Polypropylene Random Copolymer for Pressure Pipe Systems

Description
Beta-PPR™ RA7050-GN is a PP-RCT\(^{(1)}\), a Polypropylene-Random-Copolymer with an enhanced crystalline structure brought about by a special \(\beta\)-nucleation and with an improved temperature resistance. Proof of the excellent performance characteristics of Beta-PPR™ RA7050-GN is, for example, a categorised required strength (CRS) of 5 MPa at 70°C and 50 years (according to ISO 12162) in comparison to a value of 3.21 MPa for standard PP-R.
The colour of Beta-PPR™ RA7050-GN is green similar to RAL 6024.

Applications
In general Beta-PPR™ RA7050-GN is intended to be used in applications for plumbing and heating, such as in-house hot and cold water pipes and fittings, floor and wall heating systems and radiator connections.

Physical Properties**

<table>
<thead>
<tr>
<th>Property</th>
<th>Typical Value*</th>
<th>Unit</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>905</td>
<td>kg/m(^3)</td>
<td>ISO 1183</td>
</tr>
<tr>
<td>Melt Flow Rate</td>
<td>(230°C/2.16 kg)</td>
<td>0.3</td>
<td>ISO 1133</td>
</tr>
<tr>
<td>Tensile Stress at Yield</td>
<td>(50 mm/min)</td>
<td>25</td>
<td>ISO 527-2</td>
</tr>
<tr>
<td>Tensile Strain at Yield</td>
<td>(50 mm/min)</td>
<td>10%</td>
<td>ISO 527-2</td>
</tr>
<tr>
<td>Modulus of Elasticity in Tension</td>
<td>(1 mm/min)</td>
<td>900</td>
<td>ISO 527</td>
</tr>
<tr>
<td>Charpy Impact Strength, notched (+23°C)</td>
<td>40</td>
<td>kJ/m(^2)</td>
<td>ISO 179/1eA</td>
</tr>
<tr>
<td>Charpy Impact Strength, notched (0°C)</td>
<td>4</td>
<td>kJ/m(^2)</td>
<td>ISO 179/1eA</td>
</tr>
<tr>
<td>Charpy Impact Strength, notched (-20°C)</td>
<td>2</td>
<td>kJ/m(^2)</td>
<td>ISO 179/1eA</td>
</tr>
<tr>
<td>Mean Linear Thermal Coefficient of Expansion from 0°C to 70°C</td>
<td>1.5 (\times 10^{-4} K^{-1})</td>
<td></td>
<td>DIN 53752</td>
</tr>
<tr>
<td>Thermal Conductivity</td>
<td>0.24</td>
<td>W/m(\cdot)K</td>
<td>DIN 52612 Part 1</td>
</tr>
<tr>
<td>Surface Resistance</td>
<td>&gt; 10(^{12})</td>
<td>Ohm</td>
<td>DIN 53482/VDE 0303 Part 2</td>
</tr>
</tbody>
</table>

* Data should not be used for specification work.
** Measured on standard moulded specimens.

Processing guidelines
Pipe Extrusion
Pipes made of Beta-PPR™ RA7050-GN are produced on single screw extruders of 30D or more in length. They are preferably equipped with a grooved and intensely cooled feed zone. Conventional die heads, like spider mandrel, spiral melt distributor or screen cage dies, can be used as forming tools. The use of a screen pack (sieve 60 to 100 mesh) is recommended to ensure quality during production.
In general, vacuum tank calibration is used with a sizing sleeve or disc calibrator. A sizing sleeve with integrated water ring is recommended to prevent the melt from sticking in the sizing sleeve. Alternatively, a separate spray ring can be connected prior to the vacuum tank.
The cold temperature impact performance of Beta-PPR™ RA7050-GN pipes depends on the processing. Diagram 1 illustrates the influence of different processing conditions on the impact behaviour at 0°C.

\(^{(1)}\) For further information about the abbreviation see also ISO 1043-1:2001

Beta-PPR is a trademark of Borealis group.

Borealis AG | Wagramerstrasse 17-19 | 1220 Vienna | Austria
Telephone +43 1 224 00 0 | Fax +43 1 22 400 333
FN 269858a | CCC Commercial Court of Vienna
Website | www.borealisgroup.com
Polypropylene
Beta-PPR™ RA7050-GN

In order to avoid the manufacture of pipes that show a brittle behaviour at the freezing temperature the following recommendations shall be followed. It is essential that the melt temperature of the material leaving the die head lies between 220–230°C. This is achieved by setting the extruder cylinder temperatures in the range of 215–230°C and the tool temperatures in the range of 220–230°C. The specified melt temperature range provides a homogeneously and thoroughly molten polymer; a prerequisite to achieve an optimum crystal structure. Furthermore, the defined melt temperature level results in a favourable heat transfer rate for the development of the right form and degree of crystallinity.

In addition to the appropriate extruder settings the impact performance can further be enhanced by an arrangement of cooling tanks that allow for an in-line annealing or by a post-extrusion annealing process. These measures to optimise the impact performance are optional.

Diagram 1: Impact performance of pipes 25 x 3,5 mm measured at 0°C according to the EN 1411

Injection Moulding of Fittings
Beta-PPR™ RA7050-GN can be processed on every modern injection moulding equipment with screw plasticators. Machine parameters and processing conditions used for standard PP-R can be applied to Beta-PPR™ RA7050-GN. The temperature settings shall be selected such that the polymer temperature increases uniformly; ideally from 200°C at the feed hopper to 220–250°C at the injection nozzle. At no time should the mass temperature exceed 250°C as degradation of the material will start to take place.

As the melt temperature during injection moulding of fittings is usually above 220°C the right form and degree of crystallinity is attained thereby a good low temperature impact behaviour level is achieved. To obtain a stable and homogeneous melt it is best to choose a dosing volume between 1D and 3D. Outside these limits irregular filling of the mould, air inclusions or surface streaks may arise.
Polypropylene
Beta-PPR™ RA7050-GN

Storage and handling
Beta-PPR™ RA7050-GN should be stored in dry conditions at temperatures below 50ºC and protected from UV-light. Improper storage can initiate degradation, which results in odour generation and colour changes and can have negative effects on the physical properties of the product.

Safety
Beta-PPR™ RA7050-GN is not classified as dangerous preparation.

Dust and fines from the product carry a risk of dust explosion. All equipment should be properly earthed. Inhalation of dust should be avoided as it may cause irritation of the respiratory system. Small amounts of fumes are generated during processing of the product. Proper ventilation is therefore required.

Recycling
The product is suitable for recycling using modern methods of shredding and cleaning. In-house production waste should be kept clean to facilitate direct recycling.

A Safety Data Sheet is available on request. Please contact your Borealis representative for more details on various aspects of safety, recovery and disposal of the product.

Limitation of use
This product is not sold for pipe applications in North America.

Related documents
The following related documents are available on request, and represent various aspects on the usability, safety, recovery and disposal of the product.

Recovery and disposal of Polylefins
Information on Emissions from Processing and Fires
Safety Data Sheet, SDS
Environmental Fact Sheet

Liability Statements on:
- Compliance to regulations for drinking water pipes
- Statements on chemicals and certain regulations and norms
Polypropylene
Beta-PPR™ RA7050-GN

Legal disclaimer

The product(s) mentioned herein are not intended to be used for medical, pharmaceutical or healthcare applications and we do not support their use for such applications.

To the best of our knowledge, the information contained herein is accurate and reliable as of the date of publication, however we do not assume any liability whatsoever for the accuracy and completeness of such information.

Borealis makes no warranties which extend beyond the description contained herein. Nothing herein shall constitute any warranty of merchantability or fitness for a particular purpose.

It is the customer's responsibility to inspect and test our products in order to satisfy itself as to the suitability of the products for the customer's particular purpose. The customer is responsible for the appropriate, safe and legal use, processing and handling of our products.

No liability can be accepted in respect of the use of any Borealis product in conjunction with any other products and/or materials. The information contained herein relates exclusively to our products when not used in conjunction with any other material unless as specifically provided for in the test methods stated above.