscle's efficient design technology makes the motor suitable for battery operation.

Contact Myostat Motion Control for further information about operating voltage ranges and current draw.





Various Interfaces

The Cool Muscle can be controlled via different interfaces, including Pulse trains, Analog, Computer and PLC I/O. Choose The type that best suits your needs. Ethernet, CAN open and other industrial buses are available for the Cool Muscle as an option.



Minimum modification required to improve your existing design and improve performance.

	Control	Variations
 P Type	Pulse train	CW/CCW Step/Direction
 C Type	PC Embedded Computer PLC Discrete I/O	Pre-Programmed Dynamic Command
R Type	Analog Input CML commands	Position, Speed 2-axes Contouring



Programmable

Program the Cool Muscle to create the motion you need. Define motion profiles and create programs using easy-to-understand Cool Muscle Language (CML). Motion programs you create can be stored in the Cool Muscle's EEPROM. The programs can be executed via PC, embedded computer or triggered using I/O.



Great solution for repetitive motion. Simple and compact machines.

CML

Cool Muscle Language is a robust set of ASCII commands that lets you easily create motion programs. Commands include conditional, iterative, and mathematical functions.

Logic Banks

Logic bank programming moves beyond motion programming into logic and mathematical functions, running at a fixed scan rate for PLC type functionality.

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
END.1

Define motion programs using the motion profiles defined above.

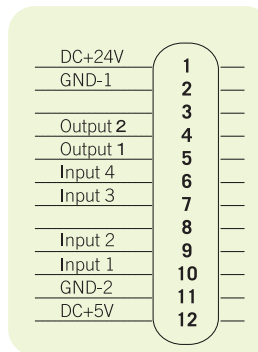


Powerful Pre-programmed Functions

The Cool Muscle system comes with over 90 user definable parameters and pre-programmed functions. These remove the need to program typical routines such as Homing, Feeding, Torque based motion, Speed, or Position Control.



Logic Banks are also an excellent way to Program complex I/O interactions



Input Functions examples:

- Origin Sensor/Homing
- Manual Feed
- Manual Jog
- Execute Bank
- Origin Search
- Motor Free
- Enable Motor
- Execute Next Step
- Execute Previous Step

Output Functions examples:

- Alarm
- In-position
- Registration



Logic Programming and PLC Functionality

The Cool Muscle's 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.



Create custom tasks to monitor internal system metrics and variables which execute in parallel with other system operations.

COOL MUSCLE™ FEATURES

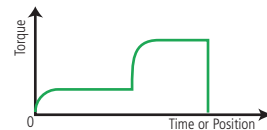


Torque Control and Feedback

The Cool Muscle 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.

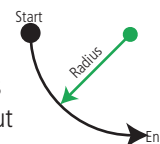


Closing the loop with external load cells is also quick and efficient utilizing the analog input's PI controller and the pre-set functions built into the Cool Muscle



2-Axes Co-ordinated Motion

Both the CM1 and CM2 R Type servos provide 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.



Straight forward adhesive dispensing



3D Printing can be optimised by switching to the P Type Cool Muscle. Ghosting and noise are drastically decreased, while linear print speed, filament resolution and retraction speeds are dramatically increased

CM1 Communications/Network Interface Options

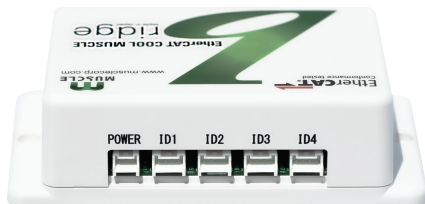
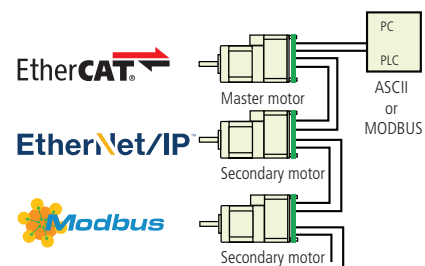


Network Communications

The Cool Muscle offers you multiple networking solutions. Connect multiple Cool Muscles in a daisy chain style network. In the daisy chain network Cool Muscles can tell other motors to activate programs as well as receive commands from a computer or an embedded controller.



Ethernet based network options are now available in two form factors.



Muscle Corporation's EtherCAT bridge allows 4 Cool Muscles to be attached to any EtherCAT network. Multiple bridges can be used on one network to expand the number and types Cool Muscles on the network. The EtherCAT bridge reduces the per axis cost of adding EtherCAT, and helps in applications where motor space is restricted.



Industrial Buses

RS-232, RS-485, MODBUS RTU, Ethernet TCP/IP, Ethernet IP, MODBUS TCP, EtherCAT, and other industrial interfaces are available as options for the Cool Muscle servo systems. Our engineers provide technical support based on extensive experience integrating the Cool Muscle with third party controllers, HMIs, and PLCs.

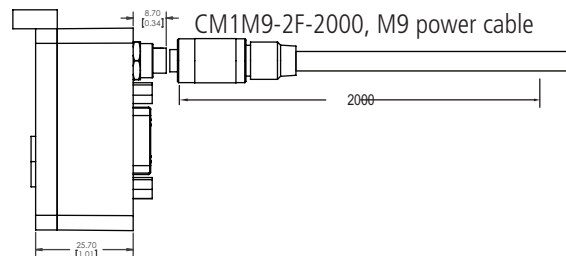
Drawings and technical specifications for each interface are available from www.coolmuscle.com or from your local distributor.



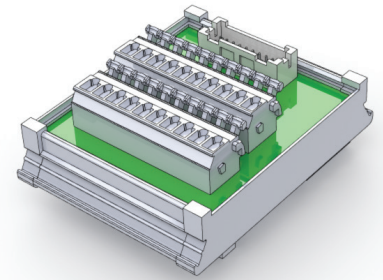
By using MODBUS RTU, compliant PLCs and touch panels can be directly connected to a Cool Muscle, economically extending the system I/O count for demanding applications.

COOL MUSCLE™

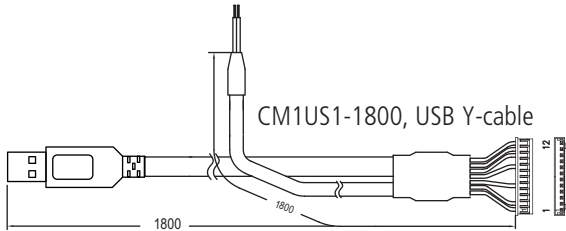
Networking Interfaces, Breakout Boards, and Cabling



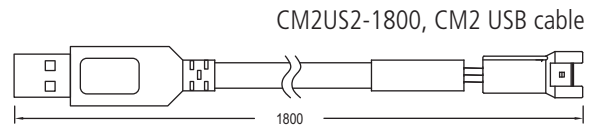
-SRLM DB9 RS-232 or -EIO Expanded I/O interface option



CM2IO2-DRBP, CM2 breakout board



CM1US1-1800, USB Y-cable



CM2US2-1800, CM2 USB cable



Interface & Cabling Options

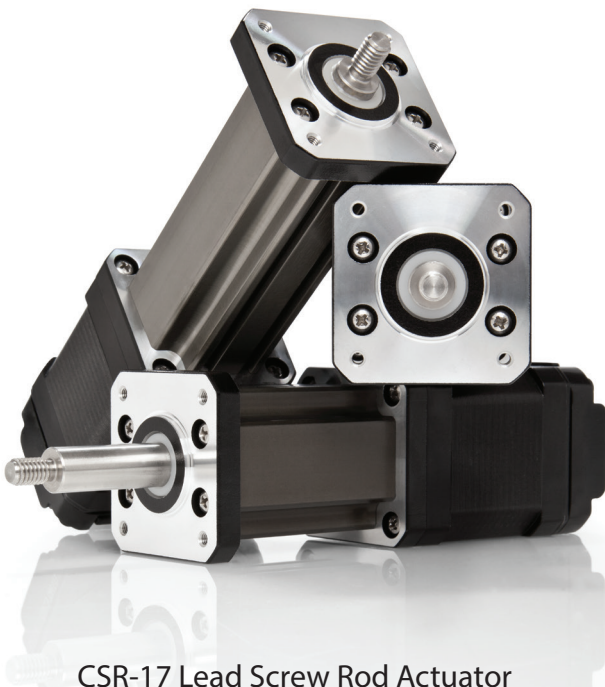
A wide range of communications, I/O, and Power cables are available for the CM1 and CM2 motors. Series specific DIN rail breakout boards and prototyping boards are also supplied by Myostat Motion Control from standard stock or as custom build to order items. Please contact us to ensure that you receive the best cables for your application.

For a full listing of cables, breakout boards, and interfaces. Visit www.coolmuscle.com/interfaceoptions



Each motor comes with 40cm or 50cm single ended cables to help you get started.

Integrated Linear Actuators



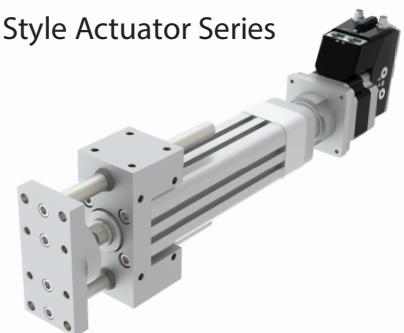
CSR-17 Lead Screw Rod Actuator



Myostat offers a wide range of Cool Muscle integrated actuators based on ball screws, lead screws, belt drives, and rack & pinion assemblies. Rod style actuators with force ratings up to 2000LbsF are also bundled with both CM1 and CM2 servo systems.

For full specifications, please review the Integrated Actuators Brochure or look to www.coolmuscle.com

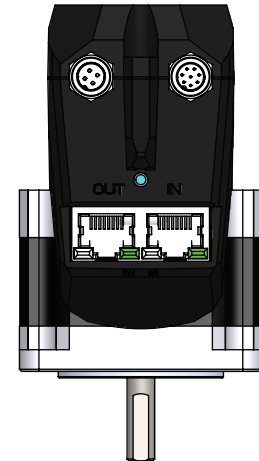
ISO15552 Rod Style Actuator Series



CM1-E & CM1-T SERIES

Specifications

MODEL	CM1-□-17L30C	CM1-□-17S30C	CM1-□-23L20C	CM1-□-23S30C
Mass lbs (kg)	1.1905 (0.54)	0.8378 (0.38)	2.6015 (1.18)	1.3669 (0.62)
Maximum Speed	3000rpm	3000rpm	2000rpm	3000rpm
Continuous Torque Nm(oz.in)	0.36 (50.98)	0.084 (11.89)	0.89 (126)	0.3 (42.48)
Peak Torque Nm(oz.in)	0.53 (75)	0.12 (16.56)	1.24 (175.6)	0.42 (65.14)
Load Inertia Allowance g-cm ² (oz-in-s ²)	760 (1.07 x 10 ⁻³)	380 (5.38 x 10 ⁻³)	4.6 x 10 ³ (6.5 x 10 ⁻³)	1.4 x 10 ³ (1.9 x 10 ⁻³)
Motor Inertia g-cm (oz-in-s ²)	74 (1.04 x 10 ⁻³)	36 (5.09 x 10 ⁻³)	3.6 x 10 ² (5.09 x 10 ⁻³)	1.0 x 10 ² (1.4 x 10 ⁻³)
Encoder	Incremental magnetic encoder (50,000 pulses per rotation)			
Control Method	Closed loop vector control			
Input Supply Voltage	DC24V±10%			
Input Supply Current Rated (Continuous Torque/Rated Peak Torque)	1.5A/1.8A	0.8A/1.0A	2.6A/3.4A	3.9A/5.1A
Resolution Pulse Rotation (Pulse/Rotation)	200, 400, 500, 1000(default), 2000, 2500, 5000, 10000, 25000,50000, Select by parameter			
Environmental Conditions Operating/Storage Temperature	between 0 °C and 40°C/ between -20°C and +60°C			
Operating Humidity	Less than 90% Relative Humidity			
Shock/Vibration	Less than 10G /Less than 1G			



EtherCAT®
EtherNet/IP™

EtherCAT Features

- Implements CiA402 drive profile
- CSP, CSV, PV, PP and HM modes available
- Integrated IO mapped to PDO objects
- 1ms PDO timing for accurate synchronized motion
- Explicit Device ID implemented for enhanced device identification

EtherNet/IP Features

- Add-on Instructions simplify programming and speed development
- Operate in Position, Speed, or Torque control mode
- Integrated 2 port switch for network expansion
- On-board I/O accessible by the PLC

Motor Features

- Integrated motor drive, 50kppr encoder, I/O, and EtherCAT slave controller
- Closed loop servo control with Vector Drive and H Infinity controller
- NEMA 17 and NEMA 23 sizes
- Separate 24V drive and control power
- Energy efficient and cool running

Power Connector

CONNECTOR	PART NUMBER	SUPPLIER
Motor Connector	09 0081 20 04	Binder
Female Cable Side Mating Connector	99 0080 102 04	Binder
4m Power Cable	CM1M9-4F-4000	Myostat

I/O Connector

CONNECTOR	PART NUMBER	SUPPLIER
Motor Connector	09 0481 22 08	Binder
Female Cable Side Mating Connector	99 0480 102 08	Binder
4m Power Cable	CM1M9-8F-4000	Myostat

For Further Information:

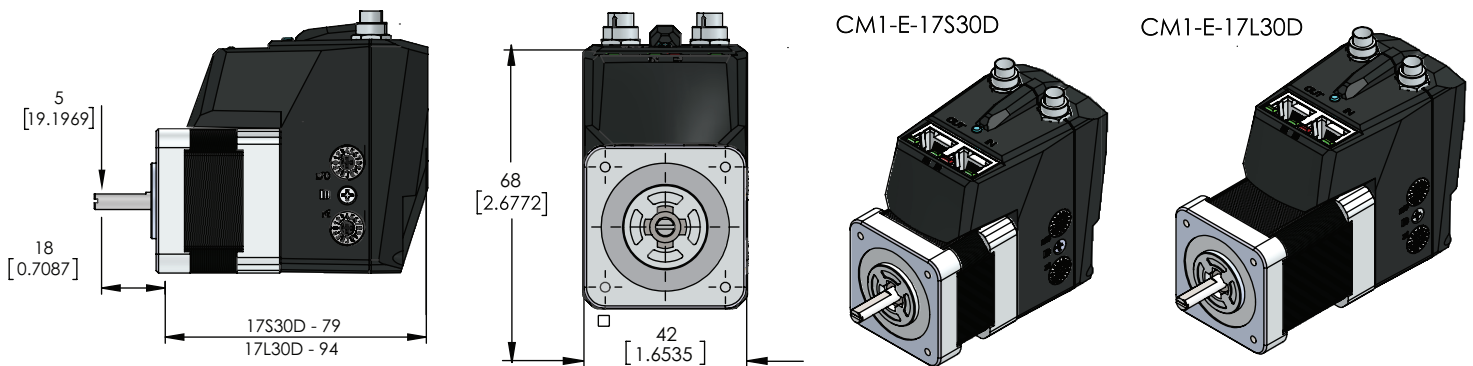
Click here: [CM1-E EtherCAT User Guide](#)
[CM1-T EtherNet/IP User Guide](#)

CM1-E & CM1-T DRAWINGS

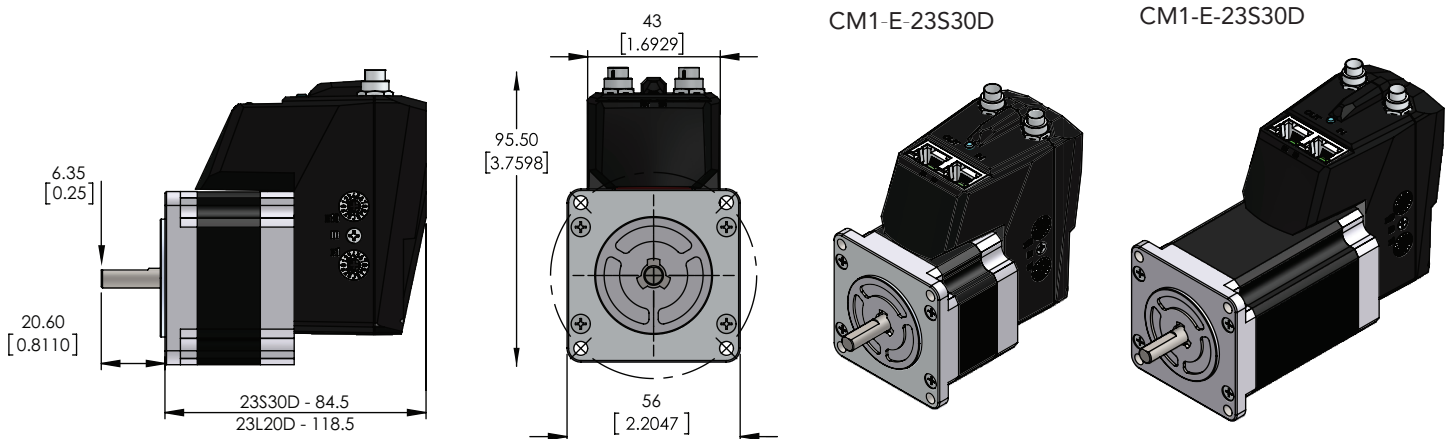
■ Model Name

CM1-E-17L30 D

Generation	Interface E-EtherCAT CIA 402	Size 17 23	Length Long Short	Max Speed 30 ... 3000rpm 20 ... 2000rpm	H/W Version D
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CM1-E-23S30 D



CM1-E & CM1-T Integrated EtherCAT Servo Systems

The intelligence and efficiency of the Cool Muscle servos, combined with an EtherCAT interface

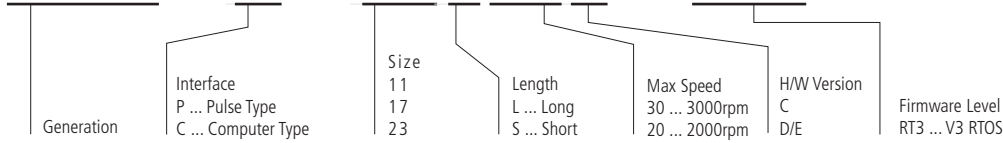
Cool Muscle Ethernet servos provide EtherCAT, EtherNet/IP, MODBUS TCP, and TCP/IP interface options.

The CM1-E motor is fully EtherCAT compliant. The CM1-E retains all the capabilities of the standard CM1, including the advanced H Infinity controller, programmable functions, and a highly responsive vector drive. The CM1-T motor is a certified Ethernet/IP device, including a range of add-on instructions that speed time to installation. Unique to the CM1-E and CM1-T is a 4 pin 24Vdc input, allowing separate power inputs for the drive and controls with STO functionality

CM1 SPECIFICATIONS

Model Name

CM1 - C - 11L30D - RT3



Specifications

MODEL	CM1-□-11L30	CM1-□-11S30	CM1-□-17L30	CM1-□-17S30	CM1-□-23L20	CM1-□-23S30
Mass lbs (kg)	0.6614 (0.30)	0.5291 (0.24)	1.0141 (0.46)	0.7 (0.32)	2.4251 (1.10)	1.1905 (0.54)
Maximum Speed	3000rpm	3000rpm	3000rpm	3000rpm	2000rpm	3000rpm
Continuous Torque Nm(oz.in)	0.055 (7.78)	0.027 (3.8)	0.36 (50.98)	0.084 (11.89)	0.89 (126)	0.3 (42.48)
Peak Torque Nm(oz.in)	0.078 (11.1)	0.039 (5.5)	0.53 (75)	0.12 (16.56)	1.24 (175.6)	0.42 (65.14)
Load Inertia Allowance g-cm ² (oz-in-s ²)	180 (2.5 x 10 ³)	80 (1.1 x 10 ³)	760 (1.07 x 10 ³)	380 (5.38 x 10 ³)	4.6 x 10 ³ (6.5 x 10 ³)	1.4 x 10 ³ (1.9 x 10 ³)
Motor Inertia g-cm ² (oz-in-s ²)	18 (2.5 x 10 ⁻⁴)	8 (1.1 x 10 ⁻⁴)	74 (1.04 x 10 ⁻³)	36 (5.09 x 10 ⁻⁴)	3.6 x 10 ² (5.09 x 10 ⁻³)	1.0 x 10 ² (1.4 x 10 ⁻³)
Encoder	Incremental magnetic encoder (50,000 pulses per rotation)					
Control Method	Closed loop vector control					
Input Supply Voltage	DC24V±10%					
Input Supply Current Rated (Continuous Torque/Rated Peak Torque)	1.2A/1.5A	0.8A/1.0A	1.5A/1.8A	0.8A/1.0A	2.6A/3.4A	3.9A/5.1A
Resolution Pulse Rotation (Pulse/Rotation)	200, 400, 500, 1000(default), 2000, 2500, 5000, 10000, 25000,50000, Select by parameter					
Environmental Conditions Operating/Storage Temperature	between 0 °C and 40°C/ between -20°C and +60°C					
Operating Humidity	Less than 90% Relative Humidity					
Shock/Vibration	Less than 10G /Less than 1G					

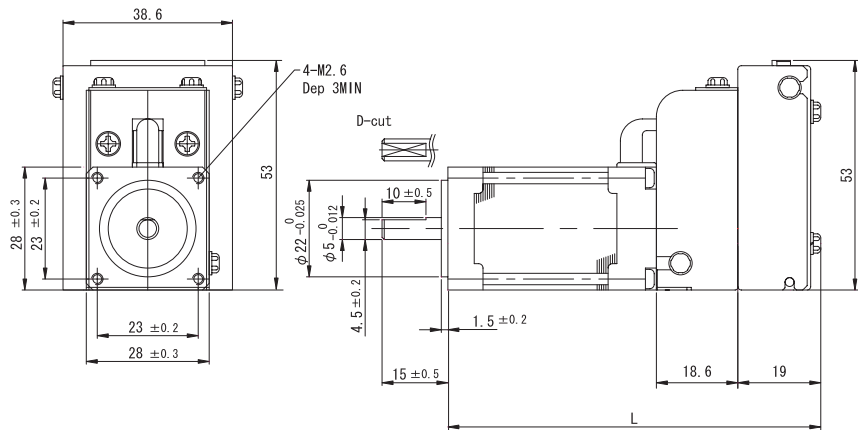
I/O Specifications

SIGNAL	Parameter	MIN.	MAX.	UNIT.
Digital Input 1 & 2	Voltage Range	0	24	Vdc
	Photo-coupled	0	0.8	Vdc
	Sinking/Sourcing	2.4	24	Vdc
	Operating Current	7	15	mA
	<i>f</i>	-	500	KHz
UART 0 & 1 RX/TX	Pulse Width	0.8	-	µs
	Voltage Range	0	5	Vdc
Digital Input 3 & 4	Communications Speed	9600	512000	Kbps
	Voltage Range	0	5	Vdc
Sourcing	Low Level	0	0.8	Vdc
	High Level	2.4	5	Vdc
	Pulse Width	120	-	µs
Analog Functions (IN4)	Hardware A/D Resolution	-	10	bits
	Software Oversampling	-	13	bits
Output 1 & 2	Maximum Voltage	-	24	Vdc
	Current - see note	-	20	mA
5Vdc Output	Voltage Range	4.5	5	Vdc
	Output Current - see note	-	50 *	mA

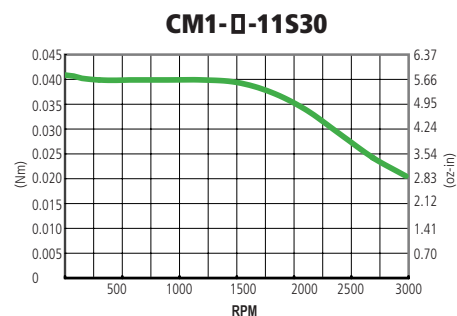
*Note: Combined current draw of O1, O2, IN3, IN4 and 5Vdc source should not exceed 200mA. O1 & O2 should not exceed 50mA each.

CM1 DRAWINGS

■ CM1 - □ - 11S30/11L30 DIMENSIONS (UNIT:mm)

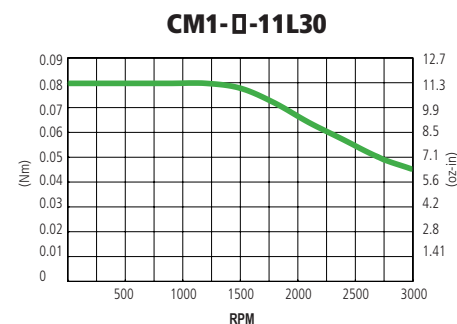
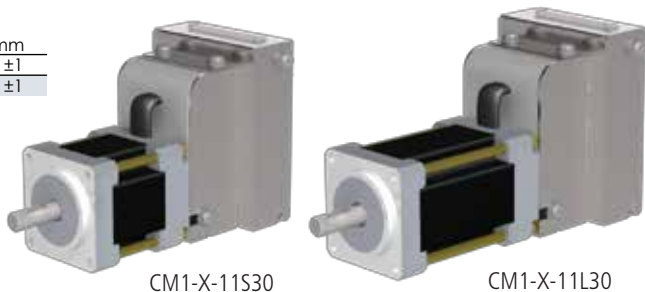


■ Torque Curve

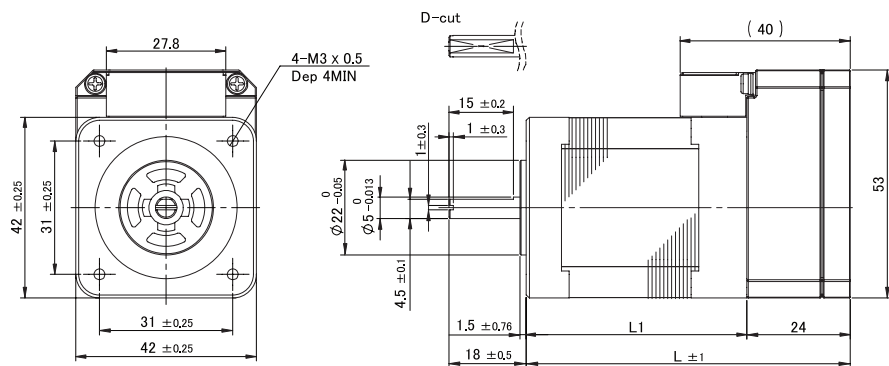


■ Motor Length

MODEL	L mm
CM-X-11L30	85 ± 1
CM-X-11S30	71 ± 1

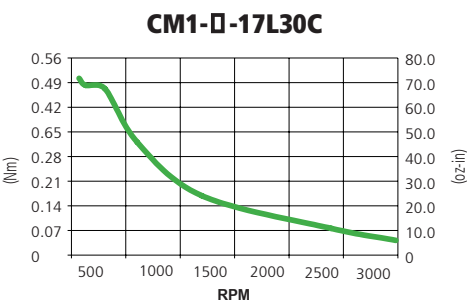
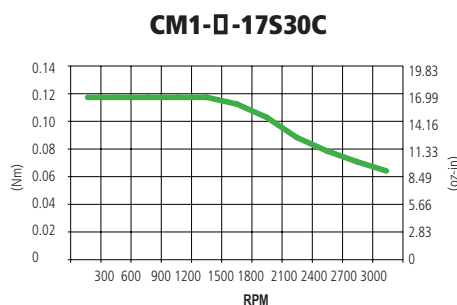


■ CM1 - □ - 17S30C/17L30C DIMENSIONS (UNIT:mm)



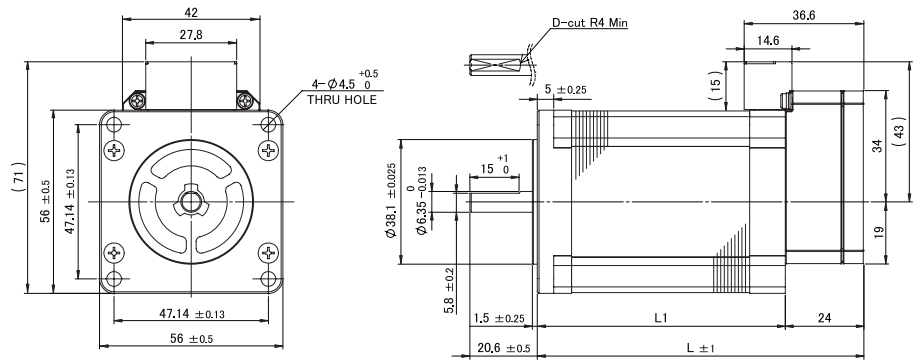
■ Motor Length

MODEL	L inch(mm)
CM-X-17L30C	3 (76.5)
CM-X-17S30C	2.38 (60.5)



CM1 DRAWINGS

CM1 - □ - 23S30C/23L20C DIMENSIONS (UNIT:mm)



MODEL	L inch(mm)
CM-X-23S30C	2.6 (66)
CM-X-23L20C	3.93 (100)

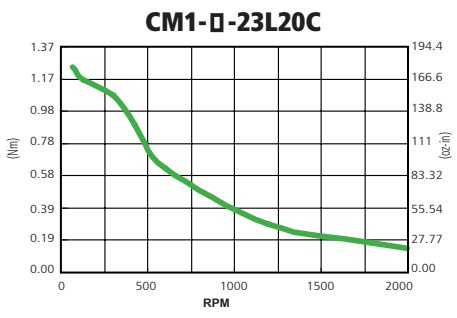
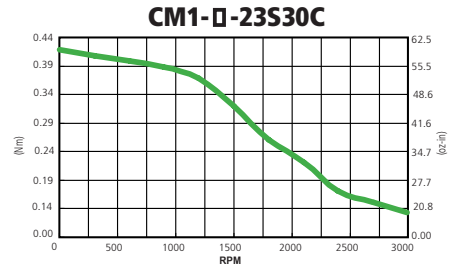


CM1-X-23S30C



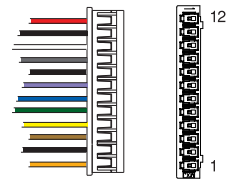
CM1-X-23L20C

Torque Curve



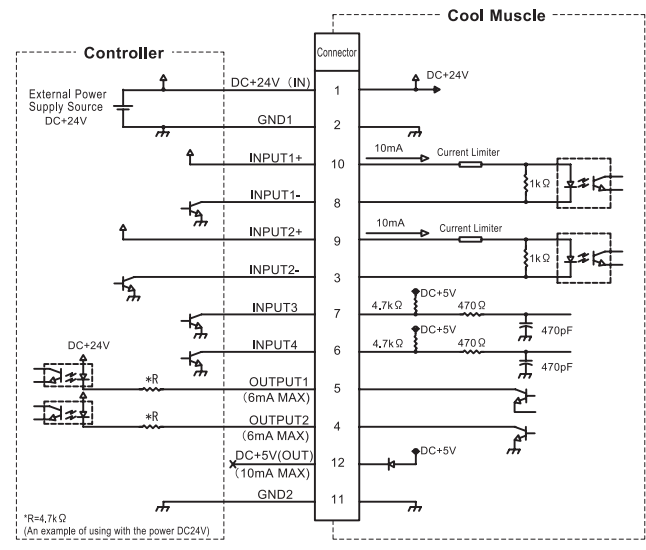
Connector Pin Configurations

Motor Cable Receptacle Housing 51065-1200 (Molex)



No	Wire Color	Function
1	Orange	+24Vdc
2	Black	Power Ground
3	Brown	Input 2-
4	Yellow	Output 2
5	Green	Output 1
6	Blue	Input 4
7	Violet	Input 3
8	Black	Input 1-
9	Grey	Input 2+
10	White	Input 1-
11	Black	Signal 5Vdc Ground
12	Red	+5Vdc Output

Connection Example



CM2 SPECIFICATIONS

Model Name

CM2 - C - 56B 20C - R

Control Type
P ... Pulse Type
C ... Computer Type
R ... Circular Interpolation Type

Motor Size
56 ... 56 □
60 ... 60 □

Motor Output
10 ... 100 W
40 ... 400 W

Hardware Revision
C

Shaft Style
R ... Round shaft
K ... Keyway
D ... D-cut
W ... Double D-cut

Specifications

MODEL	CM2-□-56B10C	CM2-□-56B20C	CM2-□-60A10C	CM2-□-60A20C	CM2-□-60A40C
Input AC Voltage [V]	Single-phase or Three-phase AC100 - 240 ± 10% (Frequency: 50/60Hz ± 5%)		Single-phase or Three-phase AC200 - 240 ± 10% (Frequency: 50/60Hz ± 5%)		
Rated Current[Arms] 100VAC Single Phase (3 Phase)	2.2 (1.3)	3.6 (2.3)	1.9 (1.3)	—	—
Rated Current[Arms] 200VAC Single Phase (3 Phase)	1.2 (0.7)	2.2 (1.6)	1.0 (0.7)	1.6 (1.2)	3.0 (2.4)
Motor Output[W]	100	200	100	200	400
Rated Speed [min ⁻¹]	5,000	6,000	3,000	3,000	3,500
Max. Speed [min ⁻¹]	8,000	8,000	5,000	5,000	5,000
Rated Torque[N·m] (kgf·cm)	0.19 (1.95)	0.32(3.25)	0.32 (3.25)	0.64 (6.5)	1.09 (11.1)
Max.Torque[N·m] (kgf·cm)	0.57 (5.85)	1.15 (11.7)	0.95 (9.7)	1.191 (19.5)	3.82 (39)
Rotor Inertia Moment (kg·m ²)	0.091 x 10 ⁻⁴	0.18 x 10 ⁻⁴	0.09 x 10 ⁻⁴	0.18 x 10 ⁻⁴	0.34 x 10 ⁻⁴
Allowable Inertia Moment of Load	Less than 10 times of Rotor Inertia				
Allowable Radial Load[N·m] (kgf·cm) 20mm off from the mounting surface	58.8(6)	58.8(6)	196(20)	196(20)	196(20)
Allowable Thrust Load[N·m] (kgf·cm)	29.4(3)	29.4(3)	68.6(7)	68.6(7)	68.6(7)
Encoder	Incremental Magnetic Encoder				
Resolution (ppr)	From 200 to 50,000 set by parameter				
Control Method	Closed Loop Sinusoidal Vector Control				
Memory Capacity	Number of Program banks / Ladder Logic banks : Each up to 30				
	Number of Commands : Up to 1000				
	Number of data : Position 200/ Speed 15/Acceleration 8/Timer 8/Torque limit 8/General variable 15				
Protective Functions	Position error overflow, over voltage, overload, temperature error, push motion error, emergency stop				
I/O	Control Input Digital Input : 6 (including pulse Input 2), Analog Input : 1				
	Control Output Digital Output : 4, Analog Output : 1				
	Communication port Host and Slave communications 2 port. Conforming to RS-232C.				
Cooling Method	Passive Air Cooled				
Mass[kg]	1.2	1.7	1.1	1.3	2.0
Environment	Operating Temperature 0 - +40°C (non-freezing)				
	Storage Temperature -20 - +60°C (non-freezing)				
	Operating/ Storage Humidity 90% relative humidity or less (non-freezing, non-condensing)				
	Atmosphere Indoor use only (no direct sunlight). No corrosive gas, inflammable gas, oil or dust.				
	Altitude 1,000m above sea level or lower				
	Shock 10G (98m/s ²) or less				
	Vibration 1G (9.8m/s ²) or less				

CM2 SPECIFICATIONS

I/O Specifications

All ratings at 25 degrees C ambient air temperature unless otherwise noted.

ITEMS		CONDITIONS	MIN.	TYP.	MAX.	UNIT
Digital Input 1 (IN1+ - IN1-/IN2+ - IN2-) *1	Applied voltage	IN1+ - IN1-, IN2+ - IN2-	0	-	24	V
	Lower-level input voltage		0	-	0.8	
	High-level input voltage		3	-	24	
	Pulse input frequency		-	-	500	KHz
	Input pulse width		0.8	-	-	μ s
	Input pulse rise/fall time		-	-	0.1	μ s
Digital Input 2 (IN3,4,5,6/INCOM) *2	Applied voltage	IN3,4,5,6 - INCOM	0	-	24	V
	Low-level input voltage		0	-	0.8	
	High-level input voltage		3	-	24	
Analog Input (ANALOG IN)	Input voltage	ANALOG IN - GND	0	-	5	V
	Operating voltage	Position control or Speed control (one direction)	0.2	-	4.8	
		Torque control or Torque feedback control	0.2	-	4.8	
		Speed control (CW direction)	2.6	-	4.8	
		Speed control (CCW direction)	0.2	-	2.4	
Digital Output (OUT1,2,3,4/OUTCOM) *3	Withstand voltage	OUT1,2,3,4 - OUTCOM	-	-	30	V
	Continuous load current		-	-	20	mA
	OFF AE Leak current		-	0.1	1	nA
Analog Output (ANALOG OUT)	Output voltage	ANALOG OUT - GND	1	-	4	V
	Output current		-	-	7	mA
+5V Output (+5VOUT)	Output voltage	+5V - GND	4.5	5	5.5	V
	Output current		-	-	200	mA
Communication Line (RXD0/TXD0) (RXD1/TXD1)	Baud rate	RXD0,RXD1 - GND	9.6	-	230.4	Kbps
	Input voltage		-25	-	25	V
	Positive-going input threshold voltage		-	1.8	2.4	
	Negative-going input threshold voltage		0.8	1.5	-	
	Input resistance	3	5	7	K Ω	
	Output voltage (MAX)	TXD0,TXD1 - GND	-13.2	-	13.2	V
	Output voltage swing range		\pm 5	\pm 5.4	-	

*1 The polarity of input voltage for IN1+(IN2+) is plus(+) to IN1-(IN2-).

As each input (IN1-, IN2-) is equipped with current regulative diode, the input current can be 8 - 12 mA.

*2 Plus or minus polarity is acceptable for the input voltage between IN3,4,5,6 and INCOM.

Each input (IN3,4,5,6) is equipped with resistor 10K Ω in series.

*3 Plus or minus polarity is acceptable for the applied voltage between OUT1,2,3,4 and OUTCOM.

Each output (OUT1,2,3,4) is equipped with resistor 1K Ω in series.

CM2 SPECIFICATIONS

Signal Arrangements

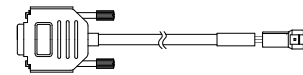
Name		Connector		Function	
Power Supply Connector		1	R / L1	3 phase AC input / Single phase AC	
		2	S	3 phase AC input	
		3	T / L2	3 phase AC input / Single phase AC	
		4	E	Protective Earth	
Communication Connector	Host Connector	1	RXD0	RS-232C Receive Data from Host	
		2	TXD0	RS-232C Transmit Data from Host	
		3	GND	Communication GND	
	Slave Connector	1	TXD1	RS-232C Transmit Data to Slave	
		2	RXD1	RS-232C Receive Data to Slave	
		3	GND	Signal GND	
I/O Connector		1	+5V	+5V Output (0.2A max)	
		2	INPUT1+	Digital Input1+ : CW+ : pulse+ :	
		3	INPUT1-	Digital Input1- : CW- : pulse+ :	
		4	INPUT2+	Digital Input2+ : CCW+ : Direction+ :	
		5	INPUT2-	Digital Input2- : CCW- : Direction- :	
		6	INPUT3	Digital Input3	
		7	INPUT4	Digital Input4	
		8	INPUT5	Digital Input5	
		9	INPUT6	Digital Input6	
		10	INPUT COM	Common for Digital Input3,4,5,6	
		11	OUTPUT1	Digital Output1	
		12	OUTPUT2	Digital Output2	
		13	OUTPUT3	Digital Output3	
		14	OUTPUT4	Digital Output4	
		15	OUTPUT COM	Common for Digital Output1,2,3,4	
		16	ANALOG IN	Analog Input	
		17	ANALOG OUT	Analog Output	
		18	N.C.	-	
		19	GND	Signal Ground	
		20	GND	Signal Ground	

Cable Option

- Serial Communications Cable
CM2RS2-2000W: DB9, 2m, RS232
- I/O Cable
CM2IO2-2000S: 20 wire, 2m, all I/O
- Power Cable
CM2PW2-2000S: 1 or 3 phase power
- Daisy Chain Network Cable
CM2DC2-2000W: motor to motor network
- USB Communications Cable
CM2US2-1800W: USB, 1.8m

Cable Part Description

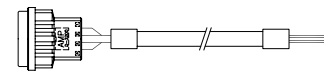
CM2RS2 - 2000W
 CM2 motor | RS232 | Length in mm | S Single ended | W Double ended



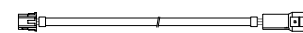
CM2IO2 - 2000S
 I/O



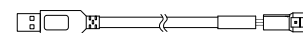
CM2PW2 - 2000S
 Power



CM2DC2 - 2000W
 Daisy Chain Network



CM2US2 - 1800W
 CM2 motor | USB | Length in mm | W Double ended

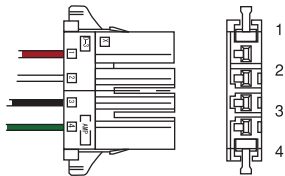


Cable	Interface	Max. Length	Connector	# of Conductors	AWG
CM2US2	USB	1.8m	JST XARR-03VF / USB	4	26
CM2IO2	I/O	5m	JST XADR-20V	20	26
CM2RS2	RS-232	5m	JST XARR-03VF / DB9 F	3	26
CM2PW2	Power	5m	AMP 1-179552-4	4	18
CM2DC2	Daisy Chain	5m	JST XAP-03V-1 / XARR-03VF	3	26

CM2 SPECIFICATIONS

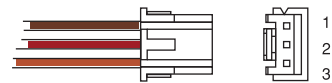
Motor Side Connector Pin Configuration

Power Receptacle



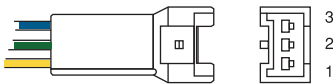
No	Wire Color	Function
1	Red	R / L1 3 phase AC input / Single phase AC
2	White	S 3 phase AC input
3	Black	T / L2 3 phase AC input / Single phase AC
4	Green	E Protective Earth

Communications Connectors



No	Wire Color	Function
1	Brown	RXD0 RS-232C Motor Receive Data
2	Red	TXD0 RS-232C Motor Transmit Data
3	Orange	GND Communication GND

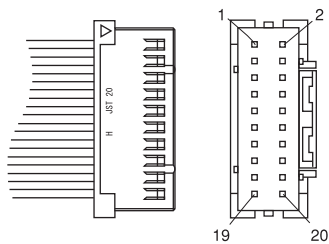
Host Connector XAP-03V-1 (JST)



3	Blue	GND Communication GND
2	Green	RXD1 RS-232C Motor Receive Data
1	Yellow	TXD1 RS-232C Motor Transmit Data

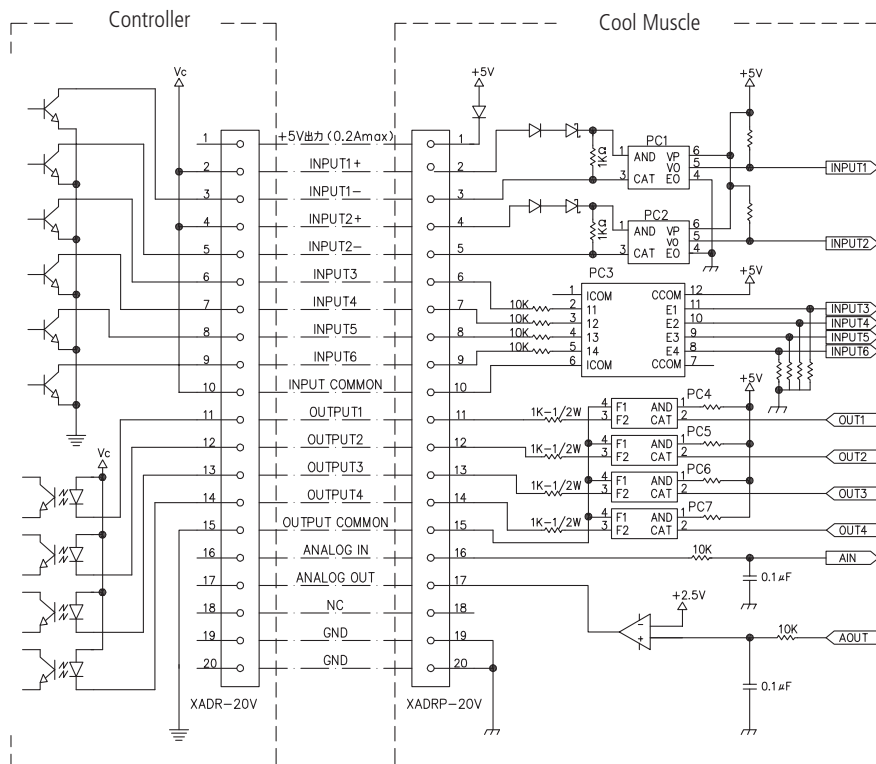
Secondary Connector XARR-03VF (JST)

I/O Receptacle XADRP-20V (JST)



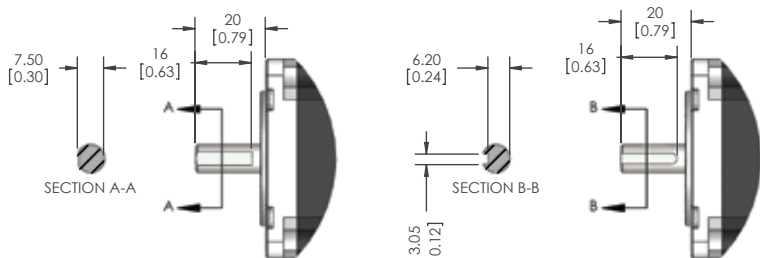
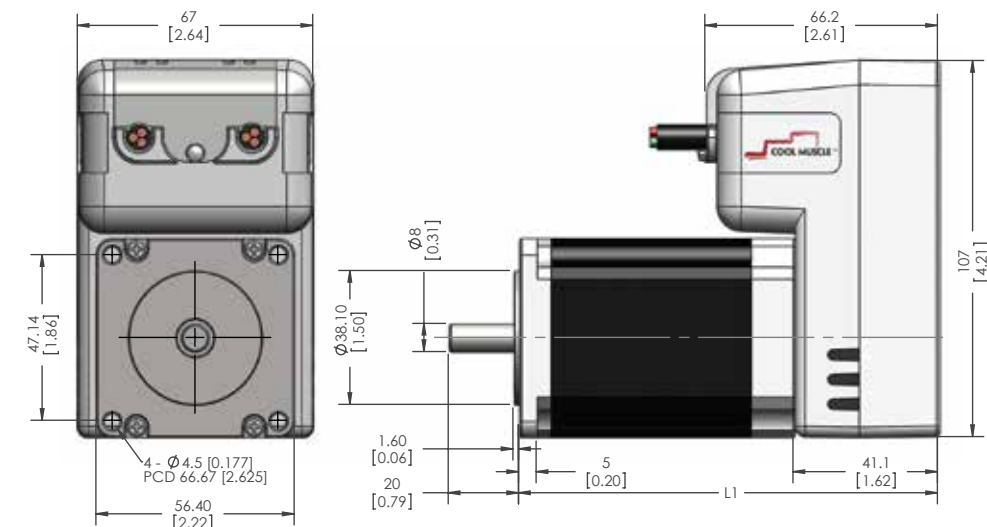
No	Wire Color	Function	No	Wire Color	Function
1	Brown	+5V +5V Output (0.2A max)	2	Red	INPUT1+ Digital Input1+ / Step+
3	Orange	INPUT1- Digital Input1- / Step-	4	Yellow	INPUT2+ Digital Input2+ / Direction+
5	Green	INPUT2- Digital Input2- / Direction-	6	Blue	IINPUT3 Digital Input 3
7	Purple	IINPUT4 Digital Input 4	8	Gray	IINPUT5 Digital Input 5
9	White	INPUT6 Digital Input 6	10	Black	INPUT COM Common for Input 3,4,5,6
11	Brown	OUTPUT1 Digital Output 1	12	Red	OUTPUT2 Digital Output 2
13	Orange	OUTPUT3 Digital Output 3	14	Yellow	OUTPUT4 Digital Output 4
15	Green	OUTPUT COM Common for Output1,2,3,4	16	Blue	ANALOG IN Analog Input
17	Purple	ANALOG OUT Analog Output	18	Gray	
19	White	GND Signal Ground	20	Black	GND Signal Ground

Connection Example



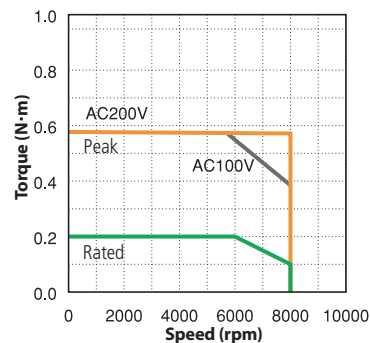
CM2 SPECIFICATIONS

■ CM2 -□ - 56B10C / CM2 -□ - 56B20C Dimensions UNIT:mm (inch)

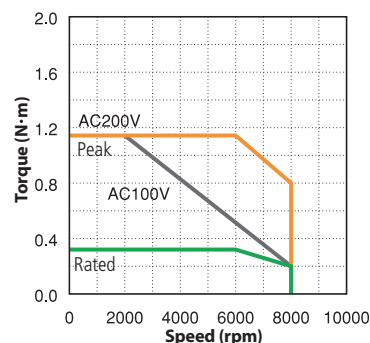


■ Torque Curves

CM2-□-56B10C (100W)



CM2-□-56B20C (200W)



■ Motor Lengths

Model Name	L1
CM2-□-56B10C	93.2 (3.67)
CM2-□-56B20C	119.2 (4.69)



CM2-□-56B10C



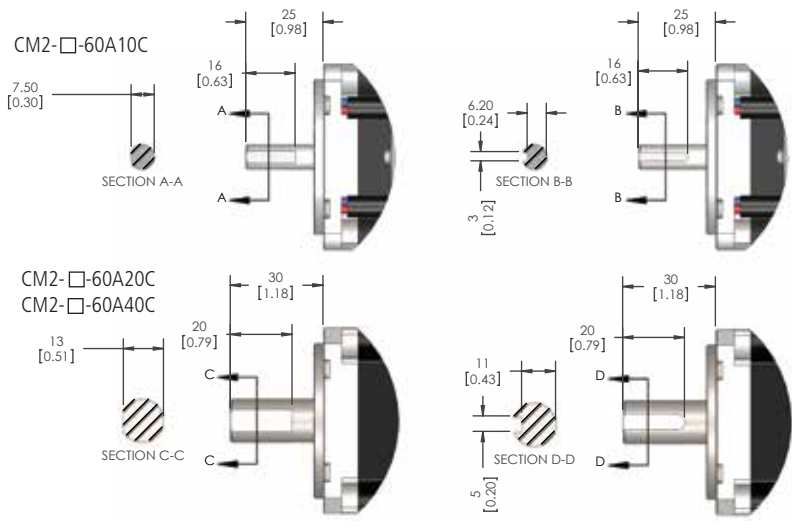
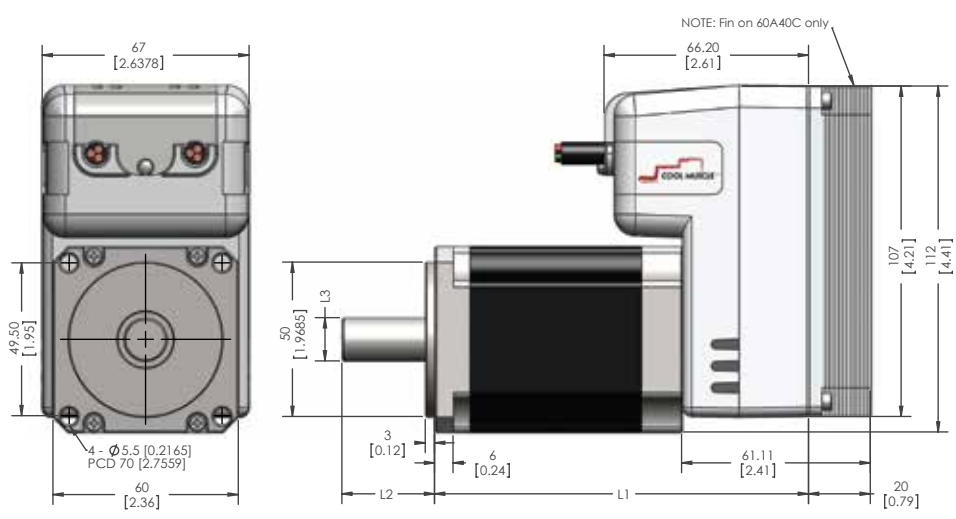
CM2-□-56B20C



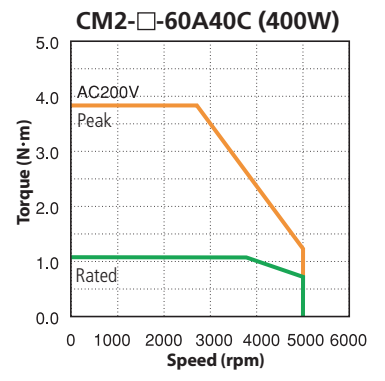
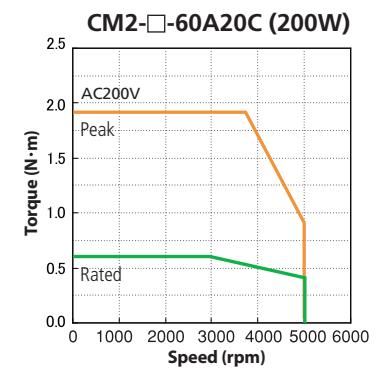
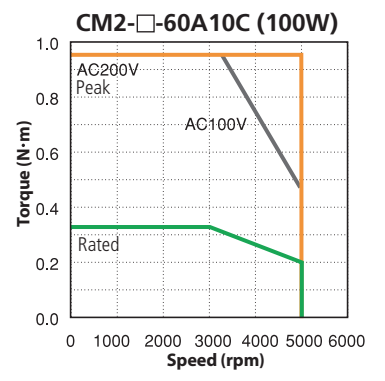
The CM2 56 frame size servo system is designed for high speed applications such as rapid traverse systems in pick and place robots. The 56mm frame size is similar to the NEMA 23 standard, but has an 8mmOD shaft to accommodate the higher wattage capabilities of these AC servos. Myostat provides shaft couplings, linear actuators, and gearheads matched to this motor system.

CM2 DIMENSIONS

■ CM2 -□- 60A10C, 60A20C, 60A40C Dimensions UNIT: mm (inch)



■ Torque Curves



■ Motor Lengths

Model Name	L1	L2	L3
CM2-□-60A10C	88.1 (3.47)	25 (0.98)	Ø8
CM2-□-60A20C	99.1 (3.90)	30 (1.18)	Ø14
CM2-□-60A40C with heat radiation fin	141.1 (5.56)	30 (1.18)	Ø14



CM2-□-60A10C



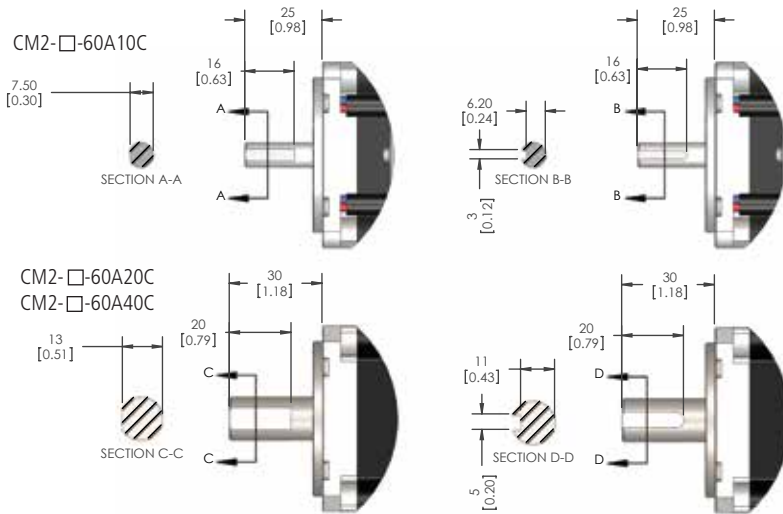
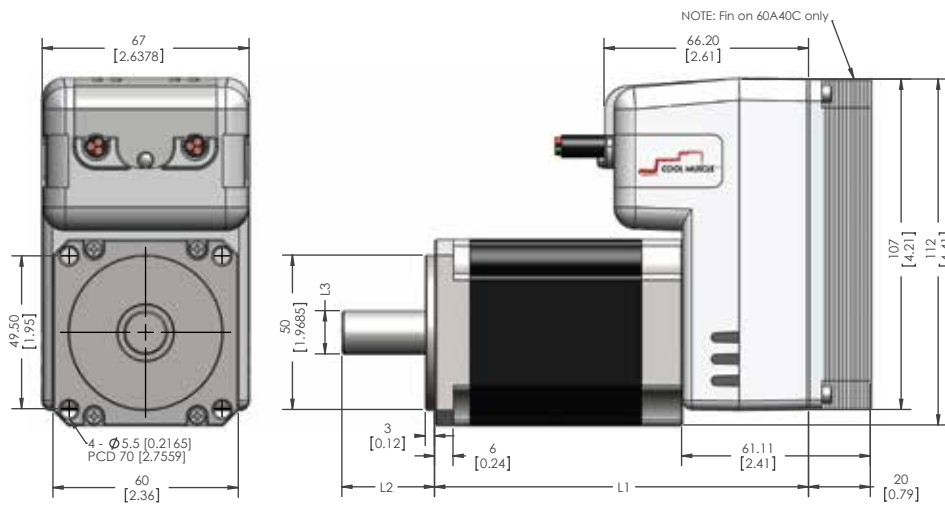
CM2-□-60A20C



CM2-□-60A40C

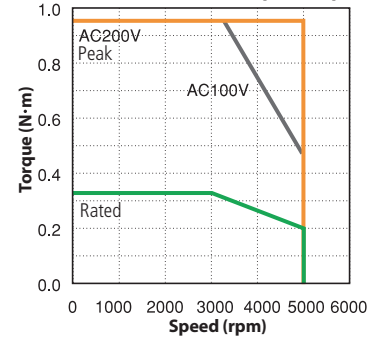
CM2 DIMENSIONS

CM2 -□- 60A10C, 60A20C, 60A40C Dimensions UNIT: mm (inch)

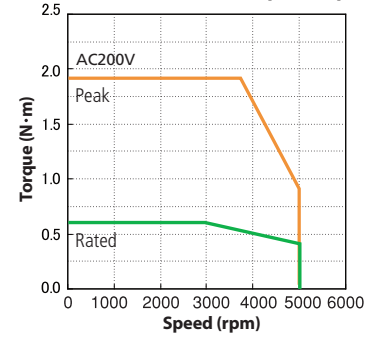


Torque Curves

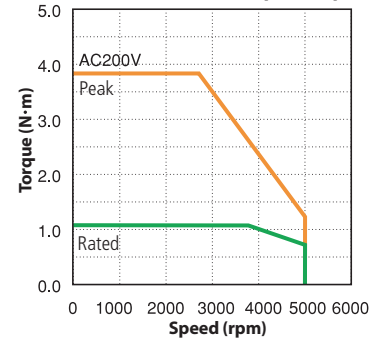
CM2-□-60A10C (100W)



CM2-□-60A20C (200W)



CM2-□-60A40C (400W)



Motor Lengths

Model Name	L1	L2	L3
CM2-□-60A10C	88.1 (3.47)	25 (0.98)	Ø8
CM2-□-60A20C	99.1 (3.90)	30 (1.18)	Ø14
CM2-□-60A40C with heat radiation fin	141.1 (5.56)	30 (1.18)	Ø14



CM2-□-60A10C



CM2-□-60A20C



CM2-□-60A40C

LX Series In-Line Gearbox

Model Name

LX-060-010-17608

Series
LX

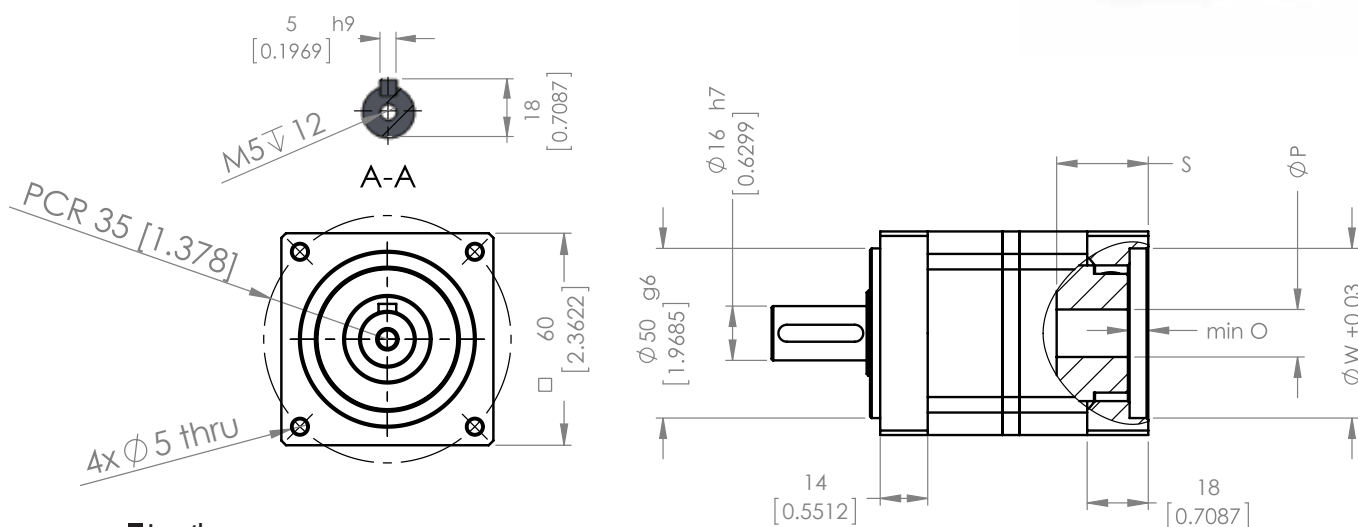
Body Size
042 ... 42mm
060 ... 60mm
090 ... 90mm

Ratio
003 ... 3:1
~
100 ... 100:1

Motor Mount
17608 ... CM1-X-23XXX
~
17610 ... CM2-X-56BXX



LX-060-003-01917 in-line planetary gearbox Dimensions (UNIT:mm [inch])



Lengths

Ratios	L
3:1 to 10:1	78 [3.07]
12:1 to 100:1	102.5 [4.35]

Flange Options

Cool Muscle Model	Input Flange
CM1-X-23XXX	-17608
CM2-X-56BXX	-17610
CM2-X-60A10A	-01910
CM2-X-60A40C	-01917
Right angle combinations available	

Operational Specifications

LX-060 Model	
Backlash	6arcmin
Radial Load	500N
Axial Load	600N
Torsional Stiffness	3Nm/arcmin
Service Life	10000hrs



Gearbox Performance

All gearboxes are pre-matched for Cool Muscle servos. Torque and speed output specifications are dependant on the matched motor. The LS Series gearbox operates at a 95% efficiency rating for the single stage model and 90% for the double stage model. These values can be used to calculate the final torque output of the combined motor + gearbox combination.

Gearbox backlash is measured at 6arc/min for single stage units and 10 arc/min for double stage units. All gear boxes are sealed for use in any orientation and rated to IP65.

40mm, 60mm, and 90mm frame sizes are available to fit NEMA 17 to 34 or 40mm to 90mm motor frame sizes.

CAD files with full dimensions for each size are available at www.myostat.ca



With ratios of 20:1 or greater, please use the LX-090 size gearbox with the CM2-X-60A40C.

R Series Right Angle Gearbox

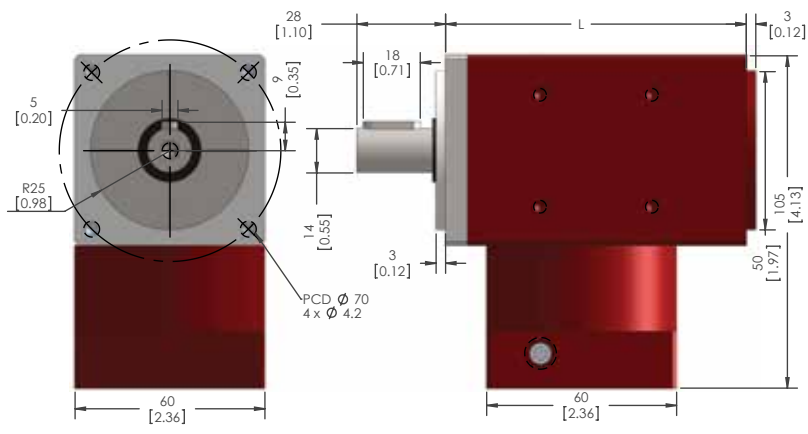
■ Model Name

RLAS-060-005-17608

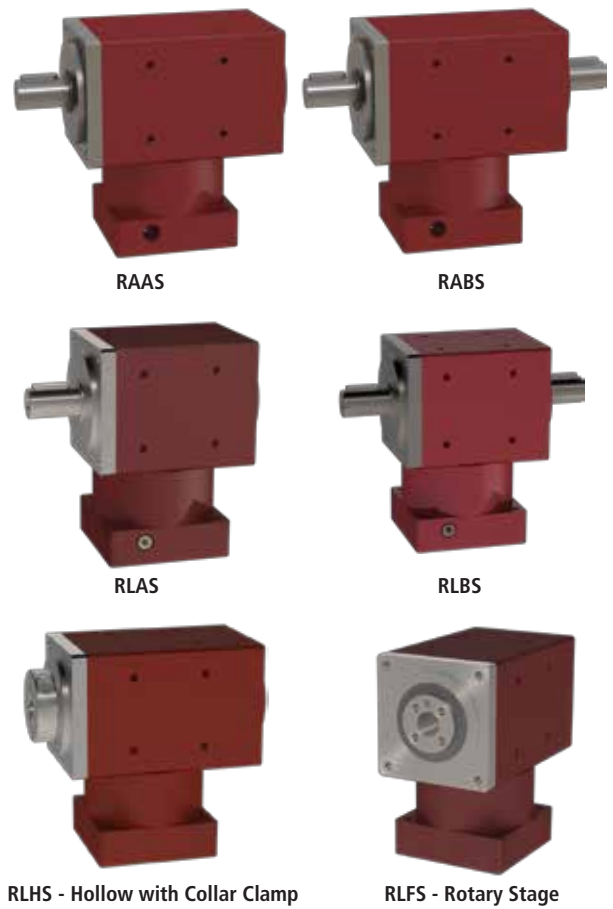
Series RAAS RABS ~ RAHS RLFS	Body Size 042 ... 42mm 060 ... 60mm 090 ... 90mm	Ratio 001 ... 1:1 ~ 005... 5:1	Motor Mount 17608 ... CM1-X-23XXX ~ 17610 ... CM2-X-56BXX
---------------------------------------	---	---	--



■ R-060 right angle gearbox Dimensions (UNIT:mm [inch])



■ Model Variations



■ Flange Options

Cool Muscle Model	Input Flange
CM1-X-23XXX	-17608
CM2-X-56BXX	-17610
CM2-X-60A10C	-01910
CM2-X-60A40C	-01917

Specific CAD files are available from www.coolmuscle.com

■ Lengths

Model	Ratios	L
Single / Dual Output		mm [inch]
RAAS / RABS	1:1~5:1	95 [3.74]
RLAS / RLBS	2:1~5:1	76 [2.99]
RAHS / RAPS	1:1~5:1	95 [3.74]
RLHS / RLPS	2:1~5:1	76 [2.99]
RLFS	2:1~5:1	76 [2.99]



Gearbox Performance

The R Series gearbox operates at a 95% efficiency rating, using helical bevel gears. Gearbox backlash is measured at 6arc/min. Each model is offered in both single and dual output variations. Customizations to both the motor input flange and the gearbox output are available.

Please contact Myostat Motion Control Inc. for additional technical information.



As an alternative, HY Hypoid right angle gearbox provides 5:1, 10:1, and 20:1 ratios in a small space envelope. The HY Gearbox can be supplied on its own, or with a matching motor.

Shaft Couplings

■ PRODUCT NAME - RELI-A-FLEX®

RCSA20C - 8 - 5

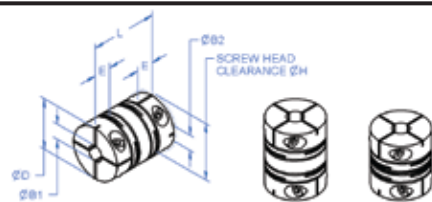
Basic Part #
Long
Short

Aluminium

Outside
Diameter

C: Clamp
S: Set Screw
G: Reli-a-Grip®

Bore size
Ø B1-B2



(Reli-a-Grip® option shown)

RCL (Long) RCS (Short)

■ Bore sizes and dimensions (mm - Imperial sizes available) * Not all sizes shown, Diameters from 6mm to 40mm available.

Basic Part #	Material	Size	Standard bore sizes B1 and B2		O/D ØD	Ø H	Length L	Hub Length E	Fitted Screw
			Bore tolerance +0.020/-0.00						
RCS (Short)	A (Aluminium)	13C	3 4 5 6		13.0	14.5	16.8	5.0	M1.6
		16C	3 4 5 6 8		16.0	18.0	17.5	5.9	M2
		20C	4 5 6 8 10		20.0	21.8	21.5	6.6	M2.5
		25C	5 6 8 10 12		25.0	26.9	25.8	7.6	M3
RCL (Long)		13C	3 4 5 6		13.0	14.5	20.0	5.0	M1.6
		16C	3 4 5 6 8		16.0	18.0	23.5	5.9	M2
		20C	4 5 6 8 10		20.0	21.8	26.0	6.6	M2.5
		25C	5 6 8 10 12		25.0	25.0	34.0	7.6	M3

■ Technical Specifications

Basic Part #	Material	Size	Torsional Stiffness mNm/arc min	Radial Compliance microns/N	Misalignment			Max Mass g
					Parallel mm	Angular deg	Axial mm	
RCS (Short)	A (Aluminium)	13C	13C	29.2	0.08	2.5	±0.30	4.4
		16C	16C	28.9	0.10	2.5	±0.40	8.6
		20C	20C	23.4	0.12	3.0	±0.50	14.9
		25C	25C	20.0	0.16	3.0	±0.70	27.5
RCL (Long)		13C	13C	64.3	0.15	2.5	±0.30	5.5
		16C	16C	65.1	0.20	2.5	±0.40	10.6
		20C	20C	62.0	0.25	3.0	±0.50	18.7
		25C	25C	82.2	0.40	3.0	±0.70	38.5

■ Torque and Speed Capacity

Basic Part #	Material	Size	Typical Torque Capacity			
			Reversing (Nm)	Non Rev (Nm)	Peak (Nm)	Max Speed
RCS (Short)	A (Aluminium)	13C (13G)	0.35 (0.45)	0.55 (0.60)	0.50 (0.70)	12000
		16C (16G)	0.55 (0.75)	0.85 (1.15)	1.25 (1.65)	10000
RCL (Long)		20C (20G)	0.95 (1.30)	1.45 (1.95)	2.45 (3.25)	7500
		25C (25G)	1.55 (2.05)	2.35 (3.10)	3.90 (5.20)	5000

Specifications vary according to bore size. Please enquire. Reli-a-Flex is a registered trademark of Reliance Precision Limited

■ Reli-a-Grip Clamp Option

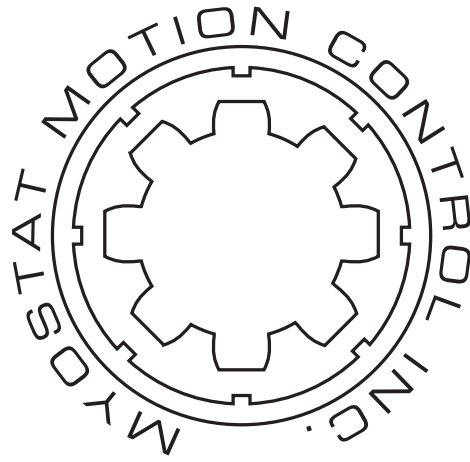
Unique Clamp Provides Stronger Shaft Grip And Higher Allowable Torque Transfer.

Aluminium alloy grade 7075-T6.

Alocrom 1000 surface finish.

Standard bore tolerance +0.020/0.000mm.





Myostat Motion Control Inc.

17817 Leslie Street, Unit 21

Newmarket Ontario Canada L3Y 8C6

Tel: +1 905-836-4441

info@coolmuscle.com

www.coolmuscle.com



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