

Bayblend[®] FR3030

- (PC+ABS) blend
- Non-reinforced
- Flame-retardant, halogen-free to DIN/VDE 0472, 815
- Extrusion grade with a high melt rigidity and outstanding thermoforming properties

Short description

Flame-retardant extrusion grade; Vicat/B 120 temperature = 115 °C; good extrusion and vacuum-forming behavior; UL recognition 94 V-0 (1.5 mm); halogen-free according to DIN VDE 0472,815; glow wire temperature (GWFI): 960 °C at 1.0 mm.

Characterization

Bayblend[®] FR3030 is a non-reinforced, flame-retardant, amorphous thermoplastic polymer blend based on polycarbonate (PC) and acrylonitrile-butadiene-styrene copolymer (ABS). It is noted, in particular, for its favorable combination of mechanical and thermal properties as well as its excellent extrusion and thermoforming behavior. With a chlorine, bromine and iodine content of < 0.2 % by weight and a fluorine content of < 0.1 % by weight, it is classified as "halogen-free" under the terms of DIN/VDE 0472, Part 815.

Delivery form

Bayblend[®] FR3030 is available worldwide and supplied in the form of oval or cylindrical granules in 25-kg polyethylene sacks, large cartons with a PE liner, in big bags or in bulk. The product is available in its natural color or in a wide range of opaque shades.

The production plants for Bayblend[®] have been certified to DIN ISO by the appropriate quality organizations.

The certificates can be found in the internet at <http://www.bayermaterialscience.com> (Customer Services/Certificates/Quality).

Applications

The main fields of application for FR3030 are in the transport sector (trim for the interior of buses, rail vehicles and boats), the electrical sector (cable and wiring ducts, electrically insulating pipes, conductor rails and conductor rail covers) and the construction sector (e.g. semi-finished products and composite systems with other materials).

PVC-free materials can be desirable or even prescribed for public buildings (including airports, hospitals, schools) on fire protection grounds, with the aim of minimizing risks and consequential damage. In such cases, halogen-free Bayblend[®] FR3030 constitutes an excellent alternative for all kinds of electrical installation profiles, for example.

Properties (see also table)

Bayblend[®] FR3030 is noted for its optimum toughness, stiffness, heat resistance and flame retardance, together with its excellent pre- and post-processing behavior.

In addition to complying with the WEEE and RoHS EU Directives, Bayblend[®] FR3030 generally (depending on its color) meets the requirements of the most important ecolabels, including the Blue Angel, the EU "Flower", the Nordic Swan and the TCO. Detailed information is available on the internet at <http://plastics.bayer.com>.

Mechanical properties

Bayblend[®] FR3030 has a high impact and notched impact strength over a wide range of temperatures. This ensures that housing components in this material can also withstand high external mechanical loading without sustaining any damage. The high stiffness for



an unreinforced product (the modulus of elasticity in tension is around 2650 MPa) allows thin-walled parts to be produced with the necessary stiffness too.

Thermal properties

Bayblend® FR3030 has a Vicat softening temperature (VST/B 120) of around 115 °C.

This means it considerably exceeds the heat resistance of at least 75 °C in the ball pressure test (IEC 60335-1). FR3030 thus constitutes an ideal housing material for providing protection against contact with live parts.

When components are subjected to a low level of mechanical stressing, no major dimensional changes are to be expected on short-term exposure to temperatures of up to a maximum of 105 °C. The maximum permanent service temperature will depend on the molded part geometry, the type of stressing and the requirements profile.

The melting range starts as of approximately 200 °C, while thermal decomposition commences at about 300 °C.

The coefficient of linear thermal expansion (ISO 11359-1,-2, 23 °C – 55 °C) displays only a low anisotropy and is in the range of $0.7 \times 10^{-4}/K$.

Burning behaviour

Bayblend® FR3030 attains a UL 94 V-0 recognition in a wall thickness of 1.5 mm and above (all colors). A UL 94-5VB listing is available for a wall thickness of 2.0 mm (all colors), and a UL 94-5VA listing for a wall thickness of 3.0 mm (all colors).

A glow wire temperature of 960 °C to IEC 60695-2-12 is attained with a wall thickness of 1.0 mm.

Bayblend® FR3030 has passed the "German Railway Test" to DIN 54837/5510 in sheet thicknesses of 1.5 / 2.0 and 2.5 mm with a rating of S-4, SR-2 and ST-2.

An M1 classification can be attained in the Epiradiateur cabin test to NF P 92-5011 (own test) in sheet thicknesses of 2.0 to 4.0 mm.

Bayblend® FR3030 passes the "Cable Duct Test" to DIN EN 50085-1 and DIN VDE 0604, Part 1 on molded

parts (40 mm x 60 mm) with wall thicknesses of less than 1.5 mm.

Rheological properties

Bayblend® FR3030 is noted for its relatively high viscosities in the low shear-rate range. In the light of the very high melt rigidity that this gives rise to, FR3030 is eminently suited to processing by extrusion, extrusion blow molding and thermoforming.

The viscosity curves are presented in the Annex.

Chemical resistance

At room temperature, molded parts in Bayblend® are resistant to mineral acids, a large number of organic acids and also aqueous saline solutions. Bayblend® parts are not resistant to bases, aromatics, ketones, esters, chlorinated hydrocarbons and a number of greases and oils. Their resistance to chemicals is additionally a function of the temperature, the loading duration and the internal and external stress status of the molded part; it should be checked in the individual case.

Weatherability

As with most thermoplastics, exposure to light/weathering leads to color changes and to a reduction in mechanical properties. This reduction in properties, however, is not so pronounced, and the requirements of the data processing industry for housing materials, for example, can still be met.

The majority of colors reliably fulfil the light aging standard for indoor applications to ASTM D 4459 (the so-called IBM test), which is recognized worldwide in accordance with OEM requirements, with a permitted range of $\Delta E = 1.5 \text{ max}$.

It is best to paint parts that have to meet particularly stringent requirements, such as for outdoor applications.

Processing

Bayblend® FR3030 is generally processed by extrusion and thermoforming. All modern single-screw extruders are suitable.





Extruders

Single-screw extruders should essentially be used for processing Bayblend® FR3030. Apart from two-stage degassing screws or three-section screws, special screw concepts with integrated barrier zones and also mixing and shearing sections have proved successful.

Use is generally made of three-section screws with a pitch of 1 D and a length of 25 D to 30 D. The flight depth ratio (feed zone to metering zone) should be in the region of 2.5:1 to 3:1.

A particularly uniform melt flow can be guaranteed by means of melt pumps.

Drying

No more than 0.02% residual moisture may be present in the granules when Bayblend® FR3030 is processed by extrusion. Moisture in the plastic melt can lead to surface defects in the form of streaks. An excessive moisture content can be eliminated through vacuum degassing during extrusion, or by drying the granules prior to processing. It is possible to employ a combination of drying and degassing. Dry-air dryers are recommended for the drying.

Drying conditions: 2 – 4 h at 90 – 100 °C (dry-air dryer).

Excessively long drying should be avoided, since discoloration may otherwise result.

Sheet extrusion

Melt temperature¹⁾: 240 to 260 °C

The extruder should be set to give a maximum melt temperature of 260 °C. Overheating and excessively long melt residence times should be avoided, since these can result in material damage, i.e. a reduction in toughness or surface defects in the form of streaks. The process conditions will depend on the extrudate being produced and the plant technology that is available.

The following barrel and mold temperatures can be taken by way of a guide:

Section 1: 220 – 240 °C
Section 2: 230 – 240 °C
Section 3: 240 – 250 °C
Section 4: 240 – 250 °C
Die: 240 – 250 °C

The temperature for the downstream equipment (screen-changer, melt pump, coex-adaptor and slot

die) should ideally be coordinated with the temperature of the last barrel section.

Roll temperatures on the calender

The temperatures depend on the calender design, the take-off rate and the sheet geometry (thickness and surface).

Guide values for calenders with a vertical roll arrangement, melt introduction between rolls 1 and 2:

Roll 1 (bottom): 80 – 110 °C
Roll 2 (center): 90 – 120 °C
Roll 3 (top): 100 – 110 °C

Profile extrusion

Melt temperature¹⁾: 230 to 250 °C

When FR3030 is used for profile extrusion, it is best to employ a barrel temperature profile that falls from the feed hopper to the screw tip. The temperatures should be selected in such a way that the melt temperature does not notably exceed 250 °C.

The following temperature settings can be taken by way of a guide:

Section 1: 250 – 270 °C
Section 2: 240 – 260 °C
Section 3: 230 – 250 °C
Section 4: 230 – 250 °C
Die: 240 – 250 °C

1) see also disclaimer at the end of this Technical Information

Calibration

Preference should be given to calibration with indirect cooling. Post-cooling of the profile can be carried out in a water bath.

Finishing

- Forming: hot-forming processes, such as thermoforming, bending, stamping.
- Machining: sawing, drilling, milling, turning, planing, filing, punching. The use of carbide-tipped tools is recommended.
- Joining: screw connections, gluing, welding.
- Post-treatment: painting, printing, foam-coating, metallizing, laser marking.

Recycling

After use, single-sort molded parts in Bayblend® FR3030 which do not contain any pollutants can be mechanically recycled. Molded parts which are not pollutant-free can be chemically recycled or incinerated with energy recovery.

Products should be labeled in accordance with DIN EN ISO 11469. For parts in Bayblend® FR3030 the labeling is:



>PC+ABS FR (40)<

Further details on this can be found in our Technical Information PCS-1164.

Further literature

Brochure: "Bayblend® - the Polycarbonate Blend" containing details of the range of grades – reference data – properties – processing.

Special notes

The information given in Safety Data Sheet No. 112000010247 must be observed.

The safety data sheet is available to registered customers on the internet at

<http://www.bayerone.bayer.com>

or can be sent out by request.

It contains details of labeling, handling and storage, as well as information on composition, product safety and toxicological/ecological profiles.

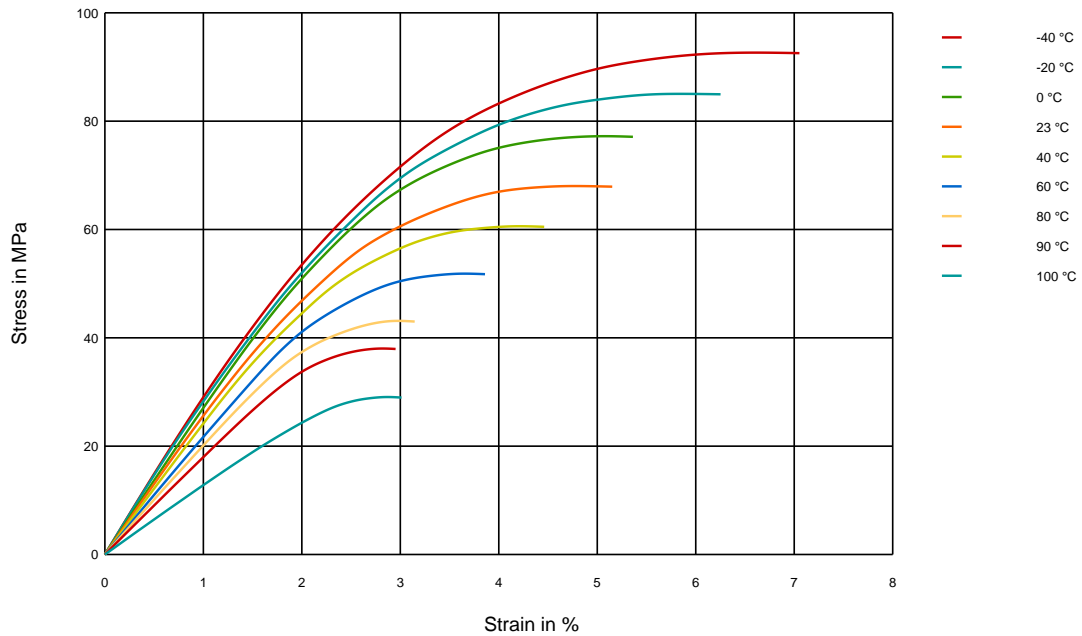


Fig. 1: Isothermal stress-strain curves up to yield stress from the short-time tensile test to ISO 527-1,-2 of Bayblend® FR3030.

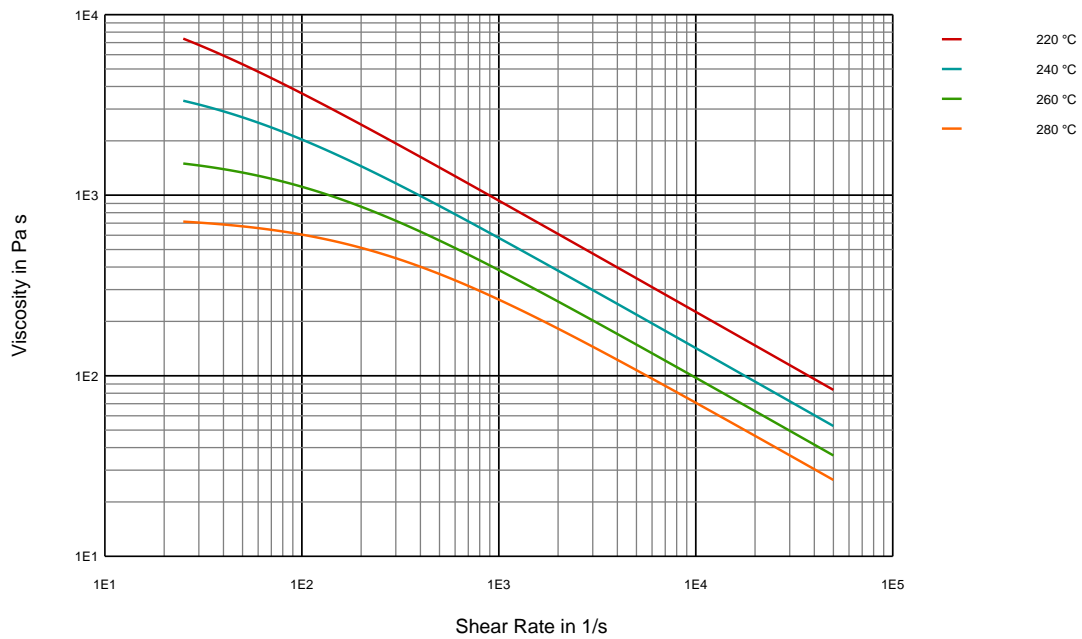


Fig. 2: Melt viscosity as a function of shear rate b. o. ISO 11443-A of Bayblend® FR3030.



Typical Values

Property	Test Condition	Unit	Standard	Bayblend® FR3030
Rheological properties				
C Melt volume-flow rate	260 °C; 5 kg	cm ³ /10 min	ISO 1133	11
Molding shrinkage, parallel	150x105x3; 260 °C / MT 80 °C	%	b.o. ISO 2577	0.5 - 0.7
Molding shrinkage, normal	150x105x3; 260 °C / MT 80 °C	%	b.o. ISO 2577	0.5 - 0.7
Melt viscosity	1000 s ⁻¹ ; 260 °C	Pa·s	b.o. ISO 11443-A	410
Mechanical properties (23 °C/50 % r. h.)				
C Tensile modulus	1 mm/min	MPa	ISO 527-1,-2	2650
C Yield stress	50 mm/min	MPa	ISO 527-1,-2	69
C Yield strain	50 mm/min	%	ISO 527-1,-2	5
Stress at break	50 mm/min	MPa	ISO 527-1,-2	53
Strain at break	50 mm/min	%	b.o. ISO 527-1,-2	> 50
Izod impact strength	23 °C	kJ/m ²	ISO 180-U	N
Izod notched impact strength	23 °C	kJ/m ²	ISO 180-A	40
Izod notched impact strength	-30 °C	kJ/m ²	ISO 180-A	10
Thermal properties				
C Temperature of deflection under load	1.80 MPa	°C	ISO 75-1,-2	98
C Temperature of deflection under load	0.45 MPa	°C	ISO 75-1,-2	106
C Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	113
Vicat softening temperature	50 N; 120 °C/h	°C	ISO 306	115
C Coefficient of linear thermal expansion, parallel	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1,-2	0.68
C Coefficient of linear thermal expansion, transverse	23 to 55 °C	10 ⁻⁴ /K	ISO 11359-1,-2	0.72
C Burning behavior UL 94 (1.5 mm)	1.5 mm	Class	UL 94	V-0
C Burning behavior UL 94-5V	2.0 mm	Class	UL 94	5VB
Burning behavior UL 94-5V	3.0 mm	Class	UL 94	5VA
Electrical properties (23 °C/50 % r. h.)				
C Relative permittivity	100 Hz	-	IEC 60250	3.2
C Relative permittivity	1 MHz	-	IEC 60250	3.1
C Dissipation factor	100 Hz	10 ⁻⁴	IEC 60250	37
C Dissipation factor	1 MHz	10 ⁻⁴	IEC 60250	75
C Volume resistivity		Ohm·m	IEC 60093	1E15
C Surface resistivity		Ohm	IEC 60093	1E17
C Electrical strength	1 mm	kV/mm	IEC 60243-1	35
C Comparative tracking index CTI	Solution A	Rating	IEC 60112	350
Other properties (23 °C)				
C Water absorption (saturation value)	Water at 23 °C	%	ISO 62	0.5
C Water absorption (equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.2
C Density		kg/m ³	ISO 1183-1	1190
Processing conditions for test specimens				
C Injection molding-Melt temperature		°C	ISO 294	260
C Injection molding-Mold temperature		°C	ISO 294	80
C Injection molding-Injection velocity		mm/s	ISO 294	240

C These property characteristics are taken from the CAMPUS plastics data bank and are based on the international catalogue of basic data for plastics according to ISO 10350.

Impact properties: N = non-break, P = partial break, C = complete break

colored fields = UL recognition

Remark melt viscosity: true viscosity determined using the method of representative viscosity.





This information and our technical advice - whether verbal, in writing or by way of trials - are given in good faith but without warranty, and this also applies where proprietary rights of third parties are involved. Our advice does not release you from the obligation to check its validity and to test our products as to their suitability for the intended processes and uses. The application, use and processing of our products and the products manufactured by you on the basis of our technical advice are beyond our control and, therefore, entirely your own responsibility. Our products are sold in accordance with the current version of our General Conditions of Sale and Delivery.

Unless specified to the contrary, the values given have been established on standardized test specimens at room temperature. The figures should be regarded as guide values only and not as binding minimum values. Please note that, under certain conditions, the properties can be affected to a considerable extent by the design of the mold/die, the processing conditions and coloring.

Under the recommended processing conditions small quantities of decomposition product may be given off during processing. To preclude any risk to the health and well-being of the machine operatives, tolerance limits for the work environment must be ensured by the provision of efficient exhaust ventilation and fresh air at the workplace in accordance with the Safety Data Sheet. In order to prevent the partial decomposition of the polymer and the generation of volatile decomposition products, the prescribed processing temperatures should not be substantially exceeded.

Editor: Global Innovations - Polycarbonates
Bayer MaterialScience AG
D-51368 Leverkusen, Germany
www.bayermaterialscience.de
pcs-info@bayermaterialscience.com