



**SLOVENSKI STANDARD**  
**SIST-TP CEN/TR 15339-4:2015**  
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**Vročje brizganje - Varnostne zahteve za opremo za vroče brizganje - 4. del:  
Oskrbovanje s plinskim in tekočim gorivom**

Thermal spraying - Safety requirements for thermal spraying equipment - Part 4: Gas and liquid fuel supply

Thermisches Spritzen - Sicherheitsanforderungen für Einrichtungen für das thermische Spritzen - Teil 4: Gas- und Flüssigbrennstoffversorgung

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**ICS:**

25.220.20      Površinska obdelava      Surface treatment

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TECHNICAL REPORT  
RAPPORT TECHNIQUE  
TECHNISCHER BERICHT

**CEN/TR 15339-4**

December 2014

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ICS 25.220.20

English Version

**Thermal spraying - Safety requirements for thermal spraying  
equipment - Part 4: Gas and liquid fuel supply**

Projection thermique - Exigences de sécurité relatives au  
matériel de projection thermique - Partie 4: Alimentation en  
gaz et en combustible liquide

Thermisches Spritzen - Sicherheitsanforderungen für  
Einrichtungen für das thermische Spritzen - Teil 4: Gas- und  
Flüssigbrennstoffversorgung

This Technical Report was approved by CEN on 16 September 2014. It has been drawn up by the Technical Committee CEN/TC 240.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## Foreword

This document (CEN/TR 15339-4:2014) has been prepared by Technical Committee CEN/TC 240 "Thermal spraying and thermally sprayed coatings", the secretariat of which is held by DIN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

CEN/TR 15339, *Thermal spraying - Safety requirements for thermal spraying equipment* is composed of the following parts:

- *Part 1: General requirements*
- *Part 2: Gas control units* (published as a European Standard)
- *Part 3: Torches for thermal spraying and their connection and supply units*
- *Part 4: Gas and liquid fuel supply*
- *Part 5: Powder and wire feed units*
- *Part 6: Spray booth, Handling system, Dust collection, Exhaust system, Filter*

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**CEN/TR 15339-4:2014 (E)****1 Scope**

This Technical Report specifies safety requirements of equipment for thermal spraying, in this case of gas supply including supply of liquid fuels. It deals with safety requirements for storage and the high pressure piping system from storage to the gas control unit or pressure regulator equipment. Safety requirements for gas hoses, hose assembly and torches are presented in CEN/TR 15339-3.

This document should be used in conjunction with CEN/TR 15339-1, which deals with general aspects of designing, manufacturing, and/or putting into service of machines or equipment and with the responsibility to issue the CE Conformity Declaration.

**2 Normative references**

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 657, *Thermal spraying — Terminology, classification*

EN 15339-2, *Thermal spraying — Safety requirements for thermal spraying equipment — Part 2: Gas control units*

EN ISO 3821, *Gas welding equipment — Rubber hoses for welding, cutting and allied processes (ISO 3821)*

CEN/TR 15339-1, *Thermal spraying — Safety requirements for thermal spraying equipment — Part 1: General requirements*

CEN/TR 15339-3, *Thermal spraying — Safety requirements for thermal spraying equipment — Part 3: Torches for thermal spraying and their connections and supply units*

CEN/TR 15339-6, *Thermal spraying — Safety requirements for thermal spraying equipment — Part 6: Spray booth, Handling system, Dust collection, Exhaust system, Filter*

**3 Function of thermal spraying equipment****3.1 General**

Thermal spraying processes are described and schematically represented in EN 657.

Thermal spraying processes as flame, plasma or HVOF (high velocity oxygen fuel) spraying use inert, flammable and oxidizing gases which possess a significant potential of danger. Oxygen is considered as a dangerous gas because hardly inflammable material will burn in the presence of a certain concentration of oxygen.

Pressurised air, nitrogen, or carbon dioxide (CO<sub>2</sub>) are applied for cooling the substrate's surface or the part to be sprayed. Fuel gases and oxygen are used for fusing of sprayed coatings made out of self fluxing alloys.

For such applications, an appropriate and safe supply shall be ensured by gases from manifold cylinder banks, cryogenic gas tanks or public piping systems (natural gas).

The installation of the gas delivery system, taken in conjunction with control measures, such as gas detection flow rates, and interlocking of the thermal spray equipment, forms a crucial part of the HAC. The respective class shall be considered. For details, see CEN/TR 15339-1 and CEN/TR 15339-6.

## 3.2 Gases for thermal spraying

Table 1 — Gases for thermal spraying

Thermal spraying process	Gases and mixtures used - Remarks
Flame spraying	acetylene (C <sub>2</sub> H <sub>2</sub> ) propane (C <sub>3</sub> H <sub>8</sub> ) <sup>a</sup> propylene (C <sub>3</sub> H <sub>6</sub> ) hydrogen (H <sub>2</sub> ) oxygen (O <sub>2</sub> ) air carbon dioxide (CO <sub>2</sub> ) <sup>c</sup>
High Velocity Oxygen Fuel spraying (HVOF)	acetylene (C <sub>2</sub> H <sub>2</sub> ) ethene (C <sub>2</sub> H <sub>4</sub> ) propane (C <sub>3</sub> H <sub>8</sub> ) <sup>a</sup> CNG (natural gas) <sup>b</sup> hydrogen (H <sub>2</sub> ) oxygen (O <sub>2</sub> ) nitrogen (N <sub>2</sub> ) air carbon dioxide (CO <sub>2</sub> ) <sup>c</sup>
Cold spraying	helium (He) nitrogen (N <sub>2</sub> ) and their mixtures air
Detonation spraying	acetylene (C <sub>2</sub> H <sub>2</sub> ) propylene (C <sub>3</sub> H <sub>6</sub> ) oxygen (O <sub>2</sub> ) nitrogen (N <sub>2</sub> ) air carbon dioxide (CO <sub>2</sub> ) <sup>c</sup>
Arc spraying	argon (Ar) nitrogen (N <sub>2</sub> ) argon or nitrogen mixtures air carbon dioxide (CO <sub>2</sub> ) <sup>c</sup>
Plasma spraying	argon (Ar) helium (He) hydrogen (H <sub>2</sub> ) nitrogen (N <sub>2</sub> ) and their mixtures air carbon dioxide (CO <sub>2</sub> ) <sup>c</sup>
Laser spraying, Laser cladding	helium (He) nitrogen (N <sub>2</sub> ) argon (Ar)

## CEN/TR 15339-4:2014 (E)

Thermal spraying process	Gases and mixtures used - Remarks
	and their mixtures air carbon dioxide (CO <sub>2</sub> ) <sup>c</sup>
<p><sup>a</sup> Propane is applied as a liquid gas containing <math>\geq 95\%</math> C<sub>3</sub>H<sub>8</sub> and remnants or traces of butane (C<sub>4</sub>H<sub>10</sub>), ethane (C<sub>2</sub>H<sub>6</sub>), ethene (C<sub>2</sub>H<sub>4</sub>) or butane-isomers</p> <p><sup>b</sup> CNG (natural gas) contains mainly methane (CH<sub>4</sub>), however its content varies between 80 and more than 95 %. Further constituents are inert gases, ethane, propane, butane, pentane (C<sub>5</sub>H<sub>12</sub>). The PCI (BTU) can be kept constantly adjusted by the N<sub>2</sub> content.</p> <p><sup>c</sup> CO<sub>2</sub> can be applied beside of pressurized air or nitrogen for cooling the substrate or the coating itself.</p>	

### 3.3 Safety related features of gas, liquid fuel, and cooling water supply

- Storage of burnable and inflammable gases.
- Storage of liquid fuels.
- Supply of high pressure gases in the high pressure gas supply system (> 20 bar) running from the storage to the spraying equipment, e.g. to the gas control cabinet (for details, see EN 15339-2) or to the stop and control fitting of the torch hose (for details, see CEN/TR 15339-3).
- Supply of liquid fuel from the storage to the control cabinet (for details, see EN 15339-2).
- Supply of oxygen or air for acceleration the combustion of the spray jet.
- Storage, supply and distribution of cooling media for thermal spraying.

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### 4 Potential hazards <https://standards.iteh.ai/catalog/standards/sist/a52b89c7-fb40-43ae-a78c-52a8e390beed/sist-tp-cen-tr-15339-4-2015>

For a safe operation and supply of gaseous and liquid fuels, the following hazards shall be considered for normal operation or foreseeable abnormal circumstances.

- Risk of fire or explosion:
  - if leakage occurs on the connections in the piping system;
  - if the distance between gas cylinders or bundles of different gases is not appropriate;
  - if leakages are produced when changing the connections.
- Risk of over-heating or damage by impairment of ice, snow, direct sunlight to the gas supply.
- Release of gases or liquids under high pressure.
- Impairment of the environment by gases and/or liquids.
- Risk of anoxia in the spray cabin by release of inert gases (e.g. Ar) or CO<sub>2</sub>, if the ventilation is not working, or if the operator enters the cabin before sufficient venting occurred (refer to 5.7)
- Risk and increase of fire by release of oxygen.
- Risk of flashback, if the stop valve or the gas pressure reducing fitting does not operate sufficiently.



## 5 Safety requirements – Protection measures

### 5.1 General requirements and measures

Specific safety conditions and protective measures are required by European, national or local regulations. These requirements shall be fulfilled predominantly. The following equipment is covered by this Technical Report.

Gas cylinders, manifold cylinder bundles and cryogenic gas tanks, storage receptacle for liquid fuel, piping systems for gases, liquid fuel and cooling media.

Appropriate devices and equipment to fulfil the requirements are:

- gas stop valves;
- gas pressure regulator;
- shutt-off valve;
- gas pressure control;
- pressure reducing valves;
- pipes for the connection of the gas cylinders from the storage receptacle to the control cabinet, or within the control cabinet;
- fittings, connecting parts;
- pressure gauges;
- flashback arresters;
- non-return valves.

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### 5.2 Safety requirements and protection measures for gas storage

Wherever possible, stores for cryogenic liquid gas tanks, bulk supply of gases and/or tanks for liquid fuels shall be located outside the work area, in purpose-built bays that can be locked.

The storage area shall be well ventilated, kept clean and the cylinders shall be protected against ice and snow and direct sunlight. Access shall be given for the delivery and removal of bundles or cylinders by lorries.

Fuel gases and oxygen shall be stored separately, either by a distance or by a fire resistant wall. The limits of the permissible quantity of LPG, propane and acetylene stored together shall be considered.

Heating and/or gasification of the LPG piping may be necessary to avoid liquefaction of the LPG in the piping and/or feeding the spraying system. This phenomenon may appear at high pressures and low temperatures

Annex A represents schematically layouts for gas and liquid fuel supply for several thermal spraying processes.

### 5.3 Safety requirements and protection measures for high pressure gas supply

A fixed installation of this gas supply system (more than 20 bar gas pressure) shall be applied for thermal spraying using solid piping as far as possible. Hoses of suitable material and pressure range shall be used in order to reduce the risk of damages and leakage. A sufficient flow shall be available.