TECHNICAL DATA SHEET

GRILAMID L 20 H FR

General product description

Grilamid L 20 H FR is a flame retarded, medium viscosity product, based on Polyamide 12 (PA12).

Grilamid L 20 H FR contains no halogen or phosphorus, it has a light natural colour and is heat stabilised.

Grilamid L 20 H FR is used for production of high value injection moulding and extrusion parts.

The special features of Grilamid L 20 H FR are:

- Flame resistant, UL94 V-2 at 0.8 mm
- Halogen and phosphorus free
- Light natural colour
- Glow wire temperature 960°C at 1mm
- Heat stability
- Good chemical resistance
- High surface quality
- Good dimensional stability
- High processing speed
- Low density, low weight

Application examples

Grilamid L 20 H FR is suitable for injection moulding and extrusion parts in electro/ electronic applications.

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PROPERTIES

Mechanical Properties

		Standard	Unit	State	Grilamid L 20 H FR
Tensile E-Modulus	1 mm/min	ISO 527	MPa	cond.	1500
Tensile strength at yield	50 mm/min	ISO 527	MPa	cond.	40
Elongation at yield	50 mm/min	ISO 527	%	cond.	10
Tensile strength at break	50 mm/min	ISO 527	MPa	cond.	35
Elongation at break	50 mm/min	ISO 527	%	cond.	> 50
Impact strength	Charpy, 23°C	ISO 179/2-1eU	kJ/m²	cond.	no break
Impact strength	Charpy, -30°C	ISO 179/2-1eU	kJ/m²	cond.	no break
Notched impact strength	Charpy, 23°C	ISO 179/2-1eA	kJ/m²	cond.	7
Notched impact strength	Charpy, -30°C	ISO 179/2-1eA	kJ/m²	cond.	6
Shore-D hardness		ISO 868	-	cond.	72

Thermal Properties

Melting point	DSC	ISO 11357	°C	dry	178
Heat deflection temperature HDT/A	1.80 MPa	ISO 75	°C	dry	50
Heat deflection temperature HDT/B	0.45 MPa	ISO 75	°C	dry	130
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	1.2
Maximum usage temperature	long term	ISO 2578	°C	dry	90-110
Maximum usage temperature	short term	ISO 2578	°C	dry	150

Electrical Properties

Dielectric strength		IEC 60243-1	kV/mm	cond.	34
Comparative tracking index	CTI	IEC 60112	-	cond.	600
Specific volume resistivity		IEC 60093	Ω · m	cond.	10^{12}
Specific surface resistivity		IEC 60093	Ω	cond.	10^{12}

General Properties

Density		ISO 1183	g/cm³	dry	1.05
Flammability (UL94)	0.8 mm	ISO 1210	rating	-	V-2
Water absorption	23°C/sat.	ISO 62	%	-	1.4
Moisture absorption	23°C/50% r.h.	ISO 62	%	-	0.7
Linear mould shrinkage	long.	ISO 294	%	dry	0.55
Linear mould shrinkage	trans.	ISO 294	%	dry	0.75

Product-nomenclature acc. ISO 1874: PA12, MHF, 18-010

General Processing information for Grilamid L 20 H FR

This technical data sheet for Grilamid L 20 H FR provides you with useful information on material preparation, machine requirements, tooling and processing.

MATERIAL PREPARATION

Grilamid L 20 H FR is delivered dry and ready for processing in sealed, air tight packaging. Pre-drying is not necessary.

Storage

Sealed, undamaged bags can be kept over a long period of time in storage facilities which are dry, protected from the influence of weather and where the bags can be protected from 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 L 20 H FR is dried and packed with a moisture content of less than 0.10 %. Should the packaging become damaged or the material is left open too long, then the material must be dried. A too high moisture content reduces the optical (streaks) and mechanical (embrittlement) qualities of the final product.

Drying can be done as follows:

Desiccant dryer

Temperature:	max. 80°C
Time:	4 - 12 hours
Dew point of the dryer:	-30°C

Vacuum oven

Temperature:	max. 100°C
Time:	4 - 12 hours

Drying temperature

Polyamides are subject to the effects of 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 colour only !) as a comparison sample.

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

Use of regrind

Grilamid L 20 H FR 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.
- Quantity addition to original material
- Colour variation
- Reduction of properties

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

INJECTION MOULDING PROCESSING

Grilamid L 20 H FR 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 must be longer than the length of the back flow valve (without decompression distance).

Selecting the injection unit

Shot volume = 0.5 - 0.8 x
(max. shot volume)

Heating

At least three separately controllable heating zones, able of reaching cylinder temperatures up to 300°C are required. A separate nozzle heating is necessary. The cylinder flange temperature must be temperature 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 kN[1)] x projected area (cm^2)

[1)] in cavity pressure of 750 bar

TOOLING

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

Gate and runner

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

To avoid premature solidification of the melt and difficult mould filing, 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 best surface finish and a high weld line strength is achieved with a high injection speed and when a sufficiently long post pressure is 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.

Basic machine settings

In order to start up the machines for processing Grilamid L 20 H FR, the following basic settings are recommended:

Temperatures

Flange	40°C
Zone 1	220°C
Zone 2	225°C
Zone 3	230°C
Nozzle	230°C
Tool	40 - 80°C
Melt	230 - 250°C

Pressures / Speeds

Injection speed	medium
Hold-on pressure (spec.)	300 - 800 bar
Dynamic pressure (hydr.)	5 - 15 bar
Screw speed	50 - 100 min^{-1}

EXTRUSION PROCESSING

Grilamid L 20 H FR can be processed economically and problem-free on all machines suitable for polyamides.

Screw

Wear protected, universal screws are recommended (3 zones).

Screw

Length:	24 D - 25 D
Compression ratio:	2.5 - 3.1

Grooved Feeding Zone

A grooved bush is not usually recommended for the extrusion of polyamides In order to obtain a higher through-put by using a grooved bush it's depth should not exceed 0.5 mm.

PROCESSING

Basic machine settings

In order to start up the machines for processing Grilamid L 20 HFR, the following basic settings are recommended:

Temperatures

Hopper zone	60-90°C
Feeding zone	160 - 180°C
Compressions zone	190 - 200°C
Metering zone	200 - 220°C
Head	200 - 220°C
Nozzle	200 - 220°C
Melt	200 - 220°C
Cooling bath temperature	15 - 40°C

CUSTOMER SERVICES

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

- Rheological design calculation / FEA
- Material selection
- Processing support
- Tool and component design

For further details concerning extrusion please refer to our Technical Information Booklet “Tube Extrusion” available from your EMS-GRIVORY specialist.

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

HAR/08.2001
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