



Polycarbonate and polycarbonate blends for the electrical and electronics industries

Makrolon[®], Apec[®], Bayblend[®] and Makroblend[®]





Selected equipment specifications

Equipment specifications	Ball pressure test (°C) IEC 60695-10-2	Glow wire test (°C) IEC 60695-2-11 ¹⁾	Comparative tracking index CTI (V) IEC 60112
Boxes and enclosures for electrical accessories for household and similar fixed electrical installations up to 1,000 V AC up to 1,500 V DC			
Live parts	125 (±2)	850	175
Insulation parts	70 (±2)	650	
DIN EN 60670-1 (VDE 0606-1)			
Plugs and socket outlets up to 400 V 25 A; Flat non-wirable two-pole plugs, 2.5 A 250 V, with cord, for the connection of Class II equipment for household and similar purposes			
Live parts	125 (±5)	750 ³⁾	
Insulation parts		650 ³⁾	
EN 50075:1900 (VDE 0620-101)			
Plugs, socket outlets and couplers for industrial purposes			
Live parts	125 (±5)	850 ⁴⁾	175
Insulation parts	80 (±3)	650 ⁴⁾	175
IEC 60309-1 (VDE 0623-1)			
Plugs and socket outlets for household and similar purposes			
Live parts	125 (±5)	850 ²⁾	175
Insulation parts	70 (±3)	650 ²⁾	175
DIN VDE 0620-1 (VDE 0620-1)			
Appliance couplers for household and similar general purposes			
Hot-operated	155 (±2)		
Live parts	125 (±2)	750 ⁵⁾	175
Insulation parts	75 (±2)	650 ⁵⁾	
DIN EN 60320-1 (VDE 0625-1)			
Edison screw lampholders			
E5 and E10	125	650	175
E14	170	650	175
DIN EN 60238 (VDE 0616-1)			
Lampholders for tubular fluorescent lamps and starter holders			
	125	650	175
DIN EN 60400 (VDE 0616-3)			
Luminaires			
Live parts	125	⁶⁾	175
Insulation parts	75	650 ⁶⁾	
DIN EN 60598-1 (VDE 0711-1)			
Household and similar electrical appliances			
Live parts	125 (±2)	850	} ≥ 100 to ≥ 600 (depending on the group of materials and distance between the contacts)
Insulation parts	75 (±2)	550	
Supervised		750 (live parts) / 650 (insulation parts)	
Unsupervised		VDE-certified products or 850 and 750 ⁶⁾	
DIN EN 60335-1 (VDE 0700-1)			
Hand-held motor-operated electric tools			
Live parts	125 (±2)	550	175
Insulation parts	75 (±2)		
DIN EN 60745-1 (VDE 0740-1)			
Conduit systems for cable management		750	
DIN EN 61386-1 (VDE 0605-1)			
Connecting devices for low-voltage circuits for household and similar purposes			
Live parts	125 (±2)	850 ⁶⁾	175
Insulation parts	70 (±2) or 40 (±2)	650 ⁶⁾	
DIN EN 60998-1 (VDE 0613-1)			

¹⁾ according to GWFI test (IEC 60695-2-12) on finished part

²⁾ according to DIN EN 60695-2 (VDE 0471-2)

³⁾ according to Part 4-10 of HD 444.2.1

⁴⁾ according to IEC 60695-2-1

⁵⁾ according to IEC 60695-2-11; IEC 60695-2-12 and IEC 60695-2-13 are applicable

⁶⁾ according to IEC 60695-2-10

⁷⁾ according to IEC 60695-2-12

⁸⁾ with a flaming combustion time of < 2 s

⁹⁾ The test specimens are to be subjected to the needle flame test according to IEC 60695-11-5. Each test specimen is to be subjected to the test flame for 10 s.



The right product for your application

The Covestro product portfolio comprises polycarbonates, polycarbonate blends and copolycarbonates. Their outstanding set of properties makes them ideal for applications in the electrical/electronics sector.

Product portfolio

- Makrolon®: Polycarbonate
- Bayblend®: Polymer blends based on polycarbonate (PC) and acrylonitrile butadiene styrene copolymer (ABS) and rubber-modified polycarbonates (PC) and styrene acrylonitrile copolymer (SAN) blends
- Makroblend®: Blends based on polycarbonate (PC) and polybutylene terephthalate (PBT) or polyethylene terephthalate (PET)
- Apec®: Copolycarbonate with heat resistance up to 200 °C

This brochure contains a table of guide values for Covestro's product portfolio for the electrical and electronics sector to make it easier for users to select the right material for applications in this field.

It also contains a table with selected equipment specifications and descriptions of three important testing methods (page 14 ff.).

Polycarbonate and polycarbonate blends for the electrical and electronics industries – product selection guide

Apec®, Makrolon®, Bayblend® and Makroblend®

	Product	Transparent	High flow	High gloss	Improved chemical resistance	Improved hydrolysis resistance	Improved toughness	GF reinforced	Mineral reinforced	PET modified ⁶⁾	PBT modified ⁶⁾	Ball pressure test ≥ 125°C	Ball pressure test ≥ 155°C	HDT-A ≥ 85°C	RTI ≥ 100°C	V-0 @ 0.75 mm	V-0 @ 1.2 mm	V-0 @ 1.5 mm	5V-B @ 2 mm	GWFI 650°C @ 1.5 mm	GWFI 850°C @ 1.5 mm	GWFI 960°C @ 1.5 mm	GWIT 775°C @ 1.5 mm	Adapted for extrusion	
APEC® page 6-9	1695																			n.m.					
	1895, 1897, 2095, 2097 ¹⁾																			n.m.					
	FR1892												n.m.		n.m.										
	9354																								
Makrolon® page 6-9	2205, 2207, 2405, 2407																								
	2605, 2607																								
	2805, 2807																								
	2467 ²⁾																								
	2665, 2667 ²⁾																								
	2865 ²⁾																								
	FR6002 ³⁾																								
	6165 X																								
	6265 X, 6267 X																								
	6555, 6557																								
	6485, 6487																								
	6717																								
	1260																								
	1837																								
	1095																								
	8025, 8035																								
	GF9002																								
9415, 9417																									
9125 ⁴⁾ , 9425																									
BAYBLEND® page 10-13	T45 PG																			n.m.					
	T65 HI																			n.m.					
	T65 PG																			n.m.					
	T65 XF, T85 XF ⁵⁾																			n.m.					
	T90 HT																								
	T88 GF-10, T88 GF-20, T88 GF-30																								
	FR3000																								
	FR3000 HI																								
	FR3005 HF																								
	FR3008 HR																								
	FR3010																								
	FR3010 HF																								
	FR1514																								
	FR1514 BBS073																								
	FR3030																								
	ET3032 FR																								
FR3021																						n.m.	n.m.		
MAKROBLEND® page 10-13	S7916 ⁶⁾																			n.m.					
	UT3905, UT3907																			n.m.					
	UT6005, UT6007, KU2-7915 ⁷⁾																			n.m.					
	KU2-7609																				n.m.				
	DP7645																				n.m.				
	UT235 M																				n.m.				
UT4045 G																				n.m.					

¹⁾ Improved heat distortion (20°C) compared to Apec® 1895, 1897
²⁾ V2 at 3 mm
³⁾ UL classification valid for white, gray, black colours
⁴⁾ Improved flowability compared to Makrolon® 9425
⁵⁾ Improved heat distortion (10°C) compared to Bayblend T65 XF

⁶⁾ PBT+PC-I Blend
⁷⁾ PC+PBT-I Blend
⁸⁾ Higher thermal stability, higher dimensional stability, lower shrinkage
⁹⁾ Superior chemical resistance, superior toughness, higher crystalline
 n.m. – not measured, expectation to meet the target

Polycarbonate for the electrical and electronics industries

Apec® and Makrolon®

Product range	Abbreviation	Rheological properties					Mechanical properties													Thermal properties											
		Melt volume flow-rate (MVR)		Melt viscosity	Molding shrinkage		Tensile modulus	Yield stress	Yield strain	Stress at break	Strain at break	Nominal strain at break	Charpy impact strength		Izod impact strength	Charpy notched impact strength ⁴⁾		Izod notched impact strength ⁴⁾		Coefficient of linear thermal expansion		Vicat softening temperature		Resistance to heat (ball pressure test)	Temperature of deflection under load (HDT)		Relative temperature index (1.5 mm)				
		ISO 1133	Shear rate 1,000 s ⁻¹ ; 260°C	b.o. ISO 11443-A	ISO 294-4		1 mm/min	50 mm/min	50 mm/min	50 mm/min	50 mm/min	50 mm/min	23°C	-30°C	23°C	-30°C	23°C	-30°C	23-55°C	50 N; 50°C/h	50 N; 120°C/h	A	B		Electric strength	Tensile impact strength	Tensile strength				
		cm ³ /10 min	°C; kg	Pa · s	parallel	transverse	MPa	MPa	%	MPa	%	%	kJ/m ²	kJ/m ²	kJ/m ²	kJ/m ²	kJ/m ²	kJ/m ²	parallel	transverse	10 ⁻⁴ /K	°C	°C	°C	°C	°C	°C	°C	°C		
APEC®	1695 T >PC-HT<	45	330; 2.16	114 ¹⁾	0.75	0.75	2,400	68	6.2	64	110	> 50	N	N	N	N	10	10	9	9	0.65	0.65	157	158	150	138	150	140	130	140	
	1895 T >PC-HT<	18	330; 2.16	214 ¹⁾	0.85	0.85	2,450	74	6.6	62	100	> 50	N	N	N	N	8	8	7	7	0.65	0.65	182	183	172	158	173	150	130	150	
	1897 T >PC-HT<	18	330; 2.16	214 ¹⁾	0.85	0.85	2,450	74	6.6	62	100	> 50	N	N	N	N	8	8	7	7	0.65	0.65	181	182	171	157	172	150	130	150	
	2095 T >PC-HT<	8	330; 2.16	360 ¹⁾	0.90	0.90	2,450	76	6.9	60	80	> 50	N	N	N	N	6	6	6	6	0.65	0.65	202	203	189	173	192	150	130	150	
	2097 T >PC-HT<	8	330; 2.16	360 ¹⁾	0.90	0.90	2,450	76	6.9	60	80	> 50	N	N	N	N	6	6	6	6	0.65	0.65	201	202	188	172	191	150	130	150	
	FR1892 T >PC-HT-FR<	18	330; 2.16	--	--	--	2,450	74	6.6	--	--	> 50	N	N	--	--	--	--	--	--	0.65	0.65	--	183	--	158	173	80	80	80	
	9354 >PC-HT-FR<	12	330; 2.16	211 ¹⁾	0.85	0.85	2,400	72	6.8	62	80	> 50	N	N	N	N	8	8	8	8	0.65	0.65	184	185	174	159	174	140	120	140	
MAKROLON®	2205 T >PC<	34	300; 1.2	--	0.65	0.65	2,400	65	6.0	60	120	> 50	N	N	--	--	55P (C)	12C	--	--	0.65	0.65	145	146	136	124	137	125	115	125	
	2207 T >PC<	34	300; 1.2	--	0.65	0.65	2,400	65	6.0	60	120	> 50	N	N	--	--	55P (C)	12C	--	--	0.65	0.65	143	145	135	123	136	125	115	125	
	2405 T >PC<	19	300; 1.2	--	0.65	0.70	2,400	65	6.0	65	125	> 50	N	N	--	--	65P	14C	--	--	0.65	0.65	145	146	136	124	137	125	115	125	
	2407 T >PC<	19	300; 1.2	--	0.65	0.70	2,400	66	6.0	65	120	> 50	N	N	--	--	65P (C)	14C	--	--	0.65	0.65	143	145	135	124	136	125	115	125	
	2605 T >PC<	12	300; 1.2	--	0.70	0.75	2,400	66	6.1	70	120	> 50	N	N	--	--	70P	16C	--	--	0.65	0.65	144	145	135	125	136	125	115	125	
	2607 T >PC<	12	300; 1.2	--	0.70	0.75	2,400	66	6.1	70	120	> 50	N	N	--	--	70P	14C	--	--	0.65	0.65	143	143	135	123	135	125	115	125	
	2805 T >PC<	9	300; 1.2	--	0.65	0.70	2,400	66	6.2	70	130	> 50	N	N	--	--	75P	16C	--	--	0.65	0.65	144	146	136	125	137	125	115	125	
	2807 T >PC<	9	300; 1.2	--	0.65	0.70	2,400	66	6.1	70	130	> 50	N	N	--	--	75P	14C	--	--	0.65	0.65	143	145	135	124	136	125	115	125	
	2467 T >PC-FR<	19	300; 1.2	--	0.65	0.70	2,400	66	6.0	70	130	> 50	N	N	--	--	65P (C)	14C	--	--	0.65	0.65	144	145	136	124	138	125	115	125	
	2665 T >PC-FR<	12	300; 1.2	--	0.70	0.75	2,400	66	6.1	70	130	> 50	N	N	--	--	70P	16C	--	--	0.65	0.65	143	145	135	124	136	125	115	125	
	2667 T >PC-FR<	12	300; 1.2	--	0.70	0.75	2,400	67	6.1	70	120	> 50	N	N	--	--	70P	14C	--	--	0.65	0.65	143	144	135	123	135	125	115	125	
	2865 T >PC-FR<	10	300; 1.2	--	0.65	0.70	2,400	66	6.2	70	130	> 50	N	N	--	--	75P	16C	--	--	0.65	0.65	145	146	136	125	137	125	115	125	
	6165 X >PC-FR<	28	300; 1.2	--	0.65	0.70	2,350	65	6.0	55	120	> 50	N	N	--	--	15C	12C	--	--	0.65	0.65	143	--	--	124	136	125	115	125	
	6265 X >PC-FR<	19	300; 1.2	--	0.65	0.65	2,400	65	6.0	65	120	> 50	N	N	--	--	65P (C)	12C	--	--	0.65	0.65	145	146	136	124	137	125	115	125	
	6267 X >PC-FR<	19	300; 1.2	--	0.65	0.65	2,450	67	6.0	65	120	> 50	N	N	--	--	12C (P)	12C	--	--	0.65	0.65	142	145	135	122	134	125	115	125	
	FR6002 >PC-FR<	18	300; 1.2	--	0.5-0.7	0.5-0.7	2,350	64	6.0	65	120	> 50	N	N	--	--	15C (P)	--	--	--	--	--	--	143	--	--	124	137	120	110	120
	6555 T >PC-FR<	10	300; 1.2	--	0.70	0.75	2,400	66	6.2	65	115	> 50	N	N	--	--	70P	14C	--	--	0.65	0.65	144	145	136	125	137	125	115	125	
	6557 T >PC-FR<	10	300; 1.2	--	0.65	0.70	2,400	66	6.1	65	115	> 50	N	N	--	--	70P (C)	14C	--	--	0.65	0.65	143	144	135	124	136	125	115	125	
	6485 >PC-FR<	9	300; 1.2	--	0.65	0.70	2,400	66	6.1	65	120	> 50	N	N	--	--	70P (C)	14C	--	--	0.65	0.65	144	145	136	124	136	125	115	125	
	6487 >PC-FR<	9	300; 1.2	--	0.70	0.75	2,450	66	6.0	65	115	> 50	N	N	--	--	70P (C)	12C	--	--	0.65	0.65	143	141	135	122	134	125	115	125	
	6717 T >PC-FR<	3	300; 1.2	--	0.70	0.75	2,400	67	6.4	65	105	> 50	N	N	--	--	70P	14C	--	--	0.7	0.7	146	147	137	127	139	125 (2.0 mm)	115 (2.0 mm)	125 (2.0 mm)	
	1260 >PC-I<	33	300; 1.2	--	0.65	0.70	2,350	63	5.8	55	100	> 50	N	N	--	--	55P	14C	--	--	0.7	0.7	142	143	134	122	135	125	105	115	
	1837 >PC-I<	11	300; 1.2	--	0.65	0.70	2,200	58	5.7	60	120	> 50	N	N	--	--	60P	50P	--	--	0.7	0.7	141	143	134	121	134	80	80	80	
	1095 >PC-GF15<	6	300; 1.2	--	0.45	0.45	4,600	64 ⁵⁾	4.6 ⁵⁾	45 ⁵⁾	12 ⁵⁾	--	--	120C	100C	--	--	10C	--	--	--	0.35	0.65	142	145	136	135	141	80	80	80
	8025 >PC-GF20<	6	300; 1.2	--	0.55	0.35	4,000	58 ⁵⁾	3.5 ⁵⁾	50 ⁵⁾	6.5 ⁵⁾	--	--	55C	65C	--	--	12C	--	--	--	0.45	0.55	146	147	137	134	141	125	115	125
	8035 >PC-GF30<	4	300; 1.2	--	0.50	0.35	5,100	59 ⁵⁾	2.5 ⁵⁾	55 ⁵⁾	3.5 ⁵⁾	--	--	40C	45C	--	--	8C	--	--	--	0.35	0.55	147	148	137	135	141	125	115	125
GF9002 >PC-GF10 FR<	15	300; 1.2	--	0.50	0.45	3,900	60 ⁵⁾	4.5 ⁵⁾	45 ⁵⁾	10 ⁵⁾	--	--	> 100C	> 40C	--	--	8C	--	--	--	0.4	0.6	141	142	--	132	--	80 (0.75 mm)	80 (0.75 mm)	80 (0.75 mm)	
9415 >PC-GF10 FR<	6	300; 1.2	--	0.60	0.45	3,800	64 ⁵⁾	4.4 ⁵⁾	45 ⁵⁾	15 ⁵⁾	--	--	150C (N)	120C (N)	--	--	10C	--	--	--	0.4	0.65	145	146	137	136	142	125	115	125	
9417 >PC-GF10 FR<	6	300; 1.2	--	0.60	0.45	3,800	64 ⁵⁾	4.6 ⁵⁾	45 ⁵⁾	15 ⁵⁾	--	--	150C (N)	120C (N)	--	--	10C	--	--	--	0.4	0.65	143	144	136	135	141	125	115	125	
9125 >PC-GF20 FR<	8	300; 1.2	--	0.35	0.45	5,800	--	--	85 ⁵⁾	2.5 ⁵⁾	--	--	40C	45C	--	--	8C	--	--	--	0.3	0.65	145	146	136	138	142	130	125	125	
9425 >PC-GF20 FR<	5	300; 1.2	--	0.35	0.45	5,800	--	--	86 ⁵⁾	2.6 ⁵⁾	--	--	40C	50C	--	--	8C	--	--	--	0.3	0.65	146	148	136	138	142	130	125	125	

¹⁾ Melt viscosity of Apec® measured at 340°C

⁴⁾ Apec® and Makrolon® are tested b. o. ISO 179/1eA and b.o. ISO 180/A at 3 mm wall thickness

⁵⁾ 5 mm/min

Impact behavior:

N = non break

P = partial break

C = complete break

These values are typical values only. Unless explicitly agreed in written form, they do not constitute a binding material specification or warranted values. Values may be affected by the design of the mold/die, the processing conditions and coloring/pigmentation of the product. Unless specified to the contrary, the property values given have been established on standardized test specimens at room temperature.

T = available in transparent colors

b.o. = based on

Polycarbonate for the electrical and electronics industries

Apec® and Makrolon®

Product range	Abbreviation	Electrical properties										Flame behavior															Other properties			
		Relative permittivity		Dissipation factor		Volume resistivity	Surface resistivity	Electrical strength	Comparative tracking index CTI	Outdoor use		Burning behavior UL 94					Oxygen index	Glow wire test (GWFI)					Glow wire test (GWIT)					Density	Water absorption (saturation value)	Water absorption (equilibrium value)
		100 Hz	1 MHz	100 Hz	1 MHz			1 mm	Solution A	Class	Class	Minimum thickness (mm)					Method A												23°C	23°C; 50 % r.h.
		IEC 60250		IEC 60250		IEC 60093	IEC 60093	IEC 60243-1	IEC 60112	(f1)	(f2)	UL recognition						ISO 4589-2	IEC 60695-2-12					IEC 60695-2-13					ISO 1183-1	ISO 62
DIN EN ISO 1043-1		10 ⁻⁴	10 ⁻⁴	Ohm · m	Ohm	kV/mm	Rating	mm	mm	V-0	V-1	V-2	HB	5VA	5VB	%	0.75 mm		1.0 mm	1.5 mm	2.0 mm	3.0 mm	0.75 mm	1.0 mm	1.5 mm	2.0 mm	3.0 mm	kg/m ³	%	%
APEC®	1695 T >PC-HT<	3.0	2.9	10	90	1E15	1E16	35	250	-	-	-	-	1.5	-	-	26	-	-	-	900	-	-	-	-	-	1,180	0.3	0.12	
	1895 T >PC-HT<	2.9	2.8	10	80	1E15	1E16	35	250	-	-	-	-	1.5	-	-	26	-	-	-	850	-	-	-	-	-	1,150	0.3	0.12	
	1897 T >PC-HT<	2.9	2.8	10	90	1E15	1E16	35	250	-	-	-	-	1.5	-	-	26	-	-	-	850	-	-	-	-	-	1,150	0.3	0.12	
	2095 T >PC-HT<	2.9	2.8	10	90	1E15	1E16	35	600	-	-	-	-	1.5	-	-	25	-	-	-	800	-	-	-	-	-	1,130	0.3	0.12	
	2097 T >PC-HT<	2.9	2.8	10	90	1E15	1E16	35	600	-	-	-	-	1.5	-	-	25	-	-	-	800	-	-	-	-	-	1,130	0.3	0.12	
	FR1892 T >PC-HT-FR<	2.9	2.8	10	80	1E14	1E15	35	225	-	-	3.0 (CL)	-	-	1.5 (CL)	-	-	-	-	-	960	-	-	-	875	-	875	1,150	0.3	0.12
9354 >PC-HT-FR<	2.9	2.8	10	90	1E14	1E15	35	225	-	-	1.5	-	-	-	3.0	-	35	-	960	-	960	-	-	-	-	-	1,150	0.3	0.12	
MAKROLON®	2205 T >PC<	3.1	3.0	5	90	1E14	1E16	34	250	0.75 (CL)	-	-	0.75-2.8 (CL)	2.9 (CL)	-	-	28	850	875	875	-	930	875	875	875	-	875	1,190	0.3	0.12
	2207 T >PC<	3.1	3.0	5	90	1E14	1E16	34	250	0.75 (CL)	-	-	0.75-2.8 (CL)	2.9 (CL)	-	-	28	850	850	875	-	930	875	875	875	-	875	1,190	0.3	0.12
	2405 T >PC<	3.1	3.0	5	90	1E14	1E16	34	250	-	-	-	0.36-2.6	2.7-6.0	-	-	27	850	850	875	-	930	875	875	875	-	875	1,200	0.3	0.12
	2407 T >PC<	3.1	3.0	5	90	1E14	1E16	34	250	0.75	-	-	0.75-2.6	2.7-6.0	-	-	27	850	850	875	-	930	875	875	875	-	875	1,200	0.3	0.12
	2605 T >PC<	3.1	3.0	5	90	1E14	1E16	34	250	-	-	-	0.75-2.4	2.5-6.0	-	-	28	850	850	850	-	930	875	875	875	-	875	1,200	0.3	0.12
	2607 T >PC<	3.1	3.0	5	90	1E14	1E16	34	250	-	-	-	0.75-2.4	2.5-6.0	-	-	28	850	850	850	-	930	875	875	875	-	875	1,200	0.3	0.12
	2805 T >PC<	3.1	3.0	5	90	1E14	1E16	34	250	0.75	-	-	0.75-2.4	2.5-6.0	-	-	28	850	850	850	-	930	875	875	875	-	900	1,200	0.3	0.12
	2807 T >PC<	3.1	3.0	5	90	1E14	1E16	34	250	0.75	-	-	0.75-2.4	2.5-6.0	-	-	28	850	850	850	-	930	875	875	875	-	875	1,200	0.3	0.12
	2467 T >PC-FR<	3.1	3.0	5	90	1E14	1E16	34	225	0.75	-	6.0	-	0.75-3.0	-	-	30	825	-	850	-	960	850	850	850	-	850	1,200	0.3	0.12
	2665 T >PC-FR<	3.1	3.0	5	90	1E14	1E16	34	225	-	-	6.0	-	0.75-3.0	-	-	30	850	-	850	-	960	875	875	875	-	875	1,200	0.3	0.12
	2667 T >PC-FR<	3.1	3.0	5	90	1E14	1E16	34	225	-	-	6.0	-	0.75-3.0	-	-	30	850	-	850	-	960	-	875	875	-	875	1,200	0.3	0.12
	2865 T >PC-FR<	3.1	3.0	5	90	1E14	1E16	34	225	-	-	6.0	-	0.75-3.0	-	-	32	850	-	850	-	960	875	900	900	-	900	1,200	0.3	0.12
	6165 X >PC-FR<	3.1	3.0	-	-	1E14	1E16	34	225	1.2	-	1.2-3.1	-	-	-	-	35	-	-	960	-	960	-	-	-	-	-	1,200	0.3	0.12
	6265 X >PC-FR<	3.1	3.0	8	90	1E14	1E16	34	225	0.75	-	1.5-3.0	-	-	-	-	36	960	-	960	-	960	875	-	-	-	900	1,200	0.3	0.12
	6267 X >PC-FR<	3.1	3.0	8	90	1E14	1E16	34	225	-	-	1.5-6.0	-	-	-	-	36	960	-	960	960	960	-	-	-	-	-	1,200	0.3	0.12
	FR6002 >PC-FR<	3.0	2.9	8	88	1E15	1E16	34	250	-	-	1.75 (GY, WT, BK)	-	-	-	-	>32	960	-	960	-	960	850	-	850	-	930	1,200	-	-
	6555 T >PC-FR<	3.1	3.0	8	90	1E14	1E16	34	225	1.5 (CL)	1.0	3.0-6.0	-	1.0-1.5	-	-	35	875	-	960	-	960	875	875	875	-	875	1,200	0.3	0.12
	6557 T >PC-FR<	3.1	3.0	8	90	1E14	1E16	34	225	0.75 (CL)/1.5	-	3.0-6.0	-	0.75 (CL)/1.5	-	-	36	900	-	960	-	960	875	875	875	-	900	1,200	0.3	0.12
	6485 >PC-FR<	3.1	3.0	8	90	1E14	1E16	34	225	1.5	0.75	1.5-6.0	-	-	-	3.0-6.0	36	960	-	960	-	960	875	-	875	-	875	1,200	0.3	0.12
	6487 >PC-FR<	3.1	3.0	8	90	1E14	1E16	34	225	1.5	-	1.5-3.0	-	-	-	3.0	36	-	-	960	-	960	-	875	900	-	930	1,200	0.3	0.12
	6717 T >PC-FR<	3.1	3.0	10	90	1E14	1E16	34	225	-	-	2.0-3.0	-	-	-	-	43	960	-	960	-	960	875	875	900	-	900	1,200	0.3	0.12
	1260 >PC-I<	3.1	3.0	10	100	1E14	1E16	34	250	-	-	-	-	0.75-3.0	-	-	30	875	-	900	-	960	875	-	875	-	900	1,200	0.3	0.12
	1837 >PC-I<	3.2	3.1	14	125	1E14	1E16	34	225	-	-	-	-	-	0.75 ³⁾	-	30	850	-	875	-	900	-	-	825	-	850	1,190	0.4	0.12
	1095 >PC-GF15<	3.2	3.2	10	90	1E14	1E16	38	175	-	-	3.0	-	1.5	-	-	27	850	-	960	-	960	850	-	900	-	900	1,290	0.2	0.1
	8025 >PC-GF20<	3.3	3.3	10	90	1E14	1E16	36	175	-	-	-	6.0	1.5-3.0	-	-	32	800	850	960	-	960	850	-	875	-	875	1,340	0.2	0.1
	8035 >PC-GF30<	3.5	3.5	15	90	1E14	1E16	36	175	1.5 (BK)	1.5	-	1.5-6.0	-	-	-	37	960	-	960	-	960	875	-	875	-	875	1,420	0.2	0.1
GF9002 >PC-GF10 FR<	3.2	3.2	10	90	1E14	1E16	36	175	-	-	1.2-3.0	0.75	-	-	-	37	960	-	960	-	960	-	-	800	-	875	1,270	0.3	0.1	
9415 >PC-GF10 FR<	3.2	3.2	10	90	1E14	1E16	36	175	1.5	0.8	1.5-3.0	-	0.75	-	-	35	960	-	960	-	960	900	-	900	-	900	1,270	0.3	0.1	
9417 >PC-GF10 FR<	3.2	3.2	10	90	1E14	1E16	36	175	1.5 (BK, GY)	1.5	1.5-6.0	-	-	-	3.0 (NC, BK, GY) / 6.0	35	960	-	960	-	960	-	-	900	-	900	1,270	0.3	0.1	
9125 >PC-GF20 FR<	3.3	3.3	10	90	1E14	1E16	36	175	1.5 (WT, GY)	1.0	1.5-3.0	-	-	-	-	35	-	-	960	-	960	-	-	850	-	850	1,340	0.2	0.1	
9425 >PC-GF20 FR<	3.3	3.3	10	90	1E14	1E16	36	175	0.5	-	1.5-6.0	-	0.5	-	3.0-6.0	35	960	-	960	-	960	875	-	875	-	875	1,340	0.2	0.1	

³⁾ Covestro Measurement

T = available in transparent colors
r.h. = relative humidity

Burning behavior UL94 (UL recognition)
BK = black
CL = clear
GY = gray
NC = natural color
WT = white

These values are typical values only. Unless explicitly agreed in written form, they do not constitute a binding material specification or warranted values. Values may be affected by the design of the mold/die, the processing conditions and coloring/pigmentation of the product. Unless specified to the contrary, the property values given have been established on standardized test specimens at room temperature.

Polycarbonate blends for the electrical and electronics industries

Bayblend® and Makroblend®

Product range	Abbreviation	Electrical properties										Flame behavior															Other properties					
		Relative permittivity		Dissipation factor		Volume resistivity	Surface resistivity	Electrical strength	Comparative tracking index CTI	Outdoor use		Burning behavior UL 94					Oxygen index	Glow wire test (GWFI)					Glow wire test (GWIT)					Density	Water absorption (saturation value)	Water absorption (equilibrium value)		
		100 Hz	1 MHz	100 Hz	1 MHz			1 mm	Solution A	(f1)	(f2)	Minimum thickness (mm)					Method A	IEC 60695-2-12					IEC 60695-2-13					ISO 1183-1	ISO 62	ISO 62		
		IEC 60250		IEC 60250		IEC 60093	IEC 60093	IEC 60243-1	IEC 60112	UL 746C		UL recognition					ISO 4589-2	Class					Class					kg/m³	%	%		
DIN EN ISO 1043-1		10 ⁻⁴		10 ⁻⁴		Ohm · m	Ohm	kV/mm	Rating	mm	mm	V-0	V-1	V-2	HB	5VA	5VB	%	0.75 mm	1.0 mm	1.5 mm	2.0 mm	3.0 mm	0.75 mm	1.0 mm	1.5 mm	2.0 mm	3.0 mm	mm	%	%	
BAYBLEND®	T45 PG	>ABS+PC<	3.1	3.0	35	85	1E14	1E16	35	275	--	--	--	--	--	0.85	--	--	--	--	--	--	700	--	--	--	--	--	1,100	0.7	0.2	
	T50 XF	>PC+ABS<	3.1	3.0	25	90	1E14	1E17	40	250	--	--	--	--	--	0.85	--	--	--	--	--	--	--	--	--	--	--	1,110	0.7	0.2		
	T65 XF	>PC+ABS<	3.1	3.0	30	85	1E14	1E16	35	250	--	--	--	--	--	0.85	--	--	--	--	--	--	750	--	--	--	--	--	1,130	0.7	0.2	
	T85 XF	>PC+ABS<	3.1	3.0	20	85	1E14	1E16	35	225	--	--	--	--	--	0.85	--	--	--	--	--	--	750	--	--	--	--	--	1,140	0.7	0.2	
	T65 AT	>PC+ABS<	--	--	--	--	1E13	1E15	--	--	--	--	--	--	--	0.85 ³⁾	--	--	--	--	--	--	700	--	--	--	--	--	1,130	1.0	0.2	
	T65 HI	>PC+ABS<	3.0	2.9	25	85	1E14	1E16	35	275	--	--	--	--	--	0.85 ³⁾	--	--	--	--	--	--	750	--	--	--	--	--	1,110	0.7	0.2	
	T65 PG	>PC+ABS<	3.1	3.0	30	85	1E14	1E16	35	250	--	--	--	--	--	0.85 ³⁾	--	--	--	--	--	--	750	--	--	--	--	--	1,130	0.7	0.2	
	T80 XG	>PC+ABS<	--	--	--	--	1E14	1E17	45	175	--	--	--	--	--	0.85 ³⁾	--	--	--	--	--	--	750	--	--	--	--	--	1,140	0.7	0.2	
	T90 HT	>PC+ABS<	3.1	2.9	15	90	1E14	1E17	35	--	--	--	--	--	--	0.85	--	--	--	--	--	--	850	--	--	--	--	--	1,160	0.7	0.2	
	W85 XF	>PC+ASA<	3.1	2.8	25	105	1E14	1E16	35	225	--	--	--	--	--	0.85 ³⁾	--	--	--	--	--	--	800	--	--	--	--	--	1,160	0.5	0.2	
	T88 GF-10	>PC+SAN-I-GF10<	3.2	3.0	25	90	1E14	1E16	35	200	--	--	--	--	--	0.85	--	--	--	--	--	--	850	--	--	--	--	--	1,220	0.4	0.2	
	T88 GF-20	>PC+SAN-I-GF20<	3.3	3.2	25	85	1E14	1E17	35	150	--	--	--	--	--	0.85	--	--	--	--	--	--	800	--	--	--	--	--	1,290	0.4	0.2	
	T88 GF-30	>PC+SAN-I-GF30<	3.6	3.4	30	85	1E14	1E17	35	175	--	--	--	--	--	0.85 ³⁾	--	--	--	--	--	--	700	--	--	--	--	--	1,375	0.4	0.1	
	T95 MF	>PC+ABS-TD9<	3.2	3.0	15	90	1E14	1E16	35	200	--	--	--	--	--	0.85 ³⁾	--	--	--	--	--	--	960	--	--	--	--	--	1,240	0.6	0.2	
	T90 MF-20	>PC+SAN-I-TD20<	3.3	3.2	15	32	1E14	1E16	35	225	--	--	--	--	--	0.85 ³⁾	--	--	--	--	--	--	800	--	--	--	--	--	1,290	0.5	0.2	
	FR3000 HI	>PC+ABS-FR(40)<	3.2	3.1	50	60	1E14	1E16	35	350	--	--	1.5	--	--	--	3.0	2.0	--	900	900	960	960	960	800	800	800	800	1,180	0.5	0.2	
	FR3005 HF	>PC+ABS-FR(40)<	3.2	3.1	50	65	1E14	1E16	35	350	--	--	1.5	--	--	--	3.0	1.8	--	--	960	960	--	960	--	775	775	775	775	1,180	0.5	0.2
	FR3008 HR	>PC+ABS-FR(40)<	3.2	3.1	50	70	1E14	1E16	30	300	--	--	1.5	1.2	--	--	3.0	2.0	--	--	960	960	960	960	775	800	800	800	1,200	0.5	0.2	
	FR3010	>PC+ABS-FR(40)<	3.2	3.1	50	70	1E14	1E16	35	350	--	--	1.5	1.2	--	--	3.0	2.0	--	--	960	960	960	960	775	850	850	850	850	1,180	0.5	0.2
	FR3010HF	>PC+ABS-FR(40)<	3.2	3.1	40	70	1E14	1E16	35	350	--	--	1.5	--	--	--	3.0	2.2	--	--	960	960	960	960	--	850	850	850	850	1,180	0.5	0.2
FR1514	>PC+ABS-FR(40)<	3.2	3.1	20	85	1E15	1E17	35	350	--	--	1.5	1.0 (BK)	--	--	3.0	2.0	--	850	850	850	850	960	775	800	800	800	800	1,190	0.5	0.2	
FR1514 BBS073	>PC+ABS-FR(40)<	3.2	3.1	20	85	1E15	1E17	35	350	--	--	1.5	1.0 (BK)	--	--	3.0	2.0	--	850	850	850	850	960	775	800	800	800	800	1,190	0.5	0.2	
FR3030	>PC+ABS-FR(40)<	3.2	3.1	37	75	1E15	1E17	35	350	--	--	1.5	--	0.75	--	3.0	2.0	--	--	960	960	960	960	--	--	825	825	825	1,190	0.5	0.2	
ET3032 FR	>PC+TD10FR(40+72)<	--	--	--	--	--	--	--	--	--	--	0.75	--	--	--	3.0 ³⁾	2.0 ³⁾	--	960	--	960	--	960	900	--	900	--	900	1,300	0.5	0.2	
FR3021	>PC+ABS-TD15FR(40)<	3.1	3.0	50	70	1E14	1E16	35	275	--	--	1.5	--	--	--	--	--	--	--	--	--	960	--	--	--	--	--	1,280	0.5	0.2		
MAKROBLEND®	S7916	>PBT+PC-I<	3.1	2.9	23	140	> 1E15	> 1E17	--	600	--	--	--	--	--	0.8 ³⁾	--	--	20	--	--	--	650	--	--	--	--	--	1,200	0.5	0.2	
	UT3905	>PC+PBT-I<	3.2	3.0	6	45	> 1E15	> 1E17	30	600	--	--	--	--	--	1.6 ³⁾	--	--	21	--	--	--	750	--	--	--	--	--	1,200	0.5	0.2	
	UT3907	>PC+PBT-I<	3.2	3.0	6	45	> 1E15	> 1E17	30	600	--	--	--	--	--	1.6 ³⁾	--	--	21	--	--	--	750	--	--	--	--	--	1,200	0.5	0.2	
	UT6005	>PC+PBT-I<	3.2	3.0	7	45	> 1E15	> 1E17	30	600	--	--	--	--	--	1.6 ³⁾	--	--	21	--	--	--	750	--	--	--	--	--	1,200	0.5	0.2	
	UT6007	>PC+PBT-I<	3.2	3.0	7	45	> 1E15	> 1E17	30	600	--	--	--	--	--	1.6 ³⁾	--	--	21	--	--	--	750	--	--	--	--	--	1,200	0.5	0.2	
	KU2-7915	>PC+PBT-I<	3.2	3.1	10	120	> 1E15	> 1E17	30	600	--	--	--	--	--	0.75 (YL, BK)	--	--	21	--	--	--	750	--	--	--	--	--	1,200	0.5	0.2	
	KU2-7609	>PC+PBT-I-MD20<	3.2	3.1	26	95	> 1E15	> 1E17	34	250	--	--	--	--	--	0.8 ³⁾	--	--	21	--	--	--	800	--	--	--	--	--	1,300	0.8	0.2	
	DP 7645	>PC+PET-I<	--	--	13	144	> 1E15	> 1E17	33	175	--	--	--	--	--	0.8 ³⁾	--	--	20	--	--	--	--	--	--	--	--	--	1,200	0.3	0.15	
UT235 M	>PC+PET-MD15<	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1,340	0.4	0.2		
UT4045 G	>PC+PBT-GF20<	3.6	3.4	13	144	> 1E15	> 1E17	33	175	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1,400	0.3	0.15		

³⁾ Covestro Measurement

r.h. = relative humidity

These values are typical values only. Unless explicitly agreed in written form, they do not constitute a binding material specification or warranted values. Values may be affected by the design of the mold/die, the processing conditions and coloring/pigmentation of the product. Unless specified to the contrary, the property values given have been established on standardized test specimens at room temperature.

Selected testing methods

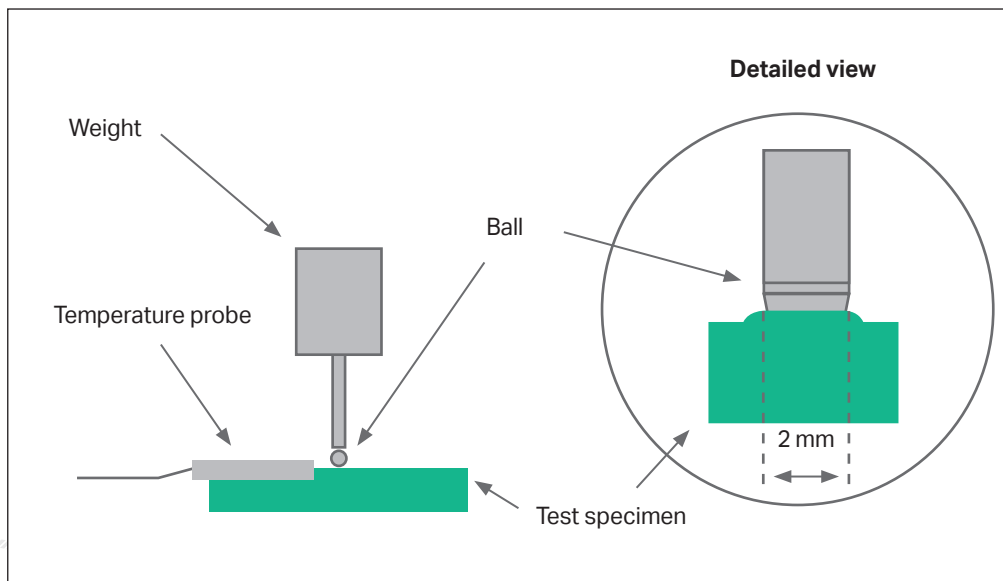
The following pages give a description of some of the most important test methods that are used to establish the properties required for the selected equipment specifications (see foldout).

Ball indentation test to IEC 60695-10-2

This test method is used to determine the dimensional stability of the plastic when subjected to elevated temperatures.

The result of the test is the temperature at which the ball produces an indentation diameter of max. 2 mm.

Ball indentation



Glow wire flammability test to IEC 60695-2-11 and -13

GWFI (Glow Wire Flammability Index)

This test is used to determine the glow wire flammability index.

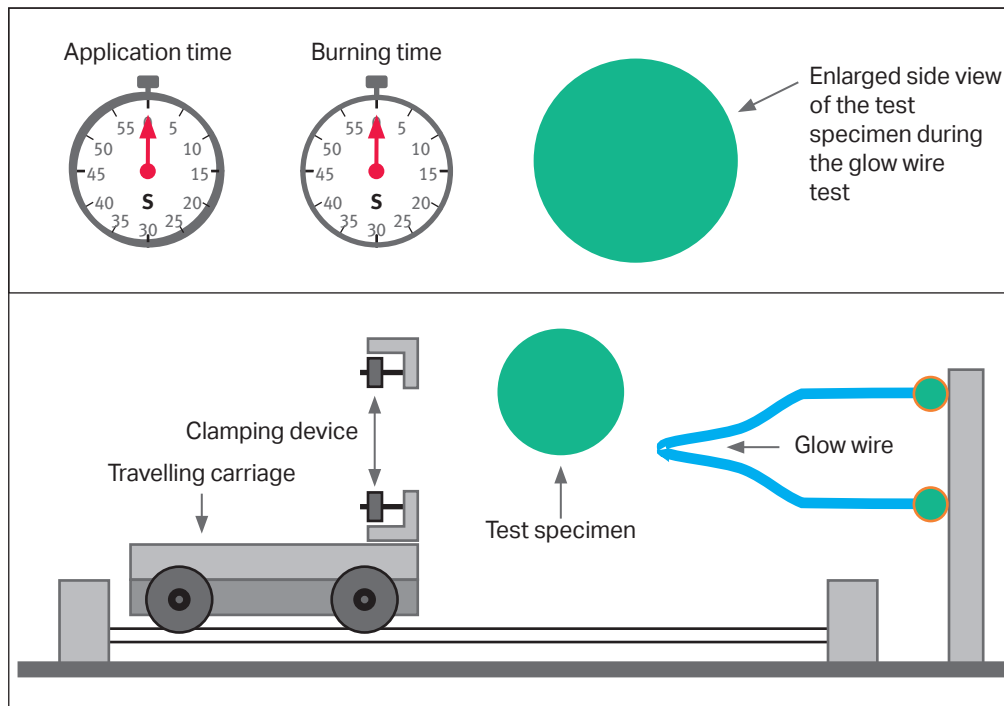
Test criterion for three consecutive test specimens of the same thickness:

- a) Maximum temperature at which the specimen must extinguish within 30 s after removal of the wire.
- b) Furthermore, flaming drips from the specimen must not ignite a tissue paper underneath.

GWIT (Glow Wire Ignition Temperature)

This test is used to determine the glow wire ignition temperature. Test criterion for three consecutive test specimens of the same thickness: The glow wire ignition temperature is the temperature 25 °C higher (30 °C higher if between 900 °C and 960 °C) than the highest temperature measured at the end of the glow wire at which there is no ignition during the contact time (ignition is defined as glowing or burning for longer than 5 s).

Glow wire flammability test



Tracking resistance to IEC 60112 (CTI)

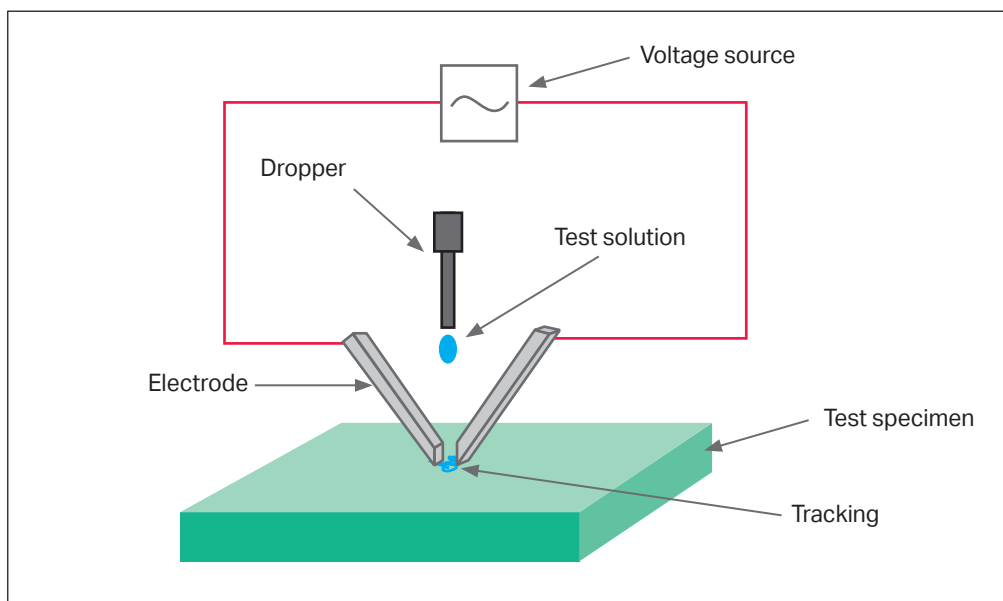
This method is used to assess the relative resistance of insulating materials to tracking. As a general rule, two different test solutions (A and B) can be used to investigate tracking.

Test piece	$\geq 20 \text{ mm} \times 20 \text{ mm} \times 3 \text{ mm}$
Test voltage	between 100 V and 600 V (48 – 62 Hz)
Test solution A (CTI A)	3.95 Ohm · m
Test solution B (CTI B)	1.98 Ohm · m
Drop interval	30 s
Drop volume	20 mg
Failure criteria	Interrupting current > 0.5 A

The CTI (comparative tracking index) is the highest voltage at which no specimen fails during testing on five samples, each after the application of 50 drops.

CTI (V)	Rating to UL 746C
$600 \leq \text{TI}$	0
$400 \leq \text{TI} < 600$	1
$250 \leq \text{TI} < 400$	2
$175 \leq \text{TI} < 250$	3
$100 \leq \text{TI} < 175$	4
$0 \leq \text{TI} < 100$	5

CTI / Tracking



Household appliance standard IEC 60335-1

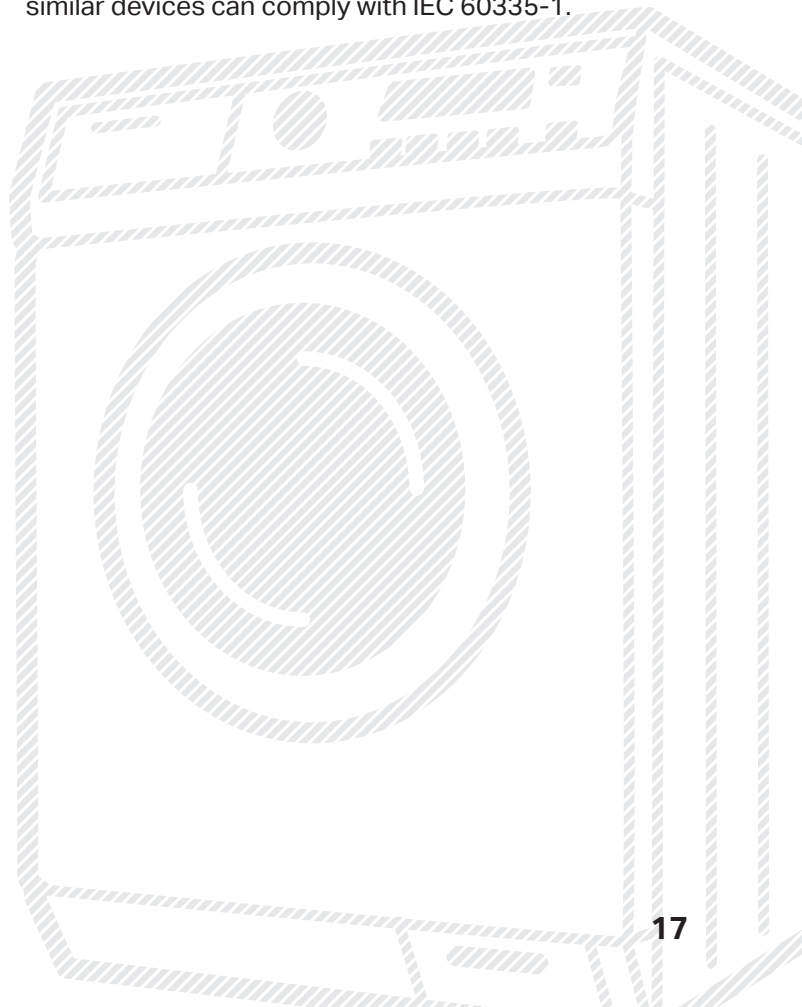
The advanced standard IEC 60335-1 for domestic appliances deals with electrical, mechanical and thermal hazards and fire and radiation hazards from domestic electrical appliances. It covers the safety of devices with a rating of no more than 250 V for single-phase appliances and 480 V for other appliances.

Plastics used for domestic appliances in accordance with the standard must pass a fire-resistance test. The precise values that need to be achieved depend on the electric current and whether the appliance is to be operated with or without supervision.

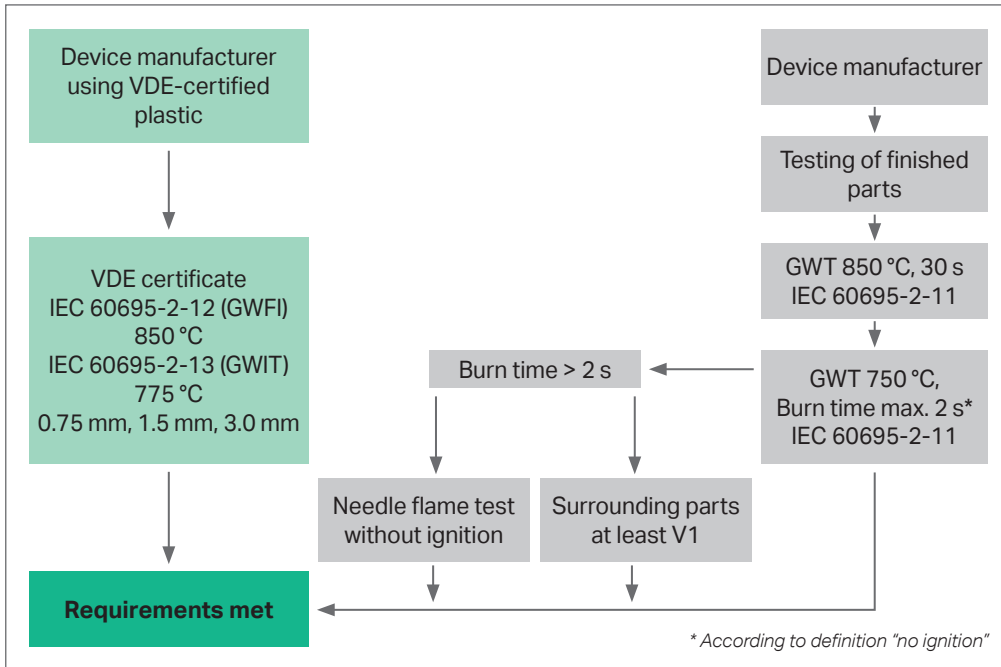
According to standard IEC 60335-1 for domestic appliances, a plastic used in unsupervised appliances with a current of more than 0.2 A may only be used if the specimens pass two glow wire flammability tests. The plastic must achieve a GWFI of at least 850 °C (Glow Wire Flammability Index, IEC 60695-2-11 or IEC 60695-2-12) and a

GWIT of 775 °C (Glow Wire Ignition Temperature, IEC 60695-2-13), and the test specimen must not be thicker than the corresponding finished component. If the test material does not satisfy these requirements, the tests must be performed on the finished part and documented. To pass such tests on the finished part is significantly more difficult, more complex and more costly.

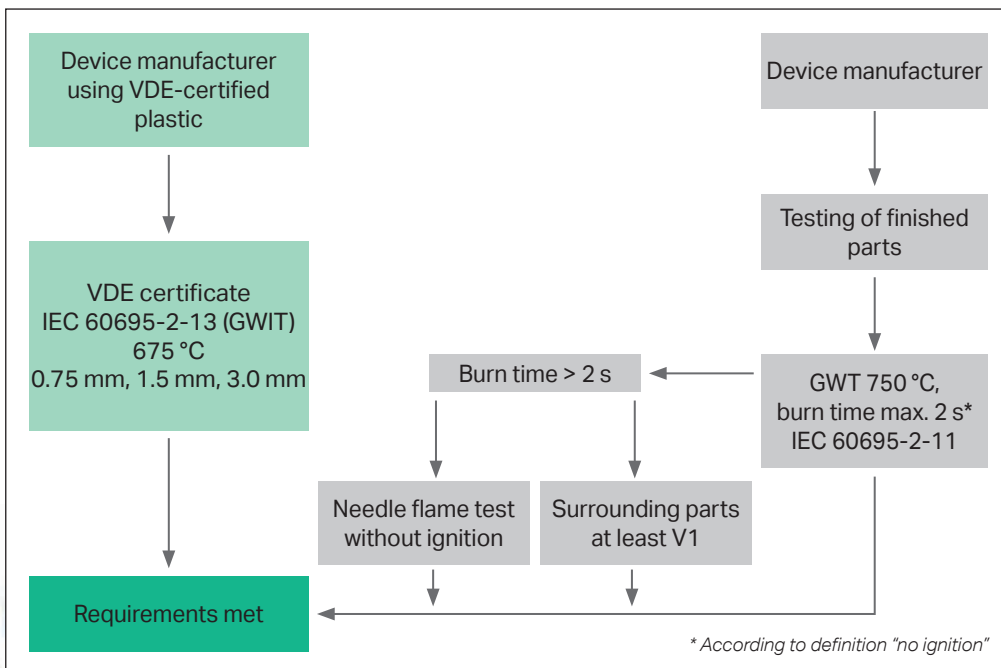
The various testing schedules on pages 18/19 show how electrical household appliances and similar devices can comply with IEC 60335-1.



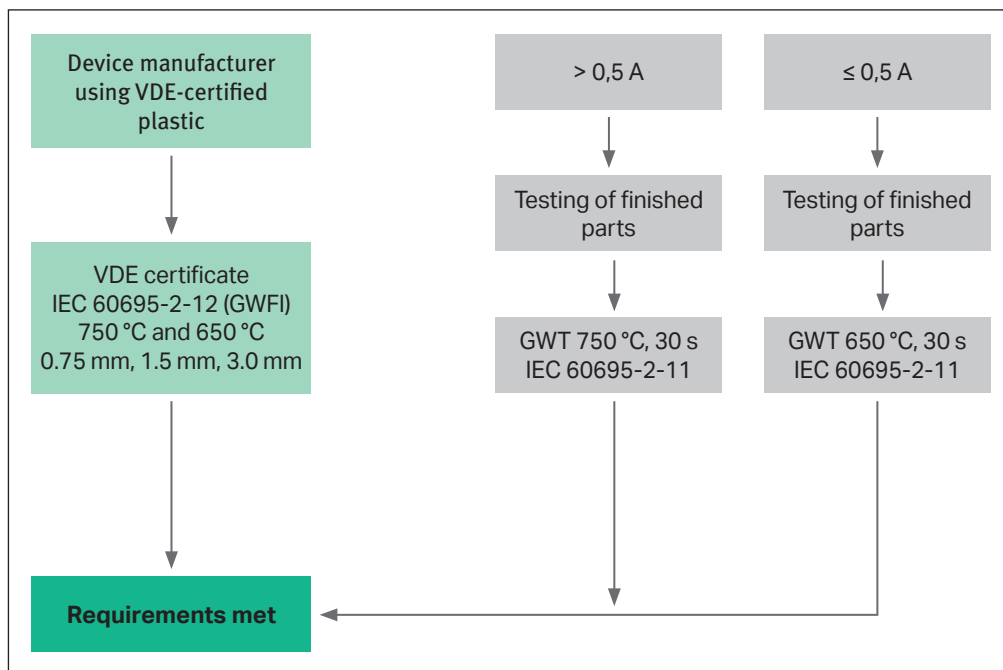
Testing schedule for components in unsupervised operation, current > 0.2 A



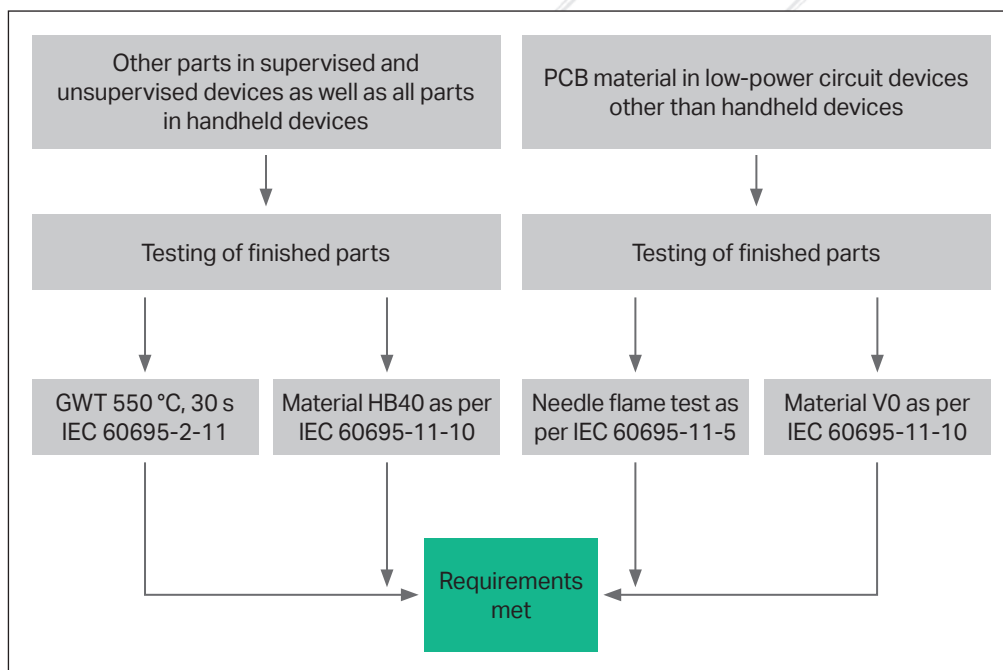
Testing schedule for components in supervised operation, current ≤ 0.2 A



Testing schedule for components in supervised operation, current > 0.5 A and ≤ 0.5 A



Testing schedule for components in supervised and unsupervised operation, current > 0.2 A



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