A Supersedes: VA 918 490, March 2020

Procedural Instructions - VA 918 490

"Certification of filler metals and welding consumables used for joint welding and build-up welding on metallic materials by DB Systemtechnik"

Release date: January 2024

Application note: **The German text of these Procedural Instructions VA 918 490 will be binding.**
The English translation is for information purposes only.

QUALITY SYSTEM CERTIFICATION
DNV·GL
ISO 9001

Foreword

DIN EN 13479 only still applies to filler metals for fusion welding of metallic structures or composite structures made from metal and concrete in built structures. With the new standard, the chemical composition of the filler metal is the only verifiable product characteristic. The product characteristics dimensions and shape as well as mechanical properties no longer need to be verified.

Note 1: the ZTV-ING demands as evidence of welding consumables:

> "Approvals for welding consumables including certificates of conformity from DB Minden and suitability certificates in accordance with DIN EN 13479 with an approval certificate in accordance with DIN EN 14532-1.

Note 2: the ZTV-W demands as evidence for welding consumables:

> “All welding consumables must meet the requirements of DIN EN 13479 and have a CE label. For the regulated area of hydraulic steel construction, the suitability test must be carried out in accordance with DIN EN 14532-1. The product characteristics of size and shape, mechanical properties of the weld metal and the welded joint and chemical composition must be checked and must correspond to the associated product standards in accordance with DIN EN 1090-2. "

For the regulated areas of railway bridge construction and other engineering structures, rail vehicle construction work and welding on rails and permanent way components, the following product characteristics still apply to filler metals

- Dimensions and shape of the filler metal,
- Mechanical properties of the weld metal and the welded joint,
- Chemical composition of the filler metal.

The type qualification testing of the filler metals is conducted, as previously, in accordance with DIN EN 14532-1 (for steel filler metals) and DIN EN 14532-3 (for filler metals).

The requirements for factory production control as per the system 2+ are described for the first time in section 3.

Contents **Page**

Annexes:

1. General information, Scope

These procedural instructions (hereafter: "PIs") apply to the testing, certification and monitoring of filler metals and welding consumables (excluding shielding gases) by DB Systemtechnik in the sectors:

- **Rail vehicle construction** in accordance with the DIN EN 15085 series of standards, DIN 27201-6 and DB Guidelines 951.0010 and 951.0020,
- **Welding on rails and permanent way components** in accordance with DB Guideline 824,
- **Railway bridge construction work and work on other engineering structures** in accordance with DB Guideline 804.

These PIs contain

- the requirements for the **product certification of filler metals** by DB Systemtechnik (section 2),
- the requirements for the **certification and monitoring of factory production control** (hereafter "FPC") as per the system 2+ in accordance with the Regulation (EU) 305/2011, Annex V, section 1.3,
- the **certification procedure** (section 4),
- the requirements for **marking/labelling of the filler metals** (section 6).

Any references in the following sections to other sets of rules and regulations (e.g. DIN, DIN EN standards) or to annexes to these PIs are references to those sets of rules and regulations or annexes as amended from time to time.

2. Product certification requirements

2.1 Marking/labelling of the filler metals

The filler metals shall be marked/labelled in accordance with the DIN EN filler metal standard that applies to the filler metal. The marking/labelling system "A" applies to steels.

With filler metals for unalloyed steels, the marking/labelling must include the marks for the minimum yield strength, the Charpy V-notch impact energy and the chemical composition.

2.2 Verification of type qualification testing and the factory production control

The following provides the basis for product certification:

2.2.1 Verification of the type qualification testing of the filler metal

- **Steel – filler metals**:
  Type qualification testing as per DIN EN 14532-1 - Welding consumables - Test methods and quality requirements - Part 1: Primary methods and conformity assessment of consumables for steel, nickel and nickel alloys as well as for build-up welding DIN EN 14532-2 - Welding consumables - Test methods and quality requirements - Part 2: Supplementary methods and conformity assessment of consumables for steel, nickel and nickel alloys.
  The requirements in **Annex 4** of these PIs also apply to the type qualification testing.
- **Aluminium – filler metals**:
  Type qualification testing as per DIN EN 14532-3 - Welding consumables - Test methods and quality requirements - Part 3: Conformity assessment of wire electrodes, wires and rods for welding of aluminium alloys.
  The requirements in **Annex 4** of these PIs also apply to the type qualification testing.
- **Filler metals for rail joint welding and rail resurfacing by welding** in accordance with DB Guideline 824:
  The requirements in **Annex 5** also apply to the product certification.
  Before filler metals are used for work for DB AG, **operational testing** shall be carried out by DB Netz AG in addition to type qualification testing.

The type qualification testing as set out in DIN EN 14532 shall be verified in the form of a type qualification report by one of the bodies stated under 4.1.2 and by one of the bodies stated under 4.1.3 for rail joint welding and rail resurfacing by welding in accordance with DB Guideline 824. The test results shall be enclosed with the type qualification report.

2.2.2 Verification of the factory production control

The initial inspection of the FPC as per the system 2+ in accordance with Regulation (EU) 305/2011, Annex V, section 1.3 shall be verified by means of certification by one of the bodies listed under 4.1.2.

3. Factory production control requirements

3.1 Set-up of an FPC

Manufacturer, supplier or trader of filler metals shall create, document and maintain an FPC system to ensure that the marketed products match the stated execution criteria. The FPC shall correspond to the system 2+ in accordance with Regulation (EU) 305/2011, Annex V, section 1.3.

The FPC shall include the work instructions, the regular tests, the analyses and/or the assessments as well as the use of the results in order to monitor raw materials and other incoming materials, the production process and the product.

The manufacturer must introduce work instructions to ensure that the product tolerances in the manufacture of the filler metal match the values specified in the suitability test. With regard to the test scope and frequency, DIN EN 14532-1:2004, Annex N (steel filler metals) or DIN EN 14532-3:2004, Annex H (Al filler metals) shall apply. Requirements, limits and tolerances shall correspond to section 3.4 of these PIs.

3.2 Verification of the FPC

The FPC shall be verified via an initial inspection and continuous monitoring (once a year) by one of the certification bodies listed in section 4.1.2.

3.3 Product testing and evaluation

The manufacturer shall create work instructions to ensure that the specified values of all stated properties were met. This involves the following properties:

- Dimensional and shape tolerances,
- Mechanical properties,
- Chemical composition.

Control measures for mechanical properties and for the chemical composition are defined in DIN EN 14532-1:2004, Annex N (steel filler metals) or DIN EN 14532-3:2004, Annex H (Al filler metals). Dimensions and shape must be tested with each batch or each production unit.

3.4 Test requirements

The following requirements apply:

3.4.1 Dimensions and shape

Dimensional and shape tolerances shall meet DIN EN ISO 544

3.4.2 Mechanical properties

The mechanical properties shall meet the specific requirements of the applicable filler metal classifying standard. In those cases where the requirements for the specific properties are not stipulated in the classifying standard, the relevant subsections in DIN EN 14532-1 (steel filler metals) or DIN EN 14532-3 (Al filler metals) shall be followed.

3.4.3 Hazardous substances

All-weld metal must not separate out any hazardous substances, which exceed the permissible limits stated in the applicable European standards for the material or in national guidelines of the respective Member State.

3.4.4 Chemical composition

The chemical composition shall comply with the relevant filler metal classifying standard.

4. Certification procedure

4.1 Certification and testing bodies

4.1.1 The certification body for product certification is:

DB Systemtechnik GmbH
Werkstoff- und Fügetechnik, Fachberatungsstelle Schweißtechnik
Bahntechnikerring 74, 14774 Brandenburg-Kirchmöser, Germany

Head: Mr Kupiec
Tel.: +49 3381/812-576
Mobile: +49 171 2958435
E-mail: sebastian.kupiec@deutschebahn.com

Deputy: Mr Klatt
Tel.: +49 3381/812-626
E-mail: andreas.klatt@deutschebahn.com

4.1.2 The certification bodies for the FPC system and product testing centres are:

- TÜV Nord Hamburg
- TÜV Rheinland Köln
- TÜV Süd München
- TÜV Thüringen

Contact persons for the individual TÜVs can be obtained from the certification body for product certification.

4.1.3 The product testing centre for filler metals used for permanent way welding work is:

- DB Netz AG, Fachstelle Schienentechnik
- Anerkannte EBA-Prüfsachverständige, Tätigkeitsbereich Oberbauschweißen
- DB Systemtechnik, Oberbauschweißtechnik

4.2 Initial product certification

Applications for product certification shall be submitted to DB Systemtechnik by the applicant (manufacturer, supplier or trader) using the application form shown in **Annex 1, Part 1**.

The chosen brand name shall **not** be used by another manufacturer, supplier, trader, or used within a Group of its Group subsidiary companies. This also applies to different spellings.

The application shall be accompanied by:

- A description of the product and a current TÜV identification sheet.
- If filler metals are manufactured in several production facilities:
  - A list of all production facilities (**manufacturer's certificate**) and the declaration of consent using the pre-printed form from **Annex 1, Part 1**.
  - Evidence that all production facilities manufacture the product according to the same specification.
- When purchasing semi-finished products (pre-drawn wires, strips, etc.):
  - Evidence of the same chemical and mechanical properties of the original filler metal subjected to type qualification testing.
  - Evidence of the FPC by the supplier/manufacturer, which certified by one of the bodies stated under 4.1.2.
- The type qualification report and the results of the type qualification testing of the filler metal.
  - The type qualification report and the results of the type qualification testing should not be more than 15 years old. Following its initial approval, the filler metal was also extended demonstrably as per DIN EN 14532-1:2004, *Annex O (steel filler metals) and/or DIN EN 14532-3:2004, Annex I (Al filler metals). If no mechanical properties* were to have been demonstrated for wire electrodes within the extension, up-to-date evidence (no more than 7 years old) *of the mechanical properties shall be provided.*
- Evidence of the initial inspection of the FPC or, if already available, evidence of the monitoring of the FPC (monitoring report and manufacturer check list).

Application documents shall be sent by **e-mail** to the e-mail addresses listed in 4.1.1.

Note: all documents to be submitted shall be presented in German language version.

4.3 Transfer of product certification

Product certification can be transferred from **an original manufacturer** to the name of a supplier or trader, provided the following requirements are met:

- The origin and composition of the filler metal or welding consumable for which an application is being made is identical to that at the time of the initial product certification,
- The owner of the initial product certification (original manufacturer) shall provide a declaration of consent stating that the owner agrees with the proposed transfer to the name of the supplier or trader,
- The product to be transferred shall have a brand name different from that of the original product; the chosen brand name shall **not be used autonomously** by the manufacturer, the supplier, the trader or used within a group and of its Group subsidiary companies,

Note: Several original manufacturers cannot be transferred to a single brand name.

Applications for product certification shall be submitted to DB Systemtechnik by the applicant (supplier or trader) using the application form shown in **Annex 1, Part 2**. Applications shall be accompanied by:

- A description of the product and a current TÜV identification sheet.
- Manufacturer's certificate including declaration of consent as per **Annex 1, Part 2**. "Transfer of DB certification".
- Evidence of initial inspection of the FPC system of the Applicant (certificate, report and manufacturer check list) or, if already provided, evidence of monitoring of FPC system (monitoring report and manufacturer check list).

The application documents shall be **e-mailed** to the e-mail addresses stated in 4.1.1.

Note: all submitted documents shall be submitted in German language version.

4.4 Extension of product certification

In order to maintain the validity of a certificate after its period of validity has expired, evidence shall be provided to DB Systemtechnik that the requirements of these PIs are still being met. Applications to extend product certification shall be submitted to DB Systemtechnik **before** the period of validity expires using an application form as shown in **Annex 1, Part 3**. The application shall be accompanied by:

- A list of all filler metals for which extensions are being sought using the sample form shown in **Annex 1, Part 3** "Extension of DB certification".
- A list showing the following shall be enclosed for the filler metals for which an extension is sought:
  - In case of approval transfers, all manufacturers/suppliers shall be stated for each approval.
  - If a filler metal is manufactured in several production facilities, all production facilities shall be stated for each approval.
  - When purchasing semi-finished products (pre-drawn wires, strips, etc.), all production facilities shall be stated for each approval.
- Where the applicant is not a manufacturer, the manufacturer's declaration of consent shall be obtained from the original manufacturer (**Annex 1, Part 3)**.
- Evidence of the monitoring of the applicant's FPC.
- The current TÜV identification sheet for each filler metal.

Application documents shall be sent by **e-mail** to the e-mail addresses listed in 4.1.1.

Note: all documents to be submitted shall be presented in German language version.

4.5 Product certification modification/ extension

Applications for certification shall be submitted to DB Systemtechnik by the applicant using the application form shown in **Annex 1, Part 4**. **Only** the original manufacturer can apply for an extension of the scope of the original product. An application can then be submitted for a modification if the modification is within the scope of the original product.

The application shall be accompanied by:

- A current TÜV identification sheet.
- If filler metals are manufactured in several production facilities:
  - A list of all production facilities using the pre-printed form in Annex 1.
  - Evidence that all production facilities manufacture the product according to the same specification.
- When purchasing semi-finished products (pre-drawn wires, strips, etc.):
  - Evidence of the same chemical and mechanical properties of the original filler metal subjected to type qualification testing.
  - Evidence of the FPC by the supplier/manufacturer, which certified by one of the bodies stated under 4.1.2.
- The type qualification report and the results of the type qualification testing of the filler metal.
  - The type qualification report and the results of the type qualification testing should not be more than 15 years old. Following its initial approval, the filler metal was also extended demonstrably as per DIN EN 14532-1:2004, *Annex O (steel filler metals) and/or DIN EN 14532-3:2004, Annex I (Al filler metals). If no mechanical properties* were to have been demonstrated for wire electrodes within the extension, up-to-date evidence (no more than 7 years old) *of the mechanical properties shall be provided.*

Application documents shall be sent by **e-mail** to the e-mail addresses listed in 4.1.1.

Note: all documents to be submitted shall be presented in German language version.

4.6 Change of company name

Applications for a change of company name for existing DB certifications shall be submitted to DB Systemtechnik by the applicant (manufacturer) using the application form shown in **Annex 1, Part 5**. Applications shall be accompanied by:

- Evidence of initial inspection of the FPC system (certificate, report and manufacturer check list) or, if already provided, evidence of monitoring of FPC system (monitoring report and manufacturer check list).

The application documents shall be **e-mailed** to the e-mail addresses stated in 4.1.1.

Note: all submitted documents shall be submitted in German language version.

4.7 Production relocation/extension

If a product is relocated/extended, an FPC in accordance with System 2+ pursuant to Regulation (EU) 305/2011, Annex V, Section 1.3 shall generally be set up and inspected for all new production facilities. The inspection of the FPC and the evidence that the original filler metal subjected to type qualification testing is identical for all new production facilities shall be provided to DB Systemtechnik via a monitoring report and accompanied by one of the bodies stated in 4.1.2.

4.8 Approval certificate

After examining the documents submitted, DB Systemtechnik shall issue an approval certificate on the basis of these PIs (see sample certificate in **Annex 2**).

The approval certificate is published exclusively via the "online register EN 15085" of SLV Halle (see also section 4.10).

The approval certificate shall include the following information:

- **Manufacturer** or **supplier** or **trader.**
- **Filler metal**, specifically:
  - Type of filler metal (covered electrode, GMAW wire electrode, etc.),
  - Brand name.
  - Standardised designation of welding filler metal using the "A" classification system.
- **Approval No.** (see Annex 2 for explanatory notes).
- **Period of validity**: **3 years**.
- **Scope of approval certificate**, specifically:
  - Shielding gases as per DIN EN ISO 14175 (see Annex 4, Table 2 for details).
  - Materials group in accordance with CEN ISO/TR 15608 or material; the following additional information is required for:
    - Steels: for higher strength steels, the permissible range for the upper yield strength (R_{eH}) shall also be stated.
    - Aluminium and aluminium alloys: material designation as per DIN EN 573.
  - Welding process in accordance with DIN EN ISO 4063.
  - Welding positions in accordance with DIN EN ISO 6947.
  - Type of current / polarity.
  - Diameter range.
  - Comments / Welding conditions.

Annex 3 contains detailed information about the scope of the approval certificate issued for the certified materials and for other materials considered to be covered by the approval certificate.

4.9 List of code numbers

In order to identify the production facility or facilities, DB Systemtechnik provides a list of code numbers in addition to the information in the approval certificate. This list is supplied only to the applicant together with notification of certification.

The code number issued may be made up of numbers only, letters only or a combination thereof as agreed between the manufacturer and DB Systemtechnik.

The manufacturer, supplier or trader shall display the code number on the label behind the approval number (see also Annex 6).

Note: the code number does not appear on the approval certificate.

4.10 Validity / expiry

The certification applies until it expires and providing the requirements in these PIs are met. If no extension is requested the certification becomes invalid once expired and the DB approval certificates are deleted in the "online register EN 15085" of SLV Halle.

Certification applies only to the manufacturer, supplier or trader stated in the certificate and its certified / monitored production facilities (corresponding to the list of code numbers).

The brand name appearing in the approval certificate can only be used in association with the specified manufacturer, supplier or trader and the DB approval no. / code no.

A DB approval number or brand names shall not be used for any production facility that has not been inspected as part of the DB approval procedure.

The filler metals produced and kept in stock until a certification expires can also be used after the certificate expires. In this case, in addition to the marking/labelling as per Annex 6, the production date must be verified by an inspection certificate as per DIN EN 10204-3.1.

In the event of queries or discrepancies, please contact the e-mail addresses listed in 4.1.1.

4.11 Costs

The costs for certification, modification / extension, transfer, change of company name and extension shall be borne by the applicant. These fees include management of and free access to the online register EN 15085 of SLV Halle.

The costs of carrying out operational testing shall be borne by DB AG.

4.12 Online register of certified filler metals

All of the approval certificates for filler metals issued by DB Systemtechnik are entered into the "online register EN 15085" of SLV Halle.

All approval certificates visible in the online register EN 15085 of SLV Halle are valid. This shall also apply to approval certificates with expired validity; in this case the renewal process is not yet complete. Invalid approval certificates will be deleted immediately.

The approval certificates can be accessed free of charge from the websites "www.en15085.net" or "www.en1090.net" from where they can be downloaded as pdf files.

5. Quality assurance

To verify quality consistency, the FPC system operated by the manufacturer, supplier or trader shall be monitored at least once a year by one of the FPC certification bodies listed in section 4.1.2 and the results documented in a monitoring report for DB Systemtechnik.

If the manufacturer, supplier or trader refuses FPC monitoring, DB Systemtechnik reserves the right to revoke the approval certificates.

6. Product marking/labelling and declaration of conformity

The filler metals shall be clearly marked/labelled in both packed and unpacked states. The standardised designation of the filler metals is based on the "A" classification system.

The manufacturer, supplier or trader shall include the CE mark on the product label to demonstrate the conformity of the filler metal supplied.

Annex 6 contains the requirements governing the marking/labelling of filler metals.

Note regarding supplies in areas subject to technical approval by the building inspectorate:
A declaration of performance in accordance with Regulation (EU) No. 305/2011 shall be drawn up for the filler metal to be supplied and the declaration shall be delivered together with the product.

7. Liability for defects

The "General Terms and Conditions of Procurement of DB AG and its Affiliated Companies" – as amended from time to time – shall apply.

8. Jointly applicable standards, regulations and guidelines

DIN EN ISO 544	Welding consumables - Technical delivery conditions for filler metals and fluxes - Type of product, dimensions, tolerances and markings
DIN EN 14532-1	Welding consumables - Test methods and quality requirements - Part 1: Primary methods and conformity assessment of consumables for steel, nickel and nickel alloys
DIN EN 14532-2	Welding consumables - Test methods and quality requirements - Part 2: Supplementary methods and conformity assessment of consumables for steel, nickel and nickel alloys
DIN EN 14532-3	Welding consumables - Test methods and quality requirements - Part 3: Conformity assessment of wire electrodes, wires and rods for welding of aluminium alloys
DIN EN 15085-4	Railway applications – Welding of railway vehicles and components – Part 4: Production requirements
DIN 27201-6	State of railway vehicles - Basic principles and production technology - Part 6: Welding
DBS 918 005	Technical specifications for the design and construction of railway bridges and other engineering structures
DB Guideline 951.0010	Guideline – Welding of railway vehicles; Regulations governing new builds, vehicle conversion/redesign and spare parts
DB Guideline 951.0020	Guideline – Welding of railway vehicles; Regulations governing welding maintenance work
DB Guideline 824	Guideline – Permanent way maintenance procedures
DB Guideline 804	Guideline – The planning, construction and maintenance of railway bridges (and other engineering structures)
ZTV-ING	Additional technical contractual terms and guidelines for engineering structures of the Federal Highway Research Institute
ZTV-W	Additional technical contract conditions - hydraulic engineering for hydraulic steel structures of the Federal Ministry of Transport and digital Infrastructure department waterways, shipping

Annex 1, Part 1

DB Systemtechnik
Zertifizierungsstelle für Schweißzusätze
14774 Brandenburg-Kirchmöser, Germany

Application for initial certification of filler metals

Applicant:_____ Telephone:_____

Street, No.:_____ Fax: _____

Postcode, city:_____ E-mail: _____

Queries to:_____ Telephone: _____

E-mail: _____

The application for initial certification is made for the following filler metal:

Type of filler metal: _____

Brand designation: [1] _____

Designation of standard: [2] _____

Area of application applied for:

Materials group pursuant to ISO/TR 15608 or material [3]**:**	
Welding method:	
Welding positions:	
Type of current and polarity:	
Diameter range:	
Remarks / Welding conditions:	

[1] The brand name is linked to the manufacturer / supplier and the DB approval number.

[2] Use the mandatory designation of the standard as per the "A" system (yield strength and Charpy V-notch impact energy parameters – as far as specified in the standards – as well as chemical composition). With shielding gas filler metals the shielding gas subgroup as per DIN EN ISO 14175 shall also be stated.

[3] For Al alloys, the material shall be stated as per DIN EN 573.

Evidence of origin: [4)]

DB approval no.:	Brand name	Manufacturer (name, address)

Declaration of consent:

We confirm that we supply / manufacture the above-mentioned product(s) to company:

.....

We undertake to inform you of any changes without delay.

....

Place and date **Signature (manufacturer/supplier) and stamp**

The applicant

- undertakes to comply with accepted engineering standards (EN 15085-4 and the valid EN standards for filler metals),
- agrees that the approval certificates can be included in the online register EN 15085 of SLV Halle, viewed in the free access area and downloaded,
- assumes the costs of the certification procedure,
- undertakes to notify any change to the proof of origin without delay.

Enclosures:

☐ Product description
☐ TÜV identification sheet
☐ Manufacturer's certificate / declaration of consent for manufacture under licence
☐ Test report concerning suitability testing of the filler metal
☐ Test report concerning initial inspection of the FPC
☐ Evidence of monitoring the FPC

_____ _____

Place, date **Signature (applicant) and stamp**

[4)] Required if the **applicant is not also the production facility**.

Annex 1, Part 2

DB Systemtechnik
Zertifizierungsstelle für Schweißzusätze
14774 Brandenburg-Kirchmöser, Germany

Application for transfer of DB certifications

Applicant:_____ Telephone:_____

Street, No.:_____ Fax: _____

Postcode, city:_____ E-mail: _____

Queries to:_____ Telephone: _____

E-mail: _____

We hereby apply for transfer of one or more DB certifications for filler metals from the company:

.....

to our brand name for the products listed in the following table.

The applicant

- undertakes to comply with accepted engineering standards (EN 15085-4 and the valid EN standards for filler metals),
- agrees that the approval certificates can be included in the online register EN 15085 of SLV Halle, viewed in the free access area and downloaded,
- assumes the costs of the certification procedure,
- undertakes to notify any change to the proof of origin without delay.

....
Place, date **Signature (applicant) and stamp**

Declaration of consent of the manufacturer/supplier:

We confirm that we supply the above-mentioned product(s) to company:

.....

and accept transfer of the products to the name of the applicant under his brand name given above. We undertake to inform you of any changes without delay.

....
Place and date **Signature (manufacturer/supplier) and stamp**

Enclosures:

☐ TÜV identification sheet

☐ Evidence of monitoring the FPC

The following filler metals should be transferred:

Our brand name	Manufacturer's brand name	Manufacturer's DB approval no.	Certification body of the FPC

....

Place, date **Signature (manufacturer/supplier) and stamp**

Annex 1, Part 3

DB Systemtechnik
Zertifizierungsstelle für Schweißzusätze
14774 Brandenburg-Kirchmöser, Germany

Application for extension of DB certifications

Applicant:_____ Telephone:_____

Street, No.:_____ Fax: _____

Postcode, city: _____ E-mail: _____

Queries to:_____ Telephone: _____

E-mail: _____

We hereby apply for the extension of DB certifications for the products listed in the following table.

The applicant

- undertakes to comply with accepted engineering standards (EN 15085-4 and the valid EN standards for filler metals),
- agrees that the approval certificates can be included in the online register EN 15085 of SLV Halle, viewed in the free access area and downloaded,
- assumes the costs of the certification procedure,
- undertakes to notify any change to the proof of origin without delay.

....
Place, date **Signature (applicant) and stamp**

Declaration of consent of the manufacturer/supplier:[7)]

We confirm that we still supply the above-mentioned product(s) to company:

.....

and accept extension of the transfer. We undertake to inform you of any changes without delay.

....
Place and date **Signature (manufacturer/supplier) and stamp**

Enclosures:

☐ TÜV identification sheet
☐ Evidence of monitoring the FPC

6) Mandatory designation of the standard as per the "A" system.

7) Required if the **applicant is not itself the manufacturer**.

The following filler metals should be extended:

DB approval no.	Brand name	Standard designation [6]	Original manufacturer

..... **.....**

Place and date **Signature (manufacturer/supplier) and stamp**

Annex 1, Part 4

DB Systemtechnik
Zertifizierungsstelle für Schweißzusätze
14774 Brandenburg-Kirchmöser, Germany

Application for modifying / extending existing DB certifications

Applicant:_____ Telephone:_____

Street, No.:_____ Fax: _____

Postcode, city:_____ E-mail: _____

Queries to:_____ Telephone: _____

E-mail: _____

We hereby apply for the modification / extension of an existing DB certification for the products listed in the following table.

The applicant

- undertakes to comply with accepted engineering standards (EN 15085-4 and the valid EN standards for filler metals),
- agrees that the approval certificates can be included in the online register EN 15085 of SLV Halle, viewed in the free access area and downloaded,
- assumes the costs of the certification procedure,
- undertakes to notify any change to the proof of origin without delay.

....
Place, date **Signature (applicant) and stamp**

Declaration of consent of the manufacturer/supplier:[7)]

We confirm that we still supply the above-mentioned product(s) to company:

.....

and accept extension of the transfer. We undertake to inform you of any changes without delay.

....
Place and date **Signature (manufacturer/supplier) and stamp**

Enclosures:

☐ TÜV identification sheet
☐ Evidence of monitoring the FPC
☐ Test report concerning suitability testing of the filler metal

6) Mandatory designation of the standard as per the "A" system.

7) Required if the **applicant is not itself the manufacturer**.

The following filler metals should be modified / extended:

Brand name	DB approval no.	Modification / extension

Annex 1, Part 5

DB Systemtechnik
Zertifizierungsstelle für Schweißzusätze
14774 Brandenburg-Kirchmöser, Germany

Application for name change of the certificate holder of existing DB certifications

Applicant:_____ Telephone:_____

Street, No.:_____ Fax: _____

Postcode, city:_____ E-mail: _____

Queries to:_____ Telephone: _____

E-mail: _____

We hereby apply for the change of company name of existing DB certifications.

Applicant (old address):	**Applicant (new address):**
.....	.....
.....	.....

The applicant

- undertakes to comply with accepted engineering standards (EN 15085-4 and the valid EN standards for filler metals),
- agrees that the approval certificates can be included in the online register EN 15085 of SLV Halle, viewed in the free access area and downloaded,
- assumes the costs of the certification procedure,
- undertakes to notify any change to the proof of origin without delay.

....
Place and date **Signature (applicant) and stamp**

Enclosures:

☐ Test report concerning initial inspection of the FPC
☐ Evidence of monitoring the FPC

Annex 2

DB Systemtechnik
Zertifizierungsstelle für Schweißzusätze
14774 Brandenburg-Kirchmöser
Germany

Zulassungszertifikat für Schweißzusätze und Schweißhilfsstoffe

Hersteller: Fa. MusterWeld
Lichtbogenstraße 1
1000 Berlin

Schweißzusatz:	SG-Drahtelektrode	**DB-Zulassungs-Nr.:**	42.999.01
Markenbezeichnung:	Weld SG 2	**Geltungsdauer:**	31.05.2018
Normbezeichnung:	DIN EN ISO 14341-A-G 42 2 C1 4Si1 DIN EN ISO 14341-A-G 46 4 M21 4Si1		

Geltungsbereich aufgrund der nach VA 918 490 durchgeführten Eignungsprüfung:

Werkstoffgruppe nach DIN EN ISO/TR 15608[1)]:	Mit den Schutzgasen nach DIN EN ISO 14175: a) C1, M2, M3: 1.1, 1.2 b) M21: 1.1 bis 2.1
Schweißprozess nach DIN EN ISO 4063:	135
Schweißpositionen nach DIN EN ISO 6947:	PA, PB, PC, PD, PE, PF, PG
Stromart und Polung:	= (+)
Durchmesserbereich:	0,8 – 1,6 mm
Bemerkungen / Schweißbedingungen:	./.

Kirchmöser, 21.05.2015

.....
(Leiter der Zertifizierungsstelle)

1) For details of other materials covered by the approval certificate: see VA 918 490, Annex 3.

2) The basis for certification is VA 918 490, based on DIN EN 14532-1-3

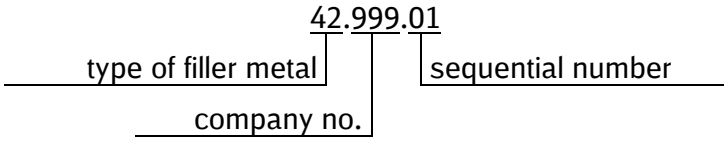
Structure and meaning of the approval number:

The approval number is composed of three blocks:

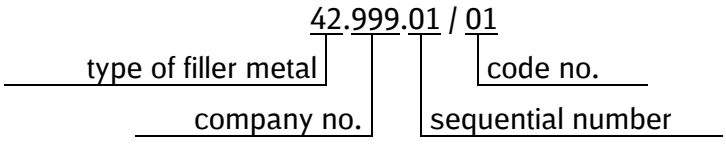
- The first block is a two-digit number that designates the type of filler metal:
  - 10: Covered electrodes for manual metal arc welding of unalloyed and low-alloy steels.
  - 20: Filler metals for build-up welding.
  - 30: Covered electrodes for manual metal arc welding of stainless steels.
  - 4x: Filler metals for gas metal arc welding:
    - 42: for unalloyed and low-alloy steels
    - 43: for stainless steels.
  - 5x: Filler metals for submerged arc welding:
    - 51: Granulated welding flux
    - 52: Wire electrodes, flux-cored electrodes.
  - 6x: Filler metals for non-ferrous metals and cast iron:
    - 61: for aluminium and aluminium alloys
    - 62: for cast iron
    - 63: for copper and copper alloys.
  - 70: Filler metals for oxy-fuel welding.
  - 8x: Filler metals for welding work on the permanent way:
    - 81: for rail joint welding
    - 82: for rail resurfacing by welding
- The second block is a three-digit number that identifies the owner of the certification (manufacturer, supplier or trader).
- The third block is a two-digit sequential number.

Examples:

1. **Approval number in the approval certificate:**



2. **Approval number with code number on label:**



Annex 3

DB Systemtechnik
Zertifizierungsstelle für Schweißzusätze
14774 Brandenburg-Kirchmöser, Germany

Information on the scope of certified materials

1. Certified materials groups and additional materials groups covered in accordance with CEN ISO/TR 15608

In addition to the tested materials groups and/or materials listed under "Scope of approval certificate", the following materials groups and/or materials are also considered to be covered by the approval certificate.

Annex 3, Table 1: Unalloyed and low-alloy steels, cast steel, fine grain structural steels

Certified materials group	Material designation according to selected DIN EN materials standards [1]	Applicable materials groups according to CEN ISO/TR 15608
Materials group 1 as defined in CEN ISO/TR 15608 (unalloyed steels with $R_{eH} \leq 460$ MPa)		
1.1	S235JR to S275J2+N DIN EN 10025-2 S275N DIN EN 10025-3 S275M DIN EN 10025-4	1.1
1.2	S235JR to S355K2 DIN EN 10025-2 S275N to S355N or NL[2] DIN EN 10025-3 S275M to S355M or ML[2] DIN EN 10025-4 GE200, GE240 DIN EN 10293 B500A, B500B DIN 488-1	1.1, 1.2
1.3	S235JR to S355K2 DIN EN 10025-2 S275N to S460N or NL[2] DIN EN 10025-3 S275M to S460M or ML[2] DIN EN 10025-4 GE200, GE240 DIN EN 10293 B500A, B500B DIN 488-1[4]	1.1, 1.2, 1.3, 2.1
1.4	S235JR to S355K2 DIN EN 10025-2 S275N to S355N or NL[2] DIN EN 10025-3 S275M to S355M or ML[2] DIN EN 10025-4 S275J0W - S355J2W DIN EN 10025-5 GE200, GE240 DIN EN 10293	1.1, 1.2, 1.4
Materials group 2 as defined in CEN ISO/TR 15608 (Thermomechanically treated fine grain steels with $R_{eH} > 360$ MPa)		
2.1	S420M to S460M or ML[2] DIN EN 10025-4 S355MC to S460MC DIN EN 10149-2	1.1, 1.2, 1.3, 2.1
2.2	S500MC to S700MC DIN EN 10149-2	1.2, 1.3, 2.1, 2.2 [3]
Materials group 3 as defined in CEN ISO/TR 15608 (quenched and tempered fine grain steels with $R_{eH} > 360$ MPa)		
3.1	S460Q to S690Q, QL or QL 1[2] DIN EN 10025-6	1.2, 1.3, 2.1, 2.2, 3.1 [3]
3.2	S890Q to S960Q, QL or QL 1[2] DIN EN 10025-6	2.2, 3.1, 3.2 [3]
Materials group 11 as defined in CEN ISO/TR 15608 (unalloyed steels with carbon content > 0.25%)		
11	E295 to E360 DIN EN 10025-2 C35 to C60 DIN EN 10083-2 GE300 DIN EN 10293	11

[1] In addition to the steels listed, all unalloyed steels in the same strength class but designated in accordance with another steels standard are also considered to be covered by the approval certificate. This also applies to steels supplied in different delivery conditions (e.g. S690Q DIN EN 10025-6 also includes S700MC DIN EN 10149-2).

[2] The approval certificate applies to steels with the delivery condition codes NL, ML or QL only if the required Charpy V-notch impact energy is included as part of the relevant standardised material designation.

[3] The approval certificate only applies to materials that lie within the range for the upper yield strength (R_{eH}).

[4] The approval certificate also applies to the welding of load-bearing butt-welded joints in reinforcing steel (as specified in DIN EN ISO 17660-1, section 7.2) if in the relevant standardised material designation the code number indicating yield strength is at least "50".

Annex 3, Table 2: Stainless steels

Certified materials group	Material designation according to selected DIN EN materials standards [3)]	Applicable materials groups according to CEN ISO/TR 15608
Materials group 7 as defined in CEN ISO/TR 15608 (ferritic, martensitic stainless steels)		
7.1	X2CrNi12 (1.4003) DIN EN 10088 X2CrTi12 (1.4512) DIN EN 10088 X5CrNiMoTi 15-2 (1.4589) DIN 5512-3	7.1
Materials group 8 as defined in CEN ISO/TR 15608 (austenitic stainless steels)		
8.1 without Mo	X5CrNi18-10 (1.4301) DIN EN 10088 X2CrNiN18-7 (1.4318) DIN EN 10088 X6CrNiTi18-10 (1.4541) DIN EN 10088 X6CrNiNb18-10 (1.4550) DIN EN 10088	8.1 without Mo
8.1	X5CrNi18-10 (1.4301) DIN EN 10088 X6CrNiTi18-10 (1.4541) DIN EN 10088 X6CrNiNb18-10 (1.4550) DIN EN 10088 X5CrNiMo17-12-2 (1.4401) DIN EN 10088 X6CrNiMoTi17-12-2 (1.4571) DIN EN 10088 X5CrNiMoTi15-2 (1.4589) DIN EN 10088	8.1, 8.1 without Mo
Werkstoffgruppe 10 in Anlehnung an CEN ISO/TR 15608 (Austenitische ferritische nichtrostende Stähle (Duplex)		
10.1	X2CrNiMoN22-5-3 8 (1.4462) DIN EN 10088	10.1
10.2	X2CrNiMoN25-7-4 (1.4410) DIN EN 10088	10.2

[3)] In addition to the steels listed, all steels in the same materials group are also considered to be covered by the approval certificate.

Annex 3, Table 3: Aluminium and aluminium alloys as per DIN EN 573)

Filler metal as per DIN EN ISO 18273	Certified materials	Other materials covered by the approval cert.	Materials group according to CEN ISO/TR 15608
S Al 5556A (AlMg5Mn) or S Al 5356 (AlMg5Cr(A)) or S Al 5087 (AlMg4,5MnZr) or S Al 5183 (AlMg4,5Mn0,7(A))	EN AW-5083 EN AW-7020	EN AW-5049 [Al Mg2Mn0,8] EN AW-5052 [Al Mg2,5] EN AW-5754 [Al Mg3] EN AW-5083 [Al Mg4,5Mn0,7] EN AW-5019 [Al Mg5] EN AW-6060 [Al MgSi] EN AW-6063 [Al Mg0,7Si] EN AW-6005A [Al SiMg] EN AW-6082 [Al Si1MgMn] EN AW-7020 [Al Zn4,5Mg1]	22.2, 22.3, 22.4 23.1, 23.2
S Al 5754 (AlMg 3)	EN AW-5754	EN AW-5052 [Al Mg2,5] DIN EN AW-5754 [Al Mg3]	22.3
S Al 4043 (AlSi5) or S Al 4043A (AlSi5(A))	EN AW-6005A	EN AW-6005A [Al SiMg] EN AW-6060 [Al MgSi] EN AW-6063 [Al Mg0,7Si] EN AW-6082 [Al Si1MgMn]	23.1
	AlSi casting alloys up to 7% Si	AlSi and AlSiMg casting alloys	24.1, 24.2
		Al casting alloys in combination with Al wrought alloys	22.1-22.4 / 24.1-24.2 23.1-23.2 / 24.1-24.2
S Al1450 (Al 99,5Ti)	EN AW-1050A	EN AW-1098 [Al 99,98] EN AW-1080A [Al 99,8] EN AW-1050A [Al 99,5] EN AW-1200 [Al 99,0]	21

Annex 3, Table 4: Group classification for cast iron

Certified materials group	Material designation according to selected DIN EN materials standards	Applicable materials groups as defined in CEN ISO/TR 15608
Materials group 71 as defined in CEN ISO/TR 15608 (lamellar graphite cast iron / grey cast iron)		
71	EN-GJL-100 to DIN EN-GJL-350 DIN EN 1561	71
Materials group 72 as defined in CEN ISO/TR 15608 (spheroidal graphite cast iron)		
72	EN-GJS-350 to DIN EN-GJS-900 DIN EN 1563	72
Materials group 73 as defined in CEN ISO/TR 15608 (malleable cast iron)		
73	EN-GJMW-350 to DIN EN-GJMW-800 DIN EN 1562	73

2 Joints between dissimilar materials

Joints between dissimilar materials between materials made from the same or different materials groups are permissible if:

- The materials groups being welded are listed in the approval certificate (individually or in combination),

  or
- With the combination CrNi steels / unalloyed steels, the material combination is listed in the approval certificate.

3 Scope of approval certificate in the case of cold-wire feeder systems and hybrid welding processes

If a certified GMAW wire electrode is fed as "cold wire" (e.g. 52 with cold-wire feeding) or if a hybrid welding process is used (e.g. 52 / 135), the scope of the approval certificate with respect to materials is the same as that for the certified GMAW process.

4 Build-up welding

Approval applies only to the tested material listed under "Scope of approval certificate" or for the specified hardness.

5 Wall thickness limitation

If welding consumables are certified by DB Systemtechnik, the wall thickness limitation according to DIN EN ISO 14532-1 no longer applies.

Except for the stick electrode types R, R(C) and RR. A wall thickness limitation is specified separately here.

Notice:

For wall thicknesses t ≥ 50 mm, proof is recommended for the user of the welding consumables via a welding process test according to DIN EN ISO 15614-1, level 2.

6. Rail steels

6.1 Rail joint welding

In addition to the tested rail steel listed under "Scope of approval certificate" and designated in accordance with the DIN EN 13674-1 standard, all rail steels of lower strength are also considered to be covered by the approval certificate, including rail steels designated in accordance with other relevant standards.

Note:

The final 10 mm below the top of the rail shall be welded with a filler metal that has been approved for build-up welding (rail resurfacing) work on the rail steel.

6.2 Rail resurfacing by welding

Approval applies only to the tested rail steel listed under "Scope of approval certificate" and designated in accordance with the DIN EN 13674-1, including rail steels of the same strength designated in accordance with other relevant standards.

Annex 4

DB Systemtechnik
Zertifizierungsstelle für Schweißzusätze
14774 Brandenburg-Kirchmöser, Germany

Requirements to be met by filler metals used for joint welding and build-up welding on rail vehicles, railway bridges and other engineering structures

1. General requirements

All of the filler metals listed in **Table 1** may be certified. The restrictions and/or supplementary requirements listed in **Table 2** also apply.

2. Testing of welded joints and weldability

In contrast to the requirement in DIN EN 14532-1, it is sufficient to test the welded joint in welding position PA.

Testing shall always be carried out to verify suitability for root pass welding as set out in DIN EN 14532-1, section 6.2.3.8.

In addition to the provisions of DIN EN 14532-1 to DIN EN 14532-3, weldability tests shall be performed for all of the welding positions included in the application. It shall be established whether the welding parameters specified by the manufacturer enable a defect-free weld to be achieved. If problems arise in a particular welding position, the welded joint made in that welding position shall be subjected to full testing.

3. Supplementary requirements for unalloyed steels and higher strength fine grain structural steels

- Only similar filler metals and low-alloy filler metals are approved for welding joints between unalloyed steels.
- Depending on the first symbol block within the standardised material designation (indicates upper yield limit of the weld metal) and the base material used in the suitability test, the following materials groups may be licensed as per CEN ISO/TR 15608:

1. First symbol block in the standardised designation of the weld metal	**Licensable materials group according to CEN ISO/TR 15608**
35 (R_{eL} or $R_{p0.2}$ ≤ 355 MPa) [1)]	1.2
42 (R_{eL} or $R_{p0.2}$ ≤ 420 MPa) [1)]	2.1 with R_{eH} ≤ 420 MPa
46 (R_{eL} or $R_{p0.2}$ ≤ 460 MPa) [1)]	2.1 (R_{eH} ≤ 460 MPa)
50 (R_{eL} or $R_{p0.2}$ ≤ 500 MPa) [1)]	3.1 (R_{eH} ≤ 500 MPa)
55 (R_{eL} or $R_{p0.2}$ ≤ 550 MPa) [1)]	3.1 (R_{eH} = 420 to 550 MPa)
62 (R_{eL} or $R_{p0.2}$ ≤ 620 MPa) [1)]	3.1 (R_{eH} = 500 to 620 MPa)
69 (R_{eL} or $R_{p0.2}$ ≤ 700 MPa) [1)]	3.1 (R_{eH} = 550 to 700 MPa)
89 (R_{eL} or $R_{p0.2}$ ≤ 890 MPa) [1)]	3.2 (R_{eH} = 690 to 890 MPa)
96 (R_{eL} or $R_{p0.2}$ ≤ 960 MPa) [1)]	3.2 (R_{eH} = 890 to 960 MPa)

[1)] The lower yield strength (*R*eL) applies as per DIN EN ISO 16834-A. If the yield point cannot be clearly identified, the 0.2% offset yield strength (*R*p0.2) shall be used

If different grades of steel are to be joined by welding, the minimum requirement to be met by the weld metal shall be that for the steel grade with the lower yield strength.

4. Supplementary requirements for stainless steel filler metals

Only similar filler metals are approved for welding joints between stainless steels.

The welding consumable "18 8 Mn" is only licensable for "Black / White joints" (materials group 8.1 as defined in CEN ISO/TR 15608 with unalloyed steels).

5. Supplementary requirements for aluminium and aluminium alloys

In addition to the weld testing required by DIN EN 14532-3, the following tests shall also be performed for welded joints on aluminium and aluminium alloys:

- Two bending test specimens for each of face-side bend test and root (reverse-side) bend test, Requirements: see DIN EN ISO 15614-2 section 7.4.3.
- 1 microsection,
  Requirements: see DIN EN 14532-1 section 6.2.6.5.

6. Supplementary requirements for build-up welding work on unalloyed steels

In addition to the requirements set out in DIN EN 14532-2, filler metals used for resurfacing work shall also be subjected to the following tests and shall meet the following requirements:

6.1 Preparing the test pieces

Depending on the welding process used, a weld in the form of a two-layer or three-layer build-up shall be prepared on the parent metal for which the application is being made for all covered electrode or filler wire diameters. The following tests shall be performed:

- Determination of weldability.
- Materials testing:
  - surface crack testing using magnetic-particle inspection,
  - a hardness test (HV10, after surface grinding of build-up weld, surface hardness measured with at least five indentations);
  - a macrosection (transverse section) and hardness profile at an angle of 15° to the surface from the HAZ to the surface.
- Chemical composition: to be demonstrated using a specimen of the built-up material as detailed in DIN EN ISO 6847.

6.2 Requirements

Filler metals used for build-up welding shall meet the requirements set out in DIN EN 14700, specifically:

- Designation in accordance with DIN EN 14700, section 10.
- Hardness: in accordance with the classification system in DIN EN 14700, Annex A and the scope of the approval being sought by the manufacturer.
- Chemical composition: designation of alloy type in accordance with DIN EN 14700, Table 2.
- Weldability: defect-free build-up welding shall be possible using the welding parameters provided by the manufacturer.
- Macrosection specimen: no internal defects.

6.3 Monitoring of the manufacturing process

Proper monitoring of the process of manufacturing filler metals (as defined in DIN EN 14700) requires that the following procedures be performed on ten manufactured units within a period of two years:

- Chemical analysis of the all-weld metal;
- Surface hardness of a build-up weld after surface grinding.

7. Testing of filler metals

Table 3 summarises all of the necessary tests on filler metals and lists the relevant standard and the required measuring instruments or equipment.

Depending on the type of filler metal, the tests listed in **Table 4** may also be required.

The test results shall be documented in a test report as detailed in DIN EN 14532-1, Annex J or DIN EN 14532-3, Annex D.

Annex 4, Table 1: List of welding filler metal product groups for use in rail vehicle construction

Construction product / Product group	Applicable standard
Welding consumables – Rods, wires and deposits for tungsten inert gas welding of non-alloy and fine grain steels	DIN EN ISO 636: 2017-09
Welding consumables – Covered electrodes for manual metal arc welding of high-strength steels	DIN EN ISO 18275: 2018-12
Welding consumables - Covered electrodes, wires, rods and tubular cored electrodes for fusion welding of cast iron	DIN EN ISO 1071: 2016-05
Welding consumables – Covered electrodes for manual metal arc welding of stainless and heat-resisting steels	DIN EN ISO 3581: 2018-03
Welding consumables – Covered electrodes for manual metal arc welding of non alloy and fine grain steels	DIN EN ISO 2560: 2021-12
Welding consumables – Covered electrodes for manual metal arc welding of creep-resisting steels	DIN EN ISO 3580: 2017-08
Welding consumables - Rods for gas welding of non alloy and creep-resisting steels	DIN EN 12536: 2000-08
Welding consumables – Solid wire electrodes, tubular cored electrodes and electrode/flux combinations for submerged arc welding of non alloy and fine grain steels	DIN EN ISO 14171: 2016-12
Welding consumables – Covered electrodes for manual metal arc welding of nickel and nickel alloys	DIN EN ISO 14172: 2016-02
Welding consumables – Fluxes for submerged arc welding and electroslag welding	DIN EN ISO 14174: 2019-09
Welding consumables – Wire electrodes and weld deposits for gas shielded metal arc welding of non alloy and fine grain steels	DIN EN ISO 14341: 2020-12
Welding consumables – Wire electrodes, strip electrodes, wires and rods for arc welding of stainless and heat resisting steels	DIN EN ISO 14343: 2017-08
Welding consumables – Welding consumables for hard-facing	DIN EN 14700: 2023-02
Welding consumables – Wire electrodes, wires, rods and deposits for gas shielded arc welding of high strength steels	DIN EN ISO 16834: 2012-08
Welding consumables – Tubular cored electrodes for gas shielded and non-gas shielded metal arc welding of non alloy and fine grain steels	DIN EN ISO 17632: 2016-05
Welding consumables – Tubular cored electrodes and rods for gas shielded and non-gas shielded metal arc welding of stainless and heat-resisting steels	DIN EN ISO 17633: 2021-09
Welding consumables – Tubular cored electrodes for gas shielded metal arc welding of creep-resisting steels	DIN EN ISO 17634: 2015-12
Welding consumables - Wire electrodes, wires and rods for welding of aluminium and aluminium alloys	DIN EN ISO 18273: 2016-05
Welding consumables – Solid wire electrodes, solid strip electrodes, solid wires and solid rods for fusion welding of nickel and nickel alloys	DIN EN ISO 18274: 2023-09
Welding consumables – Tubular cored electrodes for gas-shielded and non-gas-shielded metal arc welding of high strength steels	DIN EN ISO 18276: 2017-07
Welding consumables – Wire electrodes, wires, rods and deposits for gas-shielded arc welding of creep-resisting steels	DIN EN ISO 21952 2012-08
Welding consumables – Solid wire electrodes, tubular cored electrodes and electrode-flux combinations for submerged arc welding of high strength steels	DIN EN ISO 26304: 2018-05
Welding consumables – Solid wires and rods for fusion welding of copper and copper alloys	DIN EN ISO 24373: 2018-11
Welding consumables – Solid wire electrodes, tubular cored electrodes and electrode-flux combinations for submerged arc welding of creep-resisting steels	DIN EN ISO 24598: 2019-09

Annex 4, Table 2: Additional requirements supplementary to those in rail vehicle construction standards

Filler metals	Restrictions / Additional requirements
Covered electrodes	
Covered electrodes for aluminium and aluminium alloys	No approval certification issued for these filler metals.
Deep penetration covered electrodes	
Covered electrodes as per DIN EN ISO 2560 with an electrode efficiency of > 200%	
Coating type "R" and "RC", medium-thick (D/d < 1.6) as per DIN EN ISO 2560. [1)] [previously: R3 and R(C)3 as per DIN 1913]	Approval applies only to root pass and light sheet welding (t ≤ 3 mm) and to welding of reinforcing steel as per DIN EN ISO 17660.
Coating type "RR" with an electrode efficiency ≤ 125% and RC, thick covering (D/d ≥ 1.6) and a designator for the Charpy V-notch impact energy A or 0 as detailed in DIN EN ISO 2560. [1)] [previously: RR5, RR(C)5, RR6, RR(C)6 as per DIN 1913]	Approval only applies to: • S235 (St 37) with t ≤ 16 mm and a ≤ 10 mm • S275 (St 44) with t ≤ 12 mm and a ≤ 8 mm • S355 (St 52) with t ≤ 8 mm and a ≤ 6 mm.
Coating type "RR" with an electrode efficiency > 125% and RA with an electrode efficiency > 160% as per DIN EN ISO 2560. [previously: RR11 with an efficiency ≥ 150%, AR11 with an efficiency ≥ 160% as per DIN 1913]	Approval applies only to fillet welds with a ≤ 10 mm and to the materials S235 to S355.
[1)] D = diameter of electrode covering; d = diameter of core wire	

Annex 4, Table 2 (continued)

Filler metals	Restrictions / Additional requirements
Welding rods, wire electrodes and flux-cored wire electrodes for gas metal arc welding in accordance with DIN EN ISO 636, DIN EN ISO 1071, DIN EN ISO 14341, DIN EN ISO 14343, DIN EN ISO 16834, DIN EN ISO 17632, DIN EN ISO 17633, DIN EN ISO 17634, DIN EN ISO 18273, DIN EN ISO 18274, DIN EN ISO 18276, DIN EN ISO 21952	
For unalloyed steels and fine grain construction steels up to $R_{eH} \leq 500$ MPa	Approval for welding rods, wires and flux-cored wires covers the scope specified in the approval certificate in combination with the tested shield gas(es) as set out in DIN EN 14532-1, Table 4[2)]. The shielding gas main group listed in the approval certificate is designated in accordance with DIN EN ISO 14175. The wall thickness limits in DIN EN ISO 14532-1 do not apply.
For stainless steels, quenched and tempered fine grain construction steels with $R_{eH} > 500$ MPa	Approval for welding rods, wires and flux-cored wires covers the scope specified in the approval certificate in combination with the tested shield gas(es) as set out in DIN EN 14532-1, Table 4[2)]. Shielding gas subgroup listed in the approval certificate is designated in accordance with DIN EN ISO 14175. The wall thickness limits in DIN EN ISO 14532-1 do not apply.
For aluminium and aluminium alloys	Approval for welding rods, wires and flux-cored wires covers the scope specified in the approval certificate in combination with the tested shield gas as set out in DIN EN 14532-3. The shielding gas main group listed in the type-approval certificate is designated in accordance with DIN EN ISO 14175.
For cold-wire laser welding and hybrid laser welding	Approval for GMAW wire electrodes also covers: – welding process 52 with cold-wire feeding – the combined welding processes 52 / 135 or 52 / 131.
Granulated flux and wire electrodes for submerged arc welding in accordance with DIN EN ISO 14171, DIN EN ISO 14174, DIN EN ISO 16834, DIN EN ISO 26304, DIN EN ISO 24598	
Granulated welding flux	Approval for granulated flux applies to the wire electrodes for submerged arc welding (SAW) listed in the scope of the approval certificate and designated in accordance with the relevant standard for SAW wire electrodes and the standard classification of the wire-Granulated welding flux combination. The wall thickness limits in DIN EN ISO 14532-1 do not apply.
Wire electrodes for submerged arc welding	Approval for a SAW wire electrode applies to all approved granular fluxes whose scope of approval contains the relevant SAW wire electrode.
[2)] If type qualification testing is carried out with shielding gases from two different main groups or subgroups, the testing shall also cover the intermediate gas main groups or subgroups.	

Annex 4, Table 3: Summary of tests to be performed

Parameter / quantity under test	Type of inspection	Relevant standard	Measuring instruments / equipment [1)]	Comments
Dimensions - Diameter - Coating thickness - Length - Grain size	 Dimensional measurement Dimensional measurement Dimensional measurement Dimensional measurement	 DIN EN ISO 544 - DIN EN ISO 544 DIN EN ISO 14174	 Vernier callipers Vernier callipers Measuring rod Test sieve	. / .
Physical condition - Adhesion of electrode coating - Clamping surface, ignition surface - Electrode efficiency - Adhesion of copper coat (or similar) - Spools, cast, helix - Surface roughness	 Visual inspection Visual inspection, dimensional measurement Dimensional measurement Coiling test, visual inspection Dimensional measurement Visual inspection	 - DIN EN ISO 544 DIN EN 22401 - DIN EN ISO 544 DIN EN 14532-3	 Visual inspection Visual inspection, measuring rod Scales, vernier callipers, measuring rod Visual inspection, magnifying glass Visual inspection, plane table, measuring rod magnifying glass, microscope	 for aluminium only
Marking	Visual inspection	DIN EN ISO 544	Visual inspection	. / .
Chemical composition - Analysis of rod and wire materials - Analysis of weld metal	 Analysis Analysis	Handbuch f. d. Eisenhüttenlaboratorium [Lab Manual for Ferrous Metallurgy] also: DIN EN ISO 6847	 Chemical laboratory (wet chemical analysis, spectral analysis)	. / .
Weldability	Electrode acceptance test	. / .	Visual inspection	[previously: E DIN 1913-101]
Weld metal - Mechanical properties	 Tensile strength tests [2)] Notched-bar impact tests	 DIN EN ISO 15792-1 DIN EN ISO 5178 DIN EN ISO 6892-1 DIN EN ISO 148-1 DIN EN ISO 9016	 Tensile testing machine, pendulum impact tester, cooling equipment, thermometer	. / .
Delta ferrite content	Dimensional measurement	DIN EN ISO 8249	Annex E (EN14532) Metallographic lab	For CrNi alloys only

Annex 4, Table 3: Summary of tests to be performed (continued)

Parameter / quantity under test	Type of inspection	Relevant standard	Measuring instruments / equipment [1)]	Comments
Weld - **Mechanical properties**	Visual inspection Tensile strength testing Bending test [2)] Notched-bar impact test	DIN EN ISO 17637 DIN EN ISO 15792-2 (steel) DIN EN ISO 4136 DIN EN ISO 5173 DIN EN ISO 148-1 DIN EN ISO 9016	Visual inspection Tensile testing machine, Bending machine, pendulum impact tester, cooling equipment, thermometer	. / .
- **Hardness profile**	Hardness testing	DIN EN ISO 9015-1 DIN EN ISO 6507-1 DIN EN ISO 6506-1	Hardness tester after Brinell or Vickers	. / .
- **Weld structure / bead sequence**	Macrosection Microsection	DIN EN ISO 17639	Metallographic lab	. / .
Susceptibility to hot cracking [3)]	Double fillet weld test specimen	DIN EN ISO 17641-2	Magnifying glass, surface inspection tools	. / .
Internal defects	Fillet weld test specimen (FW) Butt weld (BW)	DIN EN ISO 15792-3 DIN EN 12517	Destructive and non-destructive testing equipment	. / .
Hydrogen content	Measurement of hydrogen content in weld metal	DIN EN ISO 3690	Lab equipment to determine hydrogen content	. / .
IGC resistance	Cross-over joint test	DIN EN ISO 3651-2	Lab equipment for corrosion testing	. / .

1) In addition to the test instruments and equipment listed, welding equipment may also be needed to make the requisite test pieces / specimens from the particular filler metal under test.

2) Testing in untreated state within 72 hours of the start of the manufacturing process. This test shall be carried out for all ferritic covered electrodes, flux-cored wire electrodes and granulated welding flux with the exception of hydrogen-controlled electrodes of type H5 or H10.

3) Only required for "CrNi alloys with FN<3".

Annex 4, Table 4: Scope of initial testing of welding filler metals

Test	Covered electrodes	GMAW wire and rod electrodes			GMAW flux-cored wire electrodes	Filler metals for SAW		Comments
		for steels	for Al and Al alloys	nickel-based		for unalloyed steels	for CrNi alloys	
Dimensions, physical condition and marking/labelling DIN EN ISO 544 and DIN EN ISO 14174	X	X	X	X	X	X	X	-
Chemical composition DIN EN 14532-1 or -3 and relevant product standards for filler metals	X (weld metal)	X (weld metal, wire electrode)	X (wire electrode)	X (weld metal, wire electrode)	X (weld metal)	X (weld metal, wire electrode)	X (weld metal, wire electrode)	-
Weldability	X	X	X	X	X	X	X	Suppl. test
Weld metal test specimen DIN EN 1597 DIN EN 14532-1 or -3 product standards for filler metals	X	X	X (NDT: RT)	X	X	X	X	-
Weld specimen 1) DIN EN 14532-1 or -3	X	X 2)	X	X	X	X	X	-
Weld structure / bead sequence, hardness profile DIN EN 1043-1	X 3)	X 3)	X 3)	X	X 3)	X	X 3)	-
Susceptibility to cracking DIN EN 14532-1 and DIN EN ISO 17641-2	X CrNi alloy FN<3	-	-	X	X CrNi alloy FN<3	-	X CrNi alloy FN<3	-
Internal defects DIN EN 1435	X	X	X	X	X	X	X	-
External defects DIN EN 970	X	X	-	X	X	X	X	
Hydrogen test	Only required for hydrogen-controlled filler metals as defined in the relevant product standard or manufacturer's specification.							
IGC resistance	CrNi alloy if specified	CrNi alloy if specified	-	-	CrNi alloy if specified	-	X if specified	Suppl. test
Delta ferrite content DIN EN ISO 8249	CrNi alloy if specified	CrNi alloy if specified	-	-	CrNi alloy if specified	-	X if specified	-

1) For X120Mn12 / GJS 400 or S355J2: see Table 5

2) For quenched and tempered fine grain steels with $R_{eH} > 500$ MPa, testing of the shielding gas subgroup as per DIN EN ISO 14175 is required in addition to the provisions of DIN EN 14532-1, Table 4. If there are more than two shielding gas subgroups, testing shall be carried out with the shielding gas subgroups with the highest and lowest degree of burn-off.

3) The hardness profile does not apply to steels in materials group 8 according to ISO / TR 15608 and Al alloys (21-23 according to materials group ISO / TR 15608).

Annex 4, Table 5: Extent of a weld metal test specimen X120Mn12 (1.3401) with the materials group 72 or 1.2 according to CEN ISO / TR 15608

For the weld specimen X120Mn12 / GJS 400 or X120Mn12 / S355J2 an overlap (X120Mn12, t = 4 – 8 mm) shall be welded as a weld sample, each with a single-layer and multi-layer fillet weld. The scope of testing is given in the following table.

Parameter / quantity under test	Type of inspection	Relevant standard	Measuring instruments / equipment [1)]
- **Surface inspection**	Dye penetrant testing (PT)	DIN EN ISO 3452-1	Penetrant system
- **Hardness profile**	Hardness testing from the middle macrosection	DIN EN ISO 9015-1 DIN EN ISO 6507-1 DIN EN ISO 6506-1	Hardness tester after Brinell or Vickers
- **Weld structure / bead sequence**	Three macrosections (beginning, middle, end of weld metal test specimen)	DIN EN ISO 17639	Metallographic lab

Annex 5

DB Systemtechnik
Zertifizierungsstelle für Schweißzusätze
14774 Brandenburg-Kirchmöser, Germany

Requirements to be met by filler materials used for rail joint welding and rail resurfacing by welding

1. Foreword

The content of Annex 5 was prepared by DB Netz AG, Headquarters, Rail Technology Competence Unit, and agreed upon and approved by the German Federal Railway Authority (EBA).

2. Fundamental requirements

Detailed specifications regarding the use of filler materials for resurfacing welding work on rails and other parts of the permanent way and for the welding of rail joints are provided in DB Guideline 824.

Before filler materials are used for DB Netz AG's regular operations, operational testing shall be carried out by DB Netz AG. The operational testing period is normally 5 years or 100 million tonnes of load, or a period determined on an individual basis by the Rail Technology Competence Unit of DB Netz AG.

Once the filler materials have passed the suitability test and operational testing, DB Netz AG's Rail Technology Competence Unit shall approve the filler materials for DB Netz AG's regular operations and a certificate shall be issued to this effect.

The certification of the filler materials shall be carried out by DB Systemtechnik, DB Netz AG, Rail Technology Competence Unit or by a recognised EBA inspection expert in the field of permanent way welding.

The following sections set out the requirements for suitability testing for filler materials for rail resurfacing by welding and other parts of the permanent way and for the welding of rail joints.

3. Approval and release of filler materials for arc build-up welding in accordance with DIN EN 15594

3.1 Fundamental requirement:

The approval and release of filler materials with the associated welding procedure specifications [WPS] is generally compatible with the requirements of EN ISO 15613. Due to the specific requirements regarding the resistance (durability) of repair welds and use in the permanent way, e.g. rolling contact fatigue, the approval and release test must be carried out in accordance with this specification.

3.2 Information from the manufacturer:

- Toxicity threshold
- Rail steel grade in accordance with EN 13674-1
- Covered electrode classification in accordance with EN ISO 3580
- Wire electrode classification in accordance with EN ISO 14341
- Chemical analysis and batch analysis
- Storage requirements with manufacturer recommendations
- Current range/voltage range/polarity
- Dimensions, length and diameter
- Tubular cored electrode spool size and efficiency
- Drying requirements
- Description of the identification system
- Ideal application methods
- Durability of vacuum-packed covered electrodes

3.3 Batch testing by the manufacturer:

The batch testing characteristics are:

- Concentricity/roundness and dimensions
- Chemical composition
- Consumption, e.g. filler wire guides

3.4 Test arrangements

3.4.1 Test overview

- Mechanical testing
- Chemical analysis of the pure welding material with batch review
- Hardness
- Welding reliability (under laboratory conditions)
- Freedom from cracks
- Weld metal porosity
- Craters
- Open circuit voltage (OCV) requirements
- Welding parameters, defined in a WPS
- Number of defects, size of defects

3.4.2 Statements on the general weldability

The testing body must prepare a written statement on the general weldability that includes the following:

- Build-up weld shape
- Cratering
- Spatter
- Slag characteristics
- Ignitability and re-ignitability
- Other relevant information

All tests must be carried out on the rail material for which the approval/release is to be obtained. These tests must be carried out for a single run, for single-layer build-up welding and for five-layer build-up welding.

Testing on a single run is used to check for cracking after grinding.

Testing on single-layer build-up welding is used to assess the impact of the build-up welding on the rail steel.

Testing on five-layer build-up welding is used to assess the impact of the welding material in the individual layers of the build-up welding.

Microsections and hardness measurements according to Brinell and Vickers are carried out on single-layer and five-layer build-up welding. The macro Brinell hardness test is used to assess the surface: HBW 2.5/187.5. HV 30 over the welds, HV 0.2 in the fusion line with 10 offset impressions.

The test piece for five-layer build-up welding must be ground to a finish and subjected to ultrasonic testing.

3.5 Laboratory tests

The aim of the laboratory tests is to prove the suitability of the filler materials for successful repairs on approved rail steel grades.

The following build-up welds are required for the laboratory tests:

- Single build-up weld on the rail: one test piece as per Fig. 17
- One layer on the rail: one test piece as per Fig. 17
- Five layers on the rail: one test piece as per Fig. 17

The test pieces are created with stringer beads. The number of beads depends on the width of the test piece (rail head), but there should be at least five.

The welds must be subjected to magnetic particle inspection (MPI) in accordance with EN 1290 or dye penetrant testing (DPT) in accordance with EN 571-1.

3.5.1 Description of the specimen for laboratory testing

Figures 17 and 18 describe the requirements for the test piece with regard to the dimensions, preparation details and the locations of the measuring points for measuring the preheating.

The preheating must extend 75 mm from the prepared area (point A).

The preheating must extend over the entire thickness of the rail head (point B) and must be in the range of 400 °C to 450 °C; the interpass temperature must not exceed 500 °C and must not fall below 400 °C.

Length C of the test piece must be at least 600 mm.

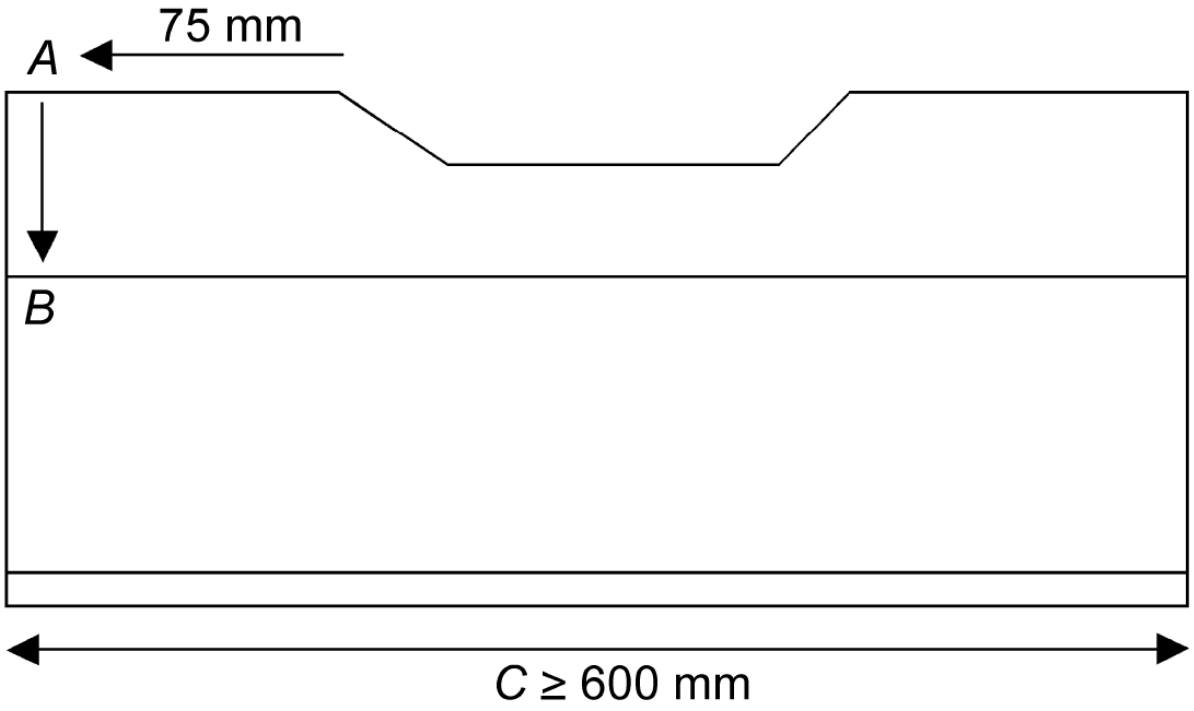
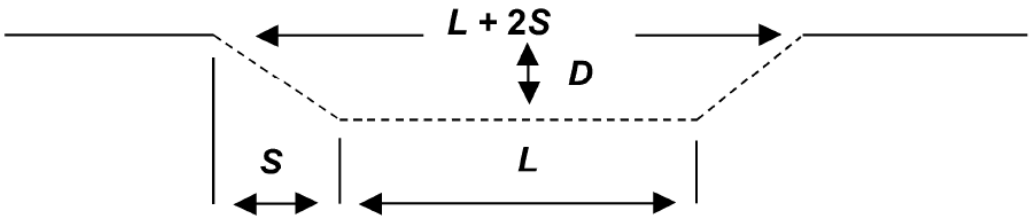


Figure 17: Example of a test piece

For the tests, the transverse prepared area must extend across 100% of the rail head width.



Legende

D Tiefe des Ausarbeitung

$S \geq 5D$

$L + 2S \geq 200$ mm

Fig. 18: Example of prepared area on a test piece

The dimension D must be large enough so that the surface of the last layer is even with the surface of the surrounding rail.

For DB Netz AG, the distance L + 2S is set at 250 mm. Welding must be carried out from left to right. The edge zones (S) are not used for testing. The test specimen is taken from the centre of area L.

3.5.2 Testing a single run

3.5.2.1 Objective

This test is used to verify the compatibility of the filler materials with the rail steel. No preparation is required for this build-up weld.

3.5.2.2 Description

The test piece of the corresponding steel grade must be at least 600 mm long. The running surface of the test piece must be lightly sanded to remove any rust. The test piece must be preheated in accordance with the preliminary welding procedure specification (pWPS) and the location of the preheating measurement must be selected in accordance with **Section 4.1**.

3.5.2.3 Inspection and assessment of the build-up weld

The build-up weld must be cleaned, and slag and spatter must be removed. The build-up weld must first be visually inspected "as welded".

After the visual inspection, the build-up weld must be ground down until it is 0.5 mm to 0.8 mm below the rail surface. After grinding, the build-up weld must be subjected to magnetic particle testing (MPI) or dye penetrant testing (DPT). The build-up welding must comply with the specifications set out in **Section 4.7**.

If the build-up weld fails the MPI or DPT, testing must be terminated. The approval of the welding consumables must be rejected for this steel grade.

3.5.3 Test for single-layer build-up welding

3.5.3.1 Objective

This test is used to examine the impact of single-layer build-up welding on the rail material and to check for homogeneity.

3.5.3.2 Description

The test piece of the corresponding steel grade must be at least 600 mm long. The rail must be prepared in accordance with **Section 4.1**.

Only in the case of MMA electrodes must the length of the joint preparation be calculated in such a way that the full length of the electrode minus 80 mm is used. This length can be derived from the individual build-up weld on the rail.

3.5.3.3 Inspection and assessment of the build-up weld

The build-up welding must be cleaned, slag and splatter must be removed, and the surface must be checked using MPI or DPT. The build-up weld must be divided as set out in **Section 4.5** and prepared for hardness testing and metallurgical examination. All results must comply with the requirements set out in **Section 4.7**.

If the build-up weld fails the MPI or DPT, testing must be terminated. On completion, the rail must be ground to the rail head profile.

3.5.4 Test for multi-layer build-up welding

3.5.4.1 Objective

This test is used to determine the integrity of the metal used for multi-layer build-up welding on rails.

3.5.4.2 Description

The test piece of the corresponding steel grade must be at least 600 mm long. The rail must be prepared in accordance with **Section 4.1**.

Only in the case of MMA electrodes must the length of the joint preparation be calculated in such a way that the full length of the electrode minus 80 mm is used. This length can be derived from the individual build-up weld on the rail. For completion, the build-up welding must consist of at least five layers and the rail must be ground down to match the rail head profile.

3.5.4.3 Inspecting and assessing build-up welds

The build-up weld must be cleaned, slag and splatter must be removed, and the surface must be checked using MPI or DPT. The build-up weld must be divided and prepared for hardness testing and metallurgical examination as set out in **Section 4.5**. All results must comply with the requirements set out in **Section 4.7**.

If the build-up weld fails the MPI or DPT, testing must be terminated.

3.5.4.4 Report on the welding tests

The welder must document the following:

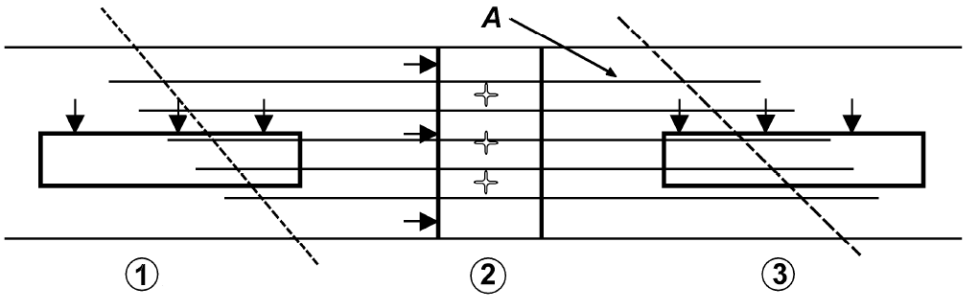
- The behaviour of the electrode during welding
- The ignition behaviour (ignitability and re-ignitability)
- Smoke production
- The removability of slag and spatter
- Cratering

3.5.5 Preparing, examining and testing test pieces

3.5.5.1 Labelling test pieces for examination

A number of test pieces with single-layer and multi-layer build-up welding are required. Figure 20 describes the separation cuts (thick lines) for sampling and the locations for the hardness tests (stars).

The arrows indicate the surfaces for the location of the macro/micro examinations.



Legende

① Länge mindestens 100 mm (es muss mindestens 10 mm in den Bereich der ungeschweißten Schiene vor Beginn der Auftragschweißung hineinreichen); die Tiefe muss mindestens die Tiefe des Ausarbeitung +10 mm sein

② Breite mindestens 20 mm; die Tiefe muss die Tiefe des Ausarbeitung +20 mm sein

③ Länge mindestens 100 mm (es muss mindestens 10 mm in den Bereich der ungeschweißten Schiene nach dem Ende der Auftragschweißung hineinreichen); die Tiefe muss mindestens die Tiefe der Ausarbeitung +10 mm sein

A schematisches Beispiel eine Auftragschweißung

Figure 19: Location of the macro/micro examinations

3.5.6 Hardness testing for the build-up welding and the non-welded rail

This applies to single-layer and multi-layer build-up welding.

- Surface hardness test

To determine the hardness on the surface of the build-up weld, the hardness must be measured at three points using test method HBW 2.5/187.5 in accordance with EN ISO 6506-1.
Specimen 2 in Figure 19 indicates the locations for the hardness measurement. The hardness measurement must be taken in the centre and the measuring points must be 10 mm apart. The hardness must be expressed as the mean value of the three measurements.

- Hardness testing in build-up welding

The hardness profile for the build-up weld must be determined in the vertical axis of the build-up weld using the HV10 test method in accordance with EN ISO 6507-1. The indentations must start 3 mm below the rail head and must be recorded 1.5 mm apart along the centre line of the rail profile. Hardness impressions of the unaffected base rail must extend into the area of the unaffected parent material (at least five characterising indentations). Specimen 2 from Figure 19 is to be used for this test.

Figure 20 describes locations for hardness testing in build-up welding.

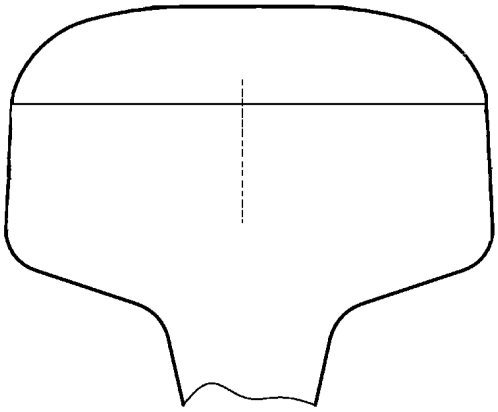


Figure 20: Example of locations for hardness testing

3.5.6.1 Macro and micro testing

In preparation for the examination, the test piece must be polished free of grooves and then etched with a nitrate-like solution (2% or 4% nitric acid in alcohol). Other etching processes are not permitted.

3.5.7 Acceptance criteria

3.5.7.1 Hardness

The acceptance criteria for hardness are listed in Table 09.

Steel grade	Position	Single layer	Multi-layer
R260	Surface	max. 380 HBW	290 HBW to 340 HBW
	Build-up welding	Not applicable	max. 400 HV10
R350HR	Surface	max. 400 HBW	340 HBW to 390 HBW
	Build-up welding	Not applicable	max. 400 HV10

Table 09: Hardness requirements for the surface of the build-up welding

The same filler materials must provide acceptable hardness values for single-layer and multi-layer build-up welding.

3.5.7.2 Macro and micro testing

The maximum permissible porosity for rail welding is significantly lower than that for manufacturing in general. This is due to the chemical composition and the cyclical load sustained during operations.

Defects must be assessed on the cross-section of the specimen (test piece 2) and on longitudinal sections (test pieces 1 and 3) over a total length of 100 mm.

The acceptance criteria for macro/micro analyses are shown in Table 10.

Defect type	Acceptance criteria
Cracks	Not permissible
Crater cracks	Not permissible
Individual pores	0 mm to 0.12 mm, unlimited
	0.12 mm to 0.3 mm, max. 3 per test piece
	0.3 mm to 1 mm, max. 1 per test piece
	>1 mm, not permissible
Pore groups[a]	Max. 0.4 mm, max. 3 groups per test piece
Linear pores[b]	Not permissible
Extended cavities / wormholes	Not permissible
Solid inclusions	None obvious in the polished test pieces
Lack of fusion	Not permissible
Differences	Not permissible
a Pores are categorised as groups if the distance between two pores is smaller than the diameter of a pore.	
b Linear pores are defined by the arrangement of three or more pores in one plane.	

Table 10: Acceptance criteria for macro and micro analyses

At 100x magnification, the test piece must not show any signs of retained martensite. At a magnification of 100x or above, signs of retained martensite are to be ignored.

3.6 On-track tests

3.6.1 General

The on-track tests must be carried out on a rail made of the steel grade to be approved.

The build-up welding must be carried out in accordance with the requirements of the WPS.

The test welds should be carried out in the centre of the rail head. The rail should be loaded with mixed traffic at 160 km/h and a load of at least 60 Tlt/t. The tests can be analysed on simulated defects over the full width of the rail head. Tracks with material breakouts can be examined visually and using ultrasound. The evaluations can be recorded 14 days before the welding. The test vehicles must be free of obvious and internal defects.

A description of the site can be created to describe the rails used, the insulated rail joints and the condition of the rails in the area extending 4.5 m on both sides of the test welds.

This description can include the flatness measurement and the intended centre line of the weld, 500 mm on both sides of the weld. Under no circumstances may the flatness deviation exceed 0.2 mm.

For the on-track tests, the welding conditions, the number of prepared areas, the route categories, the dimensions of the prepared areas, the test distances and the average tonnage must be recorded.

3.6.2 Preparation details

The details of the prepared area must comply with the specifications set out in **Section 4.1**.

In the case of transverse prepared areas, the prepared area must extend across the entire width of the rail head.

3.6.3 Scope of testing

The tests must include the following:

- a: Testing for surface cracks
- b: Detection of localised deformation (wear or plastic material deformation) by checking the levelness of the build-up weld with the base rail over a length of 1.0 m
- c: Soundness of the weld

3.6.4 Test methods

- For test a: visual inspection and MPI or DPT
- For test b: straightedge and feeler gauge or electronic straightedges
- For test c: Ultrasonic testing (UT) in accordance with the requirements of the railway authority (rail company)

3.6.5 Requirements for the track test pieces

Two types of repair welds are necessary to analyse the impacts:

Two types of prepared areas are required to examine affected and unaffected welding material:

- Four test pieces with one layer
- Four test pieces with × layers (at least five layers)

3.7 Acceptance criteria

3.7.1 Rail evenness

If a flatness deviation of more than 0.2 mm, measured over a length of 1 metre, is detected after a load of 5 million tonnes, the test piece must be rejected.

3.7.2 Surface defects

No visible defects are permitted when carrying out magnetic particle inspection (MPI) or dye penetrant testing (DPT).

3.7.3 Premature wear of the weld

Deviations in the running surfaces of more than 0.2 mm over a test length of 1 m in the rail cross-section compared to the measurement after the first day are not permissible.

After completion of the test welds, any defects that occur that are not related to the weld shall be excluded from the metrological evaluation of the build-up welds.

3.7.4 Frequency of testing

The on-track tests must be carried out over a period of five years or a track load of 100 million tonnes and must be carried out at least after the first day, after the first month, after six months and then annually or as determined on an individual basis.

Records of track inspections must be kept for evaluation purposes.

3.8 Analysis, results reports and decisions based on the track tests

3.8.1 General

On completion of all on-track tests, the body carrying out the test must draw up a report containing the following points:

- List of all general information
- Records of the track inspections
- Proposal of the issuing body regarding the filler materials and WPS

3.8.2 List of all general information

- Authorising rail company
- Route category
- Route description
- Condition of the rails before welding (ultrasonic testing)
- Rail designation
- Location
- WPS (manufacturer of the filler material/identification/dimensions /classification)
- Name of the engineer responsible for the on-track testing

3.8.3 Records of the track inspections

The test report after each test must include the following:

- Presence of any cracks
- The geometric deviations in the longitudinal and transverse directions and the deformations
- Soundness of the weld as determined by an ultrasonic examination

3.9 Decision regarding the filler materials and WPS by the body carrying out the tests

The body carrying out the tests must state in this report whether the filler material and the associated WPS meet the acceptance criteria.

3.10 Declaration of conformity for filler materials

All filler materials used after the track tests must be available with the same quality, performance and characteristics as the materials used in the tests and shall be supplied in accordance with EN ISO 544. The labelling of the filler materials used in production must reflect their conformity with the filler materials used in the tests.

4 Approval and release of filler materials for arc joint welding

4.1 Fundamental requirements

The fatigue resistance of welded joints on rail steels is tested using the constant-amplitude fatigue test. The test must be carried out on a rail joint that matches the form of the rail and the steel grade for which the approval/release is to apply.

The quality of execution of the weld to be tested must match the subsequent actual condition (production on the track/in the workshop).

Mechanical post-treatment of the bead transitions, in deviation from the series, is not permissible.

4.1.1 Fatigue test

The fatigue resistance must be determined using the "past-the-post" test method.

4.1.1.1 "Past-the-post" test method

Three test pieces are required. The weld must be within ± 10 mm of the centre of the test piece.

a) Each test piece must be positioned in the test device in such a way that the centre line of the weld is within 3 mm of the centre line of the stamping tool.

b) The maximum stress to be applied is 200 MPa, the minimum stress is set at 25 MPa. The test pieces must not be more than 100 mm longer than the outer span.

No defects may occur during the application of five million vibrations.

c) The weld is loaded with a sinusoidal, cyclical load so that the maximum and minimum stress values are reached. The specified values must be kept within 2% of the required nominal value. The fatigue test is carried out either until fracture occurs or until five million load cycles have been reached.

If the test piece fractures, the result must be documented as a failure. If the test piece remains intact, it is documented as "fatigue-tested".

4.1.2 Documentation

The following values must be documented for each test series:

- The inner and outer span of the test rig
- The distance between the centre line of the stamping tool and the support points
- The nominal stress converted to the outer bending curve

The following must be documented for each test:

- Whether the test piece has failed the test or is documented as "fatigue-tested"
- In the event of failure, the location of the fracture

5 Approval and release

The application for approval for the railway infrastructure sector must be submitted to the German Federal Railway Authority, Sgb. 215, Arnulfstrasse 9/11, 80335 Munich, Germany.

All necessary documents must be enclosed with the application:

- For filler materials for arc build-up welding on rails, according to Section 2 and Section 3
- For filler materials for arc joint welding on rails, according to Section 2 and Section 4

The German Federal Railway Authority issues a U-EBA mark with the approval.

The application for approval for use at DB Netz AG must be submitted to DB Netz AG, headquarters, Rail Technology Competence Unit, Adam-Riese-Strasse 11-13, 60327 Frankfurt am Main.

All necessary documents must be enclosed with the application:

- Authorisation for operational testing or approval from the German Federal Railway Authority
- For filler materials for arc build-up welding on rails, in accordance with Section 2 and Section 3
- For filler materials for arc joint welding on rails, in accordance with Section 2 and Section 4

If a filler material has a CE marking, EBA approval is not required; release for use by DB Netz AG must be applied for in all cases. If a filler material is included and named in DB Netz AG's 824 guidelines, the named filler material shall be deemed to be approved.

5.2 Changes, name changes, changes to product designations

All changes, e.g. changes to the name or company name of the manufacturer, changes to product designations etc., must be reported to the approval and release bodies and a corresponding renewed approval or release must be applied for.

The changes and any conformity with the previous product must be demonstrated to the approval and release bodies using suitable documentation. These must be confirmed by one of the bodies named in Section 4.1.3.

5.3 Quality assurance

In order to demonstrate consistent quality, the manufacturer's, supplier's or dealer's own internal production control must be monitored at least once a year by an accredited testing centre in accordance with system 2+ and evidence of this must be provided to DB Netz AG, Rail Technology Competence Unit, in the form of a monitoring report and the manufacturer's checklist.

If the manufacturer, supplier or dealer refuses to comply with monitoring, DB Netz AG's Rail Technology Competence Unit reserves the right to withdraw approval.

5.4 Costs

All services mentioned, such as

- product testing/evaluation,
- quality monitoring within the framework of the WPK,
- approval,
- release
- and field testing,

are subject to a charge. The cost rates can be obtained from the respective service provider. All costs shall be borne by the applicant.

Annex 6

DB Systemtechnik
Zertifizierungsstelle für Schweißzusätze
14774 Brandenburg-Kirchmöser, Germany

Requirements governing the marking/labelling of filler metals

The following information is to be clearly and durably marked on the smallest possible packaging unit to be supplied:

- Manufacturer, supplier or trader
- Brand name,
- Standardised designation using the classification system "A" for unalloyed and low-alloy steels including classification symbols for yield strength and Charpy V-notch impact energy,
- Dimensions of filler metals,
- Weight or quantity,
- Batch number or production unit,
- Labelling for welding consumables for hard-facing according to VA 918 490 (see **Fig. 1**),
  or
  CE mark with declaration of performance in accordance with Regulation (EU) No 305/2011 (CPR) (see **Fig. 2**).
- DB approval number,
- Code number identifying the production facility, to be displayed after the DB approval number (see also **Fig. 1** and **Fig. 2**).

If wire electrodes are supplied without packaging (e.g. in mesh boxes), the full designation including CE mark shall be displayed on each spool.

Examples of smallest allowed packaging units: spool for wire electrodes, smallest pack of electrodes.

Fig. 1: Sample label, for welding consumables for hard-facing according DIN EN 14700

MusterWeld	***Mustermarke 100***		
	wire electrode for welding hard-facing von unalloyed and low-alloy steels DIN EN ISO 14700-S – Fe1 Shielding gas as per DIN EN ISO 14175 - M 21 Approvals: TÜV (00000); GL, DB approval no.: 42.999.01/01 ***MusterWeld Schweißtechnik KG, 1000 Berlin, Lichtbogenstr. 1***		
Notified body **0035** **Certificated VA 918 490**	***Weight*** ***15 kg***	***Serial no.*** ***47111***	***ø*** ***1,2 mm***

Fig. 2: Sample label with indication of declaration of performance

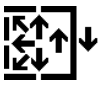
<table>
<tr><td rowspan="3">MusterWeld

CE

0035
05

0035-CPR-12345

DIN EN 13479+DIN EN 14532</td><td colspan="3">Sample brand 100</td></tr>
<tr><td colspan="3">MSG wire electrode for welding unalloyed and low-alloy steels
DIN EN ISO 14341-A - G 46 4 M21 3Si1
Shielding gas as per DIN EN ISO 14175 - M 21
Approvals: TÜV (00000); GL, DB approval no.: 42.999.01/01

=+ 

MusterWeld Schweißtechnik KG, 1000 Berlin, Lichtbogenstr. 1
www.musterweld.de</td></tr>
<tr><td>Weight
15 kg</td><td>Serial no.
47111</td><td>ø
1.2 mm</td></tr>
</table>