BRITISH STANDARD

BS EN
15339-2:2007

Thermal spraying — Safety requirements for thermal spraying equipment —

Part 2: Gas control units

The European Standard EN 15339-2:2007 has the status of a British Standard

ICS 25.220.20

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 15339-2:2007.

The UK participation in its preparation was entrusted to Technical Committee STI/40, Thermally sprayed inorganic finishes.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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Projection thermique - Exigences de sécurité relatives au matériel de projection thermique - Partie 2: Unités de régulation de l'alimentation en gaz

Thermisches Spritzen - Sicherheitsanforderungen für Einrichtungen für das thermische Spritzen - Teil 2: Gaskontrolleinheiten

This European Standard was approved by CEN on 3 February 2007.

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Foreword

This document (EN 15339-2:2007) has been prepared by Technical Committee CEN/TC 240 “Thermal spraying and thermally sprayed coatings”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2007, and conflicting national standards shall be withdrawn at the latest by September 2007.

EN 15339 *Thermal spraying — Safety requirements for thermal spraying equipment* consists of the following parts:

Part 2: Gas control units

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This European Standard specifies safety requirements of machines and equipment for thermal spraying, in this case of gas control units. This European Standard should be used in conjunction with the Part 1 which deals with general aspects when designing, manufacturing, and/or putting in service of machines or equipment.

Generally the requirements of EU-Directive 94/9/EC are valid for the use of this European Standard.

2 Normative references

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

EN 559, *Gas welding equipment — Rubber hoses for welding, cutting and allied processes*

EN 560, *Gas welding equipment — Hose connections for equipment for welding, cutting and allied processes*

EN 561, *Gas welding equipment — Quick-action coupling with shut-off valves for welding, cutting and allied processes*

EN 657, *Thermal spraying — Terminology, classification*

EN 730-1, *Gas welding equipment — Safety devices — Part 1: Incorporating a flame (flashback) arrestor*

EN 730-2, *Gas welding equipment — Safety devices — Part 2: Not incorporating a flame (flashback) arrestor*

EN 982, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics*

EN 13611, *Safety and control devices for gas burners and gas-burning appliances — General requirements*

prEN 15069, *Safety gas connection valves for metal hose assemblies used for the connection of domestic appliances using gaseous fuel*

EN 60079-0, *Electrical apparatus for explosive gas atmospheres — Part 0: General requirements (IEC 60079-0:2004)*

EN 60079-1, *Electrical apparatus for potentially explosive atmospheres — Part 1: Flameproof enclosure "d" (IEC 60079-1:2003)*

EN 60079-2, *Electrical apparatus for explosive gas atmospheres — Part 2: Pressurized enclosures "p" (IEC 60079- 2:2001)*

EN 60079-10, *Electrical apparatus for explosive gas atmospheres — Part 10: Classification of hazardous areas (IEC 60079-10:2002)*

EN 60204-1, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005, modified)*

EN 60529, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*

EN 61310-1, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, auditory and tactile signals (IEC 61310-1:1995)*

EN 61310-2, *Safety of machinery — Indication, marking and actuation — Part 2: Requirements for marking (IEC 61310-2:1995)*

EN 61496-1, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests (IEC 61496-1:2004, modified)*

EN 61779-1, *Electrical apparatus for the detection and measurement of flammable gases — Part 1: General requirements and test methods (IEC 61779-1:1998, modified)*

ISO 1219-1, *Fluid power systems and components — Graphic symbols and circuit diagrams — Part 1: Graphic symbols for conventional use and data-processing applications*

ISO 1219-2, *Fluid power systems and components — Graphic symbols and circuit diagrams — Part 2: Circuit diagrams*

ISO 2928, *Rubber hoses and hose assemblies for liquefied petroleum gas (LPG) in the liquid or gaseous phase and natural gas up to 25 bar (2,5 MPa) — Specification*

ISO 7000, *Graphical symbols for use on equipment — Index and synopsis*

IEC 60417-DB[1)], *Graphical symbols for use on equipment*

3 Gas control units

3.1 Function

Gas control units are designed in order to control and/or close loop control and/or monitor of gas flows which are applied for thermal spraying processes according to EN 657.

Moreover gas control units can provide further functions such as controlling and/or closed loop controlling and/or monitoring of:

— current and/or voltage;

— feeding liquid flow volumes or masses (fuel, cooling water);

— other cooling media (air, CO_2 and others);

— wire feed rate velocities;

— as well as various control functions of the spraying process.

3.2 Design

Concerning the art of design and scope of control and closed loop control technique the systems can be divided into the following main components:

— monitoring or operation (e.g. HMI – Human Machine Interface);

— control logic (e.g. PLC unit);

— gas control unit;

[1)] Online-Database - It will be updated permanently. Access to the database is on a subscription basis alternatively for a period of 3, 6, 12, or 24 months. Preview available at http://domino.iec.ch/IEC60417

— pump system for liquid fuels applied at high velocity oxygen fuel spraying (HVOF);

— pumping and/or conveying and/or monitoring of cooling media.

In any gas control unit all of the above mentioned components or only some of them can be integrated in a gas control unit (see examples in Annex A, Figures A.1 to A.3).

4 Components within a gas control unit

Within a gas control unit various components typically perform the following functions:

a) gas measuring and gas control;

   — flow meter tube;

   — critical orifice;

   — gas mass flow controller;

   — gas valve;

b) gas pressure measuring;

   — pressure transducer;

   — pressure gauge;

c) gas conveying;

   — hosing;

   — piping;

   — fitting;

d) housing;

   — sheet metal cabinet of an appropriate guard class (IP);

e) gas safety;

   — sensor with control unit;

   — shut off valve;

   — flashback arrestor;

f) water- and power junction;

   — special fittings with power connectors;

g) liquid fuel control;

   — pump;

   — impeller-type flow meter.

Annex A shows schematic examples for design of gas control units.

5 Requirements

5.1 General

Thermal spraying technology also uses flammable gases for flame, plasma or HVOF processes which imply a significant potential of danger. Also pure oxygen shall be considered as a dangerous gas because heavy inflammable material will burn in the presence of a defined concentration of oxygen.

5.2 Local separation of gas and electric power

The local separation of gas and electric power provides an important safety feature and shall be realized.

5.3 Solid piping

Solid piping for at least fuel, flammable gas and oxygen conveying gas lines shall be used where ever possible.

5.4 Leak test

In any case a leak test shall be carried out after installation and before starting the coating work.

6 Safety standards

The following standards reveal the safety guidelines which shall be adhered to for evaluation as well as for manufacturing of gas control units for thermal spraying.

a) Area: gas control unit general

- EN 60079-0;
- EN 60079-10;
- EN 60204-1.

b) Area: housing and cabinets

- EN 60079-1;
- EN 60079-2;
- EN 60529.

c) Area: monitoring and operation

- EN 61310-1;
- EN 61310-2;
- EN 61496-1.

d) Area: liquid pump, e.g. for fuel

- EN 982.

e) Area: safety devices

- EN 730-1;
- EN 730-2;
- EN 13611;
- EN 61779-1.

f) Area: operators manual – documentation

- IEC 60417-DB;
- ISO 1219-1;
- ISO 1219-2;
- ISO 7000.

g) Area: piping – hosing within gas cabinet

- prEN 15069;
- ISO 2928.

h) Area: input and output

- EN 559;
- EN 560;
- EN 561.

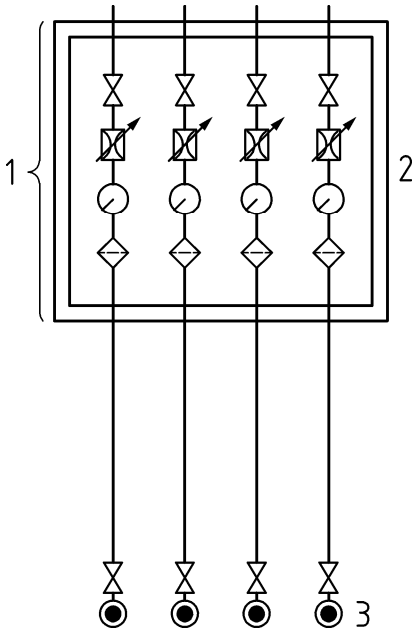
7 National rules

National laws, regulations and standards for the use of this European Standard should be mentioned in the national foreword of this European Standard.

Annex A
(informative)

Examples for design of gas control units

A.1 Simple gas control unit

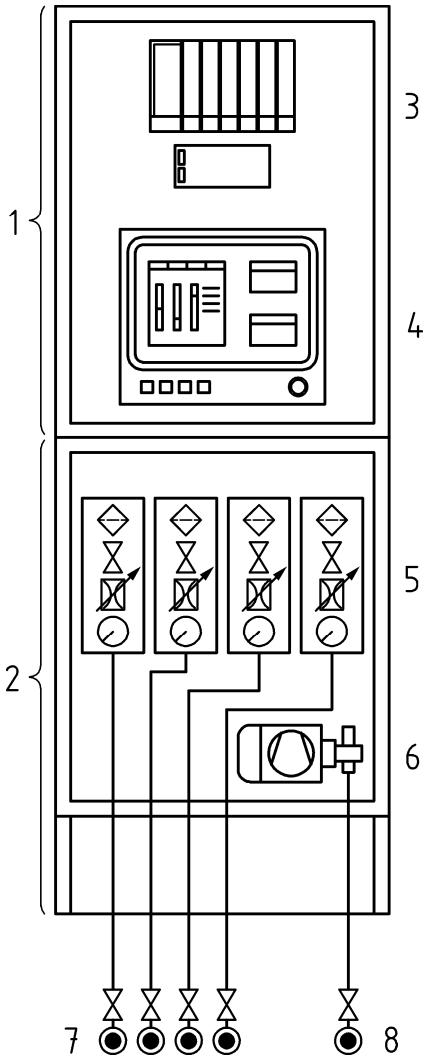


Key

1 MMI (Media Measurement Interface)
2 gas control
3 gas fitting

Figure A.1 — Simple gas control unit

A.2 Gas control-closed loop control with integrated HMI



Key

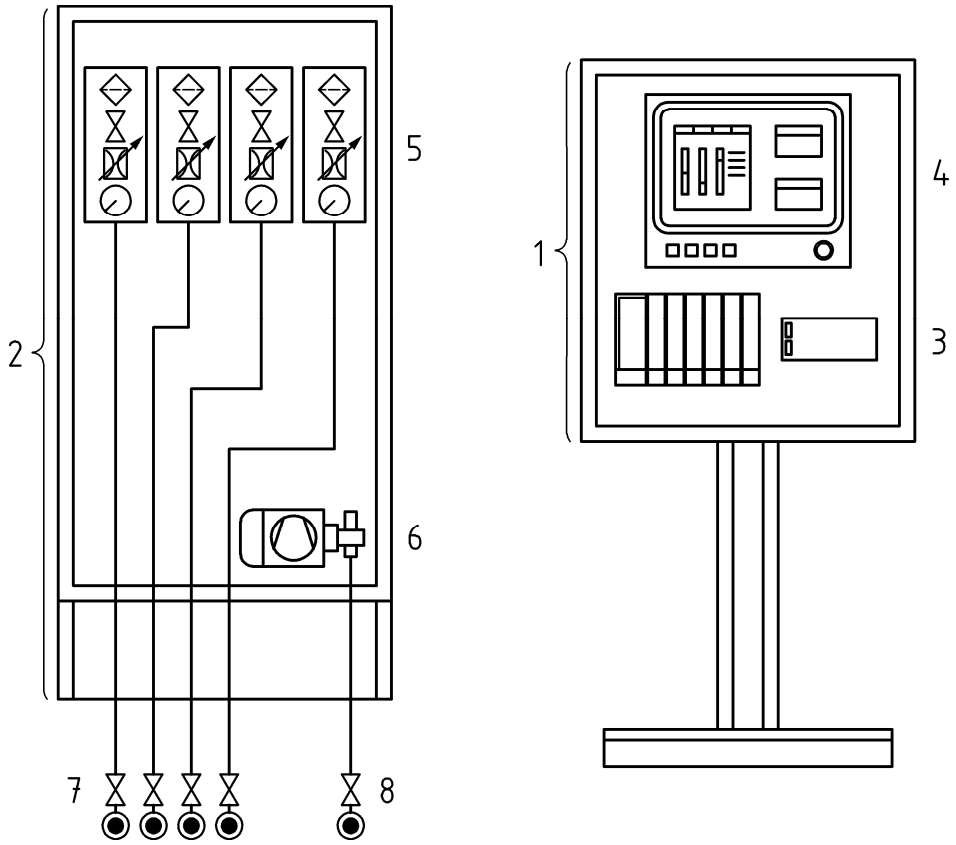
1 separate HMI (Human Machine Interface)
2 gas control unit (MMI – Media Measurement interface)
3 record data printer
4 monitor
5 gas controller
6 pump for liquid fuel or cooling medium
7 gas fitting
8 liquid fuel fitting

Figure A.2 — Gas control-closed loop control with integrated HMI

A local separation can be achieved by using appropriate sheet metal guards, see Figure A.2.

A.3 Gas control-closed loop control with separate HMI

While electrical components of the control unit such as PLC, switches, relays and so on are mounted into the operator cabinet, gas control lines are mounted in a separate gas cabinet, see Figure A.3. This cabinet may be installed at a distance from the operator e.g. on top of the sound protection cabin.



Key

1 separate HMI (Human Machine Interface)
2 gas control unit (MMI – Media Measurement interface)
3 record data printer
4 monitor
5 gas controller
6 pump for liquid fuel or cooling medium
7 gas fitting
8 liquid fuel fitting

Figure A.3 — Gas control-closed loop control with separate HMI

A.4 Pressurized enclosures

A.4.1 General

Gas control units may be equipped with compressed air with safety switches controlling the purging of the cabinet as well as cabinets with interlock switches on doors which shut down the systems when a door is opened. Generally, modern technology offers reliable safety components.

Figure A.4 shows a schematic set-up of a safe gas control unit for thermal spraying.

A.4.2 Pressure control

Figure A.4 shows the schematic set up of a gas control cabinet. After the gas input (8) (here from the top) a pressure sensor (5) is monitoring the input pressure of the gas supply. If the input pressure is too low dangerous flash backs can be generated during ignition. If the pressure is too high gas carrying components can be damaged by higher than rated maximum pressure.

The input pressure can be monitored and action be taken to stop the supply (e.g. solenoid valve) if the pressure drops or increases out of tolerance range.

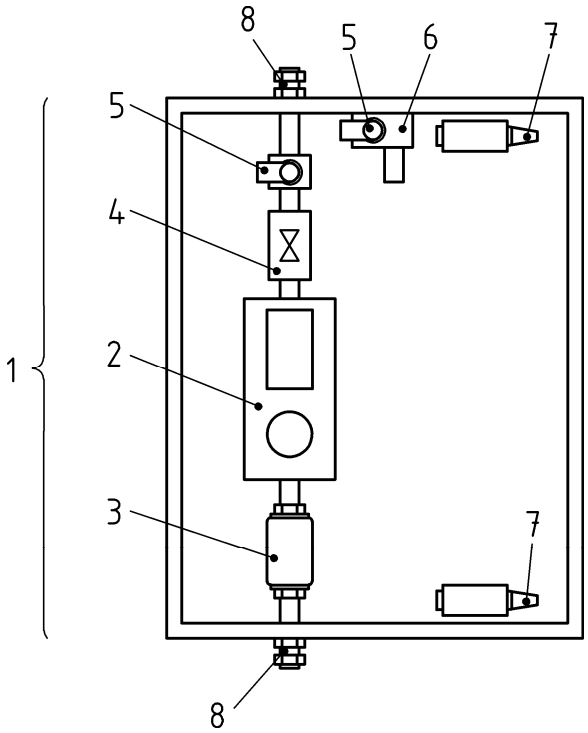
A mass flow controller (2) controls the exact mass of gas conveyed using an integrated valve. Directly after the output the gas is flowing through a flashback arrestor (3). The complete gas line should be equipped with a non return lock (in this case inside the flashback arrestor (3)) as well as safety gas fittings with turn round lock (8). The last ones ensure maximum sealing after mounting due to high precision threads.

A.4.3 Ventilation

A steady ventilation by air flow (6) monitored by pressure sensor (5) (see Figure A.4) prohibits a flammable gas entry into the electrical cabinet. Furthermore, electrical devices are cooled.

On the other hand a slight pressurisation serves against dust entrapment.

Besides air purging a gas cabinet may employ suitable gas detectors (7) (see Figure A.4) to control the atmosphere inside the cabinet, positioned according to the density of the gas. The detectors are connected to the PLC of the thermal spraying equipment and/or to a constant current supplied monitoring unit.



Key

1	gas control unit	5	pressure sensor
2	mass flow controller	6	compressed air purge
3	flashback arrestor	7	gas sensor for lighter respectively heavier gases than air
4	solenoid valve	8	gas input respectively gas output fitting with turn round lock

Figure A.4 — Schematic set-up of a safe gas control unit

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