STANDARD/SPECIFICATION	NUMBER
MOULDING MATERIAL DSV	GOST 17478-72*
	SUPERSEDES —
	SHT 1 OF 16

This standard pertains to moulding, thermosetting, glass fibre(DSV), manufactured on the base of refined phenol-formaldehyde resin as binder & complex glass fibre, consisting of elementary fibres of diameter max. 11 microns, as filler.

Moulding material DSV is used for direct and cast moulding of parts of structural and elect. engineering purposes, suitable for operation at temperature -60 to +200°C and in tropical climatic conditions.

Colour of parts of moulded material is preserved even in case of prolonged action of temperature +80 to 120°C.

1. TYPES AND GRADES

1.1. Depending on the quantity of twists of impregnated glass fibres, the following types of moulding material should be produced:

DSV-2-R-2M - granules from two impregnated non-twisted glass fibres with overall thickness 42.0x2 tex;

DSV-4-R-2M - granules from four complex glass fibres with overall thickness 42.0x4 tex.

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* Re-edition(Nov.1976) with modification No.1, published in April 1976.

APPROVED			MATL/SPECN.			
ENGINEER GP. INCHARGE			HEAT TREAT			
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HINDUSTAN AERONAUTICS LIMITED-NASIK DIVN. INDIA

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Properties	Norms
13. Volume resistivity, Ohm.cm:	
a) in supply condition at test temperature 200°C	8.6×10^{11}
b) after ageing at 200°C for 300 hrs followed by keeping at 98% relative humidity at 40°C for 48 hrs.	1.8×10^{9}
14. Dielectric strength, kv/mm:	
a) in supply condition at test temp. 200°C	5.7 - 8.0
b) after ageing at 200°C for 300 hrs followed by keeping at 98% relative humidity at 40°C for 48 hrs.	2.4
15. Stress-rupture strength at 20°C, in hrs: σ = 0.7 of σ_u.	1000
16. Losses of 50% strength, at 200°C, in hrs.	200
17. Resistance to frost, in °C.	(-)180
18. Tensile strength, in kg/cm^2, minimum:	
DSV-2-R-2M :	
grade L	750
grade O	850
grade P	1000
DSV-4-R-2M :	
grade L	600
grade O	700
grade P	950

(Revised edition - "Standards information catalogue" No.4 of 1976).

APPENDIX 2
(recommended)
to GOST 17478-72

REGIMES OF PROCESSING THE MOULDING MATERIAL IN TO ARTICLES.

Method of processing	Moulding regimes			
	Temp. of mould, in °C	Unit pressure, in kg/cm²	Temp. of casting cylinder, in °C	Holding for 1 mm thickness, in minutes
Direct moulding	140-150	200-600	-	1.5 (but not less than 5)
Cast moulding	135-170	600-1300	125-130	1.0 (but not less than 3)

Note : 1. Unit pressure during moulding depends on the shape of article, and during cast moulding - on the c/s area of gate.

2. Mould temperature for cast moulding is determined by the time for filling the mould: 170°C in case of filling the mould in max. 20 seconds; and 135°C - in minimum 60 seconds.

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Other standards referred to in this standard:

GOST 4648-71; GOST 4651-68; GOST 4647-69;
GOST 9141-65; GOST 6433.2-71; GOST 6433.3-71;
GOST 9147-73; GOST 6371-73; GOST 4460-66;
GOST 11547-76; GOST 5959-71; GOST 2991-69;
GOST 2228-75; GOST 2226-75.

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APPENDIX : 1
(reference)
to GOST 17478-72

TABLE OF

PROPERTIES OF MOULDING MATERIAL DSV.

Properties	Norms
1. Density, gm/cm^3	1.7-1.85
2. Bulk weight, gm/cm^3	0.1-0.25
3. Estimated shrinkage, in %, max.	0.15
4. Heat resistance as per Martin, in °C, minimum	280
5. % oil resistance and benzene resistance	plus
6. Acid-resistance, in %, max.	0.1
7. Water absorption in 24 hrs, in %, max.	0.2
8. Reaction of water extract	Neutral
9. Coefficient of linear expansion, ℓ/°C, in temperature range :	
20 - 80°C	$12 \times 10^{-6} - 9 \times 10^{-6}$
80 - 160°C	$8 \times 10^{-6} - 4 \times 10^{-6}$
10. Heat resistance, K.cal./kg.degree, at 25 - 200°C.	0.31-0.36
11. Heat conductance K.cal/m.hr.degree	0.34-0.31
12. Surface resistivity, Ohm:	
a) in supply condition at test temp. 200°C	2.8×10^{12}
b) after ageing at 200°C for 300 hrs followed by keeping at 93% relative humidity at 40°C for 48 hrs.	2.1×10^{9}

The certificate should contain:

a) name or trade mark of manufacturing plant;

b) name, grade and colour of material;

c) batch number;

d) net weight;

e) manufacturing date;

f) qualitative properties regarding the conducted tests or conformity to the requirements of this standard;

g) this standard no.

5.4. Moulding material, packed as per point 5.1, is transported in dry, sheltered transport means.

5.5. Moulding material should be stored in dry clean place at temperature not above +25°C in packed condition.

6. MANUFACTURER'S GUARANTEE

6.1. Moulding material should be accepted by the quality control deptt. of manufacturing plant. Manufacturer should guarantee the conformity of all supplied batches of moulding material DSV to the requirements of this standard provided the customer observes the storage conditions, given in this standard.

6.2. Guaranteed shelf-life of colourless moulding material is 6 months and that of coloured - is 3 months from the date of manufacture. On lapse of the given period, the moulding material (before use) is again subjected to tests and is considered suitable in case of conformity of all its properties to the technical requirements.

5. PACKING, MARKING, TRANSPORTATION AND STORAGE.

5.1. Moulding material is packed in polyethylene bags, sealed and packed in plywood (GOST 5959-71) or wooden(GOST 2991-69)* boxes, lined with burlap(GOST 2228-75).

In case of transportation of moulding material in containers, substitution of plywood or wooden boxes by multi-layered paper bags(GOST 2226-75)is allowed.

Note : By mutual agreement with customer, moulding material may be packed in rubberised bags or any other airtight tare.

(Revised edition - "Standards information catalogue" No.4 of 1976).

5.2. A tag or label with following particulars is affixed to every box or paper bag:

a) name or trade mark of manufacturing plant;

b) name, grade and colour of the material;

c) batch number;

d) net and gross weight;

e) manufacturing date;

f) this standard no.

5.3. Each batch of moulding material should be furnished with a certificate, attesting its quality and conformity to the requirements of this standard.

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* valid upto 01.01.78

Note : It is allowed to use complex glass fibres of other thicknesses provided the overall thickness of impregnated glass fibres in granule is maintained.

1.2. Depending on the length of granules, following types of glass fibre should be produced (in each 3 grades):

L - used for manufacturing thin-walled parts by cast moulding, average length of granules should be upto 6 mm;

O - used for cast moulding and direct moulding, average length of granules should be 10^{+2}_{-1} mm;

P - used for fabricating high-strength, large parts by direct moulding, average length of granules should be 20 ± 2 mm.

Method of calling the moulding material from 2 fibres on binder R-2M, grade L:

DSV-2-R-2M of grade L GOST 17478-72.

1.3. Each type of moulding material can be supplied coloured-black, orange, red, green and lettuce-green colour.

2. TECHNICAL REQUIREMENTS

2.1. Moulding material should correspond to the requirements and norms, given in table 1, as regards physico-mechanical properties.

2.2. Moulding material should be free-flowing, without impurities, with uniform application of binder. Binding material in solid inseparable lumps is not allowed.

2.3. Colour of moulding material for fabricating colourless product should be yellow of various shades. Moulded specimens (bricks, discs or cylinders) from moulding material should have smooth surface without bulges, cracks and exfoliations. Presence of red strands of binder and white strands of glass fibre is allowed.

Coloured moulding material should correspond to the masters, approved mutually between manufacturer and customer.

3. RULES OF ACCEPTANCE

3.1. Moulding material is offered for acceptance in batches. The quantity of moulding material of same grade, identical colour, processed in resin of single batch and furnished with a single quality certificate, is taken as a batch.

3.2. For quality verification of a received batch of moulding material, the sample is taken from 10% of packed items of a batch, but from not less than 3 items. Total weight of selected sample of moulding material should be minimum 1.6 kg.

3.3. In case of obtaining unsatisfactory results of tests even for one of the properties, repetitive tests should be conducted on samples, selected from double the quantity of items from the same batch and on double the quantity of specimens. Results of repetitive tests are final.

Table : 1

Properties	NORMS FOR GRADES: DSV-2-R-2M L Colourless	DSV-2-R-2M L Coloured	DSV-2-R-2M O Colourless	DSV-2-R-2M O Coloured	DSV-2-R-2M P Colourless	DSV-2-R-2M P Coloured	DSV-4-R-2M L Colourless	DSV-4-R-2M L Coloured	DSV-4-R-2M O Colourless	DSV-4-R-2M O Coloured	DSV-4-R-2M P Colourless	DSV-4-R-2M P Coloured	Test methods
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Static bending strength, kg/cm^2, minimum	1600	1600	2400	2300	3000	2800	1400	1200	2000	2000	2700	2700	As per GOST 4648-71.
2. Compression strength, in kg/cm^2, minimum	1300	-	1300	-	1300	-	1300	-	1300	-	1300	-	As per GOST 4651-68 and pt.4.2 of this standard.
3. Impact strength, $kg.cm/cm^2$ minimum	45	45	70	60	80	80	35	35	70	50	90	70	As per GOST 4647-69 and pt.4.3 of this standard.
4. Dielectric permittivity at frequency 10^6 Hz, maximum	7	8	7	8	7	8	7	8	7	8	7	8	As per GOST 9141-65* and pt. 4.5 of this std.

* Valid upto 01.01.78

1	2	3	4	5	6	7	8	9	10	11	12	13	14
5. Loss factor at frequency 10^6 Hz, maximum.	0.04	0.05	0.04	0.05	0.04	0.05	0.04	0.05	0.04	0.05	0.04	0.05	As per GOST 9141-65* and pt. 4.5 of this std.
6. Volume resistivity, Ohm.cm, minimum.	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}	As per GOST 6433.2-71 and pt. 4.6 of this std.
7. Surface resistivity, in Ohm, minimum.	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}	10^{12}	- " -
8. Dielectric strength at frequency 50 Hz, in kV/mm, minimum.	14	-	14	-	14	-	14	-	14	-	14	-	As per GOST 6433.3 -71 and pt. 4.7 of this standard.
9. Content of [illegible], in %	38±2	39±2	38±2	39±2	38±2	39±2	38±2	39±2	38±2	39±2	38±2	39±2	As per pt. 4.8

* Valid upto 01.01.78

1	2	3	4	5	6	7	8	9	10	11	12	13	14
10. Content of moisture and volatile substances, in %.	1.5-3	1.5-3	1.5-3	1.5-3	1.5-3	1.5-3	1.5-3	1.5-3	1.5-3	1.5-3	1.5-3	1.5-3	As per point 4.8
11. Content of soluble substances of binder in ethyl alcohol, in %, minimum.	80	80	80	80	80	80	80	80	80	80	80	80	As per point 4.9.

Note : 1. For DSV moulding material, coloured in black colour, the volume resistivity (in Ohm.cm) and surface resistivity (in Ohm) should be minimum 10^{11}.

2. Reference properties of moulding material DSV are given in appendix 1.

4. TEST METHODS

4.1. Specimens, used for testing the moulding material, and their moulding regimes are given in table 2.

Table : 2

Specimen dimensions, in mm	Moulding regimes		
	Unit pressure, kg/cm^2	Temperature, in ^{o}C	Holding time, in minutes
Brick (30±1)x(10±0.5)x(4±0.2). Cylinder of dia. 10±0.5 and height 15±0.5. Disc of dia. 100±0.5, thickness from 2 to 5.	200-350	145±5	10

Note : Preliminary heating and pressing is allowed as per optimum process.

Specimens in the form of bricks are pressed only in unicellular folding moulds.

(Revised edition - "Standards information catalogue" 4 of 1976).

4.2. Compression strength is determined as per GOST 4651-68 on specimens in the form of cylinder.

4.3. Impact strength is determined as per GOST 4647-69 on specimens without notch with rate of motion of pendulum at the moment of impact $3.8^{+0.2}_{-0.0}$ m/sec.

4.4. Specimens for electrical tests are heat treated at 90±3°C for an hour followed by cooling in a drying cabinet (containing dry calcium chloride) upto room temp. Tests should be conducted in room conditions not later than 3 minutes after cooling.

4.5. Dielectric permittivity and loss factor at frequency 10^6Hz are determined as per GOST 9141-65* on specimens in the form of disc having dia. 100±0.5 mm and thickness 2±0.2 mm.

4.6. Volume and surface resistivity are determined as per GOST 6433.2-71 on specimens in the form of disc of dia. 100±0.5 mm and thickness 2±0.2 mm at voltage 1000volts.

4.7. Dielectric strength is determined as per GOST 6433.3-71 on specimens in the form of disc of dia. 100±0.5 mm and thickness 2±0.2 mm.

4.8. Determination of content of binder, moisture and volatile substances.

4.8.1. Containers and apparatus:

crucible to GOST 9147-73;

thermostat;

muffle furnace;

desiccator to GOST 6371-73;

calcium chloride (freshly calcined) to GOST 4460-66.

(Revised edition - "Standards information catalogue" no.4 of 1976).

4.8.2. Procedure

2 gm of moulding material is placed in a clean(initially calcined upto constant weight) crucible and weighed on balance with an accuracy upto 0.0002 gm. The crucible with contents is transferred to a thermostat, heated upto 100-105°C and held for 1 hour. Then the crucible is cooled in desiccator over calcined calcium chloride upto room temperature and weighed with the same accuracy.

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* Valid upto 01.01.78

Then the crucible with its content is placed in muffle furnace and calcined at 500-600°C till the contents in crucible become white.

The crucible is cooled in desiccator over calcined calcium chloride upto room temp. and weighed.

(Revised edition - "Standards information catalogue" no.4 of 1976).

4.8.3. Calculation of results

Content of moisture and volatile substances(X) and binder (X_1), in %, is calculated as per formulae:

$$X = \frac{(G-G_1) \cdot 100}{(G - G_3)} \; ; \; X_1 = \frac{(G_1-G_2) \cdot 100}{(G-G_3)},$$

where : G - weight of crucible with weighed portion, in gm;

G_1 - weight of crucible with weighed portion after drying, in gm;

G_2 - weight of crucible with weighed portion after calcination, in gm;

G_3 - weight of empty calcined crucible, in gm.

The arithmetical mean of 3 determinations is taken as the test result.

4.9. Determination of content of soluble substances of binder in ethyl alcohol.

4.9.1. Reagents, containers and apparatus:

sythetic ethyl alcohol to GOST 11547-76;

Cooch's crucible to GOST 9147-73;
desiccator to GOST 6371-73;
thermostat;

muffle furnace.

4.9.2.- Procedure

2 gm of moulding material is placed in a clean, initially calcined crucible, weighed on balance with an accuracy upto 0.0002 gm and extracted two times (for 30 minutes each) with 300 ml of ethyl alcohol, then the crucible with its contents is kept in thermostat(heated upto 105±5°C and held for 20 minutes. Then it is cooled in desiccator upto room temperature and weighed.

Then the crucible with its contents is placed in muffle furnace (heated to 450-500°C) and calcined till the weighed portion becomes white, then it is cooled in desiccator and weighed.

4.9.3. Calculation of results.

% content of soluble substances of binder in ethyl alcohol (X_2) is calculated as follows:

$$X_2 = \frac{(G-G_1) \cdot 100}{(G-G_2)} ,$$

where : G - weight of crucible with weighed portion, in gm;

G_1 - weight of crucible with weighed portion after extraction and drying, in gm;

G_2 - weight of crucible with weighed portion after calcination, in gm.

The arithmetical mean of two determinations is taken as the test result.