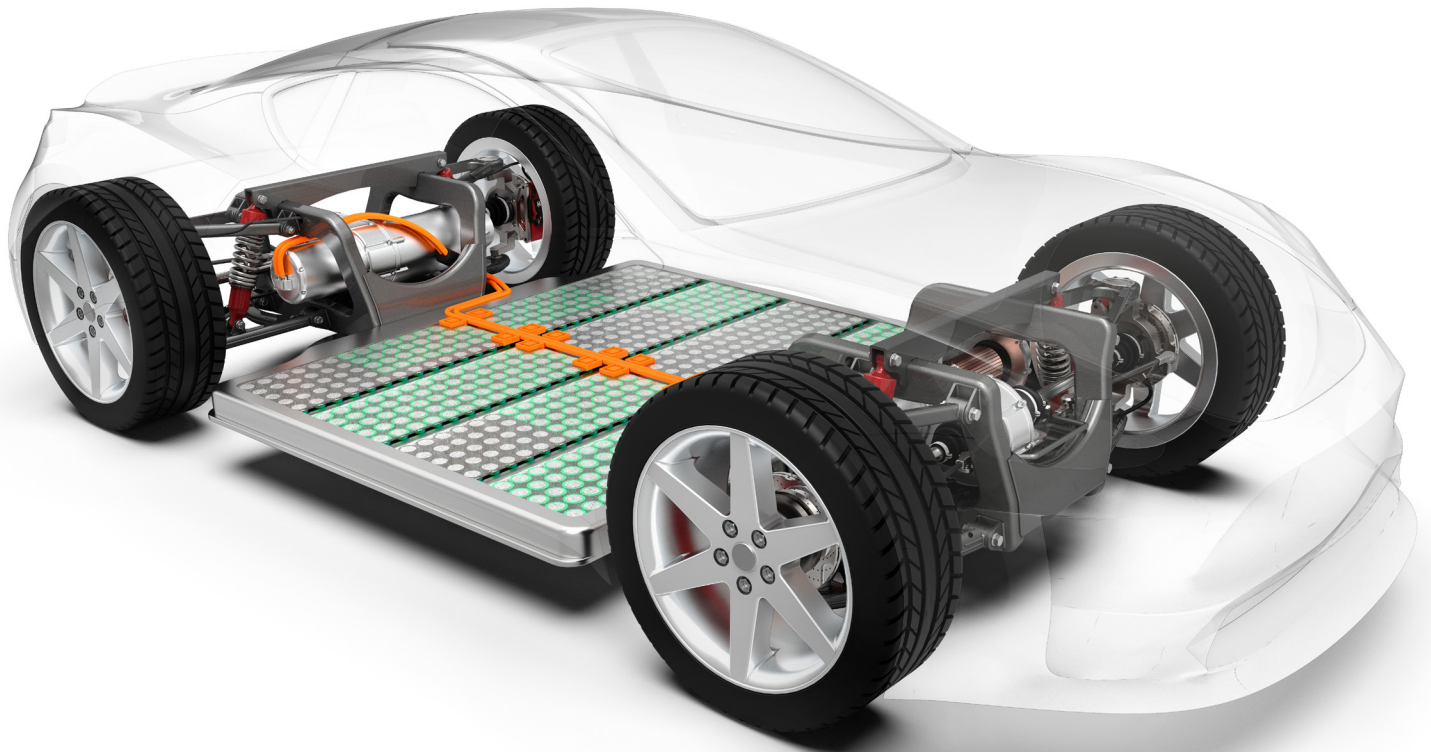


Solutions for Electric Vehicle Battery Applications



Adhesive solutions that drive innovation

Solutions for Electric Vehicle Battery Applications

As a global technology leader, Adhesives Research (AR) provides connectivity, thermal management, and moisture barrier protection to critical electronics segments, including Electric Vehicle (EV) Battery production. AR's portfolio of pressure sensitive adhesives is designed for a broad range of applications throughout the cell, module, and pack, including electrode and conductive bonding, encapsulation, device wrapping, shock absorbency, and process aids. Our chemists and engineers are passionate about developing novel products that enable our customers to overcome challenging applications in meeting the demands of an ever-evolving EV Battery market.

Module and Pack Applications:

Conductive Bonding:

Highly conductive tapes to solve interconnection challenges, available as foil-backed tapes, transfer tapes and heat seals

Thermal Interface Material Bonding:

Adhesives specially designed to facilitate bonding of thermal interface materials to enable heat transfer between components in the module/pack

Process Aids:

Ultra-clean release liners and protective films to withstand the extreme coating and baking conditions for electronics production with no chemical contamination

Vibration, Noise, and Corrosion Management:

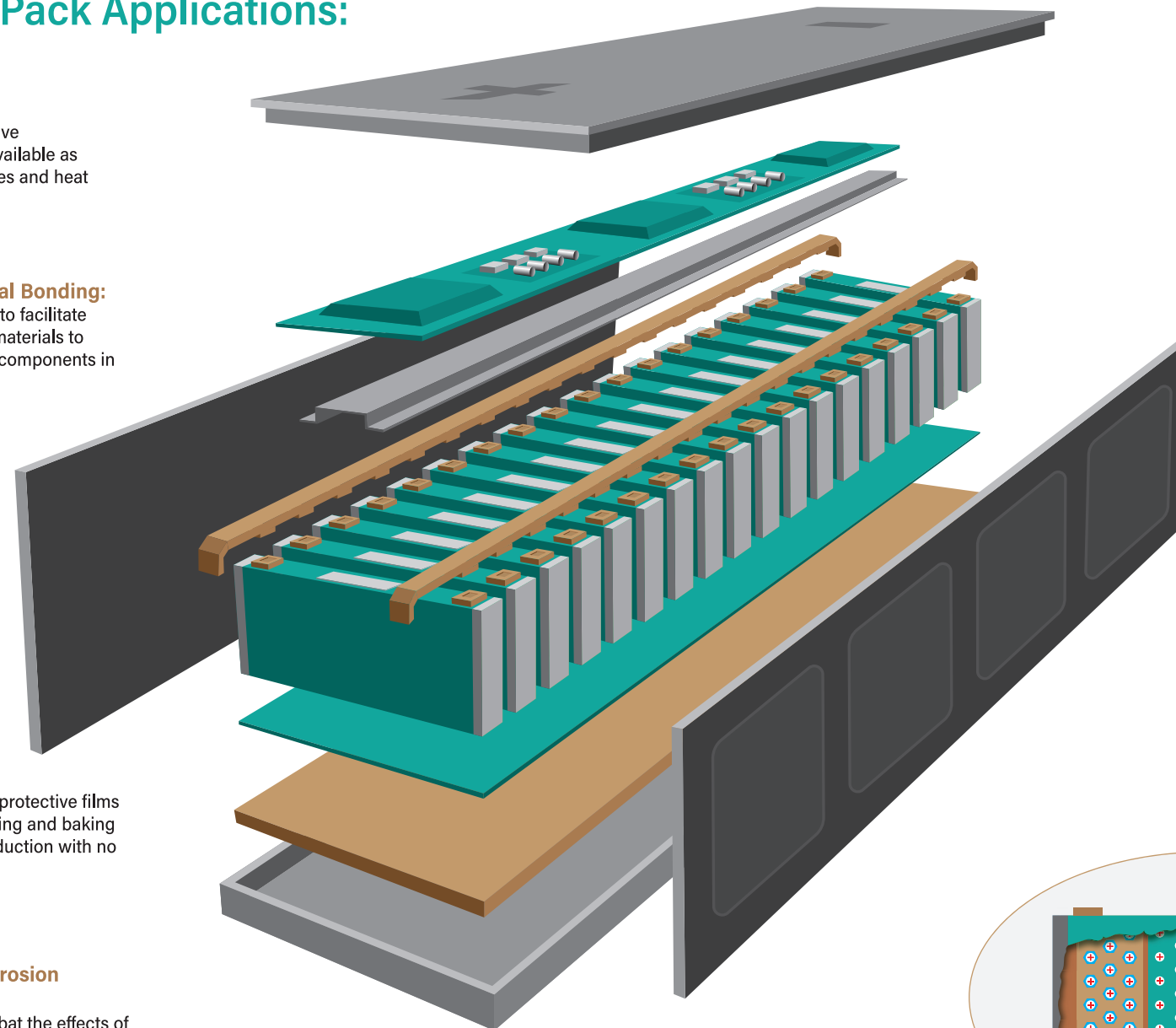
Dampening adhesives to combat the effects of nuisance factors such as harmonics/clattering and decay

Wire Management:

Adhesives and tapes for securing, handling and wrapping harnesses/cables within the battery pack

General Bonding:

Versatile bonding options throughout the module and pack (including low VOC, low surface energy and high surface energy substrates)



Cell Applications:

Edge Sealing and Moisture Barrier Protection:

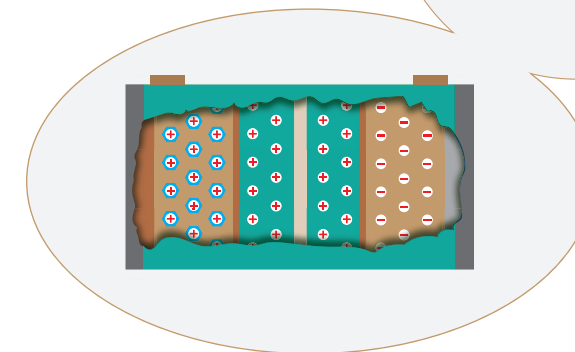
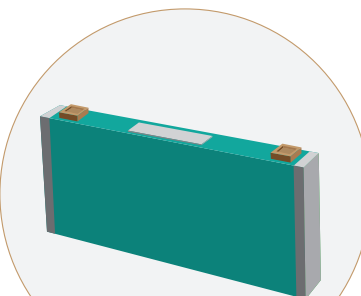
Specialty hydrophobic adhesives, with superior thermoxidative and UV stability, to protect the most sensitive battery components

Device Wrapping:

Electrically insulating options to protect and isolate battery cells and components

Shock Absorbent Pads:

Low surface energy and foam bonding adhesives for high-performance shock-absorbing applications



Thermal Runaway Protection:

Bonding solutions to incorporate barrier and isolating materials in the battery

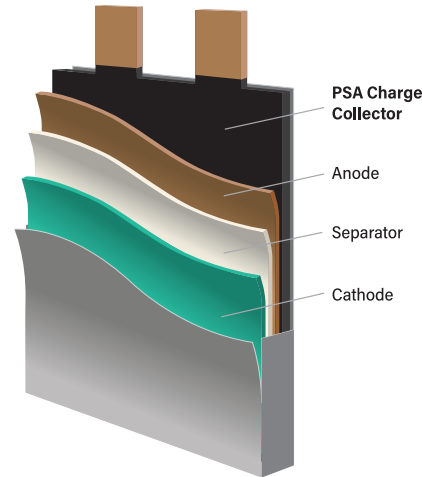
Electrode Bonding:

Ultra-thin adhesives for direct electrode bonding with cell tabs to enable increased energy density

Technology Highlights Electrode Bonding

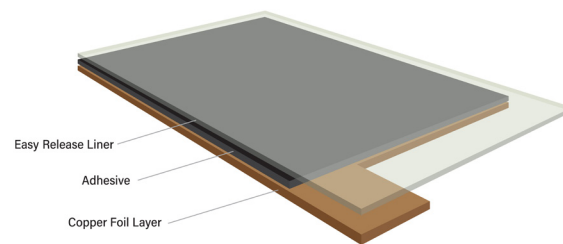
Key features:

- ✓ Non-reactive adhesive chemistry for direct electrode contact.
- ✓ Ultra-thin tape enhances energy density
- ✓ Efficient cell assembly compared to conventional electrodes.



Electrode Bonding

| | ARcare® 93802 | ARcare® 94141 | ARcare® 94274 |
|--------------------------------|------------------|-----------------------|------------------------|
| Description | High-performance | Ultra-thin, high-peel | Ultra-thin, high shear |
| Adhesive Thickness | 25 µm | 5 µm | 5 µm |
| Peel Adhesion, Stainless Steel | 23 oz/in | 31 oz/in | 12 oz/in |
| Loop Tack, Stainless Steel | 16 oz/in | 5 oz/in | 18 oz/in |
| Static Shear, 70°C | 9 min | 16 min | >5,000 min |



Transfer Tape

- Allows for easy die cutting and handling.
- Designed/manufactured in the USA.
- Slit sizes and length options.

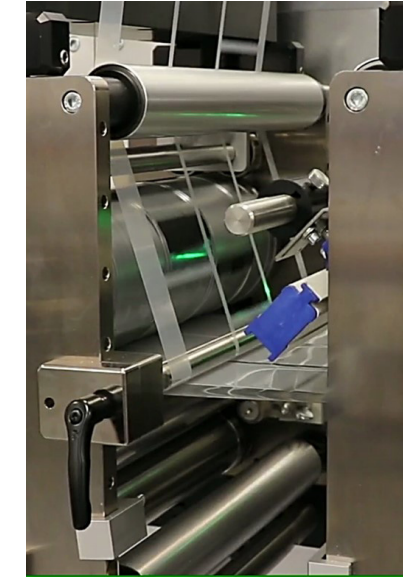
Converted Parts

- Ready to assemble complete with foil tab.
- Available in individual parts or roll-to-roll.
- Customizable options.

Technology Highlights Ultra-Clean Process Aids

Key Release Liner features:

- ✓ Clean release and practically no silicone transfer.
- ✓ PET substrates can withstand coating and baking/curing conditions.
- ✓ Available with tailorable release levels.

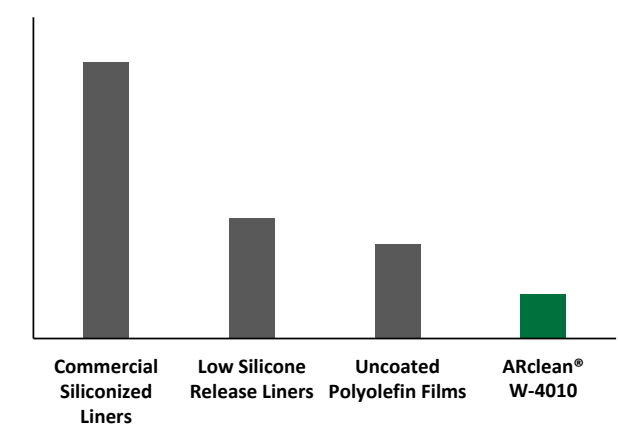


Ultra Clean Process Aids

| Release Liner | Extractable Silicone | Substrate |
|------------------|--|-------------------|
| ARclean® W- 4010 | 5 ng/cm ² both release and back side | 2 mil (51 µm) PET |
| ARclean® W- 4013 | 5 ng/cm ² both release and back side | 2 mil (51 µm) PET |
| ARclean® W- 5030 | 4 ng/cm ² release side and 3 ng/cm ² back side | 2 mil (51 µm) PET |

AR's Ultra-Clean Release Liners provide unmatched cleanliness for sensitive electronics applications. Available with smooth release profiles at tailored release levels, these process aid films are ideal for coating and curing of sensitive electrolyte films, functional coatings, and more.

Ultra Clean Process Aids



Adhesive Guide

ELECTRODE BONDING

| Product | Description | Construction | Adhesive type/ thickness | Peel Adhesion, Stainless Steel | Loop Tack, Stainless Steel | Static Shear, 70°C |
|---------------|------------------------|--------------|-----------------------------|-----------------------------------|-------------------------------|--------------------|
| ARflow® 93802 | High-performance | TT | Rubber/25 µm | 23 oz/in | 16 oz/in | 9 min |
| ARflow® 94141 | Ultra-thin, high-peel | TT | Rubber/5 µm | 31 oz/in | 5 oz/in | 16 min |
| ARflow® 94274 | Ultra-thin, high-shear | TT | Rubber/5 µm | 12 oz/in | 18 oz/in | >5,000 min |

DEVICE WRAPPING

| Product | Description | Construction | Backing color/type/ thickness | Adhesive type/ thickness | Release Liner type/ thickness | Peel Adhesion to Stainless Steel ozf/in (N/25 mm) |
|---------------|---|--------------|----------------------------------|-----------------------------|----------------------------------|---|
| ARcare® 93948 | Resistant to high-temp bubbling & bond failure; Acid-free | SCT | Black/PET/51 µm | Acrylic/25 µm | PET/51 µm | 50 (13.9) |
| ARcare® 92073 | Clean, low VOCs, heat resistant; Acid-free | SCT | Black/PET/76 µm | Acrylic/38 µm | PET/51 µm | 78 (21.7) |
| ARcare® 93945 | Clean adhesive; Highly flexible polyurethane backing | SCT | Clear/PU/51 µm | Acrylic/73 µm | PET/51 µm | 74 (20.1) |
| ARcare® 93469 | Low tack for temporary/in-process device wrapping applications; Heat stabilized PET backing | SCT | Clear/ PET/ 51 µm | Acrylic/18 µm | PET/51 µm | 3 (0.8) |
| ARcare® 7759 | Clean adhesive; Clear PET backing | SCT | Clear/ PET/ 51 µm | Acrylic/30 µm | PET/51 µm | 50 (13.9) |

SHOCK ABSORBENT PADS

| Product | Description | Construction | 1st Release Liner (Type/ Thickness) | 1st Adhesive (Type/ Thickness) | Carrier (Color/ Type/ Thickness) | 2nd Adhesive (Type/ Thickness) | 2nd Release Liner (Type/ Thickness) | Peel Adhesion to Stainless Steel (ozf/in [N/25 mm]) |
|------------------------------|--|---|--|-----------------------------------|--|-----------------------------------|--|---|
| ARclad® 8626-78 (Grey Foam) | Acrylic adhesive designed for a water-tight bond; Resistant to temperature extremes, humidity, & vibrations | DCFT | Blue/ PP/102 µm | Acrylic/58 µm | Grey or Black/closed-cell PE foam/1/32" (794 µm) | Acrylic/58 µm | Blue PP/76 µm | 100 (27.8) |
| ARclad® 8726-78 (Black Foam) | | | | | | | | |
| ARclad® 72000 Series | Rubber-based adhesive formulated for superior anchorage to foam & shock-absorbing materials; High peel adhesion & shear performance | See ARclad® 72000 Series table for construction details | | | | | | 163 (45.3) |
| ARclad® 73000 Series | Acrylic formulated for superior anchorage to foam & shock-absorbing materials; High peel adhesion & shear performance on low surface energy substrates | See ARclad® 73000 Series table for construction details | | | | | | 122 (33.9) |

Adhesive Guide

GENERAL BONDING

| Product | Description | Construction | 1st Release Liner (Type/ Thickness) | 1st Adhesive (Type/ Thickness) | Carrier (Color/ Type/ Thickness) | 2nd Adhesive (Type/ Thickness) | 2nd Release Liner (Type/ Thickness) | Peel Adhesion to Stainless Steel (ozf/in [N/25 mm]) |
|----------------------|---|---|--|-----------------------------------|--|-----------------------------------|--|---|
| ARclad® 7418 | Aggressive acrylic adhesive with superior adhesion to various surfaces | TT | White/ Poly-coated paper/160 µm (double-faced) | Acrylic/64 µm | | | | 50 (13.9) |
| ARclad® 8645-78 | Temperature-resistant foam tape offering excellent shear and peel performance on diverse surfaces | DCFT | Blue/ PP/76 µm (double-faced) | Acrylic/58 µm | Grey/closed-cell PE foam/ 42 mil (1067 µm) | Acrylic/58 µm | | 85 (23.6) |
| ARclad® 8314-10 | Resistant to temperature and humidity; Offers strong adhesion to low surface energy materials and is ideal for rough surfaces and gap filling | DCFT | White/ SCK paper/81 µm (double-faced) | Acrylic/84 µm | Clear PET/ 25 µm | Acrylic/84 µm | | 90 (25.0) |
| ARclad® 71000 series | Acrylic designed for enhanced bonding to high surface energy materials | See ARclad® 71000 Series table for construction details | | | | | | 89 (24.7) |
| ARclad® 73000 series | Acrylic designed for enhanced bonding to low surface energy materials | See ARclad® 73000 Series table for construction details | | | | | | 122 (33.9) |
| ARclad® 74000 series | Clean acrylic with low outgassing and low VOCs | See ARclad® 74000 Series table for construction details | | | | | | 48 (13.3) |

THERMAL RUNAWAY PROTECTION

| Product | Description | Construction | 1st Release Liner (Type/ Thickness) | 1st Adhesive (Type/ Thickness) | Carrier (Color/Type/ Thickness) | 2nd Adhesive (Type/ Thickness) |
|----------------------|---|---|--|-----------------------------------|------------------------------------|-----------------------------------|
| ARclad® 73000 series | Acrylic designed for enhanced bonding to low surface energy materials | See ARclad® 73000 Series table for construction details | | | | |

THERMAL INTERFACE MATERIAL BONDING

| Product | Description | Construction | 1st Release Liner (Type/ Thickness) | 1st Adhesive (Type/ Thickness) | Carrier (Color/Type/ Thickness) | 2nd Adhesive (Type/ Thickness) |
|----------------------|---|---|--|-----------------------------------|------------------------------------|-----------------------------------|
| ARclad® 71000 series | Acrylic designed for enhanced bonding to high surface energy materials | See ARclad® 71000 Series table for construction details | | | | |
| ARclad® 72000 Series | Rubber-based adhesive formulated for superior anchorage to foam & shock-absorbing materials; High peel adhesion & shear performance | See ARclad® 72000 Series table for construction details | | | | |
| ARclad® 73000 series | Acrylic designed for enhanced bonding to low surface energy materials | See ARclad® 73000 Series table for construction details | | | | |

Adhesive Guide

CONDUCTIVE BONDING

| Product | Description | Construction | 1st Release Liner (Type/Thickness) | 1st Adhesive (Type/Thickness) | Carrier (Color/Type/Thickness) | 2nd Adhesive (Type/Thickness) | 2nd Release Liner (Type/Thickness) | Peel Adhesion to Stainless Steel (ozf/in [N/25 mm]) | Volume Resistance | Surface Resistance |
|-----------------|--|--------------|------------------------------------|------------------------------------|--|-------------------------------|------------------------------------|---|-------------------|--------------------|
| ARcare® 93758 | Performance conductive acrylic; Resistant to creep, temperature, and humidity; Tin-coated backing for oxidation and corrosion resistance | SCT | Clear/PET/51 µm | Highly conductive acrylic/25 µm | Roll-annealed tin-coated copper foil/36 µm | | | 35 (9.7) | <2 mΩ | <0.5 Ω |
| ARcare® 92570 | Die-cuttable construction with superior EMI shielding and grounding capabilities | SCT | Clear/PET/51 µm | Highly conductive acrylic/33 µm | Copper foil/18 µm | | | 62 (17.2) | <2 mΩ | <118 mΩ |
| ARclad® 93853 | Heat-seal adhesive for shielding and electrical bonding; Resistant to temperature and humidity | SCT | | Conductive curable heat seal/33 µm | Roll-annealed tin-coated copper foil/36 µm | | | 40 (11.1) | <50 mΩ | <118 mΩ |
| ARclad® 9032-70 | Transfer tape adhesive with superior z-axis conductivity due to its unique filler package | TT | Clear/PET/51 µm | Conductive acrylic/25 µm | | | White PET/51 µm | 30 (8.3) | <10 mΩ | >10 kΩ |
| ARclad® 8001-77 | Double-coated adhesive offering conformability to rough surfaces | DCT | White/Poly-coated paper/160 µm | Conductive Acrylic/51 µm | Highly conductive nonwoven/20 µm | Conductive Acrylic/51 µm | Poly-coated paper/160 µm | 45 (12.5) | <0.5 Ω | <4 Ω |

VIBRATION, NOISE AND CORROSION MANAGEMENT

| Product | Description | Construction | 1st Release Liner (Type/Thickness) | 1st Adhesive (Type/Thickness) | Carrier (Color/Type/Thickness) | 2nd Adhesive (Type/Thickness) | 2nd Release Liner (Type/Thickness) | Peel Adhesion to Stainless Steel (ozf/in [N/25 mm]) |
|------------------------------|---|---|------------------------------------|-------------------------------|--|-------------------------------|------------------------------------|---|
| ARclad® 8626-78 (Grey Foam) | Acrylic adhesive designed for a water-tight bond; Resistant to temperature extremes, humidity, & vibrations | DCFT | Blue/PP/102 µm | Acrylic/58 µm | Grey or Black/closed-cell PE foam/1/32" (794 µm) | Acrylic/58 µm | Blue PP/76 µm | 100 (27.8) |
| ARclad® 8726-78 (Black Foam) | | | | | | | | |
| ARclad® 72000 Series | Rubber-based adhesive for superior bonding to foam & shock-absorbing materials; Water-tight seal with high peel & shear performance | See ARclad® 72000 Series table for construction details | | | | | | 163 (45.3) |
| ARclad® 74000 series | Clean acrylic with low outgassing and low VOCs | See ARclad® 74000 Series table for construction details | | | | | | 48 (13.3) |

WIRE MANAGEMENT

| Product | Description | Construction | Carrier (Color/Type/Thickness) | Adhesive (Type/Thickness) | 2nd Release Liner (Type/Thickness) | Peel Adhesion to Stainless Steel (ozf/in [N/25 mm]) |
|----------------------|--|---|--------------------------------|---------------------------|------------------------------------|---|
| ARclad® 74000 series | Clean acrylic with low outgassing and low VOCs | See ARclad® 74000 Series table for construction details | | | | 48 (13.3) |

Adhesive Guide

EDGE SEALING & MOISTURE BARRIER PROTECTION

| Product | Description | Construction | 1st Release Liner (Type/Thickness) | Adhesive (Type/Thickness) | 2nd Release Liner (Type/Thickness) | Peel Adhesion to Stainless Steel (ozf/in [N/25 mm]) | Moisture permeability (g-mil/m2-day) |
|---|---|---|------------------------------------|---------------------------|------------------------------------|---|--------------------------------------|
| ARclear® 44005 (formally ARcare® 93453) | Moisture barrier adhesive with strong adhesion to various substrates; Chemically inert with excellent thermo-oxidative and UV stability | TT | Clear/PET/51 µm | Rubber/13 µm | Clear PET/51 µm | 45 (12.5) | 2.2 |
| ARclear® 44010 (formally ARcare® 92734) | Moisture barrier adhesive with strong adhesion to various substrates; Chemically inert with excellent thermo-oxidative and UV stability | TT | Clear/PET/51 µm | Rubber/25 µm | Clear PET/51 µm | 45 (12.5) | 2.2 |
| ARclear® 44110 (formally ARcare® 93378) | Moisture barrier adhesive with strong adhesion to various substrates; Chemically inert with excellent thermo-oxidative and UV stability | TT | Clear/PET/51 µm | Rubber/25 µm | Clear PET/127 µm | 50 (13.9) | 2.2 |
| ARclad® 72000 Series | Rubber-based adhesive for superior bonding to foam & shock-absorbing materials; Water-tight seal with high peel & shear performance | See ARclad® 72000 Series table for construction details | | | | | 163 (45.3) |
| ARclad® 73000 series | Acrylic adhesive designed for water-tight bonding to low surface energy materials | See ARclad® 73000 Series table for construction details | | | | | 122 (33.9) |

PROCESS AIDS

| Product | Description | Construction | Carrier (Color/Type/Thickness) | Adhesive (Type/Thickness) | Release Force (g/2in) |
|---------------|--|--------------|--------------------------------|---------------------------|-----------------------|
| ARclean® 4010 | Ultra-clean liner with ultra-low extractables; Ideal for sensitive electrical components and cast materials like ceramics and colloids | SCT/Liner | Clear/PET/51 µm | | 10 |
| ARclean® 4013 | | SCT/Liner | Clear/PET/76 µm | | 10 |
| ARclean® 4026 | | SCT/Liner | Clear/PET/51 µm | | 10 |
| ARclean® 5030 | | SCT/Liner | Clear/PET/51 µm | | 54 |
| ARclad® 79027 | Low-tack acrylic suitable for temporary protection or as a process aid for casting | SCT | Clear/PET/51 µm | Acrylic/18 µm | 17 |
| ARclad® 79029 | | SCT | Clear/PET/51 µm | Acrylic/23 µm | 113 |

Adhesive Guide

ARclad® 71000 Series

| Product | Construction | 1st Release Liner (Type/Thickness) | 1st Adhesive (Type/Thickness) | Carrier (Color/Type/Thickness) | 2nd Adhesive (Type/Thickness) |
|---------------|--------------|---|-------------------------------|--------------------------------|-------------------------------|
| ARclad® 71020 | TT | Brown, Poly-coated Kraft Paper / 109 µm | Acrylic / 51 µm | - | - |
| ARclad® 71035 | TT | Brown, Poly-coated Kraft Paper / 109 µm | Acrylic / 89 µm | - | - |
| ARclad® 71150 | DCT | Brown, Poly-coated Kraft Paper / 109 µm | Acrylic / 51 µm | Clear PET / 25 µm | Acrylic / 51 µm |
| ARclad® 71180 | DCT | Brown, Poly-coated Kraft Paper / 109 µm | Acrylic / 89 µm | Clear PET / 25 µm | Acrylic / 89 µm |

ARclad® 72000 Series

| Product | Construction | 1st Release Liner (Type/Thickness) | 1st Adhesive (Type/Thickness) | Carrier (Color/Type/Thickness) | 2nd Adhesive (Type/Thickness) |
|---------------|--------------|---|-------------------------------|--------------------------------|-------------------------------|
| ARclad® 72020 | TT | Brown, Poly-coated Kraft Paper / 109 µm | Rubber / 51µm | - | - |
| ARclad® 72035 | TT | Brown, Poly-coated Kraft Paper / 109 µm | Rubber / 89 µm | - | - |
| ARclad® 72150 | DCT | Brown, Poly-coated Kraft Paper / 109 µm | Rubber / 51µm | Clear PET / 25 µm | Rubber / 51µm |
| ARclad® 72255 | DCT | Brown, Poly-coated Kraft Paper / 109 µm | Rubber / 51µm | Tissue / 38 µm | Rubber / 51µm |
| ARclad® 72340 | DCT | Brown, Poly-coated Kraft Paper / 109 µm | Rubber / 51µm | DC Scrim | Rubber / 51µm |

ARclad® 73000 Series

| Product | Construction | 1st Release Liner (Type/Thickness) | 1st Adhesive (Type/Thickness) | Carrier (Color/Type/Thickness) | 2nd Adhesive (Type/Thickness) |
|---------------|--------------|---|-------------------------------|--------------------------------|-------------------------------|
| ARclad® 73020 | TT | Brown, Poly-coated Kraft Paper / 109 µm | Acrylic / 51 µm | - | - |
| ARclad® 73035 | TT | Brown, Poly-coated Kraft Paper / 109 µm | Acrylic / 89 µm | - | - |
| ARclad® 73150 | DCT | Brown, Poly-coated Kraft Paper / 109 µm | Acrylic / 51 µm | Clear PET / 25 µm | Acrylic / 51 µm |
| ARclad® 73180 | DCT | Brown, Poly-coated Kraft Paper / 109 µm | Acrylic / 89 µm | Clear PET / 25 µm | Acrylic / 89 µm |

ARclad® 74000 Series

| Product | Construction | 1st Release Liner (Type/Thickness) | 1st Adhesive (Type/Thickness) | Carrier (Color/Type/Thickness) | 2nd Adhesive (Type/Thickness) |
|---------------|--------------|---|-------------------------------|--------------------------------|-------------------------------|
| ARclad® 74018 | TT | Brown, Poly-coated Kraft Paper / 109 µm | Low VOC Acrylic / 46 µm | - | - |
| ARclad® 74030 | TT | Brown, Poly-coated Kraft Paper / 109 µm | Low VOC Acrylic / 76 µm | - | - |
| ARclad® 74146 | DCT | Brown, Poly-coated Kraft Paper / 109 µm | Low VOC Acrylic / 46 µm | Clear PET / 25 µm | Low VOC Acrylic / 46 µm |
| ARclad® 74251 | DCT | Brown, Poly-coated Kraft Paper / 109 µm | Low VOC Acrylic / 46 µm | Tissue / 38 µm | Low VOC Acrylic / 46 µm |
| ARclad® 74336 | DCT | Brown, Poly-coated Kraft Paper / 109 µm | Low VOC Acrylic / 46 µm | DC Scrim | Low VOC Acrylic / 46 µm |

Types of Tape Construction

Transfer Tape (TT)

Unsupported adhesive is coated directly onto a release liner, allowing transfer films to be the most flexible and conformable of all bonding systems.

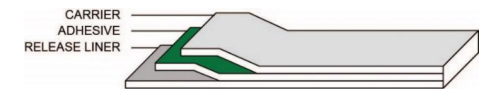
- ✓ Vibration damping
- ✓ Bonds with consistently thin line
- ✓ High strength bonding to a variety of industrial substrates
- ✓ Conforms well to irregular surfaces



Single-Coated Tape (SCT)

Single-coated tapes consist of a backing that is coated on one side with an adhesive. Single-coated tapes are available either in selfwound rolls or with a release liner for ease of application.

- ✓ Ideal for over-lamination
- ✓ Protecting
- ✓ Energy management



Double-Coated Tape (DCT)

Double-coated tapes have a carrier that is coated on both sides with an adhesive, eliminating heat and solvent cure cycles. The instant bonding capabilities of double-coated tapes make them very conducive to automation and high-speed processing.

- ✓ Offers ease of handling
- ✓ Bonding rigid materials to irregular surfaces
- ✓ Compensates for thermal expansion
- ✓ Reduces sound, shock, and vibration
- ✓ Allows use of two different adhesives per application



Heat-activated Film Tape

Heat-activated film tapes require heat and pressure to achieve final bonding to any surface.

- ✓ Ideal for plasticized materials
- ✓ High ultimate bonding strength
- ✓ Conforms to irregular or textured surfaces



High-performance Thin Foam Tape

High-performance thin foam tape is designed for mounting smart devices and other components in various electronics applications.

- ✓ Fill narrow gaps
- ✓ Excellent impact resistance
- ✓ Distribute stress uniformly over the bonded area





Adhesives Research®

About Adhesives Research:

Adhesives Research is a permanently independent developer and manufacturer of adhesives and coatings for various markets.

We utilize our material knowledge, polymer synthesis/formulation expertise, and versatile manufacturing capabilities to supply key components to the industry. We offer robust products and technologies and can also rapidly customize to meet the specific needs of an application.

Headquartered in Glen Rock, PA. Adhesives Research has also sales and manufacturing facilities in Ireland and sales offices in China and Singapore.

To learn more information about how Adhesives Research can help solve tape and materials engineering challenges, contact us today.



Scan me for more details

2023, Adhesives Research, Inc.

(October 2023)

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