



COURSE MANUAL: *STAINLESS STEEL TIG-WELDING*
MODULE 8

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MODULE 8

Objective:

To have knowledge of the function "quality control"

To know the basic principals for the common NDT methods used in welding

To achieve knowledge in how to qualify welders according to ISO 9606 and EN 287.

Extent.

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- Introduction to ISO 14731: Welding coordinator and relations IIW qualifications
- Consideration of imperfections in welding (ISO 6520-1)
- Consideration of the level of quality (ISO 5817)
- Control of dimension. Surface, and changes in shape
- Control of cracks and other faults on the surface by visual control (VT), penetration (PT) or magnetic particle test control (MT).
- Determine internal irregularities in welds with radiography (RT) or ultrasonic test (UT).
- Destructive test to measure the mechanical qualities.
- The purpose of testing
- Standards for qualification of welders
- Essential variables, range of approval, validity, test pieces, and testing of welders.

Expected result.

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- Ability to perform a simple visual control of a weld according to EN 970 and to consider the results according to ISO 5817.
- Ability to describe the following destructive and non-destructive methods: bend-testing, hardness, tensile testing, and impact test, VT, MT, PT, RT og UT
- Ability to determine the validity for the area of approval.
- Define the essential variables for testing.

Inspection and testing

Inspection and testing is work being done before, during, and after welding. We have looked into parts of this in module 7 as work being done during the welding process itself.

Finally, this also includes testing of welds with different NDT methods.

In several cases, there may be a contract demand that the customer shall verify some of the inspection points and tests to be performed. It should also be noticed that the results from inspection and testing shall be documented with positive or negative reporting.

Positive reporting means writing a separate report for each control.

Negative reporting means that where the control has not found any errors, it is only signed for that the control is performed according to procedure. Only in those cases where there are reportable errors, a report will be written.

The responsibility for performing inspections according to plan is given to the control department, this is not the welders responsibility. The person or organization performing the test is responsible for this. However, the welder will normally be responsible visual control of own work.

Welder

A welder's main topic is to join metallic materials using different melting processes. This may include large constructions, small objects, and details.

Central elements of work in the welding profession are:

- To understand and interpret drawings
- To work by working instructions and WPS (welding procedures)
- To handle materials, filler materials, and tools for material treatment
- To plan work in a wider sense, including taking care of HES for one self and the colleagues, and to be an active part in the internal control system at the company
- To prepare the work before starting the work process
- To perform the welding processes according to defined method
- To consider the quality of own work against the demands made, and to report non conformances
- To consider the economic consequences of choosing methods, non conformance and quality according to the requirements made for the product
- Independently to perform maintenance and control of welding equipment

The profession's demands for knowledge and skills are tied to quality assurance, drawing, welding technology, material technology, process understanding, and digital skills. A welder must be able to see his working process in conjunction with the work instructions, and to interpret these according to international standards and product requirements. One must be able to perform the work within the given time schedules, for instance detailed planning of own work in the production process. The welder must contribute to a safe workplace in a multi-cultural environment where the level of

competence may vary.

The profession's development and position in society

The welder must keep up to date in the evolution of the society, both nationally and internationally. The profession's distinctive character implies the use of a number of materials, processes, and methods that are continuously developing. This means that the welder must participate in a life-long learning process, where for instance ICT and digital tools are increasingly used. Simultaneously, the welder must be able to learn from other's experience ,make it his own, and transfer it to others.

Certification

Certification requirements

The ISO 9606 series of standards describe a system for qualification and testing of welders to be able to evaluate their abilities in a limited area of welding conditions. This assures quality control for a specific work, but the standard does not describe an education or training programme. However, the industry needs welders with wider education to satisfy a higher degree of flexibility in production, and these guidelines describe a combination of wide theoretical and practical knowledge, confirmed by tests of increasing difficulty, including ISO 9606 qualification and theoretical testing.

The EU's directives and product standards will usually require that the executing part has personnel with certificates according to valid standards.

In addition to the two most common standards mentioned here, there are a number of other standards to be used, see the overview over relevant standards.

Maintenance of a welding certificate

The standard for the certificate sets requirements for how a certificate is to be maintained, the standard also specifies validity of the certificate.

The validity may vary with the kind of the certificate, so this should be controlled according to the standard referred to in the certificate.

An EN 287 and ISO 9606 kind of certificate is valid for two years as long as the the certificate is signed every six months by the welding responsible person in the company.

After two years, the certificate is prolonged. How this is done practically may vary between countries.

Welding Coordinator

The role of the Welding Coordinator will depend on the size of the company and its organization. This means that extent of work and requirements to formal education and competence may vary. The extent of the coordination work is described in the standard EN 719 and in the report CR 13576 from CEN. Knowledge is achieved by education and experience. In amendment A to EN 719 , it is recommended what level of education the company should use according to the EWF system.

This may be split into the following groups:

- EWE (European Welding Engineer)
- IWE (International Welding Engineer)
- EWT (European Welding Technician)
- IWT (International Welding Technician)
- EWS (European Welding Specialist)
- IWS (International Welding Specialist)

The company shall appoint at least one welding coordinator (authorized), who will have an overall responsibility for the welding and the required authority (for instance, to stop production). It is also possible that a welding coordinator can be responsible for one or more sub-contractors.

A company can hire an external person as the company's responsible welding coordinator.

If the company has an extensive field of work, the tasks may be shared between a main coordinator, an assisting coordinator, and welding leaders. Assisting coordinators and welding leaders may report to the main coordinator. The welding coordinator's competence may be documented according to the EWF's education level.

The work tasks of the coordinator may be chosen from the following overview (se også EN 719):

- Organization of quality management according to ISO 3834
- Coordination of welding procedures approval
- Maintenance and distribution of registers of approved WPS
- Preparation of WPS and signature
- Preparation of instructions in general for approval of welders
- Create, maintain, and distribute registers of welders and welding certificates
- Being an advisor and a specialist regarding purchase of equipment and materials
- Coordinate training and maintaining competence
- Personnel training for approval of welders

- Being a resource for other departments and units (design etc.)
- Following up sub-contractors

Diploma

The directives for the international education and training of welders have been evaluated and prepared by Group A in the International Authorisation Board (IAB) at IIW. These directives seek harmonizing education, training, and qualification to an international level. They provide a foundation for evaluation of both theoretical and practical knowledge, the latter also in connection with requirements in ISO 9606.

The complete IIW – International Welder course consists of modules divided into theoretical education, practical training, and testing. The practical training – practice in welding and test welding – is based on relevant instruction and training in relation to these directions. It consists of three areas of education and training: Fillet Welder, Plate Welder, and Pipe welder.

The practical training recommended in these directives will assure that the candidate achieves the wide skills needed for practical work in the industry.

The theoretical education achieved by this training programme may be transferred to other welding processes or groups of materials as long as the time from examination is no longer than 5 (five) years. The specific modules for materials and processes must be studied and examined.

After an approved theoretical and practical test, the ANB will issue a certificate and a diploma for the candidate. The certificate shall include the extent of the education.