Replaces:
RN 830-3-1:2023-04-26

Delivery Conditions for nitriding steel

Punched discs and rings of 31CrMoV9 for rotors with peripheral speeds < 50 m/s

Content

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Changes

2025-01-22:
The following changed in comparison to RN 830-3-1:2023-04-26:

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.:	1.8519
	Material designation:	31CrMoV9
	Delivery conditions:	Punched disc /ring 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 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 10204	Metallic products - Types of inspection documents
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 683-5	Heat treatable steels, alloy steels and free-cutting steels - Part 5: Nitriding steels
RN 1089	Rings; Machining allowances and tolerances
RN 1092	Punched discs; Machining allowances and tolerances
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.	0.27		0.40			2.30	0.15		0.10	
max.	0.34	0.40	0.70	0.02	0.025	2.70	0.25		0.20	0.30
	Sn	**Al**	**N**	**Ti**	**Nb**	**Sb**	**O_2**	**Ca**	**H_2**	**Al / N**
min.		0.01								
max.	0.05	0.04	0.012				25 ppm		2.0 ppm	3.7

4 Physical characteristics

Table 2 **Mechanical properties in the final heat-treated state** (Test temperature: 20° C)

	Rm		$Rp_{0.2}$	A5 [%]			Z [%]			Av [J]		
	[N/mm²]	[N/mm²]	[N/mm²]	longit.	tang.		longit.	tang.		longit.	tang.	
	min.[1)]	max.[1)]	min.	min.	min.		min.	min.		min.	min.	
rings	750	*900*	650	12	10		35	25		40	27	
punched discs	*850*	1100	700	11	9		35	25		45	25	

[1)] italic values deviating from DIN EN ISO 683-5

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 683-5
- testing: DIN EN ISO 642

end distance [mm]:	5	11	25	40
hardness [HRC]:	47-56	46-56	39-53	36-50

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

5 Manufacturing

a) Forging reduction ratio (VG)
- continuous casting: VG ≥ 5.0 — ingot casting: 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: +QT
- treatment method: liquid quenching and tempering
- annealed to: tempering values (see Table 2)

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: RN 1089 and RN 1092

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) Testing
- material identification check: to be carried out
- ultrasonic testing: RN 1934 for rotors with 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)