

# Material specifications

## Material selection and specifications

ABB offers Ty-Rap cable ties and accessories in a wide variety of materials, each suitable for specific environmental conditions.

The purpose of this document is to help you choose the best material for your particular application. The effects of climate, flames, chemicals, temperature extremes and radiation on the different materials are clearly shown in the following tables to simplify the process.

Once you've determined which material is best for you, you can choose from the wide variety of Ty-Rap cable ties, ID ties, mounting bases, tie-down straps, and more, offered by ABB.

### How to use Table 1

Table 1 simplifies the selection process by giving the relative performance ratings of materials offered by ABB. For example, if your application is in an extremely cold environment, 4 materials will meet your needs: fluoropolymer, polyamide 12, Halar® \* and stainless steel. Then the cost may be your next most important criterion. Of these 4 options, polyamide 12 would be the most cost effective. However, if the tensile strength is important, then stainless steel would be the best choice.

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.

\* Halar® is a registered trademark of Solvay Solexis, inc.

Refer to Tables 2 and 3 (pages C140-C142) for more detailed information regarding the physical properties of the materials and the chemical resistance of the materials, respectively.

Table 1

	Materials available									
	Polyamide 6.6 Natural	Polyamide 6.6 weather resistant	Polyamide 6.6 Natural heat stabilised	Polyamide 6.6 flame retardant	Polyamide 12 weather resistant	Polypropylene weather resistant	Fluoro-polymer	Halar®	Stainless steel	Toughened weatherable acetal
UV resistant	1	4	1	1	4	4	5	5	5	4
Radiation resistant	1	1	1	1	1	1	4	4	5	1
Flexible at low temperatures	3	3	3	2	4	3	4	4	5	4
Flexible at high temperatures	3	3	4	3	2	2	4	4	5	2
Flame retardant	3	3	3	4	1	1	4	4	5	1
Tensile strength	3	3	3	3	2	1	3	3	5	2
Relative cost	Low	Low	Low	Medium	Medium	Low	High	High	High	High
Résistance chimique	See table 3									

1 = Less suitable  
5 = More suitable

## Material selection ordering guide

### Physical properties of cable tie materials

Table 2

		Polyamide 6.6 Natural	Polyamide 6.6 weather resistant	Polyamide 6.6 Natural heat stabilised	Polyamide 6.6 flame retardant	Polyamide 12 weather resistant	Poly- propylene weather resistant	Fluoro- polymer radiation resistant	Fluoro- polymer ECTFE	Stainless steel
<b>Physical properties of Ty-Rap cable tie materials</b>										
Tensile strength (Yield) @ 23°C (Dry-As-Molded) <sup>(1)</sup>	psi	12 000	12 000	12 000	11,000	7 500	4 600	6 700	6 600	90 000
Flammability Rating	–	UL 94 V-2	UL 94 V-2	UL 94 V-2	UL 94 V-0	–	–	UL 94 V-0	UL 94 V-0	–
Radiation Resistance	rads	1 x 105	1 x 105	1 x 105	1 x 105	1 x 105	1 x 105	2 x 108	2 x 108	2 x 108
UV Resistance	–	Poor	Good	Poor	Poor	Good	Good	Excellent	Excellent	Excellent
Water Absorption (24 hrs)	%	1,3	1,2	1,4	1,4	0,25	0,1	<,01	<,01	None
Oxygen Index	–	28	28	31	34	–	–	30	52	–
Max. continuous use temp.	°C/°F	85 / 185	85 / 185	105 / 221	65 / 149	85 / 185	85 / 185	150 / 302	160 / 320	537 / 1000
Min. continuous use temp.	°C/°F	-60 / -76	-60 / -76	-60 / -76	-20 / -4	-40 / -40	-40 / -40	-60 / -76	-46 / -50	-80 / -112
Colour	–	Natural	Black	Green tint	White	Black	Black	Aqua	Maroon	Stainless

<sup>(1)</sup> ASTM D638-878 except stainless steel which is ASTM E8

## Stainless steel cable ties

### Specification

AISI type name or number	201		201 ¼ hard		301	
	UNS designation	S20100	S20100	S20100	S30100	S30100
Specification	ASTM	A-666	A-666	A-666	A-666	A-666
	C	0.15 Max.	C	0.03 Max	C	0.15 Max.
	Mn	5.50 - 7.50	Mn	5.50 - 7.50	Mn	2.00 Max.
% of the main alloying elements	Si	0.75 Max	Si	1.00 Max	Si	1.00 Max
	Cr	16.00 - 18.00	Cr	16.00 - 18.00	Cr	16.00 - 18.00
	Ni	3.50 - 5.50	Ni	3.50 - 5.50	Ni	6.00 - 8.00
	N	0.25 Max	N	0.25 Max		
<b>Physical properties</b>						
Density , lb/in. <sup>3</sup>		0.28		0.28		0.29
Mod. elasticity in tension x 106 PSI		28.0		28.6		28.0
Structure		Austenitic		Austenitic		Austenitic
	32 - 212°F	8.7		9.0		9.4
Average coefficient of thermal expansion by °F x 10-6	32 - 600°F	9.7		10.0		9.5
	32 - 1000°F	10.2		10.5		10.1
	32 - 1200°F	10.5		-		10.4
Melting interval		2,550 - 2,650°F		2,550 - 2,650°F		2,550 - 2,590°F
<b>Electrical properties</b>						
		Non magnetic		Non magnetic		Non magnetic
Magnetic permeability, annealing		μ = 1.02		μ = 1.02		μ = 1.02
Electrical resistivity, microhm - cm, 70° F		69.00		69.00		72.00
<b>Mechanical properties</b>						
Rockwell hardness		90 - 95R <sub>B</sub>		20 - 30R <sub>B</sub>		75 - 95R <sub>B</sub>
Tensile strength -spec. min. of BAND-IT (PSI) and typical (PSI)		100,000 115,000		120,000 135,000		100,000 105,000
Yield strength - spec. min. by BAND-IT (PSI) and typical (PSI)		45,000 45,000		85,000 90,000		45,000 55,000
% elongation per 2in. spec. min. of BAND-IT (PSI) and typical (PSI)		40 55		40 45		40 50
Tensile strength at	1,300°F	37,500		37,500		35,500
High temperature	1,500°F	23,000		23,000		22,500
Short term tests (PSI)	1,700°F	11,000		11,000		11,000
<b>Corrosion resistance</b>						
Normal atmosphere and fresh water		Good		Good		Good
Industrial atmosphere		Good		Good		Good
Marine atmosphere		Middling		Middling		Middling
Salt water		No		No		No
Mild chemicals		Middling		Middling		Middling
Oxidizing chemicals		Middling		Middling		Middling
Reducing chemicals		No		No		No

All values in this table are for reference only.

## Material specifications

### Flammability rating UL

#### Flammability ratings UL

Note: 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 mm x 12,7 mm (5 in. x ½ in.) 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 swatch.

#### Materials classed V-0:

A material classed 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 12 in. 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 V-1:

A material classed 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 12 in. 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 V-2:

A material classed 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 12 in. 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 ½ inch x 5 inches (12.7mm x 127mm) specimen held at one end in a horizontal position with marks at 1 inch (25.4mm) and 5 inches (127mm) from the free end. A flame is applied to the free end for 30 seconds or until the flame front reaches the 1 inch (25.4mm) mark. If combustion continues the duration is timed between the 1 inch (25.4mm) mark and the 5 inch (127mm) mark. If combustion stops before the 5 inch (127mm) 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 (3mm) in thickness will be classified 94HB if it has a burning rate of less than 3 inches (76.2mm) per minute or stops burning before the 5 inches (127mm) 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.

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#### Selecting the right material for your applications

ABB 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 ABB.

#### 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
- Indoor applications

#### 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, weather resistant

- Similar to Polyamide 6.6, but recommended for outdoor applications
- UV-resistant
- Halogen free and Silicone free
- Ty-Fast ties in weather resistant Polyamide 6.6 are available in black color only (with 2% carbon for military specifications)
- Ty-Rap ties in weather resistant Polyamide 6.6 are available in black color (with 2% carbon for military specifications) and in a wide range of colors (except natural)
- Flammability rating: UL 94 V-2



UV-resistant



Weather-proof

## Material specifications

### Material selection and specifications

#### Polyamide 6.6, heat stabilised

- Similar to Polyamide 6.6, but increased operating temperatures, up to 105°C (221°F)
- Excellent tensile strength
- High temperature resistance
- Color: natural (may have a greenish tint)
- Flammability rating: UL 94 V-2



Heat resistant

#### 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 (221°F)
- Combines the features & benefits of Polyamide 6.6, weather resistant and Polyamide 6.6, heat stabilised
- Color: black
- Flammability rating: UL 94 V-2



UV-resistant



Weather-proof



Heat resistant

#### 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
- Color: black
- Flammability rating: UL 94 V-2



UV-resistant



Weather-proof



Low temperature flexibility



Chemically resistant

#### Polyamide 6.6, flame retardant

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



Flame retardant

#### Polyamide 6.6 detectable

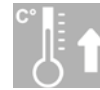
- Similar to Polyamide 6.6, but contains a compound detectable by metal detectors (tested and rated at 1.5mm (0.06") diameter ferrous sphere setting) and X-ray equipment
- Color: bright blue, also contributes to visual detection
- Especially recommend for the food industry, and for any other contamination sensitive industry using detection equipment
- Halogen free and silicone free
- Flammability rating: UL 94 V-2



Detectable

#### Polyamide 4.6, extra high temperature (150°C)

- Similar to Polyamide 6.6, but outstanding resistance to high temperatures up to 150°C (221°F)
- Halogen free and silicone free
- Color: light green
- Flammability rating: UL 94 V-2



Heat resistant

## Material specifications

### Material selection and specifications

#### 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
- Color: black
- Flammability rating: UL 94 HB



UV-resistant



Weather-proof



Chemically resistant

#### Polypropylene, detectable

- Similar to standard Polypropylene, but contains a compound detectable by metal detectors (tested and rated at 1.5mm (0.06") diameter ferrous sphere setting) and X-ray equipment
- Color: bright blue, also contributes to visual detection
- Especially recommend for the food industry, and for any other contamination sensitive industry using detection equipment
- Halogen free and silicone free
- Flammability rating: UL 94 HB



Detectable

#### ETFE Fluoropolymer

- Tensile strength slightly lower than Polyamide 6.6
- ETFE Fluoropolymer 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
- Color: aquamarine



UV-resistant



Flame retardant



Heat resistant



Low temperature flexibility



Weather-proof



Radiation resistant



Chemically resistant

#### ECTFE Fluoropolymer

- Similaire aux performances du ETFE fluoropolymère
- Faible émission de fumée lors de sa combustion
- Recommandé pour les applications liées à la ventilation, aération, évacuation de fumée
- Couleur: Bordeaux
- Flammability rating: UL 94 V-0



UV-resistant



Flame retardant



Heat resistant



Low temperature flexibility



Weather-proof



Low smoke



Chemically resistant

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## Material specifications

### Material selection and specifications

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Toughened weatherable  
acetal

- 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
- Limited self-extinguishing properties
- Color: black
- Flammability rating: UL 94 HB



UV-resistant

Weather-  
proofChemically  
resistant



## Material selection ordering guide

### Chemical resistance

Table 3 shows the resistance of Ty-Rap cable tie materials to various chemicals. The table is designed to help you determine

the cable tie material best suited for a particular chemical environment.

**Table 3: Resistance of available materials to various chemicals at 21°C**

Reagents	Concentration	HS PA6.6	TV	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	15.0
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

#### Ratings

E = Excellent

S = Satisfactory

F = Fair

NR = Not Recommended

(AQ = Aqueous)

## Material selection ordering guide

### Chemical resistance

Table 3: Resistance of available materials to various chemicals at 21°C

Reagents	Concentration	HS PA6.6	TV	DEL	PA6.6	UV PA6.6	FR PA6.6	UV PA12	PP	UVPP	TZ	SS
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
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

#### Ratings

E = Excellent

S = Satisfactory

F = Fair

NR = Not Recommended

(AQ = Aqueous)

## Material selection ordering guide

### Chemical resistance

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

Reagents	Concentration	HS PA6.6	TV	DEL	PA6.6	UV PA6.6	FR PA6.6	UV PA12	PP	UVPP	TZ	SS
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
Potassium Sulfate	5%	–	E	–	–	–	–	E	E	E	E	E
Potassium Sulfide	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
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	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

#### Ratings

E = Excellent

S = Satisfactory

F = Fair

NR = Not Recommended

(AQ = Aqueous)

## Material specifications

### Characteristics des matières adhésives

#### 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 (0.8mm) 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

- Also applicable on concrete and other porous surfaces
- UV resistant

#### Technical information

- Description: 2 component glue
- Weight: 0.21 kg

#### Installation instructions for Cat. no.: 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 (68°F)

Cat. no.: TC2PA

#### Characteristics

- 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

#### Adhesive material specifications

Property	Method	Unit of measure	Rubber based (self-adhesive)	Acrylic based (2 component glue)
Coated sides	–	each	2	2
Foam density	–	Kg/m <sup>3</sup>	96.9	96.9
Peel adhesion	PSTC 1	N/cm width	10.9	10
	ASTM D 1000	Average		8.8
Shear adhesion	natural	15.0	15.0	10
22°C (71.6°F) 50% RH	PSTC 7	Hours	100 +	8 +
22°C (71.6°F) occasional wetting		N/m <sup>2</sup>	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/°F Min	-18	-29
	–	°C/°F Max	+66	+79
Flammability	ASTM D 624		Slow burn	Slow burn

## Material specifications

### Unit conversion factors

#### Unit conversion factors

Unit	x	Constant	=	Unit	Unit	x	Constant	=	Unit
BTU		778.0		foot-pound (ft x lb)	gallons		0.13368		cubic foot (ft <sup>3</sup> )
BTU		1054.8		Joules	gallons		231.0		cubic inch (in <sup>3</sup> )
BTU		0.293		Watt-hours (W x h)	gallons		3,785.332		cubic centimetres (cm <sup>3</sup> )
centimetres (cm)		0.032808		feet (ft)	grams (g)		15.432		grains
centimetres (cm)		0.3937		inches (in)	gram/centimetre <sup>3</sup> (gm/cm <sup>3</sup> )		0.0361275		pounds/in <sup>3</sup> (lb/in <sup>3</sup> )
centimetres (cm)		0.00001		kilometres (km)	horsepower (hp)		33,000.0		ft x lb/min
centimetres (cm)		0.010		metres (m)	horsepower (hp)		550.0		ft x lb/sec
centimetres (cm)		10.0		millimetres (mm)	horsepower (hp)		745.7		Watts (W)
circular mils		0.00064516		circular millimetres	inch (in)		0.027178		yards (yd)
circular mils		0.0000007854		inches <sup>2</sup> (in <sup>2</sup> )	inch (in)		0.083333		feet (ft)
circular mils		0.000506671		square millimetres (mm <sup>2</sup> )	inch (in)		0.00002540		kilometre (km)
circular mils		0.7854		mils <sup>2</sup>	inch (in)		0.025400		metre (m)
cubic centimetre (cm <sup>3</sup> )		0.000035314		cubic foot (ft <sup>3</sup> )	inch (in)		2.54000514		centimetre (cm)
cubic centimetre (cm <sup>3</sup> )		0.061023		cubic inch (in <sup>3</sup> )	inch (in)		25.4000514		millimetre (mm)
cubic centimetre (cm <sup>3</sup> )		0.000001		cubic metre (m <sup>3</sup> )	inch (in)		1,000.0		mils
cubic centimetre (cm <sup>3</sup> )		0.0026417		gallons	Joules		0.000948		BTU
cubic foot (ft <sup>3</sup> )		17,280		cubic inch (in <sup>3</sup> )	Joules		107		ergs
cubic foot (ft <sup>3</sup> )		28317.016		cubic centimetre (cm <sup>3</sup> )	liters (l)		61.0250		cubic inch (in <sup>3</sup> )
cubic inch (in <sup>3</sup> )		0.00057870		cubic feet (ft <sup>3</sup> )	metres (m)		1.093611		yard (yd)
cubic inch (in <sup>3</sup> )		0.000016387		cubic metre (m <sup>3</sup> )	metres (m)		3.2808333		feet (ft)
cubic inch (in <sup>3</sup> )		16.387162		cubic centimetre (cm <sup>3</sup> )	metres (m)		39.37		inch (in)
cubic metre (m <sup>3</sup> )		1,000,000.0		centimetre (cm)	metres (m)		100.0		centimetre (cm)
cubic metre (m <sup>3</sup> )		35.314456		cubic foot (ft <sup>3</sup> )	miles		1,760.0		yards (yd)
cubic metre (m <sup>3</sup> )		264.17		gallons	miles		5,280.0		feet (ft)
foot (ft)		0.00018939		miles	miles		1.6093		kilometre (km)
foot (ft)		0.33333		yards (yd)	millimetres (mm)		0.0032808		feet (ft)
foot (ft)		12		inches (in)	millimetres (mm)		0.03937		inch (in)
foot (ft)		0.00030480		kilometres (km)	millimetres (mm)		0.001		metres (m)
foot (ft)		0.30480		metres (m)	millimetres (mm)		0.01		centimetres (cm)
foot (ft)		30.480		centimetres (cm)	millimetres (mm)		39.3701		mils
foot (ft)		304.80		millimetres (mm)	millimetres (mm)		1,000.0		microns (µm)
foot/pound (ft/lb)		0.00067197		metres/grams (m/g)	Watts (W)		44.25		ft x lb/minute
foot-pound (ft x lb)		0.001285		BTU	Watts (W)		0.737562		ft x lb/sec
foot-pound (ft x lb)		1.356		Joules (J)	Watts (W)		0.001341		horsepower (hp)
foot/pound (ft/lb)		0.1383		kilogram/metre (kg/m)	Watt-hours (W x h)		3.41266		BTU
gallons (US)		3.785332		litres (l)					