TECHNICAL DATA SHEET

GRILON BS/2

General product description

Grilon BS/2 is an unreinforced, nucleated standard PA6 injection moulding grade with normal melt viscosity.

Grilon BS/2 has the following important properties:

- Good flow behaviour
- Easy processing
- Good sliding friction characteristics

Grilon BS/2 has wide variety of applications in all market sectors, automotive, electrical, leisure and sport, e. g. clips, covers, housings.

GRILON®

EMS

PROPERTIES

Mechanical Properties

		Standard	Unit	State	Grilon BS/2
Tensile E-Modulus	1 mm/min	ISO 527	MPa	dry cond.	3300 1100
Tensile strength at yield	50 mm/min	ISO 527	MPa	dry cond.	90 45
Elongation at yield	50 mm/min	ISO 527	%	dry cond.	3 15
Tensile strength at break	50 mm/min	ISO 527	MPa	dry cond.	70 55
Elongation at break	50 mm/min	ISO 527	%	dry cond.	5 > 50
Impact strength	Charpy, 23°C	ISO 179/2-1eU	kJ/m²	dry cond.	no break no break
Impact strength	Charpy, -30°C	ISO 179/2-1eU	kJ/m²	dry cond.	no break 30
Notched impact strength	Charpy, 23°C	ISO 179/2-1eA	kJ/m²	dry cond.	4 20
Notched impact strength	Charpy, -30°C	ISO 179/2-1eA	kJ/m²	dry cond.	4 3
Ball indentation hardness		ISO 2039-1	MPa	dry cond.	140 60

Thermal Properties

Melting point	DSC	ISO 11357	°C	dry	222
Heat deflection temperature HDT/A	1.80 MPa	ISO 75	°C	dry	55
Heat deflection temperature HDT/B	0.45 MPa	ISO 75	°C	dry	170
Thermal expansion coefficient long.	23-55°C	ISO 11359	10^{-4}/K	dry	0.7
Thermal expansion coefficient trans.	23-55°C	ISO 11359	10^{-4}/K	dry	1.0
Maximum usage temperature	long term	ISO 2578	°C	dry	70 - 90
Maximum usage temperature	short term	ISO 2578	°C	dry	180

Electrical Properties

Dielectric strength		IEC 60243-1	kV/mm	dry cond.	30 28
Comparative tracking index	CTI	IEC 60112	-	cond.	600
Specific volume resistivity		IEC 60093	Ω · m	dry cond.	10^{12} 10^{11}
Specific surface resistivity		IEC 60093	Ω	cond.	10^{12}

General Properties

Density		ISO 1183	g/cm³	dry	1.14
Flammability (UL94)	0.8 mm	ISO 1210	rating	-	HB
Water absorption	23°C/sat.	ISO 62	%	-	9
Moisture absorption	23°C/50% RH	ISO 62	%	-	3
Linear mould shrinkage	long.	ISO 294	%	dry	1.05
Linear mould shrinkage	trans.	ISO 294	%	dry	1.05

Product-nomenclature acc. ISO 1874: PA 6, MR, 18-030 N

Processing information for the injection moulding of Grilon BS/2

This technical data sheet for Grilon BS/2 provides you with useful information on material preparation, machine requirements, tooling and processing.

MATERIAL PREPARATION

Grilon BS/2 is delivered dry and ready for processing in sealed, air tight packaging. Predrying 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 Grilon BS/2 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 be shown by a foaming melt 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

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 (over 300°C) or by too long melt residence time in the barrel.

Drying temperature

Polyamides are subjected to the affects 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.

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

Use of regrind

Grilon BS/2 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 mechanical properties

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

MACHINE REQUIREMENTS

Grilon BS/2 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 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 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 unreinforced 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
A draft between 1 - 2° is common for Polyamide injection moulding tools. As a rate of thumb for structured cavities the following can be applied: Maximal 0.02 mm depth of roughness for 1° of draft.

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 weldline 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 Grilon BS/2, following basic settings are recommended:

Temperatures

Flange	60 - 80°C
Zone 1	250°C
Zone 2	255°C
Zone 3	260°C
Nozzle	260°C
Tool	80°C
Melt	240 - 300°C

Pressures / Speeds

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

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.

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