

**Flammability ratings for selecting cable ties**

Note: Flammability ratings of cable tie materials per UL as follows. These tests for flammability of plastic material are intended to serve as a preliminary indication of acceptability with respect to flammability for particular applications.

UL 94 vertical burn test procedures

Test specimens of the material, with dimensions 127 x 12.7 mm (5" x 1/2"), with the thickness intended for use in the end product, are tested in both the manufactured condition and in the aged state. The test requires that the specimen be supported in a vertical fixture and a precisely controlled flame applied for a 10 second period. The flame is removed and the duration of flaming is noted. If the flame extinguishes, a second exposure to flame for 10 seconds is applied and duration of flaming is again noted. It is observed and recorded whether or not test specimens drip flaming particles that ignite a cotton swab.

Materials classed 94 V-0:

A material classed 94 V-0 shall:

- A Not have any specimens that burn with flaming combustion for more than 10 seconds after either application of the test flame
- B Not have a total flaming combustion time exceeding 50 seconds for the 10 flame applications for each set of five specimens
- C Not have any specimens that burn with flaming or glowing combustion up to the holding fixture
- D Not have any specimens that drip flaming particles that ignite the dry absorbent surgical cotton located 304.8 mm (12") below the test specimen
- E Not have any specimens with glowing combustion that persists for more than 30 seconds after the second removal of the test flame

Materials classed 94 V-1:

A material classed 94 V-1 shall:

- A Not have any specimens that burn with flaming combustion for more than 30 seconds after either application of the test flame
- B Not have a total flaming combustion time exceeding 250 seconds for the 10 flame applications for each set of five specimens
- C Not have any specimens that burn with flaming or glowing combustion up to the holding fixture

D Not have any specimens that drip flaming particles that ignite the dry absorbent surgical cotton located 304.8 mm (12") below the test specimen

E Not have any specimens with glowing combustion that persists for more than 60 seconds after the second removal of the test flame.

Materials classed 94 V-2:

A material classed 94 V-2 shall:

- A Not have any specimens that burn with flaming combustion for more than 30 seconds after either application of the test flame
- B Not have a total flaming combustion time exceeding 250 seconds for the 10 flame applications for each set of five specimens
- C Not have any specimens that burn with flaming or glowing combustion up to the holding fixture
- D Be permitted to have specimens that drip flaming particles that burn only briefly, some of which ignite the dry absorbent surgical cotton placed 304.8 mm (12") below the test specimen
- E Not have any specimens with glowing combustion that persists for more than 60 seconds after the second removal of the test flame

UL 94 horizontal burn (HB) test procedures

The test uses a 1/2 inch x 5 inches (12.7 mm x 127 mm) specimen held at one end in a horizontal position with marks at 1 inch (25.4 mm) and 5 inches (127 mm) from the free end. A flame is applied to the free end for 30 seconds or until the flame front reaches the 1 inch (25.4 mm) mark. If combustion continues the duration is timed between the 1 inch (25.4 mm) mark and the 5 inch (127 mm) mark. If combustion stops before the 5 inch (127 mm) mark, the time of combustion and the damaged length between the two marks are recorded. A set of three specimens are tested.

Materials classed 94 HB

A material that is less than 0.118 inch (3 mm) in thickness will be classified 94HB if it has a burning rate of less than 3 inches (76.2 mm) per minute or stops burning before the 5 inches (127 mm) mark. If one specimen from the set of three fails to comply, then a second set of three are tested. All three of this second set must comply.

HB rated materials are considered "self-extinguishing". This is the lowest (least flame retardant) UL94 rating.

***Nylon 6.6 = Polyamide 6.6 is Halogen-free and Silicone-free.**

Technical Information

PROPERTY	METHOD	UNIT OF MEASURE	RUBBER BASED (SELF-ADHESIVE)	ACRYLIC BASED (2 COMPONENT GLUE)
COATED SIDES	–	each	2	2
FOAM DENSITY	–	Kg/m ³	96.9	96.9
PEEL ADHESION	PSTC 1	N/cm width	10.9	
	ASTM D 1000	Average		8.8
SHEAR ADHESION				
22°C 50% R4	PSTC 7	Hours	100 +	8 +
22°C OCCASIONAL WETTING		N/m ²	68971	15174
TENSILE STRENGTH	ASTM D 412	PSI	100	100 +
TEAR RESISTANCE	ASTM D 624	N/cm	52.6	52.6 +
ELONGATION AT BREAK	–	%	400	200
SERVICE TEMPERATURE	–	°C Min	-18	-29
	–	°C Max	+66	+79
FLAMMABILITY	ASTM D 624		Slow Burn	Slow Burn

Installation instructions for self-adhesive mounting bases

- Mounting surfaces should be cleaned with alcohol based (IPA) cleaner before application
- The self-adhesive mounting bases have a double-sided adhesive tape made of synthetic foam, covered by a protecting foil.
- To install the self-adhesive mounting base, remove the protecting foil and press the mounting base onto the cleaned surface
- The thickness of the self-adhesive foam (0.8 mm) compensates the irregularities of the application surfaces and allows installations on structured surfaces of cabinet doors, on sheet metal, on machines, etc
- The adhesion is achieved immediately during the installation, which means that later repositioning is not possible

Product Ref.: TC2PA

- 2 component glue
- Consists of one tube each of adhesive and activator
- Easy application
- Stable and durable adhesion
- Applicable on all Polyamide and Aluminium mounting bases and cable clamps
- Also applicable on concrete and other porous surfaces
- UV resistant

Ordering Information

PRODUCT REF.	DESCRIPTION	WEIGHT
TC2PA	2 component glue	0.21 kg

Important note: The quality of installation of the glue mounted and self-adhesive mounting bases depend a lot on the state of the mounting surfaces (smooth or rough, clean or dirty, presence of oil, grease, dust, etc) and on the dexterity of the installer.

Thomas & Betts can not control these external parameters and therefore can not accept any responsibility about the performances of the glue mounted mounting bases and self-adhesive mounted bases.

Installation instructions for Product Ref. :

TC2PA (2 component glue)

- Mounting surfaces should be cleaned before application
- The liquid adhesive in the tube is to be spread onto the mounting surface. It can be used on most rough surfaces (like concrete)
- The activator liquid is then spread onto the surface of the mounting base
- Place the surface of the mounting base in contact with the surface where it has to be mounted, position the mounting base correctly and then press firmly
- Repositioning the mounting base remains possible only for a few seconds
- Do not use the mounting base immediately after installation. The Acrylic-based adhesive requires a set-up time that can be influenced by factors such as temperature (allow 24 - 72 hours for maximum performance)
- Temperature of installation needs to be above +20°C



UV-resistant



Flame retardant



Heat resistant



Weatherproof



Low temperature flexibility



Radiation resistant



Low smoke



Chemically resistant

Selecting the right material for your applications

Thomas & Betts offers cable ties and accessories in a wide variety of materials, each suited for specific environments. The purpose of this document, therefore, is to assist in choosing the best material for a particular application. The effects of weathering, flame, chemicals, extreme temperatures and radiation on the different materials is clearly

presented in tabular form. This will facilitate the choice of the best material for the application.

Having determined the most suitable material, one can choose from the wide variety of cable ties, identification ties, mounting bases, lashing ties, etc., offered by Thomas & Betts.

Material specifications

Note: Nylon (Polyamide) is inherently susceptible to environmental conditions. Polyamide 6.6 cable ties are moisturised to optimum performance levels at machine-side and should be stored in cool dry areas out of direct sunlight. Cable ties are packaged in plastic bags to contain moisture and should remain sealed until ready for use.

Polyamide 6.6

- Thermoplastic material used in cable ties for universal applications in the industry
- Excellent resistance to shocks, chemicals, oils and temperature fluctuations
- High surface hardness and a small coefficient of friction
- Flammability rating: UL 94 V-2
- Halogen free and Silicone free
- Available in natural version or in a wide range of colours
- Indoor applications

Polyamide 6.6, weather resistant



- Similar to Polyamide 6.6, but recommended for outdoor applications
- UV-resistant
- Halogen free and Silicone free
- Colour: black
- Flammability rating: UL 94 V-2

Polyamide 6.6, heat stabilised



- Similar to Polyamide 6.6, but increased operating temperatures, up to 105°C
- Excellent tensile strength
- High temperature resistance
- Colour: natural (may have a greenish tint)
- Flammability rating: UL 94 V-2

Polyamide 6.6, heat stabilised and UV-resistant



- Similar to Polyamide 6.6, but recommended for outdoor applications and/or high temperature applications, up to 105°C
- Combines the features & benefits of Polyamide 6.6, weather resistant and Polyamide 6.6, heat stabilised
- Colour: black
- Flammability rating: UL 94 V-2

Polyamide 6.6, flame retardant



- Excellent flammability rating: UL 94 V-0
- Ideal in areas where human life is at risk
- Colour: white

Polyamide 4.6, extra high temperature (150°C)



- Similar to Polyamide 6.6, but outstanding resistance to high temperatures up to 150°C
- Halogen free and silicone free
- Colour: light green
- Flammability rating: UL 94 V-2

Polyamide 12, weather resistant



- Extremely flexible, also at low temperatures
- Ages better than Polyamide 6.6
- UV-resistant and weatherproof
- Better chemical resistance than Polyamide 6.6
- Colour: black
- Flammability rating: UL 94 V-2

Polypropylene, weather resistant



- Resistant against inorganic acids, polyhydric alcohols, neutral and basic salts
- Resists a number of other chemicals
- UV resistant
- Lower tensile strength than Polyamide 6.6
- Colour: black
- Flammability rating: UL 94 HB

Tefzel® 280 (trademark of DuPont de Nemours)



- Tensile strength slightly lower than Polyamide 6.6
- Tefzel® 280 is inert to most solvents and chemicals, hydrolytically stable, UV and weather resistant
- Radiation resistant (meets IEEE383) and approved for nuclear plant use
- Non-outgassing properties for zero gravity applications
- Very high temperature resistance
- Flammability rating: UL 94 V-0
- The best all around plastic material for cable ties
- Colour: aquamarine

Halar® (trademark of Solvay Solexis)



- Similar to Tefzel® in performance
- Outstanding characteristic: lower smoke density when burnt
- Recommended for applications where smoke generation is a concern, such as plenum areas
- Colour: maroon
- Flammability rating: UL 94 V-0

Delrin® (trademark of DuPont de Nemours)



- Excellent resistance to a wide variety of solvents, esters, oils, greases, gasoline and other petroleum hydrocarbons
- Resistant to weak acids and bases
- Excellent resistance to UV (weatherable acetal)
- Limited self-extinguishing properties
- Colour: black
- Flammability rating: UL 94 HB

302/304 Stainless Steel

316 Stainless Steel



- Superior corrosion resistance
- Excellent tensile strengths at extreme temperatures
- High resistance to chemicals, acids and radiation
- 316 grade has a better resistance to saltwater corrosion and can be supplied with a halogen free coating
- Extensively used in offshore, rail and petrochemical industries

General

There is a number of factors to be considered when choosing the proper materials for a specific environment. It is extremely difficult to provide data on all the possible combinations or conditions that can occur and therefore, it is recommended that this information be used as a guideline and that cable tie samples be tested in the intended application, by the user, to determine suitability.

How to use Table 1:

If your application is in an extremely cold environment, three materials will answer your need: Tefzel^{®*}, Polyamide 12 and stainless steel. If you also require high tensile strength, then stainless steel is your best choice. Where high strength is not required, Polyamide 12 might be your choice as it is the less costly.

This information is based on data provided by the manufacturers of the specific materials listed and is provided only as a general guide. No specific recommendation is intended. As each application may vary, testing should be conducted by the user in the intended environment.

Table 1 gives relative performance ratings of the different materials we offer. Chemical resistance is shown in Table 2

* Trademark of E.I. Du Pont



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Material codes used in tables

MATERIAL	CODE
STANDARD POLYAMIDE 6.6	PA6.6
WEATHER RESISTANT POLYAMIDE 6.6	UV PA6.6
HEAT-STABILISED POLYAMIDE 6.6	HS PA6.6
HEAT-STABILISED UV RESISTANT POLYAMIDE 6.6	HSUV PA6.6
FLAME RETARDANT POLYAMIDE 6.6	FR PA6.6
HIGH TEMPERATURE POLYAMIDE 4.6	HT PA4.6
WEATHER RESISTANT POLYAMIDE 12	UV PA12
POLYPROPYLENE	PP
WEATHER RESISTANT POLYPROPYLENE	UV PP
TEFZEL ^{®*}	TZ
HALAR ^{®**}	HAL
DELIN ^{®*}	DEL
STAINLESS STEEL	SS

* Trademark of E.I. DuPont de Nemours and Company

** Trademark of Solvay Solexis

Table 1 - Information on cable tie materials

	POLYAMIDE 6.6	POLYAMIDE 6.6 WEATHER RESISTANT*	POLYAMIDE 6.6 HEAT STABILISED	POLYAMIDE 6.6 HEAT STABILISED UV RESISTANT	POLYAMIDE 6.6 FLAME RETARDANT	POLYAMIDE 4.6 HIGH TEMPERATURE	POLYAMIDE 12 WEATHER RESISTANT	POLYPROPYLENE WEATHER RESISTANT	HALAR®	DELIN®	STAINLESS STEEL	ETFE (TEFZEL)
	PA6.6	UV PA6.6	HS PA6.6	HSUV PA6.6	FR PA6.6	HT PA4.6	UV PA12	UV PP	HAL	DEL	SS	TZ
MATERIAL CODE	TY...M	TY...MX	TYH...M	TY...MXA	TY...MFR	TYHT...M	TYC...MX	TYP...MX	TYV...M	TYD... CSS	YRL.. or YLD... or YLS...	TYZ...M
MAX. OPERATING TEMPERATURE	TY... +85°C	TY...X +85°C	TY...39 +105°C	+105°C	+85°C	+150°C	+85°C	+85°C	+140°C	+85°C	+538°C +150°C for coated	+150°C
MIN. OPERATING TEMP.	-40°C	-40°C	-40°C	-40°C	-40°C	-40°C	-55°C	-40°C	-46°C	-40°C	-80°C	-46°C
UL FLAMMABILITY RATING	V-2	V-2	V-2	V-2	V-0	V-2	V-2	HB	V-0	HB	Excellent	V-0
SPECIFIC DENSITY	1.14	1.14	1.14	1.14	1.16	1.18	1.02	0.90 - 0.91	-	-	7.95	1.67 - 1.75
WATER ABSORPTION (24h/ASTM)	2.5 - 3.1%	2.5 - 3.1%	2.5 - 3.1%	2.5 - 3.1%	3.0 - 3.5%	1.3%	0.7 - 1.1%	0.01 - 0.03%	-	-	0%	0.02%
COLOURS	Natural**	Black	Natural***	Black	White	Light green	Black	Black	Maroon	Black	Metallic/ Black	Aquamarine
E-MODULE (N/mm²)	2000	2000	2000	2000	1400	3200	1600	1100-1300	-	-	193000	1000
NOTCH IMPACT	2-20	2-20	2-20	2-20	3-25		3.5-13	3-17	-	-	122[(IZOD)	o.B.
STRENGTH CONFORM DIN 53453 (KJ/m²)												
UV RESISTANT	■	■	■	■	■	■	■	■	■	■	■	■
FLAME RETARDANT			■	■	■	■	■	■	■	■	■	■
HEAT RESISTANT			■	■	■	■	■	■	■	■	■	■
ENHANCED WEATHERABILITY			■	■	■	■	■	■	■	■	■	■
FLEXIBLE AT LOW TEMPERATURES							■	■				
RADIATION RESISTANT							■	■				
CHEMICALLY RESISTANT											■	■
HALOGEN FREE	■	■	■	■	■	■	■	■	■	■	■	■

* 2% Carbon for military specifications

** Can be supplied in a wide range of colours

*** May have a greenish tint



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