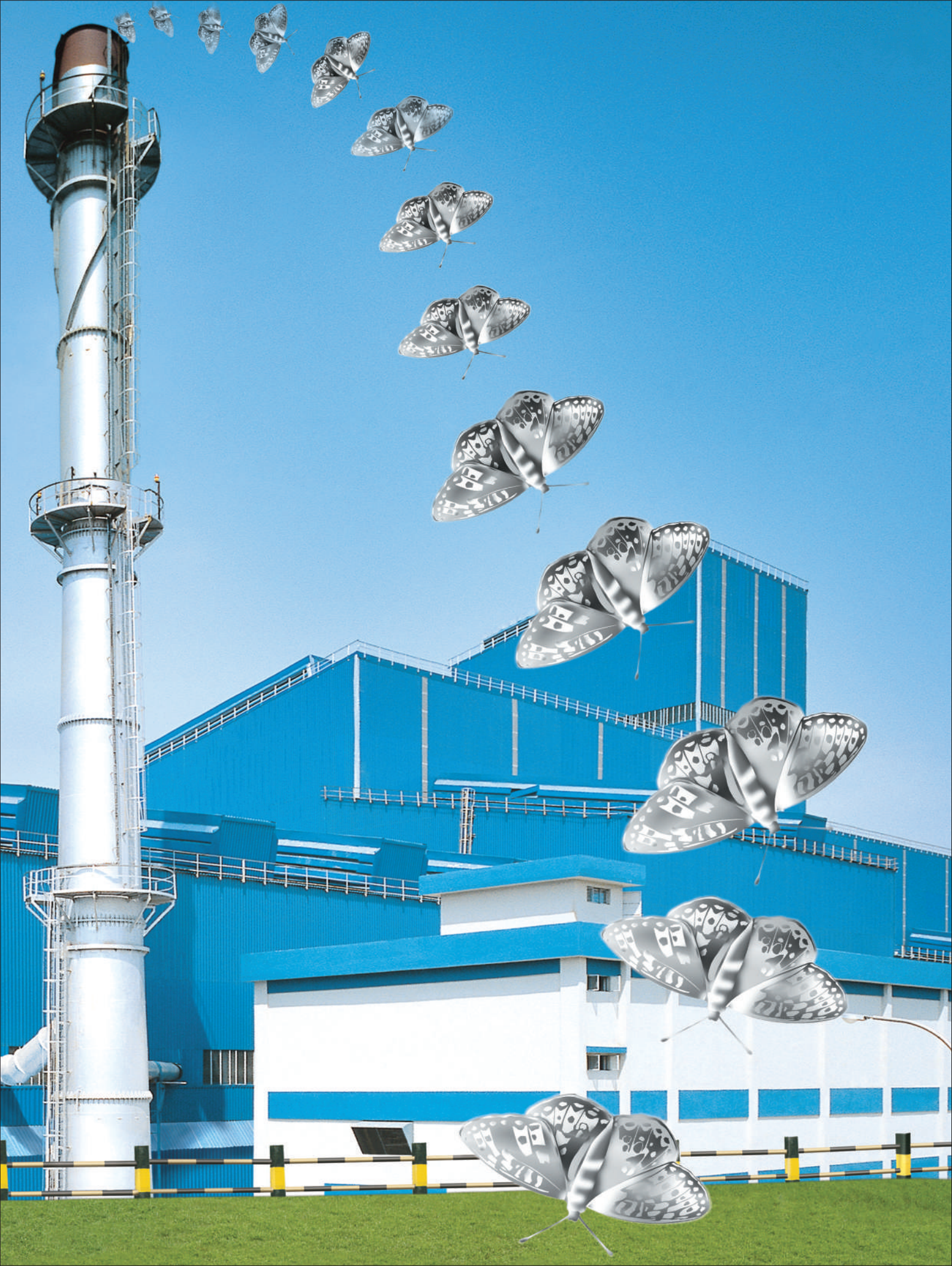




**Galvano**<sup>TM</sup>  
**Value Redefined**  
Coated Sheets and Coils



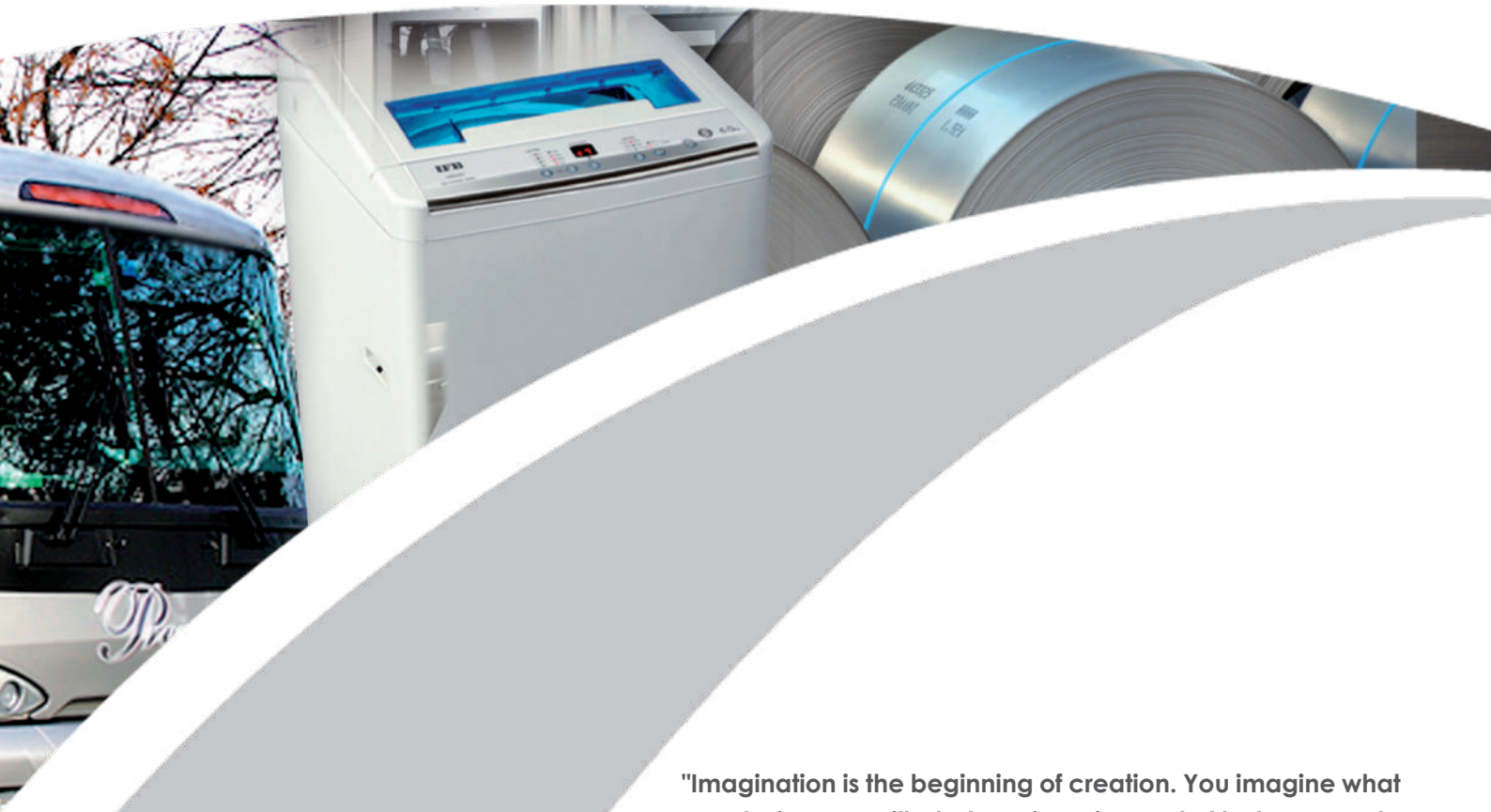


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2. Features
3. Advantages of galvanising
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# Introduction of Galvano™



**"Imagination is the beginning of creation. You imagine what you desire, you will what you imagine and at last you create what you will."**

Galvano™ is Tata Steel's tribute to the ever-changing pattern of steel demand. It is environmentally safe and economically advantageous. With Galvano™, we have redefined quality and raised the bar of strength, durability, performance and versatility.

Galvano™ marks a new beginning in the world of GP sheets by being the first zero-spangled Galvanised Plain (GP) steel offering in the country. Unlike the ordinary spangled and crushed spangled products available in the market, Galvano™ stands out with unmatched surface finish and mechanical properties with capabilities to meet the stringent quality requirements of customers.

# Features

Galvano™ redefines value for its users by offering high performance products with unmatched quality and service, second to none!

Its unique characteristics include:

- Consistent thickness
- Superior surface finish and flatness
- Excellent surface finish
- Highest corrosion resistance
- Uniform and superior zinc adhesion
- Optimum formability
- Superior paint adhesion
- Eco-friendly



# The advantages of galvanising

## CORROSION KILLS!

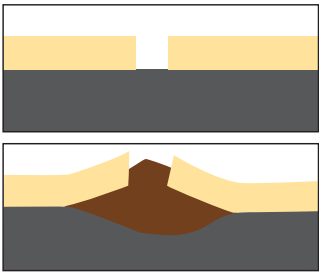
The fact that our country loses more than Rs 10000 crores per annum due to metallic corrosion of iron and steel is something we seriously need to take into account.

Common techniques such as barrier protection through painting and cathodic protection are regular antidotes for fighting corrosion. But the Hot Dip Galvanising (HDG) process is a cost-effective control process that solves most of the corrosion problems in major industrial applications. The reason for the wide-spread use of HDG is the dual action of the coating in protecting the substrate: as a barrier, it gives a strongly-bonded zinc coating

covering the steel surface, thereby sealing it from environmental attack. In addition, zinc gives the steel a cathodic protection in which the zinc sacrifices itself in order to protect the substrate, in case of a damage or minor discontinuity in coating. Its low cost, ease of application and the long maintenance-free service makes it the most favoured protection for steel.

With the supremacy of steel as an omnipresent engineering material, the power of zinc to protect and the different options it offers to the customer as well as its appearance and life mean that galvanised steel is here to stay.

## Rust undercuts scratched paint

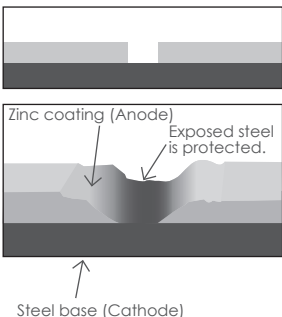


The diagram consists of two cross-sectional views of a steel surface with a yellow paint coating. The top view shows a horizontal scratch in the paint. The bottom view shows the progression of corrosion: a brown, voluminous rust pocket has formed directly beneath the scratch, and the paint film has lifted away from the metal surface, creating a blister. The rust pocket and the blister are shown to be growing.

**Paint on non-galvanised steel**

This is what happens at a scratch on painted non-galvanised steel. The exposed steel corrodes and forms a pocket of rust. Because rust is much more voluminous than steel, the pocket swells. This lifts the paint film from the metal surface to form a blister. Both the corrosion pit and the blister continue to grow.

## Zinc protects base steel, even when scratched



The diagram shows a cross-section of a steel surface with a grey zinc coating. A scratch has been made in the zinc coating, exposing the underlying steel. Labels with arrows point to the 'Zinc coating (Anode)', the 'Exposed steel is protected', and the 'Steel base (Cathode)'. The exposed steel area is shown to be protected from corrosion.

**Galvanised steel**

This is what happens at a scratch on galvanised steel. The zinc coating sacrifices itself slowly by galvanic action to protect the base steel. This sacrificial action continues as long as any zinc remains in the immediate area. Bare galvanised steel and painted galvanised steel are the best answers to corrosion.

# Life of galvanised steel

Coating mass on steel and severity of environment to which it is exposed play an important role in deciding the life of Galvanised Steel. While assessing the life of galvanised steel it is important that one takes into cognizance the White Rust and Red Rust resistance aspects of the products.

White Rust resistance of galvanised steel is a function of its passivation quality. With chemical passivation applied through hexavalent or trivalent chromium or chrome-free chemical based solution and cured on line, the Salt Spray Test (as per ASTM B 117) gives around 100 hours of white rust resistance. This does not indicate the life of the sheet in real life, but is an indication of the resistance of the material

against white staining during storage and transportation. With oiling as the Post Treatment, the Salt Spray resistance is around 08 - 10 hours against white rust.

Red Rust resistance of galvanised steel is a function of the coating weight in grams per square metre (gsm). The higher the gsm, the longer is the life of the coating. In ideal laboratory conditions, a 120 gsm coating gives more than 400 hours of resistance against red rust, provided the product is chemically passivated. For higher coating weights the resistance to red rust is higher.



# Galvanising through the state-of-art Line

Galvano™ is produced at Tata Steel's state-of-art Continuous Galvanising Line (CGL-2) at Jamshedpur, designed to cater to the high end galvanised steel requirement of Automotive and General Engineering customers. To maintain high standards in quality, the line has advanced levels of automation, operating models & equipment supplied by the world's renowned suppliers and above all a highly motivated and well trained team.

The line has been supplied by Cockerill Metallurgical Industry(CMI), Belgium, including Alstom (France), Drever S.A., Ajax (UK) & others, who have supplied a number of automotive galvanising lines throughout the world. The products in the line are ROHS certified.

Continuous Galvanising Line - Harnessing the World-Class Technology	
6 Hi Tandem Cold Rolling Mill	Hitachi, Japan
Pickling Line & Welder	Mitsubishi Electric Co., Japan
Cleaning Section	Cockeril Metallurgical Industry, Belgium
Annealing Furnace	Drever International S.A., Belgium
Zinc Pot	Ajax, UK
Air Knives & Controls	Kohler, USA
Skin Pass Mill & Tension Leveler	Danieli Wean, Italy
Post Treatment Oiler	Fara, UK
Galvannealing Furnace	Inductotherm s.a., Belgium
Coil Inspection	Cockeril Metallurgical Industry, Belgium

## Salient Features:

- Electrolytic cleaning section for high degree of strip cleaning
- Vertical annealing furnace with 18 passes giving ample residence time to the strip even at higher speed to achieve desired mechanical and metallurgical properties
- Two movable ceramic pots for quick and swift changeover of bath chemistry
- State of the art KOHLER Zinc wiping system with dual faced air knives
- RADIOMETER Coating Gauge for measuring coating amount and alloy percentage
- Online wet Skin Passing and Tension Levelling
- High levels of automation and process control





# Product characteristics

<b>Dimensions:</b>	Thickness	:	0.50 – 2.00 mm
	Width	:	900 – 1540 mm
	Inner dia	:	508 / 610 mm
	Outer dia	:	1900 mm max
	Weight	:	28 tons max
<b>Grades:</b>	DQ, DDQ, EDD/IF		
<b>Coating Type:</b>	Galvanized Zero-Spangled (Pure zinc- no lead and antimony)		
<b>Coating Mass:</b>	Galvanised : 60-400 gsm (total both sides)		
<b>Surface Condition:</b>	Zero spangle through bath, free of antimony and lead Desired surface finish – Skin Pass Mill Flatness control with Tension Leveller		
<b>Post Treatment:</b>	Chromating (Chrome 6 and Chrome 3 based) [C] Electrostatic Oiling [O] Both Chromating & Oiling [CO]		



# Available sizes

Galvano™ is available in various grades, thickness and widths as illustrated below. Orders will be accepted for thickness and width combinations covered in 'white' and 'grey' cells.

Dimensions covered under 'black' cells are beyond present capability of the mill.

Numbers indicated in some select 'grey' cells indicate the maximum width of rolling possible.

Maximum untrimmed width is 1540 mm. Galvano comes with trimmed edge.

DQ								
Width Thk	1200	1250	1300	1350	1400	1450	1500	1520
2.00								
1.75								
1.50								
1.25								
1.00								
0.90								
0.85								
0.80								
0.75								
0.70								
0.65								
0.60						1430		
0.55								
0.50				1330				

Within operating capability  
 Available upto the width indicated in the cell  
 Beyond capability

Notes : 1.) Widths indicated above come with trimmed edge of CR  
 2.) The maximum possible coating weight is 275 GSM  
 3.) Thickness of 0.50 mm is available upto 1330 mm and 0.60 mm upto 1430 mm with trimmed CR width

DDQ								
Width Thk	1200	1250	1300	1350	1400	1450	1500	1520
2.00								
1.75								
1.50								
1.25								
1.00								
0.90								
0.85								
0.80								
0.75								
0.70								
0.65								
0.60								
0.55								
0.50				1330				

Notes : 1.) Widths indicated above come with trimmed edge of CR  
 2.) The maximum possible coating weight is 275 GSM upto 0.90mm and 150 GSM beyond 0.90 mm thickness  
 3.) Thickness of 0.50 mm is available upto 1330 mm with trimmed CR width

EDD/IF								
Width Thk	1200	1250	1300	1350	1400	1450	1500	1520
2.00								
1.75								
1.50								
1.25								
1.00								
0.90								
0.85								
0.80								
0.75								
0.70								
0.65								
0.60								
0.55								
0.50				1330				

Notes : 1.) Widths indicated above come with trimmed edge of CR  
 2.) The maximum possible coating weight is 275 GSM upto 0.90mm and 150 GSM beyond 0.90 mm thickness  
 3.) Thickness of 0.50 mm is available upto 1330 mm with trimmed CR width

# Grades and properties

Mechanical Properties						
Grades	TDC	Yield Strength (MPa)	Tensile Strength (MPa)	Elongation 50 GL(%)	Hardness (HRB)	Ra (Microns)
		Min-Max	Min-Max			
DQ	GLP 1	250-350	410	32	55-65	0.8-1.6
	GLP 2	250-350	410	32	55-65	0.8-1.6
	GLP 3	250-350	410	32	55-65	0.8-1.6
	GLA 1	250-350	410	32	55-65	0.8-1.6
	GLB 1	250-350	410	32	55-65	0.8-1.6
	GLG 1	250-350	410	32	55-65	0.8-1.6
	GLG 2	250-350	410	32	55-65	0.8-1.6
DDQ	GLA 2	270 (max)	360	35	60 (max)	0.8-1.6
	GLG 3	270 (max)	360	35	60 (max)	0.8-1.6
EDD/IF	GLA 3	190 (max)	330	38	45 (max)	0.8-1.6
	GLG 4	190 (max)	330	38	45 (max)	0.8-1.6
	GLG 5	190 (max)	330	38	45 (max)	0.8-1.6

Chemical Properties							
Grades	% C (max)	% Mn (max)	% P (max)	% S (max)	% Si (max)	% Al (max)	% Micro Alloying (max)
DQ	0.1	0.5	0.03	0.03	0.04	0.02	NA
DDQ	0.05	0.3	0.025	0.02	0.025	0.02	NA
EDD/IF	0.01	0.2	0.02	0.02	0.02	0.02	0.15

TDC- Technical Delivery Condition

NA- Not Applicable



# Grades and properties

<b>Bend Test</b>				
<b>Coating Mass (gsm)</b>	<b>Angle of bend</b>	<b>Steel Grades</b>		
		<b>DQ</b>	<b>DDQ</b>	<b>EDD/IF</b>
80	180°	1†	0†	0†
100	180°	1†	0†	0†
120	180°	1†	0†	0†
140	180°	1†	0†	0†
200	180°	1†	1†	0†
225	180°	1†	1†	0†
275	180°	1†	1†	0†
350	180°	2†	NR	NR
450	180°	3†	NR	NR
600	180°	4†	NR	NR

† = Product thickness

NR = Not Recommended

There shall be no cracking (visible to naked eye) or fracture of the base metal on the outside of the bent portion leaving 7mm from both the edges of the sample.

Coarse grain developing at the line of bend shall be disregarded.

<b>Coating Mass - (gsm)</b>	<b>Minimum average coating mass in Triple Spot* Test</b>
100	100
120	120
140	140
200	200
225	225
275	275
350	350
450	450
600	600

\*Three samples for coating weight shall be taken from a sample, two from each edge and one from the center of the sheet leaving at least 50mm gap from each edge.

# The Galvano™ advantage

## Consistent Thickness

Galvano™ comes in uniform and close tolerance of thickness which ensures higher yield in end applications – meaning more number of parts per kg compared to ordinary Galvanised products. AGC (Automatic Gauge Control) in state-of-art Picking Line and Tandem Cold Rolling Mill helps in producing steel substrate with uniform thickness with close tolerance.

Thickness Tolerance*				
Thickness/Allowable Tolerance/Width	Less than 630 mm	630 mm to 999 mm	1000 mm to 1249 mm	1250 mm to 1540 mm**
0.50mm to 0.59mm	± 0.025	± 0.025	± 0.03	± 0.04
0.60mm to 0.79mm	± 0.03	± 0.03	± 0.04	± 0.04
0.80mm to 0.99mm	± 0.03	± 0.03	± 0.04	± 0.04
1.00mm to 1.24mm	± 0.03	± 0.03	± 0.04	± 0.04
1.25mm to 1.59mm	± 0.04	± 0.04	± 0.04	± 0.05
1.60mm to 1.99mm	± 0.04	± 0.04	± 0.05	± 0.06

\*On nominal thickness measured at 25 mm from the edge

\*\* 1540 mm is possible only as untrimmed hot rolled mill edge material; with single trim max width of 1525 mm is possible

## Superior Surface Finish & Absolute Flatness

Uniform texture and superior flatness in Galvano™ ensure better finish of the end-products. Tandem Cold Rolling Mill equipped with Universal Crown, Auto Shape Control , Electro Discharge Texturing machine , 4 Hi Skinpass Mill & 6 Hi Tension Leveller combined ensure best -in-class surface texture and flatness, thereby offering better finish.



# The Galvano™ advantage

## Highest Corrosion Resistance

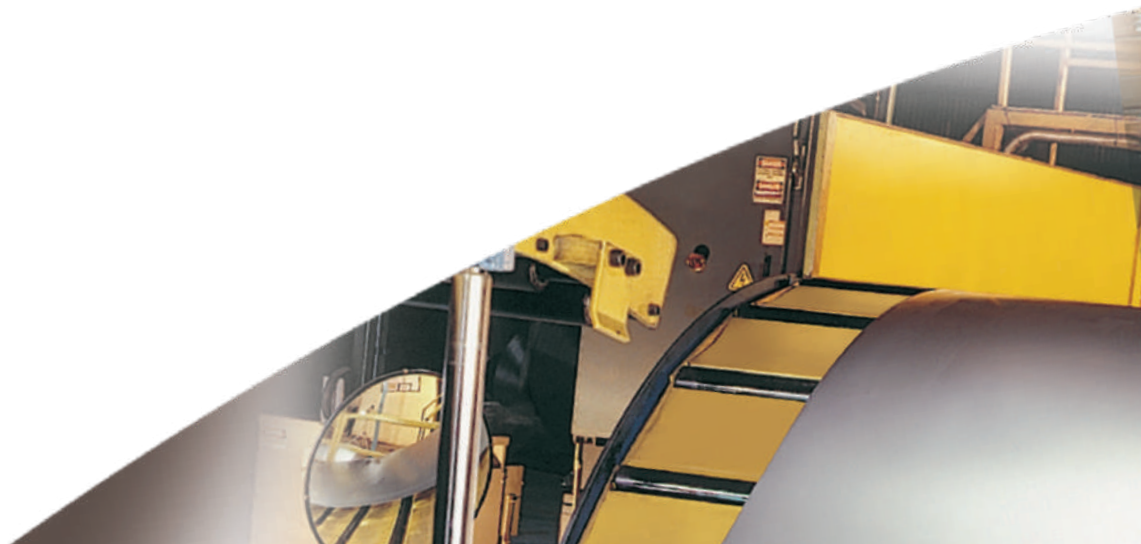
Galvano™ offers superior corrosion resistance and ensures that the end products manufactured from it not only meet but exceed their life expectancy. Higher chrome passivation ensures better White Rust resistance than ordinary Galvanised Products. Zero spangles coupled with skinpassing and uniform zinc coating ensure highest corrosion resistance.

Company	White Rust Resistance	Red Rust Resistance
Tata Steel	100-120 hrs	500-700hrs
Others	60-100 hrs	400-600 hrs

Based on 275 gsm coating as per ASTM B117

## Uniform & Superior Zinc Adhesion

Uniform and superior zinc adhesion in Galvano™ prevents zinc peel-off & crazing (pebby surface) during fabrication, thereby ensuring end-product durability & finish. Uniform zinc coating is possible through Feed-Forward X-ray mechanism in Continuous Galvanising Line – a mechanism unique to Tata Steel. Superior zinc adhesion is achieved through superior Aluminum control in coating bath Chemistry and Electrolytic cleaning of steel substrate before coating as compared to conventional alkali cleaning. Bend Test for zinc adhesion is conducted as per ASTM A653, ASTM B571, EN 10327 or JIS 3302.



# The Galvano™ advantage

## **Optimum Formability**

Galvano™ is made from steel substrate made through close control of chemical composition and having best mechanical properties – the key for forming applications. Superior quality of substrate is achieved by applying close controls on process parameters right from raw material [Iron ore & Coal] stage to steel production ensuring desired quality right from Commercial to IF grades of steel. Special oils are provided on certain grades of steel for superior stampability.

## **Superior Paint Adhesion**

Galvano™ comes with true zero-spangled surface ensuring best surface finish in painting applications, compared to the finish offered by ordinary spangled and crushed spangled GP. True zero-spangled surface with 'Ra' varying between 0.8 – 1.6 ensures superior paint adhesion, lower paint consumption and better end product finish.

## **Eco-Friendly**

Galvano™ is produced through "Lead-Free" coating Chemistry making it an Eco-Friendly steel. Unlike ordinary Galvanised steel, Galvano™ does not need additional lead in its bath chemistry making it ROHS compliant and a safer product. Tata Steel Limited also offers Trivalent Chrome passivation on customer demand.

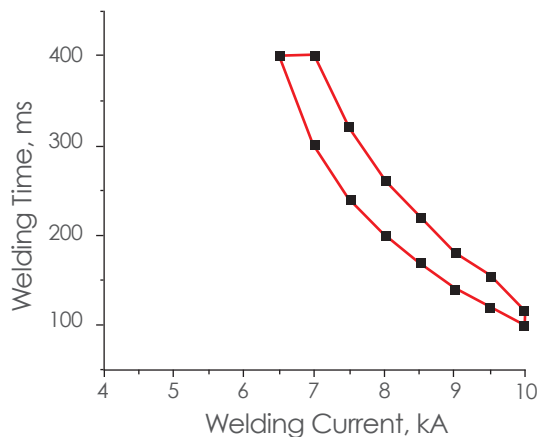


# Weldability

Welding on Galvano™ is done almost by the same welding processes done for bare steel, but with minor changes in voltage, amperage, travel speed, etc. Some of the common welding tips are explained below:

**Spot welding:** Galvano™ can be easily spot welded using standard AC or DC welding machines. The recommended welding current is 6-9 kA for 0.5 to 1.5 mm, and 7-10 kA for sheets greater than 1.5 mm thick. A convenient 1.5-2 kA of weld lobe range (operating window) helps the operator easily fix the welding parameters without risking nugget shear failure. The shear tensile and cross-tensile values are acceptable as per BS1140-93. For enhanced electrode life, Cu-Zr electrodes/or caps are recommended. Laboratory tests suggest electrode life of about 2000 welds with intermittent dressing.

**GMAW welding:** Galvano™ can be readily welded by MIG/CO<sub>2</sub> process. ER70S-6 electrode wires of 0.6-0.8 mm diameter are recommended for welding Galvano™. Parameters ensuring low heat input (short circuit or droplet) are preferred with welding current of 80-100A. Tensile values of lap-shear and fillet joints have been found to be greater than 90% of the base metal, with failure predominantly in the parent metal.

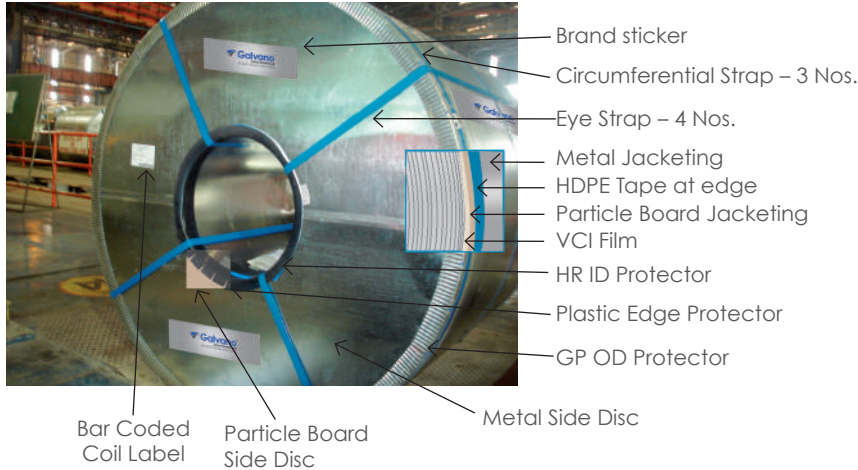


Weld lobe of Galvano™  
(0.8 mm). Coating weight: 120gsm

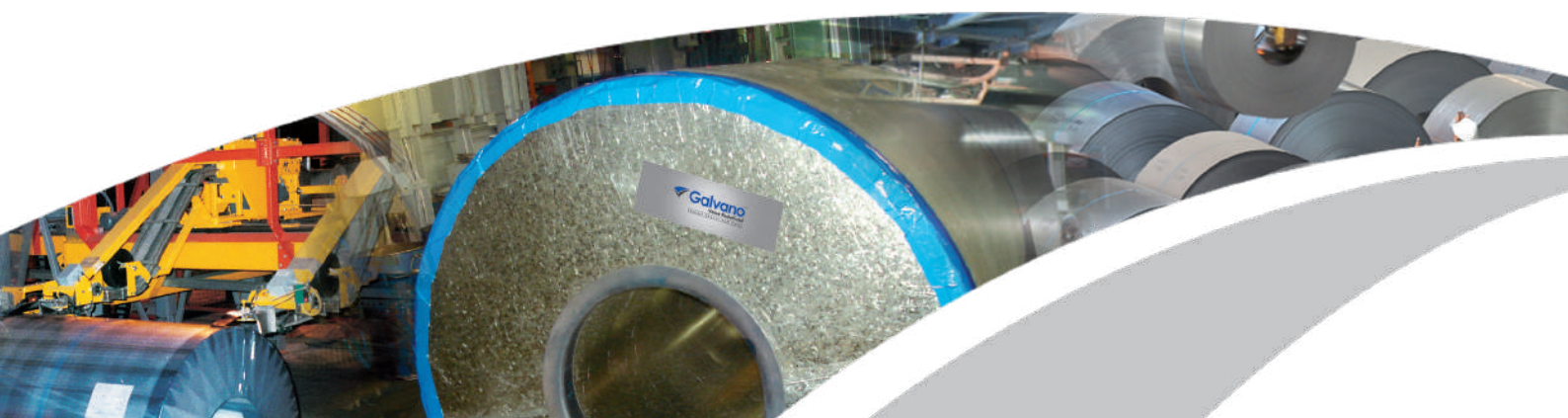
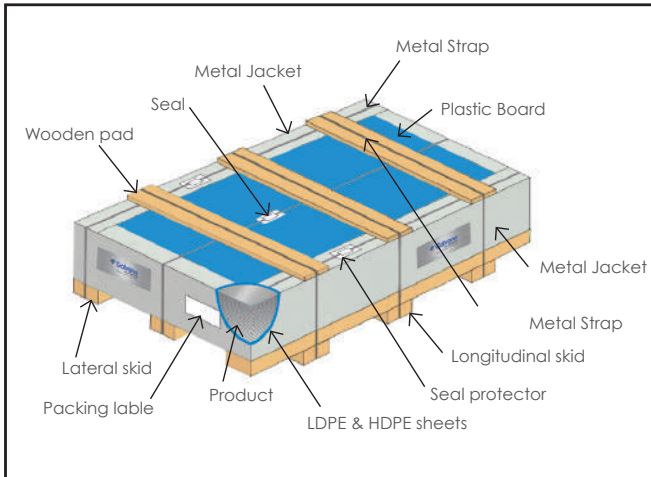


# Packaging & labelling

## Coils



## Sheet



# Grade selection guidelines

Before ordering a specific grade of Galvano™, we recommend customers and service partners to keep in mind the following questions. This list explained below is illustrative and not exhaustive. For further clarity, the nearest Sales Office of Tata Steel can be contacted.

- What is the end use for the product?
- Is the material to be used outdoors, or indoors?
- If outdoors, what kind of environment? Industrial/Marine/Normal/ Rural?
- If indoors, is it in an office/domestic environment? Is it near any source of heat/ fumes/ water/ chemical?
- What is the intended substrate grade, i.e. CQ, DQ, DDQ, EDD/IF, high strength/any other grade ?
- If the grade is not known, what are the desired mechanical properties, like YS, UTS, El% etc?
- What is the desired thickness of the substrate? What is the length & width , if known?
- What is the desired zinc coating weight, in grams per square metre, or in microns?
- What is the desired Post Treatment? [Chromated, Oiled , or Oil and Chromate Combined]
- If it is to be chemically passivated, what is the preferred chemical: Hexavalent/ Trivalent Chrome, or Chromium-free?
- What are the international / national standards the material should comply with?



# General care & maintenance

Galvanised steel protects the end products from corrosion. However, it is important to keep in mind the general care and maintenance practices to maximise product performance.

- Order as per your end usage: decide on the passivation on the coil/sheets. Oiled sheets from the plant would need degreasing for surface preparation and subsequent painting, while chemically treated or chromated sheets are not recommended for phosphating and/or painting as the adherence of the paint to the surface will be poor
- On receipt of the coil or sheets, ensure the material is free from white rust (the product of reaction of the zinc coated surface with CO<sub>2</sub>, H<sub>2</sub>O and O<sub>2</sub> of the atmosphere). For light white rust, simple mopping will prevent further spread of the defect
- In case of longer storage before use, store the material in a dry room with normal air circulation to guard against any kind of moisture ingress or entrapment
- Chromated and oiled materials should ideally be consumed within three months from the date of receipt
- Avoid contact of the material with cement, salt or any chemical during storage
- In usage, avoid continuous exposure to heat > 200 deg C, acid or alkali fumes, SO<sub>x</sub>, NO<sub>x</sub> or ammoniacal vapour
- During processing at your end, avoid scratches, handling damages and dents
- Also, avoid direct contact of the galvanised material with MS parts, which leads to premature corrosion
- For painting on the surface, or for welding, contact our nearest Application Engineers for guidance
- For technical support contact our Application Engineer

# Product authenticity

Galvano™ comes with Tata Steel's assurance of quality. Each coil is marked with invisible and chemically neutral UV ink as a guarantee of its authenticity. UV print can be viewed with the help of an UV torch, as illustrated below.



# Contact details

## Commercial Head Office

**Tata Steel Limited, Tata Centre, 43, Jawaharlal Nehru Road,  
Kolkata 700 071, West Bengal  
Tel 91 33 2288 7051/ 2288 9251 Fax 91 33 2288 2563**

## Regional Sales Office North

### New Delhi Sales Office

**Tata Steel Limited, 1st Floor, Jeevan Tara Building, 5 Sansad Marg,  
New Delhi 110001  
Tel 91 11 2334 3208/ 2374 7329 Fax 91 11 2334 3196 / 2637 2820**

### Chandigarh Sales Office

Tata Steel Limited, S.C.O. Sector 26, Madhya Marg,  
Chandigarh 160019

Tel 91 172 507 5116 Fax 91 172 279 2426

### Faridabad Sales Office

Tata Steel Limited, 2nd floor, 33 -B, N.I.T.

Faridabad 121 001, Haryana

Tel 91 129 6451 1820 Fax 91 129 241 3973

### Jaipur Sales Office

Tata Steel Limited, C.84 Prithviraj Road, C-Scheme, Jaipur 302001

Tel 91 141 228205 Fax 91 141 511 2906/ 238 4244

### Kanpur Sales Office

Tata Steel Limited, Navroz Building, The Mall, Kanpur 208 001

Tel 91 512 231 6605 Fax 91 512 231 6631

### Ludhiana Sales Office

Tata Steel Limited, B-30, 1858/1, Focal Point,

Ludhiana 141010, Punjab

Tel 91 161 267 3759 Fax 91 161 267 3459

## Regional Sales Office East

### Kolkata Sales Office

**Tata Steel Limited, 52, J N Road, Kolkata 700071**

**Tel 91 33 2282 1887/ 2282 1687 Fax 91 33 2282 7912**

### Guwahati Sales Office

Tata Steel Limited, C/o Rungta Agencies, Meena Bhawan,

Kanchan Road, Ulubari, Guwahati 781 007

Tel 91 361 252 6582 / 252 3093 Fax 91 361 254 2582

### Jamshedpur Sales Office

Tata Steel Limited, 191, Burma Road, Burma Mines,

Jamshedpur 831 001

Tel 91 657 227 0995/ 227 0901/ 214 4822 Fax 91 657 227 0685

## Regional Sales Office West

### Mumbai Sales Office

**Tata Steel Limited, New India Assurance Building,**

**Mahatma Gandhi Road, Fort, Mumbai 400 001**

**Tel 91 22 2267 7313 Fax 91 22 2261 9902**

### Ahmedabad Sales Office

Tata Steel Limited, 172/2 Ashram Road, 2nd Floor,

Premchand Hs. Annexe, Ahmedabad 380 009

Tel 91 79 6661 2606 /6661 2600-03 Fax 91 79 5561 2604

### Aurangabad Sales

Tata Steel Limited, S-22, Lind Floor, Alankananda Complex,

Adalat road, Aurangabad 431 005

Tel 91 240 2562 1477-78

### Indore Sales Office

Tata Steel Limited, 316,317 City Centre, 3rd Floor,

570 M G Road, Indore 452 001

Tel 91 731 507 3082 Fax 91 731 253 5951

### Nagpur Sales Office

Tata Steel Limited, Museum Road, Civil Lines,

Nagpur 440 001

Tel 91 712 252 0170 / 252 2209 Fax 91 712 253 7078

### Pune Sales Office

Tata Steel Limited, The Orion, Office No. 202 B, 2nd Floor,

5 Koregaon Park, Opp. St. Mira's College, Pune 411001

Tel 91 020 6604 8816 Fax 91 020 6604 8828

## Regional Sales Office South

### Chennai Sales Office

**Tata Steel Limited, 2nd Floor Eldorado Building, 112,**

**Nungambakkam High Road, Chennai 600 034**

**Tel 91 44 6696 0001 Fax 91 44 2826 9101**

### Bangalore Sales Office

Tata Steel Limited, 2nd Floor, A Wing, Jubilee Building,

45 Museum Road, Bangalore 560025

Tel 91 80 6599 0036/2532 5637 Fax 91 80 2532 5527

### Secunderabad Sales Office

Tata Steel Limited, 6th Floor, Surya Towers, 104 Sardar Patel Road,  
Secunderabad 500 003

Tel 91 40 6626 1040 Fax 91 40 2781 2418



The content is illustrative and not exhaustive.



Tata Steel Limited, Tata Centre, 43 Jawaharlal Nehru Road, Kolkata 700 071  
Tel 91 33 2288 7051, Fax 91 33 2288 2563