BRITISH STANDARD

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Industrial valves — Actuators

Part 2: Electric actuators for industrial valves — Basic requirements

ICS 23.060.20

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 15714-2:2009.

The UK participation in its preparation was entrusted to Technical Committee PSE/18/5, Valve actuators.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Foreword

This document (EN 15714-2:2009) has been prepared by Technical Committee CEN/TC 69 “Industrial valves”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2010, and conflicting national standards shall be withdrawn at the latest by April 2010.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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1 Scope

This document provides basic requirements for electric valve actuators, used for on-off and control valves. It includes guidelines for classification, design, enclosure and corrosion protection, and methods for conformity assessment.

Combinations of electric multi-turn actuators and gearboxes supplied by the actuator manufacturer are within the scope of this document. In all other cases this European Standard applies to the electric actuator only.

It does not cover: solenoid actuators, electro-hydraulic actuators and electric actuators which are integral in the design of valves.

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

The terms and definitions applicable to this European Standard are given in EN 15714-1.

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

EN 60529, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN ISO 5210:1996, *Industrial valves — Multi-turn valve actuator attachments (ISO 5210:1991)*

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

3 Classification/Designation

3.1 General

Electric valve actuators are classified per type, duty and action as detailed below.

3.2 Type: Part-turn, multi-turn or linear

3.2.1 Part-turn: An actuator which transmits torque to the valve for less than one revolution. It does not have to be capable of withstanding thrust. A combination of a multi-turn actuator plus a part-turn gearbox can be considered, for the sake of this European Standard, a part-turn actuator.

3.2.2 Multi-turn actuator: An actuator which transmits torque to the valve/gearbox for at least one revolution. It may be capable of withstanding thrust. A combination of a multi-turn actuator plus a multi-turn gearbox can be considered, for the sake of this European Standard, a multi-turn actuator.

3.2.3 Linear actuator: An actuator which transmits thrust to the valve for a defined linear stroke. A combination of a multi-turn actuator plus a linear drive can be considered, for the sake of this European Standard, a linear actuator.

3.3 Actuator duty classification

3.3.1 General

Basic design requirements for actuator duty classification are given in 4.1 and 4.7.2.

3.3.2 Class A: On-off

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.

3.3.3 Class B: Inching/positioning

The actuator is required to occasionally drive the valve to any position (fully open, intermediate and fully closed).

3.3.4 Class C: Modulating

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

3.3.5 Class D: Continuous modulating

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

3.4 Action on loss of external electric power

3.4.1 Standard action

On loss of external power, the actuator remains in the position achieved before loss of power.

3.4.2 Fail safe action

On loss of external power, the actuator is able to operate the valve to a pre-defined safe position.

4 Design requirements

4.1 Endurance

4.1.1 General

The actuator shall be designed to meet the life endurance criteria as defined in Annex A.

The endurance of modulating and continuous modulating actuators shall be based on consecutive starts spread over an intermediate stroking span of maximum 30 % of full travel.

4.1.2 Part turn actuators

Table 1 — Part-turn actuator endurance test requirements (see Annex A)

Rated torque ranges [a] Nm	Class A and B On-Off Inching (number of cycles) [b]	Class C Modulating (number of starts) [c]	Class D Continuous modulating (number of starts [c]
Up to 125	10 000	1 800 000	10 000 000
126 — 1 000	10 000	1 200 000	10 000 000
1 001 — 4 000	5 000	500 000	5 000 000
4 001 — 32 000	2 500	250 000	T B A. [d]
Above 32 000	1 000	T.B.A. [d]	T.B.A. [d]

[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), based on an average load of at least 30 % of the rated torque with the ability to transmit 100 % of the rated torque for at least 5 % at each end of travel. For angular travel other than 90°, the endurance shall be agreed between the purchaser and the manufacturer/supplier.

[c] One start consists of a movement of at least 1 % in either direction, with a load of at least 30 % of the rated torque.

[d] To be agreed between manufacturer / supplier and purchaser.

4.1.3 Multi-turn actuators

Table 2 — Multi-turn actuator endurance test requirements (see Annex A)

Rated torque ranges [a] Nm	Maximum allowable thrust [a] kN	Class A and B On-Off Inching (number of cycles) [b]	Class C Modulating (number of starts) [c]	Class D Continuous modulating (number of starts) [c]
Up to 100	≤ to 40	10 000	1 800 000	10 000 000
101 — 700	≤ 150	10 000	1 200 000	10 000 000
701 — 2 500	≤ 325	5 000	500 000	5 000 000
2 501 — 10 000	≤ 1 100	2 500	250 000	T.B.A. [d]
Above 10 000	> 1 100	1 000	T.B.A. [d]	T.B.A. [d]

[a] Based on EN ISO 5210.

[b] One cycle consists of 25 turns in both directions (i.e. 25 turns to open + 25 turns to close), based on an average load of at least 30 % of the rated torque with the ability to transmit 100 % of the rated torque for at least 10 % of the travel.

[c] One start consists of a movement of at least 1 % of travel in either direction, with a load of at least 30 % of the rated torque.

[d] To be agreed between manufacturer/supplier and purchaser.

4.1.4 Linear actuators

Table 3 — Linear actuator endurance test requirements (see Annex A)

Rated thrust ranges [a] kN	Class A and B On-Off Inching (number of cycles) [b]	Class C Modulating (number of starts) [c]	Class D Continuous modulating (number of starts) [c]
Up to 20	10 000	1 800 000	10 000 000
21 — 70	10 000	1 200 000	10 000 000
71 — 150	5 000	500 000	5 000 000
151 — 325	2 500	250 000	T.B.A. [d]
Above 325	1 000	T.B.A. [d]	T.B.A. [d]

[a] Based on EN ISO 5210.

[b] One cycle consists in a stroke of 40 mm, or in a minimum stroke (H) given in Table 5, in both directions (i.e. 40 mm to open + 40 mm to close), based on an average load of at least 30 % of the rated thrust with the ability to transmit 100 % of the rated thrust for at least 10 % of the travel.

[c] One start consists of a movement of at least 1 % of the stroke in either direction, with a load of at least 30 % of the rated thrust.

[d] To be agreed between manufacturer/supplier and purchaser.

4.2 Environmental conditions

4.2.1 General

The following environmental conditions shall apply, unless otherwise agreed between the manufacturer/supplier and purchaser:

4.2.2 Ambient temperature and humidity

The actuator shall be designed for operation at an ambient temperature range between – 20 °C and + 60 °C with relative humidity up to 80 %.

4.2.3 Altitude

The actuator shall be designed for operation at an altitude up to 1 000 m above sea level.

4.2.4 Enclosure protection

Electric actuators shall have at least enclosure protection type IP 65 to EN 60529.

4.2.5 Hazardous areas

Electric actuators intended for use in hazardous areas shall be designed and certified in accordance with the requirements of the applicable regulations.

4.2.6 External corrosion protection

Electric actuators shall be protected against external corrosion by proper material selection and/or surface treatment. The actuator manufacturer's technical documentation shall specify the corrosion protection category according to Table 4.

Table 4 — Environmental corrosion categories

Corrosion category	Typical environments	
	Exterior	Interior
C2 (low)	Atmospheres with low level of pollution. Mostly rural areas.	Unheated buildings where condensation may occur, e.g. depots, sport halls.
C3 (medium)	Urban and industrial atmospheres, moderate sulphur dioxide pollution. Coastal areas with low salinity.	Production rooms with high humidity and some air pollution, e.g. food-processing plants, laundries, breweries.
C4 (high)	Industrial areas and coastal areas with moderate salinity.	Chemical plants, swimming pools, coastal shipyards.
C5-I (very high — industrial)	Industrial areas with high humidity and aggressive atmosphere.	Buildings or areas with almost permanent condensation and with high pollution.
C5-M (very high — marine)	Coastal and offshore areas with high salinity.	Buildings or areas with almost permanent condensation and with high pollution.
Immersed in water [a]		
Im 1 (Immersed in fresh water)	River installations, hydro-electric power plants.	
Im 2 (Immersed in sea or brackish water)	Harbour areas and offshore structures.	
NOTE This table is taken, for reference purposes only, from EN ISO 12944-2. The actuator corrosion protection may also be achieved by systems/methods which deviate from those specified in EN ISO 12944-5.		
[a] Electric actuators covered by this European Standard are not designed for permanent immersion unless otherwise specified.		

NOTE This table may be used to define the corrosion category in order to help the actuator manufacturers to define the surface treatment for corrosion protection. Test assessment and test procedures are the responsibility of the manufacturer.

4.2.7 Vibrations, shock and seismic conditions

Actuators complying with this European Standard are designed without any specific reference to vibrations, shock and/or seismic conditions. If some of these conditions apply they shall be agreed upon between the manufacturer/supplier and the purchaser.

4.3 Actuator attachment

4.3.1 Part-turn actuators

The attachment for part-turn actuators shall comply with EN ISO 5211.

The output drive of part-turn actuators may be an integral part or a removable component to allow it, when necessary, to be machined to suit the driven component of the valve.

The material of the drive component shall clearly be indicated in the manufacturer's/supplier's documentation.

4.3.2 Multi-turn actuators

The attachment for multi-turn actuators shall comply with EN ISO 5210. The output drive of multi-turn actuators may be an integral part or a removable component to allow it, when necessary, to be machined to suit the driven component of the valve. The material of the drive component shall clearly be indicated in the manufacturer's/supplier's documentation.

4.3.3 Linear actuators

For linear actuators, unless otherwise agreed between the manufacturer/supplier and the purchaser, the dimensions of the attachment shall comply with those given below (Figure 1 — Table 5).

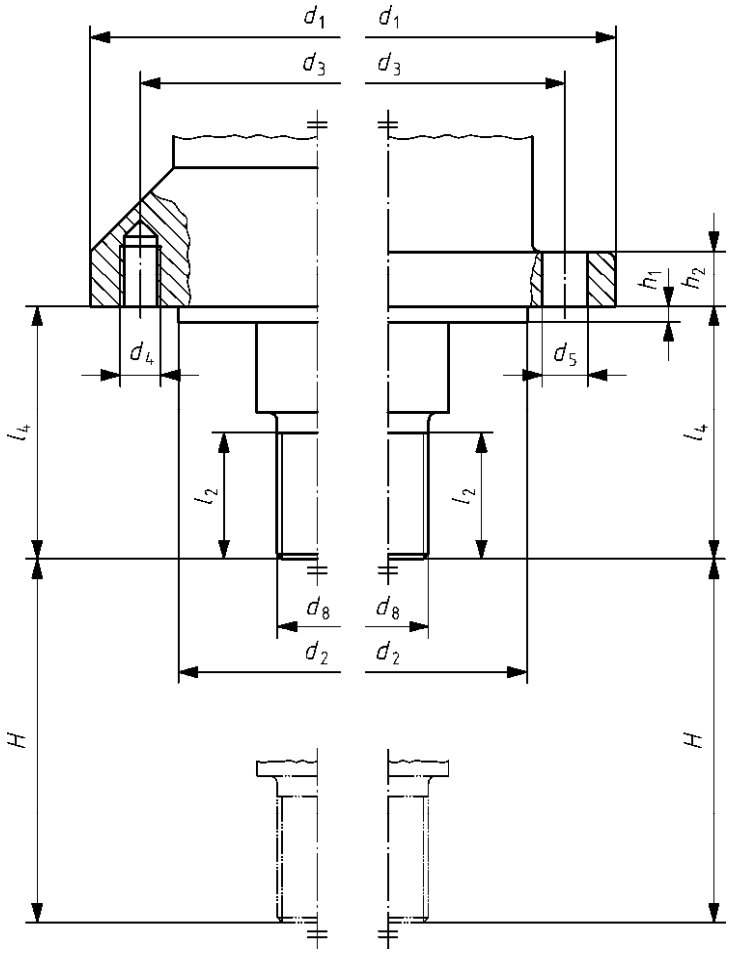

Figure 1 — Dimensions of linear output drive

Table 5 — Data and dimensions of output drive for linear actuators

Flange type	Thrust rating [a] kN	d_1	d_2 [b] f8	d_3	d_4	d_5	Number of studs or bolts	h_1 max.	h_2 min.	l_2	l_4	d_8	H [c] (min. Stroke) mm
F05	10	65	35	50	M 6	7	4	3	10	20	45	M 12 x 1,25	20
F07	20	90	55	70	M 8	9	4	3	12	25	50	M 16 × 1,5	40
F10	40	125	70	102	M 10	11	4	3	15	30	55	M 20 × 1,5	60
F12	70	150	85	125	M 12	13,5	4	3	18	35	65	M 24 × 1,5	60
F14	100	175	100	140	M 16	17,5	4	4	24	55	80	M 36 × 3	80
F16	150	210	130	165	M 20	22	4	5	30	65	90	M 42 × 3	100
F25	200	300	200	254	M 16	17,5	8	5	24	75	100	M 48 × 3	120
F30	325	350	230	298	M 20	22	8	5	30	90	120	M 56 × 4	140
F35	700	415	260	356	M 30	33	8	5	45	120	150	M 80 × 4	160

[a] The thrust values give the maximum thrust which can be transmitted through the mounting flanges, on the basis of the specific criteria given in Clause 4 of EN ISO 5210:1996, when applicable.

[b] The tolerance of the recess shall be decided by the valve manufacturer.

[c] The maximum stroke shall be provided by the manufacturer/supplier.

4.4 Standard closing direction

The standard closing direction shall be:

a) for multi-turn and part-turn actuators clockwise (CW), as viewed from the actuator side of the interface;

b) for linear actuators extended to close.

4.5 Fail safe direction

For actuators with a fixed mechanical fail safe function, the fail safe direction of movement can be either CW or CCW (Extend or Retract for linear), and shall be clearly and permanently indicated on the actuator housing in accordance with Figure 2 (see Clause 7).

For actuators including stored electrical energy systems providing a fail safe function on loss of main electrical power , supplied documentation should indicate default failsafe action/direction and possible configurable options including applicable warnings regarding stored electrical energy supply. It shall be the purchasers/users responsibility to mark the actuator with configured failsafe direction.

a) Turn clockwise (CW) | **b) Turn counter-clockwise (CCW)** | **c) Extend** | **d) Retract**

Figure 2 — Fail safe directions

4.6 Electrical connections — cable entries

All internal electrical components requiring connection to external cables shall be wired to suitable terminals, in a terminal compartment provided with the appropriate number and size of cable entries, in accordance with applicable European electrical Standards.

4.7 Performance

4.7.1 Power supply tolerances

The actuator shall be able to provide its rated torque, at the specified power supply, within the following supply tolerances:

a) nominal voltage: ± 10 %;

b) frequency (for AC supplies): ± 2 %.

4.7.2 Actuator duty performances

4.7.2.1 General

The minimum number of cycles per hour, starts per hour and/or running time per hour, for each actuator duty class are specified in 4.7.2.2, 4.7.2.3 and 4.7.2.4 and are based on an ambient temperature of + 40 °C. For other ambient temperatures, the manufacturer/supplier may state de-rating factors or applicable values.

4.7.2.2 Part-turn actuators

Table 6 — Part-turn actuator duty performances

Rated torque ranges Nm	Class A On-Off (cycles per hour [a])	Class B Inching (starts per hour [b])	Class C Modulating (starts per hour [c])	Class D Continuous (starts per hour [c])
Up to125	15	120	1 200	3 600
126 — 1 000	10	60	600	1 800
1 001 — 4 000	5	30	300	600
4 001 — 32 000	5	15	60	N.A.
Above 32 000	5	5	30	N.A.

[a] One cycle consists of nominal 90° angular travel in both directions (i.e. 90° to open + 90° to close), based on an average load of at least 30 % of the rated torque with the ability to transmit 100 % of the rated torque for at least 5 % at each end of travel, with a cumulative operating time not exceeding 15 minutes in one hour.

[b] One start consists of a movement of at least 1° in either direction, with a load of at least 30 % of the rated torque. The cyclic duration factor (i.e. the ratio between the running period and total period) shall be not less than 25 % (e.g. 1 s running and 3 s resting).

[c] One start consists of a movement of at least 1° in either direction, with a load of at least 30 % of the rated torque.

4.7.2.3 Multi-turn actuators

Table 7 — Multi-turn actuator duty performances

Rated torque ranges (Nm)	Class A On-Off (running time per hour [a])	Class B Inching (starts per hour [b])	Class C Modulating (starts per hour [c])	Class D Continuous modulating (starts per hour [d])
Up to 100	15 minutes	30	1 200	3 600
101 — 700	15 minutes	20	600	1 800
701 — 2 500	15 minutes	15	300	600
2 501 — 10 000	15 minutes	10	60	T.B.A. [e]
Above 10 000	15 minutes	5	30	T.B.A. [e]

[a] Based on an average load of at least 30 % of the rated torque with the ability to transmit 100 % of the rated torque for at least 10 % of the time.

[b] For inching, one start duration is defined by at least one revolution, with an average load of 30 % of the rated torque.

[c] For modulating, one start consists of at least ¼ revolution, with a load of at least 30 % of the rated torque. The cyclic duration factor (i.e. the ratio between the running period and total period) shall be not less than 25 % (e.g. 1 s running and 3 s resting).

[d] For continuous modulating, one start consists of at least ¼ revolution, with a load of at least 30 % of the rated torque.

[e] To be agreed between manufacturer/supplier and purchaser.

4.7.2.4 Linear actuators

Table 8 — Linear actuator duty performances

Rated thrust ranges kN	Class A On-Off (cycles per hour [a])	Class B Inching (starts per hour [b])	Class C Modulating (starts per hour [c])	Class D Continuous modulating (starts per hour [c])
Up to 20	15	30	1 200	3 600
21 — 70	10	15	600	1 800
Above 70	5	10	60	T.B.A. [d]

[a] One cycle consists in a stroke of 40 mm in both directions (i.e. 40 mm to open + 40 mm to close), based on an average load of at least 30 % of the rated thrust with the ability to transmit 100 % of the rated thrust for at least 10 % of the travel.

[b] One start consists of a movement of at least 1 % of the minimum stroke (as stated in Table 5) in either direction, with a load of at least 30 % of the rated thrust. The cyclic duration factor (i.e. the ratio between the running period and total period) shall be not less than 25 % (e.g. 1 s running and 3 s resting).

[c] One start consists of a movement of at least 1 % of the minimum stroke (as stated in Table 5) in either direction, with a load of at least 30 % of the rated thrust.

[d] To be agreed between manufacturer/supplier and purchaser.

4.7.3 Operating time and speed

For part-turn actuators the operating time shall be provided in seconds per angular stroke (e.g. s/90°).

For multi-turn actuators the operating speed shall be provided in revolutions per minute (r.p.m.).

For linear actuators the operating speed shall be provided in millimetres per second or millimetres per minute (mm/sec or mm/min).

For variable speed actuators, the maximum and minimum values shall be provided by the manufacturer/supplier.

4.8 Basic requirements

4.8.1 Motors

Actuator motors are designed by the actuator manufacturer as an integral part of the actuator in order to achieve the performances defined under 4.7.

NOTE As such they do not fall within the scope of EN 60034-1.

There is no direct relation between nominal motor power (kW) and actuator rated torques.

Asynchronous motor windings shall be protected against overheating by a suitable thermal protecting device. For other types of motors the protecting device is not mandatory.

4.8.2 Gearing and lubrication

The actuator gear mechanism shall be totally enclosed and lubricated. The method of lubrication (grease, oil and/or self lubricating materials) shall be under the responsibility of the manufacturer/supplier and shall suit the specified ambient conditions and the operation of the actuator when mounted in any orientation.

4.8.3 Manual operation

The actuator shall be provided with a means for manual operation (e.g. by hand-wheel, lever, socket wrench) or similar device for manual operation. When requested, for particular applications, manual operation may be omitted.

The drive shall be designed so that the manual operating element cannot be driven by the motor. For part-turn and linear actuators the motor may drive the manual operating element, providing that the manufacturer/supplier assures that applicable safety requirements are met.

The sizing of the operating element shall be in accordance with EN 12570.

Unless otherwise specified, the manual operating element shall be rotated clockwise to close the valve. The closing direction shall be clearly and permanently marked.

4.8.4 Travel limitation

The actuator shall include means of de-energising the motor in response to reaching set open and close positions.

Travel limiting devices shall be independently adjustable to set the open and closed valve positions.

The correct setting of such devices shall not be lost, even under loss of power and/or with manual operation.

The repeatability deviation in reaching these positions, during successive operations, shall be within 1 % of the travel for linear actuators and multi-turn actuators and max. 1° for part-turn actuators.

If the device can be connected electrically to an external circuit, the electrical rating shall be stated in the technical documentation.

4.8.5 Torque/Thrust limitation

A device for limiting actuator output torque (or thrust), acting in both directions, shall be incorporated.

NOTE The device may be by-passed during unseating of the valve.

After the torque/thrust limiting device has operated, means to prevent unwanted operation of the actuator in the same travel direction may be required.

If the device can be connected electrically to an external circuit, the electrical rating shall be stated in the technical documentation.

For small size part-turn/linear actuators up to 125 Nm/20 kN a torque/thrust limiting device is not mandatory.

4.8.6 End stop adjustment for part-turn and linear actuators

When specified, part-turn and linear actuators may be supplied with two integral mechanical end stops (one for each end position). These may be fixed or independently adjustable (minimum adjustment range $\pm$ 2 % of the travel).

4.8.7 Local position indication

Class A (on-off) part-turn actuators shall be equipped with an indicating arrangement or device to clearly show the valve obturator position. The indicator shall show the valve obturator’s position during both power and manual operation.

5 Optional equipment

5.1 General

When specified, the following options may be fitted to the actuator subject to agreement between the manufacturer/supplier and the purchaser. If the options can be connected electrically to an external circuit, the electrical rating shall be stated in the technical documentation.

5.2 Anti-condensation heater

A suitable device to inhibit condensation inside the electric control housing.

5.3 Local position indication (for multi-turn or linear actuators)

An indicating arrangement or device to clearly show the valve obturator position. The indicator shall show the valve obturator's position during both power and manual operation.

5.4 Position transmitter

A position transmitter which operates whether the actuator is in electrical or manual mode. The transmitter shall enable continuous indication of the valve obturator position at a remote location. It may be of analogue or digital type.

5.5 Actuator running transmitter

A device which provides remote indication that the actuator is running.

5.6 Additional position and/or torque signalling

Additional means of providing signalling of specific positions of travel and/or torque limiter operation for remote indication and/or control purposes.

5.7 Local control station

An integrally or remotely mounted panel providing means of local control of the actuator (open-stop-close). It may include a lockable selecting device (local-off-remote) and/or status indication.

5.8 Actuator electrical controls

5.8.1 General

Actuator electrical controls provide comprehensive functionality for remote control of the actuator. This may include the local control station (as described in 5.7).

The controls may be an integral part of the actuator or, in case of space restrictions or adverse environmental conditions (e.g. high temperatures, vibrations), separately installable.

All electrical connections, necessary for local and remote control and indication, shall be shown on the actuator wiring diagram (See Clause 8).

Optional integral control equipment may include actuator availability monitoring, response to "ESD" command and, for 3–phase power supply, phase rotation sensitive protection/correction and power supply failure protection.

5.8.2 Positioner

An integrally mounted analogue or digital device, providing positioning control. The input signal may be analogue by a voltage or a current, internally or externally powered, or digitally sourced.

Positioner type, signal type and range shall be subject to agreement between manufacturer/supplier and purchaser.

5.8.3 Controller

When specified the actuator controls may include a device to perform control functions as required.

5.8.4 Speed Control

An integrally mounted device effecting valve operating time by means of direct actuator motor operating speed control or “stop-start” (pulsing) action. The speed range/ratio and speed control position/direction are subject to agreement between manufacturer/supplier and purchaser.

5.8.5 Field Bus system interface

An integrally mounted field control device providing connectivity with host control system for actuator control, status indication and monitoring.

The field control device shall meet the specified field bus system.

5.8.6 Torque transmitter (analogue or digital)

A device that enables the indication of actuator output torque at the display of the actuator and/or at a remote location.

5.8.7 Actuator performance data logger

An internally mounted device that records data relating to the performance/operation of the valve, actuator and control system for analysis purposes.

The data to be logged shall be subject to agreement between manufacturer/supplier and purchaser.

A means of accessing/viewing the logged data shall be provided.

Connection device/analysis software etc. not integral to the actuator shall be made available.

6 Conformity assessment

6.1 General

The manufacturer/supplier shall demonstrate the compliance of his products to this European Standard by the following.

a) Carrying out all the type tests (see 6.2) to ensure all “fitness for purpose” criteria are met.

b) Controlling the production process (see 6.3) to ensure the required performance levels are continuously maintained.

c) The manufacturer/supplier shall ensure that all the requirements of this European Standard are met. Should the verification of a requirement be necessary, on a supplied product, it shall be done by carrying out the corresponding type test.

6.2 Type tests

The type tests shall correspond to all design requirements stated in Clause 4 of this European Standard.

Type test shall be carried out on actuators that are representative of the current production.

Type tests results shall be recorded in a test report, detailing the type, quantity and sizes of the actuators tested and the test equipment and measuring devices used.

To qualify a range of actuators, of the same design principle and of the same classification/designation (as per Clause 3), manufactured under the same process and from the same or equivalent materials, the type tests may be carried out on a limited number of representative sizes by applying the following rules:

a) When an actuator having a nominal output torque/thrust “x” is qualified, all actuators having nominal output torques/thrust between 50 % x and 200 % x [x/2 or 2x] are considered qualified.

b) When a part-turn actuator with an operating time of “y” is qualified, all actuators having an operating time higher than “y” are also considered qualified.

c) When a multi-turn or linear actuator with a speed of “z” is qualified, all actuators having a speed lower than “z” are also considered qualified.

d) The appropriate type tests shall be repeated when the design or the production process have been modified, which could affect the functional performances.

The type test shall be carried out by the manufacturer/suppliers, or by a competent testing institute.

A full report of these tests shall be retained by the manufacturer/supplier as evidence of compliance.

The type tests to be performed shall be those given in Table 9.

6.3 Control of production process and quality system

The manufacturer/supplier shall have a quality system capable of ensuring that manufactured products comply with the performance requirements of this European Standard.

The production verifications to be performed shall be those given in Table 9.

For actuator/gearbox combinations provided by the actuator manufacturer/supplier, combination type and production tests are not compulsory. Verification of combination torque/thrust shall be available but may be derived via calculation based on gearbox performance data.

For actuator/linear drive combinations provided by the actuator manufacturer/supplier where the linear drive is not an integral part of the electric actuator, combination output thrust production tests are not compulsory. Verification of combination thrust shall be available but may be derived via calculation based on linear drive performance data.

Gearbox performance criteria shall be verified by either test and/or calculation and by agreement between actuator and/or gearbox manufacturers/suppliers and purchaser.

Table 9 — Type tests and production tests

Item	Requirement	Clause	Type tests	Production verifications
1	Basic design	4	See Clause 4	—
1.1	Enclosure protection	4.2.4	Verify test reports of manufacturer	Random tests
1.2	External corrosion protection	4.2.6	Verify test reports of manufacturer	yes, visual, with random inspections
2	Marking	7	See Clause 7	yes
3	Endurance	4.1	Endurance test	—
4	Checking of electric wiring	8, 4.6	yes	yes
5	High voltage test, when applicable	—	yes	yes
6	Checking sense of rotation	4.4	yes	yes
7	Operating time/output speed/velocity	—	Validate manufacturer's design values	yes
8	No load current	—	yes	yes
9	Checking of manual operation	4.8.3	yes	yes
10	Output torques/thrusts	—	Validate manufacturer's design values	yes
11	Calibration of torque/thrust limiting device	4.8.5	Validate manufacturer's design values	yes
12	Setting of torque limiting device	—	Validate manufacturer's design values	yes [a]
13	Setting of travel limiting device	4.8.4	Validate manufacturer's design values	yes [a]
14	Optional equipment	5	Refer to manufacturer's technical documentation and product file, in full compliance with applicable directives.	Functional test with accessories according to supply [b]
15	Documentation	8	See Clause 8	See Clause 8

[a] When specified.

[b] Functional tests may be performed at sub assembly/component level.

7 Marking

Each actuator shall be marked legibly and indelibly with the following permanent indications:

a) manufacturer/supplier's name and/or trade mark;

b) model type and designation (as per Clause 3);

c) actuator commission and/or serial number and reference to year of manufacture (e.g. WW/YY or MM/YY);

d) voltage, current type and frequency (when applicable);

e) nominal motor power (kW);

f) nominal motor current (A);

g) actuator rated torque (Nm) / thrust (kN);

h) enclosure protection (IP designation);

i) hazardous protection (when applicable);

j) fail safe action (when applicable);

k) mandatory marks.

The following is optional:

l) duty classification and cyclic duration factor;

m) actuator operating time or speed;

n) ambient temperature range;

o) reference to this European Standard;

p) actuator attachment designation (EN ISO 5210 or EN ISO 5211);

q) angular stroke (for part-turn actuators only);

r) corrosion category (e.g. C2);

s) gear case lubrication type;

t) motor insulation class;

u) manufacturer's wiring diagram identification.

8 Documentation

The language of the relevant documentation shall be agreed between the manufacturer/supplier and the purchaser.

The manufacturer/supplier shall provide the following:

a) transport and storage instructions;

b) wiring diagram;

c) installation, commissioning, operating and maintenance instructions;

d) mandatory documentation.

The following is optional:

e) detailed overhaul instructions;

f) itemized spare parts list;

g) list of recommended spare parts;

h) production test certificate (as per 6.3).

Annex A
(normative)

Endurance test procedure

A.1 General

Actuators complying with this European Standard shall be type-tested in agreement with the following:

A.2 Test equipment

The test rig shall allow the attachment of the actuator and shall be suitably designed to allow the full travel of the actuator. It shall provide means of applying a measurable torque/thrust.

The test rig shall be equipped with following calibrated devices, as a minimum:

a) suitable electric multimeter device/s;

b) an operating cycle counter;

c) an instrument for measuring the applied torque/thrust and the operating stroke.

A.3 Test conditions

The test shall be conducted at room temperature (between 15 °C and 30 °C), under the conditions given in 4.2. The testing power supply shall be properly documented in the test documentation of the manufacturer.

A.4 Test procedure

The operating time and cycles shall be as specified by the manufacturer, in accordance with 4.1 (Endurance) and 4.7.2 (Actuator duty performances).

A.5 Acceptance criteria

At the end of the test, results shall comply with the following criteria.

a) The final torque/thrust values shall not be less than 90% of the initial values.

b) The final operating stroke/number of turns/angular travel shall remain between 98 % and 102 % of the initial value.

Annex B
(informative)

Actuator selection guidelines

B.1 General

Actuated valve malfunctions are often due to the under sizing of actuators. The initial material cost "saving" is usually insignificant, compared with the costly production losses and/or danger presented to personnel and to plant equipment.

Conversely, it is even more important, that excessive safety factors are not applied to valve torques/thrusts which may result in selected actuators being capable of twisting/shearing/bending/buckling valve stems and possibly transmitting a feedback signal that does not correspond to the valve position. This is usually associated with critical valve applications e.g. "ESD (Emergency Shut Down)" valves.

It is therefore essential that the correct size of actuator is selected together with any associated ancillary equipment.

To obtain all the information it may be necessary to question the end user, the contractor/designer, the valve manufacturer, the actuator manufacturer and ancillary equipment manufacturers.

The aim of these guidelines is to provide a clear understanding of the torque/thrust requirements and what parameters affect the correct actuator selection. Relevant questions need to be answered regarding the valve operating service, the actuator working parameters/environment, ancillary equipment and local regulations.

B.2 Selection parameters

B.2.1 General

Determine the appropriate torques/thrusts, strokes and operating speeds taking into consideration the following parameters and questions

B.2.2 Valve Questions

a) Valve manufacturer, type, size, function and operating characteristics.

b) Valve torque/thrust characteristics (seating/unseating, dynamic torque/thrust, when applicable).

c) Maximum allowable stem torque/thrust limitation (MAST).[1]

d) Safety factors.

e) Valve travel / stroke.

f) Operating Conditions: Media type, media temperature, max. sizing pressure, frequency of operation and specified operating time and applicable tolerances.

1 Note that the valve stem is not necessarily the weakest part in the drive train.

B.2.3 Actuator Questions

a) Actuator type, as indicated in 3.1.

b) Power supply (AC or DC), voltage, frequency (if AC) and applicable tolerances.

c) Actuator duty classification: as indicated in 3.2.

d) Angular travel, number of turns/stroke or linear travel.

e) Specified operating time/output speed.

f) Frequency of operations.

g) Area classification (non-hazardous or hazardous).

h) Type of remote control (binary, analogue, serial).

B.3 Ancillary Questions

If any optional equipment is required, please refer to Clause 5.

B.4 Environmental conditions (as indicated in 4.2)

NOTE These points are relevant to all ancillaries and suitable materials/protection should be selected.

a) Indoor, outdoor, saline, corrosive chemicals, etc..

b) Enclosure protection type.

c) Hazardous or non-hazardous areas.

d) Ambient temperature.

B.5 Actuator selection

After providing answers to Clause B.1, it is the responsibility of the valve manufacturer/supplier to provide operating torque values, throughout the valve's travel/stroke in both directions, including any relevant safety factors and the maximum torque/thrust that can be applied to the valve drive train.

Once the valve's torque/thrust characteristic values have been established, select an actuator, considering the minimum power supply (i.e. taking into account supply tolerances) specified by the purchaser, that provides a torque/thrust greater than the required maximum valve operating torque/thrust, taking into consideration varying valve torque/thrust values throughout its travel/stroke, in both directions.

At the maximum power supply, the maximum output torque/thrust of the selected actuator should not exceed the maximum allowable valve stem torque/thrust (MAST).

Moving time is checked and if necessary, modifications and/appropriate speed selection shall be performed.

Select appropriate materials, corrosion protection system, command and control ancillaries according to the environmental conditions, local regulations and purchaser requirements/specifications.

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