

**F – 10**  
**S – 10 / 231**

**VARNISH COATED HEAT RESISTANT WIRES**  
**SPECIFICATIONS**  
**TY 16 – 505. 280 – 79**  
**EXTRACT**

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These standards pertain to varnish coated heat resistant wires, further, herein after “wires” having current conducting core made of copper tinning, nickel coated or silver coated wire and insulated from fluoroplastic – 4 and glass fibers.

Wires are meant for fixing side assemblies of electric circuit of aviation technique and working at voltage upto 250 V d.c. or a.c. frequency upto 5000 Hz and temperature from minus 60 to + 200°C (wires with core made of copper tin coated wire)\* or from minus 60 to +250°C (wire with core made of copper nickel coated or silver coated wire). Wire may be for one time of use for a period of three hours at temperature 300°C.

Wires are supplied in climatic version B.

Example for noting conventional code of wire while indenting them and in the document of other article:

- wire grade ПТЛЭ – 250 with core of nominal dimension 0.35 mm<sup>2</sup> made of copper nickel coated wire;

“Wire ПТЛЭ – 250 – 0.35 МН ТУ 16 – 505. 280 – 79”

- wire grade ПЛТ – 200 with special index “0” and with core of nominal cross section 1.5 mm<sup>2</sup>.

“Wire ПЛТ – 200 – 0 – 1.5 ТУ 16 – 505. 280 – 79”

\* Range of ambient temperature of wire with special index “0” – from minus 50 to + 50°C.

## 1. TECHNICAL REQUIREMENTS

1.1. Grades, basic parameters and dimensions.

1.1.1. Wire are manufactured in grades:

ПТЛ – 200\* - varnish coated heat resistant wire on maximum working temperature 200°C;

ПТЛЭ – 200\* - screened varnish coated heat resistant wire on maximum working temperature 200°C;

ПТЛ – 250 – varnish coated heat resistant wire on maximum working temperature 250°C;

ПТЛЭ – 250 – screened varnish coated heat resistant wire on maximum working temperature 250°C;

1.1.2. Nominal cross section of current conducting core and outer diameter of wire should correspond to the values given in table 1.

Local increase of wire diameter on length upto 150 mm may be not more than 20% for wires of cross section upto 6.0 mm<sup>2</sup> inclusively and 10% for wires of cross section above 6.0 mm<sup>2</sup> with respect to maximum value indicated in table 1.

1.1.3. Structural length should not be more than 15 m. Length of small dimensional cut should not be more than 3 meters in the quantity not more than 15 % of total length of handed over batch.

1.2. Requirements for design.

1.2.1. Current conducting cores should be manufactured copper tin coated wire (wire for maximum working temperature of 200°C) or made of copper nickel coated or silver. Silver coated wires (wire for maximum working temperature 250°C).

Cores made of copper tin coated coated wires should correspond to GOST 22483 – 77 and have design as indicated in table 2. Core made of copper nickel coated wires or silver coated should have design of core with same cross section as it is for copper tin coated coated wires.

Allowance may not be more than 2 wires to length upto 15 m in the core of twisted bunch provided if correspond to electric resistance of cores to the requirements of point 1.3.1.1 and also in one cross section partially untin coated wire in the quantity not more than 2 for nominal cross section upto  $2.5 \text{ mm}^2$  inclusively and not more than 5 for nominal cross section above  $2.5 \text{ mm}^2$ .

1.2.2. Insulation of current conducting core should be made from the film of fluoroplastic – 4 in the form of coil and glass fiber in the form of coil and braiding followed by varnish coating with silicon organic varnish.

Thickness of insulation made of fluoroplastic – 4 should correspond to the values given in table 1.

Coefficient for surface density of bread should be less than 90%. Their may be gap in the coil made of glass fiber. On the surface of bread their may be loops and units of fibers and inflows of varnish provided these do not lead the outer diameter of wires beyond limit deviations and also local dirt.

1.2.3. Wire should core made of copper nickel coated or silver coated wire should have special colour on the thread of any colour in the coil or outer grade made of glass fiber.

1.2.4. Electrical screen should be made of copper tin coated coated wire with nominal diameter 0.12 – 0.30 mm.

Table 1

Nominal cross section of current conducting core, mm <sup>2</sup>	Thickness of insulation made of fluoroplastic – 4, mm		Outer diameter of wire, mm			
	Nominal	Minimum	Unscreened		Screened	
			Nominal	Maximum	Nominal	Maximum
0,35	0,32	0,25	2,0	2,2	2,4	2,7
0,50	0,32	0,25	2,1	2,4	2,6	2,9
0,75	0,32	0,25	2,4	2,6	2,8	3,1
1,00	0,36	0,30	2,6	2,9	3,1	3,4
1,5	0,36	0,30	2,9	3,2	3,4	3,7
2,5	0,44	0,35	3,5	3,9	4,1	4,5
4,0	0,44	0,35	4,3	4,7	4,9	5,3
6,0	0,44	0,35	5,0	5,5	5,6	6,1
10,0	0,56	0,40	6,4	7,1	7,2	7,9
16,0	0,56	0,40	7,8	8,6	8,6	9,4
25,0	0,56	0,40	9,0	9,9	9,8	10,7
35,0	0,64	0,50	10,9	11,6	12,1	12,8
50,0	0,64	0,50	12,1	13,5	13,3	14,7
70,0	0,64	0,50	14,0	15,6	15,2	16,8

1.2.5. Materials, used for manufacturing of wires, should correspond to:

copper nickel coated wire grade MH .....	- TY 16 – 705. 166 – 80
copper tin coated wire .....	- TY 16 – 505. 850 – 75
film made of fluoroplastic – 4 electrical insulated grade $\Phi$ – 4A0.....	- GOST 24222 – 80
glass fiber grade BC – 6.8 × 1 × 2 .....	- GOST 8325 – 78
silicon organic varnish grades:	
KO – 921 .....	- GOST 16508 – 70
KO – 916A .....	- TY 6 – 02 – 837 – 76
silver coated soft copper wire .....	- TY 17 PCΦCP
	30 – 3763 – 83 or
	TY 48 – 1 – 284 – 81
silver solder grade not below ПСР – 45.....	- GOST 19739 – 74,
	GOST 19746 – 74.

Table 2

Nominal cross section of current conducting core	Design of core			Electric resistance of current conducting core to d.c. on 1km length, Ohm																																																																																																		
	Nominal diameter of wire core, mm	Quantity of wires in the core	Quantity of string	Made of tin coated copper or silver coated wires, not more than	made of copper nickel coated wires																																																																																																	
					Nominal	Maximum																																																																																																
0,35	0,15	19	-	58,7	61,5	66,4																																																																																																
	0,26	7	-				0,50	0,18	19	-	41,7	41,3	45,5	0,30	7	-	0,20	16	-	0,75	0,23	19	-	25,9	26,2	27,6	0,37	7	-	1,0	0,26	19	-	20,4	20,5	21,9	1,5	0,32	19	-	13,6	13,5	14,4	2,5	0,42	19	-	8,20	7,8	8,3	4,0	0,32	49	7	4,99	5,3	5,7	6,0	0,39	49	7	3,35	3,6	3,8	10,0	0,52	49	7	2,04	1,99	2,08	16,0	0,49	84	12	1,24	1,31	1,36	25,0	0,49	133	19	0,792	0,820	0,866	35,0	0,49	189	27	0,558	0,580	0,603	50,0	0,49	259	37	0,401	0,420	0,444	70,0	0,58	259
0,50	0,18	19	-	41,7	41,3	45,5																																																																																																
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4,0	0,32	49	7	4,99	5,3	5,7																																																																																																
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50,0	0,49	259	37	0,401	0,420	0,444																																																																																																
70,0	0,58	259	37	0,286	0,302	0,315																																																																																																

1.3. Requirements to electric parameters.

1.3.1. Electric parameters of wire during acceptance in supply should correspond to the norms given in point 1.3.1.1 – 1.3.1.3.

1.3.1.1. Electric resistance of current conducting core to direct current, calculated for 1km length and temperature 20°C, should corresponds the values given in table 2.

1.3.1.2. Wires should with stand test with a.c. voltage frequency 50 Hz, at:

a) in normal climatic conditions .....1500

б) at temperature 200 and 250°C (accordingly for wires with c  
ores made of copper tin coated and copper nickel  
coated or silver coated wires .....10000

1.3.1.3. Electric resistance to insulation of wires, calculated for 1m length should be, MOhm, not less than:

a) in normal climatic conditions ..... $1 \times 10^3$

б) at temperature 200 and 250°C (accordingly for wires with c  
ores made of copper tin coated and copper nickel  
coated or silver coated wires ..... $5 \times 10^2$

1.3.2. Electrical parameters of wire during the period of operation and storing in normal climatic conditions should correspond to the norms given in points 1.3.2.1. – 1.3.2.3.



1.3.2.1. Electric resistance of current conducting core to direct current, calculated for 1km length and temperature 20°C, should not be more than 12 % from the values for acceptance and supply.

1.3.2.2. Wires should with stand test at a.c. 750 V frequency 50 Hz, for one minute.

1.3.2.3. Electric resistance to insulation of wires, calculated for 1m length should not be than  $2.5 \times 10^2$  MOhm.

1.4. Requirements to mechanical parameters.

1.4.1. Coil and bread made of glass fiber insulation should with stand at least for 50 double stroke of needle with pressing needle with the force of 5.9 N.

1.5. Requirement for stability against external effecting factors.

1.5.1. Wire should be stable to the effect of mechanical, climatic and biological factors mentioned in point 1.5.1.1. – 1.5.1.8.

1.5.1.1. Sinusoidal vibration, multiple mechanical impacts, single mechanical impact, linear acceleration, acoustic noise – as per OTY.

1.5.1.2. Maximum working temperature at operation 200 – 250 °C (respectively for wires with core made of copper tinned coated and copper nickel coated or silver coated wires)\*.

\* For wires with special index “0” – 100°C.

1.5.1.3. Decreased atmospheric pressure upto  $2 \cdot 10^3$  Pa (15 mm Hg).

1.5.1.4. Decreased working temperature of medium minus 60°C. \*\*

1.5.1.5. Change of working temperature from plus 200 to minus 60°C (for wires having core made of copper tinned coated wire) and from plus 250 to minus 60°C (for wires having core made of copper nickel coated or silver coated wires)\*.

1.5.1.6. Increased relative humidity of air upto 98% at temperature upto 35°C.

1.5.1.7. Salty (sea) fog (for wires, grades ПТЛ – 200 and ПТЛ – 250).

1.5.1.8. Fungus.

1.5.2. Wires with special index “0” should be stable to the effect of fungus.

1.5.3. Wires with special index “0” may remain in the condition of vapour of amyl and heptyl, whose contents in air should not exceed 0.005 mg of amyl and 0.0001 mg of heptyl in 1liter. Total time for being in specified condition should not exceed 6 years.

1.5.4. Wires should be stable with effect of special factors, established in corresponding state standard with the values of characteristics given for the group version 1Y to avoid the factors having characteristics И6 and И7.

During the process and immediately after the effect of factors having characteristics И1, И2, И3 the temporary decrease of electric resistance to insulation on 1m length is permitted upto the value not less than  $1 \times 10^3$  Ohm and values of characteristics И2, divided by 10 – not less than 0.1 MOhm followed by restoration of values not less than 1.0 Ohm with in maximum time of 2 ms; electric resistance to insulation of wire during the effect of factors having characteristics C, K should not be less than  $1 \times 10^2$  MOhm on length of 1 m.

Schematic and design decision for assemblies of wires in the tanks / objects should be ensure during the process of effect of factor having characteristics И8 – И11 the value of directed pulse voltage to electric insulation of cables should not be more than 0.7 kV.

#### 1.6. Requirements for reliability.

1.6.1. Minimum operating time of wires in the modes and conditions establish in these specification should be, hrs:

wires, grades ПТЛ – 250 and ПТЛЭ – 250	- 1000
wires, grade ПТЛЭ – 200	- 3000
wires, grade ПТЛ – 200	- 5000

Minimum operating time of wires of grades ПТЛ – 200 and ПТЛЭ – 200 with the special index “0” should be 45000 hours.

1.6.2. Minimum storing time of wires while storing in heated premises, and also mounted in protective apparatus or being in the protective SPTA set, should be 20 years.

While storing wires in other conditions, the minimum storing time is shortened in conformity with the factors given in table 3.

Minimums storing time of wires, grades ПТЛ – 200 and ПТЛЭ – 200 having special index “0” should be 22 years such as under shades not more than 6 years.

Table 3

Storing place as per GOST B9.003 – 80	Factor for shortened minimum storing time	
	In the packing of manufacturer	In non protective apparatus and SPTA set
In unheated storing premises	1.5	1.5
Under shades	-	1.5

1.6.3. Minimum working life of wires, with in the limits of which the operating time is ensured (point 1.6.1) and storage (pt. 1.6.2) is 20 years.

For wires having special index “0” – 22 years.