Gemeinschaft Thermisches Spritzen
Quality Management for Thermal Spraying

GTS Europe

GTSPA003

GTS
Quality Management Guidelines

September 2020

Gemeinschaft Thermisches Spritzen e.V.
Association of Thermal Sprayers

GTS Quality Management Guidelines
GTSPA003

Status: September 2020
Print date: April 2021

Gemeinschaft Thermisches Spritzen e.V.
(Association of Thermal Sprayers)
c/o Linde AG, Linde Gases Division
Carl-von-Linde-Str. 25
85716 Unterschleissheim, Germany

Telefon: +49 89 31001 5546
Fax: +49 89 31001 5364
E-Mail: info@gts-ev.de
Internet: www.gts-ev.de

Eingetragen beim / Registered at:
Amtsgericht München, Registergericht:
VR 14203 (22. Sept. 1994)

© 2021 GTS e.V. · Alle Rechte vorbehalten / All rights reserved

REMARK ON THE UPDATED EDITIONS FROM GTSPA003_1809 ONWARDS (September 2018)

After thorough examination of the GTS papers concerning GTS inspection and certification of GTS member companies, the GTS Quality Committee took the decision to merge the GTS papers

GTSPA002 GTS Certificate Guideline,
GTSPA003 GTS Quality Management Guidelines and
GTSPA013 GTS QM Company Inspection

into the one document **GTSPA003 GTS Quality Management Guidelines**. The essential elements in the papers GTSPA002 and GTSPA013 were incorporated into GTSPA003 and updated; the papers GTSPA002 and GTSPA013 are thus rendered void without replacement.

This measure is intended to eliminate any duplications and to clearly define, simplify and formulate the GTS rules in a legally compliant manner. In the course of merging the documents, updates were also conducted, in particular regarding references to standards and the description of mandatory elements in currently valid standards on quality, environmental protection, occupational health & safety and energy management.

The amendments were decided at the GTS Annual General Meeting in Vienna on 14 September 2018.

With the publication of this new edition of GTSPA003, the previous papers

GTSPA002 GTS Certificate Guideline,
GTSPA013 GTS QM Company Inspection

lose their validity and are no longer part of the GTS papers file (“Yellow File”). Please remove these papers from the file.

Unterschleissheim, 14 September 2018

© 2021 GTS e.V.

Contents

1 Definition 3
2 Scope 3
3 Purpose 3
4 Prerequisites and measures taken to assure quality in a GTS member-company 3
5 Requirements for a GTS member-company 4
5.1 Technical equipment and layout of the company 4
5.2 Description of company 4
5.2.1 Procedural rules 5
5.2.2 Work instructions (manufacturing instructions) 5
5.3 Representation of the internal quality system of a company 5
5.3.1 Definition of the internal quality management system of a company 5
5.3.2 Extent of representation of the company quality management system 6
5.3.3 Elements which are imperative for GTS certification 6
5.3.4 Has a certification of quality, environmental, occupational health and safety and/or energy management been awarded? 7
5.4 GTS certificate 8
5.4.1 Definition of GTS certificate 8
5.4.2 Company Inspection 8
5.4.3 Prerequisite for company inspection 8
5.4.4 Period of validity 8
5.4.5 Surveillance audit 8
5.4.6 Drawing up and design of the certificate 9
5.4.7 Conditions of use 10
5.5 Thermal spray personnel 10
5.5.1 GTS thermal spray specialist 10
5.5.2 “GTS qualified sprayer” and semi-skilled thermal spray personnel 12
5.6 GTS process inspection 14
5.6.1 Purpose of GTS process inspection 14
5.6.2 Prerequisite for the GTS process inspection 14
5.6.3 Implementation of the GTS process inspection 14
5.6.4 Coating of test specimen 15
5.7 GTS product or coating inspection 15
5.7.1 Criteria for the implementation of the GTS product or coating inspection 16

1 Definition

In all the statutes and rules of GTS (Association of Thermal Sprayers) a three-stage terminology for instructions and conditions is applied, and is defined as follows:

- **Guidelines**
  are rulings and binding performance targets for GTS members
- **Rules and regulations**
  are in written form prescribing how members should proceed in order to fulfil the guidelines
- **Instructions**
  are the individual measures of a member for its personnel in order to fulfil the rules and regulations.

2 Scope

- The topics quality management system, environment, occupational health and safety and energy management are summarized under the terms “GTS QM System”, “GTS QM Guideline” and “GTS QM Manual”.
- This GTS quality guideline describes the GTS quality requirements for the thermal spraying[1] of components/products in a certified GTS member-company.
- The GTS quality guideline can be partially/proportionally replaced if this is required by EG guidelines, EN standards or due to changes to the GTS quality guideline.

3 Purpose

This guideline provides the foundation for a uniform test system. The aim hereof is to confirm, in the form of the GTS-certificate, that the GTS member-company carries out thermal spraying correctly.

4 Prerequisites and measures taken to assure quality in a GTS member-company

The GTS member-company must have at its disposal suitable technical equipment and qualified personnel. An internal GTS quality system is a prerequisite.

Each member-company must prove which manufacturing areas carry out the required work (GTS application form GTSPA004). Compliance with the GTS quality requirements laid down in this GTS quality guideline must also be proved. For companies with a single GTS membership, the individual businesses (factories or manufacturing plants with separate locations) are inspected and certified separately.

Such a company inspection involves the examination and evaluation of the prerequisites for processes and personnel, and the fulfilment of GTS quality requirements according to this GTS quality guideline.

Proof of suitability for carrying out thermal spraying as a GTS member-company is effected by means of a company inspection/certification by an independent inspection authority appointed.

[1] *Plasma transferred arc welding (PTA) has also been included in the range of thermal spray processes. All terms and GTS guidelines for thermal spray processes are correspondingly valid for PTA processes.*

If a GTS member-company applies for the GTS product inspection at the same time (or subsequently), it can have its thermally sprayed products certified in compliance with assessment criteria agreed on prior to inspection, in line with the currently valid standard.

The GTS Executive Board determines the institution(s) or laboratory (-ies) authorized to conduct the inspection in accordance with DIN EN ISO 17025 and then arranges the corresponding inspection on the premises and in the name of the GTS company-member. The certification costs incurred for the acquisition of the GTS certificate are carried by the member-company being inspected.

5 Requirements for a GTS member-company

5.1 Technical equipment and layout of the company

GTS member-companies must have at their disposal suitable facilities and systems in order to carry out thermal spray work uniformly and in line with quality requirements. As a rule the following items should be included in these facilities and systems according to the production capacity:

- Workshops, as a rule working or assembly areas with roof
- Warehouse for correct storage of the components to be coated, of the spray materials and of auxiliary materials for thermal spraying
- Drying facilities for materials in powder form, as required
- Equipment and machines for the pre-treatment and processing of components prior to thermal spraying (degreasing facilities, blasting equipment, etc.)
- Spray equipment, including all supply, monitoring and control devices
- Handling systems (rotary tables, lathes, robotics, etc.), as required
- Exhausters, ventilation systems, dust filters, sound proofing and anti-glare protection or cabins (occupational health and safety), as required
- Facilities for the heat-treatment of components before and after thermal spraying, as required
- Facilities for cooling the components, as required
- Processing machines and equipment for the post-treatment of sprayed surfaces, such as grinding, turning, brushing, drum-polishing, etc.), as required
- Test facilities and test equipment to test the thermally sprayed coatings, as required
- Test facilities and test equipment to test materials, as required

If external facilities are used, corresponding proof must be furnished.

5.2 Description of company

The company description of a GTS member-company is carried out in the GTS application form (GTSPA004) for the attainment of the GTS certificate. This company description need only be re-written or revised if significant changes occur, e.g. if the “GTS thermal spray specialist” responsible is replaced.

The GTS application form must bear the signature of an authorized signatory and must be affixed with the company stamp. This document is then binding.

A complete company description, which is necessary for the attainment of the GTS certificate via a company inspection, includes the prevailing procedural rules and work instructions. However, neither are yet

relevant at the time of application and both must first be presented to the inspection authority responsible for the GTS certificate inspection. Further relevant information is provided in the GTS application for Inspection (GTSPA004).

5.2.1 Procedural rules

Measures taken in a company to assure the quality of thermal spray work, including surface treatment, must be presented in procedural rules. The procedural rules are part of the company's GTS QM system. The procedural rules describe in detail the order of procedures:

Who must do **which** tasks and **when** within the organisational structure?

5.2.2 Work instructions (manufacturing instructions)

Job instructions control the tasks and working steps of the "qualified sprayer" in his field of activity. The required determinants are specified below in order to ensure the repeatability of thermal spray processes.

These include for example:

- Pre-treatment
- Systems engineering
- Spray technology
- Possible post-treatment
- Measurement technology etc.

5.3 Representation of the internal quality system of a company

A basic requirement for the admission of a GTS member-company to the company inspection is the proof of a representable GTS quality management system (GTS QM system). The proof is effected by presenting to the accredited inspection authority a GTS quality management manual (GTS QM manual) in which the company's QM system is correctly described. In contrast to the certification inspections according to the general regulations for quality, environmental protection, occupational health and safety and energy management, a detailed inspection in limited form is conducted by the accredited inspection authority to verify the compliance of the contents of the GTS QM manual with the procedures in the company.

5.3.1 Definition of the internal quality management system of a company

The GTS QM system is a closed system of organisationally and functionally prescribed procedural rules and job instructions based upon them, which secure the faultless and reproducible production of "thermal spray products" in its single parts and in its entirety, i.e. from receipt of order to delivery and, if necessary, through to service.

5.3.2 Extent of representation of the company quality management system

The GTS QM manual represents the GTS QM system of a GTS member-company. A process-oriented approach based on current operational processes (e.g. management processes, auxiliary processes and core processes) is recommended. The amalgamation of all the identified processes is typically effected by means of a process map which presents the process sequences in graphical form.

5.3.3 Elements which are imperative for GTS certification

The topics of quality management, environmental protection, occupational health and safety and energy management listed in the table below are imperative for GTS certification. They must fulfil the requirements of the respective standards and will correspondingly undergo detailed examination.

The table broadly lists the mandatory elements of such quality management. The additional topic areas relating to environmental protection, occupational health and safety and energy management are indicated in the respective columns.

Nr.	Quality management	Environmental protection	Occupational health and safety	Energy management
5	**Leadership**			
5.1	Leadership & Commitment			
5.1.1	General			
5.1.2	Customer Focus			
5.2	Policy	Environmental Policy	Occupational Health & Safety Policy	Energy Policy
5.3	Organizational Roles, Responsibilities & Authorities			
6	**Planning**			
6.1	Actions to Address Risks and Opportunities			
6.2	Quality Objectives	Environmental Objectives	OH & S Objectives	Energy Objectives
6.3	Planning Changes			
7	**Support**			
7.1	Resources			
7.1.1	General			
7.1.2	Persons			
7.1.3	Infrastructure			
7.1.4	Process environment			
7.1.5	Monitoring and Measuring Resources			
7.1.6	Organizational Knowledge			
7.2	Competence			
7.3	Awareness			
7.4	Communication			
7.5	Documented Information			
7.5.1	General			
7.5.2	Compiling and Updating			
7.5.3	Control of Documented Information			

© 2021 **GTS** e.V.

Nr.	Quality management	Environmental protection	Occupational health and safety	Energy management
8	**Operation**			
8.1	Operational Planning and Control			
8.2	Requirements for Products and Services	Emergency Preparedness and Hazard Prevention	Emergency Planning and Response	Design
8.2.1	Customer Communication			
8.2.2	Determining Requirements Related to Products and Services			
8.2.3	Checking Requirements Related to Products and Services			
8.2.4	Changes to Requirements Related to Products and Services			
8.4	Control of Externally Provided Processes, Products and Services			
8.4.1	General			
8.4.2	Types and Extent of Control			
8.4.3	Information for External Providers			
8.5	Production and Provision of Services			
8.5.1	Control of Production and Provision of Services			
8.5.2	Identification and Traceability			
8.5.3	Property of Customers or of External Providers			
8.5.4	Preservation			
8.5.5	Post-Delivery Activities			
8.5.6	Monitoring Changes			
8.6	Release of Products and Services			
8.7	Control of Nonconforming Outputs			
9	**Performance Evaluation**			
9.1	Monitoring, Measurement, Analysis and Evaluation			
9,3	Management Review			
9.3.2	Inputs for the Management Review			
9.3.3	Outputs for the Management Review			
10	**Improvement**			
10.1	General			
10.2	Nonconformity and Corrective Action			
10.3	Continual Improvement			

5.3.4 Has a certification of quality, environmental, occupational health and safety and/or energy management been awarded?

The regulations for quality management systems require that production processes be validated and periodically revalidated in instances where the resulting output cannot be verified by subsequent monitoring or measurement. This specification pertains to thermal spraying and must be applied accordingly.

If a GTS member has already been certified according to quality, environmental, occupational health and safety and/or energy management regulations, the QM manual is only looked into during GTS certification in order to check whether special thermal spray processes have been recorded and dealt with – e.g. references to documented procedures or work instructions in the QM manual part 2 – and to what extent help with any relevant appendices needs to be provided.

© 2021 GTS e.V.

5.4 GTS certificate

5.4.1 Definition of GTS certificate

The award of the GTS certificate shows that the GTS member has successfully undergone an inspection according to GTS quality guidelines and thus can supply reproducible quality for the identified thermal spray processes described in the GTS certificate.
The GTS certificate is awarded by the GTS Executive Board after passing an inspection by an accredited inspection authority.

5.4.2 Company Inspection

The inspection of the company always includes an inspection of persons, processes and, if necessary, products. The nature and extent of the person and process inspection are determined by this guideline. The extent of the product inspection is determined solely by the GTS member-company to be tested together with the independent inspection authority. Should changes to fundamental conditions concerning processes or persons in the field of thermal spraying occur (e.g. the resignation of the “GTS thermal spray specialist” responsible or a basic change in a procedure), the GTS Executive Board must be notified. The latter decides in each individual case whether a renewed inspection is necessary.

5.4.3 Prerequisite for company inspection

The GTS member-company applies for company inspection to the GTS Executive Board. The application includes the GTS papers prescribed. The GTS Executive Board formally examines the fulfilment of internal company, process and personnel prerequisites. On fulfilment of the prerequisites, the GTS member-company applying receives the approval for company inspection. After the appointment of an inspection authority authorized by GTS in GTSPA007, the GTS member-company commissions, via the GTS Executive Board, the inspection for the attainment of the GTS certificate by the inspection authority of its choice. The price quotation of the inspection authority is made after consultation with the GTS Executive Board. All other inspection–related agreements are then made between the inspection authority and the GTS member-company itself.

5.4.4 Period of validity

The period of validity of the GTS certificate is 3 years. The automatic repeat inspection is carried out in agreement with the GTS Executive Board via the independent inspection authority.

5.4.5 Surveillance audit

After the initial GTS certification and after each re-certification (re-audit), the GTS member-company must carry out an annual surveillance audit whose nature and extent is laid down in the GTS Implementation Regulations (GTSPA007).

© 2021 **GTS** e.V.

5.4.6 Drawing up and design of the certificate

GTS is the bearer of the certificate with the logo:

The GTS certificate must be defined more closely by specifying the following details in the GTS certificate:

For the certified thermal spray process:

- flame spraying
  - powder flame spraying
  - wire flame spraying
- high velocity oxy-fuel flame spraying
- detonation spraying
- arc spraying
- plasma spraying
  - plasma spraying in air
  - plasma spraying in chambers
- laser spraying
- plasma transferred arc surfacing (PTA)
- cold spraying

and

for the certified personnel (the respective certificate is issued by the certification authority on behalf of GTS):

- GTS thermal spray specialist (with ETSS qualification) 2
- GTS qualified sprayer (with ETS qualification) 3

and if necessary

the certified product and/or coating, whereby the GTS member-company to be inspected determines the nature and extent of the inspection itself.

The GTS logo is registered with the German Patent Office under the No. 2062298.

The GTS certificate is awarded in the form of a GTS document bearing the respective certificate seal along with the certificate plaque.

---

*[2] According to the decision taken at the 19th GTS AGM 2011, the following applies: as of 01/01/2012, new members must employ at least one **GTS Thermal Spray Specialist with an ETSS qualification** to obtain the GTS Certificate; for existing members an interim period until 01/01/2017 applies. After the interim period, all GTS Thermal Spray Specialists should acquire the ETSS qualification.*
*[3] According to the decision taken at the 19th GTS AGM 2011, the following applies: as of 01/01/2012, new members must employ at least one **GTS Qualified Sprayer with an ETS qualification** to obtain the GTS Certificate; for existing members an interim period until 01/01/2017 applies. After the interim period, all GTS Qualified Sprayers should acquire the ETS qualification.*

5.4.7 Conditions of use

GTS member-companies may only use the GTS Certificate for certifies thermal spray processes which were part of the process inspection according to 5.4.2 or for certified products according to 5.7.

In general, the GTS member-company is only entitled to use the certificate stamp, the certificate plaque and the GTS certificate during the period the certificate is valid. The awarded certificate plaque and the certificate stamp remain the property of GTS.

The authorization granted to GTS members to display the GTS Certificate may not be transferred to third parties or companies.

5.5 Thermal spray personnel

GTS member-companies require for the implementation of thermal spray operations the following personnel:

- GTS thermal spray specialist (with ETSS qualification) [4]
- GTS qualified sprayer (with ETS qualification) [5]

5.5.1 GTS thermal spray specialist

5.5.1.1 Definition of "GTS thermal spray specialist"

Thermal spray operations require an active and responsible "GTS thermal spray specialist". This "GTS thermal spray specialist" is appointed and, on behalf of the spray company, authorized to supervise (or is responsible for the supervision of) all activities related to thermal spraying and is accountable for these within the company.

At least one of the company's GTS Thermal Spray Specialists must be qualified as an ETSS European Thermal Spray Specialist according to the EWF Guideline or according to ISO 12690 [4].

*[4] According to the decision taken at the 19th GTS AGM 2011 and the supplementary decision taken at the 24th GTS AGM 2016, new members as of 01/01/2012 must employ at least one **GTS Thermal Spray Specialist with an ETSS qualification** to obtain the GTS Certificate **or successfully pass examination in accordance with ISO 12690**. For existing members who employ spray staff with more than 5 years' work experience, an interim period until 01/01/2019 applies. Examination in accordance with ISO 12690 can above all be applied in countries in which no ETSS courses are available.*

*[5] According to the decision taken at the 19th GTS AGM 2011 and the supplementary decision taken at the 24th GTS AGM 2016, new members as of 01/01/2012 must employ at least one **GTS Qualified Sprayer with an ETS qualification** to obtain the GTS Certificate **or successfully pass examination in accordance with ISO 14918**. For existing members who employ spray staff with more than 5 years' work experience, an interim period until 01/01/2019 applies. Examination in accordance with ISO 14918 can above all be applied in countries in which no ETS courses are available.*

5.5.1.2 Prerequisites

The prerequisite for being appointed as a “GTS Thermal Spray Specialist“ is a qualification as a “GTS Thermal Spray Specialist“ according to this GTS guideline.

At least one of the company’s GTS Thermal Spray Specialists must be qualified as an ETSS [6] (European Thermal Spraying Specialist) according to the EWF Guideline or to ISO 12690, and at the time of application, the examination must not be older than 3 years. For existing members during an interim period, a successful examination according to this GTS guideline will suffice as the prerequisite for the “GTS Thermal Spray Specialist“. By 01/01/2019, the ETSS qualification for at least one GTS Thermal Spray Specialist must then also be attained by these member companies [6].

The “GTS thermal spray specialist” must have a written contractual agreement with the company. This must be confirmed by the signature of an authorized signatory in the GTS application form.

5.5.1.3 Training/examination leading to the title “GTS thermal spray specialist”

If the prerequisites according to point 5.5.1.1 have been fulfilled and confirmed in the GTS application form, a personnel inspection/audit can be carried out as follows.

In preparation for the GTS examination leading to the title “GTS thermal spray specialist”, it is possible to participate in special courses offered by GTS authorized training centres. A further possibility is a course of self-study with the help of the GTS software GTS-EXAM.

The written examination leading to the title “GTS thermal spray specialist” is carried out within the framework of the GTS company inspection. The examination comprises multiple choice questions (GTSPA014) laid down by GTS. For the “GTS Thermal Spray Specialist”, the area to be examined covers the entire field of thermal spraying with particular focus on the processes to be certified. In a subsequent informal interview the expert knowledge of the “GTS thermal spray specialist” is tested. The interview questions are mainly based on current company and application-oriented subjects. Documents such as standards and regulations may be used.

After passing the examination, the certificate

GTS thermal spray specialist

is issued by the certification authority on behalf of GTS.

Certificates are signed by the inspection authority.

*[6] According to the decision taken at the 19th GTS AGM 2011 and the supplementary decision taken at the 24th GTS AGM 2016, new members as of 01/01/2012 must employ at least one **GTS Thermal Spray Specialist with an ETSS qualification** to obtain the GTS Certificate **or successfully pass examination in accordance with ISO 12690**. For existing members who employ spray staff with more than 5 years’ work experience, an interim period until 01/01/2019 applies. Examination in accordance with ISO 12690 can above all be applied in countries in which no ETSS courses are available.*

5.5.1.4 Tasks and responsibilities of the "GTS thermal spray specialist"

The company must have a suitable deputy for the "GTS thermal spray specialist" at its disposal (with a minimum qualification of "GTS qualified sprayer"). The "GTS thermal spray specialist" in the production industry is, from a technical point of view, responsible for the tasks listed below, whereby some of the tasks mentioned may be delegated to other specialist persons in the company.

Essential tasks/responsibilities:

- Compliance with data in production documents
- Employment of qualified sprayers or other specialists
- Monitoring of thermal spray operations
- Use of suitable materials and auxiliary materials
- Use of suitable spray equipment, systems and devices, auxiliary and preparation facilities
- Technical consultation with regard to production planning and for employees of other operating sites
- Consultation concerning the storage of materials and auxiliary materials for thermal spraying
- Company training and inspection of thermal spray personnel
- Provision of safety data sheets and operating instructions
- Compliance with rules for the prevention of accidents
- Defining of parameters for thermal spraying, as far as no others have been defined
- Defining and monitoring of parameters especially those for mechanised thermal spray systems
- Monitoring the proper running of exhaust and ventilation systems
- Monitoring the proper running of processing facilities and equipment
- Instruction and supervision of thermal spray personnel
- Handling of test and inspection equipment

5.5.2 "GTS qualified sprayer" and semi-skilled thermal spray personnel

5.5.2.1 Definition of "GTS qualified sprayer"

A GTS member-company must have at its disposal at least one GTS qualified sprayer who has a valid examination certificate for at least one thermal spray process in use.

The "GTS qualified sprayer" must be trained for the respective thermal spray process for which the GTS member-company has employed him. The training can be conducted in internal or external courses. The "GTS qualified sprayer" works according to operating instructions, he must be able to carry out all work assigned to him in a professional way. He is directly subordinate to the "GTS thermal spray specialist" and can, in the latter's absence, represent him (see 5.5.1.4).

At least one of the company's GTS Qualified Sprayers must be qualified as an ETS European Thermal Sprayer according to the EWF Guideline or according to ISO 14918.[7]

*[7] According to the decision taken at the 19th GTS AGM 2011 and the supplementary decision taken at the 24th GTS AGM 2016, new members as of 01/01/2012 must employ at least one **GTS Qualified Sprayer with an ETS qualification** to obtain the GTS Certificate **or successfully pass examination in accordance with ISO 14918**. For existing members who employ spray staff with more than 5 years' work experience, an interim period until 01/01/2019 applies. Examination in accordance with ISO 14918 can above all be applied in countries in which no ETS courses are available.*

5.5.2.2 Prerequisites

The prerequisite for being appointed as a “GTS Qualified Sprayer” is a qualification as a “GTS Qualified Sprayer” according to GTS guidelines.

At least one of the company’s GTS Qualified Sprayers must be qualified as an ETS [7] (European Thermal Sprayer) according to the EWF Guideline or to ISO 14918, and at the time of application, the examination must not be older than 3 years. For existing members during an interim period, a successful examination according to this GTS guideline will suffice as the prerequisite for the “GTS Qualified Sprayer “. By 01/01/2019, the ETS qualification for at least one GTS Qualified Sprayer must then also be attained by these member companies [7].

The “GTS qualified sprayer” must be able to furnish proof of his qualifications according to designated criteria and be permanently employed in the company. This must be confirmed and made binding by the signature of an authorized signatory in the GTS application form (GTSPA004).

5.5.2.3 Training/examination leading to the title “GTS qualified sprayer”

If the prerequisites according to point 5.5.2.1 have been fulfilled and confirmed in the GTS application form, a personnel inspection/audit can be carried out as follows.

In preparation for the GTS examination leading to the title “GTS qualified sprayer“ it is possible to participate in special courses offered by GTS authorized training centres. DIN EN ISO 14918 – Thermal spraying – Approval testing of thermal sprayers applies as a guideline. The examination leading to the title “GTS qualified sprayer“ can be carried out within the framework of the company inspection for the attainment the GTS certificate, or first of all at a training centre or inspection authority designated by the GTS Executive Board. This comprises a practical skills test and a multiple-choice test to assess the candidate’s theoretical knowledge. The examination criteria are laid down by GTS in the GTS Paper GTSPA014.

After passing the practical and theoretical examination for the respective thermal spray process, the certificate

Qualified Sprayer
Thermal Spray process […]

is issued by the certification authority on behalf of GTS.

Certificates are signed by the inspection authority.

5.5.2.4 Tasks and responsibilities of the "GTS qualified sprayer"

The "GTS qualified sprayer" for thermal spraying in the production industry basically has the following tasks/responsibilities.

- Execution of thermal spray operations in accordance with data in production documents
- Use of suitable spray equipment, systems and devices, auxiliary and preparation facilities
- Handling of materials and auxiliary materials for thermal spraying
- Compliance with rules for the prevention of accidents
- Compliance with thermal spray parameters
- Monitoring of smooth running of ventilation systems

5.6 GTS process inspection

for the thermal spray process to be certified:

- flame spraying
  powder flame spraying
  wire flame spraying
- high velocity oxy-fuel flame spraying
- detonation spraying
- arc spraying
- plasma spraying
  plasma spraying in air
  plasma spraying in chambers
- laser spraying
- plasma transferred arc surfacing (PTA)
- cold spraying

5.6.1 Purpose of GTS process inspection

The purpose of the GTS process inspection is to provide proof of the quality and reproducibility of the thermal spray processes to be examined.

5.6.2 Prerequisite for the GTS process inspection

A prerequisite for the process inspection at a GTS member-company is the existence of suitable equipment for the thermal spray process to be inspected and corresponding work instructions (see 5.2.2).

5.6.3 Implementation of the GTS process inspection

The GTS process inspection is carried out within the framework of the company inspection of a GTS member-company. The basis for the GTS process inspection is the work instructions which the respective company has elaborated and tested for the designated thermal spray process. The process inspection is carried out in the presence of and under the supervision of the GTS member-company's "GTS thermal spray specialist". The thermal spray operation is to be carried out by the "qualified sprayer".

The conditions for the process inspection result from section 5.6.4. The certificate is only issued to the individual company in which the inspection was carried out. It can not be transferred to other manufacturing plants of an enterprise.

5.6.4 Coating of test specimen

Within the context of the process inspection, proof must be furnished that a previously defined coating can be applied and reproduced with the spray equipment. A test specimen compliant with the drawings in GTSPA015 and respectively GTSPA016 shall be coated with a spray material specified by the job shop. The relevant work instructions shall be observed.

The coating results shall be compared with a reference specimen produced with the same spray equipment prior to the inspection. The assessment criteria include coating thickness, coating roughness, and uniformity of the coating.

The type of torch manipulation, which can be effected manually, mechanically or automatically, shall be documented in the certificate.

Extent of inspection: While coating the test specimen, the following tasks must be successfully carried out by the “GTS Qualified Sprayer”:

- checking the accuracy to size of the workpiece prior to coating, plus documentation in the QM processing record
- correct and appropriate cleaning, if necessary
- masking of areas not to be coated
- correct and appropriate grit-blasting of the surface to be coated in accordance with DIN/DVS if necessary (e.g. Sa 3 according to DIN 12944 part 4).
- correct and appropriate preparation of the spray materials
- correct and appropriate preparation and adjustment of the coating equipment and additional components according to in-company or external guidelines /data sheets (e.g. procedure instructions).
- correct and appropriate coating (the relevant standards, guidelines, explanatory notes and safety regulations shall be observed)

Within the context of the above requirements for coating a test specimen, the inspection authority shall ask the “GTS Qualified Sprayer” additional questions on work procedures.

5.7 GTS product or coating inspection

In addition to the personnel and process inspection, a GTS member-company is also offered the possibility of a special product-related inspection.
The nature and extent of this voluntary inspection is determined exclusively by the GTS member-company and the independent inspection authority.

5.7.1 Criteria for the implementation of the GTS product or coating inspection

The GTS product or coating inspection is carried out following a separate application of a GTS member-company under the supervision of an independent inspection authority.

The procedure for this inspection is comparable to the GTS process inspection – it must include and cover the minimum requirements laid down therein. The conditions must be agreed on by the designated inspection authority prior to inspection (as a rule a higher standard is set for the evaluation and documentation of a product inspection).

The result of the product or coating inspection is recorded and certified by the inspection authority and the implementation of the product or coating inspection is confirmed by GTS.

GTS receives no information about the contents and the extent of the product or coating inspection.

Unterschleissheim, Germany, September 2020

© 2021 **GTS** e.V.

Gemeinschaft Thermisches Spritzen

Quality Management for Thermal Spraying