



# **PTFE USED AS A SEALANT FOR CYLINDER/VALVE CONNECTIONS**

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Prepared by WG-2 Gas cylinders and pressure vessels

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### Amendments to 138/08

Section	Change
	Editorial to align to EIGA style
3	Publications terminology added
	Improved photographs
3.4.1.2.1	References added

Note: Technical changes from the previous edition are underlined

## 1 Introduction

The most common method of ensuring a gas-tight joint at the cylinder neck/valve stem taper thread interface is to use polytetrafluoroethylene (PTFE) as a sealant, either in tape or cone form. This EIGA publication describes the use of such tape or cones.

## 2 Scope and purpose

### 2.1 Scope

This publication covers the gas-tight sealing of conical threads used on gas cylinders and cylinder valves through the use of PTFE.

### 2.2 Purpose

This publication gives practical guidance on how to achieve a gas tight connection on the cylinder valve/gas cylinder interface.

## 3 Definitions

For the purpose of this publication, the following definitions apply.

### 3.1 Publication Terminology

#### 3.1.1 Shall

Indicates that the procedure is mandatory. It is used wherever the criterion for conformance to specific recommendations allows no deviation.

#### 3.1.2 Should

Indicates that a procedure is recommended.

#### 3.1.3 May

Indicates that the procedure is optional.

#### 3.1.4 Will

Used only to indicate the future, not a degree of requirement.

#### 3.1.5 Can

Indicates a possibility or ability.

## 4 Background

PTFE is the preferred sealing material for producing a gas-tight joint on the taper threads connecting gas cylinders and cylinder valves due to its ease of use and relatively high auto ignition temperature (AIT). For the grade of PTFE used in the industrial gases industry, the AIT of 450°C to 480°C compares favourably with other oxygen compatible elastomeric materials.

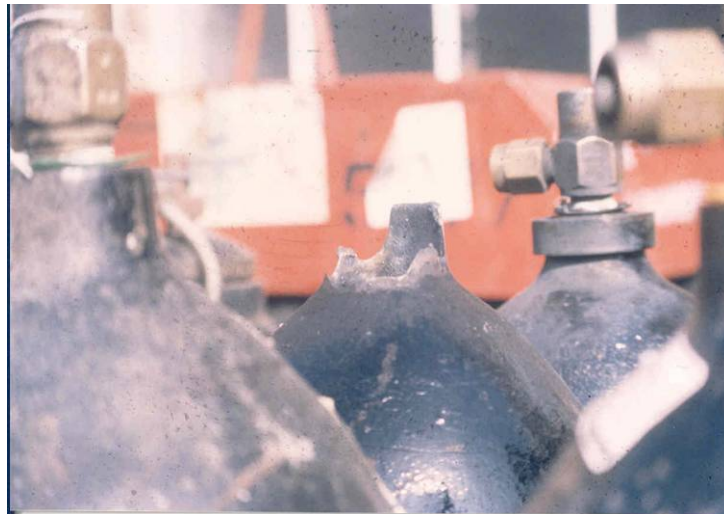
## 5 Safety considerations

The grade and thickness of the PTFE tape or cone need to be considered for a specific intended working pressure, for further details see EN 751-3 Sealing materials for metallic threaded joints in

*contact with first, second and third family gases and hot water – part 3 Unsintered PTFE [1]<sup>1</sup>*. Where use is envisaged with oxidising gases, the maximum content of the lubricant (hydrocarbon) within the tape or cone needs to be carefully specified. A commonly used value for this maximum amount of hydrocarbon level is 0.1 wt % (0.1 m/m). PTFE tape or cones with such low levels of hydrocarbon are denoted as “oxygen compatible”.

In general only oxygen compatible PTFE tape or cone should be used for all gases (even inert or flammable gases) in order not to create an unnecessary source of confusion/error on the shop floor. Because oxygen compatible PTFE tape can be easily mistaken for other grades of PTFE tape as used, for example, in the plumbing industry; some gas companies use a coloured tape to denote oxygen service.

Use of PTFE sealant that is not oxygen compatible can lead to burn-out of the neck of oxidising gas cylinders under ignition conditions (see Figure 1).



**Figure 1 Burnt out cylinder neck and valve**

It is very important that all residual PTFE debris from previous valving operations is removed from the cylinder before a valve is fitted. The neck threads of a cylinder are particularly difficult to clean thoroughly. It is essential to insure that debris from the cleaning process is removed from the cylinder and its internals before revalving.

If a valve is reused it is essential to remove any residual PTFE from its stem thread before applying new sealing material.

Note that the use of PTFE tape to seal parallel threaded joints between cylinders and valves is not permitted.

## **5.1 Materials Testing**

Oxygen compatible PTFE shall comply with the requirements of EN ISO 11114-2 *Gas cylinders. Compatibility of cylinder and valve materials with gas contents; Non-metallic materials* [2]. This compatibility shall be evaluated using the test methodology as described in EN ISO 11114-3, *Gas cylinders. Compatibility of cylinder and valve materials with gas contents. Autogenous ignition test for non-metallic materials in oxygen atmosphere* [3].

The amount of hydrocarbon residues need to be determined by a solvent extraction method as described in EN 751-3 [1].

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<sup>1</sup> References are shown by bracketed numbers and are listed in order of appearance in the reference section.

## 5.2 Tape application

For an effective, safe tape application the following aspects are important:

- correct number of turns i.e. the overall thickness of tape on the stem threads;
- In the case of valves used in aluminium alloy cylinders or stainless steel valves used in steel cylinders, extra lubrication of the first thread at the small end of the valve is necessary to avoid damage to the cylinder neck thread. This may be achieved by ensuring the first thread of the valve is fully covered by at least one layer of PTFE, see Figure 2; and
- There shall be no overhanging PTFE tape at the small end of the valve thread. Tests have shown that in such a case, PTFE tape can be cut and fall into the cylinder during valve insertion. Figure 3 shows an example of the application of excessive PTFE tape.

See EN ISO 13341, *Gas cylinders. Fitting of valves to gas cylinders* [4]

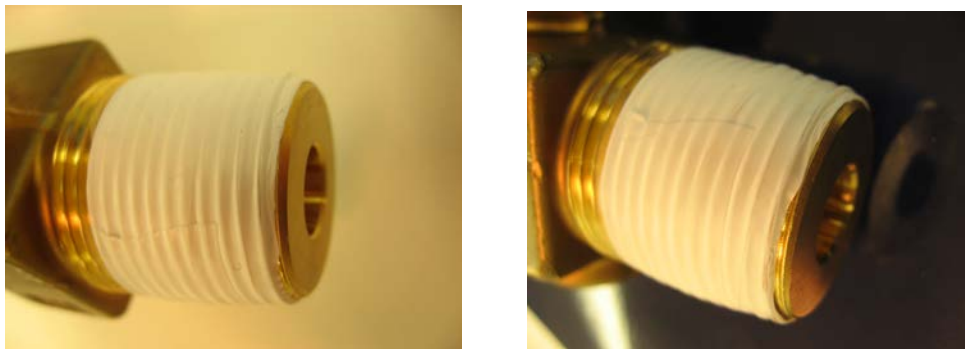


Figure 2 Typical examples of PTFE tape applied correctly to a valve thread



Figure 3 Typical example of excessive PTFE tape applied to the valve inlet thread

## 5.3 PTFE cones

PTFE cones (see Figure 4) are an alternative to tape in some applications. The user should follow the cone manufacturer's instructions and ensure that the cone used matches the thread standard of the valve. It should be noted that the PTFE cone is tapered. The largest diameter shall go first over the valve inlet thread. The cone is to be gently pushed onto the valve inlet thread. When the cone has become "tight" it is to be gently rotated clockwise and at the same time pushed further onto the thread until there is about 2 mm overhang at the bottom of the cone that is beyond the bottom face of the valve thread. **This is very important and different to the application of tape.** If there is no overhang, experience has shown that the cone will "ride up" the valve thread during the valving operation; and the joint will not seal.

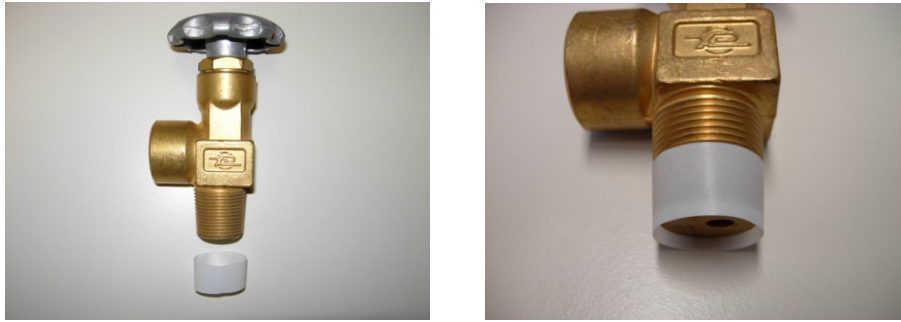


Figure 4 Typical examples of PTFE cone applied to a valve stem Note the overlap

## 6 References

Unless otherwise specified the latest edition shall apply.

[1] EN 751-3 *Sealing materials for metallic threaded joints in contact with first, second and third family gases and hot water – part 3 Unsintered PTFE*

[2] EN ISO 11114-2 *Gas cylinders. Compatibility of cylinder and valve materials with gas contents; Non-metallic materials*

[3] EN ISO 11114-3, *Gas cylinders. Compatibility of cylinder and valve materials with gas contents. Autogenous ignition test for non-metallic materials in oxygen atmosphere*

[4] EN ISO 13341, *Gas cylinders. Fitting of valves to gas cylinders*