Freeflex® Versa
Strip steel
Datasheet

Freeflex® Versa is a hardened and tempered martensitic stainless compressor valve steel alloyed with copper. The material is characterized by:

- Excellent combination of high strength and high ductility
- Extremely high fatigue strength under bending and impact stress
- Excellent surface finish
- Very high compressive residual surface stress
- Low level of non-metallic inclusions
- Very good wear resistance

Freeflex® Versa compressor valve steel has excellent dimensional tolerances and flatness.

Chemical composition (nominal)

Chemical composition (nominal) %

C	Si	Mn	P	S	Cr	Mo	Cu
0.53	0.40	0.68	≤0.025	≤0.010	14.0	1.00	0.70

Applications

Valve types:

- Flapper valves
- Reed valves
- Check valves

Fabrication

Tumbling

Recommendations on tumbling will follow.

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Finish

Edges

Edges are slit and deburred. Shaved edges can be supplied on request.

Flatness

Maximum out-of-flatness across and along the strip is 0.20% of the nominal strip width.

Surfaces

Maximum surface roughness values, cut-off 0.80 mm (0.031 in.), are shown in the table.

Thickness [mm]	Thickness [in.]	Ra [µm]	Ra [µ in.]	Rmax [µm]	Rmax [µ in.]
< 0.152	<0.006	0.13	5.2	1.5	60
≥ 0.152 - 0.203	0.006 - 0.008	0.10	4.0	1.5	60

Surface defects

A small number of surface defects, such as pits and roll marks, with a depth or height of 2 µm (80 µin.) maximum is allowed for thicknesses up to 0.508 mm (0.020 inch) and 3 µm (120 µin.) maximum for thicker material. The maximum scratch depth allowed is as follows:

Thickness		Max. allowed depth	
mm	in.	µm	µin.
≤0.203	≤0.008	0.5	20

Straightness

Out-of-straightness is defined as the maximum deviation from a straight-edge of a specified length. The following values apply:

Strip width		Max. allowed deviation	
mm	in.	mm/m	in./3 feet
≥-<20	≥0.315-<0.787	2.0	0.072
≥20-<50	≥0.787-<1.969	1.5	0.054
≥50-<125	≥1.969-<4.921	1.25	0.045
≥125	≥4.921	1.0	0.036

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Mechanical properties

Proof strength				Tensile strength		Elongation
$R_{p0.05}$		$R_{p0.2}$		R_m		
MPa	ksi	MPa	ksi	MPa	ksi	%
nominal		nominal		nominal		
1450	210	1700	247	2150	312	≥9

The values are valid for thicknesses up to 0.203 mm (0.008 inch). The manufacturing tolerance for tensile strength is ±60 MPa (±8.7 ksi).

Fatigue strength

Freeflex® Versa compressor valve steel has a high response to surface treatment, such as tumbling and shot peening, which gives a significant increase in fatigue life.Values below origin from samples in tumbled condition.

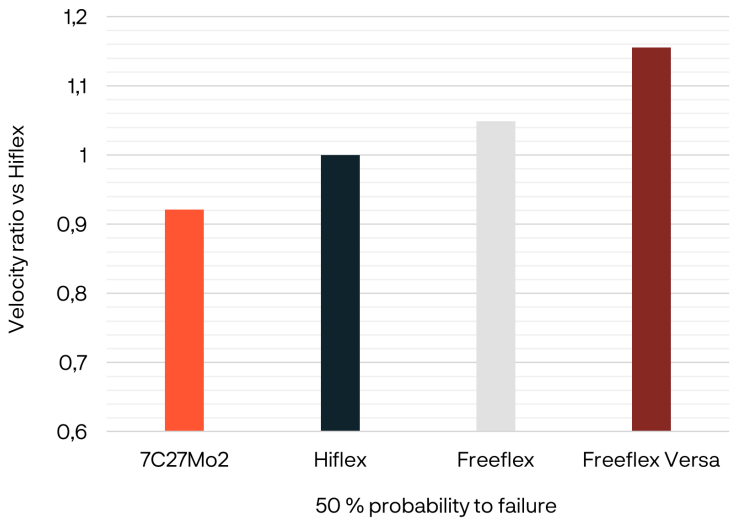
Reversed bending fatigue (mean stress = 0)

The fatigue strength of Freeflex® Versa compressor valve steel in reversed bending is 1170MPa KSI170 at a failure rate of 5%.

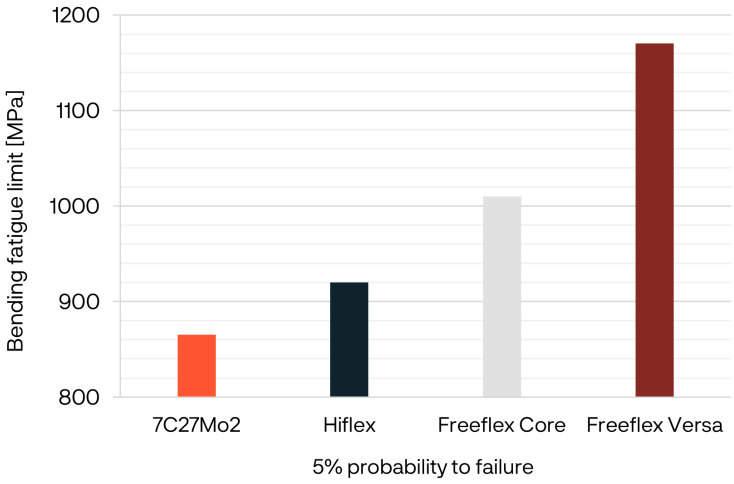
Fluctuating bending fatigue (minimum stress = 0)

Fluctuating bending fatigue strength for Freeflex® Versa has been calculated from reversed bending values at a 5% failure rate. Goodmans formula gives 758±758 MPa (110±110ksi). Gerbers formula gives 944±944 MPa (137±137ksi).

Comparison with other steel grades



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Physical properties

Density, 7.7 g/cm^3, 0.27 lb/in^3

Modulus of elasticity, static properties at 20°C (68°F)

MPa	210000
ksi	30500

Forms of supply

Conditions and forms of supply

Strip steel is supplied in labeled coils, or on labeled plastic spools, depending on weight and size. The label details the steel grade, heat, lot and coil number, and nominal size, allowing full material traceability. Material is protected against rust with oil.

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Dimensions

Thickness

Freeflex® Versa is supplied in standard thicknesses in accordance with the table. Customized thicknesses can be supplied on request.

Thickness		Tolerances	
Mm	**in.**	**mm**	**in.**
0.127	0.005	0.005	0.00019
0.152	0.006	0.005	0.00020
0.178	0.007	0.005	0.00020
0.203	0.008	0.006	0.00024

Width

Strip in standard thicknesses is stocked in widths up to 325 mm (12.8 in.), ready for slitting to the required width.

Disclaimer:

Recommendations are for guidance only, and the suitability of a material for a specific application can be confirmed only when we know the actual service conditions. Continuous development may necessitate changes in technical data without notice. This datasheet is only valid for Alleima materials.

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