Replaces:
RN 1560-3:2021-03-12

Delivery Conditions for quenched and tempered steel

Steel bars and forged shafts of 30CrNiMo8 for rotors with peripheral speeds < 50 m/s

Content

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NOTE: In the event of deviating specifications regarding chemical analysis, mechanical properties or tolerances in the drawing, the latter shall take precedence!

Changes

2023-04-06:
The following changed in comparison to RN 1560-3:2021-03-12:

a) transfer to new numbering system
b) updated references
c) editorially revised

1 Scope

This Factory Standard applies to	Material no.:	1.6580
	Material designation:	30CrNiMo8
	Delivery conditions:	steel bar / forged shaft 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 the case of dated references, only the referenced edition applies; in the 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 7527-6:1975-2	Steel Forgings; Machining Allowances and Permissible Variations for Open-die Forged Bars
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
EN 10021	General technical delivery conditions for steel products
EN 10060	Hot rolled round steel bars - Dimensions and tolerances on shape and dimensions
EN 10204	Metallic products - Types of inspection documents
EN 10228-3	Non-destructive testing of steel forgings - Part 3: Ultrasonic testing of ferritic or martensitic steel forgings
EN 10277	Bright steel products - Technical delivery conditions
EN ISO 148-1	Metallic materials - Charpy pendulum impact test - Part 1: Test method
EN ISO 642	Steel - Hardenability test by end quenching (Jominy test)
EN ISO 643	Steels - Micrographic determination of the apparent grain size
EN ISO 683-2	Heat-treatable steels, alloy steels and free-cutting steels - Part 2: Alloy steels for quenching and tempering
EN ISO 9712	Non-destructive testing - Qualification and certification of NDT personnel
RN 72	Packaging and Preservation; Supply parts for production
RN 1550	Material samples
RN 1567	Remanent magnetism in components
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.	0,26		0,50			1,80	0,30	1,80		
max.	0,34	0,40	0,80	*0,020*	*0,010*	2,20	0,50	2,20		*0,30*
	Sn	**Al**	**N**	**Ti**	**Nb**	**Sb**	**O_2**	**Ca**	**H_2**	**Al / N**
min.		0,02	0,008							
max.	0,05	0,05	0,015				25 ppm		2,0 ppm	4,0

4 Physical characteristics

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

Diameter		Rm		$Rp_{0,2}$	A5 [%]			Z [%]			Av [J]		
[mm]		[N/mm²]	[N/mm²]	[N/mm²]	longit.	tang.	transv.	longit.	tang.	transv.	longit.	tang.	transv.
over	up to	min.	max.[1)]	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.
	40	1200	*1500*	1000	9	7	-	40	25	-	30	20	-
40	100	1100	*1400*	900	10	8	6	45	25	15	35	25	-
100	160	1000	*1300*	800	11	9	7	50	35	25	45	34	24
160	250	950	*1250*	700	12	10	8	50	35	25	45	34	24
250	500	900	*1200*	650	12	10	8	45	35	25	45	34	24
500	750	850	*1150*	600	12	10	8	40	30	20	45	34	24
750	1000	800	*1100*	550	12	10	8	40	30	20	45	34	34

[1)] deviating from EN ISO 683-2

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

b) Hardenability
- Standard: EN ISO 683-2 — scatter band: +HH
- testing: EN ISO 642

end distance [mm]:	5	11	25	40
hardness [HRC]:	51-56	50-55	48-54	47-54

c) Additional properties
- radioactivity: ≤ 0,10 Bq/g

5 Manufacturing

a) Casting method and forging ratio
- bar Ø < 180 mm: continuous or ingot casting — bar Ø ≥ 180 mm: ingot casting
- bar Ø ≥ 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: +QT
- treatment method: liquid quenching and tempering

e) Surface condition
defect depth: ≤ machining allowance
- unmachined: crack- and scale-free — preturned (on request): Ra 6,3 (max. Rz 63)
- repair by welding: only after approval by REINTJES

f) Manufacturing tolerances
- forged: DIN 7527-6
- rolled: EN 10060

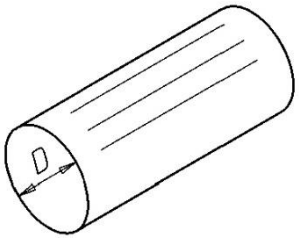
6 Testing

a) Ultrasonic testing
- standard: EN 10228-3
- scanning acc. to: Table 3, 1a, grid scanning
- type of testing: marginal and core zone testing
- probe specification: 4 MHz (normal and TR probe)
- sound attenuation: ≤ 6 dB/m
- examiner qualification: EN ISO 9712, stage 2
- testing accuracy:
  - steel bar, pre-turned / dipping bath

	diameter	quality class
zone 1 (gearing):	D ≥ 0,3 × dw	4
zone 2 (power transmission):	D < 0,3 × dw	4

  - steel bar, unmachined

entire diameter range:	0 < D ≤ dw	3



dw = bar diameter

Figure 1 Steel bar

b) Material identification check: to be carried out

7 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)	Delivery condition			
	• bar length:	≤ 6,3 m	end faces:	mechanically separated
	• bar weight:	≤ 10 t	peeled bars (+SH):	EN 10277, Tol. h10
c)	Packaging and preservation			
	•	RN 72		
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 EN 10204 - 3.1 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)