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Industrijski ventili - Gonila za ventile (ISO/DIS 22109:2019)

Industrial valves - Gearbox for valves (ISO/DIS 22109:2019)

Industriearmaturen - Armaturengetriebe (ISO/DIS 22109:2019)

Robinetterie industrielle - Réducteur pour appareil de robinetterie (ISO/DIS 22109:2019)

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 153, *Valves*.

Industrial valves — Gearbox for valves

1 Scope

This document provides basic requirements for gearboxes to operate industrial valves for manual and automated on/off and modulating duties, this includes manual override gearboxes. It includes guidelines for classification, design and methods for conformity assessment.

It does not cover gear systems which are integral part in the design of valves and subsea gearboxes.

Other requirements or conditions of use different from those indicated in this document should be agreed between the purchaser and the manufacturer or supplier (first party), 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.

ISO 5210, *Industrial valves — Multi-turn valve actuator attachments*

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

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

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

3.1
gearbox
self contained gear unit for torque/speed/orientation change that can be manually operated by handwheel/lever and/or automated with an actuator

3.2
primary gearbox
gearbox connected directly to the valve stem and transmitting a torque

3.3
ambient temperature
air temperature surrounding the gearbox

3.4
end of stroke
predefined position related to a fully open or a fully closed condition

3.5
end stop
mechanical part designed to stop the gearbox drive train movement

3.6
endurance
lifetime without failure at specified conditions and tested by the type test specified in Clause 7

3.7
indicating arrangement
device, externally visible, showing the position of the valve obturator

3.8
rated torque/thrust
classification defined by the gearbox manufacturer used to define the maximum gearbox operating torque/thrust capability

Note 1 to entry: Torque is defined in Newton meters (Nm) and thrust in Newton (N).

4 Classification

4.1 General

Gearboxes are classified per type for operation and rotation as detailed in 4.2 and 4.3.

4.2 Kind of operation

There are three kinds of operation:

— manual: gearbox designed for manual operation only, typically this has only one input, normally by a handwheel.

— automated: gearbox designed for automated operation, typically this has only one input, normally by an actuator.

— manual override: gearbox designed for overriding automated operation, typically this has two inputs: The primary input is normally an actuator. The secondary input is normally by a handwheel. the secondary input is normally disengaged when the gearbox is being used in automated mode and is engaged when manual operation is required, e.g. on loss of power.

4.3 Kind of rotation

There are two kinds of rotation:

— part-turn: gearbox which transmits torque to the valve for a rotation of less than one revolution;

— multi-turn: gearbox which transmits torque and may be capable of withstanding thrust to the valve for a rotation of at least one revolution.

5 Design requirements

5.1 Endurance

5.1.1 General

The basic design requirement for automated gearboxes duty classification are given in Table 1.

Table 1 — Automated duty classification

Class	Duty	Definition
A	On-off	The gearbox is required to drive the valve through its entire travel from the fully open position to the fully closed position or vice-versa.
B	Inching/postioning	The gearbox is required to occasionally drive the valve to any position (fully open, intermediate and fully closed).
C	Modulating	The gearbox is required to frequently drive the valve to any position between fully open and fully closed.
D	Continous modulating	The gearbox is required to continuously drive the valve to any position between fully open and fully closed.

The gearbox shall be designed to meet the endurance criteria defined in Table 2 or Table 3.

If the gearbox is provided in an automated version or required for a future automation, it shall be designed to have a minimum endurance in accordance with Table 2 or Table 3.

Gearboxes shall be type-tested in accordance with Clauses A.2 to A.5.

Table 2 — Part-turn gearboxes

Rated torque [a] (Nm)	**Manual**	**Automated**		
	On-off (number of cycles) [b]	**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	500	10 000	1 800 000	10 000 000
126 – 1 000	500	10 000	1 200 000	10 000 000
1 001 – 4 000	500	5 000	500 000	5 000 000
4 001 – 32 000	300	2 500	250 000	T.B.A. [d]
Above 32 000	250	1 000	T.B.A. [d]	T.B.A. [d]
The cycle capacity shall be obtained without changing spare parts.				

[a] Based on 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 is agreed between the purchaser and the manufacturer or supplier.

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

[d] T.B.A. means to be agreed between manufacturer/supplier and purchaser.

Table 3 — Multi-turn gearbox

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

[a] Based on 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 at least 1 % in either direction, with a load of at least 30 % of the rated torque.

[d] T.B.A. means to be agreed between manufacturer/supplier and purchaser.

5.2 Safety factor

5.2.1 Manual gearboxes

Manual gearboxes shall be capable of withstanding an input torque of at least 1,5 times the torque required to develop the rated output torque.

5.2.2 Automated gearboxes

Automated gearboxes shall be capable of withstanding an input torque of at least 2,0 times the torque required to develop the rated output torque.

5.3 Self-locking/braking

The physical concept of self-locking only applies to particular gearbox designs and is not securing positions under all conditions, e.g. vibrations. If the position of the gearbox shall be stable with torques applied to the output, the gearbox and/or additional components might need to be designed for these applications.

Braking, locking devices or assemblies might be integral parts of gearboxes and/or additional components provided by the supplier to the customer/end-user, in order to secure any given position within the stroke or cycle (in particular in the fully closed position).

In order to provide better positioning and in order to limit overshooting of positions active braking or other solutions might be necessary to incorporate into the gearbox and/or additional components.

5.4 Mechanical advantage

5.4.1 General

Mechanical advantage is the given ratio between the output and input torque. The mechanical advantage is intended as a meanvalue measured at the rated torque. The mechanical advantage is considered after an appropriated running in as per manufacturer's indication.