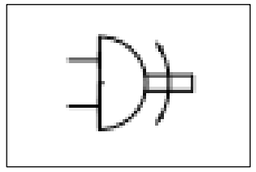
ORIGINAL INSTRUCTIONS

# Instruction Manual
# Rotary Actuator
# 56-CRQ2 Series



| | | |
|---|---|---|
| Ⓔx II 3 G | Ex h IIC T6/T6 Gc | 0°C ≤ Ta ≤ 60°C |

**Marking Description:**

| | |
|---|---|
| Ⓔx | Specific Marking for Explosion Protection |
| II | Equipment Group |
| 3 | Equipment Category |
| G | Environment (Gas) |
| Ex h | Type of Protection – Constructional Safety 'c' |
| IIC | Gas Sub-Division |
| T | Temp. Classification |
| Gc | Equipment Protection Level |
| X | Special Conditions of Use |
| Ta | Ambient Temperature Range |

The intended use of this Rotary Actuator is to convert potential energy provided by compressed air into a force which causes mechanical rotational motion.

| | |
|---|---|
| Certifcate Number: | SMC19.0025X |

**Note 1:** The X at the end of the certificate number represents that this product is subject to "Special Conditions of Use", please see Section 2.3.

## 1 Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution," "Warning" or "Danger." They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC) *1), and other safety regulations.

*1) ISO 4414: Pneumatic fluid power — General rules and safety requirements for systems and their components.
ISO 4413: Hydraulic fluid power — General rules and safety requirements for systems and their components
IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 10218-1: Robotics – Safety requirements – Part 1: Industrial robots

- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

| | |
|---|---|
| ⚠ **Danger** | Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury. |
| ⚠ **Warning** | Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury. |
| ⚠ **Caution** | Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury. |

**⚠ Warning**

- **Always ensure compliance with relevant safety laws and standards.**
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

## 2 Specifications

This product is suitable for use in Zone 2 only.

**2.1 Product Specifications:**

Refer to the operation manual for this product;

**2.1.1 Single Vane Product:**

| | | |
|---|---|---|
| Fluid | | Air |
| Max. Operating Pressure | Size 10~20 | 0.7 MPa |
| | Size 30~40 | 1.0 MPa |
| Min. Operating Pressure | Size 10 | 0.15 MPa |
| | Size 20~40 | 0.10 MPa |
| Ambient & Fluid Temperature | | 0°C to +60°C |
| Lubrication | | Not Required |
| Rotation Angles (°) | | 80° to 100°<br>170° to 190°<br>350° to 370° |
| Cushioning | Size 10~15 | Rubber Bumper |
| | Size 20~40 | None, Air Cushion |
| Output (Nm) [at 0.5MPa] | Size 10 | 0.30 |
| | Size 15 | 0.75 |
| | Size 20 | 1.84 |
| | Size 30 | 3.11 |
| | Size 40 | 5.30 |

**2.1.2 Energy and Speed Specification:**

**⚠ Warning**

- Ensure a speed is selected that is within the products allowable kinetic energy limit.
- In the case that the kinetic energy value exceeds the specification use an external method of absorbing the energy e.g. a shock absorber, if there are still concerns, please contact SMC.
- Do not stop or hold the product at the midpoint by keeping air pressure in the product, this is not an acceptable use of the product.
- If the product is used at low speed below the specified speed adjustment range, it can introduce problems such as the stick-slip phenomenon or stop movement altogether.

| Size | Allowable Kinetic Energy [J] | | | Rotation Time Adjustment Range [s/90°] |
|---|---|---|---|---|
| | Without Cushion | Rubber Bumper | Air Cushion | |
| **10** | - | 0.00025 | - | 0.2 to 0.7 |
| **15** | - | 0.00039 | - | |
| **20** | 0.025 | - | 0.120 | 0.2 to 1.0 |
| **30** | 0.048 | - | 0.250 | |
| **40** | 0.081 | - | 0.400 | |

**2.2 Production Batch Code:**

The batch code printed on the label indicates the month and the year of production as per the following table;

| Production Batch Codes | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Month \ Year | | 2021 | 2022 | 2023 | … | 2027 | 2028 | 2029 | … |
| | | Z | A | B | … | F | G | H | … |
| Jan | o | Zo | Ao | Bo | … | Fo | Go | Ho | … |
| Feb | P | ZP | AP | BP | … | FP | GP | HP | … |
| Mar | Q | ZQ | AQ | BQ | … | FQ | GQ | HQ | … |
| Apr | R | ZR | AR | BR | … | FR | GR | HR | … |
| May | S | ZS | AS | BS | … | FS | GS | HS | … |
| Jun | T | ZT | AT | BT | … | FT | GT | HT | … |
| Jul | U | ZU | AU | BU | … | FU | GU | HU | … |
| Aug | V | ZV | AV | BV | … | FV | GV | HV | … |
| Sep | W | ZW | AW | BW | … | FW | GW | HW | … |
| Oct | X | ZX | AX | BX | … | FX | GX | HX | … |
| Nov | y | Zy | Ay | By | … | Fy | Gy | Hy | … |
| Dec | Z | ZZ | AZ | BZ | … | FZ | GZ | HZ | … |

**2.3 Special Conditions of Use:**

- Products are suitable for sub-divisions IIC.
- Products are suitable for Zone 2 only.

**2.3.1 Temperature Marking:**

**2.3.1.1 Standard Product:**

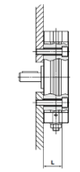
- In the normal ambient temperature range (+0°C to +40°C) the product is rated to temperature class T6.
- In the special ambient temperature range (+40°C to +60°C) the product is rated to temperature class T6.

## 3 Installation

**3.1 Installation**

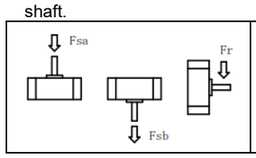
**⚠ Warning**

- Do not install the product unless the safety instructions have been read and understood.
- Do not twist or bend the cylinder or mount the product when subject to tension.
- Do not use in an application where the product is stopped mid-stroke, via an external stop.
- Do not use where cylinders are being synchronised to move a single load.
- For direct mounting, use standard hexagon socket head cap screws with the dimensions shown below;

| Mounting | Sketch | Size | L | Screw |
|---|---|---|---|---|
| Direct Mounting |  | 10 | 13 | M4 |
| | | 15 | 16 | M4 |
| | | 20 | 22.5 | M6 |
| | | 30 | 24.5 | M8 |
| | | 40 | 28.5 | M8 |

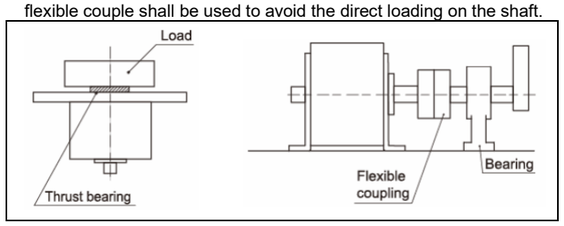
**3.1.1 Direct Loading to the Shaft**

- Although applying static loads as shown in the table below are allowable, it is recommended that they are not applied directly to the shaft.



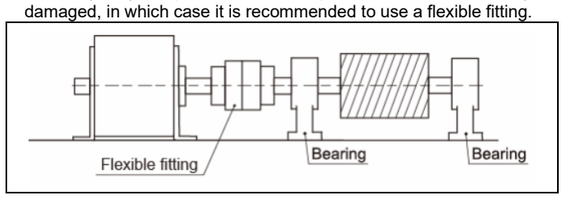

| Size | Fsa | Fsb | Fr |
|---|---|---|---|
| 10 | 15.7 | 7.8 | 14.7 |
| 15 | 19.6 | 9.8 | 19.6 |
| 20 | 49.0 | 29.4 | 49.0 |
| 30 | 98.0 | 49.0 | 78.0 |
| 40 | 108.0 | 59.0 | 98.0 |

- In order to improve operating conditions, it is recommended that a flexible couple shall be used to avoid the direct loading on the shaft.




**3.1.2 Axis Alignment on Extended Shafts**

- When the rotary actuator is used with an extended shaft, ensure that the axis centres of the rotary actuator and its counterpart are aligned. If they are off-centred, the load factor becomes large and an excessive bending moment may be applied to the shaft. In such a condition, the assembly may not perform a stable operation and the shaft may be damaged, in which case it is recommended to use a flexible fitting.




**3.2 Environment**

**⚠ Warning**

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere except within the specified rating.
- Do not expose to direct sunlight. Use a suitable protective cover.

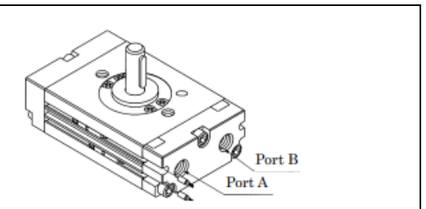
## 3 Installation (continued)

- Do not install in a location subject to vibration or impact in excess of the product's specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product's specifications.
- Do not use in wet environments, where water can remove the presence of the lubrication.
- Do not use in case of heavy dusty environments where dust can penetrate into the cylinder and dry the grease.
- Do not allow dust layers to build up on the cylinder surface and insulate the product.

**3.3 Piping**

**⚠ Caution**

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1 thread exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.




| Model | Port Size | Model | Port Size |
|---|---|---|---|
| Size 10 & 15 | M5 x 0.8 | Size 20,30 & 40 | 1/8 |

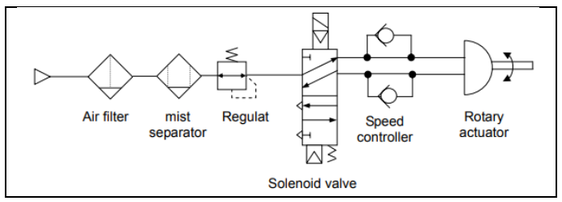
- The axis rotates clockwise when Port A is pressurised.
- The rotary actuator port is equipped with a fixed size orifice. Do not enlarge the hole. Enlarging the hole will increase the operation speed of the actuator and the consequent impact at the end of each stroke could lead to the actuator failure.

**3.4 Lubrication**

**⚠ Caution**

- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.
- If a lubricant is used in the system, refer to catalogue for details.

**3.5 Basic Circuit**




- Plugging one of the ports on the actuator is considered a non-intended use, and could relate to an increase in maximum surface temperature above what the product specification declares.

**3.6 Electrical Connection**

- The product should be grounded by the piston rod and the body in order to create an electrically conductive path to the system/application.
- Ground the product in accordance with applicable regulations.
- Do not pass an electrical current through the product.

## 4 Settings

Refer to the standard product catalogue for general setup precautions.

## 5 How to Order

Refer to catalogue for 'How to Order'.

## 6 Outline Dimensions

Refer to catalogue for outline dimensions.

## 7 Maintenance

### 7.1 General maintenance

**Caution**

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous.
- Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.
- Do not use a product which looks or contains damage, this will invalidate the certification. If damage is seen, please replace the product immediately.
- Periodically check the product for any damage or rust appearing. This could result in an increase in friction and lead to dangerous conditions. Replace the whole actuator if any of these conditions appear.

## 8 Limitations of Use

### 8.1 Limited warranty and disclaimer/compliance requirements

Refer to Handling Precautions for SMC Products.

**Caution**

### 8.2 Obligations of the end-user

- Ensure the product is used within the specification outlined.
- Ensure that the maintenance periods are suitable for the application.
- Ensure any cleaning processes to remove dust layers are made with the atmosphere in mind (e.g. using a damp cloth to avoid static build up).
- Ensure that the application does not introduce additional hazards by mounting, loading, impacts or other methods.
- Ensure that there is sufficient ventilation and air circulation around the product.
- If the product is subject to direct heat sources in the application, they should be shielded so that the actuator temperature stays within the stated operating range.

**Danger**

- Do not exceed any of the specifications listed in Section 2 of this document as this will be deemed improper use.
- Air equipment has an air leakage during operation within certain limits. Do not use this equipment when the air itself introduces additional hazards and could lead to an explosion.
- Use only Ex certified auto switches. These should be ordered separately.
- Do not use this product in the presence of strong magnetic fields that could generate a surface temperature higher than the product specification.
- Avoid applications where the shaft and the adjoining part in the application can create a possible ignition source.

## 8 Limitations of Use (continued)

- Do not install or use these actuators where there is the possibility for the shaft and adjoining parts to impact foreign objects.
- In the event of damage or failure of any parts located in the vicinity where this product has been installed, it is the responsibility of the user to determine whether or not this has compromised the safety and condition of this product and/or the application.
- External impact on the cylinder body could result in a spark and/or cylinder damage. Avoid any application where foreign objects can hit or impact the cylinder. In such situations the application should install a suitable guard to prevent this occurrence.
- Do not use this equipment where vibration could lead to failure.

## 9 Product Disposal

This product shall not be disposed of as municipal waste. Check your local regulations and guidelines to dispose this product correctly, in order to reduce the impact on human health and the environment.

## 10 Contacts

Refer to www.smcworld.com or www.smc.eu for your local distributor/importer.

**SMC Corporation**

URL : https:// www.smcworld.com (Global) https:// www.smc.eu (Europe)
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