



BACKLACK PROCESSING GUIDELINES

Valid from 1 May 2025
Version 4

TABLE OF CONTENTS

3	General
3	Transport and storage
4	General requirements for the production of test specimens and stacks
4	» Geometry of floating roller test specimens
5	» Geometry of tensile lap-shear test specimens
6	Completion of outgoing goods inspection at voestalpine
6	» General
7	» Baking of test specimens: Description of bonding process and bonding parameters for quick bonding
7	» Testing adhesion strength: Quick bonding
8	» Baking of test specimens: Description of baking device and bonding parameters for conventional bonding
10	» Testing adhesion strength: Conventional bonding
11	Inspection of incoming goods at the customer
12	Process window for customer stack production
13	Legal information

Printed copies cannot be updated on a regular basis. Please refer to the most recent content in the online data sheets found on our home page. Technical changes reserved. Errors and misprints excepted. No part of this publication may be reprinted without explicit written permission by voestalpine Stahl GmbH.

GENERAL

These processing guidelines provide information on the treatment of electrical steel coated with self-bonding-varnish made by voestalpine and apply to Remisol EB 549 rapid and Remisol EB 549 pulse. These processing guidelines set forth the requirements for transport and storage process, regulations for the production of test specimens and parameters for approval-related testing. Please direct any questions to your responsible sales personnel or technical specialist at voestalpine.

TRANSPORT AND STORAGE

The following must be observed for the transport and storage of electrical steel coated with self-bonding-varnish:

- » A limit temperature of +40 °C must not be exceeded.
This limit temperature may be reached for a maximum of one week.
The recommended storage temperature is +23 °C.
- » Dry storage must be ensured, and condensation must be avoided.
- » The period of maximum storage is six months, beginning at the time the material is supplied by voestalpine. Should the customer fail to comply with the contractually agreed acceptance dates of deliveries, the aforementioned storage period shall be reduced accordingly by the duration of acceptance default.

The above requirements must be ensured by the customer. Deviations from the above parameters can lead to negative changes in the product and/or processing properties.

GENERAL REQUIREMENTS FOR THE PRODUCTION OF TEST SPECIMENS AND STACKS

The term „test specimen“ in this document refers to a stack of sheets manufactured pursuant to DIN EN 1464 or DIN EN 1465 as described in detail below. The term „stack“ refers to a stack of sheets in the geometry of the component or close to the geometry of the component.

- » Material straightening must be avoided.
- » Stamping aids may not be used.
- » The same orientation of cutting or stamping burr must be maintained when stacking.
The height of any cutting or stamping burrs must not exceed 0.03 mm.
- » When stacking the individual laminations to test specimens, laminations must be arranged such that the bottom side of the top-most lamination is bonded together with the top side of the second lamination and so forth.
- » Local increases in pressure or temperature must be avoided during the adhesive-bonding process. A guide for the manufacturing of test specimens is available in an instructional video: www.voestalpine.com/isovac/en/insights/backlack-testing-methods-and-production-of-test-specimens
- » Varnish squeeze-out is determined during a visual inspection. The test specimens of voestalpine are inspected using laser triangulation as the standard. If varnish squeeze-out shall be tested, deburring of the single lamellas is not allowed.

Between manufacturing and testing, specimens must be stored for at least 1 hour at conditions of $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and $50 \pm 10\%$ r.H. (see DIN EN ISO 291).

GEOMETRY OF FLOATING ROLLER TEST SPECIMENS

The floating roller test specimen is made based on DIN EN 1464. The test specimen must measure 25 mm by 200 mm and be at least 3 mm high (regardless of sheet thickness). The long side of the individual laminations is positioned transverse to rolling direction.

In the case of thin material, thicker lamellas coated with the same self-bonding-varnish can be used as an alternative to simplify manipulation of the rigid joining part, e.g. 4 sheets of 0.5 mm each instead of 8 sheets of 0.25 mm each). The two uppermost lamellas must be made of the material to be tested. The test specimen height must measure at least 3 mm.

Exactly one lamination is peeled from each test specimen, regardless of sheet thickness, using the floating roller device outlined in DIN EN 1464. Parallel specimens must be prepared.

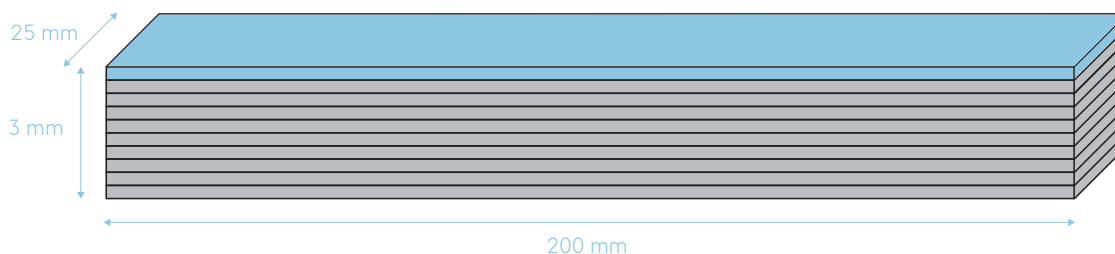


Figure 1: Geometry of test specimens for the testing of adhesion in the floating roller test

GEOMETRY OF TENSILE LAP-SHEAR TEST SPECIMENS

The geometry of test samples is selected pursuant to DIN EN 1465. The tensile lap-shear test is performed in reinforced design for all strip thicknesses, whereas the relevant part to be tested is reinforced with two layers of the same material. This serves to assess the actual quality of the bond and to prevent any plastic deformation or fracture of the joined component (see Figure 2). The overlap area is 12.5 mm by 25 mm (sample width). To avoid specimen deformation during the test, support sheets must butt against each other. Any gap is not permissible.

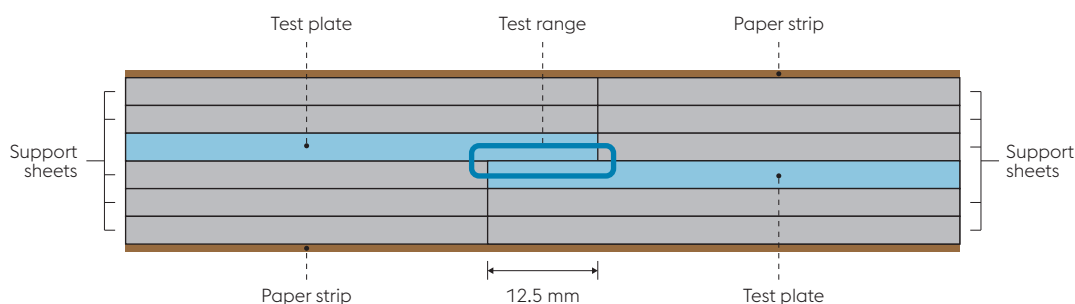


Figure 2: Geometry of test specimens (adapted from DIN EN 1465). The long side of the laminations is in rolling direction.

PROCEDURE OF OUTGOING GOODS INSPECTION AT voestalpine

GENERAL

Unless otherwise agreed with the customer, voestalpine conducts outgoing inspection to determine bondability and varnish squeeze-out. The floating roller test is based on DIN EN 1464 for quick bonding. For conventional bonding, bondability is tested using a floating roller test based on DIN EN 1464 or a tensile lap-shear test based on DIN EN 1465 (reinforced).

The adhesion strength is subject to agreement between the customer and voestalpine on a project-specific basis. The following project specifics must be taken into account:

- » Type of bonding (quick or conventional) and the respective test method
- » Steel grade used
- » Varnish and layer thickness used

Adhesion of the cured coating in as-delivered condition is tested by voestalpine by means of cross-cutting (pre-based on EN ISO 2409). Additional testing of the self-bonding-varnish beyond determination of adhesive strength and varnish squeeze-out is not performed by voestalpine.

Component testing is not conducted by voestalpine.

BAKING OF TEST SPECIMENS: DESCRIPTION OF BONDING PROCESS AND BONDING PARAMETERS FOR QUICK BONDING

Single laminations are bonded using a heating press to form a test specimen for the floating roller test: manufactured by Vogt, model A00251, including locking device, or heating presses with the same specifications. Before the test specimens are bonded, the locking device is tempered in the heating press. A PTFE film (thickness of 0.25 mm max.), which features adhesive on one side, is attached to the locking device to prevent test specimens from adhering to the locking device.

The locking device must be preheated. The device must be brought to temperature again in the event that it is not possible to prevent cooling while the specimen is being handled. This must be done within 5 seconds to prevent the locking device from cooling down again:

- » Removing the hot locking device from the heating press
- » Remove the previous test specimen as required
- » Insert single laminations to produce the new test specimen (at least 3 mm height)
- » Close the locking device
- » Insert the locking device into the heating press
- » Start the time/temperature/pressure program of the heating press

Parameters for the bonding of single laminations into test specimens, quick bonding using Remisol EB 549 rapid:

	Remisol EB 549 rapid
Pressure / MPa	3
Time with closed heating press / min	2
Temperature / °C	240

The test specimen is removed from the locking device while still hot and is cooled in air to room temperature.

TESTING ADHESION STRENGTH: QUICK BONDING

Parameters for testing using a tensile test machine with peeling device based on DIN EN 1464:

- » Testing speed: 100 mm min⁻¹
- » Temperature of test specimen: Room temperature

BAKING OF TEST SPECIMENS: DESCRIPTION OF BAKING DEVICE AND BONDING PARAMETERS FOR CONVENTIONAL BONDING

The baking device used by voestalpine is described in more detail in Figures 3 through 5 and in Table 1. It is used for the production of the test specimens for the floating roller test and the tensile lap-shear test.

Please observe the following rules when stacking single laminations in the baking device and during the baking process:

- » Specimens up to a height of 65 mm max. can be inserted into the baking device.
- » Individual test samples must be separated in the baking device by a double layer of pressure-resistant paper.
- » The pressure load must be applied to the stack before the bonding process begins. No further pressure readjustment may take place during the bonding process itself.
- » Once the single laminations have been stacked in the baking device (at room temperature), springs are inserted into the baking device, and the baking device is closed.
- » When still cold, a defined pressure is applied to the stack in the device.
- » The specimens are bonded in a preheated convection oven.
- » After bonding is complete, the test specimens are cooled in air or the closed baking device (up to temperatures below 80 °C).

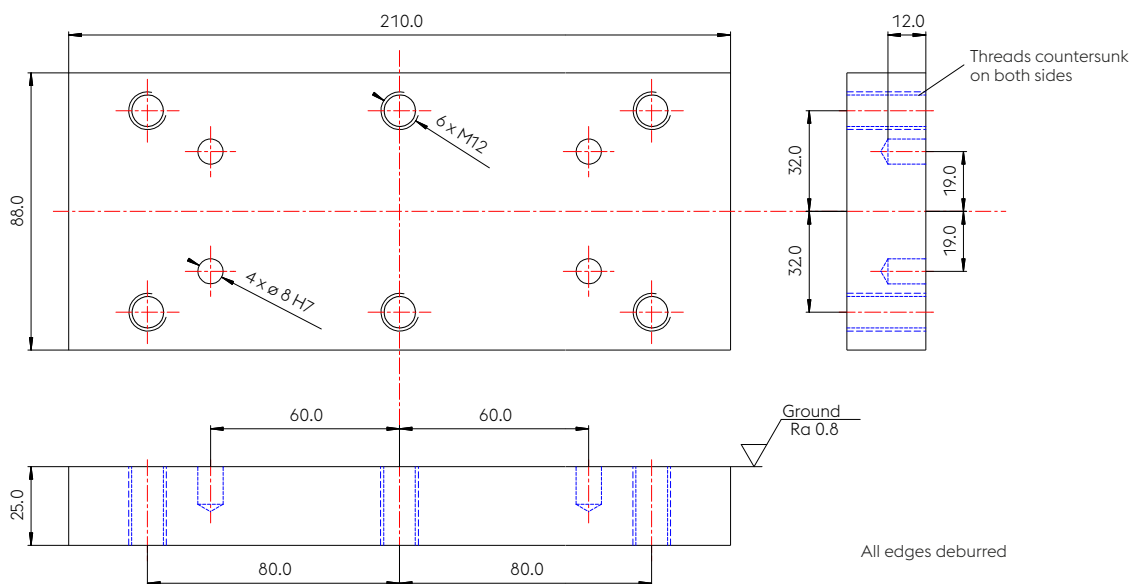


Figure 3: Base plate of baking device for the production of test samples

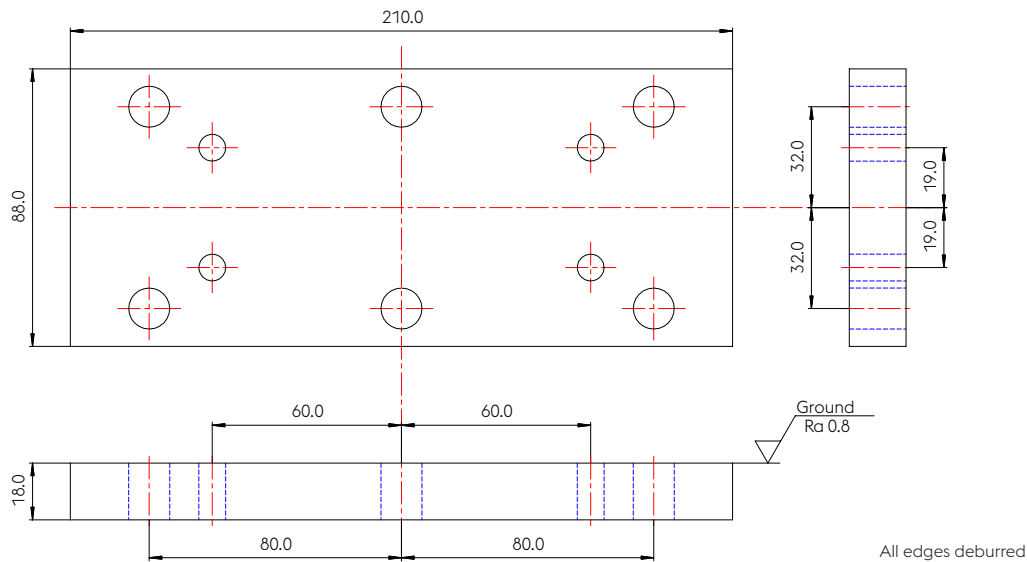


Figure 4: Head plate of baking device for the production of the test samples

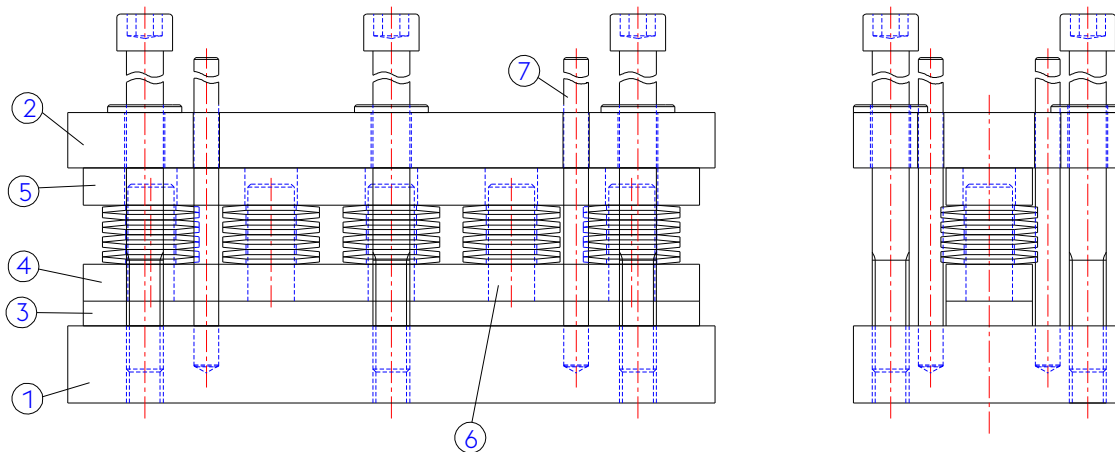


Figure 5: Assembled baking device

Table 1: Baking device component list

Component	Name	Units	Material
1	Base plate 210 x 88 x 25	1	1.4122
2	Head plate 210 x 88 x 18	1	1.4122
3	Intermediate layer 200 x 28 x 8	1	1.4122
4	Spring mount base plate 200 x 28 x 12	1	1.4122
5	Spring mount cover plate 200 x 28 x 12	1	1.4122
6	Pin Ø 16 x 37 DIN EN ISO 8734	5	
7	Round steel Ø 8 h 9 x 140	4	1.4122
	Cup springs 31.5 x 16.3 x 1.75 A DIN 2093 FDST		

The parameters for bonding the individual laminations into test specimens for conventional bonding

	Remisol EB 549 rapid	Remisol EB 549 pulse
Pressure applied at room temperature / MPa	3	1
Baking time / min	120	240
Furnace chamber temperature / °C	200	140

TESTING ADHESION STRENGTH: CONVENTIONAL BONDING

Parameters for testing using a tensile test machine based on DIN EN 1465 (tensile lap-shear test):

- » Testing speed: 10 mm min⁻¹
- » Temperature of test specimen: Room temperature

Parameters for testing using a tensile test machine with peeling device based on DIN EN 1464 (floating roller test):

- » Testing speed: 100 mm min⁻¹
- » Temperature of test specimen: Room temperature

INSPECTION OF INCOMING GOODS AT THE CUSTOMER

Upon receipt, the customer shall undertake to carry out a proper inspection of the incoming goods. This incoming inspection must be carried out in accordance with the general conditions of the voestalpine outgoing goods inspection, must include the determination of bondability based on the agreed testing method and visual inspection of any varnish squeeze-out on the adhesively-bonded test specimen. If the strip width is too small, incoming inspection at the customer must also be conducted on test specimens in the direction of rolling.

Any complaint or claim cannot be accepted for the respective material in the event that an incoming inspection has not been carried out at the customer within one month of delivery (specifically pursuant to the aforementioned testing procedures). In case of doubt, the parameters listed in this document shall be applicable to the testing of the respective self-bonding-varnish.

PROCESS WINDOW FOR CUSTOMER STACK PRODUCTION

Depending on the baking varnish used, different process windows must be observed for the processing of individual laminations into stacks. These windows can be found in the data sheets of the varnish manufacturer. The parameters listed below correspond to those in the data sheets of the varnish manufacturer.

Table 2: **Process window for electrical steel strip, coated with Remisol EB 549 rapid, quick bonding**

Parameters	Value
Pressure / MPa	3
Temperature / °C	Time / min
220	5
240	2
260	1

Table 3: **Process window for electrical steel strip, coated with Remisol EB 549 rapid, conventional bonding**

Parameters	Value
Pressure applied at room temperature / MPa	3
Temperature / °C	20 – 200 (ramp)
Time / min	120

Table 4: **Process window for electrical steel, coated with Remisol EB 549 pulse, conventional bonding**

Final stack temperature / °C	Pressure applied at room temperature / MPa	Holding time / min
25 – 140 (ramp)	1	240
25 – 150 (ramp)	1	240
25 – 160 (ramp)	3	120
25 – 200 (ramp)	3	120

LEGAL INFORMATION

voestalpine expressly reserves all rights, particularly intangible property rights (including intellectual property, copyrights, trademark rights and registered design rights etc.), to the information contained in this document.

To the extent that individual technical properties and specifications are not specifically defined by the customer, e.g. by means of meaningful measurements and limit values, such properties and specifications shall merely serve as technical guidelines and non-binding target values unless agreed on an individual basis.

voestalpine shall not grant any warranty nor be held liable for properties and/or specifications other than those explicitly agreed. This also applies to the suitability and applicability of pre-materials for certain applications as well as to the further processing of materials. All application risks and suitability risks are borne by the customer. Based on differences in production technologies, voestalpine offers no warranty nor will voestalpine be held liable with respect to the processability of electrical steel coated with self-bonding-varnish and Remisol EB 549 pulse in large-scale processes for the production of lamination stacks by the customer.

The Technical Terms of Delivery applicable to electrical steel are available at:

www.voestalpine.com/stahl/en/Download-Center

The General Terms of Sale for Goods and Services of the voestalpine Steel Division shall apply and can be accessed at:

www.voestalpine.com/stahl/en/General-Terms-of-Sale

05/2025

voestalpine Steel Division
voestalpine-Straße 3
4020 Linz, Austria
productmanagement@voestalpine.com
www.voestalpine.com/steel

voestalpine
ONE STEP AHEAD.