



**ONCOLOR™**  
**UL 94 COLORANTS**



# DESIGN & SAFETY

High-impact colors and cutting-edge design are hugely important to the success of today's sleek, modern electrical and electronic products. At the same time, manufacturers also need to consider product safety and regulatory compliance. Avient can help in both these critical areas.

OnColor™ UL 94 colorants\* for Electrical & Electronic (E&E) applications allow fast, cost-efficient project management combined with all the advantages of in-house coloration. The comprehensive concentrate portfolio provided by Avient meets customer requirements and improves the safety for consumers of electrical and electronic devices.



\* Solutions also sold as Renol™ UL 94 Colorants



# IMPORTANCE OF UL 94

There are two major established norms in the E&E industry that relate to plastics flammability: the IEC 60695 standard and the UL 94 standard. They apply to, among other things, electrical appliances, power electronics, smart buildings and grid infrastructure, electronic/electrical connectors and Electric Vehicle charging infrastructure. Through compliance with these standards, the risk of fire can be minimized in case of failure in the conductive part. Each one specifies its own fire hazard tests and fail/pass criteria, which depend on the fire resistance required for the plastic part.

Compliance to IEC 60695 part 2-11 for the end product and parts 2-12 and 2-13 for materials is required in Europe—and increasingly in other regions—for certain electrical and electronic applications. The fire hazard tests specified in this standard are known as Glow-Wire (GW) tests. Avient offers concentrates to fulfill different levels of Glow Wire temperatures. The UL 94 standard, which was originally a national standard in the USA, has gained international acceptance and is now widely used to classify plastic products and how they burn. The most common tests specified by UL 94 are the vertical burning (V-0; V-1; V-2) test and horizontal burning (HB) test.

## ONCOLOR™ UL 94 COLORANTS

In order to have a concentrate recognized by UL, the following conditions must be met:

- the color concentrate producer must be recognized by UL
- the polymer, generic or specific, must be recognized as well
- the recognition of the material combination (base resin + color concentrate) must be listed in the QMSQ2 file of the concentrate producer

- the specification limits set in the QMSQ2 file must be respected if the UL 94 recognition is to apply to the final plastic part

Avient has a wide range of color and cost options available to provide maximum flexibility. All of this is backed by project management and technical support around the world through more than 100 facilities.

## HOW TO USE THE TABLES

The tables in the next pages contain all Avient UL 94 recognized color concentrates published on UL prospector until March 2021. For most updated information please refer to Avient UL recognized color concentrate file QMSQ2 E73454.

For all HB references, the color concentrates are listed with reference to resin chemistry, which enables total flexibility of choice for the resin grade.

For V-0, V-1, V-2, 5VA and 5VB, the color concentrates have to be listed with reference to

specific resin grades. Once a specific resin has been identified for your needs, you can check in the table whether Avient has already concentrates listed for the corresponding supplier and under which conditions of use (minimum thickness, exact rating and maximum let-down ratio).

If the required resin is not listed under Avient concentrates, please contact an Avient representative to discuss more options.

GENERIC RESIN TYPE	FLAME RATING	MINIMUM THICKNESS (MM)	MAXIMUM LET-DOWN RATIO
Acetal Copolymer (POM)	HB	1.50	1:20
Acrylonitrile Butadiene Styrene (ABS)	HB	1.50	1:10
Ethylene Propylene Thermoplastic Rubber (EPTR)	HB	1.50	1:20
High Impact Polystyrene (HIPS)	HB	1.50	1:10
Liquid Crystal Polymer (LCP)	HB	0.83	1:10
Polyamide (PA)	HB	3.20	1:33
Polyamide (PA66 and PA 4/6)	HB	0.81	1:20
Polyamide 6 (PA6)	HB	0.75	1:25
Polyamide 66 (PA66)	HB	0.40	1:40
Polybutylene Terephthalate (PBT)	HB	0.81	1:20
Polybutylene Terephthalate/Polycarbonate (PBT/PC)	HB	1.50	1:10
Polycarbonate (PC)	HB	1.50	1:15
Polycarbonate/Acrylonitrile Butadiene Styrene (PC/ABS)	HB	1.50	1:20
Polycarbonate/Polyethylene Terephthalate (PC/PET)	HB	1.50	1:20
Polyethylene (PE)	HB	1.50	1:50
Polyethylene Terephthalate (PET)	HB	0.80	1:16.7
Polyketone	HB	1.50	1:20
Polymethyl Methacrylate (PMMA)	HB	3.00	1:25
Polypropylene (PP)	HB	1.50	1:15
Polystyrene (PS)	HB	0.83	1:15
Polyurethane (PUR)	HB	1.50	1:25
Polyvinylchloride (PVC)	HB	1.50	1:20
Styrene Acrylonitrile (SAN)	HB	1.50	1:20
Thermoplastic Elastomer (TPE)	HB	0.75	1:25

# UL 94 V-0, V-1, V-2

## ASCEND

GENERIC RESIN TYPE	SPECIFIC BASE RESIN	MINIMUM THICKNESS (MM)	FLAME RATING	MAXIMUM LET-DOWN RATIO
Polyamide 66 (PA66)	21X1(a)(f2), 21SPC1(a)(f2), 21SPF1(a)(f2), 21SPG1(a)(f2), 21SPM1(a)(f2), 20NSP1(a)(f2)	0.75	V-2	1:40
	22HSP(e)	0.75	V-2	1:40
	64C-R	3.0	V-2	1:50
	ECO366(e)	0.4	V-0	1:40
	ECO366H(e)	0.2	V-0	1:25
	FR350J	0.4	V-0	1:25
	20NSP(a)(f2), 21SPF(a)(f2), 21SPM(a)(f2), 21SPC(a)(f2)	0.4	V-2	1:40
	20NSP(a)(h)(f2), 21SPF(a)(h)(f2), 21SPM(a)(h)(f2), 21SPC(a)(h)(f2)	1.5	V-2	1:20
Polyamide 66/6 (PA66/6)	ECO315(e), ECO315J(e)	0.4	V-0	1:40
	M344	3.0	V-0	1:25
	909	0.75	V-0	1:25



# UL 94 V-0, V-1, V-2

## BASF

GENERIC RESIN TYPE	SPECIFIC BASE RESIN	MINIMUM THICKNESS (MM)	FLAME RATING	MAXIMUM LET-DOWN RATIO
Polyamide 6 (PA6)	8202(t1), 8202 Blend (t1)	0.71	V-2	1:25
	8202C(t1), 8202C BLEND (t1)	1.50	V-2	1:25
	8202CHS(t1) (t3), 8202C HS Blend	1.50	V-2	1:25
	8202HS(t1)	1.50	V-2	1:25
	B3S	0.80	V-2	1:25
		1.50	V-2	1:25
	B3S Q661	1.50	V-2	1:25
	B3S R03	1.50	V-2	1:25
8232G HSEFR(t9), B3U10G5 (t9)	1.50	V-0	1:25	
Polyamide 6/66 (PA6/66)	C3U (m)	0.40	V-0	1:25
	KR4205(m), C3U (m), C3U (t)(m)	0.40	V-0	1:25
	KR4205, C3U	0.40	V-0	1:25
Polyamide 66 (PA66)	1000(b), 1310-(b), Ultramid A3K Q603(+)	1.50	V-2	1:10
	A3K (o) Q790(g)(f2)	0.41	V-2	1:20
	A3K(f2), A3K Q601(f2)	0.41	V-2	1:20
	A3SK	0.41	V-2	1:25
	A5	3.00	V-2	1:33
	A3W(f1), A3W FC (f1)	0.75	V-2	1:10
	A3K R01 (t)(g)(f2)	0.40	V-2	1:20
Polybutylene Terephthalate (PBT)	B4406 G2 (o) Q798	1.50	V-0	1:20
	B4406 G2(a), B4406 G2 (o) Q717(a)	1.50	V-0	1:20
	B4406 G3 (o) Q798	1.50	V-0	1:20
	B4406 G3(a), B4406 G3 (o) Q717(a)	1.50	V-0	1:20
	B4406 G4 (o) Q798	1.50	V-0	1:20
	B4406 G4(a2), B4406 G4 (o) Q717(a2)	1.50	V-0	1:20
	B4406 G6 (o) Q798	3.00	V-0	1:12.5
	B4406 G6(%)	1.50	V-0	1:20
	B4406 G6(a1), B4406 G6 (o) Q717(a1), B4406 G6 (o) Q717 High Speed(a1)	1.50	V-0	1:20
	B4406(a), B4406 (o) Q717(a)	1.50	V-0	1:20
	B4406@	1.50	V-0	1:20
	B4450 G5, B4450 G5 (t)	0.40	V-2	1:50
Polyurethane (PUR)	11 85 A(a) FHF 000 (f2)	0.75	V-0	1:33

# UL 94 V-0, V-1, V-2

## CELANESE

GENERIC RESIN TYPE	SPECIFIC BASE RESIN	MINIMUM THICKNESS (MM)	FLAME RATING	MAXIMUM LET-DOWN RATIO
Liquid Crystal Polymer (LCP)	A130(+), MT1310	1.50	V-0	1:40
Polyamide (PA)	132F(+)(f1), 135F(+)(f1)	0.75	V-2	1:20
	HTNFR42G30NH	0.40	V-0	1:25
Polyamide 6/12 (PA6/12)	151, 151L	1.50	V-2	1:25
Polyamide 66 (PA66)	A3 GF 25 V0XI	0.40	V-0	1:25
	101(r9)(f1), 101F(r9)(f1), 101L(r9)(f1)	0.75	V-2	1:20
	103FHS(+), 103HSL(+)	0.75	V-2	1:20
	FR50(+)(f1)	0.35	V-0	1:20
	FR7025V0F(+)	0.50	V-0	1:33
Polyamide 66/6 (PA66/6)	FR72G25V0	0.80	V-0	1:25
Polyamide 66/6T (PA66/6T)	FR95G25V0NH	0.40	V-0	1:25
	HTNFR52G30BL(r3)	0.75	V-0	1:33
	HTNFR52G30L(+), HTNFR52G30(+)	0.75	V-0	1:33
	HTNFR52G30NH(r6)	0.40	V-0	1:25
		0.75	V-0	1:10
	HTNFR52G35BL	0.75	V-0	1:25
	HTNFR52G35(+), HTNFR52G35	0.75	V-0	1:33
Polyamide 6T/MPMDT	HTNFR51G35L(+)	0.81	V-0	1:33
Polybutylene Terephthalate (PBT)	2016(b)	1.50	V-0	1:20
	3116(b)	1.50	V-0	1:20
	3216(b)	1.50	V-0	1:20
	3316(b)	1.50	V-0	1:20
	3316HF	1.50	V-0	1:20
	LW9030FR	1.50	V-0	1:25
	T841FR (r4)	1.50	V-0	1:25
Polyethylene Terephthalate (PET)	FR530(l)(+)(f1), FR530L(l)(+)(f1)	0.75	V-0	1:25
Thermoplastic Elastomer (TPE)	HTR8068	1.60	V-0	1:25

# UL 94 V-0, V-1, V-2

## COVESTRO

GENERIC RESIN TYPE	SPECIFIC BASE RESIN	MINIMUM THICKNESS (MM)	FLAME RATING	MAXIMUM LET-DOWN RATIO
Polycarbonate (PC)	2407 + (z)(f1)	0.75-2.60	V-2	1:10
	2807 + MAS183	0.75	V-2	1:25
	6455 + (z)	3.00	V-0	1:25
		1.50	V-2	1:25
	6485 + (z)(f1)	1.50	V-0	1:25
Polycarbonate/ Acrylonitrile Butadiene Styrene (PC/ABS)	FR110 +	1.50	V-0	1:33
	FR3005 HF + (z), FR3005 HF + BBS314	1.50	V-0	1:12.5
	FR3010 + (z)	3.00	V-0	1:25
		1.50	V-0	1:25
	FR3010 HF +	3.00	V-0	1:25
	FR3030 +	3.00	V-0	1:25

## DOMO

GENERIC RESIN TYPE	SPECIFIC BASE RESIN	MINIMUM THICKNESS (MM)	FLAME RATING	MAXIMUM LET-DOWN RATIO
Polyamide (PA)	J 60X1 V30	0.40	V-0	1:25
Polyamide 6 (PA6)	PSB 286	0.80	V-2	1:25
		3.00	V-2	1:25
	S 60X1 V30	0.75	V-0	1:25
Polyamide 66 (PA66)	A 205F(r4)	0.38	V-2	1:25
	A 225F	0.75	V-2	1:25
	A 50H1 (r3)(f2)	0.40	V-0	1:25
	A 30G1	0.40	V-0	1:25



# UL 94 V-0, V-1, V-2

## ENVALIOR

GENERIC RESIN TYPE	SPECIFIC BASE RESIN	MINIMUM THICKNESS (MM)	FLAME RATING	MAXIMUM LET-DOWN RATIO
Polyamide 46 (PA46)	TE250F6(h1)(j)	0.50	V-0	1:25
Polyamide 6 (PA6)	F223-D(f1), F223-D /A(f1)	0.75	V-2	1:25
	K222-KGV5(f1)	0.75	V-2	1:16.7
		1.50	V-2	1:16.7
	K-FKGS6/B(f1)(y)	0.80	V-0	1:25
Polyamide 66 (PA66)	SG-KGS6/HV	0.75	V-0	1:25
Thermoplastic Elastomer (TPE)	PL460-S	1.60	V-0	1:25
Polyamide 4T (PA4T)	T11 (h)	0.40	V-0	1:20

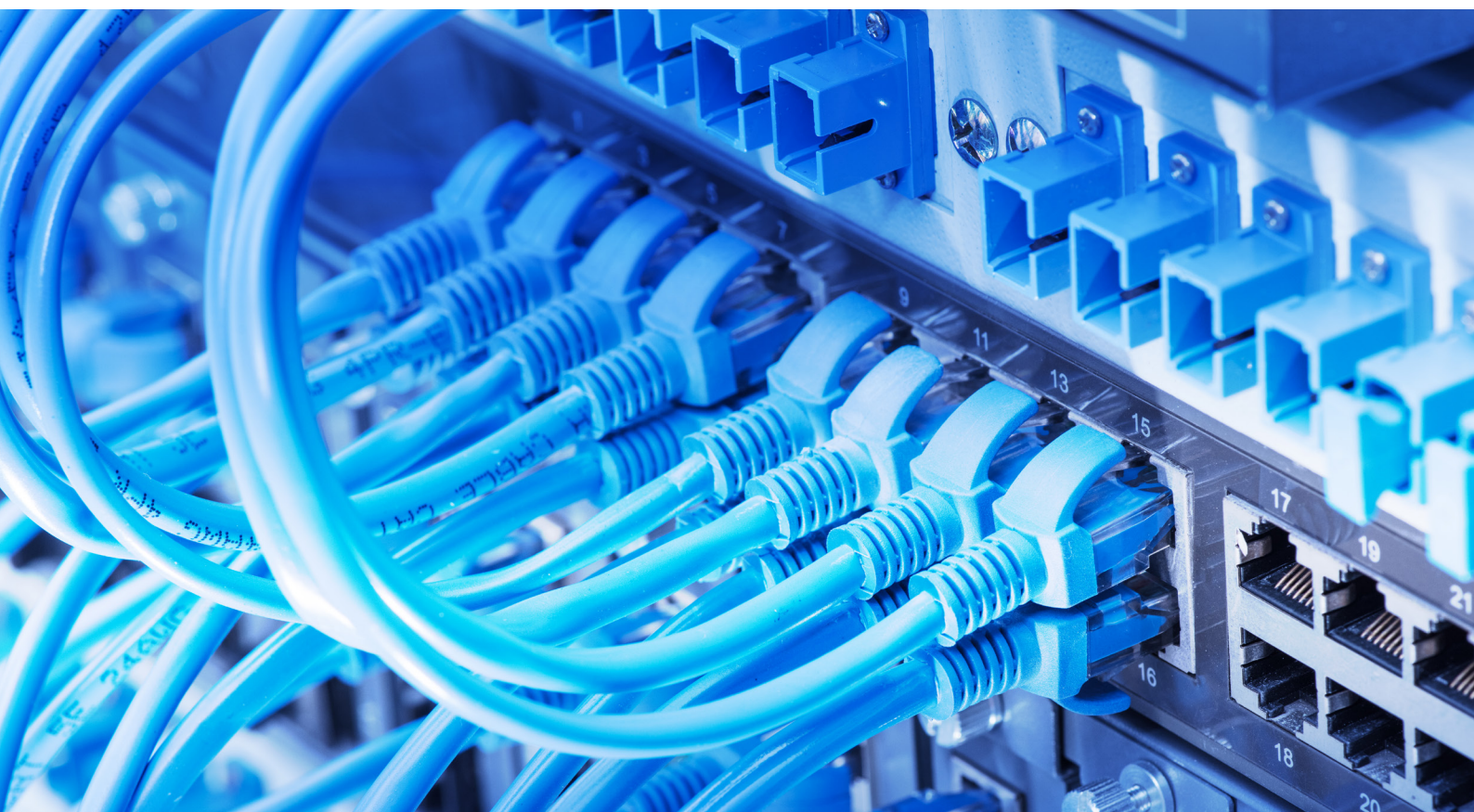
# UL 94 V-0, V-1, V-2

## EXXONMOBIL

GENERIC RESIN TYPE	SPECIFIC BASE RESIN	MINIMUM THICKNESS (MM)	FLAME RATING	MAXIMUM LET-DOWN RATIO
Ethylene Propylene Thermoplastic Rubber (EPTR)	251-80W232(f7)	1.50	V-2	1:20
	251-92W232	1.50	V-0	1:20
	251-70W232	1.50	V-0	1:10
		1.00	V-2	1:10

## LANXESS

GENERIC RESIN TYPE	SPECIFIC BASE RESIN	MINIMUM THICKNESS (MM)	FLAME RATING	MAXIMUM LET-DOWN RATIO
Polyamide 6 (PA6)	B30S+(f1)	1.50	V-2	1:25
	B31SK+	1.50	V-2	1:25
Polybutylene Terephthalate (PBT)	B4235+	1.50	V-0	1:10
	TP364-302+, BF4232+(f1)	0.75	V-0	1:25



# UL 94 V-0, V-1, V-2

## SABIC

GENERIC RESIN TYPE	SPECIFIC BASE RESIN	MINIMUM THICKNESS (MM)	FLAME RATING	MAXIMUM LET-DOWN RATIO
Polybutylene Terephthalate (PBT)	310(w)	1.50	V-0	1:20
	310SE0(w)	1.50	V-0	1:20
	310SE0(w),310SE0R(w)	1.50	V-0	1:20
	420SE0(f1)(w)(GG)(rr1)	1.50	V-0	1:20
	420SE0(f1)(w)(GG)(rr2)	1.50	V-0	1:20
	457(w)	1.50	V-0	1:20
	457(w), 451(w)	1.50	V-0	1:20
	553(a)(f1)(w)	1.50	V-0	1:20
	553(a)(f1)(w), 553E(a)(f1)(w), 553U(a)(f1)(w)	1.50	V-0	1:20
	553(w)(f1), 553M(w)(f1)	1.50	V-0	1:20
	DR48(w)	1.50	V-0	1:20
	DR48,DR48M	1.50	V-0	1:20
	V4760(a2)	0.40	V-0	1:20
	EXVX1259, ENH4550	0.40	V-0	1:20
	771	0.75	V-0	1:25
Polybutylene Terephthalate/ Polycarbonate (PBT/PC)	357(f1)(w)(IC), 357M(f1)(w)(IC), 357U(f1)(w)(IC)	1.50	V-0	1:20
	357(f1)(w)(IC), 357U(f1)(w)(IC)	1.50	V-0	1:20
	357X(f1)	1.50	V-0	1:20
	V3900WX(GG)(f1)(IA), V3901WX(GG)(f1)(IA)	3.00	V-0	1:20
		1.50	V-0	1:20
	357(w)(f2)(IC), 357M(w)(f2)(IC), 357U(w)(f2)(IC)	1.50	V-0	1:20

# UL 94 V-0, V-1, V-2

## SABIC

GENERIC RESIN TYPE	SPECIFIC BASE RESIN	MINIMUM THICKNESS (MM)	FLAME RATING	MAXIMUM LET-DOWN RATIO
Polycarbonate (PC)	221(f2)	1.50	V-2	1:25
	221R(f2)	1.50	V-2	1:25
	500(f2), 500R(f2)	3.00	V-0	1:33
	503(f1)	3.00	V-0	10:1
		1.50	V-0	10:1
	503(f1), 503R(f1)	3.00	V-0	10:1
		1.50	V-0	10:1
	943(ab)	1.50	V-0	1:20
	943(f1)	1.50	V-0	1:20
	943(f1), 923(f1)	1.50	V-0	1:20
	950A, 920ASR, FXD911A(GG), 940ASR	1.50	V-2	1:25
	CFR7630(f1)(gg*)	1.50	V-0	1:25
	ML5139R(f2)	3.00	V-0	1:33
	950A, FXD911A(GG), 940ASR	3.00	V-0	1:25
	943	1.50	V-0	1:20
920A	3.00	V-0	1:25	
	1.50	V-2	1:25	
Polycarbonate/ Acrylonitrile Butadiene Styrene (PC/ABS)	C2950	1.50	V-0	6:100
	C6200(GG)	2.00	V-0	1:20
Acrylonitrile Styrene Acrylate/ Polycarbonate (ASA/PC)	HRA222 (GG)	0.80	V-2	1:20



# UL 94 V-0, V-1, V-2

## SOLVAY (SYENSQO)

GENERIC RESIN TYPE	SPECIFIC BASE RESIN	MINIMUM THICKNESS (MM)	FLAME RATING	MAXIMUM LET-DOWN RATIO
Polyphenyl Sulfone (PPSU)	R-5100 (r1)(##), R-5000 (r1)(##)	1.50	V-0	1:10
Polyphthalamide (PPA)	AFA-4133 V0(+)(*)	0.75	V-0	1:25

## OTHERS

BASE RESIN MANUFACTURER	GENERIC RESIN TYPE	SPECIFIC BASE RESIN	MINIMUM THICKNESS (MM)	FLAME RATING	MAXIMUM LET-DOWN RATIO
ALBIS	Polypropylene (PP)	PP 13 CV2 14	1.50	V-2	1:25
AVIENT	Polyvinylchloride (PVC)	M3700(X), M3755(X)	1.50	V-0	1:25
		M3900	1.50	V-0	1:25
CHI MEI	Acrylonitrile Butadiene Styrene (ABS)	PA-765(+)	1.50	V-0	1:10
	Polycarbonate/ Acrylonitrile Butadiene Styrene (PC/ABS)	PC-510(+)	1.50	V-0	1:25
EMS-CHEMIE	Polyamide 6 (PA6)	Grilon A 26 V0	0.75	V-0	1:25
FORMOSA	Polycarbonate (PC)	#1700+(f2)	0.36-0.42	V-2	1:50
GEON	Polyvinylchloride (PVC)	85891(f1)	1.70	V-0	1:20
		85891(f2)	1.70	V-0	1:20
		M3700(X)	1.50	V-0	1:25
		M3900	1.50	V-0	1:10
			1:25		
INEOS	Polystyrene (PS)	855 HV	3.00	V-1	100:4
INVISTA	Polyamide 66 (PA66)	FRU4800 XHL (r1)	0.40	V-0	1:25
		U4820L (r1)	0.40	V-2	1:25

# UL 94 V-0, V-1, V-2

## OTHERS

BASE RESIN MANUFACTURER	GENERIC RESIN TYPE	SPECIFIC BASE RESIN	MINIMUM THICKNESS (MM)	FLAME RATING	MAXIMUM LET-DOWN RATIO
KINGFA	Polyamide 66 (PA66)	PA66-R11G25 (##)	0.25	V-0	1:25
KURARAY	Polyamide 9T (PA9T)	GP2300S	0.40	V-0	1:25
LG CHEM	Polycarbonate/ Acrylonitrile Butadiene Styrene (PC/ABS)	LUPOY GP-5106-F	3.00	V-0	1:20
LOTTE CHEMICAL	Acrylonitrile Butadiene Styrene (ABS)	VH-0800(+)	1.50	V-0	1:25
			0.75	V-2	1:10
	Polycarbonate (PC)	HN-1064(+)	1.50	V-0	1:10
			1.20	V-1	1:10
			3.00	V-0	1:25
	Polystyrene (PS)	VH-1800+	1.50	V-0	1:25
3.00			V-0	1:25	
MITSUBISHI	Polycarbonate (PC)	S-2000+(f1)	1.50-1.80	V-2	1:10
POLYMER PRODUCTS	Polystyrene (PS)	ZYNTAR 351	2.00	V-0	1:20
			1.50	V-0	1:20
		ZYNTAR 7000	2.00	V-0	1:25
		ZYNTAR 702	2.00	V-0	1:25
		8020	2.00	V-0	1:20
		8120	2.00	V-0	1:20
		8130	1.50	V-0	1:20
POLYMER RESOURCES	Polycarbonate (PC)	PC-FR1A-D, PC-FR2A-D, PC-FR3A-D	3.00	V-0	1:33
			1.50	V-2	1:33
SUMITOMO	Liquid Crystal Polymer (LCP)	E6007LHF(ra)	0.30	V-0	1:25
		E6007LHF-MR(gt)	0.20	V-0	1:12.5

# UL 94 V-0, V-1, V-2

## OTHERS

BASE RESIN MANUFACTURER	GENERIC RESIN TYPE	SPECIFIC BASE RESIN	MINIMUM THICKNESS (MM)	FLAME RATING	MAXIMUM LET-DOWN RATIO
TORAY	Polyamide 6 (PA6)	1017	1.60	V-2	1:16.5
	Polyamide 66 (PA66)	3004-V0(rr), CM3004-V0(rr)	0.40	V-0	1:25
TRINSEO	Polycarbonate (PC)	891(w)	1.10	V-0	1:25
WELLMAN	Polyamide 66/6 (PA66/6)	220-N, 21L-N, 22L-N	1.50	V-2	1:25
WESTLAKE	Polyvinylchloride (PVC)	6597(f1), HF-6597(f1)	1.50	V-0	1:25
		SP-7107 (f1)(a)	3.00	V-0	1:25



# 5VA AND 5VB

BASE RESIN MANUFACTURER	GENERIC RESIN TYPE	SPECIFIC BASE RESIN	MINIMUM THICKNESS (MM)	FLAME RATING	COLORS	MAXIMUM LET-DOWN RATIO
AVIENT	Polyvinylchloride (PVC)	M3900	1.50	5VB	ALL	1:25
					WHITE	1:10
CELANESE	Polyamide 66/6T (PA66/6T)	FR95G25V0NH	1.50	5VA	ALL	1:25
	Polybutylene Terephthalate (PBT)	LW9030FR	2.00	5VA	BLACK	1:25
			3.00	5VA	ALL	1:25
			SK642FR	1.50	5VA	BLACK
COVESTRO	Polycarbonate/ Acrylonitrile Butadiene Styrene (PC/ABS)	FR3010 + (z)	3.00	5VA	ALL	1:25
GEON	Polyvinylchloride (PVC)	M3900	1.50	5VB	ALL	1:25
					WHITE	1:10
SABIC	Polybutylene Terephthalate/ Polycarbonate (PBT/PC)	V3900WX(GG)(f1)(IA), V3901WX(GG)(f1)(IA)	3.00	5VA	ALL	1:20





**1.844.4AVIENT**  
**[www.avient.com](http://www.avient.com)**



Copyright © 2024, Avient Corporation. Avient makes no representations, guarantees, or warranties of any kind with respect to the information contained in this document about its accuracy, suitability for particular applications, or the results obtained or obtainable using the information. Some of the information arises from laboratory work with small-scale equipment which may not provide a reliable indication of performance or properties obtained or obtainable on larger-scale equipment. Values reported as “typical” or stated without a range do not state minimum or maximum properties; consult your sales representative for property ranges and min/max specifications. Processing conditions can cause material properties to shift from the values stated in the information. Avient makes no warranties or guarantees respecting suitability of either Avient’s products or the information for your process or end-use application. You have the responsibility to conduct full-scale end-product performance testing to determine suitability in your application, and you assume all risk and liability arising from your use of the information and/or use or handling of any product. AVIENT MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, either with respect to the information or products reflected by the information. This literature shall NOT operate as permission, recommendation, or inducement to practice any patented invention without permission of the patent owner.