

MATERIAL PROPERTY OVERVIEW FOR EV CONNECTORS

NEXT GENERATION MATERIALS FROM SABIC
FOR EV CHARGING INFRASTRUCTURES



EV CHARGING CONNECTORS

Replacing traditional materials with advanced thermoplastics can help optimize electric vehicle (EV) charging connectors by reducing weight and expanding design freedom. Advanced thermoplastics can also help our customers address industry requirements and regulations such as impact resistance and fire resistance while streamlining manufacturing to control cost and increase productivity.



110V~

Achtung
Hochspannung

Reifengröße
Tire size front

bar	psi
155/60R15	2.0 29
175/55R15	2.3 33

Reifengröße hinten
Tire size rear

Warme Reifen
Warm Tires

0.2 3

4 401 917 91 20



REQUIREMENTS FOR EV CHARGING CONNECTORS

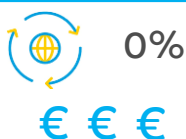
- Weatherability
- Impact resistance
- Chemical resistance
- Drive over test
- Dimensional stability
- Heat resistance
- Abrasion/scratch resistance
- Aesthetics (surface appearance)
- Flame retardant
- Re grind material possibility

MATERIAL SOLUTIONS FROM SABIC:

SABIC offers thermoplastics and glass fiber reinforced polypropylene (PP) materials for EV charging connectors.

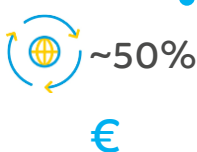
VALOX™ RESIN 357X(U)

- Passes drive over test
- Excellent surface finish
- High impact resistance



SABIC® PPc SGF H1030

- Halogen free FR
- Light weight (density)
- Excellent processability (flow)
- Stiffness due to glass fibers
- Hydrolysis resistant



STAMAX™ 30YH515 RESIN

- Halogen free FR
- Very high stiffness LGF
- High impact
- Stiffness due to glass fibers
- Hydrolysis resistant



XENOY™ 6370 RESIN

- Excellent surface finish
- Halogen free
- Good processability (flow)



COUPLER TYPES

REGULATIONS

- IEC 62196-2 provides the guidelines for each of the AC sockets and plugs.
- IEC 62196-3 provide guidelines for DC connectors.

AC CONNECTORS

TYPE 1



TYPE 2



TYPE 3



DC CONNECTORS

AA/CHAdeMO



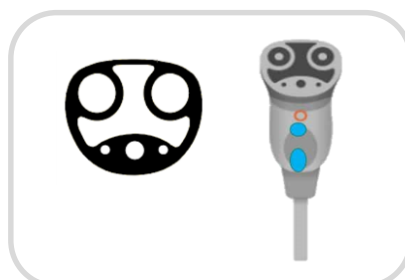
EE/CCS-1



FF/CCS-2



AC&DC TESLA CONNECTOR



EV CHARGING COUPLERS REGULATORY REQUIREMENTS

EV CHARGER COUPLERS		
EUROPE	ASIA	AMERICA
<p>IEC 62196-1/2 (AC) IEC 62196-3 (DC)</p> <p>DEGREE OF PROTECTION:</p> <ul style="list-style-type: none"> IP 21 (indoor) IP 44 (outdoor) and IPXXD <p>THERMAL</p> <ul style="list-style-type: none"> BPT: 125°C (live parts); 80°C (other part) RTI 85°C <p>AGING:</p> <ul style="list-style-type: none"> Thermal resistance after heat aging (80°C/168h) Hydro-aging 95%RH 80°C/168h no crack <p>ELECTRICAL:</p> <ul style="list-style-type: none"> CTI: 175V (CTI PLC 3 level) Isolation test acc IEC62196-1 <p>FLAMMABILITY:</p> <ul style="list-style-type: none"> Glow Wire Flame Index : 850°C active parts Glow Wire Flame Index: 650°C non active parts <p>MECHANICAL:</p> <ul style="list-style-type: none"> Ball impact & mechanical impact test at -30°C 	<p>JAPAN JARI A 0101 (AC)</p> <ul style="list-style-type: none"> Harmonized with IEC 62196-1/2 Electric law (DENAN) <p>JEVS G105 (DC, CHAdeMO)</p> <ul style="list-style-type: none"> V-0 material Dielectric withstand >2200V >1min <p>CHINA GB/T 20234.2 (AC)</p> <ul style="list-style-type: none"> Same requirement as IEC 62196-1 <p><i>other than:</i></p> <p>Pendulum impact test: -25°C/16hr aging</p> <p>CHINA GB/T 20234.3 (DC)</p>	<p>ANSI/UL 2251 / (AC) CSA C22.2 No 282-13</p> <p>THERMAL</p> <ul style="list-style-type: none"> RTI: 100/100/100°C <p>ELECTRICAL / FLAMMABILITY:</p> <ul style="list-style-type: none"> UL 94V0 → CTI 175 PLC3 /HWI PLC4 / HAI PLC3 UL 94V1/V2 → CTI 175 PLC3/HWI PLC3 / HAI PLC3 UL 94HB → CTI 175 PLC3/HWI PLC2 / HAI PLC1 <p>ENVIRONMENTAL:</p> <ul style="list-style-type: none"> UV exposure: f1, UL746C <p>MECHANICAL:</p> <ul style="list-style-type: none"> Impact drop test - 1m Drive over test <p>SAE J1772 (DC)</p> <p>UL2251</p> <ul style="list-style-type: none"> Safety testing method and requirements

MATERIAL SOLUTIONS VERSUS OTHER COMMONLY USED MATERIALS

CATEGORY	MATERIAL PROPERTY	UNITS	SABIC MATERIALS				OTHER COMMONLY USED MATERIALS		
			VALOX™ 357X RESIN (PC/PBT FR)	XENOY™ 6370 RESIN (PC/PBT GF30%)	STAMAX™ 30YH515 RESIN (PP LGF 30% FR)	SABIC® PP H1030 POLYMER (PP SGF 30% FR)	PA6GF30	PA6GF30FR	PA66GF30FR
RHEOLOGY (FLOW)	MVR 250°C, 5 kg	cc/10'	6	12	NA	8	NA	NA	NA
RHEOLOGY (FLOW)	Spiral flow	mm	125 (2mm)	160 (2mm)	600 (2mm)	450 (2mm)	250 (2mm)	200 (2mm)	225 (2mm)
MECHANICAL IMPACT	INI, 23°C	KJ/m²	36	10	15	8	16	13	10
MECHANICAL IMPACT	INI, 0°C	KJ/m²	15	7	14	7	11	10	8
MECHANICAL MODULUS	TM, 1 mm/min	GPa	2.2	8.5	7.6	8.7	5.5	6.7	7.5
THERMAL RESISTANCE	BPT, 125°C Impression width	mm	1.3	pass	1.5, pass	1.5, pass	Pass	Pass	Pass
THERMAL RESISTANCE	HDT 1.80 MPa	°C	87	140	155	160	210	205	230
THERMAL RESISTANCE	Vicat B120	°C	145	150	146	152	215	210	240
ELECTRICAL ISOLATION	HAI		0	3	On request	On request	0	0	0
ELECTRICAL ISOLATION	HWI		3	2	On request	On request	4	0	0
FLAME RETARDANCY	Non Cl / Non Br FR		N	NA	Y	Y	NA	Y	Y
FLAME RETARDANCY	UL94 (colors)	@ mm	V0 @ 0.8 (ALL)	HB @ 1.5 (ALL)	V0 @ 1.5 (BK)	V0 @ 1.5 (BK, GY, Nat)	HB @ 0.75 (All)	V0 @ 0.8 (BK)	V0 @ 0.4 (All)
FLAME RETARDANCY	UL94 (colors)	@ mm	5VA @ 2.5 (ALL)	-	V0 @ 3.0 (BK)	5VA @ 3.0	-	5VA @ 1.5 (BK)	5VA @ 1.5 (All)
FLAME RETARDANCY	GWFI	°C @ mm	960 @ 1.0	750 @ 3.2	960 @ 1.6	960 @ 1.6	750 @ 0.75	960 @ 0.4	960 @ 0.4
OUTDOOR SUITABILITY	UL746C		f1	f1	On request	On request	f1	f1	f1
SHRINKAGE FLOW / X-FLOW (AVERAGE)		%	1.4 / 1.5	0.5 / 0.6	0.2 / 0.6	0.2 / 0.9	0.5 / 0.7	0.5 / 0.7	0.3 / 0.8

SGF: Short glass fiber LGF: Long glass fiber FR: Flame retardant



CONTACT US

SABIC Headquarters

PO Box 5101
Riyadh 11422
Saudi Arabia
T +966 (0) 11 225 8000
F +966 (0) 11 225 9000
E info@sabic.com

EUROPE

SABIC Europe Head Office

PO Box 5151
6130 PD Sittard
The Netherlands
T +31 (46) 722 2222
F +31 (46) 722 0000
E info@sabic.com

ASIA PACIFIC

SABIC Asia Pacific Head Office

One Temasek Avenue
#06-01 Millenia Tower
Singapore 039192
T +65 6557 2555
F +65 6531 8101
E info@sabic.com

SABIC (Shanghai) Trading Co. Ltd.

2550, Xiupu Road Pudong
Shanghai 201319
China
T +86 21 2037 8188
F +86 21 2037 8288

UNITED STATES

SABIC Americas Head Office

Suite 100
2500 City West Boulevard
Houston, TX 77042
USA
T +1 713 532 4999
F +1 713 532 4994
E info@sabicamericas.com

DISCLAIMER: THE MATERIALS, PRODUCTS AND SERVICES OF SAUDI BASIC INDUSTRIES CORPORATION (SABIC) OR ITS SUBSIDIARIES OR AFFILIATES ("SELLER") ARE SOLD SUBJECT TO SELLER'S STANDARD CONDITIONS OF SALE, WHICH ARE AVAILABLE UPON REQUEST. INFORMATION AND RECOMMENDATIONS CONTAINED IN THIS DOCUMENT ARE GIVEN IN GOOD FAITH. HOWEVER, SELLER MAKES NO EXPRESS OR IMPLIED REPRESENTATION, WARRANTY OR GUARANTEE (i) THAT ANY RESULTS DESCRIBED IN THIS DOCUMENT WILL BE OBTAINED UNDER END-USE CONDITIONS, OR (ii) AS TO THE EFFECTIVENESS OR SAFETY OF ANY DESIGN OR APPLICATION INCORPORATING SELLER'S MATERIALS, PRODUCTS, SERVICES OR RECOMMENDATIONS. UNLESS OTHERWISE PROVIDED IN SELLER'S STANDARD CONDITIONS OF SALE, SELLER SHALL NOT BE RESPONSIBLE FOR ANY LOSS RESULTING FROM ANY USE OF ITS MATERIALS, PRODUCTS, SERVICES OR RECOMMENDATIONS DESCRIBED IN THIS DOCUMENT. Each user is responsible for making its own determination as to the suitability of Seller's materials, products, services or recommendations for the user's particular use through appropriate end-use and other testing and analysis. Nothing in any document or oral statement shall be deemed to alter or waive any provision of Seller's Standard Conditions of Sale or this Disclaimer, unless it is specifically agreed to in a writing signed by Seller. Statements by Seller concerning a possible use of any material, product, service or design do not, are not intended to, and should not be construed to grant any license under any patent or other intellectual property right of Seller or as a recommendation for the use of any material, product, service or design in a manner that infringes any patent or other intellectual property right. SABIC and brands marked with TM are trademarks of SABIC or its subsidiaries or affiliates.

© 2021 Saudi Basic Industries Corporation (SABIC). All Rights Reserved.

Any brands, products or services of other companies referenced in this document are the trademarks, service marks and/or trade names of their respective holders.