
**Railway infrastructure — Rail
welding —**

Part 1:
**General requirements and test
methods for rail welding**



This document is a preview generated by EKO



COPYRIGHT PROTECTED DOCUMENT

© ISO 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword.....	iv
Introduction.....	v
1 Scope.....	1
2 Normative references.....	1
3 Terms and definitions.....	1
4 Rail welding processes.....	3
5 General process of rail welding.....	3
6 Approval/homologation of welding processes.....	4
6.1 General.....	4
6.2 Non-destructive testing (NDT).....	4
6.3 Slow-bending test.....	4
6.4 Past-the-post fatigue test.....	5
6.5 Macro examination.....	5
6.6 Micro examination.....	5
6.7 Hardness test.....	5
6.8 Drop-hammer test (optional).....	5
6.9 Recording of defects.....	5
6.10 Test result reports.....	5
7 Acceptance in factory/track.....	6
7.1 General.....	6
7.2 Weld inspection.....	6
7.3 Straightness inspection.....	6
7.4 Documentation.....	8
8 Requirement on contractor/welder/inspector.....	8
8.1 Contractor.....	8
8.2 Welder, operator and inspector.....	8
8.3 Audit.....	9
Annex A (normative) Slow-bending test method for rail foot in tension.....	10
Annex B (normative) Slow-bending test method for rail head in tension.....	13
Annex C (normative) Three-point bending fatigue test.....	16
Annex D (normative) Four-point bending fatigue test.....	18
Annex E (normative) Macro examination.....	20
Annex F (normative) Micro examination.....	21
Annex G (normative) Hardness test.....	24
Annex H (normative) Drop-hammer test.....	26
Annex I (normative) Recording of defects on fracture faces.....	28
Annex J (normative) Ultrasonic testing.....	30
Annex K (normative) Magnetic particle testing.....	36
Annex L (normative) Dye penetrant testing.....	38
Annex M (informative) Examples of acceptance criteria for straightness.....	40
Bibliography.....	43

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 269, *Railway applications*, Subcommittee SC 1, *Infrastructure*.

A list of all parts in the ISO 23300 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Rail welding is an essential technology in the railway track domain for reducing noise and vibration on rail joints, improving ride comfort and reducing maintenance costs.

Since environments (e.g. geography, deployable resources and energy affairs) differ by region and railway line, rail welding processes have been developed to meet the requirements and conditions of each environment. As a result, various rail welding processes exist, e.g. flash butt welding (FBW), gas pressure welding (GPW), aluminothermic welding (ATW) and enclosed arc welding (EAW).

For this reason, a general rail welding standard on an international level covering conventional rail welding processes was deemed necessary. This document contributes to the development of railways by ensuring the quality of welded joints in terms of enhancing the reliability of train operation, improving the welding work efficiency and facilitating the introduction of new procedures.

This document covers the general requirements for rail welding and is used in conjunction with the subsequent parts of the ISO 23300 series, which cover the specific requirements for each welding process (such as FBW, GPW, ATW and EAW).

Railway infrastructure — Rail welding —

Part 1:

General requirements and test methods for rail welding

1 Scope

This document specifies requirements concerning the approval and/or homologation of welding processes, contractors, welders, inspectors and acceptance of welded joints in the factory and/or track.

This document is applicable to the following rail welding processes:

- a) flash butt welding (FBW);
- b) gas pressure welding (GPW);
- c) aluminothermic welding (ATW);
- d) enclosed arc welding (EAW).

In this document, 43 kg/m to 75 kg/m new flat-bottomed rails of the same profiles and same steel grades are used as the subject of welding.

This document does not specify requirements or test methods specific to each welding process. These are to be prescribed in the subsequent parts of the ISO 23300 series.

Concerning butt welding, this document is restricted to connecting rail ends.

This document does not cover the welding for construction of crossings, railway switches, signal bond installation or restoration of rails.

This document does not cover any safety regulations for welding operations.

In this document, the qualifications of individuals and organizations that are approved by the railway authority for rail welding are not specified.

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.

ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method*

ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method*

ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.