

## PROVISIONAL DATA SHEET

### GRILAMID XE 4128 BLACK 9221

#### Product description

Grilamid XE 4128 black 9221 is a modified high viscosity Polyamide 610 for extrusion as well as injection moulding.

A remarkable characteristic of tubes made out of this material is the high resistance to collapse under the influence of vacuum and high temperatures.

PA610 polymer is to a large extent based on renewable raw materials and its eco-profile is very favourable when compared to similar products based on crude oil.

The main features of Grilamid XE 4128 black 9221 are:

- high flexibility and impact resistance at low temperatures
- high stiffness at high temperatures
- high heat and chemical resistance
- easy processing

Grilamid XE 4128 black 9221 can be processed on standard tube extrusion lines suitable for polyamides.

#### Application examples

Grilamid XE 4128 black 9221 was developed for automotive tubing applications subject to high continuous use and peak temperatures. The material is particularly indicated for brake booster vacuum lines of passenger cars.



## PROPERTIES

Mechanical Properties		Standard	Unit	State	Grilamid XE 4128 black 9221
Tensile E-Modulus	1 mm/min	ISO 527	MPa	dry cond.	1200 700
Tensile strength at yield	50 mm/min	ISO 527	MPa	dry cond.	35 -
Elongation at yield	50 mm/min	ISO 527	%	dry cond.	10 -
Tensile strength at break	50 mm/min	ISO 527	MPa	dry cond.	35 30
Elongation at break	50 mm/min	ISO 527	%	dry cond.	> 50 > 50
Impact strength	Charpy, 23°C	ISO 179/2-1eU	kJ/m <sup>2</sup>	dry cond.	kein Bruch kein Bruch
Impact strength	Charpy, -30°C	ISO 179/2-1eU	kJ/m <sup>2</sup>	dry cond.	kein Bruch kein Bruch
Notched impact strength	Charpy, 23°C	ISO 179/2-1eA	kJ/m <sup>2</sup>	dry cond.	kein Bruch kein Bruch
Notched impact strength	Charpy, -30°C	ISO 179/2-1eA	kJ/m <sup>2</sup>	dry cond.	17 18
Ball indentation hardness		ISO 2039-1	MPa	dry cond.	60 35

### Thermal Properties

Melting point	DSC	ISO 11357	°C	dry	220
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	80
Thermal expansion coefficient long.	23-55°C	ISO 11359	10 <sup>-4</sup> /K	dry	1.0
Thermal expansion coefficient trans.	23-55°C	ISO 11359	10 <sup>-4</sup> /K	dry	1.5

### Electrical Properties

Dielectric strength		IEC 60243-1	kV/mm	dry cond.	33 32
Comparative tracking index	CTI	IEC 60112	-	cond.	600
Specific volume resistivity		IEC 60093	Ω · m	dry cond.	10 <sup>11</sup> 10 <sup>10</sup>
Specific surface resistivity		IEC 60093	Ω	cond.	10 <sup>12</sup>

### General Properties

Density		ISO 1183	g/cm <sup>3</sup>	dry	1.04
Flammability (UL94)	0.8 mm	ISO 1210	rating	-	HB
Water absorption	23°C/sat.	ISO 62	%	-	1.8
Moisture absorption	23°C/50% r.h.	ISO 62	%	-	4.8
Linear mould shrinkage	long.	ISO 294	%	dry	1.2
Linear mould shrinkage	trans.	ISO 294	%	dry	1.1

Product-nomenclature acc. ISO 1874: PA610+X - HI, EH, 22-010

## Information for extrusion processing of Grilamid XE 4128 black 9221

This technical data sheet for Grilamid XE 4128 black 9221 provides you with useful information on material preparation, machine requirements, tooling and processing.

### MATERIAL PREPARATION

Grilamid XE 4128 black 9221 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 period of time of at least one year when stored in 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 XE 4128 black 9221 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 recognized 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	-30°C

##### Vacuum oven

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

#### Drying temperature

Polyamides are subject 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. 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 as a comparison sample.

With longer residence times (over 0.5 hour) hopper heating or a hopper dryer (80°C) is useful.

### MACHINE REQUIREMENTS

Grilamid XE 4128 black 9221 natural can be processed economically and without problems on all machines suitable for polyamides.

#### Screw

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

##### Screw

Length	24 D - 25 D
Compression ratio	2.0:1 - 3.0:1

#### Grooved Feeding Zone

The material can be extruded with smooth or grooved feeding zone where the grooves do not exceed a depth of 0.5 mm.

### PROCESSING

#### Basic machine settings

In order to start up the machine for processing Grilamid XE 4128 black 9221 natural, the following basic settings are recommended:

##### Temperatures

Hopper zone	60 - 90°C
Feeding zone	240 - 260°C
Compression zone	240 - 260°C
Metering zone	240 - 260°C
Head	240 - 260°C
Nozzle	240 - 260°C
Melt	240 - 260°C

## 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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