



HOT-DIP GALVANIZED STEEL STRIP

Technical terms of delivery
1 September 2019



PREMIUM QUALITY
WITH REDUCED
CARBON FOOTPRINT

These general terms apply to all hot-dip galvanized steel strip supplied by companies in the voestalpine Steel Division. Please use the following link to find a list of the companies affiliated with the Steel Division:

www.voestalpine.com/stahl/en/Companies

The names of companies in the voestalpine Steel Division are referred to simply as **voestalpine** in this document.

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INTRODUCTION

voestalpine operates one of Europe's most modern steelmaking facilities in Linz. Each of the modern lines required for the production of high-quality steel strip is located next to related facilities and is highly integrated into the works.

Our goal is to innovate and go beyond standard steels, to continually offer high-quality products. The most modern manufacturing technologies, continuous quality control systems as well as intense research and development guarantee optimum product quality.

These technical terms of delivery provide information on the ordering and processing of **hot-dip galvanized steel strip**. Please direct any of your questions to your responsible sales personnel or technical specialist at voestalpine.

QUALITY MANAGEMENT

voestalpine is a quality leader in a challenging market environment, and it has become the company philosophy to meet the justified expectations and requirements of both the market and the customer with respect to every possible aspect of quality. Comprehensive quality management is a central component of the company strategy. In addition to this comprehensive quality management system, production monitoring using the most modern testing systems is also a necessity. These systems are inspected on a regular basis by external and independent agencies.

COMPREHENSIVE QUALITY MANAGEMENT

The voestalpine companies meet the highest standards of quality management and are certified pursuant to **Lloyd's Register QA Ltd.** in the United Kingdom as well as **ISO 9001** and **IATF 16949**.

This has been confirmed by numerous customer awards presented for best quality performance. Focus has been continually on this pursued path as well as on consistent implementation of all quality standards.

STATE-OF-THE-ART TESTING TECHNIQUES

voestalpine uses the most modern testing techniques and methods, laboratory information and management systems equipped with state-of-the-art technologies. The technical expertise of our testing and inspection laboratories is certified in accordance with international standards, e.g. **ISO/IEC 17025** and **ISO/IEC 17020**, and is accredited by Austrian national standards.

STEEL GRADE OVERVIEW

All steel grades named in **EN 10346** or **VDA 239-100** can be supplied. Customer specifications or special orders are subject to special agreement between the customer and voestalpine and must be included in written form in the order. Please ask for more detailed information from your voestalpine sales contact or technical customer service representative. Please use the following link to find further information about the available range of hot-dip galvanized steel grades and dimensions:
www.voestalpine.com/stahl/en

STRUCTURAL STEELS

The structural steel product family is defined by minimum yield strength, tensile strength and total elongation requirements. The alloy is based on a low-carbon strategy, whereas the strength can be adjusted by adding solid-solution-strengthening alloys. Structural steels are suitable for simple forming operations such as folding, edging and profiling.

MILD STEELS

Differentiation is made between LC and ULC/IF steels in the mild steel product family. Their field of application ranges from simple structural members to complex pressed parts that meet the highest forming requirements. The alloy design is based on a low-carbon strategy for moderate demands on forming properties. An interstitial-free (IF) alloy design is used to meet the highest forming requirements. Interstitially dissolved elements such as carbon and nitrogen are stabilized by added niobium and/or titanium. ULC/IF steels provide the best forming properties with respect to deep drawing because of their low yield strength, high total elongation and high r values. This property profile makes ULC/IF steels suitable for applications with high deep drawing demands and for creating visible parts with an attractive surface appearance.

MICROALLOYED STEELS

Microalloyed steels (HSLA = high strength low alloyed) are members of the product family of conventional high-strength steels. They feature a wide variety of yield strength levels and cover the upper strength range of conventional high-strength steels. Microalloyed steels are characterized by a high ratio of yield to tensile strength, good cold formability and good weldability. The individual strength classes are adjusted essentially by adding microalloying elements such as niobium, titanium and vanadium. These alloying elements can be added individually or in combination and lead to increased strength through grain refinement and precipitation hardening. Carbon additions and solid-solution strengthening are also used to increase the strength. As a result of their wide range of strength levels, microalloyed steels offer the possibility of optimally selecting the materials to conform to component requirements and are thus very well suited to the manufacture of structural and chassis parts.

CARBON-MANGANESE STEELS

Carbon-manganese steels belong to the product family of conventional high-strength steels. They are characterized by intermediate tensile strength and a high total elongation. Their strength is achieved through high carbon content and solid-solution-strengthening elements, particularly manganese. Adding niobium and/or titanium as alloying elements leads to precipitation hardening and grain refinement. Carbon-manganese steels are especially suitable for the production of structural and reinforcing components in the automotive industry.

BAKE-HARDENING STEELS

Bake-hardening steels belong to the product family of conventional high-strength steels. Based on their various strengths, these steels provide additional increases in yield strength during the heat treatment applications generally used in automotive painting processes. This increase in yield strength is achieved by adjusting the right amount of dissolved carbon in the steel. Bake-hardening steels are characterized by excellent forming properties, higher strength in the finished part following the coating process as well as high dent resistance and strength. This excellent property profile predestines bake-hardening steels for the production of structural components and exposed panels. They contribute substantially to the design of the automobile.

HIGH-STRENGTH IF STEELS

High-strength IF (interstitial-free) steels belong to the product family of conventional high-strength steels. They feature the best forming properties among the conventional high-strength steels as a result of their high level of work hardening, lack of a pronounced yield strength, high total elongation and a high r value. The alloy is based on a vacuum-decarburized IF strategy that is stabilized with titanium and/or niobium. The individual strength classes are achieved through adding solid-solution-strengthening alloying elements such as manganese, phosphorus and/or silicon. Their excellent property profile makes high-strength IF steels predestined for complex component applications with high demands on deep-drawing suitability and strength.

DUAL-PHASE STEELS

Dual-phase steels are part of the ahss classic product line of voestalpine in the field of ultralights and are characterized by excellent physical properties, including low yield strength, high work hardening, high tensile strength as well as high uniform and total elongation. The microstructure of dual-phase steels consists primarily of ferrite and martensite and, as its strength increases, can contain bainite, tempered martensite and residual austenite. The finely tuned microstructure achieves a balance between deep-drawing capacity and resistance to edge cracking, which is why these steels are ideal for applications in complex structural components. The balance between strength, formability and weldability of dual-phase steels leads to enormous potential in light-weight design while also achieving improved crash performance.

COMPLEX-PHASE STEELS

Complex-phase steels are part of the ahss classic product line of voestalpine in the field of ultralights and are characterized by high yield ratios at high strength, very high resistance to edge cracking and excellent bending properties. The finely tuned multiphase microstructure consists of martensite, bainite, ferrite and tempered martensite, whereas the occurrence of hard phases rises as the strength class increases. Complex-phase steels were specially developed for roll-profiling, bending and edging processes. These steels have proven themselves in industrial-scale serial production and are recommended for innovative light-weight automotive applications such as stiffeners, sills, door impact bars, seat mounting rails and auto chassis components. As a result of this balanced property profile, complex-phase steels are predestinated for applications containing crash components with a high potential for light-weight design.

DUAL-PHASE HIGH-DUCTILITY STEELS

Dual-phase high-ductility steels are an innovation of voestalpine in the field of ultralights. In contrast to classical dual-phase steels, dual-phase high-ductility steels feature significantly improved formability with respect to deep drawing. Depending on the strength class, the multiphase microstructure of dual-phase high-ductility steels consists of certain amounts of ferrite, martensite, bainite and residual austenite. This results in high resistance to edge cracking and excellent crash behavior. Based on their unique properties, dual-phase high-ductility steels make a substantial contribution to innovative light-weight design in safety-related and crash-relevant components.

TRIP STEELS

TRIP (transformation-induced plasticity) steels are part of the ahss classic product line of voestalpine in the field of ultralights. They maintain high tensile strength while achieving excellent deep-drawing properties through extraordinary uniform and total elongation. The microstructure consists of a ferritic matrix with embedded phases of bainite and residual austenite. The residual austenite is metastable and transforms during plastic deformation to martensite. This strain-induced transformation makes it possible for TRIP steels to achieve excellent deep-drawing properties and predestines them for the manufacture of complex components with pronounced deep-drawing capacity. As a result of their high crash energy absorption, TRIP steels are ideal for safety-related and crash-relevant structural components.

PRESS-HARDENING STEELS

Press-hardening steels are an innovation of voestalpine in the field of ultralights. Differentiation is made between phs-ultraform® and phs-directform®. The phs-ultraform® and phs-directform® steel grades combine the advantages of press-hardened components with the high-quality corrosion resistance of hot-dip galvanized steel strip. phs-ultraform® is press-hardened in an indirect hot forming process, whereas phs-directform® is processed through direct hot forming. Press-hardening steels permit light-weight design with regard to freedom of design, dimensional accuracy and process security and are the solution for safety-relevant components subject to heavy corrosion such as side members, cross members, A and B pillars, sills and tunnels.

HOT-ROLLED FERRITIC-BAINITIC STEELS

Ferritic-bainitic steels are characterized by medium tensile strength and good cold formability. The microstructure consists of a ferritic matrix containing bainite. The strength of the matrix is achieved through grain refinement, the precipitation of alloying elements and a high dislocation density. Ferritic-bainitic steels are primarily used in the production of structural, body and reinforcement components.

OVERVIEW OF METALLIC COATINGS

The coatings listed in the following are available according to the provisions of **EN 10346** or **VDA 239-100**. Customer specifications or special requests are subject to special agreement. Please ask for more detailed information from your voestalpine sales contact or technical customer service representative.

- » Zinc coating Z/GI
- » Zinc-iron ZF/GA
- » Zinc-magnesium coating ZM/corrender

Limitations apply to some steel grades with coating variants ZF/GA and ZM with respect to their characteristic mechanical values (in accordance with the provisions of **EN 10346** and **VDA 239-100**).

SURFACE

SURFACE QUALITY

Coatings with zinc, zinc-iron and zinc-magnesium are available as product variants in a variety of different surface finishes (supply according to the provisions of **EN 10346** and **VDA 239-100**).

- » As-coated surface (A)
- » Improved surface (B) or unexposed (U)
- » Best surface (C) or exposed (E)

Please ask for more detailed information from your voestalpine sales contact or technical customer service representative.

SURFACE FINISH FOR ZINC COATINGS

NORMAL SPANGLE (N)

Zinc crystals occur in varying brightness and size, depending on prevalent galvanizing conditions. Coating quality is not influenced by these crystals. The grade is delivered even if no preferences regarding surface quality are specified. We reserve the right to supply skin-passed material in filling orders for material with normal spangles.

MINIMIZED SPANGLE (M)

The surface shows small to macroscopic non-visible spangles caused by targeted influence on solidification. The surface appearance may vary slightly from coil to coil or within a single coil.

Explicit customer requests for non-skin-passed strip with MA surface are subject to special agreement between the customer and voestalpine and must be indicated in written form in the order.

SURFACE FINISH FOR ZINC-IRON COATINGS

Hot-dip galvanized steel strip with a zinc-iron coating is produced using an inline heat treatment method in which iron diffuses into the zinc layer. The surface is matt, gray and free of spangles (surface finish R).

SURFACE FINISH FOR ZINC-MAGNESIUM COATINGS

The production of this coating is made possible through small amounts of aluminum and magnesium in the metallic zinc bath. ZM is available in variants N and M (analogous to Z).

DIFFERENTIAL GALVANIZATION

Differing zinc coating masses on each side (differential galvanization) can be delivered upon request. The differential galvanization process may lead to differences in surface appearance.

ROUGHNESS OF ZINC AND ZINC-MAGNESIUM COATINGS

Roughness requests for surface type A cannot be accepted. As a standard, B/U and C/E surface types are delivered with a medium roughness value ranging between 0.6 and 1.9 µm. The mean roughness value Ra is determined according to the provisions of **EN 10346** and **EN 10049** (cutoff of 2.5 mm and a standard length of 12.5 mm).

When specially required, delivery of limited roughness values may be specified. This is subject to special agreement between the customer and voestalpine and must be included in written form in the order. Special surface finishes are listed in the following table.

Finish	Mean roughness value Ra [µm]
Standard	0.6-1.9
Roughness: especially smooth	0.5 max.
Roughness: smooth	0.9 max.
Special option: half matt	0.7-1.3
Special option: matt	1.3-1.9

The desired quality must be specified in the order. Special surface appearances are subject to approval when a **smooth** surface has been selected. Supply of surfaces with a glossy appearance (**especially smooth**) is subject to special agreement between the customer and voestalpine and must be included in written form in the order.

ROUGHNESS OF ZINC-IRON COATINGS

As a standard, B/U and C/E surface types are delivered with a medium roughness value ranging between 1.0 and 1.9 µm. The mean roughness value Ra is determined according to the provisions of **EN 10346** and **EN 10049** (cutoff of 2.5 mm and a standard length of 12.5 mm).

SURFACE TREATMENTS

Hot-dip galvanized steel strip is supplied exclusively with surface protection because of the danger of white rust. The following surface treatment procedures are usual:

- » Chemically passivated (C)
- » Oiled (O)

A series of additional surface treatment methods are provided by voestalpine and include inorganic as well as organic forming aids and pre-lubes of the newest generation. Please ask for more detailed information about available surface treatments from your voestalpine sales contact or technical customer service representative.

CHEMICALLY PASSIVATED (C)

To the extent not otherwise agreed, hot-dip galvanized steel strip is delivered in **chemically passivated** condition and with normal surface finish (NA) or minimized spangles (MA). Local discoloration caused by chemical passivation is permitted and does not negatively influence other quality properties. Passivation may influence further surface treatments carried out by the customer, for example phosphating. An alternative surface treatment method, e.g. **oiling**, is recommended in such instances.

OILED (O)

The MB/U and MC/E surfaces and hot-dip galvanized steel strip with ZF/GA coatings are delivered in oiled condition to the extent not agreed otherwise. The oil layer can be removed with suitable zinc-sparing degreasing agents. Depending on the processing stress, two standard coatings are available: **slightly oiled** as a temporary form of corrosion protection and as a forming aid for medium forming stress, **oiled** for very heavy forming stress.

The microtopography usually makes it necessary to increase the oil quantity on ZF/GA coatings. An even higher amount of oil may be required during highly demanding forming operations.

OIL QUANTITIES

- » Z/GI and ZM slightly oiled: approx. 0.7 g/m² per side
- » Z/GI and ZM oiled: approx. 1.0 g/m² per side
- » ZF/GA oiled: approx. 1.2 g/m² per side
- » ZF/GA heavily oiled: approx. 1.6 g/m² per side

CHEMICALLY PASSIVATED AND OILED (CO)

This combination of surface treatment is recommended where increased protection against white rust or oiling as a forming aid is required.

A certain degree of oil will invariably spread across the length and width of the strip, and some oil from heavily oiled strip will be shed from the surface during transportation and storage. This is unavoidable. When chemical passivation is combined with oil, the oil quantity is limited to 0.5 g/m² per side.

ORDER QUANTITIES AND MANUFACTURED UNITS

HOT-DIP GALVANIZED STEEL AS WIDE STRIP (COIL)

- » The minimum order quantity per line item is one coil production unit (depending on the steel grade, between approx. 18 kg/mm and approx. 20 kg/mm strip width) and/or its multiple.
- » It is possible to subdivide these coil units into smaller coils.
- » The target is fulfillment of customer orders with respect to the requested coil weight. It is permissible to fall below the ordered coil weight by up to a maximum of 30%.
- » The weight tolerance of line items whose ordered weight exceeds 100 tons is plus/minus a typical coil production unit typical for this item.

HOT-DIP GALVANIZED STEEL AS SLIT STRIP OR CUT SHEETS

- » The minimum order quantity per line item is one coil production unit, which ranges roughly between approx. 18 kg/mm and approx. 20 kg/mm strip width and/or its multiple, depending on the steel grade.
- » This coil production unit can be subdivided.
 - » Possible in small coils for slit strip, e.g. 18, 9, 4.5 kg/mm)
 - » Cut sheets and tailored blank packages can be divided into units ≤ 10 tons
- » Overdelivery and underdelivery is permitted up to $\pm 10\%$.

WEIGHTS

- » The maximum weight per steel coil is 35 tons.
- » The maximum weight per package of cut sheets is 6 tons.

All available steel grades and dimensions can generally be supplied with a specific coil weight of between approx. 18 kg/mm and approx. 20 kg/mm strip width.

AVAILABLE DIMENSIONS

With regard to geometric properties, the tolerances of all finally annealed products made by voestalpine are subject to the provisions of **EN 10346**, **VDA 239-100** and **EN 10143**. Limited tolerances and other parameters not contained in the standard are subject to special agreement between the customer and voestalpine and must be included in written form in the order. To the extent not agreed otherwise, the ordered thickness includes symmetrical thickness tolerances.

Please find more detailed information about available dimensions in the product data sheets of the respective steel grade group or use the following link to access the product information portal:

www.voestalpine.com/pro

HOT-DIP GALVANIZED STEEL AS WIDE STRIP (COIL)

Product variant	Thickness [mm]	Width max. [mm]	Outer diameter max. [mm]	Inner diameter [mm]
Zinc coating	0.45–4.00	1730	2000	600 *
Zinc-iron coating	0.45–2.30	1730	2000	600 *
corrender zinc-magnesium coating	0.45–2.30	1730	2000	600 *

Available combinations of widths and thicknesses vary depending on the steel grade.

* Indicated references are standard values.

HOT-DIP GALVANIZED STEEL AS SLIT STRIP

Product variant	Thickness [mm]	Strip width max. [mm]	Outer diameter max. [mm]	Inner diameter [mm]
Zinc coating	0.45–4.00	10–1730	700–2200	500/600 *
Zinc-iron coating	0.45–2.30	10–1730	700–2200	500/600 *
corrender zinc-magnesium coating	0.45–2.30	10–1730	700–2200	500/600 *

Available combinations of widths and thicknesses vary depending on the steel grade.

* Indicated references are standard values.

HOT-DIP GALVANIZED STEEL AS CUT-TO-LENGTH SHEETS

Product variant	Thickness [mm]	Width max. [mm]	Length max. [mm]	Package weight max. [t]
Zinc coating	0.45–4.00	210–1730	200–6700	6
Zinc-iron coating	0.45–2.30	210–1730	200–6700	6
corrender zinc-magnesium coating	0.45–2.30	210–1730	200–6700	6

Available combinations of widths and thicknesses vary depending on the steel grade.

INSPECTIONS

MATERIAL INSPECTION

Material test certificates must be requested at the time of the order in accordance with the provisions of **EN 10204**. With respect to test units, sampling and the performance of inspection tests, the stipulations contained in the respective order standards shall apply. Specific requests are subject to special agreement between the customer and voestalpine and must be included in written form in the order. Characteristic mechanical values refer to the trial sample cross section, including the coating.

ZINC COATING MASS INSPECTION

The zinc layer is generally determined as the strip moves continuously by means of x-ray fluorescence analysis. The layer is determined gravimetrically for special testing purposes or in cases of arbitration. The provisions of **EN 10346** apply (Appendix A).

ZINC ADHESION TEST

Adhesion of the zinc coating is determined by means the drop-ball impact test in accordance with **SEP 1931**. Judgment is made based on a qualitative standard series, whereas the criterion of quality is based on proper workability according to the respective application.

RETESTS

The provisions of **EN 10346** shall apply.

LABELING

Standard labeling consists of a tag per package unit and indicates the following:

- » Supplier
- » Recipient
- » Order number
- » Strip number (identification number)
- » Heat number
- » Part or package number
- » Steel grade
- » Dimension
- » Number of units
- » Weights
- » Date of production

Additional data or marking directly on the material (coil or package marking) is subject to agreement.

TECHNICAL INSPECTION OF INQUIRIES AND ORDERS

ORDERS BASED ON INTERNATIONAL STANDARDS

The customer shall specify all applicable standards (such as EN10346 and EN10143) in the inquiry or order. The parallel specification of several standards (such as **EN10346** and **VDA 239**) is expressly excluded. All order details set forth in these voestalpine Technical Terms of Delivery shall be provided in full by the customer. In the event that the required order details are not provided in full by the customer, the standard values set forth in these Technical Terms of Delivery, e.g. surface roughness, oiling, thickness tolerances etc., shall be applied to the order. Any limitations pertaining to an international standard shall be subject to prior special agreement between the customer and voestalpine and shall be included in the order in written form.

ORDERS BASED ON A CUSTOMER STANDARD OR CUSTOMER SPECIFICATION

The customer specifies all pertinent standards and specifications at the time of the inquiry or order and provides the sheet metal data card for the required dimensions. Parallel specification of a customer standard AND an international standard is expressly excluded. The customer shall be informed by voestalpine of any restrictions or objections that arise during the technical review of requested standards. The customer shall sign and return the technical review, including any restrictions and objections, to voestalpine in the event of customer acceptance. Should the customer reject the technical review in part or in full, it will be necessary for the customer and voestalpine to negotiate a standard acceptable to both parties. In the event that the customer does not expressly reject the technical opinion and takes further steps (material order, request for trial sample etc.), the technical opinion shall be deemed as accepted by the customer and voestalpine shall not accept any subsequent complaint nor recognize any claim of deviation from the customer specification.

ADDITIONAL INFORMATION

Supply as **galvanized hot-rolled strip** is possible to the extent that this is not excluded or clearly agreed.

PROCESSING INFORMATION

The product properties described herein are applicable to the extent that usage and processes are in accordance with the pertinent standards and the technical terms of delivery published by voestalpine.

Further useful information is available in **Reference Sheet 121:2003** published by the Steel Information Center on corrosion protection systems for structural elements made of steel sheet.

Should the customer have any special requests or required any limitations in order to guarantee functionality and production of the product, this shall be subject to special agreement between the customer and voestalpine and must be indicated in written form in the order. Examples of such requirements are as follows:

- » Limited tolerances
- » Special mechanical properties or specifications
- » Special applications (safety parts, oil-filter cartridges or similar)
- » Subsequent processing steps (strip coating, heat treatment)
- » Special tests

Rerolling or straightening through product stretching may be necessary for specific coil break freedom requirements. Customer requests for freedom of coil breaks are subject to special agreement between the customer and voestalpine and must be indicated in written form in the order.

As a standard, the welded joint is marked with a punched hole before and after the seam. Other marking methods are subject to individual agreement. The absence of weld seams is subject to special written agreement as part of the order.

Any special further processing requirements must be included by the customer in written form in the order for the prematerial.

In the event that recurrent defects become apparent during the unwinding of a coil or a slit coil, suggesting that the entire coil or slit coil will result in greatly increased scrap during processing, the processor shall discontinue use of the coil and notify the supplier immediately.

Steel strip absorbs tension when it is coiled, and this can lead to deviations in strip flatness when it is uncoiled (roll bending, chuck bending etc.). These deviations usually do not interfere with strip processing. Customers who require completely flat strip must employ a tension leveler that is suitable for the respective material.

Conventional emulsions must be used, particularly during the forming of hot-dip galvanized steel strip. The pH value of the emulsions may not exceed 9, and the constituents may not have any negative effect on corrosion resistance. voestalpine has tested several different emulsions and classified them as suitable for forming. Please ask for more detailed information from your voestalpine sales contact or technical customer service representative.

The following brief instructions are intended to provide assistance in the processing of hot-dip galvanized steel strip. Please ask for more detailed information from your technical customer service representative at voestalpine.

ZINC COATING VARIANT Z/GI

FORMING

Depending on the particular grade, hot-dip galvanized strip can be used for conventional forming processes such as edging, bending, curling, flanging, stamping, crimping, roll-profiling, stretch forming and deep drawing. The selection of materials depends on the demands on formability, final geometry and workpiece function. The zinc coating and the surface must be adapted to the processing parameters. The properties of the zinc require that the drawing gap and the retraction radii are enlarged in certain cases as compared to uncoated thin sheet. Altered flow behavior makes it necessary in some cases to adapt the hold-down force in forming processes.

JOINING

Conventional thermal and mechanical joining technologies as well as adhesive technologies can be used as methods of connecting. The special physical and chemical properties of the coatings, however, require adaptation of the processing parameters of some joining methods.

Hot-dip galvanized steel strip is suitable for welding using conventional welding techniques. Special adjustment of the welding parameters and electrodes is necessary for this product during resistance welding (spot, projection or stitch welding). Thin zinc coatings simplify the welding process. The fumes generated during welding should be exhausted. Corrosion protection in the welding area can be optimized by means of a suitable post-treatment process (such as zinc dust paint coating).

Hot-dip galvanized steel strip can be soft-soldered or brazed. A metallically clean surface is a precondition that can be achieved with suitable fluxing agents. Proper filling of the joint is achieved with respective brazing metals. Corrosive fluxing agents are to be carefully washed off after soldering. Mechanical joining methods such as screwing, riveting, crimping, flanging and clinching are not problematic and have the advantage that they preserve the surface and maintain anticorrosive properties. It is necessary to consider possible problems of contact corrosion when different materials are combined.

The significance of metal gluing is increasing in combination with other methods of joining. High-strength connections are achievable with modern adhesives, even between oiled products. An examination of the surface system, possible treatment processes and the adhesives themselves is advisable.

THERMAL RATING

Structural parts made of hot-dip galvanized steel strip can be subjected to long-term heat treatment up to roughly 200–250 °C. Temperature stress of longer duration can lead to negative effects in the substrate and surface material because of the diffusion reaction between the zinc coating and the substrate.

SUITABILITY FOR THE APPLICATION OF COATINGS

Hot-dip galvanized steel strip in all of its surface grades lends itself well to the application of organic coatings (such as paints or films). An MB or MC surface is the correct selection in the event of high or higher demands on a uniform surface appearance after coating. Proper pretreatment is required in order to achieve perfect adhesion.

ZINC-IRON COATING VARIANT ZF/GA

In addition to the general information above, the following applies to hot-dip galvanized steel strip with zinc-iron coatings:

JOINING

Improved spot-welding properties are to be expected as compared to other zinc-based metallic coatings. Particularly longer electrode tool life is achievable with resistance spot welding.

FORMING

The ZF/GA coating has a strong tendency toward abrasion in powdered form based on the higher strength during heavy forming, especially flattening stress. This tendency toward abrasion is primarily dependent on the coating mass. For this reason we recommend a low coating mass.

SUITABILITY FOR THE APPLICATION OF COATINGS

Based on its specific surface structure, hot-dip galvanized steel strip with a ZF/GA coating after proper cleaning is suitable for direct painting.

ZINC-MAGNESIUM COATING VARIANT ZM/CORRENDER

In order to achieve optimum results, it is important to follow the instructions for the application, processing and storage of hot-dip galvanized products with zinc-magnesium coatings as one would for hot-dip galvanized steel strip.

It is also highly recommended that galvanized strips be used and stored in a manner that allows water and moistness to run off. Dry phases should allow the material to dry and ensure that it is not permanently exposed to water.

It is necessary to consider possible problems of contact corrosion when different materials are combined.

MARKING

voestalpine reserves the right to deliver marked or unmarked material in the event that the customer when placing the order does not provide any explicit information with respect to marking.

PACKAGING

The initial inner and final outer coil windings are considered to be packaging and are not representative of the properties in the remaining windings of the coil.

The desired packaging type, package or coil weight and additional requests with respect to packaging, labeling and loading are subject to special agreement between the customer and voestalpine and must be included in written form in the order.

TRANSPORT AND STORAGE

- » Transport in dry condition
- » Store in a dry environment and protected from the weather, preferably indoors in a suitable warehouse
- » Protect against condensation (avoid excessive temperature differences)
- » Use proper supports
- » Avoid local pressure loads
- » Keep storage times short

The material must be protected against any corrosion from salts, acids, alkaline fluids or other substances containing such.

A loose, matt gray to reddish material called white rust forms on the surface when hot-dip galvanized steel strip is subject to humidity for a longer period of time with reduced ventilation. The formation of condensate on the coil surface is the main reason for white rust growth and must be avoided. Proper transport procedures and correct storage until the coils are unpacked are also measures that must be taken to avoid the formation of white rust. Temperature changes during transportation and storage are critical. Coils take approximately four days to completely assume a new ambient temperature. During this time they are subject to the risk of condensate formation. The lowest risk is reached as soon as the coils have completely assumed the new temperature.

Dark spots may appear where coil windings rub against each other and cause friction on the zinc surface. These spots affect the appearance but do not adversely affect the quality of the corrosion protection.

In the event that the customer discovers that packaging has become wet, the coil shall be immediately unpacked and wiped dry. Quick action is required in such a case. Before it is processed, the material shall be stored in a dry and well ventilated environment. In every such case, the responsible technical specialist at voestalpine shall be contacted immediately in order to be able to initiate appropriate measures.

The supplied material, including packaging, shall be checked for product quality (identification, packaging and product condition) by the recipient of the material upon arrival. In the event that material damage or any inadmissible characteristic is discovered in the material at the time it is inspected upon arrival, this shall be documented as accurately as possible in the corresponding freight documentation:

- » Trucks: CMR
- » Railway CIM: Assessment of current condition by responsible railway company
- » Waterborne vessels: Bill of lading/deletion log

Anomalies encountered on the means of transport or in the course of unloading the material shall be documented using photographs sent to the responsible contact person at voestalpine. Such documentation excludes the possibility of the material being damaged by the consignee in the warehouse and provides evidence that the delivered material was damaged before it arrived.

Hot-dip galvanized steel strip is generally intended for short-term processing. Storage for longer periods of time can lead to non-uniform surface darkening, particularly on hot-dip galvanized steel strip with ZM/corrender coatings. This only has an effect on the appearance.

Temporary surface protection (oil or chemical passivation) is applied to hot-dip galvanized steel strip at the end of the production line. The customer is responsible for verifying suitability of the respective surface protection for each application. This protection is only temporary. A maximum warranty period of three months shall apply to all methods used to protect surfaces from corrosion and shall be subject to proper storage, transport, loading and packaging in accordance with VDEh Data Sheet 114 and VDEh Data Sheet 130. (The material shipment date ex works shall apply.) Warranties shall not apply to any corrosion on non-surface-protected material.

The actual duration of protection depends on atmospheric conditions (particularly those in the warehouse). The surface protection applied in the production line may have an effect on subsequent processes such as painting or phosphating. The customer is responsible for verifying suitability of surface protection for each respective application.

GENERAL TERMS OF SALE

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 otherwise agreed. voestalpine shall not grant any warranty nor be held liable for properties and/or specifications other than those explicitly agreed upon. This also applies to the suitability and applicability of hot-dip galvanized steel strip for certain applications as well as to the further processing of materials. All application risks and suitability risks are borne by the customer.

Please use the following link to find the applicable **general terms of sale for goods and services of the voestalpine Steel Division**: www.voestalpine.com/stahl/en/The-Steel-Division/General-Terms-of-Sale

ORDER DATA

The following information is required in each order:

- » Steel grades as defined by standards or explicit specifications
- » Dimensions, tolerances
- » Edge condition
- » Material test certificates, if desired; acceptance conditions upon request
- » Order quantity
- » Coating type, coating mass, including surface quality and surface finish
- » Preservation
- » For coils and slit strip
 - » Inner diameter
 - » Min./max. outer diameter
 - » With or without weld seam
 - » Min./max. coil/ring weight or min/max. kg/mm strip width
 - » Max. package weight (packing unit)
 - » Max. package width
- » For cut sheets
 - » Max. package weight
 - » Max. package height (with or without pallets)
- » Packaging
- » Labeling, marking, stamping
- » Mode of unloading, means of unloading and possible restrictions
- » Desired delivery date
- » Destination
- » Terms of delivery (Incoterms)
- » Material application

STANDARDS, REGULATIONS AND TECHNICAL LITERATURE

The following information includes applicable product standards and references to other information provided by the Steel Information Center. References are made to these guidelines and standards, and compliance with these recommendations and specifications is mandatory (unless explicitly stated otherwise in these Technical Terms of Delivery).

PRODUCT STANDARDS

DIN EN 10143

Continuous hot-dip coated steel sheet and strip, limit dimensions and forming tolerances

DIN EN 10204

Metallic products, types of inspection documents

DIN EN 10346

Continuously hot-dip coated steel flat products for cold forming, technical delivery conditions

PUBLICATIONS OF THE GERMAN STEEL FEDERATION

CHARACTERISTIC PROPERTIES 095

Hot-dip coated strip and sheet

REFERENCE SHEET 110

Cut-edge and cathodic protection of surface-treated fine steel sheet

REFERENCE SHEET 114

Packaging, storage and transport of uncoated and coated steel strip and sheet

REFERENCE SHEET 127

Oiling on thin strips and thin cut sheets

REFERENCE SHEET 130

Chemical passivation of metallic coatings on fine steel sheet

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voestalpine
ONE STEP AHEAD.