



# IECEX Certificate of Conformity

## INTERNATIONAL ELECTROTECHNICAL COMMISSION IEC Certification Scheme for Explosive Atmospheres

for rules and details of the IECEx Scheme visit [www.iecex.com](http://www.iecex.com)

Certificate No.: IECEx FMG 17.0006X Issue No: 0 Certificate history:  
Issue No. 0 (2017-04-19)

Status: **Current** Page 1 of 4

Date of Issue: **2017-04-19**

Applicant: **Rotork Process Controls**  
5607 W. Douglas Ave  
Milwaukee, WI 53218  
**United States of America**

Equipment: **CML, CMQ, CMR Series Compact Modulating Actuators (CMA)**  
*Optional accessory:*

Type of Protection: **Flameproof "d" and Dust Protection by Enclosure "t"**

Marking:

Ex db IIB T4 Gb  
Ex tb III C T85C Db

**Standard Seals**  
Ta = -20C to +65C (Standard Version)  
Ta = -20C to +60C (UPS/HMI and HMI Versions)

**Low Temperature Seals**  
Ta = -40C to +60C (All Versions)

Approved for issue on behalf of the IECEx  
Certification Body:

J. E. Marquedant

Position:

VP, Manager - Electrical Systems

Signature:  
(for printed version)

Date:

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting the [Official IECEx Website](http://www.iecex.com).

Certificate issued by:



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FM Approvals LLC  
1151 Boston-Providence Turnpike  
Norwood, MA 02062  
United States of America





# IECEX Certificate of Conformity

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Date of Issue: 2017-04-19 Page 3 of 4  
Manufacturer: **Rotork Process Controls**  
5607 W. Douglas Ave  
Milwaukee, WI 53218  
**United States of America**

Additional Manufacturing location(s):

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.

## STANDARDS:

The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

**IEC 60079-0 : 2011** Explosive atmospheres - Part 0: General requirements  
Edition:6.0  
**IEC 60079-1 : 2014-06** Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"  
Edition:7.0  
**IEC 60079-31 : 2013** Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"  
Edition:2

*This Certificate **does not** indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.*

## TEST & ASSESSMENT REPORTS:

*A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in*

### Test Report:

GB/SIR/ExTR14.0296/00 GB/SIR/ExTR14.0296/01 GB/SIR/ExTR15.0132/00  
US/FMG/ExTR17.0005/00

### Quality Assessment Report:

GB/FME/QAR14.0009/01



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## Schedule

### EQUIPMENT:

*Equipment and systems covered by this certificate are as follows:*

Refer to attached Annex for description of equipment.

### SPECIFIC CONDITIONS OF USE: YES as shown below:

Refer to attached Annex for Specific Conditions of Use.

### Annex:

[Annex to IECEx FMG 17-0006X.pdf](#)

# Annex to IECEx FMG 17.0006X

## Rotork Process Controls

### CML, CMQ, CMR Series Compact Modulating Actuators (CMA) Size 1 & 2

#### Equipment Description

The CMA (Compact Modulating Actuator) is self contained and used for continuous remote electrical operation of a control valve. The CMA consists of a main flameproof enclosure containing all of the electrical components and an attached smaller mechanical enclosure containing only gearing and mechanical power transfer devices. It is available in three different functions: Linear, Quarter-turn, and Rotary. The main enclosure is defined into "Sizes" per the table below.

The top part of the equipment is the flameproof "d" enclosure (the main enclosure), which is cylindrical in shape and includes a base and cover. The main enclosure is constructed out of the same aluminum either Low Pressure Gravity Cast (LPGC) or High Pressure Die Cast (HPDC). The cover has three different sizes: standard, intermediate and extended. The cover houses a hand-knob which creates a cylindrical flamepath joint with the cover. The user may use the hand-knob to switch from manual to remote operation and control of the actuator. The cover forms a cylindrical flamepath joint with the base to which it is attached by four M8 screws. The joint is provided with suitable seals for environmental protection.

The main enclosure houses all of the electronic components which make up the monitoring and control circuitry. This circuitry consists of power and logic PCBs both mounted on an aluminum bracket. The bracket is fastened to a cast aluminum mount which also acts as a mount for the DC motor. The whole assembly is fastened to the base. The operator uses an LCD display to program the actuator to control the motor and the logic PCB uses a feedback mechanism to sense the position of the output shaft. There are four 3/4 NPT or M25 threaded entries to the enclosure for field wiring purposes.

#### CML – Linear Compact Modulating Actuator

The mechanical part of the linear enclosure is small in comparison to the main enclosure. This enclosure does not have any electrical components and contains mechanical components only. The enclosure houses a screw shaft which is driven by the DC motor. The shaft is supported by roller bearings and forms a flamepath through the enclosure. The shaft operates with a drive nut to provide the motion to the linear output shaft. The linear output shaft travels through a bronze bushing and into the hazardous area.

This linear output shaft has two shoulder screws threaded into it at an angle perpendicular to the center line of the shaft. The shoulder screws are about 60° apart. One screw is attached to a feedback shaft which penetrates into the electronics enclosure through a bronze bushing creating two flamepaths, one on either side of the bushing. Access to the shoulder screw is via an aluminum plate sealed from the environment. The other shoulder screw is tipped with an arrow to indicate the current position of the actuator to the user. The arrow can be seen through a window which is also sealed from the environment.

The linear actuator is available in a low temperature variant which uses different seals to allow the equipment to be used in the lower minimum ambient temperature of -40°C.

#### CMQ – Quarter-turn Compact Modulating Actuator

The mechanical part of the quarter turn enclosure is housed in an aluminum lid cast separately from the base of the main enclosure. It is sealed to the base with three screws and an environmental seal. The drive is taken from the motor by the third stage pinion shaft, supported by roller bearings, and into the gear-train. There is a long flamepath along the length of the third stage pinion shaft between the bearings. The gear-train consists of three connected gears which reduce the output RPM and increase the torque. The output shaft is the final shaft passing the drive through the enclosure into the hazardous area through the lid via bronze bushings. The output shaft is connected to a feedback shaft which penetrates into the electronic enclosure through a bronze bushing creating two flamepaths, one on either side of the bushing. Sensors are connected to the feedback shaft to report the position of the actuator to the logic PCB. The final gear is attached to the output shaft and is a half gear with a flat face in order to limit the maximum turning movement of the actuator.

The linear actuator is available in a low temperature variant which uses different seals to allow the equipment to be used in the lower minimum ambient temperature of -40°C.

#### CMR – Rotary Compact Modulating Actuator

Similar in design to the Quarter-turn, the Rotary variant mechanical side is housed in an aluminum lid cast separately from the base of the main enclosure. It is sealed to the base with three screws and an environmental seal. The drive is taken from the motor by the third stage pinion shaft, supported by roller bearings, and into the gear-train. There is a long flamepath along the length of the third stage pinion shaft between the bearings. The drive is transferred from this shaft onto the fourth stage pinion shaft and finally onto the output shaft which transfers the drive into the hazardous area via a bronze bushing. The output shaft is supported on a single steel roller bearing and also acts as a feedback shaft by passing into the main enclosure, creating a flamepath and allowing sensors to report the actuator position to the logic PCB.

Annex to IECEx FMG 17.0006X  
 Rotork Process Controls  
 CML, CMQ, CMR Series Compact Modulating Actuators (CMA) Size 1 & 2

*CML-a. Compact Modulating Actuators (CMA).*

*CMQ-b. Compact Modulating Actuators (CMA).*

*CMR-c. Compact Modulating Actuators (CMA).*

a = Size 100 or 250.

b = Size 250 or 500.

c = Size 50, 100 or 200.

Note that the manufacturer has requested the size 1 and 2 actuators and the size 3 actuators be listed on separate certificates. The CMA range includes the following variants:

Model	Size*	Minimum Thrust or Torque	Maximum Thrust or Torque	Speed	Stroke	Shut-off Thrust or Torque
CMR-50	1	2.3 Nm	5.6 Nm	11 RPM	N/A	N/A
CML-100	1	177.9 N	444.8 N	6.35 mm/s	38.1 mm	889.6 N
CMR-100	2	4.5 Nm	11.3 Nm	10 RPM	N/A	N/A
CMR-200	2	9 Nm	22.6 Nm	5 RPM	N/A	N/A
CMQ-250	1	11.3 Nm	28.2 Nm	5 s/qtr-turn	N/A	42.3 Nm
CML-250	2	444.8 N	1112 N	3.175 mm/s	38.1 mm	2200 N
CMQ-500	2	22.6 Nm	56.5 Nm	7.5 s/qtr-turn	N/A	84.8 Nm
CMR-89	3	4.04 Nm	10.1 Nm	24 RPM	N/A	N/A
CMR-125	3	5.6 Nm	14.1 Nm	18 RPM	N/A	N/A
CMR-250	3	11.3 Nm	28.2 Nm	10 RPM	N/A	N/A
CML-750	3	1334.5 N	3336.2 N	3.18 mm/s	50.8 mm	6670 N
CMQ-1000	3	45.2 Nm	113.0 Nm	11 s/qtr-turn	N/A	169.5 Nm

\*Note "Size" refers to performance aspects of the equipment; Sizes 1 and 2 are physically the same.

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**Specific Conditions of Use**

1. The critical dimensions of the flamepath joints are as follows:

<b>CML-100, CML-250 (Size 1 &amp; 2 - Linear)</b>		
<b>Flamepath</b>	<b>Maximum Gap (mm)</b>	<b>Minimum Length L (mm)</b>
Lid/Base	0.15	12.8
Base/Screw Shaft	0.145	13.5
Base/Feedback Shaft Bushing	-0.02	13.7
Feedback Shaft Bushing/Shaft	0.06	13.7
Handknob Shaft/Lid (short cover)	0.10	25.9
Handknob Shaft/Lid (intermediate and extended covers)	0.10	15.7
<b>CMR-50, CMR-100, CMR-200 (Size 1 &amp; 2 - Rotary)</b>		
<b>Flamepath</b>	<b>Maximum Gap (mm)</b>	<b>Minimum Length L (mm)</b>
Lid/Base	0.15	12.8
Base/Pinion Shaft	0.235	29.8
Base/Output Shaft	0.145	12.8
Handknob Shaft/Lid (short cover)	0.10	25.9
Handknob Shaft/Lid (intermediate and extended covers)	0.10	15.7
<b>CMQ-250, CMQ-500 (Size 1 &amp; 2 - Quarter-turn)</b>		
<b>Flamepath</b>	<b>Maximum Gap (mm)</b>	<b>Minimum Length L (mm)</b>
Lid/Base	0.15	12.8
Base/Pinion Shaft	0.235	29.8
Base/Feedback Shaft Bushing	-0.02	13.7
Feedback Shaft Bushing/Shaft	0.06	13.7
Handknob Shaft/Lid (short cover)	0.10	25.9
Handknob Shaft/Lid (intermediate and extended covers)	0.10	15.7

Note that the minimum radial clearance of shafts of rotating electrical machines shall be  $\geq 0.05$  mm

- Warning - the equipment has a non-metallic coating and has a potential static hazard. Clean only with a damp cloth.
- The screws securing the outer window frame contribute to the integrity of the flameproof enclosure and must not be removed.