



**International
Standard**

ISO 5640

**Industrial valves — Mounting
kits for part-turn valve actuator
attachment**

*Robinetterie industrielle — Kits de montage de raccordement des
actionneurs à fraction de tour*

**First edition
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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).

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

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.

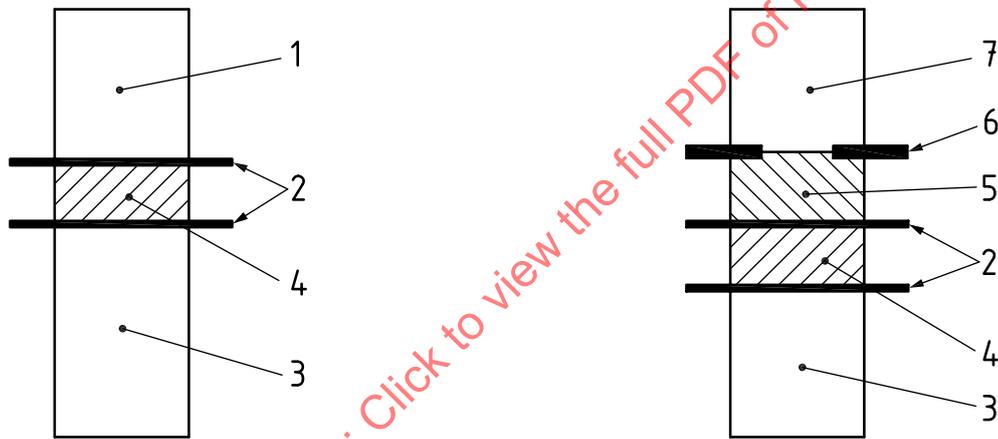
Industrial valves — Mounting kits for part-turn valve actuator attachment

1 Scope

This document provides requirements for metallic mounting kits for part-turn valves and actuator attachments.

It includes all components transmitting torques from actuators to valves with a maximum flange torque up to 16 000 Nm (up to F30 flange type).

It applies to mounting kits for part-turn valves and actuators with integral attachment flanges and drive components as described in ISO 5211 (see [Figure 1](#)), when direct mounting of the actuator on valve is not practical. [Figure 1](#) illustrates the two different types of mounting kits in the scope of this document.



a) Direct interface with mounting kit

b) Direct interface with mounting kit (when combination of a multi-turn actuator and a gearbox)

Key

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

Figure 1 — Mounting kit between part-turn actuator and valve

Stacking of mounting kits/intermediate supports is not within the scope of this document.

This document specifies methods for design and environmental corrosion protection.

When a reference is made to this document, all the requirements apply, unless otherwise agreed between the purchaser and the manufacturer/supplier, prior to order.

In this document, the term "valve" covers valve or shaft extension top-flange, and the term "actuator" covers part-turn actuator or combination of multi-turn actuator and gearbox.

Control valves are excluded from 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 5211, *Industrial valves — Part-turn actuator attachments*

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

mounting kit

group of components comprising an *intermediate support* (3.2), bolting and optional *coupling* (3.3)

3.2

intermediate support

mechanical component (bracket, spool, adapter flange) that allows the attachment between a part-turn valve and actuator or gearbox

Note 1 to entry: For electric actuators refer to ISO 22153.

Note 2 to entry: For gearboxes refer to ISO 22109.

3.3

coupling

driven component that allows torque transmission from an actuator or gearbox driving component to the *valve shaft* (3.7)

3.4

coupling clearance

clearance to ensure that there is axial movement between the actuator or gearbox and the *valve shaft* (3.7) to avoid thrust being applied between the driving and driven components

Note 1 to entry: See [Annex A](#).

3.5

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.

3.6

valve top mounting face

feature of the valve body or an additional component which is part of the valve and which allows the attachment of actuating devices or *intermediate support* (3.2)

Note 1 to entry: For details on the valve top mounting face refer to ISO 5211.

3.7

valve shaft

valve stem

part of the valve transmitting the driving torque to the obturator

3.8

part-turn actuator attachment

attachment interface of the actuator or gearbox which includes:

- parts that attach the *part-turn actuator* (3.5) or gearbox to the *intermediate support* (3.2);
- driving component of the part-turn actuator or gearbox necessary to attach it to the *coupling* (3.3) or to the driven component of the valve, which may be an integral part or a removable component of the actuator or gearbox

4 Design requirements

4.1 General

Part-turn actuator attachments shall be in accordance with ISO 5211.

4.2 Materials

Mounting kit materials shall be:

- for intermediate supports, of cast iron (CI), ductile iron (DI), carbon steel (CS), stainless steel (SS), or when agreed, other material (OT);
- for bolting (environmental corrosion categories according to [Table 1](#)):
 - categories C2 and C3: stainless steel or a corrosion-protected carbon steel;
 - categories C4, C5 and CX: stainless steel;
- other categories: material to be specified by the purchaser.

Special care shall be taken for material selection in the event of environmental critical conditions and to avoid material combinations that could promote galvanic corrosion.

4.3 Design temperature

The mounting kit shall be designed for operation at a temperature range as a minimum between -20 °C and 60 °C. Any other temperature ranges shall be agreed between purchaser and the mounting kit manufacturer.

4.4 Environmental corrosion protection

Mounting kits shall be protected against corrosion by material selection and surface treatment.

The manufacturer's technical documentation shall specify the choice of the materials and/or the type of the surface treatment.

Surface treatment system for carbon or low-alloy steels (e.g. according to ISO 630-1) shall be chosen according to the classification categories given in [Table 1](#).

Test assessment and test procedures are the responsibility of the manufacturer.

NOTE [Table 1](#) can be used to define the corrosion category and help the mounting kit manufacturers to define the surface treatment for corrosion protection.

Table 1 — 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 and coastal areas with low salinity	Production rooms with high humidity and some air pollution, e.g. food-processing plants, laundries, breweries, dairies
C4 (high)	Industrial areas and coastal areas with moderate salinity	Chemical plants, swimming pools, coastal ship and boatyards
C5 (very high)	Industrial areas with high humidity and aggressive atmosphere and coastal areas with high salinity	Buildings or areas with almost permanent condensation and with high pollution
CX (extreme)	Offshore areas with high salinity, industrial areas with extreme humidity and aggressive atmosphere, and subtropical and tropical atmospheres	Industrial areas with extreme humidity and aggressive atmosphere
Categories for water and soil:		
Category	Example of environments and structures	
Im 1 (immersed in fresh water)	River installations, hydro-electric power plants	
Im 2 (immersed in sea or brackish water)	Immersed structures without cathodic protection (e.g. harbour areas with structures like sluice gates, locks or jetties)	
Im 3 (soil)	Buried tanks, steel piles, steel pipes	
Im 4 (immersed in sea or brackish water)	Immersed structures with cathodic protection (e.g. offshore structures)	
NOTE This table is based on ISO 12944-2:2017, Tables 1 and 2. The mounting kits corrosion protection can also be achieved by systems/methods which deviate from those specified in ISO 12944-5 and ISO 12944-9.		

4.5 Mounting kit

4.5.1 Stiffness

The dimensions of the mounting kit given in this document ensure for a vertical valve shaft that the maximum flange torque, given in ISO 5211, can be transmitted.

For non-vertical valve shafts, the mounting kit manufacturer shall define any limitations.

When specified by the purchaser, the mounting kit shall also be designed for external loads (e.g. stepping load, earthquake, wind load, additional plant induced dynamic loads). In this case, for instance, the thickness as given in [Table 2](#) may be increased.

4.5.2 Intermediate support style

The intermediate support provides two equal or different attachment interfaces (actuator and valve), as per ISO 5211.

A common type is a "rectangular" bracket, as defined in [5.1](#).

The "rectangular" type is predominantly manufactured from a rectangular or square tube (e.g. the ISO 10799 series). The "rectangular" type can also be cast, fabricated or machined.

Other commonly used types are the following:

- "adapter flange": generally manufactured as one piece from casting, forging, plate or bar. It shall be provided with a suitable venting device if required, see [4.11](#);

- "spool type": generally manufactured from two flanges that correspond to the mating faces of valve and actuator, connected together by a piece of tube. The assembly is welded together to form a spool piece. The "spool type" can also be in one piece: cast, forged or machined. The spool shall be provided with a venting device, see 4.11, and/or with an opening to visualise the coupling position if required.

Other types of intermediate support may be used provided they meet the requirements of this document.

4.6 Bolting

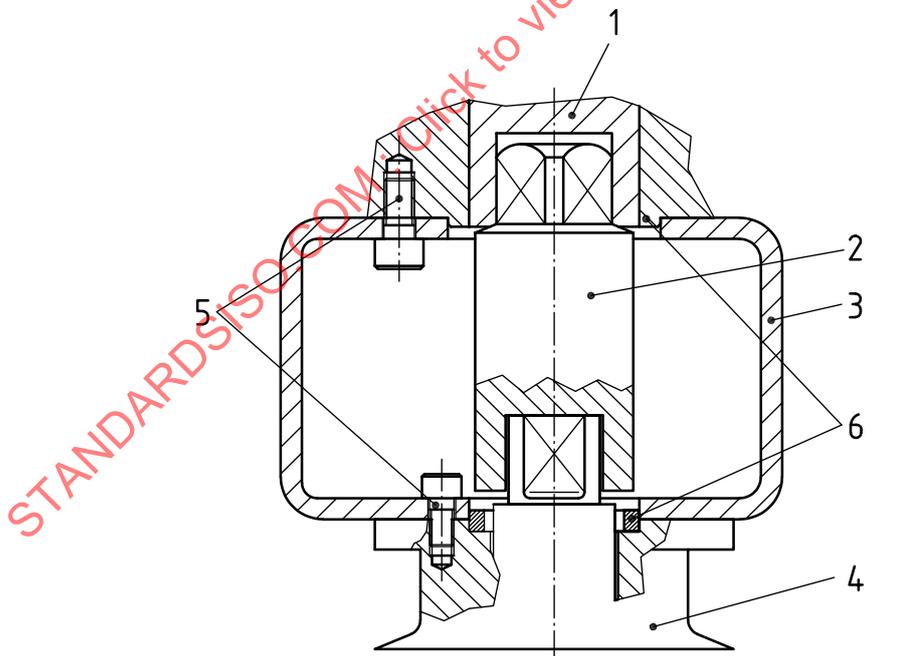
The minimum mechanical properties and fastening of the bolts (see Figure 2) shall ensure that the maximum transmissible torque (as specified in ISO 5211) can be delivered to the valve flange. Since the interfaces only transfer torque by static friction and the bolted connection is not designed for shear stresses, a safety against slipping can be derived with the defined bolt tensile stress of only 290 MPa and specification of the coefficient of friction 0,2 between the mounting interface.

When defining the bolting connection, mechanical properties shall be taken into account, in order to provide for corrosion protection (e.g. galvanic corrosion) according to Table 1 and in order to not exceed the yield strength.

Larger clamping and engagement length normally helps with load dissipation, against local stress risers, vibration and during fastening. A minimum of $1,0 \times$ the bolt size (d_4 in ISO 5211) is recommended for the clamping length. ISO 5211 is providing for at least $1,5 \times$ engagement length (h_2 in ISO 5211) of bolt size (d_4 in ISO 5211). And at least $1,2 \times$ the bolt size (d_4 in ISO 5211) is recommended.

NOTE As described in ISO 5211, the tension stress of the bolt can be calculated as 290 MPa with a tightening factor (1,6), an application factor (1,25), percentage of yield strength (90 %) and a bolt quality (8,8).

Engagement lengths between the bolt and valve and bolt and actuator shall be sufficient to avoid stripping of the threads when the bolts are tightened to the required torque. User is cautioned that the bolt may have much higher strength than the valve or actuator, requiring greater engagement length.



Key

- | | | | |
|---|--------------------|---|---------------------------------|
| 1 | actuator | 4 | valve |
| 2 | coupling (adaptor) | 5 | mounting bolt |
| 3 | bracket | 6 | spigot (integral or additional) |

Figure 2 — Bolting

4.7 Coupling

The design of the coupling shall ensure the maximum transmissible torque (as specified in ISO 5211), can be delivered to the valve shaft.

The coupling dimensions shall provide coupling clearance according to [Annex A](#). The design of both coupling ends (driven/driving) shall avoid any contact between moving and fixed parts, e.g. intermediate support, mounting fasteners, gland and gland bolts.

Applications requiring high valve cycles and/or fast cycle speeds etc. shall be considered in the selection of the coupling material and the tolerances applied.

4.8 Designation

Mounting kits shall be designated as follows:

- a) mounting kit style: adaptor flange (AF), bracket (BR), spool (SP) or other (OT) followed by the intermediate support material as per [4.2](#) (CI, DI, CS or SS);
- b) flange designations according to ISO 5211 (actuator flange type/valve flange type);
- c) if included, coupling drive identification (first for the actuator and second for the valve):
 - coupling driven (actuator side), e.g. diagonal square “D” designation, as per ISO 5211, followed by dimension s ;
 - coupling driving (valve side) designation either to ISO 5211 (additional capital letters with actual dimensions d_7 or s) or to specified/agreed dimensions, followed by actual dimensions l_8 and l_7 in mm (see [Figure A.1](#));
- d) environmental corrosion category as per [Table 1](#).

EXAMPLE ISO 5640 - BR/CI - F07/F05 - D 14/H 11-11-24 - C3.

NOTE The designation is not a marking requirement.

4.9 Position indicator

The coupling design shall have a provision for a clear and permanently marked indicator to show whether the valve is open or closed: special attention, during the assembly, should be taken when installing square drive couplings.

4.10 Buried service

When buried service is required, design details and corrosion protection shall be agreed upon between the purchaser and manufacturer/supplier.

4.11 Safety requirement

The adapter flange or the spool shall have a provision for venting any leakage that may occur through the shaft seal of the valve or from the actuator hydraulic/pneumatic supply. This may be obtained either by including a suitable vent.

4.12 Orientation

The mounting kit shall be designed, unless otherwise specified by the purchaser, for vertical valve shaft installation.

4.13 Additional means for support of the actuator

Additional supports may be necessary in order to dissipate and/or isolate external loads, such as actuator weight, vibrations or shock loading from the valve and/or piping. The mounting kit and/or additional supports shall not prohibit movements of the pipe induced e.g. by thermal expansion of the pipes.

The mounting kits/additional supports defined here shall not compromise the correct design and engineering of piping supports.

4.14 Valve/actuator package maintenance

The maintenance requirements of any valve/actuator package shall always be considered when designing and/or ordering the mounting kit. Special consideration shall be given to the following.

- Access to the mounting bolts/fasteners that connect the valve and actuator to the mounting kit: the mounting kit should have sufficient clearance to allow the installation and removal of fasteners without the need of special or modified tooling.
- Mounting kit fasteners that connect the valve and actuator to the intermediate support shall be capable of full removal without partial lifting of the valve or actuator to complete disengagement.
- Access to external valve gland adjustment mechanisms: some part-turn valves require periodic adjustment to prevent fugitive emissions.
- Access to valve lubrication facility: some plug valves require periodic lubrication in order to maintain a consistent torque requirement and prevent seizure.
- Actuator and accessories arrangement in relation to valve/pipeline flanges: the kit should be of sufficient height to allow suitable access for assembly, valve adjustment and valve/pipeline insulation/lagging.

5 Dimensions

5.1 Bracket

The bracket consists of two mounting faces, which can be either identical or different. In the latter case, the largest flange type dictates the height (H), width (W) and thickness (T), as per [Figure 3](#) and [Table 2](#) and special care needs to be taken in order to ensure the bracket can withstand the transmitted torque.

Any special requirements regarding:

- valve type, or
- actuator type, or
- required coupling type

and

- valve operational, or
- application requirements

shall be communicated to the mounting kit supplier/manufacturer.

Applications requiring high valve cycles and/or fast cycle speeds, aggressive environments, mounting orientation requirements, etc. shall be made known, and considered in the mounting kit design and selection of the coupling material and the tolerances applied.

For valves with adjustable packing glands, the valve side of the intermediate support shall not interfere with the gland packing during installation and shall permit access to adjust the packing load when necessary.

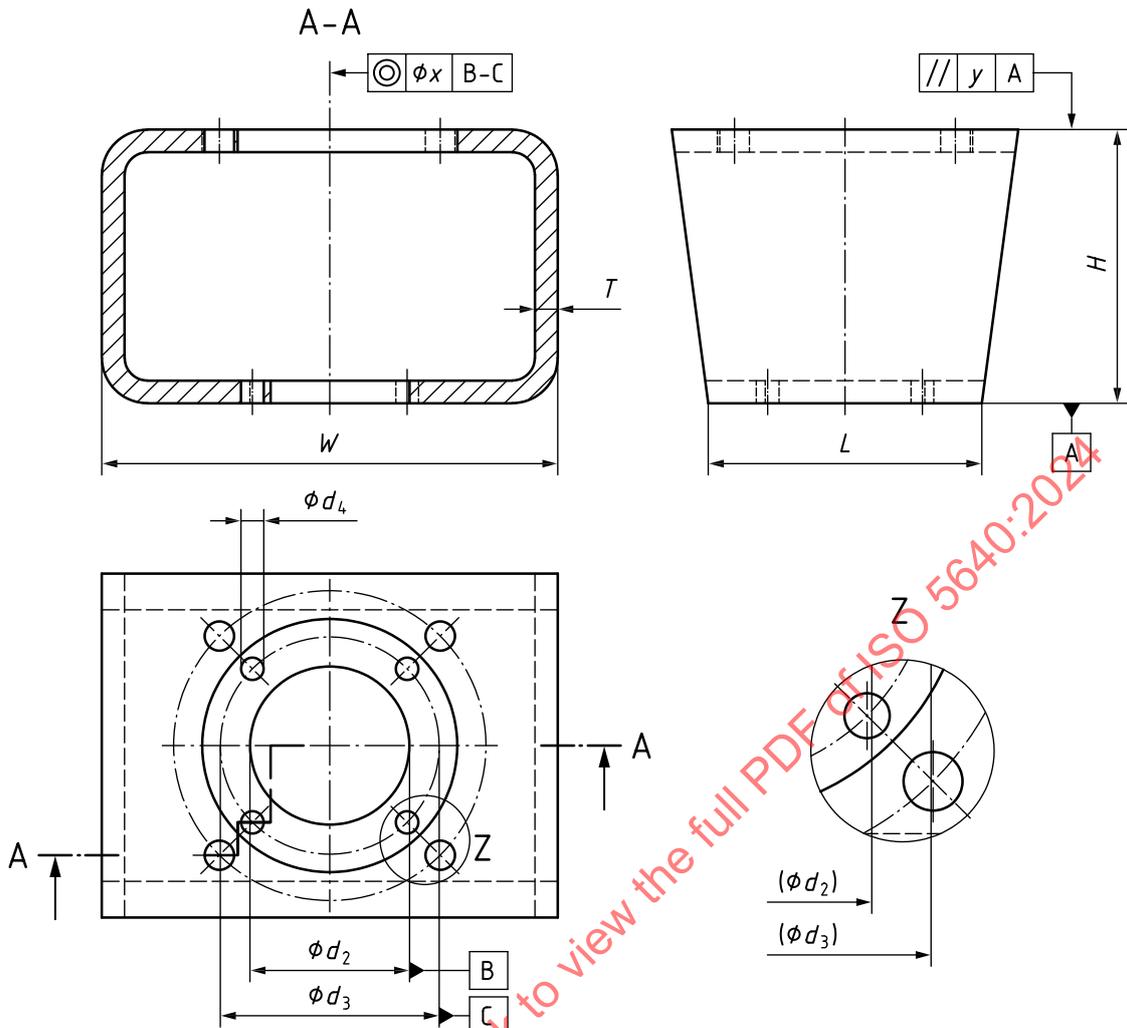


Figure 3 — Bracket dimensions

Table 2 — Bracket dimensions in millimetres

Flange type	Profile			Thick-ness <i>T</i>	ϕd_2	ϕd_3	ϕd_4	Number of screws, studs or bolts <i>n</i>	Tolerance	
	Height <i>H</i> ^a	Width <i>W</i>	Length <i>L</i>						<i>x</i>	<i>y</i>
F 03	50 ⁰ ₋₁	80	40 ⁺¹ ₀	4	25 ^{+0,15} _{+0,05}	36	5,5	4	0,1	0,1
F 04	50 ⁰ ₋₁	80	45 ⁺¹ ₀	4	30 ^{+0,15} _{+0,05}	42	5,5	4	0,1	0,1
F 05	60 ⁰ ₋₁	100	50 ⁺¹ ₀	5	35 ^{+0,15} _{+0,05}	50	6,5	4	0,1	0,1
F 07	60 ⁰ ₋₁	100	70 ⁺² ₀	5	55 ^{+0,15} _{+0,05}	70	9	4	0,1	0,1
F 10	80 ⁰ ₋₁	120	95 ⁺² ₀	5	70 ^{+0,20} _{+0,05}	102	11	4	0,2	0,2
F 12	80 ⁰ ₋₁	160	115 ⁺² ₀	6	85 ^{+0,20} _{+0,05}	125	13	4	0,2	0,2
F 14	80 ⁰ ₋₁	160	135 ⁺² ₀	6	100 ^{+0,20} _{+0,05}	140	17	4	0,2	0,2

^a The height *H* is considered as guideline. For *H* values higher than the one specified in this table, the manufacturer shall verify the stiffness.

Table 2 (continued)

Flange type	Profile				$\varnothing d_2$	$\varnothing d_3$	$\varnothing d_4$	Number of screws, studs or bolts n	Tolerance	
	Height H^a	Width W	Length L	Thick-ness T					x	y
F 16	100_{-2}^0	200	160_0^{+2}	6	$130_{+0,05}^{+0,20}$	165	21	4	0,4	0,4
F 25	200_{-2}^0	400	270_0^{+3}	10	$200_{+0,05}^{+0,25}$	254	17	8	0,4	0,4
F 30	200_{-2}^0	400	320_0^{+5}	10	$230_{+0,05}^{+0,25}$	298	21	8	0,4	0,4

^a The height H is considered as guideline. For H values higher than the one specified in this table, the manufacturer shall verify the stiffness.

5.2 Coupling design

5.2.1 General

Coupling design includes interfaces according to ISO 5211. Combinations of different coupling types to the driven and driving interfaces are possible.

NOTE For optimisation and increased interchangeability of the valve interface, see [Annex B](#).

5.2.2 Drive by key(s)

The driven and/or driving end of the coupling shall be the key(s) type as per ISO 5211 (designation "V", "W" or "X").

5.2.3 Drive by square head

The driven and/or driving end of the coupling shall be the diagonal square type as per ISO 5211 (designation "D").

5.2.4 Drive by flat head

The driven and/or driving end of the coupling shall be the flat head type as per ISO 5211 (designation "H").

5.2.5 Drive by improved flat head

The driven and/or driving end of the coupling shall be the improved flat head type as per ISO 5211 (designation "G").

5.2.6 Drive by involute spline

The driven and/or driving end of the coupling shall be the involute spline type as per ISO 5211 (designation "S").

5.2.7 Other types of drive connections

In order to meet specific performance characteristics, e.g. zero backlash, other types of drive connections different from ISO 5211 are permitted when approved by the purchaser.

5.3 Spools and adapter flanges

The height of the spool shall have the same dimension as the rectangular bracket.

The height of the adapter flange shall be specified by the valve or actuator manufacturer.

6 Marking

6.1 General

Each mounting kit shall bear the permanent indications as stated in [6.2](#). Optional indications may be added as per [6.3](#).

6.2 Mandatory information

- Bracket: for flange sizes refer to ISO 5211 (e.g. F05/F05, F07/F05).
- Coupling: for the driven end, driving dimension refer to ISO 5211 followed by the driving end dimensions identifications (e.g. D14/H11).

6.3 Optional information

- Manufacturer/supplier's identification (name and/or logo and/or trade mark).
- Reference to this document.

7 Documentation

7.1 Language

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

7.2 Product documentation

The following documentation shall be provided by the manufacturer/supplier:

- mounting kit installation including bolting pre-load, commissioning instructions and actuator's weight indication.

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Annex A (normative)

Coupling clearance

Axial clearance, between the coupling and the valve and actuator, is required to permit secure assembly without end loading of the valve shaft or actuator drive.

The critical axial dimensions of a typical assembly are shown in [Figure A.1](#). The coupling shall provide appropriate drive engagement, for both the driven and driving ends, to ensure that it transmits the rated torque. Adequate axial clearance may be achieved by the dimension C (while C is the smallest upper C_1 or lower C_2 coupling clearance) in the two positions indicated in [Figure A.1](#).

The critical axial dimensions of a typical coupling may be established, in terms of the dimensions shown in [Figure A.1](#), according to [Formulae \(A.1\)](#) and [\(A.2\)](#).

$$L_B = H - H_S + l_{C2} + C_A - C_1 \quad (\text{A.1})$$

$$l_T = l_B + l_{C1} \quad (\text{A.2})$$

The values of the minimum design coupling axial clearance, based on nominal dimensions, are given in [Table A.1](#).

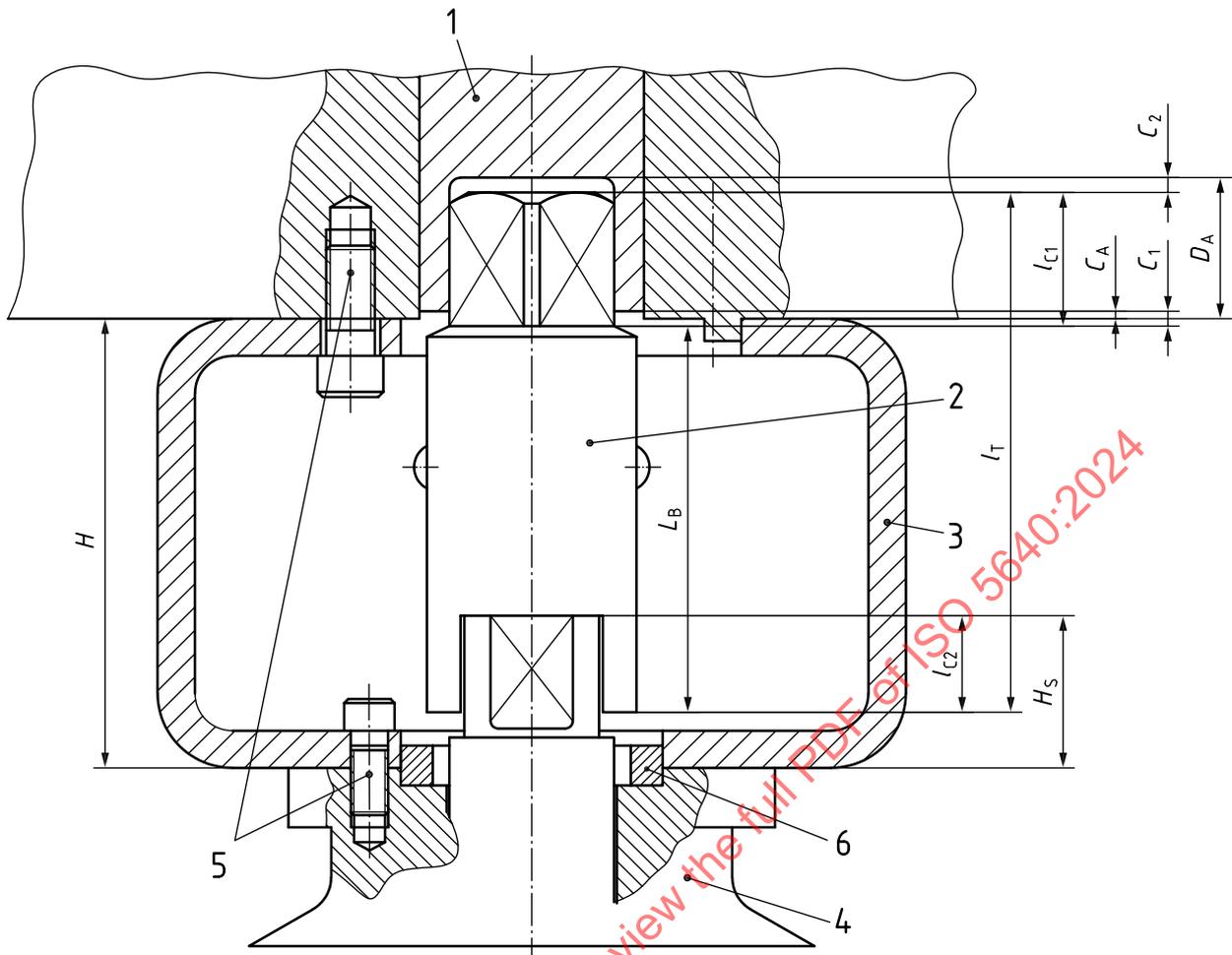
Dimension H_S shall be the maximum value under all foreseeable and/or critical working conditions. Valve conditions may change due to valve gland or seat wear and consideration should be given to any resultant changes in coupling axial clearance.

It may also be necessary to provide clearance between the coupling and bracket/spool mounting flanges or any protrusions such as bolt heads, centering spigots or valve gland components.

Care should be taken to ensure that adequate drive engagements are provided when the coupling travels to either extreme of the axial clearance.

Table A.1 — Minimum coupling axial clearance

Flange type in accordance with ISO 5211	Minimum coupling axial clearance C [mm]
F03 to F07	1
F10 to F12	1,5
F14 to F16	2
F 25 to F30	3



Key

- | | | | |
|----------|---------------------------------------|----------|---|
| 1 | actuator | H | nominal rectangular bracket or spool height (see Figure 3 and Table 2) |
| 2 | coupling (adaptor) | C_A | actuator drive clearance (as per ISO 5211) |
| 3 | bracket | D_A | actuator drive depth (as per ISO 5211) |
| 4 | valve | H_S | shaft height from valve top mounting face (as per ISO 5211) |
| 5 | mounting bolt | l_{C2} | coupling driving end engagement length |
| 6 | spigot (integral or additional) | C_1 | upper coupling clearance (see Table A.1) |
| l_{C1} | coupling driven end engagement length | C_2 | lower coupling clearance (see Table A.1) |
| l_T | total length of coupling | L_B | coupling minimum dimension within the bracket |

Figure A.1 — Mounting kit assembly

Annex B
(informative)

Proposed shaft details for ball and butterfly valves

B.1 General

This annex has been developed to propose to the valve industry the gradual implementation of new standard dimensions for the driven end of ball and butterfly valve shafts (see [Tables B.1 to B.4](#) and for an example see [Figure B.1](#)), with the aim of product optimisation and increased interchangeability levels.

The proposed height H_S is based on ISO 5211, dimensions and clearances are in line with values indicated in [Table A.1](#).

The recess reference dimension shall be in accordance with ISO 5211.

The optional spigot dimension and tolerances shall be as the one for the actuator optional spigot defined in ISO 5211.

It is recommended to indicate the close and open obturator position on the valve stem/shaft in order to allow recognising the obturator position with valves installed in piping systems.

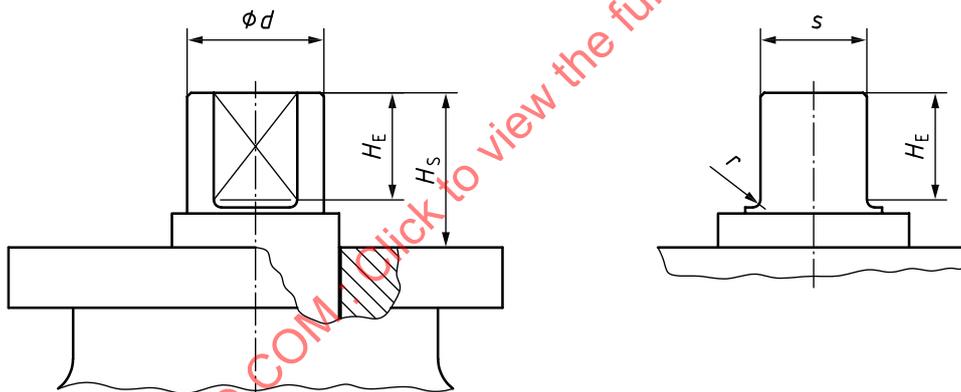


Figure B.1 — Example of valve flat head shaft

B.2 Proposed shaft details for ball valves

Table B.1 — Drive by flat head

Dimensions in millimetres

d	s	Valve top mounting face according to ISO 5211	H_E (min.)	H_S	
				Nominal	Tolerance
10	7	F03, F04, F05	8	18	0 to 1,0
12	8	F03, F04, F05	9	22	0 to 1,0
14	9,5	F04, F05, F07	10,5	27	0 to 1,0
18	12	F05, F07, F10	13	33	0 to 1,0
22	15	F07, F10, F12	16	34	0 to 1,0

^a Larger shafts are normally of key drive design and therefore not considered applicable in this proposal.