BRITISH STANDARD

BS EN
1395-2:2007

Thermal spraying — Acceptance inspection of thermal spraying equipment —

Part 2: Flame spraying including HVOF

The European Standard EN 1395-2:2007 has the status of a British Standard

ICS 25.220.20

BSI
British Standards

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 1395-2:2007. This standard together with BS EN 1395-1, BS EN 1395-3, BS EN 1395-4, BS EN 1395-5, BS EN 1395-6 and BS EN 1395-7 supersedes BS EN 1395:1996.

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

A list of organizations represented on STI/40 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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English Version

Thermal spraying - Acceptance inspection of thermal spraying equipment - Part 2: Flame spraying including HVOF

Projection thermique - Contrôle d'acceptation du matériel de projection thermique - Partie 2: Projection à la flamme y compris par le procédé HVOF

Thermisches Spritzen - Abnahmeprüfungen für Anlagen zum thermischen Spritzen - Teil 2: Flammspritzen einschließlich HVOF

This European Standard was approved by CEN on 23 December 2006.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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Foreword

This document (EN 1395-2:2007) 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 July 2007, and conflicting national standards shall be withdrawn at the latest by July 2007.

This document together with EN 1395-1, 1395-3, 1395-4, 1395-5, 1395-6 and 1395-7 supersedes EN 1395:1996.

EN 1395 consists of the following Parts, under the general title *Thermal spraying — Acceptance inspection of thermal spraying equipment*:

— *Part 1: General requirements;*

— *Part 2: Flame spraying including HVOF;*

— *Part 3: Arc spraying;*

— *Part 4: Plasma spraying;*

— *Part 5: Plasma spraying in chambers;*

— *Part 6: Manipulator systems;*

— *Part 7: Powder feed systems.*

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 requirements for the acceptance inspection of thermal spraying equipment in the case flame spraying including HVOF (high velocity oxygen-fuel), used in spray jobs to produce thermally sprayed coatings of reproducible quality.

This part should be used in conjunction with EN 1395-1, which includes general requirements and explanations of procedures.

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 657:2005, *Thermal spraying — Terminology, classification*

EN 1395-7, *Thermal spraying — Acceptance inspection of thermal spraying equipment — Part 7: Powder feed systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 657:2005 apply.

4 Principles of acceptance inspection

4.1 General

The following clauses reveal state of the art technology in thermal spraying equipment and the minimum requirements concerning a stable parameter setting and maintenance according to the classes given in Annex A or Annex B.

4.2 Flame spraying nozzle

Processing the spraying material shall be possible without any visible disturbing deposits on the burner nozzle and/or air nozzle.

4.3 Spraying material feed unit

The material feed unit shall be suitable for operation along with the spraying equipment to be tested.

The unit shall permit uniform processing of the consumables for which it is designed. It shall be possible to adjust the spraying material feed rate. The set points shall be constant and reproducible, a precondition for this being adequate and constant carrier gas pressure or actuating air pressure or supply of electrical power as appropriate.

5 Procedure of acceptance inspection

5.1 General

Spraying equipment shall be deemed properly supplied for all suitable spraying applications and for use with all suitable spraying materials required for the spraying process if it complies with the following requirements:

5.2 Gases

Flame spraying equipment shall be deemed to comply with the requirements specified in 4.1, if the values of gas pressure and gas flow do not deviate by more than 1,5 % (Class A) and 5 % (Class B) from the set points over a 20 min period of spraying.

5.3 Flame spraying nozzle

Nozzles shall be deemed to comply with the requirements specified in 4.2 if, after continuous spraying of nozzle-compatible materials at the maximum spray rate specified by the manufacturer for a period of 20 min, no disturbing deposits of spraying material have been built up.

5.4 Equipment specific tests

5.4.1 Spraying with liquid fuel

HVOF flame spraying equipment shall be deemed to comply with the requirements specified in 4.1 if the values of liquid fuel pressure and flow rate do not deviate by more than 2 % (Class A) and 5 % (Class B), from the set points over a 20 min period of spraying.

5.4.2 Wire flame spraying

The suitability of the system to process wires shall be tested with the flame burning; the length of wire fed in 1 min shall be measured. This determination shall be repeated twice more. The variations in fed length shall not exceed 5 %. For this test, wire materials and wire diameters for which the system is designed shall be used.

5.4.3 Flame spraying using rods or cords

Testing shall be carried out for 1 min1 using Al_2O_3 rods or cords of the agreed diameter.

5.4.4 Powder flame spraying

The suitability of the system to process powders applying a stand-alone as well as a burner integrated powder feed unit shall be tested according to EN 1395-7.

5.5 Backfire of flame

Backfire of the fuel gas/oxygen flame shall not occur if the spraying equipment is operated according to the manufacturer's instructions.

6 Designation

Acceptance inspection of the thermal spraying equipment for flame spraying including HVOF shall be designated as follows:

Acceptance inspection according to EN 1395-2.

7 Inspection report

An example for the inspection report applying spraying powder is given in Annex A, and applying wire, rod or cord is given in Annex B.

Annex A
(informative)

Inspection report for flame spraying equipment using spraying powder including HVOF (initial test/retest)

The initial test/retest fulfils the requirements of the acceptance inspection according to EN 1395-2.

User: .....

Manufacturer:.....

Year of manufacture: .....

Type of equipment:.....

Type of spray burner: .....

Type of powder feed unit: .....

CE-documentation complete: yes / no

Item tested, where applicable			Full scale	Set point	Change after 20 minute continuous testing			Limit		Evaluation	
					actual value		maximum deviation in %	Class in %		passed	failed
					min.	max.		Class A	Class B		
Fuel gas	pressure	bar						± 1,5	± 5		
	flow	Nl/min[1)]						± 1,5	± 5		
Oxygen	pressure	bar						± 1,5	± 5		
	flow	Nl/min[1)]						± 1,5	± 5		
Atomising gas	pressure	bar						± 1,5	± 5		
	flow	Nl/min[1)]						± 1,5	± 5		
Liquid fuel	pressure	bar						± 1,5	± 5		
	flow	l/h						± 1,5	± 5		
Carrier gas	pressure	bar						± 1,5	± 5		
	flow	Nl/min[1)]						± 1,5	± 5		
Cooling water	flow	l/min						± 5	± 10		
	inlet temperature to burner	°C						5 °C	10 °C		

[1)] Referred to temperature 0 °C and normal pressure (1 013,25 hPa).

Deposits: yes / no

Nozzle disturbance: yes / no

Sustained backfire of flame: yes / no

Time needed for stabilisation: .....

Automatic energy shutdown: – Lack of gas: yes / no

– Lack of cooling water: yes / no

Limits of error of measuring instruments: ..... % of set point (max. 5 %)

– Class 2,5 [2)]: yes / no

Comments:.....

.....

.....

.....

.....

.....

The thermal spraying equipment has been accepted: yes / no

Date:..... Inspector's signature: .....

Date:..... Customer's signature: .....

Date:..... Supplier's signature:.....

[2)] Maximum permissible error expressed by percentage of measuring span.

Annex B
(informative)

Inspection report for flame spraying equipment using spraying wire, rods or cords (initial test/retest)

The initial test/retest fulfils the requirements of the acceptance inspection according to EN 1395-2.

User: .....

Manufacturer:.....

Year of manufacture: .....

Type of equipment:.....

Type of spray burner: .....

Type of wire/rod/cord feed unit:.....

CE-documentation complete: yes / not

Testing the gas supply

Item tested, where applicable			Full scale	Set point	Change after 20 minute continuous testing			Limit		Evaluation	
					actual value		maximum deviation in %	Class in %		passed	failed
					min.	max.		Class A	Class B		
Fuel gas	pressure	bar						± 1,5	± 5		
	flow	Nl/min[3)]						± 1,5	± 5		
Oxygen	pressure	bar						± 1,5	± 5		
	flow	Nl/min[3)]						± 1,5	± 5		
Atomising gas	pressure	bar						± 1,5	± 5		
	flow	Nl/min[3)]						± 1,5	± 5		

Testing the feed unit (wire, rod, cord)

Spray material feed unit	Set points	1st test	2nd test	3rd test	Limit deviation in %		Actual deviation in %	Evaluation	
					Class A	Class B		passed	failed
Fed length mm/min					± 5	± 5			

3) Referred to temperature 0 °C and normal pressure (1 013,25 hPa).

Deposits: yes / no

Nozzle disturbance: yes / no

Sustained backfire of flame: yes / no

Time needed for stabilisation: .....

Automatic energy shutdown: – Lack of gas: yes / no

– Excessive variations in feed: yes / no

Limits of error of measuring instruments: ..... % of set points (max. 5 %)

– Class 2,5 [4]: yes / no

Comments:.....

.....

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.....

.....

.....

The thermal spraying equipment has been accepted: yes / no

Date:..... Inspector's signature: .....

Date:..... Customer's signature: .....

Date:..... Supplier's signature:.....

[4] Maximum permissible error expressed by percentage of measuring span.

Bibliography

[1] EN 1395-1, *Thermal spraying — Acceptance inspection of thermal spraying equipment — Part 1: General requirements*

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