

Reference Guide for Pressure-Sensitive Adhesive Tapes



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Tapeology: An Introduction to Pressure-Sensitive Tape

• What is a pressure-sensitive tape?

A pressure-sensitive tape is comprised of a backing coated with an adhesive on one or both sides. In the case of a double-sided tape, a release liner is utilized to prevent the roll of tape from adhering to itself.



• What are the different components of a tape?

BACKING: A backing (or carrier) is a thin, flexible material that can be coated with adhesive. It can be made of paper, fabric, film, foam, foil, non-woven material or laminate.

ADHESIVE: Typical adhesive types are natural or synthetic rubber, acrylic, and silicones.

PRIMER: A primer is used to increase the bond of the adhesive to the backing. The use of a primer assists in keeping the adhesive on the backing when a tape is removed.

RELEASE LINER: A liner is typically used for double-sided tapes, but is sometimes found on single-sided tapes as well. Siliconized paper is the main type of release liner. Siliconized film is also used in applications requiring greater flexibility and high tensile strength.

RELEASE COATING: A release coating is applied to the backing and allows the tape to unwind from the roll. Without a release coating, the tape would adhere to its own backing, and would not unwind.





How is pressure-sensitive tape manufactured?

How is tape applied?

Like the name says, pressure-sensitive tapes require "pressure" to ensure bonding. Bonding should take place at a moderate temperature (68-72 degrees F, 20-22 degrees C). To ensure maximum initial adhesion, even pressure should be applied. For acrylic tapes, maximum adhesion is typically achieved only after 72 hours minimum of dwell time. In most cases, heat, water, solvents or any other pre-treatment methods are not necessary. Many tapes, like some tesa fastening tapes, continue to build adhesion beyond 72 hours and reach maximum adhesion after seven to 15 days, due to the high level of adhesive cross-linking.



BONDING TO LOW SURFACE ENERGY (LSE) OR "HARD-TO-STICK-TO" SURFACES: Teflon, silicones, and dielectric materials (e.g. polyethylene and polypropylene) are difficult to bond. You can increase adhesive strength by pre-treating the surface with a method specifically suited to the material in question. As an example, polyethylene or polypropylene can be pre-treated via corona or adhesion promoters.



BONDING TO HIGH SURFACE ENERGY OR "EASY-TO-STICK-TO" SURFACES: In general, these surfaces bond well. However, in isolated instances, additives (e.g., plasticizers) can migrate to the surface and interact with the adhesive. For this reason, it is recommended that a compatibility test be done (especially when the tape is intended to be removed or it is applied to flexible PVC).

BONDING TO METAL SURFACES: To ensure that a chemical reaction does not occur, a check should first be made on non-ferrous metals (i.e., lead, cadmium, copper, brass, nickel). Such a chemical reaction could alter the surface polarity after contact with the adhesive.

How should application surfaces be prepared?

To guarantee optimum adhesion, surfaces must be clean, dry, grease-free, oil-free and lint-free. Substances such as dust, grease and wax must be removed before bonding. Typical cleaners include but are not limited to alcohol (IPA), esters (e.g., ethyl acetate or acetone), and naptha-based products.

• How should tesa products be stored?

For pressure-sensitive tapes to retain their properties while in storage, the following conditions should be complied with:

- 68-72 degrees F, 20-22 degrees C
- 50% relative humidity
- Rolls stored flat in their original packaging and away from direct sources of UV (i.e., lights, sun)
- Logs and spooled rolls should be stored to prevent distortion

Unless otherwise indicated on packaging, products are guaranteed for 12 months under the above-mentioned conditions.



• What are the common tests/properties of pressure-sensitive tapes?

ADHESION: Adhesion is the strength of the bond between a tape and the application surface. To measure adhesion, tape is applied to a stainless steel panel. The tape is then removed. The force required to remove (or peel) the tape determines its adhesion level. The force is measured in ounces per one inch of tape.



To measure the adhesion of masking and packaging tapes, tesa utilizes the 180-degree peel method (PSTC 3 and PSTC 1). For fastening tapes, in addition to the 180-degree peel, tesa strongly recommends the 90-degree peel method, which is the best measurement of peel adhesion to diverse substrates.

Peel adhesion is not a perfect correlation to the strength of the adhesive bond. Why? Because the test measures the initial bond, and many tapes have adhesives that build bond strength over time. Also, the test utilizes stainless steel as the surface for which the tape is applied. Typically, tape is not applied to stainless steel in real-life applications. However, the test is a good indicator of relative adhesion strength from one tape to another.





COHESION: Cohesion is the internal strength of an adhesive. Cohesive failure can be observed when removing an applied tape and finding adhesive residue on both the tape backing and the applied surface. This would indicate that the adhesive has poor internal strength, or poor cohesion.

SHEAR: Shear is the ability of an adhesive to resist creep or slippage. This property is measured by adhering a one-inch piece of tape to a stainless steel panel, then hanging a weight on one end of the tape. Shear is expressed in units of time prior to the tape slipping from the steel panel.







Good shear properties are especially important for applications like splicing where the tape is used for holding two substrates together, with force being applied in opposite directions.

TENSILE STRENGTH: Tensile strength is the force (or load) required to break a tape. This property is measured by taking a one-inch-wide piece of tape, grabbing it at both ends, and then pulling in opposite directions until the tape breaks. Tensile strength is measured in pounds per one inch of tape.

ELONGATION: Elongation is the percent in which a tape can be stretched just before breaking. This property is measured using the same method for measuring tensile strength.

THICKNESS: The thickness of a tape is the distance between the two opposite surfaces of the whole tape. Thickness is expressed in mils, or thousandths of an inch.







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Glossary of Technical Terms

• Features Relating to Backing

TENSILE STRENGTH: The load, or force, at which an adhesive tape breaks. Especially important for tapes used in baling and bundling.

CONFORMABILITY: Ability of tape to remain in full contact with the surface of an irregularly-shaped object without puckering or creasing.

ELASTIC MEMORY: Tendency of some tapes' backing to revert to its original length after becoming elongated.

ELONGATION AT BREAK: Increase in length of tape that is subject to a force which causes it to break. (Expressed as a percentage of the initial length.)

FLAME RETARDANT: (also, Self-Extinguishing, Fire-Resistant) Ability of tape to withstand exposure to a flame. Flame-retardant materials burn in direct contact with a flame, but combustion is not maintained when the flame is withdrawn. "Non-flammable" materials do not burn even when in contact with a flame.

FLEXIBILITY: Ability of a tape to be conformable or pliable during application. (Particularly affects low-temperature uses.)

IMPACT RESISTANCE: Ability of an adhesive tape to withstand sudden shocks and loads. (Especially important for tapes used in packaging.)

MOISTURE ABSORPTION: Measures the quantity of moisture absorbed and retained by a tape under specified conditions.

PRINTABILITY: Ability to accept printing inks and then maintain graphic presentation after winding and application.

WATER VAPOR TRANSMISSION RATE: Weight of water vapor passing through a defined tape surface under defined conditions of humidity, temperature and time.



Glossary of Technical Terms

• Features Relating to Adhesive

ADHESION: Strength of the bond of a tape to a surface.

COHESION: Internal strength of the adhesive.

CROSS-LINKING: Development of a three-dimensional structure within an adhesive in order to improve bond strength and resistance to temperature, oil or solvents.

DELAMINATION: A separation of the backing and the adhesive into distinct layers (also referred to as adhesive transfer).

SHEAR: The ability of an adhesive to resist creep or slippage.

WET GRAB / TACK / QUICK STICK: Ability of a tape to create an immediate bond, with a measurable strength, during the contact of the adhesive with the substrate, without applying external pressure.

General Terms

HEAT RESISTANCE: Ability of a tape to withstand a given temperature under specific conditions.

PRIMER: A coating used to enhance the bond of an adhesive to a backing.

RELEASE COATING: A coating applied to the outer surface of a backing, which will enable a tape to unwind from the roll.

RELEASE LINER: A paper or plastic material, typically having a silicone coating on one side, which is used to allow a tape to unwind from a roll (typically used for double-sided tapes and transfer adhesives).

RESISTANCE TO WEATHERING, OILS, GREASE, SOLVENTS, ACIDS, BASES, ETC.: Ability of a tape, once applied, to remain effective under such conditions.

THICKNESS: Distance between the two opposite surfaces of the whole tape.

TRANSFER ADHESIVE / TRANSFER TAPE: A layer of adhesive, without a backing, coated onto a release liner so that it can be unwound (sometimes the adhesive has a reinforcing material to enhance strength and handling).

MOPP: Monoaxially-oriented polypropylene

BOPP: Biaxially-oriented polypropylene

EB: Cured electron beam curing



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Guidelines for Success

• Choosing the Right Tape for the Job

In choosing the right tape for the job, follow these guidelines to increase the likelihood of success:

- Determine the type of materials Will the tape be placed on metal? Plastic? Cardboard? Other?
- Determine the surface condition Will the surface of this material be smooth or rough?
 - Will the surface of this material be smooth or rough?
 Determine the adhesive duration requirements
 Does the application require a permanent or temporary bond? If temporary, must the tape remove cleanly
 (e.g., for masking, surface protection or temporary holding)?
- Determine the environmental conditions Will the tape be subjected to extreme temperatures? Humidity or moisture? Chemical substances? UV light?
- Determine the application conditions How much stress is the adhesive expected to take, and in what direction is the stress expected to be applied? Does the tape need to be flexible? Would a certain thickness be more appropriate than another? How will the tape be applied? By hand? By machine?
- Determine additional needs Does the application require a colored backing? Are there specifications that the tape must comply with (e.g., military or ASTM)?



United States & Canada tesa tape, inc.

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5825 Carnegie Boulevard • Charlotte, NC 28209 Phone: 1-800-426-2181 • Fax: 1-800-852-8831 Email: customercare@tesatape.com Web Site: www.tesatape.com México

tesa tape México, S.A. de R.L. de C.V. Av. Santa Fe No. 170 • German Centre P 7-4-14 Col. Lomas de Santa Fe • Mexico D.F. C.P. 01210 Phone: +52 (55) 5292 6978 • Fax: +52 (55) 2282 7580 Email: mexico@tesatape.com



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