GOST : 7262-'8

Title : COPPEI CONDUCTOR COATED WITH VL-93: VARNISH

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USSR STATE STANDARD

COPPER CONDUCTOR COATED WITH VL-931 VARNISH

Technical Specifications

GOST 7262-78
This supersedes
GOST 7262-70

Reissued Aug. 1980 Valid upto 01.01.1985.

The present standard relates to round, copper conductor insulated with VL-931 varnish (based on polyvinylacetate) and intended for making windings of electrical machines, devices and instruments.

The standandard conforms to the IEC publication 317-1 of 1971 in so far as it relates to breakdown voltage and spot damage to conductors which have been awarded the state quality mark.

1. GRADES AND DIMENSIONS

1.1. The following grades of conductors must be manufactured:
Grade ПЭВ-1 (PEV-1) conductor insulated with VL-931 varnish to reduced thickness;
Grade ПЭВ-2 (PEV-2) conductor insulated with VL-931 varnish to standard thickness.

1.2. Nominal wire diameter, minimum diametral thickness of insulation and maximum outside diameter of the conductor must conform to the values shown in Table 1.

Limit deviations of conductors must conform to GOST 2112-79.

Calculated weight of 1 km of conductor is given in reference annexure 1.

Table 1

mm

Nominal wire diameter	Minimum diametral thickness of insulation for grade		Maximum outside diameter of wire for grade	
	PEV-1	PIV-2	PEV-1	PEV-2
0,020	0,006	—	0,035	—
0,025	0,006	—	0,040	—
(0,030)	0,008	—	0,045	—
0,032	0,008	—	0,045	—
0,040	0,008	—	0,055	—
0,050	0,010	0,012	0,070	0,080
(0,060)	0,010	0,012	0,085	0,090
0,063	0,010	0,012	0,085	0,090
0,071	0,010	0,012	0,095	0,100
0,080	0,010	0,012	0,105	0,110
0,090	0,010	0,012	0,115	0,120
0,100	0,010	0,015	0,125	0,130
0,112	0,010	0,015	0,135	0,140
(0,120)	0,010	0,015	0,145	0,150
0,125	0,010	0,015	0,150	0,155
(0,130)	0,010	0,015	0,155	0,160
0,140	0,010	0,015	0,165	0,170
(0,150)	0,015	0,020	0,180	0,190
0,160	0,015	0,020	0,190	0,200
(0,170)	0,015	0,020	0,200	0,210
0,180	0,015	0,020	0,210	0,220
(0,190)	0,015	0,020	0,220	0,230
0,200	0,015	0,020	0,230	0,240
(0,210)	0,015	0,020	0,240	0,250
0,224	0,020	0,030	0,260	0,270
(0,236)	0,020	0,030	0,275	0,285
0,250	0,020	0,030	0,290	0,300
(0,265)	0,020	0,030	0,305	0,315
0,280	0,020	0,030	0,320	0,330
(0,300)	0,020	0,030	0,340	0,350
0,315	0,020	0,030	0,355	0,365
(0,335)	0,020	0,030	0,375	0,385
0,355	0,020	0,030	0,395	0,415
(0,380)	0,020	0,030	0,420	0,440
0,400	0,020	0,030	0,440	0,460
(0,425)	0,025	0,035	0,465	0,485
0,450	0,025	0,035	0,490	0,510
(0,475)	0,025	0,035	0,525	0,545
0,500	0,025	0,035	0,550	0,570
(0,530)	0,025	0,035	0,580	0,600
0,560	0,025	0,035	0,610	0,630
(0,600)	0,030	0,040	0,650	0,670
0,630	0,030	0,040	0,680	0,700
(0,670)	0,030	0,040	0,720	0,750
(0,680)*	0,030	0,040	0,740	0,770
0,710	0,030	0,040	0,760	0,790
0,750	0,030	0,040	0,810	0,840

Table 1 Contd.

mm

Nominal wire diameter	Minimum diametral thickness of insulation for grade		Maximum outside diameter of wire for grade	
	PEV-1	PEV-2	PEV-1	PEV-2
(0,770*)	0,030	0,050	0,830	0,860
0,800	0,030	0,050	0,860	0,890
(0,830*)	0,030	0,050	0,890	0,920
0,850	0,030	0,050	0,910	0,940
0,900	0,030	0,050	0,960	0,990
(0,930*)	0,030	0,050	0,990	1,020
0,950	0,030	0,050	1,010	1,040
1,000	0,035	0,050	1,070	1,100
1,060	0,035	0,060	1,130	1,160
(1,080*)	0,035	0,060	1,150	1,180
1,120	0,035	0,060	1,190	1,220
1,180	0,040	0,060	1,260	1,280
1,250	0,040	0,060	1,330	1,350
1,320	0,040	0,060	1,400	1,420
1,400	0,040	0,065	1,480	1,510
(1,460*)	0,040	0,065	1,530	1,560
1,500	0,040	0,065	1,580	1,610
(1,560*)	0,040	0,065	1,640	1,670
1,600	0,040	0,065	1,680	1,710
1,700	0,040	0,065	1,780	1,810
1,800	0,050	0,070	1,890	1,920
1,900	0,050	0,070	1,990	2,020
2,000	0,050	0,070	2,090	2,120
2,120	0,055	0,070	2,210	2,240
2,240	0,055	0,070	2,340	2,370
2,360	0,055	0,070	2,460	2,490
(2,440*)	0,055	0,070	2,540	2,570
2,500	0,055	0,070	2,600	2,630

Notes: 1. Conductors with nominal wire sizes shown in brackets are manufactured only in technically justifiable cases.

2. Conductors with nominal wire sizes marked with an asterisk and shown in brackets are not to be used in new designs.

1.3. The conductor must be wound into a coil in a single length. The minimum weight of a length of conductor must conform to the value shown in Table 2. A length of conductor weighing less than shown in the Table may be made my mutual consent between manufacturer and user.

Table 2

Nominal wire diameter, mm	Weight of one length of conductor, g, not less than	Nominal wire diameter, mm	Weight of one length of conductor, g, not less than
From 0.020 upto 0.025 incl.	1	Over 0.14 upto 0.18 incl.	200
0.030 to 0.032	5	Over 0.18 upto 0.25 incl.	300
0.040	6	Over 0.25 upto 0.355 incl.	400
0.050	20	Over 0.355 upto 0.63 incl.	500
From 0.060 upto 0.071 incl.	30	Over 0.63 upto 0.80 incl.	1000
Over 0.071 upto 0.09 incl.	50	Over 0.80 upto 1.00 incl.	2000
Over 0.09 upto 0.14 incl.	100	Over 1.00 upto 2.50 incl.	3000

Example of conventional designation of conductor insulated with VL-931 varnish to standard insulation thickness and with nominal wire diameter of 1.25 mm.

Conductor ПЭВ-2-1.25 GOST 7262-78.

2. TECHNICAL REQUIREMENTS

2.1. The conductors must be manufactured in accordance with the requirements of the present standard.

2.2. The conductor must be uniformly covered with an unbroken layer of enamel insulation.

The conductor surface must be smooth and free from blisters and foreign inclusions.

Individual influxes on the surface of the conductor are acceptable provided all other requirements of this standard are satisfied.

2.3. Relative elongation at rupture of the conductor under tension must conform to the value shown in Table 3.

Table 3

Nominal diameter of conductor, mm	Relative elongation, % not less than
0.03 to 0.032	3
0.04	4
0.05	8
From 0.060 upto 0.10 incl.	11
Over 0.10 upto 0.20 incl.	12
Over 0.20 upto 0.44"	15
Over 0.44 upto 0.56 incl.	18
Over 0.56 upto 2.50	25

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2.4. The insulation of the conductor must withstand a test for elasticity in its initial condition.

Conductor of nominal wire diameter upto 0.355 mm inclusive must be stretched upto fracture.

Conductor of nominal wire diameter over 0.355 mm must be wound on a core of diameter specified in Table 4.

Table 4

Nominal wire diameter, mm	Diameter of core for winding conductor of grade	
	PEV-1	PEV-2
From 0.38 upto 0.69 incl.	2d	1d
Over 0.69 upto 1.25 incl.	3d	2d
Over 1.25 upto 1.68 incl.	4d	3d
Over 1.68 upto 2.50 incl.	6d	5d

d - is wire diameter

2.5. Insulation of the conductor in the unwound condition must withstand a test for elasticity after being soaked at a temperature of 125±5°C in a thermostat for 24 hours.

Conductor of nominal wire diameter upto 0.355 mm inclusive must be stretched upto rupture.

Conductor of nominal wire diameter over 0.355 mm must be a wound on a core of diameter specified in Table 4.

2.6. Insulation of the conductor of nominal wire diameter 0.38 mm and over, wound on a core of diameter specified in Table 4, must withstand a thermal shock test at a temperature of 125±5°C for 1 hour.

2.7. Insulation of the conductor must withstand an adhesion test under tension with a jerk upto rupture in the case of conductors of nominal wire diameter 0.05 to 0.77 mm and by twisting around its own axis in the case of conductors of nominal wire diameter 0.80 mm and over. The number of twists should conform to the value specified in Table 5.

Table 5

Nominal wire diameter, mm	Number of twists, not less than
0.80	13
Over 0.80 upto 0.95 incl.	9
Over 0.95 upto 1.60 incl.	7
Over 1.50 upto 2.50 incl.	4

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2.8. Insulation of conductors of diameter 0.25 and over must withstand an abrasion test for mechanical strength.

The average number of reciprocating strokes of the needle of diameter 0.4 mm must be not less than 50 and the minimum number not less than 25.

2.9. Insulation of the conductor must be capable of withstanding the action of toluene at a temperature of 60±5°C.

2.12. The number of spot damages to the insulation of the conductor with wire diameter upto 0.355 mm inclusive must not exceed the value specified in Table 7.

Table 7

Conductor grade	Nominal wire diameter, mm				
	Category 1			With State Quality Mark	
	0.02 to 0.04	0.05	0.060 to 0.355	0.02 to 0.04	0.05 to 0.355
	Number of spot damages, not exceeding				
PEV-1	10	8	7	10	5
PEV-2	-	7	5	-	3

2.13. Winding of the conductor into a reel must be even, tight and free from loosening or entanging of the turns. The distance between the top row of turns and the edge of the reel must conform to the requirements of GOST 18690-73.

2.14. The following materials must be used in the manufacture of the conductor: varnish of grade VL-931 (BL-931) to GOST 10402-75 and copper wire as per technical documentation approved in the established manner. Reference annexure 2 lists electrical resistance of 1m of wire.

2.15. Insulation of the conductor must conform to heat resistance class A as per GOST 8865-70.

Service life of the conductor reckoned in accordance with GOST 10519-76 at a temperature of 105°C must be not less than 20,000 hours.

The approximate relationship between average service life of conductor and temperature is shown by the curve in annexure 3 to this standard.

The permissible minimum ambient temperature for operation of

The average number of reciprocating strokes of the needle of diameter 0.4 mm in the abrasion test for mechanical strength must be not less than 50 and the minimum number not less than 25.

2.10. Insulation of the conductor of diameter 0.14 to 0.355 mm must withstand a test for thermal plasticity at a temperature of 160±5°C. The temperature is 170±5°C for conductors of diameter 0.38 to 2.50 mm.

2.11. Insulation breakdown voltage of the conductor must conform to the value shown in Table 6.

Table 6

Nominal wire diameter, mm	Breakdown voltage, V, not less than for conductor of grade			
	PEV-1		PEV-2	
	Category 1	With State Quality Mark	Category 1	With State Quality Mark
0,02	100	140	—	—
0,025	100	140	—	—
0,03—0,032	150	150	—	—
0,04	150	150	—	—
0,05	350	350	600	700
0,06—0,063	400	400	500	800
0,07—0,071	400	500	500	950
0,08	500	500	700	950
0,09	500	600	700	1200
0,10	600	600	800	1200
Св. 0,10 до 0,125 включ.	600	700	800	1300
» 0,125 » 0,14 »	700	800	900	1500
» 0,14 » 0,16 »	750	900	1000	1700
» 0,16 » 0,20 »	900	1000	1250	2000
» 0,20 » 0,25 »	950	1200	1300	2200
» 0,25 » 0,315 »	1000	1400	1300	2400
» 0,315 » 0,40 »	1100	—	1100	—
» 0,40 » 0,50 »	1200	—	1500	—
» 0,50 » 0,71 »	1300	—	1600	—
» 0,71 » 0,85 »	1400	—	1800	—
» 0,85 » 0,95 »	1450	—	1850	—
» 0,95 » 1,12 »	1500	—	1900	—
» 1,12 » 1,32 »	1600	—	2000	—
» 1,32 » 1,60 »	1600	—	2400	—
» 1,60 » 1,90 »	1600	—	2500	—
» 1,90 » 2,50 »	1700	—		

the conductor is minus 60°C.

3. ACCEPTANCE RULES

3.1. Acceptance tests, periodic tests and type tests have been laid down for verifying whether the quality of the conductor conforms to the requirements of this standard. These tests are be carried out by the manufacturer.

3.2. Conductors must be presented for quality control in batches.

A number of coils with conductor of a single grade and diameter subject to a maximum of 200 coils constitutes a batch.

3.3. Acceptance test for conformity with the requirements of clauses 1.2, 2.2 and 2.13 must be carried out on every coil of wire. Coils of wire which do not meet the requirements of these clauses must be rejected.

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3.4. Acceptance tests for conformity with the requirements of clause 1.3 must be conducted on 1% of the coils and for conformity with the requirements of clauses 2.3, 2.4, 2.6, 2.8, 2.11 and 2.12 on 5% of the coils, subject to a minimum of two coils.

If unsatisfactory test results are obtained against even one of these parameters, the particular test is repeated on twice the number of samples taken from the same coils of the same batch.

The results of the repeat test are applicable to the whole batch.

3.5. Periodic tests for conformity with the requirements of clauses 2.5, 2.7, 2.9 and 2.10 are carried out not less than once a quarter on 5% of the coils of wire subject to a minimum of two coils from a batch which has passed the acceptance tests.

The tests are conducted on samples of conductor of a single diameter in the following range:

From 0.02 upto 0.05 mm incl.	Over 0.05 upto 0.09 incl.
From 0.09 upto 0.18 incl.	Over 0.18 upto 0.355 incl.
From 0.355 upto 0.95 incl.	Over 0.95 upto 2.50 incl.

If unsatisfactory test results are obtained against even one of these parameters, the particular test is repeated on twice the number of samples taken from the same coils of the same batch.

The results of the repeat test are applicable to the whole batch.

3.6. Type tests for conformity with all the requirements of this standard are carried out following a change in the electrical insulation varnish if such a change is likely to affect the characteristics of the conductors.

3.7. The customer inspects 3% of the coils of a batch subject to a minimum of two coils by way of inwards goods inspection.

A batch, in this case, is defined as the number of coils of wire registered in a single quality certificate accompanying it. If unsatisfactory test results are obtained against even one of these parameters, the particular test is repeated on twice the number of samples taken from the same coils of the same batch.

The results of the repeat test are applicable to the whole batch.

4. TESTING METHODS

4.1. Conductor diameter, wire diameter and diametral thickness of insulation (clause 1.2) must be measured in accordance with GOST 14340.1-74.

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4.2. The weight of the length of conductor in a coil (clause 1.2) must be determined by weighing and calculating the difference between gross weight of coil and design weight of the bare reel.

Weighment must be done using balances having an instrument error not exceeding 5%.

of 25 to 30 m/min.

The wet contact made of felt immersed in a vessel containing a 0.015% normal solution of sodium sulphate (as per GOST 4166-76) in distilled water (to GOST 6709-72) must press upon a length of 20 ± 2 mm. The d.c. voltage between the conductor and the wet contact must be 60 ± 3V.

The cleaned end of the conductor must be connected to the positive terminal of the current source and the soultion to the negative terminal. Page 10

Current passing through the spot where the insulation has been damaged and through the wire must not exceed 1 mA.

The counter must operate at an insulation resistance of (200 to 300) x 10^3 ohms and have a sensitivity which will enable it to register 10 to 12 spot damages per second. The test must be carried out on a sample selected from a coil containing the conductor on test.

4.13. The quality of winding of the conductor on the reel (clause 2.13) is verified by external inspection without using a magnifying device. In the event of difference of opinion, the winding quality is determined by unwinding on a rewinding machine at a speed of not more than 100 m/min.

5. PACKING, MARKING, TRANSPORT AND STORAGE

5.1. Packing, marking and transport and storage are done as per GOST 24136-80 with the additional stipulations mentioned in clauses 5.2 and 5.3.

5.2. The reels used for winding the conductor must conform to standards and technical documentation approved in the established manner. Each coil of wire must have a tag indicating the following:

4.3. Surface quality of the conductor (clause 2.2) must be verified by external inspection without using magnifying devices.

4.4. Relative elongation of conductor (clause 2.3) must be determined in accordance with GOST 14340.4-69.

4.5. Test of insulation for plasticity in the initial condition (clause 2.4) and after soaking for 24 hours at a temperature of 125±5°C (clause 2.5) must be carried out in accordance with GOST 14340.3-69.

4.6. Test of insulation for thermal shock (clause 2.6) must be conducted in accordance with GOST 14340.4-69.

4.7. Insulation adhesion test (clause 2.7) must be conducted in accordance with GOST 14340.2-69.

4.8. Test of insulation for mechanical strength by abrasion (clause 2.8) must be carried out in accordance with GOST 14340.10-69. The load on the needle must conform to class А for PEV-1 grade conductor and to class Б (B) for PEV-2 grade.

4.9. Test of insulation for resistance to toluene (clause 2.9) must be conducted in accordance with GOST 14340.8-69.

The load on the needle must correspond to 1/3 the value of the load specified in GOST 14340.10-69 against class А for PEV-1 grade and class Б (B) for PEV-2 grade conductor.

4.10. Test of insulation for thermoplasticity (clause 2.10) must be carried out in accordance with GOST 14340.11-69.

4.11. Insulation voltage test (clause 2.11) must be carried out in accordance with GOST 14340.7-74.

4.12. The number of spot damages in the insulation of the conductor (clause 2.12) must be determined on a sample of length 15±1.5 m passed through the wet contact of the instrument at a speed

a) manufacturer's trademark;

b) conductor grade;

c) nominal wire diameter in mm;

d) date of manufacture (year and month)

e) number of this standard;

f) quality control department's stamp and

g) worker's card number.

5.3. A document containing the following particulars must be placed in every case containing conductors or in every container:

a) manufacturer's trademark;

b) conductor grade;

c) nominal wire diameter in mm;

d) gross and net weight of case in kg.

e) number of this standard and

f) number of coils in the case.

Gross weight of case must not exceed 100 kg. Gross weight should be limited to 50 kg, if the customer so stipulates.

6. MANUFACTURER'S GUARANTEE

6.1. The manufacturer must guarantee conformity of the conductor with the requirements of this standard provided the operating and storage conditions stipulated in this standard are observed.

Guaranteed shelf life of the conductors is one year from the date of manufacture.

Annexure 1 *ПРИЛОЖЕНИЕ 1*
For reference *Справочное*

DESIGN WEIGHT OF 1 KM OF CONDUCTOR

РАСЧЕТНАЯ МАССА 1 КМ ПРОВОДА

Nominal wire diameter, mm Номинальный диаметр проволоки, мм	Weight of conductor, kg/km for grade Масса провода, кг/км, марки		Nominal wire diameter mm Номинальный диаметр проволоки, мм	Масса провода, кг/км, марки		Weight of conductor, kg/km, for grade
	PEV-1	PEV-2		П3В-1	П3В-2	PEV-1 PEV-2
0,020	0,003		0,500	1,78	1,79	
0,025	0,005		0,530	2,00	2,01	
0,032	0,007		0,560	2,24	2,25	
0,040	0,012		0,600	2,57	2,58	
0,050	0,019	0,019	0,630	2,83	2,85	
0,060	0,028	0,028	0,670	3,20	3,22	
0,063	0,028	0,029	0,690	3,40	3,42	
0,071	0,038	0,039	0,710	3,58	3,61	
0,080	0,051	0,050	0,750	4,00	4,03	
0,090	0,062	0,063	0,770	4,22	4,25	
0,100	0,077	0,076	0,800	4,55	4,57	
0,112	0,093	0,091	0,850	4,89	4,91	
0,120	0,107	0,108	0,850	5,13	5,15	
0,125	0,116	0,117	0,900	5,75	5,78	
0,130	0,127	0,131	0,950	6,14	6,17	
0,140	0,141	0,145	0,950	6,11	6,13	
0,150	0,165	0,166	1,00	7,12	7,14	
0,160	0,188	0,189	1,06	7,99	8,02	
0,170	0,212	0,213	1,08	8,29	8,33	
0,180	0,236	0,237	1,12	8,92	8,94	
0,190	0,263	0,261	1,18	9,89	9,91	
0,200	0,290	0,292	1,25	11,08	11,10	
0,210	0,319	0,322	1,32	12,32	12,41	
0,224	0,361	0,366	1,40	13,89	13,92	
0,236	0,404	0,406	1,45	14,91	14,91	
0,250	0,452	0,454	1,50	15,90	15,94	
0,265	0,508	0,510	1,56	17,20	17,20	
0,280	0,565	0,568	1,60	18,1	18,1	
0,300	0,649	0,652	1,70	20,4	20,4	
0,315	0,709	0,713	1,80	22,9	22,9	
0,335	0,780	0,784	1,90	25,5	25,5	
0,355	0,876	0,881	2,00	28,2	28,2	
0,380	1,011	1,013	2,12	31,7	31,8	
0,400	1,11	1,15	2,24	35,4	35,4	
0,425	1,29	1,30	2,36	39,3	39,3	
0,450	1,41	1,45	2,44	42,0	42,0	
0,475	1,61	1,65	2,50	44,1	44,1	

Annexure 2
For reference

ПРИЛОЖЕНИЕ 2
Справочное

ELECTRICAL RESISTANCE OF 1 m OF CONDUCTOR WIRE

ЭЛЕКТРИЧЕСКОЕ СОПРОТИВЛЕНИЕ 1 М ПРОВОЛОКИ ПРОВОДА

1 Номинальный диаметр проволоки, мм	2 Электрическое сопротивление 1 м проволоки, Ом	1 Номинальный диаметр проволоки, мм	2 Электрическое сопротивление 1 м проволоки, Ом
0,020	54,905	0,500	0,087848
0,025	35,139	0,530	0,078177
0,032	21,445	0,560	0,070032
0,040	13,726	0,600	0,061000
0,050	8,7848	0,630	0,055328
0,060	6,1005	0,670	0,048919
0,063	5,5331	0,690	0,046125
0,071	4,3563	0,710	0,043566
0,080	3,4316	0,750	0,039044
0,090	2,7113	0,770	0,037038
0,100	2,1962	0,800	0,034316
0,112	1,7509	0,830	0,031877
0,120	1,5252	0,850	0,030398
0,125	1,4254	0,900	0,027113
0,130	1,2994	0,930	0,025390
0,140	1,1205	0,950	0,024335
0,150	0,9760	1,00	0,021952
0,160	0,85786	1,06	0,019646
0,170	0,75986	1,08	0,018825
0,180	0,67783	1,12	0,017508
0,190	0,60831	1,18	0,015773
[illegible]	0,54908	1,25	0,014056
0,210	0,49796	1,32	0,012603
0,224	0,43772	1,40	0,011207
0,236	0,39428	1,45	0,010445
0,250	0,35139	1,50	0,0097507
0,265	0,31271	1,56	0,0090230
0,280	0,28013	1,60	0,0085788
0,300	0,24400	1,70	0,0075994
0,315	0,22132	1,80	0,0067783
0,335	0,19568	1,90	0,0060837
0,355	0,17434	2,00	0,0054905
0,360	0,15208	2,12	0,0048863
0,400	0,13726	2,24	0,0043772
0,425	0,12155	2,36	0,0042999
0,450	0,10845	2,41	0,0036890
0,475	0,097329	2,50	0,0035139

1. Nominal wire diameter, mm

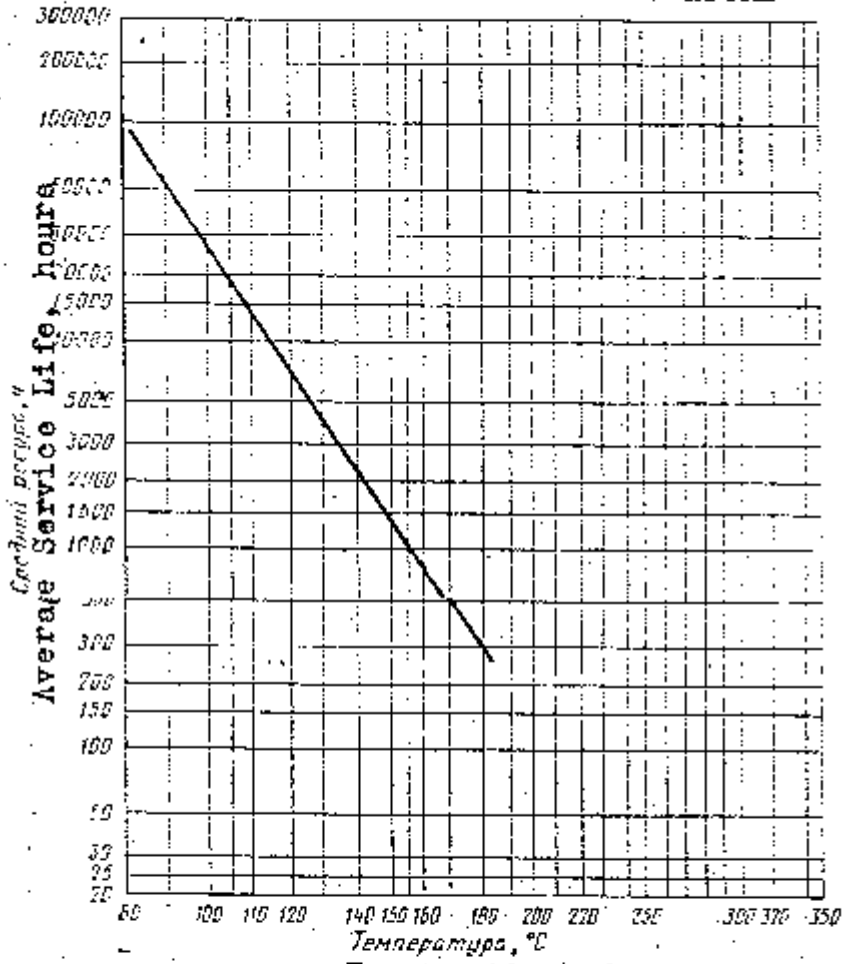
2. Electrical resistance of 1 m of wire, ohms

Annexure 3
For reference

ПРИЛОЖЕНИЕ 3
Справочное

GRAPH OF RELATIONSHIP BETWEEN AVERAGE SERVICE LIFE OF CONDUCTOR AND TEMPERATURE

ГРАФИК ЗАВИСИМОСТИ СРЕДНЕГО РЕСУРСА ПРОВОДОВ ОТ ТЕМПЕРАТУРЫ



Temperature, °C.