

Alleima® 7C27Mo2 compressor valve steel

Strip steel

Datasheet

Alleima® 7C27Mo2 is a hardened and tempered martensitic stainless steel alloyed with molybdenum. The material is characterized by:

- High strength
- Very high fatigue strength under bending and impact stress
- Excellent surface finish
- High compressive residual surface stress
- Low levels of non-metallic inclusions
- Good wear resistance

Alleima® 7C27Mo2 compressor valve steel has good dimensional tolerances and good flatness.

Standards

- UNS: S42026
- EN Number: (1.4031)*

*) Nearest equivalent grade

Chemical composition (nominal)

Chemical composition (nominal) %

C	Si	Mn	P	S	Cr	Mo
0.38	0.40	0.55	≤0.025	≤0.010	13.5	1.0

Applications

Valve production

Valves made from Alleima® 7C27Mo2 compressor valve steel should be produced with fatigue properties in mind, in order to make full use of the excellent material properties.

Valve types:

- Flapper valves
- Reed valves
- Check valves

Corrosion resistance

Alleima® 7C27Mo2 is a martensitic chromium steel alloyed with molybdenum, giving better corrosion resistance and higher corrosion fatigue strength than conventional steels of the ASTM 420 type.

Fabrication

Blanking

It is recommended that blanking is made in a straight-side press using blanking tools with sharp edges. Worn or damaged tools can cause edge defects on the valve that can be difficult to remove in later processes. A punch to die clearance of 4-10% of the strip thickness is recommended.

Tool steels ASTM D2 or D4 are recommended except for thick strip gauge, slender tool sections or small corner radii. In this case ASTM M2 steels are recommended. In both cases the tool hardness should be about 63 HRC.

Stress relieving

Stress relieving may be performed between blanking and tumbling operations in order to remove blanking stresses. A maximum temperature of 350°C (662°F) for 30-60 minutes is recommended.

Tumbling

A good tumbling operation giving a round, smooth edge is necessary in order to minimize stress concentrations. Tumbling also increases the residual compressive surface stresses which gives a significant further improvement in fatigue properties.

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 number, coil number and nominal size, allowing full material traceability. Oil is used for rust prevention.

Coils are wrapped in paper and packed in wooden cases. For overseas shipment, coils are also sealed in a plastic bag containing silica gel. Net and gross weights are marked on the case. Customised properties, dimensions and tolerances can be supplied on request.

Dimensions

Thickness

Alleima® 7C27Mo2 compressor valve steel is supplied in standard thicknesses in accordance to the table.

Customized thicknesses can be supplied on request.

Thickness, mm	Thickness, in.	Tolerance, mm	Tolerance, in.
0.152	0.006	0.005	0.00020
0.203	0.008	0.006	0.00024
0.254	0.010	0.007	0.00028
0.305	0.012	0.007	0.00028
0.381	0.015	0.008	0.00035
0.406	0.016	0.012	0.00047
0.457	0.018	0.012	0.00047
0.508	0.020	0.014	0.00055
0.559	0.022	0.020	0.00079
0.600	0.0236	0.020	0.00079
0.630	0.0248	0.020	0.00079
0.800	0.0315	0.023	0.00091
1.000	0.0394	0.027	0.00106

Width

Strip in standard thicknesses is stocked in widths up to 310 mm (12.2 in.), ready for slitting to the required width.

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 0.25 mm (0.0098 in.), are shown in the table.

Thickness		Ra		Rmax	
mm	in.	µm	µin.	µm	µin.
≤0.508	≤0.020	0.13	5.2	1.5	60
>0.508	>0.020	0.25	10.0	2.5	100

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
>0.203-≤0.508	>0.008-≤0.020	0.8	32
>0.508	>0.020	1.0	40

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

Mechanical properties

Proof strength				Tensile strength		Elongation
$R_{p0.05}$		$R_{p0.2}$		R_m		
MPa	ksi	MPa	ksi	MPa	ksi	%
nominal		nominal		nominal		
1300	189	1450	210	1800	261	≥5

The values are valid for thicknesses up to up to 1.00mm (0.039 inch). The manufacturing tolerance for tensile strength is ±80 MPa (±11,6 ksi).

Fatigue strength

Alleima® 7C27Mo2 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.

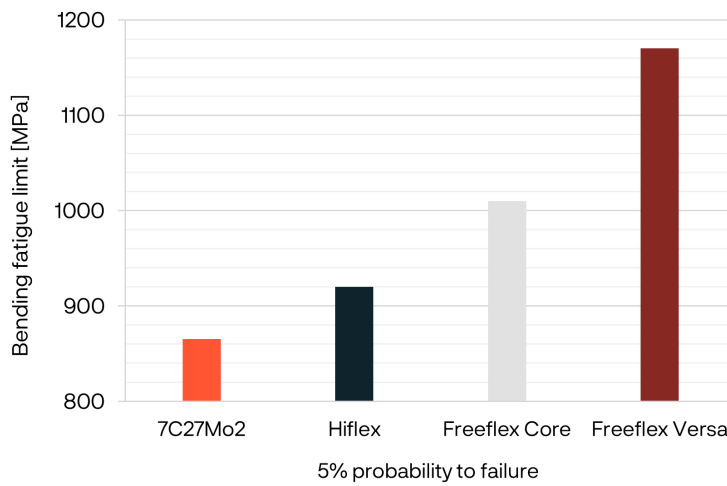
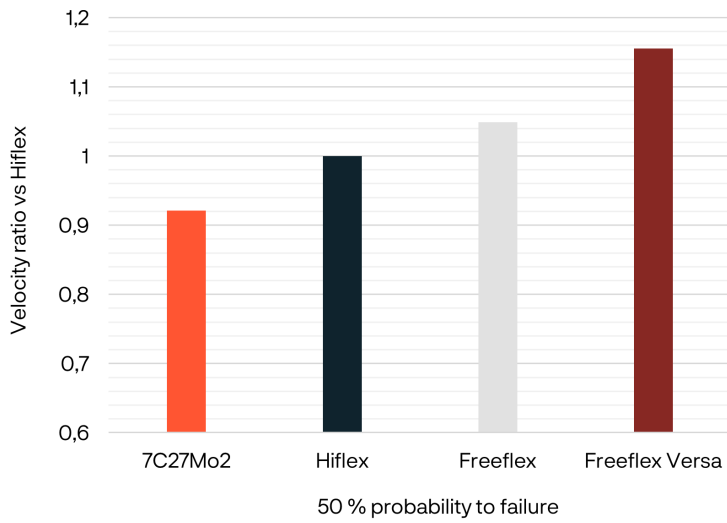
Reversed bending fatigue (mean stress = 0)

The fatigue strength of Alleima® 7C27Mo2 flapper valve steel in reversed bending is ±865 MPa (±125 ksi) at a failure rate of 5%.

Fluctuating bending fatigue (minimum stress = 0)

Fluctuating bending fatigue strength for Alleima® 7C27Mo2 compressor valve steel has been calculated from reversed bending values at a 5% failure rate. Goodmans formula gives 584±584 MPa (85±85 ksi). Gerbers formula gives 725±725 MPa (105±105 ksi).

Comparison with other steel grades



Physical properties

Density, 7.7 g/cm³, 0.27 lb/in³

Thermal conductivity

At 20°C, W/(m °C)	24
At 68°F, Btu/(ft h °F)	14

Specific heat capacity

Mean value for 50-100°C, J/(kg °C)	460
Mean value for 120-210°F, Btu/(lb °F)	0.11

Thermal expansion, mean values in temperature ranges

Temperature		Temperature	
°C	per °C (x 10 ⁻⁶)	°F	per °F (x 10 ⁻⁶)
30-100	10.5	86-200	6
30-200	11	86-400	6
30-300	11.5	86-600	6.5

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

MPa	210000
ksi	30500

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.