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Industrial valves — Part-turn actuator attachments

Robinetterie industrielle — Raccordement des actionneurs à fraction de tour

Reference number
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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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Foreword

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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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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*.

This second edition cancels and replaces the first edition (ISO 5211:2001), which has been technically revised with the following changes:

a) introduction of new flange sizes;

b) introduction of improved flat head;

c) introduction of involute spline;

d) introduction of bi-square;

e) adjustment of Clause 6 on designation;

f) positions of 180° keys on the driven component.

Introduction

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

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

Industrial valves — Part-turn actuator attachments

1 Scope

This document specifies requirements for the attachment of part-turn actuators, with or without gearboxes, to industrial valves.

The attachment of part-turn actuators to control valves in accordance with the requirements of this document is subject to an agreement between the supplier and the purchaser.

This document specifies:

— flange dimensions necessary for the attachment of part-turn actuators to industrial valves [see Figures 1 a) and 1 c)] or to intermediate supports [see Figures 1 b) and 1 d)];

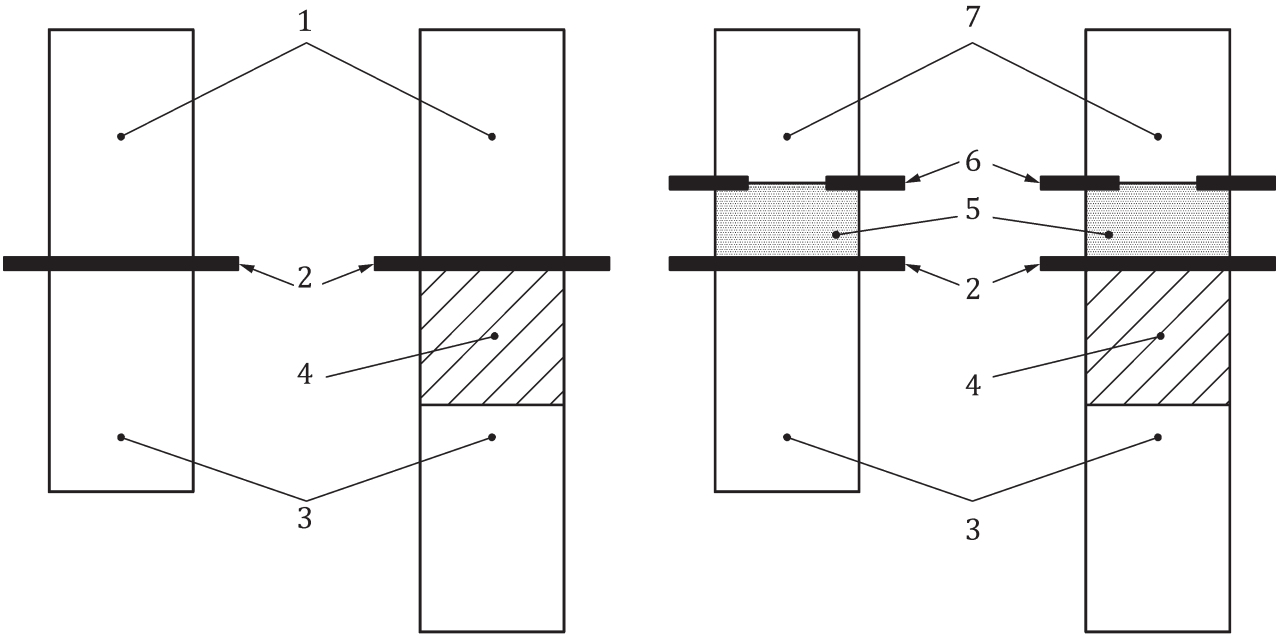
— driving component dimensions of part-turn actuators necessary to attach them to the driven components;

— reference values for torques for interfaces and for couplings having the dimensions specified in this document.

The attachment of the intermediate support to the valve is out of the scope of this document.

NOTE 1 In this document, the term “valve” may 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 part-turn gearbox is coupled to form a part-turn actuator, the multi-turn attachment to the gearbox is in accordance with ISO 5210:2017, Figures 1 c) and 1 d). A combination of a multi-turn actuator with integral part-turn gearbox supplied as a part-turn actuator is in accordance with Figures 1a) and 1b).



a) Direct interface **b) Intermediate support interface** **c) Direct interface (when combination of a multi-turn actuator and a gearbox)** **d) Intermediate support interface (when combination of a multi-turn actuator and a gearbox)**

Key

1 part-turn actuator
2 interface (see ISO 5211)
3 valve
4 intermediate support
5 gearbox
6 interface (see ISO 5210)
7 multi-turn actuator

Figure 1 — Interface between part-turn actuator and valve

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*

ISO 4156-1, *Straight cylindrical involute splines — Metric module, side fit — Part 1: Generalities*

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:

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

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

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 and/or thrust.

3.2
multi-turn actuator
actuator which transmits torque to the valve for at least one revolution and may be capable of withstanding thrust

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

3.3
part-turn actuator
actuator which transmits torque to the valve for a rotation of one revolution or less and does not have to withstand axial thrust

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

3.4
gearbox
any mechanism designed to reduce the torque required to operate a valve

3.5
torque
turning moment transmitted through the mounting flanges and connection components

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

4 Maximum flange torques

The flange torque shall comply with the values listed in Table 1 which represent the maximum torques which can be transmitted through the mounting flange.

Table 1 — Maximum flange torque values

Flange type	Maximum flange torque Nm
F03	32
F04	63
F05	125
F07	250
F10	500
F12	1 000
F14	2 000
F16	4 000
F25	8 000
F30	16 000
F35	32 000
F40	63 000
F48	125 000

Table 1 *(continued)*

Flange type	Maximum flange torque Nm
F60	250 000
F80	500 000
F100	1 000 000

The values specified in Table 1 have been defined on the basis of bolts in tension only 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 values. See Annex A for more details on the calculation method.

The selection of flange types for a particular application should take into account the additional torques that may be generated because of inertia or other factors.

5 Flange dimensions

Flanges for part-turn actuator attachments shall comply with the dimensions shown in Figure 2 and given in Table 2. The method of attachment shall be by means of studs, screws 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, screws or bolts shall be equi-spaced and positioned off-centre (see Figure 3 and Table 3) and shall conform to the requirements of ISO 273.

The flange on the valve shall have a recess corresponding to the diameter d_2. A spigot on the part-turn 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.

Above flange type F60 alternative dimensions and/or torque ratings may be used on agreement between manufacturer/supplier and purchaser.

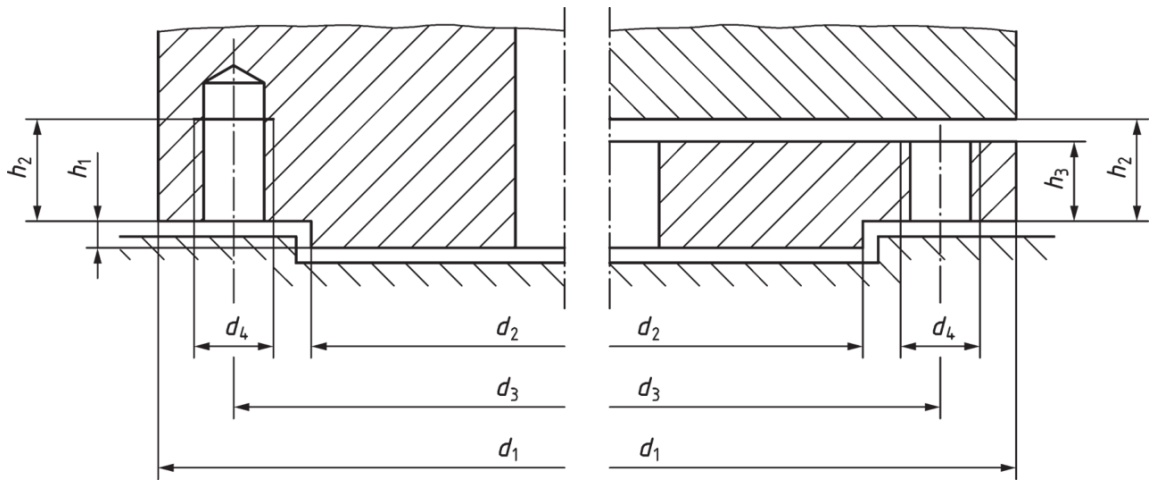


Figure 2 — Flange dimensions

Table 2 — Flange dimensions

Dimensions in millimetres

Flange type	Dimensions							Number of screws, studs or bolts
	d_1 min.	d_2 [a]	d_3	d_4	h_1 max.	h_2 min.	h_3 min.	n
F03	Ø46	Ø25	Ø36	M5	3	8	5	4
F04	Ø54	Ø30	Ø42	M5	3	8	5	4
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
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
F80	Ø900	Ø670	Ø813	M42	10	63	42	20
F100	Ø1 200	Ø870	Ø1 042	M42	10	63	42	32

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

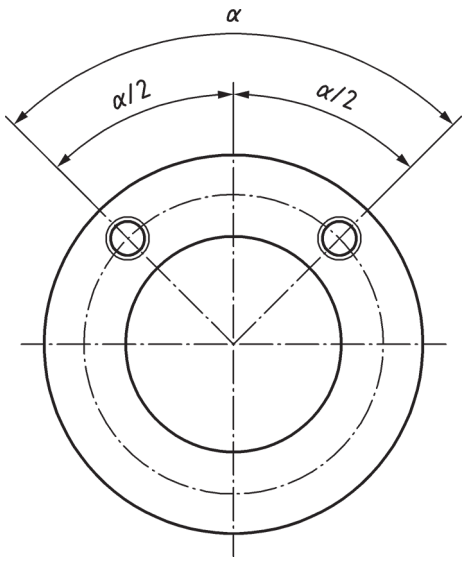


Figure 3 — Position of holes

Table 3 — Position of holes

Flange type	α/2
F03 to F16	45°
F25 to F40	22,5°
F48	15°
F60 to F80	9°
F100	5,625°

6 Designation

Part-turn valve actuator attachments shall be designated as follows:

— flange designation:
  — flange type as per Table 1;
  — a capital letter for spigot identification:
    — Y with spigot;
    — N without spigot;
— drive designation:
  — an additional capital letter for drive identification:
    — V for single-key drive;
    — W for 90° two-key drive;
    — X for 180° two-key drive;
    — L for parallel square drive;
    — D for diagonal square drive;
    — H for flat head drive;

— G for improved flat head drive;

— S for involute spline;

— T for bi-square;

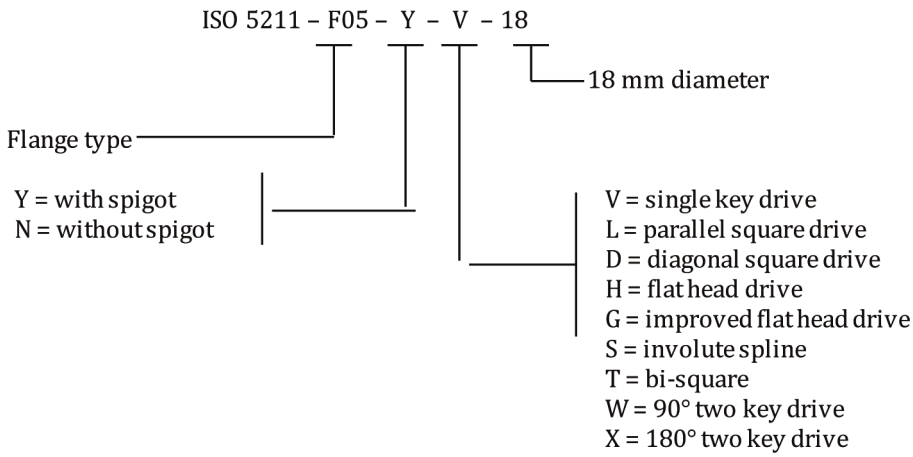
— the actual dimensions of the drive (in millimetres):

— dimension d_7 for key drives (see Figure 4 and Table 4);

— dimension s for square or flat drives (see Figures 5 or 6 and Table 5 or Figure 7 and Table 6);

— module m for involute spline (see Figure 9 and Table 8).

EXAMPLE



ISO 5211 – F05 Y – V – 18, identifies a part-turn valve actuator attachment in accordance with this document, with F05 flange type, spigot and single-key drive with 18 mm diameter.

NOTE The designation is not a marking requirement.

7 Dimensions and torques

7.1 General

To ensure that no interference can occur between the driving component and the driven component, the length of the driven component above the interface shall be limited so that there is a clearance between both parts.

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 Drive by key(s)

Dimensions of the drive components for key drive shall meet the requirements of Figure 4 and Table 4.

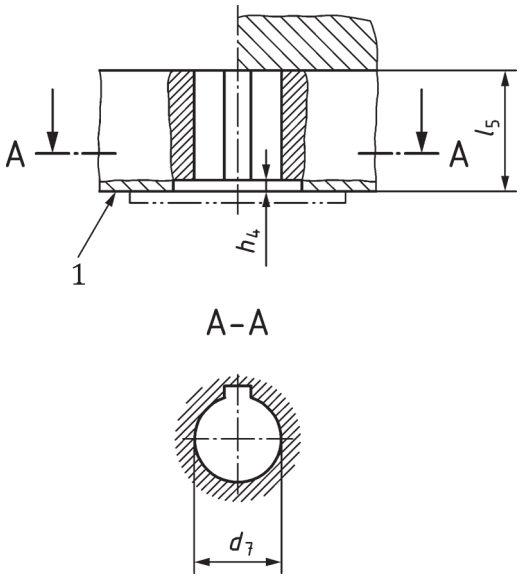
The values of d_7, h_4 and l_5 in Table 4 are based on single-key design up to 98 mm shaft diameter.

Where more than one key is required to transmit the torque, the dimensions in Table 4 shall still apply.

The key dimensions shall comply with those given in national standards.

The keyway(s) in the driving component shall correspond to the position of the key(s) supplied on the driven component as specified in 8.1, Figures 11, 12 or 13.

The key(s) shall be secured in position by suitable means.



Key

1 interface

Figure 4 — Drive by key(s)

Table 4 — Dimensions and torques for drive by key(s)

Dimensions in millimetres

Flange type	**Max. flange torque** Nm	h_4 max.[f]	l_5 min.	d_7 [a, b, g]																			
F05	125	3,0	30	Ø12	Ø14	**Ø18**[c]	Ø22	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
F07	250	3,0	35	—	Ø14	Ø18	**Ø22**[c]	Ø28	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
F10	500	3,0	45	—	—	Ø18	Ø22	**Ø28**[c]	Ø36	Ø42	—	—	—	—	—	—	—	—	—	—	—	—	—
F12	1 000	3,0	55	—	—	—	Ø22	Ø28	**Ø36**[c]	Ø42	Ø48	Ø50	—	—	—	—	—	—	—	—	—	—	—
F14	2 000	5,0	65	—	—	—	—	Ø28	Ø36	Ø42	**Ø48**[c]	Ø50	Ø60	—	—	—	—	—	—	—	—	—	—
F16	4 000	5,0	80	—	—	—	—	—		Ø42	Ø48	Ø50	**Ø60**[c]	Ø72	Ø80	—	—	—	—	—	—	—	—
F25	8 000	5,0	110	—	—	—	—	—	—	—	Ø48	Ø50	Ø60	**Ø72**[c]	Ø80	Ø98	Ø100	—	—	—	—	—	—
F30	16 000	5,0	130	—	—	—	—	—	—	—	—	—	Ø60	Ø72	Ø80	**Ø98**[c]	Ø100	Ø120	—	—	—	—	—
F35	32 000	5,0	180	—	—	—	—	—	—	—	—	—	—	—		—	—	—	Ø160	—	—	—	—
F40	63 000	8,0	200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ø180	—	—	—
F48	125 000	8,0	250	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ø220	—	—
F60	250 000	8,0	310	—	—	—	—	—	—	—	—	—	—	—	—		—	—	—	—	—	Ø280	—
F80	500 000	10	455	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ø350
F100	1 000 000	10	655	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ø440
Max. transmissible torque Nm[d]				32	63	125	250	500	1 000	1 500	2 000	3 000	4 000	8 000	12 000	16 000	e	e	e	e	e	e	e	e

[a] For flange types F05 to F30, other dimensions of d_7 between those indicated are permitted.

[b] For flange types above F30, the given d_7 values correspond to the maximum and any value up to this maximum is permitted, subject to considerations in footnote d.

[c] Indicates the preferred dimension.

[d] For flange types F05 to F30, these values are the corresponding torques which can be transmitted by the driving components having the d_7 dimensions. They are based on a maximum allowable torsional stress of 280 MPa for the driven component.

[e] The maximum transmissible torques shall be determined by calculation.

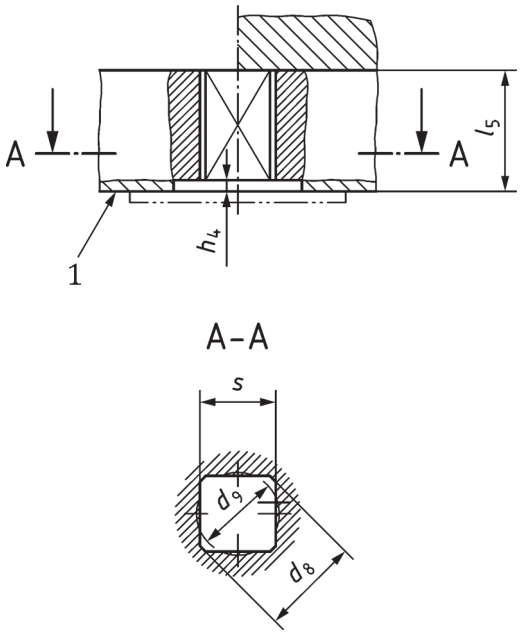
[f] h_4 min = 0,5 mm.

[g] d_7 shall be manufactured within the diameter tolerance H9.

7.3 Drive by parallel or diagonal square head

Dimensions of drive components for square heads shall meet the requirements of Figures 5 or 6 and Table 5. The choice of d_8 and d_9 depends on the manufacturing process.

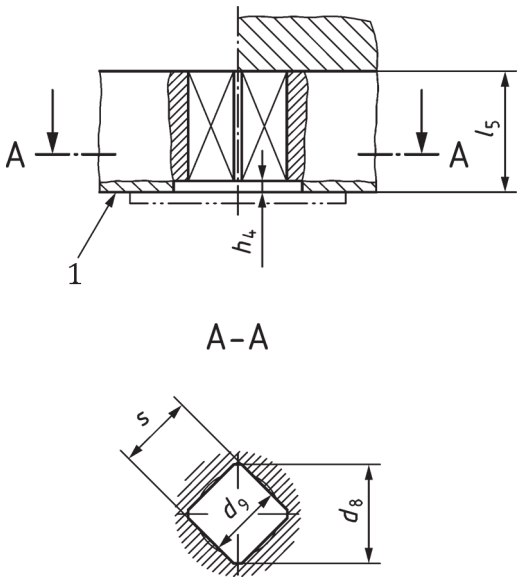
The square drive positions shall be as specified in 8.2, Figures 14 or 15.



Key

1 interface

Figure 5 — Drive by parallel square head



Key

1 interface

Figure 6 — Drive by diagonal square head

Table 5 — Dimensions and torques for drive by parallel or diagonal square head

Dimensions in millimetres

Flange type[d]	**Max. flange torque** Nm	h_4 max.[a]	s [e]										
F03	32	1,5	9	—	—	—	—	—	—	—	—	—	—
F04	63	1,5	9	**11**[b]	—	—	—	—	—	—	—	—	—
F05	125	3,0	9	11	**14**[b]	—	—	—	—	—	—	—	—
F07	250	3,0	—	11	14	**17**[b]	—	—	—	—	—	—	—
F10	500	3,0	—	—	14	17	19	**22**[b]	—	—	—	—	—
F12	1 000	3,0	—	—	—	17	19	22	**27**[b]	—	—	—	—
F14	2 000	5,0	—	—	—	—	—	22	27	**36**[b]	—	—	—
F16	4 000	5,0	—	—	—	—	—	—	27	36	**46**[b]	—	—
F25	8 000	5,0	—	—	—	—	—	—	—	36	46	**55**[b]	—
F30	16 000	5,0	—	—	—	—	—	—	—	—	46	55	**75**[b]
d_8 min			Ø12,1	Ø14,1	Ø18,1	Ø22,2	Ø25,2	Ø28,2	Ø36,2	Ø48,2	Ø60,2	Ø72,2	Ø98,2
d_9 max			Ø9,5	Ø11,6	Ø14,7	Ø17,9	Ø20	Ø23,1	Ø28,4	Ø38	Ø48,5	Ø57,9	Ø79,1
l_5 min			10	12	16	19	21	24	29	38	48	57	77
Max. transmissible torque Nm[c]			32	63	125	250	350	500	1 000	2 000	4 000	8 000	16 000

[a] h_4 min. = 0,5 mm.

[b] Indicates the preferred dimension.

[c] Maximum transmissible torques are based on a maximum allowable torsional stress of 280 MPa for the driven component.

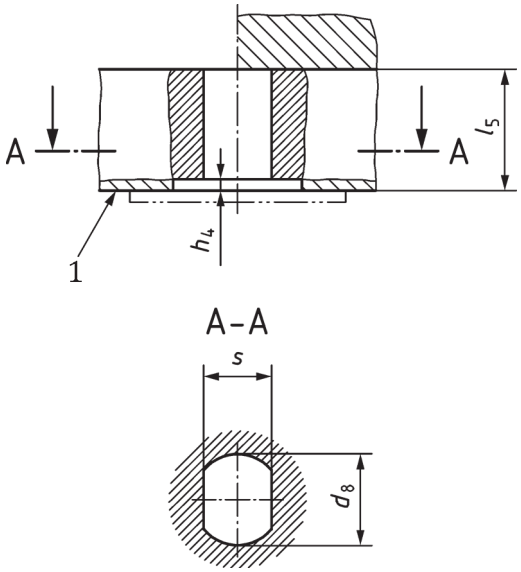
[d] Further sizes are not considered and may be discussed between supplier and the manufacturer.

[e] s shall be manufactured within the linear tolerance H11.

7.4 Drive by flat head

Dimensions of drive components for flat head drive shall meet the requirements of Figure 7 and Table 6.

The flat head drive position shall be as specified in 8.3 and Figure 16.



Key

1 interface

Figure 7 — Drive by flat head

Table 6 — Dimensions and torques for drive by flat head

Dimensions in millimetres

Flange type[d]	**Max. flange torque** Nm	h_4 max.[a]	s [e]										
F03	32	1,5	9	—	—	—	—	—	—	—	—	—	—
F04	63	1,5	9	**11**[b]	—	—	—	—	—	—	—	—	—
F05	125	3,0	9	11	**14**[b]	—	—	—	—	—	—	—	—
F07	250	3,0	—	11	14	**17**[b]	—	—	—	—	—	—	—
F10	500	3,0	—		14	17	19	**22**[b]	—	—	—	—	—
F12	1 000	3,0	—	—	—	17	19	22	**27**[b]	—	—	—	—
F14	2 000	5,0	—	—	—	—	—	22	27	**36**[b]	—	—	—
F16	4 000	5,0	—	—	—	—	—	—	27	36	**46**[b]	—	—
F25	8 000	5,0	—	—	—	—	—	—	—	36	46	**55**[b]	
F30	16 000	5,0		—	—	—	—	—	—	—	46	55	**75**[b]
d_8 min.			Ø12,1	Ø14,1	Ø18,1	Ø22,2	Ø25,2	Ø28,2	Ø36,2	Ø48,2	Ø60,2	Ø72,2	Ø98,2
l_5 min.			16	19	25	30	34	39	48	64	82	99	135
Max. transmissible torque Nm[c]			32	63	125	250	350	500	1 000	2 000	4 000	8 000	16 000

[a] h_4 min. = 0,5 mm.

[b] Indicates the preferred dimension.

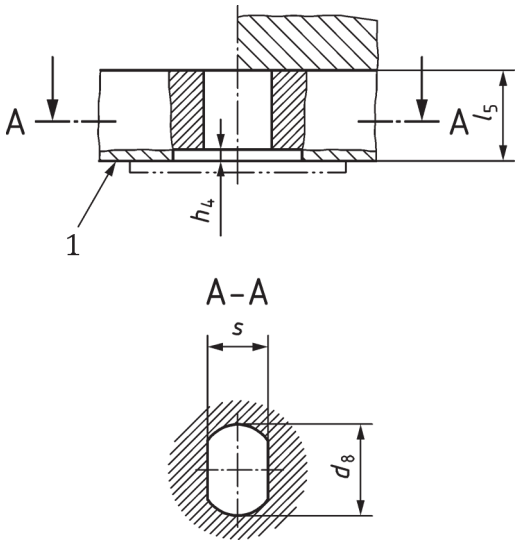
[c] Maximum transmissible torques are based on a maximum allowable torsional stress of 280 MPa for the driven component.

[d] Further sizes are not considered and may be discussed between supplier and manufacturer.

[e] s shall be manufactured within the linear tolerance H11.

7.5 Drive by improved flat head

Dimensions of drive components for improved flat head drive shall meet the requirements of Figure 8 and Table 7. The improved flat head drive position shall be as specified in 8.3 and Figure 16.



Key

1 interface

Figure 8 — Drive by improved flat head

Table 7 — Dimensions and torques for drive by improved flat head

Dimensions in millimetres

Flange type[d]	**Max. flange torque** Nm	h_4 max.[a]	s [b]									
F03	32	1,5	**8**	—	—	—	—	—	—	—	—	—
F04	63	1,5	—	**9,5**	—	—	—	—	—	—	—	—
F05	125	3,0	—	—	**12**	—	—	—	—	—	—	—
F07	250	3,0	—	—	—	**15**	—	—	—	—	—	—
F10	500	3,0	—	—	—	—	**19**	—	—	—	—	—
F12	1 000	3,0	—	—	—	—	—	**24**	—	—	—	—
F14	2 000	5,0	—	—	—	—	—	—	**32**	—	—	—
F16	4 000	5,0	—	—	—	—	—	—	—	**40**	—	—
F25	8 000	5,0	—	—	—	—	—	—	—	—	**48**	—
F30	16 000	5,0		—	—	—	—	—	—	—	—	**66**
d_8 min.			Ø12,1	Ø14,1	Ø18,1	Ø22,2	Ø28,2	Ø36,2	Ø48,2	Ø60,2	Ø72,2	Ø98,2
l_5 min.			12	15	18	22	28	36	40	44	52	70
Max. transmissible torque Nm[c]			32	63	125	250	500	1 000	2 000	4 000	8 000	16 000

[a] h_4 min. = 0,5 mm.

[b] s shall be manufactured within the linear tolerance H11.

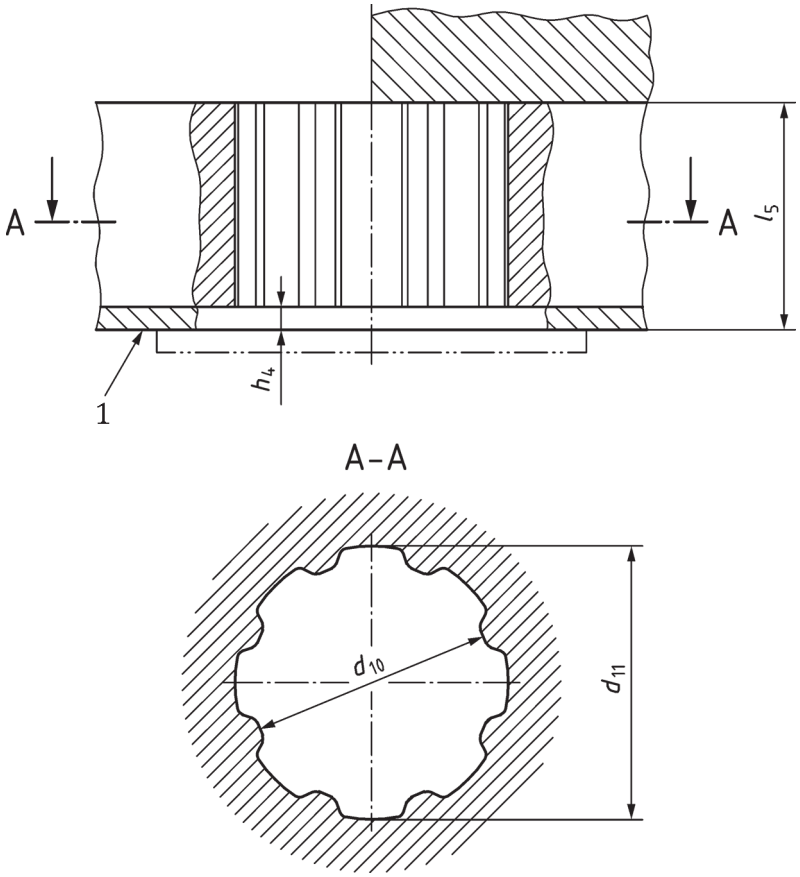
[c] Maximum transmissible torques are based on a maximum allowable torsional stress of 280 MPa for the driven component.

[d] Further sizes are not considered and may be discussed between supplier and manufacturer.

7.6 Drive by involute spline

Dimensions of drive components for involute spline shall meet the requirements of Figure 9 and Table 8.

NOTE Involute spline is according to ISO 4156-1.



Key

1 interface

Figure 9 — Drive by involute spline

Table 8 — Dimensions and torques for drive by involute spline

Dimensions in millimetres

Flange type[d]	**Max. flange torque** Nm	h_4 max.[a]	d_{11} [b]									
F03	32	1,5	Ø16,1	—	—	—	—	—	—	—	—	—
F04	63	1,5	—	Ø19,1	—	—	—	—	—	—	—	—
F05	125	3,0	—	—	Ø24,1	—	—	—	—	—	—	—
F07	250	3,0	—	—	—	Ø28,1	—	—	—	—	—	—
F10	500	3,0	—	—	—	—	Ø36,1	—	—	—	—	—
F12	1 000	3,0	—	—	—	—	—	Ø47,1	—	—	—	—
F14	2 000	5,0	—	—	—	—	—	—	Ø60,1	—	—	—
F16	4 000	5,0	—	—	—	—	—	—	—	Ø74,1	—	—
F25	8 000	5,0	—	—	—	—	—	—	—	—	Ø88,1	—
F30	16 000	5,0		—	—	—	—	—	—	—	—	Ø116,1
d_{10} min.			Ø14,5	Ø17	Ø21,5	Ø25	Ø32	Ø42	Ø54	Ø67	Ø80	Ø106
Module m (according to ISO 4156-1)			1,5	2,0	2,5	3,0	4,0	5,0	6,0	7,0	8,0	10
l_5 min.			12	15	18	22	28	36	40	44	52	70
Max. transmissible torque Nm[c]			32	63	125	250	500	1 000	2 000	4 000	8 000	16 000

[a] $h_{4\,\text{min.}} = 0{,}5$ mm.

[b] d_{11} shall be manufactured within the diameter tolerance H9.

[c] Maximum transmissible torques are based on a maximum allowable torsional stress of 280 Pa for the driven component.

[d] Further sizes are not considered and may be discussed between supplier and manufacturer.

7.7 Drive by bi-square

Dimensions of drive components for bi-square shall meet the requirements of Figure 10 and Table 9. The choice of d_8 and d_{12} depends on the manufacturing process.

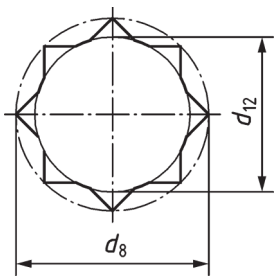


Figure 10 — Drive by bi-square

Table 9 — Dimensions and torques for drive by bi-square

Dimensions in millimetres

Flange type[d]	**Max. flange torque** Nm	h_4 max.[a]	s [e]										
F03	32	1,5	9	—	—		—	—	—	—	—	—	—
F04	63	1,5	9	**11**[b]	—	—	—	—	—	—	—	—	—
F05	125	3,0	9	11	**14**[b]	—	—	—	—	—	—	—	—
F07	250	3,0	—	11	14	**17**[b]	—	—	—	—	—	—	—
F10	500	3,0	—	—	14	17	19	**22**[b]	—	—	—	—	—
F12	1 000	3,0	—	—	—	17	19	22	**27**[b]	—	—	—	—
F14	2 000	5,0	—	—	—	—	—	22	27	**36**[b]	—	—	—
F16	4 000	5,0	—	—	—	—	—	—	27	36	**46**[b]	—	—
F25	8 000	5,0	—	—	—	—	—	—	—	36	46	**55**[b]	—
F30	16 000	5,0	—	—	—	—	—	—	—	—	46	55	**75**[b]
d_8 min.			Ø12,1	Ø14,1	Ø18,1	Ø22,2	Ø25,2	Ø28,2	Ø36,2	Ø48,2	Ø60,2	Ø72,2	Ø98,2
d_{12} max.			Ø10	Ø12,2	Ø15,5	Ø18,7	Ø20,9	Ø24,2	Ø29,6	Ø39,3	Ø50,2	Ø59,9	Ø81,6
l_5 min.			10	12	16	19	21	24	29	38	48	57	77
Max. transmissible torque Nm[c]			20	40	80	175	225	350	700	1 400	2 800	5 600	11 200

[a] $h_{4\ min.}$ = 0,5 mm.

[b] Indicates the preferred dimension.

[c] Maximum transmissible torques are based on a maximum allowable torsional stress of 280 MPa for the driven component.

[d] Further sizes are not considered and may be discussed between supplier and manufacturer.

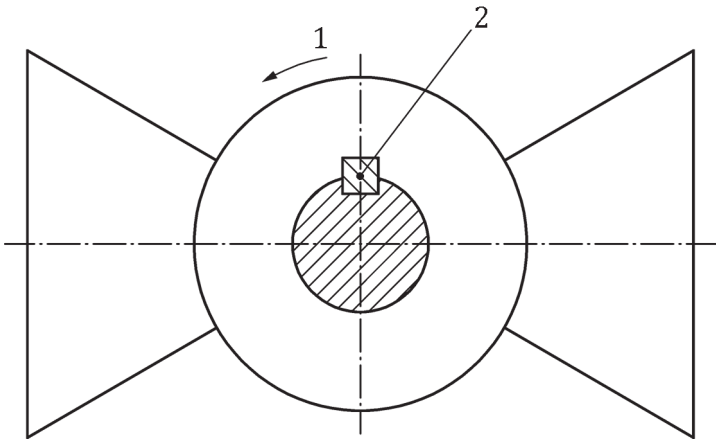
[e] s shall be manufactured within the linear tolerance H11.

8 Position of driven components at interface below part-turn actuator

8.1 Drive by key(s)

One or two keys may be used. With the valve closed, the key(s) shall be located as shown in Figures 11, 12 or 13. If more than two keys are required, their position shall be subject to an agreement between the supplier and the purchaser.

NOTE The standard closing direction is clockwise, as viewed from above the interface.

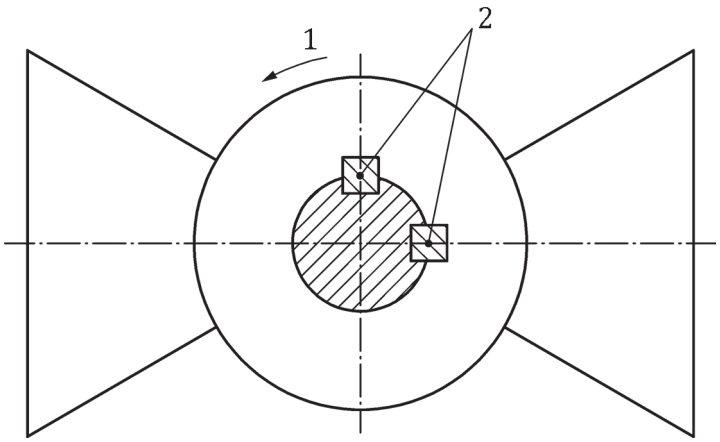


Key

1 opening direction

2 key

Figure 11 — Position of key on the driven component

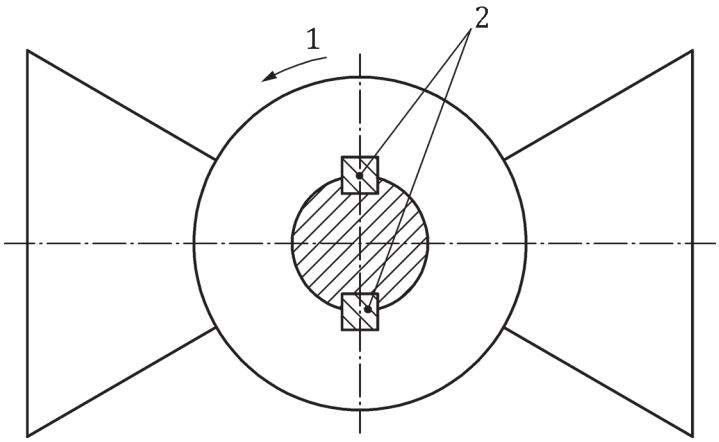


Key

1 opening direction

2 key

Figure 12 — Positions of 90° keys on the driven component



Key

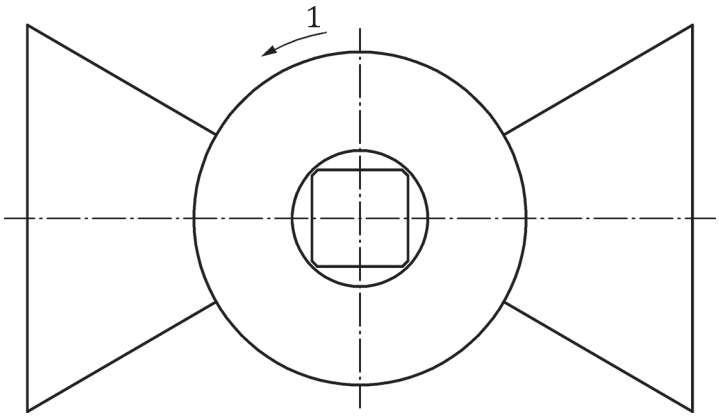
1 opening direction

2 key

Figure 13 — Positions of 180° keys on the driven component

8.2 Drive by parallel or diagonal square head or bi-square

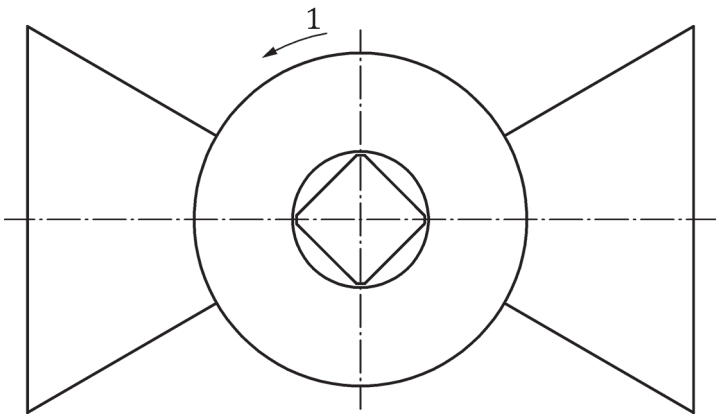
With the valve closed, the flat sides of the square head drive component shall be located as shown in Figures 14 or 15.



Key

1 opening direction

Figure 14 — Position of parallel square head driven component



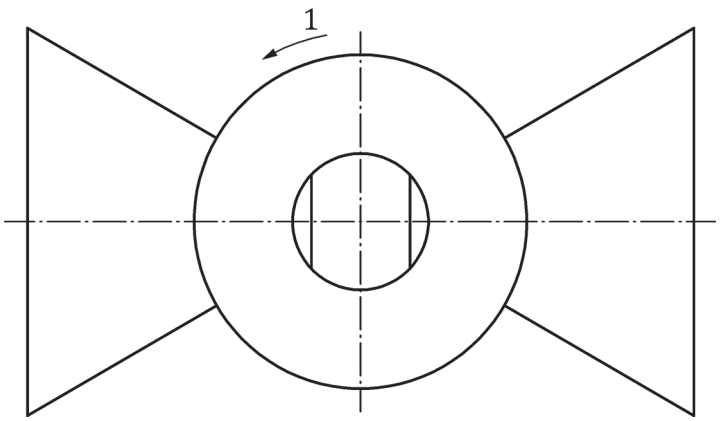
Key

1 opening direction

Figure 15 — Position of diagonal square head driven component

8.3 Drive by flat head

With the valve closed, the flat sides of the flat head drive component shall be located as shown in Figure 16.



Key

1 opening direction

Figure 16 — Position of flat head driven component

9 Dowel pins

Dowel pins across the interface between valve and actuator may be used in order to achieve an improved tolerance in positioning.

Size, number and position of dowel pins shall be agreed between supplier and customer. For flanges up to size F60, as a general guideline:

— should be positioned on the pitch circle diameter d_3;

— position should be in line or perpendicular to the valve closed position;

— diameter of the dowel pins should be the nominal value of d_4, but not larger than 30 mm.

WARNING — Dowel pins are not designed to transfer torque across the interface. A distinct load distribution can otherwise not be assumed.

Annex A
(informative)

Explanation of calculation

A.1 Basis of torque values for flange sizes

For each designated flange size, a maximum transmissible torque value is established by this document. For each flange size, geometrical design and sizing principles were established, where possible.

The calculation method, given in Formulae (A.1) and (A.2), establishes the maximum transmissible torque per flange size. The resulting torque values are supported by other calculation methods provided by existing standards.

Flanges with maximum transmissible torque values that diverge from this calculation method are established in the market.

Since the interface only transfers torque by static friction and the bolted connection is not designed for shear stresses, a safety against slipping can be derived with the defined bolt tensile stress of 290 MPa and specification of the coefficient of friction 0,2 using the formula:

$$T_R = n \times \mu \times F_{Kl} \times \frac{d_3}{2\ 000} \tag{A.1}$$

and

$$F_{Kl} = \sigma_{zul} \times A_S \tag{A.2}$$

where

μ is the coefficient of friction;

σ_{zul} is the actual bolt tensile stress, in MPa, and should be less than the bolt material tensile strength;

A_S is the tensile stress area per bolt, in mm^2;

d_3 is the pitch circle diameter, in mm;

F_{Kl} is the clamping force per bolt, in N;

n is the number of screws, studs or bolts;

T_R is the applicable output torque, in Nm.

NOTE This calculation was used to derive the maximum flange torque values in Table 1 and is not qualified for any design proofs; nor is it intended to replace engineering calculations defined by national standards or regulations.

A.2 Coefficient of friction of 0,2

Through national standards, regulations and experience within the valve industry, a coefficient of friction 0,2 in the contact area [interfaces (see Figure 1, keys 2 and 6)] of flanges between actuator and valve became established.

A.3 Tension stress bolts

The bolt quality, method of tightening and application factors are the basis for the bolt tension stress of 290 MPa.

This value is calculated using 90 % of the yield strength of a bolt quality (8.8) and assuming that the bolts are tightened with a torque wrench (tightening factor 1,6) and an application factor (1,25) for relaxation.

The bolt quality 8.8 defines

— R_m = 800 MPa, and

— R_e = 80 % × R_m = 640 MPa.

The tension stress of the bolt can be calculated as 290 MPa = R_e × 90 % / 1,6 / 1,25.

Bibliography

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

ICS 23.060.01

Price based on 24 pages