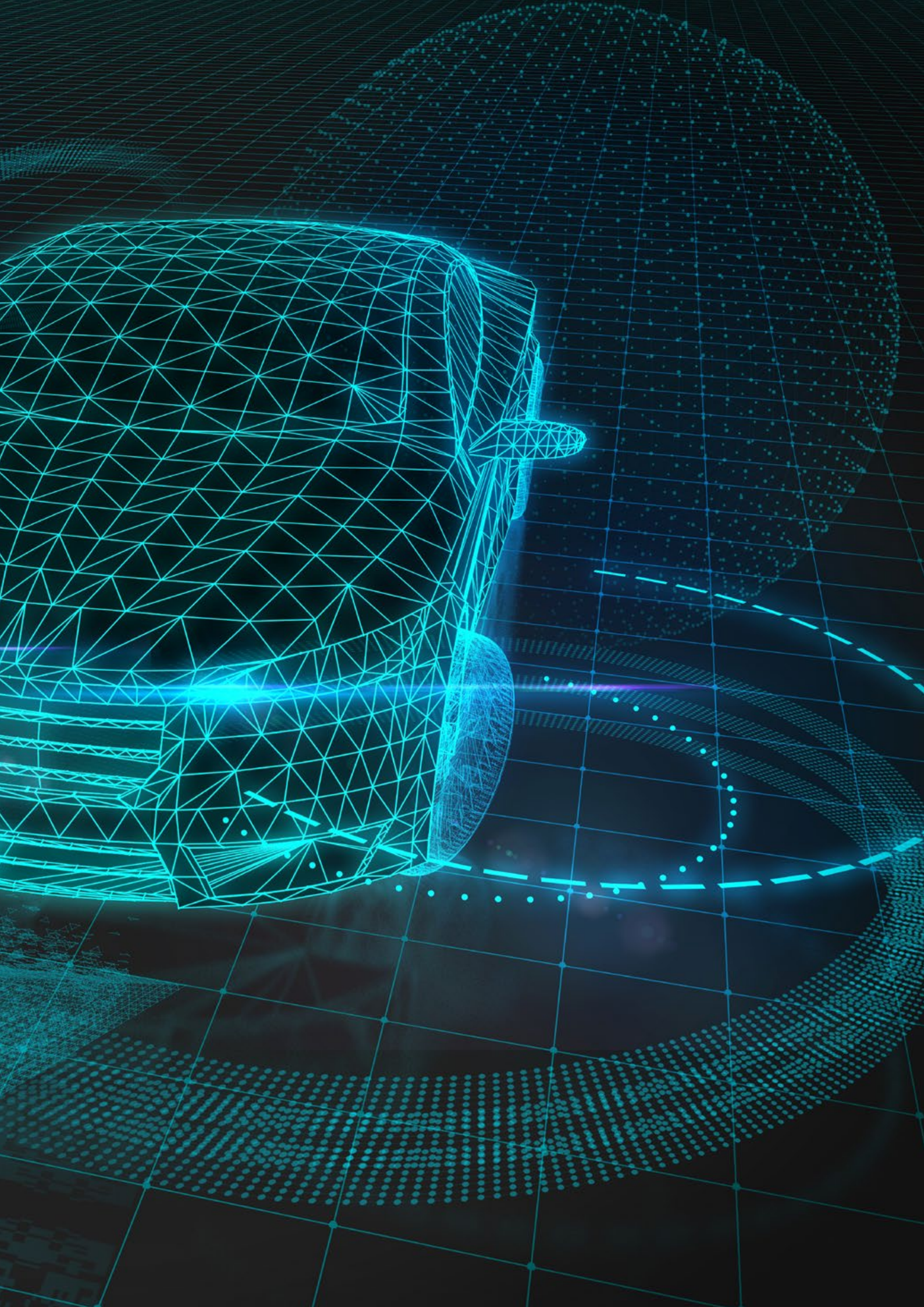
HIGH PERFORMANCE AUTOMOTIVE SENSORS

USING ULTEM™ 2300 & 2310 RESIN

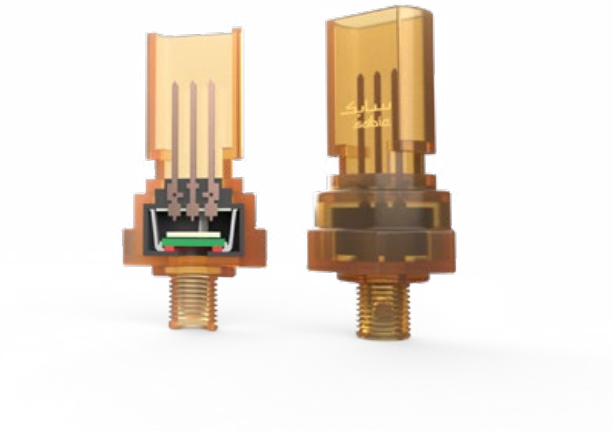
CHEMISTRY THAT MATTERS™

Sensor applications in the automotive electronics field cover a wide range, from pressure sensors for manifold and exhaust systems to magnetic sensors for gear tooth and valve position. They may fail prematurely when exposed to harsh conditions involving high temperatures and moisture.



HIGH PERFORMANCE AUTOMOTIVE SENSORS

SABIC's ULTEM™ 2300 & ULTEM 2310 resins offer a balance of properties to address demanding material requirements of automotive sensors. They can be used for sensors that need to perform under harsh conditions involving moisture, a broad range of temperatures and automotive fluids.



HIGH HEAT RESISTANCE
High heat stability up to 150°C

LOW MOISTURE ABSORPTION
Dimensional change <0.06% after 168 hours soak test using water

DIMENSIONAL STABILTY
Stable thermal expansion
Favorable CTE from -40° to 150°C

CHEMICAL RESISTANCE
Performs well against standard coolants and automotive fluids

RoHS COMPLIANCE
Regulation to reduce the impact of electronics on health and environment

INTRINSIC FLAME RETARDANCE
Without the use of FR modifiers (UL94 V0 and 5VA and FAR25.853)

MOISTURE AND HIGH HEAT RESISTANCE

ULTEM™ 2300 & 2310 resins are differentiated from other mainstream thermoplastics due to their excellent strength and dimensional stability when exposed to a combination of moisture and high temperatures. Sensors made from competitive materials may fail prematurely when exposed to these harsh conditions.

Thermoplastics, such as polyethersulfone (PES and polyamide (PA66), have a higher moisture intake than ULTEM resin. Polyphenylenesulfide (PPS) and PA66 are less suitable for sensor applications when dimensional stability becomes a critical issue at temperatures exceeding 100°C.

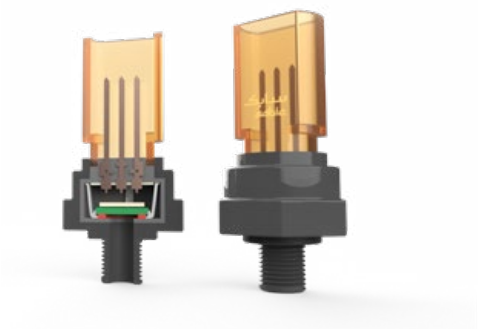
ULTEM 2300 resin is a standard flow 30% glass fiber reinforced polyetherimide (PEI) resin. For even better flow to produce smaller and thinner-wall components, ULTEM 2310 resin offers improved melt flow.

To avoid a breakdown of signals because of a mismatch in thermal expansion, metal to metal connectors may still be preferred. ULTEM 2300 & 2310 resins, with a coefficient of thermal expansion close to metal, are well-suited to overmold these connectors.

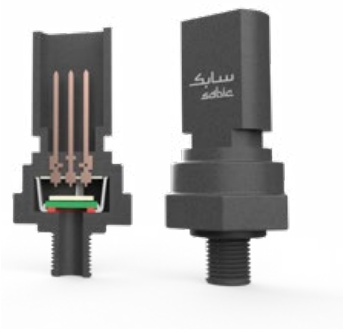
The excellent dimensional stability of these resins can also support the potential for full thermoplastic sensor solutions, which can enable complex designs and simplification of the assembly through part integration of the fluid and connector sides.

PROPERTIES	ULTEM 2300 resin	ULTEM 2310 resin
Melt Mass-Flow Rate (g/10 min)	5	7.6
Tensile Modulus (MPa)	10500	10500
CTE flow (cm/cm/°C)	1.80E-05	1.80E-05

Metal-ULTEM resin solution



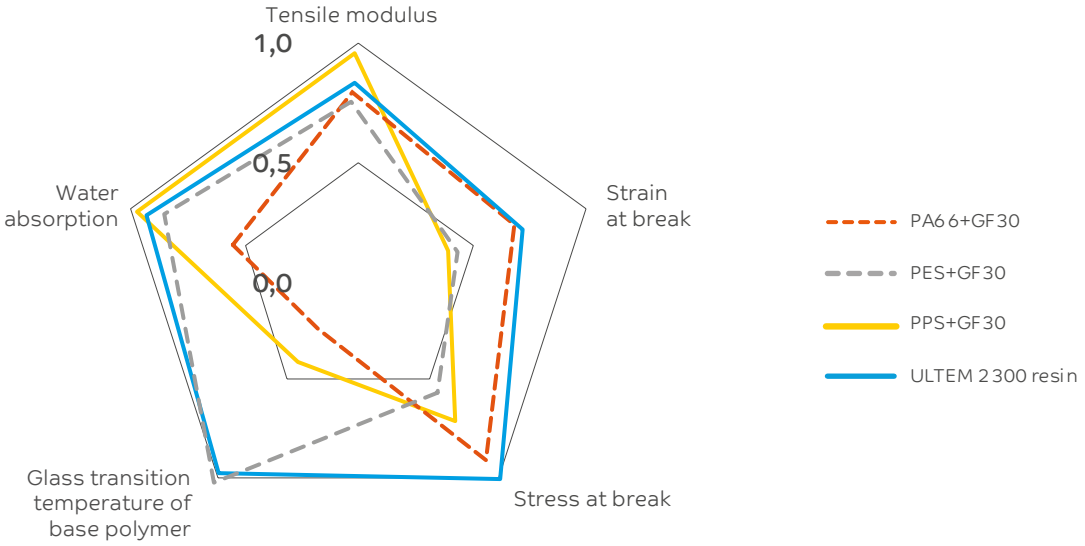
Full ULTEM resin solution



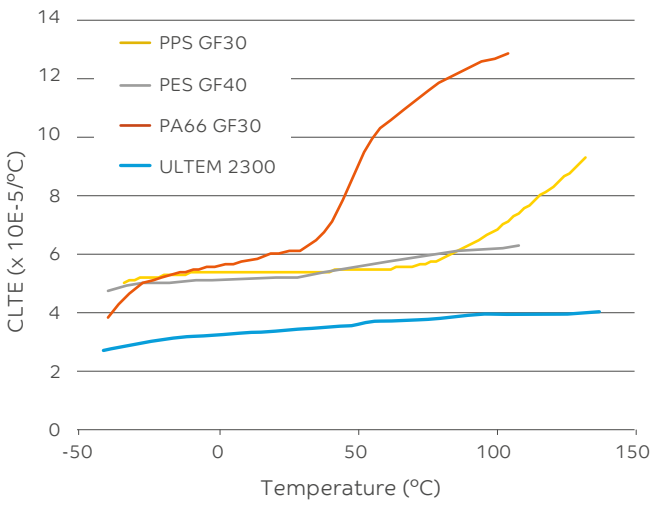
STRENGTH AND CHEMICAL RESISTANCE

ULTEM™ 2300 & 2310 resins provide similar mechanical and chemical performance. Both grades offer excellent dimensional stability, strength, stiffness, chemical resistance, and creep resistance under high temperatures due to their high glass transition temperature of 217°C.

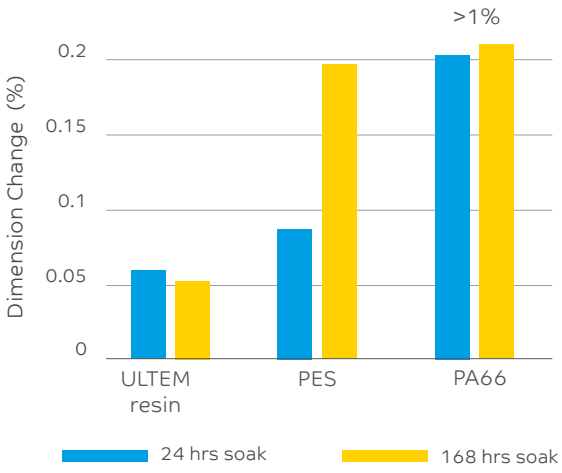
ULTEM 2300 resin: high strength & heat stability performance



Coefficient of Thermal Expansion (CTE) X-Flow



Moisture absorption



High coolant* resistance (aging at 130°C)

σ_b retention (%) Exposure time	PPA	PPS	PA46	ULTEM™ 2300 RESIN
250 hrs	71	79	25	96
500 hrs	66	79	17	96
1000 hrs	67	72	18	99
2000 hrs	29	69	12	93
3000 hrs	15	67	6	98

*Coolant: Havoline DEXCOOL - Ethylene Glycol 80-97% (antifreeze), σ_b (%) retention of tensile stress at break, σ_y (%) at yield

Chemical resistance to automotive fluids

Chemical	Exposure method	Temp (°C)	Time (days)	ULTEM™ 2300 RESIN σ_y (%)
Burmah Oil Bot 26 Transmission Fluid	Wipe	23	7	100
	Smear once	135	7	100
Havoline Dexron III	Smear once	135	7	100
	Wipe	23	7	100
Transmission Fluid	Smear once	135	7	100
Engine oil	Immersion	23	7	101
	Immersion	60	7	88

KEY Material properties

Properties	PA66 30% glass filled	PES 30% glass filled	PPS 30% glass filled	ULTEM™ 2300 RESIN
Tensile modulus (MPa)	10600	9790	12100	10500
Strain at break (%)	2.4	1.4	1.3	2.4
Stress at break (MPa)	160	99	126	175
Glass transition of base	55	220	90	217
CTE flow (cm/cm/°C)	2.70E-05	3.00E-05	2.20E-05	1.80E-05
CTE X- flow (cm/cm/°C)	9.80E-05	3.60E-05	4.50E-05	4.80E-05
Water absorption (%)	0.94	0.3	0.06	0.16
Density (kg/m^3)	1410	1610	1570	1510
Processing	++	+++	-	+++

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Please consult our website to find more information:
https://www.sabic.com/en/products/specialties

SABIC ISCC+ CERTIFIED RENEWABLE ULTEM RESIN SOLUTIONS
A new portfolio of bio-based ULTEM resins that delivers a lower carbon footprint while offering the same high performance and processability as incumbent ULTEM materials is now available.

ISCC
International Sustainability & Carbon Certification