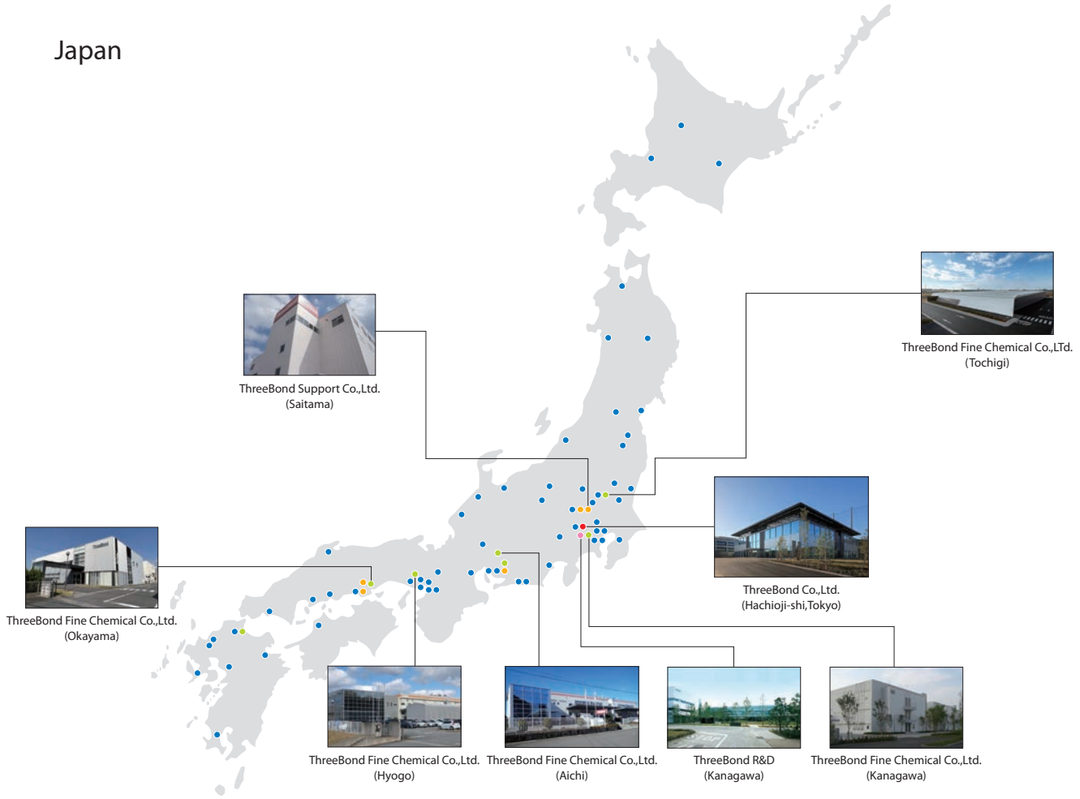
ThreeBond

Automotive Equipment Products Guide

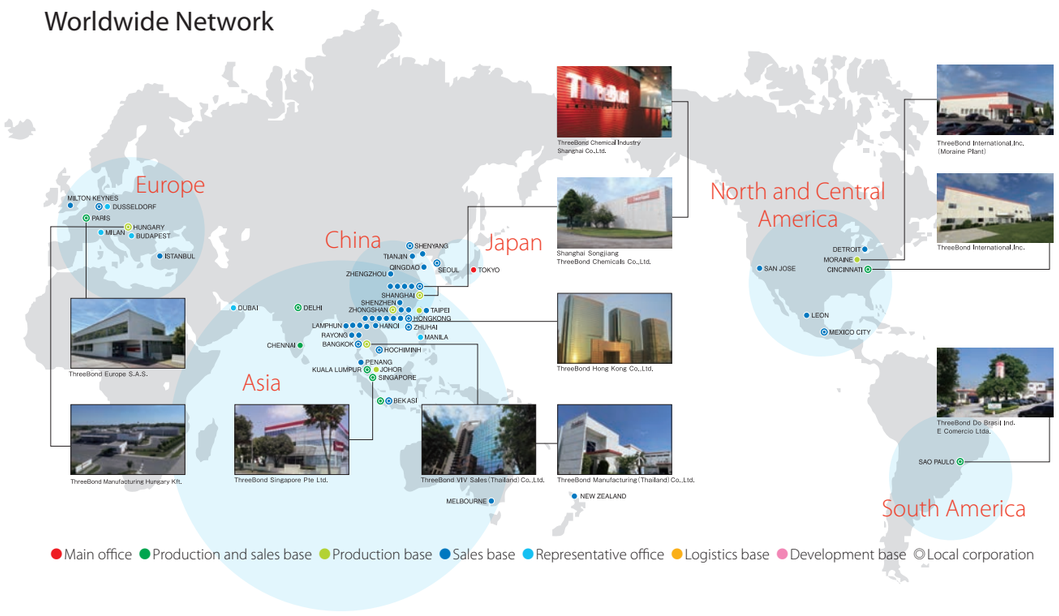
ThreeBond Network

We at ThreeBond have established ourselves as a top-tier provider of sealants and adhesives for industrial use, and we have gained the trust of our customers through our production and sales network in Japan, North and Central America, South America, Europe, Asia, and China.

Japan



Worldwide Network

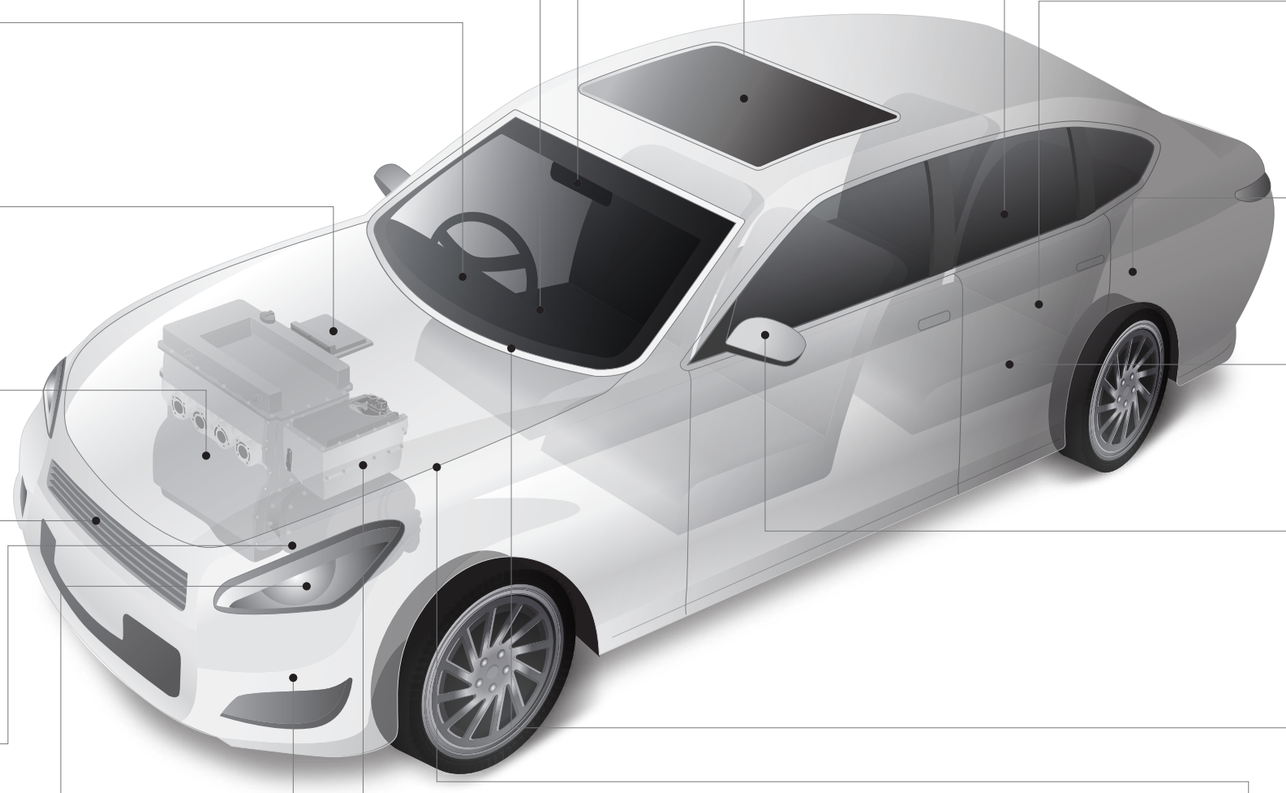


● Main office ● Production and sales base ● Production base ● Sales base ● Representative office ● Logistics base ● Development base ◎ Local corporation

Index

Automotive Equipment Products Application

The automotive industry is undergoing major changes, including the widespread adoption of electric vehicles and the evolution of autonomous driving technology. We have been active in the development of a wide range of products that respond to the evolving functions of automobile components, including sealants, adhesives, coating agents, heat dissipating agents and potting agents. Going forward, we will continue our contribution to the future of the automotive industry by taking a bold approach to meeting the needs of our customers.



Car Mounted Displays
- Panel bonding
- Panel fixing

Stereo Cameras
- Lens holders fixing
- IR cut filter fixing
- Substrate bonding

Sunroofs
- Waterproof sealing

Interior Components
- Coating agent

Head-up Displays
- Case bonding
- Lens fixing
- Sealing from moisture

Battery
- Case (Pack) sealing
- Cell fixing agent
- Liquid electrolyte sealant

ECU
- Case sealing
- Substrate heat dissipating agent

Wire harness
- Connector sealing

Engin・Gear Transmission
- Sealant for block/case joining surface
- Welch plug sealant
- MEC process

Body
- Structural adhesive

Millimeter Wave Rader
- Case sealing

Mirror
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Drive Motor
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- Lamination bonding of steel plates

Mini-motor
- Magnet fixing
- Coil impregnation
- Bearing interlocking

Headlight
- Case sealing
- Light-emitting element heat dissipation

Sonar Sensors
- Substrate sealing
- Connector sealing

Inverter
- Case sealing
- React or bonding
- Power module heat dissipation

Relay
- Sealing

Battery

Since its foundation, we have developed numerous products and techniques for sealants and adhesives with FIPG used as its core and contributed to the industry.

By making the best use of our know-how, we manufacture a rich assortment of sealant products with low moisture permeability and high resistance to liquid electrolyte for lithium ion batteries that are widely used as in-vehicle secondary batteries.
In addition, we are making positive efforts to develop and commercialize heat radiating agents and sealants for battery-related parts and sealing agents, etc. for fuel cells regarded as the next-generation energy.

Case (Pack)

Application	Pack sealing
Product	ThreeBond 1160
Characteristics	1. High moisture resistance 2. Low molecular cyclic siloxane-reduced free 3. Tin-free
Curing method	Moisture curing

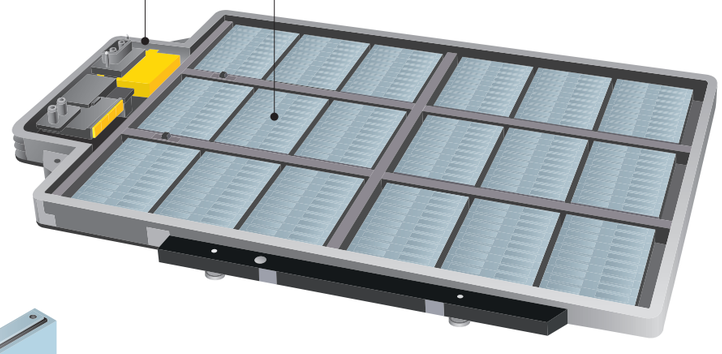
Note: "Free" in items 2 and 3 indicates that these substances are not intentionally added to the product formulation.

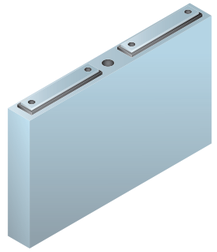
Stack

Application	Cell fixing
Product	ThreeBond 3953
Characteristics	1. Fast curing at room temperature 2. High heat and moisture resistance 3. Good flexibility
Curing method	Two component room temperature curing

Application	Heat dissipation
Product	ThreeBond 1165
Characteristics	1. Good heat radiation 2. Tin-free 3. Low molecular cyclic siloxane-Free
Curing method	Moisture curing

Note: "Free" in items 2 and 3 indicates that these substances are not intentionally added to the product formulation.





Lithium ion secondary battery square cell

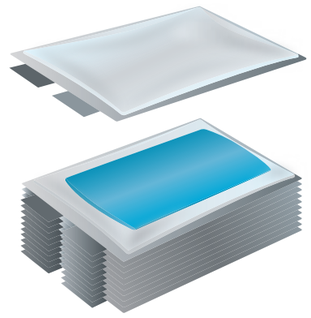
Application	Cell heat radiation
Product	ThreeBond 1165
Characteristics	1. Good heat dissipation 2. Tin-free 3. Low-molecular cyclic siloxane-free
Curing method	Moisture curing

Note: "Free" in item 2 and 3 indicates that the component is not used as part of the product design.

Application	Cell heat radiation + Fixing
Product	ThreeBond 2045B/2145B
Characteristics	1. Good heat dissipation 2. Good adhesion 3. Product equivalent by V-0 in the flame resistance standard UL94
Curing method	Two component room temperature curing

Lithium ion secondary battery cylindrical cell

Application	Liquid electrolyte sealing
Product	ThreeBond 1153E ThreeBond 1171 Series
Characteristics	1. Good resistance to liquid electrolyte 2. Low moisture permeability
Curing method	Heat curing Solvent volatilization



Lithium ion secondary battery laminated type cell

Application	Cell lamination adhesion
Product	ThreeBond 1533F
Characteristics	1. Good adhesion to hardly adherable materials *Primer treatment unnecessary since it is single-component 2. Dibutyltin compounds-free product 3. Low molecular cyclic siloxane-Free product
Curing method	Moisture curing

Note: "Free" in item 2 and 3 indicates that the component is not used as part of the product design.

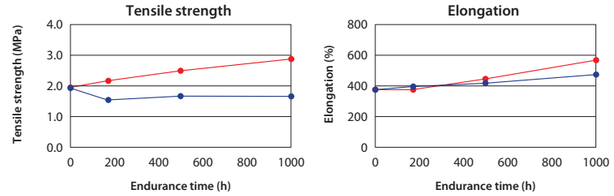
Case (Pack) sealant (Non-sillicone)

ThreeBond1160 is a tin-free one-component room temperature curing modified silicone sealant with excellent heat resistance, cold resistance and chemical resistance. It does not contain low-molecular cyclic siloxane, meaning it can be used in close proximity to electrical contact points.

Test item	Unit	ThreeBond 1160	Remarks
Appearance	-	Black	-
Viscosity	Pa•s	125	-
Hardness	-	A46	-
Elongation	%	460	No.3 dumbbell
Tensile strength	MPa	2.0	No.3 dumbbell
Tensile shear bond strength	MPa	3.4	Aluminum/Aluminum

* "Tin-free" indicates that organotin compounds are not used as part of the product design.

【Long-term durability test】

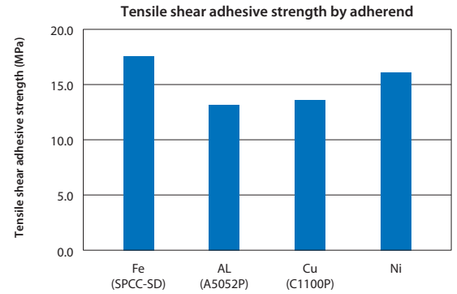


* Curing conditions: (23°C, 50%RH) × 7 days

Cell heat dissipation agents

ThreeBond 2045B/2145B are two-component room-temperature curing epoxy compound resins. They have high heat dissipation and high adhesive strength. They also meet UL94 vertical burning test V-0 flame-retardant standards.

Test item	Unit	ThreeBond 2045B (Main agent)	ThreeBond 2145B (Curing agent)	Remarks
Main components	-	Epoxy resin	Polyamine	-
Appearance	-	Pink	Light blue	-
Viscosity	Pa•s	82	124	-
Compounding ratio (mass ratio)	-	100 : 40 (Main agent: Curing agent)		-
Standard curing conditions	-	25°C×24h		-
Hardness	-	D79		-
Tensile strength	MPa	17.5		SPCC-SD
Thermal conductivity	W/m•k	2.1		-



Endurance time: 25°C×24h

Cell sealant

ThreeBond 1170H, 1171F and 1171G are one-component volatile solvent type sealants for batteries with low moisture permeability and excellent electrolyte resistance. They provide excellent sealing with volatile solvent that forms an elastic rubber-like film. They deliver excellent performance as liquid electrolyte sealants for caulked portions, encapsulated portions and safety valves of batteries.

Test item	Unit	ThreeBond 1170H	ThreeBond 1171F	ThreeBond 1171G	Remarks
Curing method	-	One-component volatile solvent type			-
Apperance	-	Blue	Black	Transparent	-
Viscosity	mPa•s	225	1800	600	-
State	-	Rubber-like elastic film			-
Moisture permeability*1	g/m²•24h	6.8	5.6	6.8	-
Chemical resistance	%	2.2	0.5	-1.9	Propylene carbonate
		2.2	0.6	-1.4	Gamma Butyrolactone
		2.9	-0.8	2.1	Dimethoxyethane

*1 (40°C, 95%RH) × 24 h

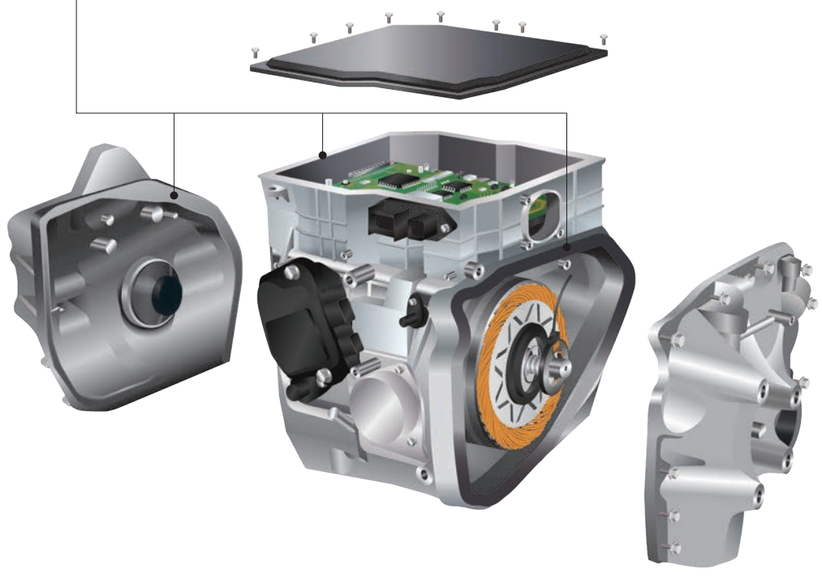
E-Axle / Engine / Gear Transmission

In recent years, the electrification of vehicles has driven increased adoption of E-axles, which integrate the motor, inverter, and reduction gear to improve efficiency. Many types of sealants and adhesives are used in E-axles. Sealants in particular require specific performance characteristics depending on the mating surface, so it is not uncommon to use multiple sealants for different applications.
We are developing sealant products and technologies that meet the increasingly diverse needs of our customers, including improving durability against high-performance, low-viscosity oils and reducing inventory management burden through sealant standardization.

Case

Application	Flange sealing	Application	Flange sealing
Product	ThreeBond 1160 Series	Product	ThreeBond 1215Q
Characteristics	1. High moisture resistance 2. Low molecular cyclic siloxane-reduced free 3. Tin-free	Characteristics	1. Good oil resistance 2. Good heat resistance 3. Good sealing properties
Curing method	Moisture curing	Curing method	Moisture curing

Note: "Free" in item 2 and 3 indicates that the component is not used as part of the product design.



Enables standardization of materials for all E-axle flange seals

Flange sealing

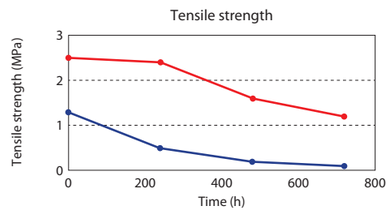
ThreeBond 1215Q is a single-component room temperature curing silicone-based sealant. It has excellent chemical resistance and is suitable for flange sealing on various mating surfaces that require resistance to high-capacity and low-viscosity oils.

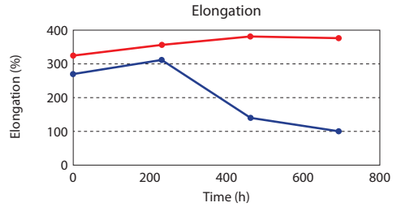
Test item	Unit	ThreeBond 1215Q	Remarks
Main components	-	Silicone	-
Curing method	-	Deoximation	-
Feature	-	Chemical resistance	-
Apperance	-	Gray	-
Viscosity	Pa•s	200	-
Specific gravity	-	1.43	-
Hardness	-	A61	-
Elongation	%	380	No.3 dumbbell
Tensile strength	MPa	2.7	No.3 dumbbell
Tensile shear adhesive strength	MPa	1.9	Aluminum/Aluminum

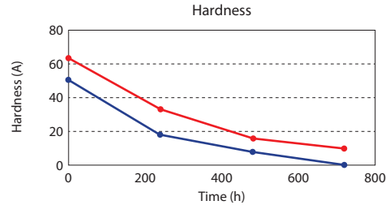
Durability test

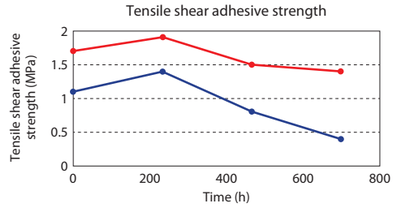
Product	Initial	After 720h
ThreeBond 1215Q		
Existing product A		 Damaged beyond recognition

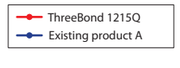
Excellent resistance to low-viscosity oil compared to the existing product







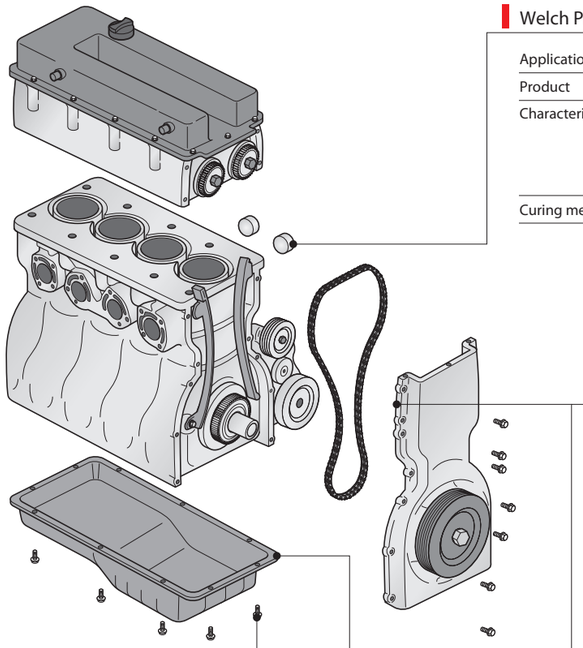




*Curing conditions: 23°C x 50%RH x 168 h
*Immersion conditions: Low-viscosity oil (transaxle fluid) at 120°C x 720 h

E-Axle / Engine / Gear Transmission

A variety of sealing agents and adhesives are used in the engines and transmissions of vehicles.
In recent years, improved adhesion to the lightweight materials substituting iron and aluminium and oil surfaces of the flange is required. To meet the diversifying needs of customers, we are working on the product and technology development of one-component room temperature curable (RTV) silicone type sealing agents.
In addition, to meet our customers' needs, we stock a large product line-up of anaerobic sealing agents suitable for the sealing and adhesion of each threaded portion and the plug.



Welch Plug

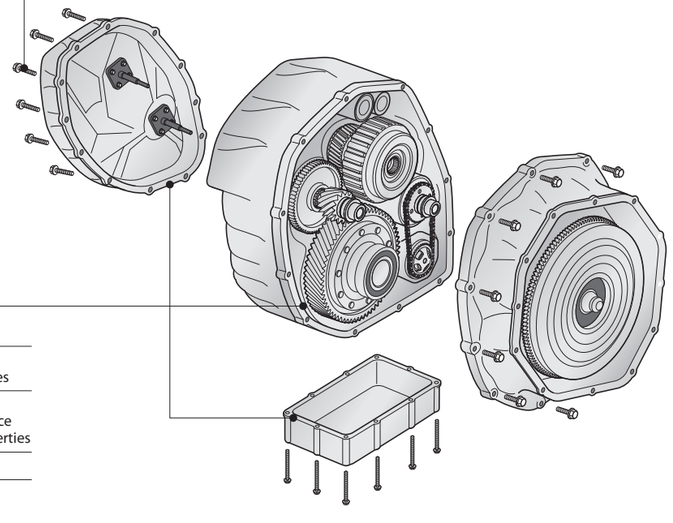
Application	Fitting, Fixing, Sealing
Product	ThreeBond 1386 Series
Characteristics	1. Good durability 2. Grades with low to high strength available 3. Fluorscence, axial force added types available
Curing method	Anaerobic curing

Oil Pan/ Chain case/ Oil pump

Application	Flange sealing
Product	ThreeBond 1217 Series
Characteristics	1. De-oxime type 2. Good engine oil resistance 3. Good initial pressure resistance 4. Good resistance to heat, cold and oil 5. Good flexibility, high elongation grades available 6. Good oil surface adhesion grade available 7. Good Magnesium material adhesion grade available
Curing method	Moisture curing

Bolt, Screw

Application	Fixing, Sealing
Product	ThreeBond 2400 Series
Characteristics	1. Fix by simply tightening 2. Good durability 3. Grades with low to high strength available 4. Acrylic- and epoxy-based products available



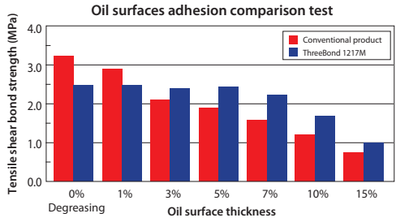
Transmission case / Oil pan

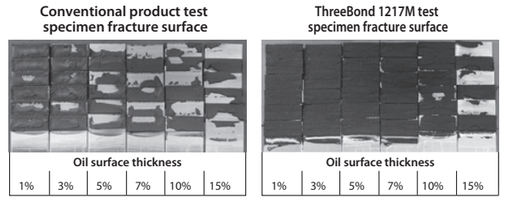
Application	Flange sealing
Product	ThreeBond 1215Q ThreeBond 1216 Series
Characteristics	1. Good oil resistance 2. Good heat resistance 3. Good sealing properties
Curing method	Moisture curing

For engine oil resistance

Oil surface adhesive FIPG

ThreeBond 1217M is a one-component room temperature curable (RTV) silicone sealing agent that has oil surface adhesion properties.
Inferior quality caused by the simplification and incomplete removal of the degreasing washing process of flange surfaces can be reduced.

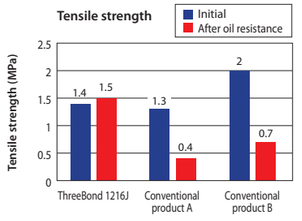


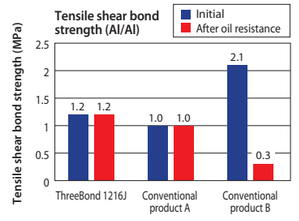


* Curing conditions: 23°C, 50%RH × 168h

For ATF® resistance

ThreeBond 1216J is a deoximation-type transmission-use one-component room temperature curing (RTV) silicone sealant with heat, cold and ATF® resistance.





* Oil resistance conditions, oil: CVT fluid, oil resistance temperature: 150°C, duration: 150 hours

Foaming test

Conventional product

ThreeBond 1216J

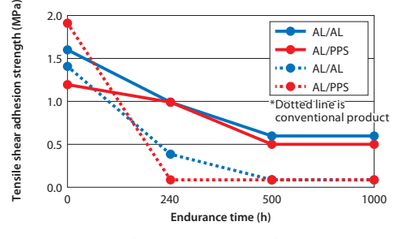
* Evaluation oil: ATF®
* Testing method: JIS K 2518 compliant, sequence I

Support for resin adhesion

ThreeBond 1207K is a deacetone-type single-component moisture-curing (RTV) silicone-based resin with resin adhesive and cooling resistant properties.

Test item	Unit	ThreeBond 1207K
Type	-	Deacetone
Appearance	-	Black
Viscosity	-	330
Specific gravity	-	1.36
Tack-free time	min	5
Deep curing performance	mm/day	2.8
Hardness	-	A46
Tensile strength	MPa	2.3
Elongation	%	268
Tensile shear bond strength (Al)	MPa Cf rate (%)	1.6 100
Tensile shear bond strength (PA66)	MPa Cf rate (%)	1.2 90
Tensile shear bond strength (PPS)	MPa Cf rate (%)	1.2 100
Tensile shear bond strength (PBT)	MPa Cf rate (%)	1.2 90

120°C coolant resistance and durability test shear strength results



*Curing conditions: 23°C, 50% RH × 168 h

Inverter / Converter

Since an inverter and a converter are composed of numerous electrical component modules, a wide variety of sealing agents and adhesives are used, according to various purposes.

The modules are expected to have higher capacity and higher performance, and to be smaller in the future. Therefore, we are developing products with more functionality, such as heat dissipating agents, potting agents, and flame-resistant adhesives, for protecting various types of substrate elements and coils used for more advanced modules.

Case

Application	Sealing and bonding (FIPG)
Product	ThreeBond 1200 Series
Characteristics	1. Good durability 2. Good adhesion 3. Excellent followability
Curing method	Moisture curing

Application	Sealing (CIPG)
Product	ThreeBond 3081J
Characteristics	1. Good durability 2. Low-compression permanent deformation 3. Reworking available
Curing method	UV curing

Application	Sealing (CIPG)
Product	ThreeBond 3166
Characteristics	1. Good durability 2. Good sealability with wide compression ratio 3. Reworking available
Curing method	UV curing

Case

Application	Anti-rust coating
Product	ThreeBond 6100 Series
Characteristics	1. Good anti rust property 2. Good durability 3. Water-type available (Product non-compatible with organic solvent poisoning prevention regulations)
Curing method	Room temperature curing

Film capacitor

Application	Protection
Product	ThreeBond 2000 and 2100 Series
Characteristics	1. Good adhesion 2. Good durability 3. Various grades of main agents and curing agents available
Curing method	Two-component curing

Capacitor

Application	Sealing
Product	ThreeBond 2222P
Characteristics	1. Good solder heat resistance 2. Good durability 3. Good adhesion
Curing method	Heat curing

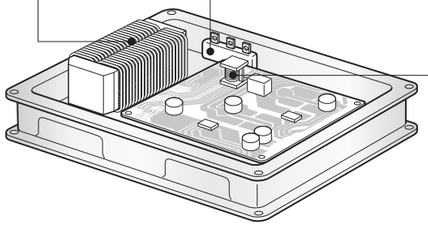
Reactor coil

Application	Heat dissipation
Product	ThreeBond 1165
Characteristics	1. Good heat dissipation 2. Tin-free 3. Low-molecular cyclic siloxane-free
Curing method	Moisture curing

Note: "Free" in item 2 and 3 indicates that the component is not used as part of the product design.

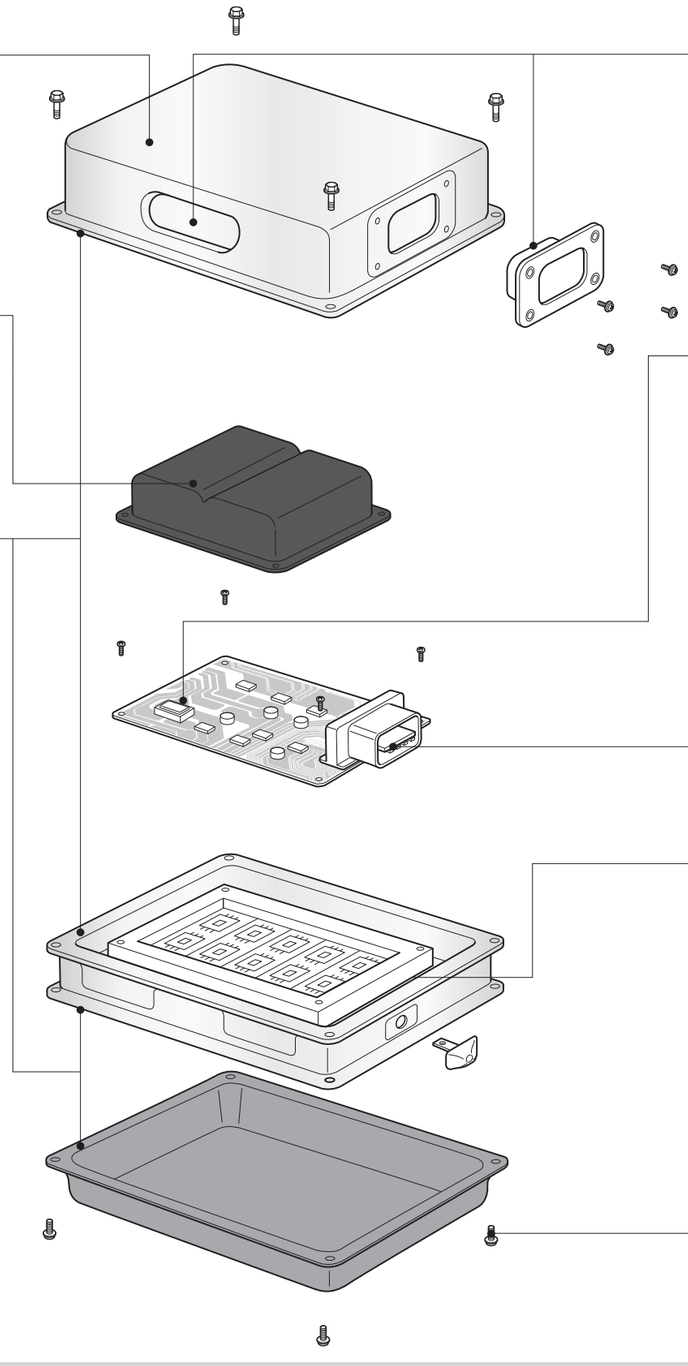
Application	Heat dissipation
Product	ThreeBond 2270 Series
Characteristics	1. Good adhesion 2. Good durability 3. Grades with higher heat resistance available
Curing method	Heat curing

Application	Fixing
Product	ThreeBond 2235L and 2237J
Characteristics	1. Good durability 2. Low linear expansion coeffi cient (TB2235L) 3. Good thermal strength (TB2237J)
Curing method	Heat curing



Components mounted on substrates

Application	Fixing
Product	ThreeBond 1537 Series ThreeBond 2272F
Characteristics	1. Product certified by V-0 in the flame resistance standard UL94 2. Low cure shrinkage 3. Good adhesion
Curing method	Room temperature curing, Heat curing



Connector cover

Application	Sealing adhesion
Product	ThreeBond 1220 Series ThreeBond 1530 Series
Characteristics	1. Good adhesion 2. Good durability 3. Tin-free product available
Curing method	Moisture curing

Note:"Free" in item3 indicates that the component is not used as part of the product design.

Components mounted on substrates

Application	Protective coating
Product	ThreeBond 1100 Series ThreeBond 3075 Series ThreeBond 3160 Series
Characteristics	1. Corrosion prevention 2. Migration prevention 3. Good adhesion
Curing method	Solvent volatilization UV curing

Application	Chip reinforcement
Product	ThreeBond 2274 Series
Characteristics	1. Good spreadability and permeability 2. High reliability (high Tg/low elasticity) 3. High adhesive strength
Curing method	Heat curing

Connector

Application	Sealing
Product	ThreeBond 2200 Series
Characteristics	1. Good durability 2. Grades that cure fast at low temperature available 3. Good adhesion
Curing method	Heat curing

Application	Sealing
Product	ThreeBond 3160 Series
Characteristics	1. Good durability 2. Good adhesion 3. Low-molecular cyclic siloxane-reduced product
Curing method	UV curing

Power module

Application	Heat dissipation
Product	ThreeBond 1165
Characteristics	1. Good heat dissipation 2. Tin-free 3. Low-molecular cyclic siloxane-free
Curing method	Moisture curing

Note: "Free" in item 2 and 3 indicates that the component is not used as part of the product design.

Application	Protection
Product	ThreeBond 3168 Series
Characteristics	1. High and low temperature resistance 2. Soft gel 3. Vibration absorbing properties
Curing method	UV curing

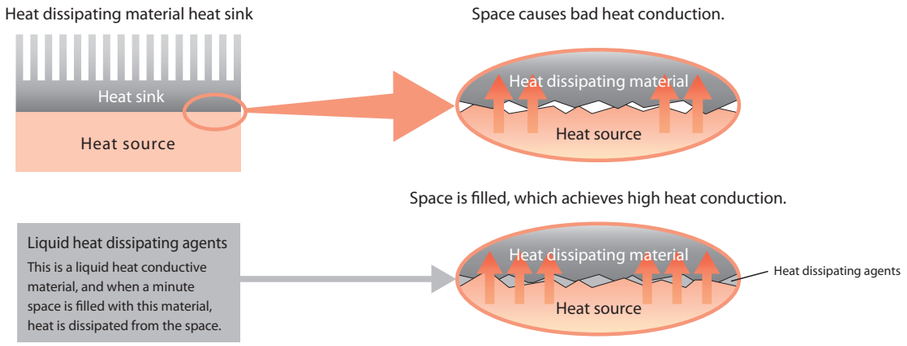
Bolt

Application	Fixing
Product	ThreeBond 2400 Series
Characteristics	1. Only tightening generates strength of adhesion. 2. Good durability 3. Grades with low to high strength available 4. Acrylic- and epoxy-based products available

Inverter / Converter

Heat dissipating agents

Since our liquid heat dissipating agents enters and adheres to a minute space in heat radiating materials, such as coils and power terminals in comparison with heat radiating sheets, it delivers an excellent heat radiating performance.



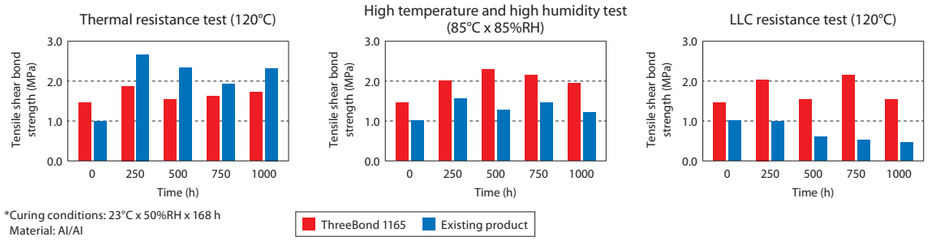
Lineup of heat dissipating agents

Item	Unit	ThreeBond 1165	ThreeBond 2045B (Main agent)	ThreeBond 2145B (Curingagent)	ThreeBond 2270J	ThreeBond 2955P
Curing method	-	Moisture curing	Two-component room-temperature curing		-	-
Appearance	-	Gray	Pink	Light Blue	White	Gray
Main component	-	Modified silicone	Epoxy resin	Polyamine	Epoxy	Modified Silicone
Viscosity	Pa•s	250	82	124	150	120
Thermal conductivity	W/m•K	3.0	2.1		4.2	4.8
Characteristics	-	-Dealcoholization type -Tin free	-Mixing ratio of 100 : 40 -High adhesion -Flame retardant equivalent to UL94 V-0 standard*		-High heat dissipation performance -Low linear expansion and Low cure shrinkage -Excellent durability	-Dealcoholization type

One-component moisture-curable non-silicone heat dissipating agent

ThreeBond 1165 is a one-component moisture-curable non-silicone heat dissipating agent with high thermal conductivity (3.0 W/m•K). It is free from the intentional addition of low molecular cyclic siloxane and organotin compounds and it retains its shape, making it suitable for adhesion and potting of various parts.

Durability data



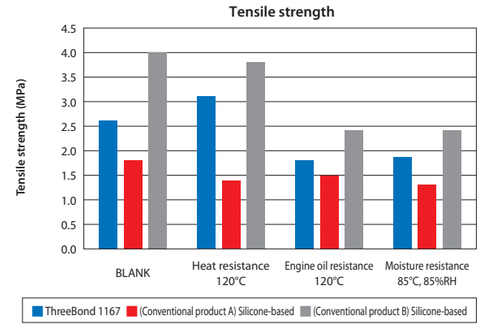
*Curing conditions: 23°C x 50%RH x 168 h
Material: Al/Al

* This product has met UL94 V-0 requirements in testing. However, this product has not been certified by UL.

Non-silicone sealant (flame-retardant grades)

ThreeBond 1167 is a single-component room temperature curing silicone sealant that has excellent heat, oil and water resistance. It is also flame retardant and free from the intentional addition of low molecular circular siloxane, alleviating concerns regarding electrical contact failure.

Test item	Unit	ThreeBond 1167	Remarks
Appearance	-	Black	-
Specific gravity	Pa•s	140	-
Viscosity	-	1.4	-
Dry time to touch	min	45	-
Hardness	-	A45	-
Elongation	%	295	No. 3 dumbbell
Tensile strength	MPa	2.3	No. 3 dumbbell
Tensile shear adhesive strength	MPa	1.4	Aluminum/Aluminum
Feature	-	Flame retardant equivalent to UL94 V-0 standard*	-

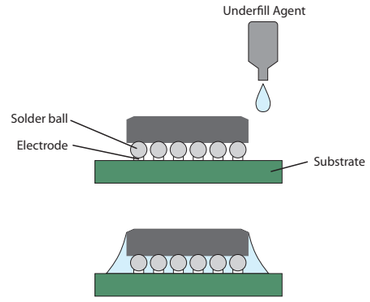


Mounting of chips

ThreeBond 2206S and 2274S are single-component heat-curing epoxy resins with high heat resistance suitable as underfill agents. They improve connection reliability by preventing IC packaging mounted on circuit boards from becoming detached due to impacts or heat cycles.

ThreeBond 2206S

(1) Low-temperature curability : This product cures at 80°C or higher.
(2) Low viscosity : It has excellent spreadability and flowability.
(3) Low-halogen type : Total chlorine content and total bromine content of less than 900 ppm each, total combined chlorine and bromine content of less than 1500ppm



ThreeBond 2274S

(1) Moderate viscosity : Good flowability, rapid penetration, and excellent workability and spreadability
(2) High reliability : High glass transition temperature and stable physical properties in an actual environment for use
(3) High adhesive strength : Excellent adhesion to copper and glass epoxy

Flame retardant grade UL94 V-0 certified or equivalent

This adhesive has been given the certificate of V-0 in the flame resistance standard UL94 (vertical combustion test). We have a rich assortment of products suitable for various purposes, such as adhesion, fixing, and potting of materials used around parts with a heat source including an inverter and converter.

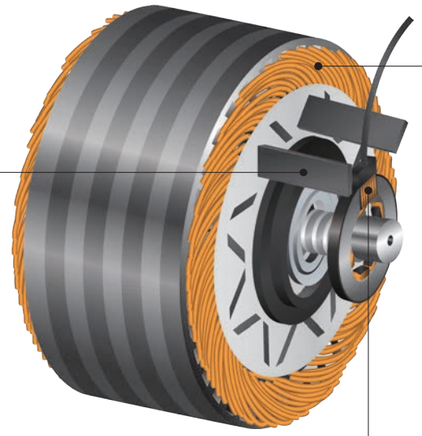
Incombustible grade lineup

Item	Unit	ThreeBond 1167	ThreeBond 1222C	ThreeBond 1537E	ThreeBond 2272F
Curing method	-	Moisture curing	Moisture curing	Moisture curing / Dealcoholization	Heat curing
Appearance	-	Black	Gray	Gray	Black
Viscosity	Pa•s	140	-	90	75
Hardness	-	A45	A45	A84	D92
Glass transition temperature	°C	-40	-60	-63	117
Tensile shear adhesive strength (Fe)	MPa	-	1.0	4.1	21.3
Remarks	-	Equivalent to UL94 V-0 standard	Certified to UL94 V-0 standard	Certified to UL94 V-0 standard	Certified to UL94 V-0 standard

Drive motor

As demand for environment-friendly vehicles, such as an electric vehicle and a hybrid vehicle, is increasing, production of drive motors installed on them is increasing.

We supplies a rich assortment of products, such as adhesives for fixing magnets, coating agents for protecting winding wires, sealants and adhesives for screws and plugs.
In addition, we are actively developing products and techniques for various types of components for resolvers, etc. and sensors.



Motor case

Application	Flange sealing
Product	ThreeBond 1215Q ThreeBond 1216 Series
Characteristics	1. High oil resistance 2. High heat resistance 3. Good sealing property
Curing method	Moisture curing

Stator

Application	Protection (winding wire section)
Product	ThreeBond 2280 Series ThreeBond 3944
Characteristics	1. High heat resistance 2. Good chemical resistance 3. Good electrical properties
Curing method	Heat-curable, two-component and UV-curable

Angle sensor (resolver)

Application	Protection (terminal and winding wire section)
Product	ThreeBond 1156 Series
Characteristics	1. Good flexibility 2. High heat resistance 3. High oil resistance
Curing method	Heat curing

Application	Protection (terminal and winding wire section)
Product	ThreeBond 1220 Series
Characteristics	1. Dealcoholization type 2. High heat resistance 3. Products for flame resistance and electric contacts available
Curing method	Moisture curing

Rotor

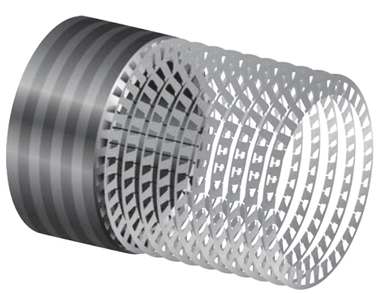
Application	Magnet fixing
Product	ThreeBond 2240 Series ThreeBond 2280 Series
Characteristics	1. High heat resistance 2. Good adhesion 3. Good electrical properties
Curing method	Heat curing

Application	Magnet fixing
Product	ThreeBond 2235L ThreeBond 2237J
Characteristics	1. Good durability 2. Low linear expansion coeffi cient (TB2235L) 3. Good thermal strength (TB2237J)
Curing method	Heat curing

Application	Magnet fixing
Product	ThreeBond 2280H
Characteristics	1. Heat expansion type (counterflow / penetration countermeasure) 2. High heat resistance 3. High oil resistance
Curing method	Heat curing (expansion)

Laminated steel plate

Application	Lamination adhesion
Product	ThreeBond 1300 Series
Characteristics	1. Good durability 2. Good heat resistance 3. Grades with low to high strength available
Curing method	Anaerobic curing



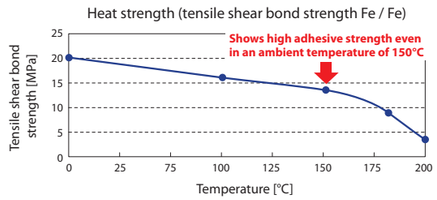
Reliable one-component heat-curable epoxy compound resin for magnet fixing

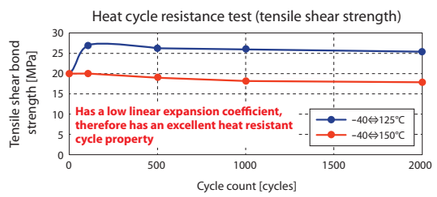
ThreeBond 2235L and 2237J are one-component heat-curable epoxy compound resins, which have a high glass transition temperature, therefore suits usages that require heat resistance. Also, it has good adhesion against a variety of materials, and suits adhesion or potting usages.

Item	Unit	ThreeBond 2235L	ThreeBond 2237J
Appearance	-	Black	White
Viscosity	Pa•s	80	115
Hardness	–	D92	D89
Glass transition temperature	-	155	150
Tensile shear bond strength	MPa	23	26
Peel bond strength	N/m	2000	3600
Dielectric breakdown strength	kV/mm	23	24
Curing method	-	140°C×30min	120°C×60min
Feature	-	High glass-transition temperature High heat resistance • Low linear expansion	High glass-transition temperature High heat resistance • High thermal strength

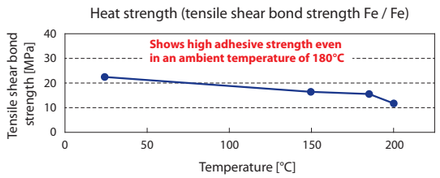
Durability data

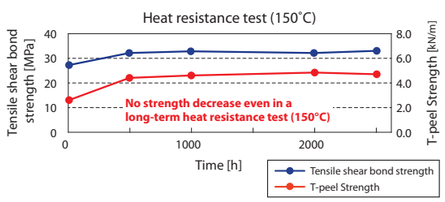
Linear expansion type ThreeBond 2235L





High heat adhesion type ThreeBond 2237J

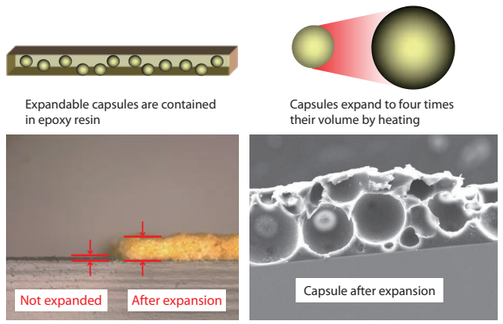




In-vehicle Motor-related product

Heat-curable expandable epoxy resin for magnet fixing

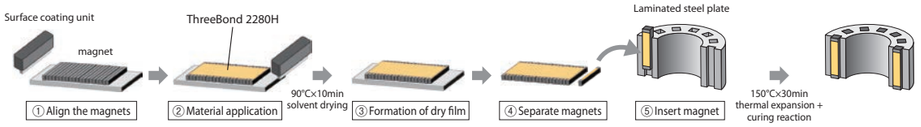
ThreeBond 2280H is heat-curable expandable epoxy resin that contains heat expandable capsules. When heated, it expands by four times its volume compared to before hardening, therefore it is suited to gap filling adhesion. For adhesion/fixing of the magnet and the rotor of IPM motors, it prevents leakage, which is a productivity problem, and provides stable adhesion by forming a dried coating on the magnet surface in advance and expanding with heat after insertion.



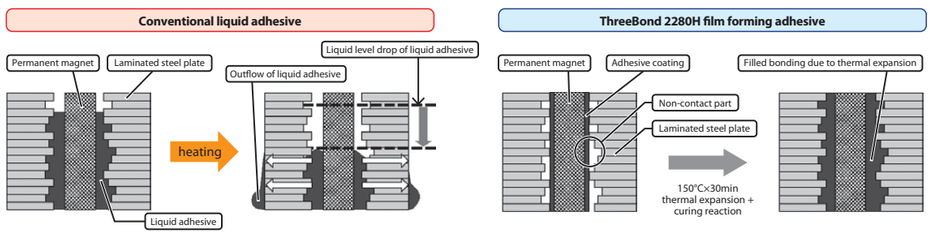
Test item	Unit	Properties	Remarks
Appearance	-	Black	-
Viscosity	Pa•s	11.0	Shear rate: $9.58s^{-1}$
Specific gravity	-	1.1	-
Tensile shear bond strength	MPa	10.6	Fe/Fe (SPCC-SD) Clearance: 50μm 2 times expansion
Glass-transition temperature	℃	170	DMA method Peak value of loss tangent at 1Hz
Elastic modulus	Pa	2.8×10^{8}	DMA (1Hz) at 4 times expansion 25°C Storage modulus value
Surface resistivity	Ω	3.0×10^{16}	-
Volume resistivity	Ω•m	4.8×10^{15}	-
Expansion multiples	times	4	-

Drying conditions: 90°C×10min Cure conditions: 150°C×30min
* The expansion ratio changes depending on the temperature rising speed

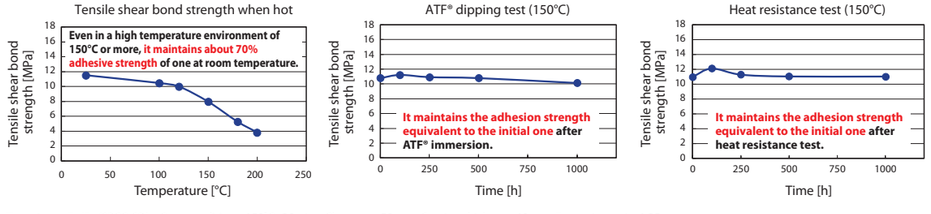
Coating process



Sectional view



Durability data

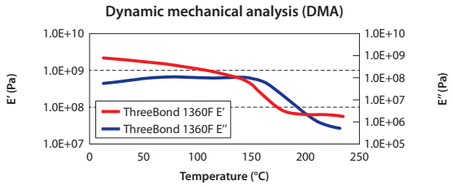


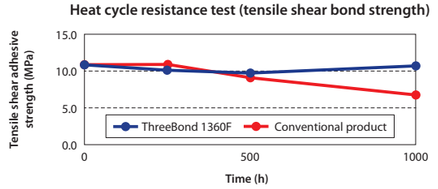
Test pieces: Fe/Fe (SPCC-SD) Cure conditions: 150°C×30min Clearance: 50μm Coating thickness: 40μm Expansion ratio: 1.25

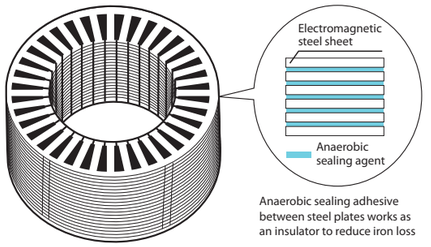
For laminated steel plate bonding / high reliability/anaerobic sealing adhesive

ThreeBond 1360F is a highly reliable anaerobic sealing adhesive that provides stable characteristics even in a high temperature environment. It suits laminated steel plate bonding, which is seeing increasing consideration and use as a means of improving motor driving efficiency.

Test item	Unit	ThreeBond 1360F	Remarks
Main components	-	Methacrylic acid ester	-
Curing method	-	Anaerobic curing	-
Appearance	-	Green	Visually
Viscosity	mPa•s	500	-
Glass transition temperature	℃	165°C	DMA Peak tanδ value
Tensile shear adhesive strength	MPa	10.8	SPCC-SD







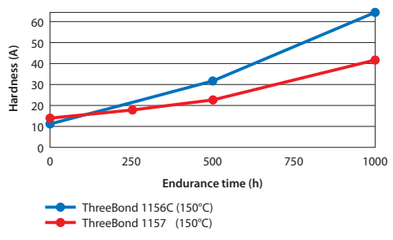
Anaerobic sealing adhesive between steel plates works as an insulator to reduce iron loss

Angle sensor (protection of terminals and winding wire sections)

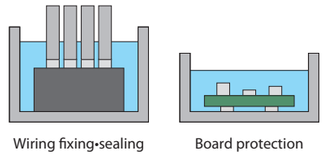
ThreeBond 1156C and 1157 are acrylic-based sealants that have excellent heat and chemical resistance.
It forms a highly-elastic rubber-like cured material suitable for seal potting for terminals and winding terminals.

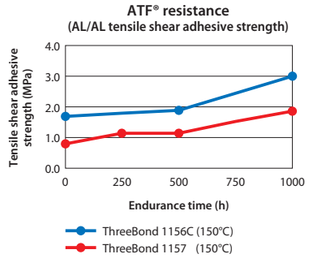
Test item	Unit	ThreeBond 1156C	ThreeBond 1157		Remarks
			Agent A	Agent B	
Appearance	-	Black	Black	White	-
Specific gravity	Pa•s	380	570	190	-
Viscosity	-	1.24	1.19	1.19	-
Hardness*	-	A15	A13		-
Tensile strength*	MPa	1.7	1.0		-
Elongation*	%	300	250		-
Tensile shear adhesive strength*	MPa	1.7 (CF80)	0.8 (CF100)		AL/AL

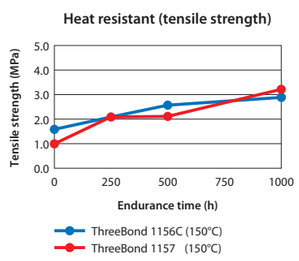
* Curing conditions: 150°C × 90 min (Curing jig heat capacity: 60 min) (ThreeBond 1156C)
100°C × 60 min (Curing jig heat capacity: 30 min) (ThreeBond 1157)



■ Usage diagram







Mini-Motor

Mini-Motors are used in all types of systems such as environmental measures, comfort, safety, information systems, etc. There are dozens of motors mounted on a single car.

With heat resistance, durability and high adhesion as our key focus, we have a product line-up that caters to applications from magnet adhesion to shaft fixing to balancer resin. We contribute to making motors smaller and lighter, improving output density, achieving higher efficiency, etc.

Winding coil

Application	Fixing / Impregnating
Product	ThreeBond 2230 Series ThreeBond 2240 Series ThreeBond 2280 Series
Characteristics	1. Good heat resistance (High Tg) 2. Good chemical resistance 3. Good electrical properties
Curing method	Heat curing

Magnet

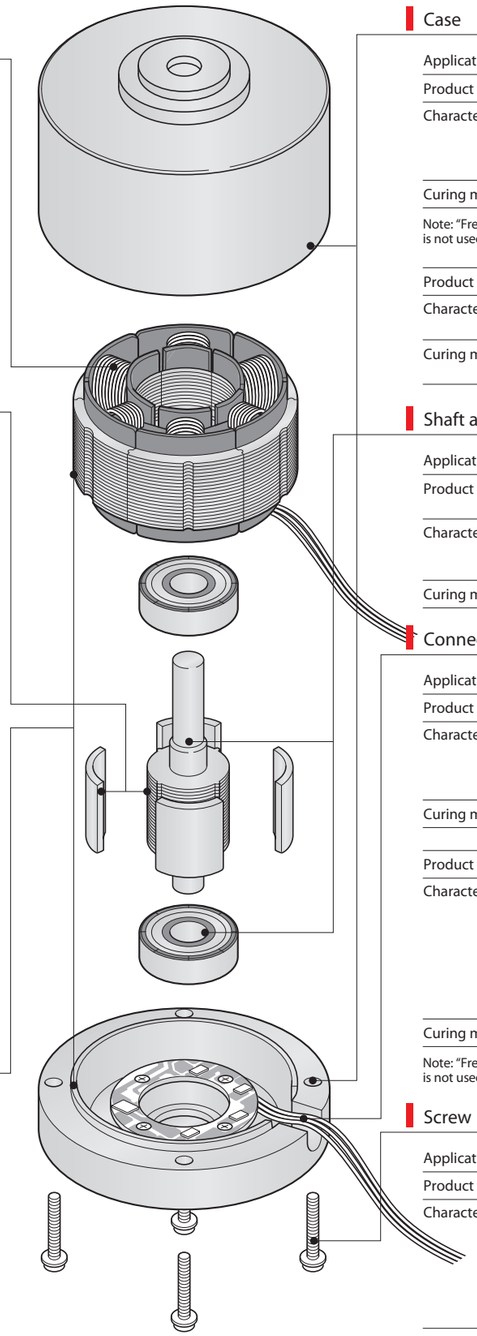
Application	Bonding
Product	ThreeBond 3953
Characteristics	1. Fast curing at room temperature 2. High heat and moisture resistance 3. Good flexibility
Curing method	Two-component room temperature curing

Product	ThreeBond 1350 Series ThreeBond 1360 Series
Characteristics	1. Good high heat resistance 2. High adhesiveness 3. Good curability
Curing method	Anaerobic curing

Product	ThreeBond 2230 Series ThreeBond 2240 Series ThreeBond 2280 Series
Characteristics	1. Good heat resistance 2. Good chemical resistance 3. Good electrical properties
Curing method	Heat curing

Blaket

Application	Bonding
Product	ThreeBond 2222P
Characteristics	1. Good heat resistance 2. Good adhesion 3. Good durability
Curing method	Heat curing



Case

Application	Bonding (FIPG)
Product	ThreeBond 1226
Characteristics	1. Tin free 2. Good adhesion 3. Low molecular cyclic siloxane-reduced product
Curing method	Moisture curing

Note: "Free" in item 1 indicates that the component is not used as part of the product design.

Product	ThreeBond 3953
Characteristics	1. Good flexibility 2. Good adhesion
Curing method	Two-component room temperature curing

Shaft and bearings

Application	Fitting
Product	ThreeBond 1350 Series ThreeBond 1360 Series
Characteristics	1. Good high heat resistance 2. High adhesiveness 3. Good curability
Curing method	Anaerobic curing

Connector cable

Application	Bonding
Product	ThreeBond 1539
Characteristics	1. Fast curing at low temperature 2. Good adhesion 3. Good durability
Curing method	Heat curing

Product	ThreeBond 1533F
Characteristics	1. Good adhesion to hardly adherable materials *Primer treatment unnecessary since it is one-component 2. Dibutyltin compounds free product 3. Low molecular cyclic siloxane-reduced product
Curing method	Moisture curing

Note: "Free" in item 2 indicates that the component is not used as part of the product design.

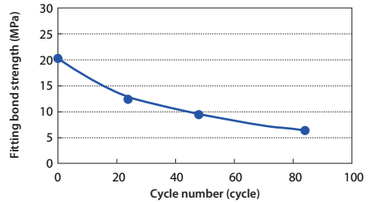
Screw

Application	Fixing
Product	ThreeBond 2400 Series
Characteristics	1. Strength of adhesion generated by simply tightening 2. Good durability 3. Grades with low to high strength available 4. Acrylic- and epoxy-based products available

Bearing and Shaft Fitting

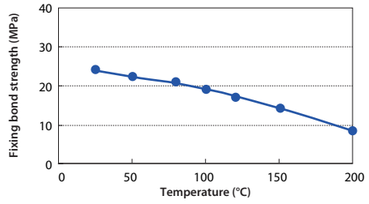
ThreeBond 1359G is an anaerobic sealant that has high strength with excellent heat resistance, and characteristics ideal for the adhesion of the bonding parts of shafts and bearings that require heat resistance and axial power.

Heat cycle test



*Test condition: Test piece for fitting, Adhesion surface 6φ × 15mm
Clearance 1/100mm (150°C × 1h to - 40°C × 1h) × 84 cycles
Material: SUS/Al (Pin/Collar)

Strength when heated



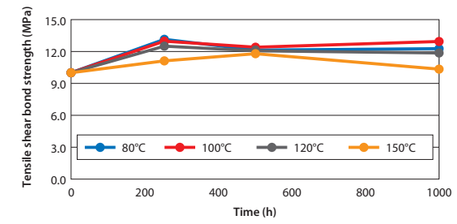
*Test condition: Test piece for fitting, Adhesion surface 6φ × 15mm
Clearance 1/100mm, 1h holding at each temperature: Fe Pin/Collar

Magnet bonding and fixing

ThreeBond 3953 is two-component room temperature curing elastic adhesive with significant high strength and high elongation. Since it has excellent in vibration absorption and strain relaxation caused by the difference in expansion of different materials, it is suitable for bonding of various materials as magnet.

Test item	Unit	ThreeBond 3953	Conventional product
Hardness	-	A87	A59
Tensile strength	MPa	10.0	3.7
Elongation	%	200	140
Shear bond strength (SPCC-SD)	MPa	10.3	5.2
Peel adhesive strength (SPCC-SD)	kN•m	2.5	1.4
Volume resistivity	Ω•m	1.1×10^{13}	2.8×10^{12}
Dielectric breakdown strength	kV/mm	23.3	20.9

Heat-resistance



Test pieces: Fe (SPCC-SD)

Pre-coat bolt MEC process

The microencapsulated reactive binder is coated onto the threads in advance. When tightened, the microcapsule is broken and the threads are locked and sealed. This environmentally-friendly screw binder uses "water" as a dilution solvent instead of organic solvents during processing.

Item	ThreeBond 2458	ThreeBond 2468	ThreeBond 2478	ThreeBond 2448	ThreeBond 2448B	ThreeBond 2488E
Type	Low strength type	Medium strength type	High strength type	High strength type	High strength type	High strength type *5
Main components	Acrylic resin			Epoxy resin		
Appearance	Green	Red	Blue	Blue	Orange	Red
Binding strength (25°C × 24h) *1	35.9 to 41.1 N•m	43.6 to 49.0 N•m	45.2 to 57.1 N•m	68.1 to 78.6 N•m	66.7 to 75.3 N•m	56.3 to 58.8 N•m
Heat resistance limit temperature: Sealing *2	170°C	170°C	170°C	170°C	170°C	170°C
Heat resistance limit temperature: Locking *3	100°C	100°C	130°C	150°C	160°C	80°C
Curing speed (20 - 25°C) *4	Practical strength: 0.5 - 1h Final strength: 24h			Practical strength: 0.5 - 1h Final strength: 24h		Practical strength: 6h Final strength: 48h

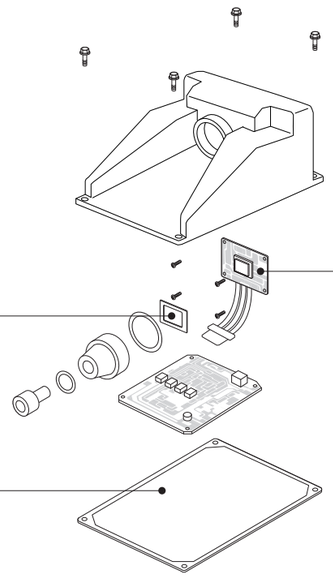
*1 JIS2 grade M10 × P1.5 (Curing condition: 25°C × 24h), use of galvanized chromate treated bolts/nuts, tightening torque 30N•m *2 Iron × Iron M10 × P1.5, hexagon bolt, turbine oil
*3 Temperature obtained when tightening torque (30N•m) and above *4 Practical strength… 50% of final strength *5 ThreeBond 2488E is a dual-use type for bolts and nuts

Autonomous Driving Devices

From monitoring cameras that display vehicle surroundings to sensing cameras that control vehicles, a lot of adhesives are used in the multifunctional car mounted camera modules.

Depending on the application, the lens number, adherend materials, etc. differ. To meet our customer's needs, We have a wide product line-up tailored for the parts in use, such as low temperature rapid-curable resin adhesives, resin for lens adhesion to LED irradiation compatible adhesives.

Sensing camera



IR cut filter

Application	Fixing
Product	ThreeBond 2235L
Characteristics	1. Low linear expansion 2. High heat resistance 3. Low curing shrinkage rate
Curing method	Heat curing

Lens barrel and lens holder, lens barrel and base

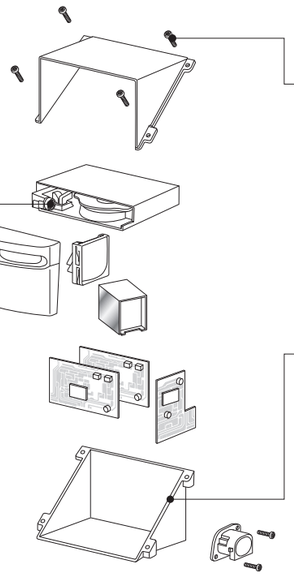
Application	Fixing
Product	ThreeBond 3142
Characteristics	1. Low linear expansion 2. Low curing shrinkage 3. High heat resistance
Curing method	UV curing + heat curing

Case

Application	Sealing
Product	ThreeBond 3178
Characteristics	1. O-ring replacement: CIPG 2. Rework possible 3. High reliability
Curing method	UV curing

Application	Sealing
Product	ThreeBond 2270J
Characteristics	1. Low linear expansion 2. Low curing shrinkage 3. High heat resistance
Curing method	Heat curing

LiDAR



Light source・lens

Application	Fixing
Product	ThreeBond 3036G
Characteristics	1. Good adhesion 2. Low curing shrinkage 3. Good durability
Curing method	UV curing

Application	Fixing
Product	ThreeBond 3142
Characteristics	1. Low linear expansion 2. Low curing shrinkage 3. High heat resistance
Curing method	UV curing + heat curing

Cover panel

Application	Adhesion・Sealing
Product	ThreeBond 1539
Characteristics	1. Fast curing at low temperature 2. Good adhesion 3. Good durability
Curing method	Heat curing

Screw

Application	Fixing, Sealing
Product	ThreeBond 2400 Series
Characteristics	1. Fix by simply tightening 2. Good durability 3. Grades with low to high strength available 4. Acrylic- and epoxy-based products available

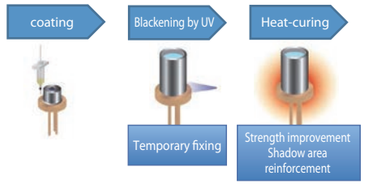
Case

Application	Sealing
Product	ThreeBond 3178
Characteristics	1. O-ring replacement: CIPG 2. Rework possible 3. High reliability
Curing method	UV curing

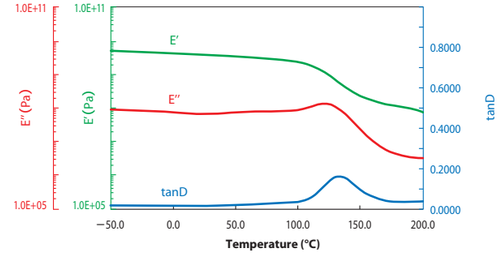
Dual cure epoxy resin for precision fixing

ThreeBond 3142 features epoxy resin as the main component and can be cured quickly with LED light sources. In shaded areas not reached by light, it can also be cured by applying heat. It has low curing shrinkage and a high glass transition temperature, making it suitable for affixing on-board automobile camera module lenses.

How to use



DMA data

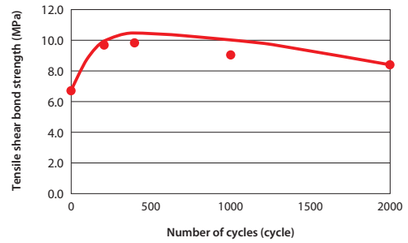


High heat dissipation one-component heat-curing epoxy resin

ThreeBond 2270J is a single-component heat-curing epoxy resin with high thermal conductivity. It has a low linear expansion coefficient and cure shrinkage, making it suitable for affixing on-vehicle automobile camera modules with precision.

Test items	Unit	ThreeBond 2270J	Remarks
Hardness	-	D96	-
Thermal conductivity	W/m•K	4.2	-
Specific gravity of cured material	-	2.9	4 g circular (30φ) cured material
Rate of contraction with hardening	%	1.4	-
Tensile shear bond strength	MPa	6.7	AL/AL (A1050P)
		9.0	Fe/Fe (SPCC-SD)
Glass transition temperature	℃	117	TMA method
Linear expansion coefficient (α1)	×10⁻⁶/℃	11	20℃ to 40℃
Linear expansion coefficient (α2)	×10⁻⁶/℃	58	160℃ to 180℃

Heat cycle test

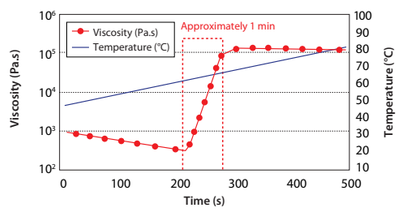


* Curing conditions: 100℃×40min

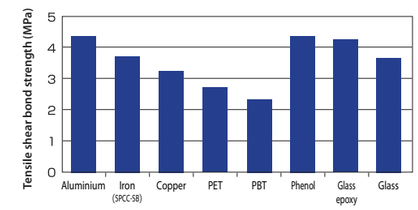
Single-component low-temperature curing elastomeric adhesive

ThreeBond 1539 is a tin-free* single-component low-temperature heat-curing elastic adhesive made from a vegetable-derived castor oil polymer. It cures quickly with low-temperature heating (60℃ curing) and has elasticity over a wide temperature range (-35℃ to 100℃), meaning it is resistant to vibration and impacts and has excellent relaxation properties against stresses such as the expansion and shrinkage of materials. In addition, it has excellent adhesion to various adherend materials.

Curing behaviour



Bond strength of each materials



Autonomous Driving Devices

As technological innovation for auto-cruising and advanced driving support systems proceeds, ThreeBond works actively on development and productization to support devices equipped as part of these systems. Since higher specifications are demanded for devices used in auto-cruising and advanced driving support systems, we will contribute to the vehicle industry by developing products and technologies for sealing and adhesive with high reliability, making use of the know-how we have cultivated in the past.

Millimeter wave radar

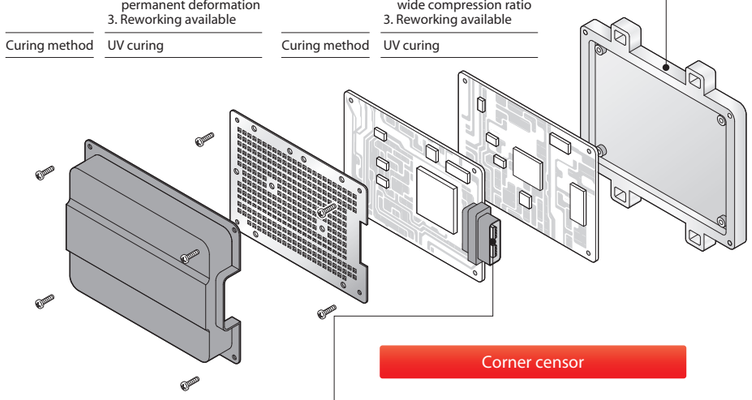
Application	Sealing (CIPG)
Product	ThreeBond 3081J
Characteristics	1. Good durability 2. Low-compression permanent deformation 3. Reworking available
Curing method	UV curing

Application	Sealing (CIPG)
Product	ThreeBond 3166
Characteristics	1. Good durability 2. Good sealability with wide compression ratio 3. Reworking available
Curing method	UV curing

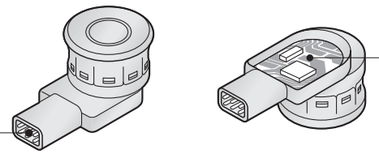
Case

Application	Sealing and bonding (FIPG)
Product	ThreeBond 1226
Characteristics	1. Tin-free 2. Good adhesion 3. Low-molecular cyclic siloxane-reduced product
Curing method	Moisture curing

Application	Sealing and bonding (FIPG)
Product	ThreeBond 1234B
Characteristics	1. Good durability 2. Good adhesion 3. Good followability
Curing method	Heat curing



Corner censor



Connector

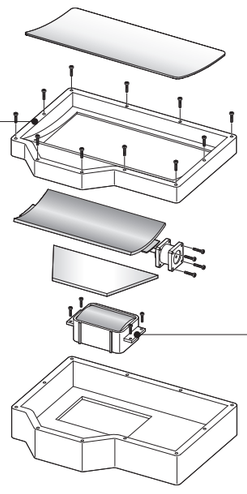
Application	Sealing
Product	ThreeBond 3160 Series
Characteristics	1. Good durability 2. Good adhesion 3. Low-molecular cyclic siloxane-reduced product
Curing method	UV curing

Application	Sealing
Product	ThreeBond 2200 Series
Characteristics	1. Good durability 2. Grades that cure fast at low temperature available 3. Good adhesion
Curing method	Heat curing

Board-mounted components

Application	Sealing
Product	ThreeBond 3164D
Characteristics	1. Flexibility 2. Good heat resistance 3. Good chemical resistance
Curing method	Heat curing

Head-up display



Housing • cover panel

Application	Sealing
Product	ThreeBond 3953
Characteristics	1. Good adhesion to each adherend material 2. High strength, high elongation 3. Room temperature curing
Curing method	Two-component room temperature curing

Lens • Mirror

Application	Lens fixing
Product	ThreeBond 3114J
Characteristics	1. Low cure shrinkage 2. High heat resistance 3. Good adhesion to each adherend material
Curing method	UV curing

UV-curable silicon resin / CIPG gel type

ThreeBond 3166 is UV-curable resin with silicon as main component. It hardens within several seconds to several dozen seconds after UV radiation. Since the hardened material has good heat and cold-resistance and flexibility, it maintains sealing characteristics in a wide range of compression rates, and reduces bad sealing, which is caused due to the influence of dimension tolerance. It suits CIPG application that requires elasticity and waterproof properties.

Test item	Unit	Properties	Remarks
Main component	-	Silicone	-
Appearance	-	Blue	Fading after curing
Viscosity	Pa•s	330	25°C
Hardness*	-	E15	-
Tensile strength	MPa	0.8	-
Elongation	%	500	-

* 45kJ/m² hardened

① Gel cured material
Seal compatible with a wide compression ratio

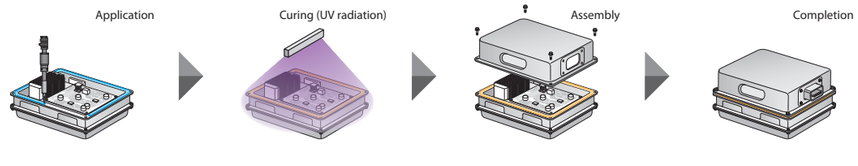
② UV-LED curable
Cure in seconds to tens of seconds

③ Good durability
High heat resistance, High temperature and humidity resistance, Good chemical resistance

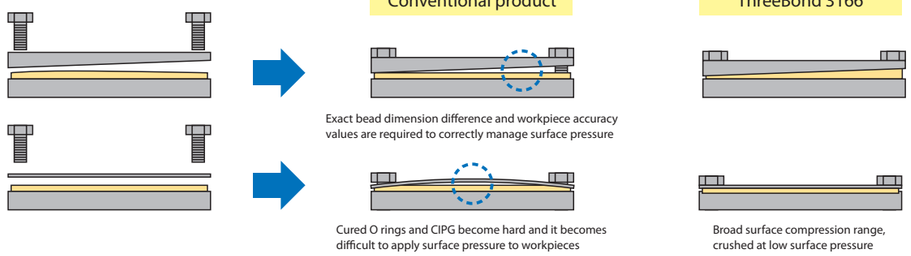
④ Reworking available
Work can be removed

■Reduced labor through CIPG application

Automation has been enabled through instant UV curing using a robot for application.

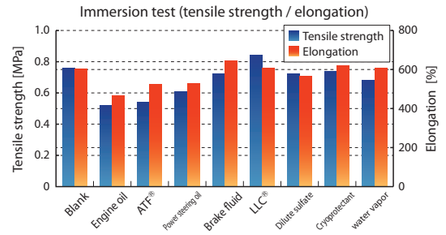


■Compared to conventional CIPG



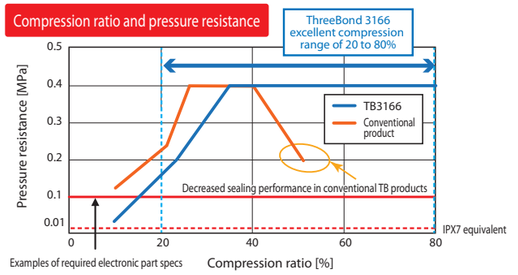
■High reliability (compared to conventional CIPG)

Chemical resistance data



<Test solution> Engine oil, gear oil, ATF®, power steering oil, brake fluid, LLC (50 wt%), concentrated sulfuric acid, dilute sulfuric acid (40 wt%), antifreezing agent (50 wt%), water vapor (120 °C, 100% saturated steam , 2 atm environment)

Compression ratio and pressure resistance

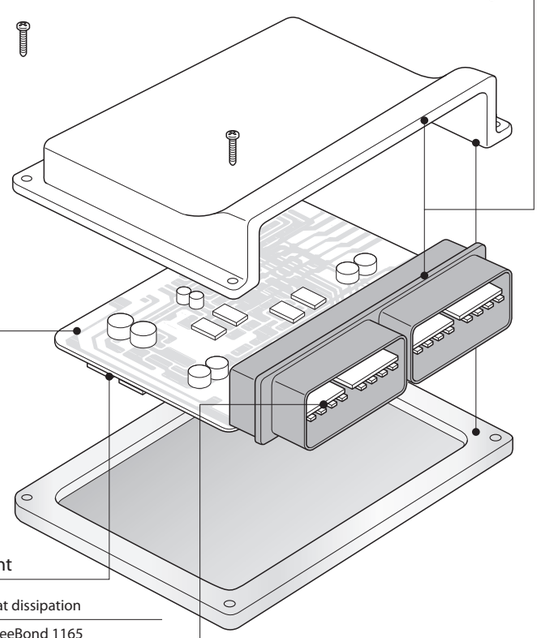


<Test solution> Bead height: 2.0 mm, Flange shape: Flat, Curing conditions: Estimated light approx. 45 kJ/m², Pressure application: Air, Pressurizing conditions: Raised at 0.01 MPa/15 sec. *Maximum pressure 0.4 MPa

Electronic Control Unit (ECU)

In recent years, vehicles have been more environment-friendly and more multifunctional. In accordance with the trend, the number of electrical components and ECUs that control them installed on one vehicle has been increased.

Accordingly, ECUs are increasingly installed in severe environments, such as an engine compartment. Therefore, higher quality and higher reliability are required of adhesives and sealing agents used for ECUs.
To meet such requirements, we have a wide assortment of products, such as ones based on FIPG that are excellent in adhesion to various types of adherends, such as engineering plastics, and reworkable ones based on CIPG.



Substrate

Application	Protective coating
Product	ThreeBond 1100 Series ThreeBond 3075 Series ThreeBond 3160 Series
Characteristics	1. Corrosion prevention 2. Migration prevention 3. Good adhesion
Curing method	Solvent volatilization UV curing

Screw

Application	Fixing
Product	ThreeBond 2400 Series
Characteristics	1. Only tightening generates strength of adhesion. 2. Good durability 3. Grades with low to high strength available 4. Acrylic- and epoxy-based products available

Case

Application	Sealing and bonding (FIPG)
Product	ThreeBond 1226
Characteristics	1. Tin-free 2. Good adhesion 3. Low-molecular cyclic siloxane-reduced product
Curing method	Moisture curing

Note: "Free" in item 1 indicates that the component is not used as part of the product design.

Application	Sealing and bonding (FIPG)
Product	ThreeBond 1234B
Characteristics	1. Good durability 2. Good adhesion 3. Good followability
Curing method	Heat curing

Application	Sealing (CIPG)
Product	ThreeBond 3081J
Characteristics	1. Good durability 2. Low-compression permanent deformation 3. Reworking available
Curing method	UV curing

Application	Sealing (CIPG)
Product	ThreeBond 3166
Characteristics	1. Good durability 2. Good sealability with wide compression ratio 3. Reworking available
Curing method	UV curing

Substrate element

Application	Heat dissipation
Product	ThreeBond 1165
Characteristics	1. Good heat dissipation 2. Tin-free 3. Low molecular cyclic siloxane-free
Curing method	Moisture curing

Note: "Free" in item 2 and 3 indicates that the component is not used as part of the product design.

Application	Heat dissipation
Product	ThreeBond 2270 Series
Characteristics	1. Good heat dissipation 2. Good electrical properties 3. Good adhesion
Curing method	Heat curing

Connector

Application	Sealing
Product	ThreeBond 3160 Series
Characteristics	1. Good durability 2. Good adhesion 3. Low-molecular cyclic siloxane-reduced product
Curing method	UV curing

Application	Sealing
Product	ThreeBond 2200 Series
Characteristics	1. Good durability 2. Grades that cure fast at low temperature available 3. Good adhesion
Curing method	Heat curing

Gasket method comparison

There are two types of liquid gaskets: FIPG method and CIPG method. In FIPG, a liquid gasket is applied to both sides of a flange to bond and seal the flange. In CIPG, a liquid gasket is applied to one side of a flange, and, after the resin has cured (after a gasket is formed), both sides of the flange are attached and tightened to be sealed with clamping pressure.

Item	FIPG (Formed In-Place Gasket)		CIPG (Cured In-Place Gasket)		Molded gasket
Sealing method	Adhesive sealing		Compression sealing		Compression sealing
Curing method	Moisture curing	Heat curing	UV curing	Heat curing	Molding
Curing speed	×	△	○	△	-
Design change	◎	◎	◎	◎	×
Inventory control	○	○	○	○	×
Automation	○	○	○	○	△
Removability	×	×	○	○	◎
Dimensional control	○	○	×	×	×

◎ : Very Excellent ○: Excellent △: slightly inferior ×: inferior -: Not applicable

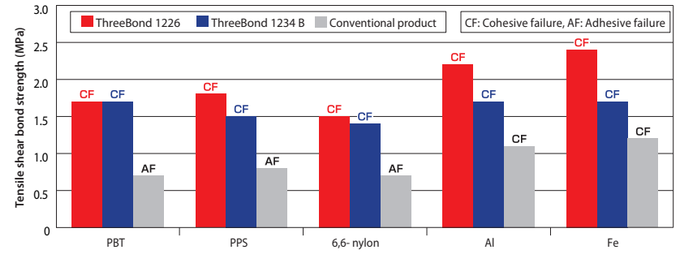
FIPG method adhesion data on each adherend

In our FIPG method, a rubber-state elastic body is formed after curing, and, this elastic body is excellent in adhesion to various types of adherends, such as metals and engineering plastics.

One-component moisture-curable silicone
ThreeBond 1226

One-component heat-curable silicone
ThreeBond 1234 B

One-component moisture-curable silicone
Conventional product



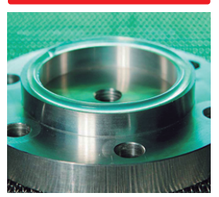
CIPG method flange design

Since sealing properties and durability differ, it depends on the shape of a flange. Therefore, the CIPG method that we proposes can deal with various types of flange designs for different purposes.

Flange	Shape	Wall on one side		Flat		Concave and convex	
	Workability	△		○		△	
	Coating properties	○		○		△	
Item \ CIPG		Rubber-state	Gel	Rubber-state	Gel	Rubber-state	Gel
Bead dimensional control		○	◎	○	◎	△	○
Compression width control		○	◎	△	○	○	◎
Pressure resistance		◎	○	○	△	◎	○
Durability		◎	◎	○	◎	○	◎

◎ : Very Excellent ○: Excellent △: slightly inferior

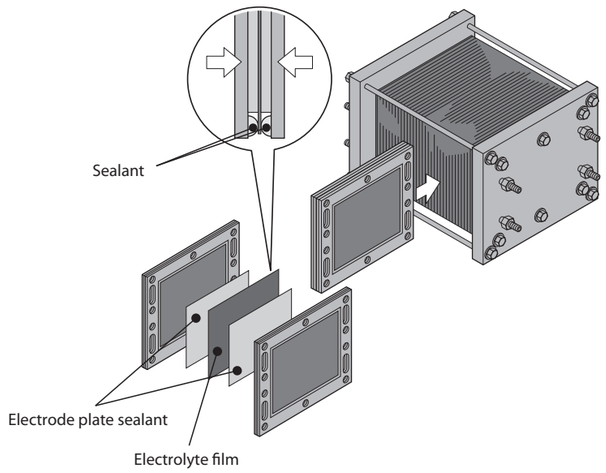
Photo of CIPG being applied



UV-curable type
ThreeBond 3081 J

Fuel Cell / Wire Harness / Relay

There is growing demand for polyolefin-based materials, which are notable for their gas barrier properties, for use in fuel cell stacks. Furthermore, we are constantly working to develop materials with a focus on our customers' production methods, going beyond the physical characteristics of the cured product to consider aspects such as viscosity and curing methods. In addition, the rising number of electric vehicles is leading to an increase in the number of connectors, wire harnesses and relays fitted to each vehicle. We promote the development of sealants, coating agents and other materials used for such components in order to contribute to providing customers with even greater quality and reliability.

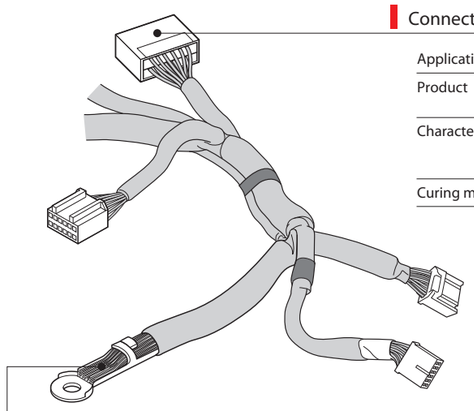


Fuel Cell

Application	Gas sealing
Product	ThreeBond 1153E
Characteristics	1. Good chemical resistance 2. Flexibility
Curing method	One-component heat-curable

Application	Gas sealing
Product	ThreeBond 3175
Characteristics	1. Good chemical resistance 2. Suitable for screen printing 3. Curable in a short time
Curing method	UV curing

Application	Gas sealing
Product	ThreeBond 3178
Characteristics	1. Good chemical resistance 2. Suitable for dispenser application 3. Reworking available
Curing method	UV curing



Connector

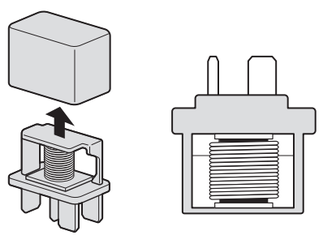
Application	Sealing
Product	ThreeBond 1156 Series ThreeBond 3013Q
Characteristics	1. Good flexibility 2. High heat resistance 3. High oil resistance
Curing method	UV curing/Heat curing

Application	Sealing
Product	ThreeBond 2222P
Characteristics	1. Excellent heat resistance 2. Excellent adhesiveness 3. Excellent durability
Curing method	Heat curing

Terminal

Application	Protection
Product	ThreeBond 3000 Series
Characteristics	1. Good adhesion 2. Grades with flexibility available 3. Grades with moisture and heat curing added available
Curing method	UV curing

Application	Protection
Product	ThreeBond 3160 Series
Characteristics	1. Good durability 2. Good adhesion 3. Low-molecular cyclic siloxane-reduced product
Curing method	UV curing



Relay

Application	Relay sealant
Product	ThreeBond 2200 Series
Characteristics	1. Solder reflow compatible grade available 2. Good durability 3. Good adhesion
Curing method	Heat curing

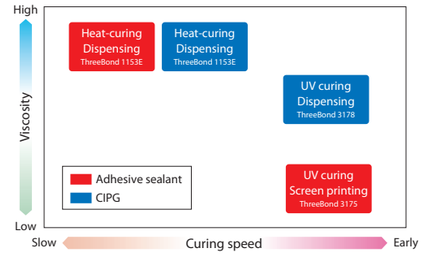
Separator / electrolyte film sealing

ThreeBond 1153E, 3175, and 3178 are flexible, yet have high gas barrier properties and chemical resistance.

Test Item	Unit	ThreeBond 1153E	ThreeBond 3175	ThreeBond 3178
Recommended application method	-	For dispensing	For screen printing	For dispensing
Curing method		Heat-curing	Visible light-curing/ UV curing	Visible light-curing/ UV curing
Main component	-	Polyolefin	Polyolefin	Polyolefin
Appearance	-	Gray	White	White
Viscosity	Pa•s	850	8	155
Hardness	-	A38	A79	A32
Tensile strength	MPa	2.4	7.1	7.1
Elongation rate	%	320	455	455
H_2 gas permeability coefficient	*	1.8×10^{14}	2.3×10^{16}	5.8×10^{16}

* mol•m/m^2•s•Pa

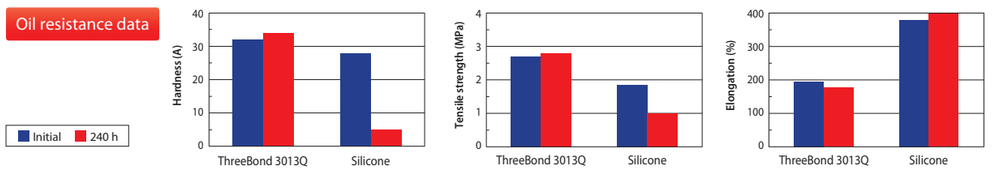
Product features



Connector sealant

ThreeBond 3013Q is a UV-curable adhesive mainly composed of acrylic rubber polymer.
It forms a rubber-state elastic body that is highly resistant to heat, cold, and oil and has a characteristic suitable for sealing connectors.

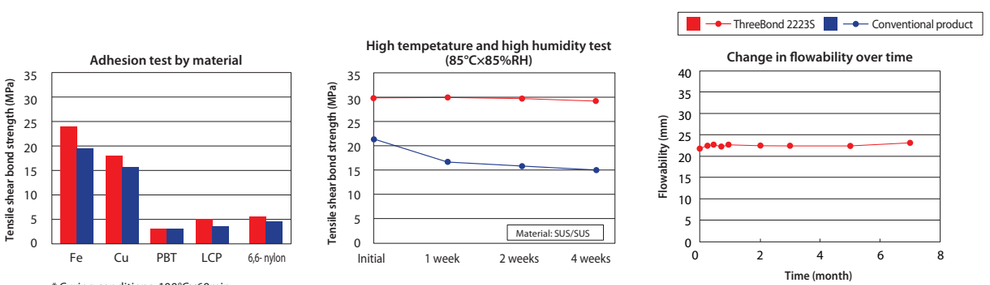
Oil resistance data



* Test condition: 120°C, Immersion oil: Engine oil

High reliability relay sealant

ThreeBond 2223S is a one-component heat-curing epoxy resin developed for relay sealing. It is a high-reliability relay sealant with excellent adhesion to various materials, durability and reflow resistance. In addition, the low change in flowability over time provides stability during use.



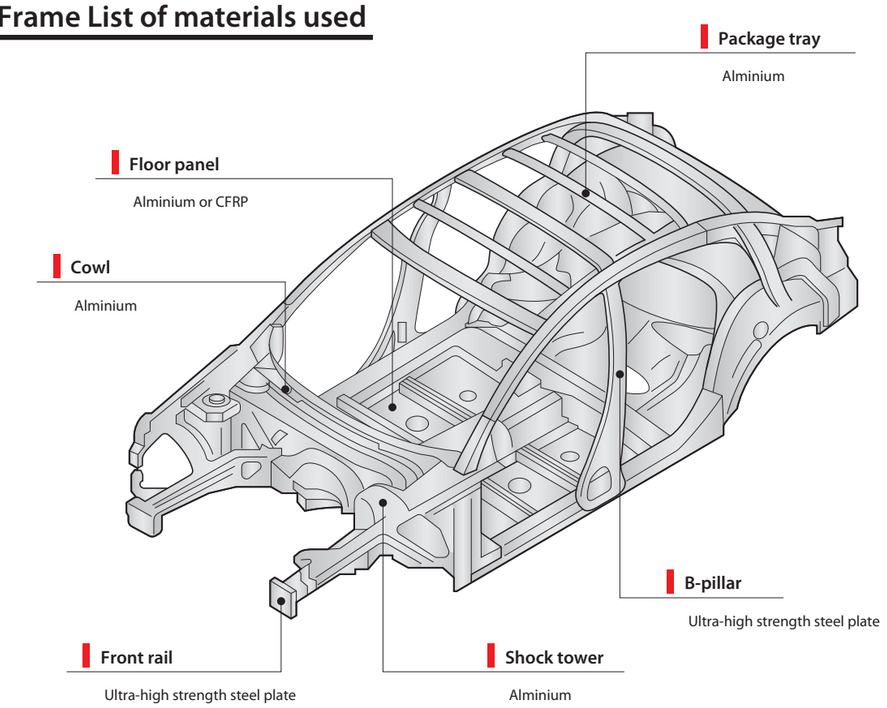
* Curing conditions: 100°C×60min

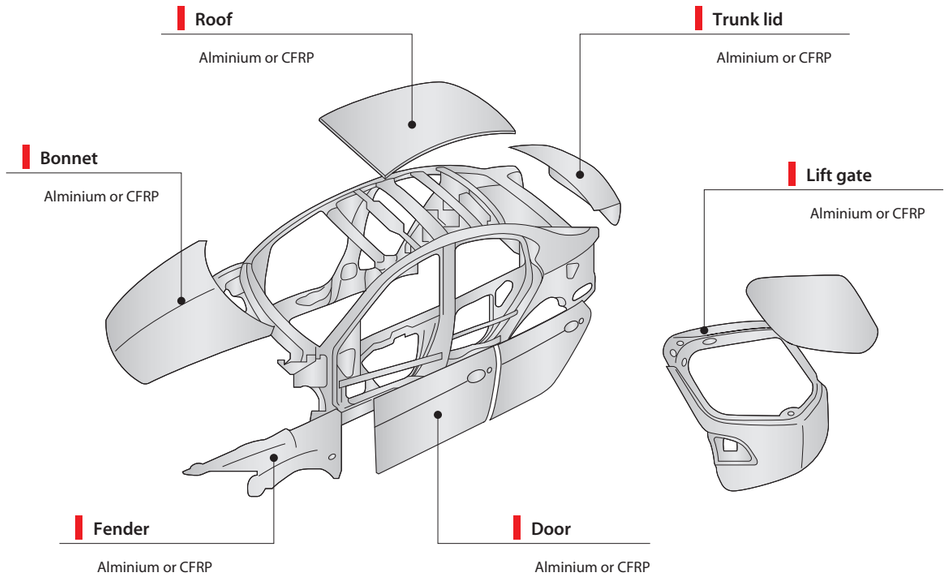
* Storage conditions: 10°C Test condition: 3TS-3120-002
Test piece: Slide glass Curing temperature: 100°C

Frame

A wide range of electric vehicles have been put on the market as part of global environment protection efforts and to comply with environmental regulations in various countries, however, the increase in the number of electronic parts and other components installed on vehicles has presented challenges in terms of weight reduction. In order to promote further innovation in the automotive industry, we are working to develop the structural adhesives required for the shift to multi-material car bodies, which is one weight reduction measures being implemented.

Frame List of materials used





One-component heat-curing epoxy resin

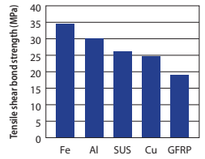
ThreeBond 2249K

[Features]

- Cures when heated and displays excellent shear bond strength and peel strength.
- Forms a tough cured material, providing excellent impact resistance.

Material	Unit	Characteristic	Remarks
Fe	MPa	34.6	SPCC-SD
Al		30.2	A6061P
SUS		26.1	SUS304
Cu		24.6	C1100P
GFRP		19.0	-

* Curing conditions: 130°C×30min



Characteristic

Test item		ThreeBond 2249K
Appearance		Black
Viscosity		882 Pa•s
Specific gravity		1.23
Tensile shear bond strength *1		34.6 MPa
T-peel strength *1		5.15 kN/m
Wedge peel	Cleaving energy *1	7.2 J
	Dynamic cleavage resistance *2	26.9 kN/m
Storage modulus		4.6 GPa
Peak loss elastic modulus		111°C
tan δ peak		126°C
Glass-transition temperature *3		118°C
Curing conditions		130°C×30min

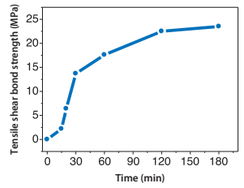
*1 Adherend: SPCC-SD *2 Adherend: SUP10
*3 Measured using thermomechanical analysis (TMA) equipment

2nd generation acrylic adhesive Two-component type

ThreeBond 3923 / 3928

[Features]

- Two-component type that attains practical strength after 30 minutes at room temperature.
- Has excellent heat resistance and maintains adhesive strength even after being kept at a high temperature.
- Mixing ratios can be approximated without significantly affecting adhesive strength. Can also be cured after application to each side of the bonding surface.



Characteristic

Test item	ThreeBond 3923 / 3928
Appearance	Translucent / Green
Viscosity	3 / 3 Pa•s
Specific gravity	1.0 / 1.0
Tensile shear bond strength *1	20 MPa
T-peel strength *1	2.7 kN/m
Bond failure energy (Gic) *2	960 J/m²
Falling weight impact test (maximum point load) *3	4402 N
Falling weight impact test (energy absorption) *3	0.9 J
Glass-transition temperature *4	70°C
Curing conditions	25°C×1day
Mixing ratio	1 : 1

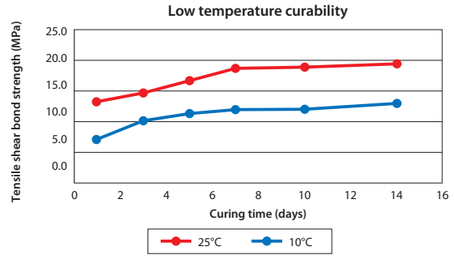
*1 Adherend: SPCC-SD *2 Adherend: SUP10 *3 Adherend: SUS304
*4 Measured using thermomechanical analysis (TMA) equipment

Two-component room -temperature curing epoxy resin Two-component type

ThreeBond 2049/2149

[Features]

- Highly flexible, with high adhesive strength.
- Excellent curability at low temperatures.
- Can be used to bond materials with different linear expansion coefficients.



Characteristic

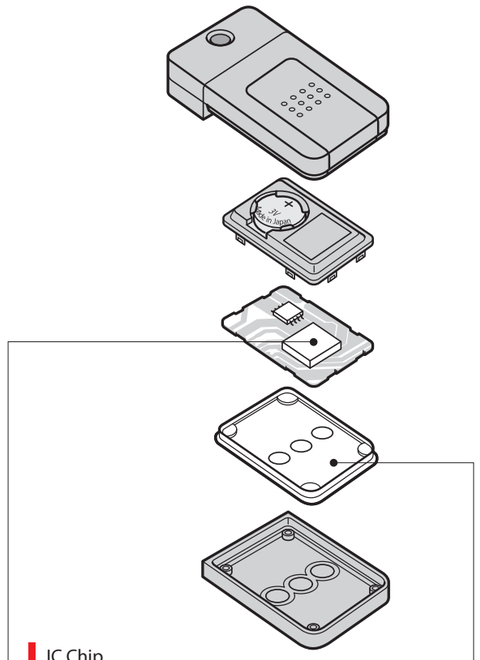
Test item	ThreeBond 2049/2149
Appearance	Black / White
Viscosity	312 / 118 Pa•s
Specific gravity	1.42 / 1.43
Mixture viscosity	138
Tack-free time	15 min
Hardness *1	D52
Tensile strength *1	7.6 MPa
Elongation *1	110%
Tensile shear strength *1	13.3 MPa
Hardness *2	D67
Tensile strength *2	14.9 MPa
Elongation *2	75%
Tensile shear strength *2	18.8 MPa
T-peel strength	2.3 kN/m
Storage elastic modulus (E')	639 MPa
Peak loss elastic modulus (E")	21°C
Peak loss tangent (tan δ)	35°C
Mixing ratio (volume ratio)	1:1

*1 Curing conditions: 25°C × 24 h *2 Curing conditions: 25°C × 168 h

Other Automotive Equipment related Parts

We develops products and technology for a variety of sealing agents and adhesives. These can be used in a diverse range of vehicle parts to meet the needs of our customers and thereby contribute to the automotive industry.
In order to improve the quality and reliability of our products, our sales, R&D and production departments work together as one to propose products that combine both application and purpose.

Smakey key



IC Chip

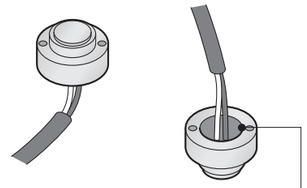
Application	Temporary chip fixing
Product	ThreeBond 3177
Characteristics	1. Curable with low integrated light quantity 2. Good adhesion of each adherend material 3. Good durability
Curing method	Light curing Moisture curing

Application	Chip reinforcement
Product	ThreeBond 2274 Series
Characteristics	1. Good coating properties and permeability 2. High reliability (High Tg / low elasticity) 3. High adhesiveness
Curing method	Heat curing

Keypad film

Application	Temporary film fixing
Product	ThreeBond 7700 Series
Characteristics	1. Fast curable 2. Good adhesion 3. Good durability 4. Gel, high peeling, impact resistant type
Curing method	Moisture curing

Keyless entry button



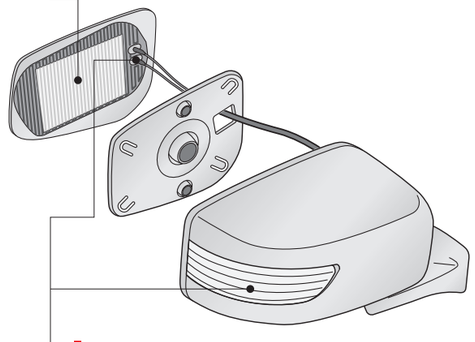
Connector, terminal

Application	Sealing
Product	ThreeBond 2200 Series
Characteristics	1. Good durability 2. Low temperature rapid curable grade available 3. Good adhesion
Curing method	Heat curing

Mirror

Mirror

Application	Bonding
Product	PANDO 690 Series
Characteristics	1. Good adhesion 2. Good durability



Terminal, side turn signal cable

Application	Protection, Fixing, Sealing
Product	ThreeBond 1530 Series
Characteristics	1. Good adhesion 2. Good durability 3. Tin free compatible products available
Curing method	Moisture curing

Note: "Free" in item 3 indicates that the component is not used as part of the product design.

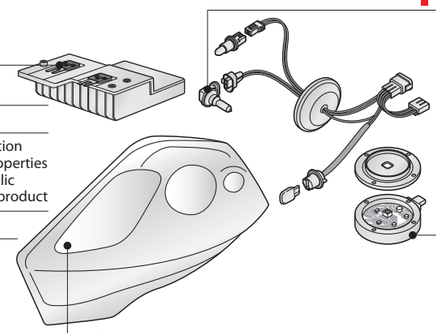
Headlight

Light source element

Application	Heat radiation
Product	ThreeBond 1225B
Characteristics	1. Good heat dissipation 2. Good electrical properties 3. Low molecular cyclic siloxane-reduced product
Curing method	Moisture curing

Terminal

Application	Sealing
Product	ThreeBond 2200 Series
Characteristics	1. Good durability 2. Low temperature rapid curable grade available 3. Good adhesion
Curing method	Heat curing



Screw

Application	Fixing, Sealing
Product	ThreeBond 2400 Series
Characteristics	1. Only tightening generates strength of adhesion 2. Good durability

Light source control unit

Application	Sealing, Bonding
Product	ThreeBond 1226
Characteristics	1. Tin free 2. Good adhesion 3. Low molecular cyclic siloxane reduced product
Curing method	Moisture curing

Application	Sealing
Product	ThreeBond 3160 Series
Characteristics	1. Good durability 2. Good adhesion 3. Low molecular cyclic siloxane reduced product
Curing method	UV curing

Note: "Free" in item 1 indicates that the component is not used as part of the product design.

Around the body

Weather strip

Application	Protection, Fixing
Product	ThreeBond 1530 Series
Characteristics	1. Good adhesion 2. Good durability 3. Tin-free compatible products available
Curing method	Moisture curing

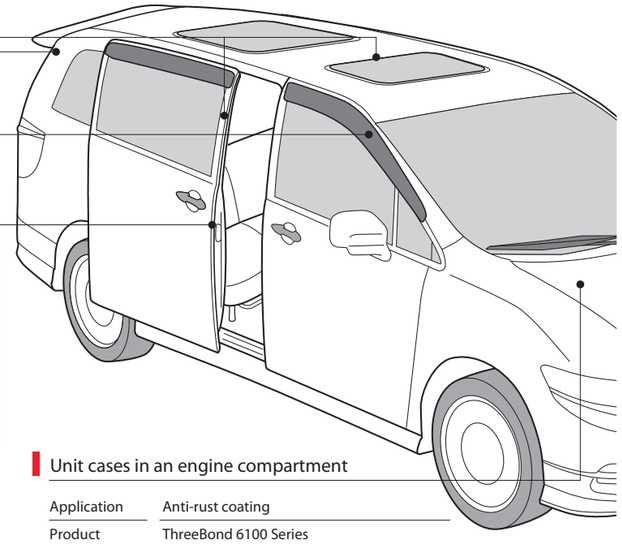
Note: "Free" in item 3 indicates that the component is not used as part of the product design.

Door visor spoiler

Application	Bonding, Sealing
Product	PANDO 690 Series
Characteristics	1. Good adhesion 2. Good durability

Touch sensor

Application	Bonding, Sealing, Protecting
Product	ThreeBond 1537 Series ThreeBond 1539 Series ThreeBond 3000 Series
Characteristics	1. Good durability 2. Good adhesion and sealing 3. Hardly adhesive material compatible grade available
Curing method	UV curing Moisture curable



Unit cases in an engine compartment

Application	Anti-rust coating
Product	ThreeBond 6100 Series
Characteristics	1. Good anti-rust properties 2. Good durability 3. Water type available (Product non-compatible with organic solvent poisoning prevention regulations)
Curing method	Room temperature curing

List of Automotive Equipment related products

ThreeBond 1150 Series (liquid gasket)

Product name		1153E	1156B	1156C	1157	
Characteristics	Unit				Agent A	Agent B
Curing method		Heat curing	Heat curing	Heat curing	Heat curing	
Appearance		Gray	Black	Black	Black	White
Viscosity	Pa•s	850	180	380	570	190
Specific gravity		1.03	1.20	1.24	1.19	1.19
Curing conditions		130°C×90 min	150°C×30 min	150°C×30 min	Two-component type (mass ratio of 1:1) + 100°C×30 min	
Physical properties after curing: Hardness		A38	A6	A15	A13	
Physical properties after curing: Tensile strength	MPa	2.4	1.2	1.7	1.0	
Physical properties after curing: Elongation	%	320	275	300	250	
Physical properties after curing: Moisture permeability (0.5mm thick) (60°C × 90%RH)	g/m²•24h	48	-	-	-	
Physical properties after curing: H_2 gas permeability coefficient	mol•m/m²•s•Pa	1.8×10^{-14}	-	-	-	
Operating temperature range(standard)	℃	-30 to 120	-30 to 150	-30 to 150	-30 to 150	
Remarks		Fuel cell for CIPG	Acrylic-based	Product with higher viscosity and higher thixotropic property than those of TB1156B	Oil resistance Good ATF resistance properties	

* Hardening conditions change depending on the thermal capacity of the adherent and peripheral parts, as well as usage.

ThreeBond 1160 Series

Product name		1160	1163	1165	1167
Characteristics	Unit				
Curing method		Moisture curing Dealcoholized	Moisture curing Special polymer	Moisture curing	Moisture curing
Appearance		Black	Black	Gray	Black
Viscosity	Pa•s	125	105	250	140
Specific gravity		1.46	1.42	2.80	1.40
Touch drying time	min	45	-	2	45
Physical properties after curing: Hardness		A46	A27	A83	A45
Physical properties after curing: Tensile strength	MPa	2.0	1.4	2.2	2.3
Physical properties after curing: Elongation	%	460	350	43	295
Physical properties after curing: Tensile shear bond strength (Aluminum)	MPa	2.4	-	1.5	1.4
Operating temperature range(standard)	℃	-	-	-	-
Remarks		Low molecular cyclic siloxane and organostannic compounds, complies with REACH regulations	Free from the intentional addition of low molecular cyclic siloxane and organotin compounds, complies with REACH regulations	Free from the intentional addition of low molecular cyclic siloxane and organotin compounds, complies with REACH regulations	Flame retardant equivalent to UL94 V-0 standard

ThreeBond 1170 Series

Product name		1170H	1171F	1171G
Characteristics	Unit			
Curing method		Solvent vaporization	Solvent vaporization	Solvent vaporization
Appearance		Blue	Black	Colorless transparent
Viscosity	mPa•s	225	1800	600
Specific gravity		0.87	0.91	0.79
Heating residue	%	8.8	14.5	5.6
Physical properties after curing: State		Rubber-like adhesive film	Rubber-like elastic film	Rubber-like adhesive film
Physical properties after curing: Moisture permeability (150 μ) (40°C x 95%RH)	g/m²•24h	6.8	5.6	6.8
Chemical resistance (mass change): Propylene carbonate	%	2.2	0.5	-1.9
Chemical resistance (mass change): Gamma-Butyrolactone	%	2.2	0.6	-1.4
Chemical resistance (mass change): Dimethoxyethane	%	2.9	-0.8	2.1
Remarks		for battery	for battery	for battery

ThreeBond 1200 Series (silicone-based liquid gasket)

Product name		1207B	1207F	1207K	1209	1215Q	1216B	1216C	1216E	1216J		1217G	1217H	1217M	1220G	1222C	1225B	1226	1234B
Characteristics	Unit																		
Curing method		Moisture curing Deacetone	Moisture curing Deacetone	Moisture curing Deacetone	Moisture curing Deacetone	Moisture curing Deoximation	Moisture curing Deoximation	Moisture curing Deoximation	Moisture curing Deoximation	Moisture curing Deoximation		Moisture curing Deoximation	Moisture curing Deoximation	Moisture curing Deoximation	Moisture curing Dealcoholized	Moisture curing Dealcoholized	Moisture curing Dealcoholized	Moisture curing Dealcoholized	Heat-curing
Appearance		Black	Aluminum color	Black	Black	Gray	Black	Light reddish brown	Gray	Reddish brown		Gray	Dark gray	Black	Milky white	Gray	White	Gray	Gray
Viscosity	Pa•s	100	-	-	-	200	-	-	-	-		-	-	-	65	-	18	97	400
Apparent viscosity (SOD)	Pa•s	-	180	Non-fluid type	140	-	120	170	200	98		301	310	280	-	-	-	-	-
Specific gravity		1.02	1.45	1.36	1.05	1.43	1.50	1.48	1.36	1.61		1.37	1.39	1.37	1.03	1.32	2.60	1.37	1.18 (Liquid specific gravity)
Tack-free time	min	3	5	5	5 (Liquid specific gravity)	10	5	5	6	13		5	6	7	10	5	5	7	-
Physical properties after curing: Hardness		A30	A56	A46	A42	A61	A50	A48	A57	A61		A60	A47	A45	A20	A45	A74	A27	A11
Physical properties after curing: Tensile strength	MPa	1.9	3.7	2.3	2.1	2.7	2.0	2.1	3.3	1.8		2.6	2.6	2.5	2.2	4.0	3.9	2.4	2.3
Physical properties after curing: Elongation	%	400	190	268	270	380	475	470	300	248		430	590	500	500	250	48	460	700
Physical properties after curing: Tensile shear bond strength (aluminum)	MPa	1.1	2.2	1.6	1.7	1.9	1.7	1.3	2.5	1.1		2.0	1.9	1.6	1.0	1.0	0.9	2.2	1.7
Thermal conductivity	W/m•K	-	-	-	-	-	-	-	-	-		-	-	-	-	-	1.59	-	-
Remarks		FIPG: Engine oil and Cooling liquid sealing UL94HB certified product	FIPG: Engine oil,Liquid coolant sealing	Excellent adhesion to resin	Resistance to heat of about 300°C	FIPG: Engine oil pan, AT case, CVT case, gear case sealing	FIPG: AT case, CVT case sealing, High-viscosity variation of 1215B	FIPG: AT case, CVT case sealing, High-viscosity variation of 1216B	FIPG: Engine oil pan sealing,AT case, Gear case, Liquid coolant sealing	FIPG: Engine oil pan sealing,AT case, Gear case sealing		FIPG: Engine oil pan sealing, Good initial pressure resistance	FIPG: Engine oil pan sealing, Good initial pressure resistance	FIPG: Engine oil pan sealing		UL-94 V-0 Certified contact point failure-preventing product			Standard curing conditions: 100°C for 1h

* The values described in the characteristics table are examples of actually measured values, and they are not guaranteed values.
* Before using the product, never fail to confirm its appropriateness and safety for a desired purpose.

List of Automotive Equipment related products

ThreeBond 1300 Series (anaerobic sealing agent)

Product name		1305N	1324N	1344J	1354	1357K	1359G	1360F	1360G	1373N
Characteristics	Unit									
Strength classification		High strength	Medium strength	Low strength	High strength	High strength	Medium strength	High strength	Medium-high strength	High strength
Main application		Screw	Screw Fitting	Screw	Fitting	Surface adhesion	Surface adhesion	Screw Fitting	Screw	Fitting
Appearance		Green	Red	Blue	Blue	Blue	Blue	Green	Red transparent	Green transparent
Viscosity	mPa•s	650	600	650	1000	12000	23000	500	1800	100
Specific gravity		1.11	1.12	1.06	1.10	1.10	1.10	1.10	1.10	1.10
Curing speed: Practical strength development[*1]	h	1	1	1	-	-	-	1	2	1
Curing speed: Final strength development	h	12	12	12	-	-	-	12	24	24
Breaking torque [*2]	N•m	47.9	27.0	23.7	-	-	-	41.6	37.6	33
Fitting adhesive strength [*3]	MPa	45.0	30.0	-	33.2	30.9	22.8	36.6	-	39
Remarks			Emits with black light	Good removability Emits with black light		Emits with black light		Not removable Emits with black light		

Product name		1375N	1386H	1386L
Characteristics	Unit			
Strength classification		High strength	Low strength	Low-medium strength
Main application		Fitting	Welch plug fitting sealing	Welch plug fitting sealing
Appearance		Green transparent	Fluorescent yellow	Blue
Viscosity	mPa•s	500	2200	2000
Specific gravity		1.12	1.10	1.10
Curing speed: Practical strength development[*1]	h	1	-	6
Curing speed: Final strength development	h	24	-	24
Breaking torque [*2]	N•m	-	15.3	23.5
Fitting adhesive strength [*3]	MPa	31.8	-	20.5
Remarks			Emits with black light	Emits with black light Prevention of galling Good coating properties

*1: Strength that is half the final strength
*2: Iron bolt/nut M10 x pitch 1.5
*3: Iron pin/color 6ø x 15 mm, clearance of 1/100 mm

ThreeBond 1390 Series (primer for anaerobic adhesives and sealants)

Product name		1390E	1390F	1390K	1390R
Characteristics	Unit				
Solvent		Alcohol	Acetone	Acetone	Alcohol
Main usages		Anaerobic accelerator	Anaerobic accelerator	Anaerobic accelerator	Anaerobic accelerator
Features		Little influence on plastics	Quick drying	Quick drying	Little influence on plastics
Appearance		Light brown	Light brown	Green	Blue green
Specific gravity		0.9	0.8	0.8	0.8
Set time (Screws[*1]) used with 1322N	sec	15 to 25	15 to 25	10 to 20	10 to 20
Remark(s)					Low halogen product

*1: Iron bolts/nut M10×Pitch 1.5

ThreeBond 1530 Series (elastic adhesive)

Product name		1530	1533	1533F	1535	1535B	1535C	1535D	1537E	1539
Characteristics	Unit									
Curing method		Moisturecuring alcohol type	Moisturecuring alcohol type	Moisturecuring alcohol type	Moisturecuring alcohol type	Moisturecuring alcohol type	Moisturecuring alcohol type	Moisturecuring alcohol type	Moisturecuring alcohol type	Heat-curing Moisture-curing
Appearance		White	White	Gray	White	Black	Colorless transparent	Gray	Gray	Black
Viscosity	Pa•s	100	100	180	75.0	90	30.0	25	90	100
Specific gravity		1.39	1.39	1.21	1.43	1.43	1.04	1.38	1.66	1.34
Tack-free	min	7	7	20	4	5	3	5	3	-
Physical properties after curing: Hardness		A44	A40	A25	A45	A45	A37	A36	A84	A70
Physical properties after curing: Tensile strength	MPa	5.9	4.5	3.0	4.5	4.2	3.5	3.6	4.2	3.5
Physical properties after curing: Elongation	%	280	280	460	180	166	136	182	50	120
Tensile shear bond strength (Iron)	MPa	5.4	5.8	3.7	5.0	5.0	7.1	4.2	4.1	3.8
Tensile shear bond strength (Aluminum)	MPa	6.6	5.7	3.9	5.8	5.0	8.7	3.9	4.3	4.3
Peel adhesive strength (Aluminum)	kN/m	2.5	3.5	-	1.7	3.0	1.7	1.7	0.9	1.5
Remarks			Complies with DBT REACH regulations UL94-HB certified product	Complies with DBT REACH regulations Bonds polyethylene, polypropylene and urethane rubber	Complies with tin REACH regulations	Complies with tin REACH regulations	Complies with tin REACH regulations	Complies with tin REACH regulations	UL94 V-0 certificated product	Heat curing Cured at 60°C

* The values described in the characteristics table are examples of actually measured values, and they are not guaranteed values.
* Before using the product, never fail to confirm its appropriateness and safety for a desired purpose.

ThreeBond 2000/2100 Series (two-component epoxy resin)

Product name		2086N		2087		2088E		2045B	2145B	2049	2149
Characteristics	Unit	Main agent	Curing agent	Main agent	Curing agent	Main agent	Curing agent	Main agent	Curing agent	Main agent	Curing agent
Appearance		Light yellow	Gray	Light yellow transparent	Light brown	Yellow transparent	Yellowish brown	Pink	Light blue	Black	White
Viscosity	Pa•s	110	50	13	30	40	4	82	124	312	118
Compounding ratio (mass ratio) Main agent/Curing agent		100/100		100/100		100/25		100/40		100/100	
Specific gravity		1.29	1.20	1.17	0.96	1.19	1.03	2.50	2.52	1.42	1.43
Usage life (when 100 g is mixed at 25°C)		5 min		-		70 min		-		-	
Curing conditions		25°C×24 h		25°C×24 h or 60°C×2 h		25°C×24 h or 120°C×1 h		25°C×24 h		25°C×24 h	
Physical properties after curing: Hardness		D70		D68		D82		D79		D52	
Physical properties after curing: Glass transition temperature	°C	29.7		70 (100°C×30 min)		170 (150°C×1 h)		45		21	
Physical properties after curing: Volume resistivity	Ω•m	-		2.0×10^{12}		-		1.9×10^{12}		-	
Physical properties after curing: Tensile shear bond strength (Iron)	MPa	14.0 (When cured at room-temperature)		25.9		22.9		17.5 (When cured at room-temperature)		13.3 (When cured at room-temperature)	
Physical properties after curing: Peel adhesive strength (Iron)	N/m	-		2140		-		880 (When cured at room-temperature)		2300 (When cured at room-temperature)	
Remarks						High thermal adhesion		Thermal conductivity 2.1W/m-K			

* Hardening conditions change depending on the thermal capacity of the adherent and peripheral parts, as well as usage.

List of Automotive Equipment related products

ThreeBond 2200 Series (one-component epoxy resin)

Product name			2202	2204	2206	2206S	2212B	2222P	2223S	2235L	2237J		2247D	2270C	2270J	2272F	2274S	2280H	2284E	2284J	2285Q	2296B
Characteristics		Unit																				
Appearance			Black	Black	Black	Black	Black	Black	Black	Black	White		Milky white	Gray	White	Black	Blue	Black	Rust Putty	Brown	Milky white	Black
Viscosity		Pa•s	15	28	120	15	25	45	42.9	80	115		45	65	150	75.0	3.8	11	-	-	120	18.5
Specific gravity			1.14	1.23	1.20	1.36	1.39	1.6	1.60	1.69	1.64		1.17	1.95	2.86	1.64	1.17	1.10	3.42	3.18	1.64	1.25
Curing conditions			70°C×50 min 80°C×20 min	70°C×50 min 80°C×20 min	70°C×50 min 80°C×20 min	80°C×30 min	80°C×30 min 100°C×20 min 120°C×10 min 150°C×1 min	100°C×60 min	100°C×60 min 120°C×30 min	140°C×30 min	120°C×60 min		150°C×30 min	100°C×40 min 120°C×30 min 150°C×20 min	100°C×40 min	100°C×60 min	120°C×10 min	90°C×30 min dry + 150°C×30 min	100°C×40 min 120°C×20 min 150°C×10 min	150°C×30 min	120°C×60 min	80°C×30 min
Physical properties after curing	Hardness		D88	D89	D87	D87	D88	D89	D91	D92	D89		D84	D93	D96	D92	-	-	D93	D95	D92	-
	Glass transition temperature	°C	110	116	99	106	109	115	118	155	150		120	140	117	117	124	-	122	128	139	47
	Volume resistivity	Ω•m	1.3×10^{15}	1.7×10^{15}	1.4×10^{13}	4.78×10^{13}	1.6×10^{14}	2.9×10^{13}	6.0×10^{13}	4.9×10^{15}	5.9×10^{15}		-	-	1.5×10^{13}	2.0×10^{13}	1.6×10^{14}	-	6.8×10^{13}	2.2×10^{13}	1.5×10^{14}	6.3×10^{13}
	Tensile shear bond strength (Iron)	MPa	13.3	16.2	18.0	12.0	12.5	25.5	24.0	23.0	26.0		35.8	21.6	9.0	21.3	23.0	10.6	13.7	9.0	23.1	22.2
	Peel adhesive strength (Iron)	N/m	331	360	380	-	300	1740	2900	2000	3600		2300	314	-	460	-	-	-	-	-	-
Remarks														Thermal conductivity 0.9W/m·K	Thermal conductivity 4.2W/m·K	UL94 V-0 certificated product				Curable at 100°C		

* Hardening conditions change depending on the thermal capacity of the adherent and peripheral parts, as well as usage.

ThreeBond 2300 Series (pre-coat bolt, seal lock processing, threelock processing)

Product name					2358C
Characteristics				Unit	
Main components					Acrylic resin Fluorine resin
Characteristics					For sealing use
Appearance					White
Applied screw diameter					-
Sealing properties	Air-tight *1	25°C	M10 bolt	MPa	2 and above
			3/4PT Plug	MPa	2 and above
	Water-tight *1	25°C	M10 bolt	MPa	2 and above
			3/4PT Plug	MPa	2 and above
	Oil-tight *2	170°C	M10 bolt	MPa	12 and above
			3/4PT Plug	MPa	12 and above
Operating temperature range (Standard)				°C	Sealing: 170°C
Remarks					Seal lock processing Aqueous type

Product name				2365B	2365C
Characteristics			Unit		
Main components				Nylon resin	Nylon resin
Characteristics				Repeated use	Repeated use
Appearance				Green	Red
Applied screw diameter				M1.6-40	M1.6-40
Repeated torque	M4×P0.7 (2N•m constriction)	Tightening torque	N•m	0.47	0.47
		Screw loosening torque (1st round)	N•m	0.40	0.40
		Screw loosening torque (5th round)	N•m	0.22	0.22
	M1×P1.5 (30N•m constriction)	Tightening torque	N•m	8.1	8.1
		Screw loosening torque (1st round)	N•m	6.5	6.5
		Screw loosening torque (5th round)	N•m	4.3	4.3
Operating temperature range (Standard)			°C	-50 to 120	-50 to 120
Remarks				Three lock processing	Three lock processing

*1: Iron seal block / tightening torque, M10 bolt: 30N•m,
1/8 plug: 4N•m, 3/4 Plug: 44N•m, maximum pressure 2MPa
*2: Iron seal block / tightening torque, M10 bolt: 30N•m,
1/8 plug: 4N•m, 3/4 Plug: 44N•m, maximum pressure 12MPa

ThreeBond 2400 Series (pre-coated bolts by MEC process)

Product name			2448	2448B	2458	2468	2468C	2478	2488	2488E
Characteristics		Unit								
Main component			Epoxy type	Epoxy type	Acrylic type	Acrylic type	Acrylic type	Acrylic type	Acrylic type	Epoxy type
Strength classification			High strength	High strength	Low strength	Medium strength	Medium strength	High strength	Medium strength	High strength
Curing conditions			25°C×24 h	25°C×24 h	25°C×24 h	25°C×24 h	25°C×24 h	25°C×24 h	25°C×24 h	25°C×48 h
Appearance			Blue	Orange	Green	Red	Purple	Blue	Blue	Red
Applied screw diameter			M2 to M40	M2 to M40	M3 or longer	M3 or longer	M3 or longer	M3 or longer	M3 or longer	M2 or longer
Strength of adhesion to each material *1	Iron	N•m	62.6	64.6	38.2	45.4	56.3	52.5	43.1	46.3
	Zinc chromate Plating	N•m	67.0	70.7	37.4	44.9	54.3	52.3	44.9	57.3
	SUS304	N•m	64.6	66.8	31.9	42.6	59.6	45.5	41.1	40.8
	Aluminum	N•m	36.4	40.9	20.6	24.8	21.5	22.3	22.4	29.0
Operating temperature range (standard)		°C	Locking: 150°C Sealing: 170°C	Locking: 160°C Sealing: 170°C	Locking: 100°C Sealing: 170°C	Locking: 100°C Sealing: 170°C	Locking: 120°C Sealing: 170°C	Locking: 130°C Sealing: 170°C	Locking: 130°C	Locking: 80°C Sealing: 170°C
Remarks			Water-type	Water-type	Water-type	Water-type	Aqueous type Less-scum type	Water-type	Water-type *For nuts	Water-type *Combined use of bolts and nuts,

*1: M10 x 1.5 bolt and nut, tightening torque: 30 N • m (15 N • m for aluminum)
* Hardening conditions change depending on the thermal capacity of the adherent and peripheral parts, as well as usage.

* The values described in the characteristics table are examples of actually measured values, and they are not guaranteed values.
* Before using the product, never fail to confirm its appropriateness and safety for a desired purpose.

List of Automotive Equipment related products

ThreeBond 3000/3100 Series (UV-curable resin)

Product name			3013Q	3020B	3074C	3081J	3081L	3081P	3084	3114	3114J		3142	3161	3164D	3166	3168(N)	3170E	3175	3177	3178
Characteristics		Unit																			
Main component			Acrylic resin	Acrylic resin	Acrylic resin	Acrylic resin	Acrylic resin	Acrylic resin	Acrylic resin	Epoxy resin	Epoxy resin		Epoxy resin	Silicone	Silicone	Silicone	Silicone	Acrylic resin	Olefin	Acrylic resin	Olefin
Appearance			Blue transparent	Light yellow	Colorless	Light yellow transparent	Milky white	Light yellow	Cadet Blue	Grayish white	White		White	Light yellow	Pale white	Blue	White	Light yellow	White	Yellow to light yellow transparent	White
Viscosity		Pa•s	23.0	3.5	7.0	95.0	65.0	400	100	26	25		60	3.0	10	330	15.0	11.2	8.0	1.2	155
Specific gravity			1.11	1.05	1.09	1.11	1.15	1.09	2.19	1.54	1.56		1.3	0.98	1.00	1.01	1.00	1.10	0.94	1.06	0.95
Curing condition (Integrated light intensity)		kJ/m^2	45	30	30	45	30	45	30	30	30		50+100℃× 1.5h	30 + moisture curing	30 + moisture curing	45	30	30	50	10	40
Physical properties after curing	Hardness		A32	D54	D70	A27	A25	E19	D90 to 95	D80	D87		D86	A30	A32	E15	Gel	D44	A79	D84	A32
	Volume resistivity	Ω•m	9.4×10^9	3.0×10^7	1.5×10^{12}	1.2×10^{10}	-	8.8×10^8	9.8×10^{12}	-	2.4×10^{12}		-	4.0×10^{12}	8.8×10^{12}	5.5×10^{11}	7.4×10^{11}	-	1.8×10^{16}	9.2×10^{13}	9.0×10^{11}
	Dielectric breakdown strength	kV/mm	21	14.0	24.1	19.0	-	24.9	18.3	-	26.2		-	12.3	30	15.1	-	-	29.9	24	26.3
Tensile shear bond strength	Glass/Iron	MPa	4.1	9.4	8.1	-	-	-	Material failure	-	-		-	2.0	-	-	-	-	-	-	-
	Glass/Aluminum	MPa	2.8	3.4	2.2	-	-	-	-	-	4.5		-	0.66	0.5	-	-	-	3.9	-	-
	Glass/Stainless steel	MPa	5.1	9.0	6.3	-	-	-	-	-	2.5		-	-	-	-	-	-	3.9	-	-
Remarks			Excellent engine oil and AT oil resistance Continuous use at approximately 120℃	Supports LED light sources, Colored black after hardening							Cure shrinkage: 1.8% Tg: 142℃ (DMA) Supports LED light sources		Dual curing Cure shrinkage: 2.0%	Dealcoholization type Low-molecular cyclic siloxane-reduced product	Dealcoholization type Low-molecular cyclic siloxane-reduced product		Excellent vibration absorption Low-molecular siloxane-reduced product		Excellent screen printability Supports LED light sources	Hybrid with an instantaneous adhesive ISO 10993 compliant	Supports LED light sources

* Hardening speed changes depending on the kind of light source, irradiation distance, etc., therefore confirm it carefully before use.

ThreeBond 3300 Series (electrical conductive resins • anisotropic conductive pastes)

Product name		3301W	3302B	3303B	3303G (NEO)(S)	3303M	3303N	3303R	3304J	3315E		3331D	3333F	3350B	3350C	3351C	3381D	
Characteristics	Unit																Main agent	Curing agent
Binder		Epoxy-based	Urethane	Siliconebased	Siliconebased	Siliconebased	Siliconebased	Siliconebased	Siliconebased	Synthetic rubberbased		Epoxy-based	Siliconebased	Acryl resinbased	Acryl resinbased	Elastomer synthetic resin	Acryl resin-based	
Electro conductive filler		Silver-based	Silver-based	Silver-based	Silver-based	Silver-based	Silver-based	Silver-based	Silver-based	Carbon-based		Silver-based	Silver-based	Silver-based	Silver-based	Nickel-based	Nickel-based	
Appearance		Silver	Silver	Light yellow	Silver	Light yellow	Light yellow	Light yellow	Silver	Black		Silver	Brown	Silver	Silver	Gray	Black	Black
Viscosity	Pa•s	37	15	22	40.0	40	41	50	80	0.6		25	20	2.5	0.09	3.0	100	100
Specific gravity		3.3	2.73	2.30	-	3.07	3.02	-	-	0.87		-	-	1.90	2.1	1.5	2.8	-
Standard curing conditions		120℃×60min or 170℃×15min	150℃× 30min	150℃×60min or 170℃×30min	180℃× 60min	180℃× 60min	180℃× 60min	180℃× 60min	210℃× 60min	80℃× 30min		80℃× 60min	80℃× 60min	25℃×4h or 60℃×1h	25℃×24h or 60℃×1h	90℃× 60min	25℃×15h or 60℃×30min	
Volume resistivity	Ω•m	1.6×10^{-6}	2.0×10^{-6}	3 to 4×10^{-5}	2.5×10^{-6}	1.9×10^{-6}	2.3×10^{-6}	2.8×10^{-6}	7.6×10^{-6}	4.3×10^{-2}		0.5×10^{-5}	1.1×10^{-5}	2 to 3×10^{-6}	0.99×10^{-6}	8.0×10^{-5}	5.0×10^{-5}	
Chip bonding strength (Ceramic chip/Glass)	MPa	-	1.5	2.9	3.0	3.6	3.1	3.5	1.9 (Gold-plated chip / Gold-plated plate)	-		19.9	2.0	-	-	-	-	
Remarks					Excellent adhesion with gold/silver electrodes	3303F alternative product			Supported nozzles: inner diameter 0.07 mm or more	Flexibility			Conductive when stretched			Halogenfree enabled	Compounding ratio 1:1	

* The values described in the characteristics table are examples of actually measured values, and they are not guaranteed values.
* Before using the product, never fail to confirm its appropriateness and safety for a desired purpose.
* "Free" indicates that the component is not used as part of the product design.

List of Automotive Equipment related products

ThreeBond 3900 Series (structural adhesive)

Product name		3923	3928	3944		3953		3955	
Characteristics	Unit			Agent A	Agent B				
Appearance		Translucent	Green	Blue	Yellow	Black	White	Light blue transparent	Light yellow transparent
Viscosity	Pa•s	3.0	3.0	650	650	3.0	30	2.4	2.4
Specific gravity		1.0	1.0	1.10	1.10	1.11	0.99	1.04	1.04
Compounding ratio (mass ratio) Main agent/Curing agent		100:100 (Its use method is contact curing.)		100:100		100:100		100:100	
Set time	min	12		4		15		5 to 15	
Curing conditions		25°C×24 h (Practical strength is obtained in about 30 minutes.)		25°C×24 h (UV light: 30kj/m²(w-LED))		25°C×7 days (50%RH) (Practical strength is obtained in 24 hours.)		25°C×24 h (Practical strength is obtained in 3 hours.)	
Tensile shear bond strength: Iron	MPa	20.0		13.4		10.3		6.6	
Tensile shear bond strength: Aluminum	MPa	14.3		-		9.6		5.6	
Tensile shear bond strength: Stainless steel	MPa	20.0		-		-		-	
Peel adhesive strength: Iron	kN/m	2.7		-		-		-	
Peel adhesive strength: Aluminum	kN/m	-		-		-		-	
Remarks									

* Hardening conditions change depending on the thermal capacity of the adherent and peripheral parts, as well as usage.

ThreeBond 6600 Series (brakes & parts cleaners)

Product name		6602L	6602P	6602R	6602S	6602U	6651D	6651F
Characteristics	Unit							
Main component		Hydrocarbon-based compound	Hydrocarbon-based compound	Hydrocarbon-based compound	Hydrocarbon-based compound	Hydrocarbon-based compound	Alcohol-based	Fluorine solvent
Features		Slow-drying type	Quick-drying type	Large type of 6602P	Quick-drying type	Slow-drying type	Semi-aqueous	Non-combustible Quick-drying type
Container form		Aerosol / Can (For refills)	Aerosol	Aerosol	Can	Can (For refills)	Can (For refills)	Aerosol / Can (For refills)
Appearance		Colorless	Colorless	Colorless	Colorless	Colorless	Colorless and transparent	Colorless
Drying performance	sec	480	30	30	30	90	400	10
Cleaning ability Brake fluid		Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
Classification according to Fire Service Act		Category 4, class 2 petroleums (water-insoluble)	Category 4, class 1 petroleums (water-insoluble)	Category 4, class 1 petroleums (water-insoluble)	Category 4, class 1 petroleums (water-insoluble)	Category 4, class 1 petroleums (water-insoluble)	Non-hazardous material	Non-hazardous material

ThreeBond 6100 Series (automotive chassis paint agents)

Product name		6101B	6102	6110C	6115	6154	6155D	6163	6164	6168
Characteristics	Unit									
Main component		Natural bitumen	Water soluble Acryl resin	Natural bitumen	Synthetic resin	Wax	Synthetic resin	Acryl resin-based emulsion	Water soluble Acryl resin	Synthetic resin
Features		Oil-based	Watersoluble	Oil-based	Oil-based	Oil-based	Aqueous thick	Aqueous	Disposable Water soluble	Aqueous high rust prevented
Appearance		Black	Black	Black	Black	Dark brown (Coated surface is clear)	Black	Black	Black	Black
Viscosity	mPa•s	15	115	22.5	1810	65	3000	210	41	200
Specific gravity		0.91	0.96	0.92	1.10	0.78	1.15	1.00	0.94	1.01
Solid content	%	30	20	39	48	15	62.5	25	21	24
Tack free	min	5	25	5	25	-	-	25	3	30
Remarks										

ThreeBond 7700 Series

Product Name		7721	7725	7727	7737	7738	7741	7781
Characteristics	Unit							
Appearance		Colourless to Light yellow transparent	Colourless	Colourless	Light yellow transparent	Light yellow transparent	Colourless to Light yellow transparent	Colourless to Light yellow transparent
Viscosity	mPa•s	5	500	2000	2000	5000	2	2
Specific gravity		1.07	1.07	1.07	1.07	1.08	1.05	1.05
Time set: Iron	sec	15	80	90	90	90	3	2
Tensile shear bond strength: Iron	MPa	18.4	16.6	17.1	25.7	27.7	15.0	14.0
Tensile shear bond strength: Aluminium	MPa	12.9	15.1	15.0	20.4	21.4	15.1	14.9
Tensile shear bond strength: Polycarbonate	MPa	Material failure	Material failure	Material failure	Material failure	Material failure	Material failure	Material failure
Tensile shear bond strength: ABS	MPa	Material failure	Material failure	Material failure	Material failure	Material failure	Material failure	Material failure
Tensile shear bond strength: NBR	MPa	Material failure	Material failure	Material failure	Material failure	Material failure	Material failure	Material failure
Tensile shear bond strength: Chloroprene rubber	MPa	Material failure	Material failure	Material failure	Material failure	Material failure	Material failure	Material failure
Operating temperature range	℃	-40 to 100	-40 to 100	-40 to 100	-40 to 100	-40 to 100	-40 to 100	-40 to 100
Remarks				Structural viscosity ratio 2.9	Structural viscosity ratio 4.8	Structural viscosity ratio 5.0	Regular use at 80°C allowed	Regular use at 80°C allowed Final strength within 30 min

* The values described in the characteristics table are examples of actually measured values, and they are not guaranteed values.
* Before using the product, never fail to confirm its appropriateness and safety for a desired purpose.

Automotive Market electrical component and LEV-related

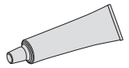
Application equipment

Energy-saving device for each container

Tube, Cartridge, Twin cartridge

We have a rich assortment of devices that can handle small-amount and large-amount sealants and adhesives.
A coating machine suitable to each vessel can be selected.

Tube



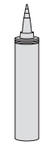
Air gun for sealant (DH1)

This is a pneumatic sealant gun.
Automatic application by machine is impossible.
For the details, contact one of our sales engineers.

Tank for tube
Air dispenser tank (minicoater C5)

The amount of injection is adjusted by injection time and tank pressure.
Automatic application by the machine is possible.

Cartridge



Cartridge-type pump (ACB-20)
Pen type manually operated valve (pencil gun)

This dispenser is excellent in high-speed dispense and operability as the result of a combination of high pressure-feeding cartridge pump and a pencil gun.
Automatic application by machine is impossible.

Air gun for sealant (DH1)

This is a pneumatic sealant gun.
Automatic application by machine is impossible.
For the details, contact one of our sales engineers.

Cartridge-type pump (PCB-20)

This is a high-pressure feeding pump designed for automatic application.
When it is combined with a robot, uniform linear application is possible.
Automatic application by machine is possible.

Dedicated to surface application
Adhesive discharging valve
RV-SN Series

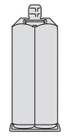
This is an adhesive discharging valve to apply material in plane-like or band-like form.
Automatic application by machine is possible.

Cartridge-type tank (TC2)
Dispensing valve (HPNV-50)
Controller for pressure (coater S4)
Desktop robot (RT8 Series)

This unit pressure-feeds a material from the cartridge and controls the open/close valve to apply the material.
When the controller is combined with a robot, it will apply the material to a programmed position.
Automatic application by machine is possible.

*The latest desktop orthogonal robots are the RT8 series. For details, contact one of our sales engineers.

Twin cartridge



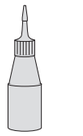
Hand gun for two-component liquid cartridge

This hand gun mixes a two-component liquid agent with its static nozzle and injects it.
Automatic application by the machine is impossible.

Energy-saving device for each vessel

Bottle, Syringe, Pail, 1kg cans

Bottle



Transcription-type simple coating machine (Coater R)

Push the screw bolt section lightly against the circumference of the rotating rotor and coat the screw section.
Automatic application by the machine is impossible.

Air syringe dispenser (Minicoater C5)

The amount of injection is adjusted by injection time and air pressure.
Automatic application by the machine is possible.

Automatic rotary application (DR1 Series) Tank (PV2)

This is a rotary coating machine for coating the inside of a cylinder with a liquid agent automatically.
Automatic application by the machine is possible.

Tank for 1 kg or less bottle or can (TG1-T) Pen type manually operated valve (pencil gun)

This dispenser is for a low-viscosity material.
Dispensing is done by pulling the gun lever.
Automatic application by machine is impossible.

Tank with low level sensor detection(TG1-TE) Minute-quantity and fixed-quantity valve TDV Dedicated controller

This is a highly durable and stable dispenser for injecting a minute amount of agent.
Automatic application by the machine is possible.

Syringe

Air syringe dispenser (Minicoater C5)

The amount of injection is adjusted by injection time and air pressure.
Automatic application by the machine is possible.

Pail

Double-acting pump for pails (AP-30) High-pressure flow gun type (High-pressure flow gun)

This dispenser is excellent in high-speed injection and operability as the result of combination of a high-pressure feeding pump for pails and a high-pressure flow gun.
Automatic application by the machine is impossible.

Single-acting pump for pails (PBⅢ-45)

This is a high-pressure feeding pump for automatic application. When it is combined with the robot, uniform linear application is possible.
Automatic application by the machine is possible.

Pump for pails (PBⅢ) One-component fixed-quantity booster (DQ1LW06) Desktop robot (RT8 Series)

When a high-pressure feeding pump for automatic application and a constant-speed injection head are combined with the robot, high-precision and uniform linear application that is not affected by changes in the environmental temperature is possible.
Automatic application by the machine is possible.

1-kg can

Air syringe dispenser (Minicoater C5)

The amount of injection is adjusted by injection time and air pressure.
Automatic application by the machine is possible.

Tank for 1 kg or less bottle or can (TG1-T) Pen type manually operated valve (pencil gun)

This dispenser is for a low-viscosity material.
Dispensing is done by pulling the gun lever.
Automatic application by machine is impossible.

Tank for 1 kg or less bottle or can (TG1-T) Needle type dispense valve (HPNV-50) Pressure controller (coater S4) Desktop robot (RT8 Series)

This device pressure-feeds a liquid agent from a tank and applies the agent by controlling the open/close valve of the nozzle section. When the dispenser is combined with the robot, it applies the agent appropriately to a programed position.
Automatic application by the machine is possible.

Gear pump dispenser for one-component agent / two-component mixer

This dispenser pressure-feeds an agent with its gear pump. It pressure-feeds each of two liquids with the gear pump and mix them with the dynamic mixer to inject the mixture. This is manufactured, according to specifications, such as a mixing ratio and injection speed.
Automatic application by the machine is possible.

Dedicated to surface application Adhesive discharging valve RV-SN Series

This is an adhesive discharging valve to apply material in plane-like or band-like form.
Automatic application by machine is possible.

Pump for 1-kg cans (PH1-20)

Pump for high-pressure feeding of materials loaded in 1kg metal cans.
Use a can opener to open 1kg material package and set it into the pump without requiring pouring of liquid.

For Industrial Use Only Do not use this product for household purposes

This product was developed for general industrial use. Before using this product, the user must accept the following terms:

- The technical data given herein are not guaranteed values, but examples of experimental values obtained by our specified test methods. We do not guarantee that the uses described herein do not conflict with any intellectual property right.
- Users are asked to examine whether the product is appropriate to the purpose of use and can be used safely before they use it and bear all responsibilities and hazards involved in its use. Never use the product for medical implants that may be embedded, injected or left in the body.
- We are not liable for personal injury or property damage caused by improper handling of this product. If the properties and usage of this product are unknown, never use it.
- For detailed safety information of the product, see the Safety Data Sheet (SDS). To obtain the SDS, contact our sales office or customer service office.
- Information in this technical document is subject to change at our discretion without notice.

Creating Our Future From a Single Drop
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● With about 100 sales offices and manufacturing plants in Japan as well as 60 sales offices and manufacturing plants that are located outside of Japan, we have established a system to quickly meet the needs of our customers.

Your request: