INTERNATIONAL STANDARD

ISO 13887

Third edition
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Cold-reduced steel sheet of higher yield strength with improved formability

Tôles laminées à froid en acier à limite d'élasticité et aptitude au formage accrues

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 13887 was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 12, *Continuous mill flat rolled products*.

This third edition cancels and replaces the second edition (ISO 13887:2004), which has been technically revised.

Introduction

With the combination of higher strength and improved formability derived from the tests outlined in this International Standard, it is possible to obtain savings in mass along with better weldability.

The last two standards listed in the Bibliography may be reviewed for comparison with this International Standard. The relationship between the standards might only be approximate; therefore, the respective standards should be consulted for actual requirements. Those who use these documents will need to determine which specifications address their needs.

Cold-reduced steel sheet of higher yield strength with improved formability

1 Scope

This International Standard applies to all grades of cold-rolled steel sheet of higher yield strength with improved formability. The steel is made according to fine-grain practice and has a suitable chemical composition, including microalloying elements, to provide improved formability. The product is intended for the fabrication of parts requiring better formability. It is generally used in the delivered condition.

This International Standard is not applicable to steels designated as commercial quality or drawing quality (see ISO 3574), steels of structural quality (see ISO 4997) or steels of high tensile strength and low yield point with improved formability (see ISO 14590).

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

ISO 16162, *Continuously cold-rolled steel sheet products — Dimensional and shape tolerances*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
cold-reduced steel sheet
product obtained from hot-rolled descaled steel sheet by cold-reducing to the required sheet thickness followed by annealing to recrystallize the grain structure

3.2
skin pass
light cold-rolling of the product

NOTE The purpose of the skin passing is one or more of the following:

a) to minimize the appearance of coil breaks, stretcher strains and fluting;

b) to control the shape;

c) to obtain a required surface finish suitable for ordering decorative painting.

Some increase in hardness and some loss of ductility will result from skin passing.

4 Conditions of manufacture

4.1 Steelmaking

Unless otherwise agreed, the processes used in making the steel and in manufacturing cold-reduced steel sheet are left to the discretion of the manufacturer. On request, the purchaser shall be informed of the steelmaking process being used.

4.2 Chemical composition

The chemical composition (heat analysis) shall conform to the requirements in Tables 1 and 2.

Table 1 — Chemical analysis (*heat analysis*)

Values expressed as a mass fraction

Grade	C % max.	Mn % max.	S % max.	Si % max.
260Y	0,08	0,60	0,025	0,50
300Y	0,10	0,90	0,025	0,50
340Y	0,11	1,20	0,025	0,50
380Y	0,11	1,20	0,025	0,50
420Y	0,11	1,40	0,025	0,50
490Y	0,16	1,65	0,025	0,60
550Y	0,16	1,65	0,025	0,60

NOTE These steels may contain one or more microalloying elements (such as niobium, titanium and vanadium) up to a total of 0,22 % (mass fraction) maximum, or phosphorus up to 0,30 % maximum.

Table 2 — Limits on additional chemical elements

Values expressed as a mass fraction

Element	Cu[a] % max.	Ni[a] % max.	Cr[a,b] % max.	Mo[a,b] % max.
Heat analysis	0,20	0,20	0,15	0,06
Product analysis	0,23	0,23	0,19	0,07

Each of the elements listed in this table shall be included in the report of the heat analysis. When the amount of copper, nickel, chromium or molybdenum present is less than 0,02 %, the analysis may be reported as < 0,02 %.

[a] The sum of copper, nickel, chromium and molybdenum shall not exceed 0,50 % on the heat analysis. When one or more of these elements are specified, the sum does not apply, in which case, only the individual limits on the remaining elements will apply.

[b] The sum of chromium and molybdenum shall not exceed 0,16 % on heat analysis. When one or more of these elements are specified, the sum does not apply, in which case, only the individual limits on the remaining elements will apply.

4.3 Chemical analysis

4.3.1 General

The chemical composition (heat analysis) shall conform to the requirements in Tables 1 and 2.

4.3.2 Heat analysis

An analysis of each heat of steel shall be made by the manufacturer to determine compliance with the requirements of Tables 1 and 2. When requested at the time of ordering, this analysis shall be reported to the purchaser or his representative.

4.3.3 Product analysis

A product analysis may be made by the purchaser to verify the specified analysis of the product and shall take into consideration any normal heterogeneity. The sampling method shall be agreed upon between the interested parties at the time of ordering. The product analysis tolerances shall be in accordance with Table 3.

Table 3 — Product analysis tolerances

Values expressed as a mass fraction

Element	Content of specified element % max.	Tolerance over maximum specified % max.
C	≤ 0,15	0,03
	> 0,15 to ≤ 0,16	0,04
Mn	≤ 0,60	0,03
	> 0,60 to ≤ 1,15	0,04
	> 1,15 to ≤ 1,65	0,05
S	≤ 0,025	0,01
Si	≤ 0,60	0,05

NOTE The above maximum tolerance is the allowable excess over the specified requirement and not the heat analysis. For example, for Grade 300Y the following product analysis values are within these tolerances: C 0,13 %; Mn 0,94 %; S 0,035 %; and Si 0,55 %.

4.4 Weldability

This product is normally suitable for welding if appropriate welding conditions are selected.

4.5 Application

It is desirable that the specified product be identified for fabrication by the name of the part or by the intended application. Proper identification of the part may include visual examination, prints or description, or a combination of these.

4.6 Mechanical properties

At the time that the steel is made available for shipment, the mechanical properties shall be as stated in Table 4 when they are determined on test pieces obtained in accordance with the requirements of Clause 6.

NOTE Prolonged storage of the sheet can cause a change in the mechanical properties (increase in hardness and a decrease in elongation) leading to an adverse effect on formability.

Table 4 — Mechanical properties

Grade	Yield stress σ_{eL} min. MPa	Tensile strength σ_m min. MPa	Percentage elongation at fracture E % min.	
			Gauge length on test piece $L_0 = 50$ mm	Gauge length on test piece $L_0 = 80$ mm
260Y	260	350	28	26
300Y	300	380	26	24
340Y	340	410	24	22
380Y	380	450	22	20
420Y	420	490	20	18
490Y	490	550	16	14
550Y	550	620	12	10

NOTE 1 MPa = 1 N/mm^2.