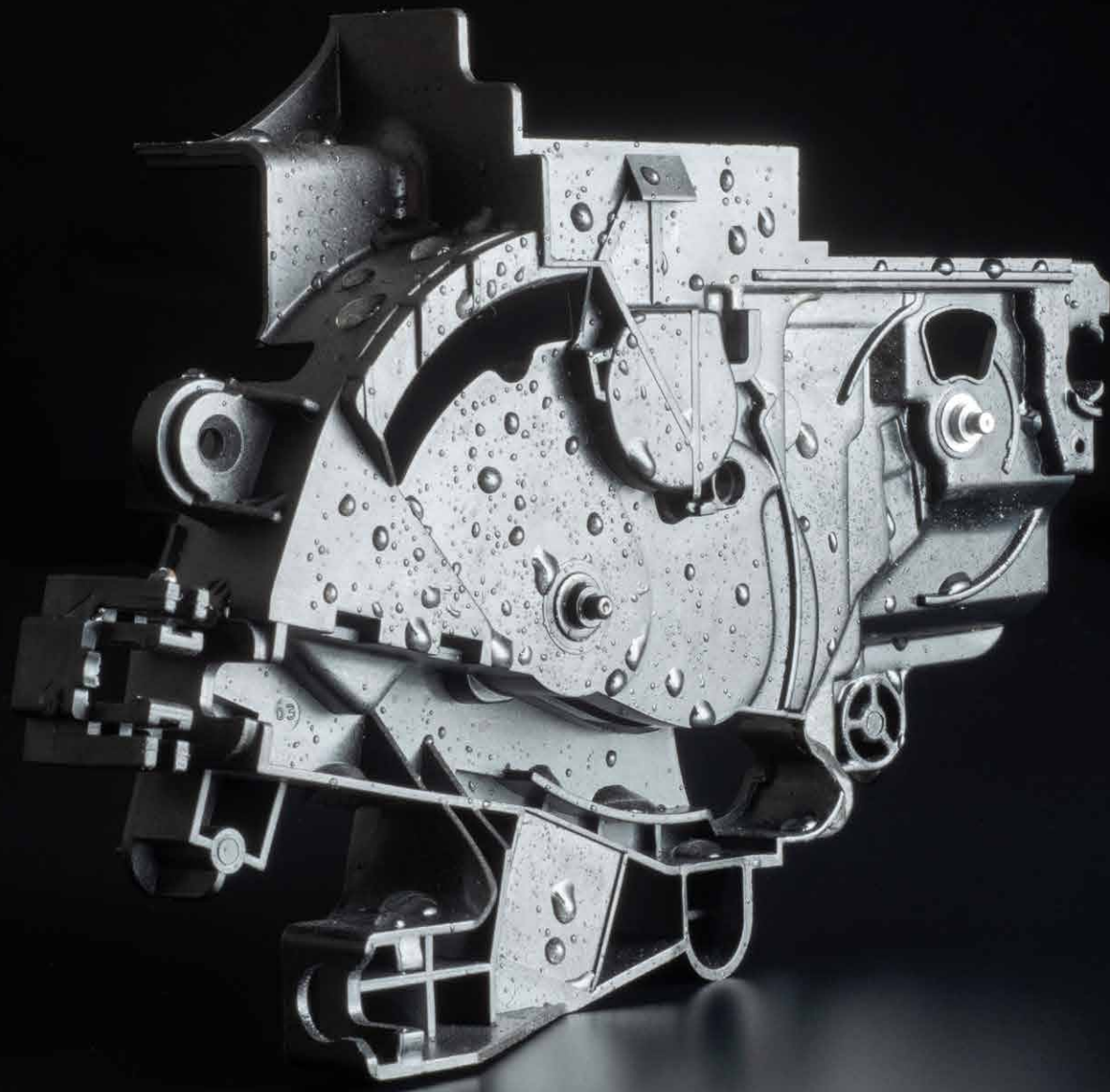


# QUALITY RESISTS.



**Pocan® XHR** – A new generation of hydrolysis-stabilized PBT compounds

**X Pocan®**

**QUALITY WORKS.**

**LANXESS**  
Energizing Chemistry

# WHY POCAN HR AND XHR?

## Pocan® XHR – a new generation of hydrolysis-stabilized PBT compounds

In many applications, polybutylene terephthalate (PBT) needs to be particularly resistant to the degradation caused by hot water, water vapor, and other media. Recently, the requirements have become even stricter. Many OEMs are looking for PBT materials that have achieved the two highest ratings of Class 4 or Class 5 in the longterm test SAE/USCAR2-6 of the US Society of Automotive Engineers (SAE) – see page 10. We have therefore complemented our hydrolysis-stabilized PBT compounds Pocan® HR (hydrolysis resistant) with the new Pocan® product range XHR (extremely hydrolysis resistant). This third generation of Pocan® HR is characterised by an even higher hydrolysis and aging resistance when exposed to media typical of certain applications. It rates excellently in the SAE/USCAR test and shows the same excellent processing characteristics as the second generation of Pocan® HR.

Pocan® XHR offers the same features as Pocan® HR

- A wide selection of products with diverse properties
- Extensive freedom in designing and selecting the production process
- Excellent processability in the injection molding process
- Good weldability

In addition, Pocan® XHR offers excellent elongation behavior and good thermal shock resistance, which make many material variants ideal for encapsulation of metal parts.

We naturally support our customers through all phases of component development – be that in material selection, component and mold engineering, component testing, or production. All of these services are part of our expertise and HiAnt® service package.



- The transmission housing of the automatic parking brake is made of Pocan B3233HR. This PBT displays not only high hydrolysis resistance but also dimensional stability, good processing behavior, and high strength and rigidity.

## Robust in humid environments

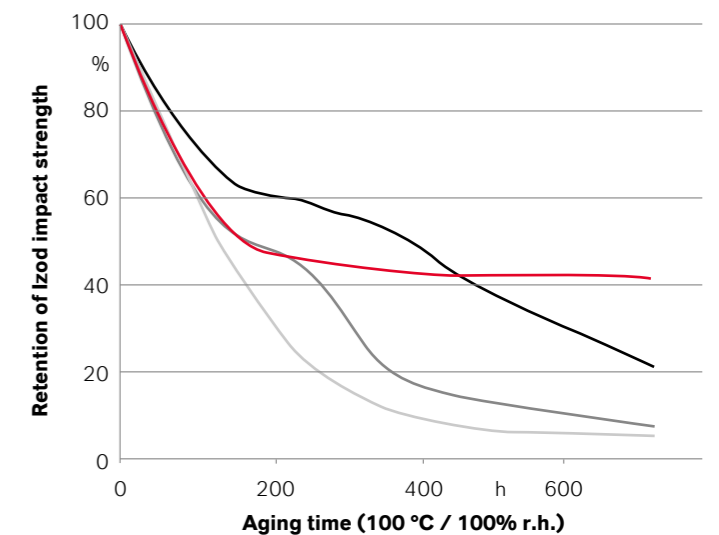
PBT sufficiently resists hydrolysis up to approximately 60 °C and can therefore withstand all natural climate conditions. At higher temperatures and wet conditions such as those prevailing in automotive engine compartments, partial degradation of the polymer chains due to moisture can occur in nonstabilized PBT grades. This effect impairs critical material properties, such as impact resistance, elongation, and strength. The members of the Pocan® HR and XHR product families have customized additive packages, which sustainably counteract this breakdown of the polymer chains and deterioration in properties (Figures 1a and 1b). The compounds are also easier to process and display outstanding mechanical properties. With these overall characteristics, Pocan® HR and XHR stand out from other comparable products. Their excellent processing behavior is expressed, for example, by the following:

- A stable manufacturing process
- Very good melt flow properties
- Constant viscosity during the injection-molding process
- Significant reduction in the formation of deposits in the mold and hot runner system

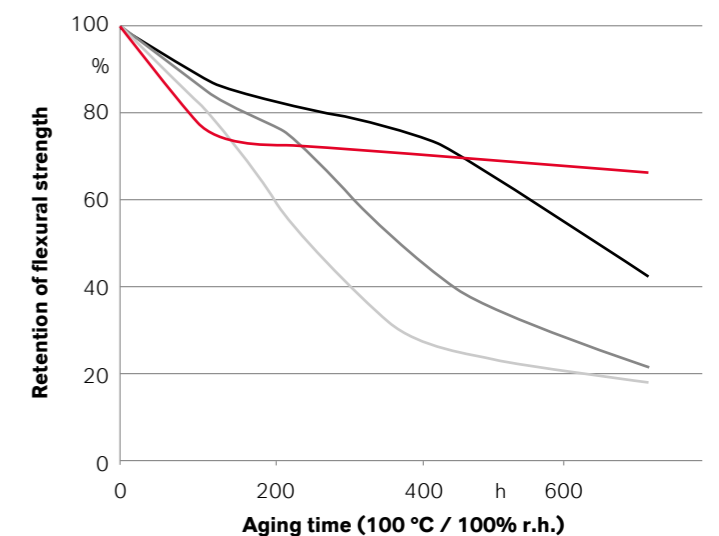
Thanks to the additives, Pocan® HR and XHR are much more resistant to hydrolysis than comparable standard products. This creates greater safety for components that must function faultlessly over their entire service life, even under the influences of moisture and temperature. Both product ranges are well suited for instance, in numerous safety applications, such as in the vicinity of the engine compartment. Typical applications are included:

- Connectors in airbags and power steering systems
- Sensors and housings, such as those on fuse boxes and control units
- Transmission housings on automatic parking brakes

Figures 1 a/b: Hydrolysis resistance of Pocan B3233HR and B3233XHR compared to standard PBTs.



— PBT GF30 — B3235XF — B3233HR — B3233XHR



— PBT GF30 — B3235XF — B3233HR — B3233XHR

# POCAN HR AND XHR

## WHAT THEY ARE!

### Versatile – the Pocan® HR and XHR range

Pocan® HR and XHR covers a wide range of properties and applications. The portfolio includes unreinforced and 15, 20, and 30 percent glass-fiber-reinforced, flame-retardant, and laser-transparent grades (table 1). Two examples are the unreinforced Pocan® B1205HR and B1205XHR. They are virtually impervious to warping and support the design of highly complex geometries. Pocan® B1205XHR has achieved the

second-highest rating in the longterm test SAE/USCAR2-6 with Class 4. With Pocan® B3216XHR and B3233XHR, we offer two new compounds with 15 and 30 percent glass fiber reinforcement, respectively – both of which have secured a Class 5 classification in the SAE/USCAR test. To design very strong and stiff structural components, the range with Pocan® B3243HR also includes a high-modulus product with a glass fiber content of 45 percent.



**Table 1: Important material properties of Pocan HR and XHR**

Product overview			HR	XF	LT	FR	Density kg/m³	Tensile modulus MPa	Tensile strain at yield / break %	Impact strength (Izod/Charpy) kJ/m²	HDT-A °C	CTI V	FR UL 94 class	USCAR class
<b>Pocan B1205HR</b>	PBT	Non-reinforced	■				1,290	2,600	3.5/-	120/150	75	600	HB	3
<b>Pocan B1205XHR</b>	PBT	Non-reinforced	■				1,290	2,200	3.8/-	100/140	65	n.d.	n.d.	4
<b>Pocan B3216HR</b>	PBT	GF15	■				1,400	5,900	-/3.7	45/50	190	300	HB	3
<b>Pocan B3216XHR</b>	PBT	GF15	■				1,350	4,500	-/4.7	50/60	190	600	n.d.	5
<b>Pocan B3216HRLT</b>	PBT	GF15	■		■		1,390	6,100	-/2.9	22/-	170	n.d.	n.d.	4
<b>Pocan TP112-001</b>	PBT	GF20	■				1,433	6,800	-/3.5	50/-	195	n.d.	n.d.	4
<b>Pocan TP155-201</b>	PBT	GF20	■		■		1,430	7,400	-/2.7	30/-	175	n.d.	n.d.	4
<b>Pocan B3235XF</b>	PBT	GF30		■			1,470	9,200	-/2.7	55/60	205	450	HB	3
<b>Pocan B3233HR</b>	PBT	GF30	■				1,480	9,600	-/2.9	55/65	205	450	HB	4
<b>Pocan B3234HR*</b>	PBT	GF30	■				1,490	9,600	-/2.9	55/65	205	425	HB	4
<b>Pocan B3233XHR</b>	PBT	GF30	■				1,480	7,900	-/3.6	55/60	200	n.d.	n.d.	5
<b>Pocan B3233HRLT</b>	PBT	GF30	■		■		1,520	10,000	-/2.8	53/60	190	300	HB	3
<b>Pocan TP155-002</b>	PBT	GF30	■		■		1,455	8,800	-/3.2	55/-	185	n.d.	n.d.	4-5
<b>Pocan BF4232HR</b>	PBT	GF30	■			■	1,670	9,800	-/2.0	35/40	195	225	V-0 (0.4)	4-5
<b>Pocan B3243HR</b>	PBT	GF45	■				1,610	14,000	-/2.4	55/60	205	n.d.	n.d.	4

\*Pocan B3234HR is optimized for improved silicone adhesion

HR = Hydrolysis resistant    XF = XtremeFlow    LT = Laser transparent  
FR = Flame retardant    n.d. = not determined

**PLEASE NOTE THAT OUR PRODUCT INFORMATION AND DATA ARE SUBJECT TO CONTINUOUS EXAMINATION AND UPDATES. MAKE SURE YOU REFER TO FURTHER INFORMATION AND THE LATEST UPDATES AT WWW.POCAN.COM**



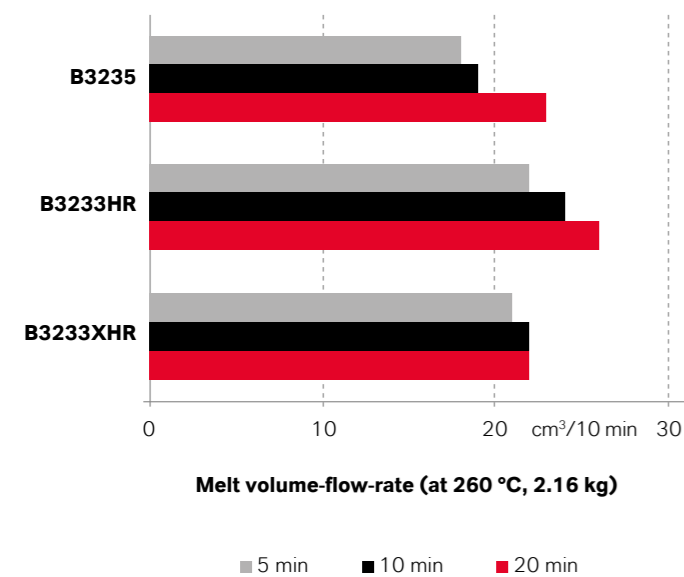
# POCAN HR AND XHR WHAT THEY PERFORM!

## Advantages at a glance

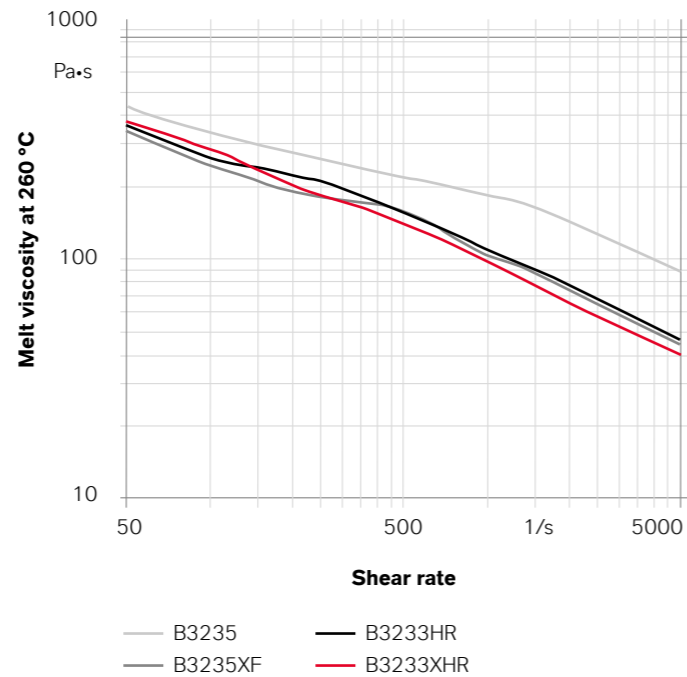
In addition to their high hydrolysis resistance and excellent processing properties, the basic strengths of Pocan® HR and XHR are:

- the highly consistent melt viscosity (no viscosity build-up) at PBT-common injection molding temperatures, which enables a reliable manufacturing process with a wide processing window (Figure 2)
- up to 35 percent higher flow values compared to standard products (Figure 3) – for example, the flow properties of Pocan® B3233XHR and Pocan® B3233HR are comparable to those of the very easy-flowing Pocan® XF grades
- improved chemical resistance – for instance, against sodium hydroxide solutions (Figure 4)
- the significantly increased long-term temperature resistance compared to standard grades, even in dry environments – the Pocan® XHR grades stand out in particular (Figures 5a and b)
- up to five percent lower density compared to standard materials, without compromising the mechanical or rheological properties
- good laser marking properties thanks to optimized colors, which is important for safety components.

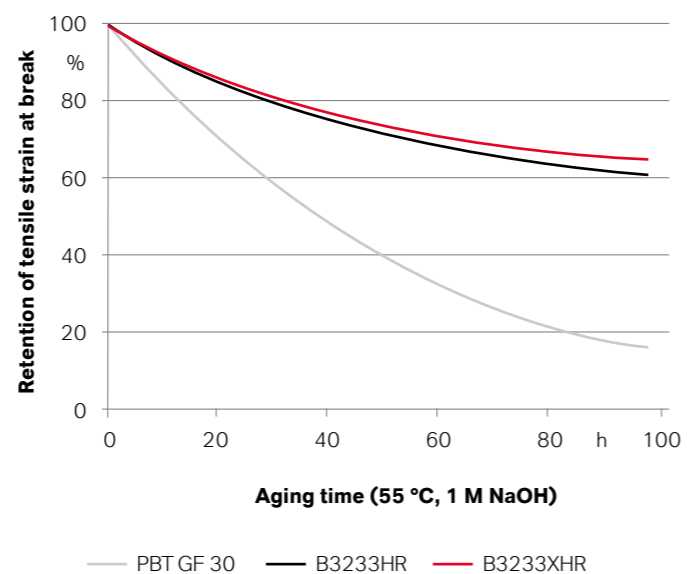
**Figure 2: The melts of Pocan B3233HR and B3233XHR are less sensitive to thermal stress during injection molding.**



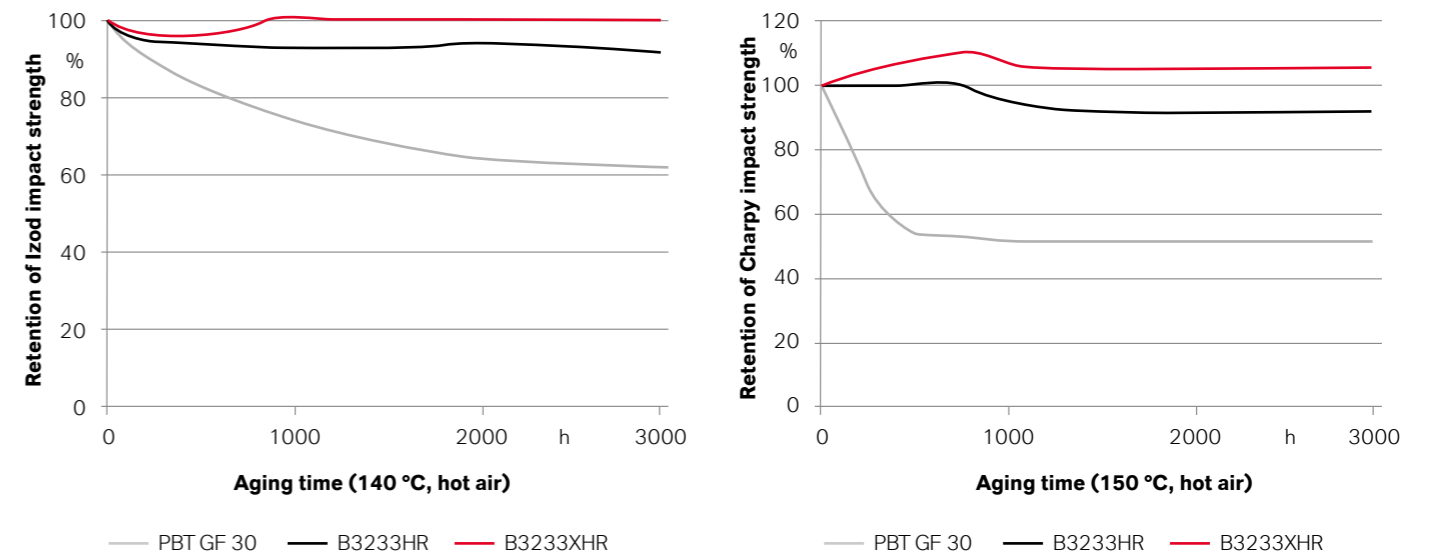
**Figure 3: Pocan HR and XHR are similarly easy-flowing compared to Pocan XF grades (Xtreme Flow).**



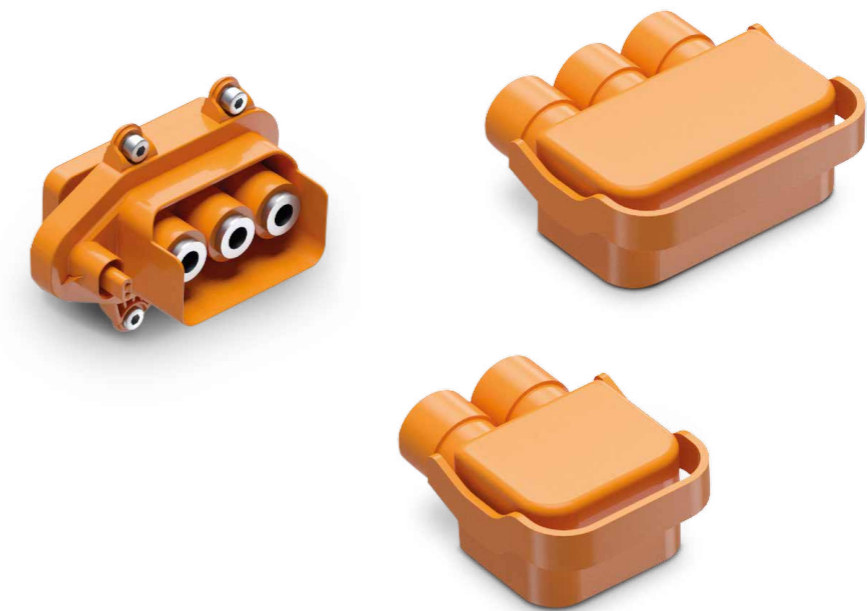
**Figure 4: Pocan HR and XHR demonstrate good stability in alkaline solutions.**



**Figures 5 a/b: Pocan HR and especially XHR are significantly more long term resistant to hot air than comparable standard PBT compounds.**



- Pocan HR is predestinated for demanding applications in high voltage systems like connectors.



# POCAN HR AND XHR POWERFUL PRODUCTS!

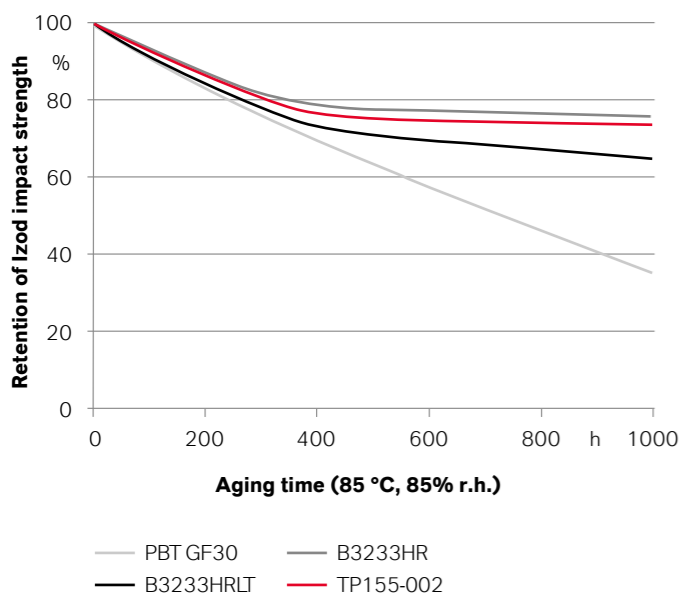
## Selected innovative materials

We regularly expand our Pocan® HR and XHR lines with new, innovative products. They are our response to market trends and reflect our close cooperation during development with partners in the respective industries.

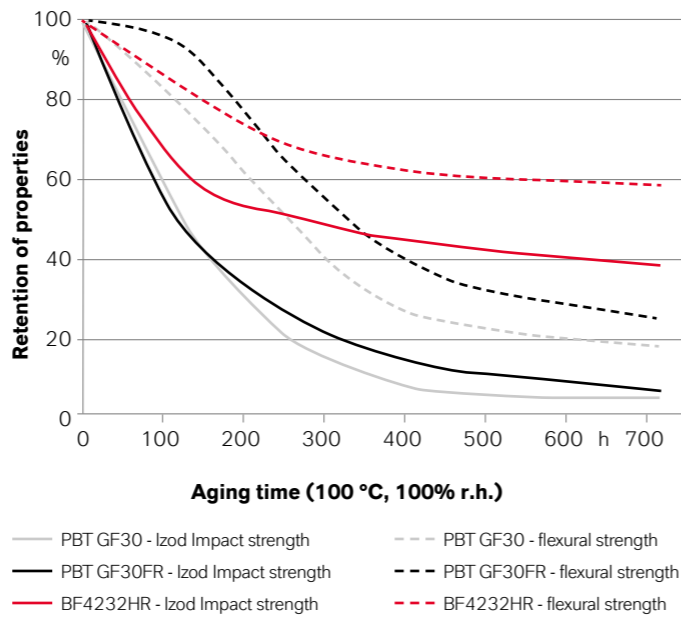
## Pocan® BF4232HR – very flame-retardant and hydrolysis resistant at the same time

We developed Pocan® BF4232HR as a flame-retardant compound reinforced with 30 percent glass fibers. It complies with fire safety standard UL 94 of the Underwriters Laboratories (UL) testing institute in the United States in all the colors tested, with the best classification of V-0 being achieved for test specimens with a thickness upwards of 0.4 mm (Yellow Card registration). The PBT simultaneously displays extraordinary hydrolysis resistance (Figure 6). The combination of high flame retardance and hydrolysis resistance is very difficult to achieve in material development and opens up entirely new fields of application for the material, such as in the rapidly growing market of electromobility. In electrical motor vehicle drive systems, for example, it is suitable for use in components requiring very high flame retardance and high dimensional stability because of their exposure to high currents.

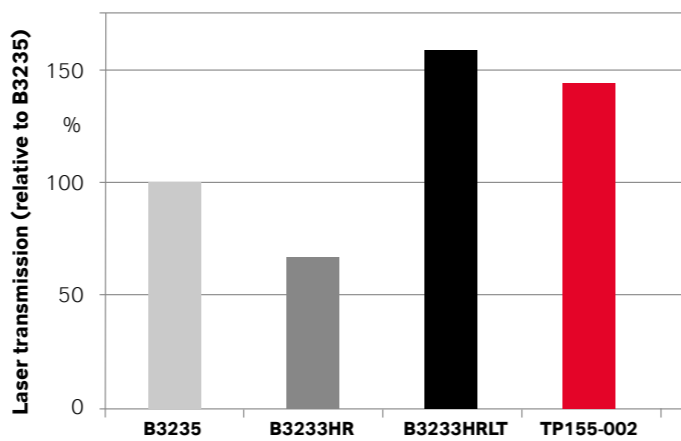
**Figure 7 a: Hydrolysis resistance of Pocan B3233HRLT and TP155-002 compared to non-laser-transparent HR and standard PBT grades**



**Figure 6: Even after 30 days storage at 100 °C, the mechanical properties of Pocan BF4232HR are still at a high level.**



**Figure 7 b: Laser transmission (780 - 1100 nm) of Pocan B3233HRLT and TP155-002 compared to non-laser-transparent HR and standard PBT grades.**



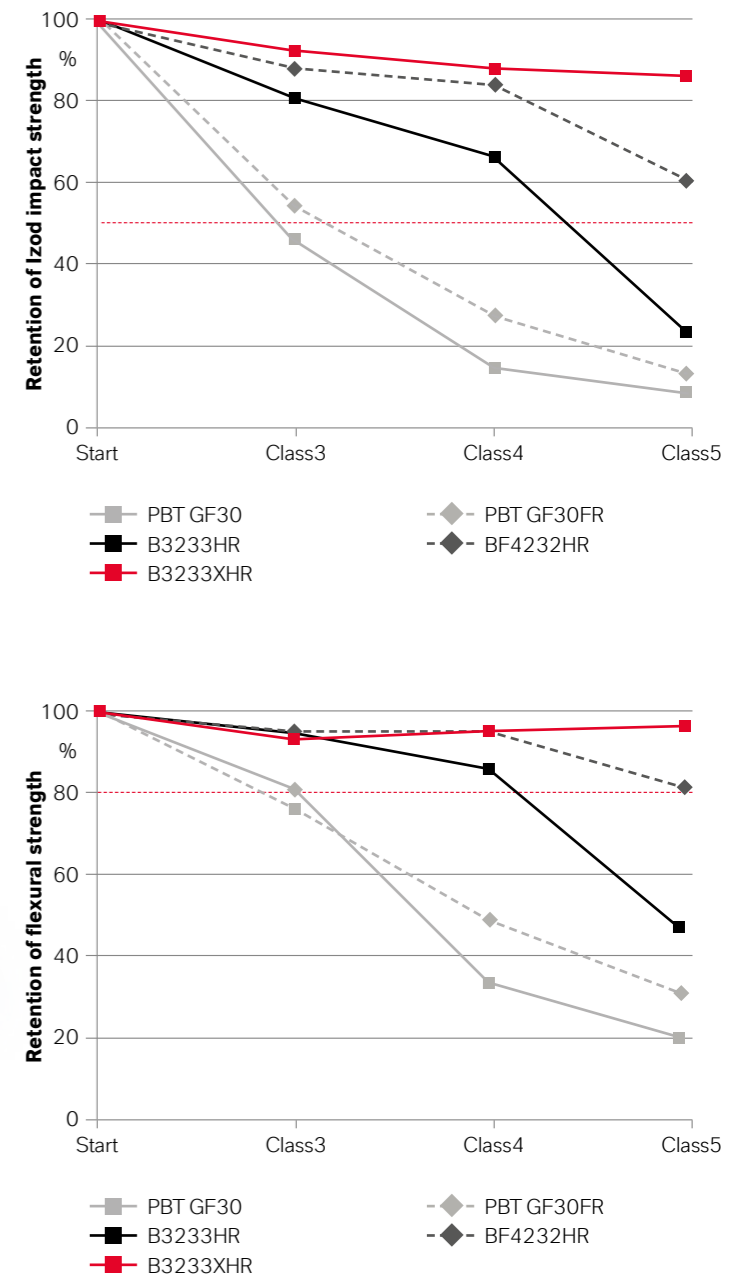
## Pocan® HRLT – tailor-made for laser welding

Laser transmission welding is being increasingly used to join electrical/electronic housings located, for instance, in the vicinity of the engine compartment. We developed the new laser-transparent PBT compounds Pocan LT (laser transparency) specifically for components that have to be resistant to heat and moisture. Outstanding product examples are Pocan® B3233HRLT and TP155-002. The latter is the LT version of B3233XHR. Compared with Pocan® B3233HR, the laser transmission of Pocan® B3233HRLT is more than twice as high in the 800 - 1,200 nm wave-length range typical of laser welding. At the same time, it is very resistant to hydrolysis (Figures 7a and 7b). Reinforced with 30 percent glass fibers, Pocan® TP155-002 shows slightly lower laser transparency compared to Pocan® B3233HRLT but as the third generation of Pocan® HR is even more hydrolytically stable (Figures 7a and b) and it has achieved a significantly better rating in the SAE/USCAR test (Figure 9). We offer both laser-transparent material types in natural color tones and in a laser-transparent black for near-infrared.



High dimensional stability makes Pocan HR an excellent choice for precision housings in hot and humid environments.

**Figure 8 a and b: Izod impact strength (a) and flexural strength (b) after storage according to USCAR2-6 (80 mm × 10 mm × 4 mm specimens).**



# POCAN HR AND XHR POWERFUL PRODUCTS!

## Specialty Pocan® XF products

In addition to the Pocan® HR product family, our XF grades Pocan® B1205XF, B3217XF, B3225XF, and B3235XF (XtremeFlow), with their very good flow properties, display higher resistance to humid environments compared to similar standard PBT grades (see Figures 1a and 1b). Several have achieved a Class 3 rating in SAE/USCAR2-6 long-term testing (+125 °C peak temperature). Further advantages of this range of product grades are excellent mechanical behavior and easy processing in a very wide processing window.

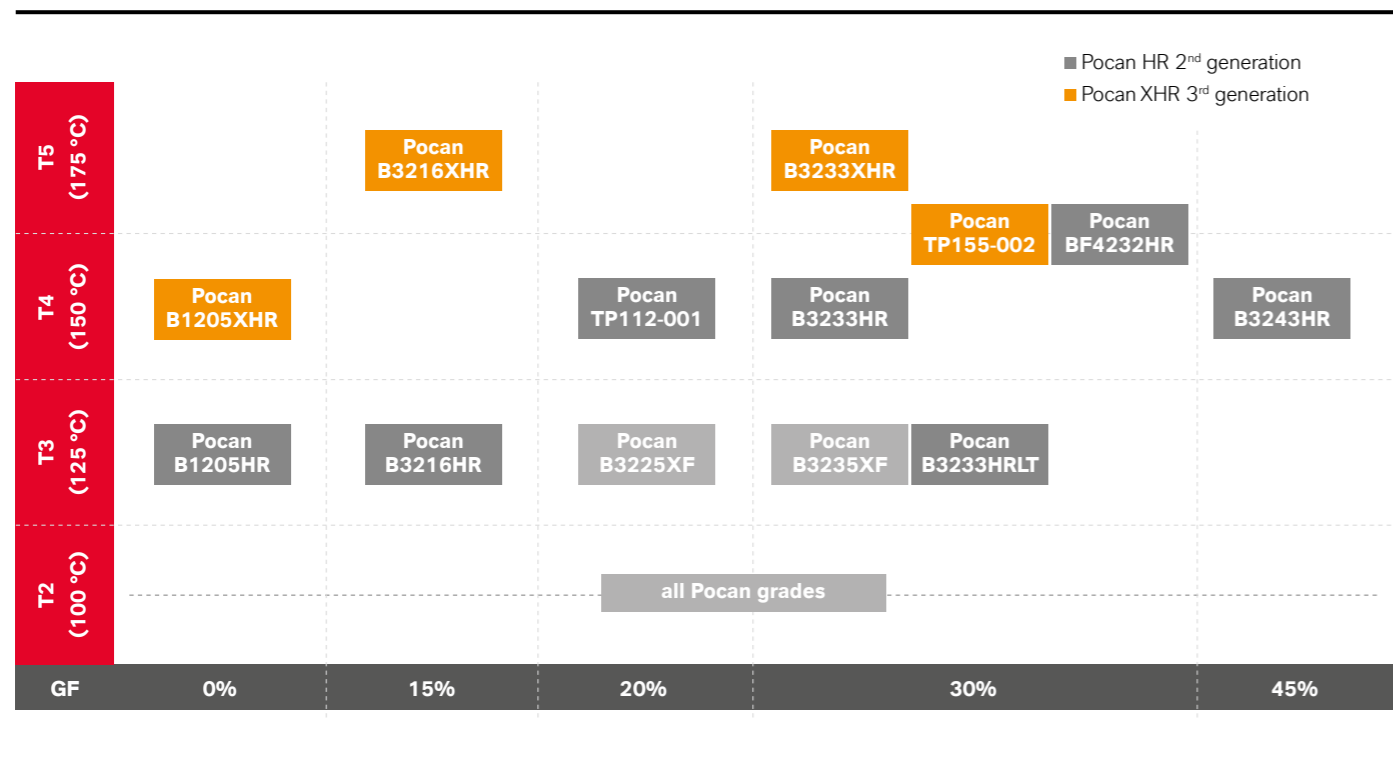
## Top results in the SAE/USCAR test

One of the most important tests for the hydrolysis resistance of PBT electrical connectors is the long-term SAE/USCAR2-6 test of the US Society of Automotive Engineers (SAE). A finished part is exposed in numerous cycles over eight hours to temperatures of -40 °C to +175 °C (Class 5) at relative humidities of up to 100 percent. The finished parts are then subjected to various functional tests. The test procedure is extremely demanding because heat and moisture mutually amplify each other in their harmful influence on the materials during aging. As a compound manufacturer, we carry out

the storage cycles on standardized test specimens and then investigate to which extent the flexural strength, and impact resistance have dropped due to aging. For PBT compounds, testing Charpy and Izod impact resistance is a particular hurdle. We have established very strict criteria for the classification of our compounds according to the USCAR classes. For example, impact resistance may only decrease by a maximum of 50 percent relative to the initial value, while flexural strength must still be at least 80 percent of the initial value.

The Pocan® XHR product range, in particular, proves its outstanding aging resistance in tests on specimens analogous to the SAE/USCAR test conditions. For example, the original flexural strength of Pocan® B3233XHR remains almost unchanged even under Class 5 test conditions. The Izod impact resistance only decreases slightly to values well above 80 percent (Figures 8a and 8b). In contrast, the flexural strength and impact resistance of standard PBT falls to lower values. Figure 9 gives an overview of the classifications of selected Pocan® HR and XHR products in the SAE/USCAR test.

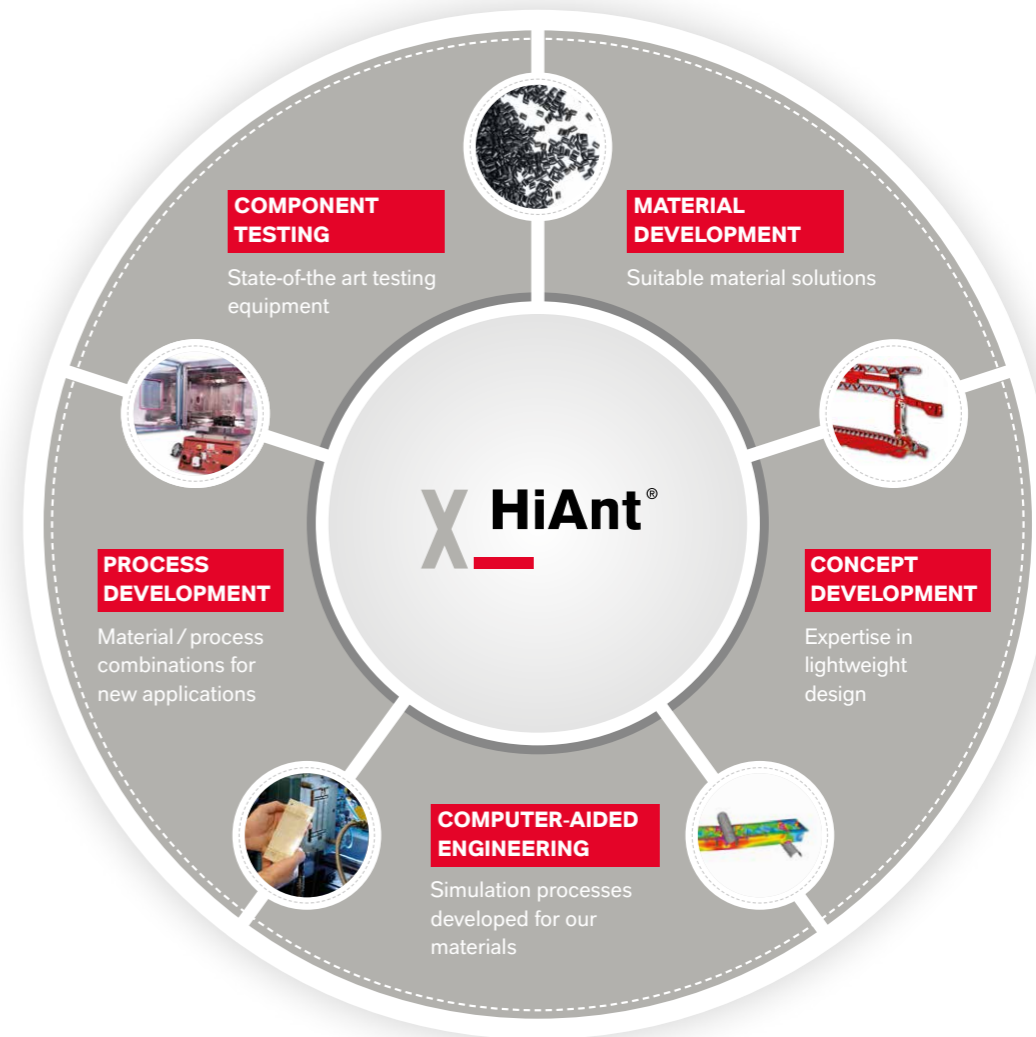
**Figure 9: SAE/USCAR2 classifications of selected Pocan HR and XHR grades (maximum ambient temperature in brackets).**



# HIANT EXPERTISE FOR TAILORED CUSTOMER SERVICE

With HiAnt®, we support customers through all development stages of components made of Pocan® HR and XHR. For example, we calculate key material data for customers, such as mechanical and rheological behavior. Another focal point is material-specific design with a wide variety of CAE tools. We also focus on material-based engineering with various CAE tools. These include calculation methods for predicting component behavior, such as integrative simulation, simulated structural optimization, and mold-filling simulation

to minimize warpage. At our Technical Service Center, we have several injection molding machines for optimizing materials and processes using customer molds. Our component testing team conducts virtually all relevant tests in line with customer standards. We further offer climate storage and media aging testing. We also provide support for initial sampling and for optimizing the series production process.





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