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Leaflet to be classified in Volumes :

- V - TRANSPORT STOCK**
- VIII - TECHNICAL SPECIFICATIONS**



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**TECHNICAL SPECIFICATION
FOR THE SUPPLY OF DRAW HOOKS (1)
WITH NOMINAL LOAD EQUAL
TO 250 kN, 600 kN or 1000 kN
FOR TRACTIVE AND
TRAILING STOCK**

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- (1) This specification also governs the supply of draw bars whose characteristics, conditions of manufacture and inspection are covered in the appendix.

NOTE

This leaflet is part of a set which also includes :

- Leaflet 520 : Wagons, coaches and vans - Draw gear
- Leaflet 583 : Wagons - Application of a special mark on interchangeable parts

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1 - PURPOSE

1.1 - Nature of parts

This specification governs the supply of draw hooks with nominal loads equal to 250 kN, 600 kN or 1000 kN, their nuts or muff couplings and draw bars (see Appendix) for rolling stock. The 1000 kN draw hooks for rolling stock with reinforced coupling must also satisfy the provisions of UIC Leaflet 520.

All the details necessary for implementation of the contract, especially those concerning the application of §§ 2.1.2, 2.2.2, 7.1 and 7.2, must be indicated in the order or its appended documents.

1.2 - List of reference documents

Reference is made to the following documents in this technical specification :

UIC Leaflets 520, 583

ISO Standards and Recommendations :

- ISO 82, ISO 83, ISO R/85, ISO/R/377, ISO R/630, ISO R/683 (1-11), ISO 6506.

2 - CHARACTERISTICS

2.1 - Materials

2.1.1 - Preparation of materials

The steel used for the manufacture of hooks, nuts or muff couplings shall emanate from killed casts produced by the electric or open hearth process, or by a top-blown pure oxygen process.

Subject to the purchasing railway's approval, the continuous casting process shall be allowed.

2.1.2 - Characteristics of the steel

The steel used shall be one of the steels defined in Table 1 hereinafter, and shall be specified, together with its metallurgical state and the hardening medium if required, in the order or its appended documents.

The muff couplings however must be made either of forged or die-forged steel. The tensile strength in the normalized state may then equal or exceed 480 N/mm².

TABLE 1

metallurgical state	Comparable ISO steel grades	N U M B E R S	Analysis on product in % (1)							Re in N/ mm ²	Rm in N/ mm ²	A % on 5d	KU ⁽²⁾ in joules	Bending at 180°
			C	Mn	Si	Cr	Mo	S	P					
Normalized N (3)	C 40 ISO R 683 (I)	I	0.38/ 0.45	0.50 0.80	0.15/ 0.40	-	-	0.050	0.050	345	590/ 710	19	20	3 e
	50 MnSi 4 -	II	≤0.60	≤1.20	≤1.00	-	-	0.050	0.050	430	750/ 860	12	10	3.5 e
Hardened and tempered T	C 55 ISO R 683 (I)	III	0.52/ 0.60	0.60/ 0.90	0.15/ 0.40	-	-	0.045	0.045	430	710/ 860	15	25	-
	42 CrMo4 ISO R 683 (II) No. 3	IV	0.38/ 0.45	0.50/ 1.00	0.15/ 0.40	0.90/ 1.20	0.15/ 0.30	0.035	0.035	550	800/ 950	14	25	-

(1) The amount of alloy in the steel must not exceed the following values in relation to the product :

Nickel : 0.30%
 Chromium : 0.30% (does not concern Grade 42 Cr Mo4 with 0.90 to 1.20% Cr)
 Molybdenum : 0.10% (does not concern Grade 42 Cr Mo 4 with 0.15 to 0.30% Mo)
 Vanadium : 0.05%
 Copper : 0.30%
 Cr + Mo + Ni + Cu ≤ 0.70%

(2) Verified on a series of two test pieces, neither of which must give a result lower than the value prescribed.
Test carried out at 20° C.

(3) Normalization treatment in this context shall consist of :

- either, after having left the part to cool sufficiently slowly after forging or die-forging down to ambient temperature away from draughts, preferably in a covered pit or beneath a frame, bringing it uniformly to a temperature above the heat-affected zone, maintaining it at that temperature for a sufficient length of time, then allowing it to cool in still air.
- or, after having left the part to cool after forging or die-forging down to a temperature between 540° C and 250° C, bringing it uniformly to a temperature above the heat-affected zone, maintaining it at that temperature for a sufficient period of time, then allowing it to cool slowly away from draughts, preferably in a covered pit or beneath a frame.

With the purchasing railway's agreement, the slow cooling need not be carried out when the steel has been effectively degassed, the object of the operation being to avoid the formation of scaling.

2.2 - Component parts

2.2.1 - Physical characteristics

2.2.1.1 - Appearance

The parts or sections of parts rough forged or die-forged must have smooth, carefully trimmed surfaces completely free of oxides.

The surface condition of sections for which machining is prescribed must comply with the conditions laid down in the order or its appended documents, or demonstrated by the specimens or standards previously acceptance-tested by the purchasing railway. There must be no deficiencies, sharp angles or accidental tool marks on the materials used.

Rough or machined connecting radii must be well formed and free from scoring.

2.2.1.2 - Soundness

The parts must be sound throughout and show no defect such as folds, flaws, or cracks of any kind.

2.2.1.2.1 - Macroscopic examination

The macroscopic examination carried out after a cross-section as defined in § 4.2.5.2.2 has been polished must not reveal any cavity or gap.

2.2.1.2.2 - Macrographic examination

After treatment, the macrographic image taken on the section indicated in § 4.2.5.2.2 must be of uniform colour and free from any pronounced trace of segregation.

2.2.2 - Geometrical characteristics

The shapes, dimensions and their tolerances must be those stipulated in the order or its appended documents.

2.2.3 - Mechanical characteristics

2.2.3.1 - Tensile test on test piece

The values of the elastic limit, tensile strength and elongation measured on a test piece taken from the hook, in delivery condition, must not be less than those stipulated in Table 1 of § 2.1.2.

If stipulated in the order or its appended documents, a second test piece intended to undergo normalization heat treatment may be taken. The values to be obtained must be specified by the purchasing railway.

2.2.3.2 - Resilience

The fracture energy of each of the resilience test pieces taken from the hooks must not be less than the value stipulated in Table 1 of § 2.1.2.

2.2.3.3 - Hardness

Hardness figures recorded on the hooks, nuts or muff couplings, in delivery condition, must be within the limits stipulated in Table 2 below :

TABLE 2

Metallurgical state	Steel grade Nos.	HBS - HBW Brinell hardness
Normalized N	I	160 to 190
	II	210 to 250
Hardened and tempered T	III	210 to 260
	IV	235 to 305

2.2.3.4 - Tensile test on hook

2.2.3.4.1 - Test under half-load

After being subjected to a tractive effort corresponding to half the nominal load, the head of the hook must not show any permanent distortion greater than 0.5 mm (dimension L, Figure 2).

2.2.3.4.2 - Test under nominal load

The hooks, and where applicable, their muff couplings, must be able to withstand a tractive effort corresponding to the nominal load for 3 minutes without fracture and without cracking or flaw.

2.2.4 - Manufacturer's brand marks

The hooks, and where relevant their muff couplings, must be stamped with the type of marks and in the position specified in the order or its appended documents.