Safety Guide
DOC.SG.BE.1 Rev. 2
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Bettis RPE-Series

Rack and Pinion Pneumatic Actuators



BETTIS

EMERSON

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1. Safety Instructions

Please read these safety warnings, cautions, and instructions carefully before using the product.

These instructions cannot cover every installation and situation. Do not install, operate, or maintain this product without being fully trained and qualified in valve, actuator, and accessory installation, operation, and maintenance.

To avoid personal injury or property damage, it is important to carefully read, understand, and follow all of the contents of the associated instruction manual, including all safety cautions and warnings. If you have any questions concerning installation, or use of this product, contact your Emerson sales office before proceeding.

1.1 ANSI 534.6 Safety Messages

⚠ WARNING -

Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

⚠ CAUTION -

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

Note/Important

Indicates information considered important, but not hazard-related

2. General Information

2.1 General Application

The Bettis™ RPE Rack and Pinion actuators are intended for the automation and operation of quarter-turn valves like Butterfly-, Ball- and Plug valves.

Rack and Pinion actuators can also be used to operate venting louvers or any other quarter-turn applications.

This product was intended for a specific range of service conditions: pressure, ambient temperature, operating media, and possibly other specifications. Do not expose the product to service conditions or variables other than those for which the product was intended.

If you are not sure what these conditions or variables are, contact your Emerson sales office for assistance. Provide the product type, size, serial number and all other pertinent information that you have available.

2.2 Inspection and Maintenance Schedules

The Bettis RPE Rack and Pinion actuators must be inspected periodically and maintained as needed. Refer to the maintenance section of manual DOC.IOM.BRPE.EN for more detailed information.

The schedule for inspection can only be determined based on the severity of your service conditions. Your installation might also be subject to inspection schedules set by applicable governmental codes and regulations, industry standards, company standards, or plant standards.

In order to avoid increasing dust explosion risk, periodically clean dust deposits from all equipment.

When equipment is installed in a hazardous area location (potentially explosive atmosphere), prevent sparks by proper tool selection and avoiding other types of impact energy.

Proper care must be taken to avoid generation of static electricity on the non-conductive external surfaces of the equipment (e.g. rubbing of surfaces, etc.). The actuator's surface temperature is dependent upon process operating conditions.

2.3 Parts Ordering

Whenever ordering parts for older products, always specify the type, size and serial number of the product and provide all other pertinent information that you can, such as part material, age of the product, and general service conditions. If you have reconfigured the product since it was originally purchased, include that information with your request.

⚠ WARNING - USE GENUINE PARTS

Use only genuine replacement parts. Components that are not supplied by Emerson should not, under any circumstances, be used in any Bettis product. Use of components not supplied by Emerson may void your warranty, might adversely affect the performance of the product, and could cause personal injury and property damage.

3. Bettis RPE-Series Actuators

These safety instructions are limited to Bettis RPE series actuators which are operating using air or inert gas. If the application requires use of a flammable or hazardous gas, you must contact your Emerson sales office for assistance.

3.1 Installation

⚠ WARNING - DO NOT EXCEED SPECIFICATIONS

To avoid personal injury and property damage caused by bursting of parts and to avoid parts damage, malfunction of control valve, or loss of control of the process caused by excessive pressure, do not exceed the maximum pressures or temperatures for this actuator, as given in the applicable product literature or on the nameplate. Use pressure-limiting or pressure-relieving devices to prevent the actuator pressure from exceeding specified limits. If you cannot determine the limits for this product, contact your Emerson sales office before proceeding.

- To avoid personal injury, always wear protective gloves, clothing, and eyewear when performing any installation operations.
- If hoisting the actuator, use a nylon sling to protect the surfaces. Carefully position the sling to prevent damage to the actuator tubing and any accessories. Also, take care to prevent people from being injured in case the hoist or rigging might slip. Be sure to use adequately sized hoists and chains or slings to handle the assembly. If an actuator/valve assembly should be lifted, it is strongly recommended to connect the nylon lifting slings in such way that the actuator and valve is supported.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.
- If installing into an existing application, also refer to the WARNING in the Maintenance section.
- Do not connect a pressure vessel, to the Actuator, with unrestricted media.
- Do not exceed the MAXIMUM stated operating pressures.
- Applying pressure directly to the actuator can turn the actuator's shaft / Valve stem.
- Applying a control signal to the actuator's solenoid can turn the Actuator / Valve assembly.

⚠ WARNING - MOVING PARTS

Stay away from moving parts to prevent serious injuries. When test cycling the actuator and valve assembly by applying pressure to the A or B port, be aware that there are moving parts like pinion top, actuator to valve coupling and the valve blade, -ball, -plug, etc.

Isolate the piping system on which an actuator-valve assembly is installed, when removing this assembly, and relieve any media pressure that may be trapped in the valve cavities before removing the actuator for maintenance.

3.2 Operation

⚠ WARNING - MOVING PARTS

When rotating the actuator stem or shaft with loading pressure applied, use caution to keep hands and tools out of the actuator travel path. Personal injury and property damage is possible if something is caught between the actuator stem and other control valve assembly parts.

3.2.1 Operating media.

1. Use clean, dry or lubricated air or inert gas.
2. **Maximum Operating Pressure (MOP)** = 8.3 barg / 120 psig
   MOP is the pressure required to produce the maximum rated torque at the break position for all actuators.
   Pressure should not exceed MOP during valve rotation.
   MOP should be the maximum pressure regulator setting.

⚠ WARNING - DO NOT EXCEED SPECIFICATIONS

It can be assured that the housing will not rupture or burst when applying 10 bar of pressure but the cycle function cannot be guaranteed as it totally depends on the time span to which actuator is subjected at 10 bar and the frequency at which these pressure peaks occurs. Every time this peak occurs will, for sure, have a significant negative effect on the life expectancy of the actuator.

3. Refer to below table on applications where the spring stroke of spring-return actuators is pneumatically operated.

Table 3.1 Maximum pressure on spring stroke of spring-return actuators

Spring set	Maximum pressure on spring stroke of spring-return actuators
N=10	7 barg / 101.5 psig
N=20	6 barg / 87.0 psig
N=30	5 barg / 72.5 psig
N=40	4 barg / 58.0 psig
N=50	3 barg / 43.5 psig
N=60	2 barg / 29.0 psig

4. Dew point at least 10K below ambient temperature.
5. For subzero applications take appropriate measures.
6. Mentioned pressure levels are "gauge pressures." Gauge pressure is equal to absolute pressure minus atmospheric pressure.

3.2.2 Operating Temperature range

1. Using standard seals and greases the operating temperature range is -20°C to + 80°C (-4°F to +176°F) as is indicated on the product label.
2. Other medias and temperatures may be used but consult your local Emerson sales office for confirmation as to suitability.

3.3 Maintenance

Before mounting or (dis) assembling the actuator consult the relevant sections of the installation, operation and maintenance manual for more detailed maintenance information.

⚠ WARNING

Avoid personal injury or property damage from sudden release of process pressure or uncontrolled movement of parts. Before performing any maintenance operations:

- Always wear protective gloves, clothing, and eyewear.
- Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.
- Do not remove the actuator from the valve while the valve is still pressurized.
- Vent any pneumatic pressure from the actuator and relieve any actuator spring pre-compression.
- Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
- Never apply pressure to a partially assembled actuator unless all pressure-retaining parts have been installed properly.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.
- Do not remove the Pistons from the Actuator Body by using air pressure when the End Caps have been removed.

⚠ CAUTION - PRESSURIZED ACTUATOR

- Do not turn out the travel stops completely when the actuator is pressurized. When adjusting the travel stops and the actuator is still pressurized, the travel stops can be “shot” away when completely turned out.

⚠ CAUTION - SPRING FORCE

- Spring-return actuators contain springs in a compressed state. Follow these instructions to release the spring force safely. The end caps of spring-return actuators sizes 25 to 600 should be free of the spring load after 10 full turns (crosswise relaxing) of the end cap screws. If there is still spring load on the end cap, this might indicate a broken spring cartridge. Stop this disassembly procedure immediately. Continuing might cause the end cap to be “shot” away causing serious injury.
  Spring return actuator size 950 to 4000 have long end cap screws to release the spring load safely.
  Refer to Appendix A of manual DOC.IOM.BE.EN for the instructions on how to safely remove the spring load before disassembling the end cap from the spring-return actuator.
- A spring-return actuator mounted on a valve, which is stuck in mid stroke, contains a high spring load which will cause a sudden rotation during disassembly of the actuator versus the valve or valve bracket. This can cause serious injury to personnel or damage to material. Refer to Appendix A of manual DOC.IOM.BRPE.EN for instructions to safely remove the spring load before disassembling the actuator form a valve, which is stuck in mid stroke.

4. Actuator accessories

The actuator may be equipped with components for control and/or feedback. Check the instructions of these components for installation, operation and maintenance instructions.

5. Instructions for use in (potential) explosive area’s.

5.1 Intended use

The Bettis RPE series pneumatic actuators are intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours, mists or by air/dusts are likely to occur. Therefore it may be used in classified Zones 1, 2 (Gasses) and/or 21, 22 (Dust).

5.2 Safety instructions

1. Assembly, disassembly and maintenance, is only allowed at the actuator, when, at the time of the activity, there is not an explosive mixture.
2. Prevent entry of explosive mixtures into the actuator. We suggest utilizing a solenoid with a "breather" function on spring-return actuators when used in potentially explosive atmospheres.
3. Provided plastic position indicator is approved for use in potentially explosive (Ex) gas group IIB areas.
   – In areas where Ex gas group IIC requirements apply, the plastic indicator for actuator sizes 25 to 350 is approved for use.
   – In areas where Ex gas group IIC requirements apply, do not use the plastic position indicator (for actuator sizes 600 up to 4000).

4. In order to avoid increasing dust explosion risk, periodically clean dust deposits from all equipment.
5. When equipment is installed in a hazardous area location (potentially explosive atmosphere), prevent sparks by proper tool selection and avoiding other types of impact energy.
6. Rack and pinion actuators do not have an inherent ignition source due to electro-static discharge, but explosion hazard may be present due to the discharge of static electricity from other valve assembly components.
   - To avoid personal injury or property damage, make sure that the valve is grounded to the pipeline before placing the valve assembly into service.
   - Use and maintain alternate shaft-to-valve body bonding, such as a shaft-to-body bonding strap assembly.
7. Proper care must be taken to avoid generation of static electricity on the non-conductive external surfaces of the equipment (e.g. rubbing of surfaces, etc.).
8. The paint protection must not exceed 200 µm if the actuator is used in a group IIC atmosphere. For group IIA or IIB atmospheres the paint protection must not exceed a thickness of 2 mm (0.08").

5.3 Maximum temperatures

⚠ WARNING - SURFACE TEMPERATURE

The actuators surface temperature is dependent upon process operating conditions. Personal injury or property damage, caused by fire or explosion, can result if the actuator's surface temperature exceeds the acceptable temperature for the hazardous area classification. To avoid an increase of instrumentation and/or accessory surface temperature due to process operating conditions, ensure adequate ventilation, shielding, or insulation of these actuator components installed in a potentially hazardous or explosive atmosphere.

Table 5.1 Temperature range for (potential) explosive area's

Temperature			Valid for actuator model
Ambient range	**Temperature class**	**TX (surface temperature)**	
-20°C(-4°F)...75°C(167°F)	T6	T85°C (185°F)	S = Standard Temperature
-20°C(-4°F)...80°C(176°F)	T5	T90°C (194°F)	
-10°C(14°F)...90°C(194°F)	T5	T100°C (212°F)	H = High Temperature
-10°C(14°F)...120°C(250°F)	T4	T130°C (266°F)	
-40°C(-40°F)...75°C(167°F)	T6	T85°C (185°F)	L = Low Temperature
-40°C(-40°F)...80°C(176°F)	T5	T90°C (194°F)	

The specified values are valid with the following conditions:
Maximum cycle frequency of the actuator is 1Hz at a maximum of 50 cycles per hour and at maximum load.

Appendix A: EU Declaration of Conformity

ROC no 11020
Rev. 4

EMERSON

Legal representative entity for the European Union:
Emerson Process Management, Valve Automation
Asveldweg 11, 7556 BR Hengelo Netherlands

BETTIS

We hereby declare, that the products specified below meet the basic health and safety requirements of the below mentioned European Directives.

Product Description :
- Bettis RPE Series - Pneumatic Actuator

Double Acting and Spring Return Actuators
- Double acting types: Type: RPED 25, 40, 65, 100, 150, 200, 350, 600, 950, 1600, 2500 or 4000
- Spring Return types: Type: RPES 25, 40, 65, 100, 150, 200, 350, 600, 950, 1600, 2500 or 4000

Product Variations:
- Product variations of the above mentioned types are still covered by the listed directives and are CE marked.

Serial Number:
- Each Actuator has an identifiable serial number.

EU-Declaration of Conformity

Issued in accordance with the:

Pressure Equipment Directive (PED) 2014/68/EU

- For Gas Group 2 (see Safety Guide DOC.SG.BE.1 section "Operating Media") Bettis RPE Series pneumatic actuators are excluded from the requirements of the Pressure Equipment Directive 2014/68/EU based on article 1, point 3.6 of the directive.
- For Gas Group 1 pressure media, first consult engineering to check compatibility of pressure media with the actuator.
- The below listed limited range of Bettis RPE Series actuator sizes are rated “Sound-Engineering-Practice” or Module A (Internal production control) and are available on request for use with Gas Group 1 media.
  - Double acting types:
    RPED 25, 40, 65, 100, 150, 200, 350, 600 or 950
  - Single acting types:
    RPES 25, 40, 65, 100, 150, 200, 350, 600 or 950

EU Declaration of Conformity

Issued in accordance with the:

ATEX Directive 2014/34/EU

ATEX Marking:
- Ex II 2G c IIC TX
  II 2D c IIIC TX
- For maximum temperature limits and classifications see Safety Guide: DOC.SG.BE.1 chapter 5, instructions for use in potentially explosive atmospheres.

Applicable standards:
- EN 13463-1:2009 EN 13463-5:2011

Declaration of Incorporation of partly completed machinery

Issued in accordance with the

Machinery Directive 2006/42/EU, Appendix IIb

Essential requirements applied and complied with:
- 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4, 1.3.7, 1.5.2, 1.5.3, 1.5.4, 1.5.7, 1.6.1, 1.7.1, 1.7.3, 1.7.4.
- Technical documentation is drafted in compliance with Appendix VII, section B.
- Before the actuator is put into operation, the machine into or onto which the actuator will be installed, must comply with the stipulations of the machinery directive.
- The relevant information concerning the machine or part will be available in the event of a motivated request from national authorities.

Applicable standards:
- EN ISO 12100:2010

Signed:
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Emerson Process Management, Valve Automation
Date: 2016-09-09
Place: Houston TX, U.S.A.

EN

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