
British Standard Specification for

Double sided pressure sensitive adhesive tapes

Rubans adhésifs double face — Spécifications

Doppelklebbänder

Foreword

This British Standard has been prepared at the request of the Adhesive Tape Manufacturers' Association and the Pressure Sensitive Manufacturers' Association under the direction of the Packaging and Freight Containers Standards Policy Committee.

This British Standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Contents

	Page
Foreword	Inside front cover
Committees responsible	Back cover
Specification	
1 Scope	2
2 Definitions	2
3 Classification	3
4 Dimensions	3
5 Peel adhesion	4
6 Freedom from defects	4
7 Release liner	4
8 Packing	4
9 Marking	4
Appendices	
A List of double sided pressure sensitive adhesive tapes	5
B Determination of shear adhesion	5
C Determination of thickness	8
D Determination of peel adhesion	9
E Determination of liner release	11
F Determination of breaking strength and elongation at break	13
G Determination of loop tack	14
H Determination of dynamic tensile adhesion strength (T-block)	15
J Determination of resistance to static shear	16
K Determination of resistance to dynamic shear (solid tapes)	18
L Determination of resistance to dynamic shear (foam tapes)	19
M Storage	19
Tables	
1 Classification	3
2 List of double sided pressure sensitive tapes	5
Figures	
1 Details of shear adhesion test	7
2 Test jig for 90° peel adhesion	9
3 Steel plate for adhesion test	11
4 Typical arrangement for stripping tape from the plate	11
5 Attachment of tape to plate (open side in contact)	12
6 Illustration of test jig and test piece attachment to tester	12
7 Attachment of tape to plate	13
8 Test jig for loop tack test	14
9 General arrangements of test plates	16
10 Details of static shear test	17
11 Preparation for open side adhesive test	20
12 Preparation for closed side adhesive test	20

Specification

1 Scope

This British Standard specifies requirements for classification, dimensions, shear adhesion, thickness, peel adhesion and packaging of rolls of double sided pressure sensitive adhesive and transfer tapes used in permanent mounting, sealing, floor covering laying, joining and similar applications.

This standard does not specify the colour of tapes.

Appendix A lists the types of tapes generally available.

Appendices B, C and D describe methods for determination of shear adhesion, thickness and peel adhesion respectively.

Recommendations for the determination of liner release, breaking strength and elongation at break, loop tack, dynamic tensile adhesion strength (T-block), static shear resistance, dynamic shear resistance of solid tapes and dynamic shear resistance of foam tapes are given in appendices E to L respectively. These properties may be agreed between manufacturer and purchaser.

Information on storage is given in appendix M.

NOTE 1. Although this British Standard specifies requirements for tapes for permanent applications, the test methods may also be suitable for tapes for non-permanent applications.

NOTE 2. The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard the following definitions apply.

2.1 pressure sensitive adhesive. A type of adhesive which in its dry solvent free form is permanently tacky at room temperature and, when applied to a variety of surfaces, forms an immediate bond.

NOTE. The bond strength may be increased by pressure and/or time.

2.2 open side (adhesive). That surface of the adhesive which is exposed on normal unwinding or separation.

2.3 closed side (adhesive). That surface of the adhesive which normally remains in contact with the release liner, on unwinding.

2.4 blocking. An undesired adhesion between touching layers of material.

2.5 carrier (double sided tapes only). The base material on to both faces of which a pressure sensitive adhesive is applied, to produce a double sided tape.

NOTE. The terms carrier and backing are frequently used incorrectly. The term backing is used for single sided tape.

2.6 conditioning. The process of subjecting material to specific temperatures and relative humidity conditions for a stipulated period of time.

2.7 double sided. A tape which has two available pressure sensitive adhesive coated surfaces.

2.8 legging. The occurrence on separation of strings or filaments of adhesive between the adhesive layer and the substrate to which it has been applied or its release liner.

2.9 pre-release. The unwanted separation of a tape from its release liner during unwinding.

2.10 release liner. A removable material which protects the adhesive face or faces.

2.11 open side (release liner). That surface of the release liner which is exposed on normal unwinding or separation.

2.12 closed side (release liner). That surface of the release liner which normally remains in contact with the adhesive on unwinding.

2.13 substrate. The surface to which a pressure sensitive tape is applied.

2.14 tack. The property of a pressure sensitive adhesive that causes a bond, with a measurable separation force, the instant the adhesive touches the substrate and without externally applied pressure.

2.15 key. The bond between the adhesive and the carrier.

2.16 double coated. A carrier with adhesive on both sides with a release liner on one or both sides to prevent the adhesive sticking face to face.

2.17 adhesion. The state in which two surfaces are held together by interfacial forces.

2.18 shear adhesion. The ability to resist forces applied in the same plane as the tape.

2.19 peel adhesion. The force required to peel a strip of tape from a substrate at a specified angle and speed.

2.20 permanent (adhesive). An adhesive that has been designed to remain permanently in position under the specified service conditions.

2.21 removable (adhesive). An adhesive that has been designed to allow subsequent removal, without damaging or contaminating the substrate under the specified service conditions.

2.22 pressure sensitive adhesive tape. A category of tape coated on one or both faces with a pressure sensitive adhesive which is permanently tacky at room temperature, and requires no activation by water, solvent or heat to adhere to a variety of dissimilar surfaces upon contact.

NOTE 1. In some cases the adhesive may be further cured by heating after application.

NOTE 2. The bond strength may be increased by pressure and/or time.

2.23 transfer tape. A tape having two available pressure sensitive adhesive surfaces without the need of a carrier and which may or may not have reinforcing fibres in it and with a release liner separating the adhesive surfaces.

2.24 modes of failure

2.24.1 adhesive failure. Failure of an adhesive bond such that the separation is at the interface of adhesive and substrate leaving no apparent residues.

2.24.2 cohesive failure. Failure of an adhesive bond such that the separation is within the adhesive.

2.24.3 delamination. Splitting of the carrier or release liner of a tape into distinct layers.

2.24.4 key failure. Failure of the bond such that separation is at the interface of adhesive and carrier.

3 Classification

3.1 General

The tapes are classified by carrier (or base material), maximum service temperature of the substrate and the adhesive type.

NOTE. The type of adhesive used on a tape can significantly affect its adhesion properties, particularly at elevated temperatures.

Typical pressure sensitive adhesives employed in the manufacture of double sided tapes include:

- (a) natural or synthetic rubber based adhesives;
- (b) polyacrylate based adhesives;
- (c) silicone compound based adhesives.

Adhesion to any particular surface can be significantly influenced by the choice of adhesive in use.

Additionally adhesives may be classified as either thermoplastic or thermosetting adhesives. A thermoplastic adhesive softens on heating and reverts to its original state on cooling. Such an adhesive could have a poor temperature range dependent on the softening temperature of the adhesive. A thermosetting adhesive softens on initial heating but becomes firmer after further heating and remains so on cooling. It does not soften appreciably on subsequent reheating.

The combinations available are considerable and advice on product suitability should be sought from the manufacturer.

3.2 Carrier

The carrier (base material) shall be solid or foamed (see appendix A).

NOTE. In the case of transfer tapes the adhesive may be reinforced with suitable fibres, for example, glass or polyester.

3.3 Maximum service temperature

The maximum service temperature of the tape system is based on the shear adhesion test (see appendix B). The maximum service temperature cannot exceed the maximum service temperature of the carrier as listed in appendix A.

When tested in accordance with appendix B, the tape shall support a minimum load of 0.25 kg for 4 h at 23 °C and from the maximum load held with a slippage of not more than 2.5 mm after 4 h at each of the six test temperatures, the tape shall be classified by the numerical code obtained using table 1.

Table 1. Classification

Test load (kg)	Test temperature (°C)					
	23	60	90	120	150	180
2.0	4	4	4	4	4	4
1.0	3	3	3	3	3	3
0.5	2	2	2	2	2	2
0.25	1	1	1	1	1	1

The digit corresponding to the maximum load supported at each test temperature with not greater than 2.5 mm slippage after 4 h shall be written in increasing temperature sequence to produce classifications such as those below.

Example 1

444331 This tape will hold a minimum of 2.0 kg at 23, 60 and 90 °C, a minimum of 1.0 kg at 120 and 150 °C and a minimum of 0.25 kg at 180 °C.

Example 2

44433 This tape will hold a minimum of 2.0 kg at 23, 60 and 90 °C and a minimum of 1.0 kg at 120 and 150 °C. The tape fails to hold 0.25 kg at 180 °C, hence there is no sixth digit.

Example 3

31 This tape will hold a minimum of 1.0 kg at 23 °C and 0.25 kg at 60 °C. The tape fails at other temperatures and masses and hence is classified by only two digits.

Example 3

4 This tape will hold a minimum of 2.0 kg at 23 °C but fails at other temperatures and masses. It is suitable for room temperature (or below) applications only.

Thus the higher the numerical classification (444444 max.) the better the overall shear adhesion of the tape at elevated temperatures.

4 Dimensions

NOTE 1. Preferred tape widths are 6, 9, 12, 15, 19, 22, 25, 30, 38 and 50 mm. Other widths may be available.

NOTE 2. Preferred tape lengths are 10, 20, 25, 33, 50, 55 and 66 m, or multiples of 50 m or 66 m. Other lengths may be available.

4.1 Core diameter

The nominal internal diameters of the cores on which tape is wound shall be 26 mm or 38 mm or 76 mm.

4.2 Tolerance on width

The tolerance on widths shall be ± 1.0 mm for widths up to and including 19 mm and ± 1.5 mm for widths greater than 19 mm.

NOTE. The width of the tape should be measured on the roll by means of a steel rule, or other suitable device, graduated in 0.5 mm divisions.

4.3 Roll length

The actual length of a roll shall be not less than the stated length.

4.4 Thickness

4.4.1 Solid and transfer tapes. The thickness of the tape, measured in accordance with C.2, shall be within $\pm 15\%$ of the nominal value unless the combination of carrier and adhesive tape makes this impossible.

4.4.2 Foamed tapes. The thickness of the tape, measured in accordance with C.3, shall be within $\pm 25\%$ of the nominal value unless the combination of carrier and adhesive tape makes this impossible.

5 Peel adhesion

When tested in accordance with appendix D, the minimum adhesion to steel of each side of a permanent tape shall be not less than 2 N per 10 mm width.

6 Freedom from defects

When the tape is unrolled there shall be no tearing of the carrier and liner.

NOTE. Each roll should be reasonably free from telescoping, gapping or other forms of distortion. When unrolled the tape should show negligible transference of adhesive to the interleaving.

7 Release liner

The rolls of tape shall be wound with a release liner which shall be made of plain or embossed plastics material, or double sided release paper interleaved between each successive turn of tape on the reel. The release liner shall be easily and cleanly removed without tearing, delamination or transference of adhesive.

8 Packing

The individual rolls of tape shall be bulk packed in such a manner that:

- (a) they are protected from dust and light;
- (b) they can be easily separated;
- (c) they are adequately protected from damage during normal transit conditions;
- (d) the cut edges of the rolls are horizontal.

NOTE 1. Wide rolls may be packed so that the cut edges are vertical provided they are suitably suspended.

NOTE 2. Appendix M gives information on storage.

9 Marking

Each transit pack shall be marked with the following information:

- (a) the number and date of this British Standard, i.e. BS 7116 : 1990*;
- (b) the shear classification of the tape (see 3.3);
- (c) the nominal width of the tape;
- (d) the nominal length of the tape on each roll;
- (e) the number of rolls in the unit pack or larger package;
- (f) the words 'This side up';
- (g) the manufacturer's or supplier's identification mark and batch number.

*Marking BS 7116 : 1990 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Appendices

Appendix A. List of double sided pressure sensitive adhesive tapes

Types of double sided pressure sensitive adhesive tapes classified by carrier and properties are given in table 2.

Table 2. List of double sided pressure sensitive tapes			
Designation	Carrier	Nominal tape thickness range	Maximum service temperature of the carrier
Solid	Woven cloth	mm 0.18 to 0.30	°C Up to and including 120
	Non-woven cloth	0.08 to 0.20	Up to and including 120
	Paper	0.10 to 0.40	Up to and including 120
	Unplasticized polyvinylchloride	0.08 to 0.18	Up to and including 60
	Polypropylene	0.08 to 0.18	Up to and including 90
	Polyester	0.07 to 0.35	Up to and including 150
	Plasticized polyvinylchloride	0.10 to 0.25	Up to and including 90
Foamed	Neoprene	0.5 to 2.5	Up to and including 120
	Polyethylene	0.4 to 3.0	Up to and including 120
	Polyvinylchloride	1.0 to 3.0	Up to and including 90
	Polyester	0.5 to 2.5	Up to and including 120
	Polyurethane	0.5 to 2.5	Up to and including 120
	Acrylate	0.4 to 2.0	Up to and including 150
Transfer tapes	With or without reinforcing fibres	0.02 to 0.25	Up to and including 180

Appendix B. Determination of shear adhesion

B.1 Principle

Test pieces applied between steel plates are subjected to specified loads at specified temperatures and the distance each test piece slips is determined.

B.2 Apparatus

B.2.1 *Three rectangular test plates of stainless steel, within the following compositional limits.*

Carbon	0.16 % max.
Silicon	0.20 % max.
Manganese	2.00 % max.
Nickel	8 % to 14 %
Chromium	11 % to 19 %

The thickness shall be at least 2 mm.

NOTE. A convenient size of plate is 200 mm X 50 mm.

The test surface of the plate shall be polished to give an abrasive satin finish (180 grit), the direction of gritting being parallel to the longer side of the plate. The surface roughness shall be determined in accordance with BS 1134 : Part 1 and shall comply with the following requirements:

arithmetical mean deviation R_a , from the mean line of the profile:

$$0.05 \mu\text{m} < R_a < 0.40 \mu\text{m};$$

maximum height of irregularities R_{max} : $< 3 \mu\text{m}$

B.2.2 Preload mass of 2.0 kg, with one face greater in size than 25 mm × 25 mm.

B.2.3 Plate holder, for maintaining the plates at an angle of 2° from the vertical in order to obtain an angle of 178° between the back of the plate and the hanging portion of the test piece (see figure 1).

B.2.4 Load masses and clips, the total load of which is 0.25, 0.5, 1 or 2 kg as appropriate.

NOTE. The actual test load comprises the total mass of the clip together with the load mass.

The clip shall be designed to prevent any slippage during the test.

B.2.5 Sharp instrument, for cutting the test specimens, after application to the plate, so as to obtain a contact area of 25 mm × 25 mm.

B.2.6 Oven, or other means of maintaining the following test conditions:

- (a) $23 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ r.h.;
- (b) $60 \pm 2^\circ\text{C}$, dry heat;
- (c) $90 \pm 2^\circ\text{C}$, dry heat;
- (d) $120 \pm 2^\circ\text{C}$, dry heat;
- (e) $150 \pm 2^\circ\text{C}$, dry heat;
- (f) $180 \pm 2^\circ\text{C}$, dry heat.

B.2.7 Static shear hangers, 50 mm × 25 mm × 2 mm, made of stainless steel of composition, hardness and surface finish specified in B.2.1. The hangers shall be scribed on the testing surface with a mark, parallel with and 25 mm from a short edge and extending across the width of the hanger.

B.3 Reagents and materials

B.3.1 4-hydroxy-4-methylpentan-2-one (diacetone alcohol).

B.3.2 Cotton wool, BPC quality, lint-free or tissue.

B.3.3 Methanol or butanone or acetone or toluene. The solvents shall be of general purpose chemical grade with the exception of toluene, which shall be sulphur free.

B.4 Preconditioning

Immediately before pieces for testing are taken, precondition each sample roll for at least 24 h in an atmosphere of $23 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ r.h.

NOTE. Preconditioning should preferably be carried out in a controlled atmosphere room. In the absence of such a room a suitable chamber and method of obtaining an approximation to the required conditioning atmosphere are specified in BS 3718.

B.5 Preparation of test pieces

Where possible carry out the test piece preparation in the conditioning atmosphere of $23 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ r.h. Where this is not possible commence the preparation within 3 min of removal of each test piece from the conditioning atmosphere.

Remove and discard the three outer turns before cutting the test pieces from the preconditioned roll. Cut three test pieces 100 mm long by 25 mm wide at intervals of not less than 300 mm. For widths greater than 25 mm, cut test pieces 25 mm wide longitudinally from the roll using a sharp tool to produce clean-cut edges. Avoid contamination of the test area at all stages.

NOTE. In order to keep the number of test pieces to a minimum it is recommended that some preliminary tests are carried out to determine the most likely highest load/highest temperature combination for a given tape.

B.6 Conditioning

Condition the test pieces by freely suspending them in an atmosphere of $23 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ r.h. for at least 2 h immediately before testing them.

Ensure that the test rig and masses are in equilibrium with the test conditions by placing them in the oven for at least 2 h.

B.7 Procedure

B.7.1 Cleaning

Carry out cleaning in an area with good fume extraction. Wipe the surface of the plate with a fresh piece of lint-free cotton wool or tissue saturated with diacetone alcohol. Dry the plate with fresh cotton wool, then wipe the test surface with a fresh piece of cotton wool saturated with one of the solvents listed in B.3.3. Dry the plate with fresh cotton wool, then repeat for a total of three cleaning operations with this solvent. Maintain the plate at a temperature of $23 \pm 2^\circ\text{C}$ for 5 ± 1 min before proceeding with B.7.2.