

LOW CARBON STEEL, COLD DRAWN BAR

1. SCOPE

1.1 This specification provides requirements for CNH Industrial low carbon, cold drawn (CD) bar steel produced as round, square, flat, and hexagon shapes. This specification is intended to replace Former CNH Company Material Specifications listed in Annex B and should be used on all applicable new and updated drawings.

1.2 REVISED GRADES – LEGACY MATERIALS

MAT1030 Revision C establishes new Grades A1 and B1 with chemistry requirements and additionally for Grade A1 mechanical property requirements. Former Grades are withdrawn and are replaced as shown in Table 1. The new grades shall be used where materials on existing drawings are updated by Design Engineering per this specification. Where these material updates are made to a drawing, the change shall be documented in the revision notes on the drawing. Annex B, Table B3 lists National Standard materials previously referenced for the MAT1030 Grades that shall not be used on new or updated drawings.

TABLE 1: CNH Grade and Material Description

CNH Grade	Replaced Grade	Description
A1	A	CD low carbon bar steel, supplied to required mechanical properties. Specify for structural applications not requiring heat treatment.
B1	B	CD low carbon bar, supplied to required chemistry ranges. Specify for general purpose applications and for parts to be heat treated by shallow case nitriding or equivalent processes. ⁽¹⁾

(1) For other heat treatments such as carburizing, equivalent HR bar material grades from CNH MAT1031 may be preferred when the benefits of cold drawing may be affected by the heat treatment.

2. RELATED SPECIFICATIONS

ASTM A370 Standard Test Methods and Definitions for Testing of Steel Products
 CNH ENPJ100 (86619032) Significant Characteristics Application
 CNH MAT1003 (86979049) Material Designations on Engineering Drawings
 CNH MAT1031 (87021629) Low Carbon Steel, Hot Rolled Bar
 ISO 6892-1 Metallic Materials-Tensile Testing; Test at Room Temperature

3. APPLICATION

3.1 Low carbon, CD steel bar is general-purpose steel that has improved size tolerances, and strength properties in the as drawn condition compared to hot rolled (HR) bar. It provides good welding properties, fair machinability, and is suitable in applications that do not require the higher strength properties of medium carbon or alloy steels. CNH Grade A1 (Table 1) should be specified for structural applications that are not heat treated. CNH Grade B1 material is produced to chemical composition and should be specified for general purpose applications or for parts to be heat treated as it exhibits fair

ISSUED BY J HANSEN 30JUN23	ECN NO. 35371505	NAME SPEC LOW CARBON CD BAR	
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surface hardening properties. Heat treatment is done primarily to improve wear resistance rather than to achieve specific strength properties.

3.2 For certain heat treatment applications, HR bar per MAT1031 may be preferred and used instead of cold drawn bar where increased dimensional control and increased core properties from cold drawing are not needed or may be affected during heat treatment.

3.3 CD round bar is generally available in diameters through 100 mm (4 in) in Europe and 150 mm (6 in) in North America. Above these diameters, round bar is commonly cold finished (e.g., turned, peeled) with HR (Hot Rolled) steel mechanical properties, See MAT1031 (87021629).

3.4 HR round bar above 25 mm (1 in) diameter can be cold finished (e.g., turned, peeled) to the same size tolerances as CD bar. Cold finished HR round bar may be specified as an alternate special requirement material, see Section 7.2.3.2.

3.5 Substitution between specified CNH Grade A1 and Grade B1 material is not permitted without the approval of CNH Industrial controlling Design Engineering.

4. REQUIREMENTS

4.1 Low carbon CD bar steel supplied according to MAT1030 shall meet all requirements of this specification, applicable National Standards, and any special requirements specified on the engineering drawing.

4.2 NATIONAL STANDARD MATERIALS

4.2.1 Annex A provides a partial listing of National Standards materials identified as generally acceptable for supply to MAT1030 grades. Other National Standard materials, not listed in Annex A, that comply with MAT1030 requirements may also be supplied. In general, it is permissible to produce parts from any of these comparable National Standard grades for the corresponding MAT1030 Grade when no special strength or composition requirements are specified.

4.2.2 CNH Industrial Design Engineering must consider the differences in dimensional tolerances and properties of National Standard materials supplied to this specification to assure functionality, reliability, and serviceability of a part when manufactured in different parts of the world. In applications where these differences can not be compensated for in the design, the material may be restricted to the originally specified National Standard material as described in CNH MAT1003 (86979049) Material Designations on Engineering Drawings.

4.3 CHEMISTRY

Materials supplied to this specification must conform to the composition limits in Table 2.

**TABLE 2: Chemistry, Low Carbon Steel CD Bar, Composition, Weight %, Heat Analysis
(Element % Maximum unless otherwise specified)**

Grade	C	Mn	P	S	Si	Ni	Cr	Mo
A1	0.25	1.40	0.045	0.050	0.40	---	---	---
B1	0.12-0.25	0.30-1.00	0.045	0.050	0.40	---	---	---

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4.4 MECHANICAL PROPERTIES

Grade A1 material supplied to this specification shall meet the mechanical properties shown in Table 3.

TABLE 3: Required Mechanical Properties for CNH MAT1030 Grade A1

CNH Grade	Diameter mm	Tensile Strength, Mpa (ksi)	Yield Strength, Mpa (ksi), Min.	Elongation %, Min.
A1	>10-16 mm	420-770 (61-112)	300 (44)	9
	>16-40 mm	390-730 (57-106)	260 (38)	10
	>40-63 mm	380-670 (55-97)	235 (34)	11
	>63-100 mm	360-640 (52-93)	215 (31)	11

4.5 DIMENSIONS AND TOLERANCES

Bar steel products shall conform to dimensional tolerances as specified in the designated National Standard.

5. SPECIAL REQUIREMENTS

5.1 Optional conditions or grades listed in National Standards may be applied as special requirements (SPCL). These requirements shall be indicated on the engineering drawing and apply to both the CNH grade and National Standard specified.

5.2 GROUND AND POLISHED CONDITION

5.2.1 Specify cold drawn, ground and polished (other conditions are cold drawn and ground; or cold drawn and polished) round bars where tighter tolerances and/or improved surface finish compared with standard cold drawn bar is required. Required tolerances for ground and polished bars may vary between applicable standards. Section 7.2.3.1 provides an example of the material designation for the CD, ground and polished special condition. For special applications requiring improved dimensional control the final dimensions, tolerances, and surface finish requirements may be noted on the engineering drawing as necessary.

5.2.2 Specify CNH MAT1031 lower strength HR bar turned/peeled and polished or turned/peeled, ground, and polished as an optional special requirement material. This condition provides improved dimensions and/or surface finish when the higher yield strength of CD bar is not critical to the applications. See section 7.2.3.2.

5.3 INTERNAL STEEL QUALITY

The minimum internal steel quality may be specified per MAT1004, CL3 as a special requirement (SPCL). This requirement shall be indicated on the engineering drawing and apply to the CNH grade and National Standard if specified, see Section 7.2.3.3.

6. INSPECTION AND REJECTION

6.1 All bar material supplied to this specification shall be equivalent in every respect to samples approved by the purchasing CNH Industrial location. While the purchasing location may test samples from incoming shipments for quality assurance, the supplier is responsible for ensuring that shipments meet the stated requirements without depending upon the purchaser's inspection.

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6.2 All National Standards and related test methods are to be latest issue unless otherwise specified.

6.3 Mechanical property testing shall be per the applicable National Standard listed in Annex A for Grade A1. If the test method is not covered within the National Standard, then testing shall be per ASTM A370 or ISO 6892-1.

7. DRAWING SPECIFICATIONS

7.1 Specifying a restricted (RSTR) or special (SPCL) material may require the use of a significant characteristic per CNH Engineering Procedure ENPJ100 (86619032). This determination will be made as part of the design review process.

7.2 Material designations are displayed as notes above the drawing title block, as described in CNH MAT1003 (86979049) Material Designations on Engineering Drawings. The required material shape should be included in the material designation. The following are examples of drawing material designations for low carbon, CD bar steel:

7.2.1 Preferred materials; also see Annex A.

CNH MATERIAL:
CD ROUND, CNH MAT1030, GRADE A1

LOCAL MATERIAL:
SEE CNH MAT1030

7.2.2 Restricted Material (RSTR)

CNH MATERIAL:
CD HEX, CNH MAT1030, GRADE B1, RSTR

LOCAL MATERIAL:
CD HEX, ASTM A108, 1018
NO ALTERNATE MATERIAL PERMITTED

7.2.3 Special Requirements (SPCL)

7.2.3.1 Cold Drawn, Ground and Polished

CNH MATERIAL:
CD ROUND, CNH MAT1030, GRADE A1, SPCL

LOCAL MATERIAL:
SEE CNH MAT1030

SPECIAL REQUIREMENTS ARE:
COLD DRAWN, GROUND AND POLISHED

7.2.3.2 CD Round Bar with cold finished HR Round Bar as an optional material

CNH MATERIAL:
CD ROUND, CNH MAT1030, GRADE B1

LOCAL MATERIAL:
SEE CNH MAT1030

OPTIONAL CNH MATERIAL:
HR ROUND CNH MAT1031, GRADE B1, SPCL

OPTIONAL LOCAL MATERIAL
SEE CNH MAT1031

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SPECIAL REQUIREMENTS (SPCL) ARE:
TURNED AND POLISHED

7.2.3.3 Internal Steel Quality per MAT1004, Class 3

CNH MATERIAL:
CD ROUND, CNH MAT1030, GRADE A1, SPCL

LOCAL MATERIAL:
SEE CNH MAT1030

SPECIAL REQUIREMENTS (SPCL) ARE:
MUST ALSO MEET STEEL QUALITY PER CNH MAT1004, CL3

8. DESIGN PROPERTIES

MAT1030 Grade B1 mechanical properties for comparable National Standard material grades are grouped together in Table 4 for engineering guidance.

Table 4: Cold Drawn Mechanical Properties (Not a MAT1030 Requirement)

CNH Grade	Local Material - National Standard	Diameter Range mm	Tensile Strength, MPa (ksi)	Yield Strength, MPa (ksi), Min	Elongation % Min.
B1	ASTM A108, 1018	20-30	440 (64) min ⁽¹⁾	370 (54) ⁽¹⁾	15 ⁽¹⁾
	ASTM A108, 1020	20-30	420 (61) min ⁽¹⁾	350 (51) ⁽¹⁾	15 ⁽¹⁾
	EN10277, C15R+C / C15E+C	>16 – 40	430-730 (62-106) ⁽²⁾	280 (41) ⁽²⁾	9 ⁽²⁾
	EN10277, C16R+C / C16E+C	>16 – 40	450-750 (65-109) ⁽²⁾	300 (44) ⁽²⁾	9 ⁽²⁾
	GB/T 3078, Gr15Mn	---	490 (71) min ^{(2), (3)}	---	7.5 ^{(2), (3)}
	IS 1570-2, Gr15C8	>20 – 40	510 (74) min ⁽²⁾	---	13 ⁽²⁾
B1	IS 1570-2, Gr20C8	>20 – 40	510 (74) min ⁽²⁾	---	12 ⁽²⁾
	CNH Minimum Design Properties ⁽⁴⁾	>16 – 40	420 min ⁽⁴⁾	280 ⁽⁴⁾	7.5 ⁽⁴⁾

(1) Properties values referenced are expected minimums from SAE J1397-1992, for 20 -30 mm diameter bar.

(2) Property values are from the National Standard. Mechanical property requirement may vary with bar diameter and may be in the National Standard.

(3) If it is required by the buyer and stated in the contract, it's available to test the mechanical properties of the steel in the delivery state; its mechanical properties shall meet the requirements shown.

(4) Recommended values for design calculations for MAT1030 Gr. B1.

ANNEX A National Standard Materials and Properties Information

1. Table A1 lists National Standard materials identified by CNH Industrial Materials Engineering that meet the chemistry requirements of Table 2 and will typically meet the mechanical properties of Table 3, for grade A1, in the cold drawn condition. Note that the National Standards may not require the same mechanical property limits of Table 3 and where differences exist between the National Standard and CNH MAT1030 specification requirements, CNH MAT1030 requirements take precedence. Other National Standard materials, not currently listed, that comply with MAT1030 requirements may also be supplied for part applications without Materials Engineering approval. Additional National Standard materials will be added to this listing by Materials Engineering as this information is available

TABLE A1: MAT1030 National Standard Materials

CNH Grade	National Standard Material / Grade	Remarks
A1	ASTM A108, 1018	(1)
	ASTM A311, 1018 (Preferred ASTM Grade)	(2)
	EN 10277, S235JRC+ C	(1), (4)
	GB/T 3078, 15 or 15Mn	(1)
	GB/T 3078, 20 or 20Mn	(1)
	IS 1570-2, 15C8P35 or 20C8P35	(1), (5)
B1	ABNT NBR 8647, 1018 Trefilada	(3)
	ABNT NBR 8647, 1020 Trefilada	(3)
	ASTM A108, 1018	(3)
	ASTM A108, 1020	(3)
	EN 10277, Gr. C15E+C or C15R+C	(4)
	EN 10277, Gr. C16E+C or C16R+C	(4)
	GB/T 3078, 15Mn	----
	IS 1570-2, 20C8P35	(1), (5)

- (1) Material must meet Table 3 requirements; additional testing may be required to guarantee mechanical properties.
- (2) ASTM A311, Grade 1018, Cold Drawn Bar has required properties that meet Table 3 requirements and is preferred in ordering over ASTM A108 which does not require mechanical properties.
- (3) Grade 1018 is preferred for heat treat applications over Grade 1020 due to having a higher Mn content.
- (4) EN 10277 has superseded EN10277-2 and EN 10277-4. EN10277 superseded EN10277-1:2008 to EN10277-5:2008.
- (5) IS 1570-2 does not specify silicon content. Must meet Table 2, chemistry requirement of 0.40% maximum silicon (Si). Additional testing may be required.

ANNEX B Former Company and National Standard Material Information

1. Table B1 shows Former CNH Company material specifications replaced by this specification.

TABLE B1: Former CNH Company Material Specifications

CNH Grade	CASE	NH Pennsylvania FNHA Standard	NH – Zedelgem Engineering Stds	NH Tractor Engineering
A	MS-381, 1018	2-A-403 (86050099)	WS 50.03, St37K	Fiat 52891, Fe 430 or SAE J403, 1018
B		2-A-404 (9842918), 2-A-351 (9842912) 2-A-701 (9842960), 2-A-801 (9842963)	WS 50.03, Ck15K	

2. Table B2 shows National Standard materials previously designated for withdrawn Grades.

TABLE B2: Local Material and National Standard References

CNH Grade	ASTM	DIN ^{(1), (2)}	BS ⁽¹⁾	EN ⁽¹⁾	UNI	FIAT
A	ASTM A108, 1018	DIN 1652-2, St37-2K	BS 970-3, 080M15	EN 10277-2, S235JRG2C+C ⁽⁴⁾	UNI EN 10277-2, S235JRG2C+C ⁽⁴⁾	Fiat 52891, Fe430 TRF
B ⁽³⁾		DIN 1652-3, Ck15K	BS 970-3, 080A15	EN 10277-4, C15R+C/C16R+C	UNI EN 10277-4, C15R+C/C16R+C	Fiat 52403, C15 TRF

- (1) EN 10277-2 superseded DIN 1652-2 and UNI 10233-3. EN 10277-4 superseded DIN 1652-3, BS 970, and UNI 10233-5.
(2) DIN tolerances: DIN 668 for standard dimensional tolerances (ISO tol h11) and DIN 671 for more restrictive tolerance (ISO tol h9).
(3) Referenced steel grades may respond differently to heat treatment processes due to differences in manganese content.
(4) Note EN 10277-2 Grade S235JRG2C+C, is now designated per EN 10277 as Grade S235JRC+C.

3. Restricted Former Listed National Standard Materials

Table B3 lists National Standard materials that were previously listed as comparable materials for the former MAT1030 Grades. These materials may be designated on existing CNH Industrial drawings and are provided here as a reference only to correlate these materials to former or current Grades. The materials listed in Table B3 shall not be used on new or updated drawings.

TABLE B3: Former National Standard Materials – (For Reference Only) ⁽¹⁾

CNH Grade	ASTM	DIN	BS	EN ⁽²⁾	UNI ⁽²⁾	FIAT
A	----	DIN 1652-2, St37-2K	BS 970-3, 080M15	EN 10277-2, S235JRG2C+C	UNI EN 10277-2, S235JRG2C+C	Fiat 52891, Fe430 TRF
B	----	DIN 1652-3, Ck15K	BS 970-3, 080A15	EN 10277-4, C15R+C/C16R+C	UNI EN 10277-4, C15R+C/C16R+C	Fiat 52403, C15 TRF

- (1) These materials may be found on legacy drawings and in previous MAT1030 revisions. When these materials on drawings are changed, they shall be updated to Table 1 MAT1030 Grades.
(2) EN 10277 has superseded EN10277-2 and EN 10277-4. EN10277 superseded EN10277-1:2008 thru EN10277-5:2008.