Technical Data Sheet

3M™ Scotch-Weld™ One-Part Epoxy Adhesive 6101 Off-White

Product Description

3M™ Scotch-Weld™ One-Part Epoxy Adhesive 6101 Off-White (AHS 1831) is a one-part epoxy exhibiting a low temperature cure or fast high temperature cure with long room temperature pot life. It is flexible and toughened resulting in high impact performance.

Product Features

- One-part with stability at room temperature
- Low temperature cure and fast cure options
- Excellent impact resistance
- Plastic Bonding
- Contains a UV indicator to enhance detection during manual or automated application

Technical Information Note

The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

Typical Uncured Physical Properties

Property	Values	Additional Information
Components	1-Part	
Color	Off-White	View
Notes: Colors may vary from nearly white to yellow/amber. Adhesive performance is not affected by color variation.		
UV Tracer	Yes	
Viscosity	50000 cP	View
Notes: Cone and Plate, RT, 5Hz, 25mm SS plates, 0.0989 rad cone		
Halogens (Cl, Br)	Representative samples have been tested and meet the chlorine and bromine content requirements of IEC 61249-2-21	View
Notes: Per IEC 61249-2-21		
Pot Life	> 4 weeks	View
Notes: Time to double viscosity measure by cone and plate rheometer.		

Viscosity	50000 cP	View

Notes: Brookfield spindle #7 50RPM

Typical Mixed Physical Properties

Property	Values	Additional Information
Cure Time	≈20 min	View

Temp C: 65C
Temp F: 149F

Notes: Time to 90% cure by differential scanning calorimetry (DSC). Includes ramp time to temperature.

Cure Time	≈3 min	View

Temp C: 90C
Temp F: 194F

Notes: Time to 90% cure by differential scanning calorimetry (DSC). Includes ramp time to temperature.

Typical Performance Characteristics

Property	Values	Additional Information
Tensile Strength	27 MPa	View

Test Method: ASTM D638

Notes: Type V dogbone. Jaw separation 2 in/min, tested at 25°C / 50%RH.

Tensile Impact on AL	2.4 J	View

Notes: Tested with Instron™ CEAST 9340 Drop Tower. Grit blasted AL frame and windows with bond area 279mm2, thickness 125µm, 2.5mm bond width. 22kN impact probe, drop height 115mm, 10Kg additional mass. Report energy required to debond coupon in tensile mode.

Elongation	100 %	View

Test Method: ASTM D638

Notes: Type V dogbone. Jaw separation 2 in/min, tested at 25°C / 50%RH.

Young's Modulus	300 MPa	View

Test Method: ASTM D638

Notes: Type V dogbone. Jaw separation 2 in/min, tested at 25°C / 50%RH.

Overlap Shear Strength	32 MPa	View

Substrate: Al to Al

Notes: 0.5in x 1.0in bond area, 6 mil thickness. Separation rate 0.1 in/min for metals and 2 in/min for metal to plastics. AL etched, steel grit blasted prior to bonding. Plastic and steel wiped with IPA prior to bonding. AL substrate thickness 0.0625in.

Overlap Shear Strength	23 MPa	View

Substrate: Al to SUS

Notes: 0.5in x 1.0in bond area, 6 mil thickness. Separation rate 0.1 in/min for metals and 2 in/min for metal to plastics. AL etched, steel grit blasted prior to bonding. Plastic and steel wiped with IPA prior to bonding. AL substrate thickness 0.0625in.

Overlap Shear Strength	6 MPa	View

Substrate: Al to PC/ABS

Notes: 0.5in x 1.0in bond area, 6 mil thickness. Separation rate 0.1 in/min for metals and 2 in/min for metal to plastics. AL etched, steel grit blasted prior to bonding. Plastic and steel wiped with IPA prior to bonding. AL substrate thickness 0.0625in.

Overlap Shear Strength	10 MPa	View

Substrate: Al to PC

Notes: 0.5in x 1.0in bond area, 6 mil thickness. Separation rate 0.1 in/min for metals and 2 in/min for metal to plastics. AL etched, steel grit blasted prior to bonding. Plastic and steel wiped with IPA prior to bonding. AL substrate thickness 0.0625in.

Overlap Shear Strength	15 MPa	View

Substrate: Al to 30% Glass Filled PC (Lexan®)

Notes: 0.5in x 1.0in bond area, 6 mil thickness. Separation rate 0.1 in/min for metals and 2 in/min for metal to plastics. AL etched, steel grit blasted prior to bonding. Plastic and steel wiped with IPA prior to bonding. AL substrate thickness 0.0625in.

Overlap Shear Strength	9 MPa	View

Substrate: Al to 50% Glass Filled Polyamide(Kalix®)

Notes: 0.5in x 1.0in bond area, 6 mil thickness. Separation rate 0.1 in/min for metals and 2 in/min for metal to plastics. AL etched, steel grit blasted prior to bonding. Plastic and steel wiped with IPA prior to bonding. AL substrate thickness 0.0625in.

Overlap Shear Strength	32 MPa	View

Dwell/Cure Time: 72.0
Dwell Time Units: hr
Substrate: Al to Al

Notes: * % retention relative to control

Overlap Shear Strength	(Substrate Failure) 6 MPa	View

Dwell/Cure Time: 72.0
Dwell Time Units: hr
Substrate: Al to PC/ABS

Notes: * % retention relative to control

Overlap Shear Strength	(100%*) 31 MPa	View

Dwell/Cure Time: 72.0
Dwell Time Units: hr
Substrate: Al to Al

Notes: * % retention relative to control

Overlap Shear Strength	(Substrate Failure, 66%*) 4 MPa	View

Dwell/Cure Time: 72.0
Dwell Time Units: hr
Substrate: Al to PC/ABS

Notes: * % retention relative to control

Overlap Shear Strength	(91%*) 29 MPa	View

Dwell/Cure Time: 72.0
Dwell Time Units: hr
Substrate: Al to Al

Notes: * % retention relative to control

Overlap Shear Strength	(Substrate Failure, 133%*) 8 MPa	View

Dwell/Cure Time: 72.0
Dwell Time Units: hr
Substrate: Al to PC/ABS

Notes: * % retention relative to control

Available Sizes

30 mL syringe, 8 oz cartridge

Storage and Shelf Life

The shelf life of 3M™ One-Part Epoxy Adhesive 6101 Off-White is 18 months from the date of manufacture when stored in the original packaging materials and stored at -20°C (-4°F).

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Bottom Matter

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Handling/Application Information

Application Examples

- Mobile device bonding
- Wearable electronic device bonding
- Electronic Assembly

Application Techniques

- Dispensing
- Jetting
- Screen or stencil printing

Directions for Use

Thaw for one to two hours at room temperature before using. Do not heat syringe above 27°C when warming.

References

Property	Values
3m.com Product Page	https://www.3m.com/3M/en_US/p/d/b5005092139/
Safety Data Sheet SDS	https://www.3m.com/3M/en_US/company-us/SDS-search/results/?gsaAction=msdsSRA&msdsLocale=en_US&co=ptn&q=6101 Off-White

Family Group

Link Tags:

- 6101 Off-White

Products
6101 Off-White

Information

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Troubleshooting Guide for 3M™ Scotch-Weld™ One-Part Epoxy Adhesive 6101 Off-White

Technical Bulletin June 2019

Product Description

3M™ Scotch-Weld™ One-Part Epoxy Adhesive 6101 Off-White is a one-part epoxy exhibiting a low temperature cure or fast high temperature cure with long Room Temperature (RT, 22±2°C) pot life. It is flexible and toughened, resulting in high impact performance.

Application Techniques

Due to its >4-week Room Temperature stability, 3M™ Scotch-Weld™ One-Part Epoxy Adhesive 6101 Off- White (6101 OW) can be applied using a variety of methods including screen printing, needle dispense, and jetting. This troubleshooting guide will provide helpful information about the product and how to investigate possible processing issues. For information about setting up dispense, jetting and screen printing parameters, refer to the following technical bulletins

- Dispensing Guide for 3M™ Scotch-Weld™ One-Part Epoxy Adhesive 6101 Off-White
- Jetting Guide for 3M™ Scotch-Weld™ One-Part Epoxy Adhesive 6101 Off-White and 6100LV Off-White
- Screen Printing Guide for 3M™ Scotch-Weld™ One-Part Epoxy Adhesive 6101 Off-White

Product Information

6101 OW: 65°C Heat Trigger Cure vs. Stability

- 6101 OW is a heat trigger cure one-part epoxy. The robust trigger temperature is around 65°C.
- The product was designed to have long stability below the trigger temperature and fast cure speed at and above the trigger temperature.
- To maximize stability, the product is shipped and should be stored cold (≤-20°C).
- At ≤-20°C, the product has an 18-month shelf life. Higher temperatures will shorten product's life.
- 6101 OW is has >4-week stability at 22±2°C. Stability refers to the time it takes for viscosity inside the syringe to double via cone and plate rheometer. Higher temperatures will shorten product's stability.

Process Considerations

1. Shipping and Receiving

a. 6101 OW is transported in insulated containers with dry ice to keep adhesive temperature ≤-20°C. The dry ice maintains a temperature of -80° C in the container, thus assuring the product remains frozen during shipping.

b. Upon receiving the shipment, the product should be immediately checked to verify that the dry ice was not depleted, and then transferred to a freezer for storage. Thermal gloves should be

worn during this transfer process. Including a temperature-recording device inside the shipper also helps to verify that the material remained frozen during shipping.

c. When the product is received, it should be immediately sent to frozen storage at ≤-20°C.
d. Use care when handling cartridges below room temperature. The plastic cartridge is more brittle and prone to cracking if dropped. Small cracks may not be immediately observed and could leak adhesive during dispense.

2. Preparing for Use

a. Care should be taken when handling frozen materials to prevent frostbite or burns to exposed skin. Thermally insulated gloves should be worn to protect hands and fingers from the frozen product and other cold surfaces.
b. Frozen adhesives must be allowed to thaw completely and equilibrate to room temperature prior to use. This must be done gradually. If the rate of warming of the syringe and adhesive is too fast, voids may be formed between the adhesive and syringe barrel. The outer surface of the syringe warms faster than the interior, resulting in the syringe barrel expanding away from the adhesive inside, forming an air void which will be expelled as the material is dispensed. Allowing the adhesive to slowly thaw, keeping the adhesive relatively uniform in temperature as it warms, is the preferred technique. Heat should never be used to thaw the adhesive.
c. Thawing should never be attempted directly from a dry ice shipper. The adhesive should be first moved to a -20°C freezer for temperature equilibration and storage. From a -20°C freezer, small syringes (5ml or less) may be moved directly to room ambient conditions. Larger syringes may require a second equilibration to refrigerator temperatures (approximately 5°C) before moving to room ambient, to slow the thawing process and reduce void formation.
d. Thawing times will vary depending on the package size and material composition. For 30mL cartridges consider 1-2 hours. For 8oz cartridges consider 2-4 hours.
e. Repeated freeze and thaw cycles aggravates void formation and uses up the work life of the material.
f. Standing the syringe in a vertical orientation with the tip down also helps to reduce voids.
g. Condensation can be wiped off the syringe body with a dry cloth.
h. Ensure the adhesive is >15°C prior to use. Low temperatures and high pressures can crack the cartridge.
i. Ensure cartridge holder and dispense equipment are designed for the cartridge. Adhesive leakage is not common when using proper equipment.

3. Applying 6101 OW

a. During applications like dispense, jetting or printing, heat from environment will accelerate the reaction of 6101 OW. For best application results keep 6101 OW at or below 25°C.
b. 6101 OW is has >4-week stability at Room Temperature (22±2°C). Stability refers to the time it takes for viscosity inside the syringe to double via cone and plate rheometer. Higher temperatures will shorten product's stability.
c. Processes that create high shear, like jetting can add localized heat and accelerate the epoxy cure. Periodic open valve (low shear) flushes and cleanouts are recommended to maintain stable dispensing or jetting output.
d. Multiple evaluations have been completed showing jetting stability over time using as small as a 150um diameter jet valve using the following settings - Mode: Timed, Close Volt: 90V, Count: 150, Stroke: 90%, Air pressure: 0.42MPa (60.9psi), Pulse: 0.35ms, Open: 0.25ms, Nozzle: 5.0S D15, Cycle: 10ms, Close: 0.2ms, System: Pico Pulse HD, Freq: 100Hz, and a 2mm distance from substrate to jet head. If output stability becomes an issue:
    i. Check if there is accumulation on the nozzle. Infrequent accumulation can occur. If accumulation occurs and the nozzle is not wiped, jet stability could be compromised and result as variable mass output or adhesive sputtering. Wipe nozzle and recheck stability.
    ii. If jetting instability continues, open-valve purge a small amount of adhesive and re-

evaluate.

iii. Jetting instability can be impacted by bulk viscosity increase. If the adhesive has cured inside the cartridge, jetting instability is expected. If jetting instability continues and adhesive viscosity is expected to be the culprit, remove cartridge from the system and replace with a new cartridge. To determine if adhesive viscosity has changed, first check with a hand dispense to confirm the adhesive flows from the cartridge. If possible, measure viscosity of the adhesive using cone and plate rheometer or Brookfield viscometer. If equipment is not immediately available, place the container back in the freezer and measure adhesive viscosity once equipment is available. If the measured viscosity has doubled compared to the COA (using the same test method), the material is considered past the pot life. For best application results keep 6101 OW at or below 22±2°C. A best practice is to document the times and temperatures the cartridge was exposed to.

4. Curing 6101 OW
    a. Although very slow cure can happen below the trigger temperature of 65°C, it is recommended to heat 6101 OW to at least the trigger temperature 65°C to begin the curing process. Once 6101 OW is triggered, it will continue to cure to completion.
    b. If the adhesive reaches 65°C for >1 minute, it will continue to cure and will be fully cured in <24 hours.
    c. It takes 20 minutes at 65°C for 6101 OW to cure as measured by 90% cure measured by Dynamic Scanning Calorimetry (DSC).
    d. It takes 3 minutes at 90°C for 6101 OW to cure as measured by 90% cure measured by DSC.
    e. Note that oven convection and substrate conduction will delay the heat transfer to the adhesive. Therefore, placing a bonded component in a 65°C oven does not equate to 1 minute of adhesive time at 65°C. Bond-line measurements should be measured for each application and process line to ensure an adequate and robust heat profile.

5. Clean Up
    a. Isopropanol (IPA) or Methyl Ethyl Ketone (MEK) are 2 cleaning solvents that are often used to cleanup 6101 OW. A variety of other solvent types may work but user evaluation is required. Always follow the manufacturers' recommendations for safe handling of the cleaning solvents.
    b. Use caution when using a solvent to clean 6101 OW. Solvents can initiate the epoxy cure. Equipment and substrates should be completely solvent free prior to using 6101OW for bonding. If using a solvent to clean wetted equipment parts and a solvent free system is not possible, use sufficient purge to flush out possible contamination.

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