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Gas cylinders — Fitting of valves to gas cylinders

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National foreword

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The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to ISO text carry the number of the ISO amendment. For example, text altered by ISO amendment 1 is indicated by [A1] ⟨A1⟩.

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Gasflaschen - Eindrehen von Ventilen in Gasflaschen (ISO 13341:2010)

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Foreword to amendment A1

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Foreword

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ISO 13341 was prepared by Technical Committee ISO/TC 58, *Gas cylinders*.

This second edition cancels and replaces the first edition (ISO 13341:1997), which has been technically revised. It also incorporates the Technical Corrigendum ISO 13341:1997/Cor.1:1998.

Gas cylinders — Fitting of valves to gas cylinders

1 Scope

This International Standard specifies the procedures to be followed when connecting cylinder valves to gas cylinders. It specifically applies to all valve and cylinder combinations connected with ISO screw threads as specified in ISO 10920 and ISO 11363-1. It defines routines for inspection and preparation prior to valving for both taper and parallel screw threads.

Torque values are given in Annex A for steel and aluminium gas cylinders including composite cylinders with steel or aluminium boss.

NOTE The procedures and practices specified in this International Standard can be beneficially applied to other valve to cylinder screw thread connection systems. ISO/TR 11364[4] lists the valve to gas cylinder threads in use worldwide. It gives details of the thread identification codes, whether the threads are interchangeable with ISO threads and if the taping procedure and torque values specified in this International Standard can be used. ISO/TR 11364[4] gives clear guidance for the method and torque for all listed inlet threads, which are not interchangeable.

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.

ISO 11114-2, *Transportable gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 2: Non-metallic materials*

ISO 11119-2, *Gas cylinders of composite construction — Specification and test methods — Part 2: Fully wrapped fibre reinforced composite gas cylinders with load-sharing metal liners*

ISO 11119-3, *Gas cylinders of composite construction — Specification and test methods — Part 3: Fully wrapped fibre reinforced composite gas cylinders with non-load-sharing metallic or non-metallic liners*

ISO 15245-1, *Gas cylinders — Parallel threads for connection of valves to gas cylinders — Part 1: Specification*

3 General requirements and recommendations

Gas cylinders and valves shall be connected so that when in use the combination is gas tight and the valve cannot be removed inadvertently from the cylinder.

The tools used to screw the valve into the gas cylinder shall fit the valve properly and the gas cylinder shall be secured against rotation during the torquing process. The tools shall not cause damage to either the valve or the cylinder. Minor marks to the valve and the cylinder are acceptable. The cylinder and the valving tool axes shall be aligned.

In addition, some composite cylinders need special treatment for the valving process, for example fixing the neck/metal boss during torquing.

Any special instructions given by the cylinder manufacturer shall be followed.

Sealing materials used between the valve stem and cylinder neck threads shall be compatible with the gas to be contained in the cylinder (e.g. oxygen), in accordance with ISO 11114-2.

Except as described in 7.3, the torque applied to the valve shall be within the relevant range given in Annex A. Valve manufacturers shall make available instructions if their specific recommendations regarding their product differ from those included in this International Standard (e.g. if their maximum torque recommendation is less than the maximum allowed in the relevant range included in Annex A).

For all threads, the maximum level of torque should not be exceeded as this will give rise to a high stress in the valve stem and/or cylinder neck.

Care shall be taken with aluminium alloy cylinders, for which valving torques are lower than for steel cylinders. Aluminium alloy cylinders shall not be valved at temperatures above ambient because, on cooling, differential contraction between the cylinder and the valve will give rise to a high stress in the cylinder neck.

High difference of temperature between cylinder neck and valve should be avoided. Some valve designs can be unsuitable to be valved at elevated temperatures (e.g. above 65 °C).

All tools and equipment used for valving cylinders shall be periodically validated for accuracy. Accuracy shall be established by measuring the torque applied to the valve of a valved cylinder as indicated in 5.4.3 for taper threads and in 6.5 for parallel threads.

NOTE Some machine tools rely on the friction between the valve and gas cylinder threads to stop the machine turning once the correct torque has been reached. For fast running machines, the inertia to be absorbed before the machine stops can result in valving torques being in practice far higher than the machine set point.

4 Preparation

4.1 A1 Each valve and cylinder thread shall be examined to ensure that they are to the same dimensional standard, e.g. ISO 11363-1 or ISO 15245-1 or that they are interchangeable according to ISO/TR 11364.

NOTE Some standards require that valve and cylinder threads are identified by marking (see ISO 10297 and ISO 13769). A1

4.2 The valve and cylinder threads shall be visually inspected for integrity and, where applicable, for damaged O-ring sealing surfaces. In particular, when valving aluminium alloy cylinders, the bottom threads on the stem of valves and the lower threads within the cylinder neck shall be fully formed at the root of the thread and free from ragged edges or burrs. Similar care is required when fitting stainless steel valves to all cylinders. Acceptance criteria for used valves are given in ISO 22434.

4.3 Threads and sealing surface on both valve and cylinder shall be checked for cleanliness. Any remnants of old PTFE sealing tape or other sealants, paints and other contaminants shall be completely removed. Care should be taken to prevent any debris falling into the cylinder. Depending on the gas service and application, before fitting the valve, it shall be ensured that the internal surface of the cylinder is clean and dry.

4.4 The top face of the cylinder, where a parallel thread is used, shall be free of paint, debris or other contamination so that the valve flange can rest directly on it when the cylinder has been valved.

5 Valving procedure for taper threaded valves

5.1 General

〈A1〉 Thread sealing can be achieved using sealant tape in accordance with 5.2 or soft metal caps in accordance with 5.3. Alternative sealing methods may be used, for example paste (see Annex B) and PTFE cones (in which case refer to the manufacturer's instructions). 〈A1〉

5.2 Wrapping with sealant tape

5.2.1 Wrapping of the valve stem with tape shall commence at the small end of the taper; the sealant tape shall be wound clockwise when looking from the base of the valve.

5.2.2 Wrapping shall be such that it protrudes beyond the small end of the valve stem by a maximum of 3 mm and a minimum of 1 mm. At the small end, there shall be a minimum of three layers of tape (see 5.2.5). Tape shall then be overlapped during wrapping to give an even double thickness all the way up to include the top thread of the valve stem. The number of layers may be adjusted depending on thickness of tape. Excessive tape thickness may increase the stress or push the tape out.

5.2.3 The tape shall not be excessively stretched during wrapping and shall be carefully torn or cut.

5.2.4 Tape shall be carefully worked into the valve thread profile.

Adherence between the tape and the valve stem thread form should be established.

5.2.5 Roll back the tape which protrudes beyond the bottom of the valve stem to leave the bottom face of the valve stem clear of tape; this will result in a doubling of the layers of tape covering the first valve stem thread at the small end. The valve shall then be fitted to the cylinder by hand prior to torquing.

5.3 Application of soft metal caps

5.3.1 Soft metal caps containing lead shall not be used with aluminium alloy cylinders.

5.3.2 The soft metal cap used shall be of the correct size.

5.3.3 After the cap is pulled over the valve stem, it shall be carefully worked into the valve thread profile with a suitable tool or a leather glove, to prevent the bottom end of the soft metal cap being cut off when the valve is fitted.

5.3.4 Valves shall be fitted to the cylinder by hand prior to torquing.

5.4 Valve torquing

5.4.1 After the valve has been screwed in by hand as far as possible and after making sure that sufficient threads are engaged, a properly fitting tool shall be used to tighten the valve into the cylinder (see Clause 3).

5.4.2 For threads according to ISO 11363-1, the torque applied shall be as specified in Annex A.

5.4.3 To validate the torque that was applied for fitting, the value shall be measured by further tightening the valve. The minimum value obtained to move the valve shall be within the limits of Annex A. A properly calibrated torque wrench shall be used.

5.4.4 If curing type of sealant fluid is used, the method described above is not applicable. A specific method should be validated and applied because anaerobic pastes solidify very quickly when the valve is fitted at the specified torque.

6 Valving procedure for parallel threaded valves

6.1 An O-ring seal dimensionally in conformance with ISO 15245-1 and compatible with the gas in service (see ISO 11114-2) shall be placed onto the valve stem. It shall be correctly positioned in the sealing area and shall not be damaged during placement.

6.2 No lubricant, sealant or tape shall be applied to the threads.

6.3 With the cylinder secured against rotation, the valve shall be fitted by hand paying particular attention to prevention of damage to the O-ring as it is engaged into the cylinder sealing area.

6.4 Once the valve has been screwed in by hand as far as possible, a properly fitting tool shall be used to apply the torque specified in Annex A.

6.5 To validate the torque that was applied for fitting, the value shall be measured by unscrewing the valve. The minimum value obtained to move the valve shall be within the limits specified in Annex A. The checked valve/cylinder assembly shall be retorqued properly after this procedure.

A calibrated torque wrench shall be used.

7 Procedure for achieving valve alignment for cylinders with fixed (e.g. welded) shroud and taper threads

7.1 The valve shall be inserted as specified in Clause 5.

7.2 Torque the valve to the minimum value, as indicated in the appropriate table, given in Annex A.

7.3 If necessary, screw the valve in further to achieve alignment of the valve outlet with the shroud opening. Do not in any case partially unscrew the valve.

NOTE Once the minimum torque in the range given in Annex A has been achieved, further rotation to align the valve should ideally continue at a lower speed without stopping; this is particularly important if a curing paste or fluid is used.

Annex A
(normative)

Valving torques for threads in accordance with ISO 11363-1 and ISO 15245-1

A.1 General

This annex applies to valves made from conventional material, e.g. stainless and carbon steels and brass.

The torque values given in this annex are based on the recommendations of gas cylinder and valve manufacturers. Many years of experience have proven that they are safe, give gas tight connections and are reliable for the full retest period.

However, for special valves (e.g. some valves with integrated pressure regulators) or special cylinders (e.g. composite cylinders with plastic liner or without liner), the manufacturers may specify reduced torque values (even below the minimum values given in this annex) that shall be applied (see Clause 3). In such a case the torque range values shall be identified by marking the cylinder in accordance with ISO 11119-2 and ISO 11119-3 and by issuing of installation instructions by the valve manufacturers. In case of doubt the manufacturer shall be consulted.

A.2 Valving torques for seamless steel cylinders and composite cylinders with steel boss

Table A.1 — Taper threads according to ISO 11363-1

Taper valve stem size	Torque Nm	
	Minimum[a]	Maximum[a]
17E	120	150
25E	200	300
NOTE Users should be aware that use of high torque levels gives the possibility of valve stem thread deformation.		
[a] All values shall be reduced to 2/3 of the values in this table for stainless steel valves.		

Table A.2 — Parallel threads according to ISO 15245-1

Parallel valve stem size	Torque Nm	
	Minimum	Maximum
M18	100	130
M25	100	130
M30	100	130

A.3 Valving torques for aluminium alloy cylinders and composite cylinders with aluminium alloy boss

Table A.3 — Taper threads according to ISO 11363-1

Taper valve stem size	Torque Nm		
	Minimum	Maximum	
		Without cylinder neck reinforcement	With cylinder neck reinforcement
17E	75	95	140
25E	95	110	180
NOTE A method to reduce tensile stress in the cylinder neck is by a shrunk-on-neck-ring reinforcement (this puts the neck into compression). Material for the neck ring should be chosen with care to ensure compatibility with the cylinder material, e.g. to avoid galvanic corrosion. This method of reducing local tensile stresses should be done by the manufacturer or with the manufacturer's guidance. It might be difficult to distinguish between a simple neck ring and a neck ring providing neck reinforcement; in case of doubt consult the cylinder manufacturer or use the lower maximum value.			

Table A.4 — Parallel threads according to ISO 15245-1

Parallel valve stem size	Torque Nm	
	Minimum	Maximum
M18	85	100
M25	95	130
M30	95	130

A.4 Valving torques for welded steel cylinders

Table A.5 — Taper threads according to ISO 11363-1

Taper valve stem size	Torque Nm	
	Minimum	Maximum
17E	90	150 (120[a], 130[b])
25E	110	300 (200[a], 250[b])
NOTE Users should be aware that use of high torque levels gives the possibility of stem thread deformation.		
[a] Reduced values for stainless steel.		
[b] Reduced values for dedicated LPG valves in accordance with ISO 14245 and ISO 15995.		

Annex B
(informative)

Application of paste as sealant

B.1 General

For some applications, for example refrigerant gases, an anaerobic paste is generally used. During tightening, the paste sticks very quickly. If the protection of the valve on the cylinder is a shield, it is necessary to angle the valve after tightening in order to put the connection just in front of the opening of the shield.

B.2 Proposed procedure

Apply the paste on the first thread of the valve, then fit the valve to the cylinder one turn by hand; the operator continues to apply paste at the base of the thread with each rotation of the valve by hand, and the valve is then fitted at a specific torque on the valving machine. This method makes it possible to avoid introducing paste inside the cylinder.

Anaerobic pastes stick very quickly when the valve is fitted at the specified torque. Apply specific procedures as recommended by the manufacturers of the cylinder, the valve and the paste.

After fitting the valve at the specified torque, it can be necessary to angle the valve after tightening. At that time the torque can be substantially greater than the applied torque. In such cases the specified torque must be regulated with a lower value. Apply specific procedures as recommended by the manufacturers of the cylinder, the valve and the paste.

Bibliography

[1] ISO 10297, *Transportable gas cylinders — Cylinder valves — Specification and type testing*

[2] ISO 10920, *Gas cylinders — 25E taper thread for connection of valves to gas cylinders — Specification*

[3] ISO 11363-1, *Gas cylinders — 17E and 25E taper threads for connection of valves to gas cylinders — Part 1: Specifications*

[4] ISO/TR 11364[1)], *Gas Cylinders — Compilation of national and international valve stem/gas cylinder neck threads and their identification and marking system*

[5] ISO 13769, *Gas cylinders — Stamp marking*

[6] ISO 14245, *Gas cylinders — Specifications and testing of LPG cylinder valves — Self-closing*

[7] ISO 15995, *Gas cylinders — Specifications and testing of LPG cylinder valves — Manually operated*

[8] ISO 22434, *Transportable gas cylinders — Inspection and maintenance of cylinder valves*

1) Under preparation.

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