

LG Medical LDPE Grade



LG Chem

The information contained herein, including, but not limited to, data, statements and typical values, are given in good faith. LG Chem makes no warranty or guarantee, expressed or implied, (i) that the result described herein will be obtained under end - use conditions, or (ii) as to the effectiveness or safety of any design incorporating LG Chem materials, products, recommendations or advice. Further, any information contained herein shall not be construed as a part of legally binding offer. Especially, the typical values should be regarded as reference values only and not as binding minimum values. Each user bear full responsibility for making its own determination as to the suitability of LG Chem's materials, products, recommendations, or advice for its own particular use. Each user must identify and perform all tests and analyses necessary to assure that its finished parts incorporating LG Chem material or products will be safe and suitable for use under end - use conditions. The data contained herein can be changed without notice as a result of the quality improvement of the products."

Plant Description – Polyolefin Division

LDPE

Yeosu



- Capacity : 160,000 MTA
- Technologies : ENICHEM

HDPE

Yeosu



- Capacity : 360,000 MTA
- Technologies : HOECHST

HDPE

Daesan



- Capacity : 160,000 MTA
- Technologies : PHILLIPS

LDPE/LLDPE

Daesan



- Capacity :
150,000 MTA-LDPE
80,000 MTA-LLDPE



- Technologies :
BASELL-LDPE
(Tubular)
DSM-LLDPE

PP

Daesan



- Capacity :
300,000 MTA
- Technologies :
Spheripol

The information contained herein, including, but not limited to, data, statements and typical values, are given in good faith. LG Chem makes no warranty or guarantee, expressed or implied, (i) that the result described herein will be obtained under end - use conditions, or (ii) as to the effectiveness or safety of any design incorporating LG Chem materials, products, recommendations or advice. Further, any information contained herein shall not be construed as a part of legally binding offer. Especially, the typical values should be regarded as reference values only and not as binding minimum values. Each user bear full responsibility for making its own determination as to the suitability of LG Chem's materials, products, recommendations, or advice for its own particular use. Each user must identify and perform all tests and analyses necessary to assure that its finished parts incorporating LG Chem material or products will be safe and suitable for use under end - use conditions. The data contained herein can be changed without notice as a result of the quality improvement of the products."

Application - Polyolefin

LG Chem's PE/PP leads the Korean petrochemical industry and is the largest producer in Korea.

Main Products – LD/LLDPE, HDPE, PP, PE Compounds

PE, PP - Application

LDPE/LLDPE

■ Extrusion Coating



■ Film/Medical Bottle



HDPE

■ PE-Xa Pipe



■ Bottle



PP

■ Automotive



■ Appliance



PE Compounds - Wire & Cable XLPE



The information contained herein, including, but not limited to, data, statements and typical values, are given in good faith. LG Chem makes no warranty or guarantee, expressed or implied, (i) that the result described herein will be obtained under end - use conditions, or (ii) as to the effectiveness or safety of any design incorporating LG Chem materials, products, recommendations or advice. Further, any information contained herein shall not be construed as a part of legally binding offer. Especially, the typical values should be regarded as reference values only and not as binding minimum values. Each user bear full responsibility for making its own determination as to the suitability of LG Chem's materials, products, recommendations, or advice for its own particular use. Each user must identify and perform all tests and analyses necessary to assure that its finished parts incorporating LG Chem material or products will be safe and suitable for use under end - use conditions. The data contained herein can be changed without notice as a result of the quality improvement of the products."

R&D Organization

Polyolefin R&D



- **Key Research :**
 - **Specialty Resins**
 - **Metallocene Catalyst**
 - **Process Development**

Polyolefin Tech Center



- **Key Activities :**
 - Technical Support**
 - Polymer Design & development**
 - Trouble Shooting**

The information contained herein, including, but not limited to, data, statements and typical values, are given in good faith. LG Chem makes no warranty or guarantee, expressed or implied, (i) that the result described herein will be obtained under end - use conditions, or (ii) as to the effectiveness or safety of any design incorporating LG Chem materials, products, recommendations or advice. Further, any information contained herein shall not be construed as a part of legally binding offer. Especially, the typical values should be regarded as reference values only and not as binding minimum values. Each user bear full responsibility for making its own determination as to the suitability of LG Chem's materials, products, recommendations, or advice for its own particular use. Each user must identify and perform all tests and analyses necessary to assure that its finished parts incorporating LG Chem material or products will be safe and suitable for use under end - use conditions. The data contained herein can be changed without notice as a result of the quality improvement of the products."

Specification

Medical Blow Molding and Film Grade

LUPURE BB120

Physical properties	Test methods	Units	Values
Melt Flow Index 190 /2.16	ASTM D 1238	g/10min	0.3
Density at 23 °C	ASTM D 792	g/cm ³	0.925
Crystalline Melting Point	DSC	°C	114

Mechanical properties	Test methods	Units	Values
Tensile Strength at Yield	ASTM D 638	kg/cm ²	100
Tensile Strength at Break	ASTM D 638	kg/cm ²	180
Elongation at Break	ASTM D 638	%	750
Hardness (Shore D)	ASTM D 2240	-	51
Softening Point (Vicat)	ASTM D 1525	°C	101
Haze(0.7T)	ASTM D 1003	%	20

The information contained herein, including, but not limited to, data, statements and typical values, are given in good faith. LG Chem makes no warranty or guarantee, expressed or implied, (i) that the result described herein will be obtained under end - use conditions, or (ii) as to the effectiveness or safety of any design incorporating LG Chem materials, products, recommendations or advice. Further, any information contained herein shall not be construed as a part of legally binding offer. Especially, the typical values should be regarded as reference values only and not as binding minimum values. Each user bear full responsibility for making its own determination as to the suitability of LG Chem's materials, products, recommendations, or advice for its own particular use. Each user must identify and perform all tests and analyses necessary to assure that its finished parts incorporating LG Chem material or products will be safe and suitable for use under end - use conditions. The data contained herein can be changed without notice as a result of the quality improvement of the products."

LUPURE BB120

Main Applications

LUPURE BB120 can be used in Pharmaceutical bottle, bags and eye drop fluid packaging

Description

**LUPURE BB120 is a low density Polyethylene with high rigidity, cleanness, optical property and outstanding productivity.
LUPURE BB120 is produced in pellet form.**

Regulatory requirements

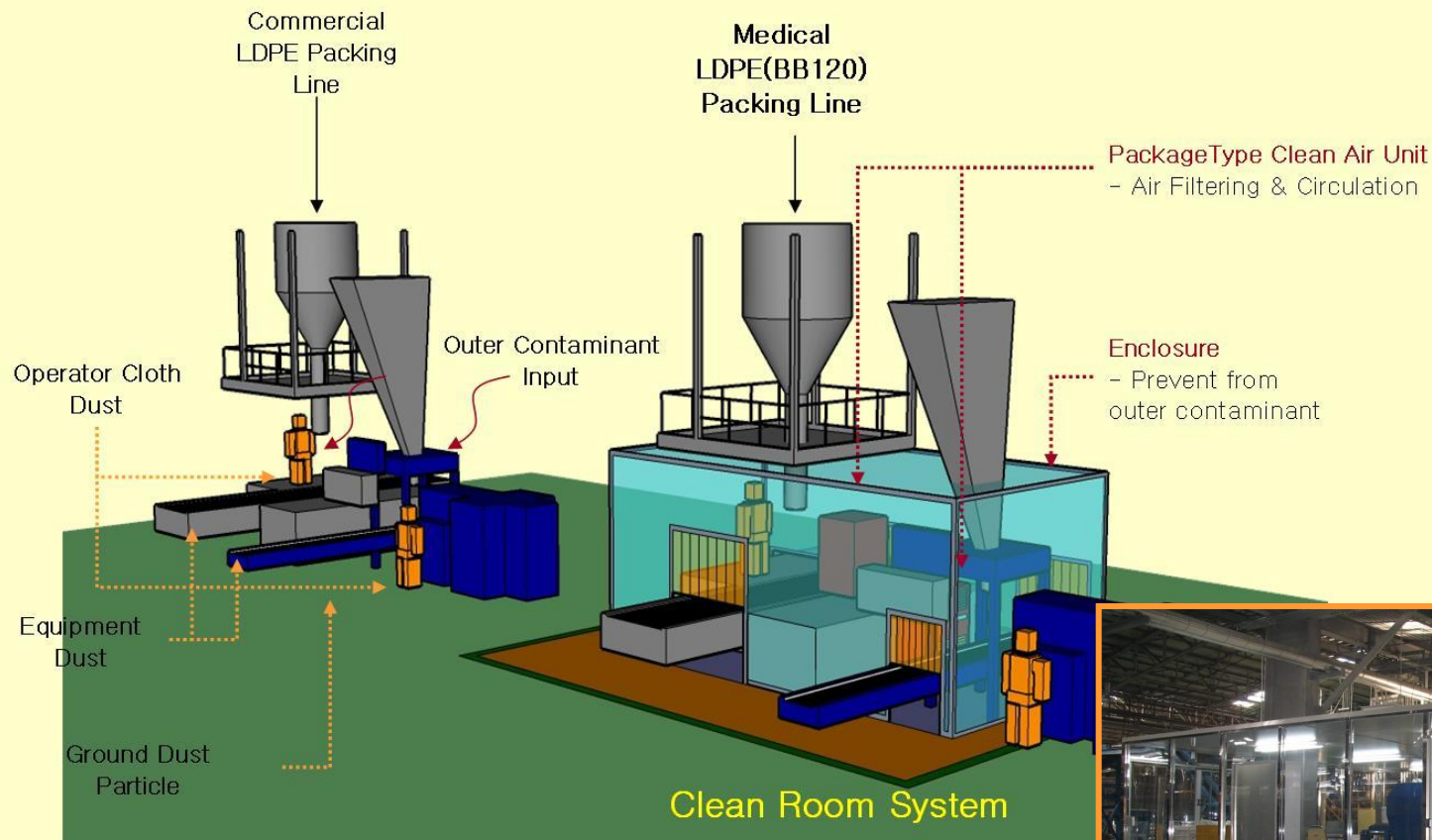
LUPURE BB120 meet the requirements of the United States Pharmacopoeia(USP) Class VI located at the US Food and Drug Administration(FDA) and EP(European Pharmacopoeia)

Cleanness technology

LUPURE BB120 is produced by highly innovated process under optimal environment and equipment for medical material production

The information contained herein, including, but not limited to, data, statements and typical values, are given in good faith. LG Chem makes no warranty or guarantee, expressed or implied, (i) that the result described herein will be obtained under end - use conditions, or (ii) as to the effectiveness or safety of any design incorporating LG Chem materials, products, recommendations or advice. Further, any information contained herein shall not be construed as a part of legally binding offer. Especially, the typical values should be regarded as reference values only and not as binding minimum values. Each user bear full responsibility for making its own determination as to the suitability of LG Chem's materials, products, recommendations, or advice for its own particular use. Each user must identify and perform all tests and analyses necessary to assure that its finished parts incorporating LG Chem material or products will be safe and suitable for use under end - use conditions. The data contained herein can be changed without notice as a result of the quality improvement of the products."

Cleaning Room Packing System – Class 10,000



The information contained herein, including, but not limited to, data, statements and typical values, are given in good faith. LG Chem makes no warranty or guarantee, expressed or implied, (i) that the result described herein will be obtained under end - use conditions, or (ii) as to the effectiveness or safety of any design incorporating LG Chem materials, products, recommendations or advice. Further, any information contained herein shall not be construed as a part of legally binding offer. Especially, the typical values should be regarded as reference values only and not as binding minimum values. Each user bear full responsibility for making its own determination as to the suitability of LG Chem's materials, products, recommendations, or advice for its own particular use. Each user must identify and perform all tests and analyses necessary to assure that its finished parts incorporating LG Chem material or products will be safe and suitable for use under end - use conditions. The data contained herein can be changed without notice as a result of the quality improvement of the products."

Container Stuffing

14MT/20ft

1000kg	1000kg	1000kg	1000kg
750kg	750kg	750kg	750kg

(Top layer) 1000kg x 2 x 4 = 8.0MT
 (Down layer) 750kg x 2 x 4 = 6.0MT
 Total :14.0MT



- WRAPPING
- TOP SHEET
- 8 Pallets

17.2/20ft

1000kg	1000kg	1000kg	1000kg	
1000kg	1000kg	1000kg	1000kg	

1000kg x 2 x 2 x 4 = 16.0MT
 Manual (48bags) = 1.2MT
 Total:17.2MT



- WRAPPING (except for manual 48 bags)
- TOP SHEET

22MT/40ft

1,250kg	1,250kg	1,250kg	1,250kg	1,250kg	1,250kg	1,250kg	1,250kg	1,000kg
---------	---------	---------	---------	---------	---------	---------	---------	---------

(Top layer) 1.0MT x 2 x 1 = 2.0MT
 (Down layer) 1.250MT x 2 x 8 = 20.0MT
 Total : 22.0mt



- WRAPPING
- TOP SHEET
- 18 Pallets

The information contained herein, including, but not limited to, data, statements and typical values, are given in good faith. LG Chem makes no warranty or guarantee, expressed or implied, (i) that the result described herein will be obtained under end - use conditions, or (ii) as to the effectiveness or safety of any design incorporating LG Chem materials, products, recommendations or advice. Further, any information contained herein shall not be construed as a part of legally binding offer. Especially, the typical values should be regarded as reference values only and not as binding minimum values. Each user bear full responsibility for making its own determination as to the suitability of LG Chem's materials, products, recommendations, or advice for its own particular use. Each user must identify and perform all tests and analyses necessary to assure that its finished parts incorporating LG Chem material or products will be safe and suitable for use under end - use conditions. The data contained herein can be changed without notice as a result of the quality improvement of the products."

Certification

USP Certification

NAMSA	
PEOPLE • SCIENCE • SOLUTIONS	
Confidential TCLAS_V17	Lab No. 07C_21467_14 P.O. No. credit card 5634 Test Facility: NAMSA 9 Morgan Irvine, CA 92618
Kurt Schulze ACTA Laboratories, Inc. 27082 Burbank Street Foothill Ranch, CA 92610	
CERTIFICATE OF COMPLIANCE USP BIOLOGICAL REACTIVITY TESTS, <i>IN VIVO</i> USP PLASTIC CLASS VI	
Test Article: BB120 (LDPE) ID No. ACTA Lab # 07-0020	
<p>USP Systemic Toxicity Study in the Mouse: The test article was prepared as indicated below and injected into mice. The saline, alcohol in saline, polyethylene glycol 400 and sesame oil extracts did not produce a significantly greater systemic reaction than the blank extractants.</p> <p>USP Intracutaneous Toxicity Study in the Rabbit: The test article was prepared as indicated below and injected intracutaneously into rabbits. The saline, alcohol in saline, polyethylene glycol 400 and sesame oil extracts did not produce a significantly greater tissue reaction than the blank extractants.</p> <p>USP Muscle Implantation Study in the Rabbit: The macroscopic reaction of the test article, implanted in rabbit muscle for five days, was not significant when compared to the USP negative control plastic.</p> <p>The test article was prepared at a ratio of 60 cm²:20 ml and extracted at 70°C for 24 hours. The test article extracts met the requirements of a USP Plastic Class VI.</p>	
mlm Date Completed <u>08-10-07</u>	Approved By <u>R. Villani</u> Robert Villani, AALAS Certified Supervisor, Toxicology
Authorization for duplication of this report, except in whole, is reserved pending NAMSA's written approval. Page 1 of 1	

EP Certification

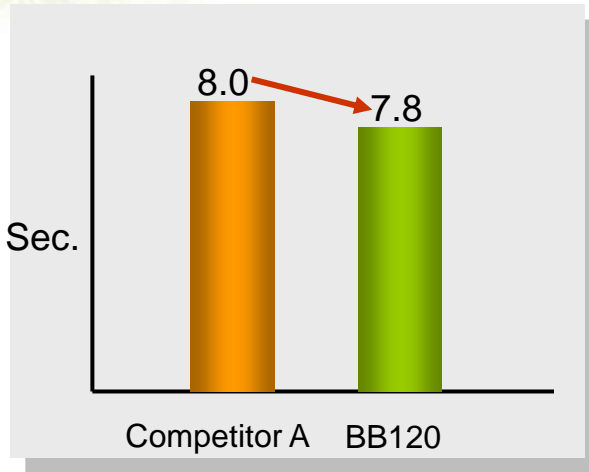
NAMSA		CONFIDENTIAL REPORT		
PEOPLE • SCIENCE • SOLUTIONS		Test Facility S Morgan Irvine, CA 92618 949.951.3110		
TEST ARTICLE NAME BB120(LDPE), LG Chem, Ltd. East 23 Floor, LG Twin Tower Bldg., NCC/PO Division, Petrochemical Company		SPONSOR Y.H. Chung B n C Corporation Room No. 2002, Solmoeck OfficeTel, 416-4 Kil-Dong Kang Dong-Ku Seoul 134-814 Korea		
TEST ARTICLE IDENTIFICATION BnC, LG BB120-313		TEST ARTICLE RECEIVED October 9, 2008		
STUDY TITLE European Pharmacopoeia Section 3, 1.3, 2001 Supplement Materials Used for the Manufacture of Containers - Polyolefines				
RESULTS				
Test	Test Article	EP Limit	Met/Did Not Meet Limit	
Identification: IR Spectrophotometry	Maxima at:	Maxima at:	Met	
	2927 cm ⁻¹	2847 cm ⁻¹	2920 cm ⁻¹	2850 cm ⁻¹
	1472 cm ⁻¹	1403 cm ⁻¹	1475 cm ⁻¹	1465 cm ⁻¹
	720 cm ⁻¹	720 cm ⁻¹	735 cm ⁻¹	720 cm ⁻¹
Titanium Dioxide	Clear and colorless	If the substance is opacified with titanium oxide, an orange-yellow color develops	Not opacified with titanium dioxide	
General Tests: Appearance	Solution S1 is less opalescent than reference solution I and colorless	Clear and colorless	Met	
Acidity	0.2 ml	≤ 1.5 ml of 0.01M NaOH required to change color of indicator to blue	Met	
Alkalinity	0.5 ml	≤ 1 ml of 0.01M HCl required to reach the beginning of the color change of indicator from yellow to orange	Met	
Absorbance	≤ 0.0045 AU	≤ 0.2 at wavelengths from 220 nm to 340 nm	Met	
Reducing Substances	19.80 ml - 19.35 ml = 0.45 ml	Difference between titration volumes for test and blank solution ≤ 5.0 ml	Met	
Substances Soluble in Hexane?	2.9%	Mass of residue obtained ≤ 5%	Met	
Extractable Aluminum	≤ 0.05 ppm *	≤ 1 ppm	Met	
Extractable Titanium	≤ 0.05 ppm *	≤ 1 ppm	Met	
Extractable Zinc	≤ 0.05 ppm *	≤ 1 ppm	Met	
Extractable Heavy Metals	≤ 2.5 ppm	≤ 2.5 ppm	Met	
Sulfated Ash	0.2%	≤ 1.0% on a 5 g sample	Met	
*EP requires a comparison be made to a "type" sample, however, a "type" sample was not available. Therefore this comparison was not made. *From NAMSA Ohio Report 08T_54149_02				
P.O. No.: Pre-Paid	Lab Number: 08C_51954_03	C_5	Page 1 of 2	

The information contained herein, including, but not limited to, data, statements and typical values, are given in good faith. LG Chem makes no warranty or guarantee, expressed or implied, (i) that the result described herein will be obtained under end - use conditions, or (ii) as to the effectiveness or safety of any design incorporating LG Chem materials, products, recommendations or advice. Further, any information contained herein shall not be construed as a part of legally binding offer. Especially, the typical values should be regarded as reference values only and not as binding minimum values. Each user bear full responsibility for making its own determination as to the suitability of LG Chem's materials, products, recommendations, or advice for its own particular use. Each user must identify and perform all tests and analyses necessary to assure that its finished parts incorporating LG Chem material or products will be safe and suitable for use under end - use conditions. The data contained herein can be changed without notice as a result of the quality improvement of the products."

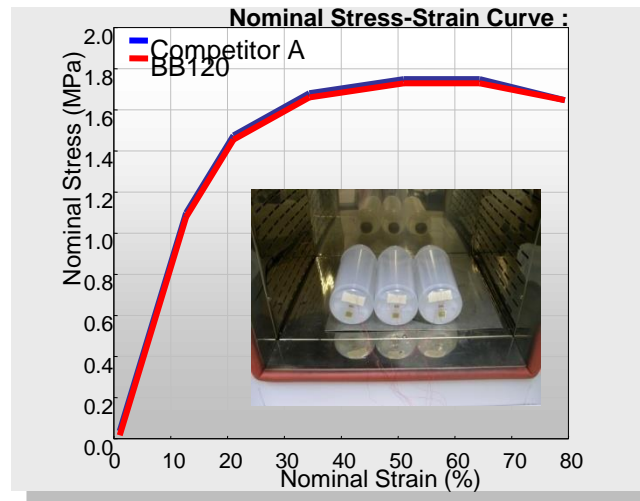
Product Specifications

LUPURE BB120 is designed to improve the cycle time, good thermal safety, and excellent transparency.

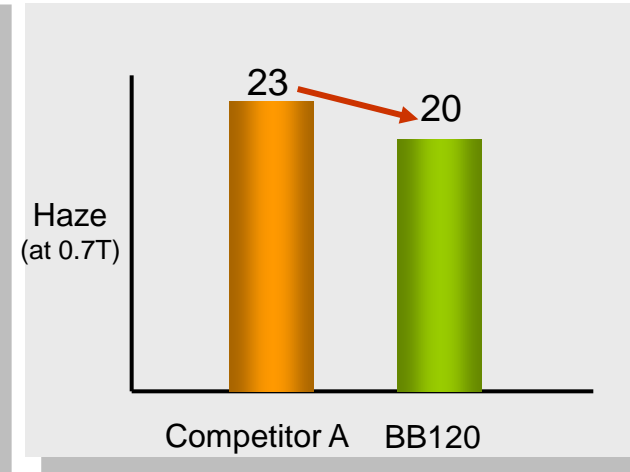
Cycle time



Thermal Deformation

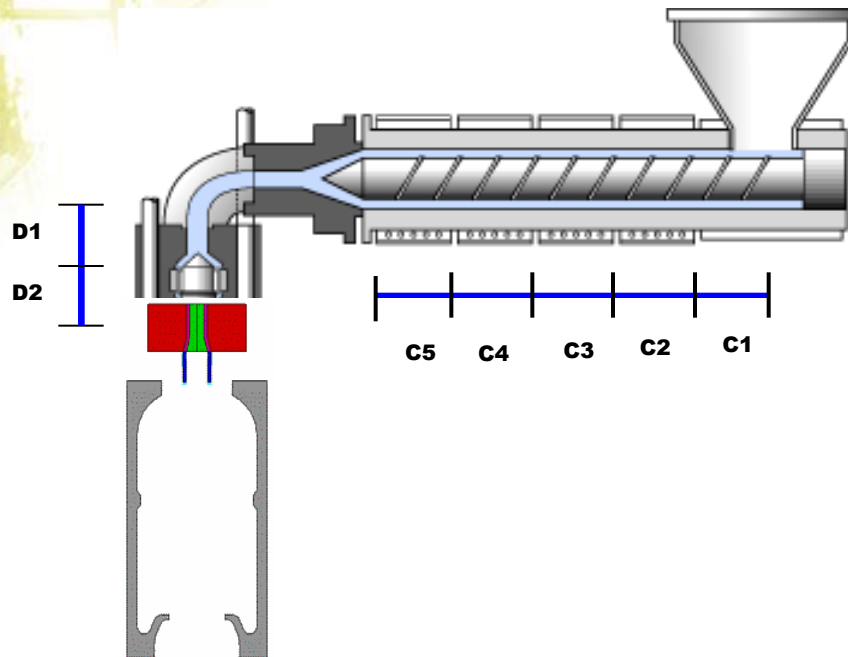


Transparency



The information contained herein, including, but not limited to, data, statements and typical values, are given in good faith. LG Chem makes no warranty or guarantee, expressed or implied, (i) that the result described herein will be obtained under end - use conditions, or (ii) as to the effectiveness or safety of any design incorporating LG Chem materials, products, recommendations or advice. Further, any information contained herein shall not be construed as a part of legally binding offer. Especially, the typical values should be regarded as reference values only and not as binding minimum values. Each user bear full responsibility for making its own determination as to the suitability of LG Chem's materials, products, recommendations, or advice for its own particular use. Each user must identify and perform all tests and analyses necessary to assure that its finished parts incorporating LG Chem material or products will be safe and suitable for use under end - use conditions. The data contained herein can be changed without notice as a result of the quality improvement of the products."

Typical Temperature Condition of BB120



Zone	Temperature (°C)
C 1	150
C 2	160
C 3	170
C 4	175
C 5	175
D 1	180
D 2	180

- Above Processing Temp Profile is will be changed by machine's condition.

The information contained herein, including, but not limited to, data, statements and typical values, are given in good faith. LG Chem makes no warranty or guarantee, expressed or implied, (i) that the result described herein will be obtained under end - use conditions, or (ii) as to the effectiveness or safety of any design incorporating LG Chem materials, products, recommendations or advice. Further, any information contained herein shall not be construed as a part of legally binding offer. Especially, the typical values should be regarded as reference values only and not as binding minimum values. Each user bear full responsibility for making its own determination as to the suitability of LG Chem's materials, products, recommendations, or advice for its own particular use. Each user must identify and perform all tests and analyses necessary to assure that its finished parts incorporating LG Chem material or products will be safe and suitable for use under end - use conditions. The data contained herein can be changed without notice as a result of the quality improvement of the products."