British Standard

BRITISH STANDARD

BS 1449-1.14: 1991

Steel plate, sheet and strip —

Part 1: Carbon and carbon-manganese plate, sheet and strip —

Section 1.14 Specification for hot rolled narrow strip supplied in a range of conditions for heat treatment and general engineering purposes

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Iron and Steel Standards Policy Committee (ISM/-) to Technical Committee ISM/10, upon which the following bodies were represented:

British Railways Board
British Steel Industry
Cold Rolled Sections Association
Society of Motor Manufacturers and Traders Limited

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

British Welded Steel Tube Association
Institution of Mechanical Engineers
National Association of Steel Stockholders

This British Standard, having been prepared under the direction of the Iron and Steel Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 31 October 1991

The following BSI references relate to the work on this standard:
Committee reference ISM/10
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Contents

Foreword

This Section of BS 1449 has been prepared under the direction of the Iron and Steel Standards Policy Committee. It is a new edition of the element of BS 1449-1:1983 covering hot rolled narrow strip for heat treatment and general engineering purposes. This Section of BS 1449, together with BS 1449-1.1 to BS 1449-1.13, BS 1449-1.15 and BS EN 10130, supersedes BS 1449-1:1983 which is withdrawn.

The requirements specified are technically identical to those applicable to hot rolled narrow strip in section four of BS 1449-1:1983. This Section of BS 1449 will be withdrawn when the requirements specified become a European Standard and are published as a British Standard.

For further explanation of this change in presentation see the foreword to BS 1449-1.1:1991.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 4, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Section of BS 1449 specifies hot rolled, low, medium and high carbon steels, rolled in widths of less than 600 mm.

NOTE The title of the publication referred to in this standard is listed on the inside back cover.

2 Definitions

For the purposes of this Section of BS 1449, the definitions given in BS 1449-1.1 apply.

3 Information to be supplied by the purchaser

The following information shall be given on the enquiry and order.

NOTE Purchasers should pay particular attention to the various options available in this standard and included in the list below.

Where no specific choice is made by the purchaser, the supplier shall select what is appropriate, except that for items a), b), c) and d) reference back to the purchaser shall be made:

a) the number of this British Standard, i.e. BS 1449-1.14;

b) the form of product required, strip or cut lengths (see **2.5** of BS 1449-1.1:1991);

c) the nominal dimensions and quantity of the product required;

d) the type of steel (see note 1 to Table 1), grade, condition and surface finish of material required (see clause **6**);

e) the edge condition required (see clause **18** of BS 1449-1.1:1991);

f) the application for which the product is intended, including the submission of a drawing;

g) whether tensile and bend, or hardness and bend, requirements are to be met (see clause **5**);

h) whether details of cast analysis are required;

i) whether the material is to be free from strain-age-embrittlement (normally applicable to grades 4, 12, 17 and 22 only);

j) whether test certificates are required for cast analysis and/or mechanical properties;

k) whether the purchaser wishes to carry out inspection at the manufacturer's works (see clause **19** of BS 1449-1.1:1991);

l) whether oiling or any other protective coating is required (see clause **7** of BS 1449-1.1:1991);

m) details of special requirements such as decarburization limits (see **6.2**) or grain size control;

n) limitations on masses and dimensions of individual coils or bundles if applicable;

o) whether special requirements are necessary for packaging or marking (see clause **21** of BS 1449-1.1:1991);

p) if a special heat treatment is to be used, specific information on the process should be given.

4 Chemical composition

The chemical compositions of the materials shall be as given in Table 1.

NOTE The cast identity of grade 4 is not normally maintained.

5 Mechanical properties

The mechanical properties of the materials shall be as given in Table 2. The material shall be supplied to comply with either the hardness and bend tests, or the tensile and bend tests, but in no case with both the hardness and tensile tests.

6 Condition of material on delivery

6.1 Designation

The condition and finish of the material shall be in accordance with the symbols included with the material grade and given on the enquiry/order (see item d) of clause **3**).

The symbols denoting material condition, if required, shall be given before the grade number of the steel, in the following order:

a) the symbols R (rimmed), B (balanced) or K (killed) signifying the type of steel: applicable only to material grades 4, 12, 17 and 22;

b) the symbol HS (hot rolled narrow) signifying the method of rolling.

If the material is required pickled, the symbol P shall appear after the grade number of the steel.

NOTE 1 **Conditions of material**. The following material conditions are available; more complete descriptions are given in Table 1 of BS 1449-1.1:1991.

HS Hot rolled on narrow strip mills

N Normalized

A Annealed

NOTE 2 **Surface finish**. The following surface finish is available; a more complete desciption is given in Table 2 of BS 1449-1.1:1991.

P Pickled finish

6.2 Decarburization

NOTE Decarburization is not applicable to grades 4, 10, 12, 17, 20 and 22.

6.2.1 *Grades 30 and 40*

When requested, the extent and nature of the normal slight decarburization shall be agreed between the manufacturer and purchaser.

6.2.2 *Grades 50, 60, 70, 80 and 95*

When specially requested, complete plus partial decarburization, as indicated by the proportion of ferrite, shall not extend to a depth below the surface greater than 3 % of the nominal thickness of the material, at a distance of not less than 20 mm from the edge.

Table 1 — Chemical composition

Rolled condition and grade	Type of steel	C		Si		Mn		S	P
		min.	max.	min.	max.	min.	max.	max.	max.
		%	%	%	%	%	%	%	%
HS4	Mild steel	—	0.12	—	—	—	0.60	0.050	0.050
HS10	Case hardening	0.08	0.15	0.10	0.35	0.60	0.90	0.045	0.045
HS12	“12” carbon	0.10	0.15	—	—	0.40	0.60	0.050	0.050
HS17	“17” carbon	0.15	0.20	—	—	0.40	0.60	0.050	0.050
HS20	“20” carbon	0.15	0.25	0.05	0.35	1.30	1.70	0.045	0.045
HS22	“22” carbon	0.20	0.25	—	—	0.40	0.60	0.050	0.050
HS30	“30” carbon	0.25	0.35	0.05	0.35	0.50	0.90	0.045	0.045
HS40	“40” carbon	0.35	0.45	0.05	0.35	0.50	0.90	0.045	0.045
HS50	“50” carbon	0.45	0.55	0.05	0.35	0.50	0.90	0.045	0.045
HS60	“60” carbon	0.55	0.65	0.05	0.35	0.50	0.90	0.045	0.045
HS70	“70” carbon	0.65	0.75	0.05	0.35	0.50	0.90	0.045	0.045
HS80	“80” carbon	0.75	0.85	0.05	0.35	0.50	0.90	0.045	0.045
HS95	“95” carbon	0.90	1.00	0.05	0.35	0.30	0.60	0.040	0.040

NOTE 1 Unless otherwise agreed at the time of ordering, the deoxidation condition for grade 4 is at the discretion of the manufacturer. Grades 12, 17 and 22 are available as rimming, balanced or killed steels and any preference should be indicated by employing the appropriate prefix to the grade (see **6.1**). Grades 10, 20, 30, 40, 50, 60, 70, 80 and 95 are all killed steels.

NOTE 2 For grades 30 to 95 inclusive the purchaser may order to restricted ranges of carbon and manganese within the ranges specified in the table. For steels containing up to and including 0.85 % C, the minimum carbon range is 0.05 % (e.g. 0.40/0.45 % C). Above 0.85 % carbon, the minimum carbon range is 0.07 % (e.g. 0.93/1.00 % C). These steel types may also be ordered with a restricted manganese range of 0.20 % (e.g. 0.60/0.80 % Mn) when this is required for special applications.

NOTE 3 The purchaser may order to specified lower maxima for sulphur and phosphorus by arrangement with the supplier.

NOTE 4 The analysis of the product may vary from the chemical composition, specified in the table for the appropriate grade, by the variations given in appendix A of BS 1449-1.1:1991. This does not apply to rimmed (R) or balanced (B) steels, which may show wider variations than those given in appendix A of BS 1449-1.1:1991.

NOTE 5 Where case hardening is to be carried out, a silicon-killed, aluminium-free steel is more suitable.

Table 2 — Mechanical properties

Rolled condition and grade	Material condition	Tensile properties[a]				Hardness HV[a]		Bend mandrel diameter[b] (180° bend) for strip thicknesses up to and including 10 mm	Remarks
		Yield strength R_e, min.	Tensile strength, R_m	Elongation A, min.					
				Original gauge length, L_o					
				50 mm	80 mm[c]	min.	max.		
		N/mm^2	N/mm^2	%	%				
HS4	Hot rolled	(170)	(280)	(25)	(23)	—	—	1a	The bend mandrel diameter for strip > 3 mm thick is 2a
HS10	Hot rolled	—	—	—	—	—	135	1a	The bend mandrel diameter for strip > 3 mm thick is 1a
HS10	Annealed[d]	—	—	—	—	—	120	1a	
HS10	Hardened in water from 900 °C (core properties of case-hardened component)	—	—	—	—	200	300	—	
HS12	Hot rolled	170	310	25	(23)	—	—	1a	
HS17	Hot rolled	200	350	25	(23)	—	—	2a	
HS20	Hot rolled	350	540	18	(16)	—	—	2a	
HS22	Hot rolled	230	400	24	(22)	—	—	2a	
HS30	Hot rolled	280	500	18	(16)	—	—	3a	
HS40	Hot rolled	300	540	16	(14)	—	(230)	4a	
HS40	Normalized	300	540	16	(14)	—	230	4a	
HS50	Hot rolled	—	—	—	—	—	(230)	—	
HS50	Normalized	—	—	—	—	—	230	4a	
HS50	Annealed	—	—	—	—	—	175	2a	
HS50	Induction or flame hardened	—	—	—	—	700	—	—	
HS60	Hot rolled	—	—	—	—	—	(270)	—	
HS60	Normalized	—	—	—	—	—	270	—	
HS60	Annealed	—	—	—	—	—	185	3a	
HS70	Hot rolled	—	—	—	—	—	(285)	—	
HS70	Normalized	—	—	—	—	250	300	—	
HS70	Annealed	—	—	—	—	—	195	4a	

Table 2 — Mechanical properties

Rolled condition and grade	Material condition	Tensile properties[a]				Hardness HV[a]		Bend mandrel diameter[b] (180° bend) for strip thicknesses up to and including 10 mm	Remarks
		Yield strength R_e, min.	Tensile strength, R_m	Elongation A, min.					
				Original gauge length, L_o					
				50 mm	80 mm[c]	min.	max.		
HS80	Hot rolled	—	—	—	—	—	(300)	—	
HS80	Normalized	—	—	—	—	270	320	—	
HS80	Annealed	—	—	—	—	—	205	5a	
HS95	Hot rolled	—	—	—	—	—	(330)	—	
HS95	Normalized	—	—	—	—	330	350	—	
HS95	Annealed	—	—	—	—	—	220	6a	

NOTE a is the thickness of the bend test piece.

[a] Tensile and hardness property figures in brackets are for guidance only.

[b] Bend mandrel diameter for strip thicknesses over 10 mm may be specified by agreement between manufacturer and purchaser.

[c] The 80 mm gauge length is currently not used in the UK but, as a step towards conforming with European practice, tentative values have been included.

[d] Material supplied in the annealed (A) condition has to be capable of meeting the specified properties in the hardened and tempered (HT) condition, when heat treated by a process agreed between the manufacturer and purchaser.

Publication(s) referred to

BS 1449, *Steel plate, sheet and strip*.
BS 1449-1.1, *General specification*.

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