

Metalphoto Division, Horizons Inc.
Summary of Technical Documentation
01/25/01

<i>Testing Organization</i>	<i>Market Application</i>	<i>Conclusions</i>	<i>Tests</i>
<p>NASA, Johnson Space Center Texas</p> <p>Document Reference: Space Station Inventory Label Specification SSP 50007</p>	<p>Space Environments</p>	<p>Metalphoto reviewed and evaluated by the Materials and Failure Analysis Branch . Metalphoto was the first choice for label material choice.</p>	<ul style="list-style-type: none"> • Flammability • Toxic off gassing • Odor • fungus resistance • thermal vacuum stability • atomic oxygen and ultraviolet • thermal cycling in Low Earth Orbit 180 days+
<p>Honeywell, Inc. Satellite Systems Operations</p> <p>Document Reference: Memorandum A3-J024-M-9500916, Laboratory Case 161311</p>	<p>Space Environments</p>	<p>Metalphoto Black and silver and gold and black labels are concluded to be acceptable for exterior applications on International Space Station. Test show performance for equivalent of 10 years exposed exterior for ISS</p>	<ul style="list-style-type: none"> • Intense VUV radiation –20,000 equivalent sun hours • Oxygen Plasma asher (for AO exposure) • Solar absorptance, infrared emittance and colorimeter values recorded.
<p>Norwegian Marine Technology Research Institute (Marintek)</p> <p>Document Reference: Corrosion test of Anodized aluminum plates – Metalphoto 23.1011.00.0391</p>	<p>Marine/Shipbuilding and Repair</p>	<p>Metalphoto nameplates are concluded to have very good corrosion resistance and are acceptable for use in offshore industries.</p> <p>Care should be taken to avoid direct contact between an aluminum nameplate and a carbon steel surface.</p>	<ul style="list-style-type: none"> • Test plates subjected to immersion in sea water and salt spray chamber with leads to accelerate galvanic reactions and free corrosion potential • Polarization was changed and samples were inspected and weighed for evaluation. • Very exhaustive and well controlled test

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<p>U.S. Army/Navy</p> <p>Document Reference: Mil -P-514D, Commercial Item Description Plate, Identification</p>	<p>Military Vessels Army Vehicles</p>	<p>Metalphoto approved and specified for wide range of combat and support vehicles and ships</p>	<ul style="list-style-type: none"> ● Thermal Shock 175°F for 5 hours to -65°F for 1 hour ● Corrosion- 150 hour salt spray exposure ● Solvents ● Weather- flaming carbon arc at 18” for 50 hours
<p>Canadian Standards Association (CSA)</p> <p>Document Reference: File 11133-1, Class 7991</p>	<p>General Industrial</p>	<p>Metalphoto labels backed with 3M pressure sensitive adhesive types 467MP, 468MP, 9471LE and 9472LE are component accepted for indoor and outdoor use</p>	<ul style="list-style-type: none"> ● Temp to 150°C ● Humidity to 95% at 40°C for 72 hours ● Fading: Xenon arc lamp 250 Hours ASTM std G26 (also same test with direct water spray ● Oil Immersion SAE 20W20 at 72°C for 18h. ● Weatherometer 750h ● Abrasion Taber Abrasor 500g at 100 cycles (same with solvent added) ● Adhesion peel tests on metals & plastics performed
<p>Underwriters Laboratories</p> <p>Document Reference: Marking and Labeling Systems PGDQ2</p>	<p>General Industrial</p>	<p>Metalphoto labels with adhesive recognized as compliant to UL test parameters</p> <p>Metalphoto was qualified after months of</p>	<ul style="list-style-type: none"> ● Humidity ● Abrasion ● Temperature ● UV ● Tear Cleaners <p>Specific tests not detailed. Generally</p>

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Boeing Commercial Aircraft Company Boeing Defense and Space Systems	Commercial Aircraft Defense and Satellite	testing and is currently the most widely used aluminum label material in the companies.	included <ul style="list-style-type: none"> • Hydraulic fluid • Jet fuel • Temperature extremes • Humidity, water, salt spray tests • Space environments • Abrasion • Solvents • UV
Document Reference: BAC5875			
Douglas Products Division Boeing Company	Commercial Aircraft	Metalphoto approved and chosen as primary aluminum marking method for aircraft production and spares.	<ul style="list-style-type: none"> • Water immersion • Fuel –1 hour TT-S-735 II, and ASM 2629 • Cleaners- Specs P-C-437 and MilC 87937 • Hydraulic Fluid –1 h room temperature • Jet Engine Oil • Peel Strength • Weather- 600 hour weatherometer • Abrasion –750 cycles 1000g • Temp =450 F 6hours, -64F 3 hours
Document reference: DPS 9.60, DMS 1674			
Horizons, Inc.	Industrial and Military	Metalphoto is determined to be suitable for use within a wide range of harsh environments.	<ul style="list-style-type: none"> • abrasion, Tabor Abrasor • Media Blast- 20% glass bead 20PSI industrial fluids, • temperature, • ultraviolet light, • salt spray, acid, base solutions
Refer to Metalphoto Performance Chart for details and recommendations			

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Lockheed Martin – Ft. Worth Texas	F22 Military Aircraft	Metalphoto is included on the qualified products list.	<ul style="list-style-type: none"> • Refer to GPP-455 test procedures

Document reference: 5PTPNG01

<p>United States Federal Government</p> <p>Document Reference: Federal Specification GPP-455</p>	<p>Tested for use by all Federal Agencies</p>	<p>Metalphoto is the subject of an extensive test to verify acceptability for a variety of military applications for the Government. GPP-455 was written specifically as a reference test giving performance parameters for Metalphoto.</p>	<ul style="list-style-type: none"> • Abrasion 7000 cycles at a 1000 g load • 3% Nitric acid immersion for 24 hours • 1000°F for 10min • 100 hour in a weatherometer for UV and water resistance • Oxygen aging 96 hours, 300psi • Oven 80°C for 72 hours • Solvent immersion for 24 hours • Also cleaning, staining and low temp resistance
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