

TECHNICAL DATASHEET

GRILAMID TRVX-50X9

General product description

Grilamid TRVX-50X9 is a 50% glass fibre reinforced amorphous polyamide. This product shows a very low tendency of distortion and is therefore especially suitable for complex and thin walled designs.

It offers a variety of interesting properties such as:

- High stiffness and strength
- Good impact resistance
- Very low distortion
- Minor sink mark tendency
- Low flash tendency
- High dimensional stability
- Low moisture absorption
- Easy processing with good melt flow

Grilamid TRVX-50X9 can be used for applications in:

- Electrical / Electronics
- Telecommunication
- Construction / Industry

Grilamid TR[®]
EMS

PROPERTIES

Mechanical Properties		Standard	Unit	State	Grilamid TRVX-50X9
Tensile E-Modulus	1 mm/min	ISO 527	MPa	cond.	12500
Tensile strength at break	5 mm/min	ISO 527	MPa	cond.	160
Elongation at break	5 mm/min	ISO 527	%	cond.	2.1
Impact strength	Charpy, 23°C	ISO 179/2-1eU	kJ/m ²	cond.	65
Impact strength	Charpy, -30°C	ISO 179/2-1eU	kJ/m ²	cond.	60
Notched impact strength	Charpy, 23°C	ISO 179/2-1eA	kJ/m ²	cond.	16
Notched impact strength	Charpy, -30°C	ISO 179/2-1eA	kJ/m ²	cond.	15
Ball indentation hardness		ISO 2039-1	MPa	cond.	190

Thermal Properties

Glass transition temperature	DSC	ISO 11357	°C	dry	125
Heat deflection temperature HDT/A	1.80 MPa	ISO 75	°C	dry	115
Heat deflection temperature HDT/C	8.0 MPa	ISO 75	°C	dry	105
Thermal expansion coefficient long.	23-55°C	ISO 11359	10 ⁻⁴ /K	dry	0.2
Thermal expansion coefficient trans.	23-55°C	ISO 11359	10 ⁻⁴ /K	dry	0.8
Maximum usage temperature	long term	ISO 2578	°C	dry	80-110
Maximum usage temperature	short term	ISO 2578	°C	dry	120

Electrical Properties

Dielectric strength		IEC 60243-1	kV/mm	cond.	32
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	1.50
Flammability (UL94)	0.8 mm	ISO 1210	rating	-	HB
Water absorption	23°C/sat.	ISO 62	%	-	1.0
Moisture absorption	23°C/50% r.h.	ISO 62	%	-	0.3
Linear mould shrinkage	long.	ISO 294	%	dry	0.05
Linear mould shrinkage	trans.	ISO 294	%	dry	0.15

Product-nomenclature acc. ISO 1874: PA MACM12+X, MH, 12-120, GF50

Processing information for the injection moulding of Grilamid TRVX-50X9

This technical data sheet for Grilamid TRVX-50X9 provides you with useful information on material preparation, machine requirements, tooling and processing.

MATERIAL PREPARATION

Grilamid TRVX-50X9 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 their mechanical properties.

Storage facilities must be dry and protect the bags from the influence of weather and from getting damaged.

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 TRVX-50X9 is dried and packed with a moisture content below 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 - 8 hours
Dew point of the dryer	< -30°C

Vacuum oven	
Temperature	max. 100°C
Time	4 - 10 hours

Circulating air drying ovens are not suitable for Grilamid TRVX-50X9. To review / monitor the effective moisture content it is recommended to use a moisture measuring device (eg Aboni or Aquatrac).

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.



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

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

Use of regrind

Grilamid TRVX-50X9 is a thermoplastic material. Hence, incomplete mouldings as well as sprues and runners can be reprocessed. The following points have to be observed:

- No thermal degradation in the previous last processing
- No contamination through foreign material, dust, oil, etc.
- Regrind has to be dry and dust-free

When adding regrind, special care has to be taken by the moulder. For high-quality technical parts only virgin material has to be used.

MACHINE REQUIREMENTS

Grilamid TRVX-50X9 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 are recommended. 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 may be 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 in-cavity pressure of 750 bar

TOOLING

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

For the mould cavities common mould tool steel quality (e.g. hardened steel) which has been hardened to level of 56 HRC is necessary. We recommend additional wear protection in areas of high flow rates in the tool (e.g. pin point gates, hot runner nozzles).

Demoulding / Draft angle

Asymmetric demoulding and undercuts are to be avoided if possible. Generous provision should be made for ejection with many large pins or a stripper plate. Draft angles for the inner and outer wall between 1 - 5° is usually sufficient. Textured surfaces require a larger draft angle (1° per 0.025 mm depth of roughness).

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)

VENTING

In order to prevent burn marks at the final filling location and at weld line locations, proper venting of the mould cavity is important. For venting away from the mould parting surface additional ejector pins should be provided (Depth 0.02-0.03 mm, length 2 - 5 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 TRVX-50X9, the following basic settings can be recommended:

Temperatures

Flange	40 - 60 °C
Zone 1	260 - 270 °C
Zone 2	270 - 280 °C
Zone 3	280 - 290 °C
Nozzle	280 - 300 °C
Tool	40 - 80 °C
Melt	280 - 300 °C

Holding pressure / Meter-

Hold-on pressure (spec.)	400 - 600 bar
Dynamic pressure (spec.)	50 - 150 bar
Screw speed	0.1-0.3 m/s

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.

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