



REPORT

Determination of the adhesive strength of adhesive tapes

Civil projects
Corrosionprotection
Laboratory

Jan Tademaweg 40
2031 CV Haarlem
P.O. Box 2113
2002 CC Haarlem
The Netherlands
T +31 23-5319544
F +31 23-5277229
E info@cot-nl.com
I www.cot-nl.com

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Client : COT bv
P.O. Box 2113
2002 CC Haarlem

Contact person : Mr. M. Walrave

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Handled by : Ing. M. Walrave
Ing. F.H. Berkvens



CONTENTS

1	INTRODUCTION.....	3
2	GENERAL DATA.....	3
3	PROCEDURE.....	4
3.1	Peel adhesion.....	4
3.2	Statistical analysis of the results.....	5
3.3	Analysis of the variance of the test results.....	5
3.4	Adhesive values given by the manufacturer	6
4	RESULTS	7
5	DISCUSSION.....	9
5.1	Received tapes	9
5.2	Peel adhesion.....	9
5.3	Z-value	9
5.4	VAR/CV	9
5.5	Adhesive values given by manufacturer.....	9
6	CONCLUSION	10
7	RECOMMENDATIONS.....	10

ANNEX I: Overview of the measured adhesive values of all tapes
ANNEX II: Product data sheets of the tested tape types



1 INTRODUCTION

The determination of the adhesion of coating and coating related products has been carried out in accordance with ISO 2409 "Cross-cut test for adhesion". For this test, adhesive tape is used. The adhesive strength of the used tape is defined in ISO 2409.

For several years the use of adhesive tapes and the adhesive strength of these tapes has been subject of discussion. For this reason COT has decided to start a large scale investigation into the adhesive strength of European used adhesion tapes.

This report describes results, discussion and conclusion of this large scale investigation.

2 GENERAL DATA

26 Tapes have been tested (number 1 – 26).

The adhesive strength of the tapes, according to ISO 2409, has been determined in accordance with IEC 60454-2 "Pressure-sensitive adhesive tapes for electrical purposes – part 2: Methods of test". The adhesive interval of the used tape, as defined in the latest edition of ISO 2409, has been set to 6 until 10 Newton per 25 mm width. The used tape, preferably transparent, shall be at least 50 mm wide.

All tests have been carried out in accordance with the standards underneath.

Method	Description
IEC 60454-2	: Pressure-sensitive adhesive tapes for electrical purposes – part 2: methods of test, chapter 11 Adhesion (2007)
ISO 2409	: Paints and varnishes – Cross-cut test (2007)

Adhesive tapes used for this test are:

- Lithographers Tape 616, 3M
- Scotch Cellophane Film Tape 610, 3M
- Scotch Filament Tape 8981, 3M
- Scapa 8010B, Scapa
- Tape 8705B Polyester Adhesive Tape, Scapa
- Scotch Tape 371, 3M
- Tesa Performance Grade UPVC Tape 4120, Tesa
- Flatback Masking Tape 250, 3M
- Tesa Premium General Purpose Carton Sealing Tape 4124 and 4104, Tesa
- Tape X, Tesa (*type unknown*)
- Tape Y (*type unknown*)

3 PROCEDURE

3.1 Peel adhesion

"Adhesive tape with an adhesive strength between 6 N per 25 mm and 10 N per 25 mm width (determined in accordance with IEC 60454-2) shall be used. The tape shall be at least 50 mm wide (ISO 2409:2007, paragraph 3.5)"

For this test a total of 26 adhesive tapes have been received. The tapes are supplied by different companies within Europe, including paint manufacturers, test institutes, real estate owners and suppliers.

The determination of the adhesive strength of the received tapes has been carried out in accordance with ISO 2409 and IEC 60454-2, in a constant environment (23 ± 2 °C and $50 \pm 5\%$ relative humidity). The requirement 6–10 N/25 mm corresponds to 2.4 – 4.0 N/10 mm.

In accordance with IEC 60454-2, chapter 11, a length of adhesive tape has been applied to a standard stainless steel panel, which is fixed vertically in one clamp of a tensile strength testing machine. The other clamp of the machine pulls the free end of the adhesive tape at an angle of 180° to the panel (see figure 1). The adhesive strength has been measured by the force required to peel the adhesive tape continuously from the panel, which corresponds to Method A of this standard.

Test panels of stainless steel with dimensions 200 x 100 x 2 mm have been used. On the edges of each panel six markings have been made within every 20 mm. The first marking has been made 50 mm from the bottom of the panel.

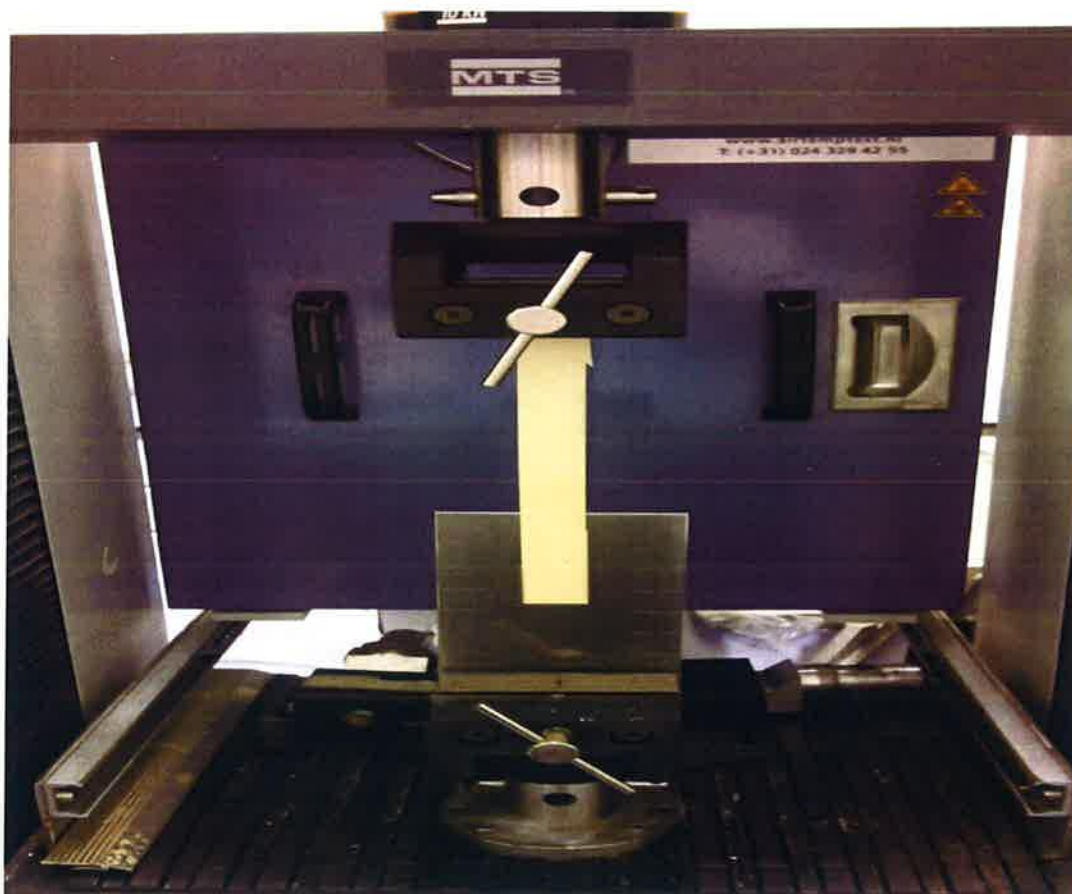


Figure 1: Tensile strength apparatus

Before the experiment all panels have been cleaned with methanol and methyl ethyl butanone. The first tape has been applied on the stainless steel panel 10 minutes after cleaning. The tape strip, with a length of 30 cm, has been pressed to the surface using a rubber roller and a weight of 2 kilograms.

Within 5 minutes from applying the tape strip, the tape strip has been peeled off the surface using a calibrated tensile strength instrument (type MTS 2/M with 10kN loadcell) with a peeling speed of 300 ± 12 mm/min. The corresponding force, expressed in Newton, is measured constantly and presented in a graph. Using this graph the force (N) at 40, 80, 120, 160 and 200 mm, corresponding to the markings on the test panel, can be read. The average value is calculated, converted to N/25 mm and N/10 mm, and statistically judged if the average force is within the boundaries as set in the standard.

Each tape has been tested in 5 fold.

3.2 Statistical analysis of the results

Using statistical analysis of the test results, one can determine whether the obtained results fits into the interval as has been set in the corresponding standard (ISO 2409).

The Z-value can be calculated using the formula underneath¹

$$z = \frac{x_{gem} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

Symbol	Description
z	: Z-value
x_{gem}	: Average adhesive strength (N/25 mm)
μ	: Real value according to standard (8 N)
σ	: Standard deviation of the real value (2 N)
n	: Number of measurements

Based upon a 95% reliability interval ($\alpha=0,05$), the measured average values can be considered to fit into the interval 8 ± 2 N/25 mm, if $-1,96 < z < 1,96$. The calculated Z-values are presented in table 2 of this report.

3.3 Analysis of the variance of the test results

The variance between the measured values within one tape can be calculated using the formula underneath:

$$\text{Variance (VAR)} = s^2$$

The coefficient of variation (CV) between the measured values within one tape can be calculated using the formula:

$$CV = \frac{s}{x_{gem}} * 100\%$$

¹ Statistiek, validatie en meetonzekerheid voor het laboratorium, Dr. J.W.A. Klaessens, 2008
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3.4 Adhesive values given by the manufacturer

The adhesive strength of the tapes, expressed in Newton per tape width on a steel substrate, has been carried out by the manufacturers and is presented in the product data sheets of the specific tape.

An overview of these adhesive results has been presented in table 3 of this report. All relevant product data sheets are added in Annex II of this report.



4 RESULTS

Table 1: test results

Tape no.	Tape width (mm)	Peel adhesion (N/25 mm)				Peel adhesion (N/10 mm)	Z-value	VAR	CV (%)	
		n	avg	std	max					
1	50	5	6.0	0.9	7.1	2.4	± 0.4	-2.25	0.73	14.3
2	25	5	9.0	3.0	15.0	4.0	± 1.0	1.49	7.74	29.8
3	25	5	6.6	0.5	7.7	2.6	± 0.2	-1.54	0.24	7.3
4	25	5	11.0	1.0	13.0	4.4	± 0.4	3.16	1.91	12.8
5	50	5	8.0	0.8	9.1	3.2	± 0.3	-0.02	0.64	10.1
6	25	5	5.3	0.9	6.6	2.1	± 0.4	-3.03	0.88	17.7
7	25	5	8.0	2.0	12.0	3.2	± 0.8	0.40	3.93	23.7
8	25	5	4.9	0.8	6.4	2.0	± 0.3	-3.48	0.59	15.7
9	25	5	6.3	0.6	7.0	2.5	± 0.2	-2.01	0.31	9.0
10	25	5	13	3.0	18.0	5.0	± 1.0	5.47	8.77	23.0
11	50	5	5.5	0.6	6.8	2.2	± 0.2	-2.82	0.38	11.2
12	50	5	7.0	1.0	8.0	2.8	± 0.4	-0.93	1.32	16.0
13	25	4	5.4	0.8	6.4	2.2	± 0.3	-2.64	0.58	14.2
14	25	5	6.0	1.0	9.0	2.4	± 0.4	-1.85	2.24	23.6
15	25	5	5.8	0.6	6.8	2.3	± 0.2	-2.51	0.36	10.3
16	25	5	6.3	0.4	6.8	2.5	± 0.2	-1.92	0.17	6.6
17	25	4	5.3	0.4	6.1	2.1	± 0.2	-2.67	0.18	7.9
18	50	5	7.8	0.6	9.1	3.1	± 0.2	-0.24	0.34	7.5
19	50	5	6.9	0.6	7.6	2.8	± 0.2	-1.26	0.38	9.0
20	50	5	6.5	0.8	7.4	2.6	± 0.3	-1.72	0.63	12.3
21	50	5	3.1	0.3	3.8	1.2	± 0.1	-5.53	0.11	11.0
22	25	5	8.0	1.0	10.0	3.2	± 0.4	-0.40	1.78	17.5
23	25	5	18.0	1.0	21.0	7.2	± 0.6	11.3	2.23	8.2
24	25	5	9.2	0.6	10.4	3.7	± 0.2	1.34	0.39	6.8
25	25	5	8.0	1.0	10.6	3.2	± 0.4	0.47	1.26	13.4
26	25	5	16.1	0.1	16.3	6.44	± 0.04	9.01	0.02	0.8



Table 2: Adhesive values given by the manufacturer

Tape	Adhesive value	Test method
Lithographers Tape 616 (3M)	: 9.75 N/25 mm	ASTM D-3330
Scotch Cellophane Film Tape 610 (3M)	: 11.75 N/25 mm	ASTM D-3330
Scotch Filament Tape 8981 (3M)	: 19.25 N/25 mm	ASTM D-3330
Scapa 8010B (Scapa)	: 11 N/25 mm	IEC 454-2
<i>Tape X (Tesa)</i>	: -	-
Tape 8705B Polyester Adhesive Tape (TQC)	: 10.75 N/25 mm	AFERA 4001
Scapa 8705B Polyester Adhesive Tape (Scapa)	: 10.75 N/25 mm	AFERA 4001
<i>Tape Y (?)</i>	: -	-
Scotch Tape 371 (3M)	: 10 N/25 mm	AFERA 4001
Tesa Performance Grade UPVC Tape 4120 and 4104 (Tesa)	: 8.75 N/25 mm	Not specified
Flatback Masking Tape 250 (3M)	: 19.25 N/25 mm	ASTM D-3330
Tesa Premium General Purpose Carton Sealing Tape 4124 (Tesa)	: 8 N/25 mm	Not specified



5 DISCUSSION

All received tapes are used by different parties to determine the adhesion of coating and coating related products.

5.1 Received tapes

Of the received 26 tapes, 8 specimen are 50 mm in width. 6 of these 8 specimen are transparent.

The use of tape, applied on a paper backing, is not recommended since these tapes are very hard to remove from the backing. Splitting and Adhesive transfer is observed by some tested tapes.

5.2 Peel adhesion

The peel adhesion values of the tested tapes (see table 1) show a lot of variation. Over the entire scale values between 2.3 and 18.0 N/25 mm have been measured. This observation can be considered a justification for this large scale investigation.

5.3 Z-value

Using the Z-value the tapes that meet the requirement for adhesive strength, in accordance with ISO 2409, can be calculated. Tapes that comply shall have a Z-value between -1.96 and +1.96.

Out of the 26 tested tapes, 13 specimens meet this requirement (tape no. 2, 3, 5, 7, 12, 14, 16, 18, 19, 20, 22, 24 and 25). When the minimum and maximum values are taking into account, only tape numbers 5 and 18 meet the requirements.

5.4 VAR/CV

The correlation of variation (CV), expressed in percentage, shows the variance in the measured data within one specimen. With an increasing CV value, the measured data are widely spread. Using this parameter, it is clear that the adhesive value of different specimen of one type of tape is not uniform. Some specimens of one type appear to meet the requirements, and another specimen does not meet the requirements.

This observation can be caused due the production process of the tape and/or the ageing of the tape (older versus newer batches).

Only 9 out of the 26 tested tapes have a CV value less than 10%.

5.5 Adhesive values given by manufacturer

The manufacturers of the tapes determine the adhesive value, on a steel substrate according to ASTM D-3330, IEC 454-2 or AFERA 4001. The correlation between these standards and the official standards ISO 2409 and IEC 60454-2 has not been checked.

Based upon the test results and the data from the product data sheets, the values do not match, possibly due to the difference in standard (except tape no. 4 and 23).

To test if a tape meets the requirements of ISO 2409, a validation test in accordance with IEC 60454-2 is advised, referring to only a product information is in most cases not appropriate.

6 CONCLUSION

Based upon the adhesive strengths of the tapes as tested in accordance with ISO 2409 and IEC 60454-2 and presented in this report, the following conclusions can be drawn.

- The tested tapes with numbers 2, 3, 5, 7, 12, 14, 16, 18, 19, 20, 22, 24 and 25 meet the requirements of ISO 2409, that used tapes shall have an adhesive strength of 6 – 10 N/25 mm. When the maximum and minimum values are taken into account only the tapes with number 5, 18 and 24 meet the requirements.
- The adhesive strength of the tested tapes showed, in most cases, a high variation within one tape, as well as between similar tapes.
- The influence of ageing (temperature and/or relative humidity) and different coated substrates, on the peel adhesion value, has not been determined.
- The adhesive strength of tapes on steel, as given by the manufacturers, are mostly carried out according to standards which are not mentioned in ISO 2409. The adhesive strength of the used tape shall be tested in accordance with IEC 60454-2.

7 RECOMMENDATIONS

Regarding this test, with respect to future test activities, the following should be considered:

- To determine the variance in all tapes more tapes should be tested in accordance with IEC 60454-2 (only practical when the types of tape are known)
- The influence of ageing (temperature and/or relative humidity) and different coated substrates, on the peel adhesion value, shall be determined.
- Since none of the tape manufacturers test their tapes according to IEC 60454-2 all new batches of tape should be tested according to IEC 60454-2.

CENTRUM VOOR ONDERZOEK
EN TECHNISCH ADVIES (COT bv)

A blue ink signature of Ing. F.H. Berkvens, written in a cursive style.

Ing. F.H. Berkvens
Quality Manager

A blue ink signature of Ing. M. Walrave, written in a cursive style.

Ing. M. Walrave
Managing Director



ANNEX I

Overview of the measured adhesive values of alle tapes

Tape no.	Width (mm)	Adhesive strength in N at ... mm					Avg		Std
		40	80	120	160	200			
1	25	4.850	4.900	4.350	4.750	4.000	4.570	±	0.385
		6.100	6.850	7.000	5.601	6.145	6.339	±	0.578
		6.750	5.950	7.000	6.750	6.343	6.559	±	0.414
		6.445	6.400	6.250	6.100	5.550	6.149	±	0.361
		7.050	6.350	6.550	5.415	6.150	6.303	±	0.599
							5.984	±	0.854
2	25	13.110	6.600	8.800	11.070	2.800	8.476	±	4.001
		7.110	5.700	7.890	7.900	5.770	6.874	±	1.088
		8.600	8.700	7.800	10.520	8.800	8.884	±	0.997
		11.600	9.350	10.860	9.000	8.000	9.762	±	1.452
		12.000	12.800	12.830	15.350	10.360	12.668	±	1.803
							9.333	±	2.781
3	25	6.800	6.800	6.420	6.400	6.300	6.544	±	0.238
		6.500	6.400	6.170	6.200	6.300	6.314	±	0.138
		6.600	6.500	6.600	6.500	6.600	6.560	±	0.055
		6.200	6.300	6.500	6.200	5.900	6.220	±	0.217
		7.700	7.700	7.500	7.300	7.150	7.470	±	0.244
							6.622	±	0.486
4	25	10.050	9.300	9.200	10.300	9.700	9.710	±	0.472
		13.000	12.500	13.400	13.000	12.540	12.888	±	0.374
		9.500	9.900	10.300	9.000		9.675	±	0.556
		11.300	11.800	12.020	11.900	10.900	11.584	±	0.470
		10.900	10.520	10.000	9.350	9.400	10.034	±	0.681
							10.824	±	1.382
5	25	8.345	8.300	8.500	8.318	8.150	8.323	±	0.125
		9.000	9.100	8.700	8.700	8.570	8.814	±	0.225
		8.000	8.080	7.600	7.685	6.900	7.653	±	0.467
		7.000	6.200	6.650	6.950	6.700	6.700	±	0.318
		8.350	8.450	8.600	8.600	8.000	8.400	±	0.247
							7.978	±	0.803
6	25	5.990	5.900	5.320	5.700	5.500	5.682	±	0.277
		4.800	5.820	4.940	3.400	2.300	4.252	±	1.394
		6.300	6.600	5.900			6.267	±	0.351
		5.600	5.800	5.380	5.700	5.850	5.666	±	0.186
		4.700	4.700	4.800	5.100	5.600	4.980	±	0.383
							5.291	±	0.936



Tape no.	Width (mm)	Adhesive strength in N at ... mm					Avg		Std
		40	80	120	160	200			
7	25	6.760	8.940	6.700	5.500	6.200	6.820	±	1.288
		8.900	8.200	11.300	9.600	7.700	9.140	±	1.405
		12.000	8.700	10.280	8.970	7.820	9.554	±	1.627
		7.120	8.100	8.570	8.600	3.800	7.238	±	2.013
		9.700	9.660	12.050	8.100	5.600	9.022	±	2.377
								8.355	±
8	25	4.780	4.800	4.950	4.100	3.700	4.466	±	0.540
		5.800	5.400	5.500	5.750	5.500	5.590	±	0.175
		5.200	5.700	4.400	5.300	3.400	4.800	±	0.914
		4.900	4.200	4.700	6.400	5.500	5.140	±	0.844
		5.100	4.400	4.310	3.400	5.100	4.462	±	0.702
								4.892	±
9	25	4.940	5.100	5.500	5.400	5.600	5.308	±	0.278
		6.800	5.900	6.900	6.900	7.000	6.700	±	0.453
		6.210	6.100	6.000	6.600	6.600	6.302	±	0.282
		6.460	6.500	6.500	6.500	6.000	6.392	±	0.220
		6.050	6.100	6.400	6.700	6.400	6.330	±	0.264
								6.206	±
10	25	10.040	13.900	8.900	13.380	10.500	11.344	±	2.183
		7.020	14.410	10.580	14.180	8.900	11.018	±	3.247
		9.500	13.670	9.800	16.160	16.920	13.210	±	3.467
		18.300	12.600	17.100	16.910	12.090	15.400	±	2.845
		11.673	14.500	13.218	14.600	13.400	13.478	±	1.187
								12.890	±
11	25	5.250	5.100	5.310	5.050	5.450	5.232	±	0.162
		5.050	5.500	5.350	4.350	5.428	5.136	±	0.471
		5.400	6.650	6.685	6.650	6.790	6.435	±	0.581
		5.280	4.990	5.645	5.550	5.660	5.425	±	0.287
		4.750	5.550	5.400	5.200	5.000	5.180	±	0.317
								5.482	±
12	25	7.200	7.450	7.400	5.740	6.505	6.859	±	0.731
		8.150	8.000	8.070	8.450	7.285	7.991	±	0.430
		6.315	7.500	6.900	6.850	4.100	6.333	±	1.317
		7.950	8.095	7.100	5.500		7.161	±	1.191
		7.905	7.950	8.360	8.270	4.900	7.477	±	1.454
								7.164	±
13	25	5.300	4.900	6.100	6.100	6.100	5.700	±	0.566
		4.000	4.080	4.730	4.450	6.400	4.732	±	0.978
		5.100	5.600	5.300	4.500	5.500	5.200	±	0.436
		6.400	6.100	5.400	5.820		5.930	±	0.425
								5.362	±



Tape no.	Width (mm)	Adhesive strength in N at ... mm					Avg		Std	
		40	80	120	160	200				
14	25	8.900	8.500	8.800	8.400	7.440	8.408	±	0.579	
		5.675	6.200	6.000	4.800	4.000	5.335	±	0.918	
		4.710	5.500	4.680	5.000	3.950	4.768	±	0.563	
		8.040	7.100	7.300	7.400	7.500	7.468	±	0.352	
		5.700	5.500	6.000	5.470	6.000	5.734	±	0.258	
								6.343	±	1.496
15	25	5.910	5.850	6.250	5.240	6.050	5.860	±	0.379	
		6.000	5.880	5.850	5.850	5.895	5.895	±	0.062	
		5.400	5.450	5.680	5.650	5.415	5.519	±	0.135	
		6.740	6.800	6.450	6.615	6.300	6.581	±	0.206	
		4.600	4.650	5.085	5.050	5.200	4.917	±	0.273	
								5.754	±	0.595
16	25	6.300	6.400	6.600	6.800	5.970	6.414	±	0.314	
		6.600	6.450	6.100	5.900	6.700	6.350	±	0.339	
		5.300	5.400	5.700	5.800	6.100	5.660	±	0.321	
		6.400	6.600	6.250	6.500	6.300	6.410	±	0.143	
		6.840	6.600	6.200	6.600	6.600	6.568	±	0.230	
								6.280	±	0.413
17	25	5.700	5.900	5.300	5.020	6.100	5.604	±	0.441	
		4.800	5.000	5.300	6.100	5.750	5.390	±	0.534	
		4.800	5.300	4.900	5.200	5.200	5.080	±	0.217	
		5.400	5.260	4.800	5.000	5.700	5.232	±	0.349	
								5.327	±	0.420
18	25	7.350	7.565	7.630	7.800	7.500	7.569	±	0.166	
		7.450	7.350	7.735	7.500	7.570	7.521	±	0.144	
		7.600	7.550	8.000	8.485	8.450	8.017	±	0.447	
		8.550	8.400	8.300	8.850	9.100	8.640	±	0.331	
		7.350	7.600	7.150	6.960	6.850	7.182	±	0.301	
								7.786	±	0.582
19	25	6.050	6.000	5.560			5.870	±	0.270	
		7.600	7.585	6.850	7.470	7.400	7.381	±	0.308	
		7.450	7.580	7.600	7.533	7.200	7.473	±	0.163	
		6.430	6.500	6.615			6.515	±	0.093	
		6.500	6.600	6.650	6.615	6.500	6.573	±	0.069	
								6.871	±	0.617
20	25	7.175	7.150	7.413	6.950	6.750	7.088	±	0.250	
		7.050	7.050	7.200	7.300	7.250	7.170	±	0.115	
		5.600	5.350	5.050	4.750	4.750	5.100	±	0.374	
		6.250	6.500	6.850	6.000	6.200	6.360	±	0.327	
		6.585	6.650	6.700	6.650	6.400	6.597	±	0.117	
								6.463	±	0.797



Tape no.	Width (mm)	Adhesive strength in N at ... mm					Avg		Std
		40	80	120	160	200			
21	25	3.200	3.500	2.950	3.300	3.350	3.260	±	0.204
		3.310	3.395	3.350	3.800	3.750	3.521	±	0.234
		2.750	2.700	2.650	2.715	2.800	2.723	±	0.056
		2.875	2.820	2.850	2.850	2.750	2.829	±	0.048
		2.850	3.195	2.800	3.060	2.800	2.941	±	0.178
							3.055	±	0.336
22	25	8.500	10.080	8.610	9.210	7.080	8.696	±	1.100
		7.000	7.000	6.400	6.100	5.900	6.480	±	0.507
		8.800	9.200	8.900	8.800	7.800	8.700	±	0.529
		7.800	6.500	6.700	4.600	5.400	6.200	±	1.235
		8.400	8.200	7.900	8.200	8.000	8.140	±	0.195
							7.643	±	1.335
23	25	19.180	20.000	19.190	20.300	17.120	19.158	±	1.242
		20.500	20.860	17.500	17.515	17.380	18.751	±	1.766
		15.420	18.700	17.950	15.330	19.140	17.308	±	1.815
		16.160	17.050	16.400	18.100	19.200	17.382	±	1.264
		16.870	18.000	18.300	18.490	17.900	17.912	±	0.628
							18.102	±	1.492
24	25	10.250	9.100	9.980	9.600	9.300	9.646	±	0.473
		9.300	9.200	9.400	9.100	9.500	9.300	±	0.158
		9.900	9.800	9.050	9.230	9.100	9.416	±	0.403
		8.600	8.000	8.970	8.100	7.960	8.326	±	0.442
		10.420	8.900	9.350	8.665	9.240	9.315	±	0.675
							9.201	±	0.626
25	25	8.500	7.600	7.900	7.680	7.300	7.796	±	0.448
		6.900	6.920	7.800	6.100	6.800	6.904	±	0.604
		8.890	8.200	8.300	8.700	8.100	8.438	±	0.340
		10.160	9.400	8.970	9.100	9.200	9.366	±	0.471
		10.600	9.500	8.700	9.200	9.900	9.580	±	0.719
							8.417	±	1.124
26	25	16.225	16.100	16.100	16.050	16.100	16.115	±	0.065
		15.850	15.925	15.875	15.975	16.075	15.940	±	0.089
		16.082	16.170	16.200	16.200	16.200	16.170	±	0.051
		15.975	15.950	15.918	15.875	15.900	15.923	±	0.040
		16.147	16.097	16.097	16.250	16.250	16.168	±	0.077
							16.063	±	0.127



ANNEX II

Product data sheets of the tested tape types

3M

Lithographers Tape

616

Technical Data

January, 2006

Product Description 3M™ Lithographers Tape 616 is an optically transparent and photographically opaque tape.

Construction	Backing	Adhesive	Color	Standard Roll Length
	Unplasticized polyvinylchloride (UPVC)	Rubber	Ruby Red	72 yds. (66 m)

Typical Physical Properties and Performance Characteristics

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

		ASTM Test Method
Adhesion to Steel:	36 oz./in. width (39 N/100 mm)	D-3330
Tensile Strength at Break:	29 lbs./in. width (509 N/100 mm)	D-3759
Elongation at Break:	50%	D-3759
Backing Thickness:	1.6 mils (.04 mm)	D-3652
Total Tape Thickness:	2.4 mils (.06 mm)	D-3652

Features

- Can be qualified to meet MIL-T-40620A.
- Ruby Red UPVC film backing to allow accurate positioning.
- Resists affects of changing atmospheric conditions to allow repeated and extended "burn" times.
- Low caliper backing to minimize ghosting and provide sharper definition.
- Pin-hole free backing to provide continuous opacity to light source to help minimize retouching.
- Firm adhesive which is long aging and resistant to softening to resist oozing during application and storage.

Application Ideas

- Opaquing, stripping and edging.
- Splicing.

3M™ Lithographers Tape

616

Major Industries

• Graphic Arts; Printed Circuit Board; Paper.

Storage

Store under normal conditions of 70°F (21°C) and 50% relative humidity.

Shelf Life

To obtain best performance, use this product within one year from date of manufacture.

Product Use

All statements, technical information and recommendations contained in this document are based upon tests or experience that 3M believes are reliable. However, many factors beyond 3M's control can affect the use and performance of a 3M product in a particular application, including the conditions under which the product is used and the time and environmental conditions in which the product is expected to perform. Since these factors are uniquely within the user's knowledge and control, it is essential that the user evaluate the 3M product to determine whether it is fit for a particular purpose and suitable for the user's method of application.

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ISO 9001:2000

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Scotch[®] Cellophane Film Tape 610



Technical Data **April, 2003**

Product Description Scotch[®] Tape 610 is a high-performance, transparent cellophane film tape featuring a high-tack adhesive system. This tape offers excellent adhesion, dispensing and handling properties.

Construction	Backing	Adhesive	Colors
	Cellophane	Pressure sensitive rubber resin	Transparent

Typical Physical Properties **Note: The following technical information and data should be considered representative or typical only, and should not be used for specification purposes.**

		ASTM Test Method
Adhesion to Steel:	43 oz./in. width (47 N/100 mm width)	D-3330
Transverse Tensile Strength:	23 lbs./in. width (402 N/100 mm width)	D-3759
Elongation at Break:	15%	D-3759
Tape Thickness - Backing:	1.43 mil (0.036 mm)	D-3652
Total:	2.3 mil (0.058 mm)	D-3652

Note: 3M is aware that Scotch[®] Tape 610 has been used by some customers to test the level of adhesion of coatings to various substrates and does not recommend this procedure due to variability in pressure-sensitive film tapes, which are inherent in their manufacture. This slight and reasonable variability is acceptable for ordinary application, but in our opinion, could render test data invalid based on these characteristics.

- Features**
- Temperature resistant.
 - Good initial bond.
 - Dimensionally stable on the application up to 300°F (149°C).
 - Easily dispensed, eliminates frustration.
 - Excellent holding properties for customer satisfaction.
 - Controlled unwind for reliable hand dispensing.
 - Immediate adhesion to a variety of substrates.

Scotch® Cellophane Film Tape

610

Available Sizes	Standard Widths:	3/8", 1/2", 3/4", 1", 1 1/2", 2", 3"
	Available by Special Order:	Custom widths and lengths available on request, subject to minimum order requirements.
	Core Size (ID):	3 in.
	Lengths:	72 yds., bulk only

For Additional Information

To request additional product information or to arrange for sales assistance, call toll free 1-800-362-3550 or visit www.3M.com/packaging. Address correspondence to: 3M Industrial Adhesives and Tapes Division, Building 21-1W-10, 900 Bush Avenue, St. Paul, MN 55144-1000. Our fax number is 651-778-4244. In Canada, phone: 1-800-364-3577. In Puerto Rico, phone: 1-787-750-3000. In Mexico, phone: 52-70-04-00.

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Scotch® Filament Tape 8981



Technical Data

June, 2009

Product Description

Scotch® Filament Tape 8981 is a high-performance packaging tape reinforced with continuous glass-yarn filaments that give the tape very high tensile strength and low stretch. The clear 3M™ Scotchpro™ backing provides excellent abrasion and moisture resistance. The aggressive packaging-grade adhesive is specifically formulated to provide an excellent balance of initial adhesion and long-term holding power to most fiberboard surfaces, including recycled and printed fiberboard surfaces.

Construction

Backing	Adhesive	Reinforcement	Backing Color
3M™ Scotchpro™ film	Pressure sensitive synthetic rubber resin	Glass yarn	Clear

Typical Physical Properties

Note: The following technical information and data should be considered representative or typical only, and should not be used for specification purposes.

		ASTM Test Method
Adhesion to Steel:	70 oz./in. width (77 N/100 mm width)	D-3330
Tensile Strength:	380 lbs./in. width (6655 N/100 mm width)	D-3759
Elongation at Break:	3%	D-3759
Total Thickness:	6.6 mil (0.168 mm)	D-3652

Features

- Meets ASTM D5330, Type II, which has replaced PPP-T-97E and CID A-A-1686A.
- Good handling.
- Printable.
- High tensile strength combined with low stretch.
- Allows printing and illustrations to be seen through the tape.
- High shear and good initial adhesion.
- Very good long-term holding power.
- Tough film backing protects the filaments and adhesive to provide longer functional tape performance.
- Good handling characteristics, saves time through ease of dispensing and tape application.
- When printed, the tape provides advertising, warning, and labeling capability.
- High tensile strength allows the use of less tape in many applications and lowers the cost per application.
- Good clarity of artwork and important messages even when covered by the tape.
- Adhesive provides very good holding under wide range of application conditions with minimum amount of tape.
- Holds instantly with minimum rubdown.
- Boxes remain securely closed through normal warehouse time cycles.

Scotch® Filament Tape

8981

Available Sizes	Available Widths	Available Lengths
	Standard Widths: .47 in. (12 mm), .71 in. (18 mm), .94 in. (24 mm), 1.4 in. (36 mm), 1.9 in. (48 mm)	60 yds. (55 m)
	.47 in. (12 mm), .71 in. (18 mm)	361 yds. (330 m)
Core Size (ID):	3 in. (76.2 mm)	

Application Techniques An extensive line of application equipment including hand-held manual dispensers and the 3M-Matic™ Semi-Automatic L-Clip Applicator S857 is available. Application of Scotch® Filament Tape 8981 is most easily accomplished at room temperature because at colder temperatures, approaching 32°F (0°C), the adhesive becomes firmer. Once applied, Scotch® Tape 8981 performs well throughout the normal temperature ranges typically encountered by packaged products in shipping and storage environments.

Storage Conditions Store behind present stock. Store in a clean, dry place. Temperature of 40-80°F (4-26°C) and 40-50% relative humidity are recommended. Rotate your stock.

Shelf Life To obtain best performance, use this product within 18 months from date of manufacture.

Technical Information The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

Product Use Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application.

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ISO 9001:2000

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TECHNICAL DATA

SCAPA 8010B

Wysokiej jakości samoprzylepna taśma poliestrowa z termoutwardzalnym klejem kauczukowym

OPIS

SCAPA 8010B to samoprzylepna taśma poliestrowa z termoutwardzalnym klejem kauczukowym.

ZASTOSOWANIE

- do zamykania cewek uzwojeń
- do owijania /zamykania folii kondensatorów
- do ochrony i łączenia niepalnych materiałów izolacyjnych stosowanych jako izolacja międzywarstwowa
- jako izolacja międzywarstwowa dla wykonań w klasie temperaturowej do + 130 stopni C
- do łączenia ekranów z blachy aluminiowej lub miedzianej
- do zewnętrznej izolacji cewek, silników, transformatorów
-

ZALETY PRODUKTU

- dobre właściwości dielektryczne
- klej kauczukowy termoutwardzalny
- można pisać po powierzchni taśmy
- kolor żółty lub bezbarwny

WŁAŚCIWOŚCI TECHNICZNE

	JEDNOSTKA	WARTOŚĆ NOMINALNA	METODA TESTOWA
GRUBOŚĆ	mm	0,052	Internal*
SIŁA ZERWANIA	N/cm	35	IEC 454-2
PRZYLEPNOŚĆ DO STALI	ON/mm	4,4	IEC 454-2
WYDŁŻENIE PRZY ZERWANIU		60-110%	
WYTRZYMAŁOŚĆ DIELEKTRYCZNA	K V	4,6	
TEMPERATURA PRACY	C	do + 130	IEC 454-2

STANDARDOWA PREZENTACJA

- Długość rolki – 66m
- Szerokość rolki – 12, 19, 25, 38 mm



TECHNICAL DATA

Scapa 8705B

Polyester Adhesive Tape

DESCRIPTION

Scapa 8705B is a polyester film coated with a fully cured acrylic adhesive system, with 0.055 mm total thickness and recommended for a variety of coil winding protection and insulation applications (130°C thermal class B).

APPLICATIONS

- Fixing and securing non-adhesive insulating materials between layers,
- Fixing output wires, copper sheets or wires harnesses,
- Layer and phases insulation,
- Outer protective insulating wraps for bobbins, transformers etc...
- Soldering protection and varied insulation uses for motors,
- Features identification (Printable),
- Cross-cut test of paints and varnishes (accordingly to EN ISO 2409).

PRODUCT BENEFITS

- 23 microns polyester films backing for improved moisture resistance, weight and space savings,
- Outstanding dielectric strength,
- Acrylic adhesive system specially designed for its resistance to solvents, freon and transformer oils,
- Service temperature: 130°C continuous – Thermal Class B,
- Good peel strength to check paints and varnishes.

TECHNICAL PROPERTIES

	Unit	Nominal value	Test Method
Total Thickness	mm	0.055	AFERA 4006
Tensile Strength	N/cm	35	AFERA 4004
Elongation at Break	%	60 to 110	AFERA 4005
Adhesion to Steel	N/cm	4.3	AFERA 4001
Breakdown Voltage	kV	5	AFERA 4011
Insulation Resistance	MΩ	1x10 ⁶	AFERA 4010
Service Temperature	°C	130	UL1446
Corrosion Factor		1	
Cross-linking Cycle		1h at 150°C – 2h at 130°C	

STANDARD PRESENTATION

- Roll length: 66 metres
- Roll width: 9, 12, 15, 19, 25, 30, 38 and 50 mm
- Core: 76 mm Scapa branded cardboard core
- Packaging: 9 and 12 mm in plastic bag; other widths are cellowrapped with a Scapa label
- Colours: Transparent

Note: Other dimensions are available upon request and may be subject to minimum order quantities.

RECOMMENDATIONS

The rolls should be stored flat on their cut edges in the original packaging. The product must be protected from dust, heat, moisture, direct sunlight and solvent fumes. Storage temperature between +10°C and +30°C. Under these conditions, the storage life of the tape in a temperate climate will be at least one year.

Surfaces should be clean, dry and free of dust, grease, oil or other contaminants.



Tape 8705B

Polyester Adhesive Tape

DESCRIPTION

Tape 8705B is a polyester film coated with a fully cured acrylic adhesive system, with 0.055 mm total thickness and recommended for a variety of coil winding protection and insulation applications (130°C thermal class B).

APPLICATIONS

- Fixing and securing non-adhesive insulating materials between layers,
- Fixing output wires, copper sheets or wires harnesses,
- Layer and phases insulation,
- Outer protective insulating wraps for bobbins, transformers etc...
- Soldering protection and varied insulation uses for motors,
- Features identification (Printable),
- Cross-cut test of paints and varnishes (accordingly to EN ISO 2409).

PRODUCT BENEFITS

- 23 microns polyester films backing for improved moisture resistance, weight and space savings,
- Outstanding dielectric strength,
- Acrylic adhesive system specially designed for its resistance to solvents, freon and transformer oils,
- Service temperature: 130°C continuous – Thermal Class B,
- Good peel strength to check paints and varnishes.

TECHNICAL PROPERTIES

	Unit	Nominal value	Test Method
Total Thickness	mm	0.055	AFERA 4006
Tensile Strength	N/cm	35	AFERA 4004
Elongation at Break	%	60 to 110	AFERA 4005
Adhesion to Steel	N/cm	4.3	AFERA 4001
Breakdown Voltage	kV	5	AFERA 4011
Insulation Resistance	MΩ	1x10 ⁶	AFERA 4010
Service Temperature	°C	130	UL1446
Corrosion Factor		1	
Cross-linking Cycle		1h at 150°C – 2h at 130°C	

STANDARD PRESENTATION

- Roll length: 11 metres
- Roll width: 9, 12, 15, 19, 25, 30, 38 and 50 mm
- Core: 76 mm Scapa branded cardboard core
- Packaging: 9 and 12 mm in plastic bag; other widths are cellowrapped with a Scapa label
- Colours: Transparent

Note: Other dimensions are available upon request and may be subject to minimum order quantities.

RECOMMENDATIONS

The rolls should be stored flat on their cut edges in the original packaging. The product must be protected from dust, heat, moisture, direct sunlight and solvent fumes. Storage temperature between +10°C and +30°C. Under these conditions, the storage life of the tape in a temperate climate will be at least one year.

Surfaces should be clean, dry and free of dust, grease, oil or other contaminants.



Scotch® Tape 371

General Purpose Box Sealing Tape

Manufactured in an ISO 9002 certified facility

Updated : July 2000
Supersedes: February 1999

Product Description 371 is a general purpose box sealing tape with a bi-axially orientated polypropylene film backing and hot melt solvent free (synthetic rubber/resin) adhesive. The ScotchPro™ polypropylene backing is edge tear and split, abrasion and moisture resistant; and provides a seal against dust and contaminants. The adhesive is specifically formulated to provide good adhesion to fibreboard.

Physical Properties
Not for specification purposes

Adhesive Type	Pressure sensitive hot melt solvent free (synthetic rubber/resin)	
Backing	28 micron (0.028 mm) bi-axially oriented ScotchPro™ polypropylene	
Total Thickness	48 micron (0.048 mm)	AFERA 4006
Colour	Transparent, white, tan	
Available Widths	Contact your local sales office	Available Lengths Contact your local sales office
Core Size (ID)	76mm (3")	
Storage Conditions	Store behind present stock, in a clean dry place. Temperature of 18-21°C (64 - 70°F) & 40-50% Relative Humidity are recommended. Rotate your stock. Under correct storage conditions the tape maintains its characteristics for one year (shelf life).	

Performance Characteristics
Not for specification purposes

Adhesion to Stainless Steel	4.0 N/cm	AFERA 4001
Tensile Strength	45.0 N/cm	AFERA4004
Elongation at Break	160 %	AFERA 4005
Static Shear	4,500 + minutes	AFERA 4012
Application	Best applied at room temperature onto a clean, dry, dust-free fibreboard surface. Once applied the product performs well throughout all temperatures typically encountered by packaged products in shipping and storage environments - including deep freeze.	

Date : June 2000
371 General Purpose
Box Sealing Tape

3M Scotch and ScotchPro are trademarks of the 3M Company.

Values presented have been determined by standard test methods and are average values not to be used for specification purposes. Our recommendations on the use of our products are based on tests believed to be reliable but we would ask that you conduct your own tests to determine their suitability for your applications. This is because 3M cannot accept any responsibility or liability direct or consequential for loss or damage caused as a result of our recommendations.



Packaging Systems Division

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3M ITALIA S.p.A.
Packaging Systems Customer Service
Via S. Bovio 3 - Milano S. Felice
20090 SEGRATE MI
ITALY

Tel. + 39 02 7035 3174/3173
Fax. + 39 02 7035 2104/3124



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Item # TESA 4120, TESA Performance Grade UPVC Tape with Quiet Release
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TESA Performance Grade UPVC Tape with Quiet Release

tesa 4120 is a packaging tape based on a PVC filmbacking and a natural rubber adhesive. It has a quiet release. tesa 4120 is easily printable.

Applications:

- tesa 4120 can be used on manual and automatic sealing equipment
- tesa 4120 is universally used to close cartons of medium range weight.

Some Tape Products have a minimum one case requirement.

Call or submit a request for quote for details.

Specifications	
Manufacturer	Tesa
Backing	UPVC
Color	Clear Tan White
Total Thickness	2.1 mils
Total Thickness (metric)	0.052 mm
Tensile Strength	29 lb/in
Tensile Strength (metric)	127 N/25 mm
Tape Thickness	32 microns
Elongation at Break	60 %
Adhesion/Steel	32 oz./inch
Adhesion/Steel (metric)	8.75 N/25 mm
Adhesive	Natural Rubber
Temperature Resistance	160 °F
Temperature Resistance	70 °C



Flatback Masking Tape

250

Technical Data

June, 2008

Product Description 3M™ Flatback Masking Tape 250 is used for bundling and holding applications where a stronger paper backing is needed.

Product Construction	Backing	Adhesive	Color	Standard Roll Length
	Flat stock paper	Rubber adhesive	Tan	60 yds. (54.8 m)

Typical Physical Properties

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

		ASTM Test Method
Adhesion to Steel:	70 oz./in. width (77 N/100 mm width)	D-3330
Tensile Strength:	58 lbs./in. width (1016 N/100 mm width)	D-3759
Elongation at Break:	4%	D-3759
Tape Thickness:	6.2 mils (0.16 mm)	D-3652
Temperature Use Range:	Up to 200°F (93°C) for 30 min.	

Features

- This rubber adhesive is aggressive and provides instant adhesion to a wide variety of surfaces.
- The treated flat stock backing has good tensile strength to resist breakage.
- Solvent and moisture resistant to provide bleed through resistance in application.
- Will generally perform satisfactorily on painted metal surfaces at temperatures up to 200°F (93°C) for about 30 minutes.
- Special backsize treatment provides easy to use controlled unwind.
- Not recommended for outdoor exposure as it may become difficult to remove.

Application Ideas

- Holding, bundling and wrapping applications for a wide variety of materials where a stronger paper backing is needed.
- 3M tape 250 can be certified to meet ASTM D 6123 / D 6123M-97.
- PPP-T42C Type II and CID-A-A-883B are obsolete standards which have been replaced by ASTM D 6123 / D 6123M-97.
- 3M no longer qualifies 3M tape 250 to meet the inactive specification MIL-F-18264D.
- 3M tape 250 has been used to conduct testing according to ASTM D-3359; however, this test method does not endorse or suggest that any particular tape must be used.
- Protecting various items during painting and construction.
- General painting when a sharp, straight paint line is needed.

3M™ Flatback Masking Tape

250

Storage Store under normal conditions of 70°F (21°C) and 50% R.H. in the original carton.

Shelf Life To obtain best performance, use this product within one year from date of manufacture.

Technical Information The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

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This Industrial Adhesives and Tapes Division product was manufactured under a 3M quality system registered to ISO 9001:2000 standards.

3M

Industrial Adhesives and Tapes Division

3M Center, Building 21-1W-10, 900 Bush Avenue
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PRODUCT INFORMATION

tesa® 4124

Premium general purpose carton sealing tape



Product Description

tesa® 4124 is a premium packaging tape based on a PVC-film backing and a natural rubber adhesive. It shows excellent performance on all kind of cardboard and provides a safe closure of medium and also heavy-weight cartons. tesa® 4124 unwinds smoothly and without noise which makes it ideal for use in hand dispensers and automatic sealing equipment.

The process of cardboard waste recycling will not be affected as confirmed by leading recycling companies and paper mills.

Main Applications

tesa® 4124 is used for manual and automatic sealing of cartons of medium to heavy weight.

Technical Data

Backing material	PVC film
Type of adhesive	natural rubber
Total thickness	65 µm
Adhesion to steel	3.2 N/cm
Elongation at break	60 %
Tensile strength	60 N/cm

Properties

Manual application	yes
Automatic application	yes
Low noise unwinding	yes
Printability	++

Evaluation across relevant tesa assortment: ++ very good, + good, o medium, - low

tesa® products prove their impressive quality day in, day out in demanding conditions and are regularly subjected to strict controls. All information and recommendations are provided to the best of our knowledge on the basis of our practical experience. Nevertheless tesa SE can make no warranties, expressed or implied, including, but not limited to any implied warranty of merchantability or fitness for a particular purpose. Therefore, the user is responsible for determining whether the tesa® product is fit for a particular purpose and suitable for the user's method of application. If you are in any doubt, our technical support staff will be glad to advise you.

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TESA Performance Grade UPVC Tape with Quiet Release

tesa 4104, a UPVC film tape with a rubber adhesive system has good aging properties, is heat shrinkable and resistant to moisture, most acids, alkalis and solvents. Tesa 4104 is printable.

Applications:

- Used for sealing cans, packets and tins
- Resealable closures on tobacco pouches
- Ideal for coding, sealing and identifying
- Reproduction film mounting in the Graphic Arts Industry
- Meets the CID-AA-113, Type 1, Class A Specification
- Splicing of plastic film

Specifications

Manufacturer	Tesa
Backing	UPVC
Color	Black Blue Clear Green Orange Red White Yellow
Total Thickness	2.5 mils
Total Thickness (metric)	63.5 microns
Tensile Strength	34.2 lb/in
Tensile Strength (metric)	150 N/25 mm
Adhesion	30 oz/in
Adhesion (metric)	8.34 N/25 mm
Elongation at Break	60 %
Adhesive	Natural Rubber
Temperature Resistance	160 °F
Temperature Resistance	70 °C

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