

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 683 / I

HEAT-TREATED STEELS, ALLOY STEELS
AND FREE-CUTTING STEELS

PART I

QUENCHED AND TEMPERED UNALLOYED STEELS

1st EDITION
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BRIEF HISTORY

The ISO Recommendation R 683/1, *Heat-treated steels, alloy steels and free-cutting steels – Part I : Quenched and tempered unalloyed steels*, was drawn up by Technical Committee ISO/TC 17, *Steel*, the Secretariat of which is held by the British Standards Institution (BSI).

Work on this question by the Technical Committee began in 1958 and led, in 1965, to the adoption of a Draft ISO Recommendation.

In January 1966, this Draft ISO Recommendation (No. 916) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Argentina	Germany	Romania
Australia	Hungary	Spain
Austria	India	Sweden
Belgium	Israel	Switzerland
Brazil	Italy	Turkey
Canada	Japan	U.A.R.
Chile	Korea, Rep. of	United Kingdom
Czechoslovakia	Netherlands	U.S.A.
Denmark	Norway	U.S.S.R.
Finland	Poland	Yugoslavia

One Member Body opposed the approval of the Draft :

France

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council which decided, in March 1968, to accept it as an ISO RECOMMENDATION.

HEAT-TREATED STEELS, ALLOY STEELS AND FREE-CUTTING STEELS

PART I QUENCHED AND TEMPERED UNALLOYED STEELS

1. SCOPE

- 1.1 This ISO Recommendation covers unalloyed wrought steels for mechanical purposes usually intended for use
- (a) in the quenched and tempered condition, or
 - (b) in the austempered condition,
- with or without subsequent cold reduction.
- 1.2 For the purpose of simplification the steels covered by this ISO Recommendation in both conditions are called 'quenched and tempered steels', and both conditions are summarized under the term 'quenched and tempered'.
- 1.3 This ISO Recommendation comprises the two series of steels, listed in Table 2, which differ in their maximum phosphorus and sulphur contents.

2. REQUIREMENTS

2.1 Production processes

Unless otherwise agreed in the order, the processes used in making the steel and the product are left to the discretion of the manufacturer, but the steel should be killed. When he so requests, the user should be informed what steelmaking process is being used.

2.2 Chemical composition and mechanical properties

- 2.2.1 The steels covered by this ISO Recommendation should be ordered and delivered in accordance with Table 1.

TABLE 1 – Types of condition of delivery

Requirements	Types of condition of delivery*							
	1	1(a)	3	3(a)	4	4(a)	5	6
Chemical composition	X	X	X	X	X	X	X	X
Hardness in a condition of delivery other than quenched and tempered	-	X	-	X	-	X	-	-
Mechanical properties of								
— quenched and tempered test bars of 16 mm diameter	-	-	X	X	-	-	-	-
— quenched and tempered ruling sections	-	-	-	-	X	X	-	-
— quenched and tempered product in final dimensions	-	-	-	-	-	-	X	-
— quenched and tempered product subsequently cold-reduced to final dimensions	-	-	-	-	-	-	-	X

* The numbers indicating the types of condition of delivery follow a co-ordinated series of numbers throughout all relevant ISO Recommendations.

The type of condition of delivery according to Table 1 should be stated at the time of enquiry and order.

2.2.2 The chemical composition expressed by the cast analysis should be in accordance with Table 2.

TABLE 2 – Types of steel and chemical composition guaranteed (applicable to cast analysis)*

Type of steel	C %	Si %	Mn %	P % max.	S % max.
C 25 C 25 e	0.22 to 0.29	0.15 to 0.40	0.40 to 0.70	0.050 0.035	0.050 0.035
C 30 C 30 e	0.27 to 0.34	0.15 to 0.40	0.50 to 0.80	0.050 0.035	0.050 0.035
C 35 C 35 e	0.32 to 0.39	0.15 to 0.40	0.50 to 0.80	0.050 0.035	0.050 0.035
C 40 C 40 e	0.37 to 0.44	0.15 to 0.40	0.50 to 0.80	0.050 0.035	0.050 0.035
C 45 C 45 e	0.42 to 0.50	0.15 to 0.40	0.50 to 0.80	0.050 0.035	0.050 0.035
C 50 C 50 e	0.47 to 0.55	0.15 to 0.40	0.60 to 0.90	0.050 0.035	0.050 0.035
C 55 C 55 e	0.52 to 0.60	0.15 to 0.40	0.60 to 0.90	0.050 0.035	0.050 0.035
C 60 C 60 e	0.57 to 0.65	0.15 to 0.40	0.60 to 0.90	0.050 0.035	0.050 0.035

* Elements not quoted in Table 2 should not be intentionally added to the steel without the agreement of the purchaser, other than for the purpose of finishing the heat. All reasonable precautions should be taken to prevent the addition, from scrap or other materials used in manufacture, of such elements which affect the hardenability, mechanical properties and applicability.

2.2.2.1 If ordered to condition of delivery type 1 or 1(a) (see Table 1), the following permissible deviations between the values specified in Table 2 and the product analysis of products up to 160 mm (6.3 in) diameter apply. Above 150 mm (5.9 in) square section, the permissible deviations should be stated at the time of enquiry and order,

TABLE 3 – Permissible deviations between specified analysis and product analysis

Type of steel	Permissible deviations*				
	C %	Si %	Mn %	P %	S %
C 25, C 25 e	± 0.02	± 0.03	± 0.04	+ 0.005	+ 0.005
C 30, C 30 e C 35, C 35 e C 40, C 40 e C 45, C 45 e C 50, C 50 e	± 0.03				
C 55, C 55 e C 60, C 60 e	± 0.04				

* ± means that in one cast the deviation may occur over the upper value or under the lower value of the specified range in Table 2 but not both at the same time.