



Membrane Switch

Technical Data

September, 2008

**Adhesive
Description**

3M™ Hi-Performance Acrylic Adhesive 200MP

This adhesive meets the requirements of most long-term applications. It offers temperature resistance to 400°F (204°C). Peel adhesion values are excellent on most membrane switch substrate materials. It features exceptional shear strength and adhesion to high surface energy (HSE) plastics and metal surfaces.

3M™ High Tack Adhesive 300MP

This adhesive is designed for applications requiring greater initial adhesion especially to low surface energy (LSE) plastic substrates. Temperature performance is up to 300°F (149°C) for most applications.

**Product
Description**

Adhesives for Selective Die-Cutting (double-linered)

3M Laminating Adhesives are available with two liners for ease of processing and selective removal of adhesive.

3M Double-Linered Adhesives offer:

- High adhesive strength – for a long-lasting durable bond
- High cohesive strength – to resist lifting and separation especially in harsh environments
- Smooth adhesive – for a uniform graphic appearance
- Environmental stability – for a long-aging performance
- Moisture stable liner – for easy, layflat processing
- Easy release liners – for fast, consistent processing

Spacers for Circuit Separation (double-coated)

3M Double-Coated Membrane Switch Spacers feature 2.0 or 5.0 mil adhesive layers for industry-standard, high-performance requirements. The 3M hi-performance acrylic adhesive 200MP provides the assurance your switch will perform through difficult environmental conditions and millions of actuations.

Spacers for Switch Assembly (single-coated)

3M Single-Coated Membrane Switch Spacers are ideal for circuit layers, metal dome placement and lead protection. The 3M hi-performance acrylic adhesive 200MP provides the assurance necessary for constructing durable, long-lasting membrane switches.

3M Single-Coated Adhesives offer:

- Smooth adhesive layer – for consistent actuation and excellent sealability of switch
- High adhesive strength – to resist moisture penetration, and environmental conditions
- High cohesive strength – to resist lifting and separation especially in harsh environments
- High temperature resistance – to resist splitting in harsh environments
- High chemical resistance – to resist contamination of contacts in harsh environments
- Heat stabilized polyester – for dimensional stability through broad temperature range
- Moisture stable liners – for easy, layflat processing
- Easy liner release – for fast, consistent processing

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Adhesives for Selective Die-Cutting (double-lined)

3M™ Adhesive	3M™ Membrane Switch Product No.	Description	Construction				
			Liner (Weight/Mils)	Adhesive (Mils)	Polyester (Mils)	Adhesive (Mils)	Liner (Weight/Mils)
Hi-Performance Acrylic 200MP	7952MP	Double-lined 467MP.	58# PCK 4.2	2	–	–	58# PCK 4.2
	7962MP	Double-lined 467MP with heavy lay-flat liner for added stiffness, controlled kiss-cutting and ease of handling.		2	–	–	83# PCK 6.2
	7953MP	Double-coated polyester for adhesive stability and ease of handling.		1.5	0.5	1.5	58# PCK 4.2
	7955MP	Double-lined 468MP.		5	–	–	58# PCK 4.2
	7965MP	Double-lined 468MP with heavy lay-flat liner for added stiffness, controlled kiss-cutting and ease of handling.		5	–	–	83# PCK 6.2
High Tack Acrylic 300MP	7951	Double-lined 300MP. High bond strength to low surface energy plastics.	58# PCK 4.2	2	–	–	58# PCK 4.2

Spacers for Circuit Separation (double-coated)

Adhesive	Product No.	Description	Construction				
			Liner (Weight/Mils)	Adhesive (Mils)	Polyester (Mils)	Adhesive (Mils)	Liner (Weight/Mils)
Hi-Performance Acrylic 200MP	7945MP	Designed to meet the performance requirements of most membrane keyboards. Outstanding resistance to temperature extremes, chemicals and humidity. Also resists oozing, lifting and separation of switch layers. All products feature 2 mils of 200MP on each side.	58# PCK 4.2	2	1	2	58# PCK 4.2
	7956MP			2	2	2	
	7957MP			2	3	2	
	7959MP			2	5	2	
	7961MP			2	7	2	
	9045MP	The 90xx series of products has a layflat liner on each side which improves die-cutting and handling of intricate die-cut parts.	94# PCK 7.0	2	1	2	94# PCK 7.0
	9056MP			2	2	2	
	9057MP			2	3	2	
	9059MP			2	5	2	
	9061MP			2	7	2	

Spacers for Switch Assembly (single-coated)

Adhesive	Product No.	Description	Construction				
			Liner (Weight/Mils)	Adhesive (Mils)	Polyester (Mils)	Adhesive (Mils)	Liner (Weight/Mils)
Hi-Performance Acrylic 200MP	7993MP	Single side spacers aid in the construction of membrane switch circuitry, i.e. to protect leads, hold domes in place, or build your own spacer	94# PCK 7.0	2	1	–	–
	7995MP			2	3	–	–
	7997MP			2	5	–	–

3M™ Membrane Switch Data Page

Typical Physical, Mechanical & Electrical Properties*

Spacers For Circuit Separation (double-coated)

3M™ Membrane Switch Product Number	3M™ Adhesive	Film / Substrate	Peel Adhesion ASTM D3330 Modified, 90° Peel		
			Initial (20 minutes)	72 hours @ 72°F (22°C)	72 hours @ 158°F (70°C)
			Typical Value oz./in. (N/100mm)	Typical Value oz./in. (N/100mm)	Typical Value oz./in. (N/100mm)
7945MP 9045MP (2-1-2)	200MP	PET/Stainless Steel	64 (70)	112 (123)	164 (180)
		PET/Aluminum	42 (46)	84 (92)	168 (185)
		PET/PET	49 (54)	67 (74)	126 (139)
		PET/Polycarbonate	50 (55)	72 (79)	84 (92)
7956MP 9056MP (2-2-2)	200MP	PET/Stainless Steel	50 (55)	113 (124)	156 (172)
		PET/Aluminum	32 (35)	75 (83)	157 (173)
		PET/PET	44 (48)	73 (80)	118 (130)
		PET/Polycarbonate	47 (52)	76 (84)	67 (74)
7957MP 9057MP (2-3-2)	200MP	PET/Stainless Steel	54 (59)	95 (105)	153 (168)
		PET/Aluminum	66 (73)	73 (80)	148 (163)
		PET/PET	37 (41)	60 (66)	136 (150)
		PET/Polycarbonate	41 (45)	66 (73)	72 (79)
7959MP 9059MP (2-5-2)	200MP	PET/Stainless Steel	30 (33)	83 (91)	134 (147)
		PET/Aluminum	31 (34)	68 (75)	124 (137)
		PET/PET	33 (36)	53 (58)	118 (130)
		PET/Polycarbonate	36 (40)	54 (59)	66 (73)
7961MP 9061MP (2-7-2)	200MP	PET/Stainless Steel	30 (33)	101 (111)	135 (148)
		PET/Aluminum	30 (33)	70 (78)	134 (147)
		PET/PET	35 (39)	61 (67)	124 (137)
		PET/Polycarbonate	37 (41)	55 (60)	67 (74)

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

3M™ Membrane Switch Data Page

Typical Physical, Mechanical & Electrical Properties*

Spacers For Circuit Separation (double-coated)

3M™ Membrane Switch Product Number	3M™ Adhesive	Cohesion Static (shear) ASTM D3654 (0.5 in. sq.)		
		Film / Substrate	72°F (22°C)/1000g	
			Typical Value Minutes ¹	Typical Value Minutes ¹
7945MP 9045MP (2-1-2)	200MP	PET/Stainless Steel	10,000+	10,000+
7956MP 9056MP (2-2-2)	200MP	PET/Stainless Steel	10,000+	10,000+
7957MP 9057MP (2-3-2)	200MP	PET/Stainless Steel	10,000+	10,000+
7959MP 9059MP (2-5-2)	200MP	PET/Stainless Steel	10,000+	10,000+
7961MP 9061MP (2-7-2)	200MP	PET/Stainless Steel	10,000+	10,000+

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3M™ Membrane Switch Data Page

Typical Physical, Mechanical & Electrical Properties*

Spacers For Circuit Separation (double-coated)

3M™ Membrane Switch Product Number	3M™ Adhesive	Cohesion Dynamic (shear) ASTM D1002 (1 in. sq.)		Tensile Strength (Yield) ASTM D2370	
		158°F (70°C)/500G		72°F (22°C)	
		Film / Substrate	Typical Value PSI / MPa	Typical Value Mils (Microns)	Typical Value PSI
7945MP 9045MP (2-1-2)	200MP	PET/Stainless Steel PET/Polycarbonate	68 (0.47) 70 (0.48)	5 (125)	2556
7956MP 9056MP (2-2-2)	200MP	PET/Stainless Steel PET/Polycarbonate	103 (0.72) 78 (0.54)	6 (150)	3971
7957MP 9057MP (2-3-2)	200MP	PET/Stainless Steel PET/Polycarbonate	79 (0.55) 66 (0.46)	7 (175)	5062
7959MP 9059MP (2-5-2)	200MP	PET/Stainless Steel PET/Polycarbonate	78 (0.54) 69 (0.48)	9 (225)	6462
7961MP 9061MP (2-7-2)	200MP	PET/Stainless Steel PET/Polycarbonate	76 (0.52) 66 (0.46)	11 (275)	7945

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Typical Physical, Mechanical & Electrical Properties*

Spacers For Circuit Separation (double-coated)

3M™ Membrane Switch Product Number	3M™ Adhesive	Dielectric Strength ASTM D149	Dielectric Constant/ Dissipation Factor	Volume / Surface Resistivity	
		Short time method (air)	ASTM D150 72°F (22°C)	ASTM D257 72°F (22°C)	
		Typical Value Volts/Mil	Typical Value D.C. / D.F.	Typical Value V.R. Ohm - cm	Typical Value S.R. Ohms
7945MP 9045MP (2-1-2)	200MP	1500	3.48 / 0.016	5.7 x 10 ¹⁴	> 5.6 x 10 ¹⁶
7956MP 9056MP (2-2-2)	200MP	1700 P	3.40 / 0.015	8.9 x 10 ¹⁴	> 5.6 x 10 ¹⁶
7957MP 9057MP (2-3-2)	200MP	1700 P	3.33 / 0.013	1.3 x 10 ¹⁵	> 5.6 x 10 ¹⁶
7959MP 9059MP (2-5-2)	200MP	1600 P	3.32 / 0.011	1.5 x 10 ¹⁵	> 5.6 x 10 ¹⁶
7961MP 9061MP (2-7-2)	200MP	1500	3.42 / 0.010	2.2 x 10 ¹⁵	> 5.6 x 10 ¹⁶

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3M™ Membrane Switch Data Page

Typical Physical, Mechanical & Electrical Properties*

Spacers For Circuit Separation (double-coated)

3M™ Membrane Switch Product Number	3M™ Adhesive	Insulation & Moisture Resistance	Coefficient of Thermal Expansion
		Mil-I-46058C (100VDC, 60 sec.)	ASTM D696 25-175°C
		Typical Value Ohms	Typical Value M/M/°C
7945MP 9045MP (2-1-2)	200MP	1.0 x 10 ¹³	6.1 x 10 ⁻⁴
7956MP 9056MP (2-2-2)	200MP	1.1 x 10 ¹³	5.1 x 10 ⁻⁴
7957MP 9057MP (2-3-2)	200MP	1.1 x 10 ¹³	5.4 x 10 ⁻⁴
7959MP 9059MP (2-5-2)	200MP	1.9 x 10 ¹³	4.7 x 10 ⁻⁴ 9059MP (2-5-2)
7961MP 9061MP (2-7-2)	200MP	1.6 x 10 ¹³	4.1 x 10 ⁻⁴ 9061MP (2-7-2)

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3M™ Membrane Switch Data Page

Typical Physical, Mechanical & Electrical Properties*

Adhesives For Selective Die Cutting (double-lined)

3M™ Membrane Switch Product Number	3M™ Adhesive	Film / Substrate	Peel Adhesion ASTM D3330 Modified, 90° Peel		
			Initial (20 minutes)	72 hours @ 72°F (22°C)	72 hours @ 158°F (70°C)
			Typical Value oz./in. (N/100mm)	Typical Value oz./in. (N/100mm)	Typical Value oz./in. (N/100mm)
7952MP 7962MP (2-0-0)	200MP	PET/Stainless Steel	31 (34)	97 (107)	156 (172)
		PET/Aluminum	41 (45)	76 (84)	157 (173)
		PET/PET	38 (42)	66 (73)	118 (130)
		PET/Polycarbonate	43 (47)	70 (71)	67 (74)
7953MP (1.5-0.5-1.5)	200MP	PET/Stainless Steel	50 (55)	113 (124)	160 (176)
		PET/Aluminum	32 (35)	75 (83)	152 (167)
		PET/PET	44 (48)	73 (80)	125 (138)
		PET/Polycarbonate	47 (52)	76 (84)	75 (83)
7955MP 7965MP (5-0-0)	200MP	PET/Stainless Steel	69 (76)	112 (123)	167 (184)
		PET/Aluminum	77 (85)	115 (127)	169 (186)
		PET/PET	77 (85)	95 (105)	164 (180)
		PET/Polycarbonate	84 (92)	102 (112)	94 (103)
7951 (2-0-0)	300MP	PET/Stainless Steel	37 (41)	77 (85)	95 (104)
		PET/Aluminum	47 (52)	61 (67)	88 (97)
		PET/PET	37 (41)	59 (65)	77 (85)
		PET/Polycarbonate	41 (45)	57 (63)	71 (79)

Spacers For Circuit Separation (single-coated)

7993MP (2-1-0)	200MP	PET/Stainless Steel	40 (44)	68 (75)	82 (90)
		PET/Aluminum	36 (40)	64 (70)	79 (87)
		PET/PET	36 (40)	46 (51)	72 (79)
		PET/Polycarbonate	38 (42)	51 (56)	62 (68)
7995MP (2-3-0)	200MP	PET/Stainless Steel	33 (36)	73 (80)	148 (163)
		PET/Aluminum	48 (53)	84 (92)	186 (205)
		PET/PET	44 (48)	63 (69)	195 (215)
		PET/Polycarbonate	42 (46)	64 (70)	147 (162)
7997MP (2-5-0)	200MP	PET/Stainless Steel	24 (26)	94 (104)	232 (255)
		PET/Aluminum	32 (35)	75 (83)	262 (288)
		PET/PET	39 (43)	66 (73)	257 (283)
		PET/Polycarbonate	36 (40)	68 (75)	135 (149)

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3M™ Membrane Switch Data Page

Typical Physical, Mechanical & Electrical Properties*

Adhesives For Selective Die Cutting (double-lined)

3M™ Membrane Switch Product Number	3M™ Adhesive	Film / Substrate	Cohesion Static (shear) ASTM D3654 (0.5 in. sq.)	
			72°F (22°C)/1000g	158°F (70°C)/500g
			Typical Value Minutes ¹	Typical Value Minutes ¹
7952MP 7962MP (2-0-0)	200MP	PET/Stainless Steel	10,000+	10,000+
7953MP (1.5-0.5-1.5)	200MP	PET/Stainless Steel	10,000+	10,000+
7955MP 7965MP (5-0-0)	200MP	PET/Stainless Steel	10,000+	10,000+
7951 (2-0-0)	300MP	PET/Stainless Steel	258	92

Spacers For Circuit Separation (single-coated)

7993MP (2-1-0)	200MP	PET/Stainless Steel	10,000+	10,000+
7995MP (2-3-0)	200MP	PET/Stainless Steel	10,000+	10,000+
7997MP (2-5-0)	200MP	PET/Stainless Steel	10,000+	10,000+

***Note:** This technical information and data should be considered representative or typical only and should not be used for specification purposes. ¹Cohesion static shear testing was stopped after 10,000 minutes.

3M™ Membrane Switch Data Page

Typical Physical, Mechanical & Electrical Properties*

Adhesives For Selective Die Cutting (double-lined)

3M™ Membrane Switch Product Number	3M™ Adhesive	Cohesion Dynamic (shear) ASTM D1002 (1 in. sq.)		Tensile Strength (Yield) ASTM D2370	
		72°F (22°C)			
		Film / Substrate	Typical Value PSI / MPa	Sample Thickness Mils (Microns)	Typical Value PSI
7952MP 7962MP (2-0-0)	200MP	PET/Stainless Steel PET/Polycarbonate	103 (0.72) 80 (0.55)	2 (50)	51
7953MP (1.5-0.5-1.5)	200MP	PET/Stainless Steel PET/Polycarbonate	105 (0.72) 88 (0.61)	3.5 (88)	1593
7955MP 7965MP (5-0-0)	200MP	PET/Stainless Steel PET/Polycarbonate	97 (0.67) 80 (0.55)	5 (125)	51
7951 (2-0-0)	300MP	PET/Stainless Steel PET/Polycarbonate	95 (0.66) 77 (0.53)	2 (50)	NA

Spacers For Circuit Separation (single-coated)

7993MP (2-1-0)	200MP	PET/Stainless Steel PET/Polycarbonate	NA NA	3 (75)	3609
7995MP (2-3-0)	200MP	PET/Stainless Steel PET/Polycarbonate	NA NA	5 (125)	6749
7997MP (2-5-0)	200MP	PET/Stainless Steel PET/Polycarbonate	NA NA	7 (175)	6273

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3M™ Membrane Switch Data Page

Typical Physical, Mechanical & Electrical Properties*

Adhesives For Selective Die Cutting (double-linered)

3M™ Membrane Switch Product Number	3M™ Adhesive	Dielectric Strength ASTM D149	Dielectric Constant/ Dissipation Factor	Volume / Surface Resistivity	
		Short time method (air)	ASTM D150 72°F (22°C)	ASTM D257 72°F (22°C)	
		Typical Value Volts/Mil	Typical Value D.C. / D.F.	Typical Value V.R. Ohm - cm	Typical Value S.R. Ohms
7952MP 7962MP (2-0-0)	200MP	880	3.40 / 0.021	1.0 x 10 ¹⁵	> 5.6 x 10 ¹⁶
7953MP (1.5-0.5-1.5)	200MP	1400	3.29 / 0.017	5.8 x 10 ¹⁴	> 5.6 x 10 ¹⁶
7955MP 7965MP (5-0-0)	200MP	600	4.06 / 0.022	1.1 x 10 ¹⁵	> 5.6 x 10 ¹⁶
7951 (2-0-0)	300MP	470	3.36 / 0.011	1.8 x 10 ¹⁴	> 5.6 x 10 ¹⁶

Spacers For Circuit Separation (single-coated)

7993MP (2-1-0)	200MP	1700	2.77 / 0.012	2.7 x 10 ¹⁵	> 5.6 x 10 ¹⁶
7995MP (2-3-0)	200MP	1700	3.03 / 0.009	3.3 x 10 ¹⁵	> 5.6 x 10 ¹⁶
7997MP (2-5-0)	200MP	1700	3.05 / 0.008	4.8 x 10 ¹⁵	> 5.6 x 10 ¹⁶

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3M™ Membrane Switch Data Page

Typical Physical, Mechanical & Electrical Properties*

Adhesives For Selective Die Cutting (double-lined)

3M™ Membrane Switch Product Number	3M™ Adhesive	Insulation & Moisture Resistance	Coefficient of Thermal Expansion
		Mil-I-46058C (100VDC, 60 sec.)	ASTM D696 25-175°C
		Typical Value Ohms	Typical Value M/M/°C
7952MP 7962MP (2-0-0)	200MP	1.3 x 10 ¹³	7.2 x 10 ⁻⁴
7953MP (1.5-0.5-1.5)	200MP	1.7 x 10 ¹³	6.7 x 10 ⁻⁴
7955MP 7965MP (5-0-0)	200MP	8.8 x 10 ¹²	9.2 x 10 ⁻⁴
7951 (2-0-0)	300MP	1.1 x 10 ¹³	4.9 x 10 ⁻⁴

Spacers For Circuit Separation (single-coated)

7993MP (2-1-0)	200MP	6.5 x 10 ¹²	4.5 x 10 ⁻⁴
7995MP (2-3-0)	200MP	9.4 x 10 ¹²	3.9 x 10 ⁻⁴
7997MP (2-5-0)	200MP	6.5 x 10 ¹²	2.8 x 10 ⁻⁴

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Environmental Performance

Typical values – not for specification use.

Temperature Range:

- Low: -40°F (-40°C)
- High long term (days, weeks): 250°F (121°C)
- High short term (min., hours): 300°F (149°C)

Chemical Resistance:

Solvent resistance is excellent when this product is properly applied to impervious materials. The adhesive resists softening through edge contact with mild acids, alkalies, oil, gasoline, kerosene, JP-4 fuel, cleaning solutions, germicides, etc. NOT RECOMMENDED FOR TOTAL IMMERSION.

Moisture and Humidity Resistance:

No adverse effect on the bond after exposure to 100% R.H. at 100°F (38°C).

Shelf Life & Storage:

Twenty-four months from date of manufacture by customer when stored in cartons at 70°F (21°C) at 50% R.H.

Bond Build-up:

The bond strength of 3M™ Hi-Performance Acrylic Adhesive 200MP generally increases as a function of time and temperature.

UV Resistance:

Adhesive is resistant to oxidation and ozone when exposed to air or sunlight (UV).

Processing**Cutting:**

Steel rule, punch press die-cuttable, digital cutter-plotter, and laser.

Roll Laminating:

Use rubber over steel roll set up with firm application pressure. Make adhesive to substrate contact at nip area only to exclude air entrapment. Use large radius platen press type system. Laminating heat assist is desirable to achieve best bond.

Special Considerations

Bond strength is dependent upon the amount of adhesive-to-surface contact developed. Firm application pressure develops better adhesive contact and thus improves bond strength.

To obtain best adhesion, the bonding surfaces must be clean, dry, and smooth. Some typical surface cleaning solvents are isopropyl alcohol or heptane.*

Ideal tape application temperature range is 70°F (21°C) to 100°F (38°C). Initial tape application to surfaces at temperatures below 50°F (10°C) is not recommended because the adhesive becomes too firm to adhere readily. However, once properly applied, low temperature holding is satisfactory.

*Carefully read and follow the manufacturer's precautions and directions for use when working with solvents.

**Certification/
Recognition**

TSCA: These products are defined as articles under the Toxic Substances Control Act and therefore, are exempt from inventory listing requirements.

MSDS: These products are not subjected to the MSDS requirements of the Occupational Safety and Health Administration's Hazard Communication Standard, 29 C.F.R. 1910.1200(b)(6)(v). When used under reasonable conditions or in accordance with the 3M directions for use, the products should not present a health and safety hazard. However, use or processing of the products in a manner not in accordance with the directions for use may affect their performance and present potential health and safety hazards.

UL: Many of these products have been recognized by Underwriters Laboratories, Inc. under Standard UL MH26206, Marking and Labeling Systems Materials Component and MH17478 Polymeric Adhesive Systems, Electrical Equipment Component. For more information on the UL Certification, please visit the 3M website at <http://www.3M.com/converter>.

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.

**Warranty,
Limited Remedy,
and Disclaimer**

Many factors beyond 3M's control and uniquely with user's knowledge and control can affect the use and performance of a 3M product in a particular application. 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. Unless an additional warranty is specifically stated on the applicable 3M product packaging or product literature, 3M warrants that each 3M product meets the applicable 3M product specification at the time 3M ships the product. 3M MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY OR CONDITION ARISING OUT OF A COURSE OF DEALING, CUSTOM OR USAGE OF TRADE. If the 3M product does not conform to this warranty, then the sole and exclusive remedy is, at 3M's option, replacement of the 3M product or refund of the purchase price.

Limitation of Liability

Except where prohibited by law, 3M will not be liable for any loss or damage arising from the 3M product, whether direct, indirect, special, incidental or consequential, regardless of the legal theory asserted, including warranty, contract, negligence or strict liability.

ISO 9001:2000

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

**Industrial Adhesives and Tapes Division
Converter Markets**

3M Center, Building 21-1W-10, 900 Bush Avenue
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800-223-7427 • 651-778-4244 (fax)
www.3M.com/converter



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10% post-consumer*

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