Replaces:
RN 810-1-1:2023-04-06

Delivery Conditions for case-hardening steel

Steel bars of 18CrNiMo7-6
for rotors with peripheral speeds < 50 m/s

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Changes

2025-01-22:

The following changed in comparison to RN 810-1-1:2023-04-06:

a) scope: correction of delivery conditions acc. to german version
b) updated references
c) ultrasonic testing outsourced in RN 1934
d) chapter 6 a): correction regarding the authorisation of IACS member societies
e) chapter 6 g): wording for required certificates clarified
f) editorially revised

1 Scope

This factory standard applies to	Material-No.:	1.6587
	Material designation:	18CrNiMo7-6
	Delivery conditions:	Steel bar
	d_N < 160 mm:	rolled / raw
	d_N ≥ 160 mm:	forged / peeled (+SH) or turned
	Use case:	Rotors with peripheral speeds < 50 m/s

2 References

The following documents, cited in part or in whole, shall apply for the use of this standard. In case of dated references, only the referenced edition applies; in case of undated references, the latest edition of the referenced document (including all amendments) applies. The applicable version of the standards listed below shall apply to all contents not covered by this factory standard.

DIN 50125	Testing of metallic materials - Tensile test pieces
DIN 50602:1985-09	Metallographic examination; microscopic examination of special steels using standard diagrams to assess the content of non-metallic inclusions
DIN EN 10021	General technical delivery conditions for steel products
DIN EN 10060	Hot rolled round steel bars - Dimensions and tolerances on shape and dimensions
DIN EN 10204	Metallic products - Types of inspection documents
DIN EN 10277	Bright steel products - Technical delivery conditions
DIN EN 10278	Dimensions and tolerances of bright steel products
DIN EN ISO 148-1	Metallic materials - Charpy pendulum impact test - Part 1: Test method
DIN EN ISO 642	Steel - Hardenability test by end quenching (Jominy test)
DIN EN ISO 643	Steels - Micrographic determination of the apparent grain size
DIN EN ISO 683-3	Heat-treatable steels, alloy steels and free-cutting steels - Part 3: Case-hardening steels
DIN EN ISO 9443	Surface quality classes for hot-rolled bars and wire rod
RN 1550	Material samples
RN 1567	Remanent magnetism in components
RN 1934	Test instruction; Ultrasonic testing
RN 1936	Labelling; Raw material, parts and gearboxes

3 Chemical composition

Table 1 Chemical composition in %

	C	Si	Mn	P	S	Cr	Mo	Ni	V	Cu
min	0.15		0.50			1.50	0.25	1.40		
max	0.21	0.40	0.90	0.025	0.010	1.80	0.35	1.70		0.30
	Sn	**Al**	**N**	**Ti**	**Nb**	**Sb**	**O_2**	**Ca**	**H_2**	**Al / N**
min		0.02	0.008							
max		0.05	0.015	0.006			25 ppm	0.0015	2.0 ppm	4.0

4 Physical characteristics

Table 2 Mechanical properties (Test temperature: 20 °C)

Rm	$Rp_{0.2}$	A5 [%]			Z [%]			Av [J]		
[N/mm²]	[N/mm²]	longit.	tang.	cross	longit.	tang.	cross	longit.	tang.	cross
min	min	min	min	min	min	min	min	min	min	min
1080	785	12	10	8	45	35	25	45	35	25

Note: The final mechanical properties can only be achieved after heat treatment (case hardening or quenching and tempering), which is usually carried out at REINTJES. When delivered, the material has lower strengths (see chapter 5 d).

a) Structure, inclusions
- grain size, standard: DIN EN ISO 643 — standard series: Table C.1; G ≥ 5
- purity degree, standard: DIN 50602 — method: K; K4 ≤ 20

b) Hardenability
- standard: DIN EN ISO 683-3 — scatter band: +HH
- testing: DIN EN ISO 642

end distance [mm]:	5	11	25	40
hardness [HRC]:	42-48	40-47	35-43	33-41

c) Additional properties
- radioactivity: ≤ 0.10 Bq/g

5 Manufacturing

a) Casting method
- bar Ø d_N < 180 mm: continuous or ingot casting — bar Ø d_N ≥ 180 mm: ingot casting
- bar Ø d_N ≥ 250 mm: forged

b) Forging reduction ratio (VG)
- forged: VG ≥ 5.0
- Ingot casting, forged: VG ≥ 3.0 — hot rolled: VG ≥ 4.0

c) Melting
- making process: E, LD, ESU (on special request)
- post-treatment: vacuum degassing (VD) for E or LD

d) Heat treatment
- treatment condition: +FP / +QT
- treatment method: liquid quenching and tempering
- anneal to: 600 up to 850 N/mm² tensile strength

e) Surface condition
- unmachined
  - $d_N \leq 160$: surface finish DIN EN ISO 9443 - Class A
- peeled (+SH) permissible defect depth
  - $160 < d_N \leq 200$: ≤ 1 mm
  - $200 < d_N \leq 350$: ≤ 2 mm
  - $350 < d_N$: ≤ 3 mm
- repair by welding: only after approval by REINTJES

f) Manufacturing tolerances
- $d_N \leq 160$: DIN EN 10060, Table 1, regular
- $d_N > 160$: d_N +2 mm / 0 mm

6 Other requirements

a) Steel and forging plant
- certified acc. to DIN EN ISO 9001 ff.
- approved by at least one member society of IACS

b) Delivery condition
- bar length: ≤ 6.3 m — end faces: mechanically separated
- bar weight: ≤ 10 t — peeled bars (+SH): DIN EN 10277, Tol. h10

c) Testing
- material identification check: to be carried out
- ultrasonic testing: RN 1934 for peripheral speeds < 50 m/s

d) Sample material and collection
- RN 1550

e) Remanent magnetism
- RN 1567

f) Labelling
- RN 1936

g) Documentation (must be digitally available upon delivery)
- acceptance test certificate 3.1 acc. to DIN EN 10204 per melt and furnace trip or per piece or production lot with specification of primary material and forging ratio
- copy of the acceptance test certificate 3.1 from the steel manufacturer
- evidence of radioactivity and remanent magnetism
- forging schedule (on special request)