



APPROVAL OF MANUFACTURER CERTIFICATE

Certificate No:
AMMM00001FA
Revision No:
4

This is to certify:

That

Buderus Edelstahl GmbH
Dillfeld 40, 35576 Wetzlar,
Germany

is an approved manufacturer of
Steel Forgings

in accordance with

DNV rules for classification – Ships
DNV-OS-B101 – Metallic materials
DNV class programme – DNV-CP-0247 Steel forgings
DNV class programme – DNV-CP-0242 Semi-finished steel products

and the following particulars:

Application area	Forgings for hull structures and equipment, Forgings for shafting and machinery, Forgings for gearing, Forgings for boilers, pressure vessels and piping systems, Stainless steel forgings Steelmaking
Steel type	Carbon and carbon-manganese, alloy, austenitic stainless, martensitic stainless, ferritic stainless
Manufacturing method	Open die forging/hot rolling
Max. weight	See page 2 ff.
Heat treatment condition	See page 2 ff.
Additional approval conditions	Including steelmaking; Including clean steel forgings of grade 18CrNiMo 7-6 (EN 10084), see details on page 2 ff.

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 classed object shall fulfill the material requirements in the applicable DNV class rules.

Issued at **Hamburg** on **2023-07-10**

for **DNV**

This Certificate is valid until **2026-06-30**.

DNV local unit: **Essen**

Approval Engineer: **Stefan Röhr**

Thorsten Lohmann
Head of Section

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Page 1 of 3

Particulars of the approval

Semi-finished products

Steel type	Product	Steel making ¹⁾	Max weight [kg]	Max. thickness [mm]	Heat treatment condition ²⁾
C and C-Mn	Ingots	EAF, IC	160 000	-	AC
Alloy	Ingots	EAF, IC	160 000	-	AC
Ferritic stainless	Ingots	EAF, IC	160 000	-	AC
Martensitic stainless	Ingots	EAF, IC	160 000	-	AC
Austenitic stainless	Ingots	EAF, IC	160 000	-	AC
C and C-Mn	Slabs	EAF, CC	-	-	AC
Alloy	Slabs	EAF, CC	-	-	AC
Ferritic stainless	Slabs	EAF, CC	-	-	AC
Martensitic stainless	Slabs	EAF, CC	-	-	AC
Austenitic stainless	Slabs	EAF, CC	-	-	AC

Forgings for hull structures and equipment

Steel type	Grade ³⁾	Manufacturing method ^{1) 4)}	Max. weight [kg]	Heat treatment condition ²⁾
C and C-Mn	NV F400UW, NV F440UW, NV F480UW, NV F520UW, NV F560UW, NV F600UW	OD, RB	95 000 (70 000) ⁵⁾	N, NT, QT
Alloy	NV F550AW, NV F600AW, NV F650AW	OD, RB	95 000 (70 000) ⁵⁾	QT

Forgings for shafting and machinery Forgings for gearing

Steel type	Grade ³⁾	Manufacturing method ^{1) 4)}	Max. weight [kg]	Heat treatment condition ²⁾
C and C-Mn	NV F400U, NV F440U, NV F480U, NV F520U, NV F560U, NV F600U, NV F640U, NV F680U, NV F720U, NV F760U	OD, RB	95 000 (70 000) ⁵⁾	N, NT, QT
Alloy	NV F600A, NV F700A, NV F800A, NV F900A, NV F1000A, NV F1100A	OD, RB	95 000 (70 000) ⁵⁾	QT

Forgings for boilers, pressure vessels and piping systems

Steel type	Grade ³⁾	Manufacturing method ^{1) 4)}	Max. weight [kg]	Heat treatment condition ²⁾
C and C-Mn	NV F450H, NV F490H	OD, RB	95 000 (70 000) ⁵⁾	N, NT, QT
Alloy	NV F0.5Mo, NV F1Cr0.5Mo	OD, RB	95 000 (70 000) ⁵⁾	NT, QT
	NV F2.25Cr1Mo	OD, RB	95 000 (70 000) ⁵⁾	N, QT

Stainless steel forgings

Steel type/grade ⁶⁾	Manufacturing method ^{1) 4)}	Max. weight [kg]	Heat treatment condition ²⁾
Austenitic stainless	OD, RB	95 000 (70 000) ⁵⁾	SHT
Ferritic stainless	OD, RB	95 000 (70 000) ⁵⁾	SHT
Martensitic stainless	OD, RB	95 000 (70 000) ⁵⁾	QT

Remarks:

- 1) OD: Open die forging; RB: Rolled bar
- 2) QT: Quenched and tempered; N: Normalised; NT: Normalised and tempered; SHT: Solution Heat Treated (Solution Annealing)
- 3) Incl. equivalent grades in acc. to other standards
- 4) Max. thickness of rolled bars: 190 mm (round bars); 300 mm (square bars)
- 5) Max. weight: 95 000 kg (free forgings); 70 000 kg (forged bars)
- 6) Stainless steel forgings shall be in accordance with recognized standards, e.g. EN 10222, ASTM A473/A965/A1049 and JIS G 3214, provided that supplementary requirements contained herein are also met

Additional approval conditions

1. Clean steel forgings in carbon, carbon-manganese and alloy steel grades are qualified for approved applications. The steels are to comply with the DNV Rules Pt. 2, Ch. 2, Sec. 6.1.10.
2. Including Premium Clean Steel according to customer specification PR DL for application in forged crankshafts
3. Including free form forged crankshafts of "Clean Steel" (see pt. 1+2 above) for approved applications
4. Blanks cut from forged bars of "clean steel forgings" (see pt. 1 above) to a diameter of max. 1450 mm are qualified with respect to fatigue endurance limits for gears.
Ref. DNV Rules Pt. 4, Ch. 2, Sec. 1.5.1
5. Sawn discs in special grade 18CrNiMo7-6 / ISO B following EN 10084 from forged bars with tensile strength in range between 1080 MPa and 1500 MPa with toughness properties (v-notched impact test) at ambient temperature of minimum 40 Joule (longitudinal) and 30 Joule (tangential/transversal) respectively delivered in "pre-hardened" condition for applications to be subject to special approval
6. Including the delivery of hot rolled semi-finished square bars (300 mm x 300 mm) intended for subsequent closed die forging operations and heat treatment
7. Including forgings in grade HY-80 acc. to MIL-S-23009C (NV-M550S)