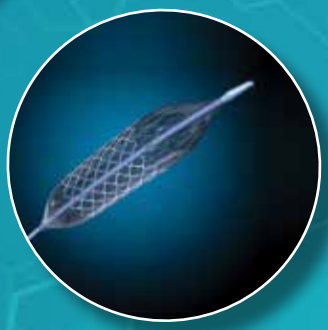
RILSAN®/PEBAX®/RILSAMID®

Property & Processing Data for Medical Applications



ARKEMA
INNOVATIVE CHEMISTRY

Pebax® Medical Grade Polymers

Medical grade Pebax® polyether block amides are plasticizer-free thermoplastic elastomers with a wide range of physical and mechanical properties achieved by varying the monomeric block types and ratios. Grades within the product range extend from soft and flexible products similar to elastomers, to those with mechanical properties approaching polyamides.

The remarkable processing ease of medical grade Pebax® elastomers makes it an excellent choice for extrusion of medical grade tubing or film applications. Other unique properties include:

- USP Class VI certification
- Sterilizable (ETO, steam, gamma up to 10Mrads)
- Bondable by adhesives or RF welding
- Easily blended with other polymers and compounded with additives
- Excellent dynamic properties due to low hysteresis
- Excellent impact resistance and low rigidification at low temperature
- Consistent durometer and flexibility at room and body temperatures
- Good resistance to most chemicals

				MEDICAL GRADE RANGE							
				Pebax®							
PROPERTIES	Description	Test Method	Units	2533 SA 01 MED	3533 SA 01 MED	4033 SA 01 MED	4533 SA 01 MED (MX 1205)	5533 SA 01 MED	6333 SA 01 MED	7033 SA 01 MED	7233 SA 01 MED
Density		ISO 1183	g/m³	1.00	1.00	1.00	1.01	1.01	1.01	1.01	1.01
Water Absorption	@20°C, 50%RH	ISO 62	%	0.4	0.4	0.5	0.4	0.6	0.7	0.7	0.7
	@23°C, 24 hrs in water	ISO 62	%	1.2	1.2	1.2	1.2	1.2	1.1	1.1	0.9
Melting Point		ISO 11357	°C	134	144	160	147	159	169	172	174
Vicat Point	Under 1 daN	ISO 306	°C	58	77	131	111	142	157	164	164
Shrinkage	Flow direction, after 24 hr, 4mm, mold at 20°C	Internal Method	%	0.5	0.5	0.4	0.4	1.2	1.2	1.2	1.2
	Transverse direction, after 24 hrs, 4mm, mold at 20°C	Internal Method	%	0.8	0.8	1.1	1.1	1.4	1.4	1.5	1.5
Hardness Shore*	Instantaneous	ISO 868	Shore D	27	33	42	46	54	64	69	69
	After 15 sec	ISO 868	Shore D	22	25	35	41	50	58	61	61
Tensile Test*	Stress at Break	ASTM D 638	Mpa	32	39	40	42	52	53	54	56
	Strain at Break	ASTM D 638	%	>750	>600	>450	>450	>450	>350	>350	>300
Flexural Modulus*		ISO 178	MPa	12	21	77	86	170	285	390	513
Charpy Impact	Unnotched 23°C	ISO 179	kJ/m²	NB	NB	NB	NB	NB	NB	NB	NB
	Unnotched -30°C	ISO 179	kJ/m²	NB	NB	NB	NB	NB	NB	NB	NB
	V-notched 23°C	ISO 179	kJ/m²	NB	NB	NB	NB	NB	NB	120 (p)	15 (c)
	V-notched -30°C	ISO 179	kJ/m²	NB	NB	NB	NB	NB	20 (c)	20 (c)	10 (c)
PROCESSING				2533 SA 01 MED	3533 SA 01 MED	4033 SA 01 MED	4533 SA 01 MED (MX 1205)	5533 SA 01 MED	6333 SA 01 MED	7033 SA 01 MED	7233 SA 01 MED
Drying**	Time		hrs	4-8	4-8	4-6	4-6	4-6	4-6	5-7	5-7
	Temperature		°C	55-65	55-65	60-70	60-70	65-75	65-75	70-80	70-80
Extrusion Temperature	Recommended		°C	205	205	220	220	220	225	235	225
	Minimum		°C	190	190	210	210	210	210	220	210
	Maximum		°C	220	220	230	230	230	240	250	240
Injection Temperature	Recommended		°C	210	210	240	240	240	260	260	260
	Minimum		°C	180	180	200	200	200	230	230	230
	Maximum		°C	240	240	270	270	270	290	290	290
Mold Temperature	Typical		°C	10-30	10-30	10-30	10-30	25-60	25-60	25-60	25-60

+ Samples conditioned 15 days at 23°C, 50% RH
++ Pebax® resins delivered dried in sealed packaging ready to be processed. Drying is only necessary for bags opened for more than 2 hours
(c) Complete break
(p) Partial break

Rilsan® and Rilsamid® Medical Grade Polyamides

Medical grade Rilsan® polyamide 11 and Rilsamid® polyamide 12 are thermoplastic polymers used in applications that require the strength and performance characteristics of a true thermoplastic, yet still offer sufficient flexibility and elongation approaching that of some elastomers. Rilsan® and Rilsamid® polymers are easy to process by most methods, including extrusion, extrusion blow molding, injection molding and rotomolding. The product matrix accommodates countless additives and filling agents, such as plasticizers, stabilizers, colorants, lubricants, impact modifiers, glass fiber, carbon fiber. Exceptional properties of these polyamide products include:

- Excellent resistance to chemicals (particularly hydrocarbons)
- Ease of processing
- Wide range of working temperatures [-40°-130°C (40-266°F)]
- High dimensional stability and low density

				MEDICAL GRADE RANGE				
				RILSAN®			RILSAMID®	
PROPERTIES	Description	Test Method	Units	BMNO MED	BESNO MED	BESVOA MED	AMNO MED	AESNO MED
Nature & designation		ISO 1874	-	PA11, MHLR, 12-010	PA11, E, 22-010	PA11, E, 22-010	PA12, M, 12-010	PA12, EHL, 22-010
Bio Based Carbon	calculation	ASTM 6866	%	100%	100%	100%	-	-
Density		ISO 1183	g/m³	1.03	1.02	1.02	1.02	1.01
Water Absorption	@20°C, 50%RH	ISO 62	%	0.75	0.75	0.75	0.7	0.7
	@23°C, 24 hrs in water	ISO 62	%	0.95	0.95	0.95	0.9	0.9
Melting Point		ISO 11357	°C	189	186	186	180	180
Heat Deflection Temperature (HDT)	under 0.45 Mpa	ISO 75	°C	145	145	145	130	130
	under 1.80 Mpa	ISO 75	°C	50	50	50	50	50
Shrinkage	flow direction, after 24 hrs, 2mm, mold @ 30°C	Internal Method	%	0.4	n/a**	n/a**	0.8	n/a**
	transverse direction, after 24 hrs, 2mm, mold @ 30°C	Internal Method	%	0.8			0.8	
Hardness Shore*	Instantaneous	ISO 868	Shore D	75	76	76	-	75
	After 15 sec	ISO 868	Shore D	68	71	71	72	69
Tensile Test*	Stress at Yield	ISO 527	Mpa	41	40	36	38	43
	Strain at Yield	ISO 527	%	5	6	5	7	5
	Stress at Break	ISO 527	Mpa	58	50	52	64	50
	Strain at Break	ISO 527	%	>200	>200	>200	>250	>200
Tensile Modulus*		ISO 527	Mpa	1280	1200	1180	1170	1440
Flexural Modulus*		ISO 178	Mpa	1140	1130	1100	1200	1180
Charpy Impact	Unnotched 23°C	ISO 179	kJ/m²	NB	NB	NB	NB	NB
	Unnotched -30°C	ISO 179	kJ/m²	NB	NB	NB	NB	NB
	V-notched 23°C	ISO 179	kJ/m²	20	15	15	9	11
	V-notched -30°C	ISO 179	kJ/m²	10	13	13	5	6
PROCESSING CONDITIONS				BMNO MED	BESNO MED	BESVOA MED	AMNO MED	AESNO MED
Drying**	Time		hrs	4-6	4-6	4-6	4-6	4-6
	Temperature		°C	80	80	80	80	80
Extrusion Temperature	Recommended		°C	n/a*	250	250	n/a*	240
	Minimum		°C		230	230		230
	Maximum		°C		280	280		270
Injection Temperature	Recommended		°C	270	n/a**	n/a**	250	n/a**
	Minimum		°C	240			230	
	Maximum		°C	290			280	
Mold Temperature	Typical		°C	20-60	n/a**	n/a**	40	n/a**

+ Samples conditioned 15 days at 23°C, 50% RH

++ Pebax®, Rilsan®, and Rilsamid® resins are delivered dried in sealed packaging ready to be processed. Drying is only necessary for bags opened for more than 2 hours

* Injection grade ** Extrusion grade

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