



## LiNNOTAMHiPERFORMANCE FR

Flame retardant cast polyamide for railway cars

**LiNNOTAMHiPERFORMANCE FR 600** and **1200** are the new cast nylon materials for flame retardation in railway cars. Due to the special additives, combined with a new casting process, these materials fulfill all the safety requirements of the highest fire hazard level (HL 3) of the latest European fire protection standard, DIN EN 45545-2.

In addition to reliable flame retardation **LiNNOTAMHiPERFORMANCE FR 600** and **1200** also offer all the other advantages of Licharz cast polyamides: outstanding sliding properties, very good impact strength and machinability as well as low weight – characteristics that make the material perfect for use in railway cars. When producing our new **LiNNOTAMHiPERFORMANCE FR 600 and 1200** we do not use flame retardants which contain halogens or inorganic substances. We do not use SCHC-substances that are possibly hazardous to health and the environment.

Our new **LiNNOTAMHiPERFORMANCE FR 600 and 1200** comply with the new norm DIN EN 45545-2 as well as with the previous norm DIN 5510-2 and NFF 16101. The newly adopted flame retardation standard DIN EN 45545-2 for railway cars was developed by the International Union of Railways (UIC) together with various European countries. By March 2016 it is expected that all existing national standards will be replaced by this new standard. This means that latest by 2017 all new rail vehicles must comply with DIN EN 45545-2.

### Application examples:

- Slider pads
- Slide rails
- Transitions
- Rollers (doors)
- Buffers
- Drawgear



# Product information

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technische kunststoffe



## LiNNOTAMHiPERFORMANCE 600 FR

	Standard	Unit	Value
<b>Mechanical values</b>			
Density	DIN EN ISO 1183	g/cm <sup>3</sup>	1,15
Yield stress	DIN EN ISO 527	MPa	80 (60)
Elongation due to tearing	DIN EN ISO 527	%	40 (100)
Modulus of elasticity Resulting from tensile test	DIN EN ISO 527	MPa	3.100 (1.800)
Modulus of elasticity Resulting from bending test	DIN EN ISO 178	MPa	3.400 (2.000)
Flexural strength	DIN EN ISO 178	MPa	140 (60)
Impact strength	DIN EN ISO 179	kJ/m <sup>2</sup>	without break
Notched-bar impact strength	DIN EN ISO 179	kJ/m <sup>2</sup>	>4 (>15)
Ball indentation hardness H <sub>358/30</sub>	DIN EN ISO 2039-1	MPa	160 (125)
Sliding friction coefficient (against Steel)	-	μ	0,36 – 0.42
<b>Thermal values</b>			
Melting temperature	DIN EN ISO 3146	°C	+ 220
Thermal conductivity	DIN 52 612	W (m · K)	0,23
Specific thermal capacity	-	J (g · K)	1,7
Coefficient of linear expansion	-	10 <sup>-5</sup> · K <sup>-1</sup>	7 – 8
Operating temperature range (long term)	-	°C	-40 to +105
Operating temperature range (short term)	-	°C	to +170
<b>Electrical values</b>			
Dielectric constant	IEC 250	-	3,7
Dielectric loss factor	IEC 250	-	0,03
Specific volume resistance	IEC 93	Ω · cm	10 <sup>15</sup> (10 <sup>12</sup> )
Surface resistance	IEC 93	Ω	10 <sup>13</sup> (10 <sup>12</sup> )
Dielectric strength	IEC 243	kV / mm	50 (20)
<b>Water absorption values</b>			
Moisture absorption in normal climate until saturated	DIN 53 175	%	2,2
Water absorption until saturated	DIN EN ISO 62	%	6,5

The values in brackets are valid for material in normal climate conditions.

All technical specifications are only for information and advice.

Legally binding assurances of properties and/or results cannot be taken from this information.

We recommend carrying out practical tests to establish the suitability of a product for a given application.

**Product range: (other dimensions are possible on request)**

Platten / Cutting		Round rods (on request)		Hollow bars	
Thickness	Format	Diameter	Length	Outside - Ø	Length
8 (6) – 100 mm	è 2000 x 1000 mm	ab Ø 6 mm	è 1000 mm	-----	
110 – 160 mm	è 1000 x 1000 mm				

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## LiNNOTAMHiPERFORMANCE 1200 FR

	Standard	Unit	Value
<b>Mechanical values</b>			
Density	DIN EN ISO 1183	g/cm <sup>3</sup>	1,03
Yield stress	DIN EN ISO 527	MPa	60 (50)
Elongation due to tearing	DIN EN ISO 527	%	55 (120)
Modulus of elasticity Resulting from tensile test	DIN EN ISO 527	MPa	2.200 (1.800)
Modulus of elasticity Resulting from bending test	DIN EN ISO 178	MPa	2.400
Flexural strength	DIN EN ISO 178	MPa	90
Impact strength	DIN EN ISO 179	kJ/m <sup>2</sup>	without break
Notched-bar impact strength	DIN EN ISO 179	kJ/m <sup>2</sup>	>15
Ball indentation hardness H <sub>358/30</sub>	DIN EN ISO 2039-1	MPa	100 (feucht)
Sliding friction coefficient (against Steel)	-	μ	0,4
<b>Thermal values</b>			
Melting temperature	DIN EN ISO 3146	°C	+ 190
Thermal conductivity	DIN 52 612	W (m · K)	0,23
Specific thermal capacity	-	J (g · K)	1,7
Coefficient of linear expansion	-	10 <sup>-5</sup> · K <sup>-1</sup>	10 – 11
Operating temperature range (long term)	-	°C	-60 to +110
Operating temperature range (short term)	-	°C	to +150
<b>Electrical values</b>			
Dielectric constant	IEC 250	-	3,7
Dielectric loss factor	IEC 250	-	0,03
Specific volume resistance	IEC 93	Ω · cm	10 <sup>16</sup> (10 <sup>13</sup> )
Surface resistance	IEC 93	Ω	10 <sup>13</sup> (10 <sup>12</sup> )
Dielectric strength	IEC 243	kV / mm	50 (20)
<b>Water absorption values</b>			
Moisture absorption in normal climate until saturated	DIN 53 175	%	0,9
Water absorption until saturated	DIN EN ISO 62	%	1,4

The values in brackets are valid for material in normal climate conditions.

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We recommend carrying out practical tests to establish the suitability of a product for a given application.

Product range : (other dimensions are possible on request)

Plates		Round rods (on request)		Hollow bars	
Thickness	Format	Diameter	Length	Outside - Ø	Length
10 – 100 mm	è 2000 x 1000 mm	ab Ø 10 mm	è 1000 mm	-----	
110 – 160 mm	è 1000 x 1000 mm				

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