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The Performance Materials Company



## Technical Information



# NCS 991 PA MV

NDS1203/672REV02

### ISOPHTHALIC CHEMICAL AND WATER RESISTANT POLYESTER RESIN LLOYDS APPROVED

#### DESCRIPTION

NCS 991 PA MV is a versatile, pre-accelerated, isophthalic, unsaturated polyester resin developed for manufacture of laminates for a wide range of critical applications where tough, high performance water and chemical resistant resin is required.

NCS 991 PA MV is thixotropic and can be applied by brush or spray equipment and may be used in the pultrusion process for the production of profiled sections.

When fully cured, NCS 991 PA MV is resistant to diesel fuel and other mildly corrosive chemicals. The low level of residual styrene of a fully cured laminate makes the resin especially suitable for the manufacture of food containers and other applications which require non-toxic, non-tainting laminates.

NCS 991 PA MV can be used with confidence for the fabrication of chemical plant, tanks, pipes and containers. Contact NCS Resins technical representatives for specific recommendations.

NCS 991 PA MV is suitable for the fabrication of high performance boat hulls. It forms a matched boat building resin system when used with NCS Ultragel 64 NAT PAE, and NCS Ultragel 64 P1075 PAE.

FEATURES	BENEFITS
Preaccelerated	Requires only the addition of suitable catalyst
Thixotropic	Minimal drainage
SABS 713-1999 approved	Meets National Quality Standards
Lloyds approved	Meets International Quality standards
Low residual styrene	Minimal tainting of foodstuffs

The information herein is to assist customers in determining whether our products are suitable for their applications. Our products are intended for sale to industrial and commercial customers. We request that customers inspect and test our products before use and satisfy themselves as to contents and suitability. Nothing herein shall constitute any other warranty expressed or implied, including any warranty of merchantability or fitness, nor is protection from any law or patent to be inferred. All patent rights are reserved. The exclusive remedy for all proven claims is replacement of our materials, and in no event shall we be liable for special, incidental, or consequential damages. Our standard conditions of contract will apply to all sales

## TYPICAL LIQUID PROPERTIES

PROPERTY	SPECIFICATION	NCS TEST METHOD
Relative density 25°/25°C	1,10 - 1,12	14
Viscosity @ 25°C, mPa.s	425 - 565	5.3
Acid value, mg KOH/g	16 - 22	13
Volatile content, %	43 - 46	7A
Geltime @ 25°C, 1 phr* BUTANOX M50, minutes	40 - 50	8
Stability in the dark @ 25°C, months	6 minimum	4.1
*phr = parts per hundred resin, by mass		

## CURING CHARACTERISTICS

NCS 991 PA MV needs only the addition of catalyst to start the curing reaction. The resin must be allowed to attain workshop temperature (23°C) before being formulated for use. The correct amount of catalyst is therefore added and thoroughly stirred into the resin shortly before use.

It is particularly important to ensure that the catalyst is thoroughly dispersed in the resin. Poorly dispersed catalyst can cause the resin to cure unevenly, resulting in laminates with under cured areas, which are a potential source of failure.

The ambient temperature and the amount of catalyst control the geltime of the resin formulation. This can be approximately determined from the tables below.

Parts of <b>Butanox M60</b> to 100 parts NCS 991 PA MV	1.0	1.5	2.0	2.5	3.0
Geltime @ 15 °C, minutes	110	87	30	25	18
Geltime @ 20 °C, minutes	73	55.5	27	15	14

Parts of <b>Butanox M50</b> to 100 parts NCS 991 PA MV	1	1.5	2.0	2.5	3
Geltime @ 20 °C, minutes	75	59	29	16	15
Geltime @ 25 °C, minutes	48	29	17	12.5	10.5
Geltime @ 30 °C, minutes	25	16	10	8	7

Parts of <b>Butanox LPT</b> to 100 parts NCS 991 PA MV	1	1.5	2.0	2.5	3.0
Geltime @ 30 °C, minutes	82	50	35	27	21
Geltime @ 35°C, minutes	71.5	48	23	18	13.5

It is recommended to use Butanox M60 at temperatures less than 25°C for a more effective laminate cure. Curing should not be carried out at temperatures below 15°C. Ideally, the catalyst level should range between 1 and 2 phr.

**POST-CURING**

Satisfactory laminates for many applications can be made from NCS 991 PA MV by curing at ambient temperature (but not less than 15°C). When optimum properties and long-term performance are required the laminate should be post-cured.

After release from the mould laminates should be allowed to mature for 24 hours at workshop temperature (23°C). They should then be post-cured for 3 hours at 80°C, although a longer period at a lower temperature will give almost the same result. The post-cure is most effective if it is carried out immediately after the 24 hour maturing period.

For all applications involving foodstuffs, it is essential to post cure the laminate for at least 3h at 85°C and then wet steam clean it for at least one hour before being put into use. For further recommendations contact a NCS Resins technical representative.

**PIGMENTS AND FILLERS**

NCS 991 PA MV can be pigmented by the addition of up to 5% NCS POLYCHROME pigment paste, but lower quantities consistent with achieving adequate hiding power are preferred if the physical properties of the cured laminate are to be maintained. In applications involving foodstuffs, or where resistance to chemicals or oils is required, refer to NCS technical representatives for advice on a suitable selection of pigment for the given application.

The addition of fillers to NCS 991 PA MV is likely to change the hardening characteristics of the resin and will affect the properties of the laminate. Fillers should be accurately checked for moisture content and effect on geltime and cure rate before use. Pigment pastes added to NCS 991 PA MV may settle out on prolonged storage, and re-incorporation of the pigments by stirring will be required before the resin is used.

**CHEMICAL PERFORMANCE**

Since chemical plant operating conditions and environments vary widely and often involve combinations of chemicals, each application must be precisely defined. NCS Resins' technical representative will be pleased to make detailed recommendations for specific applications on request.

**TYPICAL PHYSICAL PROPERTIES****Typical Properties of Cured NCS 991 PA MV (unfilled casting)**

Prepared, post-cured and tested in accordance with SABS 713-1974, as amended

Temperature of deflection - under load (1,80 MPa), °C	85
Water absorption	
7 days at 23°C, mg	41
a) Increase in mass after 28 days immersion, mg	72
b) Loss in mass after drying, mg	49
Barcol (GYZJ 934-1) hardness	37

**Typical Properties of Cured NCS 991 PA MV (unfilled casting)**

Prepared, post-cured for 24 hours @ 23°C, 2h @ 55°C and 2 hours @ 80°C and tested in accordance with BS 2782:1980

Specific gravity at 25°C	1,11
Elongation at break * %	5
Tensile strength, MPa	82
Tensile modulus, MPa	3 500
Volumetric shrinkage, %	8,1
* Filtered resin, void-free casting	

**Typical Properties of Cured NCS 991 PA MV Chopped Strand Mat Laminate**

Determined in accordance with SABS 141-1992 test methods, on a laminate containing 2 x 450 g/m<sup>2</sup> layers of chopped strand mat, conforming to the requirements of SABS 419-1972 (1992). The laminate was allowed to cure for 7 days at 23°C (±2°C), and achieve adequate cure as indicated by attainment of Barcol (GYZJ 934-1) hardness before testing.

Tensile strength, MPa:	104
Flexural strength, MPa	252
Barcol (GYZJ 934-1) hardness	55
Glass content, % m/m	31

**Typical Properties of Cured NCS 991 PA MV Standard Glass Cloth Laminate**

Prepared, post-cured and tested in accordance with SABS 713-1974, as amended

Glass content, % m/m	63,6
Flexural strength:	
a) At 23°C	544
b) At temperature of deflection	402

**STORAGE AND HANDLING**

To ensure maximum stability and maintain optimum properties, polyester resin should be stored in closed containers, maintained below 25°C and away from heat sources and sunlight. All storage should conform to local fire and building codes. Drum stock should be kept to a reasonable minimum with first-in, first-out stock rotation.

Where bung-in-head containers are stored outside, it is recommended that these be stored in a horizontal position to avoid the ingress of water.

**STANDARD PACKAGE**

Non-returnable metal drums.

Bulk supplies can be delivered by road tanker.

**MATERIAL SAFETY DATA SHEET**

A Material Safety Data Sheet is available from your NCS Resins' representative. Make certain that you obtain a copy of this guide to the safe handling of unsaturated polyester resins and resin systems.

PLEASE READ AND UNDERSTAND THE MATERIAL SAFETY DATA SHEET BEFORE WORKING WITH THIS PRODUCT

<b>WARNING:</b>	CARE MUST BE TAKEN TO AVOID DIRECT MIXING OF ANY ORGANIC PEROXIDE (CATALYST) WITH METAL SOAPS, AMINE OR ANY OTHER POLYMERISATION ACCELERATOR OR PROMOTER, AS VIOLENT DECOMPOSITION WILL RESULT!
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