

## USSR STATE STANDARD

TIN-LEAD SOLDER IN  
INGOT FORM  
Valid upto 01.01.1983

GOST 21930-76  
This supersedes  
GOST 1499-70  
in respect of ingots

The present standard relates to tin-lead solder in ingot form used for tinning and soldering various parts.

This standard takes into account the requirements of the CMEA recommendations PC 1501-68 on standardisation.

## 1. GRADES

1.1. Depending on chemical composition, tin-lead solder of the highest and first categories are produced in the following grades :

Antimony-free solder - ( ПOC 90) POS90, POS 61, POS 40, POS 30, POS 10, POS 61M, POSK 50-18, POSK 2-18 ;

Low-antimony solder - ( ПOCcy) POSSu 61-05, POSSu 50-0.5, POSSu 40-0.5, POSSu 35-0.5, POSSu 30-0.5, POSSu 25-0.5, POSSu 18-0.5;

Antimony alloy solder - ( ПOCy) POSu 95-5, ( ПOCcy) POSSu 40-2, POSSu 35-2, POSSu 30-2, POSSu 25-2, POSSu 18-2, POSSu 15-2, POSSu 10-2, POSSu 8-3, POSSu 5-1, POSSu 4-6, POSSu 4-4.

Examples of Conventional Designation :

Solder in ingot form, grade ПOC40 (POS40) :

SOLDER Ч ПOC40 GOST 21930-76  
(Ch POS40)

-Do- grade POSSu 18-0.5;

SOLDER Ч ПOCcy 18-0.5 GOST 21930-76  
(Ch POSSu)

Solder grade  
Марка припоя

Chemical  
Химический состав, composition, %  
Impurities, примеси, не более not more than

Tin Олово	Antimony Сурьма	Cadmium Кадмий	Cu Медь	Lead Свинец	Sb Сурьма	Copper Медь	Bi Висмут	AB Минералы	Fe Железо	Ni Никель	S Сера	Zn Цинк	Al Алюминий	Pb Свинец

POS90-P

ANTIMONY-FREE  
Бессурьмянистые SOLDER

Марка припоя	Олово	Сурьма	Кадмий	Медь	Свинец	Сурьма	Медь	Висмут	Минералы	Железо	Никель	Сера	Цинк	Алюминий	Свинец
ПОС 90 П	89-91	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ПОС 90	59-61	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ПОС 61-П	59-61	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ПОС 61	39-41	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ПОС 40 П	29-31	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ПОС 49	9-10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ПОС 40 П	59-61	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ПОС 61М-П	49-51	17-19	-	-	-	-	-	-	-	-	-	-	-	-	-
ПОС 61М	1,6-2,3	17,5-18,5	-	-	-	-	-	-	-	-	-	-	-	-	-

POSK 2-18-P

LOW ANTIMONY SOLDER  
Малосурьмянистые

Марка припоя	Олово	Сурьма	Кадмий	Медь	Свинец	Сурьма	Медь	Висмут	Минералы	Железо	Никель	Сера	Цинк	Алюминий	Свинец
ПОССу 61-0,5-П	59-61	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ПОССу 61-0,5	49-51	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ПОССу 50-0,5-П	39-41	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ПОССу 50-0,5	34-36	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ПОССу 43-0,5-П	29-31	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ПОССу 49-0,5	24-26	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ПОССу 35-0,5-П	17-18	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ПОССу 35-0,5		0,45-0,5	-	-	-	-	-	-	-	-	-	-	-	-	-
ПОССу 30-0,5-П			-	-	-	-	-	-	-	-	-	-	-	-	-
ПОССу 30-0,5			-	-	-	-	-	-	-	-	-	-	-	-	-
ПОССу 26-0,5-П			-	-	-	-	-	-	-	-	-	-	-	-	-
ПОССу 25-0,5			-	-	-	-	-	-	-	-	-	-	-	-	-
ПОССу 16-0,5-П			-	-	-	-	-	-	-	-	-	-	-	-	-
ПОССу 18-0,5			-	-	-	-	-	-	-	-	-	-	-	-	-

POSSu 61-0,5-P

Continuation

Продолжение

Solder grade Марка припоя	Chemical composition, % Химический состав, %				Impurities, % Примеси, не более не более than											
	Main Основной компонент	Antimony Сурьма	Cadmium Кадмий	Copper Медь	Lead Свинец	Sb Сурьма	Copper Медь	Bismuth Висмут	As Мышьяк	Fe Железо	Tin Олово	Sn Олово	Сера S	1 или 2 или 3 или 4 или 5 или	Алюминий Al	Свинец Pb
<b>ANTIMONY COPPER ALLOY SOLDER</b>																
ПОСС 95-1П	94-96	0.0-0.5	-	-	Rest Остаток	-	0.05	-	0.04	-	-	-	-	-	-	0.0
ПОСС 95-1	30-41	-	-	-	То же -0.05-	-	0.05	-	0.05	-	-	-	-	-	-	-
ПОСС 40-2П	34-36	-	-	-	»	-	0.10	-	0.02	-	-	-	-	-	-	-
ПОСС 40-2	29-31	-	-	-	»	-	0.05	0.1	0.05	-	-	-	-	-	-	-
ПОСС 35-2П	24-26	1.0-2.0	-	-	»	-	0.10	-	0.02	-	-	-	-	-	-	-
ПОСС 35-2	17-18	-	-	-	»	-	0.05	-	0.05	-	-	-	-	-	-	-
ПОСС 15-2	14-15	-	-	-	»	-	0.10	-	0.05	-	-	-	-	-	-	-
ПОСС 15-2П	9-12	-	-	-	»	-	0.05	-	0.02	-	-	-	-	-	-	-
ПОСС 8-1	7-8	2.0-3.0	-	-	»	-	0.05	-	0.02	-	-	-	-	-	-	-
ПОСС 5-1	4-5	3.5-4.0	-	-	»	-	0.10	-	0.02	-	-	-	-	-	-	-
ПОСС 4-0	3-4	5.0-6.0	-	-	»	-	0.05	-	0.02	-	-	-	-	-	-	-
ПОСС 4-1	3-4	5.0-6.0	-	-	»	-	0.05	0.2	0.05	-	-	-	-	-	-	-

Note : The letter П(P) in the solder grade designation indicates more strength requirements as to impurities content.

2. TECHNICAL REQUIREMENTS

2.1. Chemical composition of solder must conform to the values indicated in the Table.

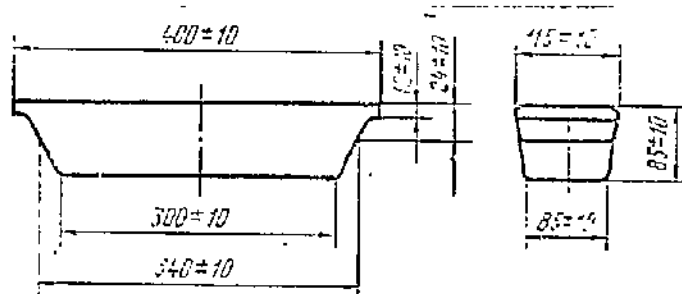
2.2. Internal dimensions of the moulds for casting ingots of solder of all grades, except POS 10, must conform to those shown in drg. 1. Internal dimensions of moulds for casting POS 10 grade solder must conform to those shown in drg. 2. Page 7

Solder may with the customer's consent be cast into ingots of other shapes, facilitating stable stacking.

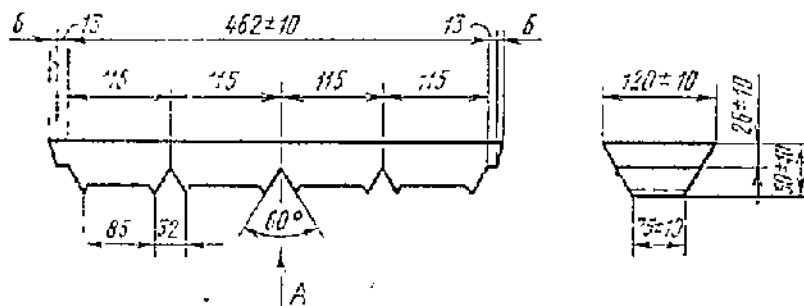
2.3. The surface of ingots must be free from extraneous inclusions and oxides. Shrinkage cavities and cracks are acceptable.

2.4. Reference annexure 1 to this standard lists the physical and mechanical properties of solder of different grades.

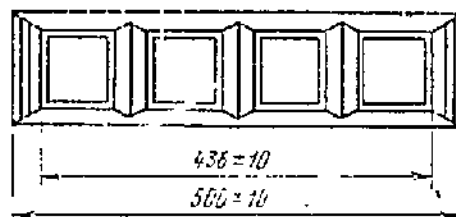
2.5. The recommended annexure 2 to this standard lists the main application areas for solder of different grades.



Черт. 1 Drg. 1



Bud A View A



Черт. 2 Drg. 2

### 3. ACCEPTANCE RULES

3.1. Solder is accepted in batches. Each batch must consist of ingots of a single grade from a single melt. No limit is placed on the weight of a batch.

3.2. Every ingot of a batch is subjected to external inspection.

3.3. Every fiftieth ingot of a batch, subject to a minimum of five ingots, is selected for checking the chemical composition of solder.

3.4. If unsatisfactory results are obtained in checking chemical composition, analysis is repeated on twice the number of samples drawn from the same batch.

Results of the repeat analysis are applicable to the whole batch.

### 4. METHOD OF TESTING

4.1. Surface of ingots is inspected visually.

4.2. Chemical analysis is carried out by drilling 8 to 10 mm diameter through holes at five points in each sample ingot in the centre and at four points along the diagonals at a distance of  $50 \pm 5$  mm from the apex of each corner. The surface of the ingots must be cleaned to remove contaminations and oxides before samples are drawn.

Chip, collected from all the ingots, is thoroughly mixed, passed through magnetic separation and reduced in bulk by melting in a steel crucible. A laboratory specimen weighing 200 g in the form of splices is collected from the thoroughly mixed molten solder. The splices are reduced to fragments of size not more than 2 mm by cutting with shears or grinding on an abrasive belt. The laboratory specimen is divided into two parts - one part is

sent for chemical analysis and the other is preserved in case a dispute arises calling for arbitration.

At the manufacturing concern, the sample may be collected from the liquid metal uniformly at the commencement, in the middle and at the end of pouring of the melt, in the form of splices and rods of diameter 8 mm and length 75 mm. Page 8

4.3. If the quantity of chip does not call for reduction of the specimen by melting, it is reduced by quartering down to 200 g and is then analysed. Chip from solder containing over 2.5% of antimony, is sifted through a sieve with No. 08 mesh as per GOST 6613-73 for determining fine fraction. The sum of the results of analysis of both the fractions is taken as the result of analysis.

4.4. Chemical analysis of all grades of solder is done in accordance with GOST 1429.0-77 to GOST 1429.10-77.

Other accelerated methods of analysis not inferior to the standard method in accuracy may also be adopted.

## 5. MARKING, PACKING, TRANSPORT AND STORAGE

5.1. The following particulars are punched on each ingot :

- a) manufacturer's trademark;
- b) solder grade;
- c) melt number;
- d) quality control stamp;
- e) state quality mark as per GOST 1.9-67.

The grade of POS 10 solder is marked on every segment of an ingot.

5.2. The quality certificate, accompanying a batch of solder

should contain the following particulars :

- a) manufacturer's name or trademark;
- b) conventional designation of solder;
- c) results of chemical analysis;
- d) batch number;
- e) net weight in kilograms;
- f) date of manufacture;
- g) state quality mark as per GOST 1.2-67 for attested products.

5.3. Ingots are transported without packing by any closed vehicle.

5.4. Solder must be stored in enclosed premises.

#### 6. SAFETY REQUIREMENTS

6.1. Operators must wear protective glasses ( to avoid eye injury) during all operations on tinning and soldering with tin-lead solders in baths with the molten surface exposed.

6.2. Shops and sections where tinning and soldering operations are carried on, must meet the requirements envisaged by the sanitary rules applicable to devices, equipment and composition of sections in which small parts are soldered using solders containing lead.

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ANNEXURE 1

For reference

PHYSICAL AND MECHANICAL PROPERTIES OF SOLDER

Solder grade	Melting point, °C		Density, g/cm <sup>3</sup>	Resistivity ohm.mm <sup>2</sup> /m	Specific heat, kcal/cm.s. degree	Ultimate tensile strength, kgf/mm <sup>2</sup>	Relative elongation, %	Impact strength, kgf/cm <sup>2</sup>	Brinell hardness HB
	Solidus	Liquidus							
ПОС 60	183	250	7.6	0.125	0.130	4.9	40	2.5	15.4
ПОС 61	183	190	8.5	0.160	0.120	4.3	45	3.0	14.4
ПОС 40	183	238	9.3	0.169	0.110	2.8	32	4.0	15.0
ПОС 10	208	240	10.8	0.200	0.084	2.2	44	4.2	15.0
ПОС 61А	183	192	8.5	0.143	0.117	4.5	45	1.1	11.9
ПОСК 52-18	442	145	8.6	0.153	0.153	4.0	35	4.3	14.0
ПОССу 61-0.5	183	189	8.5	0.140	0.120	4.5	35	3.7	13.5
ПОССу 59-0.5	183	216	8.9	0.149	0.112	3.8	33	4.4	13.2
ПОССу 45-0.5	183	235	9.3	0.160	0.090	4.0	33	4.8	13.0
ПОССу 35-0.5	183	245	9.5	0.172	0.100	3.8	37	3.9	13.3
ПОССу 33-0.5	183	255	8.7	0.179	0.090	2.6	45	3.9	13.2
ПОССу 25-0.5	183	266	10.0	0.182	0.099	3.6	35	3.9	12.6
ПОССу 18-0.5	183	277	10.2	0.198	0.084	3.6	33	3.6	11.6
ПОС 95-5	234	240	7.3	0.145	0.120	4.0	46	3.5	15.6
ПОССу 40-2	183	229	9.2	0.172	0.130	4.3	48	2.8	14.2
ПОССу 35-2	183	243	9.4	0.179	0.098	4.0	40	2.6	11.1
ПОССу 30-2	183	250	9.6	0.182	0.098	4.0	40	2.5	11.1
ПОССу 25-2	183	269	9.8	0.185	0.090	3.8	35	2.4	11.1
ПОССу 18-2	188	270	10.1	0.200	0.081	3.6	35	2.5	11.7
ПОССу 15-2	184	275	10.3	0.208	0.080	3.6	35	1.5	12.4
ПОССу 10-2	268	285	10.7	0.208	0.080	3.5	30	1.9	12.8
ПОССу 8-3	240	290	10.5	0.207	0.081	4.0	43	1.7	12.8
ПОССу 5-1	275	298	11.2	0.209	0.084	3.3	45	2.8	10.7
ПОССу 4-0	244	270	10.7	0.208	0.080	6.5	16	0.8	17.3



ANNEXURE 2  
Recommended

## MAIN APPLICATIONS AREAS FOR TIN - LEAD SOLDERS

Soldier grade	Application area
POS 90	For tinning and soldering internal joints of cooking utensils and medical apparatus.
POS 61	For tinning and soldering electrical and radio circuits, printed circuit boards, precision instruments calling for hermetically sealed joints, where excessive heating is not permitted.
POS 40	For tinning and soldering electrical equipment and galvanised iron parts with hermetically sealed joints.
POS 10	For tinning and soldering contact surfaces of electrical equipment, instruments, relays, for filling and tinning inspection plugs of steam locomotives.
POS 61M	For tinning and soldering thin (less than 0.2 mm thick) copper wires, foil and printed circuits (using soldering irons); in the cable, electrical and radio electronic industries. Solder must not be used in tinning and soldering in crucibles and baths.
POSK 50-18	For soldering parts sensitive to excessive heating and parts made of metallised ceramics; for step heating of condensers.
POSSu61-0.5	For tinning and soldering electrical equipment,

Solder grade	Application area
	soldering the elements of printed circuit boards, windings of electrical machines, zincplated radio parts when stringent temperature requirements are stipulated.
POSSu 50-0.5	For tinning and soldering aviation radiators, for soldering cooking utensils and subsequent tinning with edible tin.
POSSu 40-0.5	For tinning and soldering tinplates, windings of electrical machines; for soldering components and cables and cabling items, radiator tubes and galvanized parts of refrigeration equipment.
POSSu 35-0.5	For tinning and soldering lead sheathing over cables of noncritical electrical parts and for thin sheets used in packing.
POSSu 30-0.5	For tinning and soldering zinc sheets and radiators.
POSSu 25-0.5	For tinning and soldering radiators.
POSSu 18-0.5	For tinning and soldering heat exchanger tubes and electrical bulbs.
POSSu 95-5	For soldering in the electrical industry and for soldering pipe lines operating at elevated temperatures.
POSSu 40-2	For soldering and tinning refrigeration equipment and thin sheets used in packing. This solder has a variety of applications.
POSSu 30-2	For tinning and soldering in refrigeration equipment in the manufacture of electrical bulbs, automobile industry and for abrasive soldering.

Solder grade	Application area
POSSu 18-2	For soldering in the automobile industry.
POSSu 15-2	
POSSu 10-2	
POSSu 8-3	For tinning and soldering in the manufacture of electric bulbs.
POSSu 5-1	For tinning and soldering parts operating at elevated temperatures and for tinning radiator tubes.
POSSu 4-6	For soldering bright tinplates, for tinning and soldering parts with rolled and riveted joints made out of brass and copper and for surface tinning of the luggage compartment of automobiles.
POSSu 4-4	For tinning and soldering in the automobile industry
POSSu 2-18	For tinning and soldering metallised and ceramic parts.

Note: Low-antimony solder is recommended for soldering zinc and galvanized parts.

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epst - 21930

INTERNATIONAL SYSTEM OF UNITS (SI)

Quantity	Unit		
	Name	Russian Abbreviation	International Abbreviation
BASE UNITS			
Length	Metre	М	m
Mass	Kilogram	к	kg
Time	second	с	s
Electric current	ampere	А	A
Thermodynamic temperature	kelvin	К	K
Luminous Intensity	candela	к	cd
SUPPLEMENTARY UNITS			
Plane angle	radian	рад	rad
Solid angle	steradian	ср	sr
DERIVED UNITS			
Area	square metre	м <sup>2</sup>	m <sup>2</sup>
Volume	cubic metre	м <sup>3</sup>	m <sup>3</sup>
Density	kilogram/metre	кг/м <sup>3</sup>	kg/m <sup>3</sup>
Velocity	metre/second	М/с	m/s
Angular velocity	radian/second	рад/с	rad/s
Force (force of gravity weight)	newton	Н	N
Pressure (mechanical stress)	pascal	Па	Pa
Work, Energy, Heat	joule	Дж	J
Power, Heat flow	watt	Вт	W
Quantity of electricity, Electrical charge	coulomb	Кул	C
Electric potential, potential difference, electromotive force	volt	В	V
Electrical resistance	ohm	Ом	Ω
Conductance	siemens	См	S
Capacitance	farad	Ф	F
Magnetic flux	weber	Вб	Wb
Inductance, mutual inductance	henry	Гн	H
Specific heat	joule/kg.kelvin	Дж/кг.К	J/kg.K
Heat conductivity	w/m. Kelvin	Вт/м.К	W/m.K
Luminous flux	lumen	Лм	lm
Brightness	candel/m <sup>2</sup>	к/м <sup>2</sup>	cd/m <sup>2</sup>
Illumination	lux	лк	lx

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