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Industrial valves - Actuators - Part 3: Pneumatic part-turn actuators for industrial valves - Basic requirements

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Industrial valves - Actuators - Part 3: Pneumatic part-turn actuators for industrial valves - Basic requirements

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Foreword

This document (prEN 15714-3:2007) has been prepared by Technical Committee CEN/TC 69 “Industrial valves”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

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1 Scope

This document provides basic requirements for pneumatic part-turn valve actuators, both double acting and single acting, used for on-off and modulating control duties. It includes guidelines, recommendations and methods for enclosure and corrosion protection, control and testing.

It does not apply to pneumatic actuators which are integral parts of control valves.

Other requirements, or conditions of use, different from those indicated in this document, shall be subject to negotiations, between the purchaser and the manufacturer/supplier, prior to order.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 292-1:1991, *Safety of machinery — Basic concepts — General principles for design — Part 1: Basic terminology, methodology*

EN 292-2:1995, *Safety of machinery — Basic concepts — General principles for design — Part 2: Technical principles and specifications*

EN 10204:1997, *Metallic products — Types of inspection documents*

prEN 12516-3:1996, *Valves — Shell design strength — Part 3: Experimental method*

EN 12570:2000, *Industrial valves — Method for sizing the operating element*

prEN 1503-3:2000, *Valves — Materials for bodies, bonnets and covers — Part 3: Cast irons specified in European Standards*

EN 60529:2000, *Degrees of protection provided by enclosures (IP Codes)*

EN ISO 3231:1998, *Paints and varnishes — Determination of resistance to humid atmospheres containing sulphur dioxide*

EN ISO 4628-1:1982, *Paints and varnishes — Evaluation of degradation of paint coatings — Designation of intensity, quality and size of common types of defect — Part 1: General principles and rating schemes*

EN ISO 5211:2001, *Industrial valves — Part-turn actuator attachments*

EN ISO 9001:1994, *Quality systems — Model for quality assurance in design, development, production, installation and servicing*

EN ISO 9002:1994, *Quality systems — Model for quality assurance in production, installation and servicing*

ISO 7-1 Rp:1994, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

(ISO 4406:1999, *Hydraulic fluid power — Fluids — Method for coding the level of contamination by solid particles*)

ISO 9227:1990, *Corrosion tests in artificial atmospheres — Salt spray tests*

98/37/EU, *Machinery Directive*

EU 97/23/EC-May 97, *Pressure Equipment Directive*

ANSI B1.20.1 1992, *Pipe Threads, General Purpose (Inch)*

EN 736-1:1995, *Valves — Terminology — Part 1: Definition of types*

EN 736-2:1997, *Valves — Terminology — Part 2: Definition of components of valves*

EN 736-3:1999, *Valves — Terminology — Part 3: Definition of terms*

ISO 5599-1:2001, *Pneumatic fluid power — Five port directional control valves — Part 1: Mounting interface surfaces without electrical connector*

ISO 5599-2:2001, *Pneumatic fluid power — Five port directional control valves — Part 2: Mounting interface surfaces with optional electrical connector*

ISO 5599-3:1990, *Pneumatic fluid power — Five port directional control valves — Part 3: Code system for communication of valve functions*

ISO 8573-1:2001, *Compressed air — Part 1: Contaminants and purity classes*

ISO 8573-2:1996, *Compressed air for general use — Part 2: Test method for aerosol oil content*

ISO 8573-3:1999, *Compressed air — Part 3: Test methods for measurement of humidity*

ISO 8573-4:2001, *Compressed air — Part 4: Test method for solid particle content*

3 Designation

Part-turn actuators are designated by function, action and interface as detailed below.

3.1 Function

Isolating (On-Off) and/or control.

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3.2 Action

— Double Acting (DA)

— Single Acting (SA) with spring action to move clock-wise (CW) or counter clock-wise (CCW), as per clause 4.10.4

3.3 Valve actuator attachment

As per EN ISO 5211

4 Design requirements

The following data shall be provided by the manufacturer/supplier to enable correct actuator selection and performance evaluation.

4.1 Output torques

The guaranteed minimum output torque capability of the actuator, in both directions, at specified supply pressures shall be provided by the manufacturer/supplier.

Where the output torque varies with the stroke, in a non-linear relationship, tabulated data and/or torque/stroke curves shall be provided.

4.2 Design life of part-turn actuators

The actuator shall be designed to have a minimum design life, without maintenance, in accordance with values given in Table 1. These are based on a load of at least 60 % of the rated torque at 0.55 MPa (5.5 bar) supply pressure defined in clause 4.8 (Motive Energy) and in accordance with the test procedure detailed in Annex A.

Table 1 — Minimum number of cycles for Part Turn Actuators

Nominal torque ^a (Nm)	Piston or vane actuator Minimum number of cycles ^b	Maximum stroking time for testing, based on 0-90° (s)
≤ 125	500.000	3
≤ 1.000	500.000	5
≤ 2.000	250.000	8
≤ 8.000	100.000	15
≤ 32.000	25.000	20
≤ 63.000	10.000	30
≤ 125.000	5.000	45
≤ 250.000 ^c	1.000	60
^a Based on EN ISO 5211. ^b One cycle consists of nominal 90° angular travel in both directions (i.e. 90° to open + 90° to close). For angular travel other than 90°, the design life shall be agreed between the purchaser and the manufacturer/supplier. ^c For torque values above 250.000 Nm, the minimum number of cycles shall be agreed between manufacturer/supplier and purchaser.		

4.3 Minimum moving pressure

The actuator minimum moving pressure for double acting actuators, at ambient temperature, shall be made available, by the manufacturer/supplier upon request.

4.4 Leakages

The actuator shall have no visible external leakage for the duration of the production test.

The test pressure shall be nominal pressure (0.55 MPa ≅ 5.5 bar).

The minimum duration for the leakage detection test shall be:

15 seconds for volumes up to and including 2 litres.

30 seconds for volumes up to and including 5 litres.

60 seconds for volumes above 5 litres.

4.5 Moving time

The actuator manufacturer/supplier shall state the moving time in both directions, without external load and without valve, at nominal pressure and without any significant external restriction on supply flow rate and exhaust.

4.6 Angle for part-turn actuators

Part-turn actuators without adjustable end-stops shall be designed for an output movement of 90° (-0° , $+2^\circ$) as standard.

For part-turn actuators with adjustable end-stops and a standard nominal output movement of 90° , the adjustment range shall be stated by the manufacturer/supplier but shall be, at least, $\pm 3^\circ$.

Other angles are subject to agreement between the manufacturer/supplier and purchaser.

4.7 Air volume

The manufacturer/supplier shall indicate the internal actuator displaced volume (litres) for both directions, including the dead volumes.

4.8 Motive energy

4.8.1 Operating medium

The operating medium should be compressed air, unless otherwise specified.

Other compressed gases or pressurised fluids may be used, on agreement between the manufacturer/supplier and purchaser, ensuring they are compatible with internal actuator parts and lubricants.

4.8.2 Quality

The operating medium must have a dew point equal to -20°C or, at least, 10°C below the ambient temperature (ISO 8573 Part 1, Class 3). The maximum particle size shall not exceed $40\text{ }\mu\text{m}$ (ISO 8573 Part 1, Class 5).

If the operating medium is instrument air, it shall be dust-free and oil-free.

4.8.3 Pressure

The manufacturer/supplier shall indicate the actuator's pressure limits. The maximum operating pressure shall be 0.8 MPa (8 bar), unless otherwise specified. The minimum design pressure for pressurised parts shall be 1.5 times the maximum operating pressure.

4.9 Environmental conditions

4.9.1 Ambient temperature

The actuator shall be designed, as a standard, for operation at a minimum ambient temperature range between $-20\text{ }^{\circ}\text{C}$ and $+60\text{ }^{\circ}\text{C}$, unless otherwise agreed between the manufacturer/supplier and purchaser.

4.9.2 Enclosure protection

The non pressurised enclosure of the actuator shall be at least IP 54 according to EN 60529 (excluding the exhaust port).

4.9.3 Corrosion protection

The actuator corrosion protection shall meet at least the following corrosion type tests:

- Salt spray test (NSS): according to ISO 9227 (12/91): minimum duration of the exposure shall be 96 hours.
- Corrosion rates shall be evaluated according to EN ISO 4628 (1982). The minimum rate shall be:
 - Rusting (R_i) ≤ 1
 - Blistering ≤ 2 (S2)

The test shall be carried out on the assembled actuator. Pressure connections and venting orifices shall be sealed.

Test conditions for other particular environments (e.g. sulphur dioxide test according to EN ISO 3231) shall be subject to an agreement between the manufacturer/supplier and the purchaser.

4.10 Basic design

4.10.1 Safety requirements

Actuators shall be designed taking into account the technical principles and specifications for safety of machinery given in EN 292 Parts 1 and 2. The design of spring return actuators shall permit the safe assembly/disassembly, when complying with the manufacturer/supplier's instructions.

4.10.2 Part-turn valve actuator attachment

The valve attachment for part-turn actuators shall comply with EN ISO 5211: Industrial valves — Part-Turn Actuator Attachments.

The output drive of part-turn actuators may be an integral part or a removable component.

The material of the drive component shall be clearly indicated in the supplier's literature.

4.10.3 Pressure connections

The actuators shall normally have two pressure connections.

The position, location, orientation and form of the pressure connections shall be established by the manufacturer.

Connections shall be clearly identified with numbers (2 and 4), in accordance with ISO 5599-2.