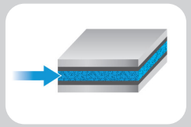
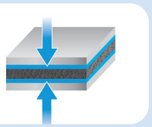
Fundamentals of Bonding Tape

KEY CONTRIBUTOR

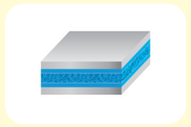
Core (Foam Substrate)



Adhesive



Combination (Core & Adhesive)



COLOR

What is it: Tape Color

Importance: In most applications the edge profile of the tape will be the only visible portion. Engineers prefer matching tape color to the components being bonded.

GAUGE

What is it: Tape Thickness mm (in.)

Importance: Most customers choose thinner tapes (due to less expensive vs. thicker tapes). Most projects have a predefined thickness specified, due to application specifics. Thicker tapes can act as gap fillers between nonparallel surface and can absorb expansions more easily. Thinner tapes can perform better in hanging attachment applications (less foam material is a benefit).

CONFORMABILITY

What is it: Tape Softness or ability of the tape to compress. Higher conformability allows for better "wet-out" of the adhesive (ability to make complete intimate contact with a surface)

- 3 = Excellent: >95% wet-out
- 2.5 = Excellent to Good/Moderate: 85%–95% wet-out
- 2 = Good/Moderate: 75%–85% wet-out
- 1.5 = Good/Moderate to Poor: 65%–75% wet-out
- 1 = Poor: <65% wet-out

Importance: Improve surface contact (increase bond strength). Very important for bonding irregular (rough or curved) surfaces

DIE-CUTABILITY

What is it: Ability of tape to be cut without sticking. Measured qualitatively (excellent or moderate)

- 3 = Excellent
- 2 = Moderate
- 1 = Fair

Importance: For tapes that will be cut into intricate shapes, it is preferred that the tape will cut without sticking too much to the die or itself.

DISSIPATION OF MOUNTING STRESS

What is it: Ability to absorb, as well as disperse bonding stresses within the foam.

Ability to dissipate stresses:

- 3 = Excellent
- 2 = Moderate
- 1 = Poor

Importance: Applications can often experience increased stress variations, caused by temperature changes or physical changes of the components attached. It's preferred that the tape can absorb moderate changes into the core without permanently impacting the tape or altering the adhesive bond.

INITIAL ADHESION (TACK)

What is it: Measure of adhesion strength after a short time, typically 20 minutes.

- 3 = Fast adhesion built-up
- 2 = Moderate adhesion built-up
- 1 = Slow adhesion built-up

Importance: For applications that could experience stress shortly after bonding, it's preferred to have a good quick stick or fast adhesion build. Factors to consider:

- Need to compare initial adhesion to the final bond strength (typically after 72 hours) to check the adhesion build
- High initial adhesion often comes as a tradeoff to long term holding power

SUGGESTED TEMPERATURE RANGE FOR TYPICAL APPLICATION CONDITIONS: °C

What is it: Measured in °C

Operating temperature range where the tape will see limited change in performance

Importance: Need to be sure the tape can perform over the expected application temperatures. Combination of the core chemistry and adhesive are determining factors.

MAX INTERMITTENT TEMPERATURE °C

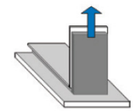
What is it: Max. temperature to which the tape may be exposed for a short period (< 5 minutes) under load and in which thermal degradation is negligible to non-existing

Importance: Defines the failure point of the bonding tape

PEEL ADHESION

What is it: The most common industry test (ASTM D3330) for tape adhesion. Indicates the bond strength to a singular surface, when backed with an aluminum film 90° or 180° peel adhesion test on stainless steel, 23°C/50%RH/300mm/min (12 inches/min), 72h dwell-time

- 3 = ≥ 40 N/cm
- 2.5 = < 40–≥ 30 N/cm
- 2 = < 30–≥ 20 N/cm
- 1.5 = < 20–≥ 10 N/cm
- 1 = < 10 N/cm



Importance: This test is considered an industry product benchmark.

Factors to consider:

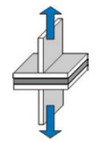
- Can be either 90° or 180° peel angle
- Typically run after 72 hours dwell time
- It is not representative of actual application stresses
- Useful to check if surface treatment (primer) may be required.

Industry Standard Test: ASTM D3330/AFERA 4001

DYNAMIC TENSILE ADHESION

What is it: A common industry test (ASTM D897) to check for bond strength related to the end application. The tape is bonded between two substrates and pulled perpendicular to the parts. On aluminum, 23°C/50%RH/50mm/min (2 inches/min), 72h dwell-time

- 3 = ≥ 100 N/cm²
- 2.5 = < 100–≥ 80 N/cm²
- 2 = < 80–≥ 60 N/cm²
- 1.5 = < 60–≥ 40 N/cm²
- 1 = < 40 N/cm²



Importance: Dynamic means the process of constant change (the parts are pulled apart at a constant speed). Tensile relates to the capability to be drawn out or stretched.

Factors to consider:

- Test is run to failure, and the force (lbs or N) to separate is measured
- This test IS indicative of application stresses (Applications with dynamic loads typically have multiple types of stress).

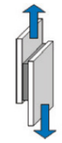
Industry Standard Test: ASTM D897/AFERA 4004

DYNAMIC SHEAR ADHESION

What is it: A common industry test (ASTM D1002) to check for bond strength related to the end application. The tape is bonded between two substrates and pulled parallel to the parts.

On stainless steel, 23°C/50%RH/12.7mm/min (0.5 inch/min), 72h dwell-time

- 3 = ≥ 80 N/cm²
- 2.5 = < 80–≥ 70 N/cm²
- 2 = < 70–≥ 50 N/cm²
- 1.5 = < 50–≥ 30 N/cm²
- 1 = < 30 N/cm²



Importance: Dynamic means the process of constant change (the parts are pulled apart at a constant speed). Shear relates to the parallel nature of the test.

Factors to consider:

- Test is run to failure, and the force (lbs or N) to separate is measured
- This test IS indicative of application stresses (Applications with dynamic loads typically have multiple types of stress such as tensile and shear).

Industry Standard Test: ASTM D1002/AFERA 4024

STATIC SHEAR ADHESION

What is it: A common industry test (ASTM D3654) to check for holding power. The tape is bonded between two substrates and a weight is attached to one end. On stainless steel, 1kg/6.25cm²(1 inch²)/1 week, 72h dwell-time

- 3 = 100°C (212F)
- 2.5 = 70°C (158°F)
- 2 = 70°C (158°C), weight < 1kg–≥ 0.5 kg
- 1.5 = 23°C (73°F)
- 1 = FAIL @ 23°C

Importance: Static means that there is no test speed other than gravity. Shear relates to the parallel nature of the test. Factors to consider:

- Test is run with a set amount of weight. The amount of movement and/or time is recorded.
- This test IS indicative of application stresses (holding power)

Industry Standard Test:
ASTM D3654/AFERA 4012

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*Strong Feature

		Market		IND	IND	AUTO	OPT	OPT	IND	IND	IND	IND	IND	IND	AUTO	AUTO	AUTO
				PUR Foam (Select)		PUR Foam (Special)			Acrylic Foam (Select)						Acrylic Foam (Special)		PE Foam (h-old AUTO)
		Adhesive Type		Acrylic		Acrylic			Acrylic						Acrylic		Modified Acrylic
		Standard Liner		HDPE Blue	HDPE Blue Logo	HDPE Blue	Paper - Blue/WH	Paper - WH	Blue LDPE or HDP	Blue LDPE or HDP	Blue LDPE or HDP	Blue LDPE or HDP	Blue LDPE or HDP	Blue LDPE or HDP	Blue LDPE or HDP	Blue HDP	Brown Siliconized Paper
Category	**Key Contributor**	**What**	**Legend**	**V2800**	**V1300**	**Z500/E500**	**OP7**	**OP5C**	**A7100**	**A7100R**	**A7200**	**A7300**	**A7400**	**A7500**	**Z2000**	**Z3000**	**F-0501/ F-0801**
"Snapshot" Summary				*BEST Overall Performance PUR Product*	*Value Priced PUR Product*	*BEST Performing Automotive PUR Tape*	*Designed Specifically for Optical Pad Market*		*Thinnest Transparent Product*	*Best Dynamic Shear Transparent Product*	*Widest Gauge Range and Best overall performance of Transparent Products*	*Gray Tape, Ideal for Exterior Applications*	*White Tape, Ideal for Interior Applications*	*Black Tinted Version of A7200*	*BEST Performing Automotive Acrylic Tape for Primerless MSE:MSE*	*BEST Performing Automotive Acrylic Tape for Primerless LSE:MSE*	*Automotive PE Tape for Emblems*
General	Core (Foam Substrate)	COLOR	Tape Color	Black	White	Black	Black	Black	Transparent	Transparent	Transparent	Gray	White	Black Translucent	Gray	Dark Gray	Black
General	Core (Foam Substrate)	GAUGE	Tape Thickness in. (mm)	0.03 (0.8) 0.045 (1.1) 0.062 (1.6) 0.09 (2.3) 0.12 (3.0)	0.03 (0.8) 0.062 (1.6) 0.124 (3.1)	0.02 (0.5) 0.03 (0.8) 0.045 (1.1) 0.062 (1.6) 0.09 (2.3) 0.12 (3.0)	0.03 (0.8)	0.03 (0.8)	.005 (.13) .01 (.25)	.008 (.20)	0.02 (0.5) 0.028 (0.7) 0.039 (1.0) 0.059 (1.5) 0.079 (2.0) 0.118 (3.0)	0.02 (0.5) 0.031 (0.8) 0.043 (1.1)	.024 (0.6) .043 (1.1) .079 (2.0)	.028 (0.7) .043 (1.1) .063 (1.6)	.031 (0.8) .045 (1.14) .060 (1.52) .079 (2.0)	.031 (0.8) .043 (1.1) .059 (1.5)	0.5mm 0.8mm
General	Core (Foam Substrate)	CONFORM-ABILITY	3 = Excellent: >95% wet-out 2.5= Excellent to Good/ Moderate: 85%–95% wet-out 2 = Good/Moderate: 75%–85% wet-out 1.5 = Good/Moderate to Poor: 65%–75% wet-out 1 = Poor: <65% wet-out	2.5	2	2.5	2	1.5	1	1	2	2	2	2	2	2.5	3
General	Core (Foam Substrate)	DIE-CUTABILITY	3 = Excellent 2 = Moderate 1 = Fair	3	3	3	3	3	2	2	1	3	3	1	3	3	3
General	Core (Foam Substrate)	DISSIPATION OF MOUNTING STRESS	Ability to dissipate stresses: 3 = Excellent 2 = Moderate 1 = Poor	2	2	2	2	3	1	1	3	2.5	2.5	3	3	3	1
Bonding Performance	Adhesive	INITIAL ADHESION (TACK)	3 = Fast adhesion built-up 2 = Moderate adhesion built-up 1 = Slow adhesion built-up	2	2	2	1.5	2	2	2	2	2	2	2	3	3	3
General	Combination of Core and adhesive	SUGGESTED TEMPERATURE RANGE FOR TYPICAL APPLICATION CONDITIONS: °C	Measured in °C Operating temperature range where the tape will see limited change in performance	-40–93C	-40–93C	-40–93C	N/A	N/A	-35–93C	-35–93C	-35–93C	-35–93C	-35–93C	-35–93C	-35–93C	-35–93C	-30–90C
General	Combination of Core and adhesive	MAX INTERMITTENT TEMPERATURE °C	Max. temperature to which the tape may be exposed for a short period (< 5 minutes) under load and in which thermal degradation is negligible to non-existing	150C	150C	150C	N/A	N/A	150C	150C	150C	150C	150C	150C	150C	150C	80C
Bonding Performance	Combination of Core and adhesive	PEEL ADHESION	3 = ≥ 40 N/cm 2.5 = < 40–≥ 30 N/cm 2 = < 30–≥ 20 N/cm 1.5 = < 20–≥ 10 N/cm 1 = < 10 N/cm	1.5	1.5	1.5	2	2	1.5	1.5	1.5	2.5	2.5	1.5	2.75	2.75	2
Bonding Performance	Combination of Core and adhesive	DYNAMIC TENSILE ADHESION	3 = ≥ 100 N/cm² 2.5 = < 100–≥ 80 N/cm² 2 = < 80–≥ 60 N/cm² 1.5 = < 60–≥ 40 N/cm² 1 = < 40 N/cm²	3	2	3	2.5	2.5	1	1	2	2	2	2	2	2	N/A
Bonding Performance	Combination of Core and adhesive	DYNAMIC SHEAR ADHESION	3 = ≥ 80 N/cm² 2.5 = < 80–≥ 70 N/cm² 2 = < 70–≥ 50 N/cm² 1.5 = < 50–≥ 30 N/cm² 1 = < 30 N/cm²	3	2.5	3	2.5	2.5	1	2	1.5	1.5	1.5	1.5	3	3	N/A
Bonding Performance	Combination of Core and adhesive	STATIC SHEAR ADHESION	3 = 100°C (212°F) 2.5 = 70°C (158°F) 2 = 70°C (158°C), weight < 1kg–≥ 0.5 kg 1.5 = 23°C (73°F) 1 = FAIL @ 23°C	3	3	3	3	3	1.5	1.5	3	3	3	3	3	3	N/A
Other Unique Attributes					General Purpose; Value priced	Automotive Approved for Emblem Bonding; True Black	Value Priced	Reinforced, High Torsion Resistance			Best visual clarity and Low Haze	Maintains Performance after aging exposure			Automotive Approved for trim Applications	Automotive Approved for trim Applications	Automotive Approved for Emblem; Low-Surface Energy adhesion