

TECHNICAL DATA SHEET

GRILAMID TR 90 LXS

Product description

Grilamid TR LXS grades are transparent thermoplastic polyamides based on amorphous polyamide with aliphatic and cycloaliphatic blocks and semi crystalline polyamide. Grilamid TR 90 LXS show a microcrystalline behaviour and offers a variety of interesting properties such as:

- Clear transparency even in high wall thicknesses
- Good light natural colour
- Can be coloured in transparent as well as opaque colours
- high toughness at low temperature
- high fatigue strength
- Excellent chemical- and stress-crack resistance
- High resistance to cooking water
- Ductile breakage, high flexibility

Grilamid TR LXS grades show good feeding properties, high flow and are suitable for production of optical and technical demanding parts in the application fields of:

- Optic
- Electro / Electronics
- Automotive
- Mechanical engineering
- Domestic appliances
- Sanitary

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PROPERTIES

Mechanical Properties

| | | Norm | Unit | State | Grilamid TR 90 LXS |
|---------------------------|---------------|---------------|-------------------|-------|--------------------|
| Tensile E-Modulus | 1 mm/min | ISO 527 | MPa | cond. | 1500 |
| Tensile strength at yield | 50 mm/min | ISO 527 | MPa | cond. | 60 |
| Elongation at yield | 50 mm/min | ISO 527 | % | cond. | 6 |
| Tensile strength at break | 50 mm/min | ISO 527 | MPa | cond. | 40 |
| Elongation at break | 50 mm/min | ISO 527 | % | cond. | > 50 |
| Impact strength | Charpy, 23°C | ISO 179/2-1eU | kJ/m ² | cond. | no break |
| Impact strength | Charpy, -30°C | ISO 179/2-1eU | kJ/m ² | cond. | no break |
| Notched impact strength | Charpy, 23°C | ISO 179/2-1eA | kJ/m ² | cond. | 9 |
| Notched impact strength | Charpy, -30°C | ISO 179/2-1eA | kJ/m ² | cond. | 12 |
| Ball indentation hardness | | ISO 2039-1 | MPa | cond. | 85 |

Thermal Properties

| | | | | | |
|--------------------------------------|------------|-----------|---------------------|-----|-----|
| Glass transition temperatures | DSC | ISO 11357 | °C | dry | 125 |
| Heat deflection temperature HDT/A | 1.80 MPa | ISO 75 | °C | dry | 80 |
| Heat deflection temperature HDT/B | 0.45 MPa | ISO 75 | °C | dry | 100 |
| Thermal expansion coefficient long. | 23-55°C | ISO 11359 | 10 ⁻⁴ /K | dry | 0.9 |
| Thermal expansion coefficient trans. | 23-55°C | ISO 11359 | 10 ⁻⁴ /K | dry | 0.9 |
| Maximum usage temperature | long term | ISO 2578 | °C | dry | 80 |
| Maximum usage temperature | short term | ISO 2578 | °C | dry | 95 |

Electrical Properties

| | | | | | |
|------------------------------|-----|-------------|-------|-------|------------------|
| Dielectric strength | | IEC 60243-1 | kV/mm | cond. | 35 |
| Comparative tracking index | CTI | IEC 60112 | - | cond. | 600 |
| Specific volume resistivity | | IEC 60093 | Ω · m | cond. | 10 ¹¹ |
| Specific surface resistivity | | IEC 60093 | Ω | cond. | 10 ¹² |

General Properties

| | | | | | |
|------------------------|---------------|----------|-------------------|-----|------|
| Density | | ISO 1183 | g/cm ³ | dry | 1.00 |
| Flammability (UL94) | 0.8 mm | ISO 1210 | rating | - | HB |
| Water absorption | 23°C/sat. | ISO 62 | % | - | 3 |
| Moisture absorption | 23°C/50% r.h. | ISO 62 | % | - | 1.5 |
| Linear mould shrinkage | long. | ISO 294 | % | dry | 0.45 |
| Linear mould shrinkage | trans. | ISO 294 | % | dry | 0.60 |

Product-nomenclature acc. ISO 1874: PA MACM12 + PA 12, GHLT, 18-020

Processing information for the injection moulding of Grilamid TR 90 LXS

This technical data sheet for Grilamid TR 90 LXS provides you with useful information on material preparation, machine requirements, tooling and processing.



Silver streaks can also be caused by overheating of the material (over 320°C) or by too long melt residence time in the barrel.

MATERIAL PREPARATION

Grilamid TR 90 LXS is delivered dry and ready for processing in sealed air tight packaging. Predrying is not necessary.

Storage

Amorphous polyamides can be stored over years without negatively influencing its mechanical properties. However, in order to ensure optimal colour and transparency, Grilamid should not be stored for more than 6 months. At temperatures above 25°C in combination with long storage times, the oxidation saturation process of the granulate is accelerated. Hence, it is advised to keep storage temperatures below 25°C. The above mentioned effect becomes only visible after injection moulding and shows itself in parts which have a more yellow appearance. Storage facilities must be dry and protect the bags from the influence of weather and damage.

Handling and safety

Detailed information can be obtained from the "Material Safety Data Sheet" (MSDS) which can be requested with every material order.

Drying

Grilamid TR 90 LXS is dried and packed with a moisture content of less than 0.08 %. Should the packaging become damaged or be left open too long, then the material must be dried. A too high moisture content can be shown by a foaming melt, excessive nozzle drool and silver streaks on the moulded part.

Drying can be done as follows:

Desiccant dryer

| | |
|-------------------------|-------------|
| Temperature: | max. 80°C |
| Time: | 4 - 6 hours |
| Dew point of the dryer: | -30°C |

Vacuum oven

| | |
|--------------|-------------|
| Temperature: | max. 80°C |
| Time: | 4 - 8 hours |

Drying time

If there is only little evidence of foaming of the melt or just slight silver streaks on the part, then the above mentioned minimal drying time will be sufficient. If material is stored open for days, shows strong foaming, unusually easy flow, streaks or a rough surface on the moulded part, then the maximum drying time is required.

Drying temperature

Polyamides are affected by oxidation at temperatures above 80°C in the presence of oxygen. Visible yellowing of the material is an indication of oxidation. Hence, temperatures above 80°C for desiccant dryers and temperatures above 100°C for vacuum ovens should be avoided. In order to detect oxidation it is advised to keep a small amount of granulate (light colours only !) as a comparison sample.

At longer residence times (over 1 hour) hopper heating or hopper dryer (80°C) is useful.

Use of regrind

Grilamid TR 90 LXS is a thermoplastic material. Hence, incomplete mouldings as well as sprues and runners can be reprocessed. The following points should be observed:

- Moisture absorption
- Grinding: Dust particles and particle size distribution
- Contamination through foreign material, dust, oil, etc.
- Level of addition to original material
- Colour variation
- Reduction of mechanical properties

When adding regrind, special care has to be taken by the moulder.

MACHINE REQUIREMENTS

Grilamid TR 90 LXS can be processed economically and without problems on all machines suitable for polyamides.

Screw

Wear protected, universal screws with shut-off nozzles are recommended (3 zones).

Screw

| | |
|--------------------|-------------|
| Length: | 18 D - 22 D |
| Compression ratio: | 2 - 2.5 |

Shot volume

The metering stroke (less decompression distance) must be longer than the length of the non-return-valve.

Selecting the injection unit

$$\text{Shot volume} = 0.5 - 0.9 \times (\text{max. shot volume of injection unit})$$

Heating

At least three separately controllable heating zones, capable of reaching cylinder temperatures up to 350°C. Separate nozzle heating is necessary. The cylinder flange temperature must be controllable (cooling).

Nozzle

Open nozzles are simple, allow an easy melt flow and are long lasting. There is however, the danger that during retraction of the screws following injection of the melt, air maybe drawn into the barrel (decompression). For this reason, needle shut-off nozzles are often used.

Clamping force

As a rule of thumb the clamping force can be estimated using the following formula:

Clamping force

$$7.5 \text{ kN}^1 \times \text{projected area (cm}^2\text{)}$$

¹⁾ for a cavity pressure of 750 bar

TOOLING

The design of the mould tool should follow the general rules for transparent thermoplastics.

For the mould cavities common mould tool steel quality (e.g. hardened steel) which has been hardened to a level of 56 HRC is recommended.

Venting

In order to prevent burning marks and improve weldline strength, proper venting of the mould cavity should be provided (venting channels on the parting surface dimensions: Depth 0.02 mm, width 2 - 5 mm).

Gate and runner

To achieve the best mould filling and avoid sink marks, a central gate at the thickest section of the moulding is recommended. Pin point (direct) or tunnel gates are more economical and more common with technical moulding.

To avoid premature solidification of the melt and difficult mould filling, the following points should be considered:

Gate diameter

0.8 x thickest wall section of the injection moulding part

Runner diameter

1.4 x thickest wall section of the injection moulding part (but minimum 4 mm)

PROCESSING

Mould filling, post pressure and dosing

The injection speed should be regulated so as to reduce towards the end of the filling cycle in order to avoid burning. For dosing at low screw revolutions and pressure the cooling time should be fully utilised.

Basic machine settings

In order to start up the machine for processing Grilamid TR 90 LXS, the following basic settings are recommended.

Temperatures

| | |
|--------|-------|
| Flange | 40°C |
| Zone 1 | 240°C |
| Zone 2 | 245°C |
| Zone 3 | 250°C |
| Nozzle | 245°C |
| Tool | 40°C |
| Melt | 265°C |

Pressures / Speeds

| | |
|--------------------------|----------------------------|
| Injection speed | middle - high |
| Hold-on pressure (spec.) | 300 - 600 bar |
| Dynamic pressure (hydr.) | 5 - 10 bar |
| Screw speed | 50 - 100 min ⁻¹ |

CUSTOMER SERVICES

EMS-GRIVORY is a specialist in polyamide synthesis and the processing of these materials. Our customer services are not only concerned with the manufacturing and supply of engineering thermoplastics but also provide full technical support including:

- Rheological design calculation / FEA
- Prototype tooling
- Material selection
- Processing support
- Mould and component design

We are happy to advise you. Simply call one of our sales offices.

The recommendations and data given are based on our experience to date, however, no liability can be assumed in connection with their usage and processing.

HAA/05.2005
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