TECHNICAL DATA SHEET

GRIVORY HT2V-3X V0

Product description

Grivory HT2V-3X V0 is a 30% glass-fibre reinforced flame retardant (UL 94 V-0) engineering thermoplastic material based on a semi-crystalline, partially aromatic copolyamide.

Grivory HT2V-3X V0 is halogen free and free of red phosphorous.

RoHS: Grivory HT2V-3X V0 is in compliance with RoHS (2002/95/EC, Restriction of Hazardous Substances)

WEEE: Parts produced from Grivory HT2V-3X V0 are not subject to "selective treatment" according the Directive 2002/96/EC on Waste Electrical and Electronic Equipment.

ISO polymer designation: PA 6T/66
ASTM-designation: PPA, polyphthalamide

The main distinguishing feature of Grivory HT, when compared to other polyamides, is its good performance at high temperatures providing parts which are stiffer, stronger and have better heat distortion stability and chemical resistance.

Grivory HT2V-3X V0 is especially suitable for injection moulded parts in electrical and electronic applications with high requirements and a material flame class acc. UL 94 V-0. The Material is suitable for lead-free SMT reflow soldering acc. e.g. JEDEC J-STD-020C (peak temperature 260°C). Components conforming to JEDEC MSL2 are achievable.

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PROPERTIES

Mechanical Properties

		Standard	Unit	State	Grivory HT2V-3X V0
Tensile E-Modulus	1 mm/min	ISO 527	MPa	dry cond.	10'500 10'500
Tensile strength at break	5 mm/min	ISO 527	MPa	dry cond.	140 130
Elongation at break	5 mm/min	ISO 527	%	dry cond.	2 2
Impact strength	Charpy, 23°C	ISO 179/2-1eU	kJ/m^2	dry cond.	40 40
Impact strength	Charpy, -30°C	ISO 179/2-1eU	kJ/m^2	dry cond.	35 35
Notched impact strength	Charpy, 23°C	ISO 179/2-1eA	kJ/m^2	dry cond.	7 7
Notched impact strength	Charpy, -30°C	ISO 179/2-1eA	kJ/m^2	dry cond.	6 6
Ball indentation hardness		ISO 2039-1	MPa	dry cond.	240 230

Thermal Properties

Melting point	DSC	ISO 11357	°C	dry	310
Heat deflection temperature HDT/A	1.80 MPa	ISO 75	°C	dry	> 280
Heat deflection temperature HDT/C	8.00 MPa	ISO 75	°C	dry	190
Thermal expansion coefficient long.	23-55°C	ISO 11359	$10^{-4}/K$	dry	0.25
Thermal expansion coefficient trans.	23-55°C	ISO 11359	$10^{-4}/K$	dry	0.45
Maximum usage temperature	long term	ISO 2578	°C	dry	150
Maximum usage temperature	short term	ISO 2578	°C	dry	240

Electrical Properties

Dielectric strength		IEC 60243-1	kV/mm	dry cond.	34 34
Comparative tracking index	CTI	IEC 60112	-	cond.	600
Specific volume resistivity		IEC 60093	$\Omega \cdot m$	dry cond.	10^{10} 10^{10}
Specific surface resistivity		IEC 60093	Ω	cond.	10^{11}

General Properties

Density		ISO 1183	g/cm^3	dry	1.43
Flammability (UL94)	0.35 - 3.2 mm 3 mm	ISO 1210	rating	-	V-0 5VA
Glow wire temperature (1mm, 2mm)	IEC GWFI	IEC 60695-2-12	°C	-	960
	IEC GWIT	IEC 60695-2-13	°C		775
Oxygen Index	LOI	ISO 4589-2	%	dry	> 35
Water absorption	23°C/sat.	ISO 62	%	-	3.5
Moisture absorption	23°C/50% r.h.	ISO 62	%	-	1.3
Linear mould shrinkage	long.	ISO 294	%	dry	0.1
Linear mould shrinkage	trans.	ISO 294	%	dry	0.9

Product-nomenclature acc. ISO 1874: PA 6T/66, MHF, 11-120, GF30

Processing information for the injection moulding of Grivory HT2V-3X V0

This technical data sheet for Grivory HT2V-3X V0 provides you with useful information on material preparation, machine requirements, tooling and processing.

MATERIAL PREPARATION

Grivory HT2V-3X V0 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
During its manufacturing process Grivory HT2V-3X V0 is dried and packed with a moisture content of $\leq$ 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 result in a foaming melt 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 dryer:	-40°C

Vacuum oven

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

Drying time
Openly stored material which shows foaming, unusually easy flow or rough surfaces on the moulded part, needs drying.

Silver streaks can also be caused by overheating of the material (over 350°C) or by too long melt residence time in the barrel.

Drying temperature
Temperatures above 80°C for desiccant dryers and temperatures above 100°C for vacuum ovens should be avoided. Visible yellowing in light colours can be an indication for oxidative degradation. Here it can be useful to retain a small sample of granules for comparison.

At longer residence times in the hopper (over 1 hour) hopper heating or a hopper dryer (80°C) can be useful.

Use of regrind
Grivory HT2V-3X V0 is a thermoplastic material. Hence, incomplete mouldings as well as sprues and runners can be reprocessed.
To keep property and colour changes to a minimum, special care needs to be taken by the moulder. Particularly the following points should be observed:

- Avoid moisture absorption (otherwise drying may become necessary)
- Watch for similar particle size/distribution
- Contamination through foreign material, dust, oil, etc. must be avoided

It is recommended to limit regrind to maximum of 25% as long as the requirements of the endproduct allow this.

MACHINE REQUIREMENTS

Grivory HT2V-3X V0 can be processed economically on all machines suitable for polyamides. Wear and corrosion protected equipment is expressly recommended.

Screw
Abrasion and corrosion resistant universal 3-zone screws with check valves 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
At least three separately controllable heating zones, able of reaching cylinder temperatures up to 350°C are required. 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 screw after injection, 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 glass fibre reinforced thermoplastics.

For the mould cavities common mould tool steel quality (e.g. hardened steel) which has been hardened to level of 56 - 65 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 Grivory HT solidifiy very quickly 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 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 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 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 Grivory HT2V-3X V0, following basic settings can be recommended:

Temperatures

Flange	80 - 100°C
Zone 1	300 - 320°C
Zone 2	300 - 325°C
Zone 3	300 - 325°C
Nozzle	300 - 320°C
Tool	100 - 140°C
Melt	320°C

Pressures / Speeds

Injection speed	medium - high
Hold-on pressure (spec.)	500 - 800 bar
Dynamic pressure (spec.)	5 - 15 bar
Peripheral screw speed	5 - 15 m/min

Start up and purging

Foreign materials in the cylinder should be removed with suitable purging materials. Hot-runner systems should be purged likewise. Glass fibre reinforced polyamide 66 is a suitable “bridging material”.

Cylinder heating should start with a clean, product-free screw, starting from the temperature level of the “bridging material” of 300°C up to the required temperature level of 310-320°C (see processing data).

After at least three full dosings (free-shots) the start-up procedure can be implemented.

After completion of production with Grivory HT the screw, cylinder and melt distribution system should be cleaned out thoroughly.

Conditioning

The dimensions and the mechanical properties of Grivory HT products are only marginally influenced by moisture absorption. For testing purposes, parts can be stored in a climatic chamber until an increase in weight of 1 % has been achieved. In order to avoid stress through swelling, conditioning in hot water is to be avoided.

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
- Prototype tooling
- Material selection
- Processing support
- Mould and component design

We are happy to advice 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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