Annexure 3 to GOST 2060-73
ПРИЛОЖЕНИЕ 3 к ГОСТ 2060-73
Справочное Reference

Cross-sectional Area and Theoretical Weight of 1 m of Drawn Rods

Nominal diameter mm	Cross-sectional area of rods, mm^2			Theoretical weight of 1 m of rods, kg		
	Rounds	Squares	Hexagons	Rounds	Squares	Hexagons
3,0	7,07	—	—	0,060	—	—
3,5	9,62	—	—	0,080	—	—
4,0	12,57	—	—	0,106	—	—
4,5	15,90	—	—	0,135	—	—
5,0	19,6	25,0	21,7	0,17	0,21	0,18
5,5	23,8	30,3	26,2	0,20	0,26	0,22
6,0	28,3	36,0	31,2	0,24	0,31	0,27
6,5	33,2	42,3	36,6	0,28	0,36	0,31
7,0	38,5	49,0	42,4	0,33	0,42	0,36
7,5	44,2	56,2	48,7	0,38	0,48	0,42
8,0	50,3	64,0	55,4	0,43	0,54	0,47
8,5	56,7	72,2	62,6	0,48	0,61	0,53
9,0	63,6	81,0	70,2	0,54	0,69	0,60
9,5	70,9	90,2	78,2	0,60	0,77	0,66
10,0	78,5	100,0	86,6	0,67	0,85	0,74
11,0	95,0	121,0	104,8	0,81	1,03	0,89
12,0	113,1	144,0	124,7	0,96	1,22	1,06
13,0	132,7	169,0	145,4	1,13	1,44	1,26
14,0	153,9	196,0	169,7	1,31	1,67	1,44
15,0	176,7	225,0	194,9	1,50	1,91	1,66
16,0	201,1	—	—	1,71	—	—
17,0	227,0	289,0	250,3	1,93	2,46	2,13
18,0	254,5	—	—	2,16	—	—
19,0	283,5	361,0	312,6	2,41	3,07	2,66
20,0	314,2	—	—	2,67	—	—
21,0	346,4	441,0	381,9	2,94	3,75	3,25
22,0	380,1	484,0	419,1	3,23	4,11	3,56
23,0	415,3	—	—	3,53	—	—
24,0	452,4	576,0	498,8	3,85	4,90	4,24
25,0	490,9	—	—	4,17	—	—
27,0	572,6	729,0	631,0	4,87	6,20	5,36
28,0	615,8	—	—	5,23	—	—
30,0	706,9	900,0	779,0	6,01	7,65	6,62
32,0	804,2	1021,0	887,0	6,84	8,70	7,54
35,0	962,1	1225,0	1060,9	8,18	10,41	9,02

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ominal diameter mm	Cross-sectional area of rods, mm^2			Theoretical weight of 1 m of rods, kg		
	Rounds	Squares	Hexagons	Rounds	Squares	Hexagons
36.0	1017.9	1296.0	1122.0	8.65	11.02	9.54
38.0	1134.1	1444.0	1250.5	9.64	12.27	10.63
40.0	1256.6	-	-	10.68	-	-
41.0	-	1681.0	1456.0	-	14.29	12.38
45.0	1590.4	-	-	13.50	-	-
46.0	-	2116.0	1832.0	-	17.99	15.57
50.0	1963.5	2500.0	2190.0	16.69	21.25	18.40

Note: Density of brass has been taken as 8.5 g/cm^3 in calculating theoretical weight.

Annexure 4 to GOST 2060-73
Reference

Cross-sectional Area and Theoretical Weight of 1 m of Extruded Rods

Nominal diameter, mm	Cross-sectional area of rods, mm2			Theoretical weight of 1 m of rods, kg		
	Rounds	Squares	Hexagons	Rounds	Squares	Hexagons
10	78,5	—	—	0,67	—	—
11	95,0	—	—	0,81	—	—
12	113,1	—	—	0,96	—	—
14	153,9	—	—	1,31	—	—
16	201,1	—	—	1,71	—	—
18	254,5	—	—	2,16	—	—
20	314,2	—	—	2,67	—	—
22	380,1	484,0	419,1	3,23	4,11	3,56
23	415,3	—	—	3,53	—	—
24	—	576,0	498,8	—	4,90	4,24
25	490,9	—	—	4,17	—	—
27	—	729,0	631,0	—	6,20	5,36
28	615,8	—	—	5,23	—	—
30	706,9	900,0	779,0	6,01	7,65	6,62
32	804,2	1024,0	887,0	6,84	8,70	7,54
35	962,1	—	—	8,18	—	—
36	—	1296,0	1122,0	—	11,02	9,54
38	1134,1	—	—	9,64	—	—
40	1256,6	—	—	10,68	—	—
41	—	1681,0	1456,0	—	14,29	12,38
42	1385,4	—	—	11,78	—	—
45	1590,4	—	—	13,52	—	—
46	—	2116,0	1832,0	—	17,99	15,57
48	1809,6	—	—	15,33	—	—
50	1963,5	2500,0	2165,0	16,69	21,25	18,40
55	2375,8	3025,0	2620,0	20,19	25,71	22,27
60	2827,4	3600,0	3118,0	24,03	30,60	26,50
65	3318,3	4225,0	3659,0	28,21	35,91	31,10
70	3848,5	4900,0	4243,0	32,71	41,65	36,07
75	4417,9	5625,0	4871,0	37,55	47,81	41,40
80	5026,6	6400,0	5542,0	42,73	54,40	47,11
85	5674,5	—	—	48,23	—	—
90	6361,7	8100,0	7014,0	54,07	68,70	59,62
95	7088,2	—	—	60,25	—	—

Nominal diameter, mm	Cross-sectional area of rods, mm^2			Theoretical weight of 1 m of rods, kg		
	Rounds	Squares	Hexagons	Rounds	Squares	Hexagons
100	7854.0	1000.0	8660.0	66.76	85.00	73.61
110	9503.3	-	-	80.78	-	-
120	11309.7	-	-	96.13	-	-
130	13273.3	-	-	112.72	-	-
140	15393.8	-	-	130.85	-	-
150	17671.5	-	-	150.21	-	-
160	20106.2	-	-	170.90	-	-

Note: Density of brass has been taken as 8.5 g/cm^3 in calculating theoretical weight.

Annexure 5 to GOST 2060-73
Reference

Approximate Density of Brass

Brass Grade	Density, g/cm^3
Л 60	8.40
Л 63	8.40
Л 63 non-magnetic	8.40
ЛС 59-1	8.45
ЛС 59-1 non-magnetic	8.45
ЛС 63-3	8.50
ЛС 63-3 non-magnetic	8.50
ЛО 62-1	8.45
ЛЖС 58-1-1	8.45
ЛМц 58-2	8.50
ЛЖМц 59-1-1	8.50
ЛАЖ 60-1-1	8.20

Annexure 6 to GOST 2060-73
Reference

Approximate Hardness of Rods

(Brinell Hardness values)

rass rade	Manufacturing process and material condition	Rod diameter, mm	Brinell hardness not less than
60	Extruded Drawn soft Drawn medium hard Drawn hard	10-160 3-50 3-40 3-12	- 80 100 130
63	Extruded Drawn soft Drawn medium hard Drawn hard	10-160 3-50 3-40 3-12	- 70 100 130
C59-1	Rxtruded Drawn soft Drawn medium hard Drawn hard	10-160 3-50 3-40 3-12	- 80 100 130
C 63-3	Drawn hard Drawn medium hard	3-9.5 10-14 15-20 10-20	155 143 130 95
O62-1	Extruded Drawn medium hard	10-160 3-50	- 100
A ЖС -1-1	Extruded Drawn medium hard	10-160 3-50	- 130
Мц58-2	Extruded Drawn medium hard	10-160 3-12 over 12-50	- 130 125
ЖМц -1-1	Extruded Drawn medium hard	10-160 3-12 over 12-50	- 130 130
A Ж -1-1	Extruded	10-160	-

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Annexure 7 to GOST 2060-73

Reference

A Method for Inspecting Press Shrinkage Cavities

1. Purpose and General Requirements of inspection

1.1 The method described here is a guide for ultrasonic inspection with a view to detecting press shrinkage cavities and defining their terminal point in rods of diameter 10 mm and over extruded out of non-ferrous metals and alloys. The method uses ultrasonic flaw detection by contact and transmits ultrasonic frequencies inwards from the cylindrical surface of the article. Any ultrasonic flaw detector may be used with an appropriate probe providing adequate sensitivity which can be adjusted with reference to a standard specimen.

This method of inspection envisages the use of scanner with built-in separately integrated probes as well as directly integrated probes for ultrasonic detection. The scanner maintains reliable and stable acoustic contact between the piezo-electric converter of the probe and the article during motion ie when the probe is moved along the surface of the article under inspection. This is achieved by a continuous supply of liquid.

1.2 The physical fundamentals of the method and the sequence of operations of the flaw detector have been described very briefly here to enable an understanding of the technique and procedure for locating the terminal point of the press-shrinkage cavity in extruded rods.

1.3 Only those persons who have received training and possess a certificate of having completed a course on ultrasonic flaw detection and have studied the present method thoroughly may be allowed to carry out inspection using this device.

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1.4 As the factories accumulate experience on ultrasonic flaw detection the method may be further elaborated and refined in consultation with the State Scientific Research and Design Institute for nonferrous alloys and their processing.

2. Standard (Master) Specimens for Adjusting Sensitivity and Automatic Inspection Range of the Flaw Detector

2.1 Special standard specimens are prepared from 300 mm long pieces of rods with diameter 100, 60, 40 and 25 mm for adjusting the flaw detector to the given sensitivity. The specimens must be of the same alloy as the article under inspection or one with nearly the same acoustic properties.

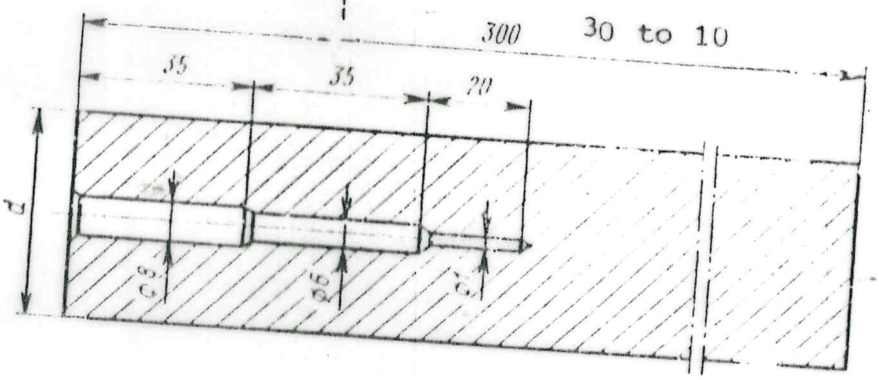
2.2 The outside surface condition of the standard specimen must be no worse than that of the article under inspection.

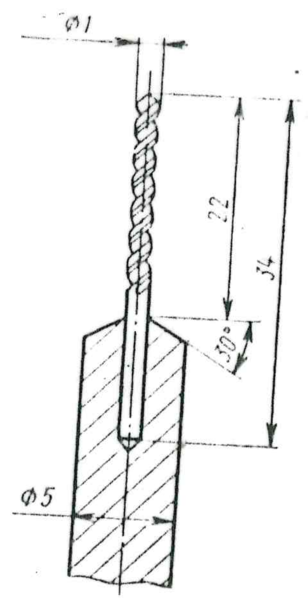
2.3 The portion of the article from which the standard specimen is prepared must be free from internal defects of metallic origin which may be detected by the ultrasonic method while adjusting the flaw detector for the highest real sensitivity.

2.4 The drawing below shows a standard specimen for adjusting the sensitivity of the apparatus for inspecting rods. The diameter of the blank for making the standard specimen is selected from the Table below depending on the diameter of the rod to be inspected.

mm

Diameter of blank for standard specimen	Diameter of rod under inspection
100	80 to 180
65	80 to 150
40	50 to 30
20	30 to 10





2.5 A standard specimen is considered to be valid if it carries attestation by the Head of the central Laboratory of the manufacturing factory.

3. Preparation for Inspection

3.1 The articles must be cleaned to remove dirt, dust, grease, paint and other impurities before conducting inspection with the flaw detector.

3.2 The probe and the signal lamp are connected to the flaw detector. The scanner is connected to the tank containing the contact liquid. The flow of contact liquid is adjusted by means of the regulating valve in such a manner as to ensure reliable acoustic contact and minimum consumption of contact liquid (water).

3.3 Connected of flaw detector to the supply and operation of the instrument must be carried out in accordance with the technical description and operating instructions of the particular type of flaw detector used for inspection.

3.4 The oscilloscope part of the flaw detector must be adjusted before beginning to tune the instrument. Brightness, focus, vertical and horizontal hold of the oscilloscope must be adjusted such that the scanning line occupies a portion below the centre line of the screen by about 1/3 the radius and is well focussed without a bright spot at its starting point.

3.5 The knobs in the front panel, of the instrument must be set in the following positions while tuning the flaw detector for determining the terminal point of the cavity in the article.

"Frequency" - in the position corresponding to the frequency of the probe of the У3К (UZK - Ultra-Sonic Detector);

"Sounding Range" in position II.

3.6 The sensitivity of the flaw detector is tuned using appropriate standard specimens. Maximum amplitude of the echosignal from the control reflector is obtained by moving the probe in the zone of minimum diameter of the control reflector. The "sensitivity" knob is rotated to set the amplitude of the echosignal from the control reflector to approximately half the height of the screen.

3.7 The leading edge of the gate pulse of the automatic defect signalling system is set to be alongside the trailing edge of the sounding pulse and the trailing edge of the gate pulse alongside the leading edge of the ground echosignal.

3.8 The correctness of tuning of the flaw detector must be checked after every two hours of operation with respect to the standard specimen.

4. Inspection Procedure

4.1 Inspection should be carried out in the quality control section. The inspection area should be convenient and should provide free access all around the circumference of the end of the tube where the press shrinkage cavity is likely to be found.

4.2 Inspection starts with the rear end of the extruded article. The surface of the article through which the ultrasonic oscillations are transmitted must be smooth and free from sharp dents, cavities and scratches.

The temperature of the unit under test must not be over 40°C.

4.3 Press shrinkage cavity in rods has an extended shape and varying orientation of reflecting surfaces in relation to the generatrix. Most frequently it lies close to the centre of the rod. Therefore its detectability from different surfaces may be different.

4.4 Suitable devices of the roller, knife-edge or other type with built-in ultrasonic probe are recommended to be used for mechanised movement of the probe along the surface of the unit under test.

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4.5 Rods of diameter less than 60 mm are checked at the 5 MHz band and those of diameter over 60 mm at the 2.5 MHz band. Lower frequencies are recommended to be used for detecting the terminal point of press shrinkage cavity in rods made out of material possessing elastic anisotropy and coarsegrained structure.

4.6 The scanner is placed on the cavity end ~~of the tube~~ and pressed tightly to the surface; the ground echosignal must now appear on the screen. As soon as the ground echosignal appears, the scanner is moved around and along the tube.

4.7 The scanning rate of the probe along the surface of the tube, is selected so as to secure reliable acoustic contact. This must not be more than 0.5 m/s.

4.8 The screen must be watched for the presence of acoustic contact while moving the probe across and along the article. A reliable ground echosignal indicates satisfactory transmission of ultrasonic oscillations into the tube. If the echosignal is lost in spite of the probe being serviceable and the tuning being correct, the reliability of acoustic contact is checked by increasing the flow of contact fluid and cleaning the tube surface with cotton waste.

4.9 The existence of a cavity may be surmised from the appearance of an additional, echosignal to the left of the ground reflection.

4.10 Once the cavity is detected the probe is moved along the article in order to determine its length and terminal point. This is ascertained by rotating the scanner around the article at the spot where the additional echosignal disppears altogether.

4.11 Having detected the extent of the cavity ultrasonically, a clearly visible identification mark is made along the circumference of the article.

4.12 While checking alloys having non-uniformly elastic coarse-grain structure, it is necessary to make a thorough inspection of the rear end of the rod where the structural noise is lower and the ground echosignal is stable. The location of the echosignal from the cavity is observed against the background of unstable structural noise and the cavity is tracked till the echosignal disappears from the CRT of the flaw detector. The scanner is moved along the rod all the time watching the echosignal from the cavity which unlike the structural noise is stable.

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Annexure 8 to GOST 2060-73
Reference

Suggested Applications of Rods

Brass grade	
Л63	In all branches of industry
ЛС 59-1	-do-
ЛС63-3 and ЛЖС58-1-1	In the watchmaking industry
ЛО62-1	In marine ship building industry
ЛМц58-2 and ЛЖМц59-1-1	In the ship building industry
ЛАЖ60-1-1	In the aviation industry

Revision No.1 to GOST 2060-73 - Brass Rods

(ISI. No.4, 1976)

Clause 2.7; Table 4; Heading "Manufacturing Process"

Delete the words "Drawn soft and".

Clause 2.7; Table 4; Add new note.

Note: In the case of drawn medium hard rods, curvature is not standardised. It may be established by mutual consent between manufacturer and customer.

Clause 2.12; Table 6; Mechanical properties of drawn medium hard rods made out of ЛС 59-1 grade alloy is to be included in the new version as given below:

Brass grade	Manufacturing process and material condition	Rod diameter, mm	Ultimate Tensile Strength, σ_{B}, kgf/mm^2	Relative elongation δ_{10}, %
			not less than	
ЛС 59-1	Drawn Medium hard	from 3 to 12 over 12 upto 20 over 20 upto 40	42 40 40	8 12 15

Clause 4.5 Reference to GOST 1497-61 is amended to GOST 1497-73.