



## alform® M SERIES

### Thermomechanically rolled steels with excellent cold formability

Thermomechanically rolled alform® steels have a low-carbon, fine-grained microstructure. The steel can be stress-relief-annealed between 530 and 580 °C. Annealing above 580 °C is not permitted and would result in diminished minimum yield strength. Should heat treatment above 580 °C be necessary, please contact our quality control department. These steel grades comply with all requirements of comparable steels pursuant to EN 10149-2.

#### Convincing advantages:

- » Very good cutting, punching and forming capability
- » Very good weldability because of low carbon equivalent
- » Improved properties with narrower limits than those of comparable standard steels



Premium quality  
with reduced carbon footprint

alform®  
greentec steel

## Chemical composition

Ladle analysis in weight percent and carbon equivalent

alform®	C max.	Si max.	Mn max.	P max.	S max.	Al min.	Cr max.	Ni max.	Mo max.	Cu max.	V max.	Nb max.	Ti max.	B max.	CEV max.
280 M <sup>1)</sup>	0.10	0.05	0.70	0.020	0.010	0.020	0.3	0.3	0.08	0.3	0.05	0.05	0.05	0.003	0.18
315 M <sup>1)</sup>	0.10	0.05	0.90	0.020	0.010	0.020	0.3	0.3	0.08	0.3	0.05	0.05	0.05	0.003	0.22
340 M <sup>1)</sup>	0.10	0.05	1.20	0.020	0.010	0.020	0.3	0.3	0.08	0.3	0.05	0.05	0.05	0.003	0.26
355 M <sup>1)</sup>	0.10	0.05	1.20	0.020	0.010	0.020	0.3	0.3	0.08	0.3	0.05	0.06	0.05	0.003	0.28
380 M <sup>1)</sup>	0.10	0.05	1.20	0.020	0.010	0.020	0.3	0.3	0.08	0.3	0.05	0.06	0.05	0.003	0.30
420 M <sup>1)</sup>	0.10	0.05	1.40	0.020	0.010	0.020	0.3	0.3	0.08	0.3	0.05	0.06	0.05	0.003	0.34
460 M <sup>1)</sup>	0.10	0.05	1.50	0.020	0.008	0.020	0.3	0.3	0.08	0.3	0.07	0.07	0.07	0.003	0.36
500 M <sup>1)</sup>	0.10	0.05	1.60	0.020	0.008	0.020	0.3	0.3	0.08	0.3	0.07	0.07	0.07	0.003	0.38
550 M <sup>1)</sup>	0.12	0.05	1.70	0.020	0.008	0.020	0.3	0.3	0.08	0.3	0.07	0.07	0.15	0.003	0.40
600 M	0.12	0.50	1.90	0.020	0.008	0.020	0.3	0.3	0.30	0.3	0.07	0.07	0.15	0.005	0.42
650 M	0.12	0.50	2.00	0.020	0.008	0.020	0.3	0.3	0.30	0.3	0.07	0.07	0.15	0.005	0.44
700 M	0.12	0.50	2.10	0.020	0.008	0.020	0.3	0.3	0.30	0.3	0.15	0.08	0.20	0.005	0.46

<sup>1)</sup> When these steel grades are to be **galvanized as Class 1**, the following restrictions apply:  
Si 0.03% max. and P 0.018% max.; CEV = C + Mn/6 + (Cr+Mo+V)/5 + (Ni+Cu)/15

## Mechanical properties: Tensile test

Test direction: longitudinal, minimum values for R<sub>eH</sub> und R<sub>m</sub> also apply in cross direction.

R<sub>p0.2</sub> applies for the yield strength in case of missing R<sub>eH</sub> and in arbitrary cases

A<sub>80</sub> for thicknesses < 3 mm

A<sub>5</sub> for thicknesses ≥ 3 mm

alform®	Yield strength R <sub>eH</sub>	Tensile strength R <sub>m</sub>	Elongation [%] min.	
	[MPa]	[MPa]	A <sub>80</sub>	A <sub>5</sub>
280 M	280 – 400	370 – 470	24	28
315 M	315 – 440	390 – 490	22	26
340 M	340 – 470	420 – 520	20	24
355 M	355 – 480	430 – 530	20	24
380 M	380 – 510	450 – 550	20	24
420 M	420 – 550	480 – 600	18	22
460 M	460 – 590	520 – 640	16	19
500 M	500 – 650	550 – 680	15	18
550 M	≥ 550	600 – 740	14	17
600 M	≥ 600	650 – 800	13	16
650 M <sup>2)</sup>	≥ 650	700 – 850	12	15
700 M <sup>2)</sup>	≥ 700	750 – 930	11	14

<sup>2)</sup> The yield strength may be lower by 20 MPa for thicknesses > 8 mm.

**Mechanical properties: Notch impact energy, edging radii, bending mandrel diameter**

alform®	Notch impact energy <sup>3)</sup> A <sub>v</sub> [Joule]		Edging radii <sup>4)</sup> Ri min. at 90° edging			Bending mandrel diameter BgD min. (transverse test specimens) Sheet thickness = s
	M Test temperature -20 °C	ME Test temperature -40 °C <sup>5)</sup>	s < 3 mm	s 3-6 mm	s > 6 mm	
280 M	40	-	0.25 s	0.5 s	0.8 s	0 s
315 M	40	-	0.25 s	0.5 s	0.8 s	0 s
340 M	40	-	0.25 s	0.5 s	0.8 s	0 s
355 M (ME)	40	27	0.25 s	0.5 s	0.8 s	0 s
380 M (ME)	40	27	0.25 s	0.5 s	0.8 s	0.5 s
420 M (ME)	40	27	0.5 s	1.0 s	1.0 s	0.5 s
460 M (ME)	40	27	0.5 s	1.0 s	1.4 s	1.0 s
500 M (ME)	40	27	0.8 s	1.2 s	1.6 s	1.0 s
550 M (ME)	40	27	0.8 s	1.2 s	1.6 s	1.5 s
600 M (ME)	40	27	0.8 s	1.2 s	1.6 s	1.5 s
650 M (ME)	40	27	0.8 s	1.2 s	1.6 s	1.5 s
700 M (ME)	40	27	0.8 s	1.2 s	1.6 s	1.5 s

<sup>3)</sup> A<sub>v</sub>, minimum mean value from three samples (ISO-V, longitudinal) as related to full-size specimen (10 x 10 mm).

<sup>4)</sup> Smallest permissible inside radius at 90° edging, Ri min

<sup>5)</sup> Values at -40 °C are guaranteed for limited dimension ranges and material is labeled **ME** upon request.

Notch impact energy can be measured from a plate thickness ≥ 3 mm upon request.

Note: Notch impact energy tests in thicknesses < 6 mm do not conform with applicable Euronorm standards.

**Dimensions**

Examples of maximum width per thickness

alform®	Thickness [mm]								
	2.0	2.5	3.0	3.5	4.0	6.0	12.0	15.0	20.0 <sup>4)</sup>
280 M	1620	1620	1620	1620	1620	1620	1620	-	-
315 M	1620	1620	1620	1620	1620	1620	1620	1620	-
340 M	1620	1620	1620	1620	1620	1620	1620	-	-
355 M	1500	1620	1620	1620	1620	1620	1620	1620	1750
380 M	1500	1620	1620	1620	1620	1620	1620	1620	-
420 M	1360	1620	1620	1620	1620	1620	1620	1620 <sup>4)</sup>	-
460 M	1360	1620	1620	1620	1620	1620	1620	1620 <sup>4)</sup>	-
500 M	1280	1480	1620	1620	1620	1620	1620	-	-
550 M	1280	1480	1620	1620	1620	1620	1620	-	-
600 M	1250	1380	1500	1620	1620	1620	-	-	-
650 M	1250	1380	1500	1620	1620	1620 <sup>4)</sup>	-	-	-
700 M	1250	1380	1500	1620	1620	1620 <sup>4)</sup>	1620 <sup>4)</sup>	1380 <sup>4)</sup>	-

<sup>4)</sup> Available only as cut sheets in unpickled condition.

Additional dimensions upon request.  
Depending on the dimensions and strength, we also supply pickled, oiled and trimmed

Steel strip	Slit steel strip	Cut sheets	Cut shapes
Width: 900 - 1620 (1750) mm	Thickness: up to 8 mm	Thickness: up to 20 mm	Upon request
Weight/Width: 18 - 20 kg/mm	Strip widths: beginning at 30 mm	Length: up to 12 m (18 m)	



Premium quality with reduced carbon footprint



Hot-rolled steel strip – greentec steel Edition

Max. carbon footprint 2.10 kg CO<sub>2</sub>e per kg of steel <sup>1)</sup>

<sup>1)</sup> per EN 15804+A2 (EPD methodology) cradle to gate

All products, dimensions and steel grades listed in each voestalpine supply range are available as greentec steel Edition.

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