Training Package
TP 37/24

Safe Design and Handling of Filling Connectors

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Objective

Connectors are used in cylinder filling stations for connecting the filling hose to the cylinder valve outlet. Connectors are complex components that require monitoring, care and maintenance. This training package is designed to prevent incidents and to promote safe handling.

Scope

This Training Package covers the following aspects of filling connectors:

- Definition
- Minimum requirements
- Safe design
- Handling
- Maintenance
- Storage
- Lifetime

Definitions

- Connector:

A filling connector is defined as a device that connects directly from a hose to the cylinder valve outlet, using a corresponding standard or company specification, for example DIN, CGA, BS, CEN, IS, GB, KSB, JIS, BS. It allows the pressurisation and / or depressurisation of the cylinder. Connectors can also include appropriate features to allow filling of Residual Pressure Valves (RPVs).
Filling connectors are usually fixed installed to a hose or pigtail.

- Adaptor:

A filling adaptor is defined as a device that converts a filling connector to fit a valve that has a different connection, for example using a connector with a GB thread to fill a CGA valve outlet. Adapters are often in use in case of cross border filling.

Adaptors

- The general use of adapters should be avoided. A connector specific to the valve outlet is recommended
- Filling adaptors shall be kept in a controlled area with access limited to authorised personnel, particularly when used for oxygen / flammable mixtures
- Adaptors shall be kept in an appropriately clean area for gas service

Minimum Requirements

- Filling connectors should be stored to avoid physical damage and contamination when not in use.

- Filling connectors used in oxygen, oxidiser or other "oxygen clean" service shall be stored and maintained in accordance with oxygen cleanliness requirements.

- Cleanliness requirements of the filling connector shall be maintained throughout its life (for example oxygen or high purity service). Where cleanliness requirements exist for different connectors, they shall be stored separately and identified accordingly.

Minimum Requirements

- Oxygen clean filling connectors storage shall be identified as oxygen clean.
- Only use spare parts recommended by the manufacturer and approved for the specific gas service.
- Connectors shall have the correct pin length to open the residual pressure device to avoid damaging the RPV mechanism of the valve or provide insufficient flow area through the valve
- Spring loaded connectors shall have the correct spring strength to fully open the RPV
- Filling connectors shall not be used at customer sites

Safe design of filling connectors

Material

- Material selection should be made to accommodate compatibility with the gas and overall strength and durability (wear and tear). Before final selection of material, consideration shall be given to the following standards:

EN ISO 11114 – 1 Transportable Gas Cylinders – Compatibility of cylinder and materials with gas contents Metallic Materials

EN ISO 11114 – 2 Transportable Gas Cylinders – Compatibility of cylinder and materials with gas contents Non Metallic Materials

Non-metallic materials for Oxygen use can be tested in accordance with

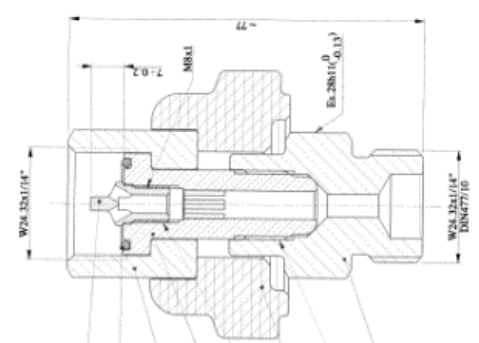
EN ISO 11114 – 3 Gas Cylinders – Compatibility of cylinder and valve materials with gas contents Autogenous ignition test non-metallic in oxygen atmosphere

- The recommended minimum hardness of the sealing elastomer shall be suitable for the application – See EIGA Doc 908

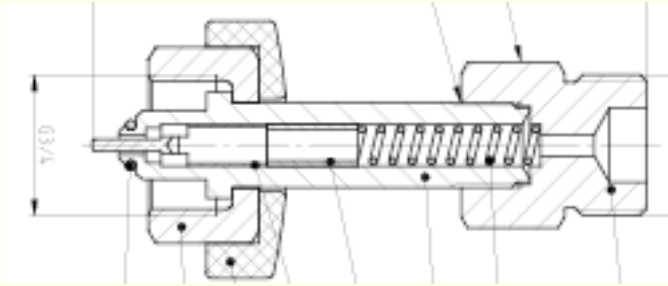
Safe design of filling connectors

Different designs of filling connectors are described below

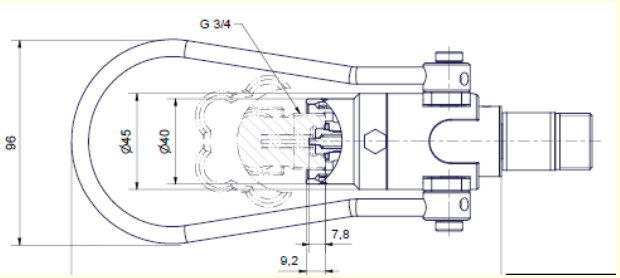
Fixed RPV pin design



Spring RPV pin design



Quick connect design



Note: Ensure that the quick connect is fitted with an integrated safety concept, preventing the valve from being disconnected accidentally while under pressure.

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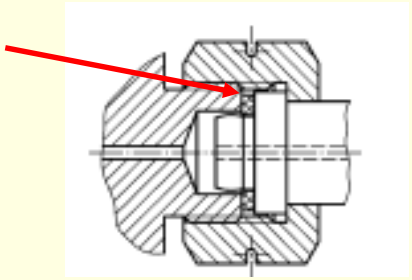
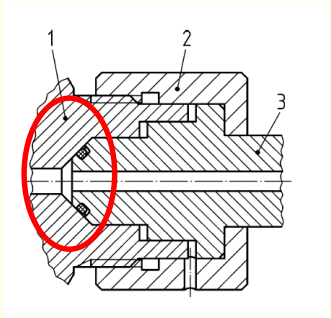
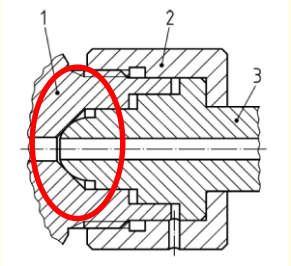
Safe design of filling connectors

- There are two types of sealing system:
  - Non-metallic, for example with O-ring





  - Metal to metal, for example bull nose (without O-ring)



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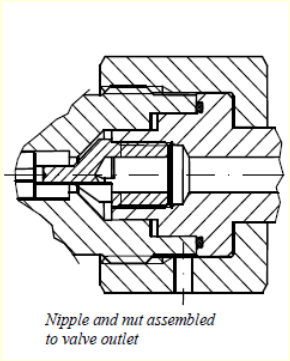
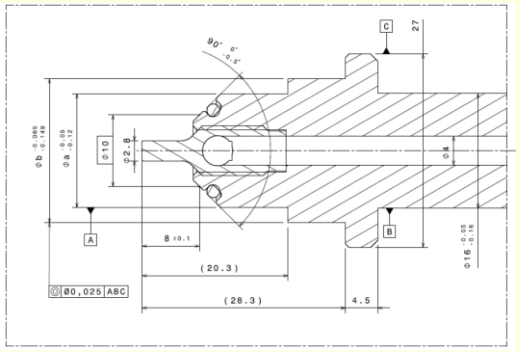
Safe design of filling connectors

In cases where a PIN for opening the non return mechanism is required, the connector design should account for the potential reduction in flow area.
Below are two systems (outer and inner O-ring), for more information see EIGA Doc 908 is there an AIGA equivalent ?.



Nipple and nut assembled to valve outlet



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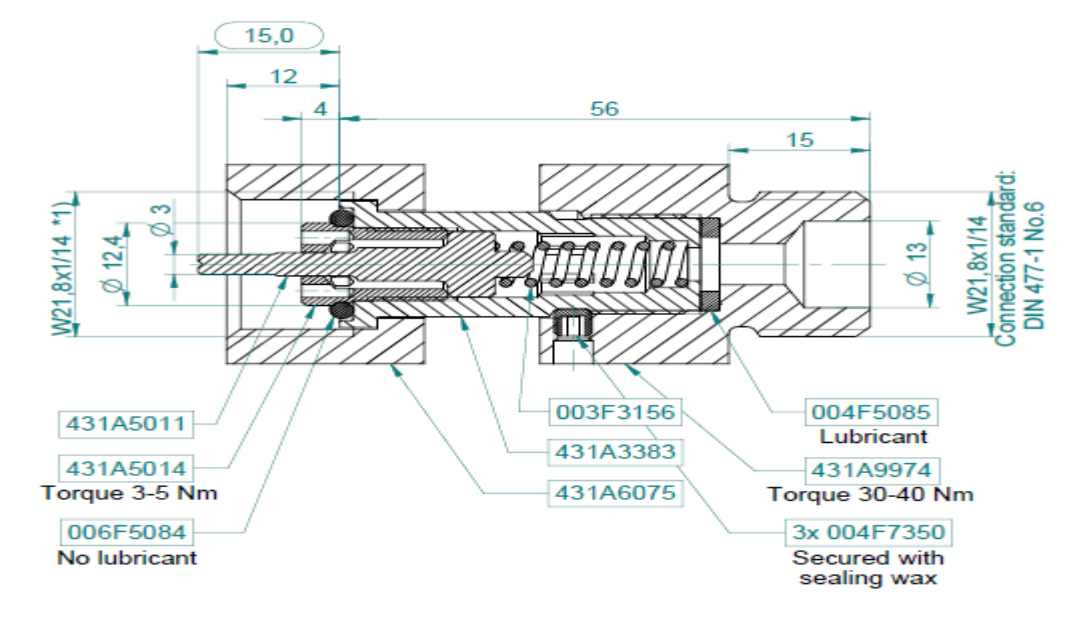
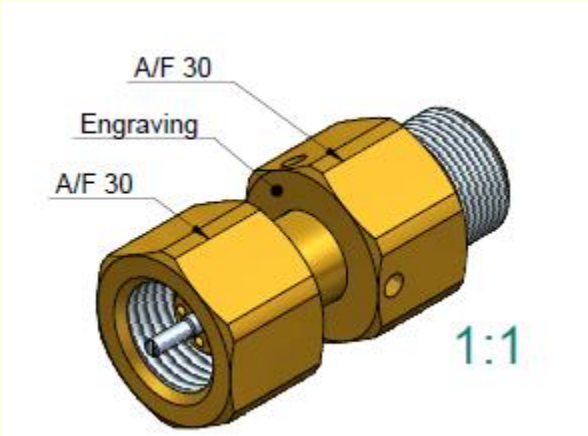
Handling/use of filling connectors

Markings

Filling connectors should be labelled with operational information such as:

- Working pressure
- Test pressure
- Date of manufacturing
- Gas service
- Manufacturer sign
- Connection type





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Maintenance of filling connectors

Spare parts list

- A detailed spare parts list should be available. Only original spare parts, or authorised parts, should be used. For more info see EIGA Doc 908.

Lifetime of filling connectors

- Filling connectors usually do not have a defined lifetime. However, lifetime may be affected by connecting cycle, supplier instructions and hazard assessment.
- Operators should check the following issues prior to filling:
  - ✓ PIN condition (bent, damaged, worn)
  - ✓ O-ring condition (damaged, deformed)
  - ✓ Free of contamination (free from leak spray)

O-ring and pin inspection points

Missing O-ring

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References

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- EIGA Doc 908, *300 Bar Residual Pressure Valve Filling Connectors*, European Industrial Gases Association, www.eiga.eu
- AIGA 098, *A Reference Guide for Industrial Gas Cylinder Valve Outlet Connections*, AIGA Asia Industrial Gases Association, *www.asiaiga.org*

Stay Safe & Thank You

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