Braskem Resins for Piping Systems

Braskem

Braskem Resins for Piping Applications

Due to properties such as durability, ease of installation, flexibility and lightness, chemical and electrical inertness, ease of handling, low maintenance cost, reduced number of joints, low roughness coefficient, leak-tightness, and high abrasion resistance, the use of polyethylene in pipe manufacturing is increasingly becoming a reality in the production of water and gas distribution networks, building connections, water mains, sewage systems, submarine outfalls, risers, and flowliners, among many other applications.

In pursuit of continuous improvement of its portfolio by offering increasingly robust solutions for the sanitation and gas segments, Braskem has developed the PE 100 resin family, which stands out for its high chemical and mechanical resistance.

PE 100 resins are produced in black (GP100BKXP and GP100BKLS) and blue (GP100BLXP) for water piping applications, and orange (GP100ORXP) for gas piping applications.

The high resistance to Slow Crack Growth (SCG) of Braskem's PE 100 family enables the use of trenchless and sandless installation techniques (e.g., relining, horizontal directional drilling), which avoid the need for open trenches and sand bedding. In addition to PE 100 resins,

For non-pressure applications, Braskem offers GP5550 resins, used in the production of smooth pipes for mining, energy and telecom conduits, and in blends for irrigation pipes, as well as the recently developed Rigeo HD1954M resin, designed for protective ducts in energy and telecom systems and for drainage in roads and sports fields.

Rigeo HD1954M features high Oxidative Induction Time (OIT) and meets the NCLS (Notched Ligament Stress) >24 h requirement of the AASHTO M294 standard (American Association of State Highway and Transportation Officials), ensuring the necessary protection during production and throughout the service life of corrugated pipes. The optimal balance between rheological and mechanical properties allows Rigeo HD1954M to offer excellent processability and high flexibility in the produced pipes, facilitating installation. Additionally, Rigeo HD1954M can be used to produce corrugated pipes of various diameters, adapting to different manufacturing processes.

Compliance with Brazilian and International Standards

Braskem's PE 80 and PE 100 resins meet the requirements of Brazilian standards (ABNT NBR 14462 – 2016 and ABNT 15561 – 2024) and major international standards (ISO4427 – 2019, ISO4437 – 2024, DIN 8075, and EN 1555).

Classification

PE 80 and PE 100 resins are classified based on their performance regarding internal hydrostatic pressure resistance, or more precisely, their resistance to circumferential stress for a projected service life of 50 years at a temperature of 20 °C. This performance is evaluated through long-term hydrostatic pressure tests conducted in international laboratories, which allow for the estimation of pipe behavior over a period of 50 years or more. Based on the long-term pressure resistance tests, a regression analysis is performed according to ISO 9080, followed by the determination of the MRS (Minimum Required Strength) and the classification of the resin according to ISO 12162. The MRS is the value used to classify the material and to determine the pipe wall thickness according to the final application. In practice, for a given pressure, the higher the MRS, the thinner the pipe wall can be.

PE 80 – MRS = 8 a 9,99 MPa

PE 100 – MRS = 10 a 11,19 MPa

Rigeo HD1954M

Rigeo HD1954M features high Oxidative Induction Time (OIT) and complies with the requirements established by ISO 21138 (Plastics piping systems for non-pressure underground drainage and sewerage – Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP), and polyethylene (PE)), ensuring the necessary protection during production and throughout the service life of the corrugated pipe. The optimal balance between rheological and mechanical properties allows the GM5255 resin to offer excellent processability, resulting in pipes with reduced weight and high stiffness, which facilitates installation. Additionally, Rigeo HD1954M can be used in the production of corrugated pipes of various diameters, adapting to different existing manufacturing processes.

Non-Pressurized Piping Systems

Typical Properties		Melt Flow Rate (190 °C / 2,16 Kg)	Melt Flow Rate (190 °C / 5 Kg)	Melt Flow Rate (190 °C / 21,6 Kg)	Density	Tensile Strength at Yield [a]	Tensile Strength at Break	Flexural Modulus – 1% Secant	Hardness (Shore D) [a]	Izod Impact Strength [a]	Environmental Stress Cracking Resistance [a/b] (10% Igepal)	Environmental Stress Cracking Resistance [a/b] (100% Igepal)	Vicat Softening Temperature[a]	Deflection Temperature under Load (0,45 MPa) [a]	*Notched Constant Ligament-Stress* (NCLS)
Method Units		ASTM D 1238	ASTM D 1238	ASTM D 1238	ASTM D 792	ASTM D 638	ASTM D 638	ASTM D 790	ASTM D 2240	ASTM D 256	ASTM D 1693	ASTM D 1693	ASTM D 1525	ASTM D 648	ASTM F 2136
		g/10 min	g/10 min	g/10 min	g/cm³	MPa	MPa	MPa	–	J/m	h/F50	h/F50	°C	°C	h
PEAD/HDPE	Rigeo HD1954M	0,19	–	13	–	30	35	1.250	–	–	>400	>1.000	125	70	> 50
		Single- and double-wall corrugated pipes for non-pressure sewage and stormwater drainage; energy and telecom conduits.													
	GP5550	–	0,30	9,0	0,951	26	40	1.190	66	NB	> 1.000	> 1.000	126	70	> 450
		Smooth pipes for mining; energy and telecom conduits; preparation of blends for irrigation pipes.													
	HT4219	0,15	–	20	0,943	23	30	860	62	–	>1.000	> 1.000	122	58	–
		Thin-wall irrigation pipes, as well as medium- and thick-wall pipes.													
PEBDL/ LLDPE	LL5400S	1,0	–	–	0,918	–	–	–	–	–	–	–	–	–	–
		Thin-wall irrigation pipes, as well as medium- and thick-wall pipes.													

a) Test specimen molded by compression according to ASTM D 4703.

b) Test performed on a 2 mm plate at 50 °C.

Pressurized Piping Systems – PE 80

Typical Properties		Melt Flow Rate (190 °C / 2,16 Kg)	Melt Flow Rate (190 °C / 5 Kg)	Melt Flow Rate (190 °C / 21,6 Kg)	Density	Tensile Strength at Yield [a]	Tensile Strength at Break	Flexural Modulus – 1% Secant	Hardness (Shore D) [a]	Izod Impact Strength [a]	Environmental Stress Cracking Resistance [a/b] (10% Igepal)	Environmental Stress Cracking Resistance [a/b] (100% Igepal)	Vicat Softening Temperature[a]	Deflection Temperature under Load (0,45 MPa) [a]	*Slow Crack Growth* (SCG)	*Rapid Crack Propagation* (RCP-S4 – pc,S4) [c]
Method Units		ASTM D 1238	ASTM D 1238	ASTM D 1238	ASTM D 792	ASTM D 638	ASTM D 638	ASTM D 790	ASTM D 2240	ASTM D 256	ASTM D 1693	ASTM D 1693	ASTM D 1525	ASTM D 648	ISO 13479	ISO 13477
		g/10 min	g/10 min	g/10 min	g/cm³	MPa	MPa	MPa	–	J/m	h/F50	h/F50	°C	°C	h	bar
PEAD/HDPE	GM5010T2B	–	0,45	11	0,947	22	36	1.090	62	260	> 1.000	> 1.000	122	69	> 500	–
		Pressure pipes, PE 80 classification, blue color, for building water service connections.														

a) Test specimen molded by compression according to ASTM D 4703.

b) Test performed on a 2 mm plate at 50 °C.

c) Pipe with 180 mm diameter.

Complies with the requirements of ISO 4427:19 and NBR 15561:24 standards only for pipes with wall thickness less than 32 mm.

Pressurized Piping Systems – PE 100

Typical Properties	Índice de Fluidez (190 °C / 2,16 Kg)	Melt Flow Rate (190 °C / 5 Kg)	Melt Flow Rate (190 °C / 21,6 Kg)	Density	Tensile Strength at Yield [a]	Tensile Strength at Break	Flexural Modulus – 1% Secant	Hardness (Shore D) [a]	Izod Impact Strength [a]	Environmental Stress Cracking Resistance [a/b] (10% Igepal)	Environmental Stress Cracking Resistance [a/b] (100% Igepal)	Vicat Softening Temperature[a]	Deflection Temperature under Load (0,45 MPa) [a]	*Slow Crack Growth* (SCG)	*Rapid Crack Propagation* (RCP-S4 – pc,S4) [c]
Method Units	ASTM D 1238	ASTM D 1238	ASTM D 1238	ASTM D 792	ASTM D 638	ASTM D 638	ASTM D 790	ASTM D 2240	ASTM D 256	ASTM D 1693	ASTM D 1693	ASTM D 1525	ASTM D 648	ISO 13479	ISO 13477
	g/10 min	g/10 min	g/10 min	g/cm³	MPa	MPa	MPa	–	J/m	h/F50	h/F50	°C	°C	h	bar
GP100BLXP	–	0,25	6,5	0,949	24	38	1.030	65	NB	> 1.000	> 1.000	126	67	> 2.500	–
	Pressure pipes, PE 100 classification, blue color, for building water service connections, distribution networks, and water mains.														
GP100BKXP	–	0,25	6,5	0,958	25	40	1.090	65	NB	> 1.000	> 1.000	125	68	> 2.500	–
	Pressure pipes, PE 100 classification, black color, for water distribution, pressurized sewage systems, submarine outfalls, submarine cable sheathing, and mining applications.														
GP100BKLS NOVO/NEW	–	0,19	6,5	0,957	24	35	1.090	65	NB	>1.000	>1.000	125	68	>1.000	–
	Large-diameter, thick-wall pressure pipes, PE 100 classification, black color, for water and pressurized sewage distribution, submarine outfalls, submarine cable sheathing, and mining applications.														
GP100ORXP	–	0,25	6,5	0,948	24	38	1.050	64	NB	> 1.000	> 1.000	125	69	> 2.500	> 10
	Pressure pipes, PE 100 classification, orange color, for gas distribution and submarine cable sheathing.														

a) Test specimen molded by compression according to ASTM D 4703.

b) Test performed on a 2 mm plate at 50 °C.

c) Pipe with 180 mm diameter.

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