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

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Foreword

This document (prEN 15085-4:2004) has been prepared by Technical Committee CEN/TC 256 “Railway Applications”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive:

— Council Directive 93/38/EEC of 14 June 1993 coordinating the procurement procedures of entities operating in the water, energy, transport and telecommunications sectors[1])

This series of European Standards prEN 15085 "Railway applications – Welding of railway vehicles and components" consists of the following parts:

— Part 1: General

— Part 2: Quality requirements and certification of welding manufacturer

— Part 3: Design requirements

— Part 4: Production requirements

— Part 5: Inspection, testing and documentation

[1]) Official Journal of the European Communities No L 199 of 9.8.93

Introduction

Welding is an essential process in the manufacture of railway vehicles and their parts. The required provisions for the special process "welding" are laid down in the standards EN ISO 9001 (see [1]) and EN 729 (see [2] to [5]). The basis of these provisions is the basic technical welding standards in respect of the special requirements for the construction of railway vehicles.

This standard is aimed at defining the terms of enforcement applicable to European Standards, it shall not be construed as a substitute to these standards.

This standard can also be used by internal and external parties, including certification bodies, to assess the organisation's ability to meet customer, regulatory and the organisation's own requirements.

1 Scope

This standard applies to the welding of metallic materials during the manufacture and repair of railway vehicles and vehicle parts. It

— describes the rules of the welding work preparation,

— describes the rules of carrying out the weld work.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 287-1, *Qualification test of welders – Fusion welding – Part 1: Steels.*

EN 287-2*, Approval testing of welders – Fusion welding – Part 2: Aluminium and aluminium alloys (includes Amendment A1:1997).*

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 steel (includes Amendment A1:1997).*

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 1011-2, *Welding – Recommendation for welding of metallic materials – Part 2: Arc welding of ferritic steels.*

EN 1011-4, *Welding – Recommendations for welding of metallic materials – Part 4: Arc welding of aluminium and aluminium alloys.*

prEN 10204:2000-05, *Metallic products – Types of inspection documents.*

prEN 13479, *Welding consumables – General product standard for filler metals and fluxes for fusion welding of metallic materials.*

prEN 14532-1, *Welding consumables – Test methods and quality requirements – Part 1: Primary methods and conformity assessment of consumables for steel, nickel and nickel alloys.*

prEN 14532-2, *Welding consumables – Test methods and quality requirements – Part 2: Supplementary methods and conformity assessment of consumables for steel, nickel and nickel alloys.*

EN 15607, *Specification and qualification of welding procedures for metallic materials – General rules.*

EN ISO 544, *Welding consumables – Technical delivery conditions for welding filler metals – Type of product, dimensions, tolerances and marking.*

EN ISO 4063, *Welding and allied processes – Nomenclature of processes and reference numbers.*

EN ISO 9013:2002, *Thermal cutting – Classification of thermal cuts – Geometrical product specification and quality tolerances (ISO 9013:2002).*

EN ISO 14555:1998, *Welding – Arc stud welding of metallic materials.*

CR ISO/TR 15608, *Welding – Guidelines for a metallic material grouping system.*

prEN ISO 15609-1, *Specification and approval of welding procedures for metallic materials – Welding procedure specification – Part 1: Arc welding.*

prEN ISO 15609-3, *Specification and approval of welding procedures for metallic materials – Welding procedure specification – Part 3: Electron beam welding.*

prEN ISO 15609-4*, Specification and approval of welding procedures for metallic materials – Welding procedure specification – Part 4: Laser beam welding.*

prEN ISO 15609-5, *Specification and approval of welding procedures for metallic materials – Welding procedure specification – Part 5: Resistance welding.*

prEN ISO 15611, *Specification and qualification of welding procedures for metallic materials – Qualification based on previous welding.*

prEN ISO 15613, *Specification and approval of welding procedures for metallic materials – Approval by a pre-production welding test.*

prEN ISO 15614-1, *Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys (ISO/FDIS 15614- 1:2003). Note: Intended as replacement for EN 288-3:1992.*

prEN ISO 15614-2, *Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 2: Arc welding of aluminium and its alloys (ISO/FDIS 15614-2:2004) / Note: Intended as replacement for EN 288-4:1992.*

prEN ISO 15614-4, *Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 4: Finishing welding of aluminium castings (ISO/DIS 15614-4:2003).*

prEN ISO 15614-5*, Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 5: Arc welding of titanium, zirconium and their alloys (ISO/FDIS 15614-5:2003).*

prEN ISO 15614-6*, Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 6: Arc welding of copper and its alloys (ISO/DIS 15614-6:2003).*

EN ISO 15614-8*, Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 8: Welding of tubes to tube-plate joints (ISO 15614-8:2002).*

prEN ISO 15614-9, *Specification and approval of welding procedures for metallic materials – Welding procedure test – Part 9: Underwater hyperbasic wet welding (ISO/DIS 15614-9:2000).*

prEN ISO 15614-10, *Specification and approval of welding procedures for metallic materials – Welding procedure test – Part 10: Hyperbasic dry welding (ISO/DIS 15614-10:2000).*

EN ISO 15614-11*, Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 11: Electron and laser beam welding (ISO 15614-11:2002).*

prEN ISO 15614-12*, Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 12: Spot, seam and projection welding (ISO/FDIS 15614-12:2003).*

prEN ISO 15614-13, *Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 13: Resistance butt and flash welding (ISO/DIS 15614-13:2002).*

EN ISO 15620, *Welding – Friction welding of metallic materials.*

ISO 10447, *Welding – Peel and chisel testing of resistance spot, projection and seam welds.*

prEN 15085-1:2004, *Railway applications – Welding of railway vehicles and components – Part 1: General.*

prEN 15085-2:2004, *Railway applications – Welding of railway vehicles and components – Part 2: Quality requirements and certification of welding manufacturer.*

prEN 15085-3:2004, *Railway applications – Welding of railway vehicles and components – Part3: Design requirements.*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in prEN 15085-1:2004 apply.

4 Preparation before welding

4.1 Welding planning documents

4.1.1 General

Welding planning documents shall be prepared by the manufacturers with the assistance of the recognised welding coordinator grade 1 for new and converted vehicles and maintenance of rail vehicles (see prEN 15085-2:2004, 5.1.2). Type, scope and time of the submission or inspection shall be agreed between customer and contractor.

For the construction of rail vehicles it is necessary to have:

4.1.2 Operation lay-out sheets for the sub-assemblies

— bogie (sub-assemblies, assembly);

— underframe (with sub-assemblies);

— body (side wall, end wall, roof);

— further sub-assemblies with high safety and functional requirements (e. g. cardan shafts, brake cross members, motor housing, hollow shaft drive, drawbar coupling, bogie pivot pin, cross bearer).

4.1.3 Other welding planning documents

For more complicated assemblies the welding sequence plans can be necessary, e. g. for:

— bogies (bogie polster, bogie centre plate including bogie pivot pin member, solebar, headstock, bogie pivot pin cross member, traction bar coupling, assembly of solebar and cross member);

— underframe (including cross member, solebar, headstock, bogie pivot pin cross member, traction bar coupling).

Standardised welding sequence plans (that applies for different types of vehicle) are also allowed.

Furthermore, other welding planning documents can be necessary (e. g. tacking sequence plans, repairing plans, test plans, documents for jigs and tools, inspection documents for non destructive tests, remarks for protection of labour and health, plans for separating of damaged parts, special instructions for electronic parts).

4.1.4 Welding procedure specification

For weld seams with welding quality classes A to C3 welding procedure specifications according to EN 15607 (EN 288-2) and, dependent on the welding process according to series of standards prEN ISO 15609, to EN ISO 14555 or to EN ISO 15620, are necessary. For welding quality class D this is only necessary if the customer demands it.

Dependent on the quality classes according to TC 256 WI 165 the following evidences are necessary for the welding procedure specification:

— Welding quality class A:
Evidence according to series of standards prEN ISO 15614 (EN 288-3, EN 288–4) or to EN ISO 15620 (EN 288-8 only, if an approved WPS according to EN 288-3 or EN 288-4 exists); for materials with R_m > 500 MPa or fully mechanised welding processes: EN 288-3 or EN 288-4. For the WPAR the acceptance criteria of welding quality class A (prEN 15085-3:2004, table 5 and table 6) shall be fulfilled.

— Welding quality class B, C1, C2, C 3:
Evidence according to series of standards prEN ISO 15614, EN ISO 14555, EN ISO 15620 or prEN ISO 15613 (EN 288-8); for materials with R_m > 500 MPa or fully mechanised welding processes: EN 288-3 or EN 288-4.

— Welding quality class D:
Evidence according to prEN ISO 15611 or prEN ISO 15613
(generally recommended; necessary if required by the customer).

4.2 Test specimens

4.2.1 General

Test or work specimens (mock-ups) are sample welded joints to provide evidence of the dexterity of the welder or that the welds have been done in accordance with the conditions.

Test specimens may be necessary

— to check and ensure that the design is satisfactory as specified in prEN 15085-3:2004;

— to guarantee the weld process;

— to demonstrate the qualification of the welders;

— to demonstrate the quality of the weld seam.

Test specimens shall be welded as specified in prEN ISO 15613. They can be welded separately as test plates, as sample sub-assemblies or together with sub-assembly, for example, as an extension of the weld seam.

They should be done and documented in the weld production under the supervision of the responsible welding coordinator.

The test specimens should be listed in the test planning documents or specified by the welding coordinator.

One test specimen can be used for several tasks.