

APPROVAL OF MANUFACTURER CERTIFICATE

This is to certify:

That
SSAB Europe Oy
Rautaruukintie 155, 92101 Raahe,
Finland

is an approved manufacturer of
Steelmaking and Rolled Steel Products

in accordance with
DNV GL rules for classification – Ships
DNVGL-OS-B101 – Metallic materials

and the following particulars:

Application area	Normal strength steel High strength steel Extra high strength steel Z-grade steels (plates with trough thickness properties) Steels for boiler and pressure vessels Steel for low temperature service
Product	Plates and sheets, Strips
Manufacturing method	Basic oxygen converter (BOC), Continuous casting (CC)
Max. thickness / diameter	See particulars of the approval
Heat treatment condition	See particulars of the approval
Additional approval conditions	See particulars of the approval

Manufacturer(s) approved by this certificate is/are accepted to deliver according to DNV GL, DNV and GL rules. Materials to be applied to DNV GL classed object shall fulfill the material requirements in the applicable DNV GL class rules.

Issued at **Hamburg** on **2020-11-09**

for **DNV GL**

This Certificate is valid until **2023-12-31**.

DNV GL local station: **Finland**

Approval Engineer: **Torben Schälicke**

Thorsten Lohmann
Head of Section

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Job Id: **263.11-004288-9**
 Certificate No: **AMMM00000HK**
 Revision No: **7**

Particulars of the approval

Normal strength steel

Grade	Product	Steel making ¹⁾	Fine grain elements	Max. Thickness (mm)	Heat treatment condition ²⁾	Z-quality
VL A, VL B, VL D	Plate ³⁾	BOC, CC	Al	50	AR, NR	Z35
			Al+Ti			
			Al	150	N	Z35
VL E	Plate ³⁾	BOC, CC	Al	150	N	Z35
				15	TM	Z35
			Al+Nb	150	N	Z35
				40	TM	Z35

High strength steel

Grade	Product	Steel making ¹⁾	Fine grain elements	Max. Thickness (mm)	Heat treatment condition ²⁾	Z-quality
VL A27S	Plate ³⁾	BOC, CC	Al	35	AR	Z35
				60	N	Z35
VL D27S	Plate ³⁾	BOC, CC	Al	25	AR	Z35
				69	N	Z35
VL E27S	Plate ³⁾	BOC, CC	Al	60	N	Z35
				15	TM	Z35
VL A32	Plate ³⁾	BOC, CC	Al	12	AR	Z35
				60	NR	Z35
			Al+Nb, Al+Nb+V Al+Nb+V+Ti	60	NR	Z35
				150	N	Z35
				40	TM	Z35
				80	TM	Z35
VL D32	Plate ³⁾	BOC, CC	Al, Al+Nb	60	NR	Z35
VL D32, VL E32	Plate ³⁾	BOC, CC	Al, Al+Nb, Al+Nb+V Al+Nb+V+Ti	150	N	Z35
				40	TM	Z35
			Al+Nb+Ti	80	TM	Z35
VL F32, VL F36	Plate	BOC, CC	Al+Nb+Ti	70	TM	Z35

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High strength steel

Grade	Product	Steel making ¹⁾	Fine grain elements	Max. Thickness (mm)	Heat treatment condition ²⁾	Z-quality
VL A36, VL D36	Plate ³⁾	BOC, CC	Al, Al+Nb	10	AR, NR, N	Z35
			Al+Nb, Al+Nb+V	12	AR	Z35
				60	NR	Z35
			Al+Nb	60	N	Z35
				40	TM (AcC)	Z35
Al+Nb+V, Al+Nb+V+Ti	150	N	Z35			
Al+Nb+Ti	80	TM	Z35			
VL E36	Plate ³⁾	BOC, CC	Al+Nb	60	N	Z35
				40	TM (AcC)	Z35
			Al+Nb+V, Al+Nb+V+Ti	150	N	Z35
			Al+Nb+Ti	80	TM	Z35
VL A40	Plate ³⁾	BOC, CC	Al+Nb, Al+Nb+V, Al+Nb+Ti, Al+Nb+V+Ti	12.5	AR	Z35
				40	N	Z35
			Al+Nb+Ti	70	TM	Z35
VL D40, VL E40	Plate ³⁾	BOC, CC	Al+Nb, Al+Nb+V, Al+Nb+Ti, Al+Nb+V+Ti	40	N	Z35
			Al+Nb+V+Ti	20	TM	Z35
			Al+Nb+Ti	70	TM	Z35

Steel with improved weldability

Grade	Product	Steel making ¹⁾	Fine grain elements	Max. Thickness (mm)	Heat treatment condition ²⁾	Z-quality
VL DW36, VL EW36	Plate	BOC, CC	Al+Nb+Ti	70	TM	-
VL DOW460, VL EOW460 ⁴⁾	Plate	BOC, CC	Al+Nb	20	TM	-
			Al+Nb+Ti	70	TM	-

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Extra high strength steel

Grade	Product	Steel making ¹⁾	Fine grain elements	Max. Thickness (mm)	Heat treatment condition ²⁾	Z-quality
VL A420, VL D420, VL E420	Plate	BOC, CC	Al+Nb+Ti	60	TM	Z25
VL A460, VL D460, VL E460 ⁸⁾	Plate	BOC, CC	Al+Nb+Ti	40	TM	-
VL AO420, VL DO420, VL EO420, VL AO460, VL DO460, VL EO460	Plate	BOC, CC	Al+Nb+Ti	70	TM	Z25
			Al+Nb	40	TM	Z35
VL FO460	Plate	BOC, CC	Al+Nb+Ti	70	TM	-
VL A500, VL D500, VL E500 ⁸⁾	Plate	BOC, CC	Al+Nb+Ti	40	TM	-
VL AO500, VL DO500, VL EO500	Plate	BOC, CC	Al+Nb+V+Ti	20	TM	-
			Al+Nb+Ti	40	TM	-
VL A620, VL D620, VL E620, VL A690, VL D690, VL E690 ⁶⁾⁷⁾	Plate	BOC, CC	Al+Nb+V+Ti	40	QT	Z35

Rolled steels for boiler and pressure vessels

Grade	Product	Steel making ¹⁾	Fine grain elements	Max. Thickness (mm)	Heat treatment condition ²⁾	Z-quality
VL 360 0A, VL 410-0A, VL 460-0A	Plate	BOC, CC	Al	25	AR	-
VL 360-0N, VL 360-1FN VL 410-0N, VL 410-1FN	Plate	BOC, CC	Al, Al+Nb	100	N	-
VL 460-0N, VL 460-1FN, VL 490-0N, VL 490-1FN, VL 510-1FN	Plate	BOC, CC	Al, Al+Nb	80	N	-

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Steel for low temperature service

Grade	Product	Steel making ¹⁾	Fine grain elements	Max. Thickness (mm)	Heat treatment condition ²⁾	Z-quality
VL 360-2FN, VL 2-2, VL 4-2	Plate	BOC, CC	Al, Al+Nb Al+Nb+Ti	40	N	-
VL 2-3, VL 2-4, VL 2-4L VL 4-3, VL 4-4, VL 4-4L	Plate	BOC, CC	Al+Nb, Al+Nb+Ti	40	N	-
VL 4-4 (mod) ⁵⁾	Plate	BOC, CC	Al+Nb+V+ Ti	25	N+TM, NR+N	-

Remarks:

- 1) BOC: basic oxygen converter
CC: continuous casting
- 2) AR: as rolled
NR: normalising rolling
TM: thermo-mechanical rolling
N: normalised
- 3) Including strip, thickness max. 15 mm
- 4) Including improved impact properties: 50/36 J at -60°C
- 5) Mod: **Alloyed with 0.20 – 0.80% Ni; ReH min. 310 MPa; Rm 540 – 650 MPa**
- 6) Qualified max. heat input. 1.4 kJ/mm. **C_{eq} = 0.55 during weldability testing**
- 7) Yield strength to tensile strength ration >0.94 for applications according DNVGL RU-Ship is subject to case by case approval
- 8) Qualified max. heat input. 1.8 kJ/mm