Often copied but never matched: Our double-sided PET range

Technical guide

Discover the ideal bonding solution

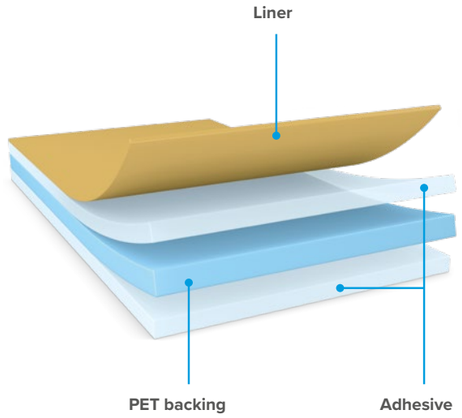
Our double-sided filmic performance offer – certified and unmatched

We have expanded our product assortment with two new products (tesa® 4945 and tesa® 4953) that meet the same high-performance standards as our famous tesa® 4965 Original Next Gen (205 µm), providing customers with a full range of tape thickness options.

tesa® 4945 and tesa® 4953 offer two new thicknesses - 50 µm and 100 µm – giving customers greater flexibility and the ability to choose the best option for their specific needs.

Our new performance range products come with a set of certifications, including UL 969, ensuring reliability and appeal for industries requiring certified solutions.

By adding these products to our assortment, we are guaranteeing consistent performance levels and meeting the needs of our customers.

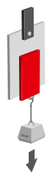
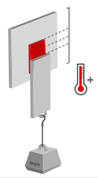


	tesa® 4965	tesa® 4953	tesa® 4945
Total thickness w/o liner [µm]	205	100	50
Adhesive	Tackified acrylic (biomass balanced)	Tackified acrylic	Tackified acrylic
Backing type	90% PCR PET	PET	PET
Backing thickness [µm]	12	12	12
Color	Transparent	Transparent	Transparent
Liner type	**PV0:** red MOPP **PV1:** paper	**PV20:** branded paper	**PV20:** branded paper
Liner thickness [µm]	PV0: 80 I PV1: 69	69	69
Dimensions offered [m x mm]	100 x 1372	100 x 1372	100 x 1250

Performance offer
- Go2products covering a broad variety of applications with a reliable performance
- Many approvals and certificates
- Proven in the market

Key features

High bonding | Excellent on smooth surfaces | Quick bonding | Chemical resistance | Excellent die-cutting | Temperature resistance | Environmental resistance

Test method	Peel adhesion	Static shear resistance	Dynamic shear resistance	Short term temperature resistance	SAFT test (Shear adhesion failure temperature)	Static peel	Anti-Lifting / Repulsion test
Test method							
Substrate	Various	Stainless steel	Steel plate / Steel plate	Aluminum	Stainless steel	PC	PC
Temperature [°C]	23	23	23	130–220	40–200	23	23
Dwell time	Initial & 72h	Initial	72h	Initial	30min	24h	24h
Bonding area [mm]	20	13 x 20	25 x 25	19 x 21	25 x 25	150 x 20	150 x 20
Speed	300 mm/min	/	50 mm/min	/	0.5°C/min	/	/
Load	N/A	10N	N/A	80g	500g	150g	/
Result	180° average peel adhesion [N/cm]	Holding duration [min]	Maximum force [N/cm²]	Maximum temperature [°C] Short term: 15min	Shear adhesion failure temperature [°C]	Peel distance per hour [mm/h] Test ended after 8 hours	Edge lifting distance after 24h [mm]

General product performance

Why double-sided PET tapes are the preferred choice for our converting partners?

Our double-sided PET tapes with tackified acrylic are the preferred choice for many of our converting partners due to their outstanding performance and versatility. These tapes offer excellent adhesion properties, ensuring a strong and reliable bond on a variety of surfaces, including metals, plastics, and glass. The PET backing provides superior dimensional stability and durability, making them ideal for demanding applications.

Furthermore, our tackified acrylic adhesive is engineered to deliver exceptional shear strength and temperature resistance, ensuring long-lasting performance even in challenging environments. The tapes are easy to handle and convert, allowing for efficient processing and application.

By choosing our double-sided PET tapes, our partners benefit from a high-quality, reliable solution that meets their diverse bonding needs, enhancing productivity and end-product performance.

	tesa® 4965	tesa® 4953	tesa® 4945
Thickness w/o Liner [µm]	205	100	50
Adhesion on HSE substrates	Excellent	Excellent	Excellent
Adhesion on MSE substrates	Excellent	Excellent	Excellent
Adhesion on LSE substrates	Good	Good	Good
Static Shear (10N, 23°C) [min]	>10,000	>5,000	Lightweight applications only
Tack	Good	Good	Good
Temperature resistance [°C]	-40 to 200 (short)	-40 to 200 (short)	-40 to 200 (short)

Please note: The following technical information provides qualitative rankings and typical values. Please note that these values have not been statistically validated and should not be used for specification purposes. They are influenced by different factors, including the polarity and roughness of the substrate, the pressure applied during application, the time the adhesive is allowed to dwell, the rate at which it is peeled, and the surrounding environmental conditions, such as temperature.

Certificates and compliance*

General certifications

VDA 278 – Outgassing Performance
Our low VOC portfolio does not contain any single substances restricted by the GB regulation (China), the indoor concentration guideline by JAMA (Japanese Automobile Manufacturers Association), or the Japanese Ministry of Health, Labor, and Welfare (MHLW).

Skin Contact Safety Evaluation according to:
- ISO 10993-10 (Part 10: Tests for skin sensitization) – No evidence for skin sensitization
- ISO 10993-5 (Part 5: L929 Cells - Cytotoxicity Test) – No evidence for skin sensitization

UL certification
Compliance with UL 969 („Standard for Marking & Labeling Systems“) file MH18055.

Individual certifications

Letters of Conformation / Statements
Statements available confirming the non-use of specific regulated substances in the tapes composition, e.g.
- Indirect food contact
- Halogen content
- Various test reports
- Heat capacity etc.
- Product carbon footprint (PCF)
- etc.

Fire Safety Certification
DIN EN 45545-2 fulfilling 2R1+HL3 (European Railway Standard For Fire Safety) – available for tesa® 4965.

ISCC PLUS Certificate
We support the transition to a bioeconomy by increasing the use of bio-circular materials. The bio-circular materials are allocated to selected products using the ISCC PLUS mass balance approach. Valid for our production site Hamburg producing tesa® 4965.

* not all certificates are available for each tape in the performance series.

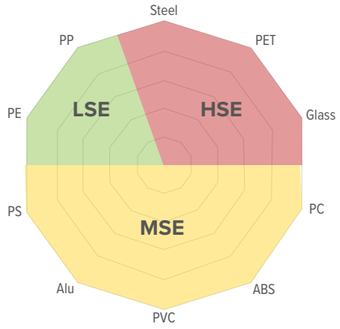
tesa Sustainability Marker Industry

This icon identifies our more sustainable products. We continually strive to make our products and assortment more sustainable. To demonstrate our initiatives and efforts in the industrial segment, this marker highlights our more sustainable products. **Scan this code or klick to learn more!**

Peel adhesion performance

Peel adhesion assesses the adhesive‘s effectiveness on a substrate and is applicable to all types of applications. Tests encompass various substrates, including metals, glass, and plastics, representing a spectrum of materials that are easy or challenging to bond. However, it is important to note that peel adhesion values serve as an indication, and the performance on customer-specific materials, particularly plastics, may vary. It is crucial to avoid applying the same peel force experienced during testing in real-world bonding designs.

Please note: The following pages present a benchmarking analysis of tesa® 4965, tesa® 4953, and tesa® 4945 against comparable competitor tapes with similar total thickness (excluding liner), 12µm PET backings, and modified acrylic adhesives. It is crucial to note that evaluating the performance and suitability of a tape for specific applications requires considering multiple performance tests. Tape performance cannot be accurately ranked based on a single test procedure, such as the commonly used peel adhesion. Customers should conduct a comprehensive evaluation of tape performance within their own application and production processes to ensure optimal results.

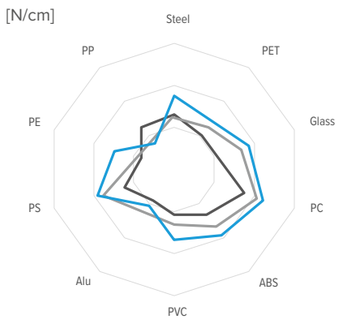


Peel adhesion performance was evaluated on various substrates, which can be clustered into high surface energy (HSE) substrates, medium surface energy (MSE) substrates, and low surface energy (LSE) substrates. The higher the peel adhesion strength, the better the tape performs on a specific substrate. In the spider web graph, peel adhesion increases from the center to the outer edges.
These evaluations help in understanding how different surface energies affect the adhesion strength and reliability of the bond. Additionally, the data gathered from these tests show whether a tape is well-balanced across various substrates or tailored to specific niche applications.

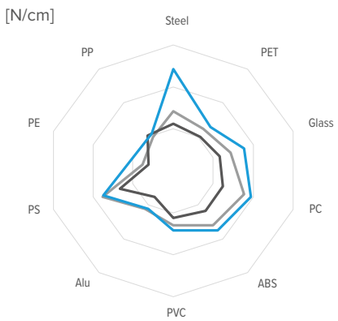
- LSE
- HSE
- MSE

Peel adhesion measurements – without dwell time

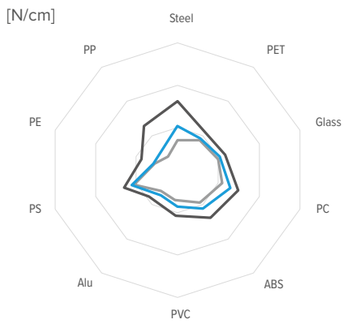
205 µm – tesa® 4965 and comparable competitor products



100 µm – tesa® 4953 and comparable competitor products



50 µm – tesa® 4945 and comparable competitor products



tesa® product | Product of competitor A | Product of competitor B

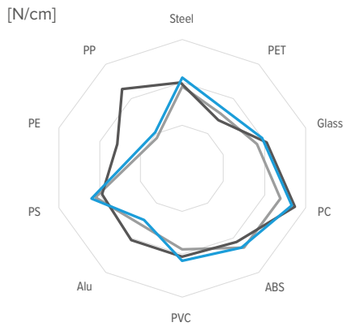
Peel adhesion [N/cm] of the three tesa® tapes without dwell time – Technical data sheet values

	Steel	Aluminum	PET	PC	ABS	PVC	PS	PE	PP
tesa® 4965 205 µm	11.5	9.2	9.2	12.6	10.3	8.7	10.6	5.8	6.8
tesa® 4953 100 µm	11.0	7.9	7.0	9.2	7.6	7.0	8.3	4.6	4.4
tesa® 4945 50 µm	7.0	5.2	5.3	6.5	5.3	5.7	5.4	3.1	3.0

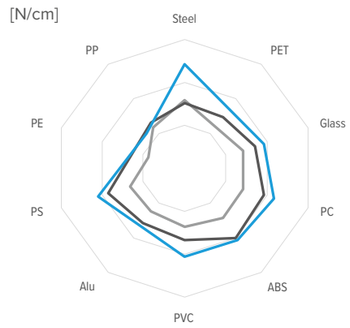
Acrylic adhesive tapes generally exhibit increased peel strength after application and an extended dwell time. The following three graphs illustrate the ultimate peel adhesion performance after 72 hours on various substrates.

Peel adhesion measurements – with 72h dwell time

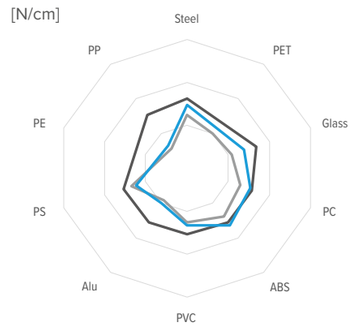
205 µm – tesa® 4965 and comparable competitor products



100 µm – tesa® 4953 and comparable competitor products



50 µm – tesa® 4945 and comparable competitor products



tesa® product | Product of competitor A | Product of competitor B

The peel adhesion measurements showcase the well-rounded performance of tesa® 4965, tesa® 4953, and tesa® 4945 tapes across a diverse array of substrates. These tapes exhibit particularly strong adhesion on High Surface Energy (HSE) and Medium Surface Energy (MSE) substrates, while still delivering moderately good performance on challenging Low Surface Energy (LSE) substrates.

Test method – 180° peel adhesion

- This method allows for the evaluation of various substrates.
- Peel adhesion is measured at a rate of 300mm/min and at an angle of 180°.
- Measurements without dwell time and after a 72-hours dwell time confirm the significance of dwell time and the final strength in the application.
- Initial measurements provide insights into immediate performance, which is crucial during handling.
- The test result for 180° peel adhesion is expressed in [N/cm], representing the average force required to remove the tape from the substrate.

Static peel measurements

The test replicates the process of mounting objects overhead and introduces a controlled peel into the system. It evaluates the static peel of a strip of tape from a standard test panel under a specified weight.

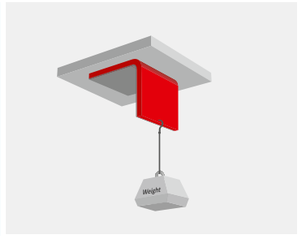
	tesa® products	Products of competitor A	Products of competitor B
205 µm	+	0	-
100 µm	+	+	-
50 µm	0	0	-

+ good 0 medium - low

In the static peel test, performance is assessed qualitatively: less peel indicates superior performance. Only tesa® 4965, tesa® 4953, and one competitor's 100 µm tape demonstrated strong results in this test. All 50 µm tapes showed a deficiency in static peel resistance and competitor B exhibited and overall weak performance level in this test.

Test method – 90° static peel

- The tape is applied to a Polycarbonate (PC) substrate.
- Static peel is measured at a 90° angle and at a temperature of 23°C.
- The static peel is induced by applying a 150g load at the end of the respective tape being bonded to the PC substrate.
- The peel distance is measured after various times.
- Peel distances below 5 mm/h are ranked as good (+), while distances between 5 to 20 mm/h are ranked as medium (0). Any peel distance above 20mm/h is ranked as low performance (-).

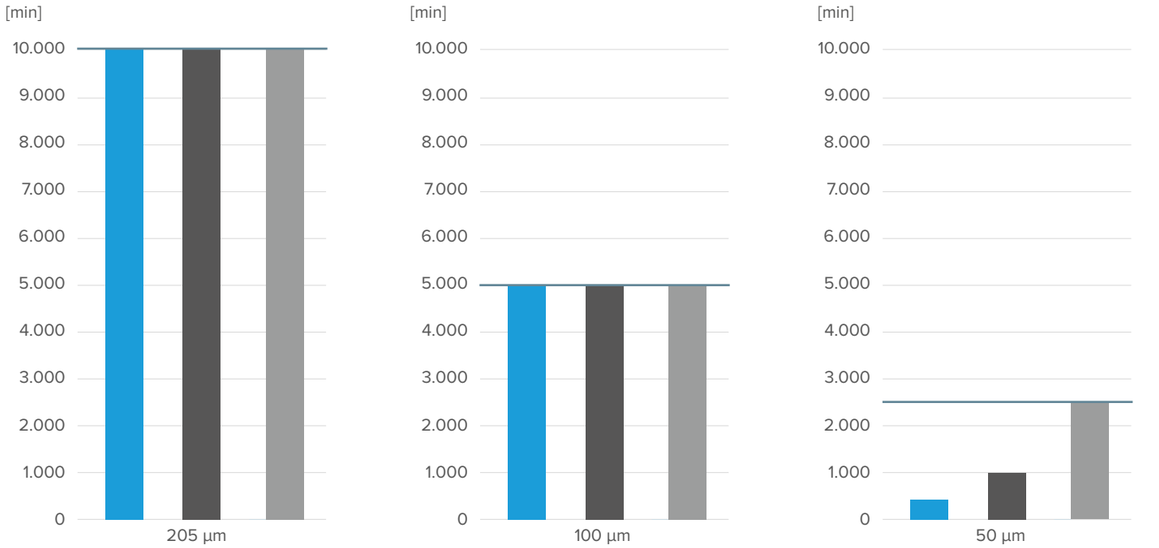


Static shear performance

Room temperature

Shear forces exert their influence parallel to the bonding surface. Among static loads, shear loads are the most relevant. Static (dead) loads, like the weight of a mounted panel, remain constant over time. The shear performance is considered better when the tape can endure without shearing off the substrates for an extended duration.

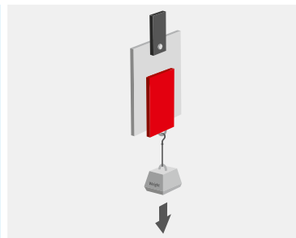
At room temperature [23°C]



All tapes exhibit excellent shear performance with a static shear load of 10N. However, the 50 µm tapes are rather to be used for light weight applications.

Test method – static shear resistance

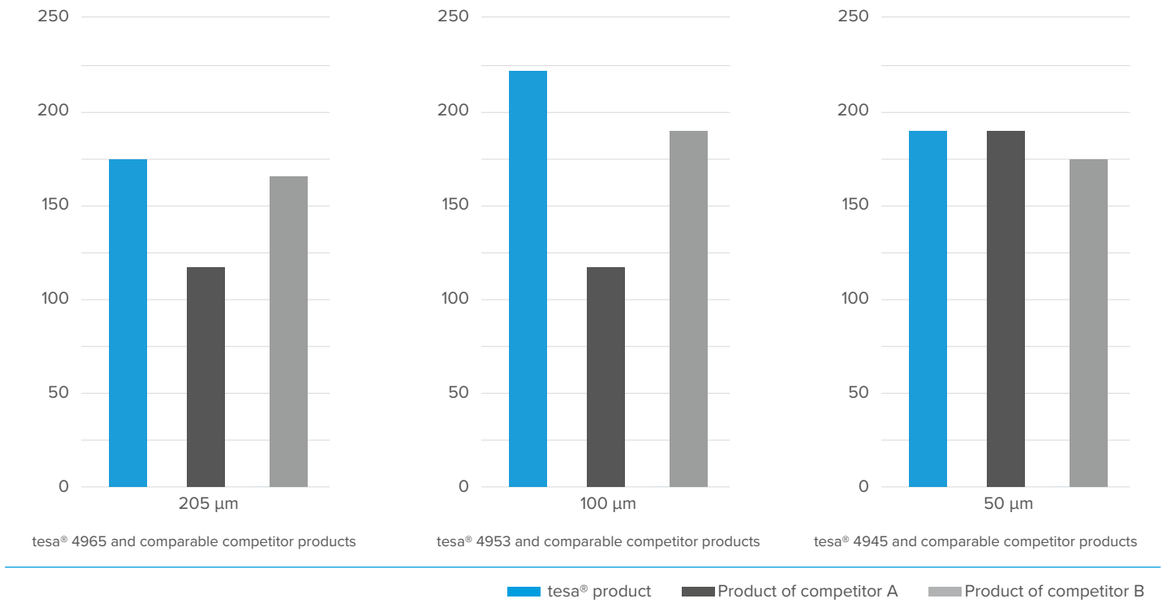
- Shear performance is evaluated over a duration of up to 10,000 minutes, 5,000 minutes or 2,500 minutes, depending on the tape thickness. The horizontal line in each graph indicates when the measurement was stopped.
- The shear test was conducted at room temperature (23°C) with a shear load of 1kg (10N).
- The shear performance is strongly dependent on the bonding area.
- The duration cap was selected differently to reflect the individual thicknesses, e.g. thinner tapes are expected to be for light weight bonding applications rather than heavy weight as for the thick tapes.



Dynamic shear performance

Room temperature

Shear forces act in parallel to the bonding surface. The test results are dependent on the substrate and the speed at which the test is conducted. Dynamic loads are characterized by their changes over time. Dynamic tests evaluate the short-term performance, typically within a timeframe of minutes, primarily focusing on assessing cohesive properties. These tests are crucial for understanding how materials behave under real-world conditions, where loads can vary rapidly. By analyzing dynamic responses, engineers can predict failure modes and improve material design for better durability and reliability.



The dynamic shear test results highlight the exceptional performance of the three tesa® tapes under dynamic shear loads. The three compared 50 µm tape versions demonstrate comparable strength. While the products of competitor A fall short in dynamic shear resistance for their 200 µm and 100 µm tape versions. The products of competitor B show performance levels equal to tesa's offerings.

Test method – dynamic shear resistance

- Dynamic shear test evaluates the max. force to separate the double-sided tape bonded to HSE steel substrates.
- A velocity of 50mm/min is applied to induce the separation.

Short term temperature resistance

Measurement range 130°C – 220°C

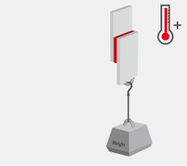
The short-term temperature resistance test evaluates an adhesive tape's ability to withstand high temperatures over brief periods without compromising its performance. By determining the maximum temperature the tape can endure short-term, this test provides crucial information for applications involving sudden or temporary heat exposure. This method is essential for predicting the tape's behavior in scenarios where it may be subjected to intermittent high temperatures, ensuring its reliability and effectiveness.

		130°C	170°C	200°C	220°C
205 µm	**tesa® 4965**				
	Product of competitor A		Not passed	Not passed	Not passed
	Product of competitor B				Not passed
100 µm	**tesa® 4953**				
	Product of competitor A	Not passed	Not passed	Not passed	Not passed
	Product of competitor B				Not passed
50 µm	**tesa® 4945**				
	Product of competitor A				
	Product of competitor B				

The assessment of short-term temperature resistance highlights the exceptional resilience of the three tesa® tapes to high temperatures over brief periods. While the products of competitor B also demonstrates excellent temperature resistance, the products of competitor A clearly underperforms in high-temperature conditions.

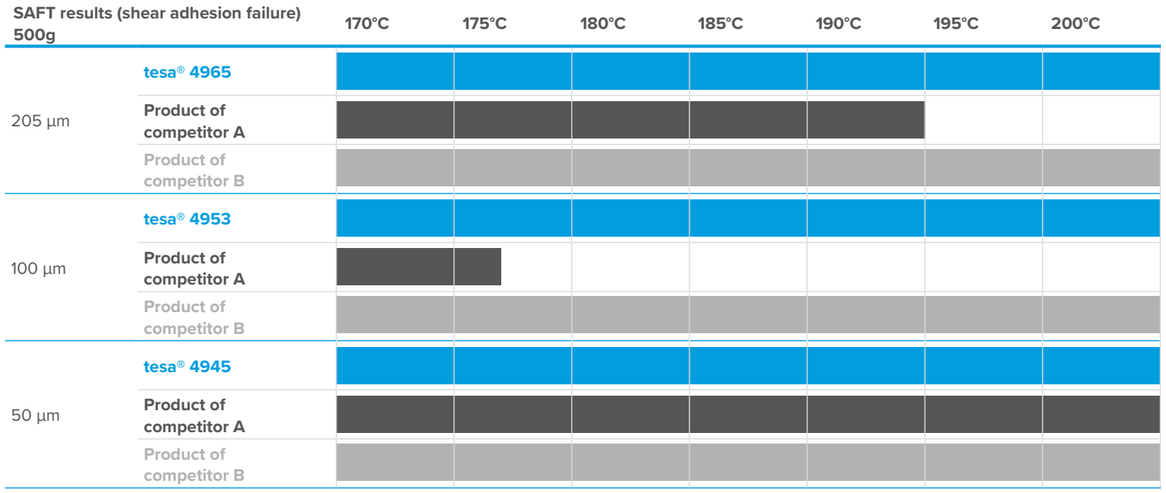
Test method – temperature resistance short term

- Shear distance at various temperatures at 80g shear load is measured.
- Short term temperature resistance: Temperature with less than 1mm shear distance after 15min under shear load.
- Temperature resistances were tested between 130°C and 220°C



Shear adhesion failure temperature (SAFT)

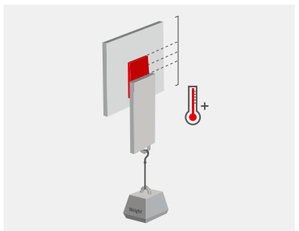
The Shear Adhesion Failure Temperature (SAFT) test is another method for assessing a tape‘s temperature durability. It also determines the temperature at which an adhesive tape loses its bonding strength under a constant shear load, providing critical insights into the tape‘s thermal stability. By applying a temperature ramp to identify the exact temperature at which adhesive failure occurs, the SAFT test helps predict the tape’s performance in high-temperature applications, ensuring reliability and safety. This test is essential for understanding how adhesive tapes will behave under prolonged exposure to elevated temperatures, aiding in the selection of suitable materials for demanding environments.



The SAFT test results confirm the findings from the short-term temperature resistance measurements detailed on the previous page. The performance of tesa® tapes and Competitor B‘s tapes are comparable, whereas products of competitor A clearly fall short.

Test method – shear adhesion failure temperature

- The test is conducted between 40°C and 200°C with a temperature ramp rate of 0.5°C per minute.
- An appropriate static load i.e. 500g is selected.
- The temperature at which the the tape separates from the panel is recorded. This test differs from the Short term temperature resistance tests as the static shear load is higher and a temperature profile is applied. Furthermore, this test according to AFERA 5013 records the full adhesive failure compared to 1mm shear distance in the short term temperature resistance measurement.



Anti repulsion

This test method assesses the anti-repulsion performance of the tape when applied at a specific angle. Anti-repulsion is crucial when the tape is used on curved surfaces or around edges, as it measures the tape‘s ability to resist lifting or peeling away under stress. High anti-repulsion performance ensures that the tape maintains a strong bond and reliable adhesion, even in challenging applications. For example, in scenarios like edge wrapping or securing components on contoured surfaces, a tape with excellent anti-repulsion properties will provide consistent and durable performance, preventing failures and maintaining the integrity of the taped object.

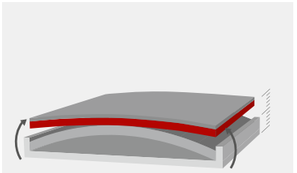
	tesa® products	Products of competitor A	Products of competitor B
205 µm	+	0	-
100 µm	0	+	-
50 µm	-	0	-

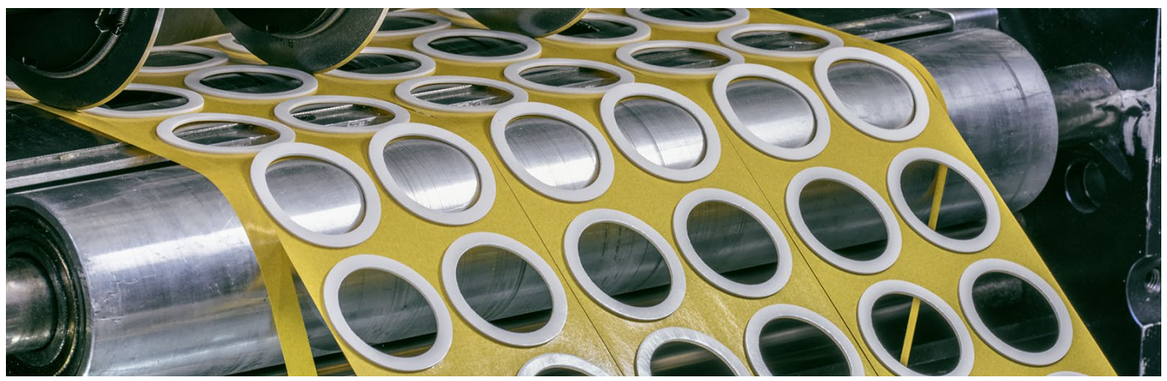
\+ good 0 medium - low

The test results highlight the excellent performance of tesa® 4965 for applications requiring anti repulsion strength. Using the same test conditions for all three 50 µm tapes show the importance of the adhesive layer thicknesses, as all three 50 µm thin tapes are showing weaknesses in this test.

Test method – anti repulsion

- The tape is applied to an aluminum plate.
- A static force is exerted by adhering the composite to a curved polycarbonate (PC) substrate.
- The restoring force of the aluminum plate results in failure after a certain period.





tesa® Customer Solution Center

Let us help you shape the future

To make industrial processes as efficient as possible, it is crucial to choose the right tape. Depending on the substrate, environmental conditions, and the method of application, tapes with very different characteristics may be required. Our tesa® Customer Solution Center supports your company in finding the perfect tape and application solution for your individual requirements.

Interested in tape support? Reach out to our acrylic core tape experts!

We work closely with our sales team to identify the key specifications of your project. Whether you are looking for a way to replace traditional fastening techniques (e.g. screws, rivets, or liquid glue) with a high performance double-sided acrylic foam tape or having problems to identify the ideal tape for your application, our tape consultants can offer the right advice and expertise. Feel free to reach out to your local tesa® sales representative or check out our webpage.

Material models for numerical methods

Today's construction designs are becoming more and more complex. Joint designs get smaller whereas load requirements and movements go to the extremes. In certain cases the use of well known analytical formulas are no longer sufficient to exhaust the systems capabilities. In order to reduce testing effort during the design phase, which is time consuming and costly, numerical methods come into play. Numerical methods like finite element analysis (FEA) are used to analyze the behavior of engineering structures and components under different conditions. It is widely accepted in many engineering disciplines and can be in addition or prior to tape tests. We have extensive experience in that area and are able to assist our customers with an interpretation of simulation results.

07/2024

Certifications

Our company is focused on international quality, environmental, and occupational safety standards.

Please find more information regarding our certifications at:
www.tesa.com/certifications