



# HOT DIP GALVANNEALED STEEL

PRODUCT DATA BULLETIN



**Construction**

**Auto Body Panels**

**Electrical Enclosures**

**J.K. Steel Corporation's Hot Dip Galvannealed Steel**, known as ZINCGRIP® GA Steel, is continuously coated on both sides with a zinc-iron alloy. Galvannealed steel is a specialized variation of galvanized steels where induction heating is used to alloy the zinc coating with the steel to create a zinc-iron coating. The hot dip process, pioneered by J.K. Steel Corporation, provides a tight metallurgical bond between the steel and coating. This process results in a material with the strength and formability of steel plus the corrosion protection of the zinc-iron coating. Zinc protects the base metal by providing a barrier to corrosive elements and also by the sacrificial nature of the coating.

ZINCGRIP GA Steel is available with special surface finishes, tailored for specific applications, and in a variety of base metal grades and coating weights. ZINCGRIP GA Steel is widely used in many applications in automotive and general manufacturing.

# HOT DIP GALVANNEALED STEEL

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

#### Formability

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

#### Paintability

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

#### Weldability

ZINCGRIP GA Steel can be joined using a variety of accepted welding practices. Its spot weldability is improved over free zinc coatings.

### COATING CHARACTERISTICS

The hot dip coating process assures a tightly adherent, uniform coating of zinc on both sides of the product. The strip passes through an induction furnace after the coating pot to allow the iron from the base metal to further diffuse into the zinc creating a zinc-iron alloy layer. The coating is nominally 8 – 13% iron. Precise temperature control provides sufficient ductility in the coating to permit normal fabrication practices without incurring significant coating damage or powdering. Coating designation at A40 and higher may not be suitable for higher forming applications due to the inherent attributes of the coating.

ZINCGRIP GA Steel has a dull gray surface with no spangle which provides a good base for painting. For best results, the surface should be carefully cleaned with an alkaline cleaner, however in some cases, cleaning by a solvent may be acceptable. Cleaning should be followed by a pre-treatment prior to painting.

ZINCGRIP GA Steel coatings are specified in several 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 J.K.Steel Corporation representative.

TABLE 1 – COATING WEIGHT

Coating Designation	Coating Weight Min.	
	oz./ft. <sup>2</sup>	g/m <sup>2</sup>
Triple Spot Designation (Total Both Sides)		
A01	No Min.	No Min.
A20	0.20	61
A30	0.30	92
A40	0.40	122
A50	0.50	153
A60	0.60	183
Single Spot Designation (Single Sides)		
45A/45A	0.15/0.15	45/45
60A/60A	0.20/0.20	60/60

For other coating weights, please inquire.

FIGURE 1 – COATING DESIGNATION

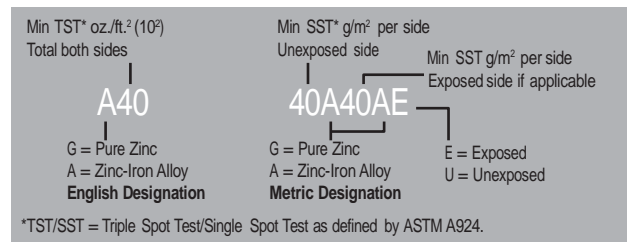


FIGURE 2 – COATING CROSS SECTION



\* Layers not shown to scale.

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## PRODUCT DESCRIPTION

### SURFACE PROTECTION AND LUBRICATION

To prevent staining in transit and storage, ZINCGRIP GA Steel should be coated with a protective oil. The mill can apply a mineral oil with a rust preventative combination, a preapplied press forming lubricant, a mill-applied phosphate coating or a chemical treatment (with or without oil). A chemical treatment is not recommended if the product will be painted unless proper surface preparations are taken. Specific chemical treatment requirements (such as RoHS) must be clearly indicated and reviewed.

### 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, J.K.Steel Corporation

can directly affect the mechanical properties of the steel having 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 will allow the production of high quality ZINCGRIP GA 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) and is produced in such a manner that parts formed from DDS steel should not exhibit stretcher strain.

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 J.K.Steel Corporation's most ductile product.

For high strength applications, ZINCGRIP GA 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 Table 2.

### SPECIFICATIONS

ZINCGRIP GA Steel is produced in conformance to the following specifications:

ASTM A653	Base metal chemistry, grades and coatings
ASTM A924	General requirements and tolerances

For any specifications not listed here, contact your J.K.Steel Corporation 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 J.K.Steel Corporation can provide through arrangements with outside processors.

### MORE INFORMATION/TECHNICAL ASSISTANCE

J.K.Steel Corporation'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 issue.

### MILL LIMITS

ZINCGRIP GA Steel are available in thicknesses from 0.018 in. (0.46 mm) to 0.080 in. (2.03 mm), and widths up to 80 in. (2032 mm) depending on thickness. For sizes outside of these limits, please contact your J.K.Steel Corporation representative.

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

# HOT DIP GALVANNEALED STEEL

## TABLES

**TABLE 2 – TYPICAL MECHANICAL PROPERTIES – STANDARD GRADES**

Quality Designation	Description	YS		UTS		Min. Elong. %	n	r <sub>m</sub>
		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.	38	265	50	345	37	–	–
Deep Drawing Steel (DDS)	DDS may be used in drawing applications	26	179	46	317	40	0.23	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 degassing and offer excellent drawability.	24	165	45	310	43	0.23	1.6
Extra Deep Drawing Steel Plus (EDDS+)		22	152	44	301	48	0.24	1.6

Typical properties produced by J.K.Steel Corporation 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 these steel designations is associated with unique requirements for chemical composition and with non-mandatory, 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 780 DP 980

For strength levels not listed, please inquire.

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## TABLES

**TABLE 4 – ENGINEERING PROPERTIES**

Young's Modulus of Elasticity	200 x 10 <sup>3</sup> MPa at 20 °C
Density	7.87 g/cm <sup>3</sup> 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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