



WANHUA CHEMICAL
GROUP CO., LTD.

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CLARNATE®
Polycarbonate Resins



Wanhua Chemical Group Co.,Ltd. Performance Polymers Business Unit

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Disclaimer

The data given in this document are typical values for reference only. The specific guarantee indexes shall be subject to the sales contract.

It is the user's responsibility to test the products purchased from us to verify whether they are suitable for the proposed process, use and standard. The application and processing of our products are affected by a variety of factors, which are beyond our control, so they are all the responsibility of the users themselves.

It is our bounden duty to help customers solve technical problems in the process of using our products. However, any indirect losses caused by technical guidance to customers are not covered by our company.

Under no circumstances shall our company be liable for:

- (1) Indirect, secondary, consequential loss, loss of profit available.
- (2) Loss of any third party other than the customer due to resale, lease or gift of the product.
- (3) Other raw materials purchased from our company, labor loss, water and electricity loss, maintenance cost loss, production loss.



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Product Manual



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Innovation Creates Growth 创新成就卓越



Wanhua Chemical

To be a world-class innovative chemical company with deep pride in our people and respect from society

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Innovation Creates Excellence



Introduction

About Wanhua

Wanhua Chemical Group Co.,Ltd. is among the global leading suppliers of chemical innovative products, To provide our customers worldwide with competitive products and comprehensive solutions, Wanhua Chemical has built up six key production complexes in Yantai, Ningbo, Sichuan, Fujian and Zhuhai in China, and Hungary, set up subsidiaries and offices in more than ten countries and regions including Europe, the United States, and Japan.

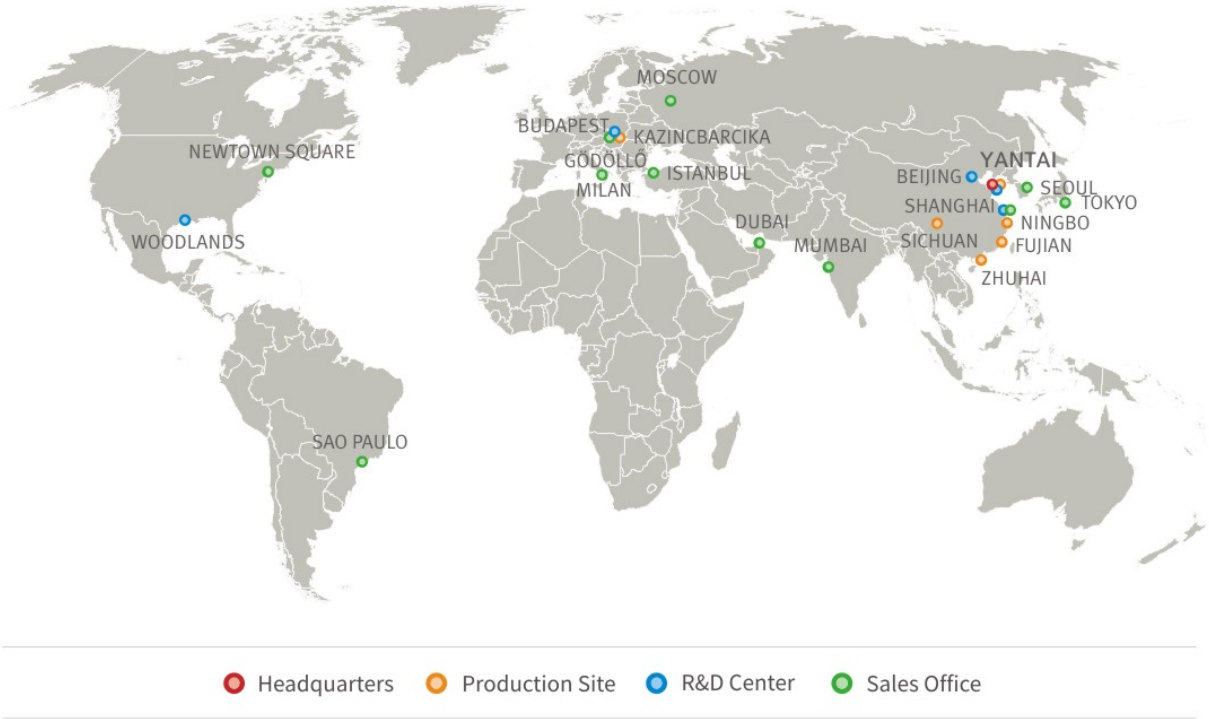
Our business covers Polyurethanes (Pus), petrochemicals, and performance chemicals. The industries include homeware and furniture, sports and leisure, automobiles and transportation, building and construction, electronics and electrical appliances, personal care, and green energy.

Wanhua Chemical will take "Advancing Chemistry Transforming Lives " as the first mission. We will continue to innovate in the field of chemical new materials, lead the development of the industry, and create a better life for mankind!

Business Scope

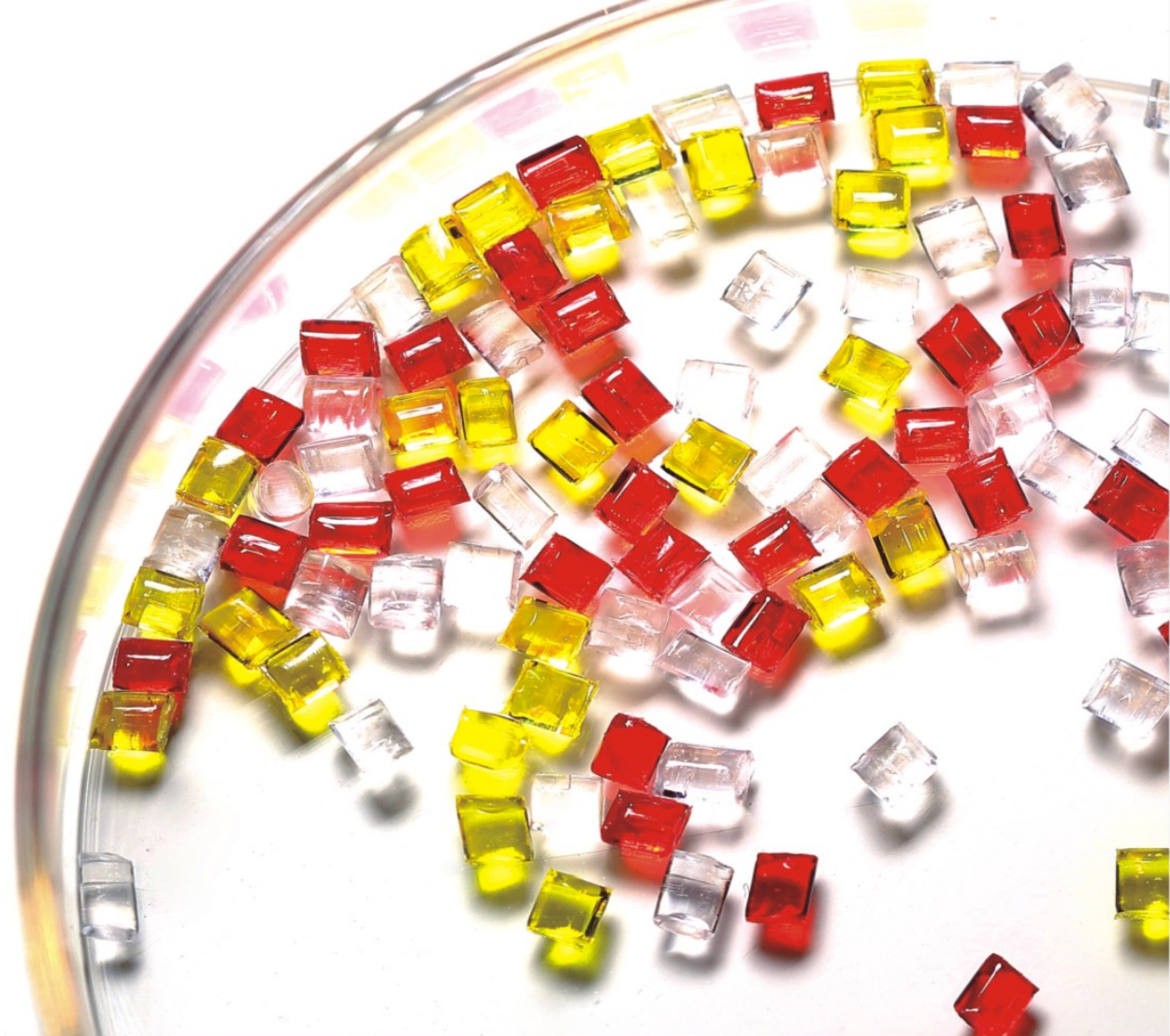
Polyurethanes			
	• MDI	• System House	
	• TDI	• MDI/TDI Variant	
	• Polyol		
Petrochemicals			
• Propylene	• EO	• PO	• PP
• Butanol	• SM	• MMA	• PVC
• Ethylene	• PE	• MTBE/TBA	• AA+AE
Performance Chemicals			
• Modified Plastics	• TPU	• PA Emulsion	• PUD
• Bio-degradable materials	• PMMA	• ADI Series	• C3/C4
• Specialty Amines Series	• PC	• Specialty Nylon	

Global Network



Awards & Honors

2007 The first prize of National Science and Technology Progress	2015 Shandong Governor Quality Award
2008 National Environment-friendly Project	2009-2017 Five consecutive sessions Award for Hewitt Best Employers in China
2010 The second prize of National Science and Technology Progress	2018 C&EN-Global Top 50
2011 China Grand Awards for Industry-Recognition Award	2019 The first Chinese company to join the Together for Sustainability (Tfs) Initiative in 2019 Won PPG's Excellent Supplier Award in 2016 and 2019
2012 Top 100 Innovative Companies in China	



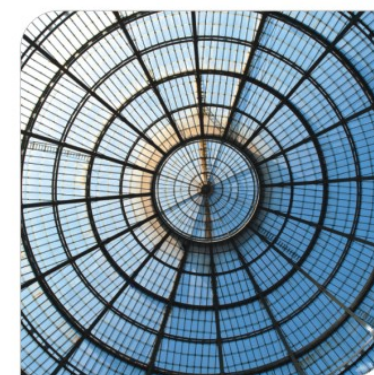
Wanhua Chemical Polycarbonate Business

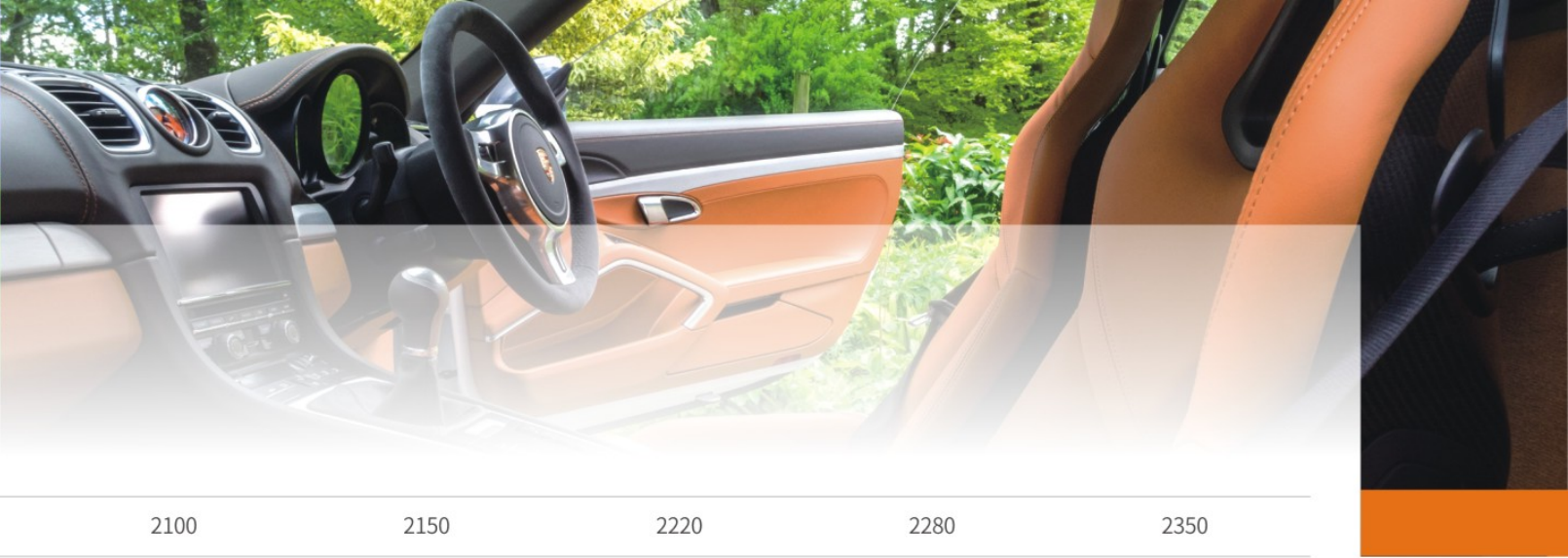
Polycarbonate is a kind of thermoplastic engineering plastics with excellent comprehensive properties, which shows inherent optical transparency. It has excellent impact resistance, heat resistance, flame retardancy and dimensional stability in a wide temperature range. It is suitable for injection molding, extrusion, blow molding and other processing technologies, and is widely used in automotive, electronic and electrical, home appliances, construction, optics, medical and consumer goods fields.

Wanhua chemical's polycarbonate production process adopts the self-developed interface polycondensation phosgene method, carries out continuous technological innovation, develops high-quality and differentiated polycarbonate products, and is committed to becoming a world-class supplier of high-quality polycarbonate and solutions with the advantages of the whole industrial chain.

Clarnate® Polycarbonate Product Portfolio

		
General Purpose Grades	Special Grades	High Performance Polycarbonate
Powder	Headlamp grade Flame retardant grade	Si-PC Copolymer
Granule	Film grade Food contact grade	High heat-resistance PC
	Medical grade Water bottle grade	
	Optical lens grade IR control grade	





CLARNATE® General Purpose PC - Powder

Typical Values

Grades				2030	2030B	2070	2100	2150	2220	2280	2350
Features				High Viscosity	High Viscosity, Branched, High Melt Strength	High Viscosity	Medium Viscosity	Medium Viscosity	Low Viscosity	Low Viscosity	Low Viscosity
Properties	Standards	Test Conditions	Units								
Physical Properties											
Melt mass-flow rate (MFR)	ASTM D1238	300°C; 1.2kg	g/10min	2.5	3	6.5	9.5	16	20	27	34
Mold Shrinkage	ASTM D955	—	%	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7
Water Absorption	ASTM D570	23°C	%	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Density	ASTM D792	—	g/cm³	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Mechanical Properties											
Tensile Strength	ASTM D638	50mm/min	MPa	72	72	72	72	70	68	62	62
Tensile Modulus	ASTM D638	1mm/min	MPa	2200	2200	2300	2300	2300	2300	2300	2300
Strain at Break	ASTM D638	50mm/min	%	120	120	120	120	120	120	115	115
Flexural Strength	ASTM D790	2mm/min	MPa	96	96	96	96	96	97	90	90
Flexural Modulus	ASTM D790	2mm/min	MPa	2200	2200	2300	2300	2300	2300	2300	2250
Izod Notched Impact Strength	ASTM D256	23°C	KJ/m²	95	85	86	80	75	72	65	60
Thermal Properties											
Heat Distortion Temp.	ASTM D648	1.82Mpa; 3.2mm	°C	133	133	131	130	128	127	125	124
Vicat Softening Temp.	ASTM D1525	120°C/h; 50N	°C	154	154	151	150	148	147	148	146
Optical Properties											
Haze	ASTM D1003	3mm	%	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Light Transmittance	ASTM D1003	3mm	%	90	90	90	90	90	90	90	90
Flammability Properties											
Flame Rating	UI94	3mm	—	HB	HB	HB	HB	HB	HB	HB	HB
	UI94	1.5mm	—	V2	V2	V2	V2	V2	V2	V2	V2



CLARNATE® General Purpose PC –Granule

Typical Values

Grades				A1030	A1070	A1073	A1077	A1100	A1105	A1107	A1150	A1155	A1220	A1225	A1227	A1280	A1285	A1357
Features				High viscosity	High viscosity	High viscosity, UV stabilized	High viscosity, easy release, UV stabilized	Medium viscosity	Medium viscosity, easy release	Medium viscosity, easy release, UV stabilized	Medium viscosity	Medium viscosity, easy release	Low viscosity	Low viscosity, easy release	Low viscosity, easy release, UV stabilized	Low viscosity	Low viscosity, easy release	Low viscosity, easy release, UV stabilized
Properties	Standards	Test Conditions	Units															
Physical Properties																		
Melt mass-flow rate (MFR)	ASTM D1238	300°C; 1.2kg	g/10min	2.5	7	7	7	9.5	9.5	10	16	16	20	20	21	27	27	34
Mold Shrinkage	ASTM D955	—	%	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7
Water Absorption	ASTM D570	23°C	%	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Density	ASTM D792	—	g/cm³	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Mechanical Properties																		
Tensile Strength	ASTM D638	50mm/min	MPa	62	72	72	72	72	72	70	70	70	68	68	68	62	62	62
Tensile Modulus	ASTM D638	1mm/min	MPa	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300
Strain at Break	ASTM D638	50mm/min	%	120	120	120	120	120	120	120	120	120	120	120	120	115	115	115
Flexural Strength	ASTM D790	2mm/min	MPa	90	96	96	98	97	97	98	97	97	97	97	97	90	90	90
Flexural Modulus	ASTM D790	2mm/min	MPa	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2250
Izod Notched Impact Strength	ASTM D256	23°C	KJ/m²	95	86	86	84	80	80	78	75	75	72	72	65	70	70	68
Thermal Properties																		
Heat Distortion Temp.	ASTM D648	1.82Mpa; 3.2mm	°C	133	130	130	129	130	130	128	128	128	127	127	127	125	125	124
Vicat Softening Temp.	ASTM D1525	120°C/h; 50N	°C	154	151	151	150	150	150	149	148	148	147	147	146	148	148	146
Optical Properties																		
Haze	ASTM D1003	3mm	%	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Light Transmittance	ASTM D1003	3mm	%	90	89	89	89	89	89	89	89	89	89	89	89	90	90	90
Flammability Properties																		
Flame Rating	UI94	3mm	—	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB	HB
	UI94	1.5mm	—	V2	V2	V2	V2	V2	V2	V2	V2	V2	V2	V2	V2	V2	V2	V2

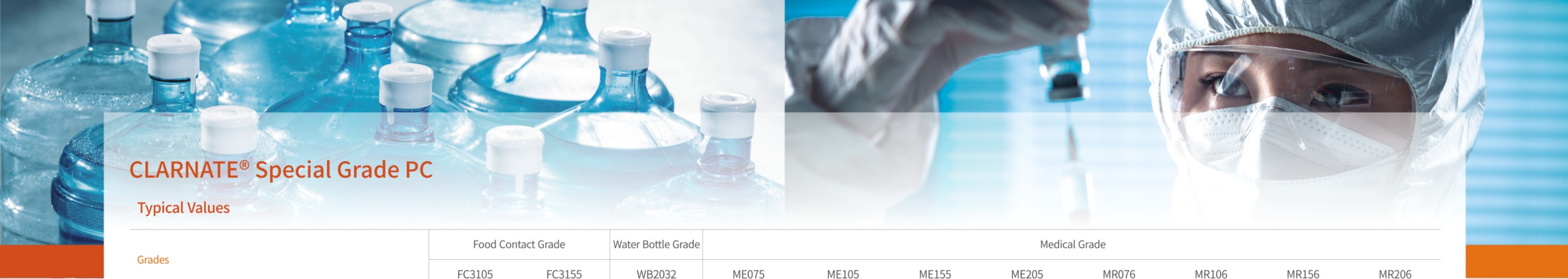
The typical values listed are for reference only.

CLARNATE® Special Grade PC

Typical Values

Grades				Automotive Lighting Grade				Optical Lens Grade		Film Grade	Transparent Flame Retardant Grade			Infrared Control Grade	
				HL6157	HL6227	A1225BK	A1355BK	OL1058	OL2078	FL5105	FR2720T	FR2820T	FR3710T	IR1157	IR2227
Features				Medium Viscosity, Easy Release, UV Stabilized	Low Viscosity, Easy Release, UV Stabilized	High Gloss Black, Low Viscosity, Easy Release	High Gloss Black, Low Viscosity, Easy Release	Medium-high Viscosity, Easy Release, UV Stabilized	UV 400nm Cut-off, Medium-high Viscosity, Easy Release	High Cleanliness, Medium Viscosity, Easy Release	Halogen Free, Medium-high Viscosity, Easy Release	Halogen Free, Medium Viscosity, Easy Release,	Halogen Free, High Viscosity, Easy Release,	IR-Absorbing, Low Viscosity, UV Stabilized	IR-Transmission, Low Viscosity, UV Stabilized
Properties	Standards	Test Conditions	Units												
Physical Properties															
Melt mass-flow rate (MFR)	ASTM D1238	300°C; 1.2kg	g/10min	17	20	20	33.5	6	7	10	8	11	3	16	20
Mold Shrinkage	ASTM D955	—	%	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7
Water Absorption	ASTM D570	23°C	%	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Density	ASTM D792	—	g/cm³	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Mechanical Properties															
Tensile Strength	ASTM D638	50mm/min	MPa	70	68	65	62	75	72	72	70	70	70	70	65
Tensile Modulus	ASTM D638	1mm/min	MPa	2300	2300	2300	2300	2350	2300	2300	2200	2250	2200	2300	2300
Strain at Break	ASTM D638	50mm/min	%	120	120	130	115	130	120	120	130	100	130	110	120
Flexural Strength	ASTM D790	2mm/min	MPa	97	97	90	90	95	95	97	95	95	95	90	90
Flexural Modulus	ASTM D790	2mm/min	MPa	2300	2300	2350	2250	2400	2300	2300	2300	2300	2300	2350	2350
Izod Notched Impact Strength	ASTM D256	23°C	KJ/m²	72	72	65	68	88	80	80	90	65	90	75	65
Thermal Properties															
Heat Distortion Temp.	ASTM D648	1.82Mpa; 3.2mm	°C	127	127	127	124	128	128	130	129	126	129	128	127
Vicat Softening Temp.	ASTM D1525	120°C/h; 50N	°C	147	147	147	146	148	148	150	150	146	150	148	147
Optical Properties															
Haze	ASTM D1003	3mm	%	<0.8	<0.8	—	—	<0.8	<0.8	<0.8	0.2	<0.8	<0.8	<3	—
Light Transmittance	ASTM D1003	3mm	%	90	89	<0.01	0	88	87	89	90	89	87	—	695nm 1.5mm 5%; 850nm 1.5mm 90%; 940nm 1.5mm 90%
Flammability Properties															
Flame Rating	UI94	3mm	—	HB	HB	HB	HB	—	HB	HB	—	—	—	HB	HB
	UI94	1.5mm	—	V2	V2	—	V2	—	V2	V2	3.0mm V0	3.0mm V0	1.5mm V0	—	—

The typical values listed are for reference only.



CLARNATE® Special Grade PC

Typical Values

Grades				Food Contact Grade		Water Bottle Grade	Medical Grade							
				FC3105	FC3155	WB2032	ME075	ME105	ME155	ME205	MR076	MR106	MR156	MR206
Features				Food Contact Certification, Medium Viscosity, Easy Release	Food Contact Certification, Low Viscosity, Easy Release	Branched Structure, High Viscosity, Food Contact	ETO & Steam Sterilization, High Viscosity, Easy Release	ETO & Steam Sterilization, Medium Viscosity, Easy Release	ETO & Steam Sterilization, Medium Viscosity, Easy Release	ETO & Steam Sterilization, Low Viscosity, Easy Release	γ& e-Beam Sterilization, High Viscosity, Easy Release	γ& e-Beam Sterilization, Medium Viscosity, Easy Release	γ& e-Beam Sterilization, Medium Viscosity, Easy Release	γ& e-Beam Sterilization, Low Viscosity, Easy Release
Properties		Standards	Test Conditions	Units										
Physical Properties														
Melt mass-flow rate (MFR)	ASTM D1238	300°C; 1.2kg	g/10min	10	15	3	7	9	16	20	7	10	16	20
Mold Shrinkage	ASTM D955	—	%	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7	0.5-0.7
Water Absorption	ASTM D570	23°C	%	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Density	ASTM D792	—	g/cm³	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Mechanical Properties														
Tensile Strength	ASTM D638	50mm/min	MPa	75	70	70	70	70	70	68	70	70	70	68
Tensile Modulus	ASTM D638	1mm/min	MPa	2300	2300	2200	2300	2300	2300	2300	2300	2300	2300	2300
Strain at Break	ASTM D638	50mm/min	%	130	130	130	120	120	120	120	120	120	120	120
Flexural Strength	ASTM D790	2mm/min	MPa	95	95	95	95	95	95	95	95	95	95	95
Flexural Modulus	ASTM D790	2mm/min	MPa	2400	2400	2300	2300	2300	2300	2300	2300	2300	2300	2300
Izod Notched Impact Strength	ASTM D256	23°C	KJ/m²	80	80	90	85	85	75	72	85	80	75	72
Thermal Properties														
Heat Distortion Temp.	ASTM D648	1.82Mpa; 3.2mm	°C	128	127	129	130	130	128	127	127	127	125	125
Vicat Softening Temp.	ASTM D1525	120°C/h; 50N	°C	149	148	149	151	150	148	147	148	147	145	145
Optical Properties														
Haze	ASTM D1003	3mm	%	—	—	0.8	—	—	—	—	—	—	—	—
Light Transmittance	ASTM D1003	3mm	%	88	88	60	75	75	75	75	75	75	75	75
Flammability Properties														
Flame Rating	UI94	3mm	—	—	—	—	—	—	—	—	—	—	—	—
	UI94	1.5mm	—	—	—	—	—	—	—	—	—	—	—	—

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