USSR STATE STANDARD

Electrolytic Copper Powder	GOST 4960-75
Technical Specifications	This supersedes GOST 4960-68
OKP 17 9310	Valid upto 01.01.1982.

The present standard applies to copper powder obtained by electrolysis and intended for making parts by powder metallurgy and for other purposes. The powder is also used in elctrical engineering, machine-building and chemical industries.

This standard is in full conformity with the CMEA recommendation PC 3457-72, PC 1334-74, PC 1327-74, PC 1328-74, PC 2750-70 and PC 1329-68.

1. GRADES

1.1. The following grades of copper powder are manufactured depending on physical and chemical properties:

Nonstabilized powder : PMAu, PMA, PMu and PM
(ПМАУ) (ПМА)(ПМУ) (П М)

Stabilized powder : PMS-1u, PMS-1, PMS-2u and PMS-2
(П МС-1у) (ПМС-1) (ПМС-2у) (П МС-2)

Stabilized caulking powder : PMS-Vu and PMS-V
(П МС-Ву) (П МС-В)

Lowdispersion, stabilized powder : PMS-l
(П МС-Н)

1.2. The recommended annexure lists application areas for different grades of copper powder.

2. TECHNICAL REQUIREMENTS

2.1. Chemical composition of copper powder must conform to the norms given in Table 1.

Table 1

Grade	Chemical composition, %							Moisture, % max,	Calcined residue after treating the powder with nitric acid, %, maximum
	Cu min.	Impurities, max							
		Fe	Pb	As	Sb	O	SO$_4$		
PMS-Vu	99.8	0.02	0.05	0.005	0.01	0.10	0.01	0.05	0.05
PMS-V	99.5	0.02	0.05	0.005	0.01	0.10	0.01	0.05	0.05
PMAu, PMU PMS-1u, PMS-2u	99.7	0.02	0.05	0.005	0.01	0.20	0.01	0.05	0.05
PMA, PM PMS-1, PMS-2	99.5	0.02	0.05	0.005	0.01	0.30	0.01	0.05	0.05
PMS-K, PMS-N	99.5	0.08	0.05	0.005	0.01	0.50	0.01	0.05	0.10

Note : SO$_4$ – Sulphates of metals reckoned in terms of SO$_4$.

2.2. Grain size composition of copper powder must conform to the norms shown in Table 2 and 3.

Table 2

Grade	Grain size composition		
	Sieve nos. with meshes as per GOST 3584-73	Grain size class, mm	Fraction content, %
PMS-Vu, PMS-V	–	Less than 0.045	10-25
	0045K	over 0.045 upto 0.063	25-35
	0063K	" 0.063 " 0.100	35-45
	01K	" 0.100 " 0.140	5-15
	014K	" 0.140 " 0.224	Not more than 1.0
	0224K	" 0.224	Not more than 0.1

Table 3

Grade	Nominal grain size of powder mm	Passage through sieve with meshes as per GOST 3584-73, % not less than						Residue on sieve of nominal size, % not more than
		045K	0224K	018K	01K	0071K	0045K	
PMA, PMAu	0.1	–	–	–	99.5	90	73 to 80	0.5
PM, PMu	0.1	–	–	–	99.5	90	65 to 80	0.5
PMS-1, PMS-1u	0.1	–	–	–	99.5	90	65 to 80	0.5
PMS-2, PMS-2u	0.071	–	–	–	–	99.5	85 to 90	0.5
PMS-K	0.45	90	–	10	–	–	–	10
PMS-N	0.224	–	95	–	–	–	–	5

Note: 1. Powder of grades PM, PMu, PMS-1 and PMS1u, intended for the electrocarbon industry, must pass through a sieve with 0045K mesh upto 70 to 80%.

2. Powder of PMS-2 and PMS-2u grades must pass through a sieve with 0045K mesh upto 00 to 00%

2.3. Powder must be free from foreign impurities and lumps.

2.4. Copper powder must conform to a mutually agreed specimen in respect of colour.

2.5. Bulk density of the powder and the spread in its values must conform to the norms shown in Table 4.

Table 4

Grade	Bulk density, g/cm^3	Permissible spread in values of bulk density g/cm^3
PMA, PMAu	1.3 to 1.5	±0.1
PM, PMu	1.25 to 2.0	±0.1
PMS-1, PMS-1u	1.25-1.9	±0.1
PMS-2, PMS-2u	1.3 to 2.0	±0.1
PMS-K, PMS-N	2.5 to 3.5	±0.1
PMS-V, PMS-Vu	2.4 to 2.7	±0.1

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Note : Bulk desnity of copper powder, intended for electrocarbon industry, must conform to the range 1.25 to 1.45 g/cm^3 for grades PMA, PMAu, PM and PMi; to the range 1.7 to 2.0 g/cm^3 for grades PMS-1 and PMS-1u and to the range 1.8 to 2.1 g/cm^3 for grades PMS-2 and PMS-2u.

2.6. The proportion of particles having conventional diameter of 10 microns and less in PMA grade copper powder must be 25 to 60%.

2.7. PMA grade copper powder must have a unit surface of particles ranging 1000 to 2000 cm^2/g.

2.8. PMA grade copper powder must have resistivity not exceeding 25 $ohm.mm^2/m$.

2.9. A raw specimen made out of copper powder of grades PMS-V and PMS-Vu with porosity 25% (density 6.67 g/cm^3) must withstand a bending force of not less than 60 kgf/cm^2.

2.10. Flow of PMS-V copper powder measured in terms of time taken for a sample weighing 50 g to flow through a funnel with outlet hole diameter 2.54 mm must not exceed 36 seconds.

2.11. Properties of each packing unit of a batch of PMS-V, PMS-Vu, PMA and PMAu grade powders must not differ from the average values for the corresponding characteristic of the batch by more than ± 10%.

2.12. Particles of copper powder of all grades must be dendrite shaped.

3. ACCEPTANCE RULES

3.1. Copper powder is offered for acceptance in batches of not more than 1000 kg. A batch consists of averaged powder of a single grade manufactured to a single production schedule and covered by a single quality certificate.

3.2. Conformity of the quality of copper powder with the requirements of the present stadard is determined on the basis of results of tests on an average sample prepared from individual samples drawn from the different containers of a batch.

The weight of individual samples must not be less than 0.2 % of the weight of copper powder in the packing unit.

3.3. The manufacturer may determine the proportion of lead, arsenic, antimony, sulphate compounds of metals and oxygen as also the particle shape, not less frequently than once a month and the moisture content of the powder on every fifth batch.

3.4. Each packing unit is checked for the presence of extraneous impurities and lumps.

3.5. If unsatisfactory results are obtained in the analysis against even a single parameter, the particular test is repeated on twice the number of samples drawn from the same batch of copper powder.

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

4. METHODS OF TESTING

4.1. SELECTION AND PREPARATION OF SAMPLES.

4.1.1. An individual sample is drawn in accordance with GOST 2721-71 from each container using a sampler (drg. 1) or by interrupting the continuous jet in the beginning, in the middle and at the end of filling each container forming part of the batch.

SAMPLER

Drg. 1
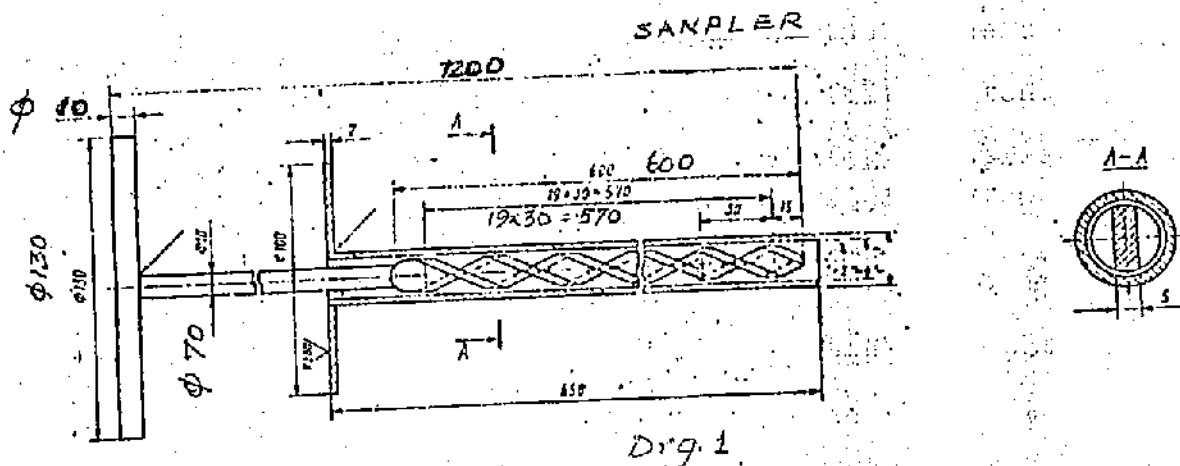
4.1.2. The selected samples are combined, throughly mixed and reduced by quartering down to an average sample weighing 500 g.

4.2. COPPER CONTENT IS DETERMINED AS IN GOST 13938.1-78.

4.3. IRON, ANTIMONY, LEAD AND ARSENIC CONTENTS ARE DETERMINED IN ACCORDANCE WITH GOST 9717.0-75 TO 9717.3-75 OR GOST 13938.4-78.

4.4. OXYGEN CONTENT DETERMINATION

4.4.1. ESSENCE OF THE METHOD.

When a weighed portion of copper powder is treated with ammonium chloride solution in an atmosphere of carbondioxide gas, the total oxidised copper fully enters the solution.

Cuprous oxide in the solution is determined by titration with potassium permanganate. The total oxidised copper in the solution is determined by titration with sodium thiosulphate. The difference between total oxidised copper and the cuprous oxide is recalculated in terms of cupric oxide. Oxygen content in the copper powder is calculated from these data.

4.4.2. APPARATUS AND REAGENTS.

Installation for determining Oxygen content (drg. 2).

Analytical balance.

Technical balance with weighing error not exceeding 0.01 g.

Drying cabinet with heating termperature upto 105°C.

25 ml burettes.

10, 50 and 100 ml cylindrical measuring jars.

Ammonium chloride to GOST 3773-72 15% solution.

Sulphuric acid to GOST 4204-77, diluted to 1:3.

Nitric acid to GOST 4461-77.

Potassium iodide to GOST 4232-74.

Soluble starch to GOST 10163-76, 0.5% solution.

Sodium bicarbonate to GOST 4201-66.

Copper sulphate to GOST 4165-78, 10% solution.

Potassium permanganate to GOST 20490-75, 0.1N solution (fixanal).

Sodium thiosulphate to CT C Э B 223-75.

4.4.3. ANALYSIS.

A weighed portion of 5 g of copper powder (weighed in an analytical balance with error not exceeding 0.0002 g) is placed in a 100 ml dry flask 1 with outlet pipe. The upper tube of the flask which goes right down to the bottom, is connected successively to the flasks 2 and 3, to the 200 ml Drexel bottles 4 and 5 and finally to the Kipp's apparatus 6. The outlet channel of the flask 1 is connected to a filtering funnel of diameter 40 to 60 mm with a perforated glass plate No.2 or No. 3. The funnel is inserted into the filtering flask and a vacuum is drawn. The funnel is closed with a stopper fitted with an outlet tube which serves for connection to flask 1.

INSTALLATION FOR DETERMINING OXYGEN CONTENT
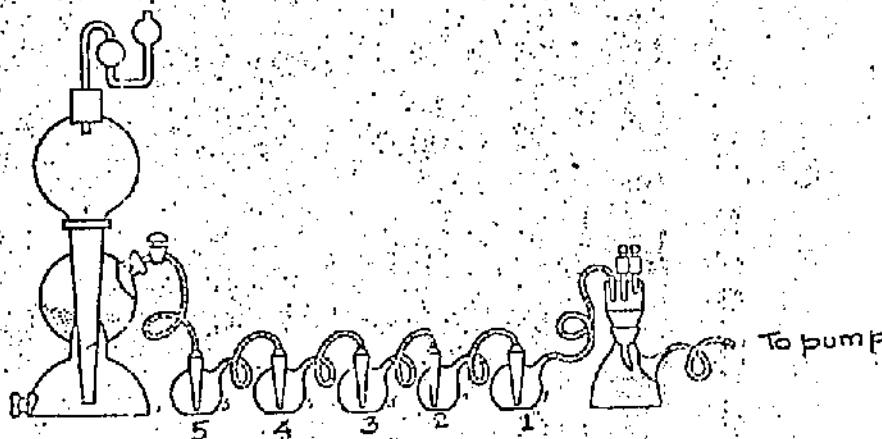
Hundred millilitres of 15% ammonium chloride solution is poured into flask 2. Fifty millilitres of distilled water are poured into flask 3. In order to remove hydrogen sulphide and hydrochloric acid vapour, carbondioxide gas is passed through the Drexel bottle 5 which has copper sulphate in it. A saturated solution of sodium bicarbonate is passed through the Drexel bottle 4 for the same purpose.

The Kipp's apparatus is filled with marble pieces and concentrated hydrochloric acid.

A strong current of carbondioxide gas is passed through the solutions for 7 minutes. Flask 1 containing the weighed portion must at this time be disconnected rrom flask 2. After the solution is saturated with carbondioide gas, flask 1 containing the weighed portion of powder is connected to flask 2 and a current of carbondioxide gas is passsd through the entire setup for 3 to 7 minutes.

After this and without stopping the flow of carbondioxide gas, one half of the ammonium chloride solution is transferred from flask 2 to flask 1 containing the powder.

The powder and the solution in the flask are shaken without pause for 15 minutes. The solution is then poured into the funnel carrying a medium density filter. A vacuum is drawn in the filtering flask and the solution is sucked out, trying to leave the precipitate in the flask itself. The remaining ammonium chloride solution is poured back into the funnel and sicked into the same flask for vacuum filtering.

The connecting tube of flask 1 is closed with a clamp and flask 2 is disconnected. Flask 1 is comected to flask 3. The precipitate in flask 1 and on the filter is rinsed with distilled water drawn from flask 3. The weighed powder and the water in the flask are

shaken two or three times and the solution is transferred to the funnel and sucked into the flask.

Five millilitres of hydrochloric acid diluted 1:3 are added to the filtrate obtained as above and the solution is titrated quickly with a 0.1 N potassium permanganate solution till a steady rose colour is retained. Next, 2 g of potassium iodide are added to the titrated solution and the flask is securely closed with a stopper. The potassium iodide is completely dissolved. The flask containing the solution is kept in a dark place for 5 minutes for complete liberation of iodide.

After the lapse of this period, the liberated iodine is titrated with a 0.1 N solution of sodium thiosulphate till the solution acquires a light yellow colour. Two or three millilitres of starch solution are added and the solution titrated till it becomes completely colourless.

The cuprous oxide (Cu_2O) content in the specimen is determined from the quantity of potassium permanganate used up in titration. The total copper content (in the form of Cu_2O + CuO) is calculated from the titration of the sodium thiosulphate solution. The difference between the total copper and the cuprous oxide is recalculated in terms of copper oxide.

4.4.4. PROCESSING OF RESULTS.

Oxygen content (X) as a percentage is calculated using the formula

$$X = Y.0.111 + Z.0.201$$

where 0.111 is the factor for converting cuprous oxide into oxygen;

0.201 is the factor for converting cupric oxide into oxygen;

Y is the cuprous oxide content (Cu_2O), %, reckoned using the formula

$$Y = \frac{V.K.1.12.0.006354.100}{m},$$

where V is the volume of the 0.1 N solution of potassium permanganate used up in titration, ml;

K is the correction factor for the 0.1 N solution of potassium permanganate;

1.12 is the factor for recalculating from copper into cuprous oxide;

0.006354 is the titre of sodium permanganate with respect to copper, g/ml;

m is the weighed amount of copper powder, g;

Z is the cupric oxide content (CuO), %, reckoned using the formula,

$$Z = \frac{(V_1 K_1 - VK).0-006354.1.25.100}{n},$$

where V_1 is the volume of the 0.1 N solution of sodium thiosulphate used up in titration, ml;

K_1 is the correction factor for the 0.1 N solution of sodium thiosulphate;

1.25 is the factor for recalculation from copper to cupric oxide;

0.006354 is the titre of sodium thiosulphate, g/ml;

The arithmetic mean of results from four determinations, differing from each other by not more than 0.03 % is taken as the result of analysis.

4.4.5. Loss of weight on calcination in hydrogen may be determined by mutual consent.

4.5. PROPORTION OF METAL SULPHATES RECALCULATED IN TERMS OF SULPHATE ION (SO_4) IS DETERMINED AS DESCRIBED IN GOST 10671.5-74.

4.6. PROPORTION OF RESIDUE INSOLUBLE IN NITRIC ACID

4.6.1. APPARATUS AND REAGENTS

Analytical balance

500 ml beakers

Porcelain crucibles to GOST 9147-73

Desiccators

Nitric acid to GOST 4461-77

Ashless filters.

4.6.2. Analysis

Five grams of copper powder are weighed out with error not exceeding 0.0002 g and placed in a 500 ml beaker. About 100 to 120 ml of 1:1 dilute nitric acid is poured into the beaker in small portions. No heating is applied while the powder dissolves in the acid.

At the end of the reaction the contents of the beaker are warmed and then allowed to boil for 10 to 15 minutes, after which the solution is diluted with distilled water and filtered. The residue on the filter is rinsed several times with hot watter till the reaction of such rinsing water on the copper disappears (with potassium hexacyanoferrate). The filter containing the precipitate is placed in a calcined and weighed porcelain crucible and carefully calcined in a muffle furnace at a temperature of 800 to 850°C till its weight becomes constant. The crucible with the calcined residue is cooled in a desiccator and weighed.

4.6.3. PROCESSING OF RESULTS

The proportion of residue (X_1) insoluble in nitric acid as a percentage is calculated using the formula

$$X_1 = \frac{m_1 \cdot 100}{m}$$

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where m_1 is the weight of calcined insoluble residue, g;

m is the weight of the powder before calcining, g;

The arithmetic mean of the results of two parallel determinations the permissible difference between them being within 0.005%, is taken as the result of the analysis.

4.7. Chemical composition may also be determined by other methods which can produce similar accuracy.

4.8. DETERMINATION OF GRANULOMETRIC COMPOSITION

Grain size composition is determined by sieve analysis using a set of seives with meshes to GOST 3584-73.

The weight of a sample of copper powder for sieve analysis should be 100 g for PMS - Vu and PMS-V grades and 2 g for the other grades.

4.8.1. ANALYSIS

The sieve is set up in the ascending order of cell sizes with a tray beneath the sieves. The sample under test is loaded on to the top most sieve and the cover is replaced. The set of sieves is mounted over a vibrator model 029 M and the machine is switched ON for 20 minutes (the frequency of vibration being 140 to 180 per minute). Isolated fractions are removed from the sieves and the tray and weighed with error not exceeding 0.01 g.

The weight of all weighed fractions for PMS-Vu and PMS-V grade powder must be not less than 99% of the weight of sample being tested and not less than 98% for other grades.

4.8.2. PROCESSING OF RESULTS

The proportion of different fractions (X_2) as a percentage is calculated using the formula

$$X_2 = \frac{m_1 \cdot 100}{m} \quad ,$$

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where m is the weight of sample being tested, g and

m₁ is the weight of the particular fraction, g.

4.9. The number of particles of copper powder with conventional diameter not more than 10 microns is determined by sediment analysis using a mutually agreed method.

4.10. Bulk density is determined as in GOST 19440-74.

4.11. FLUIDITY DETERMINATION

4.11.1. SUBSTANCE OF THE METHOD

The method is based on determining the time taken by 50 g of the powder sample to flow out of a funnel with a calibrated outlet hole.
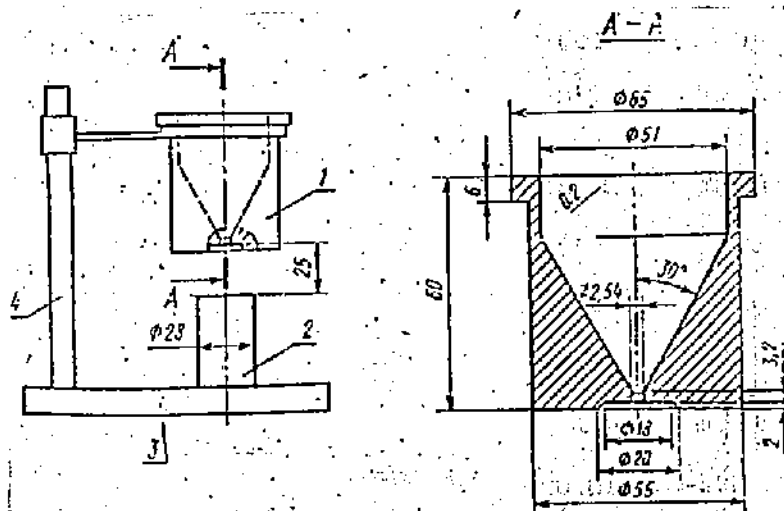
4.11.2. APPARATUS.

APPARATUS FOR DETERMINING FLUIDITY (Drg.3)
Stop watch.

Technical balance with measuring error not exceeding 0.01 g.

APPARATUS FOR DETERMINING FLUIDITY

1. Funnel made of paramagnetic material of hardness 140HB(Ст 10X grade steel) with calibrated outlet hole of diameter 2.51 mm;

2. Receiving cylinder;

3. Stand;

4. Upright of stand.

Drg.3

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4.11.3. TEST PROCEDURE

Fluidity of the powder is determined from the time (in seconds) taken for the powder to flow out of the funnel, multiplied by a correction factor and rounding off to the nearest whole number of seconds. A 50 g portion of powder weighed with error not exceeding 0.1 g is poured into the funnel with inlet opening closed taking care to see that the throat of the funnel is filled with powder. The outlet hole is opened and the powder collected in the receptacle. The start and end of the flow are fixed by means of the stop watch.

The installation must rest on a horizontal base insulated from all shaking and vibration.

4.11.3.1. DETERMINATION OF CORRECTION FACTOR

The funnel is calibrated by allowing 100 cm^3 of distilled water, measured by a pipette, to flow through it and measuring the time taken for the flow. The stop watch is stopped at the moment the jet disappears.

Water and air should be at a temperature of $20 \pm 1°C$ during the measurement.

The arithmetic mean of five measurements, differing from one another by not more than 0.3 second, is taken as the test result.

The average number of seconds is considered as the stamped value "S" for the funnel. This number must be 25 ± 2 seconds. The numerical value of the stamp must be punched on the funnel.

The correction factor for a fresh funnel (without any wear) is 25.3 divided by the number stamped on the funnel.

4.11.4. PROCESSING OF RESULTS

The arithmetic mean of results of five determinations of flow time in seconds multiplied by the correction factor determined during calibration is taken as the test result.

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4.12. DETERMINATION OF THE STRENGTH OF RAW MOULDING

4.12.1. The essence of the method consists of the ability of the sample of a given density to withstand, in bending, a stress not less than 60 kgf/cm^2.

4.12.2. APPARATUS AND DEVICES

Pressmould;

A test press of any design that permits a test pressure of 0 to 10 tf in compression to be applied at a rate of 10kgf/min.

4.12.3. TEST PROCEDURE

The test is carried out on samples of size 30x10x5 mm. The inside surface of the matrix is wetted with a solution, consisting of 100 g of zinc stearate diluted with 1 litre of trichloromethane, using a brush, for the preparation of samples. The surface is dried with a jet of air. The specimen is prepared by weighing out 10.01 g of the powder with error not exceeding 0.0002 g.

The powder is poured over the die and spread uniformly. A pressure of 350 kgf/cm^2 is applied twice. The test is carried out on at least three specimens prepared with a tolerance of $\pm$ 0.02 mm in thickness.

The upper part of the specimen is marked and the moulding is tested for strength. Pressure is applied on the moulding, gradually, increasing it at the rate of 10 kgf per minute and noting the value at the moment of destruction of the specimen.

4.12.4. PROCESSING OF RESULTS

The ultimate strength of the mould (σ) in kgf/cm^2 is calculated using the formula,

$$\sigma = \frac{3 \, P_{\zeta}, \, 1}{2b, a^2},$$

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where P_k is the force at the moment of destruction, kgf;

l is the distance between supports, mm;

a is the thickness of the specimen, mm and

b is the width of the specimen.

The arithmetic mean of the results of three determinations, differing from one another by no more than 0.1 kgf/cm^2, is taken as the test result.

4.13. DETERMINATION OF SURFACE AREA PER UNIT WEIGHT

4.13.1. APPARATUS

ПCX-4 (PSKh-4) apparatus

4.13.2. Test procedure

A weighed portion of 30 g of powder is placed in a dish on a layer of filter paper and levelled by gentle stroking and compacted with a plunger (by hand). The height of the layer is then measured by means of a cone on the plank of the plunger and the scale against the outer surface of the dish. Small spheres arranged below the powder provide some unloading, the extent of which must be such that the liquid in the manometer rises to the level of the upper bulb. The time taken for the meniscus of the liquid in the manometer to move from one mark to another in seconds is noted. The ambient temperature is also noted.

4.13.3. PROCESSING OF RESULTS

Unit surface area (S) in m^2/kg is calculated using the formula,

$$S = K \frac{M.t}{m},$$

where K is the constant of the instrument indicated in its mannual;

M is the coefficient for the height of the layer being measured and the ambient temperature, found from the Table in the operating instructions of the apparatus;

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t is the time taken for the meniscus to drop from one mark to another, seconds and,

m is the weighed portion of powder, g.

The arithmetic mean of the results of three determinations, differing by not more than $0.1 m^2/kg$, is taken as the test result.

4.14. Resistvity of copper powder is determined by a mutually acceptable method.

4.15. Moisture content in powder is determined as described in GOST 18317-73 (in force till 01.01.1979).

Moisture content may also be determined by the Dean and Stark method using toluene as the solvent as described in GOST 2477-65.

4.16. Particle shape is determined with a microscope at 300 magnification factor.

4.17. Check for absence of extraneous impurities and lumps is carried out by externally inspecting and filtering an individual sample selected as in clause 4.1.1. through a No. 018 K sieve.

5. PACKING, MARKING, TRANSPORT AND STORAGE

5.1. Copper powder is packed in galvonised steel barrels conforming to GOST 5044-71 with removable top cover and internal polyethylene insert as per GOST 17811-72 which is (was) in force till 01.01.1979.

50 g of silicagel or grade KCM or Ш CM as per GOST 3956-76
(KSM) (ShSM)
is placed on the surface of unstabilized powder. The polyethylene insert is secured or packed in two layers ensuring that it remains leakproof during transport and storage.

Barrels are of capacity 25, 50 or 75 litres. Smaller barrels

may be used by mutual consent. Soft rubber-cord containers with two-ply polyethylene lining as per GOST 17811-72 (valid upto 01.01.1979) may also be used.

5.2. Transport containers are marked in accordance with GOST 14192-77. Caution sign "Keep away from moisture" is painted on them. The following additional particulars are also painted on the containers;

a) nomenclature and designation of the grade of powder;

b) batch number;

c) date of manufacture and

d) designation of this standard.

5.3. Every batch of powder must be accompanied by a quality certificate indicating:

a) manufacturer's name or trademark;

b) nomenclature and grade of power;

c) batch number;

d) number of cases in the batch;
e) Gross and net weight;
f) results of analyses and tests conducted;

g) date of manufacture and

h) designation of the present standard.

The accompanying document must be placed in packing case No.1 and its case marking must additionally carry the legend, "Quality certificate".

5.4. Copper powder is carried by all kinds of covered transport. Powder must not be carried along with oxygen and other active chemical substances. Powder must be protected against incidence of moisture.

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5.5. Powder is stored in original factory packing in enclosed premises at temperatures not exceeding 20°C and in atmosphere, free from reducing substances.

6. MANUFACTURER'S GUARANTEE

6.1. Copper powder must go through acceptance by the quality control department of the manufacturing concern. The manufacturer must guarantee conformity of copper powder with the requirements of the present standard, provided the customer observes the storage conditions defined in this standard.

Guaranteed shelf life of copper powder of grades PMS-1, PMS-1u; PMS-2, PMS-2u, PMS-k and PMS-N is six months and that of grades PMS-V, PMS-Vu, PM, PMu, PMA and PMAu is two months from the date of manufacture.

After the lapse of shelf life, copper powder may be used after checking for conformity with all the requirements of the present standard.

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Annexure

Recommended

Application Areas for Copper Powder

Grades	Application areas
PMS-V and PMS-Vu	In the aviation industry.
PMA, PMAu, PM, PMu	In the aviation, electrical engineering, chemical and machine-building industries for the manufacture of critical parts, brushes of electrical machines and filters for fine filtering of oils.
PMS-1, PMS-1u PMS-2, PMS-2u	In powder metallurgy for the manufacture of sintered parts, rings, bushes etc. and in instrument making.
PMS-K	In the electrocarbon industry for finishing contacts.
PMS-N	In metal-ceramic industry for the manufacture of less critical parts.

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Revision No 1. dated 20.7.79 to
GOST 4960-75 .

Valid upto 0.11.79.

Add the word "Specifications" to the title of the standard.

Insert the following revised version of clause 2.11.

"The quality parameters defined for PMS-V and PMS-Vu grade powder in each packing unit of the batch must not differ from the average values for the corresponding characteristics of the batch by more than ± 10 %.

Clause 4.2. For the reference GOST 13938.1-68" read "GOST 13938.1-78".

Clause 4.3. For the reference "GOST 9717-61 read GOST 9717.0-75 to GOST 9717.3-75; for GOST 13938.4-68" read GOST 13938.4-78".

Clause 4.4.2.   Amend references as below:

GOST 4204-66   to GOST 4204-77;

GOST 3118-69   to GOST 3118-77;

GOST 4461-67   to GOST 4461-77;

GOST 4165-68   to GOST 4165-78.

Delete reference to GOST 4215-66.

Clause 4.6.1.   Amend reference to "GOST 4461-67. to read " GOST 4461-77".

Clause 4.13.1. Add the words, "or ПCX-2 (PSKh-2)".

Clause 5.2. Add to subclause (b) the words " and the number of the packing unit".   Amend the reference, "GOST 14192-71" to " GOST 14192-77".

Clause 5.3. Insert the following new version of subclause (d).

"d. the total number and serial numbers of packing units forming the batch".

REVISION No. 2 to GOST 4960-75.

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Valid upto 01.12.81.

Insert code: OKP 17 9310 under title.

Clause 3.1. Add new paragraph:

The quality certificate must contain:

manufacturer's name or trademark;

nomenclature and grade of powder;

batch number;

number of cases in the batch;

gross and net weight;

results of analyses and tests conducted;

date of manufacture and

insert new text of clause 3.2.

3.2. Acceptance and type tests are conducted in order to verify conformity of the quality of copper powder with the requirements of the present standard. The weight of the combined sample must be not less than 0.2% of the batch weight.

Type tests are to be conducted according to a schedule agreed upon by the designer, manufacturer and user of the product".

Clause 4.1.1.

Instead of "individual "read "spot";

Instead of "GOST 9721-71 "read "GOST 9721-79".

Add new paragraph

"The weight of spot sample must be not less than 0.2% of the weight of one packing unit".

Insert new clause 4.1.2. as follows:

"The selected spot samples are combined, thoroughly mixed and reduced to an average sample of weight 500 g by quartering".

Clause 4.4.2.

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Instead of "GOST 4204-66 "read" GOST 4202-77"

GOST 3118-67   GOST 3118-77

GOST 4461-67   GOST 4461-77

GOST 4201-65   GOST 4201-79

GOST 4165-68   GOST 4165-78

Add the following to the last paragraph:

"in accordance with standards and technical documentation".

Clause 4.6.1.

Amend reference to GOST 9147-73 to read "GOST 9147-80".

Clause 5.1. Para 1. Delete the word "galvanised".

Amend references as below:

GOST 5044-71 to read GOST 5044-79

GOST 17811-72 to read GOST 17811-78;

Paragraph 3, after the words by mutual consent add the following " Steel containers of other designs with polyethylene inserts may be used".

Clause 5.2. Insert new version of paragraph 1. as below:

5.2. Transport containers are marked in accordance with GOST 14192-77. Caution signs 'Keep away from moisture " and " Hermetically Sealed" as well as additional particulars are painted on them".

Insert new version of clause 5.3.

5.3. The quality certificate must be placed in case no. 1 which must carry the additional marking "Quality certificate".

(Information Standards Indicator No.9, 1981).