

## Metalphoto® White Paper: Attachment Guide

“Identification labels used shall be as permanent as the normal life expectancy of the item and be capable of withstanding the environmental tests and cleaning procedures specified for the item to which it is affixed.”<sup>1</sup>



When selecting the proper attachment method, there are three considerations:

- Environment in which the item will be located (i.e. indoor/outdoor).
- Type of surface for attachment (i.e. smooth metal/rough plastic).
- Thickness of Metalphoto (e.g. foil 0.003” vs. rigid 0.032”).

There are two primary ways of attaching Metalphoto - either with adhesive or mechanically with rivets/fasteners.



<i>Adhesive Attachment:</i>	<i>Mechanical Attachment:</i>
• High Surface Energy (HSE)	• Rivets
• Low Surface Energy (LSE)	• Screws
• Very High Bond (VHB™)	• Hang Tags
	• Bolts
	• Snap Fit

<sup>1</sup>MIL-STD-130, Identification Marking of U.S. Military Property (<https://www.wbdg.org/ccb/FEDMIL/std130n.pdf>).

VHB™ is a trademark of 3M Corporation.

Metalphoto® is a registered trademark of Horizons Inc.

## 2 Metalphoto

### Adhesive Attachment

The most common adhesive type to use for label attachment is pressure sensitive adhesive (PSA). Before selecting the right PSA, it is important to understand the surface energy of the material to which your Metalphoto label, tag or plate will be adhered. High surface energy materials are easier to bond to than low surface energy materials.

High energy surfaces include painted and non-painted metals, plastics such as PVC, polyester, epoxy, polycarbonate, fiberglass and acrylic materials. These items accept almost any type of PSA. Low energy surfaces include plastics such as polystyrene, polyethylene, polypropylene and some coatings like Teflon®. These items exhibit weaker attraction and require specialized low surface energy adhesives.

Since **Metalphoto is compatible with all adhesive types**, the type of surface to which you intend to affix your label determines the proper adhesive to use. Always consult your Metalphoto converter to determine the right adhesive to use for your application.

For thinner gauges of Metalphoto, 0.003", 0.005" and 0.008" (sometimes referred to as "foils") it is highly recommended to attach with pressure sensitive adhesive (vs. mechanical methods). For curved surfaces, Metalphoto is available in dead soft temper so it can conform to irregular surfaces.

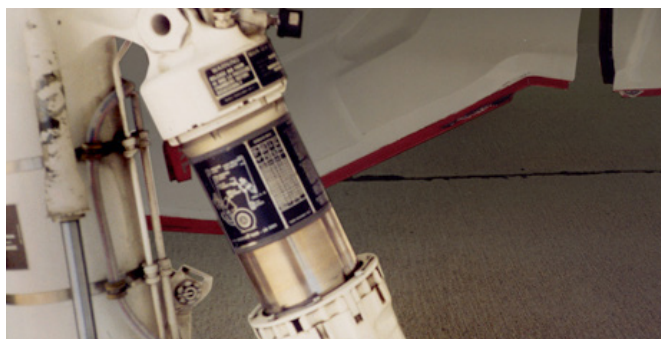
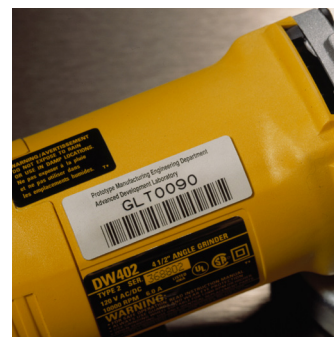
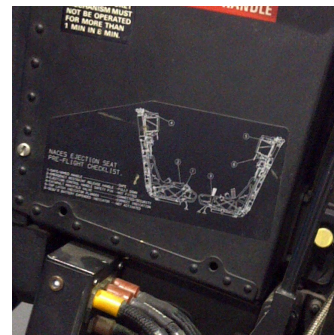
#### Characteristics of adhesive attachment:

- Does not require any specialty tools except a cleaning solution (e.g. isopropyl alcohol) and soft rubber roller.
- Bonds the entire label/plate to the mating surface.
- Adhesive helps to separate/insulate label from surface (see galvanic corrosion on page 3).
- Labels need pressure sensitive adhesive applied prior to installation (typically done by your Metalphoto converter).

To ensure your Metalphoto remains properly adhered on any surface, keep the following tips in mind:

- The surface must be dry and free of contaminants, dirt, particles, etc.
- Firm pressure must be applied to increase the flow and contact of the adhesive with the surface.
- Adhesives will meet maximum holding power after 72 hours. Do not subject label to abuse before that time.
- Adhesive should be stored at 70°F (21°C) and 50% relative humidity to retain performance and properties.
- Application surface temperature should be above 50°F to avoid adhesive becoming stiff and not properly wetting to attachment surface.

Refer to the adhesive manufacturer's specification sheet if you have any questions about proper application procedures.



## Mechanical Attachment

Mechanical attachment methods include techniques such as screw fastening, riveting, hang tags or snap fits which employ a fastener or other physical means of attachment. These methods can be used for joining Metalphoto to all surfaces including other metals.

Unlike adhesive which provides complete attachment over the entire back surface, mechanical attachment have to resist the separation force at the specific attachment points. This is why thickness of Metalphoto being used needs to be taken into consideration. Rigid (0.020", 0.032", 0.063" and 0.125") Metalphoto can be attached with adhesive and/or mechanically. If a drawing calls for Metalphoto under 0.020" to be mechanically fastened, we recommend including a pressure sensitive adhesive as well.

### Characteristics of mechanical attachment:

- Less sensitive to attachment conditions and operating temperatures.
- Typically requires holes in both Metalphoto and attachment surface.
- Maximum bond strength is achieved immediately.
- Dissimilar metal (galvanic) corrosion can be eliminated with proper insulators and fasteners.

To ensure your Metalphoto remains properly attached mechanically, keep the following tips in mind:

- Inspect hole locations on label/plate prior to drilling holes in mating surface.
- If mounting to an aluminum surface, use aluminum fasteners.
- If mounting to a dissimilar metal (steel, brass, etc.), isolate metals properly to prevent galvanic corrosion.

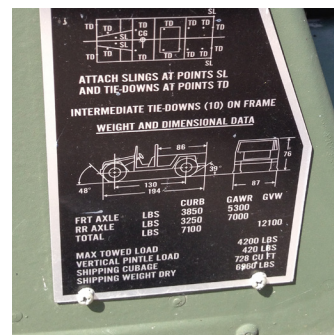
## Galvanic Corrosion

When two different metals are in direct contact and subjected to a corrosive or conductive environment, there is an electrical current flow between them. This current flow causes the corrosion of the least corrosion-resistant (active) metal to increase and corrosion of the more corrosion-resistant (inactive) metal to decrease. This form of corrosion is called galvanic or two-metal corrosion. Corrosion progressively destroys the metal, causing weakness, which can lead to failure; unless it is controlled through proper attachment.

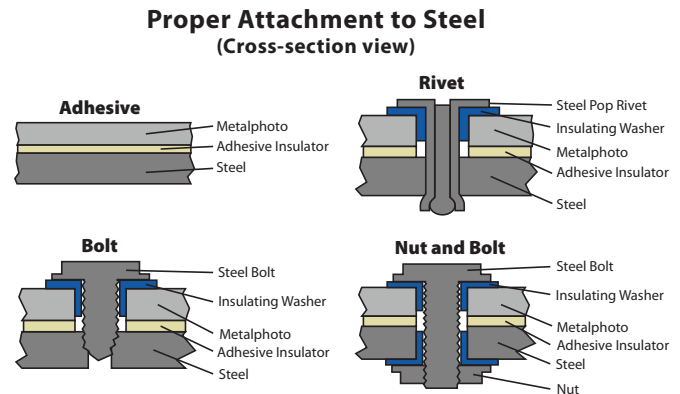
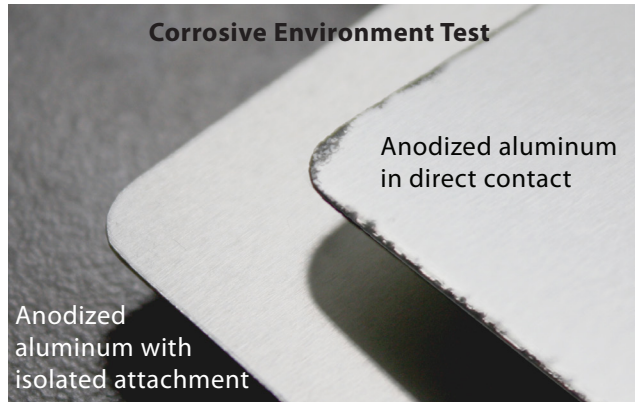
Aluminum is listed toward the active end of corrosion resistance, while brass and stainless steel are listed toward the inactive end. If aluminum and brass/stainless steel were directly connected and immersed in a corrosive environment (i.e. salt solution) the corrosive rate of the aluminum would be accelerated while the rate of the brass/stainless steel would be reduced.

When dissimilar metals come in contact (i.e. Metalphoto and steel), there are several design guidelines that can be employed to minimize galvanic corrosion:

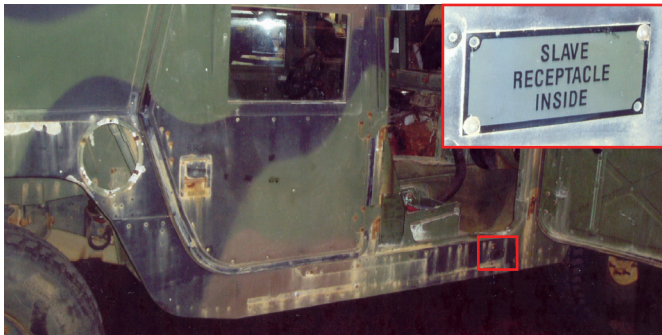
1. When connecting two pieces of the same material, use a fastener/bolt made of the same material. For example, use an aluminum fastener when connecting two pieces of aluminum.
2. When fastening aluminum to a dissimilar metal (brass, steel, etc.) insulate the two metals from each other by using proper washers, gaskets, or sleeves made of plastic. Remember to never use fasteners of dissimilar metals (i.e., never use a fastener made of brass or copper to fasten aluminum and steel).



3. When dissimilar metals come in contact, use a nonabsorbent insulator to isolate. Paint or prime the contact surface of the two metals even if they have protective coatings. Where possible, use tape instead of caulk. Caulk in a joint between dissimilar metals can squeeze out and allow the two metals to contact. Closed-cell Neoprene™ tape or pressure sensitive adhesive tends to do a better job of isolating. Apply corrosion-inhibiting material (washers, compounds, etc.) under heads of screws or bolts inserted into dissimilar metal, even if they already have been treated is suggested.<sup>2</sup>



#### Examples of Metalphoto properly attached to steel with no corrosive degradation.



## Conclusion

When Metalphoto is properly attached, it will achieve many years of reliable use. For over 65 years, industrial and military engineers have specified Metalphoto photosensitive anodized aluminum in applications where permanent product identification is critical. Metalphoto's technology permanently seals a UV-stable image inside of anodized aluminum, offering the confidence of unparalleled durability, image resolution and readability.

When paired with suitable adhesive or mechanical attachment, Metalphoto is used for component labels, machine nameplates, barcode labels, operator control panels, maintenance schematics, architectural signage and many more applications where permanent identification is critical.

Neoprene™ is a trademark of DuPont.

<sup>2</sup> Norwegian Marine Technology Research Institute (Marintek) corrosion test of anodized aluminum plates – Metalphoto. Report #23.1011.00.0391, December 8, 1991.