

# 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:

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

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 **2020-04-14**for **DNV GL**This Certificate is valid until **2020-12-31**.DNV GL local station: **Turku**Approval Engineer: **Christian Wildhagen**


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**Thorsten Lohmann**  
**Head of Section**

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Job Id: **263.11-004288-8**  
 Certificate No: **AMMM00000HK**  
 Revision No: **6**

## Particulars of the approval

### Normal strength steel

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

### High strength steel

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

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### High strength steel

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

### Steel with improved weldability

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

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### Extra high strength steel

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

### Rolled steels for boiler and pressure vessels

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

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### Steel for low temperature service

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

#### 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. **Ceq = 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