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Steel flat products

Hot rolled sheet and strip

Technical delivery conditions
Mild unalloyed steels for cold reducing

DIN 1614 Part 1

Flacherzeugnisse aus Stahl; warmgewalztes Band und Blech; technische Lieferbedingungen; weiche unlegierte Stähle zum Kaltwalzen

This standard, together with DIN 1614 Part 2, March 1986 edition, supersedes the September 1974 edition.

In keeping with current practice in standards published by the International Organization for Standardization (ISO), a comma has been used throughout as the decimal marker.

See Explanatory notes for connection with Standard ISO 3576 – 1976 published by the International Organization for Standardization (ISO).

Contents

1 Field of application

1.1 This standard applies to strip continuously hot rolled from the mild unalloyed steels listed in table 1, intended for further processing by cold reducing into sheet or strip complying with the requirements of DIN 1623 Part 1 or cold reduced strip complying with the requirements of DIN 1624.

1.2 This standard shall only be applied to longitudinally slit strip by special agreement.

1.3 Unless otherwise specified in this standard, the general technical delivery conditions laid down in DIN 17 010 shall also apply for the supply of these products.

1.4 This standard does not apply to hot rolled flat products made from

- mild unalloyed steels for immediate cold forming (see DIN 1614 Part 2),
- general structural steels (see DIN 17 100),
- steels with high temperature strength (see DIN 17 155),
- steels for quenching and tempering (see DIN 17 200),
- case hardening steels (see DIN 17 210).

2 Concepts

2.1 Flat products are products which have an almost rectangular cross section with a width much greater than the thickness.

2.2 Strip is a flat product which is wound to form a coil immediately after the final rolling pass or after having passed the installations connected to the roll. In the rolled condition, strip has slightly curved edges but can also be supplied with trimmed edges, or made by slitting a wider strip.

3 Dimensions and permissible dimensional deviations

DIN 1016 shall apply for the dimensions and permissible dimensional deviations.

4 Masses

The mass of the steels specified in this standard shall be calculated taking the density as 7,85 kg/dm^3.

5 Classification into grades

5.1 This standard covers the steel grades listed in table 1. Supply shall be exclusively on the basis of the chemical composition (see subclause 7.3).

5.2 The choice of the steel grade is left to the discretion of the purchaser. It is recommended that the supplier be consulted, if necessary, in order to decide which steel grade and which surface finish are suitable for the intended application.

Continued on pages 2 to 4

Table 1. **Classification into grades and chemical composition (cast analysis) of the strip intended for further processing by cold reducing**

Steel grade		Type of deoxidation [1]	Chemical composition [2] % by mass				
Symbol	Material number		C Maximum	Mn	P Maximum	S Maximum	N Maximum
St 22	**1.0320**	Optional	0,10	≤ 0,45	0,035	0,035	0,007[3]
USt 23	**1.0321**	U	0,08	0,20 up to 0,40	0,025	0,025	0,007[3]
RRSt 23	**1.0359**	RR	0,10	≤ 0,45	0,030	0,030	[4]
St 24	**1.0327**	RR	0,08	≤ 0,40	0,025	0,025	[4]

1) See subclause 7.2.
2) As determined in the cast analysis. Other elements, except aluminium, shall not be added to the melt without the approval of the purchaser.
3) The values represent the content of free nitrogen.
4) The nitrogen must be fixed. The steel shall thus contain at least 0,02 % of metallic aluminium. The addition of other nitrogen-fixing elements shall be agreed with the purchaser.

6 Designation and ordering

6.1 The standard designation for a steel complying with the requirements of this standard shall consist of

- the term "steel";
- the number of this standard;
- the symbol or material number identifying the steel grade (see table 1).
- Example:

  Steel DIN 1614 – RRSt 23

  or

  Steel DIN 1614 – 1.0359

6.2 The specifications of the dimensional standard shall apply for the standard designation of the products.

6.3 The order shall provide all information necessary for a clear description of the products required, as well as their condition and testing. If the designations as specified in subclauses 6.1 and 6.2 are not adequate for this purpose (e.g. if a surface finish other than that specified in subclause 7.5.1 is required), the additional information required shall be appended to these.

7 Requirements

7.1 Steelmaking process

The steelmaking process is left to the discretion of the manufacturer; the purchaser shall be informed, on request, of the type of process used.

7.2 Type of deoxidation

7.2.1 The type of deoxidation of steel grade St 22 is left to the discretion of the manufacturer.

7.2.2 Steel grade St 23 may be supplied in the rimming (U) or specially killed (RR) condition. The type of deoxidation required shall be stated in the designation.

7.2.3 Steel grade St 24 shall be supplied specially killed (RR).

7.3 Chemical composition

7.3.1 The values applicable for the cast analysis are given in table 1.

7.3.2 Table 2 gives the amounts by which the product analysis may deviate from the limit values applicable to the cast analysis.

Any verification of the values determined in the product analysis in the course of acceptance inspection shall be specially agreed at the time of ordering.

7.3.3 Owing to the fact that hot rolled strip is ordered and supplied in coils with masses which can differ greatly, as a function of the strip width, fluctuations of the chemical composition determined in the cast and product analyses may occur. The suitability for the production of cold reduced sheet and strip complying with DIN 1623 Part 1 or of cold reduced strip complying with DIN 1624, assuming proper processing, shall however be ensured.

Table 2. **Amounts by which the chemical composition in the product analysis may deviate from the limit values applicable to the cast analysis** (see table 1)

Element	Amount by which the product analysis may deviate from the limit values applicable to the cast analysis % by mass	
	St 22 and USt 23 steels	RRSt 23 and St 24 steels
C	+ 0,02	+ 0,01
Mn	+ 0,05	+ 0,05
P	+ 0,010	+ 0,005
S	+ 0,010	+ 0,005
N	+ 0,001	–

7.4 Weldability

The steels specified are suitable for welding by the usual welding processes. It is, however, desirable that the welding process be specified at the time of ordering. In the case of flat products which have not been descaled, the welding process shall allow for the presence of a layer of scale.

7.5 Surface condition

7.5.1 Hot rolled flat products complying with this standard are usually supplied in the as-rolled condition, i.e. with a non-descaled surface.

7.5.2 The following as delivered conditions are also permitted if specially agreed at the time of ordering:

- chemically or mechanically descaled, unoiled;
- descaled and oiled.

Note. If the products are supplied in the unoiled condition there is an increased risk of the flat products becoming scratched or scored on either the manufacturer's or user's premises. Furthermore, there is an increased risk of rust formation.

7.5.3 An application appropriate to the flat product grade, assuming proper processing, should not be impaired by the surface condition. Pores, small grooves, small pits, slight scratches and coil breaks left by uncoiling are permitted.

7.5.4 If the flat products are not supplied in a descaled condition, it shall be possible to remove the scale from the whole length and width by the usual methods within an appropriate period. The surface shall therefore be free from oils and greases and from dyes which cannot be removed by normal descaling. Agreed colour markings or inscriptions on the permissible rough-rolled ends are excepted.

7.5.5 If the products are intended for galvanizing or the application of other types of surface coating, this shall be specially stated at the time of ordering.

Steel grades complying with this standard are not suitable for the production of cold reduced sheet and strip specified in DIN 1623 Part 3, i.e. for mild unalloyed steels for vitreous enamelling; special agreements shall be made for these at the time of ordering.

7.5.6 The intention of further processing the hot rolled strip to cold reduced flat products with surface appearances 05 (as specified in DIN 1623 Part 1) and RP or RPG (as specified in DIN 1624) shall be stated at the time of ordering.

7.6 Edge condition

7.6.1 Depending on the order, the flat products shall be supplied either with mill edges (NK) or with trimmed edges (GK).

7.6.2 The edge condition shall not impair the application of the flat products, assuming proper processing.

8 Testing

8.1 Tests to be carried out and documents on materials testing

8.1.1 The purchaser may stipulate, for all steel grades specified in this standard, that one of the documents on materials testing complying with DIN 50049 be furnished.

8.1.2 If it is agreed that a document is to be furnished which, in accordance with DIN 50049, requires that tests be carried out on the consignment itself, then the specifications of subclauses 8.2 to 8.6 shall apply.

8.2 Acceptance units

8.2.1 The cast shall be the acceptance unit.

8.2.2 The acceptance unit shall consist of flat products of the same steel grade and nominal thickness.

8.3 Number of tests

If it has been agreed that the chemical composition is to be verified on the product, this verification shall be carried out on one test piece per cast (see subclause 7.3.2).

8.4 Sampling

For the purposes of the product analysis, chips shall be taken evenly distributed over the complete cross section of the product to be tested.

8.5 Test methods to be applied

The chemical composition shall be determined by the methods [1] described by the Chemists' Committee of the *Verein Deutscher Eisenhüttenleute* (Society of German Ferrous Metallurgy Engineers).

8.6 Retests

The specifications of DIN 17010 shall apply to retests.

9 Marking and packaging

9.1 Marking

Flat products complying with this standard shall be marked with a durable tie-on label or adhesive strip containing the delivery information according to the details of designation given in the relevant dimensional standards. Additional marking shall be by special agreement.

9.2 Packaging

The coils shall be bound in such a way that they cannot be damaged and so that no waps may come undone in the course or normal careful loading, transportation and storage.

1) See the "Standards and other documents referred to" clause.

Standards and other documents referred to

DIN 1016	Steel flat products; hot rolled strip, hot rolled sheet under 3 mm thick; dimensions, permissible dimensional deviations and deviations of form and mass
DIN 1614 Part 2	Steel flat products; cold reduced sheet and strip; technical delivery conditions; mild unalloyed steels for immediate cold forming
DIN 1623 Part 1	Steel flat products; cold reduced sheet and strip; technical delivery conditions; mild unalloyed steels for cold forming
DIN 1623 Part 3	Steel flat products; cold reduced sheet and strip; technical delivery conditions; mild unalloyed steels for vitreous enamelling
DIN 1624	(at present at the stage of draft) Steel flat products; cold reduced mild unalloyed steel strip in rolling widths not exceeding 650 mm; technical delivery conditions
DIN 17 010	General technical delivery conditions for steel and steel products
DIN 17 100	Steels for general structural purposes; quality standard
DIN 17 155	Creep resistant steel plate and strip; technical delivery conditions
DIN 17 200	Steels for quenching and tempering; technical delivery conditions
DIN 17 210	(at present at the stage of draft) Case hardening steels; technical delivery conditions
DIN 50 049	Documents on materials testing

Handbuch für das Eisenhüttenlaboratorium 2) (Handbook for the ferrous metallurgy laboratory);
volume 2A: *Die Untersuchung der metallischen Stoffe* (Investigation of metallic materials);
volume 3A: *Probenahme* (Sampling)
volume 5: *Normen, Begriffe, Definitionen und ausgewählte Kapitel der Röntgenfluoreszenzspektrometrie und der Statistik* (Standards, terminology and selected sections to X-ray fluorescence spectrometry and statistics)

Previous editions

DIN 1614 Part 1: 09.74

Amendments

The following amendments have been made in comparison with the September 1974 edition.

a) The field of application has been restricted to mild unalloyed steels for cold reducing.

b) The specification relating to the type of deoxidation for steel grade St 22 (see table 1) has been changed.

c) Steel grade RRSt 23 (see table 1) has been included for the first time.

Explanatory notes

The field of application of this revised edition of DIN 1614 Part 1 has been restricted to mild unalloyed steels intended for further processing by cold reducing. The grades intended for immediate cold reducing also dealt with in the September 1974 edition of the standard are now covered by DIN 1614 Part 2. The splitting up of the technical delivery conditions according to the intended application of the steels simplifies the comparison with international and regional standards already published or planned in accordance with this scheme. It also permits a more rapid updating of the individual Parts according to the state of the art.

Hot rolled strip made from the steels listed in the present standard (see table 1) is used as the original product for the production of cold reduced sheet and strip complying with DIN 1623 Part 1 and DIN 1624. The classification into grades has, accordingly, been based on DIN 1623 Part 1 (February 1983 edition). In detail, this means that the type of deoxidation of steel grade St 22 (previously rimming) is now made optional and that a new grade, RRSt 23, has been included.

The material is supplied exclusively on the basis of the chemical composition of the steels. It therefore appeared justified that the specifications be extended to cover elements such as manganese, phosphorus and sulfur, which are not mentioned in the technical delivery conditions for the cold reduced flat products. The values given in tables 1 and 2 have been adopted almost without amendment from the September 1974 edition of DIN 1614 Part 1.

ISO 3576 – 1976, Hot-rolled carbon steel sheet coils for the production of cold-reduced products, does not apply only to mild unalloyed steels. It is a generic specification for a number of grades of hot rolled strip intended for further processing by cold reducing and, for instance, gives no concrete specifications regarding the chemical composition.

International Patent Classification

C 22 C 38/00
G 01 M 19/00

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