BASF material solutions for charging systems

BASF
We create chemistry

TABLE OF CONTENTS

BASF material solutions for charging systems

BASF offers a wide range of material solutions for charging infrastructure

Mobile charging systems

Wall box

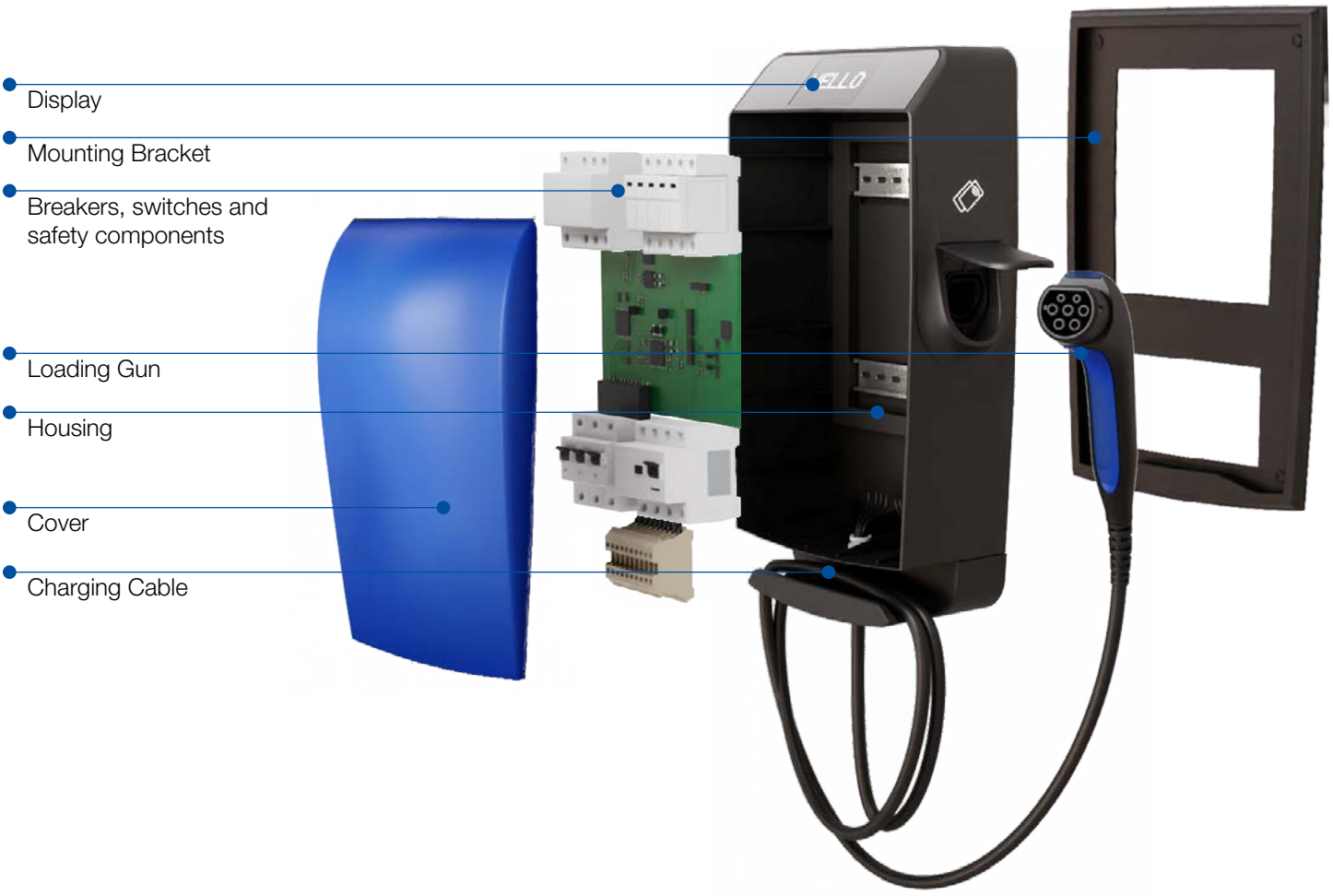
Ultramid®, Ultradur®, Ultrason® and Elastollan® Portfolios

Different requirements are based on the individual function of the part within the wall box.

BASF offers a wide range of materials, e.g.:

- Deep gloss for surface applications
- Structural materials for frames and brackets
- Elastic materials for cables and haptic elements
- A broad portfolio of flame retardant products

WALL BOX OVERVIEW

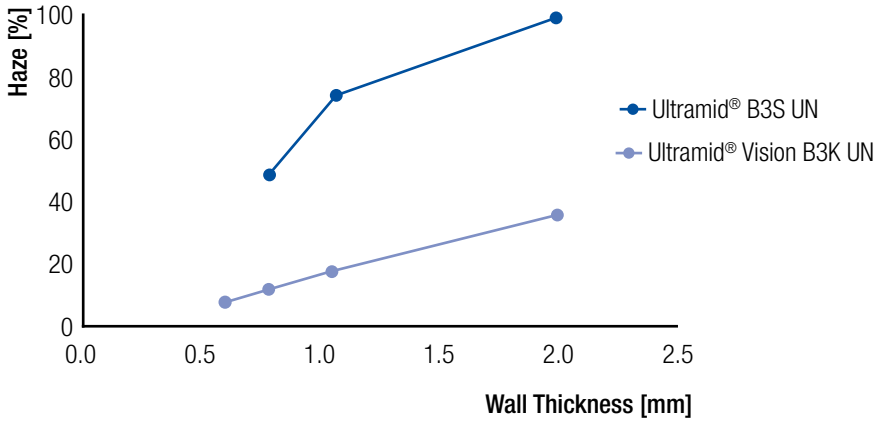


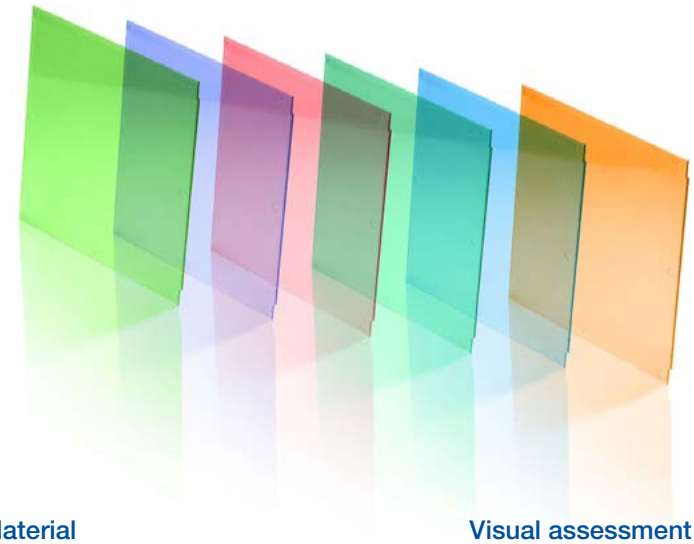
	Ultramid®	Ultradur®	Ultrason®	Elastollan®
Display	✓		✓	
Cover	✓			
Housing	✓	✓		
Mounting Bracket	✓			
Charging Cable				✓
Loading Gun	✓			✓
Breakers, Switches and Safety Components	✓			✓

DISPLAY

Ultramid® Vision

- First semi-transparent PA6 grade
- High scratch resistance
- Good chemical resistance
- UL94 V2 and UL 746C compliant





Material	Visual assessment
Ultramid® Vision	No scratch mark
Transparent PA12 copolymer	No scratch mark
Polyether sulfone	Visible scratch mark (approx. 0.25 µm)
Polycarbonate	Highly visible scratch mark (approx. 1 µm)
Copolyester	Barely visible scratch mark (approx. 0.2 µm)
SAN	Highly visible scratch mark (approx. 0.3 µm)
Polypropylene with clarifier	Highly visible scratch mark (approx. 0.5 µm)

Proven chemical resistance against:

- Sun screen (tested according to PV3964)
- Sunflower oil
- Chloroform
- Isopropanol
- Glycerin
- Cyclohexane
- Methyl ethyl ketone
- Methanol

Test	0.4 mm	0.75 mm	1.5 mm	3 mm
UL94	HB	V-2	V-2	V-2
HWI	0*	0*	0*	0*
HAI	0*	0*	0*	0*
GWFI (°C)	960	960	960	960
GWIT (°C)	960	930	900	750
CTI (V)				550 (500)

* UL746C: materials with HB / V-2 rating and HWI/HAI <2 can be used in applications requiring V-0 rating!

DISPLAY

Ultrason® E2010

- Transparent material
- UL94 V0
- Excellent temperature resistance

Flammability		Value	Testing method
Flammability class - UL	1.5 mm, ALL	V-0	UL 94 IEC 60695-11-10, -20
	3.0 mm, NC	V-0, 5VA	UL 94

Electrical properties		Value	Testing method
Hot-wire ignition (HWI)	1.5 mm	PLC 2	UL 746A
	3.0 mm	PLC 1	
High amp arc ignition (HAI)	1.5 mm	PLC 0	UL 746A
	3.0 mm	PLC 0	

Comparative tracking index (CTI)	PLC 4	UL 746A

Thermal properties		Value	Testing method
RTI Elec	1.5 mm	180°C	UL 746B
	3.0 mm	180°C	
RTI Imp	1.5 mm	180°C	UL 746B
	3.0 mm	180°C	
RTI Str	1.5 mm	190°C	UL 746B
	3.0 mm	190°C	

COVER

Ultramid® Deep Gloss

- High gloss (different colors)
- Surface textures possible
- Excellent scratch resistance
- High chemical and good UV resistance

High gloss colors

Surface textures

Erichsen Scratch Test:	
acc. to PV3952,10 N, needle Ø 1 mm	ΔL=0.1 (acc. to DIN 5033-4) (scratch depth: 0.87 µm)
acc. to DBL9202,10 N, needle Ø 1 mm	O.K. (visual assessment)
acc. to GS93045-9, 5 N, needle Ø 0.75 mm	assessment index: 2A

Tested chemical resistance:

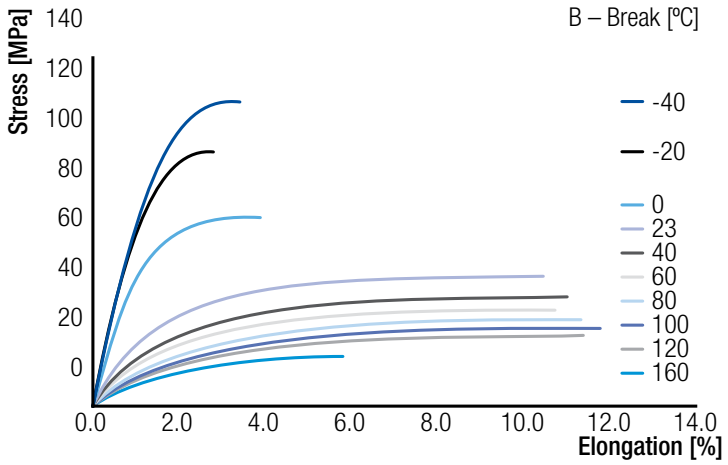
- Sunscreen
- Perspiration
- Ethyl alcohol
- Plastic cleaner
- Window cleaner
- Soapy water

Accelerated weathering test (Indoor, acc. to DIN75202)	4 Cycles (280 h)	6 Cycles (420 h)
Color change ΔE	0.3	0.7
Greyscale	4 - 5	4
Gloss 20°(Gloss units)	94.3	74.8
Gloss retention (20°)	101%	80%

HOUSING

Ultramid® B3UG4

- UL94 V2 and UL746C compliant
- High mechanical strength
- Good processability
- Hal. free



Flammability		Value	Testing method
Flammability class - UL	0.71 mm, BK	V-2	UL 94 IEC 60695-11-10, -20
	1.5 mm, BK	V-2	UL 94
	3.0 mm, BK	V-2	

Electrical properties		Value	Testing method
Hot-wire ignition (HWI)	0.71 mm	PLC 3	UL 746A
	1.5 mm	PLC 2	
	3.0 mm	PLC 1	
High amp arc ignition (HAI)	0.71 mm	PLC 0	UL 746A
	1.5 mm	PLC 0	
	3.0 mm	PLC 0	

Comparative tracking index (CTI)	PLC 1	UL 746A
Dielectric strength	17 kV/mm	ASTM D149
High voltage arc tracking rate (HVTR)	PLC 0	UL 746A
Volume Resistivity	1.0E+10 ohms*cm	ASTM D257 IEC 60093
Arc Resistance	PLC 6	ASTM D495

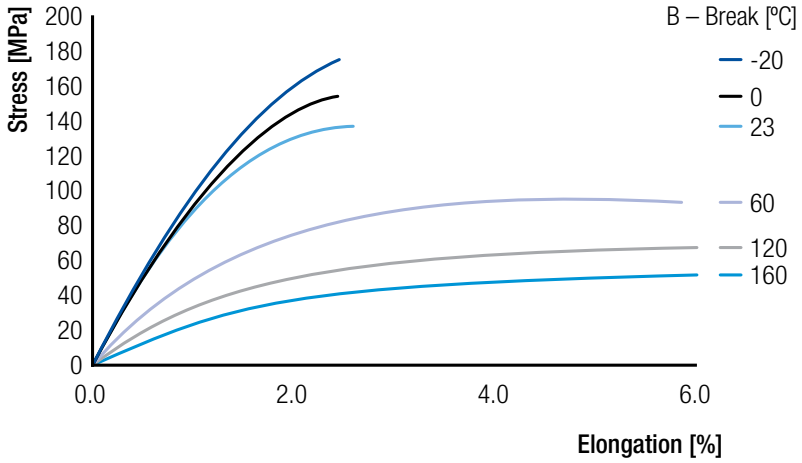
Thermal properties		Value	Testing method
RTI Elec	0.71 mm	140°C	UL 746B
	1.5 mm	140°C	
	3.0 mm	140°C	
RTI Imp	0.71 mm	125°C	UL 746B
	1.5 mm	125°C	
	3.0 mm	125°C	
RTI Str	0.71 mm	140°C	UL 746B
	1.5 mm	140°C	
	3.0 mm	140°C	

Physical properties	Value	Testing method
Dimensional Change	0.00%	ASTM D1042 ISO 2796
Outdoor suitability	f1	UL 746C

HOUSING

Ultradur® B4300 G6

- UL94 HB
- High mechanical strength
- Good processability



If your wall box requires an IP gasket between housing, display and cover, we offer formed-in-place foam gasket solutions based on Elastofoam® I PU Systems.

MOUNTING BRACKET

Ultramid® B3GK24

- UL94 HB
- GWFI > 650C
- Reduced warpage
- Good processability

MOUNTING BRACKET

Ultramid® B3U50G6

- UL94 V0
- Halogen free
- Suitable for unattended household appliances (IEC 60335)

Flammability		Value	Testing method
Flammability class - UL	0.40 mm, ALL	HB	UL 94
	0.75 mm, ALL	V-0	UL 94 IEC 60695-11-10, -20
	1.5 mm, ALL	V-0, 5VA	UL 94 IEC 60695-11-10, -20
	3.0 mm, ALL	V-0, 5VA	UL 94 IEC 60695-11-10, -20
	0.40 mm, ALL	HB75	IEC 60695-11-10, -20
Electrical properties			
Hot-wire ignition (HWI)	0.40 mm	PLC 0	UL 746A
	0.75 mm	PLC 0	
	1.5 mm	PLC 0	
	3.0 mm	PLC 0	
High amp arc ignition (HAI)	0.40 mm	PLC 0	UL 746A
	0.75 mm	PLC 0	
	1.5 mm	PLC 0	
	3.0 mm	PLC 0	
Comparative tracking index (CTI)		PLC 1	UL 746A
Inclined-plane tracking		1.0 kV	ASTM D2303
Thermal properties			
RTI Elec	0.40 mm	140°C	UL 746B
	0.75 mm	150°C	
	1.5 mm	150°C	
	3.0 mm	150°C	
RTI Imp	0.40 mm	105°C	UL 746B
	0.75 mm	115°C	
	1.5 mm	115°C	
	3.0 mm	115°C	

Ultramid® B3EG6

- UL94 HB
- High mechanical strength
- Good processability

Thermal properties			
RTI Elec	0.75 mm	120°C	UL 746B
	1.5 mm	120°C	
	3.0 mm	120°C	
	6.0 mm	120°C	
RTI Imp	1.5 mm	95.0°C	UL 746B
	3.0 mm	95.0°C	
	6.0 mm	95.0°C	
RTI Str	1.5 mm	130°C	UL 746B
	3.0 mm	130°C	
	6.0 mm	130°C	
Flammability class - UL	1.5 mm, ALL	HB	UL 94
	3.0 mm, ALL	HB	UL 94
	6.0 mm, ALL	HB	UL 94
	3.0 mm, ALL	HB40	IEC 60695-11-10, -20
	6.0 mm, ALL	HB40	IEC 60695-11-10, -20
	1.5 mm, ALL	HB75	IEC 60695-11-10, -20

CHARGING CABLE

Elastollan® 1176A10FR and 1188A10FR

- Non-halogenated FR ether grades
- Superior hydrolysis resistance
- Abrasion toughness with low conductivity
- Improved over-mold adhesion due to low filler content
- Cold temperature flexibility

For more information, go to
https://wireandcable.basf.us/features/read/elastollan-1176a10fr-and-1188a10fr-new-solutions-for-emobility

LOADING GUN

Haptic element – Elastollan® 1185

- Good adhesion to PA housing
- Good chemical resistance
- UV resistance

Contact carrier – Ultramid® B3U42G6

- UL94 V0
- Halogen free
- CTI 600

Housing – Ultramid® B3SR03

- High chemical resistance
- UL94 V2 UL f1 approved
- High toughness

BREAKERS, SWITCHES AND SAFETY COMPONENTS

Materials with UL, IEC, CCC, CSA approvals:

- Ultramid® B3UG4 → UL94 V2 (0.71mm), CTI usw.
- Ultramid® B3U42G6 → UL94 V0 (0.8mm), CTI 600
- Ultramid® C3U → UL94 V0 (0.4mm), GWIT 775
- Ultramid® A3UG5 → UL94 V0 (0.75mm)
- Ultramid® B3U30G6 → UL94 V2 (0.75mm)

PUBLIC CHARGING STATION OVERVIEW

HPC-Loading Gun

Smart Meter

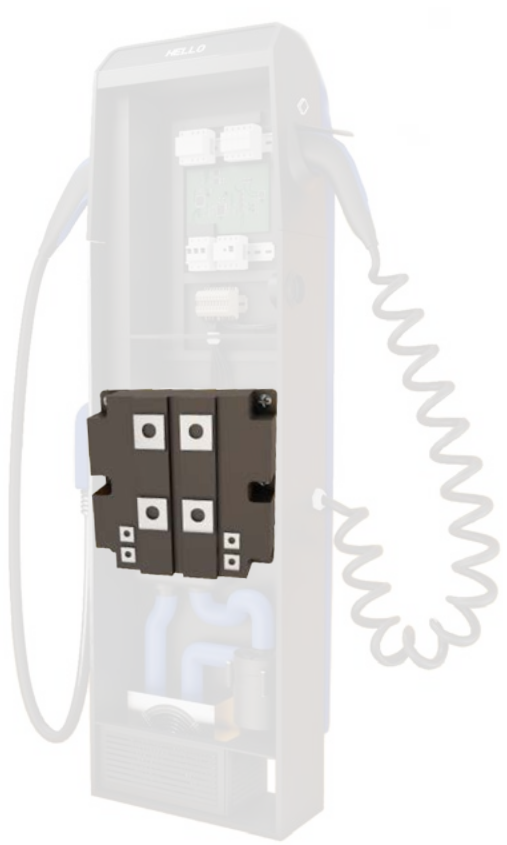
Power Electronics

Tubes

	Ultramid®	Ultradur®	Ultrason®	Elastollan®
HPC-Loading Gun				
Smart Meter				
Power Electronics		✓		
Tubes				
Charging Inlet	✓	✓		
High voltage connectors for power distribution	✓	✓		
Durable orange-colored products	✓	✓		

PUBLIC CHARGING STATION - POWER ELECTRONICS

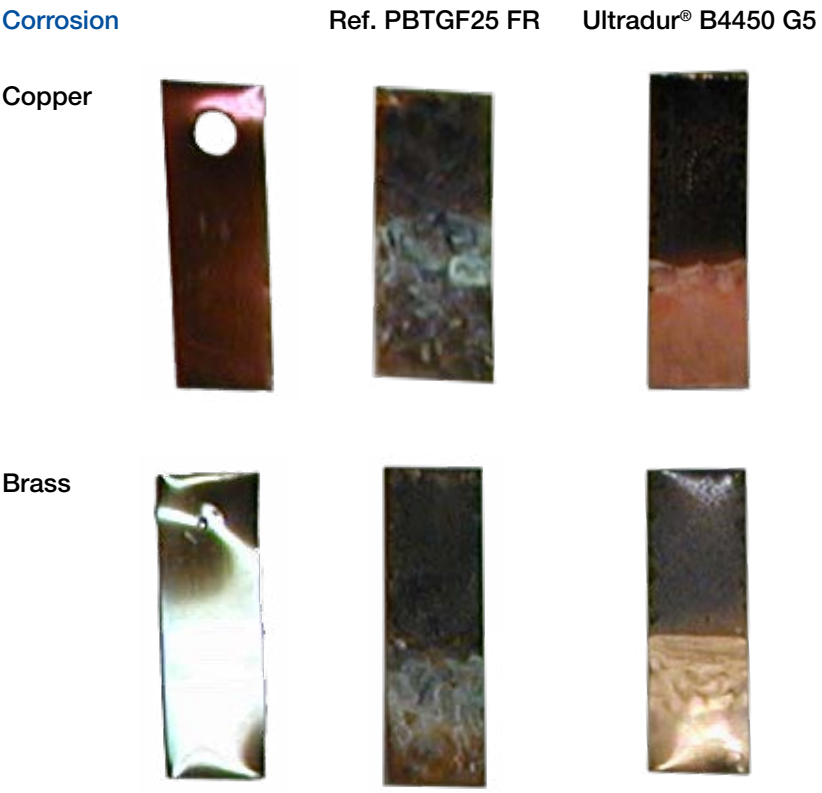
Ultradur® B4450G5



Key requirements

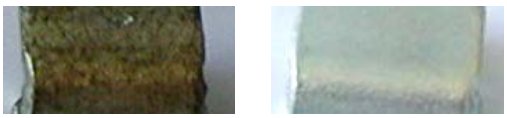
- Electric insulation of high AC and DC voltages
- Excellent insulation performance for tight contact arrays
- High CTI and RTI
- Constant dielectric strength
- Very few free ions, to avoid electrical corrosion under DC currents
- Long term thermal resistance
- Thermal conductivity if risk of hot spots exist

Corrosion



Storage of metal contacts and pellets in moist heat at 70 °C for 55 days.

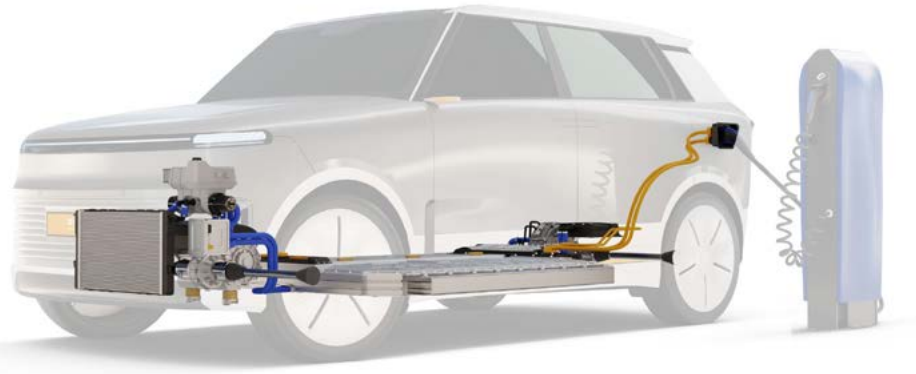
Deposits



Storage of metal contacts and pellets in dry heat at 150 °C for 7 days.

Significantly reduced risk of corrosion and deposits

CHARGING INLET



Key requirements

- High mechanical strength
- UV resistance
- High CTI
- Dielectric strength

Ultramid® B3EG6 black

- UL94 HB

Ultramid® B3U30G6 black

- UL94 V2

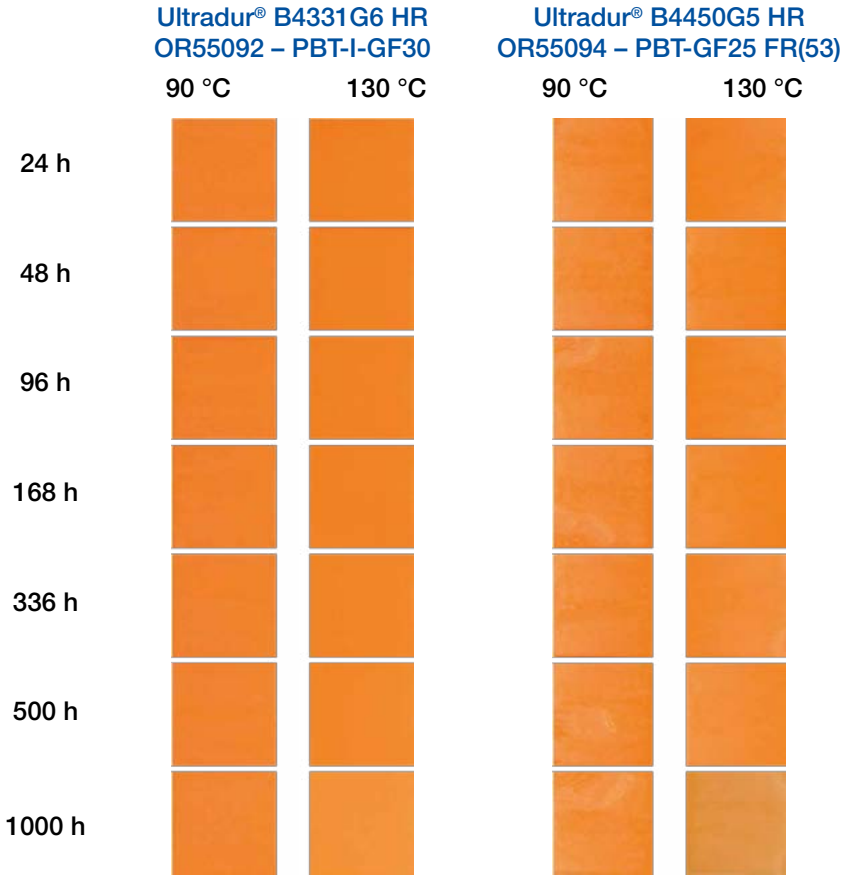
Ultradur® B4450G5 black

- UL94 V0

HIGH VOLTAGE CONNECTORS FOR POWER DISTRIBUTION

Ultradur® and Ultramid®

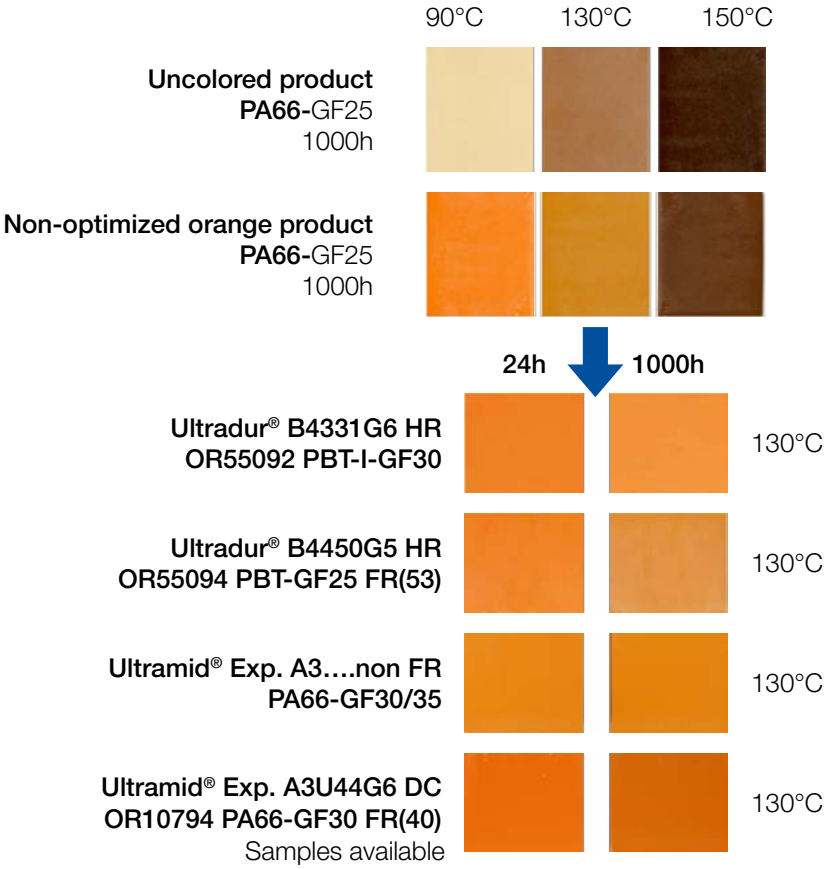
- UL94 HB and V0
- High mechanical strength
- High CTI
- Hydrolysis resistance
- Good processability
- Durable orange color



DURABLE ORANGE-COLORED PRODUCTS

Ultradur® and Ultramid®

Existing materials and new developments



To learn more about our innovative solutions, please go to:

Virtual Car:

https://plastics-rubber.basf.com/global/en/performance_polymers/industries/pp_automotive/applications/application_electronics_for_automotive/appl_emobility/virtual-car.html

eMobility solutions:

www.eMobility-plastics.basf.com

Automotive Electric and Electronic solutions:

https://plastics-rubber.basf.com/northamerica/en/performance_polymers/industries/pp_automotive/applications/application_electronics_for_automotive.html

Elastollan solutions for EV Charging Cables:

https://wireandcable.basf.us/features/read/elastollan-1176a10fr-and-1188a10fr-new-solutions-for-emobility

Adam Marcinkowski
Application Development Engineer
adam.marcinkowski@basf.com

Hadwan Hadwan
Senior eMobility Application Engineer
Mobile: 313-580-5344
hadwan.hadwan@basf.com

Christopher Bradlee
Market Segment Manager – Extrusion
Mobile: 734-512-3527
christopher.bradlee@basf.com

Edna Betancourt
Market Segment Manager - E&E
Mobile: 52-1-449-911-1575
edna.betancourt@basf.com

BASF
We create chemistry