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Industrial valves — Multi-turn valve actuator attachments

Robinetterie industrielle — Raccordement des actionneurs multitours aux appareils de robinetterie

Reference number
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Foreword

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This document was prepared by Technical Committee ISO/TC 153, *Valves*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 69, *Industrial valves*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 5210:2017), which has been technically revised.

The main changes are as follows:

— dimensions and tolerances for keys and keyways were added in a new Annex B;

— a reference to the new Annex B was added in 7.3 and 7.5;

— editorial changes were made.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

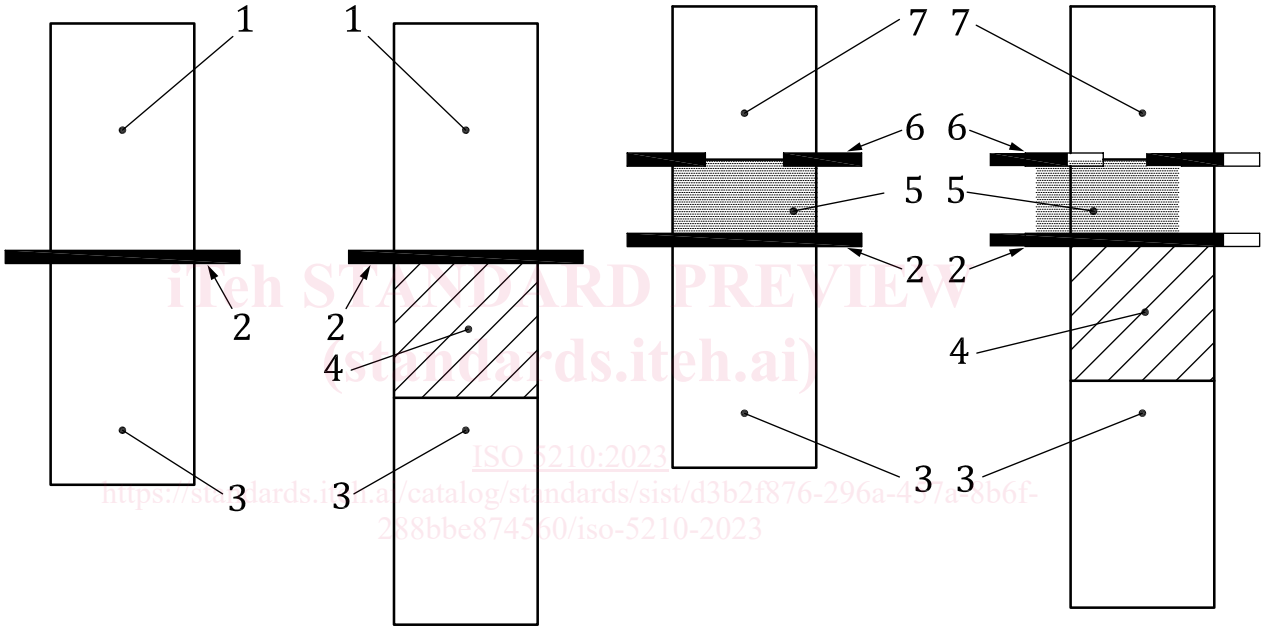
Introduction

The purpose of this document is to establish certain basic requirements for the attachment of multi-turn actuators, in order to define the interface between actuator and valve.

This document is, in general, considered in conjunction with the specific requirements which may be agreed between the parties concerned.

NOTE 1 In this document, the term “valve” can also be understood to include “valve with an intermediate support” [see Figure 1 b)].

NOTE 2 When a combination of a multi-turn actuator and separate multi-turn/linear gearbox is coupled to form an actuator, the multi-turn attachment to the gearbox is in accordance with this document [see Figures 1 c) and 1 d)]. A combination of a multi-turn actuator with integral multi-turn/linear gearbox supplied as an actuator is in accordance with Figures 1 a) and 1 b).



a) Direct interface

b) Intermediate support interface

c) Direct interface (when combination of a multi-turn actuator and multi-turn/linear gearbox)

d) Intermediate support interface (when combination of a multi-turn actuator and a multi-turn/linear gearbox)

Key

1 multi-turn/linear actuator
2 interface (see ISO 5210)
3 valve
4 intermediate support
5 gearbox
6 interface (see ISO 5210)
7 multi-turn actuator

Figure 1 — Interface between multi-turn/linear actuator and valve

Industrial valves — Multi-turn valve actuator attachments

1 Scope

This document specifies the requirements for the attachment of multi-turn actuators to valves.

Throughout this document, “actuator” can be understood as “actuator and/or gearbox” providing a multi-turn and/or linear output.

It specifies:

— flange dimensions necessary for the attachment of actuators to industrial valves [see Figure 1 a)] or to intermediate supports [see Figure 1 b)];

— those driving component dimensions of actuators which are necessary to attach them to the driven components;

— reference values for torque and thrust for flanges having the dimensions specified in this document.

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 273, *Fasteners — Clearance holes for bolts and screws*

3 Terms and definitions

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

ISO and IEC maintain terminology 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
actuator
any device designed for attachment to a general-purpose industrial valve in order to provide for the operation of the valve

Note 1 to entry: The device is designed to operate using motive energy which may be electrical, pneumatic, hydraulic, manual, etc., or a combination of these. Movement is limited by travel, *torque* (3.4) and/or *thrust* (3.5).

3.2
multi-turn actuator
actuator (3.1) which transmits *torque* (3.4) to the valve for at least one revolution and may be capable of withstanding *thrust* (3.5)

Note 1 to entry: An actuator may be a combination of a multi-turn actuator and multi-turn gearbox.

3.3
linear actuator
actuator (3.1) which transmits *thrust* (3.5) to the valve for a defined linear stroke

Note 1 to entry: An actuator may be a combination of a *multi-turn actuator* (3.2) and linear gearbox.

3.4
torque
turning moment transmitted through the mounting flanges and couplings

Note 1 to entry: Torque is expressed in newton-metres.

3.5
thrust
axial force transmitted through the mounting flanges and couplings

Note 1 to entry: Thrust is expressed in kilonewtons.

4 Maximum torques and thrusts

The torque and thrust shall comply with the values listed in Table 1 which represent the maximum torques and thrusts which can be transmitted simultaneously through the mounting flanges and couplings. They are based upon specified criteria.

Table 1 — Maximum torque and thrust values

Flange type	Torque [Nm]	Thrust [kN]
F05	20	10
F07	40	20
F10	100	40
F12	250	70
F14	400	100
F16	700	150
F25	1 200	200
F30	2 500	325
F35	5 000	700
F40	10 000	1 100
F48	20 000	2 000
F60	40 000	4 000

The values specified in Table 1 have been defined on the basis of bolts in tension at a stress of 290 MPa and a coefficient of friction of 0,2 between the mounting interface. All variations in these defined parameters lead to variations of the transmittable torque and/or thrust values. See Annex A for an explanation on the calculation method.

The selection of flange size for a particular application should take account of additional torques and/or thrust that may be generated at the valve stem because of sizing, safety factors, inertia or other similar factors. Specifically, the torque and thrust generated at the maximum output torque and/or thrust of the selected actuator shall be calculated and considered in the selection of the flange along with the ability of the valve and actuator to withstand such torque and thrust forces.

5 Flange dimensions

Flanges for actuator attachment shall comply with the dimensions shown in Figure 2 and given in Table 2. The method of attachment shall be by means of studs or through bolting. When through

bolting is used, the diameter of the clearance holes shall permit the use of bolts of a size given by the corresponding dimension d_4 in Table 2.

Holes for the studs/bolts shall be positioned off-centre (see Figure 3 and Table 3), shall be equi-spaced and shall conform to the requirements of ISO 273.

The interface on the valve shall have a recess corresponding to the diameter d_2. A spigot on the actuator is optional.

The minimum values for dimension h_2 shown in Table 2 apply to flanges having material of proof stress $R_e \geq 200$ MPa. The minimum values for dimension h_2 applied to flanges having materials of proof stress $R_e \leq 200$ MPa shall be agreed between manufacturer and purchaser. The minimum values for dimension h_3 shall be at least $1 \times d_4$.

Dimension d_1 has been based on providing sufficient landing for the nuts and bolt heads where applicable. Such landing is defined as a radius from the bolt hole centre with the dimension $(d_1 - d_3) / 2$, and is a minimum. The flange shape of both valve and actuator outside these areas of landing is left to the option of the manufacturer.

The dimensions and bolting material are based on bolts in tension at a maximum stress of 290 MPa. On agreement, between the manufacturer/supplier and purchaser, bolting material with different tensile strength can be used, with no dimensional changes but with potential variation of the transmittable torque and thrust value.

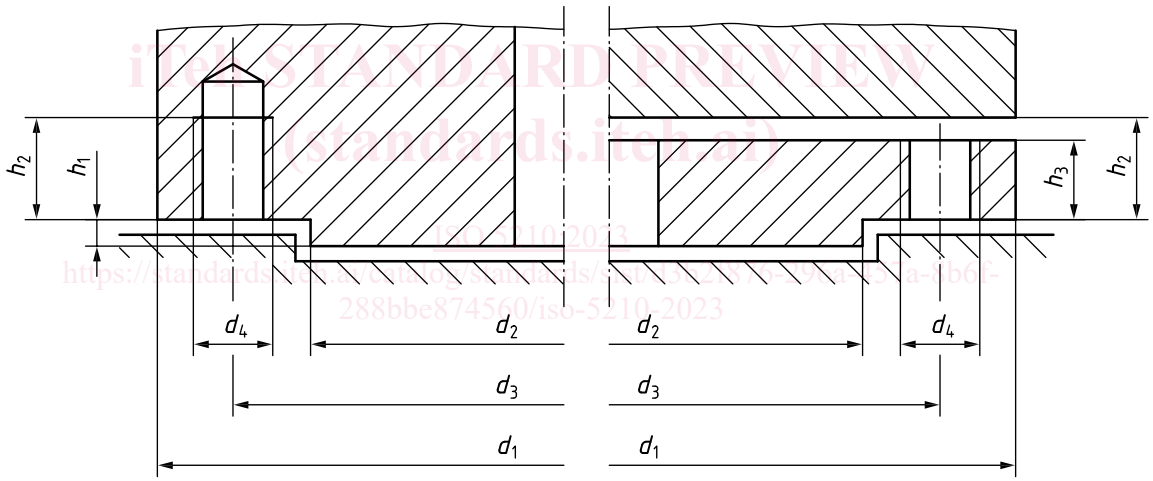


Figure 2 — Flange dimensions

Table 2 — Flange dimensions

Dimensions in millimetres

Flange type	Dimensions							Number of studs or bolts
	d_1 min.	d_2 [a]	d_3	d_4	h_1 max.	h_2 min.	h_3 min.	n
F05	Ø65	Ø35	Ø50	M6	3	9	6	4
F07	Ø90	Ø55	Ø70	M8	3	12	8	4
F10	Ø125	Ø70	Ø102	M10	3	15	10	4
F12	Ø150	Ø85	Ø125	M12	3	18	12	4
F14	Ø175	Ø100	Ø140	M16	4	24	16	4
F16	Ø210	Ø130	Ø165	M20	5	30	20	4
F25	Ø300	Ø200	Ø254	M16	5	24	16	8

[a] d_2 shall be manufactured within the diameter tolerance f8.

Table 2 *(continued)*

Flange type	Dimensions							Number of studs or bolts
	d_1 min.	d_2 [a]	d_3	d_4	h_1 max.	h_2 min.	h_3 min.	n
F30	Ø350	Ø230	Ø298	M20	5	30	20	8
F35	Ø415	Ø260	Ø356	M30	5	45	30	8
F40	Ø475	Ø300	Ø406	M36	8	54	36	8
F48	Ø560	Ø370	Ø483	M36	8	54	36	12
F60	Ø686	Ø470	Ø603	M36	8	54	36	20

[a] d_2 shall be manufactured within the diameter tolerance f8.

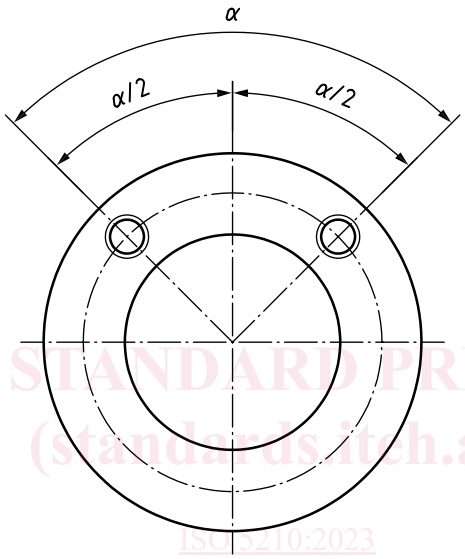


Figure 3 — Positions of the holes for the studs/bolts

Table 3 — Positions of holes

Flange type	$\alpha/2$
F05 to F16	45°
F25 to F40	22,5°
F48	15°
F60	9°

6 Designation

Flanges are designated by flange type according to Table 1.

7 Dimensions of driving and driven components

7.1 General

The dimensions of the driving and driven components shall comply with the dimensions given in Tables 4 to 8.

The depth of engagement of the valve-driven component into the actuator drive component and the surface area of contact between the faces of the actuator drive component and the faces of the valve-

driven component, should be considered to ensure that the stresses caused by contact do not exceed the capability of the component materials. In some cases it may be necessary to use materials with superior mechanical properties and/or to reduce the output torque of the actuator.

7.2 Dimensions for assemblies capable of transmitting both torque and thrust: Group A

Dimensions for assemblies of group A shall be as shown in Figures 4 and 5, and given in Table 4.

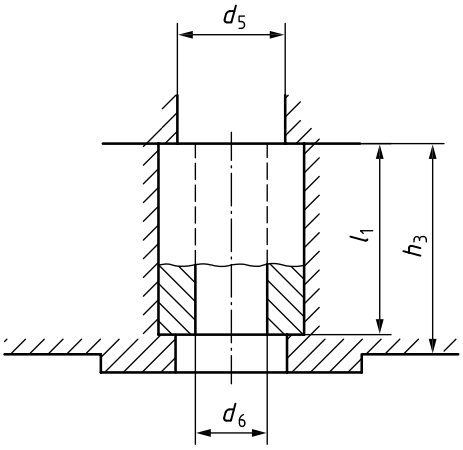
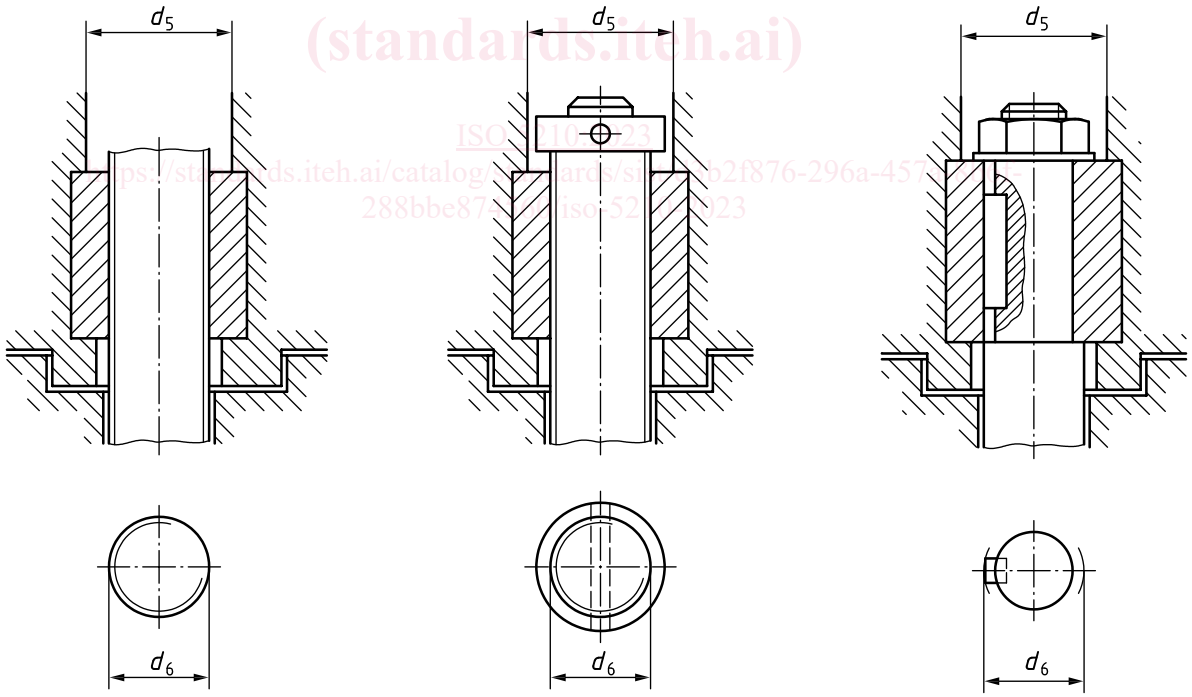


Figure 4 — Driving component, group A



a) Example for rising stem **b) Example for rising stem with limit stop** **c) Example for non-rising stem**

Figure 5 — Examples for rising and non-rising stem — Driven component, group A

For rising stem dimension d_5 permits clearance for the rising and non-rotating stem and for any device to restrict the downward travel of the valve stem.