alform®

S 355 / 420 / 460 ML toughcore
alform plate 355 / 420 / 460 M toughcore

Outstanding toughness even to the core up to 140 mm plate thickness

alform® toughcore is characterized by its extremely high toughness even to the core as a result of the remarkably fine microstructure throughout the entire cross-section. The microstructure is refined even in half plate thickness by accelerated cooling and consecutive fast reheating during the rolling process.

The new generation of thermomechanically rolled (TMCP) steel is manufactured in a completely new and patented process and in accordance to EN 10025-4 that enables unique combinations of properties with respect to thickness, strength, excellent toughness and best weldability. The so produced heavy plates show their remarkable potential particularly in the thickness range from 100 mm to 140 mm.

alform® toughcore creates higher safety standards and enhances the potential for the use of heavy plates in steel construction, bridge building and the manufacture of penstocks, vehicles and cranes. alform® steels are produced via LD-route and are cast as fully killed steel.

Convincing advantages

- Extremely high toughness
- Higher levels of safety
- Exploration of arctic regions
- Best weldability

greentec steel

Premium quality
with reduced carbon footprint

alform®
greentec steel

voestalpine Grobblech GmbH
www.voestalpine.com/grobblech

voestalpine
ONE STEP AHEAD.

Chemical composition

Heat analysis in mass %

Steel grade	C max.	Si max.	Mn max.	P max.	S max.	Cr max.	Mo max.	B max.	Ti max.	Ni max.	Cu max.	Nb max.	N max.
S 355 ML toughcore alform plate 355 M toughcore	0.05	0.35	1.60	0.01	0.002	0.25	0.2	0.0005	0.02	0.5	0.25	0.04	0.008
S 420 ML toughcore alform plate 420 M toughcore	0.07	0.35	1.60	0.01	0.002	0.25	0.3	0.0005	0.02	0.5	0.25	0.04	0.008
S 460 ML toughcore alform plate 460 M toughcore	0.07	0.35	1.60	0.01	0.002	0.25	0.3	0.0005	0.02	0.5	0.25	0.04	0.008

Carbon equivalent

Steel grade	Plate thickness [mm]	Mass [%] CEV [1] max.
S 355 ML toughcore alform plate 355 M toughcore	40 - 140	0.43
S 420 ML toughcore alform plate 420 M toughcore	40 - 140	0.45
S 460 ML toughcore alform plate 460 M toughcore	40 - 140	0.45

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

Mechanical properties: Notch impact energy

Notch impact energy in as-delivered condition

Steel grade	Plate thickness [mm]	Notch impact energy A_v min./A min. [2] [J] (¼ t) Test temperature		Notch impact energy A_v min./A min. [2] [J] (½ t) Test temperature	
		-80 °C	-65 °C	-60 °C	-45 °C
S 355 ML toughcore alform plate 355 M toughcore	> 40 ≤ 100	150 / 105	150 / 105	100 / 35	100 / 35
	> 100 ≤ 140	-	150 / 105	-	100 / 35
S 420 ML toughcore alform plate 420 M toughcore	> 40 ≤ 100	150 / 105	150 / 105	100 / 35	100 / 35
	> 100 ≤ 140	-	150 / 105	-	100 / 35
S 460 ML toughcore alform plate 460 M toughcore	> 40 ≤ 100	150 / 105	150 / 105	100 / 35	100 / 35
	> 100 ≤ 140	-	150 / 105	-	100 / 35

[2] Notch impact bending test in accordance with EN ISO 148-1 on Charpy-V longitudinal samples.
Normative requirements acc. to EN 10025 at -50 °C min. 27/19J in ¼ t

Mechanical properties: Tensile test

Standard values for as-delivered condition

Steel grade	Plate thickness [mm]	Yield strength $R_{p0.2}$ [3] (¼ t) [MPa] min.	Yield strength $R_{p0.2}$ [3] (½ t) [MPa] min.	Tensile strength R_m [3] (¼ t) [MPa]	Tensile strength R_m [3] (½ t) [MPa]
S 355 ML toughcore alform plate 355 M toughcore	> 40 ≤ 100	355	355	470 - 600	470 - 600
	> 100 ≤ 140	345	345	460 - 590	460 -590
S 420 ML toughcore alform plate 420 M toughcore	> 40 ≤ 100	420	380	500 - 630	490 - 630
	> 100 ≤ 140	380	365	480 - 620	470 - 620
S 460 ML toughcore alform plate 460 M toughcore	> 40 ≤ 100	460	400	550 - 680	540 - 680
	> 100 ≤ 140	400	385	500 - 660	490 - 660

Steel grade	Uniform elongation Ag [3] [%]	Fracture elongation $L_0 = 5.65 \sqrt{S_0}$ A5 [3] [%]	$R_{p0.2} / R_m$ max.
S 355 ML toughcore alform plate 355 M toughcore	10	25	0.92
S 420 ML toughcore alform plate 420 M toughcore	10	25	0.92
S 460 ML toughcore alform plate 460 M toughcore	10	25	0.92

[3] Tensile test in accordance with EN ISO 6892-1 on transverse samples.

Available dimensions

Maximum width per thickness; minimum width 1,500 mm

Steel grade	Plate thickness [mm]	Max. width [mm]	Max. length [mm]	As-delivered condition
S 355 ML toughcore alform plate 355 M toughcore	40 - 140	3,800	18,700	toughcore®
S 420 ML toughcore alform plate 420 M toughcore	40 - 140	3,800	18,700	toughcore®
S 460 ML toughcore alform plate 460 M toughcore	40 - 140	3,800	18,700	toughcore®

Additional dimensions upon request.

OUR PATH TO A GREENER FUTURE

Premium products in the greentec steel Edition

With greentec steel, voestalpine is pursuing an ambitious step-by-step plan in the long-term decarbonization of steel production. The declared objective is to achieve carbon-neutral production by 2050, and the initial steps have already been taken. Process-optimized production operations already prevent up to 10% of the direct CO_2 emissions at the Linz site. The material and processing properties of the steel are not affected in any way in this production route. Each voestalpine heavy plate product is available in premium quality in the greentec steel Edition with a reduced carbon footprint and unique benefits.

greentec steel

Premium quality with reduced carbon footprint

alform®

greentec steel

Heavy plates (excl. heads and clad plates) – greentec steel Edition
Max. carbon footprint 2.21 kg CO_2e per kg of steel [1]

[1] per EN 15804+A2 (EPD methodology) cradle to gate

Please find further information about toughcore® and downloadable files at **www.voestalpine.com/toughcore/en**

Please find further information about alform® and downloadable files at **www.voestalpine.com/alform/en**

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