

	Steel flat products Hot rolled patterned plate Dimensions, mass, permissible deviations	DIN 59 220
<p>Flachzeug aus Stahl; warmgewalztes Blech mit Mustern; Masse, Gewichte, zulässige Abweichungen</p> <p><i>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.</i></p> <p style="text-align: center;">Dimensions in mm</p> <p>1 Field of application</p> <p>This standard applies to hot rolled patterned plate (bulb plate, checker plate) as described in subclause 4.1, 3 mm to 10 mm thick, in widths from 600 mm up to 2000 mm, made from steels specified in clause 5.</p> <p>2 Concept</p> <p>Patterned plate is understood to mean plate one side of which (important for its application) shows a regular embossed pattern (bulb pattern or diamond pattern), the other side of which usually has a smooth surface. The pattern improves the nonskid and nonslip properties.</p> <p>3 Designations</p> <p>3.1 Standard designation</p> <p>3.1.1 The standard designation of plate conforming to this standard shall contain the following details in the order stated:</p> <ul style="list-style-type: none"> term (plate); DIN number; symbol or material number for the steel grade; code letter (T or R) for the type of pattern (see subclause 4.1); thickness of the plate, in mm (see subclause 6.1.1). <p>3.1.2 The term "plate" may be replaced by the abbreviation "Bl" as specified in DIN 1353 Part 2.</p> <p>3.1.3 Example of standard designation</p> <p>A patterned plate in RSt 37-2 steel (material number 1.0038) as specified in DIN 17 100, pattern T, 5 mm thick, shall be designated:</p> <p style="text-align: center;">Plate DIN 59 220 – RSt 37-2 – T 5 or Plate DIN 59 220 – 1.0038 – T 5</p> <p>3.2 Designation for ordering</p> <p>3.2.1 To ensure the satisfactory handling of an order for plate conforming to this standard, the standard designation (the sequence of the elements of which shall not be changed) as given in subclause 3.1 shall be supplemented by the following information:</p> <ul style="list-style-type: none"> a) quantity ordered or number of units (detail preceding the standard designation); b) width and length, in mm (details following the standard designation). <p>3.2.2 Example of designation for ordering</p> <p>20 t of plate designated as in subclause 3.1.3, 1200 mm in width and 2000 mm in length:</p> <p style="text-align: center;">20 t plate DIN 59 220 – RSt 37-2 – T 5 × 1200 × 2000 or 20 t plate DIN 59 220 – 1.0038 – T 5 × 1200 × 2000</p> <p style="text-align: right;">Continued on pages 2 to 5</p>		

4 Types of pattern and condition on delivery

4.1 Types of pattern

4.1.1 Plate conforming to this standard may be supplied with pattern

T (bulb plate) as shown in figure 1 or

R (checker plate) as shown in figure 2.

4.1.2 The values given in the illustrations are guideline values.

4.1.3 The patterns shall not be in parallel to the longitudinal edges of the plate.

4.2 Condition on delivery

Products conforming to this standard shall be supplied in the hot rolled condition, with the surface untreated and generally with cut edges.

5 Material

Unless otherwise specified, hot rolled patterned plate conforming to this standard shall be supplied in steels specified in DIN 17 100. Other steel grades shall be the subject of a particular agreement; however, the specifications of this standard only apply to materials having a specified minimum yield strength up to 355 N/mm².

6 Dimensions, permissible deviations of dimension, mass and form

6.1 Thickness

6.1.1 The nominal thickness is understood to mean the thickness of the plate measured at a point without pattern (see also subclause 7.2.1).

6.1.2 The nominal thicknesses to be preferred when ordering are given in table 1.

6.1.3 Table 1 also lists the permissible deviations in thickness and the permissible variations in maximum and minimum thickness of the same plate (for testing see subclause 7.2.1).

Table 1. Permissible deviations in thickness and permissible variations in thickness of the same plate

Nominal thickness <i>s</i> ¹⁾	Permissible deviations from <i>s</i>	Permissible variation in thickness (referred to nominal thickness <i>s</i>)
3	+ 0,6 - 0,4	0,8
4		0,8
5	+ 1,1 - 0,4	0,9
6		0,9
8	+ 1,2 - 0,5	0,9
10		0,9

¹⁾ Please note subclause 6.1.1.

6.2 Width

6.2.1 Patterned steel plate is usually supplied in widths from 600 mm up to 2000 mm.

6.2.2 It is permitted to exceed the nominal width ordered by 20 mm. A negative deviation in nominal width is not permitted (see also subclause 7.2.2).

6.3 Length

Table 2 lists the permissible positive deviation in the nominal length ordered. A negative deviation in nominal length is not permitted.

Table 2. Permissible positive deviation in nominal length

Nominal length		Permissible positive deviation in nominal length
from	up to but not including	
	4 000	20
4 000	6 000	30
6 000	8 000	40
8 000	10 000	50
10 000	15 000	75
15 000	20 000 ¹⁾	100

¹⁾ Including 20 000 mm.

6.4 Mass

6.4.1 The theoretical mass of patterned steel plate given in table 3 has been calculated on the basis of a density of 7,85 kg/dm³. It has been established by taking the theoretical mass of the base metal with an addition for the embossed pattern:

2 kg/m² for pattern T, and

4 kg/m² for pattern R.

6.4.2 The permissible positive deviation from the theoretical mass in terms of quantity delivered is shown in table 3. The plate delivered shall be plate of the same steel grade and of the same nominal dimensions.

Table 3. Theoretical mass and permissible deviations in mass

Nominal thickness s	Theoretical mass ¹⁾ kg/m ²		Permissible positive deviation from the theoretical mass, in %, for quantities delivered ²⁾ , in t				
	T	R	below 5	from 5 up to but not including 15	from 15 up to but not including 40	from 40 up to 250	over 250
3	25,55	27,55	13,5	13	12	11,5	11
4	33,40	35,40	13,5	13	12	11,5	11
5	41,25	43,25	13,5	13	12	11,5	11
6	49,10	51,10	13,5	13	12	11,5	11
8	64,80	66,80	11,5	11	10	9,5	9
10	80,5	82,5	11,5	11	10	9,5	9

¹⁾ See subclause 6.4.1.
²⁾ See subclause 6.4.2.

6.5 Straightness and squareness

6.5.1 It shall be possible to inscribe a rectangle having the nominal dimensions ordered in respect of width and length in every plate delivered.

6.5.2 In addition, it may be particularly agreed that the deviation from straightness shall not exceed 0,2% of the actual length of the plate, and that the out-of-squareness shall not exceed 1% of the actual width of the plate (see subclauses 7.2.4 and 7.2.5).

6.6 Flatness

6.6.1 Table 4 lists the permissible deviations from flatness (for testing see subclause 7.2.6).

6.6.2 It should be noted that improper handling of the plate when transported or stored is liable to increase considerably the deviations from flatness.

Table 4. Permissible deviations from flatness

Nominal thickness <i>s</i>	Permissible deviations from flatness for a gauge length of	
	1000 ¹⁾	2000
3	9	14
4	9	14
5	8	12
6	8	12
8	7	11
10	7	11

¹⁾ Where the distance between the two points of contact of the plate with the straightedge is less than 1000 mm, the deviation from flatness shall not exceed 1 % of this distance, but the values given in the table shall not be exceeded. This specification applies only to gauge lengths of not less than 300 mm.

7 Testing for dimensional accuracy**7.1 Scope of test programme**

If an inspection test has been agreed, the number of plates to be tested by the manufacturer for dimensional accuracy shall also be agreed.

7.2 Test procedure**7.2.1 Thickness**

The thickness of the plate shall be determined at a point outside the patterned area. The distance of the measuring point from the edges of the plate shall not be less than 25 mm.

7.2.2 Width

The width shall be measured at right angles to the longitudinal axis of the finished plate.

7.2.3 Length

The length of the plate is deemed to be the length of the largest rectangle that can be inscribed in the plate delivered.

7.2.4 Straightness

The deviation from straightness is deemed to be the maximum distance of a longitudinal edge of the plate from a straight line joining the two ends of this longitudinal edge. It shall be measured on the concave side of the plate.

7.2.5 Squareness

The out-of-squareness *u* is deemed to be the vertical projection of a transverse edge on a longitudinal edge (see figure 4).

7.2.6 Flatness

The plates to be tested for deviation from flatness shall be placed on a flat horizontal surface; they shall rest freely under their own weight (see subclause 6.6.2).

The deviation from flatness is deemed to be the maximum distance between the smooth side of the plate and a straightedge 1000 mm or 2000 mm long, which can be laid in any desired direction. Only that part between two points of contact between the straightedge and the plate may be taken into consideration. The deviations from flatness shall be measured at a distance of not less than 25 mm from the longitudinal edges and not less than 200 mm from the ends of the plate (see figure 5).

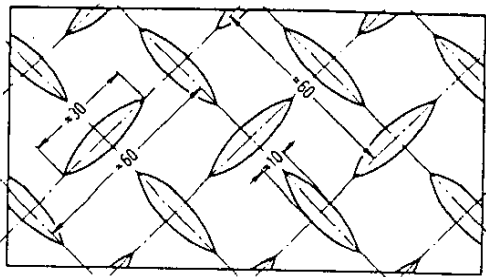


Figure 1. Pattern T

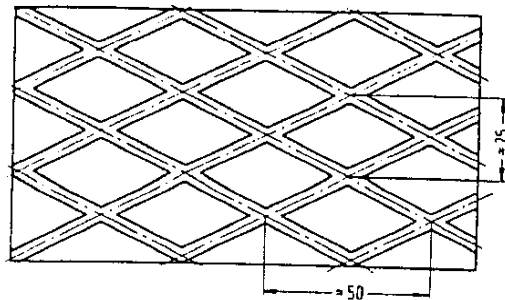


Figure 2. Pattern R

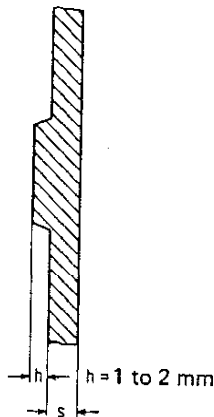


Figure 3. Height of pattern

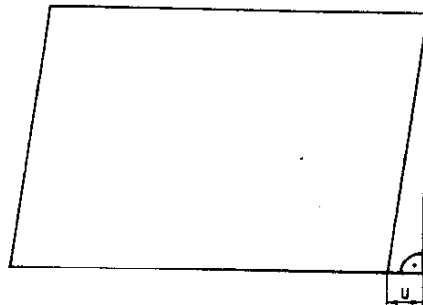


Figure 4. Determination of deviation from squareness

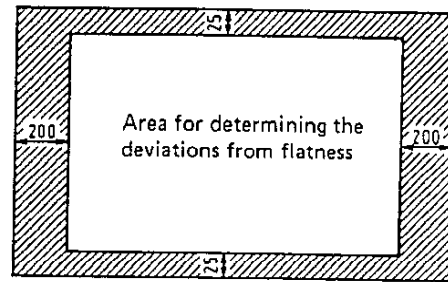


Figure 5. Testing the flatness

Standards referred to

- DIN 1353 Part 2 Abbreviations of terms for semi-finished products
 DIN 17 100 Steels for general structural purposes; quality standard

Other relevant standards and documents

- DIN 1543 Steel flat products; hot rolled plate 3 to 150 mm thick; permissible deviations of dimension, weight and form
Stahl-Eisen-Lieferbedingungen (Iron and steel delivery conditions) 014¹⁾
Warmbreitband mit Mustern; Masse, Gewichte, zulässige Abweichungen (Patterned hot wide strip; dimensions, masses, permissible deviations)

Explanatory notes

This first edition of DIN 59 220 specifies the permissible deviations of dimension, mass and form for hot rolled patterned steel plate.

The only types of pattern T (bulb pattern) and R (diamond pattern) that are deliverable at present for steel plate (see figures 1 and 2) have been standardized, the height of the pattern being between 1 and 2 mm.

The permissible deviations in thickness, width and length and the details relating to straightness, squareness and flatness (which are given in clause 6) are in conformity with the specifications for plate with smooth surface as described in DIN 1543 (October 1981 edition), whilst the values regarding the theoretical mass (table 3) have been slightly increased.

International Patent Classification

B 21 B 1-26

¹⁾ Published by: *Verein Deutscher Eisenhüttenleute* (Society of German Ferrous Metallurgy Engineers); obtainable from: *Verlag Stahleisen mbH*, Postfach 8229, D-4000 Düsseldorf 1.