A Word About K-Sun LABELShop® Tape Tests

K-Sun LABELShop® Tapes were tested in our laboratory and in the field to simulate harsh conditions. All tests were conducted by K-Sun personnel except peel value tests which were conducted by an independent company. The results and conclusions reached in this report are from the tests.

You may experience different results than those stated in this report depending on many factors like changing humidity, temperature, age of the tape, surface materials used, application temperature, etc. Therefore, it is strongly recommended you test a specific K-Sun LABELShop® tape on the surface you want to label to be sure it meets your needs. It would be impossible for us to test all tapes under all field conditions. These tests are a guide to help you determine if the label made with K-Sun LABELShop® printers will work for most of your applications.

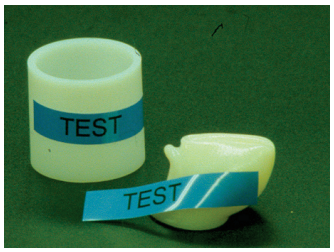
Conclusion
Based on our tests, K-Sun LABELShop® tape is very durable under a wide variety of harsh conditions found indoors or outside. When properly applied to a clean, smooth surface at temperatures above 40ºF, K-Sun LABELShop® tape can withstand extremes in heat, cold, and high humidity conditions. The labels can withstand cleaning with many household cleaners and solvents and will stay attached with excellent resistance to smearing, scratching, and edge curl or peel.

Heat Resistance

A series of different color K-Sun LABELShop® tape samples were tested on metal, glass, plastic, and wire for heat resistance. Tests were conducted in a drying oven (American Scientific Products Model DX-58).

TEST #1
The following tape samples were placed on sheet metal and glass panels and heated at 100ºC (212ºF) for 24 hours.

Type of Tape	Scratch Resistance	Color Background	Adhesion Strength	Image Quality
Black on Green	excellent	no change	excellent	excellent
Black on White	excellent	no change	excellent	excellent
Black on Yellow	excellent	no change	excellent	excellent
White on Green	excellent	no change	excellent	excellent
White on Clear	excellent	no change	excellent	excellent
White on Black	excellent	no change	excellent	excellent
White on Red	excellent	no change	excellent	excellent



PLASTIC CORE MELTS BEFORE LABEL

TEST #2
The test panels from Test #1 were reheated for a second 24-hours at 150ºC (302ºF). (2) New panels on glass and sheet metal were inserted in the drying oven and heated for 24 hours at 150ºC (302ºF) along with the original test panels. Test panels from #1 were observed. Only slight fading of tape was noted on all samples except “White on Black” and “White on Green”. The “White on Black” and “White on Green” did not fade. All samples from Test #1 had excellent scratch resistance, adhesion strength, and image quality.

The two new panels heated for 24 hours at 150ºC (302ºF) had very slight background color fading in “Black on Yellow”, “Black on White”, “Black on Blue”, and “White on Red”. All other test sample colors on the new test panels did not show any change in color and exhibited excellent scratch resistance, adhesion strength, and image quality.

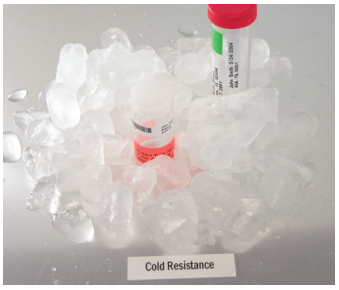
TEST #3
Heat test of adhesive on a curved surface. A sample of “Black on Blue” tape was attached to a round polystyrene core and heated for 24-hours at 150ºC (302ºF). Upon removal from the drying oven, it was observed the plastic had melted but the tape strip was not effected. The tape showed no sign of fading, or damage. The adhesive remained attached to part of the melted plastic.

TEST #4
A test panel of tape was placed outdoors on the building roof on a metal plate facing South. Temperature variation on the roof was a range from 30ºF to 98ºF in a variety of humidity and sunlight conditions for 90 days. All tapes tested, except Fluorescent Colors, held up to this environment with no background fading or image deterioration. The Fluorescent colors had background fading but image quality was not changed. All tape samples had excellent scratch resistance and adhesion to the metal plate. Because outdoor testing is still underway and will continue for several years, a projected outdoor life is not possible at this time. However, early test data indicates K-Sun LABELShop® tape will stand up to all weather conditions depending on the surface type and temperature when applied.

CONCLUSION
K-Sun LABELShop® tapes retained their adhesive strength, image quality and scratch resistance at high temperature ranges over a sustained period of time. Minor background color fading did occur in some of the tapes when temperatures reached 150ºC (302ºF) for 24 hours but it was not significant. For general labeling of equipment, wire, panels, folders, manuals, parts, bins, shelves, pipes, plastic and many other smooth surface items, K-Sun LABELShop® tape will stand up to high heat conditions.

Cold Resistance

Samples of K-Sun LABELShop® tape were placed on flat metal, glass, and curved plastic cores and placed in a freezer for 30 days at 0ºF. When removed, all samples were covered with ice and allowed to melt. When observed, all tape samples remained attached securely and there was no edge peel or curl. The scratch resistance and image quality of all tape samples was excellent. Adhesion was strong.



CONCLUSION

Moisture and extreme cold did not effect the labels on sheet metal, glass, or plastic. Based on a 30 day test, it appears that K-Sun LABELShop® tape will not be adversely effected by cold temperatures so long as the label was applied on a clean, dry, smooth surface at room temperature. Once applied properly, the adhesive will hold firmly on a variety of smooth surface materials even in cold, wet environments.

Wire Tabbing and Marking

Samples of K-Sun LABELShop® tape were placed around electrical wire with the adhesive surfaces joined vertically and horizontally. The adhesive was applied to itself in a vertical tab position and also applied label surface to adhesive and rolled horizontally around itself. The samples were heated in a drying oven at 150ºC (302ºF) for 24-hours. Other samples were frozen at 0ºF for 30 days, and submerged in water for 30 days.

HEATED TEST

The samples that were heated for 24 hours at 150ºC held up extremely well and did not separate. The tape remained firmly adhered to itself around the wire. Only slight fading of the tape background color occurred but the image quality and scratch resistance were both excellent. (Of special note: the background color of the red and white wire also faded in the heat)

FROZEN TEST

The samples placed in the freezer at 0ºF also held up very well. The adhesive held firmly to itself and did not release or separate from the wire. Both the vertical and horizontal labeled samples stayed together during extreme cold and wet conditions.

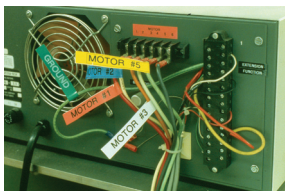
WATER TEST

The samples submerged in water at 70ºF for 30 days held up extremely well. The adhesive did not separate from itself. The tape did not swell or peel off the wire. Image quality and scratch resistance of all samples submerged in water for 30 days was excellent.

CONCLUSION

K-Sun LABELShop® tape is a very thin polyester material with an acrylic adhesive that is compatible with itself. Tape samples tabbed over wires stayed together in high heat conditions. Cold temperatures and extreme moisture did not adversely effect the adhesive or image quality. The labels remained attached to the wire. Because the tape is thin, it is an excellent product for wire marking.

WIRE TABBED IN WATER FOR 30 DAYS



LABELShop® TAPE IS DESIGNED TO STICK TO ITSELF

Peel Strength

Six separate samples of K-Sun LABELShop® tapes were tested for peel strength on stainless steel and glass. Test method PSTC-1 “Peel Adhesion for Single Coated Tapes 180 degree Angle” was used. The following results were observed:

TEST ON STAINLESS STEEL

Black on Yellow.....	.878 lbs./in. (398.2 grams/in.)
Black on Fluorescent Orange.....	.909 lbs./in. (412.4 grams/in.)
Black on White.....	.878 lbs./in. (398.2 grams/in.)

TEST ON GLASS

Black on Yellow.....	1.599 lbs./in. (725.3 grams/in.)
Black on Fluorescent Orange.....	1.348 lbs./in. (611.6 grams/in.)
Black on White.....	1.724 lbs./in. (782.2 grams/in.)

CONCLUSION

The adhesion strength of K-Sun LABELShop® tape will vary from one color to another and also depending upon the surface applied. It is recommended that all K-Sun LABELShop® tape be applied on a clean, dry, smooth surface for optimum holding results. It is safe to assume all K-Sun LABELShop® tapes will remain affixed to most smooth surfaces under all but the most extreme environments.

Chemical Resistance

K-Sun LABELShop® tapes were tested for resistance to water, acid, oil, and cleaning solvents found in hospitals, labs, factories, offices, and homes. The following tests were conducted and the results observed.

TEST #1 – WATER

Samples of K-Sun LABELShop® tapes were applied to curved plastic cores, wire, flat metal, and glass slides and submerged 100% in tap water at 70°F for 30 days. All tape samples stayed permanently affixed to all the different materials. The adhesive did not separate or peel off. Scratch resistance and image quality remained excellent. No fading of tape color was observed and no swelling of tape base or adhesive bleed was observed. The tape samples tested held up extremely well to total submersion in water for 30 days.

TEST #2 – ACID

A sample of "Black on White" tape was placed on a glass slide and immersed in a solution of Hydrochloric Acid 20, Baume (31.45%) and 50% distilled water for 30 days. The sample remained affixed to the glass slide. No fading of the image or tape background color was observed. Scratch resistance and image quality was excellent. No adhesive peel or curl was observed.

TEST #3 – CLEANING SOLVENTS

One of the major concerns of labels in special environments is cleaning. Hospitals, offices, labs, plants, warehouses, and homes all need to clean labels from time to time. (8) different cleaning products were tested on four color tape samples placed on metal plates. Eight plates were made up with four tape samples each (Black on White; Black on Fluorescent Orange; Black on Yellow; and White on Blue) The samples were cleaned with the liquid and then rubbed dry. This procedure was repeated 500 times on each tape sample. The cleaners used were Fantastick, Mr. Clean, Lysol, 409, Windex, Clorox Bleach, Ammonia, Isopropyl Alcohol 70% by volume. The following results were observed:

Results Observed	Black on White	Black on Fl. Orange	Black on Yellow	White on Blue
Scratch Resistance	excellent	excellent	excellent	excellent
Tape Color Bkgrd	no change	no change	no change	no change
Adhesive Strength	excellent	excellent	excellent	excellent
Image Quality	excellent	excellent	excellent	excellent

ACID BATH TEST FOR 30 DAYS

CONCLUSION

All of the test samples held up to cleaning with the above products 500 times. The tape background colors did not fade or discolor. The adhesive remained affixed to the metal plates with no peel or curl. The scratch resistance and image quality were excellent. Based upon the tests conducted, it appears K-Sun LABELShop® tape can stand up to multiple cleaning with most household products found on the store shelf. However, if you have specific cleaner not tested here, it is recommended you test a tape sample to determine if it meets your specific requirements.

Labels on Demand to Meet a Wide Variety of Applications

K-Sun LABELShop® tape is very unique. It is a tear–resistant polyester base with a pressure sensitive acrylic adhesive system designed to provide durability and a long life. Both Standard and Industrial grade tapes will be available in dozens of size, color, and adhesive combinations to meet specific market applications. K-Sun has the capability to design and manufacture a wide range of specialty tapes to meet new applications that arise. If you have a need for a special adhesive or color, be sure to contact you local K-Sun LABELShop® distributor.