

# TITANIUM DATA SHEET

## InvariBold™ 40

### Grade Selection

Optimal performance of InvariBold™ 40 is assured by its highly engineered properties, which appear in Table I. Grade 2 is appropriate for most applications. Other grades may be considered where design parameters such as wind resistance require elevated mechanical properties. It should be noted that grades with higher mechanical properties will be somewhat more difficult to fabricate. For most applications, Grade 2 offers a practical balance between formability and strength. InvariBold™ 40 is at home in severe environments, such as seacoast atmospheres subjected to salt water spray.

### Pounds Per Piece

Thickness (in.) x Width (in.) x Length (in.) x .163

### Available Sizes

Please refer to Table II. Coils and cut lengths up to 288" are available.

### Typical Surface Characteristics

Width of rib cycle (tooth and groove)..... .04"  
 Depth of rib pattern..... .001"

### Fire Resistance

Titanium is a high melting point alloy which will provide superior resistance to fire damage than lower melting point alloys and combustible materials.

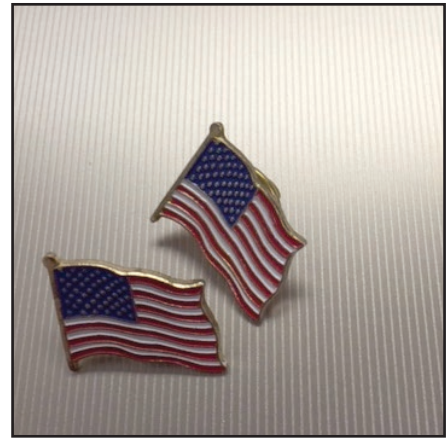
### Flatness

InvariBold™ 40 is supplied to ASTM standard commercial allowances.

### Fabrication

InvariBold™ 40 is readily welded or soldered. While formation of a heat tint scale can be avoided through use of shield gasses, care must be taken to remove this scale through chemical means. Flux residue must be thoroughly removed after soldering. Since InvariBold™ 40 is essentially non-directional, it is not necessary to orient panels in relation to the rolling direction. However, to avoid the possibility that any subtle directional differences will be visible, we recommend panels be fabricated to maintain orientation of the original sheet alignment.

Titanium's relatively low modulus of elasticity, compared to other metals like stainless steel, results in substantial springback behavior during forming. This must be accounted for in tooling setups. Further, bend radii that are more generous than those used for most other metals are recommended. Additionally, titanium is more susceptible to galling than other metals and may require a more aggressive lubrication technique.



### Product Description

*InvariBold™ 40 is a directional, linear ribbed titanium finish designed for use in architectural applications. Its moderate reflectivity lends itself to a variety of applications, including wall panels, coping and trim. Since InvariBold™ 40 has no coatings to deteriorate, it will last indefinitely with little maintenance.*

Table I		Grade 2
<b>CHEMICAL ANALYSIS</b>		
Titanium	99.2% min.	
C, Fe, H, N, O	.705% max.	
<b>TYPICAL MECHANICAL PROPERTIES</b>		
Yield Strength (psi)	40,000	
Elongation in 2 inches	20%	
Hardness (Rockwell B)	80	
<b>PHYSICAL PROPERTIES</b>		
Density (lb./cu. in.)	.163	
Modulus of Elasticity in Tension (x 10 <sup>6</sup> lb./sq. in.)	15.0	
Mean Coefficient of Thermal Expansion per °F (x 10 <sup>-6</sup> )	32 - 212°F	4.8
	32 - 600°F	5.1
	32 - 1000°F	5.4
Melting Point Range °F	3,030	

Table II	Size Range (inches)				
	WIDTH				
THICKNESS	.75 - 18	>18 - <24	24 - 36	>36 - 48	>48 - 60
.0291 - .075	●	●	●	●	
.0178 - .029	●	●	●	●	
.015 - .0177	●	●	●	●	

## Installation

InvariBold™ 40 is supplied with a high grade UV resistant protective plastic covering designed to withstand the elements for several weeks. However, it is advisable to remove this material promptly after installation to prevent adhesive residue from remaining on the finish.

Despite the uniform finish, titanium has a certain degree of natural color variation. It should be further noted that any metallic surface, even a painted one, is sensitive to misalignment of panels on differing planes. Care should be taken to ensure installation within reasonable tolerances in order to maximize visual consistency in panels. After installation is completed, any rust stains from tools or construction debris must be removed.

## Maintenance

Designed to be essentially maintenance free, InvariBold™ 40 will last indefinitely without requiring attention. It may, however, be appropriate to clean the surface to maintain its original appearance. Any detergent/ammonia solution can be effective for general cleaning. There are a variety of aerospace cleaners and solvents on the market that are appropriate to address stains and adhesive residues.

## Environmental Impact

Titanium is recyclable and extremely stable at ambient temperatures. Further, without VOC emissions, which are inherent in coated products, InvariBold™ 40 is an environmentally sensible solution.



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## Limited Warranty

Contrarian Metal Resources (CMR) warrants its ASTM InvariBold™ 40 product against corrosion for a period of thirty (30) years from the date of purchase, subject to the limitations described in this warranty and provided the material is utilized solely for architectural applications and in normal atmospheric conditions. For purposes of this warranty, corrosion is defined as through wall penetration of the titanium. No warranty is made regarding mechanical damage, physical damage or damage as a result of substandard workmanship after receipt of the product from CMR (including but not limited to welding, shaping, or forming using methods that are not best practices for titanium of the grade in question) or using inappropriate cleaning solutions. This warranty does not cover any product that has been subject to misuse, neglect or accident. Use on chemical or manufacturing facilities, which produce or use chemicals known to have a deleterious effect on titanium, is excluded from this warranty. Please contact CMR prior to purchase if there is any question regarding application.

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