

rotork®

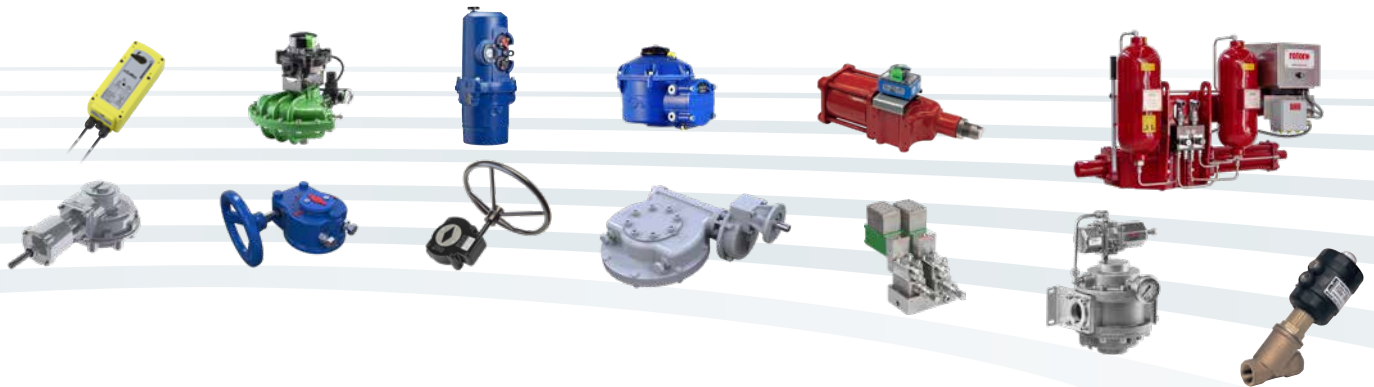
Keeping the World Flowing
for Future Generations

CMA Range



Linear, Part-Turn and Multi-Turn Control Valve Actuators

Reliability in critical flow control applications



Reliable operation when it matters

Assured reliability for critical applications and environments. Whether used infrequently or continuously, Rotork products will operate reliably and efficiently.

Quality-driven global manufacturing

We offer products that have been designed with over 60 years of industry and application knowledge.

Our research and development ensures cutting edge products are available for multiple applications across multiple industries.

Customer focused service and worldwide support

Rotork solve customer challenges and develop new solutions that are tailored to the needs of our clients.

We offer dedicated, expert service and support from initial inquiry, to product installation, to long term after sales care.

Low cost of ownership

Long-term reliability prolongs service life.

Rotork helps to reduce long term cost of ownership and provides greater efficiency to process and plant.

CMA Range

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Comprehensive product range serving multiple industries

Rotork products offer improved efficiency, assured safety and environmental protection across sectors such as the Power, Oil & Gas, Water & Wastewater, HVAC, Marine, Mining, Pulp & Paper, Food & Beverage, Pharmaceutical and Chemical sectors.

Market leaders and technical innovators

We have been the recognised market leader in flow control for over 60 years.

Our customers rely upon Rotork for innovative solutions to safely manage the flow of liquids, gases and powders.

Global presence, local service

We are a global company with local support.

Manufacturing sites, service centres and sales offices throughout the world provide unrivalled customer services, fast delivery and ongoing, accessible support.

Corporate social responsibility is at the heart of our business

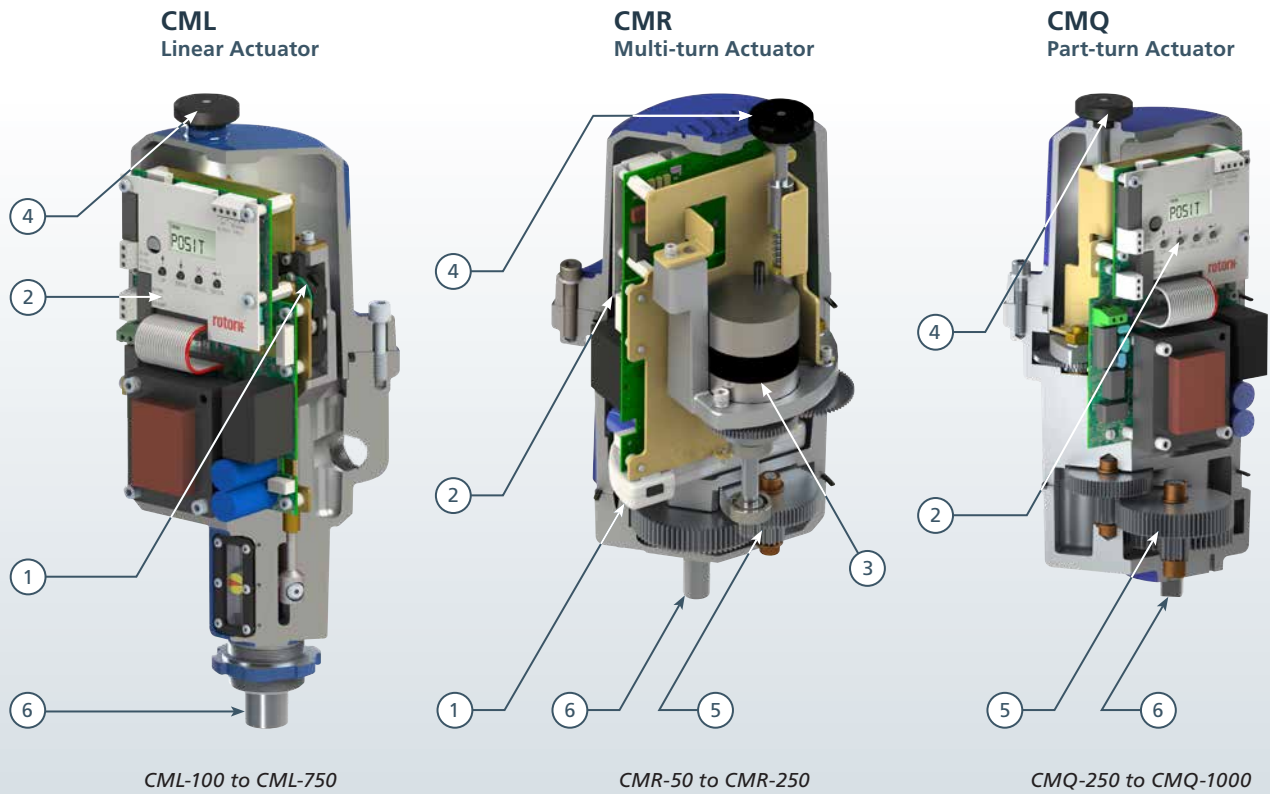
We are socially, ethically and environmentally responsible and committed to embedding CSR across all our processes and ways of working.

Compact modulating actuators for **precise position control** and modulation applications

- › Accurate and repeatable position control with up to 0.1% accuracy
- › Explosionproof to international standards
- › Optional Reserve Power Pack (RPP) for fail-to-position functionality
- › Adjustable speed control
- › All electric solution for linear, part-turn and multi-turn control valve and pump applications
- › Encoder technology for dependable position measurement
- › Suitable for mounting in any orientation
- › Zero stick slip during operation
- › Suitable for 1-phase or DC power supplies
- › Built-in HMI allows for quick and simple setup
- › Permanently lubricated, maintenance-free drive train
- › Less than 1 watt standby power
- › Brushless DC motor for reliable, accurate, S9 / Class D continuous modulation capability
- › Optional integral local controls and positional display
- › Compatible with a wide variety of fieldbus, hardwired and analogue site systems



Advanced Engineering – CMA Range Standard Unit



1 Encoder Technology

The CMA utilises absolute encoder technology where a unique digital code corresponds to the angular position (CMQ), stroke length (CML) or multi-turn (CMR) position of the actuator.

The sensor is 12-bit for part-turn and linear actuators and 10-bit for multi-turn actuators. The sensor is installed on the final output drive, removing any internal backlash effect that may exist in the drive train.

2 User Interface

Two programmable relays offer discrete digital indication for a number of different conditions. Contact form is configurable to make or break the content when active.

Field selectable adjustments for:

- Deadband
- Zero and span
- Command signal type
- Standard or reverse acting
- Manual-auto operation
- Fail-to-position on loss of signal capability

3 DC Brushless Motor

The CMA uses a high efficiency, continuous rated, brushless DC motor allowing for maintenance-free, S9 / Class D continuous modulation duty.

4 Hand Drive

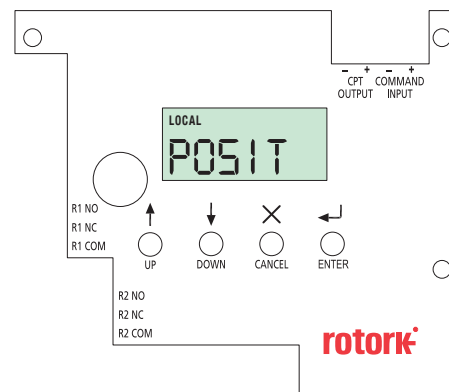
A hand drive mechanism is provided as standard for all CMA actuators to allow manual operation of the valve. Pressing down on the hand-knob shaft engages a gear in the upper section of the drive train and releasing the knob causes the spring to disengage the gear.

5 Geartrain

The simple yet durable, efficient spur gear drive train is lubricated for life with proven high reliability.

6 Output Drive

The CMQ base conforms to MSS SP-101 or ISO 5211. CML and CMR may be adapted to suit individual valves.



Advanced Engineering – CMA Range Options

CML
Linear Actuator



CMQ
Part-turn Actuator



Section view showing Local Controls and Reserve Power Pack (RPP) options

Optional Local Controls - CML, CMQ & CMR

The CMA range of linear, part-turn and multi-turn actuators can be provided with integral local control selectors and an LED backlit display for clear valve position indication.

The local controls option includes the following features:

- **Linear, part-turn or multi-turn control** with continuous indication of valve position in 0.1% increments
- **Large, easy-to-read screen** with icons for fast diagnostic feedback
- **Vivid display** showing actuator position, critical and non-critical fault symbols
- **Valve position** as a percentage of set valve travel (e.g. 100% = Open)
- **Control selection knobs** provide Local, Stop or Remote operation mode selection and Open or Close input commands for position adjustment in local control mode
- **Unauthorised operation** can be prevented by locking the selector latch in place with a padlock

Optional Reserve Power Pack (RPP) - CML & CMQ

This option includes all the benefits of the local controls option with the addition of fail-to-position functionality:

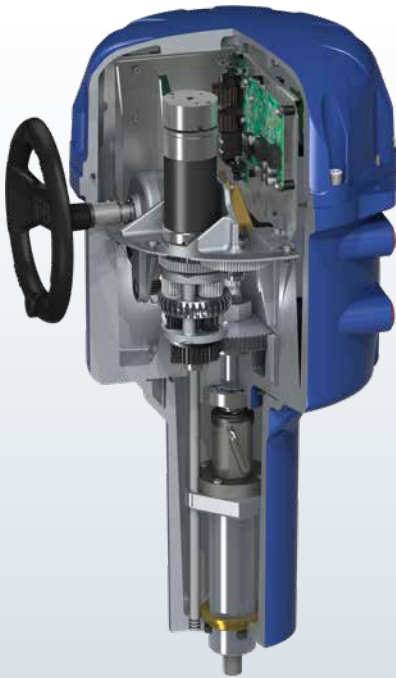
- **Linear or part-turn control** with continuous indication of valve position even during power loss
- **Reserve Power Pack (RPP)** provides the actuator with enough stored energy to perform a predetermined action on mains power failure
- **Vivid display** showing position, fault and RPP status
- **Super capacitor technology** ensures reliability as they are not susceptible to the damaging effects of repeat partial charging / discharging
- **Power loss action** is easily configured via the standard CMA Human Machine Interface (HMI)



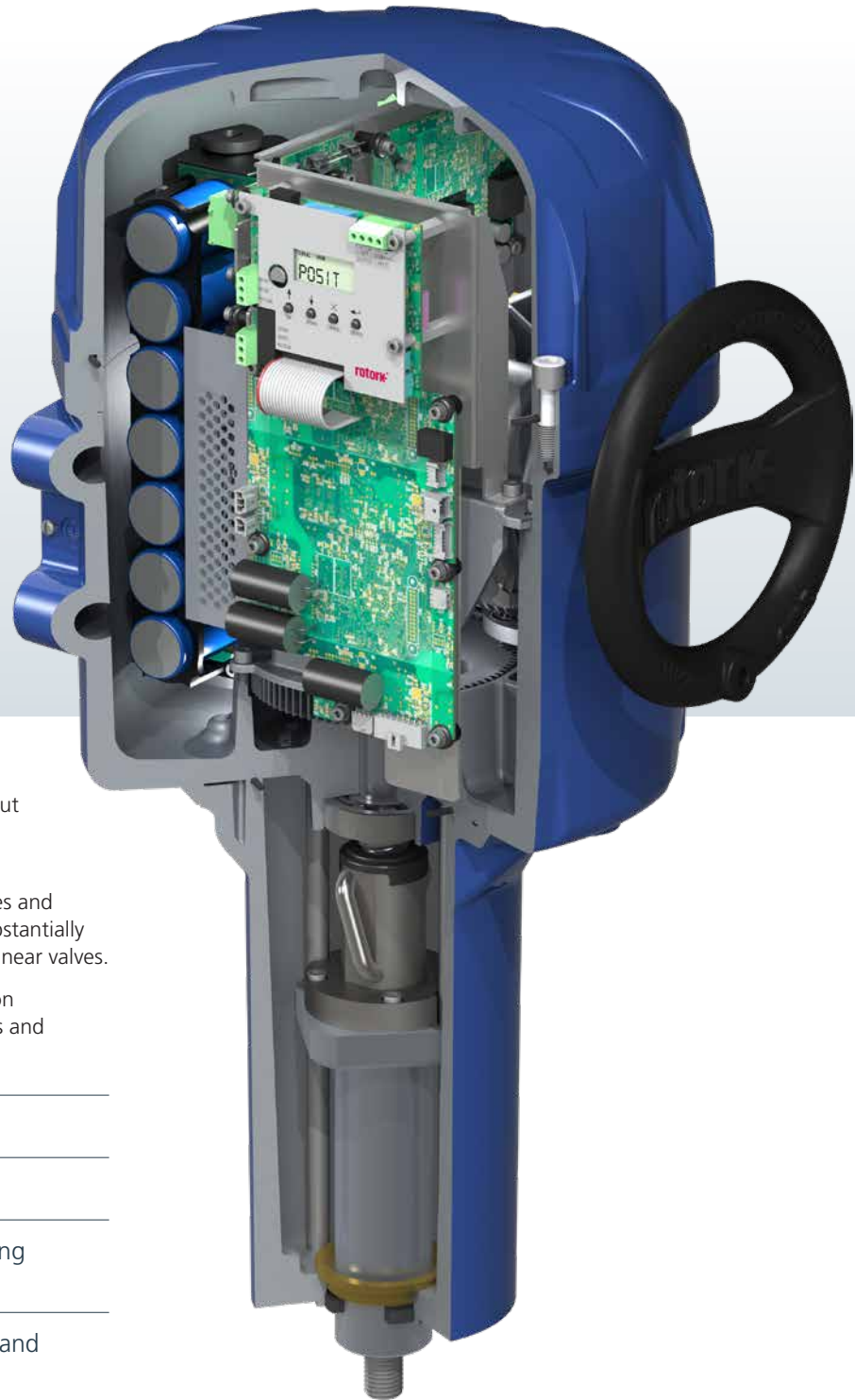
Padlockable

Advanced Engineering – CMA Range Extension

CML Linear Actuator



CML-1500 to CML-3000



Increased Linear Actuator Performance

CML-1500 and CML-3000 deliver increased thrust output and stroke length to enable the electric automation of larger control valves with higher pressure ratings.

CML-1500 and CML-3000 maintain the array of features and functions available with CMA range actuators while substantially extending the performance capabilities for direct drive linear valves.

CMA electric actuators can also offer significant emission reductions compared to equivalent pneumatic actuators and the necessary infrastructure required to support them.

- › Seating thrust up to 4,500 lbf (20 kN)
- › Modulating thrust up to 3,000 lbf (13.3 kN)
- › Accurate and repeatable position control using 4-20 mA signal with 0.1% accuracy
- › Ball screw drive train for increased reliability and efficiency at higher thrust
- › Integral local controls and positional display
- › Electric solution for advanced automation of large control valves

Advanced Design Features

CMA Advanced Design Features

The CMA encompasses advanced design in a compact, robust and reliable package.

- The brushless DC motor technology provides high dynamic performance with a maintenance free, high endurance drive train
- Thrust or torque is instantly delivered to the valve to provide smooth operation without any stick/slip effect to disrupt the process variable. The sturdy mechanical drive train eliminates the unwanted movements associated with spring diaphragm actuators
- CML and CMQ Self Locking actuators include an anti-backdrive mechanism capable of resisting up to 125% of the rated thrust or torque of the actuator
- CMA actuators provide a compact, flexible solution optimised for applications with space constraints
- The high accuracy positioning ability of CMA actuators ensures it can satisfy demanding operating requirements of many control valve applications
- Digital communication options including *Pakscan™*, HART®, Foundation Fieldbus®, Profibus®, DeviceNet® and Modbus® are available

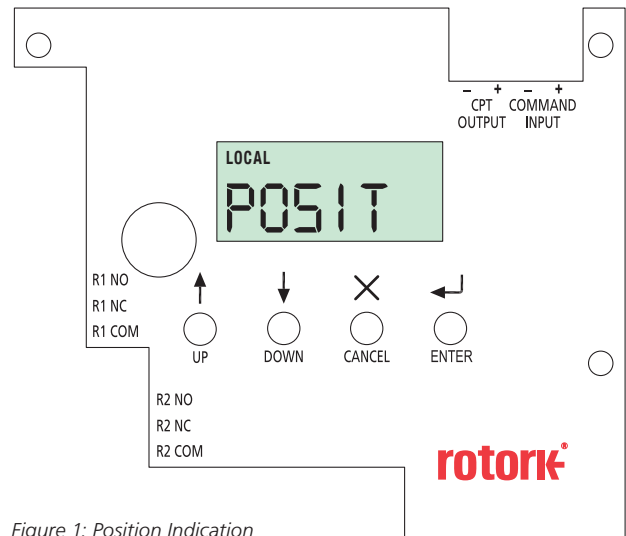


Figure 1: Position Indication

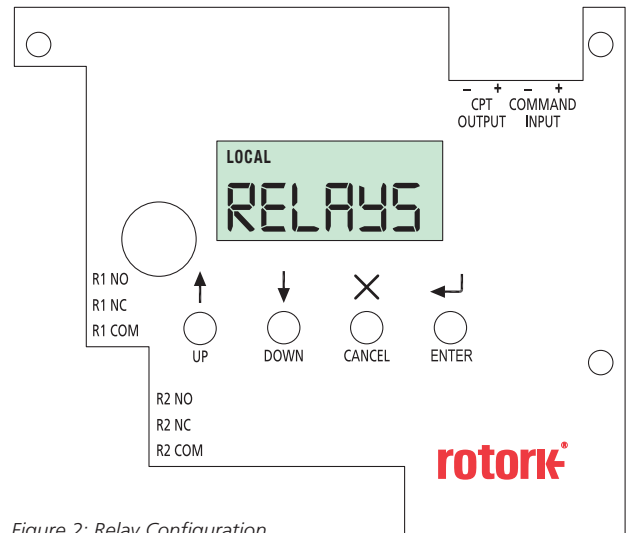


Figure 2: Relay Configuration

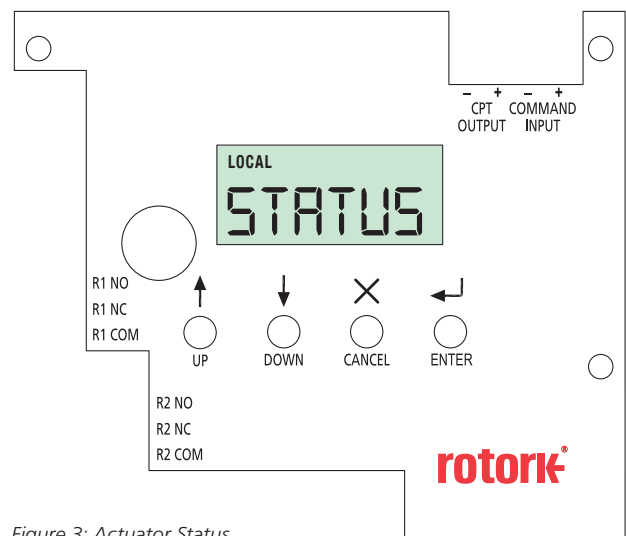


Figure 3: Actuator Status

System Integration

Bus Network Compatibility

In addition to Rotork's own *Pakscan*TM network system, Rotork actuators are compatible with most industry standard fieldbus systems via network cards that are fitted in the main electronics enclosure.

*Pakscan*TM

The Rotork *Pakscan* system is a world leader in flow control automation. *Pakscan* continues to be at the forefront of network technology, helping to control over 170,000 field units. *Pakscan*'s superior technology keeps it ahead of the competition.

Now with 30 years installed experience *Pakscan* has found preference in all industry sectors and many diverse applications.

At the heart of the *Pakscan* system is the Rotork *Master Station*, providing the vital link between the control system and the devices in the field. The field devices are connected to the Rotork *Master Station* using *Pakscan* or Modbus[®] networks which have been designed for use in industries and applications where robust and reliable plant control and monitoring is required.

***Pakscan*: comprehensive solutions for modern plant control and monitoring.**

- Automatic network monitoring and fault management
- Rotork *Master Station* with hot standby capability
- Redundant, fault tolerant field networks
- Fully pre-configured Rotork *Master Station*
- Intuitive touch screen user interface
- Long distance and high device count without the need for external repeaters
- Well recognised, simple Modbus RTU / TCP host communications
- Field and host communication diagnostics
- Built in webpages for full system diagnostics
- Commission field devices without the need for the host control system
- Field networks open to third party devices
- Efficient low cost Install with minimum cost of ownership
- Multiple host connectivity
- Backed by Rotork global support

Contact Rotork for further details.



The HART[®] signal consists of two parts, the analogue 4-20 mA current loop and a superimposed digital variable frequency signal. Traditionally the 4-20 mA loop is used for control and the superimposed digital signal for feedback, diagnostics and configuration. Configuration and feedback using the HART digital signal can be achieved using the host connected to the actuator to select the parameters required.

See PUB092-001 for further details



The Rotork Foundation Fieldbus[®] module connects directly onto the standard Foundation H1 bus system. The ability to report extensive actuator feedback within a single input block as well as system diagnostic information makes Rotork the first choice for use with a Foundation Fieldbus system.

See PUB089-001 for further details.



Rotork's DeviceNet[®] module Electronic Data Sheet description file is used to set up the actuator parameters to allow the systems performance to be optimised. The Rotork module has been certified by the Open DeviceNet Vendor Association.

See PUB090-001 for further details.



Profibus[®] is a leading international network protocol for Rotork's Profibus DP module uses DP-V0 cyclic comms and extended actuator diagnostics and configuration is included in the DP-V1 acyclic data. EDD and DTM files allow the Rotork device to be incorporated into asset management systems, whilst the GSD file guarantees device interoperability.

See PUB088-001 for further details.

Modbus[®]

Rotork's Modbus[®] module allows actuators to be connected to a 2-wire RS485 network for direct communication to a PLC or DCS using Modbus RTU protocol.

See PUB091-001 for further details.

RIRO

For discrete hardwired control, the optional RIRO (Remote In Remote Out) can be fitted. The option allows the user to hardwire a discrete digital control (24 VDC nominal or 120 VAC nominal) for open and close operation. The option also allows up to four extra relay contacts to be available for various functions.

See PUB094-004 for further details.

Technical Data

Mechanical Performance

Speed or operating time values shown below are at 100% speed setting. Speed can be reduced to 50% in 1% increments.

CMA actuators are suitable for S9 (IEC60034) / Class D (EN15714-2) operating duty.

The rated force (thrust or torque) for each size of actuator is detailed below. Operating time tolerance +/-10%.

CML and CMQ Self Locking units can resist backdriving forces from the valve up to 125% of rated load without movement. All CMA actuators are factory calibrated.

CML: Linear Actuator

Model	Min Modulating Thrust		Max Modulating Thrust		Max Seating Thrust*		Max Speed		Max Stroke	
	lbf	N	lbf	N	lbf	N	inches/sec	mm/sec	inches	mm
CML-100	60	267	100	445	150	667	0.25	6.35	1.5	38.1
CML-250	150	667	250	1,112	375	1,668	0.13	3.18	1.5	38.1
CML-750	450	2,002	750	3,336	1,125	5,004	0.13	3.18	2.0	50.8
CML-1500	900	4,003	1,500	6,672	2,250	10,009	0.23	5.72	4.5	114.3
CML-3000	1,800	8,007	3,000	13,345	4,500	20,017	0.23	5.72	4.5	114.3

Note: CML-750 operating speed is reduced to 30% of rated when operating below -25 °C (-13 °F).
12 VDC CML-1500 and CML-3000 may reduce operating speed to 10% in order to maintain operating thrust through stroke.

CMQ: Part-turn Actuator

Model	Min Modulating Torque		Max Modulating Torque		Max Seating Torque*		CMQ High Speed Operating Time	CMQ Self Locking Operating Time
	lbf.in	Nm	lbf.in	Nm	lbf.in	Nm	secs	secs
CMQ-250	150	16.9	250	28.2	375	42.4	5	10
CMQ-500	300	33.9	500	56.5	750	84.7	7.5	15
CMQ-1000	600	67.8	1000	113.0	1,100	124.3	11	22

Note: CMQ low speed units are self-locking up to 125% of rated load. CMQ high speed units are not self-locking.

* Seating Torque and Thrust – Some applications require tight seating of the valve in the close position. The CMA has a selective seating capability. The seating torque/thrust values shown for CML and CMQ are the forces available to close a valve tightly at the end of travel. The seating torque/thrust option can be selected and configured during setup (at "close action" selection, choose "torque" or "thrust" as applicable).

CMR: Multi-turn Actuator

Model	Min Torque		Max Torque		Max Speed	Min Stroke	Max Stroke
	lbf.in	Nm	lbf.in	Nm	RPM	turns	turns
CMR-50	20	2.3	50	5.6	11	0.25	320
CMR-89	35.6	4.0	89	10.1	24	0.25	320
CMR-100	40	4.5	100	11.3	10	0.25	320
CMR-125	50	5.6	125	14.1	18	0.25	320
CMR-200	80	9.0	200	22.6	5	0.25	320
CMR-250	100	11.3	250	28.2	10	0.25	320

Positioning Control Performance

The following control positioning performance is based on a 4-20 mA control system with CMA operating over its maximum stroke, rated speed and constant force with minimum deadband set and with a linear demand/valve characteristic. Resolution is defined as: minimum change in input signal required for guaranteed response.

4-20 mA Positioning - % demand signal range

		Equal to or better than:
Resolution	Linear and Part-turn	0.2%
	Multi-turn	2°
Linearity		1%

CML-1500 and CML-3000 have positioning resolution of 0.1% or less.

Position Feedback Performance

The following position feedback performance is based on CMA operating at maximum stroke with a linear characteristic set. Feedback calibration is automatic to the set limit positions. Resolution is defined as: minimum change in position required for feedback signal change.

4-20 mA Feedback - % feedback signal range

		Equal to or better than:
Resolution	Linear and Part-turn	0.2%
	Multi-turn	2°
Linearity		1%

Ultimate performance will be determined by the process, valve and control system.

Design Specifications

Vibration, Shock and Noise

CMA actuators are suitable for applications where vibration and shock severity does not exceed the following:

Type	Level
Plant induced vibration	1 g RMS total for all vibration within the frequency range of 10 to 1000 Hz.
Shock	5 g peak acceleration.
Seismic	2 g acceleration over a frequency range of 1 to 50 Hz if it is to operate during and after the event.
	5 g over a frequency range of 1 to 50 Hz if it is only required to maintain structural integrity.
Emitted noise	Independent tests have shown that at 1 m generated noise does not exceed 61 db (A).

Levels quoted are those present at the actuator mounting interface. It should be noted that the effects of vibration are cumulative and therefore an actuator subjected to significant levels may have reduced life.

Conduit Entries

CMA actuators are supplied with four conduit entries for suitable power and field wiring connection. Rotork can provide adaptors and blanking plugs to suit your site requirements.

Actuator Type	Standard	Optional*
CML / CMQ / CMR	4 x M25 x 1.5p	4 x 3/4" NPT

*This conduit entry solution is achieved using reducers.

Paint Finish

The standard paint finish is RAL5010 (blue, polyester powder coated to Rotork specification RS237). Optional paint colours and finishes are available, please contact Rotork for more information.

Unpainted units available for OEM customers.

Approvals

Regulatory Standards

Compliance with the following European Economic Community Directives permits the CMA range of actuators to be CE marked under the provision of the Machinery Directive.

Directive	Applicable to	Reference
Electromagnetic compatibility (EMC)	Immunity to / emissions of electromagnetic energy	2004/108/EC by application of BS EN 61326-1:2006
Low Voltage (LV)	Electrical Safety	2006/95/EC by application of BS EN 601010-1:2010
Machinery*	Product Safety	Actuators follow the provision of the Machinery Directive (2006/42/EC) by the application of BS EN ISO12100-1:2003+A1:2009. The CMA must not be put into service until the equipment into which it is being incorporated has been declared to be in conformity with the provisions of the European Community Machinery Directive 98/37/EC and 98/79/EC *
Waste Electrical Equipment	Exempt under the scope	

*Actuators are not classified as machines within the scope of the machinery directive. Contact Rotork for a copy of our Declaration of Conformity and Incorporation.

Approvals

Non-Hazardous and Hazardous Certified Enclosures

All CMA actuator hazardous and non-hazardous area enclosures are watertight to IP66, IP67* and NEMA 4.

CMA actuators are available with the following enclosure types for which the ambient working temperature ranges are stated.

Prior to installation, actuators should be stored in a dry location with a temperature range not exceeding -50 to +70 °C (-58 to +158 °F).

Option temperatures use different actuator components, please specify temperature requirement. Hazardous area approvals for other country standards are available; please contact Rotork.

CMA Range actuators are built in accordance with the following standards:

Non-Hazardous Area Enclosures

WT: Standard Watertight

Standard	Rating	Standard Temperature	Low Temperature Option
BS EN 60529 (1992)	IP66/67, IP68*	-30 to +70 °C (-22 to +158 °F)	-40 to +60 °C (-40 to +140 °F)
NEMA (US)	4 & 6	-30 to +70 °C (-22 to +158 °F)	-40 to +60 °C (-40 to +140 °F)

*CML-1500 and CML-3000 are IP68 7m for 72 hours

Hazardous Area Enclosures

European ATEX Directive

Directive/Standard	Rating	Standard Temperature	Low Temperature Option
Directive = 2014/34/EU	II 2GD c	-20 to +65 °C (-4 to +150 °F)	
Standard = EN 60079-0 EN 60079-1, EN 60079-31 EN 13463-1, EN 13463-5	Ex db IIB T4 Gb Ex tb IIIC T85°C Db	Units fitted with UPS or HMI option -20 to +60 °C (-4 to +140 °F)	-40 to +60 °C (-40 to +140 °F)

International Hazardous Area IECEx

Directive/Standard	Rating	Standard Temperature	Low Temperature Option
No Directive	II 2GD	-20 to +65 °C (-4 to +150 °F)	
Standard = IEC 60079-0 IEC 60079-1, IEC 60079-31	Ex db IIB T4 Gb Ex tb IIIC T85°C Db	Units fitted with UPS or HMI option -20 to +60 °C (-4 to +140 °F)	-40 to +60 °C (-40 to +140 °F)

USA Hazardous Area – Factory Mutual (FM) Certified Explosionproof to NEC Article 500

Class	Division	Group	Standard Temperature	Low Temperature Option
I	1	C, D	-20 to +65 °C (-4 to +150 °F)	
II	1	E, F, G	Units fitted with UPS or HMI option -20 to +60 °C (-4 to +140 °F)	-40 to +60 °C (-40 to +140 °F)

Enclosures Types 4/IP66/IP67*

Canadian Hazardous Area – Factory Mutual Canada (FMC) Certified Explosionproof to NEC Article 500 (CML-1500 and CML-3000 only) Canadian Standards Association (CSA EP) to NEC Article 500 (All other CMA variants)

Class	Division	Group	Standard Temperature	Low Temperature Option
I	1	C, D	-20 to +60 °C (-4 to +140 °F)	
II	1	E, F, G	Units fitted with UPS or HMI option -20 to +60 °C (-4 to +140 °F)	-40 to +60 °C (-40 to +140 °F)

Site Services

Rotork understand the value of prompt, punctual and superior site services. Rotork Site Services have specialist expertise, insight and experience in service support for mission-critical flow control and instrumentation solutions for oil and gas, water and wastewater, power, chemical process and industrial applications. We offer global frontline support backed by dedicated in-house experts.

Our service solutions increase plant efficiency and reduce maintenance costs, while workshop services return equipment to as-new condition. Our experience and understanding of the flow control industry means we have extensive insight and ideas of what we can do to provide significant value to our customers and their operations.

Rotork Site Services is comprised of two main areas; Lifetime Management and Site Services. Lifetime Management is the suite of services within Rotork Site Services which help you manage the risk associated with aging assets and includes our Reliability Services offering. Site Services comprises essential actuator service, repair, maintenance and upgrades.

Rotork has specialist expertise, insight and experience in flow control.

We provide insight into how we can deliver value to our customers.

Our service solutions increase plant efficiency and reduce maintenance costs.



Site Services

Lifetime Management

The services available within Lifetime Management offer a complete solution to managing the risks associated with the life cycle of your equipment and their obsolescence (which compromise reliable performance and valuable uptime).

The aim of Lifetime Management is to provide you with constant support and minimum- to- no disruption to your production flow. It is a customisable service offering designed to seamlessly maintain and improve your assets. We manage the inherent risks associated with advances in technology, component obsolescence and ageing equipment for you. We are committed to helping customers maximise the continuous, fault-free operation and working life of their actuators. Supporting the continuous and reliable operation of your plant allows for improved performance and increases in valuable uptime.

Lifetime Management covers:

- Reliability Services
 - Health Check
 - Planned Maintenance
 - Enhanced Warranty
 - Predictive Maintenance
- Upgrade Services (retrofit)
- Planned Shutdown Support (service or run time)
- Life Cycle Services (based on years in service or run time)
- Overhauls/Refurbishment
- Customised Spares Programme
- Training
- Consultancy



Site Services

Rotork's Site Services comprises the essential on-site actuator service, repair, maintenance and upgrades part of our service offering, plus the commissioning of new actuators and applications. It includes off-site work completed at a Rotork Support Centre including recertification, automation, testing and product selection.

Our decades of experience in the industrial actuation and flow control markets means that customers can rely on us to understand their problems and to deliver reliable, economic solutions. Rotork's talented and experienced engineers have an in-depth understanding of the problems that are faced in the field and they know how to fix them.

On sites where providing evidence of valid asset certification is a legal requirement, Rotork engineers can carry out the necessary OEM level inspections and provide the statutory paperwork to comply with regulations.

- Planned Shutdown Support
- Actuator Workshop Overhaul
- Field Support
- Valve Automation Services
 - On-site
 - Off-site
- Global Support



rotork®



www.rotork.com

A full listing of our worldwide sales and service network is available on our website.

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