



EKC International FZE

Safety Instructions For Handling & Inspection Manual For Refillable Seamless Steel Gas Cylinders



1. Sensitivity of cylinder materials to operating conditions and their solution .

<u>Material</u>	<u>Possible Damage</u>	<u>Solution</u>
Steel	May experience painted and cylinder	Ensure steel is Corrosion of Surfaces is not in direct Contact with others metals.
	Impact Damage	Ensure cylinders are Protected from debris and other external objects. Use cylinder shields.
	Weather	Cylinder surface may get Affected by ultraviolet Radiation, if exposed to direct sunlight. Use of Periodic inspection of External coating.
	Temperature Range	Settled temperature of gas in cylinder may vary from a minimum of -40 °C to +65 °C
	Cylinder Temperature	The temperature of the cylinder material may vary from a minimum of -40°C to +65°C The temperature over +65°C may be sufficiently local or short enough duration, that the temperature of gas in the cylinder never exceed +65° C.
	Chemical Attack	Avoid exposure to harsh Chemicals, automotive fluids and battery acids. Do periodic inspection, check For pitting, discoloration of Cylinder surface, signs Of oxidation.
	Abrasion	Abrasion may occur due to Continuous rubbing Of cylinder with the badly Handling of cylinders.

2. Cylinder handling:



- Loading the gas cylinder on trolley if possible.
 - Wear steel toe capped shoes and industrial quality gloves.
 - Undo securing bars on trolley and slide it near the cylinder.
 - Unhook chain from rack and place palm of hand on top of cylinder neck, get firm grip.
 - Tilt cylinder slightly forward so it's rest on the rim of the base and use the other hand to rotate cylinder it from rack to trolley.
 - Cylinders should not be dropped.
 - Cylinders should not be dragged.
 - Cylinders should not be lifted by using the attached valves as leverage or support.
 - Cylinders should not be used as roller for shifting loads.
 - Cylinder should never be allowed to become a part of any electrical circuit, earthing.
 - If forklifts are used to lift the cylinders, take extra precaution as the forks can inflict damage to the cylinders.
 - Protect cylinders from contact with ground, ice, snow, water, salt corrosive liquids and high temperatures.
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- Do not use welding equipment near the cylinders.
 - Do not hit cylinders with tools or other objects.

3. Training:

Training is an important way of achieving competence and contributes to the laboratory's health And safety culture at all levels. All employees must be given the following training.

1. **General Training** on manual handling as part of induction training which should outline all the relevant health and safety issues associated with manual handling operations.
2. **Task specific training** identified by suitable risk assessment of all manual handling tasks performed by staff. Thus employees involved with handling of gas cylinders must receive specific manual handling training, as well as refresher training, including some practical session in the course to demonstrate to staff how to perform the manual handling task e.g. proper manual handling technique to load and propel a cylinder.

4. Cylinder Inspection:

All cylinders are designed with high safety factors and undergo stringent quality tests in all stages of the manufacturing process. The cylinders need to be periodically examined / retested after few years* to ensure safety throughout their service life. Periodic inspection determines their general conditions and fitness for further usage.

Preparation of cylinder

The cylinder external surface must be clean for an effective visual inspection. If this is not the case, the cylinder must be cleaned with a water-based detergent. The use of abrasives and/or chemicals should be avoided. If protective cover materials (stone shields and other protective covers) prevent an effective inspection, they must be removed prior to inspection.

Cylinder Depressurization

Cylinders that have been involved in accident, which may have damaged the container, or cylinders with known or suspected damage shall be depressurized prior to examination.



5. There are three types of inspections (See table below) which can be carried out to assess the cylinders over all condition and fitness levels.

Inspection Type	Description	Removal of cylinder	Frequency
Visual	Primary inspection Method, recommended By manufacturer.	No	Quarterly
Hydrostatic	Required by cylinders Manufacturers should Done as per the guidelines Of local regulatory Authority.	Yes	every 5 years or decided by regulatory body of the country.
Acoustic Emission	Non destructive test that May be done in conjunction to supplement visual inspection.	No	May be performed along with visual inspection. However this is not a Substitute for hydrostatic test.

** The duration of periodical inspection/Re-testing is defined by the regulatory authority of each country.

6. Guidelines for visual inspection:

Visual inspection can be carried in two ways.

- a. Periodic General Inspection.
- b. Periodic Detailed Visual Inspection.



Elements Of Visual Inspection

Inspection Type	Description	Frequency
General visual inspection.	Inspection performed by Operation engineer, Maintenance manager and technicians to check for any signs of damage to the cylinder & valve.	During routine maintenance or every month or quarter.
Detail Visual Inspection	Detail inspection should be performed by trained technical staff as recommended by the manufacturing standard, local regulatory authority or from cylinder manufacturer.	3 Years

Detailed visual inspection on gas cylinder should be carried out at a recommended frequency.

7.0 Acceptance Criteria

Visual examination of the surface is made to detect the cylinder damage or evidence of potential damage like corrosion, cuts, scratches, gouges, fractures, material loss / removal, discoloration of the cylinder surface (soot, charring, chemical attack, etc) evidence of impact of accidents, and deterioration of the surface.

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9.0 Type Of Cylinder Damage

Surface corrosion:

Surface corrosion on steel can produce rusting or pitting. This surface corrosion can reduce the cylinder wall thickness, which is left untreated could result in weakening of the cylinder or failure.

Solution: Always ensure cylinders are painted. Light corrosion can be cleaned and cylinders repainted. For heavy corrosion and pitting, the approximate depth of pitting should be determined and the cylinders should be removed from service if the depth of the corrosion or pitting exceeds more than 0.5 mm and reduces the minimum design thickness.

Fatigue Cracks:

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Any type of metal container such as high pressure seamless steel gas cylinder will suffer from fatigue cracking. If it is subjected to a large number of pressure cycles. This type of fatigue generally starts from the interior of the cylinder.

Impact Damage:

If impact damage is suspected, the cylinder should be carefully examined using the detailed visual inspection procedure. The area of greatest concern is the neck and bottom of the cylinder. Impact damage may also occur when cylinders are dropped during handling. Extreme care should be taken when cylinders are being moved.

Stress corrosion:

Stress corrosion can occur when the cylinders come in contact with a corrosive liquid. Acids such as battery acid are one of the most corrosive agents.

Fire and Heat Damage:

Fire and heat damage can occur in all type of cylinders. If cylinder has been involved in a fire, then the cylinder should be removed from the service and retested. A more common form of damage is heat damage when the cylinder is too close to a heat source. Even though steel cylinders are less susceptible to such damage still they should properly taken care of.

10. Protection and Inspection of cylinder valves

- Ensure only good quality of certified valves to be used
- Ensure if cylinders are manufactured and tested as per TPED/ADR with “Pi” marking, so only “Pi” marked valve should be used on the same cylinders.
- Protect the valves by giving protection of valve guard.

11. Repainting

The only allowable repair to the cylinder is the paint repair (touch up) that shall be done after the necessary preparation. The touch up must be done with 2 layers of paint:

1st layer, minimum 35 micron of zinc rich epoxy primer.

2nd layer, minimum 40 micron of epoxy finished coat.

12. Maintenance

Check the condition and fitting of valves once in a month.

Check the leakages if any once in month.

13. Damage Monitoring

Cylinder having damages accepted or repaired must be monitored at every periodic inspection in order to detect if further damage has occurred. Retest the cylinder in case of increased in damage.
