Replaces:
RN 810-1-1:2025-01-22

# Delivery Conditions for case-hardening steel

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

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**Changes**

2026-11-04:

The following changed in comparison to RN 810-1-1:2025-01-22:

a) Chapter 2 DIN EN 10277 issue date added
b) Chapter 6 Other requirements subitem a) changed to "two member societies"



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## 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 10277:2018-10 | 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 — 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 two member societies 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)