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Bahnanwendungen - Schweißen von Schienenfahrzeugen und -fahrzeugteilen - Teil 2: Anforderungen an Schweißbetriebe

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European foreword

This document (EN 15085-2:2020) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by April 2021, and conflicting national standards shall be withdrawn at the latest by April 2021.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 15085-2:2007. The main changes compared to the previous edition are listed below:

a) Requirements for certification of manufacturer have been deleted;

b) Classification levels and activities of manufacturers have been defined.

This series of European Standards EN 15085 “*Railway applications - Welding of railway vehicles and components*” consists of the following parts:

— *Part 1: General;*

— *Part 2: Requirements for welding manufacturers;*

— *Part 3: Design requirements;*

— *Part 4: Production requirements;*

— *Part 5: Inspection, testing and documentation;*

— *Part 6: Maintenance welding requirements.*

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

Welding is a special process in the manufacture of railway vehicles and their parts.

The general requirements for welding process control are defined in the EN ISO 3834 and EN ISO 14554 series of standards. The EN 15085 series of standards supplements those requirements and defines special requirements for the construction and maintenance of railway vehicles.

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

1 Scope

This document defines the classification levels for welded components, the types of activity typically undertaken and the requirements to be fulfilled to demonstrate conformance.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 15085-1, *Railway applications - Welding of railway vehicles and components - Part 1: General*

EN 15085-3, *Railway applications - Welding of railway vehicles and components - Part 3: Design requirements*

EN 15085-4, *Railway applications - Welding of railway vehicles and components - Part 4: Production requirements*

EN 15085-5, *Railway applications - Welding of railway vehicles and components - Part 5: Inspection, testing and documentation*

EN 15085-6,[1] *Railway applications - Welding of railway vehicles and components - Part 6: Maintenance welding requirements*

EN ISO 3834 (all parts), *Quality requirements for fusion welding of metallic materials*

EN ISO 14554 (all parts), *Quality requirements for welding - Resistance welding of metallic materials*

EN ISO 14731:2019, *Welding coordination - Tasks and responsibilities (ISO 14731:2019)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15085-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

[1] Under preparation. Stage at the time of publication: prEN 15085-6.

3.1
safety relevance
description of the consequences of a failure of a welded component with respect to the effects on persons, facilities and the environment

Note 1 to entry: The safety relevance of a welded component is distinguished as follows:

Low: Failure of the welded component does not lead to any direct impairment of the overall function. Consequential events with personal injuries are unlikely

Medium: Failure of the welded component leads to an impairment of the overall function and/or may lead to consequential events with personal injuries

High: Failure of the welded component leads to consequential events with personal injuries and breakdown of the overall function

Note 2 to entry: Safety relevance assessment should be done according to EN 50126 series.

4 Classification levels and activities of manufacturers

4.1 Classification level

Manufacturers and the components they weld are classified in three levels depending on the safety relevance of the welded component (see 3.1).

The classification levels are defined as follows:

CL 1 For welded railway vehicles and their welded components with high safety relevance.

CL 2 For welded components of railway vehicles with medium safety relevance. (Welded joints with high safety category according to EN 15085-3 are not permitted)

CL 3 For welded components of railway vehicles with low safety relevance. (Welded joints with high or medium safety category according to EN 15085-3 are not permitted)

Table 1 allocates the most common components of railway vehicles in classification levels.

Deviations from the classification given in Table 1 are permitted.

Deviations that result in a lower classification than the ones given in Table 1 shall be documented and justified. The approach for safety relevance assessment given in the EN 50126 series of standards may be used for this purpose.

Table 1 — Allocation of components to their classification level

CL	Component
CL 1	New build, conversion and repair of rail vehicles and their components Examples for components: — bogies (headstocks, solebars, cross bearers, bogie frames); — underframes of locomotives, passenger rolling stock and freight wagons (extensions, solebars, cross bearers, bolsters, assembly); — car bodies (end and side walls, roof, driver cabin, floor plate assembly, energy absorption modules, anti-climbers); — freight wagon assembly (e.g. floor plates of car transporters, load fixing elements); — draw and buffing gear; — supporting frames, brackets and tensioning straps for exterior equipment (e.g. tanks, electrical, air-conditioning and compressed air containers); — wheelset mountings, axleboxes, spring supports, shock absorbers, vibration dampers; — brake equipment (magnetic track brake, brake rods, brake triangles, brake cylinders, brake cross beams); — supporting frames for heavy duty vehicles including road/rail vehicles; — welded components for drag transmission from bogie to vehicle (bolster); — fuel tanks of vehicles; — entrance and end doors (locking systems and structural elements); — step frames, hand rails and railings on the outside of the vehicle or in entry areas; — exterior self-supporting equipment boxes and underfloor containers (fresh water and waste-water containers); — roof construction (pantograph, panelling); e.g. equipment (CL 2), frames (CL 1) — exterior traction and power equipment (transformer casing, transformer suspension, engine suspension, transmission suspension, attachment for traction motor, instrument racks); — power transmission parts (traction coupling, cardan shafts); — turning and tipping equipment (e.g. freight wagon); — obstacle deflectors and snow ploughs; — stanchions and lashing rings; — exhaust systems including pipes; — wheel scotches; — pressure gas tanks, tanks and tank containers of rail vehicles with test pressure [a]; — containers for dangerous materials [a]; — compressed-air reservoirs for rail vehicles [a].

CL	Component
CL 2	New build, conversion and repair of structural parts for rail vehicles, e.g.: — parts inside of passenger coaches (partitions, walls, doors, panelling); — supporting frame, brackets and tensioning straps for interior equipment (electrical, air-conditioning and compressed air installations); — driving cab equipment; — lavatory parts and water containers with installations that are inside of the vehicle body; — interior doors and ramps; — fastenings for brake pipes; — underframe equipment boxes that are supported by another frame; — self-supporting gearboxes and consoles for hand brake operation; — interior traction and power equipment (transformer casing, transformer suspension, engine suspension, transmission suspension, attachment for traction motor, instrument racks); — seating frames; — pressurized air pipes. New build, conversion and repair of non-pressurized containers without special test pressure, e.g.: — payload container for non-dangerous materials; — other transport containers.
CL 3	New build, conversion and repair production of simple attached parts for rail vehicles, e.g: — cranks and levers for various operations; — striking plates; — interior equipment boxes and switch cabinets (including gearboxes and consoles for hand brake operation that are supported by another frame); — holders for index plates; — covers for freight wagons (heat protection on tank wagons); — steps, handrails, railings inside of the vehicle. New build, conversion and repair of parts or trade supply parts for rail vehicles, for instance: — window frames; — ventilation grilles.
[a] If a harmonized standard for a specific product exists, e.g. EN 286 for compressed-air reservoirs or EN 14025 for containers for dangerous materials, it supersedes the requirements of this document.	

For welded joints between components with different classification levels, the higher classification level shall be applied to the entire welded assembly.

The classification level for finishing welding of cast parts shall be the same as the entire welded assembly.

4.2 Type of activity of the manufacturer

A manufacturer of welded railway vehicles or components can undertake one or more of the types of activities listed in Table 2. All activities shall conform to the requirements defined in the relevant part of EN 15085 series of standards.

Table 2 — Types of activity

Type of activity	Indicator	Description
Design	D	Calculation, design and documentation for the production and maintenance of welded railway vehicles and components
Production	P	Manufacturing, modification and testing of welded railway vehicles and components (including replacement parts).
Maintenance	M	Repair of welded railway vehicles and components by welding (including testing).
Purchase and supply	S	Purchase and supply of welded components for new fabrication or maintenance activities without carrying out welding operations

5 Requirements for the manufacturer

5.1 General

The quality requirements for manufacturers performing welding activities on rail vehicles and components are specified in the EN ISO 3834 series of standards. The relevant part of EN ISO 3834 requirements to be applied shall be determined by the classification level as follows: EN ISO 3834-2 for CL 1, EN ISO 3834-3 for CL 2 or EN ISO 3834-4 for CL 3.

For resistance welding EN ISO 14554 shall be considered.

A manufacturer, who fulfils the CL 1 requirements for a particular activity may also perform the same activity on components with CL 2 or CL 3 classification.

A manufacturer, who fulfils the CL 2 requirements for a particular activity may also perform the same activity on components with CL 3 classification.

A manufacturer, who fulfils the CL 3 requirements for a particular activity may only perform the same activity on components with CL 3 classification.

5.2 Welders and welding operators

The manufacturer shall have a sufficient number of welders and operators trained and qualified as defined in EN 15085-4.

5.3 Welding coordination

5.3.1 General

Where welding activities are carried out it is the responsibility of the manufacturer to demonstrate that welding coordination tasks are fulfilled.

The manufacturer shall have an adequate number of suitably qualified welding coordinators, with the relevant technical knowledge and experience, for the tasks they undertake according to EN ISO 14731.

The manufacturer shall provide documentary evidence that the technical knowledge and experience of the welding coordinator(s) is at the required level. Tasks and areas of competence of welding coordinators are defined in Annex A.

For the purpose of this document, three levels of welding coordinators are defined below:

— **Level A**: Personnel with comprehensive technical knowledge according to EN ISO 14731 and adequate professional experience for the relevant scope of application;

— **Level B**: Personnel with specific technical knowledge according to EN ISO 14731 and adequate professional experience for the relevant scope of application;

— **Level C**: Personnel with basic technical knowledge according to EN ISO 14731 and adequate professional experience for the relevant scope of application.

To assist the manufacturer to develop its welding coordination team the guidance in Annex D can be used to evaluate the current level of technical knowledge of its welding coordinators and identify gaps for personnel development.

The manufacturer shall have a written procedure on how to qualify and establish welding coordinators according to this document.

5.3.2 Welding coordinators with comprehensive technical knowledge (Level A)

Personnel shall have comprehensive technical knowledge in welding and related technologies according to EN ISO 14731 relevant to the assigned tasks and obtained by a combination of education, training and / or experience. In addition, an understanding of the EN 15085 series of standards shall be demonstrated.

As guidelines, to demonstrate comprehensive technical knowledge the following qualification may be used:

a) Personnel with qualification according to Doc. IAB-252/EWF-416 – International Welding Engineer (IWE) or European Welding Engineer (EWE);

b) Personnel with qualification according to Doc. IAB-252/EWF-416 – International Welding Technologist (IWT) or European Welding Technologist (EWT) and evidence of comprehensive technical knowledge.

5.3.3 Welding coordinators with specific technical knowledge (Level B)

Personnel shall have specific technical knowledge in welding and related technologies according to EN ISO 14731 relevant to the assigned tasks and obtained by a combination of education, training and / or experience. In addition, an understanding of the EN 15085 series of standards shall be demonstrated.

As guidelines, to demonstrate specific technical knowledge the following qualification may be used:

a) Personnel with qualification according to Doc. IAB-252/EWF-416 – International Welding Technologist (IWT) or European Welding Technologist (EWT);

b) Personnel with qualification according to Doc. IAB-252/EWF-416 – International Welding Specialist (IWS) or European Welding Specialist (EWS) and evidence of specific technical knowledge.

5.3.4 Welding coordinators with basic technical knowledge (Level C)

Personnel shall have basic technical knowledge in welding and related technologies according to EN ISO 14731 relevant to the assigned tasks and obtained by a combination of education, training and / or experience. In addition, an understanding of the EN 15085 series of standards shall be demonstrated.

As guidelines, to demonstrate basic technical knowledge the following qualification may be used:

a) Personnel with qualification according to Doc. IAB-252/EWF-416 – International Welding Specialist (IWS) or European Welding Specialist (EWS);

b) Personnel with qualification according to Doc. IAB-252/EWF-416 – International Welding Practitioner (IWP) or European Welding Practitioner (EWP) with evidence of basic technical knowledge.

5.3.5 Welding coordination organization

The organization of the manufacturer shall be structured to allow welding coordinators to accept their tasks and responsibilities without reservation according to EN ISO 14731 and be able to issue instructions and make technical decisions related to welding independent of the manufacturing operation.

The welding coordinator should be directly employed by the welding manufacturer; however, if the manufacturer subcontracts a welding coordinator, the requirements of 5.3.6 shall apply.

The responsibilities, competencies and the relationships within the organization for all personnel performing managerial, design, production or inspection work, which influence the quality of the welding work, shall be documented. As a minimum, the following items shall be specified and described:

a) tasks of the welding coordinators (when there are several equal-graded welding coordinators, their work and areas of responsibility shall be specified);

b) rules for deputising for the welding coordinator (also applies to recognized subcontracted welding coordinator);

c) activities which require the involvement of the responsible welding coordinators e.g. contract review;

d) measures which are required if the welding coordinator is absent (deputising for the welding coordinator; welding work that is still permitted; cessation of welding work);

e) involvement of the welding coordinators in other processes (e.g. preparation of quotations, design, subcontracting).

The minimum requirements for welding coordination based on classification level (CL) are defined in Annex B.

The manufacturer shall ensure that all of its locations performing welding related tasks have the required number and level of welding coordinators defined in Annex B, based on classification level and activities performed.

For CL 1 the owners of the company / organization, general managers and production managers cannot be recognized as a responsible welding coordinator. For small manufacturers – please see Annex C for definition – recognition of the above mentioned personnel is possible, provided the requirements for welding coordination personnel are met.

For CL 2 and CL 3 recognition of company / organization owners, general manager and production managers is possible, provided the requirements for welding coordination personnel are met.

5.3.6 Subcontracted welding coordinator

Welding coordinators who are not permanently employed by the manufacturer are treated as subcontracted welding coordinators. They can be recognized as the manufacturer's welding coordinator providing the following conditions are fulfilled:

a) The manufacturer shall ensure and demonstrate that the subcontracted welding coordinator is available as necessary to fulfil his tasks according to Annex A.

b) The work of the subcontracted welding coordinator shall be defined according to 5.3.5 and documented. The date, location, duration, and type of activities shall be recorded.

The welding coordination activity is the core issue in the field of application of this series of standards. For this reason, the manufacturer shall take particular care in subcontracting welding coordination task, especially when:

— welding coordinator is subcontracted by a number of companies; or

— the manufacturer subcontracts a number of welding coordinators.

5.4 Inspection personnel

The manufacturer shall have sufficient qualified inspection personnel as defined in EN 15085-5.

5.5 Technical requirements

The manufacturer performing activities P or M (as defined in Table 2) shall have suitable technical equipment according to EN ISO 3834 and EN ISO 14554 for resistance welding, with the following additional requirements as necessary:

a) Roofed, dry, ventilated and sufficiently lit workshops and working places;

b) Areas for storing welding consumables (i.e. filler materials, fluxes, etc.) in accordance with the consumable manufacturer's recommendations;

c) If different materials are welded (e.g. aluminium and stainless steels), separate tools, machines and equipment shall be used for each material, or prior to processing, those shall be cleaned;

d) Suitable power supply;

e) Suitable testing equipment;

f) Lifting gear for transporting and turning parts;

g) Work platforms;

h) Turning devices or manipulators to facilitate welding in the flat position;

i) Clamping devices for heavy welding assemblies (e.g. floor, side, front wall and roof panels, underframes, bogies, containers, and fuel tanks);

j) Devices for straightening;

k) Protection if working with aluminium or stainless steel, to keep away dust, spatter and contaminants which might reduce the corrosion resistance of the parent metal or the quality of the weld.

Additional technical requirements for production and maintenance are described in EN 15085-4 and EN 15085-6.

5.6 Welding procedure specification (WPS)

The manufacturer shall have qualified WPS as defined for production according to EN 15085-4 and for maintenance according to EN 15085-6.

6 Manufacturer's declaration of the welding activities and organization

The manufacturer shall record the following items in a document:

a) The name and address of the manufacturer;

b) The highest classification level (CL) (see 4.1) and type of welded components covered by EN 15085 (see Table 1 for examples of components);

c) The types of activities performed (see 4.2);

d) The location where each activity is undertaken;

e) A list of names, qualifications and levels of welding coordination personnel with clear nomination of the responsible welding coordinator (see 5.1 and 5.3);

f) Executed welding processes, material groups used according to CEN ISO/TR 15608 and the range of thicknesses of base materials, for which the manufacturer is qualified.

If there is a change to any of the above items, the declaration shall be revised accordingly. If the change is related to items a) to e) the customers of projects in progress shall be informed.

The manufacturer shall have readily available documented evidence to demonstrate fulfilment of its declaration.

7 Supervision of subcontracting

Prior to ordering any parts from its subcontractors, the manufacturer responsible for delivery of the final product to the customer shall verify and clearly document that they are able to comply with the requirements of the relevant parts of EN 15085 and any additional requirements

When appropriate the manufacturer responsible for delivery of the final product may also perform inspections at its subcontractors and their suppliers. Such inspections shall be carried out under the supervision of the manufacturer's responsible welding coordinator.

As a minimum for components with CL 1:

a) An evaluation of the subcontractor's component production shall be performed to assess its capability to comply with the relevant parts of EN 15085.

b) Prior to any production activities the manufacturer responsible for the final product shall inform the customer of any subcontracted welded components and their suppliers. Each welded component shall be traceable to its manufacturer.

First article inspection (FAI) on subcontracted welded components shall be performed according to EN 15085-5.

Annex A
(normative)

Tasks and areas of competence of the welding coordinator

Table A.1 specifies the relationship between essential welding related tasks, level of competence (see 5.3) and the manufacturing phases to be performed in relation to EN ISO 14731:2019, Annex B.

Table A.1 — Relationship between essential welding related tasks and the manufacturing phases to be performed

Essential welding related tasks		**Level of competence necessary in manufacturing phase**				
Related clause from EN ISO 14731:2019, Annex B	**Essential welding related tasks to be considered when appropriate**	**Contract analysis phase**	**Design phase**	**Work preparation phase**	**Production phase**	**Post-production phase**
B.1 Review of requirements	— product standard to be used, together with any supplementary requirements	A, (B, C)	—	—	—	—
B.2 Technical review	— parent material(s) specification and welded joints properties;	—	A, (B, C)	—	—	—
	— joint location with relation to the design requirements;	—	A, (B, C)	—	—	—
	— requirements for weld performance class;	—	A, (B, C)	—	—	—
	— location, accessibility and sequence of welds, including accessibility for inspection and non-destructive testing;	—	A, B, (C)	—	—	—
	— other welding requirements, e.g. batch testing of consumables, ferrite content of weld metal, ageing, hydrogen content, permanent backing, use of peening, surface finish, weld profile;	—	A, (B, C)	A, (B, C)	—	—
	— dimensions and detail of joint preparation and completed weld	—	A, B, (C)	—	—	—

Essential welding related tasks		Level of competence necessary in manufacturing phase				
Related clause from EN ISO 14731:2019, Annex B	**Essential welding related tasks to be considered when appropriate**	**Contract analysis phase**	**Design phase**	**Work preparation phase**	**Production phase**	**Post-production phase**
B.3 Subcontracting	With regard to subcontracting, the suitability of any subcontractor for welding fabrication shall be ensured.	A, B, (C)	A, B, (C)	A, B, (C)	—	—
B.4 Welding personnel	With regard to welding personnel, the qualification of welders and welding operators shall be carried out (including training, instruction, performance and assessment)	A, B, (C)	A, B, (C)	A, B, (C)	—	—
B.5 Equipment	The suitability of welding and associated equipment shall be ensured.	A, B, (C)	A, B, (C)	A, B, (C)	—	—
B.6 Production planning	— reference to the appropriate procedure specifications for welding;	—	A, B, C	A, B, C	—	—
	— allocation of qualified personnel	—	—	A, B, C	—	—
B.7 Qualification of the welding procedures	— method and range of qualification with regard to the qualification of the welding procedures	—	A, (B, C)	—	—	—
	— performance and assessment of welding procedure qualification	—	A, (B, C)	A, (B, C)	—	—
B.8 Welding procedure specifications	With regard to welding procedure specifications, the range of qualification shall be determined.	—	A, (B, C)	A, (B, C)	—	—
B.9 Work instructions	With regard to work instructions, the issuing and use of work instructions shall be determined.	—	—	A, (B, C)	—	—

Essential welding related tasks		Level of competence necessary in manufacturing phase				
Related clause from EN ISO 14731:2019, Annex B	**Essential welding related tasks to be considered when appropriate**	**Contract analysis phase**	**Design phase**	**Work preparation phase**	**Production phase**	**Post-production phase**
B.10 Welding consumables	— compatibility	–	A, B, (C)	–	–	–
	— delivery conditions	–	A, B, (C)	A, B, (C)	–	–
	— any supplementary requirements in the welding consumables purchasing specifications, including the types of welding consumable inspection document	–	A, B, (C)	A, B, (C)	–	–
	— storage and handling of welding consumables	–	–	A, B, C	A, B, C	–
B.11 Materials	— any supplementary requirements in the material purchasing specifications, including the types of inspection document for the material	A, (B, C)	A, (B, C)	–	–	–
	— storage and handling of the parent material	–	–	A, B, C	A, B, C	–
B.12 Inspection and testing before welding	— suitability and validity of welder's and welding operator's qualification certificates	–	A, B, (C)	A, B, (C)	A, B, (C)	–
	— suitability and validity of the welding procedure specification;	–	A, B, (C)	A, B, (C)	–	–
	— identity of the parent material and welding consumables	–	–	A, B, C	A, B, C	–
	— joint preparation, fit-up, jigging and tacking	–	A, B, C	A, B, C	A, B, C	–
	— any special requirements in the welding procedure specification (e.g. prevention of distortion)	A, B, C	A, B, C	A, B, C	–	–
	— suitability of working conditions for welding, including the environment	–	A, B, C	A, B, C	A, B, C	–
	— performance and assessment of mock-ups	–	A, B, (C)	A, B, (C)	A, B, (C)	–

Essential welding related tasks		Level of competence necessary in manufacturing phase				
Related clause from EN ISO 14731:2019, Annex B	**Essential welding related tasks to be considered when appropriate**	**Contract analysis phase**	**Design phase**	**Work preparation phase**	**Production phase**	**Post-production phase**
B.13 Inspection and testing during welding	— essential welding parameters	—	—	—	A, B, C	—
	— preheating/interpass temperature	—	—	A, B, C	A, B, C	—
	— cleaning and shape of runs and layers of weld metal	—	—	—	A, B, C	—
	— back gouging	—	—	—	A, B, C	—
	— welding sequence	—	—	—	A, B, C	—
	— correct use and handling of welding consumables	—	—	—	A, B, C	—
B.14 and B.15 Inspection and testing after welding	— use of visual inspection	—	—	—	A, B, (C)	A, B, (C)
	— use of non-destructive testing	—	—	—	A, (B, C)	A, (B, C)
	— use of destructive testing	—	—	—	A, (B, C)	A, (B, C)
	— results and records of post-operations (e.g. post-weld heat treatment, ageing)	—	—	—	—	A, (B, C)
B.16 Non-conformance and corrective actions	With regard to non-conformance and corrective actions, the necessary measures and actions (e.g. weld repairs, re-assessment of repaired welds, corrective actions) shall be determined.	—	—	—	A, (B, C)	A, (B, C)
B.17 Calibration and validation of measuring, inspection and testing equipment	The necessary methods and actions shall be determined.	—	—	A, (B, C)	A, (B, C)	—
B.18 Identification and traceability	The applicable actions shall be determined.	A, (B, C)	A, (B, C)	A, (B, C)	A, (B, C)	A, (B, C)
B.19 Quality records	Preparation and release of the necessary welding records and documents shall be carried out.	A, (B, C)	A, (B, C)	A, (B, C)	A, (B, C)	A, (B, C)

Essential welding related tasks		Level of competence necessary in manufacturing phase				
Related clause from EN ISO 14731:2019, Annex B	**Essential welding related tasks to be considered when appropriate**	**Contract analysis phase**	**Design phase**	**Work preparation phase**	**Production phase**	**Post-production phase**
B.20 Health and safety and environment	With regard to health and safety and environmental issues, all relevant rules and regulations shall be considered	A, B, C	A, B, C	A, B, C	A, B, C	A, B, C

Explanations:

A, B, C fully authorized

(B), (C) for manufacturer with CL 2 and CL 3 fully authorized according to Annex B; for manufacturer with CL 1 limited authorization after agreement with the responsible welding coordinator

– not applicable

Annex B
(normative)

Requirements for the welding coordination of manufacturers

Table B.1 defines the minimum requirements for manufacturers.

Table B.1 — Minimum requirements for manufacturers

Classification level		**CL1**	**CL 2**	**CL 3**
	Type of activity (see Table 2)			
Manufacturer's evidence of compliance (see Clause 6)	P, M, D, S	Required	Required	Required
Weld performance classes (CP) according to EN 15085-3	P, M, D, S	All	CP B2, CP C2, CP C3 and CP D	CP C2 and CP C3 with low safety category and CP D
Quality requirement	P, M, D, S	EN ISO 3834-2 EN ISO 14554-1	EN ISO 3834-3 EN ISO 14554-2	EN ISO 3834-4 EN ISO 14554-2
Responsible welding coordinator, minimum level	P, D	Level A	Level B	Level C
	S	Level B	Level C	Level C [b]
	M	Level A [a]	Level B	Level C

Classification level		**CL1**	**CL 2**	**CL 3**
1st deputy of the responsible welding coordinator, minimum level	D, S	Not required	Not required	Not required
	P	Level A	Level C	Not required
	M	Level A [a]	Level C	Not required
	P (Small Manufacturer) (see Annex C)	Level C	Welder with technical knowledge and experience in welding	Not required
	M (Small Manufacturer) (see Annex C)	Level C [a]	Welder with technical knowledge and experience in welding	Not required
Others deputies, minimum level	D, S	Not required	Not required	Not required
	P, M	Sufficient number of Level C, who can cover the welding activities and the possible shifts with welding.	Sufficient number of Level C, who can cover the welding activities and the possible shifts with welding.	Not required
Welders and operators	P, M	Welders or welding operators shall be qualified according to EN 15085-4.		
Testing personnel	P, M, S	Testing personnel for welding quality tests shall be qualified according to EN 15085-5.		
Welding instruction	P, M	Welding procedure specification (WPS) and / or welding procedure qualification record (WPQR) according to EN 15085-4.		

[a] In case of welding manufacturer (M = maintenance) with several sites, welding coordination activities may be managed as follows:
- One level A responsible welding coordinator for managing welding activities at all sites;
- One level A deputy welding coordinator;
- One level B deputy welding coordinator at each site. In case of "small" site (see Annex C) one level C deputy welding coordinator;
- Other level C deputies welding coordinators if necessary.

[b] Only required for weld performance classes CP C2 and CP C3.

Annex C
(informative)

Guideline to evaluate the size of a welding manufacturer

In order to evaluate the "size of a welding manufacturer (*WM*)" the welding entity may be analysed by the following criteria and evaluated according to Formula WM. For a manufacturer with multiple sites, this evaluation should be done for each site separately.

a The total number of welders and welding operators under the responsibility of the welding coordination team (see 5.3) (The factor is minimum 1.)

b The number of activities performed: only P and/or M = 1; P and/or M plus D and/or S = 2 (The factor is between 1 to 2.)

c The number of types of welded materials: non-stainless steel, stainless steel, non-ferrous metallic alloys. (The factor is between 1 to 3.)

d The number of shifts per day: less than or equal to 2 shifts = 1; more than 2 shifts = 2. (The factor is between 1 to 2.)

e The number of welding processes used (two digits groups according to EN ISO 4063) (The factor is minimum 1.)

f A coefficient for the classification level of the welded sub-assemblies (CL 1 = 10, CL 2 = 5, CL 3 = 1)

Formula WM:

$$WM = a \cdot b \cdot c \cdot d \cdot e \cdot f$$

If this product "*WM*" is less or equal than 1500, the manufacturer should be considered as "small manufacturer".

Annex D
(informative)

Guidance for the evaluation of the technical knowledge of welding coordinators

The level of technical knowledge indicated in Table D.1 is defined as follows:

1: Basic knowledge of the subject

2: Application and use of principles and rules

3: Overall mastery of the subject

4: Ability to develop method and procedures

Table D.1 — Requested technical knowledge of welding coordinators with different levels of competence (see 5.3)

1 Welding processes and equipment	Level A	Level B	Level C
1.1 Cutting and other edge preparation processes			
Understand in detail/acquire a full knowledge of/explain/interpret the basic principles and scope of application of the most common cutting and edge preparation processes used in welded construction and their principles of action, including equipment, procedures and common problems. Specifies and knows how to inspect the use of torch, plasma, gouging electrode and air arc cutting processes.	3	2	2
1.2 Heating and heat straightening			
Understand in detail/acquire a full knowledge of/explain/interpret the basic principles and scope of application of the heating, flame rectification and heat straightening processes used in welded construction and their principles of action, including equipment, procedures and common problems. Specifies and knows how to inspect use of the processes.	4	2	2
1.3 Preheating, post-heating			
Understand in detail/acquire a full knowledge of/explain/interpret the basic principles and scope of application of the preheating (including preheating of weld zones when the ambient temperature is below 5 °C) and post-heating processes used in welded construction and their principles of action, including equipment, procedures and common problems. Specifies and knows how to inspect use of the processes.	4	3	2
Knowledge of weld sequence plans for manufacturing	3	3	2

2 Materials and their behaviour during welding	Level A	Level B	Level C
2.1 Designation of base materials			
Knowledge of how to search for and use standards for definition, designation and classification of the metallic materials used.	3	2	2
Be able to determine the equivalence of a material (including cancelled designations).	4	1	1
2.2 Heat treatment of base materials and welded joints			
Understand in detail/Give the principles of materials' properties when they have been heat-treated. Including stress-relief heat treatment applications (general or localized).	4	2	2
2.3 Fatigue cracking phenomena			
Understand the basic mechanisms of fatigue cracking and how variables have an influence on crack formation. Be able to propose solutions to improve the rail component's service strength.	3	1	1
2.4 Thermo-mechanically treated and high strength low alloy steels, if used			
Knowledge of how to weld thermo-mechanically treated steels and high strength low alloy steel	3	1	1
Understand the influence of repair welding on thermo-mechanically treated steels and high strength low alloy steels	3	1	1
2.5 Aluminium and aluminium alloys, if used			
Knowledge of how to weld aluminium and its alloys.	3	2	2
Knowledge of how to work with aluminium and its alloys.	3	2	2
Knowledge of the different welding processes for aluminium and its alloys.	3	3	2
Understand the influence of maintenance welding on aluminium and its alloys.	3	2	1

3 Design and calculation	Level A	Level B	Level C
3.1 Behaviour of welded structures under dynamic loading			
Explain the phenomenon of fatigue.	3	2	1
Fully understand the development of fatigue, the calculation of loading cycles, the influence of notches and ways to prevent them.	3	2	1
Understand the method for determining a stress category (EN 15085-3).	3	2	1
Knowledge of the fundamental design rules for a component subject to fatigue.	3	2	1
3.2 Finishing treatment of welds as per EN 15085-3			
Understand and explain the gains expected of treatments to improve weld shape and finishing treatments in order to reduce residual stress.	3	2	1
Knowledge of how to specify and inspect the use of finishing treatment.	3	2	1
3.3 Structural detailing of railway vehicles and components as per EN 15085-3			
Understand the specific requirements for the design of structural members in this field of application with regard to weld calculation.	3	2	1
Understand the design documents according to EN 15085-3 and other relevant standards, technical specifications and guidelines	4	3	2

4 Fabrication, applications engineering	Level A	Level B	Level C
4.1 Quality control during manufacture			
Understand in detail the requirements and function of quality control in manufacturing. Know precisely the roles of the welding coordinator as per EN ISO 14731 and EN 15085-2. Supervise traceability and control.	3	3	3
Knowledge of work preparation (industrialization) of welded components according to EN 15085.	3	3	2
Knowledge of the necessary welding planning documents according to EN 15085-4.	4	3	3
Knowledge of weld sequence plans for manufacturing.	3	3	2
4.2 Health and safety			
Understand in detail/acquire a full knowledge of/explain the health and safety hazards involved in welding and related techniques and the methods to mitigate them. Recommend and specify risk prevention techniques and personal and collective protective equipment.	3	2	2
4.3 Non-destructive testing			
Knowledge of the use and ability to explain the scope of non-destructive tests applied to welded components. Supervise inspection and testing.	3	2	1
Understand in detail/acquire a full knowledge of/explain the principles of visual inspection. Interpret the appropriate standards (e.g. EN ISO 5817, EN ISO 10042 and EN 15085-3).	3	2	2
Be able to interpret a defect and link it to its potential causes.	3	2	1
4.4 Repair welding			
Knowledge of repair welding problems both in manufacturing and in service.	4	4	3
Knowledge of maintenance operations and the related operating criteria.	4	3	2
Coordinate feedback from maintenance welding operations.	4	3	2
Develop weld sequence plans for repair welding	3	3	2
4.5 Fitness for purpose			
Acquire an understanding of the need to have and use critical evaluation techniques in engineering. Coordinate feedback relating to the analysis of welded assembly failures.	3	2	1
Knowledge of the in-service behaviour of the components whose welding processes are under his/her supervision.	3	2	1

5 Welding quality management	Level A	Level B	Level C
5.1 Review of requirements			
Check the scope of validity of the EN 15085 classification (classification level, materials, processes and thicknesses ranges used).	3	2	2
Propose an action plan in the event of differences between the requirements and the expertise.	4	2	1
Know and be able to apply the Quality Management System e.g. EN ISO 9000/ISO TS 22163.	3	2	1
Know and be able to apply the welding quality requirements as per EN ISO 3834.	3	2	2
Know and be able to apply the welding requirements for rail vehicles and components as per EN 15085.	3	3	3
5.2 Subcontracting			
Check the expertise of any subcontractor in the field of railway vehicle welding.	4	2	1
Depending on the classification level, perform the appropriate audits (EN 15085-2:2020, Clause 7).	4	2	2
5.3 Welding personnel			
Define and supervise welders' qualifications.	4	3	3
Communicate, raise awareness of all the actors regarding welding quality.	4	3	3
Knowledge of the production weld tests and the necessity to check the skill of the welders according to EN 15085-4.	4	3	3
Support, train and supervise welders.	3	3	3
5.4 Qualification of welding procedures			
Determine the method of qualification of welding procedures, taking into account the requirements of EN 15085-4 and the scopes of validity.	4	3	3
Knowledge of the production weld tests and the necessity to check a welding procedure according to EN 15085-4.	4	3	2
5.5 Welding consumables			
Check the compatibility and delivery and storage conditions of filler metals.	3	2	2
Determine the conformity of filler metals by the certificate review as per EN 10204 and conformity with EN ISO 544 and EN 13479 (including CE marking).	3	2	2
5.6 Materials			
Determine conformity of the base materials by the material certificate review as per EN 10204.	3	3	2
Ensure the traceability of certificates until cutting the base material.	3	3	3
Check the storage and handling of base materials.	3	3	3

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