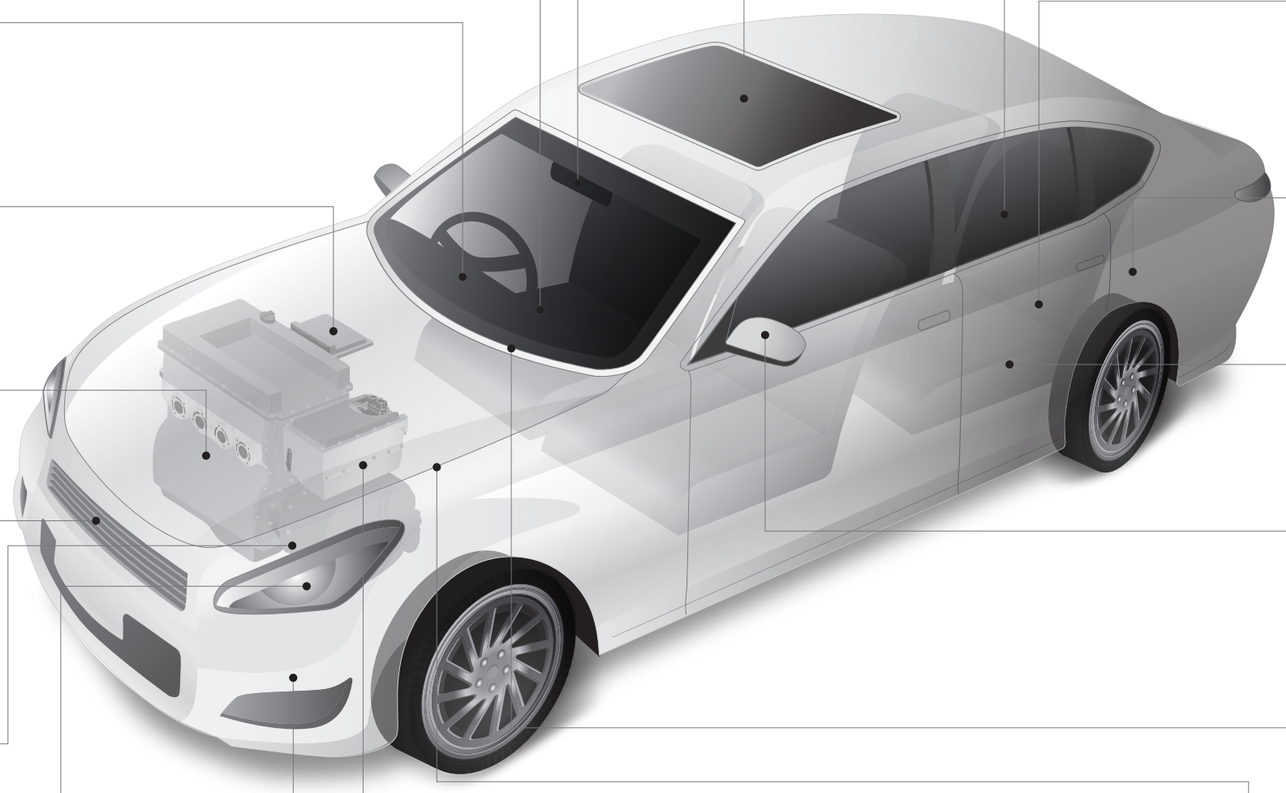
ThreeBond

Automotive Equipment Products Guide

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
- Sealing from moisture
- Substrate bonding

Sunroofs
- Waterproof sealing

Interior Components
- Coating agent

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

Battery
- 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
- Waterproof sealing for cables

Drive Motor
- Flange sealing
- Resolver protection
- Magnet fixing
- Laminated steel plate bonding

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

Headlight
- Case sealing
- Light-emitting element heat dissipation

Sonar Sensors
- Substrate sealing
- Connector sealing

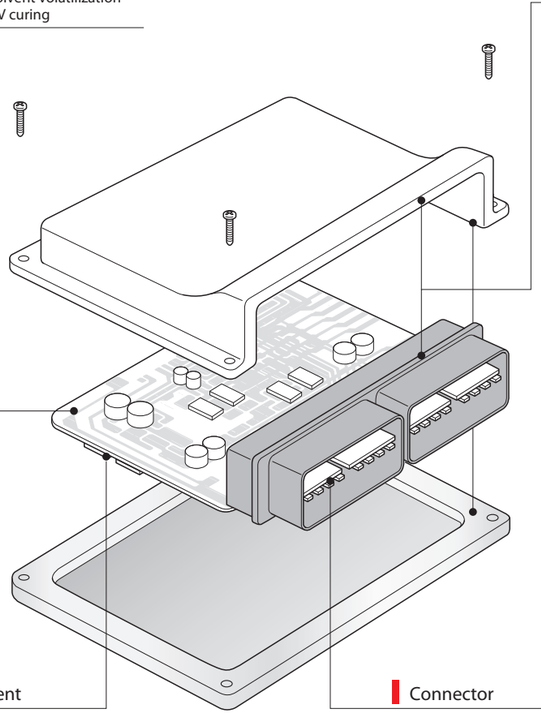
Inverter
- Case sealing
- React or bonding
- Power element heat dissipation

Relay
- Sealing

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

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 1225 Series ThreeBond 2955 Series
Characteristics	1. Good heat dissipation 2. Good electrical properties 3. Low-molecular cyclic siloxane-reduced product
Curing method	Moisture curing

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

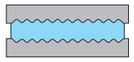
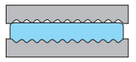
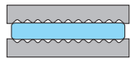
Connector

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

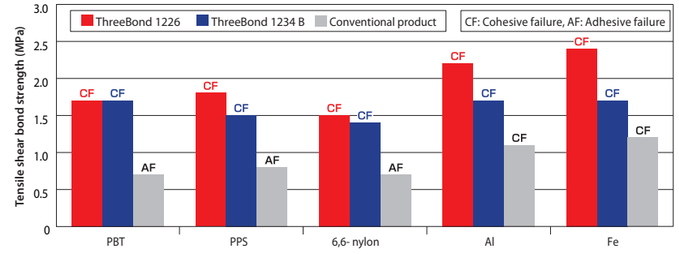
FIPG method adhesion data on each adherend

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



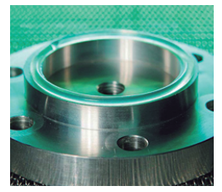
CIPG method flange design

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

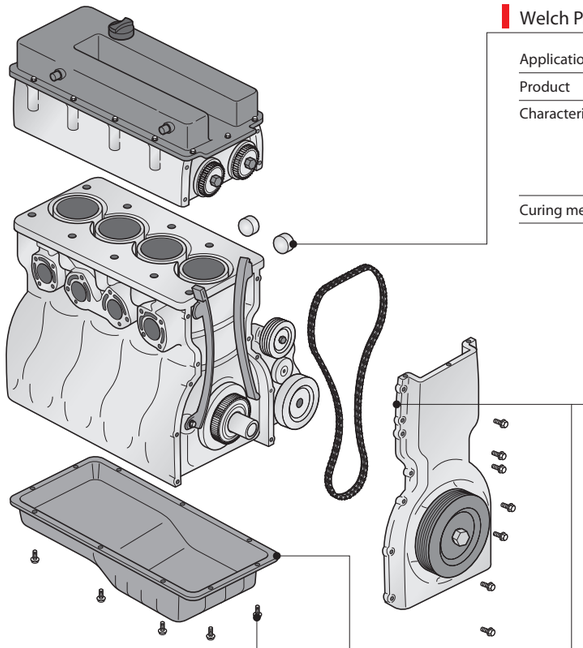
Photo of CIPG being applied



UV-curable type
ThreeBond 3081 J

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

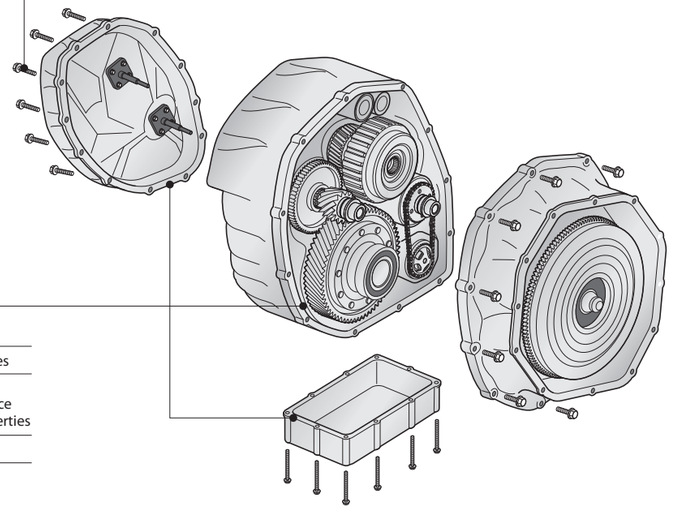
Application	Fitting, Fixing, Sealing
Product	ThreeBond 1386 Series
Characteristics	1. Good durability 2. Grades with low to high strength available 3. Fluorscence, axial force added types available
Curing method	Anaerobic curing

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



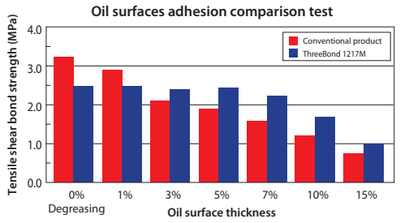
Transmission case / Oil pan

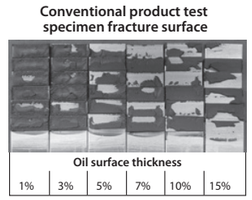
Application	Flange sealing
Product	ThreeBond 1216 Series
Characteristics	1. Good oil resistance 2. Good heat resistance 3. Good sealing properties
Curing method	Moisture curing

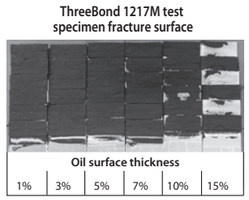
For engine oil resistance

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.



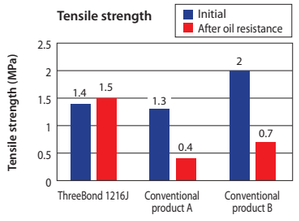


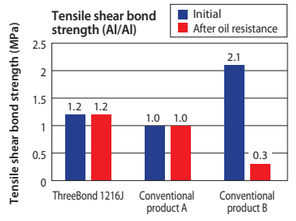


* Curing conditions: 23°C, 50%RH × 168h

For ATF® resistance

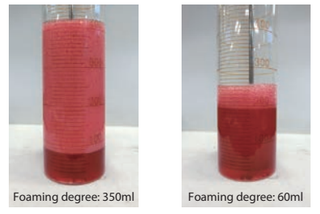
ThreeBond 1216J is a deoximation-type transmission-use one-component room temperature curing (RTV) silicone sealant with heat, cold and ATF® resistance.





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

Foaming test

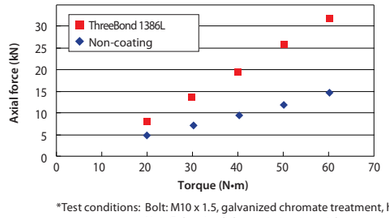


* Evaluation oil: ATF®
* Testing method: JIS K 2518 compliant, sequence I

Anaerobic sealing agent for welch plugs

Three Bond 1386L is an anaerobic sealing agent suitable for the bonding and sealing welch plugs.
This product has excellent resistance to chemicals (engine oil and liquid coolants) and its state of application can be checked by use of a fluorescence sensor.

Axial force data



*Test conditions: Bolt: M10 x 1.5, galvanized chromate treatment, hexagon head bolts
Nut: Galvanized chromate treatment, hexagon nut

Application visibility by use of black light

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 paid much attention to 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.

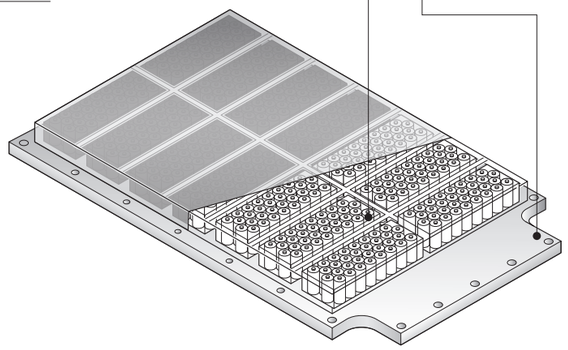
Stack

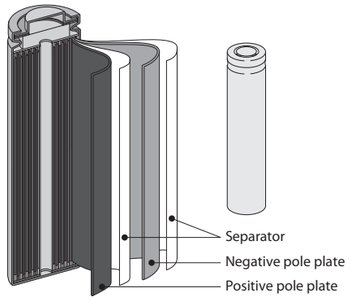
Application	Cell fixing	Application	Heat dissipation
Product	ThreeBond 3951D	Product	ThreeBond 2955P
Characteristics	1. Fast curing at room temperature 2. High heat and moisture resistance 3. Good flexibility	Characteristics	1. Good heat radiation 2. Good electrical properties 3. Low molecular cyclic siloxane-Free
Curing method	Two component room temperature curing	Curing method	Moisture curing

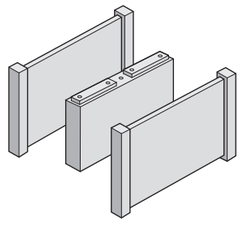
Pack

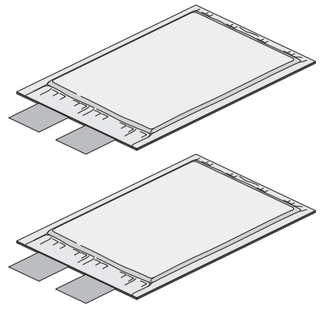
Application	Pack sealing
Product	ThreeBond 1160
Characteristics	1. High moisture resistance 2. Low molecular cyclic siloxane-reduced free 3. Tin-free
Curing method	Moisture curing

* "Free" in items 2 and 3 indicates that the product is free from intentional addition.









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 square cell

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

Lithium ion secondary battery laminated type cell

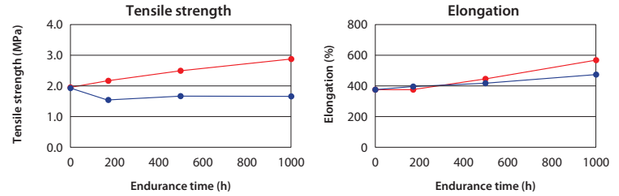
Application	Cell lamination adhesion
Product	ThreeBond 1533F
Characteristics	1. Good adhesion to hardly adherable materials *Primer treatment unnecessary since it is single-component 2. Dibutyltin compounds-free product 3. Low molecular cyclic siloxane-Free product
Curing method	Moisture curing

Non-silicone sealant

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	%	380	No.3 dumbbell
Tensile strength	MPa	2.2	No.3 dumbbell
Tensile shear bond strength	MPa	3.4	Aluminum/Aluminum

【Long-term durability test】



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

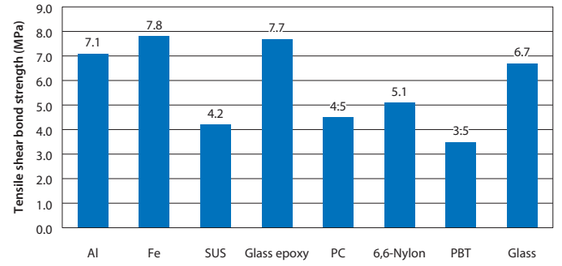
Cell fixing agent

ThreeBond 3951D is a two-component elastic adhesive that forms an elastic rubber-like cured material. It is resistant to vibration and impacts and has excellent relaxation properties against stresses such as the expansion and shrinkage of materials. It also has excellent adhesion with a wide range of materials, including metals, plastics and inorganic materials.

Test item	Unit	ThreeBond 3951D	
		Main agent	Curing agent
Appearance	-	Transparent	White
Viscosity	Pa•s	8.5	12.5
Specific gravity	-	1.16	1.00
Hardness	%	A62	
Tensile strength	MPa	5.7	
Elongation	%	230	

* Curing conditions: (23°C, 50%RH) × 7 days
* Compounding ratio (mass ratio) of main agent to curing agent = 1:1

Tensile shear bond strength by material



* Test method: 3TS-4100-011 Between plates of the same material, application to both surfaces

Sealant for batteries

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	-2.0	Propylene carbonate
		2.2	0.6	-1.3	Gamma Butyrolactone
		2.9	-0.8	2.2	Dimethoxyethane

*1 (40°C, 95%RH) × 24 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

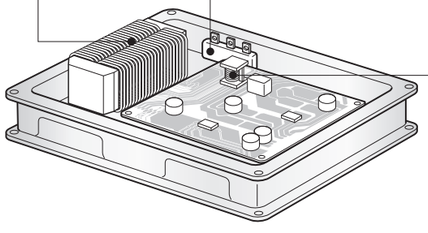
Application	Sealing
Product	ThreeBond 2222P
Characteristics	1. Good solder heat resistance 2. Good durability 3. Good adhesion
Curing method	Heat curing

Reactor coil

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

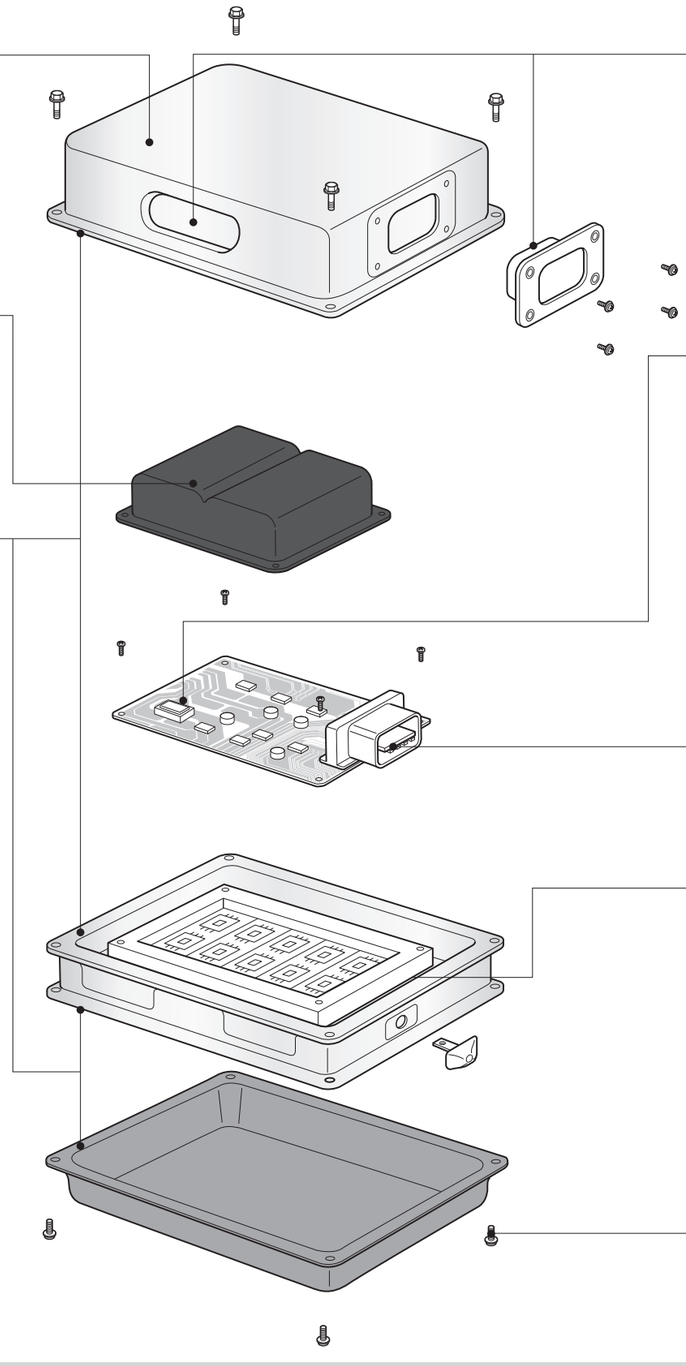
Application	Heat dissipation
Product	ThreeBond 2270 Series
Characteristics	1. Good adhesion 2. Good durability 3. Grades with higher heat resistance available
Curing method	Heat curing

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 2045/2145 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

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 element

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

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

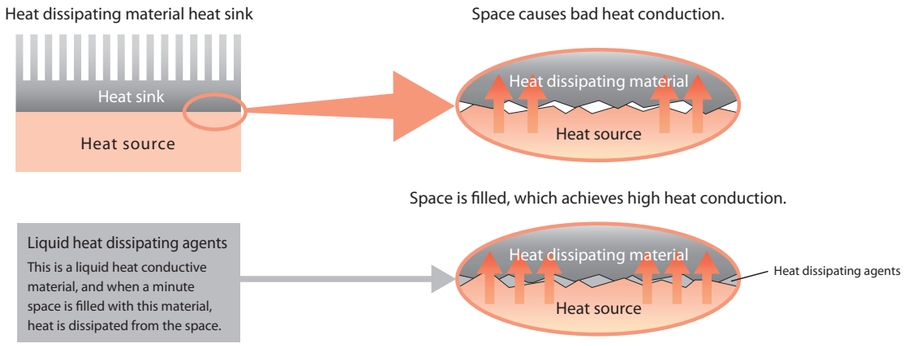
Bolt

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.



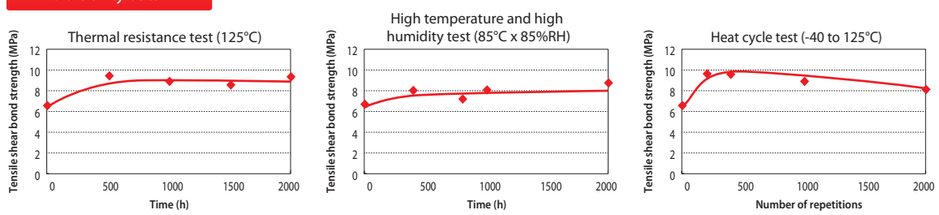
Lineup of heat dissipating agents

Item	Unit	ThreeBond 1225B	ThreeBond 1225C	ThreeBond 2270J	ThreeBond 2955P
Curing method	-	Moisture curing	Moisture curing	Heat curing 100°C for 40 min	Moisture curing
Appearance	-	White	Gray	White	Gray
Main component	-	Silicone	Silicone	Epoxy	Modified Silicone
Viscosity	Pa･s	18	70	150	120
Thermal conductivity	W/m･K	1.59	2.5	4.2	4.8
Characteristics	-	-	-	- High heat dissipation performance - Low linear expansion and low cure shrinkage - Excellent durability	- High heat dissipation performance - Low-molecular cyclic siloxane-reduced product - Low-halogen product

High-heat-dissipation one-component heat-curable epoxy compound resin

ThreeBond 2270J is a one-component heat-curable epoxy compound resin with high thermal conductivity (4.2W/m･K). Therefore, it can cure at low temperature. It is suitable to bonding and potting of which durability is required.

Durability data



*Curing condition: 100°C×40 min
Material Al/Al

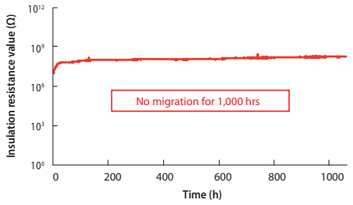
Coating agent

ThreeBond 3075E is a UV-curable coating agent that is excellent in water resistance, transparency, flexibility, and surface curability. When this agent is used for coating the substrates of electrical components, it exerts a moisture-proof effect to prevent corrosion and migration of electrodes.

Test item	Unit	ThreeBond 3075E	Remarks
Appearance	-	transparent	-
Viscosity	Pa･s	20	-
Specific gravity	-	1.11	25 °C
Thick film curability	mm	9.0 2.0	Integrated light quantity: 30 kJ/m² Integrated light quantity: 5 kJ/m²
Water absorption rate	%	1.7	2-hr boiling
Cure shrinkage	%	4.8	Underwater displacement method
Total light transmittance	%	98	Film thickness of 50μm

* Curing condition: 30 kJ/m²

Migration test



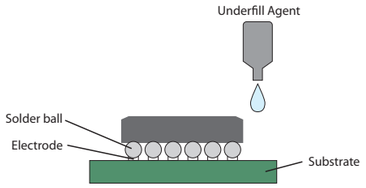
* Test condition: Dry paint film 20 to 25 μm
85°C x 85%RH x 100 VDC

Mounting of chips

ThreeBond 2274 Series is a one-component heat-curable epoxy compound resin developed as an underfill agent.
The series improves connection reliability since it can absorb the impact on the IC package mounted on a substrate and prevent the package from dropping due to heat cycles.

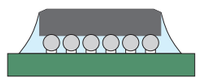
ThreeBond 2274B

(1) Low-temperature curability : This product cures at 80°C or higher.
(2) Low viscosity : It has excellent spreadability and flowability.
(3) Repairability added : After the agent cures, it is possible to disconnect mounted CSP and BGA parts and remove the cured agent by heating.



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



Certified according to incombustibility standard UL94 V-0

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 1222C	ThreeBond 1537E	ThreeBond 2045	ThreeBond 2145	ThreeBond 2272F
Curing method	-	Moisture curing	Moisture curing / Dealcoholization	Two liquid mixture room temperature setting		Heat curing
Appearance	-	Gray	Gray	Black	Orange	Black
Viscosity	Pa･s	-	90	180	1.6	75
Hardness	-	A45	A84	D87		D92
Glass transition temperature	°C	-60	-63	53		117
Tensile shear adhesive strength (Fe)	MPa	1.0	4.1	10		21.0
Remarks	-	UL-94 V-0 Certified contact point failure-preventing product	UL-94 V-0 Certified contact point failure-preventing product	UL94 V-0, F☆☆☆☆ certified		UL-94 V-0 Certified contact point failure-preventing product

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

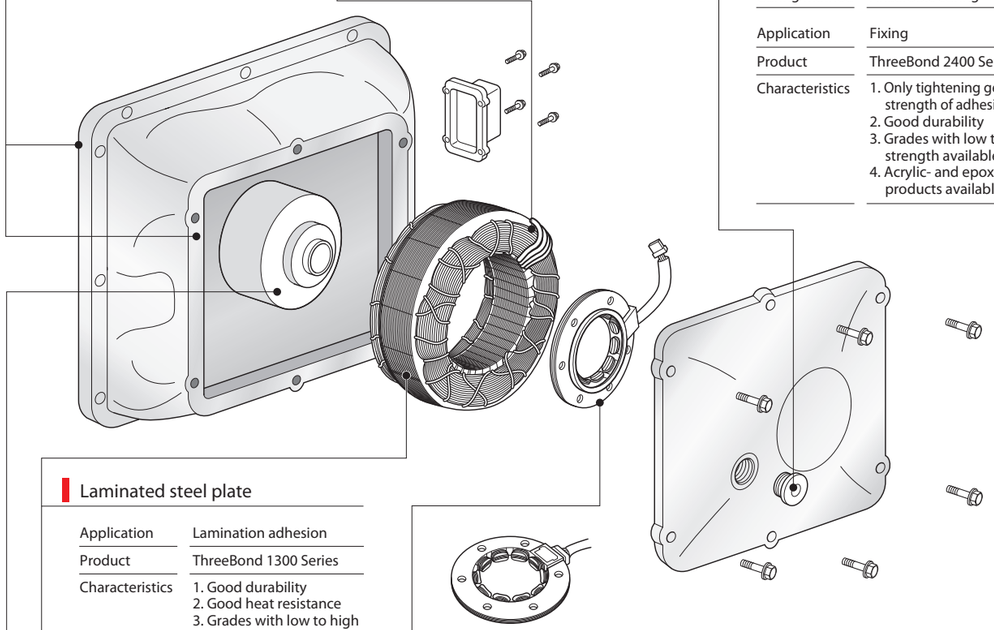
Application	Flange sealing
Product	ThreeBond 1216 Series
Characteristics	1. High oil resistance 2. High heat resistance 3. Good sealing property
Curing method	Moisture curing

Stator

Application	Protection (winding wire section)
Product	ThreeBond 2280 Series
Characteristics	1. High heat resistance 2. Good chemical resistance 3. Good electrical properties
Curing method	Heat curing

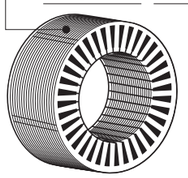
Plug

Application	Fixing and sealing
Product	ThreeBond 1386 Series
Characteristics	1. Good durability 2. Grades with low to high strength available 3. Type with fluorescence and axial force added available
Curing method	Anaerobic curing
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



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



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

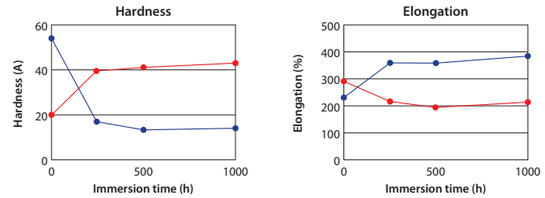
Application	Magnet fixing
Product	ThreeBond 2235L ThreeBond 2237J
Characteristics	1. Good durability 2. Low linear expansion coeffi cient (TB2235L) 3. Good thermal strength (TB2237J)
Curing method	Heat curing

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)

Flange sealing

ThreeBond1158 is a dealcoholization type one-component, moisture-curing, acrylic resin-based liquid gasket for FIPG.
It forms a rubber-like elastomer with excellent heat resistance, cold resistance and oil resistance, making it suitable for sealing drive motor flanges, where resistance to ATF® and CVTF® is required.

Test item	Unit	ThreeBond 1158	Remarks
Main components	-	Acrylic rubber	-
Curing method	-	Moisture curing Dealcholized	-
Feature	-	Oil resistance	-
Apperance	-	Black	-
Viscosity	Pa•s	200	-
Specific gravity	-	1.35	-
Hardness	-	A20	-
Elongation	%	300	No.3 dumbbell
Tensile strength	MPa	1.8	No.3 dumbbell
Tensile shear bond strength	MPa	1.8	Aluminum/Aluminum
Operating temperature	°C	-30 to 150	-



* Curing conditions: 23°C×50%RH; 7 days
* Immersion conditions: AT oil at 120°C

ThreeBond 1158 — Silicone type FIPG

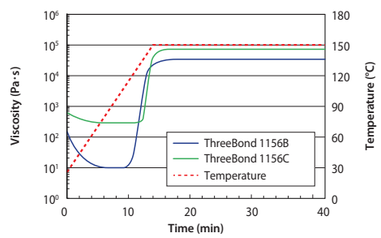
Angle sensor (protection of terminals and winding wire sections)

ThreeBond 1156B and 1156C are a one-component heat-curable acrylic-based sealants.
After curing, it becomes a rubber-state elastic body with excellent heat and chemical resistance and it is suitable for sealing and potting terminals and winding wire sections.

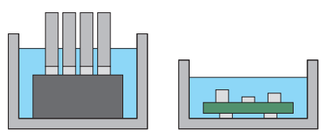
Test item	Unit	ThreeBond 1156B			ThreeBond 1156C		
		Initial	Heat resistance	Chemical resistance	Initial	Heat resistance	Chemical resistance
Hardness	—	A6	A15	A18	A15	A25	A27
Tensile strength	MPa	1.2	1.6	1.6	1.7	2.2	2.1
Elongation	%	275	235	245	300	230	215
Tensile shear bond strength	MPa	1.5	2.1	1.2	1.8	2.4	1.8

* Curing condition: 150°C × 90min, adhesion thickness: 1 mm, test piece: aluminum
* Test condition: Heat resistance and chemical resistance, 150°C × 240h, test oil: AT oil

Curing behavior

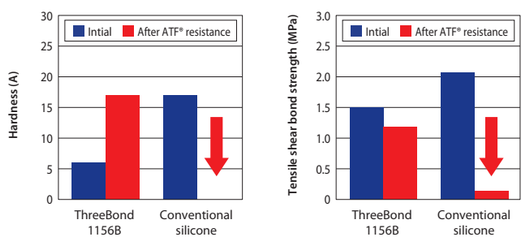


■ Usage diagram



Wiring fixing•sealing　　Board protection

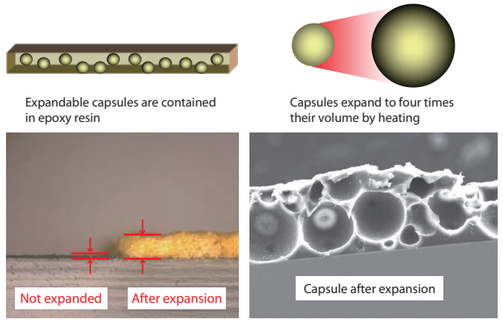
■ ATF® resistance (150°C×240h)



In-vehicle Motor-related product

Heat-curable expandable epoxy resin

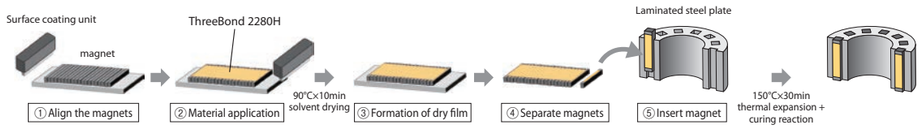
ThreeBond 2280H is heat-curable expandable epoxy resin that contains heat expandable capsules. When heated, it expands by four times its volume compared to before hardening, therefore it is suited to gap filling adhesion. For adhesion/fixing of the magnet and the rotor of IPM motors, it prevents leakage, 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.



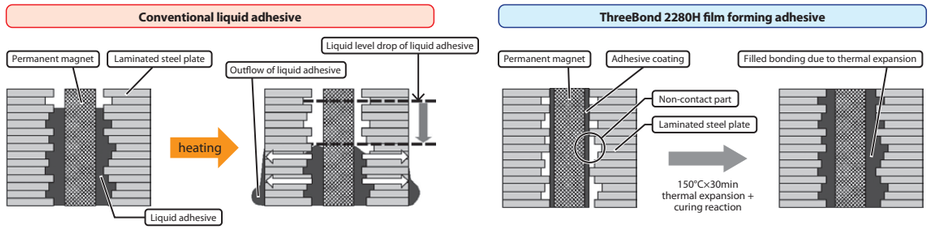
Test item	Unit	Properties	Remarks
Appearance	-	Black	-
Viscosity	Pa•s	11.0	Shear rate: 9.58s^{-1}
Specific gravity	-	1.1	-
Tensile shear bond strength	MPa	10.6	Fe/Fe (SPCC-SD) Clearance: 50μm 2 times expansion
Glass-transition temperature	℃	170	DMA method Peak value of loss tangent at 1Hz
Elastic modulus	Pa	2.8×10^{8}	DMA (1Hz) at 4 times expansion 25℃ 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℃×10min Cure conditions: 150℃×30min
* The expansion ratio changes depending on the temperature rising speed

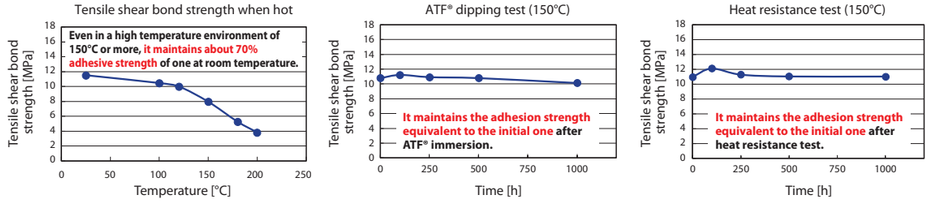
Coating process



Sectional view



Durability data



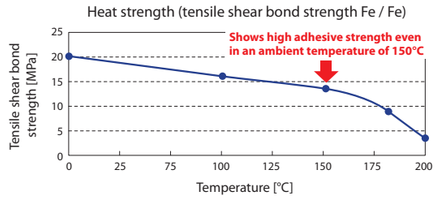
Test pieces: Fe/Fe (SPCC-SD) Cure conditions: 150℃×30min Clearance: 50μm Coating thickness: 40μm Expansion ratio: 1.25

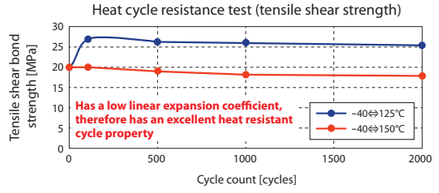
Reliable one-component heat-curable expandable epoxy compound resin

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.

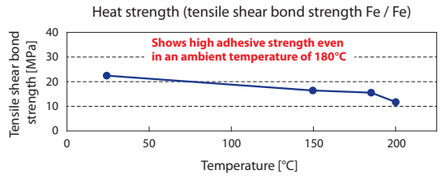
Durability data

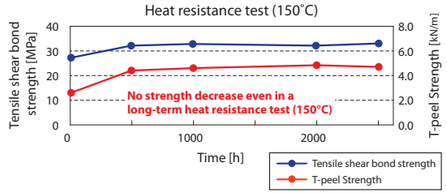
Linear expansion type ThreeBond 2235L





High heat adhesion type ThreeBond 2237J

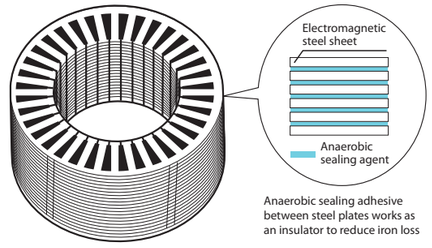




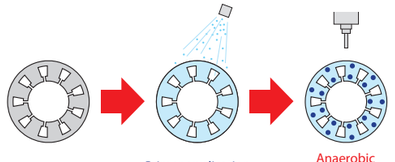
For laminated steel plate bonding / high reliability/anaerobic sealing adhesive

ThreeBond 1357K is highly reliable anaerobic sealing adhesive that provides stable characteristics even in a high temperature environment. It suits laminated steel plate bonding, which is considered and used more and more to improve motor driving efficiency.

Test item	Unit	ThreeBond 1357K	Remarks
Features	-	UV curability imparted	UV-LED compatible
Appearance	-	Blue	Visually
Appearance (fluorescence)	-	Blue light emission	Black light (365nm)
Viscosity	Pa•s	12.0	Shear rate 100s^{-1}
T type peeling adhesive strength	kN/m	1.71	SPCC-SD
Glass-transition temperature	℃	157.3	DMS tanD Peak value



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



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

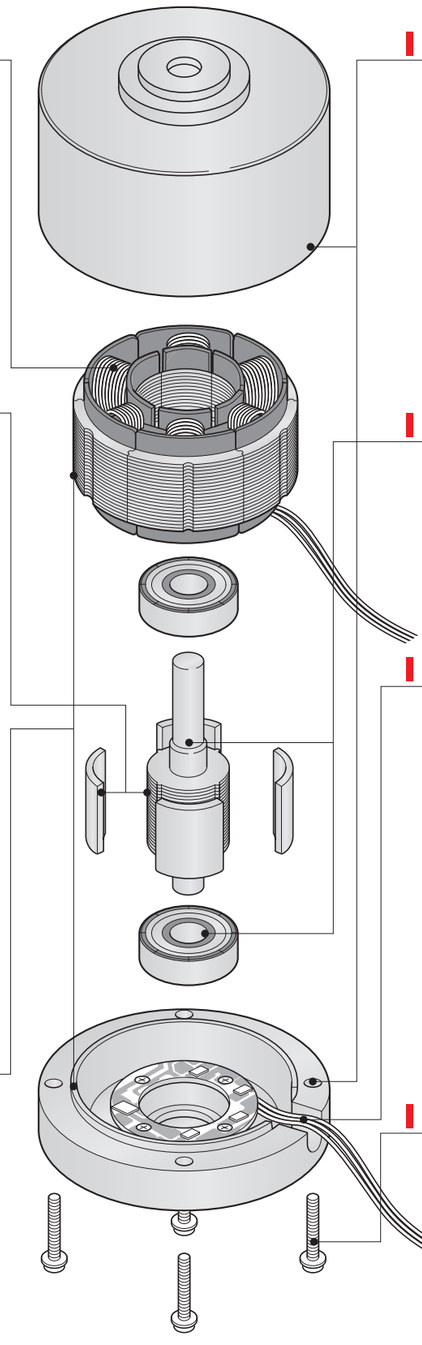
Application	Fixing / Impregnating
Product	ThreeBond 2230 Series ThreeBond 2240 Series ThreeBond 2280 Series
Characteristics	1. Good heat resistance (High Tg) 2. Good chemical resistance 3. Good electrical properties
Curing method	Heat curing

Magnet

Application	Bonding
Product	ThreeBond 3955 Series
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
Product	ThreeBond 3950 Series
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

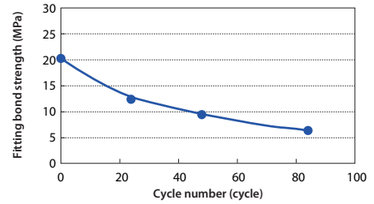
Screw

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

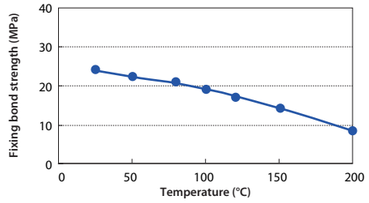
ThreeBond 1359G is an anaerobic sealant that has high strength with excellent heat resistance, and characteristics ideal for the adhesion of the bonding parts of shafts and bearings that require heat resistance and axial power.

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

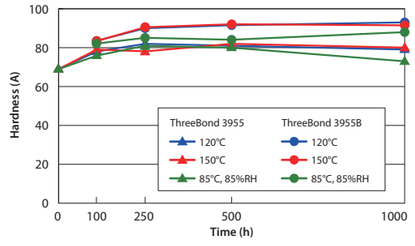
ThreeBond 3955 and 3955B are a two-component room temperature curable low elasticity adhesive agent that is fast curing and has excellent resistance to heat and moisture.
By mixing the two liquids, a flexible cured product is formed without heating from an external heat source.
In addition, with excellent vibration and shock absorbency and superior stress relaxation of material's expansion and contraction, it is suitable for use in magnet fixing and more.

Characteristics comparison of individual two-component mixed-type base resin

Test items	Acrylic type			Epoxy type	Silicone type
	ThreeBond 3955	ThreeBond 3955B	Conventional product		
Curing speed	○	○	○	○	△
Bonding strength	○	◎	◎	◎	△
Flexibility	◎	◎	△	×	◎
Heat resistance	○	○	△	○	◎
Moisture resistance	○	○	△	○	○
Chemical resistance	○	○	△	○	○

*ThreeBond 3955B: UV curable type

ThreeBond 3955・3955B Hardness



*Curing conditions: 25°C × 24h

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

Collision Preventing Device · Automatic Driving Device

As technology innovation for driving support and auto-cruising proceeds, ThreeBond works actively on development and productization to support devices equipped. Since higher specifications are demanded for collision prevention and auto-cruising devices, 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

Control board · fan · heat sink heat dissipation

Application	Heat dissipate
Product	ThreeBond 1225 Series ThreeBond 2955 Series
Characteristics	1. Good heat dissipate 2. Good electrical properties 3. Low-molecular cyclic siloxane-reduced product
Curing method	Moisture curing

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

Unit case

Application	Case sealing • Bonding
Product	ThreeBond 1153E
Characteristics	1. Good chemical resistance 2. Flexibility
Curing method	Heat curing

Lens • Mirror

Application	Lens fixing
Product	ThreeBond 3038 Series ThreeBond 3114 Series
Characteristics	1. Low cure shrinkage 2. Good adhesion to each adherend material 3. LED curing available (3038 Series)
Curing method	UV curing

Application	Lens fixing
Product	ThreeBond 2296 Series
Characteristics	1. Fast curing at low temperature 2. Good adhesion to each adherend material 3. Good durability
Curing method	Heat 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

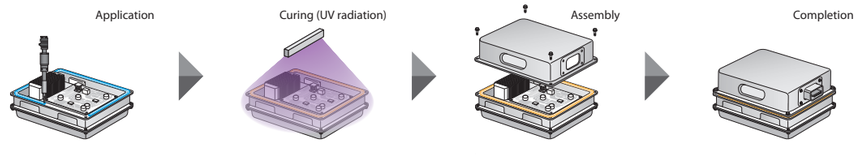
② UV-LED curable
Cure in seconds to tens of seconds

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

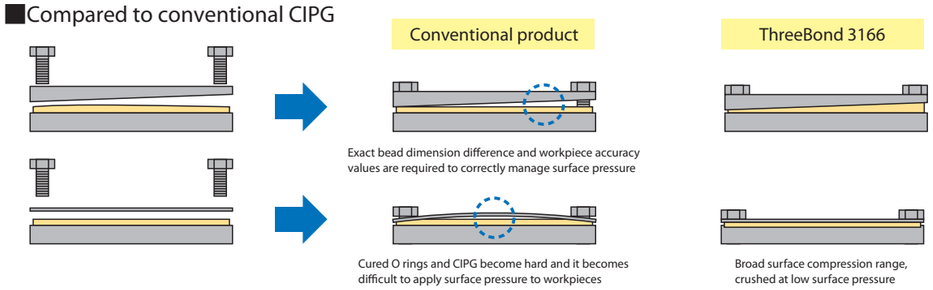
④ Reworking available
Work can be removed

■Reduced labor through CIPG application

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

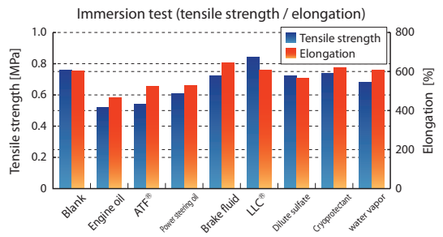


■Compared to conventional CIPG



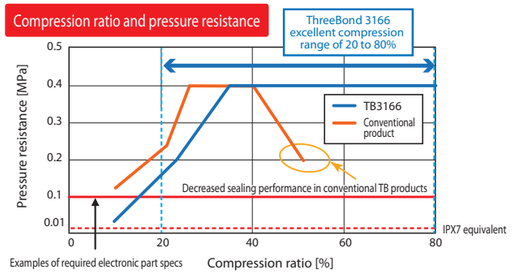
■High reliability (compared to conventional CIPG)

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

Car Mounted Camera

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, resin for lens adhesion to LED irradiation compatible resin.

Lens fitting portion
Adjustment screw and barrel
Lens holder

Application	Casing sealing and bonding
Product	ThreeBond 2202 Series ThreeBond 2296 Series
Characteristics	1. Fast curing at low temperature 2. Good adhesion of each adherend material 3. Good durability
Curing method	Heat curing

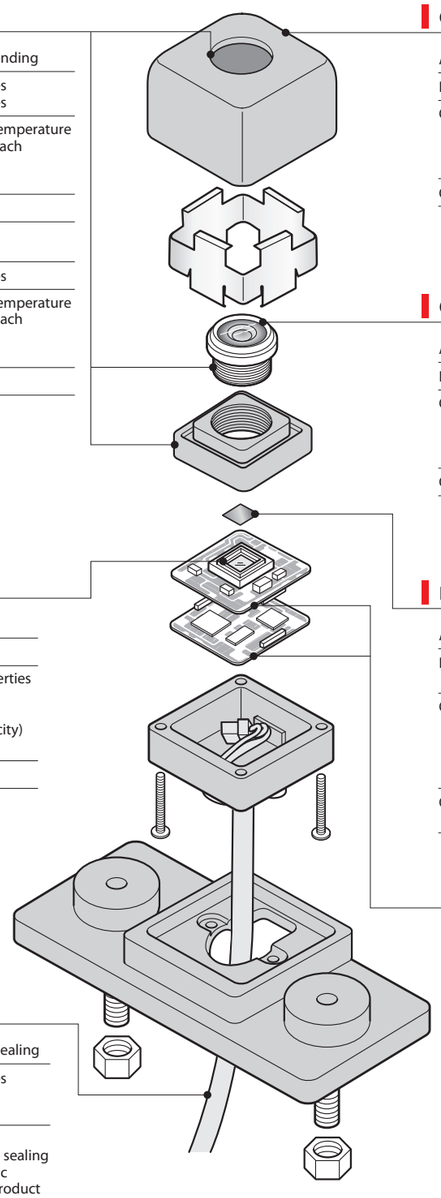
Application	Screw fixing
Product	ThreeBond 2296 Series
Characteristics	1. Fast curing at low temperature 2. Good adhesion to each adherend material 3. Good durability
Curing method	Heat curing

Case

Application	Case sealing
Product	ThreeBond 3081 Series
Characteristics	1. Good durability 2. Low compression permanent deformation 3. Reworking possible
Curing method	UV curing

Optical lens

Application	Lens fixing
Product	ThreeBond 3114 Series
Characteristics	1. Low cure shrinkage 2. Good adhesion to each adherend material 3. LED curing available
Curing method	UV curing



IC chip

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

IR cut filter

Application	Bonding, Fixing
Product	ThreeBond 2296 Series ThreeBond 3170 Series
Characteristics	1. Good adhesion to each adherend material 2. Good durability 3. Visible light curing available (3170 Series)
Curing method	UV curing (Visible light possible), Heat curing

Substrate

Application	Substrate bonding
Product	ThreeBond 2206 Series ThreeBond 2270 Series ThreeBond 3114 Series
Characteristics	1. Low cure shrinkage 2. Good adhesion to each adherend material
Curing method	Heat curing, UV curing

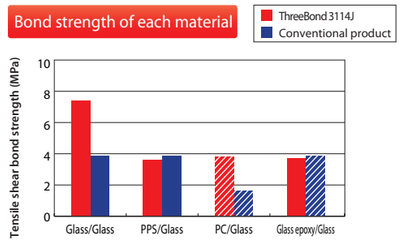
Connector

Application	Connector bonding, Sealing
Product	ThreeBond 1537 Series ThreeBond 1539 ThreeBond 3164D
Characteristics	1. Good durability 2. Good adhesion and sealing 3. Low molecular cyclic siloxane-reduced product
Curing method	Moisture curable, Heat curing UV curing

UV curable resin for precise fixing

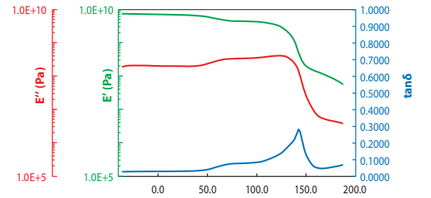
ThreeBond 3114J is a light-curable acrylic resin that has substantial curing properties even under LED light sources.
As it shows high adhesion to various adherend materials as well as low curing shrinkage, it is ideal for lens fixing.

Bond strength of each material



*Curing conditions: UV-LED (365nm) 300mW × 10 sec
No shaded effect indicates material failure.

DMA data

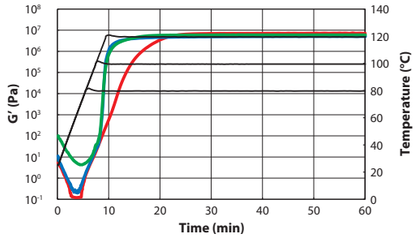


*Curing conditions: 30 kJ/m²×1, High-pressure mercury lamp, exposure wavelength 365 nm, irradiation distance 15 cm
*measuring conditions: 1 Hz

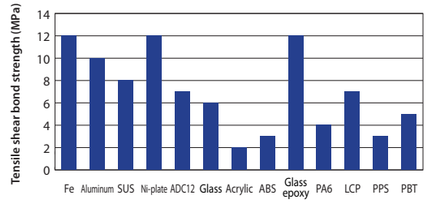
Low temperature curing one-component epoxy compound resin

ThreeBond 2206S is a one-component heat curing epoxy resin with excellent low-temperature curing performance. This product cures quickly at low temperatures (from 80C°), making it excellent for use and productivity improvement in parts and applications where heat damage is an issue. It demonstrates high bonding performance with a variety of adherend materials so it is suitable for attaching and fixing parts of on-board automobile camera module holders and the area around lenses.

Curing behavior



Adhesive strength by material

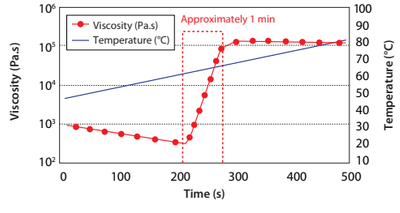


*Curing conditions: 80°C × 30 min

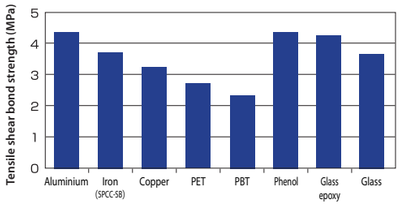
Connector Seal

ThreeBond 1539 is a tin-free one-component low-temperature heat curing elastic adhesive made from a vegetable-derived castor oil polymer.
As a fast heat curable type at low temperatures (cured at 60°C) with elasticity at a wide temperature range (-35°C to 100°C),
it is strong even against vibrations and shock and has excellent stress relaxation for the expansion and contraction of materials. Moreover,
it has excellent adhesiveness to various types of adherend materials.

Curing behaviour

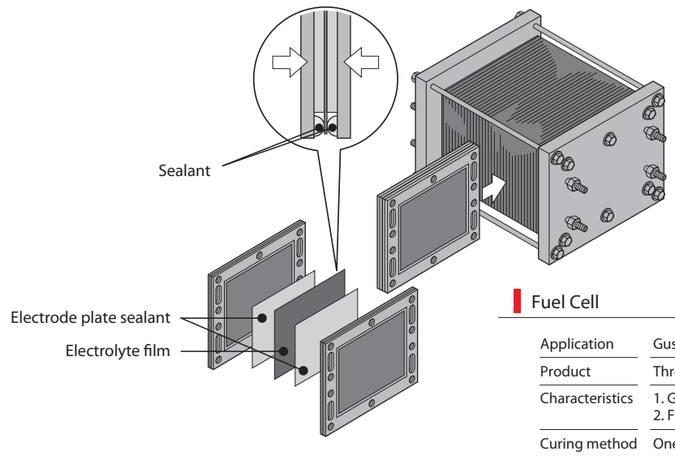


Bond strength of each materials



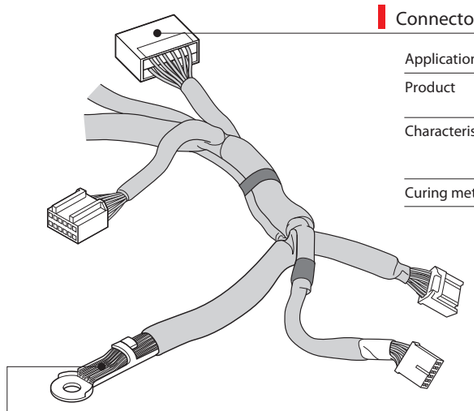
Fuel Cell / Wire Harness / Relay

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



Connector

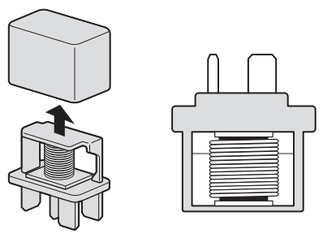
Application	Sealing
Product	ThreeBond 1156 Series ThreeBond 3013Q
Characteristics	1. Good flexibility 2. High heat resistance 3. High oil resistance
Curing method	UV curing/Heat curing

Application	Sealing
Product	ThreeBond 1153
Characteristics	1. Good flexibility 2. Good gas barrier property 3. Low moisture permeability
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

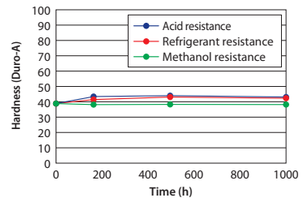
Application	Relay sealant
Product	ThreeBond 2200 Series
Characteristics	1. Solder reflow compatible grade available 2. Good durability 3. Good adhesion
Curing method	Heat curing

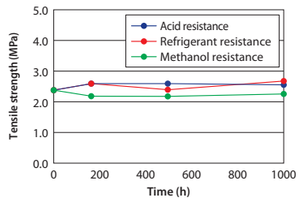
Separator / electrolyte film sealing

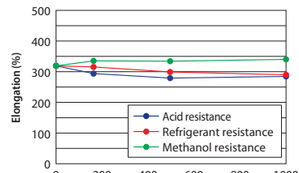
ThreeBond 1153E is a one-component heat-curing olefin-based sealant. It is flexible and has excellent gas barrier properties and chemical resistance.

Test item	Unit	ThreeBond 1153E	Remarks
Appearance	-	Gray	-
Viscosity	Pa•s	850	-
Hardness	-	A38	-
Elongation	%	320	No.3 dumbbell
Tensile strength	MPa	2.4	No.3 dumbbell
Tensile shear bond strength	MPa	2.5	Aluminum/Aluminum
H_2 gas permeability coefficient	*1	1.8×10^{-14}	1 mm thick
O_2 gas permeability coefficient	*1	7.8×10^{-15}	1 mm thick
Moisture permeability (thickness of 0.5 mm)	g/m²•24h	2.4	60°C×90%RH
Glass-transition temperature	°C	-53	tan δ peak

*Curing conditions: 130°C×90min *1 mol•m/m²•s•Pa







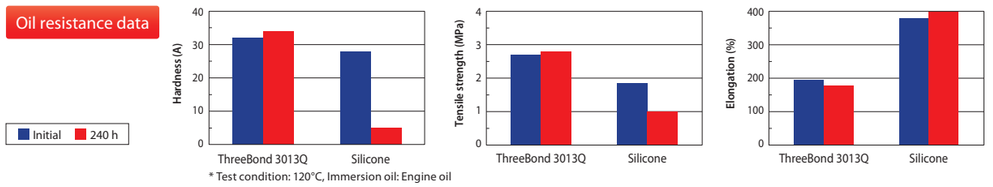
* Durability conditions
- Acid resistance: 90°C×168,500, 1000h (aqueous sulfuric acid solution with pH of 2)
- Resistance to refrigerant: 90°C×168,500, 1000h (50 wt% aqueous ethylene glycol solution)
- Methanol resistance: 50°C×168,500, 1000h (50 wt% aqueous methanol solution)

* Test conditions
- Cured material: No. 3 dumbbell, thickness of 2 mm
- Curing conditions: 130°C×90min
- Tension rate: 500mm/min

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.

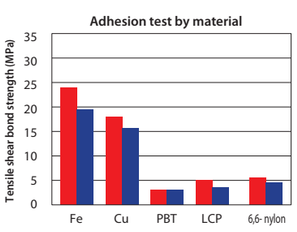
Oil resistance data



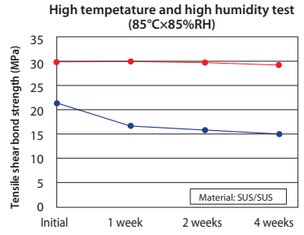
* Test condition: 120°C, Immersion oil: Engine oil

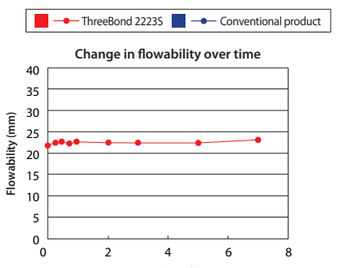
High reliability relay sealant

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



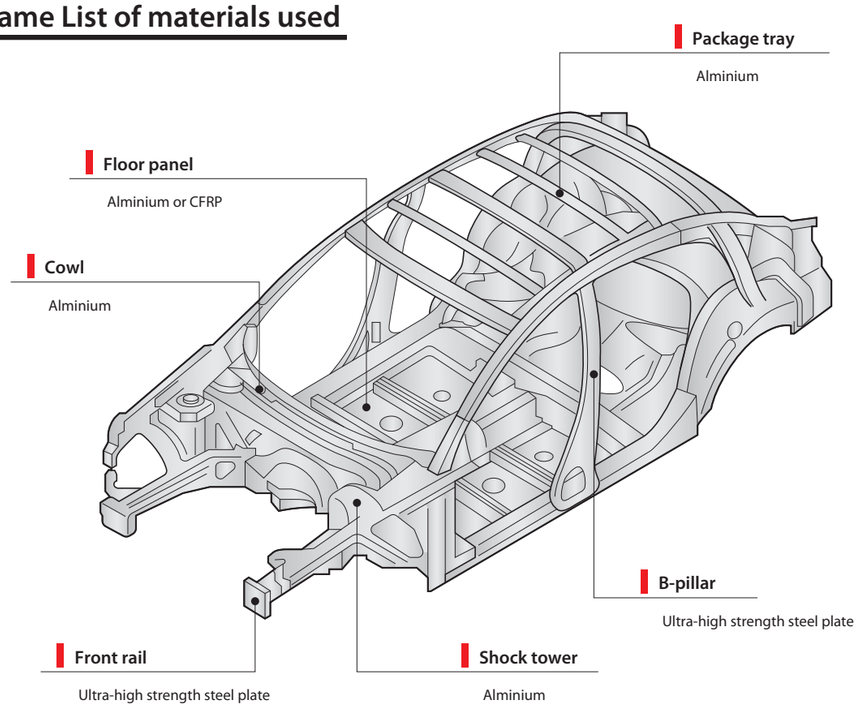


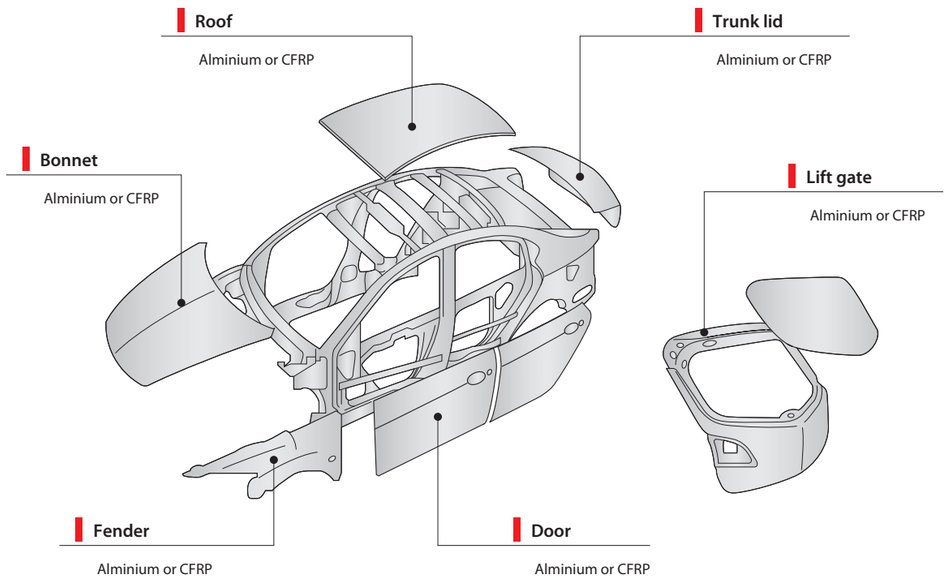
* Storage conditions: 10°C Test condition: 3TS-3120-002
Test piece: Slide glass Curing temperature: 100°C

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

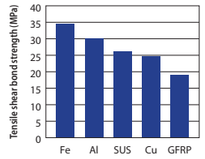
ThreeBond 2249K

[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	-

* Testing method: Tensile shear bond strength (3TS-4100-011)
Curing conditions: 130°C×30min



Characteristic

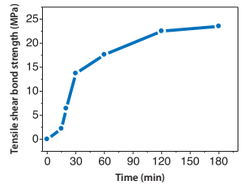
Test item		ThreeBond 2249K
Appearance		Black
Viscosity		882 Pa•s
Specific gravity		1.23
Tensile shear bond strength *1		34.6 MPa
T-peel strength *1		5.15 kN/m
Wedge peel	Cleaving energy *1	7.2 J
	Dynamic cleavage resistance *2	26.9 kN/m
Storage modulus		4.6 GPa
Peak loss elastic modulus		111°C
tan δ peak		126°C
Glass-transition temperature *4		118°C
Curing conditions		130°C×30min

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	22 MPa
T-peel strength *1	2.9 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

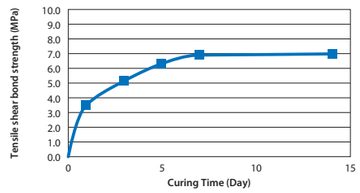
Epoxy/modified silicone elastic adhesive Two-component type

ThreeBond 3952D

[Features]

- Forms a flexible, tough cured material, providing high peel strength.
- Provides stable, strong adhesion over a wide temperature range.
- Can be used to bond materials with different linear expansion coefficients.

(Check the adhesive layer thickness, adhesive strength, etc. prior to use)



* Curing conditions: (23°C, 50%RH)× 7 days
Testing method: 3TS-4100-011 application to both surfaces
Compounding ratio (mass ratio): Main agent : Curing agent=1:1
Test piece material: Iron (SPCC-SD)

Characteristic

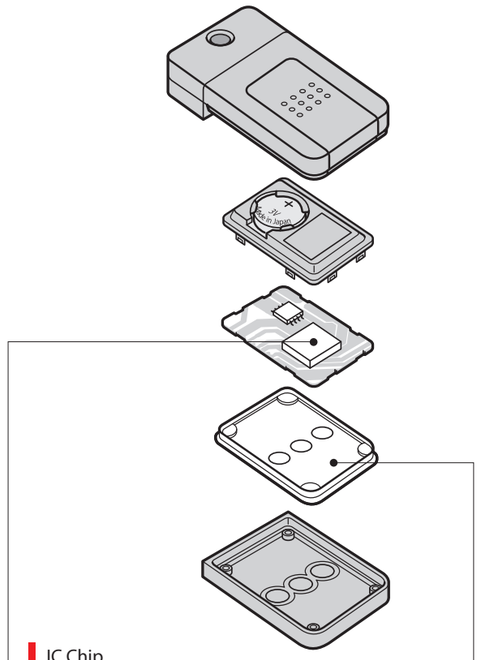
Test item	ThreeBond 3952D
Appearance	Black / White
Viscosity	32 / 16 Pa•s
Specific gravity	1.16 / 1.00
Tensile shear bond strength *1	6.9 MPa
T-peel strength *1	4.5 kN/m
Bond failure energy(Gic) *2	826 J/m²
Falling weight impact test (maximum point load) *3	4066 N
Falling weight impact test (energy absorption) *3	1.0 J
Glass-transition temperature *4	-63°C
Tensile shear bond strength (Al)	5.5 MPa
Tensile shear bond strength (6,6-Nylon)	3.2 MPa
Tensile shear bond strength (Copper)	4.9 MPa
Tensile shear bond strength (Acrylic)	5.2 MPa
Tensile shear bond strength (Polycarbonate)	4.8 MPa
Tensile shear bond strength (PBT)	5.5 MPa
Curing conditions	25°C×7 days (50%RH)
Mixing ratio	1 : 1

*1 : Adherend - Cold rolled steel plate SPCC-SD
*2 : Adherend - Spring steel plate SUP10
*3 : Adherend - Stainless steel plate SUS304
*4 : Measured using thermomechanical analysis (TMA) equipment
*5 : Adherend - Aluminum plate A 1050P
*6 : Adherend - Stainless steel plate SUS430

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.

Keyless remote control



IC Chip

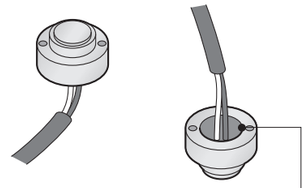
Application	Temporary chip fixing
Product	ThreeBond 3177
Characteristics	1. Curable with low integrated light quantity 2. Good adhesion of each adherend material 3. Good durability
Curing method	Light curing Moisture curing

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



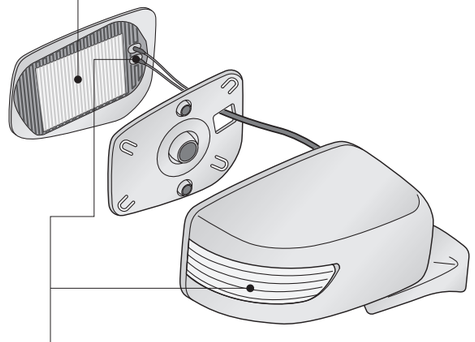
Connector, terminal

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

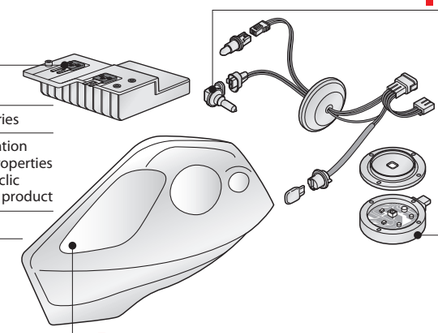
Headlight

Light source element

Application	Heat radiation
Product	ThreeBond 1225 Series
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

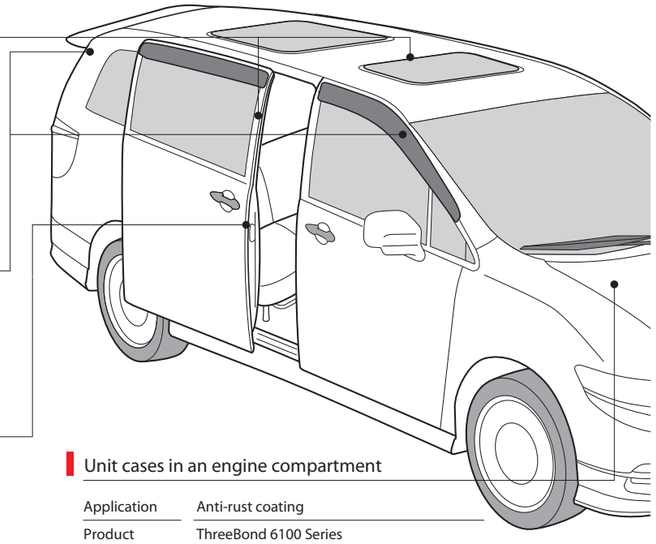
Application	Fixing, Sealing
Product	ThreeBond 2400 Series
Characteristics	1. Only tightening generates strength of adhesion 2. Good durability

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

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

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
Characteristics		Unit			
Curing method			Heat curing	Heat curing	Heat curing
Appearance			Gray	Black	Black
Viscosity		Pa•s	850	180	380
Specific gravity			1.03	1.20	1.24
Curing conditions			130°C×90 min	150°C×30 min	150°C×30 min
Physical properties after curing	Hardness		A38	A6	A15
	Tensile strength	MPa	2.4	1.2	1.7
	Elongation	%	320	275	300
	Moisture permeability (0.5mm thick) (60°C×90%RH)	g/m²•24h	48	-	-
	H_2 gas permeability coefficient	mol•m/m²•s•Pa	1.8×10^{-14}	-	-
Operating temperature range(standard)		°C	-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

ThreeBond 1160 Series

Product name			1160
Characteristics		Unit	
Curing method			Moisture curing Dealcoholized
Appearance			Black
Viscosity		Pa•s	125
Specific gravity			1.46
Touch drying time		min	45
Physical properties after curing	Hardness		A46
	Tensile strength	MPa	2.0
	Elongation	%	460
	Tensile shear bond strength (Aluminum)	MPa	2.4
Operating temperature range(standard)		°C	-
Remarks			Low molecular cyclic siloxane and organostannic compounds, complies with REACH regulations

ThreeBond 1170 Series

Product name			1170H	1171F	1171G
Characteristics		Unit			
Curing method			Solvent vaporization	Solvent vaporization	Solvent vaporization
Appearance			Blue	Black	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 elastic film	Rubber-like elastic film	Rubber-like elastic film
	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	-2.0
	Gamma-Butyrolactone	%	2.2	0.6	-1.3
	Dimethoxyethane	%	2.9	-0.8	2.2
Remarks			for battery	for battery	for battery

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

ThreeBond 1200 Series (silicone-based liquid gasket)

Product name			1207B	1207F	1209	1216B	1216C	1216E	1216J	1217G	1217H		1217M	1220G	1222C	1225B	1225C	1226	1234B
Characteristics		Unit																	
Curing method			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 Dealcoholized	Moisture curing Dealcoholized	Moisture curing Dealcoholized	Moisture curing Dealcoholized	Moisture curing Dealcoholized	Heat-curing
Appearance			Black	Aluminum color	Black	Black	Light reddish brown	Gray	Reddish brown	Gray	Dark gray		Black	Milky white	Gray	White	Gray	Gray	Gray
Viscosity		Pa•s	-	-	-	-	-	-	-	-	-		-	65	50	18	70	-	400
Apparent viscosity (SOD)		Pa•s	100	170	140	120	170	215	95	300	330		280	-	-	-	-	97	-
Specific gravity			1.01	1.50	1.05	1.50	1.48	1.36	1.61	1.37	1.36		1.37	1.04	1.32	2.60	2.90	1.37	1.18
Tack-free time		min	3	5	5	20	5	6	13	5	5		7	10	5	5	10	7	-
Physical properties after curing	Hardness		A30	A56	A42	A50	A48	A57	A61	A60	A51		A45	A20	A45	A74	A81	A27	A11
	Tensile strength	MPa	1.9	3.7	2.1	2.0	2.1	3.3	1.8	2.6	2.6		2.5	2.2	4.0	3.9	2.5	2.4	2.3
	Elongation	%	400	190	270	500	470	300	250	430	470		500	500	250	48	50	460	700
	Tensile shear bond strength (aluminum)	MPa	1.1	2.2	1.7	1.7	1.3	2.5	1.1	2.0	2.3		1.6	1.0	1.0	0.9	1.1	2.2	1.7
Thermal conductivity		W/m•K	-	-	-	-	-	-	-	-	-		-	-	-	1.59	2.5	-	-
Remarks			UL-HB Certified contact point failure-preventing product	FIPG: Engine oil,Liquid coolant sealing	Resistance to heat of about 300°C	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			Tin-free	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		1375N	1386H	1386L
Characteristics	Unit													
Strength classification		High strength	Medium strength	Low strength	High strength	High strength	Medium strength	High strength	Medium-high strength	High strength		High strength	Low strength	Low-medium strength
Main application		Screw	Screw Fitting	Screw	Fitting	Surface adhesion	Surface adhesion	Screw Fitting	Screw	Fitting		Fitting	Welch plug fitting sealing	Welch plug fitting sealing
Appearance		Green	Red	Blue	Blue	Blue	Blue	Green	Red transparent	Green transparent		Green transparent	Fluorescent yellow	Blue
Viscosity	mPa•s	650	600	650	1000	12000	23000	500	1800	90		500	2200	2000
Specific gravity		1.11	1.12	1.06	1.10	1.10	1.10	1.10	1.10	1.10		1.12	1.10	1.10
Curing speed: Practical strength development[*1]	h	1	1	1	-	-	-	1	2	1		1	-	6
Curing speed: Final strength development	h	12	12	12	-	-	-	12	24	24		24	-	24
Breaking torque [*2]	N•m	46.0	27.0	23.7	-	-	-	41.6	37.6	-		-	15.3	23.5
Fitting adhesive strength [*3]	MPa	45.0	30.0	-	33.2	30.9	22.8	36.6	-	38.2		31.8	-	20.5
Operating temperature range (standard)	℃	-40 to 150	-40 to 150	-40 to 150	-40 to 125	-40 to 175	-40 to 200	-40 to 200	-40 to 200	-40 to 150		-40 to 120	-40 to 150	-40 to 150
Remarks		For permanent fixing				Emits light with black light		For permanent fixing						Prevention of galling Coating properties Good

*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 1530 Series (elastic adhesive)

Product name		1530	1533	1533F	1535	1535B	1535C	1535D	1537E	1539
Characteristics	Unit									
Curing method		Moisture curing	Moisture curing	Moisture curing	Moisture curing	Moisture curing	Moisture curing	Moisture curing	Moisture curing	Heat curing
Appearance		White	White	Black	White	Black	Colorless transparent	Gray	Gray	Black
Viscosity	Pa•s	100	100	180	75	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	0.91	1.5
Remarks		B: Black C: Translucent D: Gray	Dibutyl- and Tin-free	Dibutyl- and Tin-free	Tin-free Different colors exist	Tin-free Different color from 1535	Tin-free Different color from 1535	Tin-free Different color from 1535	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 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		0.8	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 2000/2100 Series (two-component epoxy resin)

Product name		2023		2103		2086N		2087		2088E		2045		2145	
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		Light yellow transparent		Light yellow	Gray	Light yellow transparent	Light brown	Yellow transparent	Yellowish brown	Black		Orange	
Viscosity	Pa•s	900 (mPa•s)		20 (mPa•s)		110	50	13	30	40	4	180		1.6	
Compounding ratio (mass ratio) Main agent/Curing agent		100/10				100/100		100/100		100/25		100/10			
Specific gravity		1.13		0.97		1.29	1.20	1.16	0.96	1.19	1.03	1.82		0.99	
Usage life (when 100 g is mixed at 25°C)		27 min				5 min		60 min		70 min		100 min			
Curing conditions		25°C×48 h or 100°C×1 h				25°C×30 min or 5°C×20 h		25°C×24 h or 60°C×2 h		25°C×24 h or 120°C×1 h		25°C×72 h			
Physical properties after curing: Hardness		D85				D70		D70		D82		D87			
Physical properties after curing: Glass transition temperature	℃	80.0				29.7		72.0 (100°C×30 min)		170.0 (150°C×1 h)		-			
Physical properties after curing: Volume resistivity	Ω•m	1×10^{14}				-		2.9×10^{12}		-		5.9×10^{12}			
Physical properties after curing: Tensile shear bond strength (Iron)	MPa	16.0				14.0		21.4		22.9		10			
Physical properties after curing: Peel adhesive strength (Iron)	N/m	275				-		1220		4400		300			
Remarks		Other grades available				Fast curing at low temperature		Structural adhesion		High thermal adhesion		UL94 V-0 Certifi ed Product F☆☆☆☆			

* 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)

Characteristics	Unit	2202	2204	2206	2206S	2212B	2222P	2223S	2235L	2237J
Appearance		Black	Black	Black	Black	Black	Black	Black	Black	White
Viscosity	Pa•s	13	28	120	15	25	45	42.9	80	115
Specific gravity		1.14	1.23	1.20	1.37	1.39	1.60	1.60	1.69	1.64
Curing conditions		80℃×20 min	80℃×20 min	80℃×20 min	80℃×30 min	100℃×20 min	100℃×60 min	100℃×60 min	140℃×30 min	120℃×60 min
Physical properties after curing: Hardness		D88	D89	D85	D87	-	D89	D91	D92	D89
Physical properties after curing: Glass transition temperature	℃	111	109	104	106	109	115	118	155	150
Physical properties after curing: Volume resistivity	Ω•m	1.3×10^{15}	1.7×10^{14}	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}
Physical properties after curing: Tensile shear bond strength (Iron)	MPa	9.3	9.4	13.6	12.0	10.2	25.5	24.0	23.0	24.0
Physical properties after curing: Peel adhesive strength (Iron)	N/m	331	419	378	-	338	1740	2900	2000	3600
Remarks		Low temperature-curable type	Low temperature-curable type	Low temperature-curable type Peel strength	Low halogen content	High moisture resistance, Cured at 150℃ in 1 min	Good solder heat resistance, Thermal shock resistance, Shear/peel strength	Low change in flowability, stable Good adhesion, Moisture resistance	High glass transition temperature, Moisture resistance, Low linear expansion coefficient	High glass transition temperature, Moisture resistance, Heat strength, Peel strength

Characteristics	Unit	2247D	2270C	2270J	2272F	2274B	2274S	2280H	2284D	2284E	2285	2296B
Appearance		Milky white	Gray	White	Black	Black	Blue	Black	Brown	Rust	Milky white	Black
Viscosity	Pa•s	45	65	150	75	4.7	3.8	11	Putty	Putty	140	18.5
Specific gravity		1.17	1.95	2.86	1.64	1.13	1.17	1.1	3.2	3.42	1.56	1.25
Curing conditions		150℃×30 min	100℃×40 min	100℃×40 min	100℃×60 min	85℃×45 min	120℃×30 min	90℃×30 min dry + 150℃×30 min	100℃×40 min 120℃×20 min 150℃×10 min	100℃×40 min 120℃×20 min 150℃×10 min	120℃×60 min 150℃×30 min	60℃×30 min 80℃×30 min
Physical properties after curing: Hardness		D84	D93	D96	D92	D84	-	-	D90	D93	D90	-
Physical properties after curing: Glass transition temperature	℃	120	140	117	117	97	124	-	120	120	140	47
Physical properties after curing: Volume resistivity	Ω•m	-	-	1.5×10^{13}	2.0×10^{13}	4.5×10^{14}	1.6×10^{14}	-	8.9×10^{12}	-	2.3×10^{14}	6.3×10^{13}
Physical properties after curing: Tensile shear bond strength (Iron)	MPa	35.8	21.6	9.0	21.3	16.0	23.0	10.6	9.8	8.8	24.0	22.2
Physical properties after curing: Peel adhesive strength (Iron)	N/m	2300	314	490	460	-	-	-	-	-	543	-
Remarks			High heat dissipation	High heat dissipation	UL94 V-0 certificated product	Underfill agent With repairability added	Underfill agent	Heat expansion type	For balancing a motor		High heat resistance	Low temperature-curable Low-halogen product

* 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)

Characteristics				Unit	2358
Main components					Fluororesin
Characteristics					For sealing use
Appearance					White
Applied screw diameter					-
Sealing properties	Air-tight *1	25℃	M10 bolt	MPa	2 and above
			3/4PT Plug	MPa	2 and above
	Water-tight *1	25℃	M10 bolt	MPa	2 and above
			3/4PT Plug	MPa	2 and above
	Oil-tight *2	17℃	M10 bolt	MPa	12 and above
			3/4PT Plug	MPa	12 and above
Operating temperature range (Standard)				℃	Seal 170
Remarks					Seal 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

Characteristics			Unit	2365B	2365C
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)			℃	-50 to 120	-50 to 120
Remarks				Three lock processing	Three lock processing

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

Characteristics		Unit	2448	2448B	2458	2468	2478	2488	2488E
Main component			Epoxy type	Epoxy type	Acrylic type	Acrylic type	Acrylic type	Acrylic type	Epoxy type
Strength classification			High strength	High strength	Low strength	Medium strength	High strength	Medium strength	High strength
Curing conditions			25℃×24 h	25℃×24 h	25℃×24 h	25℃×24 h	25℃×24 h	25℃×24 h	25℃×48 h
Appearance			Blue	Orange	Green	Red	Blue	Blue	Red
Applied screw diameter			M2 to M40	M2 to M40	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	52.5	43.1	46.3
	Zinc chromate Plating	N•m	67.0	70.7	37.4	44.9	52.3	44.9	57.3
	SUS304	N•m	64.6	66.8	31.9	42.6	45.5	41.1	40.8
	Aluminum	N•m	36.4	40.9	20.6	24.8	22.3	22.4	29.0
Operating temperature range (standard)		℃	Locking: 150℃ Sealing: 170℃	Locking: 160℃ Sealing: 170℃	Locking: 100℃ Sealing: 170℃	Locking: 100℃ Sealing: 170℃	Locking: 130℃ Sealing: 170℃	Locking: 130℃	Locking: 80℃ Sealing: 170℃
Remarks			Water-type	Water-type	Water-type	Water-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 2900 Series (coating agent)

Product name			2907D	2907E
Characteristics		Unit		
Appearance			Light yellow	Clear
Viscosity		mPa•s	-	-
Specific gravity			0.83	0.96
Heating residue		%	27	5
Tack-free time			within 90 min	within 20 min
Physical properties after curing	Volume resistivity	Ω•m	-	-
	Dielectric breakdown strength	kV	-	-
	Moisture permeability (40°C x 95%RH)		-	-
Remarks				Aerosol type

ThreeBond 2955 Series (heat radiating agent)

Product name			2955P	2955Q
Characteristics		Unit		
Appearance			Gray	Gray
Viscosity		Pa•s	120	103
Specific gravity			3.1	3.1
Tack-free time		h	24 or less	24
Physical properties after curing	Thermal conductivity	W/m•K	4.8	4.5
	Volume resistivity	Ω•m	3.1×10^{14}	-
	Surface resistivity	Ω	1.7×10^{17}	-
	Dielectric breakdown strength	kV/mm	19	15
Remarks				

ThreeBond 3000/3100 Series (UV-curable resin)

Product name			3006D	3013Q	3020B	3074C	3075E	3081J	3081L	3081P	3084
Characteristics		Unit									
Main component			Acrylic resin	Acrylic resin	Acrylic resin	Acrylic resin	Acrylic resin	Acrylic resin	Acrylic resin	Acrylic resin	Acrylic resin
Appearance			Blue transparent	Blue transparent	Light yellow	Colorless	Colorless	Light yellow transparent	Milky white	Light yellow	Cadet Blue
Viscosity		Pa•s	2	23	3.5	7.0	20	95	70.0	400	100
Specific gravity			1.07	1.11	1.05	1.09	1.11	1.11	1.14	1.09	2.19
Curing condition (Integrated light intensity)		kJ/m^2	30	45	30	30	30	45	30	45	30
Physical properties after curing	Hardness		A50	A32	D54	D70	D50	A27	A21	E19	D90 to 95
	Volume resistivity	Ω•m	2.6×10^{8}	9.4×10^{9}	3.0×10^{7}	1.5×10^{12}	1.1×10^{12}	1.2×10^{10}	-	8.8×10^{8}	9.8×10^{12}
	Dielectric breakdown strength	kV/mm	30	21	14.0	24.1	23.6	19.0	-	24.9	18.3
Tensile shear bond strength	Glass/Iron	MPa	5.3	4.1	9.4	8.1	8.7	-	-	-	Material failure
	Glass/Aluminum	MPa	6.1	2.8	3.4	2.2	4.1	-	-	-	-
	Glass/Stainless steel	MPa	5.2	5.1	9.0	6.3	9.5	-	-	-	-
Remarks				Excellent engine oil and AT oil resistance Continuous use at approximately 120°C	Supports LED light sources, Colored black after hardening						

Product name			3114	3114J	3161	3164D	3166	3168	3170E	3177
Characteristics		Unit								
Main component			Epoxy resin	Epoxy resin	Silicone	Silicone	Silicone	Silicone	Acrylic resin	Acrylic resin
Appearance			Grayish white	White	Light yellow	Pale white	Blue	White	Light yellow	Yellow to light yellow transparent
Viscosity		Pa•s	26	25	3	10	330	15	11.2	1.2
Specific gravity			1.54	1.56	0.98	1.00	1.01	1.01	1.10	1.06
Curing condition (Integrated light intensity)		kJ/m^2	30	30	30 + moisture curing	30 + moisture curing	45	30	30	10
Physical properties after curing	Hardness		D80	D87	A30	A32	E15	Gel	D44	D84
	Volume resistivity	Ω•m	-	2.1×10^{12}	4.0×10^{12}	8.8×10^{12}	5.5×10^{11}	2.7×10^{12}	-	9.2×10^{13}
	Dielectric breakdown strength	kV/mm	-	26.2	12.3	30	15.1	-	-	24
Tensile shear bond strength	Glass/Iron	MPa	-	0.1	2	-	-	-	-	19.5 (Iron/Iron)
	Glass/Aluminum	MPa	-	4.5	0.7	0.5	-	-	-	16.9 (Aluminum/Aluminum)
	Glass/Stainless steel	MPa	-	-	0.9	-	-	-	-	17.9 (SUS/SUS)
Remarks				Cure shrinkage: 18% Tg: 142°C (DMA) Supports LED light sources	Dealcoholization type Low-molecular cyclic siloxane-reduced product	Dealcoholization type Low-molecular cyclic siloxane-reduced product		Excellent vibration absorption Low-molecular siloxane-reduced product		Hybrid with an instantaneous adhesive ISO 10993 compliant

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

* 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 3900 Series (structural adhesive)

Product name			3923	3928	3950D		3951D		3952D			3955		3955B	
Characteristics		Unit													
Appearance			Translucent	Green	Clear	White	Clear	White	Black	White		Light blue transparent	Light yellow transparent	Blue	Light yellow
Viscosity		Pa•s	3.0	3.0	2.7	2.2	8.5	12.5	32	16		2.4	2.4	5.5	5.0
Specific gravity			1.00	1.00	1.18	1.00	1.16	1.00	1.16	1.00		1.04	1.04	1.05	1.05
Compounding ratio (mass ratio) Main agent/Curing agent			100:100 (Its use method is contact curing.)		1:1		1:1		1:1			100:100		100:100	
Set time			10 to 12 min		15 min		10 min		12 min			5 to 15 min		3 to 10 min	
Curing conditions			25°C×24 hrs (Practical strength is obtained in about 30 minutes.)		23°C×50%RH×7days		23°C×50%RH×7days		23°C×50%RH×7days			25°C×24 hrs (Practical strength is obtained in 3 hours.)		25°C×24 hrs (Practical strength is obtained in 1 hour.)	
Tensile shear bond strength	Iron	MPa	26.5		5.2		7.8		6.9			6.6		6.6	
	Aluminum	MPa	16.7		2.3		7.1		5.5			5.6		4.9	
	Stainless steel	MPa	23.5		-		-		-			6.2		6.2	
Peel adhesive strength	Iron	kN/m	2.7		-		-		-			0.4		0.8	
	Aluminum	kN/m	3.1		-		-		-			0.3		0.3	
Remarks												Good flexibility		Good flexibility With UV curing added	

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

ThreeBond 5211/5222 Series (sealant)

Product name			5211	5222M
Characteristics		Unit		
Curing method			Moisture-curing	Moisture-curing
Appearance			Various types *1	Various types *2
Viscosity		Pa•s	Paste	450
Specific gravity			1.04	1.40
Tack-free time		min	10	60
Physical properties after curing	Hardness		A23	A28
	Tensile strength	MPa	1.5	0.9
	Elongation	%	534	400
Tensile shear bond strength	Iron	MPa	1.4	1.2
	Aluminum	MPa	1.5	1.2
	Acrylic	MPa	1.1	0.5
Operating temperature range (standard)		°C	-60 to 200 (250)	-40 to 100
Remarks			Deoximation	Dealcoholized Paintable

*1: White, gray, clear, ivory, black, aluminum, and amber
*2: White, gray, ivory, and black

ThreeBond 6100 Series

Product Name		6154K	6168
Characteristics	Unit		
Main component		Wax	Synthetic resin
Features		Effective concealment Thick coating	Aqueous
Appearance		Black	Black
Viscosity	mPa•s	3700	200
	s	-	-
Specific gravity		0.85	1.01
Heating residue	%	46	24
Tack-free time	min	-	30
Salt spray testing	h	-	1000 (Recommended film thickness: 40μm)
Remarks			

ThreeBond 7700 Series

Product Name		7721	7737	7738	7741	7781	7789
Characteristics	Unit						
Appearance		Colourless to Light yellow transparent	Light yellow transparent	Light yellow transparent	Colourless to Light yellow transparent	Colourless to Light yellow transparent	Light yellow transparent
Viscosity	mPa•s	5.0	2000	5000	2.0	2.0	25000
Specific gravity		1.07	1.07	1.08	1.05	1.05	1.09
Time set Iron	sec	15	90	90	3	2	10
Tensile shear bond strength Iron	MPa	18.4	25.7	27.7	15.0	14.0	21.0
Aluminium		12.9	20.4	21.4	15.1	14.9	15.9
Polycarbonate		Material failure	Material failure	Material failure	Material failure	Material failure	Material failure
ABS		Material failure	Material failure	Material failure	Material failure	Material failure	Material failure
NBR		Material failure	Material failure	Material failure	Material failure	Material failure	Material failure
Chloroprene rubber		Material failure	Material failure	Material failure	Material failure	Material failure	Material failure
Operating temperature range	°C	-40 to 100	-40 to 100	-40 to 100	-40 to 100	-40 to 100	-40 to 100
Remarks			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	Structural viscosity ratio 6.5

* 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

Energy-saving device

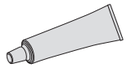
Energy-saving device for each vessel

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.

Application Equipment

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.

Individual catalog number #36

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.

Individual catalog number #2

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.

Individual catalog number #5

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.

Individual catalog number #6

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.

Individual catalog number #30

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.

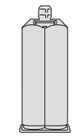
Individual catalog number #36

Cartridge-type tank (LVCT-AC)
Dispensing valve (HPNV-50)
Controller for pressure (coater S4)
Desktop robot (RT7 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.

Individual catalog number #15

Twin cartridge



Hand gun for two-component liquid cartridge

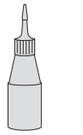
This hand gun mixes a two-component liquid agent with its static nozzle and injects it.
Automatic application by the machine is impossible.

Individual catalog number #18

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.

Individual catalog number #10

Air syringe dispenser (Minicoater C5)

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

Individual catalog number #11

Manual rotary applicator (RTA-H)

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

Individual catalog number #12

Automatic rotary application (RTM2)

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.

Individual catalog number #13

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.

Individual catalog number #3

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.

Individual catalog number #17

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.

Individual catalog number #11

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.

Individual catalog number #7

Single-acting pump for pails (PBⅢ-30/45)

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.

Individual catalog number #8

Pump for pails (PBⅢ) One-component fixed-quantity booster (fixed-quantity booster) Desktop robot (RT7 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.

Individual catalog number #9

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.

Individual catalog number #11

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.

Individual catalog number #3

Tank for 1 kg or less bottle or can (TG1-T) Needle type dispense valve (HPNV-50) Pressure controller (coater S4) Desktop robot (RT7 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.

Individual catalog number #14

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.

Individual catalog number #30

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 center.
- Information in this technical document is subject to change at our discretion without notice.

Creating Our Future From a Single Drop
ThreeBond Co., Ltd.
4-3-3 Minamiosawa, Hachioji, Tokyo 192-0398
0120-56-1456 TEL 81 42 670 5333

● 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: