



GE Plastics

**GE Engineering Thermoplastics
PRODUCT GUIDE**



CYCOLOLAC[®]
ABS Resin

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CYCOLAC ABS Resin

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COVER: CYCOLAC® resin is used for the housing of a small, portable compressor/nebulizer designed for the managed care environment. The resin offers improved aesthetics, high impact resistance, plus moldability properties that allow for thin-wall design.

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CYCOLAC ABS Resin

CYCOLAC® ABS Resin

CYCOLAC acrylonitrile-butadiene-styrene (ABS) thermoplastic resin is widely recognized as an engineering material offering a good balance of properties centering around toughness, hardness and rigidity. Resin grades in this product family consist of a blend of an elastomeric component and an amorphous thermoplastic component. The elastomeric component is usually polybutadiene or a butadiene copolymer. The amorphous thermoplastic component is SAN: a copolymer of styrene and acrylonitrile. The flexibility offered by the use of the three monomer system (A, B and S) allows the tailoring of the property profile.

CYCOLAC resins allow designers the precise properties needed for an application without over- or under-specifying. They provide physical and economic advantages in head-on comparison with metal, wood and other conventional design materials. They also offer a clear-cut choice when compared with competitive thermoplastics.

CYCOLAC resins have wide processing latitude and deliver a favorable price/performance relationship in injection molding, extrusion, blow molding, structural foam and electroplating processes. Colors can also be matched to exacting specifications.

Acrylonitrile provides:

- chemical resistance
- fatigue resistance
- hardness and rigidity
- melt strength

Butadiene provides:

- low-temperature ductility
- impact resistance
- melt strength

Styrene provides:

- processing ease (flow)
- gloss
- hardness and rigidity

Material Properties

CYCOLAC resins offer:

- outstanding toughness and durability
- low specific gravity
- Relative Thermal Index up to 176°F (80°C)
- dimensional stability at elevated temperatures
- flame resistance
- high gloss
- ease of processing

Typical applications for CYCOLAC resins include:

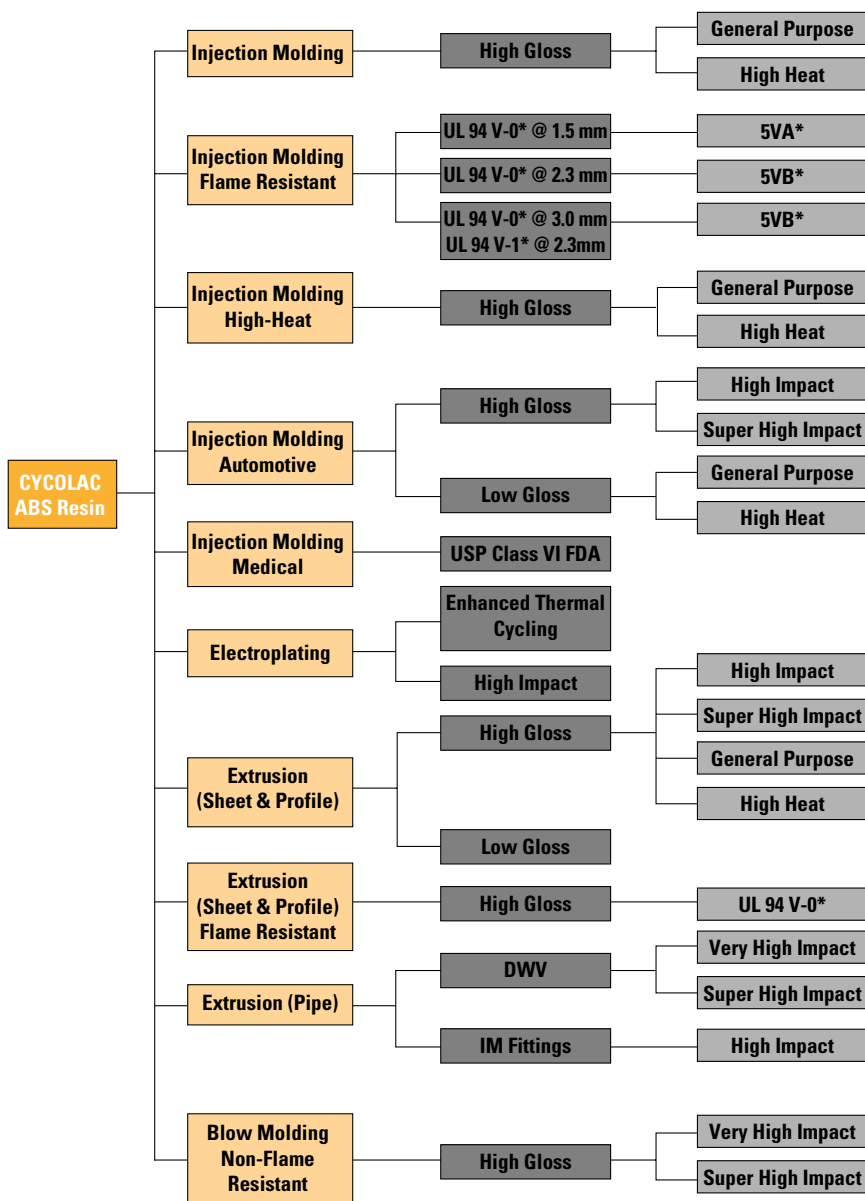
- automotive consoles, door panels, exterior grilles and lift gates
- housewares and small appliance housings
- personal care and medical devices
- business equipment and computer housings
- electronic, telecommunication and corded phone housings
- building and construction products
- toys

Although CYCOLAC resins are resistant to a wide range of chemicals, these resins, depending on the grade, are more or less sensitive to certain solvents and chemicals, especially under stressed conditions.

Where an application requires exposure to, or immersion in, certain environments, prototypes or suitable stressed samples of the material must be tested under actual operating conditions.

CYCOLAC G-Series resins are general purpose grades. This family of ABS materials is based on a blend technology which greatly enhances the flow/impact property balance and color performance compared to conventional ABS technology materials. This results in high impact products with excellent flow characteristics, as well as increased heat resistance and modulus. CYCOLAC G-Series resins have a wider processing window, leading to advantages in both cost and ease of processing.

CYCOLAC ABS Resin



*These ratings are not intended to reflect hazards presented by any material under actual fire conditions.

Material Properties

CYCOLAC General Purpose Resin Grades

GPM4700

- very high impact

GPM5500

- high rigidity
- high flow
- medium impact

GPM5600

- high flow
- high impact

GPM6300

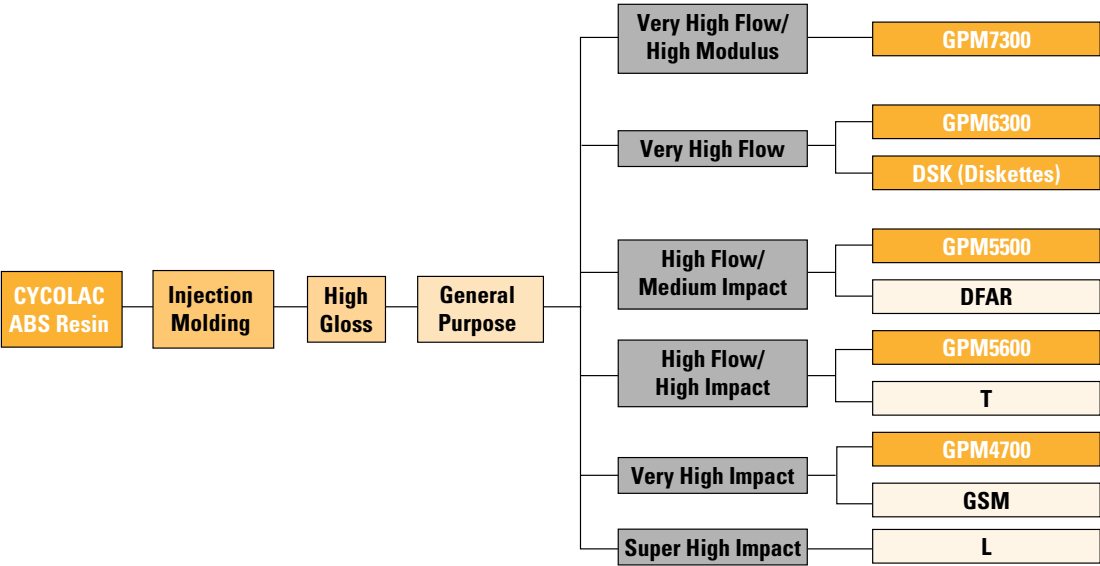
- very high flow

GPM7300

- very high flow
- high modulus

DSK

- computer microdiskette applications
- very high flow



CYCOLAC ABS Resin

Typical Property Values - CYCOLAC General Purpose Resin Grades								
PROPERTY	ENGLISH UNITS (SI UNITS)	TEST METHOD	CYCOLAC GPM4700 resin	CYCOLAC GPM5500 resin	CYCOLAC GPM5600 resin	CYCOLAC GPM6300 resin	CYCOLAC GPM7300 resin	CYCOLAC DSK resin
MECHANICAL								
Tensile Strength, yield, Type 1, 0.125" (3.2 mm)	psi(MPa)	ASTM D 638	6,000(41)	6,500(45)	5,500(38)	6,400(44)	9,400(65)	6,100(42)
Tensile Modulus, Type I, 0.125" (3.2 mm)	psi(MPa)	ASTM D 638	290,000(2,000)	330,000(2,275)	300,000(2,070)	340,000(2,345)	460,000(3,170)	350,000(2,410)
Tensile Elongation, yield, Type I, 0.125" (3.2 mm)	%	ASTM D 638	—	—	—	—	—	34
Tensile Elongation, break, Type 1, 0.125" (3.2 mm)	%	ASTM D 638	—	20.0	—	—	—	—
Flexural Strength, yield, Type 1, 0.125" (3.2 mm)	psi(MPa)	ASTM D 790	9,800(68)	10,800(74)	10,000(69)	11,000(76)	15,500(107)	10,800(74)
Flexural Modulus, 0.125" (3.2 mm)	psi(MPa)	ASTM D 790	320,000(2,205)	380,000(2,620)	310,000(2,135)	360,000(2,480)	500,000(3,445)	370,000(2,550)
Hardness, Rockwell L	—	ASTM D 785	—	—	—	—	98	—
Hardness, Rockwell R	—	ASTM D 785	105	110	105	110	120	111
IMPACT								
Izod Impact, notched, 73°F (23°C)	ft-lb/in(J/m)	ASTM D 256	7.5(400)	5.5(294)	6.5(347)	4.5(240)	0.8(43)	4.0(214)
Izod Impact, notched, -40°F (-40°C)	ft-lb/in(J/m)	ASTM D 256	—	—	—	—	—	1.3(69)
Gardner Impact, 73°F (23°C)	ft-lbs(J)	ASTM D 3029	—	—	—	—	—	5.0(7)
THERMAL								
HDT, 66 psi (0.45 MPa), 0.125" (3.2 mm)	°F(°C)	ASTM D 648	—	—	—	—	203(95)	—
HDT, 66 psi (0.45 MPa), 0.250" (6.4 mm) unannealed	°F(°C)	ASTM D 648	205(96)	205(96)	203(95)	205(96)	210(99)	—
HDT, 264 psi (1.82 MPa), 0.125" (3.2 mm) unannealed	°F(°C)	ASTM D 648	178(81)	178(81)	176(80)	178(81)	181(83)	174(79)
HDT, 264 psi (1.82 MPa), 0.250" (6.4 mm) unannealed	°F(°C)	ASTM D 648	—	—	182(83)	—	—	—
Relative Thermal Index, Elec Prop	°C	UL 746 B	60/80**	60	60	60	—	60
Relative Thermal Index, Mech Prop with impact	°C	UL 746 B	60/80**	60	60	60	—	60
Relative Thermal Index, Mech Prop without impact	°C	UL 746 B	60/80**	60	60	60	—	60
PHYSICAL								
Specific Gravity, solid	—	ASTM D 792	1.04	1.04	1.03	1.04	1.07	1.05
Mold Shrinkage, flow, 0.125" (3.2 mm)	in/in E-3	ASTM D 955	5-8	5-8	5-8	5-8	—	6-8
Melt Flow Rate, nom'l 230°C/3.8 kgf (I)	g/10 min	ASTM D 1238	4.5	7.0	8.0	13.0	20.0	17.2
Melt Viscosity, 260°C, 1000 sec-1	poise	—	1,750	1,550	1,450	1,350	960	1,100
FLAME CHARACTERISTICS*								
UL 94 HB Flame Class Rating	in(mm)	UL 94	0.058(1.47)	0.062(1.58)	0.062(1.58)	0.062(1.58)	—	0.059(1.50)
CSA (See File for complete listing)	File no.	CSA LISTED	LS88480	LS88480	LS88480	LS83480	—	—
Oxygen Index (LOI)	%	ASTM D 2863	—	—	19.0	—	—	—

*These ratings are not intended to reflect hazards presented by any material under actual fire conditions.

** Consult UL guide for RTI by color.

Material Properties

CYCOLAC General Purpose Resin Grades (continued)

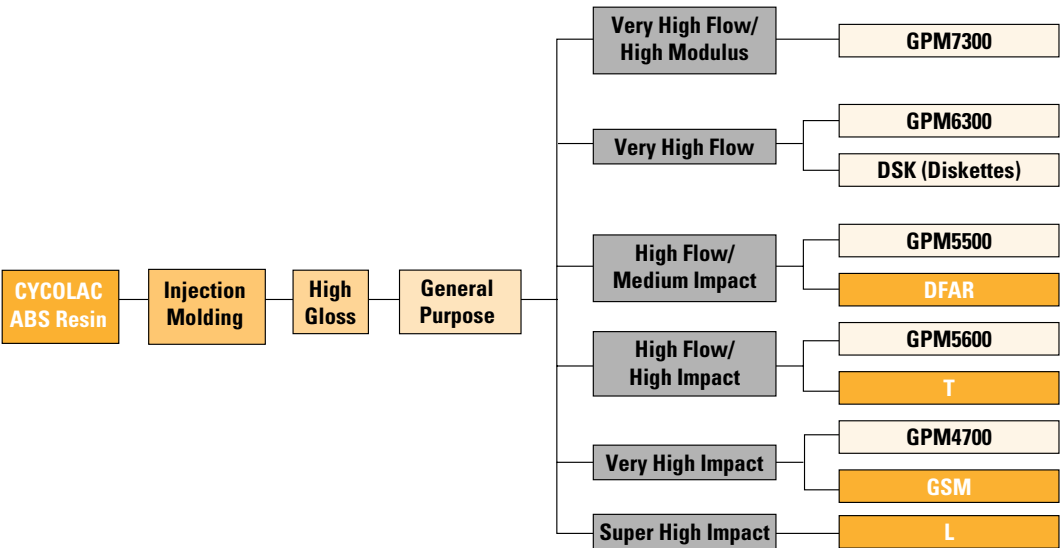
- DFAR

 - high flow
 - medium impact
 - high gloss
 - high modulus
- GSM

 - good toughness
 - very high impact
- L

 - super high impact
 - good low temperature impact
- T

 - high flow
 - high impact
 - very good gloss



CYCOLAC ABS Resin

Typical Property Values - CYCOLAC General Purpose Resin Grades						
PROPERTY	ENGLISH UNITS (SI UNITS)	TEST METHOD	CYCOLAC DFAR resin	CYCOLAC T resin	CYCOLAC GSM resin	CYCOLAC L resin
MECHANICAL						
Tensile Strength, yield, Type 1, 0.125" (3.2mm)	psi(MPa)	ASTM D 638	6,200(43)	6,000(41)	6,300(43)	5,000(34)
Tensile Modulus, Type 1, 0.125" (3.2mm)	psi(MPa)	ASTM D 638	340,000(2,345)	330,000(2,275)	320,000(2,205)	260,000(1,790)
Flexural Strength, yield, Type 1, 0.125" (3.2mm)	psi(MPa)	ASTM D 790	11,400(79)	10,500(72)	10,700(74)	8,500(59)
Flexural Modulus, 0.125" (3.2mm)	psi(MPa)	ASTM D 790	360,000(2,480)	340,000(2,345)	330,000(2,275)	270,000(1,860)
Compressive Strength	psi(MPa)	ASTM D 695	—	7,600(52)	—	5,800(40)
Compressive Modulus	psi(MPa)	ASTM D 695	—	340,000(2,345)	—	170,000(1,170)
Hardness, Rockwell R	—	ASTM D 785	108	103	105	93
IMPACT						
Izod Impact, notched, 73°F (23°C)	ft-lb/in(J/m)	ASTM D 256	4.0(214)	6.5(347)	7.0(374)	8.5(454)
Izod Impact, notched, -22°F (-30°C)	ft-lb/in(J/m)	ASTM D 256	—	2.4(128)	—	—
Izod Impact, notched, -40°F (-40°C)	ft-lb/in(J/m)	ASTM D 256	1.2(64)	1.5(80)	2.0(107)	2.6(139)
Gardner Impact, 73°F(23°C)	ft-lbs(J)	ASTM D 3029	10(14)	—	—	—
THERMAL						
HDT, 66 psi (0.45 MPa), 0.125" (3.2 mm), unannealed	°F(°C)	ASTM D 648	—	201(94)	—	198(92)
HDT, 264 psi (1.82 MPa), 0.125" (3.2 mm), unannealed	°F(°C)	ASTM D 648	178(81)	180(82)	180(82)	174(79)
HDT, 66 psi (0.45 MPa), 0.250" (6.4 mm), unannealed	°F(°C)	ASTM D 648	205(96)	205(96)	205(96)	203(95)
HDT, 264 psi (1.82 MPa), 0.250" (6.4 mm), unannealed	°F(°C)	ASTM D 648	—	185(85)	—	—
Thermal Conductivity	W/m-°C	ASTM C 177	—	0.19	—	—
CTE, flow, -40°F to 100°F (-40 to 40°C)	in/in °F(m/m-°C)	ASTM E 831	4.9 E-5(8.8 E-5)	5.3 E-5(9.5 E-5)	5.3 E-5(9.5 E-5)	6.1 E-5(11.0 E-5)
Relative Thermal Index, Elec Prop	°C	UL 746B	60	60/65**	60/80**	60
Relative Thermal Index, Mech Prop with impact	°C	UL 746B	60	60/80**	60/80**	60
Relative Thermal Index, Mech Prop without impact	°C	UL 746B	60	60/65**	60/80**	60
PHYSICAL						
Specific Gravity, solid	—	ASTM D 792	1.04	1.04	1.04	1.02
Mold Shrinkage, flow 0.125" (3.2mm)	in/in E-3	ASTM D 955	5-8	5-8	5-8	5-8
Melt Flow Rate, nom'l 200°C/5.0 kgf (G)	g/10 min	ASTM D 1238	1.6	1.7	—	—
Melt Flow Rate, nom'l 230°C/3.8 kgf (I)	g/10 min	ASTM D 1238	6.0	7.0	2.5	1.0
Melt Viscosity, 260°C, 1000 sec-1	poise	—	—	1800	2050	—
ELECTRICAL						
Volume Resistivity	ohm-cm(Ohm-m)	ASTM D 257	—	—	3.7 E15(3.7 E13)	—
Dielectric Strength, in air, 62 mils	V/mil(kV/mm)	ASTM D 149	—	—	427(16.8)	—
FLAME CHARACTERISTICS*						
UL 94 HB Flame Class Rating	in(mm)	UL 94	0.062(1.58)	0.062(1.58)	0.058(1.47)	0.058(1.47)
CSA (See File for complete listing)	File no.	CSA LISTED	LS88480	LS88480	LS88480	—
Oxygen Index (LOI)	%	ASTM D 2863	—	19.0	19.0	—

*These ratings are not intended to reflect hazards presented by any material under actual fire conditions.

**Consult UL guide for RTI by color.

Material Properties

CYCOLAC Flame Resistant Resin Grades

V100

- UL/CSA rated*
- non-PBBE additives
- good properties/toughness
- very good moldability

SEA2

- UL/CSA rated*
- non-PBBE additives
- suitable for business equipment

VW300

- UL/CSA rated*
- very good indoor UV properties
- very good moldability with no bloom

VW55

- UL rated*
- good indoor UV properties
- very good moldability with no bloom

KJU

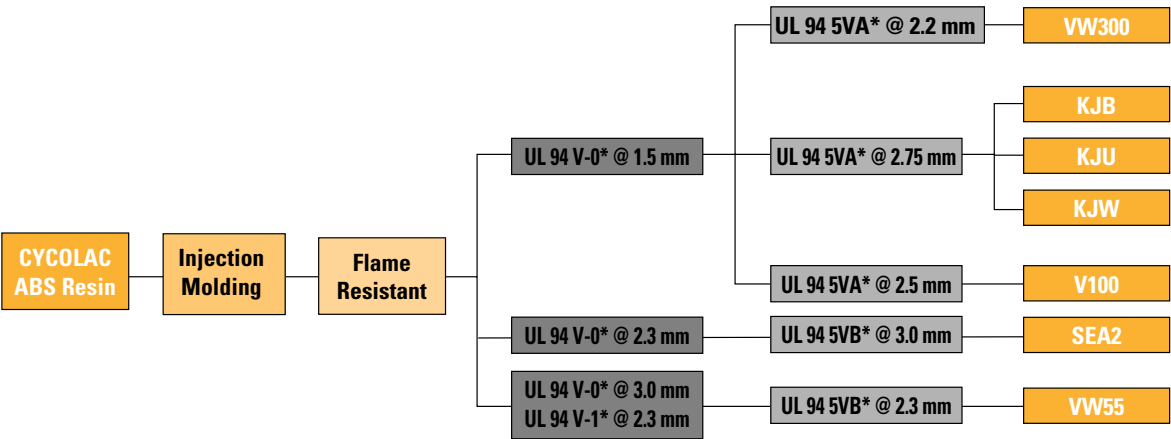
- UL/CSA rated*
- medium impact
- business machine applications
- very good indoor UV properties

KJB

- UL/CSA rated*
- medium impact
- wide processing range

KJW

- UL/CSA rated*
- good physical properties
- good processing
- good toughness



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CYCOLAC ABS Resin

Typical Property Values - CYCOLAC Flame Resistant Resin Grades									
PROPERTY	ENGLISH UNITS (SI UNITS)	TEST METHOD	CYCOLAC V100 resin	CYCOLAC SEA2 resin	CYCOLAC VW300 resin	CYCOLAC VW55 resin	CYCOLAC KJU resin	CYCOLAC KJB resin	CYCOLAC KJW resin
MECHANICAL									
Tensile Strength, yield, Type 1, 0.125" (3.2mm)	psi(MPa)	ASTM D 638	6,300(43)	5,900(41)	5,400(37)	5,500(38)	5,800(40)	5,500(38)	6,000(41)
Tensile Modulus, Type 1, 0.125" (3.2mm)	psi(MPa)	ASTM D 638	340,000(2,345)	380,000(2,620)	320,000(2,205)	310,000(2,135)	320,000(2,205)	320,000(2,205)	300,000(2,070)
Flexural Strength, yield, Type 1, 0.125" (3.2mm)	psi(MPa)	ASTM D 790	10,500(72)	10,000(69)	8,800(61)	9,500(65)	10,000(69)	9,500(65)	10,000(69)
Flexural Modulus, 0.125" (3.2mm)	psi(MPa)	ASTM D 790	360,000(2,490)	380,000(2,620)	310,000(2,135)	350,000(2,400)	330,000(2,275)	330,000(2,275)	330,000(2,275)
Compressive Strength	psi(MPa)	ASTM D 695	—	—	—	—	7,650(53)	7,650(53)	—
Compressive Modulus	psi(MPa)	ASTM D 695	—	—	—	—	200,000(1,380)	200,000(1,380)	—
Hardness, Rockwell R	—	ASTM D 785	104	—	101	100	97	97	99
IMPACT									
Izod Impact, notched, 73°F (23°C)	ft-lb/in(J/m)	ASTM D 256	3.0(160)	4.8(256)	3.0(160)	5.0(267)	4.0(214)	4.0(214)	4.0(214)
Izod Impact, notched, -40°F (-40°C)	ft-lb/in(J/m)	ASTM D 256	—	—	—	—	1.0(53)	1.0(53)	—
Gardner Impact, 73°F(23°C)	ft-lbs(J)	ASTM D 3029	20.0(28.0)	20.0(28.0)	15.0(20.0)	19.0(26.0)	—	—	—
Instrumented Impact, Energy @ peak, 73°F (23°C)	in-lbs(J)	ASTM D 3763	324(36.5)	321(35.1)	—	—	—	—	—
THERMAL									
HDT, 66 psi (0.45 MPa), 0.125" (3.2 mm) unannealed	°F(°C)	ASTM D 648	—	178(81)	—	—	—	—	194(90)
HDT, 66 psi (0.45 MPa), 0.250" (6.4 mm) unannealed	°F(°C)	ASTM D 648	—	—	—	—	190(88)	190(88)	195(91)
HDT, 264 psi (1.82 MPa), 0.125" (3.2 mm) unannealed	°F(°C)	ASTM D 648	162(72)	162(72)	168(75)	178(81)	162(72)	162(72)	168(76)
CTE, flow, -40°F to 100°F (-40 to 40°C)	in/in °F(m/m-°C)	ASTM E 831	—	—	—	6.2 E-5(11.2 E-5)	—	—	6.2 E-5(11.2 E-5)
Relative Thermal Index, Elec Prop	°C	UL 746B	60	60	60	60	60	60/90**	60/90**
Relative Thermal Index, Mech Prop with impact	°C	UL 746B	60	60	60	60	60	60/85**	60/85**
Relative Thermal Index, Mech Prop without impact	°C	UL 746B	60	60	60	60	60	60/90**	60/90**
PHYSICAL									
Specific Gravity, solid	—	ASTM D 792	1.21	1.14	1.20	1.15	1.21	1.21	1.19
Water Absorption, 24 hrs @ 73°F (23°C)	%	ASTM D 570	—	—	—	—	0.220	—	—
Mold Shrinkage, flow, 0.125" (3.2mm)	in/in E-3	ASTM D 955	5-7	5-7	5-7	5-8	5-8	5-8	5-8
Melt Flow Rate nom'l, 230°C/3.8 kgf (l)	g/10 min	ASTM D 1238	4.0	6.0	5.5	4.5	7.5	7.5	4.0
Melt Viscosity, 232°C, 100 sec ⁻¹	poise	ASTM D 3825	—	—	—	2,370	—	—	—
OPTICAL									
Gloss, untextured, 60 °	—	ASTM D 523	—	—	—	—	—	96	96
ELECTRICAL									
Volume Resistivity	ohm-cm(Ohm-m)	ASTM D 257	—	—	—	—	1.4 E14(1.4 E12)	1.4 E14(1.4 E12)	—
Dielectric Strength, in air, 62 mils	V/mil(kV/mm)	ASTM D 149	—	—	—	—	400(15.7)	400(15.7)	—
FLAME CHARACTERISTICS*									
UL 94 V-1 Flame Class Rating	in(mm)	UL 94	—	—	—	0.090(2.30)	—	—	—
UL 94 V-0 Flame Class Rating	in(mm)	UL 94	0.059(1.50)	0.090(2.30)	0.059(1.50)	0.118(3.0)	0.059(1.50)	0.058(1.47)	0.058(1.47)
UL 94 5VA Flame Class Rating	in(mm)	UL 94	0.098(2.50)	—	0.079(2.00)	—	0.108(2.75)	0.108(2.75)	0.108(2.75)
UL 95 5VB Flame Class Rating	in(mm)	UL 94	—	0.098(2.50)	—	0.090(2.30)	—	—	—
CSA (See File for complete listing)	File no.	CSA LISTED	LS88480	—	LS88480	—	LS88480	LS88480	LS88480
Oxygen Index (LOI)	%	ASTM D 2863	29.0	—	30.0	—	29.0	29.0	29.0
Radiant Panel Flame Spread Index, RP75	in(mm)	ASTM E 162	—	—	—	—	—	0.060(1.52)	0.060(1.52)

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**Consult UL guide for RTI by color.

Material Properties

CYCOLAC High Heat Resin Grades

X11

- automotive applications
- high heat
- high impact
- UL 94HB rating*

X17

- very high heat
- good moldability
- high modulus
- UL 94 HB rating*

Z48

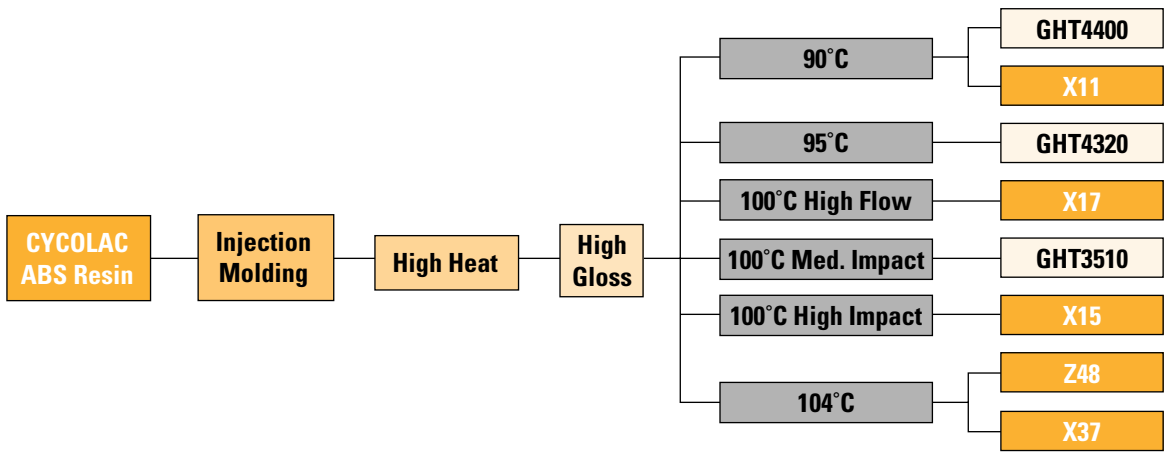
- automotive applications
- highest heat
- good moldability/
dimensional stability

X15

- automotive applications
- high heat
- very good impact
- improved processability
- UL 94 HB rating*

X37

- highest heat
- medium impact
- UL 94 HB rating*



*These ratings are not intended to reflect hazards presented by any material under actual fire conditions.

CYCOLAC ABS Resin

Typical Property Values - CYCOLAC High Heat Resin Grades							
PROPERTY	ENGLISH UNITS (SI UNITS)	TEST METHOD	CYCOLAC X11 resin	CYCOLAC X15 resin	CYCOLAC X17 resin	CYCOLAC X37 resin	CYCOLAC Z48 resin
MECHANICAL							
Tensile Strength, yield, Type 1, 0.125" (3.2mm)	psi(MPa)	ASTM D 638	6,000(41)	6,600(45)	7,200(50)	7,000(48)	6,800(47)
Tensile Modulus, Type 1, 0.125" (3.2mm)	psi(MPa)	ASTM D 638	300,000(2,070)	320,000(2,205)	350,000(2,410)	350,000(2,410)	330,000(2,275)
Flexural Strength, yield, Type 1, 0.125" (3.2mm)	psi(MPa)	ASTM D 790	10,000(69)	11,300(78)	12,500(86)	12,000(83)	12,000(83)
Flexural Modulus, 0.125" (3.2mm)	psi(MPa)	ASTM D 790	310,000(2,135)	340,000(2,345)	380,000(2,620)	350,000(2,410)	350,000(2,410)
Compressive Strength	psi(MPa)	ASTM D 695	7,200(50)	—	9,400(65)	8,600(59)	8,600(59)
Compressive Modulus	psi(MPa)	ASTM D 695	300,000(2,070)	—	380,000(2,620)	340,000(2,345)	340,000(2,345)
Hardness, Rockwell R	—	ASTM D 785	105	108	113	109	110
IMPACT							
Izod Impact, notched, 73°F (23°C)	ft-lb/in(J/m)	ASTM D 256	6.0(320)	5.0(267)	3.0(160)	4.0(214)	4.0(214)
Izod Impact, notched, -22°F (-30°C)	ft-lb/in(J/m)	ASTM D 256	2.0(107)	—	1.1(59)	—	—
Izod Impact, notched, -40°F (-40°C)	ft-lb/in(J/m)	ASTM D 256	1.6(85)	1.6(85)	0.7(37)	1.0(53)	1.0(53)
Gardner Impact, 73°F (23°C)	ft-lbs(J)	ASTM D 3029	—	—	—	10.0(14)	9.0(12)
THERMAL							
HDT, 66 psi (0.45 MPa), 0.125" (3.2 mm) unannealed	°F(°C)	ASTM D 648	208(98)	225(107)	226(108)	—	230(110)
HDT, 264 psi (1.82 MPa), 0.125" (3.2 mm) unannealed	°F(°C)	ASTM D 648	185(85)	202(94)	204(96)	—	210(99)
HDT, 264 psi (1.82 MPa), 0.250" (6.4 mm) unannealed	°F(°C)	ASTM D 648	194(90)	212(100)	214(101)	219(104)	219(104)
HDT, 66 psi (0.45 MPa), 0.250" (6.4 mm) unannealed	°F(°C)	ASTM D 648	—	230(110)	—	—	237(114)
CTE, flow, -40 to 100°F (-40 to 40°C)	in/in °F(m/m-°C)	ASTM E 831	5.1 E-5(9.2 E-5)	—	3.7 E-5(6.6 E-5)	4.4 E-5(7.9 E-5)	4.4 E-5(7.9 E-5)
Relative Thermal Index, Elec Prop	°C	UL 746B	60	60	60	60	—
Relative Thermal Index, Mech Prop with impact	°C	UL 746B	60	60	60	60	—
Relative Thermal Index, Mech Prop without impact	°C	UL 746B	60	60	60	60	—
PHYSICAL							
Specific Gravity, solid	—	ASTM D 792	1.04	1.05	1.05	1.05	1.05
Mold Shrinkage, flow, 0.125" (3.2 mm)	in/in E-3	ASTM D 955	5-8	5-8	5-8	5-8	5-8
Melt Flow Rate, nom'l 230°C/3.8 kgf (l)	g/10 min	ASTM D 1238	1.5	1.0	1.5	1.0	1.0
Melt Viscosity, 260°C, 1000 sec-1	poise	ASTM D 3825	2250	2250	2250	—	2550
ELECTRICAL							
Dielectric Strength	V/mil(kV/mm)	ASTM D 149	—	—	—	937(36.8)	—
FLAME CHARACTERISTICS*							
UL 94 HB Flame Class Rating	in(mm)	UL 94	0.058(1.47)	0.058(1.47)	0.058(1.47)	0.064(1.62)	—

*These ratings are not intended to reflect hazards presented by any material under actual fire conditions.

Material Properties

CYCOLAC High Heat Resin Grades (continued)

GHT3510

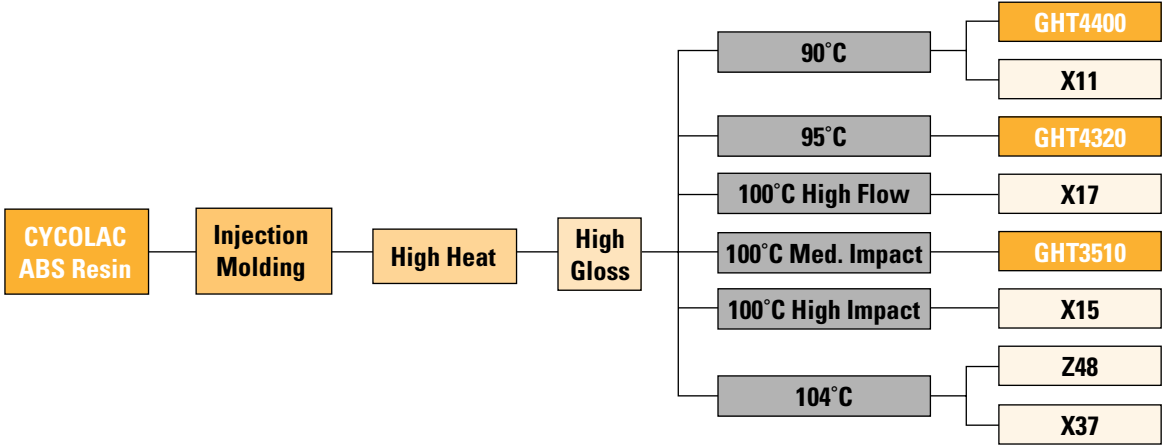
- very high heat
- medium impact

GHT4320

- automotive applications
- high heat
- UL 94 HB rating*

GHT4400

- automotive applications
- very good flow
- high heat



*This rating is not intended to reflect hazards presented by any material under actual fire conditions.

CYCOLAC ABS Resin

Typical Property Values - CYCOLAC High Heat Resin Grades					
PROPERTY	ENGLISH UNITS (SI UNITS)	TEST METHOD	CYCOLAC GHT3510 resin	CYCOLAC GHT4320 resin	CYCOLAC GHT4400 resin
MECHANICAL Tensile Strength, yield, Type 1, 0.125" (3.2mm) Tensile Modulus, Type 1, 0.125" (3.2mm) Flexural Strength, yield, Type 1, 0.125" (3.2mm) Flexural Modulus, 0.125" (3.2mm) Hardness, Rockwell R	psi(MPa) psi(MPa) psi(MPa) psi(MPa) —	ASTM D 638 ASTM D 638 ASTM D 790 ASTM D 790 ASTM D 785	6,600(45) 320,000(2,205) 11,300(78) 350,000(2,410) 109	7,400(51) 350,000(2,410) 12,500(86) 380,000(2,620) 115	6,500(45) 320,000(2,205) 11,000(76) 340,000(2,340) 109
IMPACT Izod Impact, notched, 73°F (23°C) Izod Impact, notched, -22°F (-30°C) Instrumented Impact Energy @ peak, 73°F (23°C)	ft-lb/in(J/m) ft-lb/in(J/m) in-lbs(J)	ASTM D 256 ASTM D 256 ASTM D 3763	4.5(240) 1.6(85) 120(14)	3.5(187) 1.1(59) 120(14)	6.0(320) 1.7(91) —
THERMAL HDT, 66 psi (0.45 MPa), 0.125" (3.2mm) unannealed HDT, 264 psi (1.82 MPa), 0.125" (3.2mm) unannealed HDT, 264 psi (1.82 MPa), 0.250" (6.4mm) unannealed Relative Thermal Index, Elec Prop Relative Thermal Index, Mech Prop with Impact Relative Thermal Index, Mech Prop without Impact	°F(°C) °F(°C) °F(°C) °C °C °C	ASTM D 648 ASTM D 648 ASTM D 648 UL 746 B UL 746 B UL 746 B	223(106) 199(93) 210(99) — — —	217(103) 194(90) 203(95) 60 60 60	207(97) 185(85) 197(92) — — —
PHYSICAL Specific Gravity, solid Mold Shrinkage, flow, 0.125" (3.2mm) Melt Viscosity, 260°C, 1000 sec-1 Melt Flow Rate, nom'l 220°C/10.0 kgf	— in/in E-3 poise g/10 min	ASTM D 792 ASTM D 955 — ASTM D 1238	1.05 5-8 2,250 4.5	1.05 5-8 2,000 8.0	1.04 5-8 1,900 11.5
FLAME CHARACTERISTICS* UL 94 HB Flame Class Rating	in(mm)	UL 94	—	0.059(1.50)	—

*This rating is not intended to reflect hazards presented by any material under actual fire conditions.

Material Properties

CYCOLAC Automotive Resin Grades

GDT2510

- low gloss
- high heat
- good processability
- precolored and natural available

GDT6400

- low gloss
- unpainted interior applications
- precolored available

GPT3800

- super high impact
- interior applications
- precolored and natural available

GPT5500

- large part applications
- precolored and natural available

AR

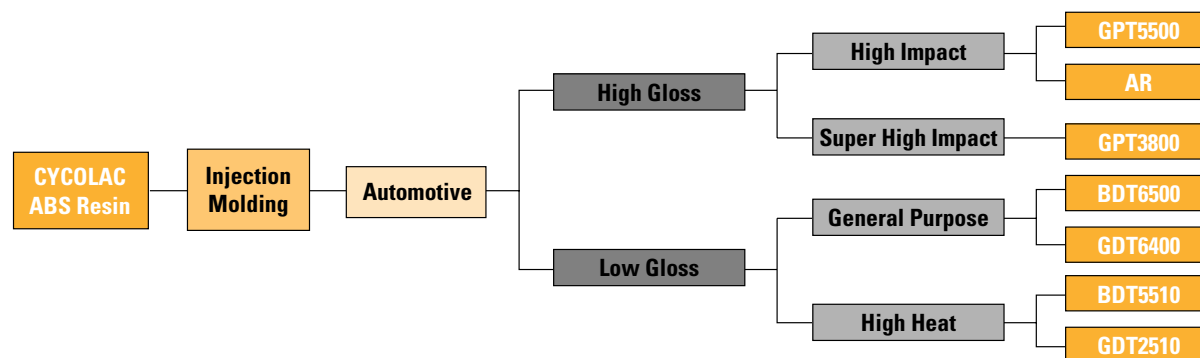
- good toughness/rigidity/flow
- precolored available

BDT5510

- high heat
- low gloss
- interior applications
- color concentratable natural only

BDT6500

- low gloss
- high flow
- color concentratable natural only



CYCOLAC ABS Resin

Typical Property Values - CYCOLAC Automotive Resin Grades									
PROPERTY	ENGLISH UNITS (SI UNITS)	TEST METHOD	CYCOLAC GDT2510 resin	CYCOLAC GDT6400 resin	CYCOLAC GPT3800 resin	CYCOLAC GPT5500 resin	CYCOLAC AR resin	CYCOLAC BDT5510 resin	CYCOLAC BDT6500 resin
MECHANICAL									
Tensile Strength, yield, Type 1, 0.125" (3.2mm)	psi(MPa)	ASTM D 638	6,600(46)	6,500(45)	5,200(36)	6,100(42)	7,000(48)	7,700(53)	7,000(48)
Tensile Modulus, Type 1, 0.125" (3.2mm)	psi(MPa)	ASTM D 638	305,000(2,100)	320,000(2,205)	260,000(1,790)	340,000(2,345)	330,000(2,275)	330,000(2,275)	320,000(2,205)
Flexural Strength, yield, Type 1, 0.125" (3.2mm)	psi(MPa)	ASTM D 790	10,500(72)	10,200(70)	8,400(58)	10,500(72)	11,800(81)	11,700(81)	10,500(72)
Flexural Modulus, 0.125" (3.2mm)	psi(MPa)	ASTM D 790	325,000(2,240)	320,000(2,205)	260,000(1,790)	370,000(2,550)	350,000(2,410)	357,000(2,460)	350,000(2,410)
Hardness, Rockwell R	—	ASTM D 785	105	—	—	109	108	—	—
IMPACT									
Izod Impact, notched, 73°F (23°C)	ft-lb/in(J/m)	ASTM D 256	5.0(267)	4.7(251)	9.0(481)	5.2(278)	5.5(294)	5.5(294)	3.5(187)
Izod Impact, notched, -40°F (-40°C)	ft-lb/in(J/m)	ASTM D 256	—	—	—	—	1.4(75)	—	—
Instrumented Impact Energy @ peak, 73°F (23°C)	ft-lbs(J)	ASTM D 3763	—	21.8(30)	—	—	—	—	—
Instrumented Impact Energy @ peak, -22°F (-30°C)	ft-lbs(J)	ASTM D 3763	—	8.5(12)	—	—	—	—	—
THERMAL									
HDT, 66psi (0.45 MPa), 0.125" (3.2mm) unannealed	°F(°C)	ASTM D 648	211(99)	198(92)	192(88)	—	201(94)	208(98)	201(94)
HDT, 66 psi (0.45 MPa), 0.250" (6.4mm) unannealed	°F(°C)	ASTM D 648	—	—	—	205(96)	205(96)	—	—
HDT, 264 psi (1.82 MPa), 0.125" (3.2mm) unannealed	°F(°C)	ASTM D 648	190(88)	174(79)	168(76)	173(78)	174(79)	187(86)	178(81)
HDT, 264 psi (1.82 MPa), 0.250" (6.4mm) unannealed	°F(°C)	ASTM D 648	198(92)	182(83)	—	187(86)	185(85)	193(89)	185(85)
CTE flow -40°F to 140°F (-40°C to 60°C)	in/in-°F(m/m-°C)	ASTM E 831	—	8.6 E-5 (16 E-5)	—	—	—	7.5 E-5 (14 E-5)	8.6 E-5 (16 E-5)
Relative Thermal Index, Elec Prop	°C	UL 746B	—	60	—	—	60	—	—
Relative Thermal Index, Mech Prop with impact	°C	UL 746B	—	60	—	—	60	—	—
Relative Thermal index, Mech Prop without impact	°C	UL 746B	—	60	—	—	60	—	—
PHYSICAL									
Specific Gravity, solid	—	ASTM D 792	1.05	1.05	1.02	1.04	1.04	1.05	1.05
Mold Shrinkage, flow, 0.125" (3.2mm)	in/in E-3	ASTM D 955	5-8	5-8	5-8	5-8	5-8	5-8	5-8
Melt Flow Rate, nom'l 230°C/3.8 kgf	g/10 min	ASTM D 1238	—	—	—	6.5	5.5	3.2	3.3
Melt Flow Rate, nom'l 220°C/10.0 kgf	g/10 min	ASTM D 1238	6.0	16.0	—	—	—	—	—
Melt Viscosity, 260°C, 1000 sec-1	poise	—	2,200	1,600	2,000	1,600	1,700	1,630	1,550
OPTICAL									
Gloss, untextured, 60 °	—	ASTM D 523	25	—	90-95	—	—	25	25
FLAME CHARACTERISTICS*									
UL 94 HB Flame Class Rating	in(mm)	UL 94	—	0.059(1.50)	—	—	0.058(1.47)	—	—
FMVSS 302 Burn Rate on 0.100" (nominal)	in/min	GEP 530D	—	0.8	—	—	—	1.5	0.8
FMVSS 302 Burn Rate on 0.050" (nominal)	in/min	GEP 530B	—	1.5	—	—	—	2.6	1.5

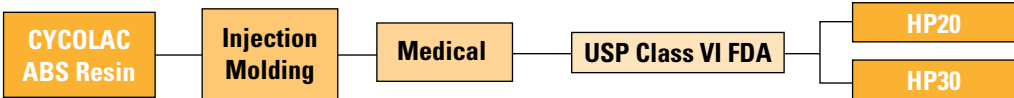
*These ratings are not intended to reflect hazards presented by any material under actual fire conditions.

Material Properties

CYCOLAC Medical Resin Grades

- HP20**
 - very high flow
 - color stable
 - sterilizable
 - USP Class VI
 - FDA repeat use food contact

HP30
 - high flow
 - color stable
 - sterilizable
 - USP Class VI
 - FDA repeat use food contact



Typical Property Values - CYCOLAC Medical Resin Grades				
PROPERTY	ENGLISH UNITS (SI UNITS)	TEST METHOD	CYCOLAC HP20 resin	CYCOLAC HP30 resin
MECHANICAL Tensile Strength, yield, Type 1, 0.125" (3.2 mm) Tensile Modulus, Type 1, 0.125" (3.2 mm) Flexural Strength, yield, Type I, 0.125" (3.2 mm) Flexural Modulus, 0.125" (3.2 mm) Hardness, Rockwell R	psi(MPa) psi(MPa) psi(MPa) psi(MPa) —	ASTM D 638 ASTM D 638 ASTM D 790 ASTM D 790 ASTM D 785	6,400(44) 340,000(2,345) 11,000(76) 360,000(2,480) 110	6,900(48) 360,000(2,480) 11,000(76) 380,000(2,620) 110
IMPACT Izod Impact, notched, 73°F (23°C)	ft-lb/in(J/m)	ASTM D 256	4.5(240)	5.0(267)
THERMAL HDT, 264 psi (1.82 MPa), 0.125" (3.2 mm) unannealed HDT, 66 psi (0.45 MPa), 0.250" (6.4 mm), unannealed	°F(°C) °F(°C)	ASTM D 648 ASTM D 648	178(81) 205(96)	178(81) 205(96)
PHYSICAL Specific Gravity, solid Mold Shrinkage, flow, 0.125" (3.2 mm) Melt Flow Rate, nom'l 230°C/3.8 kgf(1)	— in/in E-3 g/10 min	ASTM D 792 ASTM D 955 ASTM D 1238	1.04 5-8 13.0	1.04 5-8 7.0

CYCOLAC ABS Resin

CYCOLAC Electroplatable Resin Grades

EP

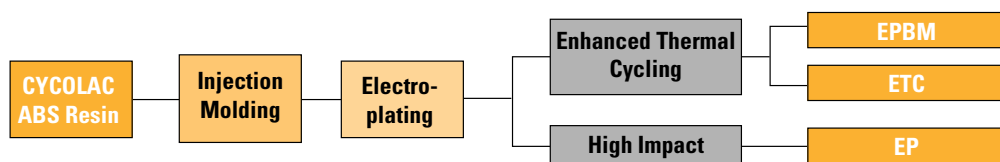
- high impact
- available in grey (3510) only

EPBM

- best thermal cycling of CYCOLAC resins
- high modulus
- available in grey (3570) only

ETC

- automotive applications
- high impact
- available in grey (3540) and black (4051)



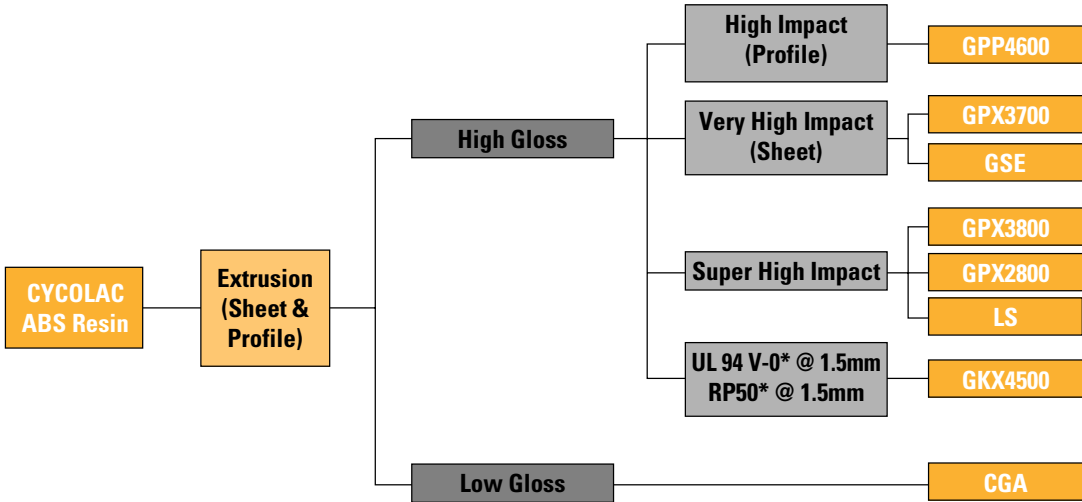
Typical Property Values - CYCOLAC Electroplatable Resin Grades					
PROPERTY	ENGLISH UNITS (SI UNITS)	TEST METHOD	CYCOLAC EP resin	CYCOLAC EPBM resin	CYCOLAC ETC resin
MECHANICAL Tensile Strength, yield, Type 1, 0.125" (3.2mm) Tensile Modulus, Type 1, 0.125" (3.2mm) Flexural Strength, yield, Type 1, 0.125" (3.2mm) Flexural Modulus, 0.125" (3.2mm) Hardness, Rockwell R	psi(MPa) psi(MPa) psi(MPa) psi(MPa) —	ASTM D 638 ASTM D 638 ASTM D 790 ASTM D 790 ASTM D 795	5,500(38) 300,000(2,070) 10,000(69) 340,000(2,345) 105	6,900(48) 370,000(2,550) 12,800(88) 380,000(2,620) 113	6,400(44) 330,000(2,275) 10,500(72) 350,000(2,410) 106
IMPACT Izod Impact, notched, 73°F (23°C) Izod Impact, notched, -22°F (-30°C)	ft-lb/in(J/m) ft-lb/in(J/m)	ASTM D 256 ASTM D 256	7.0(374) 1.3(69)	6.0(320) 1.0(53)	7.0(374) 1.5(80)
THERMAL HDT, 66 psi (0.45 MPa), 0.125" (3.2 mm), unannealed HDT, 264 psi (1.82 MPa), 0.125" (3.2 mm), unannealed HDT, 66 psi (0.45 MPa), 0.250" (6.4 mm), unannealed CTE, flow, -40°F to 100°F (-40°C to 40°C) Relative Thermal Index, Elec Prop Relative Thermal Index, Mech Prop with impact Relative Thermal Index, Mech Prop without impact	°F(°C) °F(°C) °F(°C) in/in-°F(m/m-°C) °C °C °C	ASTM D 648 ASTM D 648 ASTM D 648 ASTM E 831 UL 746B UL 746B UL 746B	201(94) 180(82) 207(97) 3.8 E-5(6.8 E-5) 60 60 60	205(96) 185(85) 210(99) 3.6 E-5(6.5 E-5) 60 60 60	201(94) 178(81) 205(96) 3.9 E-5(7.0 E-5) — — —
PHYSICAL Specific Gravity, solid Mold Shrinkage, flow, 0.125" (3.2mm) Melt Flow Rate, nom'l 230°C/3.8 kgf	— in/in E-3 g/10 min	ASTM D 792 ASTM D 955 ASTM D 1238	1.04 5-8 6.5	1.05 4-6 6.0	1.04 5-8 4.5
FLAME CHARACTERISTICS* UL 94 HB Flame Class Rating Oxygen Index, (LOI)	in(mm) %	UL 94 ASTM D 2863	0.058(1.47) 19.0	0.059(1.50) —	— —

*These ratings are not intended to reflect hazards presented by any material under actual fire conditions.

Material Properties

CYCOLAC Extrusion Resin Grades

GPX2800 • super high impact • good processability	CGA • extrusion/ thermoforming • low gloss	GKX4500 • UL V-0 rated* • very good processing and sheet aesthetics
GPX3700 • high impact • very good processability	GSE • very good toughness • good formability • high gloss	
GPX3800 • super high impact • very good processability	LS • toughness • high gloss	
GPP4600 • profile extrusion grade for coextrusion • suggested for substrate only		



*This rating is not intended to reflect hazards presented by any material under actual fire conditions.

CYCOLAC ABS Resin

Typical Property Values - CYCOLAC Extrusion Resin Grades										
PROPERTY	ENGLISH UNITS (SI UNITS)	TEST METHOD	CYCOLAC GPX2800 resin	CYCOLAC GPX3700 resin	CYCOLAC GPX3800 resin	CYCOLAC GPP4600 resin	CYCOLAC CGA resin	CYCOLAC GSE resin	CYCOLAC LS resin	CYCOLAC GKX4500 resin
MECHANICAL										
Tensile Strength, yield, Type 1, 0.125" (3.2mm)	psi(MPa)	ASTM D 638	4,800(33)	6,100(42)	5,400(37)	6,800(47)	4,200 (29)	6,500(45)	5,200(36)	5,700(39)
Tensile Modulus, Type 1, 0.125" (3.2mm)	psi(MPa)	ASTM D 638	240,000(1,655)	310,000(2,135)	280,000(1,930)	380,000(2,755)	240,000(1,655)	320,000(2,205)	260,000(1,790)	300,000(2,070)
Flexural Strength, yield, Type 1, 0.125" (3.2mm)	psi(MPa)	ASTM D 790	8,200(56)	10,500(72)	9,600(66)	12,500(86)	7,600(52)	11,000(76)	8,500(59)	9,400(65)
Flexural Modulus, 0.125" (3.2mm)	psi(MPa)	ASTM D 790	240,000(1,655)	340,000(2,345)	300,000(2,070)	380,000(2,755)	240,000(1,655)	330,000(2,275)	260,000(1,790)	300,000(2,070)
Hardness, Rockwell R	—	ASTM D 785	92	105	99	112	81	105	94	—
IMPACT										
Izod Impact, notched, 73°F (23°C)	ft-lb/in(J/m)	ASTM D 256	8.6(459)	7.7(411)	8.4(449)	6.0(320)	8.0(427)	7.0(374)	8.5(454)	5.2(278)
Izod Impact, notched, -40°F (-40°C)	ft-lb/in(J/m)	ASTM D 256	4.5(240)	2.7(144)	3.5(187)	—	1.6(85)	—	2.5(134)	—
Falling Dart Impact, 73°F (23°C), 0.125" (3.2 mm)	ft-lbs(J)	GE	38(52)	33(48)	35(47)	30(41)	—	—	—	26(35)
Falling Dart Impact, -40°F (-40°C), 0.125" (3.2 mm)	ft-lbs(J)	GE	26(35)	12(16)	23(31)	—	18(24)	19(26)	30(41)	—
THERMAL										
HDT, 66 psi (0.45 Mpa), 0.125" (3.2 mm), unannealed	°F(°C)	ASTM D 648	—	—	—	—	—	203(95)	—	—
HDT, 66 psi (0.45 Mpa), 0.250" (6.4 mm), unannealed	°F(°C)	ASTM D 648	199(93)	203(95)	201(94)	210(99)	199(93)	208(98)	203(95)	188(87)
CTE, flow, -40°F to 200°F (-40°C to 93°C)	in/in-°F(m/m-°C)	ASTM E 831	6.0 E-5(10.8 E-5)	4.1 E-5(7.4 E-5)	5.1 E-5(9.2 E-5)	3.6 E-5(6.48 E-5)	6.1 E-5(11 E-5)	5.3E-5(9.5 E-5)	6.0E-5(11 E-5)	—
Relative Thermal Index, Elec Prop	°C	UL 746B	60	60	60/80**	—	60	60	60	60
Relative Thermal Index, Mech Prop with impact	°C	UL 746B	60	60	60/80**	—	60	60	60	60
Relative Thermal Index, Mech Prop without impact	°C	UL 746B	60	60	60/80**	—	60	60	60	60
PHYSICAL										
Specific Gravity, solid	—	ASTM D 792	1.02	1.04	1.03	1.05	1.02	1.04	1.02	1.22
Mold Shrinkage, flow, 0.125" (3.2mm)	in/in E-3	ASTM D 955	5-8	5-8	5-8	5-8	5-8	5-8	5-8	—
Melt Viscosity, 232°C, 100 sec ⁻¹	poise	—	19,700	16,000	17,400	—	—	—	—	—
Melt Flow Rate, nom'l 220°C/ 10.0 kgf	g/10 min	ASTM D 1238	2.5	—	3.5	—	—	—	—	—
Melt Flow Rate, nom'l 230°C/ 3.8 kgf	g/10 min	ASTM D 1238	—	1.2	—	—	—	2.5	1.0	—
OPTICAL										
Gloss, untextured, 60°, Extruded Sheet	—	ASTM D 523	96	98	97	97	16	90	90	90
FLAME CHARACTERISTICS*										
UL 94 HB Flame Class Rating	in(mm)	UL 94	0.062(1.57)	0.062(1.57)	0.059(1.50)	—	0.059(1.50)	0.058(1.47)	0.058(1.47)	—
UL 94 V-0 Flame Class Rating	in(mm)	UL 94	—	—	—	—	—	—	—	0.059 (1.50)
UL 94 5VA Flame Class Rating	in(mm)	UL 94	—	—	—	—	—	—	—	0.118 (3.00)
UL 94 5VB Flame Class Rating	in(mm)	UL 94	—	—	—	—	—	—	—	0.098 (2.50)

*These ratings are not intended to reflect hazards presented by any material under actual fire conditions.

** Consult UL guide for RTI by color.

Material Properties

CYCOLAC Specialty Pipe Resin Grades

GPP3900

- pipe extrusion applications
- drain, waste and vent pipe fittings
- NSF compliant
- available in black (BK1122N) only

LDM

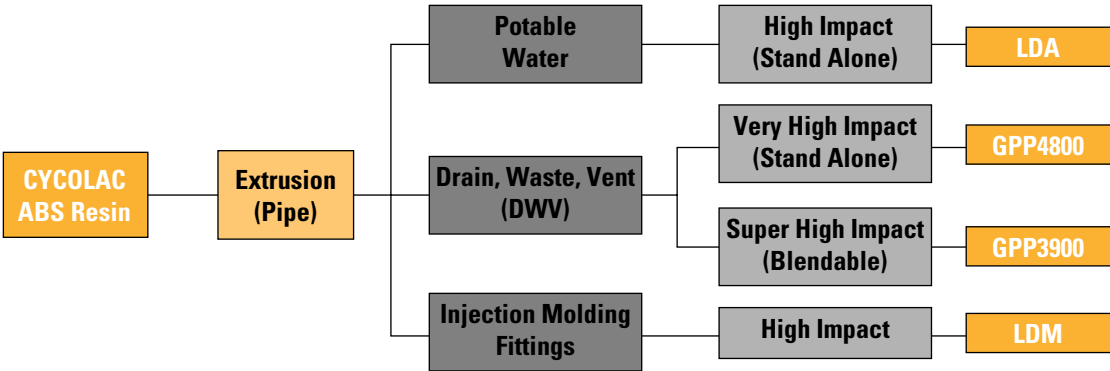
- pipe fitting applications
- high flow
- NSF compliant
- available in black (BK1122N) only

GPP4800

- pipe extrusion applications
- drain, waste and vent pipe
- NSF compliant
- available in black (BK1122N) only

LDA

- potable water applications
- NSF compliant
- available in black (4102N) only



Typical Property Values - CYCOLAC Specialty Pipe Resin Grades						
PROPERTY	ENGLISH UNITS (SI UNITS)	TEST METHOD	CYCOLAC GPP3900 resin	CYCOLAC LDA resin	CYCOLAC LDM resin	CYCOLAC GPP4800 resin
MECHANICAL Tensile Strength, yield, Type 1, 0.125" (3.2mm) Tensile Modulus, Type 1, 0.125" (3.2mm) Flexural Strength, yield, Type 1, 0.125" (3.2mm) Flexural Modulus, 0.125" (3.2mm) Hardness, Rockwell R	psi(MPa) psi(MPa) psi(MPa) psi(MPa) —	ASTM D 638 ASTM D 638 ASTM D 790 ASTM D 790 ASTM D 785	5,700(39) 270,000(1,860) 9,300(64) 300,000(2,070) 99	5,000 (34) 260,000 (1,790) 8,500 (59) 270,000 (1,860) —	7,000(48) 340,000(2,345) 11,500(79) 360,000(2,480) —	5,200(36) 273,000(1,800) 8,500(59) 267,000(1,840) —
IMPACT Izod Impact, notched, 73°F (23°C) Izod Impact, notched, -22°F (-30°C)	ft-lb/in(J/m) ft-lb/in(J/m)	ASTM D 256 ASTM D 256	8.4(449) 3.5(187)	8.5(456) 4.5(240)	7.5(400) 2.4(128)	8.3(443) 3.8(203)
THERMAL HDT, 66 psi (0.45 MPa), 0.250" (6.4 mm), unannealed HDT, 264 psi (1.82 MPa), 0.125" (3.2mm), unannealed	°F(°C) °F(°C)	ASTM D 1238 ASTM D 648	199(93) 174(79)	203(95) 174(79)	207(97) 178(81)	199(93) 174(79)
PHYSICAL Specific Gravity, solid Mold Shrinkage, flow, 0.125" (3.2mm) Melt Flow Rate, nom'l 220°C/ 10.0 kgf Melt Flow Rate, nom'l 230°C/ 3.8 kgf	— in/in E-3 g/10 min g/10 min	ASTM D 792 ASTM D 955 ASTM D 1238 ASTM D 1238	1.05 5-8 3.0 —	1.02 5-8 — 1.1	1.05 5-8 16.0 6.3	1.03 5-8 9.1 —

CYCOLAC ABS Resin

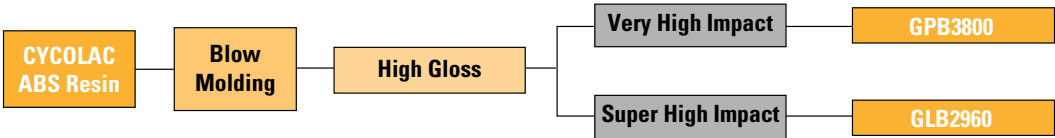
CYCOLAC Blow Molding Resin Grades

GPB3800

- high modulus
- very high impact
- very good melt strength

GLB2960

- super high impact
- very good low temperature impact
- very good melt strength



Typical Property Values - CYCOLAC Blow Molding Resin Grades				
PROPERTY	ENGLISH UNITS (SI UNITS)	TEST METHOD	CYCOLAC GPB3800 resin	CYCOLAC GLB2960 resin
MECHANICAL Tensile Strength, yield, Type 1, 0.125" (3.2mm) Tensile Modulus, Type 1, 0.125" (3.2mm) Flexural Strength, yield, Type 1, 0.125" (3.2mm) Flexural Modulus, 0.125" (3.2mm) Hardness, Rockwell R	psi(MPa) psi(MPa) psi(MPa) psi(MPa) —	ASTM D 638 ASTM D 638 ASTM D 790 ASTM D 790 ASTM D 785	6,100(42) 310,000(2,135) 10,500(72) 340,000(2,345) 105	4,800(33) 240,000(1,655) 8,200(56) 240,000(1,655) 92
IMPACT Izod Impact, notched, 73°F (23°C) Izod Impact, notched, -40°F (-40°C) Falling Dart Impact, 73°F (23°C)	ft-lb/in(J/m) ft-lb/in(J/m) ft-lbs(J)	ASTM D 256 ASTM D 256 GE	7.7(411) 2.7(144) 33(45)	8.6(459) 4.5(240) 38(52)
THERMAL HDT, 66 psi (0.45 MPa), 0.250" (6.4 mm), unannealed CTE, flow, -40°F to 100°F (-40°C to 40°C) Relative Thermal Index, Elec Prop Relative Thermal Index, Mech Prop with impact Relative Thermal Index, MechProp without impact	°F(°C) in/in-°F(m/m-°C) °C °C °C	ASTM D 648 ASTM E 831 UL 746B UL 746B UL 746B	203(95) 4.1 E-5(7.4 E-5) 60 60 60	199(93) 6.0 E-5(10.8 E-5) 60 60 60
PHYSICAL Specific Gravity, solid Mold Shrinkage, flow, 0.125" (3.2mm) Melt Viscosity, 232°C, 100 sec-1	— in/in E-3 poise	ASTM D 792 ASTM D 955 ASTM D 3825	1.04 5-8 16,000	1.02 5-8 19,700
FLAME CHARACTERISTICS* UL 94 HB Flame Class Rating	in(mm)	UL 94	0.062(1.57)	0.062(1.57)

*This rating is not intended to reflect hazards presented by any material under actual fire conditions.

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