EUROPEAN CYLINDER MAKERS ASSOCIATION

Recommended method for determination of loose particles in gas cylinders

Working Instruction: WI 003

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European Cylinder Makers Association
Technical Group for seamless gas cylinders
For safe and efficient European gas cylinders

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1 Scope

This working instruction describes the method for determination of loose particles for seamless steel, aluminium alloy and Type 2 composite cylinders up to 150 litre water capacity. The determination of hydrocarbons is described in ECMA WI 001 (Hydrocarbon Test Method)

NOTE 1: This WI does not consider Type 3 and Type 4 composite cylinders.

NOTE 2: Sticky particles are not considered.

NOTE 3: The described particle test is based on the determination of the quantity of loose particles. The user defines the acceptable limits for particles per cylinder type.

2 Symbols

TL	Weight of empty, clean and dry Petri dish (in mg)
BL	Weight of Petri dish containing loose particles (in mg)
WL	Weight of loose particles (in mg)
WP	Total content of loose particles (in mg/m^2)
CS	Approximate internal cylinder surface (in m^2)
Di	Internal diameter of the cylinder (in m)

3 Sampling

The sample cylinder shall be taken out of the production flow after final cleaning (shot blasting and / or washing) or at the stage of product acceptance as agreed upon by the concerned parties. Prior to testing, the cylinder should be visually inspected to ensure that all internal surfaces are dry.

4 Test method

Procedure for determination of loose particles:

a) The cylinder shall be brought into an inverted position and tapped repeatedly (approximately 5 times) with a hammer made from soft material (e.g. plastic). Care shall be taken to protect the operator and not to damage the cylinder surface.
Any particles that fall out of the cylinder shall be collected onto an adequately sized, dry and clean sheet of paper that was previously placed underneath the cylinder's opening. Attention shall be paid that no air draught blows away any particles.

NOTE: Specific handling equipment shall be used, when inverting large cylinders (e.g.50 l) in order to guard against possible incidents (including injuries)

b) The particles gathered on the paper shall be carefully placed in a Petri dish. Attention shall be paid to the complete transfer of particles. The weight of the Petri dish (TL) shall be established to an acceptable accuracy (e.g. 1 mg) prior to pouring the particles into it.

c) The Petri dish with the particles (BL) shall then be weighed to an acceptable accuracy (e.g. 1mg and consequently calculated the total weight of loose particles (WL) according to 5.

5 Calculation of results

The total content of loose particles can be quoted as mg or mg per m^2 of approximate internal cylinder surface.

Weight of loose particles: WL [mg] = BL - TL

Approximate cylinder internal surface: CS [m^2] = Di [m] * π * cylinder length [m]

Total content of loose particles: WP [mg/m^2] = WL / CS