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UDC 669.3-426.2:006.354

Group B 74 (V74)

USSR STATE STANDARD

COPY NO. 1

Electrical grade copper wire

GOST 2112-79

(CT C9 B

1383-78)

OKP 18 4490

This supercedes

GOST 2112-71

Valid upto 01.01.1986

The present standard applies to round copper wire intended for making conductors and cables and for other electrotechnical purposes.

This standard is in full conformity with CT C9B 1383-78 and the CMEA recommendations PC 1844-74 on standardisation.

1. Grades and Dimensions

1.1 Wires must be made to the following grades:

MM - soft copper;

MT - hard copper and

MC - copper for overhead lines.

1.2 Nominal diameter of wires and tolerance in it must conform to values specified in Table 1.

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Copper wire for overhead lines must be made with nominal diameter of 2.00; 2.51; 3.00; 3.63 or 4.00 mm. Wires may be made to other nominal diameters against order supported by proper justifications.

Ovality in cross-section must not result in the tolerance in diameter being exceeded.

Example of conventional designation of 1.00 mm diameter hard copper

Wire MT - 1.00 GOST 2112-79

① 40003 RD
AL. No. 17
I - 1769

② 40026TD/A-42
I 2209

③ 40015 RD
AL. 73/46

Shts-13

13 sheets

[Signature]
24/1/87

GSC
19/2/87

Nominal diameter	Tolerance	Nominal diameter	Tolerance	Nominal diameter	Tolerance	Nominal diameter	Tolerance
3.15		3.53*		3.81*	+0.03	4.80	+0.04
3.20		3.55		4.00		5.00	
3.27		3.57		4.10		5.20	
3.28*		3.61		4.11*		5.65	+0.05
3.30	+0.03	3.66	+0.03	4.15		6.00	
3.34		3.67*		4.23	+0.04	6.60	
3.35		3.72		4.25		8.00	
3.36*		3.75		4.50		9.42	+0.06
3.45		3.80		4.75			

* Not to be used in new designs.

2. Technical Requirements

2.1 Wire must be manufactured in conformity with the requirements of this standard.

2.2 Copper wire rod to GOST 13842-74 must be used for making copper wire.

2.3 Wire surface must be clean. Minor defects (scratches, tiny holes etc) and other defects arising out of the production process are acceptable provided their depth measured during control dressing does not exceed the tolerance in diameter specified in Table 1.

Slight temper colour is permitted on soft wire.

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2.4 Mechanical properties of MT and MM grade wire must conform to the values specified in Table 2 and those of grade MC to Table 3.

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2.5 Wire of grades MT and MC with nominal diameter from 1.00 to 6.00 mm inclusive must withstand the number of bendings specified in Table 4 without breaking.

Nominal diameter of wire, mm	Bending mandrel radius, mm tolerance ± 0.05 mm		Number of bendings not less than	
	MT	MC	MT	MC
From 1.00 to 1.20 incl.	2.5	-	7	-
over 1.20 " 2.00 "	5.0	10.0	6	15
" 2.00 " 2.60 "	6.0	10.0	6	15
" 2.60 " 3.00 "	7.5	10.0	7	10
" 3.00 " 3.50 "	7.5	-	5	-
" 3.50 " 4.00 "	10.0	10.0	5	9
" 4.00 " 5.00 "	10.0	-	4	-
" 5.00 " 6.00 "	15.0	-	5	-

Bend test is not carried out on MT and MC grade wire of nominal diameter less than 1.00 and over 6.00 mm, nor on MM grade wire.

2.6 MC grade wire must withstand, winding six closely packed turns on a mandrel of the same diameter as the wire and unwinding of these turns without breaking or peeling.

2.7 Electrical resistance of copper wire on DC must conform to the value specified in Table 5, when ^{20.0}reduced to 1 mm² cross-sectional area and 1 m. length at $\pm 20^\circ\text{C}$.

Nominal diameter of wire, mm	Specific electrical resistance of wire ohm. m, not more than	
	MM	MT, MC
Upto 1.00		0.0180
over 1.00 upto 2.44 incl.	0.01724	0.0178
2.50 and over		0.0177

2.8 Weight of a piece of wire must conform to the values specified in Table 6.

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Table 7

Name of check and test	Clause no.		Quantity of samples
	Technical Require- ment	Testing method	
Physical dimensions	1.2	4.2	3% of the bundles, coil or drums of wire, subject to minimum of three per batch
Requirements relating to wire surface:			100% of the bundles, coils or drums of wire.
as to defects	2.3	4.2	
as to cleanliness		4.3	
Ultimate strength and relative elongation	2.4	4.4	3% of the bundles, coil or drums of wire, subject to a minimum of three per batch
No. of bends	2.5	4.5	-do-
Strength while winding	2.6	4.6	-do-
Electrical Resistance	2.7	4.7	-do-
Weight of wire	2.8	4.8	100% of the bundles, coil or drums

3.4 If unsatisfactory results are obtained in the random sample tests in respect of even a single parameter, the particular test is repeated on twice the number of bundles or coils. The repeat test results are applicable to the whole batch.

3.5 Inward Goods Inspection for conformity with the requirements of the present standard is carried out by the customer on 3% of the bundles or coils of wire subject to a minimum of three bundles or coils per batch. Bundles or coils of wire received against a single quality certificate are treated as constituting a batch.

The excess of the actual measured maximum diameter at the given section over the nominal diameter is taken as the ovality.

4.3 Surface purity of the wire must be checked for conformity with the requirements of clause 2.3 by external inspection without using magnification devices.

4.4 Ultimate strength and relative elongation (clause 2.4) must be checked on a tensile testing machine as per GOST 10446-63 for wire having elongation over 10% and by the method described in GOST 10446-63 for wire having elongation upto and including 10%.

The test must be carried out on not less than 3 specimens of gauge length 200 mm. The arithmetic mean of three measurements must be taken as the final result.

4.5 Bend test (clause 2.5) must be carried out on not less than three specimens of wire as per GOST 1579-63.

The arithmetic mean of three measurements must be taken as the final result.

Wire of diameter upto 3.00 mm must be tested under a tensile force of 19.6 N (2 kgf).

4.6 Winding test (clause 2.6) must be conducted as per GOST 10447-63.

4.7 GOST 7229-76 must be followed for resistance measurement (clause 2.7)

4.8 The weight of the length of wire in a coil or drum, determined as the difference between the gross and net weights of the coil or drum as well as the weight of a bundle (clause 2.8) of wire is determined by weighing in balances as per GOST 19491-74 and GOST 23676-79.

Revisions

COPY NO. 1

1. Page 4, clause 2.4 Table 2 column 2, ultimate strength
Add the word "over" before each figure.
i.e over 200 to 290
over 200 to 280
over 200 to 270
over 200 to 260
2. Page 5, clause 2.7 Amend "Temperature $\pm 20^{\circ}\text{C}$ " to read $+ 20^{\circ}\text{C}$;
3. Table 5, Amend unit of measurement "ohm.m" to read "Microohm.m".
4. Clause 4.4 Amend reference GOST 10446-63 "to read" GOST 10446-80"
5. Clause 4.5 Amend reference "GOST 1579-63 "to read" GOST 1579-80"
6. Clause 4.6 Amend reference "GOST 10447-63" to read" GOST 10447-80"
7. Clause 4.8 Amend reference "GOST 19471-74" to read GOST 24104-80"
8. Replace the annexure with the new version.

Correlation of wire grades

GOST 2112-79 Grade	CT C 3 B 2127-80 Types
MM	1
MT	2

DERIVED SI UNITS WITH PROPRIETARY NAMES

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Quantity	Unit		Expression for derived unit		
	Name	Symbol	using other units	using base SI units	
Frequency	hertz	Hz	-	s^{-1}	
Force	newton	N	-	m, kg.	s^{-2}
Pressure	pascal	Pa	N/m^2	$m, kg.$	s^{-2}
Energy, work, heat	joule	J	$N \cdot m$	$m, kg.$	s^{-2}
Power, energy, flow	watt	W	J/c	$m, kg.$	s^{-3}
Quantity of electricity, electric charge	coulomb	C	A.s	s.A	
Electric potential	volt	V	W/A	$m, kg.$	$s^{-3} A^{-1}$
Electric capacitance	farad	F	C/V	$m, kg.$	$s^{-4} A^2$
Electric resistance	ohm		V/A	$m, kg.$	$s^{-3} A^2$
Conductance	siemens	S	A/V	$m, kg.$	$s^{-3} A^2$
Magnetic flux	weber	Wb	V.s	$m, kg.$	$s^{-2} A^{-1}$
Magnetic induction	tesla	T	Wb/m ²	$kg.$	$s^{-2} A^{-1}$
Inductance	henry	H	Wb/A	$m, kg.$	$s^{-2} A^{-2}$
Luminous flux	lumen	lm	-	cd.sr. *	
Illumination	lux	lx	-	$m, cd.sr.*$	
Nucleid activity	beckerel	bk	-	s^{-1}	
Radiation dosage	grey	gr	-	m, s^{-2}	

* The supplementary unit steradian figures along with base SI units in these two expressions.

Table 1

mm							
Nominal diameter	Tolerance	Nominal diameter	Tolerance	Nominal diameter	Tolerance	Nominal diameter	Tolerance
0.020	±0.002	0.265	±0.005	0.850	±0.015	1.88*	±0.0
0.025		0.280		0.900		1.90	
0.030		0.300✓		0.930*		1.95*	
0.032		0.315		0.950		2.00	
0.035*		0.320		0.970		2.02*	
0.040✓		0.335	±0.007	1.00	±0.02	2.03	
0.045*		0.350*		1.04		2.10*	
0.050✓		0.355		1.06		2.12	
0.060		0.370		1.08*		2.13*	
0.063		0.380		1.10		2.14	
0.071	±0.003	0.400		1.12		2.24	
0.080		0.420*		1.13		2.25	
0.090		0.425		1.18		2.26*	
0.100		0.450		1.20		2.36	
0.112		0.475		1.25		2.44*	
0.120		0.490	±0.010	1.30		2.50	
0.125		0.500		1.32		2.51*	
0.130		0.520*		1.35		2.52	
0.132		0.530		1.38		2.59	
0.140		0.560		1.40		2.61	
0.150	±0.005	0.580		1.45*		2.63	
0.160		0.600		1.50		2.65	
0.170		0.630✓		1.53		2.73	
0.180		0.640		1.56*		2.76	
0.190		0.670		1.60		2.80	
0.200✓		0.680		1.62*		2.83*	
0.210		0.690*	±0.015	1.68*		2.84	
0.224		0.710		1.70		2.85	
0.230		0.750		1.74*		2.95	
0.236		0.770*		1.78		3.00	
0.250		0.800		1.80		3.02	
0.260		0.830*		1.81*		3.05*	

Mechanical properties of wire of grade

Nominal diameter
of wire,
mm

		MPa	MT		
		With State Quality Mark	First quality category		
		Ultimate strength, MPa, (kgf/mm ²)	Relative elongation, %	Ultimate strength, MPa, (kgf/mm ²)	Relative elongation, %
		Not less than			
over	0.020 и 0.025 incl	6	450(45)	—	450(45)
	0.025 до 0.050 включ.	10			
	0.060 и 0.063	12			
	0.071	200—290			
	0.080	(20—29)	430(43)	—	420(42)
	0.090	15			
	0.100 incl	16			
over	0.100 до 0.120 включ.	17			
	0.120 . 0.150 .	18	430(43)	0.6	400(40)
	0.150 . 0.190 .	200—280			
	0.190 . 0.580 .	(20—28)			
	0.580 . 0.970 .	25		0.6	0.6
	1.00 incl	30	430(43)		400(40)
over	1.00 до 1.95 включ.	200—270			
	1.95 . 2.95 .	(20—27)		1.0	1.0
	2.95 . 4.80 .	30	400(40)	1.5	390(38)
	4.80 . 9.42 .	200—260	380(38)	2.0	360(36)
		(20—26)			

A batch may contain not more than 15% of bundles, coils or drums with wire of weight not less than 50% of the values specified in Table 6.

Nominal diameter of wire, mm		Table 6 Weight, kg not less than	
		in coil or drum	in bundle
0.020 and 0.025		0.03	-
0.030; 0.032; 0.035		0.10	-
0.040 and 0.045		0.20	-
0.050		0.50	-
0.060 and 0.063		0.60	-
0.071		0.80	-
0.080		1.0	-
0.090		1.2	-
from 0.100 upto 0.140 incl.		2.0	-
over 0.140 " 0.200 "		5.0	-
" 0.200 " 0.38 "		6.0	-
" 0.38 " 0.58 "		10.0	-
" 0.58 " 0.97 "		15.0	20.0
" 0.97 " 3.81 "		40.0	40.0
" 3.81 " 9.42 "		60.0	60.0

3. Acceptance Rules

3.1 Acceptance tests are prescribed for the manufacturer to check conformity of the quality of wire with the requirements of the present standard.

3.2 Wires are accepted in batches. Wire of a single grade and diameter presented for accepted at one time constitutes a batch.

3.3 The manufacturer must conduct acceptance tests on wires in accordance with Table 7.

If unsatisfactory results are obtained in the random sample tests in respect of even a single parameter, the particular test is repeated on twice the number of bundles or coils. The repeat test results are applicable to the whole batch.

4. Testing Methods

4.1 All measurements and tests must be carried out at normal climatic conditions: air temperature of $25 \pm 10^{\circ}\text{C}$, relative humidity of 45 to 80% and atmospheric pressure of 94 to 107 kPa (630 to 800 mm Hg.col.) unless other conditions are stipulated in the standards for testing methods and equipment.

4.2 Wire diameter and ovality of section (cl.1.2) must be measured in the course of production using a micrometer type MP-0-25 with scale, division 0.002 mm (GOST 4381-58) for diameters upto 0.400 mm and a micrometer type MK-0-25 (GOST 6507-78) for diameters over 0.400 mm.

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Wire diameter and ovality of section (cl.1.2) must be measured in accordance with GOST 12177-79.

Measurement is made in two places not less than 100 mm apart, from each end. In evaluating insignificant defects on the surface (cl.2.3) the one with the greatest depth is determined visually. The portion of the wire at the defective place is cleaned till the defect disappears. The difference in wire diameter at the place cleaned up and at an adjoining point is taken as the magnitude of the defect. Diameter is measured as per GOST 12177-79.

5. Packing, Marking, Transport and Storage

5.1 Packing, marking, transport and storage of wire must conform to the requirements of GOST 18690-73.

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5.2 Wire of diameter upto 0.59 mm must be wound in coils and wire of diameter 0.59 mm and over in coils, drums or bundles (with the customer's concurrence).

Lengths of finished wire of MC grade must not be soldered or welded.

Inside diameter of bundles must be 350 to 700 mm for MC grade wire.

5.3 The following particulars must be indicated on the label fastened to each coil, drum or bundle of wire:

- a) manufacturer's trade mark;
- b) grade of wire;
- c) wire diameter in millimetres;
- d) net weight in kg;
- e) date of manufacture;
- f) D.C.D. stamp and
- g) number of this standard.

6. Manufacturer's Guarantee

6.1 The manufacturer guarantees conformity of the wire with the requirements of the present standard provided transport and storage conditions are observed.

Guaranteed shelf life of the wire is 6 months from the date of manufacture.

ANNEXURE

Reference

Section 1 GOST 2112-79 corresponds to CTC9 B.1383-78.

3
Price 5 Kopecks

BASE SI UNITS

Quantity	Unit		
	Name	Russian symbol	International symbol
Length	metre	М	m
Weight (Mass)	Kilogram	кг	kg
Time	second	с	s
Current	ampere	А	A
Thermodynamic temperature	kelvin	К	K
Amount of substance	mole	моль	mol
Intensity of light	candela	кд	cd

SUPPLEMENTARY SI UNITS

Plane angle	radian	рад	rad
Solid angle	steradian	ср	sr