

# TESTMETHODS

of monta Klebebandwerk GmbH



## CONTENT

2	Introduction	8	Rolling ball
3	Overview	9	Shear adhesion
6	Conditions	10	Carton test
7	Adhesion strength	11	Breaking load

# INTRODUCTION

With this brochure, we inform you about the test methods used at monta. First, we give you a general overview. In the following chapters, you can find more detailed information about the different test methods.

Various factors are to be considered and adjusted when you choose a self-adhesive tape for a special application. The correct choice is therefore not always easy.

The right choice of products protects your goods and saves money. A securely sealed carton is essential for safe transportation from dispatch to final destination.

Test us. We accept the challenge and are the competent partner at your side.



# OVERVIEW

What criteria have to be considered for a secure, permanent carton closure with self-adhesive packaging tape?

Not only do the different test values have to be determined and analyzed, but the different parameters have to work together to support your requirement. The pairing of an adhesive tape and of an appropriate, dry and clean carton is the essential starting point.

Further, temperature, pressure and conditions of application have great influence regarding a secure seal.

We therefore present to you the most important test methods which we use to analyze and monitor our quality:

## 1. ADHESION STRENGTH

In practice, the adhesion strength has to be analyzed in relation to the tack and shearing strength on a carton. In the lab, the adhesion strength is tested on a steel plate in order to receive comparable results. A high adhesion strength on steel alone does not guarantee a permanent carton closure. The balanced interaction of adhesion strength, tack and shear adhesion on carton are crucial for a secure carton closure.

## 2. ROLLING BALL

The tack describes the initial adhesion which is determined with the rolling-ball-test. In this test, a measurement is taken of the distance a steel ball travels when released down a ramp onto the sticky side of an adhesive tape. The shorter the distance, the better the tack.

A good rolling-ball-value speaks in favor of the adhesive and demonstrates that the adhesive links itself to the carton fibers quickly and is bonding well with the substrate.

## 3. SHEAR ADHESION

Shear adhesion describes the connection between adhesive and carton. For the shear adhesion test, one end of a length of self-adhesive tape is applied to a vertically positioned piece of recycled carton (carton from 100% recycled paper) and a weight is applied to the free end. The time until the weight pulls the tape off is measured. The longer it sticks, the better the shear adhesion.

## 4. THE CARTON TEST

When selecting a self-adhesive tape, the carton quality and the reset force of the carton flaps must be considered. The carton surface should be dry, clean and free from separating agents such as silicon or wax. The carton should be well cut, show neat folding and be glued precisely.

In the 1980s, monta developed an application-oriented test which is an important element of the monta quality testing routine. A sealed overfilled recycled carton is placed for 48 hours in a closed room with a temperature of 40°C and 60% air humidity. This test shows whether the tape sticks on the carton and matches the used carton quality.



## 5. BREAKING LOAD

The stability of the adhesive tape is important, especially when the closed carton is stressed during transport, the package is very heavy or when dangerous goods are shipped. The determined breaking load describes the force which is necessary to break/tear an adhesive tape of defined width.

# ADVICE FOR STORAGE AND APPLICATION

## 1. ADVICE FOR STORAGE

Self-adhesive packaging tapes can only be stored for a limited period of time due to their characteristics and chemical composition. High temperatures in summer and sub-zero temperatures in winter influence the tape even in closed cartons. Inappropriate storage exerts influence on the product characteristics: the roll of adhesive tape changes its shape and the properties of the adhesive change. The adhesive embrittles and comes loose. For optimal handling and processing, we recommend storing the self-adhesive tapes in the original packaging in a dry and dark place and between 15°C and 25°C. This way the tape keeps its original characteristics and can be used without problems.

## 2. ADVICE FOR APPLICATION

When applying self-adhesive tapes on a carton, always put focus on a steady application pressure. If the application pressure is not firm enough, the tape lifts itself from the carton surface and the carton opens.

## Traceability / Inspection Number

In the industry, the traceability of the used materials in production is a key instrument of the quality management and is used at monta Klebebandwerk GmbH, as a DIN EN ISO 9001 certified company.

From the raw materials to the finished product, every single step in production is controlled, protocolled and finally printed as an encoded inspection number on the carton label above the barcode on the left side. The inspection number allows the company to retrace important information of the production, such as raw material batches, the coating line or worker at the slitting machine.

**Trocken und lichtgeschützt bei ca. 20 °C lagern.**  
**Store in a dry place at about 20 °C.**  
**Keep away from sunlight.**  
**Tenir au sec à environ 20 °C et à l'abri**  
**de la lumière.**  
**Bei Raumtemperatur verarbeiten.**  
**To apply at room temperature.**  
**Appliquer à température ambiante.**

## EXCURSUS

In English, self-adhesive tapes are also referred to as „pressure sensitive tapes“ (PST). PST emphasizes that self-adhesive tapes have to be applied with pressure. This enables the adhesive to connect to the carton surface and ensures a secure closure of the box.

When applied with a tape dispenser, please make sure that the track is close to the carton to fix the tape with the pressure flap along the total length of the carton and the front sides.

When a carton closing machine is used, the tape is automatically applied with steady pressure.

In order to avoid damage to the roll, please do not open carton or plastic shrink with sharp or pointed objects. Our boxes do have a so called push-and-pull perforation, so the cartons can be opened easily.

Generally it is important that both adhesive tape and carton are stored at room temperature.



# CONDITIONS

Test results depend very much on the used testing equipment, a thorough execution and consistent room conditions. All tests are conducted according to our test methods.

OPTIMAL CONDITIONS ARE STRINGENT FOR EXACT TESTING:

- Cleanliness, air humidity and room temperature are regularly monitored.
- Laboratory equipment complies with international standards and is regularly maintained and calibrated
- Steel plates for testing are cleaned with a solvent moist cellulose and dried with a lint free cloth before and after every testing.
- Tests are executed by trained personnel.

This way we guarantee correct test results.



# ADHESION STRENGTH

## 1. DEFINITION

Adhesion strength describes the force necessary to remove a strip of self-adhesive tape of defined width under defined conditions (angle, pressure, speed) from a standard stainless steel plate for testing.

## 2. NATURE OF TEST

Before a sample of the adhesive tape is taken for testing, three outer layers of the roll of adhesive tape are removed.

The sample has a dimension of approx. 400mm length and 25mm width. Because 80% of self-adhesive tapes for packaging are wider, a piece in the required 25mm width is cut from the original roll.

This sample is placed on a stainless steel plate (200mm x 50mm x 2mm) and pressed on with a 2kg metal roller (diameter min. 50mm).

From the prepared steel plate, one end of the adhesive tape (25mm in length) is lifted from the surface. The steel plate is fixed in the moveable clamp of the testing machine; the free end of the tape is fastened with another clamp.

With a speed of 300 +/- mm/min., the adhesive tape is peeled from the steel plate. The testing machine records the needed force and shows the values on a display constantly.

After the test has been completed, the average value is calculated as the adhesion strength on steel.

The value is expressed with the force (N), which is needed to peel the tape from the steel surface and the width of the sample (25mm): N/25mm.

For the various types of adhesive [natural rubber, synthetic rubber (hotmelt), acrylic] and adhesive formulations, different average values have been defined and specified.

This test method according to Afera 5001 was developed for monitoring of the production and definition of specifications. At montax the test results qualify the release of an adhesive mixture, the coated jumbos and slit material. Also the adhesion strength is used for comparison of products.

Yet the adhesion strength alone provides limited information for use in practice. Other criteria have to also be considered.





# ROLLING BALL

## 1. DEFINITION

The „rolling ball“ test determines the tack, i.e. immediate adhesion of a self-adhesive tape. The immediate tack is important for secure carton sealing because the reset forces put immediate pressure on the adhesive tape.

The denotation “tack” refers to the immediate tack/wet grab on steel surface and is not necessarily synonymous for the initial adhesion on carton. Here the wetting characteristics of the carton also are very important. The initial adhesion of natural rubber adhesives is better than the initial adhesion of hotmelt or acrylic adhesives, because natural rubber adhesives connect better with the carton fibers due to their composition.

## 2. NATURE OF TEST

The outer layers of an adhesive tape roll being tested are removed after which a sample of 20cm is taken. This is placed with the sticky side up on scale paper. A steel ramp is placed at the end of the test setting.

Using tweezers, a cleaned metal ball is placed on the rolling-ball-ramp and rolls down the ramp after release of the “brake”.

The distance the steel ball travels on the tape (measured from the end of the ramp) is the rolling-ball-value, which is measured in cm. Depending on the type of adhesive, different values are achieved.





# SHEAR ADHESION

## 1. DEFINITION

The shear adhesion describes the time it takes for a sample of self-adhesive tape under constant strain to shear off a defined testing surface and shows how well the adhesive connects with the substrate.

Further, the shear adhesion is a measure of cohesion (internal stability) of the adhesive and provides information regarding the quality of the adhesive.

## 2. NATURE OF TEST

In preparation, from a roll of self-adhesive tape, two samples with a width of 1cm are taken. One end of the sample is stuck to an area of 1cm<sup>2</sup> of testliner (100% recycled paper) and pressed four times onto the carton using a 2kg heavy roll.

Now the shear adhesion test is completed in a conditioned room with 23°C +/- 2°C. The testliner is placed in a vertical bracket. The lower end of the adhesive strip is formed to a loop to which a weight of 565g is fixed. This tensile strain causes the tape to shear off.

With an integrated time sensor the time until the tape shears off is measured and shown in hours.

Depending on the type of adhesive, the shear values vary. The best values are achieved with natural rubber. The results of acrylic adhesive lie usually only within minutes.

At monta, the tests are explicitly conducted on testliner. This way we come up to the real requirements, the secure closure of cartons. How well an adhesive connects to the carton fibers is in practice a main factor. According to Afera, the shear adhesion is tested on stainless steel which does not give much feedback to the performance of the adhesive in practice.



# CARTON TEST

The carton test was developed in the 1980s by monta. This practical testing method complements the theoretical standard tests and provides realistic results regarding a permanent carton closure.

## 1. DEFINITION

The carton test demonstrates whether an adhesive tape becomes loose when sealing an overfilled recycling carton and the carton opens unintentionally.

## 2. NATURE OF TEST

A carton made from recycled paper is filled with tubes (long adhesive tape cores) which overlap the carton by 2-3mm. We use the same cartons for testing which are used in our production. The test is conducted with every batch of adhesive.

Through the overfilling, a pressure is created which increases the reset forces of the carton flaps. Then the carton is closed with self-adhesive tape. The tape is applied over the whole length of the carton, overlapping both front sides by 5cm. Now the carton is labeled with date, time and reference number.

The overfilled and sealed carton is put into a climate room with 40°C room temperature and 60% relative air humidity for 48 hours.

The combination of heat and air humidity is a challenge for adhesive tape and carton:

- The high air humidity diffuses into the carton and affects the carton stability and the tape from the inside and the outside.
- By overfilling, the tension created challenges the closure of the carton.

Carton and self-adhesive tape meets requirements if the tape does not shear off and the carton stays well closed. The test is passed when the carton can be removed from the climate room after 48 hours without having opened.

You are probably aware that if a carton does not stay closed, the fault is first suspected within the tape. But the carton surface can be very variable due to the share of recycled paper, varnishing or impregnation. The right combination of carton and tape is crucial. If required, we are happy to test on the carton used by you or your customers.



# BREAKING LOAD

## 1. DEFINITION

The breaking load describes the required force to break a defined strip of self-adhesive tape.

## 2. NATURE OF TEST

From a tape roll for testing, the outer layers are removed and 5 samples (200mm x 25mm) are taken. The sample strips are placed vertically in the tractive power testing machine. With a speed of 300 +/- 30mm/min, the fixed sample strips are pulled apart until they break.

The average values of the 5 tests result in the breaking load, which is expressed by the force (N) and the width of the sample (25mm): N/25mm. Depending on the supporting material used and its thickness, different values are specified.

The breaking load according to Afera 5004 gives information about the uniformity and quality of a self-adhesive tape, as well as the ability to withstand strain.





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