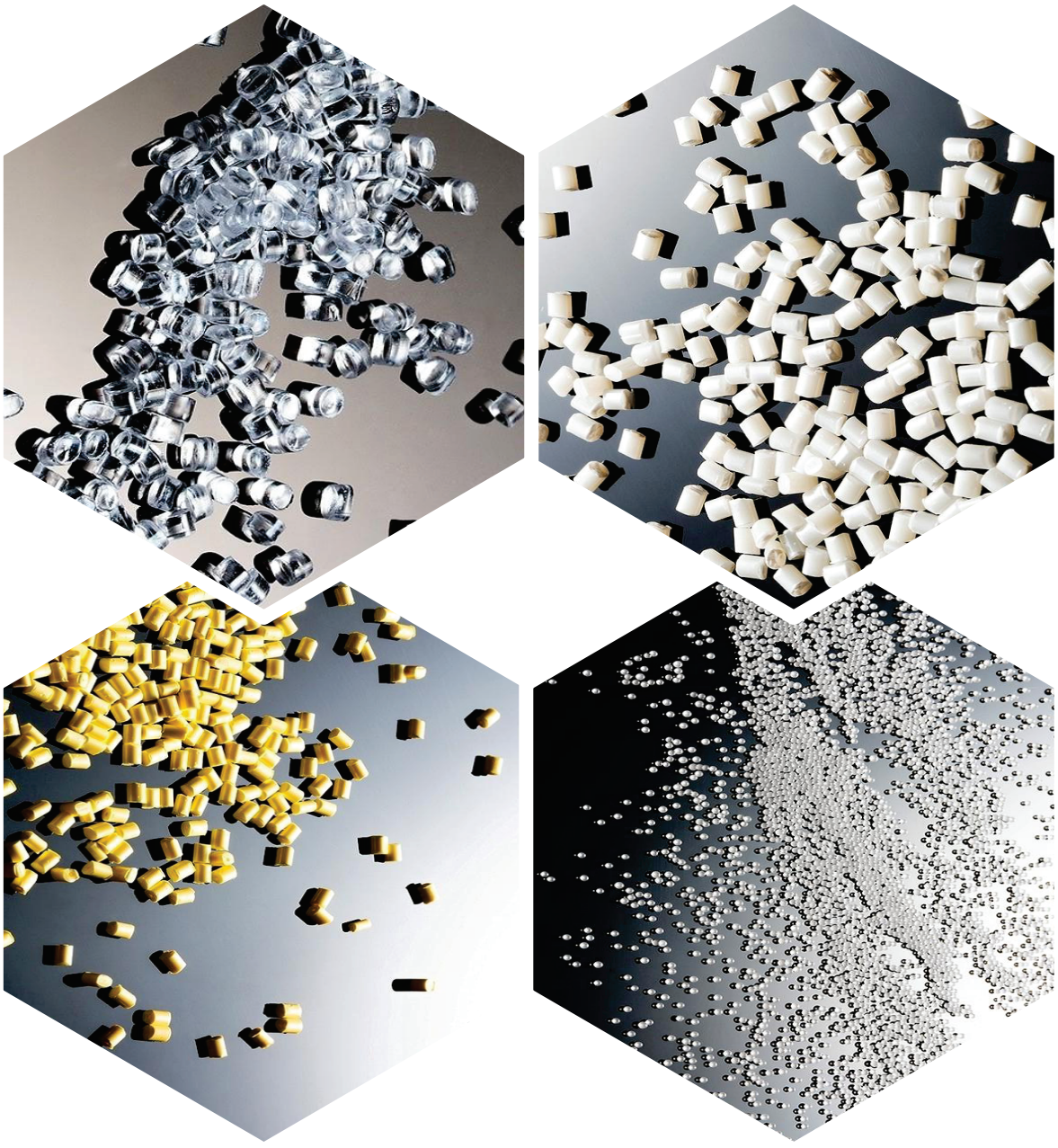
SolutionPartner

LG Polymers India Pvt. Ltd.

GPPS / HIPS / CPS / EPS



LG Chem

GPPS

SolutionPartner

Refrigerator Parts

23NF-NP/23NFA-NP/23NFD-NP/ 23NFW-NP/23NFS-NP
- Medium flow
- Customized Tinge

Extruded Sheets

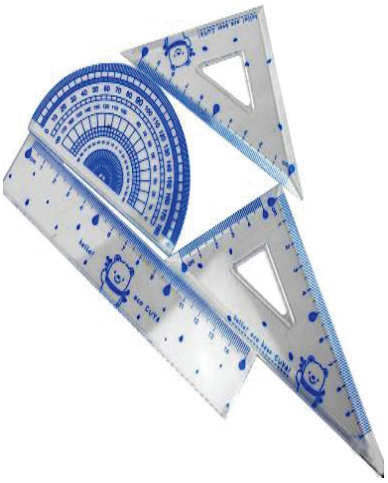
23ES-NP
- Medium flow
- Excellent Clarity

Foamed PS

24EP-NP
- Less flow
- High Molecular Weight
- Extrusion Grade

General Purpose

18MF-NP/16HF-NP
- High flow
- Easy Processing



Typical Properties

GPPS (General Purpose Polystyrene)

Property	ASTM	Test Condition	Unit	23 NF-NP	23 NFA-NP	23 NFD-NP	23 NFW-NP	23 ES-NP	24 EP-NP	18 MF-NP	16 HF-NP
MECHANICAL											
Tensile Strength	D 638	6.3 mm/min	kg/cm^2	415	415	415	415	415	440	410	400
Elongation	D 638	6.3 mm/min	%	5	5	5	5	5	5	2	2
Flexural Strength 1/8" (3.2 mm)	D 790	1.3 mm/min	kg/cm^2	900	900	900	900	900	1100	850	800
Flexural Modulus 1/8" (3.2 mm)	D 790	1.3 mm/min	kg/cm^2	36000	36000	36000	36000	36000	38000	34000	32000
Izod Impact, Notched 1/4" (6.4 mm)	D 256	-	kg-cm / cm notch	1.2	1.2	1.2	1.2	1.2	1.3	1.1	1.0
Rockwell Hardness	D 785	-	R Scale	115	115	115	115	115	116	115	115
THERMAL & OPTICAL											
VSP	D 1525	120°C/1hr, 1kg	°C	96	96	96	96	96	98	95	94
HDT	D 648	1.82 Mpa/ 120°C/1Hr	°C	80	80	80	80	80	80	80	78
Transmittance	D 1003	-	%	95	95	95	95	95	95	95	95
RHEOLOGICAL											
Melt Flow Index	D 1238	200°C/5 kg	gm/10min	5.8	5.8	5.8	5.8	4.7	3.0	9.0	16.0
GENERAL											
Shrinkage	D 955	-	%	0.4 - 0.6	0.4 - 0.6	0.4 - 0.6	0.4 - 0.6	0.4 - 0.6	0.4 - 0.6	0.4 - 0.6	0.4 - 0.6
Sp. Gravity	D 792	-	-	1.04	1.04	1.04	1.04	1.04	1.04	1.02	1.02
Characteristics			**Flow**	Medium	Medium	Medium	Medium	Medium	Low	Normal	High
			Tinge	Less Blue	Aqua Clear	Diamond Clear	Water Clear	Less Blue	Less Blue	Medium Blue	High Blue
Major Applications				Refrigerator parts, Crisper tray, Foam Sheet, Water purifier parts.	Refrigerator parts, Crisper tray, Chiller tray.	Refrigerator parts, Crisper tray, Chiller tray.	Refrigerator parts, Crisper tray, Chiller tray, Water purifier parts.	Extruded sheets, Advertising boards, Window panels.	Extruded foam sheet for disposable application	Stationery, Wall Clocks, Novelties, beads, Bangles, CD Jewel Case, Household applications.	Hand Injection Molding, Master Batches, Refrigerator liner sheet Cap layer.

- Confirms to the US Food and Drugs Administration, Title 21-Food and Drugs (Food for Human consumption), Part 177, Section 177.1640 - Polystyrene & Rubber modified Polystyrene
- All grades are RoHS Certified.
- The values of properties in the above table have been obtained from the test specimens manufactured under controlled conditions of injection molding.
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HIPS

SolutionPartner

ESCR HIPS

309ES-NP
- Very Low Flow
- Refrigerator Liners

General Purpose

302NF-NP/307NFE-NP
- Medium Flow
- Moldings / Disposables

High Gloss HIPS

301HG-NP/312HGH-NP
- Medium Flow
- High Impact Strength

High Flow HIPS

314HF-NP
- High Flow
- Good Strength
- GAIN Applications

Typical Properties

HIPS (High Impact Polystyrene)

Property	ASTM	Test Condition	Unit	301 HG-NP	312 HGH-NP	302 NF-NP	307 NFE-NP	306 MF-NP	314 HF-NP	309 ES-NP
MECHANICAL										
Tensile Strength	D 638	50 mm/min	Kg/cm^2	310	310	300	300	200	190	220
Elongation	D 638	50 mm/min	%	35	40	50	50	50	50	75
Flexural Strength 1/8" (3.2 mm)	D 790	1.3 mm/min	Kg/cm^2	450	450	450	450	350	350	340
Flexural Modulus 1/8" (3.2 mm)	D 790	1.3 mm/min	Kg/cm^2	25000	25000	24000	25000	22000	22000	18000
Izod Impact, Notched 1/4" (6.4 mm)	D 256	-	Kg-cm / cm notch	7.5	9.5	8.0	8.0	8.5	8.5	10
Rockwell Hardness	D 785	-	R Scale	103	103	93	93	93	93	93
Gloss	D 2457	60° angle	-	95	95	-	-	-	-	-
THERMAL										
VSP	D 1525	120°C/1hr, 1kg	°C	95	95	96	97	94	94	98
HDT	D 648	1.82 Mpa/ 120°C/1Hr	°C	75	75	75	75	70	70	80
RHEOLOGICAL										
Melt Flow Index	D 1238	200°C/5 kg	gm/10min	5.5	5.5	5.0	4.0	9.5	11.0	3.0
GENERAL										
Shrinkage	D 955	-	%	0.4-0.8	0.4-0.8	0.4-0.8	0.4-0.8	0.4-0.8	0.4-0.8	0.4-0.8
Sp. Gravity	D 792	-	-	1.03	1.03	1.03	1.03	1.03	1.02	1.03
Flammability	UL 94	@3.0 mm	Rating	*HB	HB	HB	HB	HB	HB	HB
Characteristics				High Gloss	High Gloss High Impact	General Molding	Extrusion	High flow	GAIN Molding	ESCR
Major Applications				Air conditioner parts, Refrigerator parts, Washing machine panels, Air Cooler bodies, Geyser bodies.	Washing machine panel, Wash lid, spin lid and refrigerator table tops, Vacuum cleaner housing, Air Cooler front panel. Mixers, Geysers, Cap layer.	Electronics, Novelties, Stationery, Disposables.	Disposables, Extrusion applications.	Electronics	TV cabinets especially in GAIN applications.	Refrigerator liners, Containers for food & diary packaging specially for fatty acid, Yogurt.

* **Horizontal Burning**

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Typical Properties

Property	ASTM	Test Condition	Unit	Pre-colored High Gloss HIPS	FR HIPS	
					19FR-0ZO11 FR White	19FR-9Z004 FR Black
MECHANICAL						
Tensile Strength	D 638	50 mm/min	kg/cm^2	280	190	190
		6.3 mm/min	kg/cm^2	-	-	-
Elongation	D 638	50 mm/min	%	40	40	40
		6.3 mm/min	%	-	-	-
Flexural Strength 1/8" (3.2 mm)	D 790	1.3 mm/min	kg/cm^2	440	400	400
Flexural Modulus 1/8" (3.2 mm)	D 790	1.3 mm/min	kg/cm^2	24000	24000	24000
Izod Impact, Notched 1/4" (6.4 mm)	D 256	6.4 mm	kg-cm /cm notch	8.0	7.0	7.0
Gloss	D 2457	60° angle	-	92	-	-
THERMAL						
VSP	D 1525	120 °C/1hr, 1kg	°C	95	94	94
HDT	D 648	1.82 Mpa/ 120°C /1 Hr.	°C	75	70	70
RHEOLOGICAL						
Melt Flow Index	D 1238	200°C/5 kg	gm/10 min	5.5	6.0	6.0
GENERAL						
Shrinkage	D 955	-	%	0.4 - 0.8	0.4 - 0.8	0.4 - 0.8
Flammability	UL 94	@3.0 mm	Rating	* HB	*V_0	V_0
UL File No : E 191480 (https://iq.ulprospector.com/en/profile?e=123353)						
Characteristics				High Gloss HIPS	RoHS Compliance Flame Retardant HIPS	
Major Applications				Refrigerator, AC, Washing Machine, Water Purifier parts, Mixer, Grinder.	Flame Retardant Electrical & Electronic appliances, TV back cover, Circuit Boards, Relay Boxes etc.	

* Horizontal Burning, V_0 rating

Note: Customized pre-colored grades in GPPS, HIPS and UV stabilized grades.

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Polystyrene Processing Guidelines

▪ Pre-drying

Pre-drying generally not required. In case of Pre-Colored Polystyrene or when using Masterbatch, pre-heating for 2-3 hours at 60-80°C may be required to avoid silver streaks or surface defects due to hygroscopic nature of Masterbatch or any other additives.

▪ Typical Processing Conditions

Injection molding

Barrel temperature (°C)	Feed Zone	160 - 180
	Compression Zone	190 - 200
	Metering Zone	200 - 215
	Nozzle	215 - 220
Mould temperature (°C)		40 - 60

Extrusion

Barrel temperature (°C)	Feed Zone	150 - 180
	Compression Zone	200 - 220
	Metering Zone	220 - 230
Die Head temperature (°C)		200 - 220

▪ Product Safety

Processing may release fumes, which may be irritating to eyes. Sufficient ventilation should be provided in the working area. If it causes eye discomfort, use a full-face respirator. Handling & fabrication of plastic resin may result in the generation of dust. Dust resulting from sawing, filing & sanding of plastic parts in post molding operations may cause irritation to eyes. While performing these operations, use an approved personal protective equipments. If irritation continues, consult physician.

▪ Other Information

Packing

Supplied as (3x3 mm) cylindrical shaped granules in 25 kg PP laminated woven sack bags.

Storage & Handling Precautions

Should be stored in the original shipping of 25 kg woven sack bag, unopened and undamaged in a humidity controlled environment and should not exposed to direct sunlight & heat.

EPS

SolutionPartner

Block Applications

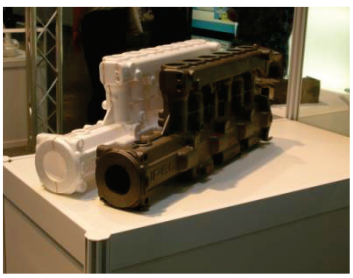
B121NN / B221NN / B321NN / D422NH / D522NH

- Low density EPS
- Cold storage applications
- Bean bags, Decorations, Garlands

Shape Applications

B325NN /B422NN / B522NN

- Good surface finish
- Fish box Packaging
- Electrical & Electronics Packaging



Other Applications

- Construction
- Helmets
- Pattern Casting
- Disposable Cups

Typical Properties

EPS (Expandable Polystyrene)

General Grades			
Grade	**Bead Size Range Dia (mm)**	**Recommended Density (g/l)**	**Major Applications**
B121NN	1.4 - 2.5	16.0	Low density blocks, Garlands, Decorative beads, Bean Bags.
B221NN	1.0 - 2.0	15.0	Low density blocks, Floats.
B321NN	0.9 - 1.2	15.0	Medium density blocks, Low density thick wall moldings, Cold storage insulations.
B325NN	0.6 - 1.2	16.0	Medium / High density blocks, Shape moldings.
B422NN	0.6 - 1.0	16.0	Medium wall thickness shape Moldings, Fish boxes
B522NN	0.4 - 0.7	20.0	Thin wall shape moldings, High density blocks.
B525NN	0.4 – 0.5	25.0	High density blocks and shape applications
B624NN	0.3 - 0.5	45.0	Thin wall disposable cups and trays. Pattern castings.
Low Density Grades			
D422NH	0.6 - 1.0	15.5	Low and Medium density blocks
D522NH	0.4 - 0.7	18.0	
Flame Retardant Grades (Test Method- IS 4671 Standard)			
R255NF	1.0 - 2.0	16.5	Roof insulations, Electrical & Electronics packaging.
R355NF	0.9 - 1.2	17.0	
R455NF	0.6 – 1.0	18.0	
R555NF	0.4 - 0.7	22.0	Shape Moldings.

NH - Low Density, NF – Flame Retardant

Recommended Density - 1st Pass Pre-expansion.

Influence of Ambient temperature / Seasonal effects

Coastal Areas - High relative humidity in air, needs longer maturation time

Non Coastal Areas

Summer - High temperatures, Shorter maturation time

Winter - Low temperature, Longer maturation time

1) The values mentioned in above table are obtained during Pre-expansion under specific conditions and are only for reference.
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EPS – Guidelines

Tips for Processing

Steam :

- All steam lines should be well insulated to avoid generation of more condensate & heat loss.
- Use dry and saturated steam for EPS processing.
- Install Steam Accumulator to avoid pressure drops & for dry steam.
- Steam traps should be provided for periodic removal of condensate.
- Install PRV to maintain constant steam pressure.

Pre-Expander :

- Proper distribution of steam in the pre-expander is more important for achieving desired density.
- Clean the pre-expander bottom plate periodically for even steam distribution.
- Prefer slit type nozzles to bottom plate for easy maintenance.
- Ensure smooth surface for Steam chamber, agitator & baffles to avoid sticking of beads.

Measurement & Monitoring :

- Use Pressure & Temperature Gauges for better process parameters control.

Valves :

- Use Globe Valves in steam lines for fine control of steam pressure.

Handling and Storage

- Should be stored in dry & well ventilated environment at temp <25°C, away from heat / hot surface to avoid pre puff formation.
- Packed material must not be exposed to direct sunlight or for long periods to indirect sunlight and must be protected from Mechanical damage.
- At higher temperatures (>25 °C) there is a loss of blowing agent which results in higher density.
- The storage areas should be provided with ventilation ports, protected with a mesh to avoid entry of rodents located at the lower most (Blowing agent used is heavier than air, will settle at bottom).
- If the storage temperature exceeds the recommended level, processing performance will gradually deteriorate and the minimum achievable density of moulded product will increase. Density will also be governed by the storage time - longer storage time gives higher density.
- Smoking, exposure to naked light and welding in the proximity is forbidden.
- Keep away from Fire and Sparks.
- Proper earthing to be provided for all equipment & conveying lines to avoid fire accidents due to Static charge.

EPS – Trouble Shooting

Pre-expansion

Problem	Cause	Remedy
Lumping	• Steam temperature too high • Blowing agent loss - due to prolonged / improper storage • Residence time too long • Ineffective steam distribution	• Reduce steam pressure / temperature • Try fresh material Improve the storage condition • Reduce the take off height • Clean steam distributor
Bead shrinkage	• Steam temp. / Pressure too high • Feed rate less • Residence time too high • Less blowing agent • Air drier temperature too high	• Decrease steam pressure • Increase feed rate • Reduce the take off height • Try fresh material • Dampen the air pressure
Prefoam too wet	• Wet steam • Excessive steam condensation	• Insulate steam lines, • Ensure steam traps are working • Check steam supply
Density increase During Pre-expansion	• Low steam pressure • Wet steam • High feed rate • Low take off height	• Increase steam pressure • Drain the condensate • Optimize feed rate • Increase take off height
Density increase In Silo	• Sharp bends in conveying lines • Conveying air velocity high/cold	• Eliminate / reduce sharp bends • Reduce air velocity / increase temperature

Moulding

Problem	Cause	Remedy
Mould shrinkage	• Too long steaming • Too high steam pressure • Too fast cooling • Less shot weight • Short filling of mould	• Reduce steaming time • Reduce steam pressure • Lower cooling time • Increase density • Clear feed jets
Mould bulging	• Less cooling time • Less maturation time • Improper cooling	• Increase cooling time • Increase maturation time • Check cooling system (filter choke)
Moulds contain voids	• Incomplete filling • Poor venting • Too big beads	• Check and clear feed jets • Improve venting • Use smaller beads
Moulds contains too much water	• Too low density • Too long steaming • Wet steam • Wet Pre-puff	• Increase density • Decrease steaming time • Drain condensate , ensure condensate free steam • Increase maturation time.
Poor fusion	• Too long maturation time • Insufficient steam time • Insufficient steam pressure • Wrong steaming procedure • Insufficient filling	• Reduce maturation time • Increase steaming time • Increase steam pressure • Check steaming procedure • Improve filling
Localized fusion	• Condensate left out in the mould • Poor mould venting • Nearby steam jets choked	• Increase mould preheating • Improve venting & filling • De-choke nearby steam jets

LG Polymers India Pvt. Ltd.

SolutionPartner

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