Replaces:
RN 810-4:2023-04-26

Delivery Conditions for case-hardening steel

Bevel gears of 18CrNiMo7-6
for rotors with peripheral speeds < 50 m/s

Contents

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Changes

2025-01-22:

The following changed in comparison to RN 810-4:2023-04-26:

a) updated references
b) ultrasonic testing outsourced in RN 1934
c) chapter 6 a): correction regarding the authorisation of IACS member societies
d) chapter 6 f): wording for required certificates clarified
e) editorially revised

1 Scope

This factory standard applies to	Material-No.:	1.6587
	Material designation:	18CrNiMo7-6
	Delivery conditions:	Bevel gears hot formed; unmachined / pre-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 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 10204	Metallic products - Types of inspection documents
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 6506-1	Metallic materials - Brinell hardness test - Part 1: Test method
ISO 6336-5	Calculation of load capacity of spur and helical gears - Part 5: Strength and quality of materials
RN 1550	Material samples
RN 1567	Remanent magnetism in components
RN 1927	Case-hardening
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*	*0.012*	*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	35	25	25

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 and forging reduction ratio (VG)
- continuous casting: VG ≥ 6.0 (not permitted for Ø > 180 mm)
- ingot casting: hot rolled: VG ≥ 4.0 — forged: VG ≥ 3.0

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

c) Heat treatment
- treatment condition: Ø Da < 1000: +FP / +QT — Ø Da ≥ 1000: +QT
- treatment method: liquid quenching and tempering
- anneal to: 600 to 850 N/mm² tensile strength

d) Surface condition
- defect depth: ≤ machining allowance
- unmachined: crack and scale free — pre-turned (on request): Ra 6.3 (max. Rz 63)
- repair by welding: only after approval by REINTJES

e) Manufacturing tolerances: see drawing

6 Other requirements

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

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

c) Sample material and collection
- RN 1550

d) Remanent magnetism
- RN 1567

e) Labelling
- RN 1936

f) 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)