

**MECHEL CMP Metallurgical Specification MS 87-238 160516**

**Steel grade:** S235JR+N (1.0038+N); S355J2+N (1.0577)

**Normative documentation** DIN EN 10025-2:2005<sup>1)</sup>+ MS 87-238 160516

**Name of material:** hot-rolled plate

**Scope and Delivery Condition:** Hot-rolled plate is delivered in not-pickled condition and without oil coating. The normalizing (N) is to be replaced by identical heat treatment during hot-working.

Dimensions and permissible variations expressed in mm for plates with trimmed edges and cut ends shall conform to requirements of table 1.

Table 1

Thickness	Width	Length	Permissible variations		
			in thickness	in width	in length
from 8 to 15 exclusive	1500;	6000	-0,5/+0,9	-0/+20	-0/+40
from 15 to 20 inclusive	2000		-0,6/+1,0		
20	2000	8000			-0/+50

Note - The cutting obliquity shall not cause plates being outside the permissible variations in length.

Dimensions and permissible variations expressed in mm for plates with mill edges and mill ends shall conform to requirements of table 2.

Table 2

Thickness	Width	Length	Permissible variations		
			in thickness	in width	in length
25	2000	7000-8500	-0,7/+1,3	-0/+100	not specified
30	2000	7000-8000			
40	2000	5000-6000	-0,9/+1,7		

**Notes**

- 1 It is allowed to deliver separate plates with flame cut of edge and/or ends.
- 2 Plates are delivered in different lengths within specified range, length is specified by Producer.
- 3 Narrowing of the width of the plate is allowed up to 100 mm at the area of 500 mm length from the end of plate. The measurement of length is carried at a distance of at least 150 mm from cavity of mill end.

Desirable deviation from flatness:

- for plates in thickness up to 20 mm incl. – no more than 7 mm per a meter,
- for plates in thickness 25 mm and 30 mm - no more than 6 mm per a meter,
- for plates in thickness 40 mm - no more than 5 mm per a meter.

Actual deviation from flatness shall be no more than 10 mm per a meter for plates in all thicknesses.

**Surface quality:** Class A of subgroup 1 DIN EN 10163-2:2005 and limits subject to the minus side of permissible variation in thickness as stated in tables 1 and 2.

Surface condition is checked without using magnifying devices as per Producer's practice.

**Chemical composition** of steel based on heat analysis shall conform to requirements of table 3, % by mass.

Table 3

Steel grade	C	Mn	Si	P	S	Cu	Ni	Cr	N	Al	Mo	V
S235JR (1.0038)	0,17	1,40	+	0,035	0,035	0,20	0,20	0,20	0,012	+	+	+
	max	max		max	max	max	max	max	max			
S355J2 (1.0577)	0,20	1,60	0,55	0,025	0,025	0,20	0,20	0,20	+	+	+	+
	max	max	max	max	max	max	max	max				

**Notes**

- 1 S235JR (1.0038) – rimming steel not permitted  
S355J2 (1.0577) – fully killed steel nitrogen binding elements in amount sufficient to bind the available nitrogen.
- 2 The symbol «+» means that mass content of element is not specified, but checked and shall be reported in the inspection certificate.

Table 3(continued)

3 The carbon equivalent *CEV* for both steel grades shall be determined as follows:

$$CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

Value of carbon equivalent shall conform to requirements of table 6 of DIN EN 10025-2:2005.

When calculating the carbon equivalent value, the mass content of the elements reported in the inspection certificate shall be used in the formula.

Sampling and sample preparation for the determination of chemical composition shall comply with DIN EN ISO 14284:2003 or GOST R ISO 14284-2009.

Measuring technique of mass content of elements in steel shall be at the discretion of the Producer.

Permissible variations for product analysis (made by the Customer) shall conform to requirements of table 4, %.

Table 4

Steel grade	C	Mn	Si	P	S	N
S235JR (1.0038)	+0,02	+0,10	—	+0,005	+0,005	+0,002
S355J2 (1.0577)	+0,03	+0,10	+0,05	+0,005	+0,005	—

Note – the symbol «—» means that permissible variations for specified element are not allowed.

**Macrostructure of plates** shall be free of delaminations. The absence of delaminations is guaranteed by Producer's technology.

**Mechanical properties and impact energy:**

- for plates in thickness up to 20 mm inclusive shall conform to requirements of tables 7 and 9

DIN EN 10025-2:2005;

- for plates in thickness over 20 mm desirable values of the tested parameters are specified in tables 7 and 9 DIN EN 10025-2:2005. Actual test results shall not be considered as defective and shall be reported in the inspection certificate.

Tensile testing is carried out as per ISO 6892-1:2009(E). Test pieces dimensions are at the discretion of the Producer. Sampling shall be as per Producer's practice.

Impact testing is carried out as per ISO 148-1:2009(E).

One plate per lot shall be subject to inspection to determine mechanical properties and impact energy.

Sampling is as per Producer's practice.

**UST** as per DIN EN 10160:1999, quality class S1 as per table 3, class E1 as per table 5 - for trimmed edges. The extent of testing is 100 %.

**Rules of acceptance:** plates are delivered by lots. The lot shall consist of plates from the same steel grade, from the same heat and dimension.

10 % of plates per a lot shall be subject to shape and dimensions inspection.

Dimensions and shape of plates shall be measured as per Producer's practice with measuring means providing suitable accuracy of measurement.

**Unspecified** rules of acceptance, test methods, sampling and test piece selection, testing and re-testing procedures, measuring means and equipment that provide suitable accuracy when checking the tested parameters, the calibration of measuring means and equipment shall be at the discretion of the Producer.

**Rounding of numbers:** carried out as per ISO 80000-1:2009(E) (rule B).

**Packing:** Plates are delivered in bundles without strapping as per Producer's practice. The mass of bundles shall not exceed 8 mt.

Each bundle is accompanied by packing list including number of plates per a bundle.

**Marking on plates:** shall be painted or hot stamped with conventional numeric code (steel grade and heat number shall be decoded in the inspection certificate).

**Marking on the top plate of the bundle:** one thermostable tag shall be attached on the top plate of each bundle.

Marking shall provide heat number, steel grade, sizes of plates.

**Marking on tags:** heat number, steel grade, size and mass and CE marking. Two tags are attached to the bundle with transverse strapping tape in one turn.

**Inspection Certificate:** in accordance with DIN EN 10204:2005 3.1, reporting normative documentation (DIN EN 10025-2:2005+MS 87-238 160516), all the tested parameters and referencing all the applied standards, stating «*Material is free from radiation and mercury contamination*» and with CE marking.

**Customer's Signature**

**Producer's Signature**

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- 1) **The requirements of indicated standard are to be fulfilled, taking into consideration the following additions, alterations and definitions.**

(DIN EN 10025-2:2005+MS 87-238 160516) shall be reported in the order.