

GTSPA 003

GTS Quality Management Guidelines

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Gemeinschaft Thermisches Spritzen e.V.
Association of Thermal Sprayers

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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 (DIN EN ISO 9001), environment (DIN EN ISO 14001), occupational health and safety (BS OHSAS 18001) and energy management (DIN EN ISO 50001) are summarized under the terms “GTS QM System”, “GTS QM Guideline” and “GTS QM Manual”.
- This GTS quality guideline describes the GTS requirements for the thermal spraying¹ of components/products in a GTS member-company.
- The GTS quality guideline is part of the GTS certificate guideline (GTSPA002). It can be partially/proportionally replaced if this is required by EG guidelines, EN-standards or due to changes to the GTS certificate-guideline.

3 Purpose

This GTS quality 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 requirements laid down in this GTS quality guideline and compliance with the GTS certificate guideline must also be proved.

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 by the GTS Executive Board.

For companies with a single GTS membership, the individual businesses (factories or manufacturing plants with separate locations) are inspected and certified separately.

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.

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

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 (following DIN-EN 45014).

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 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 be signed by the person responsible 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. This includes e.g.:

- 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 inspection according to DIN EN ISO 9001 quality), DIN EN ISO 14001 (environmental protection), BS OHSAS 18001 (occupational health and safety) and DIN EN ISO 50001 (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. It can contain up to 8 chapters based on the requirements of DIN EN ISO 9001. The 8 elements are concerned with processes, recognition of faults, correction of errors and other measures, often of a preventative nature, which are described in detail therein.

5.3.3 Elements of DIN EN ISO 9001:2000 which are imperative for GTS certification are

The elements DIN EN ISO 9001 (quality), DIN EN ISO 14001 (environmental protection), BS OHSAS 18001 (occupational health and safety) and DIN EN ISO 50001 (energy management) listed in the table below are imperative for GTS certification. They must fulfil the requirements of the respective standard DIN ISO certification and will correspondingly undergo a detailed examination.

ISO 9001 (quality)	ISO 14001 (environment)	BS OHSAS 18001 (ASI)	ISO 50001 (energy)
4.2.3	4.4.5	4.4.5	4.5.4.2
4.2.4	4.5.4	4.5.4	4.6.5
5.1	4.2 / 4.4.1	4.2 / 4.4.1	4.2.1
5.2	4.3.1 / 4.3.2 / 4.6	4.3.1 / 4.3.2 / 4.6	4.4.4
5.3	4.2	4.2	4.3
5.4	4.3	4.3	4.4
5.4.1	4.3.3	4.3.3	4.4.1 / 4.4.6 / 4.4.3
5.4.2	4.3.3	4.3.3	4.4.3
5.5	---	---	---
5.5.1	4.1 / 4.4.1	4.1 / 4.4.1	4.4.5
5.5.2	4.4.1	4.4.1	4.2.2
5.5.3	4.4.3	4.4.3	4.5.3
5.6	4.6	4.6	4.7
5.6.1	4.6	4.6	4.7.1
5.6.2	4.6	4.6	4.7.2
5.6.3	4.6	4.6	4.7.3
6.1	4.4.1	4.4.1	---
6.2	---	---	---
6.2.1	4.4.2	4.4.2	---
6.2.2	4.4.2	4.4.2	4.5.2
6.3	4.4.1	4.4.1	---
6.4	---	---	---
7.1	4.4.6	4.4.6	---
7.2.1	4.3.1 / 4.3.2 / 4.4.6	4.3.1 / 4.3.2 / 4.4.6	4.4.3 / 4.4.2
7.2.2	4.3.1 / 4.4.6	4.3.1 / 4.4.6	---
7.2.3	4.4.3	4.4.3	4.5.3
7.4.3	4.4.6	4.4.6	4.5.7
7.5.1	4.4.6	4.4.6	4.5.1 / 4.5.5
7.5.2	4.4.6	4.4.6	---
7.5.3	---	---	---
7.5.4	---	---	---
7.5.5	4.4.6	4.4.6	---
7.6	4.5.1	4.5.1	4.6.1
8.1	4.5.1	4.5.1	---
8.2.4	4.5.1	4.5.1	4.6.1
8.3	4.4.7 / 4.5.3	4.4.7 / 4.5.3	4.6.4
8.5.2	4.5.3	4.5.3	4.6.4
8.5.3	4.5.3	4.5.3	4.6.4

In the table above, the mandatory elements of DIN EN ISO 9001 are listed in the left column. The corresponding topic areas DIN EN ISO 14001, BS OHSAS 18001 and DIN EN ISO 50001 have been allocated in the respective rows.

5.3.4 Has certification according to DIN EN ISO 9001, DIN EN ISO 14001, BS OHSAS 18001 or DIN EN ISO 50001 been awarded?

In DIN EN ISO 9001 thermal spraying is defined under special processes and must be correspondingly dealt with.

If a GTS member has already been certified according to DIN EN 9001, DIN EN ISO 14001, BS OHSAS 18001 or DIN EN ISO 50001, 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.

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 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 the guideline “GTS QM Company Inspection (GTSPA013)”. 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 (named in the GTS Implementation Requirements 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 In-process inspection or in-process audits

After the initial GTS certification, the GTS member-company must carry out an annual in-process inspection (in-process audit) whose nature and extent is laid down in the implementation requirements.

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) ²
- GTS qualified sprayer (with ETS qualification) ³

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 ².

² 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.

³ 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 GTS QM guidelines.

At least one of the company’s GTS Thermal Spray Specialists must be qualified as an ETSS ⁴ (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 the GTS QM Guideline/GTS QM Company Inspection (GTSPA013) 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 ⁴.

The “GTS thermal spray specialist“ must have a fulltime employment contract with the company. This must be confirmed and made binding by filling in and signing 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 according to GTS certificate guideline 8.2.2.

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.

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 laid down by GTS. 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 and the GTS Executive Board.

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.

5.5.1.4 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 ⁵.

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.

5.5.2.2 Prerequisites

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

At least one of the company’s GTS Qualified Sprayers must be qualified as an ETS ⁵ (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 the GTS QM Guideline/GTS QM Company Inspection (GTSPA013) 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 ⁵.

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 filling in and signing 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 according to GTS certificate guideline 8.2.2.

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 multiple choice questions. 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 and the GTS Executive Board.

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

5.6.1 Purpose of GTS process inspection

The purpose of the GTS process inspection is to provide proof of the 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.

5.6.2.1 Work instructions

A document in which the required actuating variables are individually listed in order to ensure the repeatability of thermal spray processes (see 5.2.2). Work instructions prescribe which individual operating steps are to be carried out, e.g.:

- Pre-treatment
- Systems engineering
- Spray technology
- Post-treatment, if necessary
- Measurement technology, etc.

Work instructions must be presented to the inspection authority prior to the inspection for the attainment of the GTS certificate.

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 (GTS QM Company Inspection (GTSPA013)) are laid down by GTS. 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.

5.7 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.

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