



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

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 ¹⁾	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 ¹⁾	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 ¹⁾	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 ¹⁾	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	0.28
380 M ¹⁾	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	0.30
420 M ¹⁾	0.10	0.05	1.40	0.020	0.010	0.020	0.3	0.3	0.08	0.3	0.05	0.05	0.05	0.003	0.34
460 M ¹⁾	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 ¹⁾	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 ¹⁾	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

¹⁾ 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_{eH} und R_m also apply in cross direction.

R_{p0.2} applies for the yield strength in case of missing R_{eH} and in arbitrary cases

A₈₀ for thicknesses < 3 mm

A₅ for thicknesses ≥ 3 mm

alform®	Yield strength R _{eH}	Tensile strength R _m	Elongation [%] min.	
	[MPa]	[MPa]	A ₈₀	A ₅
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 – 580	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 ²⁾	≥ 650	700 – 850	12	15
700 M ²⁾	≥ 700	750 – 930	11	14

²⁾ 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 ³⁾ A _v [Joule]		Edging radii ⁴⁾ 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 ⁵⁾	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

³⁾ A_v, minimum mean value from three samples (ISO-V, longitudinal) as related to full-size specimen (10 x 10 mm).

⁴⁾ Smallest permissible inside radius at 90° edging, Ri min

⁵⁾ 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
280 M	1620	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	1620
355 M	1500	1620	1620	1620	1620	1620	1620	1620
380 M	1500	1620	1620	1620	1620	1620	1620	1620
420 M	1360	1620	1620	1620	1620	1620	1620	1620
460 M	1360	1620	1620	1620	1620	1620	1620	1620
500 M	1280	1480	1620	1620	1620	1620	1620	1500
550 M	1280	1480	1620	1620	1620	1620	1620	1500
600 M	1250	1380	1500	1620	1620	1620	1620	1500
650 M	1250	1380	1500	1620	1620	1620 ⁴⁾	1620 ⁴⁾	1500
700 M	1250	1380	1500	1620	1620	1620 ⁴⁾	1620 ⁴⁾	1500

⁴⁾ 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:	bis 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)		

The information and product properties contained in this printed material are non-binding and serve the sole purpose of technical orientation. They do not replace individual advisory services provided by our sales and customer service teams. The product information and characteristics set forth herein shall not be considered as guaranteed properties unless explicitly stipulated in a separate contractual agreement. For this reason, voestalpine shall not grant any warranty nor be held liable for properties and/or specifications other than those subject to explicit agreement. This also applies to the suitability and applicability of products for certain applications as well as to the further processing of materials into final products. All application risks and suitability risks shall be borne by the customer. The General Terms of Sale for Goods and Services of the voestalpine Steel Division shall apply to all materials supplied by the voestalpine Steel Division and can be accessed using the following link: www.voestalpine.com/stahl/en/The-Steel-Division/General-Terms-of-Sale

Technical changes are reserved. Errors and misprints are excepted. No part of this publication may be reprinted without explicit written permission by voestalpine Stahl GmbH.

Please find further information and downloadable files at the following link:
www.voestalpine.com/alform

