

POLYAMIDE 12 (PA 12)

Physical and mechanical properties: Polyamide 12, or also called Nylon 12, is an amorphous and transparent thermoplastic made from amino-lauric acid or laurolactam monomers that each have 12 carbons. It is manufactured and sold, among other, by the company EMS-Grivory under the name Grilamid TR. The main physical characteristics of PA-12 are as follows:

- High transparency, even with thick walled components
- Clear and light inherent color
- Very high flexural fatigue strength
- Very good toughness, even at low temperatures
- Dimensional stability and dynamic strength
- Light weight due to low density

Having a transmission equivalent to the one of PMMA and COP (Zeonex), PA-12 is a good high temperature alternative to these latter. Optically, the other link with these more classical optical plastics is the refraction index, which is around 1.50, sensitively equivalent to the one of PMMA and COP.

Chemical properties: Low water absorption and density, 1.01 g/mL, result from its relatively long hydrocarbon chain length, which also confers it dimensional stability and an almost paraffin-like structure. PA 12 is also chemical resistant and insensitive to stress cracking. However, as a polyester, it must not be used with the following materials at ambient temperature:

- Acids - Acetic / Chloroacetic / Chlorosulphonic / Chromic (80%) / Cresylic (50%) / Formic / Hydrofluoric / Nitric / Phosphoric / Sulphuric
- Aceto-acetic ester
- Antimony trichloride
- Aqua regia
- Benzaldehyde
- Bromine
- Chlorine, dry/wet
- Manganate, potassium (K)
- Phenol
- Sulphur dioxide / trioxide

Please refer to the manufacturer or Gaggione for a use at a temperature superior or equal to 60 °C, in which case the chemical use is more restrictive. Also, we do not recommend the use of alcohols, and prefer Acetone for cleaning purposes.

Electrical properties: In the electronics field, Polyamide 12 is used for covering cables and insulating material, while in the automobile industry it is used to prepare oil and gasoline resistant tubes.

Thermal properties: The main and big advantage of Polyamide 12 is its high resistance in temperature. Indeed, thanks to its high glass transition temperature (155-160 °C), relatively to PMMA and even Zeonex and OKP-4, it possesses a heat deflection temperature under 0.45 MPa that can go up to 145 °C, for the TR 55 grade. PA-12 is combustible and burns without producing an excessive amount of smoke (UL 94 HB)

Printing and marking properties: PA-12 is suitable for both vacuum-applied metallization and silk-screening. It is for instance prepared as sheets and sintered powder for coating metals.

Implementation properties:

- Injection: Due to its low and mainly isotropic shrinkage, PA-12 is an easy processing material.
- Machining: As OKP-4 very well resist to high temperature, machining is feasible on this material (diamond turning for instance).
- Gluing: Adhesion to PA-12 is theoretically possible, in a way depending on the substrate. Ask Gaggione for more information if needed.

- Welding: Ultrasonic welding, for example, can easily weld PA-12. However, as it is hygroscopic, injected parts require drying in an oven at 60°C overnight prior to welding.

Summary by GAGGIONE SAS

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