

	Welding personnel Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanized and automatic welding of metallic materials English version of DIN EN 1418	DIN EN 1418
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**EUROPEAN STANDARD
NORME EUROPÉENNE
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EN 1418

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ICS 25.160.10

Descriptors: Welders, approval testing.

English version

Welding personnel

**Approval testing of welding operators for fusion welding
and resistance weld setters for fully mechanized and
automatic welding of metallic materials**

Personnel en soudage – Epreuve de qualification des opérateurs soudeurs pour le soudage par fusion et des régleurs en soudage par résistance pour le soudage totalement mécanisé et automatique des matériaux métalliques

Schweißpersonal – Prüfung von Bedienern von Schweißeinrichtungen zum Schmelzschiessen und von Einrichtern für das Widerstandsschiessen für vollmechanisches und automatisches Schweißen von metallischen Werkstoffen

This European Standard was approved by CEN on 1997-11-03.

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 Central Secretariat or to any CEN member.

The European Standards exist 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 Central Secretariat has the same status as the official versions.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 121 "Welding", the secretariat of which is held by DS.

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of an identical text or by endorsement, at the latest by June 1998, and conflicting national standards shall be withdrawn at the latest by June 1998.

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

Introduction

This standard is intended to provide the basis for the mutual recognition by examining bodies for approval related to the competence of welding operators and resistance weld setters in the various fields of application. Tests shall be carried out in accordance with this standard unless more severe tests are specified by the relevant application standards when these shall be applied.

In order to make this standard applicable for fusion and resistance welding, the terminology especially for welding operator in the field of fusion welding and resistance weld setter in the field of resistance welding was clarified.

The welding operator's/resistance weld setter's ability and job knowledge continue to be approved only if the welding operators/resistance weld setters are working with reasonable continuity on welding work within the extent of approval.

All new approvals are to be in accordance with this standard from the date of issue.

However, this standard does not invalidate previous approvals made to former national standards or specifications, providing the intent of the technical requirements is satisfied and the previous approvals are relevant to the application and production work on which they are to be employed.

Also, where additional tests have to be carried out to make the approval technically equivalent it is only necessary to do the additional tests that should be made in accordance with this standard.

Considerations of previous approvals to former national standards or specifications should be made at the time of the enquiry or contract stage and agreed between the contracting parties.

1 Scope

This standard specifies requirements for approval of welding operators for fusion welding and resistance weld setters for fully mechanized and automatic welding processes of metallic materials. Only welding operators/resistance weld setters responsible for the setting up and/or adjustment during welding have to be approved. Personnel exclusively performing the programming of the welding unit or operation of the welding unit do not need any particular approval.

This standard is applicable when approval testing of operators/resistance weld setters is required by the contract or by the application standard.

This standard does not apply to welding operators in resistance welding (see 3.10) or under hyperbaric conditions.

2 Normative references

This standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 288-2

Specification and approval of welding procedures for metallic materials – Part 2: Welding procedure specification for arc welding

EN 288-3

Specification and approval of welding procedures for metallic materials – Part 3: Welding procedure tests for the arc welding of steels

EN 288-4

Specification and approval of welding procedures for metallic materials – Part 4: Welding procedure tests for the arc welding of aluminium and its alloys

EN 288-8

Specification and approval of welding procedures for metallic materials – Part 8: Approval by a pre-production welding test

EN 719

Welding coordination – Tasks and responsibilities

EN ISO 9956-10

Specification and approval of welding procedures for metallic materials – Part 10: Welding procedure specification for electron beam welding (ISO 9956-10:1996)

EN ISO 9956-11

Specification and approval of welding procedures for metallic materials – Part 11: Welding procedure specification for laser beam welding (ISO 9956-11:1996)

ISO/DIS 857: 1995

Welding and allied processes – Welding, brazing and soldering processes – Vocabulary

ISO 10447

Welding – Peel and chisel testing of resistance spot, projection and seam welds

3 Definitions

For the purposes of this standard, the classification of manual welding and partly mechanized welding according to table 1 of ISO/DIS 857: 1995 and the following definitions apply:

3.1 automatic welding: Welding where all operations are performed automatically. Manual adjustment of welding variables during welding is not possible.

3.2 function test: Test of a welding unit set-up in accordance with a Welding Procedure Specification (WPS).

3.3 fully mechanized welding: Welding where all main operations (excluding the handling of the work piece) are performed automatically. Manual adjustment of welding variables during welding is possible.

3.4 pre-production welding test: A welding test having the same function as a welding procedure test, but based on a non-standard test piece, simulating production conditions.

3.5 production test: Welding test carried out in the production environment on the welding unit, on actual products or on simplified test pieces. The main characteristic of a production test is , that normal production is interrupted during this test.

3.6 production sample testing: Sample testing of actual welding products sampled from a continuous production using the welding unit. No interruption of normal production during sampling is necessary.

3.7 programming: Incorporation of the approved welding procedure specification and/or the specified movements of the welding unit into a programme.

3.8 robotic welding: Automatic welding using a manipulator that can be pre-programmed to different welding directions and fabrication geometries.

3.9 setting-up: Correct adjustment of the welding unit before welding and if required by entering the robot programme.

3.10 welding operator: In fusion welding a person who performs fully mechanized or automatic welding. In resistance welding the welding operator uses equipment with mechanized or fully mechanized relative movement between the welding gun and the workpiece and is only given task orientated training (see also clause 1).

3.11 resistance weld setter: Person who sets up mechanized or automatic welding.

3.12 welding unit: The totality of equipment which performs the welding. The welding unit can include jigs and fixtures, one or more robots, feeding units and other ancillary equipment. The equipment can perform loading and unloading of the work pieces.

3.13 welding unit operation: Starting and if necessary stopping the production cycle. The operation can include loading and unloading of the work pieces.

3.14 examiner or examining body: A person or organization who verifies compliance with the application standard. The examiner/examing body shall be acceptable to any contracting parties.

4 Approval

4.1 General

Welding operators/resistance weld setters shall be approved by one of the following methods, as detailed in 4.2:

- approval based on welding procedure test, see 4.2.1;
- approval based on pre-production welding test or production test, see 4.2.2;
- approval based on production sample testing, see 4.2.3;
- approval based on function test, see 4.2.4.

Any of the approval methods can be supplemented by a test of knowledge related to welding technology. Such a test is recommended, but not mandatory. Annex A includes a recommendation for such a examination.

The methods shall be supplemented by a test of the functional knowledge appropriate to the welding unit see in Annex B.

The essential variables and the range of approval is specified in the appropriate subclauses of 4.2 and the validity in 4.3.

4.2 Essential variables and ranges of approval

4.2.1 Approval based on welding procedure testing

A welding operator/resistance weld setter having successfully completed a welding procedure test in accordance with the relevant Part 3 or Part 4 of EN 288, shall be considered approved for that type of welding unit used.

Provided that the welding operator/resistance weld setter works according to an approved welding procedure specification (WPS), there is no limitation for the range of approval provided, that the type of welding unit and the welding process are not changed.

A suggested form for the certificate is shown in Annex C.

4.2.2 Approval based on pre-production welding test or production test

A welding operator/resistance weld setter having successfully completed a pre-production welding test in accordance with EN 288-8 or production test shall be considered approved for that type of welding unit used.

Provided that the welding operator/resistance weld setter works according to an approved welding procedure specification (WPS), there is no limitation for the range of approval provided, that the type of welding unit and the welding process are not changed.

A suggested form for the certificate is shown in Annex C.

4.2.3 Approval based on production sampling testing

A welding operator/resistance weld setter having successfully set up the production shall be considered approved if representative samples of the items produced are approved. This testing of production samples is to be in accordance with the requirements of the contracting parties.

Provided that the welding operator/resistance weld setter works according to an approved welding procedure specification (WPS), there is no limitation for the range of approval provided, that the type of welding unit and the welding process are not changed.

A suggested form for the certificate is shown in Annex C.

4.2.4 Approval based on function test

A welding operator/resistance weld setter having successfully performed a function test shall be considered approved for that type of welding unit. A function test shall include the following:

- to know the correlation between parameter deviations and the welding results;
- to control parameter setting at the welding unit according to WPS;
- to test the operational items of the welding unit according to WPS;
- to report of any malfunction of the welding unit, which influenced the weld.

Provided the welding operator/resistance weld setter works according to an approved welding procedure specification (WPS), there is no limitation for the range of approval provided, that the type of welding unit and the welding process are not changed.

A suggested form for the certificate is shown in Annex C.

4.2.5 Automatic and robotic welding

The following changes require a new approval:

- welding with or without arc and/or joint sensor;
- change from single-run to multi-run technique;
- change of robotic type and system including numerical control unit;
- other essential variables specific to the processes used.

Welding without joint sensor also covers welding with joint sensor, but not vice versa. Welding with multi-run technique also covers single-run technique, but not vice versa.

4.3 Period of validity

The validity of the welding operator's/resistance weld setter's approval starts from the date of welding of the test piece, provided that the required tests are satisfactory.

A welding operator's/resistance weld setter's approval shall remain valid for a period of two years provided that the employer/welding coordinator in accordance with EN 719 confirms that both following conditions are fulfilled:

- a) The welding operator/resistance weld setter shall be engaged with reasonable continuity on welding work within the current range of approval. An interruption for a period no longer than six months is permitted.
- b) There shall be no specific reason to question the welding operator's/resistance weld setter's knowledge.

If any of these conditions are not fulfilled, the approval shall be cancelled.

The employer/welding coordinator may sign the relevant certificate at six-month intervals in respect of the foregoing.

5 Prolongation

The validity of the approval on the certificate may be prolonged for further periods of two years, within the original range of approval, provided each of the following conditions according to 4.3 are fulfilled:

- the production welds are of the required quality;
- records of tests, e. g. half-yearly documentation about radiographic or ultrasonic inspections or test reports about fracture test or peel and chisel test in accordance with ISO 10447 shall be maintained on file with the operator's/resistance weld setter's approval certificate.

The examiner or examining body shall verify compliance with the above conditions and sign the prolongation of the welding operator's/resistance weld setter's approval test certificate.

6 Certificate

The examiner or examining body shall certify that the welding operator/resistance weld setter has successfully passed the approval test. All relevant test conditions shall be recorded on the certificate. If the welding operator/resistance weld setter fails any of the prescribed tests, no certificate shall be issued.

The certificate shall be issued under the sole responsibility of the examiner or examining body and shall contain all the information detailed in Annex C. The format of Annex C is recommended to be used as the welding operator's/resistance weld setter's approval test certificate.

If any other form of welding operator's/resistance weld setter's approval test certificate is used, it shall contain the information required in Annex C. The manufacturer's WPS as shown in EN 288-2, EN ISO 9956-10 or EN ISO 9956-11 shall give information about materials, welding positions, welding processes and range of welding parameters etc., in accordance with this standard.

The welding operator's/resistance weld setter's approval test certificate shall be issued at least in one of the following languages : English, French, German.

Each change of the essential variables for the approval testing beyond the permitted ranges requires a new test and a new approval certificate.

7 Documentation

Certificates and test reports/records of welding tests and prolongations shall be kept on file.

Annex A (informative)

Knowledge on welding technology

A.1 General

The test of job knowledge is recommended, but it is not mandatory.

However, some countries can require that the welding operator/resistance weld setter undergoes a test of job knowledge. If the job knowledge test is carried out, it should be recorded on the welding operator's/resistance weld setter's certificate.

This annex outlines the job knowledge that a welding operator/resistance weld setter should have to ensure that procedures are followed and common practices are complied with. The job knowledge indicated in this annex is only pitched at the most basic level.

Owing to different training programmes in various countries, it is only proposed to standardize general objectives or categories of job knowledge. The actual questions used should be drawn up by the individual country, but should include questions on areas covered in A.2, relevant to the welding operator's/resistance weld setter's approval test.

The actual tests of a welding operator's/resistance weld setter's job knowledge can be given by any of the following methods or combinations of these methods:

- a) written objective tests (multiple choice);
- b) oral questioning following a set of written questions;
- c) computer testing;
- d) demonstration/observation testing following a written set of criteria.

The test of job knowledge is limited to the matters related to the welding process used in the test.

A.2 Requirements

A.2.1 Welding equipment

A.2.1.1 Arc welding

- a) Identification of gas cylinders;
- b) Identification and assembly of essential components;
- c) Selection of correct nozzles and welding torches;
- d) Wire feed control method.

A.2.1.2 Beam welding

- a) Electron beam welding equipment;
- b) Laser beam welding equipment.

A.2.1.3 Pressure welding

- a) Types and equipment
- b) Identification and assembly of essential components.

A.2.1.4 Resistance welding

- a) Identification and assembly of essential components;
- b) Selection of correct electrodes;
- c) Cooling system;
- d) Maintenance of the equipment.

A.2.2 Welding processes¹⁾**A.2.2.1 Shielded metal-arc welding (114, 131, 135, 136, 137, 141, 15)**

- a) Procedures;
- b) Types and size of electrodes;
- c) Identification of shielding gas and flow rate (without 114);
- d) Type, size and maintenance of nozzles/contact tip;
- e) Selection and limitation of mode of metal transfer;
- f) Protection of the welding arc from draughts.

A.2.2.2 Submerged arc welding (121, 122)

- a) Procedures;
- b) Drying, feeding and correct recovery of flux;
- c) Correct alignment and travel of welding head;
- d) Single-wire or multi-wire process;
- e) Influence of welding current and voltage.

A.2.2.3 Electron beam welding (76)

- a) Procedures;
- b) Parameters and their influence to the welding process;
- c) Focussing system
- d) Parameter controlling
- e) Preparation of parent material;
- f) Vacuum system including leak test;

A.2.2.4 Laser beam welding (751)

- a) Procedures;
- b) Parameters and their influence to the welding process;
- c) Focussing system
- d) Parameter controlling
- e) Preparation of parent material;
- f) Choice of relevant gases;
- g) Processing in/on different types of laser;
- h) Type of mode for operation;

A.2.2.5 Pressure welding (41, 42, 44, 45)

- a) Procedures;
- b) Type of equipment;
- c) Surface preparation;
- d) Control system;

A.2.2.6 Resistance welding (21, 22, 23, 24, 25, 29)

- a) Procedures;
- b) Surface preparation;
- c) Parameters;
- d) Material and shape of electrodes, contact area and fixing of electrodes;
- e) Method of welding;
- f) Control and surveillance system;
- g) Causes of defect;
- h) Test methods.

A.2.3 Parent metals

- a) Identification of material;
- b) Methods and control of pre-heating;
- c) Control of interpass temperature.

¹⁾ The numbers refer to EN 24063.

A.2.4 Consumables

- a) Identification of consumables
- b) Storage, handling and conditioning of consumables;
- c) Selection of correct size;
- d) Cleanliness of wire electrodes and flux-cored electrodes;
- e) Control of wire spooling;
- f) Control and monitoring of gas flow rates and quality;
- g) Principles of welding without consumables.

A.2.5 Safety and accident prevention

A.2.5.1 General

- a) Electrical risk;
- b) Mechanical risk;
- c) Risk of welding fumes and gases;
- d) Noise risk;
- e) Risk by radiographic application (if relevant).

A.2.5.2 All arc processes

- a) Environment with increased hazard of electric shock;
- b) Radiation from the arc;
- c) Effects of stray arcing;
- d) Effects of poor earthing.

A.2.6 Visual examination of welds

- a) Knowledge of visual examination.

Annex B (normative)

Functional knowledge appropriate to the welding unit

This annex outlines the functional knowledge appropriate to the welding unit that a welding operator/resistance weld setter should have to ensure that procedures are followed and common practices are complied with.

B.1 Welding sequences/procedures in the relevant process

Appreciation of welding procedure requirements and the influence of welding parameters.

B.2 Joint preparation and weld representation in the relevant process

- a) Conformance of joint preparation to welding procedure specification (WPS);
- b) Cleanliness of fusion faces.

B.3 Weld imperfection in the relevant process

- a) Identification of weld imperfection;
- b) Causes;
- c) Prevention and remedial action.

B.4 Welding operator's/resistance weld setter's approval

The welding operator/resistance weld setter shall be aware of the range of the approval.

B.5 Process operation

- a) Knowledge of programming (if relevant);
- b) Knowledge of the control system and signals given by this system;
- c) Moving system;
- d) Auxiliary equipment;
- e) Jigs and fixtures and set-up;
- f) Parameters and adjustment within the given procedures;
- g) Safety regulations and precautions;
- h) Start-stop procedures

Annex C (informative)

Approval test certificate for welding operators/resistance weld setters

Manufacturer's welding procedure specification

Reference No. (if applicable):

Name of welding operator/resistance weld setter:

Identification:

Method of identification:

Date and place of birth:

Employer:

Code/testing standard:

Examiner or examining body

Reference No.

Photograph
(if required)

Job knowledge: acceptable / not tested (delete as necessary)

Weld details	Range of approval
Welding process	-
Welding unit	-
Details in accordance with 4.2.5	
Joint sensor	-
Single run/multirun technique	
Robotic type	

Additional information is available on attached sheet and/or welding procedure specification No.:

The approval is based on: - Welding procedure test in accordance with 4.2.1 ☐ - Pre-production welding test or production test in accordance with 4.2.2 ☐ - Production sampling testing in accordance with 4.2.3 ☐ - Function test in accordance with 4.2.4 ☐ Results of the approval test see document No. (Welding procedure approval record or other documents of testing)		Name, date and signature Examiner or examining body Date of issue Location Validity of approval until	
Prolongation for approval by examiner or examining body for the following 2 years (see clause 5)		Prolongation for approval by employer/welding coordinator for the following 6 months (see clause 5)	
Date	Signature	Position or title	