

TECHNICAL DATA SHEET

GRILAMID LV-3 X ESD BLACK

Product description

Grilamid LV-3 X ESD black is an antistatic Polyamide 12 for injection moulding with 30% glass fibre reinforcement.

Main attributes are:

- antistatic with resistivity $< 10^6$ Ohm
- good fuel and zinc chloride resistance
- good surface quality
- heat resistant
- good processability

Application examples

Applications requiring antistatic properties such as fuel system quick connectors, valves housings, structural parts of safety devices and instruments requiring ESD protection.

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PROPERTIES

Mechanical Properties		Standard	Unit	State	Grilamid LV-3 X ESD black
Tensile E-Modulus	1 mm/min	ISO 527	MPa	cond.	7100
Tensile strength at break	5 mm/min	ISO 527	MPa	cond.	120
Elongation at break	5 mm/min	ISO 527	%	cond.	4.5
Impact strength	Charpy, 23°C	ISO 179/2-1eU	kJ/m ²	cond.	60
Impact strength	Charpy, -30°C	ISO 179/2-1eU	kJ/m ²	cond.	45
Notched impact strength	Charpy, 23°C	ISO 179/2-1eA	kJ/m ²	cond.	11
Notched impact strength	Charpy, -30°C	ISO 179/2-1eA	kJ/m ²	cond.	9
Ball indentation hardness		ISO 2039-1	MPa	cond.	125

Thermal Properties					
Melting point	DSC	ISO 11357	°C	dry	178
Heat deflection temperature HDT/A	1.8 MPa	ISO 75	°C	dry	165
Heat deflection temperature HDT/C	8.0 MPa	ISO 75	°C	dry	125
Thermal expansion coefficient long.	23-55°C	ISO 11359	10 ⁻⁴ /K	dry	0.8
Thermal expansion coefficient trans.	23-55°C	ISO 11359	10 ⁻⁴ /K	dry	1.2
Maximum usage temperature	long term	ISO 2578	°C	dry	90 - 120
Maximum usage temperature	short term	ISO 2578	°C	dry	150

Electrical Properties					
Dielectric strength		IEC 60243-1	kV/mm	cond.	-
Comparative tracking index	CTI	IEC 60112	-	cond.	-
Specific volume resistivity		IEC 60093	Ω · m	cond.	< 100
Specific surface resistivity		IEC 60093	Ω	cond.	< 10 ³

General Properties					
Density		ISO 1183	g/cm ³	dry	1.29
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	%	-	0.5
Linear mould shrinkage	long.	ISO 294	%	dry	0.25
Linear mould shrinkage	trans.	ISO 294	%	dry	1.00

Product-nomenclature acc. ISO 1874: PA12, MHRZ, 18-080, GF30+C

Processing information for the injection moulding of Grilamid LV-3 X ESD black

This technical data sheet for Grilamid LV-3 X ESD black provides you with useful information on material preparation, machine requirements, tooling and processing.

MATERIAL PREPARATION

Grilamid LV-3 X ESD is delivered dry and ready for processing. Predrying is not necessary.

Storage

Sealed, undamaged bags can be kept over a period of at least one year in dry storage facilities.

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 LV-3 X ESD black is dried and packed with a moisture content of $\leq 0.10\%$. 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 - 12 hours
Dew point of the dryer	-25°C

Vacuum oven

Temperature	max. 100°C
Time	4 - 12 hours

Drying time

The drying time depends on the moisture content and on the dryer equipment. The moisture content should be measured after drying.



Silver streaks can also be caused by overheating of the material (over 300°C) or by too long melt residence time in the barrel.

Drying temperature

Polyamides are affected by oxidation at temperatures above 80°C in the presence of oxygen. Hence, temperatures above 80°C for desiccant dryers and temperatures above 100°C for vacuum ovens should be avoided.

Longer residence times in open hoppers (over 1 hour) should be avoided.

Use of regrind

Grilamid LV-3 X ESD black is a thermoplastic material. Hence, incomplete mouldings as well as sprues and runners can be reprocessed.

Information:

- additional moisture can create a negative influence on process and product performance
- Grinding: Dust particles and particle size distribution
- a contamination through foreign material, dust, oil, etc. is to avoid
- Level of addition to original material must be stabilised with a dosing system
- a variation of colour are possible
- regrind can create a change of mechanical and antistatic properties

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

MACHINE REQUIREMENTS

Grilamid LV-3 X ESD black can be processed economically and without problems on all machines suitable for polyamides.

Screw

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

Screw

Length	18 D - 22 D
Compression ratio	2 - 2.5

Shot volume

The metering stroke (less decompression distance) must be longer than the screw diameter.

Selecting the injection unit

Shot volume = $0.5 - 0.8 \times$
(max. shot volume of injection unit)

Heating

At least 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.

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 reinforced 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

Parts moulded from Grilamid LV-3 X ESD showing excellent dimensional stability. Asymmetric demoulding and undercuts are to be avoided. It is favourable to foresee high numbers of large ejector pins or a stripper plate. Demoulding draft angles between 1 to 5° are acceptable. Following values can be considered:

(VDI 3400)	12	15	18	21	24	27
Depth of roughness (µm)	0.4	0.6	0.8	1.1	1.6	2.2
Demoulding angle (°)	1	1	1.1	1.2	1.3	1.5

(VDI 3400)	30	33	36	39	42	45
Depth of roughness (µm)	3.2	4.5	6.3	9	13	18
Demoulding angle (°)	1.8	2	2.5	3	4	5

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 burning marks and improve weld line 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).

PROCESSING

Mould filling, post pressure and dosing

The best surface finish and a high weld line strength are achieved when a high injection speed and a sufficiently long post pressure time are employed.

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.

dosing time

$$0.7 - 0.9 \times \text{cooling time (s)}$$

Basic machine settings

In order to start up the machine for processing Grilamid LV-3 X ESD black, the following basic settings are recommended:

Temperatures

Flange	70 - 90°C
Zone 1	240 - 260°C
Zone 2	250 - 270°C
Zone 3	260 - 280°C
Nozzle	260 - 280°C
Tool	70 - 90°C
Melt	260 - 290°C

Our recommended melt temperature is between 275 - 285°C. For a better flow rate it is possible to increase the melt temperature up to 290°C. In this case the material may show a reduction of mechanical and antistatic properties which has to be verified on the part.

Pressures / Speeds

Injection speed	medium - high
Hold-on pressure (spec.)	300 - 800 bar
Dynamic pressure (spec.)	50 - 100bar
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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This version replaces all previous product specific data sheets.

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