P355NL1 Steel Plate

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1.0566 · P355NL1 is the low-temperature member of the P355N family in EN 10028-3: the same micro-alloyed, aluminium-killed, normalised fine-grain steel as P355NH, but with impact energy guaranteed at −40 °C (27 J transverse / 40 J longitudinal) and a tighter chemistry. It is the plate of LPG and propane spheres, bullets and mounded vessels whose minimum design metal temperature reaches −40 °C, of refrigerated-ammonia and butadiene storage, and of process vessels in Kazakhstan, Siberia and the Balkans where the winter ambient itself sets the MDMT. Supplied 6–100 mm to order from EU and Turkish mills with 3.1 or 3.2 certificates, UT and Z-quality.

1.0566 | Yield ≥ 355 MPa | KV 27 J at −40 °C | Normalised fine grain | 6–100 mm to order

The moment a vessel's MDMT drops below −20 °C, P355NH stops being enough on paper: P355NL1 is the same 355 MPa plate with the Charpy done at −40 °C, and it is what the inspector wants to see on the certificate of a propane sphere.

CHEMICAL COMPOSITION

Element	C	Si	Mn	P	S	Al	Nb	V	Ti	Ni	Cr	Mo	Cu	N
max. % (ladle)	≤ 0.18	≤ 0.50	1.10–1.70	≤ 0.025	≤ 0.010	≥ 0.020	≤ 0.05	≤ 0.10	≤ 0.03	≤ 0.50	≤ 0.30	≤ 0.08	≤ 0.30	≤ 0.020

Nb + Ti + V ≤ 0.12 %. Mills typically run C 0.12–0.15 %, S ≤ 0.005 % for NL1. CEV ≤ 0.43.

MECHANICAL PROPERTIES

Thickness	Yield ReH min (MPa)	Tensile Rm (MPa)	Elongation A min	Impact KV
≤ 16 mm	355	490–630	22 %	27 J trans. / 40 J long. at −40 °C
> 16–40 mm	345	490–630	22 %	27 / 40 J at −40 °C
> 40–60 mm	335	490–630	22 %	27 / 40 J at −40 °C
> 60–100 mm	325	480–620	21 %	27 / 40 J at −40 °C
Elevated temperature	—	—	—	Rp0.2 at 50–400 °C as for P355NH on request

EQUIVALENT GRADES

System	Grade	Note
DIN 17102	TStE 355	direct predecessor
EN 10028-3	P355NH / P355NL2	siblings: −20 / −50 °C
ASTM	A537 Cl. 1 (−45 °C option)	normalised C-Mn-Si pressure plate
ASTM	A516 Gr. 70 normalised + impact	commonly substituted under ASME
EN 10025-3	S355NL	structural −50 °C, no pressure certification
GOST 5520	09G2S (approx.)	CIS low-temperature vessel steel

DESIGN TEMPERATURE AND GRADE CHOICE

MDMT	Grade	Impact test	Typical service
≥ −20 °C	P355N / P355NH	40 J at −20 °C	steam drums, air receivers, ambient LPG in temperate climates
−20 to −40 °C	P355NL1	27 J at −40 °C	propane / LPG spheres and bullets, mounded storage, continental winters
−40 to −50 °C	P355NL2	27 J at −50 °C	refrigerated LPG, Siberian and Arctic sites
below −50 °C	nickel steels (X8Ni9, 5 % Ni) / austenitic	—	LNG, ethylene, LPG at −60 °C

Impact values are minimum transverse at the stated temperature per EN 10028-3 Table 5; longitudinal values are higher. The pressure code (PED / AD 2000 / ASME VIII) and the design MDMT govern the choice.

STANDARDS

EN 10028-3:2017 — P355NL1, 1.0566 · PED 2014/68/EU; AD 2000 W1 / W10 · EN 10160 UT; EN 10164 Z15/Z25/Z35 · DIN 17102 — TStE 355 (withdrawn)