



Heavy plates

alform®

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Thermomechanically rolled fine-grained steels

The steel grades of the alform® series are thermomechanically rolled, weldable and bendable fine-grained structural steels. Plates made of these steels combine the good toughness properties of the thermomechanically rolled fine-grained steels according to EN 10025-4 with the excellent cold forming properties of the cold forming steels according to EN 10149-2.

The alloying concept provides very low carbon contents and low carbon equivalents, which aims in very good weldability. In particular, the high-strength grades (alform plate 500 M and alform plate 550 M) provide special advantages in areas, where weight savings are of great importance. The steel grades of the alform® series are used in steel construction, bridge building and the manufacture of penstocks, vehicles and cranes.

Convincing advantages

- Very good weldability
- Excellent cold formability
- Excellent toughness
- Best surface

Chemical composition

Heat analysis in mass %

alform®	C max.	Si max.	Mn max.	P ¹⁾ max.	S ¹⁾ max.	Nb ²⁾ max.	V ²⁾ max.	Ti ²⁾ max.	Cr max.	Ni max.	Cu max.	Mo max.
plate 355 M	0.10	0.40	1.60	0.012	0.003	0.05	0.05	0.02	0.30	0.30	0.30	0.10
plate 420 M	0.10	0.40	1.70	0.012	0.003	0.05	0.05	0.02	0.30	0.30	0.30	0.20
plate 460 M	0.10	0.40	1.70	0.012	0.003	0.05	0.05	0.02	0.30	0.70	0.30	0.20
plate 500 M	0.10	0.40	2.00	0.012	0.003	0.09	0.05	0.02	0.50	0.70	0.30	0.50
plate 550 M	0.10	0.40	2.00	0.012	0.003	0.09	0.05	0.02	0.50	0.70	0.30	0.50

¹⁾ The standard EN 10025-4 would permit significantly higher values: P max. 0.025; S max. 0.020

²⁾ The total of Nb, V and Ti must not exceed 0.22%.

Different elements are not alloyed.

Carbon equivalent

Standard values for carbon content and carbon equivalent

alform®	Plate thickness [mm]	C [%]	CEV ³⁾ [%]	CET ⁴⁾ [%]	PCM ⁵⁾ [%]
plate 355 M	20	0.04	0.33	0.20	0.13
plate 420 M	20	0.04	0.33	0.20	0.13
plate 460 M	20	0.04	0.36	0.22	0.15
plate 500 M	20	0.05	0.43	0.27	0.17
plate 550 M	20	0.05	0.44	0.29	0.19

³⁾ CEV = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15, according to IIW

⁴⁾ CET = C + (Mn + Mo)/10 + (Cr + Cu)/20 + Ni/40, according to SEW 088

⁵⁾ PCM = C + Si/30 + (Mn + Cu + Cr)/20 + Ni/60 + Mo/15 + V/10 + 5*B, according to API 5L

Mechanical properties: Tensile test

alform®	Plate thickness ⁶⁾ [mm]	Yield strength ⁷⁾ YS [MPa] min.	Tensile strength ⁷⁾ UTS [MPa]	Fracture elongation ⁷⁾ A ₅ [%] min.
plate 355 M	8 ≤ 16	355	470 - 630	22
	> 16 ≤ 40	345	470 - 630	22
	> 40 ≤ 63	335	450 - 610	22
	> 63 ≤ 100	325	440 - 600	22
plate 420 M	8 ≤ 16	420	520 - 680	19
	> 16 ≤ 40	400	520 - 680	19
	> 40 ≤ 63	390	500 - 660	19
	> 63 ≤ 100	380	480 - 650	19
plate 460 M	8 ≤ 16	460	540 - 720	17
	> 16 ≤ 40	440	540 - 720	17
	> 40 ≤ 63	430	530 - 710	17
	> 63 ≤ 100	410	510 - 690	17
plate 500 M	8 ≤ 30	500	570 - 750	16
	> 30 ≤ 50	480	550 - 750	16
	> 50 ≤ 80	460	550 - 750	16
plate 550 M	8 ≤ 30	550	600 - 760	16
	> 30 ≤ 50	530	570 - 730	16

⁶⁾ Larger thicknesses on request.

⁷⁾ Tensile test in accordance with EN 10002 on transverse samples.

Mechanical properties: Notch impact energy/Edging radii

alform®	Plate thickness [mm]	Notch impact energy ⁹⁾ Av [Joule] min.		Edging radii Ri min. at 90° edging (s=plate thickness) Position of the bending edge to the rolling direction	
		Testing direction Longitudinal Test temperature -50 °C	Testing direction Transverse Test temperature -50 °C	Longitudinal	Transverse
plate 355 M	8 ≤ 100	27	16	1.5 s	1.0 s
plate 420 M	8 ≤ 100	27	16	2.0 s	1.5 s
plate 460 M	8 ≤ 100	27	16	2.0 s	1.5 s
plate 500 M	8 ≤ 80	27	16	3.0 s	2.0 s
plate 550 M	8 ≤ 50	27	16	3.0 s	2.0 s

⁹⁾ Notch impact bending test in accordance with EN 10045 on Charpy-V longitudinal samples at -50 °C.

The mean value from 3 individual samples must reach the specified requirements. No individual value may be below 70% of the guaranteed mean value. For thicknesses < 10 mm, samples similar to Charpy-V with dimensions of 10 x 7.5 mm are tested. The guaranteed value is reduced in proportion to the sample cross-section.

Available dimensions

Maximum width per thickness; minimum width 1,500 mm

alform®	Plate thickness ⁹⁾ [mm]	Max. width [mm]	Max. length [mm]	As-delivered condition ¹⁰⁾
plate 355 M	8 ≤ 100	3,800	18,700	TM + ACC
plate 420 M	8 ≤ 100	3,800	18,700	TM + ACC
plate 460 M	8 ≤ 100	3,800	18,700	TM + ACC
plate 500 M	8 ≤ 80	3,800	18,700	TM + ACC
plate 550 M	8 ≤ 50	3,800	18,700	TM + ACC

⁹⁾ The maximum length is 17,000 mm for thicknesses of 8 < 9 mm and widths of ≥ 3,450 - 3,800 mm.

The maximum length is 17,000 mm for thicknesses of 9 < 10 mm and widths of > 3,650 - 3,800 mm.

¹⁰⁾ TM thermomechanically rolled; ACC accelerated cooled

Additional dimensions upon request.

Please find further information and downloads at www.voestalpine.com/Grobblech.

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