

# Silicone RTVs

in Aerospace & Aviation



## Driving the innovation behind flight

When it comes to assembling, sealing and protecting critical components in the air or in space, why leave anything to chance? Having developed silicone materials used on every manned US space flight, including the material used to produce the sole of the boot that first imprinted the moon, Momentive sets the standard of excellence in aerospace and aviation silicone technologies. We are proud of our long standing relationships and contributions to the successes of the world's venture into outer space.

From the beginning, our company has been at the forefront of silicone advances. Our scientists came up with the first "direct process" for making methylchlorosilanes, the key building block for all silicone products today. We developed the first silane coupling agent for fiberglass and composites, the first construction sealant that hardens at room temperature, and the first successful one-part addition cure technology for adhesives.

It is Momentive's history and flight time in aviation and aerospace that separates its product offerings from others in the industry. Our strength is deeply rooted in the long and prestigious history of GE technology, innovation, technical service, and application engineering.

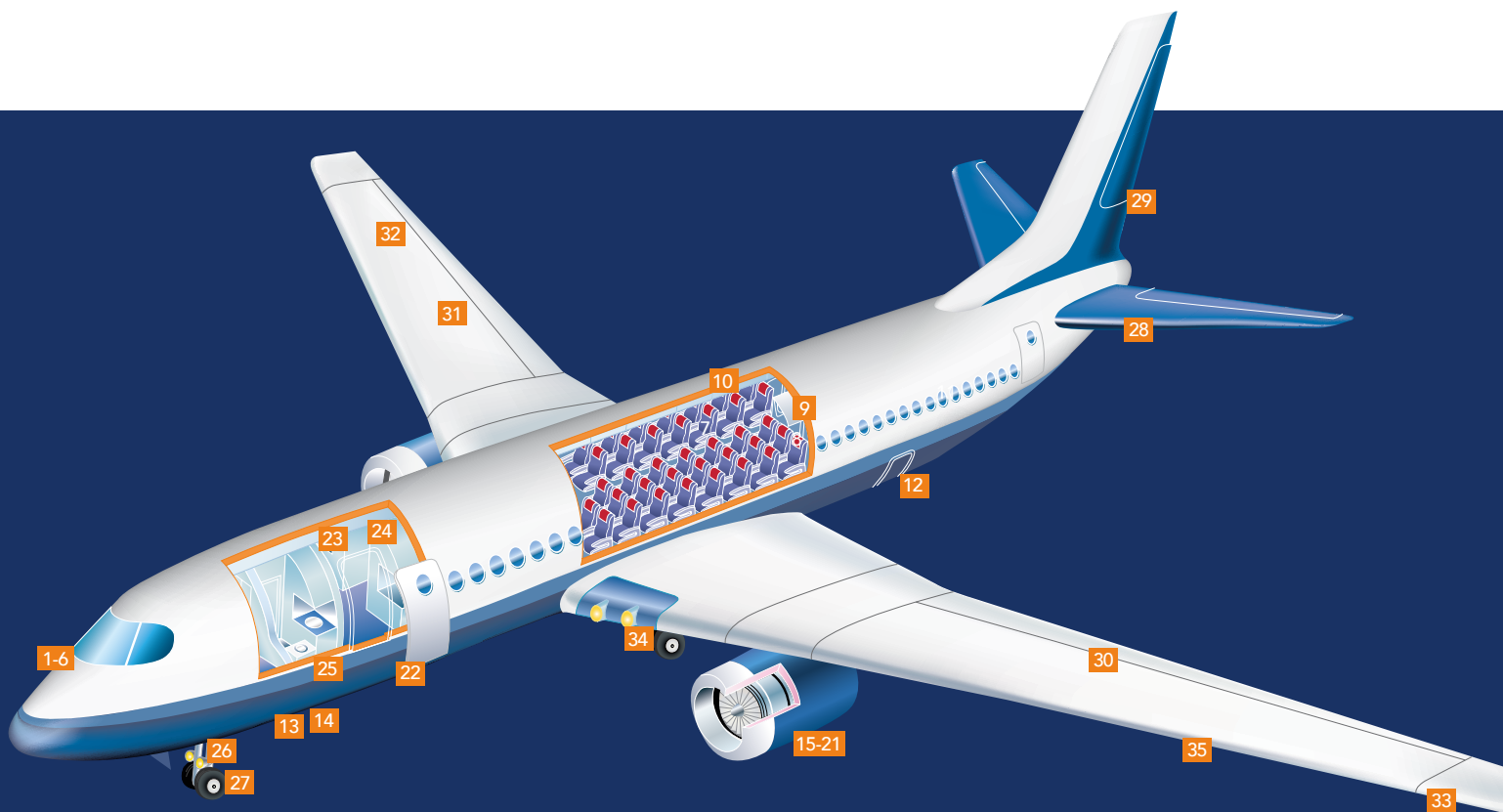
From materials used for bonding thermal shields on space shuttles and rockets, to aircraft assembly adhesives and sealants, to vibration-dampening potting materials for vital electronics, our silicone RTVs keep air-and spacecraft operating smoothly.

Momentive produces a wide range of materials used in a multitude of mechanical, electrical, and sealing applications. These products are designed for use in challenging conditions and include sealants, adhesives, potting and encapsulating compounds, optical materials, and thermal management materials. Our flight heritage, value-added process innovations, global reach, and commitment to successful business relationships can help you reduce costs, heighten quality, and soar above the competition.

*Ask your sales representative how Momentive may serve your aerospace and aviation needs.*

# Commercial Aircraft Solutions at Work

Momentive offers reliable aviation products used in many aspects of aircraft assembly and maintenance; from adhesives for wings and fuel tanks to sealants for electrical wire and everything in between.



## Silicone RTVs in an Aircraft

### COCKPIT

- 1 Black Box Encapsulant
- 2 Cockpit Instrument Seal
- 3 Electrical Box Sealant
- 4 Radome Sealant
- 5 Sealant, Potting/Encapsulant for Computer Units
- 6 Weatherstrip Adhesive

### CABIN

- 7 In-flight Entertainment System Sealant
- 8 Lighting Sealant
- 9 Overhead Bin Sealant
- 10 Vent Duct Sealant
- 11 Window Assembly Sealant

### CARGO AREA

- 12 Cargo Door Seal
- 13 Electrical Wire Sealant
- 14 Firewall Penetration Sealant

### ENGINE

- 15 Engine Gasket
- 16 Engine Molded Seals
- 17 Engine Electronics Potting
- 18 Engine/Thermal Shield
- 19 Filletting Hardware Heads
- 20 Gas Turbine Bracket Adhesive
- 21 Joint Fill Compound

### GALLEY

- 22 Door Gasket Seal
- 23 Formed Gaskets
- 24 Galley Sealant
- 25 Lavatory Sealant
- 26 Light Lens Sealant
- 27 Potting Landing Gear Electrical Devices

### TAIL

- 28 General Maintenance Sealant
- 29 Hydraulic Switch/Control Sealant

### WING

- 30 Fuel Cell Coating
- 31 Fuel Tank Electrical Device

### Sealant

- 32 Fuel Tank Sealant
- 33 Hydraulic Gear Box Sealant
- 34 Lighting Sealant
- 35 Edge Sealant

# Product / Application Selector Guide

|                                      |  | One-Component                           |   |   |   |   |   |   |  |   |
|--------------------------------------|--|---|---|---|---|---|---|---|--|---|
| Potential Products <sup>(1)</sup>    |  | RTV 100 series                          | RTV 106                                 | RTV 116                                 | RTV 133   | RTV 142                                 | RTV 157<br>RTV 159                      | RTV 160<br>RTV 162<br>RTV 167           | FRV 1106<br>FRV 1109<br>fluorosilicone       | SilCool*<br>thermal management materials                            |
| Features                             |  | High performance adhesives.             | High temperature, paste adhesive.       | High temperature, flowable adhesive.    | UL94 V-0 component recognized, neutral cure adhesive. | Low volatile adhesive.                  | High strength adhesives.                | Neutral cure adhesives.                 | Adhesive with excellent chemical resistance. | Thermally conductive adhesives and greases. Cure options available. |
| Substrate Adhesion                   |  | Primerless adhesion to many substrates. | Primerless adhesion to many substrates. | Primerless adhesion to many substrates. | Primerless adhesion to many substrates.               | Primerless adhesion to many substrates. | Primerless adhesion to many substrates. | Primerless adhesion to many substrates. | Primerless adhesion to many substrates.      | Primerless adhesion to many substrates.                             |
| Potential Applications               |  |   |   |   |   |   |   |   |  |   |
| Exterior                             | Cargo Door Seals                                   |   |   |   |   |   | X                                       |   |  |   |
|                                      | Door Gasket Sealant                                |   |   |   |   |   | X                                       |   |  |   |
|                                      | Lighting Sealant                                   |   |   |   |   |   | X                                       |   |  |   |
|                                      | Filleting Hardware Heads                           |   |   |   |   |   | X                                       |   |  |   |
|                                      | Joint Fill Compound                                | X                                       | X                                       |   |   |   | X                                       |   |  |   |
|                                      | Potting Landing Gear Electrical Devices            |   |   |   |   |   |   |   |  |   |
|                                      | Sealant for Smooth Exterior Edge of Aircraft Wing  |   |   |   |   |   | X                                       |   |  |   |
|                                      | Weather Strip Adhesive                             |   |   |   |   |   | X                                       |   |  |   |
| Electronics                          | Radome Sealing                                     |   |   |   |   | X                                       |   | X                                       |  |   |
|                                      | Circuit and Terminal Protection                    |   |   |   |   | X                                       |   | X                                       |  | X   |
|                                      | Cockpit Instrument Sealant                         |   |   |   |   | X                                       |   | X                                       |  |   |
|                                      | Electrical Wire Sealant                            |   | X                                       | X                                       |   |   |   | X                                       |  |   |
|                                      | Sealing, Potting and Encapsulating Computer Units  |   |   |   |   | X                                       |   | X                                       |  | X   |
|                                      | Electronics Power Equipment Encapsulant            |   |   |   |   |   |   | X                                       |  | X   |
|                                      | Sensors and Components                             |   |   |   |   |   |   |   |  | X   |
| Engine                               | Interlayers/Displays/LEDs                          |   |   |   |   |   |   |   |  |   |
|                                      | Gasketing  |   | X                                       | X                                       | X   | X                                       | X                                       |   | X  |   |
|                                      | Heat Insulator/Thermal Blanket                     |   | X                                       | X                                       | X   | X                                       | X                                       |   |  |   |
|                                      | Heat Shielding                                     |   | X                                       | X                                       | X   | X                                       | X                                       |   |  |   |
|                                      | Molded Seals                                       |   | X                                       | X                                       | X   | X                                       | X                                       |   |  |   |
|                                      | Electronics Potting                                |   | X                                       | X                                       | X   | X                                       | X                                       | X                                       |  |   |
| General                              | Gas Turbine Bracket Adhesive                       |   | X                                       |   |   |   |   |   |  |   |
|                                      | Extreme High Temperature Potting and Encapsulating |   |   |   |   |   |   |   |  | X   |
|                                      | Firewall Penetration Sealant                       |   |   |   | X   |   |   |   |  |   |
|                                      | Light Lens Sealant and Adherent                    |   |   |   |   |   | X                                       |   |  |   |
| Wing/Fuel                            | Shock Absorber Between Metal Aircraft Parts        |   |   |   |   |   |   | X                                       |  |   |
|                                      | General Aircraft Maintenance Sealant               | X                                       |   |   |   |   | X                                       |   |  |   |
|                                      | Electrical Devices Within Fuel Tank                |   |   |   |   |   |   |   | X  |   |
|                                      | Fuel Cell Coating                                  |   |   |   |   |   |   |   | X  |   |
|                                      | Fuel Tank Sealant                                  |   |   |   |   |   |   |   | X  |   |
| Interior                             | Sealing Hydraulic Gear Boxes                       |   |   |   |   |   |   |   | X  |   |
|                                      | Sealing Hydraulic Switches and Controls            |   |   |   |   |   |   |   | X  |   |
|                                      | Electrical Box Sealant                             |   |   |   |   |   |   | X                                       |  |   |
|                                      | Pre-Formed Gaskets                                 | X                                       |   |   |   |   | X                                       |   |  |   |
|                                      | Galley Sealant                                     | X                                       |   |   |   |   |   |   |  |   |
|                                      | In-Flight Entertainment System Sealant             | X                                       |   |   |   |   |   |   |  |   |
|                                      | Lavatory Sealant                                   | X                                       |   |   |   |   |   |   |  |   |
| Miscellaneous                        | Lighting Sealant                                   |   |   | X                                       |   |   |   |   |  |   |
|                                      | Ventilation Duct Sealant                           | X                                       | X                                       |   | X   |   |   |   |  |   |
|                                      | Window Assembly Sealant                            | X                                       |   | X                                       | X   | X                                       |   |   |  |   |
|                                      | Battery Sealant                                    |   |   |   |   |   |   | X                                       |  |   |
|                                      | Black Box Gel Encapsulant                          |   |   |   |   |   |   | X                                       |  |   |
|                                      | Charger Sealant                                    |   |   |   |   |   |   | X                                       |  |   |
| Thrust Reversers                     | Heating and Cooling Tube Sealant                   |   |   |   |   |   |   |   | X  |   |
|                                      | Landing Gear Sealant                               |   |   |   |   |   |   |   | X  |   |
|                                      | Thrust Reversers Heat Shielding                    |   |   |   |   |   |   |   |  |   |
|                                      | Thrust Reversers Insulator                         |   |   |   |   |   | X                                       |   |  |   |
| Thrust Reversers Vibration Dampening |  |   |   |   |   | X                                       |   |   |  |   |

| Two-Component                                    |   |  |   |  |   |   |  |  |
|--|---|--|---|--|---|---|--|--|
| SnapSil*<br>fast cure<br>adhesives               | RTV 11<br>RTV 21<br>RTV 41                              | RTV 31<br>RTV 60   | RTV 88<br>RTV 88HB  | RTV 560<br>RTV 566<br>(low volatile)   | RTV 511<br>RTV 577<br>RTV 567<br>(low volatile)           | RTV 6136<br>RTV 6139  | RTF 7000<br>foam                                 | InvisiSil*<br>optical<br>encapsulants                                    |
| Very fast cure<br>adhesives.                     | General purpose potting<br>compound/<br>encapsulant.    | High temperature, flowable<br>potting<br>compound/<br>encapsulant. | High temperature,<br>paste potting<br>compound/<br>encapsulant. | Extreme<br>temperature<br>performance<br>potting<br>compound/en<br>capsulants. | Low temperature<br>potting<br>compounds/<br>encapsulants. | Low modulus,<br>gel potting<br>compound/en<br>capsulants.   | Variable<br>density foam<br>system.              | Optically clear,<br>high refractive<br>index encapsulants. Heat<br>cure. |
| Primerless<br>adhesion<br>to many<br>substrates. | May require<br>a primer<br>for bonding<br>applications. | May require<br>a primer<br>for bonding<br>applications.            | May require<br>a primer<br>for bonding<br>applications.         | May require<br>a primer<br>for bonding<br>applications.                        | May require<br>a primer<br>for bonding<br>applications.   | Pressure<br>sensitive<br>adhesion<br>to many<br>substrates. | Primerless<br>adhesion<br>to many<br>substrates. | Primerless<br>adhesion<br>to many<br>substrates.                         |
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| X  |   | X  | X   | X  | X   |   |  |  |
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| X  |   |  |   |  |   |   |  |  |
|  |   | X  | X   | X  |   |   |  |  |
|  |   | X  | X   | X  |   | X   |  |  |

# Superior Products for Aviation & Aerospace

## One-Component, Room Temperature Cure Adhesives/Sealants

- The RTV 100 series product family is Momentive's premier line of acetoxycure adhesives with FDA, UL, NSF, and USDA recognition, and meets MIL-A-46106 specifications. This high performance line, in both paste and flowable grades, offers primerless adhesion to many substrates. Both RTV 106 and RTV 116 adhesives offer high temperature performance.
- RTV 133 is a black, one-component adhesive that is suggested where resistance to burning of the finished product is a design consideration. It offers high strength, primerless adhesion to many substrates and a non-corrosive (alkoxy) cure. It has UL94 V-0 component recognition.
- RTV 142 is a non-corrosive, low-volatile paste adhesive that can be considered for electronic gasketing or vertical/overhead applications.
- RTV 157 and RTV 159 are high strength, paste adhesives with an acetoxycure. RTV 159 offers high temperature and high strength performance.
- The RTV 160 series of adhesives are non-corrosive to sensitive metals found in electronics. This series offers products of varying viscosities and UL component recognition. RTV 162 and RTV 167 are paste adhesives that comply with MIL-A-46146. RTV 167 is a high strength paste. RTV 160 is a flowable material.
- The adhesive sealant FRV 1106 is a paste consistency, fluid resistant product for use in fuel, solvent and chemical environments. This acetoxycure sealant offers primerless adhesion, room temperature cure, and weathering resistance.
- SilCool\* thermally conductive TSE 3000 series of adhesives are available in both room temperature and heat cure, as well as one and two-component options. This series of materials has a variety of viscosities from flowable to paste-like. SilCool thermally conductive TIG series of greases are also available for applications needing removability/reworkability.





## Two-Component, Room Temperature Cure Adhesives/Sealants and Potting Compounds/Encapsulants

- SnapSil\* fast cure RTV 200 series of adhesives are a line of fast room temperature curing, two-component high strength adhesives that can be considered for applications on assembly lines to quick turn around maintenance and repair. Available in a convenient single caulker, it is easy to use with a standard caulking gun. The RTV 200 series adheres to most substrates with no primer necessary.
- RTV 11, RTV 21 and RTV 41 are three of Momentive's general-purpose two-part silicone encapsulants that can be an excellent choice for the aviation environment. They cure at room temperature and offer superior adhesion with primers.
- RTV 31, RTV 60 and RTV 88/88HB, part of Momentive's high temperature two-part silicone materials, differ primarily in viscosity in the uncured state. RTV 31 and RTV 60 can be excellent choices for potting and encapsulating applications, while RTV 88/88HB can be considered for vertical or overhead surfaces.
- RTV 560, RTV 566, RTV 567, RTV 511, and RTV 577 can provide outstanding adhesion with a primer at low temperatures. All cure at room temperature and provide variable cure rates by adjusting the curing agent. RTV 560 and RTV 566 offer the widest useful temperature range of all Momentive products (-115°C to +260°C). RTV 566 and RTV 567 can be excellent choices for aviation/aerospace applications requiring low outgassing. RTV 511 is a flowable sealant. RTV 577 is highly viscous and an outstanding choice for sealing and insulating on vertical and overhead surfaces.
- The RTV 6100 series of silicone dielectric gels are liquid silicones, which cure to form soft, gel-like elastomers. They help preserve dielectric integrity, offer shock and vibration dampening, and provide outstanding protection to delicate electronic assemblies in harsh environments. They offer a variety of cure rates and primerless adhesion to most substrates. RTV 6136 is a high strength gel; RTV 6196 is a fast curing gel.

## Two-Component Potting Compounds/Encapsulants

- RTF 7000 is a variable density foam that is supplied as a two component liquid that chemically react when mixed to generate foam.
- The InvisiSil\* optically clear encapsulants series of products are two-part optically clear, non-yellowing, heat curable gels and elastomers. This series of products have high light transmittance and a high refractive index. Typical applications for these products are LED encapsulants as well as inner layer materials for displays and coating on optical devices.





# Superior Products for Avionics

Long-term, reliable protection of sensitive electronic components is essential to many electronic applications today. Increasingly small systems and rising circuit densities have resulted in hotter operating temperatures, and driven demand for high-performance solutions for heat dissipation. Designers confronting these challenges will find a range of solutions from Momentive Performance Materials. Our SilCool\* family of adhesives and compounds deliver the high-thermal conductivity, thin bond lines, and low thermal resistance required for high performance components. For applications requiring environmental or stress protection, Momentive offers a selection of silicone adhesives/sealants, encapsulants, and potting materials.

## **Thermally Conductive Silicone Grease Compounds**

Momentive's thermally conductive SilCool grease compounds can offer excellent thermal conductivity, as well as excellent stability, penetration, temperature resistance, and low bleed. These properties enable SilCool grease compounds to draw heat away from devices, contributing to improved reliability and operational efficiency of electronic components. The combination of processing performance and thermal conductivity that these grease compounds offer makes them good candidates for thermal interface applications in high-performance devices and packages, such as TIM2 applications in CPUs and MPUs

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## **Thermally Conductive Silicone Adhesives**

Momentive Performance Materials developed its family of SilCool thermally conductive adhesives to help deliver thin bond lines, which contribute to low thermal resistance while providing excellent adhesion and reliability. This series of heat-cured, one-part adhesives excel in thermal interface applications that demand good structural adhesion. Examples include spreaders and heat generators, and thermal interfaces to heat sinks in TIM2 applications. Additional thermal adhesives from Momentive offer the process convenience of one-part condensation cure with moderate heat dissipation. Target applications include board assemblies and sealants in power modules and sensors.

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## **Potting and Encapsulation Materials**

Momentive Performance Materials offers a variety of dielectric potting and encapsulation materials to protect electronic components from moisture and harmful contaminants, while providing stress relief protection to circuits from thermal, vibration, and mechanical stress. Momentive offers a range of materials including one and two-part products, elastomeric rubber grades, low-modulus gels, conformal coatings and specialized grades including thermally conductive, flame retardant, and low volatile materials.

# Frequently Asked Questions

## Why RTV silicone?

RTV silicones consist of rubber and gel products developed for adhesion, sealing, coating and encapsulation/potting applications. The Si-O backbone of silicones provides inherent excellent temperature performance, both high temperature stability and low temperature flexibility, excellent dielectric properties, and outstanding weatherability resistance. With our long history in Aviation and Aerospace, Momentive's RTV silicones are an excellent choice for many applications.

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## What is Momentive's quality assurance?

Momentive has outstanding lot traceability. We conduct quality tests on every batch of silicone and can provide a Certificate of Analysis to our customers upon request. This helps our customers reduce cost by avoiding redundant testing. Additionally, Momentive is an ISO certified facility.

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## Does cured silicone rubber outgas?

Momentive has formulated specialty RTV grades to reduce outgassing substantially when used under extreme conditions, e.g., high temperature and vacuum. General purpose silicones can outgas under these types of conditions. Please contact Momentive's Customer Service for technical assistance or for more information.

## Do I need to use a primer?

It depends on your application requirements and product choice. For example, one-component RTV products offer primerless adhesion to most substrates, while most two components do not. Momentive recommends that you test the product in your application before using it.

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## How can I get Technical Product Data Sheets, samples and MSDS for Momentive materials?

Product Data Sheets and MSDS are available on our web site, [www.momentive.com](http://www.momentive.com).

Sample requests are available through an authorized Momentive distributor or through our Customer Service Centers. See back page for Momentive contact information.







[www.momentive.com](http://www.momentive.com)

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**Customer Service Centers**

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