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UNITED KINGDOM CONFORMITY ASSESSMENT

UK-TYPE EXAMINATION CERTIFICATE



2 Equipment or Protective systems intended for use in Potentially Explosive Atmospheres –
UKSI 2016:1107 (as amended by UKSI 2019:696) – Schedule 3A, Part 1

3 UK-Type Examination Certificate No: FM21UKEX0072X

4 Equipment or protective system: Size 3 CML, CMQ, CMR Series
(Type Reference and Name) Size 4 and 5 Series
Compact Modulating Actuators (CMA)
Electronic Valve Actuators

5 Name of Applicant: Rotork Controls Inc

6 Address of Applicant: 5607 W Douglas Ave
Milwaukee, WI 53218
United States of America

7 This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and documents therein referred to.

8 FM Approvals Ltd, Approved Body number 1725, in accordance with Regulation 42 of the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016, UKSI 2016:1107 (as amended by UKSI 2019:696), certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Schedule 1 of the Regulations.
The examination and test results are recorded in confidential report number:

3060693revRR227966 dated 2nd August 2021

9 Compliance with the Essential Health and Safety Requirements, with the exception of those identified in item 15 of the schedule to this certificate, has been assessed by compliance with the following documents:

ENI EC 60079-0:2018, EN 60079-1:2014, EN 60079-31:2014, EN ISO 80079-36:2016,
EN ISO 80079-37:2016 and EN 60529:1991 +A1:2000 +A2:2013

10 If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to specific conditions of use specified in the schedule to this certificate.

11 This UK-Type Examination certificate relates only to the design, examination and tests of the specified equipment or protective system in accordance with the Regulations. Further requirements of the Regulations apply to the manufacturing process and supply of this product. These are not covered by this certificate.

12 The marking of the equipment or protective system shall include:



II 2 GD Ex db h IIB T4 Gb
Ex h tb IIIC T85°C Db

For Standard Seals:
Ta = -20°C to +65°C (Standard Version)
Ta = -20°C to +60°C (UPS/HMI & HMI Versions)

For Low Temperature Seals:
Ta = -40°C to +60°C (All Versions)

Victor Aluko-Oginni
Certification Manager, FM Approvals Ltd.

Issue date: 2nd March 2022

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13 Description of Equipment or Protective System:

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. The Size 3 Actuators are available in three different functions: Linear, Quarter-turn, and Rotary. The Size 4 and 5 Actuators are available with Linear function only. The main enclosure is defined into "Sizes" per the table on the following page.

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). For Size 3 actuators, the cover has three different sizes: standard, intermediate and extended. For Size 4 and 5 actuators, there is one cover size. The enclosure houses a hand-knob which creates a cylindrical flamepath joint. 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 secured by fasteners. 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 ¼ NPT or M25 threaded entries to the enclosure for field wiring purposes.

The enclosures for the Size 3 CML, CMQ, CMR Series Compact Modulating Actuators provide environmental Degree of Protection IP67, and enclosure for the Size 4 and 5 CML Series Linear Compact Modulating Actuators provide environmental Degree of Protection IP66/IP68 (7m, 72hr), in accordance with EN 60529 in order to protect the equipment against the ingress of water and dust.

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

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.

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

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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.

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.

CML-a. Compact Modulating Actuators (CMA).

CMQ-b. Compact Modulating Actuators (CMA).

CMR-c. Compact Modulating Actuators (CMA).

a = Size 750, 1500 or 3000.

b = Size 1000.

c = Size 89, 125 or 250.

Model	Size	Minimum Thrust or Torque	Maximum Thrust or Torque	Speed	Stroke	Shut-off Thrust or Torque
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
CML-1500	4	2668.8 N	6672 N	4.57 mm/s	114.3 mm	10 kN
CML-3000	5	5337.6 N	13.34 kN	4.57 mm/s	114.3	20 kN

14 Specific Conditions of Use:

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

CML-750 (Size 3 - Linear)		
Flamepath	Maximum Gap (mm)	Minimum Length L (mm)
Lid/Base	0.15	12.8
Base/Screw Shaft	0.235 ¹	37.3
Base/Feedback Shaft Bushing	-0.02 ²	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
CMR-89, CMR-125, CMR-250 (Size 3 - Rotary)		
Flamepath	Maximum Gap (mm)	Minimum Length L (mm)
Lid/Base	0.15	12.8
Base/Pinion Shaft	0.235 ¹	37.3
Base/Output Shaft	0.145 ¹	13.0
Handknob Shaft/Lid (short cover)	0.10	25.9
Handknob Shaft/Lid (intermediate and extended covers)	0.10	15.7

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CMQ-1000 (Size 3 - Quarter-turn)		
Flamepath	Maximum Gap (mm)	Minimum Length L (mm)
Lid/Base	0.15	12.8
Base/Pinion Shaft	0.235 ¹	37.3
Base/Feedback Shaft Bushing	-0.02 ²	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
CML-1500 and CML-3000 (Size 4 & 5 - Linear)		
Flamepath	Maximum Gap (mm)	Minimum Length (mm)
Lid / Base	0.20	26.4
Screw Shaft Bushing / Shaft	0.10	68.5
Base / Screw Shaft Bushing	0.361	36.96
Handwheel Shaft / Base	0.20	27.9

Note 1: This dimension includes an allowance for the 0.05mm requirements defined in clause 8.1.2 of EN 60079-1:2014

Note 2: Negative sign denotes an interference fit.

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

15 **Essential Health and Safety Requirements:**

In addition to the Essential Health and Safety Requirements covered by the standards listed at item 9, all other requirements are demonstrated in the confidential report identified in item 8.

16 **Test and Assessment Procedure and Conditions:**

This UK-Type Examination Certificate is the result of testing of a sample of the product submitted, in accordance with the provisions of the relevant specific standard(s), and assessment of supporting documentation. It does not imply an assessment of the whole production.

Whilst this certificate may be used in support of a manufacturer's claim for UKCA Marking, FM Approvals Ltd accepts no responsibility for the compliance of the equipment against all applicable Regulations in all applications.

This Certificate has been issued in accordance with FM Approvals Ltd's UKCA Certification Scheme.

17 **Schedule Drawings**

A list of the significant parts of the technical documentation is annexed to this certificate and a copy has been kept by the Approved Body.

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18 Certificate History

Details of the supplements to this certificate are described below:

Date	Description
6 th August 2021	Original Issue.
2 nd November 2021	<u>Supplement 1:</u> Report Reference: - RR229730 dated 25 th October 2021. Description of the Change: Minor editorial updates to labels only.
2 nd March 2022	<u>Supplement 2:</u> Report Reference: - PR461421 dated 18 th February 2022. Description of the Change: Minor revisions and corrections to labels and instructions not affecting safety.

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Blueprint Report

Rotork Controls Inc (1000006662)

Class No 3615

Original Project I.D. 3060693

Certificate I.D. FM21UKEX0072X

<u>Drawing No.</u>	<u>Revision Level</u>	<u>Drawing Title</u>	<u>Last Report</u>	<u>Electronic</u>
047385	J	CMA Approvals for CMA Size 3 Linear	RR227966	Yes (pdf)
047386	J	CMA Approvals for CMA Size 3 Rotary	RR227966	Yes (pdf)
047387	K	CMA Approvals for CMA Size 3 Quarter turn	RR227966	Yes (pdf)
047762	D	CMA Approvals Ignition Hazard Assessment for CMA Size 3 Linear	RR227966	Yes (pdf)
047763	D	CMA Approvals Ignition Hazard Assessment for CMA Size 3 Rotary	RR227966	Yes (pdf)
047764	D	CMA Approvals Ignition Hazard Assessment for CMA Size 3 Quarter Turn	RR227966	Yes (pdf)
049126	F	CMA Approvals for CMA Size 4 and 5 Linear	RR227966	Yes (pdf)
049127	C	CMA Approvals: Ignition Hazard Assessment for CMA Size 4 and 5 Linear	RR227966	Yes (pdf)
049520	C	Nameplate, CMA, UKEX, IIB, Milwaukee, Size 3	PR461421	Yes (pdf)
049521	C	Nameplate, CMA, UKEX, IIB, Milwaukee, Size 4&5	PR461421	Yes (pdf)
ER-1088	1	Ignition hazard assessment for CMA Series of Actuators	RR227966	Yes (pdf)
PUB094-009-00	01/22	CMA Installation and Maintenance Instructions	PR461421	Yes (pdf)
PUB094-019-00	01/22	CML1500 and CML3000 Installation and Maintenance Instructions	PR461421	Yes (pdf)