



SLOVENSKI STANDARD

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Izvajanje EN 729, ki obravnava zahteve po kakovosti pri talilnem varjenju kovinskih materialov

Implementation of EN 729 on quality requirements for fusion welding of metallic materials

Einführung von EN 729 über Qualitätsanforderungen für das Schmelzschweißen metallischer Werkstoffe

Soudage - Mise en application des exigences de qualité de l'EN 729 pour le soudage par fusion des matériaux métalliques

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Implementation of EN 729 on quality requirements for fusion welding of metallic materials

Soudage - Mise en application des exigences de qualité de
l'EN 729 pour le soudage par fusion des matériaux
métalliques

Einführung von EN 729 über Qualitätsanforderungen für
das Schmelzschweißen metallischer Werkstoffe

This CEN Report was approved by CEN on 3 March 1999. It has been drawn up by the Technical Committee CEN/TC 121.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This Technical Report was prepared by the Technical Committee CEN/TC 121 "Welding", of which the Secretariat is held by DS.

The Technical Committee decided to publish this Technical Report.



Introduction

Welding is considered as a special process because the final result may not always be capable of being verified by testing. The quality of the weld is to be manufactured into the product, not inspected. This means that welding normally requires continuous control and/or that documented procedures are followed. The standard series EN 729 concerning quality requirements in welding has been prepared to identify the controls and procedures required. The EN 729 series has also been adopted by ISO as ISO 3834.

It has to be noted that EN 729 is not a quality system standard replacing ISO 9000 but it forms a useful tool when ISO 9000 is applied for manufacturers. If this is the case, it should appear from the certificate that also the requirements of EN 729 are fulfilled. However, EN 729 can also be used without ISO 9000.

Until now EN 729 is intended for arc welding of metallic materials and it is independent of products. However, the principles and many of the detailed requirements are also relevant for other welding processes, and welding related processes. Additional parts for resistance welding are under preparation.

One of the intentions of EN 729 is to help the contracting parties that they should not have to go into details with requirements in the field of welding, a reference to EN 729 should be sufficient to demonstrate the capabilities of the manufacturer to control welding activities. This concept also applies to committees responsible for drafting product standards.

The implementation of EN 729 may also coincide with new or revised requirements in product standards (codes etc. for welded structures and products). Some manufacturers may have experience more stringent requirements with regard to welding procedure testing, approval testing of welders, etc. Discussion of these aspects is beyond the scope of this Technical Report.

The standard does not in itself require external assessment or certification. However, assessments by customers and certification by independent bodies are a growing trend in commercial relations and the standard serves as a checklist for these purposes as well as for those manufacturers implementing the standard to demonstrate capability of their welding performance.

1 Scope

The intention of this Technical Report is to give manufacturers some ideas of why EN 729 has become important and how to implement appropriate parts and clauses of EN 729. It is assumed that those manufacturers have studied that standard before reading this report.

2 Normative references

This Technical Report 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 Technical Report only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 287

Approval testing of welders (*Parts see table B.1*)

EN 288

Specification and approval of welding procedures for metallic materials (*Parts see table B.1*)

EN 719

Welding coordination – Tasks and responsibilities

EN 729-1

Quality requirements for welding – Fusion welding of metallic materials – Part 1: Guidelines for selection and use

EN 729-2

Quality requirements for welding – Fusion welding of metallic materials – Part 2: Comprehensive quality requirements

EN 729-3

Quality requirements for welding – Fusion welding of metallic materials – Part 3: Standard quality requirements

EN 729-4

Quality requirements for welding – Fusion welding of metallic materials – Part 4: Elementary quality requirements

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EN 1418

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

prEN ISO 9606

Approval testing of welders (*Parts see table B.1*)

ISO 3834

Quality requirements for welding – Fusion welding of metallic materials (*same parts as EN 729-1 to -4*)

ISO 9000-1

Quality management and quality assurance standards – Part 1: Guidelines for selection and use

ISO 9000-3

Quality management and quality assurance standards – Part 3: Guidelines for the application of ISO 9001 to the development, supply and maintenance of software

ISO 9000-4

Quality management and quality assurance standards – Part 4: Guide to dependability programme management

ISO 9001

Quality systems – Model for quality assurance in design, development production, installation and servicing

ISO 9002

Quality systems – Model for quality assurance in production, installation and servicing

3 Abbreviations

For the purposes of this report, the following abbreviations apply.

EN	European Standard
EFW	European Federation for Welding, Joining and Cutting
NDT	Non Destructive Testing
PWHT	Post Weld Heat Treatment
pWPS	preliminary Welding Procedure Specification
WI	Work Instruction
WPAR	Welding Procedure Approval Record
WPS	Welding Procedure Specification

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4 Utilisations of the normative references in EN 729

In order to achieve full conformity to EN 729 the normative references given in the standard shall be applied throughout. While the conversion of EN-standards to EN ISO-standards is going on, EN standards can be replaced by identical ISO-standards. However, it is recognised that in some cases, arising from contractual requirements, manufacturers may use other standards, i.e. other than perhaps EN 287 / prEN ISO 9606 or EN 288. Such deviations are permitted but clearly full conformity with EN 729 cannot then be achieved. Such deviations shall be clearly recorded on any relevant certification.

5 Reasons for using EN 729**5.1 General**

The following subclauses give some guidance as to when EN 729 might be adopted. During the present transition period national rules may still not fully recognise EN 729.

5.2 EU-Directives and EN-Standards

The EU-Directives lay down safety requirements these are "the essential requirements" for a given product whilst an EN-standard provides technical solutions which will, if correctly followed, ensure compliance with the directive. In addition the manufacturer shall take steps to ensure that laws on product reliability for his welded products are met. EN 729 provides the manufacturer with measures which can demonstrate that welding has been correctly controlled.

5.3 Product standards

In Europe there are several product standards in preparation or publication where a reference to EN 729 is given. Relevant existing and draft standards should be taken into account.

5.4 Customers or their representatives

As the use of EN 729 increases manufacturers will start to use it for marketing purposes. Also purchasers of welded products will specify that manufacturers demonstrate their competence by compliance with EN 729.

5.5 Third party

Third parties have already started to require that manufacturers conform to EN 729, especially in the field of pressure vessels and steel structures. It is also assumed that EN 729 will replace a number of existing national rules required by third parties.

5.6 ISO 9000

ISO 9000 does not give any detailed requirements on welding, but for such a purpose EN 729-2 is an excellent tool.

6 Document control and quality systems

Full document control is required when operating EN 729-2 in conjunction with ISO 9001 or ISO 9002.

However EN 729-2 itself does not require fully documented systems and procedures; but it is anticipated that such documentation will be the most effective way of demonstrating compliance. Whether used in conjunction with ISO 9001 or ISO 9002 or not, any manufacturer shall be able to show compliance via suitable objective evidence.

For EN 729-3 and EN 729-4, the manufacturer may use simplified arrangement to ensure that manufacturing is properly controlled; e.g. by the use of flow charts to describe functions, and have arrangement to ensure that correct documentation is available to the welders and other persons involved in fabrication.

7 Implementation in fabrication

7.1 General guidelines for implementation

7.1.1 Basic principles

EN 729 specifies criteria for a number of categories of requirements, notably requirements relating to:

- 1) The manufacturer's procedures for the overall control of welding as a special process.
- 2) Procedures for production (e.g. welding procedure specifications for EN 729-2 and EN 729-3).
- 3) Documentation of competence, capability and suitability (e.g. welder's certificates).

Each category is treated in some detail below. Further comments relate to the manufacturer's organisation, the implementation in an ISO 9000 environment and finally some comments to some individual elements of the control.

7.1.2 Implementation

A well established manufacturer in a particular industrial sector should already comply with all requirements relating to procedures for production as well as all requirements to documentation of competence, capability and suitability. For such manufacturers EN 729 should not incur any extra activities or costs. However, some manufacturers may have to take action for one or more of the following reasons:

- 1) The implementation of EN 729 coincides with a general transition from national to European standards. Implementation of EN 729 may e.g. be linked to a transition from a previously used (and well known) national standard to approval testing of welders to EN 287 / prEN ISO 9606.
- 2) A manufacturer with an existing ISO 9001 or ISO 9002 quality system will find that those procedures do not adequately focus on the welding aspects as detailed in EN 719 and EN 729, and should therefore have to revise them.
- 3) The implementation of EN 729 may also coincide with the publication of new or revised requirements in application standards (codes etc. for welded structures and products). Some manufacturers may have experience for more stringent requirements as regards welding procedure testings, approval testing of welders, etc.

7.1.3 Procedures for control of welding

The procedures for control of welding should specify what is to control, how it is controlled - if necessary by reference to one or more procedure or standard, allocate tasks and responsibilities and specify reporting and documentation.

EN 729 does not, as a general rule, require written specification of procedures for control of welding (EN 729-2 requires a few). EN 729 requires that the procedures are efficient and judged by their results. Examples are:

- All parts of EN 729 require that the manufacturer maintains welding equipment and keeps them in good order. This is an objective requirement which in principle only can be checked by a technical inspection of the conditions of the welding equipments in the workshop.
- All parts of EN 729 require approval of the welders. Reference is made to EN 287 / prEN ISO 9606 and EN 1418, which permits an objective check of the certificates for all welders and welding operators.

No manufacturer is able to accomplish e.g. maintenance of welding equipment and approval testing of welders and welding operators, without a procedure for control of such activities. Manufacturers already well established in particular industrial sectors have procedures for control of welding. The procedures may be informal (not specified in writing) or described in written specifications.

For all parts of EN 729 it is essential that the manner by which a company is organized in respect to welding including relationship with EN 729 is adequately specified in writing. The establishment of written specification of procedures for control of welding formally not required by EN 729-3 and EN 729-4 and is only to some degree by EN 729-2 necessary. They represent the main effort for most manufacturers during implementation of EN 729. Operational costs should be negligible. Some manufacturers may have actually experience for a more efficient control and lower costs as an indirect result.

Annex A includes lists of procedures for control which have been found useful by some manufacturers.

7.1.4 Production procedures

7.1.4.1 General

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EN 729 requires explicitly that a number of production procedures shall be documented. These procedures are listed in table 1. A few may not be relevant, for example procedures for post weld heat treatment, if PWHT is not performed.

Table 1: Documented production procedures¹⁾

EN 729-2	EN 729-3	EN 729-4
8. Equipment – Maintenance plans	8. Equipment – Maintenance plans	
9. Welding activities – Procedure planning sheet (or similar) – Welding procedure specifications – Inspection plans	9. Welding activities – Procedure planning sheet (or similar) – Welding procedure specifications – Inspection plans	8. Welding activities – Specification of welding process and consumables ²⁾
10. Welding consumables – Procedures for storage, handling and use of consumables	10. Welding consumables – Procedures for storage, handling and use of consumables	
12. Post weld heat treatment – Procedure specification	12. Post weld heat treatment – Procedure specification	
14. Non-conforming and corrective action – Procedures for flame straightening, mechanical bending etc.	14. Non-conforming and corrective action – Procedures for flame straightening, mechanical bending etc.	11. Non-conforming and corrective action – Procedures for flame straightening, mechanical bending etc.
1) The numbers refer to the appropriate clauses of the relevant part of EN 729.		
2) Registration of joint preparation, welding process and consumable may be needed in order to provide documentation.		

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It should be noted that several controlled procedures (7.1.2) level do not have a counterpart at the production level. The explanation is that several European standards provide detailed procedures at the operational level. Approval testing of welders is specified in EN 287 / prEN ISO 9606, welding procedure testing in e.g. EN 288-3, etc.

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7.1.4.2 Welding

EN 288-1 includes information on specification and approval of welding procedures and specifies five general methods for approval of welding procedures:

- approved consumables;
- procedure testing;
- pre-production testing;
- standard procedure;
- previous experience.

If the product standard does not specify which method (part of EN 288) to be used it shall be agreed between the contracting parties.

The actual results of the testing are recorded in a welding procedure approval record (WPAR). The results are summarized in the table 2.

Table 2: Documentation with regard to welding procedure approval

Task	EN 729-2	EN 729-3	EN 729-4
Preliminary planning of approval	pWPS	pWPS	pWPS
Approval	WPAR ³⁾	WPAR ³⁾	No documentation required ^{1), 3)}
Specification of welding procedure	WPS	WPS	WPS ¹⁾
Work instruction (WI)	WPS or dedicated WI (optional)	WPS or dedicated WI (optional)	Verbal communication
Documentation of process	Production report (optional, usually not required)	Not relevant ²⁾	Not relevant
<p>1) The welding procedures specifications (WPS) applied in an EN 729-4 context are well established and are considered "known to be satisfactory". The WPS may usually be reduced to a specification of welding process, parent material and welding consumables. Further the supplier of the welding consumables may have indicated wide ranges for the essential welding parameters which then have to be adhered to.</p> <p>2) Records of actual welding data during fabrication may not be useful unless the instruments for measurement are calibrated/verified.</p> <p>3) The WPAR shall be signed by the examiner/examining body. The pWPS, the WPS and the WI are usually all prepared and signed by the authorized welding coordinator on the manufacturer's own responsibility.</p>			

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When standard procedures are used (see EN 288-7) preliminary planning of approval of welding procedures become non relevant.

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7.1.4.3 Other processes

The principles for approval of other production processes are to some extent similar, to that of welding. The same general methods (see 7.1.4.2) for approval stated above for welding, also may be applied for other production procedures used in connection with welding fabrication.

The actual application are specified below for selected procedures.

– Non destructive testing

Non destructive testing (NDT) of welds is specified in several standards and usual practice therefore corresponds to the use of a standard procedure specification for NDT. The NDT operator uses the relevant standard directly or is instructed by a written procedure prepared on the basis of the relevant standard. There is always established a "production report" in the shape of a report on the results of the NDT. This report includes registration of all essential NDT parameters used during the testing. Such a report is prepared also for EN 729-4 applications.

– Post weld heat treatment

Situation analogous to the one described above for NDT except for the fact that post weld heat treatment is not usually relevant for EN 729-4 application. Quality requirements for heat treatment will be stated in a separate CEN Technical Report.

– Thermal cutting

Documentation arising from pre-production testing may be necessary when cutting sensitive materials for which experience is limited or where there is a risk of hard zones at the cut edges that could be harmful in the final product.

7.2 Organization

The term "manufacturer" is widely used as a designation for the entity performing and responsible for welding co-ordination. However, strictly speaking, control of welding is performed by an organization, that is a body of people working under the control of a single team of welding coordinators (as defined in EN 719). An organization in this context is often, but not always the same as a legal body. Some typical situations are outlined in the table 3 and they should illustrate the principles.

Table 3: Organization and tasks

Situation	Comments
Large corporation comprising a number of divisions, each having a team of welding co-ordinators referring to division manager	Feasible, but EN 729 shall be implemented independently for each division. Please note that each division shall consider all other divisions as subcontractors.
Large corporation comprising a number of divisions, controlled by a single team of welding co-ordinators referring to the corporate management.	Corporate implementation involving all divisions is feasible. Problematic, in case one or more divisions (performing welding) do not comply. Such divisions should not be permitted to deliver any welding to a division having implemented EN 729.
Manufacturer (main contractor) wishing a subcontractor to work under his EN 729 control.	Feasible only on the condition that the subcontractor is fully controlled by the main contractor (e.g. 100% owned subsidiary). The main contractor's authorized welding co-ordinators shall have the power and the means to efficiently control the subcontractor's welding.

All organizations which do not comply to the above are designated "subcontractors" for the purpose of EN 729. If subcontractors do not comply with EN 729 in their own right then the manufacture shall ensure that they can meet the requirements of any particular contract. [SIST CR 13576:2000](https://standards.iteh.ai/catalog/standards/sist/ebe29280-7848-4fea-83bf-4967d6144618/sist-cr-13576-2000)

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8 Interpretation of particular clauses in EN 729

8.1 Minimizing the requirements in EN 729

All manufacturers adopting EN 729 in conjunction with a quality management system to either ISO 9001 or ISO 9002 shall comply with EN 729-2. This is not an unreasonable requirement, because the ISO 9001 or ISO 9002 system will already include all the quality elements detailed in EN 729 for example, contract review, material control, documentation, procedures and planning. Thus, for an ISO 9001 or ISO 9002 manufacturer the main task in implementing EN 729 will be the development of welding coordination arrangement as required by EN 719. However, under some circumstances, full implementation of all the EN 729-2 requirements for a manufacturer working in conjunction with ISO 9001 or ISO 9002 may be unnecessarily onerous. EN 729-1 gives guidance on the concept of minimizing the requirements, which is introduced to avoid such unnecessary work. Minimizing can be adopted in the following circumstances.

8.1.1 Where welding is not the primary activity

Where the manufacturer's primary activity is producing and selling welded fabricated products, then it is almost certain that the full requirements of EN 729-2 will be relevant.

However, there are many manufacturer's for whom welding is an incidental procedure, but who have adopted ISO 9001 or ISO 9002 primarily to assure the quality of their overall operation. For example, manufacturers of process equipment such as refrigerators or air conditioning units mounted on welded frames, electrical control switch, gear manufacturers etc.