GOST : 9045-80

Title : COLD-ROLLED THIN SHEETS
FOR COLD STAMPING

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USSR STATE STANDARD

Cold-rolled Thin sheets out of Low Carbon Alloy Steel for Cold Stamping
Technical specifications
OKP 09 7300

GOST 9045-80
This supersedes GOST 9045-70
Valid upto 01.07.1986.

The present standard relates to thin-walled, cold-rolled stock made out of low carbon alloy steel of thickness 0.5 to 3 mm, in sheets and rolls, intended for cold stamping.

1. CLASSIFICATION

Thin-walled, cold-rolled stock is subdivided as follows:

Into four categories with respect to suitability for drawing:

ВОСВ (VOSV) - Extremely intricate drawing;

ОСВ (OSV) - Very intricate drawing;

СВ (SV) - Intricate drawing ant

ВГ (VG) - Extremely deep drawing

Into three groups with respect to surface finish:

Very high finish - I

High finish - II

Improved finish - III

Into three categories with respect to surface condition:

Glossy - зл (gl);

Matt - м (m);

Rough - ш (Sh).

Into two categories with respect to rolling accuracy:

Improved accuracy - А

Normal accuracy - Б (B).

EXAMPLES OF CONVENTIONAL DESIGNATION

Sheet, made out of 08Ю grade steel, 1.0 mm thick, 1000 mm wide, 2000 mm long, with improved rolling accuracy, very high surface finish with matt surface and suitable for very intricate drawing:

Sheet $\dfrac{\text{A-1.0x1000x2000 GOST 19980-74}}{\text{1 - M - ОСВ - 08Ю GOST 9045-80}}$
A

Roll of steel of grade 08кп, 0.8 mm thick, 1500 mm wide, made to ordinary rolling accuracy, with high surface finish, matt surface and made suitable for extremely deep drawing;

$\dfrac{\text{Б -0.8x1500 GOST 19904-71}}{\text{II - 2Л - B - 08кпGOST 9045-80}}$
(чв) -(V) - (кп)

2. TECHNICAL REQUIREMENTS

2.1. Rolled stock is manufactured in conformity with the requirements of the present stadard and to technical documentation approved in the established maner.

2.2. Rolled stock must conform to the requirements of GOST 19904-74 in respect of dimensions, limit deviations and flatness.

Rolled stock belonging to group I surface finish is manufactured with a high degree of flatness if no other group is stipulated by the customer.

Table 1

Steel grade	Proportion of elements by weight, %								
	Carbon max	Mn	S	P	Al metallic	Si	Cr	Ni	Cu
			max			max			
08Ю	0.07	0.20 to 0.35	0.025	0.020	0.02 to 0.07	0.01	0.03	0.06	0.06
08пс	0.09	0.20 to 0.45	0.030	0.025	-	0.04	0.10	0.10	0.15
08кп	0.10	0.20 to 0.40	0.030	0.025	-	0.03	0.10	0.10	0.15

Note: 1. Presence of aluminium is permissible in 08пс steel.

2. Carbon content upto 0.08% by weight is permissible in 08Ю grade steel provided the norms for mechanical properties are met.

3. Arsenic and nitrogen content in 08Kp steel by weight must conform to GOST 1050-74.

4. Remaining elements - copper upto 0.15% and nickel upto 0.10% by weight may be present in 08ю grade steel.

5. Silicon content upto 0.03% and chromium content upto 0.04% by weight is permitted in 08ю grade steel provided the norms for mechanical properties are met.

2.3. Rolled stock is made out of low carbon alloy steels with the chemical composition shown in Table 1.

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2.4. Sheets are trimmed on all sides. Sheets obtained from rolls, rolled in a continous rolling mill, may be manufactured with rolled longitudinal edge. Rolled stock in rolls may be manufactured with rolled or trimmed edge.

2.5. Trimmed edges must be free from peeling and edge cracks visible to the naked eye. Defects, exceeding half the limit deviation in sheet width and resulting in width going beyond nominal value, are not permitted at the edges of sheets.

2.6. Rolled stock supplied in rolls must not have edges bent at an angle of 90° and over, or twisted or torn ends. The length of a cut piece of less than full width must not exceed the width of the roll.

2.7. The surface of rolled stock must be free from scabs, blisters, projections, metal particles rolled in, cuts, dirt rolled in or flakes. Peeling is not acceptable.

2.8. Characteristics of the quality and condition of the surface of rolled stock are set out in Table 2.

2.9. Mechanical properties of rolled stock must conform to the requirements of Table 3.

2.10. Sheets and rolls are manufactured in dressed condition. They may, by mutual consent, be manufactured without dressing, in

which case, slip bands or lines and crumpled edges are acceptable and proof stress and surface finish parameters are not standardised.

2.11. Thin sheets must be subjected to a deep drawing test. The depth of spherical indentation must conform to the norms shown in Table 4.

2.12. Microstructure of rolled stock must conform to the requirements shown in Table 5.

2.13. Ferrite No. 10 grain is permitted in rolled stock intended for extremely deep drawing BT (VG) and made out of 08кп and 08пс grades of steel provided the requirements in respect of mechanical and technological properties are met.

2.14. Grain number is not standardised for rolled stock having an extended grain structure.

Grain dimension and shape are defined with reference to specimens approved in the established manner.

2.15. Rolled stock must be subjected to heat treatment. The manufacturer decides upon the kind of heat treatment.

2.16. Rolled stock may be manufactured without deep drawing test and without checking microstructure and mechanical properties, provided facilities are available with the customer for stamping the metal.

2.17. Sheets and rolls must be smeared on both sides with a thin layer of neutral oil. Rolled stock may, by mutual consent, be manufactured without such oiling in which case traces of oil are acceptable.

Table 2

Group	Surface condition	Surface finish	Nature of surface finish quality
I	Glossy	Surface finish Ra not more than 0.6 micron	Isolated minor grooves and scratches more than 20 mm long are not permitted on the face of the sheet or roll (ie. on the better quality surface).
	Matt	Surface finish Ra 0.8 to 1.6 micron; Density of roughness Sm not more than 0.20 mm; Type and direction of nonuniformity arbitrary	The reverse side of the sheet or roll must be free from scratches, cavities and impressions exceeding half the limit deviation in the sheet thickness.
	Rough	Surface finish Ra more than 1.6 micron	Temper colour is not acceptable.
II	Glossy or rough	Surface finish is not standardised	Waviness, grooves, scratches more than 50 mm long and exceeding half the limit deviation in the thickness of the sheet or roll are not permitted on the face of the sheet or roll.
			Waviness, grooves, scratches, marks left while dressing, cavities, dents and impression exceeding the limit deviation in sheet or roll thickness are not permitted on the reverse side of the sheet.
			Dirt patches are acceptable.
			Temper colour is not permitted on both sides of the sheet or roll at a distance exceeding 50 mm from the edge of the sheet or roll.
III	Glossy or rough	Surface finish is not standardised	Face and reverse sides of the sheet or roll should be free from waviness, grooves, scratches, marks left while dressing cavities and impressions exceeding the limit deviations in thickness of the sheet or roll.
			Dirt patches are permitted.
			Temper colour is not permitted at a distance of more than 20 mm away from the edges of sheet or roll. Temper colour all over the surface of the sheet or roll may be permitted by mutual consent.

Note. 1. Surface finish may be defined with reference to an agreed master specimen.

2. A thin film of rust is acceptable if rolling is done without lubrication.

3. Surface defects may be removed by dressing with a fine grained emery or felt ring using abrasive paste on sheets of all groups except the face of group I surface finish. Dressing depth must not result in minus tolerance of the sheet thickness being exceeded.

4. Sheets and rolls of group II surface finish may, at customer's request be made to standardised surface finish, the norms being agreed upon mutually.

5. Other values for surface finish parameters may be set by mutual consent.

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Table 3

Category	Steel	Yield limit, σ_T, MPa, (kgf/mm^2) max	Ultimate strength, σ_B, MPa (kgf/mm^2)	Relative elongation, %, δ_4 min. for sheet thickness			Rockwell hardness HRB, max
				from 0.5 upto 1.5	from 1.5 upto 2.0	from 2.0 upto 3.0	
ВОСК (VOSV)	08Ю	186(19)	255-323 (26-33)	40	42	-	46
ОСВ (OSV)	08Ю	196(20)	255-323 (26-33)	36	40	-	46
СВ (SV)	08Ю	206(21)	255-353 (26-36)	34	38	-	48
ВГ (VG)	08КП 08ПС	-	255-363 (26-37)	28	29	30	-

Note: 1. Rolled stock suitable for extremely deep drawing is manufactured with standardised yield limit at customer's request, the norms being defined by mutual consent.

2. Steel of grades 08Ю and 08ПС may be substituted for 08КП grade steel in the manufacture of rolled stock suitable for extreme deep drawing.

3. An increase in ultimate tensile strength by 29 MPa (3 kgf/mm^3) is permitted provided all other requirements of this standard are met.

4. A reduction in the relative elongation by 2 units is permissible in rolled stock less than 0.7 mm thick.

Table 4

Sheet thickness	Depth of spherical indentation, not less than, for category of drawing			
	ВОСВ (VOSV)	ОСВ (OSV)	СВ (SV)	ВГ (VG)
0.5	9.7	9.4	9.2	9.0
0.6	10.0	9.8	9.6	9.4
0.7	10.4	10.2	10.0	9.7
0.8	10.7	10.6	10.4	10.0
0.9	11.0	10.9	10.6	10.3
1.0	11.2	11.1	10.8	10.5
1.1	11.4	11.3	11.0	10.8
1.2	11.6	11.5	11.2	11.0
1.3	11.8	11.7	11.4	11.2
1.4	11.9	11.8	11.5	11.3
1.5	12.0	11.9	11.6	11.5
1.6	12.1	12.0	11.7	11.6
1.7	12.2	12.1	11.9	11.8
1.8	12.3	12.2	12.0	11.9
1.9	12.4	12.3	12.1	12.0
2.0	12.5	12.4	12.2	12.1

Note: Norms for depth of spherical indentation for intermediate thicknesses are taken as applicable to the nearest lower thickness.

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Table 5

Category of drawing	Ferrite grain number	Structureally free cementite, not more than
ВОСВ (VOSV)	6,7,8,9	2
ОСВ (OSV)		2
СВ (SV)		3
ВГ (VG)		3

Note: 1. Ferrite grain may be nonuniform with in two adjacent numbers.

2. Dimensional norms for grain size relate to the structure of equiaxial grains.

2.18. Relative elongation and depth of spherical indentation for rolled stock out of 08KP and 08C grades of steel, supplied in dressed condition, is guaranteed by the manufacturer for 10 days from the date of despatch.

3. ACCEPTANCE RULES

3.1 Rolled stock is accepted in batches. A batch of sheets and rolls must consist of steel from a single melt-ladle, one charge of the furnance or from a single heat treatment schedule in the case of continuous action furnaces, steel belonging to a single category of drawing, having the same thickness and the same surface finish group and must be accompanied by a single quality certificate in accordance with GOST 7566-69 with the additional stipulation that the remark "extended grain" should be entered for the structure with extended grain.

3.2. Two sheets or one roll from a batch is the sampling scale for quality check on rolled stock.

3.3. Microstructure of rolled stock is checked at customer's request.

3.4. Surface finish is checked at customer's request.

3.5. If unsatisfactory test results are obtained in respect of even a single parameter, repeat tests are carried out in accordance with GOST 7566-69.

4. METHODS OF TESTING

4.1. Mechanical and technological properties of rolled stock are checked by cutting out one transverse specimen for tensile test and another for the drawing test, out of each selected sheet or roll. The place where the specimen is cut is determined in conformity with GOST 7564-73.

4.2. Dimensions and flatness of sheets and rolls are checked in

accordance with 19904-74.

4.3. Samples for chemical analysis are drawn as specified in GOST 7565-73.

4.4. Chemical analysis of steel is carried out in conformity with GOST 22536.0-77 to GOST 22536.10-77 or by other methods providing the required accuracy.

4.5. Surface quality of rolled stock is checked by external inspection without using magnification devices.

4.6. Tensile test is carried out as per GOST 11701-66 on a specimen with a design length of 80 mm and width of 20 mm.

Tensile test may, by mutual consent, be carried out specimens of initial design length $25\sqrt{F_0}$ and width b_0 = 12.5 mm for sheets of thickness 0.6 to 1.6 mm and b_0 = 20 mm for sheets of thickness over 1.6 mm and upto 3.0 mm.

4.7. The tensile stress diagram for rolled stock of drawing categories VOSV, OSV and SV should not have pronounced upper ReH and lower ReL yeild limits. The surface of specimens after the tests must be free from bands representing sliplines.

4.8. Drawing test on rolled stock is conducted as per GOST 10510-80 Each specimen is tested at three places, corresponding to the middle and edges of the width (but not closer than 40 mm to the edges). The aritmetic mean is taken as the test result for each specimen. The test may be conducted on an Erichsen apparatus using 80 to 90 mm wide samples.

4.9. Microstructure is determined in accordance with GOST 5639-65 and GOST 5640-68.

4.10. Statistical and nondestructive methods of inspection, agreed upon between the manufacturer and customer may be used for

evaluating rolled stock quality.

5. MARKING, PACKING, TRANSPORT AND STORAGE

5.1. Packing and marking are done as per GOST 7566-69.

5.2. Inside diameter of the roll and its maximum and minimum weight must conform to GOST 19904-74.

5.3. Sheets are bundled into packets. Packets are wrapped in soft sheets or packed into metal boxes arranged in wooden crates and securely fixed with steel strips.

Packets of sheets must, if the customer insists, be wrapped in waste-proof paper.

Other methods of packing the sheets are also permitted.

5.4. Rolled stock may be despatched by any form of transport.

5.5. Rolled stock is stored in enclosed premises or under conditions which exclude the possibility of moisture falling on it.