

Notices and signs

Lamps and ceiling lights

Walls

Toys

Gifts and decorations

Display cabinets

Glazing

Television, computer and monitor filters

Displays and other publicity elements

## NUDEC<sup>®</sup> PMMA

Polymethylmethacrylate - Acrylic sheets

- Excellent transparency, with a 92% light transmission
- Bright and colourless
- High rigidity
- Good insulation with high electrostatic charges
- Resistant to outside weather
- Elevated hardness
- Suitable for decoration
- They can be moulded
- Intermediate mechanical strength
- The surface is suitable for buffing
- They are resistant to non-polar solvents (oils and aliphatic hydrocarbons)
- Apt for contact with foodstuffs

# NUDEC<sup>®</sup> PMMA

## Properties

### Dimensional stability to heat

Prolonged exposure to heat must not exceed 80°C.

### Cracking under pressure

The appearance of cracking essentially depends on the joint action of a chemical agent, temperature, applied stress and the time during which these are applied.

### Ageing

NUDEC PMMA sheets show excellent stability to outside weather conditions, including UV radiation. Even after years of exposure to sunlight, the sheets do not show any substantial variations in their properties.

When used in exterior applications, the protective film must be removed immediately, since exposure to sunlight can cause permanent adhesion to the sheet.

STANDARD SPECIFICATIONS FOR PMMA RESIN			
	CODE	UNIT	VALUE
<b>PHYSICAL</b>			
Density	ISO 1183	g/cm <sup>3</sup>	1.20
<b>MECHANICAL</b>			
Tensile strength @ yield	ISO 527	MPa	(*)
Tensile strength @ breakage	ISO 527	MPa	83
Elongation @ breakage	ISO 527	%	5
Tensile modulus of Elasticity	ISO 527	MPa	3,200
Flexural strength	ISO 178	MPa	120
Charpy impact strength notched	ISO 179	kJ/m <sup>2</sup>	(*)
Charpy impact strength un-notched	ISO 179	kJ/m <sup>2</sup>	20
Rockwell hardness M/R scale			92/(*)
Ball pressure hardness	ISO 2039	MPa	185
<b>OPTICAL</b>			
Light transmission	ASTM D-1003	%	92
Refractive index	ASTM D-542		1.489
<b>THERMAL</b>			
Maximum Service temperature		°C	80
VICAT Softening temperature (10 N)	ISO 306	°C	116
VICAT Softening temperature (50 N)	ISO 306	°C	107
Heat deflection temperature, HDT A (1.8 MPa)	ISO 75-2	°C	97
Heat deflection temperature HDT B (0.45 MPa)	ISO 75-2	°C	101
Coefficient of linear thermal expansion	ISO 75-2	x10 <sup>5</sup> /°C	7

These data correspond to raw material values

(\*) Non-applicable

CHEMICAL RESISTANCE			
CHEMICAL PRODUCT	BEHAVIOUR		
	SATISFACTORY	REGULAR	UNSATISFACTORY
Mineral oil	X		
Vegetable oil	X		
Acetone			X
Acetic acid			X
Water	X		
Turpentine		X	
Ammonia		X	
Detergents		X	
Ethanol			X
Petrol	X		
Glycerine	X		
Methanol			X
Toluene			X

REACTION TO FIRE		
COUNTRY	CODE	CLASSIFICATION
GREAT BRITAIN	BS 476: Part 7	3
GERMANY	DIN 4102-1	B2
FRANCE	NFP 92-507	M4

A NUDEC PMMA safety file is available for any additional type of query.

## Handling

### Cleaning

A solution of water and neutral detergent may be employed. They should always be cleaned and dried with a soft cloth with very little pressure.

### Cutting

#### Important!

Do not remove the protective film from the sheets before cutting, and once this has been accomplished, blowing or suction should be employed to eliminate any chips.

#### Manual cutting

Cutting should always be carried out with a fine-blade saw, with the sheet firmly held in place to prevent vibration. The teeth should be well-sharpened.

#### Cutting with a blade

When cutting with a blade, this should be passed several times in order to achieve the desired depth (this should be a minimum of half the thickness), employing a uniform pressure.

The sheet must be firmly secured to prevent sliding. Afterwards, the sheet should be placed on a flat surface and gentle pressure applied until it breaks. Sandpaper may be employed to eliminate any burrs.

#### Sawing

##### Cutting recommendations for NUDECPMMA sheets

- Disc diameter: 350 - 400 mm
- Number of teeth: 84 - 106
- Rotation speed: 2,800 - 4,500 rpm
- Advance speed: 12 - 18 m/min

#### Type of teeth

Alternate teeth or combined straight and trapezoid.

The sheet must be firmly secured to prevent them rising up and causing cracks when the disc passes.

The translation speed should be as uniform as possible.

The disc must be regularly sharpened.

### Polishing

NUDECPMMA sheets can be polished using a mechanical buffer at a speed of 1,500 rpm and avoiding surface over-heating. Polishing requires a balance between rotation speed and applied pressure.

Final polishing is achieved with soft cloth or flannel discs at high speed (4,000 rpm), with buffing paste.

Edges may be polished using a high temperature air jet (200 to 300°C) or by use of a flame.

### Drilling

Metal and wood drill bits may be employed.

The larger the diameter, the lower the speed. Water or air can be used for cooling.

A hole diameter that is approximately 1.5 mm larger than that of the screw to be used should be drilled in order to take sheet dilation into account.

The sheet must be firmly secured to prevent breaking.

#### Recommended drill speeds:

Diameter (mm)	rpm
1.6	7,000
6.4	1,800
12.7	900

### Gluing

NUDECPMMA sheets can be glued together to form a transparent joint. Depending on the application and surfaces to be glued together, various types of glue available on the market and suitable

for methacrylate sheets can be employed, such as those containing dichloromethane.

#### The following should be taken into consideration when selecting an adhesive:

- Chemical compatibility with the sheets
- Aesthetics of the finished joint
- Dilation and contraction with temperature changes
- Fragility, rigidity and flexibility
- Alterability with respect to outside weather conditions, where applicable
- Duration and useful lifetime
- Adhesive strength (adherence to the plastic)
- Final usage requirements

#### Important!

To prevent air bubbles, the glue should be allowed to stand for a while before application, until none can be seen.

#### It is recommended that:

The surfaces to be glued are clean and degreased.

The glued parts must be allowed to dry for twenty-four hours so that maximum hardness is achieved.

### Thermoforming

NUDECPMMA sheets are easily thermoformable in any oven with air circulation. The sheet temperature must exceed 140°C.

If the sheets have been stored in a damp environment, it is preferable for them to be previously dried for a few hours (two to four) at an approximate temperature of between 80 to 85°C in order to avoid thermoforming problems. To achieve a good finish, the mould employed can also be heated to between 50 and 60°C. An excessive mould temperature could harm the sheets.

*All NUDEC products use film to protect the surface from possible damage during production and transport. This protective film is not prepared to withstand high temperatures and must be removed prior to thermoforming or hot-bending.*

### Bending

NUDECPMMA sheet bending requires a bending template, together with a heating element or incandescent wire. The area to be bent must be completely and uniformly heated.

We recommend that the smallest radius be twice the sheet thickness. It is a good idea to cool the part of the sheet that is closest to the bending line.

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### Decoration

#### Silk-screening

NUDECPMMA sheets can be silk-screened just like other materials. Acrylic-based and two-component inks are recommended: epoxy or polyurethane.

#### Painting

They can also be painted by normal spray methods. No prior surface treatment is necessary, apart from cleaning. The paint that is employed must be specially indicated by the manufacturer as suitable for use on methyl polymethacrylate. In general, it is recommended that they contain an acrylic resin base with low-aggressivity solvents. They can also be vacuum metallised.

*The print film should be removed just prior to printing to prevent the surface from damage.*

## Responsibility clause

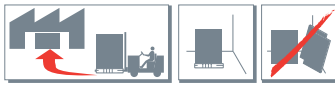
- NUDEC, S.A. supplies its products in accordance with the indications prepared by the purchaser with respect to the ordered material and quality. In this sense, NUDEC, S.A. provides its customers with all available professional and technical information deriving from its product analyses.
- Once the material has been delivered by NUDEC, S.A., the purchaser is fully responsible for all subsequent application, treatment, use and/or utilisation of this same material, whether by the actual purchaser or by third parties, with complete indemnity for NUDEC, S.A.
- The purchaser is wholly and solely responsible for carrying all tests or analyses, of any nature, which are required to verify that the product can be effectively applied for the purpose sought by the purchaser or by any third parties to whom the purchaser supplies the product or for whom it is installed.
- NUDEC, S.A. is exempt from any responsibility deriving from any inadequate or defective application of its products by the purchaser or subsequent third parties, and only accepts damages deriving directly from possible defects of its products at origin.



## Transport

Dirt and sharp angles may damage the surface in the case of friction.

- During transport, stable, flat pallets should always be used and the sheets secured to prevent sliding.
- The sheets must not be allowed to slide over each other during loading and unloading operations.
- They should be lifted by hand without any dragging or by suction-cup lifting equipment.



## Storage

An incorrect storage position can lead to permanent deformation.

- The sheets should be stored in closed premises that guarantee normal environmental conditions.
- The sheets should be stored one on top of the other on flat horizontal surfaces and fully supported over their total area.
- The topmost panel should be covered with a sheet of polyethylene or cardboard etc.
- NUDEC PMMA sheets must not be stored in direct sunlight or under conditions of high humidity and/or temperature as this can have a negative effect of protective film adhesion.



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