

APPROVAL OF MANUFACTURER CERTIFICATE

This is to certify:

That

**GROUP KARL DIEDERICHS
Plant Karl Diederichs KG - Dirostahl
Luckhauser Strasse 1 - 5
Remscheid, Germany**

is an approved manufacturer of
Steel Forgings

in accordance with
DNV GL rules for classification – Ships

and the following particulars:

Product	Open die forgings (incl. bars and seamless rolled rings)
Steel type(s)	Forgings for hull structures and equipment Forgings for shafting and machinery Forgings for gearing Forgings for boilers, pressure vessels and piping systems Ferritic steel forgings for low temperature service Stainless steel forgings
Max. weight	36000 kg
Delivery Condition	Normalized, (double) normalized + tempered, quenched + tempered, annealed, solution annealed + quenched
Remarks	see Particulars of the approval

Manufacturer(s) approved by this certificate is/are accepted to deliver according to DNV GL, DNV and GL rules.

This Certificate is valid until **2019-03-06**.

Issued at **Hamburg** on **2016-03-07**

DNV GL local station: **Essen**

Approval Engineer: **Oliver Krömer**



for **DNV GL**

Digitally Signed By: Wildhagen, Christian

Location: DNV GL Hamburg, Germany

Signing Date: 2016-03-07, on behalf of

Thorsten Lohmann
Head of Section

Particulars of the approval

Forgings:

Grade	Product	Supply Condition	Casting Method	Thickness [mm], max.	Weight [kg], max.
Forgings for hull structures and equipment					
F400UW, F440UW, F480UW, F520UW, F560UW, F600UW	FF, ST	N, N+T, Q+T	CC, IC	1600	36000
F550AW, F600AW, F650AW	FF, ST	Q+T	CC, IC	1600	36000
Forgings for shafting and machinery					
F400U, F440U, F480U, F520U, F560U, F600U, F640U, F680U, F720U, F760U	FF, ST	N, N+T, Q+T	CC, IC	1600	36000
F600A, F700A, F800A, F900A, F1000, F1100A	FF, ST	Q+T	CC, IC	1600	36000
Forgings for boilers, pressure vessels and piping systems					
F450H, F490H	FF, ST	N, N+T, Q+T	CC, IC	1600	36000
F0.5Mo, F1Cr0.5Mo	FF, ST	N+T, Q+T	CC, IC	1600	36000
F2.25Cr1MoN	FF, ST	N+T	CC, IC	1600	36000
F2.25Cr1MoQT	FF, ST	Q+T	CC, IC	1600	36000
Ferritic steel forgings for low temperature service					
F450L, F490L	FF, ST	N, N+T, Q+T	CC, IC	1600	36000
F3.5Ni, F5Ni	FF, ST	N+T, Q+T	CC, IC	1600	36000
F9Ni	FF, ST	N+N+T, Q+T	CC, IC	1600	36000
Non-alloy steels					
C & C-Mn steels acc. to EN 10083-2	FF, ST	N, N+T, Q+T	CC, IC	1600	36000
C & C-Mn steels acc. to EN 10250-2	FF, ST	N, N+T, Q+T	CC, IC	1600	36000
C & C-Mn steels acc. to SEW 550	FF, ST	N, N+T, Q+T	CC, IC	1600	36000
C & C-Mn steels acc. to EN 10084	FF, ST	N+T, Q+T	CC, IC	1600	36000
C & C-Mn steels acc. to EN 10222-2	FF, ST	N, N+T, Q+T	CC, IC	1600	36000
C & C-Mn steels acc. to EN 10222-4	FF, ST	N, Q+T	CC, IC	1600	36000
C & C-Mn steels acc. to EN 10269	ST	N, Q+T	CC, IC	900	36000

Job Id: **263.11-002797-2**
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Grade	Product	Supply Condition	Casting Method	Thickness [mm], max.	Weight [kg], max.
Alloy steels					
Alloy steels acc. to EN 10083-3	FF, ST	Q+T	CC, IC	1600	36000
Alloy steels acc. to EN 10250-3	FF, ST	Q+T	CC, IC	1600	36000
Alloy steels acc. to SEW 550	FF, ST	Q+T	CC, IC	1600	36000
Alloy steels acc. to EN 10084	FF, ST	Q+T	CC, IC	1600	36000
18CrNiMo7-6 acc. to EN 10084 ^{1),2)}	FF, ST	Q+T	CC, IC	1600	36000
Alloy steels acc. to EN 10222-2	FF, ST	N+T, Q+T	CC, IC	1600	36000
Nickel steels acc. to EN 10222-3	FF, ST	N+N+T, N+T, Q+T	CC, IC	1600	36000
Alloy steels acc. to EN 10269	ST	Q+T	CC, IC	900	36000
Stainless steels					
Austenitic steels acc. to EN 10088-3	FF, ST	S+Q	CC, IC	1600	36000
Austenitic steels acc. to EN 10222-5	FF, ST	S+Q	CC, IC	1600	36000
Austenitic steels acc. to EN 10269	ST	S+Q	CC, IC	900	36000
Duplex steels acc. to EN 10088-3	FF, ST	S+Q	CC, IC	1600	36000
Duplex steels acc. to EN 10222-5	FF, ST	S+Q	CC, IC	1600	36000
Ferritic steels acc. to EN 10088-3	FF, ST	A	CC, IC	1600	36000
Martensitic steels acc. to EN 10222-5	FF, ST	Q+T	CC, IC	1600	36000
Martensitic steels acc. to EN 10222-5	FF, ST	Q+T	CC, IC	1600	36000

FF: open die forgings ST: forged bars N: normalized A: annealed N+T: normalized + tempered
 N+N+T: double normalized + tempered Q+T: quenched + tempered S+Q: solution annealed + quenched
 CC: continuous castings IC: ingot casting

Remarks:

- 1) Clean steel forgings of grade 18CrNiMo7-6 acc. to EN 10084 are qualified for approved applications (see pt. 2). Special requirements for clean steel forgings are given in DNV GL rules Pt. 2, Ch. 2, Sec.6, [1.6.10].
- 2) Subject to special approval, clean steel forgings of grade 18CrNiMo7-6 acc. to EN 10084 are approved for further processing to gears acc. to DNV GL Class Guideline No. DNVGL-CG-0036, and classed to "high grade".

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Connecting Elements and Fittings:

Grade	Product	Supply Condition	Casting Method	Outer Dia. [mm], max.	Height [mm], max.	Weight [kg], max.
Forgings for hull structures and equipment						
F400UW, F440UW, F480UW, F520UW, F560UW, F600UW	NR	N, N+T, Q+T	CC, IC	Ø3500	800	8000
F550AW, F600AW, F650AW	NR	Q+T	CC, IC	Ø3500	800	8000
Forgings for shafting and machinery						
F400U, F440U, F480U, F520U, F560U, F600U, F640U, F680U, F720U, F760U	NR	N, N+T, Q+T	CC, IC	Ø3500	800	8000
F600A, F700A, F800A, F900A, F1000, F1100A	NR	Q+T	CC, IC	Ø3500	800	8000
Forgings for boilers, pressure vessels and piping systems						
F450H, F490H	NR	N, N+T, Q+T	CC, IC	Ø3500	800	8000
F0.5Mo, F1Cr0.5Mo	NR	N+T, Q+T	CC, IC	Ø3500	800	8000
F2.25Cr1MoN	NR	N+T	CC, IC	Ø3500	800	8000
F2.25Cr1MoQT	NR	Q+T	CC, IC	Ø3500	800	8000
Ferritic steel forgings for low temperature service						
F450L, F490L	NR	N, N+T, Q+T	CC, IC	Ø3500	800	8000
F3.5Ni, F5Ni	NR	N+T, Q+T	CC, IC	Ø3500	800	8000
F9Ni	NR	N+N+T, Q+T	CC, IC	Ø3500	800	8000
Non-alloy steels						
C & C-Mn steels acc. to EN 10083-2	NR	N, N+T, Q+T	CC, IC	Ø3500	800	8000
C & C-Mn steels acc. to EN 10250-2	NR	N, N+T, Q+T	CC, IC	Ø3500	800	8000
C & C-Mn steels acc. to SEW 550	NR	N, N+T, Q+T	CC, IC	Ø3500	800	8000
C & C-Mn steels acc. to EN 10084	NR	N+T, Q+T	CC, IC	Ø3500	800	8000
C & C-Mn steels acc. to EN 10222-2	NR	N, N+T, Q+T	CC, IC	Ø3500	800	8000
C & C-Mn steels acc. to EN 10222-4	NR	N, Q+T	CC, IC	Ø3500	800	8000
Alloy steels						
Alloy steels acc. to EN 10083-3	NR	Q+T	CC, IC	Ø3500	800	8000
Alloy steels acc. to EN 10250-3	NR	Q+T	CC, IC	Ø3500	800	8000

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Alloy steels acc. to SEW 550	NR	Q+T	CC, IC	Ø3500	800	8000
Alloy steels acc. to EN 10084	NR	Q+T	CC, IC	Ø3500	800	8000
18CrNiMo7-6 acc. to EN 10084 ^{1),2)}	NR	Q+T	CC, IC	Ø3500	800	8000
Alloy steels acc. to EN 10222-2	NR	N+T, Q+T	CC, IC	Ø3500	800	8000
Nickel steels acc. to EN 10222-3	NR	N+N+T, N+T, Q+T	CC, IC	Ø3500	800	8000
Stainless steels						
Austenitic steels acc. to EN 10088-3	NR	S+Q	CC, IC	Ø3500	800	8000
Austenitic steels acc. to EN 10222-5	NR	S+Q	CC, IC	Ø3500	800	8000
Duplex steels acc. to EN 10088-3	NR	S+Q	CC, IC	Ø3500	800	8000
Duplex steels acc. to EN 10222-5	NR	S+Q	CC, IC	Ø3500	800	8000
Ferritic steels acc. to EN 10088-3	NR	A	CC, IC	Ø3500	800	8000
Martensitic steels acc. to EN 10222-5	NR	Q+T	CC, IC	Ø3500	800	8000
Martensitic steels acc. to EN 10222-5	NR	Q+T	CC, IC	Ø3500	800	8000

NR: seamless rolled rings N: normalized A: annealed N+T: normalized + tempered Q+T: quenched + tempered
 N+N+T: double normalized + tempered S+Q: solution annealed + quenched CC: continuous castings IC: ingot casting

Remarks:

- 1) Clean steel forgings of grade 18CrNiMo7-6 acc. to EN 10084 are qualified for approved applications (see pt. 2). Special requirements for clean steel forgings are given in DNV GL rules Pt. 2, Ch. 2, Sec.6, [1.6.10].
- 2) Subject to special approval, clean steel forgings of grade 18CrNiMo7-6 acc. to EN 10084 are approved for further processing to gears acc. to DNV GL Class Guideline No. DNVGL-CG-0036, and classed to "high grade".