



TSD 6206 A

PLANT PURCHASING SPECIFICATION

BHOPAL

BP 27669

Rev. No. 03

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SUPERSEDES
BP 27669 Rev. 02**4-METHYL-CYCLOHEXANE-1,2-DICARBONIC ACID ANHYDRIDE
HARDENER****1. General**

This specification covers the technical requirements of liquid 4-Methyl-cyclohexane-1, 2-dicarboxic acid anhydride Hardener for use with Bisphenol-A epoxy resin for vacuum pressure impregnation.

2. Application

Used in appropriate mixing quantity with epoxy resins for impregnation of windings of electrical machines as per VPI Technology.

3. Compliance With National Standards

There is no Indian Standard covering this type of material.

4. Materials

The material shall be ordered on BHEL approved sources & their grades only.

5. Requirements**5.1 Composition and Class**

The hardener shall be based on 4-Methyl-cyclohexane-1, 2-dicarboxic acid anhydride. It shall be of low viscosity and very low reactivity when processed with Bisphenol-A epoxy resin to BP 27664.

Mixtures of epoxy resin to BP 27664 and hardener to BP 27669 shall show good thermal, mechanical and electrical properties upto 155 °C.

The IR spectra of the hardener lots should always comply with the sample lot type approved earlier and no deviation from this shall be allowed.

5.2 The material shall comply with the requirements given in Table 1 with a test sample received for evaluation.

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in line with Siemens
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Table 1

S.No.	Characteristics	Requirements	Method of test Referred as under
1	Viscosity at 25 °C	45-65 mPa.s	Corp St AA 0851710
2	Density at 25 °C (g/cm³)	1.13-1.17	

5.3 Additional Test for Acceptance of Hardener**53.1. Determination of free acids**

This property shall be checked by increase in viscosity at 70°C, when mixed with resin to BP 27664.

Resin and hardener are heated in separate containers to 70°C and **thereafter 100** pbw of the resin shall be mixed with **120** pbw of the hardener to BP 27669. The viscosity of this resin mix is determined **at 70°C (Cl. 5.3.2.1)**.

The resin mix is divided equally into 4 glass containers **G1, G2, G3 & G4**.

Resin mix in G1 & G2 is heated for 20 hours at **100°C**. Thereafter, viscosity of these two samples is measured at **70°C (Cl 5.3.2.2)**. The individual values should not **differ** from their mean by more than **0.5 mPa.s**.

Resin mix in G3 & G4 is heated for 10 days at 70°C. Thereafter, viscosity of these two samples is measured at 70°C (Cl 5.3.2.3). The individual values should not differ **from** their mean by more than **0.5 mPa.s**.

Viscosity shall be measured in a Brooke field **Viscometer** with **UL** Adapter at **12rpm**.

The measure of reactivity of the impregnating resin is determined from the difference in viscosity before and after heating (Cl. 5.3.2.2 & Cl. 5.3.2.3).

While conducting the **test**, due attention should be paid to see that the glass containers used are not contaminated by the compounds having a catalytic or inhibiting influence on the impregnating resin and thus increase or reduce the viscosity while heating.

It should be ensured that the testing conditioned tolerance of the measuring method is less than **0.2 mPa.s**.

53.1.1. Measurement of Viscosity of Mixed resin as per Cl 5.3.1 at 70 °C (Corporate Standard CS-AA 0851710)**53.1.1.1. Initial Viscosity**

Viscosity at 70°C

≤18.5 mPa.s



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5.3.1.1.2. Heating for 20 hours at 100 °C

Viscosity after 20 hrs / 100 ° C < 19.9 mPa.s
Permissible Viscosity increase after 20 hrs / 100 ° C < 1.4 mPa.s

5.3.1.1.3. Heating for 10 days at 70 °C

Viscosity after 10 days / 70 ° C < 21.5 mPa.s
Permissible Viscosity increase after 10 days / 70 ° C < 3.0 mPa.s

5.3.2. Checking of sediments in hardener when supplied in barrels

In each case, two barrels of each batch are checked for sediments at temp > 20 °C by drawing sample from the bottom of the barrel with long glass tube. If sedimentation is noticed in even one of the barrels, all the barrels of the batch to be checked. The barrels with sediments should be rejected.

5.4. Shelf Life and Keeping Property

When stored under cover in a dry place in the original sealed container at room temperature, the material shall retain the properties prescribed in this specification for a period of at least 24 months after the date of manufacture which shall be subsequent to the date of placing order.

Note:

After expiry of shelf life the hardener shall be tested for viscosity at 70 °C after mixing the recommended resin hardener proportion as per clause 5.3.1 and reactivity test i.e. increase in viscosity measured at 70 °C after heating at 100 °C for 20 hours. Increase in viscosity shall be < 2 mPa.s from the initial value.

6. Test Certificate

Three copies of test certificate shall be supplied bearing the following information.

BP 27669 Rev 03: 4-Methyl-cyclohexane-1, 2-dicarboxylic acid anhydride Hardener

BHEL Order No.

Batch No.

Size and No. of drums



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Date of Manufacture

Date of Expiry

Storage Conditions

Test results containing the properties of material as per Table 1 of clause 5.2 and clause 5.3.

In addition, the supplier shall ensure to enclose one copy of test certificate along with their dispatch documents to facilitate quick clearance of the material.

7. Packing and Marking

The material shall be packed in non-reactive drums of 200 litres or any suitable size as per our order and sealed. The drums are to be suitably packed to prevent damage during transit. Each drum shall bear the following information.

**BP 27669 : 4-Methyl-cyclohexane-1, 2-dicarboxylic acid anhydride
Hardener**

BHEL Order No.

Batch No.

Supplier's Name

Date of Manufacture

Date of Expiry

Storage Condition

Net Weight

8. Rejection & Replacement

Material failing to conform to this specification will be rejected. The supplier shall undertake to replace the rejected material at his own cost.