



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<sup>®\*</sup>, 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

### 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 <sup>®*</sup>	TZ
HALAR <sup>®**</sup>	HAL
DELTRIN <sup>®*</sup>	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 WEATHER RESISTANT*	POLYAMIDE HEAT STABILISED	POLYAMIDE HEAT STABILISED UV RESISTANT	POLYAMIDE FLAME RETARDANT	POLYAMIDE HIGH TEMPERATURE	POLYAMIDE WEATHER RESISTANT	POLYPROPYLENE WEATHER RESISTANT	HALAR® TYV...M	DELIRIN® TYD... CSS	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	+85°C	+85°C	+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	■	■	■	■	■	■	■	■	■	■	■	■

See table 2 (pages 120 - 122)

\* 2% Carbon for military specifications  
 \*\* Can be supplied in a wide range of colours  
 \*\*\* May have a greenish tint

Table 2 - Resistance of available materials to various chemicals at 21°C

REAGENTS	CONCENTRATION	HS PA6.6	HAL	DEL	PA6.6	UV PA6.6	FR PA6.6	UV PA12	PP	UVPP	TZ	SS
Arsenic Acid	40%	–	–	–	–	–	–	–	E	E	–	E
Acetaldehyde	50%	S	–	–	S	S	S	–	–	–	–	–
Acetone	100%	E	E	F	E	E	E	E	E	E	E	E
Aluminum Hydroxide	AQ	–	E	–	–	–	–	–	E	E	E	E
Ammonia	All	–	E	–	–	–	–	E	E	E	E	E
Ammonium Carbonate	5%	S	E	–	S	S	S	E	E	E	E	E
Ammonium Hydroxide	10%	E	E	F	E	E	E	–	E	E	E	E
Ammonium Nitrate	–	–	E	–	–	–	–	E	E	E	E	E
Ammonium Sulfate	10%	–	E	–	–	–	–	S	S	S	S	S
Barium Carbonate	All	–	E	–	–	–	–	E	E	E	E	E
Barium Chloride	5%	NR	–	–	NR	NR	NR	E	E	E	E	E
Barium Sulfate	10%	E	–	–	E	E	E	E	E	E	E	E
Barium Sulfide	10%	S	–	–	S	S	S	E	E	E	E	E
Benzene	100%	E	E	F	E	E	E	E	S	S	E	E
Benzoic Acid	100%	NR	E	–	NR	NR	NR	E	E	E	E	E
Butyric Acid	50%	NR	E	–	NR	NR	NR	–	E	E	E	E
Calcium Carbonate	AQ	–	E	–	–	–	–	–	E	E	E	E
Calcium Hydroxide	20%	–	F	E	–	–	–	–	E	E	E	E
Calcium Hydrochlorite	2	NR	–	–	NR	NR	NR	–	F	F	F	F
Calcium Sulfate	2%	–	E	–	–	–	–	–	E	E	E	E
Carbon Tetrachloride	100%	E	E	E	E	E	E	E	F	F	E	E
Chlorine (WET)	–	NR	–	–	NR	NR	NR	–	F	F	F	F
Chlorine (DRY)	–	NR	–	–	NR	NR	NR	–	NR	NR	F	F
Chloroacetic Acid	30%	NR	–	–	NR	NR	NR	–	–	–	F	F
Chloroform	100%	–	E	–	–	–	–	F	F	F	E	E
Chromic Acid	50%	NR	S	–	NR	NR	NR	–	F	F	F	F
Citric Acid	50%	S	E	E	S	S	S	E	E	E	E	E
Copper Cyanide	10%	–	E	–	–	–	–	–	E	E	E	E
Copper Nitrate	50%	–	E	–	–	–	–	–	E	E	E	E
Cider	–	–	E	–	–	–	–	–	E	E	E	E
Dichloroethane	100%	–	E	–	–	–	–	–	–	–	E	E
Diethyl Ether	100%	–	E	S	–	–	–	E	E	E	E	E
Ethyl Alcohol	100%	S	E	–	S	S	S	E	E	E	E	E
Ethyl Chloride	100%	–	S	E	–	–	–	F	F	F	E	E
Ethylene Glycol	100%	E	E	S	E	E	E	–	E	E	E	E
Ferric Hydroxide	All	–	E	–	–	–	–	–	E	E	E	E
Ferric Nitrate	10%	–	E	–	–	–	–	–	E	E	E	E
Ferrous Sulfate	10%	–	E	–	–	–	–	–	E	E	E	E
Fuel Oil	100%	–	E	–	–	–	–	E	–	–	E	E
Furfural	100%	–	E	–	–	–	–	–	F	F	E	E
Gallic Acid	AQ	–	E	–	–	–	–	–	–	–	E	E
Gasoline	100%	E	E	–	E	E	E	–	S	S	E	E
Glycerine	100%	–	E	–	–	–	–	E	E	E	–	E
Hydrocyanic Acid	All	–	E	–	–	–	–	–	E	E	E	E
Hydrogen Peroxide	30%	NR	E	F	NR	NR	NR	S	E	E	E	E
Hydrogen Sulfide	Dry	NR	E	–	NR	NR	NR	E	E	E	E	E

## Ratings

E = Excellent

S = Satisfactory

F = Fair

NR = Not Recommended

(AQ = Aqueous)

Table 2 - Resistance of available materials to various chemicals at 21°C

REAGENTS	CONCENTRATION	HS PA6.6	HAL	DEL	PA6.6	UV PA6.6	FR PA6.6	UV PA12	PP	UVPP	TZ	SS
Iodoform	100%	-	E	-	-	-	-	-	-	-	E	E
Isopropyl Alcohol	100%	S	E	-	S	S	S	E	E	E	E	E
Jet Fuel	100%	E	E	-	E	E	E	-	S	S	E	E
Lactic Acid	10%	E	E	-	E	E	E	S	E	E	E	E
Lanolin	10%	E	E	-	E	E	E	E	E	E	E	E
Lead Acetate	5%	-	E	-	-	-	-	-	E	E	E	E
Linseed Oil	10%	E	E	E	E	E	E	E	E	E	E	E
Magnesium Carbonate	All	-	E	-	-	-	-	E	E	E	E	E
Magnesium Chloride	10%	F	-	-	F	F	F	F	F	F	F	F
Magnesium Nitrate	All	-	E	-	-	-	-	E	E	E	E	E
Malic Acid	AQ	-	E	-	-	-	-	-	E	E	E	E
Mercury	100%	-	E	-	-	-	-	E	E	E	E	E
Methyl Alcohol	100%	S	E	-	S	S	S	E	E	E	E	E
Methyl Chloride	100%	-	S	-	-	-	-	-	S	S	E	E
MethylEthyl Ketone	100%	-	E	F	-	-	-	E	E	E	E	E
Naptha	100%	-	E	-	-	-	-	-	E	E	E	E
Nitric Acid	30%	NR	E	NR	NR	NR	NR	-	E	E	E	E
Nitric Acid	30-70%	NR	S	NR	NR	NR	NR	-	F	F	S	E
Nitrous Acid	5%	-	E	-	-	-	-	-	F	F	E	E
Oieic Acid	100%	-	E	S	-	-	-	-	E	E	E	E
Oxalic Acid	10%	-	E	-	-	-	-	S	E	E	E	E
Paraffin	100%	E	E	-	E	E	E	E	E	E	E	E
PetroleumEther	100%	-	E	-	-	-	-	E	F	F	E	E
Phenol	90%	NR	E	NR	NR	NR	NR	-	E	E	E	E
Phosphoric Acid	10%	NR	E	-	NR	NR	NR	-	E	E	E	E
Picric Acid	1%	-	E	-	-	-	-	-	E	E	E	E
Potassium Bromide	AQ	-	-	-	-	-	-	-	S	S	S	S
Potassium Carbonate	1%	-	E	-	-	-	-	E	E	E	E	E
Potassium Chlorate	AQ	-	E	-	-	-	-	S	E	E	E	E
Potassium Dichromate	40%	NR	E	-	NR	NR	NR	F	E	E	E	E
Potassium Ferrocyanide	25%	-	E	-	-	-	-	-	E	E	E	E
Potassium Hydroxide	5%	S	E	-	S	S	S	-	E	E	E	E
Potassium Iodide	All	-	E	-	-	-	-	E	E	E	E	E
Potassium Nitrate	50%	F	E	-	F	F	F	E	E	E	E	E
Potassium Permanganate	5%	NR	E	S	NR	NR	NR	NR	E	E	E	E
PotassiumSulfate	5%	-	E	-	-	-	-	E	E	E	E	E
PotassiumSulfide	AQ	-	E	-	-	-	-	-	E	E	E	E
Propyl Alcohol	100%	E	E	-	E	E	E	-	E	E	E	E
Silver Nitrate	10%	-	E	-	-	-	-	E	E	E	E	E
Sodium Acetate	60%	E	E	-	E	E	E	-	E	E	E	E
Sodium Bicarbonate	All	E	E	-	E	E	E	E	E	E	E	E
Sodium Bisulfate	10%	-	E	E	-	-	-	E	E	E	E	E
Sodium Borate	All	-	E	-	-	-	-	-	E	E	E	E
Sodium Carbonate	5%	E	E	S	E	E	E	E	E	E	E	E
Sodium Chlorate	25%	-	E	E	-	-	-	S	E	E	E	E
Sodium Chloride	2%	E	E	S	E	E	E	E	E	E	E	E
Sodium Fluoride	5%	-	-	-	-	-	-	-	F	F	F	F

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Sodium Hydroxide	10%	E	E	S	E	E	E	E	E	E	E	E
Sodium Hyposulfite	AQ	-	E	-	-	-	-	-	-	-	E	E
Sodium Nitrate	5%	E	E	-	E	E	E	E	E	E	E	E
Sodium Nitrite	AQ	-	E	-	-	-	-	S	E	E	E	E
Sodium Perchlorate	10%	-	E	-	-	-	-	-	-	-	E	E
Sodium Phosphate	5%	-	E	-	-	-	-	E	E	E	E	E
Sodium Sulfate	5%	S	E	-	S	E	E	E	E	E	E	E
Sodium Thiosulfate	5%	-	-	S	-	-	-	S	S	S	S	S
Stearic Acid	100%	-	E	-	-	-	-	F	E	E	E	E
Sulfur	100%	-	E	-	-	-	-	E	E	E	E	E
Sulfur Dioxide	All	NR	E	-	NR	NR	NR	E	E	E	E	E
Sulfuric Acid	Conc.	NR	E	NR	NR	NR	NR	-	S	S	E	E
Sulfuric Acid	5%	NR	F	F	NR	NR	NR	F	F	F	F	F
Tannic Acid	10%	-	E	-	-	-	-	-	E	E	E	E
Tartaric Acid	50%	-	E	E	-	-	-	E	E	E	E	E
Tetrahydrofuran	100%	-	F	E	-	-	-	S	F	F	E	E
Toluene	100%	E	E	F	E	E	E	E	F	F	E	F
Xylene	100%	E	-	E	E	E	E	F	F	E	E	
Zinc Chloride	70%	F	E	NR	F	F	F	E	E	E	E	E
Zinc Nitrate	AQ	-	E	-	-	-	-	E	E	E	E	E
Zinc Sulfate	AQ	-	E	-	-	-	-	E	E	E	E	E

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