Replaces:
RN 1555-2:2010-07-13

Delivery Conditions for quenched and tempered steel

Steel bars of 34CrNiMo6
for rotors with peripheral speeds > 50 m/s

Content

Page

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 1555-2:2010-07-13:

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

1 Scope

This Factory Standard applies to	Material no.:	1.6582
	Material designation:	34CrNiMo6
	Delivery conditions:	steel bar; free-form forged hot formed; 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 7527-6:1975-02	Steel Forgings; Machining Allowances and Permissible Variations for Open-die Forged Bars
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 10204	Metallic products - Types of inspection documents
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
SEP 1923	Ultrasonic testing of steel forgings to stringent standards, in particular for components in turbine and generator systems
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.	0,30		0,50			1,30	0,15	1,30		
max.	0,38	0,40	0,80	0,015	0,005	1,70	0,30	1,70		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	0,05			20 ppm	0,0030	1,7 ppm	3,7

4 Physical characteristics

Table 2 **Mechanical properties** (Test temperature: 20° C / degree of transformation: φ ≥ 6,0)

Diameter		Rm	$Rp_{0,2}$	A5 [%]		Z [%]		Av [J]	
[mm]		[N/mm²]	[N/mm²]	longit.	transv.	logit.	transv.	longit.	transv.
over	up to	min.	min.	min.	min.	min.	min.	min.	min.
	40	1100	900	11	-	35	-	30	-
40	100	1000	800	13	-	40	-	35	-
100	160	950	700	14	13	40	34	45	22
160	250	900	650	14	13	40	34	45	22
250	500	850	600	15	13	50	45	45	22
500	750	800	550	13	11	55	35	45	30
750	1000	750	500	13	11	50	35	45	30

a) Structure, inclusions
- grain size, standard: EN ISO 643 — Standard series: Table C.1; G ≥ 6
- 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]:	53-58	51-57	50-57	50-57

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

5 Manufacturing

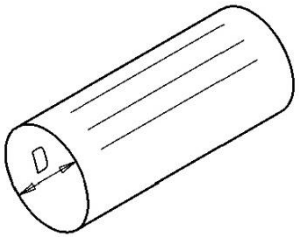
a)	Casting method:	ingot casting
b)	Melting	
	• making process:	E, LD, ESU (on special request)
	• post-treatment:	vacuum degassing (VD) for E or LD
c)	Heat treatment	
	• treatment condition:	+QT, quenched and tempered, stress-relieved annealed after pre-machining
	• treatment method:	liquid quenching and tempering
d)	Surface condition	
	• defect depth:	≤ machining allowance
	• unmachined:	rust-, crack- and scale-free preturned: max. Rz 40
	• repair by welding:	not permitted
e)	Manufacturing tolerances	DIN 7527-6

6 Testing

a) Ultrasonic testing

- standard: SEP 1923
- scanning acc. to: D3, D7
- type of testing: marginal and core zone testing
- probe specification: 4 MHz (normal, TR and 45° angle 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 (power transmission):	D ≥ 0,2 × dw	1a
zone 2 (core cross section):	D < 0,2 × dw	2a, 2b for EE+VE with extension



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:	5 - 6 m	rod end:	smooth sawn
	• bar weight:	≤ 10 t		
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)			