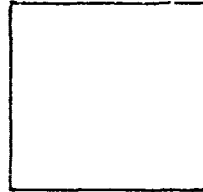


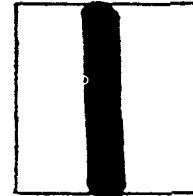
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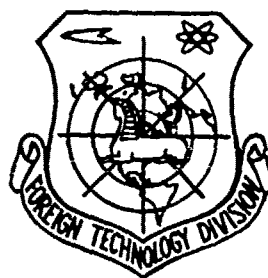
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FOREIGN TECHNOLOGY DIVISION



ELECTRICAL INSULATING VARNISH ML-92



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EDITED TRANSLATION

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20 July 1979

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ELECTRICAL INSULATING VARNISH ML-92

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PREPARED BY:

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FOREIGN TECHNOLOGY DIVISION
WP.AFB, OHIO.

U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	<i>A a</i>	A, a	Р р	<i>P p</i>	R, r
Б б	<i>B b</i>	B, b	С с	<i>C c</i>	S, s
В в	<i>V v</i>	V, v	Т т	<i>T t</i>	T, t
Г г	<i>G g</i>	G, g	У у	<i>U u</i>	U, u
Д д	<i>D d</i>	D, d	Ф ф	<i>F f</i>	F, f
Е е	<i>E e</i>	Ye, ye; E, e*	Х х	<i>X x</i>	Kh, kh
Ж ж	<i>Zh zh</i>	Zh, zh	Ц ц	<i>C c</i>	Ts, ts
З з	<i>Z z</i>	Z, z	Ч ч	<i>Ch ch</i>	Ch, ch
И и	<i>I i</i>	I, i	Ш ш	<i>Sh sh</i>	Sh, sh
Й й	<i>Y y</i>	Y, y	Щ щ	<i>Shch shch</i>	Shch, shch
К к	<i>K k</i>	K, k	Ъ ъ		"
Л л	<i>L l</i>	L, l	Ы ы	<i>Y y</i>	Y, y
М м	<i>M m</i>	M, m	Ь ь		"
Н н	<i>N n</i>	N, n	Э э	<i>E e</i>	E, e
О о	<i>O o</i>	O, o	Ю ю	<i>Yu yu</i>	Yu, yu
П п	<i>P p</i>	P, p	Я я	<i>Ya ya</i>	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ё in Russian, transliterate as yë or ë.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	sinh ⁻¹
cos	cos	ch	cosh	arc ch	cosh ⁻¹
tg	tan	th	tanh	arc th	tanh ⁻¹
ctg	cot	cth	coth	arc cth	coth ⁻¹
sec	sec	sch	sech	arc sch	sech ⁻¹
cosec	csc	csch	csch	arc csch	csch ⁻¹

Russian English

rot curl
lg log

ELECTRICAL INSULATING VARNISH ML-92

GOST 15865-70

By decree of the Committee of Standards, Measures and Measuring Instruments attached to the Council of Ministers of the USSR from 15 April 1970 No. 513 the period of introduction is established from 1 January 1971.

Nonobservance of the standard is punishable by law

This standard is extended to the electrical insulating varnish ML-92, which is a solution of the mixture of glyptal varnish and melamine formaldehyde resin K-421-02 in organic solvents.

The varnish ML-92 is intended for the impregnation of windings of electrical machines, apparatuses and transformers and for the covering of electrical insulating parts. Varnish ML-92 has the heat resistance class of V.

1. Technical Requirements

1.1. According to the physicochemical and electrical indices, the varnish ML-92 must conform to the requirements and standards indicated in the table.

[See table on next page.]

Table

Name of indices	Standards
1. The presence of mechanical inclusions in the varnish	Absent
2. Outer form of film of varnish	After drying the varnish must form a glossy uniform smooth film from light brown to dark brown color
3. Viscosity according to viscosimeter VZ-4 at 20°C in s [seconds], not less than	25
4. Content of dry residue in %	50-55
5. Acid number in mg of KOH, not more than	10
6. Content of free formaldehyde in %, not more than	0.6
7. Time of drying at 105-110°C in hours, not more than	1
8. Ability of varnish to dry in thick layer at 115-120°C in hours, not more than	16
9. Thermo-elasticity of film at 150°C in hours, not less than	48
10. Hardness of film according to a pendulum instrument at 20±1°C, no less than	0.40
11. Oil resistance of film in kgf, not less than	8
12. Electrical strength of film in kV/mm, not less than	65
13. Specific volumetric resistance of film in $\Omega \cdot \text{cm}$, not less than	30
at 20±2°C	$1 \cdot 10^{14}$
after action of water for 24 h at 20±2°C	$5 \cdot 10^{12}$

Note: Indices of electrical strength and specific volumetric electrical resistance at 130±2°C prior to 1 January 1972 have not been standardized, and determination of them is mandatory.

1.2. The formula which provides the conformity of the quality of the varnish to requirements of this standard must be coordinated with the Ministry of the electrical engineering industry of the

USSR.

1.3. In the production and use of varnish, precautionary measures provided in the appropriate instructions on accident prevention must be observed.

1.4. When necessary, before use, the varnish is diluted down to the working viscosity with toluene (GOST 14710-69 or GOST 9880-61), with xylene (GOST 9949-62 or GOST 9410-60) or a mixture of these solvents with white spirit (GOST 3134-52) in a ratio of not less than 3 : 1.

1.5. The prepared varnish must be accepted by the technical control of the manufacturer. The manufacturer must guarantee the conformity of the produced varnish to requirements of this standard.

1.6 The manufacturer is obligated to replace free of charge the varnish during twenty months from the shipment date of it to the address of the user if during the indicated period the user detects a nonconformity of the varnish to requirements of this standard. The varnish must be replaced under the condition of the observance of the rules of transporting and storage indicated in GOST 9980-62..

2. Method of Tests

2.1. For a control check by the user of the quality of the Varnish and also the conformity of the packaging, packing and marking to requirements of this standard, the rules of sampling and methods of tests indicated below must be applied.

2.2. Taken for the batch is the quantity of varnish obtained for one industrial process and accompanied by one quality certificate.

2.3. In the checking of the received batch of varnish, the sampling is selected per GOST 9980-62.

2.4. The presence of mechanical impurities is determined per GOST 13526-68.

2.5. The outer form of the film of the varnish is determined visually with the natural scattered light. The varnish is applied by the pouring onto a clean glass plate with a dimension of 90 X 120 mm and then dried at 105-110°C for one hour. After cooling

the film of the varnish is examined.

2.6. The viscosity of the varnish is determined according to GOST 8420-57 by the viscosimeter VZ-4 at 20°C.

2.7. The content of the dry residue in the varnish is determined per GOST 6989-54 at 20°C.

2.8. The acid number of the varnish is determined per GOST 13526-68.

2.9. Determination of the content of free formaldehyde

2.9.1. Applicable reagents and solutions:

potassium hydroxide (caustic potash) per GOST 4203-65, chemically pure, 0.5 N solution;

saline acid per GOST 3118-67, chemically pure, 1 N solution;

sodium sulfite (sodium sulfite), crystalline per GOST 429-66, chemically pure, 20% solution;

rectified (hydrolytic) of higher purity;

toluene per GOST 5789-69;

alcohol-toluene mixture in a 1 : 2 ratio;

phenolphthalein (indicator) per GOST 5850-51.

2.9.2. Conducting of the test

4-6 g of tested varnish taken with an accuracy of up to 0.01 grams ^{are} weighed in a flask with a capacity of 250 ml (with a ground-glass stopper) and dissolved in 10 ml of an alcohol-toluene mixture. The obtained solution is neutralized by a titrated solution of caustic potash up to the appearance of a rose-colored coloring which does not disappear for 30 seconds. Then there are added 20 ml of a solution of sodium sulfite into the flask, which is preliminarily neutralized by a phenolphthalein solution of a saline acid up to a slight rose color, and again there are added two to three drops of phenolphthalein and titrated that which is separated as a result of the reaction of KOH 1 normal with a solution of saline acid.

The titration is finished with the absence of coloring at the place of the drop of the drop of phenolformaldehyde added to the already decolorized titrated solution.

The content of the free formaldehyde (X) in percent is calculated according to the formula

$$X = \frac{0.03 \cdot V \cdot 100}{G}$$

where

V is the volume of precisely 1 N solution of saline acid spent for the titration of the varnish being tested, in ml;

0.03 - quantity of formaldehyde corresponding to 1 ml precisely of 1 N solution of saline acid, in g;

G - weighing of varnish in g.

2.10. The drying time of the film of the varnish is determined per GOST 13526-68 on plates of copper band 0.1 mm thick (GOST 434-53) of brand MGM. The varnish is applied per GOST 13526-68. The first layer of varnish before the repeated dipping and the second layer of varnish before the hot drying are held at $20 \pm 2^\circ\text{C}$ for 15-20 minutes. Then the plates with the applied varnish are dried at $105-110^\circ\text{C}$ for 1 hour.

2.11. The ability of the varnish to get dry in a thick layer is determined per GOST 13526-68 at 120°C for 16 hours. Before the hot drying the boxes with the varnish are held at $20 \pm 2^\circ\text{C}$ for 30 minutes. The dry varnish layer must be uniform, transparent, without blisters and wrinkles and must be well separated from the foil in the heated state.

2.12. The thermoelasticity of the varnish film is determined per GOST 13526-68 on plates of copper band 0.1 mm thick (GOST 434-53) of the brand MGM. The varnish is applied and dried according to item 2.10, and the second layer of varnish is dried at $115-120^\circ\text{C}$ for one hour. Then the plates are held in a thermostat at 150°C for 48 hours. The specimens are removed from the thermostat, cooled down to $20 \pm 2^\circ\text{C}$ and tested per GOST 6806-53 around a rod with a diameter of 3 mm.

2.13. The hardness of the film is determined per GOST 5233-67. The varnish is applied per GOST 13526-68, held at $20 \pm 2^\circ\text{C}$ for 15-20 minutes and dried at $115-120^\circ\text{C}$ for 6 hours.

2.14. The oil resistance of the film of the varnish is determined per GOST 13526-68 on plates of copper band 0.1 mm thick (GOST 434-53) of brand MGM. The application of the varnish and

intermediate drying is carried out according to item 2.10. Then the plates with the applied varnish are dried at 115-120°C for 6 hours.

2.15. The electrical strength and specific volumetric resistance at $20 \pm 2^\circ\text{C}$, at $130 \pm 2^\circ\text{C}$ and after the action of water are determined per GOST 13526-68 on plates of a cold-cathode copper sheet 0.4-0.6 mm thick (GOST 495-70). The varnish is applied and dried according to item 2.14. Each determination is carried out on two plates.

Used in determining the specific volumetric electrical resistance are the measuring and protective electrodes in the form of foil ground to the surface of the specimen.

3. Packing, Marking, Transporting, and Storage

3.1. The packing, marking, transporting, and storage of the varnish are done per GOST 9980-62.

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A210 DMAAC	2	E017 AF/RDXTR-W	1
B344 DIA/RDS-3C	9	E403 AFSC/INA	1
C043 USAMIIA	1	E404 AEDC	1
C509 BALLISTIC RES LABS	1	E408 AFWL	1
C510 AIR MOBILITY R&D	1	E410 ADTC	1
LAB/FIO			
C513 PICATINNY ARSENAL	1	FTD	
C535 AVIATION SYS COMD	1	CCN	1
C591 FSTC	5	ASD/FTD/NIIS	3
C619 MIA REDSTONE	1	NIA/PHS	1
D008 NISC	1	NIIS	2
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P005 DOE	1		
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NSA/1213/TDL	2		