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Industrijski ventili - Pogoni - 3. del: Pnevmatični pogoni z delnim zasukom za industrijske ventile - Osnovne zahteve

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

Industriearmaturen - Antriebe - Teil 3: Pneumatische Schwenkantriebe für Industriearmaturen - Grundanforderungen

Robinetterie industrielle - Actionneurs - Partie 3: Actionneurs pneumatiques à fraction de tour pour robinetterie industrielle - Prescriptions de base

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

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 69.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (prEN 15714-3:2021) 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.

This document will supersede EN 15714-3:2009.

In comparison with the previous edition, the following technical modifications have been made:

— addition of new terms and definitions;

— improvement of the classification and the designation with on-off and modulating duty classification;

— addition of a new Clause 5 on motive energy;

— enhancement of the basic design requirements;

— modification of the conformity assessment with type test indications and control of production process.

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 and to pneumatic actuators designed for permanent immersion in fresh or sea water.

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

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

EN ISO 5211, *Industrial valves - Part-turn actuator attachments (ISO 5211)*

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

EN 15714-1, *Industrial valves - Actuators - Part 1: Terminology and definitions*

EN 60529, *Degrees of protection provided by enclosures (IP Code) (IEC 60529)*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15714-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
part-turn actuator
actuator which transmits torque to the valve for less than one revolution; it does not have the capability of withstanding thrust

Note 1 to entry: Part-turn actuators are classified by action and duty.

3.2
stroke
single and complete movement from one end of travel to the other

3.3
end stop
mechanical part designed to stop the actuator drive train at an end position

Note 1 to entry: End stop can be fixed or adjustable.

3.4
output torque
minimum guaranteed output torque capability of the actuator, in both directions, at specified supply pressures conditions as provided by the manufacturer/supplier

Note 1 to entry: Where the output torque varies with the stroke, in a linear or nonlinear relationship with pressure, tabulated data and/or torque versus stroke diagram shall be provided at significant pressure values for each direction of movement.

3.4.1
rated torque
characterizing figure, indicated by the actuator manufacturer/supplier, used to define the maximum actuator operating torque

Note 1 to entry: The rated torque corresponds to the maximum torque value developed by the actuator when powered with maximum allowable pressure.

3.4.2 Nominal torque

3.4.2.1
double acting version
minimum guaranteed output torque of the actuator, at any point of the stroke, with nominal supply pressure 0,55 MPa (5,5 bar)

3.4.2.2
single acting version
guaranteed output torque of the actuator with pneumatic nominal supply 0,55 MPa (5,5 bar) at the beginning of the stroke in the direction to compress the spring

3.4.3
start torque
actuator output torque at the beginning of the stroke in the direction of movement

3.4.4
maximum operating torque
MOT
for double acting version, output torque of the actuator when the pressure of the power supply corresponds to the maximum allowable pressure; for single acting version the maximum output torque between the torque at the beginning of the stroke when the pressure of the power supply corresponds to the maximum allowable pressure and the torque generated by the spring at the end of specified compression stroke

Note 1 to entry: The maximum torque value shall be indicated by the manufacturer/supplier; the value shall be not lower than 1,45 times the nominal torque.

3.5.1
Air Starting Torque
AST
output torque, at defined pressure value, at the beginning of the stroke in opposition to the spring

3.5.2
Air Ending Torque
AET
output torque, at defined pressure value, at the end of the stroke when spring is at its maximum compression

3.5.3
Air Running Torque
ART
any output torque value between AST and AET at defined pressure value

3.5.4
Spring Ending Torque
SET
output torque generated by the spring at the end of its stroke with no air in the cylinder

3.5.5
Spring Starting Torque
SST
output torque generated by the spring at its maximum compression with no air in the cylinder

3.5.6
Spring Running Torque
SRT
any output torque value between SST and SET

4 Classification/Designation

4.1 Duty classification

4.1.1 General

According to their intended function, two versions of linear valve actuators are defined by this document: on-off duty and modulating duty.

4.1.2 On-off duty

The actuator is required to drive the valve through its entire travel from the fully open position to the fully closed position or vice-versa.

4.1.3 Modulating duty

The actuator is required to continuously drive the valve to any position between fully open and fully closed or vice.

4.2 Action

4.2.1 Double Acting (DA)

Actuator which requires the supply of motive energy to operate in both travel directions.

4.2.2 Single Acting (SA)

Actuator which requires external power to operate the valve in one direction only, the return stroke being powered by an alternative form of stored energy (Fail-Safe actuators).

For the purpose of this document, the stored energy shall be supplied by a mechanical spring.

5 Motive energy

5.1 Operating medium

The operating medium shall be compressed air, unless otherwise specified. Other compressed gases may be used, on agreement between the manufacturer/supplier and purchaser, ensuring they are compatible with all the parts in contact with the fluid including the lubricants.

5.2 Quality

Humidity of the operating medium shall be Class 2 according to ISO 8573-1:2010, Table 2.

For ambient temperature conditions different from the standard stated at 7.6.1, the dew point shall be at least 10 °C below the minimum operating ambient temperature.

It is recommended that the content of particles per cubic meter in the operating medium shall not exceed Class 5 according to ISO 8573-1:2010, Table 1; particles up to a maximum 40 µm size are acceptable in the operating medium provided that a right analysis of the behaviour of the ancillaries (8.1), when mounted on the actuator, is done.

5.3 Pressure

The manufacturer/supplier shall indicate the actuator's pressure limits.

Unless otherwise specified the following values shall be considered within the scope of this document:

a) nominal supply pressure: 0,55 MPa (5,5 bar);

b) maximum allowable pressure shall be at least 0,8 MPa (8 bar);

c) design pressure for pressurized parts at least 1,1 times the maximum allowable pressure;

d) the minimum test pressure for pressurized parts shall be 1,50 times the design pressure.

6 Actuator performance data

6.1 Minimum moving pressure

For double acting actuators, the minimum moving pressure, at no load condition and ambient temperature, shall be made available by the manufacturer/supplier upon request.

For single acting actuators, the minimum starting and release pressure in contrast to the spring at the beginning and ending of the nominal stroke, at no load condition and ambient temperature, shall be made available by manufacturer/supplier upon request.

6.2 Operating time

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

6.3 Displacement volume

Internal actuator displaced volumes for each direction, including the dead volumes, for the maximum stroke without any external limitation

Displacement volume should be expressed in litres.

7 Basic design requirements

7.1 Safety requirements

Actuators shall be designed to take into account the technical principles and specifications for safety.

The design of spring return actuators shall permit the safe assembly/disassembly, when complying with the manufacturer/supplier's instructions.

Provisions shall be taken to avoid that the pressure within the spring enclosure exceeds 0,05 MPa (0,50 bar) during the actuator operation if the spring is not located in a pressurized enclosure.

7.2 Actuator attachment

Attachment for part-turn actuators as per EN ISO 5211.

7.3 Angular stroke

Standard angular stroke for part-turn actuators shall be 90°.

For part-turn actuators, without adjustable end-stops, the standard tolerance on 90° angular stroke shall be 0°/+2° for each end of stroke.

For part-turn actuators, with adjustable end-stop in one or both directions, the adjustment range referred to 90° angular stroke shall be stated by the manufacturer/supplier but at least not less than ± 3° for each end where adjustable stroke is provided.

Tolerances on adjustment for any other angular strokes, within the limit of one revolution, are subject to agreement between the manufacturer/supplier and purchaser.

7.4 Endurance of part-turn actuators

The actuator shall be designed to guarantee a minimum endurance, without maintenance, in accordance with values given in Table 1; minimum endurance shall be demonstrated by a suitable test.

For double acting actuators the endurance test shall be performed at a load, along the complete stroke, of at least 60 % of the minimum run torque developed with 0,55 MPa (5,5 bar) nominal supply pressure.

For single acting actuators the endurance test shall be performed at a load, along the complete stroke, of at least 60 % of the minimum value between the minimum air run torque at 0,55 MPa (5,5 bar) nominal supply pressure and the minimum spring run torque.

Number of cycles and stroking time for the endurance test shall be selected from Table 1 considering the range of rated torque (4.1) where the actuator under test falls.

Test endurance shall be performed in accordance with the procedure detailed in Annex A.

Table 1 — Endurance test parameters

Rated torque[a] (Nm) X	Minimum number of cycles[b]	Maximum stroking time (s) for testing based on 90° angular stroke
≤ 125	500 000	3
> 125 to ≤ 1 000	250 000	5
> 1 000 to ≤ 2 000	100 000	8
> 2 000 to ≤ 8 000	50 000	12
> 8 000 to ≤ 16 000	25 000	15
> 16 000 to ≤ 32 000	12 500	20
> 32 000 to ≤ 63 000	5 000	30
> 63 000 to ≤ 125 000	3 200	45
> 125 000 to ≤ 250 000	1 600	60

[a] Range of rated torques based on EN ISO 5211.

[b] Number of cycles based on On-Off duty version; for On-Off duty version one cycle consists of nominal 90° angular travel in both direction (i.e. 90° to open + 90° to close). For Modulating control duty version, the number of cycles, the angular travel and the moving speed for the endurance test shall be agreed between the purchaser and manufacturer/supplier. For angular travel other than 90° the endurance parameters shall be agreed between the purchaser and manufacturer/supplier.

7.5 Leakage

A leakage detection test shall be carried out on static condition, at both end of stroke for double acting version and with spring compressed for single acting version, on the whole pressure retaining parts of the actuator.

The test pressure value shall be at 1,1 times the maximum allowable pressure, with a minimum 0,55 MPa (5,5 bar).

The minimum duration shall be:

a) 30 s for displacement volumes up to and including 10 l;

b) 60 s for displacement volumes up to and including 100 l;

c) 120 s for displacement volumes above 100 l.

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

Specific procedure to perform this test, even with ancillaries if any, including the percentage of tested units for mass production, shall be established by the manufacturer/supplier.