



HOT DIP GALVANIZED STEEL

PRODUCT DATA BULLETIN



Auto Body Panels

Appliances

HVAC Agricultural Equipment

Transportation

AK Steel's Hot Dip Galvanized Steel, known as ZINCGRIP® Steel, is continuously coated on both sides with a zinc coating. The hot dip process, pioneered by AK Steel, provides a tight metallurgical bond between the steel and the coating. This process results in a material with the strength and formability of steel plus the corrosion protection of zinc. Zinc protects the base metal by providing a barrier to corrosive elements and also by the sacrificial nature of the coating.

ZINCGRIP Steel is available with special surface finishes, tailored for specific applications, and in a variety of base metal grades and coating weights. ZINCGRIP Steel is widely used in many applications in the automotive, appliance, construction, HVAC, and other industries.

PRODUCT DESCRIPTION

PRODUCT FEATURES

Corrosion Resistance

The zinc coating protects the base metal by providing a barrier to corrosive elements and also by the sacrificial nature of the coating. Ultimate service life depends on coating thickness and the severity of the environment.

Excellent Surface Appearance

ZINCGRIP Steel is available as EXTRASMOOTH™ or ULTRASMOOTH® for the most demanding surface critical applications.

Formability

ZINCGRIP Steel can be used to produce parts containing simple bends to parts with deep drawing requirements.

Paintability

ZINCGRIP Steel is readily paintable provided proper pre-treatment is performed.

Weldability

ZINCGRIP Steel can be joined using a variety of accepted welding practices.

COATING CHARACTERISTICS

The hot dip coating process assures a tightly adherent, uniform coating of zinc on both sides of the product. A thin alloy layer readily permits normal fabrication practices without incurring significant coating damage.

Hot dip coatings are specified in a wide range of coating weight categories as shown in Table 1. The differences in designation are explained by the diagram in Figure 1. A schematic of the coating cross section is shown in Figure 2. For coating weights not listed, contact your AK Steel representative.

SURFACE PROTECTION AND LUBRICATION

To prevent staining in transit and storage, it is recommended that ZINCGRIP Steel be treated with a rust preventive oil. The oil is a combination of a rust preventive and a mineral oil. A chemical passivating treatment can also be supplied. A chemical treatment is not recommended if the product will be painted unless proper surface preparations are taken. Specific chemical treatment requirement (such as RoHS) must be clearly indicated and reviewed.

A preapplied press forming lubricant can be supplied. A dry film (acrylic/polymer) lubricant can also be supplied by further processing ZINCGRIP Steel through a coil coating facility.

ZINCGRIP Steel can be supplied with a zinc-phosphate coating called PAINTGRIP® for applications that require paint pre-treatment.

TABLE 1 – COATING WEIGHT

Coating Designation	Coating Weight Min.	
	oz./ft. ²	g/m ²
Triple Spot Designation (Total Both Sides)		
G01	No Min.	No Min.
G30	0.30	92
G40	0.40	122
G60	0.60	183
G90	0.90	275
G115	1.15	351
G140	1.40	427
G165	1.65	504
G185	1.85	565
G210	2.10	641
G235	2.35	717
Single Spot Designation (Single Side)		
20G/20G	0.07/0.07	20/20
40G/40G	0.13/0.13	40/40
50G/50G	0.16/0.16	50/50
60G/60G	0.20/0.20	60/60
70G/70G	0.23/0.23	70/70
90G/90G	0.29/0.29	90/90
98G/98G	0.32/0.32	98/98

Note: 1 oz./ft.² coating weight = 0.0017 in. coating thickness
7.14 g/m² coating mass = 1 μm coating thickness

For other coating weights, please Inquire.

FIGURE 1 – COATING DESIGNATION

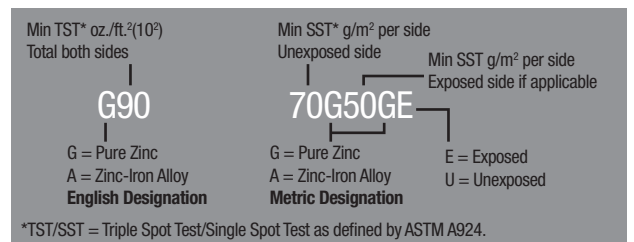


FIGURE 2 – COATING CROSS SECTION



Layers not shown to scale.

PRODUCT DESCRIPTION

SURFACE/FINISH

ZINCGRIP Steel is available in three types of surface appearances.

Minimized Spangle is ZINCGRIP Steel that, through control of the coating bath chemistry, has no visible spangle. It is available with the full range of coating weights and base metal qualities. It is used in noncritical surface applications and is not guaranteed to be free from stretcher strain, luder lines, or fluting.

EXTRASMOOTH is a product that is produced by skin passing the coated sheet to smooth the surface and impart resistance to stretcher strain and fluting. It is suited for applications where appearance is important. EXTRASMOOTH is recommended for coil coated applications.

ZINCGRIP ULTRASMOOTH Steel is a skin pass product with superior surface appearance, uniformity and consistency. Applications would include more stringent surface quality requirements.

AK Steel utilizes nitrogen finishing to control coating weight and smooth the coating. This technology, along with coating bath chemistry control, combine to produce a superior zinc coated product.

Regular spangle product is not available from AK Steel.

FORMABILITY AND MECHANICAL PROPERTIES

The formability of all steel products is a result of the interaction of many variables. These variables include: the mechanical properties of the steel, the forming system (tooling) used to manufacture parts, and the lubrication used during forming. Of these three, AK Steel can directly affect the mechanical properties of the steel. Tight control over chemical composition, hot rolling parameters, the amount of cold reduction, in-line annealing time and temperature, and the amount of additional processing allow the production of high quality ZINCGRIP Steel to meet customers' requirements.

Commercial Steel Type B (CS Type B) and Forming Steel Type B (FS Type B) should be used for moderate forming or bending applications. These products are produced from aluminum-killed continuously cast slabs and unless otherwise specified, have a carbon content of 0.02 to 0.15% C and 0.02 to 0.10% C respectively. To prevent the occurrence of fluting or stretcher strains during forming or processing, both products must be ordered as EXTRASMOOTH. These products are subject to aging and the temper rolling effect is temporary.

For more stringent forming applications, Deep Drawing Steel (DDS) should be ordered. DDS has a controlled carbon content (< 0.06% C). Interstitial Free (I-F) steel may be supplied at the manufacturer's discretion unless low carbon (non I-F) is specifically requested at the time of purchase.

Extra Deep Drawing Steel (EDDS) or Extra Deep Drawing Steel Plus (EDDS+) should be ordered for the most demanding forming applications. These steels, also known as Interstitial Free (I-F) steel, are produced from vacuum degassed (< 0.010% C), stabilized grades. EDDS+ has the lowest carbon content available and has been specially formulated to be AK Steel's most ductile product.

For high strength applications, ZINCGRIP Steel is available as Structural Steel (SS) or High Strength Low Alloy Steel (HSLAS). Bake Hardenable (BH), Dent Resistant (DR) and Dual Phase (DP) Steels are also available.

Typical mechanical properties are shown in Tables 2 – 5.

SPECIFICATIONS

ZINCGRIP Steels are produced in conformance to the following specifications:

ASTM A653	Base metal chemistry, grades, and coatings
ASTM A755	Hot dip coil-coated for exposed building products
ASTM A924	General requirements and tolerances
ASTM A929	Corrugated steel pipe
AASHTO M218	Galvanized culvert sheets

For any specifications not listed here, contact your AK Steel Sales or Technical Representative.

OUTSIDE PROCESSING

Tailored blanks, tension leveling, re-squaring, slitting, cutting-to-length, and coil coating are just some of the services AK Steel can provide through arrangements with outside processors.

MORE INFORMATION/TECHNICAL ASSISTANCE

AK Steel's Technical Representatives can provide you with more detailed information concerning this product. They also are available to assist you in reviewing any welding, forming, painting, or other material selection issues.

MILL LIMITS

ZINCGRIP Steel is available in thicknesses from 0.018 in. (0.46 mm) to 0.134 in. (3.40 mm), and widths up to 80 in. (2032 mm), depending on the thickness. For sizes outside these limits, please contact your AK Steel representative.

The standard inner diameter of our coils is 24 in. (609 mm).

TABLES

TABLE 2 – TYPICAL MECHANICAL PROPERTIES – STANDARD GRADES

Quality Designation	Description	YS		UTS		Min. Elong. %	n	r _m
		ksi	MPa	ksi	MPa			
Commercial Steel (CS Type B)	May be moderately formed. A specimen cut in any direction can be bent flat on itself without cracking.	41	283	53	365	36	0.19	–
Forming Steel Type B (FS Type B)		37	255	50	348	37	0.20	–
Deep Drawing Steel (DDS) Low Carbon	May be used in drawing applications.	32	220	48	330	40	0.19	1.3
Deep Drawing Steel (DDS) Ultra-Low Carbon		25	172	42	303	42	0.22	1.5
Extra Deep Drawing Steel (EDDS)	Interstitial Free (I-F) steels are made by adding titanium and/or columbium to the molten steel after vacuum degassing and offer excellent drawability.	24	165	45	310	44	0.23	1.6
Extra Deep Drawing Steel Plus (EDDS+)		22	148	43	290	46	0.24	1.7

Typical properties produced by AK Steel for these grades.

Commercial Steel, Deep Drawing Steel, and Extra Deep Drawing Steel are designations described in the ASTM specifications for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process A653/A653M. Each of the steel sheet designations is associated with unique requirements for chemical composition and with nonmandatory, typical mechanical properties. All properties are tested per ASTM A370.

TABLE 3 – ASTM SPECIFIED PROPERTIES – HIGHER STRENGTH GRADES

Quality Designation	Description	Min. YS		Min. Tensile Strength		Min. Elong. %
		ksi	MPa	ksi	MPa	
Structural Steel (SS)	33 (230)	33	230	45	310	20
	37 (255)	37	255	52	360	18
	40 (275)	40	275	55	380	16
	50 Class 1	50	340	65	450	12
High Strength Low Alloy Steel (HSLAS)	40	40	275	50	340	22
	50	50	340	60	410	20
	50 (HSLAS-F)	50	340	60	410	22
	55 Class 2	55	380	65	448	18
	60	60	420	70	482	16

The following qualities are available to various customer requirements.

Bake Hardenable (BH) grades offer good formability with increased strength from work hardening and subsequent paint/bake cycle.	Dent Resistant (DR) grades offer good formability with increased strength from a high work hardening rate.	Dual Phase (DP)
BH 180 BH 210 BH 220 BH 240 BH 250 BH 260	DR 180 DR 190 DR 210	DP 590 DP 600 DP 780 DP 980

For strength levels not listed, please inquire.

TABLES

TABLE 4 – SAE SPECIFIED PROPERTIES NOT COVERED BY ASTM

Quality Designation	Description	Min. YS		Min. Tensile Strength		Min. Elong. %
		ksi	MPa	ksi	MPa	
High Strength Low Alloy Steel (HSLAS)	045XLK	45	310	55	380	22

TABLE 5 – AASHTO SPECIFIED PROPERTIES

Quality Designation	Description	Min. YS		Min. Tensile Strength		Min. Elong. %
		ksi	MPa	ksi	MPa	
AASHTO M218	CSP	33	230	45	310	20

TABLE 6 – ENGINEERING PROPERTIES

Young's Modulus of Elasticity	200 x 10 ³ MPa at 20 °C
Density	7.87 g/cm ³ at 20 °C
Coefficient of Thermal Expansion	Low-Carbon/HSLAS: 12.4 µm/m/°C in 20 °C to 100 °C range I-F Steel: 12.9 µm/m/°C in 20 °C to 100 °C range
Thermal Conductivity	Low-Carbon/HSLAS: 89 W/m°C at 20°C I-F Steel: 93 W/m°C at 20°C
Specific Heat	481 J/kg/°C in 50 °C to 100 °C range
Electrical Resistivity	0.142 µΩ•m at 20 °C





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Headquartered in West Chester, Ohio, AK Steel is a world leader in the production of flat rolled carbon, stainless and electrical steel products, primarily for automotive, appliance, construction and electrical power generation and distribution markets. The company operates seven steel plants and two tube manufacturing plants across four states – Indiana, Kentucky, Ohio and Pennsylvania. All of the company's steel plants are ISO/TS 16949, ISO 9001 and ISO 14001 certified for their quality and environmental management systems. AK Steel is a publicly held company traded over the New York Stock Exchange under the symbol AKS – aligning the company with many of the most prominent corporations in America.

The information and data in this document are accurate to the best of our knowledge and belief, but are intended for general information only. Applications suggested for the materials are described only to help readers make their own evaluations and decisions, and are neither guarantees nor to be construed as express or implied warranties of suitability for these or other applications.

Data referring to material properties are the result of tests performed on specimens obtained from specific locations of the products in accordance with prescribed sampling procedures; any warranty thereof is limited to the values obtained at such locations and by such procedures. There is no warranty with respect to values of the materials at other locations.

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Revision 10.23.12

