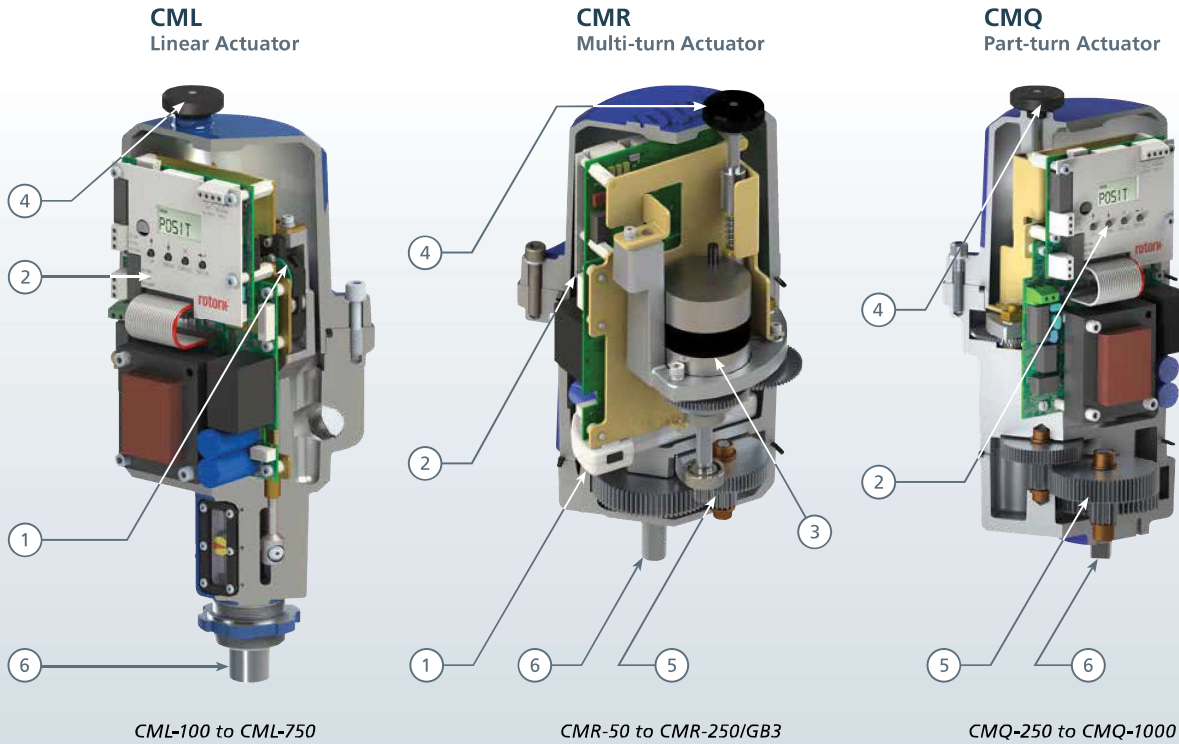




# Advanced Engineering – CMA Range Standard Unit



## 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

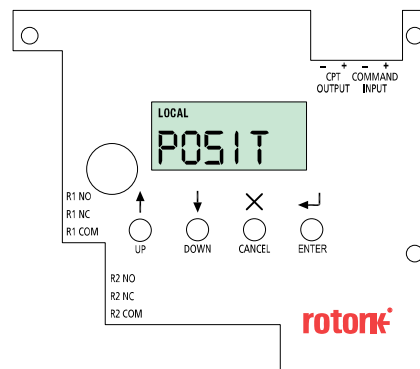
A hand drive mechanism is provided as standard for all CMA actuators to allow manual operation of the valve. Pressing down on the hand-knob shaft engages a gear in the upper section of the drive train and releasing the knob causes the spring to disengage the gear.

## 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:

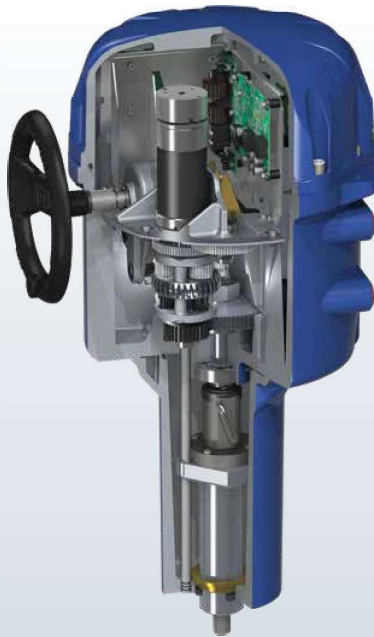
- **Linear or part-turn control** with continuous indication of valve position even during power loss
- **Reserve Power Pack (RPP)** provides the actuator with enough stored energy to perform a predetermined action on mains power failure
- **Vivid display** showing position, fault and RPP status
- **Super 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)



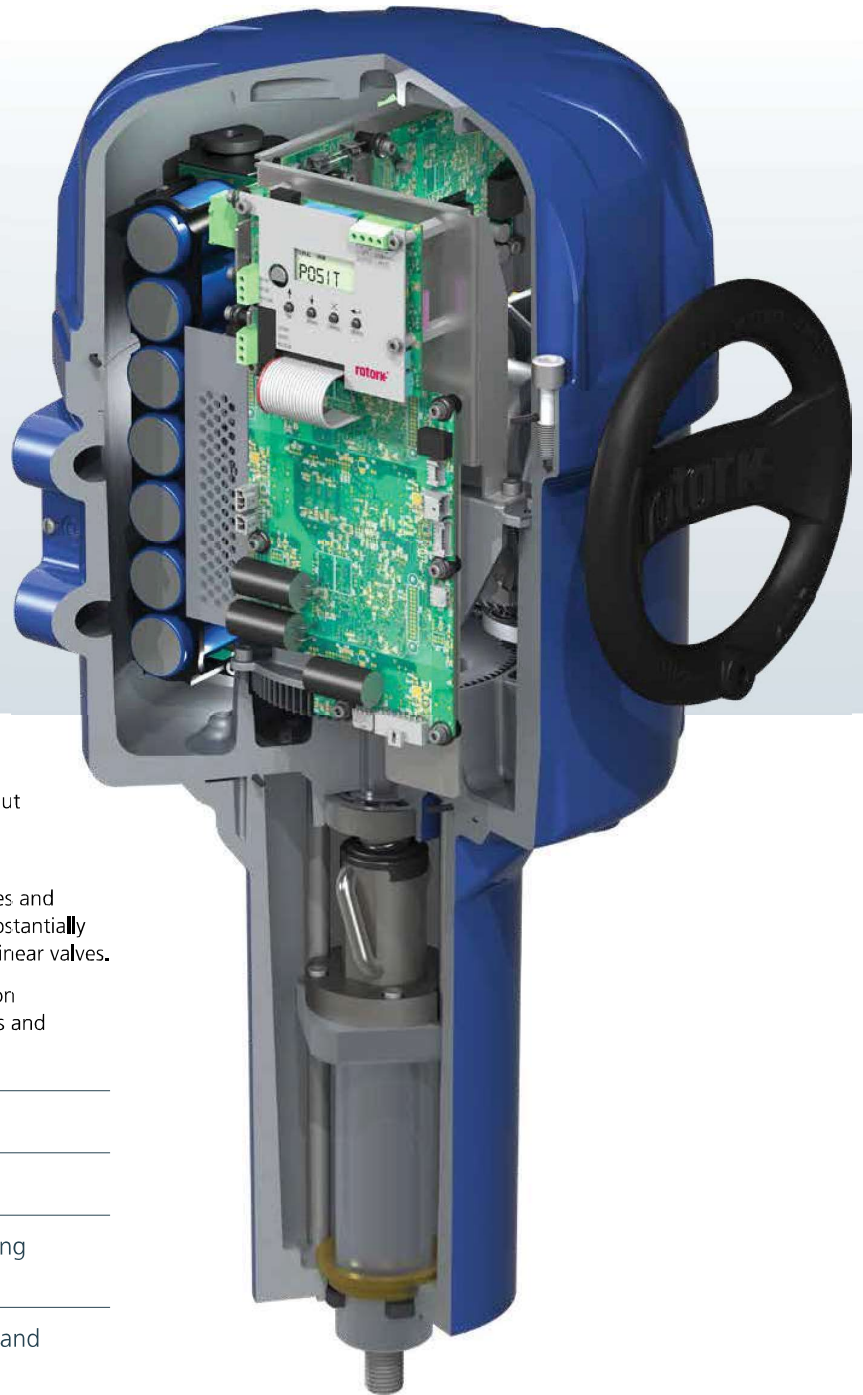
Padlockable

## 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

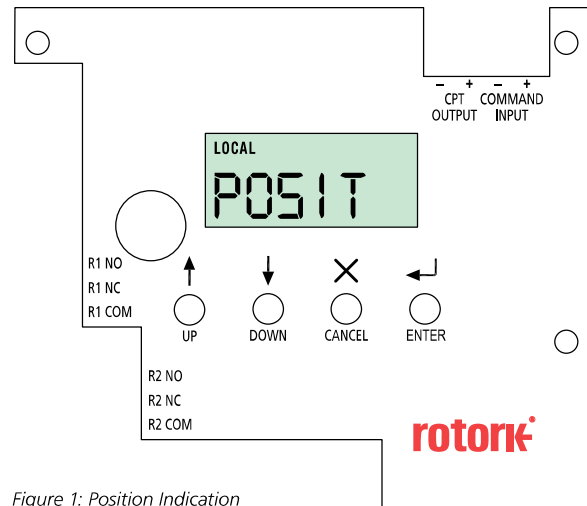


Figure 1: Position Indication

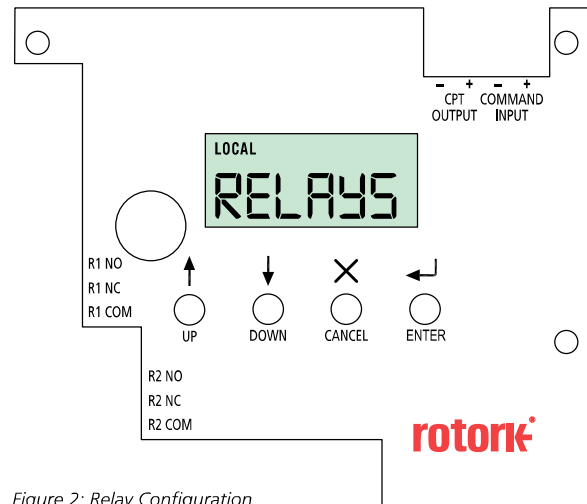


Figure 2: Relay Configuration

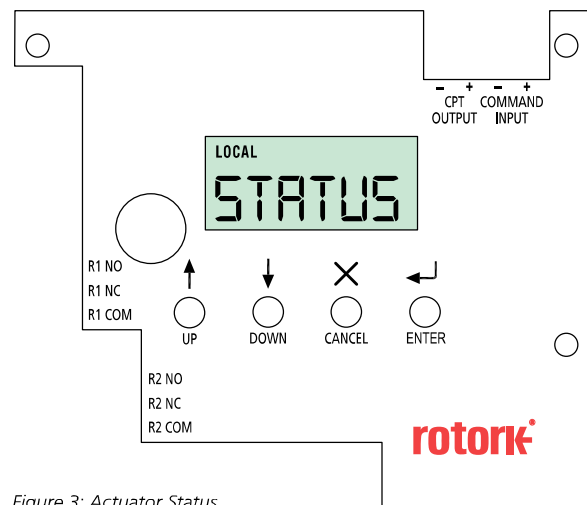


Figure 3: Actuator Status

## System Integration

### Bus Network Compatibility

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

## *Pakscan*<sup>™</sup>

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<sup>®</sup> 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<sup>®</sup> 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<sup>®</sup> 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<sup>®</sup> 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<sup>®</sup> 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<sup>®</sup>**

Rotork's Modbus<sup>®</sup> 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

#### 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
CMR-250/GB3	160	18.1	400	45.2	5.8	0.25	200

### 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:

<b>Resolution</b>	Linear and Part-turn	0.2%
	Multi-turn	2°
<b>Linearity</b>		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:

<b>Resolution</b>	Linear and Part-turn	0.2%
	Multi-turn	2°
<b>Linearity</b>		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)
CSA (Canadian)	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)

## Client Support and Site Services



Rotork actuators are recognised as the best in the world for reliability and safety in the most demanding applications. To maintain this hard-earned leadership position, Rotork is committed to helping clients to maximise the continuous, fault-free operation and working life of all their actuators.

With established operations and worldwide service centres we are able to offer same-day or next-day service to all our customers. Our Rotork factory trained engineers have skills in both multi-purpose and industry specific applications and carry with them spare parts and specialist test equipment. Our operations utilise a documented Quality Management system established in accordance with ISO9001.

Rotork aims to be your number one choice for taking care of fault diagnosis, service repairs, scheduled maintenance and system integration needs.

Visit [www.rotork.com](http://www.rotork.com) to identify your nearest service centre.

Rotork has expertise and specialist knowledge of every aspect of flow control.

Our service solutions increase plant efficiency and reduce maintenance costs.

Workshop services return equipment to as-new condition.



## Client Support and Site Services

### Global Service and Support

Rotork understands the value of prompt and punctual customer site services and aims to supply our customers with superior flow control solutions, by providing high quality, innovative products and superior service – **on time, every time.**

Whether you have an actuator requiring on-site servicing, a custom design service requirement or a new actuator installation, we can deliver the fastest turnaround with the least plant disruption.

### Accreditation and Assurance

Rotork is accredited with all major safety authorities around the world, providing our clients with reassurance and peace of mind.

Rotork's engineering teams are experts in the design and implementation of actuation solutions for all circumstances and environments. Our global knowledge base draws upon previous installations and environmental situations.

Our track record and commitment to undertaken engineering projects is second to none. Rotork is trusted by major utility and industrial companies to design, install and maintain their actuation stock. We keep their plants operating at peak efficiency, helping them to be more profitable and at the same time meet ever tightening industry watchdog requirements.

Using accredited project managers we have the knowledge and expertise to design, build and install any standard or custom actuator installation for you, on time and in budget.

### Asset Management

Rotork is a corporate member of the Institute of Asset Management, the professional body for whole life management of physical assets.



***Giving You Peace of Mind,  
Guaranteed Quality and  
Improving Your Site Efficiency***



### Actuator Workshop Overhaul

- Supporting Rotork and non-Rotork products
- Workshop facilities including torque testing and re-coating
- Large OEM stock in all workshops
- Fully trained and experienced service engineers
- Loan actuator facilities

### Field Support

- Site repairs and commissioning
- Upgrades
- Fault finding and maintenance
- Call-out with fully equipped service vehicles

### Client Support Programme (CSP)

- Select a level of service tailored for you – gold, silver or bronze
- Improves production throughput
- Reduces the cost of maintenance year-on-year
- Allows customers to manage the challenge of 'Risk vs Budget' in maintenance operations
- Lifecycle management includes planned and predictive maintenance with a focus on equipment reliability and availability as well as asset management
- Generated reports detail cost savings and performance improvements

### Planned Shutdown Support

- Preventative maintenance
- On-site overhaul and testing
- OEM spares and support
- Support for Rotork and non-Rotork products
- Achieve tight shutdown return to service targets
- Project management and supervision

### Valve Automation Centres

- Actuator upgrade
- Manual valve automation
- Control and automation
- System integration

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