
Requirements for Weld Suppliers

AA 4.2

1 Purpose

Ensure the necessary welding quality of purchased parts.

2 Scope

For all suppliers of welding parts for MAHLE Behr Industry GmbH & Co. KG (group).

Customer requirements for parts with a welded design that go beyond the requirements of these instructions must be observed. Corresponding specifications can be found in our construction documents (drawings), such as:

Requirements for welding **rail vehicle parts** according to DIN EN 15085. The welding permit is issued by an authority recognized by the EBA or by the approval authority of the respective country (such as SLV or TÜV).

Requirements for welding **aviation equipment** are listed in the following specifications:

DIN 29595, fusion-welded metal components for aviation and aerospace.

DIN 2303; quality requirements for production and maintenance organizations of military structures.

These specifications refer to other specifications that must be correspondingly observed.

3 Terms and Definitions

MBI:	MAHLE Behr Industry (group)
MS:	Management System
DB-AG:	Deutsche Bahn AG
EBA:	Federal Railroad Bureau (Eisenbahn-Bundesamt)
LBA:	Federal Aviation Bureau (Luftfahrt-Bundesamt)
SFI:	Weld engineer
SLV:	Institute for Weld Training and Testing (Schweißtechnische Lehr- und Versuchsanstalt)
TÜV:	Technical Inspection Agency (Technischer Überwachungsverein)
AK 51, 52, 54, 55:	Acceptance codes according to AA 6.3.2-7

4 Responsibilities

See 5 Procedures.

The responsibilities for the content of sections 5.1 to 5.7 must be determined by the internal work instructions for the suppliers.

5 Procedures

The following sections describe all requirements for supplier welding. The requirements are examined by Quality Assurance when evaluating/ approving suppliers according to VA 4.2.2.1. If deviations occur, proceed according to VA 4.2.2.1.

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The validity of the supplier's welding permit is monitored by the MBI welding supervision personnel according to VA 7.3-4.

The supplier must have all subsequently cited requirements in the form of valid work / procedural instructions or other documents.

5.1 Weld Supervision

The responsible welding supervisor must at least be qualified as a professional welder (must have documentation).

In the case of CL1 parts according to DIN EN 15085 and aviation parts (parts with AK 51, 52, 54, 55; see order or construction documentation), the following activities must be done by a welding engineer (SFI):

- Contract inspection according to Section 5.2
- Inspection and release of weld drawings
- Creation of welding instructions (WPS) for all seams (containing for example the welding process, welding parameters, welding sequence and implementation, intermediate inspections, preheating and heat after-treatment).
- Recognition of welding instructions according to DIN EN ISO 15613 as a minimum requirement
- Recognition of new welding procedures/ instructions
- Creation of welding plans and other manufacturing specifications concerning welding.
- Planning and preparation of welder tests (new and refresher tests).
- Administration of welder certifications and records.
- Ensure that only qualified welders are used.
- Practical and theoretical training and instruction of welding personnel.
- Proper use of welding equipment and auxiliary equipment.
- Ensure that only serviced and inspected devices are used.
- Maintain company welding permit (for example, for welding rail vehicle parts: welding permit according to DIN EN 15085)
- Before work starts, provide timely information on the extension (send documentation) or loss of the welding permit or certificate to MBI.
- For aviation equipment, the requirements as per DIN 29595 and guidelines DIN 2303 and their references to other specifications must be maintained.
- Non-destructive tests are specified by MBI in the drawings or welding plan or by the welding engineer (SFI). Ensure that the non-destructive tests specified by MBI (or by the SFI supplier) in the drawings or welding plan, are performed by appropriate personnel.
- Inspections (visual inspections or other non-destructive inspections) of the welded components and samples by qualified personnel (according to DIN EN 473, DIN EN 4179) (or inspection by an external institution with corresponding qualifications).

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- Overall evaluation of the welding of a component, evaluation of inspection results. Making improvements to the welding process.
- If subcontractors are used for welding, they must also demonstrate corresponding qualifications according to this work instruction. MBI Quality Assurance releases the subcontractors (see Section 5.7).
- If the supplier develops and designs the welded components or aggregates (such as impellers - welded rotors), a welding supervisor must also be hired in addition to the professional welder.
- Constructions for rail vehicles must correspond to DIN EN 15085 and FSF drawing guidelines. These are to be provided to MBI upon request.

5.2 Contract Inspection

Before the supplier confirms the order, the supplier must ensure in a contract examination that all welding requirements can be met. This also includes:

- Inspection from an engineering perspective of the layout, design and execution of the weld joints according to the design documents (drawings). Exposed flaws are to be reported to MBI before confirming the order.
- Check of completeness of the specifications.

5.3 Materials

Materials are to be used according to the specifications.

Basic materials must be identified (short description or standard materials, possibly also colored). The identification must be designed to last during transport and storage.

The following applies to the identification and storage of welding filler materials:

- Welding rods must also be individually identified by flags or embossing
- Welding wire must also be identified on the roll or box
- Bar electrodes must also be identified by stamping the casing
- Appropriate storage conditions (if applicable a special storage room for special materials).

5.4 Welder Tests and Welding Permits

The welding supervisor is responsible for obtaining and maintaining welder qualification according to Section 5.1. The welders' qualifications must correspond to the requirements of DIN EN 287-1, DIN EN ISO 9606-2 for aviation equipment (valid certification must be presented).

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5.5 Equipment

Welding equipment is subject to the testing and equipment-monitoring program. Welding and auxiliary welding devices must be serviced (see Section 5.1).

5.6 Inspections and Documentation

The visual inspection of the welded components for completeness, dimensional accuracy, weld appearance, shape and limit deviations can be done by the welder.

If necessary, the visual inspection and all additional non-destructive inspections may only be done by qualified and certified persons (qualified inspection personnel according to DIN EN 473, or DIN EN 4179, such as the dye penetration test, magnetic powder test, ultrasound test).

For all inspection plans provided by MBI (corresponding to the parts list), the inspections by the welder must be confirmed by a signature on the inspection plan. In addition (corresponding to instructions in the inspection plan), the welding supervisor must sign the inspection plan. All requirements in VA 4.2 must be maintained.

First samplings and raw part inspections must be done at the suppliers for certain parts corresponding to the specifications in VA 4.2. The MBI welding supervisory personnel is responsible for accepting the welding jobs, and they must be informed in a timely manner (1 week) before acceptance.

5.7 Sub-Contracting

The manufacture of welded parts may only be assigned to subcontractors after approval has been given by MBI Quality Assurance. The subcontractors must meet all the requirements of these procedural instructions.

Suitable companies must be chosen to heat-treat weld seams done by subcontractors. The welding supervisor is to be included in the selection process.

5.8 Welding Permits

The supplier must present a welding permit according to DIN EN 15085 that demonstrates the following

- The welded parts are used for systems that are installed in federal railroads maintained by the Federal Railroad Bureau Authority (EBA); that is, at least for all parts intended for DB-AG (as the final customer). This requirement systems from the "Eisenbahn Bau- und Betriebsordnung" (EBO) [Regulations for the Construction and Operation of Railways]; corresponding specifications can be found in the MBI construction documents (drawings).
- This standard is binding in customer contracts.

If these provisions are inapplicable, the company does not have to have a welding permit. However, all the requirements of AA 4.2 must be met.

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6 Further Applicable Documents

Procedural and work instructions for MBI locations are assigned to the respective (MS).

VA 4.2:	Quality Requirements for Purchased and In-House Parts
VA 4.2.2.1:	Supplier Evaluation
VA 7.3-4:	Welding
AA 6.3.2-7:	Acceptance Codes
DIN EN 287-1:	Certification of Welders (Steel)
DIN EN ISO 9606-2:	Certification of Welders (Aluminum)
DIN EN ISO 15613:	Requirements and Qualification of Welding Processes of Metal Materials – Qualification Based on Prioritized Work Test
DIN EN 15085:	Welding of Rail Vehicles and Rail Vehicle Parts
DIN 29595:	Fusion-Welded Metal Components for Aviation and Aerospace
DIN EN ISO 14731:	Welding Supervision, Duties and Responsibilities
DIN EN ISO 3834:	Quality Requirements for Fusion-Welding of Metal Materials
DIN EN 473:	Qualification and Certification of Personnel for Non-Destructive Testing
DIN 29591:	Aviation and Aerospace Certification of Welders
DIN EN 4179:	Aviation and Aerospace Qualification and Approval of Personnel for Non-Destructive Testing
DIN 2303:	Quality Requirements for Production and Maintenance Organizations of Military Structures