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1 Introduction

The main reason for standardizing valve outlet connections is to prevent product mix-up and interconnection of non-compatible gases.

This will enhance both safety and quality during filling and usage of various gases and gas mixtures.

2 Scope and Purpose

The document is a practical guide for the selection of cylinder valve outlets for industrial gases and gas mixtures.

Medical and electronics grade gases are not covered in this document.

The document does not apply to connections for cryogenic gases withdrawal and gases for breathing equipment. (For guidelines on these container types see “AIGA 019, Connections for portable liquid cylinders” or “AIGA 016, Safety Features of Portable Cryogenic Liquid Containers for Industrial and Medical Gases”).

3 Definitions

Terminology:

– Shall indicates that the procedure is mandatory. It is used wherever conformance to specific recommendation allows no deviation.
– Should indicates that a procedure is recommended.
– May and Need not indicate that the procedure is optional.
– Will is used only to indicate the future, not a degree of requirement.
– Can indicates a possibility or ability.

4 Valve Selection and Usage

4.1 Valve Outlet Connections

Applicable national regulation needs to be followed in countries where one exists.

Following is the recommended standard for selecting industrial gas cylinder valve outlet connections in countries where a national regulation does not exist.

ISO 5145 Cylinder Valve Outlets for Gases and Gas Mixtures – Selection and Dimensioning [1]

ISO 5145 [1] presents a system for determining valve outlets for gas cylinders for all gases or gas mixtures. It will be of interest and use for those countries that have no national standards or regulations.

It is recommended to use ISO 5145[1] when selecting cylinder valves for 300 bar or above.

4.2 Selection of Valves

There shall be suitable equipment and a system in place to ensure that the appropriate valves are fitted for the service of the gas cylinder and that the valves are installed in accordance with ISO 13341 [2] and/or national approved standard where available, including the stem thread matching the cylinder internal neck thread.

References are shown by bracketed numbers and are listed in order of appearance in the reference section.
Special care shall be taken to ensure that the maximum permitted torque value is not exceeded while fitting a valve.

4.3 Commonly Used Cylinder Valves

Following are the commonly used valve types for Industrial Gases

- Standard Valves
- Residual Pressure Valves
- Pressure Reducing Valves
- Valves with Integrated Pressure Regulators

The design of the valves can be either:

- Packed Valves
- Diaphragm Valves (tied and non tied)
- ‘O’ ring seal Valves.

4.4 Valve Operation

Major steps in valve operation are

- Use spindle key or hand wheel type valves
- If using spindle key, do not over-torque by using lever extension. Follow manufacturer’s instructions on torque levels.
- Open and close valves slowly

Pneumatically operated valves are sometimes used for special applications. Follow manufacturer’s instruction for operating these valves

4.5 Valves with Parallel Threads

Valves with parallel threads and ‘O’ rings are recommended for use with Aluminium Alloy cylinders. This would prevent the scenario where the cylinder neck thread seizes onto the valve’s brass thread when over-tightened.

When the taper threaded valves are used on aluminium Alloy cylinders, especially for higher pressure and toxic and flammable gases, shrink-on neck collars should be fitted. The collar keeps the threads under compression.

Note: No PTFE tape or similar sealant shall be used on the parallel threaded valves and compatibility of O-rings with gas being filled shall be ensured

4.6 Residual Pressure Valve (RPV)

Residual Pressure Valves (RPVs) are also known as Minimum Pressure Retaining (MPR) valves.

A RPV maintains positive pressure within the cylinder, thus avoiding atmospheric contamination of the contents in case the cylinder valve is left open.

RPVs can be both with and without non-return devices.

In case of RPVs with non-return feature, a special fill connector is required during filling to deactivate the non-return function.
5 Valve Protection

Valve guards or valve caps should be used on all cylinders with a neck ring / collar provision to accommodate valve protection. This can

- protect valves from damage during transportation and handling
- improve safety during cylinder handling (for example, the valve protection helps to prevent valve shear during accidental fall of cylinders thus avoiding a projectile situation or hazards of gas released from the cylinder

Valve protection should not impede the attachment of regulators or other accessories and should be designed in accordance with ISO 11117 [3] or equivalent standard.

Valve protection may not be present when there is no gas pressure inside the cylinder.

Valves without any protection shall be tested for High Impact Strength as per ISO 10297 [4], at a minimum. However, valve protection offer much greater protection if a cylinder should fall.

6 Cylinder Valve Maintenance

Any attempt to repair a valve should be done by the manufacturer or by trained personnel in accordance with manufacturer’ guidelines.

Where valves are reused, they shall be periodically inspected and refurbished as necessary. If there is no national standard on valve refurbishment, it is recommended to use ISO 22434:2006 [5].

Rejected valves should not be repaired and reused.

The valves shall be inspected for external damage and usability during Pre-fill Inspection.

7 Adaptors

Adaptors shall not be used while making connections to the cylinder valves. Adaptors defeat the purpose of standardizing cylinder valve outlet connections based on the gas properties and associated hazards.

Several serious incidents have occurred in the past due to inappropriate usage of adaptors, leading to mixing of non compatible gases or filling wrong gas in cylinders.

Use of adaptors can only be considered with a proper review, control and approval by a competent person in the organization. The use of a work permit system is to be included when there is a need for temporary use of adaptor for the work.

8 Commonly Used Standards and Valve Connections in Asia

The following table lists the commonly followed standards and valve outlet connections for some of the industrial gases in countries in Asia.

Some countries allow import of cylinders with valve outlet connections suited to the country of origin.
### Commonly Followed Standards and Valve Outlet Connections for various Countries in Asia:

<table>
<thead>
<tr>
<th>Gas Name</th>
<th>Formula</th>
<th>Flammable</th>
<th>Toxic</th>
<th>Korean Standard KSB 6214</th>
<th>Thai Standard TIS 88-2517</th>
<th>CGA V-1 (Taiwan, Philippines)</th>
<th>Indian Standard IS 3224</th>
<th>JIS B 8244 (Acetylene) &amp; 8246 (Japan, Taiwan)</th>
<th>BS 341 (Singapore, Indonesia, Malaysia)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetylene</td>
<td>C2H2</td>
<td>y</td>
<td>n</td>
<td>14 Ø5 W22</td>
<td>W22m-14-LH-INT</td>
<td>300 825°-14 NGO-RH-EXT</td>
<td>510 885°-14 NGO-LH-INT</td>
<td>2 G 5/8 RH</td>
<td>As per JIS B 8244 2, 4 5/8 BSP.F.-L.H.</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO2</td>
<td>n</td>
<td>n</td>
<td>2 G5/8 RH</td>
<td>W22m-14-RH-INT</td>
<td>320 825°-14 NGO-RH-EXT</td>
<td>320 825°-14 NGO-RH-EXT</td>
<td>7 EXT W21.8 x 1.814-RH</td>
<td>A1 W22mm-14-RH-EXT 8 0.860-1 TPI Whit.-R.H.</td>
</tr>
<tr>
<td>Country</td>
<td>Industry Standard</td>
<td>Remarks</td>
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<tr>
<td>Bangladesh</td>
<td>BS 341</td>
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<td>China</td>
<td>GB 15383-2011</td>
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<tr>
<td>India</td>
<td>IS 3224</td>
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<tr>
<td>Indonesia</td>
<td>No specific standard</td>
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<tr>
<td>Japan</td>
<td>JIS B 8244</td>
<td>Other international standards (eg. CGA V-1) are also used</td>
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<tr>
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<tr>
<td>Malaysia</td>
<td>BS 341</td>
<td>Industrial below 250 bar</td>
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<tr>
<td>Malaysia</td>
<td>ISO 5145</td>
<td>Industrial above 250 bar</td>
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<tr>
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<td>Follows CGA V-1</td>
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<tr>
<td>Pakistan</td>
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<tr>
<td>Sri Lanka</td>
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<tr>
<td>Singapore</td>
<td>No specific standard</td>
<td>BS 341 is commonly used except Nitrogen where BS 8 is used</td>
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<tr>
<td>South Korea</td>
<td>KSB 6214</td>
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<tr>
<td>Taiwan</td>
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<td>Follows CGA V-1, JIS</td>
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<tr>
<td>Thailand</td>
<td>TIS 88-2517</td>
<td>Follows CGA V-1</td>
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9 References

The following were used as references in this publication


Other References


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<thead>
<tr>
<th>No.</th>
<th>Standard Reference</th>
<th>Description</th>
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<tr>
<td>18.</td>
<td>AIGA 016</td>
<td>Safety Features of Portable Cryogenic Liquid Containers for Industrial and Medical Gases. <a href="http://www.asiaiga.org">www.asiaiga.org</a></td>
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<td>19.</td>
<td>AIGA 019</td>
<td>Connections for Portable Liquid Cylinders. <a href="http://www.asiaiga.org">www.asiaiga.org</a></td>
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