

TECHNICAL DATA SHEET

GRIVORY GM-2H/20 NATURAL

Product description

Grivory GM-2H/20 natural is a 20 % mineral filled Polyamide alloy. It is a sophisticated alloy composed of aliphatic and partially aromatic copolyamide.

Grivory GM-2H/20 natural shows an outstanding property profile:

- high stiffness and strength even at elevated temperatures
- dimensional stability, low warp
- good chemical resistance
- good surface finish

It is targeted for injection moulding applications with high quality requirements. Compared to PA6 or PA 66 with the same mineral content it shows a higher stiffness after moisture absorption. Typical applications are metalized automotive parts.

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PROPERTIES

Mechanical properties		Standard	Unit	State	Grivory GM-2H/20 natural
Tensile Strength at break	5 mm/min	ASTM 638	MPa	dry	85
Elongation at break	5 mm/min	ASTM 638	%	dry	4
Flexural strength	1.3 mm/min	ASTM 790	MPa	dry	125
Flexural modulus	1.3 mm/min	ASTM 790	MPa	dry	3200
Notched impact strength	Izod, 23°C	ASTM 256	J/M	dry	85
General properties					
Density		ISO 1183	g/cm ³	dry	1.28
Melting point	DSC	ISO 11357	°C	dry	260
Moisture absorption	23°C/50% r.h.	ISO 62	%	-	1.5
Water absorption	23°C/sat.	ISO 62	%	-	5.5

Product-nomenclature acc. ISO 1874: PA66+PA6I/6T, MH, 14-040, MD 20

Processing information for the injection moulding of Grivory GM-2H/20 natural

This technical data sheet for Grivory GM-2H/20 natural provides you with useful information on material preparation, machine requirements, tooling and processing.

MATERIAL PREPARATION

Grivory GM-2H/20 natural is delivered dry and ready for processing in sealed, air tight packaging. Predrying is not necessary provided the packaging is undamaged.

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

Grivory GM-2H/20 natural 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 can be shown by a foaming melt when injected freely into the atmosphere (free shot) and silver streaks on the moulded part.

The drying can be done as follows:

Desiccant dryer

Temperature:	max. 80°C
Time:	4 - 12 hours
Dew point of the drier:	-25 °C

Vacuum oven

Temperature:	max. 100 °C
Time:	4 - 12 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. Material, which is stored open over days, which shows strong foaming, unusually easy flowing, streaks and rough surface on the moulding part, then the maximal drying time is required.



Silver streaks can also be caused by overheating of the material 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. 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.

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

Use of regrind

Grivory GM-2H/20 natural 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 with foreign material, dust, oil, etc.
- Quantity addition to original material
- Colour variation
- Reduction of mechanical properties

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

MACHINE REQUIREMENTS

Grivory GM-2H/20 natural can be processed economically and problem-free on all machines suitable for polyamides.

Screw

Wear protected, universal 3 zone screws are recommended.

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

The injection moulding machine should have at least three separately controllable heating zones, able of reaching cylinder temperatures up to 350°C. A 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
$7.5 \text{ kN}^{1)} \times \text{projected area (cm}^2)$
¹⁾ in cavity pressure of 750 bar

TOOLING

The design of the mould tool should follow the general rules for glass fibre filled 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. 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° and 3° is usually sufficient. Textured surfaces require a larger draft angle (1° per 0.025 mm depth of roughness).

(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 an optimal mould-fill and to avoid sink marks, a central gate at the thickest section of the moulding is recommended. Pin point gate (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)

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 high weld line strength is achieved with a high injection speed and a sufficiently long post pressure.

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 Grivory GM-2H/20 natural, the following basic settings are recommended:

Temperatures

Flange	80°C
Zone 1	260°C
Zone 2	270°C
Zone 3	275°C
Nozzle	270°C
Tool	80 - 120°C
Melt	270 - 300°C

Pressures / Speeds

Injection speed	medium - high
Hold-on pressure (spec.)	300 - 800 bar
Dynamic pressure (hydr.)	5 - 15 bar

Appropriate peripheral screw speeds are in the range of 3-12 m/min (0.05-0.2 m/s)

Screw-Ø / Peripheral screw speed

Ø 25 mm	40-150 rpm
Ø 30 mm	30-130 rpm
Ø 40 mm	25-95 rpm
>Ø 50 mm	20-75 rpm

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 glad to advise you. Simply call one of our sales offices.

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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. The data are not to be construed as specifications.

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